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M-412

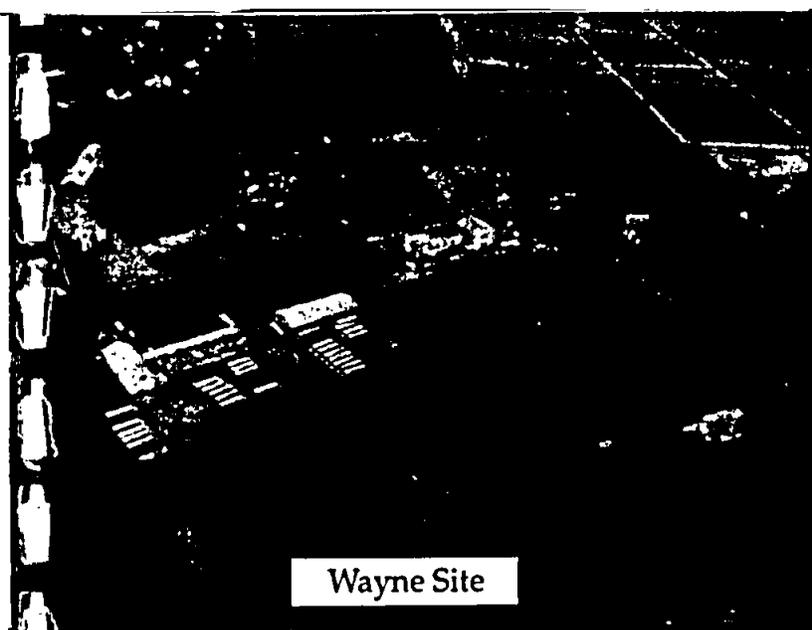
Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

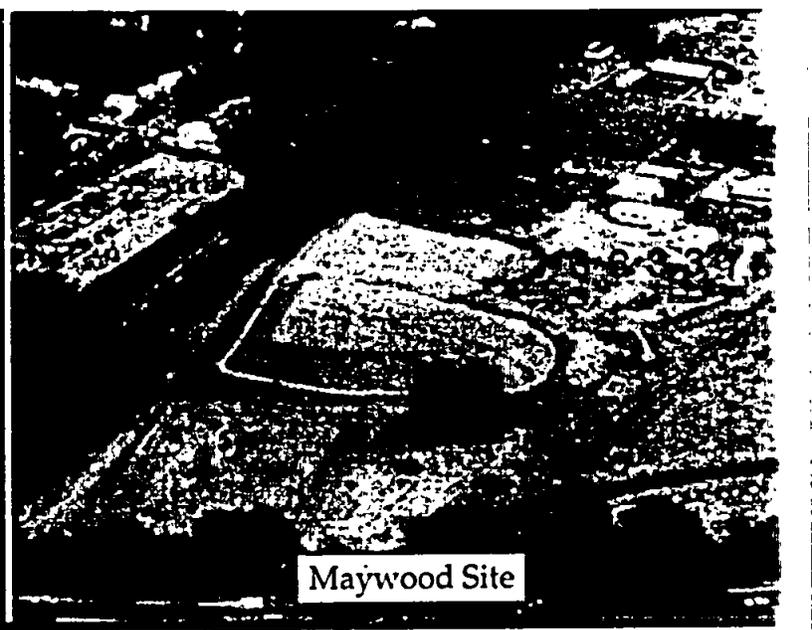
for Maywood, New Jersey



U.S. Department of Energy

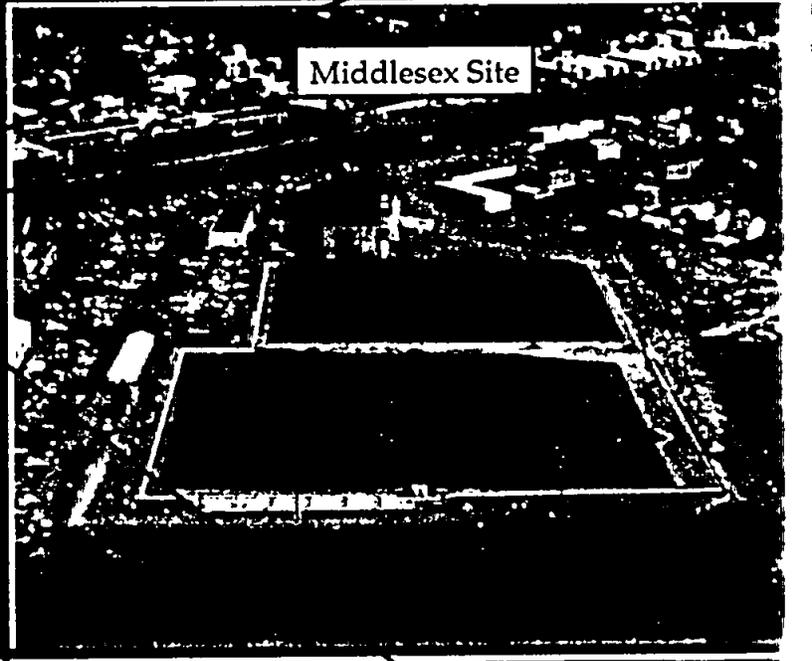


Wayne Site

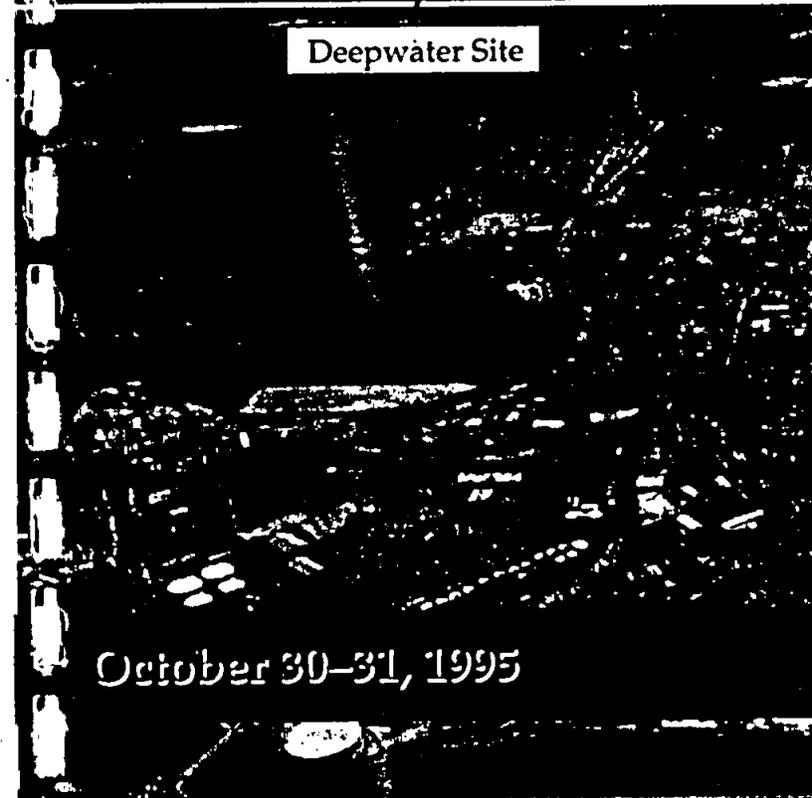


Maywood Site

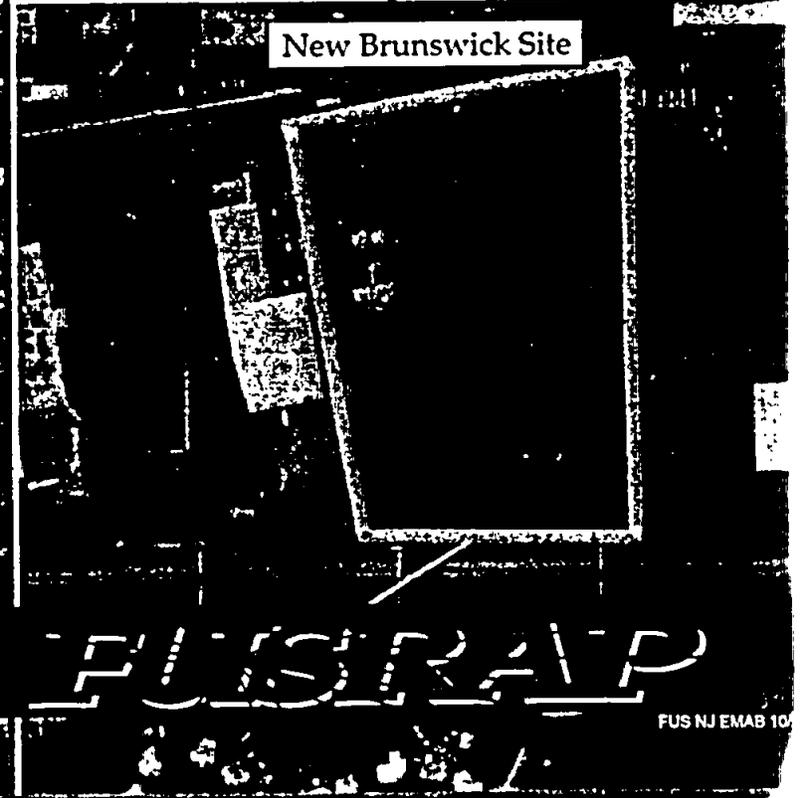
EMAB
 Briefing On
 1 New Jersey
 FUSRAP
 Sites

Middlesex Site



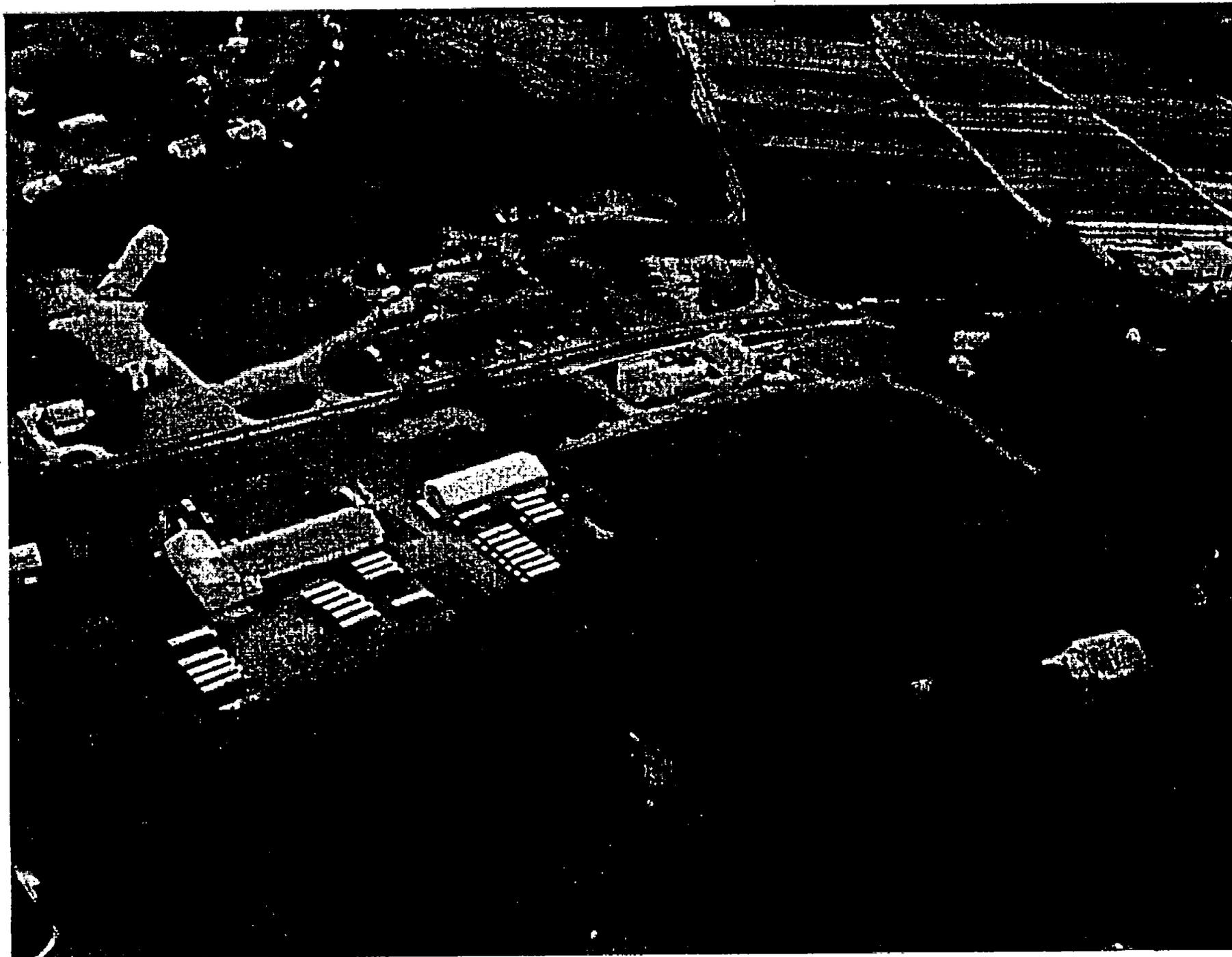
Deepwater Site



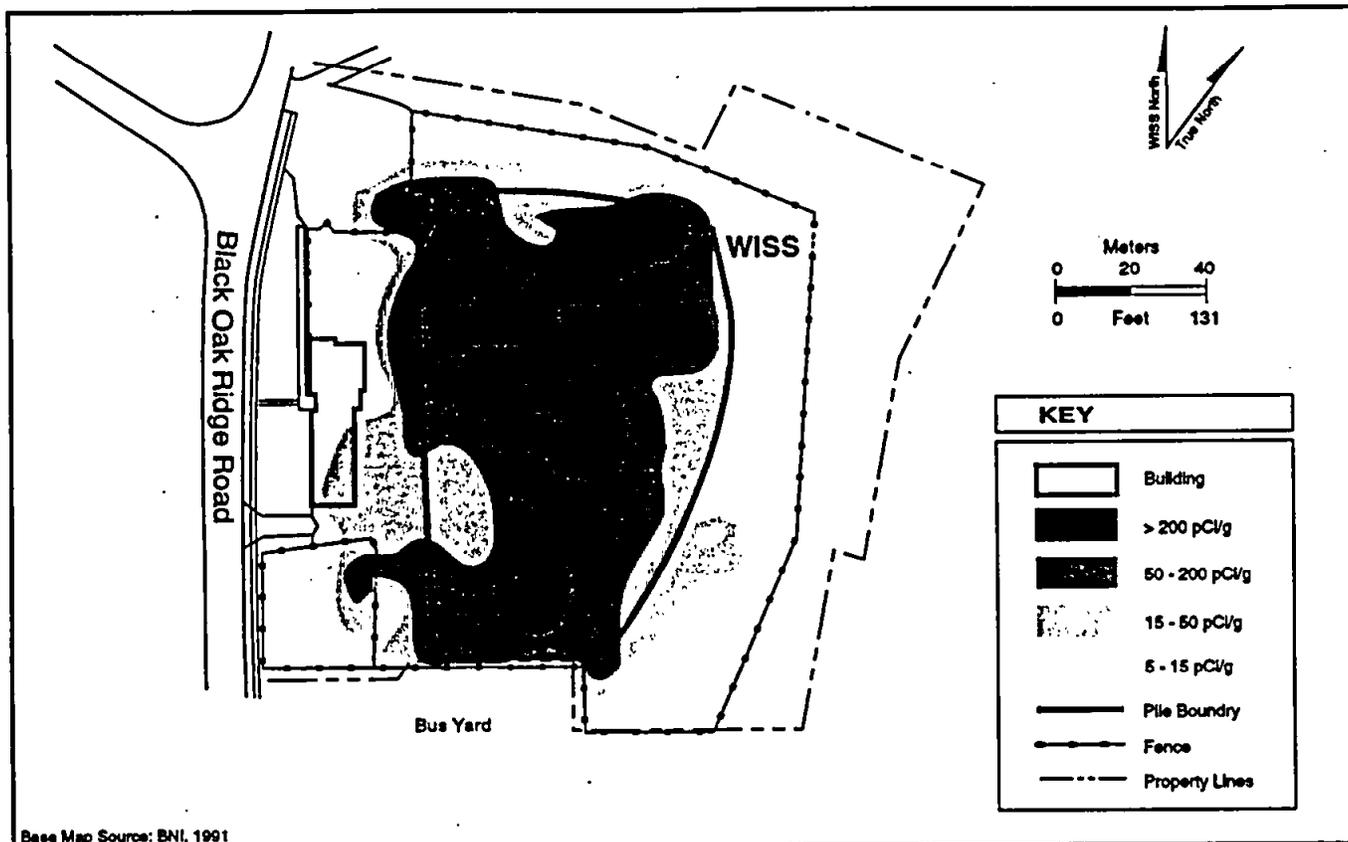
New Brunswick Site

October 30-31, 1995

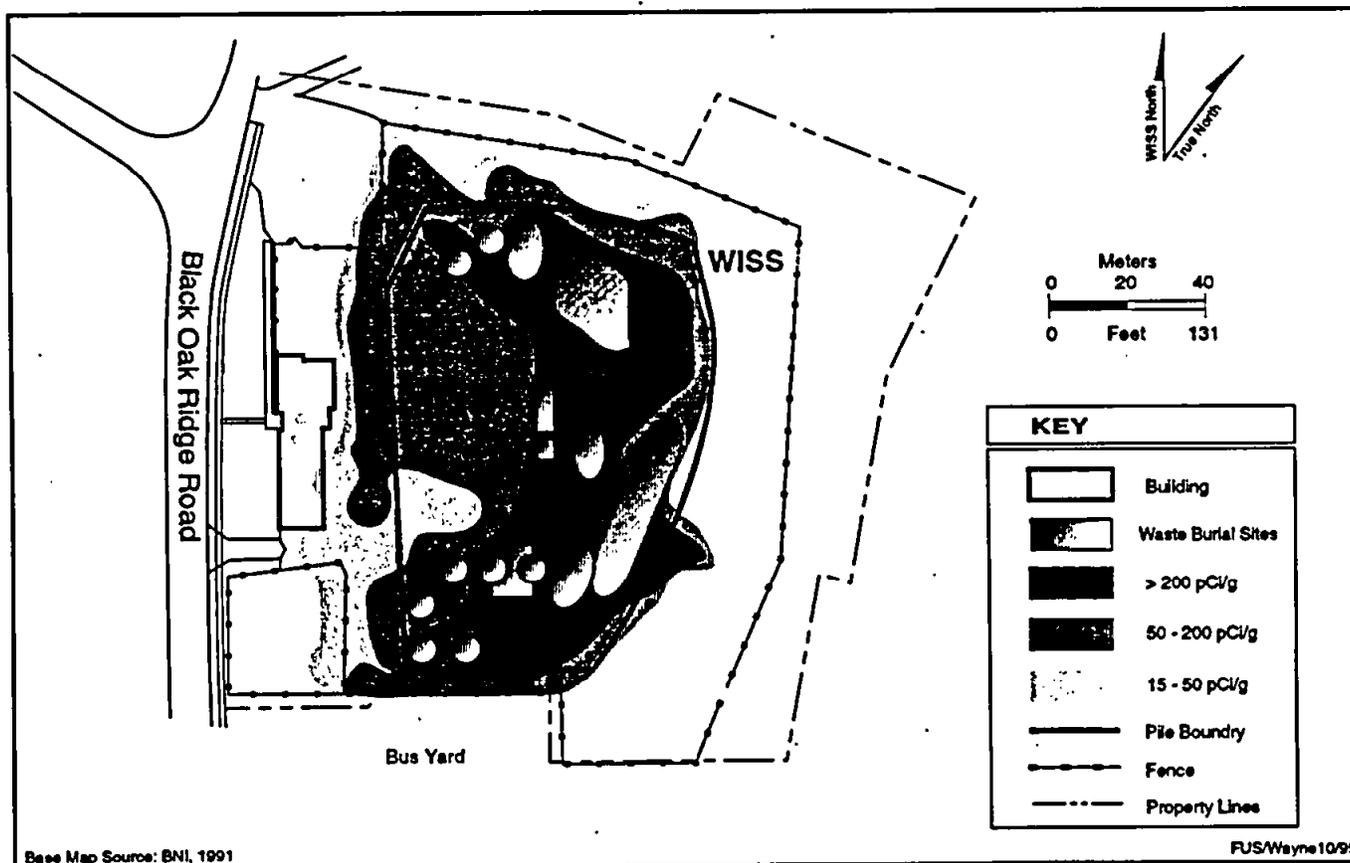
FUSRAP



Wayne Site



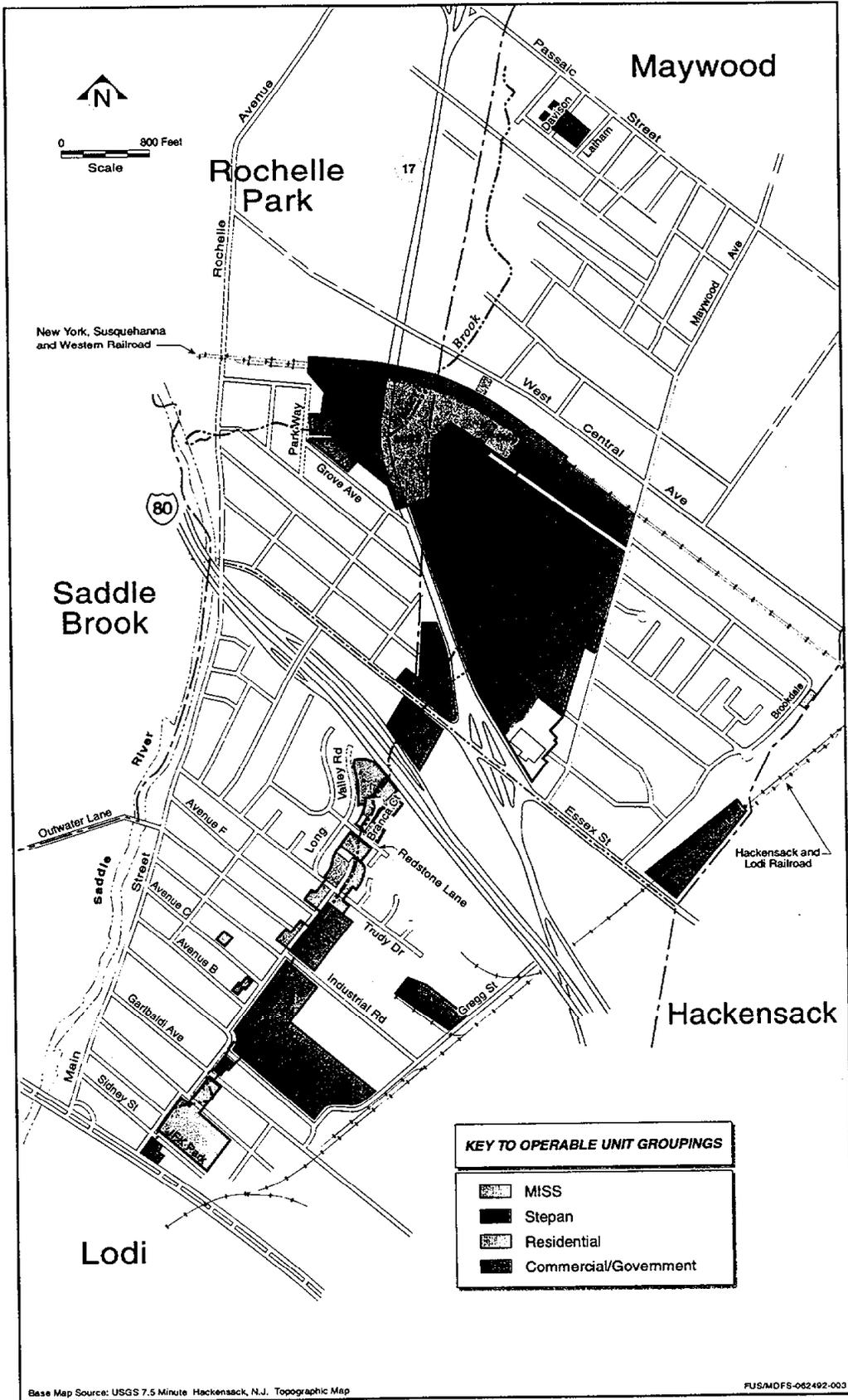
Thorium-232 Concentrations in the Surface Soil (0" to 6") at WISS



Thorium-232 Concentrations in the Subsurface Soil (6" to 5') at WISS



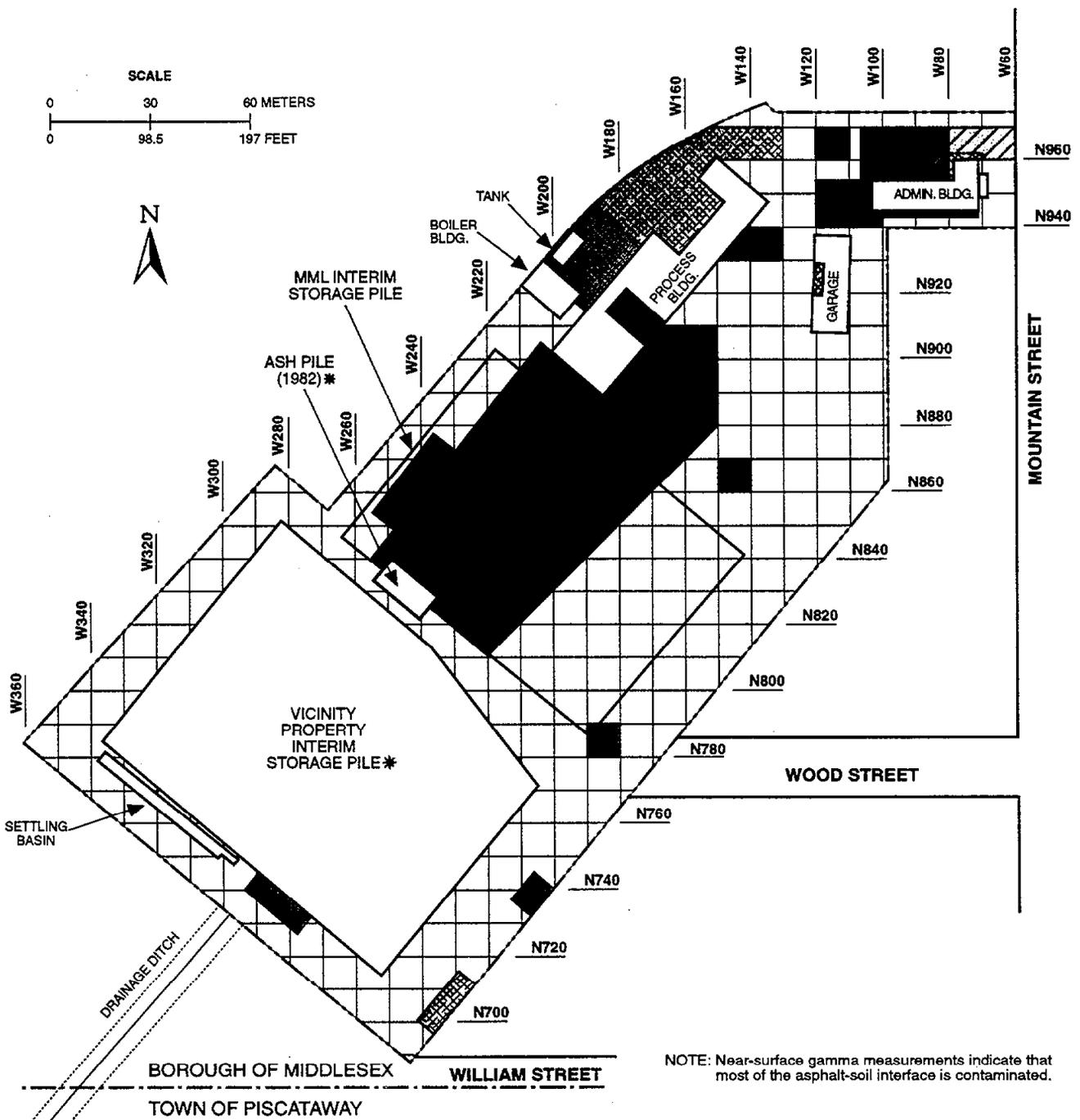
Maywood



Map of the Maywood Site Showing the Locations of MISS and Vicinity Properties



Middlesex Sampling Plant



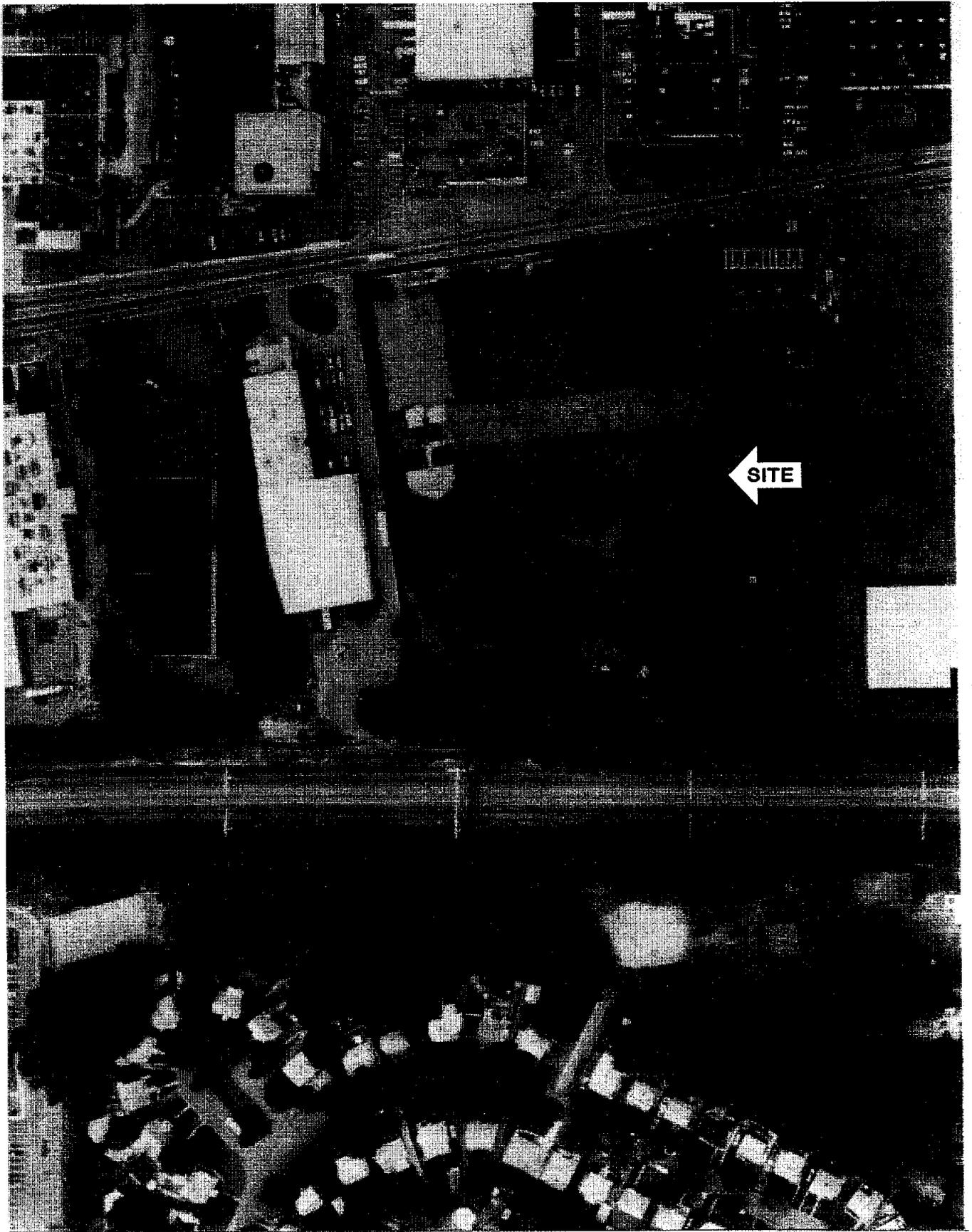
NOTE: Near-surface gamma measurements indicate that most of the asphalt-soil interface is contaminated.

LEGEND	
Depth of Contamination in feet (Above 15 pCi/g)	
Grass	0.5 – 1.0 Feet
Asphalt/Gravel Cover (Floor covering inside buildings)	1.0 – 1.5 Feet
* No Surveys Performed Under the Piles	2.0 – 2.5 Feet
	3.0 – 3.5 Feet
	4.5 Feet

Source: BNI 1985

FUS/MX 1095

Areas of Subsurface Radiologic Contamination Above 15 pCi/g Based on Soil Sample Results and Boring Logs.



New Brunswick Site



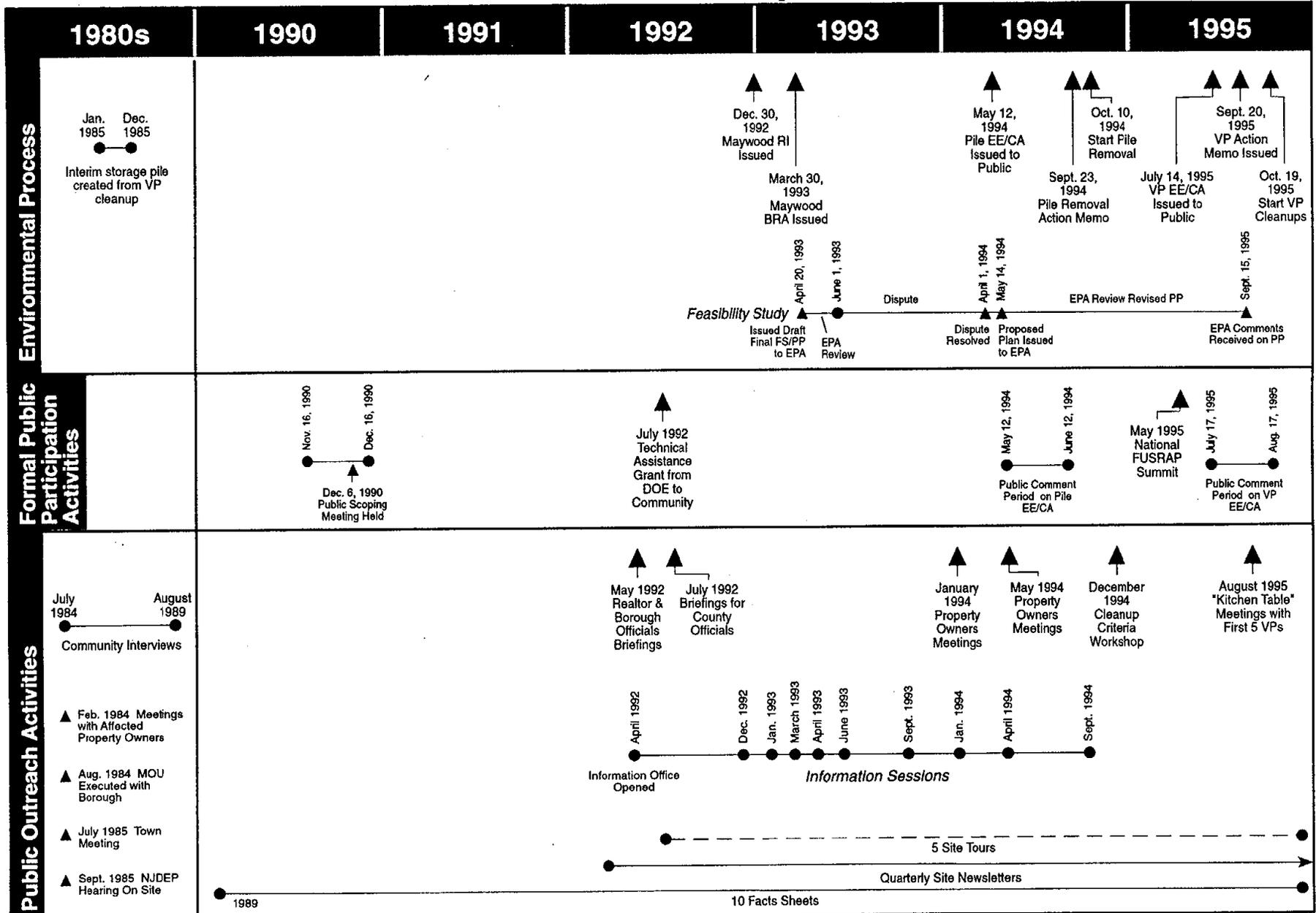
Du Pont & Co. Site

SITE NAME	LOCATION	DESCRIPTION	OWNER	SITE ACTIVITY	WASTE TYPES	ESTIMATED VOLUME	SITE STATUS
MAYWOOD	MAYWOOD, ROCHELLE PARK, LODI	Site consists of the Maywood Interim Storage Site (MISS), the Stepan Company property and 83 vicinity properties. MISS is a 12-acre fenced lot with a 2-acre interim waste storage pile from cleanup of 26 vicinity properties. The Stepan property is an 18-acre fenced area adjacent to MISS.	DOE (MISS), Stepan Company & numerous commercial, residential & government properties	Commercial thorium processing	Radioactive: Thorium-232 Radium-226 Uranium-238 (By-product material)	379,000 yd ³	NPL ^a site FFA ^b Ongoing activities: Pile removal Phase I property cleanups
WAYNE	WAYNE	6.4-acre fenced site, Wayne Interim Storage Site (WISS), with a building and a 2.7-acre interim waste storage pile. There are also 25 vicinity properties remediated previously.	DOE	Commercial thorium processing	Radioactive: Thorium-232 Radium-226 Uranium-238 (By-product material)	109,000 yd ³	NPL ^a site FFA ^b Ongoing activities: Pile removal
MIDDLESEX SAMPLING PLANT	MIDDLESEX	9.6-acre site, Middlesex Sampling Plant (MSP), with 4 buildings and 2 interim storage piles consisting of material from cleanup of the Middlesex Municipal Landfill (MML) and vicinity properties (VP).	DOE	Temporary storage of Belgian Congo ores	Radioactive: Uranium-238 Thorium-232 Radium-226 Hazardous: Lead	88,510 yd ³	Planned activities: Ditch cleanup Building D & D Treatment demo
NEW BRUNSWICK SITE	NEW BRUNSWICK	5.6-acre site that is fenced and unoccupied. Structures here removed during previous cleanup.	DOE	Assaying and sampling	Radioactive: Uranium-234, -235, -238 Thorium-232 Radium-226 Cesium-137	4,500 yd ³	Planned activities: FY96 remedial action
DU PONT & COMPANY	DEEPWATER	700 acres on north shore of Delaware River. One large building, waste lagoon, central drainage ditch, and waste burial area.	E.I. Du Pont de Nemours & Company	Uranium products research	Radioactive: Uranium-238	8,270 yd ³	Possible activities: FY97 remedial action

^aNPL - National Priorities List

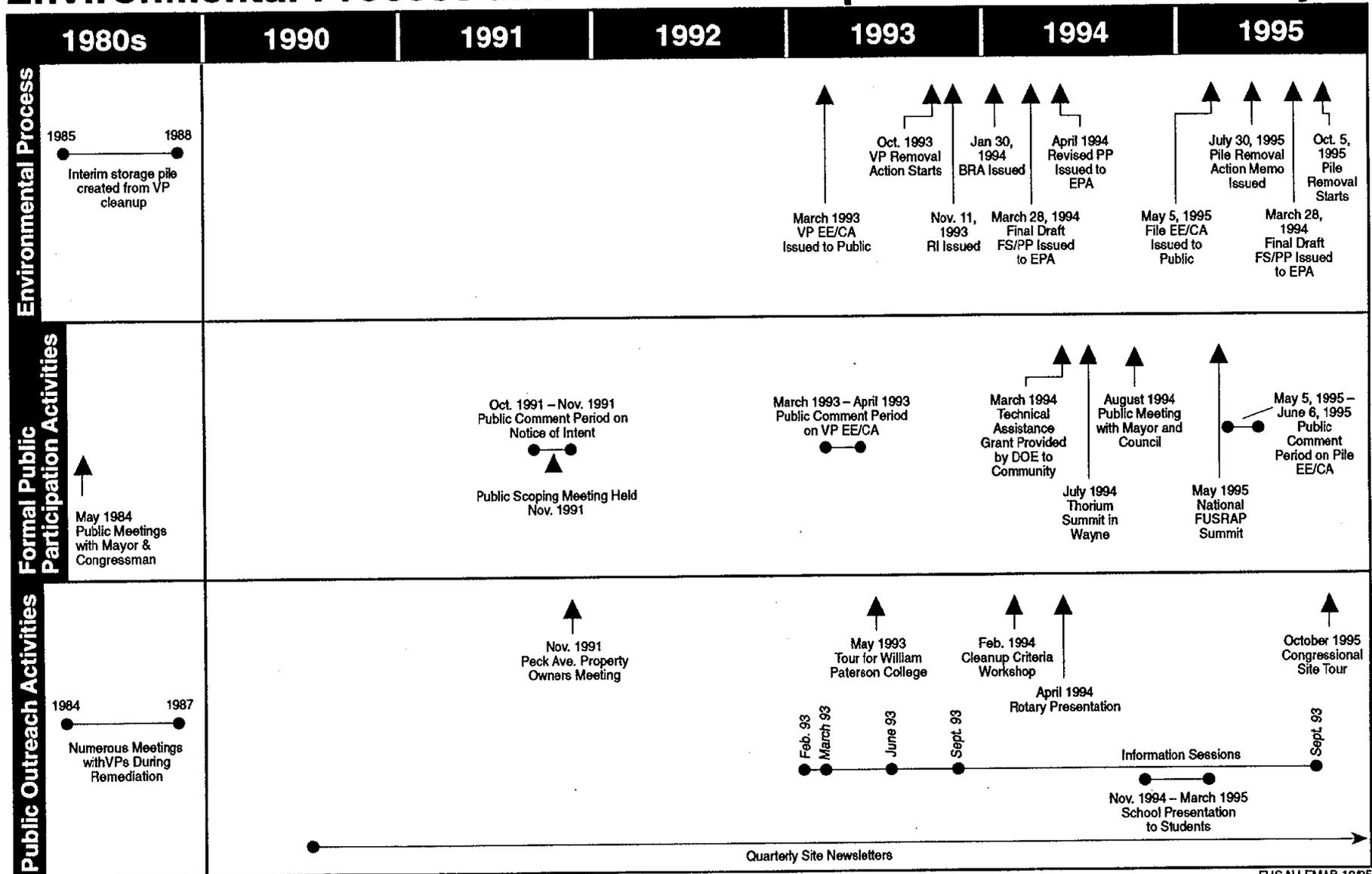
^bFFA - Federal Facilities Agreement

Environmental Process and Public Participation Timeline for Maywood



NOTE: • News releases are issued to announce work starts / completions
 • Display advertisements are issued to local media to announce publications of documents for public comment and final publication, information sessions, and public meetings

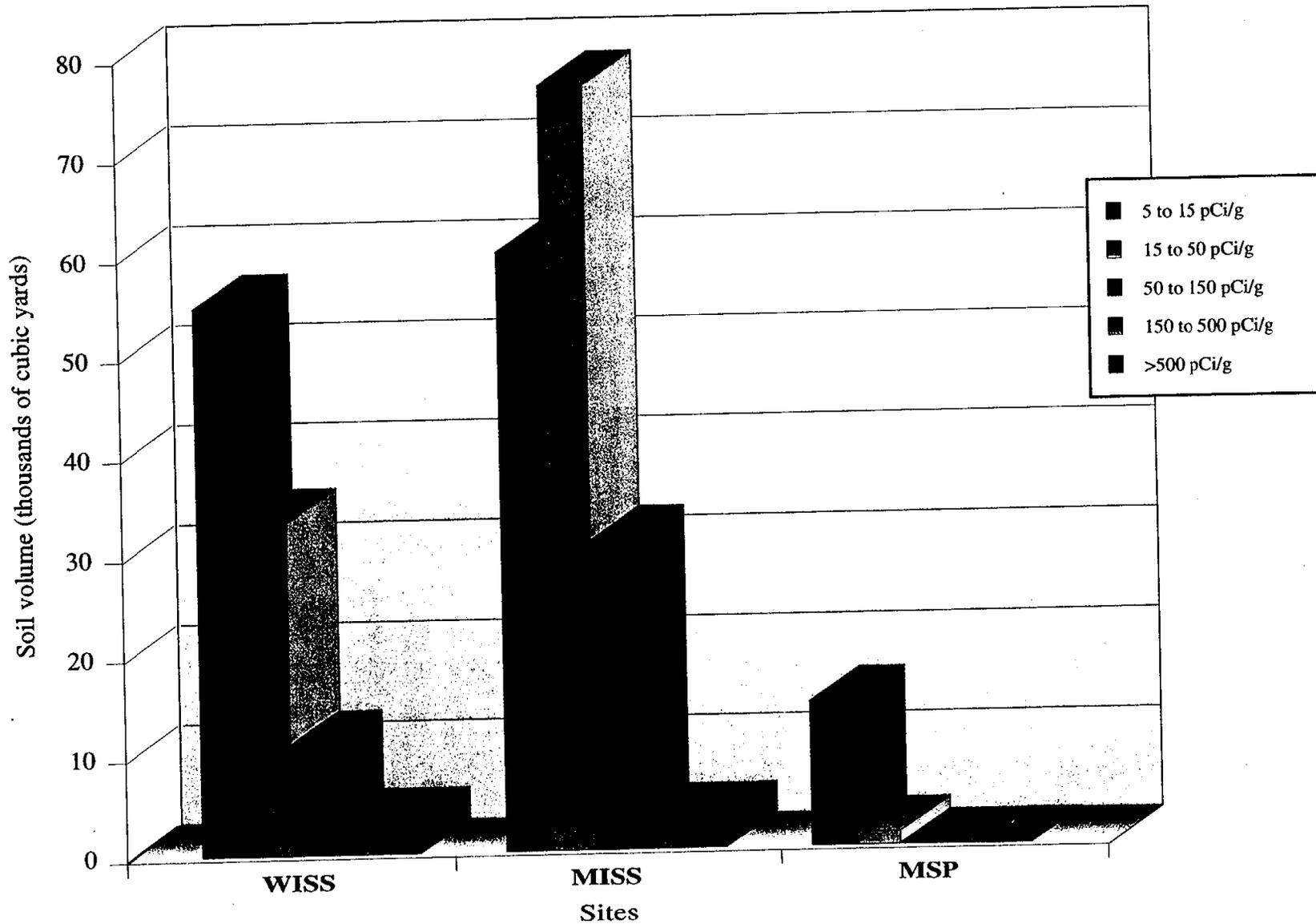
Environmental Process and Public Participation Timeline for Wayne



FUS NJ EMAB 10/95

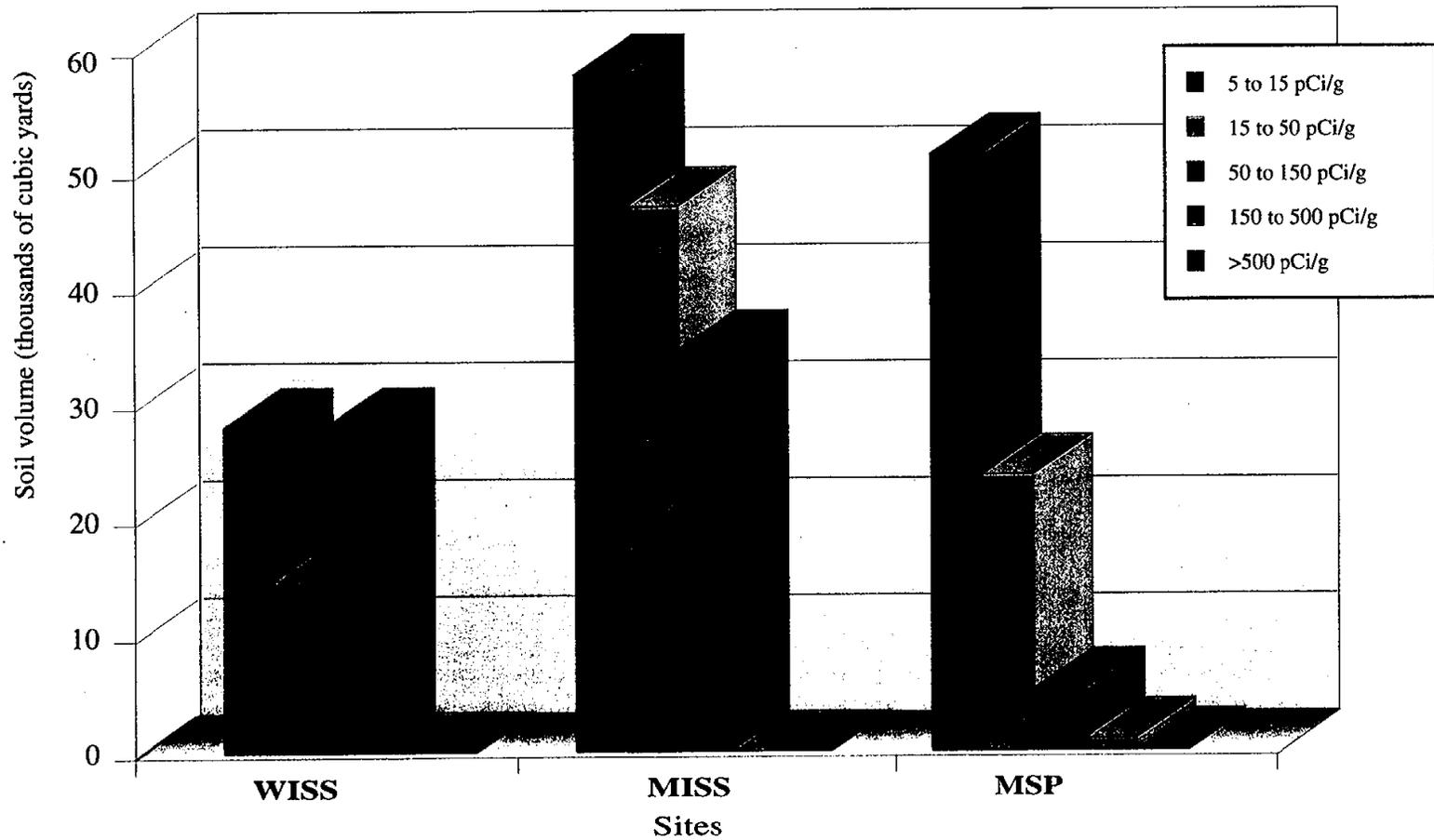
NOTE: • News releases are issued to announce work starts / completions
 • Display advertisements are issued to local media to announce publications of documents for public comment and final publication, information sessions, and public meetings

Distribution of Th-232 by Soil Volume* at New Jersey Sites



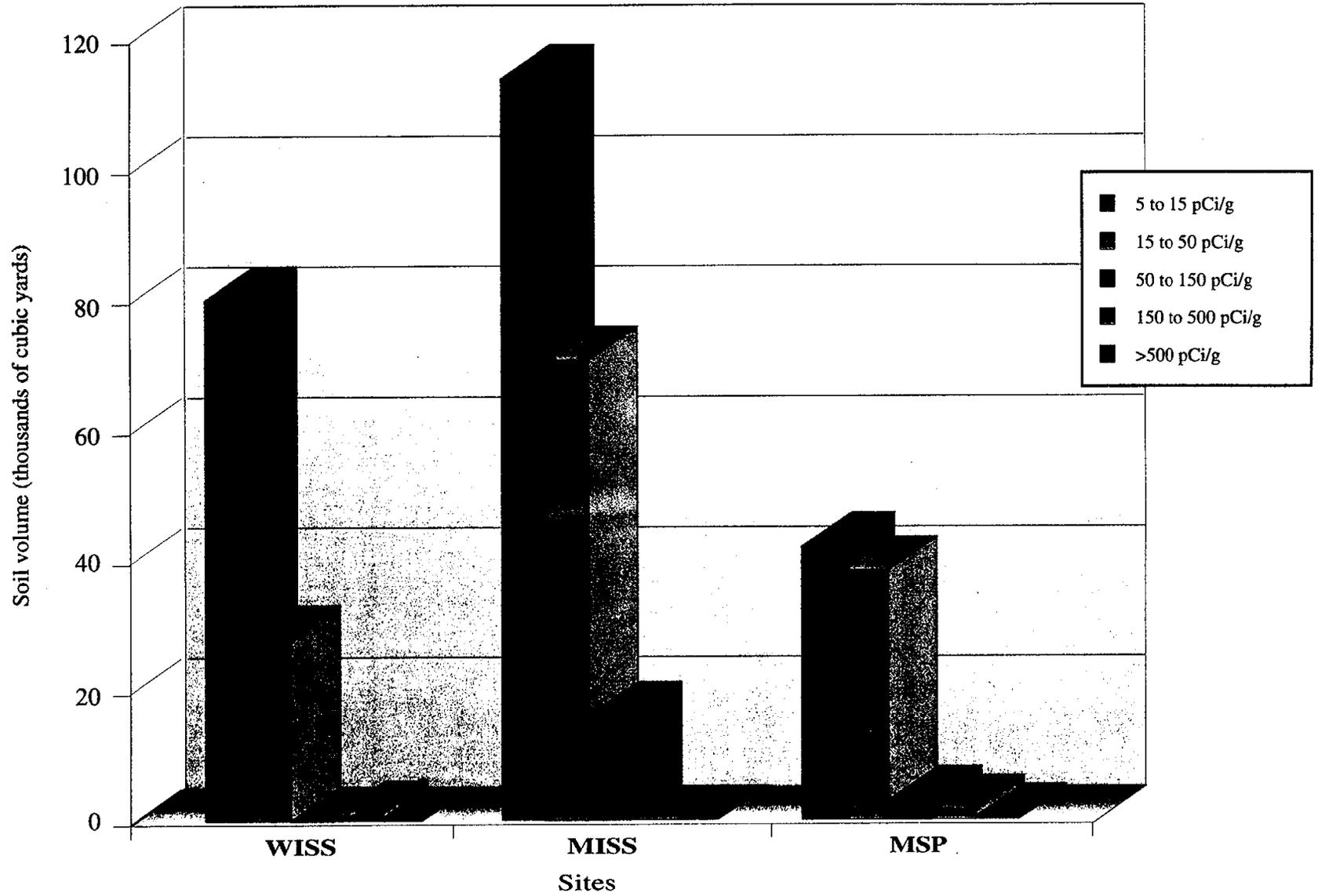
* Soil volume includes both pile and in situ soils

Distribution of Ra-226 by Soil Volume* at New Jersey Sites



* Soil volume includes both pile and in situ soils

Distribution of U-238 by Soil Volume* at New Jersey Sites



* Soil volume includes both pile and in situ soils

CLEANUP CRITERIA

- **Dispute between EPA Region II and DOE**

April 1993

DOE submitted draft final Feasibility Study (FS) and Proposed Plan (PP) for the Maywood site to EPA, identifying 40 CFR 192 as a relevant and appropriate requirement for site cleanup. Proposed cleanup criteria were:

- 5 pCi/g averaged over the first 15 cm below the surface.
- 15 pCi/g averaged over 15 cm-thick layers more than 15 cm below the surface.

June 1993

EPA disputed DOE's proposal saying that 15 pCi/g was not a "health-based" standard. EPA proposed instead 5 pCi/g through all soil layers regardless of depth.

- **Resolution of dispute**

DOE agreed to not specify 40 CFR 192 as an ARAR and instead developed site specific cleanup criteria.

Maywood

- Surface and subsurface soil at residential properties will be remediated to 5 pCi/g above background.
- Non-residential properties will be excavated to 5 pCi/g for surface soil and 15 pCi/g above background for subsurface soil with an "as low as reasonably achievable" (ALARA)^a goal of 5 pCi/g above background.

Wayne

- Criteria would depend on future land use of the property and would be consistent with Maywood.

Estimated Dose and Risk from Residual Soil Contamination				
	Effective Dose Equivalent (mrem/year)		Lifetime Excess Cancer Risk	
	Resident Scenario	Employee Scenario	Resident Scenario	Employee Scenario
Expected Condition ^b				
Mean	1.2 (1.5) ^c	2 (4) ^c	1×10^{-6} (1×10^{-6}) ^c	6×10^{-6} (1×10^{-5}) ^c
RME ^c	1.2 (1.8) ^c	2 (4) ^c	6×10^{-6} (6×10^{-6}) ^c	2×10^{-5} (4×10^{-5}) ^c
Minimum Cover ^d				
Mean	16 (21) ^c	8 (14) ^c	4×10^{-5} (6×10^{-5}) ^c	2×10^{-5} (4×10^{-5}) ^c
RME ^c	16 (22) ^c	8 (14) ^c	1×10^{-4} (2×10^{-4}) ^c	8×10^{-5} (1×10^{-4}) ^c

^aIn the context of DOE's ALARA program, the cleanup criteria specified for a remedial action are considered as upper limits only, and the actual level of remediation attained may be significantly greater, such as in the case of the 26 residential properties previously remediated at the Maywood site where, although DOE utilized a 15pCi/g cleanup criterion, post-remedial action data showed that the cleanup levels achieved were below 5 pCi/g above background.

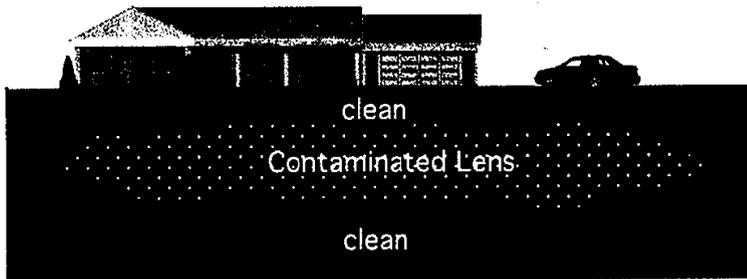
^bExpected Condition - 0.3 m (residential) or 1 m (commercial) clean cover over residual contamination.

^cRME - Reasonable Maximum Exposure.

^dMinimum Cover - 0.15 m (6 in) clean soil over residual contamination.

^eFirst value represents time=0; parenthetical value is maximum dose/risk over the period of analysis (t=1000 years), if different from time=0.

Maywood Current Condition Residential Use



Assumption:

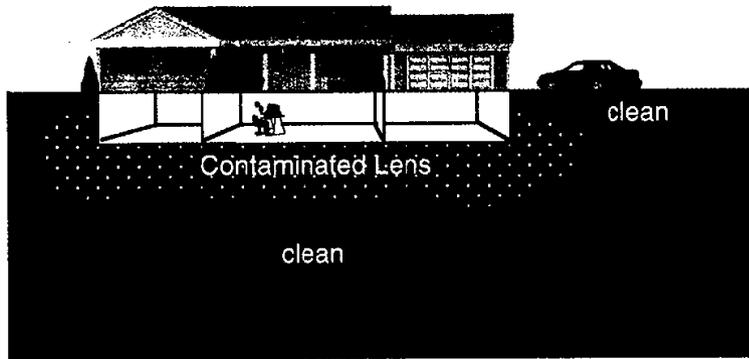
3.5-foot clean cover over 1.5-foot thick contamination zone, under entire house, residence: 12 hours inside, 6 hours outside.

Pathways	Dose (mrem for first year)
• Direct Exposure	0.0058
• Inhalation	0
• Ingestion	0
Total	0.0058

Radon Levels Inside the Structure

- 0.0002 WL or
- 1% of the EPA uranium mill-tailings standards

Maywood Current Condition Residential Use – With Basement



Assumption:

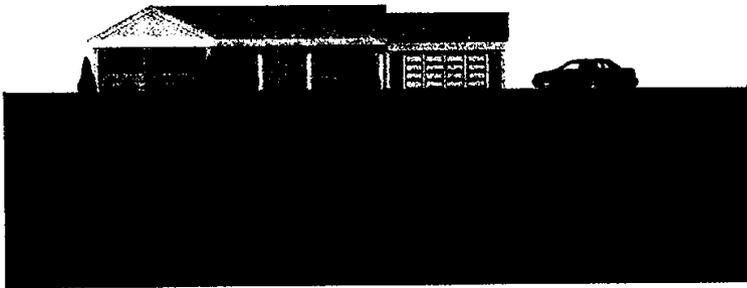
1-foot clean cover over 7-foot thick contamination zone, under entire house, 6 hours in basement, 3 hours outside, assumes 30% of the direct exposure is shielded by building materials.

Pathways	Dose (mrem for first year)
• Direct Exposure	5.6
• Inhalation	0
• Ingestion	0
Total	5.6

Radon Levels Inside the Structure

- 0.002 WL or
- 10% of the EPA uranium mill-tailings standards

Maywood Remediated to Criteria Residential Use



Assumption:

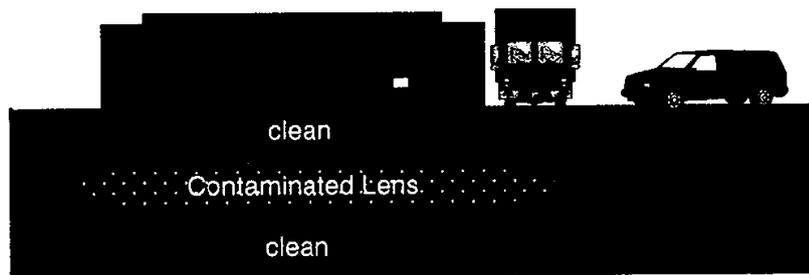
3.5-foot clean cover over 1.5-foot thick zone with residual radionuclides, under entire house, residence: 12 hours inside, 6 hours outside.

Pathways	Dose (mrem for first year)
• Direct Exposure	0.0033
• Inhalation	0
• Ingestion	0
Total	0.0033

Radon Levels Inside the Structure

- 0.0001 WL or
- 0.5% of the EPA uranium mill-tailings standards

Maywood Current Condition Commercial Use



Assumption:

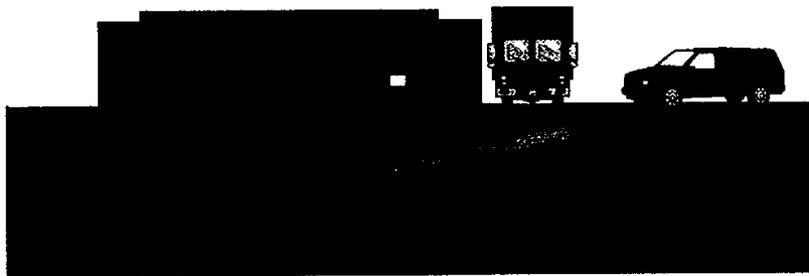
0.5-foot clean cover, 4-foot contamination zone, 40 hours per week indoors, 1 hour per day outdoors, contamination under entire building.

Pathways	Dose (mrem for first year)
• Direct Exposure	34.0
• Inhalation	0
• Ingestion	0
Total	34.0

Radon Levels Inside the Structures

- 0.004 WL or
- 20% of the EPA uranium mill-tailings standards

Maywood Remediated to Criteria Commercial Use



Assumption:

4.5-foot clean cover, 4-foot zone with residual radioactivity, 40 hours per week indoors, 1 hour per day outdoors, contamination under entire building.

Pathways	Dose (mrem for first year)
• Direct Exposure	0.00046
• Inhalation	0
• Ingestion	0
Total	0.00046

Radon Levels Inside the Structure

- 0.001 WL or
- 5% of the EPA uranium mill-tailings standards

REMEDIALTION ALTERNATIVES FOR THE MAYWOOD SITE

DESCRIPTION OF ALTERNATIVES (Based on draft Feasibility Study issued April 1994)	COST* IN MILLIONS	DISPOSAL VOLUME ^b (1000 x yd ³)
No Action.	23	0
Excavation and Commercial Disposal. Excavation of accessible contaminated soils on commercial/government properties and complete excavation of MISS and residential properties with commercial disposal.	284	379
Excavation, Treatment and Commercial Disposal. Excavation of accessible contaminated soils on commercial/government properties and complete excavation of MISS and residential properties; onsite treatment of soils and commercial disposal of treatment residuals.	179	76
Excavation, Treatment and Onsite Disposal. Excavation of accessible contaminated soils on commercial/government properties and complete excavation of MISS and residential properties, treatment and disposal of treatment residuals in an onsite cell.	186	76
Excavation and In-State Disposal. Excavation of accessible contaminated soils on commercial/government properties and complete excavation of MISS and residential properties; disposal of soils at an in-state facility.	288	379
Phased Excavation and Commercial Disposal. Phase I includes complete excavation of storage pile, residential properties and one commercial/government property. Phase II includes excavation and treatment of the remaining accessible soils at the Maywood site with commercial disposal of treatment residuals.	179	76
ALTERNATIVES UNDER DEVELOPMENT	COST* IN MILLIONS	DISPOSAL VOLUME ^b (1000 x yd ³)
Partial Excavation, Treatment and Commercial Disposal with Capping Onsite. Capping of selected areas (>150 pCi/g) at MISS, Stepan and Sears with institutional controls. Excavation, treatment and commercial disposal of residuals from other commercial/government properties.	74	13
Partial Excavation, Treatment and Commercial Disposal. Excavation of selected areas (>150 pCi/g) with commercial disposal at MISS, Stepan and Sears; institutional controls at MISS, Stepan and Sears. Excavation, treatment and commercial disposal of residuals from other commercial/government properties.	90	48

*Cost is in 1996 dollars.

^bExcavated volume (approximately 15 per cent greater than *in situ* volume).

Note: Descriptions of alternatives based on feasibility study include complete description of each alternative, however, cost estimates and volumes exclude pile removal (\$23M) and Phase I remediation (\$30M).

REMEDIALTION ALTERNATIVES FOR THE WAYNE SITE

DESCRIPTION OF ALTERNATIVES (Based on draft Feasibility Study issued April 1995)	COST* IN MILLIONS	DISPOSAL VOLUME ^b (1000 x yd ³)
No Action.	22	0
Complete Excavation and Commercial Disposal. Removal of storage pile and complete excavation of contaminated soil with commercial disposal. Decontamination and partial demolition of WISS building.	74	81
Partial Excavation, Commercial Disposal and Capping Onsite. Removal of storage pile with commercial disposal and capping of burial pit area.	33	0
Complete Excavation and In-State Disposal. Removal of storage pile and complete excavation of subsurface soil with in-state disposal. Decontamination and partial demolition of WISS building.	108	81
Phased Excavation, Treatment and Commercial disposal. Phase I includes treatment of the storage pile and commercial disposal of residuals. Phase II includes excavation and treatment of subsurface materials with commercial disposal of residuals. Decontamination and partial demolition of WISS building.	58	42
ALTERNATIVES UNDER DEVELOPMENT	COST* IN MILLIONS	DISPOSAL VOLUME ^b (1000 x yd ³)
Selected Excavation, Commercial Disposal and Capping Onsite. Excavation of soils with concentrations >150 pCi/g with commercial disposal and capping of remaining subsurface material.	64	40

*Cost is in 1996 dollars.

^bExcavated volume (approximately 15 per cent greater than *in situ* volume).

Note: Descriptions of alternatives based on feasibility study include complete description of each alternative, however, cost estimates and volumes exclude removal of pile which is in progress under turnkey contract with Envirocare.

REMEDIATION ALTERNATIVES FOR THE MIDDLESEX SITE

ALTERNATIVES UNDER DEVELOPMENT	COST* IN MILLIONS	DISPOSAL VOLUME (1000 x yd ³)
Complete Excavation and Commercial Disposal. Complete excavation and commercial disposal of VP pile, subsurface material and building rubble. Complete excavation, stabilization and commercial disposal of MML pile.	140	120
Excavation, Treatment and Commercial Disposal. Excavation, treatment and commercial disposal of treatment residuals from VP pile. Excavation, treatment and stabilization of treatment residuals from MML pile with commercial disposal of residuals. Subsurface soils and building rubble to commercial disposal.	87	42
Partial Excavation, Treatment and Commercial Disposal. Excavation, treatment and commercial disposal of treatment residuals from VP pile. Spreading and compaction of the MML pile. 6" asphalt cap over VP backfill and MML soil. Building rubble to local landfill.	39	12
Consolidate and Cap. Spreading and compaction of the two piles onsite and 6" asphalt cap placed over 9.6-acre area.	17	0
Complete Excavation and In-State Disposal. Complete excavation and in-state disposal of MML pile, VP pile, subsurface material and building rubble.	88	89

*Cost is in 1996 dollars.

REMEDIATION ALTERNATIVES FOR THE NEW BRUNSWICK SITE

ALTERNATIVES UNDER DEVELOPMENT	COST* IN MILLIONS	DISPOSAL VOLUME (1000 x yd ³)
No Action.	8.6	0
Containment and Institutional Controls. Installation of permanent cap of native topsoil (2 ft) to cover an area of 0.3 acres.	9.0	0
Partial Excavation and Commercial Disposal. Excavation of hot spots and commercial disposal. Backfill with clean soil. Assumes future industrial land use.	1.9	1.6
Excavation and Commercial Disposal. Excavation and commercial disposal of the contaminated soils. Assumes release without radiological restrictions.	4.6	4.5

*Cost is in 1996 dollars.

HEALTH STUDIES

MAYWOOD

- 1987 NJDOH^a investigation showed that cancer statistics in Maywood, Lodi and Rochelle Park do not exceed those of the rest of the State of New Jersey.
- 1990 ATSDR^b and NJDOH concluded that human exposure to radionuclides and/or hazardous substances is possible via interaction with contaminated soils at Maywood site.
- 1990 "Cancer cluster study" done by Mr. John Tamburro, a member of the community.
- 1991 Independent review of Tamburro study by two separate, independent epidemiologists (Dr. F. Davis, Associate Professor, Epidemiology and Biostatistics, School of Public Health, University of Illinois at Chicago; Dr. K. Mallin, Associate Director, Epidemiology, Illinois Cancer Council, Chicago) failed to establish a definite linkage between radioactive materials and chemicals at Maywood and excess cancer.
- 1995 ATSDR health consultation commissioned by Maywood Borough. Report in preparation.
- 1995 ATSDR and NJDOH cancer incidence study. Report in preparation.

WAYNE

- 1990 ATSDR and NJDOH concluded that human exposure to radionuclides was possible via interaction with contaminated soils at the Wayne site.
- 1990 Paper published in a peer-reviewed scientific journal (Najem & Voyce, *American Journal of Public Health*) described a study of 112 households in the vicinity of the Wayne site in which "no definite conclusions" could be drawn from documented data on possible adverse health effects.
- 1994 Article in *Rachel's Hazardous Waste News* commented on the Najem & Voyce study and concluded that the study indicated adverse health effects among persons living near Wayne. (A conclusion not drawn by Najem & Voyce).
- 1995 A consultant to Wayne township, RWMA^c, performed a health survey to assess the baseline public health characteristics of the Wayne site and concluded that the apparent elevated cancer mortality rate in the survey group was conceivably caused by, but could not be definitely linked to, radioactive contamination from the Wayne site.
- 1995 DOE requested ATSDR review of the RWMA health survey. ATSDR questioned the existence of the perceived cancer cluster without additional data collection and analysis of confounding variables. They also pointed out that the design of the RWMA study would inherently be unable to establish causality.

^aNJDOH - New Jersey Department of Health.

^bATSDR - Agency for Toxic Substances and Disease Registry.

^cRWMA - Radioactive Waste Management Associates.

TREATMENT ACTIVITIES

TREATMENT GOALS

- Meet cleanup criteria.
- Reduce volume of material requiring transportation and disposal as low-level radioactive waste.
- Reduce remediation costs so that treatment is competitive with "hog & haul".

MAYWOOD

Preliminary Characterization

- 1991 Subsurface samples were taken from the MISS pile and analyzed by NAREL^a to evaluate feasibility of treatment. Results indicated a 70% volume reduction might be attainable for MISS pile soils using particle-size separation treatment.
- 1992 Additional samples were collected from the subsurface at various locations on the Maywood site for further characterization. These results indicated that a 80% volume reduction might be attainable for the Maywood subsurface using particle-size separation.

Treatability Studies

- 1996 Complete treatability studies (characterization & screening; optimization & selection) will be performed by Sanford Cohen & Associates for subsurface soils.

WAYNE

Preliminary Characterization

- 1994 Samples were collected from the WISS pile and analyzed by NAREL^a to evaluate feasibility of treatment. Results indicated that particle-size separation might achieve up to 50 to 65% volume reduction.
- 1994 Subsurface samples were taken from under the pile. Results indicated that volume reduction by particle-size separation alone is not a viable option for remediation due to high radionuclide concentrations.

Treatability Studies

- 1996 Characterization & screening treatability studies will be performed by Sanford Cohen & Associates for subsurface soils.
- 1997 Complete treatability studies (characterization & screening; optimization & selection) will be completed for the Wayne subsurface and pits.

MIDDLESEX

Treatability Studies

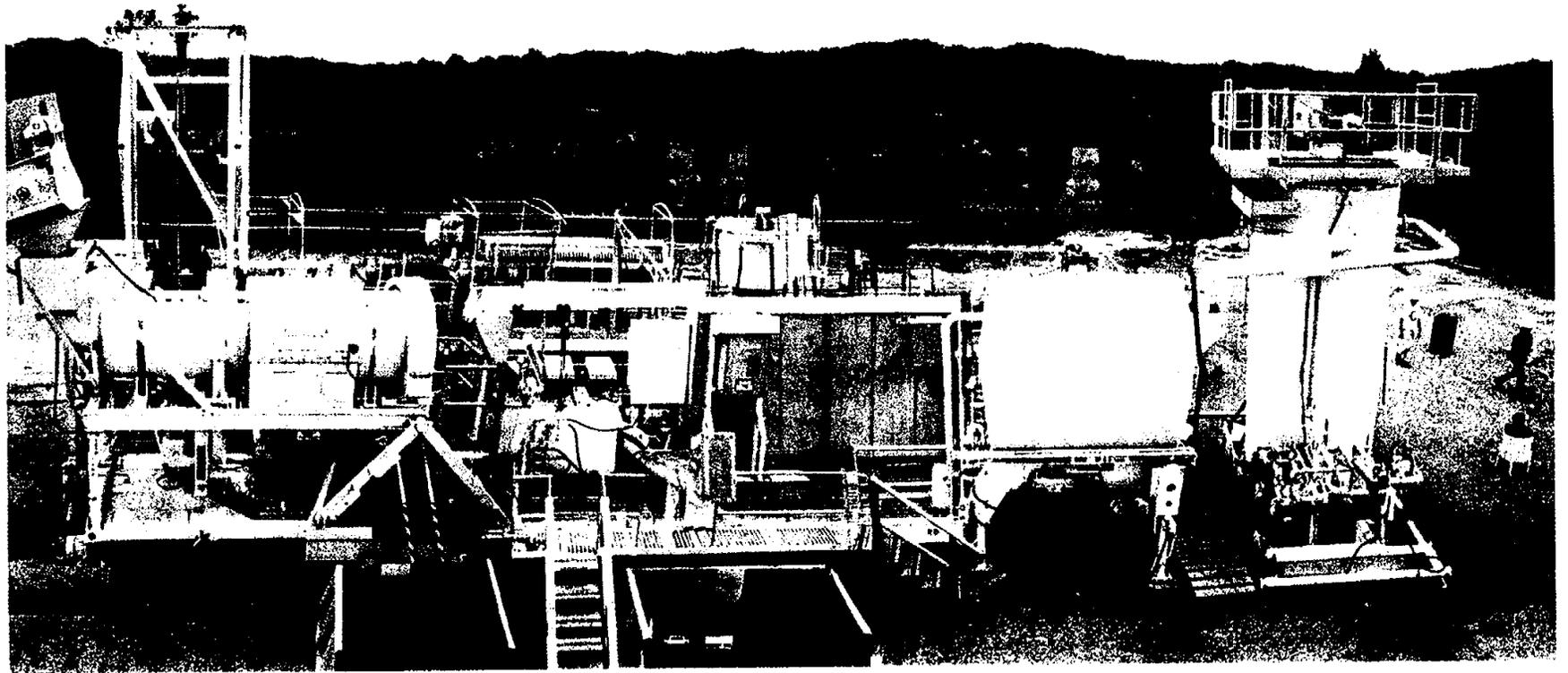
- 1995 Initial characterization and screening treatability studies were performed by Clemson Technical Center (CTC). Results indicated:
- Physical processes (particle-size separation) appear effective for the MML pile in reducing volume of contaminated soils.
 - Particle-size separation alone for the VP pile is not promising.
 - Attrition scrubbing is a viable pretreatment option for MML and VP soils.
- 1996 CTC is evaluating other technologies for both piles - density separation and chemical extraction. Also, stabilization (immobilization) studies will be done for MML pile soils.
- 1997 Commercial pilot demo planned.

VORCE^b pilot tests

- 1996 Hot tests planned on Maywood pile and subsurface soils, and Wayne pile.

^aNAREL - National Air and Radiation Environmental Laboratory.

^bVORCE - Volume Reduction Chemical Extraction pilot-size soil-washing machine.



VORCE Soil Washing System