Honeywell

SOURCE MATERIALS LICENSE

SUB-526
DOCKET 40-3392

METROPOLIS PLANT
NOVEMBER 2002 REVISION

NRC FORM 374

U.S. NUCLEAR REGULATORY COMMISSION

MATERIALS LICENSE

Pursuant to the Atomic Energy Act of 1954, as amended, the Energy Reorganization Act of 1974 (Public Law 93-438), and the applicable parts of Title 10, Code of Federal Regulations, Chapter I, Parts 19, 20, 30, 31, 32, 33, 34, 35, 36, 39, 40, 51, 70, and 71, and in reliance on statements and representations heretofore made by the licensee, a license is hereby issued authorizing the licensee to receive, acquire, possess, and transfer byproduct, source, and special nuclear material designated below; to use such material for the purpose(s) and at the place(s) designated below; to deliver or transfer such material to persons authorized to receive it in accordance with the regulations of the applicable Part(s). This license shall be deemed to contain the conditions specified in Section 183 of the Atomic Energy Act of 1954, as amended, and is subject to all applicable rules, regulations, and orders of the Nuclear Regulatory Commission now or hereafter in effect and to any conditions specified below.

Licensee	
1. Honeywell Internatonal, Inc.	3. License Number SUB-526, Amendment 15
2. P.O. Box 430 Metropolis, Illinois 62960	4. Expiration Date June 30, 2005
	5. Docket No. 40-3392 Reference No.

6. Byproduct Source, and/or Special Nuclear Material	7. Chemical and/or Physical Form	8. Maximum amount that Licensee May Possess at Any One Time Under This License
A. Natural uranium	A. Yellowcake, U_3O_8, UO_2, UO_3, UF_4, UF_6	A. 68 million kg (150 million lbs)
B. Cs-137	B. Sealed sources	B. 100 millicuries
C. Any licensed material between atomic numbers 1-100	C. Quality control samples	C. 1 µCi total
D. Depleted uranium	D. Yellowcake, U_3O_8, UO_2, UF_4, UF_6	D. 68 kg (150 lbs)
E. Unirradiated uranium	E. UF_4	E. 4080 kg (9,000 lbs)

9. Authorized place of use: The licensee's existing facilities at Metropolis, Illinois.

10. Authorized use: For use in accordance with the statements, representations, and conditions in Chapters 1 through 7 of the application dated September 23, 1998, and enclosure dated October 1, 1998, and with supplements dated December 1, 1998, and March 29, December 2, and December 7, 1999, and September 5, November 30, December 19, and December 22, 2000, April 12, 2001, and January 20, 2003.

11. The licensee shall maintain and execute the response measures in the Radiological Contingency Plan (Emergency Response Plan) dated August 15, 1993, and as amended by letters dated March 19 and 30, 1999, and June 12, 2000, or as provided by the licensee consistent with 10 CFR Section 40.35(f).

MATERIALS LICENSE **SUPPLEMENTARY SHEET**	License Number SUB-526
	Docket or Reference Number 40-3392
	Amendment No. 15

12. The licensee is hereby granted the special authorizations in Chapter 1, Sections 1.6.1, 1.6.2, 1.6.3, and 1.6.8.

13. The average concentration of uranium in calcium fluoride released to each commercial organization, for any consecutive 12-month period, shall not exceed 212 pCi/gram.

14. Safety features of the facility that are identified as critical to the safe operation of the process and are under the control of a distributed control system (DCS) computer interlock shall meet the following requirements. The software or computer code that contains the program for interlocks or process controllers shall be documented and maintained as part of the plant Process Safety Information and shall be subject to the licensee process modification procedure (PT-101), after licensed material is introduced into the system.

15. The Metropolis Works PSM mechanical integrity program shall be in place before the Uranium Hexafluoride Deconversion Pilot Plant begins operation.

16. The licensee shall meet all financial assurance requirements within 30 days of the closing of ownership transfer of assets.

17. Notwithstanding the date of Amendment 13, this amendment becomes effective on the date of the closing of ownership transfer of assets.

18 Notwithstanding the requirements of License Condition 10, NRC License Chapter 1, Section 1.2 Site Location, Page 1-1 is modified to read as shown below. This License Condition expires on July 31, 2001.

1.2 Site Location

The Allied Signal Metropolis Plant is located on approximately 1,000 acres of land in Massac County at the southern tip of Illinois, along the north bank of the Ohio River. The site perimeter is formed by U. S. Highway 45 to the north, the Ohio River to the south, an industrial coal blending plant to the west and privately owned, developed land to the east. Plant operations are conducted in a single fenced-in, restricted area covering approximately 59 acres in the north-central portion of the site.

FOR THE NUCLEAR REGULATORY COMMISSION

Date: 1/30/03

By: [signature]
Daniel M. Gillen, Chief
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety
and Safeguards
Office of Nuclear Material Safety
and Safeguards

PART I

LICENSE CONDITIONS

(CHAPTERS 1 - 7)

Chapter 1

Standard Conditions and Special Authorizations

1.1 Name, Address, and Corporate Information

The UF_6 conversion and deconversion facility is owned and operated by Honeywell International, Inc. Corporate headquarters are located in Morristown, New Jersey. The plant is located in Massac County, Illinois near the City of Metropolis. The plant mailing address is:

Honeywell
P. O. Box 430
Metropolis, IL 62960

1.2 Site Location

The Honeywell Metropolis Plant is located on approximately 1,000 acres of land in Massac County at the southern tip of Illinois, along the north bank of the Ohio River. The site perimeter is formed by U.S. Highway 45 to the north, the Ohio River to the south, an industrial coal blending plant to the west and privately owned, developed land to the east. Plant operations are conducted in a double fenced-in, restricted area covering approximately 59 acres in the north-central portion of the site.

The city of Metropolis (population approximately 7,000) is located approximately one mile SE of the site. The nearest school is approximately 2 miles ESE, the nearest permanent residence is 1,850 feet NNE of the Facility.

1.3 License Number and Period of License

A 10-year Source Material License SUB-526, was issued in June 1995 and will expire on June 30, 2005.

1.4 Possession Limits

The current source material possession limit is 150 million pounds ($6.8E^7$ kg). The source material consists of natural uranium primarily as: uranium ore concentrates, UO_2, UO_3, UF_4, and UF_6, chemical intermediates of these compounds. A possession limit of 150 pounds (68 kg) has been authorized for depleted natural uranium. Product UF_6 contains about 67.6% U-nat. and is possessed as a liquid, solid, or a gas. Authorization

has been granted for a 100 millicurie Cs^{137} sealed calibration source, and several <1µCi/yr quantity control samples.

1.5 Authorized Activities

Authorized activities shall be conducted inside the restricted area fence and consist of activities directly related to the chemical conversion of uranium ore concentrates into uranium hexafluoride and deconversion of UF_6 into UO_3 or UO_2. A description of the major UF_6 conversion process steps is as follows:

The plant receives uranium ore concentrates (in 55-gallon drums) from various uranium mills. The contents of all drums in each lot are sampled in the Sampling Plant, unless they are wet or contain hard ore, to obtain representative analytical samples. Sampled ore concentrates are charged into the UF_6 conversion process through a drum dumping station. The concentrates either go directly to the ore preparation section via the calciner, or through the sodium removal unit (for impurity removal, principally sodium) and then to the calciner. Following the calciner, the concentrates are blended, agglomerated, dried, crushed, and sized to a uniform particle called "prepared feed". Concentrates that are classified as wet or hard ores will be processed through the ponds muds calciner prior to blending with other concentrates.

The prepared feed enters one of the two available fluid bed reductors. In the reductor the uranium is reduced to the dioxide form utilizing hydrogen from dissociated ammonia. The uranium dioxide from the reductor is continuously fed via a closed system, into two fluid bed hydrofluorinators which are operated in series. A countercurrent flow of anhydrous HF converts the uranium dioxide into uranium tetrafluoride (UF_4).

The UF_4 is fed into one of three available fluid bed fluorinators that also contain an inert fluidizing matrix (CaF_2). Elemental fluorine is used as the fluidizing gas to convert the UF_4 into gaseous UF_6 which is volatilized from the fluorinator. Some residual uranium, and non-volatile uranium daughter products remain in the bed matrix which is recycled and reused until the buildup of chemical contaminates prohibit further use. The volatilized UF_6 gas which also contains excess fluorine and HF is passed through a series of filters for particulate removal, and through a series of cold traps for UF_6 collection.

The bulk of the UF_6 is condensed in a series of primary cold traps. Secondary and tertiary cold traps operated at lower temperatures remove

residual UF_6 not collected in the primary traps. Crude UF_6 is removed from the cold traps intermittently following liquefaction by heating, and then transferred to still feed tanks to await purification by fractional distillation. Crude UF_6 from the still feed tanks is fed through a low boiler, and then a high boiler distillation column for final product purification. The product UF_6, which exceeds DOE purity requirements, is condensed and packaged into DOT approved cylinders.

Process off-grade materials which contains significant quantities of uranium may be processed through an on-site uranium recovery unit, or shipped off-site to a licensed facility for uranium recovery processing. Uranium recovered from these operations may be recycled through the UF_6 conversion plant.

Some low level uranium bearing residues may be packaged and shipped directly to a licensed radioactive waste broker or to a licensed radioactive waste disposal site when recovery of the contained uranium is not economical.

Product UF_6 cylinders are periodically washed and tested to assure design integrity. Cylinder cleaning residues which contain uranium daughter products (principally Th^{234} and a Pa^{234}) are stored on-site and eventually disposed of at a licensed waste disposal facility.

Other operations which involve the handling of significant quantities of source material include: outdoor storage pads for ore concentrates and UF_6 cylinders; a uranium recovery unit; a KOH Muds recovery unit, pond muds calciner; and a Laboratory building which houses facilities for conducting process control, product, and radiological control analyses.

1.5.1 Safety Controls Utilized in Filling and Handling Liquid UF_6 Cylinders

The UF_6 continuous sampling system is used to obtain a UF_6 sample between the high boiler column and the product take-off control valve. This system eliminates the need to rotate the cylinder from the 12 o'clock position to the 9 o'clock position, and heating the cylinder for a minimum of six hours before a sample is removed from the homogenized UF_6. This will help eliminate the possibility of a hydrostatic failure on a UF_6 product cylinder.

If the UF_6 product cylinder must be sampled instead of using the continuous sampling system, the following controls are used to

minimize hot cylinder movement and to assure a product cylinder is not overfilled:

1. The cylinder is placed on two separate load cells during the product filling process. The load cell weights are continuously indicated and recorded in the control room. A separate UF_6 product flow totalizer is utilized to measure the amount of UF_6 filled into a cylinder. A manual calculation is also performed of flow rate versus time to determine by a third method, when the cylinder has been filled to the plant administrative limit. Cylinder filling operations are not conducted unless at least two independent methods exist for determining the amount of UF_6 filled into the cylinder. Plant administrative fill limits have been established below those listed in ANSI N14.1 (refer to Section 1.5.2).

2. After filling, the cylinder is lifted approximately four inches using a crane, which is equipped with a built-in digital scale. If the re-confirmed weight is within established fill limits, the cylinder is then lowered and rotated from the 12 o'clock position to the 9 o'clock position, heated in a steam chest and sampled. The crane is remote control operated which allows operation from ground level rather than from an elevated crane cab. Thus, immediate escape is provided for the operator in the event of an accident.

3. After sampling, the cylinder is lifted vertically about 8-10 feet above the fill position, and then moved horizontally about 50 feet and lowered onto a beam scale buggy for final product weight determination.

4. The weighed cylinder is then transferred to a mobile storage buggy using a vertical lift of about six feet and horizontal movement of approximately ten feet.

5. The mobile storage buggy is transported about 150 yards to one of the three designated cooling areas where the cylinder remains on the buggy a minimum of four days for solidification. The product cylinder is then either shipped or transferred to the UF_6 cylinder storage area.

   The 30B product cylinders are transported to a designated cooling area north of the drum crusher building.

In addition, the following controls shall be utilized to minimize any release of UF_6 which could occur during the liquid filling of product UF_6 cylinders (e.g., pigtail leak or failure).

1. An automatic shut-off valve is positioned in the liquid UF_6 filling manifold. This valve may be closed immediately to prevent further cylinder filling if a UF_6 leak occurs in the pigtail piping.

2. A remote controlled drive motor is positioned on the product cylinder valve of the cylinder which is being filled. The cylinder valve may be closed immediately to prevent back flow of UF_6 from the cylinder should a leak in the pigtail piping occur.

   These two controls may be simultaneously activated from several locations to limit the UF_6 available for release during a pigtail failure, to a minimal amount which would not be expected to produce off-site effects.

1.5.2 <u>UF_6 Cylinder Fill Limits</u>

The maximum fill limits for uranium hexafluoride cylinders shall not exceed the packaging limit in effect at the time the cylinder was manufactured as specified by American National Standards N14.1 1990, 1987, 1982, 1971. Plant administrative fill limits will be set at least 100 lbs. less than the ANSI N14.1 limits. If the weight of UF_6 in a 30 or 48 inch diameter cylinder exceeds by more than 100 pounds or 500 pounds, respectively, the maximum fill limits specified in ANSI N14.1; heating of the cylinder shall not be allowed without specific procedures approved by the Plant Manager. The licensee shall notify NRC of any cylinder filled in excess of these weights and of planned remedial actions. Heating of other cylinder types containing UF_6 in excess of the ANSI N14.1 limits, shall not be permitted without specific procedures approved by the Plt. Manager.

1.5.3 <u>Controls to Prevent Hydrocarbon Introduction Into UF_6 Cold Traps, Piping, and Product Cylinders.</u>

The following controls shall be utilized to prevent hydrocarbon contamination of UF_6 cold trap systems, and UF_6 Product cylinders:

<u>UF_6 Process System:</u>

1. Since UF_6 is produced, distilled and packaged in a closed system, the probability of hydrocarbon contamination during normal operations is extremely low.

2. The possibility of hydrocarbon contamination does exist during equipment and piping maintenance. The source of contamination would be from replacement equipment or piping. These sources are eliminated via extensive degreasing procedures. Administrative controls are utilized in the form of increased supervision during the maintenance of UF_6 bearing equipment and piping.

3. Cylinder sampling and line evacuations are performed using an oil filled vacuum pump. The vacuum system is engineered with safeguards that provide an oil trapping capacity in excess of 20 times the volume of oil contained in the vacuum pump. Additionally, one trap contains activated alumina to prevent oil mist carryover. A check valve in this system prevents oil contamination due to back flow. The system also contains a "fail safe" slam valve that closes automatically upon loss of power to the vacuum pump motor. Similar safeguards have been engineered into the laboratory UF_6 sub-sampling system.

<u>UF_6 Product Cylinders:</u> **(Inspection and cleaning procedures are detailed in the "UF_6 Cylinder Quality Assurance Manual"):**

1. Cylinders that contain "heels" which are received at the Plant have been sealed with tamper evident seals in accordance with ANSI N14.1.

2. New cylinders manufactured for the Plant are inspected at the manufacturing site during the production process. Newly manufactured cylinders are degreased in accordance with ANSI N14.1. The cylinders are inspected by plant personnel immediately prior to valve and plug installation. Upon installation, valves and plugs are sealed in a manner consistent with the provisions of ANSI N14.1 for full or empty UF_6 cylinders.

3. When cleaned cylinders (that are not owned by Honeywell) are to be received, the owner shall certify as to the absence of hydrocarbons in the cylinders. Additionally, these cylinders shall be sealed in a manner consistent with the provisions of ANSI N14.1. Alternatively, cylinders that do not meet these specifications shall have the valves and plugs removed and an

internal inspection shall be performed by plant personnel prior to filling.

4. All cylinders received at the Plant undergo an external receiving inspection. An integral part of this inspection is an evaluation of the tamper evident seals. Violation of the seals would be readily apparent. Evidence of a broken seal will be investigated and appropriate action will be taken.

5. Once received, cylinders are secured within the plant restricted area. These cylinders are subject to the same scrutiny as other sensitive areas within the plant property.

6. Cylinders that receive five-year recertification, are washed and/or hydrostatically tested for other reasons, are internally inspected prior to reuse. Water and air systems are engineered to preclude any contamination of the cylinders with oil.

1.5.4 **Controls Utilized to Limit Ethylene Glycol Contamination of UF_6 From Primary Cold Trap Operations:**

The following controls shall be utilized to detect and minimize the potential of contaminating UF_6 with ethylene glycol during routing operation of primary cold traps:

1. A weight and temperature indicator/alarm shall be used on the UF_6 Surge Tank to alert the process operator of an unusual weight or temperature increase.

2. A weight and temperature indicator/alarm shall be used on the UF_6 Dump Tank to alert the process operator of an unusual weight or temperature increase.

3. The temperature and weight of the UF_6 Surge Tank shall be recorded before and after a primary cold trap is heated in preparation for draining. An excessive gain in temperature or weight will require notification to the General Foreperson.

4. An excessive gain in temperature or weight of the UF_6 Dump Tank will require notification to the General Foreperson.

5. Each cold trap which is returned to service after washing or internal repairs shall have the tare weight determined before and after completion of one (1) heating and cooling cycle. An

excessive gain in weight during this cycle will require notification to the General Foreperson.

1.5.5 Deconversion Process Description

A side stream of uranium hexafluoride vapor will be obtained from the product take off of the existing high boiler distillation column. This stream will precede the existing UF_6 flow orifice and will be measured independently using a mass flow meter similar to that used on the existing automatic sampling system. The UF_6 will be contacted in a reactor with an azeotrope of HF and water that is recycled from this end of the process. The UF_6 reacts instantaneously with the water in the azeotrope to form UO_2F_2 (solid) and HF (gas). The HF and excess water leave the reactor in vapor form. They will be filtered for removal of entrained particulate and then distilled. Distillation overhead will be pure anhydrous HF that can be returned to the existing UF_4 process. Distillation bottoms will be azeotropic, aqueous HF that is recycled to the pilot plant process.

The UO_2F_2 falls by gravity to the bottom of the reactor where it is screw conveyed to a second reactor. This reactor is multistage and serves two purposes. In the first portion of the reactor, the UO_2F_2 is pyrolytically converted to U_3O_8 by heating the powder to a high temperature. In the second portion of the reactor, conversion is completed by reaction with steam (generated from the water in the recycled azeotrope). The residual fluoride in the crude U_3O_8 product is then stripped using raw steam resulting in a product of pure U_3O_8. For production of UO_2, the steam in the stripping process is replaced with hydrogen. The hydrogen reduces the U_3O_8 to UO_2 while also stripping residual fluorides.

The product oxide is then collected in 55-gal drums and retained for sampling and analysis. This product may be shipped to other sites or the material will be returned to the UF_6 process at Metropolis for conversion back to UF_6

1.6 Exemption and Special Authorizations

1.6.1 An exemption to 20.1902 (a) and (e), and 20.1904(a) is requested. Rather than post and label individual radioactive material areas and containers, plant entrances are posted with signs bearing the radiation symbol and the words:

CAUTION
RADIATION AREA
RADIOACTIVE MATERIALS

Any area or container in this plant may contain radioactive materials.

1.6.2 Sealed sources shall be subject to the leak testing and actions specified in, "License Condition for Leak Testing Sealed Byproduct Material Sources," dated April 1993.

1.6.3 Release of equipment or packages from the plant site, or to uncontrolled areas on-site shall be in accordance with, "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material", dated April 1993.

1.6.4 Notwithstanding provisions which may be allowed under the Facility Decommissioning Plan, no licensed material shall be buried on-site without specific approval by the Nuclear Regulatory Commission.

1.6.5 For purposes of this license condition section of the license renewal application, the term "are" shall be interpreted as "shall be" in all instances where this term is used to denote services or actions by the licensee.

1.6.6 For purposes of this license the term “Health Physicist” shall mean the Health Physics Supervisor, a Health Physics Specialist, or a Health Physics Team Leader.

1.6.7 The licensee requests authorization to receive quality control samples containing any licensed material between atomic numbers 1-100. The total activity in such samples shall not exceed one (1) microcurie per year.

1.6.8 An exemption to 40.60(b)(3) is requested for the on-site Medical Facility. Plant employees routinely enter the Medical Facility (wearing plant clothing) for physical exams, minor first aid, and medication. An exemption is requested for those employees who enter the medical facility for minor first aid treatment, or other unplanned medical treatment, with spreadable contamination on their person. Each employee who enters the facility for unplanned medical treatment shall monitor clothing and shoes prior to entry. If contamination is detected at levels greater than 1000 DPM/100 cm^2

(total, fixed + removable, alpha, and beta-gamma), the employee shall don shoe covers or disposable coveralls as appropriate. The Medical Facility shall be monitored daily (Monday through Friday during operation) for removable alpha contamination. Removable alpha contamination which exceeds 200 DPM/100 cm^2 shall be reported to NRC as an incident in accordance with 40.60(b)(3).

1.6.9 The license requests authorization to possess up to 150 pounds of depleted uranium.

Chapter 2

General Organizational and Administrative Requirements

2.1 Organizational Responsibilities and Authority

The Metropolis UF_6 conversion plant is owned and operated by Honeywell International, Inc. Corporate headquarters are located in Morristown, New Jersey. The top ranking member of management at the plant site is the Plant Manager, who reports directly to the Director of Operations, Fluorine Products in Morristown, New Jersey. This Leader reports to the Vice President & General Manager of Fluorine Products also in Morristown.

Operations of the plant are administered by a plant staff which is organized as shown in Figure 2.1, Page 2-8.

The Plant Manager's primary responsibility is the safe, efficient, and reliable operation of the facility. The Plant Manager delegates this responsibility through his staff managers. The Plant Manager is responsible for operations through the Nuclear Services & Fluorine Products Leaders, and customer contact through the CLM (Customer Linked Manufacturing) group. The Maintenance Manager is responsible for mechanical maintenance. The Manager of Engineering is responsible for commercial development, capital engineering, laboratory QC and Management Assurance.

The Manager, Regulatory Affairs, is responsible for Environmental, Health Physics, OSHA-PSM Compliance, and Security. This manager has three supervisors reporting to him: The Environmental Supervisor, the Health Physics Supervisor and the Security Team Project Manager. If a conflict of interest should develop, these supervisors may communicate directly with the Plant Manager.

The Health Physics Supervisor's primary responsibility is for compliance with Nuclear Regulatory Commission licensing and inspection requirements. Responsibilities also include Occupational Health in non-uranium manufacturing areas. Responsibilities also include management liaison, and supervision of Health Physics personnel. An indirect reporting relationship is provided to the Safety/Industrial Hygiene Specialist located in Morristown, NJ.

The Corporate Headquarters Staff also provides engineering, and environmental support services as required by the plant.

2.2 Personnel Education and Experience Requirements

The minimum qualifications for the staff positions which relate directly to administration and supervision of the NRC regulatory compliance program shall be as follows:

Manager- Regulatory Affairs:

Requires a Bachelor's Degree in Engineering, Science or related discipline and 8 or more years of diversified experience in chemical manufacturing, including supervisory or management experience. Must possess knowledge of applicable NRC regulations and an extensive knowledge of the Nuclear Fuel Cycle. Must possess sound judgment and ability to work effectively with management and government officials.

Health Physics Supervisor:

Position requirements must include a Bachelor's Degree in Physical or Biological Science and a minimum of three years Health Physics or related experience sufficient to maintain an effective radiation safety program. The designation "Health Physicist" as used in this license shall refer to either the Health Physics Supervisor, Health Physics Team Leader, or the Health Physics Specialist.

Health Physics Team Leader:

The minimum requirements for this position includes a Bachelor's Degree in Physical or Biological Science and at least three years of Health Physics or related experience.

Health Physics Specialist:

The minimum requirements for this position include a Bachelor's Degree in Physical or Biological Science and at least one year of Health Physics or related experience.

Manager Engineering

Position requirements include a Bachelor's degree in Chemistry or Chemical Engineering, five years of Technical experience and three years of supervisory or management experience.

Supervisor-Management Assurance/Training Coordination:

Position requirements include a Bachelor's degree in Chemistry, Chemical Engineering or Mechanical Engineering with at least five years of plant experience.

2.3 Safety Review Committees

The plant shall maintain the following safety review committees:

Safety Councils:

"A" Council Safety Committee:

Meets monthly and consists of the Plant Manager, the departmental managers, the Health Physicist, the Safety Leader, four hourly employees, one each from the Production, Maintenance, Sampling and Instrument departments, and HP Team Leader or HP Specialist. The purpose of the council is to review significant accidents and injuries; and to establish plant health and safety policy.

"B" Council Safety Committee:

"B" Council Committee consists of first-line Supervisors and Forepersons, and all hourly personnel. "B" Council meetings are conducted monthly for employee training, and review of plant safety and radiological safety procedures.

ALARA Committee:

A plant ALARA "As Low As Reasonably Achievable" committee shall be utilized by management to ensure that exposures and effluent releases are effectively controlled. This committee consists of the Plant Manager, the Department Managers, the Health Physics Supervisor, and the President, and Vice-President of the local union. The committee meets quarterly to review the radiological safety program performance for the previous quarter, and to formulate plans for reducing employee or environmental radiation exposures. Regulatory Guides 8.10 and 8.37 are utilized by the committee for formulating plant operating philosophy in reducing exposures. Business transacted at the meetings includes a detailed evaluation of personnel and environmental exposures to identify undesirable trends. An investigation and action plan may be utilized in reversing significant increases observed in the exposure trend analyses.

The Action Plan is maintained and distributed to all members.

Hazard Review Committee:

Process Hazard Analysis (PHA) teams are maintained for the purpose of evaluating specific operating areas for significant potential risk. Each committee is responsible for recommending solutions which will reduce the risk of serious employee injury, major equipment damage, or off site injury or environmental effects.

Each team consists of members as outlined in the plant policy Process Hazard Analysis Procedure. Each committee meets as often as necessary to adequately evaluate risks. Records are maintained of risks evaluated and recommendations made.

2.4 Approval Authority for Personnel Selection

The Plant Manager shall have the final approval authority for selection of personnel in safety-related staff positions and safety review committee membership.

2.5 Training

The plant shall maintain the following training for new employees and re-training for experienced employees:

New employees receive a first-day indoctrination in plant industrial and chemical safety which includes the issuance of personal safety equipment, demonstrations of proper use of safety equipment and lectures covering the importance of and proper procedures for radiation protection. Additionally, each employee is issued and requested to study the "Employee Safety Handbook". A safety indoctrination form which outlines the initial training, the assignment of lockers, the issuance of Approved Monitoring Device (AMD) and safety equipment, and the fitting of respirators is signed and dated by the Safety Leader, the Health Physicist and the new employee.

During the employee's first week, a portion of each day is spent with his immediate foreperson reviewing safety and radiation protection procedures. Adequacy of this training is the responsibility of the foreperson and is based on their on-the-job performance.

All experienced employees are re-instructed in safety hazards and proper radiation protection procedures at monthly "B" Council Safety meetings.

Typical radiation safety topics used in monthly employee training include: radiological emergency planning, ALARA, air activity measurements, surface contamination, decontamination procedures, waste disposal, external dose control, dose units and limits, uranium deposition and toxicity, biological effects of radiation, respiratory protection, and employee rights and responsibilities. An annual quiz is normally given to determine subjects which need additional training emphasis.

The plant "Emergency Response Team" members shall receive twenty-four (24) hours training per year. Topics covered will be fire control, emergency rescue, chemical hazards and other information which pertains to the plant "Emergency Response Plan".

Plant operators shall be trained, and refresher training provided in accordance with plant policy entitled "Process Operator Training". These training records are retained by the Plant Training Coordinator.

Personnel with appropriate Health Physics training shall be present at the plant at all times when operations involving source material are being conducted.

2.6 Operating Procedures

Plant operations shall be conducted in accordance with written "Standard Operating Procedure Manuals". Each manual provides detailed instructions for proper operation of each Production unit, and includes information pertaining to employee health and safety, environmental protection, and hazardous chemicals handled in the unit. "Standard Operating Procedure Manuals" require approval by four supervisors and managers as described in the "Process Modification Procedure" in the Metropolis Plant Policy Manual.

Process changes which could be detrimental to employee health and safety, environmental quality, or the equipment being modified shall be approved in accordance with the plant "Process Modification Procedure". Plant written procedures shall be reviewed, revised, approved, and implemented in accordance with Plant Policy titled "Procedure Control Policy".

In addition, the Health Physicist reviews and approves capital appropriation requests before monies are spent for significant process changes. The Health Physics department also inspects and approves, in writing, radiation work permits where employees must enter confined spaces which have been used in processing radioactive materials. Procedural or equipment changes which could increase employee radiation exposure are reviewed by

Health Physics Department prior to implementation.

2.7 Internal Audits and Inspections

Inspections of plant operation involves essentially continuous observation by cognizant supervisory personnel on multiple daily visits through the facility to ascertain that operations are being conducted in accordance with standard procedures.

A primary responsibility of the plant Health Physics Department is to review and audit plant operations for compliance with the license, and NRC regulations. The Health Physicist has been delegated the authority to shut down operations or require additional safety precautions when he deems such measures are needed.

The Health Physicist shall conduct a formal audit of plant operations which involve source materials in accordance with a written plan to determine compliance with regulations, license conditions, and licensee procedures.

All areas involving source materials shall be audited at least annually. The findings of the audit, including deficiencies and the corrective actions taken, shall be documented in a formal report to the Plant Manager. In addition, an annual radiation protection program audit may be conducted by an individual from outside the plant staff. Results from this audit are reported directly to plant management.

The Metropolis Plant Management Assurance organization shall perform audits of specified plant policies, programs and procedures. These audits are normally independent of other routine audits described herein. The program is implemented to verify that specified plant operations, maintenance, regulatory and other policies, programs and procedures are being complied with. Responsibility for the implementation of this program has been delegated to the Manager of Regulatory Affairs and in turn to the Supervisor of Management Assurance.

The program shall consist of specified policies, programs and procedures from each of the departments within Metropolis Works. Verification of compliance with these will be made via audit, investigation and/or surveillance by a member of the Management Assurance organization or its authorized delegate.

Although it is a separate and objective entity, it is incumbent upon the Management Assurance organization to interact with all areas of Metropolis Works while verifying compliance; identifying and reporting

deviations; and recommending possible improvements or corrective action. Plant staff meetings are normally held monthly. The Regulatory Affairs Manager attends the meetings to provide interface with the Plant Manager concerning plant radiological safety programs and procedures.

In addition to the plant audit and inspection program, business unit HS&E personnel also conducts plant audits to assure compliance with company, federal, and state standards for Occupational Health, Safety, and Pollution Control.

2.8 Investigations and Reporting

The plant Health Physicist or Regulatory Affairs Manager shall be responsible for investigating incidents and analyzing situations which could result in an NRC reportable incident. Incidents which are reportable in accordance with NRC regulations as outlined in Regulatory Guide 10.1, shall be reported by the Plant Manager or his designee. The plant Health Physics Procedure: "Procedure For Reporting Radioactive Materials Incidents to The Nuclear Regulatory Commission" is utilized to evaluate the reportability of incidents.

2.9 Records

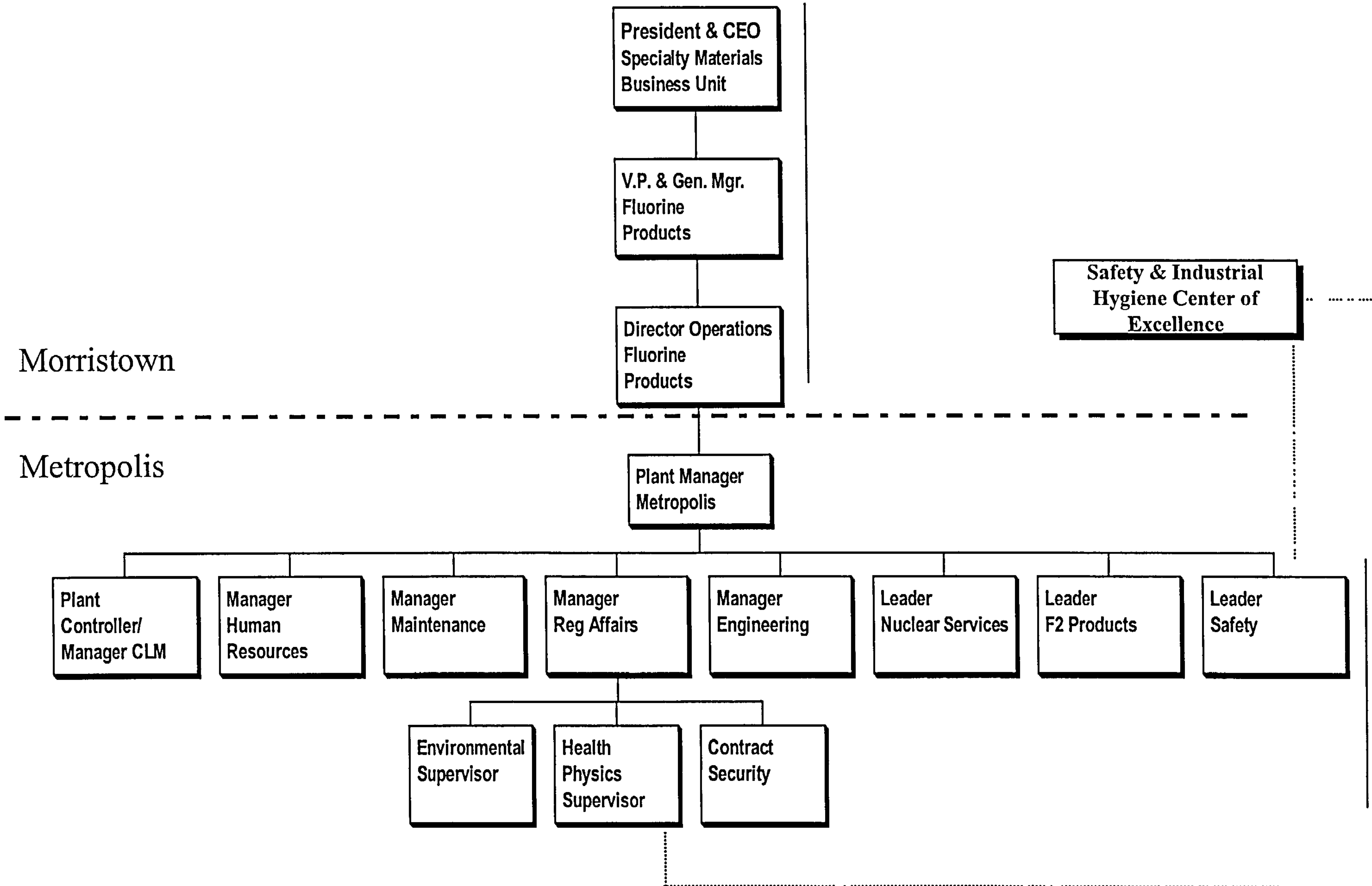
Records which relate directly to radiation exposure of employees or members of the public (e.g., AMD's, bioassay results, environmental air concentrations, etc.) shall be retained until NRC authorizes disposition. Other records which relate indirectly to exposure (e.g., contamination smears, daily air activity measurement, daily stack sampling, etc.) shall be retained a minimum of five (5) years; however, prior to their disposition a summary report shall be prepared. These summary reports shall be retained until NRC authorizes disposition.

Documentation generated by the plant Management Assurance Program, such as reports of audit, investigation or surveillance, are maintained by the Supervisor, Management Assurance. Documentation of this nature shall be maintained for a minimum of five (5) years.

The licensee shall prepare, on a semiannual basis, a report summarizing and evaluating all of the radiological measurements made at the facility, including airborne radioactivity, surface contamination, internal and external exposures, effluents, and environmental monitoring. This report shall be provided to the ALARA Committee, the Plant Manager, and other levels of supervision as necessary for appropriate action.

Figure 1

ORGANIZATIONAL CHART



Revised: November 2002
NRCORG2002

Chapter 3

Radiation Protection

3.1 Special Administrative Requirements

3.1.1 ALARA Policy

The ALARA policy and implementation of the policy shall be as described in Section 2.3 (Safety Review Committees).

3.1.2 Radiation Work Permit Procedures

The plant shall utilize a "Confined Space Permit" system to ensure safe job performance during non-routine maintenance operations, involving licensed material, for which no established procedure exists. A plant "Confined Space Permit" is taken to be synonymous with a "Radiation Work Permit" for licensing purposes.

Prior to performing work for which a Radiation Work Permit (Confined Space Permit) is required, the employee shall be provided with specific instructions regarding the task, the necessary safety precautions, and any safety equipment required. Receipt and understanding of this information shall be documented on the permit and shall include the employee's signature.

An initial Confined Space Permit must be approved by either a Process Leader or Departmental Manager. The Health Physicist, Safety Leader, and the Foreperson also sign this permit before the vessel is entered. The Health Physicist only signs if the confined space contains radioactive materials. Upon completion of the job, the permit cards for entries into radioactive material vessels are retained for documentation of procedure effectiveness.

In addition, Health Physics personnel shall be present whenever entry is made into containment structures, including ventilation baghouses, where the potential exists for exposure to airborne radioactivity concentrations greater than those specified in 10 CFR Part 20, Appendix B, Table 1.

A "Health Physics Data Card" is utilized at the job site to document employee exposures. These cards are also retained for NRC inspection.

3.2 Technical Requirements

3.2.1 Restricted Area -- Access Control

Control of public and employee access to the plant operating area (restricted area) shall be controlled in accordance with the following: Access to the 59-acre plant operating area is restricted by using two separate six-foot cyclone fences with three strands of barbed wire at the top of each. Entrance gate surveillance is provided by guards employed by an outside contractor who specializes in such service. Employees and visitors enter the plant area through the main gate which is secured by a guard on a twenty-four hour per day basis. Construction personnel and ore concentrate deliveries enter through the Sampling Plant gate which is secured by a guard, or monitored on remote controlled TV equipment. Details of security plan are considered "Safeguards", and revealed only to selected personnel.

Protective outer garments (lab coats, or coveralls, shoe covers) are provided to employees, visitors, and contractors who work or enter an area where radioactive materials are processed. Entrances for the following buildings will be posted for requiring protective clothing: Feed Materials, Sampling Plant, Ore Storage, Wet Process, Cylinder Wash, KOH, Ponds Mud, BM/FF Storage, and Radioactive Crusher. The east end of the main laboratory, and the Health Physics Radiochemical Laboratory will also require protective outer garments. The appropriated entrances will be posted. Change rooms are provided in the Administration Building near the Security Guard Station.

Honeywell salaried employees, visitors, and contractors that work in buildings or areas where no radioactive materials are processed may not be required to wear outer protective garments. This policy will be outlined in the Plant Policy Manual. This will depend on the nature of work, safety hazards, and potential exposures to non- radioactive chemicals. The following buildings will not require outer protective garments: EPF/CaF2, Powerhouse, Fluorine, Maintenance Shop & Stores, and all offices. West end of the main laboratory including the Dispensary will not require outer garments. All Honeywell hourly employees will be required to wear protective outer garments.

Contractors and visitors taking a walking tour and remain on the roadway and do not enter any of the non-radioactive processing buildings will not be required to wear protective garments. Railroad personnel will not be required to don protective garments when switching railcars inside the restricted plant area.

Upon exiting the restricted area, visitors and employees deposit protective clothing and shoe covers in appropriate containers for in-plant laundering or reuse. These items do not leave the plant site.

All visitors, contractors, and employees who have entered the restricted area shall perform personal exit monitoring upon leaving in accordance with the following:

The licensee shall maintain operational survey instruments for personnel contamination surveys at the main exits on the north side of the restricted area. There are other exits, but they are not used on a routine basis. Specific instructions would be required if these other exits were to become active. These instruments shall be of a suitable type and sensitivity to detect the presence of contamination on the skin or clothing in excess of 1,000 dpm/100 cm^2. Individuals shall monitor each time they exit the restricted area. If contamination in excess of 1,000 dpm/100 cm^2 is detected, decontamination of the individual shall be performed to reduce levels to background of < 1,000 dpm/100 cm^2. The licensee shall not permit any individual to exit the restricted area with removable contamination above 1,000 dpm/100 cm^2 without the specific approval of the Health Physicist.

In the event an individual is contaminated above the exit limit, cleaning of the contaminated area with soap and water is performed to reduce the contamination level to background of <1,000 dpm/100 cm^2. Experience indicates that contamination picked up on coveralls during the normal working day is negligible. There are, however, instances when an employee or contractor may be required to work under conditions such that contamination is significant. At such times, additional coveralls, shoe covers, respiratory protection, and gloves are required to insure that adequate protection is afforded. Upon completion of the job, the outer clothing is removed and placed in plastic bags at the job site. The employee then proceeds to a shower provided in the UF_6 facility for decontamination and changes into clean coveralls. The employee then proceeds to the regular shower and locker room to change in the normal manner at the end of his shift. The contaminated clothing removed in the UF_6 facility is stored and washed separately from the routine clothing. In this way, the spread of and possible resuspension of contamination is minimized.

Articles to be released for unrestricted use that have been used in the uranium process are surveyed by Health Physics personnel to assure contamination levels meet the criteria specified in "Guidelines For Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material", April 1993.

Empty transport vehicles used to deliver ore concentrates into the plant are surveyed prior to release. Outgoing shipments of uranium product, low-level wastes, and uranium analytical samples are also surveyed to assure compliance with applicable DOT radiation limits.

3.2.2 Ventilation

The surveillance program for ventilation systems shall be as follows:

Areas in the UF_6 process that produce dusts, mists, or fumes containing uranium or other toxic materials are provided with in series dust collectors and scrubbers, or other ventilation equipment designed to reduce employee or environmental exposure to as low as reasonably achievable levels. These exit points are continuously sampled to determine uranium content.

The general ventilation system used in the UF_6 area consists of a series of fresh air intake units and a series of window fans and roof vents. Environmental uranium losses are calculated based on workroom activity samples.

Additionally, the main control room has a separate air conditioning system. The Control Room is maintained under a slight positive pressure (during a UF6 release) and has a fresh air intake located outside the UF_6 process building. Continuous workroom air sampling is provided in this area.

In addition to the analysis of gaseous emissions, operating personnel provide continuous surveillance of the operation of pollution control equipment. Additional samples, visual observation, and other precautions are taken as necessary to ensure optimum performance of pollution control equipment.

Laboratory hoods which are routinely used to handle radioactive materials are checked monthly to measure face velocity. If the average face velocity does not exceed 100 linear feet per minute, the hood will not be used for radioactive materials.

3.2.3 Work-Area Air Sampling

The air sampling and analysis program shall be conducted in accordance with the following:

There are currently fifty-six (fixed) continuous work area air samplers in the UF_6 building, three in the Sodium Removal facility, two in the drum dumping area, and ten in the Sampling Plant to determine airborne radioactivity levels. The sampling filters from all air sampling points are changed and counted daily for Alpha radioactivity. The air activity is calculated (µCi/ml) and reported daily during periods of normal operation. However, during periods of abnormal operating conditions (visible spills or leaks), the sample filters are changed after the upset is corrected and the area decontaminated of visible contamination. Respirators are required for potentially exposed employees during this period. The air samples are usually or normally changed (after decontamination) at two-hour intervals until analytical results indicate the air activity is less than 30% of the Derived Air Concentration (DAC). Respirator requirements are then removed.

The administrative action level of 30% of DAC, when combined with estimated occupancy factors, is selected to limit employee exposure to airborne uranium to as low as reasonably achievable levels. If the average activity on any floor in the Feed Materials building is greater than 30% of DAC, or any four (4) of eight individual air samples exceed 30% of DAC, the entire floor is posted for precautionary use of respirators and an informal investigation is conducted by the Production Foreperson and Health Physics Department to correct the problem. If any single air sample is greater than DAC, a formal investigation is initiated by the Health Physics Department, and the Production Foreperson documents the cause and corrective action taken on an "Incident & Spill Report".

Each fixed breathing zone sampler is located approximately five feet above the floor and consists of: a 25 mm open-face filter holder, particulate or membrane filter, flow meter, and associated fittings for connection to a central sample vacuum system. Eight samplers are located on each floor of the UF_6 facility. The sampling rate used is 40 SCFH which is approximately equal to "standard man" respiration rate. Employee lapel samples are taken at least once per year on representative employees, to verify the results from the fixed air samplers, and may also be used in specific exposure evaluations.

3.2.4 Radioactivity Measurement Instrumentation

Instruments routinely used in radiation surveys are shown in the following table:

HEALTH PHYSICS SURVEY INSTRUMENTS

Type	Use	Sensitivity	Calibration	
			Range	Frequency
Geiger Counter	General Survey	Beta-Gamma >40 KeV	0-200 mr/hr	Quarterly*
Thin Window Radiation Monitor	Surface Contamination	Alpha-Beta-Gamma	0-50,000 CPM	Quarterly
Scintillation Alpha Counter	Surface Contamination Air Filters	Alpha	0.3-999,999 CPM	Monthly
Internal Proportional Counter	Air Filters Surface Contamination	Alpha-Beta	0.1-999,999 CPM	Quarterly

The thin window, scintillation, and IPC counters are calibrated using a certified U_3O_8 source. The Geiger counters are calibrated using the Cs^{137} sealed source listed in Paragraph 1.4. Appropriate check sources are also available to monitor instrument response during use. In the event measurements are required which are beyond the capabilities of plant instrumentation, an outside vendor shall be utilized to perform the analysis. The Cs^{137} sealed source for calibrating Health Physics instruments is leak-tested at a minimum of 6-month intervals.

3.2.5 Radiation Exposure

The Occupational Radiation Exposure Control Program shall be based upon: confinement of natural uranium in process vessels to the maximum extent possible; visual observation of spills or leaks and air monitoring of the resultant contamination (described in Section 3.2.3); required use of respiratory protection; bioassays to determine uranium intake; external-whole body radiation monitoring; and a computerized records management system to document individual TEDE annually on an NRC Form 5.

* Or immediately before use.

Respiratory Protection:

The respiratory protection program will be conducted in accordance with 10 CFR Part 20.1703 "Use of individual respiratory protection equipment" and Regulatory Guide 8.15.

Respirator use is required at the action level of 30% of DAC. When conditions indicate that the protection provided by a half-face respirator may be inadequate, respiratory equipment is used which will provide the individual greater protection, such as a full-face gas or airline mask, or self-contained breathing apparatus, as appropriate. For purposes of calculating individual exposure to airborne radioactivity, protection credit may be taken when the concentration exceeds DAC. The respiratory protection factors utilized are in accordance with 10 CFR Part 20, Appendix A, and Regulatory Guide 8.15.

Bioassay:

The bioassay program shall be conducted as follows:

Bioassays consist of routine and special urinary uranium sampling for evaluation of employee intake of natural uranium compounds. Whole body counting may be performed by an outside contractor for those employees exposed to a class "Y" uranium compound, when urinary uranium analysis indicate work restrictions should be imposed. The program utilizes guidance provided in Regulatory Guide 8.9 (July 1993). Intakes are calculated using the methodology provided in NUREG/CR-4884, "Interpretation of Bioassay Measurements", July 1987, in conjunction with the computer program "INDOS" developed by Skrable Enterprises Inc., Dec. 1987.

Hourly employees are required to leave a routine urine sample twice monthly following a 24-96 hour absence from work.

Salaried personnel who routinely work inside the restricted area shall be sampled monthly. The routine sampling schedule is appropriately adjusted to allow for vacations, illnesses, etc.

Special urinary uranium samples are collected following confined space entries, e.g., baghouses, where the air concentrations may exceed DAC; and following a UF_6 release if employees have been exposed. In addition, employees are encouraged to submit urine samples at the end of a workshift, following a suspected exposure to airborne uranium to determine if an exposure has actually occurred.

The evaluation level used is 15 μg/L, and the investigation level is 60 μg/L urinary uranium. Employees whose urinary excretion rate exceeds 15 μg/L are resampled for confirmation. If the excretion rate exceeds 60 μg/L, the intake is investigated and daily urinary uranium samples are normally

obtained until the results are less than the evaluation level. Work restrictions are considered if the bioassay data indicates the intake exceeds 30% of the Annual Limit on Intake (ALI) for mixed solubility material ("Y", "W", and "D"). Work restrictions are imposed if results indicate the weekly intake limit (10 mg) for class "D" uranium or the ALI has been exceeded.

Employees exposed to highly soluble UF_6 are required to submit two (2) special urine samples within the first 24 hours following exposure, usually at 3-6 hours post exposure, and 16-20 hours post exposure. The investigation level for these samples is 200 µg/L and work restrictions are imposed if it appears the 10 mg weekly limit for soluble uranium may be exceeded. Daily sampling is continued until the concentration is less than 15 µg/L.

External Radiation - Personnel Monitoring:

The external exposure monitoring program shall be conducted as follows:

Each Honeywell employee that routinely works inside the restricted area shall be issued an individually assigned an Approved Monitoring Device (AMD) if they work in an area that processes radioactive materials. The Approved Monitoring Device (AMD) service is supplied by outside vendors specializing in such service. The vendor supplies new badges on a quarterly basis for salaried employees, and monthly for hourly employees. Salaried employees who routinely work in the Administration Building or contractors who normally do not work in a uranium processing area are not assigned an Approved Monitoring Device (AMD). The vendor is instructed to notify the Health Physicist, via telephone or fax, of any whole body exposure exceeding 125 mrem during a month, and an investigation is conducted to determine the source of the exposure.

Process vessels are posted caution - "Radiation Area" if the exposure rate exceeds 5 mr/hr at 30 centimeters from the source. In addition, magenta and yellow floor stripes are provided around the equipment to provide an additional buffer zone and warning device for employees.

Investigative beta-gamma instrument surveys are conducted when a process or procedural change is made which could result in increased employee exposure. Exposure rate and occupancy factors are appropriately utilized to determine if additional precautions are needed. Additionally, each time a radioactive material vessel is entered for inspection or repairs (confined space entry), a radiation survey is conducted by the Health Physicist and appropriate employee protection is specified utilizing time, distance and shielding considerations.

3.2.6 Surface Contamination:

For purposes of surface contamination monitoring, the following terms shall apply to areas within the plant restricted area:

<u>Controlled Areas</u>: Plant areas in which uranium is processed and could be present in unencapsulated form.

<u>Intermediate Areas</u>: Production areas for non-radioactive fluorine based chemicals, and plant support facilities.

<u>Uncontrolled Areas</u>: Plant areas where food may be consumed, locker rooms, and entrance/exit areas from the plant.

All specified areas are monitored for removable alpha contamination in accordance with the frequency, and action levels specified in Table 3.2.6. Any area found to exceed the specified action level is scheduled for immediate decontamination. Follow-up surveys shall be conducted following decontamination of the area.

TABLE 3.2.6

SURFACE CONTAMINATION MONITORING

UNCONTROLLED AREAS	INTERMEDIATE AREAS	CONTROLLED AREAS
Action Level: 200 dpm/100 cm²	Action Level: 200 dpm/100 cm²	Action Level: 5000 dpm/100 cm²
Survey Frequency: (Weekly)	Survey Frequency: (Quarterly)	Survey Frequency: (Quarterly)
Admin. Bldg. - 1st Floor	Laboratory	Feed Materials Bldg.
Construction Gate Bldg.	Maintenance Shop	U Recovery & NaR Bldg.
DUF_6 Control Room	Fluorine Plants	KOH Muds Bldg.
Lab Library	SF6 Bldg.	Sampling Plant
Main Lunchroom	Power House	Cylinder Wash Bldg.
Sampling Plt. Lunchroom	CFx Bldg.	Ore Storage Bldg.
Storehouse Office Area	Storehouse	Drum Dumper Bldg.
Locker Rooms	Admin. Bldg. - 2nd Floor	Drum Crusher Bldg.
FMB Control Room	Safety/Laundry	
U Rec. & NaR Ct. Room	EPF Area	
KOH Muds Bldg. Ct. Rm.	Health Physics Offices	
Maintenance Offices		
Production Offices Bldg.		
Capital Engr./CLC Offices		
Maintenance Engr. Off.		
Health Physics Bldg.		
Fluorine Plt. Control Rm.		
Purchasing Offices		
Admin. Laundry		
Sampling Plt. TQ Room		
SF6 Control Room		
CFx Control Room		
Powerhouse Control Rm.		
Fluorine Plant Office Trailer		
Plant Dispensary shall be monitored daily (Monday through Friday) for removable alpha contamination.		

Chapter 4

Environmental Protection

4.1 Effluent Control System

There are numerous (currently 52) individual stacks and exhaust fans associated with the operation of the UF_6 conversion process which could contain significant concentrations of uranium. Exhaust fan losses are calculated based on workroom air activity monitoring. The process stacks are sampled continuously at isokinetic flow conditions using particulate filters to measure the uranium emission rate. If moisture or chemical attack precludes the use of particulate filters, a combination water scrubber-mist impinger is normally used. Stack samples which could have a high loss potential are collected twice per twenty-four hours and counted for Alpha radioactivity. If the loss potential is small, the samples are collected once each twenty-four hours. Each twenty-four hours the individual filters for each sample point are composited and analyzed for total uranium emissions. An investigation limit is established for each dust collector stack (usually 5000 DPM for secondary dust collectors). If the stack limit is exceeded on three (3) successive samples, an investigation is conducted to correct the problem. Due to the large number of individual emission sources, an additional investigation level for gaseous uranium emissions is utilized based on the average of four (4) continuous air samples collected at the restricted area fence line which are changed weekly. The investigation level is based on the average quarterly uranium concentration which would produce an annualized dose of 10 mrem (EDE), if an individual were continuously present at the fence line.

Compliance with 40 CFR 61, or 190, as appropriate, dose limits for members of the public shall be determined as follows:

4.1.1 If the average concentration of total alpha radioactivity (the sum of natural uranium, radium-226, and thorium-230) measured from samples collected from existing Station No. NR-7 (adjacent to the home of the nearest residence north-northeast of the plant) exceeds 3.0×10^{14} µCi/ml over any calendar quarter, the licensee shall, within 30 days, prepare and submit to the Commission a written report which identifies the cause for exceeding the limit and the corrective actions to be taken by the licensee to reduce radioactivity release rates. If the parameters important to a dose assessment change, a report shall be submitted within 30 days which describe the changes

in parameters and includes an estimate of the resultant change in dose commitment.

4.1.2 In the event that the calculated dose to any member of the public in any consecutive 12-month period is about to exceed the limits specified in 40 CFR 190.10, the licensee shall take immediate steps to reduce emissions so as to comply with 40 CFR 190.10. As provided in 40 CFR 190.11, the licensee may petition the Nuclear Regulatory Commission for a variance from the requirements of 40 CFR 190.10[1] If a petition for a variance is anticipated, the licensee shall submit the request at least 90 days prior to exceeding the limits specified in 40 CFR 190.10.

4.1.3 The licensee shall continue the existing environmental air monitoring program (committed to in Section 4.2, including commitment to monitor fluoride). Continuous air sampling shall be conducted at all the stations and the air samples shall be composited at each station and analyzed at least monthly for uranium and at least quarterly for radium-226 and thorium-230. All radiological analyses specified above shall be performed with analytical sensitivity of at least 10^{-16} μCi/ml.

4.1.4 Samples taken at Station No. NR-7 shall be composited at least quarterly and analyzed for uranium solubility. The solubility analysis shall follow the methodology and procedures established by Battelle Pacific Northwest Laboratories (BNWL)[2,3] or an equivalent method acceptable to NRC.

4.1.5 The air sampler at Station No. NR-7 shall be operated continuously except for those periods required for disassembly or repair. A one (1) micron particle size shall be assumed for purposes of dose calculation.

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[1]The report or petition should be submitted to the Director, Office of Nuclear Material Safety and Safeguards, with a copy to the Director of Region III's Division of Radiation Safety and Safeguards.

[2]Solubility Classification of Airborne Products from Uranium Ores and Tailings Piles - D. R. Kalkwarf, BNWL, November 1978, USDOE contract No. EY-76-C-04-1830.

[3]Second Quarterly Report on Solubility Classification of Airborne Products from LWR-Fuels Plants - D. R. Kalkwarf, BNWL, October 15, 1979.

4.1.6 The actual material solubilities, and air concentrations, determined as required in this license condition shall be used to calculate the dose to the public for purposes of demonstrating compliance with 40 CFR 190, or 40 CFR 61, as appropriate. In addition, the Computer Code COMPLY shall be utilized to estimate the dose produced from stack emissions.

All liquid effluents from the facility are discharged through the main effluent via natural drainage into the Ohio River. The main plant effluent is continuously sampled, and the composite sample is analyzed daily for uranium. The investigation level for uranium in the liquid effluent is established at 1.0 PPM "U" as a monthly average. This concentration would produce an individual ingestion dose of <1 mrem/yr (EDE) at the nearest downstream municipality which could, but does not use Ohio River water as a drinking water source.

4.2 Environmental Monitoring

The environmental air monitoring program shall consist of taking continuous air samples (low volume) at four points along the restricted area fence line (Stations No. 9, 10, 12 and 13). Two additional samplers are located near the site boundary in the prevailing wind direction (Stations No. 8 and 11). One sampler is located off-site approximately one mile down wind of the Feed Materials building (Station No. 6). An additional (high volume) continuous air sampler is installed at the location of the nearest down wind residence (Station No. NR-7). Each low volume (No. 6, 8, 9, 10, 11, 12, and 13) sampler is changed weekly and analyzed for uranium and fluoride content. Results are reported as μCi/ml uranium and $\mu g/m^3$ fluoride. Additionally, a quarterly composite of the weekly samples is sent to a vendor analytical laboratory to determine the airborne concentrations of Ra^{226} and Th^{230}.

The main plant liquid effluent in continuously sampled and a daily composite is analyzed for uranium content. The daily samples are composited into a monthly composite sample which is analyzed for uranium, gross alpha, gross beta, and several non-radiological constituents. Quarterly composites of the monthly samples are analyzed by a vendor analytical laboratory for Ra^{226} and Th^{230} concentration.

Environmental water and sediment samples are taken semi-annually from four locations on the Ohio River. One sample is obtained upstream and

one sample downstream relative to the plant outflow. One sample is collected from the river at the point of plant outflow, and the fourth sample is obtained on the opposite side of the river. In addition, three inland samples are collected from area lakes and ponds. These samples are analyzed for uranium and fluoride content. In addition, on a semiannual basis, Honeywell shall take samples and perform uranium and fluoride analyses of bottom sediment from the liquid effluent drainage ditch at locations approximately 700 and 1400 feet downstream of Outfall 002 monitoring station.

Additional environmental samples are collected semi-annually of soil and vegetation. Six sample stations are located on site at the same location of the low volume air samplers. Seven additional stations are located off-site in the surrounding areas of Illinois and Kentucky covering a radius of about eight miles from the plant. Each sample is analyzed for uranium and fluoride content. Additionally, direct radiation is continuously monitored using environmental AMD's. An environmental Approved Monitoring Device (AMD) is located on the restricted area fence on each side of the plant. One badge is located at the nearest property boundary, two are located at the nearest residence monitor, and one is located at the Metropolis airport, approximately one mile NE of the facility. The badges are exchanged quarterly for analysis by a vendor laboratory.

Results from the radiological environmental monitoring program are reviewed by the Health Physicist and evaluated by considering applicable NRC environmental criteria, or other applicable Federal or State criteria relating to environmental quality. Management is notified of undesirable trends, and results which may indicate non-compliance with applicable environmental standards.

The plant NPDES permit (No. IL 0004421) has been renewed by the Illinois Environmental Protection Agency, effective February 1, 2002 through January 31, 2006. The plant liquid effluent shall be monitored in accordance with the terms and conditions of the permit.

The plant has also been issued a permit by the Illinois Environmental Protection Agency for the storage and treatment of hazardous waste generated on-site. This permit is in effect from May 5, 1987 until March 31, 1997. This permit regulates operation of the EPF Ponds and storage of drummed hazardous waste on the laboratory waste storage pad. The application to renew this permit was submitted in September 1996; the agency has indicated it will be issued in the first quarter of 2003.

Some of the drummed hazardous waste is "mixed waste" in that it contains both RCRA hazardous waste and low concentrations of uranium. This waste must remain stored on-site until a facility for treatment and/or disposal is permitted. The remaining drummed waste is periodically shipped off-site for appropriate disposal.

There are currently forty-three (43) groundwater monitoring wells installed on the plant site. Of these eight (8) are used for landfill monitoring; twenty-seven (27) for RCRA Facility Investigation; ten (10) for RCRA compliance monitoring; nine (9) wells are sampled quarterly for pH, Fluoride, specific conductance, gross alpha activity and gross beta radioactivity. One additional well is utilized for groundwater surface elevation measurements only. There are two (2) wells that are common to RCRA Facility Investigation and landfill monitoring wells.

Chapter 5

Special Processes

5.1 Proprietary Information

Although portions of the UF_6 conversion and DUF_6 deconversion processes are considered proprietary, Safety, Health, and Environmental data and methods are not considered proprietary.

The following special processes are utilized to minimize the environmental impact which might be associated with operation of the plant:

An Environmental Protection Facility (EPF) is utilized to remove chemical pollutants (primarily fluoride) from the main plant effluent stream. The facility process uses calcium hydroxide to precipitate fluorides as insoluble calcium fluoride. The precipitated "synthetic" calcium fluoride solids are recovered in the Calcium Fluoride Recovery Facility. The "synthetic" CaF_2 is subsequently transported to any commercial organization that uses "synthetic" CaF_2 as a substitute for natural fluorspar in a commercial process. The average concentration of uranium in calcium fluoride released to each commercial organization, for any consecutive 12-month period, shall not exceed 212 pCi/gram. The effluent from the EPF plant has a pH of approximately 13. After final solids removal in settling basins, the pH is automatically adjusted to a pH range of 6-9 using H_2SO_4. This stream is combined with other treated wastewaters. This combined stream is then mixed with uncontaminated cooling water and the effluent from the uranium settling ponds at the main effluent mixing basin before being discharged into the Ohio River.

Wastewater that may contain significant quantities of uranium is routed through Settling Ponds No. 3 and No. 4 which are used as uranium spill control ponds.

The pH of the Uranium Settling Ponds No. 3 and 4 is maintained slightly basic to minimize dissolved uranium loss. As the effluent leaves the second uranium spill control pond, the level is measured to determine flow rate and a proportional sample is taken for a 24-hour composite sample. The pH and uranium content of the composite sample is analyzed daily. The effluent from the uranium settling ponds is then mixed with the remainder of the facility effluent before discharging into the Ohio River. A settling pond may be removed from service due to a leak, degradation of the liner, or excessive solids build-up (controlled by monitoring 'U' content

of discharge, and periodic measurement of solids level). When feasible, pond clean-out is performed during the summer months. The uranium bearing sludge removed from the settling ponds may be processed through the Uranium Recovery unit or shipped off-site to another licensed Facility for recovery of contained uranium. Any solids remaining after in-plant uranium recovery processing are dried and packaged with other solid waste for off-site burial or processing.

5.2 Process Vents - Radioactive and Hazardous Chemical Controls

Dust collectors and scrubbers are operated in series where the gases could contain significant quantities of uranium or hazardous chemicals. Radioactive release limits and controls are listed in Section 4.1 (Effluent Control System). In addition, each gaseous emission source is operated in accordance with an individual air permit obtained from the Illinois Environmental Protection Agency. Operational and administrative controls are utilized to shut down and repair the emission source to prevent violation of the air permit or excessive concentrations of radioactive materials at the restricted area fence line.

5.3 Occupational Safety

Action levels and corrective actions for employee exposure to radioactive materials are shown in Chapter 3 (Radiation Protection). Industrial hygiene sampling and monitoring is performed as required by OSHA regulations. Current PEL's or other appropriate physical hazard limits are utilized to evaluate employee exposure. Evaluations are also performed for new chemicals or physical hazards which may be introduced into the workplace due to new or revised processes.

An extensive "Hazard Communication Program" is maintained to assure employee awareness of chemical hazards in the plant. Annual physical examinations and medical monitoring are provided for exposed employees. Additionally, urinary fluoride monitoring is provided for employees working in the fluorine products areas of the plant to document fluoride exposure in these non-uranium manufacturing areas.

The plant fire protection program shall be conducted in accordance with the provisions described in Section 9.7 of this license application.

5.4 Chemical Safety Plan

The Honeywell Metropolis Plant Chemical Safety Plan (CSP) has been developed to comply with OSHA 1910.119. In addition, the CSP is responsive to Nuclear Regulatory Commission concerns regarding potential impacts of chemical accidents on Radiological operations. The plant shall comply with the specific elements of the CSP as described in Chapter 13.4 of this license application.

5.5 Standby Utilities

Standby utilities are maintained in order to facilitate a safe and orderly shutdown of the process units during a complete power failure. Standby utilities are provided as follows:

Standby Electrical Power - Standby electrical power is provided from an electrical generator located in the Powerhouse building. The standby electrical generator is diesel powered and delivers 480 volts of alternating current. In the event that electrical power is interrupted, the standby generator automatically starts and comes to a "standby" mode. The standby power is then distributed, as required, to the following:

1. Standby power is provided to the Administration Building and the Laboratory Building for lighting in the Dispensary, Lab, and Health Physics. Power is also provided for the Health Physics air sampling system, and emergency exit lighting in process buildings.

2. Standby power is provided to one deep well pump so that a water source is available for operation of the process boilers.

3. Standby power is provided to all three process boiler instrument panels and all boiler support equipment which, along with the emergency water supply, allows the production of steam for space heating and to provide a source of heat for critical process equipment.

4. Standby power is provided to critical instrumentation in the fluorination and distillation areas of the UF_6 process and to one fluorination scrubbing train. This gives operating personnel the capability to monitor the in-process UF_6 and to evacuate piping or vessels as needed to maintain the process in a safe condition.

Liquid Nitrogen System - In addition to standby electrical power, a pressurized nitrogen system is also provided. This system is used to

provide pressure for pneumatic instrumentation and to provide an inert gas for purging process piping and vessels during an electrical power failure. During a power failure, the liquid nitrogen supply source is automatically routed through a pair of ambient air vaporizers which require no external source of power. During a power failure, the system is completely self-sufficient and requires no external source of electrical power, steam, etc.

The vaporized nitrogen as described in the preceding paragraph is automatically valved into the critical plant air systems and to the inert gas system. Normally open (power to close) solenoid valves are located on tie lines between the nitrogen header and the plant air and inert gas headers. During a power failure, these valves automatically open thereby supplying nitrogen pressure for critical pneumatic instrumentation and purging of equipment.

5.6 Radioactive Waste Management:

Radioactive solid wastes are generated from routine operation of the UF_6 conversion and DUF_6 deconversion facilities. The routine wastes generated consist primarily of contaminated filters, paper, floor sweepings, cleaning rags, and contaminated scrap metal. These materials are normally compacted or supercompacted for volume reduction before being shipped to a licensed waste disposal site or licensed waste broker. The plant radioactive waste program follows guidance provided in 10 CFR Part 61.

The solid radioactive wastes generated in the uranium recovery process consist primarily of inorganic insoluble material (calcium fluoride) which contains small quantities of natural uranium. The average concentration of uranium (nat.) is approximately 10,000 -20,000 PPM. This material also contains other long-lived isotopes which have not been removed in the uranium milling process. The average concentration of significant isotopes is about 0.03 μCi/gm. These residues are dried, appropriately packaged, stored in specially designated areas, and then either shipped to a licensed off-site facility for recovery of contained uranium, or disposed of at an LSA waste disposal site.

Contaminated pieces of process equipment and piping being discarded are decontaminated where feasible to recover uranium values. Contaminated metals may be compacted for volume reduction or shipped as is to a licensed disposal site or licensed disposal broker. Non-contaminated scrap metal is sold to various scrap metal dealers. Thorough radiation monitoring is done to assure that the residual radioactivity level is below

applicable NRC unrestricted release criteria before the material is released from the plant site. Other items, e.g., scrap wood, which may be recyclable or useful to members of the public, may be released if residual radioactivity levels are below NRC release criteria.

Chapter 6

6.1 Decommissioning Plan

At the end of the plant life, this conversion/deconversion facility and site shall be decontaminated and decommissioned in accordance with an NRC approved Decommissioning Plan. Financial Assurance for decommissioning cost has been provided through a Honeywell International Inc. Corporate self-guarantee, dated June 2, 2000. The self-guarantee financial assurance mechanism was approved by NRC, as License Amendment No. 17, on May 26, 1994 and updated in License Amendment No. 14, May 24, 2001. Honeywell International Inc. Financial Assurance self-guarantee was updated April 5, 2002.

Chapter 7

7.1 Radiological Contingency Plan

The plant has implemented a Radiological Contingency Plan (RCP) dated August 15, 1993. The RCP has been amended by letters dated March 19 and 30, 1999, and June 12, 2000. This plan has been approved by the Nuclear Regulatory Commission and License Condition 11, dated March 1, 2001.

PART II

SAFETY DEMONSTRATION

(CHAPTERS 8 - 14)

Chapter 8

Overview of Operation

8.1 Corporate Information

The Metropolis UF_6 conversion plant is owned and operated by units of Honeywell International Inc., and Corporate headquarters are located in Morristown, New Jersey. The top ranking member of management at the plant site is the Plant Manager, who reports directly to the Director of Operations, Fluorine Products. The Director of Operations reports to the Vice President & General Manager of Fluorine Products, who reports directly to the President of the Specialty Materials Sector.

8.2 Financial Qualification

Honeywell International Inc. is a very large, financially secure organization with annual world wide sales exceeding 24 billion dollars. The assets of the Corporation are more than adequate to provide cash for the operation and decommissioning of the Metropolis Plant. A summary of the Honeywell Financial Report (10 K) is included with the decommissioning Financial Assurance document, dated April 5, 2002.

8.3 Summary of Operating Objective and Process

Honeywell International Inc. operates a privately owned uranium hexafluoride conversion facility at Metropolis, Illinois. The Metropolis facility chemically converts natural uranium ore concentrates into high purity uranium hexafluoride (UF_6). The UF_6 product from the facility is shipped to enrichment plants. Following enrichment, the uranium is converted into fuel for use in nuclear power reactors.

The present plant is a multi-product chemical manufacturing facility producing sulfur hexafluoride, iodine and antimony pentafluoride, and uranium hexafluoride. The production of uranium hexafluoride is the only operation requiring licensing by USNRC pursuant to the provision of 10 CFR 40. The licensed facility is designed to produce in excess of 14,000 short tons per year of uranium as UF_6 from uranium ore concentrates. The plant feed usually assays about 75% uranium and the final UF_6 product contains less than 300 parts per million impurities. In the Honeywell process, the ore concentrates feed is carried through the successive steps of feed preparation, reduction, hydrofluorination, fluorination and

distillation. Chemical reactions are carried out in fluid bed reactors. The process is sometimes referred to as the "fluoride volatility process".

Although fluorine chemical (non-radioactive) sales have increased, the last major expansion occurred in 1995 in the fluorine plant and the uranium hexafluoride (UF_6) production facilities.

8.4 Site Description

8.4.1 Geographical

The Honeywell Metropolis Plant is located on approximately 1000 acres of land in Massac County at the southern tip of Illinois. The primary site perimeter is formed by U.S. Highway 45 to the North, the Ohio River to the South, an industrial coal blending plant to the West and privately owned, developed land to the East. Plant operations are conducted in a fenced in, restricted area covering 59 acres in the North-Central portion of the site. An additional 100 acres of land has been acquired directly across U.S. Highway 45, N-NE of the plant since the last license renewal. This addition increases the total site property to approximately 1000 acres.

The plant site is located in gently rolling hills, typical of Southern Illinois, and is bounded on the South by the Ohio River flood plain. The surface water drainage of the site is to the South into the Ohio River.

Approximately 25% of the site consists of idle agricultural fields which are returning to their natural state, 25% is currently utilized for agriculture (soybeans or corn), the remaining property is heavily wooded, second-growth timber.

8.4.2 Demographical:

The plant site is located in a predominately agricultural area. In Massac County about 70 percent of the land area is used for farming and 30 percent is woodlands, idle farms, or urban areas. The population of the area has remained fairly stable since 1900, but in recent years has followed the national trend in farming areas of increasing urban concentration and declining farm population. Cities and towns within a twenty-five mile radius of the site and having a population of more than one thousand are shown in Table 8.4.2(A), Page 8-12.

The cumulative population distribution within a 50-mile radius of the Metropolis plant is presented in Table 8.4.2(B), Page 8-14. Within a one-mile radius of the facility, the total population is only 201 persons, and most of these are concentrated in the E to ESE sectors near the city of Metropolis. The population of 42 shown in the NNE sector has been reduced by about ½ since the 1980 census due to acquisition of additional property by Honeywell since 1980. The properties which have been acquired from 1986 to present (refer to Figure 8.4.2(C), Page 8-15), have reduced the residences within 2000 ft. of the plant to: three (3) transient mobile homes, and two (2) permanent residences. The nearest residence sampling device is currently located between the two nearest residences, 1850 feet NNE of the Feed Materials Building. There are no facilities which would present significant evacuation problems within the immediate vicinity of the site.

8.4.3 Meteorological

The Metropolis site is located at the southern tip of Illinois on the North bank of the Ohio River. Due to the location of the site, the climate is more characteristic of Kentucky than of Illinois. Because of a slight modifying influence of the river, the absolute temperature range is smaller than in Illinois. Temperatures of 100°F or higher and zero or lower each occur with a frequency of about once in five years.

The normal precipitation for the site area is 45-46 inches per year and most of this falls during the winter and spring months. July through October is the driest period. The wettest single month is March, while the driest is October.

The average winter has only occasional light snows. The ground remains bare most of the time, and only about fifteen days per season have a snow cover of one inch or more. The seasonal average snowfall is ten inches. The average annual depth of freeze penetration in the soil is about five inches. During much of the average winter, the ground remains unfrozen.

The area has a long period average of fifty-three thunderstorm days per year, but the number of damaging winds and hail storms is not large. The entire Southern Illinois, Western Kentucky area has a forty-five year tornado frequency rate of 2.5 tornadoes per year. The

maximum five-minute wind velocity recorded for the site area is sixty-three miles per hour.

A summary of wind direction, speed and stability categories is shown in Tables 8.4.3, Pages 8-16 - 8-18. This meteorological data is taken from AIRDOS-PC, January 1988, and represents average conditions at the Paducah, Kentucky Department of Energy plant, two miles south of the Honeywell site. The Paducah data is expected to be typical of conditions at the Honeywell site. The predominant wind is from the South, South-Southwest, and Southwest about 36% of the time. The average speed from these directions is approximately five meters/second. Wind speed and direction from other directions are reasonably uniformly distributed.

8.4.4 Hydrological:

8.4.4.1 Groundwater

Within the site area, deposits of Alluvium and Loess do not yield enough water for domestic use. When saturated by precipitation, these formations transmit water to the underlying aquifers of the Pleistocene and Pliocene series. The mixed gravel, sand and clay of the Pleistocene and Pliocene series is the principal aquifer for domestic use. Domestic wells may be bored to a depth of 120 feet before encountering the Porter's Creek Clay formation. The Porter's Creek Clay is not an aquifer but does retard groundwater movement between the Pliocene gravel and the sand in the McNairy formation. The McNairy and Tuscaloosa formations may yield enough water for domestic use but the high iron content and fine grained matrix make these formations generally unattractive. The shallowest aquifer adequate for most industrial needs is the Mississippian limestone which occurs at a depth of 300 to 500 feet. The yield of an industrial well penetrating the Mississippian limestone exceeds one thousand gallons per minute, but usually the water is hard.

The Metropolis Plant water supply is pumped from wells bored into the Mississippian limestone. Process wells No's. 1, 2 and 3 are drilled to depths of 455 feet, 520 feet and 500 feet, respectively. The plant sanitary well is 412 feet deep. The total capacity of these four wells is in excess of

4500 gpm and significantly greater than normal operating requirements. Wells 1, 3 and the sanitary well have been in use since 1958. The No. 2 well was drilled in 1971. After placing automatic recorders on the other three wells, a seventy-two hour pumping test was performed on the No. 2 well in October 1971. The drawdown was measured in all four wells during the test. During the pumping test of Well 2, a drawdown of 1.5 feet was observed in the sanitary well and two feet in Well 1 with no apparent drawdown experienced in Well 3. It was concluded that significant hydrologic connection exists between the sanitary well and Wells 1 and 2, but this system has no apparent interconnection with Well 3.

The Illinois Department of Public Health administers the drinking water regulations of the U.S. Environmental Protection Agency. The analysis required and frequency of testing is determined by the Department of Public Health based on the results obtained from previous analyses. The most recent testing for lead, copper, volatile organic chemicals, herbicides/pesticides, and inorganics/metals were less than current standards. Please refer to Page 8-21 to 8-23.

There are no other private water users within the boundaries of the site. Public water use is obtained from the Massac County Water District (county residents) and the City of Metropolis. Both of these sources withdraw their water from wells in the Mississippian limestone aquifer.

The Plant's routine RCRA groundwater monitoring network consists of ten wells - two upgradient, seven downgradient, and the tenth well is used for groundwater surface elevation determination only. The nine monitoring wells are sampled and analyzed quarterly for pH, specific conductance, fluoride, gross alpha and gross beta. The quarterly results from each well are statistically compared to historical upgradient groundwater quality. Results are reported to Illinois EPA.

Other groundwater monitoring wells are installed and sampled as necessary to satisfy any additional monitoring

that may be required by the plant's RCRA Operating Permit.

8.4.4.2 Surface Water

There are no surface streams within the boundaries of the site; however, there are several natural water drainage concourses which carry rainwater run-off toward the Ohio river.

Most surface streams outside the site boundary are used for recreation and for watering livestock. Numerous farm ponds and lakes are found throughout the area. The Ohio River which bounds the site on the South is used for barge transportation, commercial and sport fishing and as a source of water supply for Paducah, Kentucky, eleven miles upstream of the site. The river is approximately 3000 feet wide with a normal pool elevation of 290 feet above mean sea level. River flow is regulated by flood control structures, the nearest being lock and dam No. 52 at Brookport, Illinois, about seven miles upstream from the site.

Stage-discharge records have been maintained at Metropolis, Illinois (Illinois Central Railroad Bridge), since 1928. The maximum discharge was 1,780,000 cfs on February 1, 1937, and the minimum discharge of 15,000 cfs occurred on July 30, 1930. Average discharge is 265,000 cfs. The 7 day, 10 year low flow recorded is 43,600 cfs.

Although flooding is an annual event, the plant site has never been reached by flood waters. While the 1937 flood reached an elevation of 342 feet, the probable elevation of a 100-year flood (1 in 100 chance of occurring in a given year) in the area is 337 feet. The plant site elevation is 375 feet, and is considerably above the most extreme flood level projected.

8.4.5 Seismological

The site area is in the northern part of the Mississippi Embayment which has had a long history of seismic activity. The only major

earthquakes in historic times were the New Madrid earthquakes of 1811-1812, centered about 60 miles Southwest of the site. This earthquake was one of the strongest on record in this country. Major faults, trending toward New Madrid, are found approximately twenty-five to thirty miles east and west of the site. These faults, which occurred millions of years ago have not been active in geologically recent time.

Seismologists are unable to accurately predict the recurrence rates for destructive earthquakes such as those of 1811-1812 because of their infrequent occurrences. Nevertheless, experience indicates that major earthquakes originating along the New Madrid fault zone are capable of causing extensive damage in the Metropolis area. One such estimate concluded that a recurrence of an earthquake of the New Madrid intensity had a maximum likelihood of occurring once in 100-300 years in the entire seismic region.

The soil structure in the plant area may have a viscous or visco-elastic response to earthquake loading and may be susceptible to ground wave motion from distant earthquakes; however, severe ground motion tends to be reduced due to the soil structure present.

8.4.6 Geological

The Metropolis Plant site is located in the northern part of the Mississippian Embayment. This geological area of Southern Illinois and Western Kentucky is characterized by Quaternary surface materials and subsurface layers of Tertiary and Cretaceous which lie on Mississippian undifferentiated carbonate rocks. The chief geologic resources within the area are sand, gravel, and groundwater.

Gently rolling hills are the predominant surface feature of the site area. Drainage is directly; or indirectly through secondary watersheds, into the Ohio river. Bottomland and light colored terrace soils are found along the Ohio River which forms the South boundary of the site. These soils were developed primarily from outwash or alluvium under forest vegetation. Soils in the remainder of the area are light colored silt loams, with moderately slow to slowly permeable subsoils developed primarily under forest vegetation from loess.

The Quaternary surficial materials consisting of clayey silt, silty clay, sand silt, and loess are found throughout the area at depths of from

0-60 feet. The Continental and Porter's Creek clay deposits are principally brown sand, gravel, and clay. The McNairy and Clayton formations consist primarily of sand, clay and silt and extend from approximately 135 feet to greater than 225 feet beneath the surface. The McNairy and Clayton formations rest upon Paleozoic rock.

8.5 Location of Buildings on Site

The location of buildings on the site for the manufacture of Fluorine Chemicals (SF_6, IF_5, SbF_5, and F_2), UF_6 conversion, and support services are shown on drawing MTW-4781, Appendix "B".

Most of the uranium processing equipment is housed in a six-story structure termed the Feed Materials Building where essentially all of the steps in the UF_6 manufacturing process are conducted. Other areas and buildings in which operations are conducted involving the handling or processing of significant quantities of source material include the following:

8.5.1 A Sampling Plant which receives and samples ore concentrates for uranium assay and moisture content.

8.5.2 The Sodium Removal and Uranium Recovery Facilities which are housed in buildings where high sodium content ore concentrates are treated to remove this impurity, and where recycled materials are processed to recover contained uranium.

8.5.3 The KOH muds washing facility which removes fluorides and KOH from the potassium diuranate muds generated in the fluorination scrubber system. The washed potassium diuranate is then processed through Sodium Removal. The wash liquors are neutralized at EPF.

8.5.4 The Calcining Facility which dries the incoming feed material and recovered uranium as the first step in ore preparation.

8.5.5 The Pond Mud Calciner Drier where hard/wet ore concentrates and KOH Muds are processed prior to packaging for blending with additional ore concentrates at the Feed Materials Building for conversion to UF_6.

8.5.6 The Laboratory Building which houses facilities for conducting process control, product, and radiological control analyses.

8.5.7 The Cylinder Wash Building where UF_6 product cylinders are periodically washed and hydrostatically tested prior to reuse.

8.5.8 Outdoor pads for storage of drums of ore concentrates and other uranium bearing materials, as well as UF_6 product cylinders.

Additional plant facilities which are involved directly in the UF_6 manufacturing process but do not involve the handling of any significant quantities of source material include a fluorine manufacturing building, a fluoride waste treatment facility with four large CaF_2 settling ponds, a powerhouse, a reductor off-gas incinerator, and two small uranium settling ponds to collect any uranium spills.

The only plant addition since the last license renewal is the construction of additional floor space in the Feed Materials Building and the Fluorine Plant.

8.6 Maps and Plot Plans:

A plot plan of the plant is shown in Drawing MTW-4781, Appendix "B". This drawing also shows the location of the restricted area fence and distance and direction of public facilities of interest. Figure 8.6(A), Page 8-19 shows the location of the site property boundary, and Figure 8.6(B), Page 8-20 indicates the location of the site relative to Southern Illinois and Western Kentucky.

8.7 License History

The Metropolis Plant was built at its present location to supply UF_6 to the U.S. Atomic Energy Commission under a five-year contract (1959-1964). Presently, however, the plant supplies conversion services for the commercial nuclear power industry as part of the Nuclear Fuel Cycle. A brief licensing history of the plant is as follows:

License No.	Issue Date	Renewal Dates	Comments
C-4493	12/17/58		Original License
C-4493		December 1959	
C-4493		December 1960	
C-4493		January 1962	Changed to SUB-526

SUB-526	January 1962	February 1965	
SUB-526		February 1968	
SUB-526		August 1977	
SUB-526		May 1985	
SUB-526		June 1995	

8.8 Changes in Procedures, Facilities, and Equipment

A proposed change to an existing procedure, process modification, equipment change or addition of a new process is subjected to review and approval in accordance with a plant procedure entitled "Process Modification Procedure". The primary purpose of the procedure is to assure proper review and approval of changes to equipment or processes which could be detrimental to employee health and safety, environmental quality, or the integrity of the equipment. The following areas of expertise review each proposed modification (PT-101 Form) before the change is implemented:

AREA PROCESS ENGINEER
AREA PRODUCTION TEAM LEADER
AREA MAINTENANCE SUPERVISOR
ENVIRONMENTAL SUPERVISOR
SAFETY LEADER
HEALTH PHYSICS SUPERVISOR
MANAGER MAINTENANCE
MANAGER ENGINEERING/CAP
MANAGER REGULATORY AFFAIRS

In addition, an Appropriation Request (A.R.) must be prepared and approved before equipment or new installations which cost more than 1,000 dollars may be purchased. The A.R.'s are reviewed and approved by the Safety Leader, Health Physics Supervisor, Environmental Supervisor, appropriate department manager, Regulatory Affairs Manager, as appropriate, and Plant Manager before the item may be purchased.

Records of approved changes and A.R. purchases are maintained for review. The Management Assurance Supervisor performs audits to verify that these procedures are being followed, and issues written reports of audit findings.

Table 8.4.2(A)

Population and distance to towns with population over one thousand within twenty-five miles of plant site (1980 Census)

Illinois

Town	Distance (Miles)	Population
Brookport	7.5	1064
Metropolis	1.0	7124
Mound City	23	1224
Vienna	19	1420

Kentucky

Town	Distance (Miles)	Population
Calvert City	24.5	2388
LaCenter	13	1044
Paducah	8.5	29315
Wickliffe	23	1034

Table 8.4.2(B)

Cumulative 1980 Population within 80 km (50 miles) of the Allied-Signal Company UF_6 Conversion Plant at Metropolis, IL

Direction	Distance (Miles) 0-1	0-2	0-3	0-4	0-5	0-10	0-20	0-30	0-40	0-50
N	18	18	18	220	220	428	1,366	3,420	9,619	20,450
NNE	42	62	142	142	370	569	1,105	1,846	14,123	26,244
NE	21	21	168	293	311	469	1,590	4,616	6,728	10,746
ENE	12	172	205	205	231	608	1,183	3,753	8,549	14,151
E	54	54	337	337	402	958	1,611	4,545	9,614	17,927
ESE	24	2,353	2,353	2,353	2,452	3,520	7,540	15,416	18,339	20,051
SE	0	0	1,716	2,785	3,185	19,047	47,099	54,149	65,567	72,106
SSE	0	0	1,208	1,507	1,507	4,703	10,957	18,994	30,453	50,055
S	0	0	0	461	516	1,767	3,468	8,302	15,367	24,992
SSW	0	0	146	259	259	1,280	3,081	5,837	9,732	15,425
SW	0	0	120	334	431	848	2,859	6,182	7,965	13,568
WSW	0	19	19	19	115	691	3,441	12,823	19,581	35,659
W	0	0	57	57	153	501	1,825	6,616	9,519	30,730
WNW	0	71	126	126	313	615	1,748	4,884	8,240	41,922
NW	18	18	68	231	240	637	2,171	4,094	15,032	43,627
NNW	12	99	229	229	237	394	2,909	6,026	21,454	26,203
Total	201	2,787	6,912	9,558	10,942	37,035	93,953	161,503	269,882	499,856

Figure 8.4.2(C)
Allied Property Acquisitions

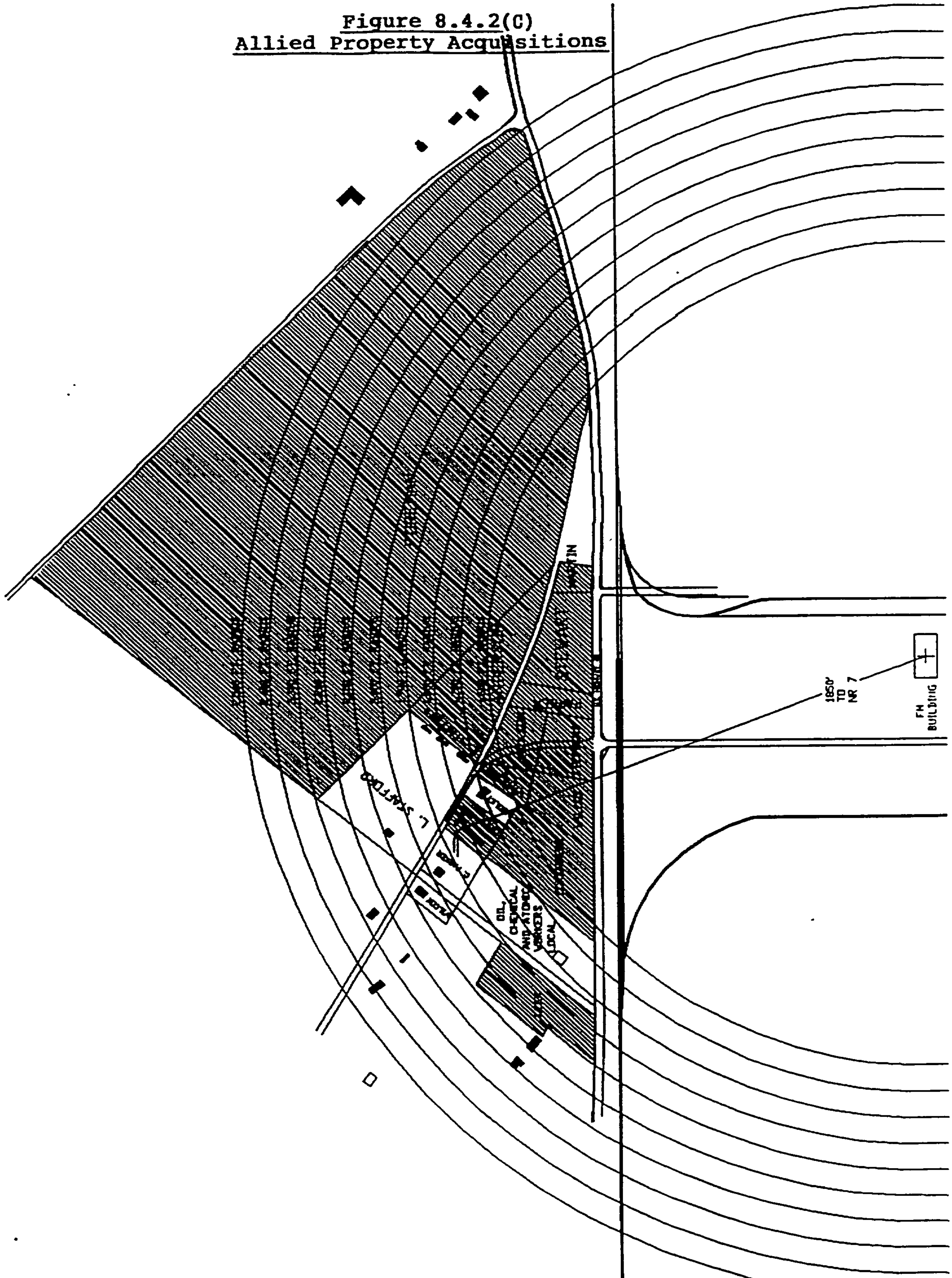


Table 8.4.3

Site Meteorology

FREQUENCIES OF WIND DIRECTIONS AND TRUE-AVERAGE WIND SPEEDS

WIND TOWARD	FREQUENCY	WIND SPEEDS FOR EACH STABILITY CLASS (METERS/SEC)						
		A	B	C	D	E	F	G
1	0.110	1.94	2.41	3.36	4.90	3.75	1.44	0.00
2	0.046	1.21	2.26	3.18	4.35	3.39	1.29	0.00
3	0.039	1.14	2.13	2.78	3.14	2.74	1.26	0.00
4	0.041	1.79	2.03	2.88	3.32	2.86	1.31	0.00
5	0.048	1.66	2.09	3.02	3.48	2.98	1.18	0.00
6	0.040	1.90	2.47	3.43	3.89	3.07	1.37	0.00
7	0.063	1.85	2.77	3.14	3.74	3.33	1.37	0.00
8	0.061	1.91	2.44	3.71	4.70	3.63	1.38	0.00
9	0.069	1.21	2.15	3.69	5.01	3.83	1.42	0.00
10	0.053	1.42	2.71	3.91	5.76	4.11	1.44	0.00
11	0.052	1.28	2.03	3.21	5.65	3.98	1.53	0.00
12	0.039	1.86	2.55	3.42	5.54	3.90	1.48	0.00
13	0.036	1.40	2.58	3.74	5.24	3.63	1.39	0.00
14	0.050	1.73	2.88	4.20	5.46	3.66	1.54	0.00
15	0.114	2.05	2.70	4.05	5.30	3.93	1.40	0.00
16	0.141	2.03	2.87	4.14	5.67	4.01	1.58	0.00

WIND DIRECTIONS ARE NUMBERED COUNTERCLOCKWISE STARTING AT 1 FOR DUE NORTH

Table 8.4.3

Site Meteorology

FREQUENCY OF ATMOSPHERIC STABILITY CLASSES FOR EACH DIRECTION

SECTOR	FRACTION OF TIME IN EACH STABILITY CLASS						
	A	B	C	D	E	F	G
1	0.0105	0.0540	0.0918	0.3725	0.1461	0.3251	0.0000
2	0.0063	0.0813	0.0718	0.3745	0.1307	0.3354	0.0000
3	0.0175	0.0986	0.1024	0.2466	0.0937	0.4412	0.0000
4	0.0239	0.1272	0.1334	0.3130	0.0962	0.3063	0.0000
5	0.0204	0.1319	0.1498	0.3386	0.0834	0.2760	0.0000
6	0.0193	0.1113	0.1678	0.4080	0.0807	0.2129	0.0000
7	0.0198	0.1081	0.1364	0.3848	0.0822	0.2686	0.0000
8	0.0143	0.0694	0.1176	0.4765	0.0845	0.2376	0.0000
9	0.0042	0.0665	0.0985	0.4989	0.1199	0.2121	0.0000
10	0.0074	0.0458	0.0985	0.6032	0.1129	0.1322	0.0000
11	0.0186	0.0515	0.1072	0.5420	0.1074	0.1734	0.0000
12	0.0176	0.0664	0.1191	0.5057	0.0677	0.2234	0.0000
13	0.0217	0.0903	0.1207	0.3778	0.0788	0.3108	0.0000
14	0.0153	0.0724	0.1393	0.4280	0.0858	0.2593	0.0000
15	0.0051	0.0658	0.1402	0.4037	0.1246	0.2606	0.0000
16	0.0007	0.0386	0.1102	0.5209	0.1588	0.1707	0.0000

Table 8.4.3

Site Meteorology

FREQUENCIES OF WIND DIRECTIONS AND RECIPROCAL-AVERAGED WIND SPEEDS

WIND TOWARD	FREQUENCY	WIND SPEEDS FOR EACH STABILITY CLASS (METERS/SEC)						
		A	B	C	D	E	F	G
1	0.110	1.41	1.62	2.14	3.59	3.53	1.04	0.00
2	0.046	0.93	1.52	1.87	3.22	3.17	0.97	0.00
3	0.039	0.90	1.45	1.66	1.90	2.68	0.95	0.00
4	0.041	1.28	1.30	1.69	2.28	2.75	0.98	0.00
5	0.048	1.18	1.40	1.84	2.17	2.84	0.92	0.00
6	0.040	1.37	1.63	2.23	2.83	2.90	1.01	0.00
7	0.063	1.33	1.93	1.95	2.62	3.11	1.00	0.00
8	0.061	1.39	1.51	2.57	3.31	3.39	1.01	0.00
9	0.069	0.93	1.32	2.41	3.58	3.60	1.03	0.00
10	0.053	1.03	1.74	2.57	4.57	3.96	1.04	0.00
11	0.052	0.96	1.28	1.83	4.13	3.79	1.09	0.00
12	0.039	1.34	1.57	2.15	4.17	3.69	1.06	0.00
13	0.036	1.02	1.64	2.14	3.88	3.39	1.01	0.00
14	0.050	1.23	2.18	3.19	4.06	3.42	1.10	0.00
15	0.114	1.53	1.86	2.66	3.98	3.73	1.02	0.00
16	0.141	1.51	1.90	2.71	4.59	3.83	1.12	0.00

WIND DIRECTIONS ARE NUMBERED COUNTERCLOCKWISE STARTING AT 1 FOR DUE NORTH

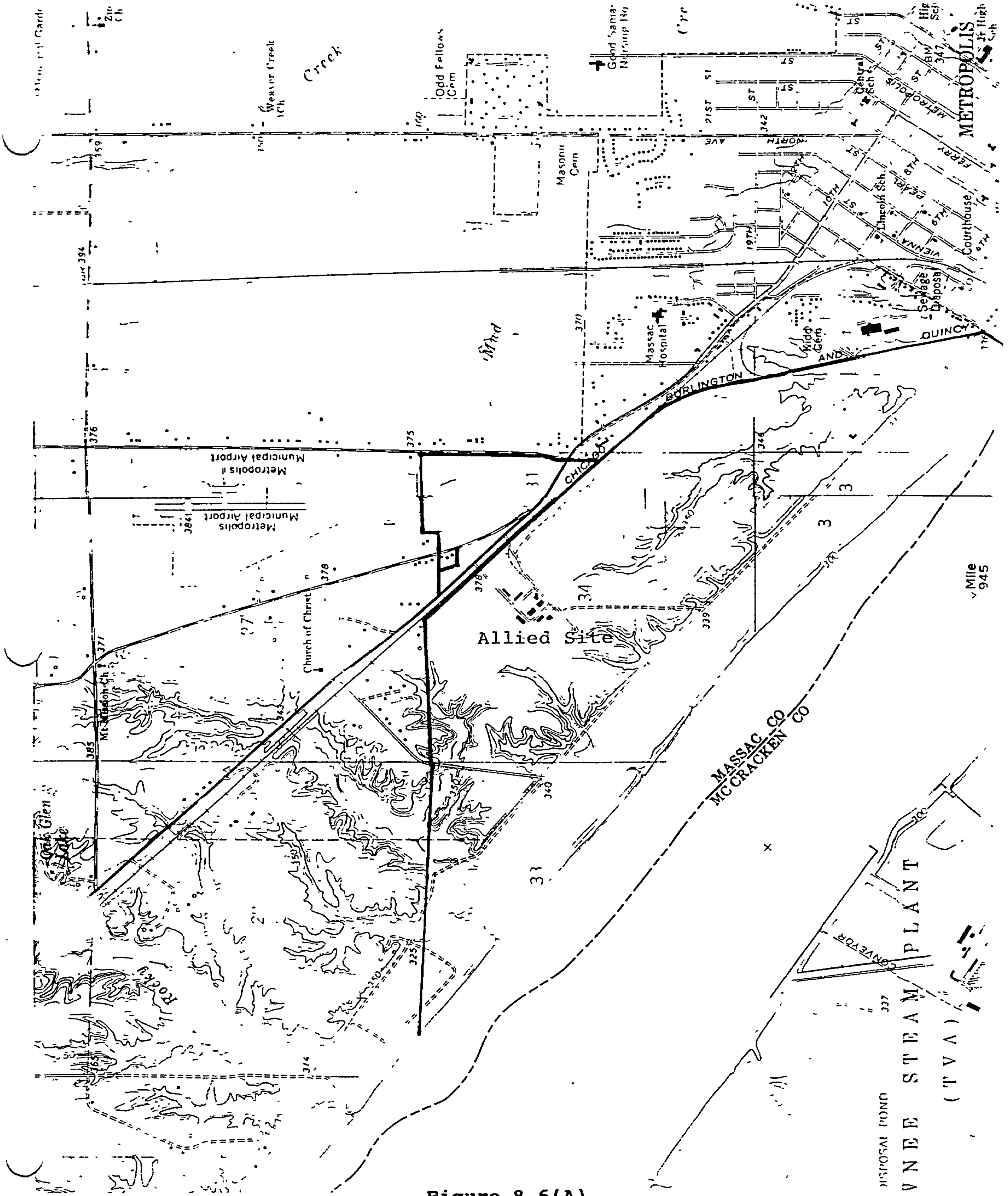


Figure 8.6(A)

Allied-Signal Site Boundary

Date: July 1, 1994

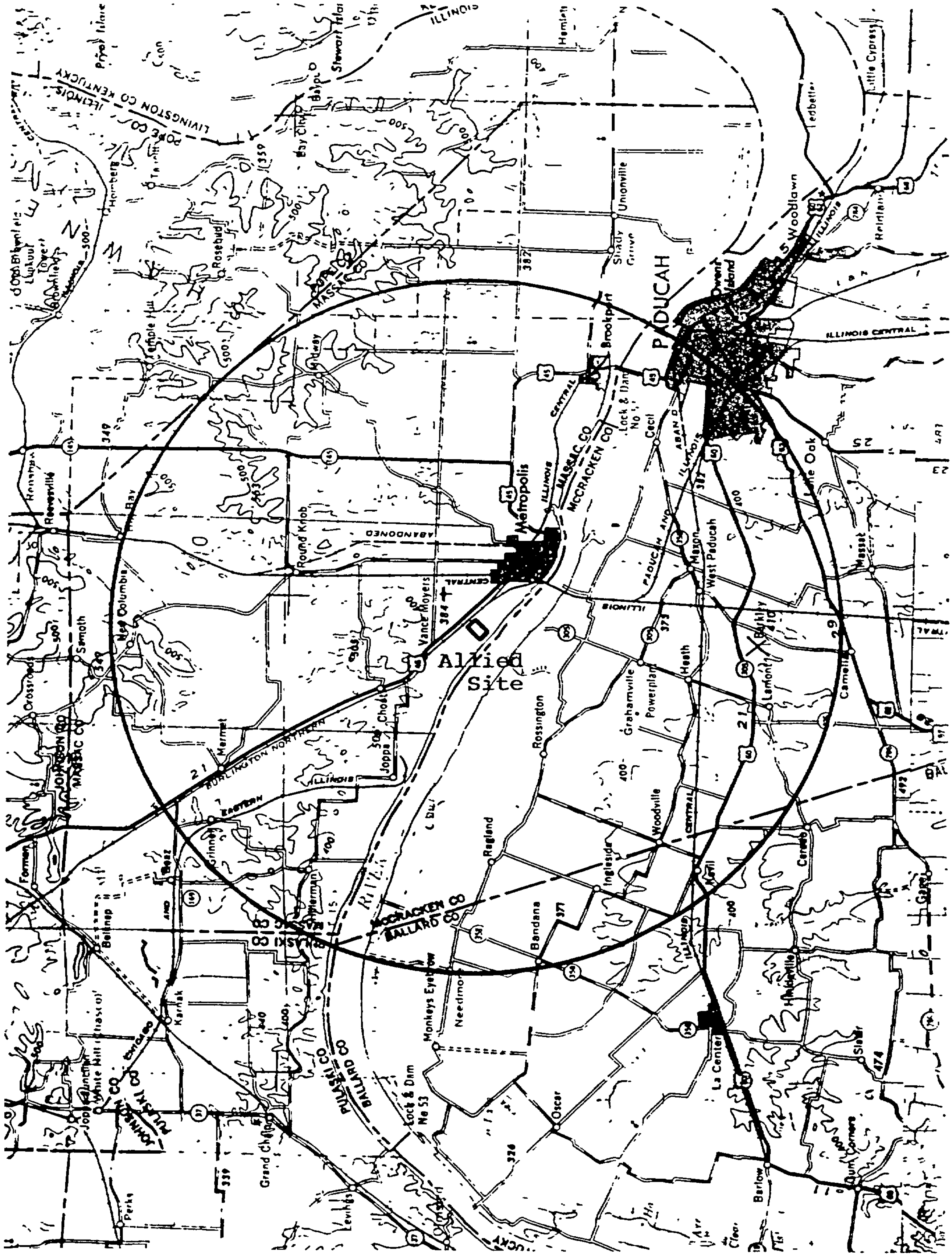


Figure 8.6(B)

Allied-Signal Site

ILLINOIS DEPARTMENT OF
PUBLIC HEALTH
A Healthier Today For A Better Tomorrow

02/12/94

0042127

LLIED SIGNAL
R #1 RT 45N
ETROPOLIS IL 62960

EAR OWNER/OPERATOR:

THIS OFFICE HAS RECEIVED THE RESULTS OF LEAD AND COPPER ANALYSES ERFORMED ON YOUR NON-TRANSIENT, NON-COMMUNITY PUBLIC WATER SUPPLY ON 9/17/93. THIS TESTING IS REQUIRED BY UNITED STATES ENVIRONMENTAL PROTECTION GENCY REGULATIONS AND THE DRINKING WATER SYSTEMS CODE ADOPTED BY THIS EPARTMENT. LABORATORY ANALYSES HAVE SHOWN THAT LEAD AND COPPER ACTION LEVELS STABLISHED IN THESE RULES HAVE NOT BEEN EXCEEDED IN YOUR WATER SUPPLY IN HE INITIAL 6 MONTH SAMPLING PERIOD. YOU ARE NOW REQUIRED TO PERFORM HE NEXT ANALYSIS BY 03/17/94, ACCORDING TO THE POPULATION YOU SERVE. IF HOSE RESULTS ARE ALSO BELOW THE LEAD AND COPPER ACTION LEVEL, YOU WILL BE DVISED THAT YOU MAY REDUCE TESTING FREQUENCY TO ANNUALLY AS WELL AS REDUCE HE NUMBER OF TAPS SAMPLED.

POPULATION SERVED	NUMBER OF TAPS TO BE SAMPLED
3,301 - 10,000	40
501 - 3,300	20
101 - 500	10
< OR = 100	5

YOU WILL RECEIVE SEPARATE NOTIFICATION OF TEST RESULTS AND TESTING JE DATES FOR VOLATILE ORGANIC CHEMICALS, PESTICIDES AND HERBICIDES, AND NORGANIC CHEMICALS/METALS. IF YOU HAVE ANY QUESTIONS CON CERNING THESE EQUIREMENTS, PLEASE CONTACT THIS OFFICE AT (217)782-5830.

SINCERELY,

Richard Petrella

RICHARD PETRELLA, P.E.
DIVISION OF ENVIRONMENTAL HEALTH

C: REGION/LOCAL HEALTH DEPARTMENT
PWS02304 CNTY: 127 REGN: 5

Date: July 1, 1994

ILLINOIS DEPARTMENT OF PUBLIC HEALTH

A Healthier Today For A Better Tomorrow

02/19/94

.LIED SIGNAL
: #1 RT 45N
:TROPOLIS IL 62960

0042127

:AR OWNER/OPERATOR:

WE HAVE RECEIVED THE RESULTS OF CHEMICAL ANALYSES PERFORMED ON YOUR TER SUPPLY IN COMPLIANCE WITH UNITED STATES ENVIRONMENTAL PROTECTION AGENCY SEPA) REGULATIONS AND THE DRINKING WATER SYSTEMS CODE ADOPTED BY THIS PARTMENT. THE TABLE BELOW SHOWS THE STATUS OF EACH CATEGORY TESTED AS PORTED BY A LABORATORY AND INDICATES WHEN YOU WILL BE REQUIRED TO TEST R THESE CONTAMINANTS AGAIN. A "YES" ENTRY IN THE WAIVER GRANTED COLUMN DICATES THAT, AS THE RESULT OF MEETING CURRENT STANDARDS, YOU ARE GRANTED WAIVER WHICH ALLOWS A REDUCTION IN FUTURE SAMPLING UNTIL THE DATE SHOWN. THE MESSAGE IN THE OVERALL RESULTS COLUMN IS "DETECTS" OR "ABOVE CEPTABLE LIMITS," A SEPARATE LETTER IS ENCLOSED.

TEGORY OF TEST	TEST DATE	OVERALL RESULTS	WAIVER GRANTED	DATE NEXT TEST DUE
LATILE ORG CHEMICALS	09/21/93	NO DETECTS	YES	09/21/99
RBICIDES/PESTICIDES	11/08/93	NO DETECTS	YES	11/08/96
ORGANICS/METALS	05/20/93	ACCEPTABLE LIMITS	NO	05/20/96

BECAUSE THE VULNERABILITY ASSESSMENT PERFORMED BY OUR DEPARTMENT HAS TERMINED YOUR SUPPLY IS NOT VULNERABLE TO ASBESTOS CONTAMINATION, YOU ARE ANTED A PERMANENT WAIVER TO INITIAL AND FUTURE SAMPLING FOR ASBESTOS. RTHER COPPER AND LEAD SAMPLING REQUIREMENTS WILL BE REPORTED TO YOU PARATELY.

A REVISED COPY OF THIS LETTER WILL BE SENT TO YOU EACH TIME WE CEIVE NEW TEST RESULTS. IF YOU HAVE ANY QUESTIONS CONCERNING THESE QUIREMENTS, PLEASE CONTACT THIS OFFICE AT (217)782-5830.

SINCERELY,

Richard Petrella

RICHARD PETRELLA, P.E.
DIVISION OF ENVIRONMENTAL HEALTH

: REGION/LOCAL HEALTH DEPARTMENT
PWS02301 CNTY: 127 REGN: 5

Date: July 1, 1994

ILLINOIS DEPARTMENT OF PUBLIC HEALTH

A Healthier Today For A Better Tomorrow

04/30/94

ILLIED SIGNAL
:R #1 RT 45N
IETROPOLIS IL 62960

IEAR OWNER/OPERATOR:

THIS OFFICE HAS RECEIVED THE RESULTS OF LEAD AND COPPER ANALYSES 'ERFORMED ON YOUR NON-TRANSIENT, NON-COMMUNITY PUBLIC WATER SUPPLY. THIS ESTING IS REQUIRED BY UNITED STATES ENVIRONMENTAL PROTECTIION AGENCY EGULATIONS AND THE DRINKING WATER SYSTEMS CODE ADOPTED BY THIS DEPARTMENT. ABORATORY ANALYSES HAVE SHOWN THAT THE LEAD AND COPPER ACTION LEVELS STABLISHED IN THESE RULES HAVE NOT BEEN EXCEEDED IN YOUR WATER SUPPLY IN HE SECOND 6 MONTH SAMPLING PERIOD. YOU ARE NOW ADVISED THAT YOU MAY EDUCE TESTING FREQUENCY TO ANNUALLY (BY 03/16/95) AS WELL AS EDUCE THE NUMBER OF TAPS SAMPLED BASED ON THE POPULATION YOU SERVE. SEE HE ATTACHED TABLE. YOU WILL RECEIVE SEPARATE NOTIFICATION OF TEST RESULTS ND TESTING DUE DATES FOR VOLATILE ORGANIC CHEMCIALS, PESTICIDES AND ERICIDES, AND INORGANIC CHEMICALS.

SINCERELY,

Richard Petrella

RICHARD PETRELLA, P.E.
DIVISION OF ENVIRONMENTAL HEALTH

C: REGION/LOCAL HEALTH DEPARTMENT
PWS02305 ID: 0042127 CNTY: 127 REGN: 5

Chapter 9

Facility Description

9.1 Plant Layout

A flowsheet which depicts the UF_6 conversion process is shown in Figure 9.1, Page 9-18. The deconversion process is shown in Figure 9.2, Page 9-19. The layout of the plant is shown in Drawing MTW-4781, Appendix "B". The process description and associated flowsheets are contained in Chapter 13.

9.2 Utilities and Support Systems

9.2.1 Electric Power

The plant production processes and supporting activities require a large amount of electrical power to operate. The electrical power is provided by Central Illinois Public Service through a 69,000 volt sub-station within the restricted area fence. Since the chemical processes contain hazardous materials at elevated temperatures and pressures, these processes operate using many electrically and/or pneumatically operated safety features. In addition, some of the processes contain chemicals that must be kept warm. The fluorine cells' electrolyte, for instance, is cooled during normal operation but must be kept warm using steam heat when down.

Standby utilities are maintained in order to facilitate a safe and orderly shutdown of the process units during a complete power failure. Standby utilities are provided as follows:

Standby Electrical Power - Standby electrical power is provided from an electrical generator located in the Powerhouse building. The standby electrical generator is diesel powered and delivers 480 volts of alternative current. In the event that electrical power is interrupted, the standby generator automatically starts and comes to a "standby" mode. The standby power is then distributed, as required, to the following:

1. Standby power is provided to the Administration Building and the Laboratory Building for standby lighting in the Dispensary, Lab, and Health Physics. Power is also provided for emergency exit lighting in process buildings.

2. Standby power is provided to one deep well pump so that a water source is available for operation of the process boilers.

3. Standby power is provided to all three process boiler instrument panels and all boiler support equipment which, along with the emergency water supply, allows the production of steam for space heating and to provide a source of heat for critical process equipment, including the Health Physics air sampling pump.

4. Standby power is provided to critical instrumentation in the fluorination and distillation areas of the UF_6 process and to one fluorination scrubbing train. This gives operating personnel the capability to monitor the in-process UF_6 and to evacuate piping or vessels as needed to maintain the process in a safe condition.

Liquid Nitrogen System - In addition to standby electrical power, a pressurized nitrogen system is also provided. This system is used to provide pressure for pneumatic instrumentation and to provide an inert gas for purging process piping and vessels during an electrical power failure. During a power failure, the liquid nitrogen supply source is automatically routed through a pair of ambient air vaporizers which require no external source of power. During a power failure, the system is completely self-sufficient and requires no external source of electrical power, steam, etc. Emergency nitrogen is automatically valved into the critical plant air systems and to the inert gas system. Normally open (power to close) solenoid valves are located on tie lines between the nitrogen header and the plant air and inert gas headers. During a power failure. these valves automatically open thereby supplying nitrogen pressure for critical pneumatic instrumentation and purging of equipment.

9.2.2 Compressed Air

Three different compressed air systems are provided for plant operation, each is designed to supply the quantity and quality of compressed air necessary for the end use:

1. **Fluidizing Air** - The fluidizing air system is capable of delivering the highest quality (lowest dewpoint) air but has the smallest capacity of the three air systems. Fluidizing air must be delivered to the plant extremely dry and free of

contaminants because it is used in the Fluorination and Distillation areas where it comes in contact with fluorine (F_2) and uranium hexafluoride (UF_6).

2. **Instrument Air** - The instrument air system is capable of delivering air to the plant in almost equivalent quality as fluidizing air but its capacity is slightly greater than fluidizing air. This air must also be delivered to the plant very dry and free of particulate matter because it is used to operate all of the pneumatic instrumentation in the plant.

3. **Plant Air** - The plant air system has the largest capacity of the three compressed air systems and so the quality of this air may be less than both the fluidizing air and instrument air systems. It is not critical, however, that the dewpoint of this air system be maintained as low as fluidizing air. Each of the three compressed air systems obtains air as follows: Atmospheric air is drawn through a screen into the intake of the compressor from just above the Powerhouse roof. The air is compressed in one or two stages to 80-105 psig and about 200°F. The compressed air is cooled to about 80°F and condensed moisture is removed from the compressed air through a float trap. The air is then passed through a receiver to disengage and drop out any residual moisture. The air then passes through a desiccant dryer, a filter to remove desiccant particles, a surge receiver, and then to the plant consumers. The quality of the final air product is determined by the extent of final purification utilized.

   Certified breathing air for use in masks and protective suits is obtained in cylinders from an outside vendor.

9.2.3 Water

There are three primary water systems in the plant: The Process Water System, the Sanitary Water System, and the Fire Water System. The Process Water is supplied from three (3) deep wells, each greater than 400 feet in depth. The Sanitary Water System is supplied with water from a fourth well 412 feet deep. All wells are drilled into the Mississippian limestone aquifer and are located within the restricted area. The Fire Water System is considered a "closed" system in that it does not normally need fresh water makeup. Fire water is supplied from the fire water storage tank, which may be replenished as needed from the Process Water

System. Each of these systems has a specific function but interconnections are provided to ensure adequate water supply during emergencies or for deep well pump repairs.

The four plant deep well pumps are all Layne vertical centrifugal pumps powered by three-phase electrical motors and are designed for continuous operation. The #1, #2, and #3 deep well pumps supply the Process Water System while the #4 (Sanitary) deep well pump supplies the Sanitary Water System. The capacity of the three process pumps is about 4500 gallons/min. the sanitary well pump is rated at 200 GPM.

The liquid effluent from the entire plant is normally about 2800-3000 GPM, thus, adequate excess capacity exists for emergency use.

9.2.4 Steam

Some chemical processes at the plant require steam in order to produce the final products. The primary use of steam is for:

1. Steam tracing both indoors (mostly UF_6 lines) and outdoors for freeze protection.

2. The UF_6 Distillation process for vaporizing and reboiling the UF_6.

3. The three gaseous fluorine plants to keep the cell electrolyte in liquid form during periods of downtime.

The steam is produced at 90 psig pressure in the Powerhouse; however, the highest pressure required by the process is about 70 psig.

Steam is provided by three steam boilers which are located in the Powerhouse, along with other supporting equipment needed to produce the steam. The boilers are Erie city, two-drum, water-tube types that are rated at 200 psig.

Each boiler is equipped to burn either natural gas, LPG, or #2 fuel oil depending on which fuel is more economical. The #2 oil is stored on-site and is used only as an emergency backup fuel in the event the natural gas supply is interrupted. Each boiler is

equipped with extensive safety controls to assure a safe combustion process.

Each boiler is also equipped with dual relief valves to relieve steam pressure in the boiler if it should ever rise above 130 psig.

9.2.5 Refrigeration

In the fluorination reactors, uranium tetrafluoride (UF_4) in a bed of calcium fluoride (CaF_2) is reacted with elemental fluorine (F_2) gas at high temperature. The hot gases exiting the reactors contain crude uranium hexafluoride (UF_6), excess F_2, particulate CaF_2, air, hydrofluoric acid (HF), and other fluorinated impurities. The gas stream first passes through a set of sintered metal filters which remove all particulate solids including the CaF_2. The gas then passes through a set of refrigerated cold traps to remove the UF_6, then through a caustic scrubbing system to remove all other hazardous chemicals prior to venting the remaining air to the atmosphere.

The cold trap system consists of primary, secondary, and tertiary cold traps. The gas flows through each type of cold trap in series; the minimum number of cold traps allowed for various levels of operation is specified in the operating procedures. Cooling and heating for the primary cold traps is accomplished in two steps to minimize thermal stress. Initial cooling for PCT's is provided by a 90°F - 110°F glycol solution (intermediate system) which is heated or cooled as needed by steam or well water respectively. Cooling below the 90°F - 110°F range is accomplished with a cold glycol solution which is chilled by a G-114 refrigeration system. Initial heating to 90°F - 110°F also comes from the intermediate system. Heating above the 90°F - 110°F range is supplied via a hot glycol solution which is heated by steam. The secondary and tertiary cold traps are chilled with R-134a refrigerant and heated with steam. Cooling for the R-134a refrigeration system's condenser is provided by second refrigeration system utilizing R-123 refrigerant.

The gas exiting the tertiary cold traps then flows through a caustic scrubbing system. In the caustic scrubbing system, the residual gas stream is contacted, in several vessels, with a potassium hydroxide (KOH) solution. The KOH solution removes essentially all of the remaining fluoride-bearing components of the gas

stream. The remaining air is then vented to the atmosphere through a stack. The stack is continuously monitored to measure the quantity of uranium discharged to the atmosphere.

9.3 Ventilation Systems

Uranium processing areas that produce dusts, mists, or fumes containing uranium or other toxic materials are provided with in-series dust collectors or in-series scrubbers to reduce employee or environmental exposure to as low as reasonably achievable levels. The fabric filter baghouses are rated at greater than 95% efficiency each. Providing two, and sometimes three gaseous cleanup systems in series allows a decontamination factor of greater than 10^4. Refer to Table 9.3, Page 9-20 and 9-21 for rated efficiency of each gaseous cleanup system.

The general ventilation system used in the UF_6 process area consists of a series of Dravo fresh-air intake units and a series of window and roof exhaust fans. The total air flow through the process building is sufficient to ensure a complete air changeout approximately once every five minutes. In addition, the distillation section is provided with containment walls to prevent the spread of UF_6 vapors in the event of a release, and exit stairwells are enclosed to provide contamination free egress from the building.

The main control room has a separate air conditioning systems. This area can be maintained under a slight positive pressure during a UF_6 release, and is provided with dual fresh air intakes located outside each end of the UF_6 process building.

Laboratory hoods which are routinely used to handle unencapsulated uranium are checked monthly and adjusted to assure adequate face velocity.

Workroom air concentrations of uranium are continuously monitored in process areas to assure the ventilation systems are adequately controlling employee exposures.

Each individual uranium emission source is continuously monitored. This emission data is computerized to provide emission data on a daily, monthly or annual basis. Figure A-1 in Appendix A, "Trend Analysis", indicates stack emissions are being effectively controlled. Operational and administrative controls are utilized to shut down equipment when the concentration of uranium in the exit stack exceeds the established administrative limit for the stack.

Essentially all of the stack emissions of uranium are of mixed solubility (Class D, W, and Y) due to the variety of milling processes used to produce ore concentrates; however, in the fluorination and distillation sections the emissions are primarily highly soluble UO_2F_2 from UF_6 decomposition.

In addition to analysis of the stack samples collected, operating personnel monitor the pressure drop across the dust collectors to assure proper operation. Samples are also analyzed from the off-gas scrubbers as required to minimize emissions. Additional samples, visual observation, and precautions are taken as necessary to ensure optimum performance of the pollution abatement equipment.

Stacks which contain non-radiological emissions are required to have an approved operating permit from the Illinois Environmental Protection Agency (IEPA). Each emission source is operated in accordance with the IEPA Air Permit.

9.4 Radioactive Waste Handling

9.4.1 Liquid Waste

All liquid wastes from the facility are discharged through the main effluent via natural drainage into the Ohio River. Figure 9.4.1(a), Page 9-22, depicts the current wastewater disposition scheme. The main plant effluent is continuously sampled, and the composite sample is analyzed daily for uranium. In the event of a major spill which could significantly increase effluent water concentrations of uranium or other chemicals controls such as diking, neutralization, etc., are utilized to minimize contamination of the liquid effluent. Suspended and dissolved solids, pH, and fluoride, are monitored in accordance with the NPDES permit. The daily samples of the main effluent are composited into a monthly sample that is analyzed for numerous impurities. Typical analyses of pollutant concentrations are shown in Table 9.4.1(b), Page 9-23.

An environmental protection facility (EPF) is utilized to remove chemical pollutants (primarily fluoride) from the main plant effluent stream. The facility process uses calcium hydroxide to precipitate fluorides as insoluble calcium fluoride. The precipitated "synthetic" calcium fluoride solids are separated in settling basins. This "synthetic" CaF_2 may be recovered and recycled to any commercial organization which can use synthetic CaF_2 as a substitute for naturally occurring CaF_2 (fluorspar).

Recycle of this synthetic CaF_2 will reduce the mining and subsequent depletion of the naturally occurring mineral.

The effluent from the EPF plant has a pH of approximately 13 and is automatically adjusted to a pH range of 6-9 using H_2SO_4. This stream is combined with other treated wastewater. This combined stream is then mixed with uncontaminated cooling water and the effluent from the uranium settling ponds and monitored before being discharged into the Ohio River.

Wastewater which is known to contain uranium, and does not contain significant quantities of fluoride, is routed through the #3 and #4 uranium spill control ponds.

The HF water scrubber liquors are routed directly to the environmental protection facility for HF neutralization. The uranium content of this stream averages less than 10 ppm uranium.

The pH of the uranium settling ponds (Ponds No. 3 & 4) is maintained slightly basic to minimize dissolved uranium loss. Experience indicates that approximately 80 - 90% of the uranium loss from these ponds is soluble uranium. As the effluent leaves the second uranium pond, the level is measured to determine flow rate and a proportional sample is taken for a 24-hour composite sample. The pH and uranium content of the composite sample is analyzed daily. The average flow from these two ponds is approximately 25 gpm. The effluent from the uranium settling ponds is then mixed with the remainder of the facility effluent before discharging into the Ohio River.

The solids level in the ponds is measured periodically; an individual pond is removed from service when the available "freeboard" is reduced to approximately 2 feet. The solids removed from No. 3 and 4 ponds during a cleanout may be pumped or dumped into the pond muds calciner for drying and are packaged into drums. The settling ponds solids are processed in the uranium recovery unit for recovery of the contained uranium.

These settling ponds are predominately an above grade system. Only about two feet of each pond is below grade. Each time a pond is emptied and cleaned, a thorough examination is made of the lining. The lining is 62 mil EPDM (Ethylene-Propylene Diene

Monomer) rubber installed over previously used asphalt and burlap liners. The material in the ponds is alkaline and the EPDM rubber liner has excellent resistance to alkaline solutions. In the event a pond liner should develop a leak, seepage drains are installed under each pond which discharge into the main effluent which is continuously sampled. In addition, groundwater monitoring wells are provided downgradient of these ponds.

"Mixed Waste" which is currently (January 2002) being stored at the plant, consists of:

- 402 gallons of used lubricating oils from various maintenance activities in the plant.
- 305 gallons of sludge from several drums from which the liquid was decanted prior to shipment for disposal.
- 116 gallons of waste acetone from laboratory analytical activities.
- 100 gallons of TBP, TEHP and CFC-113 extraction solvent from laboratory analytical activities.
- 50 gallons of sand blast fines.
- 1630 gallons of fluorine trench muds.

All of the "mixed waste" listed above is stored on a covered, concrete storage pad that is permitted by the plant's Resource Conservation and Recovery Act (RCRA) issued by the Illinois Environmental Protection Agency. These wastes remain in storage because of a lack of facilities to treat or dispose of these wastes.

The plant has shipped 1820 gallons of mixed waste to Diversified Scientific Services, Inc. of Kingston, TN in October 1995 for incineration.

In July 1998 370 gallons of mixed waste was shipped to Perma Fix at Gainesville, Florida for burning.

9.4.2 Solid Wastes

Radioactive solid wastes are generated from routine operation of the uranium processes. The routine wastes generated consist primarily of contaminated filters, papers, floor sweepings, cleaning rags, gloves, etc. These materials are collected in marked containers, segregated by radioactivity monitoring to reduce volume, and then containerized. The containerized material may then be compacted on site for additional volume reduction or shipped to a licensed supercompactor before final disposal at a licensed site. These volume reduction programs have significantly reduced final disposal volumes, e.g., approximately 14,000 ft^3/year since 1989, compared to 20,000 to 40,000 ft^3 during previous years.

Contaminated pieces of process equipment, and other scrap metal being discarded are decontaminated where feasible to recover uranium; they are also compacted or supercompacted for volume reduction, before being shipped to a licensed waste disposal broker or a licensed waste disposal site. Non-contaminated scrap metal is sold to various scrap metal dealers. Thorough radiation monitoring is done to assure that the residual radioactivity level is below NRC public release criteria. Other items, e.g., scrap wood, which may be recyclable or useful to members of the public, may be released if residual radioactivity levels are below NRC release criteria.

9.5 Shipping and Receiving

The Metropolis plant receives uranium ore concentrates via common carrier (truck) from uranium mills throughout the world. Each "sole use" shipment of drums is unloaded at the Sampling Plant. Upon completion of unloading, each trailer is monitored for residual radioactivity in accordance with appropriate DOT or NRC standards before the trailer is released from the plant. If a trailer is found to be contaminated, appropriate decontamination measures are taken and the trailer remonitored to assure regulatory requirements are satisfied.

Outgoing shipments of UF_6 product cylinders, low-level waste, or off-grade residues to be recycled are monitored to assure compliance with regulatory standards. A shipment is not allowed to leave the site until all requirements are satisfied.

9.6 Chemical Systems

The major chemicals used in Uranium Hexafluoride (UF_6) manufacturing process are shown in Table 9.6, Page 9-25. The storage and distribution of these chemicals is accomplished as follows:

9.6.1 **Ammonia** - the storage of ammonia is accomplished in two horizontal, standard ASME dished head tanks. The storage tanks are constructed of mild steel and insulated with polyurethane coating.

Pressurized NH_3 vapor (via a compressor) is the driving force for filling the storage tanks. Steam is then used to increase vapor pressure to transfer NH_3 to process areas.

Potential contact with NH_3 requires the proper protective gear. Relief valves protect the storage tanks from overpressurization. Any release is discharged to the atmosphere through tall vertical pipes, elevated more than 20 feet above the top of the tank.

9.6.2 **Hydrofluoric Acid** - the storage of AHF is accomplished in three (3) horizontal ASME dished head tanks. The storage tanks are constructed of mild steel.

AHF is transferred both to the storage tanks and from the storage tanks to process areas by inert gas pressure.

Potential contact with HF requires the proper protective gear. The integrity of the tanks is preserved with rupture discs and relief valves. An inadvertent release from a storage tank discharges into a "Dump Tank" of equivalent design. The "Dump Tank" in turn relieves into a water scrubber, which discharges to the plant wastewater treatment facility. Remote operated valves are employed to isolate transport vehicles (tank cars, etc.) and storages in an emergency.

9.6.3 **Potassium Hydroxide** - The storage of potassium hydroxide is accomplished in a horizontal, standard ASME dished head tank. The tank is constructed of mild steel.

Potassium Hydroxide is transferred to storage and process areas by a pump. Potential contact with KOH requires proper safety gear. Environmental releases are minimized by providing containment diking beneath discharge piping, pumps, and rail

cars. Additionally, the tank is equipped with an overflow which discharges into the containment area.

9.6.4 **Sulfuric Acid** - The storage of sulfuric acid is accomplished in a horizontal, standard ASME dished head tank. The storage tank is constructed of mild steel.

Sulfuric Acid is unloaded and transferred by air pressure as the driving force.

Potential contact with sulfuric acid requires proper safety gear. Tank integrity is protected by an overflow line containing a rupture disc. Any release to the environment is controlled by diked containment.

9.7 Fire Protection

9.7.1 System Design

There is no available record of the name of the person or firm which designed the plant system (CIRCA 1956). Honeywell headquarters personnel provide guidance and professional expertise on proper selection and design of fire protection equipment and system design. In addition, industrial risk insurance carriers provide expertise and recommendations during their annual audits of the fire protection program.

The standards by which the fire protection system at Metropolis Works was designed and constructed were those codes and standards in effect at the time of construction in 1956. The plant fire protection system is appropriate for the plant areas protected, and utilizes the guidance provided in various NFPA standards, e.g., NFPA 10, 14, 24. In addition, modifications may also be made based upon audit recommendation by the industrial risk insurance carriers.

9.7.2 Fire Control Systems

9.7.2.1 Water Supply

A 250,000 gallon above ground reservoir dedicated to the fire protection system provides water supply for fire fighting. The tank level is maintained by a float operated valve and piping from the process water main. The tank

is heated in winter. Fire pump suction can also be taken directly from the process water system through appropriate valving.

Water for fire protection in the Administration Building, Laboratory and Sampling Plant is provided from the process water system. These buildings are not connected to the primary plant fire system.

9.7.2.2 Fire Water Pressure

A 1000 GPM at 120 psi pump provides pressure for the fire mains. The pump is provided with both a diesel engine and electric motor on a common shaft. Both the motor and engine start on pressure drop controllers with the electric motor being energized first due to a decreased pressure in the main. If the electric motor fails, the diesel engine starts. The diesel engine is also provided with redundant manual starting controls if the automatic controller fails.

Automatic operation of either pump activates an alarm in the Powerhouse. If both the electrical and diesel motors fail, process water will pressurize the system through a check valve arrangement at a pressure of 65 psi.

A jockey pump maintains the static pressure in the fire mains and compensates for minor pressure variations due to leaks in the system.

The fire pump is operated weekly when the drain tests are conducted on the sprinkler systems. The electric motor and the diesel engine are operated to perform this test.

The pump is flow tested annually by an insurance carrier. Both the electric motor and diesel engine are used for the test.

The pump was dismantled and rebuilt in 1984 and receives routine preventive maintenance as needed.

9.7.2.3 Fire Water Distribution

Primary fire water piping is eight inches in diameter with six inch distribution pipes to the various areas. Supply to these areas is controlled by post indicator valves. Fire main installation meets the standards of NFPA 24. "Installation of Private Fire Mains".

9.7.2.4 Sprinklered Areas

A pre-action wet sprinkler system provides protection for the maintenance shop and stores area. The system was engineered by the Grinnell Company presumably in 1956 with revisions in 1977. Sprinkler drain tests are made monthly.

9.7.2.5 Deluge System

The main rectifiers for the gaseous fluorine plants that are located in close proximity are provided with a water deluge system unless the oil is of a non-combustible type. The fire deluge system is a dry system with flow controlled by Quartzoid detectors or equivalent which operate a Grinnell multi-matic valve on rate of rise. This system is flow tested annually by activating a detector with heat application. This test is witnessed by an insurance carrier representative annually.

Four liquefied Petroleum Gas (Propane) tanks are provided with deluge protection by two 250 gpm deck guns, or water cannons. The deck guns are flow tested quarterly.

9.7.2.6 Hose Houses

Metropolis Works currently has seven hose houses. Five were installed in 1956 according to NFPA standards. A sixth at the Sampling Plant was installed in 1968. The seventh was installed on the south pad in 1999. Each house is equipped with a minimum of 300 feet of double jacketed, neoprene lined hose and appropriate accessories. The fire hose is hydrostatically tested and re-racked annually.

Six houses have a fire water hydrant in close proximity. Hydrants are visually inspected monthly and flushed annually at the time of hydrostatic testing of the hoses. Hoses are tested by a fire equipment service contractor.

9.7.2.7 Standpipes

Standpipes are located in various areas of the plant as follows:

<u>Feed Materials Building</u>:

Three hose reels are located on each floor. Fifty feet of 1½" polyester jacketed neoprene lined hose with variable pattern shutoff nozzle is provided on each reel. The minimum pressure is 75 psi. These standpipes are part of the main fire water distribution system.

<u>Administration Building</u>:

Two standpipes with hose cabinets are located on the second floor, and five standpipes with hose cabinets on the first floor. Each cabinet contains fifty feet of 1½" polyester jacketed, neoprene lined hose with variable pattern shutoff nozzle. Minimum pressure is 65 psi. These standpipes are pressurized from the process water system.

<u>Laboratory</u>:

Two standpipes with hose cabinets are located in the main hallway. Each cabinet contains fifty feet of 1½" polyester jacketed neoprene lined hose with variable pattern shutoff nozzle. The minimum pressure 65 psi. These standpipes are pressurized from the process water system.

<u>Shop/Stores</u>:

Four standpipes with hose are provided in the shop/stores building. Each reel contains 75 feet and each rack contains 50 feet of polyester jacketed neoprene lined hose with variable pattern shutoff nozzle. This system is pressurized from the fire main.

9.7.2.8 Fire Extinguishers

Metropolis Works maintains appropriate supplies of portable fire extinguishers. These are distributed and maintained in accordance with NFPA 10 "Portable Fire Extinguishers". Fire extinguisher hydrostatic testing is performed by a fire equipment service contractor.

9.7.3 Emergency Response Team

Metropolis Works maintains Emergency Response Teams whose responsibilities include fire protection. Each ERT member receives hands-on training and classroom instructions that are pertinent to the duties and functions members are expected to perform. Each team member receives 24 hours of training per year. This training may include, but is not limited to CPR, Hazardous Materials Response, Rescue, First-Aid, S.C.B.A., Decontamination Procedures, Fire Safety, Personal Protective Equipment, etc.

Additional training will be provided to the shift forepersons who are responsible for the Emergency Response Teams. The Safety Leader has received additional industrial fire training.

A letter of assistance has also been signed with the Massac County Fire Department stating that, if an emergency exceeds the facility capabilities, they may be contacted for assistance.

9.7.4 Personal Protective Equipment

Number 2 and 4 hose houses contain six (6) sets of personal protective equipment designed to protect the Emergency Response Team. This equipment consists of helmets, face shields, coats, pants, gloves, boots and S.C.B.A.'s.

9.7.5 Combustible Storage

Most of the raw materials and products at Metropolis Works are non-combustible. Many combustibles are incidental to the operation and are generated as refuse. The uncontaminated refuse is deposited in metal drums and disposed of by incineration, or stored in a separate area for on-site burial.

9.7.6 Fire Reporting

There are no automatic fire alarms. Persons observing a fire are instructed to dial the public address system on the plant phone system and announce the location of the fire. The Emergency Response Team will respond to fight the fire. The Massac County Fire Department would be contacted for assistance if the emergency exceeded the capability of the Emergency Response Team.

9.7.7 Tests and Inspections

Routine testing and inspection of the plant fire apparatus and accessories are conducted by an hourly employee under the supervision of the Safety Professionals. Refer to Table 9.7., Page 9-26. In addition, Honeywell's insurance carrier conducts routine, detailed inspections of the plant fire protection program. Written inspection reports are reviewed and appropriate action taken for deficiencies or recommendations.

9.7.8 Fire Hazard Analysis

An initial fire hazard analysis was performed in December 1994 and updated in May 1998. These reports indicate that the fire hazards are low at this facility due to non-combustible construction. Most of the combustible material are wooden pallets which have been phased out for storage of uranium concentrate drums. The pallets were reduced to chips in May 1998 and temporarily stored on the southeast concrete pad, and have been shipped off site for burial.

9.7.9 Fire Protection Action Plan

The plant maintains a "Fire Preplanning Guide" which follows OSHA 29 CFR 1910.38. This facility also has a mutual aid agreement with the Massac County Fire Department. An open invitation is provided to this agency for plant orientation and familiarization of the facility.

Figure 9.1

UF6 CONVERSION FLOWSHEET

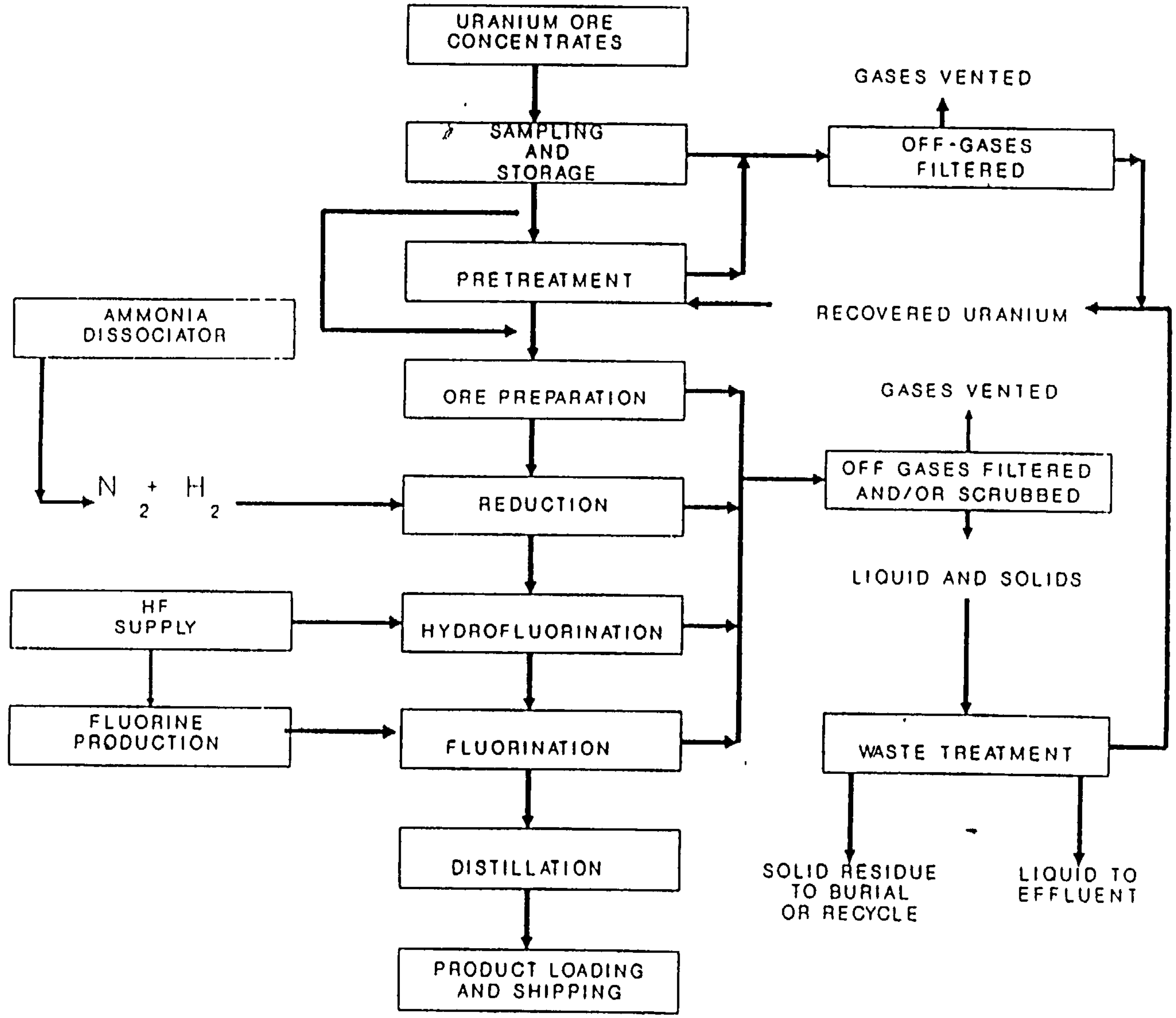


FIGURE 9.2
DECONVERSION FLOWSHEET

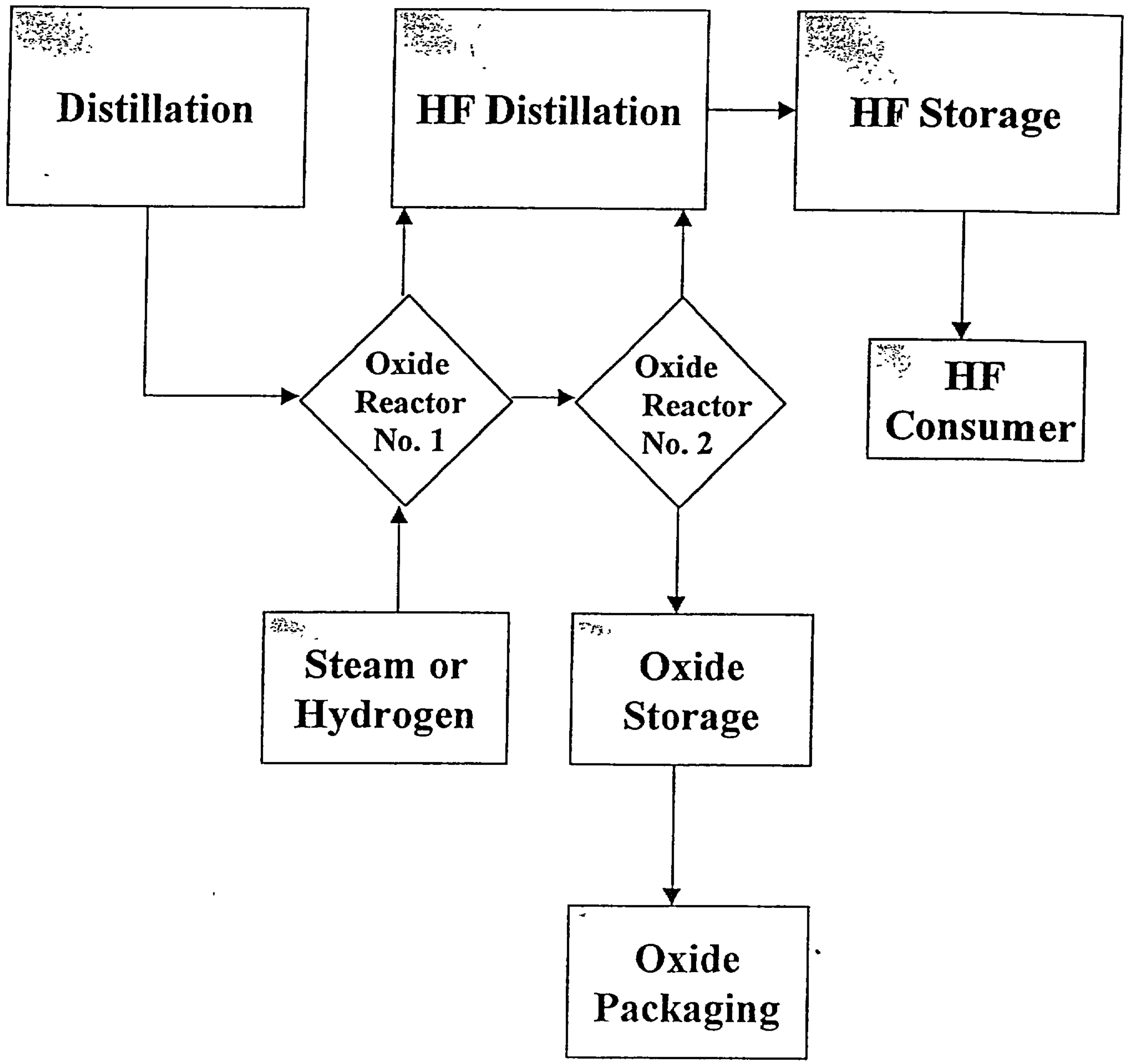


TABLE 9.3 GASEOUS CLEANUP SYSTEMS

(Rated efficiency in parenthesis)

Description	Stack No.	Contaminate Removed	Primary Control	Secondary Control	Tertiary Control
Wet Oxide Dust Collector	1-1	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Dry Oxide Dust Collector	1-2	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Drum Cleaner Dust Collector	1-3	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Oxide Vacuum Cleaner	1-4	Particulates	Cyclone (95.0)	Baghouse (95.0)	Baghouse (99.
UF_4 Vacuum Cleaner	1-7	Particulates	Cyclone (80.0)	Baghouse (99.9)	Baghouse (99.
"B" UF_4 Dust Collector	1-10	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Dry Oxide Dust Collector	1-11	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Ash Vacuum Cleaner	1-12	Particulates	Cyclone (80.0)	Baghouse (99.9)	
Ash Dust Collector	1-12	Particulates	Baghouse (99.9)	Baghouse (99.9)	
"A" Fluorinator Filters	1-13	Particulates	Metal Filters (>99.9)	Metal Filters (>99.9)	
"A" Fluorinator Scrubbers	1-13	F_2, HF, & UF_6	Spray Tower (80.0)	Packed Tower (99.0)	Coke Box (99.(
"B" Fluorinator Filters	1-14	System Identical to 1-13			
"B" Fluorinator Scrubbers	1-14	System Identical to 1-13			
"C" Fluorinator Filters	System identical to 1-13 (May use either "A" or "B" Fluorinator scrubber system)				
"A" Top Hydrofluorinator Filter	1-23	Particulates	Carbon Filters (>99.9)	Carbon Filters (>99.9)	
"B" Top Hydrofluorinator Scrubber	1-23	HF	H_2O Venturi Jets (88.0)	KOH Venturi Jets (85.0	KOH Packed Tower (99.0)

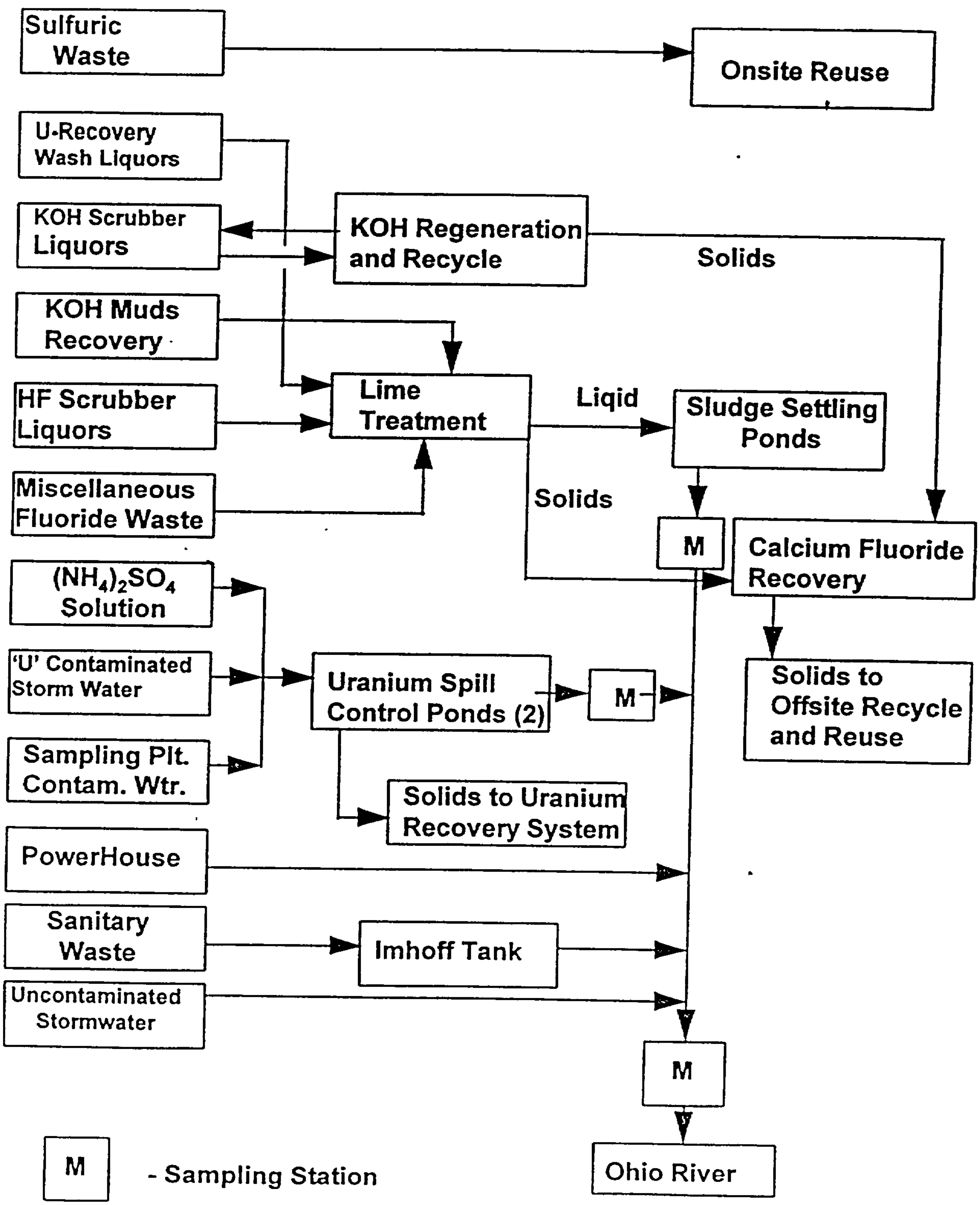
TABLE 9.3 G[illegible]S CLEANUP SYSTEMS (continued)

(Rated efficiency in parenthesis)

Description	Stack No.	Contaminate Removed	Primary Control	Secondary Control	Tertiary Control
"B" Top Hydrofluoriantor Filter	1-24	System Identical to 1-23			
"B" Top Hydrofluorinator Scrubber	1-24	System Identical to 1-23			
"A" UF_4 Dust Collector	1-46	Particulates	Baghouse (99.9)	Baghouse (99.9)	
H_2S Incinerator Stack	1-48	H_2S, and S	Sulfur Condenser	Incinerator (99.0)	
Drum Inverter Dust Collector	1-54	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Uranium Recovery Dust Collector	3-2	Particulates	Baghouse (99.9)		
Pond Mud Calciner	4-2	Particulates, HF, SO_2	Baghouse (99.9)	Spray Tower (95.0)	
Sampling Plant Dust Collector	17-1	Particulates	Baghouse (99.9)	Baghouse (99.9)	
Sampling Plant Vacuum Cleaner	17-2	Particulates	Baghouse (99.9)	Baghouse (99.9)	

Figure 9.4.1(a)

WASTEWATER DISPOSITION



Date: October 1, 1998

TABLE 9.4.1(b)

Liquid Effluent Contaminants (Monthly Average)

Contaminant	1987	1988	1989
Chloride			
Chromium (Cr^{+6})	.06 mg/L	<0.06 mg/L	0.06 mg/L
Fluoride	3.0 mg/L	2.7 mg/L	3.2 mg/L
Iron	0.13 mg/L	0.13 mg/L	0.13 mg/L
Molybdenum	0.13 mg/L	0.17 mg/L	0.13 mg/L
Nickel	0.06 mg/L	0.06 mg/L	0.06 mg/L
Phosphate	0.31 mg/L	0.27 mg/L	0.29 mg/L
Solids, Dissolved	536.0 mg/L	568.3 mg/L	623.5 mg/L
Solids, Suspended	1.1 mg/L	0.85 mg/L	0.88 mg/L
Sulfate	182.6 mg/L	208.2 mg/L	206.4 mg/L
Uranium	0.42 mg/L	0.36 mg/L	0.47 mg/L
Uranium (Range of Values)	0.33 - 0.69 mg/L	0.28 - 0.58 mg/L	0.19 - 1.0 mg/L
Vanadium	0.13 mg/L	0.13 mg/L	0.13 mg/L
Radioactivity, Alpha	0.17 pCi/ml	0.15 pCi/ml	0.13 pCi/ml
Radioactivity, Alpha (Range of Values	0.07 - 0.27 pCi/ml	0.07 - 0.27 pCi/ml	0.02 - 0.38 pCi/ml
Radioactivity, Beta	0.19	0.20 pCi/ml	0.17 pCi/ml
Radioactivity, Beta (Range of Values)	0.10 - 0.25 pCi/ml	0.09 - 0.33	0.07 - 0.22 pCi/ml

LIQUID EFFLUENT CONTAMINANTS (ANNUAL AVERAGE)

	1990	1991	1992	1993
Chloride	30.6 mg/L	28.6 mg/L	32.8 mg/L	34.6 mg/L
Chromium (Cr^{+6})	0.06 mg/L	0.11 mg/L	0.06 mg/L	0.06 mg/L
Fluoride	3.44 mg/L	3.91 mg/L	3.07 mg/L	2.75 mg/L
Iron	0.13 mg/L	0.13 mg/L	0.13 mg/L	0.13 mg/L
Molybdenum	0.13 mg/L	0.14 mg/L	0.13 mg/L	0.13 mg/L
Nickel	0.06 mg/L	0.06 mg/L	0.06 mg/L	0.06 mg/L
Phosphate	0.33 mg/L	0.40 mg/L	0.31 mg/L	0.30 mg/L
Solids Dissolved	693.4 mg/L	831.0 mg/L	836.2 mg/L	840.6 mg/L
Solids Suspended	1.08 mg/L	1.06 mg/L	1.08 mg/L	1.57 mg/L
Sulfate	250.6 mg/L	337.9 mg/L	344.2 mg/L	347.3 mg/L
Uranium	0.29 mg/L	0.42 mg/L	0.48 mg/L	0.39 mg/L
Uranium (Range of Values)	0.21 - 0.41 mg/L	0.29 - 0.69 mg/L	0.34 - 0.65 mg/L	0.30 - 0.59 mg/L
Vanadium	0.13 mg/L	0.13 mg/L	0.13 mg/L	0.13 mg/L
Radioactivity - Alpha	0.12 pCi/ml	0.16 pCi/ml	0.23 pCi/ml	0.17 pCi/ml
Radioactivity Alpha Range of Values	0.03 - 0.19 pCi/ml	0.1 - 0.29 pCi/ml	0.07 - 0.38 pCi/ml	0.11 - 0.3 pCi/ml
Radioactivity Beta	0.20 pCi/ml	0.28 pCi/ml	0.36 pCi/ml	0.36 pCi/ml
Radioactivity Beta Range of Values	0.11 - 0.25 pCi/ml	0.19 - 0.42 pCi/ ml	0.10 - 0.73 pCi/ml	0.22 - 0.56 pCi/ml

Table 9.6

Major Chemical Storage Systems

Chemical	Maximum Quantity Stored (lbs.)	Where Used
Ammonia	120,000	Reduction of Uranium ore concentrates to UO_2
Hydrofluoric Acid	424,000	Conversion of UO_2 to UF_4
Potassium Hydroxide	102,400	Scrubbing exit gases for environmental protection
Sulfuric Acid	256,000	Used in digestion of high sodium ore concentrates (Sodium Removal Process)

Date: October 1, 1998

Table 9.7

AlliedSignal

PLANT LOSS PREVENTION INSPECTION

DATE: ______________ BY: ______________________________

THIS INSPECITON IS DESIGNED TO MINIMIZE LOSS POTENTIALS AND ASSURE THAT ALL FIRE PROTEC EQUIPMENT WILL BE IN GOOD OPERATING CONDITION AND AVAILABLE IN THE EVENT OF AN EMERGEN. NSPECTIONS SHALL BE MADE ONCE A WEEK BY A COMPETENT INDIVIDUAL AND REVIEWED BY PERSONS WIT AUTHORITY TO HAVE DEFICIENCIES CORRECTED

CONTROL VALVES

List all valves controlling sprinklers or fire protection water supplies.

VALVE NO.	LOCATION	OPEN	SHUT	SEALED	WATER PRESS.	PRESS. WITH DRAIN OPEN	VALVE NO.	LOCATION	OPEN	SHUT	SEALED	WATER PRESS.	PRESS. WITH DRAIN OPEN
PI-1	Water Tank						C-5	#5 F/H					
PI-2	Pump Room						C-6	FMB-W					
PI-3	Pump Room						C-7	FMB-W					
PI-4	GF2 East						S-1	GF2 Rect.					
PI-6	#5 Hosehouse						S-2	GF2 Rect.					
PI-7	#1 Hosehouse						S-3	GF2 Rect.					
C-1	GF2 West S						B-1	UF6 Basement					
C-2	GF2 West A&B						B-2	UF6 Basement					
C-3	GF2 West D&E						B-3	UF6 Basement					
C-4	#4 F/H												

SPRINKLER SYSTEMS

	YES	NO		YES	NO
WERE ALL ALARMS TESTED?			IS ANY PIPING DISCONNECTED?		
DID ALL ALARMS OPERATE?			ARE ANY SPRINKLERS OBSTRUCTED?		
ARE ANY SPRINKLERS DISCONNECTED?			ARE THERE EXTRA HEADS ON HAND?		

EXPLAIN ANY DEFICIENCIES

FIRE PUMPS

NAME OR NO. OF PUMP	DRIVER	TURNED OVER?	OPERATED AUTOMATICALLY?	DISCHARGE PRESS.	RESERVOIR FULL?	CONDITION OF PUMP
Fairbanks	Electric					
Fairbanks	Diesel					
Jockey Meter ( )	Electric					

DIESEL HOURS

STOP		PROPANE Date:			
START		DELUGE Time:			
HOURS		Battery Volts	#1	#2	#3

Explain any deficiencies

YARD HYDRANTS AND HOSE HOUSES

HOSE OUSE	NO. FT. HOSE	NO. NOZZLES	ANY EQUIP. MISSING?	COND. OF HOUSE	COND. OF HOSE	HOSE HOUSE	NO. FT. HOSE	NO. NOZZLES	ANY EQUIP. MISSING?	COND. OF HOUSE	COND. OF HOSE
1	450					4	300				
2	300					5	300				
3	300					6	300				

XTINGUISHERS

Are all units charged? ______________ Accessible? ______________ Any missing? ______________

Additional units needed? ______________ Condition? ______________

Explain any deficiencies

Chapter 10

Organizational and Personnel

10.1 Organizational Responsibilities

The Metropolis UF_6 conversion plant is owned and operated by Honeywell International, Inc. Corporate Headquarters are located in Morristown, New Jersey. The top ranking member of management at the plant site is the Plant Manager, who reports directly to the Director of Operations, Fluorine Products in Morristown, New Jersey. This individual reports to the Vice President & General Manager of Fluorine Products, who is also located in Morristown.

The Plant Manager's primary responsibility is the safe, efficient, and reliable operation of the facility. The Plant Manager delegates this responsibility through his staff managers. The Plant Manager is responsible for operations through the Nuclear Services & Fluorine Products Leaders, and customer contact through the CLM (Customer Linked Manufacturing) group. The Maintenance Manager is responsible for mechanical maintenance. The Manager of Engineering is responsible for commercial development, capital engineering, laboratory QC and Management Assurance.

The Manager, Regulatory Affairs, is responsible for Environmental, Health Physics, OSHA-PSM Compliance, and Security. This manager has three supervisors reporting to him: The Environmental Supervisor, the Health Physics Supervisor and the Security Team Project Manager. If a conflict of interest should develop, these supervisors may communicate directly with the Plant Manager.

10.2 Organization Charts

The plant Organization Chart is shown in Figure 1, Page 2.8. The title of each individual and the flow of responsibility is shown on the chart. The responsibilities for Managerial positions are described in Section 10.1, and the functions of key supervisory personnel are described in Section 10.4.

10.3 Operating Procedures

Plant operations are conducted in accordance with written "Standard Operating Procedure Manuals". Each manual provides detailed instructions for proper operation of each production unit, and includes information

pertaining to employee health and safety, environmental protection, and hazardous chemicals handled in the unit. "Standard Operating Procedure Manuals" require review and approval by the appropriate supervisors and managers as described in the "Process Modification Procedure" in the Metropolis Plant Policy Manual

Process changes which could be detrimental to employee health and safety, environmental quality, or the equipment being modified are approved in accordance with the plant "Process Modification Procedure". Plant written procedures are reviewed, revised, approved, and implemented in accordance with Plant Policy entitled "Procedure Control Policy".

In addition, the Health Physicist reviews and approves capital appropriation requests before monies are spent for significant process changes. The Health Physics Department also inspects and approves, in writing, radiation work permits where employees must enter vessels which have been used in processing radioactive materials. Procedural or equipment changes which could increase employee radiation exposure are reviewed by Health Physics prior to implementation.

10.4 Functions of Key Personnel

In addition to the key managerial positions described in Section 10.1, the following personnel are also considered key personnel in assuring compliance with regulatory requirements:

10.4.1 Safety Leader

The Safety Leader's primary responsibility in Safety is responsibility for assuring compliance with OSHA regulations for industrial safety, fire protection, and coordination of the plant Safety Program. The position reports directly to the Plant Manager.

10.4.2 Health Physics Supervisor

The responsibility in Health Physics is for compliance with Nuclear Regulatory Commission licensing and inspection requirements. Responsibilities also include Occupational Health in non-uranium manufacturing areas, management liaison, and supervision of Health Physics personnel. The position reports directly to the Manager of Regulatory Affairs. An indirect reporting relationship is also provided to the Safety & Industrial Hygiene Center of Excellence in Morristown, New Jersey.

10.4.3 Environmental Supervisor

This individual is responsible for assuring compliance with all Federal and State environmental regulations, other than radiological, which impact upon plant operations. The position reports directly to the Manager of Regulatory Affairs.

10.4.4 Supervisor , Management Assurance/Training Coordination

This Supervisor's primary responsibility is the implementation of the plant Management Assurance Program. The position reports directly to the Manager of Regulatory Affairs; however, if a conflict of interest should develop, this Supervisor may communicate directly with the Plant Manager.

All Managers and Supervisors in critical plant areas are required to post a written notice of absence, and to designate a responsible individual for the position during vacations, illnesses, or other plant absences.

10.5 Education and Experience of Key Personnel

The minimum qualifications for the staff positions which relate directly to administration and supervision of the NRC regulatory compliance program are as follows:

10.5.1 Manager Regulatory Affairs

Requires a Bachelor's degree in Engineering, Science or related discipline and 8 or more years of diversified experience in chemical manufacturing, including supervisory or management experience. Requires knowledge of applicable NRC regulations and an extensive knowledge of the Nuclear Fuel Cycle. Must possess sound judgment and ability to work effectively with management and government officials.

10.5.2 Health Physics Supervisor

Position requirements must include a Bachelor's degree in Physical or Biological Science and a minimum of three years Health Physics or related experience sufficient to maintain an effective radiation safety program.

10.5.3 Supervisor of Health Physics Team Leader

The minimum requirements for this position include a Bachelor's degree in Physical or Biological Science and at least three years of Health Physics or related experience.

10.5.4 Health Physics Specialist

The minimum requirements for this position include a Bachelor's Degree in Physical or Biological Science and at least one year of Health Physics or related experience.

10.5.5 Manager Engineering

Position requirements include a Bachelor's degree in Chemistry, Chemical Engineering, five years of Technical experience and three years of supervisory or management experience.

10.5.6 Supervisor Management Assurance/Training Coordination

Position requirements include a Bachelor's degree in chemistry, Chemical Engineering or Mechanical Engineering with at least five years of plant experience.

10.6 Training

The plant maintains the following training for new employees and retraining for experienced employees:

New employees receive a first-day indoctrination in plant industrial and chemical safety which includes the issuance of personal safety equipment, demonstrations of proper use of safety equipment and lectures covering the importance of and proper procedures for radiation protection. Additionally, each employee is issued and requested to study copies of the "Employee Safety Handbook". A safety indoctrination form which outlines the initial training, the assignment of lockers, the issuance of an Approved Monitoring Device (AMD) and safety equipment, and the fitting of respirators is signed and dated by the Safety Leader, the Health Physicist and the new employee.

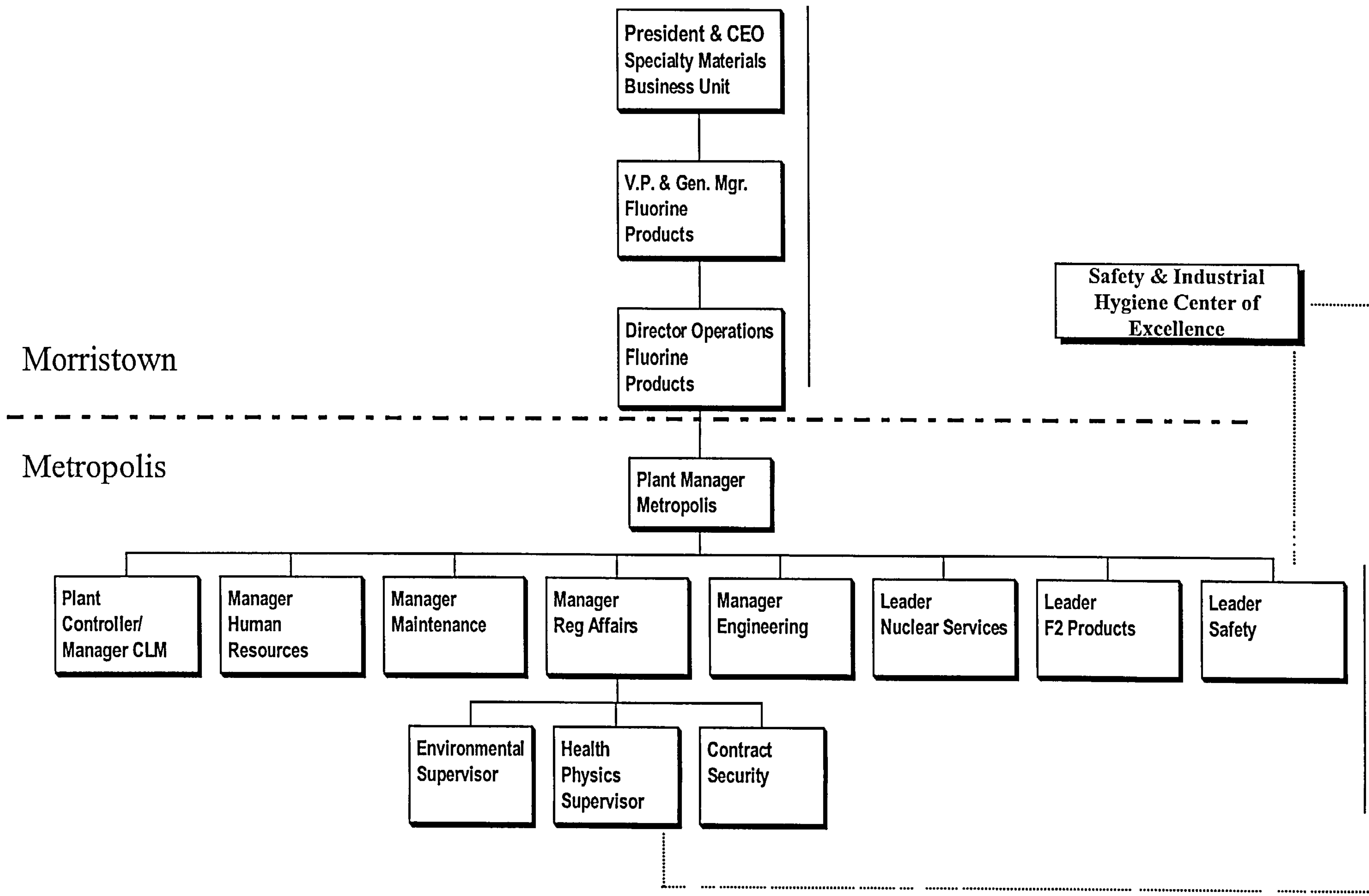
During the employee's first week, a portion of each day is spent with his immediate supervisor reviewing safety and radiation protection procedures. Adequacy of this training is verified by his performance, and informal examination by his foreperson.

All experienced employees are reinstructed in safety hazards and proper radiation protection procedures at monthly "B" Council Safety meetings. Typical radiation safety topics used in monthly employee training include: radiological emergency planning, ALARA, air activity measurements, surface contamination, waste disposal, external dose control, dose units and limits, uranium deposition and toxicity, respiratory protection, and employee rights and responsibilities. An annual quiz is normally given to determine subjects which need additional training emphasis.

The plant "Emergency Response Team" receives twenty-four hours per year training in fire control, emergency rescue, chemical hazards and other pertinent information from the plant "Emergency Response Plan".

Plant operators are trained, and refresher training provided in accordance with plant policy entitled: "Process Retraining Requirements". These training records are retained by the Plant Training Department.

Figure 1
ORGANIZATIONAL CHART



Revised: November 2002
NRCORG2002

Chapter 11

Radiation Protection

11.1 Program

The management and staff of the Honeywell, Metropolis plant are committed to maintaining employee, and environmental radiation exposures As Low As Reasonably Achievable (ALARA). Sufficient manpower, resources, and equipment are provided to assure an effective radiation protection program. NRC Regulatory Guides are utilized to assure that methods and actions are taken which are appropriate for a UF_6 conversion plant radiation protection program.

The plant program is described in detail in Sections 11.2 through 11.14 of this chapter.

11.2 Posting and Labeling

Plant radiation areas, and airborne radioactivity areas are identified using signs, labels, signals, and controls as required in 10CFR20.1901-20.1905. These employee warning systems are described in detail in Sections 11.4, 11.9, and 11.13 of this chapter.

An exemption to 20.1902 (a) and (e), and 20.1904 (a) has been requested in Chapter 1, Section 1.6.1 rather than post and label individual radioactive material areas and containers. The plant radiation safety training program is utilized to assure employees are familiar with the hazards associated with radioactive materials. In addition, outside contractors and vendors who must work in radioactive material areas are indoctrinated in plant Health Physics practices prior to starting work.

11.3 External Radiation - Personnel Monitoring

Each Honeywell employee working in a uranium processing area within the restricted area is issued an individually assigned TLD whole-body badge. A TLD badge service is used to perform the analytical scenario. The vendor supplies new badges on a quarterly basis for salaried employees, and monthly for hourly employees. The vendor is instructed to notify the Health Physicist, via telephone or fax, of any whole body exposure exceeding 125 millirem during the month or 375 millirem during the quarter, and a lens dose exceeding 375 millirem during a month. An investigation is conducted to determine the source of the exposure. These investigation limits are based on annual exposure limits required in 10CFR20.1201.

Historical data and plant operating experience indicate employees are unlikely to receive an annual whole body exposure of more than 500 mrem. Employees working in the ore concentrate sampling plant or other jobs where close contact with uranium or its daughter products occur, are most likely to receive higher than average exposures. The Sampling Plant was converted from falling stream sampling to an auger system in December 1994 to minimize personnel exposures.

Table A-1, Page A-2, Appendix "A" shows the whole body exposures recorded during the most recent 10 year period 1984-93. Thirty-five (35) exposures of more than 500 mrem have been measured during the last 5 years of plant operation. Although fewer personnel were employed in 1988-89, the percentage of employees at background radiation level has remained above 70% during the 10-year period.

11.4 Radiation Surveys

Based upon the very low potential for significant whole body exposure, and many years of operating experience, routine beta-gamma exposure measurements from operating equipment are not performed; however, an effective system has been devised for employee protection:

Process equipment which has or could possibly have radiation fields in excess of 5 millirem per hour at a distance of 30 centimeters from the source are posted caution - "Radiation Area". In addition, yellow and magenta floor stripes are provided around the equipment to provide an additional buffer zone and warning device for employees. The floor stripes are utilized in conjunction with training to warn employees to minimize stay-times in these areas.

Investigative beta-gamma instrument surveys are conducted when a process or procedural change is made which could result in increased employee exposure. Exposure rate and occupancy factors are appropriately utilized to determine if additional precautions are needed. Additionally, each time a radioactive material vessel is entered for inspection or repairs (confined space entry), a radiation survey is conducted by the Health Physicist and appropriate employee protection is specified utilizing time, distance and shielding considerations. Airborne radioactivity surveys are also periodically made in radioactive material vessels (primarily baghouses) to assure the specified respiratory protection is adequate for worker protection.

11.5 Reports and Records

11.5.1 Records which relate directly to radiation exposure of employees or members of the public are retained until NRC authorizes disposition. These records include:

- Personnel and environmental TLD dosimetry results
- Bioassay results (urinalysis and whole body counts)
- Environmental measurements (air, soil, vegetation and water)
- Unusual events reportable to NRC (overexposures, excessive concentrations, etc.)

11.5.2 Records which relate indirectly to employee or environmental exposure are maintained a minimum of five (5) years; however, a summary report is prepared prior to disposal. These records include:

- Contamination smear results
- Daily workroom air activity measurements
- Daily gaseous and liquid effluent measurements
- Fence line air sampling data
- Health Physics incident reports

11.5.3 The following reports and records are maintained a minimum of five (5) years:

- NRC Inspection Reports
- ALARA Meeting Minutes
- Quarterly Health Physics Audit Reports
- Semi-annual Radiological Environmental Report
- Health Physics Instrument Calibrations
- Employee Training Records
- Management Assurance Program Documentation
- Investigations of unusual events

11.6 Instruments

The natural uranium processed in the plant is primarily an alpha emitter; however, sufficient beta-gamma rays are present from the uranium, and uranium daughters to provide an alternate method for measuring contamination. Alpha counting is the primary method utilized for measuring airborne radioactivity, removable contamination smears, and daily stack filter control samples. Beta-gamma measurements are utilized in conjunction with DOT requirements to make direct surveys, and smear measurements of transport vehicles and packages. Beta-gamma Geiger

counters are also used for equipment surveys and confined space entry surveys. Thin window alpha-beta-gamma survey meters are utilized for personnel monitoring to assure maximum sensitivity measurement on personnel exiting the plant. Both gross alpha and gross beta counts are performed on liquid effluent samples.

Kinetic Phosphorescence Analyzer (KPA) analysis for uranium is a very sensitive analytical method, and may be used to confirm the alpha counting methods utilized in the plant. Sufficient instrumentation and back-ups are maintained to assure an effective Health Physics monitoring capability. Instruments routinely used in radiation surveys are shown in the following table:

HEALTH PHYSICS SURVEY INSTRUMENTS

Type	Use	Sensitivity	Calibration	
			Range	Frequency
Geiger Counter	General Survey	Beta-Gamma >40 KeV	0-200 mr/hr	Quarterly
Thin Window Radiation Monitor	Surface Contamination	Alpha-Beta-Gamma	0-50,000 CPM	Quarterly
Scintillation Alpha Counter	Surface Contamination Air Filters	Alpha	0.3-999,999 CPM	Monthly
Internal Proportional Counter	Air Filters Surface Contamination	Alpha-Beta	0.1-999,999 CPM	Monthly

The thin window, scintillation, and IPC counters are calibrated using a certified U_3O_8 source. The Geiger counters are calibrated using a Cs^{137} sealed source. Appropriate check sources are also available to monitor instrument response during use. In the event measurements are required which are beyond the capabilities of plant instrumentation, an outside vendor is utilized to perform the analysis.

Health Physics instrumentation is stored in the plant Health Physics facility. This facility consists of: a radiochemistry laboratory where wet and radioactivity measurements are performed; a respirator fitting area; a KPA laboratory; and three (3) offices. All standardization of methods and instruments is performed by trained Health Physics technicians under the direction of a Health Physics Supervisor.

11.7 Protective Clothing

The normal protective clothing program consists of requiring employees actively engaged in uranium operations to wear plant clothing and shoes. Personnel are assigned two lockers each, a "hot" and a "cold" locker. Each employee is issued three sets of coveralls which have their locker number

printed on them for return to the individual. When an employee reports for work, he is required to change into coveralls, safety shoes, a hard hat and safety glasses. At the end of the shift, the coveralls are placed in containers provided for that purpose. Company-provided equipment is kept in the "hot" locker assigned to the employee and does not leave the plant site. Used coveralls are taken to the plant laundry where they are washed, dried and returned to the respective employee.

Experience indicates that contamination picked up on coveralls during the normal working day is negligible. There are, however, instances when an employee may be required to work under conditions such that contamination is significant. At such times, additional coveralls, or disposable coveralls, shoe covers, respiratory protection, and gloves are required to insure that adequate protection is afforded. Upon completion of the job, the outer clothing is removed and placed in plastic bags at the job site. The employee then proceeds to a shower provided in the UF_6 facility for decontamination, and changes into clean coveralls. The employee then proceeds to the regular shower and locker room to change in the normal manner at the end of his shift. The contaminated clothing removed in the UF_6 facility is stored and washed separately from the routine clothing. In this way, the spread of and possible resuspension of radioactive material is minimized.

Outer protective garments are provided to employees and visitors who may be exposed to surface contamination while working inside the buildings that contain uranium. Railroad personnel will not be required to don protective garments when switching railcars inside the restricted area. Change rooms are provided in the Administration Building near the Security Guard Station. After donning appropriate protective clothing, employees and visitors pass by the Guard Station before entering the restricted area.

Upon exiting the restricted area, visitors and employees deposit protective clothing and shoe covers in appropriate containers for in-plant laundering or reuse. These items do not leave the plant site. All visitors and employees who have entered the restricted area of the plant are required to perform personal exit monitoring before leaving the site.

Additional protective clothing and equipment is required for maintenance operations which could potentially expose the employee to hazardous chemicals during line breaking, or other potentially hazardous activities. Equipment required for each job is specified in the Supervisor's Safety Manual, Job Safety Analysis sheet, or on the work Permit authorizing the activity. The equipment utilized meets the requirements of the NIOSH "Certified Personal Protective Equipment List".

Protective equipment utilized under accident conditions also meets the requirements of the "Certified Personal Protective Equipment List". In addition, appropriate personnel are trained in the use of specific emergency equipment which may be utilized by the plant "Emergency Response Team", or in responding to a major UF_6 release as outlined in the "Radiological Contingency Plan".

11.8 Administrative Control Levels, Including Effluent Control

The administrative controls, and actions for the radiation protection monitoring programs are shown in Table 11.8, Page 11-16, and 11-17.

11.8.1 Gaseous Effluent Monitoring Program:

Stack monitoring is the primary method utilized to control gaseous releases of uranium. These methods are described in Chapter 4.

A comprehensive environmental air monitoring program is also conducted to demonstrate compliance with applicable environmental air quality standards. The environmental air monitoring program consists of taking continuous air samples (low volume) at four points along the restricted area fence line (Stations No. 9, 10, 12, and 13). Two samplers are located near the site boundary in the prevailing wind direction (Stations No. 8 and 11). One sampler is located off-site approximately one mile downwind of the Feed Materials building (Station No. 6). An additional continuous air sampler is located at the location of the nearest downwind residence (Station NR-7).

Each low volume (No. 6, 8, 9, 10, 11, 12, and 13) sampler is changed weekly and analyzed for uranium and fluoride content. Results are reported as μCi/ml uranium and $\mu g/m^3$ fluoride. Additionally, a quarterly composite of the 13 weekly samples is sent to a vendor analytical laboratory for Ra^{226} and Th^{230} analysis. Weekly samples obtained at the nearest resident (NR-7) sample station are analyzed for uranium (μCi/ml). In addition, quarterly composites of the weekly (NR-7) samples are analyzed by a vendor laboratory for Ra^{226} and Th^{230}.

Quarterly simulated lung fluid solubility tests are also run on the NR-7 sample to determine the biological half-life of uranium collected during the quarter. The "site specific" data collected from Station NR-7 is used to calculate compliance with 40CFR61 requirements.

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The lower limit of detection using these methods is <1E^{-16} µCi/ml for uranium, and <5E^{-17} µCi/ml for Ra^{226} and Th^{230}.

11.8.2 Liquid Effluent Monitoring Program

Compliance with applicable effluent release limits and water quality criteria is determined by sampling the plant effluent discharge (see Figure 11.8.1, Page 11-18 and the Ohio River (discussed in Chapter 12) which is the receiving stream for plant effluents.

The main plant effluent is continuously sampled and a daily composite is analyzed for uranium content. The daily samples are composited into a monthly composite sample which is analyzed for uranium, gross alpha, gross beta, and several non-radiological constituents. Quarterly composites of the monthly samples are analyzed by a vendor laboratory for Ra^{226} and Th^{230}. Effluent water samples are also collected in accordance with conditions prescribed in the plant NPDES permit. Additional information related to liquid effluents is provided in Sections 4.2, 5.1, and 9.4.1 of this application.

The lower limit of detection for uranium in water samples is <0.001 PPM, and <2E^{-10} µCi/ml for Ra^{226} and Th^{230}, respectively.

Results from the Radiological Environmental Monitoring Program (air and water) are reviewed weekly, as appropriate. The environmental information is utilized to perform trend analysis. Undesirable trends are reported to Plant Management via ALARA meetings, quarterly Health Physics audits, or immediately depending on the severity of the condition. Appropriate information from the monitoring program is also utilized to prepare the semi-annual "effluent report" required by NRC regulations.

11.8.3 Compliance Methods for 40CFR Part 61

The "Site Specific" analytical data collected at the nearest residence sampling station (NR-7) is used to calculate the nearest resident radiation dose in conjunction with dose conversion factors provided in Federal guidance Report No. 11. The dose factors assume a particle size of 1 AMAD and vary by solubility, in accordance with the Federal Guidance Report.

The nearest residents are adults, they do not consume vegetables from a home garden, nor do they pasture beef or daily cattle. The

nearest beef cattle pasture land is approximately 1½ miles NE of the plant and is grazed during the growing season. The nearest dairy cattle are grazed approximately 8 miles east of the plant. For dose calculation purposes, 100% occupancy is assumed for the nearest resident. $Radium^{226}$ is taken to be class "W" solubility in accordance with ICRP-30 and $Thorium^{230}$ is assumed to be class "Y" solubility.

The quarterly dose to the nearest resident is derived by combining air concentration and solubility with dose factors from Federal Guidance No. 11 as follows:

Dose (mrem/qtr.) = Air Concentration (µCi/cc) (Note 1)
X Annual Breathing Rate (Note 2)
X Solubility Fraction (Note 3)
X Dose Conversion Factor
X 1000 (mrem/Rem)
X 0.25 (¼ of year)

Note (1) - Natural uranium concentration is factored by

Isotopic composition:

U^{234} - 0.48877

U^{238} - 0.48877

U^{235} - 0.02245

Note (2) - The annual breathing rate is taken to be 8.32 E^{9}cc, based upon 16 hours non-occupational @ 9600 L/8 hrs. and 8 hrs. resting @ 3600 L/8 hrs.

Note (3) - The solubility fraction found from simulated lung fluid testing, "D", "W", or "Y".

Repetitive calculations are performed for each significant isotope according to the solubility and air concentration measured. The 50 year dose commitments calculated from plant gaseous emissions are shown in Chapter 12. In addition, the EPA computer program, "COMPLY", has been utilized to model stack emissions for calculation of the nearest resident dose.

11.9 Respiratory Protection

The MTW Plant Policy Manual lists the buildings that require a respirator before the person enters. Failure to wear a respirator in a designated area may subject an employee to disciplinary action. No extended periods of time are anticipated for the wearing of respirators by individuals, and indeed, experience has shown that this is true. Respirators are normally worn following process equipment breakdowns which result in area contamination. Flashing red lights, posting, and written instructions are used to insure that employees wear respirators in airborne contamination areas until such time that air sampling indicates the air activity in the area has been reduced to an acceptable level. An in-plant administrative limit of 30% of DAC is used as the air activity level at which respirators are worn.

Each potentially exposed employee is given an annual quantitative respirator fit test. The employee is informed which mask size and model provides the greatest protection factor. Only NIOSH certified respiratory equipment is utilized, and the program is implemented in accordance with 10 CFR 20 requirements, and Regulatory Guide 8.15. Each new employee is fitted and instructed in the proper fitting of respirators, and in positive/negative pressure field tests for respirator function immediately prior to use. These instructions and fitting procedures are repeated annually for all potentially exposed employees.

When conditions indicate that the protection provided by a half-face respirator may be inadequate, respiratory equipment is used which will provide the individual greater protection factors, such as a full-face canister or airline mask, or self-contained breathing apparatus, as appropriate. This respiratory protective equipment is available at strategic locations throughout the plant for immediate use. For purposes of computing individual exposures to airborne radioactivity, the respiratory protection factors used are in accordance with the recommendations contained in NUREG-0041 "Manual of Respiratory Protection Against Airborne Radioactive Materials", and Regulatory Guide 8.15.

At the end of each shift, used respirators are deposited in one of the receptacles provided for this purpose throughout the plant. Respirators thus collected are completely disassembled and cleaned. Each cartridge is checked for radioactivity using a beta-gamma probe to detect low levels of activity. Any cartridge showing radioactivity above 300 CPM is discarded. All parts of the used respirator except the cartridges are then washed, disinfected, rinsed, dried, and packaged prior to re-issue.

11.10 Occupational Exposure Analysis

External Exposure:

Results from monitoring employee external whole body dose (TLD's) are shown in Table A-1, Page A-2. During the last 10 years of plant operation, the fraction of employees at natural background has remained relatively constant at 70 - 80% of the plant population; however, during the 1990-1993 period, a slight increase in a few individual exposures were observed. These relatively higher exposures are associated with the Sampling Plant, and fluorination assistant operators whose exposure times have been increased due to production rates.

Internal Exposure:

Results from the routine urinary uranium sampling program, for the most recent four-year period, are shown in Table 11.10 (A), Page 11-19. Only five routine sample exceeded the action level during the four-year period, and the maximum individual exposure was less than 10 MPC-hrs. during that work week. Special urinary uranium samples are also obtained following exposure to a UF_6 release or after baghouse work. The data from these samples are presented in Table 11.10 (B), Page 11-20. As might be expected exposures from specific incidents are somewhat higher. Approximately 5-8% of the samples exceeded the urinary uranium action level during the period. Each of these incidents was investigated and documented. No exposure exceeded 40 MPC-hrs.

Routine whole body counting results for the years 1990, 1991, 1992, and 1993 are shown in Table 11.10(C), Page 11-21. None of the individual counts of the 488 performed during the four year period exceeded the minimum detection level.

11.11 Measures Taken to Implement ALARA

A plant ALARA, "As Low As Reasonably Achievable", Committee is being utilized by management to ensure that exposures and effluent releases are effectively controlled. This committee consists of the Plant Manager, the Department Managers, the Nuclear Services Leader, Health Physics Supervisor, and the President, and Vice-President of the local union. The committee meets quarterly to review the radiological safety program performance for the previous quarter, and to formulate plans for reducing employee or environmental radiation exposures. Regulatory Guide 8.10 and 8.37 are utilized by the committee for formulating plant operating philosophy in reducing exposures.

Business transacted at the meetings includes a detailed evaluation of personnel and environmental exposures to identify undesirable trends. An investigation and action plan may be utilized in reversing significant increases observed in the exposure trend analyses. The written action plan is then distributed to all members.

The primary objectives of the ALARA Committee are:

1. Monitor operations and exposure records to determine where exposures may be reduced.
2. Assure employee training, and how to utilize information on-the-job to keep exposure ALARA.
3. Modify procedures and equipment when change will reduce exposure at reasonable cost.
4. Assure adequate personnel, space, and money is provided for the Health Physics Program.
5. Provide the Health Physicist sufficient authority to enforce safe plant operation.

Examples of ALARA trend charts utilized by the committee are shown in Appendix "A", Pages A-1 through A-6. Undesirable trends are corrected to assure an NRC reportable incident does not result. Major projects completed as a result of ALARA efforts are shown in Table 11.11, Page 11-22. One example of ALARA effectiveness is shown in the Air Activity Trend Chart for the drum dumping operation. Prior to 1980 air activity was about 100 - 120% of the then MPC (maximum permissible concentration), occupancy was about 3 hrs./shift and respirators were worn. In 1980 new larger dust collectors were installed to improve ventilation. This action reduced air activity to approximately 25-60% of the then MPC during the next few years but continued use of respirators was required. In 1984 high pressure water cleaning equipment was substituted for steel shot blasting of emptied drums to remove residual uranium. This action reduced air activity to less than 10% of NRC limits, and respirator requirements were removed.

11.12 Bioassay Program

The plant bioassay program consists of routine and special urinary uranium sampling for evaluation of employee exposure to the natural uranium compounds processed in the plant. The program utilizes guidance provided in Regulatory Guide 8.9 (July 1993). Intakes are calculated using the methodology provided in NUREG/CR-4884,

"Interpretation of Bioassay Measurements", July 1987, in conjunction with the computer program "INDOS" developed by Scrabble Enterprises Inc., Dec. 1987.

Hourly employees are required to leave a routine urine sample twice monthly following a 24-96 hour absence from work.

Salaried personnel who routinely work inside uranium processing areas shall be sampled monthly. The routine sampling schedule is appropriately adjusted to allow for vacations, illnesses, etc.

Special urinary uranium samples are collected following confined space entries, e.g., baghouses, where the air concentrations may exceed DAC; and following a UF_6 release, if employees have been exposed. In addition, employees are encouraged to submit urine samples at the end of a work shift, following a suspected exposure to airborne uranium to determine if an exposure has actually occurred. Follow-up special samples are obtained if results exceed the evaluation level.

The Kinetic Phosphorescence Analyzer (KPA) is used for urinary uranium. Beginning January 1, 1994, the evaluation level used is 15 µg/L, and the investigation level is 60 µg/L urinary uranium. Employees whose urinary excretion rate exceeds 15 µg/L are resampled for confirmation. If the excretion rate exceeds 60 µg/L, the intake is investigated and daily urinary uranium samples are normally obtained until the results are less than the evaluation level. Work restrictions are considered if the bioassay data indicates the intake exceeds 30% of ALI (annual limit on intake) for mixed solubility material ("Y", "W", and "D"). Work restrictions are imposed if results indicate the weekly intake limit (10mg) for class "D" uranium or the ALI has been exceeded.

Employees exposed to highly soluble UF_6 are required to submit two (2) special urine samples within the first 24 hours following exposure, usually at 3-6 hours post exposure, and 16-20 hours post exposure. The action level for these samples is 200 µg/L and work restrictions are imposed if it appears the 10 mg weekly limit for soluble uranium may be exceeded. Daily sampling is continued until the concentration is less than 15 µg/L.

Whole body counting will be performed by an outside contractor if, based on urinalysis results, a Class "Y" intake could exceed 5 Rem committed effective dose equivalent. Work restrictions and whole body counting are considered if bioassay data indicate the intake could exceed 30% of the appropriate ALI for the material of exposure.

Results from the four most recent years of bioassay sampling are provided in Section 11.10 "Occupational Exposure Analysis".

The bioassay evaluation level of 15μg/L and investigation level of 60 μg/L correspond to 2% and 10%, respectively, of the ALI (annual limit on intake) as defined in 10CFR20. Table 11.12, Page 11-23, provides the urinary uranium concentrations which correspond to the appropriate evaluation and investigation levels for urine samples collected at 14-day intervals. If the chemical compound to which the employee was exposed is known, the corresponding evaluation level may be used; however, if the exposure compound is not known, UF_4 will be used as the compound of choice in accordance with the ALARA concept. The urinary uranium concentrations are rounded to correspond with previously established plant data bases. Exposure to UF_6 is limited by chemical toxicity to the kidney rather than annual radiation dose (10CFR20.1202(e)). The value of 35 μg/L shown in table represents the urinary uranium concentration which would be expected in urine at 14 days after an unknown intake of 10mg of uranium, which is the weekly intake limit. It is extremely unlikely an unknown exposure to UF_6 could occur in the plant due to the highly visible "smoke" produced by a small quantity of UF_6. Special bioassay samples are required following a UF_6 release.

Routine whole body counting does not appear to be a useful method for measuring exposures to the more soluble natural uranium compounds to which employees may be exposed. For example, an acute exposure of 30% of the ALI from ore concentrates or UF_4 would result in a lung deposition of less than 15 μg of U^{235}, or about 24% of the minimum detection limit of the whole body counter. Whole body counting does appear useful as an additional investigative method for employees exposed to Class "Y" natural uranium. Acute exposures are readily detected from excretion of the Class "D" component in conjunction with incident investigation of air activity, and employee interviews to determine the solubility of the intake material.

11.13 Air Sampling and Internal Exposure Program

The primary control utilized in the plant for maintaining internal exposures as low as reasonable achievable is confinement of source material within process vessels. Extensive air sampling determines when confinement is breached and during these occasions respiratory protection is utilized by employees working in the contaminated area.

There are currently fifty-six (fixed) continuous work area samplers in the UF_6 building, three in the Sodium Removal facility, two in the drum dumping area, and ten in the Sampling Plant to determine airborne

radioactivity levels. The sampling filters from all air sampling points are changed and counted daily for Alpha radioactivity. The air activity is calculated (µCi/ml) and reported daily during periods of normal operation. However, during periods of abnormal operating conditions (visible spills or leaks), the sample filters are changed after the upset is corrected and the area decontaminated of visible contamination. Respirators are required for potentially exposed employees during this period. The air samples are then changed at two-hour intervals until analytical results indicate the air activity is less than 30% of the DAC (derived air concentration). Respirator requirements are then removed.

The respirator action level of 30% of DAC, is calculated to be $5.0E^{-11}$ µCi/ml by assuming the exposure is to UF_4 (32% D, 68% Y). This is a conservative action level since most exposures are to uranium ore concentrates or UF_6 which would produce a higher calculated action level. If the average activity on any floor in the Feed Materials building is greater than 30% of DAC, or any four (4) of eight individual air samples exceeds 30% of DAC, the entire floor is posted for precautionary use of respirators and an informal investigation is conducted by the Production Foreperson and Health Physics department to correct the problem. If any single air sample is greater than DAC ($1.7E^{-10}$ µCi/ml for UF_4), a formal investigation is initiated by the Health Physics Department, and the Production Foreperson documents the cause and corrective action taken on a "Incident & Spill Report".

Each fixed breathing zone sampler is located approximately five feet above the floor and consists of: a 25 mm open-face filter holder, fiberglass or membrane particulate filter, flow meter, and associated fittings for connection to a central sample vacuum system. Eight samplers are located on each floor of the UF_6 facility. The sampling rate used is 40 SCFH which is approximately equal to "standard man" respiration rate. Employee lapel samples are taken at least once per year to determine the representation of the fixed air samplers, and may also be used in specific exposure evaluations.

Employee urinary uranium results (See Sec. 11.12 Bioassay Program) are periodically compared to air sampling data. Reasonable agreement is obtained during normal operations (no respirators required); however, during leak or spill conditions, air filters tend to plug, and it is difficult to determine employee occupancy and effectiveness of respiratory protection to calculate DAC-hrs. of exposure. Under such conditions, bioassay sampling and dose modeling appear more appropriate than air sampling for the determination of actual exposures.

11.14 Surface Contamination

Surface contamination is controlled by minimizing leaks and spills through a good preventative maintenance program. Daily visual surveys are made in uranium processing areas to detect leaks of highly visible LSA uranium compounds. Contamination detected in this manner is scheduled for cleanup by the full-time decontamination personnel employed by the plant. Possible spread of contamination to other plant areas is minimized by specific spill control procedures and the protective clothing program described in Section 11.7.

For purposes of surface contamination monitoring, the plant restricted area is divided as follows:

Controlled Areas: Plant areas in which uranium is processed and could be present in unencapsulated form.

Intermediate Areas: Production areas for non-radioactive fluorine based chemicals, and plant support facilities.

Uncontrolled Areas: Plant areas where food may be consumed, locker rooms, and entrance/exit areas from the plant.

All specified areas are monitored for removable alpha contamination in accordance with the frequency, and action levels specified in Section 3.2.6. Any area found to exceed the specified action level is scheduled for immediate decontamination. Follow-up surveys are conducted following decontamination of the area to assure the contamination has been reduced to less than the action level.

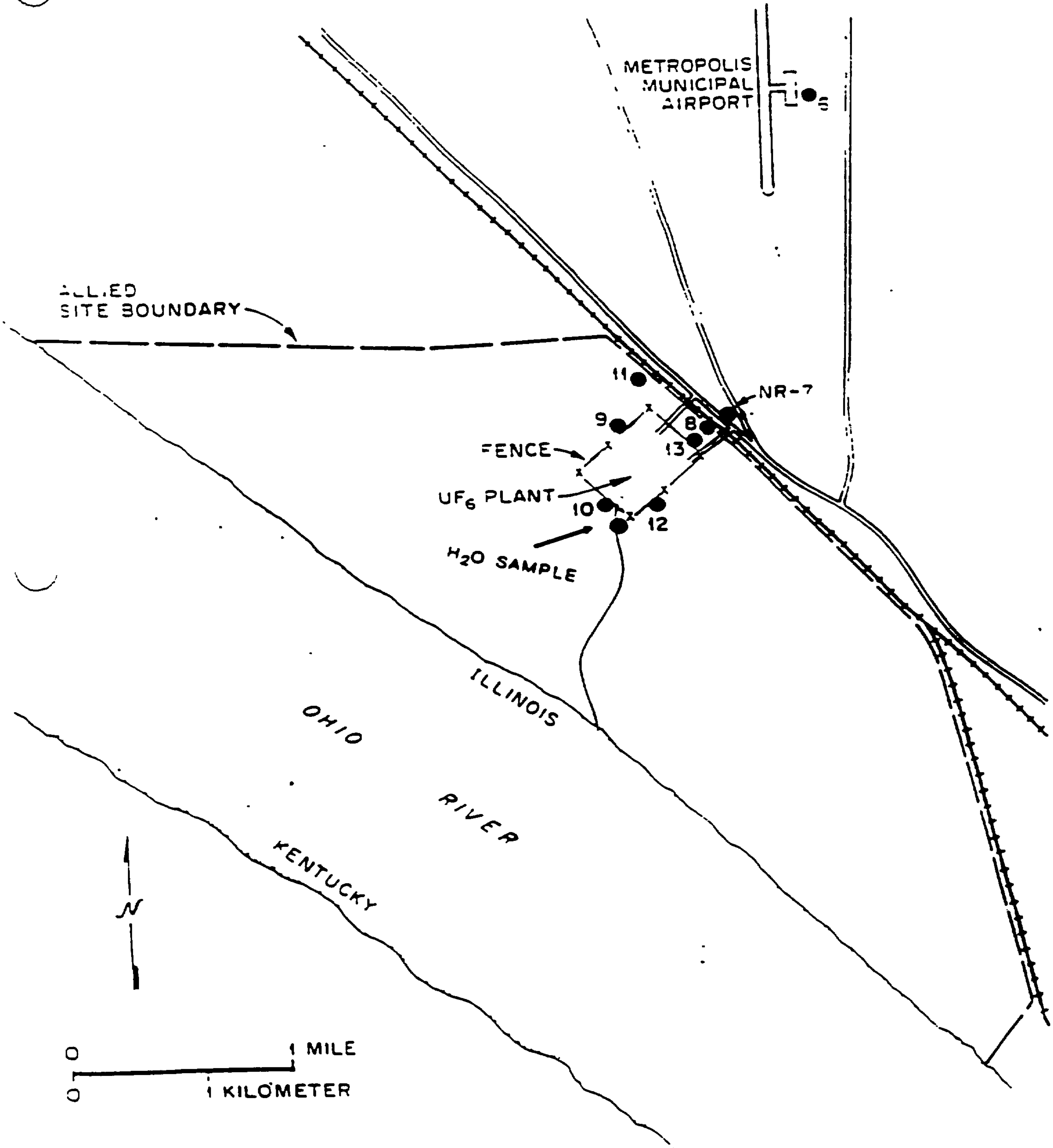
A review of monitoring results during the most recent 4 years of operation (see Table 11.14, Page 11-24) indicates a maximum of 1.1% of samples from uncontrolled areas exceeded the plant action level during the four year period. As might be expected, the area most likely to be found contaminated above the action level is the Feed Materials control room floor; however, the maximum contamination level found there was < 700 DPM/100 cm^2, compared to the NRC public release limit of 1000 DPM/100 cm^2.

TABLE 11.8

ADMINISTRATIVE CONTROL LEVELS

MONITORING PROGRAM	MEASUREMENT FREQUENCY	ACTION LEVEL	PRESCRIBED ACTION
Occupational Exposure: External Whole Body (TLD Badge)	Quarterly Monthly	375 mrem/Qtr. 125 mrem/Mo.	1. Interview employee. 2. Record or adjust exposure based on facts obtained.
Internal Exposure	Bimonthly	15 µg/L (evaluate)	1. Confirm result by resampling.
Urinalysis (ore conc.; UF_4)	Bimonthly	60 µg/L (investigate)	1. Confirm result. 2. If confirmed, interview employee. 3. Initiate special urine sampling. 4. Restrict employee if >10 mg Class "D" intake.
Urinalysis (UF_6)	Two samples/24 hrs.	200 µg/L	Same actions as above.
Airborne Radioactivity: Workroom air samples	Daily	Avg. >30% of DAC	1. Require respirators. 2. Investigate by Health Physics. 3. Resample workroom air.
Workroom air samples	Daily	>DAC on any sample	1. Require respirators. 2. Investigate. 3. Document on "Incident Report". 4. Resample workroom air.
Stack monitors	Daily	5000 DPM on 3 successive samples	1. Investigate. 2. Take appropriate corrective action including shutdown.
Fence line monitors	Weekly	>10 mrem CEDE/year; investigated quarterly.	1. Review plant operations. 2. Take appropriate corrective action.

MONITORING PROGRAM	MEASUREMENT FREQUENCY	ACTION LEVEL	PRESCRIBED ACTION
Liquid Effluents:			
Plant effluent monitor	Daily	1 PPM uranium as a monthly average, investigated monthly.	1. Review plant operations. 2. Take appropriate corrective action.
Surface Contamination:			
Controlled areas	Monthly	5000 DPM/100 Cm^2 (alpha)	1. Decontaminate. 2. Re-survey. 3. Additional corrective action as required.
Intermediate areas	Quarterly	200 DPM/100 Cm^2 (alpha)	Same as above.
Uncontrolled areas	Weekly	200 DPM/100 Cm^2 (alpha)	Same as above.
Equipment release	As required	NRC unrestricted release guidelines.	Same as above.
Skin contamination	Daily	1000 DPM/100 cm^2 over background (alpha + beta + gamma)	Same as above.



<u>**Figure 11.8.1**</u>

<u>**Location of Air and Liquid Effluent Sampling Stations**</u>

TABLE 11.10(A)

ROUTINE URINARY URANIUM DATA

Number and Percent of Samples

	1990		1991		1992		1993	
Concentration	Number	% Samp	Number	% Samp	Number	% Samp	Number	% Samp
< 5 µg/l	5108	95.60	4657	89.30	5604	90.2	6470	95.50
5 to 15 µg/l	230	4.30	523	10.00	545	8.8	254	3.75
15 to 30 µg/l	3	0.05	34	0.65	96	1.5	44	0.65
> 30 µg/l	2	0.03	1	0.01	0	0	2	0.1

<u>TABLE 11.10(B)</u>

<u>SPECIAL URINARY URANIUM DATA</u>

Number and Percent of Samples

	1990		1991		1992		1993	
Concentration	**Number**	**% Samp**	**Number**	**% Samp**	**Number**	**% Samp**	**Number**	**% Samp**
< 5 µg/l	133	63.6	69	52.6	177	54.1	176	57.7
5 to 15 µg/l	40	19.1	37	28.2	83	25.4	73	23.9
15 to 30 µg/l	17	8.1	17	12.9	42	12.8	39	12.7
> 30 µg/l	19	9.1	8	6.1	25	7.6	17	5.5

TABLE 11.10(C)

WHOLE BODY COUNTING

Number and Percent of Samples

	1990		1991		1992		1993	
Concentration	Number	% Samp	Number	% Samp	Number	% Samp	Number	% Samp
<MDL	179	100	120	100	54	100	135	100
MDL to 100	0		0		0		0	
100 to 200	0		0		0		0	
> 200	0		0		0		0	
MDL = 63 µg U-235								

TABLE 11.11

PLANT ALARA COMMITTEE

MAJOR PROJECTS COMPLETED:

PROJECT	COMPLETED	COST
• Walkway gratings – Wet Process	Jul. 1980	30K
• D.D. Dust Collector	Nov. 1980	93K
• Vacuum Cleaner – S. Plant	Mar. 1981	48K
• D.D. Water Spray Cleaning	1984	100K
• Residential Property Acquisition	1987	350K
• Top Entry Dust Collectors	1988	180K

TABLE 11.12

EVALUATION AND INVESTIGATION LEVELS (ROUTINE SAMPLES)

Compound	Urinary Uranium Concentration (µg/L)	
	0.10 ALI (Investigate)	0.02 ALI (Evaluate)
• Ore Concentrate (40% D, 60% W)*	258	52
• UF_4 (32% D, 68% Y)*	60	12.1
• UO_2 (5% D, 95% Y)*	3.1	0.6
• UF_6, UO_2F_2 (100% D)*	520	104
• UF_6, UO_2F_2 (Chem. Toxicity)**		35

*For radiation dose limits when 1 ALI = 5000 mrem

**To control chemical toxicity - see 10 CFR 20.120(e)

TABLE 11.14

SURFACE CONTAMINATION MONITORING RESULTS EXCEEDING THE ACTION LEVEL

	Uncontrolled Areas				Intermediate Areas				Controlled Areas			
	Action Level: 200 dpm/100 cm				Action Level: 200 dpm/100 cm				Action Level: 5000 dpm/100 cm			
	1990	1991	1992	1993	1990	1991	1992	1993	1990	1991	1992	1993
FMB												
CTL RM					0	0	0	0	0	0	0	0
EAST FL	4	10	3	5								
SOUTH FL	8	13	17	28								
OFF FL	7	9	8	4								
NAR & UC												
CTL RM FL	9	4	3	6								
PROD												
FOREMEN'S												
OFFICE FL	0	5	2	2								
LUNCH ROOM FL	0	1	0	0								
	28	42	33	45								