

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

RCRA Corrective Action Environmental Indicator (EI) RCRIS Code (CA725) Current Human Exposures Under Control

Facility Name: FMC Corporation

Facility Address: Route 47, North Delsea Drive, Malaga, New Jersey 08328

Facility EPA ID#: NJD009448432

Definition of Environmental Indicators (for the RCRA Corrective Action)

Environmental Indicators (EIs) are measures being used by the Resource Conservation and Recovery Act (RCRA) Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved) to track changes in the quality of the environment. The two EIs developed to date indicate the quality of the environment in relation to current human exposures to contamination and the migration of contaminated groundwater. An EI for non-human (ecological) receptors is intended to be developed in the future.

Definition of “Current Human Exposures Under Control” EI

A positive “Current Human Exposures Under Control” EI determination (“YE” status code) indicates that there are no unacceptable human exposures to “contamination” (i.e., contaminants in concentrations in excess of appropriate risk-based levels) that can be reasonably expected under current land- and groundwater-use conditions (for all contamination subject to RCRA corrective action at or from the identified facility [i.e., site-wide]).

Relationship of EI to Final Remedies

While final remedies remain the long-term objectives of the RCRA Corrective Action program, the EIs are near-term objectives, which are currently being used as program measures for the Government Performance and Results Act of 1993 (GPRA). The “Current Human Exposures Under Control” EI is for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and does not consider potential future land- or groundwater-use conditions or ecological receptors. The RCRA Corrective Action program’s overall mission to protect human health and the environment requires that final remedies address these issues (i.e., potential future human exposure scenarios, future land and groundwater uses, and ecological receptors).

Duration / Applicability of EI Determinations

EI determination status codes should remain in the Resource Conservation and Recovery Act Information (RCRAInfo) national database ONLY as long as they remain true (i.e., RCRAInfo status codes must be changed when the regulatory authorities become aware of contrary information).

Facility Information

The FMC Corporation (FMC) site is situated on approximately 2.75 acres of land along North Delsea Drive (State Highway Route 47) in Malaga, Franklin Township, Gloucester County, New Jersey. Current land uses in the area are commercial and residential. The facility is bordered by a service station and self-storage warehouse to the northeast, an unoccupied restaurant to the southeast, a Conrail railroad line and the former Grasso property to the southwest, and the Malaga Villa Apartments and a small shopping center (including a laundromat) to the northwest.

Between 1963 and 1986, this site was used for manufacturing, packaging, and storing agricultural chemicals and products, including insecticides, pesticides, and herbicides. Since 1986, the FMC site has been used solely as a warehouse and distribution point for dry and aqueous agricultural products (fertilizers, herbicides, insecticides, and pesticides) manufactured at other FMC plants around the country. A portion of the on-site warehousing is also leased to United Agri Products, Inc., for distribution and storage of similar agricultural products. In 1996, FMC purchased the former Grasso property southwest of the main plant site to allow access for monitoring of impacted groundwater migrating from on-site contaminant source areas.

In addition to the warehouses, the former facility layout included several aboveground storage tanks, a concrete truck off-loading area, and a reinforced concrete tank without secondary containment. This concrete tank was used until August 1982 for storage and evaporation of floor washwaters, drum rinsate, and pesticide residuals from process operations; consequently, it was classified as an interim status RCRA hazardous waste treatment unit. FMC implemented closure activities for the tank in 1986, following New Jersey Department of Environmental Protection (NJDEP) approval of the RCRA Closure Plan. The results of a 1986 site assessment required under New Jersey's Environmental Cleanup Responsibility Act (ECRA) indicated that residual pesticide contamination remained in soil at the former tank area. As a result, FMC prepared a Supplemental RCRA Closure Plan proposing additional remedial action for this area, which was approved by NJDEP and implemented by FMC in 1987. NJDEP approved closure of the RCRA unit in 1988.

Additional environmental investigations were conducted to assess other impacted areas at the site under both RCRA and ECRA, which was replaced by New Jersey's Industrial Site Recovery Act (ISRA) in 1993. In addition to groundwater, eight areas of environmental concern (AECs) were identified with impacts to surface soil, subsurface soil, and/or sediment. FMC and NJDEP signed a Memorandum of Agreement (MOA) in May 1995 requiring remediation of impacted soil and groundwater. As documented in the NJDEP-approved April 1999 Soils Remedial Action Report, pesticide-contaminated soil from the FMC site was excavated and disposed off site. An area of pesticide-contaminated soil was also removed from the adjacent Malaga Villa Apartments property, as documented in the NJDEP-approved Off-Site Remedial Action Report dated May 2003.

A semi-annual groundwater monitoring program has been implemented at the site to monitor the extent and changing concentration of contaminants beneath the FMC site and the former Grasso property. Because drinking water for the surrounding area is provided by private wells, several rounds of tap water sampling were also conducted. As outlined in the April 2004 Monitored Natural Attenuation Work Plan, FMC believes that all remaining groundwater contamination can be addressed via monitored natural attenuation (MNA). After completing two years of annual sampling and analysis for natural attenuation indicator parameters and evaluating changes in groundwater contaminant concentration trends, FMC plans to submit an MNA evaluation to NJDEP and EPA in mid 2006. FMC also plans to submit documentation for institutional controls for soil (i.e., a deed notice) and groundwater (i.e., classification exception area [CEA]) to NJDEP and EPA in mid 2006.

1. Has **all** available relevant/significant information on known and reasonably suspected releases to soil, groundwater, surface water/sediments, and air, subject to RCRA Corrective Action (e.g., from solid waste management units (SWMUs), regulated units (RUs), and areas of concern (AOCs)), been **considered** in this EI determination?

If yes - check here and continue with #2 below.

If no - re-evaluate existing data, or

If data are not available skip to #6 and enter IN (more information needed) status code

Summary of Solid Waste Management Units (SWMUs) and Areas of Environmental Concern (AECs):

A site assessment conducted by Weston Environmental as part of closure activities in 1986 identified the following AECs at the FMC site:

AEC-1, Soils at Office Septic System
AEC-2, Soils at the Truck Loading Area
AEC-3, Soils at Former Tank Farm
AEC-4, Soils at Closed RCRA Area and NJPDES Investigation
AEC-4A, Soils at Former Railroad Siding
AEC-5/5A, Soils near the Former Liquids Formulation Building
AEC-6, Sediment within the Stormwater Retention Basin
AEC-7, Soils at the Central Parking Area
AEC-8, Soils between Warehouses

See Figure 2-1 from the Remedial Action Selection Report (Ref. 5) for the locations of the AECs and surrounding properties. As shown on this figure, a portion of AEC 4A extends outside of the facility property line towards the Conrail tracks. Information on the RCRA-regulated tank is provided below, along with a discussion of on- and off-site soil impacts associated with the AECs, a brief description of off-site soil impacts at the Malaga Villa Apartments, and information on site-wide groundwater.

RCRA-Regulated Tank

The only RCRA-regulated unit identified at the FMC site was a 1,600 gallon, six-inch reinforced concrete tank used until August 1982 for storage and evaporation of floor washwaters, drum rinsate, and pesticide residuals from process operations (Ref. 1). This unit was not equipped with secondary containment and is believed to be the predominant source of pesticide contamination in groundwater beneath the site. FMC submitted a RCRA Closure Plan for the tank to NJDEP in September 1984, and NJDEP approved it in December 1985 (Ref. 1). In accordance with the approved plan, FMC removed the concrete tank/wastewater tank and approximately 575 cubic yards of associated soil in 1986. An ECRA site assessment conducted in 1986 indicated that elevated pesticide concentrations remained in soil at the former tank. Based on these results, FMC proposed a Supplemental RCRA Closure Plan for the former tank area, which was approved by NJDEP and implemented by FMC in 1987 (Ref. 5). Additional soil excavations were conducted, and the area was stabilized via capping with asphalt. Following collection of a final set of soil and groundwater samples from the excavation in July 1988, the excavation was backfilled with clean soil and capped with asphalt with approval from NJDEP (Ref. 2).

Soil Impacts at the AECs

Based on a preliminary exposure assessment and receptor analysis in the Remedial Action Selection Report (Ref. 5), FMC determined that further evaluation and remedial alternative assessment was required for the following AECs: 2, 3, 4, 4A, 5/5A, 7, and 8. The analysis concluded that isolated areas of soil at these AECs containing constituents of concern above New Jersey Non Residential Direct Contact Soil Cleanup Criteria (NJ NRDCSCC) would require active remediation to minimize potential exposures to potential receptors, and to protect groundwater quality beneath and downgradient of the site. Accordingly, FMC implemented a soil excavation program in 1997 at the following areas: AEC 3; AEC 4; AEC 5/5A; and 19 satellite excavation areas spread across the remaining AECs that required remedial action, including some off-site areas associated with AEC 4A. Approximately 1,365 cubic yards of pesticide-impacted soil were excavated from these areas and sent for off-site treatment/disposal at an appropriately regulated RCRA facility. The excavated areas were backfilled and revegetated, and permanent fencing was reinstalled around the active portion of the facility as an engineering control. Confirmation samples collected from the various excavations indicated that, while the majority of soil exceeding NJ NRDCSCC had been removed, residual contaminant concentrations in certain areas remained above NJ NRDCSCC. In the Soils Remedial Action Report (Ref. 7), FMC proposed to delineate soil to New Jersey Residential Direct Contact Soil Cleanup Criteria (NJ RDCSCC) either through the use of concentration gradients or additional sampling and analysis. No further action for soil was proposed beyond delineation to NJ RDCSCC and submittal of a deed notice (Ref. 7). NJDEP approved the Soils Remedial Action Report without exception on June 15, 2001 (Ref. 9).

While further excavation and engineering controls are planned for these discrete areas with residual soil contamination (Ref. 14), the soil excavation activities were successful in removing the source of pesticide contamination that has historically impacted site groundwater (Ref. 7). FMC is currently preparing deed notice documentation, which will limit use of the property to nonresidential purposes, to address residual contamination remaining above the unrestricted NJ RDCSCC. FMC anticipates submitting this documentation to NJDEP and EPA in mid 2006 (Ref. 13).

Soil Impacts at the Malaga Villa Apartments

In the early 1990s, an area of pesticide-impacted soil was identified at the Malaga Villa Apartments and shopping center (Ref. 4). FMC proposed to remediate this area of soil contamination to residential, unrestricted use standards (Ref. 3). In November 1997, pesticide-contaminated soil located immediately adjacent to the southwest side of the septic system for Building 100 of the Malaga Villa Apartment property was excavated to NJ RDCSCC and removed from the property (Ref. 8).

A limited Phase II soil and groundwater investigation was independently conducted at the Malaga Villa Apartments in 1998 as part of a change in property ownership. Residual traces of pesticides were reported in surface soil above the applicable NJ RDCSCC. Additional delineation sampling was completed in May 1999. FMC excavated the impacted soils for off-site disposal in late 2002. Post-excavation soil sampling indicated that cleanup goals had been achieved (i.e., residual pesticide concentrations were below relevant NJ RDCSCC), and the area was backfilled to original grade with clean soil (Ref. 10). NJDEP approved this action with no further requests on August 12, 2003 (Ref. 11).

Groundwater Impacts

Geology at the FMC site is relatively simple and characteristic of the Atlantic Coastal Plain (Ref. 2). The site is directly underlain by the Cohansey Sand Formation, which is approximately 95 feet thick in this area. This formation consists of an upper sandy unit approximately 25 to 30 feet thick, separated from a second sandy unit by a clay unit approximately 1.5 to 5 feet thick. Groundwater occurs in both sand units, with the water table first encountered at a depth between 2 and 10 feet below ground surface. Flow

in the upper sandy unit is generally toward the southwest, but two areas of localized groundwater mounding have been observed southeast and northwest of the site due to the presence of a stormwater retention basin and Laundromat leachfield in those areas, respectively. Flow in the second sand unit is also southwesterly, with no evidence of mounding. The reported permeability of the clay unit separating the sand layers is between 1.88×10^{-8} to 7.8×10^{-8} centimeters per second (cm/sec). While this layer limits groundwater flow, downward hydraulic gradients have been observed between the two units. According to FMC documentation, it is likely that this gradient is transient and the result of active spring recharge to the upper sand unit at the time of measurement (Ref. 2).

Low levels of pesticides, presumably associated with known soil impact areas (as discussed above), have been reported in groundwater beneath the FMC site. Organochlorine pesticides (OCPs) are the most frequently detected constituents of concern (COCs) in on-site groundwater. Pesticides historically detected above their respective New Jersey Ground Water Quality Criteria (NJ GWQC) for Class IIA groundwaters include: chlordane, lindane, alpha-BHC, endosulfans, dieldrin, aldrin, endrin, 4,4'-DDD, 4,4'-DDT, and 4,4'-DDE (Ref. 6). Based on the results of several Hydropunch investigations (Ref. 5), FMC determined that the area of impacted groundwater extended from the northwestern corner of the FMC property (near well MW-4), downgradient to the southwest for a distance of approximately 500 feet, crossing the original FMC property line and migrating beneath the former Grasso property (which is now owned by FMC). Using clean sidegradient Hydropunch results, FMC estimated the maximum plume width to be approximately 250 to 300 feet. A semi-annual groundwater monitoring program has been implemented at the site to monitor the extent and changing concentration of contaminants in groundwater beneath the FMC site and the former Grasso property. FMC believes that all remaining groundwater contamination can be addressed via MNA (Ref. 12). A final decision on this proposal will be made in mid-2006, after completing two years of annual sampling and analysis for natural attenuation indicator parameters, and after evaluating changes in groundwater contaminant concentration trends.

References:

1. Site Inspection Report for FMC Corporation. Prepared by NUS Corporation. Dated March 8, 1990.
2. Results of ECRA Investigations and Remedial Cleanup Plan for the FMC Corporation Malaga Site. Prepared by Roy F. Weston, Inc. Dated July 1992.
3. Letter from Barbara Ritchie, FMC, to Lois Arbegast, NJDEP, re: FMC Corporation Draft Partial Clean Up Plan and Sampling Plan Approval. Dated February 2, 1993.
4. Letter from Douglas Stuart, NJDEP, to Barbara Ritchie, FMC, re: Response to Draft Partial Cleanup Plan Approval dated February 2, 1993. Dated June 23, 1993.
5. Remedial Action Selection Report for FMC Corporation. Prepared by Blasland, Bouck & Lee, Inc. (BBL). Dated November 1995.
6. Groundwater Quality Monitoring Program Plan. Prepared by BBL. Dated July 1998.
7. Soils Remedial Action Report for FMC Corporation. Prepared by BBL. Dated April 1999.
8. Updated Phase II Environmental Assessment for Malaga Villa Apartments, Volume I of III. Prepared by EcolSciences, Inc. Dated June 2, 1999.
9. Letter from Paul Harvey, NJDEP, to Brian McGinnis, FMC, re: Soils Remedial Action Report. Dated June 15, 2001.
10. Off-site Remedial Action Report for FMC Corporation. Prepared by BBL. Dated May 2003.
11. Letter from Paul Harvey, NJDEP, to John Tang, FMC, re: Off-site Remedial Action Report. Dated August 12, 2003.
12. Letter from John Tang, FMC, to Paul Harvey, FMC, re: Monitored Natural Attenuation Plan. Dated April 16, 2004.
13. Letter from Shawn Tollin, BBL, to Andrew Park, EPA, re: Response to April 24, 2006 Booz Allen Hamilton Memorandum to USEPA. Dated May 25, 2006.
14. Personal communication between Shawn Tollin, BBL; Andrew Park, EPA; and Amy Brezin, Booz Allen Hamilton, June 1, 2006.

2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be “**contaminated**”¹ above appropriately protective risk-based levels (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria) from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

Media	Yes	No	?	Rationale/Key Contaminants
Groundwater	X			Dieldrin, endrin, heptachlor epoxide
Air (indoors) ²		X		
Surface Soil (e.g., <2 ft)	X			Dieldrin, gamma-chlordane, heptachlor
Surface Water		X		
Sediment		X		
Subsurface Soil (e.g., >2 ft)	X			Aldrin, alpha-chlordane, DDD, DDT, dieldrin, endrin, ethion, ethyl parathion, gamma-BHC, gamma-chlordane, heptachlor
Air (Outdoor)		X		

___ If no (for all media) - skip to #6, and enter YE, status code after providing or citing appropriate levels, and referencing sufficient supporting documentation demonstrating that these levels are not exceeded.

X If yes (for any media) - continue after identifying key contaminants in each contaminated medium, citing appropriate levels (or provide an explanation for the determination that the medium could pose an unacceptable risk), and referencing supporting documentation.

___ If unknown (for any media) - skip to #6 and enter IN status code.

Rationale :

Groundwater

Historical Groundwater Quality

Groundwater beneath and downgradient of the FMC site was evaluated as part of several investigations. The ECRA investigation conducted in 1992 included analysis of on-site groundwater samples for pesticides, PCBs, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), and priority pollutant metals. Constituents reported above then-current NJ GWQC included a variety of OCPs, benzene, and several metals. The latter constituents were reported above screening criteria in

¹ “Contamination” and “contaminated” describe media containing contaminants (in any form, NAPL and/or dissolved, vapors, or solids, that are subject to RCRA) in concentrations in excess of appropriately protective risk-based “levels” (for the media, that identify risks within the acceptable risk range).

² Recent evidence (from the Colorado Department of Public Health and Environment, and others) suggest that unacceptable indoor air concentrations are more common in structures above groundwater with volatile contaminants than previously believed. This is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration necessary to be reasonably certain that indoor air (in structures located above (and adjacent to) groundwater with volatile contaminants) does not present unacceptable risks.

upgradient well MW-8. Because this well is located immediately downgradient of an off-site gasoline service station, FMC suggested that these exceedances were associated with an off-site contaminant source and regional background groundwater quality (Ref. 3).

On-site monitoring wells and the on-site production well were sampled quarterly in 1994 for VOCs, SVOCs, metals, and pesticides. Constituents detected above the NJ GWQC during this monitoring period included benzene, methylene chloride, bis(2-ethylhexyl)phthalate, pentachlorophenol, and a variety of metals and OCPs. By the fourth quarter of 1994, concentrations of benzene and methylene chloride were approaching or had reached nondetectable levels. In addition, detected concentrations of bis(2-ethylhexyl)phthalate and pentachlorophenol were at or below their respective NJ GWQCs by the fourth quarter of 1994. For this reason, these constituents were eliminated as COCs for groundwater at FMC and will not be considered further in this EI determination. Metals detected during the 1994 investigation showed the greatest concentrations and number of NJ GWQC exceedances in upgradient, on-site well MW-8. Because it is unlikely that these concentrations are site-related, metals (with the exception of lead) were also eliminated as groundwater COCs and will not be further addressed in this EI determination. Pesticides, however, were retained for ongoing monitoring.

Groundwater Monitoring

The most recent available groundwater quality data for FMC were obtained during the tenth semi-annual groundwater monitoring round conducted in November 2005 (Ref. 8). During this round, groundwater samples were collected from nine shallow and four deep monitoring wells beneath the FMC site and the former Grasso property. During this monitoring event, a total of 11 NJ GWQC exceedances were reported for three OCPs. The maximum contaminant levels for these OCPs are presented in Table 1.

Table 1: Maximum Concentrations Exceeding NJ GWQC in November 2005

Contaminant	NJ GWQC (µg/L)	Maximum Detected Concentration (µg/L)	Well
Dieldrin	0.03	3.4	MW-1
Endrin	2	3.2	MW-4A
Heptachlor epoxide	0.2	1	MW-2

Source: Ref. 8.

The highest levels of OCP contamination were reported in the shallow aquifer on the western side of the site, extending to well MW-10 on the former Grasso property. No exceedances were reported in the deep aquifer or in downgradient sentinel wells MW-9, MW-11, and MW-11D.

Groundwater samples have also been analyzed for lead during the various semi-annual monitoring rounds. Lead was not reported above its NJ GWQC of 5 µg/L in any well, on site or off site, during the November 2005 monitoring round. In fact, since initiation of the groundwater monitoring program, lead has been reported above its NJ GWQC only once (at wells MW-2D and MW-4AD during the May 2004 sampling round). Based on the overall lack of NJ GWQC exceedances, lead will not be considered further in this EI determination.

Off-site Potable Well Sampling

In addition to sampling from monitoring wells, water quality from potable wells in the area has also been evaluated. Two off-site drinking water wells, at the Malaga Villa Apartments Laundromat and at the residence above Mr. C's Bar, were repeatedly sampled in January 1994. No contamination was reported above method detection limits (Ref. 2). Furthermore, it was determined that these wells are actually

located hydraulically upgradient or side-gradient of the FMC site, and that their capture zones are insufficient to draw impacted groundwater from the FMC site (Ref. 2). Supplemental tap water sampling conducted at the Laundromat in 1998 and 1999 confirmed that no pesticide contamination was present in off-site drinking water (Ref. 6). In addition, domestic potable wells located in a small residential area southwest of the former Grasso property were sampled in June 1993, even though these residents were situated approximately 1,000 feet downgradient of the area of impacted groundwater. Potable wells from the four residences sampled in this area showed no detectable concentrations of site-related constituents of concern (Ref. 3).

Air (Indoors)

To evaluate the potential for contaminants to migrate to indoor air at the FMC site, the maximum concentrations of volatile COCs detected in the most recent shallow groundwater sampling event would typically be compared to the State of Connecticut Proposed Revisions to the Groundwater Volatilization Criteria for the Industrial/Commercial Scenario (CT I/C GWVC) (March 2003). However, the three OCPs of concern in groundwater at this site (i.e., dieldrin, endrin, and heptachlor epoxide) are not considered significantly volatile to be of concern for indoor air, and no CT I/C GWVC exist for these contaminants. Consequently, indoor air quality will not be considered further in this EI determination.

Surface/Subsurface Soil

As stated in the response to Question 1, the majority of soil exceeding NJ NRDCSCC on site and off site has been removed (Refs. 4, 5, and 6). Table 2 below presents maximum contaminant levels in surface and subsurface soil confirmation samples collected on site and off site after the 1997 soil remedial action; only those contaminants reported above applicable standards are included. Surface soil is considered between 0 and 2 feet below ground surface (bgs), while subsurface soil is considered more than 2 feet bgs. Analytical results for on-site soil were compared to NJ NRDCSCC because the facility is active. By contrast, analytical results for off-site soil, and the narrow stretch of AEC 4A soil that is within the FMC property boundary but outside the fence surrounding the active portion of the facility, were compared to NJ RDCSCC because these areas are not restricted to industrial workers. See Figure 1 from Ref. 11 for a site map showing the facility property boundary and fence line.

On-site exceedances were reported after the large scale excavations at AECs 3, 4, and 5/5A, as well as isolated excavation of hot spots at AECs 2, 4A, and 7. Off-site exceedances are associated with excavation areas 15 and 16 at AEC 4A, and excavation area 9 at AEC 4. Each of these areas and AECs is shown on Figure 4-1 from the Soils Remedial Action Report, dated April 1999 (Ref. 4).

It should be noted that, although some subsurface soil samples also reported NJ NRDCSCC exceedances (as shown below), these samples were collected at the groundwater interface and, in some cases, after removal of a visible sheen. Consequently, the listed subsurface soil sample results may not be representative of actual soil conditions.

Table 2: Maximum Soil Contaminant Concentrations After the 1997 Remedial Action (µg/kg)

Contaminant	RDCSCC	NRDCSCC	Maximum Conc.	Location
ON-SITE SOIL EXCEEDANCES				
<i>Surface Soil</i>				
Dieldrin	42	180	2,300	AEC 2
Gamma-Chlordane	490	4,400	7,000	AEC 2
Heptachlor	150	650	3,400	AEC 2
<i>Subsurface Soil *</i>				
Aldrin	40	170	310,000	AEC 4
DDD	3,000	12,000	77,000	AEC 4
DDT	200	9,000	78,000	AEC 4
Dieldrin	42	180	180,000	AEC 4
Gamma-BHC	490	4,400	66,000	AEC 4
Gamma-Chlordane	490	4,400	99,000	AEC 4
Heptachlor	150	650	200,000	AEC 4
OFF-SITE SOIL EXCEEDANCES				
<i>Surface Soil</i>				
Dieldrin	42	180	340	AEC 4A
<i>Subsurface Soil *</i>				
Gamma-Chlordane	490	4,400	5,100	AEC 4

Source: Ref. 4.

* Samples collected at groundwater interface; absorbent pad used to remove sheen prior to sampling. Result may not be representative of actual soil conditions.

Subsequent to the remedial action, FMC delineated remaining contamination in surface soil to NJ NRDCSCC on site and NJ RDCSCC outside the facility fence line (Refs. 10 and 11). Maximum contaminant concentrations reported during delineation sampling in 2001, 2003, and 2005 were provided on Figure 2 from Reference 11, and are presented in Table 3 below. The maximum concentration for each AEC investigated is shown, and only those concentrations exceeding applicable direct contact standards are included.

Table 3: Maximum Surface Soil Contaminant Concentrations in Delineation Sampling Effort (µg/kg)

Contaminant	RDCSCC	NRDCSCC	Maximum Conc.	Location
Dieldrin	42	180	20,000	AEC 2
			1,300	AEC 4A
			7,600	AEC 5
			4,500	AEC 7
Gamma-Chlordane	490	NE	2,800	AEC 2

Source: Ref. 11.

NE: Criteria not exceeded.

FMC currently proposes to: 1) excavate a small amount of soil outside the fence to remove all NJ RDCSCC exceedances, 2) place engineering controls to eliminate on-site worker exposure to contaminated surface soil above NJ NRDCSCC inside the fence boundary, and 3) complete deed notice documentation to limit use of the property to nonresidential purposes (Refs. 9 and 10). FMC anticipates that these activities will be completed in late summer or early fall of 2006 (Ref. 10). Nevertheless, because these actions have not yet been implemented, surface and subsurface soil contamination will be carried forward for further consideration in this EI determination.

Surface Water/Sediment

No surface water bodies are present on the FMC property, and no areas are currently identified as sediment. As shown on Figure 1 from Groundwater Monitoring Report No. 10 (Ref. 8), the original FMC facility is situated approximately 300 feet northwest of the Malaga Branch Creek. The Malaga Branch Creek also flows along the southeastern boundary of the former Grasso property, which is now owned by FMC.

Surface water and sediment adjacent to the facility could be impacted by contamination entrained in storm water runoff, or by groundwater discharges into surface water. Because the majority of significantly impacted soil has been removed from the site, and because excavation areas on site have been backfilled and revegetated or capped with asphalt (Refs. 1 and 4), it is unlikely that significant quantities of contaminated soil would be picked up by storm water running across the property. It is also unlikely that the concentrations of contamination entrained in storm water would remain significant as the flow progresses from source areas on the original FMC property, across the wooded former Grasso property, and into the Malaga Branch Creek.

Shallow groundwater contours shown on the figure indicate that groundwater flows to the southwest from the original FMC facility and beneath the northeast corner of the former Grasso property. Due to its sidegradient location to the original FMC facility, impacted groundwater in this area is not expected to discharge to surface water. Although groundwater may discharge into the Malaga Branch Creek at the southwestern corner of the former Grasso property, site-related groundwater contamination has not yet, and is not expected to, reach the creek at this location before dropping to nondetectable levels.

Because neither of the possible migration pathways appears complete at this time, neither surface water or sediment will be considered further in this EI determination.

Air (Outdoors)

Migration of dust-borne contaminants is expected to be minimal at this site because soil impact areas have been excavated, backfilled, and either revegetated or covered by an asphalt cap (Refs. 1 and 4). Other areas are covered by building structures or gravel (Ref. 10). In addition, migration of contamination from groundwater to outdoor air is not expected to be of concern because, as stated above, the three OCPs reported in groundwater are not highly volatile and are only present in limited and declining concentrations. Thus, ambient air is not expected to be a significant exposure pathway of concern at the FMC site. This assessment is supported by ambient air sampling conducted at the facility fence line during excavation activities in 1997. The results of this sampling effort indicated no detectable pesticide concentrations (Ref. 4).

References:

1. Results of ECRA Investigations and Remedial Cleanup Plan for the FMC Corporation Malaga Site. Prepared by Roy F. Weston, Inc. Dated July 1992.
2. Letter from Joseph Tomalavage, Roy F. Weston, Inc., to Joseph Goliszewski, NJDEP, re: FMC Corporation Malaga Site Off-site Drinking Water Wells. Dated February 1, 1994.
3. Remedial Action Selection Report for FMC Corporation. Prepared by BBL. Dated November 1995.
4. Soils Remedial Action Report for FMC Corporation. Prepared by BBL. Dated April 1999.
5. Updated Phase II Environmental Assessment for Malaga Villa Apartments, Volume I of III. Prepared by EcolSciences, Inc. Dated June 2, 1999.

6. Off-site Remedial Action Report for FMC Corporation. Prepared by BBL. Dated May 2003.
7. Letter from Paul Harvey, NJDEP, to John Tang, FMC, re: Off-site Remedial Action Report. Dated August 12, 2003.
8. Letter from James Bodamer, FMC, to Paul Harvey, NJDEP, re: Groundwater Monitoring Report No. 10. Dated May 4, 2006.
9. Letter from Shawn Tollin, BBL, to Andrew Park, EPA, re: Response to April 24, 2006 Booz Allen Hamilton Memorandum to USEPA. Dated May 25, 2006.
10. Personal communication between Shawn Tollin, BBL; Andrew Park, EPA; and Amy Brezin, Booz Allen Hamilton, June 1, 2006.
11. Email from Andrew Park, EPA, to Amy Brezin, Booz Allen Hamilton, re: FMC Malaga Requested Information. Dated June 9, 2006.

3. Are there **complete pathways** between “contamination” and human receptors such that exposures can be reasonably expected under the current (land- and groundwater-use) conditions?

Summary Exposure Pathway Evaluation Table
*Potential **Human Receptors** (Under Current Conditions)*

“Contaminated” Media	Residents	Workers	Day-Care	Construction	Trespasser	Recreation	Food ³
Groundwater	No	No	No	Yes	–	–	No
Air (indoor)							
Surface Soil (e.g. < 2 ft)	No	Yes	–	Yes	No	No	No
Surface Water							
Sediment							
Subsurface Soil (e.g., > 2 ft)	–	–	–	Yes	–	–	–
Air (outdoors)							

Instruction for Summary Exposure Pathway Evaluation Table :

1. Strike-out specific Media including Human Receptors’ spaces for Media which are not “contaminated” as identified in #2 above.
2. Enter “yes” or “no” for potential “completeness” under each “Contaminated” Media — Human Receptor combination (Pathway).

Note: In order to focus the evaluation to the most probable combinations some potential “Contaminated” Media - Human Receptor combinations (Pathways) do not have check spaces. These spaces instead have dashes (“--”). While these combinations may not be probable in most situations they may be possible in some settings and should be added as necessary.

___ If no (pathways are not complete for any contaminated media-receptor combination) - skip to #6, and enter “YE” status code, after explaining and/or referencing condition(s) in-place, whether natural or man-made, preventing a complete exposure pathway from each contaminated medium (e.g., use optional Pathway Evaluation Work Sheet to analyze major pathways).

X If yes (pathways are complete for any “Contaminated” Media - Human Receptor combination) - continue after providing supporting explanation.

___ If unknown (for any “Contaminated” Media - Human Receptor combination) - skip to #6 and enter “IN” status code

³ Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish)

Rationale :

Groundwater

Because there is no public water distribution system within several miles of the FMC site, extensive public, industrial, and domestic water supplies are drawn from groundwater (Ref. 1). Thus, the potential for ingestion of groundwater on site and in the surrounding area will be considered for purposes of this EI determination.

A production well drawing from the shallow groundwater was formerly used on site for process water. However, this well has been abandoned and replaced with a well extending into a deeper, unimpacted aquifer to meet the facility's water supply needs (Ref. 3). Furthermore, this well is double-cased to prevent shallow groundwater from entering the well and contaminating the water supply or the deeper aquifer. Finally, prior to obtaining approval from the Gloucester County Health Department for use of the well as a potable water source, FMC was required to perform water quality testing to document that the water was acceptable for consumption (Ref. 3). Based on the depth, construction, and water quality associated with the new production well, ingestion of impacted groundwater is not an exposure pathway of concern for on-site workers.

Groundwater exceedances are present at the highest concentrations the western side of the FMC site and extend downgradient to well MW-10 on the former Grasso property. As stated previously, no detectable OCP contamination has been reported during recent sampling rounds in downgradient sentinel wells MW-9, MW-11, and MW-11D. Furthermore, as discussed in the response to Question 2, samples collected southwest and downgradient of the site at several potable drinking water wells indicated no detectable concentrations of site-related contaminants (Ref. 2). Because impacted groundwater does not currently extend off site (i.e., beyond the original FMC property and the former Grasso property, which is now owned by FMC), and because water quality at downgradient drinking water wells has not been negatively impacted, ingestion of impacted shallow groundwater is not a concern for residents or other off-site receptors who obtain water from shallow groundwater in the site vicinity.

In addition to considering contact with groundwater via ingestion, this EI determination must consider dermal contact with groundwater. As mentioned in response to Question 2, a limited amount of additional soil excavation is planned for the FMC site in late summer or early fall of 2006 (Ref. 6). Given that shallow groundwater is encountered at depths of less than ten feet bgs, direct dermal contact with impacted groundwater is considered a potentially complete exposure pathway for on-site remedial workers (classified as construction workers for purposes of this EI determination).

Surface/Subsurface Soil

On-site Receptors

As presented in the response to Question 2, there are several on-site areas with residual pesticide contamination in surface/subsurface soil above NJ NRDCSCC and NJ RDCSCC. The FMC site is an active industrial facility and still in the corrective action mode, working towards a final remedy. Consequently, a variety of on-site receptors must be considered for potential exposure to impacted surface/subsurface soil, including site workers (e.g., FMC employees), construction workers (e.g., remedial workers or utility workers), and trespassers.

Based on the fact that contamination remains in place in soil above NJ NRDCSCC and remedial activities are ongoing, the potential for direct exposure to impacted surface/subsurface soil is being considered a

potentially complete pathway for on-site construction/remedial workers for purposes of this EI determination. In addition, because surface soil exceedances have been reported in several grass-covered areas (as shown on Figure 2 from Reference 7), surface soil is also being considered a potentially complete pathway for general site workers (e.g., FMC employees). Because both the original FMC property and the adjacent Grasso property (now owned by FMC) are surrounded by fencing with locked gates (Ref. 6), trespasser contact with impacted surface soil on site is not considered a complete pathway for purposes of this EI determination.

Off-site Receptors

As also presented in the response to Question 2, several off-site areas report residual pesticide contamination in surface/subsurface soil above NJ NRDCSCC and NJ RDCSCC.

Surface soil exceedances associated with AEC 4A were reported southwest of the site, between the original FMC property fence line and the active Conrail railroad easement (Ref. 4). As shown in Photo 1 from Reference 5, this off-site area is heavily vegetated and located immediately adjacent to an active rail line. Consequently, it is unlikely that trespassers frequent the area; facility representatives indicate that, indeed, trespassers have never been observed in this area (Ref. 6). It is also unlikely that any trespassers who do enter the area would significantly disturb surface soil. For these reasons, direct contact between trespassers and impacted surface soil in the AEC 4A off-site area is not considered complete for purposes of this EI determination. However, because FMC plans to conduct a small amount of additional excavation in this area to remove soil contamination above NJ RDCSCC, direct contact between construction/remedial workers and contaminated surface soil in this area is considered a potentially complete pathway for purposes of this EI determination.

Off-site subsurface soil exceedances associated with AEC 4 were reported in the bottom sample from excavation 9, west of the FMC fence line on the Malaga Villa Apartments property (Ref. 4). However, as indicated in the response to Question 2, the excavation in which the exceedance was reported (location BPX-9-B1) was advanced to groundwater, and a visible sheen was removed with absorbent pads prior to collection of the subsurface soil sample at the groundwater interface. Consequently, these concentrations are likely more representative of groundwater conditions than subsurface soil conditions. Furthermore, subsurface delineation samples collected in this area following the off-site excavation effort indicated no residual NJ RDCSCC exceedances (Ref. 5), and no additional excavation is planned. As a result, direct contact between construction/remedial workers and subsurface soil in this area is not an exposure pathway of concern for purposes of this EI determination. In addition, because no surface soil exceedances were reported in this location, other potential receptors (i.e., residents, general off-site workers, recreational users, trespassers) can be eliminated for this area.

References:

1. Results of ECRA Investigations and Remedial Cleanup Plan for the FMC Corporation Malaga Site. Prepared by Roy F. Weston, Inc. Dated July 1992.
2. Remedial Action Selection Report for FMC Corporation. Prepared by BBL. Dated November 1995.
3. Letter from Stephen Cox, BBL, to Riche Outlaw, NJDEP, re: Response to NJDEP Comment Letter Dated March 28, 1996 on the Remedial Action Selection Report. Dated September 11, 1996.
4. Soils Remedial Action Report for FMC Corporation. Prepared by BBL. Dated April 1999.
5. Off-site Remedial Action Report for FMC Corporation. Prepared by BBL. Dated May 2003.

6. Personal communication between Shawn Tollin, BBL; Andrew Park, EPA; and Amy Brezin, Booz Allen Hamilton, June 1, 2006.
7. Email from Andrew Park, EPA, to Amy Brezin, Booz Allen Hamilton, re: FMC Malaga Requested Information. Dated June 9, 2006.

4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **significant**⁴ (i.e., potentially “unacceptable”) because exposures can be reasonably expected to be: 1) greater in magnitude (intensity, frequency and/or duration) than assumed in the derivation of the acceptable “levels” (used to identify the “contamination”); or 2) the combination of exposure magnitude (perhaps even though low) and contaminant concentrations (which may be substantially above the acceptable “levels”) could result in greater than acceptable risks?

X If no (exposures cannot be reasonably expected to be significant (i.e., potentially “unacceptable”) for any complete exposure pathway) - skip to #6 and enter “YE” status code after explaining and/or referencing documentation justifying why the exposures (from each of the complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

_____ If yes (exposures could be reasonably expected to be “significant” (i.e., potentially “unacceptable”) for any complete exposure pathway) - continue after providing a description (of each potentially “unacceptable” exposure pathway) and explaining and/or referencing documentation justifying why the exposures (from each of the remaining complete pathways) to “contamination” (identified in #3) are not expected to be “significant.”

_____ If unknown (for any complete pathway) - skip to #6 and enter “IN” status code.

Rationale :

Groundwater

As discussed in response to Question 3, direct contact between contaminated groundwater and on-site remedial workers is being considered a potentially complete exposure pathway at this time. However, any on-site remedial worker exposures to impacted groundwater that may occur at the site are not expected to be significant. Remedial workers are assumed to wear personal protective equipment (PPE) and adhere to strict Occupational Safety and Health Administration (OSHA) guidelines. Thus, direct exposures to on-site contaminated groundwater for remedial workers conducting remedial activities are not expected to pose a significant risk.

Current site tenants also maintain adequate training and controls to protect site workers during construction activities unrelated to corrective action. Specifically, monthly safety meetings are conducted and tailored to site-specific issues, several employees have completed the 24-hour OSHA HAZWOPER training and associated refreshers, and the remaining employees are trained in facility-specific health and safety issues (Ref. 3). Consequently, direct exposures to on-site contaminated groundwater by construction workers not performing corrective actions are not expected to pose a significant risk.

Surface/Subsurface Soil

Direct exposure to impacted on-site and off-site surface/subsurface soil by remedial and/or construction workers is not expected to be significant at the FMC site because, as discussed above, these workers are

⁴ If there is any question on whether the identified exposures are “significant” (i.e., potentially “unacceptable”) consult a Human Health Risk Assessment specialist with appropriate education, training, and experience.

assumed to wear PPE and adhere to strict OSHA and facility-specific training guidelines during relevant operations.

As stated in the response to Question 3, excavation of remaining on-site soil with pesticide concentrations exceeding NJ NRDCSCC is not planned; however, FMC plans to implement engineering controls to effectively minimize potential on-site worker exposure to impacted surface soil (Ref. 2). Furthermore, most on-site areas where surface soil exceedances have been reported are covered by gravel, concrete, and bituminous pavement (Refs. 1 and 3). The small grass-covered area associated with NJ NRDCSCC exceedances in AEC 2 (shown north of Warehouse B and B1 on Photo 5 from Reference 3) appears to be generally unused, but the surrounding paved areas are used for storage of palleted product materials and trailer unloading. Based on these usage patterns, it appears unlikely that workers would spend considerable time in the grassy and gravel-covered areas where NJ NRDCSCC exceedances have been reported or that potential exposures would be significant, given the amount of surface cover present. It also appears unlikely that surface soil in this area would be disturbed to any significant extent. The area of surface soil exceedances in the on-site portion of AEC 4A (shown southwest of Warehouses B and B1 on Photo 2 from Ref. 3) is overgrown with grass, rather than being neatly mowed and manicured. The area is also separated from adjacent on-site areas by a barbed wire fence, and bordered off site by an active railroad line (Ref. 3). Based on these considerations, it appears unlikely that site workers have reason to frequent these areas, and exposure to the AEC 4A impact area is not expected to be significant. A small area of NJ NRDCSCC exceedances is present behind Warehouse C in AEC 5, but is only used for the temporary storage of pallets. This area is covered with gravel and concrete, and FMC estimates that a site worker may spend, at most, two hours per week in the area (Ref. 3); therefore, potential exposures are expected to be minimal. Finally, as shown on Figure 3 and Photo 5 from Reference 3, the grassy area associated with NJ NRDCSCC exceedances at AEC 7 is situated at the far corner of the original FMC property, on the opposite side of the parking area from active facility operations and buildings. Although this area appears to be kept neatly mowed, it is unlikely that general site workers would spend extended periods of time in this area since it is removed from facility operations.

Therefore, given the lack of planned intrusive activities, the minimal amount of accessible or frequently used exposed soil surfaces, and the training and controls currently in place to protect on-site workers, general site worker exposure to contaminated on-site surface soils is not expected to be significant.

References:

1. Soils Remedial Action Report for FMC Corporation. Prepared by BBL. Dated April 1999.
2. Personal communication between Shawn Tollin, BBL; Andrew Park, EPA; and Amy Brezin, Booz Allen Hamilton, June 1, 2006.
3. Email from Andrew Park, EPA, to Amy Brezin, Booz Allen Hamilton, re: FMC Malaga Requested Information. Dated June 9, 2006.

5. Can the “significant” **exposures** (identified in #4) be shown to be within acceptable limits?

_____ If yes (all “significant” exposures have been shown to be within acceptable limits) - continue and enter “YE” after summarizing and referencing documentation justifying why all “significant” exposures to “contamination” are within acceptable limits (e.g., a site-specific Human Health Risk Assessment).

_____ If no (there are current exposures that can be reasonably expected to be “unacceptable”) - continue and enter “NO” status code after providing a description of each potentially “unacceptable” exposure.

_____ If unknown (for any potentially “unacceptable” exposure) - continue and enter “IN” status code.

Rationale :

Not applicable. See the response to Question 4.

6. Check the appropriate RCRIS status codes for the Current Human Exposures Under Control EI event code (CA725), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (and attach appropriate supporting documentation as well as a map of the facility):

YE - Yes, "Current Human Exposures Under Control" has been verified. Based on a review of the information contained in this EI Determination, "Current Human Exposures" are expected to be "Under Control" at the FMC Corporation site, EPA ID# NJD009448432, located at Route 47, North Delsea Drive in Malaga, New Jersey, under current and reasonably expected conditions. This determination will be re-evaluated when the Agency/State becomes aware of significant changes at the facility.

NO - "Current Human Exposures" are NOT "Under Control."

IN - More information is needed to make a determination.

Completed by: _____ Date: _____
Michele Benchouk
Environmental Consultant
Booz Allen Hamilton

Reviewed by: _____ Date: _____
Amy Brezin
Environmental Consultant
Booz Allen Hamilton

Also reviewed by: _____ Date: 7/20/2006
Andrew Park, RPM
RCRA Programs Branch
EPA Region 2

_____ Date: 7/20/2006
Barry Tornick, New Jersey Section Chief
RCRA Programs Branch
EPA Region 2

Approved by: Original signed by: _____ Date: 8/4/2006
Adolph Everett, Chief
RCRA Programs Branch
EPA Region 2

Locations where references may be found:

References reviewed to prepare this EI determination are identified after each response. Reference materials are available at U.S. EPA, Region 2.

Contact telephone numbers and e-mail: Andrew Park
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FINAL NOTE: THE HUMAN EXPOSURES EI IS A QUALITATIVE SCREENING OF EXPOSURES AND THE DETERMINATIONS WITHIN THIS DOCUMENT SHOULD NOT BE USED AS THE SOLE BASIS FOR RESTRICTING THE SCOPE OF MORE DETAILED (E.G., SITE-SPECIFIC) ASSESSMENTS OF RISK.

Attachments

The following attachments have been provided to support this EI determination:

- Attachment 1 - Summary of Media Impacts Table

Attachment 1: Summary of Media Impacts Table

AEC	GW	AIR (Indoors)	SURF SOIL	SURF WATER	SED	SUB SURF SOIL	AIR (Outdoors)	CORRECTIVE ACTION MEASURE	KEY CONTAMINANTS
AEC 2	No	No	Yes	No	No	No	No	Excavation and off-site disposal of contaminated soil Engineering controls planned for remaining area of contaminated surface soil Deed notice planned	Organochlorine pesticides (OCPs)
AEC 4A	No	No	Yes	No	No	Yes	No	Excavation and off-site disposal of contaminated soil Further excavation of remaining area of contaminated surface soil planned Deed notice planned	OCPs
AEC 5/5A	No	No	Yes	No	No	No	No	Excavation and off-site disposal of contaminated soil Engineering controls planned for remaining area of contaminated surface soil Deed notice planned	OCPs
AEC 7	No	No	Yes	No	No	No	No	Excavation and off-site disposal of contaminated soil Engineering controls planned for remaining area of contaminated surface soil Deed notice planned	OCPs
Site-Wide Groundwater	Yes	No	No	No	No	No	No	Semi-annual monitoring of groundwater quality and natural attenuation parameters Classification Exception Area (CEA) planned Monitored natural attenuation program planned	OCPs