LMS/NBL/S04816

New Brunswick, New Jersey, Site

Investigation Plan to Identify Potential Radiological Contamination in a Sanitary Sewer

December 2008

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1.0 Background

According to a report by the Argonne National Laboratory (1984), Phase I of the deactivation and decommissioning activities at the New Brunswick, New Jersey, site (NBL) was performed in 1978 with the intent of releasing the buildings for unrestricted use. However, contamination was more widespread than anticipated, and it was determined that additional extensive cleanup would be required. Phase II cleanup began in March 1981. Phase IIA involved decontamination and removal of all above-ground structures; it was completed in September 1981. Phase IIB consisted of the removal of all on-site concrete foundations, drain lines, and contaminated soil. Phase IIB was completed in June 1984. As part of Phase II, an assessment of contamination in the off-site sanitary sewer and storm drains was completed.

For the sake of expediency, all on-site drain lines and pipes were considered to be contaminated and were disposed of with the other radioactive waste generated during site remediation. Exceptions to this were two sewer lines running along the east fence of the property that could be broken open for complete surveys and were found to be uncontaminated; they were disposed of in a local landfill. After on-site pipes were removed, composite soil samples were collected from the remaining trenches to ensure the absence of "hot spots." Concentrations of all trench samples met cleanup criteria that existed at the time. Results of trench samples are summarized in Table B-11 from the decontamination and decommissioning report from the Argonne National Laboratory (ANL) (ANL 1984, excerpted in Appendix A). Thirteen samples were collected from along the sewer lateral that is thought to terminate at Manhole 26 (with y values of 180.7). Radium-226 in those samples ranged from 0.6 to 5.1 picocuries per gram (pCi/g), while thorium-232 ranged from 0.7 to 1.8 pCi/g. Uranium-235 was detected in three samples, at 0.8, 0.4, and 0.3 pCi/g. Uranium-238 and americium-241 were below detection in all 13 samples.

During the Phase II remediation, questions were raised about the potential for radioactive contamination in off-site sanitary and storm sewer drain lines. As a result, an investigation was conducted in 1982 (Appendix E of ANL 1984, excerpted in Appendix A as published in the Certification Docket). Various types of samples were collected from off-site and on-site sanitary sewer lines and from an outfall location about 0.25 mile from the site. At two locations, contamination was detected with a portable instrument. The section of pipe at one of these locations (location number 200) was removed and disposed of as contaminated. At the location showing the highest off-site activity concentration (location number 210), scrapings were collected in the vicinity of a cracked sewer tile at the base of Manhole 26 and submitted for radionuclide analysis. This sample exhibited elevated levels of radionuclides (See Figure 1, Table E-1 from ANL 1984). No elevated activity was detected at the outfall.

The decontamination and decommissioning report (ANL 1984) concluded that the activity levels in scrapings from around the cracked pipe were higher than those at other locations, and that the exposure rate was also higher than "normal." However, it was not considered to be a serious concern, though it was not "officially dismissed." The report concluded that the sewer pipe should be replaced or that the proper agencies should be informed that potential risk was considered to be insignificant and that no further action is anticipated. The report did also note that "the total activity which could be trapped under the broken tile at sample location number 210, or at other inaccessible points in the line, is unknown." The item was never officially resolved.

TABLE E-1. SANITARY SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS PICO CURIES IN DISSOLVED SOLIDS/mℓ OF SOLUTION[a] Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
200[b]	5/25/82	342 ±34	6490	462 ±150	815 ±82	7	37	93±5/41±5
		"	"	"	"	"	"	"
200[c]	5/25/82	3.3	40.8	-	< 0.06	-	2.5	12.1±3.1
		0.08± .02	6.2E-5	-	< 0.01	-	5E-5	8E-5/1E-5
210[d]	5/25/82	4.56± .05	16.2[e]	66 ±20[e]	128 ±13	35	0.6	3.6/27
		< 0.01	-	-	< 0.01	-	-	-
210[f]	5/25/82	0.34± .03	0.8	0.22± .11	5.14± .05	-	0.7	0.05/0.006
		0.21± .02	1.5E-4	-	< 0.01	-	< 5E-5	<3E-5/<2E-5
230	5/25/82	1.80	6.84	0.17	2.27	-	1.19± .11	3.19±.22/0.52±.04
		0.02± .01	1.5E-4	< 0.01	0.03± .02	-	1.1E-3	<3E-5/<3E-5
240	5/25/82	< 0.09	0.2	-	0.27	-	<0.01	<0.01/<0.01
		< 0.01	1.5E-4	5.2E-5	0.03± .02	-	<5E-5	<3E-5/<3E-5
250	5/25/82	1.13	13.4	0.38	2.31	-	0.11	0.04/0.31
		0.09± .03	5E-3	< 0.01	0.29± .09	-	1E-4	3.8E-2/3.8E-2
330	5/25/82	< 0.02	0.38	< 0.01	-	-	-	-
		0.09± .09	1.5E-3	< 0.01	0.05± .02	-	<1E-5	<7E-4/<7E-4
340	5/25/82	2.86	1.57	-	-	-	-	-
		0.69± .07	-	0.16	0.04± .02	-	<1E-4	1E-5/1.4E-4
350	5/25/82	0.86	1.26	0.05	-	-	0.002±.002	0.004±.002/<0.02
		< 0.01	7E-4	-	0.26± .08	-	<5E-4	6E-3/0.12

[a]The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per mℓ of solution.

[b]Scrapings from 5-ft sections of sewer pipe at about 50 ft from connection to city main on the NBL site.

[c]Water which ran out of sanitary sewer line when 5-ft section was removed.

[d]Scraping from broken tile at bottom of manhole.

[e]There is an unresolved discrepancy between the shown concentration of total U and that of ^{234}U.

[f]Random samples of sludge from manhole.

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Figure 1. Table E-1 from ANL 1984

A preliminary site visit to inspect Manhole 26 in November 2008 led to the discovery that the sides of the manhole had been grouted over, and the original sample location number 210 is no longer accessible (Figure 2 and Appendix B). Additionally, no evidence of a lateral pipe leading to the NBL property could be found. Therefore, the original sample cannot be replicated, and the U.S. Department of Energy (DOE) cannot visually inspect the manhole and lateral pipe to determine the integrity of the lines and the likelihood that leakage could have occurred. DOE believes that this proposed investigation and historical investigations can result in data that support a determination of whether additional remedial action or ongoing controls are needed.

Figure 2. Interior of Manhole 26 at the New Brunswick, New Jersey, Site.

2.0 Objectives of This Study

The tasks described in this work plan are intended to identify either the presence or absence of radiological contamination in the manhole interior and surrounding soils that will lead to (1) the release of underground piping and surrounding soils for unrestricted use ***or*** (2) a determination that portions of the manhole/pipe and surrounding soils will require future remediation and must be placed under institutional control until that occurs.

The activities described here are anticipated to fulfill requirements for a characterization survey as specified in the State of New Jersey's *Field Sampling Procedures Manual*, Chapter 12, "Radiological Assessment." The sampling approach is consistent with general sampling requirements of *New Jersey Administrative Code* (NJAC) Section 7:26E-3.4 for site investigations and for subsurface radiological surveys described in the State of New Jersey's *Field Sampling Procedures Manual*, Chapter 12, "Radiological Assessment." Results of soil laboratory analysis will be compared with derived concentration guideline levels (DCGLs) in NJAC 7:28-12 to determine if remediation is necessary or if the manhole and surrounding soils can be released for unrestricted use.

Sampling of Manhole 26 will be biased, based on accessibility, professional judgment, and site history. The work will consist of an initial interior dose rate and gamma radiological survey of the manhole interior, followed by an exterior geoprobe survey of soils as close to the manhole as possible. Geoprobe borings will be checked for anomalous gamma radiation. Appendix C is an

analysis by Jim Berger, CHP, of the potential to identify low activities of gamma-emitting radionuclides in soil using instruments that also have been used to detect uranium daughter products on uranium mill tailings investigations. The tasks and objectives of the surveys are described in Table 1 and shown on Figure 3.

Table 1. Characterization Tasks and Objectives for the Sewer Investigation at the New Brunswick, New Jersey, Site

Task	Use	Decision/Conclusion
Radiological gamma scan and exposure rate measurements of the interior of manhole using handheld instruments and following DOE-compliant procedures)	Compare results to 10 CFR 835 limits for occupational exposure rates Determine if gamma activity from beneath the grout is present that would indicate the location of the 1982 sample	Determine need for controls for future utility work in manhole/sewer Determine if the manhole materials must be managed as radioactive waste for future disposal
Geoprobe two continuous cores alongside Manhole 26 (see Figure 3). If possible, additional borings may be collected from alongside the assumed location of the lateral	Profile soil and determine if granular material was used to bed manhole Perform field radiological analysis of soil cores	Granular material will suggest that samples be collected at top of native material Identify portions of cores with elevated gamma readings
Collect samples from the geoprobe cores for laboratory analysis; samples will be collected from a depth within 6" of the manhole base; an additional sample will be collected from the top 6 inches of native material if different from above. Samples with elevated gamma readings or having unusual visual characteristics will also be collected	Submit soil samples for laboratory analysis for alpha and gamma spectrometry	Determine if radiological contamination leaked into soil outside manhole Determine if liquid radiological contamination percolated down through granular material and collected in top layer of native soil
Gamma logging of geoprobe holes adjacent to manhole; 0.5-foot intervals per New Jersey Radiological Assessment procedures	Identify areas of elevated gamma activity; measurement interval ensures any soils > 5 pCi/g Ra-226 are detected if the contamination is within 1.5 feet of the boring	Determine if soil requires future remediation. Evaluate potential concentrations of other radionuclides based on relative Ra-226 activities to other radionuclide activities in 1982 sample result from crack in sewer tile. Determine depth to collect sample(s) for lab analysis Determine thickness of contaminated zone to select appropriate DCGLs
Results from laboratory analysis of soil samples for radionuclides	Confirm presence/absence of contamination based on gamma survey; determine if non-gamma emitters present; compare to DCGLs; based on correlation with gamma survey, delineate areas requiring remediation; determine appropriate management of investigation-derived waste	If > DCGLs, require future remediation; if < DCGLs, soils need no restrictions

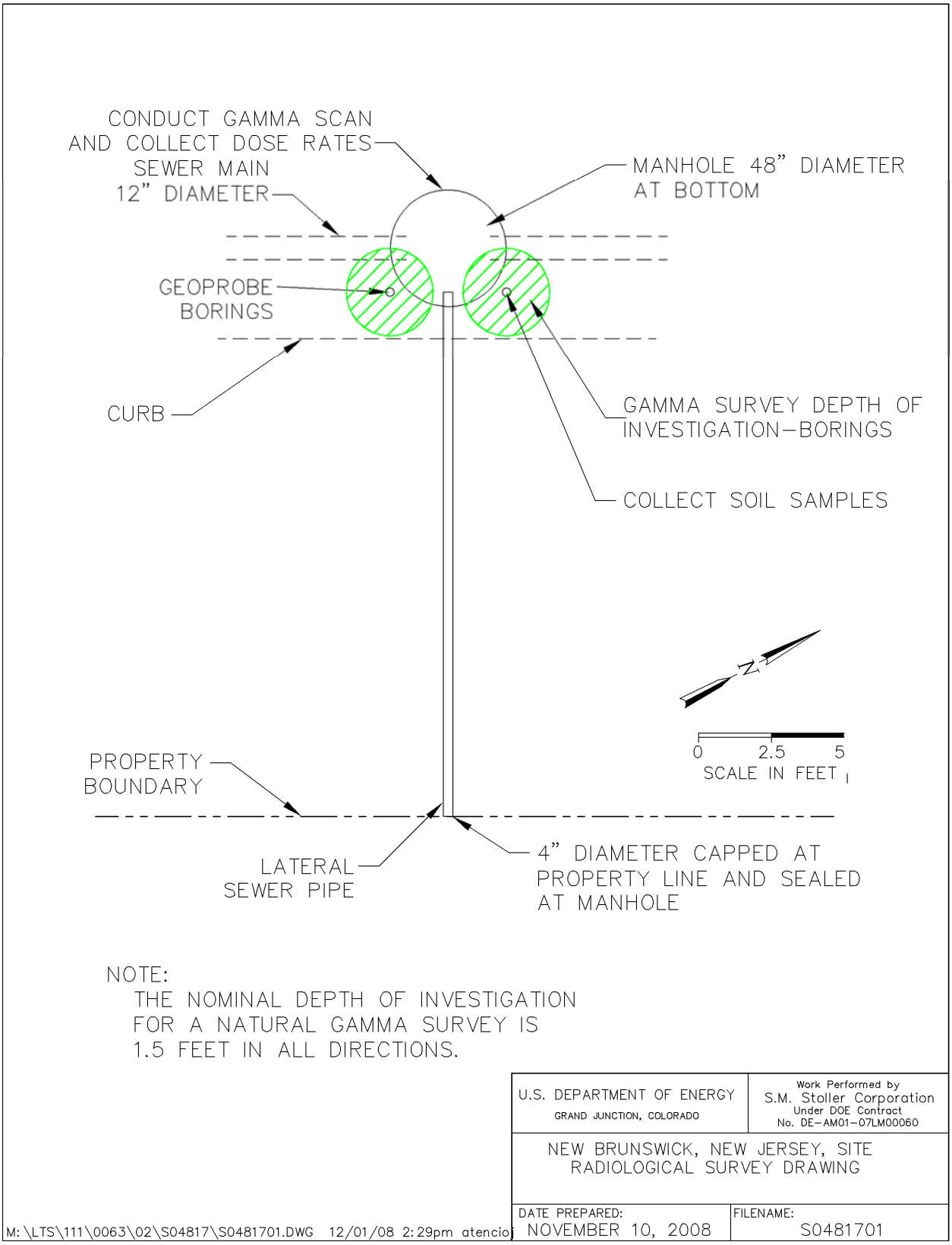

Figure 3. Plan View of the Investigation Area at the New Brunswick, New Jersey, Site

It is anticipated that the interior survey will result in one of two conclusions regarding future work in the manhole:

1. If any of the sampling methods used during the interior survey clearly indicates that the manhole does not meet radiological release criteria for surface contamination ***or*** that occupational exposure rates are exceeded, it is assumed that the manhole will need to be considered a controlled area. Appropriate worker protection will be required for future work in the manhole and any portions of the manhole/sewer removed for repair or replacement in the future will need to be scanned and, if necessary, disposed of as regulated radioactive material. DOE will implement the Deed Notice (Appendix D).

2. If the sampling methods used for the interior survey indicate no radiological contamination above background, the assumptions will be made that no controls will be required for worker protection for future work in the manhole and that restrictions will be applied to scan pipe and other materials before disposal during future repairs or replacement. Restrictions will be managed through implementation of the Deed Notice.

The combination of the interior and exterior surveys will result in one of two outcomes regarding future remediation:

1. If the interior survey of the manhole detected no elevated radiological contamination and if all soil analyses are below DCGLs, a future owner can perform a sewer tie-in without restriction as long as any abandoned sewer lines are undisturbed.

2. If the interior of the manhole has elevated radiological contamination or if any DCGL is exceeded in any soil sample, it is assumed that the piping/soil will require future remediation and the site will be referred to the U.S. Army Corps of Engineers (USACE) for further assessment and remediation under the Formerly Utilized Sites Remedial Action Program, or FUSRAP. DOE will implement the Deed Notice until such time that remediation can occur. USACE will monitor and, if necessary, control any utility work near the manhole and lateral alignment.

It is expected that the information collected to meet the objectives discussed above will be sufficient to allow the potential buyer/developer of the NBL property to obtain the proper permits and fulfill other requirements needed to move forward on his plans.

3.0 References

ANL (Argonne National Laboratory) 1984. *Phase II Decontamination and Decommissioning of the New Brunswick Laboratory—New Jersey Site, Interim Report*, ANL-OSH/HP-84-110, November.

NJAC 7:26E-3.4. *New Jersey Administrative Code*, Section 7:26E-3.4, "Technical Requirements for Site Remediation," State of New Jersey, current version.

NJAC 7:28-12. *New Jersey Administrative Code*, Section 7:28-12, "Soil Remediation Standards for Radioactive Materials," State of New Jersey, 2000.

State of New Jersey, current version. *Field Sampling Procedures Manual*, Chapter 12, "Radiological Assessment."

Appendix A

Excerpts of Site Reports

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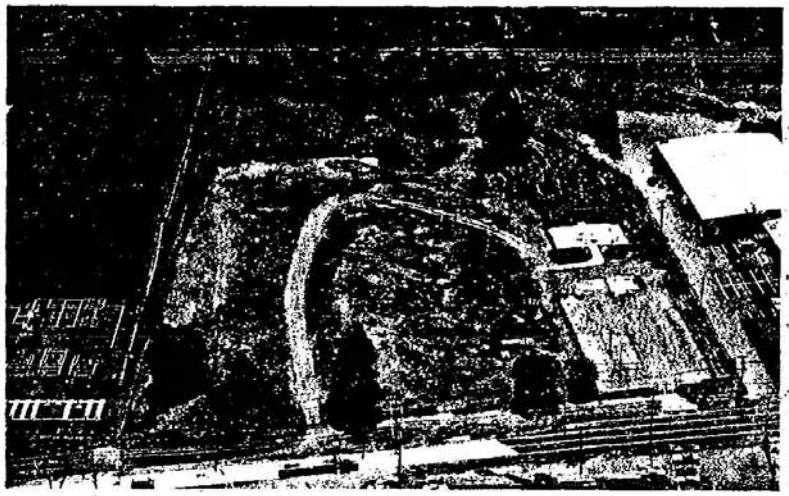
ANL-OHS/HP-84-110

PHASE II DECONTAMINATION AND DECOMMISSIONING OF THE NEW BRUNSWICK LABORATORY -- NEW JERSEY SITE

INTERIM REPORT



ARGONNE NATIONAL LABORATORY

NOVEMBER 1984

Sewer Lines

Because it was inefficient to determine which portions of the sewer lines in the I pad area were uncontaminated, all of the pipes from that area were considered to be contaminated above the release criteria and were placed directly into radioactive-waste shipping bins for disposal at the NTS in Mercury, Nevada.

Approximately 2350 ft of Duriron pipe, reinforced concrete pipe, and clay tile pipe (2 to 12-in diameter) were removed from the former I Building area and disposed of as radioactive waste in 15 bins (1200 ft^3).

The two sewer lines which ran along the east fence of the property (see Fig.A-18) were disposed of in the local landfill because they could be broken open for complete surveys and were found uncontaminated. One of the lines (sanitary sewer) was 6-inch vitrous clay tile from the former A Building Hot Cell Facility (which was never used). The other line was a storm drain made of 15-inch reinforced concrete pipe. There was 420 ft of the 6-inch pipe and 540 ft of the 15-inch pipe.

After the pipes (contaminated and clean) were excavated, a composite soil sample was taken from the trench (in approximately 30-ft sections). The trench was surveyed before the sample was taken to assure that there were no hot spots that were initially hidden by the pipe. If no contamination was detected, the sample

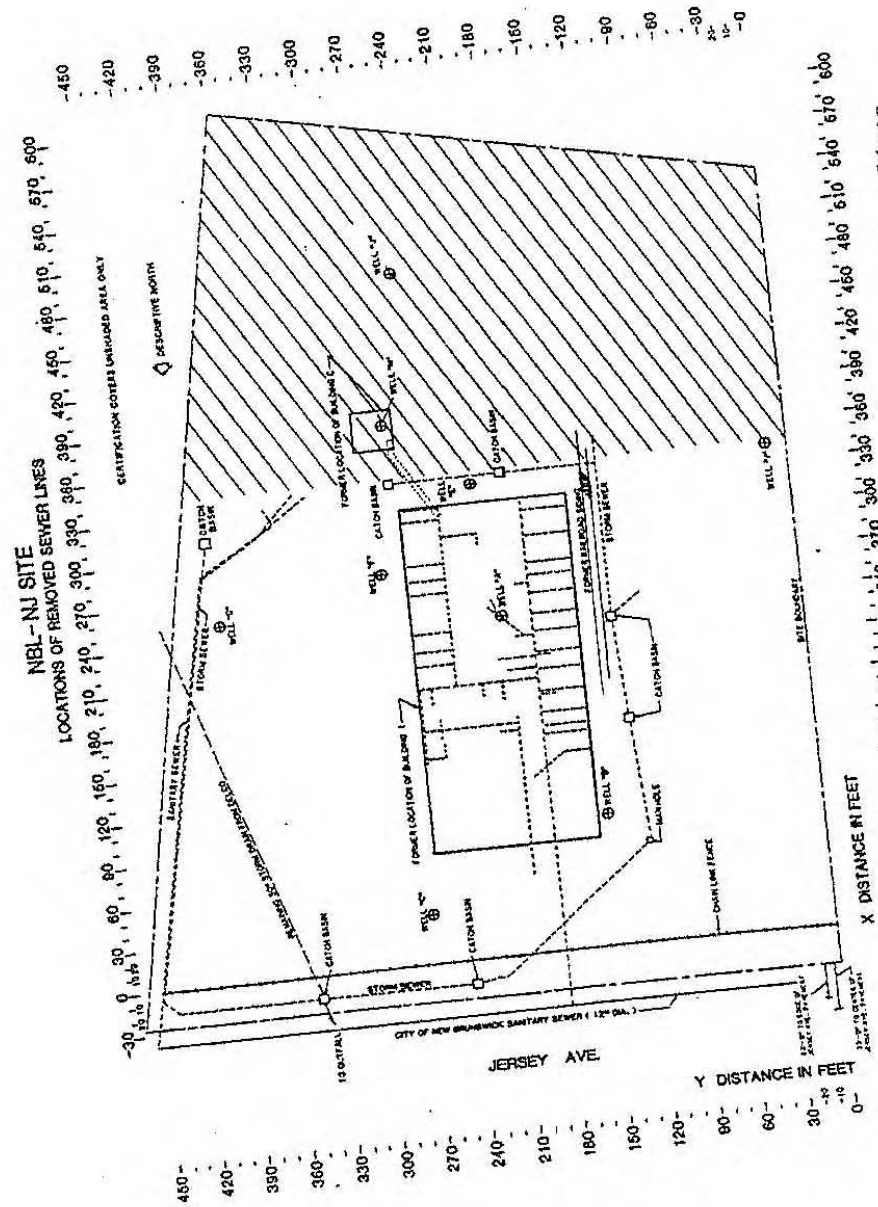


Figure A-18. Former Locations of Removed Sewer Lines

was collected and given a number with the prefix "TS" (for trench sample). Each sample's location in an X,Y,Z coordinate system was documented in a logbook and also written on the sample container. The results of trench sample analyses are given in Table B-11. The concentrations found are within the criteria. The location of each trench and trench samples are shown in Figures A-19 and A-20.

In Table B-11, the second column gives the locations of the two ends of the line along which a sample was collected. For example, sample TS-1 was collected along the line which has one end located at X,Y coordinate 240,150 and has the other end at X,Y coordinate 240,180. The coordinate pair tells that the line (the trench) is parallel to the Y axis (because both X coordinates are the same). The difference between the Y coordinate (180-150) shows that the length of the line for sample TS-1 was 30 ft.

A total of approximately 3300 ft of sewer lines (contaminated and clean) were removed from the site. The locations of most of the lines agreed with as-built drawings. However, a few sections of cast iron pipe (not shown on the drawings) were found under former I Building floor but were not connected to the rest of the system and, therefore, believed to have been abandoned during building renovation. All of the drain lines on the site were removed.

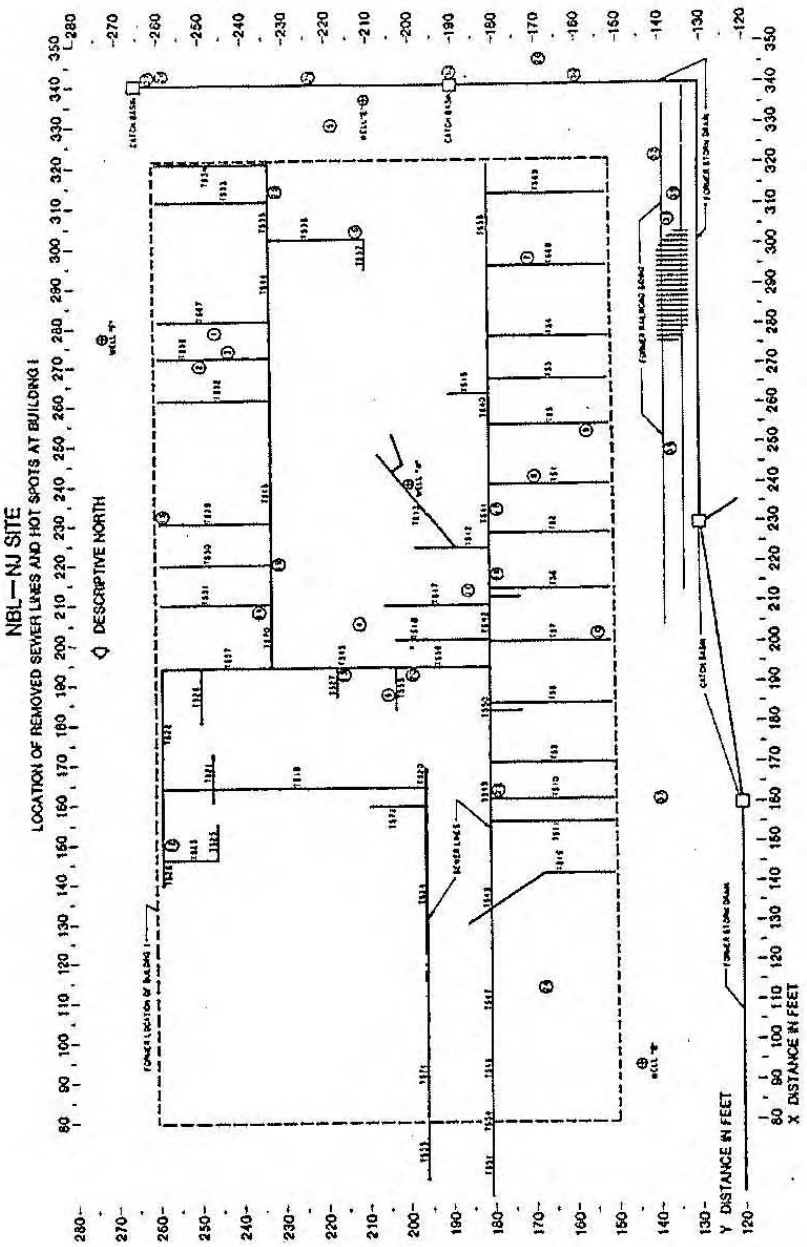


Figure A-19. Trench Samples Under Building I Pad

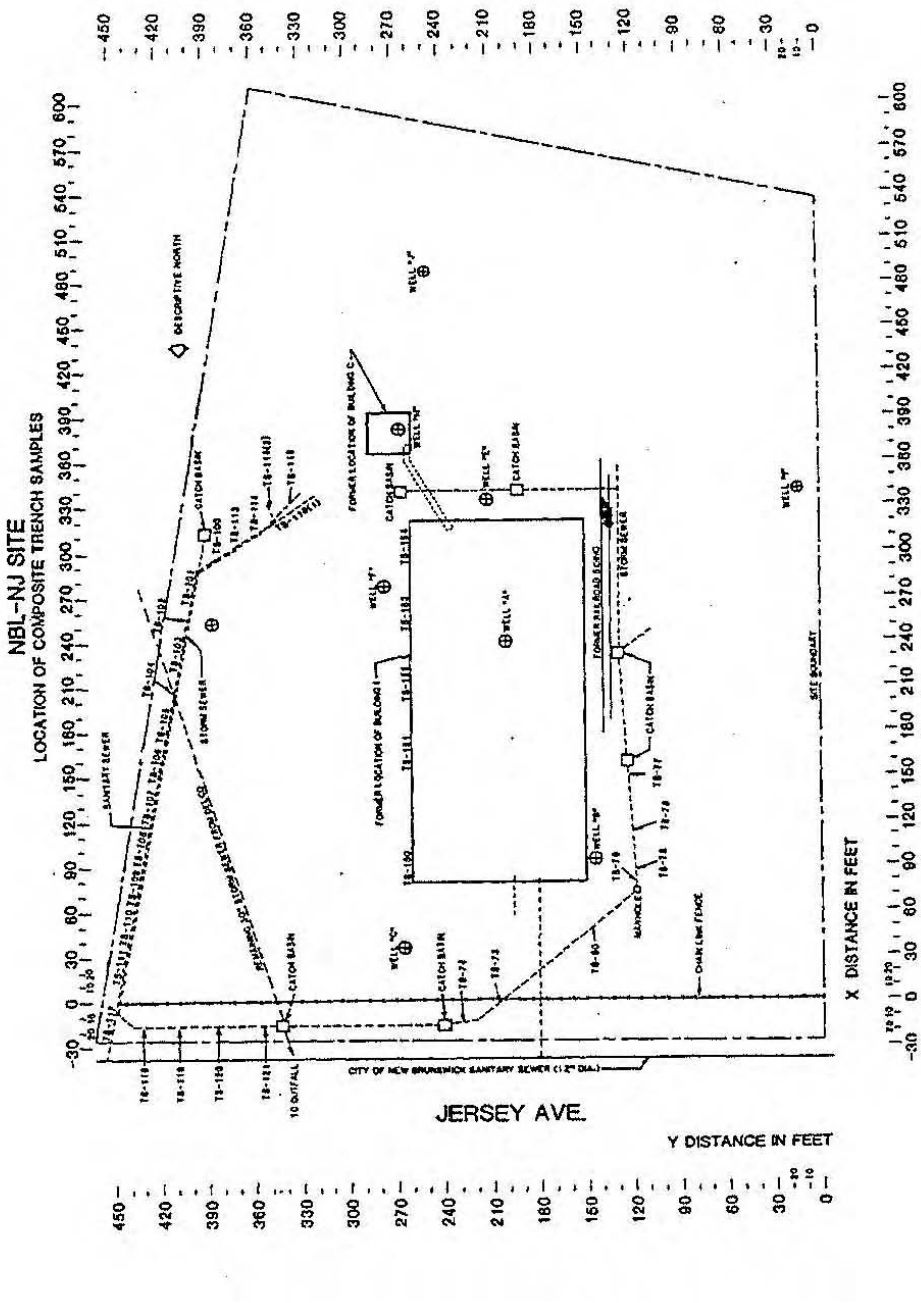


Figure A-20. Location of Trench Samples

The sanitary drains were removed up to the city main and the inlet to the main was sealed by a licensed plumber (see Figs. A-21 and A-22). The seal was examined and approved by a city inspector. The storm sewer lines were removed up to the catch-basins outside the fence and the inlet to the basins was similarly sealed and inspected.

Problems at the Railroad Spur

Part of the plan for Phase IIB was to move the pitchblende contaminated soil along the east side of the former I Building to the rear of the site. The pitchblende contaminated soil was supposedly used to fill in a railroad spur along the dock of the building. The railroad tracks were found at about 4 ft below the ground surface. However, no contamination was found in the fill above the tracks. A few hot spots of contamination were found at and below the level of the tracks but this contamination was not pitchblende. The largest area of contamination was found at hot spot No. 33 (see Figs. A-16 and A-17) between the tracks and about 20 ft north of the former location of an incinerator. The contaminated material, which filled 14 bins (1120 ft^3) appeared to be associated with incinerator ash. There were miscellaneous pieces of laboratory glassware but none of them were contaminated. The ash-like material was covered with white sand.

The tracks, wooden ties, and the storm drains from that area were

Figure A-21. Removal of Sewer Lines Up To City Main

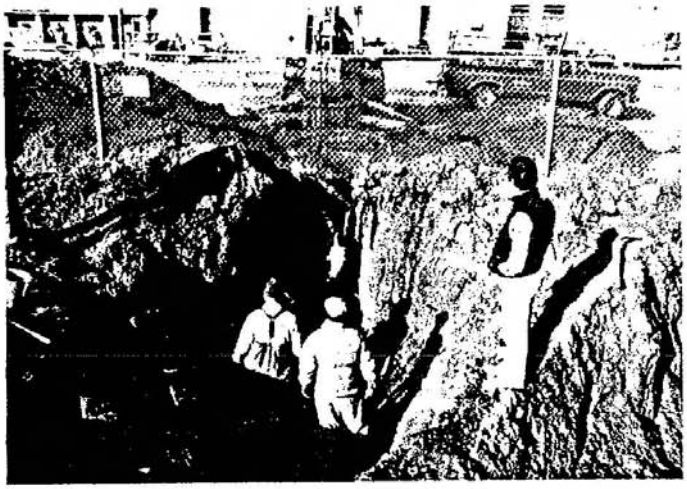


Figure A-22. Preparation of Seal Inlet to City Sewer Main

TABLE B-11. TRENCH SAMPLES - COMPOSITES

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226[d]	U-238	U-235	Th-232	Am-241
TS-1	240, 150 240, 180	1.0/2.0	1.7	31.0	1.8 (11%)	< 8.3	< 0.3	1.2 (15%)	< 0.3
TS-2	228.7, 150 228.7, 180.7	1.0/2.0	0.4	31.1	2.8 (8%)	< 8.3	< 0.3	1.8 (12%)	< 0.3
TS-3	266.5, 150 266.5, 180.7	1.0/2.0	1.1	34.0	2.7 (9%)	< 8.3	< 0.3	1.6 (15%)	< 0.3
TS-4	276, 150 276, 180.7	1.0/1.5	1.7	40.6	1.4 (18%)	< 8.3	1.5 (17%)	1.4 (13%)	< 0.3
TS-5	254.9, 150 254.9, 180.7	1.0/2.0	1.7	41.0	2.2 (14%)	< 11.8	0.6 (50%)	1.7 (18%)	< 0.4
TS-6	212.6, 150 212.6, 180.7	1.0/2.0	3.0	44.5	3.6 (10%)	< 11.8	< 0.4	1.9 (18%)	< 0.4
TS-7	200.4, 150 200.4, 180.7	1.0/2.0	2.0	38.7	3.7 (7%)	< 8.3	< 0.3	1.7 (14%)	< 0.3
TS-8	184.6, 150 184.6, 180.7	1.0/2.0			2.8 (13%)	< 11.8	< 0.4	1.9 (15%)	< 0.4

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-9	170, 150 170, 180.7	1.0/2.0	0.3	40.3	2.2 (16%)	< 11.8	< 0.4	1.7 (19%)	< 0.4
TS-10	160.6, 150 160.6, 180.7	1.0/2.0	0.6	44.5	3.0 (6%)	< 6.8	< 0.3	1.3 (12%)	< 0.3
TS-11	154.8, 150 154.8, 180.7	1.0/2.0	1.7	31.0	2.4 (15%)	< 11.8	< 0.4	1.4 (24%)	< 0.4
TS-12	223.6, 180.7 223.6, 199	1.0/2.0	0.4	31.1	3.4 (7%)	< 6.8	< 0.3	1.3 (19%)	< 0.3
TS-13	223.6, 189 247.2, 207.4	1.0/2.0	1.1	34.0	5.8 (25%)	< 11.8	1.7 (25%)	1.8	< 0.3
TS-14	235.3, 198.4 235.3, 209.8	1.0/2.0	1.4	41.0	3.6 (10%)	< 11.8	< 0.4	1.4 (22%)	< 0.4
TS-15	262.6, 180.7 262.6, 210	1.0/2.0	0.7	19.0	1.6 (17%)	< 11.8	< 0.4	0.7 (32%)	< 0.4
TS-16(1)	141.8, 150 141.8, 168.5	1.0/2.0	0.2	33.3	2.0 (15%)	< 11.8	< 0.4	1.2 (23%)	< 0.4
TS-16(2)	141.8, 168.5 128, 195.6								

TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-17	209, 180.7 209, 206.5	1.0/2.0	2.3	24.8	3.8 (7%)	< 8.3	< 0.3	1.5 (14%)	< 0.3
TS-18	200.9, 180.7 200.9, 206.5	1.0/2.0	1.2	32.2	2.8 (12%)	< 11.8	< 0.4	1.5 (19%)	< 0.4
TS-19	164, 196.5 164, 260.8	1.0/2.0	0.6	29.2	2.0 (10%)	< 12.2	< 0.4	1.3 (22%)	< 0.4
TS-20	164, 168 164, 196.5	1.0/2.0	0.5	27.5	2.4 (14%)	< 11.8	< 0.4	1.4 (20%)	< 0.4
TS-21	165, 247 176, 247	1.0/2.0			2.2 (13%)	< 11.8	< 0.4	1.3 (20%)	< 0.4
TS-22	146, 260.8 194.1, 260.8	1.0/2.0	0.5	29.2	2.0 (13%)	< 10.0	< 0.4	1.3 (19%)	< 0.4
TS-23	146, 246 146, 260.8	1.0/1.5	0.4	31.1	1.8 (17%)	< 11.8	< 0.4	0.8 (34%)	< 0.4
TS-24	123, 196.5 164, 196.5	1.0/1.5	1.1	31.6	1.8 (16%)	< 11.8	< 0.4	1.2 (22%)	< 0.4

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-25	146, 246 155, 246	1.0/2.0	0.8	31.2	1.8 (19%)	< 11.8	< 0.4	0.5 (54%)	< 0.4
TS-26	138, 260.8 146, 260.8	1.0/2.0	0.8	22.2	1.8 (6%)	< 4.0	< 0.2	1.0 (9%)	< 0.2
TS-27	170.5, 217.7 194.1, 217.7	1.0/2.0	0.9	16.7	1.6 (18%)	< 11.8	< 0.4	1.0 (25%)	< 0.4
TS-28	179, 250 194.1, 250	1.0/2.0	0.2	34.2	2.0 (17%)	< 11.8	< 0.4	0.4 (90%)	< 0.4
TS-29	230.2, 233.4 230.2, 260.8	1.0/1.0	0.4	19.7	1.3 (11%)	< 6.8	< 0.3	1.0 (14%)	< 0.3
TS-30	220, 233.4 220, 270.8	1.0/1.0	0.4	30.7	1.2 (23%)	< 11.8	< 0.4	1.0 (22%)	< 0.4
TS-31	209.5, 233.4 209.5, 260.8	1.0/1.0	0.8	34.4	2.0 (12%)	< 11.8	< 0.4	1.7 (15%)	< 0.4
TS-32	261.4, 233.4 261.4, 260.8	1.0/1.2	0.6	23.1	1.6 (20%)	< 11.8	< 0.4	0.4 (62%)	< 0.4
TS-33	312, 233.4 312, 260.8	1.0/1.2	1.6	18.3	1.2 (24%)	< 11.8	< 0.4	0.4 (60%)	< 0.4

TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-34	320, 233.4 320, 260.8	1.0/1.2	1.6	18.3	1.8 (18%)	< 11.8	< 0.4	0.5 (49%)	< 0.3
TS-35	301.9, 233.4 320, 233.4	1.0/1.2	0.4	25.1	1.8 (18%)	< 11.8	< 0.4	1.3 (18%)	< 0.2
TS-36	301.9, 209.9 301.9, 233.4	1.0/1.2			0.8 (28%)	< 11.8	< 0.4	< 0.2	< 0.4
TS-37	293, 209.9 301.9, 209.9	1.0/1.2	0.4	23.7	1.1 (23%)	< 11.8	< 0.4	0.3 (73%)	< 0.4
TS-38	272, 233.4 272, 260.8	1.0/1.2	1.7	39.1	2.2 (10%)	< 8.3	< 0.3	1.3 (10%)	< 0.3
TS-38(2)	272, 233.4 272, 260.8	1.0/1.5			2.0 (11%)	< 8.3	< 0.3	1.8 (12%)	< 0.4
TS-39	276, 180.7 322.3, 180.7	1.5/1.8	0.3	23.9	2.5 (9%)	< 8.3	< 0.3	1.2 (17%)	< 0.4
TS-40	240, 180.7 276, 180.7	1.5/1.8	0.8	45.7	3.6 (10%)	< 11.8	0.8 (44%)	1.7 (20%)	< 0.4

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-41	212.6, 180.7 240, 180.7	1.5/2.0	0.8	58.3	3.0 (10%)	< 11.8	< 0.4	1.6 (19%)	< 0.4
TS-42	194.1, 180.7 212.6, 180.7	1.8/2.0	0.8	44.9	1.8 (18%)	< 11.8	< 0.4	0.7 (34%)	< 0.4
TS-43	194.1, 203.3 194.1, 233.4	1.8/2.0	0.6	38.2	1.5 (35%)	< 6.8	0.6	1.6 (16%)	< 0.3
TS-44	272, 233.9 301.9, 233.9	1.8/2.0	0.9	35.7	3.0 (43%)	< 11.8	0.9 (43%)	2.4 (14%)	< 0.4
TS-45	230.2, 233.4 272, 233.4	1.9/2.0	1.0	33.6	3.3 (9%)	< 11.8	< 0.4	1.4 (16%)	< 0.4
TS-46	81.5, 180.7 105.5, 180.7	2.5/2.5	0.7	30.7	2.9 (12%)	< 11.8	< 0.4	1.6 (19%)	< 0.4
TS-47	105.5, 180.7 129.5, 180.7	2.5/2.5	0.5	38.3	3.8 (10%)	< 11.8	< 0.4	1.8 (17%)	< 0.4
TS-48	129.5, 180.7 149.3, 180.7	2.5/2.5	0.4	33.5	0.6 (92%)	< 8.3	0.3 (90%)	1.7 (13%)	< 0.3
TS-49	149.3, 180.7 171.2, 180.7	2.5/2.5	1.9	33.3	5.1 (9%)	< 11.8	< 0.4	1.5 (23%)	< 0.4

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-49(2)	149.3, 180.7 171.2, 180.7	2.5/2.5			1.3 (72%)	< 8.3	0.4 (71%)	1.5 (15%)	< 0.3
TS-50	171.2, 180.7 194.1, 180.7	2.5/2.5	0.9	37.7	3.4 (12%)	< 11.8	< 0.4	1.0 (32%)	< 0.4
TS-51	51.5, 180.7 76.5, 180.7	1.5/1.5			1.5 (10%)	< 6.2	< 0.2	1.2 (13%)	< 0.2
TS-52	26.5, 180.7 51.5, 180.7	1.5/1.5	0.4	43.9	0.9 (13%)	< 5.5	< 0.2	0.8 (14%)	< 0.2
TS-53	0, 180.7 26.5, 180.7	1.5/1.5			1.7 (10%)	10.7 (69%)	< 0.4	1.1 (26%)	< 0.4
TS-54	65.6, 196.5 79.5, 196.5	2.0/2.0			1.9 (12%)	< 8.3	< 0.3	1.5 (16%)	< 0.3
TS-55	65.5, 196.5 79.5, 196.5	1.5/1.5			2.2 (13%)	< 11.8	< 0.4	1.5 (18%)	< 0.4
TS-56	194.1, 180.7 194.1, 203.3	1.8/2.0			1.9 (5%)	2.6 (85%)	< 0.2	1.5 (7%)	< 0.2
TS-57	194.1, 233.4 194.1, 260.8	1.8/2.0	2.7	36.9	2.2 (15%)	< 11.8	< 0.4	1.6 (18%)	< 0.4

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPH xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-59	183, 203.3 194, 203.3	1.0/1.0	1.1	21.3	2.4 (14%)	< 11.8	< 0.4	1.7 (16%)	< 0.4
TS-60	222, 129 252, 129	1.5/1.5			2.0 (12%)	< 8.3	0.6 (38%)	1.8 (12%)	0.5
TS-61	252, 129 282, 129	1.5/1.5			1.4 (14%)	< 8.3	< 0.3	1.1 (20%)	< 0.3
TS-62	282, 129 312, 129	1.5/1.5			2.2 (9%)	< 6.8	< 0.3	1.3 (13%)	< 0.3
TS-63	312, 129 342, 129	1.5/1.5			2.1 (10%)	< 6.8	< 0.3	2.5 (8%)	< 0.3
TS-67	281.4, 233.4 281.4, 260.8	1.0/1.5	2.0	40.5	2.8 (12%)	< 11.8	< 0.4	1.6 (19%)	< 0.4
TS-70	194.1, 233.4 230.2, 233.4	1.9/2.0	0.5	31.5	2.4 (13%)	< 11.8	< 0.4	1.5 (19%)	< 0.4
TS-72	159.1, 196.5 159.1, 210.6	2.0/2.0	0.8	20.1	1.4 (22%)	< 11.8	< 0.4	0.8 (25%)	< 0.4
TS-73	0, 202 12, 216	2/2	0.9	28.2	1.5 (10%)	< 6.8	< 0.3	1.3 (11%)	< 0.3

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-74(1)	12, 216 19, 226	2/2	1.1	41.3	1.9 (11%)	< 8.3	< 0.3	1.3 (13%)	< 0.3
TS-74(2)	19, 226 19, 238	2/2	1.1	41/3	1.9 (11%)	< 8.3	< 0.3	1.3 (13%)	< 0.3
TS-75	194, 122 194, 140				2.0 (15%)	< 11.8	1.0 (35%)	1.6 (16%)	< 0.4
TS-76	95, 122				3.8 (7%)	< 17.0	< 0.4	1.8 (15%)	< 0.1
TS-77	148, 122				4.0 (6%)	< 6.8	< 0.2	1.3 (13%)	< 0.3
TS-78	72, 120				2.4 (23%)	53.0 (24%)	2.2 (22%)	2.3 (15%)	< 0.4
TS-79	70, 120				4.2 (9%)	< 11.8	1.9 (56%)	1.6 (18%)	< 0.4
TS-80	47.6, 143				2.0 (16%)	< 21.0	< 0.5	1.6 (19%)	< 0.1

TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-81(1)	Unknown				4.1 (18%)	45.4 (16%)	1.3 (18%)	2.5 (8%)	< 0.3
TS-81(2)	Unknown				1.9 (12%)	< 14.2	< 0.4	1.4 (16%)	< 0.1
TS-100	295, 395 317, 395	2/2			2.1 (15%)	< 11.8	< 0.4	1.4 (21%)	< 0.4
TS-101	270, 398 295, 395	2/2			1.8 (12%)	< 8.3	< 0.3	1.5 (15%)	< 0.3
TS-102	245, 402 270, 398	2/2			1.5 (16%)	< 9.0	< 0.3	1.3 (16%)	< 0.3
TS-103	220, 406 245, 402	2/2			1.7 (12%)	< 7.3	< 0.3	1.3 (14%)	< 0.3
TS-104	195, 410 220, 406	2/2			2.1 (8%)	< 6.0	< 0.2	1.3 (12%)	< 0.2
TS-105	170, 416 195, 410	2/2			2.2 (7%)	< 5.2	< 0.2	1.5 (9%)	< 0.2
TS-106	145, 420 170, 416	2/2			2.3 (10%)	< 5.2	< 0.2	1.5 (13%)	< 0.2

TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-107	120, 424 145, 420	2/2			2.2 (8%)	< 6.8	< 0.2	1.6 (11%)	< 0.3
TS-108	95, 428 120, 424	2/2			2.5 (12%)	< 6.8	< 0.3	1.7 (16%)	< 0.3
TS-109	70, 432 95, 428	2/2			2.2 (10%)	< 8.3	< 0.3	1.7 (19%)	< 0.3
TS-110	45, 436 70, 432	2/2			2.4 (12%)	10.5 (>100%)	< 0.4	1.7 (16%)	< 0.1
TS-111	20, 440 45, 436	2/2			1.6 (13%)	< 6.8	< 0.3	1.5 (14%)	< 0.3
TS-113	289, 397 302, 276	2/2			2.0 (9%)	< 6.8	< 0.2	1.4 (12%)	< 0.3
TS-114	302, 376 316, 350				2.4 (12%)	< 17.0	< 0.4	1.7 (17%)	< 0.1
TS-115	316, 350 337, 323				1.9 (12%)	< 8.3	< 0.3	1.3 (13%)	< 0.3

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-116(1)	312, 356 340, 330				2.2 (12%)	< 10.2	< 0.4	1.7 (21%)	< 0.4
TS-116(2)	322, 346 336, 352				2.2 (12%)	< 10.2	< 0.4	1.7 (21%)	< 0.4
TS-117(1)	-6.3, 450		0.5	33.1	2.1 (9%)	< 6.8	< 0.2	1.4 (11%)	< 0.3
TS-117(2)	-6.3, 450		0.3	31.7	0.6 (>100%)	< 6.8	0.2 (>100%)	1.4 (13%)	< 0.3
TS-118	-16, 424 -16, 437		1.1	29.9	2.4 (11%)	< 17.0	< 0.4	1.6 (16%)	< 0.1
TS-119	-19, 408 -19, 437	2/2	0.9	39.1	1.7 (18%)	< 21.0	< 0.5	1.6 (19%)	< 0.2
TS-120	-19, 379 -19, 408				1.8 (12%)	< 8.3	< 0.3	1.2 (13%)	< 0.3
TS-121	-19, 350 -19, 379				2.1 (13%)	< 17.0	< 0.4	1.6 (18%)	< 0.1
TS-150	78.5, 260.8 128.5, 260.8				2.6 (8%)	< 8.3	< 0.2	1.2 (18%)	< 0.3

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TABLE B-11. TRENCH SAMPLES - COMPOSITES - (cont'd.)

SAMPLE NO.	LOCATION[a] X,Y (FEET)	IN SITU[b] CPM xE3	GROSS ALPHA CPM	GROSS BETA CPM	PICO CURIE/GRAM[c] Ra-226	U-238	U-235	Th-232	Am-241
TS-151	128.5, 260.8 178.5, 260.8				2.0 (11%)	< 8.3	< 0.2	1.5 (15%)	< 0.3
TS-152	178.5, 260.8 228, 260.8				2.0 (11%)	< 8.3	< 0.2	1.3 (15%)	< 0.3
TS-153	228, 260.8 278, 260.8				2.2 (10%)	< 8.3	< 0.2	1.4 (14%)	< 0.3
TS-154	278, 260.8 328, 260.8				2.0 (11%)	< 8.3	< 0.2	1.4 (16%)	< 0.3
TS-159	300, 142 300, 152				1.9 (16%)	< 11.8	< 0.4	1.4 (17%)	< 0.4
TS-160	280, 142 280, 152				2.2 (23%)	< 30.0	< 0.8	1.7 (29%)	< 0.2
TS-161	260, 142 260, 153				2.8 (9%)	< 8.3	< 0.3	1.3 (16%)	< 0.3
TS-162	240, 142 240, 152				2.2 (17%)	< 21.0	< 0.5	1.5 (24%)	< 0.2
TS-163	214, 142 214, 152				2.8 (13%)	< 11.8	< 0.4	1.6 (19%)	< 0.6

TABLE B-11

TRENCH SAMPLES-COMPOSITES - (cont'd.)

FOOTNOTES

[a]The coordinate pairs give the locations of the two ends of the line along which a sample was collected. For example, sample TS-1 was collected along the line which has one end located at X,Y coordinate 240,150 and has the other end at X,Y coordinate 240,180. The coordinate pair tells that the line (the trench) is parallel to the Y axis (because both X coordinates are the same). The difference between the Y coordinate (180-150) shows that the length of the line for sample TS-1 was 30 feet.

[b]In situ measurements were taken with a collimated 2 mm.x 50 mm NaI(Tℓ) detector connected to a single channel analyzer and ratemeter. The analyzer was operated in the gross mode with the threshold set at 17 keV. The number on the left side of the slash mark is the background count rate measured when the detector was pointed up and held at about 2 meters above the ground. The number on the right side of the slash mark is the count rate measured with collimated detector at the soil surface.

[c]The less-than values which are listed give the minimum detectable concentrations. (See Appendix F for discussion of minimum detectable concentrations.) Errors (at 95% confidence level) given in percent are due to counting statistics only.

[d]Based on peaks from radon (^{222}Rn) daughters ^{214}Bi (609, 1120, or 1764 keV), and/or ^{214}Pb (295 or 352 keV). It was assumed that ^{222}Rn was at 50% equilibrium with its parent (Ra-226) so the concentration of ^{226}Ra was twice that of the radon daughters.

NJ.14-05

Certification Docket for the Remedial Action Performed at the New Brunswick Site in New Brunswick, New Jersey

Department of Energy
Office of Assistant Manager
for Environmental Management
Oak Ridge Operations

October 2001

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APPENDIX E

OFFSITE DRAINS

After Phase IIA was completed, questions were raised about the extent of radioactive contamination in offsite sanitary and storm sewer drain lines. Pre-D&D investigations had indicated that onsite sanitary sewer lines were contaminated and that low levels of contamination were also found in an offsite storm drain catch basin. Based on these findings, it was decided that ANL should do a more extensive investigation of offsite and onsite drains to better define the extent of the contamination.

Samples were taken from the offsite sanitary sewer line (upstream and downstream) in six manholes along Jersey Avenue (see Fig. E-1). Two samples were also taken from the onsite sanitary sewer lines at about 50 feet from their connections to the city main. One sample was from the line from the former I Building and the other was from the line of the former A Building.

Samples were taken from the storm sewer lines at four offsite catch basins and at three points onsite (two catch basins and one manhole). The locations of storm sewer samples are shown in Figure E-1.

The storm sewer emptied into an outfall about ¼ mile from the NBL-NJ site (see Fig. E-1). Sediment and water were taken at the outfall and at 10 locations along the stream.

Most of the collected samples were analyzed for radioactivity per gram of undissolved solids (scrapings and filterable suspended solids). Some samples were also analyzed for activity in dissolved solids per mℓ of water. A few samples from the stream were also analyzed for non-radioactive metals such as arsenic, barium, cadmium, etc.

The results of the radioactivity analyses of samples from the sanitary sewer lines are listed in Table E-1, and that from the storm sewer lines are listed in Table E-2. The data show that there is measurable radioactive contamination in the offsite sanitary sewer line (primarily at sample location number 210) and in the offsite storm sewer (primarily at sample location number 260) at concentrations which are above that normally found in the natural environment (see Table B-7 for typical background concentrations in soil and water). The data also show that the activity is primarily associated with undissolved solids. The activity in dissolved solids per mℓ of water was at background levels at all sampling points.

When samples were collected, especially in manholes, the area sampled was surveyed with a portable radiation survey instrument. Only at sample locations 200 and 210 (in sanitary sewer) was the contamination detectable with the portable instrument. At sample location 200, which is onsite, the section of pipe removed to obtain a sample was disposed of as radioactive waste. At sample location 210, an offsite sanitary sewer manhole, there was detectable contamination around a broken sewer tile (12" in diameter open top vitrous tile) at the base of the manhole. Scrapings from this tile showed the highest offsite activity concentration.

The activity concentrations in the stream connected to the storm sewer outfall were essentially the same as that found in the natural environment. The results of stream sample analyses are listed in Table E-3.

The implication of the findings as of 1982 is that, although there is definitely above background concentrations of radioactivity in the offsite sanitary line and in the offsite storm drain, the contamination is not at levels which would be a serious threat to the public or the environment. It must be noted, however, that the total activity which could be trapped under the broken tile at sample location number 210, or at other inaccessible points in the line, is unknown. The fact that the activity concentrations in the stream are at background levels suggest that the remaining contamination in the storm sewer line is probably not very mobile and that the stream has already diluted or cleaned itself of past contamination.

The results of analyses of stream samples for the concentration of non-radioactive elements which are usually of concern in water quality are listed in Table E-4. The results for all elements, except that for iron at sample location 290, are within the acceptable limits listed in Table E-5.

TABLE E-1. SANITARY SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS / PICO CURIES IN DISSOLVED SOLIDS/ml OF SOLUTION[a]						
		Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
200[b]	5/25/82	342 ±34 -	6490 -	462 ±150 -	815 ±82 -	7 -	37 -	93±5/41±5 -
200[c]	5/25/82	3.3 0.08± .02	40.8 6.2E-5	- -	< 0.06 < 0.01	- -	2.5 5E-5	12.1±3.1 8E-5/1E-5
210[d]	5/25/82	4.56± .05 < 0.01	16.2[e] -	66 ±20[e] -	128 ±13 < 0.01	35 -	0.6 -	3.6/27 -
210[f]	5/25/82	0.34± .03 0.21± .02	0.8 1.5E-4	0.22± .11 -	5.14± .05 < 0.01	- -	0.7 < 5E-5	0.05/0.006 <3E-5/<2E-5
230	5/25/82	1.80 0.02± .01	6.84 1.5E-4	0.17 < 0.01	2.27 0.03± .02	- -	1.19± .11 1.1E-3	3.19±.22/0.52±.04 <3E-5/<3E-5
240	5/25/82	< 0.09 < 0.01	0.2 1.5E-4	- 5.2E-5	0.27 0.03± .02	- -	<0.01 <5E-5	<0.01/<0.01 <3E-5/<3E-5
250	5/25/82	1.13 0.09± .03	13.4 5E-3	0.18 < 0.01	2.31 0.29± .09	- -	0.11 1E-4	0.04/0.31 3.8E-2/3.8E-2
330	5/25/82	< 0.02 0.09± .09	0.38 1.5E-3	< 0.01 < 0.01	- 0.05± .02	- -	- <1E-5	- <7E-4/<7E-4
340	5/25/82	2.86 0.69± .07	1.57 -	- 0.16	- 0.04± .02	- -	- <1E-4	- 1E-5/1.4E-4
350	5/25/82	0.86 < 0.01	1.26 7E-4	0.05 -	- 0.26± .08	- -	0.002±.002 <5E-4	0.004±.002/<0.02 6E-3/0.12

[a]The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per ml of solution.

[b]Scrapings from 5-ft sections of sewer pipe at about 50 ft from connection to city main on the NBL site.

[c]Water which ran out of sanitary sewer line when 5-ft section was removed.

[d]Scraping from broken tile at bottom of manhole.

[e]There is an unresolved discrepancy between the shown concentration of total U and that of ^{235}U.

[f]Random samples of sludge from manhole.

TABLE E-2. STORM SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS PICO CURIES IN DISSOLVED SOLIDS/mℓ OF SOLUTION[a] Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
280	5/25/82	0.62 < 0.1	268.33 0.044	- -	54 0.03±.02	- -	0.36±.07 <3E-5	0.91±.2/0.58±.15 <3E-5/<3E-5
270	5/25/82	1.38 0.05± .02	35.39 2.8E-3	0.30 .03± .02	1.43 < 0.01	- -	0.28 <3E-5	1.72/0.08 <2.8E-5/<2.8E-5
300	5/25/82	-	0.70	-	0.74±.02	-	0.034±.006	0.002±.001/<0.001
220	5/25/82	1.63 < 0.01	30.69 0.60	0.30 -	1.15 < 0.01	- -	5.04 <5E-4	2.13/0.15 1.3E-3/5E-4
260	5/25/82	<10	99.61	15	<30	-	<1.25	<1.25/<1/25
310	5/25/82	0.44	1.1	0.02	-	-	0.002±.002	<0.001/0.002±.002

[a]The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per mℓ of solution.

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TABLE E-3. STREAM SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS[a] PICO CURIES IN DISSOLVED SOLIDS/mℓ OF SOLUTION Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
290	5/25/82	-	> 151[b]	-	-	-	< 2.0	< 9.0/<3.0
		0.04± .02	8.8E-4	-	-	-	<4E-5	<5E-5/<5E-5
290	11/18/82	-	0.8 to 1.9[b]	-	.77± .02	-	0.021±.003	.005 to 0.036
500	11/18/82	-	0.1 to 2.0[c]	-	0.74± .02	-	0.34 ±.006	0.004 to 0.076
530	11/18/82	-	0.8	-	-	-	0.003	0.017
580	11/18/82	-	0.8	-	-	-	0.003	0.013
590	11/18/82	-	1.0	-	-	-	0.005	0.020
400[d]	11/18/82	-	1.6	-	-	-	0.008	0.021

[a]The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per mℓ of solution.

[b]Analysis of samples taken at the storm sewer outfall on May 25, 1982, initially implied that the concentration of total uranium was significantly above background concentrations for the NBL area. However, because the sample size was very small and the estimated total activity was near the detection limit of the analytical technique, the interpretation of the result was considered questionable. To resolve this uncertainty, six additional samples were taken on November 18, 1982, at the same location and at other points in the stream. The range of total U concentrations for the November 18, 1982, samples were typical of that usually found in the natural environment and are essentially the same as that found in the control sample taken at location number 400.

[c]Range of values for six samples taken from the same area.

[d]Control soil sample taken from bank of stream (beyond maximum rise of stream).

TABLE E-4. STREAM SAMPLES
(Collected 11/18/82)

Sample Location	Water Quality: Average Concentration in mg/Liter[c]												
	Ag	As	Ba	Cd	Cr	Cu	F	Fe	Mn	Ni	Pb	Se	Zn
290	0.002		0.1350	0.0016	0.0070	0.350		28.300	5.030	0.0180	0.0070		0.0880
540[a]	0.002	0.0100	0.2884	0.0002	0.0028	0.0021	0.1120	0.1000	0.0550	0.0050	0.0010	0.0050	0.0200
540[b]	0.0002	0.0050	0.1880	0.0002	0.0150	0.0080	0.1020	0.7200	0.2480	0.0100	0.0030	0.0050	0.0250
592	0.0002	0.0050	0.2010	0.0003	0.0060	0.0780	0.1520	0.5800	0.7670	0.0090	0.0040	0.0050	0.0320

[a]Sample at outlet of 18-in pipe before water enters stream.

[b]Sample taken from stream.

[c]The values listed are the total elemental concentrations. The concentration of chromium is the total of chromium (VI) and chromium (III).

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Appendix B

Trip Report, “New Brunswick Site Visit”

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New Brunswick Site Visit

Summary:
I visited the site of the former New Brunswick Laboratory, on November 18, 2008 to learn more about the work location and to look inside two sanitary sewer manholes located along Jersey Avenue adjacent to the former laboratory site. S.M. Stoller has been asked by the U.S. Department of Energy to duplicate a sampling activity that was performed at the base of one of the sanitary manholes at the location where the clay sanitary sewer line entered the manhole from the former laboratory site. The project team has had many questions that could not be answered without knowing the actual configuration of the manhole and how the sanitary line from the former laboratory entered the manhole. When each manhole was opened, there was no visual evidence of a sanitary line from the former site entering the city sanitary sewer line.

Introduction:
I was asked to visit the site of the former New Brunswick Laboratory, located at 986 Jersey Avenue, in New Brunswick, New Jersey. The former site buildings and structures have been removed and the U.S. Department of Energy (DOE) is in the process of transferring the property to private ownership. The New Jersey Department of Environmental Protection has a question about a historical sample collected at the location where the sanitary sewer line from the New Brunswick Laboratory enters the main sanitary sewer line in the right of way along Jersey Avenue. The sample in question indicated low levels of fixed radiological contamination. The DOE has asked SM Stoller to replicate the previous sample collected from the sanitary line from the former laboratory site. Also, the prospective buyer needs reassurance that he will not encounter contaminated or hazardous materials if he ties the site sewer into the sewer system at the manhole where the elevated sample was collected.

Results:
During my visit, I met with Eric Hoff from Hoff Brothers (Sewer and Excavation Service). Hoff Brothers has been asked by Stoller to perform a visual and video inspection of the sanitary line from the manhole back to the site property line. Eric removed the cover from the manhole we wanted to inspect. At the top of the manhole, there was evidence the manhole was brick and mortar construction. It appears a relatively new layer of mortar has been applied to the entire interior surface of the manhole. There was no visual evidence the sanitary line from the former laboratory had entered the manhole. It appears the former line was likely filled with cement and then covered over with the new coating of mortar. Pictures of the interior of the manhole are included with this report. The top opening of the manhole is twenty-five inches in diameter. The manhole opens up and is a little more than four feet in diameter at the bottom. The manhole is nine feet deep where the flow enters the manhole and ten feet deep where the flow exits the manhole. There was a definite odor of organic solvents when the manhole was first opened.

Eric and I went to the next manhole to the north to look inside to view its configuration. This second manhole was nearly identical to the first manhole. There was no sign of a lateral entering this manhole from the former laboratory site either. This manhole had also been refurbished with a new coating of mortar. Site documents indicate a lateral sewer service that ran along the east property line was tied into this manhole. DOE removed the lateral in the early 1980s and sealed the entry point at the manhole. There was no evidence of the lateral's point of entry; it had been covered with the new mortar. Pictures of the interior of this manhole are also included with this report.

Results (cont):
While I was waiting for Eric to arrive, I took time to look over the area along the road to verify the presence and locations of underground and overhead utilities in the area. The manhole is located in the paved shoulder of Jersey Avenue. The edge of the manhole is about eighteen inches from the outside (east) edge of the traffic lane. The paved shoulder east of the manhole is about four feet wide. The poles for the overhead telephone and electric power lines are set about eighteen inches off the asphalt shoulder. There is a gas line (already flagged by PSE&G, 1-800-880-PSEG) about two feet to the east of the telephone/electric poles. Spray paint markings for the gas line indicate it is six feet-eight inches below the surface. There is a storm sewer line about six feet east of the gas line. The storm sewer line is about eighteen to twenty four inches in diameter, and it appears to be about nine feet to the bottom of the storm sewer manhole (visible through an open grate at the storm sewer manhole).

There is about fifteen to twenty feet between the east edge of the storm sewer line and the fence that forms the northwest boundary of the former laboratory site. The city water line is marked along the west side of Jersey Avenue, away from the sanitary line. There was a water lined marked perpendicular across Jersey Avenue about fifteen feet south of the sanitary manhole. This water line appears to be the connection between the city water and a PIV located on the former laboratory site. This water line should not be an issue with any work adjacent and to the east of the sanitary manhole.

The sanitary manhole is located between two of the telephone/electric poles, and with the sag of the lines between the two poles, the telephone lines are about 14 to 15 feet above the ground. The electric power line for the street light is about 16 inches above the telephone lines. The remaining electric transmission lines are located above the street light power lines. Pictures of the overhead power lines are included with this report. The heights provided are only estimates.

The traffic flow along Jersey Avenue in this area is intermittent. The area consists of light industry, warehouses and other businesses. There is a traffic signal to the south at How Lane that results in periods of heavy traffic flow and then no traffic flow. There was a wide range of vehicles passing this location, including quite a few eighteen wheelers while I was there. The manhole is only about eighteen inches off the traffic lane and the speed limit through the area is forty (40) miles per hour.

Recommendations:
Since the sanitary sewer line from the former New Brunswick Laboratory site is no longer accessible, I recommend no further investigation be performed at this time. It is unlikely a vitreous clay sewer pipe that has been identified by past sampling as having fixed radiological contamination could be free-released and treated as non-radiological waste. In addition, the location of the overhead and underground utilities along the east side of Jersey Avenue would make it difficult to collect a sufficient number of soil samples to provide a good characterization of the soil near the abandoned sanitary sewer lateral. The presence and location of the line should be identified in the site deed along with the instruction that any excavation activity that may contact the sanitary line should be performed with the potential for contacting and creating low-level radiological waste.

Photos:

DSCN0295	Jersey Avenue looking north, manhole located in road shoulder
DSCN0296	Jersey Avenue looking north, overhead phone and electric lines, underground gas line marked with yellow flags
DSCN0297	Jersey Avenue looking south, storm sewer manhole grate east of the road
DSCN0300	Jersey Avenue looking north, water line marked with blue paint, running perpendicular to the sanitary sewer line, about 15 foot south of the manhole
DSCN0301	Jersey Avenue, looking north, overhead phone and electric power lines
DSCN0302	Jersey Avenue, looking north, about 100 feet south of the manhole
DSCN0303	Jersey Avenue, looking north, area between road shoulder and the property fence line
DSCN0307	Looking east from the manhole cover
DSCN0308	Jersey Avenue looking south, about 80 feet north of the manhole, gas line shutoff valve located at yellow cover plate
DSCN0312	Jersey Avenue looking south, northbound traffic adjacent to the manhole
DSCN0319	Interior of the manhole, the ladder rungs are facing the road, the NBL site is to the right side of the photo
DSCN0320	Interior of the manhole
DSCN0321	Interior of the manhole
DSCN0322	Open manhole with the manhole cover set aside
DSCN0324	Interior of the next sanitary manhole to the north, this manhole is also adjacent to the NBL site

Digitally signed by Roger B. Grant
DN: cn=Roger B. Grant, c=us, o=u.s. government, ou=department of energy, public cas, people
Reason: I am the author of this document
Date: 2008.11.30 08:51:10 -05'00'

Prepared By: _____ **Date:** __11/30/2008_____

Roger B Grant, CIH, CSP, S.M. Stoller Corp.

Jersey Avenue, looking north, manhole located in road shoulder

Jersey Avenue, looking north, overhead phone and electric lines, underground gas line marked with yellow flags

Jersey Avenue, looking south, storm sewer manhole grate east of the road

Jersey Avenue, looking north, water line marked with blue paint, running perpendicular to the sanitary sewer line, about 15 feet south of the manhole

Jersey Avenue, looking north, overhead phone and electric power lines

Jersey Avenue, looking north, about 100 feet south of the manhole

Jersey Avenue, looking north, area between road shoulder and the property fence line

Looking east from the manhole cover

Jersey Avenue, looking south, about 80 feet north of the manhole, gas line shutoff valve located at yellow cover plate

Jersey Avenue, looking south, northbound traffic is adjacent to the manhole

Interior of the manhole, the ladder rungs are facing the road, the NBL site is to the right side of the photo

Interior of the manhole

Open manhole with manhole cover set aside

Interior of the next sanitary manhole to the north, this manhole is also adjacent to the NBL site

Appendix C

Detection Sensitivity of In-situ Gamma Measurements

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Detection Sensitivity of In-situ Gamma Measurements

The methodologies recommended in the Multi-Agency Radiation Surveys and Site Investigation Manual (MARSSIM) Sections 6.7.1. and 6.7.2 were used to estimate minimum detectable responses for Eberline 2-inch × 2-inch (SPA-3) and Bicorn ½-inch × 3-inch sodium iodide (NaI) detectors. For a static count over a time period of *t* the equation is:

$$\text{Minimum detectable count} = [3 + 4.65\ (\text{BKGD rate}*t)^{0.5}]/t$$

and for scanning the equation is:

$$\text{Minimum detectable count rate} = d'* (\text{BKGD rate}*i/60)^{0.5}]\ 60/i$$

where *d'* is the factor for probability of detection and *i* (dwell time) is the time under the influence of the volume of soil in question. From the tables of calibration data, background count rates were assumed to be approximately 15, 000 counts per minute (c/m) for the 2-inch × 2-inch detector and 3,250 c/m for the ½-inch × 3-inch detector. A static count time of 1 minute and a scan dwell time of 1 second were assumed for the calculation; the conservative value of 1.38 was chosen for *d'*. Resulting calculations are:

Table 1. Detectable Count Level for 1-Minute Static Counts and 1-Second Dwell Time Scans

Detector	Detectable Level (c/m)	
	Static Count	Scan
2-inch × 2-inch	573	1309
½-inch × 3-inch	268	609

Based on the calibration information, it is estimated that over 95 percent of the detected uranium-ore photons originate from a soil volume within about 15 inches of the detector. The response factors for the detectors are 0.00892 picocuries per gram per counts per second (pCi/g/c/s) or 6,726 counts per minute per picocurie per gram (c/m/pCi/g) for the 2-inch × 2-inch detector and 0.04942 picocuries per gram per counts per second (pCi/g/c/s) or 1,214 c/m/pCi/g for the ½-inch × 3-inch detector. This calibration was determined (for practical purposes) for an infinite thickness of contaminated soil. Also, the calibration was through a ¼-inch steel liner, and it is assumed that the effective thickness of the Geoprobe liner and the lateral clay drainage line will be comparable to that of the calibration source liner; therefore, no liner correction factor was applied to these response values. Because it was considered likely that the volume of contaminated soil around a leaking pipe or in a residual deposit would be less than the that of the calibration source, several rough Microshield calculations were performed and the responses, relative to the calibrated configuration, were determined to be 0.48, 0.74, and 0.93 for cylindrical radii of 3, 6, and 12 inches, respectively, around the detector. In addition, the relative effect of the linear thickness of the contaminated deposit for a 6-inch cylindrical radius configuration was determined to be approximately 0.55 and 0.80 for linear thicknesses of 6 and 12 inches, respectively, along the axis of the detector.

Estimated detection sensitivities for uranium ore of several different configurations are indicated on Table 2. The scan calculation also incorporates the recommended surveyor performance factor of $(0.5)^{0.5}$.

Table 2. Detection Sensitivities for Various Configurations of Uranium Ore

Detector (inches)	Source Dimensions (inches)		Detection Sensitivity (pCi/g)	
	Radius	Length	1-Minute Static Count	Scan (1-second dwell time)
2 × 2	>15	30	0.12	0.28
2 × 2	12	30	0.13	0.30
2 × 2	6	30	0.16	0.37
2 × 2	3	30	0.25	0.57
2 × 2	6	6	0.29	0.67
2 × 2	6	12	0.20	0.46
½ × 3	>15	30	0.22	0.70
½ × 3	12	30	0.24	0.76
½ × 3	6	30	0.30	0.95
½ × 3	3	30	0.46	1.28
½ × 3	6	6	0.55	1.73
½ × 3	6	12	0.38	1.19

The estimates indicate that small volumes of uranium-ore-contaminated soil below the unrestricted use concentrations of 3 pCi/g (assumed to include background of approximately 1 to 1.25 pCi/g of radium 226) should be readily detected by static counts and scans with either of the detectors. The static count is, of course, the more sensitive technique; however, it requires considerably more time to thoroughly cover the suspect soil volume than can be achieved with a scan. A combination of these techniques would optimize the advantages of both.

It should be noted that these are simplified calculations and provide only rough approximations of the full effect of contaminated soil volume dimensions on the observed count rate. Also, these calculations assume that the volume of contaminated soil is homogeneous and that there is no shielding by clean soil between the detector and the contaminated material; 12 inches of clean soil will reduce the total photon flux by a factor of 90 to 95 percent. Therefore, the detection sensitivities at a detector/source distance of 12 or more in soil would be roughly a factor of 10 to 20 times higher, or greater.

The sample results indicate that Th-232 is the dominant gamma-emitting contaminant present. Typically, sodium iodide detectors will be more sensitive for Th-232 + D than for Ra-226 + D. As a first approximation, the detection sensitivity concentrations for the Thorium series will be about 70 percent of those for uranium ore, which indicates that the level of 2 pCi/g of Th-232 (about 1 to 1.5 pCi/g above typical background) would also be detectable.

Bottom line is that a combination of scan and static count surveys of suspect soil volumes should identify the presence of small deposits of uranium ore or Th-232 contamination above the guideline levels. As the deposits become larger, the probability of detection at the guideline levels increases. Some discrepancies in the soil sample analysis are indicated, and a single sample does not provide a high level of confidence regarding the identity and relative abundances of radionuclides potentially present. Therefore, I would be reluctant to draw conclusions regarding the detectability of other radionuclides, based on the response to uranium ore or Th-232.

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Appendix D

Draft Deed Notice

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N.J.A.C. Section 7:26E - Deed Notice
U.S. Department of Energy Office of Legacy Management
Sewer in Public Right-of-Way near 986 Jersey Avenue, New Brunswick, Middlesex County, NJ

WHEN RECORDED RETURN TO
Steven R. Schiesswohl, Realty Officer
US Department of Energy, Office of Legacy Management
11025 Dover Street, Suite 1000
Westminster, CO 80021-5573

Date:
Fee:
Recorder:
Filed by:
For:

Deed Notice
986 Jersey Avenue, New Brunswick, Middlesex County, NJ

IN ACCORDANCE WITH N.J.S.A. 58:10B-13, THIS DOCUMENT IS TO BE RECORDED IN THE SAME MANNER AS ARE DEEDS AND OTHER INTERESTS IN REAL PROPERTY.

Prepared by: _____
[Signature]

Christopher Clayton
[Print name below signature]

Recorded by:

_____
[Signature, Officer of County Recording Office]

_____
[Print name below signature]

DEED NOTICE

This Deed Notice is made as of the _____ day of _____, ____, by the United States of America, c/o U.S. Department of Energy, Office of Legacy Management, 1000 Independence Avenue SW, Washington, DC, 20585 (together with his/her/its/their successors and assigns, collectively "Owner").

1. THE PROPERTY. This Deed Notice address potential radiological contamination associated with Manhole 26, part of a sanitary sewer in the right-of-way of Jersey Avenue, New Brunswick, New Jersey (the "Property"). The right-of-way is owned by Middlesex County and is administered by the Middlesex County Department of Public Works. The potential contamination may remain from operations conducted by the U.S. Department of Energy and predecessor agencies at 986 Jersey Avenue in New Brunswick, New Jersey ("Associated Property"). The United States of America, c/o U.S. Department of Energy (DOE) Office of Legacy Management, owns in fee simple the Associated Property designated as Block(s) 598

Lot(s) 6, on the tax map of the City of New Brunswick, Middlesex County, the New Jersey Department of Environmental Protection Program Interest Number (Preferred ID) for the site which includes this Associated Property is G000000080; and the Associated Property is more particularly described in Exhibit A, which is attached hereto and made a part hereof. Exhibit A shows also the relationship if the Property and the Associated Property. The United States obtained the Associated Property by virtue of the following deeds recorded in the Office of the Clerk/Register of Middlesex County, New Jersey:

1) Deed from The McBee Company to United States of America dated August 27, 1948, and recorded August 31, 1948 at Book 1406 Page 476 and
2) Deed from Manor Real Estate to United States of America dated March 18, 1949 and recorded August 22, 1949 at Book 1456 Page 312.

2. DEPARTMENT'S ASSIGNED BUREAU. The Bureau of Case Management was the New Jersey Department of Environmental Protection program that was responsible for the oversight of the remediation of the Associated Property. The matter was Case No. G000000080.

3. SOIL CONTAMINATION. The DOE and the U. S. Army Corps of Engineers have not characterized or remediated contaminated soil in the right-of-way. However, in said Manhole 26, scrapings from around a cracked tile in the sewer system had elevated levels of radioactivity. Thus, there is a possibility that soil surrounding the sewer line was contaminated at concentrations that do not allow for the unrestricted use of the Property. This potential soil contamination is described, including the type, concentration and specific location of such potential contaminants, in Exhibit B, which is attached hereto and made a part hereof. As a result, there is a statutory requirement for this Deed Notice in accordance with N.J.S.A. 58:10B-13.

4. CONSIDERATION. In accordance with the New Jersey Department of Environmental Protection's approval of the remedial action work plan for the remediation of the site which included the Property, and in consideration of the terms and conditions of that approval, and other good and valuable consideration, Owner has agreed to subject the Property to certain statutory and regulatory requirements which impose restrictions upon the use of the Property, to restrict certain uses of the Property, and to provide notice to subsequent owners, lessees and operators of the restrictions and the monitoring, maintenance, and biennial certification requirements outlined in this Deed Notice and required by law, as set forth herein.

5A. RESTRICTED AREAS. Due to the potential presence of these contaminants, the Owner has agreed, as part of the remedial action for the Property, to restrict the use of certain parts of the Property (the "Restricted Areas"); a narrative description of these restrictions, along with the associated monitoring and maintenance activities and the biennial certification requirements are provided in Exhibit C, which is attached hereto and made a part hereof. The Owner has also agreed to maintain a list of these restrictions on site for inspection by governmental enforcement officials.

6A. ALTERATIONS, IMPROVEMENTS, AND DISTURBANCES.

i. Except as provided in Paragraph 6B, below, no person shall make, or allow to be made, any alteration, improvement, or disturbance in, to, or about the Property which disturbs any engineering control at the Property without first obtaining the express written consent of the Department of Environmental Protection. Nothing herein shall constitute a waiver of the obligation of any person to comply with all applicable laws and regulations including, without limitation, the applicable rules of the Occupational Safety and Health Administration. To request the consent of the Department of Environmental Protection, contact:

Department of Environmental Protection
Division of Remediation Management and Response
Bureau of Operation, Maintenance, and Monitoring
Deed Notice Inspection Program
P.O. Box 413
401 E. State Street
Trenton, NJ 08625-0413

ii. Notwithstanding subparagraph 6A.i., above, the Department of Environmental Protection's express written consent is not required for any alteration, improvement, or disturbance provided that the owner, lessee or operator:

(A) Notifies the Department of Environmental Protection of the activity by calling the DEP Hotline, at 1-877-WARN-DEP or 1-877-927-6337, within twenty-four (24) hours after the beginning of each alteration, improvement, or disturbance;

(B) Restores any disturbance of an engineering control to pre-disturbance conditions within sixty (60) calendar days after the initiation of the alteration, improvement or disturbance;

(C) Ensures that all applicable worker health and safety laws and regulations are followed during the alteration, improvement, or disturbance, and during the restoration;

(D) Ensures that exposure to contamination in excess of the applicable remediation standards does not occur;

(E) Submits a written report, describing the alteration, improvement, or disturbance, to the Department of Environmental Protection within sixty (60) calendar days after the end of each alteration, improvement, or disturbance. The owner, lessee or operator shall include in the report the nature of the alteration, improvement, or disturbance, the dates and duration of the alteration, improvement, or disturbance, the name of key individuals and their affiliations conducting the alteration, improvement, or disturbance, a description

of the notice the Owner gave to those persons prior to the disturbance, the amounts of soil generated for disposal, if any, the final disposition and any precautions taken to prevent exposure. The owner, lessee, or operator shall submit the report to:

Department of Environmental Protection
Division of Remediation Management and Response
Bureau of Operation, Maintenance, and Monitoring
Deed Notice Inspection Program
P.O. Box 413
401 E. State Street
Trenton, NJ 08625-0413

7A. MONITORING AND MAINTENANCE OF DEED NOTICE, AND PROTECTIVENESS CERTIFICATION. The persons in any way responsible, pursuant to the Spill Compensation and Control Act, N.J.S.A. 58:10-23.11a et seq., for the hazardous substances that remain at the Property, the persons responsible for conducting the remediation, the Owner, and the subsequent owners, lessees, and operators, shall monitor and maintain this Deed Notice, and certify to the Department on a biennial basis that the remedial action that includes this Deed Notice remains protective of the public health and safety and of the environment. The subsequent owners, lessees and operators have this obligation only during their ownership, tenancy, or operation. The specific obligations to monitor and maintain the deed notice shall include all of the following:

i. Monitoring and maintaining this Deed Notice according to the requirements in Exhibit C, to ensure that the remedial action that includes the Deed Notice continues to be protective of the public health and safety and of the environment;

ii. Conducting any additional remedial investigations and implement any additional remedial actions, that are necessary to correct, mitigate, or abate each problem related to the protectiveness of the remedial action for the site prior to the date that the certification is due to the Department pursuant to iii, below, in order to ensure that the remedial action that includes this Deed Notice remains protective of the public health and safety and of the environment.

iii. Certify to the Department of Environmental Protection as to the continued protectiveness of the remedial action that includes this Deed Notice, on a form provided by the Department and consistent with N.J.A.C. 7:26C-1.2 (a)1, every two years on the anniversary of the date stamped on the deed notice that indicates when the deed notice was recorded;

8. ACCESS. The Owner and the subsequent owners, lessees and operators agree to allow the Department, its agents and representatives access to the Property to inspect and evaluate the continued protectiveness of the remedial action that includes this Deed Notice and to conduct additional remediation to ensure the protection of the public health and safety and of the

environment if persons responsible for monitoring the protectiveness of the remedial action, as described in Paragraph 7, above, fail to conduct such remediation pursuant to this Deed Notice as required by law. The Owner, and the subsequent owners and lessees, shall also cause all leases, subleases, grants, and other written transfers of an interest in the Restricted Areas to contain a provision expressly requiring that all holders thereof provide such access to the Department.

9. NOTICES.

i. The Owner and the subsequent owners and lessees, shall cause all leases, grants, and other written transfers of an interest in the Restricted Areas to contain a provision expressly requiring all holders thereof to take the Property subject to the restrictions contained herein and to comply with all, and not to violate any of the conditions of this Deed Notice. Nothing contained in this Paragraph shall be construed as limiting any obligation of any person to provide any notice required by any law, regulation, or order of any governmental authority.

ii. Owner and all subsequent owners and lessees shall notify any person intending to conduct invasive work or excavate within the Restricted Areas at the Property, including, without limitation, tenants, employees of tenants, and contractors of the nature and location of contamination in the Restricted Areas, and, of the precautions necessary to minimize potential human exposure to contaminants.

iii. The Owner and the subsequent owners shall provide written notice to the Department of Environmental Protection at least thirty (30) calendar days before the effective date of any conveyance, grant, gift, or other transfer, in whole or in part, of the owner's interest in the Restricted Area.

iv. The Owner and the subsequent owners shall provide written notice to the Department within thirty (30) calendar days following the owner's petition for or filing of any document initiating a rezoning of the Property. The Owner and the subsequent owners shall submit the written notice to:

Department of Environmental Protection
Division of Remediation Management and Response
Bureau of Operation, Maintenance, and Monitoring
Deed Notice Inspection Program
P.O. Box 413
401 E. State Street
Trenton, NJ 08625-0413.

10. ENFORCEMENT OF VIOLATIONS.

i. This Deed Notice itself is not intended to create any interest in real estate in favor of the Department of Environmental Protection, nor to create a lien against the Property, but merely is intended to provide notice of certain conditions and restrictions on the Property and

to reflect the regulatory and statutory obligations imposed as a conditional remedial action for this site.

ii. The restrictions provided herein may be enforceable solely by the Department against any person who violates this Deed Notice. To enforce violations of this Deed Notice, the Department may initiate one or more enforcement actions pursuant to N.J.S.A. 58:10-23.11u and require additional remediation and assess damages pursuant to N.J.S.A. 58:10-23.11g.

11. SEVERABILITY. If any court of competent jurisdiction determines that any provision of this Deed Notice requires modification, such provision shall be deemed to have been modified automatically to conform to such requirements. If a court of competent jurisdiction determines that any provision of this Deed Notice is invalid or unenforceable and the provision is of such a nature that it cannot be modified, the provision shall be deemed deleted from this instrument as though the provision had never been included herein. In either case, the remaining provisions of this Deed Notice shall remain in full force and effect.

12. SUCCESSORS AND ASSIGNS. This Deed Notice shall be binding upon Owner and upon Owner's successors and assigns, and subsequent owners, lessees and operators while each is an owner, lessee, or operator of the Property.

13. MODIFICATION AND TERMINATION.

i. Any person may request in writing, at any time, that the Department modify this Deed Notice where performance of subsequent remedial actions, a change of conditions at the Property, or the adoption of revised remediation standards suggest that modification of the Deed Notice would be appropriate.

ii. Any person may request in writing, at any time, that the Department terminate this Deed Notice because the conditions which triggered the need for this Deed Notice are no longer applicable.

iii. This Deed Notice may be revised or terminated only upon filing of an instrument, executed by the Department, in the office of the County Clerk of Middlesex County, New Jersey, expressly modifying or terminating this Deed Notice.

14A. EXHIBIT A. Exhibit A includes the following maps of the Property and the vicinity:

i. Exhibit A-1: Vicinity Map - A map that identifies by name the roads, and other important geographical features in the vicinity of the Property (for example, Hagstrom County Maps);

ii. Exhibit A-2: Metes and Bounds Description - A metes and bounds description of the Property, including reference to tax lot and block numbers for the Property;

iii. Exhibit A-3: Property Map - A scaled map of the Property, scaled at one inch to 200 feet or less, and if more than one map is submitted, the maps shall be presented as overlays, keyed to a base map; and the Property Map shall include diagrams of major surface topographical features such as buildings, roads, and parking lots.

14B. EXHIBIT B. Exhibit B includes the following descriptions of the Restricted Areas:

i. Exhibit B-1: Restricted Area Map - A separate map for each restricted area that includes:

(A) As-built diagrams of each engineering control, including caps, fences, slurry walls, ground water monitoring wells, and ground water pumping system;

(B) As-built diagrams of any buildings, roads, parking lots and other structures that function as engineering controls; and

(C) Designation of all soil and sediment sample locations within the restricted areas that exceed any soil or sediment standard that are keyed into one of the tables described in the following paragraph.

ii. Exhibit B-2: Restricted Area Data Table - A separate table for each restricted area that includes:

(A) Sample location designation from Restricted Area map (Exhibit B-1);

(B) Sample elevation based upon mean sea level;

(C) Name and chemical abstract service registry number of each contaminant with a concentration that exceeds the unrestricted use standard;

(D) The restricted and unrestricted use standards for each contaminant in the table; and

(E) The remaining concentration of each contaminant at each sample location at each elevation (or if historic fill, include data from the Department's default concentrations at N.J.A.C. 7:26E-4.6, Table 4-2).

14C. EXHIBIT C. Exhibit C includes narrative descriptions of the institutional controls as follows:

i. Exhibit C-1: Deed Notice as Institutional Control: Exhibit C-1 includes a narrative description of the restriction and obligations of this Deed Notice that are in addition to those describe above, as follows:

(A) General Description of this Deed Notice:

(1) Description and estimated size of the Restricted Areas as described above;

(2) Description of the restrictions on the Property by operation of this Deed Notice; and

(3) The objective of the restrictions.

(B) Description of the monitoring necessary to determine whether:

(1) Any disturbances of the soil in the Restricted Areas did not result in the unacceptable exposure to the soil contamination;

(2) There have been any land use changes subsequent to the filing of this Deed Notice or the most recent biennial certification, whichever is more recent;

(3) The current land use on the Property is consistent with the restrictions in this Deed Notice;

(4) Any newly promulgated or modified requirements of applicable regulations or laws apply to the site; and

(5) Any new standards, regulations, or laws apply to the site that might necessitate additional sampling in order to evaluate the protectiveness of the remedial action which includes this Deed Notice, and conduct the necessary sampling.

(C) Description of the following items that will be included in the biennial certification:

(1) A monitoring report that describes the specific activities, pursuant to (A) and (B), above, conducted in support of the biennial certification of the protectiveness of the remedial action that includes this Deed Notice;

(2) Land use at the Property is consistent with the restrictions in this Deed Notice; and

(3) The remedial action that includes this Deed Notice continues to be protective of the public health and safety and of the environment.

15. SIGNATURES. IN WITNESS WHEREOF, Owner has executed this Deed Notice as of the date first written above.

WITNESS:

_____ _____

[Signature] Steven R. Schiesswohl
Realty Officer

STATE OF _____ SS.:
COUNTY OF _____

I certify that on _____, 20__, Steven R. Schiesswohl, U.S. Department of Energy Office of Legacy Management, personally came before me, and this person acknowledged under oath, to my satisfaction, that this person.

(a) is named in and personally signed this document; and

(b) signed, sealed and delivered this document as his or her act and deed.

_____

_____, Notary Public
[Print Name and Title]

EXHIBIT A

Exhibit A includes the following maps of the Property and the vicinity:

i. Exhibit A-1: Vicinity Map

A map that identifies by name the roads, and other important geographical features in the vicinity of the Property (for example, Hagstrom County Maps).

See Figure A–1

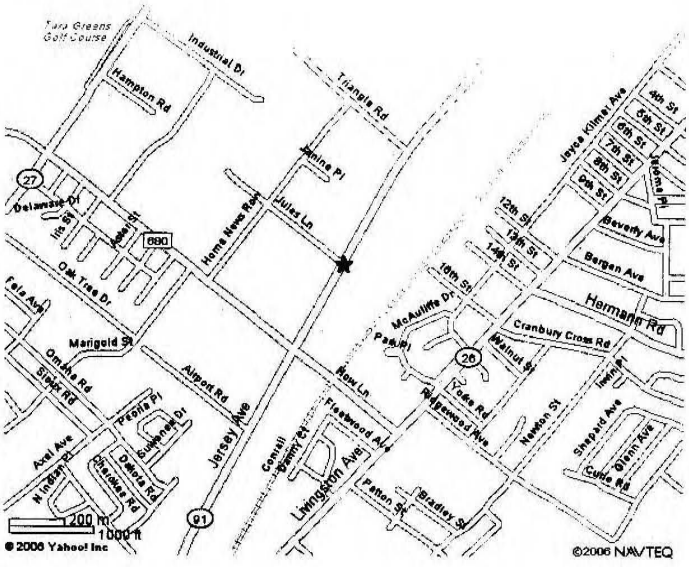


Figure A–1. Vicinity Map

ii. Exhibit A-2: Metes and Bounds Description

A metes and bounds description of the Property, including reference to tax lot and block numbers for the Property.

Beginning at the west corner of Block 598 Lot 6, City of New Brunswick, County of Middlesex, State of New Jersey, then proceeding northeast along the common boundary between said Block 598 Lot 6 and the Jersey Avenue right-of-way 175.7 feet, then

proceeding northwest on a line perpendicular to said boundary 8.0 feet to the true point of beginning, then northeast parallel to said ROW boundary 20 feet, then NW along a line perpendicular to said ROW boundary 20 feet, then southwest along a line parallel to said ROW boundary 20 feet, then SE along a line perpendicular to said ROW boundary 20 feet to the true point of beginning.

iii. Exhibit A-3: Property Map

A scaled map of the Property, scaled at one inch to 200 feet or less, and if more than one map is submitted, the maps shall be presented as overlays, keyed to a base map; and the Property Map shall include diagrams of major surface topographical features such as buildings, roads, and parking lots.

A land survey map of the Associated Property is attached as Figure A–3a. This map was generated in conjunction with the 2007 sealed land survey and is annotated herein to show the location of the Property relative to the Associated Property. The metes and bounds description of the Property (Exhibit A-2) uses a corner of the Associated Property as a point of beginning. Figure A–3a also includes location information for the sewer obtained by the land surveyor from the Middlesex County Department of Public Works, which provides location information for Manhole 26. Figure A–3b is an aerial photograph of the Property showing global positioning system location information for Manhole 26.

N.J.A.C. Section 7:26E - Deed Notice
U.S. Department of Energy Office of Legacy Management
Sewer in Public Right-of-Way near 986 Jersey Avenue, New Brunswick, Middlesex County, NJ

Figure A–3a. Annotated Survey and Utility Map

Figure A-3b. Aerial Photograph and GPS Location Information

EXHIBIT B

EXHIBIT B. Exhibit B includes the following descriptions of the Restricted Areas:

Exhibit B-1: Restricted Area Map

A separate map for each restricted area that includes:

(A) As-built diagrams of each engineering control, including caps, fences, slurry walls, ground water monitoring wells, and ground water pumping system;

(B) As-built diagrams of any buildings, roads, parking lots and other structures that function as engineering controls; and

(C) Designation of all soil and sediment sample locations within the restricted areas that exceed any soil or sediment standard that are keyed into one of the tables described in the following paragraph

See Figure B–1.

Exhibit B-2: Restricted Area Data Table

A separate table for each restricted area that includes:

(A) Sample location designation from Restricted Area.

(B) Sample elevation based upon mean sea level;

(C) Name and chemical abstract service registry number of each contaminant with a concentration that exceeds the unrestricted use standard;

(D) The restricted and unrestricted use standards for each contaminant in the table; and

(E) The remaining concentration of each contaminant at each sample location at each elevation (or if historic fill, include data from the Department's default concentrations at N.J.A.C. 7:26E-4.6, Table 4-2).

Characterization data for the Property are included as Figure B–2. Specific analytical results are shown on Table E–1 of that figure and are presented again in Table B–2.

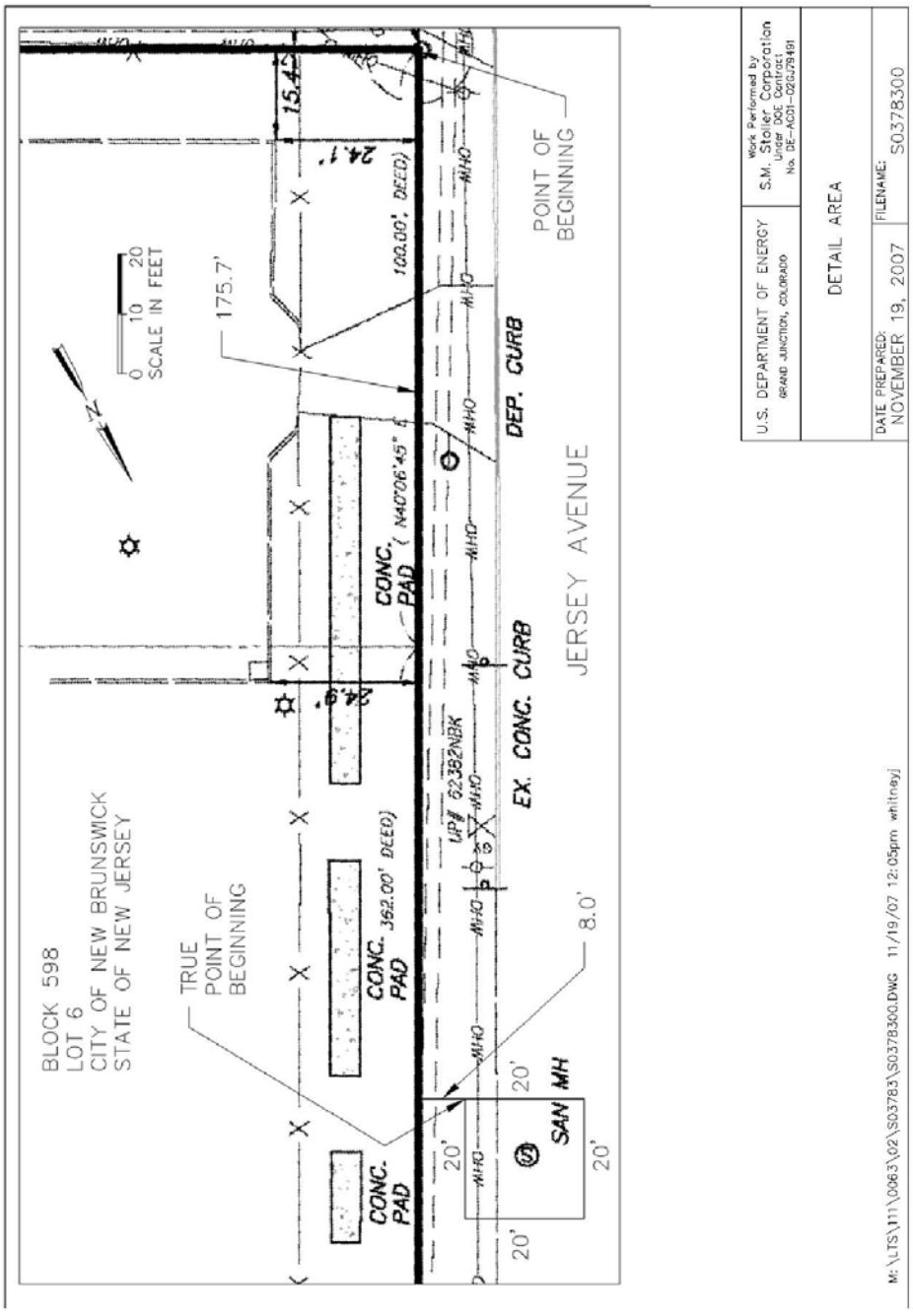
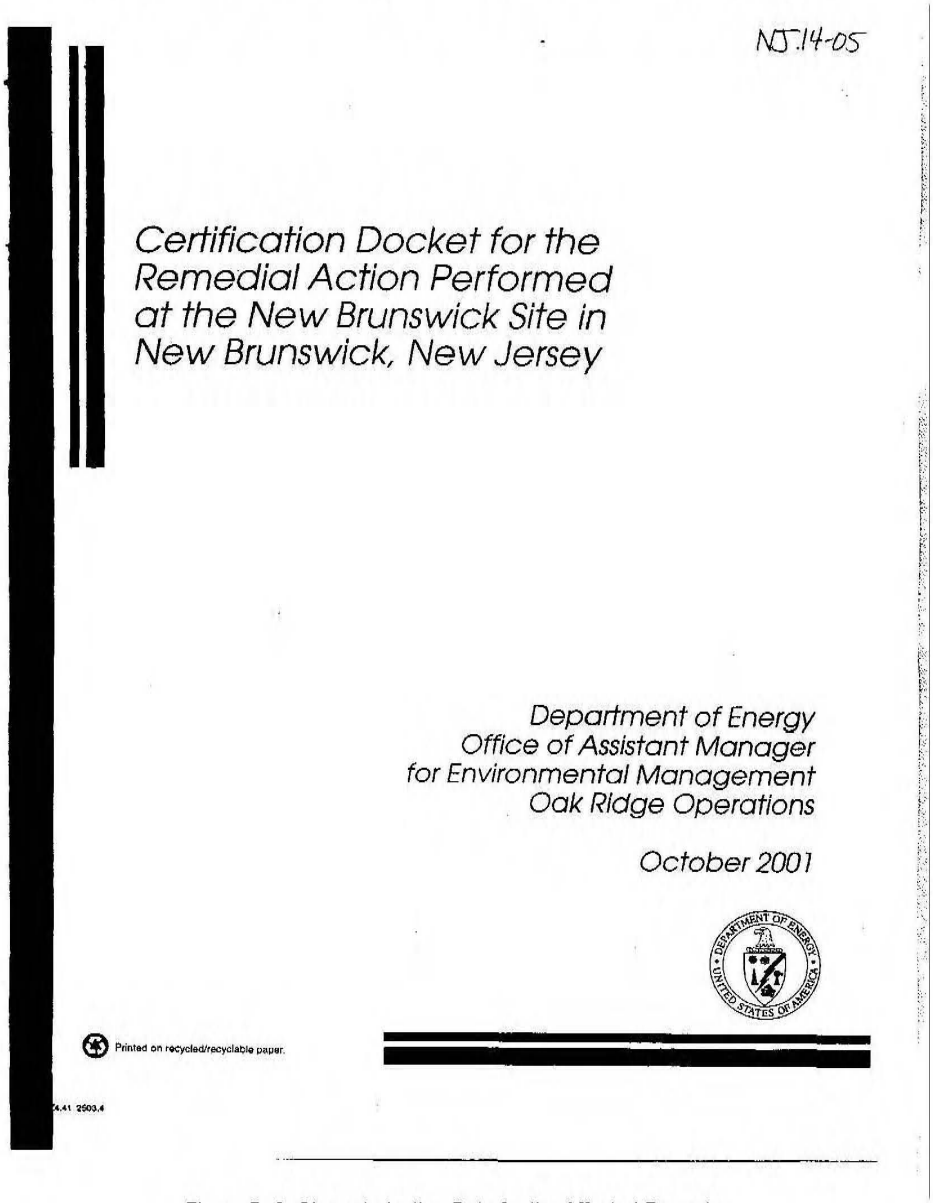


Figure B–1. Detail of Survey Map Showing Metes and Bounds Description of Restricted Area


NJ.14-05

Certification Docket for the Remedial Action Performed at the New Brunswick Site in New Brunswick, New Jersey

Department of Energy
Office of Assistant Manager
for Environmental Management
Oak Ridge Operations

October 2001

Printed on recycled/recyclable paper.

Figure B–2. Characterization Data for the Affected Property

Figure A-47. Railroad Siding at Rear of Site

offsite contamination. At that time, the hot spot discovered along the west fence during the certification survey should also be examined to determine the extent of offsite contamination.

Item 3

Between Phases IIA and IIB, offsite drain lines were examined to assess the extent of contamination that was probably due to NBL-NJ activities. The examination showed (see Appendix E) that there were no significant amounts of contaminated

Figure B-2 (continued). Characterization Data for the Affected Property

residue in those portions of the offsite drains which were accessible. However, in one man-hole (sanitary sewer) the activity concentration in scrapings from around a cracked tile was above that found in all other portions of the system. The exposure rate at that location was also higher than "normal." This point is mentioned not because it is a serious concern but more because it has not been officially dismissed.

It is recommended that a decision should be made to either replace that section of the offsite sewer line (after consultation with the city) or to inform the proper agencies that the potential risk is considered to be insignificant and that no further action is anticipated. Note that the replacement of the sewer pipe will entail considerable planning and engineering since this 12" line services a number of industrial facilities upstream of NBL-NJ. Provisions, therefore, must be provided to maintain an uninterrupted flow of sewage for the duration of any cleanup operations.

Item 4

During Phase IIA of the D&D, contaminated soil was removed from the former C Building Plutonium Laboratory and from a pipe trench between Buildings C and I. At that time, the cleanup criterion was 15 pCi/g of ^{241}Am per gram of soil.

Figure B-2 (continued). Characterization Data for the Affected Property

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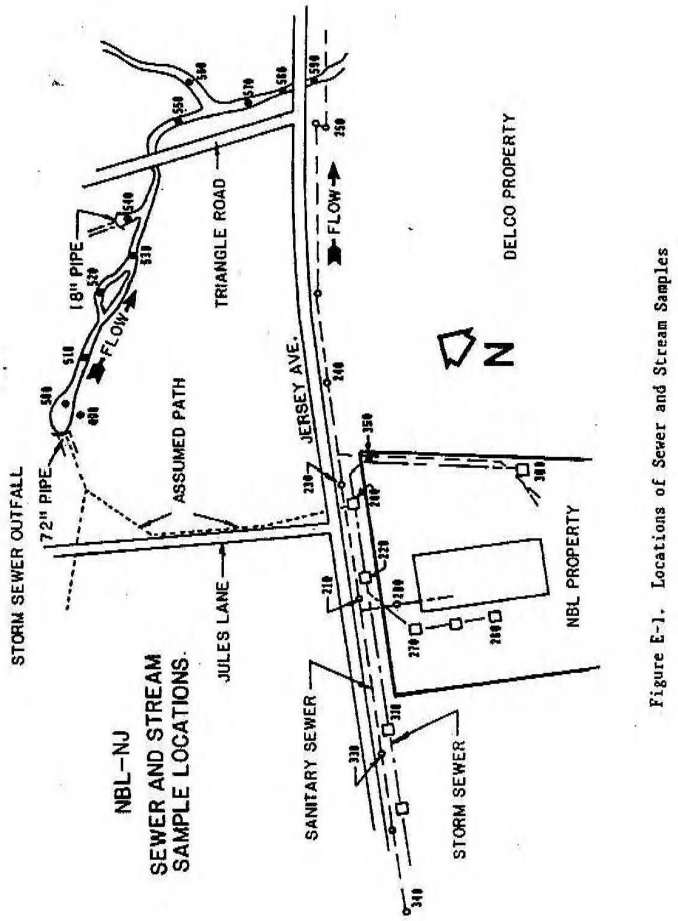

Figure E-1. Locations of Sewer and Stream Samples

Figure B–2 (continued). Characterization Data for the Affected Property

APPENDIX E

OFFSITE DRAINS

After Phase IIA was completed, questions were raised about the extent of radioactive contamination in offsite sanitary and storm sewer drain lines. Pre-D&D investigations had indicated that onsite sanitary sewer lines were contaminated and that low levels of contamination were also found in an offsite storm drain catch basin. Based on these findings, it was decided that ANL should do a more extensive investigation of offsite and onsite drains to better define the extent of the contamination.

Samples were taken from the offsite sanitary sewer line (upstream and downstream) in six manholes along Jersey Avenue (see Fig. E-1). Two samples were also taken from the onsite sanitary sewer lines at about 50 feet from their connections to the city main. One sample was from the line from the former I Building and the other was from the line of the former A Building.

Samples were taken from the storm sewer lines at four offsite catch basins and at three points onsite (two catch basins and one manhole). The locations of storm sewer samples are shown in Figure E-1.

The storm sewer emptied into an outfall about ¼ mile from the NBL-NJ site (see Fig. E-1). Sediment and water were taken at the outfall and at 10 locations along the stream.

Figure B−2 (continued). Characterization Data for the Affected Property

APPENDIX E

OFFSITE DRAINS

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Samples were taken from the offsite sanitary sewer line (upstream and downstream) in six manholes along Jersey Avenue (see Fig. E-1). Two samples were also taken from the onsite sanitary sewer lines at about 50 feet from their connections to the city main. One sample was from the line from the former I Building and the other was from the line of the former A Building.

Samples were taken from the storm sewer lines at four offsite catch basins and at three points onsite (two catch basins and one manhole). The locations of storm sewer samples are shown in Figure E-1.

The storm sewer emptied into an outfall about ¼ mile from the NBL-NJ site (see Fig. E-1). Sediment and water were taken at the outfall and at 10 locations along the stream.

Figure B–2 (continued). Characterization Data for the Affected Property

Most of the collected samples were analyzed for radioactivity per gram of undissolved solids (scrapings and filterable suspended solids). Some samples were also analyzed for activity in dissolved solids per mℓ of water. A few samples from the stream were also analyzed for non-radioactive metals such as arsenic, barium, cadmium, etc.

The results of the radioactivity analyses of samples from the sanitary sewer lines are listed in Table E-1, and that from the storm sewer lines are listed in Table E-2. The data show that there is measurable radioactive contamination in the offsite sanitary sewer line (primarily at sample location number 210) and in the offsite storm sewer (primarily at sample location number 260) at concentrations which are above that normally found in the natural environment (see Table B-7 for typical background concentrations in soil and water). The data also show that the activity is primarily associated with undissolved solids. The activity in dissolved solids per mℓ of water was at background levels at all sampling points.

When samples were collected, especially in manholes, the area sampled was surveyed with a portable radiation survey instrument. Only at sample locations 200 and 210 (in sanitary sewer) was the contamination detectable with the portable instrument. At sample location 200, which is onsite, the section of pipe removed to obtain a sample was disposed of as radioactive waste. At sample location 210, an offsite sanitary sewer manhole, there was detectable contamination around a broken sewer tile (12" in diameter open top vitrous tile) at the base of the manhole. Scrapings from this tile showed the highest offsite activity concentration.

Figure B−2 (continued). Characterization Data for the Affected Property

The activity concentrations in the stream connected to the storm sewer outfall were essentially the same as that found in the natural environment. The results of stream sample analyses are listed in Table E-3.

The implication of the findings as of 1982 is that, although there is definitely above background concentrations of radioactivity in the offsite sanitary line and in the offsite storm drain, the contamination is not at levels which would be a serious threat to the public or the environment. It must be noted, however, that the total activity which could be trapped under the broken tile at sample location number 210, or at other inaccessible points in the line, is unknown. The fact that the activity concentrations in the stream are at background levels suggest that the remaining contamination in the storm sewer line is probably not very mobile and that the stream has already diluted or cleaned itself of past contamination.

The results of analyses of stream samples for the concentration of non-radioactive elements which are usually of concern in water quality are listed in Table E-4. The results for all elements, except that for iron at sample location 290, are within the acceptable limits listed in Table E-5.

Figure B–2 (continued). Characterization Data for the Affected Property

TABLE B-1. SANITARY SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS / PICO CURIES IN DISSOLVED SOLIDS/ml OF SOLUTION							
		Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
200[b]	5/25/82	342 ±34 -	6490 -	462 ±150 -	815 ±82 -	7 -	37 -	9335/4155 -
205[c]	5/25/82	3.3 0.08± .02	40.8 6.2E-5	- -	< 0.06 < 0.01	- -	2.5 5E-5	12.1/3.1 8E-5/8E-5
210[d]	5/25/82	4.56± .05 < 0.01	16.2[e] -	66 ±20[e] -	128 ±13 < 0.01	35 -	0.6 -	3.6/27 -
210[f]	5/25/82	0.34± .03 0.21± .02	0.8 1.5E-4	0.22± .11 -	5.1±4 .05 < 0.01	- -	0.7 < 5E-5	0.05/0.006 <3E-5/<2E-5
230	5/25/82	1.40 0.02± .01	6.84 1.5E-4	0.17 < 0.01	2.27 0.03± .02	- -	1.19± .11 1.1E-3	3.19±.22/0.52±.04 <3E-5/<3E-5
240	5/25/82	< 0.09 < 0.01	0.2 1.5E-4	- 5.2E-5	0.27 0.03± .02	- -	<0.01 <5E-5	<0.01/<0.01 <3E-5/<3E-5
250	5/25/82	1.13 0.09± .03	13.4 5E-3	0.18 < 0.01	2.11 0.19± .09	- -	0.11 1E-4	0.04/0.31 3.8E-2/3.6E-2
330	5/25/82	< 0.02 0.09± .09	0.38 1.5E-3	< 0.01 < 0.01	- 0.05± .02	- -	- <1E-5	- <7E-4/<7E-4
340	5/25/82	2.86 0.69± .07	1.57 -	- 0.16	- 0.04± .02	- -	- <1E-4	- 1E-5/1.4E-4
350	5/25/82	0.86 < 0.01	1.26 7E-4	0.05 -	- 0.26± .08	- -	0.002±.002 <5E-4	0.004±.002/<0.02 6E-3/0.12

[a] The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per ml of solution.

[b] Scrapings from 5-ft sections of sewer pipe at about 50 ft from connection to city main on the MBL site.

[c] Water which ran out of sanitary sewer line when 5-ft section was removed.

[d] Scraping from broken tile at bottom of manhole.

[e] There is an unresolved discrepancy between the shown concentration of total U and that of ^{235}U.

[f] Random samples of sludge from manhole.

Figure B−2 (continued). Characterization Data for the Affected Property

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TABLE B-2. STORM SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS / PICO CURIES IN DISSOLVED SOLIDS/ml OF SOLUTION [a] Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
280	5/25/82	0.62	268.33	-	54	-	0.361.07	0.911.2/0.581.15
		< 0.1	0.044	-	0.031.02	-	<3E-5	<3E-5/<3E-5
270	5/25/82	1.38	35.38	0.30	1.43	-	0.28	1.72/0.08
		0.051 .02	2.8E-3	.031 .02	< 0.01	-	<3E-5	<2.8E-5/<2.8E-5
300	5/25/82	-	0.70	-	0.741.02	-	0.0341.006	0.0021.001/<0.001
220	5/25/82	1.63	30.69	0.30	1.15	-	5.04	2.13/0.15
		< 0.01	0.60	-	< 0.01	-	<5E-4	1.3E-3/5E-4
260	5/25/82	<10	99.61	15	<30	-	<1.25	<1.25/<1/25
310	5/25/82	0.44	1.1	0.02	-	-	0.0021.002	<0.001/0.0021.002

[a] The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per ml of solution.

Figure B-2 (continued). Characterization Data for the Affected Property

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TABLE E-2. STORM SEWER SAMPLES

Sample Location	Collection Date	PICO CURIES/GRAM OF UNDISSOLVED SOLIDS PICO CURIES IN DISSOLVED SOLIDS/ml OF SOLUTION Ra-226	Total U	U-235	Th-232	Np-237	Am-241	Pu-239/238
280	5/25/82	0.62 < 0.1	268.33 0.044	- -	54 0.031.02	- -	0.361.07 <3E-5	0.911.2/0.581.15 <3E-5/<3E-5
270	5/25/82	1.38 0.051 .02	35.39 2.8E-3	0.30 .031 .02	1.43 < 0.01	- -	0.28 <3E-5	1.72/0.08 <2.8E-5/<2.8E-5
300	5/25/82	-	0.70	-	0.741.02	-	0.0341.006	0.0021.001/<0.001
220	5/25/82	1.63 < 0.01	30.69 0.60	0.30 -	1.15 < 0.01	- -	5.06 <1E-4	2.11/0.15 1.3E-3/3E-4
260	5/25/82	<10	99.61	15	<30	-	<1.25	<1.25/<1/25
310	5/25/82	0.44	1.1	0.02	-	-	0.0021.002	<0.001/0.0021.002

[a]The first line for each sample location gives the activity per gram of undissolved (filtered) solids and the second line gives the activity in dissolved solids (liquid filtrate) per ml of solution.

Figure B-2 (continued). Characterization Data for the Affected Property

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TABLE E-4. STREAM SAMPLES
(Collected 11/18/82)

Sample Location	Water Quality: Average Concentration in mg/liter [c]													
	Ag	As	Ba	Cd	Cr	Cu	F	Fe	Mn	Ni	Pb	Se	Zn
290	0.002		0.1350	0.0016	0.0070	0.350		28.300	5.030	0.0180	0.0070		0.0080
540[a]	0.002	0.0100	0.2884	0.0002	0.0028	0.0021	0.1120	0.1000	0.0550	0.0050	0.0010	0.0050	0.0200
540[b]	0.0002	0.0050	0.1880	0.0002	0.0150	0.0080	0.1020	0.7200	0.2480	0.0100	0.0030	0.0050	0.0250
592	0.0002	0.0050	0.2010	0.0003	0.0060	0.0760	0.1520	0.5800	0.7670	0.0090	0.0060	0.0050	0.0320

[a]Sample at outlet of 18-in pipe before water enters stream.
[b]Sample taken from stream.
[c]The values listed are the total elemental concentrations. The concentration of chromium is the total of chromium (VI) and chromium (III).

Figure B-2 (continued). Characterization Data for the Affected Property

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TABLE E-5. TYPICAL WATER QUALITY STANDARDS*

Constituent	Concentrations in mg/mℓ Stream	Effluent	
Ammonia Nitrogen (as N)	1.5	2.5 4.0	(April - October) (November - March)
Arsenic	1.0	0.25	
Barium	5.0	2.0	
Cadmium	0.05	0.15	
Chromium (VI)	0.05	0.3	
Chromium (III)	1.0	1.0	
Copper	0.02	1.0	
Cyanide	0.025	0.025	
Fluoride	1.4	15	
Iron	1.0	2.0	
Lead	0.1	0.1	
Manganese	1.0	1.0	
Mercury	0.0005	0.0005	
Nickel	1.0	1.0	
pH	6.5-9.0	5.0-10.0	
Selenium	1.0	1.0	
Silver	0.005	0.1	
Sulfate	500	-	
Total Dissolved Solids	1000	-	
Zinc	1.0	1.0	

*Used by Illinois Water Pollution Control Board.

Figure B-2 (continued). Characterization Data for the Affected Property

Table B–2. Restricted Area Data Table

N.J.A.C. Section 7:26E - Deed Notice
U.S. Department of Energy Office of Legacy Management
Sewer in Public Right-of-Way near 986 Jersey Avenue, New Brunswick, Middlesex County, NJ

Sample Location Identifier	Sample Elevation	Name and CAS Number	Limited Restricted/Unrestricted Use Standard[a] (pCi/g)	Analytical result (pCi/ml)
210	Base of manhole 26	Radium-226 13982-63-3	5/3	4.56 +/- 0.05
210	Base of manhole 26	Total Uranium 7440-61-1	na	16.2[b]
210	Base of manhole 26	Uranium-235 15117-96-1	37/29	66 +/- 20
210	Base of manhole 26	Thorium-232 7440-29-1	3/2	120 +/- 13
210	Base of manhole 26	Neptunium-237 13994-20-2	na	35
210	Base of manhole 26	Americium-241 14596-10-2	na	0.6
210	Base of manhole 26	Plutonium-239/238 15117-48-3 / 13981-16-3	na	3.6 / 27

Key: CAS = chemical abstract service registry number; pCi/ml = picocuries in dissolved solids per milliliter of solution
[a]Allowed Incremental Guideline Levels of Individual Radionuclides in soils; 1 ft vertical extent values; N.J.A.C. 7:28-12; these values are provided for informational purposes only; no characterization data are available for comparison
[b]Table E–2 states, "There is an unresolved discrepancy between the shown concentration of Total U and that of U-235."
na = not available

EXHIBIT C.

Exhibit C includes narrative descriptions of the institutional controls and engineering controls as follows:

Exhibit C-1: Deed Notice as Institutional Control:

Exhibit C-1 includes a narrative description of the restriction and obligations of this Deed Notice that are in addition to those describe above, as follows:

(A) General Description of this Deed Notice:

(1) Description and estimated size of the Restricted Areas as described above:

DOE and its predecessor agencies used the property at 986 Jersey Avenue, New Brunswick, New Jersey, as a general radionuclide laboratory, known as the New Brunswick Laboratory, between 1948 and 1973. After laboratory operations were relocated, DOE remediated the property to approved cleanup standards in 1996.

During remediation of the Associated Property at 986 Jersey Avenue, New Brunswick, New Jersey, elevated radioactivity was detected at a cracked sewer pipe at a manhole (designated Sample Location 210 by the investigators), in the Jersey Avenue Right-of-Way. The radioactivity appeared to have been fixed onto the pipe and contamination was not detected at downstream locations. Scrapings from that location contained elevated radionuclide activities. Neither intrusive nor destructive investigations were conducted, so it is not known if contamination spread to the soils or bedding materials outside the sewer. Available documentation is posted at http://www.lm.doe.gov/land/sites/nj/brunswick/brunswick2.htm in the Certification Docket under "Considered Sites Database Site Specific Documents" and included in Exhibit B.

DOE determined that the contamination does not pose a risk to worker or public health and safety or to the environment. Records of the risk assessment have not been located.

The Property occupies 400 feet squared and the contaminated pipe is an estimated 10 to 15 feet below the road surface.

(2) Description of the restrictions on the Property by operation of this Deed Notice:

DOE will implement the actions described below to maintain protectiveness and regulatory compliance.

1. DOE will establish contacts within the municipal entity ("Public Works") that is responsible for sewer management and maintenance. DOE will develop an agreement with Public Works that describes the occurrence of suspect contamination and requires Public Works to contact DOE if planned or emergency repairs are conducted at the occurrence. Public Works will agree to segregate all solid material from the affected area if work is required before DOE can mobilize radiological control staff to the site.
2. DOE will contact Public Works annually to determine if repairs or reconstruction are planned for the coming year. The communication will be documented in the DOE New Brunswick site records collection and copied to NJDEP and Public Works.
3. DOE will request that zoning plats are annotated to include notice of the potential contamination and provide contact information.
4. DOE will determine if there is a mechanism in place locally for permitting street penetrations. If so, DOE will attempt to establish a means whereby street penetrations in the area of the suspected contamination are checked for involvement with the affected sewer and, if, so, are monitored so that proper protections and disposal practices are followed.
5. DOE will provide a stainless steel plaque to the sewer managers to be hung in the manhole at Location 210. The plaque will describe the contamination, provide contact information for DOE, and advise persons accessing the area to not disturb the affected area without monitoring and appropriate protections.

An institutional controls checklist, which includes contact information, is attached as part of this exhibit.

DOE will initiate the above actions within 4 months of agreement between DOE and NJDEP

(3) The objective of the restrictions.

The objective of the restrictions is to provide notice to DOE in the event that the potentially contaminated soils become accessible. At that time, DOE will assess the occurrence to determine if regulated materials are present and if the occurrence presents a hazard to human health or the environment. DOE will properly disposal of the regulated contaminated materials and seek removal of further land use restrictions in accordance with N.J.A.C. 7:26E-8.2.

(B) Description of the monitoring necessary to determine whether:

(1) Any disturbances associated with the soil in the Restricted Areas did not result in the unacceptable exposure to the soil contamination:

DOE or an agent of DOE will physically inspect the Property once every two years to determine if soil in the restricted area has been subjected to any excavation or earth-moving activities. Results of the inspection will be reported to NJDEP as a biennial certification in accordance with N.J.A.C. 7:26E-8.5.

(2) There have been any land use changes subsequent to the filing of this Deed Notice or the most recent biennial certification, whichever is more recent:

In conjunction with the biennial inspection, DOE or an agent of DOE will contact the City of New Brunswick, NJ, Department of Planning, Community and Economic Development and the Middlesex County, NJ, Planning Board to determine if zoning restrictions have been modified since the last inspection.

(3) The current land use on the Property is consistent with the restrictions in this Deed Notice:

The Property is currently within a public right-of way. During the biennial inspection, DOE or an agent of DOE will ascertain if land use changes have occurred within the restricted area that have not been approved by DOE and NJDEP. This information will be included in the biennial certification. If land use has changed and does not comply with the conditions of this Deed Notice, and DOE determines that the new land use may pose a risk to human health or the environment, DOE will notify the New Jersey Department of Environmental Protection at (877) 927-6337 (the NJDEP hotline number) within 48 hours.

(4) Any newly promulgated or modified requirements of applicable regulations or laws apply to the site:

In conjunction with the biennial inspection, DOE or an agent of DOE will contact the City of New Brunswick, NJ, Department of Planning, Community and Economic Development; the Middlesex County, NJ, Planning Board; and the New Jersey Department of Environmental Protection to determine if any newly promulgated or modified requirements of applicable regulations or laws apply to the site.

(5) Any new standards, regulations, or laws apply to the site that might necessitate additional sampling in order to evaluate the protectiveness of the remedial action which includes this Deed Notice, and conduct the necessary sampling:

If any newly promulgated or modified requirements of applicable regulations or laws apply to the site, DOE will determine if additional sampling is required and report conclusions in the biennial certification.

(C) Description of the following items that will be included in the biennial certification:

DOE will include the following information in the biennial certification report:

(1) A monitoring report that describes the specific activities, pursuant to (A) and (B), above, conducted in support of the biennial certification of the protectiveness of the remedial action that includes this Deed Notice:

(2) Land use at the Property is consistent with the restrictions in this Deed Notice:

(3) The remedial action that includes this Deed Notice continues to be protective of the public health and safety and of the environment.

Exhibit C-2: Paved Public Road as Engineering Control:

Exhibit C-2 includes a narrative description of soil cap as follows:

(A) General Description of the engineering control:

(1) Description of the engineering control;

The engineering control consists of an asphalt-covered road section owned and maintained by Middlesex County, New Jersey. The configuration of the road section, (e.g., thicknesses of asphalt and base course layers) is unknown.

(2) The objective of the engineering control; and

The control is intended to prevent direct exposures to potentially contaminated soils located at depth.

(3) How the engineering control is intended to function.

The control functions as a physical barrier between receptors and potentially contaminated soils.

(B) Description of the operation and maintenance necessary to ensure that:

(1) Periodic inspections of each engineering control are performed in order to determine its integrity, operability, and effectiveness;

(2) Each engineering control continues as designed and intended to protect the public health and safety and the environment;

(3) Each alteration, excavation or disturbance of any engineering control is timely and appropriately addressed to maintain the integrity of the engineering control;

(4) This engineering control is being inspected and maintained and its integrity remains so that the remedial action continues to be protective of the public health and safety and of the environment;

(5) A record of the self-inspection dates, name of the inspector, results of the inspection and condition(s) of this engineering control. Sampling, for example, may be necessary if it is not possible to visually evaluate the integrity/ performance of this engineering control; and

To comply with items (B)(1) through (B)(5) above, DOE or an agent of DOE will physically inspect the site once every two years to determine if soil in the restricted area has been subjected to any excavation or earth-moving activities. Results of the inspection will be reported to the New Jersey Department of Environmental Protection as a biennial certification in accordance with N.J.A.C. 7:26E-8.5.

If evidence is found indicating disturbance in the restricted area, DOE or an agent of DOE will contact the Property owner to determine if restoration of the asphalt-covered pavement section will materially degrade the effectiveness of the engineering control. Routine maintenance or road reconstruction will not degrade the effectiveness of the engineering control because the restricted area lies at the base of Manhole 26 and will not be disturbed by these activities. It is unlikely that land will changed.

(6) Any new standards, regulations, or laws apply to the site that might necessitate additional sampling in order to evaluate the protectiveness of the remedial action which includes this Deed Notice, and conduct the necessary sampling.

In conjunction with the biennial inspection, DOE or an agent of DOE will contact the City of New Brunswick, NJ, Department of Planning, Community and Economic Development; the Middlesex County, NJ, Department of Planning, Middlesex County Planning Board; and the New Jersey Department of Environmental Protection to determine if any newly promulgated or modified requirements of applicable regulations or laws apply to the site.

(C) Description of the following items that will be included in the biennial certification:

DOE will include the following information in the biennial certification report:

(1) A monitoring report that describes the specific activities, pursuant to (A) and (B), above, conducted in support of the biennial certification of the protectiveness of the remedial action that includes this Deed Notice;

(2) The engineering controls continue to operate as designed; and

(3) The remedial action that includes the engineering control continues to be protective of the public health and safety and of the environment.

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