

Interim Final 2/5/99  
Revised 9/20/02

RCRA Corrective Action  
Environmental Indicator (EI) RCRA Info code (CA750)  
Migration of Contaminated Groundwater Under Control

Facility Name: TRW Inc. \_\_\_\_\_  
Facility Address: 300 Ramsey Street, Sullivan, MO 63080 \_\_\_\_\_  
Facility EPA ID #: MOD094390416 \_\_\_\_\_

## DETERMINATION RESULT: YES

1. Has **all** available relevant/significant information on known and reasonably suspected releases to the groundwater media, 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?

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

If no - re-evaluate existing data, or

if data are not available, skip to #8 and enter "IN" (more information needed) status code.

The former TRW facility is located in Sullivan, Missouri, south of Highway 44, in Franklin County, Missouri (see Figure 1). The facility has undergone a number of ownership changes since Ramsey Corporation (Ramsey) opened it in 1950. Ramsey, a wholly owned subsidiary of TRW, manufactured automobile pistons at the facility from 1950 to 1983 (O'Brien & Gere [OBG] 1997). Manufacturing processes included a chrome plating operation and used a number of organic solvents and petroleum-based raw materials. Chrome plating ended at the facility in 1983 (OBG 1997). In 1984, Ramsey changed its name to TRW Automotive Products, Inc., which later merged into TRW. In 1987, the facility was sold to Sullivan Warehousing and Sister Property, Inc., and manufacturing operations (metal stamping and tool manufacturing) continue at the facility (OBG 1997; U.S. Environmental Protection Agency [EPA] 2000). On December 11, 2002, a wholly owned subsidiary of Northrup Grumman Corporation was merged with and into TRW, Inc., with TRW Inc. surviving the merger as a wholly owned subsidiary of Northrup Grumman Corporation. On January 1, 2003, substantially all of the divisional assets and liabilities relating to the automotive business of the former TRW Inc. were assigned to TRW Automotive U.S. LLC. On February 28, 2003, Northrup Grumman Corporation sold TRW's automotive business to a wholly owned indirect subsidiary of TRW Automotive Holdings Corporation. TRW Automotive Holdings Corporation was a wholly owned by a private investment company, who in February 6, 2004, completed an initial public offering of approximately 24% of its common stock. TRW Automotive U.S. is referred to as "TRW" throughout this document on any issues occurring after January 1, 2003.

The former TRW facility has been monitored and investigated since at least 1983, when TRW began voluntary investigation and remediation of its surface impoundments (OBG 1997). The facility had operated under Resource Conservation and Recovery Act (RCRA) interim status beginning in 1980 but changed its status to hazardous waste generator only in 1983 (OBG 1997). From 1983 to 1986, TRW collected soil samples from potential source areas and found evidence that soils had been impacted by site operations (OBG 1997). These

investigations resulted in extensive remedial activities (primarily excavation) from July to November 1985 (OBG 1997). In 1993, the facility entered into a consent order with EPA (OBG 1997). The Current Conditions Report (CCR) required by the order was completed in 1993 and included soil and groundwater sampling, hydrogeological characterization, human health risk assessment, and ecological assessment (OBG 1997). During the CCR investigation, the consent order specified that interim measures be implemented. Interim measures included preparing a Groundwater Monitoring Plan (GMP), Drinking Water Contingency Plan (DWCP), and a Pump and Treatment Plan (PTP) (OBG 1997). The facility completed the RCRA Facility Investigation (RFI) in 1997 and the Corrective Measures Study (CMS) in 1998. After a public comment period, EPA issued the final remedy decision in early 2002 (EPA 2002a).

The consent order identified five solid waste management units (SWMU) and two areas of concern (AOC), all potential soil source areas associated with industrial processes involving constituents that could migrate to groundwater (OBG 1997). The SWMUs and AOCs are shown in Figure 2 and described in greater detail below. The primary contaminants released to soil, groundwater, sediment, and surface water from TRW's SWMUs are metals derived from the plating process, especially chromium and lead, and chlorinated volatile organic compounds (VOCs), in particular trichloroethene (TCE).

SWMU 1 – Former Surface Impoundments (Lagoon Area). SWMU 1 is the site of five former surface impoundments that received electroplating settling sludges (OBG 1997). Although the wastewater discharged to the lagoon consisted primarily of solutions from the chrome-plating operations, soil samples collected from the area of the lagoons suggested that wastewater also contained some TCE. Three lagoons were installed in 1964 (currently designated Lagoons 2, 3, and 4) (OBG 1997). An additional lagoon was installed in 1974 but was drained and re-excavated in 1980. This lagoon was then turned into two lagoons (Lagoons 1 and 5) (OBG 1997). Before 1973, untreated wastewater was discharged from the lagoons into Winsel Creek Tributary. In 1973, a chemical wastewater treatment process was installed at the lagoons to reduce dissolved levels of chromium prior to lagoon settling (OBG 1997). After 1973, discharges to the creek were regulated under a National Pollutant Discharge Elimination System (NPDES) permit (OBG 1997). TRW began closure of the lagoons in 1985, removing 480,000 gallons of pumpable sludge and 8,400 tons of sludge and soil from the lagoon holding cells (OBG 1997). Confirmation samples were collected from the base of the excavation, and the pit was backfilled with clean fill (OBG 1997).

SWMU 2 – Drum Storage Area. SWMU 2 consisted of a sheet-metal shed on a concrete pad in which drums of TCE waste were managed (OBG 1997). Drums of waste were held for less than 90 days and disposed of off site (OBG 1997). The area is no longer in use, but it was not included in the 1985 closure activities (OBG 1997). Based on the distribution of TCE contamination in groundwater, SWMU 2 is a likely source area (EPA 2001).

SWMU 3 – Material Burn Area. Before 1983, TRW disposed of facility trash and miscellaneous debris by burning it on site at SWMU 3 (OBG 1997). In 1986 and 1987, soils known or suspected to be contaminated in the area of the SWMU were excavated and removed (OBG 1997). Material was excavated to a depth of about 30 feet, and confirmation samples were collected (OBG 1997).

SWMU 4 – Burn Material Deposit Areas. SWMU 4 consists of two areas – the lagoon area and the facility area – in which ash and residual wastes from the material burn area (SWMU 3) were deposited before 1983 (OBG 1997). The facility area also included a 30,000-gallon underground storage tank (UST) containing fuel oil (OBG 1997). In 1986 and 1987, soils known or suspected to be contaminated in the area of the SWMU were excavated and removed (OBG 1997). In the lagoon area, soils were excavated to an average depth of 6 feet, confirmation samples were collected from the base of excavation, and the pit was backfilled with clean fill (OBG 1997). The facility area was excavated to a depth of about 30 feet, confirmation samples were collected from the base of excavation, and the pit was backfilled with clean fill (OBG 1997). During closure activities (1986 and 1987), the UST also was removed (OBG 1997).

SWMU 5 – Plating Operations Area. SWMU 5 included the inground process tanks that held plating and cleaning mixtures containing lead and chromium wastes. In 1986 and 1987, the chrome plating building was demolished, and the soils under and around the building were excavated and disposed of off site (OBG 1997). Soils were excavated to a depth of about 30 feet, and confirmation samples were collected (OBG 1997).

AOC 1 – TCE and Mineral Spirits Storage Area. AOC 1 was an area south of the facility used for aboveground tank storage of virgin and product grade TCE and mineral spirits (OBG 1997). In 1984, the tanks were emptied and cleaned when TRW discontinued operations at the Sullivan site (OBG 1997).

AOC 2 – Winsel Creek Tributary. Before 1964, process wastewater from the facility was discharged directly to Winsel Creek Tributary (OBG 1997). After 1964, the tributary received wastewaters directly from the settling lagoons (SWMU 1). Since 1973, wastewater from the facility also has been treated to reduce dissolved chromium before lagoon settling, and the resulting treated wastewater discharged to the tributary has been regulated under a NPDES permit (OBG 1997).

## **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 EI 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 “Migration of Contaminated Groundwater Under Control” EI**

A positive “Migration of Contaminated Groundwater Under Control” EI determination (“YE” status code) indicates that the migration of “contaminated” groundwater has stabilized, and that monitoring will be conducted to confirm that contaminated groundwater remains within the original “area of contaminated groundwater” (for all groundwater “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 “Migration of Contaminated Groundwater Under Control” EI pertains ONLY to the physical migration (i.e., further spread) of contaminated groundwater and contaminants within groundwater (e.g., non-aqueous phase liquids or NAPLs). Achieving this EI does not substitute for achieving other stabilization or final remedy requirements and expectations associated with sources of contamination and the need to restore, wherever practicable, contaminated groundwater to be suitable for its designated current and future uses.

### **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).

2. Is groundwater known or reasonably suspected to be “contaminated”<sup>1</sup> above appropriately protective “levels” (i.e., 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, anywhere at, or from, the facility?

If yes - continue after identifying key contaminants, citing appropriate “levels,” and referencing supporting documentation.

If no - skip to #8 and enter “YE” status code, after citing appropriate “levels,” and referencing supporting documentation to demonstrate that groundwater is not “contaminated.”

If unknown - skip to #8 and enter “IN” status code.

Rationale and Reference(s):

### Groundwater

Groundwater at the facility is contaminated with VOCs, particularly TCE, and metals, particularly chromium. TCE, *cis*-1,2-dichloroethene (DCE), 1,2-dichloroethane (DCA), chromium, and lead have exceeded MCLs or site-specific cleanup objectives (EPA 2002a, 2002b; Arcadis 2003a). Both *cis*-1,2-DCE and 1,2-DCA are breakdown products of TCE. Table 1 shows historical maximum concentrations of metals and VOCs found in groundwater at the facility, and Table 2 shows the concentrations of TCE and chromium in all wells at the site in samples collected in 2001, 2003, 2005 and 2007. Because of the high concentrations of TCE in some samples, detection limits for other compounds such as *cis*-1,2-DCE sometimes exceed the MCL for the compound. As a result, *cis*-1,2-DCE and other breakdown products of TCE, such as vinyl chloride, may be present in groundwater at concentrations that exceed their respective MCLs. However, no vinyl chloride has been detected in any monitoring wells in TRW’s groundwater monitoring network (MDNR 2005). In addition, contaminated groundwater has migrated off site to nearby municipal drinking water wells. There also exists the potential that contaminants of potential concern (COPCs) from the site (TCE) have impacted LaJolla Springs/Meramec Cavern Complex (as signified by dye trace data), although contaminants of concern (TCE, CFC, acetone) from a different source, the City of Sullivan’s closed landfill, have consistently been detected in samples from the spring (MDNR 2005).

Groundwater is used throughout the region for private, municipal and industrial water supplies. The locations of private and municipal supply wells in the vicinity of the former TRW facility are shown on Figure 3. Locally, seven active municipal supply wells are located within the City of Sullivan (COS-2, COS-3, COS-5, COS-7, COS-9, COS-10 and COS-11). Table 2 summarizes the analytical results for the Sullivan municipal drinking water wells. Samples collected from municipal well COS-2 in the June 2003, 2005 and 2007 sampling events had concentrations of TCE that exceeded the MCL. In addition, samples collected from municipal wells COS-3, COS-7, COS-8, COS-9, and COS-11 had detectable concentrations of TCE. However, from 2001 to 2007, only COS-2 and COS-8 had samples that exceeded the MCL (Arcadis 2003a). Municipal well COS-8 was taken out of service in 2004 due to TCE contamination at concentrations above its MCL. Municipal well COS-2 is currently in operation and has a treatment system in place due to continued TCE contamination. Municipal wells COS-1, COS-4 and COS-6 have all been taken out of service for reasons other than contamination. The depths of these municipal wells range from 655 to 964 feet.

Based on available records there are six operational and one non-operational private well(s) within a 1-mile radius of the facility and several private wells within a 5-mile radius (Figure 3). Well information indicates that

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<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 appropriate “levels” (appropriate for the protection of the groundwater resource and its beneficial uses).

many of the private wells are completed approximately 300 to 500 feet below grade. No site related contaminants have been detected in these wells (Table 2).

Results of the RFI identified lead contamination in the shallow groundwater zone at levels up to 46 ppb. The site established cleanup objective for lead is 15 ppb. The elevated levels of lead were predominantly found onsite however an adjacent offsite well OBG-13S did have elevated levels of lead (Figure 4). Lead was not detected in the intermediate or deep groundwater zones at levels exceeding the established cleanup objective.

Results of the RFI identified chromium contamination in the shallow groundwater zone at levels up to 11,000 ppb. The established cleanup objective for chromium is 100 ppb. The elevated levels of chromium were predominantly found onsite in the former plating area operation and former surface impoundment area (Figure 5). Chromium has been detected offsite in the shallow groundwater zone in wells adjacent to the site (OBG-9s and MW-4) (Figure 5). Chromium was not detected in the intermediate or deep groundwater zones at levels exceeding the established cleanup objective.

Results of the RFI identified TCE contamination in the shallow groundwater zone at levels up to 41,000 ppb. The established cleanup objective for TCE is 5 ppb. The elevated levels of TCE were predominantly found onsite in the former drum storage area and the former surface impoundment area (Figure 6). TCE was also detected in the intermediate groundwater zone at levels exceeding the established cleanup objective (Figure 7). TCE was also detected in the deep groundwater zone in one monitoring well OBG-01DD. TCE was also detected in COS-2 at levels exceeding its MCL.

The contaminants 1,2 DCE and 1,2 DCA were also detected in the shallow groundwater zone at levels above their cleanup objectives of 700 ppb and 5 ppb respectively (Figure 8). Both 1,2 DCE and 1,2 DCA have been detected offsite in the shallow groundwater zone in wells in close proximity to the site (Figure 8) Neither of these contaminants were detected in the intermediate or deep groundwater zones at levels exceeding their respective cleanup objectives.

Oak Grove Village (OGV) is located approximately one mile northeast of TRW (Figure 9). In June of 1986, TCE was detected in OGV's sole municipal drinking water well (OGV01). Subsequent samplings have detected TCE at concentrations ranging from 1.5 ug/L to 99.6 ug/L. In July 1991, OGV closed OGV01 and began purchasing water from the City of Sullivan. In December 1991, OGV drilled a new well (OGV02). Subsequent sampling of OGV02 revealed concentrations of TCE above maximum contaminant levels. OGV resumed purchasing water from Sullivan. An air stripper was later installed on OGV02 and sampling indicated that concentrations of TCE in treated water were below maximum contaminant levels. OGV subsequently stopped purchasing water from Sullivan. Currently OGV receives its water supply from OGV02 after treatment through an air stripper. All private wells known to be contaminated are on wellhead treatment systems.

The contamination that has affected the OGV wells is known as the OGV Well Superfund Site which is defined as the regional contaminant plumes in groundwater that have contaminated the OGV wells and the surrounding area. On September 13, 2001, the EPA, with State concurrence, proposed the OGV Well Superfund site for the EPA's Superfund National Priorities List (NPL). On September 5, 2002, the NPL listing became final.

Investigations at the OGV site were conducted in phases (Phase I and Phase II). Phase I involved area-wide sampling of residential, commercial, and municipal wells, as well as springs and creeks. Phase II involved the installation of monitoring wells and sampling additional residential and commercial/industrial wells, suspected source areas, sewers and surface water (Winsel Creek and the Meramec River). The conclusion of the Phase II investigation determined that additional work was needed to fill data gaps (Post Phase II RI). The results of the OGV Post Phase II RI eliminated all but two potential source areas for the OGV well contamination, the TRW facility and the closed Sullivan Landfill.

The closed Sullivan Landfill operated from 1970 to 1983. From 1970 to 1975, this 28-acre landfill accepted municipal and industrial wastes in a ravine fill. From 1975 to 1983, a trench fill area was utilized north of the ravine wastes. An industrial waste cell, built in the trench area, stored about 200 drums and buckets of industrial wastes. Sullivan and TRW conducted a drum removal at the landfill in May 1992. Drums and buckets were

sampled, removed and disposed off-site. The landfills closure requirements included a composite (soil and geomembrane) cover over the landfill's solid waste, and a system to collect and dispose of onsite seep leachate during and after construction of the cover.

TRW currently has an active groundwater monitoring and recovery system (Figure 10). Groundwater samples at the facility have been collected since at least 1990 and TRW has installed 42 monitoring wells (Arcadis 2005) (Figure 11). Additional shallow and intermediate depth monitoring wells were required by the final remedy but have not yet been installed as negotiations on a corrective measures implementation order to be issued under state authority are on-going (EPA 2002a, MDNR 2005). Monitoring wells at the facility are designated as shallow (completed 115 to 160 feet bgs), intermediate (320 to 325 feet bgs), or deep (550 feet bgs). Intermediate and deep wells are screened in the primary regional aquifer, at about the same depth as many domestic and municipal wells in the area (OBG 1997).

Table 1 – Historical Maximum Concentrations of Constituents in Groundwater

Constituent	Concentration (ug/l)	Well	Date	EPA MCL (ug/l)	Other Wells Exceeding MCL
<b>Dissolved Metals</b>					
Chromium	<b>7,500</b>	MW-1	June 2001	100	MW-3
<b>Total Metals</b>					
Chromium	<b>28,800</b>	MW-1	June 2005	100*	
Lead	<b>180</b>	MW-3	June 1996	15 <sup>†</sup>	
<b>Volatile Organic Compounds</b>					
1,2-Dichloroethane	<b>140</b>	MW-3	Sept. 1994	5	
<i>cis</i> -1,2-Dichloroethene	<b>3,800</b>	OBG-05S	June 2002	70	MW-2, MW-3, MW-4, OBG-02S, OBG-03S, OBG-04S, OBG-06S, OBG-15S, OBG-16S
Trichloroethene	<b>41,000</b>	OBG-02S	Dec. 1997	5	MW-1, MW-2, MW-3, MW-4, OBG-01S, OBG-03S, OBG-04S, OBG-05S, OBG-06S, OBG-07S, OBG-09S, OBG-10S, OBG-11S, OBG-13S, OBG-15S, OBG-16S, OBG-20S, OBG-21S, OBG-01D, OBG-04D, OBG-08D, OBG-11D, OBG-13D, OBG-21D, OBG-01DD, LOC-111, COS-02, COS-08

**Notes:**

Concentrations in bold exceed the MCL (EPA 2002b). Table derived from the second quarter 2003 groundwater monitoring report (Arcadis G&M 2003a) and the 2006 Annual Groundwater Monitoring Report (Arcadis 2007).

MCLs are established for drinking water. Unfiltered samples analyzed for total metals contain suspended sediment that normally would be removed from drinking water. These suspended sediments may contain contaminants that would not be present in dissolved groundwater.

† EPA has not established an MCL for lead. The 15 µg/l concentration is an action level.

EPA = U.S. Environmental Protection Agency

MCL = Maximum contaminant level

µg/l = Micrograms per liter

Table 2 – Trichloroethene and Total Chromium in Groundwater, 2001 - 2007									
Well	Well Type	TCE June 2007 (µg/l)	TCE, June 2005 (µg/l)	TCE, June 2003 (µg/l)	TCE, June 2001 (µg/l)	Total Cr. June 2007 (µg/l)	Total Cr, June 2005 (µg/l)	Total Cr, June 2003 (µg/l)	Total Cr, June 2001 (µg/l)
<b>Summary of 150 Foot Zone</b>									
MW-1	M	2,100	1,700	1,700	2,000	27,400	28,800	7,700	7,700
MW-2	M	1,300	1,300	2,600	5,900	500	590	630	240
MW-3	M	6,000	5,600	7,800	7,300	6,400	5,900	2,900	850
MW-4	M	2,600	2,600	2,600	2,400	98	25	320	20
OBG-01S	M	27	45	67	26	48	< 5.0	5.1	< 10.0
OBG-02S	M	1,600	12,000	8,200	38,000	100	200	190	30
OBG-03S	M	2,200	2,400	2,100	2,100	46	31	33	40
OBG-04S	M	1,500	2,100	2,700	2,000	140	130	130	140
OBG-05S	M	16,000	26,000	25,000	24,000	180	98	210	290
OBG-06S	M	38	7,000	8,200	13,000	26	97	36	40
OBG-07S	M	190	280	140	310	32	<5.0	11	< 10.0
OBG-09S	M	1,800	1,400	1,400	2,200	190	16	63	80
OBG-10S	M	12	DRY	DRY	24	65	DRY	DRY	10
OBG-11S	M	4.5	DRY	DRY	7	260	DRY	DRY	230
OBG-12S	M	<1.0	<1.0	< 0.41	<1.0	25	56	36	< 10.0
OBG-13S	M	19	DRY	DRY	5	56	DRY	DRY	30
OBG-14S	M	<1.0	<1.0	< 0.41	<1.0	5.9	< 5.0	< 1.5	< 10.0
OBG-15S	M	<100.0	< 100.0	< 20	< 50.0	NA	NS	< 1.5	< 10.0
OBG-16S	M	2,400	2,500	5,200	6,000	<5.0	< 5.0	< 1.5	< 10
OBG-17S	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10
OBG-18S	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10
OBG-19S	M	<1.0	<1.0	< 0.41	<1.0	74	24	650	10
OBG-20S	M		DRY	DRY	DRY		DRY	DRY	DRY
OBG-21S	M	390	290	260	490	13	5.2	< 1.5	< 10
OBG-22S	M		NA	< 0.41	< 1		NA	< 1.5	< 10
OBG-23S	M	<1.0	<1.0	< 0.41	<1.0	<5.0	< 5.0	< 1.5	< 10
<b>Summary of 325 Foot Zone</b>									
OBG-01D	M	1,600	1,600	1,500	1,200	17	12	10	10
OBG-04D	M	6.9	6.5	6.5	6	<5.0	< 5.0	< 1.5	< 10.0
OBG-08D	M	2,500	2,000	1,500	1,300	31	19	17	20
OBG-11D	M	12	13	15	11	<5.0	< 5.0	< 1.5	< 10.0
OBG-12D	M	4.3	3.1	3.1	2	<5.0	< 5.0	< 1.5	< 10.0
OBG-13D	M	2,000	1,300	1,100	1,300	58	39	28	30
OBG-14D	M	<1.0	<1.0	< 0.41	<1.0	<5.0	< 5.0	< 1.5	< 10.0
OBG-17D	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10
OBG-18D	M	2.0	2	1.6	1	NA	NA	< 1.5	< 10
OBG-19D	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10
OBG-21D	M	26	19	21	22	<5.0	< 5.0	< 1.5	< 10
<b>Summary of 550 Foot Zone</b>									
OBG-01DD	M	360	540	260	190	28	25	22	< 10.0
OBG-14DD	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10.0
OBG-18DD	M	<1.0	<1.0	< 0.41	<1.0	NA	NA	< 1.5	< 10
OBG-20DD	M	2	1.8	< 0.41	< 1	NA	NA	< 1.5	< 10
<b>Summary of Private Wells</b>									
LOC-105	P	<1.0	<1.0	< 0.42	< 0.50	<5.0	< 5.0	< 1.5	< 10
LOC-111	P	NA	NA	NA	NA	NA	NA	NA	NA
LOC-157	P	<1.0	<1.0	< 0.42	< 0.50	<5.0	< 5.0	< 1.5	< 10
LOC-244	P	<1.0	<1.0	< 0.42	< 0.50	<5.0	< 5.0	< 1.5	< 10
LOC-245	P	<1.0	<1.0	< 0.42	< 0.50	<5.0	< 5.0	< 1.5	< 10
LOC-246	P	<1.0	<1.0	< 0.42	< 0.50	<5.0	< 5.0	< 1.5	< 10
<b>Summary of Sullivan Municipal Wells</b>									
COS-2	D	33	43	28	NS	NA	NA	< 1.5	NA
COS-3	D	<1.0	<1.0	< 0.25	0.28 J	NA	NA	< 1.5	< 10
COS-4	D		<1.0	< 0.25	< 0.50		NA	< 1.5	< 10

COS-5	D	<1.0	<1.0	< 0.25	< 0.50	NA	NA	< 1.5	< 10
COS-6	D	<1.0	<1.0	NS	NS	NA	NA	NS	NS
COS-7	D	<1.0	<1.0	< 0.25	0.12 J	NA	NA	< 1.5	< 10
COS-8	D	Closed	Closed	< 0.25	2.4	Closed	Closed	< 1.5	< 10
COS-9	D	2.5	1.7	3.6	0.49 J	NA	NA	< 1.5	< 10
COS-10	D	<1.0	<1.0	< 0.20	< 0.50	NA	NA	< 1.5	< 10
COS-11	D	<1.0	<1.0	< 0.10	0.9	NA	NA	< 1.5	< 10

**Notes:**

Concentrations in bold exceed the MCL (EPA 2002b). Table derived from the second quarter 2006 groundwater monitoring report (Arcadis G&M 2006). Because MCLs are specified for dissolved metals, total metals concentrations exceeding site-specific cleanup levels are in italics.

Cr = Chromium  
D = Municipal drinking water well  
EPA = U.S. Environmental Protection Agency  
J = Estimated  
M = Monitoring well  
MCL = Maximum contaminant level

µg/l = Micrograms per liter  
NA = Not analyzed  
NS = Not sampled. A number of shallow wells were dry during sampling events.  
P = Private domestic well  
TCE = Trichloroethene

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3. Has the **migration** of contaminated groundwater **stabilized** (such that contaminated groundwater is expected to remain within "existing area of contaminated groundwater"<sup>1</sup> as defined by the monitoring locations designated at the time of this determination)?

If yes - continue, after presenting or referencing the physical evidence (e.g., groundwater sampling/measurement/migration barrier data) and rationale why contaminated groundwater is expected to remain within the (horizontal or vertical) dimensions of the "existing area of groundwater contamination"<sup>2</sup>.

If no (contaminated groundwater is observed or expected to migrate beyond the designated locations defining the "existing area of groundwater contamination"<sup>2</sup>) - skip to #8 and enter "NO" status code, after providing an explanation.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

The facility is located in an area underlain by the Ozark Aquifer which consists of Ordovician and Cambrian dolomite, chert and sandstone. Bedrock formations underlying the site included as part of the regional "Ozark Aquifer" include the Ordovician Gasconade Dolomite, and the Cambrian Eminence and Potosi Dolomites (Figure 12). Investigations in the region have reported the occurrence of two main water bearing units. The upper water bearing unit includes all formations from the ground surface to the base of the Ordovician Gasconade Dolomite approximately 350 feet below grade. The lower water bearing unit includes the Cambrian Eminence and Potosi Dolomites, which underlie the Gasconade Dolomite. Groundwater at the site has been subdivided into shallow, intermediate and deep. Shallow wells are completed below the first encountered groundwater table (Roubidoux Formation), intermediate depth wells are completed to depths ranging from 320 to 325 ft. (Gasconade Dolomite) and deep wells are complete to depths of approximately 550 ft. (Eminence and Potosi Dolomite) (OBG 1997).

The subsurface geology in the Sullivan area is complex and includes structural and karstic (fractures in rock that have been enlarged by groundwater movement) features that significantly influence groundwater flow gradients, velocities and directions. These complex features invoke inherent uncertainties in the development of a comprehensive hydrogeologic model for the area. The shallow, intermediate, and deep groundwater zones are all interconnected through structural and karstic features as evidenced by the presence of springs, sinkholes, losing streams, caves and dissolution along geological fracture/fault zones in the vicinity of the former TRW facility. As a result of these geologic features, groundwater flow in Sullivan and the surrounding area including OGV is complex. The underlying aquifer provides most of the drinking water used in Sullivan and OGV.

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<sup>1</sup> "existing area of contaminated groundwater" is an area (with horizontal and vertical dimensions) that has been verifiably demonstrated to contain all relevant groundwater contamination for this determination, and is defined by designated (monitoring) locations proximate to the outer perimeter of "contamination" that can and will be sampled/tested in the future to physically verify that all "contaminated" groundwater remains within this area, and that the further migration of "contaminated" groundwater is not occurring. Reasonable allowances in the proximity of the monitoring locations are permissible to incorporate formal remedy decisions (i.e., including public participation) allowing a limited area for natural attenuation.

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Although contaminant concentrations in specific wells fluctuate over time the configuration of the contaminant plume has remained consistent. Figure 6 and 7 delineate the extent of TCE contamination in the shallow and intermediate zones from the RFI Report (OBG 1997). In comparison, Figures 13 and 14 delineate the extent of TCE contamination in the shallow and intermediate groundwater zones based on the results of the 2004 (Figure 13) and 2006 (Figure 14) groundwater monitoring reports (Arcadis 2005 & Arcadis 2007). These figures demonstrate a consistency in plume extent over approximately ten years. Comparison of the analytical results for the municipal wells (Table 2) which are completed in the intermediate and deep groundwater zones also demonstrates this consistency.

The continual operation of this municipal well (COS-2) also incidentally acts as a containment mechanism that precludes the majority of contaminated groundwater from further migrating out of the immediate vicinity of the site and COS-2. Diffuse, low-level TCE contamination exists beyond the capture zone for COS-2. The plume beyond this capture zone is less than 50 ppb and typically near the drinking water standard of 5 ppb. Pumping of COS-2 likely captures any further transport from the former TRW site.

4. Does "contaminated" groundwater **discharge** into **surface water** bodies?

If yes - continue after identifying potentially affected surface water bodies.

If no - skip to #7 (and enter a "YE" status code in #8, if #7 = yes) after providing an explanation and/or referencing documentation supporting that groundwater "contamination" does not enter surface water bodies.

If unknown - skip to #8 and enter "IN" status code.

Rationale and Reference(s):

Specific surface water bodies which are potentially affected by contamination from the former TRW facility include the tributary to Winsel Creek adjacent to the TRW facility and underground streams and springs at the Meramec Caverns/LaJolla Springs Cavern Complex

5. Is the **discharge** of "contaminated" groundwater into surface water likely to be "**insignificant**" (i.e., the maximum concentration<sup>2</sup> of each contaminant discharging into surface water is less than 10 times their appropriate groundwater "level," and there are no other conditions (e.g., the nature, and number, of discharging contaminants, or environmental setting), which significantly increase the potential for unacceptable impacts to surface water, sediments, or eco-systems at these concentrations)?

If yes - skip to #7 (and enter "YE" status code in #8 if #7 = yes), after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of key contaminants discharged above their groundwater "level," the value of the appropriate "level(s)," and if

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<sup>2</sup> As measured in groundwater prior to entry to the groundwater-surface water/sediment interaction (e.g., hyporheic) zone.

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there is evidence that the concentrations are increasing; and 2) provide a statement of professional judgment/explanation (or reference documentation) supporting that the discharge of groundwater contaminants into the surface water is not anticipated to have unacceptable impacts to the receiving surface water, sediments, or eco-system.

\_\_\_\_\_ If no - (the discharge of "contaminated" groundwater into surface water is potentially significant) - continue after documenting: 1) the maximum known or reasonably suspected concentration<sup>3</sup> of each contaminant discharged above its groundwater "level," the value of the appropriate "level(s)," and if there is evidence that the concentrations are increasing; and 2) for any contaminants discharging into surface water in concentrations<sup>3</sup> greater than 100 times their appropriate groundwater "levels," the estimated total amount (mass in kg/yr) of each of these contaminants that are being discharged (loaded) into the surface water body (at the time of the determination), and identify if there is evidence that the amount of discharging contaminants is increasing.

\_\_\_\_\_ If unknown - enter "TN" status code in #8.

**Rationale and Reference(s):**

Surface water near the facility is not contaminated (OBG 1997; EPA 2000). EPA confirmed the lack of contamination in surface water in the Statement of Basis and final remedy documents (EPA 2000, 2002a). Surface-water samples were collected from Winsel Creek Tributary, adjacent to TRW, in 1992 and 1993 and analyzed for VOCs, filtered and unfiltered priority pollutant metals, hexavalent chromium, oil and grease, and TPH (OBG 1997). Based on comparison with background (upstream) samples, beryllium, calcium, silver, acetone, 1,1,1-trichloroethane (TCA), and oil and grease were determined to be elevated in surface water (OBG 1997). However, none of these constituents was found at its level of concern. Beryllium and silver were below the Missouri Water Quality Standards for aquatic life (Missouri Code of State Regulations 20-7). Because of its low toxicity, calcium was not considered a chemical of concern. Acetone and 1,1,1-TCA were detected downstream, but not immediately downstream, of the facility, making attribution to the facility unlikely. Finally, given the facility's industrial setting and the ubiquity of oil and grease as contaminants in industrial settings, these could not be attributed directly to the site (OBG 1997).

The results of dye tracer tests have shown hydrological connections between Winsel Creek and nearby springs (MDNR 1988; OBG 1997). Meramec State Park, about 3 miles east of Sullivan, is the location of large caverns, and the LaJolla Spring Cavern Complex, about 7 miles northeast of Sullivan, is the site of a large show cave (Meramec Caverns 2003). Groundwater flow beneath the facility also appears to be influenced by the operation of the City of Sullivan's municipal wells.

There is a potential that contaminated groundwater from the facility may have traveled as far as the Meramec Caverns/LaJolla Springs Cavern Complex. Dye trace studies of groundwater at the TRW facility detected dye in water samples collected at the Meramec Caverns/LaJolla Springs Cavern Complex (EPA 2002a). Moreover, groundwater collected in 2003 from the stream inside the cave had concentrations of TCE (12.3 µg/l) that exceeded the MCL (MDNR 2003). Although the dye trace study indicates that contaminated groundwater may be traveling to the cavern from the former TRW facility, the presence of chlorofluorocarbons (CFC) in water samples collected from the Meramec Caverns/LaJolla Springs Cavern Complex suggests that the nearby closed City of Sullivan landfill is a potential source. The landfill is currently part of an ongoing Superfund investigation (Tetra Tech 2003). Analysis of groundwater samples collected from MW-1, adjacent to the closed landfill, has detected the presence of CFCs at the landfill site. Investigations at the landfill have also determined that the landfill was constructed on top of a buried karst feature (sinkhole) and could be acting as a conduit for contaminant migration from the landfill. In addition TRW is not a known source for CFC contamination.

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As part of the OGV investigation, dye traces studies of Winsel Creek (a losing stream in proximity to MW-1 [adjacent to the closed landfill] ) and a sinkhole beneath the closed Sullivan Landfill just east of MW-1 have emerged at La Jolla Spring approximately 2 miles east of the closed Sullivan Landfill. This suggests a subsurface connection between the Meramec Caverns/LaJolla Springs Cavern Complex and the area around MW-1 and the closed Sullivan Landfill.

Determining the potential contribution of TCE at the Meramec Caverns/LaJolla Springs Cavern Complex that may have originated from the former TRW facility is difficult and may never be confirmed (MDNR 2005). RFI data suggest that surface water is not currently contaminated adjacent to the former TRW facility (OBG 1997). Groundwater analyses and dye trace studies from the area adjacent to the closed Sullivan landfill suggest that the landfill is a potential source for contamination detected at the Meramec Caverns/LaJolla Springs Cavern Complex.

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6. Can the **discharge** of "contaminated" groundwater into surface water be shown to be "**currently acceptable**" (i.e., not cause impacts to surface water, sediments or eco-systems that should not be allowed to continue until a final remedy decision can be made and implemented<sup>3</sup>)?

\_\_\_\_\_ If yes - continue after either: 1) identifying the Final Remedy decision incorporating these conditions, or other site-specific criteria (developed for the protection of the site's surface water, sediments, and eco-systems), and referencing supporting documentation demonstrating that these criteria are not exceeded by the discharging groundwater; OR 2) providing or referencing an interim-assessment<sup>4</sup>, appropriate to the potential for impact, that shows the discharge of groundwater contaminants into the surface water is (in the opinion of a trained specialists, including ecologist) adequately protective of receiving surface water, sediments, and eco-systems, until such time when a full assessment and final remedy decision can be made. Factors which should be considered in the interim-assessment (where appropriate to help identify the impact associated with discharging groundwater) include: surface water body size, flow, use/classification/habitats and contaminant loading limits, other sources of surface water/sediment contamination, surface water and sediment sample results and comparisons to available and appropriate surface water and sediment "levels," as well as any other factors, such as effects on ecological receptors (e.g., via bio-assays/benthic surveys or site-specific ecological Risk Assessments), that the overseeing regulatory agency would deem appropriate for making the EI determination.

\_\_\_\_\_ If no - (the discharge of "contaminated" groundwater can not be shown to be "**currently acceptable**") - skip to #8 and enter "NO" status code, after documenting the currently unacceptable impacts to the surface water body, sediments, and/or eco-systems.

\_\_\_\_\_ If unknown - skip to 8 and enter "IN" status code.

Rationale and Reference(s):

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<sup>3</sup> Note, because areas of inflowing groundwater can be critical habitats (e.g., nurseries or thermal refugia) for many species, appropriate specialist (e.g., ecologist) should be included in management decisions that could eliminate these areas by significantly altering or reversing groundwater flow pathways near surface water bodies.

<sup>4</sup>The understanding of the impacts of contaminated groundwater discharges into surface water bodies is a rapidly developing field and reviewers are encouraged to look to the latest guidance for the appropriate methods and scale of demonstration to be reasonably certain that discharges are not causing currently unacceptable impacts to the surface waters, sediments or eco-systems.

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7. Will groundwater **monitoring** / measurement data (and surface water/sediment/ecological data, as necessary) be collected in the future to verify that contaminated groundwater has remained within the horizontal (or vertical, as necessary) dimensions of the "existing area of contaminated groundwater?"

If yes - continue after providing or citing documentation for planned activities or future sampling/measurement events. Specifically identify the well/measurement locations which will be tested in the future to verify the expectation (identified in #3) that groundwater contamination will not be migrating horizontally (or vertically, as necessary) beyond the "existing area of groundwater contamination."

If no - enter "NO" status code in #8.

If unknown - enter "IN" status code in #8.

Rationale and Reference(s):

Exposure to contaminated groundwater from beneath the former TRW facility has been addressed by air stripper design and installation on municipal well COS-2, with VOCs being removed from the water prior to introduction into the City's water supply system. The continual operation of this municipal well (COS-2) also incidentally acts as a containment mechanism that precludes the majority of contaminated groundwater from further migrating out of the immediate vicinity of the site and COS-2. Diffuse, low-level TCE contamination exists beyond the capture zone for COS-2. The plume beyond this capture zone is less than 50 ppb and typically near the drinking water standard of 5 ppb. Pumping of COS-2 likely captures any further transport from the former TRW site.

An operation and maintenance plan sets forth requirements for TRW, including time frames for repair in the event the air stripper fails to operate, thus keeping this municipal well in operation as much as practicable. As part of the final remedy consent order being negotiated at the time of this EI, TRW has a Groundwater Monitoring Plan in place that requires regular sampling of their groundwater monitoring well network of 41 monitoring wells and all City of Sullivan municipal wells. Monitoring wells are sampled at frequencies ranging from quarterly to biennially; City of Sullivan municipal wells and a selection of domestic wells are sampled and analyzed quarterly (EPA 2003). All samples are analyzed for VOCs and for total chromium and total lead. Some samples with high turbidity also may be filtered and analyzed for dissolved metals (OBG 1997; Arcadis G&M [Arcadis] 2002). If sampling data indicates that the contaminant plume is migrating beyond the currently understood boundary of the monitoring well network, TRW is required to install additional monitoring wells as necessary to define the new extent of the contaminant plume. Additionally, a Drinking Water Contingency Plan is in place with TRW that requires any newly identified contamination at a private or municipal well (that is above the action levels) to be evaluated as to the source of contamination. If it is determined by the agencies that the contaminant's origin was the former TRW facility, the contingency plan would be triggered and TRW would evaluate treatment or an alternative water supply source. The facility also currently operates two shallow depth recovery wells with associated air strippers, and the final remedy requires installation of an additional intermediate depth recovery well (EPA 2000, 2002a). It is anticipated that the completion of the on-site deeper recovery well, as part of the final remedy, will further restrict plume movement and lessen concentrations both on-site and in COS-2 over time (MDNR 2005).

Superfund has proposed a preferred remedy for the OGV site to address contaminated groundwater. The preferred remedy for the OGV site is: Alternative Water Supply/Treatment at Private Wellheads, Groundwater Monitoring and Operation/Monitoring of Air Stripper. This remedy involves: abandonment and plugging of OGV01; providing clean water sources via the placement of wellhead treatment systems or a connection to the public water supply at those residential and commercial/industrial wells that exceed the remediation goal; conducting a well survey; monitoring groundwater at residential, commercial/industrial, municipal and monitoring wells to ensure the safety of the water source. Currently, wellhead treatment systems are in place for residential

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wells with TCE contamination above the MCL and municipal well OGV02 is equipped with an air stripper to reduce levels of TCE in the municipal water supply. Currently there are no known unacceptable exposures to contaminated groundwater associated with the OGV site occurring. Groundwater quality sampling as part of the proposed remedy at the OGV site, along with the groundwater monitoring associated with the TRW site (as mentioned above) will serve as a regional network of wells to monitor groundwater contamination in the area.

Investigations at the TRW facility and the OGV site have revealed the presence of similar contaminants at both sites. The presence of karst features in the subsurface has further complicated the issues of the extent and source for groundwater contamination in the area. Some data exists (groundwater pumping data) which suggests that there could be a connection between the contamination identified in the OGV wells and the TRW site. Other data, specifically the detection of trichlorofluoromethane (CFC-11 [Freon] ) in OGV municipal wells suggests that the contamination in the OGV wells is the result of an alternate source(s). Specifically the closed Sullivan Landfill which is located approximately .75 miles northeast of OGV01 and OGV02. Other data which suggest a source other than TRW for the OGV well contamination include: 1) Analytical results of groundwater samples collected from MW-1, which is adjacent to the closed landfill has detected the presence of Freon, TCE, cis-1,2-DCE, 1,1-DCA and methylene chloride; 2) A sinkhole (karst feature) which has been identified in the closed Sullivan Landfill just east of MW-1. The sinkhole acts as a direct conduit for contaminant migration to the subsurface.

The investigations at both TRW and OGV have identified the potential exposure points for contaminated groundwater. Measures are in place to treat groundwater prior to consumption and to monitor groundwater quality in the region. The presence of karst features in the subsurface complicates the ability to effectively monitor the extent of contamination with certainty, however, overlapping groundwater monitoring networks are in place which are expected to minimize this uncertainty and provide adequate knowledge of future contaminant extent. As indicated above, contingencies will also be in place in the consent order and related documents which will address installation of additional monitoring wells when, and if, needed.

As part of the OGV site, Superfund is planning additional investigation of potential source areas for the OGV groundwater contamination. This will include further investigation of the closed Sullivan Landfill.

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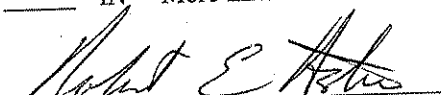
8. Check the appropriate RCRA Info status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

YE - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the TRW facility, EPA ID # MOD094390416, located at 300 Ramsey Street, Sullivan, MO 63080. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

NO - Unacceptable migration of contaminated groundwater is observed or expected.

IN - More information is needed to make a determination.

Completed by:

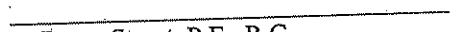


Robert E. Aston, R.G.  
Project Manager,  
RCRA Corrective Action & Permits Branch  
EPA Region 7

Date:

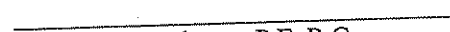
9/26/07

Reviewed by:

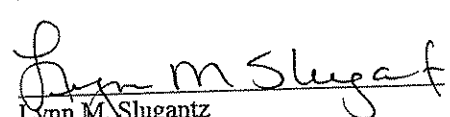
  
R. Bruce Stuart, P.E., R.G.  
Chief, Groundwater Unit  
Permits Section  
Missouri Department of Natural Resources

Date:

Supervisors:

  
Richard A. Nussbaum, P.E., R.G.  
Chief, Permits Section  
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Hazardous Waste Program

Date:

  
Lynn M. Slugantz  
Branch Chief,  
RCRA Corrective Action & Permits Branch  
EPA Region 7

Date:

9/26/07

Migration of Contaminated Groundwater Under Control  
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R. Check the appropriate RCRA Info status codes for the Migration of Contaminated Groundwater Under Control EI (event code CA750), and obtain Supervisor (or appropriate Manager) signature and date on the EI determination below (attach appropriate supporting documentation as well as a map of the facility).

**YI** - Yes, "Migration of Contaminated Groundwater Under Control" has been verified. Based on a review of the information contained in this EI determination, it has been determined that the "Migration of Contaminated Groundwater" is "Under Control" at the TRW facility, EPA ID # MOD094390416, located at 300 Ramsey Street, Sullivan, MO 63080. Specifically, this determination indicates that the migration of "contaminated" groundwater is under control, and that monitoring will be conducted to confirm that contaminated groundwater remains within the "existing area of contaminated groundwater" This determination will be re-evaluated when the Agency becomes aware of significant changes at the facility.

**NO** - Unacceptable migration of contaminated groundwater is observed or expected.

**IN** - More information is needed to make a determination.

Completed by: *Robert F. Aston*  
Robert F. Aston, R.G.  
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RCRA Corrective Action & Permits Branch  
EPA Region 7

Date: 9/26/07

Reviewed by: *R. Bruce Stuart*  
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Permits Section  
Missouri Department of Natural Resources

Date: 9/26/07

Supervisors: *Richard A. Nussbaum*  
Richard A. Nussbaum, P.E., R.G.  
Chief, Permits Section  
Missouri Department of Natural Resources  
Hazardous Waste Program

Date: 9/27/07

*Lynn M. Slagatz*  
Lynn M. Slagatz  
Branch Chief,  
RCRA Corrective Action & Permits Branch  
EPA Region 7

Date: 9/26/07

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Locations where References may be found:

EPA Region 7 Headquarters  
RCRA Files  
901 North 5<sup>th</sup> Street  
Kansas City, Kansas 66101

Hazardous Waste Program Files  
Missouri Department of Natural Resources  
1738 E. Elm Street  
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**REFERENCES**

- ABB Environmental Services, Inc. 1992. "Site Investigation and Remedial Assessment Report, Sullivan Landfill." September.
- Arcadis G&M (Arcadis). 2002. "Second Quarter 2002, Quarterly Groundwater Monitoring Report, Former TRW Facility." August 23.
- Arcadis. 2003a. "Revisions to Second Quarter 2003, Quarterly Groundwater Monitoring Report, Former TRW Facility." October 22.
- Arcadis. 2003b. "Third Quarter 2003, Quarterly Groundwater Monitoring Report, Former TRW Facility." November 26.
- Arcadis. 2005. "2004 Annual Groundwater Monitoring Report, Former TRW Facility" February 2005.
- Arcadis. 2007. "2006 Annual Groundwater Monitoring Report, Former TRW Facility" March 2007.
- City of Sullivan (Sullivan). 2002. "Appeal by the City of Sullivan, Missouri, in re TRW/Ramsey Site." May
- Environmental Protection Agency, U.S. (EPA). 2000. "Public Notice, Statement of Basis, and Administrative Record." April.
- EPA. 2001. "Hazard Ranking System National Priorities List Candidate Site Documentation Record for Oak Grove Village Well." June.
- EPA. 2002a. "Final Remedy Decision, TRW, Incorporated." February.
- EPA. 2002b. "List of Contaminants and their MCLs (Maximum Contaminant Levels)." EPA 816-F-02-013. July.
- EPA. 2003. Letter regarding the Addendum to the Revised Groundwater Monitoring Plan Dated July 3, 2002. To Richard Bell, TRW. From John Smith. September 12.
- Meramec Caverns. 2003. "Meramec Caverns." Accessed on December 22. On-line Address:  
<http://www.americascave.com/>
- Missouri Department of Natural Resources (MDNR). 1988. "Addendum to Oak Grove Village Public Water Supply Well PA/SI, Franklin County, Missouri." July 28.
- MDNR. 2003. Letter regarding Phase 2 Remedial Investigation and Combined Air Monitoring and Water Sampling. To Les Turilli, Meramec Caverns. From Candice McGhee. December 12.
- MDNR. 2005. Letter regarding air and water sampling results at cave complex. To: Les Turilli, Meramec Caverns, From: Candice McGhee.
- MDNR. 2007. Superfund Proposed Plan For Interim Action, Oak Grove Village Well Site, Operable Unit 1, Oak Grove Village, Missouri.
- O'Brien & Gere Engineers, Inc. (OBG). 1997. "Resource Conservation and Recovery Act (RCRA) Facility Investigation Report, Former TRW Facility, Sullivan, Missouri." June.

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OBG. 1998. "Draft Report Corrective Measures Study, TRW, Inc." June.

Tetra Tech. 2003. Record of Conference Call Attended by Tetra Tech, EPA, and MDNR Representatives.  
December 3.

TRW Automotive [TRW]. 2003. Letter regarding Taste and Odor Complaints. To Robert K. Morrison, EPA.  
From Richard Bell. September 12.