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AGENDA, OVERHEADS AND HANDOUT FROM THE FERNALD CITIZENS TASK FORCE MEETING OF APRIL 9, 1994

04/09/94

TASK FORCE/PUBLIC
37
HANDOUTS

FERNALD CITIZENS TASK FORCE

A U.S. DEPARTMENT OF ENERGY SITE-SPECIFIC ADVISORY BOARD

Chair:
John S. Applegate

Members:
James Bierer
Marvin Clawson
Lisa Crawford
Pam Dunn
Dr. Constance Fox
Guy Guckenberger
Darryl Huff
Jerry Monahan
Tom B. Rentschler
Robert Tabor
Warren E. Strunk
Thomas Wagner
Dr. Gene Willeke

Alternates:
Russ Beckner
Jackie Embry

Ex Officio:
J. Phillip Hamric
Graham Mitchell
Jim Saric

AGENDA

April 9, 1994

1. *Time and Place*

The next regularly scheduled meeting of the Task Force will be on Saturday, April 9, 1994, from 8:30 a.m. to noon, at the AmeriSuites in Forest Park, Ohio. We will begin the meeting promptly at 8:30.

2. *Subjects*

8:00	Continental breakfast (optional)
8:30	Call to order
	Approval of minutes
	Chair's Remarks
	Status of action items and initiatives
8:50	Briefing on DOE's baseline (Jack Craig)
9:00	New information in the toolbox (Doug Sarno)
10:00	Break
10:15	Review of available technology options (Doug Sarno)
11:40	Opportunity for public participation
11:50	New business
	Wrap-up
	Subjects for next meeting
12:00	Adjourn
	Lunch (optional)

3. *Documents*

The documents relevant to the meeting's subjects are being developed by the Task Force staff. They will be distributed at the meeting.

4. *New Materials for Briefing Books (enclosed)*

None.

P. O. BOX 544 · ROSS, OHIO 45061 513·648·6478

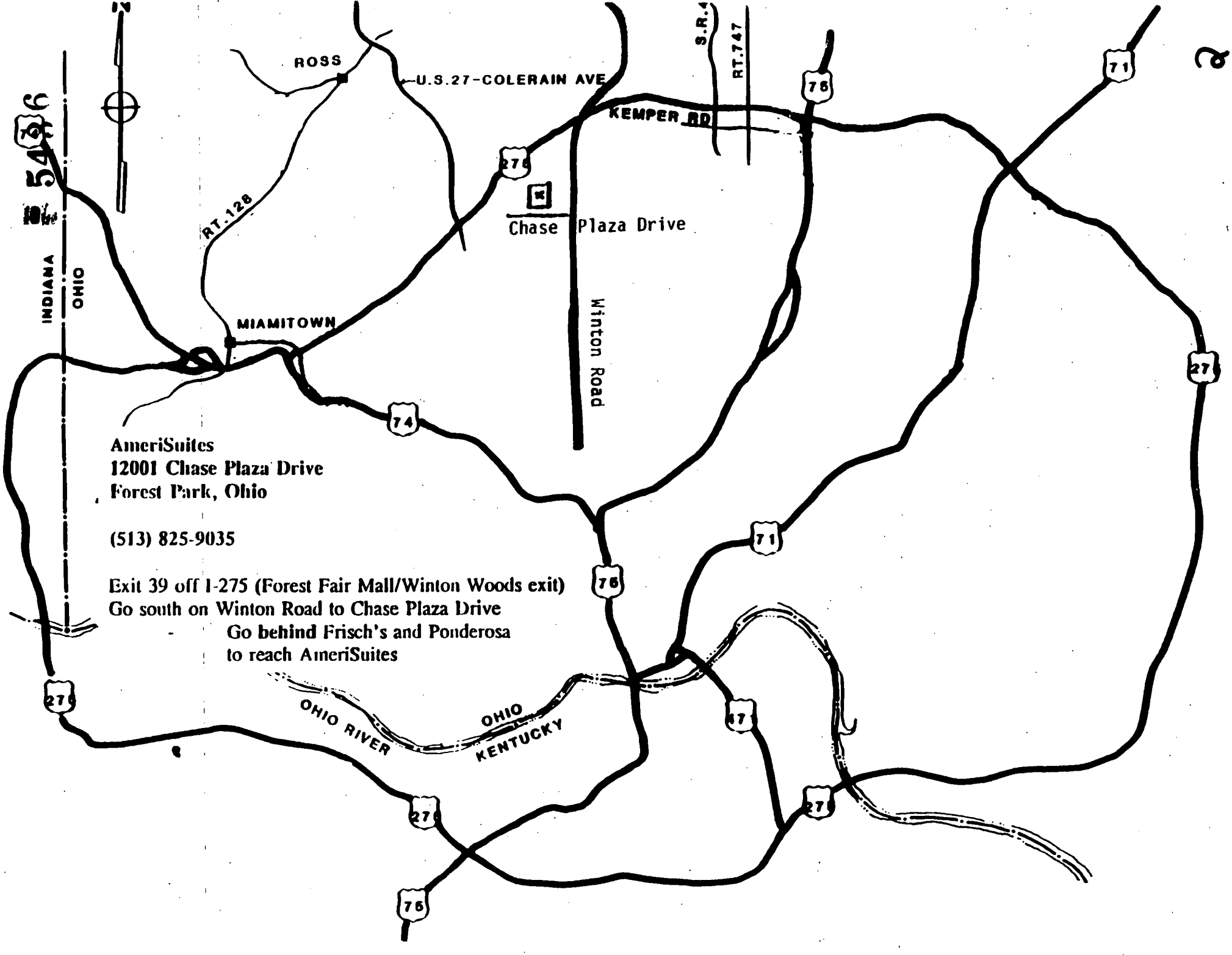
5. *Chair's Announcements*

The Task Force and FRESH are sponsoring a workshop on Envirocare, which is a permitted commercial disposal facility located in Clive, Utah. Envirocare is the country's first licensed facility for the disposal of low activity radioactive and mixed wastes. The workshop is scheduled for 7 p.m. on April 7 at the Meadowbrook in Ross, Ohio. The public also is encouraged to attend.

Also, for those of you who may not have heard the good news, Graham Mitchell has been promoted to chief of the Office of Federal Facilities Oversight for Ohio EPA. Graham will continue to serve as the state's representative on the Task Force. Tom Schneider takes over as Ohio EPA's lead coordinator for Fernald, while Laura Hegge will continue with public outreach and technical support for Fernald.

6. *Other Meetings of Interest (calendars enclosed)*

- Natural Resources Trusteeship Workshop, 7 p.m. on April 12, 1994, Meadowbrook, Ross, Ohio.



AmeriSuites
12001 Chase Plaza Drive
Forest Park, Ohio

(513) 825-9035

Exit 39 off I-275 (Forest Fair Mall/Winton Woods exit)
Go south on Winton Road to Chase Plaza Drive
Go behind Frisch's and Ponderosa
to reach AmeriSuites

FERNALD CITIZEN TASK FORCE
CHART OF CONVERSION FACTORS

1 milligram per kilogram (mg/kg) = 1 part per million (ppm) =
1 microgram per gram (μg/g)

1 μg uranium/g soil = 1 ppm = 0.67 pCi/g

1 microgram per kilogram (μg/kg) = 1 part per billion (ppb) =
1 nanogram per gram (ng/g)

1 milligram per liter (mg/L) = 1 part per million (ppm)

1 microgram per liter (μg/L) = 1 part per billion (ppb)

1 microgram uranium per liter water = .67 pCi/L

Scientific Notation: very large and very small numbers are often expressed in scientific, or exponential, notation. The exponent identifies how many times the base number is multiplied by itself. In the example 10^2, 10 is the base number and 2 is the exponent. Therefore, 10^2 means multiply 10 by 10 which equals 100. An easy way to remember exponential notation (in base 10) is to write a one followed by the number of zeros equal to the exponent. For example, 10^2 would be expressed as 1 followed by 2 zeros, or 100. 10^6 would be written as a 1 followed by 6 zeros or 1,000,000.

Metric System unit prefixes: prefixes are often employed as substitutes for exponential notation (e.g., k, or kilo = 10^3 = 10 X 10 X 10 = 1000). Most commonly used prefixes are multiples of 1000, or 10^3. We can relate these prefixes to simple fractions. That is, if the prefix is positive, the in the numerator(the top number of a fraction), the multiple is greater than one and the exponent is positive (e.g. 10^3 = 1 X 1000/1). If the prefix relates to the denominator, the multiple is less than 1 and the exponent is negative (e.g., 10^{-3} = 1 X 1/1000 or 0.001).

TABLE OF METRIC SYSTEM PREFIXES

PREFIX	SYMBOL	EXPONENTIAL NOTATION	DECIMAL EQUIVALENT
mega-	M	10^6	1,000,000
kilo-	k	10^3	1,000
centi-	c	10^{-2}	0.01
milli-	m	10^{-3}	0.001
micro-	μ	10^{-6}	0.000001
nano-	n	10^{-9}	0.000000001
pico-	p	10^{-12}	0.000000000001

MAJOR CLEANUP COMPONENTS AT THE FEMP

COMPONENTS	DESCRIPTION	PATHWAYS AND CONTAMINANTS OF CONCERN[a]	LEADING REMEDIAL ALTERNATIVE
Pit Sludges (OU1)	Contents of waste pits 1 through 6 and the Clearwell plus cap and liner materials in direct contact with waste; sludges generated in the AWWT (similar characteristics to waste pit sludges)	Ingestion of water from the Great Miami River (GMR) Aquifer provides the largest contribution to overall risk for both carcinogens and chemical toxicants. The total carcinogenic risks are approximately 1 in 10 (10^{-1}) for all exposure routes. Ingestion of groundwater containing metals (arsenic) and ^{238}uranium contributes almost half of this receptor's total risk followed by external exposure to surface soils/pit materials and inhalation of dust. Uranium and thorium isotopes and arsenic are the major carcinogens for these exposure pathways. Other pathways with cancer risk exceeding 1 in 10,000 (10^{-4}) or hazard quotient greater than 1 include: ingestion of food affected by dust; direct contact with soils and pit materials; domestic and agricultural use of groundwater; and ingestion of meat and dairy products from cows grazed and watered on-site.[b]	Removal, treatment (thermal drying) and Off-site disposal at permitted facility
Flyash Piles (OU2)	OU2 consists of the following subunits: the Active Flyash Pile, South Field, Inactive Flyash Pile, lime sludge, and solid waste landfill	The highest total carcinogenic risk (RME on-property farmer) for all of Operable Unit 2 is about 1 in 270 (3.7×10^{-3}). The risks and hazards from OU2 result primarily from the three subunits which contribute most to the ground water contamination (i.e., Active Flyash Pile, South Field, and Inactive Flyash Pile). The major pathway for the carcinogenic risk is soil containing ^{228}thorium, ^{228}radium, and beryllium. The second major pathway is ingestion of water from the Great Miami River Aquifer due to the presence of ^{238}uranium.[c]	Off-site disposal of Thorium- Radium contaminated materials and In-Situ or other on-site containment for low hazard waste
Total Soils (all OUs)	Contaminated soils and rubble amenable to or requiring decontamination by treatments such as soil washing prior to disposition (i.e., Soil under OU1 waste pits, waste and contaminated soil excavated from OU2, soil and rubble from OU3, soil from OU4 and OU5)	If this material is treated as proposed, the primary risk will be from airborne dust generated during excavation. The contaminants of concern in soils under the waste pits should be the same as those which leach into the GMR aquifer(i.e., arsenic and uranium). For OU2 wastes, the most likely contaminants of concern are ^{228}thorium, ^{228}radium, ^{238}uranium, arsenic, and beryllium. Soil and rubble from OU3 is not well characterized at this time. Contaminants of concern will probably include radium, thorium, uranium, and miscellaneous organics. For OU4 and 5 soils, cancer and noncancer risk are highest to the on-property farmer. The cancer risk for this individual is about 1 in 15 (6.5×10^{-2}) with uranium and arsenic being the contaminants of concern. The primary chemical toxicant is also uranium with a Hazard Index of 270.	Excavation, Soil Washing, On/Off Site Disposal

[a] The information in this column is taken the exposure assessment for the on-property reasonable maximum exposure (RME) resident farmer
[b] REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 1, Volume 5, Appendix E, section E.7.1
[c] REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 2, Volume 4, Section 6.3.6, Operable Unit 2 Cumulative Risk

MAJOR CLEANUP COMPONENTS AT THE FEMP

COMPONENTS	DESCRIPTION	PATHWAYS AND CONTAMINANTS OF CONCERN[a]	LEADING REMEDIAL ALTERNATIVE
K-65 Wastes (OU4)	Silo contents, contaminated bentonite clay inside silos used to reduce radon emissions, and decant sump sludge	The Incremental Lifetime Cancer Risk (ILCR) to the RME on-property farmer is 100% (greater than 1). The risk is primarily attributable to ^{226}radium and ^{228}thorium in soil from the external radiation exposure route. The risks contributed by air (about 1 in 20 or 5×10^{-2}) and groundwater (about 1 in 14,000 or 7×10^{-5}) are minor in comparison to soil.[d]	Removal, vitrification, off-site disposal.
Structural Debris (OU3 and OU4)	OU4 structural debris (silo 4) , OU3 structural debris from Interim Remedial Action (porous, consolidated material not easily decontaminated)	Detailed risk assessment information will not be available until the draft Remedial Investigation (RI) Report is completed on 03/13/96. The major contaminant by volume will be uranium. The prohibition on the disposal of mixed waste (hazardous and radioactive) will require thorough characterization for RCRA hazardous wastes. Short term increases in risk to off-site populations during remediation would occur via air and surface water pathways.[e]	Demolition, removal, on-site storage[c]
Transite (OU3)	OU3 structural debris	Transite is an asbestos-containing material. Friable (loose) asbestos would pose the greatest risk to off-site receptors as an airborne contaminant.	Dismantlement, interim storage, on-site disposal
Misc. equipment (OU3)	OU3 Safe Shutdown program	This component is to be secured and place in storage/disposal. Radioactive contamination concentrations may be high resulting in risk from direct radiation. Some components may be associated with hazardous waste management units.	Dismantlement, Interim storage, on-site disposal
Metals (OU3)	OU3 structural debris and recyclable materials	This component poses some risk to off-site populations during dismantlement of structures. Additional risk may be attributed to any secondary waste generated during decontamination. After decontamination, this component will be suitable for recycling.	Dismantlement, Interim storage, on-site disposal

[a] The information in this column is taken the exposure assessment for the on-property reasonable maximum exposure (RME) resident farmer
[b] REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 1, Volume 5, Appendix E, section E.7.1
[c] REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 2, Volume 4, Section 6.3.6
[d] REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 4, Volume 3, Appendix D.7
[e] The OPERABLE UNIT 3 PROPOSED PLAN/ENVIRONMENTAL ASSESSMENT FOR INTERIM REMEDIAL ACTION contains some information on potential contaminants.

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APPROXIMATE WASTE VOLUMES AND POSSIBLE DISPOSITION (SOURCE: WASTE INFORMATION MANUAL - December 31, 1993)

COMPONENT	IN-PLACE VOLUME (yd^3)	TREATMENT METHOD	OFF-SITE DISPOSAL (cubic yds)[f]	OFF-SITE DISPOSAL (truckloads)[a]	ON-SITE STORAGE (cubic yds)	ON-SITE STORAGE (acres)[b]
Pit Sludges (OU1)	630,200[d]	dry	630,200[d]	25,208[d]	0	0
Flyash Piles (OU2)	167,350	cap	no change	0	167,350	6.5
Total Soils (all OUs)[g]	1,340,350	wash	278,550	11,142	1,061,800	41.14
K-65 Wastes (OU4)	13,990	vitrify	13,990	560	0	0
Structural Debris (OU3,OU4)	118,110	none	0	0	118,110	4.58
Transite (OU3)	1,500	none	0	0	1,500	0.06
Misc. equipment (OU3)	109,800	none	54,900	0	54,900	2.13
Metal (OU3)	7,700	recycle	7,700	308	0	0
TOTALS	2,387,000		983,340	37,138	1,403,660	47.91[e]

[a] assumes each truckload contains 25 cubic yards
[b] assumes 25,813 yds^3 per acre with waste stored 16 ft. high (except capped in-place waste material from OU2)
[c] includes the solid waste landfill, lime sludge ponds, active and inactive flyash piles
[d] includes AWWT sludge volume generated per year (not included in totals)
[e] does not include 6.5 acres of solid waste capped in-place (OU2)
[f] no credit for treatment volume reduction
[g] includes the portion of concrete and block to be washed prior to disposition

CHARACTERISTICS OF KEY FEMP CONTAMINANTS: RADIONUCLIDES

General Characteristics of Radiation: Chemical toxins must be taken into the body before any adverse health effects can occur. However, unlike chemical toxins, exposure to radiation may also occur even when the radioactive materials are outside the body. Radionuclides may also present risk from chemical toxicity, however the risk as carcinogens usually dominates risk assessments.

Alpha (α) Particles (radiation) outside the body cannot penetrate through the outer, dead, layer of skin so material that emits alpha radiation is only hazardous if taken into the body. However, once inside the body, alpha radiation poses a much higher risk than beta or gamma radiation.

Beta (β) Particles (radiation) can penetrate through the outer layer of skin and is capable of causing adverse health effects even when outside the body. Beta radiation is easily shielded (stopped) by any matter and cannot penetrate from outside the body to the internal organs. Therefore, beta radiation is a threat to external tissues such as the skin and eyes. Beta radiation is stopped rather easily even by air. It is nearly impossible for beta particles to travel more than 30 feet through the air.

Gamma (γ) Rays (radiation) have the characteristic of traveling long distances and penetrating deeply into matter. Gamma radiation can penetrate deep into body tissues and cause injury to internal organs. Radiation from the ^{238}uranium decay series is predominantly particulate (alpha and beta) with a relatively small percent abundance of gamma emitters.

Key Contaminant	Characterization of Threat	Half-life or Persistence	Background Levels[a]	Standards: Drinking Water	Standards: Soil/Other
Uranium	α emission: cancer of the lung and lymphoma; kidney toxicity	^{238}U = 4.5 billion years, decays to lead	^{238}U(+ 2 progeny) = 1.22 pCi per gram of soil	(Proposed)[b]: 20 pCi U per liter of water (29.9 parts per million)	
Thorium	α/γ emissions: Cancer of the bone and liver	^{228}Th = 1.91 years ^{232}Th = 14.1 billion years	^{228}Th = 1.43 pCi/g	(Current)[c]: 15 pCi gross alpha activity per liter of water (excluding Rn and U)	
Radium	α/γ emissions: cancer of skin and bones	^{226}Ra = 1602 years ^{228}Ra = 6.7 years	^{226}Ra (+5 progeny) = 1.45 pCi/g ^{228}Ra (+1 progeny) = 1.19 pCi/g	(Current) 5 pCi per liter total Radium. (Proposed) 20 pCi per liter each (^{226}Ra and ^{228}Ra)	Soil: 5 pCi total radium per gram (surface) and 15 pCi radium per gram (subsurface)[d]
Radon	α emission: cancer of the lungs	^{222}Rn = 3.8 days		(Proposed): 300 pCi radon per liter of water	Air: 20 pCi/-m^2-s emission rate per source[e](e.g., K-65 silos)

[a] Background levels in soil, 95th percentile: Proposed Plan for Remedial Actions at Operable Unit 4 (DOE/EIS-0195D) February 1994
[b] Proposed Maximum Contaminant Level - 56 FR (Federal Register) 33050, July 18, 1991
[c] Current Maximum Contaminant Level - 41 FR 28404, July 9, 1976
[d] 5 pCi/g averaged over the first 15 cm below the surface, 15 pCi/g averaged over any 15 cm depth greater than 15 cm below the surface, both limits apply to concentrations above background and are averaged over an area of 100 m^2.
[e] 40 CFR 61.190, Subpart Q - National Emission Standards for Radon Emissions from Department of Energy Facilities

CHARACTERISTICS OF KEY FEMP CONTAMINANTS: INORGANICS

General Characteristics of Chemical Toxins:

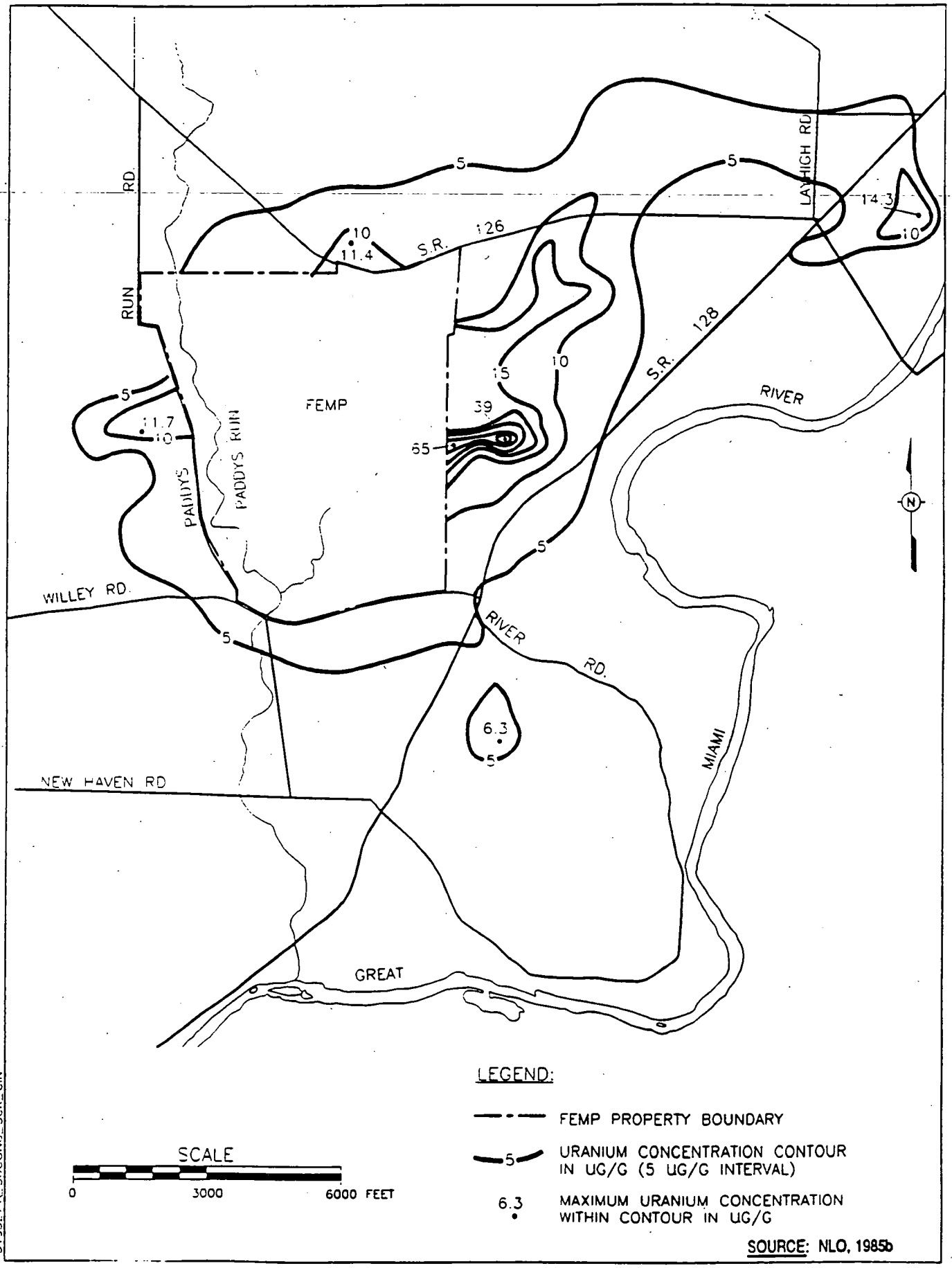
Chemical toxins must be taken into the body before any adverse health effects can occur. Chemicals may enter the body through inhalation, ingestion, injection, and by absorption through the skin. Types of interactions (additive, synergistic or antagonistic)between different chemicals have generally not been quantified, risk characterization does not consider antagonistic or synergistic effects and an assumption of additivity is made.

Key Contaminants	Characterization of Threat	Half-life or Persistence	Background Levels[a]	Legal Standards: Drinking Water	Legal Standards: Soil/Other
Arsenic	skin cancer	does not break down	8.45 mg/kg	(Current[c] - under review) 0.05 mg per liter (50 ppb)	
Beryllium	dermatitis, acute pneumonitis, probable human carcinogen	does not break down	0.6 mg/kg	(Current)[c] 0.004 mg per liter (4 ppb)	
Cadmium	kidney/liver toxicity	does not break down	0.82 mg/kg	(Current)[c] 0.005 mg per liter (5 ppb)	
Cobalt	allergen, pneumoconiosis	does not break down			

CHARACTERISTICS OF KEY FEMP CONTAMINANTS: ORGANICS

Key Contaminants	Characterization of Threat	Half-life or Persistence	Background Levels	Legal Standards: Drinking Water	Legal Standards: Soil/Other
Organics (e.g., PCB's, PAH's)	cancer of the skin and stomach	very persistent	0.00 mg/kg[f]	Chemical specific	

[a] Background levels in soil, 95th percentile: Proposed Plan for Remedial Actions at Operable Unit 4 (DOE/EIS-0195D) February 1994
[b] Proposed Maximum Contaminant Level - 56 FR (Federal Register) 33050, July 18, 1991
[c] Current Maximum Contaminant Level - 41 FR 28404, July 9, 1976
[d] 5 pCi/g averaged over the first 15 cm below the surface, 15 pCi/g averaged over any 15 cm depth greater than 15 cm below the surface, both limits apply to concentrations above background and are averaged over an area of 100 m^2.
[e] 40 CFR 61.190, Subpart Q - National Emission Standards for Radon Emissions from Department of Energy Facilities
[f] Polychlorinated biphenyl (PCB) background - Operable Unit 2 Feasibility Study,March 25, 1994 Draft



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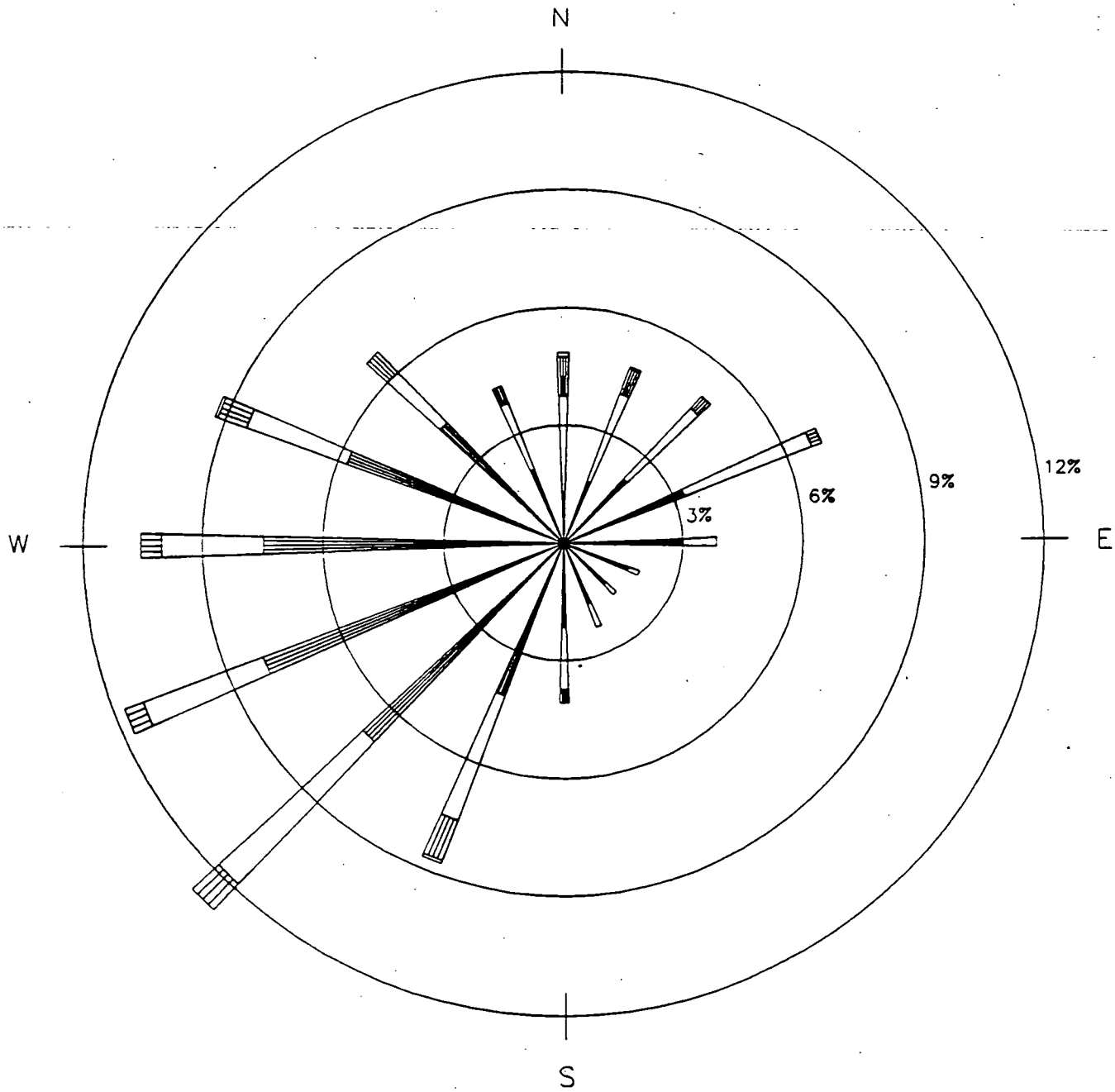
URANIUM CONCENTRATIONS IN SURFACE SOILS ADJACENT TO THE FEMP DURING 1984



WIND SPEED CLASS BOUNDARIES
(METERS/SECOND)

NOTES:

DIAGRAM OF THE FREQUENCY OF OCCURENCE FOR EACH WIND DIRECTION. WIND DIRECTION IS THE DIRECTION FROM WHICH THE WIND IS BLOWING. EXAMPLE – WIND IS BLOWING FROM THE NORTH 4.8 PERCENT OF THE TIME.

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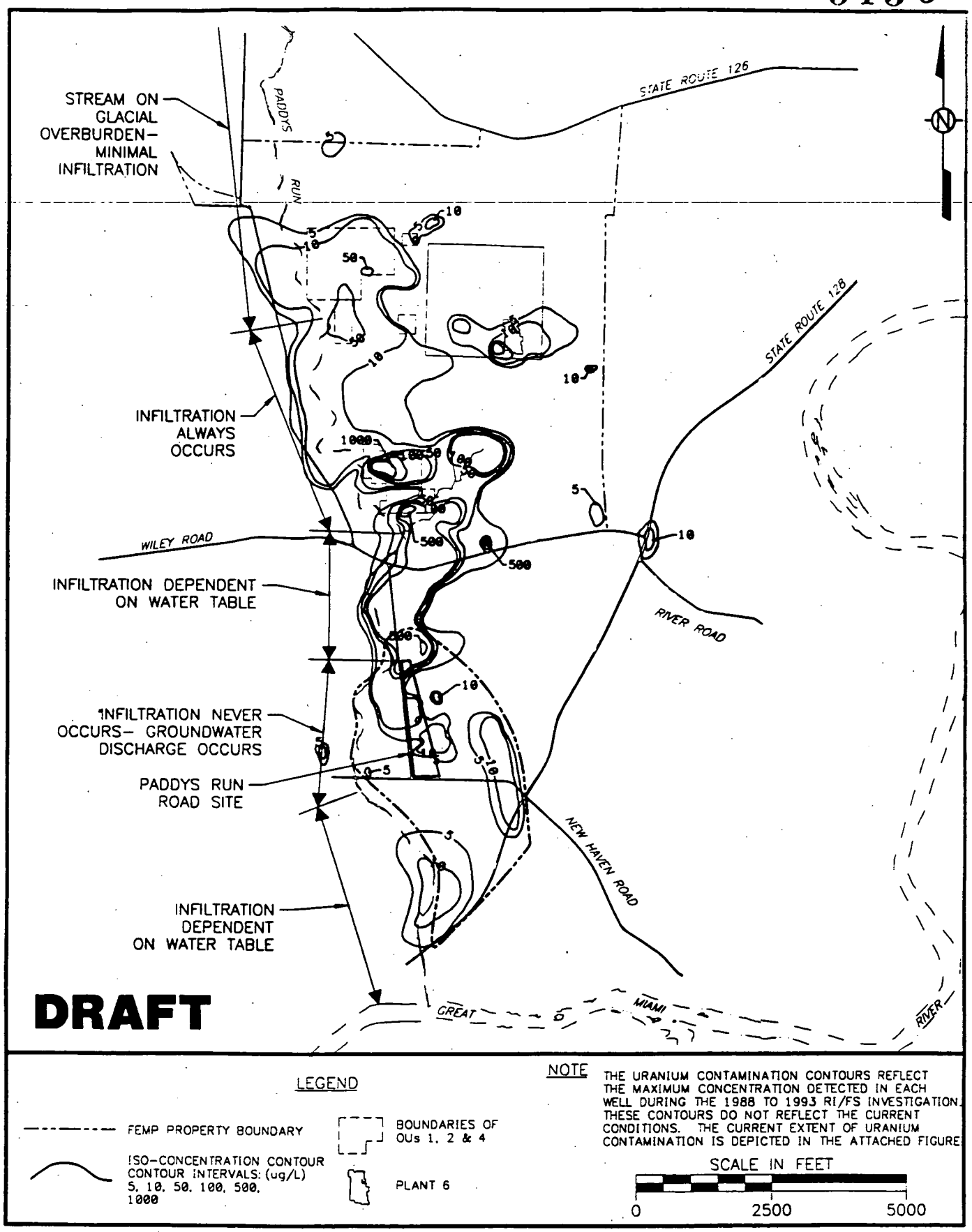
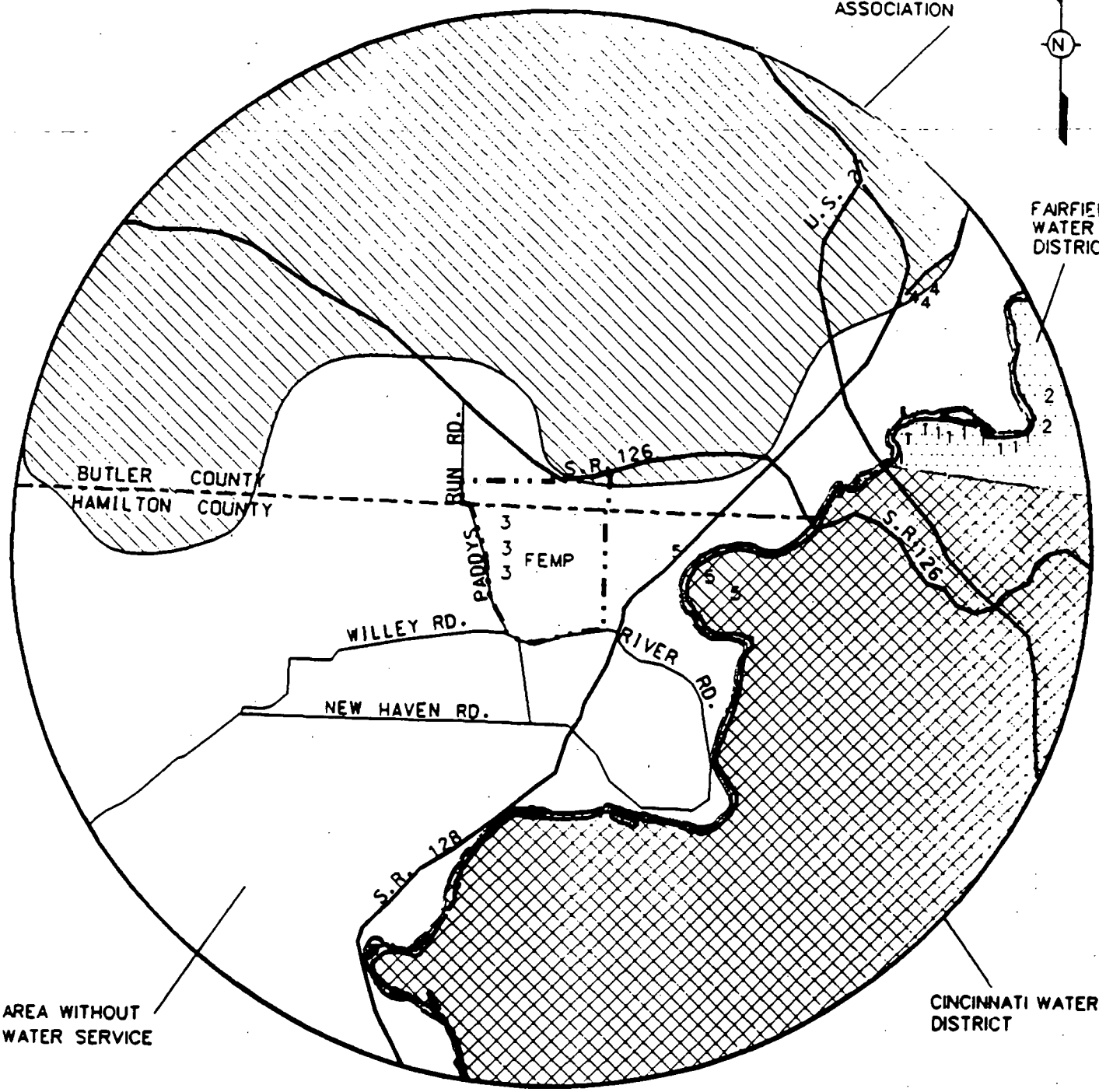
WIND ROSE FOR 10-METER LEVEL



TOTAL URANIUM CONTOURS BASED ON MAXIMUM OBSERVED IN TYPE 2 WELLS



NAME OF WATER USER	TYPE OF WATER SUPPLY	NUMBER OF PEOPLE SERVED
1. CINCINNATI BOLTON PLANT	MUNICIPAL	86,000
2. HAMILTON	MUNICIPAL	60,000
3. FEMP	NON-COMMUNITY	1,500
4. WATER ASSOCIATION	PUBLIC	25,800
5. SOUTHWESTERN OHIO	INDUSTRIAL	13 INDUSTRIES

SCALE

0 1.5 3 MILES

DATE: APRIL 7, 1984
REVISION: 0

MAJOR WATER USERS WITHIN A FIVE-MILE RADIUS OF THE FEMP

POPULATION - MEDIAN HOUSEHOLD INCOME

	Population			Median Household Income		
AREA	1980	1990	2010	1980	1990	2010
Morgan Township	4,076	4,972	6,000	$23,510	$39,247	$n/a
Crosby Township	n/a	3,000	3,600	$ n/a	$ n/a	$n/a
Ross Township	n/a	6,500	7,800	$ n/a	$ n/a	$n/a
5 mile radius	n/a	22,927	27,500	$ n/a	$ n/a	$n/a
Butler County	258,787	291,479	361,483	$30,963	$32,963	$n/a
Hamilton County	873,203	866,228	882,275	$27,581	$29,498	$n/a
OKI Region	1,660,257	1,744,124	1,946,386	$27,002	$30,936	$n/a

n/a - not available

The State populations are expected to continue to show more conservative rates of growth in comparison to the nation. Ohio growth rates will average 2% between 1990 & 2000 and drop to 1% between 2000 and 2010.

The Tri-state regional population is expected to grow at a higher rate because of the healthy urban economy. Approximately 200,000 additional residents are expected during the planning period for the Tri-state regional area. This is reflected in a 6% increase between 1990 and 2000, and a 5% increase between 2000 and 2010. Butler County has led the state in growth since 1980, the increase could be in excess of 10%.

Description of Waste Management Options

VITRIFICATION

Vitrification is a treatment process that converts contaminated materials into a chemically inert and stable glass and crystalline product that has extremely durable mechanical and chemical properties. The high temperatures utilized in the process will destroy organics and fix metals into the nonleachable stabilized melt. In vitrification, the waste mixture must have sufficient mineral content to form the glassy/crystalline matrix. If the waste is low in silica or alumina compounds, they may be added in the form of sand or soil. While there are several proven methods for vitrification, the one most appropriate for FEMP waste utilizes a ceramic lined melter with large submerged plate electrodes and relies on the conductivity of the molten glass. This technology has been used quite extensively for the treatment and disposal of high level nuclear waste.

Vitrification, as a waste stabilization method, has the advantage of operating as a closed system. The feed, limited to 4 inches, is gravity fed on a conveyor into the reactor. The waste is destroyed at a nominal temperature of 3000° F. The off-gas and particulates are drawn off by an induction fan and treated through a cyclone, a baghouse, and an acid gas scrubber. Solid waste is withdrawn from the lower section of the chamber via separate molten glass and metal taps. Both particulate and gas streams can be recycled to the reactor. The residue streams from the vitrification unit are molten metal, scrubber water, and off-gas. The concentrations of hazardous constituents in the residuals are such that further treatment is not required.

After organic contaminants are destroyed by the process, the residual solids are fluxed into the molten glass. The residual solids (such as ash and heavy metal oxides) and nontoxic solid components such as silica, alumina, and lime, are incorporated into the glass and become part of its matrix. The degree to which the residual contaminants are retained in the molten glass during processing is dependent upon the type of molten-glass process, the processing conditions, and the chemical elements comprising the glass.

The final product is generally reduced in volume by factors of from 2 to 100, depending on the soil characteristics and product quality requirements. When cooled, the inorganics, metals and radionuclides remain fixed and immobilized in a glass matrix that does not dissolve in water, has high leach resistance, and exhibits strength properties better than those of concrete. The glass possesses hydration properties similar to those of obsidian, which hydrates at rates of less than 1 mm/10,000 years. At these rates, the life of the glass matrix can be expected to exceed 1 million years.

The Battelle PNL has provided preliminary screening of the vitrification process as a satisfactory method for stabilizing the contents of the silos. This method is based on well-developed technologies from commercial metal and glass melting industries.

SOIL WASHING

Soil washing is a process whereby a solvent (water or acid) is introduced to contaminated soil, mixed, and then decanted from the soil to remove one or more contaminant and isolates them from the soil. Similar technologies have been used extensively in the mining industry to extract uranium from mineral ores. Removal efficiency depends on the characteristics of the soil and type of contamination. While volatile organics can be removed with up to 90 percent efficiency, semivolatile organics and inorganics will be removed with less efficiency. Cleanup levels to support unrestricted or residential land uses are not likely to be achieved. Soil washing will generate two or more soil/aqueous waste streams. One stream will contain concentrated contamination which can then be treated. The eventual waste disposal volume may be significantly less than the original soil volume. The remaining fraction will contain a major portion of the original soil volume and could be returned to the excavation site as backfill depending on the removal efficiency achieved and selected future land use.

Mineral acids are the likely agents to remove radionuclides at FEMP. Mineral acids dissolve constituents into the liquid phase for subsequent separation. Hydrochloric, nitric, and sulfuric acids have been used for uranium, thorium, and radium extraction from ores and soils. Supplemental chemical additives,such as inorganic salts and/or oxidizing agents, have been used with mineral acids to improve extraction efficiency for specific radionuclides. The acids and other chemicals utilized in soil washing may present additional hazards which need to be considered in design and operation.

CEMENTATION

There are four primary goals of cementation:

- Improve the handling characteristics.
- Improve the physical characteristics.
- Decrease the surface area across which the transfer or loss of chemical constituents can occur.
- Limit the solubility of any contaminants contained in the waste.

Cementation immobilizes hazardous constituents in waste by incorporation of it into the structure of the solidified material. In typical cases the process utilizes water additives and pozzolans such as fly ash, kiln dust, or cement to solidify solids and sludge containing organic and inorganic chemical. The final product is monolithic material with structural strength and significantly reduced leaching potential.

Most waste that is in a slurry form can be mixed directly with cement. The suspended solids will be incorporated into the solidified matrix. This process is especially effective for waste with high concentrations of heavy metals, since most multivalent cations are converted into insoluble hydroxides or carbonates at the pH of the cement mixture. Metal ions may also be incorporated

into the crystal structure of the cement minerals that are formed. Materials in the waste such as sulfides, asbestos, latex, and solid plastic wastes may actually increase the strength and stability of the waste concrete.

The presence of certain compounds in the waste and the mixing water can be detrimental to the setting and curing of the mixture of waste and cement. Soil components, such as organic materials, silt, clay, or lignite, may delay the setting curing of common cement for several days. All insoluble materials passing through a 200 mesh sieve are undesirable, as they may coat the larger particles and weaken the bond between the particles and the cement. Soluble salts of manganese, tin, zinc, copper, and lead may cause large variations in setting time and significant reduction in physical strength. Salts of zinc, copper, and lead are the most detrimental. Other compounds that retard the setting of cement, even at low concentrations, include sodium salts of arsenate, borate, phosphate, iodate, and sulfide. Materials containing large amounts of sulfate not only retard the setting of cement but, by reacting to form calcium sulfoaluminate hydrate, they cause swelling and spalling in the solidified waste containing cement. If nitrates are present they may interfere with this process as well.

THERMAL DRYING

The waste materials are dried by processing through equipment designed to apply heat and remove the water and other liquids. Drying reduces the volume of waste but does not have a significant effect on the toxicity, mobility, or volume of contaminants. Some drying processes can handle large volumes of waste - in the range of tons per day.

One type of drying facility potentially suitable for processing the large quantities of material at the FEMP is a rotary kiln. Rotary kilns are capable of processing solids, sludges, slurries, liquids and solids simultaneously. The flow of material through a rotary kiln is determined by the kiln's slope and rotation speed, as well as by the characteristics of the waste material being processed. Mechanical tumbling of the waste material in the rotary kiln - similar to that of a clothes dryer - exposes the wet material to continuous and uniform heat.

As the material moves through the kiln, surface water and any absorbed moisture evaporates before the dried material is discharged. The kiln is installed on a slight slope so that the bed of solids advances through the kiln by force of gravity.

Also being considered for utilization are flash dryers, spray dryers, and multiple hearth dryers.

ON SITE DISPOSAL

The on site disposal option will utilize an engineered facility that, depending on the characteristics of the materials to be disposed of, satisfies the requirements for disposal of low-

level radioactive waste or mixed waste. Conceptually, the disposal facility includes the following design features:

- Multilayered cap system - including vegetative soil layer, geotextile, high permeability drainage layer, intruder barrier (roller compacted concrete), low permeability clay layer, and common fill;
- Solidified waste forms;
- Multilayered liner system - including reinforced concrete mat (beneath the waste forms), high permeability drainage layers (2 layers in the liner system), low permeability clay layers (2 layers in the liner system), and geotextile; and
- Leachate collection and detection systems

The disposal facility is intended for permanent waste disposal purposes with a design life of 1,000 years. The structure is designed to withstand high-intensity earthquakes and severe weather conditions; e.g., tornado, snow, and rainwater intrusion. It can accept unsorted low-level radioactive or mixed waste in bulk and/or containerized forms. Hydrogeological investigations and siting studies are underway to identify the best on site location for the disposal facility.

OFF SITE DISPOSAL

The contaminated soils and sediments may be transported to a regulated disposal facility such as NTS, Envirocare, or Portsmouth for permanent disposal. As a condition of NTS disposal, no untreated wet, raw waste, or free liquids will be accepted. An additional NTS requirement is that the waste can be characterized as either mixed or low-level radioactive waste. If identified as mixed waste, it will only be accepted in a solidified form. Radioactive waste from the FEMP is currently shipped to NTS; however, depending on the level of uranium in the material and whether any organics are present, the soil could qualify for disposal at other low-level disposal facilities in closer proximity to the FEMP. Waste transport may be provided by truck or railroad and packaged in low specific activity (LSA) boxes.

Comparison of Waste Management Options
(April 9, 1994)

Waste Management Options	Waste Component	Effectiveness	Long Term Reliability and Operational Requirements	Potential Risk During Remediation	Relative Cost
Vitrification	Contents of Silos, Pit waste, Dirty Fraction soil washing (on site only)	Very effective in stabilizing wastes Significantly reduces mobility of radionuclides and inorganics by binding into a glass-like matrix Destroys organics Reduces radon emissions by fusing material into nonporous glass Considered to be an innovative technology and best demonstrated available technology for high -level nuclear waste. Volume reduction by factors of from 2 to 100 may be achieved. Although very stable, vitrified waste is still radioactive, and may be higher in activity than the original waste stream before volume reduction.	The non crystalline solid is very effective for reducing the leachability of the contaminants from the waste form. Radioactive waste must still be disposed. The vitrified waste exhibits strength properties better than those of concrete. Waste form has properties similar to many minerals and will remain stable for very long periods of time.	Potential for gamma radiation exposures during material handling and processing will require shielding and/or remote operations. Potential for radon releases prior to solidification of the vitrified waste, for volatilization of organics prior to thermal destruction, and for release of metals and radionuclides during high heat melt.	High capital cost and unit cost for processing, but volume reduction results in lower disposal costs.
Soil washing	Soil	Reduces radionuclides, metals, and organics concentrations. Reduction of radionuclide concentrations to free-release or residential levels may not be achievable.	Concentrated contaminants in "dirty" fraction will require disposal as low level radioactive waste. Process will generate wet waste which requires further processing/drying prior to disposal.	Industrial accidents; Air and liquid waste streams; worker exposure during processing. Acids or other chemicals used as extractants may pose hazards	Moderate

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Comparison of Waste Management Options
(April 9, 1994)

Waste Management Options	Waste Component	Effectiveness	Long Term Reliability and Operational Requirements	Potential Risk During Remediation	Relative Cost
Cementation	Contents of Silos, Pit waste, Dirty Fraction soil washing (on site only)	* Cement is mixed with the waste using equipment that is similar to that used in the concrete industry. It includes a feed system, mixing vessels, and a curing area. * The solidified mass significantly reduces mobility of radionuclides, metals, inorganics and organics. * The process may cause an increase of the waste volume up to 150% depending on characteristics of the waste stream. * Flyash and/or Waste water could be used in the process, thereby providing a means for disposal of other wastes as well. * It will facilitate storage, transportation and disposal.	* A relatively new application of an existing process but has not been proven, Long-term stability and leachability are not strongly documented. * Could be an effective interim step if approval if off site disposal is not obtained. * In the future may have to remove and ship off site for disposal. * Immobilizes but does not destroy wastes, long-term disposal still required.	* During processing the handling of the soil could cause airborne dust leading to exposure to workers.	Moderate
Thermal Drying	Pit wastes	Drives off moisture, thereby enabling waste to meet disposal facility acceptance criteria. Does not significantly alter toxicity, mobility, or volume of contaminants. A slight reduction in volume would result from reducing the moisture content and void ratio. Not adversely impacted by the heterogeneity of the waste pit contents.	Contaminants are not physically or chemically fixed in the waste matrix.	Drying is a commonly applied technology throughout various industries therefore the risks would be standard.	High

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Comparison of Waste Management Options
(April 9, 1994)

Waste Management Options	Waste Component	Effectiveness	Long Term Reliability and Operational Requirements	Potential Risk During Remediation	Relative Cost
Disposal On-Site	ALL	Isolation of the waste will protect human health and the environment from contact with or exposure to radiation or toxic materials as long as the integrity of the disposal facility is maintained. The design includes features to protect against intrusion, infiltration, erosion, leaching, and penetrating radiation exposure.	Engineered cell designed for a 1,000 year life with minimal maintenance. However, site is over sole source aquifer and is in relatively populated area. If engineering and institutional controls fail, there is greater potential risk to human health and the environment. Long term monitoring and maintenance will be required to ensure continued performance.	Increased level of activity on site will result in increased potential for radiation exposures and associated accidents. Permanent disruption/restricted use of up to 100 acres of the site. Permanent disruption of over one acre of on-site wetlands.	High
Disposal Off-Site	ALL	Isolation of the waste will protect human health and the environment from contact with or exposure to radiation or toxic materials as long as the integrity of the disposal facility is maintained. The design and disposal site location includes features to protect against intrusion, infiltration, erosion, leaching, and penetrating radiation exposure.	Two potential disposal locations are in very dry climatic regions, with no surface water in the vicinity, no usable groundwater, and no human populations for many miles. Under such conditions, there is a high degree of confidence that the disposal facility will continue to perform as designed for long periods of time.	Shipping waste from FEMP will result in increased potential for transportation accidents.	High

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Environmental Glossary

activity - The number of nuclear decays per unit time in a sample of a radioactive substance.

advanced waste water treatment - The objective of the system being built for the Fernald site is to provide advanced treatment of site waste water streams to remove radionuclides. There are two phases: Phase I, for stormwater runoff and Phase II, for waste waters generated as a result of conducting cleanup activities. The system is scheduled to begin operating in early 1995.

ALARA - As Low As Reasonably Achievable, or keeping radiation emissions and exposures to levels set as far below regulatory limits as is reasonably possible in order to protect public health and the environment.

alpha radiation - The most energetic but least penetrating form of radiation. It can be stopped by a sheet of paper and cannot penetrate human skin. However, if an alpha-emitting isotope is inhaled or ingested, it will cause highly concentrated local damage.

antagonism - The interaction of two chemicals having an opposing,or neutralizing effect on each other.

aquifer - A permeable body of rock capable of yielding quantities of groundwater to wells and springs.

ARARs - Applicable or relevant and appropriate requirements, a comprehensive set of laws and regulations that are relevant to guide the selection of cleanup activity at a particular site.

asbestos - A strong and incombustible fiber widely used in the past for fireproofing and insulation. The small, buoyant fibers are easily inhaled or swallowed, causing a number of serious diseases including: asbestosis, a chronic disease of the lungs that makes breathing more and more difficult; cancer; and mesothelioma, a cancer (specific to asbestos exposure) of the membranes that line the chest and abdomen.

attenuation - The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

baseline risk assessment - The study and estimation of risk from taking no activity. Involves estimates of probability and consequence.

Becquerel (Bq) - The International System (SI) unit for activity of radioactive material. One becquerel is that quantity of radioactive material in which one atom is transformed per second or undergoes one disintegration per second.

beta radiation - High-energy electrons (beta particles) emitted from certain radioactive material. Can pass through 1 to 2 centimeters of water or human flesh and can be shielded by a thin sheet of aluminum. Beta particles are more deeply penetrating than alpha particles but, because of their smaller size, cause less localized damage.

bioassay - Measurement of radioactive material deposited within or excreted from the body. This process includes whole body and organ counting as well as urine, fecal, and other specimen analysis.

bioremediation - Use of living organisms to clean up oil spills or remove other pollutants from soil, water, or wastewater.

buffer zone - The smallest region beyond the disposal unit that is required as controlled space for monitoring and for taking mitigative measures, as may be required.

carcinogen - A cancer-causing agent.

CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund), the federal law that guides cleanup of hazardous waste sites.

curie - A unit of radioactivity that represents the amount of radioactivity associated with one gram of radium. To say that a sample of radioactive material exhibits one curie of radioactivity means that the element is emitting radiation at the rate of 3.7 million times a second. Named after Marie Curie, an early nuclear scientist.

daughter product - An element formed by the radioactive decay of another element; often daughter products are radioactive themselves

decay - The process whereby radioactive particles undergo a change from one form, or isotope, to another, releasing radioactive particles and/or energy.

decontamination - The removal of unwanted material (typically radioactive material) from facilities, soils, or equipment by washing, chemical action, mechanical cleansing or other techniques.

dioxin - One of the most hazardous of all chemicals, can cause both acute and long-term effects ranging from chloracne, a skin disease, to cancer, reproductive failures, and reduced resistance to infectious disease.

dose - Quantity of radiation or energy absorbed; measured in rads. (See **rad**).

dose equivalent - A term used to express the amount of effective radiation received by an individual. A dose equivalent considers the type of radiation, the amount of body exposed, and the risk of exposure. Measured in rems. (See **rem**).

effluent - A waste discharged as a liquid.

electron - An elementary particle with a unit negative charge and a mass 1/1837 that of the proton. Electrons surround the positively charged nucleus and determine the chemical properties of the atom.

elemental compound - Any of the 109 substances that cannot be broken down further without changing its chemical properties. Singly or in combination, the elements constitute all matter.

emergent wetlands - A wetland class characterized by erect, rooted, herbaceous hydrophytes (i.e., the roots of these plants grow in the saturated zone and the plant body emerges into the atmosphere).

exposure - A measurement of the displacement of electrons from atoms caused by x-rays or by gamma radiation. Acute exposure generally refers to a high level of exposure of short duration; chronic exposure is lower-level exposure of long duration.

fission - The splitting of a heavy nucleus into two or more radioactive nuclei, accompanied by the emission of gamma rays, neutrons and a significant amount of energy. Fission usually is initiated by the heavy nucleus absorbing a neutron, but it also can occur spontaneously.

feasibility study (FS) - the Superfund study following a remedial investigation which identifies, develops, evaluates and selects remedial action alternatives.

gamma rays - Penetrating electromagnetic waves or rays emitted from nuclei during radioactive decay, similar to x-rays. Dense materials such as concrete and lead are used to provide shielding against gamma radiation.

geohydrology - The science dealing with underground water, often referred to as hydrogeology.

groundwater - Water beneath the earth's surface that fills pores between materials such as sand, soil or gravel. Groundwater is a major source of water for agricultural and industrial purposes and is an important source of drinking water for about half of all Americans.

half-life - The time required for a radioactive substance to lose 50 percent of its activity by decay. The half-life of the radioisotope plutonium-239, for example, is about 24,000 years. Starting with a pound of plutonium-239, in 24,000 years there will be one-half pound of plutonium-239, in another 24,000 years there will be one-fourth pound, and so on. (A pound of material remains, but it gradually becomes a stable element.)

hazardous waste - A solid waste or combination of solid wastes that, because of quantity, concentration or physical, chemical or infectious characteristics, may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness or pose a substantial hazard to human health or the environment when improperly treated, stored, transported, disposed or otherwise managed. About 290 million tons of hazardous wastes are generated in the United States each year. A small percentage (about 4 percent) is recycled. The rest is treated, stored or disposed. Of the hazardous wastes disposed, most are injected as a liquid into the ground in specially designed injection wells. A large quantity is placed in surface impoundments (pits, ponds and lagoons). A small portion is placed directly on the land or buried.

high-level radioactive wastes - Highly radioactive material, containing fission products, traces of uranium and plutonium, and other transuranic elements, that results from chemical reprocessing of spent fuel. Originally produced in liquid form, high-level waste must be solidified before disposal.

ion - Atomic particle, atom or chemical radical bearing an electric charge, either negative or positive.

ionization - Removal of electrons from an atom, for example, by means of radiation, so that the atom becomes charged.

ionizing radiation - Radiation that has enough energy to remove electrons from substances it pass through, forming ions.

isotopes - Atoms of the same element that have equal numbers of protons, but different numbers of neutrons. Isotopes of an element have the same atomic number by different atomic mass. For example, uranium-238 and uranium-235.

leachate - The solution formed when soluble components have been removed from a material.

leaching - To remove a soluble substance from a material by dissolving it in a liquid, and then removing the liquid from what is left.

low-level radioactive waste - discarded radioactive material such as rags, construction rubble, glass, etc., that is only slightly or moderately contaminated. This waste usually is disposed of by land burial.

Maximum Concentration Limit (MCL) - The regulatory limit for various constituents, usually organics and inorganics; there are different levels for different media, such as air, soil, and water. The MCL cannot be exceeded.

metals - The term "trace metals" refers to metals that are present either in the environment or in the human body in very low concentrations, such as copper, iron, and zinc. Heavy metals are those trace metals whose densities are at least five times greater than water, such as cadmium, lead, mercury, and uranium. Toxic metals are all those metals whose concentrations in the environment are now considered to be harmful, at least to some people in some places.

millirem - A unit of radiation dosage equal to one-thousandth of a rem. A member of the public can safely receive up to 500 millirems per year, according to federal standards, but the U.S. EPA ordinarily limits public exposure to 25 to 100 mrem/year.

mixed waste - Contains both radioactive and hazardous components.

mobility - The ability of constituents to move, such as through various environmental media.

naturally occurring radioactive materials (NORM) - The natural radioactivity in the environment. Natural

radiation consists of cosmic rays, filtered through the atmosphere from outer space, and radiation from the naturally radioactive elements in the earth (primarily uranium, thorium, radium and potassium). Also known as natural radiation.

Nevada Test Site (NTS) - A government-owned repository for radioactive wastes.

pathways - The means by which contaminants move. Possible pathways include air, surface water, groundwater, plants and animals.

PCB - Polychlorinated biphenyl, a synthetic, organic chemical once widely used in electrical equipment, specialized hydraulic systems, heat transfer systems, and other industrial products. Highly toxic and a potent carcinogen. Any hazardous wastes that contain more than 50 parts per million of PCBs are subject to regulation under the Toxic Substances Control Act.

picocuries - Measurement of radioactivity. A picocurie is one million millionth, or a trillionth, of a curie, and represents about 2.2 radioactive particle disintegrations per minute.

plume - A defined area of groundwater containing contamination that originates from a particular source such as a waste unit.

plutonium - An artificially produced element that is fissile and radioactive. It is created when an atom of uranium-238 captures a slow neutron in its nucleus.

pneumoconiosis - A disease of the lungs caused by the habitual inhalation of irritant mineral or metallic particles.

risk assessment - the study and estimation of risk from a current or proposed activity. Involves estimates of the probability and consequence of an action.

rad - Radiation absorbed dose, a measurement of ionizing radiation absorbed by any material. A rad measures the absorption of a specific amount of work (100 ergs) in a gram of matter.

radiation - Fast particles and electromagnetic waves emitted from the nucleus of an atom during radioactive disintegration.

radioactive - Giving off, or capable of giving off, radiant energy in the form of particles (alpha or beta radiation) or rays (gamma radiation) by the spontaneous disintegration of the nuclei of atoms. Radioisotopes of elements lose particles and energy through the process of radioactive decay. Elements may decay into different atoms or a different state of the same atom.

radioactive waste - A solid, liquid or gaseous material of negligible economic value that contains radionuclides in excess of threshold quantities except for radioactive material form post-weapons-test activities.

radioisotope - An unstable isotope of an element that eventually will undergo radioactive decay (i.e., disintegration). Radioisotopes with special properties are produced routinely for use in medical treatment and diagnosis, industrial tracers, and for general research.

radionuclide - A radioactive species of an atom.

radon - A radioactive gas produced by the decay of one of the daughters of radium. Radon is hazardous in unventilated areas because it can build up to high concentrations and, if inhaled for long periods of time, may cause lung cancer.

rem - Roentgen equivalent man, a unit used in radiation protection to measure the amount of damage to human tissue from a dose of ionizing radiation. Incorporates the health risks from radiation.

stochastic effects - Malignant and hereditary disease for which the probability of an effect occurring, rather that

its severity, is regarded as a function of dose without a threshold for radiation protection purposes.

synergism - The cooperative interaction of two or more chemicals or other phenomena producing a greater total effect than the sum of their individual effects.

teratogen - Substance that causes malformation or serious deviation from normal development of blastocysts, embryos and fetuses.

threshold dose - The minimum dose of radiation that will produce a detectable effect.

transuranic wastes - Waste materials contaminated with isotopes above uranium in the periodic table. Transuranic waste is long-lived, but only moderately radioactive.

uranium - The heaviest element found in nature. Approximately 997 out of every 1000 uranium atoms are uranium-238. The remaining 3 atoms are the fissile uranium-235. The uranium-235 atom splits, or fissions, into lighter elements when its nucleus is struck by a neutron.

Natural uranium consists of three primary isotopes; U^{238}, U^{235}, and U^{234}. The typical isotopic abundances of different commercial classes of uranium are listed in the table below.

TYPICAL ISOTOPIC ABUNDANCES
Grams of Isotope per 100 Grams Natural Uranium

ISOTOPE	NATURAL URANIUM	TYPICAL COMMERCIAL FEED ENRICHMENT	DEPLETED
U^{238}	99.27	97.01	99.75
U^{235}	0.72	2.96	0.25
U^{234}	0.006	0.03	0.0005

Normal uranium is uranium metal which has been processed (extracted) from naturally occurring ores and has the approximate percent abundances of principle isotopes as natural uranium.

vitrification - A method of immobilizing waste that produces a glass-like solid that permanently captures the radioactive materials.

Volatile organic compounds (VOCs) - chemicals that contain carbon and commonly also contain hydrogen, oxygen and other elements. The prefix "volatile" means that the compound evaporates rapidly. Most industrial solvents are volatile. VOCs are found in some liquid and air waste releases.

wetlands - Areas that are inundated by surface or ground water with a frequency sufficient to support and, under normal circumstances does or would support, vegetative or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflow, mud flats, and natural ponds.

FERNALD PROJECT Cleanup REPORT

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April 1994

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DOE Workshop

on the protection of

Natural Resources at Fernald

7:00 p.m. Tuesday, April 12

Meadowbrook Inn, Ross, Ohio

Safe Shutdown in progress

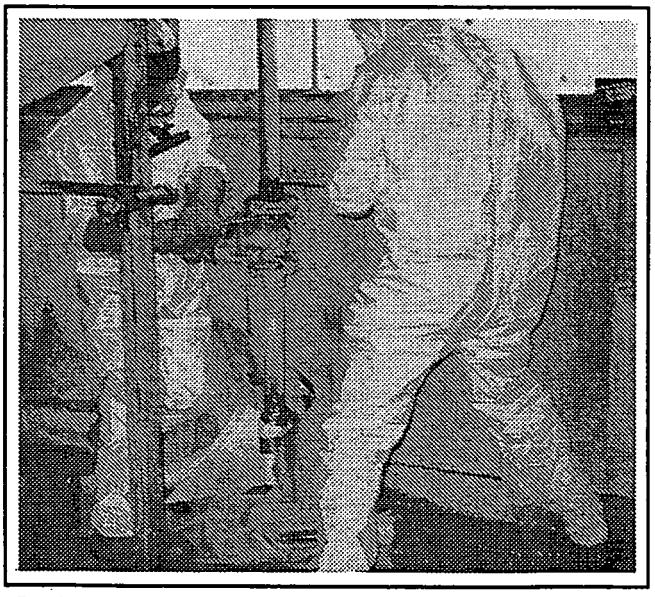
Fernald workers are now removing materials from equipment and lines as part of Safe Shutdown activities are in progress in the former production area.

The Safe Shutdown program is responsible for removal of former production materials that were in the equipment and lines when Fernald's production operations were suspended in July 1989.

Approximately 337,000 pounds of solid materials and 419,000 gallons of liquid material are to be removed from equipment and lines. The removal process will take approximately three years to complete.

Implementation plans have been developed for removal of materials from equipment in Plant 4. The potassium hydroxide system has been emptied except for an area of frozen lines. A safety assessment is in progress for the hydrogen fluoride recovery system, and the plan for clean-out of the hydrogen off-gas system is expected to be initiated soon.

This work is necessary before building decontamination and dismantlement activities can proceed in the former production area.



Fernald workers loosen a pipe as Safe Shutdown operations are under way in Plant 4.

Soil washing technology promising

Progress continues to be made on demonstrating a new treatment process for removing uranium from contaminated soil so it cannot pose a threat to human health or the environment.

Results from down-scale testing of the soil decontamination process known as "soil washing" is showing promise for significantly cleaning uranium-contaminated soils

Continued on page 3

Plant 7 dismantling in progress

Project Development Group, Inc. (PDG), a FERMCO subcontractor, is in the process of dismantling the interior of Plant 7 including electrical conduit, piping and duct work, and the interior walls.

Workers are expected to begin removing the building's transite siding in June 1994. PDG has subcontracted with Best Group, Inc., to remove all of the structural steel and concrete from the building. Actual dismantling of the steel structure is expected to begin in August 1994.

The seven-story Plant 7, the tallest building on the Fernald site, is the first of approximately 125 buildings planned for dismantlement as part of Fernald's environmental restoration mission.

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New yardstick available to measure progress

DOE has approved a FERMCO planning document that spells out specific remediation work that can be accomplished in Fiscal Years (FY) 1994-99 with the funds available for Fernald.

Called the baseline, the document is a detailed, yet flexible, planning document containing the technical descriptions of remediation work to be performed, time schedules for completing the work, and cost estimates. It can be described as a yardstick by which DOE measures FERMCO's performance.

The baseline can be adjusted to reflect changes in actual funding levels which may be altered in the Congressional budget process. In addition, the precision of the baseline will be enhanced each time U.S. EPA announces a Record of Decision (ROD) selecting a final cleanup alternative for one of Fernald's five Operable Units.

The RODs for four Operable Units will be issued in 1994 and 1995; the ROD for Operable Unit 3 (production area) will be issued in 1997.

The baseline addresses the Consent Agreement between DOE and the U.S. EPA, including the requirement that field work must be started within 15 months after a ROD is issued. Projects addressing immediate environmental concerns are prioritized in the baseline.

Fernald's budget for FY 1994 is $302 million. For FY 1995, the DOE has requested $294 million. Major work to be performed during those two years include Plant 7 dismantling, Plant 1 Ore Silos dismantling, Uranyl Nitrate Hexahydrate (UNH) neutralization, Advanced Wastewater Treatment facility construction and startup, vitrification pilot plant construction, and continued waste shipping to the Nevada Test Site. Much of this work is in progress today.

FERMCO, FAT&LC agree on four-year contract

FERMCO and the Fernald Atomic Trades and Labor Council (FAT&LC) have signed a new labor contract.

Membership of the FAT&LC overwhelmingly ratified the new agreement, which became effective March 1, 1994, and expires February 28, 1998. The previous contract had expired September 30, 1993, and the union had been working without a contract while negotiations continued.

Les McCraw, chairman of Fluor Corporation (parent company of FERMCO), said "We face a great challenge in cleaning up the Fernald site. A team effort will be needed to make our goals a reality. I am convinced that the successful conclusion of this collective bargaining process puts us on a path forward to achieve our mutual goals."

Gene Branham, vice president of FAT&LC, said the contract represents a collective effort to meet the concerns of all parties. "This is an imaginative and precedent-setting agreement which will allow us to clean up the Fernald site in a safe and cost-effective manner," Branham said.

Construction workers installing pipeline in the new Advanced Wastewater Treatment facility, which is expected to be operational in January 1995.

Uranium metal to be shipped for disposal

Fernald is awaiting approval to ship 2.2 million pounds of depleted uranium metal to the Nevada Test Site (NTS) for disposal. The material was processed at Fernald for the U.S. Army.

Once approval is received, the material will be shipped at the rate of five truckloads per week and will take 14 weeks to complete. Since the material is the highest purity metal ever produced at Fernald, it will be disposed of in a separate trench where it will be retrievable should future needs require it.

This is Phase II of the Army metal removal project. Phase I, which was completed in November 1992, involved the removal of four million pounds of depleted uranium metal to Barnwell, S. C. Once Phase II is complete, there will be no more Army-owned metal on site.

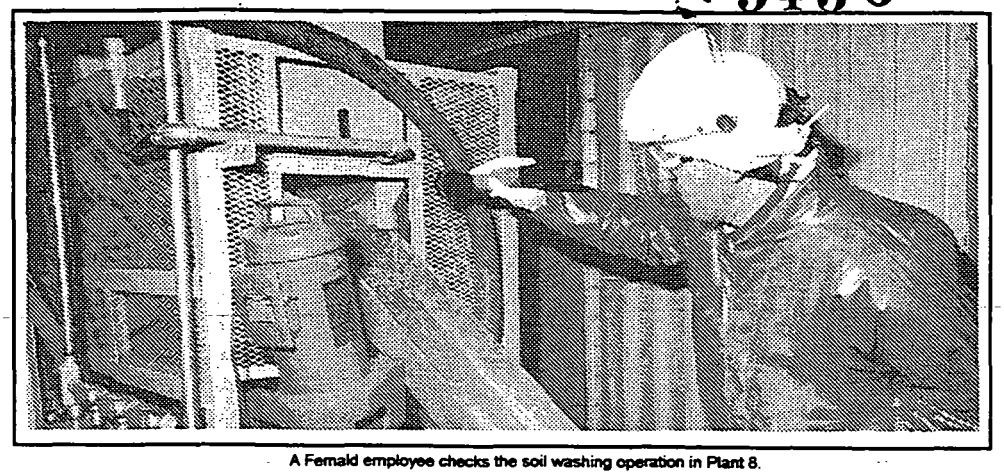
Soil Washing
Continued from page 1

in a timely and cost-effective manner.

The process being developed at Fernald uses physical and chemical means to separate the uranium from the soil. The uranium, and other contaminants of concern, are concentrated into a small volume of residue for disposal. The intent is to have treated soil returned to the site of excavation. The liquid extraction solution can be treated in wastewater treatment systems.

Soil decontamination work at Fernald is part of an approach that integrates development work sponsored by DOE's Office of Technology Development (OTD) with those of the Office of Environmental Restoration. The OTD uses a multi-faceted approach to develop and apply new technologies.

Fernald was chosen as the host site because its large volume of uranium-contaminated soils are representative of the technical challenges that will be faced at other DOE sites. More efficient excavation technologies also are being developed to remove only contaminated layers of soils.



A Fernald employee checks the soil washing operation in Plant 8.

Turpin wins Science Bowl

Five students from Cincinnati Turpin High School defeated 31 other local teams to become champions of the 1994 Regional Science Bowl. The February competition was organized by the Fernald Environmental Management Project.

The Turpin team adeptly responded to questions on the subjects of mathematics, chemistry, computer science, astronomy, biology and earth science, to come out on top. The team will travel to Washington, D.C. in April 1994, to compete in the National Science Bowl against about 50 regional winners from other DOE sites across the country.

Roger Bacon High School finished second, Harrison High placed third and Summit Country Day came in fourth.

Flyash disposal program reduces radioactive waste volume

Newly-generated flyash from Fernald's boiler plant is being shipped off site to a landfill for disposal as non-radioactive waste.

Flyash is the waste product from burning coal in the boiler plant to provide steam heat for buildings on the Fernald site.

Until recently, flyash was trucked from the boiler plant and dumped on an existing flyash pile located on the south side of Fernald property. Because portions of that flyash pile were mixed with uranium-contaminated materials in the past, the continued practice of dumping there was contributing to the amount of flyash that ultimately must be dealt with as radioactive waste. The existing flyash piles are targeted for cleanup as part of Fernald's Operable Unit 2 (Other Waste Units).

Now, all newly-generated flyash goes directly from the boiler plant to trucks equipped with roll-off boxes. Those boxes are covered with tarpaulins, monitored to ensure they are not radioactive, and sent to a holding area. Rumpke, Inc., the low-bid vendor, picks up the boxes of flyash, dumps the material at its Colerain Township landfill, and returns the empty containers to Fernald.

"Under this new procedure, we're able to control newly-generated flyash very well from generation to disposal," said Rod Warner, Operable Unit 2 manager for the DOE.

"Only newly-generated flyash straight from the coal-fired boiler plant is picked up by Rumpke for landfilling. The existing flyash piles on Fernald property will be remediated under the terms of the Record of Decision scheduled to be issued by the U.S. EPA in January 1995," Warner said.

Excess equipment transferred to Army

Fernald workers have completed the removal of 11 pieces of new excess equipment for transfer to the U.S. Army.

Originally purchased for production purposes, the equipment was never used and has a book value of $1.6 million. DOE would have received approximately $800 for this equipment if it had been sold as scrap metal.

However, due to strict radiological controls maintained at Fernald, this equipment may have had to be disposed of as radioactive waste. It would have cost approximately $100,000 to package, transport and dispose of the equipment at the Nevada Test Site.

The U.S. Army will install the equipment at Aerojet Ordnance Division in Tennessee, where the equipment will be utilized for its designed purpose.

Plan for K-65 silos conditionally approved

DOE has received U.S. EPA's conditional approval of the Draft Final Feasibility Study/Proposed Plan-Draft Environmental Impact Statement (FS/PP-DEIS) for Operable Unit 4 (Silos 1-4 including the two K-65 silos).

The EPA will grant final approval after DOE satisfactorily responds to EPA's comments on the key cleanup document. Public comment on the proposed cleanup alternatives will be solicited before issuing a Record of Decision mandating final cleanup actions for Operable Unit 4.

The K-65 silos contain radium-bearing wastes which generate radon gas. A third silo contains dried uranium- and thorium-bearing wastes; the fourth silo is empty.

As a result of the FS/PP-DEIS, DOE has selected vitrification of K-65 and Silo 3 contents as the preferred alternative for final cleanup of Operable Unit 4. The vitrified material would be shipped to the Nevada Test Site for disposal. All four silos would be demolished.

The rubble from the silos, along with associated structures, soil and other debris, would be stored at Fernald until a final decision is reached on how similar materials from other operable units will be dispositioned.

A formal public comment period on the FS/PP-DEIS for Operable Unit 4 began March 7 and will end April 20.

The FS/PP-DEIS is available for public review at the Public Environmental Information Center, 10845 Hamilton-Cleves Road, Harrison.

CTC environmental program gets boost from Fernald

FERMCO has awarded a $96,310 contract to Cincinnati Technical College (CTC) to develop an Associates Degree program in Environmental Engineering Technology.

The DOE's Office of Technology Development is funding the contract as part of its program to train technicians and technologists for employment at DOE and other environmental restoration and waste management sites.

The funding provides support for faculty, curriculum development, laboratory equipment, student financial assistance, and development of a recruitment plan for historically under-represented groups as well as students from the Fernald area.

Larry Morris, Dean of the CTC Engineering Technologies Division, said the program is intended to provide education leading to a wide variety of career opportunities for first line supervisors and field workers in industrial waste treatment and hazardous waste generation, accumulation, storage, treatment, and disposal.

The curriculum also addresses job specific skills such as safety, hazardous waste handling, laboratory and field sampling and analysis, and knowledge of environmental regulatory requirements.

"CTC is an outstanding and innovative educational institution and this program affords its students unique opportunities to learn, observe, and develop their skills near a major Superfund site actively involved in remediation," said Phil Hamric, manager of the DOE Fernald Office.

Cincinnati Technical College is a state-supported two-year institution with accredited associate degree programs serving a three state region.

FERNALD PROJECT CLEANUP REPORT
U.S. Department of Energy
Fernald Field Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705

The Fernald Project Cleanup Report is prepared by Fernald Environmental Restoration Management Corporation monthly for the U.S. Department of Energy, to inform the community about cleanup progress at the Fernald Environmental Management Project.
Address all inquiries regarding the **Fernald Project Cleanup Report** to:
Jack R. Craig
Assistant Manager for Environmental Restoration
U.S. Department of Energy
Fernald Field Office
P.O. Box 398705
Cincinnati, Ohio 45239-8705
telephone: (513) 648-3107
Fernald Field Office.....Mr. J. Philip Hamric, manager

#2568ap94

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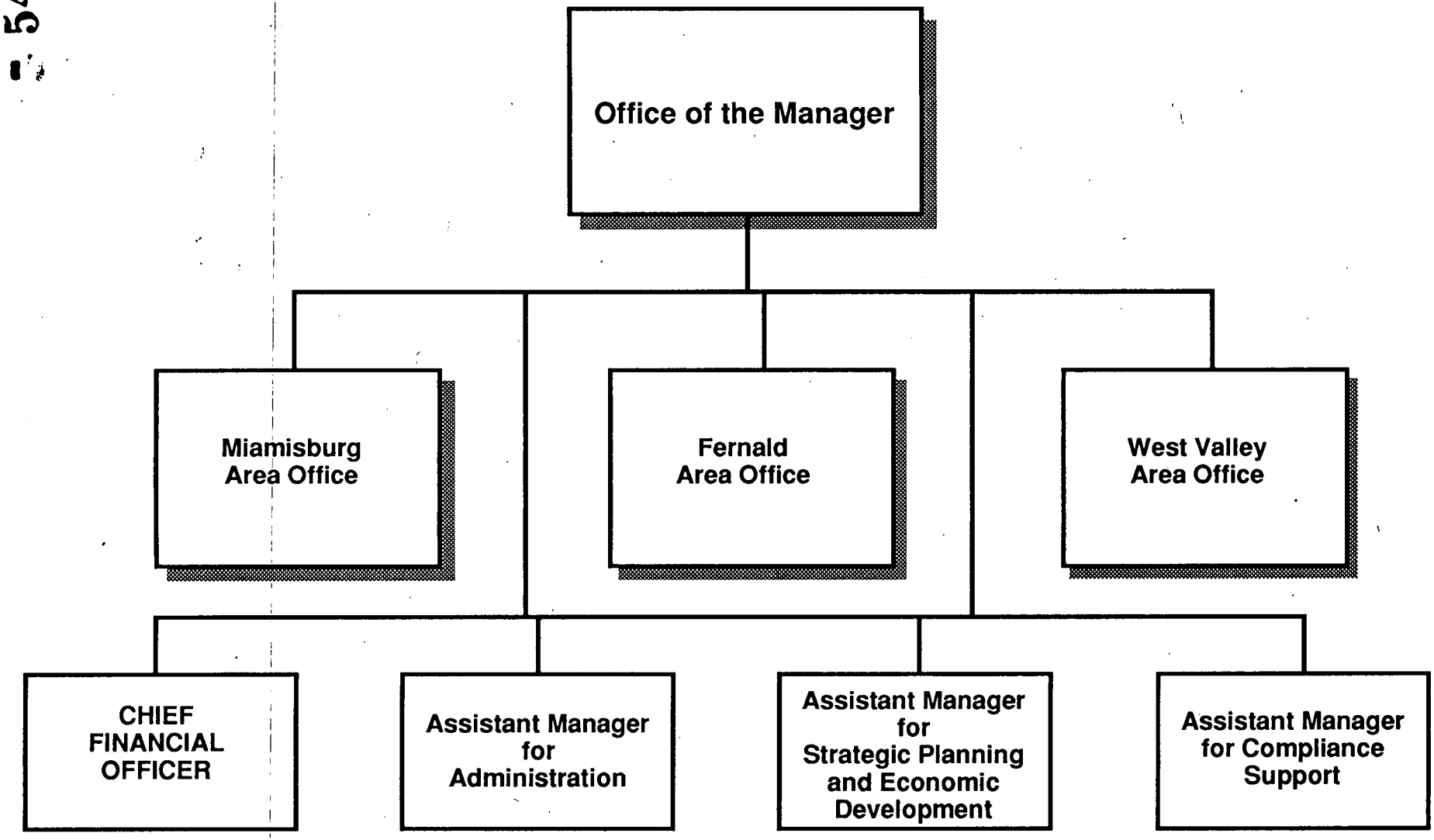
PROPOSED STRUCTURE
OHIO FIELD OFFICE



NEW ORGANIZATION VISION

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54 36

- Decentralize to the Extent Possible to Empower the Three Area Offices
- OFO Staff Will Support the Area Offices with a Balance of Oversight
- In Recognition of the National Performance Review:
  - Consolidate Support Functions (Administration, Finance, Procurement), as Necessary, for Efficiency
  - Maximize Federal Technical Management Capabilities to Ensure Appropriate "Front-end Loading" for Reduced Reliance on Contractor Staff

OHIO FIELD OFFICE

Civil Rights
111 EEO Manager N200

Public Affairs N200
106 Public Affairs Officer
107 Public Affairs Specialist
108 Public Affairs Specialist A

Office of the Manager
101 Manager B
102 Deputy Manager B
103 Executive Assistant D
104 Executive Secretary D
105 Management Assistant D
N100

Chief Counsel
201 Chief Counsel
203 Deputy Chief Counsel
202 Attorney
204 Attorney A
205 Paralegal/FOIA Officer D
206 Secretary D
N200

Miamisburg Area Office

Fernald Area Office

West Valley Area Office

Chief Financial Officer N300
301 Chief Financial Officer**
302 Secretary D
303 Review Team Leader A
304 Audit Liaison A
305 Financial Review Spec. A
306 Internal Review Specialist A
FN 5 On-Site Support Staff
WV 1 On-Site Support Staff A

Finance Division N310
321 Finance Director
322 Secretary D
323 Accountant
324 Accountant
325 Accountant
326 Accountant A
327 Payroll Specialist A
328 Travel Specialist A
329 Accounting Technician
330 Accounting Technician A
331 Accounting Technician A
332 Accounting Technician A

Budget Division N320
341 Budget Director
342 Secretary D
343 Program/Cost Analyst A
344 Cost Analyst A
345 Budget Analyst
346 Budget Analyst A
347 Budget Analyst A
348 Budget Analyst A
349 Budget Assistant A
350 (Budget Assistant) B

Assistant Manager for Administration N400
401 Assistant Manager**
402 Secretary D
FN 5 On-Site Support Staff
WV 1 On-Site Support Staff A

Human Resources Division N410
411 Human Resources Director A
412 Secretary D
413 Personnel Officer
414 Contract Ind. Rel. Spec.
415 Contract Ind. Rel. Spec.
421 Personnel Mgmt. Spec. A
418 Personnel Mgmt. Spec. A
416 Personnel Assistant/Typing A
417 Personnel Action Clerk A
419 Technical Training Specialist A
420 Personnel Security Spec.
431 Admin. Support Leader A
432 Information Mgmt. Specialist A
433 Computer Specialist A
434 Computer Specialist
435 Security Specialist
436 Nuclear Safeguards A
437 Directive Clerk

Contract Division N420
441 Spvr. Contracting Officer
442 Mgmt. Asst./Proc. Clerk D
451 Contr. Officer/Team Ldr. A
452 Contract Specialist
453 Contract Specialist
454 Contract Specialist
455 Proc. Policy Analyst A
456 Proc. Policy Analyst A
457 Procurement Analyst
458 Procurement Assistant A
459 (Procurement Assistant) B
460 Procurement Clerk D
461 SB/SDB Specialist A
462 Pricing Analyst A
471 Prpty. Mgmt. Off./Team Ldr. A
472 Real Property Mgmt. Spec. A
473 Ind. Property Mgmt. Spec.

Assistant Manager For Strategic Planning And Economic Development N500
501 Assistant Manager B
502 Secretary D
503 Economic Development Specialist A
504 Economic Development Specialist
505 Engineer/Strategic Planning
506 Engineer/Tech. Transfer
507 General Engineer B
508 Quality Improvement Specialist
509 Quality Improvement Engineer C
510 Program Manager
511 Project Engineer C

Assistant Manager for Compliance Support N600
601 Assistant Manager C
602 Secretary D
FN 2 On-Site Support Staff
WV 1 On-Site Support Staff B

611 Safety/Standards Team Leader
612 Safety Engineer B
613 Industrial Hygienist B
614 Health Physicist B
615 Nuclear Engineer B
616 Quality Assurance Engineer B
617 Fire Protection Engineer B

621 Compliance Team Leader
622 Transportation Mgmt. Spec. B
623 Environmental Eng.
624 Emergency Mgmt. Specialist B
625 Chemical Engineer B
626 Assessment Specialist B
627 Regulatory Compliance Spec. B

KEY:
Bold = New Hires
(Bold) = FY 96 Position
** = Vacancy Transfer
A = FTE Bid Block

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3/29/94

Total Positions

	OFO	FN	WV	MI	Total
FTE Level:	105	68	28	38	239
OFO On-Site:	15	(12)	(3)	(0)	15
Subtotal:	120	68	28	38	254
FY96:	122	73	28	45	268

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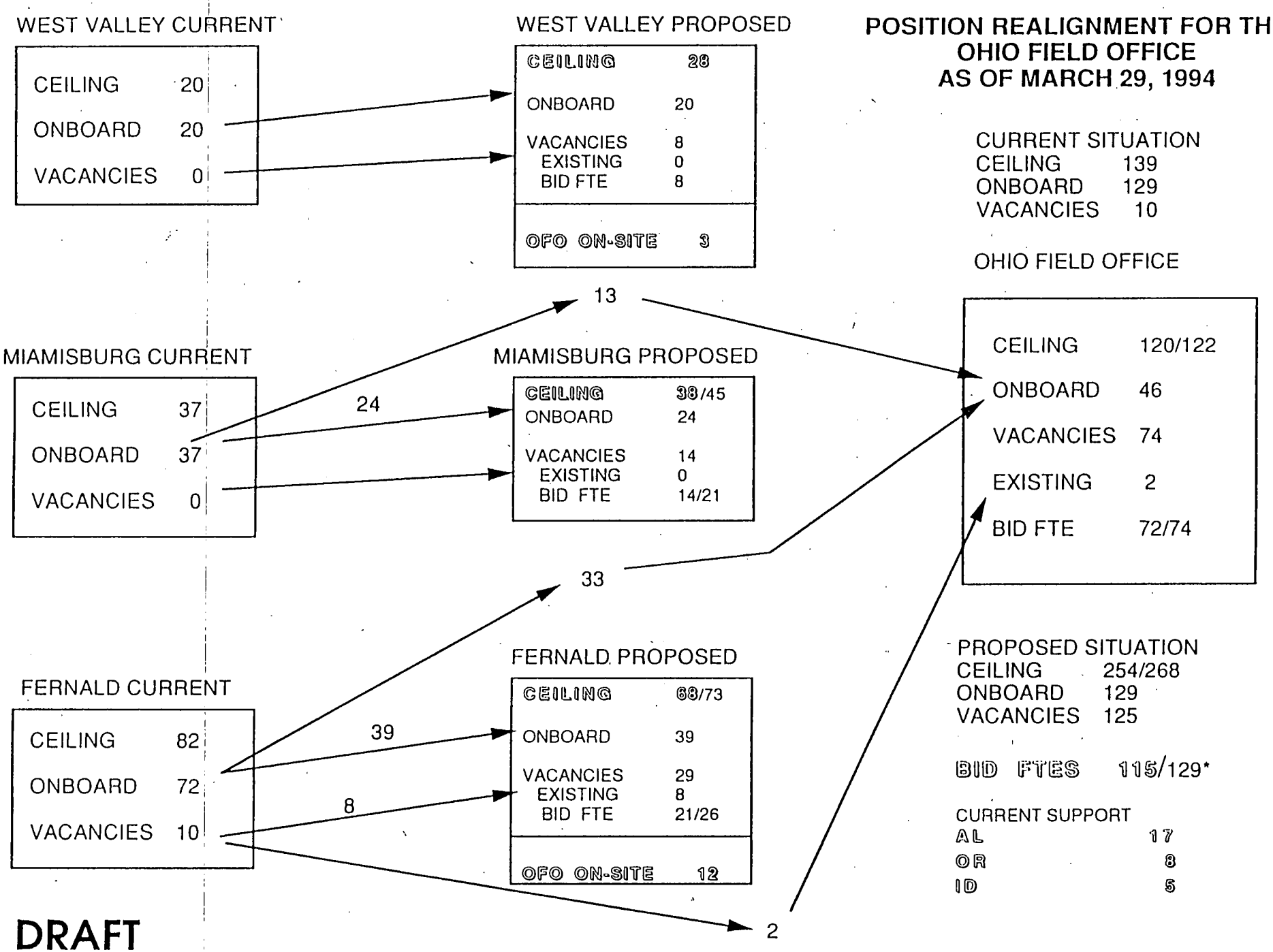
POSITION REALIGNMENT FOR THE OHIO FIELD OFFICE AS OF MARCH 29, 1994



CURRENT SITUATION
CEILING 139
ONBOARD 129
VACANCIES 10

PROPOSED SITUATION
CEILING 254/268
ONBOARD 129
VACANCIES 125

BID FTES 115/129*

CURRENT SUPPORT
AL 17
OR 8
ID 5

DRAFT

* ASSUMES 1:1 TRANSFER OF MIAMISBURG DP FTES TO EM
FTE NOTATION: FY95/FY96

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3/29/94

FERNALD AREA OFFICE
Proposed

KEY:
- bold = Bld FTE
- (bold) = FY96 Positions
- • = Current Vacancies
- Ⓐ = FTE Bld Block

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Office of the Director

101 Director
102 Deputy Director•
103 Executive Secretary•
104 Public Affairs Specialist
105 Administrative Officer FP100

Office of Environmental Management

201 Associate Director
202 Deputy Assoc. Dir.
203 Secretary•
204 Secretary•
205 Secretary Ⓓ

211 Team Leader OU1
212 Engineer/Scientist
213 Engineer/Scientist
214 Engineer/Scientist Ⓒ
215 Engineer/Scientist Ⓒ

221 Team Leader OU2•
222 Engineer/Scientist
223 Engineer/Scientist
224 Engineer/Scientist Ⓒ
225 Engineer/Scientist Ⓒ

231 Team Leader OU3
232 Engineer/Scientist
233 Engineer/Scientist
234 Engineer/Scientist
235 Engineer/Scientist
236 Engineer/Scientist Ⓒ

241 Team Leader OU4
242 Engineer/Scientist
243 Engineer/Scientist Ⓒ
244 Engineer/Scientist Ⓒ

251 Team Leader OU5•
252 Engineer/Scientist
253 Engineer/Scientist
254 Engineer/Scientist
255 Engineer/Scientist Ⓒ

261 Waste Mgmt Team Leader Ⓒ
262 Engineer/Scientist
263 Engineer/Scientist Ⓑ
264 Engineer/Scientist Ⓑ
265 (Engineer/Scientist) Ⓔ

FP200

Office of Safety, Operations & Technical Support

301 Associate Director
302 Deputy Assoc. Director
303 Secretary•
304 Secretary Ⓓ

311 Facility Rep./Team LDR. Ⓑ
312 Facility Rep.•
313 Facility Rep
314 Facility Rep
315 Facility Rep Ⓑ
316 Facility Rep. Ⓑ

321 Engineering Team Leader
322 Construction Eng.
323 Construction Eng.
324 Construction Eng. Ⓑ
325 Construction Eng. Ⓑ
326 Construction Eng. Ⓑ
327 (Construction Eng.) Ⓔ
328 General Eng.
329 General Eng.
330 Cost Analyst
331 (Cost Analyst) Ⓔ

341 ES&H Team Leader Ⓑ
342 Safety Engineer
343 Safety Engineer
344 Industrial Hygienist
345 Health Physicist Ⓓ
346 Engineer /Scientist
347 Engineer/Scientist
348 Safety & Health Spec. Ⓑ

351 Technology and Economic Development Team Leader
352 General Engineer Ⓑ
353 (General Engineer) Ⓔ
354 (General Engineer) Ⓔ

FP300

OFO On-Site Support

Chief Financial Officer

N308 Management Analyst
N309 Budget/Cost Analyst
N310 Budget Assistant (R)
N311 Accountant (R)
N312 Program Analyst

Administration Support

N481 Contract Spec.
N482 Pers. Mgmt. Spec. (R)
N483 Employee Rel Asst.(R)
N484 Procurement Asst. (R)
N485 Management Assistant

Standards and Compliance

N603 Standards/Compliance Team Leader
N604 Standards/Compliance Engineer

FP400

Total Positions

Fernald/OFO:	68/12
FY96:	73/12

Location Code: FP

DRAFT
3/29/94

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MIAMISBURG AREA OFFICE
Proposed

KEY:
- bold = Bld FTE
- (bold) = FY96 Positions
- • = Current Vacancies
- Ⓐ = FTE Bld Block

35

Office of the Director

101 Director
102 Deputy Director
104 Executive Secretary
105 Administrative Officer Ⓑ

DP100

Office of Environmental Management DP200

201 Associate Director Ⓒ
202 Secretary

211 Proj. Eng./Team Leader
212 OU1 Project Engineer Ⓒ
213 (OU2 Project Engineer) Ⓔ
214 OU4 Project Engineer Ⓒ
215 OU5 Project Engineer Ⓒ
216 OU9 Project Engineer Ⓒ
217 (OU6 Project Engineer) Ⓔ

221 Environ. Spec. Team Ldr.—State/Local
222 Environ. Spec.—NEPA
223 Environ. Spec.—RCRA
224 (Environ. Spec.-- CERCLA) Ⓔ
225 Waste Mgmt. Eng.—Ops.
226 Waste Mgmt.—Min/Treatment Ⓒ
227 D&D Engineer—Pu Areas
228 D&D Engineer—H-3 Areas
229 (D&D Engineer) Ⓔ

Office of Safety, Operations & Technical Support

301 Associate Director Ⓑ
302 Secretary
303 Secretary

311 Facility Rep./Team Ldr. Ⓑ
312 Facility Rep.
313 Facility Rep.
314 Facility Rep.

321 Prgm. Mgr.—Team Leader Ⓒ
322 Prgm. Mgr.—Spec. Proj.
323 (Tech Dev Engineer) Ⓔ
324 Project Engineer

331 Facility Eng./Team Ldr.
332 Facility Engineer
333 Facility Engineer
334 Facility Engineer Ⓑ

341 Safety Team Ldr. Ⓑ
342 OSHA Comp. Spec.
343 Construction/Fire Safety Eng.
344 (Nuclear Safety Eng.) Ⓔ
345 Ind. Safety Eng. Ⓑ

351 Occ Health Team Ldr.
352 Ind. Hygienist Ⓑ
353 (Health Physicist) Ⓔ

DP300

Total Positions : 38
FY96: 45

Location Code: DP

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3/29/94

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WEST VALLEY AREA OFFICE
Proposed

KEY:
bold = Bld FTE
• = Current Vacancies
Ⓐ = FTE Bld Block

Office of the Director
101 Director
102 Deputy Director
103 Executive Secretary Ⓓ
104 Administrative Officer
WP100

Environmental Management
211 Engineering/Technology Team Leader
212 General Engineer
213 General Engineer
214 General Engineer Ⓒ

221 Env. Team Leader
222 Engineer/Scientist
223 Engineer/Scientist Ⓑ
224 Engineer/Scientist Ⓑ
225 General Engineer

231 Vitrification Projects Team Leader
232 General Engineer
233 General Engineer Ⓒ
234 General Engineer Ⓒ

235 Secretary Ⓓ

WP200

Operations & Support
311 Operations/Maint. Team Leader
312 General Engineer
313 General Engineer
314 Nuclear Engineer
315 Facility Rep.
316 Secretary Ⓓ

321 Site-Wide Programs Team Leader
322 QA Specialist
323 Safety Engineer
324 Health Physicist

WP300

OFO On-Site Support
Chief Financial Officer
N313 Budget/Cost Analyst Ⓐ

Administration Support
N486 Contract Specialist Ⓐ

Standards and Compliance
N605 Safety/Compliance Eng Ⓑ

Total Positions
West Valley/OFO: 28/3
FY96: 28/3

Location Code: WP

NEW ORGANIZATION VISION

- No Stove Pipes/More Significant Teaming
- Replace Support Service Contractors with Federal Staff
- Minimize the Mid-Management Level (1:10 Manager to Staff Ratio)
- Improved Capabilities for:
  - Outreach
  - Stakeholder/Regulator Coordination (DNFSB,GAO,IG, etc.)
  - E S & H
  - Cost Engineering/Control
  - Technical Project Management Control
  - Economic Development