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Nuclear Issues Activist Team - Fuel Facilities Working Group - Linda C. Modica, Chair

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2011 JAN - 6 AM 8:40

28 December 2010

Ms. Cindy Bladey, Chief
Rules, Announcements & Directives Branch
Division of Administrative Services
Office of Administration
Mail Stop: TWB-05-B01M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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RE: DOCKET ID NRC-2009-0435; COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT FOR THE RENEWAL OF U.S. NUCLEAR REGULATORY COMMISSION LICENSE NO. SNM-124 FOR NUCLEAR FUEL SERVICES, INC., DOCKET NO. 70-143, OCTOBER 2010

Dear Ms. Bladey:

The enclosed comments on the Draft Environmental Assessment (Draft EA) for the proposed renewal of Nuclear Fuel Services' (NFS) license for another 40 years are submitted on behalf of the Sierra Club's National Nuclear Issues Activist Team. While comments are made on issues raised in the Draft EA or on adverse environmental impacts caused by NFS's operations in Erwin, Tennessee but ignored by NRC staff (hereinafter Staff or NRC), page-by-page comments are also provided where Staff assertions are quoted and then addressed.

The Enclosure to this letter contains our Public Comments. The Attachment includes the Appendix to the Public Comments.

Respectfully submitted,

/s/ Linda C. Modica

Linda Cataldo Modica

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cc: Ms. Molly Barkman, NRC Office of General Counsel

ENCLOSURE: Public Comments on Draft Environmental Assessment (Draft EA) for Proposed Renewal of Nuclear Fuel Services' (NFS) Special Nuclear Materials (SNM) License for 40 Years

ATTACHMENT: Appendix to Public Comments

*SUNSI Review Complete
Template = ADM-013*

*E-REDS = ADM-03
Add = J. Park (JRP)*

PUBLIC COMMENTS ON DRAFT ENVIRONMENTAL ASSESSMENT (Draft EA) FOR PROPOSED RENEWAL OF NUCLEAR FUEL SERVICES' (NFS) SPECIAL NUCLEAR MATERIALS (SNM) LICENSE FOR 40 YEARS

Sierra Club Nuclear Issues Activist Team

28 December 2010

A. SUMMARY

Careful analysis of NRC's Draft EA has resulted in the formation of the following conclusions:

1. The Draft EA failed to completely describe all of the activities at the NFS-Erwin site – especially radioactive and mixed hazardous waste processing (euphemistically called “recovering uranium from scrap generated internally or from other facilities” by NFS and “volume reduction” by both NFS & Studsvik) as well as storage, disposal, heat treatment and incineration of nuclear waste. Therefore, NRC Staff failed to accurately assess the full range of adverse public health and environmental impacts of the proposed 40-year extension of SNM-124
2. The Draft Finding of No Significant Impact (FONSI) is unjustifiable because it is based on shallow review of only some NFS operations, and completely failed to assess the public health and environmental impacts on the extensive waste processing, storage, shipping and disposal operations at the NFS-Erwin site.
3. For these reasons and the others discussed below, the Draft EA & FONSI should be withdrawn and an EIS prepared on the NFS, AREVA & Studsvik operations in Erwin and on their cumulative impacts to public health and the environment.
4. Because offsite contamination has been documented by Professor Michael Ketterer, PhD to be so widespread, the geographic scope of the EIS on NFS's proposed 40-year license renewal needs to encompass the 50 river miles that NFS has contaminated with (at least) highly-enriched uranium.
5. The license-renewal process should be suspended until the National Academy of Sciences (NAS) completes its cancer risk assessment of NFS.
6. After the EIS and NAS studies are complete, NRC should renew NFS's license for two (2) years, with a possibility for renewal for another 2 years. That should be enough time --
 - a. for Staff to approve a decommissioning plan for the entire NFS site (including Studsvik);
 - b. for NFS to embark on a robust hiring program of Unicoi County residents willing to work on the decontamination of the entire site;
 - c. for NFS to enter into an agreement with the skilled union workforce who could safely accomplish the disassembly of equipment & processes and their shipment to a site where homes, schools and businesses are miles away, rather than feet from, the NFS/Studsvik public health hazard. The agreement with the union should give workers the option to transfer within the Babcock & Wilcox (B&W) corporation at the same (or better) wage & benefit package. It should also ensure current workers who have been exposed to radiation due to secret weapons work at the NFS site are fully covered by Energy Employees Occupational Illness Compensation Program Act (EEOICPA) provisions. Finally, lifetime health insurance coverage for union workers and their families should be included in the severance package for employees who do not transfer within B&W or who retire once site contamination is remediated.

B. SPECIFIC COMMENTS

1. Page v. & Page 7-1: “NRC staff prepared” this Draft EA

Comment: According to the List of Preparers on p. 7-1, Center for Nuclear Waste and Regulatory Analyses (hereinafter CNWRA or Center) employees and subcontractors accounted for 13 of the 15 preparers of the NFS Draft EA. Yet, the Draft EA asserts on Page v that Staff prepared the report. Additionally, three local community & environmental leaders met with CNWRA analysts and NRC officials in November 2009 when we were told that the Center would prepare the report for NRC review -- just as it had done for the June 2002 Environmental Assessment for Proposed License Amendments to Special Nuclear Material License No. SNM-124 Regarding Downblending and Oxide Conversion of Surplus High-Enriched Uranium¹ for the BLEU project

¹ ML050540094, 2002-06-30, Title page

operated by AREVA on NFS property. In the interest of transparency, CNWRA should be acknowledged with a byline since its analysts accounted for 87% of the preparers.

2. Page v. & Page 1-2 cf. Page 2-1: "Current facility operations include: ... Recovering uranium from scrap generated internally or from other facilities" (p.v & p.1-2) while Page 2-1 describes "other operations, including: ... radioactive waste management (e.g., activities to process waste to reduce, reuse, package, and ship to proper disposal sites)"

Comment: By glossing over NFS's substantial waste-processing, storage and disposal operations in the Executive Summary and Chapter 1, it seems as though Staff is attempting to avoid assessing the adverse environmental impacts that these activities cause. And while Page 2-1 expands the description of NFS's waste-processing operations somewhat, the Draft EA's analysis of the environmental and sociological impacts of waste processing, storage and disposal in Erwin remains grossly deficient.

Preparation of an Environmental Impact Statement (EIS) would rectify this deficiency and also provide transparency on the extent of NFS's waste storage, processing and disposal operations – information that the Erwin public deserves so that they can properly defend their health and welfare.

3. Page 1-2: "The NFS site is presently the only facility that operates its classified processes for the government."

Comment: While the public has no interest in knowing the details of the classified processes performed by NFS, as citizens whose tax dollars pay NFS for its contracted services, the public has a right to know (1) which federal agencies are supporting NFS's operations, (2) the general terms of those government contracts – that is, if they are "cost plus" and what profit percentage/markup over cost is guaranteed to Babcock & Wilcox (B&W) shareholders, and (3) in general terms, what classified products are made for government agencies. Only by knowing if there are a number of classified products produced by NFS, and whether some or all of them are (or could be) made by other corporations or by our national laboratories, can the veracity of the cited statement be assessed.

This matter is raised because there is evidence that, while NUMEC was making Navy reactor fuel in Apollo, PA – the same product manufactured by NFS in Erwin – both communities were told that they were the sole suppliers of fuel for the Navy. Also, during a June 11, 2009 telephone conference with Region II officials, a now-retired Branch Chief stated to concerned citizens of Erwin, Jonesborough & Greeneville:

"The product from the CD Line – if it gets operational – goes two places. One is it's going back to DOE as part of the weapons program and the rest is going to make commercial fuel for TVA reactors."²

Further, the nationwide community of non-proliferation and DU campaigners have a right to know whether work supporting new nuclear weapons production is being done in Erwin. But most importantly and in the interest of justice, if any workers at NFS are being exposed to radiation because of nuclear weapons work, then the Special Exposure Cohort needs to be expanded to cover these current workers and provide for their long-term health care.

4. Page 1-3: "The NRC staff did not separately address the 10-year alternative throughout the Draft EA, because the staff determined that the site operations and the types of potential impacts during a 10-year license renewal period would be expected to be the same as for the proposed 40-year license renewal period."

Comment: The preparers of this Draft EA should have known better than to make the arbitrary and capricious determination that impacts of a 10-year license-renewal period would be the same as for a period of time four (4) times longer. Even the most superficial analysis of NFS's license history would have revealed that the Erwin company's SNM license has been amended ninety (90) or so times just since 1999 when it was last renewed. So, since past is prologue, the assumption that site operations would be essentially the same 10 years into the future, compared with 40 years hence, is utterly unreasonable.

Likewise, the "types of potential impacts" to the environment and to public health have varied widely over the past decade's onslaught of license amendments: Banner Spring Branch has been destroyed; BLEU operations were constructed, requiring 3 license amendments just for that new process; more HEU and mixed hazardous waste was allowed to be stored onsite; and Erwin got stuck with pressurized UF6 canisters that Department of Transportation rules won't allow to be shipped to a remote site away from population centers.

Staff's unreasonable and unjustified assumptions, led it to not only arbitrarily limit the number and quality of alternatives but to also wrongly issue a Draft Finding of No Significant Impact (FONSI). These capricious actions are not irretrievable, however, since an EIS would result in greater public input and, therefore,

² Foxfire Reporting Services, "Transcript of Conference Telephone Call Held on June 11, 2009 with the United States Nuclear Regulatory Commission Region II and Concerned Citizens of Erwin, Jonesborough & Greeneville", private home library of Linda Cataldo Modica.

closer peer review and scrutiny of the NRC.

But even before scoping meetings for an NFS EIS occur, NRC can and should expand the number of alternatives to the Proposed Action. For example, the Canadian model of nuclear regulation should be considered for NFS where 1-2 year license renewals would force NFS to keep its environmental data up-to-date and the public well informed. A one-to-two-year renewal schedule would also free the NRC to authorize an EIS every time this waste processing, storage and disposal operation requested a license renewal.³

5. Page 1-3: "The SER will document NFS compliance with provisions in 10 CFR Parts 20 and 70. ... The NRC staff decision on the proposed action will be based on the results of both the EA and SER."

Comment: On July 13, 2010, Region II official Mr. Victor McCree said in Atlanta that NRC "trusts but verifies". Yet, NRC does not currently have a program for independent water and air quality sampling or for public or worker health assessment as evidenced by NRC's response to written questions: "independent sampling of effluents is not performed by the agency".⁴ Therefore, not only do senior NRC officials make uninformed statements to the public, but Staff has also made baseless, arbitrary and capricious assertions in the Draft EA that the SER "will document" that NFS is in compliance with 10 CFR Part 20 Appendix B (hereinafter 10CFR20) provisions and that the SER "will document NFS compliance". Further, while the public is able to peer review the Draft EA prior to final decision making on NFS's unprecedented 40-year license-renewal request, it is our understanding that the public will not have the opportunity to scrutinize the draft SER.

On the general issue of Safety Evaluation Reports regarding NFS license amendments, the public has been privy to some that have been issued without public review and those SERs -- especially the one on the Commercial Development Line (CD Line) -- miserably failed to allay the public's concerns about the storage and processing of Uranium Hexafluoride (UF₆) in Erwin. In that SER for the high-public-interest CD Line, NRC accepted NFS assurances -- despite the fact that it was unreasonable to do so because of the company's history of serial non-compliance and the findings of the February 2008 safety culture review by independent expert consultants (hereinafter SCUBA I) that found NFS's safety culture to be virtually non-existent⁵ -- that the licensee would "comply with the intent [sic] of various fire protection standards" in 50-year-old Building 301 that would house the new CD Line process. Staff further asserted in that 14-page SER (prepared by six (6) "principal contributors") that the fire barrier wall that separated the Main Processing Room from all surrounding areas was "considered an item IROFS".⁶ Because none of the 6 preparers of the CD Line SER chose to mention the existence, or absence, of ventilation ductwork in that fire barrier wall, it is not known if NFS's failure to "perform required fire damper safety inspections" -- as had already been "identified by the NRC in October 2008"⁷, just 7 months prior to the SER's completion -- affected fire safety in the CD Line building.

The shallow scrutiny that characterizes NRC reports not only fails to adequately assess the environmental and public health impacts of NRC decisions, but it also fails to disabuse the public of its intense skepticism of NRC oversight programs. The SER for Amendment 79 is another case in point. This SER was only a tad over 2 pages long, yet had four (4) "principal contributors".⁸ Again, as in the case of the CD Line, NFS's possession-limit increase was a high-public-interest issue. Yet the NRC saw fit to produce only a 2-1/4 page "evaluation" of the safety impacts of allowing a serially-non-compliant licensee store more highly-enriched uranium (HEU) in the middle of a low-income neighborhood. The 3-1/2 page SER for Amendment 62 (with two (2) "principal contributors") is another example of a so-called evaluation that couldn't possibly analyze the impact on safety of DOE-determined shipment schedules and quantities since 3-1/2 pages hardly even qualify as a report.⁹

Therefore, given the fact that (1) the Draft EA is inadequate and (2) the NRC has never presented the public with documentation of "NFS compliance with provisions in 10 CFR Parts 20 and 70" before, Staff will not be able to justify a final EA & FONSI. Therefore, an EIS on the proposed, unprecedented 40-year license-renewal request is warranted and necessary.

³ Part 51.20, "criteria for and identification of licensing and regulatory actions requiring environmental impact statements", states in paragraph (b)(11) that "Issuance of [sic] renewal of a license authorizing receipt and disposal of radioactive waste from other persons" demands an EIS. See www.nrc.gov/reading-rm/doc-collections/cfr/part051/full-text.html, accessed 12/13/10.

⁴ Response to LModica 2010-11-19.docx

⁵ NFS Safety Culture Board of Advisors, NFS-Erwin Site 2007 Independent Safety Culture Assessment Results Report, February 16, 2008

⁶ ML090490686, 2009-05-11, page 9 of 14

⁷ NFS Safety Culture Board of Advisors, NFS-Erwin Site 2009/2010 Independent Safety Culture Assessment Results Report, June 21, 2010, Attachment G-1, Fire Damper Inspection Program, page G-2 (ML101820096, 2010-06-29)

⁸ ML073190632, 2007-11-23

⁹ ML072630136, 2005-06-28

6. Page 1-4: “For the purposes of its NEPA reviews, the NRC staff considers [sic] an NRC licensee’s compliance with other federal and state permits to be protective of public health and safety, given the expectation [sic] that the various limits and conditions in the permits are reflective of the issuing agency’s regulatory authority.”

Comment: Since NRC has proven its willingness to grant dozens of license amendments based on unreasonable “assurances” from a serially-non-compliant licensee, it follows that NRC would make the unsafe assumption that the NRC’s lax modus operandi guides other federal and state permitting practices as well. The completeness of Table 1-1 on Page 1-4 is questionable since it lists only 11 NFS permits & licenses, while Appendix 1 to these comments (Table 1-2 of NFS Emergency Plan dated June 2, 1998) lists 20, calling into question the thoroughness of Staff’s research into basic, knowable facts.

Two of the permits that will be discussed further here are listed in Staff’s Table 1-1: NFS’s Storm Water Permit TNR050873 and its National Pollution Discharge Elimination System (NPDES) Permit TN0002038. Regarding the former, the only Storm Water Permit found in TDEC’s Johnson City files consisted of a double-sided single page, which is hardly impressive as “protective of public health and safety”. Since information on limits to storm water constituents are not made available to the public – if they exist at all – and the “receiving waters” are stated to be “Martins Creek ... and Nolichucky River (mile marker 95)”, the public is left with more questions than answers. (Appendix 2) Does the permit mean that storm water runs off directly into Martins Creek and that run off is also piped from NFS to the Nolichucky and that it enters the river at mile marker 95? Or does the permit mean that Martins Creek enters the Nolichucky at mile marker 95? If the latter is what TDEC meant, then why does the schematic on Page R-13 of NFS’s NPDES permit indicate that “Martin’s” [sic] Creek enters the Nolichucky at “Mile 94.7”? (Appendix 3) (More on Martin Creek later in these comments.)

NFS’s now-expired NPDES permit is even more troubling. Page R-25 only includes limits on thirteen (13) pollutants that NFS discharges into the Nolichucky at its outfall at mile marker 94.6. (Appendix 4) And only NFS’s discharges of “Uranium, Natural, Total” were limited despite the fact that TDEC had jurisdiction over several other non-source, non-byproduct and non-SNM materials discharged by NFS, and regulated by the State of Tennessee as indicated by Table 1-1 of NFS’s June 2, 1998 Emergency Plan. (Appendix 5) Some of the radioactive pollutants for which discharge limits are not set in the NPDES Permit, that are within State jurisdiction (according to Appendix 5), and that are discharged by NFS (according to the Biannual Effluent Monitoring Reports cited by Draft EA preparers), seem to include, but may not be limited to: Americium-241; Cesium-137, Thorium, Plutonium-239 and Uranium-238 (as depleted uranium). The absence of strict discharge limits for these and other radionuclides in NFS’s permit leads the public to consider State controls on NFS’s discharges inadequate to protect drinking water sources like the Nolichucky.

Permit restrictions on the amount of non-radiological pollutants allowed to be discharged by NFS to its Waste Water Treatment Facility (WWTF), and then to the Nolichucky, are limited to just 9 chemicals – chlorine, nitrogen/ammonia, nitrite/nitrate, fluoride, cadmium, copper, lead, mercury and silver. When compared to the list of 43 chemicals found in August 3, 1990 NFS correspondence to the Tennessee Department of Health & Environment (Appendix 6), the short list of chemical discharges nominally controlled by the NPDES permit seems inadequate for environmental protection. Is NFS no longer using the chemicals listed in Appendix 6, or, since the BLEU & CD Line processes were licensed were other chemicals added? Only through the in-depth analysis of an EIS, accompanied by independent testing for chemical and radioactive pollutants, will the public be satisfied that NRC has adequately assessed the impacts of the proposed major federal action.

Finally, Staff’s determinations that federal and state permits are protective of public health and safety are proven to be arbitrary and capricious by NFS’s own data. Specifically, if NRC, USACE, EPA & TDEC permits are protective of our environment, why is Banner Spring Branch over 45 times more radioactive than background levels & why is Martin Creek over 10 times more radioactive than upstream levels?¹⁰ Why were these and other “irreversible and irretrievable commitments of resources” never responsibly analyzed in an EIS as required by the National Environmental Policy Act (NEPA)?¹¹

7. Page 1-5 to Page 1-6: “NRC staff determined [sic] that the following listed areas were beyond the scope of this environmental assessment because (i) they were safety and enforcement issues or (ii) they were not within the NRC’s regulatory authority ... Material control and accountability; Criticality safety controls; Equipment failures; Plant building stability; Seismic risk analysis (likelihood); Safety culture; Terrorism; License violations; NRC enforcement actions; Requests for cancer studies”.

Comment: Staff’s restriction of the scope of the Draft EA not only helped cause the draft report to be deficient but also did much to justify an EIS on the proposed major federal action of this fuel/waste-processing facility’s

¹⁰ ML091900063, 2009-06-30, p. 4-2

¹¹ Sec. 102(2)(C)(iv), <http://ceq.eh.doe.gov/Nepa/regs/nepa/nepaegia.htm>, accessed 28March08

request for a 40-year license renewal. The arbitrary and capricious nature of NRC's limitation of scope is reflected in the Draft EA's internal contradictions. On the one hand, NRC claims that "inspections reports" ... "were reviewed and considered", while on the other hand Staff arbitrarily put equipment failures, material control and accountability (MC&A), equipment failures & license violations outside the scope of the Draft EA even though these matters are frequently the subject of inspection reports and are clearly within NRC's regulatory authority. Further, the Commission's own Fiscal Year 1998 Annual Report to Congress on Abnormal Occurrences dealt specifically with "seismic risk from liquid uranium hexafluoride"¹² while NFS's own 1998 Emergency Plan included earthquakes, tornados, hurricanes, etc. in "natural phenomena" that "could result in any of the previously described on-site accidents" (i.e., nuclear criticality, UF6 release, UN release, major fire). "The potential consequences would be of similar severity as those described in Sections 2.1.1 through 2.1.3" as summarized in Table 2-1. (Attachment 7)

Since the EIS on the decommissioning of NFS's former West Valley, NY reprocessing plant includes an entire chapter on seismology¹³, Staff's arbitrary exclusion of seismic risk from the scope of a Draft EA on a 40-year license renewal request further supports the need for an EIS on the proposed, unprecedented major federal action. The very public NEPA scoping process should determine the appropriate scope for an EIS, and the NRC should embark upon an EIS for NFS as soon as Staff returns from holiday leave.

Finally, regarding the exclusion of "requests for cancer studies" from the Draft EA's scope, as Staff should know, the NRC has requested that the National Academy of Sciences (NAS) perform a study of cancer risk around nuclear facilities and that nuclear fuel facilities – NFS specifically – would be included in the study. In the interest of public health and community trust, it would be beneficial for the NRC to hold the license renewal process in abeyance not only until an EIS is performed but also until NAS completes its study.

8. Page 2-1: "NFS has stated that the activities discussed here would be expected to continue during the renewal period (NFS, 2009b)."

Comment: While the activities discussed in the Draft EA may very well continue, additional processes are also likely to be the subject of dozens of License Amendment Requests (LARs) per decade as has happened with SNM-124 since 1999. Because there is no recognition of the likelihood of these future LARs nor analysis of their attendant environmental impacts, this Draft EA is an insufficient evaluation of the proposed action's adverse effects. Therefore, an EIS needs to be done.

9. Page 2-1: "NFS enclosed Banner Spring Branch in an underground pipe in 2005" & Page 3-22: "Banner Spring Branch is entirely contained inside an underground enclosed pipe and no longer offers habitat for wildlife"

Comment: Banner Spring Branch is a clear example of a major adverse environmental impact – the destruction of a natural stream through massive radiological contamination, dredging and culverting – that NRC has failed to recognize and which delegitimizes it's 1999 FONSI on NFS's 10-year license renewal request. As mentioned previously, NEPA regulations, as promulgated by the Council on Environmental Quality, clearly require detailed analyses of "any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented".¹⁴ The destruction of Banner Spring Branch is an "irreversible and irretrievable" commitment of a resource yet that significant adverse environmental impact has never been reviewed, no less analyzed in detail. Therefore, Staff should set the scoping process for an EIS in motion as soon as it has finished organizing and internalizing comments to its Draft EA.

10. Page 2-1: "Martin Creek empties into Indian Creek 1,067 m [3500 ft] north of the NFS site, and North Indian Creek then empties into the Nolichucky River" cf. Page 2-2, Figure 2-1: Map showing Martin Creek emptying into the Nolichucky River cf. Page 3-16: Geologic map showing Martin Creek flowing into North Indian Creek

Comment: Appendix 9 includes 2 pages from NFS's NPDES Permit renewal application, 2 pages from Erwin Utilities NPDES Permit renewal application, and a color copy of the latest topographic map of the Erwin Quadrangle. Page A-18, "TOPO! Map printed on 01/27/10 from 'Nuclear Fuel Services.tpo' and 'Untitled.tpg'", clearly marks "Martin Creek", "Banner Spring", "NFS Erwin Facility", "Nolichucky River", and "Outfall 001". On the topographic map on Page A-20, "Erwin WWTP" is clearly labeled and to the northeast of the Erwin WWTP label, in script, are the words "North Indian" following along the creek channel that mostly parallels "New U.S. 23". North Indian Creek shows up even more clearly on the color topo on Page A-21.

Now compare Page A-18 with Page A-21. The former, copyrighted in 2001, does not show "New U.S.

¹² ML072470275, 1999-05-31, p.1

¹³ DOE, Final Environmental Impact Statement for Decommissioning and/or Long-Term Stewardship at the West Valley Demonstration Project and Western New York Nuclear Service Center, DOE/EIS-0226, January 2010, p. xxvi

¹⁴ Ibid

23" cutting across Bend Island and then crossing over North Indian Creek. But it does indicate that, before the four-lane divided highway was built, the Nolichucky wrapped itself around Bend Island and that the river's eastern channel flowed into North Indian Creek (at contour interval 1620). Obvious from the color topo is that highway construction not only restricted the flow of river water to the channel flowing around Bend Island's east, but also created a very narrow channel that was diverted under the highway (at about contour interval 1640) from where it flowed north past the Industrial Park. Martin Creek flows into this Nolichucky River channel just north of where CSX's rail yard starts to widen with a spur for NFS. The Nolichucky channel remains narrow as it flows around Bend Island's east where it ultimately empties – as it historically did – into North Indian Creek (at contour interval 1620). Bottom line: none of the topographic maps, nor Figure 2-1 from the Draft EA, show Martin Creek emptying into North Indian Creek as asserted by the NRC on Page 2-1. The schematic from NFS's now-expired NPDES permit (see Appendix 3, p. A-5) also contradicts Staff's assertion.

One exceptional, outlier map from the Draft EA – Figure 3-5 on Page 3-16 -- requires brief mention. If the waterway labeled North Indian Creek truly is North Indian, its direction of flow would be to the south while the Nolichucky flows north as does the eastern channel of the Nolichucky that flows around Bend Island's east. The accuracy of the underlying geology depicted on Figure 3-5 must also be called into question especially since Staff chose not to include a reference for the geologic map on Page 3-16.

If basic, knowable facts about the hydrology of the area around NFS are not presented correctly in an NRC EA, how can the public trust Staff assertions about how well their health and environment are being protected by NRC regulations and inspection programs? Without an EIS on NFS, the NRC should continue to expect distrust from a skeptical public.

11. Page 2-1: "Those activities are supported by other operations, including: ... radioactive waste management (e.g., activities to process waste to reduce, reuse, package, and ship to proper disposal sites)"

Comment: Staff's description of "radioactive waste management" in Erwin hints at the possibility that recycling (also known as reprocessing) activities are being conducted by NFS – though possibly more limited in extent than NFS's former West Valley, NY operations. On the other hand, the Complaint filed by Impact Plastics, Inc. in its Civil Action against NFS on May 31, 2002 is far more explicit in its description of NFS as a reprocessor:

"3. Defendant, Nuclear Fuel Services, Inc. ("NFS"), is a corporation organized under the laws of the State of Maryland. The primary purpose and processes of NFS is recycling irradiated uranium in spent nuclear fuel. This process has led to a substantial contamination of the NFS property which is adjacent to and south of the plaintiffs' property." (Appendix 8 presents the first two pages of the May 31, 2002 Complaint.)

If NFS is reprocessing in Erwin, then this Draft EA should have explicitly described those activities, just as NFS's 2009 Environmental Report should have. If NFS is not reprocessing irradiated nuclear fuel in Erwin, why would a court brief (likely filed under penalty of perjury) describe NFS activities as those of a spent fuel reprocessor? This important issue needs to be clarified by an EIS on all of NFS's operations, including those hidden from the public for no apparent security benefit.

Further, if NFS is reprocessing spent fuel in Erwin, then the licensee is subject to the quality-control requirements of Appendix B to Part 50 – "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants" – as some members of the Erwin community have been arguing since the March 6, 2006 spill of HEU was revealed to the public.

12. Page 2-3 & Page 2-4: "Table 2-1. Estimated and Allowable Annual Air Emissions..."

Comment: Table 2-1 is an example of the presentation by NRC of poor quality data – estimated rather than actual, and for only one year – in an apparent attempt at spinning the corporate yarn that the tons of pollutants spewed into our air annually are merely fractions of the number of tons the state allows. Then is our health safe, are juvenile neurological systems safe, when "only" fractions of tons of known carcinogens mixed with "only" fractions of tons of known neurotoxins mixed with "only" fractions of tons of volatile organic compounds are spewed into our air annually? What are the cumulative health impacts of breathing in toxic chemicals mixed with radioactive pollutants?

With another young man (only 48 years old) from Washington Street in Erwin succumbing to cancer this past week, this community deserves answers from a rigorously-researched EIS performed through sensitive public engagement according to the letter and spirit of NEPA.

13. Page 2-4: "The primary pathway for surface runoff is ... first into Banner Spring Branch" cf. Page 3-13: "The channel of Banner Spring Branch is man-made, originates onsite, and flows through the NFS site. In 2003, it was enclosed in an underground pipe ... to prevent contamination from storm water runoffs"

Comment: Page 3-13 of the Draft EA as well as NFS's Storm Water Permit TNR050873 contradict Staff's

assertion on Page 2-4 that runoff first flows into Banner Spring Branch. The Storm Water Permit states that the "receiving waters" for storm water are "Martins [sic] Creek ... and Nolichucky River (mile marker 95)". See Appendix 2, Page A-3. Such internal inconsistencies within Staff's Draft EA call into question NRC's Draft FONSI and are further indications that an EIS is warranted.

14. Page 2-4: "Prior to discharge, waste water is to be below limits set forth in 10 CFR Part 20 and in compliance with the facility's National Pollutant Discharge Elimination System permit" cf. Page 2-8: "Table 2-5" cf. Page 2-9: "A grab sample is taken quarterly from each batch at the WWTF and analyzed for gross alpha and gross beta radiation. In addition, a monthly composite sample is analyzed for uranium isotopes."

Comment: NRC's statement on Page 2-4 implies that, for each batch of wastewater discharged, concentrations for each radionuclide in the batch are measured to ensure that the 10CFR20 limits for each isotope are met. But then Page 2-9 indicates that quarterly samples are analyzed only for alpha and beta radiation and not for individual radionuclides, and that only uranium isotopes are evaluated in monthly composite samples.

Yet, with all this data that NRC alleges NFS collects, all the NRC presents to the public is an "X" in the columns of Table 2-5 to indicate to which radioactive materials we are being exposed and via what pathway. Another deficiency of Table 2-5 is its misleading title since neither airborne nor waterborne effluents stay "at the NFS Site". Instead, they travel offsite to the air we breathe and into the Nolichucky – source of drinking water for thousands of customers in Washington & Greene Counties.

Does Table 2-5 include all the radionuclides NFS discharges offsite to our air and water? If so, why aren't Ac-227 and Pa-231 included in Table 2-5 since NFS reports their discharges from its WWTF in its Biannual Effluent Monitoring Reports from 2005 through 2009?

Finally, since the Draft EA cites Biannual Effluent Monitoring reports from 2000 through 2009 in its list of references, why couldn't the 15 preparers of this inadequate "assessment" present the public with a time series of air and water effluents, by radionuclide, per year from 2000 through 2009? Does the NRC think so little of our Southern Appalachian community that Staff imagined that an "X" would satisfy us? Or did none of the preparers believe the data in NFS's Biannual Effluent Monitoring reports or couldn't make sense of the negative quantities discharged either?

The exposed public deserves far, far better than NRC has presented them in this woefully inadequate Draft EA. Therefore, in the interest of justice, an EIS that honestly quantifies chemical and radiological exposures and their cumulative effluents and impacts needs to be performed on NFS.

15. Page 2-10: "Table 2-6. NFS Annual Employment From 2004 to 2009 With Projections to 2050" cf. Pages 2-8 & 2-9: "Table 2-5. Radionuclides in Effluents at the NFS Site"

Comment: While Table 2-6 presents a time series of data from 2004 to 2009 and even projects a range of employment numbers for 2020 & 2050, Table 2-5 only checks boxes. Nor does Table 2-5 attempt to quantify effluents – in terms of liters discharged to water or cubic meters emitted to air – for any of the 22 radionuclides listed in the table, and not even for a single year. If historic & current employment at NFS is knowable, then why isn't historic & current pollution? And if employment can be forecast out 40 years, why didn't NRC forecast NFS's effluents out 40 years and then calculate the cumulative exposures from 40 more years of operations?

Absent an analysis of historic, current and forecasted data on chemical & radioactive effluents, NFS's Draft FONSI is truly arbitrary and baseless.

16. Page 3-6: "3.3.3 Income" cf. Page 3-8: "Additionally, there is not a significant difference in the percentage of low-income population in Erwin as compared with the State of Tennessee"

Comment: Mysteriously, this section provides no analysis of the data presented in Table 3-7, nor is there any explanation why the data on per capita income for Unicoi County and for Erwin are for only 2007 while 2006-2008 per capita income data are provided for the State and other counties. But, if Staff had compared Median Household Income in Unicoi County and in Erwin to the Tennessee average for 2006-2008, it would have found that the Household Incomes in Unicoi County and Erwin amounted to only 68% of the State average. Likewise, in 2006-2008, Unicoi County's Median Family Income was only 69% of the Tennessee average while Erwin family incomes fared a tad better with 70.5% of the State average. But the bottom line in Erwin and Unicoi County is that local household and family incomes are approximately 30% below statewide averages.

To any reasonable, unbiased person, a 30% difference in anything – prices, quantities, speed, altitude, rainfall, etc. -- is a significant difference. But not to Staff. Instead, even though the household and family incomes of Erwin and Unicoi County workers are almost one-third lower than statewide levels, NRC arbitrarily and capriciously asserted that "there is not a significant difference in the percentage of low-income population in Erwin as compared with the State of Tennessee". How did Erwin and Unicoi County incomes get 30% lower than the State's if the percentage of the low-income population here wasn't significantly higher?

Staff's determination that a "detailed EJ review" was not warranted was wrongly concluded and callously arbitrary. Therefore, in the interest of environmental justice, an EIS needs to be performed regarding this proposed major federal action.

17. Page 3-19 & 3-20: "The chlorinated solvent plume, which includes trichloroethylene, perchloroethylene, and their degradation products, extends vertically into the bedrock to a depth of 12 m [40 ft] below the surface and horizontally offsite"

Comment: What is the depth of the monitoring well that led NRC to assert that TCE/PCE contamination extends to only 40 feet below the surface? Could the contamination extend beyond 40 feet? Does NRC have any independent verification of the vertical and horizontal extent of the TCE/PCE plume or, as it seems, is Staff solely reliant on RAI responses and NFS reports? Were the 5 wells and springs within 5 miles of NFS tested for TCE/PCE contamination? If not, why not since Staff indicates on Page 3-18 that those 5 "major water supplies" are "associated with faulted or fractured rocks or karstic features" and those wells and springs could be connected to NFS's contaminant plumes via faults or fractures?

When NRC performs the NEPA-required hard look at NFS's uranium, chlorinated solvent and Plutonium plumes through an EIS, Sierra urges Staff to retain independent geologists to perform dye traces so that underground flow of contaminants can be traced, and threats to drinking water supplies can be accurately assessed.

18. Page 3-23: "3.8 Noise"

Comment: This section ignores the noise pollution caused by NFS security staff at the company's firing range in Washington County. As property owners within 5 miles of the firing range will attest, there are times when the detonations and practice drills are so noisy that dogs are driven to distraction and it feels unsafe to be outdoors or even in an exterior room of your house. Noise pollution from NFS's firing range adjacent to the Cherokee National Forest would seriously and adversely impact the wilderness experience that hunters, anglers, hikers and campers seek in the Cherokee. Since it often sounds as though large ordnance are being detonated, wildlife is also likely to be adversely impacted by severe noise pollution. The cumulative impact to wildlife may be to drive them from the area altogether.

NRC's failure to account for the noise generated by NFS's firing range biases the results of its "analysis". Therefore, Staff's Draft FONSI was wrongly concluded and should be withdrawn.

19. Page 3-24: "Scenic and Visual Resources"

Comment: This section ignored the problem of light pollution that NFS's watch towers, spot lights and security lights cause for a large portion of the valley. Even if the buildings on site can not be seen from the Nolichucky or from the Appalachian Trail, it is probable that the high-intensity lights that flood the facility can be seen from great distances, including Forest Service recreational areas such as Chestoa. Light pollution spoils the wilderness experience and, therefore, creates a large adverse impact on scenic and visual resources.

20. Page 3-26: "The ATSDR study did not apply to the use of radioactive materials by NFS"

Comment: The ATSDR Public Health Assessment on NFS, despite failing to assess the impacts on health of radioactive materials released by NFS into the air and water and onto the land, did nevertheless find that NFS was an "indeterminant public health hazard" based on past conditions. This serious finding indicates that NRC's past EAs & FONSIs missed, glossed over, or ignored major adverse impacts of NFS operations that caused NFS to become a hazard to public health.

Together with an EIS, the upcoming National Academy of Sciences study of cancer risk around NFS, should fill the huge gaps in public health knowledge left by the incomplete and inadequate Public Health Assessment.

21. Page 3-26 & 3-27: "Table 3-13. Radionuclides in Effluents at the NFS Site"

Comment: As with Table 2-5, Staff omitted effluents to NFS's WWTF of Ac-277 and Pa-231, failed to quantify annual historic, current and projected discharges and emissions, and merely provided the public with a checked box if the radionuclide traveled from the "BLEU Sewer" or "Sewer" to the Erwin POTW, entered the Nolichucky via NFS's WWTF, or if the radionuclide was also emitted into the air via NFS's stacks.

All four plutonium isotopes are discharged into the Nolichucky and into the air by NFS. Yet, ATSDR warns strenuously against airborne exposure in its fact sheet on Plutonium: "If you know or suspect that plutonium has been released to the air, you should leave the area immediately" (Appendix 10). So, what is the public to do? Whose guidance should it trust? As Staff might recall, at the October 2010 Groundwater Workshop in Rockville, one of the panelists (who had been a senior ATSDR official) noted that the public trusts their personal physicians most, other public health officials next, and federal agencies like NRC least.

Yet, in the interest of gaining at least a modicum of public trust, Staff should advocate for an EIS that follows the public health approach described by Thomas A. Burke in Chapter 7 of Handbook for Environmental Risk Decision Making¹⁵, while requesting that the CDC be an important contributor to the EIS – or maybe even the sole organizer of a rigorous NEPA analysis.

22. Page 3-30: “The NFS Environmental Report ... described accidents with the potential for off-site consequences. These accidents include...uranium hexafluoride (UF6) release...”

Comment: The portion of the June 2, 1998 Emergency Plan dealing with a UF6 Release (Appendix 11) was recently reviewed by a retired nuclear quality control engineer. His comments, which he encouraged me to share with the NRC, follow:

“Date: Sat, 25 Dec 2010 20:49:15 +0000
Subject: Re: 1998 Emergency Plan/Waste Processing

Linda,

Barbara brought me a hard copy of the Emergency Plan and I can tell you that the p2-2 UF6 assumes that there is only powdered UF6 wafting through the air and that it might drift gently along with the breeze and settle softly on the grass. They make no mention of Fluorine gas!

Well I'm here to tell you that those 60 year old cylinders have isotopic separation of Fluorine gas from the original UF6, making F2 and UF4 or some other U salts. That the Fluorine gas in some of those cylinders currently exceeds the 400 psi pressure design safety limit and that they can explosively release that Fluorine gas over a kill zone area the size of a small football stadium. (per NRC: release lethal gas 100 meters in diameter) 50 ppm F2 is a lethal concentration

When it lets go there is no Emergency Plan --- If you are close and you aren't wearing a chemical protective suit with its own air --- you are DEAD! The F2 will immediately make HF acid in your airways and you drown on your own blood! If you are outside the instant kill zone the HF can still get ya.

By the way HF like any acid will burn your skin and flesh --- but this stuff goes to your bones and takes the calcium out of your blood, which in turn screws up your pulse rate and your heart runs wild and bursts! Sorry to be so graphic but you really need to know just what this stuff really is. You don't have to worry about radiation effects. Fluorine gas is the most highly reactive chemical known to man and will start and sustain a fire even with some metals!

That Emergency Plan reference to UF6 is a joke!
Buzz”

Any death that might result from a Fluorine gas release in Erwin should be considered by Staff to be a LARGE, adverse impact which would clearly destabilize the community. Therefore, an EIS is warranted by virtue of the fact that NFS proposes to continue processing UF6 within hundreds of feet of the offsite public.

23. Page 4-1 to 4-20: “4.0 Environmental Impacts”

Comment: This entire chapter is so riddled with inconsistencies, blatantly-biased statements, non sequiturs and wrong assumptions that it places an undue burden on the public to provide all the necessary comments to counter numerous, baseless assertions. Therefore, the comments on this Chapter will highlight the most blatant errors of omission and unreasonable assumptions that have led Sierra to conclude that this entire chapter needs to be redone especially because of Staff's obvious bias toward the proposed action.

Still, some specific comments might be useful in that they might help NRC management see how Staff turned NEPA's intent on its head by equating positive environmental impacts – see p. 4-2 – with adverse or detrimental environmental impacts.

- Page 4-7: Section 4.11 is mentioned but cannot be found.
- Page 4-7: Staff's determination that a 40-year license renewal would have an insignificant impact on air quality is arbitrary, capricious and baseless since, as was mentioned above, a single death from a Fluorine gas release would irrevocably destabilize the Erwin community. Therefore, the adverse impact of the proposed action is LARGE.
- Page 4-8: Staff provides no supporting analysis, time-series data, or quantitative estimates of cumulative impacts on air resources. Therefore, this finding of insignificant cumulative impacts is unjustified and should be withdrawn.

24. Page 4-8 & 4-9: Staff “expects...expects...expects” and then “concludes that the impacts to surface water quality ... under the proposed action would be localized and SMALL”.

Comment: Research performed by Professor Michael Ketterer, PhD of Northern Arizona University is summarized in his November 11, 2010 Interim Report (Appendix 12). Not only did Dr. Ketterer find that HEU

¹⁵ C. Richard Cothorn, Ph.D., Handbook for Environmental Risk Decision Making: Values, Perceptions & Ethics (New York: Lewis Publishers, 1996), pp. 93-101.

contamination in the Nolichucky extended at least 50 river miles downstream of NFS, but that an offsite spring, locally known as Whaley Spring, was contaminated with HEU as well.

While it was hoped that Professor Ketterer's Draft Report on offsite plutonium contamination would have been able to be presented with these comments, that report has been delayed. As soon as it becomes available, Ketterer's plutonium report will be provided as further evidence that NRC's Draft EA & FONSI were wrongly concluded, and should be withdrawn in favor of an EIS on the proposed action.

C. CONCLUSION

An analysis of offsite contamination conducted for and with local community members by a forensic chemist whose expertise is in environmental transport of radiological contaminants has found HEU linked to NFS over a 50-river-mile stretch of the Nolichucky River downstream of Erwin. By any measure, this extensive contamination is significant and has caused huge, irreversible adverse impacts to the river as well as to riverfront, private property.

The findings of this unbiased, independent research have reinforced the public's belief that federal and state licenses and permits, as well as NRC oversight programs, do not adequately protect public health or the quality of the environment on which our health relies.

Therefore, the Sierra Club urges the NRC to withdraw its Draft EA & FONSI and produce an unbiased, in depth analysis of the public health and environmental impacts of NFS operations in Erwin, with an aim toward achieving environmental justice, worker protection, public health and scientific integrity through an Environmental Impact Statement.

Table 1-2

NFS Licenses and Permits

Type of License/Permit	Issuing Agency	License/Permit No.
Special Nuclear Materials License	NRC	SNM-124
Quality Assurance Program for Radioactive Material Packages	NRC	71-0249
Radioactive Source Material License	State of TN	S-86001
Radioactive Byproduct Material License (Sealed Sources)	State of TN	R-86002
Registration of Neutron Generator	State of TN	A-8601-E5
Registration of X-Ray Producing Equipment	State of TN	786-0008
RCRA Permit (Part B)	State of TN	TNHW-066
NPDES Permit for Waste Water Treatment Facility (WWTF)	State of TN	TN0002038
NPDES Permit for Stormwater Discharge	State of TN	TNR050873
Air Pollution Control Permits	State of TN	11 Permits
POTW (Sanitary Sewer) Discharge Permit	City of Erwin	013
Waste Transportation Permit	State of South Carolina (SC)	0030-41-97-X
Ponds Decommissioning License	State of TN	S-86007

Page A-1

Appendix 1

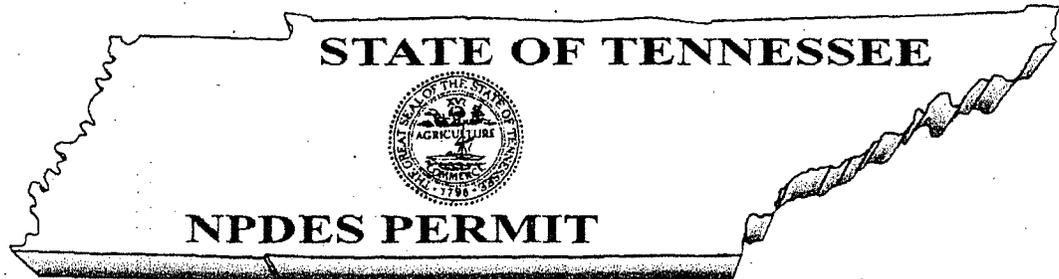
Table 1-2
NFS Licenses and Permits
(Cont.)

Radioactive Material (R&D) License	State of TN	R-86008
Radiological Waste License-for-Delivery	State of TN	T-TN001
Hazardous Material Certificate of Registration	Department of Transportation (DOT)	061297004007F
Certificates of Compliance for Shipping Packages	NRC/DOT	10 Certificates of Compliance
Radioactive Material (Mixed Waste) Treatment License	State of TN	S-86009
Radioactive Material (UCAR Carbon Co.) License	State of TN	S-86010
Radioactive Materials License for off site Temporary Remediation Projects	NRC	41-25193-01

Page A-2

Appendix 1 -- continued

Appendix 2



Tracking No. TNR050873

General NPDES Permit for
**STORM WATER DISCHARGES ASSOCIATED WITH
INDUSTRIAL ACTIVITY (TMSP)**

Tennessee Department of Environment and Conservation
Division of Water Pollution Control
401 Church Street
6th Floor, L&C Annex
Nashville, Tennessee 37243-1534

Under authority of the Tennessee Water Quality Control Act of 1977 (T.C.A. 69-3-101, et seq.) and the delegation of authority from the United States Environmental Protection Agency under the Federal Water Pollution Control Act, as amended by the Clean Water Act of 1977 (33 U.S.C. 1251, et seq.):

Discharger: **Nuclear Fuel Services, Inc.**
is authorized to discharge: storm water associated with industrial activity
from a facility located at: **1205 Banner Hill Road in Erwin, Unicoi County**
to receiving waters named: **Martins Creek (mile marker N/A), and Nolichucky River (mile marker 95)**
in accordance with effluent limitations, monitoring requirements and other conditions set forth herein.

Coverage under this general permit shall become effective on **August 4, 2009** and shall expire on **May 14, 2014**.

Notice of Coverage Issuance date: **August 4, 2009**.

Paul E. Davis

Paul E. Davis, Director
Division of Water Pollution Control

Applicable Sector(s): **CP**

TMSP Requirements and Sectors are located at <http://www.state.tn.us/environment/permits/strnih2o.shtml>

Appendix 2 -- continued

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Water Pollution Control
PERMIT SECTION
Sixth Floor - L & C Annex
401 Church Street
Nashville, TN 37243

MR. ROBERT HOLLEY
NUCLEAR FUEL SERVICES, INC.
1205 BANNER HILL ROAD
ERWIN, TN 37650

Tennessee Multi-Sector Permit (TMSP) Notice of Coverage Fact Sheet

The Division of Water Pollution Control received from your company a Notice of Intent (NOI) to be covered under the Tennessee Storm Water Multi-Sector General NPDES Permit for discharges of Storm Water associated with Industrial Activity (TMSP). The new TMSP became effective on June 1, 2009, and expires on May 14, 2014. **We have recorded your facility's information and are hereby notifying you that your facility is covered under this general permit.**

Enclosed with this fact sheet you will find a Notice of Coverage with the permit tracking number, facility's name, address, receiving stream information and the industry-specific sector(s) that apply to your facility. In order to get a copy of the TMSP requirements we ask you to visit our web site located at: <http://www.state.tn.us/environment/permits/stmnh2o.shtml>. We will provide you with a printed copy of the TMSP only upon your request.

At our web site, you will be able to download general and sector-specific requirements, as well as permit rationale, Notice of Determination, TMSP guidance documents, links to relevant web sites, and a copy of a No Exposure Certification form. If you do not have access to the Internet, or have other questions, please contact us at 1-888-891-TDEC or by E-mail at Storm.Water@tn.gov.

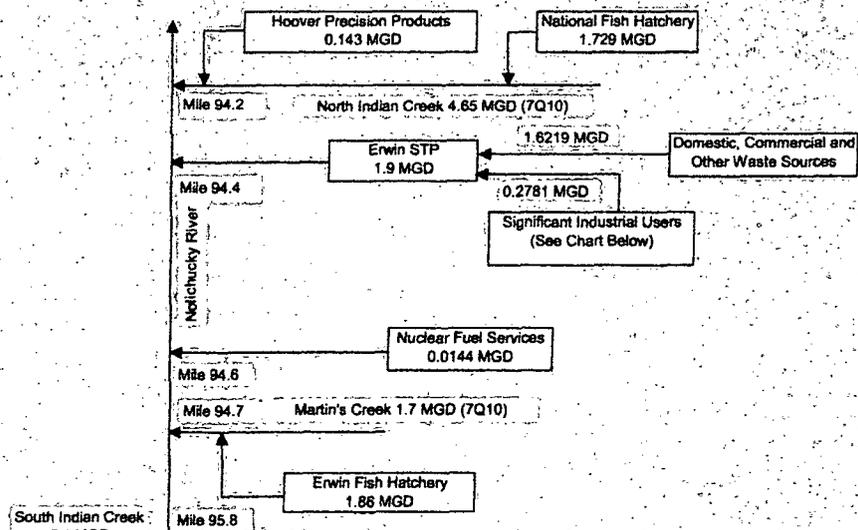
Thank you for your time and assistance.

Sincerely,
Permit Section
Division of Water Pollution Control

Appendix 3

Nuclear Fuel Services (Rationale)
 NPDES Permit TN0002038
 Page R-13 of R-25

Flow Diagram and Significant Industrial Users List



Erwin STP Significant Industrial Users		
Facility	Process Wastewater (MGD)	Non-Process Wastewater (MGD)
Vesuvius	0.0562	Not Given
CSX Transportation	0.0268	Not Given
NN Ball and Roller	0.0440	Not Given
Framatome	0.0075	Not Given
Hoover Precision Products	0.0000	0.0095
Morrill Motors	0.0000	0.0023
Specialty Tires of America	0.0226	Not Given
Studevik, Inc.	0.0000	0.0055
Nuclear Fuel Services	0.1047	Not Given
Total	0.2808	0.0173

Appendix 4

Nuclear Fuel Services (Rationale)
 NPDES Permit TN0002038
 Page R-25 of R-25

APPENDIX 4b

New Permit Limits

PERMIT LIMITS						
OUTFALL 001						
EFFLUENT CHARACTERISTIC	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
	MONTHLY		DAILY		MSRMT. FRQNCY.	SAMPLE TYPE
	AVG. CONC. (mg/l)	AVG. AMNT. (lb/day)	MAX. CONC. (mg/l)	MAX. AMNT. (lb/day)		
FLOW	Report (MGD)*		Report (MGD)*		1/batch	Estimate
pH	Range 6.0 - 9.0**				1/batch	Grab
TOTAL SUSPENDED SOLIDS (TSS)	30	--	40	--	1/batch	Grab
SOLIDS, SETTLEABLE	--	--	0.5 ml/l	--	1/batch	Grab
CHLORINE, TOTAL RESIDUAL (TRC)***	--	--	2.0	--	1/batch	Grab**
COD	--	--	370	--	1/Month	Grab
NITROGEN, AMMONIA TOTAL	20	--	30	--	1/batch	Grab
NITRITE PLUS NITRATE NITROGEN	--	250	--	375	1/batch	Grab
FLUORIDE, Soluble	15	--	20	--	1/batch	Grab
ARSENIC, TOTAL	--	--	Report	--	1/quarter	Grab
CADMIUM, TOTAL	--	--	0.01	--	1/Month	Grab
CHROMIUM, TOTAL	--	--	Report	--	1/quarter	Grab
COPPER, TOTAL	--	--	1.0	--	1/Month	Grab
LEAD, TOTAL	--	--	0.1	--	1/Month	Grab
MERCURY, TOTAL***	0.00037	--	0.050	--	1/batch	Grab
NICKEL, TOTAL	--	--	Report	--	1/quarter	Grab
SILVER, TOTAL	--	--	0.05	--	1/Month	Grab
URANIUM, NATURAL TOTAL	2.0	--	4.0	--	1/batch	Grab
TETRACHLOROETHYLENE	--	--	Report	--	1/quarter	Grab

* Flow shall be reported in Million Gallons per Batch.
 ** pH and TRC analyses shall be performed within fifteen (15) minutes of sample collection.
 *** The chronic mercury limit shall apply only if the discharge of batches containing mercury occur four (4) or more consecutive days/week during the monitoring period; otherwise, only the daily maximum limit for batches containing mercury shall apply. If any individual analytical test result for mercury is less than the minimum quantification level (0.0002 mg/L), then a value of zero (0) may be used for DMR calculations and reporting requirements.
 **** The total residual chlorine limit is only applicable when chlorine is used in the treatment process.

JAH
 TN0002038.doc

Appendix 5

Table 1-1

Summary of Major NFS Radioactive Material Licenses

Isotope	Form/Maximum Quantity	Regulatory Agency
Uranium-235	Any non-pyrophoric form/any enrichment, including uranium containing up to 1 ppm transuranics - 7,000 kgs of U-235	NRC
Uranium-233	Any form - 250 grams for Research & Development (R&D) Activities; 1 kg residual contamination from previous operations	NRC
Plutonium	Any form - 200 grams for R&D Activities; 10 millicuries containing calibration and counting standards Any form - 200 grams as stored material from previous operations Any form - as residual contamination and hold-up from previous operations (quantity as specified in License SNM-124, Chapter 7) Any form - 200 grams as contaminated equipment and materials received for decontamination or volume reduction	NRC
Uranium - Natural	Any form - 350,000 lbs, 1,000 kgs for R&D Activities, 1000 kg for treatment of mixed waste, 50 millicuries from waste water surface impoundment, Pond 4 waste disposal area, and inoperable truck scale pit.	Tennessee (TN)
Uranium - Depleted	Any form - 350,000 lbs, 1,000 kgs for R&D Activities, 1000 kg for treatment of mixed waste, 200 millicuries from waste water surface impoundment, Pond 4 waste disposal area, and inoperable truck scale pit.	TN
Thorium	Any form - 50,000 lbs, 4,500 lbs.; 1,000 kgs for R&D Activities, 1,000 kg for treatment of mixed waste	TN
Tc-99, Ce-137, Np-237, Pa-234	Any form - 100 millicuries, 500 millicuries, 1 millicurie, 10 millicuries	TN
Radioactive Material with Atomic Numbers 1-91 (except Th)	Any form - 5 millicurie/isotope for R&D Activities and Analysis; 50 Ci each isotope not to exceed 500 Ci total, for treatment of mixed waste	TN
Cs-134, Cs-137, Co-58, Co-60, Eu-152, Eu-154, Eu-155, I-129, Ni-63, Pa-231, Pr-147, Ra-226, Ra-228	Any form - 100 m Ci for R&D Activities and Analysis, plus 100 mCi I-129 for treatment of mixed waste	TN

Appendix 5 -- continued

Table 1-1

Summary of Major NFS Radioactive Material Licenses (cont.)

H-3	Any form - 2 Ci for R&D Activities, 15 Ci for treatment of mixed waste	TN
Transuranics with Atomic Numbers 93-96, except SNM	Any form - 10 μ Ci each isotope not to exceed 100 μ Ci total, for R&D Activities and Analysis, 2 Ci for treatment of mixed waste	TN
Cs-137, Co-60	5 Ci - each isotope for treatment of mixed waste	TN
Am-241, Co-60, Y-169, Ce-137, Sr/Y-90, Co-57, Y-88, Cd-109, Sn-113, Ce-139, Hg-203, H-3, Cf-252, Gd-148, Pu-239, Cm-244	Deposited sources, Sealed sources, Doped scintillation crystals, Disk sources, Isotopes contained in metal foil	TN

Appendix 6

86-29 11



RECEIVED

Nuclear Fuel Services, Inc.
205 Banner Hill Rd.
Erwin, TN 37650
(615) 743-9141

Division of Solid Waste Management

Date 8/6/90 File No. _____

GOV-01-55
ACF-90-281
21G-90-075

CERTIFIED MAIL #SR0003
RETURN RECEIPT REQUESTED

Received by JG

August 3, 1990

Mr. Darrell S. Hale
Assistant Regional Director
Tennessee Department of Health & Environment
Division of Solid Waste Management
1733 Sunset Drive
Johnson City, TN 37601-3621

Dear Mr. Hale:

As requested during your July 18, 1990, inspection, enclosed are the following documents:

- ATTACHMENT I: Listing of Chemicals Currently Discharged to NFS Waste Water Treatment Facility (WWTF)
- ATTACHMENT II: Listing of Chemicals Currently Discharged to Erwin Public Owned Treatment Works (EPOTW)

NFS believes that those RCRA listed or potentially characteristic chemicals included on Attachments I and II are all exempt from RCRA by virtue of one or more of the following mixing rules:

1. Rule 1200-1-11-.02(c)1.(ii) (III)
2. Rule 1200-1-11-.02(c)1.(ii) (IV) IV
3. Rule 1200-1-11-.02(c)1.(ii) (IV) V

NFS inputs to the EPOTW (Attachment II) consist primarily of shower and toilet discharges. The source of the majority of chemicals listed on this Attachment are small quantity use from safety laboratories.

If you have any questions, or if we can be of further assistance, please contact Mr. Dale E. Gergely, Health Physics and Environmental Safety Manager, at NFS.

Sincerely,

NUCLEAR FUEL SERVICES, INC.

Donald Paine
Donald Paine, Ph.D.
Vice President
Safety & Regulatory

DP/BMM/pdj
Attachments

Appendix 6 -- continued

ATTACHMENT I

Current Routine Discharges to the NFS Waste Water Treatment Facility (WWTF)

Acetone	Ammonium Hydroxide
Methanol	Cyclohexane
Methyl Isobutyl Ketone	Potassium Dichromate
Silver Nitrate	Silver Chloride
Hydrofluoric Acid	Methyl Chloroform
Silver Sulfate	Potassium Hydroxide
Chloroform	Pyridine
Hexanol	Hydrochloric Acid
Hydrogen Peroxide	Nitric Acid
Sodium Fluoride	Ethylene Glycol
Hexamethylenetetramine	Urea
Zironyl Nitrate	Zironyl Chloride
Aluminum Oxide	Sulfuric Acid
Aluminum Nitrate	Mercuric Chloride
Tartaric Acid	Acetic Acid
Ammonium Acetate	Ethyl Alcohol
Potassium Oxylate	Potassium Pyrosulfate
Magnesium Perchlorate	Oxalic Acid
Phenolphthalein	Trioctylphosphine Oxide
Sodium Hydroxide	Phosphoric Acid
Tributyl Phosphate	Amsco
Ferric Nitrate	

NOTE:

1. CHEMICALS LISTED INCLUDE THOSE WHICH ARE RCRA LISTED OR POTENTIALLY CHARACTERISTIC AND THOSE USED AT NFS IN QUANTITIES GREATER THAN APPROXIMATELY ONE (1) POUND PER YEAR.
2. OTHER CHEMICALS MAY POTENTIALLY BE DISCHARGED TO THE NFS WWTF IN EXTREMELY SMALL QUANTITIES PER YEAR. HOWEVER, NONE OF THESE SMALL QUANTITIES OF CHEMICALS ARE RCRA LISTED.

Table 2-1

Postulated Accident Summary

Accident Type	Accident Initiator	Assumed Subsequent Control Failures		Worst Case Dose at Site Boundary			Acute Health Effects at Site Boundary*	
		Engineering	Administrative	Radioactivity (rem)	Toxicity		Radioactivity	Toxicity
					IJ (mg)	III (mg/m ³)		
Nuclear Criticality	<ul style="list-style-type: none"> - Loss of concentration/density control; - Loss of geometry control; - Loss of moderation control; - Loss of reflection control; - Loss of interaction (array) control; - Loss of mass; - Loss of poison control 	<ul style="list-style-type: none"> - Failure of double contingency principle; - Incorrect determination of concentration, density, volume, and/or mass; - Geometry control failure; - Moderation control failure; - Reflection control failure; - Incorrect use of poison control devices in unfavorable geometry tanks; - In-line uranium monitoring system failure 	<ul style="list-style-type: none"> - Less than adequate procedures and training; - Less than adequate Raschig ring inspection; - Human error; - Less than adequate SRI maintenance Program 	<ul style="list-style-type: none"> - 9.4 (I131); - 9.1 (I131) - (Thyroid) 	NA	NA	No immediate effect	No immediate effect

NOTE:

* EPA threshold for acute health effects in adults is fifty (50) rem (Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA, May 1992).

Table 2-1

Postulated Accident Summary
(cont.)

Accident Type	Accident Initiator	Assumed Subsequent Control Failures		Worst Case Dose at Site Boundary			Acute Health Effects at Site Boundary*	
		Engineering	Administrative	Radioactivity (rem)	Toxicity		Radioactivity	Toxicity
					U (mg)	III: (mg/m ³) low exposure		
Airborne Radiological Release (UF ₆)	UF ₆ leak concurrent with a complete failure of two (2) independent scrubber systems. (A UF ₆ leak could result from overheating or heating an overfilled or damaged cylinder, or from an undetected cylinder valve or pigtail leak.)	<ul style="list-style-type: none"> - UF₆ processing ventilation enclosure less than adequate; - Heating system temperature failure; - Overpressurization of piping system; - Faulty UF₆ pigtail; - Piping system failure 	<ul style="list-style-type: none"> - Less than adequate procedures and/or training; - Less than adequate weighing of cylinder upon receipt and/or prior to processing; - Failure to perform cold pressure check on cylinder prior to heating; - Failure to conduct leak check prior to processing; - Failure to operate UF₆ scrubber and main building scrubber during processing; - Failure to use CO₂ for emergency freeze-out; - Less than adequate maintenance 	- 2.0 (TEDE); - 17 (CDB - Lung)	0.18	0.049 (low exposure)	No immediate effect	No immediate effect

NOTE:

* EPA threshold for acute health effects in adults is fifty (50) rem (Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA, May 1980)

**Table 2-1
Postulated Accident Summary
(cont.)**

Accident Type	Accident Initiator	Assumed Subsequent Control Failures		Worst Case Dose at Site Boundary			Acute Health Effects at Site Boundary*	
		Engineering	Administrative	Radioactivity (rem)	Toxicity		Radioactivity	Toxicity
					U (mg)	HF (mg/m ³)		
Major Fire (Building 233 & 300 Complex)	<ul style="list-style-type: none"> - Electrical fault; - Ignition of combustible materials; - Equipment malfunction; - Chemical reactions; - Human error 	<ul style="list-style-type: none"> - Faulty electrical installation; - Less than adequate combustible and flammable gas equipment construction; - Failure of explosive range metering devices; - Failure of smoke detection devices and fixed fire suppression equipment 	<ul style="list-style-type: none"> - Less than adequate procedure and/or training; - Improper use of ignition sources and combustible materials; - Incorrect storage of combustible wastes; - Less than adequate preventative maintenance program; - Incorrect use of chemicals; - Less than adequate inspections and audits; - Incorrect permitting of work involving ignition sources 	<ul style="list-style-type: none"> - Building 233: 0.67 (CEDE), 5.5 (CDI); - 1.4mg - 300 Complex: 0.53 (CEDE), 4.4 (CDI); - 1.4mg 	0.63	NA	No immediate effect	No immediate effect
					0.04	NA	No immediate effect	No immediate effect

NOTE:
* EPA threshold for acute health effects in adults is fifty (50) rem (Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA, May 1992).

Table 2-1

Postulated Accident Summary
(cont.)

Accident Type	Accident Initiator	Assumed Subsequent Control Failures		Worst Case Dose at Site Boundary			Acute Health Effects at Site Boundary	
		Engineering	Administrative	Radioactivity (rem)	Toxicity		Radioactivity	Toxicity
					I (mg)	II ^a (mg/m ³)		
Natural Phenomena (earthquake, tornado, hurricane, and flood)	- Act of God	- Less than adequate building code standards	- Less than adequate emergency preparedness	- Reference worst case dose	- Reference worst case dose	- Reference worst case dose	No immediate effect	No immediate effect

NOTE:

* EPA threshold for acute health effects in adults is fifty (50) rem (Manual of Protective Action Guides and Protective Actions for Nuclear Incidents, EPA, May 1992).

Appendix 8

COPY

FILED

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
AT GREENEVILLE

MAY 31 10 57 AM '02

U.S. DISTRICT COURT
EASTERN DISTRICT OF TENNESSEE
BY **BP**

IMPACT PLASTICS, INCORPORATED, *
a Tennessee Corporation, *
PRESTON TOOL AND MOLD, INC., *
a Tennessee Corporation, and *
GERALD M. O'CONNOR, *
JR., *

Plaintiffs, *

vs. *

NUCLEAR FUEL SERVICES, INC., *
a Maryland Corporation, *

Defendant. *

CIVIL ACTION

NO. _____

2:02-CV-148

C O M P L A I N T

Plaintiffs, Gerald M. O'Connor, Jr., Impact Plastics, Incorporated, and Preston Tool and Mold, Inc., hereby file this Complaint and would show the Court as follows:

COUNT I

DAMAGE TO REAL PROPERTY AND
OTHER PROPERTY INTERESTS:

1. Count I of this case arises out of common law claims for damages to real property and an ongoing business resulting from environmental contamination.

2. The plaintiffs are owner, lessor and lessees of real property located at 1070-A Industrial Drive, Erwin, Tennessee (hereinafter the "Contaminated Property"). Plaintiff O'Connor is

Appendix 8 -- continued

a citizen of the State of Tennessee; plaintiff, Impact Plastics, Incorporated, is a domestic corporation organized in the State of Tennessee; and, plaintiff, Preston Tool and Mold, Inc., is a domestic corporation organized in the State of Tennessee.

3. Defendant, Nuclear Fuel Services, Inc. ("NFS"), is a corporation organized under the laws of the State of Maryland. The primary purpose and processes of NFS is recycling irradiated uranium in spent nuclear fuel. This process has led to a substantial contamination of the NFS property which is adjacent to and south of the plaintiffs' property. NFS's agent for service of process is Dwight D. Ferguson, Jr., 205 Banner Hill Road, Erwin, Tennessee.

4. NFS is subject to the jurisdiction of this Court as is more clearly set out below, as well as in Counts II, III and IV hereof.

5. This Court has subject matter jurisdiction over this case pursuant to 28 U.S.C. §1332 (the amount in controversy exceeding \$75,000) and it further has jurisdiction pursuant to 42 U.S.C. § 9607(a) and § 9613(b).

6. Venue is proper in this Court pursuant to 28 U.S.C. § 1391(a)(2) as well as 42 U.S.C. § 9613(b).

7. Groundwater beneath the NFS property is contaminated with chloroform, 1,2 dichloroethylene (1,2 DCE), tetrachloroethylene (PCE), trichloroethylene (TCE), vinyl chloride, tributyl phosphate

Appendix 9

NFS NPDES App - 2/24/10

TDEC Files



NUCLEAR FUEL SERVICES, INC.
a subsidiary of The Babcock & Wilcox Company

1205 banner hill road ■ erwin, tn 37650 ■ phone 423.743.9141
www.nuclearfuelservices.com

RECEIVED

21G-10-0038
GOV-05-01-01
ACF-10-0059
February 24 2010

FEB 25 2010

JOHNSON CITY ENVIRONMENTAL
ASSISTANCE CENTER

U.S. Environmental Protection Agency
Permit Section
Sam Nun Atlanta Federal Center
61 Forsyth Street, SW
Atlanta, GA 30303-3104

Reference: NPDES Permit No. TN0002038

Dear Sirs:

Enclosed are the Nuclear Fuel Services, Inc. (NFS) NPDES Permit Renewal Application Forms 1 and 2C. Attachments 1 through 7 and Appendices: 5-1, 5-2, 6-1 through 6-6, and 7-1 through 7-17 are also enclosed to provide additional information. A work stoppage at the NFS site prohibited the collection and analysis of samples representative of routine operations. This was communicated to Mrs. Beverly Brown, State of Tennessee, Johnson City Field Office. Mrs. Brown discussed this matter with Mr. Vojin Janjic, State of Tennessee, Division of Water Pollution Control, Nashville, Tennessee. Mr. Janjic instructed NFS to use 2005 NPDES Permit Application data for attributes not normally collected and when routine operations are resumed, to collect additional samples for analysis and submit the resulting data. The attachments and appendices flag the 2005 NPDES Permit data.

If you or you staff have any questions, require additional information, or wish to discuss this, please contact me or Mr. Robert Holley, Environmental Safety Manager, at (423) 743-1777. Please reference our unique document identification number (21G-10-0038) in any correspondence concerning this letter.

Sincerely,
NUCLEAR FUEL SERVICES, INC.

B. Marie Moore,
Safety & Regulatory

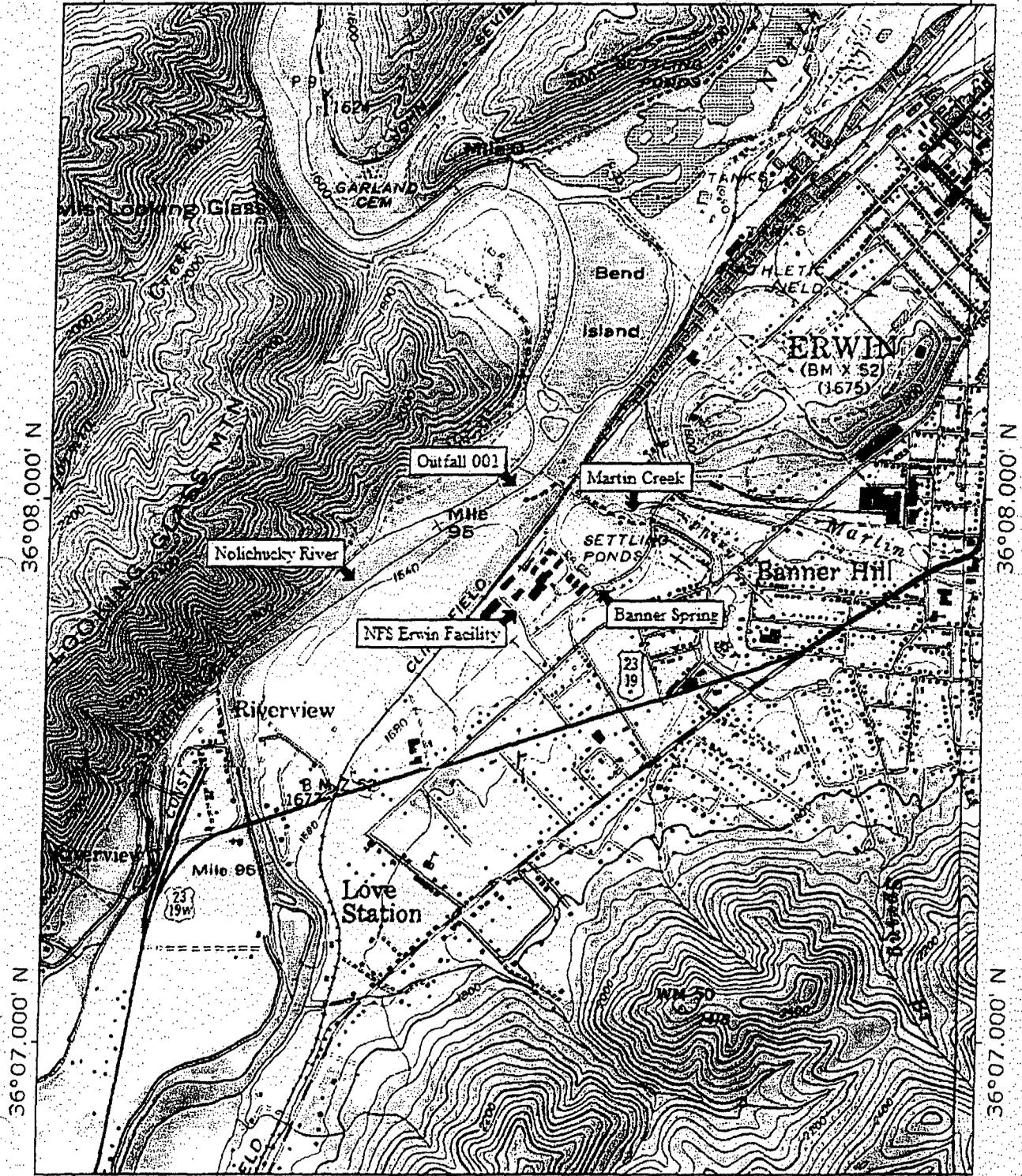
JMG/pj
Enclosure

cc: Mr. Jeff Horton
Environmental Field Office Manager
Johnson City Environmental Assistance Center
2305 Silverdale Road
Johnson City, TN 37601-2162

nuclear fuel services, inc., a subsidiary of The Babcock & Wilcox Company

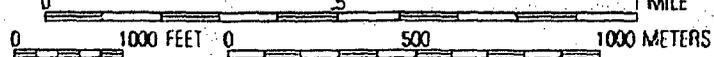
Appendix 9 -- continued
ATTACHMENT 3

TOPO! map printed on 01/27/10 from "Nuclear Fuel Services.tpo" and "Untitled.tpg"
 82°27.000' W 82°26.000' W WGS84 82°25.000' W



82°27.000' W 82°26.000' W WGS84 82°25.000' W

MN ↑ TN
 6 1/2"



Printed from TOPO! ©2001 National Geographic Holdings (www.topo.com)

Appendix 9 -- continued

Erwin Potus - NPDES App - 03A45

M-86 - Erwin (Orange)

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

OFFICE CORRESPONDENCE

RECEIVED

MAR 18 2010

JOHNSON CITY ENVIRONMENTAL ASSISTANCE CENTER

DATE: March 3, 2010
 TO: Monya Bradley, Central Office, WPC
 FROM: Sandra Vance, Johnson City Environmental Field Office, WPC
 SUBJECT: **Permit Section**, Acknowledgment of Receipt
 NPDES Permit Application Comments
 Johnson City Environmental Field Office

APPLICATION OR DRAFT COMMENTS **DATE REC.**

Erwin Wastewater Treatment Plant	
NPDES Permit TN0023001	
NPDES Permit Application	
Unicoi County	<i>3/5/10</i>

Received By: *MEB*

Please note the Permit Application Check List by Sandra Vance. Enclosed are the (1) Permit Application Check List, (2) Watershed Evaluation and Antidegradation Policy Checklist, and (3) EPA Forms 1 and 2A. **Please forward to Julie Harse, Permit Section.**

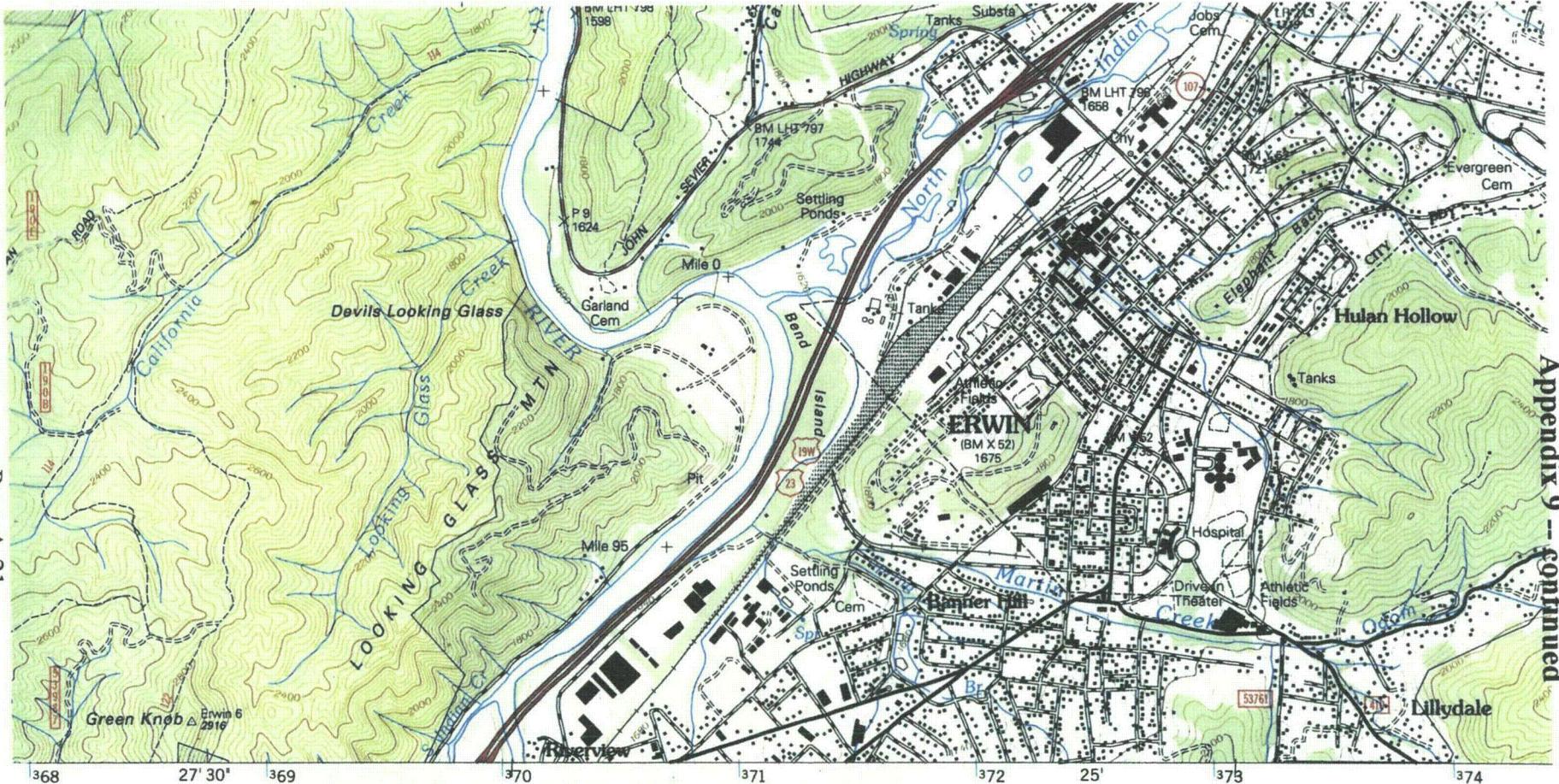
Please return this sheet to Johnson City Environmental Field Office, Attention: Sandra Vance.

From	Date
SKV	3/3/10
JKH	3/3/10
To	
MEB	

RECEIVED

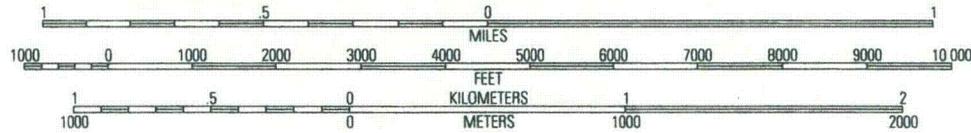
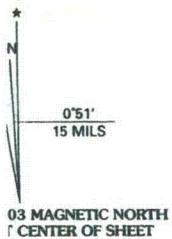
MAR 05 2010

Permit Section



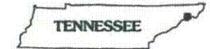
Appendix 9 -- continued

SCALE 1:24 000



CONTOUR INTERVAL 40 FEET
 SUPPLEMENTARY CONTOUR INTERVAL 20 FEET
 NATIONAL GEODETIC VERTICAL DATUM OF 1929
 TO CONVERT FROM FEET TO METERS, MULTIPLY BY 0.3048

THIS MAP COMPLIES WITH NATIONAL MAP ACCURACY STANDARDS
 FOR SALE BY U.S. GEOLOGICAL SURVEY, P.O. BOX 25286, DENVER, COLORADO 80225
 AND TENNESSEE DEPARTMENT OF CONSERVATION, DIVISION OF GEOLOGY,
 NASHVILLE, TENNESSEE 37243
 A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST



QUADRANGLE LOCATION

1	2	3	1 Leesburg
			2 Jonesborough
			3 Johnson City
4		5	4 Telford
			5 Unicoi
			6 Flag Pond
6	7	8	7 Chestoa
			8 Hunt Dale

ADJOINING 7.5' QUADRANGLES

- Interstate
- U. S.
- State
- County
- National Forest, su
for passenger cars
- National Forest, su
high clearance veh
- National Forest Tr.

This fact sheet answers the most frequently asked health questions (FAQs) about plutonium. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Plutonium is a radioactive material that is produced in nuclear reactors; only trace amounts occur naturally. It has been found to cause lung, liver, and bone cancer in plutonium workers. Plutonium has been found in at least 16 of 1,689 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is plutonium?

Plutonium is a silvery-white radioactive metal. Most plutonium is found combined with other substances. Trace amounts of plutonium occur naturally, but large amounts have been produced in nuclear reactors. Trace levels of plutonium can be found in the environment, from past nuclear bomb tests. The most common plutonium isotopes are plutonium-238 and plutonium-239.

Plutonium can exist in several forms, called isotopes, based on how it was made. All plutonium isotopes are radioactive. Their atoms eventually change into a different element and give off radiation. This process is called radioactive decay.

The half-life is the time it takes for half of the plutonium to undergo radioactive decay and change forms. The half-life of plutonium-238 is 87.7 years. The half-life of plutonium-239 is 24,100 years.

What happens to plutonium when it enters the environment?

- Plutonium released during atmospheric testing of nuclear bombs, which ended in 1980, is the source of most of the plutonium in the environment worldwide.
- Plutonium is also released to the environment from research facilities, waste disposal, nuclear fuel reprocessing facilities,

nuclear weapons production facilities, and accidents at facilities where plutonium is used.

- Plutonium can be transported in the atmosphere.
- It can be deposited on land or water by settling or by precipitation.
- Plutonium can stick to particles in soil, sediment, and water.
- Plutonium isotopes will undergo radioactive decay in the environment.

How might I be exposed to plutonium?

- Everyone is exposed to very low levels of plutonium in air, and possibly in drinking water and food.
- Exposure to higher levels could occur from an accidental release during its use, transport, or disposal.
- Workers at nuclear facilities using plutonium may be exposed to higher levels of it.
- People who live near facilities that use plutonium in their operations may be exposed to it from releases to the air.

How can plutonium affect my health?

The main health effect from exposure to plutonium is cancer which may occur years after exposure. The types of cancers you would most likely develop are cancers of the lung, bones, and liver. These types of cancers have occurred in workers who were exposed to plutonium in air at much higher levels than is in the air that most people breathe.

ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>

How likely is plutonium to cause cancer?

The Department of Health and Human Services (DHHS), International Agency for Research on Cancer (IARC), and the EPA's Office of Air and Radiation consider plutonium to be a human carcinogen. The likelihood of you developing cancer depends on how much plutonium you were exposed to and how long it remains in your body. The levels which most people are exposed are very low and of little health consequence.

How can plutonium affect children?

Studies in young animals have shown that a larger amount of the plutonium deposited in the lung will move to growing bones. Therefore, it is possible that the bones of children could be more severely affected by plutonium than the bones of adults; however, this has not been shown in humans or laboratory animals.

Studies in animals have also shown that a larger amount of plutonium that enters the gut of newborn animals is absorbed into the body.

We do not know if plutonium causes birth defects or affects the ability to have children, although some plutonium that reaches the blood can be found in ovaries and testes.

How can families reduce the risks of exposure to plutonium?

People do not generally live near facilities that use plutonium in their operations. Some people may be slightly more exposed to plutonium due to releases of plutonium through filtered stack-emissions or waste water. Any releases are to be within regulatory limits. Disposal sites are deep underground and away from the public.

If you know or suspect that plutonium has been released to the air, you should leave the area immediately.

Is there a medical test to determine whether I've been exposed to plutonium?

Plutonium can be measured in the urine and feces even at very low levels. These measurements can be used to estimate the total amount of plutonium that has entered the body.

The levels of plutonium in body can be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The U.S. Nuclear Regulatory Commission (USNRC) has recommended an exposure limit of 0.1 rem/year for the general public and 5 rem/year for plutonium workers. These regulations are for all forms of radiation combined, so they are not only for plutonium.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Plutonium (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



Appendix 11

- instantaneous emission of gamma and neutron radiation;
- exposure to airborne radionuclides;
- uranium toxicity; and,
- fission product noble gases.

The maximum exposed receptor would receive a total effective dose equivalent (TEDE) of 9.4 rem and a total dose equivalent (TDE) to the thyroid of 9.1 rem which would result in no acute health effects (see Table 2-2, Nuclear Criticality: Dose to the Maximally Exposed Off-site Resident). The maximally exposed receptor would not receive any significant chemical toxicity from uranium, and thus, the only off-site impact would be fission product noble gases. Factors and assumptions used to estimate this dose are documented in the Emergency Plan Safety Report (EPSR).

2.1.2 UF₆ Release

An accidental release of UF₆ from the 300 Complex to the environment has been evaluated. Two (2) such releases occurred at NFS in May, 1972, and August, 1979. The possibility of recurrence of this accident is remote due to the current design of the UF₆ process. However, an accident scenario has been postulated for the release of UF₆ from the 300 Complex. The major concern of the postulated release of UF₆ is the hazards associated with chemical toxicity rather than radiation dose. The maximum exposed receptor is six hundred (600) feet downwind of the NFS site. The maximally exposed receptor would receive the following radiation and chemical doses: TEDE of 2.0 rem, CDE to the lung of 17 rem, a uranium intake of 0.18 milligrams (mg), and a hydrogen fluoride intake of 0.049 mg/m³ (one [1] hour exposure). At these levels the radiation dose would not require protective action measures in accordance with EPA Protective Action Guidelines and uranium toxicity would not exceed the public exposure levels of ten (10) mg for soluble uranium intake. Hydrogen fluoride would not exceed the public exposure limit of twenty-five (25) mg/m³ for a thirty (30) minute period. No acute health effects to off-site individuals exists from a release of this nature.

*UF₆ recep
only 600
downwind
cf p. 2-1
where calc
was 656'*

2.1.3 Major Fires

A major fire is defined as a fire which cannot be reasonably controlled by local personnel and equipment, and/or, may impair radiological and chemical safety. The occurrence of a major fire at the NFS facility which could result in a significant radiological and chemical release to the environment is highly unlikely. All processing facilities are rated non-combustible. Combustible materials are restricted and electrical and heating equipment are carefully maintained. Automatic fire suppression systems are used in areas with high fire

*Haha!
"Electrical
... equipment
... catch
maintained"*

Appendix 12



NORTHERN
ARIZONA
UNIVERSITY

November 11, 2010

**INTERIM REPORT: Results for Isotopic Studies of Uranium in Environmental Samples
from the Vicinity of the Nuclear Fuel Services Facility, Erwin, TN**

Prepared by: Michael E. Ketterer, PhD, Professor, Chemistry and Biochemistry, Box 5698,
Northern Arizona University, Flagstaff AZ 86011-5698

Executive Summary: A study is currently being conducted to determine uranium "signatures" in environmental media (water, soil, aquatic sediments, and biota) near the Nuclear Fuel Services (NFS) facility in Erwin, Tennessee. The overall purpose of the work is to determine the extent to which uranium (U) and related contaminants have been dispersed off-site. The study has involved collection of environmental samples from publicly accessible locations near NFS, followed by laboratory analyses of these samples.

The results discussed herein clearly indicate the presence of enriched uranium, originating from the NFS, in water and sediment samples. The NFS-derived U is present in water and sediments relatively far downstream at Davy Crockett Lake and even past the Davy Crockett Dam. It not been possible to accurately estimate the total quantities of enriched U present in Davy Crockett Lake, though these quantities are likely to be very considerable. The results demonstrate that U-contaminated water containing enriched U is being discharged in apparent violation of NPDES Permit No. TN0002038. The results also demonstrate the entry of groundwater discharges of NFS-derived enriched U into the surface waters, and point to serious questions about the scope/extent of groundwater contamination near the NFS facility.

Appendix 12 -- continued

Purpose. A study is being conducted of uranium “signatures” in environmental media (water, soil, aquatic sediments, and biota) near the Nuclear Fuel Services (NFS) facility in Erwin, Tennessee. The overall purpose of the work is to determine the extent to which uranium (U) and related contaminants have been dispersed off-site. The study has involved collection of environmental samples from publicly-accessible locations near NFS, followed by laboratory analyses of these samples. Mass spectrometry, a well-established analytical technique, has been used to measure relative numbers of atoms for different isotopes (nuclear forms) of U. The results from mass spectrometry are used to compare U found in the environment vs. its known/expected isotopic composition in Nature, in order to evaluate whether naturally occurring U is being mixed with U from other sources that are not naturally occurring. This study is ongoing, and complete results are not yet available, given the open-ended scope/magnitude of the question, and the absence of publicly available information regarding environmental contamination and releases from a facility that has been operating for more than 50 years.

Scope: The results presented in this report are intended to be of a *demonstrative* nature, and do not necessarily reflect a complete set of all results that have been obtained to date. This report emphasizes these ratios as “signatures” of the presence of U from the NFS, without attempting to evaluate or interpret the total amounts or concentrations of U present in the environmental media. Though the concentrations of U present in the environment are of interest, and the total quantities of NFS-derived U present in the environment is an important concern, these data and interpretations thereof are beyond the scope of this interim report. These questions will be addressed in the future as part of ongoing work.

Background: Uranium isotopes. Uranium (U) has four different isotopes (nuclear forms) that occur in detectable quantities in Nature. The chemical behavior of these isotopes is essentially identical; the different isotopes are designated by their mass numbers. The mass number (a) is the sum of the number of protons (p) and neutrons (n) present in the nucleus of the U atom, and isotopes are designated by the element symbol with the mass number being written as a superscript on the left side of the element symbol: ${}^a\text{U}$. All U atoms have $p = 92$. The four isotopes that occur in detectable quantities in Nature are ${}^{234}\text{U}$, ${}^{235}\text{U}$, ${}^{236}\text{U}$, and ${}^{238}\text{U}$. Each of these isotopes has different nuclear properties (half-life, decay energy, and susceptibility to fission).

Uranium occurs in Nature, and is expected to be ubiquitous in water, soil, sediment, and the biosphere. The isotopes ${}^{235}\text{U}$ and ${}^{238}\text{U}$ are primordial; they have been present since the solar system was accreted. The isotope ${}^{236}\text{U}$ is present in very small amounts in Nature as a result of spontaneous fission processes of other U isotopes, followed by neutron capture of ${}^{235}\text{U}$. The isotope ${}^{234}\text{U}$ is present in small amounts in Nature as a continuously produced decay product in the ${}^{238}\text{U}$ decay series. The relative proportions of ${}^{234}\text{U}$, ${}^{235}\text{U}$, ${}^{236}\text{U}$, and ${}^{238}\text{U}$ present in Nature are fairly constant and predictable. ${}^{238}\text{U}$ is the most abundant isotope, and it is convenient to express the isotope composition of U as “ratios” or “isotope ratios”, that is, as ratios of numbers of atoms. Examples of ratios are ${}^{234}\text{U}/{}^{238}\text{U}$, ${}^{235}\text{U}/{}^{238}\text{U}$, and ${}^{236}\text{U}/{}^{238}\text{U}$, discussed in this report.

Processes related to the nuclear fuel cycle can produce U of altered isotope composition. “Enriched” U refers to U with a *higher* ${}^{235}\text{U}/{}^{238}\text{U}$ atom ratio than the naturally occurring ratio, and “depleted” refers to U with a *lower* ${}^{235}\text{U}/{}^{238}\text{U}$ atom ratio than the naturally occurring ratio. In the enrichment process, the lighter isotopes are selectively concentrated, with the objective of preparing a material of enhanced ${}^{235}\text{U}$ content for use as a nuclear reactor fuel or a fission weapon device. The enrichment process also enhances the ${}^{234}\text{U}$ content, and ${}^{234}\text{U}/{}^{238}\text{U}$ is higher

Appendix 12 -- continued

than the typical values found in Nature. Similarly, the enrichment process also produces "tails" from which most of the ^{235}U has been removed (depleted U). Depleted U also has lower $^{234}\text{U}/^{238}\text{U}$ than naturally occurring U.

Some samples of enriched or depleted U also contain readily detectable amounts of ^{236}U ; this isotope usually indicates the presence of U that has been previously irradiated by neutrons in a nuclear reactor. During the Cold War era, the US Government was concerned with an apparent shortage of U, and much of the U introduced into the nuclear fuel cycle had been recovered from plutonium production reactors, referred to as "recycled" U. Most samples of depleted and enriched U contain at least some ^{236}U introduced from previous blending of recycled U.

The following compares the U ratios expected in Nature vs. "enriched" and "depleted" U:

Type of Uranium	$^{234}\text{U}/^{238}\text{U}$	$^{235}\text{U}/^{238}\text{U}$	$^{236}\text{U}/^{238}\text{U}$
Naturally occurring	~ 0.000055 (a)	0.0072527 (b)	< 0.000000001 (c)
Enriched U	> 0.000055	> 0.0072527	Up to ~ 0.01
Depleted U	< 0.000055	< 0.0072527 (d)	~ 0.00003 typical

(a) The ratio between ^{234}U and ^{238}U is variable in Nature due to disequilibria in open systems present in the Earth surface environment. (b) This ratio is essentially constant in Nature, and has only been shown to vary by ~ 1-2 parts per thousand relative as a result of natural fractionation processes. A few exceptional naturally occurring situations where $^{235}\text{U}/^{238}\text{U}$ differs, such as the Oklo reactor, have also been identified. (c) The highest concentrations of ^{236}U in Nature are found in U ores, with $^{236}\text{U}/^{238}\text{U} \sim 10^{-10}$ being typical. Natural samples of non-ore materials are expected to contain these or lower levels of ^{236}U .

When U of different isotope compositions is mixed, the resulting sample exhibits a ratio that reflects the isotope compositions of the different pure components, and the respective total number of U atoms originating from each source. As a hypothetical example of this, when varying amounts of an enriched U sample having $^{235}\text{U}/^{238}\text{U} = 0.05$ are mixed with naturally occurring U ($^{235}\text{U}/^{238}\text{U} = 0.0072527$), the resulting samples exhibit ratios of $0.0072527 < ^{235}\text{U}/^{238}\text{U} < 0.05$. In this situation, any detectable increase in $^{235}\text{U}/^{238}\text{U}$ above 0.0072527, outside of the ~ 1-2 part per thousand relative deviation expected in Nature, is clear and incontrovertible evidence for the presence of some U in the sample derived from the enriched source. Analogous mixing behavior occurs for the $^{234}\text{U}/^{238}\text{U}$ and $^{236}\text{U}/^{238}\text{U}$ ratios. The detection of *any* measurable $^{236}\text{U}/^{238}\text{U}$ usually indicates the presence of enriched or depleted U, from a recycled U component (previously irradiated in a reactor), though small amounts of ^{236}U have apparently also been produced via nuclear weapons testing.

Owing to their value as tracers of mixing between U from different sources, the ratios $^{234}\text{U}/^{238}\text{U}$, $^{235}\text{U}/^{238}\text{U}$, and $^{236}\text{U}/^{238}\text{U}$ are all used herein as probes of mixing between naturally occurring U

Appendix 12 -- continued

and enriched U derived from the NFS facility. Any positive deviation in $^{235}\text{U}/^{238}\text{U}$ vs. Nature, and any detectable $^{236}\text{U}/^{238}\text{U}$ are interpreted in this manner, absent the existence of any other plausible sources of anthropogenic U.

Samples and Analyses. This interim report discusses U signature results from the following categories of samples: A) surface water from the Nolichucky River and its tributaries in the vicinity of the NFS facility; B) wastewater discharges and solid residue from the NPDES-permitted outfall to the Nolichucky River at Mile 94.6; and C) sediments from the Nolichucky River and its tributaries. Ongoing work will address other types of environmental samples.

Grab samples of water have been collected in 125 mL glass jars or 50 mL polypropylene test tubes. Grab samples of aquatic sediments have been collected using trowels, coring tubes, and plastic pipes. All sampling activities were conducted by the author, his undergraduate student (Kara M. Saaty), and collaborators from the local community.

Samples were prepared by appropriate laboratory procedures, as required, and were analyzed by the technique of inductively coupled plasma mass spectrometry (ICPMS). The facilities at Northern Arizona University were used in this study. The author has 22 years experience in the use of ICPMS in environmental samples and ratio measurements, and has 14 years experience on using ICPMS in studies of U in environmental media. Details on lab procedures will be discussed in future reports.

Results: Surface Water. Results are tabulated below for selected surface water samples collected at the indicated locations. Additional site descriptions will be discussed in future reports. The numbers in parentheses adjacent to the reported ratios are the uncertainties in the measured ratios (\pm one standard deviation); thus, 0.00012(1) should be read as 0.00012 ± 0.00001 .

It is evident that *all* of these samples, with the exception of ER-19, exhibit $^{235}\text{U}/^{238}\text{U}$ ratios exceeding the naturally occurring value of 0.0072527. It is beyond any reasonable doubt that the water in the Old Nolichucky River channel (adjacent to the Erwin Linear Trail) and North Indian Creek contain contributions from "enriched" U, as these samples exhibit $^{235}\text{U}/^{238}\text{U} > 0.01$, a finding that could only be produced via mixing of naturally occurring and "enriched" U. The source of the enriched U is clearly the NFS facility. The enriched U-contaminated water is most likely entering the surface waters through multiple routes, including non-point source surface runoff, and subterranean discharge. One subterranean discharge point, referred to locally as Whaley Spring (ER-4), was located and specifically sampled; this water could be readily identified by its lower temperature vs. surface waters at the time of sampling. The samples exhibiting elevated $^{235}\text{U}/^{238}\text{U} > 0.01$ also exhibit detectable $^{236}\text{U}/^{238}\text{U}$ ratios.

The mixing between naturally occurring and enriched U is also observable in the Nolichucky River, though not at location ER-19 (indistinguishable from Nature). This category of samples includes those from Davy Crockett Lake (DC-11, DC-18, DC-20), the spillway below the Davy Crockett Dam (DC-21), and an additional location (TW-5) several km downstream of Davy Crockett Dam. Note that detectable ^{236}U is also present in some of these samples, though a statement that it is "not detectable" does not indicate absence of ^{236}U (it could not be measured

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under the analytical conditions employed, though ^{236}U possibly could still be measured using other conditions). One location in the Nolichucky River (ER-32) also exhibits an enriched U signature. *The only plausible interpretation for these findings is that the NFS facility is the source of the enriched U component.* The NFS enriched U is most likely present in the downstream Nolichucky River samples through several entry routes, including the NPDES permitted outfall at River Mile 94.6, and the subterranean discharges. An enriched U signature is also evident in Greeneville tap water (Samples GVL-1w and GVL-7w), from a time series of tap water samples collected between August 26 and September 16, 2010). No evidence to date indicates any U concentrations exceeding 30 $\mu\text{g/L}$ (the drinking water standard set by US EPA) in any surface or tap water samples.

Sample Name	Location	$^{234}\text{U}/^{238}\text{U}$	$^{235}\text{U}/^{238}\text{U}$	$^{236}\text{U}/^{238}\text{U}$
ER-2	Wooden bridge area, linear trail	0.00020(1)	0.01256(5)	0.000054(4)
ER-4	Whaley Spring - subterranean seep	0.00021(1)	0.01681(6)	0.000065(2)
ER-10	Old Nolichucky channel	0.00021(1)	0.01505(6)	0.000065(2)
ER-19	Nolichucky River, ~ Mile 94	0.00013(2)	0.00740(15)	Not detectable
ER-28	N. Indian Cr., downstream Martin Cr.	0.00021(1)	0.01329(5)	0.000048(4)
ER-32	Nolichucky River, ~ Mile 90	0.00011(1)	0.00854(13)	Not detectable
DC-11	Davy Crockett Lake, 8/11/2010	0.00012(1)	0.0087(1)	Not detectable
DC-18	Davy Crockett Lake, 9/17/2010	0.00009(1)	0.00821(4)	0.000014(1)
DC-20	Davy Crockett Lake, 9/17/2010	0.00012(1)	0.00762(1)	0.000011(1)
DC-21	DC Lake spillway, 9/17/2010	0.00012(1)	0.00858(11)	0.000017(4)
TW-5	Nolichucky River, ~ Mile 41	0.00013(1)	0.000834(19)	Not detectable
GVL-1w	Greeneville tap water	0.00016(3)	0.00857(8)	Not detectable
GVL-7w	Greeneville tap water	0.00023(6)	0.00819(27)	Not detectable
Natural U signatures		~ 0.000055	0.0072527	< 10⁻⁹

Results: Aquatic Sediments. Results are tabulated below for selected aquatic samples collected at the indicated locations. Additional site descriptions will be discussed in future reports. The numbers in parentheses adjacent to the reported ratios are the uncertainties in the measured ratios (\pm one standard deviation); thus, 0.000077(5) should be read as 0.000077 ± 0.000005 .

In a manner similar to discussed above, most of these samples demonstrate, unequivocally and beyond any reasonable doubt, that there is enriched U present in the environment. The various ratios result from mixing between naturally occurring U and enriched U from the NFS facility. Evidence for the presence of enriched U (derived from NFS) has been observed as far downstream as Davy Crockett Lake, using a series of surface grab samples collected at different points within the lake (DC-1 through DC-16 below). The presence of U with a very high $^{235}\text{U}/^{238}\text{U}$ is observed in the Nolichucky River within the immediate vicinity of the NFS NPDES outfall at River Mile 94.6 (Samples ER-12 and ER-13), and in solid material scraped from within the end of the plastic outfall pipe itself (Sample NPDES). The Old Nolichucky River Channel, in the vicinity of the Erwin Linear Trail and close to the boundary of the NFS facility, contains sediments contaminated with enriched U from the NFS facility (Samples ER-3, ER-5, and ER-14). Sediment from North Indian Creek (ER-29) also has an enriched U signature. Notably,

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however, sediments collected upstream of the NFS facility, in Martin Creek and in the Nolichucky River, exhibit U signatures that are not significantly different from Nature.

In many of the samples containing enriched U (as evidenced by $^{235}\text{U}/^{238}\text{U} > 0.0072527$), correlated changes in $^{234}\text{U}/^{238}\text{U}$ and detectable $^{236}\text{U}/^{238}\text{U}$ ratios are evident. The inability to measure $^{236}\text{U}/^{238}\text{U}$ (under the analytical conditions employed) *does not* imply that NFS-derived ^{236}U is absent in Davy Crockett Lake; the possible presence of NFS-derived ^{236}U therein is currently being addressed by additional analytical work in progress.

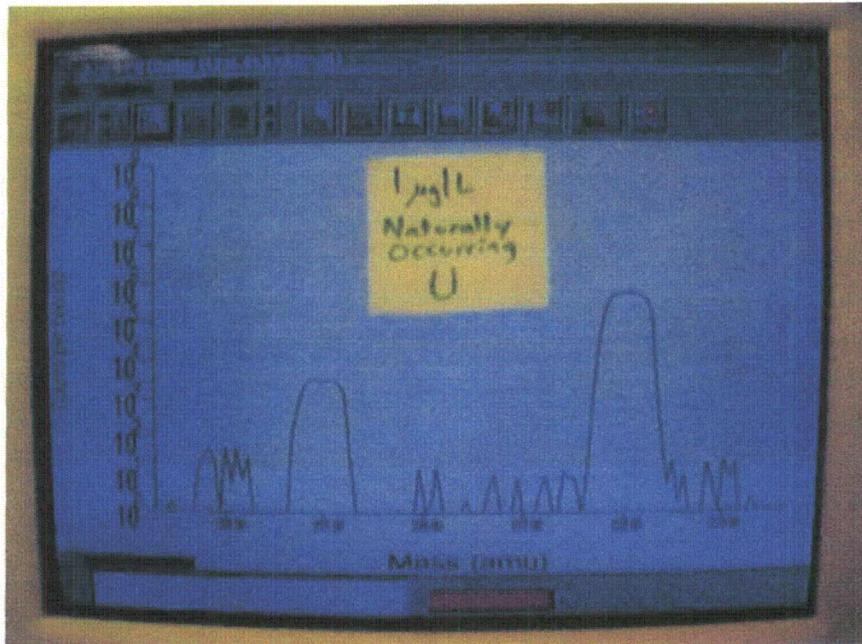
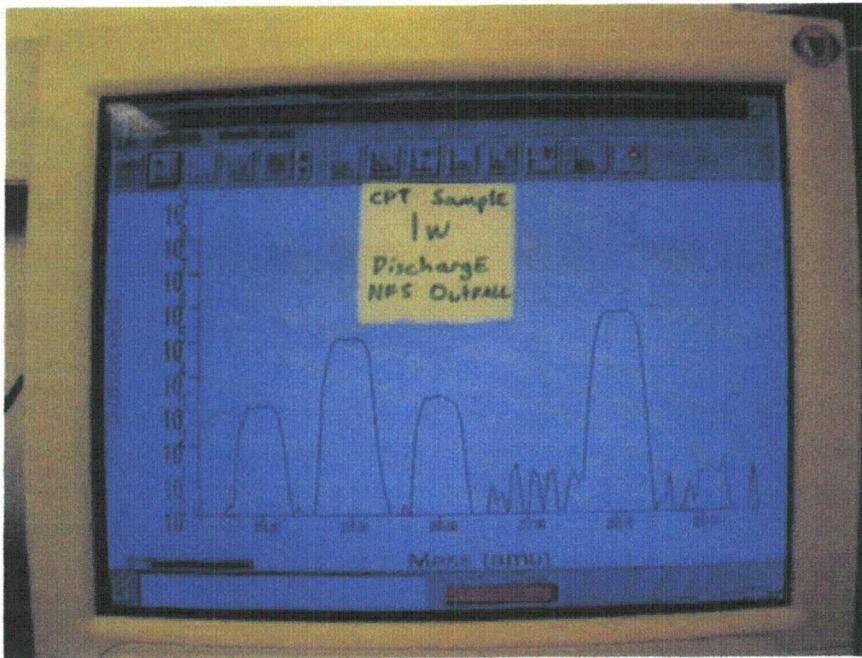
Sample Name	Location	$^{234}\text{U}/^{238}\text{U}$	$^{235}\text{U}/^{238}\text{U}$	$^{236}\text{U}/^{238}\text{U}$
DC-1	Davy Crockett Lake sediment	0.000077(5)	0.00839(13)	Not detectable
DC-2	Davy Crockett Lake sediment	0.000075(1)	0.00919(4)	Not detectable
DC-4	Davy Crockett Lake sediment	0.000076(6)	0.00861(3)	Not detectable
DC-5	Davy Crockett Lake sediment	0.000077(3)	0.00841(2)	Not detectable
DC-8	Davy Crockett Lake sediment	0.000063(1)	0.00842(3)	Not detectable
DC-9	Davy Crockett Lake sediment	0.000076(3)	0.00880(5)	Not detectable
DC-10	Davy Crockett Lake sediment	0.000092(6)	0.00990(27)	Not detectable
DC-15	Davy Crockett Lake sediment	0.000070(2)	0.00797(1)	Not detectable
DC-16	Davy Crockett Lake sediment	0.000088(4)	0.00921(4)	Not detectable
ER-3	Sediment, Old Nolichucky River channel	0.000194(4)	0.0176(1)	0.000069(7)
ER-5	Sediment, Old Nolichucky River channel	0.000122(8)	0.0136(1)	0.000024(3)
ER-12	Bank sediment, near NPDES outfall	0.000319(5)	0.0255(1)	0.000094(7)
ER-13	Bank sediment, near NPDES outfall	0.000335(2)	0.0273(2)	0.000981(2)
ER-14	Sediment, Old Nolichucky River channel	0.000976(31)	0.092(4)	0.000228(10)
ER-29	Sediment, Indian Creek	0.000134(4)	0.0115(1)	0.000026(1)
NPDES	Sediment from inside NPDES outfall	0.00373(4)	0.2742(2)	0.00684(31)
ER-38	Martin Creek sediment, upstream	0.000067(2)	0.00716(10)	Not detectable
Noli-Up	Nolichucky River sediment, upstream	0.000057(2)	0.00710(6)	Not detectable
Natural U signatures		~ 0.000055	0.0072527	< 10 ⁻⁹

Results: NPDES Outfall. Water from the NPDES outfall was collected at several points in time, and all of these samples exhibit U with very high $^{235}\text{U}/^{238}\text{U} \gg 0.0072527$. As an example, water collected on July 13, 2010 exhibited $^{235}\text{U}/^{238}\text{U}$ of 0.60 and grossly elevated $^{234}\text{U}/^{238}\text{U}$ and $^{236}\text{U}/^{238}\text{U}$ ratios as well. These results indicate that the waters being discharged from the outfall are in clear violation of NPDES Permit No. TN0002038, which specifically regulates and permits releases of "Uranium, Natural, Total". The U being discharged from this outfall is not naturally occurring U as is required by the Permit. The sediment obtained from within the discharge pipe itself (labeled "NPDES" in the tabulated sediment results) and from the Nolichucky River near the outfall (ER-12, ER-13) demonstrate cumulative releases of similar material in the past, though the timeframe is undefined.

The contrast between U from the NPDES outfall (water sample of May 28, 2010) and naturally occurring U is immediately obvious in the mass spectra depicted below. These plots show (on a logarithmic vertical scale) the relative numbers of atoms of each mass. Note that the naturally occurring U has no detectable ^{236}U , and relative amounts of ^{234}U and ^{235}U vs. ^{238}U are congruent

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with the natural signatures. In contrast, the signatures for the NPDES outfall are vastly different and clearly underscore the presence of enriched U.

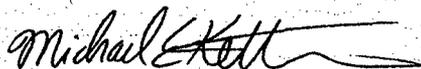


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Summary. The results discussed herein clearly indicate the presence of enriched uranium, originating from the NFS, in environmental media. The NFS-derived U is present in water and sediments relatively far downstream at Davy Crockett Lake and even past the Davy Crockett Dam. It has not been possible to accurately estimate the total quantities of enriched U present in Davy Crockett Lake, though it is considered important to address this, using an appropriate series of piston cores. The results demonstrate that U-contaminated water containing enriched U is being discharged in apparent violation of NPDES Permit No. TN0002038. The results also demonstrate the entry of groundwater discharges of NFS-derived enriched U into the surface waters, and point to serious questions about the scope/extent of groundwater contamination near the NFS facility.

This work is ongoing and additional results will be presented as interim reports and a final report in the future.

Submitted by:



Michael E. Ketterer, PhD

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