



Nuclear Fuel Services, Inc.
P.O. Box 337, MS 123
Erwin, TN 37650

(615) 743-9141

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

21G-95-0009
GOV-01-55
LIC-01
ACF 95-017
February 8, 1995

Mr. Robert C. Pierson, Chief
Licensing Branch, NMSS
U. S. Nuclear Regulatory Commission
Mail Stop T 8 D-14
Washington, DC 20555-0001

- Reference: 1) Docket No. 70-143; SNM License 124
- 2) Decommissioning/Interim Measures Workplan for the Pond 4 Area, Solid Waste Management Units 2, 4 and 6, Revision 1, dated June 16, 1994
- 3) Confirmatory Order Modifying License, Robert M. Bernero to Andrew M. Maxin, dated June 23, 1994

Dear Mr. Pierson:

Pursuant to Condition 3 of Reference 3, Nuclear Fuel Services, Inc. (NFS), hereby submits its plans for remediating those areas of Pond 4 which are outside of Building 410. This submittal also includes, as required by Reference 3, a discussion and an evaluation of the potential impact on worker and public radiation exposures, and an evaluation of the potential impact on groundwater, from these activities.

Plans for Remediation of Pond 4 Areas Outside of Building 410

These activities will be conducted in accordance with the guidelines and requirements of Reference 2, which has been approved by the NRC for work inside Building 410 (Reference 3). The plans discussed herein address only those activities which are unique to work conducted outside of Building 410, which are different from or in addition to those specified in Reference 2, or which are provided for clarification.

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Excavation of areas outside of Building 410 will be conducted in accordance with Section 2.1.2.4 of Reference 2. After separation of debris and wastes, contaminated soil will be transferred into Building 410 where processing will take place as described in Section 2.1 of Reference 2. Soil will be transferred to and from the sorting and separation area in Building 410 by means of a dump truck or other similar earth-moving equipment. Appropriate controls will be implemented during the handling and transfer of materials to prevent the further spread of contamination. These controls may include both physical and administrative controls such as: covering of transport vehicles; wetting of materials being transported; containerizing of materials when appropriate; and conducting material transfer work only during suitable weather conditions.

Excavation work outside of Building 410 will be performed using standard open field excavation techniques, and only when weather and soil conditions are suitable. Excavation work will not take place if it is raining, when outside temperatures are extremely hot or cold, when winds are excessive, or if other conditions exist which could result in unsafe working conditions, as determined by the project manager or safety personnel.

The amount of area scheduled for excavation at any one time will be limited in order to minimize potential safety problems. Exposed surfaces in the excavation area and along transport areas will be kept damp to minimize airborne radioactivity and/or the spread of radioactive contamination to other areas.

During periods when no excavation work is taking place, suitable coverings such as tarpaulins or other materials may be used to protect against the adverse effects of the elements. This determination will be made by the project manager or safety personnel based on such factors as weather conditions, characteristics of exposed materials, and survey and monitoring results.

Standard construction site controls, such as settling basins, straw bales, silt fencing, and/or excavation site pumping will be utilized to minimize surface water runoff and thus minimize the potential spread of contamination to other areas.

Evaluation of Estimated Worker and Public Radiation Exposures

Characterization data generated in the Pond 4 area has shown that the vast majority of the source term (buried waste material) is located within the area below Building 410. This was a primary consideration in determining the size and location of the building. Based on this fact, the work which is to be performed outside of Building 410 can be accomplished at a lower radiological risk potential than work which is being performed inside Building 410.

Experience to date in the remediation of the Pond 4 area inside Building 410 has shown no significant impact on worker or environmental/public safety (Attachment I). Impact was evaluated through review of results from worker lapel air samplers, stationary air samplers inside Building 410, environmental air samplers, and perimeter air samplers. Worker exposures have been measured at less than 1% of the Derived Air Concentration (DAC). Environmental and perimeter air samplers showed no increase during operations. Impact to the environment/public was assessed using dispersion modeling of building effluent as measured by stationary samplers. The modeled exposures totaled 0.5% of the environmental effluent concentration limit.

Experience in the remediation of Ponds 1, 2, and 3 (Ponds Project) was also used to assess the potential impact of the Pond 4 outdoor remediation activities (Attachment II). The assessment showed that no significant impact on worker or environmental/public safety is expected from the Pond 4 outdoor work activities. The impact predicted is a local, insignificant increase in the radioactivity of the environment. Source term based projections of the impact of Pond 4 remediation activities were made by evaluating the Ponds Project impact on the Radioactivity of environmental media. The Ponds Project assessment included a comprehensive examination of the pre- and post-project environmental sample analysis results for air, water, soil, sediment and vegetation. These results were statistically correlated with the estimates of the progress toward source term removal. The results of the assessment showed that the Ponds Project had an observable, but insignificant impact on the immediate local environment (onsite) and that the Pond 4 activities are estimated to have a less significant impact.

Evaluation of Potential Groundwater Impact

Data from the Pond 4 characterization effort indicates that buried waste materials are not believed to extend more than 7 feet below ground level. The ongoing groundwater monitoring program indicates that the radius of influence of the groundwater drawdown system has provided sufficient drawdown to reduce the water table to approximate 5.3 feet below ground elevation. If, during excavation, the depth of waste is found to extend below the groundwater table, in-situ pumping will be instituted to remove the water during excavation activities. The water which is removed will be processed through the NFS Waste Water Treatment Facility (WWTF) utilizing existing procedures and in accordance with 10 CFR Part 20 effluent release criteria. Groundwater monitoring wells located along the West perimeter of the NFS site will continue to be collected on a quarterly basis prior to, during and following the excavation activities to determine the impact, if any, of excavation activities.

NFS requests prompt NRC review and approval of this plan, in order that remediation work may begin around mid-March, 1995, which is NFS' best estimate of when weather conditions would permit. NFS further requests that Condition 3 of Reference 3 be deleted. NFS has determined that no license amendment is required for this activity.

If you have questions or need additional information concerning this submittal, please contact me or Mr. David G. Culberson, Licensing Manager, at (615)743-2504. Please use our unique document identification number (21G-95-0009) any correspondence concerning this letter.

Sincerely,

NUCLEAR FUEL SERVICES, INC.



Andrew M. Maxim
Vice President
Safety and Regulatory Management

AMM:DGC/jpc

cc: Regional Administrator
Region II, U. S. Nuclear Regulatory Commission
101 Marietta St., NW, Suite 2900
Atlanta, GA 30323

Mr. Eldan Testa
Project Inspector
U. S. Nuclear Regulatory Commission, Region II
101 Marietta Street NW, Suite 2900
Atlanta, GA 30323

ATTACHMENT I
To Letter Dated February 8, 1995
A. M. Maxin to R. C. Pierson

Summary Report

Impact of Airborne Radioactive Effluent From the
Pond 4 Remediation Project

Nuclear Fuel Services, Inc.

November 10, 1994

Summary Report:

Impact of Airborne Radioactive Effluent from the Pond 4 Remediation Project

November 10, 1994

Prepared for

The United States Nuclear Regulatory Commission

By

Nuclear Fuel Services, Inc.

9502160265 950208
PDR ADDCK 07000143
C PDR

Executive Summary

This report summarizes an environmental study conducted of airborne radioactivity releases from the Pond 4 Decommissioning Project and the potential impact on the local environment/public and project workers. Data used in this study originated from airborne radioactivity measurements taken within the Pond 4 building (Bldg. 410) and at environmental and perimeter air sampling stations. Dose estimating models were used to assess the significance of the airborne radioactivity effluent. The study showed that no significant impact has resulted from the radioactive effluent released during Pond 4 Decommissioning Project activities, and therefore, demonstrates the acceptability of proposed Pond 4 activities which will be conducted outside of Building 410.

Objectives

To determine the significance of the impact of the Pond 4 Decommissioning Project as it relates to the environment, worker safety and regulatory compliance.

To determine if the proposed Pond 4 Decommissioning Project excavation activities outside of Building 410 are likely to have a significant impact on the environment or worker safety.

Approach

Determine the measured impact (based on data from the perimeter, environmental, and worker lapel samplers) and the potential impact (based on Bldg. 410 sampler data and dispersion modeling) of radioactive effluent releases from the Pond 4 Decommissioning Project on the local environment. At the time of this report, the project has completed approximately three months of remediation operations.

Environmental radioactivity measurements of air, surface water, vegetation, and soil have been made throughout the year, both before and during the project. At the time of this report, not all of the data from the environmental media were available; however, the complete data for airborne effluent (both indoor and environmental), which is the most indicative pathway, is available. This data provides the basis of the impact assessment. A comparison of the environmental data from before operations began and the data obtained during operations will determine if activities have affected the site effluent radioactivity concentrations. The data was also used to demonstrate the level of regulatory compliance through comparison to public dose limits and effluent concentration limits. Worker lapel sample data will provide the level of worker exposure that has been observed during the project to date.

Results

Before and During Operations Comparison

The environmental air samplers closest to the Pond 4 Decommissioning Project area are perimeter samplers number 170, 171 and 217 (Figure 1). Data from these samplers, located within the plant Protected Area, indicated no significant increase in radioactivity concentrations from before the Pond 4 Decommissioning Project operations (the second quarter of 1994) to the third quarter of 1994 when operations were underway (Table 1). Sampler number 324, located approximately 8 kilometers south of Bldg 410 near the Asheville Highway, represents the background.

Data from worker lapel samplers were available for the entire project; however, only data from the third quarter of 1994 represents exposure to workers performing the excavation operations. An average of $1.33\text{E-}12$ $\mu\text{Ci/ml}$ (gross alpha) concentration was detected through these samplers.

Table 1: Perimeter Air Sampler Data From Before and During the Project

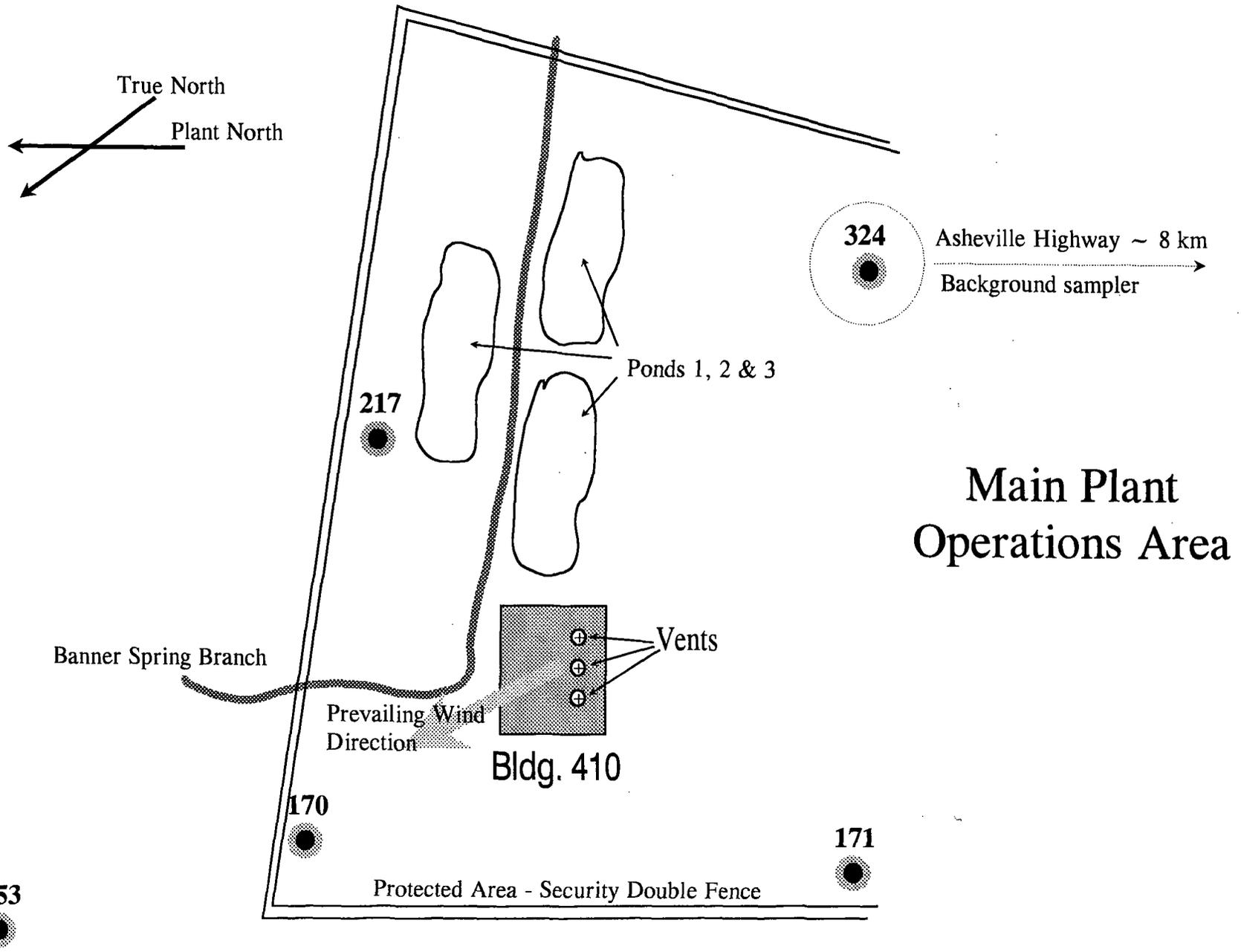
Sampler #	Before (2 nd Quarter 1994) ($\mu\text{Ci/ml}$)	During (3 rd Quarter 1994) ($\mu\text{Ci/ml}$)	Difference ($\mu\text{Ci/ml}$)
324 (Background)	1.9E-15	2.3E-15	+ 0.4E-15
170	1.7E-15	1.3E-15	- 0.4E-15
171	2.3E-15	2.7E-15	+ 0.4E-15
217	2.3E-15	2.4E-15	+ 0.1E-15
553	2.2E-15	2.6E-15	+ 0.4E-15

Regulatory Compliance Demonstration

Compliance with applicable environmental regulations is demonstrated through the measured concentrations in air at, or near, the plant protected area boundary (Figure 1) and estimations of the potential dose received at the site boundary. Table 2 gives the applicable environmental limits, the dose or concentration estimates, and the percentage of the regulatory limit which the dose or concentration estimate represents.

The EPA 40-CFR-61(Ref. 1) compliance dose estimate was calculated using the EPA

Figure 1: Air Samplers



Not to Scale

COMPLY computer code. Release estimates were based on the average results for the four (4) stationary air samplers located inside the Pond 4 building (Bldg. 410). The average result from these samplers was 1.7E-10 $\mu\text{Ci/ml}$ for short-lived radionuclides (^{220}Rn and progeny) and 1.6E-13 $\mu\text{Ci/ml}$ for long-lived radionuclides (primarily ^{234}U). Initial (short-lived radionuclides) and 7-day (long-lived radionuclides) count results from these samplers are shown in Figure 2. The receptor modeled for the dose estimate was at the nearest protected area boundary, which is approximately 88 meters (measured along the ground) from the building vents.

Table 2: Demonstration of Regulatory Compliance - Environmental

Regulation	Limit	Site Estimate ⁺ (Fence-line)	Site Percent of Limit
EPA 40-CFR-61, Subpart I	10 mrem/yr	0.3 mrem/yr	3.0 %
EPA 40-CFR-190, Subpart B	25 mrem/yr	Average 0.17 mrem/yr (Range .04 - .4 mrem/yr)	0.7 %
TDEC 1200-2-5-.60*	100 mrem/yr		0.2 %
	3E-11 $\mu\text{Ci/ml}$, ^{220}Rn	8.4E-14 $\mu\text{Ci/ml}$	0.3 %
	5E-14 $\mu\text{Ci/ml}$, ^{234}U	8.0E-17 $\mu\text{Ci/ml}$	0.2 %

* Same as NRC 10-CFR-20, Subpart D

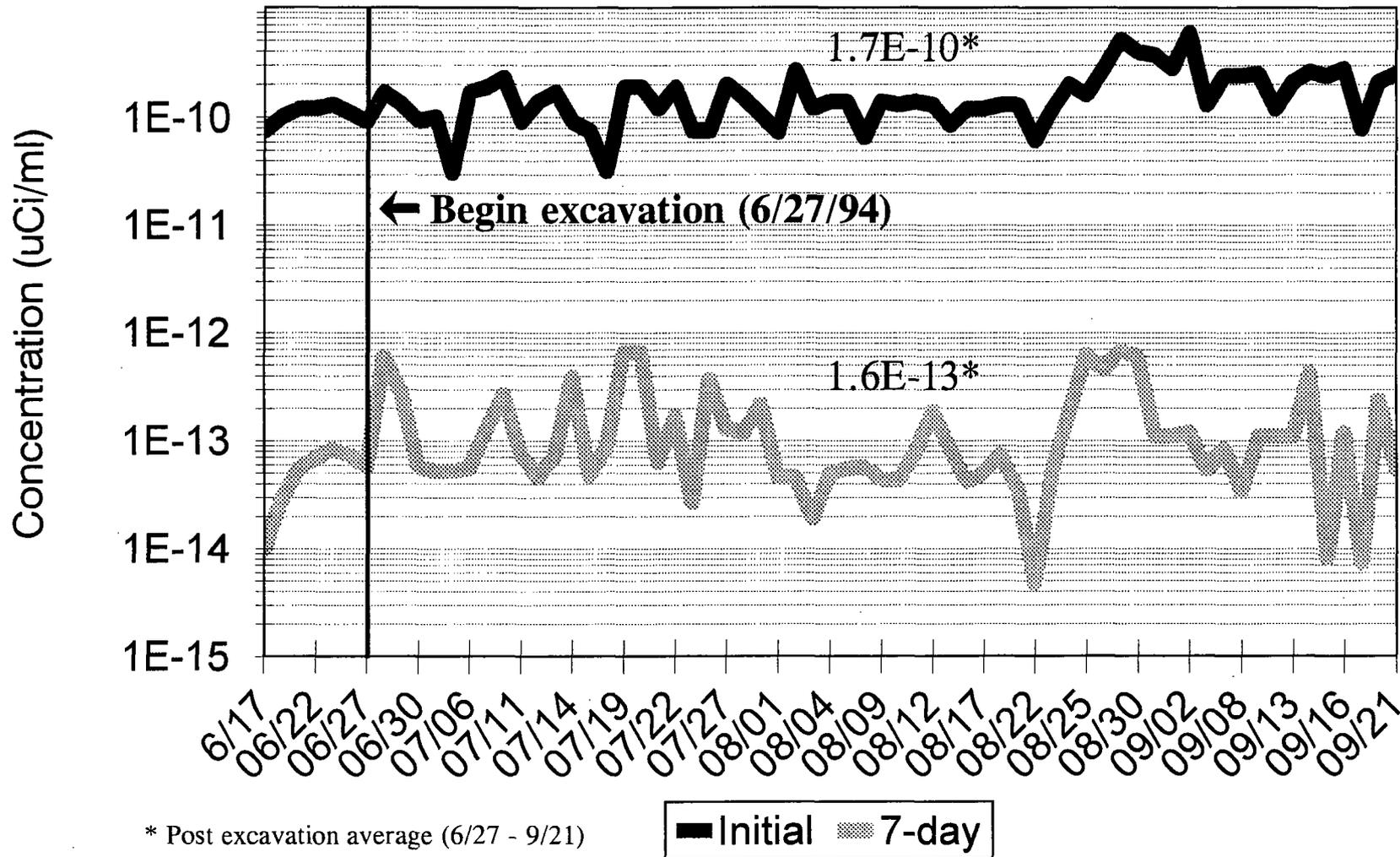
⁺ Dose estimates include the short-lived ^{220}Rn and long-lived ^{234}U , ^{235}U and ^{238}U . The concentration site estimates are based on hand calculated dispersion modeling.

For the EPA 40-CFR-190 (Ref. 2)/TDEC 1200 (Ref. 3) dose estimate, a combination of methods was employed. This included: the EPA COMPLY (Ref. 4) code, as described above, the EPA CAP88-PC (Ref. 5) computer code, and hand calculations using standard gaussian dispersion equations with pasquill-gifford stability class based coefficients.

For the TDEC 1200, effluent concentration estimates for the ^{234}U value were initially to be obtained by taking the average total activity, excluding background, measured at the four (4) most relevant air sampling stations (Figure 1). Since this average includes data from sources other than Pond 4 Decommissioning Project, the result obtained would not be a specific indicator of Pond 4 Decommissioning Project activities, but rather would represent the upper limit of the measured impact from the activities. For the quarter being studied these samplers measured a net result of zero activity, therefore, the value reported as the site estimate in this case was estimated using standard gaussian dispersion modeling equations with pasquill-gifford stability class based

Figure 2: Pond 4 Airborne Radioactivity

Avg. Results from 4 Samplers in Bldg. 410



coefficients. It should be noted that the estimated value from the modeling ($8.0E-17$ $\mu\text{Ci/ml}$) is below the minimum detection capability of the environmental sampling system. The ^{220}Rn value, for which no environmental measurements are available, is specific to the Pond 4 Decommissioning Project since it was determined from stationary air sampler data gathered in the Pond 4 area. The stationary air sampler data was used to approximate the building effluent and standard dispersion modeling equations were again used to arrive at "fence-line" concentrations. Figure 3 shows the measured and modeled effluent concentrations used in determining compliance.

Compliance with worker exposure limits to airborne radioactivity can be demonstrated by comparing the worker lapel sampler results to the applicable Derived Air Concentrations (DAC) (Ref. 3). The primary radioactivity that is detected on the samplers are daughters of ^{220}Rn (thoron) for which the applicable DAC value is $9E-9$ $\mu\text{Ci/ml}$. Given the average lapel result of $1.33E-12$ $\mu\text{Ci/ml}$ the typical exposure is less than 1% of the regulatory limit.

Discussion

Based on the results from stationary samplers inside Building 410, it is apparent that low-levels of airborne radioactivity, primarily ^{220}Rn and associated progeny, are being released from the Pond 4 area. The significance of this impact can be measured in terms of the concentrations of these radionuclides (measured and/or modeled) at the plant protected area boundary and the potential dose associated with these concentrations. As shown in Table 2, both in terms of concentration and dose potential, the impact on the local environment due to effluent from the Pond 4 Decommissioning Project activities has, to date, been minor. The largest portion of the impact is from the ^{220}Rn and associated progeny, which would be released regardless of the remediation activities. The only means of reducing the overall releases of ^{220}Rn is by removal of the source, which is the objective of the remediation.

Worker exposure from airborne radioactivity, particularly progeny of ^{220}Rn , is apparent, but at levels that are typically less than 1% of the occupational DAC. This result indicates that sufficient ventilation is being provided within the building.

Due to the insignificant worker and environmental exposures resulting from the Pond 4 Decommissioning Project activities inside Building 410, activities outside Building 410 are also expected to result in an insignificant exposure.

Figure 3: Measured and Modeled Concentrations Potentially Attributable to Pond 4

Building Effluent Concentrations

Modeled:
1.6E-13 uCi/ml U-234
1.7E-10 uCi/ml Rn-220

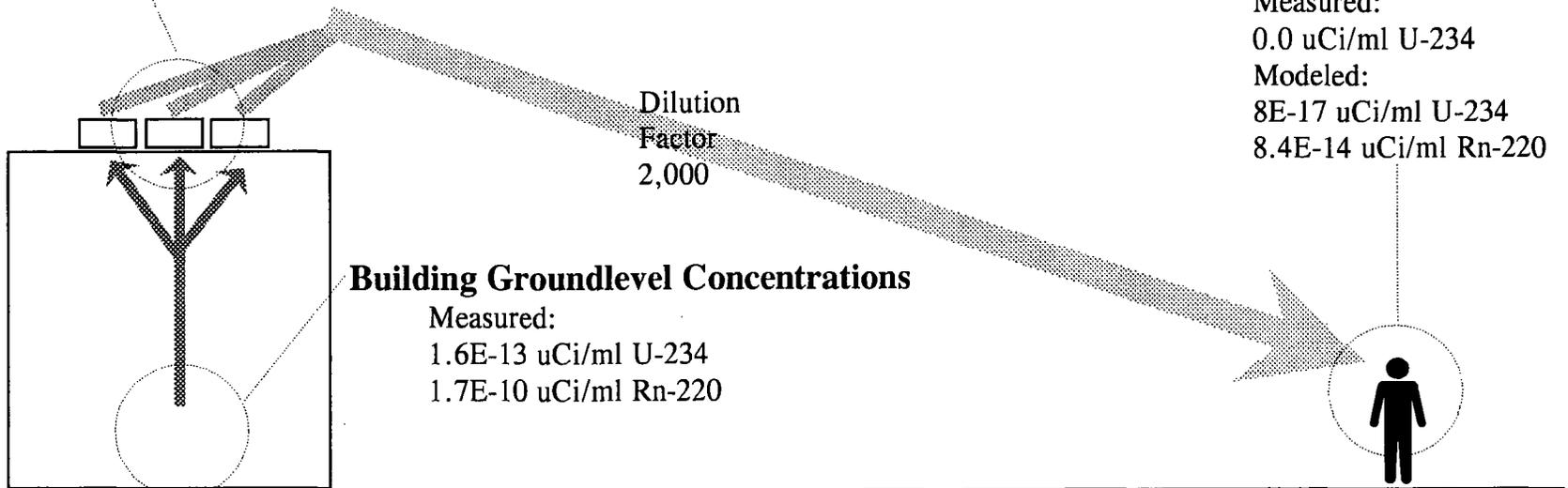
Fenceline/Receptor Concentrations

Measured:
0.0 uCi/ml U-234
Modeled:
8E-17 uCi/ml U-234
8.4E-14 uCi/ml Rn-220

Dilution
Factor
2,000

Building Groundlevel Concentrations

Measured:
1.6E-13 uCi/ml U-234
1.7E-10 uCi/ml Rn-220



Not to Scale

Conclusions

1. As of this date, the impact on the local environment of radioactive effluent from the Pond 4 Decommissioning Project has been found to be insignificant and the worker exposure to airborne radioactivity has been adequately controlled.
2. Pond 4 Decommissioning Project activities can be conducted outside Building 410 with an insignificant impact on the local environment and worker safety.

References

1. United States Environmental Protection Agency, Title 40, Code of Federal Regulations, Part 61, Subpart I, National Emission Standard for Radionuclide Emissions from Facilities Licensed by the Nuclear Regulatory Commission.
2. United States Environmental Protection Agency, Title 40, Code of Federal Regulations, Part 190, Subpart B, Environmental Standards for the Uranium Fuel Cycle.
3. Tennessee Department of Environment and Conservation, Chapter 1200-2-5, Standards for Protection Against Radiation, part .60, Dose Limits for Individual Members of the Public. 1993.
4. United States Environmental Protection Agency, Office of Radiation Programs, COMPLY computer code, EPA/520/1-89-001. 1989.
5. United States Environmental Protection Agency, Office of Radiation Programs, CAP88-PC computer code version 1.0, EPA/402-B-92-001. 1992.

JWN: File - p4impact.wpd

ATTACHMENT II
To Letter Dated February 8, 1995
A. M. Maxin to R.C. Pierson

Summary Report

Review of Environmental Sampling Results in the Vicinity of the
Ponds 1, 2, and 3 Decommissioning with Source Term Comparisons
and Impact Estimations for the Pond 4 Area

Nuclear Fuel Services, Inc.

May 26, 1994

Summary Report:

**Review of Environmental Sampling Results
in the Vicinity of the Ponds 1, 2, and 3
Decommissioning With Source Term
Comparisons and Impact Estimations for the
Pond 4 Area**

May 26, 1994

Prepared for

The United States Nuclear Regulatory Commission

By

Nuclear Fuel Services, Inc.

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PDR ADDCK 07000143
C PDR

Executive Summary

This report summarizes an environmental study conducted by NFS in which the concentrations of radioactivity at locations most likely to be impacted by the Ponds 1, 2, and 3 Decommissioning operations were tracked from one year prior to operations until the majority of the source term had been removed. The environmental sample results were correlated with source term removal and, in the instances of a positive correlation, the predicted impact of the proposed Pond 4 outdoor activities was evaluated.

Correlations were statistically significant for a few local (on-site) environmental media; however, the concentrations were observed at insignificant levels relative to the applicable regulatory limits.

The estimated effect of the outdoor portion of the Pond 4 remediation is a local (on-site), insignificant, increase in the radioactivity of the environment.

Objectives

This review of environmental data was conducted in order to show the impact that the Ponds 1, 2, and 3 Decommissioning project had on the local (on-site) environment with respect to radiological contaminants. An additional objective is to show, by comparison of source terms, the potential impact on the environment of the Pond 4 decommissioning work to be performed outside of Building 410 (a building which covers the majority of the Pond 4 waste removal operations area).

Approach

Radiological concentrations were tracked for the most relevant environmental media for the year prior to commencement of Ponds 1, 2, and 3 Decommissioning operations, and continuing through the end of 1993 (by which time the majority of the source term had been removed). Data from the following select numbers and types of sampling stations were included in this study: three (3) perimeter air; four (4) off-site air; six (6) sediment; three (3) soil, three (3) vegetation; and seven (7) surface water. Figures 1, 2 and 3 show the locations of sample collection.

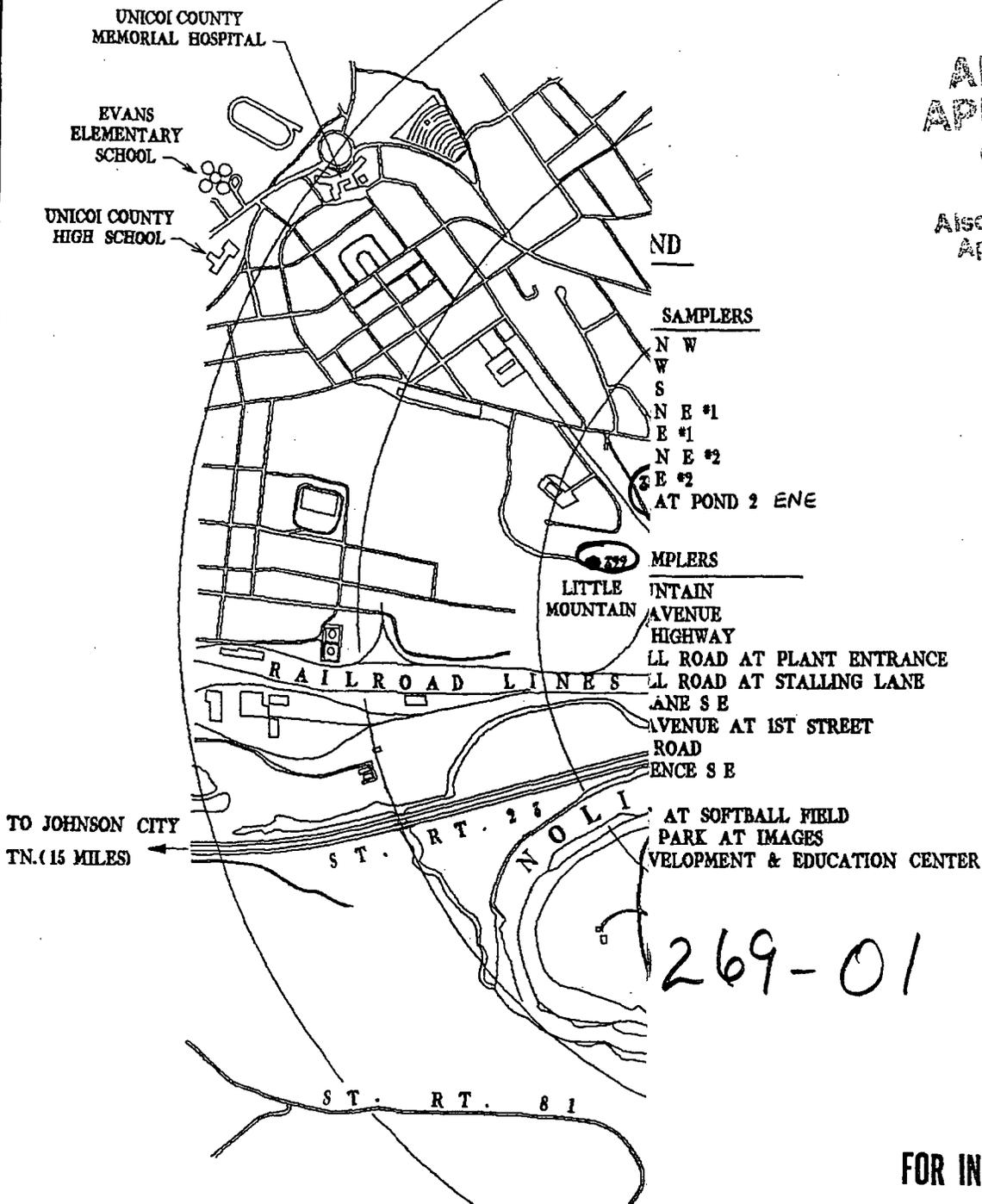
Correlations between the progress toward source term removal and the results of radioactivity analyses were statistically determined. The correlation coefficient was used to determine the strength of the relationship between the two variables; these relationships do not indicate causation.

Finally, a comparison of the net environmental impact of the overall source term removal on statistically correlated environmental medias from the Ponds 1, 2, and 3 will be used to estimate the potential impact of the waste removal work planned to be conducted outside of

CATIONS

**ANSTEC
APERTURE
CARD**

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269-01

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CLEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

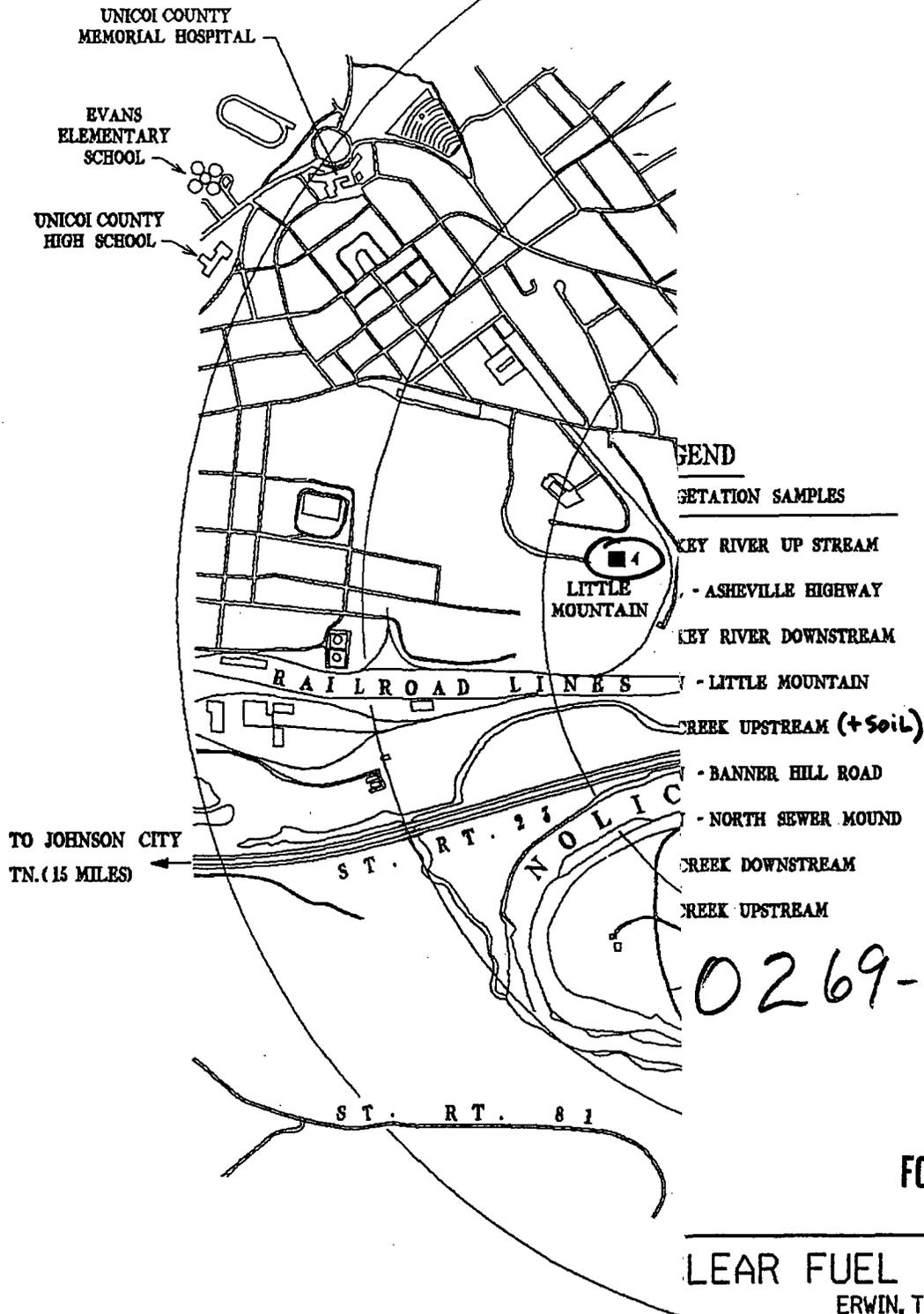
TITLE **ENVIRONMENTAL
SAMPLE LOCATIONS**

W.G. HENSLEY	SCALE 1"=1500'	DATE 8-25-93
AS-BUILT APPROVALS	000-C0125-B	
<i>J. C. Lyles</i>		
DRAWING NO.		

Figure 1

ANSTEC APERTURE CARD

Also Available on
Aperture Card



- LEGEND**
- VEGETATION SAMPLES
 - KEY RIVER UP STREAM
 - ASHEVILLE HIGHWAY
 - KEY RIVER DOWNSTREAM
 - LITTLE MOUNTAIN
 - CREEK UPSTREAM (+Soil)
 - BANNER HILL ROAD
 - NORTH SEWER MOUND
 - CREEK DOWNSTREAM
 - CREEK UPSTREAM

0269-02

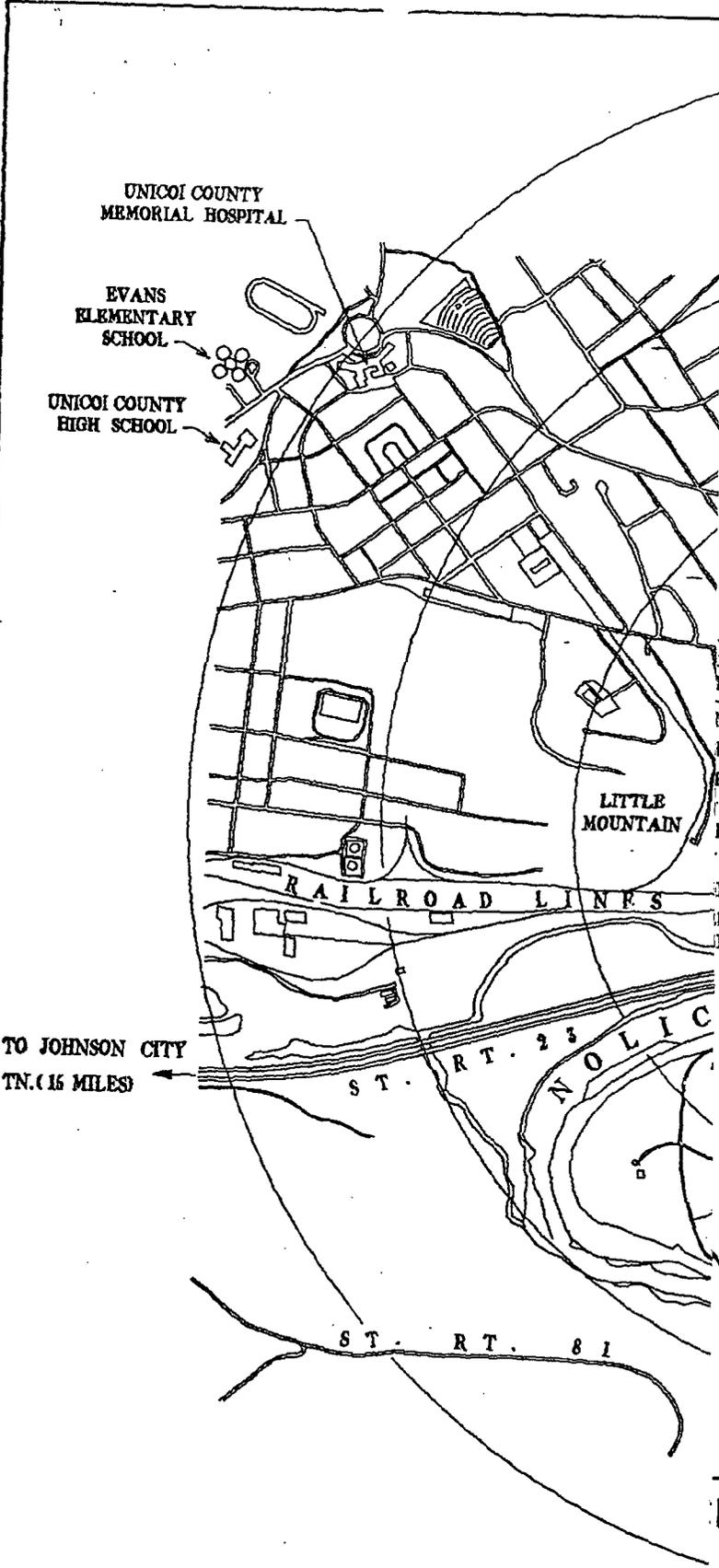
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LEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

TITLE
**SOIL, SILT & VEGETATION
SAMPLE LOCATIONS**

W.G. HENSLEY	SCALE 1"=1500'	DATE 11-5-93
BUILT APPROVALS	DRAWING NO. 000-C0110-B	
<i>W.G. Hensley</i>		

Figure 2



**ANSTEC
APERTURE
CARD**

Also Available on
Aperture Card

- LEGEND**
- RIVER SAMPLE LOCATIONS
 - NG BRANCH UPSTREAM
 - BK UPSTREAM AT CAROLINA AVE.
 - BK DOWNSTREAM
 - RIVER DOWNSTREAM AT POINT NEAR UNICOI CO. DUMP
 - RIVER UPSTREAM
 - NG BRANCH DOWNSTREAM
 - BK UPSTREAM FROM NG BRANCH MOUTH

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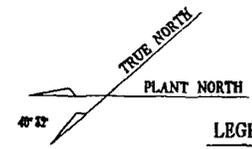
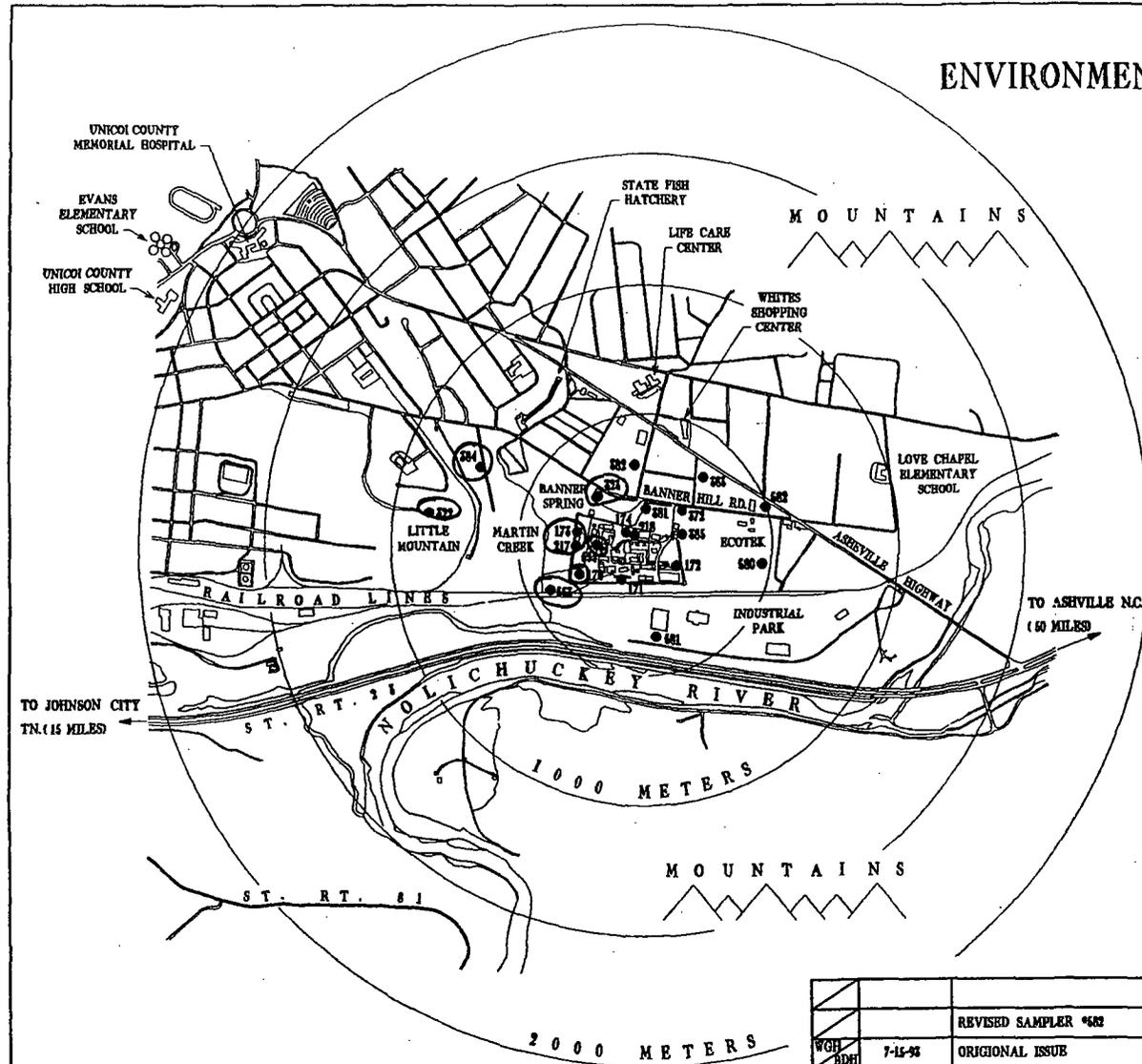
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LEAR FUEL SERVICES, INC.
ERWIN, TENNESSEE

TITLE		
SURFACE WATER SAMPLE LOCATIONS		
T.E. BLEVINS	SCALE 1"=1500'	DATE 08-15-94
BUILT APPROVALS	000-C0111-B	
<i>W. Nagy</i>		
DRAWING NO.		

Figure 3

ENVIRONMENTAL SAMPLE LOCATIONS



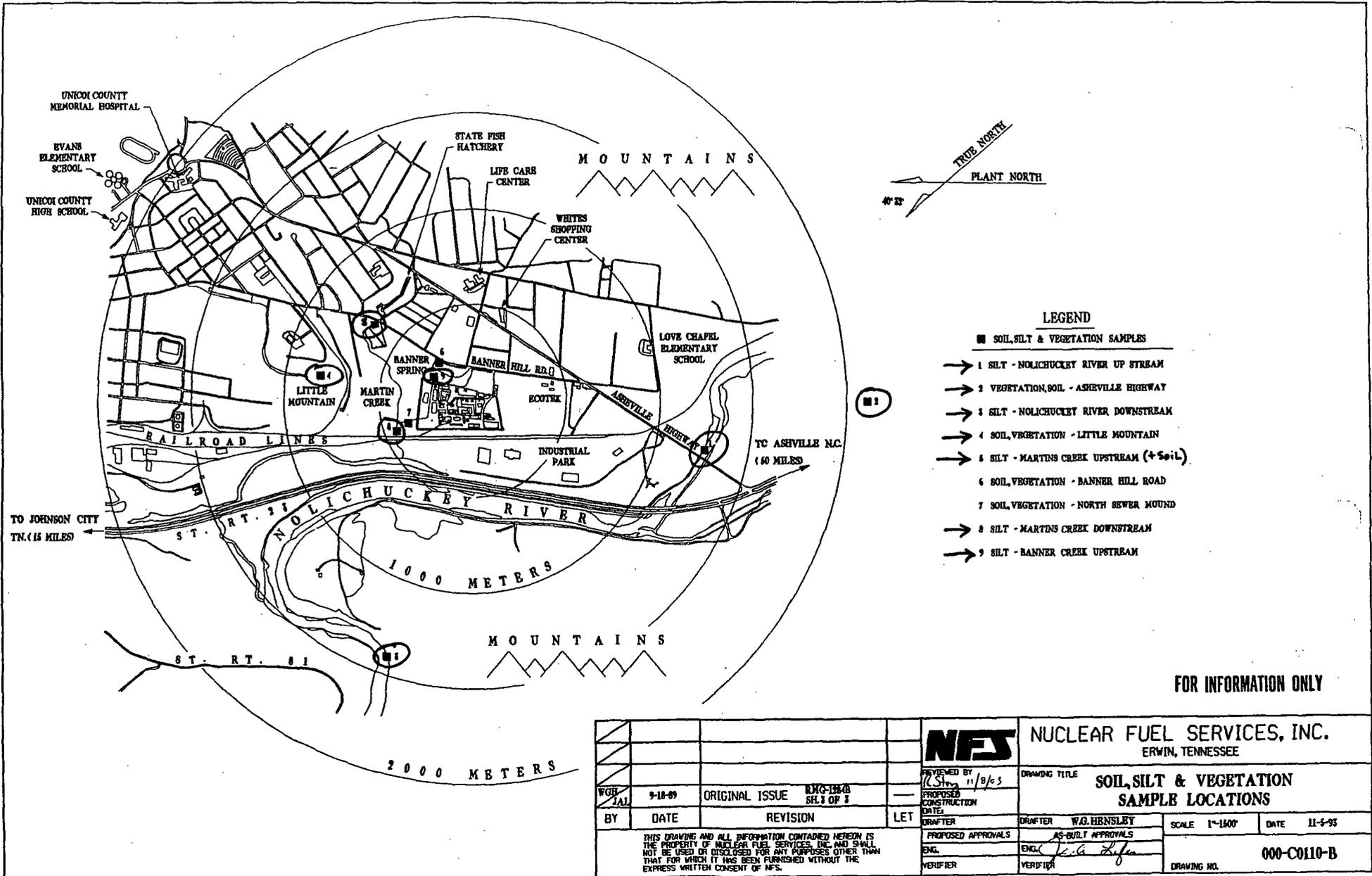
LEGEND

- "PERIMETER" AIR SAMPLERS
 - 170 PERIMETER N W
 - 171 PERIMETER W
 - 172 PERIMETER S
 - 173 PERIMETER N E #1
 - 174 PERIMETER E #1
 - 217 PERIMETER N E #2
 - 218 PERIMETER E #2
 - 655 PERIMETER AT POND 2 ENE
- "OFFSITE" AIR SAMPLERS
 - 322 LITTLE MOUNTAIN
 - 323 CAROLINA AVENUE
 - 324 ASHEVILLE HIGHWAY
 - 372 BANNER HILL ROAD AT PLANT ENTRANCE
 - 381 BANNER HILL ROAD AT STALLING LANE
 - 382 STALLING LANE S E
 - 383 HIGHLAND AVENUE AT 1ST STREET
 - 384 SPAR MILL ROAD
 - 385 SECURITY FENCE S E
 - 655 SEWER PAD
 - 680 S OF PLANT AT SOFTBALL FIELD
 - 681 INDUSTRIAL PARK AT IMAGES
 - 682 CAREER DEVELOPMENT & EDUCATION CENTER

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		REVISED SAMPLER #682	A	NFS	NUCLEAR FUEL SERVICES, INC. ERWIN, TENNESSEE	
WGH BDH	7-15-93	ORIGINAL ISSUE			REVIEWED BY TC Steg 11/9/93	DRAWING TITLE
WGH JAL	9-20-89	ORIGINAL ISSUE	RMG-1887B SEL 3 OF 3	PROPOSED CONSTRUCTION DATE		
BY	DATE	REVISION	LET	DRAFTER	DRAFTER	SCALE 1"=1500'
				PROPOSED APPROVALS	AS-BUILT APPROVALS	DATE 8-25-92
				ENG.	ENG. <i>J. B. Ziegler</i>	000-C0125-B
				VERIFIER	VERIFIER	DRAWING NO.

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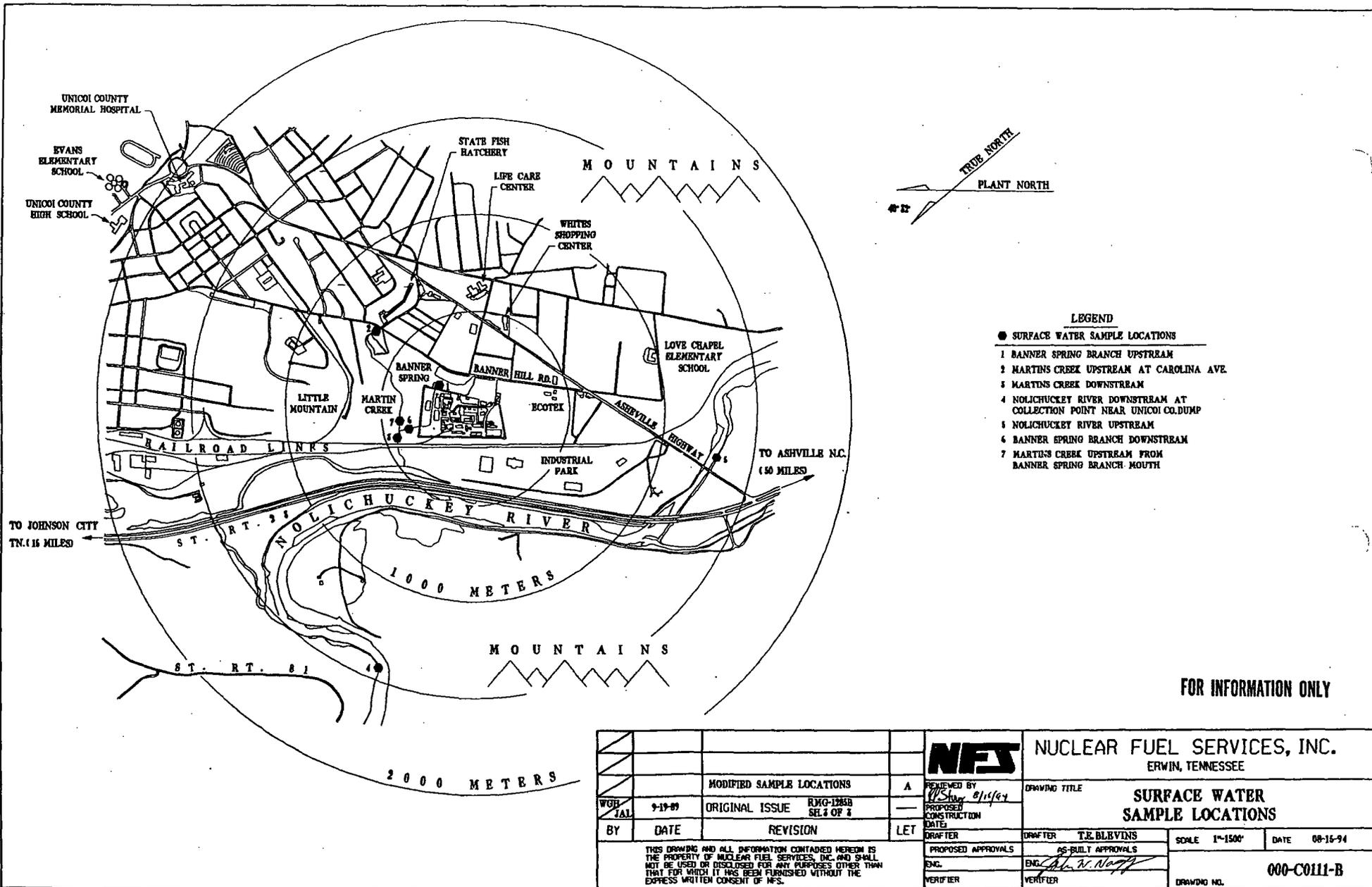
LEGEND

- SOIL, SILT & VEGETATION SAMPLES
- ➔ 1 SILT - NOLICHUCKEY RIVER UP STREAM
- ➔ 2 VEGETATION, SOIL - ASHEVILLE HIGHWAY
- ➔ 3 SILT - NOLICHUCKEY RIVER DOWNSTREAM
- ➔ 4 SOIL, VEGETATION - LITTLE MOUNTAIN
- ➔ 5 SILT - MARTINS CREEK UPSTREAM (+Soil)
- ➔ 6 SOIL, VEGETATION - BANNER HILL ROAD
- ➔ 7 SOIL, VEGETATION - NORTH SEWER MOUND
- ➔ 8 SILT - MARTINS CREEK DOWNSTREAM
- ➔ 9 SILT - BANNER CREEK UPSTREAM

FOR INFORMATION ONLY

				NFS		NUCLEAR FUEL SERVICES, INC. ERWIN, TENNESSEE	
				REVIEWED BY <i>(Signature)</i> 11/8/63	DRAWING TITLE SOIL, SILT & VEGETATION SAMPLE LOCATIONS		
WGB JAL	9-18-63	ORIGINAL ISSUE	RMG-124/B SLS OF 3	PROPOSED CONSTRUCTION DATE	DRAFTER W.G. HENSLEY	SCALE 1"=150'	DATE 11-5-63
BY	DATE	REVISION	LET	PROPOSED APPROVALS	AS-BUILT APPROVALS	000-C0110-B DRAWING NO.	
				ENG. <i>(Signature)</i>	ENG. <i>(Signature)</i>		
				VERIFIER	VERIFIER		

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				NFS		NUCLEAR FUEL SERVICES, INC. ERWIN, TENNESSEE			
		MODIFIED SAMPLE LOCATIONS		A		DRAWING TITLE			
WOB		9-17-89		ORIGINAL ISSUE		SURFACE WATER SAMPLE LOCATIONS			
BY		DATE		REVISION		SCALE 1"=1500'			
				LET		DATE 08-15-94			
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				DRAFTER		DRAFTER		DRAWING NO. 000-C0111-B	
				VERIFIER		VERIFIER			

Figure 3

Building 410 as part of the Pond 4 decommissioning. For simplicity, the source terms will be defined as the total radioactivity associated with uranium-235 and thorium-232, since these radionuclides are significant and representative contaminants of both the Ponds 1, 2, and 3 and the Pond 4 areas.

Results

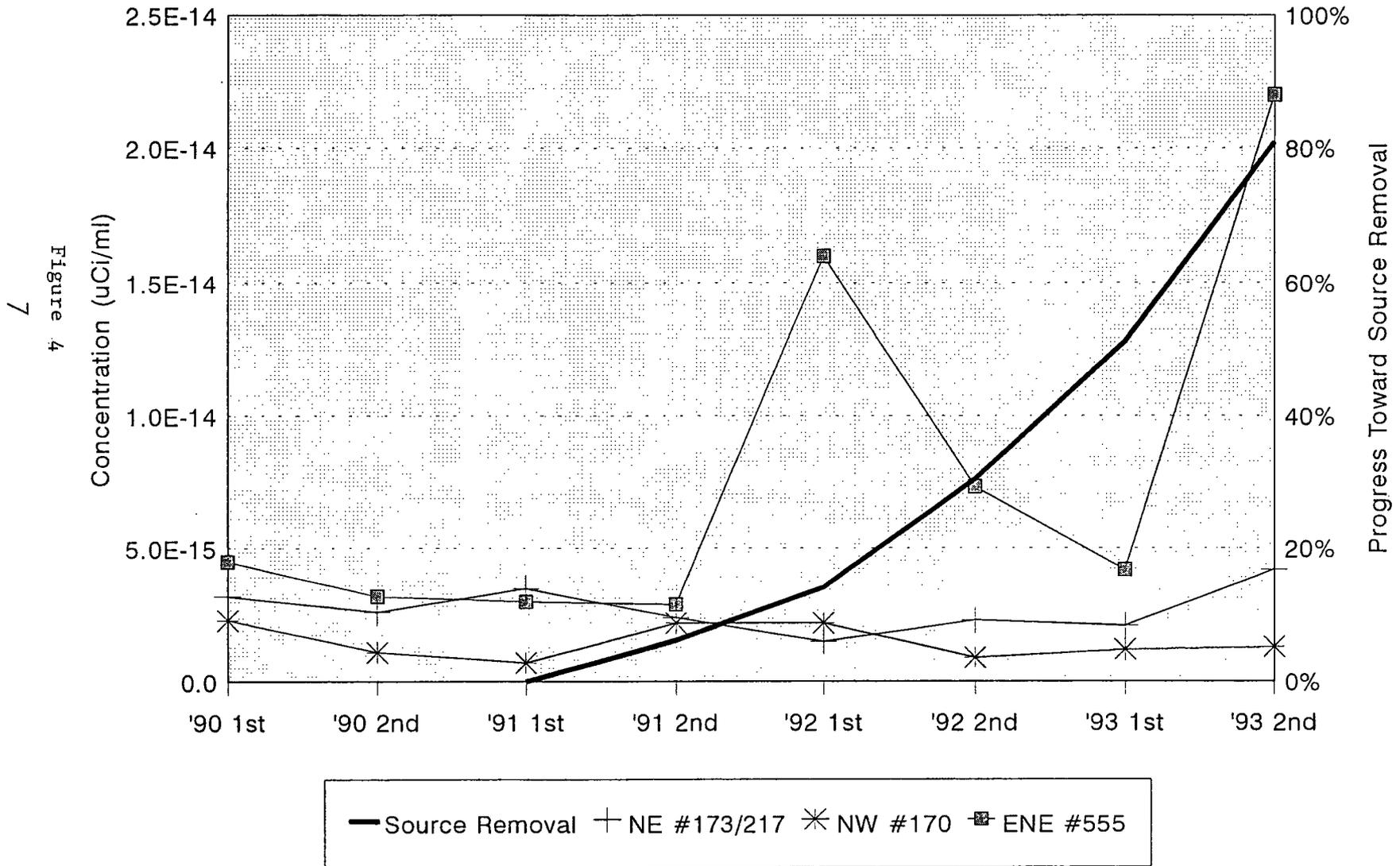
Table 1 gives the estimated percent removal of the Ponds 1, 2, and 3 Decommissioning source term over the time of the study. Since the radioactivity was essentially distributed uniformly throughout the sediment, the estimation was arrived at by comparing the total quantity of sediment removed by the end of each time period to the estimate of total sediment volume. In addition to statistical correlation, these results are graphically depicted (Figure 4, 5 and 6) along with the environmental sampling results in order to make visually evident any relationships between the environmental results and the progress toward source term removal.

Table 1: Progress Toward Ponds 1, 2, and 3 Source (sediment) Removal

Time period	1990		1991		1992		1993	
	1 st Half	2 nd Half						
Percent removal	0%	0%	0%	6%	14%	30%	51%	81%

Table 2 gives the average environmental media analysis results for both pre- and post-Ponds 1, 2, and 3 Decommissioning operations, the percent change observed, and the correlation coefficient between the source term removal progress and the environmental sample analysis results. Table 2 includes information only for those sampling locations at which a reasonable statistical correlation exists between source term removal and environmental sample analysis results. These relationships are graphically depicted in Figures 4, 5, and 6 (for perimeter air, sediments, and surface water, respectively). Correlation coefficients were tested by means of the t distribution using the standard error of the correlation coefficient. Correlations were considered significant if $t_8 > t_{(0.05)}$.

Perimeter Air Environmental Sampling Results

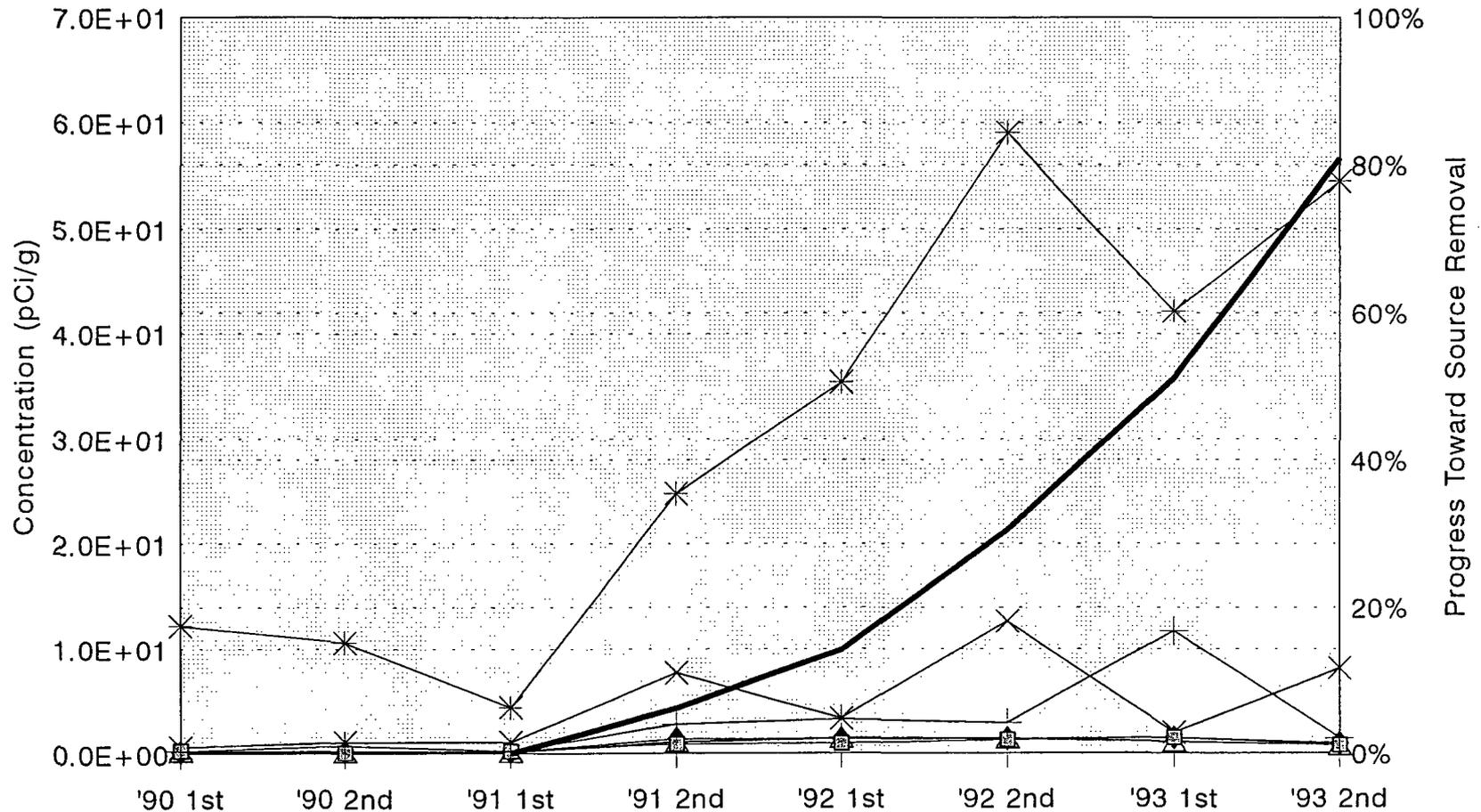


Maximum Permissible Concentration is 4E-12

Sediments

Environmental Sampling Results

Figure 5
8

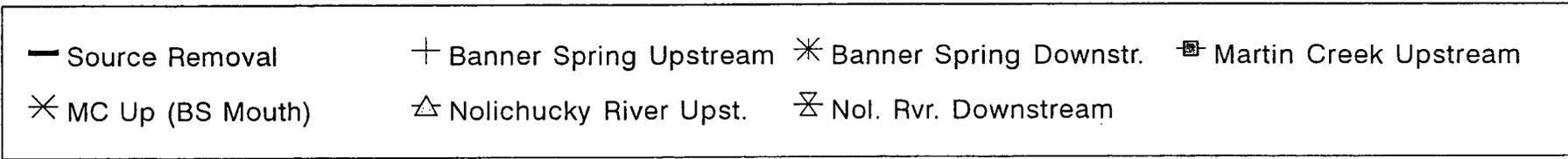
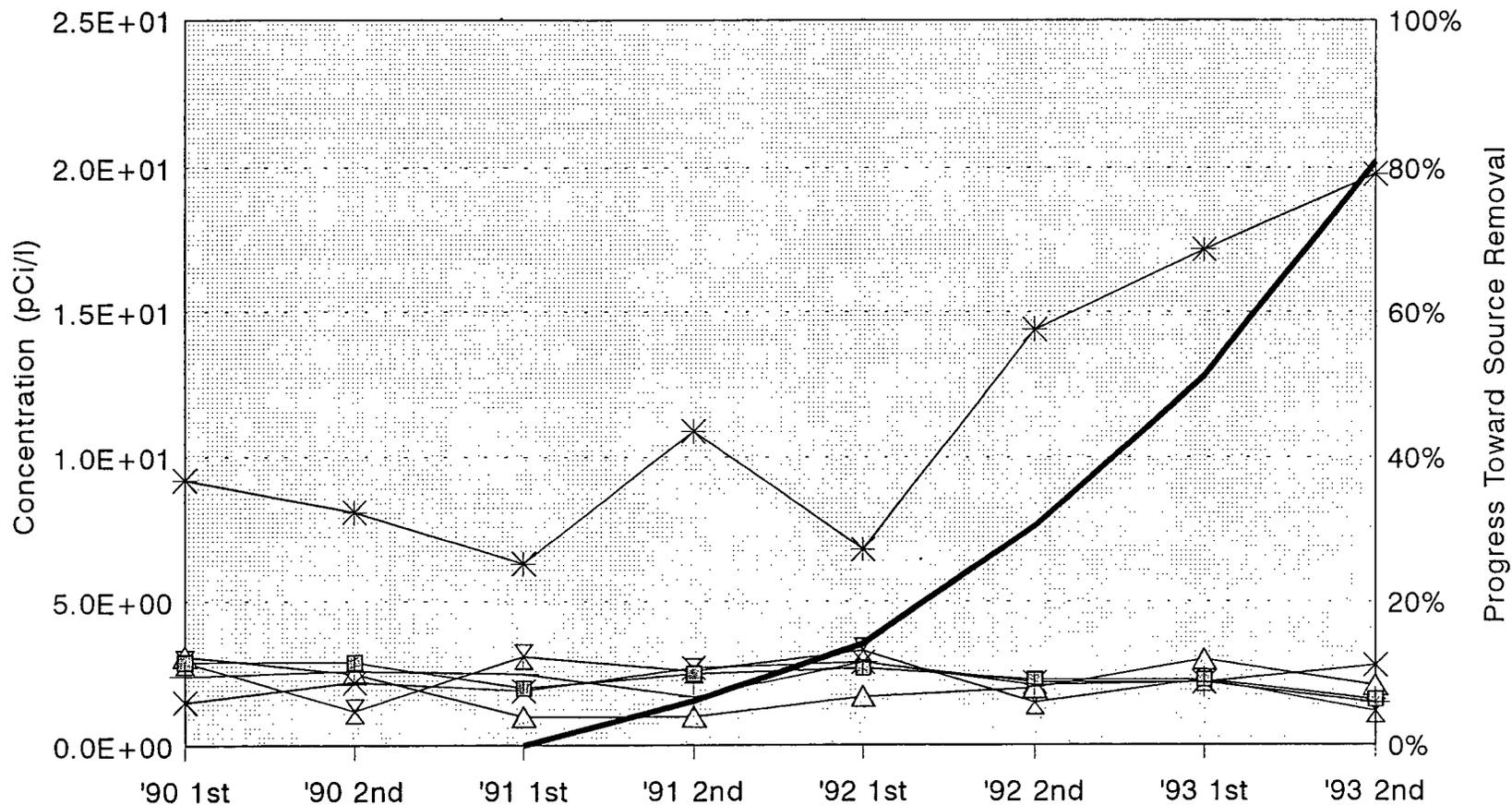


— Source Removal + Banner Spring Upstream * Banner Spr. Downstream □ Martin Creek Upstream
 × Martin Cr. Downstream ◆ Nolichucky Rvr. Upstr. △ Nolich. Rvr. Downstr.

Surface Water

Environmental Sampling Results

Figure 6
9



Maximum Permissible Concentration is 3E+4 pCi/l

Table 2: Evaluation of the Influence of Ponds 1, 2, and 3 Decommissioning on Environmental Samples

Media/Location	Pre-Ponds Average	Post-Ponds Average	Percent Change	Correlation Coefficient	Significance Level
Perimeter Air (uCi/ml) ENE #555	3.6 E-15	1.0 E-14	194%	0.6444	0.05
Sediment (pCi/g) Banner Spring Downstream	9.07	43.18	376%	0.8195	0.01
Surface Water (pCi/l) Banner Spring Downstream	7.87	13.82	76%	0.9325	0.001

Table 3 gives the estimated source terms for the Ponds 1, 2, and 3, Pond 4 total, and Pond 4 areas outside of Building 410. The estimate for Pond 4 areas outside of Building 410 for uranium-235 is about the same as for the Ponds 1, 2, and 3, however, the thorium-232 is estimated to be considerably lower. Overall the estimated Pond 4 outdoor source term is approximately 10% of the estimated Ponds 1, 2, and 3 source term.

Table 3: Source Terms

Location	U-235 (Ci)	Th-232 (Ci)
Ponds 1, 2, & 3	0.28	4.90
Pond 4 Total	3.60	0.40
Pond 4 Outside of Building 410	0.36	0.04

Impact on the environment from the planned Pond 4 decommissioning activities to be conducted outside of Building 410 can be estimated by accounting for both the source term percentage (~10%, based on Table 3) and the observed increase in the environmental media (~200% on average, based on Table 2). Accounting for these modifying factors, the impact is estimated to be an increase in contamination of environmental media by 20%. As observed for the Ponds 1, 2, and 3 Decommissioning project, the increase would be expected only in the immediate, local (on-site) environment.

Discussion

Of the sixteen (16) locations and five (5) different environmental medias studied, only two (2) locations and three (3) media showed a correlated increase. Statistically significant correlations were observed for both the water and the sediments in Banner Spring Branch and at the perimeter air sampling station. It is reasonable that these areas were influenced since they are situated on-site near the Ponds 1, 2, and 3 Decommissioning operations. Banner Spring Branch runs through the Ponds 1, 2, and 3 site, and the perimeter air sampling station is the closest station to the Ponds 1, 2, and 3 site located directly adjacent to Pond 1.

Of the three (3) media noted which have a correlated increase, two (2) can be readily compared with regulatory limits; air and surface water. The air for perimeter location ENE #555 was operating at approximately 0.1 % of the Maximum Permissible Concentration in air (MPC_a) prior to the Ponds 1, 2, and 3 Decommissioning operations. During operations the concentrations rose to 0.3 % of the MPC_a . Similarly, concentrations in Banner Spring Branch rose from 0.03 % of the Maximum Permissible Concentration in water (MPC_w) to 0.05 %. Although in each instance the increase is readily observable and statistically significant, the concentrations involved are not. Therefore, if the predicted 20 % increase were to result from the Pond 4 operations, it would be of even less significance than the increases attributed to the Ponds 1, 2, and 3 Decommissioning operations.

Conclusions

1. Ponds 1, 2, and 3 Decommissioning was found to have an observable, but insignificant impact on the immediate, local (on-site) environment.
2. The estimated impact of the Pond 4 source removal activities to be conducted outside of Building 410 is an insignificant increase of the radioactivity concentrations in the immediate, local (on-site) environment.

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