

DOCUMENTATION OF ENVIRONMENTAL INDICATOR DETERMINATION

Interim Final 2/5/99

**RCRA Corrective Action  
Environmental Indicator (EI) RCRA Info code (CA725)  
Current Human Exposures Under Control**

**Facility Name:** Modine Manufacturing Company  
**Facility Address:** 179 Sunset Drive, Camdenton, Missouri, 65020  
**Facility EPA ID #:** MOD062439351

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 (SWMU), Regulated Units (RU), and Areas of Concern (AOC)), been **considered** in this EI determination?

  X   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.

Modine entered into a Corrective Action Abatement Order on Consent (Order) with the Department of Natural Resources' Hazardous Waste Program (HWP) in July 1999. A complete review of previous investigations was conducted at that time to identify all areas of potential concern at the facility. A summary of these areas and the corrective action activities up to the date of the Order are included in the Order and in the *Summary Report of Investigative and Remedial Activities Conducted to Achieve Closure of the Interim TSD Facility, Modine Manufacturing Company, Camdenton, Missouri* (Dames & Moore, 1998).

The Modine facility is located on approximately 67 acres in Camdenton, Missouri. The facility manufactures aluminum and copper coils and feeder parts used in the manufacture of heat transfer products. Operations began at the site in 1967 under ownership of Dawson Metal Products. Sundstrand Tubular Products took over operations from 1974 to 1990. Modine is the current owner and has operated the facility since 1990.

Historically, 36 SWMUs and four AOCs have been identified at the subject property (Jacobs Engineering 1992). Wastes generated by facility processes have included chromium precipitate, used lubricating and hydraulic oil, solvent-based paint wastes, treatment sludge, and spent chlorinated solvents.

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**BACKGROUND**

**Definition of Environmental Indicators (for the RCRA Corrective Action)**

Environmental Indicators (EI) are measures being used by the RCRA Corrective Action program to go beyond programmatic activity measures (e.g., reports received and approved, etc.) 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 objective of the RCRA Corrective Action program the EI 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 are for reasonably expected human exposures under current land- and groundwater-use conditions ONLY, and do 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 Determinations status codes should remain in RCRA Info national database ONLY as long as they remain true (i.e., RCRA Info status codes must be changed when the regulatory authorities become aware of contrary information).

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2. Are groundwater, soil, surface water, sediments, or air **media** known or reasonably suspected to be **“contaminated”**<sup>1</sup> above appropriately protective risk-based “levels” (applicable promulgated standards, as well as other appropriate standards, guidelines, guidance, or criteria [e.g., Maximum Contaminant Levels (MCLs), the maximum permissible level of a contaminant in water delivered to any user of a public water system under the Safe Drinking Water Act] from releases subject to RCRA Corrective Action (from SWMUs, RUs or AOCs)?

<b>Media</b>	<b>Yes</b>	<b>No</b>	<b>?</b>	<b>Rationale/Key Contaminants</b>
Groundwater	X			
Air (indoors) <sup>2</sup>	X			
Surface Soil (e.g., <2 ft)		X		<b>See below for all media</b>
Surface Water		X		
Sediment		X		
Subsurf. Soil (e.g., >2 ft)	X			
Air (outdoors)		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.

<sup>1</sup> “Contamination” and “contaminated” describes 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).

<sup>2</sup> Recent evidence (from the Colorado Dept. 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.

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Rationale and Reference(s):

**GROUNDWATER**

Groundwater at and around the facility is contaminated with Trichloroethene (TCE) at concentrations above the maximum contaminant level (MCL) of 5 parts per billion (ppb). The presence of metals was noted in several soil and groundwater samples collected from the former lagoon and surrounding area. It was determined that metals concentrations above detection limits are representative of background and reflect the natural occurrence of metals in soil in central Missouri (SECOR, 2003). No other constituents are present at concentrations above state or federal standards. Concentrations of TCE above the MCL have been detected in groundwater monitoring wells located at and in the off-site vicinity of the facility, a City of Camdenton municipal well (the Mulberry well), and a nearby private well (Burnau Well). Sundstrand is conducting a concurrent investigation of the migration and extent of groundwater contamination from the nearby former (closed) Hulett Lagoon, through a cooperative agreement with Missouri's Superfund program. Due to the proximity of the two sites, there is a high probability of commingling TCE plumes.

TCE was detected above the MCL of 5 ppb in the Mulberry well in 1998. The City of Camdenton has continued sampling the Mulberry well for volatile organic compounds. Monthly sampling of the Mulberry well shows TCE concentrations ranging from 6 ppb to 47.7 ppb. No other constituents have been detected in the Mulberry well. The Mulberry well is located approximately 600 feet east-southeast of Modine and 1000 feet south of the former Hulett Lagoon. The Mulberry well was drilled in 1986 to a depth of about 900 feet below ground surface (bgs) and cased to a depth of about 400 feet bgs. (SECOR, 2002) The Mulberry well was taken off-line by the city in 1998. No other constituents have been detected in the Mulberry well and none of the other city wells have detected VOCs at levels of concern.

A private well is located at the Burnau residence across the street (north) from the Modine facility. This well is a secondary water source, and primary drinking water for the residence comes from the Camdenton public water supply. In 1998, a water sample was collected from the Burnau well from an outside spigot, after the spigot ran for 12 minutes to purge stagnant water from the pressure tank. The samples were analyzed for VOCs and semi-volatile organics. Results for TCE were 210 µg/l and 170 µg/l for the duplicate sample; these levels are above the TCE MCL of 5 µg/l (MDNR 1998). Results for *cis*-1,2-dichloroethene (*cis*-1,2-DCE) were 12 µg/l and 13 µg/l for the duplicate (MDNR 1998); these levels are below the EPA MCL for *cis*-1,2-DCE (70 µg/l).

**INDOOR AIR**

Contaminated groundwater and subsurface soil are suspected to remain below the building foundation. Thus, volatilization of contaminants from groundwater and subsurface soil into indoor air has been identified as a potential pathway of human health concern. An air quality assessment was conducted by CH2M Hill at Modine in March 2003 (CH2M Hill 2003). Air samples were collected from six locations within the manufacturing building. Samples were taken during conditions under which highest potential for vapor migration is expected to occur. These conditions include:

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- Late winter or early spring;
- Indoor air temperatures are 10 degrees F greater than outdoor temperatures;
- Winds are greater than 5 miles per hour;
- Soil around the building is saturated by precipitation, while soil beneath the building remains dry providing a preferential pathway for vapor migration beneath the building;
- Mechanical heating systems are in operation; and
- Mechanical fans are off and doors and windows are closed.

Indoor air samples were collected at six locations using 24-hour integrated canister sampling. Samples were analyzed for eight VOCs. TCE, cis-1,2-DCE, tetrachloroethene (PCE), methylene chloride, and vinyl chloride were detected in some of the samples. All other VOCs sampled were non-detect. The sum of the overall detected concentrations plus half the detection limit for those constituents not detected were below the sum of EPA's Target Indoor Air Concentrations for those VOCs sampled. The average concentration of TCE in indoor air and the individual sample concentrations of TCE were above EPA's Target Indoor Air Concentrations as contained in EPA's draft Vapor Intrusion Guidance for a Target Cancer Risk of  $1 \times 10^{-4}$  and a Target Hazard Quotient of 1 (EPA, 2002).

Based upon further development of site specific screening levels, the indoor air concentrations were within the acceptable incremental excess lifetime cancer risk range of  $1 \times 10^{-4}$  to  $1 \times 10^{-6}$  and the non-cancer target hazard quotient of 1.0. The potential contribution of ambient concentrations of the contaminants of concern in outdoor air and the fact that solvents containing the contaminants of concern are no longer used inside the building were considered in this evaluation. These site-specific screening levels were based on a Target Cancer Risk of  $1 \times 10^{-4}$ , a Target Hazard Quotient of 1, and the following input parameters:

- Exposed population – Adults only
- Average body weight – 70 kilograms (kg)
- Inhalation Rate – 1 cubic meter per hour ( $\text{m}^3/\text{hr}$ ) based on activities conducted at the facility being classified as light to moderated activity level in accordance with EPA's Exposure Factors Handbook (EPA, 1997)
- Exposure time – 9 hours per day (hr/day) based on an 8-hour workday, 0.5-hour lunch break, and 0.25 hours on either side of clocking in and out.
- Exposure frequency – 250 days per year (5 days per week – 50 days per year)
- Exposure duration – 25 years

Table 1 summarizes results of this assessment and Table 2 shows calculation of screening levels.

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<b>Table 1 Air Quality Assessment Sample Results</b>					
<b>Sample ID Number</b>	<b>Location Description</b>	<b>Analyte</b>	<b>Result (ppbv)</b>	<b>EPA Target Indoor Air Concentrations R=10<sup>-4</sup>, HI=1 (ppbv)</b>	<b>Site Specific Indoor Air Concentrations R=10<sup>-4</sup>, HI=1 (ppbv)</b>
MD-AS-01	Office Wing conference room	Methylene Chloride	1.13	44	554.9
		Tetrachloroethene	0.2	12	46.9
		Trichloroethene	14.6	0.41	84.5
MD-AS-02	Office wing restroom sink area	<i>cis</i> -1,2-Dichloroethene	0.88 (J)	8.83	80.2
		Methylene Chloride	0.64 (J)	44	554.9
		Tetrachloroethene	0.517	12	46.9
		Trichloroethene	61.5	0.41	84.5
MD-AS-03	NE Plant Corner	Tetrachloroethene	0.578	12	46.9
		Trichloroethene	46.7	0.41	84.5
MD-AS-04	Training room near chemical storage area	Tetrachloroethene	0.444	12	46.9
		Trichloroethene	56.5	0.41	84.5
		Vinyl Chloride	0.009	11	81.8
MD-AS-05	Center of plant near welding bays	Tetrachloroethene	0.602	12	46.9
		Trichloroethene	42.2	0.41	84.5
		Vinyl Chloride	0.009	11	81.8
MD-AS-06	South end of plant in historical degreaser location	<i>cis</i> -1,2-Dichloroethene	0.62	8.83	80.2
		Methylene Chloride	0.81	44	554.9
		Tetrachloroethene	0.528	12	46.9
		Trichloroethene	34.6	0.41	84.5
MD-AS-07	Outside air sample	Tetrachloroethene	0.053	12	46.9
		Trichloroethene	0.204	0.41	84.5
MD-AS-08	Duplicate of MD-AS-05	Tetrachloroethene	0.528	12	46.9
		Trichloroethene	42.7	0.41	84.5
		Vinyl Chloride	0.015	11	81.8

**Notes:** This table derived from the Indoor Air Quality Assessment, (CH2M Hill 2003).

EPA's "Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils, (November, 2002)

Corrective Action Indoor Air Quality Assessment (CH2M Hill, 2002d)

J = The analyte was positively identified but the report value is estimated

ppbv = parts per billion volume

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<b>Table 2 Calculation of Risk-Based Concentrations</b>							
<b>Constituent</b>	<b>Inhalation Slope Factor (kg-day/m)</b>	<b>Inhalation RfD (mg/kg-day)</b>	<b>Screening Levels in Air (ug/m3)</b>			<b>Final Screening Level in Air (ug/m<sup>3</sup>)</b>	<b>Final Screening Level in Air (ppbv)</b>
			<b>Carcinogenic</b>	<b>Non-Carcinogenic</b>	<b>Lowest Value</b>		
Cis-1,2-Dichloroethene		1.00E-02		1.14+02	1.14+02	1.14+02	29
Methylene Chloride	1.65E-03	8.57E-01	1.93E+03	9.73E+03	1.93E+03	1.93E+03	560
Tetrachloroethene	1.00E-02	1.71E-01	3.18E+02	1.94E+03	3.18E+02	3.18E+02	47
Trichloroethene	7.00E-03		4.54E+02		4.54E+02	4.54E+02	84
Vinyl Chloride	1.54E-02	2.86E-02	2.06E+02	3.25E+02	2.06E+02	2.06E+02	81

**Notes:** Toxicity values for cis-1,2-dichloroethene, methylene chloride, and vinyl chloride were obtained from EPA's IRIS (Integrated Risk Information System) database or HEAST (Health Effects Assessment Summary Tables) document.

Toxicity values for tetrachloroethene and trichloroethene were obtained from California Environmental Protection Agency's (Cal-EPA) Office of Environmental Health and Hazards Assessment (OEHHA) database.

Conversion from µg/m<sup>3</sup> to ppbv is based on standard conditions (760 mm Hg and 25 deg C).

This table derives from the Air Sampling Results Report dated December 2003 (CH2M Hill 2003).

**SURFACE AND SUBSURFACE SOIL**

Contaminated surface and subsurface soil was present at the west side of the Modine plant. Contaminants detected in the soil include cis-1,2-dichloroethene, trichloroethene, and vinyl chloride. Contaminated soil with concentrations in excess of CALM Soil Target Concentrations (STARC) Leaching to Groundwater (C<sub>LEACH</sub>) levels were originally excavated. Vinyl Chloride and cis-1,2-DCE were not present at concentrations exceeding CALM Groundwater Target Concentrations (GTARC) levels in groundwater samples collected from nearby on-site monitoring wells; therefore, they did not appear to be leaching into the underlying groundwater. As a result alternative site-specific soil cleanup action levels were developed in accordance with guidance provided in Appendix C-Tier 2 Cleanup Levels of CALM. The Synthetic Precipitation Leaching Procedure (SPLP) analysis of soil samples was used to determine the site-specific leaching potential of the chlorinated VOCs to the underlying groundwater. Soil samples were collected from the areas assumed to be the most contaminated portion of the impacted in-place soil. Based on the results of the total and SPLP VOC analyses, determination of acceptable total VOC residual concentrations of cis-1,2-DCE, TCE, and vinyl chloride in the site soil were made. Subsequently, soil with concentrations exceeding the calculated site-specific cleanup action levels was removed (CH2M Hill, 2002b).

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Approximately 4,614 tons of VOC impacted surface and subsurface soil with concentrations above the site-specific action levels were excavated and removed to the top of bedrock, the excavation was subsequently backfilled with clean soil and restored. The possibility exists that contaminated soil remains under the manufacturing building. Table 3 includes a comparison of confirmation samples analytical results to site-specific cleanup levels for cis-1,2-DCE, TCE, and vinyl chloride.

**SURFACE WATER**

Modine has a General Storm Water Permit issued by the department's Water Pollution Control Program (Permit Number MO-R203055). The facility storm sewer directs surface runoff to the southern end of the site. Runoff not collected in the storm sewer flows southwest-west to a series of manhole collection points directing runoff through a lift station to the Camdenton Publicly Owned Treatment Works (Jacobs, 1992). No permanent surface water bodies exist on the Modine property. Sampling of stormwater runoff and a stream and spring downgradient of the site showed no VOCs detected in surface water (Law, 1994).

**SEDIMENT**

No sediment samples have been collected on the Modine property as no permanent bodies of surface water exist on the site. Sediments in the downgradient stream were not sampled as no contaminants were found in surface water samples from the stream and the primary constituents of concern are VOCs, hence, it can be reasonably assumed that sediments have not been impacted from known releases at the Modine facility.

**OUTDOOR AIR**

Outdoor air at the Modine facility was evaluated during 2003 concurrently with indoor air. Low concentrations of TCE and PCE were detected in the outdoor air sample and appear to represent ambient background concentrations.

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<b>Table 3 Comparison of Confirmation Sample Analytical Results to Site-Specific Cleanup Levels</b>			
<b>Sample Identification</b>	<b>cis-1,2-DCE (mg/kg)</b>	<b>TCE (mg/kg)</b>	<b>Vinyl Chloride (mg/kg)</b>
MO-1W-02	1.00	ND(0.025)	0.110
MO-1W-03	ND(0.025)	ND(0.025)	ND(0.025)
MO-1W-04	ND(0.025)	ND(0.025)	ND(0.025)
MO-1W-05	ND(0.025)	ND(0.025)	ND(0.025)
MO-1W-05D	ND(0.025)	ND(0.025)	ND(0.025)
MO-1W-06	0.401	ND(0.025)	0.088
MO-1W-06D	ND(0.025)	ND(0.025)	ND(0.025)
MO-2W-01	0.490	ND(0.031)	ND(0.031)
MO-2W-01D	0.389	ND(0.031)	ND(0.031)
MO-3W-01	0.490	ND(0.029)	ND(0.029)
MO-3W-02	0.211	ND(0.029)	ND(0.029)
MO-4W-01	0.110	ND(0.029)	ND(0.029)
MO-4W-02	1.14	ND(0.029)	ND(0.029)
MO-5W-01	0.590	ND(0.029)	0.071
MO-6W-01	0.065	ND(0.029)	ND(0.029)
MO-6W-02	0.361	ND(0.029)	ND(0.029)
MO-6W-03	ND(0.032)	ND(0.302)	0.052
MO-6W-03D	ND(0.032)	ND(0.032)	ND(0.32)
MO-7W-1B	ND(0.029)	ND(0.029)	ND(0.029)
MO-8W-01	0.387	ND(0.029)	0.031
MO-9W001	1.19	ND(0.030)	0.216
MO-10W-03	ND(0.031)	ND(0.032)	ND(0.032)
MO-10W-04	ND(0.034)	ND(0.034)	ND(0.034)
MO-10W-05	ND(0.030)	ND(0.030)	ND(0.030)
MO-10W-06	3.420	ND(0.031)	ND(0.031)
MO-10W-07	1.120	ND(0.028)	ND(0.028)
MO-11W-01	1.820	0.154	0.130
MO-11W-02	ND(0.025)	ND(0.025)	ND(0.025)
MO-11W-03B	ND(0.029)	ND(0.029)	ND(0.029)
MO-11W-04B	ND(0.031)	ND(0.031)	ND(0.031)
MO-12W-01	ND(0.032)	ND(0.032)	ND(0.032)
MO-12W-02	ND(0.030)	ND(0.030)	0.089
MO-12W-03	ND(0.032)	ND(0.032)	0.110
MO-13W-01	0.359	ND(0.032)	0.100
MO-13W-02	1.77	ND(0.032)	ND(0.032)
MO-14W-01	0.051	ND(0.030)	ND(0.030)
MO-14W-02	ND(0.037)	ND(0.037)	0.069
<b>Site-Specific Cleanup</b>	<b>8.68</b>	<b>0.38</b>	<b>0.32</b>

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<b>Table 3 Comparison of Confirmation Sample Analytical Results to Site-Specific Cleanup Levels</b>			
<b>Sample Identification</b>	<b>cis-1,2-DCE (mg/kg)</b>	<b>TCE (mg/kg)</b>	<b>Vinyl Chloride (mg/kg)</b>
<b>Levels</b>			
MO-14W-03	0.060	ND(0.030)	0.041
MO-15W-01	ND(0.035)	ND(0.035)	ND(0.035)
MO-15W-02	ND(0.033)	ND(0.033)	ND(0.033)
MO-15W-03	ND(0.036)	ND(0.036)	ND(0.036)
MO-16W-01	ND(0.032)	ND(0.032)	ND(0.032)
MO-16W-02	ND(0.031)	ND(0.031)	ND(0.031)
MO-16W-03	ND(0.031)	ND(0.031)	ND(0.031)
MO-SP-02	1.570	ND(0.028)	ND(0.028)
<b>Site-Specific Cleanup Levels</b>	<b>8.68</b>	<b>0.38</b>	<b>0.32</b>

**Notes:** This table is derived from the July 2002 Corrective Action Report prepared by CH2M Hill (2002c)  
MO-SP-02 = Sample collected beneath former contaminated soil stockpile  
MO-1W-01 = Sample collected from excavation wall  
ND (0.028) = Not detected at a concentration greater than the listed reporting limit  
Mg/kg = milligrams/kilogram  
Bold denotes concentration exceeding site-specific cleanup levels  
J = Estimated Concentration,  
D = Field Duplicate

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?

<b>Summary Exposure Pathway Evaluation Table Potential Human Receptors (Under Current Conditions)</b>							
<b>“Contaminated” Media</b>	<b>Residents</b>	<b>Workers</b>	<b>Daycare</b>	<b>Construction</b>	<b>Trespassers</b>	<b>Recreation</b>	<b>Food<sup>1</sup></b>
Groundwater	Yes	No	-----	Yes	-----	-----	-----
Air (indoors)	No	Yes	-----	No	-----	-----	-----
<del>Soil (surface, e.g., &lt;2 ft)</del>	-----	-----	-----	-----	-----	-----	-----
<del>Surface Water</del>	-----	-----	-----	-----	-----	-----	-----
<del>Sediment</del>	-----	-----	-----	-----	-----	-----	-----
Soil (subsurface e.g., >2 ft)	No	No	-----	Yes	-----	-----	-----
<del>Air (outdoors)</del>	-----	-----	-----	-----	-----	-----	-----

<sup>1</sup> Indirect Pathway/Receptor (e.g., vegetables, fruits, crops, meat and dairy products, fish, shellfish, etc.)

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Instructions 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 ("\_\_\_"). 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 <u>Pathway Evaluation Work Sheet</u> 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  |

Rationale and Reference(s):

This evaluation assesses potential risk to both on-and off-site receptors. Pathways between Modine contamination and receptors might include use of and/or contact with contaminated groundwater and contact with contaminated subsurface soil or indoor air. Surface water, sediment, surface soil, and outdoor air are not known or are not likely to be contaminated above levels of concern and therefore can be excluded from further consideration.

Four categories of potential receptors can be excluded: day care, trespassers, food and recreational activities. There are currently no on-site facilities for day-care. Because Modine is industrial and mostly paved, all food pathways are excluded. The lack of any on-site recreational facilities or other appurtenances that might make trespassing attractive along with existing property access restrictions makes exposure through recreational use or trespassing improbable.

Three kinds of receptors must be evaluated for potential exposure: residents, facility workers and contract construction workers. Modine is still operational, so facility workers must be considered. No specific information is available about Modine's use of contract construction workers. However, it is likely that contract workers would perform any excavation, construction, or utility work, and this class of receptors must be considered. The properties immediately north and east of Modine property are low-density residential neighborhoods, and

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two day care centers are located within 1 mile of the facility (Switchboard.com 2003). The First Baptist Church of Camdenton is 0.6 mile east of Modine, and Pinocchio's Pre-School and Day Care is approximately 1 mile east of Modine.

### **GROUNDWATER**

Nearby residents and contract excavation workers could use or come into contact with contaminated groundwater. Modine is connected to city water; therefore facility workers should not be exposed to contaminated groundwater via ingestion, dermal contact or inhalation. Monitoring wells provide a pathway through which facility or contract sampling personnel could be exposed to contaminated groundwater; however, such personnel are required to wear appropriate personal protective equipment to mitigate such exposures. Onsite monitoring wells are located within the facility fence and are padlocked making incidental exposure of workers (non-sampling personnel) to contaminated groundwater unlikely. Most drinking water in the area around the facility is provided by city utilities (MDNR 1998), making exposure of residents unlikely. TCE has been routinely detected in the nearby City-operated Mulberry well above the MCL of 5 ppb. Subsequent to the recognition/confirmation of the TCE contamination, the Mulberry well was taken off-line by the City but continues to be pumped to waste periodically for the purpose of controlling the groundwater contaminant plume. The concentrations of TCE in the water that is pumped to waste quickly decrease to non-detect levels, so significant exposure to TCE in the wastewater is unlikely. TCE has not been detected in any other city municipal wells. Samples collected from the Burnau residence had concentrations of TCE above EPA MCLs, and the well was not closed. This private well is a secondary source of water for the resident as they are hooked up to the municipal water supply system. This well is reportedly not used for drinking water but may see periodic use for other domestic purposes. Hence, the residents may occasionally be exposed to contaminated groundwater, however, the frequency and duration of such exposure is likely insignificant. In general, the water table at the facility is too deep to be encountered by excavation workers. However, because perched groundwater is sometimes found at relatively shallow depths, contract excavation workers could be exposed to contaminated groundwater.

### **INDOOR AIR**

Facility workers in the manufacturing and office areas of Modine are likely to be exposed to indoor air levels above EPA Target Indoor Air Levels (EPA, 2002b). However, concentrations in indoor air fall below site specific screening levels. Thus, no unacceptable human exposure to contamination for workers currently exists within the manufacturing building. These screening levels were based on a Target Cancer Risk of  $1 \times 10^{-4}$  and a Target Hazard Quotient of 1 (see Tables 1 and 2 and the associated discussion above).

### **SUBSURFACE SOIL**

The only known area where potentially contaminated subsurface soil (greater than 2 feet) may exist is located underneath the manufacturing building. Contract excavation workers are the only receptors that might reasonably be exposed to contaminated subsurface soils beneath the building. Facility workers are not likely to come into contact with soils deeper than 2 feet bgs. As the known extent of residually contaminated subsurface soil is on-site and physical site access restrictions exist, residents are unlikely to come into contact with such soil.

**Current Human Exposures Under Control**  
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4. Can the **exposures** from any of the complete pathways identified in #3 be reasonably expected to be **“significant”**<sup>1</sup> (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 can not 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 expected to be “significant.”
- If unknown (for any complete pathway) - skip to #6 and enter “IN” status code

Rationale and Reference(s):

Exposures can be considered significant if the duration or intensity of exposure to contaminated materials is greater than expected when calculating screening levels or if the level of contamination is substantially above screening levels. Completed exposure pathways at Modine include:

1. Workers – indoor air
2. Residents – groundwater
3. Contract construction workers – groundwater, subsurface soil

**Workers**

Complete pathways exist for exposure of manufacturing and office workers, within the building, to TCE above EPA Target Indoor Air concentrations. However, concentrations in indoor air fall below site specific screening levels. Therefore, worker exposure inside the manufacturing building is not likely to be significant.

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<sup>1</sup>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.

Concentrations of VOCs detected inside the manufacturing building will be addressed as part of the facility's occupational safety and health program regulated under OSHA, in accordance with EPA's draft vapor intrusion guidance. The five constituents detected in indoor air: TCE, cis-1,2-DCE, vinyl chloride, and methylene chloride, were added to the existing Hazard Communications Program and to the existing annual exposure monitoring program (CH2M Hill, 2003).

### Residents

Complete pathways exist for exposure of nearby residents to contaminated groundwater. Sampling in 1998 revealed that a well at the Burnau residence, across Sunset Drive from the Modine facility, had been impacted by TCE. MDNR provided the results of the sampling investigation to Mr. Burnau and advised the family not to drink the water from their well. Because of this advisory and because the well is a secondary water source, the exposure of the Burnaus to the contaminated groundwater is not expected to be significant. TCE was detected in the Mulberry well above the MCL of 5 ppb. The Mulberry Well was taken off-line by the City. TCE has not been detected in any other city municipal wells.

### Contract Construction Workers

Although perched groundwater is sometimes encountered at shallower depths, the usual depth to groundwater is about 150 feet. Contract construction workers would only be exposed to subsurface soil if subsurface soil investigations are conducted beneath the building and during this event they would be wearing personal protective equipment. Moreover, because they are not full-time employees on site, their exposure to contaminated groundwater or subsurface soil would be limited in duration. Therefore, contract excavators' exposure to contaminated media likely would not be significant.

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 and Reference(s):



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