

**GROUNDWATER MONITORING REPORT
FOR THE
OCTOBER 1999 SAMPLING EVENT
GROUNDWATER INCIDENT NO. 10032**

**GIRMES SITE, FORMERLY SKF USA INC.
BUNCOMBE COUNTY, NORTH CAROLINA**

PREPARED BY RMT, INC., NORTH CAROLINA

December 1999

Robert P. Stevens, P.E.
Project Manager



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Certification

The hydrogeology work for the Girmes Site, formerly SKF USA Inc. in Buncombe County, North Carolina, was performed by an RMT, Inc. Consulting Hydrogeologist in support of RMT, Inc., North Carolina.

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist
RMT, Inc.



Section 1

Introduction

The J.L. deBall Girmes of America (Girmes) site is a former textile plant located on Old Highway 74 East in Asheville, North Carolina. The site was formerly occupied by SKF USA Inc. (SKF) from approximately 1960 to 1973. North Carolina Department of Environment and Natural Resources (NC DENR) issued SKF a Notice of Violation (NOV) on April 2, 1993 (Groundwater Incident Number 10032). In response to the NOV and associated correspondence, SKF conducted a Comprehensive Site Assessment (CSA) in 1993 and 1994. Volatile organic compounds (VOCs), in particular, trichloroethene, 1,2-dichloroethene, and vinyl chloride were found in groundwater at the site. The results of the CSA were submitted to NC DENR in November 1994. Following the CSA, a Corrective Action Plan (CAP) to address groundwater with dissolved VOCs was prepared and submitted to NC DENR in October 1996.

The CAP for the Girmes site is being implemented by RMT, Inc., North Carolina (RMT). A groundwater recovery system consisting of three groundwater recovery wells and an air stripper unit were installed in 1997 and early 1998. The system began operation on March 4, 1998.

In accordance with the CAP, groundwater elevations are to be measured in all wells on a quarterly basis. Water samples are collected from all 29 monitoring wells, three recovery wells, and four surface water stations, on a semiannual basis. Thirteen of these monitoring wells, along with the three recovery wells, are also to be sampled quarterly. Quarterly sampling is scheduled to occur in January, April, July, and October of each year. Those wells specified in the CAP to be sampled semiannually are sampled in April and October of each year. The CAP specifies that the samples are to be analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride.

This report presents results of the October 1999 quarterly monitoring event.



Section 2

Groundwater Elevations

Groundwater elevations were measured from all of the monitoring and recovery wells on October 25, 1999. Groundwater elevations measured on October 25, 1999, along with pre-startup elevations measured in January 1998, and historical water levels measured since system startup are summarized in Table 1. Three bedrock monitoring wells, MW-14, MW-18, and MW-21 have been dry since July 1998 as a result of drawdown associated with the groundwater recovery system. Bedrock monitoring well MW-22 has been dry since April 1999.

Water levels were used to construct the water table map shown on Plate 1. As specified in the CAP, hydrographs were also prepared for bedrock wells MW-4, MW-5, MW-14, MW-17, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, MW-27, and MW-28A. These hydrographs are presented in Appendix A. The hydrographs include water levels measured in 1997 to identify groundwater trends prior to system startup. Several wells exhibited significant drawdown after system startup. For these wells, an inferred data point, based on the last actually measured water level, was plotted on the hydrograph for the date of March 4, 1998. The purpose of the inferred data point is to better illustrate drawdown since system startup.

The water table map and hydrographs for wells MW-14, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, and MW-27 continue to show a significant cone of depression around the recovery wells since system startup. Wells MW-14, MW-18, MW-21, and MW-22 continue to be dry. On the southwest side of the facility, water levels in wells MW-19, MW-23, MW-24, and MW-28 increased slightly (0.07 to 1.21 feet) from water levels measured in July 1999. Meanwhile, water levels in wells MW-26R, MW-27, and MW-28A decreased slightly (0.22 to 1.23 feet). The water level in recovery well RW-1 increased slightly (0.86 feet) since last measured in July 1999. The water level in recovery well RW-4 increased 2.79 feet since July 1999. The increase in water level in monitoring wells MW-19, MW-23, and MW-24 may be in response to the increased water level in recovery wells RW-1 and RW-4. The water level in recovery well RW-3 decreased slightly (0.11 feet) since July 1999. The cone of depression continues to extend over 1,100 feet laterally in a northwest/southeast direction, parallel with Gashes Creek. The cone also continues to reach beneath Gashes Creek and encompasses well MW-23.

On the northeast side of the facility, all of the monitoring wells exhibited decreases in water level of 0.07 feet (MW-16A) to 2.73 feet (MW-17). Monitoring well MW-12 had a decline in

water level of 5.43 feet; however, this water level is not consistent with previous water levels recorded for this well and is suspect.

During the April 1999 sampling event, it was noted that while most water levels on the northeast side of the facility increased (as a result of the wetter season), three wells, MW-1, MW-5, and MW-6, had declines in water level. In the report for the April sampling event, it was suggested that the decline in the wells might be a result of the cone of depression for the remediation system on the southwest side of the facility beginning to reach that area. With most or all of the water levels on the northeast side of the facility declining during the July and October 1999 sampling events (as a result of the sustained drought), potential responses to pumping on the southwest side of the facility has not been noticeable. The water levels in these three wells will continue to be watched to determine if the cone of depression for the recovery system has reached these wells.

Table 1
Summary of Groundwater Elevations

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Section 3

Groundwater and Surface Water Quality

Groundwater samples were collected from 25 monitoring wells and recovery wells RW-1, RW-3, and RW-4 on October 26 through October 28, 1999. Surface water samples were collected at stations SW-1 through SW-4 at that time. Sampling locations are shown on Figure 1 and Plate 1. Wells MW-14, MW-18, MW-21, and MW-22 were dry due to drawdown and could not be sampled. Groundwater samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. In addition, nine wells were analyzed for tetrachloroethene. Analytical results are summarized in Table 2. Laboratory analytical reports are presented in Appendix B. Tables 3 and 4 present summaries of historical concentrations of trichloroethene and 1,2-dichloroethene.

3.1 Standard Monitoring Program

During the October 1999 sampling event, 19 monitoring wells were sampled on the northeast side of the Girmes facility (Plate 1). Trichloroethene was detected in samples collected from 10 wells, with the concentrations exceeding the NC 2L standard of 0.0028 mg/L in nine of the samples. Trichloroethene concentrations increased slightly in wells MW-2, MW-4, MW-5, and MW-17, and decreased slightly in wells MW-9 and MW-20. Concentrations were generally unchanged in the remaining four wells (MW-7, MW-10, MW-11, and MW-15A). Groundwater samples collected from seven monitoring wells also had detections of 1,2-dichloroethene. Concentrations of 1,2-dichloroethene exceeded the NC 2L standard of 0.07 mg/L in three of these samples (MW-4, MW-5, and MW-10). 1,2-Dichloroethene concentrations increased slightly in wells MW-4, MW-7, and MW-10. The 1,2-dichloroethene concentration in wells MW-2, MW-5, MW-9, and MW-20 remained generally unchanged.

Vinyl chloride was detected in two wells, MW-10 and MW-13, on the northeast side of the Girmes facility. The detected concentration in MW-13, 0.0046 mg/L, has decreased from the previous sampling event (0.015 mg/L in July 1999) and exceeds the NC 2L standard of 0.000015 mg/L. Trichloroethene and 1,2-dichloroethene were not detected in MW-13. Well MW-10 had an estimated vinyl chloride concentration of 0.00067 mg/L. This concentration also exceeds the NC 2L standard. Vinyl chloride was not detected in MW-10 when last sampled in April 1999.

On the southwest side of the Girmes facility, seven monitoring wells, MW-19, MW-23, MW-24, MW-26R, MW-27, MW-28, and MW-28A, and three recovery wells, RW-1, RW-3, and RW-4, were sampled. Monitoring wells MW-14, MW-18, MW-21, and MW-22 were dry and could not be sampled. Trichloroethene was detected in groundwater samples from five monitoring wells

(MW-19, MW-23, MW-24, MW-26R, and MW-28A) and all three recovery wells. Detected concentrations in all of the wells, except MW-26R, exceeded NC 2L standards. 1,2-Dichloroethene was detected in six of the groundwater samples with no concentrations exceeding the NC 2L standards.

Trichloroethene concentrations decreased slightly in samples collected from monitoring wells MW-24, MW-26R, MW-28A, and all three recovery wells. The trichloroethene concentration increased slightly in monitoring well MW-19 and was generally unchanged in well MW-23. Concentrations of 1,2-dichloroethene decreased slightly in monitoring well MW-26R and recovery well RW-3, and increased slightly in well MW-19. The 1,2-dichloroethene concentrations were generally unchanged in the remaining wells, MW-23, MW-28A, RW-1, and RW-4.

Vinyl chloride was detected only in wells MW-23 and MW-26R, on the southwest side of the Girmes facility. These wells are located on Dotson's property on the southwest side of Gashes Creek. The detected concentration in MW-26R, 0.029 mg/L, is a slight decrease from the previous sampling event and is above the NC 2L standard. The detected concentration in MW-23, 0.00028 mg/L, is estimated and is above the NC 2L standard.

Surface water samples were collected from Gashes Creek at stations SW-1, SW-2, SW-3, and SW-4. Samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. None of these constituents were detected in any of the samples.

3.2 Tetrachloroethene

Since shortly after startup of the groundwater recovery system, tetrachloroethene has been found in the influent to the treatment system. Select monitoring wells sampled during the January 1999 monitoring event were analyzed for tetrachloroethene in addition to the standard analytical parameters. The January 1999 analytical results along with historical groundwater analytical data collected at the site during the Comprehensive Site Assessment lead SKF to the conclusion that the tetrachloroethene and other VOCs found on the southwest side of Gashes Creek have no relationship to the affected groundwater found on the Girmes facility.

In the Groundwater Monitoring Report for the January 1999 Sampling Event, SKF modified the groundwater monitoring program to continue monitoring all of the wells specified in the CAP according to the specified schedule. In addition to trichloroethene, 1,2-dichloroethene, and vinyl chloride, recovery wells RW-1, RW-3, and RW-4 and select monitoring wells would also be sampled for tetrachloroethene.

During the October 1999 sampling event, monitoring wells MW-19, MW-23, MW-24, MW-26R, MW-28, MW-28A, and the three recovery wells were analyzed for tetrachloroethene. Analytical results are included in Table 2. Tetrachloroethene was not detected in any of the monitoring wells on the Girmes side (northeast) of Gashes Creek; however, tetrachloroethene was detected in monitoring wells MW-23 and MW-28A located on the southwest side of Gashes Creek. Tetrachloroethene was detected in two of the recovery wells, RW-1 and RW-3. These wells recover groundwater from the southwest side of Gashes Creek as indicated by the water table map on Plate 1. These are the same two monitoring wells and two recovery wells in which tetrachloroethene was detected in January, April, and July 1999. The tetrachloroethene concentration in recovery well RW-3 increased slightly while concentrations in the other three wells decreased.

The analytical results for tetrachloroethene confirm the results obtained in January, April, and July 1999. The tetrachloroethene found in these wells appears to be the result of a release on the southwest side of Gashes Creek and does not appear to be related to groundwater quality on the Girmes facility. However, SKF will, for the time being, continue analyzing groundwater samples from wells MW-18, MW-19, MW-21, MW-23, MW-24, MW-26R, MW-28, MW-28A, RW-1, RW-3, and RW-4 for tetrachloroethene in order to monitor concentration trends and their effects on the groundwater recovery system.

Figure 1 Location of Data Points

Table 2
Analytical Results for Groundwater and Surface Water Samples
Collected October 26 to October 28, 1999

Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Section 4

Recovery System Performance

The groundwater recovery system utilizes three recovery wells to capture affected groundwater. Water from these wells is pumped to an air stripper where VOCs are removed, and treated water is discharged into Gashes Creek. Influent and effluent to the stripper is sampled on a monthly basis. Effluent flow is recorded continuously. The analytical results for the influent and effluent are used along with the flow data to estimate the amount of trichloroethene removed each month. Monthly volumes of treated groundwater and the estimated amount of trichloroethene removed since system startup in March 1998 through October 1999 are summarized in Table 5. During August 1999 through October 1999, it is estimated that 4.1 million gallons of groundwater were recovered and treated. It is estimated that over 18.2 pounds of trichloroethene were removed during August 1999 through October 1999.

The pumping rates in all three recovery wells are being adjusted periodically until water level equilibrium near the bottom of the wells can be reached.

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
February 1998	0	0	0	Not operational
March 1998	28	1.58	N/C ⁽¹⁾	Startup 3/4/98
April 1998	30	1.62	39.1	Normal operation
May 1998	31	1.64	35.6	Normal operation
June 1998	30	1.58	17.1	Normal operation
July 1998	31	1.53	17.9	Normal operation. Adjusted pump rate for RW-4
August 1998	31	1.42	14.2	RMT coordinating maintenance of pump controllers
September 1998	30	1.47	13.5	Normal operation, pump controllers repaired/calibrated
October 1998	31	1.40	11.7	Removed pump from RW-3. Pump will be cleaned and repaired, as needed.
November 1998	30	1.30	11.9	RW-3 pump replaced
December 1998	31	1.28	6.7	Normal operation
January 1999	31	1.31	7.5	Auto dialer was reprogrammed. System inspected.
February 1999	28	1.33	7.42	Normal operation
March 1999	31	1.33	3.27	Normal operation. Calibrated flow meter and updated flow meter software.
April 1999	30	1.35	1.90	Normal operation. System inspected during groundwater sampling.
May 1999	31	1.46	10.7	Normal operation
June 1999	30	1.39	7.06	Normal operation
July 1999	31	1.46	7.05	Normal operation

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
August 1999	31	1.42	7.1	Normal operation
September 1999	30	1.33	6.6	Normal operation
October 1999	31	1.35	4.5	Normal operation. System inspected during groundwater sampling.
Total since system startup, March 4, 1998	607	28.55	230.8	For period beginning March 4, 1998, and ending October 31, 1999.

⁽¹⁾ Excluding March 1998.



Appendix A

Hydrographs for Bedrock Wells



Appendix B

Laboratory Analytical Reports

**GROUNDWATER MONITORING REPORT
FOR THE
JANUARY 2000 SAMPLING EVENT
GROUNDWATER INCIDENT NO. 10032**

**GIRMES SITE, FORMERLY SKF USA INC.
BUNCOMBE COUNTY, NORTH CAROLINA**

PREPARED BY RMT NORTH CAROLINA, INC.

April 2000

Robert P. Stevens, P.E.
Project Manager



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Certification

The hydrogeology work for the Girmes Site, formerly SKF USA Inc. in Buncombe County, North Carolina, was performed by an RMT, Inc. Consulting Hydrogeologist in support of RMT North Carolina, Inc.

Britney Camper
Groundwater and Environmental
Scientist

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist
RMT, Inc.



Section 1

Introduction

The J.L. deBall Girmes of America (Girmes) site is a former textile plant located on Old Highway 74 East in Asheville, North Carolina. The site was formerly occupied by SKF USA Inc. (SKF) from approximately 1960 to 1973. North Carolina Department of Environment and Natural Resources (NC DENR) issued SKF a Notice of Violation (NOV) on April 2, 1993 (Groundwater Incident Number 10032). In response to the NOV and associated correspondence, SKF conducted a Comprehensive Site Assessment (CSA) in 1993 and 1994. Volatile organic compounds (VOCs), in particular, trichloroethene, 1,2-dichloroethene, and vinyl chloride were found in groundwater at the site. The results of the CSA were submitted to NC DENR in November 1994. Following the CSA, a Corrective Action Plan (CAP) to address groundwater with dissolved VOCs was prepared and submitted to NC DENR in October 1996.

The CAP for the Girmes site is being implemented by RMT North Carolina, Inc. (RMT). A groundwater recovery system consisting of three groundwater recovery wells and an air stripper unit were installed in 1997 and early 1998. The system began operation on March 4, 1998.

In accordance with the CAP, groundwater elevations are to be measured in all wells on a quarterly basis. Water samples are collected from all 29 monitoring wells, three recovery wells, and four surface water stations, on a semiannual basis. Thirteen of these monitoring wells, along with the three recovery wells, are also to be sampled quarterly. Quarterly sampling is scheduled to occur in January, April, July, and October of each year. Those wells specified in the CAP to be sampled semiannually are sampled in April and October of each year. The CAP specifies that the samples are to be analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride.

This report presents results of the January 2000 quarterly monitoring event.



Section 2

Groundwater Elevations

Groundwater elevations were measured from all of the monitoring and recovery wells on January 25, 2000. Groundwater elevations measured on October 25, 1999, along with pre-startup elevations measured in January 1998, and historical water levels measured since system startup are summarized in Table 1. Three bedrock monitoring wells, MW-14, MW-18, and MW-21 have been dry since July 1998 as a result of drawdown associated with the groundwater recovery system. Bedrock monitoring well MW-22 has been dry since April 1999.

Water levels were used to construct the water table map shown on Plate 1. As specified in the CAP, hydrographs were also prepared for bedrock wells MW-4, MW-5, MW-14, MW-17, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, MW-27, and MW-28A. These hydrographs are presented in Appendix A. The hydrographs include water levels measured in 1997 to identify groundwater trends prior to system startup. Several wells exhibited significant drawdown after system startup. For these wells, an inferred data point based on the last actually measured water level was plotted on the hydrograph for March 4, 1998, the date of system startup. The purpose of the inferred data point is to better illustrate drawdown since system startup.

The water table map and hydrographs for wells MW-14, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, and MW-27 continue to show a significant cone of depression around the recovery wells since system startup. Wells MW-14, MW-18, MW-21, and MW-22 continue to be dry. On the southwest side of the facility, water levels in wells MW-19, MW-27, and MW-28A increased slightly (0.43 to 1.31 feet) from water levels measured in October 1999. Meanwhile, water levels in wells MW-20, MW-23, MW-24, MW-26R, and MW-28 decreased slightly (0.12 to 0.83 feet). Due to its pumping cycle, the water level in recovery well RW-3 exhibits an increase (56 feet) since it was last measured in October 1999. The water levels in recovery wells RW-1 and RW-4 decreased 17.29 feet and 10.95 feet respectively since October 1999. The decrease in water level in monitoring wells MW-23, MW-24, and MW-26R may be in response to the draw down in recovery wells RW-1 and RW-4. The cone of depression continues to extend over 1,100 feet laterally in a northwest/southeast direction, parallel with Gashes Creek. The cone also continues to reach beneath Gashes Creek and encompasses well MW-23.

On the northeast side of the facility, the water level in monitoring wells MW-1, MW-10, and MW-12 exhibit an increases of 0.83 feet to 2.55 feet. The remaining wells are generally unchanged as the water level fluctuation was within ± 0.35 feet.

Table 1
Summary of Groundwater Elevations

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Section 3

Groundwater and Surface Water Quality

Groundwater samples were collected from 10 monitoring wells and recovery wells RW-1, RW-3, and RW-4 on January 26 and 27, 2000. Sampling locations are shown on Figure 1 and Plate 1. Wells MW-14, MW-18, and MW-21 were dry due to drawdown and could not be sampled. Groundwater samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. In addition, eight wells were analyzed for tetrachloroethene. Analytical results are summarized in Table 2. Laboratory analytical reports are presented in Appendix B. Tables 3 and 4 present summaries of historical concentrations of trichloroethene and 1,2-dichloroethene.

3.1 Standard Monitoring Program

During the January 2000 sampling event, five monitoring wells, MW-2, MW-4, MW-5, MW-9, and MW-13, were sampled on the northeast side of the Girmes facility (Plate 1).

Trichloroethene and 1,2-dichloroethene were detected in samples collected from all of these wells except MW-13. Detected concentrations of trichloroethene exceeded the NC 2L standard of 0.0028 mg/L. Detected concentrations of 1,2-dichloroethene exceeded the NC 2L standard of 0.07 mg/L in only two (MW-4 and MW-5) out of the five wells. Trichloroethene concentrations increased in wells MW-2, MW-4, and MW-5, and decreased in well MW-9. Likewise, 1,2-dichloroethene concentrations increased slightly in well MW-5, but decreased slightly in MW-4, and MW-9. Concentrations in well MW-2 remain unchanged.

Vinyl chloride was detected in one well, MW-13, on the northeast side of the Girmes facility. The detected concentration in MW-13, 0.0024 mg/L, has decreased from the previous sampling event (0.0046 mg/L in October 1999) and exceeds the NC 2L standard of 0.000015 mg/L. Trichloroethene and 1,2-dichloroethene were not detected in MW-13.

On the southwest side of the Girmes facility, five monitoring wells, MW-19, MW-23, MW-24, MW-26R, and MW-28A, and three recovery wells, RW-1, RW-3, and RW-4, were sampled. Monitoring wells MW-14, MW-18, and MW-21 were dry and could not be sampled. Trichloroethene was detected in groundwater samples from five monitoring wells (MW-19, MW-23, MW-24, MW-26R, and MW-28A) and all three recovery wells. Detected concentrations in all of the wells, except MW-26R, exceeded NC 2L standards. 1,2-Dichloroethene was detected in groundwater samples from four of the monitoring wells (MW-19, MW-23, MW-26R, and MW-28A) and in all three recovery wells, although none of the concentrations exceeded the NC 2L standard.

Trichloroethene concentrations decreased slightly in samples collected from monitoring wells MW-23, MW-26R, and MW-28A. The trichloroethene concentration increased slightly in monitoring wells MW-19 and MW-24 and all three recovery wells. Concentrations of 1,2-dichloroethene decreased slightly in monitoring wells MW-23, MW-26R, MW-28A, and recovery well RW-3, and increased slightly in well MW-19 and recovery well RW-4. The 1,2-dichloroethene concentrations were generally unchanged in the remaining wells.

Vinyl chloride was detected only in one monitoring well (MW-26R), on the southwest side of the Girmes facility. These wells are located on Dotson's property on the southwest side of Gashes Creek. The detected concentration in MW-26R, 0.027 mg/L, is a slight decrease from the previous sampling event and is above the NC 2L standard.

3.2 Tetrachloroethene

Since shortly after startup of the groundwater recovery system, tetrachloroethene has been found in the influent to the treatment system. Select monitoring wells sampled during the January 1999 monitoring event were analyzed for tetrachloroethene in addition to the standard analytical parameters. The January 1999 analytical results along with historical groundwater analytical data collected at the site during the CSA led SKF to the conclusion that the tetrachloroethene and other VOCs found on the southwest side of Gashes Creek have no relationship to the affected groundwater found on the Girmes facility.

In the Groundwater Monitoring Report for the January 1999 Sampling Event, SKF modified the groundwater monitoring program to continue monitoring all of the wells specified in the CAP according to the specified schedule. In addition to trichloroethene, 1,2-dichloroethene, and vinyl chloride, recovery wells RW-1, RW-3, and RW-4 and select monitoring wells would also be sampled for tetrachloroethene.

During the January 2000 sampling event, monitoring wells MW-19, MW-23, MW-24, MW-26R, MW-28A, and the three recovery wells were analyzed for tetrachloroethene. Analytical results are included in Table 2. Tetrachloroethene was not detected in any of the monitoring wells on the Girmes side (northeast) of Gashes Creek; however, tetrachloroethene was detected in monitoring wells MW-23 and MW-28A located on the southwest side of Gashes Creek. Tetrachloroethene was detected in two of the recovery wells, RW-1 and RW-3. These wells recover groundwater from the southwest side of Gashes Creek as indicated by the water table map on Plate 1. These are the same two monitoring wells and two recovery wells in which tetrachloroethene was detected in January, April, July, and October 1999. The tetrachloroethene concentration in monitoring well MW-23 increased slightly while concentrations in the other three wells decreased.

The analytical results for tetrachloroethene confirm the results obtained in January, April, July, and October 1999. The tetrachloroethene found in these wells appears to be the result of a release on the southwest side of Gashes Creek and does not appear to be related to groundwater quality on the Girmes facility. However, SKF will, for the time being, continue analyzing groundwater samples from wells MW-18, MW-19, MW-21, MW-23, MW-24, MW-26R, MW-28, MW-28A, RW-1, RW-3, and RW-4 for tetrachloroethene in order to monitor concentration trends and their effects on the groundwater recovery system.

Figure 1 Location of Data Points

Table 2
Analytical Results for Groundwater Samples
Collected January 26 to January 27, 2000

Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Historical Trichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Section 4

Recovery System Performance

The groundwater recovery system utilizes three recovery wells to capture affected groundwater. Water from these wells is pumped to an air stripper where VOCs are removed, and treated water is discharged into Gashes Creek. Influent and effluent to the stripper is sampled on a monthly basis. Effluent flow is recorded continuously. The analytical results for the influent and effluent are used along with the flow data to estimate the amount of trichloroethene removed each month. Monthly volumes of treated groundwater and the estimated amount of trichloroethene removed since system startup in March 1998 through January 2000 are summarized in Table 5. During November 1999 through January 2000, it is estimated that 3.8 million gallons of groundwater were recovered and treated. It is estimated that over 12.3 pounds of trichloroethene were removed during November 1999 through January 2000.

The pumping rates in all three recovery wells are being adjusted periodically until water level equilibrium near the bottom of the wells can be reached.

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
February 1998	0	0	0	Not operational
March 1998	28	1.58	N/C ⁽¹⁾	Startup 3/4/98
April 1998	30	1.62	39.1	Normal operation
May 1998	31	1.64	35.6	Normal operation
June 1998	30	1.58	17.1	Normal operation
July 1998	31	1.53	17.9	Normal operation. Adjusted pump rate for RW-4
August 1998	31	1.42	14.2	RMT coordinating maintenance of pump controllers
September 1998	30	1.47	13.5	Normal operation, pump controllers repaired/calibrated
October 1998	31	1.40	11.7	Removed pump from RW-3. Pump will be cleaned and repaired, as needed.
November 1998	30	1.30	11.9	RW-3 pump replaced
December 1998	31	1.28	6.7	Normal operation
January 1999	31	1.31	7.5	Auto dialer was reprogrammed. System inspected.
February 1999	28	1.33	7.42	Normal operation
March 1999	31	1.33	3.27	Normal operation. Calibrated flow meter and updated flow meter software.
April 1999	30	1.35	1.90	Normal operation. System inspected during groundwater sampling.
May 1999	31	1.46	10.7	Normal operation
June 1999	30	1.39	7.06	Normal operation
July 1999	31	1.46	7.05	Normal operation

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
August 1999	31	1.42	7.1	Normal operation
September 1999	30	1.33	6.6	Normal operation
October 1999	31	1.35	4.5	Normal operation. System inspected during groundwater sampling.
November 1999	30	1.31	6.1	Normal operation
December 1999	31	1.29	6.0	Normal operation
January 2000	31	1.19	5.2	Normal operation
Total since system startup, March 4, 1998	699	32.34	248.1	For period beginning March 4, 1998, and ending January 31, 2000.

⁽¹⁾ Excluding March 1998.



Appendix A

Hydrographs for Bedrock Wells



Appendix B

Laboratory Analytical Reports

**GROUNDWATER MONITORING REPORT
FOR THE
APRIL 2000 SAMPLING EVENT
GROUNDWATER INCIDENT NO. 10032**

**Girmes Site, FORMERLY SKF USA INC.
BUNCOMBE COUNTY, NORTH CAROLINA**

PREPARED BY RMT NORTH CAROLINA, INC.

June 2000

Robert P. Stevens, P.E.
Project Manager



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Certification

The hydrogeology work for the Girmes Site, formerly SKF USA Inc., in Buncombe County, North Carolina, was performed by an RMT, Inc. consulting hydrogeologist in support of RMT North Carolina, Inc.

Britney Camper
Groundwater and Environmental
Scientist

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist
RMT, Inc.



Section 1

Introduction

The J.L. deBall Girmes of America (Girmes) site is a former textile plant located on Old Highway 74 East in Asheville, North Carolina. The site was formerly occupied by SKF USA Inc. (SKF) from approximately 1960 to 1973. North Carolina Department of Environment and Natural Resources (NC DENR) issued SKF a Notice of Violation (NOV) on April 2, 1993 (Groundwater Incident Number 10032). In response to the NOV and associated correspondence, SKF conducted a Comprehensive Site Assessment (CSA) in 1993 and 1994. Volatile organic compounds (VOCs), in particular trichloroethene, 1,2-dichloroethene, and vinyl chloride, were found in groundwater at the site. The results of the CSA were submitted to NC DENR in November 1994. Following the CSA, a Corrective Action Plan (CAP) to address groundwater with dissolved VOCs was prepared and submitted to NC DENR in October 1996.

The CAP for the Girmes site is being implemented by RMT North Carolina, Inc. (RMT). A groundwater recovery system consisting of three groundwater recovery wells and an air stripper unit were installed in 1997 and early 1998. The system began operation on March 4, 1998.

In accordance with the CAP, groundwater elevations are to be measured in all wells on a quarterly basis. Water samples are collected from all 29 monitoring wells, three recovery wells, and four surface water stations, on a semiannual basis. Thirteen of these monitoring wells, along with the three recovery wells, are also to be sampled quarterly. Quarterly sampling is scheduled to occur in January, April, July, and October of each year. Those wells specified in the CAP to be sampled semiannually are sampled in April and October of each year. The CAP specifies that the samples are to be analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride.

This report presents results of the April 2000 monitoring event, including the quarterly groundwater elevation measurement at all wells, and the semi-annual sampling at all wells (except for dry wells).



Section 2

Groundwater Elevations

Groundwater elevations measured on April 18, 2000, are summarized in Table 1 along with pre-startup elevations measured in January 1998, and historical water levels measured since system startup. Three bedrock monitoring wells, MW-14, MW-18, and MW-21, have been dry since July 1998 as a result of drawdown associated with the groundwater recovery system. Bedrock monitoring well MW-22 has been dry since April 1999.

Water levels were used to construct the water table map shown on Plate 1. As specified in the CAP, hydrographs were also prepared for bedrock wells MW-4, MW-5, MW-14, MW-17, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, MW-27, and MW-28A. These hydrographs are presented in Appendix A. The hydrographs include water levels measured in 1997 to identify groundwater trends prior to system startup. Several wells exhibited significant drawdown after system startup. For these wells, an inferred data point based on the last actually measured water level prior to startup was plotted on the hydrograph for March 4, 1998, the date of system startup. The purpose of the inferred data point is to better illustrate drawdown since system startup.

The water table map and hydrographs for wells MW-14, MW-18, MW-19, MW-21, MW-23, MW-24, and MW-27 continue to show a significant cone of depression around the recovery wells since system startup. Wells MW-14, MW-18, MW-21, and MW-22 continue to be dry. On the southwest side of the facility, water levels in wells MW-19, MW-20, MW-22, MW-23, MW-24, MW-26R, MW-27, and MW-28A increased slightly (0.18 to 2.28 feet) from water levels measured in January 1999. Meanwhile, water level in well MW-28 decreased slightly (0.5 feet). Due to its pumping cycle, the water level in recovery well RW-3 exhibited a decrease (56 feet) since it was last measured in January 1999. The water levels in recovery wells RW-1 and RW-4 increased 10.14 feet and 10.53 feet respectively since January 2000. The increased water levels in the majority of the monitoring wells on the southwest side of the facility may be in response to the decreased groundwater recovery from wells RW-1 and RW-4. The cone of depression continues to extend over 1,100 feet laterally in a northwest/southeast direction, parallel with Gashes Creek. The cone also continues to reach beneath Gashes Creek and encompasses well MW-23.

On the northeast side of the facility, the water level in monitoring wells MW-1, MW-16, and MW-16A exhibit a decrease of 0.12 feet to 2.17 feet. The remaining wells exhibit an increase in water levels of 0.3 feet to 6.33 feet. The highest increases were found in wells MW-12 (increase

of 6.33 feet), MW-13 (increase of 4.44 feet), and MW-17 (increase of 5.07 feet). These wells are located just upgradient of the Department of Transportation (DOT) administration building. The remaining wells on this side of the site had increases in water levels ranging from 0.12 feet to 2.76 feet.

Monitoring well MW-1, located near the southeast corner of the Girmes facility, had a decrease in water level of over 2 feet while other wells in this area had increases in water levels. Adjacent wells MW-6 and MW-5 had slight increases in water levels (0.57 feet and 0.3 feet, respectively). However, the amount of increase was less than that exhibited in most other wells in this area of the facility. An examination of water level trends for wells MW-1, MW-5, and MW-6 on Table 1 and the hydrograph for MW-5 (see Appendix A) show an overall decreasing trend in groundwater elevations since the startup of the remediation system. The remaining wells on this side of the facility appear to exhibit seasonal fluctuations. The overall water level trend in monitoring wells MW-1, MW-5, and MW-6 indicate that these wells are being affected by pumping of the groundwater recovery system on the southwest side of the facility.

Table 1
Summary of Groundwater Elevations

Page 1



Section 3

Groundwater and Surface Water Quality

Groundwater samples were collected from 25 monitoring wells and from recovery wells RW-1, RW-3, and RW-4 on April 18, April 19, and April 20, 2000. Sampling locations are shown on Figure 1 and Plate 1. Wells MW-14, MW-18, MW-21 and MW-22 were dry due to drawdown and could not be sampled. Groundwater samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. In addition, eight monitoring wells and recovery wells RW-1, RW-3, and RW-4 were analyzed for tetrachloroethene. Analytical results are summarized in Table 2. Laboratory analytical reports are presented in Appendix B. Table 3 and Table 4 present summaries of historical concentrations of trichloroethene and 1,2-dichloroethene.

3.1 Standard Monitoring Program

During the April 2000 sampling event, seventeen monitoring wells, MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10, MW-11, MW-12, MW-13, MW-15, MW-15A, MW-16, MW16A, and MW-17, were sampled on the northeast side of the Girmes facility (Plate 1). Trichloroethene was detected in samples collected from monitoring wells MW-2, MW-4, MW-5, MW-7, MW-9, MW-10, and MW-11. Detected concentrations of trichloroethene exceeded the NC 2L standard of 0.0028 mg/L in all seven wells. 1,2-Dichloroethene was detected in samples collected from monitoring wells MW-2, MW-4, MW-5, MW-9, and MW-10. The detected concentrations exceeded the NC 2L standard of 0.07 mg/L in only two (MW-4 and MW-5) out of these five wells. Trichloroethene concentrations decreased in wells MW-2, MW-4, MW-5, MW-7, MW-10 and MW-11, and increased in well MW-9. Likewise, 1,2-dichloroethene concentrations decreased slightly in wells MW-2, MW-4, MW-5 and MW-10, but increased slightly in MW-9.

Vinyl chloride was detected in samples collected from only one well, MW-13, on the northeast side of the Girmes facility. The detected concentration in MW-13, 0.0049 mg/L, has increased from the previous sampling event (0.0024 mg/L in January 1999) and exceeds the NC 2L standard of 0.000015 mg/L. Trichloroethene and 1,2-dichloroethene were not detected in MW-13.

On the southwest side of the Girmes facility, eight monitoring wells – MW-19, MW-20, MW-23, MW-24, MW-26R, MW-27, MW-28, and MW-28A – and three recovery wells – RW-1, RW-3, and RW-4 – were sampled. Monitoring wells MW-14, MW-18, MW-21 and MW-22 were dry and could not be sampled. Trichloroethene was detected in groundwater samples from six monitoring wells (MW-19, MW-20, MW-23, MW-24, MW-26R, and MW-28A) and all three

recovery wells. Detected concentrations in all of the wells, except MW-26R, exceeded NC 2L standards. 1,2-Dichloroethene was detected in groundwater samples from four of the monitoring wells (MW-20, MW-23, MW-26R, and MW-28A) and in all three recovery wells. Samples collected from only one well, MW-26R, had 1,2-dichloroethene concentrations that exceeded the NC 2L standard.

Trichloroethene concentrations decreased slightly in samples collected from monitoring wells MW-19 and MW-28A and recovery wells RW-1 and RW-3. The trichloroethene concentration increased slightly in monitoring wells MW-20, MW-23, and MW-26R and recovery well RW-4. Trichloroethene concentrations remained consistent in monitoring well MW-24. Concentrations of 1,2-dichloroethene decreased slightly in monitoring wells MW-23 and MW-28A and in recovery wells RW-1 and RW-3, and increased slightly in wells MW-20, MW-26R and recovery well RW-4.

Vinyl chloride was detected only in samples collected from one monitoring well (MW-26R), on the southwest side of the Girmes facility. These wells are located on Dotson's property on the southwest side of Gashes Creek. The detected concentration in MW-26R, 0.051 mg/L, is a slight increase from the previous sampling event and is above the NC 2L standard.

Surface water samples SW-1 through SW-4 were collected at four locations along Gashes Creek. Sample locations are shown on Figure 1 and Plate 1. Samples were analyzed for trichloroethene, 1,2-dichloroethene, vinyl chloride, and tetrachloroethene. Analytical results are included in Table 2. None of the analytical constituents were detected.

3.2 Tetrachloroethene

Since shortly after startup of the groundwater recovery system, tetrachloroethene has been found in the influent to the treatment system. Select monitoring wells sampled during the January 1999 monitoring event were analyzed for tetrachloroethene in addition to the standard analytical parameters. The January 1999 analytical results, along with historical groundwater analytical data collected at the site during the CSA, led SKF to conclude that the tetrachloroethene and other VOCs found on the southwest side of Gashes Creek have no relationship to the affected groundwater found on the Girmes facility.

In the Groundwater Monitoring Report for the January 1999 Sampling Event, SKF modified the groundwater monitoring program to continue monitoring all of the wells specified in the CAP according to the specified schedule. In addition to trichloroethene, 1,2-dichloroethene, and vinyl chloride, recovery wells RW-1, RW-3 and RW-4 and select monitoring wells would also be sampled for tetrachloroethene.

During the April 2000 sampling event, monitoring wells MW-19, MW-23, MW-24, MW-26R, MW-28 and MW-28A and the three recovery wells were analyzed for tetrachloroethene. Analytical results are included in Table 2. Tetrachloroethene was not detected in any of the monitoring wells on the Girmes side (northeast) of Gashes Creek; however, tetrachloroethene was detected in samples collected from monitoring wells MW-23 and MW-28A located on the southwest side of Gashes Creek. Tetrachloroethene was also detected in samples collected from two of the recovery wells, RW-1 and RW-3. These wells recover groundwater from the southwest side of Gashes Creek as indicated by the water table map on Plate 1. All four wells had tetrachloroethene concentrations exceeding the NC 2L standard. These are the same two monitoring wells and two recovery wells in which tetrachloroethene was detected in January, April, July, and October 1999 and January 2000. The tetrachloroethene concentration in monitoring well MW-23 decreased slightly, while concentrations in the other three wells increased.

The analytical results for tetrachloroethene confirm the results obtained in January, April, July, and October 1999 and January 2000. The tetrachloroethene found in these wells appears to be the result of a release on the southwest side of Gashes Creek and does not appear to be related to groundwater quality on the Girmes facility. However, for the time being, SKF will continue analyzing groundwater samples from wells MW-18, MW-19, MW-21, MW-23, MW-24, MW-26R, MW-28, MW-28A, RW-1, RW-3, and RW-4 for tetrachloroethene in order to monitor concentration trends and their effects on the groundwater recovery system.

Figure 1 Location of Data Points

Table 2
Analytical Results for Groundwater Samples
Collected April 18, 2000 to April 20, 2000

Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Section 4

Recovery System Performance

The groundwater recovery system uses three recovery wells to capture affected groundwater. Water from these wells is pumped to an air stripper, where VOCs are removed, and treated water is discharged into Gashes Creek. Influent and effluent to the stripper is sampled on a monthly basis. Effluent flow is recorded continuously. The analytical results for the influent and effluent are used along with the flow data to estimate the amount of trichloroethene removed each month. Monthly volumes of treated groundwater and the estimated amount of trichloroethene removed since system startup in March 1998 through January 2000 are summarized in Table 5. During February 2000 through April 2000, it is estimated that 3.5 million gallons of groundwater were recovered and treated. It is estimated that over 18.7 pounds of trichloroethene were removed during February 2000 through April 2000.

The pumping rates in all three recovery wells are being adjusted periodically until water level equilibrium near the bottom of the wells can be reached.

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
February 1998	0	0	0	Not operational
March 1998	28	1.58	N/C ⁽¹⁾	Startup 3/4/98
April 1998	30	1.62	39.1	Normal operation
May 1998	31	1.64	35.6	Normal operation
June 1998	30	1.58	17.1	Normal operation
July 1998	31	1.53	17.9	Normal operation. Adjusted pump rate for RW-4
August 1998	31	1.42	14.2	RMT coordinating maintenance of pump controllers
September 1998	30	1.47	13.5	Normal operation, pump controllers repaired/calibrated
October 1998	31	1.40	11.7	Removed pump from RW-3. Pump will be cleaned and repaired, as needed.
November 1998	30	1.30	11.9	RW-3 pump replaced
December 1998	31	1.28	6.7	Normal operation
January 1999	31	1.31	7.5	Auto dialer was reprogrammed. System inspected.
February 1999	28	1.33	7.42	Normal operation
March 1999	31	1.33	3.27	Normal operation. Calibrated flow meter and updated flow meter software.
April 1999	30	1.35	1.90	Normal operation. System inspected during groundwater sampling.
May 1999	31	1.46	10.7	Normal operation
June 1999	30	1.39	7.06	Normal operation
July 1999	31	1.46	7.05	Normal operation

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
August 1999	31	1.42	7.1	Normal operation
September 1999	30	1.33	6.6	Normal operation
October 1999	31	1.35	4.5	Normal operation. System inspected during groundwater sampling.
November 1999	30	1.31	6.1	Normal operation
December 1999	31	1.29	6.0	Normal operation
January 2000	31	1.19	5.2	Normal operation
February 2000	29	1.17	5.8	Normal operation
March 2000	31	1.25	6.6	Normal operation
April 2000	30	1.08	6.3	Normal operation
Total since system startup, March 4, 1998	791	35.84	266.8	For period beginning March 4, 1998, and ending April 30, 2000.

⁽¹⁾ Excluding March 1998.



Appendix A

Hydrographs for Bedrock Wells



Appendix B

Laboratory Analytical Reports

**GROUNDWATER MONITORING REPORT
FOR THE
JULY 2000 SAMPLING EVENT
GROUNDWATER INCIDENT NO. 10032**

**Girmes Site, FORMERLY SKF USA INC.
BUNCOMBE COUNTY, NORTH CAROLINA**

PREPARED BY RMT NORTH CAROLINA, INC.

September 2000

Robert P. Stevens, P.E.
Project Manager



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Certification

The hydrogeology work for the Girmes Site, formerly SKF USA Inc., in Buncombe County, North Carolina, was performed by an RMT, Inc. consulting hydrogeologist in support of RMT North Carolina, Inc.

Britney Camper
Groundwater and Environmental
Scientist

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist
RMT, Inc.



Section 1

Introduction

The J.L. deBall Girmes of America (Girmes) site is a former textile plant located on Old Highway 74 East in Asheville, North Carolina. The site was formerly occupied by SKF USA Inc. (SKF) from approximately 1960 to 1973. North Carolina Department of Environment and Natural Resources (NC DENR) issued SKF a Notice of Violation (NOV) on April 2, 1993 (Groundwater Incident Number 10032). In response to the NOV and associated correspondence, SKF conducted a Comprehensive Site Assessment (CSA) in 1993 and 1994. Volatile organic compounds (VOCs), in particular trichloroethene, 1,2-dichloroethene, and vinyl chloride, were found in groundwater at the site. The results of the CSA were submitted to NC DENR in November 1994. Following the CSA, a Corrective Action Plan (CAP) to address groundwater with dissolved VOCs was prepared and submitted to NC DENR in October 1996.

The CAP for the Girmes site is being implemented by RMT North Carolina, Inc. (RMT). A groundwater recovery system consisting of three groundwater recovery wells and an air stripper unit were installed in 1997 and early 1998. The system began operation on March 4, 1998.

In accordance with the CAP, groundwater elevations are to be measured in all wells on a quarterly basis. Water samples are collected from all 29 monitoring wells, three recovery wells, and four surface water stations, on a semiannual basis. Thirteen of these monitoring wells, along with the three recovery wells, are also to be sampled quarterly. Quarterly sampling is scheduled to occur in January, April, July, and October of each year. Those wells specified in the CAP to be sampled semiannually are sampled in April and October of each year. The CAP specifies that the samples are to be analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride.

This report presents results of the July 2000 sampling event.



Section 2

Groundwater Elevations

On July 26, 2000, groundwater levels were measured in wells being sampled as part of the July 2000 sampling event. Water levels were not collected from the remaining wells. On August 4, 2000, groundwater levels were measured in all available monitoring wells and recovery wells. Water levels measured on August 4, 2000 are summarized in Table 1 along with pre-startup elevations measured in January 1998, and historical water levels measured since system startup. Six monitoring wells (MW-12, MW-15, MW-15A, MW-16, MW-16A, and MW-17) are located in paved areas on the Department of Transportation (DOT) property. These wells were covered by recent paving activities of DOT and were not accessible for measuring water levels. We plan to locate and uncover these wells in early September 2000; therefore they should be accessible during the next sampling event in October 2000.

During the last quarter, recovery wells RW-1 and RW-4 had problems due to wear from two years of continuous operations. Well RW-4 has only operated intermittently, while RW-1 is no longer operational at all. Pumps for these wells have been ordered and are scheduled to be replaced in early September 2000. Because of pumping problems in recovery wells RW-1 and RW-4, the groundwater recovery system is not reaching the optimum drawdown of the water table. As a result, the cone of depression in the southwest portion of the site is not as deep or as wide spread as seen in previous monitoring events, although most of the surrounding wells continue to show the effects of the minimal pumping operations. One bedrock monitoring well, MW-18, has been dry since July 1998 due to the drawdown associated with the groundwater recovery system. This well was still dry on August 4, 2000. Monitoring wells MW-14 and MW-21 have been dry since July 1998; however, both wells had measurable water levels on August 4, 2000. Bedrock monitoring well MW-22 has been dry since April 1999.

Water levels were used to construct the water table configuration shown on Plate 1. As specified in the CAP, hydrographs were also prepared for bedrock wells MW-4, MW-5, MW-14, MW-17, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, MW-27, and MW-28A. These hydrographs are presented in Appendix A. The hydrographs include water levels measured in 1997 to identify groundwater trends prior to system startup. Several wells exhibited significant drawdown after system startup. For these wells, an inferred data point based on the last actually measured water level prior to startup was plotted on the hydrograph for March 4, 1998, the date of system startup. The purpose of the inferred data point is to better illustrate drawdown since system startup.

The water table configuration and hydrographs for wells MW-14, MW-18, MW-19, MW-21, MW-23, MW-24, and MW-27 continue to show a cone of depression around the recovery wells since system startup, though the August 2000 data shows it to be less prominent than in the past. Wells MW-18 and MW-22 continue to be dry. On the southwest side of the facility, water levels in wells MW-19, MW-20, MW-26R, MW-28, and MW-28A decreased slightly (0.08 to 0.49 feet) from water levels measured in April 2000. Meanwhile, water levels in wells MW-21, MW-23, MW-24, and MW-27 increased (0.14 to 3.1 feet). Due to its pumping cycle, the water level in recovery well RW-3 exhibited an increase (25 feet) since it was last measured in April 2000. The water levels in recovery wells RW-1 and RW-4 increased 44.96 feet and 6.94 feet respectively since April 2000 as well RW-1 was no longer operating and well RW-4 was operating intermittently. The increased water levels in the majority of the monitoring wells on the southwest side of the facility may be in response to the decreased groundwater recovery from wells RW-1 and RW-4. The cone of depression continues to extend over 1,100 feet laterally in a northwest/southeast direction, parallel with Gashes Creek. The cone also continues to reach beneath Gashes Creek and encompasses well MW-23.

On the northeast side of the facility, the water level in monitoring wells MW-1, MW-2, MW-4, MW-5, MW-6, MW-7, MW-8, MW-9, MW-10 and MW-13 exhibit a decrease of 0.01 feet to 2.85 feet. Monitoring well MW-13 exhibits an increase in water levels of 0.26 feet. Water levels in monitoring wells MW-12, MW-15, MW-15A, MW-16, MW-16A, and MW-17 were not measured as they had been covered when DOT re-paved the parking lots. The asphalt covering these wells will be removed before the next sampling event.

Monitoring wells MW-1, MW-5, and MW-6 located near the east corner of the Girmes facility, have exhibited an overall decreasing trend in groundwater elevations since the startup of the remediation system. The remaining wells on this side of the facility appear to exhibit seasonal fluctuations. The overall water level trend in monitoring wells MW-1, MW-5, and MW-6 indicate that these wells are being affected by pumping of the groundwater recovery system on the southwest side of the facility. Water levels measured in these wells in August 2000 continued to decline slightly and do not indicate an immediate response to the reduced pumping at the groundwater recovery system.

Table 1
Summary of Groundwater Elevations

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Table 1
Summary of Groundwater Elevations

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Section 3

Groundwater and Surface Water Quality

Groundwater samples were collected from 10 monitoring wells and from recovery wells RW-1, RW-3, and RW-4 on July 27 and July 28, 2000. Sampling locations are shown on Figure 1 and Plate 1. Wells MW-14, MW-18, and MW-21 were dry at that time due to drawdown and could not be sampled. Groundwater samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. In addition, five monitoring wells and recovery wells RW-1, RW-3, and RW-4 were analyzed for tetrachloroethene. Analytical results are summarized in Table 2. Laboratory analytical reports are presented in Appendix B. Table 3 and Table 4 present summaries of historical concentrations of trichloroethene and 1,2-dichloroethene.

3.1 Standard Monitoring Program

During the July 2000 sampling event, five monitoring wells, MW-2, MW-4, MW-5, MW-9, and MW-13, were sampled on the northeast side of the Girmes facility (Plate 1). Trichloroethene was detected in samples collected from four out of the five monitoring wells, MW-2, MW-4, MW-5, and MW-9. Detected concentrations of trichloroethene exceeded the NC 2L standard of 0.0028 mg/L in these four wells. 1,2-Dichloroethene was also detected in samples collected from these four monitoring wells. The detected concentrations exceeded the NC 2L standard of 0.07 mg/L in only two (MW-4 and MW-5) of these four wells. Trichloroethene concentrations decreased in wells MW-2 and MW-4, and increased in wells MW-5 and MW-9. Likewise, 1,2-dichloroethene concentrations decreased slightly in well MW-2 but increased slightly in wells MW-4, MW-5, and MW-9. Neither trichloroethene nor 1,2-dichloroethene was detected in monitoring well MW-13.

Vinyl chloride was detected in samples collected from only two wells, MW-4 and MW-13, on the northeast side of the Girmes facility. The detected concentration in well MW-4 was estimated at 0.0013J mg/L. Vinyl chloride was not detected in this well during the previous sampling event. The Vinyl chloride concentration in well MW-13 was 0.0054 mg/L, which is an increase from the previous sampling event (0.0049 mg/L in April 2000). Vinyl chloride concentrations in both wells exceed the NC 2L standard of 0.000015 mg/L.

On the southwest side of the Girmes facility, five monitoring wells – MW-19, MW-23, MW-24, MW-26R, and MW-28A – and three recovery wells – RW-1, RW-3, and RW-4 – were sampled. Monitoring wells MW-14, MW-18, and MW-21 were dry and could not be sampled. Trichloroethene was detected in groundwater samples from four monitoring wells (MW-19, MW-23, MW-24, and MW-28A) and all three recovery wells. Detected concentrations in all of

the wells, except MW-26R, exceeded NC 2L standards. 1,2-Dichloroethene was detected in groundwater samples from four of the monitoring wells (MW-19, MW-23, MW-26R, and MW-28A) and in all three recovery wells. None of the detected concentrations of 1,2-dichloroethene exceeded the NC 2L standard.

Trichloroethene concentrations decreased in samples collected from monitoring wells MW-23, MW-24, and MW-26R and recovery wells RW-1 and RW-3. The trichloroethene concentration increased in monitoring well MW-19 and in recovery well RW-4. Trichloroethene concentrations remained consistent in monitoring well MW-28A. Concentrations of 1,2-dichloroethene decreased in monitoring wells MW-23 and MW-26R and increased in wells MW-19, MW-28A and recovery wells RW-1, RW-3, and RW-4. 1,2-Dichloroethene was not detected in well MW-24

Vinyl chloride was detected only in samples collected from one monitoring well (MW-26R), on the southwest side of the Girmes facility. This well is located on Dotson's property on the southwest side of Gashes Creek. The detected concentration in MW-26R, 0.025 mg/L, is a slight decrease from the previous sampling event but remains above the NC 2L standard.

3.2 Tetrachloroethene

Since shortly after startup of the groundwater recovery system, tetrachloroethene has been found in the influent to the treatment system. Select monitoring wells sampled during the January 1999 monitoring event were analyzed for tetrachloroethene in addition to the standard analytical parameters. The January 1999 analytical results, along with historical groundwater analytical data collected at the site during the CSA, led SKF to conclude that the tetrachloroethene and other VOCs found on the southwest side of Gashes Creek have no relationship to the affected groundwater found on the Girmes facility.

In the Groundwater Monitoring Report for the January 1999 Sampling Event, SKF modified the groundwater monitoring program to continue monitoring all of the wells specified in the CAP according to the specified schedule. In addition to trichloroethene, 1,2-dichloroethene, and vinyl chloride, recovery wells RW-1, RW-3 and RW-4 and select monitoring wells would also be sampled for tetrachloroethene.

During the July 2000 sampling event, monitoring wells MW-19, MW-23, MW-24, MW-26R, and MW-28A and the three recovery wells were analyzed for tetrachloroethene. Analytical results are included in Table 2. Tetrachloroethene was detected in samples collected from monitoring wells MW-23 and MW-28A located on the southwest side of Gashes Creek. Tetrachloroethene was also detected in samples collected from all three of the recovery wells, RW-1, RW-3, and RW-4. These wells recover groundwater from the southwest side of Gashes Creek as indicated

by the water table map on Plate 1. All five wells had tetrachloroethene concentrations exceeding the NC 2L standard. With the exception of recovery well RW-4, these are the same monitoring wells and recovery wells in which tetrachloroethene was detected in January, April, July, and October 1999 and January 2000. The tetrachloroethene concentration in monitoring well MW-23 decreased slightly, while concentrations in the other three wells increased.

The analytical results for tetrachloroethene confirm the results obtained in January, April, July, and October 1999 and January 2000. The tetrachloroethene found in these wells appears to be the result of a release on the southwest side of Gashes Creek and does not appear to be related to groundwater quality on the Girmes facility. However, for the time being, SKF will continue analyzing groundwater samples from wells MW-19, MW-23, MW-24, MW-26R, MW-28A, RW-1, RW-3, and RW-4 for tetrachloroethene in order to monitor concentration trends and their effects on the groundwater recovery system.

Figure 1 Location of Data Points

Table 2
Analytical Results for Groundwater Samples
Collected July 27 and July 28, 2000

Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Section 4

Recovery System Performance

The groundwater recovery system uses three recovery wells to capture affected groundwater. Water from these wells is pumped to an air stripper, where VOCs are removed, and treated water is discharged into Gashes Creek. Influent and effluent to the stripper is sampled on a monthly basis. Effluent flow is recorded continuously. The analytical results for the influent and effluent are used along with the flow data to estimate the amount of trichloroethene removed each month. Monthly volumes of treated groundwater and the estimated amount of trichloroethene removed since system startup in March 1998 through July 2000 are summarized in Table 5. During May 2000 through July 2000, the flow from recovery wells RW-4 and RW-1 declined as a result of well RW-1 no longer operating and well RW-4 operating intermittently. New pumps have been ordered for these wells and will be installed during early September 2000. The estimated amount of groundwater that was recovered and treated during April 2000 through July 2000 is 2.04 million gallons. It is estimated that over 4.85 pounds of trichloroethene were removed during May 2000 through July 2000. After the pumps on RW-1 and RW-4 are replaced, the amount of treated water and trichloroethene removed is expected to increase. The cone of depression surrounding the recovery wells is expected to quickly expand to its previous size.

The pumping rates in all three recovery wells will continue to be adjusted periodically after the new pump installation until water level equilibrium near the bottom of the wells can be reached.



**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
February 1998	0	0	0	Not operational
March 1998	28	1.58	N/C ⁽¹⁾	Startup 3/4/98
April 1998	30	1.62	39.1	Normal operation
May 1998	31	1.64	35.6	Normal operation
June 1998	30	1.58	17.1	Normal operation
July 1998	31	1.53	17.9	Normal operation. Adjusted pump rate for RW-4
August 1998	31	1.42	14.2	RMT coordinating maintenance of pump controllers
September 1998	30	1.47	13.5	Normal operation, pump controllers repaired/calibrated
October 1998	31	1.40	11.7	Removed pump from RW-3. Pump will be cleaned and repaired, as needed.
November 1998	30	1.30	11.9	RW-3 pump replaced
December 1998	31	1.28	6.7	Normal operation
January 1999	31	1.31	7.5	Auto dialer was reprogrammed. System inspected.
February 1999	28	1.33	7.42	Normal operation
March 1999	31	1.33	3.27	Normal operation. Calibrated flow meter and updated flow meter software.
April 1999	30	1.35	1.90	Normal operation. System inspected during groundwater sampling.
May 1999	31	1.46	10.7	Normal operation
June 1999	30	1.39	7.06	Normal operation
July 1999	31	1.46	7.05	Normal operation



**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
August 1999	31	1.42	7.1	Normal operation
September 1999	30	1.33	6.6	Normal operation
October 1999	31	1.35	4.5	Normal operation. System inspected during groundwater sampling.
November 1999	30	1.31	6.1	Normal operation
December 1999	31	1.29	6.0	Normal operation
January 2000	31	1.19	5.2	Normal operation
February 2000	29	1.17	5.8	Normal operation
March 2000	31	1.25	6.6	Normal operation
April 2000	30	1.08	6.3	Normal operation
May 2000	31	0.661	1.05	Flow from RW-4 has declined. Field technician will adjust flow
June 2000	30	0.693	1.9	Maintenance issues identified during site visit. Flow remains lower than normal
July 2000	31	0.69 ⁽²⁾	1.9	Pumps functional at a reduced rate. Meters are marginally functional.
Total since system startup, March 4, 1998	883	37.88	271.65	For period beginning March 4, 1998, and ending April 30, 2000.

⁽¹⁾ Excluding March 1998.

⁽²⁾ Estimated, flow data not yet available



Section 5

Recommendations

The groundwater remediation system on the southwest side of the Girmes facility has been in operation since March 4, 1998. The cone of depression surrounding the system grew rapidly following system start-up extending a length of over 1,100 feet. The operation of the remediation system has resulted in a decline in water levels in three wells on the DOT side of the facility, near the east corner of the building. To date, the groundwater recovery system has treated over 37 million gallons of water and has removed over 271 pounds of trichloroethene.

Currently, the remediation system is not operating at its maximum efficiency. In early September, we are scheduled to replace pumps in recovery wells RW-1 and RW-4, and replace worn valves and flow meters in all three recovery wells. Groundwater recovery will increase significantly after these tasks have been completed.

After consideration of two years of data on groundwater quality and the extent of influence of the groundwater recovery system, SKF recommends the following modifications to the remediation program.

- Reduce groundwater monitoring frequency from quarterly to semiannually. We have sufficient understanding of groundwater quality trends since system startup that quarterly sampling and water level measurements are no longer necessary. Semiannual measurements should be sufficient.
- Continue operating the current groundwater recovery system for another two years. Groundwater recovery will be maintained in all three recovery wells. Water quality and elevations will be monitored in all recovery and monitoring wells including those on the Dotson side of Gashes creek and those on the DOT side of the Girmes facility. Following this two-year period, SKF will make recommendations concerning further operations and modifications, if necessary, of the remediation system.



Appendix A

Hydrographs for Bedrock Wells



Appendix B

Laboratory Analytical Reports

**GROUNDWATER MONITORING
REPORT FOR THE
OCTOBER 2000 SAMPLING EVENT
GROUNDWATER INCIDENT NO. 10032**

**Girmes Site, FORMERLY SKF USA INC.
BUNCOMBE COUNTY, NORTH CAROLINA**

PREPARED BY RMT NORTH CAROLINA, INC.

December 2000

Robert P. Stevens, P.E.
Project Manager



Certification

The hydrogeology work for the Girmes Site, formerly SKF USA Inc., in Buncombe County, North Carolina, was performed by an RMT, Inc. consulting hydrogeologist in support of RMT North Carolina, Inc.

Dan O. Madison, Jr., P.G.
Consulting Hydrogeologist
RMT, Inc.



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Section 1

Introduction

The J.L. deBall Girmes of America (Girmes) site is a former textile plant located on Old Highway 74 East in Asheville, North Carolina. The site was formerly occupied by SKF USA Inc. (SKF) from approximately 1960 to 1973. North Carolina Department of Environment and Natural Resources (NC DENR) issued SKF a Notice of Violation (NOV) on April 2, 1993 (Groundwater Incident Number 10032). In response to the NOV and associated correspondence, SKF conducted a Comprehensive Site Assessment (CSA) in 1993 and 1994. Volatile organic compounds (VOCs), in particular trichloroethene, 1,2-dichloroethene, and vinyl chloride, were found in groundwater at the site. The results of the CSA were submitted to NC DENR in November 1994. Following the CSA, a Corrective Action Plan (CAP) to address groundwater with dissolved VOCs was prepared and submitted to NC DENR in October 1996.

The CAP for the Girmes site is being implemented by RMT North Carolina, Inc. (RMT). A groundwater recovery system consisting of three groundwater recovery wells and an air stripper unit were installed in 1997 and early 1998. The system began operation on March 4, 1998.

In accordance with the CAP, groundwater elevations are to be measured in all wells on a quarterly basis. Water samples are collected from all 29 monitoring wells, three recovery wells, and four surface water stations, on a semiannual basis. Thirteen of these monitoring wells, along with the three recovery wells, are also to be sampled quarterly. Quarterly sampling is scheduled to occur in January, April, July, and October of each year. Those wells specified in the CAP to be sampled semiannually are sampled in April and October of each year. The CAP specifies that the samples are to be analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride.

This report presents results of the October 2000 sampling event.



Section 2

Groundwater Elevations

On October 23, 2000, groundwater levels were measured in all monitoring wells and recovery wells at the Girmes site. Water levels are summarized in Table 1 along with pre-startup elevations measured in January 1998, and historical water levels measured since system startup.

Water levels were used to construct the water table configuration shown on Plate 1. As specified in the CAP, hydrographs were also prepared for bedrock wells MW-4, MW-5, MW-14, MW-17, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, MW-27, and MW-28A. These hydrographs are presented in Appendix A. The hydrographs include water levels measured in 1997 to identify groundwater trends prior to system startup. Several wells exhibited significant drawdown after system startup. For these wells, an inferred data point based on the last actually measured water level prior to startup was plotted on the hydrograph for March 4, 1998, the date of system startup. The purpose of the inferred data point is to better illustrate drawdown since system startup.

The water table configuration and hydrographs for wells MW-14, MW-18, MW-19, MW-21, MW-22, MW-23, MW-24, and MW-27 continue to show a cone of depression around the recovery wells since system startup.

During the spring of this year, recovery wells RW-1 and RW-4 had problems due to wear from two years of continuous operations. Well RW-4 only operated intermittently, while RW-1 was no longer operational. As a result, water levels measured during the last sampling event had risen in the vicinity of the recovery wells. The pumps for these wells were replaced in early September 2000 and are now in operation. The water level drawdown in monitoring wells surrounding the recovery wells has returned to levels found prior to the degradation of the pumps.

On the southwest side of the facility, wells MW-14, MW-18, MW-21, and MW-22 are dry. The remaining wells all exhibited declines in water levels since measured in August 2000. The amount of decline was 0.1 to 0.29 feet at wells MW-28 and MW-28A (located 600 feet northwest of the recovery well system) and was much greater, 0.77 to 6.14 feet, in wells closer to the recovery system. The water level in the three recovery wells declined 16 to 50 feet. The cone of depression continues to extend over 1,100 feet laterally in a northwest/southeast direction, parallel with Gashes Creek. The cone also continues to reach beneath Gashes Creek and encompasses well MW-23.

On the northeast side of the facility, water levels declined 0.33 feet in well MW-5 to 2.54 feet in well MW-13. None of the wells exhibited increases in water level. Monitoring wells MW-1, MW-5, and MW-6 located near the east corner of the Girmes facility, have exhibited an overall decreasing trend in groundwater elevations since the startup of the remediation system. The remaining wells on this side of the facility appear to exhibit seasonal fluctuations. The overall water level trend in monitoring wells MW-1, MW-5, and MW-6 indicate that these wells are being affected by pumping of the groundwater recovery system on the southwest side of the facility.

Table 1
Summary of Groundwater Elevations

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Table 1
Summary of Groundwater Elevations

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Section 3

Groundwater and Surface Water Quality

Groundwater samples were collected from 25 monitoring wells and from recovery wells RW-1, RW-3, and RW-4 on October 24 through October 26, 2000. Sampling locations are shown on Figure 1 and Plate 1. Wells MW-14, MW-18, MW-21, and MW-22 were dry at that time due to drawdown and could not be sampled. Groundwater samples were analyzed for trichloroethene, 1,2-dichloroethene, and vinyl chloride. In addition, five monitoring wells and recovery wells RW-1, RW-3, and RW-4 were analyzed for tetrachloroethene. Analytical results are summarized in Table 2. Laboratory analytical reports are presented in Appendix B. Table 3 and Table 4 present summaries of historical concentrations of trichloroethene and 1,2-dichloroethene.

3.1 Standard Monitoring Program

During the October 2000 sampling event, 18 monitoring wells were sampled on the northeast side of the Girmes facility (Plate 1). Trichloroethene was detected in samples collected from nine wells, with the concentrations exceeding the NC 2L standard of 0.0028 mg/L in seven of the wells. Trichloroethene concentrations decreased in well MW-7, and concentrations were generally unchanged in wells MW-11 and MW-20. Six wells – MW-2, MW-4, MW-5, MW-9, MW-10, and MW-17 – had increases in trichloroethene concentrations. 1,2-Dichloroethene was detected in samples collected from six monitoring wells. The detected concentrations exceeded the NC 2L standard of 0.07 mg/L in only three wells – MW-4, MW-5, and MW-6. 1,2-Dichloroethene concentrations increased in wells MW-4 and MW-10 but remained generally unchanged in wells MW-2, MW-5, MW-9, and MW-20. Neither trichloroethene nor 1,2-dichloroethene was detected in monitoring well MW-13.

Vinyl chloride was detected in only one well, MW-13, on the northeast side of the Girmes facility. The detected concentration was 0.0056 mg/L, which is generally the same as the previous sampling event (0.0054 mg/L in July 2000). Vinyl chloride concentrations exceeded the NC 2L standard of 0.000015 mg/L.

On the southwest side of the Girmes facility, seven monitoring wells – MW-19, MW-23, MW-24, MW-26R, MW-27, MW-28, and MW-28A – and three recovery wells – RW-1, RW-3, and RW-4 – were sampled. Monitoring wells MW-14, MW-18, MW-21, and MW-22 were dry and could not be sampled. Trichloroethene was detected in groundwater samples from four monitoring wells (MW-19, MW-23, MW-24, and MW-28A) and all three recovery wells. Detected concentrations in all of the wells exceeded NC 2L standards. 1,2-Dichloroethene was detected in groundwater

samples from four of the monitoring wells (MW-19, MW-23, MW-26R, and MW-28A) and in all three recovery wells. None of the detected concentrations of 1,2-dichloroethene exceeded the NC 2L standard.

Trichloroethene concentrations decreased in recovery well RW-4. The trichloroethene concentration increased in monitoring well MW-19 and in recovery wells RW-1 and RW-3. Trichloroethene concentrations remained generally the same in monitoring wells MW-23, MW-24, and MW-28A. Concentrations of 1,2-dichloroethene decreased in recovery well RW-4, and increased slightly in monitoring well MW-26R and recovery well RW-1. The 1,2-dichloroethene concentration in the remaining 4 monitoring and recovery wells was generally unchanged.

Vinyl chloride was detected in only one monitoring well (MW-26R) on the southwest side of the Girmes facility. This well is located on Dotson's property on the southwest side of Gashes Creek. The detected concentration in MW-26R, 0.0032 mg/L, is a slight increase from the previous sampling event but remains above the NC 2L standard.

Surface water samples, which are to be collected semiannually, were inadvertently left out during this sampling event. The surface water samples were collected on December 4, 2000, and are presently being analyzed. Results will be submitted as an addendum to this report as soon as analyses are complete.

3.2 Tetrachloroethene

Since shortly after startup of the groundwater recovery system, tetrachloroethene has been found in the influent to the treatment system. Select monitoring wells sampled during the January 1999 monitoring event were analyzed for tetrachloroethene in addition to the standard analytical parameters. The January 1999 analytical results, along with historical groundwater analytical data collected at the site during the CSA, led SKF to conclude that the tetrachloroethene and other VOCs found on the southwest side of Gashes Creek have no relationship to the affected groundwater found on the Girmes facility.

In the groundwater monitoring report for the January 1999 sampling event, SKF modified the groundwater monitoring program to continue monitoring all of the wells specified in the CAP according to the specified schedule. In addition to trichloroethene, 1,2-dichloroethene, and vinyl chloride, recovery wells RW-1, RW-3, and RW-4 and select monitoring wells would also be sampled for tetrachloroethene.

During the October 2000 sampling event, monitoring wells MW-19, MW-23, MW-24, MW-26R, and MW-28A and the three recovery wells were analyzed for tetrachloroethene. Analytical

results are included in Table 2. Tetrachloroethene was detected in samples collected from monitoring wells MW-23 and MW-28A located on the southwest side of Gashes Creek. Tetrachloroethene was also detected in samples collected from two of the recovery wells, RW-1 and RW-3. These wells recover groundwater from the southwest side of Gashes Creek as indicated by the water table map on Plate 1. All four wells had tetrachloroethene concentrations exceeding the NC 2L standard. Tetrachloroethene has consistently been found in these wells since analyses for trichloroethene began in January 1999.

The analytical results for tetrachloroethene confirm the results obtained in January, April, July, and October 1999 and January, April, and July 2000. The tetrachloroethene found in these wells appears to be the result of a release on the southwest side of Gashes Creek and does not appear to be related to groundwater quality on the Girmes facility. However, for the time being, SKF will continue analyzing groundwater samples from wells MW-19, MW-23, MW-24, MW-26R, MW-28A, RW-1, RW-3, and RW-4 for tetrachloroethene in order to monitor concentration trends and their effects on the groundwater recovery system.

Figure 1 Location of Data Points

Table 2
Groundwater Samples
Collected October 24, 2000 to October 26, 2000

Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Historical Trichloroethene Concentrations Detected in Groundwater

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Table 3
Historical Trichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Table 4
Historical 1,2-Dichloroethene Concentrations Detected in Groundwater

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Section 4

Recovery System Performance

The groundwater recovery system uses three recovery wells to capture affected groundwater. Water from these wells is pumped to an air stripper, where VOCs are removed, and treated water is discharged into Gashes Creek. Influent and effluent to the stripper is sampled on a monthly basis. Effluent flow is recorded continuously. The analytical results for the influent and effluent are used along with the flow data to estimate the amount of trichloroethene removed each month. Monthly volumes of treated groundwater and the estimated amount of trichloroethene removed since system startup in March 1998 through October 2000 are summarized in Table 5. During August 2000, the flow from recovery wells RW-4 and RW-1 remained relatively low as a result of well RW-1 no longer operating and well RW-4 operating intermittently. New pumps were installed in RW-1 and RW-4 on September 6 and 7, 2000. Flow meters were replaced on all three recovery wells. Following replacement of the pumps and flow meters, flow from the recovery wells increased significantly.

The estimated amount of groundwater that was recovered and treated during August 2000 through October 2000 is 3.269 million gallons. It is estimated that over 29 pounds of trichloroethene were removed during August 2000 through October 2000.

The pumping rates in all three recovery wells will continue to be adjusted periodically until water level equilibrium near the bottom of the wells can be reached.

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
02/98	0	0	0	Not operational
03/98	28	1.58	N/C ⁽¹⁾	Startup 3/4/98
04/98	30	1.62	39.1	Normal operation
05/98	31	1.64	35.6	Normal operation
06/98	30	1.58	17.1	Normal operation
07/98	31	1.53	17.9	Normal operation. Adjusted pump rate for RW-4
08/98	31	1.42	14.2	RMT coordinating maintenance of pump controllers
09/98	30	1.47	13.5	Normal operation, pump controllers repaired/calibrated
10/98	31	1.40	11.7	Removed pump from RW-3. Pump will be cleaned and repaired, as needed.
11/98	30	1.30	11.9	RW-3 pump replaced
12/98	31	1.28	6.7	Normal operation
01/99	31	1.31	7.5	Auto dialer was reprogrammed. System inspected.
02/99	28	1.33	7.42	Normal operation
03/99	31	1.33	3.27	Normal operation. Calibrated flow meter and updated flow meter software.
04/99	30	1.35	1.90	Normal operation. System inspected during groundwater sampling.
05/99	31	1.46	10.7	Normal operation
06/99	30	1.39	7.06	Normal operation
07/99	31	1.46	7.05	Normal operation
08/99	31	1.42	7.1	Normal operation
09/99	30	1.33	6.6	Normal operation

**Table 5
Operations Summary**

CALENDAR MONTH	DAYS	WATER TREATED (million gallons)	TCE REMOVED (pounds)	COMMENTS
10/99	31	1.35	4.5	Normal operation. System inspected during groundwater sampling.
11/99	30	1.31	6.1	Normal operation
12/99	31	1.29	6.0	Normal operation
01/00	31	1.19	5.2	Normal operation
02/00	29	1.17	5.8	Normal operation
03/00	31	1.25	6.6	Normal operation
04/00	30	1.08	6.3	Normal operation
05/00	31	0.661	1.05	Flow from RW-4 has declined. Field technician will adjust flow
06/00	30	0.693	1.9	Maintenance issues identified during site visit. Flow remains lower than normal
07/00	31	0.624 ⁽²⁾	3.02	Pumps functional at a reduced rate. Meters are marginally functional.
08/00	31	0.725	4.6	Replacement equipment purchased, operation and maintenance (O&M) trip scheduled.
09/00	30	1.274	11.7	Repairs made on September 6 and 7. Flow restored to approximately 45,000 gpd.
10/00	31	1.27 ⁽²⁾	12.7	Normal operation
Total since system startup	975	41.083	301.77	For period beginning March 4, 1998, and ending October 31, 2000.

⁽¹⁾ Excluding March 1998.

⁽²⁾ Estimated, flow data not yet available



Section 5

Recommendations

The groundwater remediation system on the southwest side of the Girmes facility has been in operation since March 4, 1998. The cone of depression surrounding the system grew rapidly following system start-up extending a length of over 1,100 feet. The operation of the remediation system has resulted in a decline in water levels in three wells on the Department of Transportation (DOT) side of the facility, near the east corner of the building. To date, the groundwater recovery system has treated over 41 million gallons of water and has removed over 301 pounds of trichloroethene.

During the summer of 2000, the remediation system was not operating at its maximum efficiency. In early September, we replaced pumps in recovery wells RW-1 and RW-4, and replace worn valves and flow meters in all three recovery wells. Groundwater recovery increased significantly after these tasks had been completed.

After consideration of two years of data on groundwater quality and the extent of influence of the groundwater recovery system, SKF recommends the following modifications to the remediation program.

- Reduce groundwater monitoring frequency from quarterly to semiannually. We have sufficient understanding of groundwater quality trends since system startup that quarterly sampling and water level measurements are no longer necessary. Semiannual measurements should be sufficient.
- Continue operating the current groundwater recovery system. Groundwater recovery will be maintained in all three recovery wells. Water quality and elevations will be monitored in all recovery and monitoring wells including those on the Dotson side of Gashes creek and those on the DOT side of the Girmes facility. Following this two-year period, SKF will make recommendations concerning further operations and modifications, if necessary, of the remediation system.



Appendix A

Hydrographs for Bedrock Wells



Appendix B

Laboratory Analytical Reports
