VOLUME 1

PRELIMINARY ASSESSMENT/ SITE INVESTIGATION REPORT – RADIOLOGICAL

GPU NUCLEAR, INC. OYSTER CREEK NUCLEAR GENERATING STATION

U.S. ROUTE NO. 9
FORKED RIVER, NEW JERSEY

Site Remediation Program
Case No. E99575

Prepared for:

GPU Nuclear, Inc.
U.S. Route No. 9
Forked River, New Jersey 08731

and

AmerGen Energy Co, LLC
2301 Market Street S22-1
P.O. Box 8699
Philadelphia, Pennsylvania

February 28, 2000

McLaren/Hart, Inc.

Blue Bell Executive Campus
470 Norristown Road, Suite 300
Blue Bell, Pennsylvania 19422

SCIENCE : STRATEGY : TECHNOLOGY : SOLUTIONS

McLaren/Hart, Inc.

INTRODUCTION

VOLUME 1

PRELIMINARY ASSESSMENT/ SITE INVESTIGATION REPORT – RADIOLOGICAL

GPU NUCLEAR, INC.
OYSTER CREEK NUCLEAR GENERATING STATION

U.S. ROUTE NO. 9
FORKED RIVER, NEW JERSEY

Site Remediation Program
Case No. E99575

Prepared for:

GPU Nuclear, Inc.
U.S. Route No. 9
Forked River, New Jersey 08731

and

AmerGen Energy Co, LLC
2301 Market Street S22-1
P.O. Box 8699
Philadelphia, Pennsylvania

February 28, 2000

McLaren/Hart, Inc.

Blue Bell Executive Campus
470 Norristown Road, Suite 300
Blue Bell, Pennsylvania 19422

Introduction

This Radiological Preliminary Assessment Report (PAR) and Site Investigation Report (SIR) addresses radiological concerns at the Oyster Creek Nuclear Generating Station (OCNGS). It was assembled, based upon discussions with NJDEP, as part of a request for a deferral of radiological ISRA investigations and remediations, in order to postpone issues of federal preemption and ISRA applicability until decommissioning of the OCNGS. It relies on an extensive database of historical information gathered by the seller, as well as more recent information assembled as part of buyer's due diligence. It does not duplicate all of the information already assembled and submitted to NJDEP on non-radiological issues, some of which may nonetheless be useful to NJDEP. It is submitted without waiving the issues of ISRA applicability and federal preemption raised in GPU Nuclear's application pending before NJDEP.

The terms "radiological concerns", "radiological AOC(s)", "area(s) of concern", and "AOC(s)", as used throughout this document, mean any area of concern involving radiological substances regulated by the federal Nuclear Regulatory Commission (NRC) as a "source", "special nuclear" and/or "by product" material, as such terms are defined in and to the extent regulated under the Atomic Energy Act.

By "Decommissioning" we mean the complete retirement and removal of OCNGS from service and the restoration of the Site on which OCNGS operates, as well as any planning and administrative activities incidental thereto, including but not limited to (a) the dismantlement, decontamination, storage, and/or entombment of the Plant, in whole or in part, and any reduction or removal, whether before or after termination of the NRC license for the Plant, of radioactivity at the Site, and (b) all other activities necessary for the retirement, dismantlement and decontamination of the Plant, all as regulated by, or required to comply with, all applicable requirements of the Atomic Energy Act and the NRC's or its successor's rules, regulations, orders and pronouncements thereunder, the NRC Operating License for OCNGS and any related decommissioning plan (see, e.g., 10 C.F.R. Parts 50.75, 50.82, 51.53, and 51.95)."

Radiological monitoring activities associated with the OCNGS have focused on certain target radionuclides, particularly Cs-137 and Co-60 and to a lesser extent Sr-90, as trend indicators for radiological contamination. Although there are literally hundreds of radioisotopes present at the plant, mostly in the active fuel in the reactor (most of which have short - seconds to days- half lives), because the fission and activation process is essentially a constant, physically defined process, the ratios between the various longer lived isotopes tend to be fairly constant, particularly when compared with time to similar portions of the process. Thus, radwaste and water transportable long-lived activity in the plant process streams changes little over time. Because of this, a few easily measured radionuclides can be used as surrogate indicators of the entire mix. NRC regulations require detailed analysis of various waste streams including the lower activity, and hard-to-detect nuclides. These periodic analyses provide convincing radioisotopic ratio data that show that the use of the surrogate indicators is an effective tool. When this mixture

ratio data is combined with the values of the NRC default soil guideline limits for decommissioning, the mixture information clearly shows that the unusual and hard to detect isotopes will not contribute significantly to dose to a member of the public or plant workers if remediation decisions are based on the concentrations of the surrogate indicators.

Throughout this report, the existing conditions of radionuclide concentrations in soils are compared to the NRC decommissioning default guideline concentrations. This is intended to provide some indication of the limited extent of eventual remediation required when the plant eventually enters decommissioning. However, the NRC decommissioning soil guideline concentrations are not relevant to an operating nuclear power plant. The very existence of the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) and the soil guidelines recognizes that conditions at operating facilities are not and will not be always consistent with the decommissioning criteria. This is clearly recognized as acceptable for continued operation by the NRC. During operation, the plant is expected to control effluents and maintain the dose to the public and plant workers at As Low As Reasonably Achievable (ALARA) levels. The presence of small amounts of plant related radioactivity in on-site soils or groundwater does not represent a significant or even measurable dose to the public or the plant workers. Throughout this report it is shown that the radionuclide activity currently in the soils at the Oyster Creek plant are not impacting the offsite environment. Doses to plant workers from the limited activity in the soils are also insignificant. The NRC residual activity guidelines assume that a family lives, grows food, and has a drinking water well, etc. on the property. The dose assessment is based on this scenario, and doses are limited to 25 mrem to this resident farmer family. This scenario is impossible at an operating plant. Workers do not live here, they do not grow food crops, and the drinking water is carefully monitored and shown to be unaffected, and is not withdrawn from shallow wells in the highest affected soil areas. Even if all of the dose in the resident scenario was from the direct radiation from the activity in the soil, this equates to a dose rate of approximately 0.003 mrem per hour. Workers in the plant routinely enter areas where dose rates are 100,000 times higher than this. The areas where radiological impacts to soils are the greatest, e.g. in the vicinity of the old radwaste surge tank and the condensate storage tank, are not characterized by dose rates of 0.003 mrem per hour. The radioactive materials actually inside the tanks themselves are creating dose rates in the vicinity of the tanks that are thousands of times higher than 0.003 mrem per hour. Far more radiation dose would be accumulated by the plant workers removing the soils as a consequence of the proximity to the contained sources nearby than could ever be avoided by removal of the few thousandths of a mrem per hour being contributed by the soil activity.

This Radiological PAR/SIR also documents the fact that any radionuclide contamination of the on-site soil or groundwater at the OCNGS has not impacted the off-site environment. This conclusion is supported by the results of an ongoing Radiological Environmental Monitoring Program that has spanned a period of more than 33 years and has resulted in the collection of more than 40,000 samples of air, surface water, ground water, rain water, sediment, fish, clams, crabs, vegetables and soil. Independent

environmental monitoring programs conducted by the NJ Department of Environmental Protection and the US Nuclear Regulatory Commission have confirmed these results. The results of this off-site Radiological Environmental Monitoring Program satisfy any requirement for a Baseline Ecological Evaluation and Ecological Risk Assessment as specified by the Technical Requirements for Site Remediation (N.J.A.C. 7:26E).

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION

PRELIMINARY ASSESSMENT REPORT

4/98

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF RESPONSIBLE PARTY SITE REMEDIATION
P.O. Box 435, TRENTON, NJ 08625-0435

PRELIMINARY ASSESSMENT REPORT

Answer all questions. Should you encounter any problems in completing this form, we recommend that you discuss the matter with a representative from the Site Remediation Program. Submitting incorrect or insufficient data may cause processing delays and possible postponement of your transaction

PLEASE PRINT OR TYPE

Date: February 28, 2000

Industrial Establishment/Site Name **GPU Nuclear, Inc./Oyster Creek Nuclear Generating Station**

Address **P.O. Box 388, US Route 9**

City or Town **Forked River** Zip Code **08731**

Municipality **Lacey and Ocean Townships** County **Ocean**

Lacey Township Block (s)	**1001**	Lots (s)	**4**
	100		**1-20 and 20.01**
	101		**1**
	138		**2**
	139		**11**
Lacey Township Block (s)	**41**	Lots (s)	**43**
	63		**7**

Site Remediation Program Case Number or EPA Identification Number **E99575**

This PAR is restricted to the radiological issues for the locations described in Question 1 below. Non-radiological areas of concern were addressed in a separate Preliminary Assessment, which was submitted to the NJDEP in December of 1999. Accordingly, this PAR does not address concerns at the adjacent Forked River site (which is addressed in ISRA Case No. E98542) nor does it address non-radiological concerns.

1. Present a history of ownership and operations at the industrial establishment, in tabular form, from the time the site was naturally vegetated or utilized as farmland in accordance with N.J.A.C. 7:26E-3.1(c) 1.i. (attach additional sheets as necessary).

For the purposes of discussion, the property is divided into two portions. Parcel 1 is identified as the developed portion of the site located primarily within the "horseshoe" formed by the Intake and Discharge Canals west of Route 9 (identified as the Oyster Creek Nuclear Generation Station or "OCNGS"). Parcel 2 is identified as the area located east of Route 9 which is primarily heavily vegetated and undeveloped (See Appendices L and M).

Summary of Site Operations and Ownership

Portion of Site	Block	Lot	Township	Name of Property Owner	Name of Property Operator	From	To
OCNGS	1001	4	Lacey	**Norman C. And Elsie H. Finninger**	**Same**	**Unknown**	**1/28/61**
	41	43	Ocean				
OCNGS	1001	4	Lacey	**Jersey Central Power and Light (JCP&L)**	**Same**	**1/28/61**	**1980**
	41	43	**Ocean**				

OCNGS	1001 41	4 43	Lacey Ocean	JCP&L	GPUN	1980	Present

Summary of Site Operations and Ownership (cont.)

Portion of Site	Block	Lot	Township	Name of Property Owner	Name of Property Operator	From	To
East of Rt. 9	100 63	1-20 & 20.01 7	Lacey Ocean	NOR-RU-EL, Inc.	Same	Unknown	6/28/66
East of Rt. 9	100 63	1-20 & 20.01 7	Lacey Ocean	JCP&L	Same	6/28/66	1980
East of Rt. 9	100 63	1-20 & 20.01 7	Lacey Ocean	JCP&L	JCP&L/GPUN	1980	Present
East of Rt. 9	101	1	Lacey	Mayer Construction	Same	Unknown	3/8/71
East of Rt. 9	101	1	Lacey	JCP&L	Same	3/8/71	1980
East of Rt. 9	101	1	Lacey	JCP&L	JCP&L/GPUN	1980	Present
East of Rt. 9	138	2	Lacey	Charles R. Pearl & Marie D. Pearl (H/W)	Same	Unknown	1/18/66
East of Rt. 9	138	2	Lacey	JCP&L	Same	1/18/66	1980
East of Rt. 9	138	2	Lacey	JCP&L	JCP&L/GPUN	1980	Present
East of Rt. 9	139	11	Lacey	Wilnor Realty Co.	Same	Unknown	11/17/65
East of Rt. 9	139	11	Lacey	JCP&L	Same	11/17/65	1980
East of Rt. 9	139	11	Lacey	JCP&L	JCP&L/GPUN	1980	Present

2A. In accordance with N.J.A.C. 7:26E-3.1(c) 1.ii, provide a clear and concise description of the past industrial/commercial operation(s) conducted on site by each owner and operator. To the extent available the site history shall include an evaluation of the following sources of information: (1) Sanborn Fire Insurance Maps; (2) MacRae's Industrial Directory; (3) Title and Deed; (4) Site plans and facility as-built drawings; (5) federal, state, county and local government files; (6) The Department Geographic Information System. (7) and any additional sources which may be available for a specific site.

Site history is frequently an item where preliminary assessments are incomplete. The Industrial Site Recovery Act requires that a diligent inquiry be made, researching the site history back to January 1, 1932. Common answers to this question have included: "Unknown", or "We are only a tenant on the site and have no knowledge of prior site history". Neither of these answers satisfies the requirement for a due diligent inquiry.

To avoid having a PA found incomplete by the Department due to insufficient information, the site history must be researched. The following are ways of obtaining information regarding site history: title searches: contacting the local and county health officials and municipal agencies (for example, local fire and police departments, and local planning, zoning, adjustment boards); requesting any information these public agencies may have on the specific location; and, interviewing long time neighbors of the industrial establishment. Tenants should always request information from the landlord. The applicant should always document any attempts to locate this information to support a claim that a diligent inquiry has been conducted. If the prior site history demonstrates that the current building was built on vacant unimproved

property, it should be reported as such. If the site has been, or is now the subject of a site remediation, any prior cases should always be referenced.

Provide the page or appendix number where the site history may be found. Appendix A

Provide a listing of the resources utilized to compile the site history and as appropriate copies of any maps or information, which will assist the Department in evaluating your conclusions.

Name of Resource used	**Date of document reviewed**	**Appendix # if providing copies**
Historical Aerial Photography	**1940 through 1989**	**Not Applicable**
GPUN personnel	**Not Applicable**	**Not Applicable**

2B. Include a detailed description of the most recent operations subject to this preliminary assessment.

Provide the page or appendix # where the description of the most recent operations may be found. Appendix B

3. Hazardous Substance/Waste Inventory: N.J.A.C. 7:26E-3.1(c) 1.iii. List all raw materials, finished products, formulations and hazardous substances, hazardous wastes, hazardous constituents and pollutants, including intermediates and by-products that are or were historically present on the site. Note: If past usage included farming, pesticides may be a concern and should be included in this list (attach additional sheets if necessary).

Material Name	**CAS # if known**	**Typical annual usage (gallons/lbs.)**	**Storage method (i.e. Drum, tank, jars)**
Appendix C			

4 A. In accordance with N.J.A.C. 7:26E-3.1(c) 1.iv provide a summary of all current and historic wastewater discharges of Sanitary and/or **Industrial Waste** and/or sanitary sludges. Present and past production processes, including dates and their respective water use shall be identified and evaluated, including ultimate and potential discharge and disposal points and how and where materials are or were received on-site. All discharge and disposal points shall be clearly depicted on a scaled site map.

Information required under this item is intended to identify potential discharges to any on-site disposal system, such as a septic system or lagoon or drywell.

Site Information

Discharge Period		**Discharge Type**	**Discharge Location**
From	**To**		
Construction of OCNGS in 1969	1982	Sanitary	**Former On-site Treatment Facility - Treated liquids discharged to Discharge Canal (DSN 004) under NJPDES DSW Permit No. NJ 0005550; solids pumped into steel below ground steel holding tank.**
1982	Present	Sanitary	**Ocean County Utilities Authority**
1991	Present	Industrial	**Discharge from the Groundwater Treatment System goes to the sanitary lines and to the Ocean County Utilities Authority.**

Late 1970's	**Present**	**Industrial**	**Seepage pit - Backwash from the pretreatment building discharges to a seepage pit or backwash sump located adjacent to and northwest of the ambulance building. The discharge consists of sand-filter backwash water. The discharge is regulated by NJPDES DGW Permit No. NJ 0101966 (see Appendix D, Question 4A).**

Discharges authorized under NJPDES Permit No. NJ0005550 are discussed in Appendix D.

4B. Provide a narrative of disposal processes for all historic and current process waste streams and disposal points (attach additional sheets if necessary).

See Appendix E

5. This question requires the applicant to conduct a diligent inquiry into the current and historic operations at the site to identify all of the potential areas of concern, which formerly or currently exists at the industrial establishment as defined in N.J.A.C. 7:26E-1.8.

Diligent inquiry as defined in N.J.A.C.7: 26E-1.8 states:

A. Conducting a diligent search of all documents which are reasonably likely to contain information related to the object of the inquiry, which documents are in such person's possession, custody or control, or in the possession, custody or control of any other person from whom the person conducting the search has a legal right to obtain such documents; and

B. Making reasonable inquiries of current and former employees and agents whose duties include or included any responsibility for hazardous substances, hazardous wastes, hazardous constituents, or pollutants, and any other current and former employees or agents who may have knowledge or documents relevant to the inquiry.

In accordance with N.J.A.C. 7:26E3.1(c)1.v., a narrative shall be provided for each area of environmental concern describing the (A) Type; (B) Age; (C) Dimensions of each container/area; (D) Chemical Content; (E) Volume; (F) Construction materials; (G) Location; (H) Integrity (i.e., tank test reports, description of drum storage pad); and (I) Inventory control records, unless a Department-approved leak detection system, pursuant to N.J.A.C. 7:1E or 7:14B, has always been in place and there is no discharge history. If sampling is not proposed for any identified area of environmental concern, please explain why it is believed that the area of environmental concern does not contain contaminants above the applicable remediation standards. Submit all necessary documentation to verify this belief. The required narrative need not describe the sampling to be completed; however, it should state that sampling will be completed in accordance with the appropriate section of N.J.A.C.7:26E. Detailed descriptions of all remediation activities shall be described in the site investigation report in accordance with N.J.A.C.7:26E-3.13. Note: If the industrial establishment has multiple locations for one type of area of concern (example: underground storage tanks are located in 3 separate areas of the facility), each area must be discussed separately.

Please indicate if any of the potential areas of environmental concern listed below in #5A through #5G, as defined in N.J.A.C. 7:26E-1.8, formerly or currently exist at the industrial establishment by indicating Yes or No in the appropriate space as provided.

For the Location Reference Keyed to Site Map, use either a number or letter identification and be consistent throughout each phase of the remediation, referring to the same identification provided herein.

Provide the required narrative as an appendix to this report. Do not try to provide a narrative in the space provided.

I hereby certify that a diligent inquiry has been conducted to identify all current and historical potential areas of environmental concern and based on the diligent inquiry the areas of environmental concern identified below in question 5A through 5G are the only areas of environmental concern believed to exist at the above referenced industrial establishment.

A. Bulk Storage Tanks and Appurtenances, including, without limitation :

Area of Concern	Currently or Formerly Exists at the Site, Yes/No	Location Referenced to the Site Map	Appendix Number
Aboveground storage tanks and associated piping	Yes	Appendix L, AOC- 1A, 1C, and AOC 2A through 4B	Appendix F
Underground storage tanks and associated piping	Yes	Appendix L, AOC- 5	Appendix F
Silos	No	NA	NA
Rail cars	Yes	Appendix L, AOC-6	Appendix F
Loading and unloading areas	Yes	Appendix L, AOC-7	Appendix F
Piping, aboveground and below ground pumping stations, sumps, pits	Yes	Appendix L, , AOC- 1B	Appendix F

B. Storage and Staging Areas, including

Area of Concern	Currently or Formerly Exists at the Site Yes/No	Location Referenced to the Site Map	Appendix Number
Storage pads including drum and/or waste storage	No	NA	NA
Surface impoundments and lagoons	No	NA	NA
Dumpsters	No	NA	NA
Chemical storage cabinets or closets	No	NA	NA

C. Drainage systems and areas including without limitation:

Area of Concern	Currently or Formerly Exists at the Site Yes/No	Location Referenced to the Site Map	Appendix Number
Floor drains, trenches and piping and sumps	Yes	Appendix L, AOC-8 through AOC – 11	Appendix F
Process area sinks and piping which receive process waste	Yes	Appendix L, AOC-12	Appendix F
Roof leaders when process operations vent to the roof	No	NA	NA
Drainage swales and culverts	Yes	Appendix L, AOC-13 through AOC- 15	Appendix F
Storm sewer collection systems	Yes	Appendix L, AOC-16	Appendix F
Storm water detention ponds and fire ponds	No	NA	NA
Surface water bodies	Yes	Appendix L, AOC-17 & 18	Appendix F
Septic systems leachfields or seepage pits	No	NA	NA
Drywells and sumps	No	NA	NA

D. **Discharge and disposal areas, including, without limitation:**

Area of Concern	Currently or Formerly Exists at the Site Yes/No	Location Referenced to the Site Map	Appendix Number
Areas of discharge per N.J.A.C. 7:1E*	**Yes**	**Appendix L, AOC 39 through AOC-40**	**Appendix F**
Waste piles as defined by N.J.A.C 7:26	**No**	**NA**	**NA**
Waste water collection systems including septic systems, seepage pits, and dry wells.	**Yes**	**Appendix L, AOC-19& AOC-20**	**Appendix F**
Landfills or landfarms	**No**	**NA**	**NA**
Sprayfields	No	NA	NA
Incinerators	No	NA	NA
Historic fill or any other fill material	No	NA	NA
Open pipe discharges	No	NA	NA

* - By including a description of these areas neither GPU Nuclear nor AmerGen concede or admit that these areas, or any other area in which radiological materials have been spilled or released, are subject to the requirements of NJDEP typically pertaining to regulated discharges for hazardous substances under New Jersey law. We reserve the right to argue that all such requrements are preempted by federal law governing Radiological AOCs at the OCNGS.

E. **Other areas of concern, including, without limitation:**

Area of Concern	Currently or Formerly Exists at the Site Yes/No	Location Referenced to the Site Map	Appendix Number
Electrical transformers & capacitors	Yes	Non-Radiological ISRA Submission	NA
Hazardous material storage or handling areas	Yes	Non-Radiological ISRA Submission	NA
Waste treatment areas	No	NA	NA
Discolored or spill areas	Yes	Non-Radiological ISRA Submission	NA
Open areas away from production areas	Yes	Appendix L, AOC-21 through AOC-23	Appendix F
Areas of stressed vegetation	No	NA	NA
Underground piping including industrial process sewers	No	NA	NA
Compressor vent discharges	Yes	Non-Radiological ISRA Submission	NA
Non-contact cooling water discharges	Yes	Appendix L, AOC-24A and AOC-24B	Appendix F
Areas which receive flood or storm water from potentially contaminated areas	Yes	Appendix L, AOC-24C	Appendix F
Active or Inactive production wells	Yes	Appendix L, AOC-25	Appendix F

F. Building interior areas with a potential for discharge to the environment, including, without limitation:

Area of Concern	**Currently or Formerly Exists at the Site Yes/No**	**Location Referenced to the Site Map**	**Appendix Number**
Loading or transfer areas	**Yes**	**Appendix L, AOC-4C**	**Appendix F**
Waste treatment areas	**No**	**NA**	**NA**
Boiler rooms	**Yes**	**Non-Radiological ISRA Submission**	**Appendix F**
Air vents and ducts	**Yes**	**Appendix L, AOC-29**	**Appendix F**
Hazardous material storage or handling areas	**Yes**	**Appendix L, AOC-26 through AOC-28 and AOC-30 through AOC-37**	**Appendix F**

G. Any other site-specific area of concern.

Area of Concern	**Currently or Formerly Exists at the Site Yes/No**	**Location Referenced to the Site Map**	**Appendix Number**
Upland Confined Disposal Facility	**Yes**	**Appendix L, AOC-38**	**Appendix F**
Northern Parking Area	**Yes**	**Appendix L, AOC-41**	**Appendix F**
Berms	**Yes**	**Appendix L, AOC-42**	**Appendix F**

6 If the site area exceeds two acres, an interpretation of the aerial photographic history of the site shall be submitted in accordance with N.J.A.C. 7:26E-3.1(c)1.vi. The interpretation shall be based on available current and historical color, black and white and infrared aerial photographs (scale 1:18,000 or less) of the site and surrounding area at a frequency that provides the evaluator with a historical perspective of site activities. The photographic history shall date back to 1932 or the earliest photograph available. Aerial photographs are available for review at the New Jersey Department of Environmental Protection, Tidelands Management Program, Aerial Photo Library, 9 Ewing Street, Trenton, New Jersey, (609) 633-7369. Note the applicant is not required to provide the Department with copies of the aerial photographs reviewed only an interpretation of what was observed in each photograph, which may represent an environmental concern.

_______Check here if an aerial photo review was not complete and provide a reason.

Provide the appendix number for the air photo review narratives _____**See Appendix G**_____

7. Discharge History of Hazardous Substances and Wastes, N.J.A.C. 7:26E-3.1(c)1vii :

All discharges of hazardous waste were reported in the Preliminary Assessment Dated December 1999. Discharges of radioactive materials are discussed in Appendix F and Appendix N.

A. Have there been any known discharges of hazardous substances and wastes at the site?

_______ No (Go to question #8) _________Yes (Complete Items 7B & 7C)

B. Was the Department notified of the discharge?

_______Yes; __________ No

If yes, provide the Case # ______________

C. Was a no-further-action letter, negative-declaration approval or full-compliance letter issued as a result of the cleanup of this discharge?

______ Yes (Submit a copy of the no-further-action approval)

_______No (Submit a complete Site Investigation or Remedial Action Report documenting the action taken to address the discharge)

8 In accordance with N.J.A.C.7:26E-3.1 (c) 1.vii, provide a description of any remediation activities previously conducted or currently underway at the site, including dates of discharges, remedial actions taken, and all existing sample results concerning contaminants which remain at the site. Copies of Department or other governmental agency no-further-action approvals should also be provided with a description of the areas to which the no-further-action approvals apply. This information is especially important if the approval was granted for the remediation of a portion of a site or a specific discharge event rather than the entire site subject to this preliminary assessment.

______________Check here if this question does not apply.

OCNGS has conducted limited remedial actions in certain Radiological AOCs including investigation and some excavation. Available details are provided in the discussions of the AOCs below.

Provide the appendix number for the required narrative and data summary **<u>See Appendix M & N</u>**

9. Protectiveness of past remedies, Order of Magnitude Analysis, N.J.A.C. 7:26E-3.1(c) 1.ix and N.J.A.C. 7:26E, 3.2(a)5

A. Have any areas of radiological concern previously received a No-Further-Action approval from the Department or other equivalent government agency for which no additional remediation is proposed?

__X__ No (go to question #10). ________Yes (complete 9B).

B. In accordance with N.J.S.A 58:10B-13(e) the following evaluation of the protectiveness of past remedies shall be completed for all areas of concern for which no further action was previously approved by the Department or other equivalent government agency and for which no additional remediation is proposed. All final sampling results shall be evaluated to determine if contaminant levels remaining on site are in compliance with current remediation criteria. The applicant shall complete the following:

Include a table comparing the levels of contaminants remaining in each area of concern, the numerical remediation standard approved in the remedial action workplan or at the time of no-further-action approval and the numerical remediation standards applicable at the time of the comparison. The table shall contain all sampling results, including sample location, sample media, field and laboratory identification numbers, and method detection limits, as necessary, and analytical results for all individual contaminants for each area of concern.

I hereby certify that the order of magnitude analysis required pursuant to N.J.A.C. 7:26E has been completed, since the issuance of a No-Further-Action approval, negative declaration approval or equivalent remediation approval; and (Check the appropriate statements (1), (2), (3) or (4)):

(1) _________The areas of concern listed below contain contaminants above the numerical remediation standard applicable at the time of the comparison, however no further action is required because (check the appropriate sub statement):

________(a) The contaminant concentrations remaining in the areas of concern listed below are less than an order of magnitude (factor of 10) greater than the numerical remediation standard applicable at the time of the comparison;

________(b) The areas of concern or the site was remediated using engineering and institutional controls approved by the Department and these controls are still protective of public health, safety and the environment; or

________ (c) The area of concern or the site was remediated to an approved site specific remediation standard and all of the factors and assumptions which are the basis for deriving the site specific remediation standard remain valid for the site.

Please list the areas of concern for which the previous statement applies.

Area of Concern	Location Reference Keyed to the Site Map

(2)____ **The areas of concern listed below contain contaminants above the numerical remediation standard applicable at the time of the comparison and further remediation is required because (check the appropriate sub statement):**

_______(a) **The contaminant concentrations remaining in the areas of concern listed below are** more than an order of magnitude (factor of 10) greater than the numerical remediation standard applicable at the time of the comparison;

_______(b) **The areas of concern or the site was remediated using engineering and institutional** controls approved by the Department and these controls are no longer protective of public health, safety and the environment; or

_______ (c) The area of concern or the site was remediated to an approved site specific remediation standard and some or all of the factors and assumptions which are the basis for deriving the site specific remediation standard are no longer valid;

Please list the areas of concern for which the previous statement applies.

Area of Concern	Location Reference Keyed to the Site Map

(3) ____ The areas of concern listed below do not contain contaminants above the numerical remediation standard applicable at the time of the comparison and no further remediation is required.

Please list the areas of concern for which the previous statement applies.

Area of Concern	Location Reference Keyed to the Site Map

(4)_____The contaminant concentrations remaining in the below listed areas of concern are more than an order of magnitude greater than the numerical remediation standard applicable at the time of the comparison. However, no further remediation is required by the person conducting this preliminary assessment, because, in accordance with N.J.S.A. 58:10B13(e), that person is not liable for the contamination pursuant to N.J.S.A. 58:10-23.11g.

Please list the areas of concern for which the previous statement applies.

Area of Concern	Location Reference Keyed to the Site Map

10. Historical Data on environmental quality at the Industrial Establishment

A. Have any previous sampling results documenting environmental quality of the Industrial Establishment not received a no further action approval from the Department or been denied approval by the Department? (N.J.A.C. 7:26E-3.1(c) 1.viii)

_X_____Yes (See Attachment #_____) ___________No (Go to 11)

OCNGS has conducted investigations that have not been the subject of a no further action letter. The results of those investigations either have already been provided to the department, or are being provided to the department with this PAR.

B. Have there been any known changes in site conditions or new information developed since completion of previous sampling or remediation? (If sampling results were obtained, but are not part of this application, please explain below (N.J.A.C. 7:26E-3.1(c) xi):

See response to Question 10.A (above).

11. List all federal, state and local environmental permits at this facility, including permits for all previous and current owners or operators, applied for, received, or both (attach additional sheets if necessary).

Check here if no permits are involved _______

A. **New Jersey Air Pollution Control**

Permit Number	Expiration Date	Type of Permitted Unit
099746	**12/29/00**	**Gasoline Storage Tank**
100443	**02/13/01**	**EDG Tank Vent Certificate**
117677	**07/11/04**	**Emergency Diesel Generator #1**
117678	**07/11/04**	**Emergency Diesel Generator #2**
122100	**09/08/02**	**Auxiliary Steam Boiler #2**
01-97-3007 (Application log #)	**10/29/02**	**Emergency Fire Diesel 1-1**
01-97-3550 (Application log #)	**10/09/02**	**Emergency Fire Diesel 1-2**
01-97-3800 (Application log #)	**11/14/02**	**Steam Heating Boiler - #1 Boiler**

B. Underground Storage Tank Registration Number 0043067

Size of Tank (Gallons)	Tank Contents
2,000	**Normally empty; used for emergency containment (AOC-2A, Appendix F)**

C. New Jersey Pollutant Discharge Elimination System (NJPDES) Permit

Permit Number	Discharge Type	Discharge Location Keyed to Site map	Expiration Date
NJ0005550	**OC NJPDES DSW Permit**	**NA**	**11/30/99 (Renewal application submitted 05/28/99)**
NJ0101966	**OC NJPDES DGW Permit**	**NA**	**03/31/04**

D. Resource Conservation and Recovery Act (RCRA) permit #________________

E. EPA Identification Number NJD 980649172

F. In accordance with N.J.A.C. 7:26E-3.1(c) xii, list all other federal, state, local government environmental permits for all previous and current owners or operators applied for and/or received for the site including :

(1) Name and address of the permitting agency
(2) The reason for the permit
(3) The permit identification number
(4) The application date
(5) The date of approval, denial or status of the application
(6) The name and current address of the permittees
(7) The reason for the denial, revocation or suspension if applicable
(8) The permit expiration date

_____________ Check here if no other environmental permits were applied for or received for this site.

Provide the appendix # for the required listing if other environmental permits exist for this site.

Appendix J

12. In accordance with N.J.A.C. 7:26E-3.1(c)xiii, provide a summary of enforcement actions (including but not limited to, Notice of Violations, Court Orders, official notices or directives) for violations of environmental laws or regulations (attach additional sheets if necessary):

A. Check here if no enforcement actions are involved ______(Go to 13; otherwise complete 12B)

B. (1) Name and address of agency that initiated the enforcement action

Appendix K

(2) Date of the enforcement action ____________________

(3) Section of statute, rule or permit allegedly violated ____________________

(4) Type of enforcement ____________________

(5) Description of the violation ____________________

(6) How was the violation resolved? ____________________

13. In accordance with N.J.A.C. 7:26E-3.1(c) xiv, please provide a narrative description of all areas where non-indigenous fill materials were used to replace soil or raise the topographic elevation of the site, including the dates of emplacement.

Non-indigenous fill materials were not used at the OCNGS site. Fill materials used at the site consisted of soil and sediment excavated during the construction of the Intake and Discharge Canals.

14. A. In accordance with N.J.A.C. 7:26E-3.2(a) 3.i, submit a scaled site plan, detailing the subject lot and block, property and or leasehold boundaries, location of current and former buildings, fill areas, paved and unpaved areas, vegetated areas, and all areas of concern identified above and all active or inactive wells.

Appendix L

Figure L-1:	**Areas of Concern: Western Portion of Site**
Figure L-2:	**Areas of Concern: Eastern Portion of Site**
Figure L-3:	**Site Wide Radiological Survey Results for Co-60**
Figure L-4:	**Site Wide Radiological Survey Results for Cs-137**
Figure L-5:	**Groundwater Monitoring Results**

B. Scaled historical site maps and facility as built drawings (if available).

C. A copy of the United States Geologic Survey (USGS) 7.5 minute topographical quadrangle that includes the site and an area of at least one mile radius around the site. The facility location shall be clearly noted. If a portion of the USGS quadrangle is used, the scale, north arrow, contour interval, longitude and latitude with the name and date of the USGS quadrangle shall be noted on the map.

Appendix O

15. In accordance with N.J.A.C. 7:26E-3.2, please provide the date that the site visit was completed to verify the findings of the preliminary assessment. **Non-Radiological August 12, 1998; Visits for Radiological and additional visits for Non-Radiological occurred in December 1999 and February 2000.**

16. List any other information you are submitting or which has been formerly requested by the Department:

Description	Appendix #
None at this time.	

CERTIFICATION:

The following certification shall be signed by the highest-ranking individual at the site with overall responsibility for that site or activity. Where there is no individual at the site with overall responsibility for that site or activity, this certification shall be signed by the individual having responsibility for the overall operation of the site or activity.

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this application and all attached documents, and based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information, and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Typed/Printed Name Sander Levin Title Site Director – Oyster Creek Nuclear Generating Station

Signature Sander Levin Date 2-29-00

Sworn to and Subscribed Before Me on this 29th

Date of February 192000

Betty Goodheart

Notary BETTY GOODHEART
Notary Public of New Jersey
My Commission Expires Mar. 22, 2004.

Division of Responsible Party Site Remediation
Industrial Site Recovery Act

INITIAL NOTICE FEE SUBMITTAL FORM

Case # (if known) E99575

Case Name (Active Case) ____________________

Check drawn from the account of GPU Nuclear, Inc. **Check/M.O. #** 9200899 & 9200900

Amount Enclosed $750.00

Please circle the appropriate payment location(s)

1.	General Information Notice	$100.00
[✓ 2.]	[✓ Preliminary Assessment Report]	[✓ $250.00]
[✓ 3.]	[✓ Site Investigation Report]	[✓ $500.00]
4.	Negative Declaration Review	$100.00
5.	Expedited Review Application•	$250.00
6.	Remediation in Progress Waiver Application•	$250.00
7.	Regulated Underground Storage Tank Waiver Application•	$500.00
8.	Area of Concern Waiver Application•	$200.00
9.	Limited Site Review Application•	$450.00
10.	Applicability Determination Application	$200.00
11.	De minimis Quantity Exemption Application	$200.00
12.	Limited Conveyance Application•	$500.00
13.	Remediation Agreement Application	$1000.00
	Remediation Agreement Amendment Application	$500.00
14.	Confidentiality Claim	$250.00
15.	Remedial Action Workplan Deferral Application•	$750.00

• This fee includes the costs of the Department's review of the General Information Notice required pursuant to N.J.A.C. 7:26B-3.2(a). Any person submitting this fee shall not be required to submit a separate General Information Notice fee.

Note: All applicable fees are due with the submission of each document. A case will remain with the Initial Notice Section up through the submission of a Remedial Investigation Report or the submission of a schedule to implement a Remedial Investigation or Remedial Action at Peril.

APPENDIX A

SITE HISTORY

APPENDIX A: QUESTION 2A
DESCRIPTION OF PAST INDUSTRIAL OPERATIONS

Western Portion of Property or OCNGS:

The property inside the "horseshoe" (bounded on the east by US Route 9, and on the north, south and west by the Intake and Discharge Canals), was purchased by Jersey Central Power and Light Company (JCP&L), a subsidiary of GPU, Inc., from Norman C. and Elsie H. Finninger (husband and wife) on 1/28/61. This portion of the site is where the Oyster Creek Nuclear Generating Station (OCNGS) is presently located. The approximately 132-acre property is located in Lacey Township as a portion of Block 1001, Lot 4 (Deed Book 2144, pg. 484). Approximately 12.01 acres of land located in Ocean Township, along the south bank of Oyster Creek (Block 41, Lot 43) was also purchased as part of that transaction. Prior to construction of the OCNGS, the site was vacant and undeveloped.

JCP&L purchased the land for the purpose of constructing the OCNGS. JCP&L initiated construction of the OCNGS in December of 1963 and commercial operation began on December 23, 1969.

JCP&L operated the OCNGS until 1980 when GPUN, another subsidiary of GPU, Inc., assumed responsibility for operations. GPUN continues to operate the OCNGS for JCP&L, doing business as GPU Energy.

Eastern Portion of Property:

JCP&L purchased the "Finninger Farm Property", located across US Route 9 and east of the OCNGS, from NOR-RU-EL, Inc. on 6/28/66. The 548.07 acre property is located in Lacey Township as Block 100, Lots 1-20 & 20.01 and Ocean Township as Block 63, Lot 7 (Deed Book 2600, pg. 352). Prior to that purchase, the portion of the property located in Lacey Township (536.03 acres) was used for the raising of beef cattle while the 12.04 acre parcel located in Ocean Township was undeveloped.

JCP&L purchased an undeveloped 25.25-acre parcel (Lacey Township Block 101, Lot 1) located adjacent to the north side of the Finninger Farm Property, from Mayer Construction Company on 3/8/71 (Deed Book 3110, pg. 357).

As part of the land acquisition for the construction if the intake canal for the OCNGS, JCP&L purchased a 2.01 acre undeveloped parcel (Lacey Township Block 138, Lot 2) from Charles R. Pearl and Marie D. Pearl on 1/18/66 (Deed Book 2555, pg. 411), and an undeveloped lot comprising 1.01 acres (Lacey Township Block 139, Lot 11) from Wilnor Realty Company on 11/17/65 (Deed Book 2539, pg. 369).

APPENDIX B

RECENT SITE OPERATIONS

APPENDIX B: QUESTION 2B
DESCRIPTION OF MOST RECENT OPERATIONS

Western portion of Property:

OCNGS consists of a single boiling-water nuclear reactor and a turbine-generator to produce electrical power. This equipment and auxiliary support structures are located within the area bounded on the east by U.S. Route 9 and on the north, south and west by the intake/discharge canal.

Three basic steps are involved in the process of producing electricity at the OCNGS. First, heat produced by fission in the nuclear reactor converts high purity water to steam. Second, the steam is used to drive a turbine so that some of the energy in the steam is converted to mechanical energy. Third, the turbine is connected to a generator which converts the mechanical energy of the rotating turbine into electrical energy.

Saltwater from Barnegat Bay is used to cool the steam exhausted from the turbine and to condense the steam back into water. This condensed high purity water is returned from the main station condensers to the heat source to be converted into 'steam again to continue to drive the turbine.

Eastern Portion of Property:

The eastern portion of the site is primarily heavily vegetated and largely undeveloped. JCP&L/GPUN have used the property in the following manner:

1. To deposit excavated/dredged soil and sediment during the construction of the intake and discharge canals for the OCNGS during the 1960's.
2. As a source of topsoil for re-vegetation projects on and around the OCNGS.
3. As an Environmental Laboratory (in buildings formerly located on the property) from 1975-1988.
4. To deposit dredged material resulting from periodic maintenance dredging in the intake and discharge canals. This material was all deposited at the location of the existing 17.5 acre upland Confined Disposal Facility during dredging projects in 1978, 1984 and 1997. The Confined Disposal Facility is discussed in Question 5, AOC-38.
5. As a location for environmental monitoring activities including continuous air monitoring, ground water monitoring and the planting of gardens to provide vegetables for radiological analyses.
6. The Barge Unloading Facility (AOC-7), located along the south shore of Oyster Creek (Discharge Canal) adjacent to U.S. Route 9, has been used to deliver large components, such as the turbine rotor, to the OCNGS. This facility is currently used on an intermittent basis by the Ocean County Engineering Department to load reef construction materials (concrete and used tires) onto vessels for delivery to artificial reefs in the Atlantic Ocean.

APPENDIX C

RADIOACTIVE SUBSTANCES/WASTE INVENTORY

APPENDIX C: QUESTION 3
Radioactive Substances/Waste Inventory

The vastly predominant location for radioactive material is in the reactor building, in two locations. All remaining locations together contain one millionth or less of the activity in the reactor building. The reactor vessel contains the majority of this activity most of which is short lived (half-lives of seconds to days). Fuel performance/burn-up computer calculations show that there are hundreds of different radionuclides in active fuel. However, for practical purposes of radiation protection, the isotopes of most interest in active fuel are the short lived noble gases and iodines (e.g. Xe-133, Xe-135, Kr-88, I-131, I-133, etc.). The reactor is inside a full pressure suppression containment and contains 577 used / highly irradiated fuel elements. The second location in the reactor building that contains most of the remaining activity is the spent fuel pool. The spent fuel pool is used to store spent fuel for decay and cooling. The spent fuel pool is inside a secondary containment and currently contains 2420 spent fuel elements of various ages after discharge from about 1.5 years to about 30 years. Following a relatively short period of decay, the nuclide content of the discharged fuel decreases by several orders of magnitude. Major isotopes of interest following this cooling / decay period are Co- 60, which is present as a surface film, and Cs-137 which is in the fuel.

Vastly smaller amounts of radioactive material are elsewhere throughout the plant. Short lived noble gases, activation gases (N-16) and radioiodines are present in the turbine building as a result of carry over and degassing into the main steam system. The Augmented Off-gas (AOG) building receives the non-condensable gases from the turbine / condenser system through the 30 minute delay line. The same radionuclides, less decay, (therefore no significant N-16 for example) are present in the AOG building.

The New and Old Radwaste buildings contain liquid and solid waste processing. Therefore, dominant radionuclides in this building are consistent with those transported through depressurized water: soluble and particulate fission and activation products. The nuclide mixes associated with the solid waste streams are evaluated periodically per NRC requirements in 10 CFR 61. The majority of the activity in these buildings consists of Co-60, Cs-137, and Fe-55.

The low-level Radwaste storage building contains waste that is packaged and staged for disposal and materials and equipment that is stored for re-use. Therefore, the activity in this building is consistent with the solid waste streams in the Radwaste processing buildings, and is dominated by Co-60, Cs-137, and Fe-55.

The Radiological instrument calibration facility has several sealed sources of Cs-137 that provide the dose rates needed to calibrate survey meters etc.

APPENDIX D

DESCRIPTION OF WASTEWATER DISCHARGES

APPENDIX D: QUESTION 4A
DESCRIPTION OF WASTEWATER DISCHARGES

The OCNGS is authorized to discharge to surface and groundwater in accordance with the requirements of the following NJPDES Permits:

- NJPDES Discharge to Surface Water (DSW) Permit No. NJ0005550, issued 10/21/94, effective 12/01/94 through 11/30/99 (application for renewal submitted on 05/28/99 and deemed administratively complete by NJDEP on 06/10/99); and,
- NJPDES Discharge to Ground Water (DGW) Permit No. NJ0101966 effective 04/01/99 through 03/31/04.

Parts III-B/C and IV-B/C of the NJPDES DSW Permit, which identify the sampling and reporting requirements at each outfall, are provided in this section as an attachment.

DSN 001 - Main condenser non-contact cooling water (DSW)

Samples are collected at the outfall of DSN 001 for thermal parameters, and in the main condenser discharge tunnel just east of the chlorine monitor shed prior to the outfall or at the outfall of DSN 001 for all other parameters and reported monthly.

DSN 002 - Heat exchanger non-contact cooling water (DSW)

Samples are collected from the common header located on the 23-foot elevation of the New Radwaste Heat Exchanger Room, or the sampling point located near the end of the discharge pipe for DSN 002, and reported monthly.

DSN 004 - Stormwater runoff, non-contact cooling water from reactor building and emergency service water heat exchangers and discharge from the 1-5 sump (DSW)

Samples are collected at the sample pipe located inside the fence near the terminus of the 30" header or at the outfall of DSN 004 (depending on site conditions), and reported monthly.

DSN 005 - Dilution pump discharge water (DSW)

Required flow measurements are calculated and reported monthly.

DSN 007 - Dilution pump seal water (DSW)

Samples are collected at the north side of the dilution pump structure at the outfall of DSN 007 and reported monthly.

DSN 008 - Intake screen and strainer washwater discharge (DSW)

Required flow measurements are calculated and reported monthly.

DSN 009 - Fish sampling pool (DSW)

Required flow measurements are calculated and reported monthly.

DSN K01 - Sand Filter Backwash (DGW)

Backwash from the pretreatment building discharges to a seepage pit or backwash sump located adjacent to and northwest of the ambulance building. The discharge consists of backflush overflow.

APPENDIX D: QUESTION 4A
DESCRIPTION OF WASTEWATER DISCHARGES

The following discharges are permitted under NJPDES Permit No. NJ0005550, but are located at the Forked River Combustion Turbine Facility, remote from the OCNGS. The information is provided for accuracy; however, the following discharges do not represent potential areas of concern for the OCNGS.

DSN 012 - Stormwater from the oil/water separator associated with the Combustion Turbine Facility, demineralizer water system drains, and other treated stormwater

Samples are collected at the outfall of DSN 012 (former Forked River DSN 012) and reported monthly.

DSN 013 - Stormwater

Samples are collected at the outfall of DSN 013 (former Forked River DSN 004) and reported monthly.

DSN 014 - Stormwater

Samples are collected at the outfall of DSN 014 (former Forked River DSN 007) and reported monthly.

APPENDIX E

DESCRIPTION OF HISTORIC AND CURRENT WASTE STREAMS

APPENDIX E: QUESTION 4B
DESCRIPTION OF HISTORIC AND CURRENT WASTE STREAMS

Waste Streams

Waste streams generated at the Oyster Creek Nuclear Generating Station include the following:

- Dry Active Waste: Represents the "household trash" from the contaminated areas of the plant. It consists of plastic, paper, wood, and metal.
- Irradiated Hardware: Parts of plant that require periodic replacement and are subject to neutron irradiation in the reactor and become radioactive by neutron absorption.
- Filter Media: The plant uses a filter powder-precoat filter process for cleanup of radioactively contaminated water. This filter material is removed from the filtration vessel and dewatered when expended.
- Resin: Ion exchange materials used for water purification purposes
- Evaporator Bottoms: Residual solids following evaporation volume reduction of wastewater
- Spent Fuel: Used nuclear fuel that has been subject to neutron flux and thus contains the mixed fission and activation products resulting from the fission process.

Wastes that pursuant to NRC regulations are approved for transportation and off-site disposal are ultimately sent to the following waste disposal facilities:

Radiological Waste Disposal Facility	Radiological Waste Disposal Facility
Westinghouse/ Waltz Mills Hunker Road Madison, PA 15663	Unitech Services (AKA Interstate Nuclear Services) 401 N. Third Ave Royersford, PA 19568
Interstate Nuclear Services 295 Parker Street Springfield, MA 01151	DSSI 657 Gallagher Rd Kingston TN 37763
American Ecology Recycle Center (AKA Quadrex) 109 Flint Road Oak Ridge TN 37830	Manufacturing Sciences 804 Kerr Hollow Rd Oak Ridge TN 37830
ALARON RD2 Box 2140A Wampum PA 16157	NSSI/Recovery Services PO Box 34042 5711 Etheridge St Houston TX 77034
GTS Duratek PO Box 2530 1560 Bear Creek Rd Oak Ridge, TN 37830	ATG Richland PO Box 969 2025 Battelle Blvd Richland WA 99352

APPENDIX E: QUESTION 4B
DESCRIPTION OF HISTORIC AND CURRENT WASTE STREAMS

GTS Duratek West (AKA F W Hake Associates) 1790 Dock Street Memphis TN 38113	Chem Nuclear Systems Chem Nuclear Consolidation Facility Hwy. 64 Barnwell, SC 29812
Barnwell Waste Management Facility Osborne Rd Barnwell, SC 29812 Nuclear Fuel Services West Valley, NY	Maxy Flats Disposal Facility Moorehead, KY
Hanford Disposal Facility Richland, WA	

Non-Manifested Waste Streams

- Non-hazardous solids/Non-Radioactive (i.e., paper, cardboard, plastics, metals, and office rubbish) are disposed in dumpsters at various locations at the facility. Wastes are removed for off-site disposal or recycling by the following New Jersey disposal companies: Waste Management, and E&D Recycling, Inc.
- Clean scrap metal is stored in a dumpster located at the southwestern portion of the site and is removed on an as-needed basis by a scrap metal recycling company.

APPENDIX F

AREAS OF CONCERN

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Potential Areas of Concern (AOCs) discussed in this section are shown on the following figures provided in Appendix L:

Figure L-1:	Areas of Concern: Western Portion of Site
Figure L-2:	Areas of Concern: Eastern Portion of Site
Figure L-3:	Radioactive Environmental Soil Results for Co-60
Figure L-4:	Radioactive Environmental Soil Results for Cs-137
Figure L-5:	Groundwater Monitoring Network and Results

Oyster Creek Nuclear Generating Station ("OCNGS") utilizes aboveground storage tanks, pumping stations, sumps and pits in the production of energy. A number of these operational units and their associated appurtenances contain or transport radiological materials/wastes as part of the process. Each of these systems that contain or transport radiological materials/wastes, which pose as potential Areas of Concern (AOC) as defined in N.J.A.C. 7:26E, is listed below. Non-radiological areas of concern were addressed in a separate Preliminary Assessment, which was submitted to the NJDEP in December of 1999.

A. BULK STORAGE AREAS AND APPURTENANCES

ABOVEGROUND STORAGE TANKS AND APPURTENANCES (AOCs 1 – 4)

AOC – 1A Condensate Storage Tank

The Condensate Storage Tank ("CST") is a 525,000-gallon tank that provides bulk storage of condensate for use throughout the plant. The tank is located outside the west wall of the Turbine Building. Water for filling the CST is supplied from the demineralized water system. The CST provides a surge volume for the condensate system. The make-up and spill valves transfer water between the CST and the condensate system to absorb volume changes in the condensate system. The CST is located on a concrete rim support and has no secondary containment.

OCNGS conducted a soil-sampling program for gamma-emitting radionuclides in the area of the CST and its associated Pump Shack. The results of the sampling program indicate detectable concentrations of Cobalt-60 (Co-60). Four (4) of the thirty-four (34) soil samples were above the Nuclear Regulatory Commission's ("NRC") default decommissioning facilities of 3.8 picoCuries/gram (pCi/g). Co-60 was detected at concentrations of 157 pCi/g, 22 pCi/g, 20 pCi/g

and 6.8 pCi/g. The two samples with the highest concentrations were associated with a valve and line leak and the two remaining concentrations were associated with bottom leakage from the CST. All samples in AOC-1A were collected in 1991.

In addition to the soil data noted above, two monitoring wells (W-5 and W-6) are located hydrogeologically cross gradient of the area. The monitoring wells are sampled semi-annually as part of the Radiological Environmental Monitoring Program (REMP). Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells during 1999 indicated only tritium was detected in MW-5 at a concentration of 380 pCi/l (USEPA Drinking water standard for tritium is 20,000 picoCuries per liter (pCi/l)). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Reduction in concentrations detected between 1991 & 1999;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 1B Condensate Pump Shack

Condensate from the CST is transferred to the Turbine Building through a network of aboveground and underground lines. The two pumps for the CST are located to the south of the tank in a small shack. The pumps take suction on a common header from the CST and discharge the condensate through individual spring check valves and isolation valves to a common discharge header. Normally, one pump operates continuously to supply system loads. Information pertaining to soil and groundwater sampling in this area is provided in AOC-1A above.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Reduction in concentrations detected between 1991 & 1999;
- Lack of impact to groundwater; and

- Restricted access to the AOC.

AOC – 1C Condensate Transfer System

The condensate transfer system supplies condensate water to the Turbine Building. Historically, all of the lines from the CST to the Condensate Pump Shack and the Turbine Building were underground. However, during the 1990s, many of these lines were replaced with aboveground lines or were placed in underground vaults. Detailed information regarding these process lines can be found in Attachment II to this Appendix. Information regarding soils and groundwater in this area is provided in AOC-1A above.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Reduction in concentrations detected between 1991 & 1999;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 2A Torus Water Storage Tank ("TWST")

The TWST is a 750,000-gallon AST, which is located south of the North Gate guardhouse. The TWST was installed during the construction of OCNGS in the mid to late 1960's for the storage of water used in the Reactor Building's Torus System. This AST is located on a concrete pad and has no secondary containment.

The facility conducted a soil-sampling program for the gamma-emitting radionuclides in the area of the TWST. The results of the sampling program indicate detectable concentrations of Co-60 and Cesium-137 (Cs-137), however, the concentrations detected were below the NRC decommissioning guidelines. Twelve (12) soil samples were collected in late 1999. Analytical results for the samples indicated that four (4) of the twelve (12) samples were below the method detection limits for both radionuclides. The highest concentration reported for Co-60 was 0.860 pCi/g, while the highest concentration reported for Cs-137 was 0.150 pCi/g, which is similar to normal environmental background for this nuclide. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and Appendix N.

In addition to the soil data noted above, two monitoring wells (W-5 and W-6) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-5 at a concentration of 380 pCi/L (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 2B Underground Piping from Torus Tank to Reactor Building

A 4-inch coal tar coated carbon steel line, installed in the mid-1980's, is used to transfer liquids to and from the Torus System in the Reactor Building to the Torus Tank.

In 1999, the facility conducted a soil-sampling program for gamma-emitting radionuclides in the area of the TWST lines. The results of the sampling program indicate detectable concentrations of Cs-137. However, the concentrations detected were below the NRC decommissioning guidelines. Two (2) of the five (5) samples of Cs-137 obtained were below the method detection limit. The highest concentration reported for Cs-137 was 0.117 pCi/g, which is similar to normal environmental background for this nuclide. Co-60 was not detected in any of the samples.

In addition to the soil data noted above, two monitoring wells (W-5 and W-6) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-5 at a concentration of 380 pCi/L (USEPA Drinking

water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 3A Turbine Dirty Oil Tank

OCNGS maintains a Turbine Dirty Oil Tank, which has a storage capacity of 15,000 gallons. The tank is located off the northwest corner of the Turbine Building. It is used to store lubricating oil from the turbine system during station maintenance outages that may require the Turbine Lube Oil Main Tank to be drained. The tank is inside containment with a concrete base and concrete containment walls. The volume within this containment is of sufficient capacity for both the contents of the tank plus freeboard for accumulated rainwater. At the end of the maintenance work on the turbine system (typically less than 60 days in duration), the oil may be returned and a residual quantity of oil may remain in the Dirty Oil Tank. If oil is determined to be unacceptable for return to the Turbine Lube Oil Main Tank, it is removed and properly disposed. The containment has a drain valve to allow for the removal of accumulated rainwater. All transfers between the Turbine Dirty Oil Tank and the Turbine Lube Oil Main Tank are conducted by underground pipeline.

The containment in which the Turbine Oil Dirty Tank is located was inspected for evidence of deterioration or cracking. Based on the results of the inspection, the integrity of the secondary containment unit has not been breached.

OCNGS conducted a soil-sampling program for gamma-emitting radionuclides in the area of the above referenced tank. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. However, the concentrations detected were below the NRC decommissioning guidelines and consistent with normal environmental concentrations. Detailed information

pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

In addition to the soil data noted above, two monitoring wells (W-5 and W-6) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-5 at a concentration of 380 pCi/L (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- The tank is located within secondary containment;
- Lack of impact to groundwater;
- Restricted access to the AOC; and,
- Containment system integrity good.

AOC – 3B **Turbine Dirty Oil Tank Lines**

The OCNGS maintains a Turbine Dirty Oil Tank, which has a storage capacity of 15,000 gallons. The tank is located off the northwest corner of the Turbine Building. It is used to store lubricating oil from the Turbine system during station maintenance outages that may require the Turbine Lube Oil Main Tank to be drained. The drain line for the tank system runs from the Turbine Building underground to the aforementioned tank

Two soil samples were obtained in the area of the lines and were analyzed for the gamma-emitting radionuclides. No concentrations of Co-60 or Cs-137 were detected in the samples obtained. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N. As indicated in AOC-3A, groundwater in the area of the lines has not been impacted.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Defer Activities until Decommissioning based on the following information:

- Lack of radionuclides detected in the soils;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 4A Former Waste Surge Tank

The Former Waste Surge Tank is a 100,000-gallon aluminum tank situated on a concrete rim support. The tank was historically used to store wastewater from the operational portion of the plant prior to treatment. The tank was removed from service in 1982 when a leak was detected in the base of the tank. Impacted soils were excavated and removed.

OCNGS conducted a soil-sampling program for gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the area of the Surge Tank. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. Of the one hundred seventeen (112) samples collected in 1982, 1992, and 1999 twenty-seven (27) exceed the NRC decommissioning guideline for for Co-60 and twenty-seven (27) of the samples exceeded the guideline for Cs-137. Concentrations of Co-60 ranged from below the method detection level to 1,100 pCi/g and concentrations for Cs-137 ranged from below the method detection level to 390 pCi/g. These maximum concentrations were the result of a spill in 1992. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment 1 of this Appendix and in Appendix N.

OCNGS samples groundwater on a routine basis as part of the REMP. In 1999, fifteen (15) monitoring wells were sampled in March and again in September. The results of the analysis of the thirty (30) samples collected from the on-site groundwater monitoring well network revealed that Tritium was the only plant specific radionuclide detected. Tritium was found in eight of the wells in March and five of the wells in September with concentrations ranging from 140 pCi/L to 580 pCi/L well below USEPA's drinking water standard of 20,000 pCi/L. These concentrations also reflect a significant decrease from the concentrations detected in 1998. Detailed information pertaining to the analytical samples and results from 1998 referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC – 4B Former Waste Surge Tank Lines

In 1982, the Former Waste Surge Tank and its associated lines were removed from service. The lines were emptied cleaned, flushed and capped in-place. According to facility personnel, contaminated soils were encountered during the line decommissioning process. Impacted soils were excavated and removed. Information pertaining to soil and groundwater sampling in this area is provided in AOC-4A above.

Defer Activities until Decommissioning based on the following information:

- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC-4C Old Radwaste Building Ramp

A ramp located on the eastern side of the Old Radwaste Building was used to load tanked and drummed radwaste for shipment to a licensed disposal facility. The materials were removed from the Old Radwaste Building and were loaded onto or into vehicles for removal to a licensed treatment and/or disposal facility.

Thirty-nine (39) samples were collected in 1982 at the truck ramp pavement area. The results of this sampling program indicate that nine (9) samples exceeded NRC decommissioning guideline for Co-60 and four (4) exceed the NRC guideline for Cs-137. The concentrations of Co-60 ranged from below the method detection level to 40 pCi/g. Based on the decay of Co-60 over time, the maximum concentration in 1992 is expected be below the NRC guideline today. Concentrations for Cs-137 ranged from below the method detection level to 24 pCi/g. Detailed information pertaining to the analytical samples and results from 1998 referenced above can be found in Attachment I of this Appendix and in Appendix N.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

OCNGS samples groundwater on a routine basis as part of the REMP. In 1999, fifteen (15) monitoring wells were sampled in March and again in September. The results of the analysis of the thirty (30) samples collected from the on-site groundwater monitoring well network revealed that Tritium was the only plant specific radionuclide detected. Tritium was found in eight of the wells in March and five of the wells in September with concentrations ranging from 140 pCi/L to 580 pCi/L, well below USEPA's drinking water standard of 20,000 pCi/L. These concentrations also reflect a significant decrease from the concentrations detected in 1998. Detailed information pertaining to the analytical samples and results from 1998 referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Relatively limited AOC
- Lack of impact to groundwater; and
- Restricted access to the AOC.

UNDERGROUND STORAGE TANK(S) (AOC-5)

AOC –5 **Waste Drop Tank**

The Waste Drop Tank (UST Registration No. NJ0043067, expiration 6-30-01) is a 2,000-gallon lined fiberglass UST that is located immediately outside the southern wall of the Material Warehouse. The floor drain system in the Material Warehouse is connected to the Waste Drop Tank. The floor drains have been directed to the Waste Drop Tank since the construction of the facility. Drums of petroleum and other chemical products (non-radiological) are stored in the portion of the warehouse serviced by the drain system. The purpose of the Waste Drop Tank is to act as a secondary containment sump in the event of a spill or leak from the drums. As such, the tank was constructed with a chemically resistant internal lining. The Waste Drop Tank has no discharge lines; any material collected in the tank would be pumped out within 48 hours for off-site disposal.

The tank was pumped out once when mop water from cleaning the warehouse floor was pushed into the tank drains and allowed to accumulate in the tank. Once discovered, the water was pumped out and disposed at an off-site wastewater treatment facility in accordance with

applicable regulations. The tank has not been used since that event. There have been no materials directed to the Waste Drop Tank, with the exception of the mop water that was a one-time event.

OCNGS conducted a soil-sampling program for the gamma-emitting in the area of the above referenced tank. The results of the sampling program indicate detectable concentrations of Cs-137. However, the concentrations detected were below the NRC's decommissioning guidelines. The highest concentration reported for Cs-137 was 0.125 pCi/g, which is similar to normal environmental concentration for this nuclide. Co-60 was not detected in any of the samples. Detailed information pertaining to the analytical samples and results from 1998 referenced above can be found in Attachment I of this Appendix and in Appendix N.

In addition to the soil data noted above, two monitoring wells (W-14 and W-15) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-15 at a concentration of 320 pCi/L (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

RAIL CARS (AOC – 6)

AOC – 6 Rail Road Siding

A railroad siding enters the Property west of U.S. Route 9, immediately north of the Discharge Canal; the siding divides into two spurs. The railroad siding was used for the transport of equipment and materials during the construction of the generating station. The railroad siding is

visible in aerial photographs from 1964 and 1972. GPU Nuclear personnel confirmed that the railspurs were not used after 1973.

NFA – The Railroad Siding was used solely for the transportation of construction equipment and materials into the Property and was not used after 1973. The railroad siding was not used for the transport of radiological materials or wastes.

LOADING AND UNLOADING AREAS (AOC-7)

AOC - 7 Barge Unloading Facility

The Barge Unloading Facility is located along the south shore of Oyster Creek (Discharge Canal) adjacent to US Route 9. The facility is used on an infrequent basis to deliver large mechanical components, such as the turbine rotor, to the OCNGS. The facility is also used on an intermittent basis by the Ocean County Engineering Department, to load reef construction materials (concrete and used tires) onto vessels for delivery to artificial reefs in the Atlantic Ocean.

NFA – The Barge Unloading Facility was used solely for the transport of large mechanical components and construction materials. The unloading area was not used for the transport of radiological materials or wastes.

B. STORAGE AND STAGING AREAS

There are no storage pads, surface impoundments, lagoons, or dumpsters where radioactive materials or wastes are stored. Radiological materials stored on-site are located in one of the buildings designed specifically for the storage of these materials. Each of these buildings is discussed in detail in Section F " Building Interior Areas with Potential for Discharge" of this appendix.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

C. DISCHARGE AND DISPOSAL AREAS

FLOOR DRAINS, TRENCHES, PIPING & SUMPS (AOCs 8 - 11)

AOC - 8 FLOOR DRAINS

The following table summarizes the structures at which floor drains are located, and identifies the destination of discharge(s) to the floor drains.

Structure	Destination of Discharge	Recommendation
Office Building	Sanitary Sewer	NFA: because no radiological wastes or materials are stored in this area.
Guard Houses	Sanitary Sewer	NFA: because no radiological wastes or materials are stored in this area
Emergency Diesel Generator Building	Rainwater that enters the EDGB is discharged to the Canal via a NJPDES permitted outfall (DSN 004). Floor drains near the ASTs also discharge to DSN 004.	NFA: because no radiological materials or wastes are stored or used in this building.
Pretreatment Building	Floor drains are connected to the storm sewer system that discharges to the Canal via DSN 004.	NFA: because no radiological materials or wastes are stored or used in this building.
Chlorination/ Condensate Transfer Pump House	Floor drains discharge to storm sewer system or, in event of discharge, to the condensate storage tank drain, and overflow collection system.	NFA: because no radiological materials or wastes are stored or used in this building. Condensate transfer system contains condensate in this building. Floor drains in the condensate system area are routed underground into the turbine building.
Main Office Building	Drains from office area discharge to sanitary sewer. Drains from laboratory and laundry discharge to Radwaste Treatment.	NFA: because no non-radiological materials are stored or used in the office area.
Turbine Building	All 5 drain/sumps discharge automatically to the Radwaste Treatment System. Sump #1-5 can be manually overridden to discharge to the canal via DSN 004	NFA: because drain/sumps discharge automatically to the Radwaste Treatment System.
Reactor Building	Drains/sumps discharge to Radwaste Treatment System with the exception of non-contaminated clean water lines	NFA: because all drains/sumps potentially containing radiological materials discharge to Radwaste Treatment System.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Structure	Destination of Discharge	Recommendation
Old Radwaste Building	**Floor drains discharge either to sumps, which discharge to the Radwaste Treatment system, or ultimately to the storm sewer system (to the Canal via DSN 004). A floor drain outside of secondary containment for former acid/caustic tanks drain to a pit outside of the Old Radwaste Building. The tanks were last used approximately fifteen years ago. The only potential concern associated with this drain would be if a catastrophic tank failure had resulted in an overflow of acid or caustic** materials from the secondary containment.	**NFA: because floor drains are directed automatically to the Radwaste Treatment System.**
Off-Gas Building	Floor drains discharge to building sump and, ultimately, to the Radwaste Treatment System. One drain discharges directly to the storm sewer system.	NFA: because floor drains/sumps are directed automatically to the Radwaste Treatment System.
Boiler House	Two floor drains discharge to sump 1-12, which discharges to the Radwaste Treatment System.	NFA: because floor drains/sumps are directed automatically to the Radwaste Treatment System.
New Radwaste Building	Floor drain/sumps discharge to the Radwaste Treatment System.	NFA: because floor drains/sumps are directed automatically to the Radwaste Treatment System.
Materials Warehouse	Floor drains to Waste Drop Tank (See AOC-2A)	NFA: because there are no direct discharges. The drains are directed to the Waste Drop Tank (addressed in AOC-2A).
Radwaste Storage Tanks	Drains within secondary containment routed either to building sump (or to Radwaste Treatment System) or to storm sewer on basis of radiological analyses and visual examination. The Radwaste Storage Tanks have never contained non-radiological hazardous materials.	NFA: because discharges from the Radwaste Storage Tank areas discharge to Radwaste Treatment System.

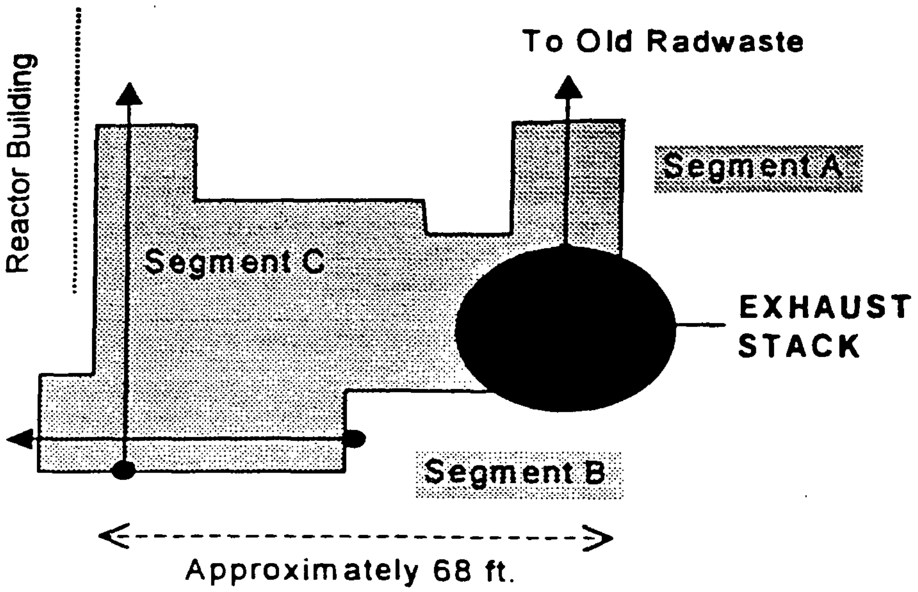
In addition, as part of the facility's REMP it monitors a composite sampler immediately downstream of discharge point 004. The samples are obtained daily and analyzed weekly for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

AOC – 9 Pipes

There are several sections to the Exhaust Tunnel System (ETS) used to transport wastewater and treated water between the Reactor Building, Turbine Building, Exhaust Stack and the Old/New Radwaste Buildings. The lines are suspended from the top of the tunnel on hangers. The sketch shown immediately below is a schematic of the location of the first three segments of the ETS. The shaded portion is the ETS complex as it enters the Exhaust Stack. The ETS near the stack is

large enough that is could be considered a subsurface structure that could impact groundwater flow (**Figure 9-1**).

Figure 9-1 SIMPLIFIED PLAN VIEW OF ETS NEAR EXHAUST STACK (not to scale)

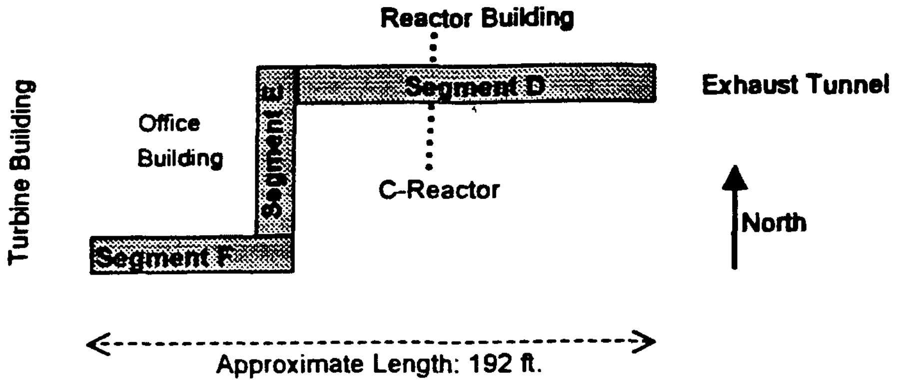


Segment A: Old Radwaste Building to Exhaust Stack

Segments D, E, & F of the ETS are also utilized as a pipe chase. A number of pipes from the Turbine Building and Reactor Building pass through the exhaust tunnel and lead to the Old Radwaste Building/New Radwaste building. The sketch below (Figure 9-2) shows the approximate locations of the remaining three segments of the ETS. "C-Reactor" is the approximate location of the centerline of the reactor.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Figure 9-2



The Exhaust Tunnel is a 2+-ft thick steel reinforced concrete structure. The sidewalls and ceiling range in thickness from 1.75-ft. to 2.5- ft. Although information regarding the construction of the tunnels is limited there is an indication that the 3-layer system similar to the one depicted in AOC-26 (leveling slab, membrane, protective slab) was used in the tunnel construction. Information regarding the potential release of contaminants from this structure is discussed in detail in Appendix M "Theoretical Release Study".

OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides in the area of the above referenced lines. The results of the sampling program indicate detectable concentrations of Cs-137. However, the concentrations detected were below the NRC decommissioning guidelines. The highest concentration reported for Cs-137 was 0.110 pCi/g, which is similar to normal environmental concentrations for this nuclide. Co-60 was not detected in any of the samples obtained. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

AOC – 10A Reactor Building Vaults

There are several vaults located along the southern wall of the Reactor Building. These vaults are used as a form of secondary containment for pipes. The Reactor Building Vaults extend 3-ft. to 6-ft. from the building and connect the Reactor Building to the Exhaust tunnel. Since these vaults connect with the Exhaust Tunnel System, this AOC is addressed along with AOC-9. Please note AOC-10A is located between Segment D of the tunnel and the Reactor Building as depicted on Figure 9-2.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC

AOC – 10B Torus Tank and Condensate Tank Line Vaults

There are several vaults located along the northwestern wall of the Turbine Building. These vaults are used as a form of secondary containment for the CST and the TWST tank lines. Each of these areas of concern is addressed along with AOC-1C and AOC-2B.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 11 Sumps

Floor drain sumps located in various buildings at the OCNGS are used to collect water that may leak from the Reactor Coolant System, Service Water System or numerous other cooling and water handling systems. Water from the Reactor Coolant System contains some radioactive

material but is otherwise highly purified. The Service Water System consists of salt water withdrawn from Barnegat Bay via the Intake Canal. Due to the Federal requirements associated with the control of radioactive materials, the wastewater disposal systems were designed to ensure that all wastewater would be processed through the plant radiological waste processing system.

Sump contents are routinely directed to the plant radiological waste processing system. On occasion, the contents of the 1-5 sump in the Turbine Building may be directed to the Discharge Canal via DSN 004 in accordance with the NJPDES DSW Permit No. NJ0005550.

Sump	Level Control	Location	Pumps to:	Proposed Action
1-1 Sump	Manual	Turbine Building Basement, NW Corner	1-3 Sump	Defer Activities until Decommissioning (See AOC-27)
1-2 Sump	Bubbler	Condenser Bay Drain Pit	Chemical Waste System	Defer Activities until Decommissioning (See AOC-27)
1-3 Sump	Bubbler	Condensate Pump Pit	Chemical Waste System	Defer Activities until Decommissioning (See AOC-27)
1-4 Sump	Bubbler	Hi/Lo Conductivity Room	Chemical Waste System	Defer Activities until Decommissioning (See AOC-27)
1-5 Sump	Bubbler	Turbine Building Basement, SW Corner	Chemical Waste System	Defer Activities until Decommissioning (See AOC-27)
1-6 Sump	Gravity Drain	Reactor Building NE	1-7 Sump	Defer Activities until Decommissioning (See AOC-26)
1-7 Sump	Bubbler	Reactor Building SE	Chemical Waste System	Defer Activities until Decommissioning (See AOC-26)
1-8 Drywell Sump	Captured Air	Drywell Pedestal Area	Chemical Waste System	Defer Activities until Decommissioning (See AOC-27)
1-9 Sump	Bubbler	Old Radwaste Large Pump Room	Chemical Waste System	Defer Activities until Decommissioning (See AOC-30)
1-10 Sump	Bubbler	Old Radwaste Small Pump Room	Chemical Waste System	Defer Activities until Decommissioning (See AOC-30)
1-11 Sump	Bubbler	ORW Small Pump Room (1st sump)	1-10 Sump	Defer Activities until Decommissioning (See AOC-30)
1-12 Sump/62/54	Bubbler	Base of Stack	Chemical Waste System	Defer Activities until Decommissioning (See AOC-28)
1-1 Sump NRW	Bubbler	New Radwaste, NW corner 23'	Chemical Waste System	Defer Activities until Decommissioning (See AOC-31)
1-2 Sump NRW	Bubbler	New Radwaste, SE corner, 23'	Chemical Waste System	Defer Activities until Decommissioning (See AOC-31)
1-3 Sump NRW	Bubbler	New Radwaste, SW corner, 23'	Chemical Waste System	Defer Activities until Decommissioning (See AOC-31)
Hi Conductivity Tank	Bubbler	Hi/Lo Room	1-5 Sump	Defer Activities until Decommissioning (See AOC-26)
Lo Conductivity Tank	Bubbler	Hi/Lo Room	High Purity Waste System	Defer Activities until Decommissioning (See AOC-26)

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Sump	Level Control	Location	Pumps to:	Proposed Action
Reactor Building Equipment Drain Tank Pump (RBEDT)	Level Switches	RBEDT Room	High Purity Waste System	Defer Activities until Decommissioning (See AOC-26)
Drywell Equipment Drain Tank Pump (CWEDT)	Level Switches	Drywell	High Purity Waste System	Defer Activities until Decommissioning (See AOC-26)
Lab Tank Pump	Manual	Reactor Building 23 NW	Chemical Waste System	Defer Activities until Decommissioning (See AOC-26)
Laundry Tank Pump	Manual	Reactor Building 23 NW	Chemical Waste System	Defer Activities until Decommissioning (See AOC-26)
1-13 Sump	Float	TB Basement (conduit run sump)	1-3 Sump	Defer Activities until Decommissioning (See AOC-27)
1-14 Sump	Manual	TB Basement (Stairwell outside SJAE rm)	1-3 Sump	Defer Activities until Decommissioning (See AOC-27)
1-15 Sump	Manual	TB Basement (Stairwell outside SJAE rm)	1-3 Sump	Defer Activities until Decommissioning (See AOC-27)
1-16 Sump	Manual	TB Basement, near 1-1 air compressor	1-5 Sump	Defer Activities until Decommissioning (See AOC-27)
Turbine Building (TBCCW) Heat Exchanger Pit	Timer	TB Basement (Under TBCCW HX)	1-5 Sump	Defer Activities until Decommissioning (See AOC-27)
Condensate Transfer Pad Sump	Manual	Turbine Building	1-3 Sump	Defer Activities until Decommissioning (See AOC-27)
AOG Sump	Manual	SW corner or AOG 23'	AOG Floor Drain Sump	Defer Activities until Decommissioning (See AOC-28)
AOG Floor Drain Sump	Manual	SW corner or AOG 23' under CCW Heat Exchange	1-12 Sump	Defer Activities until Decommissioning (See AOC-28)
Laundry Drain Tank	Manual	NW Corner or Reactor Building 23'	Waste Neutralizer Tank or Overboard	Defer Activities until Decommissioning (See AOC-28)
Lab Drain Tank	Manual	NW Corner or Reactor Building 23'	Chemical Waste System	Defer Activities until Decommissioning (See AOC-28)

The sumps at the OCNGS are directed to the plant radiological waste processing system or to the Discharge Canal via the 30" header (DSN 004), where the flow is monitored and reported in accordance with the requirements of the station's NJPDES permit. The sump vaults are constructed with concrete walls and floors with a minimum thickness of 18 to 24 inches. In

addition, the wastewater disposal systems were designed to ensure that all wastewater would be processed through the plant radiological waste processing system.

Defer Activities until Decommissioning based on the following information:

- Construction of the sumps;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

PROCESS AREA SINKS AND PIPING WHICH RECIEVE WASTE (AOC 12)

AOC-12 Process Area Sinks

Due to the Federal requirements associated with the control of radioactive materials, the wastewater disposal systems were designed to ensure that all wastewater would be processed through the plant radiological waste processing system. During the construction of the facility, all process sinks at the OCNGS were directed to that system. Discharges from a "slop" sink in the Wet Lab in the Pretreatment Building are directed to the 30" header, which discharges into the canal. Discharges from the header are monitored and reported in accordance with the station's NJPDES permit.

The processes at the OCNGS are directed to the plant radiological waste processing system or to the Discharge Canal via the 30" header, where the discharge is monitored and reported in accordance with the requirements of the station's NJPDES permit.

Defer Activities until Decommissioning based on the following information:

- Construction of the lines from the sinks;
- All process sinks in radiologically contamination areas are directed to the radwaste treatment ststem;
- Lack of impact to groundwater on-site; and
- Restricted access to the AOC.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

DRAINAGE SWALES (AOC – 13 - 16)

AOC-13 Eastern Drainage Swale

The eastern drainage swale collects water from the eastern parking lots, fuel storage area and hazardous/non-hazardous waste storage areas. There are no radiological materials or wastes stored in these areas.

In 1999, the OCNGS conducted a soil-sampling program in the fuel storage area. This area is located immediately adjacent the eastern drainage swale. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. However, the concentrations detected were below the NRC decommissioning guidelines. Twenty (20) soil samples were collected late in 1992 and an additional thirteen (13) soil samples were collected in 1999. Analytical results from the soils indicated that none of the samples obtained in 1999 contained Co-60 and the highest concentration of Cs-137 was reported at 0.111 pCi/g, which is similar to the normal environmental concentration for this nuclide. The results of the 1992 samples indicated the highest concentrations of Co-60 reported was 0.0996 pCi/g and the highest concentration of Cs-137 was 0.211 pCi/g. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils in the area of the drainage swale;
- Concentrations of the radionuclides detected in the adjacent soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of detectable radionuclides in the drainage swale;
- Lack of impact to site wide groundwater.

AOC-14 Northern Drainage Area

The Northern Drainage Area collects water from the north side of the OCNGS property. The drainage swale does not receive surface flow from production areas or radiological material/wastes storage areas.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

In 1992 and in 1999, the OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides in the northern field area. This area is located immediately adjacent the northern drainage swale. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. However, the concentrations detected were below NRC decommissioning guidelines. Eight (8) soil samples were collected in 1992 and three (3) samples were collected in 1999. Analytical results from the soils indicated that none of the samples obtained in 1999 contained either nuclide. The results of the soil samples collected in 1992 indicated the highest concentrations of Co-60 of 0.068 pCi/g and Cs-137 of 0.130 pCi/g. The concentrations are similar to normal environmental concentrations. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I and Appendix N.

Defer Activities until Decommissioning based on the following information:

- Concentrations of the radionuclides detected in the adjacent soils in 1992 were below the NRC's soil guideline for decommissioning facilities;
- Lack of detectable radionuclides in the drainage swale;
- Lack of impact to site wide groundwater.

AOC-15 Southern Drainage Area

The Southern Drainage Area collects water from the southern parking lots, Heli-Port and administration building. There are no radiological materials or wastes stored in the aforementioned areas.

In 1999, the OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the southern portion of the facility, which ultimately discharged its storm water to the southern drainage swale. The results of the sampling program indicate detectable concentrations of Cs-137 in three (3) of the eleven (11) samples collected. However, all concentrations detected were below the NRC's soil guideline at decommissioning of 11 pCi/g. Analytical results from the soils indicated that the highest concentrations of Cs-137 detected was 0.030 pCi/g, which is consistent with normal environmental background for this nuclide. Co-60 was not detected in any of the soil samples analyzed. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of the Appendix and Appendix N.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils in the area of the drainage swale, which is probably normal background;
- Concentrations of the radionuclides detected in the adjacent soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of detectable radionuclides in the drainage swale;
- Lack of impact to site groundwater.

STORM SEWER COLLECTION SYSTEMS (AOC-16)

AOC-16 Storm Sewer Collection Systems

The storm sewer collection system at the OCNGS consists of a series of catch basins and underground storm water pipelines, which receive and transport storm water throughout the station to various discharge points. Storm water discharges at the OCNGS are directed to the following:

- The Intake/Discharge Canal in accordance with the permit limits and monitoring requirements of NJPDES Permit No. NJ0005550;
- a trench located adjacent to a wooded area, north of the Main Gate Entrance (discussed in AOC-13);
- the water mound located at the northern portion of the OCNGS (discussed in AOC-18); and,
- a storm drainage area south of the Main Gate Entrance (discussed in AOC-15).

NFA - The Storm Sewer Collection System discharges are regulated under NJPDES. In addition, the drainage swales do not receive surface flow from production areas. Finally, information regarding the receiving waters, the Canal, is discussed in detail below.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

SURFACE WATER BODIES (AOC-17)

AOC - 17 Intake/Discharge Canal

The Intake/Discharge Canal was excavated during the construction of the OCNGS in the 1960's to provide cooling water for the facility operations. The Canal receives water from the Barnegat Bay, Oyster Creek and Forked River. Water from the Canal is ultimately discharged back to the Barnegat Bay. The soil and sediment excavated from the canal were used as fill at the site. Prior to the excavation of the canal, the land west of U.S. Route 9 was vacant and undeveloped, while the land east of U.S. Route 9 was used for beef cattle farming.

Maintenance of the canal has included dredging activities in 1978, 1984, and 1997. Analytical results of dredge spoils sampling and analysis conducted as part of GPUN's request for interim closure of an Upland Confined Disposal Facility are discussed in AOC-38. Discharges to the canal are discussed in AOC-24.

Oyster Creek Nuclear Generating Station samples the surface water, sediments, and aquatic life on a regular basis. In 1998 twenty-eight (28) surface water samples were obtained and analyzed for gamma-emitting radionuclides. One gamma-emitting nuclide, potassium-40 (K-40) was detected in 27 of the 28 analysis performed. Tritium (H3) activity was detected in one sample. Both of these radionuclides are naturally occurring and commonly found in salt water at or above the observed concentrations. No other plant specific radionuclides were detected in surface water samples.

Five gamma-emitting radionuclides were detected in the 8 sediment samples collected during 1998. Four of these radionuclides, beryllium-7 (Be-7), potassium-40 (K-40), radium-226 (RA-226) and thorium-232 (Th-232), are naturally occurring and not attributable to plant effluents. Cesium-137 (Cs-137), which is a fission product, was detected in both background and indicator samples. Cs-137 was widely distributed and detected in considerable abundance as a result of fallout following atmospheric weapons tests and the 1986 Chernobyl accident. Cs-137 was released in small quantities from the plant in liquid effluents in past years. The results of the sediment-sampling program indicate that the presence of Cs-137 in the sediment of the facility discharge canal and nearby portions of the Barnegat Bay may be attributable in part to past liquid discharges from the facility. A review of sediment analysis results form 1994 – 1998 period shows Cs-137 was detected in 82% of the background and only 60% of indicator samples. However, Cs-

137 concentrations detected at the two indicator stations, which are closest to the facility discharge point, show concentrations consistently higher than those found at background stations. During the previous five years, the mean concentration of Cs-137 at background stations was 0.032 pCi/g-dry, while the average concentration at the two stations closest the effluent discharge was 0.093 pCi/g-dry. In addition, during the five year period, the highest concentration of Cs-137 at an indicator station was 0.240 pCi/g-dry, which was detected in March 1996. The highest concentration found at a background station during the same five year period was 0.067 pCi/g-dry.

It is important to note that the highest concentration of Cs-137 observed in sediment (0.240 pCi/g-dry) was only slightly above the 0.180 pCi/g-dry Lower Limit Detection specified by the Nuclear Regulatory Commission and only 12% of their Reporting Level for Cs-137 in fish and broad leaf vegetation (2.0 pCi/g-wet). Over the years, there has been a dramatic reduction in liquid discharges from the facility and there have been no routine discharges of liquid radioactive wastes since 1989. As a result of this reduction in liquid effluent, as well as the ongoing natural radioactive decay process, the level of Cs-137 in sediments continues to decrease.

Concentrations of Co-60 were not detected in either indicator or background station sediment samples during 1998. No radionuclides attributable to effluent from the facility were found in samples of clams, crabs and fish collected during 1998. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the surface water, sediments, and aquatic life samples; and
- Limited concentration of radionuclides detected in the surface water, sediments, and aquatic life samples;

AOC-18 Water Mound

The water mound is a canal filled with fresh water for the purpose of maintaining a pressure head on the fresh water aquifers to prevent the intrusion of estuarine water from the Oyster Creek intake canal into the ground water. It was constructed in 1967 in accordance with the Second Interim Order issued by the New Jersey Board of Public Utility Commissioners on April 22, 1966.

Located on the south bank of the intake canal, just west of U.S. Route 9, the water mound is approximately 1,200 feet long, 30 feet wide at the top, and 15-20 feet wide at the bottom. The original depth was 8 feet with overflow drains to ensure a minimum water depth of 1.5 feet. Silt has accumulated in the water mound over the years, reducing the depth considerably. More than 30 years of sampling eleven monitoring wells located around the water mound have demonstrated that there has been no salt-water intrusion into local aquifers attributable to the operation of the intake canal for the Oyster Creek Station.

NFA for this potential AOC because the water mound does not receive surface flow from areas containing radiological materials or wastes.

D. DISCHARGE AND DISPOSAL AREAS

WASTEWATER COLLECTION SYSTEMS - SEPTIC SYSTEMS, SEEPAGE PITS (AOC-19 – 20)

AOC-19 Former On-site Wastewater Treatment Facility

Prior to the connection to the Ocean County Utilities Authority in approximately 1982, sanitary wastes at the OCNGS were directed to a former on-site treatment facility. The former treatment facility was located approximately 200 ft south of the Reactor Building. Discharges to the treatment facility included floor drains in the following: the main office building, the Turbine Building bathrooms, the "clean" (non-radiologically contaminated) portion of the Turbine Building, and the plant engineering building (or the auxiliary office building). Treated liquids discharged to the canal at Discharge Serial No. (DSN) 004 under DSW Permit No. NJ 0005550. Solids were pumped into a steel underground holding tank. Olsen's Septic Service, a local contractor, pumped the tank out on an as-needed basis. Following the connection to the municipal treatment system, aboveground structures associated with the treatment facility were removed.

In 1999, the OCNGS collected four soil samples around the former on-site wastewater facility. The results of the sampling program indicated detectable concentrations of Cs-137 in two (2) of the four (4) samples at concentrations 0.11 pCi/g and 0.036 pCi/g below NRC decommissioning guidelines at decommissioning of 11 pCi/g. Co-60 was not detected in any of the soil samples

analyzed. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of the Appendix and Appendix N.

NFA – The former on-site Wastewater Treatment System received wastewater from the non-radiological portions of the site. The treatment system was cleaned prior to demolition. In addition, groundwater in the area of the former system is monitored on a regular basis. The analytical results from the site-wide monitoring program can be found in Appendix N.

AOC-20 Seepage Pit

The domestic water system at the OCNGS withdraws water from a 300 ft deep well finished in the Kirkwood Aquifer. This water is filtered through the plant's domestic water treatment system. Approximately 2,000 gallons per day are backwashed from this treatment system to a 6 ft by 9 ft concrete cylinder with a perforated bottom that is located within 125 feet of the plant's Discharge Canal. Presently, the plant's water treatment system is a fully containerized, mobile treatment system provided by a water treatment contractor. Originally, "hard coal filters" were used to filter the domestic water for the OCNGS, however, these were abandoned in favor of the more modern trailer-mounted system. The present trailer-mounted system uses sand as a filtering media in lieu of the original hard coal system.

After water from the 300-ft deep Kirkwood well is processed by the plant's domestic water treatment system, it is also used as raw water for replenishing plant systems. To be used for this purpose, domestic water must be highly purified and demineralized. A second mobile treatment system equipped with ion exchange resins is used for this purpose. Periodically, it is necessary to exchange this second trailer-mounted fully containerized, mobile system with a regenerated system. The schedule for this exchange is not regular or calendar driven, but is dependent upon the quality of the output water. Operating experience to date has shown that a new trailer is needed about once every two months. To ensure that the water in the new system upon arrival at the OCNGS does not affect the high purity requirements of the OCNGS, it is necessary to flush the new system with domestic water that has already been filtered by the sand beds in the first trailer. Flushing is accomplished only when a new trailer-mounted system arrives on site. This new system flush consists of approximately 1,000 gallons of demineralized water, which is discharged to the 6 ft by 9-ft concrete cylinder previously described. This flushing operation occurs each time that a new trailer arrives on site.

All of these activities are regulated by NJPDES Discharge to Ground Water Permit No. NJ0101966. This permit requires annual sampling of the backflush of the domestic water treatment system. Samples of the backflush are collected prior to discharge to the 6-ft by 9-ft concrete cylinder, representing the worst case, pre-dilution conditions. The specific sampling location is the pre-treatment building, 160 ft north of the 6-ft by 9-ft cylinder. Required analyses are pH, total dissolved solids (TDS), iron and manganese. There are no permit limits for these parameters; however, reporting to the NJDEP is required if the measured values exceed the historical range. In addition, a quarterly grab sample is required prior to discharging the regenerated treatment system flush to the 6-ft by 9-ft concrete cylinder. The specific sample location is the sample outlet just west of the pre-treatment building. Although no limits are imposed, analyses for pH, TDS, total iron, chlorides, total sodium and total petroleum hydrocarbons are required. The above-described discharges have almost no effect on groundwater quality. The direction of groundwater flow in the vicinity of the discharges is towards the OCNGS Discharge Canal and the Discharge Canal is within 125 feet of the discharge to groundwater. Therefore, only a very small volume of groundwater can actually receive this discharge and that volume eventually discharges to surface water (the Discharge Canal).

In 1999, the facility conducted a soil-sampling program for the gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the area of the Seepage Pit. The results of the sampling program indicate detectable concentrations of Cs-137. However, the concentrations detected were below the NRC decommissioning guideline of 11 pCi/g. Three (3) of the five (5) samples of Cs-137 obtained were below the method detection limit. The highest concentration reported for Cs-37 was 0.084 pCi/g, which is consistent with normal background for this nuclide. Co-60 was not detected in any of the five samples. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils (probably background);
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

E. *Other Areas of Concern*

OPEN AREAS AWAY FROM PRODUCTION AREAS (AOCs 21 – 23)

AOC-21 Undeveloped Areas North, East and South of OCNGS

The areas north, east and south of the OCNGS are generally vacant and undeveloped, with the exception of the water mound located along the northern perimeter of this area (discussed in AOC-18). These areas surrounding the OCNGS have not been used for the storage or handling of radioactive material.

NFA because there have been no activities which would be expected to impact the soil.

AOC-22 Former Laydown Area at Northeast Portion of OCNGS

An area identified as the Laydown area is located at the northeast portion of the OCNGS, north-northeast of the Fuel Tank Area. The Laydown Area is a gravel/soil area at which a temporary building was located in 1991 and 1992. Grit blasting was performed in the building. A four-foot high soil pile measuring approximately 50 ft by 25 ft is located in this area. The soil pile was generated during the construction of the new office building in 1994.

OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides in the area of the above referenced tank. The results of the sampling program indicate detectable concentrations of Cs-137. However, the concentrations detected were below NRC decommissioning guideline. Four (4) of the five (5) samples for Cs-137 obtained were below the method detection limit. The highest concentration reported for Cs-37 was 0.037 pCi/g, which is consistent with normal environmental background for this nuclide. Co-60 was not detected in any of the samples. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils (probably backgroud);
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities; and

- Restricted access to the AOC.

AOC-23 Undeveloped Area East of U.S. Route 9

The majority of the Property consists of undeveloped land located east of U.S. Route 9. This area (Finninger's Farm) was formerly used for raising beef cattle until purchase by JCP&L in 1966. Historical and recent uses for this area include:

- To deposit excavated/dredged soil and sediment during the construction of the intake and discharge canals for the OCNGS (AOC-17);
- As a source of topsoil for re-vegetation projects on and around the OCNGS;
- As an office and marine-life sample processing facility (in a building formerly located on the property) for environmental consultants studying fish and other marine organisms in Barnegat Bay from 1975 through 1988. These activities included the preservation of samples of marine life in 10% formalin and 40% isopropanol.
- To deposit dredged material resulting from periodic maintenance dredging in the intake and discharge canals. This material was all deposited at the location of the existing 17.5 acre Upland Confined Disposal Facility during dredging projects in 1978, 1984 and 1997 (addressed in AOC-38); and,
- As a location for environmental monitoring activities including continuous air monitoring, ground water monitoring and the planting of gardens to provide vegetables for radiological analyses.

NFA for this potential AOC because the areas listed above have been addressed as separate AOCs or the activities conducted (source of topsoil and environmental monitoring activities) do not present potential impacts to soil/groundwater; and, there was no industrial activity in the remaining portion of the property.

NON-CONTACT COOLING WATER DISCHARGES

The OCNGS is authorized to discharge non-contact cooling water from the following outfalls in accordance with the requirements of NJPDES Permit No. NJ0005550 which was issued 10/21/94 and is effective 12/01/94 through 11/30/99 (renewal application submitted 05/28/99):

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

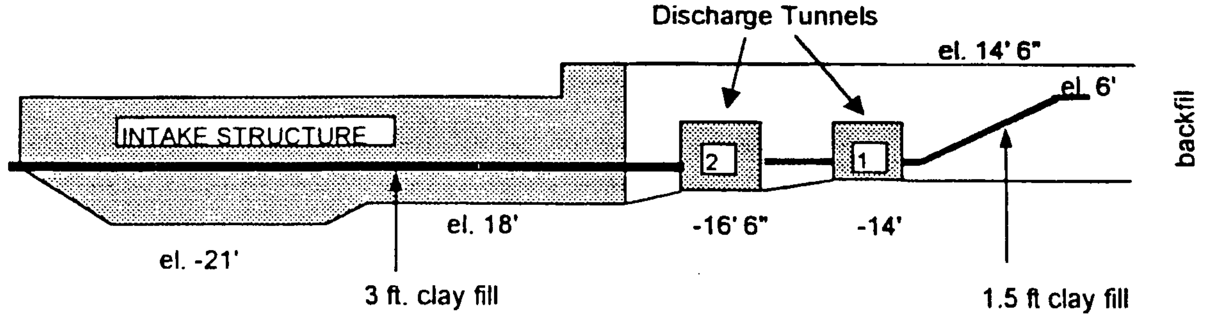
AOC-24A DSN 001 - Main condenser non-contact cooling water

Discharge DSN 001 is located at the southern side of the land bridge that separates the Intake and Discharge Canals. Samples are collected at the outfall of DSN 001 for thermal parameters, and in the main condenser discharge tunnel just east of the chlorine monitor shed prior to the outfall or at the outfall of DSN 001 for all other parameters and reported monthly.

The circulating water system supplies cooling water to the main condenser to condense low-pressure turbine exhaust steam. The circulation system consists of the circulating water system pumps and condenser along with a vacuum priming system. The four circulating water pumps each have a designed capacity of 115,000-gpm. Under normal operation, the four pumps deliver a total of 460,000 gpm, 450,000-gpm is supplied to the main condenser and 10,000 gpm is diverted to the Turbine Building Cooling Water heat exchangers. The pumps discharge into 66-inch lines which direct flow to a 10.5 ft. square tunnel to the turbine building west wall. Circulating water enters and leaves the three condenser shells through 6-ft. lines. On the discharge side of the main condenser, the 6-ft. lines join into a 10.5-ft. square tunnel, which leads the water to the discharge canal. The tunnel itself serves as a seal well, since its roof is below minimum water level in the discharge canal. The 5-ft deicing recirculation tunnel runs below the water level back to the intake structure.

The total depth of the intake structure is variable. The deepest part of the structure is approximately el. −21'. The eastern half of the structure is slightly shallower at approximately el. −18'. The structure appears to be founded on the Cohansey Formation. The clay in this area is shallower than el. −18. In the figure presented below, the bottom of the fill is presumed to be the bottom of the intake structure.

SIMPLIFIED CROSS SECTION OF INTAKE STRUCTURE (not to scale)



As described in the discussion of AOC-17 (Intake/Discharge Canal), extensive sampling of surface water, sediments and aquatic life has demonstrated that CO-60 was not detected in any environmental samples and Cs-137 was only found in sediments at concentrations slightly above the lower limit of detection.

In addition, as part of the facility's REMP, a composite sampler located immediately downstream of discharge point 004 monitors for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the surface water, sediments, and aquatic life samples; and
- Limited concentration of radionuclides detected in the surface water, sediments, and aquatic life samples

AOC-24B DSN 002 - Heat exchanger non-contact cooling water

Discharge DSN 002 is located north of the land bridge that separates the Intake and Discharge Canals. Samples are collected from the common header located on the 23-foot elevation of the New Radwaste Heat Exchanger Room, or the sampling point located near the end of the discharge pipe for DSN 002, and are reported monthly.

As described in the discussion of AOC-17 (Intake/Discharge Canal), extensive sampling of surface water, sediments and aquatic life has demonstrated that CO-60 was not detected in any environmental samples and Cs-137 was only found in sediments at concentrations slightly above the lower limit of detection.

In addition, as part of the facility's REMP it monitors a composite sampler immediately downstream of discharge point 004. The samples are obtained daily and analyzed weekly for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the surface water, sediments, and aquatic life samples; and
- Limited concentration of radionuclides detected in the surface water, sediments, and aquatic life samples

AOC-24C DSN 004 – Storm water runoff, non-contact cooling water from reactor building and emergency service water heat exchangers and discharge from the 1-5 sump

Discharge DSN 004 is located south of the land bridge that separates the Intake and Discharge Canals. Samples are collected at the sample pipe located inside the fence near the terminus of the 30" header or at the outfall of DSN 004 (depending on site conditions), and reported monthly. This point source could receive wastewater from the liquid Radwaste discharge, however, this system has not been used for 10+ years.

As described in the discussion of AOC-17 (Intake/Discharge Canal), extensive sampling of surface water, sediments and aquatic life has demonstrated that CO-60 was not detected in any environmental samples and Cs-137 was only found in sediments at concentrations slightly above the lower limit of detection.

In addition, as part of the facility's REMP it monitors a composite sampler immediately downstream of discharge point 004. The samples are obtained daily and analyzed weekly for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the surface water, sediments, and aquatic life samples;
- Limited concentration of radionuclides detected in the surface water, sediments, and aquatic life samples; and
- Discharges are monitored in accordance with the requirements of NJPDES Permit No. NJ0005550. Additional information pertaining to permitted discharges at the OCNGS is provided in Appendix D.

ACTIVE OR INACTIVE PRODUCTION WELLS

AOC-25 Production Wells

Two production wells on site are installed in the Kirkwood Formation. The South Well (Permit No. 33-1095) is 300 feet deep, located near the Diesel Generator Building and is used for potable water, and as a source of make-up water for plant systems (AOC-1A).

The North Well (Permit No. 3323652) is 162 feet deep, located north of the North Parking Area and is used for potable water and as a source of make-up water for plant systems (AOC-1A). The South Well is sampled on a quarterly basis as part of the routine REMP. The results for 1998 showed no plant specific radionuclides in water samples from the well.

NFA for this potential AOC because the wells are in use and are tested in accordance with the requirements of the Safe Drinking Water Act; and the wells are maintained within secure areas.

F. BUILDING INTERIOR AREAS WITH POTENTIAL FOR DISCHARGE

BUILDING INTERIOR AREAS (AOCs 26 – 37)

AOC –26 Reactor Building

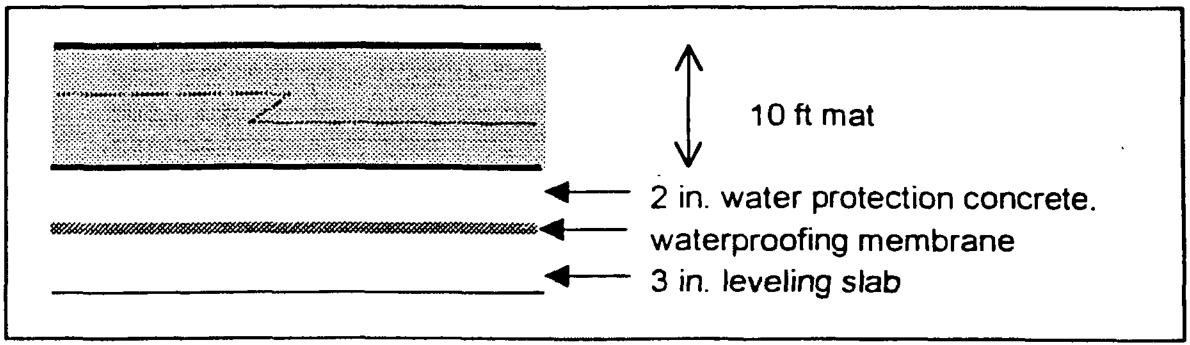
The Reactor Building stands approximately 150 feet high with 42 feet extending below grade. It serves as a secondary containment unit and houses the primary containment dry well as well as the reactor vessel and its auxiliary systems. In addition, all refueling equipment, and the spent fuel storage pool are all located inside the Reactor Building. The dry well which houses the reactor vessel, is constructed of high-density reinforced concrete with an inner steel liner measuring 120 ft. high and 70 ft. in diameter.

The Reactor Building has been designed as a secondary containment system for all operations conducted in the building. The building was designed and constructed specifically to eliminate the potential release of contaminants to the surrounding environment. The building walls are 3ft. thick reinforced concrete. The Reactor Building foundation is a 10-ft. thick steel reinforced concrete slab. Underlying the slab is a waterproofing system that consists of the following: a 3-inch

concrete leveling slab; a waterproofing membrane which extends to approximately 15-ft. below ground surface (bgs); and a 2-inch concrete protective slab. Groundwater in the area of the Reactor Building is generally located at 6 to 8 ft. bgs. As noted above, the reactor floor is approximately 42 feet below grade. Consequently, a breach in the Reactor Building floor or walls would result in groundwater entering the building. Since no groundwater has permeated the Reactor Building floor or walls, the integrity of building has been maintained.

Four soil samples were collected within the vicinity of the Reactor Building in 1999. Concentrations of Co-60 were detected in three (3) of the four (4) soil samples at concentrations raging from 0.75 pCi/g to 1.75 pCi/g. Concentrations of Cs-137 were detected in all four (4) samples ranging from 0.145 to 10.3 pCi/g. Information regarding the potential release of contaminants from this building is discussed in detail in Appendix M "Theoretical Release Study".

SIMPLIFIED CROSS-SECTION OF FOUNDATION W/ WATERPROOFING



Two monitoring wells (W-3 and W-4) are located hydrogeologically downgradient of the area and an additional two monitoring wells (MW-9 & MW-10) are located cross gradient. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-4 and MW-9 at concentrations of 140 pCi/L and 340 pCi/L respectively (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Defer Activities until Decommissioning based on the following information:

- Construction features of the building;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 27 Turbine Building

The Turbine Building houses the turbine-generator, control room, main condensers, power conversion equipment and auxiliary systems. The turbine-generator consists of one high-pressure turbine, three low-pressure turbines, a generator and an exciter. Steam is supplied to the high-pressure turbine from the reactor. After being used to drive the turbines and generator, the steam is condensed in the main condensers and returned to the reactor vessel in the form of water through the condensate and feedwater pumps. There are two sets of tunnels entering or exiting the Turbine Building. These tunnels are used to provide non-contact cooling water to the condensers. The water is subsequently returned to the canal through the second set of discharge tunnels.

The Turbine Building has been designed as a secondary containment system for all operations conducted in the building. The building was designed and constructed specifically to eliminate the potential release of contaminants to the surrounding environment. The building walls are 3ft. thick reinforced concrete and extend from the basement levels to the operating floor about 23 ft. above grade. The Turbine Building foundation is 6 ft. to 8-ft. thick steel reinforced concrete slab. The Turbine Building mat or foundation overlaps the Reactor Building mat where the two buildings abut. As noted above, the Turbine Building's bottom floor is approximately 23 feet bgs. Consequently, a breach in the Turbine Building floor or walls would result in groundwater entering the building. A detailed description of the building and information regarding the potential release of contaminants from this building is discussed in detail in Appendix M "Theoretical Release Study.

Two monitoring wells (W-3 and W-4) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-4 at a concentration of 140 pCi/L (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant

specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Construction features of the building;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC-28 Stack

The ventilation stack is 368 feet high with 26 feet extending below grade. The stack provides ventilation for the Reactor Building, Turbine Building and Radwaste facilities and is part of the facility's off-gas system. The air ejector and off-gas systems are designed to remove noncondensables from the main condensers and provide for their safe dispersal to the environment. Three steam jet air ejectors and one mechanical vacuum pump are used in a conventional arrangement for removing noncondensables from the main condensers. The nature of the noncondensables however, is quite different from that found in fossil-fueled plants: gaseous hydrogen and oxygen formed by radiolytic decomposition of the reactor water are the major constituents amounting to more than twice the volume of air in –leakage to the main condensers. The principal radioactive noncondensables are short-lived isotopes of nitrogen that occur normally in the boiling water reactor cycle. Ultimately, the system is designed to remove air and noncondensables from the main condensers, and delays radioactive materials in the hold-up pipe for decay. The exhaust from this system is discharged to the Exhaust Tunnel System and ultimately to the stack.

The base of the stack is comprised of a 7-ft. steel reinforced concrete pad. The foundation includes the typical 3 part waterproofing system (leveling slab, waterproof membrane, and protective slab). The waterproofing system may extend around the entire foundation. A single sump (Sump No. 1-12) underlies the stack foundation. The sump has a 4-ft. diameter and is located west of the center of the stack. Two primary tunnels attach to the stack from the Reactor Building/Turbine Building and the Old/New Radwaste buildings. These tunnels are described above in AOC – 9.

Two monitoring wells (W-9 and W-10) are located hydrogeologically downgradient of the area. As previously noted, the monitoring wells are sampled semi-annually as part of the REMP. Each well was sampled for gamma-emitting radionuclides associated with fission processes and tritium. The analytical results from these wells indicated only tritium was detected in MW-9 at a concentration of 340 pCi/L (USEPA Drinking water standard for tritium is 20,000 pCi/L). No other plant specific radionuclides were detected in either well. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Construction features of the Exhaust Stack;
- Lack of impact to groundwater; and
- Restricted access to the AOC.

AOC-29 Exhaust System Pipes

Exhaust gases from the main condensers are transported to the Exhaust Stack via two pipes. The primary pipe starts as a 38-inch line from the condensers and is processed through the air ejectors. The pipe from the ejectors is a 48-inch line that is used as a 30-minute holdup line to delay decaying radioactive materials. The line from the ejectors leaves the Turbine Building and extends underground to the Exhaust Stack. The second line from the steam packing exhauster and the mechanical vacuum pumps starts as a 30-inch line and expands to 36-inches at the Exhaust Stack. This line also leaves the Turbine Building and proceeds underground to the Exhaust Stack. Once in the Exhaust Stack, the gases from both lines are filtered and monitored prior to dispersion. This area was investigated along with AOC-9.

Defer Activities until Decommissioning based on the following information:

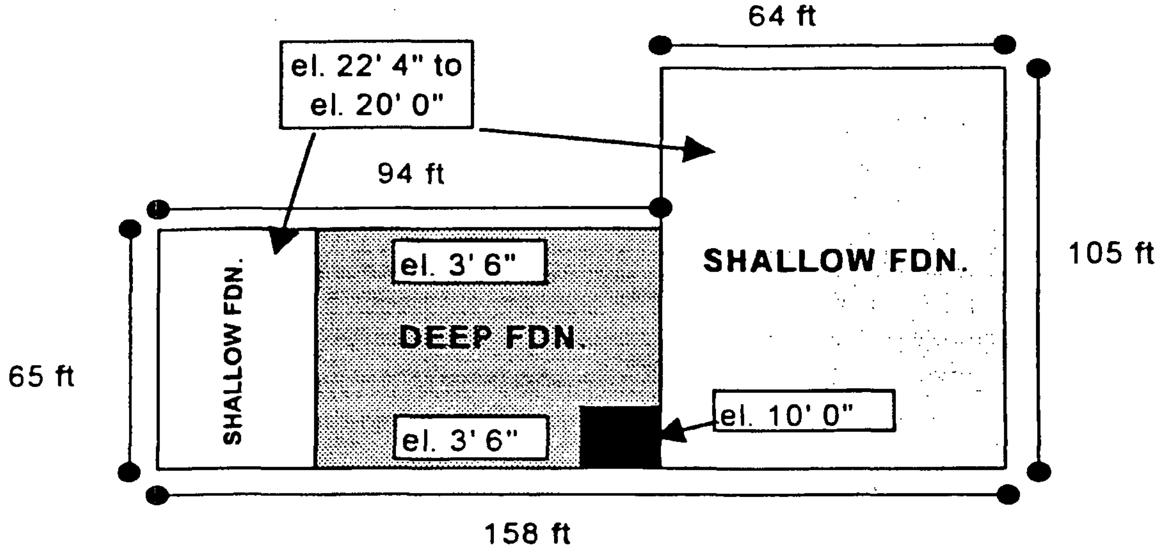
- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to groundwater; and
- Restricted access to the AOC

AOC – 30 Old Radwaste Building

The Old Radwaste Building is located directly east of the Reactor Building. The building was historically used for wastewater treatment. However, these operations were relocated to the New Radwaste Building. Currently, operations in the building include water purification and process waste disposal packaging. In addition, equipment used during plant operations for waste compaction and waste transfer is housed in the building.

The Old Radwaste Building has been designed and constructed specifically to eliminate the potential release of contaminants to the surrounding environment. The building is a single story reinforced concrete structure with a two-story penthouse. A small basement area is located in the central portion of the building and a pipe tunnel extends from this building to the New Radwaste Building and the Exhaust Stack. The building is comprised of three primary sections, see Figure, two with shallow foundations and the third section (middle section) having a deep foundation. Each of the three sections is constructed on a reinforced concrete mat. Beneath the mat, the building has an impermeable liner that is situated above a concrete leveling pad. Information regarding the potential release of contaminants from this building is discussed in detail in Appendix M "Theoretical Release Study". A detailed description of the building, sumps and tunnels is also provided in the aforementioned appendix.

SIMPLIFIED PLAN VIEW OF OLD RADWASTE BUILDING (not to scale)



The soils in the vicinity of the Old Radwaste Building were sampled extensively along with AOC-4A, AOC-4B, and AOC-4C. In addition to soil characterization as described in AOC-4, additional sampling was conducted on August 8, 1999. Sampling was conducted within the vicinity of the Old Radwaste Building's concrete pad following a spill of mop water. A total of three surface soil samples were collected for gamma-emitting radionuclides. Two samples exceeded the NRC decommissioning guideline for Co-60 at concentrations of 7 pCi/g and 10.2 pCi/g. Concentrations of Cs-137 ranged from 0.64 pCi/g to 6.04 pCi/g, below NRC decommissioning guidelines. Information regarding the sampling can be found in the respective sections. In addition, detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Construction features of the building;
- Limited extent of radionuclides detected in the soils surrounding the building;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 31 New Radwaste Building

The New Radwaste Building is located northeast of the Reactor Building. The building is used for wastewater purification/treatment processing and waste disposal packaging. The New Radwaste Building has been designed and constructed specifically to eliminate the potential release of contaminants to the surrounding environment. The building foundation is constructed of approximately 4 ft. of steel reinforced concrete underlain by a 2–inch protective concrete layer, a waterproof membrane, and a 2-inch concrete leveling mat. The thickness of the leveling mat is variable (from 2 to 4 inches); hence the use of the term "approximately" is used in describing the foundation thickness.

In 1999, the OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides around the New Radwaste Building. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. However, the concentrations detected were below the NRC decommissioning. Twenty-seven (27) samples were collected in 1981 and 1999. The highest concentration reported for Co-60 was 1.5 pCi/g and for Cs-137 the highest concentration

reported was 3.5 pCi/g. Detailed information pertaining to the analytical samples and results referenced above can be found in Attachment I of this Appendix and Appendix N.

Defer Activities until Decommissioning based on the following information:

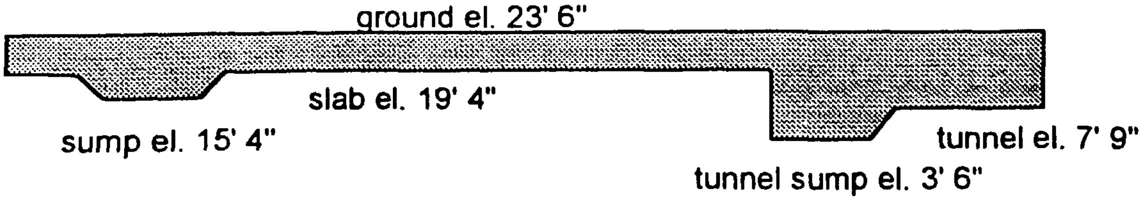
- Construction features of the building;
- Limited extent of radionuclides detected in the soils surrounding the building;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 32 New Radwaste Building Tunnel

There is a single tunnel leading from the New Radwaste Building to the Old Radwaste Building. The depth of the tunnel is at 7.67 ft. above mean sea level (approximately 14-ft. bgs). The tunnel is constructed of 3-ft. thick steel reinforced concrete. A 4-inch slab protects the bottom of the tunnel; a water membrane. The waterproof membrane extends up the sides of the tunnel and was protected by fiberboard before backfilling. Three-inch keys and 6-inch water stops key the sides of the tunnel to the top and bottom. The tunnel is equipped with a sump at the base of the tunnel where it originates in the New Radwaste Building. The construction of the sump is basically the same as the tunnel itself. The tunnel slopes downward towards the Old Radwaste Building. Information regarding the potential release of contaminants from this building is discussed in detail in Attachment I of this Appendix and in Appendix M "Theoretical Release Study". A detailed description of the building, sumps and tunnels is also provided in the aforementioned appendix.

NEW RADWASTE TUNNEL

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION



Defer Activities until Decommissioning based on the following information:

- Construction features of the tunnel;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 33 Low Level Radwaste Storage Building

The Low Level Radwaste Storage Building is located north of the New Radwaste Building. The building is used for staging radioactive materials prior to disposal or re-use.

The Low Level Radwaste Building has been designed and constructed specifically to eliminate the potential release of contaminants to the surrounding environment. This building has a reinforced concrete walls and base mat. The upper walls and ceiling are steel truss work construction, with precast concrete exterior panels on the walls, while the lower walls are steel reinforced concrete. The top of the base mat of the building is at an elevation of 25 ft. above mean sea level. Information regarding the potential release of contaminants from this building is discussed in detail in Attachment I of this Appendix and in Appendix M "Theoretical Release Study". A detailed description of the building, sumps and tunnels is also provided in the aforementioned Appendix.

The facility conducted a soil-sampling program for the gamma-emitting in the area of the Low Level Radwaste Storage Building. The results of the sampling program indicate detectable concentrations of Cs-137 in one of the four (4) samples obtained. However, the concentrations detected were below the NRC decommissioning guidelines. Analytical results for the samples indicated that three (3) of the four (4) samples were below the method detection limits for Cs-137. The highest concentration reported for Cs-137 was 0.017 pCi/g, which is consistent with normal background for this nuclide. Co-60 was not detected in any of the samples collected. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Construction features of the building;
- Limited extent of radionuclides detected in the soils surrounding the building;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

AOC – 34 Laundry Facility Radioactive Materials

A Laundry Facility is used to store laundered clothing. These clothes although laundered, may potentially contain residual licensed radioactive materials. The building is located to the northeast of the Old Radwaste Building.

Defer Activities until Decommissioning based on the following information:

- Limited potential for migration of radionuclides; and
- Restricted access to the AOC.

AOC – 35 Radioactive Materials Storage Freight Containers

There are five (5) freight containers that are used to store equipment that may potentially contain residual licensed radioactive materials. Two (2) of the containers are located east of the New Radwaste Building; two (2) of the containers are located east of the Old Radwaste Building and the fifth container is located north of the Old Radwaste Building. Each of these areas was investigated along with AOC-4C, AOC-4A, and AOC-31.

Defer Activities until Decommissioning based on the following information:

- Limited potential for migration of radionuclides; and
- Restricted access to the AOC.

AOC-36 New Maintenance Building Hot Machine Shop/Respirator Facility

The New Maintenance Building Hot Machine Shop/Respirator Facility is located immediately north of the Turbine Building. Tools and other surface contaminated equipment are maintained in the facility's Hot Machine Shop. In addition, pumps, parts and other equipment-requiring repair are stored at the machine shop. Once repaired, the equipment is placed back in service or is placed in inventory for future use.

Defer Activities until Decommissioning based on the following information:

- Limited potential for migration of radionuclides; and
- Restricted access to the AOC.

AOC-37 Instrument Calibration Trailer #20

An instrument calibration trailer is located on the southwestern portion of the property. Instruments containing sealed radioactive sources are stored in the trailer for calibration purposes.

Defer Activities until Decommissioning based on the following information:

- Limited potential for migration of radionuclides; and
- Restricted access to the AOC.

G. ANY OTHER SITE-SPECIFIC AREA OF CONCERN

AOC-38 UPLAND CONFINED DISPOSAL FACILITY

The Upland Confined Disposal Facility (CDF) is a portion of the site located east of U.S. Route 9 used for the deposition of dredged material resulting from periodic maintenance dredging in the intake and discharge canals. Maintenance dredging was conducted in 1978, 1984 and 1997. The CDF consists of 17.5 acres and is identified as Block 100, Lots 13 through 16 & 20. Perimeter fencing surrounds the CDF; locked gates restrict access to the site.

Prior to the most recent dredging project (1997), an investigation of the soil at the CDF was conducted. All samples were collected in August of 1997, and represent sediment from previous dredging projects. Eighty-six samples were collected and analyzed for the gamma-emitting

radionuclides associated with facility effluent (e.g., Co-60 & Cs-137). Only one of the 86 samples detected Co-60 at 0.075 pCi/g. Forty of the 86 samples detected Cs-137, with a maximum concentration of 0.42 pCi/g. All detections of both radionuclides were well below the NRC decommissioning concentration guidelines.

Additionally, prior to the 1997 dredging project, nine sediment cores were collected from the Forked River in areas that were to be dredged and deposited in the CDF. Eight of the nine samples had detectable levels of both Co-60 and Cs-137. All results for both radionuclides were well below the NRC guideline; the maximum concentrations for Co-60 and Cs-137 were 0.088 pCi/g and 0.27 pCi/g, respectively. Additional information pertaining to the analytical samples and results referenced above can be found in Appendix N.

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities; and
- Restricted access to the AOC.

AOC-39 Condensate Transfer Overboard Discharge Event

On September 17, 1998, approximately 148,800 gallons of condensate transfer water was discharged to the Circulating Water discharge tunnel via the Fire Protection System, and ultimately released to the Oyster Creek discharge canal. Following the release, an investigation of potentially impacted surface water, sediments and biota (clams) was conducted. In surface water, tritium levels in the condenser intake were slightly elevated (330 +/- 110 pCi/L). The maximum tritium concentration observed in surface water samples (16,000 pCi/L) did not exceed the USEPA drinking water limit (20,000 pCi/L), and USNRC effluent limitations were not exceeded. Cobalt-60 was the only gamma emitting nuclide to be detected in surface water, detected in only one of 23 samples, downstream of the 30" header (2.0 +/- 1.2 pCi/L). All sediment samples from the Barnegat Bay and the intake canal were less than the limit of detection. In Oyster Creek sediment, Co-60 was detected in 4 of 16 samples. The maximum sediment concentration was 0.056 pCi/g, well below the NRC guideline of 3.8 pCi/g. All sediment samples were less than or equal to those observed in REMP samples prior to the release. Clams in Barnegat Bay were also sampled and determined to be non-detect for Co-60; this was consistent with previous REMP

sampling results. Tritium was not found in clams collected near the mouth of Oyster Creek, however, low levels attributable to natural background were found in clams from Stouts Creek to the north and Manahawkin Bay to the south.

NFA:

- The concentrations of radionuclides measured in sediment, surface water and clams immediately following this event did not exceed any effluent limitations, drinking water standards or decommissioning guidelines;
- Reduction in concentrations of radionuclides detected in surface water over time; and
- Reduction in concentrations of radionuclides in sediments.

AOC-40 Torus System Leak (May 2, 1980)

Description: The leakage of Torus system water from the containment spray heat exchangers into the station's service water discharge resulted in the release of an unknown quantity of radiologically contaminated water. The leakage that occurred during periods of system testing which occurred for each containment spray system approximately twice per month for 15 to 30 minutes.

The Bureau of Radiation Protection was notified of the release, and when facility personnel assumed this satisfied NJDEP notification requirement, no other NJDEP offices were immediately advised. The notification process was immediately reviewed with facility personnel to prevent this oversight from reoccurring.

In addition, as part of the facility's REMP it monitors a composite sampler immediately downstream of discharge point 004. The samples are obtained daily and analyzed weekly for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

Resolution: The containment spray heat exchangers were completely retubed.

Defer Activities until Decommissioning based on the following information:

- Estimated concentrations of the radionuclides released were well below effluent limitations; and
- Limited extent of radionuclides released to the discharge canal.
- Conservative calculations assuming worst case conditions demonstrated that the isotopic concentration of the discharge were well below the effluent limitations specified by the NRC;
- As described in the discussion of AOC-17 (Intake/Discharge Canal), extensive sampling of surface water, sediments and aquatic life has demonstrated that CO-60 was not detected in any environmental samples and Cs-137 was only found in sediments at concentrations slightly above the lower limit of detection.

AOC – 41 Northern Parking Area

Soils from inside the protected area were excavated in 1982 to evaluate the construction of a building and later to adjust topography for paving. These soils contained detectable radionuclides. Following petition for approval from the NRC, these soils were relocated to the area that is now the north parking lot, between the Low Level Radwaste Storage Facility and the north domestic water pump house, placed in trenches, covered with soil and paved over. Based on extensive soil sampling conducted at the time, concentrations in this area are not expected to exceed the NRC decommissioning concentration guidelines due to mixing during relocation, and decay since placement.

Defer Activities until Decommissioning based on the following information:

- Lack of impact to groundwater;
- the AOC has been capped; and
- Restricted access to the AOC.

AOC-42 Main Fuel Oil Storage Tank/ Berms

The OCNGS excavated and removed soils to complete several projects throughout the site. If during the course of soil excavation contaminated soils are encountered, the soils are sampled and analyzed for fission related radionuclides. Soils containing low levels, but detectable, were placed in piles or in berm on-site. The berm surrounding the main oil storage tank, the berms behind the dilution pumps, the berm on the south side of the Independent Spent Fuel Storage Installation (ISFSI) and the berm around the waste surge tank have been constructed using these soils.

In 1999, the OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the berm and soils around the MFOST. The results of the sampling program indicate detectable concentrations of Co-60 in twelve (12) of the seventeen (17) samples collected. However, all concentrations detected were below the NRC's soil guideline at decommissioning of 3.8 pCi/g. The maximum concentration of Co-60 was 0.95 pCi/g. Concentrations of Cs-137 were detected in fifteen (15) of seventeen (17) samples. The maximum concentration of 3.2 pCi/g is below the NRC guideline of 11 pCi/g. Detailed information pertaining to the analytical samples and results referenced above can be found in Appendix N.

APPENDIX F: QUESTION 5
DESCRIPTION OF POTENTIAL AREAS OF CONCERN WITH PHOTODOCUMENTATION

Defer Activities until Decommissioning based on the following information:

- Limited extent of radionuclides detected in the soils surrounding the building;
- Concentrations of the radionuclides detected in the soils were below the NRC's soil guideline for decommissioning facilities;
- Lack of impact to site wide groundwater; and
- Restricted access to the AOC.

ATTACHMENT 1

AOC TABLES

Attachment I - 1999 Radiological Groundwater Data
Oyster Creek Nuclear Generating Station

	March 1999				September 1999			
Station	Tritium (pCi/L)	K-40* (pCi/L)	Ra-226* (pCi/L)	Th-232* (pCi/L)	Tritium (pCi/L)	K-40* (pCi/L)	Ra-226* (pCi/L)	Th-232* (pCi/L)
WW-1	< 130	< 30	< 40	< 7	< 130	< 40	< 60	< 13
WW-2	200 +/- 90	< 20	< 50	< 8	< 130	< 50	< 80	< 14
WW-3	< 130	< 40	< 60	< 12	160 +/- 90	< 20	< 40	< 7
WW-4	140 +/- 80	< 50	< 80	< 14	< 130	< 20	< 50	< 7
WW-5	380 +/- 100	< 60	< 70	< 14	230 +/- 90	< 40	< 50	< 13
WW-6	< 130	< 40	< 60	< 11	< 130	< 50	< 70	< 13
WW-7	580 +/- 100	< 50	< 70	< 13	190 +/- 90	< 50	< 70	< 14
WW-9	340 +/- 90	< 40	< 70	< 10	140 +/- 90	< 110	< 120	< 20
WW-10	< 130	< 50	< 70	< 15	< 130	< 19	< 40	< 6
WW-12	280 +/- 90	< 40	< 60	< 13	280 +/- 90	< 50	< 70	< 14
WW-13	< 130	< 100	< 110	< 20	< 130	< 40	< 60	< 12
WW-14	< 130	< 20	< 40	< 6	< 130	< 40	< 60	< 11
WW-15	320 +/- 90	28 +/ 17	< 40	< 6	< 130	< 50	< 70	< 13
WW-16	340 +/- 90	< 20	< 40	< 6	< 130	< 40	< 60	< 11
WW-17	< 130	< 40	< 50	< 11	< 130	< 19	< 30	< 4
Number of Wells Sampled	15	15	15	15	15	15	15	15
Maximum	580	28	N/A	N/A	280	N/A	N/A	N/A
Average	322.5	28	N/A	N/A	200	N/A	N/A	N/A
Minimum	140	28	N/A	N/A	140	N/A	N/A	N/A
Number of Positive Results	8	1	0	0	5	1	0	0

* Gamma isotopic nuclides.

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/BTN	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]
1	CAA	91-CAA-SB-0034	4/17/1991	Subsurface Soil	0-1'	Under tank	0.037
1	CAA	91-CAA-SB-0029	3/13/1991	Subsurface Soil	0-1'	NW of CST	0.470
1	CAA	91-CAA-SB-0026	3/13/1991	Subsurface Soil	0-1'	West of CST	0.160
1	CAA	91-CAA-SB-0022	3/13/1991	Subsurface Soil	0-1'	SW of CST in yard	[illegible]
1	CAA	91-CAA-SB-0013	3/13/1991	Subsurface Soil	0-1'	NW of CST	0.480
1	CAA	91-CAA-SB-0001	3/13/1991	Subsurface Soil	0-1'	North of CST	0.045
1	CAA	91-CAA-SB-0037	5/4/1991	Surface Soil	0-6"	Spill in CST Yard - Collection pit under transfer pipe	[illegible]
1	CAA	91-CAA-SB-0036	5/4/1991	Surface Soil	0-6"	Spill in CST Yard at tank discharge valve	[illegible]
1	CAA	91-CAA-SB-0033	4/17/1991	Subsurface Soil	4-5'	Under tank	0.170
1	CAA	91-CAA-SB-0031	3/13/1991	Subsurface Soil	4-5'	NW of CST	<0.030
1	CAA	91-CAA-SB-0027	3/13/1991	Subsurface Soil	4-5'	West of CST	<0.020
1	CAA	91-CAA-SB-0025	3/13/1991	Subsurface Soil	4-5'	NW of CST	0.079
1	CAA	91-CAA-SB-0023	3/13/1991	Subsurface Soil	4-5'	SW of CST in yard	0.035
1	CAA	91-CAA-SB-0009	3/13/1991	Subsurface Soil	4-5'	North of CST	<0.020
1	CAA	91-CAA-SB-0035	4/17/1991	Subsurface Soil	6-7'	Under tank	0.140
1	CAA	91-CAA-SB-0028	3/13/1991	Subsurface Soil	6-7'	West of CST	<0.014
1	CAA	91-CAA-SB-0024	3/13/1991	Subsurface Soil	6-7'	SW of CST in yard	0.034
1	CAA	91-CAA-SB-0017	3/13/1991	Subsurface Soil	6-7'	NW of CST	<0.030
1	CAA	91-CAA-SB-0030	3/13/1991	Subsurface Soil	8-9'	SW of CST in yard	<0.015
1	CAA	91-CAA-SB-0032	4/17/1991	Subsurface Soil	9-10'	Under tank	0.190
1	XWW	91-XWW-SB-0018	3/13/1991	Subsurface Soil	0-1'	SE of CST o/s fence	0.340
1	XWW	91-XWW-SB-0014	3/13/1991	Subsurface Soil	0-1'	SE of CST o/s fence	0.073
1	XWW	91-XWW-SB-0006	3/13/1991	Subsurface Soil	0-1'	East of CST	[illegible]
1	XWW	91-XWW-SB-0005	3/13/1991	Subsurface Soil	10-11'	SE of CST o/s fence	<0.070
1	XWW	91-XWW-SB-0016	3/13/1991	Subsurface Soil	4-5'	SE of CST o/s fence	0.230
1	XWW	91-XWW-SB-0007	3/13/1991	Subsurface Soil	4-5'	East of CST	0.062
1	XWW	91-XWW-SB-0002	3/13/1991	Subsurface Soil	4-5'	SE of CST o/s fence	<0.030
1	XWW	91-XWW-SB-0019	3/13/1991	Subsurface Soil	6-7'	SE of CST o/s fence	1.300
1	XWW	91-XWW-SB-0015	3/13/1991	Subsurface Soil	6-7'	East of CST	0.180
1	XWW	91-XWW-SB-0003	3/13/1991	Subsurface Soil	6-7'	SE of CST o/s fence	<0.020
1	XWW	91-XWW-SB-0020	3/13/1991	Subsurface Soil	8-9'	SE of CST o/s fence	0.190

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]
1	XWW	91-XWW-SB-0008	3/13/1991	Subsurface Soil	8-9'	East of CST	0.420
1	XWW	91-XWW-SB-0004	3/13/1991	Subsurface Soil	8-9'	SE of CST o/s fence	<0.050
1	XWW	91-XWW-SB-0021	3/13/1991	Subsurface Soil	9-10'	SE of CST o/s fence	0.340

<u>Notes:</u>

Co-60 - Cobalt 60

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60)

Attachment I - Soil Dat[illegible]ne Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
2A	EAA	99-EAA-SS-0020	9/1/1999	Surface Soil	0-12"	TWST Yard east of tank (by pump pad)	0.860	0.150
2A	EAA	99-EAA-SS-0010	9/1/1999	Surface Soil	0-12"	TWST Yard north of tank	<0.019	0.054
2A	EAA	99-EAA-SB-0226	12/2/1999	Subsurface Soil	10'-12'	Monitoring Well installationSE of TWST	ND	ND
2A	EAA	99-EAA-SB-0227	12/2/1999	Subsurface Soil	12'-14'	Monitoring Well installationSE of TWST	ND	ND
2A	EAA	99-EAA-SB-0236	12/3/1999	Subsurface Soil	13'-17'	Monitoring well installation NW of TWST	ND	ND
2A	EAA	99-EAA-SB-0225	12/2/1999	Subsurface Soil	14'-18'	Monitoring Well installationSE of TWST	ND	ND
2A	EAA	99-EAA-SB-0015	9/1/1999	Subsurface Soil	36-48"	TWST Yard north of tank	<0.015	0.032
2A	EAA	99-EAA-SB-0013	9/1/1999	Subsurface Soil	36-48"	TWST Yard east of tank (by pump pad)	<0.050	0.110
2A	XWW	99-XWW-SS-0012	9/1/1999	Surface Soil	0-12"	South of TWST Yard (~3 feet)	0.025	0.087
2A	XWW	99-XWW-SS-0009	9/1/1999	Surface Soil	0-12"	West of TWST Yard at well location	<0.016	0.038
2A	XWW	99-XWW-SB-0011	9/1/1999	Subsurface Soil	36-48"	South of TWST Yard (~3 feet)	<0.010	<0.015
2A	XWW	99-XWW-SB-0008	9/1/1999	Subsurface Soil	36-48"	West of TWST Yard at well location	<0.015	<0.018

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-177)

Attachment I - Soil Da[illegible]e Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/BTN	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
2B	XWN	99-XWN-SB-0109	11/17/1999	Subsurface Soil	2.5-3'	Torus piping to Rx Bldg	ND	0.0615
2B	XWN	99-XWN-SB-0105	11/17/1999	Subsurface Soil	2.5-3'	Torus piping to Rx Bldg	ND	ND
2B	XWN	99-XWN-SB-0096	11/17/1999	Subsurface Soil	2.5-3'	Torus piping to Rx Bldg	ND	0.0841
2B	XWN	99-XWN-SB-0167	11/22/1999	Subsurface Soil	4.5-5'	Torus piping to Rx Bldg	ND	0.117
2B	XWN	99-XWN-SB-0103	11/17/1999	Subsurface Soil	4.5-5'	Torus piping to Rx Bldg	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible]r the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area E/N	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
3A	XWN	99-XYN-SS-090	11/16/1999	Surface Soil	0-6"	Northwest corner of TB at oil spill from 8/87	0.114	0.068
3A	XWN	99-XYN-SS-0229	12/3/1999	Surface Soil	0-6"	North of Turbine Dirty Oil Collection Tank	ND	ND

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
3B	XWW	99-XWW-SB-0242	12/8/1999	Subsurface Soil	4'-4.5'	Oil Line from Dirty Oil Tank to TB	ND	ND
3B	XWW	99-XWW-SB-0241	12/8/1999	Subsurface Soil	5'-6'	Oil Line from Dirty Oil Tank to TB	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
4A/B	XWN	99-XWN-SS-0053	9/3/99	Surface Soil	0-12"	North of RB, Near transformers west of D/W Process Facility	ND	0.194
4A/B	XWN	99-XWN-SS-0037	9/2/99	Surface Soil	0-12"	North of D/W Support Center	<0.030	0.068
4A/B	XWN	99-XWN-SS-0029	9/2/99	Surface Soil	0-12"	SW corner of D/W Support Center	<0.020	0.079
4A/B	XWN	99-XWN-SB-0032	9/2/99	Subsurface Soil	192.5-204.5"	North of D/W Support Center	ND	ND
4A/B	XWN	99-XWN-SB-0055	9/3/99	Subsurface Soil	204.75-216.75"	North of RB, Near transformers west of D/W Process Facility	ND	ND
4A/B	XWN	99-XWN-SB-0034	9/2/99	Subsurface Soil	216-228"	SW corner of D/W Support Center	ND	ND
4A/B	XWN	99-XWN-SB-0054	9/3/99	Subsurface Soil	36-48"	North of RB, Near transformers west of D/W Process Facility	<0.040	0.130
4A/B	XWN	99-XWN-SB-0050	9/2/99	Subsurface Soil	36-48"	North of D/W Support Center	<0.020	0.044
4A/B	XWN	99-XWN-SB-0026	9/2/99	Subsurface Soil	36-48"	SW corner of D/W Support Center	<0.040	0.130
4A/B	YAA	99-YAA-SS-0036	9/2/99	Surface Soil	0-12"	North of ORW, NE Corner of filter pad	0.800	4.200
4A/B	YAA	99-YAA-SS-0027	9/2/99	Surface Soil	0-12"	North of ORW, NW Corner of filter pad	0.950	[illegible]
4A/B	YAA	82-YAA-SB-0069	10/13/82	Subsurface Soil	0-18" below pipe	SW of ORW Surge Tank o/s berm	[illegible]	[illegible]
4A/B	YAA	99-YAA-SS-0222	11/30/99	Surface Soil	0'-2'	Oil Line near Boiler House	ND	0.145
4A/B	YAA	82-YAA-SB-0098	10/31/82	Subsurface Soil	0-22"	NE of ORW Surge Tank (25')	4.9	[illegible]
4A/B	YAA	99-YAA-SS-0223	11/30/99	Surface Soil	0-24"	Northeast corner of Boiler House Fuel Oil pumping station	1.75	10.3
4A/B	YAA	82-YAA-SB-0115	10/31/82	Subsurface soil	0-28"	ORW Surge Tank SW of tank (15')	0.500	0.370
4A/B	YAA	82-YAA-SB-0128	10/31/82	Subsurface Soil	0-30'	ORW Surge Tank, South of tank (15')	0.223	0.893
4A/B	YAA	82-YAA-SB-0133	10/31/82	Subsurface Soil	0-30"	SW of ORW Surge Tank (25')	1.591	1.848
4A/B	YAA	82-YAA-SB-0119	10/31/82	Subsurface Soil	0-30"	ORW Surge Tank SW of tank (20')	1.600	0.800
4A/B	YAA	82-YAA-SB-0112	10/31/82	Subsurface Soil	0-30"	East of ORW Surge Tank (10')	0.745	0.534
4A/B	YAA	82-YAA-SB-0109	10/31/82	Subsurface Soil	0-30"	East of ORW Surge Tank (5')	0.792	1.355
4A/B	YAA	82-YAA-SB-0105	10/31/82	Subsurface Soil	0-30"	West of ORW Surge Tank (5')	1.606	7.2
4A/B	YAA	82-YAA-SB-0103	10/31/82	Subsurface Soil	0-30"	NE of ORW Surge Tank (10')	[illegible]	126
4A/B	YAA	82-YAA-SB-0088	10/27/82	Subsurface Soil	0-30"	SW of ORW Surge Tank o/s berm	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0008	10/7/82	Subsurface Soil	0-33'	SE of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0012	10/7/82	Subsurface Soil	0-33"	S. of ORW Surge Tank	1.612	2.454
4A/B	YAA	82-YAA-SB-0010	10/7/82	Subsurface Soil	0-33"	S. of ORW Surge Tank	2.550	14.6
4A/B	YAA	82-YAA-SB-0003	10/7/82	Subsurface Soil	0-33"	SW of ORW Surge Tank	[illegible]	29.6
4A/B	YAA	82-YAA-SB-0001	10/7/82	Subsurface Soil	0-33"	SW of ORW Surge Tank o/s berm	[illegible]	47.6
4A/B	YAA	82-YAA-SB-0007	10/7/82	Subsurface Soil	0-40'	S. of ORW Surge Tank	[illegible]	38.7
4A/B	YAA	99-YAA-SS-0003	8/19/99	Surface Soil	0-6"	North of ORW conc pad - background away from spill area	1.28	0.64
4A/B	YAA	99-YAA-SS-0002	8/19/99	Surface Soil	0-6"	North or ORW conc pad - adjacent to mop water spill area	[illegible]	2.43

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ETS	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
4A/B	YAA	99-YAA-SS-0001	8/19/99	Surface Soil	0-6"	North of ORW conc pad - Mop water spill	[illegible]	6.04
4A/B	YAA	92-YAA-SS-0001	3/2/92	Surface Soil	0-6"	ORW Surge Tank area - spill from tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SS-0067	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	1.004	0.784
4A/B	YAA	82-YAA-SS-0066	10/11/82	Surface Soil	0-6"	North of ORW - Paving	2.014	1.594
4A/B	YAA	82-YAA-SS-0065	10/11/82	Surface Soil	0-6"	North of ORW - Paving	0.503	0.446
4A/B	YAA	82-YAA-SS-0064	10/11/82	Surface Soil	0-6"	North of ORW - Paving	0.618	0.0624
4A/B	YAA	82-YAA-SS-0063	10/11/82	Surface Soil	0-6"	North of ORW - Paving	1.722	1.422
4A/B	YAA	82-YAA-SS-0062	10/11/82	Surface Soil	0-6"	North of ORW - Paving	0.863	0.625
4A/B	YAA	82-YAA-SS-0061	10/11/82	Surface Soil	0-6"	North of ORW - Paving	1.126	0.777
4A/B	YAA	82-YAA-SS-0060	10/11/82	Surface Soil	0-6"	North of ORW - Paving	1.575	1.677
4A/B	YAA	82-YAA-SS-0059	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	0.540	0.377
4A/B	YAA	82-YAA-SS-0058	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	0.913	0.844
4A/B	YAA	82-YAA-SS-0057	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	3.470	5
4A/B	YAA	82-YAA-SS-0056	10/11/82	Surface Soil	0-6"	North of ORW - Paving	not collected	not collected
4A/B	YAA	82-YAA-SS-0055	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	1.292	0.615
4A/B	YAA	82-YAA-SS-0054	10/11/82	Surface Soil	0-6"	North of ORW - Paving	0.689	0.634
4A/B	YAA	82-YAA-SS-0053	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	0.581	0.412
4A/B	YAA	82-YAA-SS-0052	10/11/82	Surface Soil	0-6"	North of ORW/South of NRW-Paving	1.110	0.510
4A/B	YAA	82-YAA-SB-0126	10/31/82	Subsurface Soil	103-120"	East of ORW Surge Tank (10')	0.710	0.308
4A/B	YAA	82-YAA-SB-0102	10/31/82	Subsurface Soil	113-143"	NE of ORW Surge Tank (25')	N/A	0.246
4A/B	YAA	82-YAA-SB-0127	10/31/82	Subsurface Soil	120-140"	East of ORW Surge Tank (10')	0.137	0.197
4A/B	YAA	82-YAA-SB-0123	10/31/82	Subsurface Soil	120-145"	ORW Surge Tank SW of tank (20')	0.200	0.650
4A/B	YAA	82-YAA-SB-0132	10/31/82	Subsurface Soil	120-150'	ORW Surge Tank, South of tank (15')	0.074	0.094
4A/B	YAA	82-YAA-SB-0094	10/31/82	Subsurface Soil	120-150"	NE of ORW Surge Tank (10')	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0075	10/13/82	Subsurface Soil	12-45"	S. of ORW Surge Tank	2.460	4.160
4A/B	YAA	82-YAA-SB-0085	10/27/82	Subsurface Soil	15-45"	S. of ORW Surge Tank	0.3958	1.993
4A/B	YAA	82-YAA-SB-0076	10/13/82	Subsurface Soil	15-48"	S. of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	99-YAA-SB-0025	9/2/99	Subsurface Soil	192-204"	North of ORW, NW Corner of filter pad	ND	0.745
4A/B	YAA	82-YAA-SB-0070	10/13/82	Subsurface Soil	19-52"	SW of ORW Surge Tank o/s berm	[illegible]	18.700
4A/B	YAA	82-YAA-SB-0083	10/27/82	Subsurface Soil	20-50"	SE of ORW Surge Tank	0.7899	2.578
4A/B	YAA	82-YAA-SB-0092	10/27/82	Subsurface Soil	22-48"	S. of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0099	10/31/82	Subsurface Soil	22-53"	NE of ORW Surge Tank (25')	0.258	1.600
4A/B	YAA	82-YAA-SB-0078	10/13/82	Subsurface Soil	24-57"	SE of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0116	10/31/82	Subsurface Soil	28-58"	ORW Surge Tank SW of tank (15')	0.2766	0.281
4A/B	YAA	99-YAA-SB-0221	11/30/99	Subsurface Soil	3.5'-4'	Oil Line near Boiler House	ND	ND
4A/B	YAA	82-YAA-SB-0087	10/27/82	Subsurface Soil	30-33"	SW of ORW Surge Tank o/s berm	ND	2.646
4A/B	YAA	82-YAA-SB-0134	10/31/82	Subsurface Soil	30-60"	SW of ORW Surge Tank (25')	0.823	1.333
4A/B	YAA	82-YAA-SB-0129	10/31/82	Subsurface Soil	30-60"	ORW Surge Tank, South of tank (15')	0.343	0.517

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0124	10/31/82	Subsurface Soil	30-60"	East of ORW Surge Tank (5')	0.428	1.681
4A/B	YAA	82-YAA-SB-0120	10/31/82	Subsurface Soil	30-60"	ORW Surge Tank SW of tank (20')	N/A	0.232
4A/B	YAA	82-YAA-SB-0113	10/31/82	Subsurface Soil	30-60"	East of ORW Surge Tank (10')	0.351	0.765
4A/B	YAA	82-YAA-SB-0104	10/31/82	Subsurface Soil	30-60"	NE of ORW Surge Tank (10')	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0095	10/31/82	Subsurface Soil	30-60"	West of ORW Surge Tank (5')	1.054	9.5
4A/B	YAA	82-YAA-SB-0011	10/7/82	Subsurface Soil	33-36"	SE of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0009	10/7/82	Subsurface Soil	33-36"	SW of ORW Surge Tank o/s of berm	[illegible]	8.4
4A/B	YAA	82-YAA-SB-0005	10/7/82	Subsurface Soil	33-36"	S. of ORW Surge Tank	0.674	1.156
4A/B	YAA	82-YAA-SB-0004	10/7/82	Subsurface Soil	33-36"	S. of ORW Surge Tank	2.767	[illegible]
4A/B	YAA	82-YAA-SB-0002	10/7/82	Subsurface Soil	33-36"	SW of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	99-YAA-SB-0030	9/2/99	Subsurface Soil	36-48"	North of ORW, NE Corner of filter pad	0.036	0.330
4A/B	YAA	99-YAA-SB-0028	9/2/99	Subsurface Soil	36-48"	North of ORW, NW Corner of filter pad	0.190	6.4
4A/B	YAA	82-YAA-SB-0090	10/27/82	Subsurface Soil	36-61"	SW of ORW Surge Tank	ND	[illegible]
4A/B	YAA	82-YAA-SB-0006	10/7/82	Subsurface Soil	40-42"	S. of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0072	10/13/82	Subsurface Soil	40-43"	S. of ORW Surge Tank	2.450	4.680
4A/B	YAA	82-YAA-SB-0077	10/13/82	Subsurface Soil	41-44"	SW of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0074	10/13/82	Subsurface Soil	45-48"	S. of ORW Surge Tank	[illegible]	6.57
4A/B	YAA	82-YAA-SB-0082	10/27/82	Subsurface Soil	45-49"	S. of ORW Surge Tank	ND	0.4814
4A/B	YAA	82-YAA-SB-0079	10/13/82	Subsurface Soil	48-51"	S. of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0091	10/27/82	Subsurface Soil	48-52"	S. of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0093	10/27/82	Subsurface Soil	50-55"	SE of ORW Surge Tank	0.3958	1.993
4A/B	YAA	82-YAA-SB-0080	10/13/82	Subsurface Soil	52-55"	SW of ORW Surge Tank o/s berm	3.200	5.4
4A/B	YAA	82-YAA-SB-0117	10/31/82	Subsurface Soil	53-77"	ORW Surge Tank SW of tank (15')	0.551	1.120
4A/B	YAA	82-YAA-SB-0100	10/31/82	Subsurface Soil	53-83"	NE of ORW Surge Tank (25')	0.155	0.649
4A/B	YAA	82-YAA-SB-0068	10/13/82	Subsurface Soil	57-60"	SE of ORW Surge Tank	1.150	4.590
4A/B	YAA	82-YAA-SB-0114	10/31/82	Subsurface Soil	60-80"	East of ORW Surge Tank (10')	0.368	1.045
4A/B	YAA	82-YAA-SB-0084	10/27/82	Subsurface Soil	60-86"	S. of ORW Surge Tank	ND	1.723
4A/B	YAA	82-YAA-SB-0130	10/31/82	Subsurface Soil	60-90"	ORW Surge Tank, South of tank (15')	0.670	0.597
4A/B	YAA	82-YAA-SB-0121	10/31/82	Subsurface Soil	60-90"	ORW Surge Tank SW of tank (20')	N/A	0.420
4A/B	YAA	82-YAA-SB-0110	10/31/82	Subsurface Soil	60-90"	East of ORW Surge Tank (5')	0.131	1.083
4A/B	YAA	82-YAA-SB-0108	10/31/82	Subsurface Soil	60-90"	NE of ORW Surge Tank (10')	2.121	6.301
4A/B	YAA	82-YAA-SB-0107	10/31/82	Subsurface Soil	60-90"	SW of ORW Surge Tank (25')	0.541	1.325
4A/B	YAA	82-YAA-SB-0096	10/31/82	Subsurface Soil	60-90"	West of ORW Surge Tank (5')	2.631	2.668
4A/B	YAA	82-YAA-SB-0089	10/27/82	Subsurface Soil	61-65"	SW of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0073	10/13/82	Subsurface Soil	7-40"	S. of ORW Surge Tank	[illegible]	9.58
4A/B	YAA	82-YAA-SB-0118	10/31/82	Subsurface Soil	77-101"	ORW Surge Tank SW of tank (15')	0.440	0.660

Attachment I - Soil Dat[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
4A/B	YAA	82-YAA-SB-0125	10/31/82	Subsurface Soil	80-103"	East of ORW Surge Tank (10')	0.136	0.356
4A/B	YAA	82-YAA-SB-0101	10/31/82	Subsurface Soil	83-113"	NE of ORW Surge Tank (25')	0.629	1.542
4A/B	YAA	82-YAA-SB-0071	10/13/82	Subsurface Soil	8-41"	SW of ORW Surge Tank	[illegible]	[illegible]
4A/B	YAA	82-YAA-SB-0081	10/27/82	Subsurface Soil	86-90"	S. of ORW Surge Tank	2.014	1.925
4A/B	YAA	82-YAA-SB-0097	10/31/82	Subsurface Soil	90-120'	West of ORW Surge Tank (5')	0.945	5.6
4A/B	YAA	82-YAA-SB-0135	10/31/82	Subsurface Soil	90-120"	ORW Surge Tank SW of tank (20')		0.730
4A/B	YAA	82-YAA-SB-0131	10/31/82	Subsurface Soil	90-120"	ORW Surge Tank, South of tank (15')	0.438	0.639
4A/B	YAA	82-YAA-SB-0122	10/31/82	Subsurface Soil	90-120"	SW of ORW Surge Tank (25')	0.280	0.430
4A/B	YAA	82-YAA-SB-0111	10/31/82	Subsurface Soil	90-120"	East of ORW Surge Tank (5')	1.698	1.844
4A/B	YAA	82-YAA-SB-0106	10/31/82	Subsurface Soil	90-120"	NE of ORW Surge Tank (10')	2.263	6.2
4A/B	YAA	82-YAA-SB-0086	10/27/82	Subsurface Soil	96", below pipe	SW of ORW Surge Tank o/s berm	[illegible]	[illegible]

Notes:

Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▇ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
4C	YAA	82-YAA-SS-0051	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	[illegible]	[illegible]
4C	YAA	82-YAA-SS-0050	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	<MDA
4C	YAA	82-YAA-SS-0049	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	<MDA
4C	YAA	82-YAA-SS-0048	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	0.0573
4C	YAA	82-YAA-SS-0047	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	2.762	2.432
4C	YAA	82-YAA-SS-0046	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	0.184	0.2643
4C	YAA	82-YAA-SS-0045	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	2.135	2.435
4C	YAA	82-YAA-SS-0044	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	[illegible]	[illegible]
4C	YAA	82-YAA-SS-0043	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	[illegible]	8.002
4C	YAA	82-YAA-SS-0042	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	1.479	1.514
4C	YAA	82-YAA-SS-0041	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	1.966	4.299
4C	YAA	82-YAA-SS-0040	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	[illegible]	[illegible]
4C	YAA	82-YAA-SS-0039	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	1.690	1.663
4C	YAA	82-YAA-SS-0038	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	[illegible]	8.6
4C	YAA	82-YAA-SS-0037	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	1.455	1.071
4C	YAA	82-YAA-SS-0036	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	2.484	2.296
4C	YAA	82-YAA-SS-0035	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	3.621	2.900
4C	YAA	82-YAA-SS-0034	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	[illegible]	[illegible]
4C	YAA	82-YAA-SS-0033	10/10/1982	Surface Soil	0-6"	West of ORW - Truck ramp area paving	3.054	1.909
4C	YAA	82-YAA-SS-0032	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	0.605	0.553
4C	YAA	82-YAA-SS-0031	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	3.017	1.967
4C	YAA	82-YAA-SS-0030	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	[illegible]	4.927
4C	YAA	82-YAA-SS-0029	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	1.567	1.348
4C	YAA	82-YAA-SS-0028	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	3.103	3.511
4C	YAA	82-YAA-SS-0027	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	3.651	3.585
4C	YAA	82-YAA-SS-0026	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	[illegible]	3.807
4C	YAA	82-YAA-SS-0025	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	1.190	1.347
4C	YAA	82-YAA-SS-0024	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	[illegible]	3.066
4C	YAA	82-YAA-SS-0023	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	0.7018	0.7458
4C	YAA	82-YAA-SS-0022	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	0.768	0.819
4C	YAA	82-YAA-SS-0021	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	<MDA
4C	YAA	82-YAA-SS-0020	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	0.8264	0.6884
4C	YAA	82-YAA-SS-0019	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	<MDA
4C	YAA	82-YAA-SS-0018	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	0.3067

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 (pCi/g)	Cs-137 (pCi/g)
4C	YAA	82-YAA-SS-0017	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	0.1264	0.0974
4C	YAA	82-YAA-SS-0016	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	1.594	1.814
4C	YAA	82-YAA-SS-0015	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	<MDA	0.1094
4C	YAA	82-YAA-SS-0014	10/10/1982	Surface Soil	0-6"	South of ORW - Truck ramp area	0.3449	0.4689
4C	YAA	82-YAA-SS-0013	10/10/1982	Surface Soil	0-6"	NW of ORW - Truck ramp area paving	1.787	1.723

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/BRN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60	Cs-137
5	XWE	99-XWE-SB-0243	12/8/1999	Subsurface Soil	7'-7.5'	South of warehouse, north of laundry trailer	ND	0.125
5	XWE	99-XWE-SB-0239	12/8/1999	Subsurface Soil	7'-7.5'	South of warehouse, north of laundry trailer	ND	0.10
5	XWE	99-XWE-SB-0238	12/8/1999	Subsurface Soil	7'-7.5'	South of warehouse, north of laundry trailer	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
13	XCD	99-XCD-SS-0062	11/15/1999	Surface Soil		drum storage area SW level D	ND	ND
13	XCD	99-XCD-SS-0065	11/15/1999	Surface Soil	0-24"	North of Level D Storage Area at access road	ND	0.072
13	XCD	99-XCD-SS-0060	11/15/1999	Surface Soil	0-24"	Level D Storage Area, southwest drum storage area	ND	ND
13	XCD	99-XCD-SS-0059	11/15/1999	Surface Soil	0-24"	Level D Storage Area, former drum collection area	ND	0.111
13	XCD	99-XCD-SS-0058	11/15/1999	Surface Soil	0-24"	Level D Storage Area, former drum collection area	ND	0.066
13	XCD	99-XCD-SS-0153	11/22/1999	Surface Soil	0-6"	Spare Main Transformer	ND	ND
13	XCD	99-XCD-SS-0152	11/22/1999	Surface Soil	0-6"	Spare Main Transformer	ND	ND
13	XCD	99-XCD-SS-0150	11/22/1999	Surface Soil	0-6"	Spare Main Transformer	ND	0.0521
13	XCD	99-XCD-SS-0092	11/16/1999	Surface Soil	0-6"	Spare Main Transformer	ND	ND
13	XCD	99-XCD-SS-0086	11/16/1999	Surface Soil	0-6"	Spare Main Transformer	ND	ND
13	XCD	92-XCD-SS-0033	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0233	0.0106
13	XCD	92-XCD-SS-0032	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0159	<0.0236
13	XCD	92-XCD-SS-0031	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0194	0.0111
13	XCD	92-XCD-SS-0030	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0277	<0.0236
13	XCD	92-XCD-SS-0029	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0246	<0.0225
13	XCD	92-XCD-SS-0028	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0279	0.0319
13	XCD	92-XCD-SS-0027	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0287	<0.0220
13	XCD	92-XCD-SS-0026	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0558	0.0973
13	XCD	92-XCD-SS-0019	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0284	<0.0230
13	XCD	92-XCD-SS-0017	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0299	<0.0207
13	XCD	92-XCD-SS-0016	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0228	<0.0207
13	XCD	92-XCD-SS-0015	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0996	0.211
13	XCD	92-XCD-SS-0014	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0190	<0.0232

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID No	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60	Cs-137
13	XCD	92-XCD-SS-0013	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0276	0.0211
13	XCD	92-XCD-SS-0012	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0177	<0.0176
13	XCD	92-XCD-SS-0011	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0223	<0.0218
13	XCD	92-XCD-SS-0010	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0246	<0.0212
13	XCD	92-XCD-SS-0009	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0256	<0.0228
13	XCD	92-XCD-SS-0008	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	<0.0217	<0.0216
13	XCD	92-XCD-SS-0007	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Construction	0.0235	<0.0247
13	XCD	99-XCD-SB-0093	11/16/1999	Subsurface Soil	12-24"	Spare Main Transformer	ND	ND
13	XCD	99-XCD-SB-0159	11/22/1999	Subsurface Soil	18-24"	Spare Main Transformer	ND	ND
13	XCD	99-XCD-SB-0084	11/16/1999	Subsurface Soil	18-24"	Spare Main Transformer	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

■ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/FS	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
14	XWS	99-XWS-SS-0071	11/15/1999	Surface Soil	0-6"	Level D Storage Area, southwest drum storage area	ND	ND
14	YFS	99-YFS-SS-0160	11/22/1999	Surface Soil	0-6"	Runoff trench east of ISFSI area	ND	ND
14	YFS	99-YFS-SS-0158	11/22/1999	Surface Soil	0-6"	Runoff trench east of ISFSI area	ND	ND
14	YFS	92-YFS-SS-0025	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.0215	0.0292
14	YFS	92-YFS-SS-0024	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.0474	0.0590
14	YFS	92-YFS-SS-0023	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	4	<0.0225
14	YFS	92-YFS-SS-0022	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.068	0.0578
14	YFS	92-YFS-SS-0021	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.0392	0.0728
14	YFS	92-YFS-SS-0020	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.0382	0.130
14	YFS	92-YFS-SS-0018	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	ND	0.0492
14	YFS	92-YFS-SS-0006	8/6/1992	Surface Soil	0-6"	Proposed ISFSI Location	0.0271	0.0328

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

■ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area EIN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
15	XCS	99-XCS-SS-0214	11/29/1999	Surface Soil	0'-0.5'	Transfromer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0213	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0212	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0211	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	0.030
15	XCS	99-XCS-SS-0210	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0207	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0202	11/29/1999	Surface Soil	0'-0.5'	Transformer area south of OCAB	ND	ND
15	XCS	99-XCS-SS-0161	11/22/1999	Surface Soil	0-6"	Oil Line in OCAB Parking Lot near Site VP Space	ND	ND
15	XCS	99-XCS-SS-0156	11/22/1999	Surface Soil	0-6"	Oil Line near Protected Area fence by MFOST	ND	ND
15	XCS	99-XCS-SS-0154	11/22/1999	Surface Soil	0-6"	Oil Line near Security outer gate for Sally Port	ND	ND
15	XTS	00-XTS-SS-0001	1/6/2000	Surface Soil	0-6"	Soil Mound West of South Parking Lot at PA Fence line	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
19	XWS	99-XWS-SB-0247	12/13/1999	Subsurface Soil	13.5'-14'	Abandoned on-site waste water treatment facility	ND	0.110
19	XWS	99-XWS-SB-0203	11/29/1999	Subsurface Soil	14.5'-15.5'	Abandoned on-site waste water treatment facility	ND	ND
19	XWS	99-XWS-SB-0224	11/30/1999	Subsurface Soil	16'-17'	Abandoned on-site waste water treatment facility	ND	0.036
19	XWS	99-XWS-SB-0248	12/13/1999	Subsurface Soil	17.5'-18'	Abandoned on-site waste water treatment facility	ND	ND

<u>Notes:</u>
Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
■ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Data [illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60	Cs-137
20	XWS	99-XWS-SS-0070	11/15/1999	Surface Soil	0-6"	Seepage pit-pretreatment backwash(shallow)	ND	ND
20	XWS	99-XWS-SS-0068	11/15/1999	Surface Soil	0-6"	Seepage pit-pretreatment backwash	ND	ND
20	XWS	99-XWS-SS-0063	11/15/1999	Surface Soil	0-6"	Seepage pit-pretreatment backwash	ND	0.058
20	XWS	99-XWS-SS-0057	11/15/1999	Surface Soil	0-6"	Seepage pit-pretreatment backwash	ND	0.084
20	XWS	99-XWS-SB-0069	11/15/1999	Subsurface Soil	10'	Seepage pit-pretreatment backwash(deep)	ND	ND

<u>Notes:</u>

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

■ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/ETN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
22	XTL	99-XTL-SS-0089	11/16/1999	Surface Soil	0-6"	NE laydown and sandblast	ND	ND
22	XTL	99-XTL-SS-0087	11/16/1999	Surface soil	0-6"	NE laydown and sandblast	ND	ND
22	XTL	99-XTL-SS-0082	11/16/1999	Surface Soil	0-6"	NE laydown and sandblast	ND	ND
22	XTL	99-XTL-SS-0075	11/16/1999	Surface Soil	0-6"	NE laydown and sandblast	ND	0.037
22	XTL	99-XTL-SB-0088	11/16/1999	Subsurface soil	1'-2'	NE laydown and sandblast	ND	ND

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
26	YAA	99-YAA-SS-0005	8/27/1999	Subsurface Soil	Unknown	East wall Rx Building by chiller pad (SW elbow)	0.75	1.68
26	YAA	99-YAA-SS-0004	8/27/1999	Subsurface Soil	Unknown	West wall of excavation RB by chiller pad (SW Elbow)	1.39	2.04
26	YAA	99-YAA-SS-0222	11/30/1999	Surface Soil	0'-2'	Oil Line near Boiler House	ND	0.145
26	YAA	99-YAA-SS-0223	11/30/1999	Surface Soil	0-24"	Northeast corner of Boiler House Fuel Oil pumping station	1.75	10.3

Notes:

Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▇ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	[illegible]
30	YAA	99-YAA-SS-0003	8/19/1999	Surface Soil	0-6"	North of ORW conc pad - background away from spill area	1.28	0.64
30	YAA	99-YAA-SS-0002	8/19/1999	Surface Soil	0-6"	North or ORW conc pad - adjacent to mop water spill area	[illegible]	2.43
30	YAA	99-YAA-SS-0001	8/19/1999	Surface Soil	0-6"	North of ORW conc pad - Mop water spill	[illegible]	6.04

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▇ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] ue Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 (pCi/g)	Cs-137 (pCi/g)
31	YAA	99-YAA-SS-0044	9/2/1999	Surface Soil	0-12"	North of NRW, North of sidewalk, I/S RCA fence	0.210	1.700
31	YAA	99-YAA-SS-0042	9/2/1999	Surface Soil	0-12"	West of NRW at macadam repair area	<0.020	0.073
31	YAA	99-YAA-SS-0040	9/2/1999	Surface Soil	0-12"	South of NRW HX Building (~30 feet)	0.240	1.600
31	YAA	99-YAA-SS-0220	11/30/1999	Surface Soil	0-6"	North of NRW Building at compressor	1.51	0.844
31	YAA	99-YAA-SS-0219	11/30/1999	Surface Soil	0-6"	North of NRW Building at compressor	1.44	0.956
31	YAA	99-YAA-SB-0039	9/2/1999	Subsurface Soil	12-24"	South of NRW HX Building (~30 feet)	<0.020	0.250
31	YAA	99-YAA-SB-0038	9/2/1999	Subsurface Soil	144-156"	West of NRW at macadam repair area	ND	ND
31	YAA	99-YAA-SB-0024	9/2/1999	Subsurface Soil	156.25-168.25"	North of NRW, North of sidewalk, I/S RCA fence	ND	ND
31	YAA	99-YAA-SB-0035	9/2/1999	Subsurface Soil	168-180	North of ORW, NE Corner of filter pad	ND	ND
31	YAA	81-YAA-SB-0011	3/1/1981	Subsurface Soil	18-30"	West of NRW - 14.5' north of NW girder of stairwell, 6' West of building	1.40	2.40
31	YAA	81-YAA-SB-0009	3/1/1981	Subsurface Soil	18-30"	West of NRW - 9' south of stairwell pad, 5.5' west of building	0.47	0.88
31	YAA	81-YAA-SB-0012	3/1/1981	Subsurface Soil	18-36"	West of NRW - 6' north of NW girder of stairwell, 6' West of building	1.20	2.40
31	YAA	81-YAA-SB-0008	3/1/1981	Subsurface Soil	18-36"	West of NRW - 9' South of NW corner, 6.5' west of building	not listed	not listed
31	YAA	81-YAA-SB-0005	3/1/1981	Subsurface Soil	18-36"	North of NRW - 4' East of NW Corner, 4' north of building	0.89	1.60
31	YAA	81-YAA-SB-0002	3/1/1981	Subsurface Soil	18-36"	East of NRW - 35' south of rollup door, 4' east of building	0.310	1.30
31	YAA	81-YAA-SB-0004	3/1/1981	Subsurface Soil	192-197.5"	East of NRW - 35' south of rollup door, 4' east of building	<MDA	0.100
31	YAA	81-YAA-SB-0001	3/1/1981	Subsurface Soil	197.5-210"	East of NRW - 35' south of rollup door, 4' east of building	<MDA	<NDA
31	YAA	99-YAA-SB-0043	9/2/1999	Subsurface Soil	36-48"	North of NRW, North of sidewalk, I/S RCA fence	0.052	0.390
31	YAA	99-YAA-SB-0041	9/2/1999	Subsurface Soil	36-48"	West of NRW at macadam repair area	<0.014	<0.012
31	YAA	99-YAA-SB-0031	9/2/1999	Subsurface Soil	48.5-60.5"	South of NRW HX Building (~30 feet)	ND	0.386
31	YAA	81-YAA-SB-0003	3/1/1981	Subsurface Soil	48-64"	East of NRW - 35' south of rollup door, 4' east of building	0.18	0.250
31	YAA	81-YAA-SB-0014	3/1/1981	Subsurface Soil	48-66"	West of NRW - 9' South of NW corner, 6.5' west of building	1.30	3.50
31	YAA	81-YAA-SB-0013	3/1/1981	Subsurface Soil	48-66"	West of NRW - 6' north of NW girder of stairwell, 6' West of building	1.20	2.30
31	YAA	81-YAA-SB-0006	3/1/1981	Subsurface Soil	48-66"	North of NRW - 4' East of NW Corner, 4' north of building	0.41	0.610
31	YAA	81-YAA-SB-0015	3/1/1981	Subsurface Soil	96-114"	East of NRW - 35' south of rollup door, 4' east of building	<MDA	<MDA
31	YAA	81-YAA-SB-0010	3/1/1981	Subsurface Soil	96-114"	West of NRW - 9' South of NW corner, 6.5' west of building	0.24	0.490
31	YAA	81-YAA-SB-0007	3/1/1981	Subsurface Soil	96-114"	North of NRW - 4' East of NW Corner, 4' north of building	<MDA	<MDA

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-147)

Attachment I - Soil Data for the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/ETN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
33	WAA	99-WAA-SS-0209	11/29/1999	Surface Soil	0'-0.5'	Transformer area at LLRWSF	ND	ND
33	WAA	99-WAA-SS-0208	11/29/1999	Surface Soil	0'-0.5'	Transformer area at LLRWSF	ND	ND
33	WAA	99-WAA-SS-0206	11/29/1999	Surface Soil	0'-0.5'	Transformer area at LLRWSF	ND	ND
33	WAA	99-WAA-SS-0201	11/29/1999	Surface Soil	0'-0.5'	Transformer area at LLRWSF	ND	0.017

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Ta[illegible].8
Upland Confined Disposal Sample Results
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
38	ZFS	97-ZFS-SB-0086	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.020
38	ZFS	97-ZFS-SB-0085	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0084	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	0.091
38	ZFS	97-ZFS-SB-0083	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.064
38	ZFS	97-ZFS-SB-0082	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0079	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.050	0.150
38	ZFS	97-ZFS-SB-0077	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.080	0.190
38	ZFS	97-ZFS-SB-0076	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.040
38	ZFS	97-ZFS-SB-0075	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0073	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.040	<0.050
38	ZFS	97-ZFS-SB-0071	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.030
38	ZFS	97-ZFS-SB-0067	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.020
38	ZFS	97-ZFS-SB-0064	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.019	<0.020
38	ZFS	97-ZFS-SB-0063	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.040
38	ZFS	97-ZFS-SB-0062	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.013	<0.020
38	ZFS	97-ZFS-SB-0061	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.020
38	ZFS	97-ZFS-SB-0060	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.037
38	ZFS	97-ZFS-SB-0059	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.036
38	ZFS	97-ZFS-SB-0058	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.070	0.077
38	ZFS	97-ZFS-SB-0057	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.030
38	ZFS	97-ZFS-SB-0054	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	0.038
38	ZFS	97-ZFS-SB-0051	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.030
38	ZFS	97-ZFS-SB-0050	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.040	<0.040
38	ZFS	97-ZFS-SB-0049	8/14/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0046	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.030
38	ZFS	97-ZFS-SB-0043	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.040	<0.050
38	ZFS	97-ZFS-SB-0039	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0037	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.026
38	ZFS	97-ZFS-SB-0036	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.020
38	ZFS	97-ZFS-SB-0033	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.023
38	ZFS	97-ZFS-SB-0030	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	<0.060
38	ZFS	97-ZFS-SB-0027	8/13/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.020

Table 3.2.8
Upland Confined Disposal Sample Results
Oyster Creek Nuclear Generating Station

AOC	Area/BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
38	ZFS	97-ZFS-SB-0024	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	<0.060
38	ZFS	97-ZFS-SB-0023	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.016	<0.030
38	ZFS	97-ZFS-SB-0022	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.030
38	ZFS	97-ZFS-SB-0021	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	0.035
38	ZFS	97-ZFS-SB-0020	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.020
38	ZFS	97-ZFS-SB-0019	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.036
38	ZFS	97-ZFS-SB-0018	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	<0.040
38	ZFS	97-ZFS-SB-0017	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	<0.020
38	ZFS	97-ZFS-SB-0016	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	0.077
38	ZFS	97-ZFS-SB-0015	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.070	0.140
38	ZFS	97-ZFS-SB-0014	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.060	<0.070
38	ZFS	97-ZFS-SB-0013	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	0.043
38	ZFS	97-ZFS-SB-0012	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.042
38	ZFS	97-ZFS-SB-0011	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	0.075	0.200
38	ZFS	97-ZFS-SB-0010	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.090	<0.080
38	ZFS	97-ZFS-SB-0009	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.020	0.072
38	ZFS	97-ZFS-SB-0008	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.050	0.110
38	ZFS	97-ZFS-SB-0005	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.017	<0.030
38	ZFS	97-ZFS-SB-0004	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	0.059
38	ZFS	97-ZFS-SB-0003	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	0.028
38	ZFS	97-ZFS-SB-0002	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.030	<0.040
38	ZFS	97-ZFS-SB-0001	8/12/1997	Subsurface Soil	0-36"	Dredge Spoils Retention Basin	<0.080	0.190
38	ZFS	97-ZFS-SB-0080	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.040	0.120
38	ZFS	97-ZFS-SB-0072	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.019	<0.030
38	ZFS	97-ZFS-SB-0070	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.018	0.034
38	ZFS	97-ZFS-SB-0069	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.040	0.170
38	ZFS	97-ZFS-SB-0065	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	0.027
38	ZFS	97-ZFS-SB-0056	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.050	<0.050
38	ZFS	97-ZFS-SB-0052	8/14/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.060	<0.060
38	ZFS	97-ZFS-SB-0048	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	0.043
38	ZFS	97-ZFS-SB-0042	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	0.053
38	ZFS	97-ZFS-SB-0040	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	<0.030

Tab[illegible].2.8
Upland Confined Disposal Sample Results
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
38	ZFS	97-ZFS-SB-0038	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.030	0.079
38	ZFS	97-ZFS-SB-0035	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	<0.030
38	ZFS	97-ZFS-SB-0032	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.060	<0.070
38	ZFS	97-ZFS-SB-0029	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.018	<0.019
38	ZFS	97-ZFS-SB-0026	8/13/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.020	0.056
38	ZFS	97-ZFS-SB-0006	8/12/1997	Subsurface Soil	36-72"	Dredge Spoils Retention Basin	<0.040	<0.050
38	ZFS	97-ZFS-SB-0081	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.030	0.059
38	ZFS	97-ZFS-SB-0078	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.020	0.033
38	ZFS	97-ZFS-SB-0074	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.020	0.041
38	ZFS	97-ZFS-SB-0068	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.015	<0.040
38	ZFS	97-ZFS-SB-0066	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.018	<0.030
38	ZFS	97-ZFS-SB-0055	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.030	0.035
38	ZFS	97-ZFS-SB-0053	8/14/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.060	0.150
38	ZFS	97-ZFS-SB-0047	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.030	<0.040
38	ZFS	97-ZFS-SB-0045	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.040	0.190
38	ZFS	97-ZFS-SB-0044	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.018	<0.016
38	ZFS	97-ZFS-SB-0041	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.040	<0.050
38	ZFS	97-ZFS-SB-0034	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.015	0..053
38	ZFS	97-ZFS-SB-0031	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.080	<0.070
38	ZFS	97-ZFS-SB-0028	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.019	0.040
38	ZFS	97-ZFS-SB-0025	8/13/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.020	0.037
38	ZFS	97-ZFS-SB-0007	8/12/1997	Subsurface Soil	72-108"	Dredge Spoils Retention Basin	<0.030	0.025

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
41	XWN	85-XWN-SS-0081	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0080	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0079	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	1.89	1.90
41	XWN	85-XWN-SS-0078	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0077	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0076	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.501
41	XWN	85-XWN-SS-0075	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0074	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0073	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0072	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0071	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0070	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0069	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0068	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	1.36	ND
41	XWN	85-XWN-SS-0067	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0066	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0065	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.521
41	XWN	85-XWN-SS-0064	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0063	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0062	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0061	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0060	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.954
41	XWN	85-XWN-SS-0059	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	2.1	0.726
41	XWN	85-XWN-SS-0058	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0057	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0056	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0055	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0054	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0053	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.718
41	XWN	85-XWN-SS-0052	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0051	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0050	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0049	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	[illegible]	Sample Number	Date	Sample Media	Depth	Sample Location	[illegible]	[illegible]
41	XWN	85-XWN-SS-0048	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0047	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0046	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0045	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0044	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0043	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0042	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0041	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0040	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0039	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0038	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0037	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0036	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0035	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0034	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0033	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0032	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0031	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0030	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0029	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0028	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0027	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0026	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0025	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.443
41	XWN	85-XWN-SS-0024	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0023	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0022	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0021	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0020	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0019	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0018	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0017	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0016	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
41	XWN	85-XWN-SS-0015	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0014	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0013	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0012	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0011	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0010	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0009	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	4.60
41	XWN	85-XWN-SS-0008	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	1.30
41	XWN	85-XWN-SS-0007	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	0.968
41	XWN	85-XWN-SS-0006	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0005	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0004	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0003	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0002	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	XWN	85-XWN-SS-0001	6/1/1985	Surface Soil	0-6"	Proposed ESSF Location	ND	ND
41	YAA	86-YAA-SS-0004	4/29/1986	Surface Soil	0-6"	Proposed ESSF Location Along RMA Fence	1.21	0.662
41	YAA	86-YAA-SS-0003	4/29/1986	Surface Soil	0-6"	Proposed ESSF Location Along RMA Fence	[illegible]	2.81
41	YAA	86-YAA-SS-0002	4/29/1986	Surface Soil	0-6"	Proposed ESSF Location Along RMA Fence	2.35	1.48

<u>Notes:</u>

Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Dat[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/RTN	Sample Number	Date	Sample Medium	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g	[illegible]	[illegible] pCi/g
41	XCP	A1	10/8-9/1982	Soil	---	---	---	---	---	---
41	XCP	A2	10/8-9/1982	Soil	---	---	---	0.31 +/- 25.4%	---	---
41	XCP	A3	10/8-9/1982	Soil	---	---	0.13 +/- 60.2%	0.10 +/- 59.0%	---	---
41	XCP	A4	10/8-9/1982	Soil	---	---	1.59 +/- 10.8%	1.81 +/- 10.0%	---	---
41	XCP	A5	10/8-9/1982	Soil	---	---	---	0.11 +/- 52.6%	---	---
41	XCP	A6	10/8-9/1982	Soil	---	---	0.34 +/- 28.0%	0.47 +/- 15.6%	---	---
41	XCP	A7	10/8-9/1982	Soil	---	---	---	---	---	---
41	XCP	A8	10/8-9/1982	Soil	---	---	0.70 +/- 20.6%	0.75 +/- 14.0%	---	---
41	XCP	A9	10/8-9/1982	Soil	---	---	---	---	---	---
41	XCP	A10	10/8-9/1982	Soil	---	---	---	---	---	---
41	XCP	A11	10/8-9/1982	Soil	---	---	---	0.06 +/- 85.0%	---	---
41	XCP	B1	10/8-9/1982	Soil	---	---	2.76 +/- 10.0%	2.43 +/- 10.0%	---	---
41	XCP	B2	10/8-9/1982	Soil	---	---	0.18 +/- 56.2%	0.26 +/- 25.8%	---	---
41	XCP	B3	10/8-9/1982	Soil	---	---	2.14 +/- 10.0%	2.44 +/- 10.0%	---	---
41	XCP	B4	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	9.00 +/- 10.0%	0.78 +/- 20.6%	---
41	XCP	B5	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	[redacted] +/- 10.0%	1.82 +/- 12.0%	0.44 +/- 58.0%
41	XCP	B6	10/8-9/1982	Soil	---	---	3.62 +/- 10.0%	2.90 +/- 10.0%	0.14 +/- 40.4%	---
41	XCP	B7	10/8-9/1982	Soil	---	---	2.48 +/- 10.0%	2.30 +/- 10.0%	---	---
41	XCP	B8	10/8-9/1982	Soil	---	---	1.46 +/- 10.4%	1.07 +/- 15.6%	---	---
41	XCP	B9	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	8.57 +/- 10.0%	0.39 +/- 32.8%	---
41	XCP	B10	10/8-9/1982	Soil	---	---	1.69 +/- 10.1%	1.66 +/- 10.0%	---	---
41	XCP	B11	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	5.71 +/- 10.0%	0.54 +/- 36.6%	2.56 +/- 10.8%
41	XCP	B12	10/8-9/1982	Soil	---	---	1.48 +/- 11.8%	1.51 +/- 10.0%	0.07 +/- 57.6%	---
41	XCP	B13	10/8-9/1982	Soil	---	---	3.05 +/- 10.0%	1.91 +/- 10.0%	0.13 +/- 43.0%	---
41	XCP	B14	10/8-9/1982	Soil	---	---	4000.0%	2400.0%	270.0%	---
41		B15	10/8-9/1982	Soil	---	---	1.97 +/- 10.0%	4.30 +/- 10.0%	0.14 +/- 33.6%	---
41	XCP	C1	10/8-9/1982	Soil	---	---	0.83 +/- 18.2%	0.69 +/- 15.2%	---	---
41	XCP	C2	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	[redacted] +/- 10.0%	0.21 +/- 25.0%	---
41	XCP	C3	10/8-9/1982	Soil	---	---	3.02 +/- 10.0%	1.97 +/- 10.0%	---	---
41	XCP	C4	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	4.93 +/- 10.0%	0.24 +/- 41.8%	---
41	XCP	C5	10/8-9/1982	Soil	---	---	1.57 +/- 11.4%	1.35 +/- 10.6%	---	---
41	XCP	C6	10/8-9/1982	Soil	---	---	3.10 +/- 10.0%	3.51 +/- 10.0%	0.30 +/- 33.2%	---
41	XCP	C7	10/8-9/1982	Soil	---	---	3.65 +/- 10.0%	3.59 +/- 10.0%	0.20 +/- 55.8%	---
41	XCP	C8	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	3.81 +/- 10.0%	0.34 +/- 29.0%	---
41	XCP	C9	10/8-9/1982	Soil	---	---	1.19 +/- 16.0%	1.35 +/- 12.5%	---	---
41	XCP	C10	10/8-9/1982	Soil	---	---	[redacted] +/- 10.0%	3.07 +/- 10.0%	0.20 +/- 32.6%	---
41	XCP	C11	10/8-9/1982	Soil	---	---	1.79 +/- 10.0%	1.72 +/- 10.0%	0.14 +/- 36.0%	---
41	XCP	C12	10/8-9/1982	Soil	---	---	0.77 +/- 18.2%	0.82 +/- 14.2%	---	---
41	XCP	C13	10/8-9/1982	Soil	---	---	0.60 +/- 18.4%	0.55 +/- 15.2%	---	---

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ETN	ample Numbe	Date	Sample Media	Depth	Sample Location	Co60 pCi/g	Cs137 pCi/g	pCi/g	Mn-54 pCi/g
41	XCP	D1	10/8-9/1982	Soil	---	---	---	---	---	---
41	XCP	D2	10/8-9/1982	Soil	---	---	2.01 +/- 11.2%	1.59 +/- 10.0%	---	---
41	XCP	D3	10/8-9/1982	Soil	---	---	0.50 +/- 20.2%	0.45 +/- 19.0%	---	---
41	XCP	D4	10/8-9/1982	Soil	---	---	0.62 +/- 76.8%	0.06 +/- 72.2%	---	---
41	XCP	D5	10/8-9/1982	Soil	---	---	1.72 +/- 10.4%	1.42 +/- 10.0%	---	---
41	XCP	D6	10/8-9/1982	Soil	---	---	0.86 +/- 15.6%	0.63 +/- 14.2%	---	---
41	XCP	D7	10/8-9/1982	Soil	---	---	1.13 +/- 15.4%	0.78 +/- 21.0%	---	---
41	XCP	D8	10/8-9/1982	Soil	---	---	0.69 +/- 18.2%	0.63 +/- 16.2%	---	---
41	XCP	D9	10/8-9/1982	Soil	---	---	1.58 +/- 10.0%	1.68 +/- 10.0%	---	---
41	XCP	E1	10/8-9/1982	Soil	---	---	1.11 +/- 15.2%	0.51 +/- 21.8%	---	---
41	XCP	E2	10/8-9/1982	Soil	---	---	0.54 +/- 17.8%	0.38 +/- 19.6%	---	---
41	XCP	E3	10/8-9/1982	Soil	---	---	0.91 +/- 16.2%	0.84 +/- 14.4%	---	---
41	XCP	E4	10/8-9/1982	Soil	---	---	3.47 +/- 10.0%	5.05 +/- 10.0%	0.11 +/- 82.2%	---
41	XCP	E5	10/8-9/1982	Soil	---	---	0.58 +/- 17.4%	0.41 +/ 22.2%	---	---
41	XCP	E6	10/8-9/1982	Soil	---	---	1.29 +/- 12.2%	0.62 +/- 16.8%	---	---
41	XCP	E7	10/8-9/1982	Soil	---	---	1.00 +/- 15.0%	0.78 +/- 14.8%	---	---

Notes:

Co-60 - Cobalt 60
Cs-137 - Cesium 137
Cs-134 - Cesium 134
Mn-54 - Manganese 54
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
■ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g
42	XWE	99-XWE-SS-0048	9/2/1999	Surface Soil	0-12"	MFOST Moat North Plug	<0.020	0.140
42	XWE	99-XWE-SS-0033	9/2/1999	Surface Soil	0-12"	MFOST Moat South Plug	ND	0.179
42	XWE	99-XWE-SS-0022	9/1/1999	Surface Soil	0-12"	MFOST Collection Sump	0.086	0.210
42	XWE	99-XWE-SS-0018	9/1/1999	Surface Soil	0-12"	MFOST NW by RCA fence	0.950	3.200
42	XWE	99-XWE-SS-0016	9/1/1999	Surface Soil	0-12"	MFOST South of Pad	ND	0.211
42	XWE	99-XWE-SS-0014	9/1/1999	Surface Soil	0-12"	MFOST North of pad at RCA fence	0.480	2.4
42	XWE	00-XWE-SS-0003	1/6/2000	Surface Soil	0-6"	Soil from berm at Main Fuel Oil Storage Tank	ND	ND
42	XWE	92-XWE-SS-0005	4/3/1992	Surface Soil	0-6"	MFOST Valve Shed South	0.519	0.968
42	XWE	92-XWE-SS-0004	4/3/1992	Surface Soil	0-6"	MFOST Valve Shed West	0.892	1.07
42	XWE	92-XWE-SS-0003	4/3/1992	Surface Soil	0-6"	MFOST Valve Shed East	0.610	1.17
42	XWE	92-XWE-SS-0002	4/3/1992	Surface Soil	0-6"	MFOST Valve Shed North	0.247	0.395
42	XWE	99-XWE-SB-0049	9/2/1999	Subsurface Soil	36-48"	MFOST Moat South Plug	ND	ND
42	XWE	99-XWE-SB-0047	9/2/1999	Subsurface Soil	36-48"	MFOST Moat North Plug	<0.014	0.016
42	XWE	99-XWE-SB-0023	9/1/1999	Subsurface Soil	36-48"	MFOST North of pad at RCA fence	<0.015	0.040
42	XWE	99-XWE-SB-0021	9/1/1999	Subsurface Soil	36-48"	MFOST South of Pad	ND	0.105
42	XWE	99-XWE-SB-0019	9/1/1999	Subsurface Soil	36-48"	MFOST Collection Sump	<0.030	0.074
42	XWE	99-XWE-SS-0157	11/22/1999	Surface Soil	0-6"	Oil Line near MFOST	ND	0.332
42	XWE	99-XWE-SS-0155	11/22/1999	Surface Soil	0-6"	Oil Line near MFOST	ND	ND
42	XWE	99-XWE-SS-0151	11/22/1999	Surface Soil	0-6"	Oil Line near MFOST	ND	0.672
42	XWE	99-XWE-SB-0017	9/1/1999	Subsurface Soil	36-48"	MFOST NW by RCA fence	0.052	0.260

<u>Notes:</u>
Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

Attachment I - Soil Dat[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co60 pCi/g	Cs137 pCi/g	Sr90 pCi/g
Other	XWN	99-XWN-SS-0046	9/2/1999	Surface Soil	0-12"	West of NRW O/S RCA fence	0.095	0.510	N/A
Other	XWN	99-XWN-SB-0045	9/2/1999	Subsurface Soil	36-48"	West of NRW O/S RCA fence	<0.015	0.094	N/A
Other	YAA	86-YAA-SS-0001	3/21/1986	Surface Soil	0-6"	Soil between FOST and RR airlock	[illegible]	2.68	N/A
Other	XWW	91-XWW-SB-0010	3/13/1991	Subsurface Soil	0-1'	Circ Water Discharge Structure	<0.020	N/A	N/A
Other	XWW	91-XWW-SB-0011	3/13/1991	Subsurface Soil	4-5'	Circ Water Discharge Structure	<0.011	N/A	N/A
Other	XWW	91-XWW-SB-0012	3/13/1991	Subsurface Soil	6-7'	Circ Water Discharge Structure	<0.013	N/A	N/A
Other	XCP	99-XCP-SS-0218	11/30/1999	Surface Soil	0'-0.5'	Transformer south of Trailer 300 Complex	ND	ND	N/A
Other	XCP	99-XCP-SS-0217	11/30/1999	Surface Soil	0'-0.5'	Transformer south of Trailer 300 Complex	ND	ND	N/A
Other	XCP	99-XCP-SS-0216	11/30/1999	Surface Soil	0'-0.5'	Transformer south of Trailer 300 Complex	ND	0.068	N/A
Other	XCP	99-XCP-SS-0215	11/30/1999	Surface Soil	0'-0.5'	Transformer south of Trailer 300 Complex	ND	0.236	N/A
Other	XCT	99-XCT-SS-0233	12/3/1999	Surface Soil	0'-0.5'	Transformer area at North Trailer Park	ND	0.07	N/A
Other	XCT	99-XCT-SS-0232	12/3/1999	Surface Soil	0'-0.5'	Transformer area at North Trailer Park	ND	0.12	N/A
Other	XCT	99-XCT-SS-0231	12/3/1999	Surface Soil	0'-0.5'	Transformer area at North Trailer Park	ND	ND	N/A
Other	XCT	99-XCT-SS-0228	12/3/1999	Surface Soil	0'-0.5'	Transformer area at North Trailer Park	ND	0.07	N/A
Other	XIA	99-XIA-SS-0237	12/3/1999	Surface Soil	0'-1.5'	North of road to switchyard south of intake structure	ND	0.072	N/A
Other	XIA	99-XIA-SS-0230	12/3/1999	Surface Soil	0'-2'	North of road to switchyard south of intake structure	ND	0.059	N/A
Other	XIA	99-XIA-SS-0199	11/24/1999	Surface Soil	0-6"	Transformer area east of intake structure	ND	ND	N/A
Other	XIA	99-XIA-SS-0198	11/24/1999	Surface Soil	0-6"	Transformer area east of intake structure	ND	ND	N/A
Other	XIA	99-XIA-SS-0196	11/24/1999	Surface Soil	0-6"	Transformer area east of intake structure	ND	ND	N/A
Other	XLA	99-XLA-SS-0187	11/23/1999	Surface Soil	0-6"	Transformer at Maintenance Fab Shop Area	ND	0.035	N/A
Other	XLA	99-XLA-SS-0171	11/23/1999	Surface Soil	0-6"	Transformer at Maintenance Fab Shop Area	ND	0.0672	N/A
Other	XLA	99-XLA-SS-0170	11/23/1999	Surface Soil	0-6"	Transformer at Maintenance Fab Shop Area	ND	0.0986	N/A
Other	XLA	99-XLA-SS-0169	11/23/1999	Surface Soil	0-6"	Transformer at Maintenance Fab Shop Area	ND	0.0368	N/A
Other	XWE	99-XWE-SS-0191	11/23/1999	Surface Soil	0-6"	Transformer at SW corner of warehouse	ND	0.177	N/A
Other	XWE	99-XWE-SS-0190	11/23/1999	Surface Soil	0-6"	Transformer at SW corner of warehouse	ND	0.179	N/A
Other	XWE	99-XWE-SS-0184	11/23/1999	Surface Soil	0-6"	Transformer at SW corner of warehouse	ND	0.15	N/A
Other	XWE	99-XWE-SS-0183	11/23/1999	Surface Soil	0-6"	Transformer at SW corner of warehouse	ND	0.215	N/A
Other	XWE	99-XWE-SB-0245	12/9/1999	Subsurface Soil	15'-18'	Monitoring well installation SW of MFOST	ND	ND	N/A
Other	XWN	99-XWN-SS-0179	11/23/1999	Surface Soil	0'-0.5'	Transformer area north of Maintenance Building	ND	0.070	N/A
Other	XWN	99-XWN-SS-0178	11/23/1999	Surface Soil	0'-0.5'	Transformer area north of Maintenance Building	ND	0.050	N/A
Other	XWN	99-XWN-SS-0177	11/23/1999	Surface Soil	0'-0.5'	Transformer area north of Maintenance Building	ND	0.108	N/A
Other	XWN	99-XWN-SS-0051	9/3/1999	Surface Soil	0-12"	NW corner of Outage Command Center	0.041	0.016	<0.014
Other	XWN	99-XWN-SS-0076	11/16/1999	Surface Soil	0-6"	North of TB at old compressor area	ND	0.101	N/A
Other	XWN	99-XWN-SS-0074	11/16/1999	Surface Soil	0-6"	North of TB at Joy Compressor Building	ND	0.039	N/A
Other	XWN	99-XWN-SS-0195	11/23/1999	Surface Soil	0-6"	Transformer area east of Outage Command Center	ND	0.327	N/A
Other	XWN	99-XWN-SS-0189	11/23/1999	Surface Soil	0-6"	Transfromer area north of NRW building	0.135	0.296	N/A
Other	XWN	99-XWN-SS-0188	11/23/1999	Surface Soil	0-6"	Transformer area north of NRW building	ND	0.0549	N/A
Other	XWN	99-XWN-SS-0186	11/23/1999	Surface Soil	0-6"	Transformer area north of NRW building	ND	0.0183	N/A
Other	XWN	99-XWN-SS-0185	11/23/1999	Surface Soil	0-6"	Transformer area north of NRW building	ND	0.117	N/A

Attachment I - Soil Dat [illegible] e Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area BTN	Sample Number	Date	Sample Media	Depth	Sample Location	Co60 pCi/g	[illegible]	Sr90 pCi/g
Other	XWN	99-XWN-SS-0182	11/23/1999	Surface Soil	0-6"	Transformer area north of NRW building	ND	0.146	N/A
Other	XWN	99-XWN-SS-0181	11/23/1999	Surface Soil	0-6"	Transformer area east of Outage Command Center	2.21	0.866	N/A
Other	XWN	99-XWN-SS-0180	11/23/1999	Surface Soil	0-6"	Transformer area west of DW Process Center	0.156	0.296	N/A
Other	XWN	99-XWN-SS-0176	11/23/1999	Surface Soil	0-6"	Transformer area east of Outage Command Center	0.352	0.307	N/A
Other	XWN	99-XWN-SS-0175	11/23/1999	Surface Soil	0-6"	Transformer area west of DW Process Center	0.136	0.102	N/A
Other	XWN	99-XWN-SS-0172	11/23/1999	Surface Soil	0-6"	Transformer area west of DW Process Center	0.071	0.102	N/A
Other	XWN	99-XWN-SS-0168	11/23/1999	Surface Soil	0-6"	Transformer area west of DW Process Center	ND	ND	N/A
Other	XWN	99-XWN-SS-0085	11/16/1999	Surface Soil	0-6"	Turbine Lube Oil Tank and Purification System	ND	0.117	N/A
Other	XWN	99-XWN-SB-0052	9/3/1999	Subsurface Soil	180-192"	NW corner of Outage Command Center	ND	ND	N/A
Other	XWN	99-XWN-SB-0056	9/3/1999	Subsurface Soil	36-48"	NW corner of Outage Command Center	0.027	0.120	N/A
Other	XWS	99-XWS-SS-0079	11/16/1999	Surface Soil	0-24"	West of Old Machine Shop	ND	0.033	N/A
Other	XWS	99-XWS-SS-0073	11/16/1999	Surface Soil	0-24"	West of Old Machine Ship	ND	ND	N/A
Other	XWS	99-XWS-SS-0126	11/18/1999	Surface Soil	0-6"	South of Blackout transformer, center of road.	ND	ND	N/A
Other	XWS	99-XWS-SS-0205	11/29/1999	Surface Soil	0-6"	Transformer area at Demin Trailer	ND	0.088	N/A
Other	XWS	99-XWS-SS-0204	11/29/1999	Surface Soil	0-6"	Transformer area at Demin Trailer	ND	ND	N/A
Other	XWS	99-XWS-SS-0197	11/24/1999	Surface Soil	0-6"	Transformer area at Demin Trailer	ND	ND	N/A
Other	XWS	99-XWS-SS-0194	11/23/1999	Surface Soil	0-6"	Transformer area east of Aux Office Building	ND	0.0777	N/A
Other	XWS	99-XWS-SS-0193	11/23/1999	Surface Soil	0-6"	Transformer area east of Aux Office Building	ND	0.11	N/A
Other	XWS	99-XWS-SS-0192	11/23/1999	Surface Soil	0-6"	Transformer area east of Aux Office Building	ND	0.0876	N/A
Other	XWS	99-XWS-SS-0173	11/23/1999	Surface Soil	0-6"	Transformer area east of Aux Office Building	0.091	0.154	N/A
Other	XWS	99-XWS-SS-0166	11/22/1999	Surface Soil	0-6"	Oil Line east of Aux Office Building	ND	ND	N/A
Other	XWS	99-XWS-SS-0165	11/22/1999	Surface Soil	0-6"	Oil Line west of Aux Office Building	ND	ND	N/A
Other	XWS	99-XWS-SS-0149	11/19/1999	Surface Soil	0-6"	West of Hazardous Waste Collection Area	ND	ND	N/A
Other	XWS	99-XWS-SS-0148	11/19/1999	Surface Soil	0-6"	East of Hazardous Waste Collection Area	ND	ND	N/A
Other	XWS	99-XWS-SS-0147	11/19/1999	Surface Soil	0-6"	East of Hazardous Waste Collection Area	ND	ND	N/A
Other	XWS	99-XWS-SS-0146	11/19/1999	Surface Soil	0-6"	South of Hazardous Waste Collection Area	ND	0.0899	N/A
Other	XWS	99-XWS-SS-0145	11/19/1999	Surface Soil	0-6"	West of Hazardous Waste Collection Area	ND	ND	N/A
Other	XWS	99-XWS-SS-0144	11/18/1999	Surface Soil	0-6"	North of Hazardous Waste Collection Area	ND	0.0258	N/A
Other	XWS	99-XWS-SS-0143	11/18/1999	Surface Soil	0-6"	West of RADIAC trailer	ND	ND	N/A
Other	XWS	99-XWS-SS-0141	11/18/1999	Surface Soil	0-6"	West of Hazardous Waste Collection Area	ND	0.0628	N/A
Other	XWS	99-XWS-SB-0240	12/8/1999	Subsurface Soil	1.5'-2.5'	Oil Line east of Aux Office Building	ND	0.050	N/A
Other	XWS	99-XWS-SB-0253	12/13/1999	Subsurface Soil	2'-2.5'	Transformer area south of Site Emergency Building	ND	ND	N/A
Other	XWS	99-XWS-SB-0252	12/13/1999	Subsurface Soil	2'-2.5'	Transformer area south of Site Emergency Building	ND	ND	N/A
Other	XWS	99-XWS-SB-0250	12/13/1999	Subsurface Soil	2'-2.5'	Transformer area south of Site Emergency Building	ND	0.067	N/A
Other	XWS	99-XWS-SB-0249	12/13/1999	Subsurface Soil	2'-2.5'	Transformer area south of Site Emergency Building	ND	ND	N/A
Other	XWS	99-XWS-SB-0246	12/13/1999	Subsurface Soil	2'-2.5'	Transformer area south of Site Emergency Building	ND	ND	N/A
Other	XWS	99-XWS-SB-0251	12/13/1999	Subsurface Soil	3'-3.5'	Transformer area south of Site Emergency Building	ND	ND	N/A
Other	XWW	00-XWW-SS-0002	1/6/2000	Surface Soil	0-6"	Soil Berm West of Dilution Pump House	ND	ND	N/A
Other	XWW	99-XWW-SS-0124	11/18/1999	Surface Soil	0-6"	West of southern Start-Up Transformer	ND	ND	N/A

AOC	Area/BLN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g	Sr-90 pCi/g
Other	XWW	99-XWW-SS-0122	11/18/1999	Surface Soil	0-6"	West of northern Start-Up Transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0123	11/18/1999	Subsurface Soil	1.5-2'	West of northern Start-Up Transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0120	11/18/1999	Subsurface Soil	1.5-2'	West of southern Start-Up Transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0244	12/9/1999	Subsurface Soil	10'-11'	Monitoring well installation SW of Chlorination Building	ND	ND	N/A
Other	XWW	99-XWW-SB-0112	11/17/1999	Subsurface Soi	2-2.5'	Transformer Area, North of all transformers	ND	0.0359	N/A
Other	XWW	99-XWW-SB-0125	11/18/1999	Subsurface Soil	2-2.5'	Transformer Area, Southeast of center transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0114	11/17/1999	Subsurface Soil	2-2.5'	Transformer Area, Northeast of all transformers	ND	0.0675	N/A
Other	XWW	99-XWW-SB-0111	11/17/1999	Subsurface Soil	2-2.5'	Transformer Area, West of northern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0107	11/17/1999	Subsurface Soil	2-2.5'	Transformer Area, Southeast of southern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0099	11/17/1999	Subsurface Soil	2-2.5'	Transformer Area, East of northern transfromer	ND	ND	N/A
Other	XWW	99-XWW-SB-0097	11/17/1999	Subsurface Soil	2-2.5'	Transformer Area, Southwest of southern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0139	11/18/1999	Subsurface Soil	4-4.5'	Transformer Area, Southwest of center transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0119	11/18/1999	Subsurface Soil	4-4.5'	Transformer Area, Southeast of center transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0110	11/17/1999	Subsurface Soil	4-4.5'	Transformer Area, North of all transformers	ND	ND	N/A
Other	XWW	99-XWW-SB-0106	11/17/1999	Subsurface Soil	4-4.5'	Transformer Area, Southeast of southern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0104	11/17/1999	Subsurface Soil	4-4.5'	Transformer Area, Southwest of southern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0102	11/17/1999	Subsurface Soil	4-4.5'	Transformer Area, West of northern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0098	11/17/1999	Subsurface Soil	4-4.5'	Transfromer Area, East of northern transformer	ND	ND	N/A
Other	XWW	99-XWW-SB-0095	11/17/1999	Subsurface Soil	4-4.5'	Transformer Area, Northeast of all transformers	ND	ND	N/A
Other	YAA	99-YAA-SB-0235	12/3/1999	Subsurface Soil	16'-18'	Monitoring well installation north of new Boiler House	ND	ND	N/A
torage Buildi	X04	99-X04-SS-0006	6/30/1999	Surface Soil	0-6"	Bldg 4, Open trench inside building	ND	0.0366	N/A
torage Buildi	XDA	99-XDA-SS-0007	7/16/1999	Surface Soil	N/A	Spill excavation on the north side of the DG Building	<MDA	0.0936	N/A
torage Buildi	XWS	99-XWS-SB-0091	11/16/1999	Subsurface Soil		Northeast corner of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SB-0083	11/16/1999	Subsurface Soil		East of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SB-0078	11/16/1999	Subsurface Soil		South of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SB-0072	11/16/1999	Subsurface Soil		East side South end of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SB-0067	11/15/1999	Subsurface Soil		Southeast corner of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SB-0066	11/15/1999	Subsurface Soil		Southwest of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0094	11/16/1999	Surface Soil		Northeast corner of Building 4	ND	0.080	N/A
torage Buildi	XWS	99-XWS-SS-0081	11/16/1999	Surface Soil		East side South end of Building4	ND	0.065	N/A
torage Buildi	XWS	99-XWS-SS-0080	11/16/1999	Surface Soil		East of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0077	11/16/1999	Surface Soil		South of Building 4	ND	0.094	N/A
torage Buildi	XWS	99-XWS-SS-0064	11/15/1999	Surface Soil		Southwest of Building 4	ND	0.095	N/A

Attachment I - Soil Da[illegible] the Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area ID	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	[illegible]	[illegible] pCi/g
torage Buildi	XWS	99-XWS-SS-0234	12/3/1999	Surface Soil	0'-2'	NW corner of DG Building at Oil Tank Moat	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0164	11/22/1999	Surface Soil	0-6"	Oil Line north of DG Building	ND	0.0316	N/A
torage Buildi	XWS	99-XWS-SS-0163	11/22/1999	Surface Soil	0-6"	Oil Line east of Building 4	ND	0.0233	N/A
torage Buildi	XWS	99-XWS-SS-0162	11/22/1999	Surface Soil	0-6"	Oil Line north of DG Building	ND	0.0296	N/A
torage Buildi	XWS	99-XWS-SS-0140	11/18/1999	Surface Soil	0-6"	West of DG Building	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0138	11/18/1999	Surface Soil	0-6"	NE of DG Building, East of road	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0137	11/18/1999	Surface Soil	0-6"	North of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0121	11/18/1999	Surface Soil	0-6"	West of Building 4	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0118	11/18/1999	Surface Soil	0-6"	West of Building 4	ND	0.165	N/A
torage Buildi	XWS	99-XWS-SS-0101	11/17/1999	Surface Soil	0-6"	South of DG Building at oil spill area from 10/80	ND	0.0894	N/A
torage Buildi	XWS	99-XWS-SS-0100	11/17/1999	Surface Soil	0-6"	South of DG Building at oil spill area from 10/80	ND	ND	N/A
torage Buildi	XWS	99-XWS-SS-0061	11/15/1999	Surface Soil	0-6"	Southeast corner of Building 4	ND	0.100	N/A

Notes:

Co-60 - Cobalt 60

Cs-137 - Cesium 137

< - Detection Limits

N/A - Not Analyzed

ND - Not Detected

▇ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-147)

Attachment I - Soil Dat[illegible]e Areas of Concern
Oyster Creek Nuclear Generating Station

AOC	Area/BLN	Sample Number	Date	Sample Media	Depth	Sample Location	Co-60 pCi/g	Cs-137 pCi/g	Sr-90 pCi/g
Sediment	---	99- -SD-0117	11/17/1999	Sediment	0-3"	---	ND	0.0601	N/A
Sediment	---	99- -SD-0116	11/17/1999	Sediment	0-3"	---	ND	ND	N/A
Sediment	---	99- -SD-0115	11/17/1999	Sediment	0-3"	---	ND	ND	N/A
Sediment	---	99- -SD-0113	11/17/1999	Sediment	0-3"	---	ND	0.0775	N/A
Sediment	---	99- -SD-0108	11/17/1999	Sediment	0-3"	---	ND	0.0621	N/A

Notes:

Co-60 - Cobalt 60
Cs-137 - Cesium 137
< - Detection Limits
N/A - Not Analyzed
ND - Not Detected
▨ Greater than NRC Guideline (3.8 pCi/g - Co-60; 11 pCi/g - Cs-137)

ATTACHMENT 2

AOC – PROCESS LINES

Attachement II - Process Lines
Oyster Creek Nuclear Generating Station

System Description	Date Installed	Above/Below Ground	Material	Line Length	Fluid/ Contamination	Coating/ Protection	Location
12" Cond. Transfer Line from CST to Core Spray System.	1969 - Please see Note 1	Underground	Aluminum	3'	Condensate	Unknown	Between the TB and RB on Northwest corner of RB
6" Cond. Transfer Line from TB (Turbine Building) through Tunnel to RB	Repaired 1980	Vault & Tunnel	Aluminum	<10'	Demin. Water	Unknown	Under Office Bldg.
6" Fuel Pool Cooling line to the Fuel Pool Filter in NRW	Replaced 1993	Vault	Aluminum	<10'	Reactor Water	Epoxy Coating w/ Nukon Wrap	
6" from the Cond. Pumps to TB (Turbine Building)	Replaced 1992	Underground	Aluminum	25'	Condensate Transfer	Epoxy Coating w/ Nukon Wrap	Between CT Shack and TB
4" Demin. Water to TB	Replaced in 1998	Above Ground Now - Replaced an Underground line	Aluminum	<15'	Demin. Water	Cathodic Protection	Between Cond Shack and Turbine Building
2" Demin. Water Transfer Pump Recirculation Lines to Tank	Replaced in 1998	Above Ground Now - Replaced an Underground line	Aluminum	<5'	Demin. Water	Cathodic Protection	Between Cond Shack and Turbine Building
4" Demin. Water from Demin. Trailer to Turbine Building	Replaced in 1998	Underground - See Note 2	Aluminum	>125'	Demin. Water	Cathodic Protection	West of CT Shack
6" Line from Demin. Tank to Cond. Transfer shack.	Replaced in 1998	Above Ground Now - Replaced an Underground line	Aluminum	>75'	Demin. Water	Cathodic Protection	West of CT Shack
4" Demin. Water to RB	Replaced 1993	Underground/vault	Aluminum	10'	Demin. Water	Cathodic Protection	South of RB
3" Reactor Cleanup Demin. Resin Transfer Line to Radwaste Bldg.	Inspected 1993	10' Underground Remainder in Piping Tunnel	Stainless Steel	<15'	RWCU Resin	Coal Tar & Epoxy Coating w/ Nukon Wrap	Under Office Bldg.

Attachement [illegible] Process Lines
Oyster Creek Nuclear Generating Station

System Description	Date Installed	Above/Below Ground	Material	Line Length	Fluid/ Contamination	Coating/ Protection	Location
3" Cond. for RWCU Demin. Resin Transfer	Inspected 1993	Underground/ Vault	Stainless Steel	<10'	Condensate	Coal Tar & Epoxy Coating w/ Nukon Wrap	Under Office Bldg.
11/2" Laundry drains to Radwaste	Inspected 1993	Vault	Stainless Steel	<10'	Water	Coal Tar & Epoxy Coating w/Nukon Wrap	Southeast Vault
1" Reactor Cleanup Sludge Transfer Line to Radwaste Bldg.	Inspected 1993	Vault & Piping Tunnel	Carbon Steel	<10'	Cleanup Sludge	Coal Tar & Epoxy Coating w/Nukon Wrap	New Vault & Under Office Building
6" Fuel Pool Cooling to Radwaste Bldg. (Filter Bypass)	Inspected 1993	Vault	Carbon Steel	<10'	Reactor Water	Coal Tar & Epoxy Coating w/Nukon Wrap	New Vault & Under Office Building
6" Cleanup to High Purity Tank (Out-of Service).	Inspected 1993	Vault	Carbon Steel	<15'	Reactor Water	Coal Tar & Epoxy Coating w/Nukon Wrap	New Vault & Under Office Building
6" Cleanup to Cond. System	Inspected 1993	Vault	Carbon Steel	<15'	Reactor Water	Coal Tar & Epoxy Coating w/Nukon Wrap	New Vault & Under Office Building
1 1/2" RBEDT Line to Radwaste Bldg.	Inspected 1993	Vault & Piping Tunnel	Carbon Steel	<15'	Water	Coal Tar & Epoxy Coating w/Nukon Wrap	New Vault & Under Office Building
2" Laundry Drains to Radwaste Bldg.	Inspected 1993	Vault	Carbon Steel	<10'	Water	Coal Tar & Epoxy Coating w/Nukon Wrap	Southeast Vault

Attachement [illegible] - Process Lines
Oyster Creek Nuclear Generating Station

System Description	Date Installed	Above/Below Ground	Material	Line Length	Fluid/ Contamination	Coating/ Protection	Location
3" RB Sump to Radwaste	Inspected 1993	Vault	Carbon Steel	<10'	Water	Coal Tar & Epoxy Coating w/Nukon Wrap	Southeast Vault
2" DWEDT to Radwaste	Inspected 1993	Vault & Piping Tunnel	Carbon Steel	<10'	Water	Coal Tar	Southeast Vault
14" Containment Spray	Inspected 1993	Vault & Piping Tunnel	Carbon Steel	<10'	Torus Water	Coal Tar & Epoxy Coating w/Nukon Wrap	Southeast Vault
3" Heating Steam Cond.	Original 1969	Underground	Carbon Steel	<20'	Water	Coal Tar	South of RB Between Vaults
8" Heating Steam	Original 1969	Underground	Carbon Steel	<20'	Steam	Coal Tar	South of RB Between Vaults
8" Condensate	Original 1969	Piping Tunnel	Carbon Steel	<5'	Water	Coal Tar	Boiler House to Base of Stack
8" Heating Steam	Original 1969	Piping Tunnel	Carbon Steel	<5'	Steam	Coal Tar	Boiler House to Base of Stack
3" Cond. Heating Steam	Original 1969	Piping Tunnel	Carbon Steel	<5'	Water	Coal Tar	Boiler House to Base of Stack
8" RBCCW supply Radwaste	Inspected 1993	Piping Tunnel	Carbon Steel	<10'	Water	Coal Tar	Under Office Bldg.
8" RBCCW return from Radwaste	Inspected 1993	Piping Tunnel	Carbon Steel	<10'	Water	Coal Tar & Epoxy Coating w/Nukon Wrap	Under Office Bldg.

Attachement II - Process Lines
Oyster Creek Nuclear Generating Station

System Description	Date Installed	Above/Below Ground	Material	Line Length	Fluid/ Contamination	Coating/ Protection	Location
30/36" Mechanical Vacuum Pump Offgas Line	1969	Underground	Carbon Steel	410'	Offgas	Coal Tar & Epoxy Coating w/Nukon Wrap	Between the TB, the Stack and the AOG.
48" Offgas Holdup	1969	Underground	Carbon Steel	510'	Offgas	Coal Tar	Between the TB, the Stack and the AOG.
4"Offgas to AOG	Installed early 1980s	Underground	Carbon Steel	100'	Offgas	Denso Anti Corrosion Tape	Between the Stack and the AOG
4" Offgas from AOG	Installed early 1980s	Underground	Carbon Steel	100'	Offgas	Denso Anti Corrosion Tape	Between the Stack and the AOG
10" Line from Cond. Tank & Cond. Shack to Hot Well	Replaced in 1996 - replaced underground line	Aboveground	Carbon Steel	30'	Condensate	Coal Tar	From the CT shack to the well wall of the TB
8" Line from Cond. To Sucker/Dump Station	Replaced in 1996 - replaced underground line	Aboveground	Carbon Steel	30'	Condensate	Coal Tar	From the CT shack to the well wall of the TB
1" Line from Cond. Shack to TB	Replaced in 1996 - replaced underground line	Aboveground	Carbon Steel	30'	Condensate	Coal Tar	From the CT Shack to the west wall of the TB
12" Overflow Line form Cond. Tank & Demin. Tank to TB	Replaced in 1996 - replaced underground line	Aboveground	Carbon Steel	75'	Air	Coal Tar	From the CT Tank and the Demin Tank to the west wall of the TB

Attachement .. Process Lines
Oyster Creek Nuclear Generating Station

System Description	Date Installed	Above/Below Ground	Material	Line Length	Fluid/ Contamination	Coating/ Protection	Location
2 1/2" Chlorine Injection Line	Replaced mid 1980s	Underground	Carbon Steel	100'	Salt Water	Internally lined (saran) pipe	From CT Shack to the top of the intake Tunnel
1 1/2" AOG Drains and Sumps	mid 1980s	Underground	Carbon Steel	175'	Sump	Denso Anti Corrosion Tape	From AOG to Boiler House
4" Torus Water Tank Return Line to the TWST	mid 1980s	Underground	Carbon Steel	1000'	Torus Water	Coal Tar	Yard

Note #1 : In 1998 OCNGS installed a sample well under this line. OCNGS attempted to collect ground water sample. OCNGS was unable to draw water concluded that this line is not leaking. OCNGS plans to periodically sample

Note #2 This line provides clean demineralized water to the plant from the Demin Water Trailers. It's not contaminated. But since the system has been classified as "Potentially Contaminated" OCNGS has been keeping track of it.

Note: #3 - The vaults on the South side of the RB have soil bottoms.

APPENDIX G

INTERPRETATION OF HISTORICAL AERIAL PHOTOGRAPHS

APPENDIX G: QUESTION 6
INTERPRETATION OF HISTORICAL AERIAL PHOTOGRAPHS

Historical aerial photographs were obtained and reviewed for the following years: 1940, 1951, 1958, 1964, 1968, 1976, 1982, and 1989. A discussion of the review of historical aerial photographs is provided below. The Property has been divided into two sections (western and eastern) for the purposes of discussion.

1940 Aerial Photograph

Western Portion

- The subject property is heavily vegetated and undeveloped.
- Route 9 is visible at the eastern boundary of the site.

Eastern Portion

- The subject property is still heavily vegetated and undeveloped.
- The area surrounding the Property is mostly vacant and undeveloped, with some residential dwellings located north of the Property.
- Two access roads (Beach Boulevard located north of the property and an access road trending east from Route 9) are visible leading into the property.
- Forked River is visible north of the Property.

1951 Aerial Photograph

Western Portion

- No significant changes have occurred since the 1940 aerial photograph.

Eastern Portion

- Buildings associated with Finninger's Farm are visible in the central portion of the site. The majority of the remaining Property is still heavily vegetated and undeveloped.
- The area surrounding the Property has not changed significantly.

1958 Aerial Photograph

Western Portion

- No significant changes have occurred since the 1951 aerial photograph.

Eastern Portion

- The majority of the property appears to be fields surrounding farm buildings. Some densely vegetated areas are still present on the east side of the property.
- The area surrounding the Property appears to be more developed with residential dwellings and small commercial buildings.

APPENDIX G: QUESTION 6
INTERPRETATION OF HISTORICAL AERIAL PHOTOGRAPHS

1964 Aerial Photograph

Western Portion

- The OCNGS is under construction; buildings and parking areas are visible at the property. A rail spur enters the property from along west side of Route 9.
- The remaining area surrounding the property is heavily vegetated and undeveloped.

Eastern Portion

- No significant changes have occurred since the 1958 aerial photograph.

1968 Aerial Photograph

Western Portion

- Additional buildings and secondary roads are present at the subject property. The Intake and Discharge Canals are visible at the western portion of the site.

Eastern Portion

- The Intake and Discharge Canals are visible along the northern and southern property boundaries.
- Additional buildings are located on the property.
- The majority of the property appears to still be used for agricultural purposes.
- The general area surrounding the property is more developed with residential dwellings and small commercial buildings.

1976 Aerial Photograph

Western Portion

- No significant changes have occurred since the 1968 aerial photograph.
- The area beyond the Property is also developed with buildings and roads (associated with the Forked River Generating Station).

Eastern Portion

- No significant changes have occurred since the 1968 aerial photograph.

1982 Aerial Photograph

Western Portion

- No significant changes have occurred since the 1976 aerial photograph.

Eastern Portion

- No significant changes have occurred since the 1968 aerial photograph.
- A disturbed area is visible on the property (Note: the disturbed area is at the area from which topsoil is removed for placement at the OCNGS).

APPENDIX G: QUESTION 6
INTERPRETATION OF HISTORICAL AERIAL PHOTOGRAPHS

1989 Aerial Photograph

Western Portion

- No significant changes have occurred since the 1982 aerial photograph.

Eastern Portion

- No significant changes have occurred since the 1982 aerial photograph.

APPENDIX H

DISCHARGE HISTORY OF HAZARDOUS SUBSTANCES AND WASTES

APPENDIX H: QUESTION 7

Discharge History of Hazardous Substances and Wastes

May 2, 1980 (AOC-40)

On May 2, 1980, the leakage of Torus system water from the containment spray heat exchangers into the station's service water discharge resulted in the release of an unknown quantity of radiologically contaminated water. The leakage that occurred during periods of system testing which occurred for each containment spray system approximately twice per month for 15 to 30 minutes.

Conservative calculations assuming worst case conditions demonstrated that the isotopic concentrations of the discharge were well below the effluent limitations specified by the USNRC.

The Bureau of Radiation Protection was notified of the release, and when facility personnel assumed this satisfied NJDEP notification requirement, no other NJDEP offices were immediately advised. The notification process was immediately reviewed with facility personnel to prevent this oversight from reoccurring.

In addition, as part of the facility's REMP it monitors a composite sampler immediately downstream of discharge point 004. The samples are obtained daily and analyzed weekly for gamma-emitting radionuclides and tritium. Information pertaining to surface water, sediment, and aquatic life sampling can be found in AOC-17.

March 2, 1992 (AOC-4A/B)

The Former Waste Surge Tank is a 100,000-gallon aluminum tank situated on a concrete rim support. The tank was historically used to store wastewater from the operational portion of the plant prior to treatment. The tank was removed from service in 1982 when a leak was detected in the base of the tank. Impacted soils were excavated and removed.

OCNGS conducted a soil-sampling program for gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the area of the Surge Tank. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. Of the one hundred seventeen (117) samples collected in 1982, 1992, and 1999

twenty-eight (28) exceed the NRC's guideline for decommissioning facilities of 3.8 pCi/g for Co-60 and twenty-seven (27) of the samples exceeded the guideline of 11 pCi/g for Cs-137. Concentrations of Co-60 ranged from below the method detection level to 1,100 pCi/g and concentrations for Cs-137 ranged from below the method detection level to 390 pCi/g. These maximum concentrations were the result of a spill in 1992. Some soils associated with the release were excavated, removed and disposed of in accordance with NRC regulations. The Surge Tank was removed from service and the lines were emptied cleaned, flushed and capped in-place

September 17, 1998 (AOC - 39)

On September 17, 1998, approximately 148,800 gallons of condensate transfer water was discharged to the Circulating Water discharge tunnel via the Fire Protection System, and ultimately released to the Oyster Creek discharge canal. Following the release, an investigation of potentially impacted surface water, sediments and biota (clams) was conducted. In surface water, tritium levels in the condenser intake were slightly elevated (330 +/- 110 pCi/L). The maximum tritium concentration observed in surface water samples (16,000 pCi/L) did not exceed the USEPA drinking water limit (20,000 pCi/L), and USNRC effluent limitations were not exceeded. Cobalt-60 was the only gamma emitting nuclide to be detected in surface water, detected in only one of 23 samples, downstream of the 30" header (2.0 +/- 1.2 pCi/L). All sediment samples from the Barnegat Bay and the intake canal were less than the limit of detection. In Oyster Creek sediment, Co-60 was detected in 4 of 16 samples. The maximum sediment concentration was 0.056 pCi/g, well below the NRC guideline of 3.8 pCi/g. All sediment samples were less than or equal to those observed in REMP samples prior to the release. Clams in Barnegat Bay were also sampled and determined to be non-detect for Co-60; this was consistent with previous REMP sampling results. Tritium was not found in clams collected near the mouth of Oyster Creek, however, low levels attributable to natural background were found in clams from Stouts Creek to the north and Manahawkin Bay to the south.

APPENDIX I

REMEDIATION ACTIVITIES

APPENDIX I: QUESTION 8
Description of Previous or Current Remediation Activities

1.0 Former Waste Surge Tank and Associated Lines (AOC-4A & 4B)

The Former Waste Surge Tank is a 100,000-gallon aluminum tank situated on a concrete rim support. The tank was historically used to store wastewater from the operational portion of the plant prior to treatment. The tank was removed from service in 1982 when a leak was detected in the base of the tank. Impacted soils were excavated and removed.

OCNGS conducted a soil-sampling program for gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the area of the Surge Tank. The results of the sampling program indicate detectable concentrations of Co-60 and Cs-137. Of the one hundred seventeen (117) samples collected in 1982, 1992, and 1999 twenty-eight (28) exceed the NRC's guideline for decommissioning facilities of 3.8 pCi/g for Co-60 and twenty-seven (27) of the samples exceeded the guideline of 11 pCi/g for Cs-137. Concentrations of Co-60 ranged from below the method detection level to 1,100 pCi/g and concentrations for Cs-137 ranged from below the method detection level to 390 pCi/g. These maximum concentrations were the result of a spill in 1992. Some soils associated with the release were excavated, removed and disposed of in accordance with NRC regulations. The Waste Surge Tank was removed from service and the lines were emptied cleaned, flushed and capped in-place.

2.0 Northern Parking Area (AOC-41)

Soils from inside the protected area were excavated in 1982 to adjust the topography prior to paving. These soils contained detectable licensed radionuclides. Following petition for approval from the NRC, these soils were relocated to the area that is now the north parking lot, between the Low Level Radwaste Storage Facility and the north domestic water pump house, placed in trenches, covered with soil and paved over. Based on extensive soil sampling conducted at the time, concentrations in this area are not expected to exceed the NRC decommissioning concentration guidelines due to mixing during relocation, and decay since placement.

3.0 Berms (AOC-42)

The OCNGS excavated and removed soils to complete several projects throughout the site. If during the course of soil excavation contaminated soils are encountered, the soils are sampled and analyzed for fission related radionuclides. Soils containing low levels, but detectable, were placed in piles or in berms on-site. The berm surrounding the main oil storage tank, the berm behind the dilution pumps, the berm on the south side of the Independent Spent Fuel Storage Installation (ISFSI) and the berm around the waste surge tank have been constructed using these soils.

In 1999, the OCNGS conducted a soil-sampling program for the gamma-emitting radionuclides associated with fission processes (e.g., Co-60 & Cs-137) in the berm and soils around the MFOST. The results of the sampling program indicate detectable concentrations of Co-60 in twelve (12) of the seventeen (17) samples collected. However, all concentrations detected were below the NRC's soil guideline at decommissioning of 3.8 pCi/g. The maximum concentration of Co-60 was 0.95 pCi/g. Concentrations of Cs-137 were detected in fifteen (15) of seventeen (17) samples. The maximum concentration of 3.2 pCi/g is below the NRC guideline of 11 pCi/g.

APPENDIX J

ENVIRONMENTAL PERMITS

APPENDIX J: QUESTION 11f
ENVIRONMENTAL PERMITS

Permit Name	Issuing Agency	Permit #	Effective Date	Expiration Date
OPERATING LICENSE				
Facility Operating License and Technical Specifications	NRC	License DRP-16	4/9/69	
UNDERGROUND STORAGE TANK				
UST Registration	NJDEP	0043067	07/01/98	06/30/01
HAZARDOUS WASTE				
RCRA Notification (EPA ID#)	USEPA	NJD980649172	NA	NA
Hazardous Materials Certificate of Registration	USDOT	042298-001-007G	05/19/98	06/30/00
WATER				
Sea Turtle – Biological Opinion and Incidental Take Statement	NMFS	M88170	09/21/95	09/21/00
OC Potable Water System	NJDEP	PWS ID# 1512386	NA	NA
Water Allocation/Diversion Permit	NJDEP	2164P	07/10/97	05/31/01
OC Laboratory Certification	NJDEP	ID# 15304	07/01/97	06/30/00
Scientific Collecting Permit	NJDEP	9813	01/01/98	12/31/99
Special Permit to Collect Shellfish	NJDEP	S258	01/01/98	12/31/99
NPDES Winter Outage Agreement	NJDEP	NA	1982	NA
Groundwater Remediation Memorandum of Agreement	NJDEP	93-06-28-1317-29 (Case #)	NA	NA
Groundwater Remediation Industrial Discharge Permit	OCUA/ LMUA	C-13-1991-030	12/01/97	11/30/99 (renewal application submitted 08/03/99)
OC Riparian Grant	NJDEP	File No. 87-0629	08/06/90	NA
Certification under the Coastal Zone Management Act	NJDEP	NA	10/22/79	NA
FR and OC Biennial Hydrographic Surveys	NJBPU	2nd Interim Order	04/22/66	Life of Plant
OC Annual Watermound Monitoring	NJBPU	2nd Interim Order	04/22/66	Life of Plant
OC Sewage Tie-In Agreement and Outfall Semiannual Monitoring	OCUA/ LMUA	NA	07/27/82	Life of Plant
WELLS				
Numerous monitoring wells are permitted throughout the site.	NJDEP	Various	Various	NA

APPENDIX J: QUESTION 11f
ENVIRONMENTAL PERMITS

Permit Name	Issuing Agency	Permit #	Effective Date	Expiration Date
DREDGING				
Department of the Army Permit	USACE	CENAP-OP-R-199701765-39	09/12/97	12/31/07
Tidelands License	NJDEP	96-0233-T	08/19/97	08/19/98
Waterfront Development/ Water Quality Certification/ Freshwater Wetland General Permit No. 1 & 2/ Special Activity Transition Area Waivers for General Permits No. 1 & 2	NJDEP	1512-93-0052.3, .4, & .5	02/04/97	02/04/02
UPLAND				
Soil Erosion & Sediment Control Plan (Upland Confined Disposal Facility)	OCSCD	#1302	06/30/98	12/31/01
MEDICAL				
Medical Waste Generator Authorization	NJDOH	NA	NA	NA
TRANSPORTATION				
OC Helistop	NJDOT	H-205	11/01/97	11/01/00

Note:
In addition to the above-referenced permits, the Oyster Creek Nuclear Generating Station holds a Facility Operating License (No. DPR-16, Docket No. 50-219) issued by the United States Nuclear Regulatory Commission.

Abbreviations:
DGW = Discharge to Ground Water
DSW = Discharge to Surface Water
EDG = Emergency Diesel Generator
FR = Forked River
GWPP = Ground Water Protection Plan
LMUA = Lacey Municipal Utilities Authority
NA = Not Applicable
NJBPU = New Jersey Board of Public Utilities
NJDEP = New Jersey Department of Environmental Protection
NJDOH = New Jersey Department of Health
NJDOT = New Jersey Department of Transportation
NMFS = National Marine Fisheries Service
NJPDES = New Jersey Pollutant Discharge Elimination System
OC = Oyster Creek
OCSCD = Ocean County Soil Conservation District
OCUA = Ocean County Utilities Authority
USACE = United States Army Corps of Engineers
USDOT = United States Department of Transportation
USEPA = United States Environmental Protection Agency

APPENDIX K

ENFORCEMENT ACTIONS

APPENDIX K: QUESTION 12
SUMMARY OF ENFORCEMENT ACTIONS

Date/Description of Violation	Name and Address of Agency That *Initiated the Enforcement Action*	Section of statute, rule or *permit allegedly violated*	Resolution
December 10, 1991: The Radwaste overboard discharge monitor was inoperable with no reasonable effort to restore operable status.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	3.15.A of the Technical Specifications	GPU concurred that the violation occurred. The overboard discharge monitor was restored to operable status.
September 17, 1996: Release of condensate water through the fire service system.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	6.8.1 of the Technical Specifications	GPU concurred that the violation occurred. Valve was renumbered to prevent reoccurrence, procedures were modified, and staff briefings were conducted.
July 3, 1997: Failure to comply with procedure resulted in small upland release from the demineralized water system.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	Regulatory Guide 1.33	GPU concurred that the violation occurred. Valve was tagged closed and locked.
February 5, 1998: Annual land-use survey was not conducted.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	6.8.4.b.2 of the Technical Specifications	GPU concurred that the violation occurred. Section 4.5 of the off-site Dose Calculation Manual was modified to clarify the annual census is not required if GPU maintains gardens for sampling purposes.
February 8, 1998: Failed to establish and implement adequate effluent radiation monitoring calibration.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	6.8.1 of the Technical Specifications	GPU concurred that the violation occurred. Procedures for RMS calibration were modified.
February 8, 1998: Failed to establish and implement procedures to verify that the design basis relative to air balance (ventilation) in some buildings was maintained.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	6.8.1 of the Technical Specifications	GPU concurred that the violation occurred. Procedures were modified and differential pressure instrumentation was added.
April 4, 1998: Procedure change to allow filling of shell side of Isolation Condensers was not developed with a safety	US. Nuclear Regulatory Commission 475 Allendale Rd.	10 CFR 50.59	GPU concurred that the violation occurred. Process of

APPENDIX K: QUESTION 12
SUMMARY OF ENFORCEMENT ACTIONS

Date/Description of Violation	Name and Address of Agency That Initiated the Enforcement Action	Section of statute, rule or permit allegedly violated	Resolution
evaluation to provide the basis that the change did not constitute an unreviewed safety question.	King of Prussia, PA 19406		using condensate for fill was cancelled and changes to system operating procedures were made.
April 4, 1998: Effluent from the shell side of the isolation condensers was not monitored/samples and controlled to demonstrate compliance with dose limits to the public.	US. Nuclear Regulatory Commission 475 Allendale Rd. King of Prussia, PA 19406	6.8.4.a.3 of the Technical Specifications	GPU concurred that the violation occurred. Effluent assessment was performed, dose to the public was calculated and reported. The valve that allowed shell to heat up providing motive force for release was repaired.

APPENDIX M

THEORETICAL RELEASE STUDY REPORT
URS GREINER WOODWARD-CLYDE
DECEMBER 1999

REPORT

THEORETICAL RELEASE STUDY

GPU NUCLEAR, INC.
OYSTER CREEK NUCLEAR GENERATING STATION

U.S. ROUTE NO. 9
FORKED RIVER, NEW JERSEY

Prepared for

GPU Nuclear, Inc.
U.S. Route No. 9
Forked River, New Jersey 08731

December 1999

URS Greiner Woodward Clyde

201 Willowbrook Boulevard
Wayne, New Jersey 07470

47-09E04092.00

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIXES

1.0
INTRODUCTION

URS Greiner Woodward Clyde (URSGWC) has prepared this report for the GPU Nuclear Corporation (GPU), US Route 9, Forked River, NJ. The scope of work for this project was to:

1. Evaluate selected structures to determine if there is the potential for a release of radionuclides from a breach in the floor slab to impact soil and/or groundwater.
2. Evaluate probable flow paths for a release using 2 dimensional groundwater modeling and, if applicable, particle tracking analyses.

This scope of work is based on initial conversations between Ms. Beverly Good, Mr. Terry Hanlon and Mr. Jay Vouglitois of GPU and Mr. Michael Carnese (URSGWC). The scope of work was subsequently modified based on the initial review of the data and subsequent conversations between Ms. Good and Mr. Carnese.

The structures originally to be evaluated, based on initial conversations, included the following:

- The New Radwaste Building;
- The Old Radwaste Building;
- The Reactor Building;
- The Turbine Building; and
- One unidentified tunnel.

During the course of reviewing the construction drawings it was determined that the unidentified tunnel was, in fact, a tunnel system that includes the following:

- New Radwaste to Old Radwaste;
- Old Radwaste to Exhaust Stack;
- Turbine and Reactor Buildings to Exhaust Stack;
- The Intake Tunnel; and,
- The Discharge Tunnel.

It was also discovered that the Intake Structure and Discharge Structures were constructed to a depth that potentially impacted the site hydrogeology because the depth of excavation of these structures resulted in the excavation of the clay layer separating the water bearing formations (the Cape May Formation and the Cohansey Formation). The change in the site stratigraphy, based on these excavations, had the potential to impact the planned 2-dimensional groundwater models by changing the hydrogeology between the major structures of concern (the Turbine Building, the Reactor Building, the Old Radwaste Building, etc.) as defined in the initial scope of work and the primary potential receptor, the Intake/Discharge Canal It was, therefore, necessary to add these structures to: 1) the summary of the site excavations; 2) the summary of the as-built drawings; 3) the geologic cross-sections; and 4) the two dimensional model cross-sections.

This report is organized as follows:

- Section 2: Summarizes the review of the as-built and excavation drawings;
- Section 3: Summarizes the stratigraphy, hydrogeology and the impacts of the construction of selected structures on the stratigraphy and hydrogeology. This section also includes an evaluation of structures with foundations below the water table using fracture flow analysis.
- Section 4: Discusses the results of the construction of two 2-Dimensional models using MODFLOW and MODPATH.
- Section 5: Presents a summary of the previous sections with conclusions and recommendations;
- Section 6: Discusses the limitations of the use of this material by GPU and others;
- Section 7: References, including a list of the as-built drawings and other drawings provided by GPU.

2.0
REVIEW OF CONSTRUCTION DRAWINGS

The first task was a review of the as-built excavation drawings and the as-built foundation construction drawings. The purpose of the review was to:

1. Determine the absolute elevation of the depth of the structure, including associated tunnels, if appropriate;
2. Determine the depth to which the initial construction excavation occurred (i.e., did the excavation extend deeper and wider than the structure).
3. Evaluate the depth of the structure relative to the local stratigraphy (i.e., the impacts on hydraulic communication between the Cape May Formation and the Cohansey Formation through excavation of the Upper Clay);
4. Evaluate the depth of the structure relative to the average depth of the water table aquifer.
5. Compile the information in a format useful for evaluating the potential impacts of the structures on the localized groundwater flow paths.

The interpretation of the "as-built" drawings, especially the excavation summary drawings was subject to some interpretation because of the following observations:

- The scale on the as-built drawings often was not "as-shown" because of changes in the size of the drawings when reproduced. It appears the drawings were, at some point, stored on microfilm and then reproduced from the microfilm. The reproduction was not to the scale of the original drawings.
- The survey (monuments) or structural reference points on the historic as-built excavation drawings are not on the current site plans (i.e., the survey monuments used for construction are not the current survey monuments used to register recent drawings). In addition, the building outlines on the as-built excavation drawings do not always agree with the current dimensions or layout of the buildings.
- The as-built excavation drawings were all from different dates. The sequence of the drawings and the references to areas already backfilled indicates the excavations for the major structures listed above took place in several stages. URSGWC constructed a composite of the excavations, extrapolating (interpreting) as necessary between drawings of different areas or between drawings that indicated multiple excavations

in the same area (e.g., The area of the Stack appears to have been excavated as part of the excavation for the Reactor and Old Radwaste Buildings, partially backfilled and later excavated again to the depth of the foundation of the Exhaust Stack).

- The limits of the excavations as shown on the as-built drawings did not always coincide with stratigraphic information from soil borings advanced as part of subsequent geotechnical or environmental investigations.
- The method of stabilizing the excavation was not always included on the excavation drawings. For example, there was no detailed excavation drawing for the Intake/Exhaust Tunnel. The standard slope used to maintain a stable excavation on most drawings was 1.5 to 1. There were, however, indications that shoring was used in place of sloping in selected areas. It could not be determined if the Tunnel excavation was one of these areas.

URSGWC compiled the as-built historical drawings into two drawings (**Figures 2-1 and 2-2**). **Figure 2-1** shows the below grade vertical extent of the structures of concern, including the tunnel system. The Exhaust Tunnel System and the Discharge Structure locations have been transcribed from as-built drawings as accurately as was possible. Some of the finer details that would not impact the conclusions of this study have not been included. Features too small to accurately represent on a 1:20 scale drawing or features overshadowed by larger structures (e.g., sumps vs. tunnels) were not transcribed from the individual construction drawings to the composite drawing. These features would be too small to be evaluated on a 2 or 3 dimensional groundwater flow model (Section 4). A summary of the drawings reviewed as part of this study is included in Section 7, References.

Figure 2-2 shows the estimates of the vertical and horizontal limits of the excavations implemented during construction. Conservative assumptions regarding the extent of excavations were made in areas where no as-built cross-sections were available based on the engineering practices demonstrated in areas with cross-sections. For example, all cross-sections indicated that for large excavations the sides were sloped at 1.5 ft. horizontal to 1 ft. vertical (1.5:1). Also, lacking additional information, URSGWC assumed excavation walls were sloped at 1.5:1. URSGWC attempted to resolve the conflicts between the soil boring logs and the as-built construction drawings. The final estimates of the limits of the represent compromises between conflicting data sets.

2.1 APPARENT HISTORICAL EXCAVATION SEQUENCE

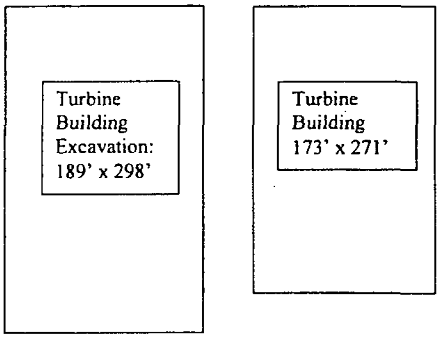
The construction excavations, exclusive of the New Rad-Waste Building and the Intake & Discharge Canal are summarized in three drawings:

- Reactor and Turbine Area Excavation Plan and Sections, Dwg. 4007-3, 9/22/64;
- Intake and Turbine Area Excavation and Backfill Plan & Sections, Dwg. 4006-2, 4/29/65; and
- Reactor Area Backfill Details, Dwg. 4010-2, 8/22/65

All three drawings were revised for "As-Built Conditions" on 5/5/70. While no drawings indicate the sequence of the excavations, the Intake and Turbine Area Excavation drawing and the Reactor Area Backfill Details refer to completed excavations in the Reactor and Turbine Areas (this includes the Old Radwaste Building).

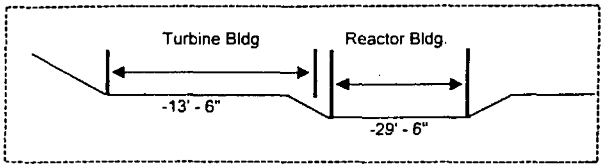
Reactor and Turbine Area Excavation Plan and Sections

The Reactor and Turbine Area Excavation Plan indicated the entire Turbine Building footprint plus a buffer was excavated to elevation (el.) -13' 0". The Turbine Building area, exclusive of the deeper structures such as the Intake/Discharge Tunnel and sump pits, was backfilled to el. 6'-5". The slope of the excavation sidewalls, where shown, was at 1.5:1. This means the excavation extended a minimum of 54 ft beyond the base of the excavation. The dimensions of the excavation exceed the dimensions of the current building. The rectangles shown below show the relative size of the Turbine Building excavation (left) vs the relative size of the Turbine Building (right).



Note: Relative scales are approximated.

The buffer zone surrounding the excavation was, presumably, the additional area needed for construction related activities. Because of the proximity of the Reactor Building to the Turbine Building, the slope of the walls of the Reactor elevation infringed on the limits of the Turbine Building excavation as shown in the sketch below (note: the elevations shown are the approximate elevations of the depth of the excavation beneath each building):



The detail section of the Reactor/Radwaste Buildings excavation demonstrates the Reactor Building excavation was to a depth of el. –29' 6" and that the Reactor Building was founded on original ground. Because the Reactor Building excavation was significantly deeper than the Turbine Building, the excavation was sloped upwards to el. –13'0". The detailed sections also indicate the Old Rad-Waste Building excavation extended to el. 13'0", well below the depth of the foundation mat of the building. As with the Turbine Building, the horizontal limits of the base of the Reactor Building and Old Rad-Waste Buildings, is significantly larger than the size of the actual building footprints.

The Turbine/Reactor excavation extended beyond the eastern limits of the Old Radwaste Building. This area was also excavated to a depth of approximately el. –14'. The invert of the deep portion of the Old-Radwaste Building slab is at el. +3' 6".

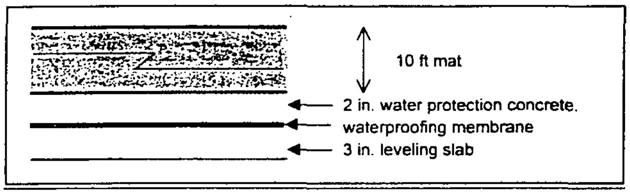
2.2 REACTOR BUILDING

The pertinent features of the Reactor Building are summarized below.

Total Depth: The base of the 10 ft thick mat of the Reactor Building is at el. –29' 6". Approximately 52.5 ft below ground surface (assume ground surface elevation of +23' 0". The mat is, apparently, founded on Cohansey Formation (i.e., there is essentially no backfill beneath the mat). The Reactor Building is the deepest of all buildings on the Site.

Foundation Construction: The Reactor Building mat is, as stated above, a 10 ft. thick steel reinforced concrete slab. Underlying the slab is a waterproofing system that consists of the following: 1) a 3 inch concrete leveling slab; 2) a waterproofing membrane; and, 3) a 2 inch concrete protective slab (see below). The waterproofing membrane apparently extends to an elevation of +5' 0" (with different construction details).

SIMPLIFIED CROSS-SECTION OF FOUNDATION W/ WATERPROOFING



Tunnels: There is one tunnel associated with the Reactor Building. This is discussed as part of the Exhaust Tunnel System.

Sumps: Two sumps were identified on Dwg. 4097-7 (Reactor Building Foundation Plan and Sections). The invert of the sumps was shown as el. –23' 0". The invert of the Reactor Building mat is deeper in the areas of the sump, to maintain a total mat thickness of approximately 10 ft from the invert of the sump (i.e., mat depth of approximately el. –33' 0". These sumps are small and so required the deepening of the mat in areas approximately 9 ft square. The sumps are not shown on the drawings or cross-sections.

Backfill: As was stated above, the leveling slab appears to be founded on the Cohansey Formation, not backfill. Presumably, the additional excavation for the sumps was localized to the sump area (no excavation details were found). There are no excavation/backfill cross-sections in the sump areas.

2.3 TURBINE BUILDING

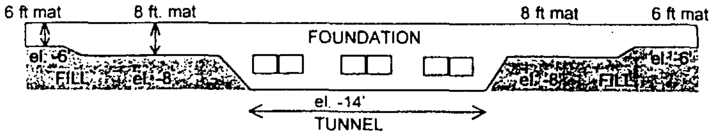
The pertinent features of the Reactor Building are summarized below.

Total Depth: The base of the 6 ft thick mat of the Turbine Building is at el. –6' 0". In the turbine areas the base is thicker (8 ft) therefore the base is deeper, el. –8' 0". The tunnel section of the building is at el. –14'. Please note that this conflicts with the maximum reported excavation depth of el. –13' as shown on the Turbine are as-built excavation drawing. The difference of one foot does not substantially impact the hydrogoelogic model.

Foundation Construction: As stated above, the mat of the turbine building is either 6' or 8' thick steel reinforced concrete. The detail drawings show the same leveling slab, waterproofing membrane and water proofing membrane protection concrete as discussed in the Reactor Building construction section (the previous section).

The excavation in the vicinity of the Turbine Building extended to approximately el. 13' 6" (near the completion depth of the Intake/Discharge Tunnel. The excavation cross-sections show the base of the tunnel structure to be founded on upper Cohansey. It appears the excavation did not extend deeper than the bottom of the tunnel.

SIMPLIFIED TURBINE BUILDING FOUNDATION (not to scale)



Tunnels: There are two sets of tunnels entering or exiting the Turbine Building:

- Intake/Discharge Tunnel; and,
- Exhaust Tunnel.

These tunnels are discussed in subsequent sections.

Sumps: There are five sumps/pits in the turbine building. Three are small pits that are not shown on the summary figure, **Figure 2-1**. There is a pair of pits adjacent to the Intake/Discharge Tunnel that have inverts of el. –14' and el. –18 ft. These are shown on **Figure 2-1** as a combined sump with multiple invert elevations.

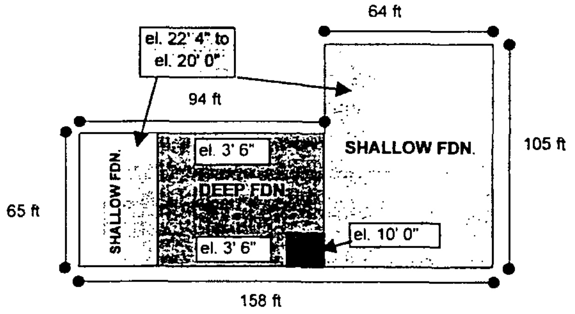
Backfill: As was stated above, the excavation drawings show the 8 ft and 6 ft mats were constructed on backfill. It appears the area of the Turbine Building was excavated to the planned depth of the intake/discharge tunnel, el. –14'-0".

2.4 OLD RADWASTE BUILDING

The pertinent features of the Old Radwaste Building are summarized below.

Total Depth: The total depth of the foundation for the Old Radwaste Building is variable (see below), including both shallow foundation and deep foundations. The shallow foundation portions are areas in which the top of the foundation slab is at el. 23' 0" (grade level). The bottom of the slab is el. 22' 4" to el. 21' 6", depending on the type of foundation construction. For the purpose of this report we will consider the average bottom of slab elevation for shallow foundation areas to be el. 22' 0". The bottom of the slab of the deep foundation portion of the building is el. 3' 6", exclusive of small area shown below. Variations in slab construction methods are discussed below.

SIMPLIFIED PLAN VIEW OF OLD RADWASTE BUILDING (not to scale)



Note: The lengths shown on the figure above were taken directly from the construction drawings. These measurements do not always agree with the field measurements collected by GPU as shown on Figure 2-1.

We cannot resolve the differences. We have, therefore, used the base map provided by GPU for the base map on all plan view figures since the base map represents actual measurements not as-built construction documents.

Foundation Construction: Much of the shallow foundation area, particularly the area east of the "deep foundation" portion of the building, is constructed with a variety of construction methods including:

- 8 inches of wire mesh reinforced concrete over 6 inches of gravel with a vapor barrier under the concrete;
- 1 ft 6 inches of steel reinforced concrete over 6 inches of gravel with or without a vapor barrier under the concrete; or
- 2 ft 6 inches of steel reinforced concrete over 6 inches of gravel with or without a vapor barrier under the concrete.

It is possible that there are additional variations on the designs discussed above. Detail drawings were not provided for the entire building.

The foundation supports in these areas range from 2 ft by 2 ft steel reinforced grade beams (base at el. 21' 0") to steel reinforced footings (7 ft at base) founded at el. 15'. The floor is also segmented into several sections and so includes construction (i.e., expansion) joints. The construction joint detail shows the joints included an 8 inch thick poured joint filler. The detail did not show evidence of an underlying vapor barrier or water proofing membrane. The majority of the details reviewed for this report were from the eastern portion of the building. It is presumed that similar construction methods were used in the western portion of the building that has a shallow foundation.

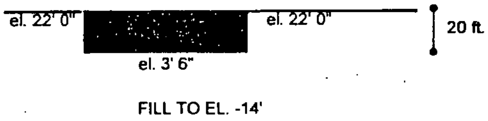
The foundation in the "deep foundation" portion of the building is 3 ft thick steel reinforced concrete and includes a water proof membrane. The maximum elevation to which the membrane extends could not be determined. The minimum elevation to which the membrane extends is el. 12' 0". The only variation in foundation elevation is in a shallower portion of the deep foundation portion of the building (see above) in which the slab thickness is reduced to 2 or 2.5 ft.

Tunnels: There is a tunnel that extends from the Old Radwaste Building to the Exhaust Stack. This tunnel will be discussed as a separate section.

Sumps: There is a minimum of one sump in the deep foundation portion of the building. In this area, the concrete thickness is maintained and so the bottom of the slab in the sump area is at el. 0' 0"(the elevation of slab minus elevation of the sump inside the building). There are two additional structures that may be sumps. There were no detailed cross-sections in this area; therefore, the depth of the sumps could not be determined. The sumps are small and have not been included in the final geologic and hydrogeologic cross-sections. Structures this size will not impact the model(s).

Backfill: The excavation for this structure extended to el. –14. This means there is approximately 18 ft of fill beneath the base of the deep foundation section and approximately 36 ft of fill beneath the shallow foundation sections of the structure (exclusive of grade beams and footings).

SIMPLIFIED EXCAVATION CROSS-SECTION (not to scale)

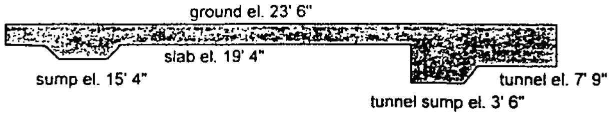


2.5 NEW RADWASTE BUILDING

The pertinent features of the New Radwaste Building are summarized below.

Total Depth: The foundation slab of the New Radwaste Building extends from el. 23' 6" to el. 19' 4". The base of the building is deeper in the sump areas or in the area of the tunnel to the Old Radwaste Building. The depth of a typical sump extends to el. 15' 4" (5 ft deeper than the normal slab. The bottom of the tunnel is at el. 7' 9" except in the area of the tunnel sump that extends to el. 3' 6".

NEW RADWASTE BUILDING CROSS SECTION (not to scale)



Foundation Construction: The foundation is constructed of approximately 4 ft of steel reinforced concrete underlain by a 2 to 4 inch protective concrete layer, a water proof membrane, and a 2-inch concrete leveling mat. The thickness of the leveling mat is consistently 2 inches. The thickness of the protective layer is, as was stated above, variable (from 2 to 4 inches); hence, the use of the term "approximately" in describing the foundation thickness.

The waterproof membrane appears to extend the height of the slab, sump or tunnel. Vertical waterproofing does not, however, include protective concrete. There is a note on one of the detail drawings stating the waterproof membrane was to be protected by fiberboard during backfilling of the excavation.

Tunnels: There is a single tunnel leading from the New Radwaste Building to the Old Radwaste Building. The depth of the tunnel is, as was stated previously, el. 7' 9". A note on a detail drawing for the tunnel notes that it slopes downward towards the Old Radwaste Building. The finish elevation of the tunnel is not known because there were not detail drawings of the tunnel exclusive of those associated with the New Radwaste Building.

Sumps: discussed above

Backfill: There are no excavation drawings for the New Radwaste Building. The base of the slab and sumps is likely founded on fill of unknown thickness. Borings near the building suggest between 0 and 10 ft of fill that appears to be very similar to the Cape May formation.

The base of the tunnel sump is at the top of the Upper Clay. This could have necessitated some excavation of the clay, perhaps on the order of 1-3 ft. The base of the tunnel, where it exits the south side of the New Radwaste Building, is approximately 2 ft above the top of the Upper Clay. URSGWC has assumed that the construction of the tunnel, near the New Radwaste Building, did not require any significant excavation of the Upper Clay (i.e., enough excavation to result in the change in the hydrogeologic characteristics of the Upper Clay near this structure). Without any information on tunnel construction methods or tunnel geometry (particularly where it enters the Old Radwaste Building), URSGWC

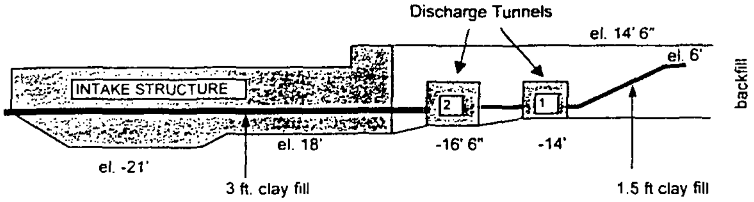
cannot determine if any excavation of the Upper Clay was required for other sections of the tunnel.

2.6 INTAKE STRUCTURE

The pertinent features of the Intake Structure are summarized below.

Total Depth: The total depth of the intake structure is variable. The deepest part of the structure is approximately el. -21'. The eastern half of the structure is slightly shallower at approximately el. -18'. The structure appears to be founded on the Cohansey Formation. The clay in this area is shallower than el. -18. In the figure presented below, the bottom of the fill is presumed to be the bottom of the intake structure (Dwg. 4006-2).

SIMPLIFIED CROSS SECTION OF INTAKE STRUCTURE (not to scale)



Foundation Construction: The intake structure is generally constructed of 2 ft thick steel reinforced concrete. Detail drawings reviewed for this report did not indicate the presence of water proofing.

Tunnels: The tunnels associated with this structure include the Intake Tunnel and electrical tunnel. The intake tunnel is discussed in Section 2.8.1. The electrical tunnel appears to be located at an elevation well above groundwater and so should not impact the conclusions of this report.

Sumps: No sumps were observed on the drawings reviewed for this report.

Backfill: The backfill, as seen in the cross-section presented above, does not appear beneath the Intake Structure. The clay fill layer is present (as shown above). The cross-section indicated the western limit of the clay layer is tied into the lower portion of the Upper Clay Formation. The clay fill layer then extends past the limits of the discharge tunnels and thins to 1.5 ft. The eastern terminus of the clay layer is the upper portion of the Upper Clay Formation. Additional details on the construction method and speculation regarding the function of this layer are presented in Section 2.8.1.

2.7 TUNNELS AND OTHER STRUCTURES

Tunnels and, if necessary, tunnel segments are discussed individually in the following sections.

2.7.1 Intake/Discharge Tunnel

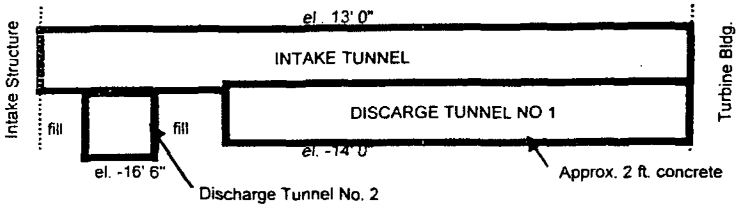
The pertinent features of the New Radwaste Building are summarized below.

Total Depth: The intake tunnel runs from the Intake Building to the Turbine Building. The interior of the intake tunnel is 10'6" by 10'6". The tunnel enters the Intake Structure from at approximately el.15'0". The Intake Tunnel slopes downward to el. 13'0" at the intersection with the Unit 1 Discharge Tunnel. From that point , the Intake and Discharge tunnel are a single structure with a maximum (top) el. of 13'0" and minimum (bottom) el. of 12'-0".

The Unit 1 and Unit 2 Discharge Tunnels are nearly identical. Both tunnels have maximum elevations of 0'6", exclusive of the last 15 ft where the tunnel enters the Discharge Canal. At the terminus, the maximum tunnel elevation appears to be approximately el. +8. The base of the tunnel ranges from el.-15'6" (near Discharge Canal) to el. –14'0" (near the Turbine Building) (see below). Note that Discharge Tunnel No. 2 is deeper than Discharge Tunnel No. 1. The depth where Discharge Tunnel No. 2 crosses underneath Discharge Tunnel No. 1 is el. –16'6". The simplified figure presented below does not show the upward slope of the Intake Tunnel that takes place west of the western limit of the Discharge Tunnel.

Please note that the Unit 2 Discharge Tunnel crosses under the Intake Tunnel approximately 40 ft. from the Intake Building. This tunnel was intended to be the discharge tunnel for a second turbine/reactor. Consequently, the tunnel terminates north of the Intake Tunnel rather than connecting to existing Turbine Building. The sketch below shows Tunnel No. 2 passing under the Intake Tunnel. The western limit of Tunnel No. 1 is where the Discharge Structure joins the Discharge Tunnel.

SIMPLIFIED CROSS-SECTION OF INTAKE/DISCHARGE TUNNELS (not to scale)



Foundation Construction: Burns and Roe Dwg. 4035 includes cross-sections of all three tunnels. The sections show that the tunnels are generally constructed of 2 ft thick concrete (see above). All three tunnels include a minimum of one expansion joint. The drawings reviewed as part of this report did not show evidence of a water proofing membrane.

Sumps: No sumps or pits were observed on the Intake and Discharge Tunnel drawings reviewed for this report.

Backfill: The intake and discharge tunnels appear to be founded on native soil. The formation at the depth of the base of the Discharge Tunnels would have been the Cohansey Formation. The Upper Clay appears to have been excavated in the area of these structures. There were two cross-sections which indicated the backfill in the area of the tunnels and the Discharge Structure was the same fill as was used in the Reactor and Turbine Buildings (with the exception of a clay layer of variable thickness (1.5 to 3 inches) that abuts the sides of the tunnels). The possible function of this clay layer was not indicated in the construction drawings or the historical reports. Neither was the method of construction or lateral extent.

Dwg. 40062, "Intake and Turbine Area Excavation and Backfill Plan and Sections," indicates the following:

- The clay backfill layer discussed above is 3 ft thick west of Discharge Tunnel No. 2.
- The clay backfill layer thins to 1.5 ft between Discharge Unit No. 1 and Discharge Unit No. 2.
- The clay backfill layer slopes upward east of Discharge Tunnel No. 1.
- The clay backfill layer along the face (presumed the southern face) of the Intake Structure and Intake/Discharge Tunnels ends at the top of the Upper Clay Layer.
- The area above the cooling water tunnel was originally backfilled to an elevation of 14' – 6". The backfill slopes upward to approximately el. 23' – 0" at the north-south road that parallels the face of the Turbine Building.

Unresolved issues regarding the backfill in this area include:

- The lateral extent of the clay backfill layer;
- The purpose of the clay backfill layer;
- The lateral extent of the tunnel excavation to the south and east; and
- The reason for constructing the clay backfill layer.

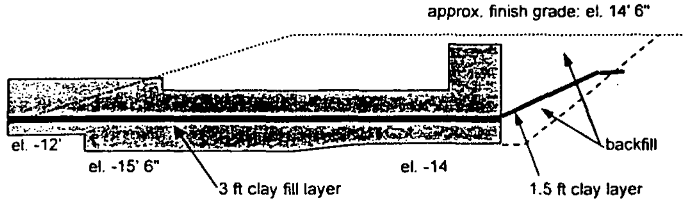
A note on Dwg. 4006-2 stated: "Clay backfill to be placed in 6" max layers and compacted with sheepfoot roller per specs.... and with not less than 4 passes per layer." A note on Dwg. 4029 (Intake Structure Foundation Plan) stated: "After construction flood intake structure to el. –7' 0" prior to shutting of dewatering system. The clay layer, where horizontal, is el. –8' to el. –11' (3 ft thick or el. –8' to el. –8' to el. –6' 6". Combined, this information suggests the clay layer may have been constructed as part of the overall dewatering plan (i.e., to be able to stop dewatering to below el. –7' 6" because of the presence of the clay fill layer. The drawings indicate the presence of the upper clay at the terminus of the clay fill layer. This further supports the speculation that the clay layer is associated with the dewatering plan (i.e., perhaps forming a temporary hydraulic barrier limiting the vertical movement of groundwater).

2.7.2 Discharge Units

The pertinent features of the New Radwaste Building are summarized below.

Total Depth: As was stated above, there are two Discharge Units, No. 1 and No. 2. No. 1 is functional. No. 2 was constructed in anticipation of constructing a second reactor building north of the current Reactor Building.

SIMPLIFIED DISCHARGE UNIT CROSS-SECTION (not to scale)



Foundation Construction: The Units were constructed of 2 ft thick steel reinforced concrete. Detail drawings reviewed for this report did not indicate the presence of a waterproofing membrane exclusive of tarpaper at some joints.

Tunnels: Discharge Unit No. 1 connects with the Discharge Tunnel that is discussed in Section 2.8.1. Discharge Unit No. 2 does not connect with a Discharge Tunnel because the second reactor was never built.

Sumps: No sumps were observed on the drawings reviewed for this report.

Backfill: The base of the Discharge Structures is founded on the Cohansey Formation. There were no drawings or cross-sections that indicated the presence of backfill beneath the Discharge Units. As with the Intake/Discharge Tunnels and the Intake Structure, the clay fill layer is present. The position and thickness of the clay layer is shown in the schematic presented above.

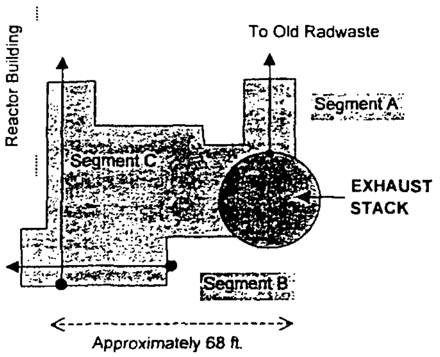
Drawing Dwg. 4026 (Circulating Water System Sections and Details Sh. #3) indicated the use of retaining walls during the construction of the discharge units. This indicates that the Discharge Units, unlike the main structures, did not require 1.5 to 1 or 2 to 1 excavation slope walls on all sides to maintain the stability of the excavation during construction. Unfortunately, there were no drawings that indicated the location or limits of the retaining walls.

2.7.3 Exhaust Tunnel System.

There are several sections to the Exhaust Tunnel System (ETS). The section locations are shown on Figure 2-1. A brief description of each segment (size and depth) is given below.

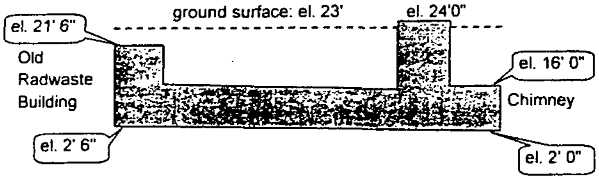
The sketch shown immediately below is a schematic of the location of the first three segments of the ETS. The shaded portion is the ETS complex as it enters the Exhaust Stack. The Exhaust Tunnel System near the stack is large enough that is could be considered a subsurface structure (see below and **Figure 2-1**).

SIMPLIFIED PLAN VIEW OF ETS NEAR EXHAUST STACK (not to scale)



Segment A: Old Radwaste Building to Exhaust Stack

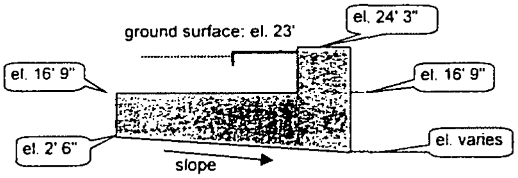
SIMPLIFIED CROSS-SECTION ETS SEGMENT A (not to scale)



Notes 1) typical wall thickness: 1' 9"; typical slab thickness 2'
2) Interior height 10 ft
3) 1" fiberboard around tunnel suggests waterproofing

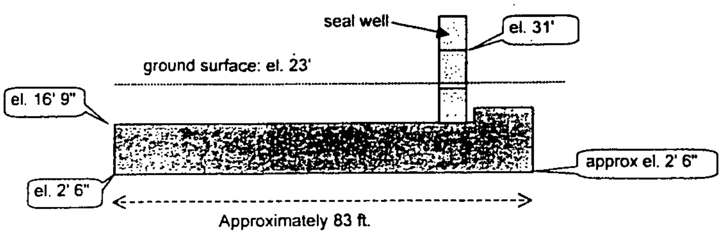
Segment B: Near Exhaust Stack to Southeast Corner of Reactor Building

SIMPLIFIED CROSS-SECTION ETS SEGMENT B (not to scale)



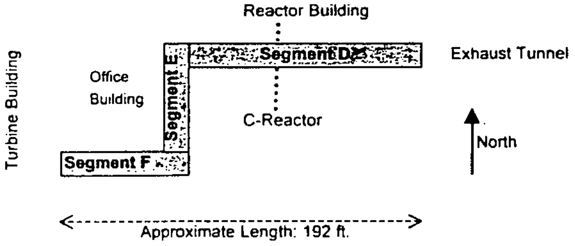
Segment C: Parallel to East Face of Reactor Building

SIMPLIFIED CROSS-SECTION ETS SEGMENT B (not to scale)



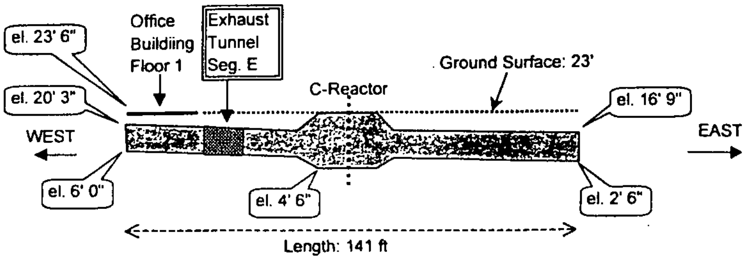
Part II of Exhaust Tunnel System

The sketch below shows the approximate locations of the remaining three segments of the Exhaust Tunnel System. "C-Reactor" is the approximate location of the centerline of the reactor.



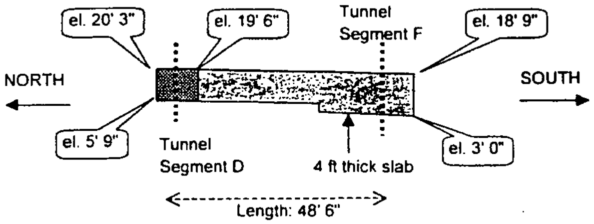
Segment D: Parallel to South Face of Reactor Building:

SIMPLIFIED CROSS-SECTION ETS SEGMENT D (not to scale)



Segment E: Parallel to East Face of Office Building

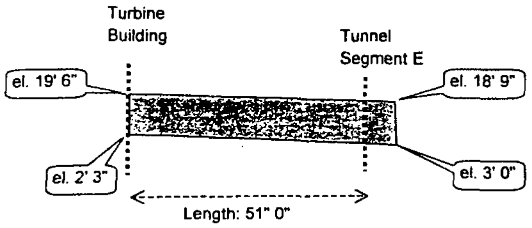
SIMPLIFIED CROSS-SECTION ETS SEGMENT E (not to scale)



Segment F: Parallel to South Face of Office Building to Turbine Building

A cross section of Segment F was not included in the drawings reviewed for this report. The cross-section presented below is based on the known elevation data from the intersection with ETS Segment E and a presumption that the tunnel slopes upward towards the Turbine Building.

ESTIMATED CROSS-SECTION ETS SEGMENT E (not to scale)



Note: 1) Assume 9" rise over length of tunnel segment based on similar rise in Segment E

Summary of General Tunnel System Characteristics

Total Depth: The maximum total depth of the ETS is el. 2' 6" exclusive of a small portion of Segment D along the center line of the reactor.

Foundation Construction: Base slabs were typically 2 ft to 2 ft 6 inches thick. The maximum thickness was 4 ft. Sidewall and ceilings were typically 1 ft 9 inches to 2 ft thick. Base slab construction appears to have included a waterproof membrane (note: the waterproofing detail referenced on the cross-sections was not included in the drawings reviewed for this report). There was one indication that the 3 layer system (leveling slab, membrane, protective slab) was used on portions of the tunnels. The extent to which this system was implemented could not be determined. It is not unreasonable to assume the three layer waterproofing system, similar to that observed on the major structures where below the water table, was used for the tunnel foundation slab with some modifications for the walls (again where below the water table).

There were several references to fiberboard used to protect the walls or roof of the tunnel (presumably during backfilling). It would seem likely that the fiberboard was protective some type of waterproofing system that could be damaged during backfilling if not protected.

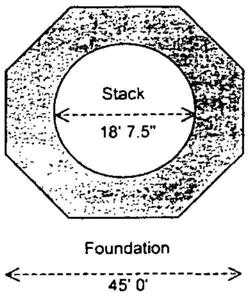
Sumps: No sumps were noted.

Backfill: The entire ETS was constructed on backfill. The backfill in the Reactor/Turbine Area extends, at a minimum, to el. –14' (also the maximum depth of the Stack). The maximum depth of the ETS is el. 2' 6". Assuming 1 ½ to 1 sidewall slopes for the excavation of the Reactor Building, the Turbine Building and the Stack, the area of the ETS must have been excavated to a depth greater than el. 2' 6".

2.7.4 Stack

The pertinent features of the Stack (Chimney) are summarized below.

PLAN VIEW OF STACK & FOUNDATION (not to scale)



Total Depth: The base of the Chimney foundation is at el. –10' 0". The sump directly under the Chimney extends to a depth of –14' 0"

Foundation Construction: The octagonal foundation is constructed of 7 ft of steel reinforced concrete. The foundation includes the typical 3 part waterproofing system (leveling slab, waterproof membrane, and protective slab). The waterproofing system may extend around the entire foundation.

Tunnels: see discussion of ETS above.

Sumps: As was stated above, a single sump underlies the stack foundation. The sump is 4 ft in diameter, located west of the center of the stack.

Backfill: The foundation for the stack is likely on Cohansey Formation at the base of the sump and backfill under the remainder of the foundation. The Upper Clay has been excavated in this area.

2.7.5 New Radwaste Tunnel

The New Radwaste Tunnel goes from the New Radwaste Building to the Old Radwaste Building. The pertinent features of the New Radwaste Tunnel are summarized below.

Total Depth: The total depth of the New Radwaste Tunnel where it exits the New Radwaste Building is el. 7' 9". As was previously stated, the tunnel slopes downward towards the Old Radwaste Building. The depth at which it intersects the Old Radwaste Building is unknown because no construction drawings of the tunnel were provided.

Foundation Construction: The only foundation information is from the detail sections on the New Radwaste Building drawings. The tunnel is constructed of 3+ ft thick steel reinforced concrete. The base of the tunnel is protected by a 4-inch protective slab, a water proof membrane and a 2-inch leveling slab. The waterproof membranes extends up the sides of the tunnel and was protected by fiberboard before backfilling. The sides of the tunnel are keyed to the top and bottom with 6-inch by 3-inch keys and 6-inch waterstop.

Sumps: The sump at the base of the tunnel where it originates was discussed in the section on the New Radwaste Building. There are no tunnel drawings to determine if there are additional sumps along the length of the tunnel or at the tunnel terminus.

Backfill: There are no excavation drawings of the New Radwaste Tunnel between the New Radwaste Building and the Old Radwaste Building. If the slope of the tunnel towards the Old Radwaste Building is minimal, the tunnel excavation should not have disturbed the Upper Clay formation. If, however, the tunnel slopes downward and enters the Old Radwaste Building in the deep portion of the building, portions of the Upper Clay would have been excavated. As-built construction drawings and excavation drawings will be evaluated by URSGWC if supplied by GPU.

2.8 SUMMARY

The detailed review of the excavation and construction drawings was intended to

1. Determine the depth and, in some cases, the location of subsurface structures that have the potential to release radiologically contaminated material to the soil or groundwater;
2. Gather data concerning the construction of these structures (e.g., foundation thickness, presence of water proofing system) to allow GPU to evaluate the potential for construction methodologies to positively or negatively impact the potential for a release.
3. Combine construction data with stratigraphic and hydrogeologic data to construct an accurate conceptual site model and 2-dimensional groundwater models.

3.0
STRATIGRAPHY AND HYDROGEOLOGY

3.1 SITE STRATIGRAPHY

There are five stratigraphic units found at the Site (exclusive of fill). These include (from shallow to deep):

- The Cape May Formation;
- The Upper Clay
- The Upper Cohansey Formation;
- The Lower Clay; and,
- The Kirkwood Formation

Descriptions of these formations are based on previous reports, principally the "Geotechnical Study, Proposed Radwaste and Off-Gas Buildings" (February 1975), the ""Phase II Report, Ground Water Monitoring System" (March 1984) , and additional boring log review is presented below. Formation thickness data is based on a review of boring logs from within the study area (Table 3-1) and outside the study area (not tabulated). There is limited information on the Lower Clay and the Kirkwood Formations since most borings were terminated in the Cohansey Formation.

An additional source of data that could provide a large amount of additional stratigraphic information would be the pre-construction boring program of 1965. A limited amount of this information (three cross-sections) was reviewed. No boring logs were available to corroborate the cross-sections. No geotechnical boring logs from the original construction foundation studies were provided to URSGWC. Without the boring information it is difficult to identify stratigraphic boundaries because descriptors such as color, density, etc. are not available. Projections of stratigraphic boundaries were, therefore, estimated in areas where data was not available.

Fill:

Description: The fill is a tan, medium to fine grained sand with trace to some silt. No evidence of soft sediment structures such as lenses of silt or coarse sand. The density is

typically less than the Cape May. Based on the excavation pattern discussed above and the description of the fill, it appears likely that much of the fill is excavated Cape May.

Thickness: The fill thickness from soil boring logs varies from 0 ft to 38 ft below ground surface (bgs) (el. 23' to el. -15'). The maximum thickness of fill was in the borings closest to the Turbine Building. The maximum fill thickness must be 53 ft (el. -30 vs. surface elevation of +23 ft) in the vicinity of the Reactor Building. This is based on the depth of the excavation for these structures (no boring log was found indicating 53 ft of fill.).

Cape May:

Description: The Cape May Formation is the youngest formation in the Oyster Creek Region. It is described as a light gray to tan medium to fine grained sand with trace to some silt and occasional coarse sand. It is generally poorly compacted.

Thickness: The Cape May Formation in the study area varies from 0 ft to 21.5 ft thick. The variation is largely due to the amount of material excavated and replaced by fill as part of the excavation process. The thickness of the Cape May where not excavated is generally in the range of 17 to 20 ft (presuming a ground surface elevation of 23 ft).

Upper Clay:

Description: The description is as follows: stiff to hard, gray, plastic organic clay containing inclusions (also described as lenses or partings) of dense fine sand with trace to some organic silt. The deposits of fine sand within the Upper Clay layer have high relative densities and are believed to be in the form of lenses or inclusions. Some boring logs describe the "sand lenses" as the dominant feature over a 1 to 5 ft. thickness. In the area southwest of the Turbine Building, approximately half of the total thickness of the Upper Clay, is silty sand (not clay).

Thickness: The Upper Clay is typically on the order of 15 to 18 ft (where not impacted by excavation). Early reports suggest a thinning trend from east to west. This trend is best observed by reviewing information from outside the study area, specifically boring logs from the "West Site" and preliminary data from the Route 9 area. This data suggests the Upper Clay may be as thick as 25 ft east of Route 9 to 0 ft at the "West Site". The lack of a map identifying the locations of these borings makes correlation difficult and

very speculative. The suggestion is, however, that there is a thinning trend from east to west but that the Upper Clay is present at 17 ft +/- 3 ft throughout the study area. Alternatively, it is possible that the conclusions drawn by previous investigators are based on a classification of the gray silty sand found in some borings as Upper Cohansey. The conclusion of this study is that the gray silty sand /sandy silt in question is part of the Upper Clay. This conclusion is reflected in the cross-section B-B'.

Cohansey Formation:

Description: Yellow-brown or tan, medium to fine sand with trace to some silt. Also contains pockets of coarse to fine sand, and occasional gravel and pockets of sandy silt. The lower portion of the Cohansey Formation was deposited in a beach or barrier bar environment, while the upper portion is a fluvial deposit. The upper portion can be identified by lower N-values (approximately 45) than the lower Cohansey (approximately 130).

Thickness: The thickness of the Cohansey is estimated to be approximately 60-75 ft. There is not enough data to identify a pattern of the thickness of this formation as with the Upper Clay.

Lower Clay:

Description: The clay is a dense gray medium to fine sand containing a trace to some organic silt and layers or inclusions of very stiff to hard gray organic clay.

Thickness: The thickness of the lower clay is on the order of 10 to 20 ft. Again, there is very limited thickness information on this formation. The majority of the boring reviewed for this study terminate well above the Lower clay.

Kirkwood Formation:

Description: This is a medium to fine sand with trace silt. Casagrande and Casagrande (1968) reported two hard clay layers within the Kirkwood formation at elevations less than –198 ft.

Thickness: Unknown in the study area.

3.2 CONSTRUCTION IMPACTS TO SITE STRATIGRAPHY

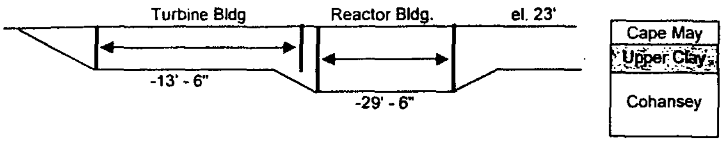
This section will describe the impacts of excavation for selected structures on the site stratigraphy, the most noteworthy of which is the removal of the Upper Clay layer which acts as a hydrogeologic aquitard (i.e., a stratigraphic unit that is a partial barrier to hydraulic communication). Included are sketches of the structure depths with the relative depths of the stratigraphic units presented in an accompanying idealized stratigraphic column. This is intended to show the depth of building and the excavation relative to the stratigraphic column.

The impacts of the construction on site stratigraphy is demonstrated on the sketches presented below as well as on the following figures:

Figure 2-2	Estimated Limits of Excavation for Selected Structures
Figure 3-1	Cross-Section A-A' (includes Old Radwaste Building, Reactor Building, Turbine Building and Intake Structure) Cross-Section B-B' (includes New Radwaste and Turbine Buildings)

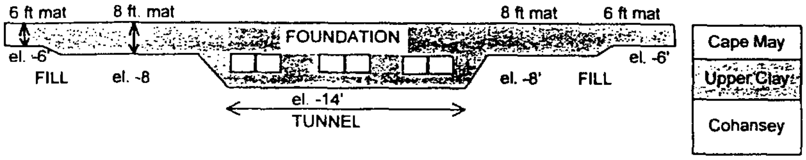
The "sketches" include the construction information from Section 2 and a simplified stratigraphic column that shows the approximate depth of the Upper Clay relative to the excavation and construction of the structure of interest.

<u>Reactor Building</u> The Reactor Building excavation extended to approximately el. –30' (53 ft bgs). This excavation resulted in the removal of the entire Cape May, and Upper Clay Formations as well as part of the upper Cohansey Formation. The sketch presented below shows the estimated elevations of the Cape May, Upper Clay, and Cohansey formations relative to the estimated excavation depths.



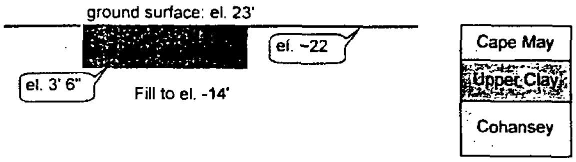
Turbine Building:

The Turbine Building excavation extended to approximately el. –14' (37 ft bgs). This excavation would also have resulted in the removal of the entire Upper Clay layer as seen in the sketch presented above. The excavation for the Turbine Building extended to el. –14' in beneath the entire footprint of the building, including areas in which the foundation slab extended only to el. –6'. This was to accommodate the depth of the Intake and Discharge Tunnels (see below).



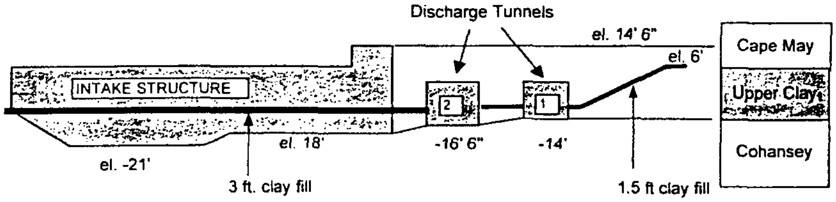
Old Radwaste Building:

The Old Radwaste Building is, as was previously stated, partially a slab on grade with shallow footings and grade beams, and partially a deep foundation structure (approximately 20 ft bgs; el. 3' 6"). However, the excavation extends to el. –14'. As such, the Upper Clay has been excavated in this area.



Intake Structure

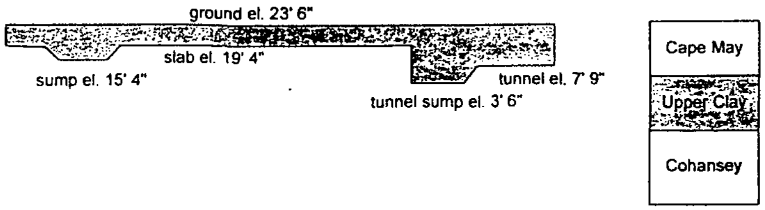
The Intake Structure and the accompanying discharge tunnels are shown on the figure below. This figure demonstrates that the Intake Structure (and the tunnels) are founded deeper than the base of the Upper Clay. The concern with these structures is that the lateral extent of the excavations is not clear from the construction drawings (i.e., there was no as-built drawing that showed whether the excavation was stabilized by a sloped excavation wall or by sheeting or by a combination of construction methods). Also, the as-built cross-sections show a 1.5 ft to 3 ft clay fill layer that was, apparently placed during the backfill of the Intake Structure and Intake/Discharge Tunnel area. This layer was reported tied into the upper portion of the Upper Clay to the east and the lower portion of the Upper Clay to the west. It is believed, however, that the "tie in" to the west could not exist after the Intake/Discharge Canal was constructed since this appears to have resulted in the excavation of the clay. It is also likely that the "tie in" to the east can currently exist because it appears the excavation for the Turbine Building and, possibly the Intake/Discharge Canals resulted in the excavation of the Upper Clay to the east.



New Radwaste Building

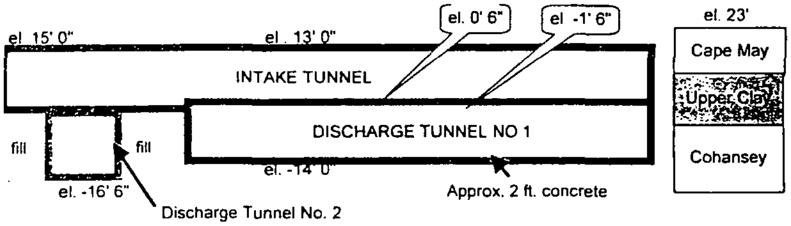
The foundation of the New Radwaste Building (including sumps) is in the Cape May formation. The top of the Upper Clay in this area is between el. 8' and el. 4'. The tunnel and tunnel sump may, therefore, have resulted in the excavation of some portion of the Upper Clay. It is not known (there are no excavation drawings) if the excavation for the construction of the New Radwaste Building was to the depth of the tunnel sump (el. 3' 6") near the tunnel sump only or if the entire building footprint was excavated to the depth of the tunnel sump. It is suspected that the deep excavation would have been performed only in the tunnel area because this is a relatively small portion of the footprint of the entire building. It does not seem likely that the choice would be made to excavate

and replace fill to el. 3' 6" unless there was a concern for the geotechnical characteristics of the soil.



Intake and Discharge Tunnels

The Intake Tunnel is shallower than the Discharge Tunnel. The Intake Tunnel (see below) is founded in the top half of the Upper Clay. The construction of the deeper Discharge Tunnel would have resulted in the excavation of the lower half of the Upper Clay and some of the Cohansey Formation.



Exhaust Tunnel System

The Exhaust Tunnel System is, as was discussed above, an extensive system. The average elevation of the bottom of the tunnel system is shallower than the elevation of the adjacent larger structure (e.g., the Reactor Building or the Turbine Building). It is, therefore, assumed that the discussion of the excavation for the Reactor Building and Turbine Building (and the later excavation for the Chimney) includes the area disturbed by the Exhaust Tunnel System.

New Radwaste Tunnel

There is no information on the depth of the New Radwaste Tunnel exclusive of that information included in the discussion of the New Radwaste Building.

3.3 HYDROGEOLOGY

3.3.1 Regional Hydrogeology

The following description was presented in the Phase I Groundwater Monitoring Report:

> "Both the Cape May and the Cohansey Formations are unconfined aquifers while an artesian aquifer exists in the Kirkwood Formation. The water level in the unconfined aquifer fluctuates seasonally. Occasional thin clay layers in the Cape May and Cohansey formations may cause slightly artesian conditions in localized areas but, in general these two formations communicate hydrologically. Thin clay layers are especially prominent near the coast. A clay layer separates the Kirkwood from the Cohansey. The clay layer acts as a confining layer and artesian heads as high as 22 feet above msl have been found in the Kirkwood (JCP&L, 1972).
>
> Water supplies in the area are derived from wells. These wells are generally 60 to 70 or more feet in depth, penetrating at least one clay boundary to preclude contamination from salt water intrusion or leachate from the many septic tanks in the area. The deeper wells penetrate the Kirkwood aquifer and yield higher quality water. There are also many shallower wells that provide domestic water supplies.
>
> On a regional scale, ground water flows generally to the southeast toward the coast, following the trend of the coastal basin sedimentary bedding…."

3.3.2 Site Hydrogeology

The site hydrogeology is dominated by two factors: 1) the Intake/Discharge Canal; 2) the excavation of the Upper Clay during construction. The excavation of the Upper Clay has resulted in a direct connection between the Cape May and the Cohansey Formations.

East of the Reactor Building the water table is several feet above the Upper Clay. West of the Turbine Building the water table is several feet below the top of the Upper Clay.

The construction of the Canal has further contributed to the change in the flow direction of the upper aquifer. Water level in the canal is approximately at sea level (presumed to be el. 0'). Before construction, the water level averaged less than 6 ft below ground surface (approximately el. 20'). Water table levels now average 12 ft below ground surface (approximately el. 12'). This is a result of the change in gradient towards the canal which is at el. 0'.

URSGWC has tabulated the stratigraphic and hydrogeologic data collected during previous investigations. The data are tabulated as follows:

Table #	**Name and Description:**
3-1	*Summary of Stratigraphic and Hydraulic Conductivity Data*: This table includes the stratigraphy and hydraulic conductivity data for former and existing well networks. In instances where data is missing, the boring or well installation log may have been missing of the data was incomplete.
3-2	*Additional Hydrogeologic Data:* Includes gradient, velocity and dispersivity data from previous work by URSGWC and others. The exact location of all of the data collection points is not known.
3-3	*Water Table Elevations:* Includes water table elevations and LNAPL thickness (if present). Data is primarily from the area of the diesel fuel spill. The table includes an evaluation of the amount of variation in elevation per well over the rounds of data presented in the table.
3-4	*Water Table Elevations: Outer Monitoring Network:* This is a round of water table elevations from the outer (background) monitoring network. Not all of the locations are shown on **Figure 3-2** because some are beyond the area shown in the figure.

This data is discussed below.

Groundwater elevation data:

URSGWC used the groundwater elevation data from the 1982 investigation because no other groundwater elevation data were available that included all of the necessary wells. The data collected quarterly by GPU only includes the wells associated with the diesel

fuel oil recovery system. This system includes a large number of wells but all are clustered southwest of the area of interest. The background water quality monitoring network is only monitored annually and not at the same time as the quarterly monitoring for the diesel fuel spill.

Seasonal Groundwater Elevation Variation: The data reviewed for this report suggest seasonal groundwater elevation variations are generally on the order of 1.5 to 2 ft (Table 3-3). The maximum variation observed was 4.8 ft; however, it could not be determined if this amount of variation was a function of the impacts of the extraction and injection system associated with the diesel fuel remediation system plus seasonal variation.

Head Difference between Cape May and Cohansey: Table 3-4 suggests the groundwater elevation in the Cohansey formation is lower than the groundwater elevation in the Cape May. In particular, the water table in wells W-1A and W-2A is significantly lower than any other Cohansey wells. The head difference in these well pairs is on the order of 9 to 10 ft. The head difference in well pairs closer to, but outside of the area in which the Upper Clay was excavated is on the order of 5 to 6 ft. Based on a preliminary review of the survey data for the W-1 and W-2 well pairs it is suspected that there is an error in the survey data. Therefore, until this is resolved URSGWC suggests the data from these pairs is erroneous. GPU has, as part of other site work, re-surveyed these wells. The new data was not available for the preparation of this report.

Well	**Year of Data**	**Deep or Shallow**	**Groundwater Elevation**	**Difference (Shal. -Deep)**	
W-5	*1983*	*Shallow*	*8.78*	W-5/6	*Shal. Higher*
W-6	1983	Deep	3.09	5.69	
W-14	*1983*	*Shallow*	*10.84*	W-14/15	*Shal. Higher*
W-15	1983	Deep	5.07	5.77	
W-1A	1999	Deep	-4.51	W-1A/1B	
W-1B	*1999*	*Shallow*	*4.77*	9.28	*Shal. Higher*
W-2A	1999	Deep	-4.90	W-2A/2B	
W-2B	*1999*	*Shallow*	*5.27*	10.17	*Shal. Higher*
W-3A	1999	Deep	4.29	W-3A/3B	
W-3B	*1999*	*Shallow*	*12.20*	7.91	*Shal. Higher*
W-4A	1999	Deep	4.63	W-4A/4B	

Well	**Year of Data**	**Deep or Shallow**	**Groundwater Elevation**	**Difference (Shal. –Deep)**	
W-4B	*1999*	*Shallow*	*8.70*	4.07	*Shal. Higher*

The instances in which the head difference between the Cape May and the Cohansey Formations is much lower are all in areas in which the Upper Clay has been excavated. This confirms the effectiveness of the Upper Clay as an aquitard.

Hydraulic Conductivity: Hydraulic conductivity and other aquifer parameters are tabulated in Tables 3-1 and 3-1. This data will, on an as needed basis, be discussed in Section 4 of this report.

3.4 FRACTURE FLOW ANALYSIS

In 1996 Woodward-Clyde prepared a letter report titled: "Groundwater Flow Calculations: Cask Drop Study – Reactor Building." This addressed the hypothetical scenario of dropping a cask of fuel rods onto the slab at the base of the Reactor Buildings. Presumably the cracks would have resulted in a pathway for the entrance of groundwater into the structure. A copy of this letter report is included as Appendix A.

Most of the structures included in the current report (including the Reactor Building) are, in part, below the water table (note: in some instances only part of the footprint of the structure is below the water table). We have evaluated the relationship of groundwater elevation to structure depth by applying the analyses used in the Cask Drop Study to all structures.

The primary flow mechanisms investigated in the Cask Drop Study were: a) flow through fractures using fractured rock analyses; and, b) "piping" (flow of soil as a viscous liquid through the cracks. The initial study demonstrated that "piping" was not a concern; consequently, we have eliminated the piping calculations from the current analysis as well.

The fracture flow analyses are summarized in Tables 3-5 and 3-6. Table 3-5 summarizes the pertinent building data (e.g., slab depth, slab thickness, etc.), groundwater elevation at the building and shows the calculate volume of water required for equilibrium to exist between the aquifer and the building interior (i.e., the water level inside the building

equals the water level outside the building). Using this information, Table 3-6 shows the calculated fracture flow rates for each structure using the formula used in the Cask Drop Study which is presented in Appendix A. The time to reach equilibrium is then calculated by dividing the volume necessary to reach equilibrium by the flow rate (the last row of Table 3-5).

Tables 3-5 and 3-6 incorporate the fracture flow formulas presented in Appendix A into an electronic spreadsheet format. URSGWC can provide these tables electronically so that the flow rates and time to equilibrium can be calculated under different conditions (e.g., fewer fractures, high or lower water table, different hydraulic conductivities, etc.).

The equilibration times presented are conservative (i.e., biased high) because:

1. A high hydraulic conductivity (approximately one order of magnitude higher than the observed average hydraulic conductivity) was used thus generating a higher than expected fracture flow rate;
2. A single flow rate was used to estimate the time to equilibration even though the flow rate would decrease as the difference in head between the aquifer and the building interior would decrease as the water level inside the building increased;
3. The number (4) and length (42 ft) of the fractures is appropriate to a catastrophic event (i.e., the cask drop scenario) but may be larger than necessary for an "average" release scenario; and,
4. The portions of the structures that are below the water table include a water proof membrane below the slab (see Section 1) and on the sides of the structures that are at or below the water table. This means the event causing the fracture would have had to create not only a breach in the slab but would also have had to breach the integrity of the water proofing system.

The results of the evaluation of ground water elevation vs. foundation elevation and the fracture flow analysis are summarized below.

DATA	**Reactor**	**Turbine**	**Old Radwaste**	**New Radwaste**	**Intake Structure**	**Intake Tunnel**	**Discharge Tunnel**
Elevation of Top of Slab	-19.5	0	0.5	23.5	-18	0.5	-12
Slab Thickness (ft)	10	6	3	5	3	2	2

DATA	**Reactor**	**Turbine**	**Old Radwaste**	**New Radwaste**	**Intake Structure**	**Intake Tunnel**	**Discharge Tunnel**
Elevation Water Table	7	5	9	10	4	5	5
Total Volume (gal)	3665200	1753424	164602	NA	756602	61597.8	89760
Q (flow) in gpm	0.080	0.025	.088	NA	0.129	0.061	0.135
Time to equilibrate (yrs)	88.3	270.7	7.2	NA	22.3	3.9	2.5

The information presented above is defined as follows:

- Elevation of Top of Slab: elevation of the top of the foundation slab of the structure in question (i.e., the elevation of the slab inside the building)
- Slab Thickness: the thickness of the base mat of each structure excluding waterproofing (i.e., leveling mat, waterproof membrane and protective mat).
- Total Volume (gallons): the volume of water necessary to fill the interior of the structure to the same elevation as the surrounding water table or to the top of the structure if the structure (e.g., the Discharge Tunnel) is completely submerged (i.e., bring inside to outside conditions to equilibrium).
- Q(flow): the flow rate of water through the fracture in gallons per minute
- Time to equilibrate: the amount of time for the water level inside the structure to equal the water level outside the structure (note: if the structure is submerged this is the amount of time to fill the structure).

This data demonstrates the potential for releases from most structures of concerns is limited because the groundwater table is above the top of the base slab (the mat). This creates a positive hydraulic head on the slab that would prevent a release from migrating out of the building. The exceptions to the positive head scenario are:

1. The New Radwaste Building: This building, as was stated in Section 1, is a slab on grade. The base of the slab is at el. 19'-4". This is above the groundwater elevation of approximately el. 10'.
2. The Old Radwaste Building: This building is partially a slab on grade with shallow grade beams and shallow footings. There is not, consequently, a positive head preventing a release from impacting soil and groundwater for that portion of the building. The central portion of the building is, however, deeper. The calculations presented on Table 3-5 and 3-6 (and above) are for the center section only.

In order to address the potential for releases from the New Radwaste Building and the shallow portions of the Old Radwaste Building, 2-dimensional groundwater flow models have been constructed. These models will be discussed in Section 3.

4.0
TWO-DIMENSIONAL MODELING

4.1 MODEL SELECTED

The most universally accepted commercially available numerical groundwater modeling code is MODFLOW, developed in 1988 by Michael G. McDonald and Arlen W. Harbaugh of the United States Geological Survey (USGS). MODFLOW is widely considered to be the industry standard for groundwater flow modeling due to its versatility and ease of application to a variety of groundwater flow problems, including two and three-dimensional flow problems in rectangular as well as radial coordinate systems. MODFLOW is named after its modular program structure, in which different "packages" may be called by the main program to simulate rivers, streams, drains, pumping wells, constant head cells, recharge, and evapotranspiration. A variety of matrix-solving numerical engines may also be called by the main program to perform the finite-difference calculations.

MODPATH is the companion particle-tracking code to MODFLOW. MODPATH allows for forward or backward particle tracking of particles in the flow field, as computed using MODFLOW. Particles can be "released" at any location within the saturated zone. Multiple particles can be released in one model run.

MODFLOW and MODPATH were selected as the groundwater flow and particle tracking codes to be used for hydrogeologic modeling at the Site because of their ease of use, familiarity to the industry and hydrogeologic community, and applicability to the Site. Applicability was determined by evaluating the goals of GPU and evaluating the ability of MODFLOW and MODPATH to meet those goals. The goals of the modeling phase of this program, as understood by URSGWC were:

- Create a two-dimensional hydrogeologic model that included selected structures and calibrate the model using available hydrogeologic data;
- Include modifications to the stratigraphy (excavation of the Upper Clay aquitard) that resulted from the construction of the Reactor Building, the Turbine Building, and other selected structures;
- Evaluate the potential for a theoretical release of a radionuclide to impact downgradient receptors (groundwater and surface water).

MODFLOW and MODPATH were used to create a 2-dimesional hydrogeologic model that:

1. Included structures that could potentially impact stratigraphy because of their size and depth;
2. Adequately represents the current hydrogeologic conditions based on available data; and,
3. Could evaluate the potential migration path of a particle released from a structure of concern (i.e., could a particle released from a building or other structure containing radionuclides impact the canal through a groundwater vector?)?

4.2 MODEL CONSTRUCTION

Two separate steady-state groundwater flow models were developed for two separate site vertical cross-sections. The first flow model simulated groundwater flow and particle transport from the Old Radwaste Building along a vertical cross-section through the Old Radwaste Building, the Reactor Building, and the Turbine Building to the Intake Structure and the Discharge Canal, from the east-northeast to the west-southwest along cross-section A-A' (**Figure 2-1**). The second model simulated groundwater flow and particle transport from the New Radwaste Building along a vertical cross-section through the New Radwaste Building and the Turbine Building to the Discharge Canal, from the north-northeast to the south-southwest along cross-section B-B' (**Figure 2-1**). **Figure 3-1** shows the limits of stratigraphic layers and construction backfill for each cross-section (i.e., geologic cross-sections including major subsurface structures).

Both models use the same boundary conditions. One edge of the model is the center of the discharge canal, assumed to be the point of discharge for the Cape May and Cohansey Aquifers at the Site. The other edge of the model is located at a topographic high point, near New Jersey Route 9, assumed to be the location of a local groundwater divide separating groundwater flow to the east towards the Atlantic Ocean from flow to the west towards the discharge canal. The impermeable base of the model is the top of the Lower Clay. *The top of the model is the ground surface. Both models consist of* 75 twenty-foot wide columns and 30 layers of two-foot and five-foot thicknesses. The models encompass cross-sections 1500 feet long and extending from the ground surface at approximately elevation +23 feet to the bottom of the Cohansey Aquifer at an elevation of approximately -70 feet.

4.3 CALIBRATION

Both models were calibrated to the 12/20/83 water table elevations that were measured by Woodward-Clyde and presented in the March 1984 *Phase II Report, Ground Water Monitoring System*. Calibration was achieved through varying the recharge and hydraulic conductivity parameters within acceptable ranges until a close match (i.e., within one order of magnitude) was made between the model hydraulic head along the cross-section and the hydraulic head measured on 12/20/83 and interpolated along the cross-section. The following table summarizes the calibrated model hydraulic conductivity:

Soil Type	**Calibrated Model Horizontal Hydraulic Conductivity (ft/s)**	**Calibrated Model Vertical Hydraulic Conductivity (ft/s)**
Cape May Formation (undisturbed)	6×10^{-5}	6×10^{-5}
Backfill	1×10^{-5}	1×10^{-5}
Upper Clay	5×10^{-7}	5×10^{-7}
Cohansey Formation (undisturbed)	7×10^{-5}	1×10^{-5}
Silt at bottom of canal	1×10^{-6}	1×10^{-6}

Hydraulic conductivities used in the model are generally slightly lower than those calculated based on field measurements; however, all values are within the expected range for the type of soils present at the site.

Recharge was applied to the top active layer of the model to represent precipitation that migrates through the unsaturated zone to recharge the groundwater. A maximum recharge value of 20 inches per year was assumed to be representative of the Oyster Creek site. This maximum value was applied to the center portions of the models that were not completely paved or covered by structures. For cross-section A-A', a recharge of 20 inches /year was applied to the unpaved area near the canal and to the area east of the Old Radwaste Building. For cross-section B-B', a recharge of 20 inches/year was applied to the area north-northeast of the New Radwaste Building. A reduced recharge value of 15 inches/year was applied to account for portions of the site that are partially paved. For cross-section A-A', this recharge value was applied to the area to the west of the Turbine Building. For cross-section B-B', the 15 inches/year recharge value was applied to the area between the canal and the Turbine Building and the unpaved portions

between the Turbine Building and the New Radwaste Building. Areas of the site that are completely paved or covered by structures were not assigned any recharge.

4.4 RESULTS AND CONCLUSIONS

The results of the modeling indicate:

1. The Intake/Discharge Canal is the ultimate receptor for groundwater in the Cape May formation and Cohansey Formation in the area of the major structures addressed by this report (**Figure 2-1**);
2. A "particle" released in the groundwater from the areas beneath the Old Radwaste Building and the New Radwaste Building migrates downgradient to the Canal. This means that a discharge impacting groundwater in the are of the New Radwaste Building or the Old Radwaste Building <u>could</u> ultimately impact the canal.
3. The depth below grade of the Turbine Building and Reactor Building is not, based on available hydrogeologic data, sufficient to prevent a discharge from the New and Old Radwaste Buildings from reaching the Canal (note: a three dimensional model could indicate a different preferred pathway such as around the sides of the deepest structures).

Both models are based on historic hydrogeologic and stratigraphic data that shows that the construction of the Canal and the excavation associated with the construction of the structures addressed in Sections 2 and 3 has resulted in major changes to the hydrogeologic regime including the localized reversal of the direction of groundwater flow in the Cape May and Cohansey formations. Data collected from the historic hydrogeologic studies conducted before and after the construction of the Reactor and Turbine Buildings support this conceptual model.

The particle tracking portion of the modeling did not include potential impacts of solubility, dispersion, advection, adsorption, etc. on contaminant fate and transport. These, and other factors not included in "particle tracking" <u>could</u> result in a reduction of contaminant concentrations to below regulatory guidelines and/practical quantitation limits.

4.5 LIMITATIONS OF MODEL

A numerical model attempts to represent continuity in space and time using a set of discrete information. The models assume that hydraulic conditions at the site are static and unvarying in magnitude and direction. It assumes homogeneous and uniform hydraulic and geologic properties of each soil type. The use of a two-dimensional model to represent a three-dimensional system may oversimplify the groundwater flow regime. Certain Site features may not be represented since they are beyond the extent of the two dimensional cross-section. The discretization of the model grid was designed to maximize computational efficiency while providing detail in the model; however, the coarseness of the grid spacing limits the placement and depiction of the model features. Despite these inherent limitations, the two dimensional numerical groundwater flow and particle tracking models calibrate to site conditions and reasonably predict particle movement downgradient in the direction of the canal.

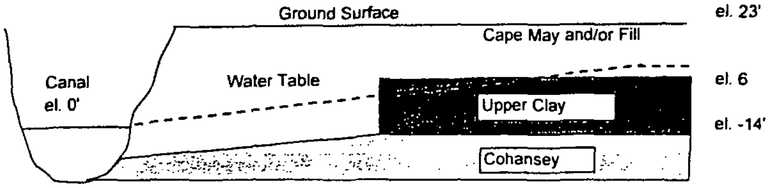
5.1 CONSTRUCTION AND STRATIGRAPHY

This section summarizes the findings of Sections 2 and 3.

5.1.1 Impacts of Construction on Site Stratigraphy and Hydrogeology

The construction of the Reactor Building, Turbine Building, Intake & Discharge Structures, etc. (Sections 2 and 3 of this report) resulted in the excavation of the Upper Clay, the aquitard separating the Cape May Formation from the Cohansey Formation. The construction of the Intake/Discharge Canal also resulted in the excavation of the Upper Clay. The largest impacts of these operations were:

- The water table aquifer in the Cape May formation and the underlying Cohansey aquifer are in direct communication in areas in which the Upper Clay has been removed.
- The groundwater flow direction of the water table aquifer and, at a minimum the upper portion of the Cohansey have been reversed. The groundwater in both the Cape May and the Cohansey formerly flowed east, towards Barnegat Bay. Groundwater in the vicinity of the plant now flows west towards the Canal.
- A groundwater trough (i.e., a depression of the piezometric surface) has been created in areas in which the Upper Clay has been excavated. The elevation of the water table aquifer is now less than the average elevation of the Upper Clay in areas west of Route 9. The sketch shown below demonstrates the change in the water table elevation resulting from the construction of the Canal and the excavation of the Upper Clay.



NOT TO SCALE

- Groundwater levels in the water table aquifer have, reportedly, dropped several feet in areas between Route 9 and the Canal. Pre-construction water levels in the Cape May formation were higher before the construction of the canal and the main (i.e., deep) buildings.

5.1.2 Construction, Stratigraphy and Release Potential

The features of each structure are summarized in tabular format below. The summary includes a qualitative evaluation of the potential for a release of radiological material within the structure to impact soil or groundwater beneath the structure based on data discussed in the previous sections of this report. The qualitative terms used for building release potential are:

- <u>Low</u>: high positive groundwater head relative to the top of the base slab of the building; thick slab (>4 ft); waterproofing present; long equilibration time calculated *in fracture flow analysis (minimum 10 yrs)*
- <u>Medium</u>: low but positive head relative to the top of the building; no confirmation of waterproofing present;
- <u>High</u>: slab above groundwater; slab less than 3 ft thick; no confirmation of waterproofing during slab construction.

These "qualitative terms" are to be used only in the context of this report and for <u>this property only</u> based on the data presented in the previous sections of this report. It is important to note that these terms are not intended to be used ad and indication of the potential for actual release. They do not infer the actual site conditions or the presence or absence of release vectors because:

1) No foundation inspections were performed (i.e., no fractures were observed)

2) All fracture flow analyses are "theoretical" and no quantitative fracture data is available;
3) It is not known if significant amounts of radiologically hazardous materials are or were stored in areas with the most negative evaluation characteristics (e.g., thin slab, no positive groundwater head, no waterproofing, etc.). The absence the storage of radiologically hazardous material reduces, if not eliminates, release potential; and,
4) There were contradictions between "as built" excavation drawings and later soil borings that could not be resolved.
5) These terms have no basis in any "regulatory" framework (e.g., NJDEP, NRC, etc.)

The remainder of this section evaluates the structures of concern. In some instances, the buildings or structures of concern have been evaluated separately (e.g., Reactor Building, Turbine Building). In other instances, structures have been evaluated as a group (e.g., the Exhaust Tunnel System).

Reactor Building

Feature	**Description**
Total Depth (Abs. Elev.)	-29'-6" (52.5 ft bgs)
Slab Construction /Thickness	10' steel reinforced concrete w/ 3 layer waterproofing system.
Stratigraphy	Founded on Cohansey formation. Upper Clay excavated.
Head on Base of Slab	Approximately 47 ft.
Fracture Flow Analysis	• Flow Rate: 0.080 gpm • Time to Equilibrate: 88 yrs
Release Receptors	Groundwater.
Release Potential	Low

Turbine Building

Feature	**Description**
Total Depth (Abs. Elev.)	-6' to -8' for majority of foundation. -14' for tunnel areas
Slab Construction /Thickness	6 ' to 8' steel reinforced concrete w/ 3 layer waterproofing system
Stratigraphy	Founded on fill. The excavation extends to the depth of the tunnels which is 6 to 8 ft below the base of the slab. The Upper Clay was excavated.

Feature	Description
Head on Base of Slab	11 ft
Fracture Flow Analysis	• Flow Rate: 0.025 gpm • Time to Equilibrate: 271 yrs
Release Receptors	Groundwater.
Release Potential	Low

Old Radwaste Building

Feature	Description
Total Depth (Abs. Elev.)	Total depth is variable (se below). Deep section is el. 3'-6" (20' below grade).
Slab Construction /Thickness	Slab on grade with grade beams for shallow parts of building. Slab thickness varies from 8" to 1'-6". 3' thick steel reinforced concrete w/ waterproof membrane in deep part of building. Thickness may be reduced to 2' to 2.5 ft is some areas.
Stratigraphy	Founded on fill. Upper Clay excavated.
Head on Base of Slab	9.5 ft
Fracture Flow Analysis	• Flow Rate: • Time to Equilibrate: This does not apply to the portion of the building that is slab-on-grade construction.
Release Receptors	Soil and Groundwater.
Release Potential	Shallow Foundation: High (thin slab, possibly no waterproofing; expansion joints shown on drawings) Deep Foundation: Low to Medium: almost 10 ft of head on slab, waterproofing shown on as-built drawings; 3 ft steel reinforced concrete foundation.

New Radwaste Building

Feature	Description
Total Depth (Abs. Elev.)	-19'-4" (4' bgs)
Slab Construction /Thickness	4' steel reinforced concrete w/ 3 layer waterproofing system.
Stratigraphy	Founded on fill or on Cape May. This issue has not been

Feature	**Description**
	resolved because no excavation drawings were available for this structure..
Head on Base of Slab	Not applicable.
Fracture Flow Analysis	Not applicable
Release Receptors	Soil and Groundwater.
Release Potential	Medium: Approximately 4 ft of steel reinforced concrete with waterproofing. No head of groundwater preventing release from impacting soil or groundwater

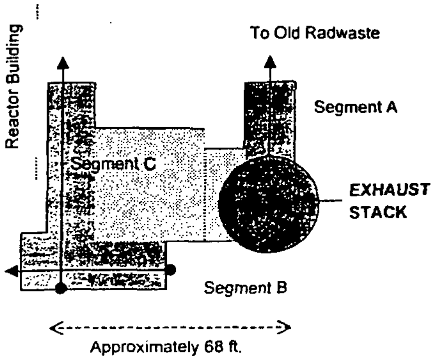
Intake Structure and Discharge Structure: These structures do not readily lend themselves to the type of qualitative assessment defined above. Both structures have a positive head on the slab but,

1) presumably do not contain material (water) that is radiologically hazardous;
2) are, in some fashion, open to the Intake and Discharge Canal and so may not be amenable to the same type of fracture flow analysis as the other structures;
3) were not considered potential release structures in GPU's initial scope of work.

These structures were considered significant more for their potential to impact the direction of groundwater flow in the water table aquifer (they extend well below the piezometric surface) and in the evaluation of the area in which the Upper Clay was no longer present (i.e., Is the Upper Clay consistently absent from the Old Radwaste Building to, and including, the Intake and Discharge Canal. The orientation and depth of these structures, as presented on **Figures 2-1 and 3-1** may impact the flow path for a potential release if a three-dimensional model is constructed at some future date.

Tunnels and Other Structures

The tunnel network is more complex than initially anticipated. There are six segments to the Exhaust Tunnel System. Three are shown on the sketch below.



There are three additional segments leading to the Old Radwaste Building, the Reactor Building and the Turbine Building. In effect, these form a single subsurface structure which includes the area in which the tunnel segments meet and ultimately enter the Exhaust Stack. There are some consistent features of the ETS, regardless of the segment:

- The floor and wall thickness is generally in the are of 2 ft.
- The foundation of the tunnels are waterproofed. The walls are also waterproofed but the method of waterproofing could not be determined for all segments.
- The tunnels generally slope towards the Exhaust Stack.
- The head on the slab is generally low because the tunnels are only partially submerged beneath the water table.

URSGWC calculated the infiltration rate and total time to equilibrium for individual tunnel segments. The average of individual segments is 2.8 years. This calculation presumes that the tunnel segments are distinct and disconnected structures. If, however, the presumption is made that the segments function as a single structure and there is one set of foundation cracks from a single event, the equilibration time is much longer, approximately 17 years. This estimate will increase if the area of the remainder of the ETS structure (stippled pattern) shown in the above sketch exclusive of the tunnels (solid gray color) is included in the calculation of the total are of the ETS. Under this scenario, the estimate to equilibrium is in excess of 25 years.

5.2 TWO DIMENSIONAL MODEL

The 2-Dimensional Model (MODFLOW) was used to combine the known information on site stratigraphy and hydrogeology with the construction information (e.g., building depths, excavation extent, etc.) into a single working hydrogeologic model. MODPATH was then used to determine if a contaminant released from a structure of concern could negatively impact groundwater and surface water. The models were not used to evaluate those structures with a positive head on the floor slab. It was assumed that the positive head on the slab would prevent a release from migrating from the inside of the building to the outside of the building.

The MODFLOW 2-dimensional models, therefore, accurately reflect the hydrogeologic conditions in the area of the Reactor and Turbine Buildings. This is demonstrated by the fact that an acceptable calibration of the model was achieved and the hydraulic conductivities used for the stratigraphic units are within the acceptable range of variation from the average observed hydraulic conductivities, particularly given the complexity of the sections resulting from multiple subsurface structures and their impact on local stratigraphy. MODPATH confirmed that a discharge impacting groundwater in the are of the New Radwaste Building or the Old Radwaste Building <u>could</u> ultimately impact the canal. Additional contaminant transport and hydrogeologic data is necessary to refine the model.

5.3 DATA GAPS

The data gaps identified in this report are as follows:

1 There is no information regarding the tunnel from the New Radwaste Building to the Old Radwaste Building.
2 There is no excavation as-built for the New Radwaste Building. The depth of the excavation underneath the building could not be determined.
3 The exact nature of the waterproofing could not be determined for all structures. Gaps are discussed in Sections 2 and 3.
4 There are no excavation drawings for the Intake and Exhaust Tunnel.

5 There is no recent groundwater elevation data that includes enough wells to draw water table aquifer contours across the entire site. The well network exists but is no longer monitored.

6 There is no groundwater elevation data east of the plant. This means the location of the groundwater divide (i.e., water flowing west to the canal vs. water flowing east to Barnegat Bay) could only be estimated.

7 The particle tracking models demonstrate a release to groundwater east of the Reactor Building could impact the Canal. The particle tracking models cannot evaluate contaminant fate and transport characteristics that could limit the horizontal extent of a theoretical plume (e.g., release volume, release concentration, solubility, dispersion, advection, adsorbtion, etc.).

The elimination of these gaps could be used to: a) create a more accurate conceptual model; b) better calibrate the mathematical model; and, c) better determine the potential extent of impact of a contaminant release.

6.0
LIMITATIONS

URS Greiner Woodward Clyde's work in accordance with our understanding of professional practice and environmental standards existing at the time the work was performed. Professional judgements presented are based on our evaluation of technical information provided by GPU Nuclear and Woodward Clyde and our understanding of site conditions. Our analyses, interpretations and judgements rendered are consistent with professional standards of care and skill ordinarily exercised by the consulting community and reflect the degree of conservatism URS Greiner Woodward Clyde deems proper for this project at this time. Models are constantly changing and it is recognized that model executable code and standards may subsequently change because of improvements in the state of practice.

The information and analytical methods used for this investigation are presented in this report. This includes, but is not limited to: 1) historical soil boring and well installation logs; 2)historical water level measurements and maps; 3) historical reports relating to environmental or engineering studies; 4) as-built excavation or construction drawings provided by GPU Nuclear, and, 5) commercially available groundwater modeling software.

NO third party shall have the right to rely on URS Greiner Woodward Clyde opinions, evaluations or conclusions rendered in connection with the services included in included in this document or any Woodward-Clyde reference document without URS Greiner Woodward-Clyde's written consent and the third party's consent to be bound by the conditions and limitations imposed by an executed contract between URS Greiner Woodward Clyde that specifically addresses this document. This limitation includes all draft and final versions of this document and all documents that include this document as a reference.

7.0
REFERENCES

Reports:

"Analyses of Dispersion, Dilution and Travel Time for Hypothetical Radionuclides Spill, Oyster Creek Nuclear Generating Station," Woodward-Clyde Consultants, September 20, 1977

"A Subsurface Investigation Around the New Radwaste Building at the Oyster Creek Nuclear Generating Station," Stephen A. Mollelo, Oyster Creek Environmental Controls Department, April, 1981

"Draft - Preliminary Assessment Report, Non-Radiological, GPU Nuclear, Inc., Oyster Creek Nuclear Generating Station, U.S. Route No. 9, Forked River," NJ, URS Greiner Woodward-Clyde, April 14, 1999

"Forked River Nuclear Station, Investigation of Stability Characteristics of Soils in the Canal Banks," letter report, Casagrande Consultants, April 22, 1972

"Foundation Investigation for the Forked River Nuclear Station, Unit 1 – West," A. & L. Casagrande, October 1970

"Geotechnical Investigation, Geophysical Study, and Foundation Recommendations: Proposed Office Building Extension Site: GPU Nuclear, Parsippany, NJ," Woodward-Clyde Consultants, April 27, 1982

"Geotechnical Study, proposed Radwaste and Off-Gas Buildings, Oyster Creek Nulclear Power Station," H.M. Horne, Woodward-Moorehouse and Associates, Inc., Clifton, NJ, February 4, 1975

"Groundwater Flow Calculations: Cask Drop Study – Reactor Building, Oyster Creek Nuclear Generating Station, Forked River New Jersey," Woodward-Clyde Consultants, letter report of April 16, 1996

"Phase I Report, Recommended Groundwater Monitoring System, Oyster Creek Nuclear Generating Station, GPU Nuclear Corporation, Forked River, New Jersey," Woodward-Clyde Consultants, August 1983

"Phase II Report, Ground Water Monitoring System, GPU Nuclear Corporation, Forked River, NJ," Woodward-Clyde Consultants, March 1984

"Progress Report – Groundwater Contamination Assessment, Oyster Creek Nuclear Generating Station", Woodward-Clyde Consultants, February 22, 1989

"Summary of Injection and Pumping Activities at the Oyster Creek Nuclear Generating Station, Forked River, NJ", Woodward Clyde Consultants, January 1992

Drawings:

Reactor Area Backfill Details, Burns and Roe, August 26, 1965

Reactor Building Foundation Plan & Sections, Burns and Roe, October 1, 1965

Reactor Building Foundation Section and Details, Burns and Roe, October 1, 1965

Reactor Building – foundation Wall Elevations and Sections, Burns and Roe,

Turbine Building Foundation Plan Sheet No. 1, Burns and Roe, April 21, 1965

Turbine Building Foundation Plan Sheet No. 2, Burns and Roe, April 19, 1965

Turbine Building Foundation Sections & Details, Sheet No. 1, Burns and Roe, April 20, 1965

Turbine Building Foundation Sections & Details, Sheet No. 2, Burns and Roe, April 20, 1965

Turbine Building Basement Floor Plan, Burns and Roe, April 25, 1966

Turbine Building Basement Floor Plan – Sections and Details, Burns and Roe, April 25, 1966

Radwaste Building, Floor @ El. 6'-6, Burns and Roe, October 13, 1966

Radwaste Building Sections and Details, Burns and Roe, October 13, 1966

Radwaste Building Sections and Details, Burns and Roe, October 13, 1966

Radwaste Building Waste Storage Area Fnd'n & Plan @ El. 23'-6, Burns and Roe, October, 13, 1966

Exhaust Tunnel & Fan Fndn: Miscellaneous Sections & Details, Burns and Roe, September 30, 1966

Office Building Foundation and Exhaust Tunnel: Plans and Specs, Burns and Roe, February 4, 1966

Intake & Turbine Area Excavations, Plans & Sections, Burns and Roe, February 4, 1966

Reactor and Turbine Area Excavation Plan & Sections, Burns and Roe, September 22, 1964

Radwaste Building Foundation Plans – Sections and Details, Burns and Roe, September 9, 1975

Radwaste Building Fdn. Sect. & Det., Burns and Roe, September 8, 1975

Radwaste Building Wall Sections and Details, Burns and Roe, February 11, 1975

Radwaste Building Plan @ El. 23'-6", Equipment Fdn. & Penetrations, Burns and Roe, September 12, 1975

Radwaste Building Plan at El. 48'-0", Equipment Fdn. & Penetrations, Burns and Roe, September 12, 1975

Circulating Water Tunnel – Sections and Details, Burns and Roe, May 5, 1965

Circulating Water System & Intake Structure – Miscellaneous Details, Burns and Roe, May 5, 1965

Circulating Water System – Sections & Details Sh. #3, Burns and Roe, May 5, 1965

Circulating Water Tunnels Plan – Sections and Details, Burns and Roe, May 5, 1965

Intake Structure Foundation Plan, Burns and Roe, April 29, 1965

OCGNS Site Composite Underground Facilities, Dwg. No. 3E-SK-M-0491, March 7, 1992

OCGNS Site Composite Underground Facilities, Dwg. No. 3E-12607-009, 010, 011, 012, 013, 014, 015, 016, All drawings dated November 22, 1988

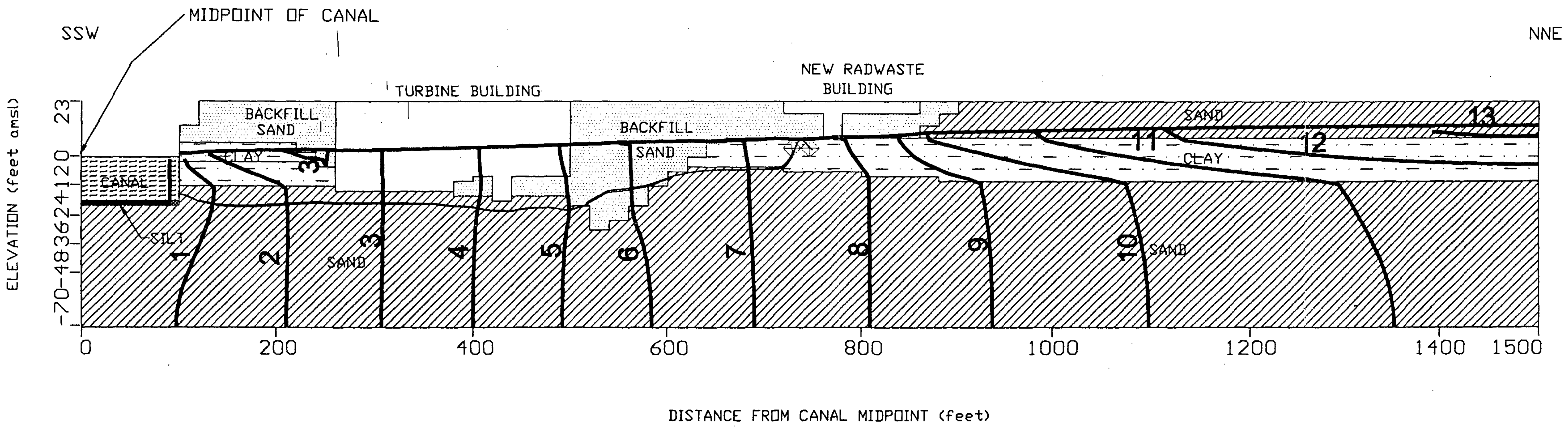
Figures

FIGURE 2-1 INCLUDED AS FIGURE 2.4.4.1 IN APPENDIX N

FIGURE 2-2 INCLUDED AS FIGURE 2.4.3.1 IN
APPENDIX N

FIGURE 3-1 INCLUDED AS FIGURE 2.4.3.2 IN APPENDIX N

FIGURE 4-1
CROSS-SECTION A-A'
EQUIPOTENTIAL LINES & PATHLINES
GPU NUCLEAR, OYSTER CREEK



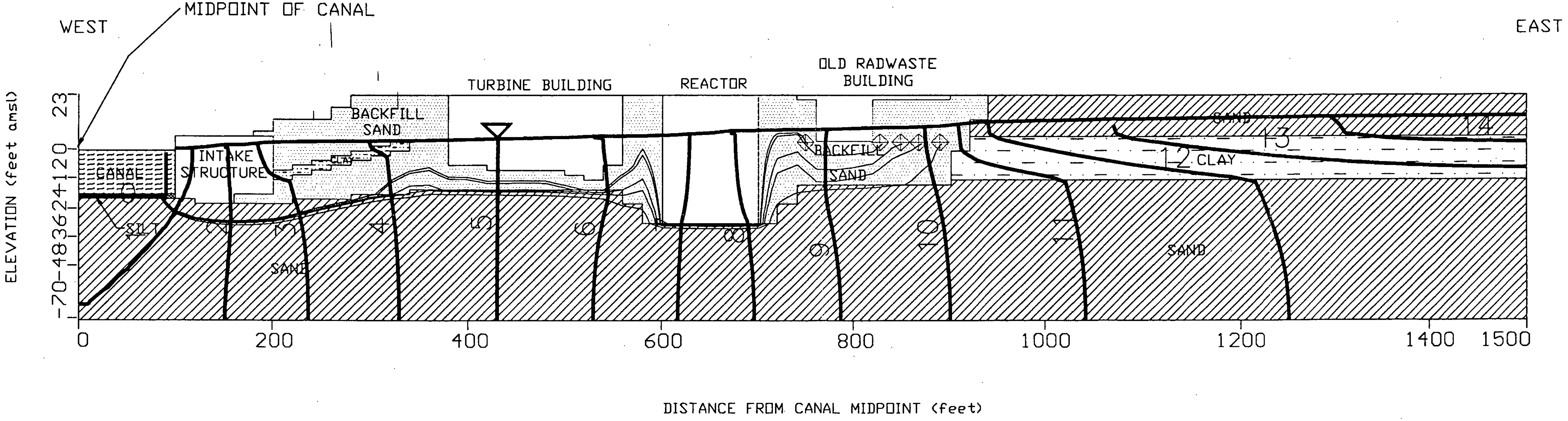
NOTE: VERTICAL EXAGGERATION = 2.5x

EQUIPOTENTIAL LINES IN FEET AMSL

SCALE 1" = 120'

4cond.dwg 10/24/99

FIGURE 4-2
CROSS-SECTION B-B'
EQUIPOTENTIAL LINES & PATHLINES
GPU NUCLEAR, OYSTER CREEK



NOTE: VERTICAL EXAGGERATION = 2.5x

EQUIPOTENTIAL LINES IN FEET AMSL

SCALE 1" = 120'

3cond.dwg 10/24/99

Tables

Table 3-1
Summary of Stratigraphic and Aquifer Data
Oyster Creek Nuclear Generating Station

Well No.	Install Date	Top of Screen (bgs)	Bottom of Screen (bgs)	Hydraulic Conductivity	Hydraulic Conductivity Units	Stratigrphic Unit	First Clay (ft bgs)	Bottom Fill (bgs)	Bottom Cape May (bgs)	Bottom Upper Clay (bgs)	Bottom Cohansey (bgs)	Bottom Lower Clay (bgs)	THICKNESS					ELEV. (Bot. Of Formation)				
													Fill	CM	UC	CO	LC	Fill	CM	UC	CO	LC
Borings and Wells from Diesel Fuel Release																						
OW- 1	Dec-88	9	19	6.67E-05	(ft/sec)	Fill/Cape May	20	unknown	unknown	eob-22												
OW- 2	Dec-88	9	19	1.59E-05	(ft/sec)	Fill/Cape May	20	unknown	unknown	eob-22												
OW- 3	Dec-88	9	19			Fill/Cape May	20.5	unknown	unknown	eob-22												
OW- 4	Dec-88	9	19	7.19E-06	(ft/sec)	Fill/Cape May	20.5	unknown	unknown	eob-22												
OW- 5	Dec-88	9	19			Fill/Cape May	20	unknown	unknown	eob-22												
OW- 6				1.17E-05	(ft/sec)																	
OW- 7				1.29E-05	(ft/sec)																	
OW- 8				1.03E-05	(ft/sec)																	
OW- 9				1.16E-05	(ft/sec)																	
OW- 10				9.41E-06	(ft/sec)																	
OW- 11				1.12E-05	(ft/sec)																	
OW- 12				7.02E-06	(ft/sec)																	
W- 1	Dec-83	40	50	3.00E-04	(ft/sec)	Cohansey		8	17	33	eob-50		8	9	16			15	6	-10		
W- 2	Nov-83	45	55	2.80E-04	(ft/sec)	Cohansey		8	18	38	eob-55		8	10	20			15	5	-15		
				2.30E-06	(ft/sec)	Cape May	from undisturbed clay/silt sample: 26-28 ft bgs															
W- 3	Nov-83	14	24	2.20E-04	(ft/sec)	Cape May		see w-4	see w-4	see w-4	see w-4											
W- 4	Nov-83	42	52	3.70E-04	(ft/sec)	Cohansey		16	ne	36	eob-52		16	0	20			7	ne	-13		
W- 5	Nov-83	10.5	20.5	2.60E-04	(ft/sec)	Cape May		see w-6	see w-6	see w-6	see w-6											
W- 6	Nov-83	42.5	52.5	1.40E-04	(ft/sec)	Cohansey		8	18	33	eob-52.5		8	10	15			15	5	-10		
				1.60E-09	(ft/sec)	Cape May	from undisturbed clay/silt sample: 30-32 ft bgs															
W- 7	Nov-83	10	20	2.10E-04	(ft/sec)	Cape May		13	18	eob			13	5				10	5			
W- 8	Nov-83	17.5	27.5	1.30E-04	(ft/sec)	Fill		eob-37														
W- 9	Nov-83	10	20	3.30E-06	(ft/sec)	Cape May		see w-10	see w-10	see w-10	see w-10											
W- 10	Nov-83	47	57	3.30E-05	(ft/sec)	Cohansey		19	ne	38	eob-57		16	0	19			4	ne	-15		
W- 11	Nov-83			na	na	na		no log	no log	no log	no log											
W- 12	Nov-83	10	20	1.10E-04	(ft/sec)	Cape May		see w-13	see w-13	see w-13	see w-13											
W- 13	Nov-83	40	50	4.50E-04	(ft/sec)	Cohansey		19	ne	33	eob-50		16	0	14			4	ne	-10		
W- 14	Nov-83	43	53	3.50E-04	(ft/sec)	Cohansey		20	ne	37	eob-53		16	0	17			3	ne	-14		
W- 15	Nov-83	10	20	3.30E-04	(ft/sec)	Cape May		see w-14	see w-14	see w-14	see w-14											
W- 16	Nov-83	10	20	2.80E-04	(ft/sec)	Cape May		19	ne	eob			19									
W- 17	Nov-83	130	150	1.50E-04	(ft/sec)	Kirkwood		?	19	34	110	145			15	76	35		4	-11	-87	-122
" "	"			3.20E-10	(ft/sec)	Kirkwood	from undisturbed lower clay sample (115-117 ft bgs) of W-17															
W- 18	Jan-88	10	20	5.17E-06	(ft/sec)	Cape M./Clay	15	unknown	unknown	eob-20												
W- 19	Jan-88	10	20	1.44E-05	(ft/sec)	Cape M./Clay	15	unknown	unknown	eob-20												
W 20	Dec-87	10	20	--	--	Cape M./Clay	19															
W- 21	Jan-88	10	20	1.62E-05	(ft/sec)	Cape M./Clay	16	unknown	unknown	eob-20												
W- 22	Jan-88	29	38	--	--	U. Clay(sand)	19	unknown	unknown	38	eob-39	(4)										
W- 23	Jan-88	10	20	1.15E-05	(ft/sec)	Cape M./Clay	19	unknown	unknown	eob-20												
W- 24	Dec-88	8.5	18.5	--	--	Fill/Cape May	20.5	unknown	unknown	eob-21												
W- 25	Dec-88	9	19	5.80E-06	(ft/sec)	Fill/Cape May	20.5	unknown	unknown	eob-22												

Table 3-2
Additional Hydrogeologic Data
Oyster Creek Nuclear Generating Station

CAPE MAY FORMATION

Source: NaCl Tracer Test At Boring TW-1: Pumping and Natural conditions (1977)

Note: This test was performed east (upgradient/sidegradient) of the operational portion of the facility (near Route 9). Presumed to be good indicator of undisturbed Cape May Formation (I.e., no fill).

Groundwater Velocity (natural conditions) = 2.86 ft/day
Groundwater Velocity (pumping at 6 gpm) = 18.5 ft/day

Hydraulic Conductivity (K) = 66.8 ft/day
Transmissivity (saturated thickness of 12 ft) = 6,000 gpd/ft

Specific Discharge (natural flow conditions calculated using K & I) = 0.641 ft/day
Specific Discharge (natural flow conditions using point dilution method) = 0.714 ft/day
Specific Discharge (pumping conditions using point dilution method) = 4.62 ft/day)

Londitudinal dispersion Dispersion Coefficient (D1) = = 4.34 ft2/day
Transvere Dispersion Coefficient (D2) = 0.391 ft2/day
Longitudinal Dispersivity = 0.235 ft @ gw velocity of 18.5 ft/day
Transverse dispersivity = 0.0211 ft @

Source: Phase II Report Groundwater Monitoring System (1982)

Hydraulic Conductivity (K) = 2.0x10E-4 ft/sec
Hydraulic Gradient (I) = 0.02 ft/ft
Porosity (n) (literature) = 25%
Velocity (V) = 1.4 ft/day

COHANSEY FORMATION

Source: Phase II Report Groundwater Monitoring System (1982)

Hydraulic Conductivity (K) = 2.7x10E-4 ft/sec
Hydraulic Gradient (I) = 0.01 ft/ft
Porosity (n) (literature) = 25%
Velocity (V) = 0.9 ft/day

Table 3-1
Summary of Stratigraphic and Aquifer Data
Oyster Creek Nuclear Generating Station

Well No.	Install Date	Top of Screen (bgs)	Bottom of Screen (bgs)	Hydraulic Conductivity	Hydraulic Conductivity Units	Stratigrphic Unit	First Clay (ft bgs)	Bottom Fill (bgs)	Bottom Cape May (bgs)	Bottom Upper Clay (bgs)	Bottom Cohansey (bgs)	Bottom Lower Clay (bgs)	THICKNESS					ELEV. (Bot. Of Formation)				
													Fill	CM	UC	CO	LC	Fill	CM	UC	CO	LC
W- 26	Dec-88	9	19	8.18E-06	(ft/sec)	Fill/Cape May	20.5	unknown	unknown	eob-22												
W- 27	Dec-88	9	19	1.64E-05	(ft/sec)	Fill/Cape May	20.5	unknown	unknown	eob-22												
W- 28	Jul-89	9	19	1.57E-05	(ft/sec)	Cape May?(5)	19	no split spoons: auger only for well installaion														
W- 29	Jul-89	9.5	19.5	1.04E-05	(ft/sec)	Cape May?(5)	19.5	no split spoons: auger only for well installaion														
W- 30	Jul-89	9	19	2.59E-05	(ft/sec)	Cape May?(5)	19	no split spoons: auger only for well installaion														
W- 31	Jul-89	9	19	1.51E-05	(ft/sec)	Cape May?(5)	19.5	(6) no split spoons: auger only for well installaion														
W- 32	Jul-89	9	19	--	--	Cape May?(5)		no split spoons: auger only for well installaion														
W- 33	Jul-89	9	19	1.79E-05	(ft/sec)	Cape May?(5)		no split spoons: auger only for well installaion														
W- 34	Nov-91	30	40	na	na	na	na	no boring log														
Recovery Wells																						
RC- 1	Aug-90	13	20	na	na	Fill/Cape May	20	no boring log														
RC- 2	Aug-90	13	20	na	na	Fill/Cape May	20	no boring log														
RC- 3	Nov-91	13	20	na	na	na	na	no boring log														
RC- 4	Nov-91	13	20	na	na	na	na	no boring log														
RC- 5	Nov-91	13	20	na	na	na	na	no boring log														
njection Wells																						
IJ- 1	Aug-90	14	18	na	na	Fill/Cape May	NE	no boring log														
IJ- 2	Aug-90	12	18	na	na	Fill/Cape May	NE	no boring log														
IJ- 3	Aug-90	12	18.5	na	na	Fill/Cape May	NE	no boring log														
IJ- 4	Aug-90	12	18	na	na	Fill/Cape May	NE	no boring log														
IJ- 5	Aug-90	12	18	na	na	Fill/Cape May	NE	no boring log														
Borings from New Radwaste Building Investigation																						
W- 1	Nov-73	na	na	na	na	na	na	3.5	15	30	88	107	3.5	11.5	15	58		19.5	8	-7	-65	-84
W- 2	Nov-73	na	na	na	na	na	na	19	ne	35	91.5	110	19	0	16	56.5		4	ne	-12	-69	-87
W- 3	Nov-73	na	na	na	na	na	na	ne	17.5	34	93	107.5	0	17.5	16.5	59		ne	5.5	-11	-70	-85
W- 4	Nov-73	na	na	na	na	na	na	ne	18	34	95	106.5	0	18	16	61		ne	5	-11	-72	-84
W- 5	Nov-73	na	na	na	na	na	na	33	ne	35	93	eob-95	33	0	2	58		-10	ne	-12	-70	
W- 6	Nov-73	na	na	na	na	na	na	9.5	18	37	93	eob-100	9.5	8.5	19	56		13.5	5	-14	-70	
W- 7	Dec-73	na	na	na	na	na	na	6	20.5	39	eob-58		6	14.5	18.5			17	2.5	-16		
W- 8	Dec-73	na	na	na	na	na	na	6.5	21.5	37.5	eob-57		6.5	15	16			16.5	1.5	-15		
W- 9	Dec-73	na	na	na	na	na	na	15	16.5	33.5	eob-55		15	1.5	17			8	6.5	-11		
W- 10	Dec-73	na	na	na	na	na	na	6	18	eob-26			6	12				17	5			
W- 10A	Dec-73							8	18	29.5	eob-57		8	10	11.5			15	5	-6.5		
W- 11	Dec-73	na	na	na	na	na	na	5	16	33	eob-55.5		5	11	17			18	7	-10		
W- 12	Oct-74	na	na	na	na	na	na	unknown	18	33	eob-51				15				5	-10		
W- 13	Oct-74	na	na	na	na	na	na	unknown	17	35	eob-56				18				6	-12		
W- 13A	Oct-74							unknown	17	eob-23									6			
W- 14	Oct-74	na	na	na	na	na	na	unknown	17	33	eob-48				16				6	-10		
W- 15	Oct-74	na	na	na	na	na	na	unknown	17	33	eob-48.5				16				6	-10		
W- 16	Oct-74	na	na	na	na	na	na	unknown	17	34	eob-37				17				6	-11		
W- 17	Oct-74	na	na	na	na	na	na	unknown	18	33	eob-35.5				15				5	-10		
W- 18	Oct-74	na	na	na	na	na	na	unknown	17.5	34.5	eob-53.5				17				5.5	-12		

Table 3-1
Summary of Stratigraphic and Aquifer Data
Oyster Creek Nuclear Generating Station

Well No.	Install Date	Top of Screen (bgs)	Bottom of Screen (bgs)	Hydraulic Conductivity	Hydraulic Conductivity Units	Stratigrphic Unit	First Clay (ft bgs)	Bottom Fill (bgs)	Bottom Cape May (bgs)	Bottom Upper Clay (bgs)	Bottom Cohansey (bgs)	Bottom Lower Clay (bgs)	THICKNESS					ELEV. (Bot. Of Formation)				
													Fill	CM	UC	CO	LC	Fill	CM	UC	CO	LC
W- 19	Oct-74	na	na	na	na	na	na	unknown	17	37	eob-53.5				20				6	-14		
Boring Information from Supplemental Report, Proposed Manintenance Building																						
A 1	unknown	na	na	na	na	na	na	28	ne	33	eob-35		28	0	5			-5	ne	-10		
A 3	unknown	na	na	na	na	na	na	18	ne	30	eob-40		18	0	12			5	ne	-7		
A 4	unknown	na	na	na	na	na	na	38	ne	ne	eob-60		38	0				-15	ne	ne		
A 4A	unknown	na	na	na	na	na	na															
A 4B	unknown	na	na	na	na	na	na	37	ne	ne	eob-40		38	0				-14	ne			
A 4C	unknown	na	na	na	na	na	na	31	ne	ne	eob-35		31	0				-8	ne			
A 4D	unknown	na	na	na	na	na	na	20	ne	eob-25												
A 6	unknown	na	na	na	na	na	na	37	ne	ne	eob-45		37	0				-14	ne	ne		
A 6A	unknown	na	na	na	na	na	na	37	ne	ne	eob-40		37	0				-14	ne	ne		
A 6B	unknown	na	na	na	na	na	na	37	ne	ne	eob-42		37	0				-14	ne	ne		
Boring Information from Analysis of Dispersion, Dilution and Travel Time for Hypothetical Radionuclides Spill, Appendix A																						
TW- 1	Jul-76	na	na	na	na	na	na	ne	21.5	eob-25			0	21.5				ne	1.5			
TW- 2	Jul-76	na	na	na	na	na	na	ne	21	eob-23			0	21				ne	2			
TW- 3	Jul-76	na	na	na	na	na	na	ne	21	eob-23.5			0	21				ne	2			
TW- 4	Jul-76	na	na	na	na	na	na	ne	21.5	31	eob-50		0	21.5				ne	1.5	-8		
								gray sand to 37, gray clay to 38														
Soil Boring Information from PC&L for the New Rad Waste Building																						
1	1981	na	na	na	na	na		8	17.5	eob-29.5			8	9.5								
2	1981	na	na	na	na	na		8.5	eob-9				8.5									
3	1981	na	na	na	na	na		8	eob-8.5				8									

Notes:
1) Boring logs not available for all soil borings or wells
2) all reports not available at the time of the preparation of this report.
3) Assume ground surface elevation is el. 23' 0" for all elevation calculations
4) Well screened in sandy portion of upper clay. Near canal, often find dark gray sand above Cohansey.
5) Cannot distinguish fill from Cape May. Depth of well suggests in Cape May. Generally not more than 10 ft fill in this area.
6) Oily odor at 14 ft.

Table 3-3
Sample Water Table Elevations
GPU Nuclear - Oyster Creek Nuclear Generating Station

			August 5, 1999				June 1990				November 1990							
Well Number	Top of Well Screen	Reference Elevation	Distance to Water	Distance to LNAPL	LNAPL Thickness	Corrected Water Elevation	Distance to Water	Distance to LNAPL	LNAPL Thickness	Corrected Water Elevation	Distance to Water	Distance to LNAPL	LNAPL Thickness	Corrected Water Elevation	Average Water Elevation	Max. Water Elevation	Minimum Water elevation	Max. Change elevation
OW- 1	13.21	23.21	17.4	16.6	0.8	6.53	15.13	14.78	0.35	8.40	18.2		2.86	7.58	7.50	8.40	6.53	1.87
OW- 2	13.15	23.15	16.67	16.48	0.19	6.65	15.23	13.97	1.26	9.05	15.87		0.77	7.97	7.89	9.05	6.65	2.40
OW- 3	12.88	22.88	17.23	16.03	1.2	6.73	15.19	14.36	0.83	8.44	Skimmer in Operation							
OW- 4	13.19	23.19	16.63	16.6	0.03	6.59	15.05	14.82	0.23	8.35	16.56		1.1	7.62	7.52	8.35	6.59	1.76
OW- 5	12.73	22.9	16.55	ne		6.35	Dewatering In Operation				18.1		2.8	7.32				
W- 2	**-23.8**	22.72	17.74	ne		4.98	19.04			3.68	19			3.72	4.13	4.98	3.68	1.30
W- 3	6.59	20.55	16.4	ne		4.15	16.1			4.45	16.31			4.24	4.28	4.45	4.15	0.30
W- 4	**-21.51**	20.49	17.15	ne		3.34	16.87			3.62	16.77			3.72	3.56	3.72	3.34	0.38
W- 7	13.06	23.36	15.7	ne		7.66	13.68			9.68	14.64			8.72	8.69	9.68	7.66	2.02
W- 18	13.43	23.43	16.62	16.23	0.39	7.16	14.91	14.48	0.43	8.91	19.29		4.04	7.78	7.95	8.91	7.16	1.75
W- 19	13 32	23.32	16.03	16.02	0.01	7.30	14.41	14.38	0.03	8.94	15.58		0.23	7.95	8.06	8.94	7.30	1.64
W- 20	13.24	23.24	18.25	ne		4.99	16.67			6.57	17.33			5.91	5.82	6.57	4.99	1.58
W- 21	12.86	23.86	17.8	ne		6.06	16.16			7.70	16.89			6.97	6.91	7.70	6.06	1.64
W- 22	**-5.61**	23.39	19.55	ne		3.84	19.29			4.10	19.33			4.06	4.00	4.10	3.84	0.26
W- 23	12.99	22.99	20	ne		2.99	15.19			7.80	15.95			7.04	5.94	7.80	2.99	4.81
W- 24	13.76	23.76	15.55	ne		8.21	14.04			9.72	14.95			8.81	8.91	9.72	8.21	1.51
W- 25	12.77	23.39	16.2	ne		7.19	13.87			9.52	15			8.39	8.37	9.52	7.19	2.33
W- 26	13.11	23.11	17.9	15.5	2.4	7.37	14.4	14.2	0.2	8.89	15.96		0.69	7.77	8.01	8.89	7.37	1.52
W- 27	13.17	23.17	16.1	15.89	0.21	7.26	Skimmer in Operation				Skimmer in Operation							
W- 28	13.2	23.2	20	ne		3.20	16.16			7.04	16.08			7.12	5.79	7.12	3.20	3.92
W- 29	13.22	23.22	20	ne		3.22	15.19			8.03	15.9			7.32	6.19	8.03	3.22	4.81
W- 30	14.4	24.4	18.36	ne		6.04	16.5			7.90	17.16			7.24	7.06	7.90	6.04	1.86
W- 31	13.94	23.94	18.4	ne		5.54	17.21			6.73	17.8			6.14	6.14	6.73	5.54	1.19
W- 32	13.5	23.5	17.52	ne		5.98	15.78			7.72	16.62			6.88	6.86	7.72	5.98	1.74
W- 33	14.23	24.23	18.3	ne		5.93	16.83			7.40	17.52			6.71	6.68	7.40	5.93	1.47
W- 34	**-6.87**	23.13	18.9	ne		4.23	Not Installed				Not Installed							

Note:
1) GW elevation = (reference elevation - distance to water) + (LNAPL thickness *0.9)
where 0.9 = assumed density of floating product.

Table 3-2
Additional Hydrogeologic Data
Oyster Creek Nuclear Generating Station

KIRKWOOD AQUIFER

Source: Mooretrench American, Inc., 1977

Transmissivity (T) = 60,000 gpd/ft
Storage Coefficient = 1x10E-4
Hydraulic Conductivity (K) (using saturated thickness of 250 ft) = 32 ft/day
Specific Discharge = 0.01 ft/day
Velocity (using assumed porosity of 20%) = 0.055 ft/day

Vertical Variation in Hydraulic Head, 12/20/83

Cape May and Cohansey Formations

Well Pair	Shallow Sand (abs. el.)	Cohansey (abs. el.)	Difference (ft)	Notes
W 3-4	3.74	2.92	0.82	Well 3 Screen: 2 ft fill, 8 ft Upper Clay, Cape May excavated
W 5-6	8.78	3.09	5.69	Likely north of Excavation Area
W 9-10	7.8	5.96	1.84	Well 9 Screen: 9 ft fill, 1 ft Upper Clay, Cape May excavated
W 12-13	9.31	5.14	4.17	Well 12 Screen: 9 ft fill, 1 ft Upper Clay, Cape May excavated
W 14-15	10.84	5.07	5.77	Upgradient of Excavation Area

Max Difference	5.77
Min Difference	0.82
Average Difference	3.66

Table 3-4
Water Table Elevations - August 5, 1999
GPU Nuclear - Oyster Creek Nuclear Generating Station

Well Number	Casing Length	Reference Elevation	Distance to Water	Distance to LNAPL	LNAPL Thickness	Water Elevation
W- 1A	50	16.29	20.8	ne		-4.51
W- 1B	20	16.12	11.35	ne		4.77
W- 2A	50	13.35	18.25	ne		-4.90
W- 2B	20	13.63	8.36	ne		5.27
W- 3A	50	19.91	15.62	ne		4.29
W- 3B	20	20.1	7.9	ne		12.20
W- 4A	50	17.85	13.22	ne		4.63
W- 4B	20	18.02	9.32	ne		8.70
LW 1	21.6	22.25	NM			NM
LW 2	47.82	22.63	18.16	ne		4.47
LW 3	21.31	22.32	10.5	ne		11.82

Note:

1) GW elevation = (reference elevation - distance to water) + (LNAPL thickness *0.9)
where 0.9 = assumed density of floating product.

Table 3-5
Fracture Flow Rates
Oyster Creek Nuclear Generating Station

DATA	Reactor	Turbine	Old Radwaste	New Radwaste	Intake Structure	Intake Tunnel	Discharge Tunnel	ETS Seg. A	ETS Seg. B	ETS Seg. C	ETS Seg. D	ETS Seg. E	ETS Seg. F	ETS Seg. F	New Radwaste Tunnel
Total Flow Distance	50	46	43	45	43	42	42	42	42	42	42	42	42	42	NA
Constant=40ft/3.38E-5 ft/s	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	1.22E+06	NA
Constant (Kf)	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	23.9	NA
Slab Thickness	10	6	3	5	3	2	2	2	2	2	2	2	2	2	NA
Constant (aq. Flow dist.)	40	40	40	40	40	40	40	40	40	40	40	40	40	40	NA
=slab thickness / Kf	0.41841	0.251046	0.125523	0.209205	0.125523	0.083682	0.083682	0.083682	0.083682	0.083682	0.083682	0.083682	0.083682	0.083682	NA
Kt = num/(denom1 + denom2)	4.10E-05	3.77E-05	3.53E-05	3.69E-05	3.53E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	3.44E-05	NA
Constant (crack length)	42	42	42	42	42	42	42	42	42	42	42	42	42	42	NA
Constant (Crack width)	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	0.0104	NA
Constant (# of cracks)	4	4	4	4	4	4	4	4	4	4	4	4	4	4	NA
Constant A = crack length *crack width * # of cracks	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	1.7472	NA
Total Head	25	5	9.5	0 (4)	14	4.5	10	7	5	5	5	5	5	5	NA
dh/dl	2.5	0.83	3.17	NA	4.67	2.25	5	3.5	2.5	2.5	2.5	2.5	2.5	2.5	NA
Q=K(t)*A*(dh/dl) units = ft3/s	1.79E-04	5.49E-05	1.95E-04	NA	2.87E-04	1.35E-04	3.01E-04	2.11E-04	1.50E-04	1.50E-04	1.50E-04	1.50E-04	1.50E-04	1.50E-04	NA
Constant (convert to gpm)	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	448.83	NA
Q (flow) in gpm	8.04E-02	2.46E-02	8.76E-02	NA	1.29E-01	6.08E-02	1.35E-01	9.45E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	NA

Table 3-6
Foundation vs. Water Table Elevations
Oyster Creek Nuclear Geneating Station

DATA	Reactor	Turbine	Old Radwaste	New Radwaste	Intake Structure	Intake Tunnel	Discharge Tunnel	ETS Seg. A	ETS Seg. B	ETS Seg. C	ETS Seg. D	ETS Seg. E	ETS Seg. F	Combine A to F	New Radwaste Tunnel
Bldg. Length (1)	140	173	53.25	(3)	85	183	120	45	35	92	141	48.5	51	51	unknown
Bldg. Width (1)	140	271	43.5	(3)	85	10	10	10	10	10	10	10	10	10	unknown
Building Area (ft 2)	19600	46883	2316	13252	7225	1830	1200	450	350	920	1410	485	510	4125	unknown
Roof	NA	NA	NA	NA	NA	13	0.5	16	17	17	19	19	19	17.6	unknown
Elevation Bottom of Roof	NA	NA	NA	NA	NA	11	-1.5	14	15	15	17	17	17	15.8	unknown
Thickness of Roof	NA	NA	NA	NA	NA	2	2	2	2	2	2	2	2	1.8	unknown
Elevation of Top of Slab	-19.5	0	0.5	23.5	18	0.5	-12	0	5	5	5	5	5	4.2	unknown
Elevation of Bottom of Slab (ft)	-29.5	-6	3.5	18.5	21	-1.5	-14	2	3	3	3	3	3	2.8	unknown
Slab Thickness (ft)	10	6	3	5	3	2	2	2	2	2	2	2	2	2	unknown
Elevation Water Table	7	5	9	10	4	5	5	7	7	7	7	7	7	7	unknown
Head (Water Table to Top of Slab)	25	5	9.5	0 (4)	14	4.5	17	7	5	5	5	5	5	5.0	unknown
Total Volume below water table (ft3)	490000	234415	22006	NA	101150	8235	12000	4500	3500	9200	14100	4850	5100	41250	unknown
Conversion ft3 to gallons	7.48	7.48	7.48	NA	7.48	7.48	7.48	7.48	7.48	7.48	7.48	7.48	7.48	7.48	unknown
Total Volume (gal)	3665200	1753424	164602	NA	756602	61598	89760	33660	26180	68816	105468	36278	38148	308550	unknown
Infiltration Rate (gpm)	0.079	2.46E-02	8.76E-02	NA	1.29E-01	6.08E-02	1.35E-01	9.45E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	6.75E-02	unknown
Time to equilibrate (min.)	46394937	71133168	1879857.6	NA	5863460	1013666	664699.31	356088.9	387741.3	1019206	1562043	537298.6	564994.4	4569808	unknown
Convert min. to yrs.	525600	262800	262800	NA	262800	262800	262800	262800	262800	262800	262800	262800	262800	262800	unknown
Time to equilibrate (yrs)	88.3	270.7	7.2	NA	22.3	3.9	2.5	1.4	1.5	3.9	5.9	2.0	2.1	17.4	unknown

Notes:

(1) Only that portion below water table

(2) The water table is above the bottom of the slab by 5 ft; however, the slab is 6 ft thick (minimum). Consequently, the water table elevation in this example is 1 ft below the top of the slab.

(3) Building not rectangular. Area = (55*45) + (168*65)

(4) Water table is below foundation

(5) Water table elevation is above the top of the tunnel; therefore, use the height of the tunnel as the head above water table.

(6) For Old Radwaste Building the calculations apply ONLY to the deep portion of the building.

I:\projects\9e04092\reports\buildingdata

Appendices

Appendix A
Cask Drop Study – 1996

Woodward-Clyde

Engineering & sciences applied to the earth & its environment

April 16, 1996
6E04626

GPU Nuclear Corporation
1 Upper Pond Road
Parsippany, NJ 07054

Attention: Mr. Abdul Baig

Subject: **Groundwater Flow Calculations: Cask Drop Study - Reactor Building**
Oyster Creek Nuclear Generating Station
Forked River, New Jersey

Gentlemen:

Woodward-Clyde Consultants (WCC), has completed a groundwater flow and soil piping analysis associated with the hypothetical cracking of the slab of the Reactor Building in the Cask Drop Study for the Oyster Creek Nuclear Generating Station. This letter report is divided into four sections: introduction, groundwater flow, piping flow, and conclusions. Our review of geotechnical considerations is presented in a separate letter-report.

1.0 INTRODUCTION

Under the hypothetical scenario of dropping the cask of fuel rods onto the slab at the base of the Reactor Building, the cracks formed in the slab create a pathway for the entrance of groundwater into the building. Because the slab elevation is below the water table elevation, and because the elevation of water in the building is also below the water table elevation, a positive inward pressure exists through the cracks, resulting in inward flow through the cracks. The conditions causing this inward flow will change only if the water level inside the building becomes equal to or greater than the outside water table elevation. As shown in the following calculations, it would take approximately 8.7 years of water seepage through the cracks for the water level inside the building to reach that state.

Should the cracks in the slab form, two separate flow mechanisms will occur. The hydraulic gradient across the slab will induce flow of groundwater through the cracks. This groundwater flow is limited by the hydraulic gradient across the slab, and the flow rate of water through the aquifer, according to the hydraulic conductivity of the geological formation. The groundwater flow rate into the building will gradually diminish over time as the head inside the Reactor Building rises, however it will be a long-term seepage effect. A calculation of the groundwater flow rates through the cracks is presented in Section 2 of this document.

Wayne Office
P.O. Box 290 • 201 Willowbrook Boulevard • Wayne, New Jersey 07470
201-785-0700 • 212-926-2878 • Fax 201-785-0023

The hydraulic gradient across the slab also will induce stresses in the soil directly below the cracks to a level higher than the strength of the soil. The saturated soil will locally lose all strength and will flow as a viscous liquid through the crack until it reaches an equilibrium. This phenomenon is known as piping, and is expected to be a short-term, relatively small quantity flow. Piping flow is limited by the hydraulic gradient across the crack and the soil friction against the sides of the crack. An approximation of the piping static equilibrium is presented in Section 3 of this document for the purposes of establishing the maximum extent of piping flow. In general, piping effects are estimated to be short-term and minimal in effect, with high soil friction limiting piping to flow within the crack.

2.0 GROUNDWATER FLOW

2.1 Assumptions

1. A simplification of the groundwater flow scenario is presented in Figure 1.

2. The aquifer at the base of the building is hydraulically connected with the Cape May water table aquifer. (Backfill area around building did not include replacement of upper clay layer following construction.) This assumption is conservative because the Cohansey aquifer has a lower head than the Cape May aquifer. Therefore, by using the head of the Cape May aquifer, a higher gradient exists below the slab. The head in the Cohansey aquifer is higher than the level of water in the building and would not cause outflow if used. Using the head for the Cohansey aquifer would reduce the flow rate into the building.

3. Material below the building slab is Cohansey sand with hydraulic conductivity $K \approx 1\times10^{-3}$ cm/s. This is conservative since aquifer tests on both aquifers indicate this value is an upper limit of aquifer conductivity.

4. The head in the water table aquifer and therefore the head at the base of the slab is 40 feet. This is a parameter taken from site measurements.

5. Water leakage from the cracked torus will result in an initial head inside the building of 5.41 feet. This is a parameter taken from simulation predictions.

6. The water in the aquifer will instantaneously fill the 10' thick crack, creating a differential head across the crack of 24.59 feet. Because this analysis is steady-state, this assumption allows the aquifer of water outside the building to become hydraulically connected with the water flowing into the building.

7. Flow into the cracks will not affect the static head of the aquifer. The aquifer is very large in comparison to the size of the cracks and is not expected to experience drawdown. This assumption is conservative because it allows a maximum gradient over time.

8. Four cracks are created with width 0.125 inches (= 0.0104 feet) and lengths of 42 feet. This is a parameter resulting from structural simulations.

9. Any piping and running sands have stabilized, and only water flow is taking place. Water flow is a separate process from piping flow and will occur once piping has stabilized.

10. A hydraulic flow distance of 40 feet is assumed as a representative flow distance through the aquifer. This is a conservative assumption since it represents a minimum flow path distance from the water table to the base of the building.

2.2 Approach

- Flow through cracks is equivalent to flow though fractured rock using the following formula for hydraulic conductivity of a single fracture (Dominico and Schwartz, p. 87).

$$K_f = \frac{\rho_w g b^2}{12\mu}$$

where

ρ_w = Density of water = 62.37 lbm/ft^3
g = gravitational acceleration = 32.2 ft/s^2
b = fracture width = 0.125 in = 0.0104 ft
μ = 2.359×10^{-5} lbf-sec/ft^2

- Flow through the aquifer is governed by the aquifer hydraulic conductivity.

K = aquifer hydraulic conductivity = 1×10^{-3} cm/s = 3.28×10^{-5} ft/s

- The hydraulic conductivity controlling flow into the Reactor Building is governed by the aquifer hydraulic conductivity and the fracture hydraulic conductivity according to the following formula:

$$\frac{50\,feet}{K_T} = \frac{40\,feet}{K} + \frac{10\,feet}{K_f}$$

where

K_T = the total effective conductivity of the flow regime near a fracture
40 feet = assumed travel distance for flow in aquifer
10 feet = travel distance for flow in fracture

50 feet = total effective travel distance for flow into the building

- Flow into the Reactor Building is computed using the following formula:

$$Q = K_T \; A \, n \, \frac{dh}{dL}$$

where

Q = total volumetric flow rate
A = total fracture opening area = 42 feet x 0.0104 feet
n = number of fractures = 4
dh = head drop across the fracture = 30 feet
dL = length of the fracture = 10 feet

2.3 Computations

- Fracture hydraulic conductivity is calculated as:

$$K_f = \frac{\rho_w g b^2}{12\mu} = \frac{62.37 \frac{lbm \cdot g}{ft^3} \cdot \frac{lbf}{lbm \cdot g} (0.0104)^2 \, ft^2}{12 \cdot 2.359 \times 10^{-5} \frac{lbf \cdot s}{ft^2}} = 23.9 \; ft/s$$

- Total hydraulic conductivity is calculated as:

$$K_T = \frac{50 ft}{\frac{40 ft}{K} + \frac{10 ft}{K_f}} = \frac{50 ft}{\frac{40 ft}{3.28 \times 10^{-5} ft/s} + \frac{10 ft}{23.9 \, ft/s}} = 4.1 \times 10^{-5} \; ft/s$$

- Because the aquifer hydraulic conductivity is much smaller than the fracture hydraulic conductivity, the aquifer hydraulic conductivity is the controlling factor in calculating the flow into the Reactor Building through the fractures.

- Flow into the Reactor Building is calculated as:

$$Q = K_T \; A \frac{dh}{dL} = 4.1 \times 10^{-5} ft/s \cdot 42 \, ft \cdot 0.0104 \, ft \cdot 4 \, \frac{24.59 \, ft}{10 \, ft} = 1.76 \times 10^{-4} \, ft^3/s = \mathbf{0.079 \; gpm}$$

- This volumetric flow rate represents a high flow rate at the initial time of water influx. As the head inside the building increases, the head differential will drop, thus decreasing the flow rate.

2.4 Sensitivity Analysis

- Since fracture flow does not govern the flow regime, aquifer parameters are the only factors that could affect flow calculations.
- If aquifer hydraulic conductivity were 10^{-2} cm/s instead of 10^{-3} cm/s, the resulting flow rate would be 0.79 gpm.
- If the water did not fill the cracks instantaneously, the head differential would be 34.59 feet instead of 24.59 feet and the resulting flow rate would be 0.11 gpm.

2.5 Conclusions

Even assuming that the flow rate is constant over time, and that the flow rate is as high as 0.79 gpm, it would take approximately 8.7 years to fill the 140' x 140' Reactor Building to the level of the water table.

3.0 PIPING FLOW

3.1 Assumptions

1. A simplification of the piping flow scenario is presented in Figure 2.
2. The aquifer at the base of the building is hydraulically connected with the Cape May water table aquifer. (Backfill area around building did not include replacement of upper clay layer following construction.) (see section 2.1 for a description of this assumption).
3. Material below the building slab is Cohansey sand with hydraulic conductivity $K \approx 1x10^{-3}$ cm/s.
4. The head in the water table aquifer and therefore the head at the base of the slab is 40 feet.
5. Water leakage from the cracked torus will result in an initial head inside the building of 5.41 feet.
6. The differential pressure across the slab is 34.6 feet. This is a conservative assumption since in actuality the flow through the crack will only be subject to this initial head differential and will be reduced over time. By using this value it assumes that the soil will be subject to the maximum stresses.

7. Flow into the cracks will not affect the static head of the aquifer.

8. 4 cracks of width 0.125 inches (= 0.0104 feet) at the top and 6 inches (0.5 feet) at the bottom, with lengths of 42 feet.

9. The piped soils are at rest in a static equilibrium. No dynamic effects are considered. This assumption is conservative since additional head losses would occur as a result of dynamic effects.

10. A dry density of the soil, ρ_s, is taken to be 2.0 g/ml.

11. The friction angle for the sand, ϕ, is taken to be 35 degrees. This is a standard value for sand against concrete.

12. The coefficient of earth pressure (lateral pressure) is taken to be $K_0 = 1 - \sin\phi = 0.43$.

3.2 Approach

Assuming that the piped soil is at static equilibrium in the crack, a determination of the height to which the soil would rise inside the building may be made. Using the diagram in Figure 2, the static upwards and downwards forces can be balanced according to the following force balance equation:

$$F_b = W + F_f$$

where

F_b = the upward buoyant force per unit length of the crack
W = the weight of the soil in the crack and above the crack per unit length of the crack
F_f = the downward friction force opposing the upward flow per unit length of the crack

3.3 Calculations

In order to determine these forces, a number of definitions are presented:

g = gravitational constant
ρ = density of water = 1.0 g/ml
ρ_s = density of the soil = 2.0 g/ml
ρ_b = buoyant density = $\rho_s - \rho$ = 1.0 g/ml
γ_w = specific gravity of water = ρg

γ_s = specific gravity of the soil = $\rho_s g = 2\gamma_w$
γ_b = buoyant specific gravity = $\gamma_s - \gamma_w = \gamma_w$
ϕ = friction angle for sand = 35°
K_0 = lateral pressure coefficient = $1 - \sin\phi = 0.43$
z = depth of soil inside building to reach static equilibrium
Δh = head differential across the crack = 34.6 feet
w_t = width of crack at top of slab = 0.125" = 0.0104'
w_b = width of crack at bottom of slab = 6.0" = 0.5'.
h_c = height of crack = 10 feet
A_c = area of crack interior in cross-section = 2.55 ft^2

- The static forces may be expressed in terms of the above parameters, according to the following equations:

$$F_b = \gamma_w\, \Delta h\; w_b$$
$$W = \gamma_s\, A_c + \gamma_s w_t z$$
$$F_f = 2h_c K_0 \gamma_b (z + 5\,ft)\cdot \tan\phi$$

Substituting in the above force balance equation gives:

$$\gamma_w \Delta h\; w_b = \gamma_s\, A_c + \gamma_s w_t z + 2h_c K_0 \gamma_b (z + 5\,ft)\cdot \tan\phi$$

Substituting the above values gives:

$$\gamma_w 34.6'\cdot 0.5' = 2\gamma_w\; 2.55 ft^2 + 2\gamma_w 0.0104'\cdot z + 2\cdot 10'\cdot 0.43\cdot 0.7\cdot 5'\;\gamma_w + 2\cdot 10'\cdot 0.43\cdot 0.7\cdot z\gamma_w$$

Simplyfing and rearranging gives an expression for z:

$$-17.9 = 6.04\, z$$
$$z < 0$$

A value for z of less than zero indicates that the friction force is sufficiently strong to prevent any water/soil mixture from moving completely through the crack and into the building under the process of piping. Soil will flow into the crack, but it will not have sufficient buoyant force to push it through the crack to the other side.

3.4 Conclusions

The above static analysis for piping flow equlibrium shows that even under the gross assumptions made, with no regard for dynamic effects, the calculated value for the maximum height the soil could reach in the crack as a result of piping is less than the height of the crack.

Under this conservative scenario, piping will result in a filling of the crack with sand, after which the sand will stop moving and water will continue to flow through it.

4.0 OVERALL CONCLUSIONS

In assessing the overall risk of radionuclide mobilization through the cracks created in the concrete slab under the Reactor Building, neither the piping flow nor the groundwater flow calculations indicate any possible method for water to leave the building under the conditions of positive inflow pressure. It is only after the overly conservative estimated time of 8.7 years, could the head inside the building even potentially reach an equilibrium with the surrounding aquifer, and even then only should the head inside the building rise to a level higher than the surrounding aquifer, could outflow actually occur. In addition, molecular diffusion of dissolved radioactive substances downward through the fractures into the underlying aquifer is not possible while there is a positive inflow pressure. In summary, the findings of the groundwater analysis indicate no risk of radionuclide transport in groundwater out of the Reactor Building in an eight-year period following the cracking of the slab, assuming no further disturbance of the slab and no further hydraulic loading inside the building.

Should you have any questions, please do not hesitate to call.

Sincerely,

Margaret T. Schwartz

Margaret T. Schwartz
Senior Staff Engineer

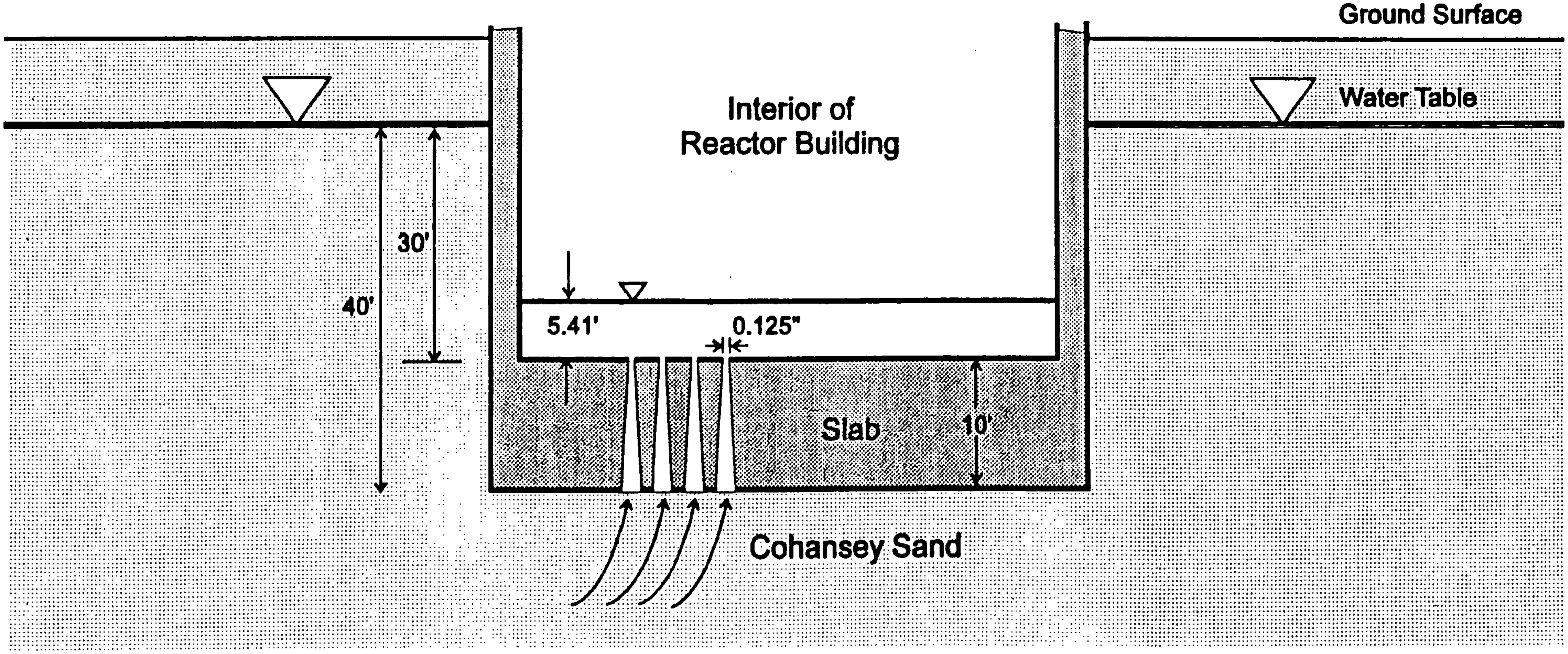
Michael Akerbergs
Project Manager

Attachments

cc: Dr. Stephen C. Tumminelli, P.E., Parsippany
Jay Vouglitois, Oyster Creek
Mike Laggart, Parsippany

Figure 1

SIMPLIFIED DIAGRAM OF GROUNDWATER FLOW

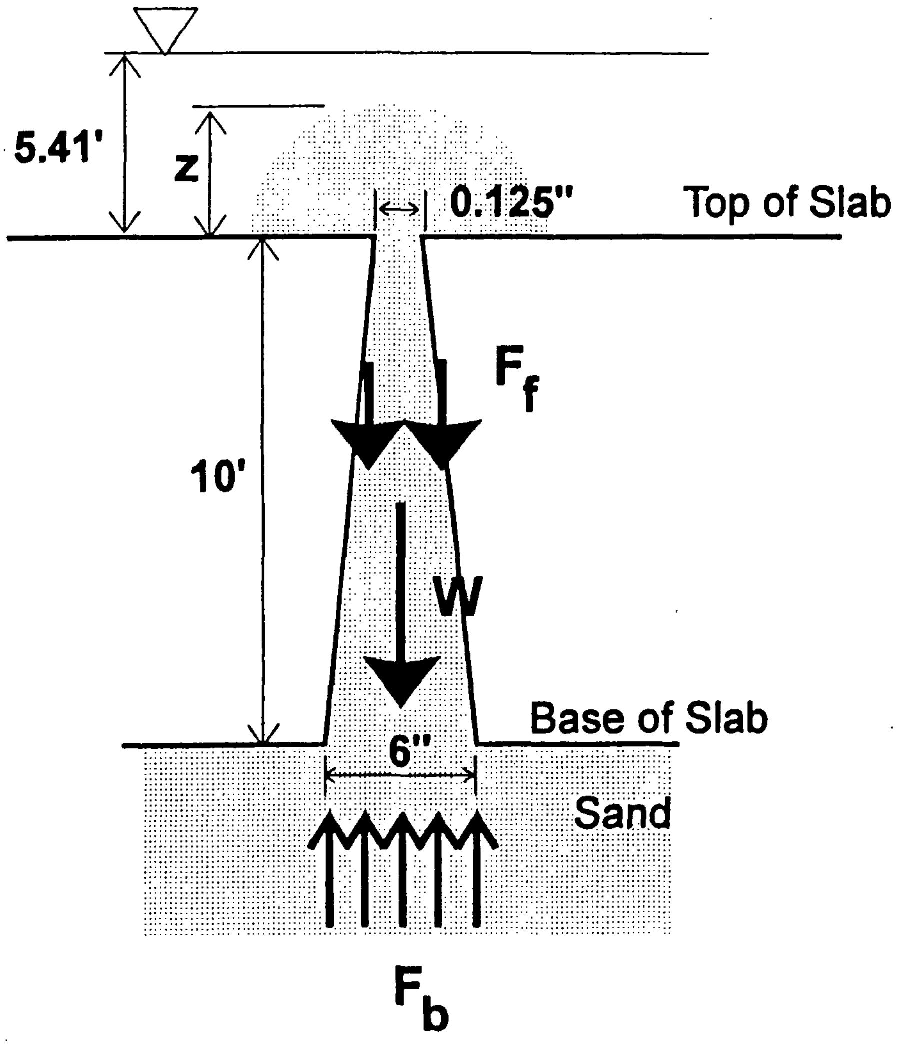


Not to Scale

t:\projects\6e04626\figure1.cdr

Figure 2

SIMPLIFIED DIAGRAM OF STATIC EQUILIBRIUM IN A CRACK FOR PIPING FLOW



Not to Scale

I:\projects\6e04626\figure2a.cdr

Appendix B
Boring and Well Installation Logs

1973
BORING LOGS
W-1 to W-19

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W1

PROJECT: Oyster Creek Nuclear Power Station		PROJECT NO: 73C807	
LOCATION: Lacey Township, New Jersey		ELEVATION AND DATUM: 23.79 MSL USC & GS	
DRILLING AGENCY: Raymond International, Inc.		DATE STARTED: 1 November 1973	DATE FINISHED: 7 November 1973
DRILLING EQUIPMENT: Mobile Drill B-61, Truck mounted		COMPLETION DEPTH: 115.9 ft	ROCK DEPTH: –
SIZE AND TYPE OF BIT: 3 7/8-in. tri-cone roller bit		NO. SAMPLES: 26	UNDIST: 10 / CORE: –
CASING 4-in. dia flush joint to 8 ft/ rovert below 8 ft		WATER LEVEL: 12.5 ft	
CASING HAMMER	WEIGHT 300 lb / DROP 24 in.	FOREMAN: R. Maier	
SAMPLER			
SAMPLER HAMMER	WEIGHT 140 lb / DROP 30 in.	INSPECTOR: A.J. Ciancia	

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES [illegible]	[illegible]	[illegible]	[illegible]	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
3 21 90		SP - SM : FILL, wet, light brown and gray, medium to fine SAND, trace silt, trace debris	0–2	S-1	SS	2.0	2 5 6 10	W1 moved 7.5 ft east of original location due to overhead wires
349	20.29		2–4	S-2A 2B 2C	SS	2.0	15 22 38 56	
32 68		SP - SM moist, tan, medium to fine SAND, trace to some silt CAPE MAY	4–6	S-3A S-3B	SS	2.0	19 23 33 34	
			6–8	S-4	SS	1.5	19 36 34	
			8–10	S-5	SS	2.0	15 19 22 27	
			10–12	S-6	SS	2.0	14 14 16 19	
			13–14	U-1L	Piston	NR	Push	U-1 No recovery due to lock malfunction
	8.79		14–15	U-1L	Piston	NR	Push	Mud turned dark at 15 ft indicating strata change
		CH – OH: moist, gray-brown, ORGANIC CLAY, with frequent partings and thin layers of gray fine sand UPPER CLAY	16–18	U-2	Piston	2.0	Push	U-2 Push 2.0 ft Recovered 2.0 ft Difficult pushing tube
			18–20	S-7	SS	1.2	WH 2 3 3	WH; weight of 140 lb hammer
			21–23	U-3	Shelby	1.87	Push	U-3 Push 2.0 ft Recovered 1.87 ft
			23–24.5	S-8	SS	1.3	2 4 6	
	-5.96		28–29.75	U-4	Shelby	1.75	Push	U-4 Push 1.75 ft Recovered 1.75 ft Refusal at 29.75 ft depth
		SP: wet, tan, medium to fine SAND, trace silt COHANSEY	30–31.5	S-9	SS	1.8	6 6 8	

FIG. A-1

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W1

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			33–34	U-5	Shelby	1.08	Push	U-5 Push 1.12 ft Recovered 1.08 ft
			34–35.5	S-10A 10B	SS	1.5	13 8 9	Refusal at 35.12 ft depth
			36–38	U-6	Shelby	1.0	Push	U-6 Push 2.0 ft Recovered 1.0 ft
			38–40	U-7L	Shelby	NR	Push	U-7 No recovery
		SP - SM: wet, tan, medium to fine SAND, trace to some silt, occasional layers of light brown, coarse to fine SAND, trace silt	40–41.5	S-11A 11B	SS	1.2	11 9 7	
			45–46.5	S-12	SS	1.3	16 13 13	
			48–50	U-8	Shelby	1.21	Push	U-8 Push 2.0 ft Recovered 1.17 ft
			50–51.5	S-13	SS	1.3	6 12 13	
			55–56.5	S-14	SS	1.5	47 68 76	
		SP - SM: wet, tan, medium to fine SAND, trace to some silt	60–61.5	S-15A 15B	SS	1.5	40 49 67	
			65–66.5	S-16	SS	1.3	12 17 20	
			68–69.5	U-9	Piston	1.54	Push	U-9 Push 1.5 ft Recovered 1.54 ft Refusal at 69.5 ft depth Possibly some wash in tube
			69.5–71	S-17	SS	1.4	21 30 47	

FIG. A4

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS
LOG OF BORING W1

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			71–73					
			73	U-10	Piston	0.33	Push	U-10 Push 0.33 ft Recovered 0.33 ft Refusal at 73.33 ft depth
			75	S-18	SS	1.3	34 25 36	
		SP - SM: wet, yellow and light brown, medium to fine SAND, trace to some silt	77–79					
			80	S-19	SS	1.4	61 72 84	
			85	S-20	SS	1.4	84 76 88	
	-64.21		88					
			90	S-21	SS	1.2	38 61 82	
			95	S-22	SS	1.5	37 40 38	
		SP -SO: wet, gray, medium to fine SAND, trace organic silt, with occasional partings and layers of gray-brown, ORGANIC CLAY LOWER CLAY	97–99					
			100	S-23	SS	1.5	6 8 10	
			105	S-24	SS	1.1	WH 10 14	WH - weight of 140 lb hammer
	-83.21		107					Drilling became difficult from 107 ft
			108–109					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS
LOG OF BORING W1

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			109					
			110	S-25	SS	0.8	49 100/4.5"	
		SP: wet, gray-brown, medium to fine SAND, trace silt KIRKWOOD	111–114					
			115	S-26	SS	0.9	50 100/5"	
	-92.11	End of boring at 115.9 ft	116					
			117–120					

FIG. A-2

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W2

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23.39 MSL USC & GS
Raymond International, Inc.	30 November 1973 / 6 December 1973
Mobile Drill B-61, Truck mounted	113.33 ft / -
4 3/4 in. tri-cone roller bit	NO. SAMPLES 25 / 7 / -
CASING 5 in. dia flush joint casing to 4 ft / revert below 4 ft	WATER LEVEL
CASING HAMMER: WEIGHT 300 lb DROP 24 in.	R. Moor
SAMPLER	
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	A. J. Clancio

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES No.	Type	Recov. ft	[illegible]	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
7 16 52 86			0–2	S-1	SS	1.8	7 9 9 13	W2 is 3.5 ft north of stake location. (Stake is 14 ft north of original W2 location)
			2–4	S-2	SS	1.9	10 14 24 24	
			4–6	S-3	SS	2.0	8 14 12 14	
		SP - SM: FILL, moist, light brown, medium to fine SAND, trace to some silt, occasional pockets of brown clayey silt	6–8	S-4	SS	2.0	7 7 7 7	
			8–9.5	S-5	SS	1.2	5 3 3	
			9.5–11	S-6	SS	0.7	2 1 2	
			12–14	U-1	Piston	1.01	Push	U-1 Push 2.0 ft Recovered 1.01 ft
		SP - SM: FILL, moist, light brown, medium to fine SAND, trace to some silt	15–17	S-7	SS	1.9	3 2 2 3	
	4.39		17–19	S-8A S-8B	SS	1.7	4 2 2 1	
			20–21.83	U-2	Piston	1.87	Push	U-2 Push 1.83 ft Recovered 1.87 ft Refusal at 21.83 ft depth
		CH - OH: moist, gray-brown, ORGANIC CLAY, with frequent partings and thin layers of gray fine SAND UPPER CLAY	23–25	U-3	Piston	2.0	Push	U-3 Push 2.0 ft Recovered 2.0 ft
			26–28	U-4	Piston	1.88	Push	U-4 Push 2.0 ft Recovered 1.88 ft
			29–31	U-5	Piston	1.88	Push	U-5 Push 2.0 ft Recovered 1.88 ft
			32–33	U-6	Piston	2.0	Push	U-6 Push 2.0 ft Recovered 2.0 ft

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W2

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			33–34	U-6	Piston	24"	Push	
	-11.61		34.8					Resistance and sounds from roller bit indicated sand from 34.8 ft depth
			35–36.5	S-9A S-9B	SS	1.4	20 17 9	
		SP - SM: wet, yellow-brown, medium to fine SAND, trace to some silt, occasional layers of light brown coarse to fine SAND, trace silt COHANSEY	41–42.5	S-10	SS	0.7	12 11 10	
			46–47.5	S-11	SS	1.2	6 6 5	
			48.5–50.5	U-7	Piston	1.84	Push	U-7 Push 2.0 ft Recovered 1.84 ft
			51–52.5	S-12 12	SS SS	1.4 1.4	18 22 29	
			56–57.5	S-13	SS	1.4	30 47 65	
		SP - SM: wet, yellow-brown, medium to SAND, trace to some silt	61–62.5	S-14	SS	1.5	19 31 36	
			66–67.5	S-15	SS	1.4	12 12 10	
			71					

FIG. A-3

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W2

ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	SP - SM: wet, yellow-brown, medium to fine SAND, trace to some silt	71–72.5	S-16	SS	1.8	10 18 21	
		76–77.5	S-17	SS	1.8	38 31 20	
		81–82.5	S-18	SS	1.3	43 80 100/6"	
		86–87	S-19	SS	0.9	44 100/5.5"	
-68.11		91–92	S-20	SS	0.5	100 100/4"	
	SP - SO: wet, gray, medium to fine SAND, trace organic silt, with frequent partings and layers of gray-brown ORGANIC CLAY LOWER CLAY	96–97.5	S-21	SS	1.4	43 91 103	
		98–99.5	S-22A S-22B	SS	1.6	8 54 88	
		100.5–102.5	U-8	Piston	2.0	Push	U-8 Push 2.0 ft Recovered 2.0 ft
		103.5–105.5	U-9	Piston	1.88	Push	U-9 Push 1.88 ft Recovered 1.88 ft
		106–107.5	S-23	SS	1.4	2 8 6	
		108–109	S-24	SS	1.4	WH WH	WH - weight of 140-lb hammer

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W2

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			109–109.5	S-25	SS	1.5	10	
	-88.71	SP: wet, gray-brown, medium to fine SAND, trace silt KIRKWOOD	110–111.8	U-10L	Piston	NR	Push	U - 10L Push 1.88 ft No recovery due to latch malfunction
			112–113	S-26	SS	1.3	37 100 100/4"	
	-80.04	End of boring at 113.33 ft						

FIG. A-4

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W3

Oyster Creek Nuclear Power Station			73C807		
Lacey Township, New Jersey			23.19 MSL USC & GS		
Raymond International, Inc.			16 November 1973	28 November 1973	
Mobile Drill B-61, Truck mounted			113.1 ft		
4 3/4 in. tri-cone roller bit			NO. SAMPLES	11	32 / –
CASING 5 in. dia flush joint to 4 ft /mm/ below 4 ft			WATER LEVEL		
CASING HAMMER	WEIGHT 300 lb	DROP 24 in.	R. Meier		
SAMPLER					
SAMPLER HAMMER	WEIGHT 140 lb	DROP 30 in.	A. J. Cancia		

CASING BLOWS	ELEV	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
9			0	S-1A	SS	2.0	3 5	
20			1	S-1B			7 10	
28 32			2	S-2	SS	1.9	7 6 6 9	
			4	S-3	SS	2.0	7 7 8 5	
		SP - SM: moist, tan, fine SAND, trace to some silt, trace medium sand CAPE MAY	6	S-4	SS	2.0	6 7 10 10	
			8	S-5	SS	2.0	6 11 16 20	
			10	S-6	SS	1.8	11 15 18 19	
			13	U-1	Piston	2.0	Push	U-1 Push 2.0 ft Recovered 2.0 ft
		SP - SM: moist, tan, fine SAND, trace to some silt, trace medium sand	14	U-1	Piston	2.0	Push	
			15	U-2	Piston	1.79	Push	U-2 Push 2.0 ft Recovered 1.79 ft
	5.79		17	7A S-7B	SS	2.0	2 3 4	
		CH - OH: moist, gray, ORGANIC CLAY with frequent partings and seams of fine SAND, trace organic silt UPPER CLAY	22	S-8	SS	2.0	4 4 7	
			24.5	U-3	Piston	2.0	Push	U-3 Push 2.0 ft Recovered 2.0 ft
			29.5	9B S-9A	SS	2.0	7 16 18	
			32	U-4	Piston	1.93	Push	

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W3

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			33	U-4	Piston	1.93	Push	
	-11.31		34.5					U-5 Push 0.08 ft Refusal at 35.08 ft Recovered 0.08 ft, jar sample taken
			35	U-6	Pitcher	1.77	Push	U-6 Drill 2.0 ft Recovered 1.77 ft
			38	U-7	Piston	1.21	Push	U-7 Push 1.23 ft Refusal at 38.23 ft Recovered 1.21 ft
		SP - SM: moist, gray and brown, fine SAND, trace silt and medium sand, occasional layers of light brown coarse to fine SAND, trace silt COHANSEY	40.5	U-8	Pitcher	1.22	Push	U-8 Drill 2.0 ft Recovered 1.22 ft
			43.5	U-9	Piston	1.88	Push	U-9 Push 1.75 ft Refusal at 45.25 ft Recovery 1.88 ft (including wash)
			46.5	U-10	Piston	1.75	Push	U-10 Push 1.79 ft Refusal at 48.29 ft Recovery 1.75 ft
			49.5	U-11	Piston	1.88	Push	U-11 Push 2.0 ft Recovery 1.88 ft
			52.5	U-12	Piston	1.27	Push	U-12 Push 1.29 ft Recovered 1.27 ft
			55	U-13	Pitcher	1.82	Drill	U-13 Drill 2.0 ft Recovered 1.82 ft
			58	U-14	Piston	1.28	Push	U-14 Push 1.08 ft Refusal at 59.08 ft Recovered 1.28 ft (including wash)
		SP - SM: moist, gray and orange-brown, fine SAND, trace silt and medium sand	60	U-15	Pitcher	1.29	Drill	U-15 Drill 2.0 ft Recovered 1.29 ft
			63	U-16	Piston	NR	Push	U-16 Push 1.17 ft Refusal at 64.17 ft No recovery due to latch malfunction
			65	U-17	Pitcher	1.48	Drill	U-17 Drill 2.0 ft Recovered 1.48 ft
			68	U-18	Piston	1.83	Push	U-18 Push 2.0 ft Recovered 1.88 ft

FIG.A-5

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W3

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			71–72	U-19	Piston	1.00	Push	U-19 Push 1.01 ft Recovered 1.00 ft (smash in tube)
			74–75	U-20	Pitcher	1.88	Drill	U-20 Drill 2.0 ft Recovered 1.88 ft
			77–78	U-21	Piston	1.67	Push	U-21 Push 1.62 ft Refusal at 78.62 ft depth Recovered 1.67 ft (smash in tube)
		SP - SM: moist, mottled gray and orange-brown, medium to fine SAND, trace silt, occasional seams of mottled coarse to fine SAND, trace silt	80–81	U-22	Piston	1.17	Push	U-22 Push 1.37 ft Refusal at 81.37 ft Recovered 1.17 ft
			82–83	U-23	Piston	1.09	Push	U-23 Push 1.30 ft Refusal at 83.30 ft depth Recovered 1.09 ft
			85–86	U-24	Pitcher	1.45	Drill	U-24 Drill 1.80 ft Recovered 1.45 ft
			87–88	U-25	Pitcher	1.40	Drill	U-25 Drill 1.80 ft Recovered 1.40 ft
		SP-SM: moist, mottled gray and orange-brown, medium to fine SAND, trace silt	90–91	U-26	Pitcher	1.48	Drill	U-26 Drill 1.80 ft Recovered 1.48 ft
	-70.11		92–93	U-27	Pitcher	1.80	Drill	U-27 Drill 1.80 ft Recovered 1.80 ft
			95–96	U-28	Pitcher	1.29	Drill	U-28 Drill 1.80 ft Recovered 1.29 ft
			97–99	U-29	Osterberg	1.58	Push	U-29 Push 1.58 ft Refusal at 99.08 ft depth Recovered 1.58 ft
		SO: moist, dark gray, medium to fine SAND, some organic silt with frequent seams and layers of ORGANIC CLAY LOWER CLAY	100–101	U-30	Piston	1.55	Push	U-30 Push 1.50 ft Refusal at 101.50 ft Recovered 1.55 ft
			103					U-31 Push 0.1 ft Refusal at 103.1 ft depth Recovered 0.04 ft (jar sample taken)
			104–106	U-32	Piston	1.46	Push	U-32 Push 1.80 ft Refusal at 105.8 ft depth Recovered 1.46 ft
	-83.31		107–109	S-10	SS	1.4	38 61 46	

FIG. A-6

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W3

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		SP - SO: moist, gray, medium to fine SAND, trace silt KIRKWOOD	109–111					Silt possibly slightly organic
	-89.91		112–113	S-11	SS	1.0	32 87 65 1½"	
		End of boring @ 113.1 ft	113–115					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W4

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23.21 MSL USC & GS
Raymond International, Inc.	8 November 1973 / 15 November 1973
Mobile Drill B-61, Truck mounted	112.6 ft / –
3 7/8 in. tri-cone roller bit	NO. SAMPLES 24 / 12 / –
CASING 4 in. dia flush joint casing to 6 ft Revert below 6 ft	WATER LEVEL
CASING HAMMER WEIGHT 300 lb DROP 24 in.	R. Maier
SAMPLER	A. J. Curcio
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	

CASING BLOWS	ELEV	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
8 17			0–2	S-1	SS	2.0	4 10 12 22	
82 106			2–4	S-2	SS	1.8	19 27 27 28	
78 112			4–6	S-3	SS	1.8	14 21 22 21	
		SP - SM : moist, yellow to orange-brown, medium to fine SAND, trace silt CAPE MAY	6–8	S-4	SS	2.0	11 14 14 19	
			8–10	S-5	SS	1.8	10 20 22 24	
			10–12	S-6	SS	2.0	12 18 22 27	
			13–14	U-1	Piston	1.88	Push	
			14–15	U-1	Piston	1.80	Push	U-1 Push 2.0 ft Recovered 1.80 ft
		SP - SM: moist, yellow to orange-brown, medium to fine SAND, trace silt	15–17	U-2	Piston	1.08	Push	U-2 Push 2.0 ft Recovered 1.08 ft
	5.29		17–18	S-7A	SS	2.0	7 5	
			18–19	S-7B			8 9	
			20–22	U-3	Osterberg	2.0	Push	U-3 Push 2.0 ft Recovered 2.0 ft
		CH - OH: moist, gray-brown, ORGANIC CLAY, with frequent partings and thin layers of gray fine sand UPPER CLAY	22–25					
			25–26.5	S-8	SS	2.0	5 6 9	
			30–31.5	S-9	SS	2.0	4 4 5	
			33					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W4

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	-10.71		33–34					Drilling becomes more difficult from 34 ft
			34–35.5	S-10A S-10B	SS	1.5	35 16 11	
			36–38	U-4	Piston	1.64	Push	U-4 Push 2.0 ft Recovered 1.64 ft
		SP - SM: wet, gray changing with depth to orange, fine SAND, trace silt and medium sand COHANSEY	41–43	U-5	Piston	1.17	Push	U-5 Push 2.0 ft Recovered 1.17 Refusal at 50.79 ft depth
			44–45.5	S-11	SS	1.8	8 9 12	
			49–50.8	U-6L	Piston	NR	Push	U-6L Push 1.79 ft No recovery due to lock malfunction
			51					U-7 Push 0.10 ft Refusal at 51.1 ft No recovery
			51–52	S-12	SS	1.5	70	
			52–52.5	S-12	SS	1.5	104	
			56–57.5	S-13	SS	1.1	57 70 90	
		SP - SM: wet, yellow - light brown, fine SAND, trace silt and medium sand	61–62.5	S-14	SS	1.4	23 30 46	
			63.5–65	U-8	Piston	NR	Push	U-8 Push 1.58 ft Refusal at 65.08 ft depth No recovery due to lock malfunction
			66–68	U-9	Piston	1.87	Push	U-9 Push 2.0 ft Recovered 1.87 ft
			71					

FIG.A-7

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W4

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			71–72.5	S-15	SS	1.5	13 21 27	
			73.5–74.5	U-10	Piston	0.83	Push	U-10 Push 1.0 ft Refusal at 74.5 ft depth Recovered 0.83 ft
		SP - SM: wet, tan medium to fine SAND, trace to some silt, occasional layer of orange-brown coarse to fine SAND, trace silt	78.5–80	S-16	SS	1.5	63 80 79	
			81–81.87	U-11	Piston	0.84	Push	U-11 Push 0.87 ft Refusal at 81.87 ft depth Recovered 0.84 ft
			86–87.5	S-17	SS	1.1	24 30 46	
		SP - SM: wet, gray, medium to fine SAND, trace silt	91–92.5	S-18	SS	1.5	21 29 38	
	-71.71		95					
			96–97.5	S-19A / S-19B	SS	1.5	27 34 21	
		SC: wet, gray-brown, medium to fine SAND, some organic silt with frequent seams and layers of gray-brown ORGANIC CLAY LOWER CLAY	99–100.5	U-12A	Shelby	NR	Push	U-12 Push 2.0 ft No recovery
			100.5–102	S-20	SS	1.5	10 12 14	S-20 ORGANIC CLAY layers 1/8-in. to 1/4-in. in thickness
			102–104	S-21A / 21B	SS	2.0	7 14 24 37	
			104–106	S-22A / 22B	SS	2.0	8 10 10 22	
	-83.11	SP: wet, gray, medium to fine SAND, trace silt KIRKWOOD	106–108	S-23	SS	2.0	9 16 34 48	

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W4

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		SP: wet, gray medium to fine SAND, trace silt	110–111.5	S-24	SS	1.5	43 66 77	
	-89.21	End of boring @ 112.5 ft						

FIG.A-8

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W6

PROJECT: Oyster Creek Nuclear Power Station		PROJECT NO: 73C807	
LOCATION: Lacey Township, New Jersey		ELEVATION AND DATUM: 22.99 MSL USC & GS	
DRILLING AGENCY: Raymond International, Inc.		DATE STARTED: 27 November 1973	DATE FINISHED: 28 November 1973
DRILLING EQUIPMENT: Mobile Drill B-61, Truck mounted		COMPLETION DEPTH: 96.5 ft	ROCK DEPTH: –
SIZE AND TYPE OF BIT: 3 7/8 in. tri-cone roller bit		NO SAMPLES: DIST. 22	UNDIST. 6 / CORE –
CASING: 4 in. dia flush joint to 6 ft / revert below 6 ft		WATER LEVEL: FIRST –	COMPL. – / 24 HR –
CASING HAMMER	WEIGHT 300 lb / DROP 24 in.	FOREMAN: R. Meier	
SAMPLER			
SAMPLER HAMMER	WEIGHT 140 lb / DROP 30 in.	INSPECTOR: A. J. Clennie	

CASING BLOWS	ELEV	DESCRIPTION	DEPTH SCALE	SAMPLES No.	Type	Recov. ft	Blows/6 in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
14			0–2	S-1	SS	1.9	4 8 12 19	
47 38			2–4	S-2	SS	1.9	15 19 30 25	
84 65			4–6	S-3	SS	1.9	11 14 13 14	
87		SP - SM: FILL, orange-brown, fine SAND, trace silt, some medium sand	6–8	S-4	SS	2.0	20 20 18 24	
			8–10	S-5	SS	1.9	11 16 12 13	
			10–11.5	S-6	SS	1.5	4 4 6	
			12.5–14.5	U-1	Piston	1.44	Push	U-1 Push 2.0 ft Recovered 1.44 ft
			14.5–16.5	U-2	Piston	1.88	Push	U-2 Push 2.0 ft Recovered 1.88 ft
			16.5–18.5	U-3	Piston	1.83	Push	U-3 Push 2.0 ft Recovered 1.83 ft
			19–20.5	S-7	SS	1.2	3 3 6	
		SP - SM: FILL, orange-brown and tan, fine SAND, trace silt and medium sand	21.5–23.5	U-4	Piston	1.94	Push	U-4 Push 2.0 ft Recovered 1.94 ft
			24–25.5	S-8	SS	1.3	WH WH 10	
			26.5–28.5	U-5	Piston	1.92	Push	U-5 Push 2.0 ft Recovered 1.92 ft
			29–30.5	S-9	SS	1.3	3 3 6	
	-10.01		32–33	U-6	Piston	1.98	Push	U-6 Push 2.0 ft Recovered 1.98 ft

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W6

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		CH - OH: moist, gray-brown, ORGANIC CLAY, with thin layers of gray fine sand	33–34	U-6	Piston	1.98	Push	
	-12.01	UPPER CLAY	34–35.5	S-10A S-10B	SS	1.4	3 5 10	
			39–40.5	S-11	SS	1.4	8 9 11	
		SP - SM: moist, gray and light brown, medium to fine SAND, trace silt COHANSEY	44–45.5	S-12	SS	1.3	11 12 12	
			49–50.5	S-13A S-13B	SS	1.3	8 13 17	
			54–55.5	S-14	SS	1.3	37 43 74	
		SP - SM: moist, tan, medium to fine SAND, trace to some silt	59–60.5	S-15	SS	1.4	37 53 46	
			64–65.5	S-16	SS	1.5	41 16 17	
			69–70.5	S-17	SS	1.8	46 58 43	

FIG. A-9

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W6

C.A. BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			71					
			74	S-18	SS	1.4	12 16 13	
			79	S-19	SS	1.0	80 80 100 2½"	
		SP - SM: moist, yellow-brown and tan, medium to fine SAND, trace silt	80					
			84	S-20	SS	1.4	82 75 100 6"	
			89	S-21	SS	1.5	42 66 87	
		SP - SM: moist, yellow-brown, medium to fine SAND, trace silt	92					
	-70.01		93					
		SP - SO: moist, gray, fine SAND, trace organic silt	94	S-22	SS	1.4	38 48 43	
	-72.81	LOWER CLAY	95					
		End of boring at 95.8 ft	96					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)

FIG. A-10

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W8

Oyster Creek Nuclear Power Station
Lacey Township, New Jersey
Raymond International, Inc.
Mobile Drill B-61 Truck mounted
3 7/8 in. tri-cone roller bit
CASING 4 in. dia flush joint casing to 8 ft /invert below 8 ft
CASING HAMMER WEIGHT 300 lb DROP 24 in.
SAMPLER
SAMPLER HAMMER WEIGHT 140 lb DROP 30 in.

73C807
23.19 MSL USC & GS
29 November 1973
30 November 1973
100.48 ft
NO. SAMPLES 22 4 -
WATER LEVEL
R. Maier
A. J. Ciancia

CASING BLOWS	ELEV	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
6 28 60 128 90 105		SP: FILL, dry, tan and yellow-brown, fine SAND, trace silt	0–9	S-1 S-2 S-3 S-4 S-5 S-6A	SS SS SS SS SS SS	2.0 1.9 1.5 1.0 1.3 1.5	6 11 14 19 11 20 27 38 21 56 50 15 17 16 7 8 10 14 10 24 48	W8 is 21.5 ft east of original location S-1 through S-6A possibly fill
	13.60	SP - SM: moist, light gray, fine SAND, trace silt CAPE MAY	9–14	S-6B U-1	 Piston	 1.88	 Push	U-1 Push 1.92 ft Refusal at 13.42 ft depth Recovered 1.88 ft
		SP - SM: moist, yellow-brown, fine SAND, trace silt and medium sand	14–18	U-2 U-3	Piston Piston	1.94 1.88	Push Push	U-2 Push 2.0 ft Recovered 1.94 ft U-3 Push 2.0 ft Recovered 1.88 ft
	5.19	CH - OH: moist, gray-brown, ORGANIC CLAY with frequent partings and seams of silty fine SAND UPPER CLAY	18–37	U-4 S-7 S-8 S-9	Piston SS SS SS	2.0 1.8 1.6 1.3	Push 3 6 5 6 7 14 4 4 6	U-4 Push 2.0 ft Recovered 2.0 ft
	-12.81	SM: moist, tan, fine SAND, some silt, trace medium sand CONANSEY	37–59	S-10A S-10B S-11 S-12 S-13 S-14	SS SS SS SS SS	1.5 1.4 1.5 1.5 1.4	5 8 19 13 16 19 8 6 11 34 40 61 28 43 47	
		SP - SM: moist, tan, medium to fine SAND, trace silt	59–71	S-15 S-16	SS SS	1.6 1.5	22 29 34 6 9 11	

FIG. A-11

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING WB

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			74–75.5	S-17	SS	1.5	36 53 46	
		SP - SM: moist, tan, fine SAND, trace to some silt, trace medium sand	79–80.5	S-18	SS	1.4	18 22 40	
			84–85	S-19	SS	0.8	64 100/6"	
		SP - SM: moist, tan, fine SAND, trace to some silt, trace medium sand	89–90.5	S-20 S-20	SS SS	1.5 1.5	41 63 88	
	-69.81		93					
		SP - SO: moist, gray, fine SAND, trace organic silt and medium sand LOWER CLAY	94–95.5	S-21	SS	1.6	37 64 88	
	-77.27		99–100.5	S-22	SS	1.3	24 88 100/5½"	
		End of boring at 100.46 ft						

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)

FIG. A-12

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W7

PROJECT: Oyster Creek Nuclear Power Station	PROJECT NO.: 73C807
LOCATION: Lacey Township, New Jersey	ELEVATION AND DATUM: 22.9 ± MSL USC & GS
DRILLING AGENCY: Raymond International, Inc.	DATE STARTED: 6 December 1973 / DATE FINISHED: 7 December 1973
DRILLING EQUIPMENT: Mobile Drill B-61, Truck mounted	COMPLETION DEPTH: 58.0 ft / ROCK DEPTH:
SIZE AND TYPE OF BIT: 4 ¾ in. tri-cone roller bit	NO. SAMPLES: DIST. 21 / UNDIST. 2 / CORE –
CASING: 5 in. dia flush joint casing to 4 ft / revert below 4 ft	WATER LEVEL: FIRST / COMPL. / 24 HR.
CASING HAMMER: WEIGHT 300 lb DROP 24 in.	FOREMAN: R. Meier
SAMPLER	INSPECTOR: A. J. Garcia
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	

CASING BLOWS: 95, 27, 62, 80

ELEV.	DESCRIPTION	DEPTH SCALE
	SP - SM: FILL, dry, yellow-brown fine SAND, trace silt and medium sand	0
16.9	SP - SM: moist, yellow-brown and gray, fine SAND, trace silt and medium sand CAPE MAY	6
	SP - SM: moist, yellow-brown, fine SAND, trace silt and medium sand	
2.4	CH - OH: moist, dark gray, ORGANIC CLAY, with partings and layers of silty fine sand UPPER CLAY	20.5
-18.3	SP - SM: moist, yellow-brown and gray, fine SAND, trace to some silt, trace medium sand, occasional layers of coarse to fine SAND, trace silt COHANSEY	39
	SP - SM: moist, yellow-brown and gray, fine SAND, trace to some silt, trace medium sand	
-35.1	End of boring at 58.0 ft	58

DEPTH SCALE	SAMPLES NO.	TYPE	RECOVERY FT	BLOWS	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
0-2	S-1	SS	1.8	2 6 10 14	
2-4	S-2	SS	2.0	16 18 18 20	
4.5-6	S-3	SS	1.4	16 13 19	
6-8	S-4	SS	2.0	8 13 13 14	
8-10	S-5	SS	2.0	11 13 22 27	
10-11.5	S-6	SS	1.4	11 15 17	
12.9-14	U-1	Piston	1.04	Push	U-1 Push 1.04 ft Refusal at 14.14 ft depth Recovered 1.04 ft
15-17	U-2	Piston	1.82	Push	U-2 Push 1.82 ft Refusal at 16.82 ft depth Recovered 1.82 ft
17-19	S-7	SS	1.8	7 11 11 13	
19-21	S-8A S-8B	SS	2.0	4 2 3 4	
24-25.5	S-9	SS	1.5	2 3 4	
29-30.5	S-10	SS	1.5	5 6 6	
34-35.5	S-11	SS	1.5	3 4 5	
39-40.5	S-12A S-12B	SS	1.5	2 4 6	
40.5-42.5	S-13	SS	2.0	5 7 10 13	
42.5-44.5	S-14	SS	2.0	10 9 8 8	
44.5-46.5	S-15	SS	2.0	6 5 5 6	
46.5-48.5	S-16	SS	1.9	6 6 7 8	
48.5-50.5	S-17	SS	1.9	6 3 5 4	
51-52	S-18	SS	2.0	12 16	
52-53	[illegible]	SS	2.0	23 27	
53-55	S-19	SS	1.8	18 31 62 100/5"	
55-57	S-20	SS	1.8	29 60 74 100/5½"	
57-58	S-21	SS	0.7	40 100/5"	R-1 Boring was advanced to 58 ft for installation of slotted piezometer with tip at el -33.4 and bentonite seal at el -14.6

FIG. A-13

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W8

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23 ± MSL USC & GS
Raymond International, Inc.	7 December 1973 / 11 December 1973
Mobile Drill B-61, Truck mounted	56.7 ft
3 7/8 in. tricone roller bit	NO. SAMPLES 9 / 14
CASING 4 in. dia casing to 6 ft / revert below 6 ft	WATER LEVEL 11.3 ft
CASING HAMMER: WEIGHT 300 lb DROP 24 in	R. Maier
SAMPLER	
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	A. J. Cenoza

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
4 14			0–2	S-1	SS	1.7	2 2 5 7	
19 32		SP - SM: FILL, dry, orange-brown fine SAND, trace silt and medium sand	2–4	S-2A S-2B	SS	2.0	5 8 6 7	
6 17			4–6	S-3A S-3B	SS	2.0	4 5 4 5	
	18.5		6–8	S-4A S-4B	SS	2.0	4 6 10 13	
		SP - SM: moist, yellow-brown and gray, fine SAND, trace silt and medium sand CAPE MAY	8–10	S-5	SS	1.9	6 9 10 15	
			10–12	S-6	SS	2.0	8 11 14 18	
			13–14	U-1	Piston	2.0	Push	U-1 Push 2.0 ft Recovered 2.0 ft
			14–15	U-1	Piston	2.0	Push	
			16–18	U-2	Piston	1.82	Push	U-2 Push 1.82 ft Refusal at 17.82 ft Recovered 1.82 ft
		SP - SM: moist, yellow-brown and gray, fine SAND, trace silt and medium sand	18					
			19–21	U-3	Piston	1.88	Push	U-3 Push 2.0 ft Recovered 1.88 ft
	1.5		21.5					
			22–24	U-4	Piston	2.0	Push	U-4 Push 2.0 ft Recovered 2.0 ft
		CH - OH: moist, dark grey, ORGANIC CLAY with partings and layers of silty fine sand UPPER CLAY	25–27	U-5	Shelby	0.83	Push	U-5 Push 2.0 ft Recovered 0.83 ft
			28–30	U-6	Shelby	2.0	Push	U-6 Push 2.0 ft Recovered 2.0 ft
			31–33	U-7	Piston	1.83	Push	U-7 Push 2.0 ft Recovered 1.83 ft

---

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W8

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		CH - OH: moist, dark gray, ORGANIC CLAY with partings and layers of silty fine sand	34–36	U-8	Piston	1.71	Push	U-8 Push 2.0 ft Recovered 1.71 ft
	-14.5		37–38.79	U-9	Piston	1.79	Push	U-9 Push 1.79 ft Refusal at 38.79 ft depth Recovered 1.79 ft
			39–41	U-10	Piston	1.98	Push	U-10 Push 2.0 ft Recovered 1.98 ft
		SP - SM: moist, yellow-brown, fine SAND, trace to some silt, trace medium sand, occasional layers of coarse to fine SAND, trace silt COHANSEY	42–44	U-11	Piston	2.0	Push	U-11 Push 2.0 ft Recovered 2.0 ft
			45–47	U-12	Piston	2.0	Push	U-12 Push 2.0 ft Recovered 2.0 ft
			48–50	U-13	Piston	1.98	Push	U-13 Push 2.0 ft Recovered 1.98 ft
			51–52	U-14	Piston	1.98	Push	U-14 Push 2.0 ft Recovered 1.98 ft
			52–53	U-14	Piston	1.98	Push	
		SP - SM: moist, yellow-brown, fine SAND, trace to some silt, trace medium sand	53–54.5	7A S-7B	SS	1.4	12 23 33	
			54.5–56	S-8	SS	1.5	13 23 34	
	-33.75	End of boring at 56.75 ft	56–56.75	S-9	SS	0.7	72 107/3"	

FIG. A-14

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W9

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23 ± MSL USC & GS
Raymond International, Inc.	12 December 1973 | 14 December 1974
Mobile Drill B-61, Truck mounted	55.0 ft | –
3 7/8 in. tri-cone bit	NO. SAMPLES 12 | 11 | –
CASING 4-in. flush joint casing to 6.0 ft /revert below 6.5 ft	WATER LEVEL
CASING HAMMER: WEIGHT 300 lb DROP 24 in.	R. Meier
SAMPLER	
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	A. J. Ciancia

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
4 34			0–2	S-1	SS	2.0	2 3 5 10	W9 is 3 ft northwest of original location due to overhead utilities
54 77			2–4	S-2	SS	2.0	8 11 14 16	
71 46/6"		SP - SM: FILL, dry, yellow-brown medium to fine SAND, trace to some silt	4–6	S-3	SS	2.0	11 14 18 17	
			6–8	S-4	SS	2.0	3 4 4 4	
			8–10	S-5	SS	1.8	2 1 2 3	
			10–12	S-6	SS	1.8	4 3 3 3	
			12–14	S-7	SS	0.7	2 1 1 2	
	8.0		14–15	S-8A	SS	1.1	WH 1	WH – weight of 140 lb hammer
	6.5	SP - SM: moist, orange-brown, fine SAND, trace silt and medium sand CAPE MAY	15–16	S-8B			4 11	
			16–18	S-9A S-9B	SS	1.5	2 3 6 5	
			19–21	U-1L	Piston	NR	Push	U-1L Push 2.0 ft No recovery due to lock malfunction
		CH - OH: moist, dark gray, ORGANIC CLAY, with frequent partings and layers of silty fine sand UPPER CLAY	22–24	U-2	Piston	1.84	Push	U-2 Push 2.0 ft Recovered 1.84 ft
			25–27	U-3	Piston	1.98	Push	U-3 Push 2.0 ft Recovered 1.98 ft
			28–30	U-4	Piston	1.98	Push	U-4 Push 2.0 ft Recovered 1.98 ft
			31–33	U-5	Piston	1.98	Push	U-5 Push 2.0 ft Recovered 1.98 ft

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W9

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	-10.5		33					
			34–36	U-6	Piston	1.98	Push	U-6 Push 2.0 ft Recovered 1.98 ft
			37–38.71	U-7	Piston	1.67	Push	U-7 Push 1.71 ft Refusal at 38.71 ft depth Recovered 1.67 ft
		SP - SM: moist, mottled orange-brown and gray, medium to fine SAND, trace silt COHANSEY	40–42	U-8	Piston	1.83	Push	U-8 Push 2.0 ft Recovered 1.83 ft
			43–44.83	U-9	Piston	1.83	Push	U-9 Push 1.83 ft Refusal at 44.83 ft depth Recovered 1.83 ft
			46–48	U-10	Piston	2.0	Push	U-10 Push 2.0 ft Recovered 2.0 ft
			49–50.75	U-11	Piston	1.73	Push	U-11 Push 1.75 ft Recovered 1.73 ft
			51–52	S-10	SS	1.0	18 100	
		SP - SM: moist, mottled orange-brown and gray, medium to fine SAND, trace silt	52–53.5	S-11	SS	1.4	36 46 76	
	-32.0		53.5–55	S-12	SS	1.5	26 29 36	
		End of boring at 55.0 ft	55					

FIG. A-15

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W10

Oyster Creek Nuclear Power Station		73C807	
Lacey Township, New Jersey		23.3 ± MSL USC & GS	
Raymond International, Inc.		17 December 1973	19 December 1973
Mobile Drill B-61, Truck mounted		28.0 ft	
3 7/8-in. Tri-cone roller bit		NO. SAMPLES	10 / 2 / –
CASING 4 in. dia flush joint to 5 ft /none below 6 ft		WATER LEVEL	– / – / –
CASING HAMMER.	WEIGHT 300 lb / DROP 24 in.	R. Maur	
SAMPLER			
SAMPLER HAMMER	WEIGHT 140 lb / DROP 30 in.	A. J. Cancia	

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
11* 68		SP - SM: FILL, dry, yellow-brown, fine SAND, trace silt and medium sand	0–2	S-1	SS	1.9	3 4 4 3	W10 is 20 ft north of W2
116 160			2–4	S-2	SS	2.0	3 6 5 8	
	17.3		4–6	S-3	SS	1.5	4 5 9 12	Obstruction encountered at 6 ft depth; W10 moved to a new location 22 ft north and 8 ft west of W2; sampling resumed at 6 ft depth
		SP - SM: dry, yellow-brown and gray, fine SAND, trace silt and medium sand CAPE MAY	6–8	S-4	SS	2.0	7 12 18 17	* Casing blows after boring was moved
			8–10	S-5	SS	2.0	8 10 14 13	
			10–12	S-6	SS	2.0	8 9 10 12	
			12–14	S-7	SS	2.0	8 14 17 23	
			14–16	S-8	SS	1.9	8 13 18 21	
	8.2	SP - SM: moist, mottled yellow-brown and gray, fine SAND, trace silt and medium sand	16–18	S-9	SS	1.8	6 8 8 6	
		CH - OH: moist, dark gray, ORGANIC CLAY with partings and layers of silty fine sand UPPER CLAY	18–20	S-10	SS	1.8	2 4 6 8	
			21–23	U-1	Piston	2.0	Push	U-1 Push 2.0 ft Recovered 2.0 ft
	-2.7		24–26	U-2	Piston	NR	Push	U-2 Push 2.0 ft No recovery Tube sheared off piston head and couldn't be retrieved. Boring W10 stopped at 26.0 ft depth. Boring moved, refer to W10A new location.
		End of boring at 26.0 ft	26–32					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING ________

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)

FIG. A-16

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W10A

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23.3 ± MSL USC & GS
Raymond International, Inc.	20 December 1973 / 28 December 1973
Mobile Drill B-61, Truck mounted	57.5 ft / –
3 7/8-in. Tri-cone roller bit	NO. SAMPLES 8 / 10
CASING 4 in. dia flush joint to 6 ft /revert below 6 ft	WATER LEVEL
CASING HAMMER: WEIGHT 300 lb DROP 24 in.	R. Maier
SAMPLER	A. J. Ciancia
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
11 27		SP - SM: FILL, dry, tan fine SAND, trace silt and medium sand	0–2	S-1	SS	1.7	4 8 8 9	W10A is 20.8 ft north and 6.6 ft west of W2 location
			2–4	S-2	SS	1.7	9 12 12 12	
			4–4.5	S-3A			5	
			4.5–6	S-3B	SS	1.9	8 9 13	
	15.3		6–8	S-4	SS	2.0	3 9 11 13	
		SP - SM: dry to moist, yellow-brown, fine SAND, trace silt and medium sand CAPE MAY	8–10	S-5	SS	2.0	9 12 16 20	Refer to W10 for soil description from 10 ft to 24 ft
	5.3		10–18					Refer to W10 for soil description from 10 ft to 24 ft depth
		CH - OH: moist, dark gray, ORGANIC CLAY with partings and layers of silty fine sand UPPER CLAY	18–24					
			24–26	U-1	Piston	2.0	Push	U-1 Push 2.0 ft Recovered 2.0 ft
			27–28.83	U-2	Piston	1.83	Push	U-2 Push 1.83 ft Refusal at 28.83 ft Recovered 1.83 ft
	-6.2	SM - SP: moist, mottled yellow-brown and gray, fine SAND, trace to some silt, trace medium sand COHANSEY	30–32	U-3	Piston	2.0	Push	U-3 Push 2.0 ft Recovered 2.0 ft

FIG. A-17

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W10A

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			33–34.48	U-4	Piston	1.48	Push	U-4 Push 1.48 ft Refusal at 34.48 ft Recovered 1.48 ft
			36–38	U-5	Piston	1.81	Push	U-5 Push 2.0 ft Recovered 1.81 ft
			39–41	U-6	Piston	0.33	Push	U-6 Push 2.0 ft Recovered 0.33 ft Poor recovery due to lock malfunction
		SM - SP: moist, mottled yellow-brown and gray, medium to fine SAND, trace to some silt with occasional layers of coarse to fine SAND, trace silt	42–44	U-7	Piston	1.75	Push	U-7 Push 2.0 ft Recovered 1.75 ft
			45–47	U-8	Piston	1.82	Push	U-8 Push 2.0 ft Recovered 1.82 ft
			48–50	U-9	Piston	2.0	Push	U-9 Push 2.0 ft Recovered 2.0 ft
			51–52	U-10	Piston	1.82	Push	
			52–52.82	U-10	Piston	1.82	Push	U-10 Push 1.82 ft Refusal at 52.82 ft Recovered 1.82 ft
		SP - SM: moist, mottled yellow-brown and gray, medium to fine SAND, trace silt	53–54.5	S-6	SS	1.4	6 34 73	
			54.5–56	S-7	SS	1.5	23 33 42	
	-34.2		56–57.5	S-8	SS	1.5	31 44 33	
		End of boring at 57.5 ft	57.5–60					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W11

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23.3 ± MSL USC & GS
Raymond International, Inc.	27 December 1973 / 2 January 1974
Mobile Drill B-61, Truck mounted	55.2 ft
3 7/8 in. Tri-cone roller bit	NO. SAMPLES 12 / 11 / –
CASING 4 in. dia flush joint casing to 8 ft / revert below 8 ft	WATER LEVEL
CASING HAMMER: WEIGHT 300 lb DROP 24 in.	R. Maio
SAMPLER	A. J. Ciancia
SAMPLER HAMMER: WEIGHT 140 lb DROP 30 in.	

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
5 18		SP - SM: FILL, dry tan, medium to fine SAND, trace silt	1	S-1	SS	2.0	3 5 8 14	
34 136			2 3	S-2	SS	2.0	19 24 30 31	
40	18.3		4	S-3A	SS	2.0	14 18	
81		SP - SM: dry to moist, mottled yellow-brown and gray, fine SAND, trace silt and medium sand CAPE MAY	5	S-3B			21 22	
			6 7	S-4	SS	2.0	6 10 11 12	
			8 9	S-5	SS	2.0	11 10 16 19	
			10 11	S-6	SS	1.8	11 14 18 20	
			12	S-7A	SS	2.0	7 9	
			13	S-7B			15 14	
	7.1	SP - SM: moist, mottled yellow-brown and gray, fine SAND, trace silt and medium sand	14 15	S-8	SS	1.9	7 12 14 14	
		CH - OH: moist, dark gray, ORGANIC CLAY, with partings and layers of silty fine sand UPPER CLAY	16 17	S-9	SS	2.0	2 2 4 6	
			18 19 20	U-1	Piston	1.82	Push	U-1 Push 2.0 ft Recovered 1.82 ft
			21 22 23	U-2	Piston	1.88	Push	U-2 Push 2.0 ft Recovered 1.88 ft
			24 25 26	U-3	Piston	1.71	Push	U-3 Push 2.0 ft Recovered 1.71 ft
			27 28 29	U-4	Piston	2.0	Push	U-4 Push 2.0 ft Recovered 2.0 ft
			30 31 32 33	U-5	Piston	1.82	Push	U-5 Push 2.0 ft Recovered 1.82 ft

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W11

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
	-10.2	— — — —	33 34 35 36	U-6	Piston	1.67	Push	U-6 Push 1.82 ft Refusal at 35.82 ft Recovered 1.67 ft
		SP - SM: moist, mottled yellow-brown and gray, fine SAND, trace to some silt, trace medium sand, occasional layers of coarse to fine SAND, trace silt COHANSEY	37 38 39	U-7	Piston	1.86	Push	U-7 Push 2.0 ft Recovered 1.86 ft
			40 41 42	U-8	Piston	1.98	Push	U-8 Push 2.0 ft Recovered 1.98 ft
			43 44 45	U-9	Piston	1.80	Push	U-9 Push 1.82 ft Refusal at 44.82 ft Recovered 1.80 ft
			46 47 48	U-10	Piston	1.86	Push	U-10 Push 1.82 ft Refusal at 47.82 ft Recovered 1.86 ft
			49 50	U-11	Piston	1.78	Push	U-11 Push 1.82 ft Refusal at 50.82 ft Recovered 1.78 ft
			51 52	S-10	SS	1.0	9 100	
		SP - SM: moist, mottled yellow-brown and gray, fine SAND, trace to some silt, trace medium sand	53	S-11	SS	1.5	29 70 100	
	-32.1		54 55	S-12	SS	1.5	38 87 100/5"	P-2 1) Piezometer installed with tip at el -20.3 (43.6 ft depth) 2) Bentonite seal installed from 28 ft to 29 ft depth
		End of boring at 55.4 ft	56 57 58 59 60					

FIG. A-18

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING OW1

Oyster Creek Nuclear Power Station	73C807
Lacey Township, New Jersey	23.8 ± MSL USC & GS
Raymond International, Inc.	8 November 1973 / 8 November 1973
Mobile Drill B-61, Truck mounted	17.0 ft
	NO. SAMPLES 2
CASING 4-in. dia hollow stem auger with insert	WATER LEVEL
CASING HAMMER: WEIGHT – DROP –	R. Maier
SAMPLER	
SAMPLER HAMMER WEIGHT – DROP –	A. J. Cancio

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES				REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
			11					OW1 is 7.0 ft east of W1 Refer to W1 log for soil description above 12 ft depth
		SP-SM: moist orange-brown fine SAND, trace to some silt, trace medium sand CAPE MAY	12–14	U-1	Piston	2.0	Push	U-1 Push 2.0 ft Recovered 2.0 ft
			15–17	U-2	Piston	1.88	Push	U-2 Push 2.0 ft Recovered 1.88 ft
	6.8	End of boring at 17.0 ft	17					Wellpoint installed with tip at el 7.8. No seal placed; sand backfilled around wellpoint and riser pipe
			18–23					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)

FIG. A-19

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-12

Oyster Creek Power Station: Radwaste Building	73C807 D
See Location Plan	Elev. +23 (approx.)
Engineering Drilling Company	8 Oct. 1974 | 8 Oct. 1974
Gardner - Denver Model 800	51.0 | Not encountered
4 ¾-in. dia tri cone bit	NO. SAMPLES 1 | 13 | 0
CASING None (drilling mud)	WATER LEVEL – | – | –
CASING HAMMER: – | WEIGHT – | DROP –	R. Bowen
SAMPLER	R. Kirby
SAMPLER HAMMER: SS | WEIGHT 140 lb | DROP 30 in.	

CASING BLOWS: No casing – Drilled with mud

DESCRIPTION:

Wash: shows coarse to fine SAND

Grey CLAY with lenses and inclusions of grey fine sand

UPPER CLAY

Change at approx. 33 ft

Yellow coarse to fine SAND

COHANSEY

Limit of Exploration

REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.):

Drilled to top of grey CLAY without taking any samples

No.	Type	Recov.	Locat.	Remarks
1	Osterberg	1.92	▨	Top: yellow fine sandy SILT Bottom: grey CLAY
2	Osterberg	1.78	▨	Top: grey CLAY Bottom: grey fine sand and grey CLAY
3	Osterberg	2.10	▨	Top: grey CLAY Bottom: grey fine SAND
4	Osterberg	1.86	▨	Top: not recorded Bottom: grey CLAY and grey fine SAND
5	Osterberg	2.0	▨	Top: grey fine SAND Bottom: not recorded
6	Osterberg	2.0	▨	Top: grey fine SAND Bottom: grey CLAY
7	Osterberg	2.0	▨	Top: grey CLAY Bottom: grey fine SAND
8	Osterberg	1.77	▨	Top: grey CLAY
8			▨	Bottom: yellow medium to fine SAND
9	Osterberg	1.79	▨	Top: yellow coarse to medium SAND Bottom: yellow coarse to medium SAND
10	Osterberg	2.00	▨	Top & Bottom: yellow coarse to fine SAND Upper 0.3 ft of sample disturbed when piston was removed
11	Osterberg	2.0	▨	Top: yellow coarse to medium SAND Bottom: yellow medium to fine SAND
12	Osterb	0.5	▨	Yellow fine SAND (jar sample) Exact length of push not known
13	Osterb	0.3	▨	Yellow coarse sand (jar sample) Tube bent badly. Exact length of push not known
14	SS	0.8	31 34 37	Yellow medium to fine SAND (blows / 6 inches)

FIG. A-20

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-13

Oyster Creek Power Station; Radwaste Building		73C807 8		
See Location Plan		+ 23 (approx.)		
Engineering Drilling Company		7 Oct. 1974	8 Oct. 1974	
Gardner - Denver Model 800		88.0 ft	Not encountered	
4 ½-in. tri-cone bit		NO. SAMPLES	1	14 · 0
CASING None – (drilling mud)		WATER LEVEL	–	– · –
CASING HAMMER: –	WEIGHT – · DROP –	W. Grandberg		
SAMPLER.		R. Kirby		
SAMPLER HAMMER: SS	WEIGHT 140 lb · DROP 30 in.			

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	[illegible]	[illegible]	[illegible]	[illegible]	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Wash shows coarse to fine SAND	0–17					Drilled to top of gray clay without taking any samples
		Approx. depth of change	17					Refer to Boring 13 A for samples from 17 ft to 22 ft The sampler used for boring W 13 samples (in this depth range) was defective.
		Gray CLAY with lenses and inclusions of gray fine SAND	22–24	5	Osterberg	2.05	▨	Top: gray fine SAND Bottom: not recorded
			24–26	6	Osterberg	1.86	▨	Top: gray CLAY Bottom: gray CLAY
		UPPER CLAY	26–28	7	Osterberg	1.90	▨	Top: gray fine SAND Bottom: gray CLAY
			28–30	8	Osterberg	1.85	▨	Top: gray fine SAND Bottom: gray fine SAND
			30–32	9	Osterberg	1.56	▨	Top: gray fine SAND Bottom: gray fine SAND
			32–33				▨	Top: gray fine SAND

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-13

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES No.	Type	Recov.	Locat.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud			33–34	10	Osterberg	1.72	▨	Bottom: gray CLAY
			34–35	11	Ost.	0	▨	Driller thinks sampler did not move.
		Change at approx. 35 ft	35–37	12	Osterberg	1.70	▨	Top: yellow fine SAND Bottom: yellow coarse to medium SAND
			38–40	13	Osterberg	1.86	▨	Top & Bottom: yellow coarse to medium SAND Upper portion of sample disturbed while pulling out piston
		Yellow coarse to fine SAND	41–43	14	Osterberg	1.80	▨	Top: yellow coarse to medium SAND Bottom. yellow fine SAND
		COHANSEY	43–45	15	Osterberg	1.85	▨	Top: yellow coarse to medium SAND Bottom: yellow fine SAND
			46–48	16	Osterberg	1.81	▨	Top & Bottom: yellow fine SAND
			49–50	17	Ost.	0	▨	No recovery. Exact length of push not known
			52–53	18	Oster	0.75	▨	Tube bent badly. Sample stored in jar. Exact length of push not known
		Limit of Exploration	55–56	19	SS	0.8	80 180/5"	Very dense gray fine SAND Split spoon blows / 6 in.

FIG. A-21

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-13 A

Oyster Creek Power Station; Radwaste Building	73C807 B
See Location Plan	+23 (approx.)
Engineering Drilling Company	10 Oct. 1974 | 10 Oct. 1974
Gardner - Denver Model 800	23.0 ft | Not encountered
4⅞-in. dia tri cone bit	NO. SAMPLES 0 | 3 | 0
CASING None – (drilling mud)	WATER LEVEL – | – | –
CASING HAMMER: None | WEIGHT – | DROP –	W. Grandberg
SAMPLER	
SAMPLER HAMMER: SS | WEIGHT 140 lb | DROP 30 in.	R. Kirby

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES		REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Wash shows coarse to fine SAND	0–17			Drilled to top of gray clay without taking any samples
		Approximate depth of change	17	1	Osterberg 2.00	Top: gray CLAY Bottom: gray fine SAND
		Gray CLAY with inclusion and lenses of gray fine sand UPPER CLAY	19	2	Osterberg 2.00	Top: gray CLAY Bottom: gray fine SAND
			21	3	Osterberg 1.88	Top: gray fine SAND Bottom: gray CLAY with inclusion of gray fine SAND
No casing – Drilled with mud		*Limit of Exploration* See boring 13 for samples at greater depth	23–32			

WOODWARD-MOORHOUSE & ASSOCIATES, INC.
CONSULTING ENGINEERS AND GEOLOGISTS
LOG OF BORING

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)

FIG. A-22

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 14

Oyster Creek Power Station; Radwaste Building		73C807 ft	
See Location Plan		+ 23 (approx.)	
Engineering Drilling Company		9 Oct. 1974	9 Oct. 1974
Gardner - Denver Model 600		47.8 ft	Not encountered
4 ⅝-in. dia tri cone bit		NO. SAMPLES 1	12 / 0
CASING None (drilling mud)		WATER LEVEL –	– / –
CASING HAMMER –	WEIGHT – / DROP –	V. Grandberg	
SAMPLER			
SAMPLER HAMMER SS	WEIGHT 140 lb / DROP 30 in.	R. Kirby	

No casing – Drilled with mud

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES No	Type	Recov	Local	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		Wash shows coarse to fine SAND	0–17.5					Drilled to top of gray clay without taking any samples
		Approximate depth of change	17.5	1	Osterberg	2.10	▨	Top: gray fine SAND, trace yellow silt Bottom: gray CLAY
			19.5	2	Osterberg	2.10	▨	Top: Gray fine SAND Bottom: Gray CLAY
		Gray CLAY with inclusions and lenses of fine SAND	21.5	3	Osterberg	2.08	▨	Top: gray CLAY Bottom: gray CLAY
			23.5	4	Osterberg	2.00	▨	Top: gray fine SAND Bottom: gray fine SAND
		UPPER CLAY	25.5	5	Osterberg	2.05	▨	Top: gray CLAY Bottom: gray CLAY and gray fine SAND
			27.5	6	Osterberg	1.95	▨	Top: gray CLAY Bottom: gray CLAY
			29.8	7	Osterberg	2.00	▨	Top: gray fine SAND Bottom: gray CLAY and gray fine SAND
			32	8	Osterb.	1.41	▨	Top: gray fine SAND

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 14

No casing – Drilled with mud

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES No	Type	Recov	Local	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
		Change at approximate depth 33.5 ft	33	8	Osterb.	1.41	▨	Bottom: yellow SAND
			35	9	Osterberg	1.65	▨	Yellow medium to fine SAND
			38	10	Osterberg	1.90	▨	Top: yellow coarse to medium SAND Bottom: yellow fine SAND
		Yellow coarse to fine SAND	41	11	Osterberg	0.8	▨	Yellow fine SAND (per sample) tube bent; extent of sample push not known ?
		COHANSEY	44.5	12	Osterberg	0	▨	Tube bent; exact extent of push not known ?
			46.5	13	SS	0.8	5 11 34	Split spoon sample Dense medium to fine SAND
		Limit of Exploration	48					

FIG. A-23

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-15

Oyster Creek Power Station, Radwaste Building	73C807 6
See Location Plan	+23
Engineering Drilling Company	7 Oct. 1974 / 7 Oct. 1974
Gardner - Denver Model 500 (Rotary rig)	48.7 ft / Not encountered
4 5/8-in. roller bit	NO. SAMPLES 4 / 13 / –
CASING None – Bentonite drilling fluid	WATER LEVEL – / – / –
CASING HAMMER: / WEIGHT None / DROP None	R. Bowen
SAMPLER	
SAMPLER HAMMER: SS / WEIGHT 140 lb / DROP 30 in.	R. C. Kirby

Casing blows: No casing – Drilled with mud

DEPTH SCALE	DESCRIPTION	No.	Type	Recov.	Blows /6 in.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
0–17	Wash indicates coarse to fine sand					Drilled to top of clay layer, no samples taken
17–19	Gray CLAY with inclusions and lenses of gray fine SAND UPPER CLAY	S-1	Osterberg	0.80		
19–21		S-2	Osterberg	0.72		Sample 2 A at same depth. Recovery = 1.17 ft
21.5–23.5		S-3	Osterberg	1.75		Sample 3 A at same depth Recovery = 0.78 ft
23.5–25.5		S-4	Osterberg	1.80		Started sample 5 at 25.3 ft in order to pick up soil loss from sample 4
25.5–27.5		S-5	Osterberg	2.00		
27.5–29.5		S-6	Osterberg	1.84		
29.5–31.5		S-7	Osterberg	1.90		
31.5–33		S-8	Osterberg	1.80		
33.5–36	Yellow-brown coarse to fine SAND COHANSEY	S-9	Osterberg	1.80		
36–38		S-10	Osterberg	2.00		
39–41		S-11	Osterberg	0.2		Sample not acceptable for testing. Stored in glass jar
42–43		S-12		0.0		Sampled length unknown, sample tube bent
43–44		S-13	F. Piston	1.0		Sampling force lifted drill rig
45–45.6		S-14	F. Pis	0.75		Sampling force lifted rig. Sample stored in jar
47.2–48.7		S-15	SS	0.8	10 8 20	Split spoon sample 2-in. o.d. spoon
48.7	Bottom of Boring					

FIG. A-24

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 18

Oyster Creek Power Station, Radwaste Building		73C007 B	
See Location Plan		+23 (approx.)	
Engineering Drilling Company		10 Oct. 1974	10 Oct. 1974
Gardner - Denver Model 500		37.0 ft	Not encountered
4 ¾-in. dia tri-cone bit		NO. SAMPLES 0	9 / 0
CASING None (drilling mud)		WATER LEVEL –	– / –
CASING HAMMER: –	WEIGHT –	DROP –	R. Benson
SAMPLER			
SAMPLER HAMMER SS	WEIGHT 140 lb	DROP 30 in	R. Kirby

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	Locat.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing - Drilled with mud		Wash indicates coarse to fine SAND	0–17					Drilled to top of gray clay layer without taking any samples
		Approximate depth of change	17					
		Gray CLAY with inclusions and lenses of fine sand UPPER CLAY	17–19	1	Osterberg	1.98	▨	Top: gray CLAY Bottom: gray CLAY
			19–21	2	Osterberg	2.05	▨	Top: gray CLAY Bottom: gray fine SAND and gray CLAY
			21–23	3	Osterberg	2.05	▨	Top: gray CLAY Bottom: gray CLAY
			23–25	4	Osterberg	2.05	▨	Top: gray CLAY Bottom: gray CLAY with inclusions of gray fine SAND
			25–27	5	Osterberg	2.00	▨	Top: gray CLAY Bottom: gray fine SAND
			27–29	6	Osterberg	2.02	▨	Top: gray CLAY Bottom: gray CLAY
			29–31	7	Osterberg	1.78	▨	Top: gray fine SAND Bottom: gray CLAY
			31–33	8	Osterberg	2.03	▨	Top: gray CLAY Bottom: yellow CLAY

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 18

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	Locat.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing - Drilled with mud			33–34					
		Approximate depth of change	34					
		Yellow-brown coarse to medium SAND COHANSEY	35–37	9	Osterberg	1.72	▨	Yellow-brown coarse to medium SAND
		Limit of Exploration	37					

FIG. A-25

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 17

Oyster Creek Power Station; Radwaste Building	73C807 B
See Location Plan	+ 23 (approx.)
Engineering Drilling Company	9 Oct. 1974 / 10 Oct. 1974
Gardner - Denver Model 800	35.8 / Not encountered
4 ¾ in. dia. tri-cone bit	NO. SAMPLES 1 / 8 / 0
CASING None (drilling mud)	WATER LEVEL – / – / –
CASING HAMMER – / WEIGHT – / DROP –	R. Bowen
SAMPLER	
SAMPLER HAMMER SS / WEIGHT 140 lb / DROP 30 in	R. Kirby

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Wash indicates coarse to fine SAND	0–17.6				Drilled to top of gray clay layer without taking any samples
		Approximate depth of change	17.6	1	Osterberg	1.96	Top: brown sandy SILT Bottom: gray fine SAND
		Gray CLAY with inclusions and lenses of fine sand		2	Osterberg	1.8	Top: gray CLAY Bottom: gray CLAY with inclusions of gray fine SAND
				3	Osterberg	2.0	Top: gray CLAY Bottom: gray CLAY
				4	Osterberg	2.0	Top: gray CLAY Bottom: gray CLAY with inclusions of gray fine SAND
No casing – Drilled with mud		UPPER CLAY		5	Osterberg	1.96	Top: gray fine SAND Bottom: gray CLAY with inclusions of gray fine SAND
				6	Osterberg	1.87	Top: gray CLAY Bottom: gray CLAY with inclusions of gray fine SAND
				7	Osterberg	2.12	Top: gray fine SAND Bottom: gray CLAY
				8	Osterberg	2.17	Top: gray CLAY

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 17

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	Locat.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Approximate depth of change	33				▨	Bottom: yellow SILT, some yellow fine SAND
		COHANSEY	33.8–35.8	9	Osterberg	0.48	▨	Tube bent Jar 9 - gray CLAY Jar 9 A - yellow coarse SAND
		Limit of Exploration	35.8					

FIG. A-26

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-18

Oyster Creek Power Station: Radwaste Building		73C807 B	
See Location Plan		+ 23 (approx.)	
Engineering Drilling Company		9 October 1974	9 October 1974
Gardner - Denver Model 500		63.5 ft	Not encountered
4-¾-in. o.d. tri-cone bit		NO. SAMPLES	1 / 14 / 0
CASING None (drilling mud)		WATER LEVEL	– / –
CASING HAMMER –	WEIGHT – / DROP –	R. Bowen	
SAMPLER		R. C. Kirby	
SAMPLER HAMMER SS	WEIGHT 140 lb / DROP 30 in.		

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	Local.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Wash shows coarse to fine SAND	0–17					Drilled to top of gray clay layer without taking any samples
		Approximate depth of change according to driller	18–20	1	Osterberg	2.00	▨	Top: yellow SILT Bottom: gray CLAY
			20–22	2	Osterberg	2.02	▨	Top: gray fine SAND Bottom: gray CLAY
		Gray CLAY with inclusions and lenses of gray fine sand	22–24	3	Osterberg	1.92	▨	Top: gray fine SAND Bottom: gray fine SAND
			24–26	4	Osterberg	1.90	▨	Top: gray fine SAND Bottom: gray fine SAND
No casing – Drilled with mud		**UPPER CLAY**	26–28	5	Osterberg	1.90	▨	
			28–30	6	Osterberg	1.90	▨	Top: gray CLAY Bottom: gray fine SAND
			30–32	7	Osterberg	2.15	▨	Top: gray fine SAND
			32–33				▨	Top: gray CLAY

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W-18

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	No.	Type	Recov.	Local.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud			33–34	8	Osterberg	1.90	▨	Bottom: yellow sandy SILT
		Approximate depth of change	35–37	9	Osterberg	1.4	▨	Top: yellow fine SAND Bottom: white coarse SAND
			38–40	10	Osterberg	less than 0.5	▨	Jar sample White coarse SAND
		Yellow coarse to fine SAND	41–43	11	Osterberg	1.80	▨	Top: yellow fine SAND Bottom: yellow fine SAND
			44–46	12	Osterberg	1.80	▨	Top: yellow fine SAND Bottom: yellow fine SAND
		COHANSEY	47–49	13	Osterberg	1.85	▨	Top: yellow fine SAND Bottom: yellow coarse to medium SAND
			50–51	14	Osterberg	0.8	▨	Jar sample Yellow medium to fine SAND
			52–53	15	SS	1.0	47 140 186	Very dense gray fine SAND 0.3 ft
No casing – Drilled with mud		Limit of Exploration	54					

FIG. A-27

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 19

Oyster Creek Power Station; Radwaste Building		73C807 B	
See Location Plan		+ 23 (approx.)	
Engineering Drilling Company		9 October 1974	10 October 1974
Gardner - Denver Model 800		52.8 ft	Not encountered
4 ⅞-in. o.d. tri-cone bit		NO. SAMPLES: 1 / 13 / 0	
CASING None (drilling mud)		WATER LEVEL: – / – / ..	
CASING HAMMER: –	WEIGHT – / DROP –	W. Grandberg	
SAMPLER		R. C. Kirby	
SAMPLER HAMMER: SS	WEIGHT 140 lb / DROP 30 in.		

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES			REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud		Wash shows coarse to fine SAND	0–17				Drilled to top of gray clay layer without taking any sample
		Approximate Depth of Change	17				
			17–19	1	Osterberg	2.06	Top: gray CLAY Bottom: gray CLAY
			19–21	2	Osterberg	2.00	Top: gray CLAY Bottom: gray CLAY
		Gray CLAY with inclusions and lenses of gray fine sand	21–23.5	3	Osterberg	2.00	Top: gray CLAY Bottom: gray fine SAND
			23.5–25.5	4	Osterberg	2.02	Top: gray fine SAND over gray CLAY Bottom: gray CLAY with inclusions of gray fine SAND
No casing – Drilled with mud		<u>UPPER CLAY</u>	25.5–28	5	Osterberg	1.98	Top: gray fine SAND Bottom: gray fine SAND
			28–30	6	Osterberg	1.98	Top: not indicated Bottom: gray CLAY
			30–32	7	Osterberg	2.07	Top: gray fine SAND Bottom: gray CLAY
			32–33				Top: gray fine SAND

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

CONSULTING ENGINEERS AND GEOLOGISTS

LOG OF BORING W - 19

CASING BLOWS	ELEV.	DESCRIPTION	DEPTH SCALE	SAMPLES No.	Type	Recov.	Locat.	REMARKS (DRILLING FLUID, DEPTH OF CASING, CASING BLOWS, FLUID LOSS, ETC.)
No casing – Drilled with mud			33–34	8	Osterberg	1.97		Bottom: gray CLAY
			34–36.5	9	Osterberg	1.97		Top: gray CLAY with inclusion of gray fine sand Bottom: gray fine SAND
		Estimated depth of change	37					
			37.5–39.5	10	Osterberg	0		Wash shows coarse sand
		Yellow coarse to fine SAND	41.5					
		<u>COHANSEY</u>	42.5–44.5	11	Osterberg	1.50		Top: coarse SAND Bottom: yellow fine SAND
			45.5–47.5	12	Osterberg	1.50		Top: yellow fine SAND Bottom: yellow fine SAND
			48.5–50.5	13	Osterberg	0		No recovery
			51.5–53	14	SS	0.8	26 44 88	Very dense, gray fine SAND
		Limit of Exploration	53					

FIG.A-28

1976
BORING LOGS
TW-1 to TW-3

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-1 **SHEET 1 OF** 2

PROJECT: OYSTER CREEK NGS	PROJECT NO.: 75C409	ELEVATION AND DATUM:	
LOCATION: LACEY TOWNSHIP, N.J.		SURVEYING AGENCY:	
DRILLING AGENCY: ENGINEERING DRILLING CO.		DATE STARTED: 6 JUL 76	DATE FINISHED: 6 JUL 76
DRILLING EQUIPMENT: MAYHEW 500		COMPLETION DEPTH:	ROCK DEPTH: NONE
SIZE AND TYPE OF BIT: 7 IN. TRICONE		NO SOIL SAMPLES: 5	DIST.: 5
		UNDIST: —	CORE: —
CASING: NONE		NO WATER SAMPLES: —	FIELD: —
		COMMERCIAL: —	—
CASING HAMMER: —	WEIGHT: — DROP: —	DRILLER: RANDY MULLEN	
SAMPLER: 24 x 2 IN. SPLIT SPOON			
SAMPLER HAMMER:	WEIGHT: 140 # DROP: 30 IN.	INSPECTOR: R. DORFLER	

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY μ mhos/cm	DEPTH. FT.	SAMPLE NO.	TYPE	RECOVERY	PENETR. RESIST. BL/6 in	REMARKS
				LOOSE, LT GRAY SILTY FINE SAND WITH TRACE SUBROUNDED FINE GRAVEL (SM)			1 2 3 4					NO DRILL MUD USED ONLY WATER
							5 6 7	1	SS	18"	4 3 3 7	
				DENSE TAN CLEAN, FINE TO COARSE SAND WITH FINE TO MED. SUBROUNDED GRAVEL (SW)			8 9					
							10 11 12	2	SS	12"	12 16 23 23	
							13					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-1

SHEET 2 OF 3

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY µ mhos/cm	DEPTH, FEET	SAMPLE No	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE PENETR. RESIST. BL/6 IN	REMARKS
				FIRM, TAN FINE SAND WITH THIN SILT LAMINATIONS EVERY 1/2 INCH (ORANGE COLOR)			13 14 15 16 17	3	SS	12"	8 11 15 20	
				FIRM, TAN CLEAN V. FINE SAND			18 19 20 21	4	SS	14"	7 6 7 2	
				FIRM, DARK GRAY CLAY (CH) WITH THIN (1/16 IN.) FINE SAND LAYERS EVERY 6 IN.			21.5 22 23 24	5	SS	20"	3 3 4 3	
				BORING TERMINATED INSTALLED 4 IN. I.D. PVC WITH 10 FT LONG SCREEN AT BOTTOM TO 21.0 FT.			25					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-2

SHEET 1 OF 2

PROJECT: OYSTER CREEK NGS		PROJECT NO: 75C409		ELEVATION AND DATUM:			
LOCATION: LACEY TOWNSHIP, N.J.				SURVEYING AGENCY:			
DRILLING AGENCY: ENGINEERING DRILLING CO.				DATE STARTED: 7 JUL 76		DATE FINISHED: 7 JUL 76	
DRILLING EQUIPMENT: MAYHEW 500				COMPLETION DEPTH: 23.0		ROCK DEPTH: —	
SIZE AND TYPE OF BIT: 7 IN. TRICONE				NO. SOIL SAMPLES: 1	DIST.: 1	UNDIST.: —	CORE: —
CASING: NONE				NO. WATER SAMPLES: —	FIELD: —	COMMERCIAL: —	—
CASING HAMMER: —	WEIGHT: —	DROP: —		DRILLER: RANDY MULLEN			
SAMPLER: 24 X 2 IN. SPLITSPOON				INSPECTOR: R. DOTTLER			
SAMPLER HAMMER:	WEIGHT: 140 #	DROP: 30 IN.					

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY µmhos/cm	DEPTH. FT.	SAMPLE NO	TYPE	RECOVERY	PENETR RESIST BL/6 IN	REMARKS
				SIMILAR TO LOG OF BORING TW-1 (ONLY 15.0 FT. AWAY)			1					NO DRILL MUD USED ONLY WATER
							2					
							3					
							4					
							5					
				SAND			6					
							7					
							8					
							9					
							10					
							11					
							12					
							13					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-2

SHEET 2 OF 2

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CON-DUC-TIVITY µmhos/cm	DEPTH, FEET	SAMPLE No.	SAMPLE Type	SAMPLE Recovery	SAMPLE Blows
							13				
							14				
							15				
							16				
				SAND			17				
							18				
							19				
							20				
				FIRM, DARK GRAY CLAY (CH) WITH THIN (1/4 IN) FINE SAND LAYERS			21 22	1	SS	20"	6 2 3 6
				BORING TERMINATED INSTALLED 4 IN. I.D. PVC WITH 10 FT LONG SCREEN AT BOTTOM TO 21.0 FT.			23				

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-3 **SHEET 1 OF** 2

PROJECT: OYSTER CREEK NGS		PROJECT NO.: 15C 409	ELEVATION AND DATUM:			
LOCATION: LACEY TOWNSHIP, N.J.			SURVEYING AGENCY:			
DRILLING AGENCY: ENGINEERING DRILLING CO.			DATE STARTED: 7 JUL 76		DATE FINISHED: 7 JUL 76	
DRILLING EQUIPMENT: MAYHEW 500			COMPLETION DEPTH: 23.5'		ROCK DEPTH: —	
SIZE AND TYPE OF BIT: 7 IN. TRICONE			NO. SOIL SAMPLES: 1	DIST.: 1	UNDIST.: —	CORE: —
CASING: NONE			NO. WATER SAMPLES: 1	FIELD:	COMMERCIAL:	
CASING HAMMER: —	WEIGHT: —	DROP: —	DRILLER: RANDY MULLEN			
SAMPLER: 24 X 2 IN. SPLIT SPOON			INSPECTOR: R. DOPALER			
SAMPLER HAMMER:	WEIGHT: 140 #	DROP: 30 IN.				

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY μ mhos/cm	DEPTH. FT.	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE PENETR. RESIST. BL/6 IN.	REMARKS
				SIMILAR TO LOG OF BORING TW-1 (ONLY 60 FT AWAY) SAND			1 2 3 4 5 6 7 8 9 10 11 12 13					NO DRILL MUD USED ONLY WATER

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-3

SHEET 2 OF 2

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY µmhos/cm	DEPTH, FEET	SAMPLE #	SAMPLE [illegible]	SAMPLE [illegible]	SAMPLE [illegible]	REMARKS
				SAND			13 14 15 16 17 18 19 20 21					
				STIFF, TAN FINE SANDY CLAY (CH) WITH SOME ROUNDED FINE GRAVEL			22	1	SS	20"	2 7 6 7	
				STIFF, DARK GRAY - CLAY (CH) WITH FINE SAND LAMINATIONS			22.5 23 23.5					
				BORING TERMINATED INSTALLED 4 IN. I.D. PVC WITH 10 FT LONG SCREEN AT BOTTOM TO 21.0 FT								

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-4 **SHEET 1 OF** 3

JOB OYSTER CREEK NGS	**PROJECT NO.** 75C409	**ELEVATION AND DATUM**	
LOCATION LACEY TOWNSHIP, N.J.		**SURVEYING AGENCY**	
DRILLING AGENCY ENGINEERING DRILLING CO.		**DATE STARTED** 7/[illegible] 76	**DATE FINISHED** 7/[illegible] 76
DRILLING EQUIPMENT MAYHEW 500		**COMPLETION DEPTH** 50.0'	**ROCK DEPTH** —
SIZE AND TYPE OF BIT 7 IN. TRICONE		**NO. SOIL SAMPLES** 2 **DIST.** —	**UNDIST.** — **CORE** —
CASING NONE		**NO. WATER SAMPLES** 1 **FIELD**	**COMMERCIAL**
CASING HAMMER —	**WEIGHT** — **DROP** —	**DRILLER** RANDY MULLEN	
SAMPLER 24 X 2 IN. SPLIT SPOON			
SAMPLER HAMMER	**WEIGHT** 140 # **DROP** 30 IN.	**INSPECTOR** R. DOARLA	

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY µ mhos/cm	DEPTH. FT.	SAMPLE NO.	TYPE	RECOV. FT.	PENETR. RESIST. BL/6 IN.	REMARKS
				SIMILAR TO LOG OF BORING TW-1 (23 FT. AWAY)			1					NO SAMPLE [illegible] [illegible] [illegible] WATER
							2					
							3					
				SAND			4					
							5					
							6					
							7					
							8					
							9					
							10					
							11					
							12					
							13					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-4

SHEET 2 OF 3

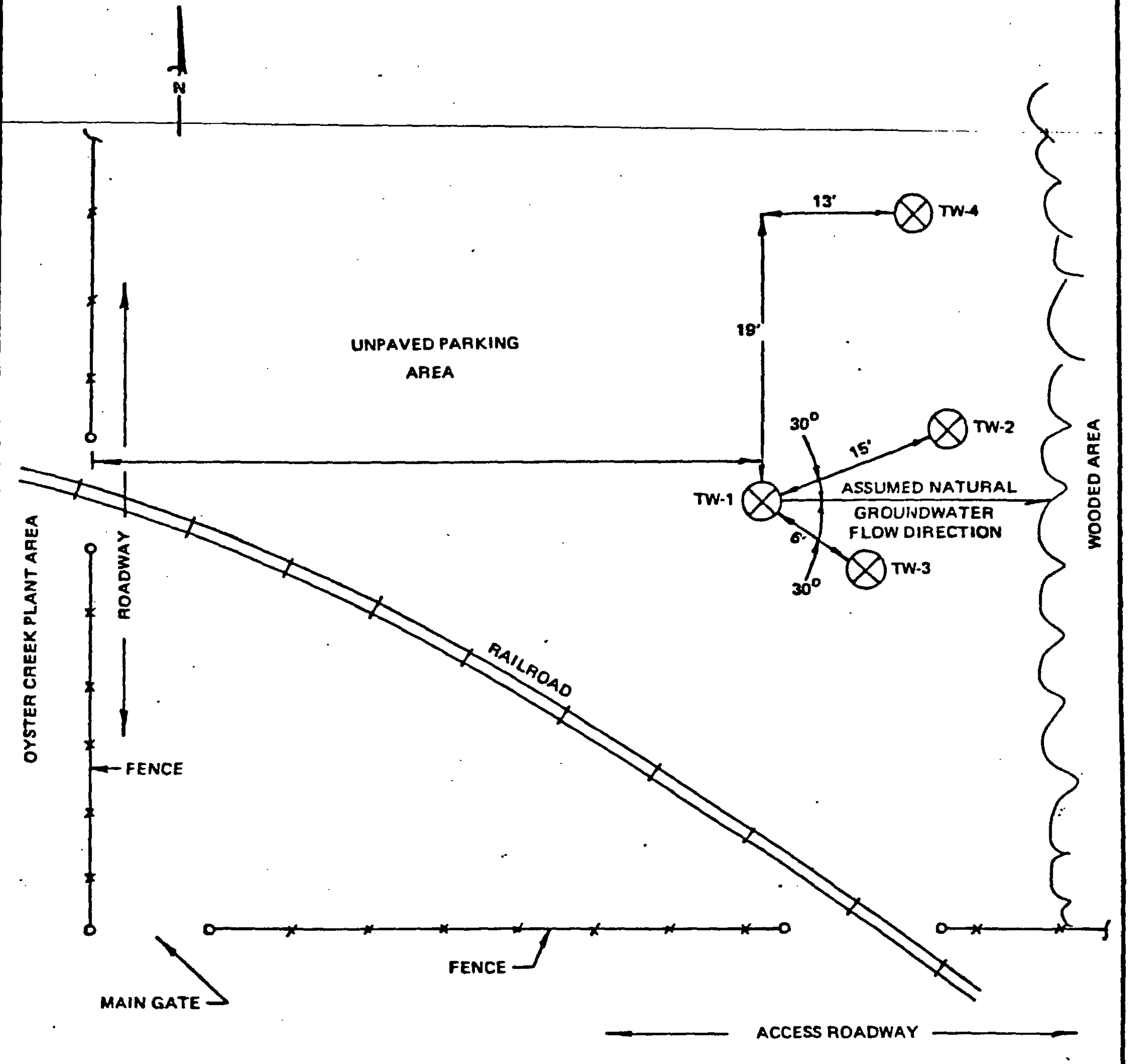
CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CON-DUC-TIVITY μ mhos/cm	DEPTH, FEET	SAMPLE NO.	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE PENETR. RESIST. BL/6IN	REMARKS
							13					
							14					
				SAND								
							15					
							16					
							17					
							18					
							19					
							20					
							21					
							21.5					
							22					
				DARK GRAY CLAY								
							23					
							24					
							25					
							26					
							27					
							28					
							29					
							30					
							31					
				SAND								
							32					

WOODWARD-MOORHOUSE & ASSOCIATES, INC.

LOG OF WELL TW-4

SHEET 3 OF 3

CASING BLOWS	ELEV. FT.	ROD	CASING	DESCRIPTION	pH	CONDUCTIVITY µ mhos/cm	DEPTH, FEET	SAMPLE #	SAMPLE TYPE	SAMPLE RECOVERY	SAMPLE PENETR. RESIST. BL/6 IN	REMARKS
				V. DENSE, GRAY V. FINE SAND (SP)			33 33.5 34 35 35.5 36	1	SS	5"	18 32 62 46	
				V. STIFF, DK. GRAY CLAY (CH) WITH FINE SAND LAMINATIONS			37	2	SS	18"	9 9 18 23	
				DENSE, TAN, SILTY FINE TO MED. SAND (SM) WITH BROWN CLAY LAYERS (1/2 IN. THICK)			38 39 40 41 42 43 44 45 46 47 48					INSTALLED 4 IN. I.D. PVC WITH 10 FT LONG SCREEN AT BOTTOM TO 49.0 FT
				COARSE SAND AND FINE GRAVEL			49					WASH ← SAMPLE
				BORING TERMINATED			50					



NOT TO SCALE

FIGURE A-1
SKETCH MAP OF TEST WELL AREA
OYSTER CREEK NUCLEAR POWER STATION
WCC JOB NO. 75C409A

1982
BORING LOGS
BE-1 to B-3
PE-1 to PE-8

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING BE1

SHEET 1 **OF** 3

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE	23.4	81C4136 A
J. E. FRITZ AND ASSOCIATES, INC. — C. PUENTE	2 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER	51 FT, 6 IN	--
HOLLOW STEM AUGER	10	-- / --
CASING	17.5 FT	-- / --
CASING HAMMER — WEIGHT — DROP	VERTICAL	
SAMPLER 2-INCH SPLIT SPOON		
SAMPLER HAMMER — WEIGHT 140 LB. — DROP 30 IN.	N. C. SCHREIER	

DESCRIPTION		DEPTH, FT					W_n,%	LL,%	PL,%	-200,%		REMARKS
		1										3" fine rounded gravel at ground surface
		2										
		3										Ground surface elevation determined by GPU surveyors
		4										
SP-SM: FILL, light brown, medium to fine SAND, trace silt		5	S1	1.75	3 5 4 6							
		6										
		7										
		8										
		9										
SP-SM: FILL, light brown fine SAND, some coarse to medium sand, trace silt		10	S2	1.5	7 9 13							
		11										
		12										
		13										
		14										
SP-SM: FILL, light brown, medium to fine SAND, occasional piece gravel		15	S3	1.5	18 22 43							
		16										
17 ft ∇		17										Water encountered at 17 ft 6 in.
CAPE MAY		18										
		19										
					7							

LOG OF BORING BE1 SHEET 2 OF 3

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
SP-SM: light brown fine SAND, at 21' CH: dark gray silty CLAY		21	S4	1.5	9 9							
21 ft		22 23 24										
SM, CH-OH: moist, dark gray, medium to fine SAND, and moist, dark gray-black, plastic-very plastic ORGANIC silty CLAY with frequent layers and partings of non-plastic silt and fine sand; alternating 3" layers		25	S5	1.2	8 11 16							
		26 27	S6	1	4 6 24							
		28 29										
UPPER CLAY		30 31 32 33 34										
SM, OH: dark gray fine SAND and moist, dark gray-black, plastic ORGANIC silty CLAY, frequent layers and partings of fine sand and non-plastic silt; alternating 3" layers		35	S7	1.3	5 10 11							
		36 37										
38 ft		38 39										
SP-SM: wet, red-brown, medium to fine SAND, trace silt		40	S8	1.5	2 9 13							
		41 42										
COHANSEY		43 44										
					20							

LOG OF BORING BE1

SHEET 3 OF 3

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLES									REMARKS
			[illegible]	[illegible]	[illegible]		Wn,%	LL,%	PL,%	-200,%		
SP-SM: wet, red-brown, medium SAND		46	S9	1.5	33 60							
		47										
		48										
		49										
SP-SM: tan, medium to fine SAND, trace coarse sand and silt		50 51	S10	1.75	5 7 14 21							
BORING TERMINATED AT 51 ft 6 in		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										
		61										
		62										
		63										
		64										
		65										
		66										
		67										
		68										
		69										

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING BE2 **SHEET** 1 **OF** 3

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE	23.5	81C4136A
J. E. FRITZ AND ASSOCIATES, INC. / C. PUENTE	1 MARCH 1982	2 MARCH 1982
TRUCK-MOUNTED AUGER	51 FT 6 IN	--
HOLLOW STEM AUGER	10	-- / --
CASING -	**WATER LEVEL** 19 FT	-- / --
CASING HAMMER / **WEIGHT** / **DROP**	VERTICAL	
SAMPLER 2-INCH SPLIT SPOON		
SAMPLER HAMMER / **WEIGHT** 140 LB. / **DROP** 30 IN.	N. C. SCHREIER	

DESCRIPTION		DEPTH, FT					W_n,%	LL,%	PL,%	-200,%		REMARKS
		1 2 3 4										Auger to 4 ft 6 in Ground surface elevation determined by GPU surveyors
-SM: FILL, light brown, medium to fine SAND, trace gravel		5 6	S1	1.5	6 7 7							
		7 8 9										
SP-SM: FILL, light brown, medium to fine SAND, trace SILT		10 11	S2	1.2	4 6 7							
		12 13 14										
SP-SM: FILL, light brown, medium to fine SAND, trace SILT		15 16	S3	1.5	7 8 7							
		17 18										
Approx. ▽		19			2							Water encountered at 19 ft

LOG OF BORING BE2 **SHEET** 2 **OF** 3

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
SP-SM: FILL, brown-gray fine SAND, some coarse to medium sand, trace silt and fine gravel		21	S4	1.5	3 4							
		22 23 24										
SP-SM: FILL, moist, tan, medium to fine SAND, one 3" layer black fine SAND, trace silt		25	S5	1.5	17 37 52							
		26 27 28 29										
SP-SM: FILL, moist, tan, medium to fine SAND, trace silt		30	S6	1	5 12 24							
		31 32 33 34										
SP-SM: FILL, moist, tan, coarse to fine SAND, trace silt		35	S7	1.3	21 50 51							
		36 37										
38 ft		38 39										
SP: moist, tan, medium SAND, some fine sand, trace coarse sand and silt		40	S8	1.5	7 9 14							
		41 42 43 44										
					7							

LOG OF BORING BE2

SHEET 3 OF 3

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
SP-SM: wet, red, medium to fine SAND, trace silt		46	S9	1.5	9 10							
COHANSEY		47										
		48										
		49										
SP: wet, red, medium to coarse SAND		50	S10	1.5	13 7 6 6							
		51										
BORING TERMINATED AT 51 ft 6 in		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										
		61										
		62										
		63										
		64										
		65										
		66										
		67										
		68										
		69										

LOG OF BORING BE3

SHEET 1 OF 3

STER CREEK NUCLEAR PLANT, Extension Site		23.2	81C4136
J. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	2 MARCH 1982	2 MARCH 1982
TRUCK-MOUNTED AUGER		51 FT 6 IN	--
HOLLOW STEM AUGER		10	-- --
CASING -		17 FT	-- --
CASING HAMMER	WEIGHT	DROP	VERTICAL
SAMPLER 2-INCH SPLIT SPOON			
SAMPLER HAMMER	WEIGHT 140 LB.	DROP 30 IN.	N. C. SCHREIER

DESCRIPTION		DEPTH, FT					W_n,%	LL,%	PL,%	-200,%		REMARKS
		1										
		2										Ground surface elevation determined by GPU surveyors
		3										
		4										
-SM: FILL, tan, medium to fine SAND, trace silt		5	S1	1	2 2 2							
		6										
		7										
		8										
		9										
SP-SM: FILL, tan, medium to fine SAND, trace fine gravel and silt		10	S2	0.75	50 67							Pieces of fine blue gravel in sample - auger through obstruction
		11										
		12										
		13										
		14										
SP-SM: FILL, tan, medium to fine SAND, trace fine gravel to coarse sand, silt		15	S3	1.5	9 10 10							
		16										
▽ ≈		17										Water encountered at 17 ft
		18										
		19										
					1							

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING BE3 SHEET 2 OF 3

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
SP-SM: Fill, layered, red and white medium to fine SAND, trace silt		21 22	S4	1.5	1 1							
23 ft		23										
CAPE MAY		24										
SP-SM: wet, tan, fine SAND, one 3" layer CH: gray CLAY		25	S5	1.5	9 12 15							
26 ft		26 27 28 29										
P-SM,CL-OL: dark gray medium to fine SAND, some silt; and dark gray to black ORGANIC plastic CLAY with frequent partings of fine SAND - alternating 3" layers		30 31 32 33	S6	1	5 4 6							
UPPER CLAY		34										
SP-SM,CH-OH: dark gray, medium to fine SAND, trace silt; and moist, dark gray-black ORGANIC silty CLAY with seams and layers of fine SAND, alternating 3" layers		35 36 37	S7	1.5	4 4 5							
38 ft		38 39										
SP-SM: wet, yellow, medium to coarse SAND		40 41	S8	1.3	5 23 27							
COHANSEY		42 43 44			10							

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING BE3 **SHEET** 3 **OF** 3

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
		46	S9	no rec	17 20							
		47										
		48										
		49										
SP-SM: wet, tan, medium to fine SAND, trace SILT and coarse sand		50	S10	2	4 5 7 13							
		51										
BORING TERMINATED AT 51 ft 6 in		52										
		53										
		54										
		55										
		56										
		57										
		58										
		59										
		60										
		61										
		62										
		63										
		64										
		65										
		66										
		67										
		68										
		69										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE1

SHEET 1 OF 1

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE		23.5 ft±(1)	81C4136A
J. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER		14 FT 8 IN	
CASING			
CASING HAMMER	WEIGHT	DROP	
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT		VERTICAL	
SAMPLER HAMMER	WEIGHT 140 LB.	DROP 30 IN.	N. C. SCHREIER

DESCRIPTION	DEPTH, FT		W_n,%	LL,%	PL,%	-200,%	REMARKS
FILL		15					Penetration resistance is in blows per foot. (1)Ground surface elevation estimated based on elevations of nearby borings Strata boundaries are approximate and are based on results of nearby borings.
	1	24					
	2	31					
	3	36					
	4	29					
	5	19					
	6	19					
	7	23					
	8	23					
	9	29					
	10	33					
	11	27					
	12	26					
	13	50/8 in					
Probe Terminated at 13 ft 8 in	14						
	15						
	16						
	17						
	18						
	19						

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE2

SHEET 1 OF 1

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE		23.5 ft± (1)	81C4136A
J. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER		15 FT	
CASING			
CASING HAMMER	WEIGHT	DROP	VERTICAL
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT			
SAMPLER HAMMER	WEIGHT 140 LB.	DROP 30 IN.	N. C. SCHREIER

DESCRIPTION	DEPTH, FT		Wn,%	LL,%	PL,%	-200,%	REMARKS
		8					Penetration resistance is in blows per foot.
	1						
		16					
	2						
		21					
	3						
		24					
	4						
		33					(1) Ground surface elevation estimated based on elevations of nearby borings
	5						
		25					
FILL	6						
		17					
	7						
		12					Strata boundaries are approximate and are based on results of nearby borings.
	8						
		15					
	9						
		15					
	10						
		15					
	11						
		23					
	12						
		29					
	13						
		55					
	14						
		63					
Probe Terminated at 15 ft	15						
	16						
	17						
	18						
	19						

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE3 SHEET 1 OF 1

PROJECT AND LOCATION OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE		ELEVATION AND DATUM 23.5 ft±(1)	PROJECT NO. 81C4136A
DRILLING AGENCY J. E. FRITZ AND ASSOCIATES, INC.	FOREMAN C. PUENTE	DATE STARTED 2 MARCH 1982	DATE FINISHED 2 MARCH 1982
DRILLING EQUIPMENT TRUCK-MOUNTED AUGER		COMPLETION DEPTH 9 FT 11 IN	ROCK DEPTH
SIZE AND TYPE OF BIT	SIZE AND TYPE CORE BARREL	NO. SAMPLES	DIST. / UNDIST. / CORE
CASING		WATER LEVEL	FIRST / COMPL. / 24 HR.
CASING HAMMER / WEIGHT / DROP		BORING ANGLE AND DIRECTION VERTICAL	
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT			
SAMPLER HAMMER / WEIGHT 140 LB. / DROP 30 IN.		INSPECTOR N. C. SCHREIER	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	RECOV. FT	PENETR. RESIST.		W_n,%	LL,%	PL,%	-200,%		REMARKS
					6							Penetration resistance is in blows per foot.
		1										
					5							
		2										
					6							
		3										
					5							
		4										(1) Ground surface elevation estimated based on elevations of nearby borings
					6							
FILL		5										
					3							
		6										
					3							
		7										Strata boundaries are approximate and are based on results of nearby borings.
					7							
		8										
					21							
		9										
					100/11 in							
Probe Terminated at 9 ft 11 in		10										
		11										
		12										
		13										
		14										
		15										
		16										
		17										
		18										
		19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE4

SHEET 1 OF 1

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE	23.5± (1)	81C4136 A
J. E. FRITZ AND ASSOCIATES, INC. / C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER	13 FT	
CASING		
CASING HAMMER / WEIGHT / DROP	VERTICAL	
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT		
SAMPLER HAMMER / WEIGHT 140 LB. / DROP 30 IN.	N. C. SCHREIER	

DESCRIPTION	DEPTH, FT			[illegible]	Wn,%	LL,%	PL,%	-200,%	REMARKS
				12					Penetration resistance is in blows per foot.
	1			17					
	2			14					(1) Ground surface elevation estimated based on elevations of nearby borings
	3			13					
	4			14					
	5			14					
FILL	6			12					Strata boundaries are approximate and are based on results of nearby borings.
	7			9					
	8			7					
	9			6					
	10			8					
	11			31					
	12			70					
PROBE TERMINATED AT 13 ft	13								
	14								
	15								
	16								
	17								
	18								
	19								

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE5

SHEET 1 OF 1

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE		23.5± (1)	81C4136A
J. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER		8 FT	
CASING			
CASING HAMMER	WEIGHT	DROP	VERTICAL
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT			
SAMPLER HAMMER	WEIGHT 140 LB.	DROP 30 IN.	N. C. SCHREIER

DESCRIPTION	DEPTH, FT		W_n,%	LL,%	PL,%	-200,%	REMARKS
FILL		9					Penetration resistance is in blows per foot. (1) Ground surface elevation estimated based on elevations of nearby borings Strata boundaries are approximate and are based on results of nearby borings.
	1						
		8					
	2						
		16					
	3						
		9					
	4						
		6					
	5						
		14					
	6						
		31					
	7						
		91					
PROBE TERMINATED AT 8 ft	8						
	9						
	10						
	11						
	12						
	13						
	14						
	15						
	16						
	17						
	18						
	19						

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE6

SHEET 1 OF 1

OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE		23.5+ (1)	81C4136 A
J. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER		14 FT	

ASING

ASING HAMMER | WEIGHT | DROP

AMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT

SAMPLER HAMMER | WEIGHT 140 LB. | DROP 30 IN.

VERTICAL

N. C. SCHREIER

DESCRIPTION	DEPTH, FT		W_n,%	LL,%	PL,%	-200,%	REMARKS
		10					Penetration resistance is in blows per foot.
	1						
		12					
	2						
		9					
	3						
		5					
	4						(1) Ground surface elevation estimated based on elevations of nearby borings
		7					
	5						
		7					
	6						
FILL		8					
	7						Strata boundaries are approximate and are based on results of nearby borings.
		7					
	8						
		7					
	9						
		8					
	10						
		9					
	11						
		10					
	12						
		26					
	13						
		75					
PROBE TERMINATED AT 14 ft	14						
	15						
	16						
	17						
	18						
	19						

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE7

SHEET 1 OF 1

PROJECT AND LOCATION OYSTER CREEK NUCLEAR PLANT, EXTENSION SITE	ELEVATION AND DATUM 23.5± (1)	PROJECT NO. 81C4136 A
DRILLING AGENCY J. E. FRITZ AND ASSOCIATES, INC. — FOREMAN C. PUENTE	DATE STARTED 3 MARCH 1982	DATE FINISHED 3 MARCH 1982
DRILLING EQUIPMENT TRUCK-MOUNTED AUGER	COMPLETION DEPTH 6 FT 8 IN	ROCK DEPTH
SIZE AND TYPE OF BIT — SIZE AND TYPE CORE BARREL	NO. SAMPLES — DIST.	UNDIST. — CORE
CASING	WATER LEVEL — FIRST	COMPL. — 24 HR.
CASING HAMMER — WEIGHT — DROP	BORING ANGLE AND DIRECTION VERTICAL	
SAMPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT	INSPECTOR N. C. SCHREIER	
SAMPLER HAMMER — WEIGHT 140 LB. — DROP 30 IN.		

DESCRIPTION	RECOVERY	DEPTH, FT	SAMPLES TYPE NO. LOG	RECOV., FT	PENETR. RESIST.		W_n,%	LL,%	PL,%	-200,%		REMARKS
FILL		0–1			12							Penetration resistance is in blows per foot.
		1–2			27							
		2–3			33							
		3–4			42							
		4–5			44							
		5–6			49							
		6–6 ft 8 in			50/8 in							
PROBE TERMINATED AT 6 ft 8 in		7										(1) Ground surface elevation estimated based on elevations of nearby borings Strata boundaries are approximate and are based on results of nearby borings.
		8										
		9										
		10										
		11										
		12										
		13										
		14										
		15										
		16										
		17										
		18										
		19										

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF PROBE PE8

SHEET 1 OF 1

YSTER CREEK NUCLEAR PLANT, EXTENSION SITE		23.5± (1)	81C4136 A
I. E. FRITZ AND ASSOCIATES, INC.	C. PUENTE	3 MARCH 1982	3 MARCH 1982
TRUCK-MOUNTED AUGER		16 FT	
SING			
SING HAMMER	WEIGHT	DROP	VERTICAL
MPLER 1.63-INCH DIA. "A" ROD WITH CONICAL POINT			
MPLER HAMMER	WEIGHT 140 LB.	DROP 30 IN.	N. C. SCHREIER

DESCRIPTION		DEPTH, FT					W_n,%	LL,%	PL,%	-200,%		REMARKS
		1										Penetration resistance is in blows per foot.
		2										
		3										Auger to 3 ft
					14							
		4										
					10							(1) Ground surface elevation estimated based on elevations of nearby borings
		5										
					6							
		6										
FILL					6							
		7										
					7							Strata boundaries are approximate and are based on results of nearby borings.
		8										
					7							
		9										
					7							
		10										
					7							
		11										
					8							
		12										
					15							
		13										
					38							
		14										
					55							
		15										
					94							
		16										
PROBE TERMINATED AT 16 ft												
		17										
		18										
		19										

1983
BORING LOGS
or
WELL INSTALLATION LOGS
W-1 to W-17

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-1 SHEET 1 OF 2

PROJECT AND LOCATION: GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO. 8204623
DRILLING AGENCY: Empire Soils Investigations	FOREMAN: Greg Miller	DATE STARTED: 12/8/83	DATE FINISHED: 12/8/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 52 ft.	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4 3/4" Drag	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST. 10 UNDIST. 0	CORE —
CASING —		WATER LEVEL: FIRST COMPL.	24 HR. 19'6.5"
CASING HAMMER —	WEIGHT —	DROP —	BORING ANGLE AND DIRECTION: vertical
SAMPLER 2" - 24" split spoon			INSPECTOR: M. Akerbergs
SAMPLER HAMMER	WEIGHT 140	DROP 30"	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	RECOV. FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
Dark brown m.&f. SAND; tr. silt FILL												
dark brown m.&f. SAND; rock fragments FILL, damp		5	S-1	1.0	5 8 8							
light brown m.&f. SAND, some silt, damp		10	S-2	1.0	10 17 20							
light brown f. SAND; loose, wet		15	S-3	0.9	8 15 15							
dark gray silty CLAY; interbeds of dark gray f. sand and clayey silt		20	S-4	0.4	6 6 10							
dark gray v.f. silty SAND interbeds of dark gray clayey SILT		25	S-5	0.4	2 2 2							
		30	S-6	0.5	[illegible]							
light brown c.&m. SAND; some gravel		35	S-7	0.2	[illegible]							

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-1

SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]	[illegible]	%	[illegible]	[illegible]	[illegible]	[illegible]	REMARKS
gray c. SAND; some gravel		[illegible]	S-8	1.5	[illegible] [illegible] 20							
light brown m. to f. SAND; medium dense		[illegible]	S-9		[illegible]							
light brown f. SAND		50	S-[illegible]		[illegible]							
END of BORING												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-2

SHEET 1 OF 2

PROJECT AND LOCATION: GPU Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623	
DRILLING AGENCY: Empire Soils Investigations, Inc.	FOREMAN: Greg Miller	DATE STARTED: 11/7/83	DATE FINISHED: 11/8/83	
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 57 ft	ROCK DEPTH: —	
SIZE AND TYPE OF BIT: 4¾" Drag	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES	DIST. 11	UNDIST. 1 · CORE —
CASING —		WATER LEVEL	FIRST	COMPL. · 24 HR. 19'6¾"
CASING HAMMER —	WEIGHT — · DROP —	BORING ANGLE AND DIRECTION: vertical		
SAMPLER 24"-2" split spoon		INSPECTOR: M. Akerbergs		
SAMPLER HAMMER	WEIGHT 140 lb · DROP 30"			

DESCRIPTION	PIEZOMETER	DEPTH, FT	TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
m. & f. SAND; some gravel, fill, [illegible]		0	S-1	1.2	5 6 9 11							
light brown f SAND; interbeds of light gray f. SAND 2-3" thick, Fill		5	S-2	1.6	4 6 5 17							
- - - - - - - - - -												
tan & light brown F. SAND		10	S-3	1.5	[illegible]							
brown to light brown F. SAND		15	S-4	[illegible]	[illegible] 20 32							[illegible] wet
dark gray firm CLAY; [illegible] silty SAND		20	S-5	1.4	3 [illegible]							
		26	U-1									[illegible] sample
- - - - - - - - - -		28										
gray to brown f. silty SAND			S-6	1.9	[illegible]							
dark gray f silty SAND		35										
dark gray silty CLAY			S-7	2.0	[illegible]							
light brown [illegible] f. silty SAND, some gravel		38	S-8	1.0	8 9 7 [illegible]							

LOG OF BORING W-2

SHEET 2 OF 2

DESCRIPTION	DEPTH, FT	SAMPLES			[illegible]	ROCK CORE					REMARKS
		[illegible]	RECOV, FT	[illegible]		RECOV %	CRACK		[illegible]	[illegible]	
light brown c. to f. SAND some gravel	50	S-9	0.8	15 [illegible] 20							
brown m. to f. SAND, some gravel	48	S-10	0.7	15 15 20 23							
brown to light brn f. SAND	55	S-11	1.8	4 42 100/5"							
END OF BORING											

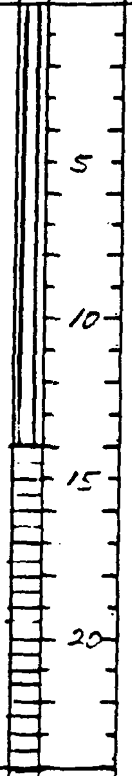
WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-3 **SHEET** 1 **OF** 1

PROJECT AND LOCATION GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 82C4623
DRILLING AGENCY Empire Soils Investigations, Inc.	FOREMAN Greg Miller	DATE STARTED 11/15/83	DATE FINISHED 11/15/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 24 ft	ROCK DEPTH ——
SIZE AND TYPE OF BIT 6" ID hollow stem augers	SIZE AND TYPE CORE BARREL ——	NO. SAMPLES: DIST. 0	UNDIST. 0 CORE ——
CASING		WATER LEVEL: FIRST	COMPL. 24 HR. 16'9"
CASING HAMMER —— WEIGHT ——	DROP ——	BORING ANGLE AND DIRECTION vertical	
SAMPLER 2"-24" split spoon			
SAMPLER HAMMER WEIGHT 140 lbs	DROP 30"	INSPECTOR M. Akerbergs	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE, NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
see log for W-4												
END of BORING												



WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-4 SHEET 1 OF 2

PROJECT AND LOCATION GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 8224623
DRILLING AGENCY Empire Soils Investigations Inc.	FOREMAN Greg Miller	DATE STARTED 11/10/83	DATE FINISHED 11/11/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 55 Ft	ROCK DEPTH —
SIZE AND TYPE OF BIT 4 3/4" Drag	SIZE AND TYPE CORE BARREL —	NO. SAMPLES DIST 10	UNDIST 0 CORE —
CASING —		WATER LEVEL FIRST	COMPL. 24 HR. 17.5"
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION vertical	
SAMPLER 24" - 2" split spoon		INSPECTOR M. Akubergs	
SAMPLER HAMMER WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV, FT	PENETR RESIST BL/6IN.		W_n,%	LL,%	PL,%	-200,%	REMARKS
surface - macadam											
light to dark brown f. SAND: fill		5	S-1	2.0	3 4 4 3						
light brown f SAND, tr. roots organic material fill		10	S-2	2.0	5 [illegible] 33						
		15	S-3	1.7	18 27 17						
dark gray stiff silty CLAY, interbeds of f. sand		20	S-4	1.8	[illegible] 10						
dark gray f silty SAND; some gravel		25	S-5	1.3	5 5 7 10						
dark gray f sand SILT some clay & sand interbeds		30	S-6	1.0	5 5 [illegible]						
		35	S-7	0.7	7 5 7 6						
light brown to red c to m. SAND, tr. silt											≈1 [illegible] at [illegible]

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-4

SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO.	SAMPLES RECOV. FT	SAMPLES PENETR. RESIST. BL/6 IN.	POCKET PENETROMETER	ROCK CORE RECOVERY %	ROCK CORE CRACK	ROCK CORE CRACK	ROCK CORE RQD	ROCK CORE CORE TIME	REMARKS
brown c. to m. SAND, some grav.		40	S-8	1.0	[illegible]							
		45	S-9	1.2	[illegible]							
light tan m. to f. SAND, tr. silt		53	S-10	.5	[illegible]							
END of BORING												

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-5 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations	FOREMAN: Greg Miller	DATE STARTED: 11/10/83	DATE FINISHED: 11/10/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 20.5 Ft	ROCK DEPTH: ——
SIZE AND TYPE OF BIT: 7 3/4" Drag	SIZE AND TYPE CORE BARREL: ——	NO. SAMPLES: DIST 0	UNDIST 0 · CORE ——
CASING ——		WATER LEVEL: FIRST	COMPL. · 24 HR. 13'9½"
CASING HAMMER	WEIGHT ——	DROP ——	BORING ANGLE AND DIRECTION: vertical
SAMPLER 24"-2" split spoon			
SAMPLER HAMMER	WEIGHT 140 lbs	DROP 30"	INSPECTOR: M. Akerbergs

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
see log for W-6												
		5										
		10										
		15										
		20										
END of BORING												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-6 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: GPU, Oyster Creek · Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations Inc.	FOREMAN: Greg Miller	DATE STARTED: 11/9/83	DATE FINISHED: 11/10/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 55 Ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT:	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST 10	UNDIST 1 · CORE —
CASING —		WATER LEVEL: FIRST	COMPL. · 24 HR. 20½"
CASING HAMMER · WEIGHT —	DROP —	BORING ANGLE AND DIRECTION: vertical	
SAMPLER 24"-2" Split Spoon		INSPECTOR: M. Akerbergs	
SAMPLER HAMMER · WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BLOWS		W_n,%	LL,%	PL,%	-200,%		REMARKS
light brown c. to f. SAND some gravel f.			S-1		5 12 [illegible]							
brown to light brown f. SAND, tr. silt fill		5	S-2		[illegible]							
brown f. SAND, some gravel, dense		10	S-3		[illegible]							
light brown f. SAND [illegible]		15	S-4	1.6	17 32 [illegible]							
dark gray silty CLAY, firm		20	S5	2.0	[illegible] 8							
dark gray f. silty SAND		25	S-6	2.0	15 [illegible] 20							
		30	U-1									[illegible]
light tan to light brown c. to f. SAND, some gravel, tr. silt		35	S-7	0.8	[illegible] 21							

LOG OF BORING W-6 **SHEET** 2 **OF** 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOG	RECOV., FT	PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE RECOV. %	CRACK		RQD	CORE TIME	REMARKS
light brown f. to m. SAND, some gravel		40	S-8	2.0	[illegible]							
light brown f. SAND, [illegible]		[illegible]	S-9		[illegible]							
light br. f. silty SAND, [illegible]		50	S-10		[illegible]							

END of boring

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-7 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations	FOREMAN: Grey Miller	DATE STARTED: 11/16/83	DATE FINISHED: 11/16/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 22 Ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4 3/4" Drag	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST. 5	UNDIST. 0 CORE —
CASING —		WATER LEVEL: FIRST	COMPL. 24 HR. 13'6"
CASING HAMMER —	WEIGHT — DROP —	BORING ANGLE AND DIRECTION: vertical	
SAMPLER 24"-2" split spoon		INSPECTOR: M. Akerbergs	
SAMPLER HAMMER	WEIGHT 140 lbs DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOG	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
brown m-f SAND, some [illegible] Fill		0	S-1	1.3	[illegible]							
tan to lt. brown f SAND, some [illegible]		5	S-2	0.9	4 4 6 6							
[illegible] lt. brown f. SAND, loose, dry. Fill		10	S-3	1.0	7 15 18 18							
[illegible] brown f. SAND, loose, wet		15	S-4	1.2	9 [illegible]							
dark gray silty CLAY, [illegible] & gray f. SAND		20	S-5	0.9	[illegible]							
END of BORING												

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-8 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: GPU, Oyster Creek, Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations Inc.	FOREMAN: Greg Miller	DATE STARTED: 11/8/83	DATE FINISHED: 11/8/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 37 ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4¼" Drag	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST. 7	UNDIST. 0 CORE —
CASING —		WATER LEVEL: FIRST	COMPL. 24 HR. 17'11½"
CASING HAMMER	WEIGHT — DROP —	BORING ANGLE AND DIRECTION: vertical	
SAMPLER 24"-2" split spoon		INSPECTOR: M. Akerbergs	
SAMPLER HAMMER	WEIGHT 140 lbs DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
brown f SAND, some gravel, fill		0	S-1	.8	4 10 10							[illegible]
		5	S-2	.2	[illegible]							
light brown m-f SAND, fill		10	S-3	.9	12 [illegible] 15							
		15	S-4	1.0	5 5 13 13							
light brown m-f SAND, wet, fill		20	S-5	1.6	[illegible]							[illegible]
		25	S-6	.	[illegible]							[illegible]
light brown m-f SAND, tr. silt, fill		35	S-7	.								[illegible]
END of Boring												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-9 SHEET 1 OF 1

PROJECT AND LOCATION GPU Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 82C4623
DRILLING AGENCY Empire Soils Investigations Inc.	FOREMAN Greg Miller	DATE STARTED 11/1/83	DATE FINISHED 11/1/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 20 ft.	ROCK DEPTH ———
SIZE AND TYPE OF BIT 4 3/4" Drag	SIZE AND TYPE CORE BARREL ———	NO. SAMPLES DIST 0	UNDIST 0 CORE ———
CASING ———		WATER LEVEL FIRST	COMPL. 24 HR. 14'11"
CASING HAMMER WEIGHT ———	DROP ———	BORING ANGLE AND DIRECTION vertical	
SAMPLER 24" - 2" split spoon		INSPECTOR M. Akiskurgs	
SAMPLER HAMMER WEIGHT 140 lb	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
see log for W-10												
		5										
		10										
		15										
		20										
END of BORING												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-10

SHEET 1 OF 2

PROJECT AND LOCATION: GPU, Oyster Creek-Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO. 8204623
DRILLING AGENCY: Empire Soils Investigations Inc.	FOREMAN: Greg Miller	DATE STARTED: 10/31/83	DATE FINISHED: 11/1/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 60 Ft	ROCK DEPTH: ———
SIZE AND TYPE OF BIT: 4¾" Drag	SIZE AND TYPE CORE BARREL: ———	NO. SAMPLES: DIST. 12	UNDIST. 0 CORE ———
CASING ———		WATER LEVEL: FIRST	COMPL. 24 HR. 17.1'
CASING HAMMER ———	WEIGHT ———	DROP ———	BORING ANGLE AND DIRECTION: Vertical
SAMPLER: 24"-2" split spoon			
SAMPLER HAMMER	WEIGHT: 140 lbs	DROP: 30"	INSPECTOR: M. Akrichays

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR. RESIST BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
brown m. to f. SAND, fill pebbles		0	S-1	.5	2 1 1 1							hit metal at 4.5 ft. Abandon hole, move over 4 ft.
brown m. to f. SAND, fill, damp		5	S-2	.6	3 7 10 11							
tan f. SAND, some gravel		10	S-3	1.2	4 7 8 7							
light tan f. SAND, tr. silt, some gravel		15	S-4	1.2	8 6 19 20							sample wet
reddish-brown silty CLAY, wet		20	S-5	1.5	1 2 3 4							
dark gray CLAY, stiff												
dark gray stiff CLAY; gray f. sand interbeds		25	S-6	1.5	7 8 10 13							
dark gray stiff CLAY; gray f. sand interbeds		30	S-7	1.8	5 5 5 8							
dark gray silty SAND, some clay		35	S-8	1.6	6 9 13 12							

LOG OF BORING W-10　SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLES			[illegible]	ROCK CORE					REMARKS
			[illegible]	[illegible]	[illegible]		[illegible] %	CRACK		[illegible]	[illegible] FT	
dark gray silty SAND, some clay			S-9	1.3	6 9 15 12							
tan to brown m to f SAND												
tan to brown m to f SAND		45	S-10	1.4	9 14 15 15							
		50	S-11	0	3 2 4 10							
light tan c. to m. SAND, some gravel		55	S-12	1.1	12 32 100/.2"							
F. silty SAND												
END of Boring		60										

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-12 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations Inc.	FOREMAN: Greg Miller	DATE STARTED: 12/7/83	DATE FINISHED: 12/7/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 20 ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4 3/4" Auger	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST. 0	UNDIST. 0 CORE —
CASING —		WATER LEVEL: FIRST	COMPL. 24 HR. 14'8"
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION: vertical	
SAMPLER 24"-2" split spoon		INSPECTOR: M. Akerbergs	
SAMPLER HAMMER WEIGHT 170 lb	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
see log for W-13												
		5										
		10										
		15										
END of Boring		20										

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-13 SHEET 1 OF 2

PROJECT AND LOCATION GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 8204623
DRILLING AGENCY Empire Soils Investigations Inc.	FOREMAN Greg Miller	DATE STARTED 12/2/83	DATE FINISHED 12/6/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 52 ft	ROCK DEPTH —
SIZE AND TYPE OF BIT 4 3/4" Drag	SIZE AND TYPE CORE BARREL —	NO. SAMPLES DIST 10	UNDIST 0 CORE —
CASING		WATER LEVEL FIRST	COMPL 24 HR 18'11½"
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION vertical	
SAMPLER 24" 2" split spoon		INSPECTOR M. Akerbergs	
SAMPLER HAMMER WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR RESIST BL/6 IN.		W_n,%	L.L.,%	PL,%	-200,%		REMARKS
fill												
m. to f. lt brown SAND, some gravel fill		5	S-1	0.9	8 16 16							
light brown to brown m. to f. SAND, tr. silt		10	S-2	1.0	12 17 21							
brown m. to f. SAND, tr silt, wet		15	S-3	0.4	5 6 6							
dark gray sand SILT, interbeds of f sand		20	S-4	0.5	3 4 4							
stiff dark gray silty CLAY, interbeds of silty sand		25	S-5	0.9	3 4 6							
gray f. silty SAND		30	S-6	0.3	3 6 7							
light brown c. to m. SAND, tr silt		35	S-7	0.9	25 20 15							

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-13 SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]	[illegible]	%	[illegible]	[illegible]	[illegible]	[illegible]	REMARKS
brown m.to f SAND, tr. silt, loose			S-8	1.0	13 9 17							
lt. brown c to f SAND, tr silt		45	S-9	0.9	15 23 28							
lt. brown c.to f. SAND, tr. silt		50	S-10	0.7	33 30 36							
END of BORING												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-14 SHEET 1 OF 2

PROJECT AND LOCATION GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 8264623
DRILLING AGENCY Empire Soils Investigations Inc.	FOREMAN Greg Miller	DATE STARTED 11/2/83	DATE FINISHED 11/3/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 57 ft	ROCK DEPTH —
SIZE AND TYPE OF BIT 4 3/4" Drag	SIZE AND TYPE CORE BARREL —	NO. SAMPLES DIST 10	UNDIST 0 CORE —
CASING —		WATER LEVEL FIRST	COMPL. 24 HR. 18'3/4"
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION vertical	
SAMPLER 24" 2" - split spoon			
SAMPLER HAMMER WEIGHT 140 lbs	DROP 30"	INSPECTOR M. Akerbergs	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
asphalt-fill												
lt brown to tan f. SAND, pebbles, fill, dry		5	S-1	2.0	3 7 18 16							
lt. brown f. SAND, tr. silt, fill		10	S-2	1.6	8 14 20 28							
lt. brown f. SAND, wet		15	S-3	1.8	8 8 19 24							
dark gray silty CLAY, interbeds of gray f SAND		20	S-4	1.9	5 8 7 15							
dark gray silty CLAY, interbeds of f. SAND		25	S-5	1.0	4 8 10 10							augering becomes suddenly easier at 27.5 ft
dark gray sandy SILT, some clay interbeds of silty CLAY + silty f SAND		30	S-6	0.7	5 11 14 16							
		35	S-7	1.8	7 8 9 9							
tan to brown f. SAND												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-14

SHEET 2 OF 2

DESCRIPTION		DEPTH, FT	SAMPLES				ROCK CORE					REMARKS
							%	CRACK			FT	
tan to brown c. to m. SAND, some gravel			S-8	0.5	0 8 3 9							
		40	S-9	–	0 0 0 0							sand running up into augers
light tan c. to m. SAND		55	S-10	0.4	29 100/.4'							
v. f. silty SAND												
END of BORING												

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-15

SHEET 1 OF 1

PROJECT AND LOCATION GPU, Oyster Creek, Forked River N.J.		ELEVATION AND DATUM	PROJECT NO. 82C4623
DRILLING AGENCY Empire Soils Investigations, Inc.	FOREMAN Gary Miller	DATE STARTED 11/3/83	DATE FINISHED 11/3/83
DRILLING EQUIPMENT CME-55		COMPLETION DEPTH 20 Ft	ROCK DEPTH —
SIZE AND TYPE OF BIT 4 3/4" Drag	SIZE AND TYPE CORE BARREL —	NO. SAMPLES DIST. 0	UNDIST. 0 CORE —
CASING —		WATER LEVEL FIRST	COMPL. 24 HR. 12'5"
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION vertical	
SAMPLER 24"-2" split spoon		INSPECTOR M. Akerbergs	
SAMPLER HAMMER WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
see log for W-14												
		5										
		10										
		15										
		20										
END of BORING												

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-16

SHEET 1 OF 1

PROJECT AND LOCATION: GPU Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM:	PROJECT NO.: 82C4623
DRILLING AGENCY: Empire Soils Investigations Inc.	FOREMAN: Greg Miller	DATE STARTED: 11/4/83	DATE FINISHED: 11/4/83
DRILLING EQUIPMENT: CME-55		COMPLETION DEPTH: 22 Ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT: —	SIZE AND TYPE CORE BARREL: —	NO. SAMPLES: DIST 5	UNDIST 0 CORE —
CASING		WATER LEVEL: FIRST	COMPL 24 HR 10'5½"
CASING HAMMER —	WEIGHT —	DROP —	BORING ANGLE AND DIRECTION: vertical
SAMPLER 24" - 2" split spoon			
SAMPLER HAMMER	WEIGHT 140 lbs	DROP 30"	INSPECTOR: M. Akerbergs

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV, FT	PENETR RESIST BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
brown to tan F. SAND, roots, Fill			S-1	.9	4 8 10 14							
lt. brown F. SAND, some gravel, Fill		5	S-2	1.2	4 9 14 20							
brown m. to f. SAND, tr. silt		10	S-3	1.9	8 18 22 28							
light tan f. SAND, tr. silt		15	S-4	1.0	2 12 23 7							sample wet
dark gray, CLAY, interbeds of f. sand		20	S-5	1.3	3 4 7 8							
END of BORING												

LOG OF BORING W-17 **SHEET** 1 **OF** 4

PROJECT AND LOCATION GPU, Oyster Creek - Forked River, N.J.		ELEVATION AND DATUM	PROJECT NO. 8264623
DRILLING AGENCY Empire Soils Investigations Inc.	FOREMAN Gary Miller	DATE STARTED 11/16/83	DATE FINISHED 12/14/83
DRILLING EQUIPMENT Mobile B-61 (started with CME-55 to 55'-abandoned)		COMPLETION DEPTH 150 Ft	ROCK DEPTH —
SIZE AND TYPE OF BIT 4¾" roller bit	SIZE AND TYPE CORE BARREL —	NO. SAMPLES DIST 19	UNDIST 1 CORE —
CASING —		WATER LEVEL FIRST	COMPL. 24 HR. 9.5¾
CASING HAMMER —	WEIGHT —	DROP —	BORING ANGLE AND DIRECTION vertical
SAMPLER 24"-2" split spoon			INSPECTOR M. Akselrod(?)
SAMPLER HAMMER	WEIGHT 140 lb	DROP 30"	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR. RESIST BL/6IN.		Wn,%	LL,%	PL,%	-200,%		REMARKS
dark brown f. sandy SILT, organic material roots			S-1	1.8	[illegible]							
dark gray silty CLAY												
light brown f. SAND, loose, dry		5	S-2	0.8	4 7 16 23							
light brown m. to f. SAND, some gravel, wet		10	S-3	1.1	8 [illegible]							
light brown fine m. to f. SAND, some gravel		15	S-4	1.0	8 [illegible]							
light brown silty CLAY, soft, some f. SAND		20	S-5	.8	4 [illegible]							
dark gray stiff clayey SILT												
dark gray stiff silty CLAY, [illegible] of dark gray f. SAND & silty sand		25	S-6	0.2	[illegible] 10							
dark gray stiff silty CLAY [illegible] dark gray f. SAND		30	S-7	0.5	[illegible]							
light gray f. to vf silty SAND, loose		35	S-8	0.6	4 4 5 9							

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-17

SHEET 2 OF 4

DESCRIPTION	DEPTH, FT	SAMPLES TYPE NO.	RECOV., FT	BLOWS	RECOVERY %	REMARKS
light brown c. to m. SAND, some gravel		S-9	0.9	19 20 22 28		
red to lt. brown c. to m. SAND, some silt	45	S-10	0.8	14 22 33 32		
light brown f. SAND, tr. silt	50	S-11	1.0	0 17 34 32		
	55					
lt. brown to pink f. SAND, dense	60	S-12	0.4	100/5"		
	65					
light brown f. to v.f. SAND	70	S-13	1.5	40 40 35		
	75					
lt. brown f. SAND, some silt	80	S-14	1.2	88 41 47		
	85					

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING WF 17

SHEET 3 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOG	SAMPLES: RECOV, FT	SAMPLES: [illegible]	POCKET PENETROMETER TSF	ROCK CORE: RECOV %	ROCK CORE: CRACK [illegible]	ROCK CORE: CRACK [illegible]	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
		90	S-15	0	100/.2'							
		95										
dark gray f. SAND, tr. silt		100	S-16	.5	100/.6'							
		105										
dark gray f. sandy SILT, interbeds of silty CLAY or f SAND		110	S-17	1.0	45 40 55							
dark brown v. stiff CLAY		115	UD/ S-18	-	-							shelby sample
		120										
dark brown stiff CLAY		125	S-19	1.9	0 0 0 0							
		130										
alternate hard/soft drilling 135-145'		135										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-17　　SHEET 4 OF 4

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLER TYPE & NO.	 RECOV, FT	 PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE RECOVERY %	CRACK SKETCH	 [illegible]	 RQD	 CORE TIME [illegible]	REMARKS
		140										
m. to F. gray SAND, dense, interbeds of CLAY		145	S-20	1.4	65 65 70/.2'							
END of BORING		150										

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-1
Project GPU Oyster Creek
Location Forked River, N.J
Project No. 824623
Installed By Empire Soils Investigations
Date 12/8/83
Time 1200
Method of Installation 0-40 Ft (6" ID auger) 40-50 Ft - mud rotary

LOG OF MONITOR WELL

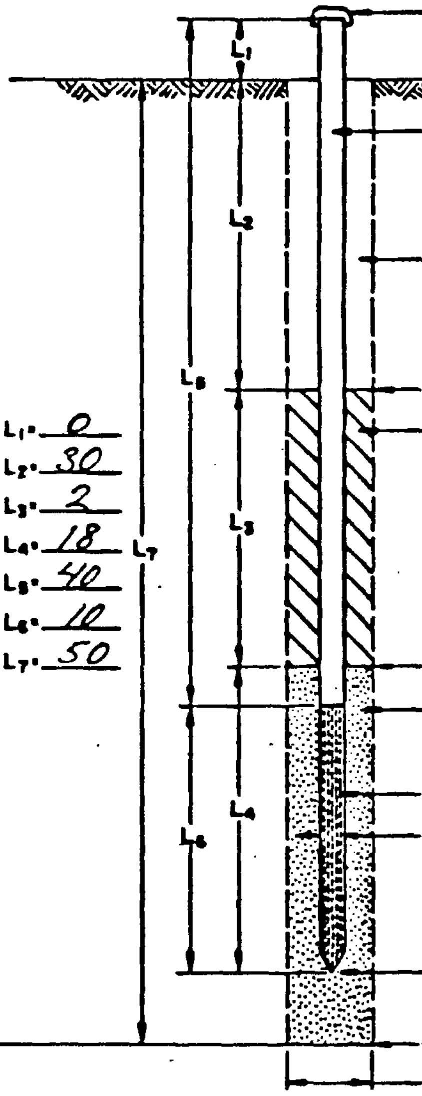
BORING

Depth in ft.	Description	Symbol
0	Fill	
	brown m. to f. SAND	SP
10		
20	dark gray stiff CLAY	CL
	dark gray silty SAND sandy SILT	SM ML
30		
40	light brown c. to m. SAND	SP
50	Bottom of boring - 52 Ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.
Top of Riser Elev.



Vented Cap
I.D. of Riser Pipe 3"
Type of Pipe PVC
Type of Backfill Around Riser cement/bentonite/sand mixture
Top of Seal Elev.
Type of Seal Material bentonite pellets
Top of Filter Elev.
Type of Filter Material natural-graded sand
Size of Openings .010"
Diameter of Monitor Well Tip 3"
Bottom of Mon. Well Elev.
Bottom of Boring Elev.
Diameter of Boring 5"

L1 = 0
L2 = 30
L3 = 2
L4 = 18
L5 = 40
L6 = 10
L7 = 50

Remarks

Inspected By M. Akerberg

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-2

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4623 Installed By Empire Soils Investigations

Date 11/8/83 Time 1000

Method of Installation 0-25 ft - 6" ID hollow stem auger; 25-55 ft - mud rotary - 4¾" drag bit

LOG OF MONITOR WELL

BORING

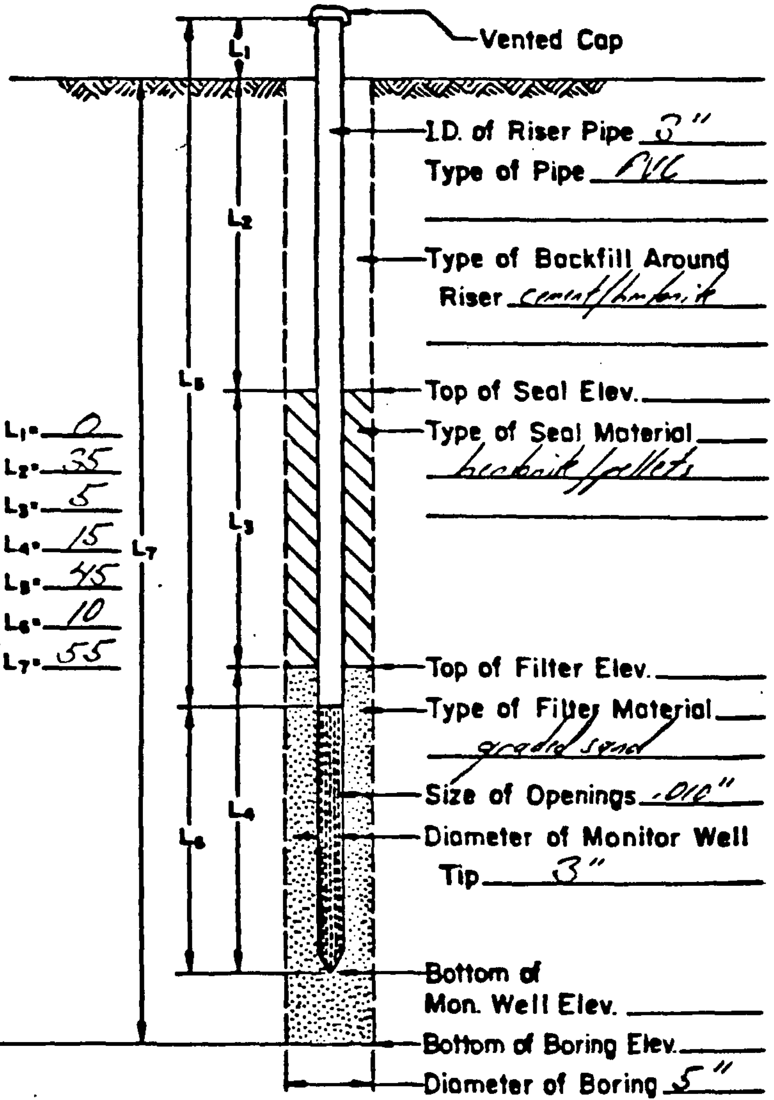
Depth in ft.	Description	Symbol
0	Fill	
10	light brown f. SAND	SP
20	dark gray firm CLAY	CL
30	dark gray f. silty SAND silty CLAY	SM CL
40	light brown c. to f. SAND	SW
50	Bottom of boring 57 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 35
L3 = 5
L4 = 15
L5 = 45
L6 = 10
L7 = 55

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser cement/bentonite

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 5"

Remarks

Inspected By M. Akerbergs

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-3
Project GPU Oyster Creek
Location Forked River, N.J.
Project No. 82C4623
Installed By Empire Soils Investigations
Date 11/15/83 Time 0900
Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

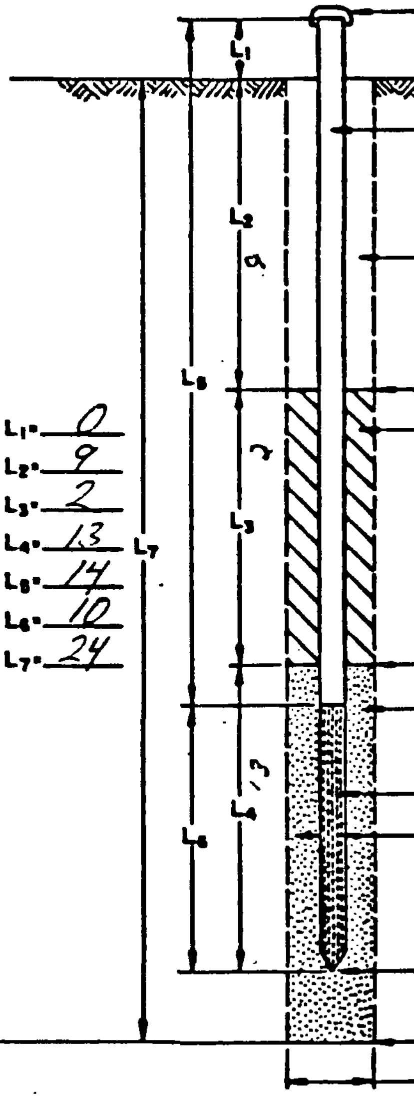
Depth in ft.	Description	Symbol
0	see log for W-4	
10		
20		
	Bottom of boring - 24 ft	
30		

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1= 0
L2= 9
L3= 2
L4= 13
L5= 14
L6= 10
L7= 24

Vented Cap
I.D. of Riser Pipe 3"
Type of Pipe PVC
Type of Backfill Around Riser bentonite/sand cement
Top of Seal Elev.
Type of Seal Material pellets (bentonite)
Top of Filter Elev.
Type of Filter Material graded sand
Size of Openings .010"
Diameter of Monitor Well Tip 3"
Bottom of Mon. Well Elev.
Bottom of Boring Elev.
Diameter of Boring 10"

Remarks

Inspected By M. Akerhagas

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-4

Project GPU Oyster Creek

Location Forked River N.J

Project No. 82C4623 Installed By Empire Soils Investigations Date 11/11/83 Time 0800

Method of Installation 0-35 ft - 6" ID hollow stem auger; 35-52 ft - mud rotary, 4 7/8" drag bit

LOG OF MONITOR WELL

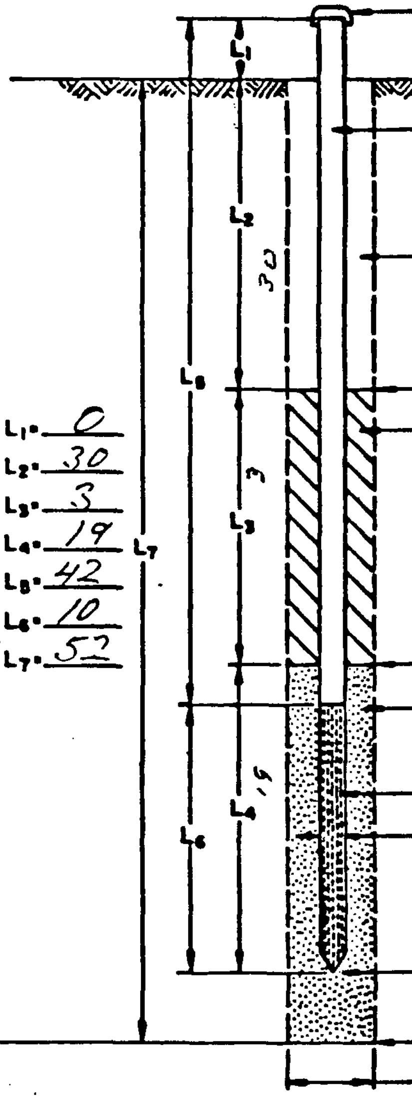
BORING

Depth in ft.	Description	Symbol
0	FILL	
	brown f. SAND	SP
10		
20	dark gray silty CLAY dark gray silty SAND	SM CL
30		
40	brown c. to m. SAND	SP
50	Bottom of boring - 55 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev. Top of Riser Elev.



L1 = 0
L2 = 30
L3 = 3
L4 = 19
L5 = 42
L6 = 10
L7 = 52

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser cement/bentonite sand mixture

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material natural sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 5"

Remarks

M W 1

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-5

Project EFU, Oyster Creek

Location Forked River, N.J.

Project No. 82C4623 Installed By Empire Soils Investigations Date 11/10/83 Time 0800

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

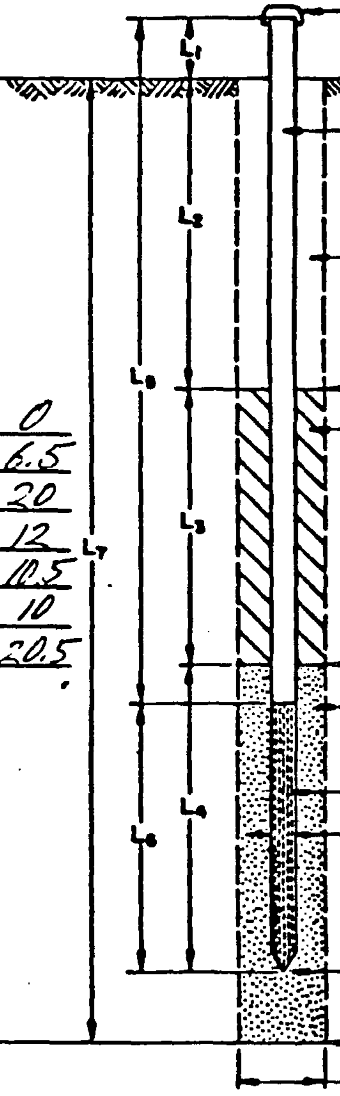
Depth in ft.	Description	Symbol
0	see log for W-6	
10		
20	Bottom of boring 20.5ft	
30		

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser bentonite sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

L1 = 0
L2 = 6.5
L3 = 20
L4 = 12
L5 = 10.5
L6 = 10
L7 = 20.5

Remarks

Inspected By M. Akrchiggs

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-6

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4623 Installed By Empire Soils Investigations Date 11/9/83 Time 1400

Method of Installation 0-10 ft - 6" ID augers; 10-52.5 ft - mud rotary - 4¾" drag bit

LOG OF MONITOR WELL

BORING

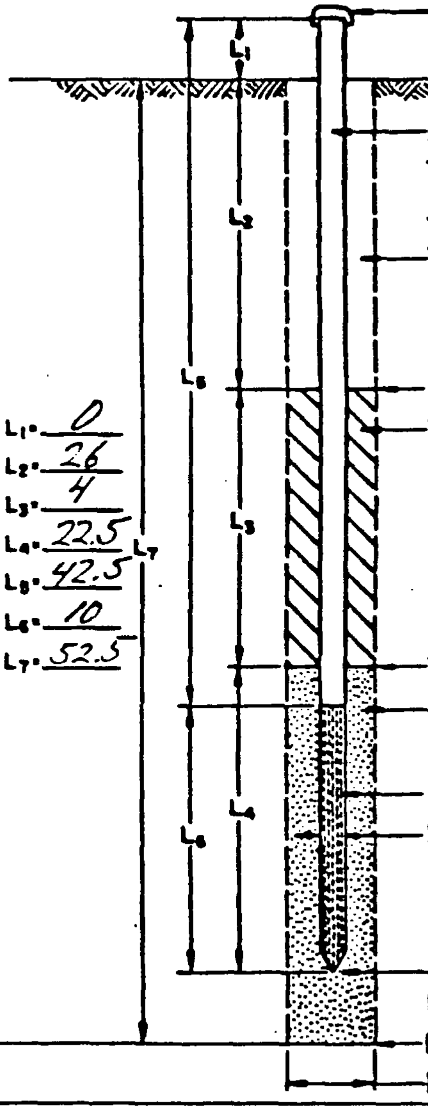
Depth in ft.	Description	Symbol
0	Fill	
10	brown f. SAND	SP
20	dark gray silty CLAY silty SAND	CL SP
30		
40	light brown c.-fm. SAND	SP
50	Bottom of boring - 55 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 26
L3 = 4
L4 = 22.5
L5 = 42.5
L6 = 10
L7 = 52.5

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser bentonite/cement sand slurry

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 5"

Remarks

Inspected By M. Akerberg

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-7

Project GPU Oyster Creek

Location Forked River N.J.

Project No. 82C46123

Installed By Empire Soils Investigations

Date 11/16/83

Time 0800

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

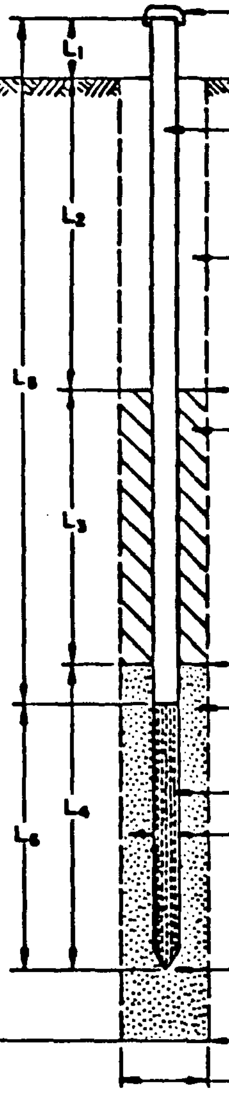
Depth in ft.	Description	Symbol
0	fill	
10	light brown f. SAND	SP
20	dark gray silty CLAY	CL
	Bottom of boring - 22 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser bentonite/cement/sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

L_1 = 0

L_2 = 6

L_3 = 2

L_4 = 12

L_5 = 10

L_6 = 10

L_7 = 20

Remarks

Inspected By M. Akerberg

WOODWARD-CLYDE CONSULTANTS

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-8

Project GPU Oyster Creek

Location Forked River [illegible]

Project No. 82C4673 Installed By Empire Soils Investigations

Date 4/8/83 Time 1800

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

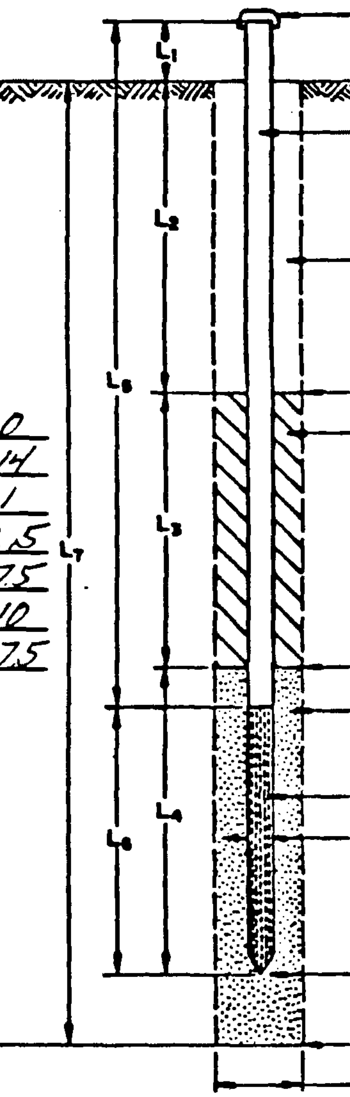
Depth in ft.	Description	Symbol
0	Fill	
	light brown m. to f. SAND	SF
10		
20		
30		
40	Bottom of boring 37 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 14
L3 = 1
L4 = 12.5
L5 = 17.5
L6 = 10
L7 = 27.5

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser bentonite/sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

Inspected By M. Akerberg

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-9

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4623 Installed By Empire Soils Investigations

Date 11/1/83 Time 1600

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

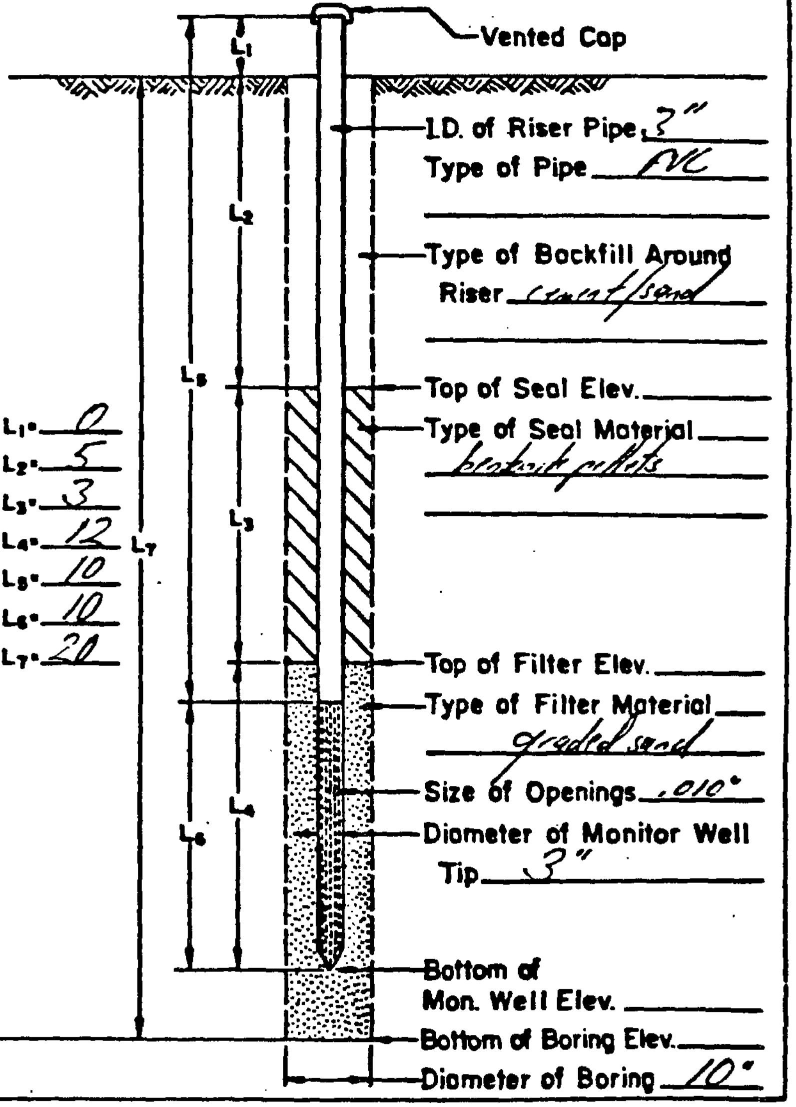
Depth in ft.	Description	Symbol
0	see log for W-10	
10		
20	Bottom of boring - 20 ft.	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 5
L3 = 3
L4 = 12
L5 = 10
L6 = 10
L7 = 20

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser cement/sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

Inspected By M. Mickings

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-10
Project GPU Oyster Creek
Location Forked River N.J.
Project No. 82C4823
Installed By Empire Soils Investigations
Date 11/1/83
Time 1400
Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

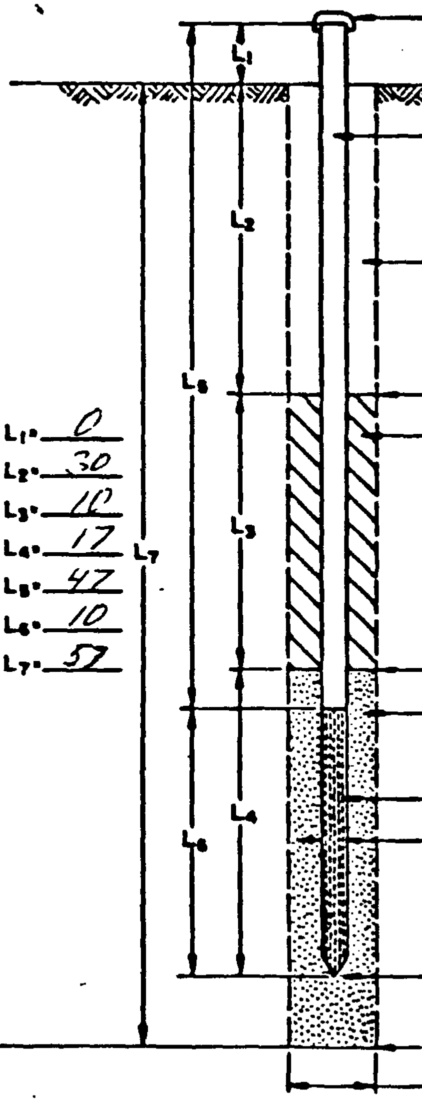
Depth in ft.	Description	Symbol
0	Fill	
10	tan f. SAND	SW
20	stiff dark gray CLAY	CL
30		
40		
	tan to brown m. to f. SAND	SP
50	Bottom of boring 60 Ft.	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 30
L3 = 10
L4 = 17
L5 = 47
L6 = 10
L7 = 57

I.D. of Riser Pipe 3"
Type of Pipe PVC

Type of Backfill Around Riser Cement/bentonite

Top of Seal Elev.
Type of Seal Material bentonite slurry-pellets

Top of Filter Elev.
Type of Filter Material natural sand

Size of Openings .010"
Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.
Bottom of Boring Elev.
Diameter of Boring 10"

Remarks

Inspected By M. Akerbergs

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-12

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4623 **Installed By** Empire Soils Investigations **Date** 12/7/83 **Time** 0900

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

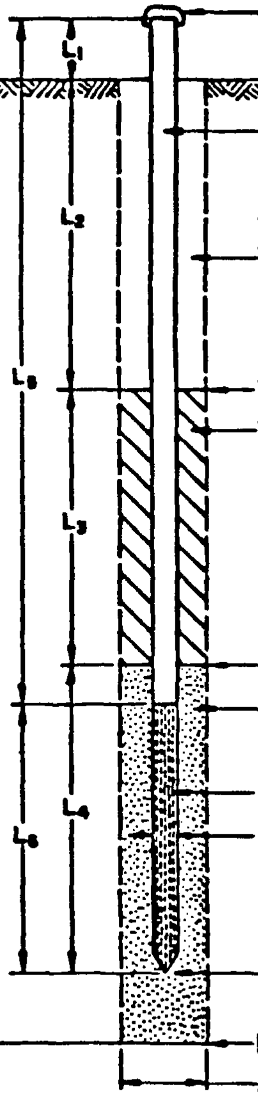
Depth in ft.	Description	Symbol
0	See log for W-13	
10		
20	Bottom of boring - 20 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 6
L3 = 2
L4 = 12
L5 = 10
L6 = 10
L7 = 20

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser bentonite/cement

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

Inspected By M. Akerlings

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-B

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4622 Installed By Empire Soils Investigation Date 12/6/82 Time 0800

Method of Installation 0-40 Ft- 6" ID auger; 40-50 Ft- mud rotary, 4 3/4" drag bit

LOG OF MONITOR WELL

BORING

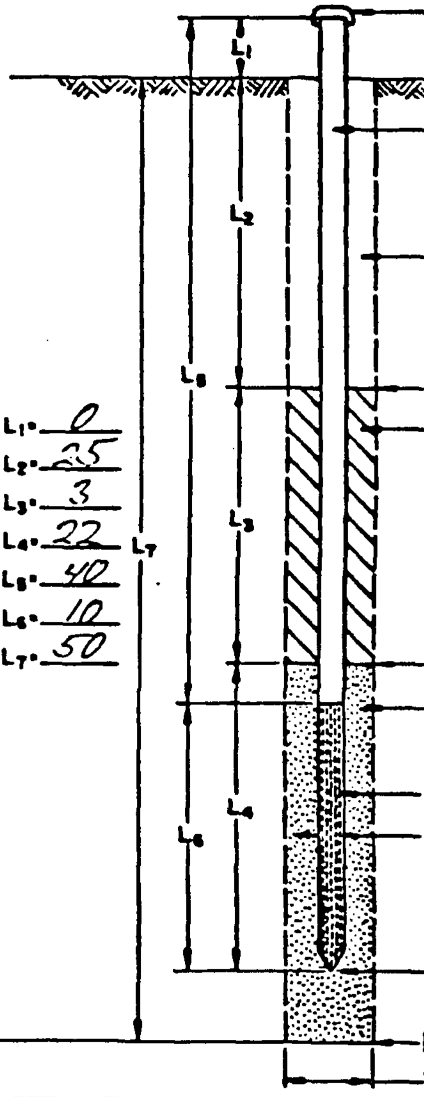
Depth in ft.	Description	Symbol
0	fill	
10	brown m. to f. SAND	SP
20	dark gray sandy SILT stiff dark gray silty CLAY	CL ML
30		
	lt brown c. to f. SAND	SP
40		
50	Bottom of boring - 52 Ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1= 0
L2= 25
L3= 3
L4= 22
L5= 40
L6= 10
L7= 50

Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser cement / bentonite / sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-14

Project GPU Oyster Creek

Location Forked River, N.J.

Project No. 82C4623

Installed By Empire Soils Investigations

Date 11/3/83

Time 0900

Method of Installation 6" ID hollow stem augers

LOG OF MONITOR WELL

BORING

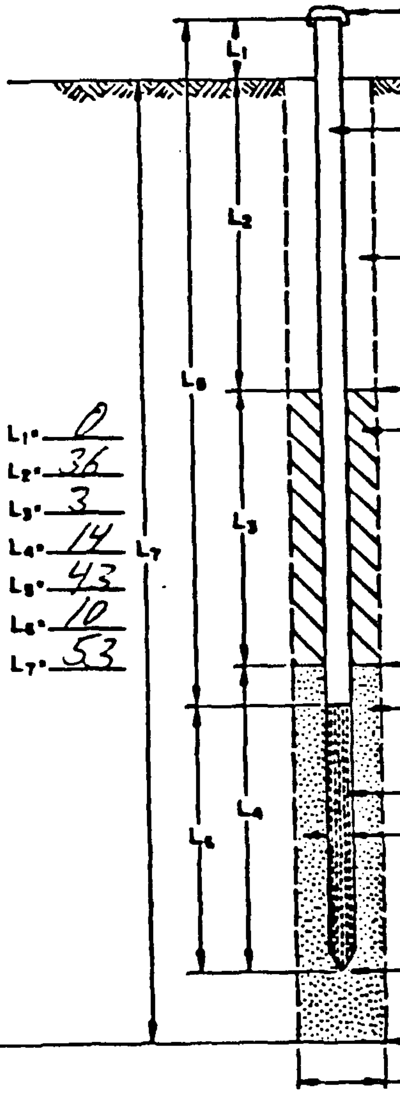
Depth in ft.	Description	Symbol
0	Fill	
10		
	light brown f. SAND	SP
20	dark gray silty CLAY	CL ML
30		
40	tan to brown c. to m. SAND	SP
50	Bottom of boring 57 Ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0
L2 = 36
L3 = 3
L4 = 14
L5 = 43
L6 = 10
L7 = 53

Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser cement/bentonite

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material natural sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

Inspected By M. Akerbergs

WOODWARD–CLYDE CONSULTANTS

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-15

Project GPU, Oyster Creek

Location Forked River, N.J.

Project No. 82C4623

Installed By Empire Soils Investigations

Date 11/3/83

Time 1400

Method of Installation 6" ID hollow stem auger

LOG OF MONITOR WELL

BORING

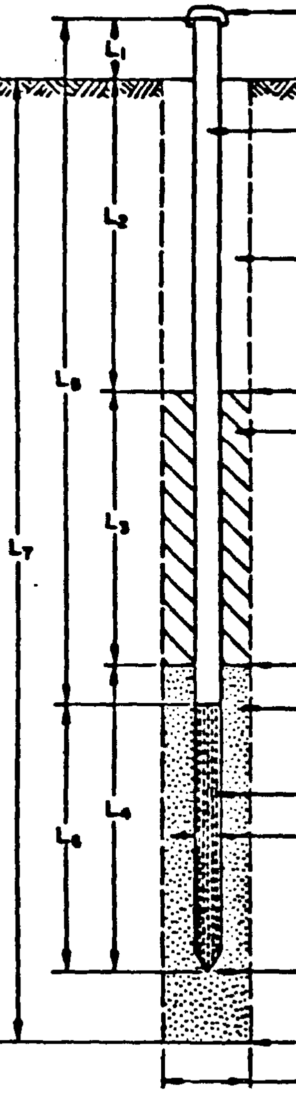
Depth in ft.	Description	Symbol
0	see log for W-14	
10		
20	Bottom of boring - 20 ft.	

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser Cement/sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

L1 = 0
L2 = 5
L3 = 3
L4 = 12
L5 = 10
L6 = 10
L7 = 20

Remarks

Inspected By

WOODWARD-CLYDE CONSULTANTS

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-16

Project GPU - Oyster Creek

Location Forked River, N.J.

Project No. 8204623 Installed By Empire Soils Investigations Date 11/4/83 Time 0900

Method of Installation 6" ID - hollow stem augers

LOG OF MONITOR WELL

BORING

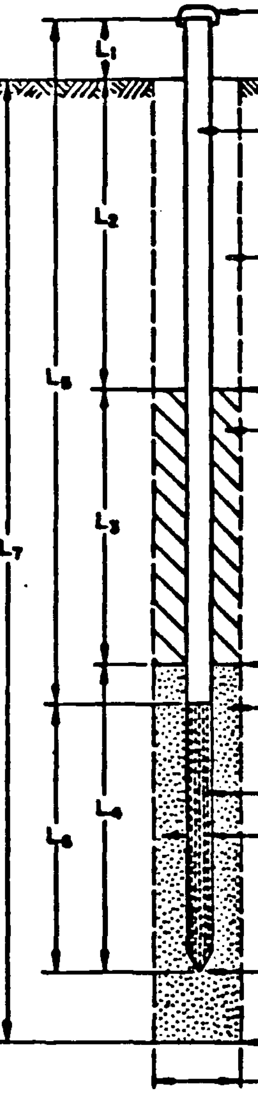
Depth in ft.	Description	Symbol
0	Fill	
10	brown to tan m. to f. SAND	SP
20	dark gray CLAY Bottom of boring - 22 ft.	CL
30		

MONITOR WELL

Type of Monitor Well

Ground Elev.

Top of Riser Elev.



L1 = 0

L2 = 5

L3 = 2

L4 = 13

L5 = 10

L6 = 10

L7 = 20

I.D. of Riser Pipe 3"

Type of Pipe PVC

Type of Backfill Around Riser [illegible] sand

Top of Seal Elev.

Type of Seal Material bentonite pellets

Top of Filter Elev.

Type of Filter Material graded sand

Size of Openings .010"

Diameter of Monitor Well Tip 3"

Bottom of Mon. Well Elev.

Bottom of Boring Elev.

Diameter of Boring 10"

Remarks

Inspected By M. [illegible]

MONITOR WELL INSTALLATION REPORT

Monitor Well No. W-17
Project GPU, Oyster Creek
Location Forked River N.J.
Project No. 82C4623 Installed By Empire Soils Investigations Date 12/14/82 Time 1500
Method of Installation 6" ID augers 0-40 ft; mud rotary 40-~~135~~150 ft 4¾" roller bit

LOG OF MONITOR WELL

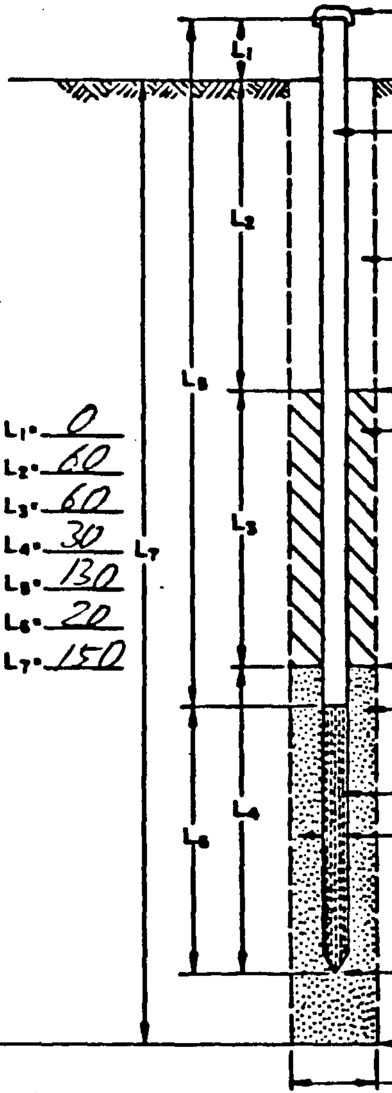
BORING

Depth in ft.	Description	Symbol
0	light brown m. to f. SAND	SP
30	stiff dark gray silty CLAY	CL
	light gray f. to m. silty SAND	SP
	light brown c. to m. SAND	SP
60	light brown f. SAND	SP
90		
	dark brown stiff CLAY	CL
120		
	dark brown silty CLAY, clayey SILT	CL/ML
150	gr. m. to f. SAND	SP
	Bottom of boring - 150 ft	

MONITOR WELL

Type of Monitor Well

Ground Elev.
Top of Riser Elev.



L1 = 0
L2 = 60
L3 = 60
L4 = 30
L5 = 130
L6 = 20
L7 = 150

I.D. of Riser Pipe 3"
Type of Pipe PVC
Type of Backfill Around Riser Cement/bentonite
Top of Seal Elev.
Type of Seal Material bentonite slurry
Top of Filter Elev.
Type of Filter Material natural sand
Size of Openings .010"
Diameter of Monitor Well Tip 3"
Bottom of Mon. Well Elev.
Bottom of Boring Elev.
Diameter of Boring 5"

Remarks

Inspected By

WOODWARD-CLYDE CONSULTANTS

1988

BORING LOGS
or
WELL INSTALLATION LOGS
W-24 to W-27
OW-1 to OW-5

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-24 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: GPU OYSTER CREEK Fork River NJ		ELEVATION AND DATUM: Not available	PROJECT NO: 87C 4649
DRILLING AGENCY: Empire Soils	FOREMAN: Damit Dillon	DATE STARTED: 12-2-88	DATE FINISHED: 12-2-88
DRILLING EQUIPMENT: CME 45 Skid Rig		COMPLETION DEPTH: 21 feet	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 6 1/2 Auger	SIZE AND TYPE CORE BARREL: Not used	NO. SAMPLES: DIST 5	UNDIST 0 / CORE 0
CASING: Not used		WATER LEVEL: FIRST 15 ft	COMPL. will dry/wet / 24 HR 14.88
CASING HAMMER —	WEIGHT — / DROP —	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2" SPLIT SPOON SAMPLER		INSPECTOR: Ramez R. Kayal	
SAMPLER HAMMER	WEIGHT 140 Lb / DROP 30"		

DESCRIPTION		DEPTH, FT	SAMPLES			blow count	W_n,%	LL,%	PL,%	-200,%		REMARKS
Black Top 4" Brown m to f SAND, tr of silt & f gravel Black gray m to f Silty SAND, tr f gravel Stain gray m to f Silty SAND, tr f gravel, moist		0–2	S-1	1.5		10 08 17 16					12.10 P.m	HNU - Background reading 0.2ppm.
Brown m to fine Silty SAND		3–4										description from wash
Light brown m to fine SAND, tr of Silt mottled yellow, moist		5–7	S-2	2.0		8 11 13 16					12:25 P.m	HNU Background reading 0.2ppm
Light Brown [illegible] m to f SAND, tr of silt, moist		10–12	S-3	1.5		4 8 10 16					1:35 P.m	HNU Background reading 0.2 ppm.
Same as above, but wet last 6" & tr of silty clay,		15–17	S-4	2.0		8 11 14 19					1:55 P.m.	HNU Background reading 0.2 ppm waited for 10 min to take a WL read well was dry
Top of Fill at 19.2 ft dark gray, black Silty CLAY, wet Fine VF Silty Sand Bottom of Boring 20 feet		19–20	S-5	2.0		9 9 9 9					2:20 pm	HNU Background reading 0.2 ppm.

WOODWARD–CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-25 **SHEET** 1 **OF** 2

PROJECT AND LOCATION GPU OYSTER CREEK Fork River NJ	ELEVATION AND DATUM Not available	PROJECT NO. 87C 4649
DRILLING AGENCY Empire Soils / FOREMAN Dermit Dillion	DATE STARTED 12-5-88	DATE FINISHED 12-5-88
DRILLING EQUIPMENT CME 45 Skid Rig	COMPLETION DEPTH 22 feet	ROCK DEPTH —
SIZE AND TYPE OF BIT 6 1/2 Auger / SIZE AND TYPE CORE BARREL Not used	NO. SAMPLES DIST. 5	UNDIST. / CORE
CASING Not used	WATER LEVEL FIRST 16 feet	COMPL. 14.80 / 24 HR. 74.78
CASING HAMMER — / WEIGHT — / DROP —	BORING ANGLE AND DIRECTION	
SAMPLER 2" SPLIT SPOON SAMPLER	INSPECTOR	
SAMPLER HAMMER / WEIGHT 140 Lb / DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO.	RECOV. FT	PENETR. RESIST. BL/6 IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
Light brown motled yellow m to f. SAND tr of Silt tr of f gravel, moist		0–2	S-1	1.8		4 4 4 3					10:05 a.m	HNU Background Reading 0.2 ppm
		2–5										
Light brown yellowish, motled black, m to f. SAND, tr of Silt, tr of f gravel, moist		5–7	S-2	2.0		4 6 5 7					10:12 a.m	HNU Background Reading 0.2 ppm
brown greyish same as above		7–10										->sample described from wash.
brown m to f SAND, tr of Silt, tr of f. gravel, moist		10–12	S-3	2.0		11 21 24 30					10:30 a.m	HNU Background Reading 0.2 ppm
		12–15										
Light brown motled white (Quartz), m to f. SAND, tr of Silty, wet at 16 feet	SCREEN	15–17	S-4	2.0		12 17 17 12					10:45 a.m	HNU Background Reading 0.2 ppm
(becoming more silty with depth		17–20										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-25

SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
Same as above but more silty Dark gray black silty CLAY, tr f silty sand, wet Bottom of boring 22 feet		21 22	S-6	1.8		3 3 3 4					11:00	HNU Background reading 0.2 ppm contact seen in split spoon.

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-26 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: GPU OYSTER CREEK Fork River NJ	ELEVATION AND DATUM: Not available	PROJECT NO: 87C 4649.
DRILLING AGENCY: Empire Soils / FOREMAN: Dermit Dillion	DATE STARTED: 12-5-88	DATE FINISHED: 12-5-88.
DRILLING EQUIPMENT: CME 45 Skid Rig.	COMPLETION DEPTH: 22 feet	ROCK DEPTH: —
SIZE AND TYPE OF BIT: / SIZE AND TYPE CORE BARREL: Not used	NO. SAMPLES: DIST 5	UNDIST — / CORE —
CASING Not used	WATER LEVEL: FIRST	COMPL. / 24 HR.
CASING HAMMER — / WEIGHT — / DROP —	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER 2" SPLIT SPOON SAMPLER		
SAMPLER HAMMER / WEIGHT 140 Lb / DROP 30"	INSPECTOR: Ramez R. Kayal	

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
brown m to f SAND, tr f silt tr of f gravel, moist		1	S-1	2 0		8 13 13 14					2:10pm	HNU Background reading 0 2p
		2										
		3										
		4										
		5										
Light Brown m to f SAND, tr f silt and c to f gravel moist		6	S-2	2.0		6 5 6 10					2:15PM	HNU Background reading 0 2pp
		7										
		8										
		9										
		10										
Light Brown m to f SAND, tr f silt and tr f f gravel, moist		11	S-3	20		10 10 12 16					2:30pm	HNU Background reading 0.2ppm
		12										
		13										
		14										→ soil from wash oil Smell Hald
		15										
Light Browngreyish m to f SAND tr f silt, wet		16	S-4	2.0		14 18 17 21					2:8pm	
		17										
(Soil becoming more silty.)		18										
		19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-26 SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
Brown m to f SAND, Some silty CLAY wet dark gray Silty CLAY, Some silty Sand, wet		21 22	S-4	2.0		4 4 5 6					3:07pm	HNU : 1ppm Monitoring Well Installed

WOODWARD—CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-27 SHEET 1 OF 2

PROJECT AND LOCATION GPU OYSTER CREEK Forked River NJ		ELEVATION AND DATUM Not available	PROJECT NO 87C4649
DRILLING AGENCY Empire Soils	FOREMAN Dermit Dillon	DATE STARTED 12-6-88	DATE FINISHED 12-6-88.
DRILLING EQUIPMENT CME-45 Skid rig		COMPLETION DEPTH 22 feet	ROCK DEPTH —
SIZE AND TYPE OF BIT 6 1/2 Auger	SIZE AND TYPE CORE BARREL Not used	NO. SAMPLES DIST 5	UNDIST — CORE —
CASING Not used		WATER LEVEL FIRST 15 Ft	COMPL. 15.27 24 HR
CASING HAMMER —	WEIGHT — DROP —	BORING ANGLE AND DIRECTION VERTICAL	
SAMPLER 2" SPLIT SPOON SAMPLER		INSPECTOR Ramez R. Kayal	
SAMPLER HAMMER	WEIGHT 140 Lb DROP 30"		

DESCRIPTION	PENETROMETER	DEPTH, FT	SAMPLES TYPE AND NO.	RECOV., FT			Wn,%	LL,%	PL,%	-200,%		REMARKS
brown m to f SAND, tr of silt & tr of f gravel, moist (at 1.0 ft to 1.3 ft light gray color)		1 2	S-1	1.5		4 8 12 10					9:40 am	first 2 inch black top and [illegible] HNU Background reading 0.2 pp.
		3 4										
light brown (yellowish) m to f SAND tr of silt, moist.		5 6 7	S-2	1.0		5 7 6 9					10:50 am	HNU Background reading 0.2 ppm
		8 9										
Yellow brown, m to f SAND, tr of silts & tr of gravel, moist		10 11 12	S-3	2.0		11 19 23 25					11:05 am	HNU Background reading 0.2 pp.
		13 14										
Light brown (yellowish) m to f SAND tr of silts, wet at 16 feet		15 16 17	S-4	2.0							11:15 am	HNU: 15 ppm.
(becoming silty with depth		18 19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING W-27 SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLER [illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
gray brownish silty SAND, tr of silty clay, wet						2						HNU ?
dark gray silty CLAY, some silty Sand wet		21	S-4	20		2 4 5				10:35am.		
Bottom of boring		22										Monitoring Installed Bottom 19 feet

WOODWARD–CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-1 SHEET 1 OF

PROJECT AND LOCATION GPU OYSTER CREEK Forked River NJ		ELEVATION AND DATUM Not available	PROJECT NO 87C4649.
DRILLING AGENCY Empire Soils	FOREMAN Dermit Dillon	DATE STARTED 12-7-88	DATE FINISHED 12-7-88
DRILLING EQUIPMENT CME 45 Skid Rig.		COMPLETION DEPTH 22 feet	ROCK DEPTH —
SIZE AND TYPE OF BIT 4 ½ ID Auger	SIZE AND TYPE CORE BARREL Not used	NO. SAMPLES: DIST 4	UNDIST — CORE —
CASING Not used		WATER LEVEL: FIRST 15	COMPL. 13.2 24 HR
CASING HAMMER — WEIGHT —	DROP —	BORING ANGLE AND DIRECTION . VERTICAL	
SAMPLER 2" SPLIT SPOON SAMPLER		INSPECTOR Ramez R. Kayal	
SAMPLER HAMMER WEIGHT 140 Lb	DROP 30"		

DESCRIPTION	PENETRATION	DEPTH, FT	SAMPLES: TYPE AND NO.	RECOV., FT	PENETR. RESIST. BL/6 IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
Brown m to f SAND, tr of silt & gravel, moist.		1–2										→ Sample describe from wash
brown m to f SAND, tr of silt & gravel, moist		5–7	S-1	2.0		6 8 8 13					11:10am	HNU Background Reading 0.2ppm Sample taken f chemical Analysis as OW-1.1 Background sample.
Sames as above		10–12	S-2	2.0		8 10 13 17					11:15am	HNU Background Reading 0.2ppm
Same as above but wet coil odor.		15–17	S-3	2.0		1 1 1 1					11:20am	HNU = 15ppm
		18–19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OK-1

SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]				W_n,%	LL,%	PL,%	-200,%		REMARKS
			[illegible]	[illegible]	[illegible]							
Dark gray, Silty CLAY, some silty sand, wet		21 22	S-4		1.8	4557					11:30am	HNU on clay background reading 0.2ppm
Bottom of boring at 22 feet												Observation well installed

WOODWARD–CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-2 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: GPU OYSTER CREEK Fork River NJ		ELEVATION AND DATUM: Not available	PROJECT NO: 87C4649.
DRILLING AGENCY: Empire Soils	FOREMAN: Dumit Dillon	DATE STARTED: 12-7-88	DATE FINISHED: 12-7-88
DRILLING EQUIPMENT: CME 45 Skid Rig		COMPLETION DEPTH: 22 feet	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4½ ID Auger	SIZE AND TYPE CORE BARREL: Not used	NO. SAMPLES: DIST 4	UNDIST — CORE —
CASING: Not used		WATER LEVEL: FIRST 15	COMPL. 24 HR
CASING HAMMER —	WEIGHT — DROP —	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2" OD SPLIT SPOON SAMPLER			
SAMPLER HAMMER	WEIGHT 140 Lb DROP 30"	INSPECTOR: Ramez R. Kayal	

DESCRIPTION	DEPTH, FT	TYPE AND NO.	RECOV., FT	PENETR. RESIST. BL/6 IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
dark brown m to f SAND, tr f silt, tr f gravel	1–3										→ Sample described from Wash
Light brown, m to f SAND, tr f silt tr f gravel, moist	5–7	S-1	1.5		7 7 7 12					12:10pm	HNU Background reading 0.2ppm
Brown same as above	8										→ Sample described from wash
Light brown, m to f SAND, mottle light gray, tr of silt & gravel, moist	10–12	S-2	2.0		6 12 20 22					12:45pm	HNU Background reading 0.2ppm
Same as above, wet.	15–17	S-3	1.5		8 18 22 21					12:55pm	HNU 10ppm

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-2 SHEET 2 OF 2

DESCRIPTION		DEPTH, FT					W_n,%	LL,%	PL,%	-200,%		REMARKS
Dark gray, Silty CLAY, some Silty sand, wet		21 22	S-4	20		2 9 6 7					1:05 PM	HNU on clay background reading 0.2 ppm
Bottom of boring at 22 feet												Observation Well installed

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-3

SHEET 1 OF 2

PROJECT AND LOCATION: GPU OYSTER CREEK Forck River NJ	ELEVATION AND DATUM: Not available	PROJECT NO: 87C4649
DRILLING AGENCY: Empire Soils FOREMAN: Dermit Dillon.	DATE STARTED: 12-6-88	DATE FINISHED: 12-6-88
DRILLING EQUIPMENT: CME-45 Skid Rig	COMPLETION DEPTH: 22 ft	ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4 ½ ID Auger SIZE AND TYPE CORE BARREL: Not Used	NO. SAMPLES: DIST 3	UNDIST — CORE —
CASING: Not Used	WATER LEVEL: FIRST 15	COMPL. 24 HR.
CASING HAMMER — WEIGHT — DROP —	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2" SPLIT SPOON SAMPLER		
SAMPLER HAMMER WEIGHT 140 Lb DROP 30"	INSPECTOR: Ramez R. Kayal.	

DESCRIPTION		DEPTH, FT	TYPE NO.	RECOV. FT			W_n,%	LL,%	PL,%	-200,%		REMARKS
brown m to f SAND, tr of silt & gravel moist		1–4										Sample described from wash
Light brown m to f SAND, tr of silt tr of gravel, moist		5–7	S-1	1.5		4 3 3 3					2:04 pm.	HNU Background reading 0.2pp
Light brown same as above		8–9										→ Sample described from wash
Same as above but yellowish		10–12	S-2	2.0		2 2 4 4					2:10 pm.	HNU Background reading 0.2pp
brown (light) m to f SAND, tr of silt wet at 15.0		14–16	S-3	2.0		3 3 3 3					2:20 pm	HNU = 7ppm → Sample taken for Chemical Anal labelled as SSB1.
becoming silt with depth.		17–19										

WOODWARD-CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING DW-3 SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLER [illegible]	 [illegible]	 [illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
3" brown grayish to tan SILTY SAND, Some Silty Clay 21.3 ft Dark gray, SILTY CLAY, Some silty sand.		21 22	S-4	20		4 5 6 7					7:32	HNU = 6 ppm
Bottom of Boring 22 feet												-> tempory Piezometer Installed.

WOODWARD–CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-4 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: GPU OYSTER CREEK Forked River NJ		ELEVATION AND DATUM: Not available	PROJECT NO: 87C4649	
DRILLING AGENCY: Empire Soils	FOREMAN:	DATE STARTED: 12-6-88	DATE FINISHED: 12-6-88.	
DRILLING EQUIPMENT: CME-45 Skid Rig		COMPLETION DEPTH: 22 feet	ROCK DEPTH: —	
SIZE AND TYPE OF BIT: 4 1/2 ID Auger	SIZE AND TYPE CORE BARREL: Not used	NO. SAMPLES: DIST. 4	UNDIST. —	CORE —
CASING: Not used		WATER LEVEL: FIRST	COMPL.	24 HR.
CASING HAMMER —	WEIGHT —	DROP —	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2" OD SPLIT SPOON SAMPLER				
SAMPLER HAMMER	WEIGHT 140 Lb	DROP 30"	INSPECTOR: Ramez R. Kagal	

DESCRIPTION	PENETROMETER	DEPTH, FT	SAMPLES TYPE NO.	RECOV. FT	PENETR. RESIST.		W_n,%	LL,%	PL,%	-200,%		REMARKS
		1										
brown m to f SAND, tr of silt & tr of f gravel moist		2										→ Sample described from wash
		3										
		4										
light brown m to f SAND, tr f silt & tr f f gravel, moist		5–7	S-1	2.0		12 15 5 8					3.30 pm.	HNU Background Reading 0.2ppm
Same as above		8										
		9										
light brown mottled dark brown, m to f SAND, tr of silt, moist		10–12	S-2	2.0		9 12 15 12					3.35 pm.	→ HNU Background reading 0.2ppm → Sample taken for Chemical analysis. labelled as SSB.2
Same as above		12–14	S-3	2.0		3 5 6 10					3.40 pm.	HNU Background reading 0.2ppm → Sample taken for Chemical analyses, labelled as SSB 2.3 .
		15										
		16										
starting 17 feet Soil is becoming more Silty, wet		17–18										
		19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-4

SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	SAMPLES									REMARKS
			[illegible]	[illegible]	[illegible]		Wn,%	LL,%	PL,%	-200,%		
brown grayish silty SAND tr of silty clay.												
Dark gray, silty CLAY, some silty Sand, wet		21 22	S-4		2.0	3 5 6 10.					3:55 pm	HNU 5 ppm Temporary Piezometer Installed
Bottom of boring 22 feet												

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-5

SHEET 1 OF 2

PROJECT AND LOCATION: GPU OYSTER CREEK Fork River NJ
ELEVATION AND DATUM: Not available
PROJECT NO: 87C4649
DRILLING AGENCY: Empire Soils
FOREMAN: Dermit Dillon
DATE STARTED: 12-7-88
DATE FINISHED: 12-7-88
DRILLING EQUIPMENT: CME 45 Skid Rig
COMPLETION DEPTH: 22 feet
ROCK DEPTH: —
SIZE AND TYPE OF BIT: 4½ ID Auger
SIZE AND TYPE CORE BARREL: Not used
NO. SAMPLES: DIST 5 UNDIST 0 CORE 0
WATER LEVEL: FIRST – COMPL. 24 HR
CASING: Not used
CASING HAMMER – WEIGHT — DROP —
BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 2" SPLIT SPOON SAMPLER
SAMPLER HAMMER WEIGHT 140 Lb DROP 30"
INSPECTOR: Ramez R. Kayal

DESCRIPTION	PENETROMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV, FT	BLOWS		Wn,%	LL,%	PL,%	-200,%		REMARKS
		1										
brown m to f SAND, tr of Silt & gravel		2										→ Sample descrb. From wash
		3										
		4										
brown. mottled dark brown m to f SAND tr of Silt & tr of gravel moist		5										
		6	S-1	2.0	1 1 1 1						9:25am	HNU Background reading 0.2pp
		7										
Same as above		8										→ sample descrb from wash
		9										
Brown m to f SAND mottled light brown. light gray and black, tr of silt, moist		10										
		11	S-2	2.0	5 6 8 8						9:38am.	HNU Background reading 0.2pp
		12										
		13										HNU = 10 ppm
Same as above, moist		14	S-3	2.0	7 6 4 3						9:43am.	Sample taken f chemical Analy labeled as SSB
		15										
		16										
		17										→ HNU on wash sample 7ppm
Soil increase in Silt Content		18										
		19										

WOODWARD-CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING OW-5

SHEET 2 OF 2

DESCRIPTION	[illegible]	DEPTH, FT	[illegible]									REMARKS
			TYPE [illegible]	[illegible]	[illegible]		W_n,%	LL,%	PL,%	-200,%		
dark grey, black Silty CLAY, Some silty Sand		21	S4	2.0		3 4 5 7					10:00am	HNU on clay. background reading 0.2ppm
Bottom of boring at 22 feet		22										temporary observatio Well installed

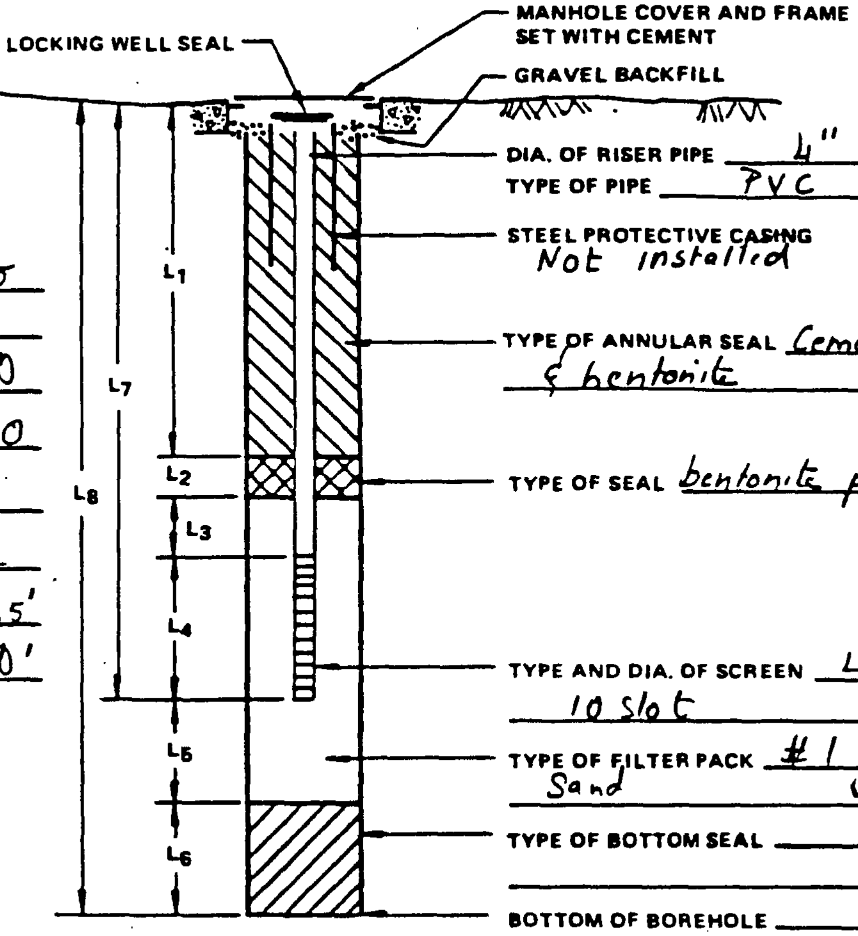
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF MONITORING WELL NO. W-24

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 22.86'	DATE FINISHED 12-2-88
METHOD OF DRILLING Hollow stem Auger DIA. OF BOREHOLE ≈10" DEPTH OF BOREHOLE 19' feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 7.94'	INSPECTOR: R. Kayal CHECKED BY:
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY	BLOCK

GENERALIZED SOIL DESCRIPTION



L1 5.5

L2 10

L3 20

L4 10.0

L5 0.5'

L6 —

L7 18.5'

L8 19.0'

DIA. OF RISER PIPE 4"

TYPE OF PIPE PVC

STEEL PROTECTIVE CASING Not installed

TYPE OF ANNULAR SEAL Cement & bentonite

TYPE OF SEAL bentonite pellets

TYPE AND DIA. OF SCREEN 4" PVC 10 Slot

TYPE OF FILTER PACK #1 grade Sand

TYPE OF BOTTOM SEAL

BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 19' Installed 4" threaded PVC, screen and riser at 18.5'. Well installation included a filter pack of #1 Sand (18.5-6.5'), bentonite Seal (6.5-5.5') and an annular seal of bentonite and cement (5.5-surface). Well Development performed with a 3 inc ID bailer. 15 gallons of water removed. Well used to dry out after each 1 gallon removed.

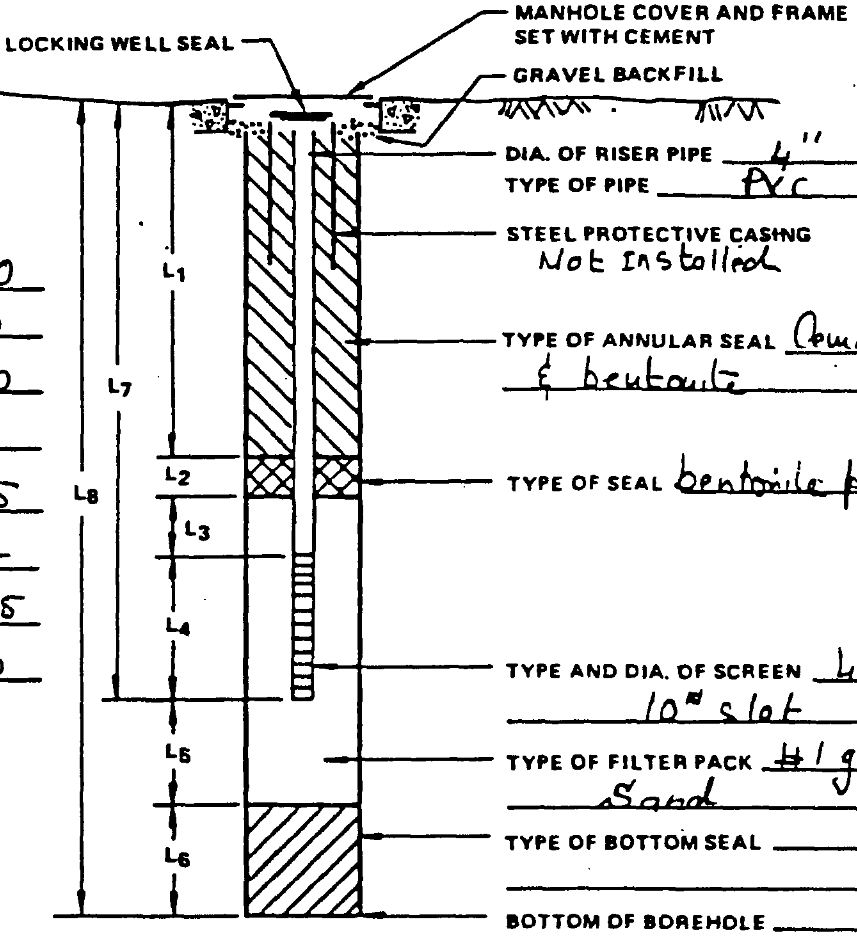
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF MONITORING WELL NO. W-25

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 22.77'	DATE FINISHED 12-5-83
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE ≈10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV.	INSPECTOR:
	GROUND WATER ELEV. 7.96'	CHECKED BY:
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY	BLOCK

GENERALIZED SOIL DESCRIPTION



L1 6.0

L2 1.0

L3 2.0

L4 10

L5 0.5

L6 —

L7 19.5

L8 20

DIA. OF RISER PIPE 4"

TYPE OF PIPE PVC

STEEL PROTECTIVE CASING Not Installed

TYPE OF ANNULAR SEAL Cement & bentonite

TYPE OF SEAL bentonite pellets

TYPE AND DIA. OF SCREEN 4" PVC 10# slot

TYPE OF FILTER PACK #1 grade Sand

TYPE OF BOTTOM SEAL

BOTTOM OF BOREHOLE

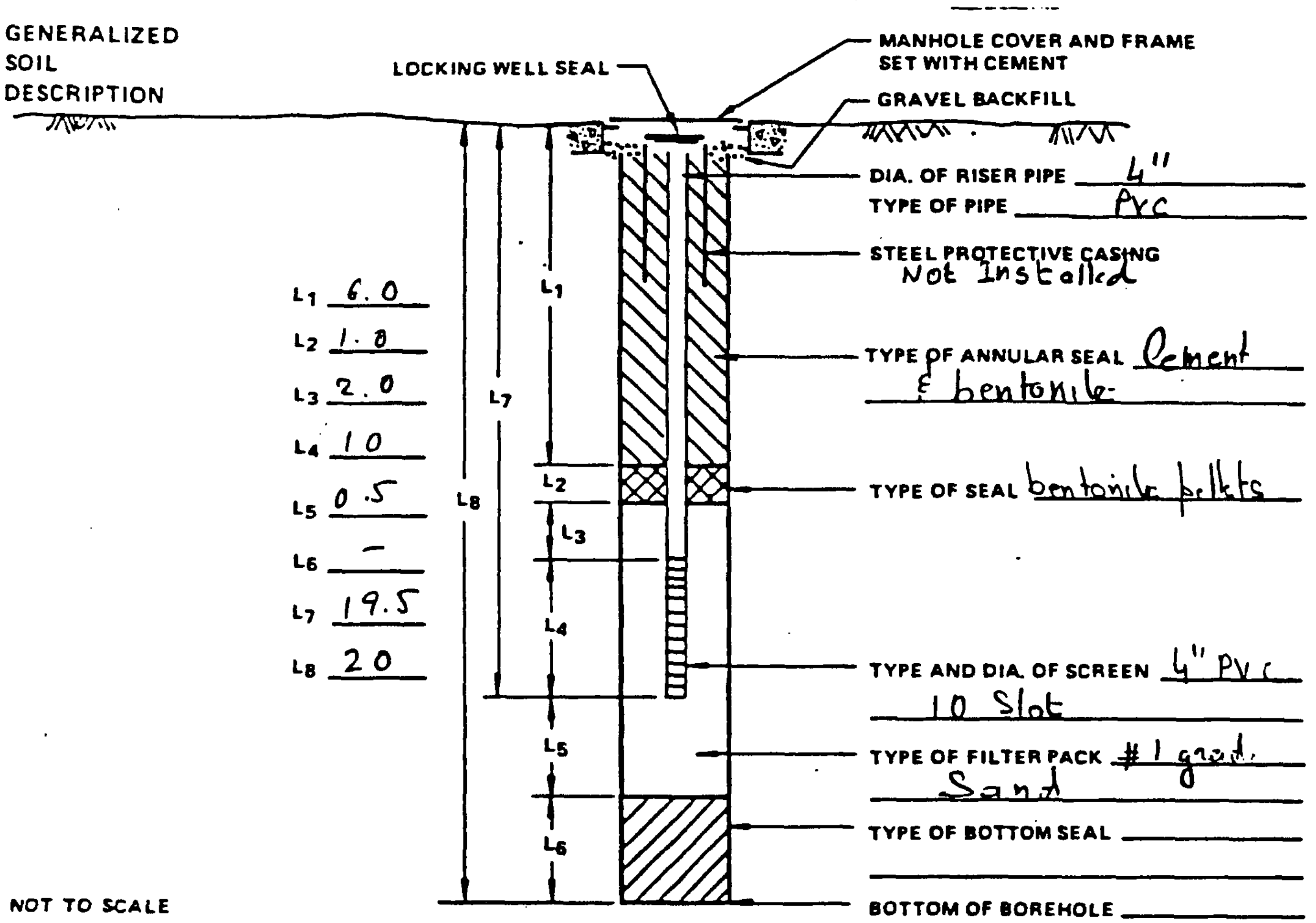
NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 20'. Installed 4" threaded PVC screen and riser at 19.5 ft. Well installation included a filter pack #1 Sand (20-7') bentonite seal (7-6') and an annular seal of bentonite and cement (6 to surface). Well development was performed with a 3" ID Bailer. 30 gallons of water were approximately removed. Well used to dry out after each 7-8 gallons removed.

WOODWARD–CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF MONITORING WELL NO. W-26

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 23.11'	DATE FINISHED 12-5-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE ≈ 10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 7.91'	INSPECTOR: CHECKED BY:
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY	BLOCK



L1 6.0
L2 1.0
L3 2.0
L4 10
L5 0.5
L6 –
L7 19.5
L8 20

DIA. OF RISER PIPE 4"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not Installed
TYPE OF ANNULAR SEAL Cement & bentonite
TYPE OF SEAL bentonite pellets
TYPE AND DIA. OF SCREEN 4" PVC 10 Slot
TYPE OF FILTER PACK #1 grad. Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 30'. Installed 4" threaded PVC screen and riser at 19.5 ft. Well installation included a filter pack #1 sand (20-7'), bentonite pellets (7-6') and an annular seal of bentonite and Cement (6' to surface). Well development was performed with a Centrifugal pump. Approximately 50 gallon of water was purged. At end of development water was Clear

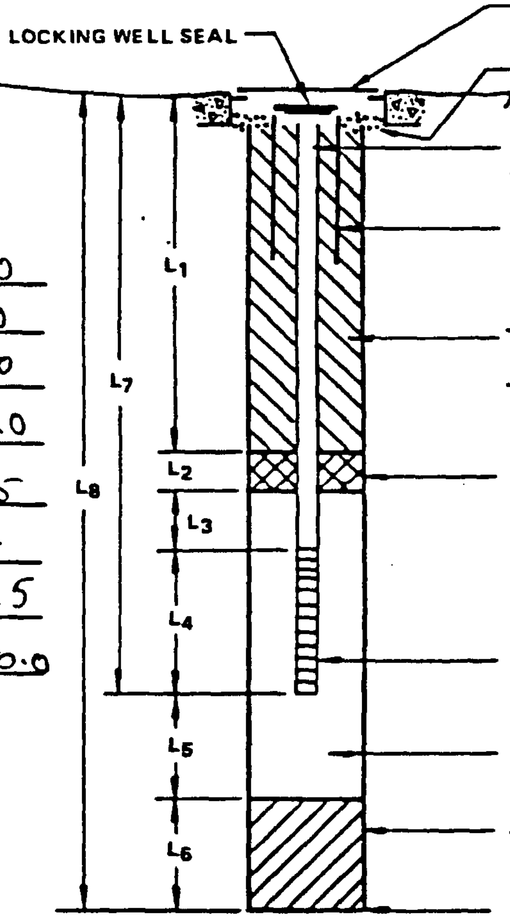
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF MONITORING WELL NO. W-27

PROJECT AND LOCATION GPU OYSTER CREEK	**GROUND ELEV. AND DATUM** Not available	**PROJECT NO.** 8764649
DRILLING AGENCY Empire Soils	**TOP OF RISER ELEV.** 23.17′	**DATE FINISHED** 12-6-88.
METHOD OF DRILLING Hollow Stem Auger **DIA. OF BOREHOLE** ≈ 10″ **DEPTH OF BOREHOLE** 20 feet	**TOP OF PROTECTIVE CASING ELEV.** **GROUND WATER ELEV.** 6.47′	**INSPECTOR:** Romez Kayal **CHECKED BY:**
LATITUDE AND LONGITUDE	**MUNICIPALITY**	**LOT**
PERMIT NO.	**COUNTY** Ocean	**BLOCK**

GENERALIZED SOIL DESCRIPTION



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 0.5
L6 –
L7 19.5
L8 20.0

MANHOLE COVER AND FRAME SET WITH CEMENT

GRAVEL BACKFILL

DIA. OF RISER PIPE 4″

TYPE OF PIPE PVC

STEEL PROTECTIVE CASING Not Installed

TYPE OF ANNULAR SEAL Cement & Bentonite

TYPE OF SEAL Bentonite pellets

TYPE AND DIA. OF SCREEN 4″ PVC 10 Slot

TYPE OF FILTER PACK #1 grade Sand

TYPE OF BOTTOM SEAL

BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 20′ Installed 4″ threaded PVC screen and riser at 19.5 ft Well installation included a filter pack #1 Sand (20-7) bentonite pellets (7-6′) and an annular seal of bentonite and cement (6′ to surface) Well development was performed with a centrifugal pump Approximately 35 gallons of water was purged Well used to dry out after each 7-8 gallons of water removed

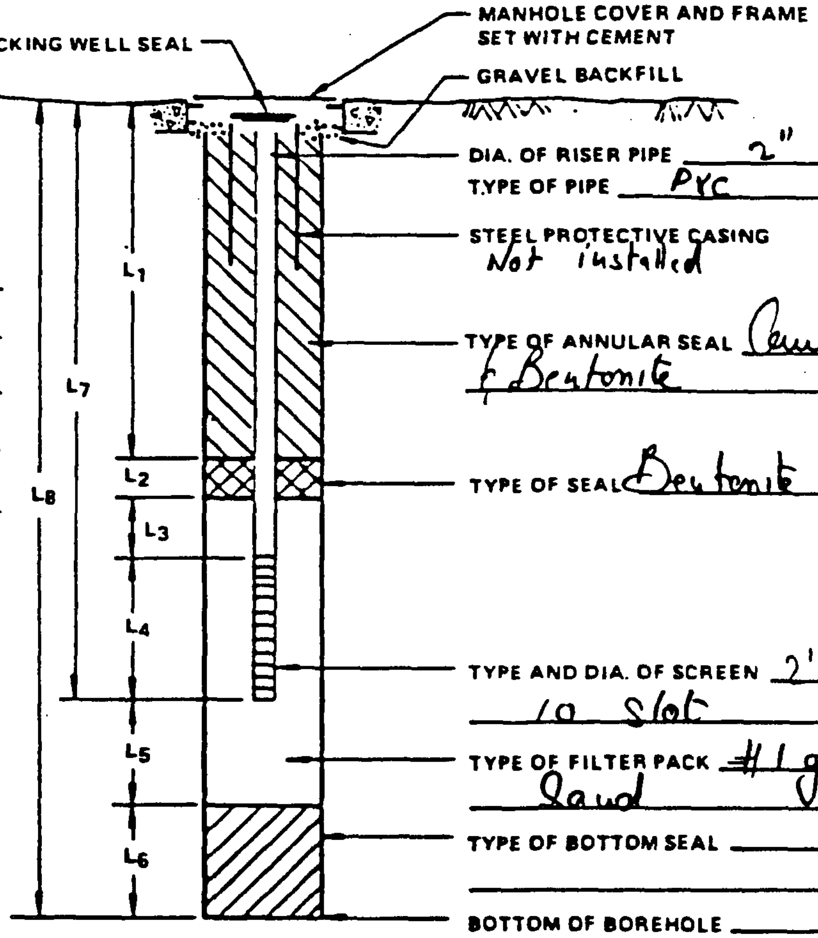
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF OBSERVATION WELL NO. OW-1

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 23.21	DATE FINISHED 12-6-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE 10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 6.83'	INSPECTOR CHECKED BY
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY Ocean	BLOCK

GENERALIZED SOIL DESCRIPTION



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 0.5
L6 –
L7 19.5
L8 20.0

DIA. OF RISER PIPE 2"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not installed
TYPE OF ANNULAR SEAL Cement & Bentonite
TYPE OF SEAL Bentonite pellets
TYPE AND DIA. OF SCREEN 2" PVC 10 Slot
TYPE OF FILTER PACK #1 grade Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

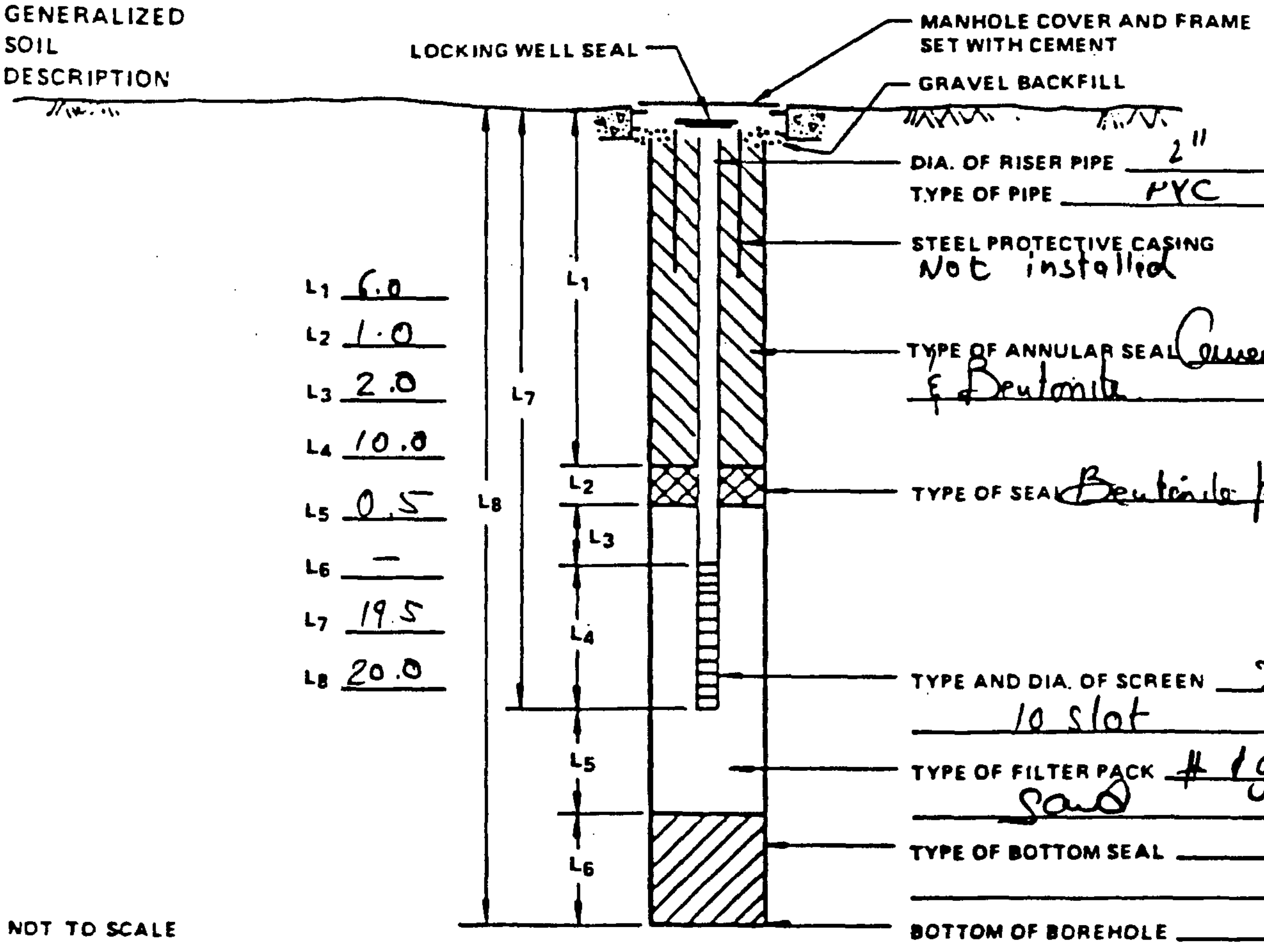
REMARKS Auger down to a depth of 20'. Installed 4" threaded PVC Screen and riser at 19.5 feet. Well installation included a filter pack #1 Sand (20-7'), bentonite pellets (7-6') and an annular seal of bentonite and Cement (6' to surface)

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF OBSERVATION WELL NO. OW-2

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 23.15'	DATE FINISHED 12-6-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE 8 10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV.	INSPECTOR R. Kayal
	GROUND WATER ELEV. 7.12'	CHECKED BY
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY Ocean	BLOCK



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 0.5
L6 –
L7 19.5
L8 20.0

DIA. OF RISER PIPE 2"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not installed
TYPE OF ANNULAR SEAL Cement & Bentonite
TYPE OF SEAL Bentonite pellets
TYPE AND DIA. OF SCREEN 2" PVC 10 slot
TYPE OF FILTER PACK #1 Grade Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 20' Installed 4" threaded PVC screen and riser at 17.5 ft. Well installation included a filter pack #1 Sand (20-7), bentonite pellets (7-6') and an annular seal of bentonite and cement (6' to surface)

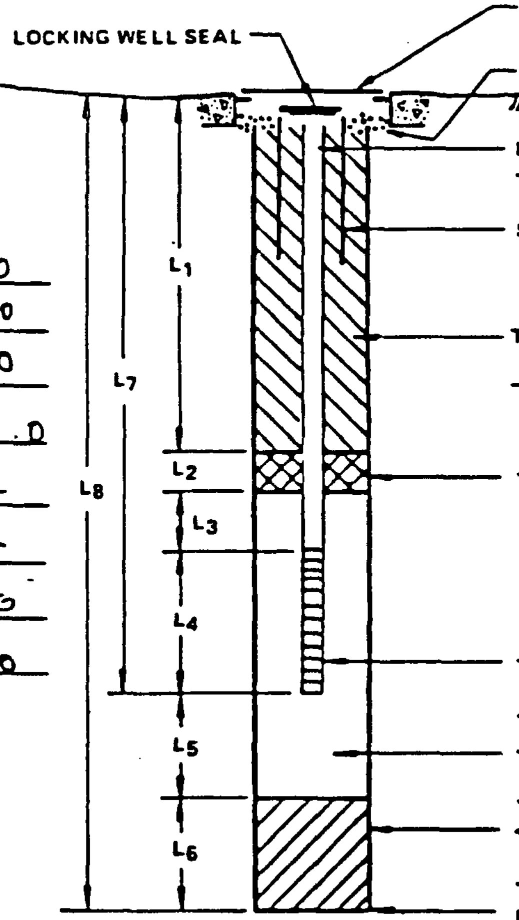
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF OBSERVATION WELL NO. OW-3 (SSB-1)

PROJECT AND LOCATION GPU OYSTER CREEK.	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 22.85'	DATE FINISHED 12-8-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE ≈10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 5.15'	INSPECTOR R. Kayal CHECKED BY
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY	BLOCK

GENERALIZED SOIL DESCRIPTION



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 –
L6 –
L7 20
L8 20

DIA. OF RISER PIPE 2"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not Installed
TYPE OF ANNULAR SEAL Cement & bentonite
TYPE OF SEAL Bentonite pellets
TYPE AND DIA. OF SCREEN 2" PVC 10 slot
TYPE OF FILTER PACK #grade Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

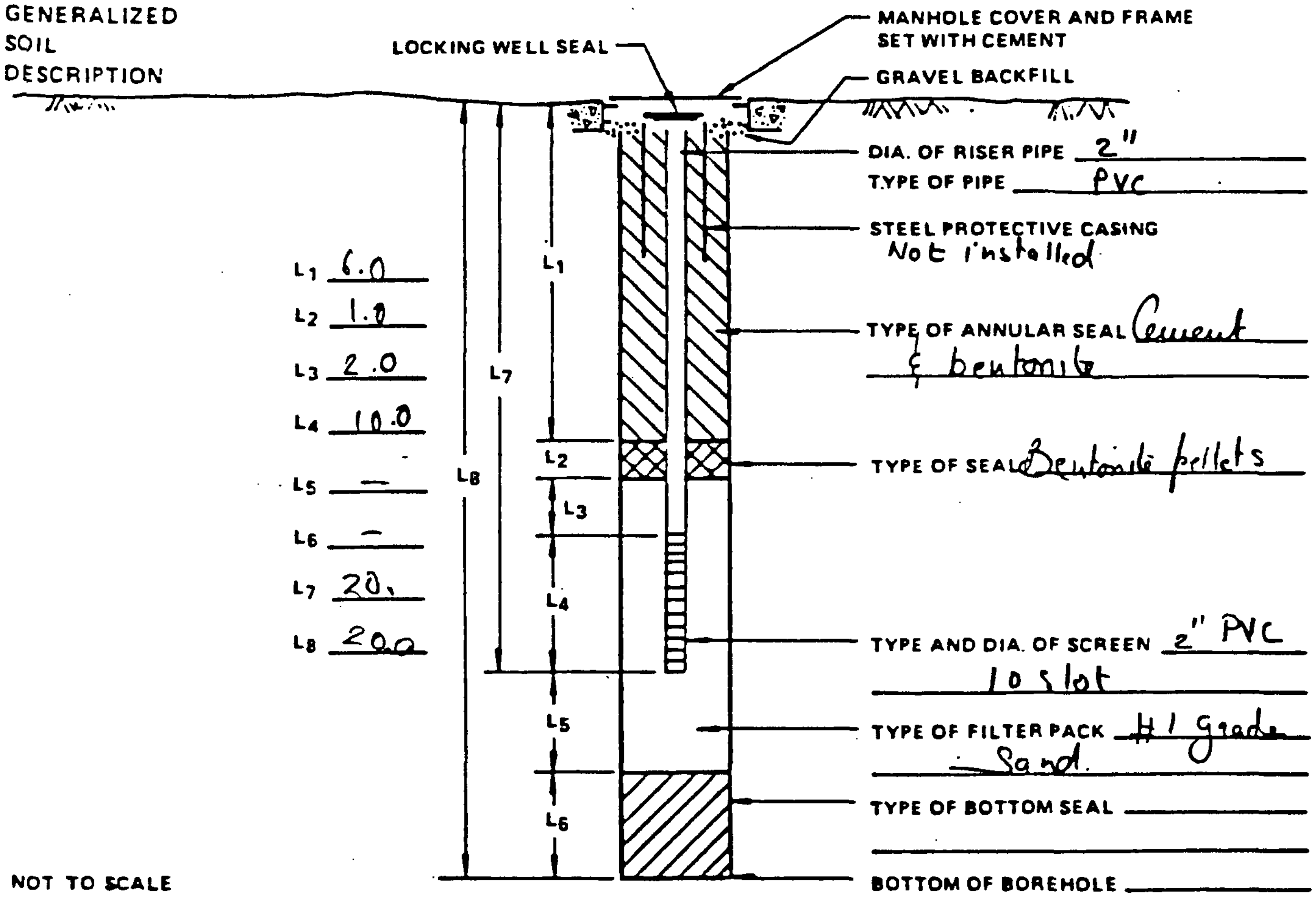
REMARKS Auger down to a depth of 20' Installed 2" temporary threaded pvc screen and riser at at 20 ft. Well was converted to a permanent Observation well 2 days later. Well caved in to 15 feet ≈ water level due to the fact that the hole was left open for 2 days. Well installation included a filter pack #1 Sand (15 to 8), bentonite pellets (8-7) and an annular seal of bentonite and cement (7' to surface).

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF OBSERVATION WELL NO. OW- 4

PROJECT AND LOCATION GPU OYSTER CREEK	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4649
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 23.19'	DATE FINISHED 12-8-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE ~10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 5.63'	INSPECTOR R. Kayal CHECKED BY
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY Ocean	BLOCK



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 –
L6 –
L7 20.
L8 20.0

DIA. OF RISER PIPE 2"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not installed
TYPE OF ANNULAR SEAL Cement & bentonite
TYPE OF SEAL Bentonite pellets
TYPE AND DIA. OF SCREEN 2" PVC 10 slot
TYPE OF FILTER PACK #1 Grade Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 20' installed temporary threaded PVC screen & riser at 20.0 ft. Well converted to permanent Observ. Well 2 days later. As a result caving occur to 15 feet depth (Water level). Well installation included natural filling (20-15 ft)(as a result of caving), a filter pack #1 Sand (15 to 8), bentonite pellets (8-7) and an annular seal of bentonite & Cement (7' to surface)

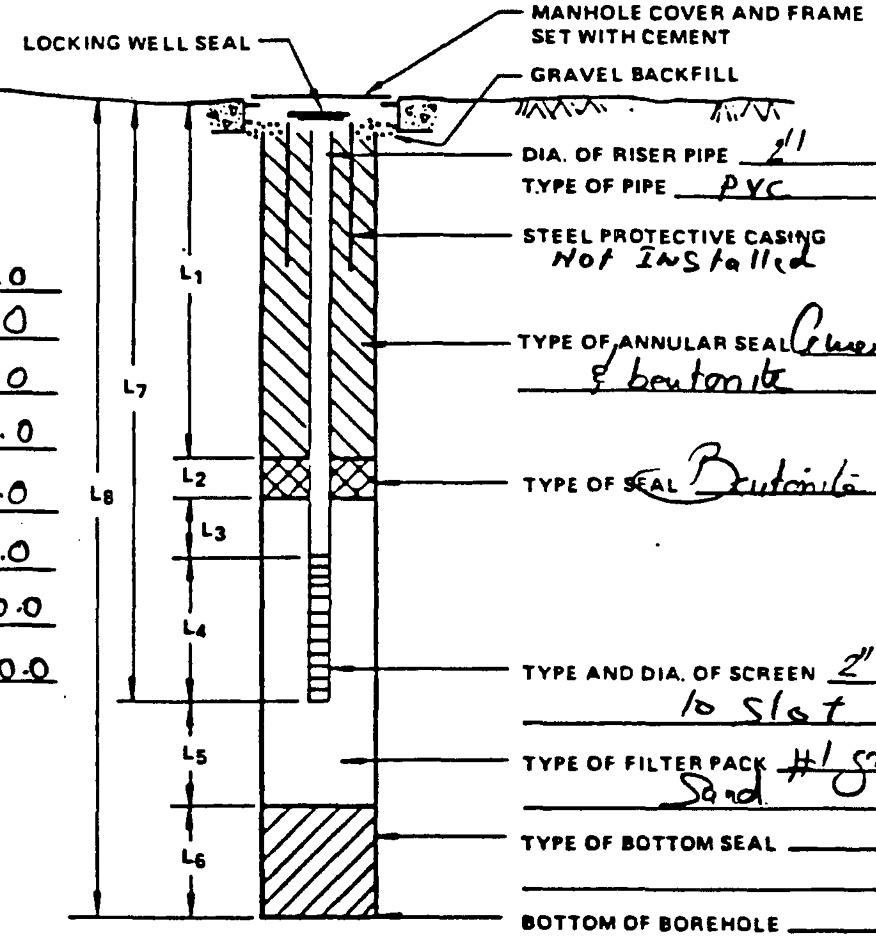
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF OBSERVATION WELL NO. OW-5

PROJECT AND LOCATION GPU OYSTER Creek	GROUND ELEV. AND DATUM Not available	PROJECT NO. 87C4619
DRILLING AGENCY Empire Soils	TOP OF RISER ELEV. 22.73'	DATE FINISHED 12-8-88
METHOD OF DRILLING Hollow Stem Auger DIA. OF BOREHOLE ≃10" DEPTH OF BOREHOLE 20 feet	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV. 4.41'	INSPECTOR R. Kayal CHECKED BY
LATITUDE AND LONGITUDE	MUNICIPALITY	LOT
PERMIT NO.	COUNTY Ocean	BLOCK

GENERALIZED SOIL DESCRIPTION



L1 6.0
L2 1.0
L3 2.0
L4 10.0
L5 0.0
L6 0.0
L7 20.0
L8 20.0

DIA. OF RISER PIPE 2"
TYPE OF PIPE PVC
STEEL PROTECTIVE CASING Not Installed
TYPE OF ANNULAR SEAL Cement & bentonite
TYPE OF SEAL Bentonite pellets
TYPE AND DIA. OF SCREEN 2" PVC 10 Slot
TYPE OF FILTER PACK #1 grade Sand
TYPE OF BOTTOM SEAL
BOTTOM OF BOREHOLE

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS Auger down to a depth of 20', Installed temporary threaded PVC screen & riser at 20.0 ft. Well converted to a permanent Observation well 1 day later. As a result caving occur to a depth of 15 feet (at Water level) Well installation included natural filling (20-15 ft) (as a result of caving), filter pack #1 Sand (15 to 8), bentonite pellets (8-7) and an annular seal of bentonite & Cement (7 to surface)

prepared 13-Aug-90

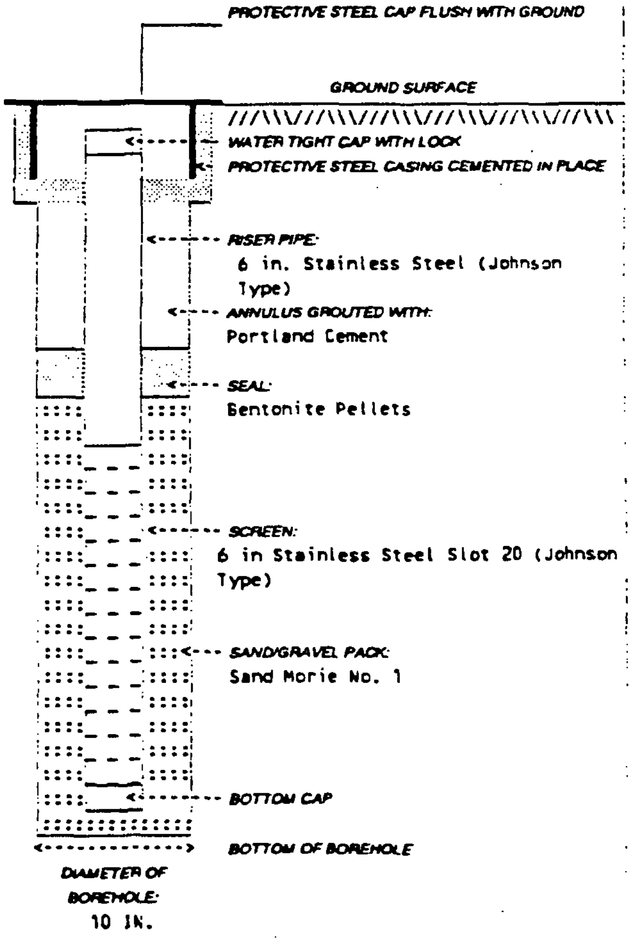
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF PIEZOMETER: RC-1

Project name & location GPU OYSTER CREEK	Project No. 87C4649	NJDEP well permit No. 33 - 27913	Elevation datum
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		Surveyor INPUT	Ground elevation 100.00 ft
Date of Completion 8/3/90		Longitude INPUT	Top of protective steel cap elevation 100.10 ft
Inspector STEPHEN MAYER		Latitude INPUT	Top of riser pipe elevation 99.75 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.75	
Orange brown M to f. SAND, trace silt, dry.		
	91.00	9.00
	89.00	11.00
Orange brown M to f. SAND, trace silt, dry.	87.00	13.00
Same as above, except wet around 15 ft. and finer with depth.		
Dark gray clay trace silt, wet	79.98	20.02
	79.50	20.50

CONSTRUCTION DETAILS



RISER PIPE: 6 in. Stainless Steel (Johnson Type)

ANNULUS GROUTED WITH: Portland Cement

SEAL: Bentonite Pellets

SCREEN: 6 in Stainless Steel Slot 20 (Johnson Type)

SAND/GRAVEL PACK: Sand Morie No. 1

DIAMETER OF BOREHOLE: 10 IN.

REMARKS (Installation, development):
Same installation procedures as for OW-6 except used 3 bags of gravel.
Well terminates with a 12 inch flush mount.

prepared 13-Aug-90

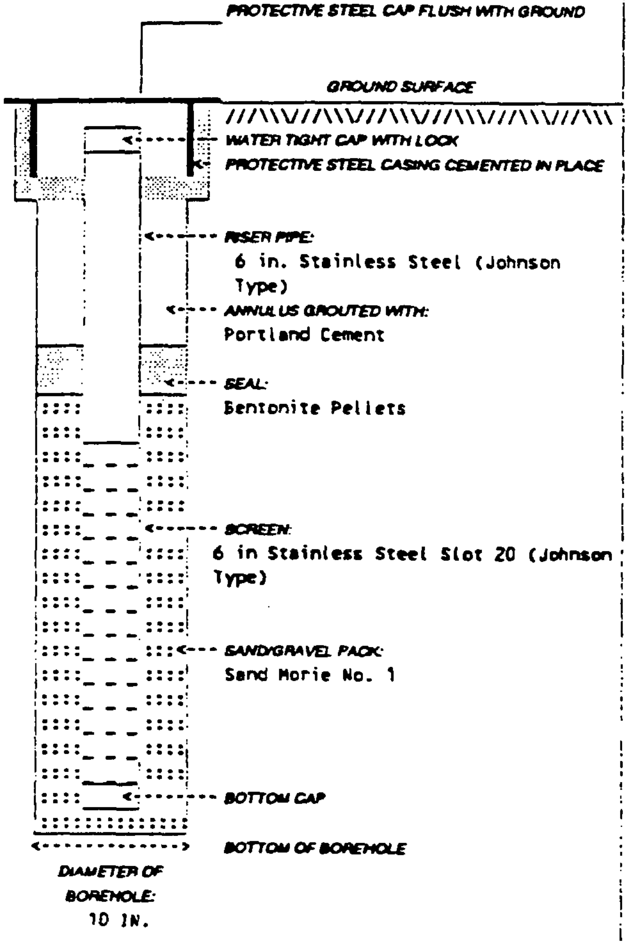
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF PIEZOMETER: RC-2

Project name & location GPU OYSTER CREEK	*Project No.* 87C4649	*NJDEP well permit No.* 33-27914	*Elevation datum*
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		*Surveyor* INPUT	*Ground elevation* 100.00 ft
Date of Completion 8/6/90		*Longitude* INPUT	*Top of protective steel cap elevation* 100.10 ft
Inspector STEPHEN MAYER		*Latitude* INPUT	*Top of riser pipe elevation* 99.75 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.75	
Orange brown M to f. SAND, trace silt, dry.		
	91.00	9.00
	89.00	11.00
Orange brown M to f. SAND, trace silt, dry.	87.00	13.00
Same as above, except wet around 15 ft. and finer with depth.		
Dark gray clay trace silt, wet	79.96	20.04
	79.00	21.00

CONSTRUCTION DETAILS



RISER PIPE: 6 in. Stainless Steel (Johnson Type)

ANNULUS GROUTED WITH: Portland Cement

SEAL: Bentonite Pellets

SCREEN: 6 in Stainless Steel Slot 20 (Johnson Type)

SAND/GRAVEL PACK: Sand Morie No. 1

DIAMETER OF BOREHOLE: 10 IN.

REMARKS (installation, development):
Same installation procedures as for OW-6 except used 3 bags of gravel.
Well terminates with a 12 inch flush mount.

1991
WELL INSTALLATION LOGS
RC-1 to RC-5
IJ-1 TO IJ-5

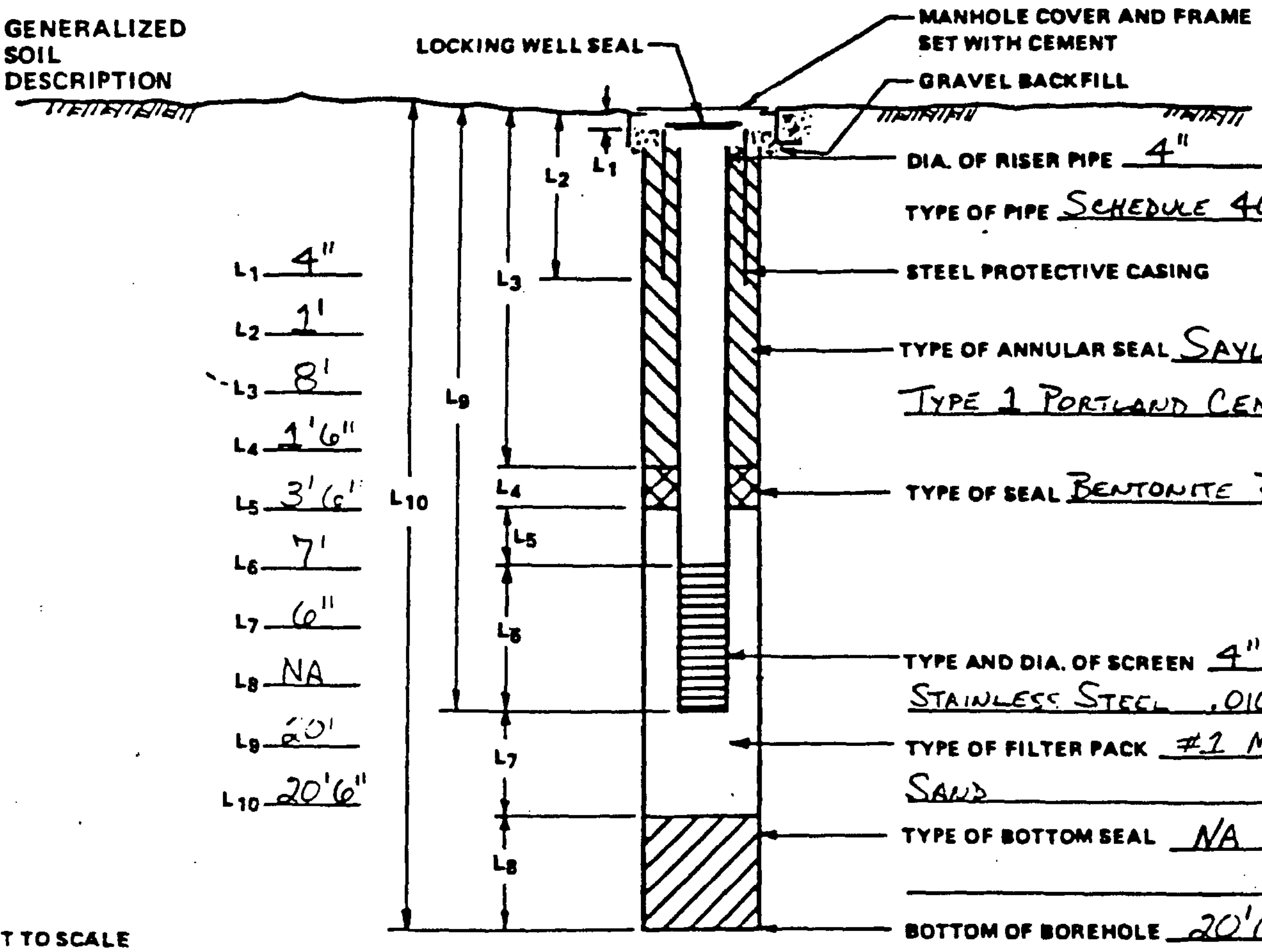
WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF FLUSHMOUNT MONITORING WELL NO. RC-3

ROJECT AND LOCATION GPU FORKED RIVER NJ	GROUND ELEV. AND DATUM	PROJECT NO. 87C4649
DRILLING AGENCY SAMUEL STOTHOFF CO. INC.	TOP OF RISER ELEV. 23.11	DATE FINISHED 11-4-91
METHOD OF DRILLING HOLLOW STEM AUGER (6¼" ID) DIA. OF BOREHOLE APPROX. 12" DEPTH OF BOREHOLE 20' 6"	TOP OF PROTECTIVE CASING ELEV.	INSPECTOR: K. KIEVIT
	GROUND WATER ELEV.	CHECKED BY:

GENERALIZED SOIL DESCRIPTION



L1 4"
L2 1'
L3 8'
L4 1'6"
L5 3'6"
L6 7'
L7 6"
L8 NA
L9 20'
L10 20'6"

DIA. OF RISER PIPE 4"
TYPE OF PIPE SCHEDULE 40 PVC
TYPE OF ANNULAR SEAL SAYLOR'S TYPE 1 PORTLAND CEMENT
TYPE OF SEAL BENTONITE PELLETS
TYPE AND DIA. OF SCREEN 4" #304 STAINLESS STEEL .010 SLOT
TYPE OF FILTER PACK #1 MORIE SAND
TYPE OF BOTTOM SEAL NA
BOTTOM OF BOREHOLE 20'6"

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS: TO BE USED AS A RECOVERY WELL
10 BAGS #1 MORIE SAND (50lbs.)
1.5 BUCKETS BENTONITE PELLETS (50lbs.)
4 BAGS PORTLAND CEMENT

PERMIT # 3329584

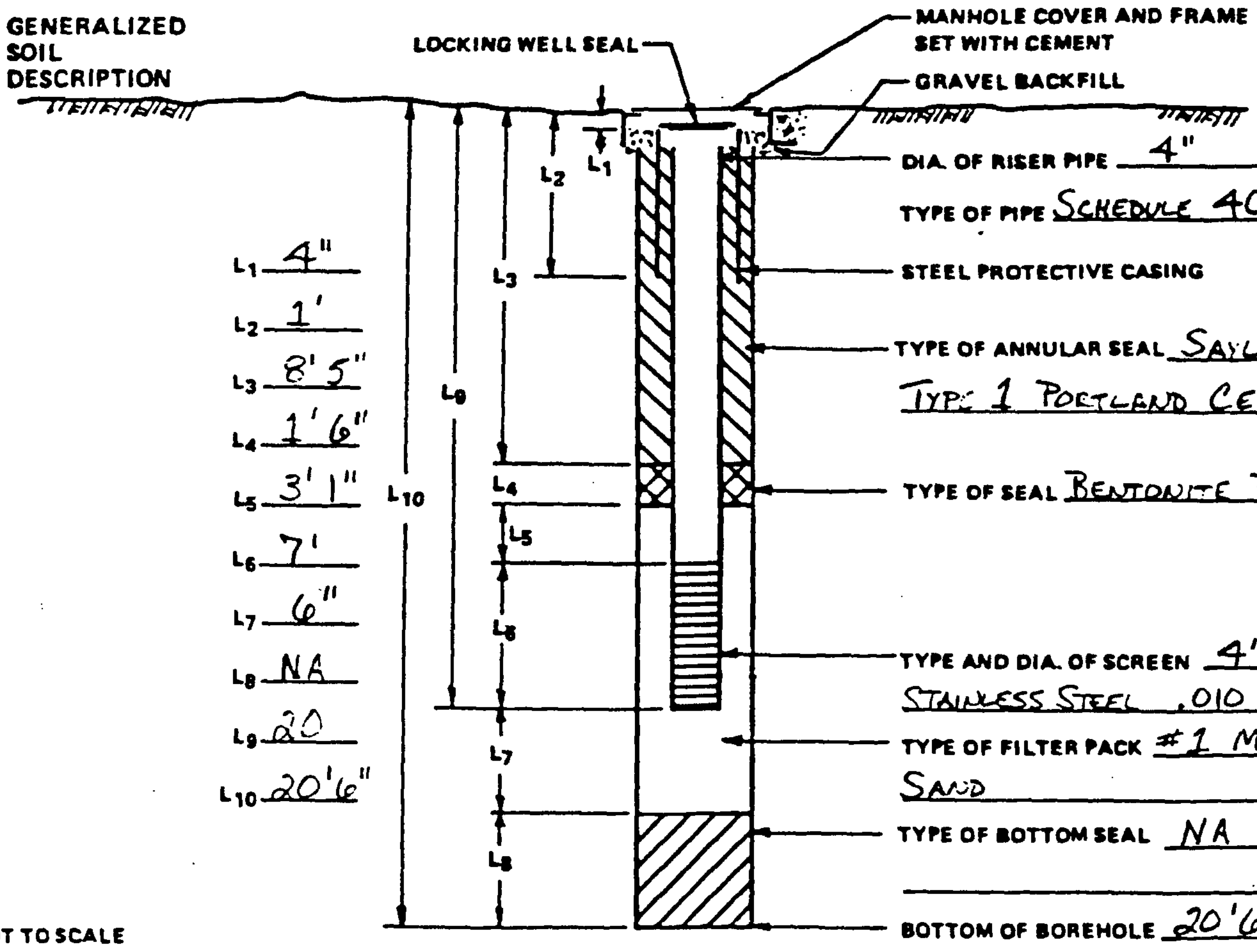
WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF FLUSHMOUNT MONITORING WELL NO. RC-4

OJECT AND LOCATION GPU Forked River NJ	GROUND ELEV. AND DATUM	PROJECT NO. 87C4649
DRILLING AGENCY Samuel Stothoff Co. Inc.	TOP OF RISER ELEV. 23.08	DATE FINISHED 11-5-91
METHOD OF DRILLING Hollow Stem Auger (6¼" ID) DIA. OF BOREHOLE Approx. 12" DEPTH OF BOREHOLE 20' 6"	TOP OF PROTECTIVE CASING ELEV.	INSPECTOR: K. Kievit
	GROUND WATER ELEV.	CHECKED BY:

GENERALIZED SOIL DESCRIPTION



L1 4"

L2 1'

L3 8' 5"

L4 1' 6"

L5 3' 1"

L6 7'

L7 6"

L8 NA

L9 20

L10 20' 6"

DIA. OF RISER PIPE 4"

TYPE OF PIPE Schedule 40 PVC

TYPE OF ANNULAR SEAL Saylor's Type 1 Portland Cement

TYPE OF SEAL Bentonite Pellets

TYPE AND DIA. OF SCREEN 4" #304 Stainless Steel .010 Slot

TYPE OF FILTER PACK #1 Morie Sand

TYPE OF BOTTOM SEAL NA

BOTTOM OF BOREHOLE 20' 6"

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS: To be used as a recovery well

10 Bags #1 Morie Sand (50lbs.)

1.5 Buckets Bentonite Pellets (50lbs.)

4 Bags Portland Cement

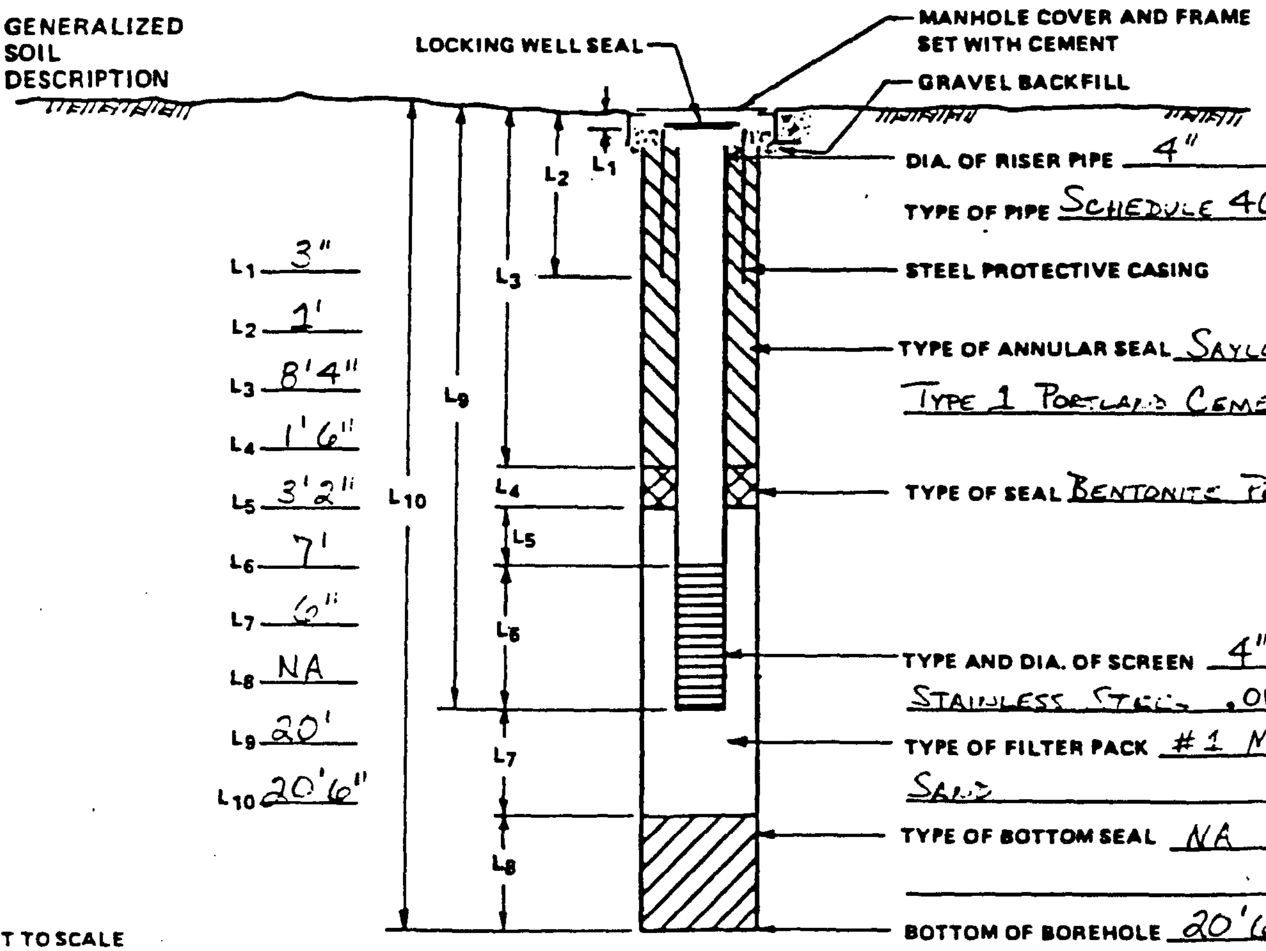
Permit # 3329585

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF FLUSHMOUNT MONITORING WELL NO. RC-5

JECT AND LOCATION GPU FORKED RIVER NJ	GROUND ELEV. AND DATUM	PROJECT NO. 87C4649
DRILLING AGENCY SAMUEL STOTHOFF CO. INC.	TOP OF RISER ELEV. 22.99	DATE FINISHED 11-5-91
METHOD OF DRILLING HOLLOW STEM AUGER (6¼" ID) DIA. OF BOREHOLE APPROX. 12" DEPTH OF BOREHOLE 20' 6"	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV.	INSPECTOR: K. KIEVIT CHECKED BY:



L1 3"
L2 1'
L3 8'4"
L4 1'6"
L5 3'2"
L6 7'
L7 6"
L8 NA
L9 20'
L10 20'6"

DIA. OF RISER PIPE 4"

TYPE OF PIPE SCHEDULE 40 PVC

TYPE OF ANNULAR SEAL SAYLOR'S TYPE 1 PORTLAND CEMENT

TYPE OF SEAL BENTONITE PELLETS

TYPE AND DIA. OF SCREEN 4" #304 STAINLESS STEEL .010 SLOT

TYPE OF FILTER PACK #1 MORIE SAND

TYPE OF BOTTOM SEAL NA

BOTTOM OF BOREHOLE 20'6"

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS: TO BE USED AS A RECOVERY WELL

10 BAGS #1 MORIE SAND (50lbs)

1.5 BUCKETS BENTONITE PELLETS (50lbs.)

4 BAGS PORTLAND CEMENT

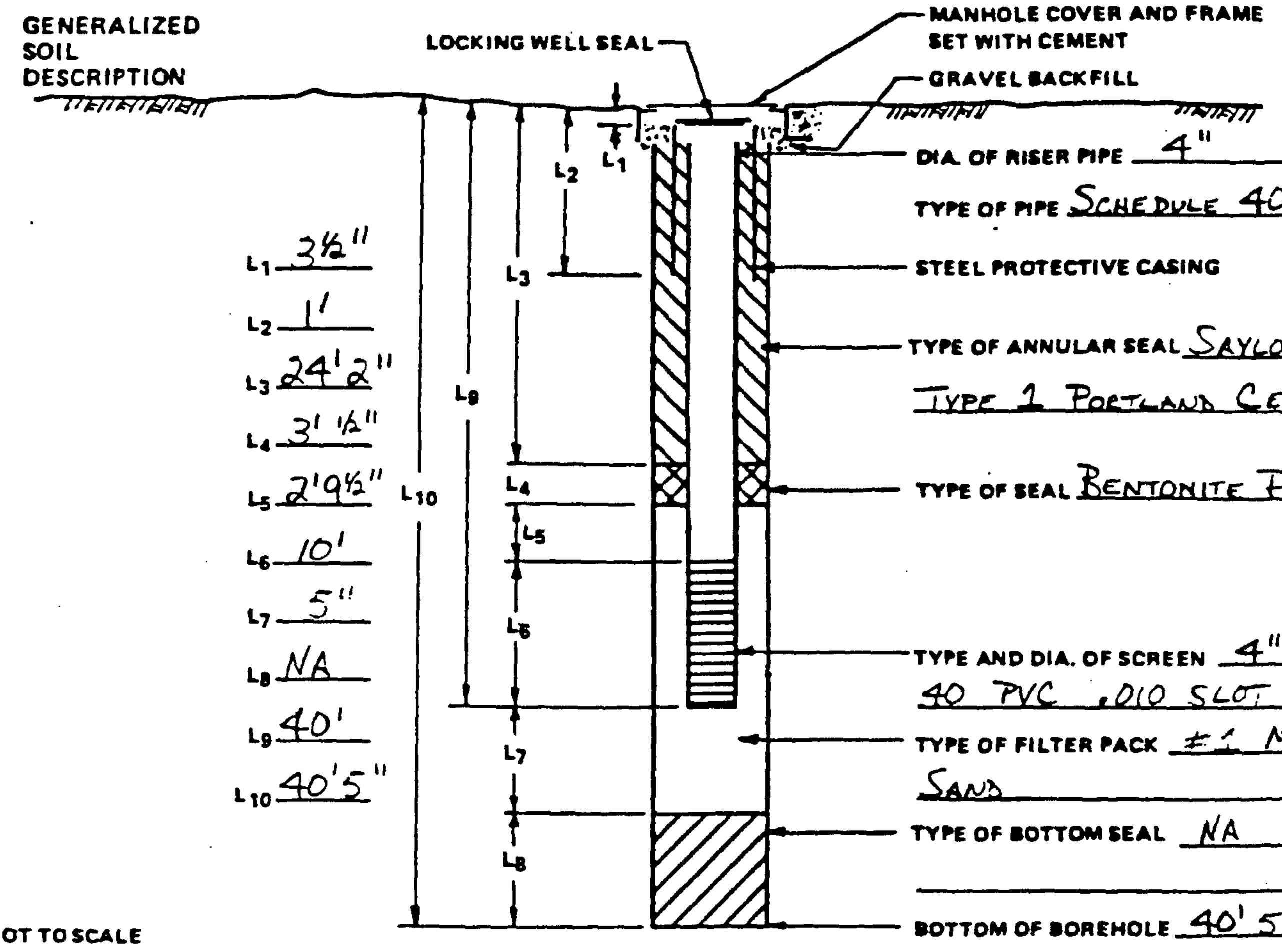
PERMIT # 3329586

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

CONSTRUCTION OF FLUSHMOUNT MONITORING WELL NO. W-34

OJECT AND LOCATION GPU FORKED RIVER NJ	GROUND ELEV. AND DATUM	PROJECT NO. 87C4649
DRILLING AGENCY SAMUEL STOTHOFF CO. INC.	TOP OF RISER ELEV. 23.13	DATE FINISHED 11-7-91
METHOD OF DRILLING MUD-ROTARY (8" TRI-CONE) DIA. OF BOREHOLE APPROX 9" DEPTH OF BOREHOLE 40' 5"	TOP OF PROTECTIVE CASING ELEV. GROUND WATER ELEV.	INSPECTOR: K. KIEVIT CHECKED BY:



L1 3½"
L2 1'
L3 24' 2"
L4 3' ½"
L5 2' 9½"
L6 10'
L7 5"
L8 NA
L9 40'
L10 40' 5"

DIA. OF RISER PIPE 4"
TYPE OF PIPE SCHEDULE 40 PVC
TYPE OF ANNULAR SEAL SAYLOR'S TYPE 1 PORTLAND CEMENT
TYPE OF SEAL BENTONITE PELLETS
TYPE AND DIA. OF SCREEN 4" SCHEDULE 40 PVC .010 SLOT
TYPE OF FILTER PACK #1 MORIE SAND
TYPE OF BOTTOM SEAL NA
BOTTOM OF BOREHOLE 40' 5"

NOT TO SCALE
(VALUES REPORTED IN FT)

REMARKS:

13 BAGS #1 MORIE SAND (50lbs.)
1.5 BUCKETS BENTONITE PELLETS (50lbs.)
6 BAGS PORTLAND CEMENT

PERMIT # 3329587

prepared 13-Aug-90

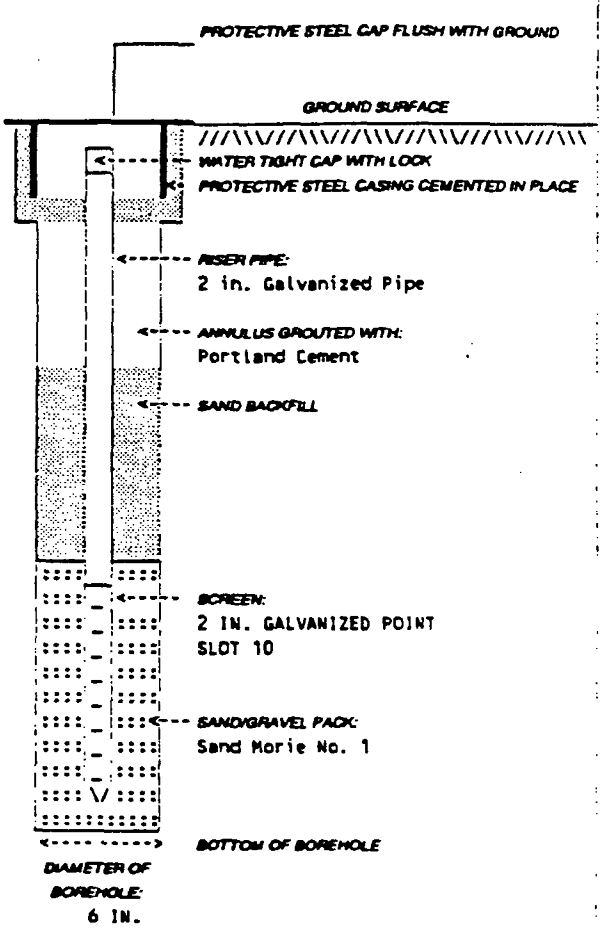
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF INJECTION WELL: IJ-1

Project name & location GPU OYSTER CREEK	Project No. 87C4649	NJDEP well permit No. 3328130	Elevation datum 22.42 ft
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		Surveyor INPUT	Ground elevation
Date of Completion 8/7/90		Longitude INPUT	Top of protective steel cap elevation
Inspector STEPHEN MAYER		Latitude INPUT	Top of riser pipe elevation 22.42ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.20	0.80
Orange brown M. to F. SAND, trace silt, dry.		
	95.00	5.00
	88.00	12.00
At 13 ft. Grey brown M. to F. SAND, trace silt, dry.	86.00	14.00
At about 15 ft. soil is wet		
At 18 ft. Grey M. to F. SAND, some silt, trace clay, lg quartz pebbles and twigs.	83.31	16.69
	82.00	18.00

CONSTRUCTION DETAILS



REMARKS (Installation, development):

Drilled borehole to 18 feet with 6 inch air rotary roller bit. Installed temporary 6 inch steel casing by lowering and driving it to bottom of borehole. Cleaned hole with air and put 12 inches of gravel at bottom of hole. Lowered Galvanized pipe and Galvanized point into borehole. Fill annulus to 12 ft below surface with 2 gravel pack bags. Remove temporary casing and backfill hole with sand. Install 2" PVC water supply side pipe to well. Cemented annular space. Well terminates with an 8 inch flush mount.

prepared 13-Aug-90

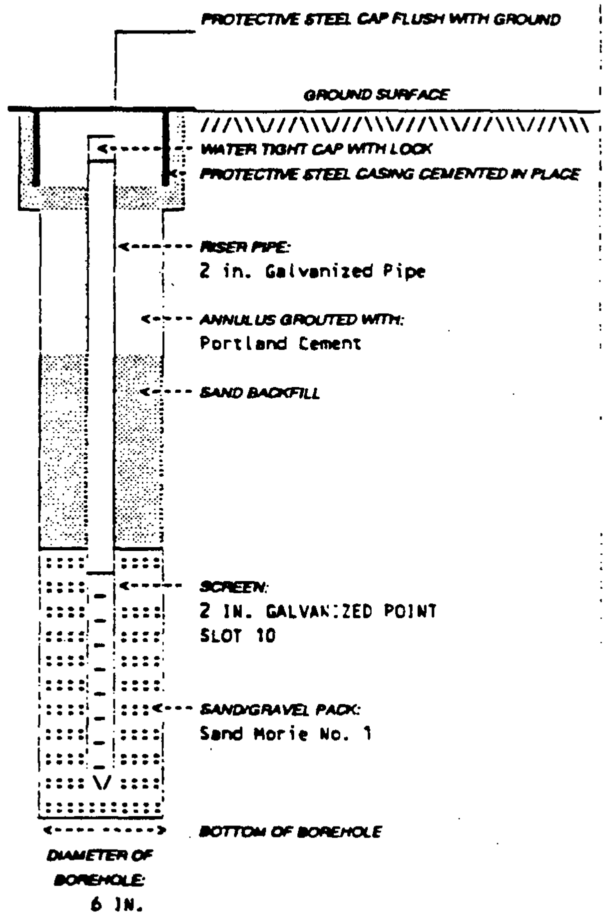
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF INJECTION WELL: IJ-2

Project name & location GPU OYSTER CREEK	Project No. 87C4649	NJDEP well permit No. 33-28131	Elevation datum 22.51 ft
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		Surveyor INPUT	Ground elevation
Date of Completion 8/7/90		Longitude INPUT	Top of protective steel cap elevation
Inspector STEPHEN MAYER		Latitude INPUT	Top of riser pipe elevation 22.51 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.40	0.60
Orange brown M. to F. SAND, trace silt, dry.		
	95.00	5.00
At 12 ft. Grey brown M. to F. SAND, trace silt, dry.	88.00	12.00
	85.00	15.00
At about 15 ft. soil is wet		
	82.60	17.40
	82.00	18.00

CONSTRUCTION DETAILS



REMARKS (Installation, development):

Drilled borehole to 18 feet with 6 inch air rotary roller bit. Installed temporary
6 inch steel casing by lowering and driving it to bottom of borehole. Cleaned hole with air and
put 12 inches of gravel at bottom of hole. Lowered Galvanized pipe and Galvanized point into
borehole. Fill annulus to 12 ft below surface with 2 gravel pack bags. Remove temporary casing
and backfill hole with sand. Install 2" PVC water supply side pipe to well. Cemented annular space.
Well terminates with an 8 inch flush mount.

prepared 13-Aug-90

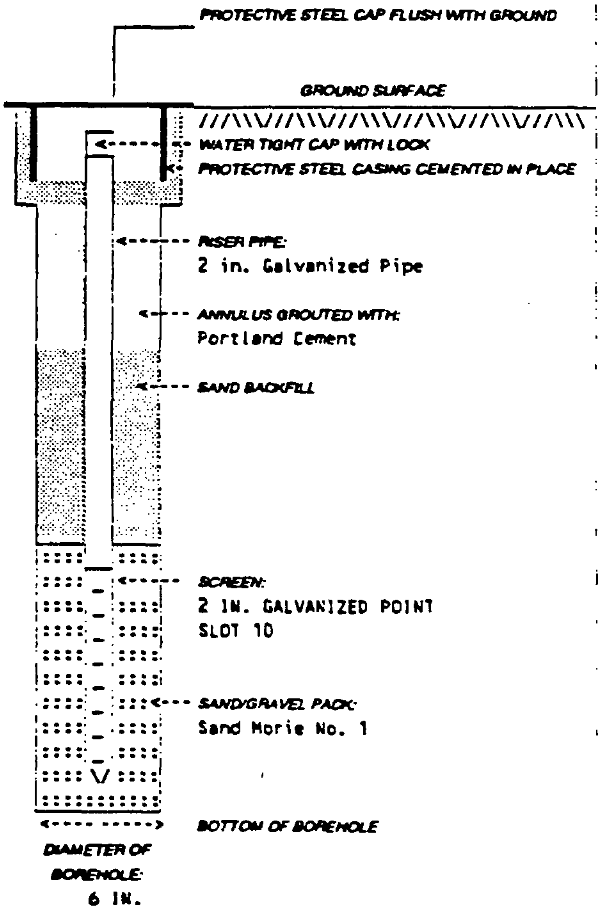
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF INJECTION WELL: IJ-3

Project name & location GPU OYSTER CREEK	*Project No.* 87C4649	*NJDEP well permit No.* 33-28132	*Elevation datum* 22.53 ft
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		*Surveyor* INPUT	*Ground elevation*
Date of Completion 8/8/90		*Longitude* INPUT	*Top of protective steel cap elevation*
Inspector STEPHEN MAYER		*Latitude* INPUT	*Top of riser pipe elevation* 22.53 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.34	0.66
Orange brown M. to F. SAND, trace silt, dry.		
	95.00	5.00
At 12 ft. Grey brown M. to F. SAND, trace silt, dry.	88.00	12.00
	86.00	14.00
At 15.5 ft. soil is wet		
	81.81	18.19
	81.50	18.50

CONSTRUCTION DETAILS



REMARKS (Installation, development):

Drilled borehole to 18.5 feet with 6 inch air rotary roller bit. Installed temporary 6 inch steel casing by lowering and driving it to bottom of borehole. Cleaned hole with air and put 12 inches of gravel at bottom of hole. Lowered Galvanized pipe and Galvanized point into borehole. Fill annulus to 12 ft below surface with 2 gravel pack bags. Remove temporary casing and backfill hole with sand. Install 2" PVC water supply side pipe to well. Cemented annular space. Well terminates with an 8 inch flush mount.

prepared 13-Aug-90

WOODWARD-CLYDE CONSULTANTS

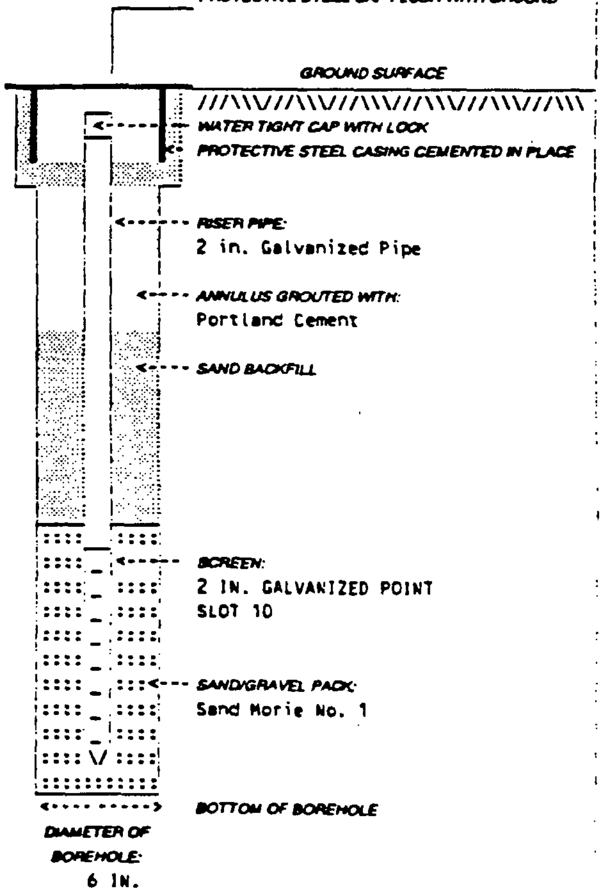
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF INJECTION WELL: IJ-4

Project name & location GPU OYSTER CREEK	Project No. 87C4649	NJDEP well permit No. 33-28133	Elevation datum 22.52 ft
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		Surveyor INPUT	Ground elevation
Date of Completion 8/8/90		Longitude INPUT	Top of protective steel cap elevation
Inspector STEPHEN MAYER		Latitude INPUT	Top of riser pipe elevation 22.52 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.10	0.90
Orange brown M. to F. SAND, trace silt, trace gravel, dry.		
	95.00	5.00
	88.00	12.00
Same as above.		
	86.00	14.00
At about 15.5 ft. soil is wet		
	83.35	16.65
	82.00	18.00

CONSTRUCTION DETAILS



PROTECTIVE STEEL CAP FLUSH WITH GROUND

GROUND SURFACE

WATER TIGHT CAP WITH LOCK

PROTECTIVE STEEL CASING CEMENTED IN PLACE

RISER PIPE: 2 in. Galvanized Pipe

ANNULUS GROUTED WITH: Portland Cement

SAND BACKFILL

SCREEN: 2 IN. GALVANIZED POINT SLOT 10

SAND/GRAVEL PACK: Sand Morie No. 1

BOTTOM OF BOREHOLE

DIAMETER OF BOREHOLE: 6 IN.

REMARKS (Installation, development):

Drilled borehole to 18 feet with 6 inch air rotary roller bit. Installed temporary 6 inch steel casing by lowering and driving it to bottom of borehole. Cleaned hole with air and put 12 inches of gravel at bottom of hole. Lowered Galvanized pipe and Galvanized point into borehole. Fill annulus to 12 ft below surface with 2 gravel pack bags. Remove temporary casing and backfill hole with sand. Install 2" PVC water supply side pipe to well. Cemented annular space. Well terminates with an 8 inch flush mount.

prepared 13-Aug-90

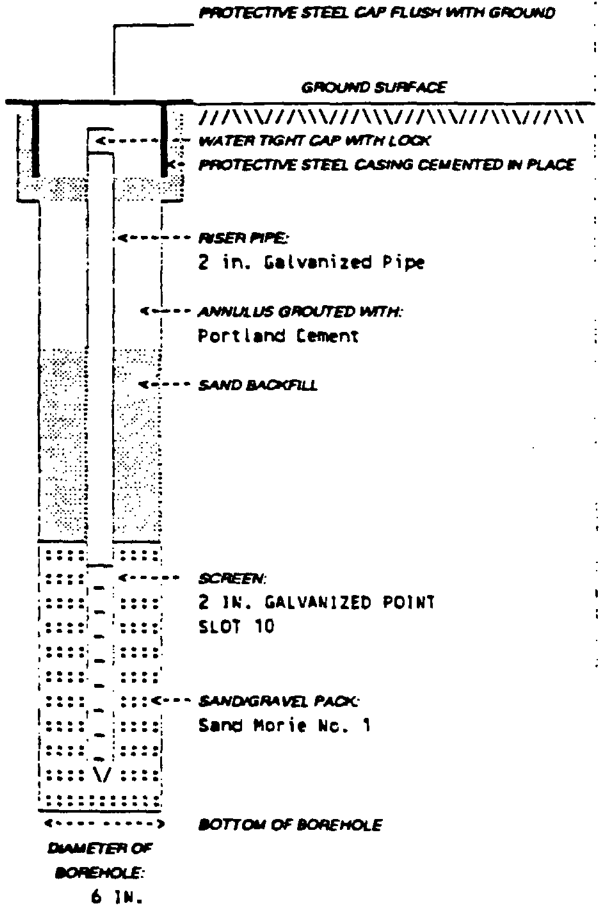
WOODWARD-CLYDE CONSULTANTS
Consulting Engineers, Geologists and Environmental Scientists

CONSTRUCTION OF INJECTION WELL: IJ-5

Project name & location GPU OYSTER CREEK	Project No. 87C4649	NJDEP well permit No. 33-28134	Elevation datum 22.58 ft
Drilling agency SAMUEL STOTHOFF-Driller DENNY WENE		Surveyor INPUT	Ground elevation
Date of Completion 8/8/90		Longitude INPUT	Top of protective steel cap elevation
Inspector STEPHEN MAYER		Latitude INPUT	Top of riser pipe elevation 22.58 ft

GENERALIZED SOIL DESCRIPTION	ELEVATIONS (ft above Mean Sea Level)	DEPTHS (ft below ground, not to scale)
	100.00	0.00
	99.06	0.94
Orange brown M. to F. SAND, trace silt, trace gravel, dry.		
	95.00	5.00
	88.00	12.00
Same as above.		
	86.00	14.00
At about 15 ft. soil is wet		
	82.30	17.70
	82.00	18.00

CONSTRUCTION DETAILS



RISER PIPE:
2 in. Galvanized Pipe

ANNULUS GROUTED WITH:
Portland Cement

SAND BACKFILL

SCREEN:
2 IN. GALVANIZED POINT
SLOT 10

SAND/GRAVEL PACK:
Sand Morie No. 1

DIAMETER OF BOREHOLE:
6 IN.

REMARKS (installation, development):

Drilled borehole to 18 feet with 6 inch air rotary roller bit. Installed temporary
6 inch steel casing by lowering and driving it to bottom of borehole. Cleaned hole with air and
put 12 inches of gravel at bottom of hole. Lowered Galvanized pipe and Galvanized point into
borehole. Fill annulus to 12 ft below surface with 2 gravel pack bags. Remove temporary casing
and backfill hole with sand. Install 2" PVC water supply side pipe to well. Cemented annular space.
Well terminates with an 8 inch flush mount.