40-7102

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October 28, 1992

Mr. Yawar Faraz
Mail Stop 6H-3
Advanced Fuel & Special Facilities Section
Fuel Cycle Safety Branch
Division of Industrial & Medical Nuclear Safety
Office of Nuclear Material Safety & Safeguards
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

RE: Revised Environmental Report for Source Material
License SMB-743 Renewal Application

Dear Mr. Faraz:

Pursuant to your letter dated April 17, 1992 requesting updated environmental information, preferably in the form of a revised environmental report, please find two copies of the subject report for your review.

If there are any questions in regards to this report, please contact Mr. David R. Smith or myself.

Sincerely,

Craig R. Rieman

Craig R. Rieman
Radiological Safety Manager

CRR:lms
Enclosure
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METALLURG, INC.

SHIELDALLOY METALLURGICAL CORPORATION

Applicant's Environmental Report for the Newfield, New Jersey Facility

Report No. IT/NS-92-118
October 28, 1992

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APPLICANT'S ENVIRONMENTAL REPORT FOR THE NEWFIELD, NEW JERSEY FACILITY

SHIELDALLOY METALLURGICAL CORPORATION
West Boulevard
Post Office Box 768
Newfield, New Jersey 08344

Report No. IT/NS-92-118
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- The relationship between local short-term uses of the environment and maintenance and enhancement of long-term productivity

- Any irreversible and irretrievable commitments of resources which would be involved if the license were renewed.

This report, which supplements the renewal package, is intended to update the information provided in 1986 and 1987 to the USNRC concerning the environmental impact of Shieldalloy's operations. It contains a description of the Newfield environment, a description of the Shieldalloy plant, a discussion of the environmental impacts associated with licensed activities, a description of the on-going environmental monitoring program, and an accident impact assessment.

wedge of unconsolidated sediments that range in age from Cretaceous to Holocene. These sediments are composed of clay, silt, sand, and gravel and are classified as continental, coastal, or marine-type deposits.

The middle to lower Cretaceous sediments are primarily continental deposits consisting of alternating layers of clay, silt, sand and gravel. The upper Cretaceous and most Tertiary sediments were deposited in beach and shelf environments, and tend to be finer grained than continental deposits. Very fine grained sediments are recognized as transgressive marine deposits, which formed during major incursions of the sea. Coarsening-upward deposits that overlie the fine-grained units are recognized as marine regressions, deposited in inner-shelf, near-shore or beach environments as the ocean was retreating (USGS 1969).

2.5 Local Geology

The geology in the immediate vicinity of the Newfield plant was characterized in detail during a Remedial Investigation completed in 1992 (TRC 1992). The surficial materials of the Shieldalloy property and the Newfield area are comprised of the Quaternary Bridgeton Formation. This formation is characterized by gravel and sand that is cemented in some areas by iron oxide. The Bridgeton Formation, a Miocene fluvial deposit, reveals itself as brown sands. Its thickness ranges from zero to 28 feet.

Below the Bridgeton Formation is approximately 120 feet of subsurface sediments consisting of variegated fine to coarse grained sands with some local silt and clay beds. These are in a formation referred to as the Cohansey. The Cohansey is a Miocene shallow marine and beach deposit, formed during alternating transgressive and regressive seas (USGS 1969). Its color varies from tan to pink, orange, brown, and red. Beneath the Cohansey are gray silts and clays belonging to the Kirkwood Formation, a Miocene mid-shelf to shallow marine deposit.

2.6 Soils

The Shieldalloy plant is located on Atlas Sheet 38 of the Gloucester County Soil Survey. Five soil mapping units are identified by the Soil Conservation Service at this location.

Downer loamy sand, Aura sandy loam, Woodstown and Dragston sandy loams, Woodstown and Klej loamy sands, and muck. The presence of these general soil types was confirmed by a surface/subsurface soil exploration program completed during the Remedial Investigation (TRC 1992).

2.7 Hydrology

The principal aquifer in Gloucester County is the Cohansey Sand. The Cohansey Sand dips southeast about 11 feet per mile and is about 130 feet thick at Newfield, New Jersey (USGS 1971). The Cohansey Sand is underlain by the Kirkwood Formation. The upper portion of the Kirkwood Formation is composed of a dark gray silt and clay. The Kirkwood Formation acts as a confining layer and restricts the downward flow of groundwater from the Cohansey Sand. The thickness of the Cohansey Sand was found to range from 110 to 120 feet (TRC 1992).

The Cohansey Sand is a watertable aquifer with depths to groundwater ranging from four feet in the southern portion of the property to 16 feet in the northern portion. Seasonal fluctuations in the watertable elevations are on the order of a few feet. Groundwater movement is to the west-southwest.

The direction of groundwater flow in both the watertable and the lower Cohansey Sand closely correspond to the general topography of the site. The watertable piezometric surface slopes downward from the slight topographic high at the northern edge of the site toward the Hudson's Branch, following the Hudson's Branch downstream toward Burnt Mill Pond. The lower Cohansey Sand piezometric surface also follows the Hudson's Branch.

Hydraulic characteristics for the Cohansey Sand include a high degree of variability in the connection between the upper and lower sands (Raviv 1988). The average linear groundwater flow velocity across the site is estimated to be two feet per day.

2.8 Regional Meteorology

Based on the Koeppen climatic classification system, the Shieldalloy plant is in a region that intersects two climatic zones: humid continental and humid subtropical. Both zones have characteristics of warm summers and mild winters. The summer's maximum average temperature is 27°C (80°F); and, the coldest month is January, with an average daily temperature of approximately 0°C (32°F). Rainfall occurs primarily in the summer months, followed by spring, fall, and winter. The average annual rainfall is approximately 40 inches per year (USDC 1982). Table 2 gives the frequency of other precipitation events such as snow, ice storms, thunderstorms and hail, as noted at the Dover Air Force Base, located approximately 40 miles to the southwest of the plant (Dover 1965).

Humidity in the region averages 70 percent annually. The average prevailing winds during the winter (December to March) are from the northwest, with a range of speeds from 14 to 21 kilometers per hour. The average monthly winds for the spring and summer months (April to August) are from a southerly to southwesterly direction at speeds ranging from 11 to 16 kilometers per hour. The winds during the fall are predominantly from the west-southwest, veering to a west-northwest direction by December. The average wind speeds are highest during the winter months (USDC 1982).

From 1899 through 1980, 12 extra-tropical cyclones, eight tropical storms, and no hurricanes passed through the region. The average annual frequency of destructive tropical cyclones is less than 0.2 (Dunlap 1967).

Tornadoes, although infrequent, do occur in the area, primarily during the spring and summer. The closest reported tornado, which was across the Delaware River in Delaware, occurred on July 1, 1954, and had a path area of 0.08 square kilometers (0.03 mile).

Thunderstorms are a seasonal phenomenon in the region of the Shieldalloy plant. Records from the Wilmington National Weather Service indicate an average of 31 thunderstorm days per year, with 26 of these days occurring during the warmer months of April through September (USDC 1980).

Severe hail storms are a relatively rare phenomena. Only eight occurrences of hail with diameters of 1.9 centimeters (0.75 inch) or greater in New Jersey have been reported between 1955 and 1967. There were six occurrences of hail during the period 1977 through 1980 (USDC 1980).

Ice or freezing rain may occur as often as one to three times per year in the region of the plant. These occurrences are most frequent during the winter. Glaze accumulations greater than 0.63 centimeter (0.25 inch) are expected only once per year. The longest duration of freezing rain at the Wilmington National Weather Service Station (located approximately 32 miles to the west of the plant) between 1977 and 1981 was 15 hours on February 15 and 16, 1979 (USDC 1980).

Figure 2 contains a wind graph from the Wilmington National Weather Service Station. This figure contains a summary of wind speed and direction for the years 1948 to 1978, and are considered to be representative of current wind conditions in the region (NOAA 1992). According to the National Climatic Data Center (NCDC), wind data do not vary significantly from year to year, therefore making frequent (i.e., annual) revisions neither practical nor necessary. Consequently, a more recent wind graph is not available.

2.9 Local Meteorology

Local meteorological data were obtained from weather stations in the near vicinity of the Newfield plant (NOAA 1991). Data from the Glassboro (approximately 12 miles northwest of the plant), Hammonton-2 (approximately 14 miles northeast of the plant), and Mays Landing (approximately 16 miles southeast of the plant) stations were used to determine average local meteorology.

The maximum average temperature, usually occurring in July, is approximately 30°C (86°F), and the minimum average temperature, usually occurring in January, is approximately -5°C (22°F). The average annual temperature is approximately 12°C (54°F).

Monthly precipitation normals are generally consistent throughout the year. The driest month, typically February, has a normal rainfall of approximately three inches. The wettest month, typically July, has a normal rainfall of approximately four inches. Annual average rainfall is approximately 44 inches.

Meteorological data were also acquired between November 1990 and February 1991 as part of the Remedial Investigation of the Newfield plant. An on-site meteorological station was installed to provide wind direction, wind speed, and precipitation data. Table 3 contains a summary of the data acquired during this period. Appendix A contains a listing of harmonic average wind speeds, arithmetic average wind speeds, and frequencies of stability classes applicable to the plant (EPA 1988).

2.10 Regional Ecology

The dominant features in the vicinity of the Shieldalloy plant are the Delaware River and the Delaware Bay. A continuum of open water, through a fringe of brackish tidal marsh of varying width, to upland fields, is the normal pattern along the shores. A thin sandy strand line separates the river and marsh in many places. The marsh area reaches several miles inland, and features numerous interconnecting tidal creeks, which in some cases extend well into the uplands. Salt marsh plants grow at the mouths of these creeks. However, these plants are gradually replaced upstream by less salt-tolerant species until, 13 to 14 kilometers inland, freshwater vegetation dominates the shoreline marshes (PSE&G 1982).

The composition of vegetation in the marsh and the upper creeks depends to some degree on the amount of spring rain. Wet springs result in lower salinity in the marsh during germination and seedling development, allowing more typically freshwater species to invade (PSE&G 1982).

Fifty-six families and 199 species of vegetation have been observed in the vicinity of the site. Of the 199 species, 134 occur in ecotones such as beaches, creek banks, dikes and roadsides (PSE&G 1982). Sixty-three of these plant species are characteristic of disturbed areas and early successional stages. The common families are Compositae, Polygonaceae, Fabaceae, Gramineae and Cyperaceae.

Vegetation near the site consists of three major habitat types. These are tidal marsh, upland fields, and woodlands. Upland fields near the site are used for cultivation. Crops, predominantly corn and soybeans, are usually rotated. Uncultivated fields contain many plant species, with panic grass, soft rush, velvet grass, marsh fleabane, foxtail grass, thoroughwort, and Kentucky bluegrass being dominant. Some areas become flooded by winter and spring rains, and become temporary wet meadows and potholes. Soft rush, marsh purslane, and spike-rush are common in these wet areas (PSE&G 1982).

Four forest habitat types have been identified in the vicinity, based on elevation and drainage. Wet lowlands feature shrubs and small trees along stream banks. This type is characterized by red maple, sweet gum, and black willow. Well-drained, mid-elevation forests comprise the same percent area as wet lowlands. White oak, red oak and red hickory are the dominant species. Well-drained, mid-elevation forests occur in relatively small scattered woodlots, which are the most common type in New Jersey. Dry forests of high elevation comprise only a small portion of the area (PSE&G 1982).

Nine species of salamanders and 11 species of frogs and toads have been recorded in the vicinity of the Shieldalloy plant. All except the southern leopard frog are restricted to freshwater areas or moist woodland inland of the marshes. Common species include red-backed salamander, northern two-lined salamander, Fowler's toad, northern cricket frog, northern spring peeper, eastern gray tree frog, chorus frog, bullfrog, green frog, and pickerel frog (PSE&G 1982).

There are 26 species of reptiles, 13 turtles, one lizard, and 12 snakes in the area. Eight were recorded from tidal marsh. Four of these, the snapping turtle, northern diamondback terrapin, eastern mud turtle, and northern water snake, inhabit the brackish portion. Other reptiles common to the area include spotted turtle, eastern box turtle, eastern painted turtle, red-bellied turtle, and eastern garter snake. Sea turtles, classified as endangered or threatened, are found occasionally in the Delaware Bay. These include the Atlantic green turtle, Atlantic Ridley, Atlantic loggerhead, Atlantic leatherback, and Atlantic hawksbill (PSE&G 1982).

There are 178 water, shore, marsh, and upland bird species in the area. Thirty-three of these species are considered to be game birds, including four upland birds, 25 water fowl, and four marsh birds. Upland game birds include the resident ring-necked pheasant, bobwhite, the migratory mourning dove, and American woodcock. Seasonal migratory waterfowl dominate the local game bird population, which includes the Canada goose, mallard, black duck, and the green-winged teal. Community composition and relative abundance of the bird population vary greatly by season, and are largely a function of migration patterns (PSE&G 1982).

A total of 45 mammal species can be expected in the general region of the plant. The small mammal population includes the house mouse, meadow vole, masked shrew, marsh rice rat, white-footed mouse, short-tailed shrew, and meadow jumping mouse. White-tailed deer, eastern cottontail rabbit, and eastern gray squirrel are the most commonly pursued game species. The opossum, New England cottontail rabbit, raccoon, red fox, gray fox, and woodchuck are also taken. Fur-bearing species commercially-trapped throughout the area include muskrat, striped skunk, raccoon, opossum, long-tailed weasel, and mink. The river otter is legally trapped only in Delaware, and the red fox only in New Jersey (PSE&G 1982).

Ten bat species have been noted in the general region of the plant. All are found infrequently in wooded areas or in buildings, with the hoary bat and the evening bat being predominant. Five additional species, the little brown myotis, eastern pipistrel, big brown bat, red bat, and seminole bat probably occur only during the warmer months, and migrate elsewhere for the winter (PSE&G 1982).

Marine mammals, such as the hooded seal, harbor seal, harp seal, and gray seal, reach the southern limits of their range in the Delaware Bay region, and are found infrequently along the ocean coast of New Jersey. Porpoises and whales have been recorded in the Atlantic Ocean and Delaware Bay. Two pilot whales, or common blackfish, beached at Delaware City in 1976 (PSE&G 1982).

2.11 Local Ecology

In the counties immediately surrounding the Newfield plant (e.g., Gloucester, Salem and Cumberland), there are 24 species that have been identified as either endangered or threatened. These include 18 species of birds, two species of reptiles, three species of amphibians, and one species of fish. Seventeen of the species are known to or are likely to breed within the surrounding counties.

3.0 FACILITY DESCRIPTION

3.1 External Appearance

The Shieldalloy plant area is surrounded by a seven-foot tall chain link fence, topped with barbed wire. There are 19 buildings on the property, and their construction is either steel frame or concrete block. The plant is divided into four functional areas, as shown in Figure 3. These are:

- Manufacturing Area -- This area contains a number of operations facilities, offices, and loading docks. For the most part, the area is covered with buildings, and asphalt or concrete pavement. Included are the Underground Storage Tank Area, the Railroad Siding Area, Department 111 (ferrocolumbium operation), Department 107 (induction melting), Department 102 (aluminothermic reduction operation), and the Chromium Button Storage Area.

- Storage Yard -- This area is located on the eastern portion of the property, and is used to store materials generated during manufacturing operations.

- Lagoon Area -- This area consists of nine lagoons located in the central portion of the property.

- Undeveloped Plant Property -- This area is located along the southern plant property boundary, and includes all undeveloped and unused areas of the plant.

Building construction at the plant occurred as manufacturing operations expanded and new products were manufactured. A chronological listing of the various structures built at the plant since 1955 is shown in Table 4.

3.2 Work Force Description

Metallurgical operations at the Newfield plant began in 1955. Shieldalloy has been the operator of the plant since that time.

Currently, there are approximately 210 employees at the Newfield facility. The workforce is relatively stable, with the total number averaging 250 over the last 10 years. The following is the current breakdown of the various positions:

- 20 Management personnel
- 50 Administrative personnel
- 120 Operations personnel
- 10 Laboratory/Analytical personnel
- 10 Maintenance personnel

3.3 Process Description

At the Newfield plant, Shieldalloy manufactures or has manufactured additives for specialty steels and super alloys; primarily, these are aluminum master alloys, metal carbides, powdered metals, and optical surfacing products. Raw materials currently used include pyrochlore, containing oxides of columbium, oxides of vanadium, aluminum metal, titanium metal, strontium metal, zirconium metal, vanadium, and fluoride (titanium and boron) salts. Other materials used as part of the routine operations include kerosene, cutting oil, caustic soda, sulfur dioxide, sulfuric acid, unleaded gasoline, diesel fuel, lubrication oil, helium, hydrogen, nitrogen, ammonia, oxygen, argon, carbon dioxide, liquid argon, and acetylene. Table 5 contains a listing of products, processes, and waste materials for the site.

In Department 111 (D111), certain metal alloys are produced which require the use of the materials regulated by the USNRC as "source material". These alloys are produced from pyrochlore by conventional electrolytical or aluminothermic smelting techniques.

The pyrochlore used as feed for the process is received and transferred to processing facilities D102 and/or D111, or temporarily stored in Warehouse D203(A) before being transferred to processing facilities D102 and/or D111. Pyrochlore exists in the solid phase and is received in a powdered form, which is packaged in woven polypropylene bags, referred to as "supersacks". Pyrochlore is used for production of three products, ferrocolumbium standard, ferrocolumbium high ratio, and columbium nickel technical grade. The following is a brief description of the manufacturing process.

A total "charge" of approximately 19,000 pounds of material is transferred to a zirconium-lined shell in the furnace and packed around the electrodes. Each charge consists of approximately 3,900 pounds of dolomite, 9900 pounds of pyrochlore,[6] 800 pounds of lime, 1150 pounds of steel, 200 pounds of remelt, and 2950 pounds of aluminum. The reaction begins when power is applied to the electrodes. During the reaction, dust is generated, which rises and is swept into the air cleaning duct. After completion of the reaction, which is approximately one hour in duration, the power is shut off and the electrodes are raised. The furnace is tilted and the slag and the metal mixture are poured into a three-pot cascade. (The slag floats on top of the metal in the first pot of the series, with the excess slag overflowing into the second and then the third pot.) At the end of the pour, the first pot contains metal with slag on top. The second and third pots contain only slag. After a cooling period, the pots are inverted. The slag and metal in the first pot are separated. The slag from all three pots is transferred, by truck, to the Storage Yard. No additional processing of the slag occurs. Essentially all of the source material remains in the slag and dust.

As many as four production runs may occur during an eight-hour work shift. Typically, production is scheduled between the hours of midnight and 10:00 a.m. in order to take advantage of lower electrical rates.

Figure 4 shows a site map, designating the buildings (departments) of the facility which are designated for storage and/or use of source material. These areas are referred to as "restricted areas", and the property boundaries are the limits of the "controlled area".

3.4 Licensed Radioactive Material Inventory

The licensed radioactive material inventory at the plant consists of the operating inventory of pyrochlore, the slag from the D111 and D102 production departments, and the dust from the

[6] The pyrochlore contains greater than 0.05% of natural uranium in the form of uranium oxide, U_3O_8, and natural thorium in the form of thorium oxide, ThO_2. The columbium pentoxide contains less than 0.05% uranium and thorium.

linings in the smelters do not contain licensable radioactive material, and do not react with the constituents of the smelting process. Spent refractory linings are transferred to the Storage Yard. Table 7 is a summary of all radioactive waste streams generated at Shieldalloy.

In the past, ferrocolumbium slag may have been used on-site as fill material for certain construction projects within the plant site. Possible placement locations include some under the southwest fence line and in the vicinity of the T12 Tank Area. The ambient exposure rates in these areas range from background to just a few microR per hour (IT 1992). Final disposition of these materials will be addressed during decommissioning of the entire site.

3.6 Non-radiological Waste Confinement and Effluent Control

Non-radioactive waste management and effluent control units at the Newfield plant include a groundwater treatment facility, various dust collectors, by-product and industrial/commercial recyclable waste collection and storage areas, and a storm water treatment facility. The storm water facility, D214, was originally constructed to treat waste water from the D102 wet scrubber and D106 chromium complex manufacturing facility, however both of these waste streams have been discontinued. Storm water runoff from D106 and D102, and regenerate wastewater from the ion-exchange units associated with the water treatment facility are now treated in D214. There are nine surface impoundments which were associated with the original design of D214 that are undergoing closure activities as directed by New Jersey Department of Environmental Protection (NJDEP).

Department 216, the groundwater treatment facility extracts groundwater that was contaminated during past operations, processes it to remove chromium contamination, and then discharges it pursuant to Shieldalloy's New Jersey Discharge Pollution Elimination System Permit No. NJ0004103 into the Hudson's Branch, a tributary of the Maurice River. A non-hazardous filtercake is generated as a result of this treatment which is then disposed of off-site in a land disposal facility. The effluent from the groundwater facility is monitored in accordance with current permit limitations and 1991 Administrative Consent Order analytical parameters, including chrome (hexavalent and total), dissolved solids, total settleable solids, pH, color, temperature, chemical oxygen demand and biological toxicity.

Shieldalloy produces a variety of non-hazardous by-products, such as slag, dross, and emission control materials. These various by-products are disposed of off-site in an appropriate disposal facility.

3.7 Permits

Shieldalloy has been issued a number of state and Federal permits which cover a wide variety of on-going operations. In July, 1986, the NJDEP issued Air Pollution Control Permit No. 074932 for operation of the dual collection system located in D111. Other air permits issued to Shieldalloy are described in Table 8.

3.8 CERCLA Action

In accordance with the requirements of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), the Newfield plant is being investigated under a New Jersey Department of Environmental Protection Administrative Consent Order (ACO) dated October 5, 1988, which cited the following New Jersey Statutes: Water Pollution Control Act, N.J.A.C. 58:10A-1 et seq., Spill Compensation and Control Act, N.J.A.C. 58:10-12.11 et seq., and Solid Waste Management Act, N.J.A.C. 13:1E-1 et seq.

4.0 ENVIRONMENTAL IMPACTS

Environmental investigations at the Shieldalloy facility have been ongoing since 1972 when the first hydrologic investigation of the site was completed. The following is a representative listing of the historic environmental investigation reports available for the site:

- "Baseline Radiological Risk Assessment for the Hudson's Branch Watershed", IT Corporation, (in press).
- "Assessment of Environmental Radiological Conditions at the Newfield Facility", IT Corporation, April 1, 1992
- "Remedial Investigation Technical Report", TRC, April, 1992.
- "Risk Assessment", TRC, February, 1992 (draft).
- "Final Remedial Investigation Work Plan for Shieldalloy Metallurgical Corporation", TRC, October, 1991.
- "Second Ground Water Sampling Event Work Plan for Shieldalloy Metallurgical Corporation", TRC, April, 1991.
- "Evaluation of Ground Water Pumping Effectiveness for Shieldalloy Metallurgical Corporation", Dan Raviv Associates, Inc., January, 1991.
- "Summary of Geohydrologic Information Collected since January 1988 for Shieldalloy Metallurgical Corporation", Dan Raviv Associates, Inc., April, 1990.
- "Radiological Survey of the Shieldalloy Corporation, Newfield, New Jersey", Oak Ridge Associated Universities, July, 1988.
- "Ground Water Remediation Alternatives for Shieldalloy Corporation", Dan Raviv Associates, Inc., January, 1988.
- "Summary of Water Analyses for Inorganic Parameters for Shieldalloy Corporation", Dan Raviv Associates, Inc., February, 1987.

- "Surface Water Contamination Study for Shieldalloy Corporation", Woodward-Clyde Consultants, March, 1975.
- "Progress Report -- Monitoring Well Program Ground Water Contamination Study", Woodward-Moorhouse & Associates, Inc., July, 1974.
- "Hydrogeologic Investigation of Ground Water Contamination, Interim Report", Roy F. Weston, Inc., February, 1972.

4.1 Radiological Impacts

Slag and baghouse dust contain essentially all of the uranium and thorium present at the Shieldalloy site. They are generated as by-products of an extraction process. The leachability of radioactive constituents from the slag is low. This indicates that leaching caused by infiltrating water is negligible, and no significant groundwater radiological contamination is expected as a result of on-site storage of slag material (Teledyne 1992).

The baghouse dust is collected in the D111 silo. The dust is in a dispersible form when placed initially onto a pile (e.g., lime pile) in the storage yard. However, upon contact with rainwater, an outer crust is formed thus rendering the dust non-dispersible.

Radiological surveys of the Newfield facility were conducted in 1988 and 1991 in order to characterize certain radiological constituents that were present both on the property, and in designated off-site locations (ORAU 1988, IT 1992). The goals of these efforts were to assess whole body exposure rates at the boundary fence of the Shieldalloy facility, and to obtain additional information on the extent and magnitude of radiological impacts of Shieldalloy activities on the environment at specific on-site and off-site locations. Appendix C contains a summary of the findings from this investigation.

Ambient external exposure rates at the Shieldalloy boundary fence are within the limits established by the U. S. Nuclear Regulatory Commission (USNRC) in 10 CFR 20.1302(b).[9] Elevated surface count rates were identified during walkover surveys due south of the D111 baghouse.[10] Also, thorium and uranium concentrations in soil/sediment that are slightly in excess of background were noted outside of the Shieldalloy property boundary in the Hudson's Branch Watershed. The most likely mechanism for transport of these radioactive materials outside of the property boundaries was assumed to be stormwater runoff, rather than movement through the groundwater. The D111 baghouse (during silo-emptying operations) and the lime pile in the storage yard were considered to be possible sources of radioactive materials in the Hudson's Branch.

Prior to evaluating the feasibility of various remedial actions for the radioactive materials contained in the Hudson's Branch, a baseline assessment of their radiological impact was performed (IT 1992b). The results of this assessment indicated that the maximum radiation dose rate to a hypothetical farm family residing in the immediate area of the Hudson's Branch, with uranium and thorium concentrations evenly-distributed throughout, is 14.18 millirem for the first year after deposition. The maximum risk of fatal cancer for this same time period is 1.77×10^{-6}.[11] However, the assumptions used in the baseline radiological risk assessment were extremely conservative, and the true risk will be significantly less than the value reported.

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9 The highest exposure rates were noted in the immediate vicinity of the ferrocolumbium slag piles, but they decrease rapidly with distance, and become indistinguishable from background within about 50 meters of the fence line. Off-site external exposure rates do not exceed USNRC limits.

10 The D111 baghouse contains low-concentration radioactive materials. The baghouse silo is emptied periodically, and its contents are transported by vehicle to the "lime pile", which is located in the southwestern corner of the storage yard.

11 This can be compared to a fatal cancer risk of 4.75×10^{-5} incurred by an average member of the United States population from annual background radiation exposure.

4.2 In-plant Radiation Safety

Shieldalloy management is committed to assuring a safe work environment for all employees, and to protecting facilities, the environment, and members of the general public from the potentially harmful effects of radiation. The basic policy of Shieldalloy regarding radiation exposure and control of radioactive materials is:

- Personnel will not be exposed to ionizing radiation without there being a demonstrable need for the operation that causes the exposure.

- Radiation exposures will be maintained as low as is reasonably achievable (ALARA) in light of economic impacts.

- Radiation exposure limits for personnel and members of the general public, as promulgated by the U. S. Nuclear Regulatory Commission (USNRC) in Title 10, Code of Federal Regulations, Part 20, *Standards for Protection Against Radiation*, will not be exceeded.

- Control measures instituted to maintain radiation exposures ALARA will not increase an individual's risk of harm from other non-radiological hazards.

A Radiation Protection Program Plan was developed to guide generation and implementation of Shieldalloy Standard Operating Procedures for radiation protection (Shieldalloy 1992). Also, release criteria exist for restricted and unrestricted areas as part of the contamination control program. Compliance with these criteria is verified by contamination surveys.

To further confirm that personnel exposures to ionizing radiation are controlled, a film-badge program has been in place since May 1, 1970 for Shieldalloy employees who have unrestricted access to the areas where source material is used. At any given time, the number of monitored employees has ranged from 15 to 40 per quarter. The results of this program indicate that, to date, no employee has exceeded 100 millirem per calendar year.

5.0 ENVIRONMENTAL MONITORING PROGRAM

5.1 Program Description

Shieldalloy maintains an environmental surveillance program in order to identify and minimize releases of radioactive materials. The objectives of this program are as follows:

- Estimate maximum potential radiation doses to the general public in the vicinity of Shieldalloy as a result of plant operation.
- Determine whether the regulatory requirements of 10 CFR 20.1301 (NRC 1991) have been met.
- Establish baseline data to aid in evaluation of decommissioning options.

The program consists of air sampling, surface and groundwater sampling, ambient exposure rate measurements, soil/sediment sampling, or some combination thereof. Measurements are performed on a planned and periodic basis. The following sub-sections describe the monitoring results for the past five years.

5.2 Summary of Groundwater Results

Shieldalloy has conducted groundwater monitoring, as requested by the New Jersey Department of Environmental Protection (NJDEP) and agreed to in the 1988 Administrative Consent Order (ACO), since December 1988. The data collected during this period have consistently demonstrated that Shieldalloy's storage and use of radioactive material has had no influence on the groundwater. The results of analyses of quarterly sampling and radionuclide analyses are comparable to background concentrations (Rieman 1991b, Rieman 1992b, Rieman 1992c, Grogan 1991, Grogan 1991b).

5.3 Summary of Ambient Gamma Radiation Results

Thermoluminescent dosimeters (TLD) have been deployed in 29 locations within the plant area and at 14 stations on the perimeter of the Shieldalloy property since March 24, 1992. The exposure rate at the boundary fence ranges from 0.01 millirem per hour to 0.14 millirem per hour, with an average rate of 0.04 millirem/hour. (The maximum exposure rate is noted in the immediate vicinity of the high-ratio ferrocolumbium slag pile.) These results are consistent with those measured during the 1991 fenceline survey (IT 1992), and are within the limits established by the USNRC in 10 CFR 20.1302(b).

5.4 Summary of Stack Emissions

The maximum possible release of airborne radionuclides from D111 is 0.0003 curies of ^{232}Th per year, and 0.000079 curies of ^{238}U per year (Rieman 1991). This estimate is based upon knowledge of the collection efficiency of the D111 dust collection system, rather than upon measurement data.

6.0 ACCIDENT IMPACT ANALYSIS

The production of specialty alloys at Shieldalloy's Newfield facility involves handling and thermal processing of raw materials, some of which contain low levels of radioactive materials. Potential operational accidents resulting in the release of radioactivity at the site might include spills of raw material, rupture of processing equipment containing source material, and the loss of waste slag from the temporary transport bins and/or from the storage yard. Other operational accidents at the site could result in the release of non-radiological constituents, as occasionally happens at other types of manufacturing facilities where flammable materials are stored and used. The following is a brief discussion of the types of accidents and their likely consequences at the Newfield plant.

6.1 Loss of Control of Radioactive Materials

During handling of the raw materials containing uranium and thorium, rupture of a container (supersack) would result in release of radioactive materials. However, the rupture of one supersack would result in the release of only 1.5 millicuries of radioactive material (uranium and thorium), that would be quickly cleaned up before contamination could spread. Although the major effect of such an incident would be short-term dispersion of the material, the impact is not expected to be great, and no measurable off-site consequence is expected.

As the ores and slag are smelted, the uranium and thorium exist as suspended insoluble compounds. Accidental release of those source materials from the smelting pots might result if a pot wall ruptures. In this circumstance, the contents of the pot would fall on to the dirt floor of D111, where it would immediately solidify. The solidified contents could be remelted or disposed of with the slag. Subsequent cleanup of the interior of the building would not release significant quantities of radioactive particulates to the atmosphere since building exhaust air passes through the D111 air cleaning system.

Transfer of slag from D111 to the Storage Yard could result in spillage of the slag if the transfer truck should accidentally over-turn. Immediate cleanup of the spilled material, which would remain in a solid, non-dispersible form, would mitigate the incident with no release of radioactive constituents off-site.

Loss of slag from the Storage Yard is not credible except during natural disasters (see below). While scavenging of these materials is possible, this is not considered to be a likely scenario considering the sheer bulk and size of the individual masses of slag, and their lack of apparent economic value.

Fires are a common occurrences in man-made structures of all types and locations. In anticipation of the potential for fires, Shieldalloy maintains sprinkler systems within each of the operations and administration buildings at the plant. Furthermore, the ores and slag are refractory materials that are incapable of combustion, and no flammable materials are stored or used in their vicinity. Therefore, dispersion by fire is not considered to be a credible accident scenario.

6.2 Natural Disasters

At plants such as Shieldalloy's Newfield facility, there is the potential for impacts to the environment as a result of possible unpredictable, non-routine natural events. These include lightning-induced fires and/or natural disasters such as floods, tornadic storms, or seismic activity. The following are the types of accidents which might reasonably be expected to negatively impact the environment:

- A tornado destroys the D111 baghouse and disperses radioactive material over a 0.08 km^2 area.[13] The majority of radioactivity is uniformly spread over this area, where it is susceptible to re-suspension. The exposure pathway of interest for this scenario is inhalation.

- A major storm erodes the collected dusts in the lime pile, moving it into the Hudson's Branch. There are multiple exposure pathways of interest for this scenario (e.g., ingestion, inhalation, and direct radiation).

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[13] The closest reported tornado had a path area of 0.08 square kilometers.

Although severe natural disasters could conceivably compromise the protective nature of the plant and its hazardous and radioactive materials storage areas, the geographical location of the plant is not predisposed to frequent occurrences of floods or tornadic storms. Even under the worst of such events, it is not likely that a significant quantity of radioactive materials would be released to the environment. With respect to the baghouse dust, under these circumstances the low-concentration radioactive materials would be in a highly dispersed form. With respect to the materials in the slag pile, their physical form is not conducive to movement.[14] Consequently, population doses as a result of the aforementioned disaster scenarios should be negligible.

6.3 Transportation Accidents

All hazardous and flammable materials are shipped in accordance with U.S. Department of Transportation regulations and any applicable state and local laws. Although collisions and other accidents that could threaten human life may occur, the non-radioactive constituents in shipments to the Newfield plant do not present any unique transportation hazard over and above those handled by other manufacturing facilities using similar chemical reagents. The only radioactive material shipped to the Newfield plant is pyrochlore, packaged in supersacks. If spilled, it can be easily cleaned, and the short-term effect of dust dispersion at an accident site would be smaller than the radiological impact of routine plant operations at the Newfield site.

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[14] This may not be true for the materials contained in the lime pile.

7.0 ALTERNATIVES

Sections 40.45 and 40.32 of Title 10, Code of Federal Regulations state that an application for renewal of a specific license will be approved if, among other things:

- The application is for a purpose authorized by the Atomic Energy Act.
- The applicant is qualified by reason of training and experience to use the source material for the purpose requested in such a manner as to protect health and minimize danger to life or property.
- The applicant's proposed equipment, facilities, and procedures are adequate to protect health and minimize danger to life and property.
- The issuance of the license will not be inimical to the common defense and security or to the health and safety of the public.

If these conditions are met, and either a finding of no significant impact on the environment, or a statement that the impact is acceptable after weighing the environmental, economic, technical, and other benefits against environmental costs, and considering available alternatives, then the action called for is the renewal of the proposed license, with any appropriate conditions to protect the environment.

Shieldalloy is requesting renewal of a source material license pursuant to Title 10 Code of Federal Regulations, Part 40. The alternative responses to this request are:

- Renew the license
- Deny the renewal application

The selection of either alternative is based on a consideration of a number of factors related to protection of health, safety, and the environment.

If the request for renewal of USNRC License No. SMB-743 is denied, Shieldalloy cannot continue to use source material (pyrochlore) in the production of ferrocolumbium alloys. Without the pyrochlore, Shieldalloy would have to cease production of ferrocolumbium alloys. This action would reduce Shieldalloy's annual revenues by approximately 26% of the annual revenue from all products manufactured at the Newfield plant. In addition, 25 to 30 employees, who are currently involved in some fashion or another with ferrocolumbium production, would be terminated from employment.

Shieldalloy is the only major United States supplier of ferrocolumbium, which is a necessary ingredient in steel-making operations. As a result, 100% of existing and projected United States needs would have to be supplied from foreign sources if the request to renew License No. SMB-743 were denied.

8.0 SUMMARY AND CONCLUSIONS

Shieldalloy Metallurgical Corporation operates a production facility for preparation of columbium (niobium) products for use in several segments of the United States industry. The columbium is recovered from ores by use of electrothermic operations. These ores contain small quantities of source material (uranium and thorium), essentially all of which accumulates in the slag and dust which are formed as by-products of the smelting operations. Shieldalloy currently holds an USNRC License (No. SMB-743) for possession of the source material. The facility is located in the State of New Jersey and occupies 60 acres in the Borough of Newfield (Gloucester County).

8.1 Summary Evaluation

The on-going operations involving the licensed materials at the Shieldalloy plant result in no significant impact on the environment. This conclusion is based on the following:

- The environmental monitoring program is comprehensive and is able to detect radiological or chemical releases resulting from the operation.
- The groundwater monitoring program is sufficient to monitor on-going operations and to provide a warning system that will minimize any radiological or chemical impact on groundwater.
- Radiological effluent from the smelting operation is only a small percentage of regulatory limits.
- The direct gamma dose to workers and to members of the general public from the slag piles in the Storage Yard will not vary significantly by the addition of licensed material, since the concentration of source material in the slag remains constant, and the piles are thick enough (greater than one meter) to be considered to be "infinitely thick".
- Uranium and thorium are well-confined in the slag matrix. Short-term leaching caused by infiltrating water is unlikely, and no significant groundwater radiological contamination has occurred or is expected to occur.

- Periodic radiological surveys are performed including annual ambient radiation exposure rate surveys, surveys during and after non-routine incidents at the operations buildings and storage yard, and periodic sampling and analysis of environmental media in the vicinity of the plant. Results to date from these efforts indicate that circumstances that might result in significant human or environmental exposure are not likely.

- While elevated ambient radiation exposure rates exist close to and within the storage yard, access to those areas is controlled to prevent human or environmental exposure of any consequence and to minimize occupational exposure of staff and visitors to the plant. Ambient exposure rates at the perimeter of the property are below regulatory limits.

- The results of contamination surveys within the operational areas of the plant indicate that while alpha-particle-emitting contamination exists on certain floor surfaces, the levels are below those which might result in human or environmental exposures of significance.

- The 1991-1992 remedial investigation (TRC 1992) indicates that soil contamination at the Shieldalloy facility consists primarily of inorganic constituents and is typically limited to near-surface (zero to two feet depth) contamination.

- Shieldalloy maintains records of periodic operational, in-plant radiological conditions, and environmental monitoring for USNRC and NJDEP inspection and review.

A number of natural events, such as tornados, fires, or storms, could result in a negative environmental impact due to the licensed activities at Shieldalloy's Newfield plant. Because the Newfield area is not pre-disposed to natural disasters, and because there are sufficient fire prevention measures in place at the plant, the probability of a significant quantity of radioactive or hazardous materials being released to the environment as a result of these accidents is considered to be low. The probability of accidental release of radiological or hazardous constituents due to transportation accidents are considered to be within acceptable bounds as a result of existing controls.

8.2 Irreversible and Irretrievable Commitments of Resources

Continued performance of licensed activities at the Newfield plant will not result in environmental commitments that cannot be altered or restored at some later time. The only irretrievable resource associated with operations at the Newfield plant is the slag that is generated during ferrocolumbium production. Although this material contains valuable non-radiological constituents (e.g., aluminum), re-cycling is not considered to be feasible due to the presence of radiological constituents.

8.3 Short- and Long-term Impacts

The radiological impact to workers and to members of the surrounding population from materials that may be released off-site due to on-going operations at the Newfield plant are not considered to be significant, and will not increase as operations continue. On-site storage of source material presents no short-term (e.g., prior to facility closure) environmental impact with the exception of indirect actions such as erosion.

Eventual disposition of slag and baghouse dust has not yet been determined, but will be based upon the available technology, the health and safety impacts of viable alternatives, and the economic feasibility of those alternatives. If a conceptual decommissioning methodology of in-situ disposal of these materials is assumed, the potential long-term impacts (e.g., post-closure) may include elevated, yet insignificant, radiation exposure rates, and changes in the contour of the land as compared to that which existed prior to construction of the Newfield plant.

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TABLE 1

POPULATION DENSITY[15]

Municipality	Population - 1990	Land Area (mi^2)	Water Area (mi^2)	Population Density (persons/mi^2 of land area)
Franklin	14,482	55.99	0.43	258.7
Mantua	10,074	15.89	0.01	633.8
Newfield	1,592	1.70	0.00	936.7
Woodbury	10,904	2.08	0.04	5,241.9
Gloucester County	230,082	324.78	12.12	708.4
Pittsgrove Township	8,121	—	—	160
Vineland	54,780	—	—	770

[15] Source: 1990 U. S. Census of Population and Housing, Summary Tape File, Prepared by Gloucester County Planning Department.

TABLE 2

FREQUENCY (%) OF PRECIPITATION EVENTS, DOVER, DELAWARE[16]

Month	Fog	Snow and/or Sleet	Hail	Thunderstorms
January	43.7	4.1	0.4	0.6
February	45.0	3.4	0.2	0.9
March	48.4	2.7	0	3.7
April	44/4	0.3	0.2	8.9
May	49.0	0	0.9	16.6
June	55.3	0	0.4	17.1
July	54.3	0	0.2	19.6
August	66.3	0	0	17.4
September	59.0	0	0	6.8
October	53.8	0	0.2	3.0
November	47.6	0.6	0.2	1.2
December	44.5	2.5	0.2	0.5
ANNUAL	51.2	1.2	0.3	8.2

[16] Reference: USDC 1982.

TABLE 3

SUMMARY OF LOCAL METEOROLOGICAL DATA[17]

Date	Average Wind Speed (mph)	Average Wind Direction (compass degrees)	Mean Temp. (°F)	Minimum Temp. (°F)	Maximum Temp. (°F)	Precip. (in)
11/04/90	1.5	209	58.5	43	74	0
11/11/90	10.8	272	47	43	51	0
11/17/90	8	350	39	31	47	0
11/25/90	6.9	228	55	41	69	0
12/02/90	2.7	231	44	30	58	0
12/09/90	4.8	264	38	28	48	0
12/16/90	8.6	277	46.5	42	51	0
12/23/90	--	--	59.5	54	65	0.55
12/30/90	--	--	50.5	36	65	0.42
01/06/91	1.5	268	40	35	45	0
01/13/91	6.2	286	27.5	18	37	0
01/20/91	3.6	238	46	37	55	0
01/27/91	3.7	208	34.5	25	44	0
02/03/91	3.8	205	46.5	31	62	0

[17] Reference: USDC 1982.

TABLE 4

SUMMARY OF FACILITY DEVELOPMENT HISTORY

Building Number	Approximately Year Constructed	Use	Additions
201	Prior to 1940	Offices	--
D101 (A, B, and C)	1952	Milling, sizing, grinding	1954, 1962, 1967, 1970
D104, D107, D109	1954	Aluminothermic titanium alloy (ferrotitanium) production	1964
D203 (A, B, C, D, E, F, and G)	1956	Warehouses	1957, 1964
D102 (A, B, and C)	1957	Aluminothermic reduction and sample room	1962, 1964
D106	Between 1951 and 1962	Former chrome oxide and chrome metal production	Between 1962-1965, 1965-1974
D204	1962	Shop, office, and storeroom	--
D112/102 (A)	1963	Crushing and packaging	--
D110	1963	Warehouse	--
D111	1964	Ferroalloy production (FeV and FeCb)	1984
D201	Between 1962 and 1965	Lower service building and office	Between 1965-1974
D115	1971	Aluminum Master Alloys	1981
D116 (A and D)	1974	Metal Powder Tablet Production	Between 1974-1979
D117	1979	Former carbide production	1981
D216	1984	Water treatment	--

TABLE 5

LIST OF PRODUCTS, PROCESSES, AND WASTE MATERIALS

Product	Process	Waste Materials
Ferrovanadium	Electric Arc Furnace	Slag, baghouse dust
Ferrocolumbium	Electric Arc Furnace	Slag, baghouse dust
Ferrotitanium	Electric Arc Furnace	Slag, baghouse dust
Ferroboron	Aluminothermic	Slag, baghouse dust
Chromium Nickel	Aluminothermic from wet/dry scrubber	Slag, baghouse dust
Columbium Nickel	Aluminothermic from wet/dry scrubber	Slag, baghouse dust
Ferrocolumbium	Aluminothermic	Slag, baghouse dust
Ferroaluminum	Induction Melting	Dross
Aluminum Base Master Alloys	Induction Melting	Dross, baghouse dust, dry scrubber

TABLE 6

APPROXIMATE SOURCE MATERIAL INVENTORY AS OF OCTOBER, 1991

Location	Volume (m^3)	Apparent Density (kg/m^3)	Total Mass (kg)	Mass of ^{232}Th (kg)	Mass of ^{238}U (kg)
FeCb Slag Pile, Standard	$1.68X10^4$	$2.74X10^3$	$4.61X10^7$	$2.17X10^5$	$2.77X10^4$
FeCb Slag Pile, High Radio	$1.04X10^3$	$3.06X10^3$	$3.19X10^6$	$1.09X10^4$	$9.57X10^2$
Lime Pile	$1.51X10^4$	$8.87X10^2$	$1.34X10^7$	$6.16X10^3$	$6.69X10^2$
Pyrochlore (Active Inventory)	--	--	--	$9.07X10^2$	$7.30X10^1$
TOTAL	--	--	--	$2.35X10^5$	$2.94X10^4$

TABLE 7

RADIOACTIVE WASTE STREAMS GENERATED AT SHIELDALLOY

Definition	Description
Baghouse dusts	Dry solids which may contain licensable quantities of radioactive materials
Baghouse Bags	Combustible dry solids which may be contaminated with licensable quantities of radioactive materials
Pyrochlore supersacks	Combustible dry solids used to contain pyrochlore ores which may be contaminated with licensable quantities of radioactive materials
Ferrocolumbium slag	Dry solids known to contain licensable quantities of radioactive materials
Spent refractory	Dry solids which may contain licensable radioactive materials
Radioactive dry combustible waste	Combustible, dry solids including plastic bags, absorbent paper and protective equipment used to prevent the spread of contamination.

TABLE 8

AIR PERMITS

Plant Stack	Certificate Number	Status	Expiration Date	Equipment Designation
55048-013	006987	Permit	12/18/92	D111 Lime Dust Baghouse
55048-014	004288	Permit	09/13/91*	D111 Lime Storage Silo Vent
55048-016	092769	Permit	01/12/96	D115 Linberg Reverb Melt Furnace
55048-018	096815	Permit	01/03/97	D115 Baghouse Discharge
55048-019	051037	Permit	06/17/96	D115 Spent Lime Silo Vent
55048-029	051362	Permit	12/09/92	D111 Baghouse Silo Filter
55048-031	051363	Permit	03/09/93	D111 Midwest Spout
55048-032	081750	Temporary	01/25/91	D111 Flex-Kleen Baghouse
55048-034	089363	Permit	10/15/94**	D103 Ball Mill Dust Collector
55048-035	089364	Permit	01/13/95	D203 Blending System Dust Collector
55048-037	090647	Permit	05/15/94	D216 Storage Tank T1000
55048-038	090648	Permit	05/15/94	D216 Storage Tank T2700
55048-039	090649	Permit	05/15/94	D216 Storage Tank T2800
55048-040	090928	Permit	12/12/94	D102 Rotoblast Dust Collector

TABLE 8 - Continued

Plant Stack	Certificate Number	Status	Expiration Date	Equipment Designation
55048-041	090929	Permit	09/08/95	D107 Dust Collector
55048-042	092140	Permit	12/07/95	D202 Dust Collector
55048-043	093280	Permit	09/25/95	D118 Briquette Pressing Operation
55048-044	094758	Permit	12/27/96	D112 Sample Room Dust Collector
55048-045	100411	Permit	10/17/92	D117 Ferroaluminum Pilot Plant
55048-046	105819	Temporary	10/17/92	D101 Vacuum
55048-047	105820	Temporary	11/09/92	D116 Dust Collector
55048-048	105821	Temporary	07/10/92	D101 Chrome Plant
--	01904657	Submitted	08/05/92	D118 Pilot Plant
--	01904501	Submitted	01/14/92	D101 Generic Mill
--	01904499	Submitted	01/14/92	D101 Micro Mill Bagger

* Renewal Submitted
** Out of Service

FIGURES

FIGURE 1
SITE LOCATION MAP

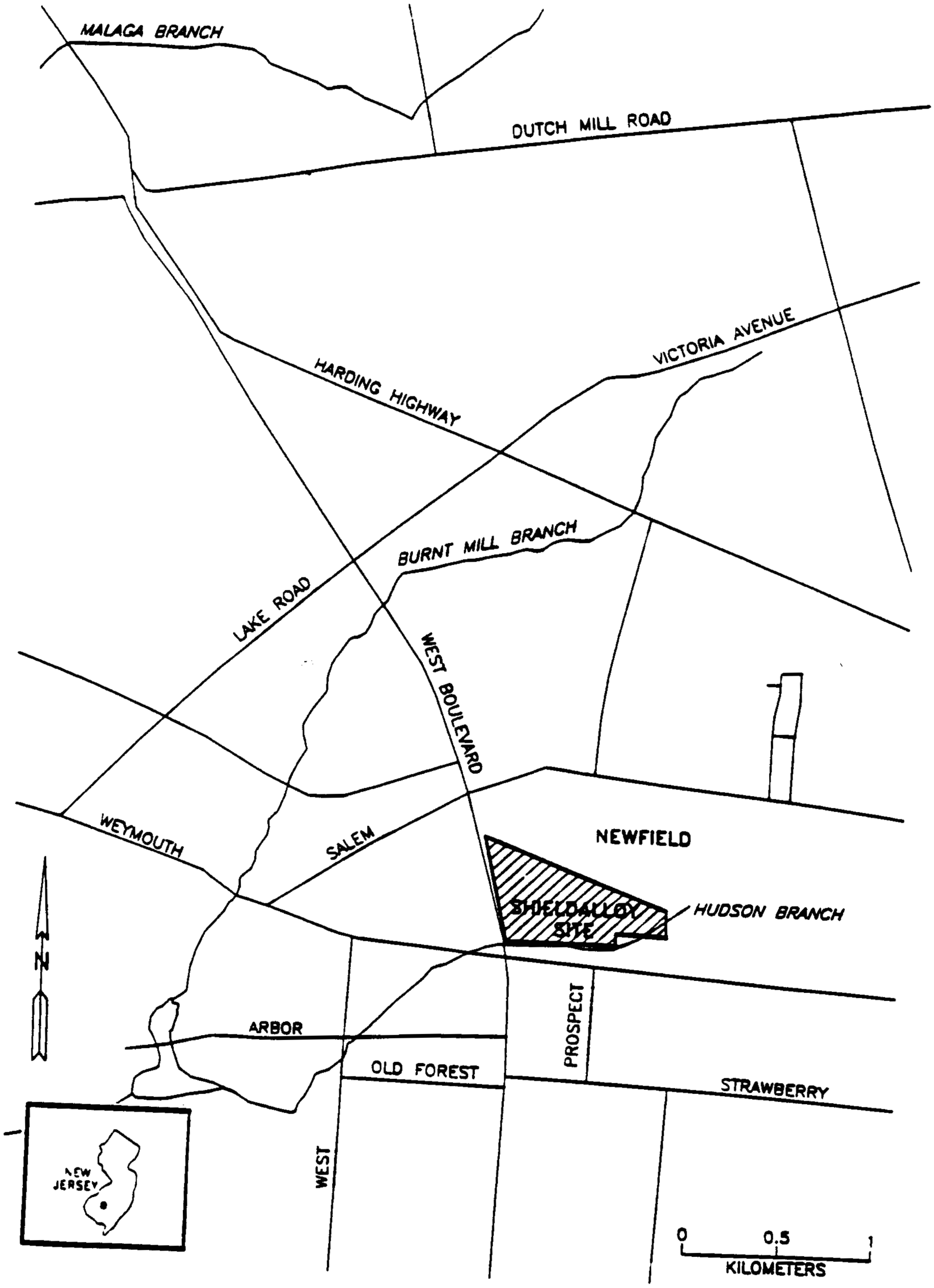


FIGURE 2
REGIONAL WIND GRAPH

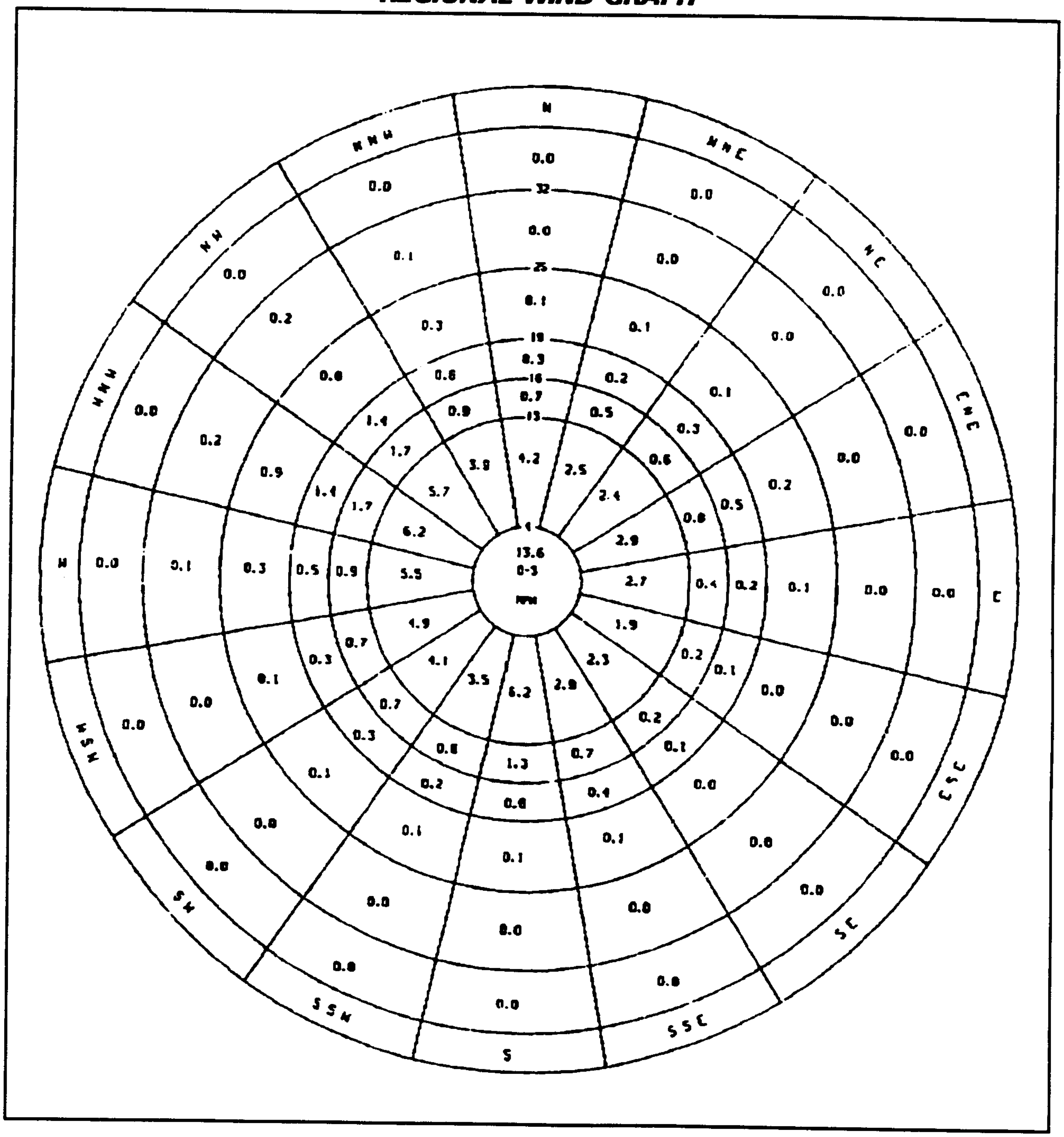


FIGURE 3
LOCATION OF FUNCTIONAL AREAS AT SHIELDALLOY

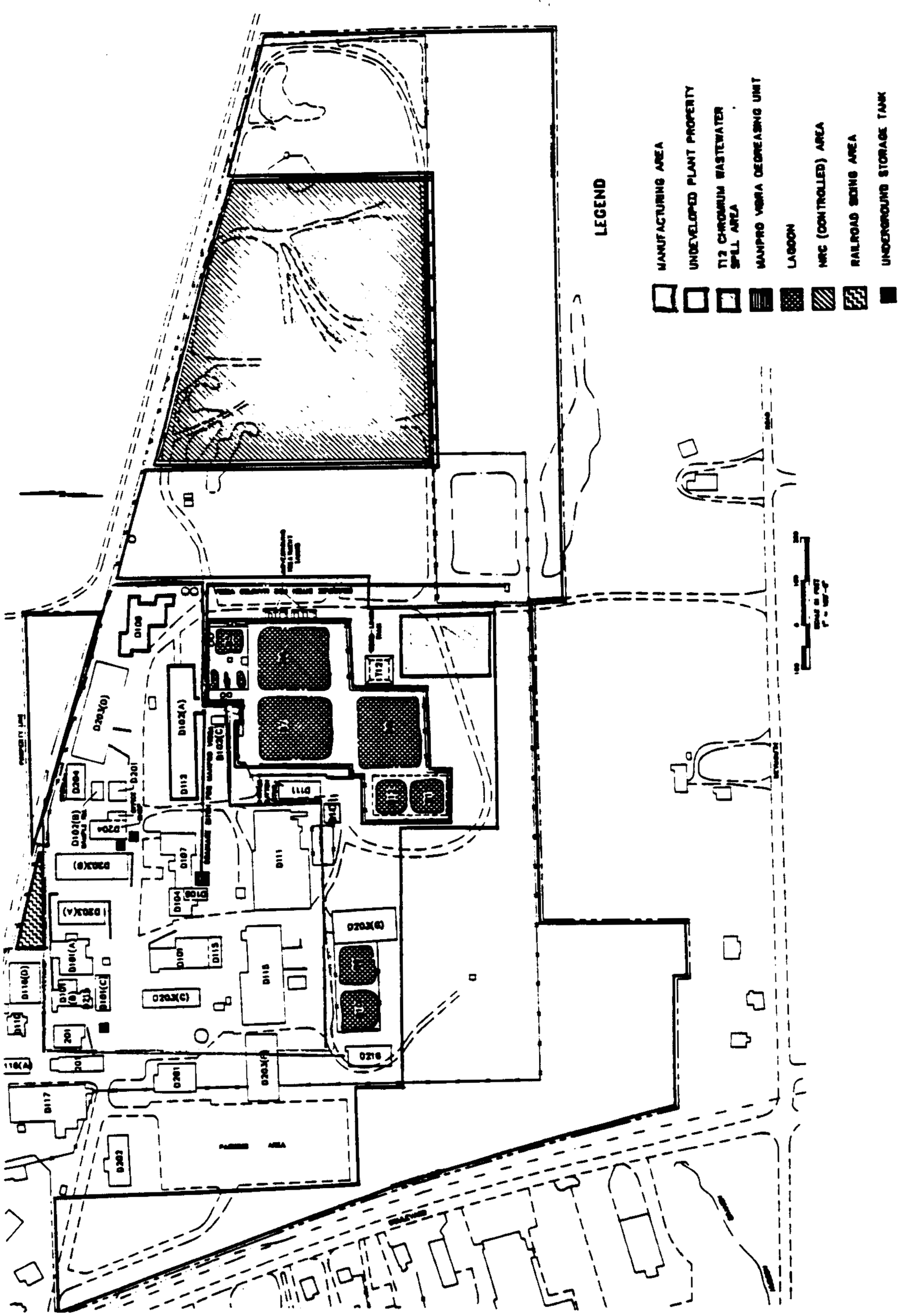


FIGURE 4
SHIELDALLOY PLANT MAP

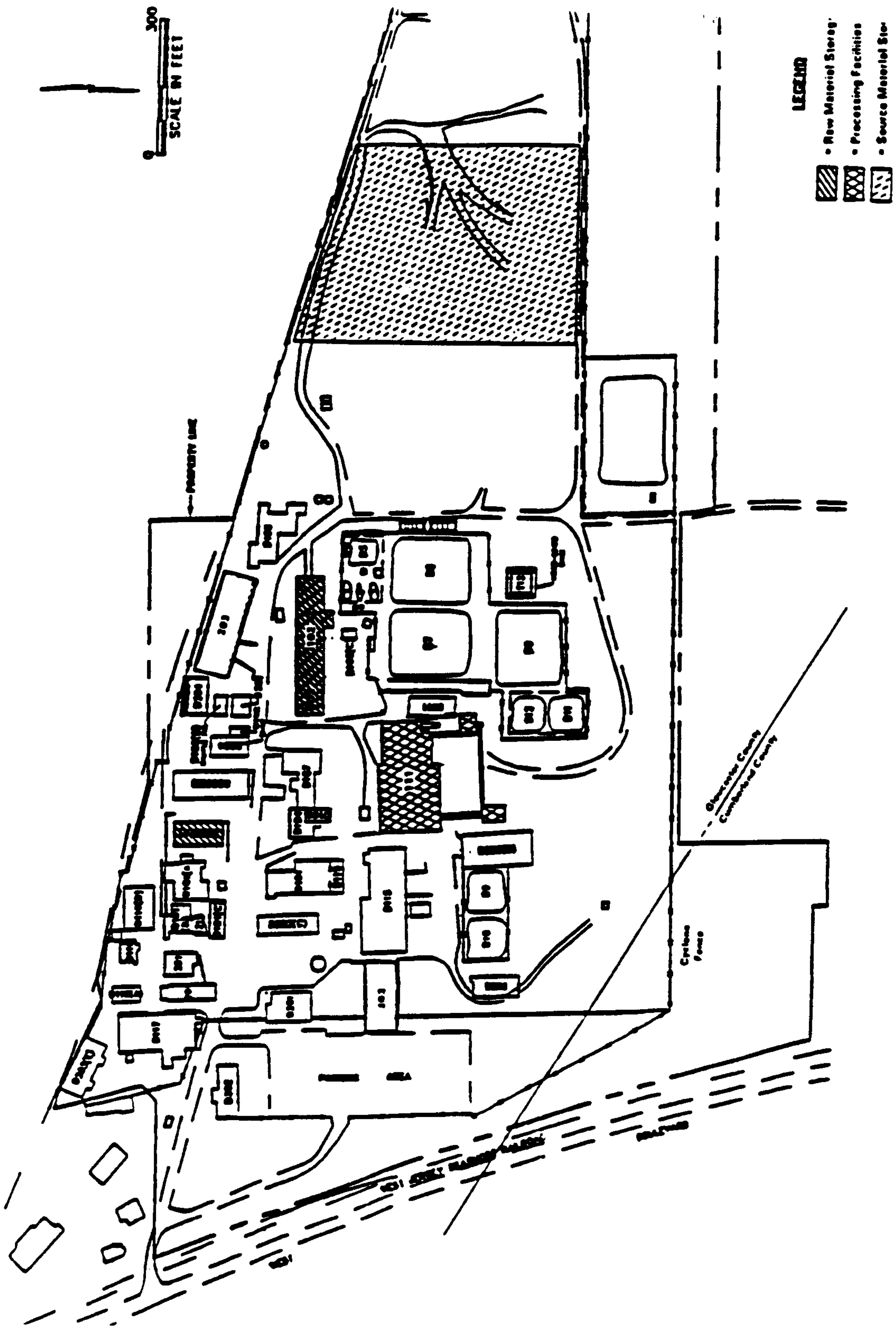
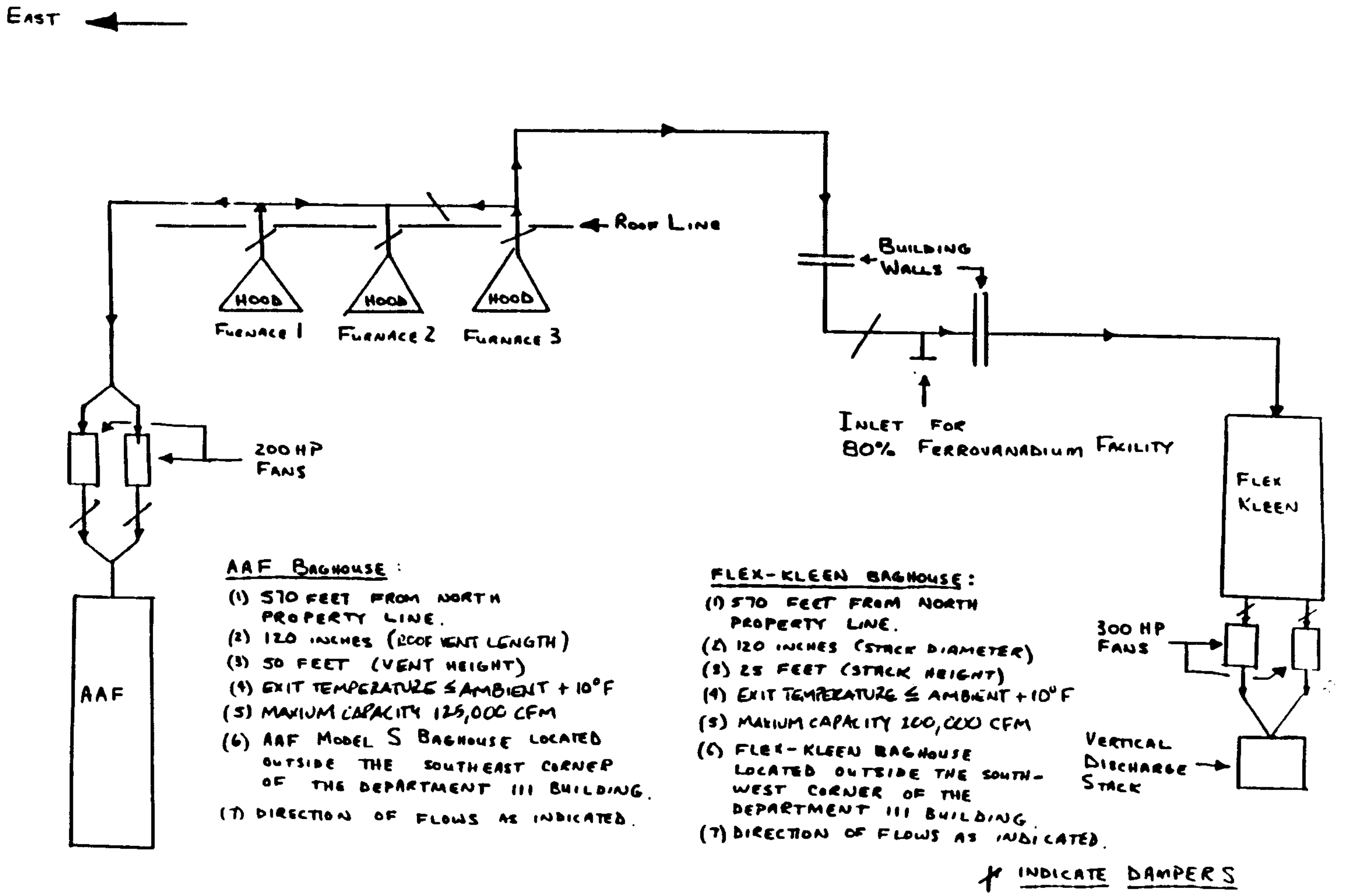


FIGURE 5
DUST COLLECTION SYSTEM



APPENDIX A

CAP88-PC WEATHER DATA FOR THE DELAWARE AIRPORT, 1988

C A P 8 8 - P C

Version 1.00

Clean Air Act Assessment Package - 1988

W E A T H E R   D A T A

Non-Radon Population Assessment
Jul 29, 1992   8:50 am

Facility: Shieldalloy Metallurgical Corporation
Address: West Boulevard
City: Newfield
State: NJ   Zip: 08311

Source Category: USNRC Licensee
Source Type: Stack
Emission Year: 1990

Comments: Test Run

Dataset Name: Shieldalloy
Dataset Date: Jul 29, 1992   8:50 am
Wind File: WNDFILES\ILG1058.WND
Population File: POPFILES\BROOKNLB.POP

HARMONIC AVERAGE WIND SPEEDS (WIND TOWARDS)

	Pasquill Stability Class							
Dir	A	B	C	D	E	F	G	Wind Frequenc
N	1.535	2.214	3.336	4.143	3.210	1.476	0.000	0.077
NNW	1.289	2.309	3.335	3.918	2.965	1.449	0.000	0.034
NW	1.465	2.127	2.436	2.960	2.791	1.422	0.000	0.034
WNW	1.513	1.885	2.668	3.406	2.695	1.351	0.000	0.026
W	1.504	2.124	3.199	3.965	3.029	1.393	0.000	0.035
WSW	1.345	2.104	3.623	4.500	3.287	1.579	0.000	0.050
SW	1.273	2.252	3.195	4.253	3.030	1.456	0.000	0.038
SSW	1.251	1.913	2.911	3.896	3.236	1.458	0.000	0.041
S	1.513	1.990	2.960	3.748	3.228	1.562	0.000	0.059
SSE	1.166	2.057	3.171	4.230	3.298	1.543	0.000	0.058
SE	1.132	2.104	3.495	5.210	3.421	1.538	0.000	0.116
ESE	1.301	1.917	3.412	5.261	3.478	1.537	0.000	0.147
E	1.415	2.043	3.235	4.227	3.490	1.529	0.000	0.080
ENE	1.421	2.154	3.315	3.934	3.315	1.603	0.000	0.075
NE	1.330	2.021	3.428	4.042	3.158	1.510	0.000	0.072
NNE	1.238	1.939	3.020	3.703	2.981	1.477	0.000	0.059

ARITHMETIC AVERAGE WIND SPEEDS (WIND TOWARDS)

	Pasquill Stability Class						
Dir	A	B	C	D	E	F	G
N	2.051	2.975	4.142	5.141	3.441	1.999	0.000
NNW	1.804	3.070	4.084	4.964	3.151	1.974	0.000
NW	1.989	2.851	3.255	3.816	2.915	1.948	0.000
WNW	2.032	2.660	3.348	4.389	2.772	1.874	0.000
W	2.024	2.799	3.915	4.985	3.231	1.919	0.000
WSW	1.868	2.825	4.195	5.594	3.523	2.087	0.000
SW	1.784	2.945	3.850	5.471	3.232	1.980	0.000
SSW	1.758	2.777	3.659	4.951	3.469	1.983	0.000
S	2.032	2.921	3.796	4.914	3.461	2.073	0.000
SSE	1.641	2.891	4.098	5.655	3.534	2.057	0.000
SE	1.590	2.925	4.392	6.655	3.657	2.053	0.000
ESE	1.818	2.767	4.302	6.665	3.711	2.052	0.000
E	1.941	2.988	4.158	5.574	3.722	2.046	0.000
ENE	1.948	2.956	4.082	5.031	3.552	2.105	0.000
NE	1.852	2.856	4.303	5.143	3.383	2.029	0.000
NNE	1.741	2.844	3.854	4.741	3.172	2.000	0.000

FREQUENCIES OF STABILITY CLASSES (WIND TOWARDS)

	Pasquill Stability Class						
Dir	A	B	C	D	E	F	G
N	0.0049	0.0383	0.0949	0.5717	0.1578	0.1324	0.0000
NNW	0.0203	0.0756	0.1507	0.5387	0.1256	0.0891	0.0000
NW	0.0209	0.0932	0.0953	0.4963	0.1544	0.1400	0.0000
WNW	0.0117	0.0642	0.0883	0.5988	0.1369	0.1003	0.0000
W	0.0065	0.0520	0.0739	0.7226	0.0870	0.0580	0.0000
WSW	0.0046	0.0372	0.0824	0.7517	0.0757	0.0484	0.0000
SW	0.0042	0.0443	0.1076	0.6747	0.0943	0.0749	0.0000
SSW	0.0103	0.0408	0.1165	0.5817	0.1388	0.1119	0.0000
S	0.0051	0.0483	0.1135	0.4899	0.1717	0.1714	0.0000
SSE	0.0050	0.0391	0.1223	0.4773	0.1434	0.2129	0.0000
SE	0.0047	0.0295	0.0998	0.5179	0.1487	0.1993	0.0000
ESE	0.0050	0.0397	0.1043	0.4790	0.1601	0.2118	0.0000
E	0.0096	0.0426	0.1097	0.3690	0.1991	0.2700	0.0000
ENE	0.0065	0.0481	0.1568	0.3367	0.2068	0.2451	0.0000
NE	0.0062	0.0457	0.1446	0.4202	0.1789	0.2043	0.0000
NNE	0.0066	0.0427	0.1132	0.4438	0.1638	0.2299	0.0000
TOT	0.0071	0.0445	0.1118	0.5049	0.1544	0.1774	0.0000

ADDITIONAL WEATHER INFORMATION

Average Air Temperature:	10.0 degrees C
	283.2 K
Precipitation:	100.0 cm/y
Lid Height:	1000 meters
Surface Roughness Length:	0.010 meters
Height Of Wind Measurements:	10.0 meters
Average Wind Speed:	4.277 m/s

Vertical Temperature Gradients:

STABILITY E	0.073 k/m
STABILITY F	0.109 k/m
STABILITY G	0.146 k/m

APPENDIX B

SUMMARY OF THE 1992 REMEDIAL INVESTIGATION

Summary of the 1992 Remedial Investigation

Soil samples collected from surface soils, test pits and soil borings at the facility exhibit primarily inorganic compounds. Volatile organic, semi-volatile organic, and PCB compounds were detected, but at levels which do not exceed New Jersey Interim Soil Action Levels. DDT was detected at levels reaching 37 ppm, which exceeds the New Jersey Interim Soil Action Level of 10 ppm. Table B-1 contains a summary of the inorganics that were detected most frequently at levels which exceed the New Jersey Interim Soil Action Levels, however none of these are associated with USNRC-licensed activities.

TABLE B-1

NON-RADIOLOGICAL CONTAMINANTS IN SOIL

Contaminant	Action Level in Soil (ppm)	Maximum Detected Concentration (ppm)	Location
Beryllium	1	60.1	Undeveloped Plant Property, along the observed floodplain of the Hudson Branch. (Other areas include the Lagoon Area, the Railroad Siding Area, and along the eastern and western sides of the Storage Yard.)
Chromium	100	5,870	Southwestern portion of the Undeveloped Plant Property, along the observed floodplain of the Hudson's Branch. (Other areas include the D106 Area, the D102 Area, the Railroad Siding Area and along the eastern and western sides of the Storage Yard.)
Nickel	100	3,360	Southwestern portion of the Undeveloped Plant Property, along the observed floodplain of the Hudson's Branch. (Other areas include the Lagoon Area, the Railroad Siding Area and along the eastern and western sides of the Storage Yard.
Vanadium	100	12,100	Southwestern portion of the Undeveloped Plant Property, along the observed floodplain of the Hudson's Branch. (Other areas include the D106 Area, the Lagoon Area, the Railroad Siding Area, the Tank T12 Area, and along the eastern and western sides of the Storage Yard.)

In addition to these inorganics, several other metals were detected at levels exceeding action levels, although less frequently than those discussed above. These metals and the frequency of detection at concentrations in excess of action levels include antimony (one time), barium (six times), lead (one time), cadmium (one time), and selenium (one time). These metals were identified in the same areas in which other inorganics were found to exceed action levels.

The inorganic concentrations in soil samples were also compared to on-site background concentrations and published ranges (USEPA and USGS) of background concentrations for the United States. While detected inorganic levels generally exceeded on-site background concentrations, most levels were within the published ranges of naturally-occurring metals.

Surface Water Samples collected during the remedial investigation indicated the presence of inorganic contaminants at levels exceeding regulatory action levels. Table B-2 gives summary of results:

TABLE B-2

NON-RADIOLOGICAL CONTAMINANTS IN SURFACE WATER

Contaminant	Regulatory Action Level (ppb)	Maximum Detected Concentration (ppb)
Chromium	50	8,520
Lead	0.75	1,240
Beryllium	5.3	468
Nickel	56	618

The highest levels of inorganics were generally detected at runoff sample locations, with concentrations generally decreasing as a function of distance downstream of the Shieldalloy facility.

Sediment samples collected from the Hudson's Branch during the remedial investigation indicated the presence of volatile organic, semi-volatile organic, and pesticide/PCB compounds, but at levels which do not exceed action levels. Beryllium, total chromium, vanadium, and antimony were detected at levels which do exceed action levels. The maximum concentrations were noted in a sediment sample collected south of the lagoon area on the Shieldalloy property. While the inorganic concentrations in sediment generally decreased with distance down-gradient of the plant, a slight increase was observed in the sample collected at the most down-gradient sampling point.

No semi-volatile organic compounds and no pesticides/PCBs were detected in ground water during the remedial investigation. Trichloroethene (TCE) was the volatile organic compound most commonly detected in ground water samples at levels exceeding the Maximum Contaminant Levels (MCLs). The highest levels of TCE were detected in the general location of the former Manpro-Vibra Degreasing Unit. Lower levels were detected down-gradient to the southwest, extending to the northeast. In the lower Cohansey Sand, maximum concentrations of TCE were detected south of the Lagoon Area and to the southwest, with a "hot spot" detected northeast of the property. During a second sampling phase, the maximum TCE concentrations shifted west, from south of the Lagoon Area to the southwest portion of the Undeveloped Plant Property. The "hot spot" was also confirmed. Other volatile organics that were detected at levels exceeding the MCLs but at a much lower frequency included 1,1-dichloroethene, 1,2-dichloroethene (total), benzene, toluene, and xylene. These were located, primarily, in an area adjacent to an underground storage tank. Methylene chloride and acetone, common laboratory contaminants, were detected in ground water samples as well as laboratory blanks, indicating their presence maybe associated with laboratory contamination.

Total chromium and lead were the inorganics most commonly detected above the MCLs in groundwater during the first round of sampling, with total chromium and antimony being most commonly detected above the MCLs in the second round. The major anion and cation analysis indicated that chromium exists primarily in a trivalent state in the ground water. Although some variability was found, comparison of filtered and unfiltered ground water sample analyses indicated that soluble inorganics are present in the groundwater, with metals concentrations in filtered samples typically at similar concentrations to those detected in unfiltered samples.

Total chromium was detected in the upper Cohansey Sand beneath the Manufacturing Area at concentrations ranging to 20,800 ppb in the first sampling round, with concentrations generally decreasing to the southwest. An elevated concentration was detected in a well located near the pumping wells, southwest of the facility. Lesser concentrations were detected further southwest of the pumping wells. In the second sampling round, total chromium in the upper Cohansey Sand was detected at a maximum level of 7,960 ppb beneath the Manufacturing Area, and the levels did not extend as far to the southwest as they did in the first round.

In the lower Cohansey Sand, total chromium levels ranged to 108,000 ppb, detected at a well location just south of the Lagoon Area. Concentrations decreased to the southwest, generally mirroring the southwestern extent of total chromium in the upper Cohansey Sand. In the second sampling round, maximum concentrations were detected south of the Lagoon Area, and the southwestern extent of total chromium mirrored that identified in the shallow sands.

Hexavalent chromium was located just west of the Lagoon Area and west of the Storage Yard during the first sampling round. The contaminant plume extends to the southwest, but not to the same extent as total chromium. During the second sampling round, detected hexavalent chromium levels decreased in the Storage Yard. Levels down-gradient to the southwest remained relatively constant, with the maximum detected concentration located in the area of extraction wells.

Hexavalent chromium in the lower Cohansey Sand was detected at the highest level (60,900 ppb) in the southwestern portion of the Undeveloped Plant Property, with concentrations extending to the southwest and increasing slightly to the northeast. The southwest extent of the plume generally agrees with the extent of the total chromium plume determined during first round sampling. In the second round, the maximum level (69,000) was detected south of the Lagoon Area, extending west and southwest. The extent of hexavalent chromium mirrors the extent of total chromium measured during the same sampling round.

Lead was detected in groundwater, with the highest level noted in an up-gradient location. Other lesser concentrations were noted in the northwestern portion of the facility, near the locations of the Railroad Siding Area and Underground Storage Tanks. MCLs were also exceeded within the lower Cohansey Sand, with concentrations generally decreasing to the southwest for both the lower and upper sands.

Antimony was detected in ground water, with maximum levels detected south of the Lagoon Area. Other inorganics detected at levels in excess of the MCL include arsenic, beryllium, cadmium, mercury, nickel, and selenium.

Analytical data from a monitoring well located down-gradient from an inactive underground storage tank which previously held unleaded gasoline indicated that a discharge of fuel products had occurred. Shieldalloy notified NJDEP of the discharge and has submitted Closure Plans for the tanks.

During the air sampling portion of the remedial investigation, titanium was the only metal species detected at a concentration exceeding federal Acceptable Ambient Levels (AALs), and it was detected at only one sample location in only two of the twelve sampling events. A review of the meteorological and chemical concentration data indicates variability in contaminant levels, which would be expected given the various meteorological conditions under which the monitoring occurred, as well as a relative consistency between the areas in which the highest particulate concentrations were detected and potential up-gradient source areas, depending on the wind conditions on a particular day. Based on the air monitoring results, it is likely that particulate sources are not collocated and that particulate source locations are variable based on on-going site operations, especially material storage activities within the Storage Yard.

APPENDIX C

SUMMARY OF THE 1991 RADIOLOGICAL SITE CHARACTERIZATION

Summary of the 1991 Radiological Site Characterization

Shieldalloy performed an assessment of environmental radiological conditions at its site in Newfield, New Jersey. For this assessment, the following two specific tasks were performed:

- Determine the whole body exposure rate at the boundary fence of the plant.
- Obtain additional information on the potential for soil and sediment contamination at on-site locations, off-site portions of the Hudson's Branch watershed, and on South Haul Road.

The maximum whole body exposure rate at the property fence line was found to be 0.13 millirem per hour, or 22 millirem in seven consecutive days. That measurement was made on the north fence line in close proximity to the slag piles.

Elevated surface count rates were identified in the following locations: (1) Far eastern property boundary, (2) Base of Building T12, (3) southwestern corner of the property along the boundary fence, and (4) on South Haul Road. Elevated surface count rates were also noted due south of the Department 111 bag house. The Department 111 bag house contains low-concentration radioactive materials. The bag house silo is emptied periodically, and its contents are transported by open vehicle to the "lime pile", which is located in the southwestern corner of the storage yard. Fugitive emissions from this transfer operation may be the source of the elevated surface soil count rates identified in this area.

The concentrations of thorium and uranium noted in off-site soil and sediment samples collected and analyzed as part of this assessment do not contribute significantly to the ambient background exposure rate. The maximum concentrations of thorium-232 and uranium-238 noted in surface soils and sediments were from samples collected within the Shieldalloy property boundaries.

Thorium and uranium concentrations in soil/sediment that are slightly in excess of background do exist outside of the Shieldalloy property boundaries. The most likely mechanism for transport of uranium and thorium outside of the property boundaries is thought to be by storm water runoff, rather than by movement through the groundwater, based upon the following:

- Elevated concentrations of uranium and thorium were found in on-site surface drainage pathways

- The radioanalytical results from routine groundwater sampling (1988 to present) do not differ significantly from background.

- Samples of surface water collected shortly after a storm event contained elevated concentrations of thorium and uranium.