United States
Environmental Protection
Agency

Office of
Emergency and
Remedial Response

EPA/ROD/R02-88/069
September 1988

EPA

Superfund Record of Decision:

G.E. Wiring, PR

50272-101

REPORT DOCUMENTATION PAGE	1. REPORT NO. EPA/ROD/R02-88/069	2.	3. Recipient's Accession No.

4. Title and Subtitle
SUPERFUND RECORD OF DECISION
GE Wiring Devices, PR
First Remedial Action - Final

5. Report Date 09/30/88

6.

7. Author(s)

8. Performing Organization Rept. No.

9. Performing Organization Name and Address

10. Project/Task/Work Unit No.

11. Contract(C) or Grant(G) No.
(C)
(G)

12. Sponsoring Organization Name and Address
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered 800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The GE Wiring Devices site is located in Juana Diaz, Puerto Rico. The General Electric Company (G.E.) owns and operates a five-acre wiring devices plant at this site, which assembled silent mercury switches from 1957 until 1969. Approximately half a ton of mercury was discarded along with 4,000 yd^3 of defective switch parts and plastic scraps in an onsite waste-fill area about 1 acre in area and 1 to 4 feet deep. Several residences are located approximately 400 feet south of the waste-fill area, which is surrounded by a concrete retaining wall and a fence. Ground water in the area is used as a source of drinking water with a public supply well located approximately 1,500 feet west of the waste-fill area. In addition, ground water flows to the west toward the San Jacaquas River. About 500,000 gallons of perched water has accumulated within the waste-fill area as a result of precipitation/recharge. Evidence indicates that contamination of the water table is occurring due to the migration of perch water through the clay layer that exists beneath the waste-fill area. Approximately 1,500 yd^3 of near-surface soil south and downgradient of the waste-fill area has been contaminated by mercury primarily as a result of previous surface runoff from the plant area. The primary contaminant of concern affecting the ground water, soil, and debris is mercury.
(See Attached Sheet)

17. Document Analysis a. Descriptors
Record of Decision
GE Wiring Devices, PR
First Remedial Action - Final
Contaminated Media: gw, soil, debris
Key Contaminants: mercury

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 21
	20. Security Class (This Page) None	22. Price

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16. ABSTRACT (continued)

The selected remedial action for this site includes: onsite hydrometallurgical treatment of the waste-fill materials, perched water, and contaminated near-surface soil with disposal of the treatment residue in the former waste-fill area, followed by covering with a clean soil cover, and onsite treatment of the process leaching agent with discharge to a POTW; additional investigation of the ground water to determine the extent of contamination; and limited ground water monitoring, provided there is no need for ground water remediation. The estimated capital cost for this remedial action is $1,912,870. There are no O&M costs associated with this remedy.

DECLARATION STATEMENT

RECORD OF DECISION

SITE NAME AND LOCATION

GE Wiring Devices, Juana Diaz, Puerto Rico

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the GE Wiring Devices Site, in Juana Diaz, Puerto Rico, developed in accordance with CERCLA, as amended by SARA, and, to the extent practicable, the National Contingency Plan. This decision is based on the administrative record for this site. The attached index identifies the items that comprise the administrative record upon which the selection of the remedial action is based.

The Commonwealth of Puerto Rico has concurred in the selected remedy.

DESCRIPTION OF THE SELECTION REMEDY

The remedial action would remediate the waste-fill area, perched water, and the mercury contaminated near-surface soils to levels which would be protective of public health. With respect to contaminated soils downgradient of the waste-fill area, since the mercury is primarily in the upper six inches of soil, the remedial action would include remediation of the upper six inches of soil at a minimum. Since groundwater data is limited, further investigation and monitoring will be conducted during design to determine the extent of groundwater contamination.

The major components of this remedial action are:

- Further treatability studies during remedial design to insure the implementability of hydrometallurgical processes, as well as continued study of other treatment alternatives.
- On-site hydrometallurgical treatment of the waste-fill materials (approximately 4000 cubic yards), perched water (approximately 1/2 million gallons) and contaminated near surface soils (approximately 1500 cubic yards);
- Treatment of the material to below health-based levels and back-filling the waste fill area with the treated materials. This area will then be covered with two feet of clean soil.
- Additional investigation of the groundwater to determine the extent of groundwater contamination;

- Limited groundwater monitoring (i.e. for a minimum of three years), provided that the additional groundwater investigation establishes that there is no need for groundwater remediation; and

- Confirmatory air monitoring and re-sampling of soil in residential yards.

DECLARATION

Consistent with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, I have determined that the selected remedy is protective of human health and the environment, attains Federal and State requirements that are applicable or relevant and appropriate for this remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

Because this remedy will not result in hazardous substances remaining on-site above health-based levels, the five-year remedial action review will not apply to this action.

9-30-88
Date

William J. Muszynski, P.E.
Acting Regional Administrator

Site Background

The G.E. Wiring Devices Site is located in the south central part of the Island in Juana Diaz, Puerto Rico. The Site is northeast of Ponce, close to the intersection of Routes 14 and 149 (See, Figures 1 and 2). The General Electric Company (G.E.) operates a wiring devices plant at this site that occupies approximately 5 acres of land. The property was originally leased from the Puerto Rico Industrial Development Company (PRIDCO); the property is now owned by G.E.

The source of contamination at the site is the waste-fill area where defective parts from silent mercury switches were discarded. These switches were assembled at the plant from 1957 until 1969. Each switch contained a hermetically sealed stainless steel button that encased a ceramic core, containing elemental mercury. Off-specification buttons were generally broken to reclaim the mercury. The steel button shells, with residual mercury and ceramic cores, were then discarded in the on-site waste-fill (pile) area where other defective switch parts and plastic scraps were also discarded. Based on test pit excavations, the waste-fill area is approximately 1 to 4 feet thick 110 feet wide and 440 feet long. As calculated in the Remedial Investigation, it is probable that roughly half a ton of mercury was discarded in the waste-fill area, based on mercury switch production and rejection documentation.

Several residences are located approximately 400 feet south of the waste-fill area. A concrete retaining wall and fence exist between the site and the residences. Groundwater in the area is used as a source of potable water. A public supply well is located approximately 1500 feet west of the waste-fill area.

Site History

The site was proposed for inclusion to the National Priorities list in December 1982. The original scoring was changed in June 1983 based on public comment. A Remedial Investigation and a Feasibility Study (RI and FS) were conducted by the General Electric Company (GE) through its contractor Law Environmental Services at the G.E. Wiring Devices Site. These activities were performed pursuant to an Administrative Consent Order II-CERCLA-30301 dated January 16, 1984. An RI report was submitted to the U.S. Environmental Protection Agency for review in October 1986. EPA determined that additional investigation was necessary in order to further define the nature and extent of contamination at the Site. A Supplemental RI and an FS report were submitted to EPA in draft in October and November 1987, respectively. The data collected during the RI were reviewed for conformance with EPA data validation requirements. Subsequently, EPA concluded that the quality of the data did not meet EPA specifications. Accordingly, in August 1988 EPA in cooperation with G.E., collected additional samples to complete the RI activities. Maps depicting sampling locations and a summary of results are presented in Figure 3 and 4 and Table 1, respectively.

The draft FS did not fully evaluate treatment alternatives for remediation of the Site and did not fully conform with the criteria set forth in the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA). As a result, EPA entered into an agreement with the U.S. Bureau of Mines to evaluate additional treatment technologies. The objectives of this evaluation were to identify and assess additional treatment technologies which, if implemented, could result in achieving a more permanent remedy by reducing the toxicity, mobility or volume of the contaminant. EPA then prepared an FS Addendum to further comply with CERCLA.

Community Relations

EPA has kept the local citizens and officials advised throughout the Superfund process. Several public meetings were held in Juana Diaz to discuss site developments. Specifically, a public meeting was held in February 1984 to discuss the provisions of the Administrative Order, as well as, to receive and respond to comments concerning the site. In April 1987, a public meeting was held to solicit comments on and discuss the findings of the RI. In September 1988, a public meeting was held to discuss and receive comments on the studies and EPA's proposed remedial action plan. Questions and comments with their corresponding responses are summarized in the attached Responsiveness Summary.

Site Characteristics

A silty clay to clayey silt unit exists immediately beneath the waste-fill materials. This unit is believed to be continuous as evidenced by its presence at 103 test pit excavations. The unit appears to be from 1 to 4 feet thick based on monitoring well logs. The permeability of the unit is in the range of 6.0×10^{-4} to 8.0×10^{-5}. However, roots were observed in the shallow soils which could increase the permeability of the soil by developing channels through which contaminated leachate could flow. The silty clay unit overlies the Holocene alluvial sediments deposited by the Rio Jacaguas River as illustrated schemetically in Figures 5 and 6. This alluvium is divided into four strata (See Figure 6): a very silty fine to coarse sand, a sandy clayey silt, a silty sand and a sand and gravel unit. Results of a resistivity survey indicate low resistivities at depths of up to 12 feet in the central and western portions of the waste-fill. This may be indicative that a zone of high moisture content is present in the alluvial sands which underlie the clay stratum in some areas of the waste-fill.

This moisture could be the result of slow downward migration of perched water through the silty clay stratum. Groundwater was encountered within the alluvial sand and gravel formation at a depth of about 45 feet below the existing grade. The groundwater potentiometric gradient has been reported to be on the order of 0.01 to 0.006 ft./ft., with a groundwater flow direction to the west towards the Rio Jacaguas River.

Perched water accumulates within the waste-fill area as a result of precipitation/recharge; the perched water generally consists of a few feet of water perched above the top of the above-referenced clay layer. The depth to the top of the perched water is approximately 2 feet below the existing grade at the waste-fill surface.

The primary route for migration of mercury appears to be through surface runoff from the waste-fill area. This results in the contamination of surface soils to the south of the waste-fill area (downgradient). The waste-fill area formerly received stormwater runoff directly from the plant area, the runoff has since been diverted by the construction of a drain pipe in 1982. The potential for vaporization of the mercury also exists. In addition, as stated above, the permeability of the clay underlying the fill area is moderate and roots were observed in these soils. Also, the resistivity data suggests that the migration of perched water through the silty clay stratum has occurred.

Furthermore, groundwater sampling suggests that the mercury has migrated to the water table. The highest concentration of mercury in the deeper groundwater (i.e., 2.2 ppb) is slightly above the Maximum Contaminant Level (2.0 ppb). However, this result was obtained only in one sampling round approximately 50 feet away from the waste-fill area. The location, number and depth of monitoring wells are inadequate to fully characterize the extent of groundwater contamination at the site. Therefore, further investigation of the groundwater will be conducted during design of the remedial action to determine the nature and extent of groundwater contamination. This work will include installation of additional groundwater monitoring wells and groundwater sampling. Additional remedial action may be necessary pending the results of this investigation.

The data collected during supplemental sampling indicates that mercury was found in the following areas:

1) In an on-site surficial waste-fill (pile) area. This area is approximately 110 feet in width and 440 feet in length and about 4 feet deep, containing roughly 4000 cubic yards of contaminated waste. The highest concentration observed in the waste-fill area is 1400 parts per million (ppm) of mercury.

2) In perched groundwater within the waste-fill area. Approximately 1/2 million gallons of contaminated water is found at shallow depths (approximately 2 feet below the ground surface). The highest concentration of mercury detected in the perched water is 6.917 ppm.

3) In soils found approximately within the upper six inches of the surface* (hereinafter referred to as "near-surface

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* In general, mercury concentrations decreased with depth in these soils. At depths below six inches mercury concentrations were below health-based levels and approached background levels.

soils") in an area which is in the direction of surface water runoff from the waste-fill area (i.e., south or downgradient). Since the number of valid soil samples is limited, the volume of contaminated soil has been calculated by multiplying the estimated areal extent of contamination by a depth of six inches. The volume of contaminated soil has been estimated at 1500 cubic yards using this conservative approach. The highest concentration of mercury detected in soils is 61.630 ppm.

Site Risks

An endangerment assessment was conducted to determine exposure routes and concentrations of mercury which may pose a risk to human health. The endangerment assessment evaluated the baseline public health risks associated with the site in the absence of any remedial action. The primary exposure routes of concern which were evaluated were ingestion of contaminated soils/waste-fill material and inhalation of mercury vapors.* Data gathered for the EPA Mercury Health Effect Update (1984) indicates that diet and ambient air inhalation yield an intake of methyl mercury that is 18% of the Reference Dose (the Reference dose is 0.0003 mg/kg-day). Therefore, in evaluating the risks posed by ingestion of contaminated soils/waste-fill material, the daily intake which would result in exceedence of 82% of the reference dose was calculated using various assumptions. This analysis indicates that mercury concentrations in excess of 38.8 ppm may result in exceeding the reference dose. The sampling data indicates that the concentrations of mercury in the soils and waste-fill area exceed this value. In addition, air modelling was conducted to predict the concentration of mercury vapors which could be emitted given the concentration of mercury detected in the soils and waste-fill materials. The modelling showed that soil concentrations in excess of 16.4 ppm may cause the EPA National Emission Standard for a Hazardous Air Pollutant (NESHAP) to be exceeded. The NESHAP for mercury is 1 ug/m^3. The modelling also indicates that there is a potential risk associated with vaporization of mercury from the waste-fill area. Additional air sampling will be conducted during the design to verify whether the NESHAP is being exceeded.

Scope of Response Action

The objectives of the remedial action are, in general, to achieve clean-up levels of mercury in the waste-fill area (including perched water) and downgradient soils which: adequately protect human health

* As discussed previously, the groundwater database for the site must be supplemented in order to fully characterize groundwater contamination. Therefore, a supplemental groundwater investigation will be conducted during design. Consequently, the risks posed by groundwater contamination will be evaluated after completion of the investigation.

and the environment, are cost-effective, and utilize permanent solutions and alternative treatment technologies (e.g., those which reduce the toxcity, mobility or volume of a hazardous substance) to the maximum extent practicable. The remedial action must also substantively comply with applicable or relevant and appropriate requirements.

The remedial action would remediate the waste-fill area and the mercury contaminated near-surface soils to levels which would be protective of public health. With respect to contaminated soils downgradient of the waste-fill area, since the mercury is primarily in the upper six inches of soil, the remedial action would include remediation of the upper six inches of soil, at a minimum. This conservative approach should ensure the removal of all soil with mercury concentrations above health-based levels. Since groundwater data is limited, further investigation and monitoring will be conducted during design to determine the extent of groundwater contamination.

Description of Alternatives

A total of nine remedial alternatives were identified in the Feasibility Study and addendum for dealing with the mercury contamination at the G.E. Wiring Devices site. They were numbered as follows:

- 1 No Action
- *2 Cap with Extraction Wells
- 3 Fixation
- 4 Cap, Cut-off Walls and Extraction Wells
- *5 Separate Waste by Mechanical Screening
- *5a Alternative 5 with Only Off-site Disposal
- *6 Separate Wastes by Mechanical Screening and Washing
- *6a Alternative 6 with Only Off-site Disposal
- 7 Excavation and Redisposal On-site
- 7a Alternative 7 with Off-site Disposal
- 8 Thermal Treatment
- 9 Hydrometallurgical Treatment

The six alternatives that EPA considered in greatest detail are summarized below. Each alternative addresses remediation of approximately 4000 cubic yards of waste-fill material, 1/2 million gallons of contaminated perched water and 1500 cubic yards of contaminated near-surface soils.

* Although evaluated in the FS, Alternative 2 was eliminated because it is ineffective compared to Alternative 4. Alternatives 5, 5a, 6 and 6a were eliminated based on technical feasibility since the waste is not amenable to physical separation.

Alternative 1

NO ACTION - This alternative is used as a baseline for comparing other alternatives and consists of leaving the site as it is. No response actions would be implemented other than long-term monitoring which would include a minimum of three wells hydraulically downgradient of the waste-fill area and three wells south of the waste-fill area (i.e., in the area where contaminated soils have been detected). Because the waste is left on-site EPA must review the remedial action no less than each 5 years after the initiation of such action to ensure that the remedial action remains protective of public health and the environment. This review of the remedial action is required under Section 121 of CERCLA. Land use restrictions would be required.

Alternative 3

FIXATION - This alternative consists of physically fixing the waste with cement to resist erosion. Trenches would be dug within the waste-fill area to facilitate drainage towards a sump. The sump, along with a leachate extraction well, would be installed at the downgradient end of the waste-fill area. Perched water within the waste-fill area would be pumped, via one extraction well and would be pretreated on-site prior to disposal at a publically owned treatment works (POTW). Treatment would consist of filtration then carbon adsorption. Contaminated near-surface soils will be excavated and consolidated in the waste-fill area. The soils and waste-fill material would then be mixed with cement to blend into an aggregate solid waste. A soil cap would be placed over the waste-fill area. This alternative does not require any long-term pumping of leachate. Long-term groundwater monitoring would be conducted to verify the long-term performance of this remedial alternative. Such monitoring would be consistent with the description provided in Alternative 1, the No Action Alternative. In addition, the remedial action would be reviewed every five years as with Alternative 1. Land use restrictions would be required for this alternative in order to ensure that the integrity of the remedial action or the function of any of the monitoring systems are not disturbed where contaminated materials are left on site.

Alternative 4

CAP, CUT-OFF WALL WITH EXTRACTION WELLS - This alternative consists of providing a multilayer impervious cap, slurry wall and leachate collection system. Trenches would be dug within the waste-fill area to facilitate drainage towards a sump. The sump with a leachate extraction well would be installed at the downgradient end of the waste-fill area. Perched water within the waste-fill area would be pumped, via one extraction well and would be pre-treated on-site prior to disposal at a POTW. Contaminated near-surface soils will be excavated and consolidated in the waste-fill area. The cap and slurry wall would then be installed. The cap would be constructed of clay underlain by a synthetic membrane liner to further reduce infiltration, sand to promote drainage, and top soil to promote vegetation and mininmize erosion. The slurry wall would surround the landfill and would be keyed into the clay stratum. Pumping and treatment of leachate from the landfill would be conducted on an as-needed basis and may be required for an indefinite period of time. The treatment system constructed for the treatment of perched water would be used to treat the leachate and would consist of filtration followed by carbon adsorption. The treated leachate would also be disposed of at a POTW. Long-term groundwater monitoring, consistent with the description provided in Alternative 1, will be conducted to assess the long-term effectiveness of this remedial alternative. Since waste remains on-site above health-based levels the remedial action must be reviewed every five years as with Alternative 1. Land use restrictions would be required for this alternative.

Alternative 7

EXCAVATION AND CONSOLIDATION ON-SITE - This alternative proposes to remove the contaminated material from the site and consolidate them in a newly constructed on-site landfill to be located in the area of contamination. The perched water would be pumped from the waste-fill area in the same manner as in Alternative 4. The waste-fill area would then be excavated and an impervious liner (i.e., with a 10^{-7} permeability) would be placed on top of the clay stratum. The waste and contaminated soils would then be placed on the liner. A cap, slurry wall and leachate collection system would be installed as with the preceding alternative. Pumping and treatment of leachate from the landfill would be conducted on an as-needed basis and may be required for an indefinite period of time. The treatment system used for treating the perched water would be used to treat the leachate and would consist of filtration followed by carbon adsorption. The treated leachate would also be disposed of at a POTW. Long-term groundwater monitoring, consistent with the description provided in Alternative 1, will be conducted to assess the long-term effectiveness of this remedial alternative. Since waste remains on-site above health-based levels, the remedial action must be reviewed every five years as with Alternative 1. Land use restrictions would be required for this alternative.

Alternative 7a

ALTERNATIVE 7 WITH OFF-SITE DISPOSAL - This alternative is the same as Alternative 7 except that the soils and waste from the waste-fill area would be shipped to a RCRA Subtitle C hazardous waste landfill in the mainland U.S., since there are currently no permitted Subtitle C disposal facilities in Puerto Rico.

Confirmatory sampling would be necessary to verify that contaminated materials left on site were below health-based levels If further investigation of the groundwater confirms that there is no significant health risked posed by groundwater, then limited long term monitoring would be conducted (i.e., a minimum of three years consistent with the description provided in Alternative 1). Land use restrictions would not be required.

Alternative 8

THERMAL TREATMENT - This alternative proposes to treat the contaminated material on-site by heating the waste until all the mercury is vaporized. Mercury has a relatively low boiling point (375°C) and most of its compounds decompose into metallic mercury readily upon heating. The mercury could then be recovered and recycled. This material may have to be reclaimed in the mainland since currently there are no facilities on the island which recover mercury. There is a range of temperatures at which a thermal treatment system for recovery of mercury from the waste could be operated. At the high end of the range is incineration of the waste. Since a high percentage of mercury is adsorbed to the plastic materials in the waste-fill area, the low end of the range would be a temperature at which the mercury could be recovered from the plastic without decomposing the plastic (between 375°C and 850°C). The optimal operating temperature of the thermal treatment system would be evaluated during design. Another potential thermal treatment option is vacuum distillation. In this process the waste would also be heated to drive-off the mercury and a vacuum would be applied to extract the mercury out of the plastic. With either type of thermal treatment the mercury vapor would be trapped and condensed. If selected, this process would be designed to achieve levels protective of public health. The residue from the process would be disposed of on-site in the former waste-fill area. A two foot soil cap would then be placed over the former waste-fill area. Since the source of contamination would be treated and the residuals left on-site would be below health-based levels, no land use restrictions would be necessary. In addition, if further investigation reveals no significant ground water contamination, then only limited groundwater monitoring would be conducted with this alternative (i.e., a minimum of three years consistent with the description provided in Alternative 1).

Alternative 9:

HYDROMETALLURGICAL TREATMENT - This type of treatment would be utilized to treat the contaminated near-surface soil, perched water and waste-fill materials. This alternative involves putting the mercury into solution by using a leaching agent such as cyanide, hypochlorite or nitric acid. The mercury would then be recovered from the aqueous solution by using various metallurgical techniques such as filtration and cementation/ precipitation. The waste would be mixed with the leaching agent until the desired level of mercury is extracted from the waste and put into solution. The process stream from the leaching stage would then be filtered. The residue from filtering would be disposed of in the former waste-fill area and capped with soil as in Alternative 8. The process would be designed to achieve treatment of mercury from the waste to below health-based levels (i.e., less then 16.4 ppm). Since it is anticipated that the treatment process could attain treatment of mercury to below acceptable levels, the actual performance standard for the treatment process would be determined by the maximum removal efficiency associated with the technology with due consideration to the corresponding incremental cost involved in achieving further removal. The mercury-laden liquid from the filtering stage would then be subjected to cementation or precipitation to remove the mercury. This result is achieved by bringing the liquid in contact with materials such as stainless steel, zinc, copper or aluminum.

During cementation, the mercury is exchanged with the metal and precipitated out. The liquid would then be recycled back through the process. It is anticipated that only one batch of leaching agent would be needed. Upon completion of the process, the remaining liquid would be treated on-site prior to discharge to a POTW. Further treatability studies will be conducted during design to optimize the treatment process. The process would be designed to meet or exceed levels protective of public health. Since the source of contamination would be treated and the residuals left on-site would be below health-based levels, no land use restrictions would be necessary. In addition, if further investigation reveals no significant ground water contamination, then only limited groundwater monitoring would be conducted with this alternative (i.e., a minimum of three years consistent with the description provided in Alternative 1).

Analysis of Remedial Action Alternatives

The remedial action alternatives described above, were then evaluated in accordance with the requirements of the National Contingency Plan (NCP) and the Comprehensive Environmental Response, Compensation and Liability Act as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA). Nine criteria relating directly to the factors mandated in Section 121 of CERCLA, including subsection 121(b)(1)(A-G) and EPA's Interim Guidance on Selection of Remedy (December 24, 1986 and July 24, 1987) were utilized for this evaluation and are as follows:

- Protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume
- Short term effectiveness
- Implementability
- Cost
- Community acceptance
- State acceptance

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Protection of human health and the environment is the central mandate of CERCLA. Protection is achieved primarily by taking appropriate action to ensure that there will be no unacceptable risks to human health or the environment.

Except for the No Action Alternative each of the alternatives affords adequate protection of public health and the environment. Alternatives 4 and 7 afford protection by providing a combination of engineering (cap, slurry wall, etc.) and institutional controls (land use restrictions). Alternative 3 provides protection by fixing the waste which limits the availability of mercury for human exposure. Alternative 7 provides protection by removing the contaminated material from the site. Alternatives 8 and 9 provide protection through treatment of the waste which reduces the concentration of mercury down to or below health-based levels.

COMPLIANCE WITH ARARs

Section 121(d) of CERCLA requires that remedial actions comply with all applicable or relevant and appropriate Federal and State requirements for the hazardous substances, pollutants or contaminants that are present on site, as well as any action-specific and locational requirements.

Applicable requirements refer to those situations where the specific legal or regulatory jurisdictional prerequisites of a particular statute or regulation are met. Relevant and appropriate requirements apply only to on site portions of remedial actions and are those which were developed to address problems similar to those encountered at a site. A relevant and appropriate requirement must be complied with to the same extent as if it were applicable.

With respect to requirements which are chemical-specific for mercury contaminated soil and debris, there are no applicable or relevant and appropriate requirements (ARARs).** Therefore, an Endangerment Assessment was performed to determine the concentration of mercury that would result in an acceptable risk level if left on-site. All of the alternatives evaluated, with the exception of the No Action Alternative, will result in site remediation which would minimize exposure to mercury concentrations above acceptable health-based levels. Air modelling indicates that 16.4 ppm is the lowest concentration of mercury which would pose a risk to public health.

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* Note, any potential risks posed by groundwater contamination will be addressed following the supplemental investigation to be conducted during design.

** Note, there are chemical specific ARARs for groundwater contaminated with mercury (i.e., the Maximum Contaminant Level promulgated pursuant to the Safe Drinking Water Act), however, the risks posed by groundwater contamination will be addressed using the data obtained during the additional groundwater investigation to be conducted during the design of the remedial action.

Air sampling will be conducted during remedial design to confirm the results of this air modelling. If the monitoring verifies this value, then 16 ppm will be the cleanup level for remedial action. However, if the air monitoring indicates that there are no levels exceeding the NESHAP, then 21 ppm, the lowest concentration of mercury which would pose a risk to public health through ingestion, will be used as the site cleanup level.

Potential action-specific ARARs were identified for the remedial alternatives which were evaluated. A discussion of such potential ARARs and the rationale for determining whether the requirement should be considered as an actual ARAR is presented below.

With respect to locational ARARs, the site appears to be in close proximity to known historic sites. A Stage IA survey will be conducted during design to identify any potential undocumented resources on or eligible for nomination to the National Register of Historic Places.

For the alternatives which involve landfill closure (Alternatives 4 and 7) the RCRA closure regulations would be relevant and appropriate. For Alternatives 4 and 7, the landfill would be closed in conformance with 40 CFR Part 264, Subpart N which describes the closure requirements for a RCRA hazardous waste landfill. Alternatives 3, 8 and 9 which treat the contaminated materials to below health-based levels would be closed consistant with a RCRA clean closure regulations.

For alternatives which involve discharge of perched water to a POTW, guidance from the EPA memorandum entitled "Discharge of Wastewater from CERCLA Sites into POTWs" would be used, as well as the permit requirements for the specific POTW. The guidance would preclude the use of a POTW which is out of compliance with its permit requirements. Accordingly, the treated perched water may only be discharged to a POTW that is permitted to accept such wastes and is operating in compliance with that permit. The on-site pretreatment must achieve the levels set forth in the POTW's permits.

The applicablity, relevance and appropriateness of the Land Disposal Restrictions (LDRs) under RCRA were considered with respect to the remedial alternatives evaluated. The LDRs would not be applicable since the contaminated materials are not hazardous wastes. With respect to relevancy and appropriateness, currently the only LDR treatment standards which have been promulgated are for non-soil and debris wastes. Treatment standards for soil and debris wastes are currently being developed by EPA. In the interim, because there are no treatment standards for soil and debris wastes and since the contaminated materials found at the site are not sufficiently similar to those for which such standards exist, the LDRs are not considered relevant and appropriate.

Section 121(d)(3) of CERCLA requires that if a remedial action involves off-site disposal at a RCRA hazardous waste landfill, such disposal may only take place if releases are not occuring from the unit which would receive the waste and any other releases from the disposal facility are controlled under a corrective action pursuant to RCRA. Alternative 7a, which provides for off-site disposal, will comply with this requirement.

While permits are not required for on-site remedial actions at Superfund sites, any on-site remedial action must meet the substantive requirements of the permitting process. Therefore, any alternative which includes on-site treatment (i.e., all alternatives except No Action) would be designed and implemented so as to comply with the substantive requirements of applicable permitting processes.

LONG-TERM EFFECTIVENESS AND PERMANENCE

Long-term effectiveness and permanence addresses the long-term protection and reliability of an alternative. This is a relative term and is therefore expressed in the degree of long-term effectiveness and permanence associated with an alternative in comparison to other alternatives being evaluated.

Alternative 1 The No Action Alternative offers no long-term protection to human health or the environment. The potential for direct contact with contaminated materials still exists. Furthermore, erosion from the waste-fill area would continue to contaminate downgradient (south of the waste-fill area) soils. This alternative will require long-term monitoring indefinitely. This alternative does not offer any degree of permanence.

Alternative 3 The Fixation Alternative would be somewhat effective in the long term in that contamination in excess of acceptable health-based levels would be bound up in the cement and thus exposure pathways (e.g., ingestion, inhalation) would be eliminated. However, the ability of this alternative to effectively prevent the migration of mercury from the fixed material indefinitely is uncertain. Therefore, long-term monitoring would be necessary and the possibility exists that other remedial actions may also be needed. Although quality control problems could be minimized by removing the waste and then processing it instead of in-situ fixation the waste remaining on-site would be above health-based levels. Therefore, this alternative would not be more permanent than Alternatives 7a, 8 and 9. The degree of permanence associated with this alternative is greater than that which would be achieved by Alternatives 1, 4, and 7 since the durability of cement is greater than the construction material which would be used to implement Alternatives 4 and 7.

Alternative 4 The Impervious Cap with Extraction Well Alternative is of limited effectiveness in the long term with respect to the reliabilty of the remedial action. There is the potential for remedy failure since the clay unit and underlying clay may not be adequate barriers to mercury migration. This potential appears to be further substantiated by the detection of mercury in the groundwater. Since the waste is left on site untreated, this alternative would require monitoring and maintenance indefinitely. As stated above, this alternative is considered less permanent than Alternative 3.

Alternative 7 The Excavation Alternative is of limited effectiveness in the long term with respect to its ability to function indefinitely. Although less likely, the potential for remedy failure exists, as with Alternative 4. The potential for leakage through the clays is mitigated relative to Alternative 4 by the installation of a synthetic membrane liner under the contaminated material and above the clay stratum. As with Alternative 4, this alternative would also require indefinite monitoring and maintenance. With respect to the degree of permanence, although this alternative offers a greater degree of permanence relative to Alternative 4, it is far less permanent than Alternative 3.

Alternative 7a Alternative 7 with Off-Site Disposal, calls for contaminated materials to be excavated down to acceptable health-based levels. Since all wastes in excess of health-based levels would be transported off site there would be limited groundwater monitoring to confirm that the action was satisfactorily completed and no long-term operation or maintenance. With respect to the site this alternative offers a higher degree of permanence than does Alternative 3.

Alternative 8 The Thermal Treatment Alternative is effective in the long term in that it reduces toxicity of contaminated material on site and decrease the concentration of mercury found on site to acceptable health-based levels. As with the preceding alternative, there would be limited confirmatory groundwater monitoring and no long term operation or maintenance. Since the toxicity and the concentration of mercury in the waste is reduced to health-based levels, this alternative offers a higher degree of permanence than does Alternative 3. With respect to the site, the degree of permanence associated with this alternative is equivalent to Alternative 7a. However, in a broader perspective this alternative is more permanent than Alternative 7a because the waste is treated instead of being relocated.

Alternative 9 The Hydrometallurgical Alternative is effective in the long term in that it effectively reduces the toxicity and concentration of mercury in the contaminated material on site resulting in a decrease in exposure to acceptable health-based levels. As with the preceding alternative, groundwater monitoring would be limited confirmatory sampling with no long-term operation or maintenance. Because the waste is treated this alternative has a higher degree of permanence associated with it than Alternative 3. The degree of permanence is essentially equal to Alternative 8.

REDUCTION OF TOXICITY, MOBILITY OR VOLUME

This evaluation criterion relates to the performance of a remedial alternative which involves treatment in terms of eliminating or controlling risks associated with the toxicity, mobility or volume of a hazardous substance. Since Alternatives 1, 4, 7 and 7a do not involve treatment these alternatives were not evaluated against this criterion.

With respect to toxicity, the data indicates that a substantial portion of the total mercury present is in the organic form. Organic mercury is much more toxic than inorganic mercury. Therefore, alternatives which convert organic mercury into inorganic mercury would result in a reduction in the toxicity of mercury.

Alternative 3 The Fixation Alternative is effective in reducing the mobility of the contaminant by preventing further erosion and reducing infiltration. This alternative, however, would increase the volume of contaminated material. The toxicity of the waste could potentially be reduced and exposure to mercury from the waste is also reduced because the waste is bound up with the cement.

Alternative 8 The Thermal Treatment Alternative would result in a substantial reduction of the volume of contaminated material on-site. Since the organic mercury is converted back into the elemental form, the toxicity of the waste is significantly reduced. The mobility of the waste is reduced proportionally to the reduction in concentration. This alternative would result in a reduction in the concentration of mercury in the contaminated material by roughly two orders of magnitude.

Alternative 9 The Hydrometallurgical Treatment Alternative would also result in a substantial reduction of the volume of contaminated material on-site. As with Alternative 8, the organic mercury is converted back into the elemental form, thus the toxicity of the waste is significantly reduced. In addition, the mobility of the waste is reduced proportionally to the reduction in concentration. This alternative would result in a reduction in the concentration of mercury in the contaminated material by roughly two orders of magnitude.

Short-Term Effectiveness

The short-term effectiveness criterion measures how well an alternative is expected to perform, the time to achieve performance, and the potential adverse impacts of its implementation.

Alternative 1 The No Action Alternative does not offer any degree of protection, and therefore is not effective in the short-term. There are however, no adverse impacts associated with implementation of this alternative.

Alternative 3 The Fixation Alternative would involve excavation of contaminated material. In the short term, there would be a small potential for worker exposure to mercury contamination during consolidation of contaminated near-surface soils and during the fixation process. However, this concern would be addressed in the health and safety plan for construction activities. This alternative should take approximately 2 years to implement.

Alternative 4 The Cap with Extraction Well Alternative would also involve excavation of contaminated materials. Consequently, in the short term, there would be the potential for worker exposure to mercury contamination during consolidation of the near-surface soils. The health and safety plan would address minimizing this exposure. This alternative should take approximately 2 years to implement.

Alternative 7 The Excavation and Consolidation On-site Alternative would involve excavation of a greater volume of contaminated material (approximately 5500 cubic yards) relative to Alternatives 3 and 4 (1500 cubic yards). This may result in an incremental increase in the potential for worker exposure to mercury contamination during implementation. As stated above, this concern would be addressed in the health and safety plan. This alternative should take approximately 2 years to implement.

Alternative 7a Alternative 7 with Off-Site Disposal involves off-site disposal and would thus increase truck traffic in the area as well as the potential for accidents involving releases of contaminated materials. As with the preceding alternatives, in the short term there is the potential for worker exposure to mercury contamination during implementation. The health and safety plan would address minimizing this exposure. This alternative should take approximately a year and a half to implement.

Alternative 8 The Thermal Treatment Alternative, as with the preceding alternatives would involve the potential for worker exposure to mercury contamination during implementation. The health and safety plan would address minimizing this exposure. With this alternative mercury from the off-gases would be condensed and recovered, however, controls may be necessary to ensure that mercury and other vapors are not released above acceptable levels. This alternative should take approximately 2 years to implement

Alternative 9 The Hydrometallurgical Alternative, as with the preceding alternatives, involves the potential for worker exposure to mercury contamination during implementation. The health and safety plan would address minimizing this exposure. In addition, each of the leaching agents used in the process present health and safety and process control considerations. Specifically, for nitric acid, since the waste-material contains plastic there is the potential for formation of picric acid which is explosive; for cyanide there is the potential for evolution of hydrogen cyanide gas; and for hypochlorite there is the potential for evolution of chlorine gas. It should be noted, however, that these are standard processes which are used in industry. These potential health and safety concerns would be addressed in the design of the process. For example, the formation of picric acid would be controlled by adjusting the concentration of the acid, the formation of hydrogen cyanide gas would be controlled by buffering the pH with a base solution, and the formation of chlorine gas would also be eliminated by buffering the pH using a basic solution. This alternative should take approximately 2 years to implement.

IMPLEMENTABILITY

Implementability addresses how easy or difficult, feasible or infeasible it would be to carry out a given alternative. This covers implementation from design through construction and operation and maintenance.

The implementability of the alternatives is evaluated in terms of technical and administrative feasibility, the availability of needed goods and services. All alternatives evaluated are technically feasible. However, some implementation problems are inherent in each of the alternatives.

Alternative 1 The No Action Alternative does not have any implementation problems, however, it does not offer any degree of protection.

For alternatives which involve handling of mercury-contaminated soils it will be necessary to develop and implement a site specific health and safety plan to reduce the potential for worker exposure to mercury. Mercury contaminated material would be handled in each of the Alternatives with the exception of Alternative Number 1, the No Action Alternative.

Alternatives which involve the off-site disposal of contaminated perched water at a POTW may pose implementation problems with respect to the availability of a POTW which complies with EPA's guidance Memorandum entitled "Discharge of Wastewater from CERCLA Sites into POTWS", dated April 15, 1986. In addition, permission from the POTW to accept the waste may be necessary.

Alternatives 8 and 9 are considered to be implementable. Both the data collected by the U.S. Bureau of Mines in their screening of potential treatment alternatives and available information on similar industrial processes suggest that these alternatives are viable options. However, further bench and pilot scale studies would be necessary prior to design and construction to further evaluate the effectiveness of these alternatives and to optimize the operating and design parameters of the treatment process.

COST

The cost evaluation of each alternative is based on the capital cost (cost to construct), long term monitoring, operation and maintenance cost (O&M) and present worth costs.

Present worth analysis was used so that the cost of each alternative could be compared on the same basis. The present worth value represents the amount of money, if invested in the base year and then expended as needed, would be sufficient to cover all costs of the remedial action over its planned life.

The capital, O&M and present worth value for each alternative is provided in Table 2.

COMMUNITY ACCEPTANCE

This evaluation criterion addresses the degree to which members of the local community might support the remedial alternatives being evaluated; and is addressed in the responsiveness summary.

COMMONWEALTH ACCEPTANCE

This criterion addresses the concern and degree of support that the commonwealth government has expressed regarding the remedial alternatives being evaluated. Puerto Rico's Environmental Quality Board concurs with EPA's selection of Alternative 9.

Selected Remedy

The selected remedial action is Alternative 9: Hyrometallurgical Treatment.

This general type of treatment would be used for the contaminated near-surface soil, perched water and waste-fill materials (approximately 1500 cubic yards, 1/2 million gallons and 4000 cubic yards, respectively). This alternative involves putting the mercury into solution by using a leaching agent such as cyanide, hypochlorite or nitric acid. The mercury would then be recovered from the aqueous solution by using various metallurgical techniques such as filtration and cementation/precipitation. The waste would be mixed with the leaching agent until the desired level of mercury is extracted from the waste and put into solution. The process stream from the leaching stage would then be filtered. The residue from filtering would be disposed of in the former waste-fill area and capped with two feet of clean soil. The process would be designed to achieve treatment of mercury from the waste to below health-based levels (See ARAR discussion). Since it is anticipated that the treatment process could attain treatment of mercury to below acceptable levels, the actual performance standard for the treatment process would be determined by the maximum removal efficiency associated with the technology with due consideration to the corresponding incremental cost involved in achieving further removal. The mercury-laden liquid from the filtering stage would then be subjected to cementation or precipitation. This process is achieved by passing the liquid through a material such as stainless steel, zinc, copper or aluminum.

During cementation the mercury is exchanged with the metal and precipitated out. The liquid would then be recycled back through the process. It is anticipated that only one batch of leaching agent would be needed. Upon completion of the process, the remaining liquid would be treated on-site prior to discharge to a POTW. Further treatability studies will be conducted during design to optimize the treatment process. The process would be designed to meet or exceed levels protective of public health. The estimated cost associated with Alternative 9 is $1,912,870.

As discussed above, the location and number of existing monitoring wells are inadequate to fully characterize the extent of groundwater contamination at the site. Therefore, further investigation of the groundwater will be conducted during design of the remedial action. This work will include installation of additional groundwater monitoring wells and groundwater sampling. Additional remedial action may be necessary pending the results of this investigation. If further groundwater investigation determines that there are no current or future risks posed by groundwater contamination, then limited groundwater monitoring would be conducted to provide further verification (i.e., a minimum of three years). In addition, air modelling was used in the endangerment assessment to predict the concentration of mercury vapors which could be emitted given the concentration of mercury detected in the soils and waste-fill materials. The modelling showed that the concentration of mercury in soils and in the waste-fill area may cause the NESHAP to be exceeded. The NESHAP for mercury is 1 ug/m^3. Therefore, confirmitory air sampling will be conducted during the design to verify the whether the NESHAP is being exceeded. During design, confirmitory soil samples will also be collected from residential yards which are downgradient in terms of surface water runoff from the site.

Statutory Determinations

Section 121 of CERCLA mandates that EPA select a remedial action that is protective of human health and the environment, cost-effective, and utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Remedial actions in which treatment which permanently and significantly reduce the volume, toxicity or mobility of a hazardous substance is a principal element are to be preferred over remedial actions not involving such treatment.

Based upon the analyses presented herein the following conclusions are reached:

° Overall Protection of Public Health and the Environment

Alternative 9 provides protection through treatment of waste above health-based levels for mercury

° Compliance with ARARs

Alternative 9 would be designed to meet or exceed ARARs. As stated above, this alternative would reduce the concentration of mercury down to or below health-based levels in the absence of chemical specific ARARs for soils and debris. The residuals will be deposited on site and covered with clean soil consistent with a RCRA clean closure.

° Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

Alternative 9 is considered to be a permanent remedial action since the concentration of mercury remaining on site would be below health-based levels. For this reason Alternative 9 has a greater degree of permanence relative to Alternatives 1, 4 and 7 where wastes are left on-site, untreated, in concentrations exceeding health-based levels. Although Alternative 3 uses treatment to reduce the mobility of the waste (and possibly the toxicity) the concentration of mercury in the waste remaining on-site would be above health-based levels. Therefore, Alternative 9 is preferred over Alternative 3 because it does not require indefinite management and monitoring of the site.

The degree of permanence associated with Alternative 9 is equivalent to Alternatives 8 and 7a with respect to the site. The degree of permanence associated with Alternative 7a is limited in that it only addresses permanence in terms of on-site conditions. Alternatives 8 and 9 would be permanent with respect to off-site as well as on-site conditions.

Alternative 9 uses alternative treatment technologies to the maximum extent practicable since it includes treatment of all waste with mercury concentrations in excess of health-based levels. The other treatment alternatives (i.e., Alternatives 3 and 8) also require the treatment of all waste with mercury concentrations in excess of health-based levels. However, Alternative 3 does not provide for recovery of mercury from the waste. Thus, Alternatives 8 and 9 have the added benefit of using alternative treatment technologies to the maximum extent practicable while recovering mercury from the waste thereby resulting in the conversion of a waste into a usable material.

° Preference for Treatment as a Principal Element

Alternative 9 satisfies the statutory preference for treatment as a principal element of a remedial action since it provides for treatment of organic mercury to inorganic mercury which significantly reduces the toxicity of the wastes.

° Cost-Effectiveness

Although Alternative 9 is not the least costly treatment option it is cost-effective. The costs are reasonable in light of the relatively small incremental (approximately 1 million dollars) cost associated with attaining a permanent remedial action, with limited monitoring; no land use restrictions and which utlizes treatment as a principal element.

In summary, Alternative 9 is the selected alternative, it is protective of public health, is cost-effective, and utilizes treatment as a principal element. Alternative 9 would provide protection of public health by using treatment to reduce the concentration of mercury on site to below health-based levels (See ARAR discussion).

The treatment process employed would reduce the toxicity of the waste by converting organic mercury into a less toxic inorganic form and would reduce the volume of contaminated materials which are above health-based levels. Since the residual mercury concentration in materials left on site would be below health-based levels, this alternative is considered a permanent remedial action. Studies conducted by the U.S. Bureau of Mines and available information on related industrial processes suggest that this alternative could be implemented. Further bench and pilot scale studies would be required to optimize the treatment process and minimize any potential short-term impacts. Alternative 9 would be designed to meet or exceed ARARs. The estimated cost for implementing Alternative 9 is $1,912,870, which is reasonable in light of the degree of protection, treatment and permanence afforded by this alternative.

Currently, Alternative 9 appears to provide the best balance of trade-offs among the alternatives examined in detial with respect to the nine evaluation criteria. In addition to satisfying the statutory preference for remedies which utilize treatment as a principal element and for permanent remedies. EPA believes that Alternative 9 is implementable based on current information. However, since this alternative has not been fully demonstrated and further treatability studies are necessary, EPA believes that it is prudent to conduct additional treatability studies on other treatment options concurrently with those to be performed for Alternative 9. This approach would minimize any delay in remediating the site, in the event that hydrometallurgical treatment is not implementable.

TABLE 1

CDM-FPC G.E. Wiring TES III WA 649 LWA Project 87525

INORGANIC RESULTS

Groundwater Samples

			MERCURY -----UNITS: UG/l-----			AMMONIA --UNITS: MG/L--		
LSDG	LSDG SEG	SAMPLE	TOTAL	INORG	ORG	as N	as NH3	REMARKS
8073	1	GE-GW-01	0.0	0.0	0.0	0.17	0.21	
8073	2	GE-GW-15	6525.0	10.4	6514.6	570.00	690.00	
8073	3	GE-GW-14	3862.8	6.4	3856.4	340.00	411.00	
8073	4	GE-GW-12	3445.2	15.2	3430.0	300.00	363.00	
8073	5	GE-GW-11	5011.2	14.1	4997.1	340.00	411.00	
8073	6	GE-GW-10	5778.0	22.8	5755.2	420.00	508.00	\
8073	6-DUP	GE-GW-10-DUP	X	X	X	410.00	496.00	/ Lab Duplicates
8074	1	GE-GW-~~05~~ 08	6917.0	14.9	6902.1	400.00	484.00	
8074	2	GE-GW-07	4046.0	5.0	4041.0	760.00	920.00	
8074	3	GE-GW-06	6786.0	18.0	6768.0	590.00	714.00	
8074	4	GE-GW-05	5220.0	13.0	5207.0	560.00	678.00	
8074	5	GE-GW-16	3654.0	6.4	3647.6	890.00	1077.00	\Blind dup.-GE-GW-07
8074	5-DUP	GE-GW-16-DUP	X	X	X	940.00	1137.00	/Lab Duplicates
8074	6	GE-GW-B2	0.0	0.0	0.0	0.00	0.00	-Bailer Rinsate Blank
8074	7	GE-GW-02	0.3	0.0	0.3	0.00	0.00	
8074	8	GE-GW-03	0.0	0.0	0.0	0.00	0.00	
8074	9	GE-GW-04	2.2	0.4	1.8	0.00	0.00	
8074	10	GE-GW-B3	0.0	0.0	0.0	0.00	0.00	-Field Blank
8074	11	GE-GW-B4	0.0	0.0	0.0	0.00	0.00	-Source Water Blank
8075	17	GE-GW-B5	0.0	0.0	0.0			Spoon Rinsate Blank
8075	18	GE-GW-B6	0.0	0.0	0.0			Dish Rinsate Blank
8075	19	GE-GW-B7	0.0	0.0	0.0			Auger Rinsate Blank

Soil Samples

			-----UNITS: UG/KG-----			
8075	1	GE-S-1SU	19000.0	5360.0	13640.0	
8075	3	GE-S-2SU	5188.0	3870.0	1318.0	
8075	5	GE-S-3SU	24950.0	3790.0	21160.0	
8075	6	GE-S-3DE	61630.0	8710.0	52920.0	
8075	7	GE-S-4SU	1330.0	390.0	940.0	
8075	9	GE-S-5SU	6180.0	2430.0	3750.0	
8075	10	GE-S-6SU	4790.0	530.0	4260.0	
8075	11	GE-S-6DE	270.0	170.0	100.0	
8075	12	GE-S-7SU	310.0	220.0	90.0	
8075	13	GE-S-7DE	588.0	0.0	588.0	Blind Dup. GE-S-7SU
8075	14	GE-S-8SU	2850.0	980.0	1870.0	
8075	15	GE-S-8DE	485.0	450.0	35.0	
8075	16	GE-S-14SU	270.0	160.0	110.0	

MERCURY values reported as 0.0 are actually < 0.2

AMMONIA values reported as 0.00 are actually < 0.1 for N and < 0.12 for NH3.

TABLE 1 CONTINUED

VOLATILE ORGANIC RESULTS

Groundwater Samples

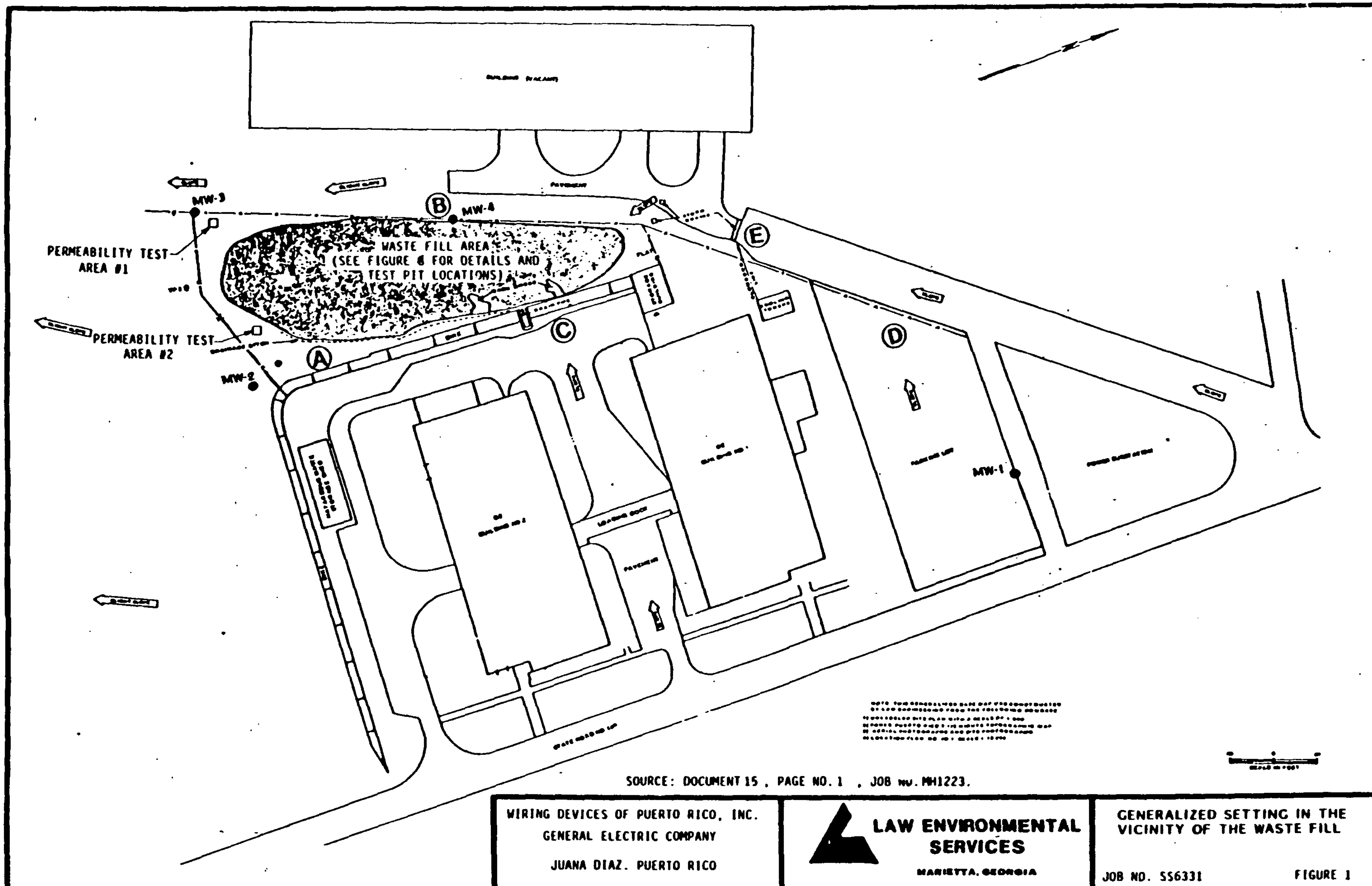
LSDG	REMARKS LSDG SEG	SAMPLE	-----VOA----- UG/L* TOTAL	COMPOUND	REMARKS
8073	1	GE-GW-01	ND		
8073	2	GE-GW-15	5.0	BENZENE	
8073	3	GE-GW-14**	ND		
8073	4	GE-GW-12**	ND		
8073	5	GE-GW-11**	ND		
8073	6	GE-GW-10**	ND		
8073	7	GE-GW-B1	2.0	CHLOROFORM	Trip Blank
8074	2	GE-GW-07**	ND		
8074	4	GE-GW-05**	ND		
8074	5	GE-GW-16**	ND		(1)
8074	6	GE-GW-B2	ND		Bailer Blank
8074	7	GE-GW-02	ND		
8074	8	GW-GW-03	ND		
8074	9	GE-GW-04	ND		
8074	11	GE-GW-B4	ND		Source water blank

* - All analyses performed at CLP detection limits

** - These samples appeared to contain surfactants (foamed). Analyses were performed on diluted samples.

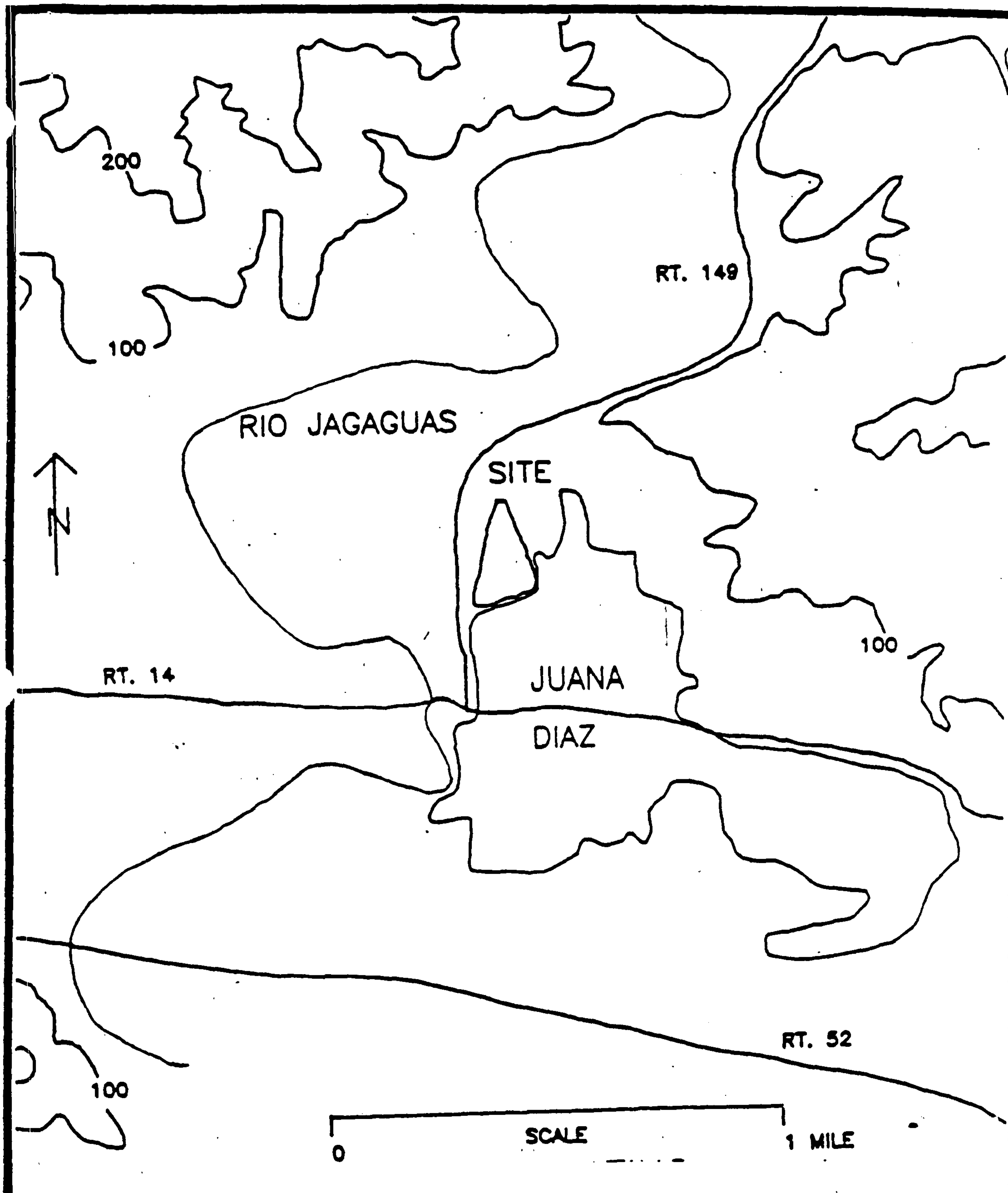
(1) - Blind duplicate of GE-GW-07

ND - Not detected or below CLP detection limit.



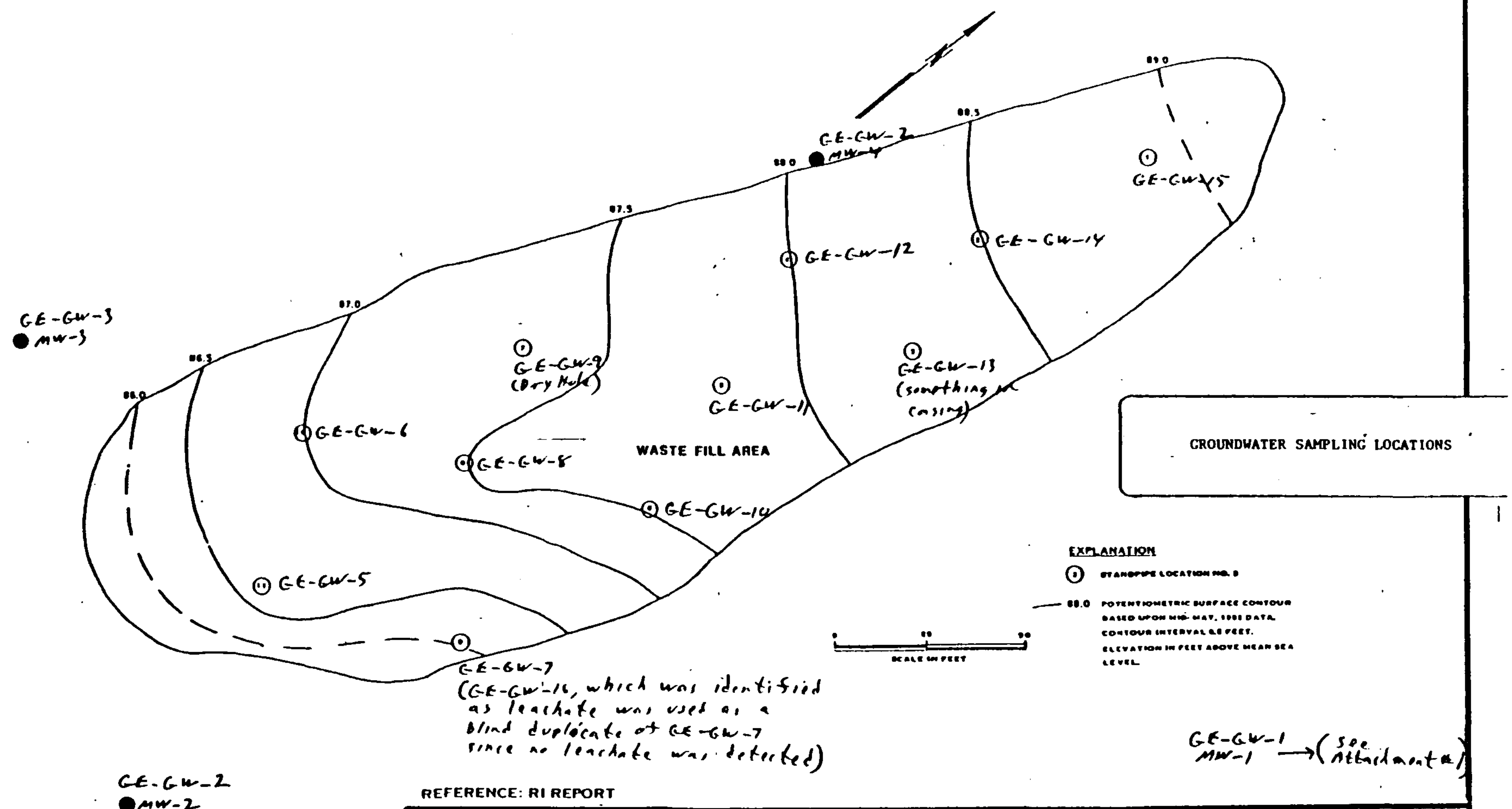
SOURCE: DOCUMENT 15 , PAGE NO. 1 , JOB NO. MH1223.

WIRING DEVICES OF PUERTO RICO, INC. GENERAL ELECTRIC COMPANY JUANA DIAZ. PUERTO RICO	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	GENERALIZED SETTING IN THE VICINITY OF THE WASTE FILL JOB NO. SS6331 FIGURE 1



SOURCE: DOCUMENT 30, PAGE NO. 10, JOB NO. MH2317.

WIRING DEVICES OF PUERTO RICO, INC. GENERAL ELECTRIC COMPANY JUANA DIAZ, PUERTO RICO	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	SITE SETTING JOB NO. SS6331 FIGURE 2



REFERENCE: RI REPORT

WIRING DEVICES OF PUERTO RICO, INC.
GENERAL ELECTRIC COMPANY
JUANA DIAZ, PUERTo RICO

LAW ENVIRONMENTAL INC.

POTENTIOMETRIC SURFACE ELEVATION OF PERCHED WATER
(MID-MAY 1982)

JOB NO. 55-6331

FIGURE 3

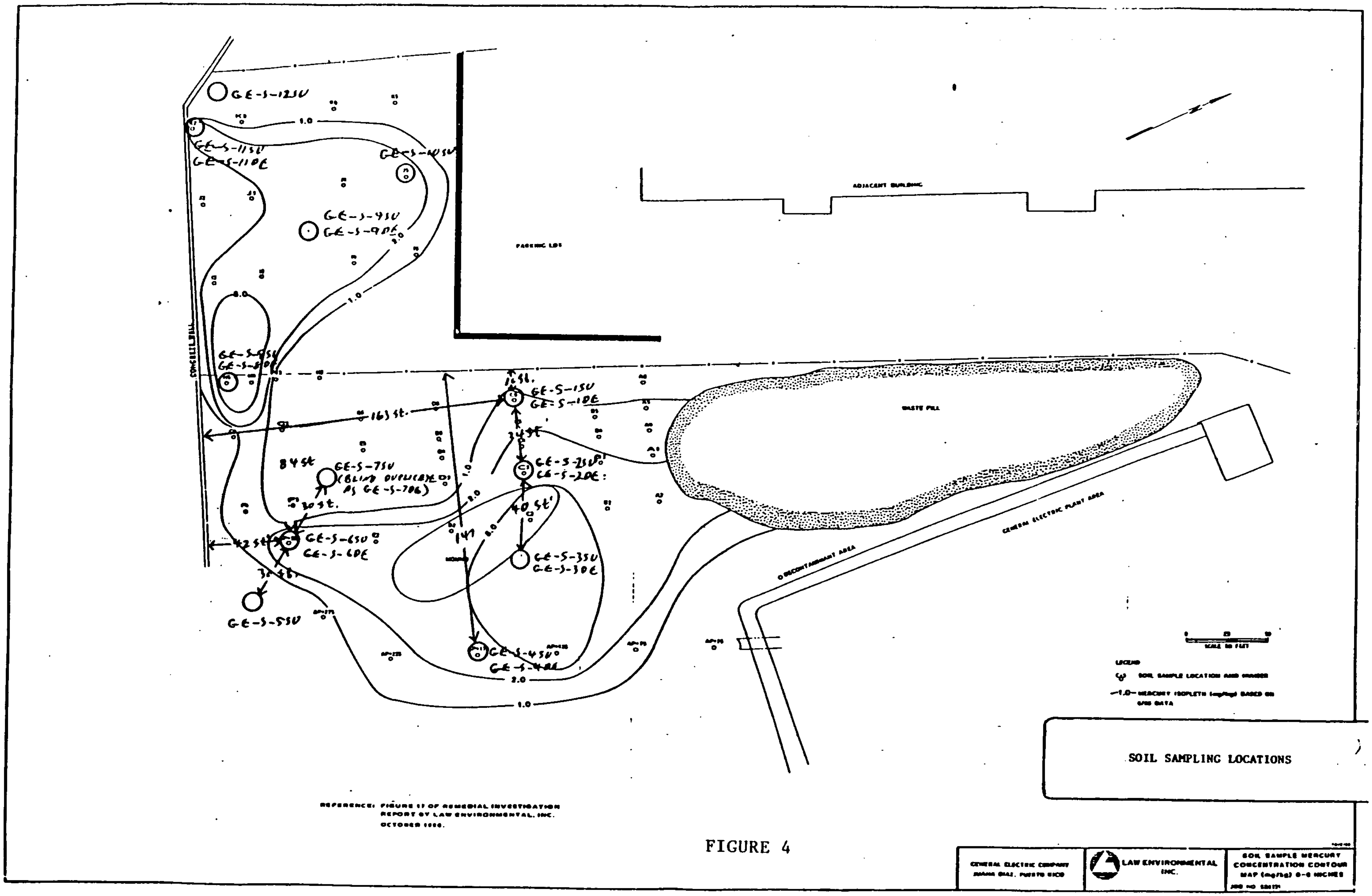
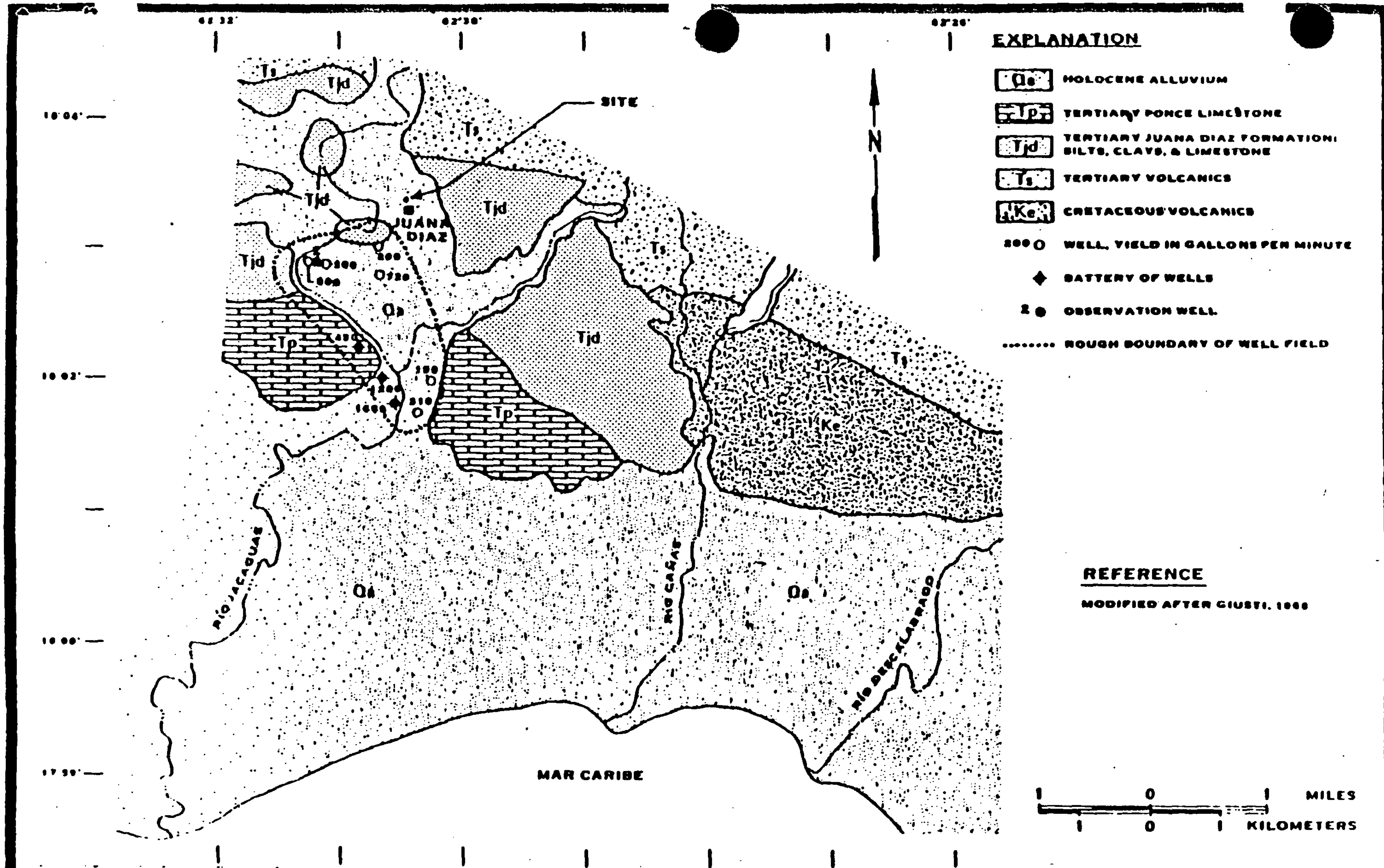
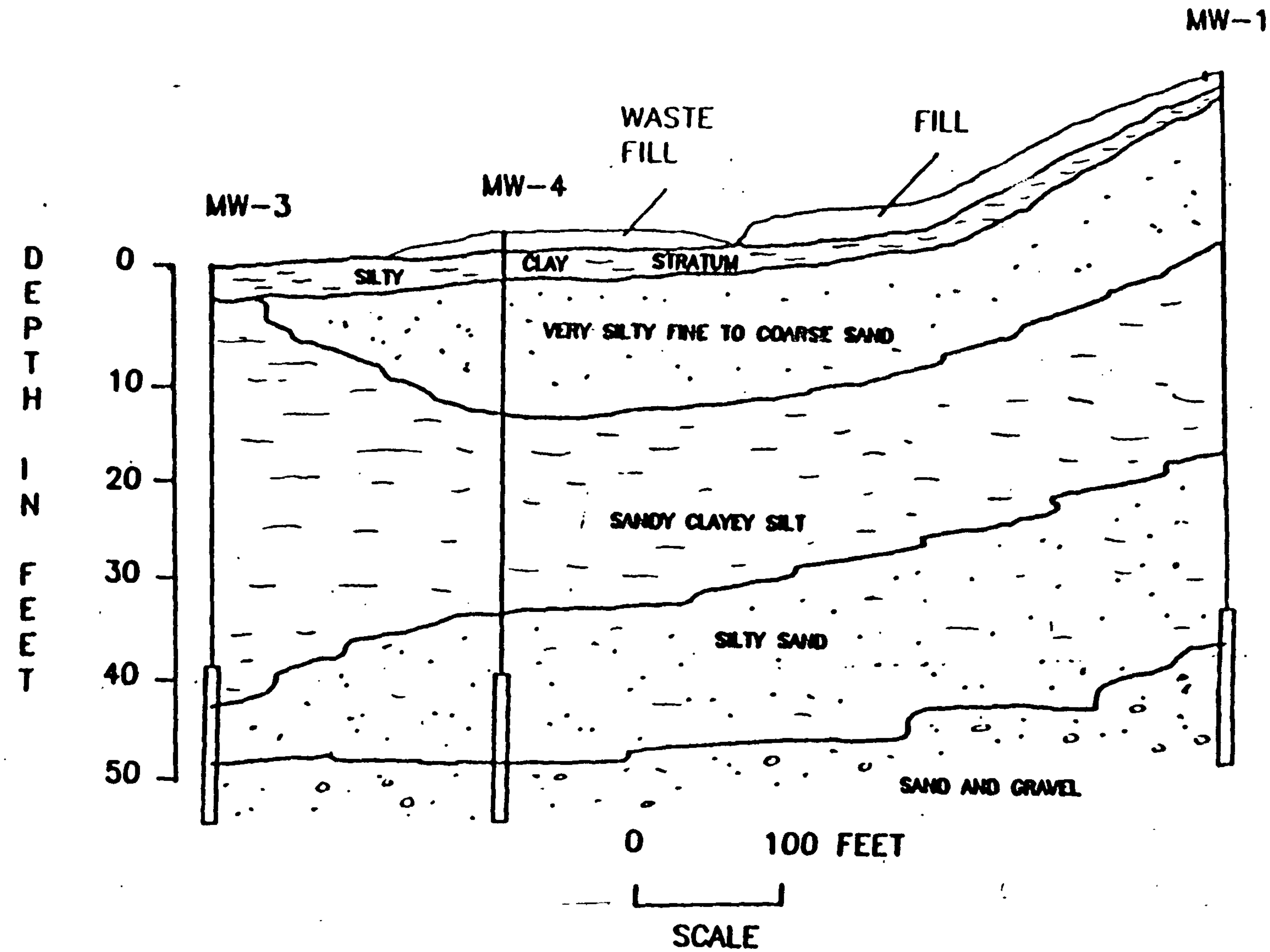

GE-S-12SU
GE-S-11SU
GE-S-11DE
GE-S-10SU
GE-S-9SU
GE-S-9DE
GE-S-8SU
GE-S-8DE
GE-S-7SU
(BLIND DUPLICATE OF GE-S-7DE)
GE-S-6SU
GE-S-6DE
GE-S-5SU
GE-S-1SU
GE-S-1DE
GE-S-2SU
GE-S-2DE
GE-S-3SU
GE-S-3DE
GE-S-4SU
GE-S-4DE
163 ft.
84 ft
30 ft.
42 ft
32 ft
16 ft.
34 ft
40 ft
147
1.0
2.0
8.0
CONCRETE WALL
PARKING LOT
ADJACENT BUILDING
WASTE PILL
GENERAL ELECTRIC PLANT AREA
DECONTAMINANT AREA
LEGEND
SOIL SAMPLE LOCATION AND NUMBER
SOIL SAMPLING LOCATIONS
REFERENCE: FIGURE 11 OF REMEDIAL INVESTIGATION REPORT BY LAW ENVIRONMENTAL, INC.
GENERAL ELECTRIC COMPANY
LAW ENVIRONMENTAL INC.
SOIL SAMPLE MERCURY CONCENTRATION CONTOUR MAP (mg/kg) 0-6 INCHES

FIGURE 4



SOURCE: DOCUMENT 13, PAGE NO. 29, JOB NO. MH2317.

WIRING DEVICES OF PUERTO RICO, INC. GENERAL ELECTRIC COMPANY JUANA DIAZ, PUERTO RICO	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	GEOLOGIC UNITS AND WELL LOCATIONS IN THE VICINITY OF THE SITE JOB NO. SS6331 FIGURE 5



SOURCE: DOCUMENT 30, PAGE NO. 33, JOB NO. MH2317.

WIRING DEVICES OF PUERTO RICO, INC. GENERAL ELECTRIC COMPANY JUANA DIAZ, PUERTO RICO	LAW ENVIRONMENTAL SERVICES MARIETTA, GEORGIA	SITE HYDROGEOLOGIC PROFILE JOB NO. SS6331 FIGURE 6

TABLE 2

SUMMARY OF COSTS

	ALTERNATIVE	CAPITAL ($)	MONITORING and O&M ($)
1.	No Action	- 0 -	71,270
3.	Fixation	834,150	82,540
4.	Capping in place with slurry wall	374,540	82,540
7.	Excavation	529,380	82,540
7a.	Alt. 7 with off-site disposal	2,563,110	4,000
8.	Thermal treatment	5,473,900	4,000
9.	Hydrometallurgical treatment	1,912,870	- 0 -