50583

Ascend Performance Materials Operations LLC
Greenwood Plant
1515 Highway 246 South
Greenwood, SC 29646
Tel 864-942-4200

December 18, 2014

Ms. Addie Walker
SC DHEC - Bureau of Land and Waste Management
State Remediation Section
2600 Bull Street
Columbia, SC 29201

RE: Ascend Performance Materials Operation LLC – Greenwood, South Carolina Plant
Ascend / Solutia / Monsanto, Greenwood County, ID #00291
Voluntary Clean-up Program, Contract # 13-4830-RP

Dear Ms. Walker;

Please find enclosed the summary report as requested during the VCP discussion meeting between Ascend and DHEC in Columbia on September 9, 2014. This document is a historical summary of the potential contamination sites located on the Ascend Property (formerly Solutia, formerly Monsanto).

At your convenience following your review of the summary report, please contact Ascend to schedule a technical review meeting.

In the meantime if you have any questions, please do not hesitate to contact me at lanapp@ascendmaterials.com or 864-942-4471, or John Gorski at jgorsk@ascendmaterials.com or 864-942-4259.

Sincerely,

Lori A. Napper
Environmental Engineer II
Ascend Performance Materials Operations LLC

Enclosures

CC: Jerry Wylie, PG, SynTerra Corporation, 148 River Street, Suite 220, Greenville, SC 29601

cc: G:\Safety\Environmental\Groundwater\SC VoluntaryCleanup\report to DHEC re VCP 121814.docx

(11)

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Exhibits

A – Aerial Photographs

B - Interviews

C – Plot Plan & Drawings

D – 1984 CRS Sirrine Sampling Report

Background

Ascend Performance Materials Greenwood Plant has been invited to enter a Voluntary Cleanup Contract (VCC) with the South Carolina Department of Health and Environmental Control (DHEC). In an effort to define the initial scope of the project Ascend has undertaken an evaluation to determine sources of potential contamination onsite.

Objective

The objective of this report is to describe the analysis conducted and communicate the conclusion reached to support a defined scope of work for the initial VCC.

Method

In assessing potential contamination onsite Ascend examined a number of available sources of information:

1. Historical aerial photographs found on the Greenwood County GIS website.
2. Interviews with current and retired employees. An effort was made to interview employees with a long tenure onsite and those that had jobs pertaining to outside work and/or handling of chemicals.
3. Old facility layouts and drawings.
4. Prior environmental sampling reports.
5. Release/spill reports.

Discussion

Aerial photographs available on the Greenwood County GIS website are available at various intervals from 1939 to 2011. None of those viewed showed any activity outside the fence line of the main plant other than logging operations on the timberland between the plant site and Lake Greenwood. Aerial photographs are attached in Exhibit A.

Ten current and former employees were interviewed about knowledge of impacts to the environment; (4 retirees and 6 current employees). The colleagues interviewed all had long tenures with the site --- going back to 1960, as well as the most recent hire interviewed in 1995. The interviews are documented in Exhibit B. From these interviews, the following concerns were noted.

Nylon waste yarn buried near the back gate was mentioned in several interviews. This has been referred to as the nylon garden and the yarn in question has recently been dug up and sold to a waste recycler. At this time the 3.9MM lbs. of yarn has been removed and the remaining yarn is scheduled to be removed from the site in Q4 2014. As this was nylon yarn waste which is inert, no environmental impacts are suspected to be present from this waste burial and **no further sampling or investigation is recommended.** This is confirmed in the 1984 CRS Sirrine report – see Exhibit D.

The interviews also refer to a hexamethylenediamine (HMD) release to the South Creek which feeds into Lake Greenwood. This refers to a spill that occurred in April, 1996. Corrective actions were implemented at that time and as the release occurred almost 20 years ago to surface water; it is assumed that no residual contamination remains. **No further sampling or investigation is recommended.**

Chemical waste from relative viscosity (RV) analyses was reportedly dumped in the CDS landfill, which is currently sampled biannually and will be part of the ongoing VCC investigation. **CDS sampling is proposed to be included in ongoing VCC investigation efforts.**

Interviews also refer to a tanker derailment in 1992-93. Reportedly the tanker did not rupture and there was no chemical release to the environment. **No further sampling or investigation is recommended.**

Old facility layout and drawings were also reviewed. One potential issue noted are some old waste ponds located between the current equalization basin and the road connecting the north and south plant areas. (Dwgs 3094-D-000-C-1-1, CG-3004, EG-3008-1) These pits may have been unlined and there is potential for existing contamination. This area was sampled in 1984 and discussed in the 1984 CRS Sirrine Report. **We would like to discuss the rationale and value in gathering further soil or groundwater data at this location**. The drawings noted are included in Exhibit C.

Numerous prior environmental sampling reports exist and have been reviewed. Many deal with the close and DHEC approval of the CDS landfill. While it is impractical to discuss each one in detail a few noteworthy exceptions will be discussed.

For over 15 years the two known contamination sites have been monitored for groundwater quality. The construction debris site (CDS) and the burn pit (BP) have been monitored since 1998 and have been recommended in the ongoing VCC effort. The summary monitoring reports give a clear idea of the contamination levels. **These sites are recommended to be included in the VCC plan.**

Also of interest is a 1984 report prepared by CRS Sirrine for Monsanto Company which owned the site at the time. Much like the intent of the VCC, the report identified 7 areas of potential contamination and sampled from all of them to draw conclusions. Of the 7 areas investigated, 3 were confirmed to have no or little contamination. Three additional areas had some degree of contamination but nothing to suggest the potential for offsite migration or ongoing releases. The burn pit area was identified as a potential risk and groundwater impacts in that area have been monitored since 1998 with DHEC oversight. **As such, the burn pit is recommended for inclusion in the VCC.** The 1984 CRS Sirrine report is included in Exhibit D.

Release reports were reviewed for additional potential contamination sources; however the release reports were dismissed for any of the following reasons:

1. Small quantities involved.

2. Indoor spills not released to environment.
3. Releases to air.
4. Spills contained and or cleaned up.

Conclusion

Based on the above evaluation, Ascend recommends focusing the scope for the initial VCC investigation as follows.

Area	Initial Steps
Burn Pit	Agree with DHEC on the objective results desired and the best path forward to achieve these results, given our current sampling plan
Construction Debris Site	Agree with DHEC on the objective results desired and the best path forward to achieve these results, given our current sampling plan
Old Waste Ponds	Pending review with DHEC of 1984 sample result either: 1. Dismiss from further consideration. 2. Agree on a soil and/or sampling plan that meets our agreed objective result

Next steps would be decided in conjunction with DHEC pending DHEC review of these evaluation results.

Exhibit A

Aerial Photographs

2011

Greenwood County, SC

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 958 feet
12/17/2014

2008

Greenwood County, SC

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 958 feet
12/17/2014

2003

Greenwood County, SC

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 958 feet
12/17/2014

Greenwood County, SC

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 1067 feet
12/17/2014

1939

Greenwood County, SC

Disclaimer: Map and parcel data are believed to be accurate, but accuracy is not guaranteed. This is not a legal document and should not be substituted for a title search,appraisal, survey, or for zoning verification.

Map Scale
1 inch = 958 feet
12/17/2014

Exhibit B

Interviews

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   1964

2. What areas/processes have you worked in here at Ascend?

   2nd floor LOI Spinning
   Solution Prep.
   Chem Lab

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   Diamine Spill to Creek

4. Was large amounts of waste buried anywhere on the plant site?

   yes / nylon yarn buried
   Formic RV waste 55gal drum Dumped.

Date: 8-08-14

Name: Rudolph Scott

Time: 13:41

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto? Feb 1, 1973

2. What areas/processes have you worked in here at Ascend? Test work for BCF & F1

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.) not sure!

4. Was large amounts of waste buried anywhere on the plant site? I think at back gate area. Nylon waste back in the 70's & 80's.

Date: 8/7/14

Name: Chuck (Charles) Horton

Time: 10:20

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?
   JAN 4, 1965

2. What areas/processes have you worked in here at Ascend?
   MFG. SPINNING, STORES, SECURITY, OFFICE SERVICE, + ENG. PLANNING + SCHDULE.

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

4. Was large amounts of waste buried anywhere on the plant site?

Date: 8-7-2014

Name: WAYNE H. BOOZER

Time: 1037 HRS

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   December 18, 1961

2. What areas/processes have you worked in here at Ascend?

   BCF

   Spinning

   Chem Lab

   Solution Prep

   Process Technology

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   In 1992-1993, a tanker derailed on train tracks near the border of the Property. Cleanup was handled by CSX

4. Was large amounts of waste buried anywhere on the plant site?

   The fiberstock behind the fence that is dug up

Date: 9:53 am

Name: Bobby Burdette

Time: July 24, 2014

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   1974

2. What areas/processes have you worked in here at Ascend?

   Utilities
   Drawjet
   Warping

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   No

4. Was large amounts of waste buried anywhere on the plant site?

   I don't know

Date: 6/
Name: Terry Collis
Time: 1400

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   2-2-81

2. What areas/processes have you worked in here at Ascend?

   TBT, LAG SPINNING PACKROOM, PUMP ROOM

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

4. Was large amounts of waste buried anywhere on the plant site?

   YARN IN BONE YARD

Date: 8-7-2014

Name: JOHNNY COSSINS

Time: 11:30 AM

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   1978

2. What areas/processes have you worked in here at Ascend?

   BCF - warping - polymer

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   no

4. Was large amounts of waste buried anywhere on the plant site?

   I don't know

Date: 8-11-14

Name: Floyd Moore

Time: 1850

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   1973

2. What areas/processes have you worked in here at Ascend?

   Sol Prep

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   Don't Know

4. Was large amounts of waste buried anywhere on the plant site?

   Don't Know

Date: 8-11-14

Name: Jesse Rivers

Time: 10 45

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

   1974

2. What areas/processes have you worked in here at Ascend?

   Process Engineering

   Process Control

   Polymer (Batch & CP)

   BCF (CCP, One Step, & Draw Jet)

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

   HMD spilled from a storage tank into a dike. Dike exit valve was open so it went straight to treatment ponds. The pond it went to had just been cleared and went to the lake. Fishermen saw dead fish floating on surface.

   HMD railcar derailed and turned over just outside the property gate. Made the news.

   NA-22 tank in North Plant solution Prep overflowed. Lori knows details

4. Was large amounts of waste buried anywhere on the plant site? *continued

   The nylon waste in the back of the Plant

* Installing a project in Salt Strike. HMD line was drained before disassembly. After it was reassembled, drain line was not closed. High pH in effluent for roughly an hour.

Date: 07/23/2014

Name: Michael Peduzzi

Time: 16:43

Interview Questions

1. What year did you start working for Ascend/Solutia/Monsanto?

1995

2. What areas/processes have you worked in here at Ascend?

Salt Strike

3. Do you recall any big/memorable spills or contaminations on the site that went to the ground or water? (i.e. ruptured tanks, overflows, etc.)

NONE

4. Was large amounts of waste buried anywhere on the plant site?

NONE

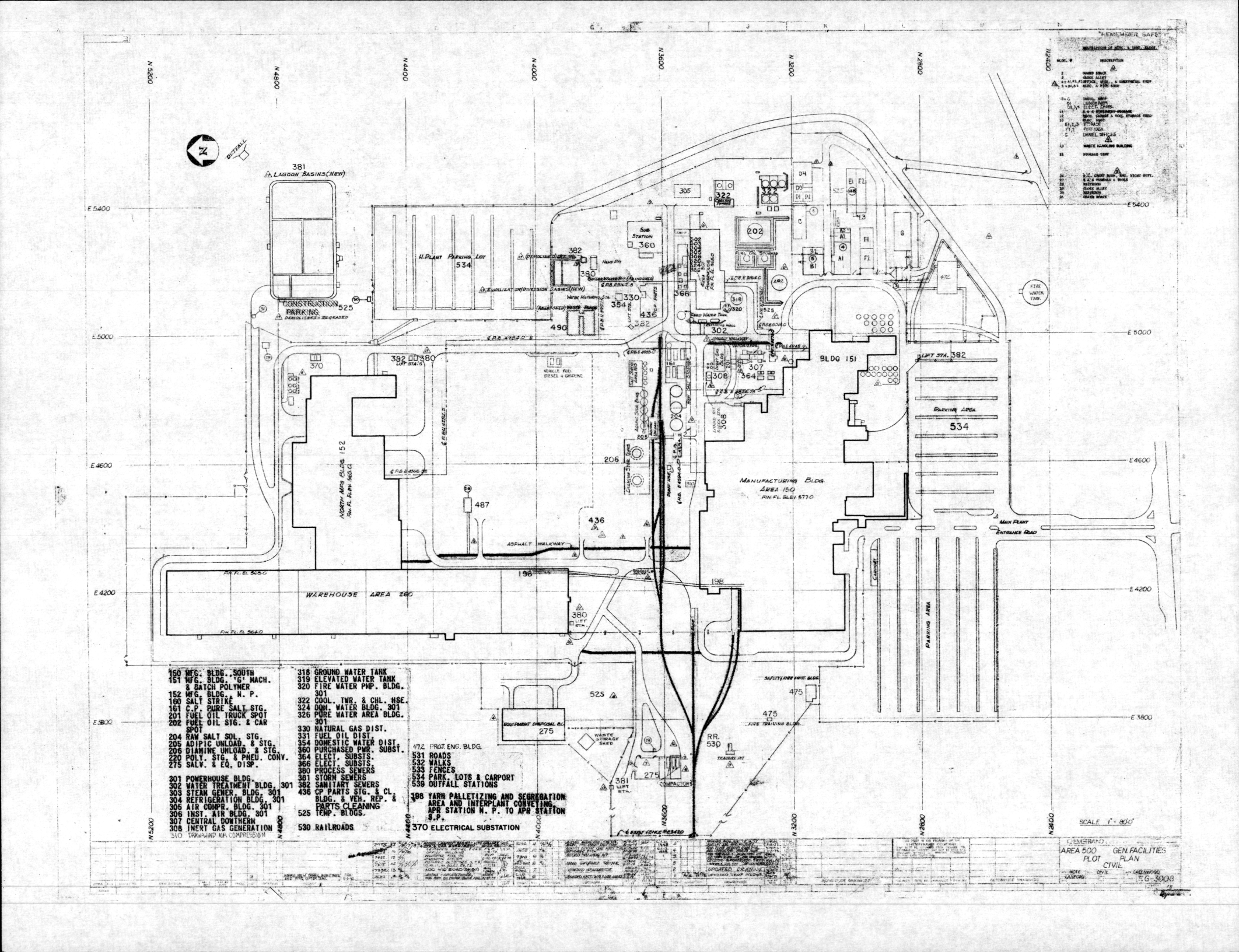
Date: 07/21/2014

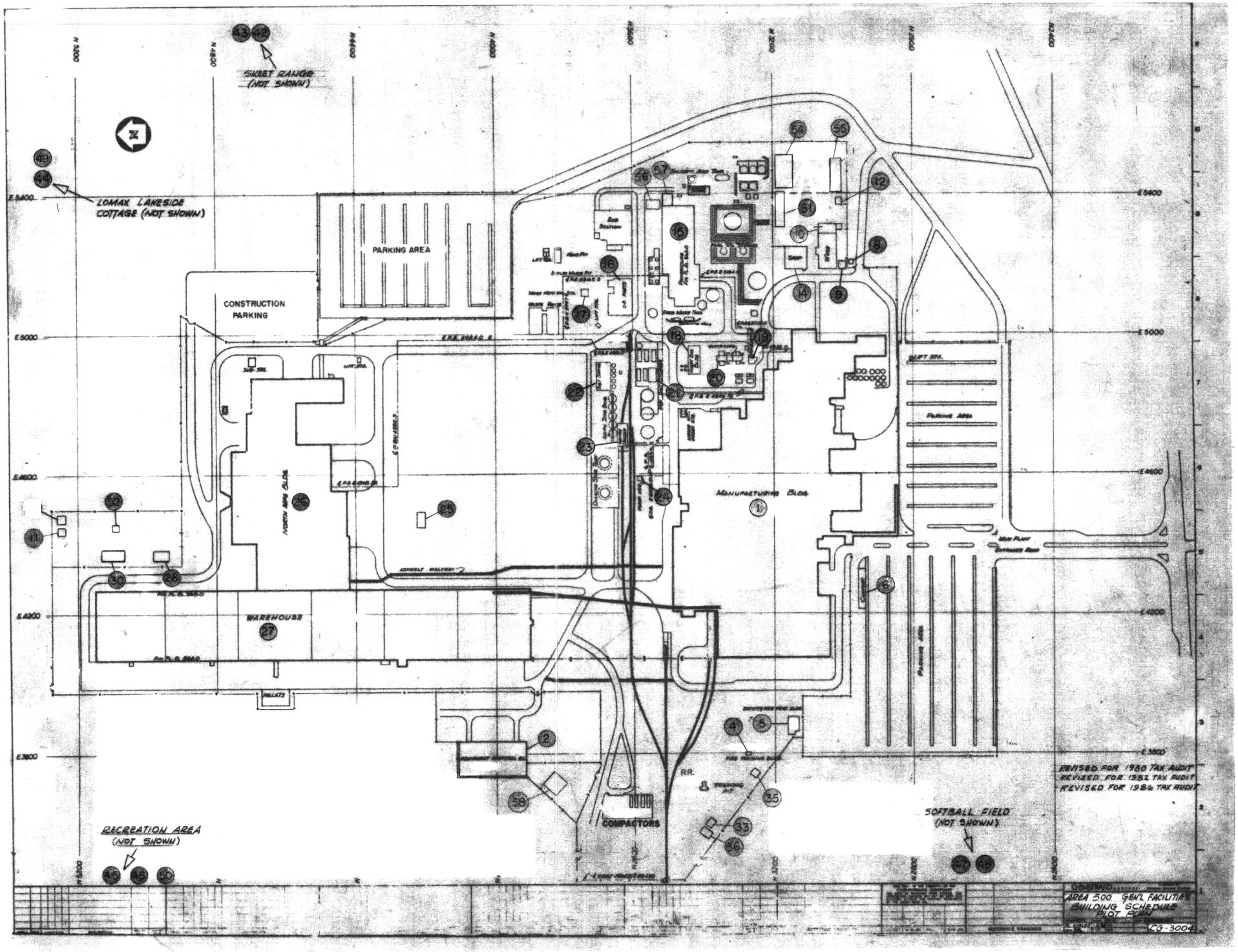
Name: Jerry Day

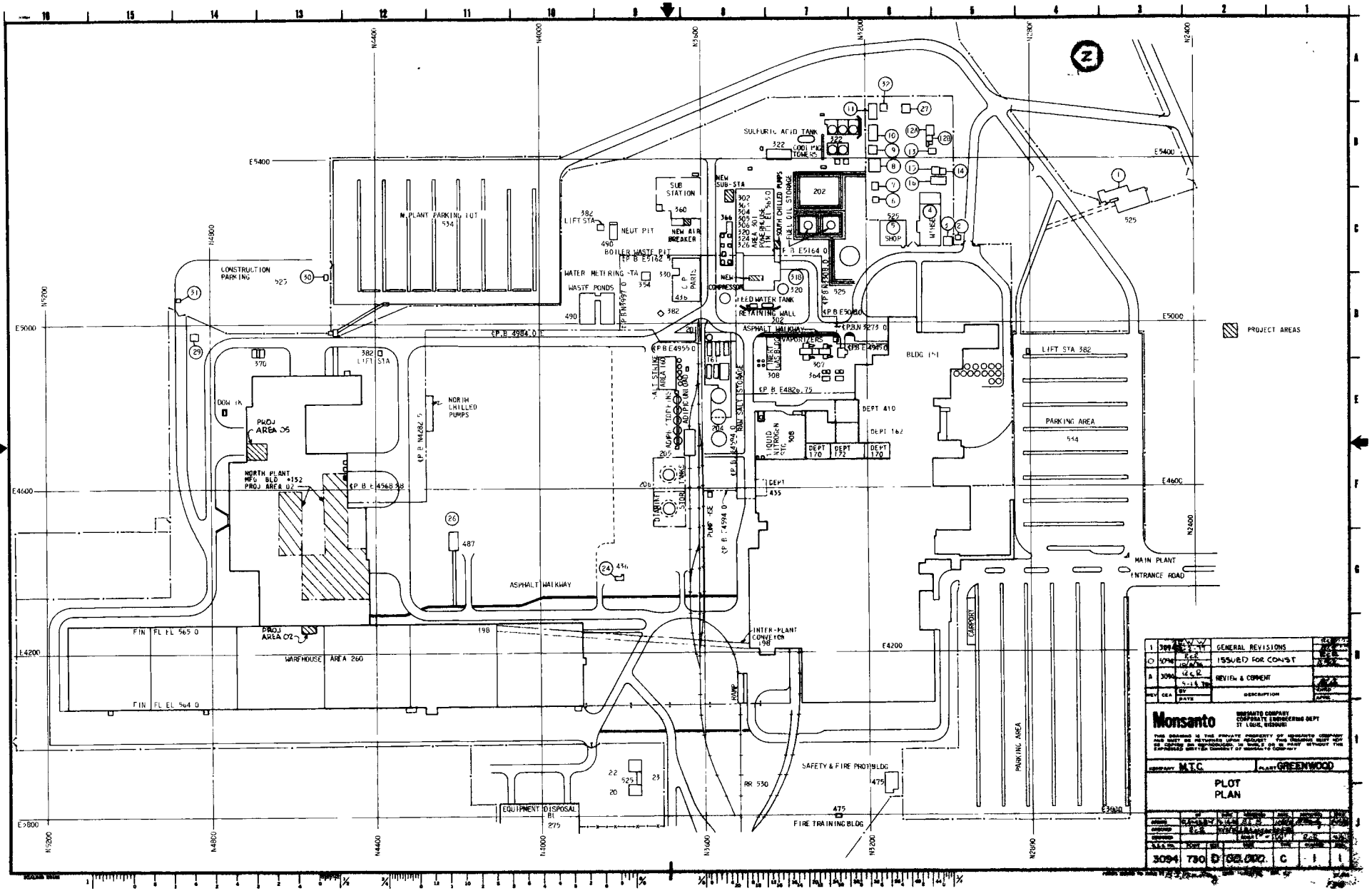
Time: 8:20

Exhibit C

Plot Plan & Drawings


150 MFG. BLDG., SOUTH
151 MFG. BLDG. 'G' MACH. & BATCH POLYMER
152 MFG. BLDG. 'A' N. P.
160 SALT STRIKE
161 C.P. PURE SALT STG.
201 FUEL OIL TRUCK SPOT
202 FUEL OIL STG. & CAR SPOT
204 RAW SALT SOL. STG.
205 ADIPIC UNLOAD. & STG.
206 DIAMINE UNLOAD. & STG.
220 POLY. STG. & PNEU. CONV.
275 SALV. & EQ. DISP.
301 POWERHOUSE BLDG.
302 WATER TREATMENT BLDG. 301
303 STEAM GENER. BLDG. 301
304 REFRIGERATION BLDG. 301
305 AIR COMPR. BLDG. 301
306 INST. AIR BLDG. 301
307 CENTRAL DOWTHERM
308 INERT GAS GENERATION
310 DRAWWIND AIR COMPRESSION
318 GROUND WATER TANK
319 ELEVATED WATER TANK
320 FIRE WATER PMP. BLDG. 301
322 COOL. TWR. & CHL. HSE.
324 DOM. WATER BLDG. 301
326 PURE WATER AREA BLDG. 301
330 NATURAL GAS DIST.
331 FUEL OIL DIST.
354 DOMESTIC WATER DIST.
360 PURCHASED PWR. SUBST.
364 ELECT. SUBSTS.
366 ELECT. SUBSTS.
380 PROCESS SEWERS
381 STORM SEWERS
382 SANITARY SEWERS
436 CP PARTS STG. & CL. BLDG. & VEH. REP. & PARTS CLEANING
525 TEMP. BLDGS.
530 RAILROADS
472 PROJ. ENG. BLDG.
531 ROADS
532 WALKS
533 FENCES
534 PARK. LOTS & CARPORT
539 OUTFALL STATIONS
198 YARN PALLETIZING AND SEGREGATION AREA AND INTERPLANT CONVEYING, APR STATION N. P. TO APR STATION S.P.
370 ELECTRICAL SUBSTATION
AREA 500 GEN. FACILITIES PLOT PLAN CIVIL
SCALE 1" = 800'
E-3008


SKEET RANGE (NOT SHOWN)
LOMAX LAKESIDE COTTAGE (NOT SHOWN)
PARKING AREA
CONSTRUCTION PARKING
MANUFACTURING BLDG.
WAREHOUSE
COMPACTORS
RECREATION AREA (NOT SHOWN)
SOFTBALL FIELD (NOT SHOWN)
RR.
REVISED FOR 1980 TAX AUDIT
REVISED FOR 1982 TAX AUDIT
REVISED FOR 1986 TAX AUDIT
AREA 500 GEN'L FACILITIES
BUILDING SCHEDULE
PLOT PLAN
CG-300A



REV	DATE	DESCRIPTION	BY
1	3094	GENERAL REVISIONS	
0	4/74	ISSUED FOR CONST	
A	3094	REVIEW & COMMENT	

Monsanto

MONSANTO COMPANY
CORPORATE ENGINEERING DEPT
ST LOUIS, MISSOURI

COMPANY M.T.C. PLANT GREENWOOD

PLOT PLAN

3094	730	D	05.002	C	1	1

Exhibit D

1984 CRS Sirrine Report

CRS SIRRINE

PLANT WIDE

HYDROGEOLOGY AND GROUNDWATER QUALITY ASSESSMENT

MONSANTO COMPANY
GREENWOOD, SOUTH CAROLINA

NOVEMBER 1, 1984

SIRRINE ENVIRONMENTAL CONSULTANTS, INC.

CRS SIRRINE, INC.
GREENVILLE, SOUTH CAROLINA

Sirrine Environmental Consultants, Inc.
A CRS Sirrine, Inc. Subsidiary
Post Office Box 5456
Greenville, South Carolina 29606
803-298 6000

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APPENDIX A "HYDROGEOLOGY OF THE MONSANTO - GREENWOOD PLANT," SOIL & MATERIAL ENGINEERS, INC.

APPENDIX B ANALYTICAL DATA
1. QUALITY CONTROL
2. GROUNDWATER AND SOILS DATA

A. INTRODUCTION

Monsanto Company in Greenwood, South Carolina commissioned an investigation to determine if any past or present operating procedures or facilities at the plant have impacted the quality of area groundwater. To accomplish this, areas have been identified where solid or liquid process and waste chemicals are stored or handled.

In addition to investigating areas and facilities that could possibly impact the groundwater, the plant-wide investigation was performed to provide evidence that no potential exists for any adverse impact to groundwater off-site. The investigation was also made to confirm that the plant facilities are hydrogeologically isolated from adjacent properties.
The areas or facilities identified for investigation are listed below and are located on Figure 1 relative to the Monsanto plant.

1. Hazardous Waste Storage Pad, Open Pit Burning, and Air Washer Discharge Area.

2. Railroad Unloading.

3. Equalization Basins.

4. Filter Cake Slurry Pond.

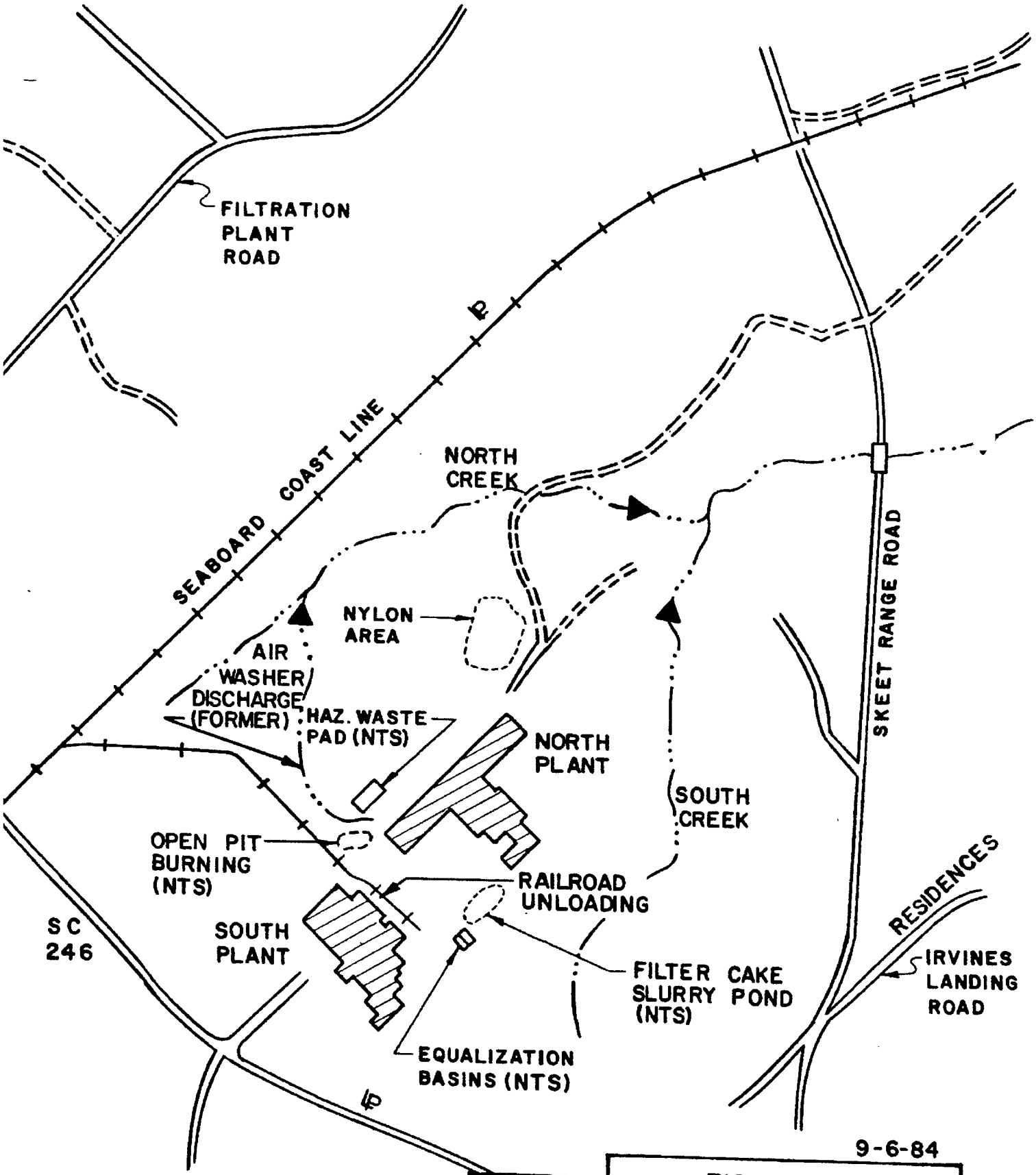
5. Nylon Disposal Area.

6. North Plant Area.

7. Boundary Areas.

Each of the above areas is discussed separately in this report.

Sirrine Environmental Consultants, Inc. coordinated and managed this plant wide investigation. Soil & Material Engineers, Inc. performed the hydrogeologic study of the site. The James H. Carr laboratory performed all analytical work. The analytical data summary is contained in Section J. The detailed "Hydrogeology of the Monsanto Property" is included as Appendix A. All laboratory water quality and soils data sheets are included in Appendix B.

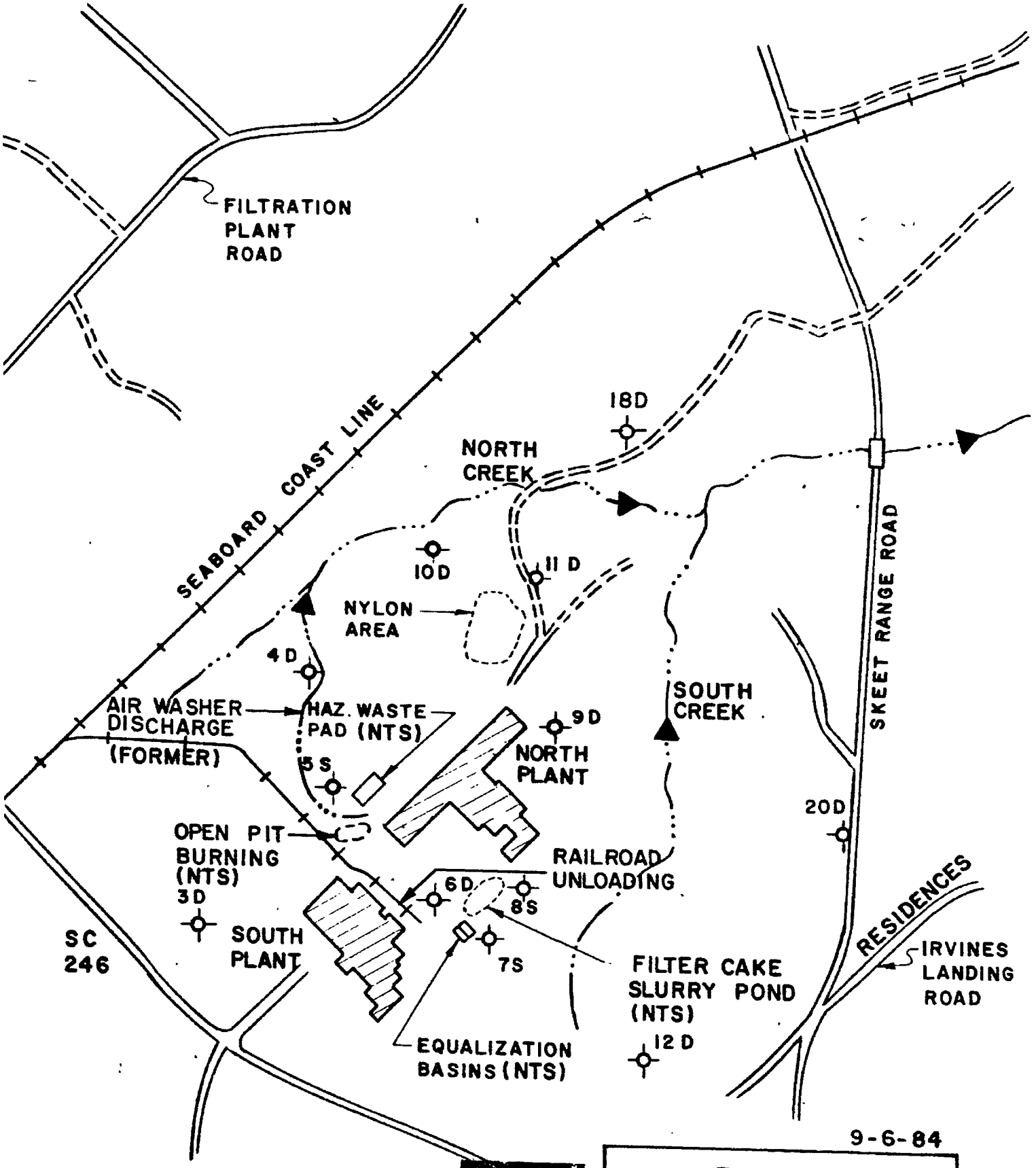


NOTE: CERTAIN FACILITIES NOT TO SCALE (NTS)

9-6-84

FIGURE 1
AREAS INVESTIGATED
PLANT WIDE STUDY
MONSANTO GREENWOOD

CRSS



9-6-84

NOTE: CERTAIN FACILITIES NOT TO SCALE (NTS)

CRSS

CRS SIRRINE

FIGURE 2
MONITORING WELLS
PLANT WIDE STUDY
MONSANTO

B. METHODS OF INVESTIGATION

The objective of the plant-wide investigation was to determine the impact, if any, of the identified areas and facilities on groundwater. To accomplish this, the investigation of each area involved the following:

1. Review of Past and Present Operating Procedures.
2. Site Reconnaissance.
3. Electromagnetic Conductivity Survey.
4. Soil Test Borings.
5. Groundwater Monitoring Well Installations.
6. Analysis of Groundwater and Soils.

Twelve groundwater monitoring wells have been installed and four soil test borings performed to determine groundwater quality and area hydrogeology. The monitoring wells and plant facilities are located on Figure 2. The soil test borings were performed immediately adjacent to the well installations at OW-5s, OW-6d, OW-7s, and OW-8s.

The areas identified for this investigation and the associated monitoring wells are presented below:

	Site	Associated Monitoring Wells
1.	Hazardous Waste Storage Pad, Open Pit Burning, and Air Washer Discharge Area	OW-4d, OW-5s
2.	Railroad Unloading Area	OW-6d
3.	Equalization Basins	OW-7s
4.	Filter Cake Slurry Pond	OW-8s
5.	Nylon Disposal Area	OW-10d, OW-11d
6.	North Plant Area	OW-9d
7.	Boundary Areas	OW-3d, OW-12d, OW-18d, OW-20d

All groundwater and soil samples collected were analyzed for priority pollutant and conventional water quality parameters to provide a comprehensive analytical scan. The soil samples were analyzed to generally chemically characterize the soil profile and to determine differences in compounds detected relative to the groundwater. Except as noted, the soil samples are composites of several samples taken at varying depths. Therefore, the soils data must be considered as a general indication of the types of compounds present and their concentrations.

C. HAZARDOUS WASTE STORAGE PAD, OPEN PIT BURNING, AND AIR WASHER DISCHARGE AREA

1. Site Description

The Hazardous Waste Storage Pad is located just west of the North Plant (Figure 1). The present facility, constructed to RCRA specifications, is a covered and diked concrete containment area. Prior to the implementation of RCRA regulations, and construction of the hazardous waste pad, certain materials now classified as hazardous were stored in this general area.

An area near the existing hazardous waste storage pad was used in the past for open pit burning. The material burned in the open pit was restricted generally to flammable materials, such as solvents. The general area of the open pit burning is shown on Figure 1.

An air washer overflow from the plant was formerly discharged to a ditch near the existing hazardous waste pad. At one time this discharge may have contained a trace of chromium which was used as a corrosion inhibitor. However, the use of any compounds containing chrome was discontinued several years ago.

Due to the relative proximity of the hazardous waste storage and open pit burning sites, and air washer discharge, these areas have been jointly investigated.

2. Monitoring Wells

Two monitoring wells were installed topographically down-gradient of the above described facilities. Well OW-5s was located immediately below the hazardous waste storage and open pit burning areas. Well OW-4d was located approximately 800 feet down-gradient of OW-5s and adjacent to the former air washer discharge stream.

Well OW-5s was installed as a shallow well, screened from 20-24 feet. Well OW-4d was installed as a deep well, open hole 60-80 feet, to determine if material conveyed down the air washer discharge ditch had percolated into the fractured bedrock.

3. Hydrogeology Considerations

The hazardous waste storage area, the old open pit burning area, and the former air washer discharge stream are all located in topographically high areas of the plant site. Due to their location near the topographic divide between the two major surface drainage features, South Creek and North Creek, these facilities are located in groundwater recharge areas. Therefore, any contamination from the above potential sources may have a greater opportunity for deeper percolation.

The detection of volatile organics at OW-4d is an indication that contaminant material has vertically migrated to the bedrock zone. At this location, the saprolite is thick (68 feet) and the groundwater samples were collected from the open hole (68-80 feet) in the granite bedrock.

As a result of the hydrogeological investigation of the plant site, it is known that as North Creek is approached, the water levels, as measured in wells tapping both the saprolite and underlying bedrock, are approximately equal. Artesian pressure exists in the bedrock zone and is demonstrated at well OW-4d where the water elevation was measured as 4 feet below land surface. Therefore, North Creek, which is the local groundwater discharge area, is interpreted to be an effective hydrologic boundary.

4. Impact to Soils and Groundwater

The complete analysis of soils and groundwater is presented in Tables 1, 2, and 3. A soil test boring was performed adjacent to Well OW-5s. Analysis of this soil sample does not indicate the presence of contamination.
The analysis of groundwater from OW-5s indicates a total volatile organic concentration of 5.2 mg/l. In addition, analyses for mercury (1.43 ug/l), TOC (17.5 mgC/l), and conductance (355 umhos/cm) were above expected concentrations as determined by the analysis of Well OW-3d. Oil and grease was detected at elevated concentrations in several plant wide wells, including OW-5s. Subsequent re-sampling and analysis indicated that the original oil and grease data were erroneous. It is suspected that oil contamination may have occurred during well development.

Volatile organics were also detected in Well OW-4d located several hundred feet downgrade from OW-5s. The total volatile concentration down-gradient at OW-4d was 1.06 mg/l. This may indicate that volatile organics may be eminating from the area around well OW-5s. The concentration of TOC (8 mgC/l) at OW-4d may also indicate that the contaminated groundwater is

being dispersed with distance from the suspected sources. The former discharge of chromium in the air washer stream, does not appear to have impacted the groundwater.

D. RAILROAD UNLOADING

1. Site Description

A railroad spur is located between the North and South Plants as shown on Figure 1. Raw materials are unloaded via the railroad spur.

2. Monitoring Wells

One monitoring well, OW-6d, and one soil boring were located in the railroad unloading area. No major spills of solid or liquid chemicals have occurred in this area. Therefore, one monitoring well, and one soil test boring, were considered adequate to confirm that this area has not impacted groundwater quality. Well OW-6d is located on Figure 2.

3. Hydrogeological Considerations

The area surrounding OW-6d is a groundwater recharge area. Therefore, there is a potential for vertical migration of any material that may be spilled at the surface.

4. Impact to Soils and Groundwater

The analysis of soils and groundwater at this site indicates the absence of priority pollutant organics. The few metals detected in the groundwater were present at very low concentrations.

Except for TOC (6.8 mgC/l), the concentrations of all other conventional water quality parameters do not indicate the presence of groundwater contamination. The elevated concentration of oil and grease (44.9 mg/l) is attributed to well development.

Pb at 0.14 mg/L ?

E. EQUALIZATION BASINS

1. Site Description

Prior to 1984, two equalization basins were utilized to receive process wastewater before it was pumped to the Wilson Creek Treatment Plant. Each basin had dimensions of approximately 20 x 40 x 8 feet. The basins were separated by a common dike as shown on Figure 1. Wastewater could have percolated into the soils and contaminated underlying groundwater.

2. Monitoring Wells

One monitoring well, OW-7s, was installed less than 100 feet topographically down-gradient of the equalization basins. Well OW-7s is located on Figure 2.

One soil test boring was also performed at OW-7s. Two soil samples were collected at this site, one from a specific depth interval (18-20 feet) and one composited from several samples taken at varying depths.

3. Hydrogeological Considerations

In certain areas of the Monsanto property, the saprolite zone is thick and unsaturated. However, at OW-7s the depth to saturated saprolite is only approximately 13 feet. Therefore, any contaminant material leaching from the equalization basins could affect groundwater in a short period of time.

The distance from the equalization basins to South Creek is approximately 600 feet. As South Creek is approached, the water levels, as measured in wells tapping both the saprolite and underlying bedrock, are approximately equal. Artesian pressure exists in the bedrock zone. Therefore, South Creek, which is the local groundwater discharge area, is interpreted to be an effective hydrologic boundary. Any groundwater in the area of the equalization basins would eventually discharge to South Creek.

4. Impact to Soils and Groundwater

The soils analysis at OW-7s did not detect the presence of organic priority pollutant compounds. Concentrations of metals and most conventional water quality parameters appear to compare very closely with uncontaminated soil samples throughout the Monsanto property. The soil sample collected at a specific depth, identified in Table 1 as OW-7, No. 3, yielded slightly elevated concentrations of TOC (4.09 mgC/gm) and ammonia (70 mg/kg).

Well OW-7s was installed to a depth of 25 feet into saturated saprolite. The groundwater analysis performed at OW-7s detected the presence of volatile organics (0.88 mg/l). In addition, elevated concentrations were noted for TOC (24.1 mgC/l) and chloride (16.0 mg/l).

The source of the volatile organics, which are mobile in the soil profile, is interpreted to be percolation from the equalization basins which have been closed. However, the absence of elevated concentrations for metals and other conventional water quality parameters indicates that the contamination at OW-7s is limited to a trace of volatile organics.

F. FILTER CAKE SLURRY POND

1. Site Description

A waste pond was utilized during the 1960's and was located in the general area shown on Figure 1. It was filled when the North Plant was constructed IN 1965. This pond was used to contain the backwash wastewater from a diatomaceous earth filter. This pond had no outlet and the material was allowed to evaporate.

2. Monitoring Wells

One monitoring well, OW-8s, was installed approximately 100 feet topographically down-gradient from the location of the former slurry pond. The location of Well OW-8s is shown on Figure 2.

In addition to the monitoring well, a soil test boring was also performed adjacent to OW-8s and a composite sample was collected.

3. Hydrogeological Considerations

The slurry pond was filled druing the construction of the North Plant. An access road now traverses the area at a surface elevaton 10-15 feet higher than the former slurry pond.

Well OW-8s is located near the base of this filled area. It is uncertain how the fill above the slurry pond affects any possible leachate movement from this area. However, because Well OW-8s is screened from 17-21 feet below the surface, the unsaturated saprolite zone is thin. Groundwater in the vicinity of OW-8s moves toward South Creek. The distance from this well to South Creek is approximately 500 feet.

4. Impact to Soils and Groundwater

The soil sample analysis for OW-8s is given in Table 1. Parameters which appear to be elevated, with respect to other soil samples analyzed at the Monsanto site, include: phosphorus (504 mg/kg), barium (267.3 mg/kg), magnesium (16,000 mg/kg), manganese (19,000 mg/kg), and phenols (3.55 ug/kg). The levels of some of the above parameters could represent natural variations in soil chemistry across the site. It should be noted, however, that no priority pollutant organics were detected in the soil profile.

The groundwater analyses for OW-8s is contained in Table 2. No organic priority pollutants were detected. In addition, the metals were detected at very low levels, although mercury was found at a concentration of 1.07 ug/l as compared to a method detection concentration of <0.5 ug/l. This groundwater sample also exhibited a slightly higher conductance (240 umhos/cm) as compared to other well samples. The concentrations of magnesium, manganese, barium, phenols, and phosphorus, which were all found at elevated levels in the soil sample, were not found to be elevated in the groundwater samples. The oil and grease concentration was measured as 43.7 mg/l. Again, well development is likely the cause.

G. NYLON DISPOSAL AREA

1. Site Description

Scrap nylon produced during the start-up of the South Plant in 1960 was buried in an approximately 10-acre area shown on Figure 1. The nylon was covered with soil and trees were planted. Although nylon is an essentially inert material, this area was identified for investigation. An electromagnetic survey, performed by Soil & Material Engineers, did not detect any unusually anomalous conductivities in the nylon disposal area.

2. Monitoring Wells

Two monitoring wells, OW-10d and OW-11d, were installed topographically down-gradient of the nylon disposal area. The nylon disposal area and wells OW-10d and OW-11d are located on Figure 2. Well OW-10d was located approximately 200 feet from the base of the nylon disposal area and adjacent to a seep. This seep is a discharge area for groundwater underlying the nylon disposal site. Therefore, should any material have been leaching from the nylon area, well OW-10d was positioned for detection.

No soil samples were collected from wells OW-10d and OW-11d due to their distance from any disposed nylon. The EM survey of this area also confirmed the absence of any disposed material other than nylon.

3. Hydrogeological Considerations

The nylon disposal area is located in a topographically high area of the plant property. However, the slope between the nylon area and North Creek is steep and the base of the nylon area is in a groundwater discharge zone. This is evidenced by the existing seep near OW-10d.

The shortest distance from the nylon disposal area to North Creek is approximately 300 feet. North Creek is the identified groundwater discharge area and it is interpreted to be a hydrologic boundary. Artesian pressure exists in the underlying bedrock in this area. Therefore, any groundwater underlying the nylon disposal area will eventually discharge to North Creek.

4. Impact to Groundwater

The analysis of groundwater from samples collected at OW-10d and OW-11d is presented in Table 2. The data from these wells do not indicate any contamination. No priority pollutant organics were detected. The metals, if detected, were present at very low concentrations. In addition, no conventional indicator of water quality was found at a concentration higher than that of other uncontaminated soils at the site.

Samples of the seep at the base of the nylon disposal area were obtained by Carr Laboratory for biological testing (March, 1984). The samples were examined for algae and plated for bacteria at the Botany Department at the University of South Carolina. The seep samples contained green algae, single cell and filamentous. However, the algae count was not abundant indicating that the seep was not overly nutrified.

The examination was negative for bacteria. However, abundant and diverse animal life was apparent indicating the seep is a suitable habitat even for sensitive species.

H. NORTH PLANT AREA

1. Site Description

The North Plant, located on Figure 1, was investigated to obtain groundwater quality and hydrogeologic information.

2. Monitoring Wells

Monitoring well OW-9d was located approximately 200 feet from the northeast corner of the North Plant (Figure 2).

No soil samples were collected because no potential contaminant sources were identified in the area.

3. Hydrogeological Considerations

The North Plant, and the area immediately surrounding OW-9d, is located in a topographically high area of the Monsanto property. This area is an identified groundwater recharge area. The potential for deeper percolation of material in recharge areas was indicated at OW-9d. Artesian pressure does exist, however, in the underlying bedrock. Therefore, as groundwater migrates toward the discharge area, there is a potential for upward movement.

Groundwater level measurements were taken at Well OW-9d and other plant wide wells. This data indicates that groundwater underlying the area of OW-9d would move toward South Creek, the local discahrge area. South Creek is interpreted to be an effective hydrologic boundary.

4. Impact to Groundwater

The groundwater quality data for Well OW-9d is presented in Table 2. The analysis for this well indicates groundwater contamination. The total volatile organic concentration was determined to be 0.23 mg/l. In addition, analytical parameters which were detected above levels found at other monitoring locations include: TOC (10 mgC/l), conductance (279 umhos/cm), phenols (22.8 ug/l), and oil and grease (1,127 mg/l).

A second sample collected from OW-9d was analyzed and found to contain <2.0 mg/l oil and grease. The source of oil and grease in the initial sample is unknown. However, contamination could have been introduced during the well development.

It is unlikely that any contamination from the drilling procedure could have introduced volatile organics. Therefore, based on one round of analysis at OW-9d, a source of groundwater contamination in the area is suspected.

The depth of the well screen at OW-9d is over 100 feet. However, the presence of a dike or fracture could convey relatively small volumes of material to OW-9d.

I. BOUNDARY AREAS

1. Site Description

Boundary areas were identified for investigation to provide hydrogeologic information, such as groundwater flow direction, and to obtain groundwater quality data.

No potential sources which could impact groundwater have been identified in the boundary areas. Relative to the boundary area adjacent to Irvines Landing Road, the closest Monsanto plant facilities are at a distance of over 2,000 feet (Figure 1).

2. Monitoring Wells

The boundary monitoring wells are located on Figure 2. Well OW-3d was located several hundred feet up-gradient from plant facilities to provide groundwater quality data. Wells OW-12d and OW-20d are located near the eastern property boundary. The purpose of these wells is to provide water quality data for the area adjacent to the Irvines Landing Road residences and to determine groundwater flow direction.

Well OW-18d is located approximately 2,500 feet north of the Monsanto production facilities. No sources which could impact groundwater quality are known or suspected in this general area. Well OW-18d was positioned to provide hydrogeologic information, including groundwater elevation.

3. Hydrogeologic Considerations

Groundwater level measurements taken at boundary wells OW-12d and OW-20d confirm that groundwater does not flow toward adjacent properties. Specifically, groundwater underlying the eastern perimeter of the site, adjacent to Irvines Landing Road, flows to South Creek.

The groundwater level in Well OW-3d confirms that groundwater underlying the front grounds of the Monsanto property, i.e., between SC Highway 246 and the South Plant is predominantly moving to the headwater spring of North Creek. There is a potential for a small subsurface area located immediately adjacent to SC Highway 246 to drain beyond Monsanto property. However, this area appears small and is located approximately 1,000 feet from any production facilities and further from any identified facilities which could potentially impact groundwater quality.

4. Impact to Groundwater

The groundwater quality data for wells OW-3d, 12d, 18d, and 20d is presented in Table 2. It is evident that there is no indication of any adverse groundwater contamination at these areas. No organic priority pollutants were detected in the groundwater from the above wells. Metals, if detected, were present at very low concentrations. In addition, all conventional water quality parameters analyzed in wells OW-12d, 18d, and 20d compared closely with that of Well OW-3d.

Again, well development is the suspected cause of elevated oil and grease levels randomly detected in the original samples from the boundary wells. A second round of purging and groundwater analysis indicated that the oil and grease had been eliminated.

J. ANALYTICAL DATA SUMMARY

Tables 1 and 2 contain the soil and groundwater analytical data, respectively. The individual laboratory analysis sheets for each sample, as prepared by the James H. Carr Laboratory, are contained in Appendix B.

WP:JSD-.5

TABLE 1
SOILS EXTRACTION DATA
PLANT-WIDE STUDY

Parameter	Haz. Pad OW-5	R. R. Unload OW-6	Equal. Basin OW-7	Equal Basin OW-7, No. 3	Waste Pond OW-8
TOC mgC/gm	0.41	0.10	0.59	4.09	0.07
Ammonia	<1.0	56	28	70	28
pH	5.3	5.1	5.2	4.8	6.1
Chloride	20	30	30	20	20
Fluoride	1.2	2.1	<1.0	1.0	1.0
Nitrate	<0.1	6.0	<0.1	<0.1	0.4
Oil and Grease	95	80	70	110	95
Phosphorus	243	82.4	161	112	504
Sulfate	64.2	44	88	25.5	235
Surfactants	0.13	0.02	0.02	0.04	<0.02
Aluminum	43,754	53,000	41,210	24,642	43,993
Barium	118.6	18	126.4	5.05	267.3
Boron	0.14	1.14	0.37	0.241	1.38
Cobalt	38	6.0	15	2.0	54
Iron	31,000	80,000	42,000	16,000	56,000
Magnesium	3,700	380	2,500	140	16,000
Molybdenum	3.1	<1.7	<1.0	<1.0	<1.0
Manganese	950	310	570	5.0	19,000
Tin	11.3	<1.7	8.5	6.6	6.0
Titanium	1,298	1,500	1,111	390	1,841
Antimony	Inter.	<0.17	Inter.	Inter.	Inter.
Arsenic	Inter.	0.81	Inter.	Inter.	Inter.
Beryllium	1.01	0.48	0.86	0.34	1.35
Cadmium	0.17	0.10	0.18	0.15	0.24
Chromium	8.7	9.0	6.9	5.1	19
Copper	61	73	60	16	54
Lead	6.4	1.9	3.1	2.0	<0.1
Mercury	0.05	<0.05	<0.05	<0.05	<0.05
Nickel	47	6.9	11	4.2	65
Selenium	1.0	2.2	<0.1	<0.1	1.3
Silver	1.4	4.5	1.48	0.82	2.1
Thallium	<0.1	0.86	<0.01	<0.1	0.42
Zinc	73	47	47	16	94
Phenols ug/kg	<0.05	0.12	0.07	0.05	3.55
Total Volatiles	ND	ND	ND	ND	ND
Acids	ND	ND	ND	ND	ND
Base Neutrals	ND	ND	ND	ND	ND
Pesticides/PCB's	ND	ND	ND	ND	ND

ND - None Detected (<10.0 ug/kg)
Inter. - Interference (other metals in high concentrations)
All Analyses mg/kg except as noted

WP:JSD-.3

TABLE 2
GROUNDWATER QUALITY DATA
PLANT-WIDE STUDY

Parameter	Boundary OW-3	Haz. Pad OW-4	Haz. Pad OW-5	R.R. Unload OW-6	Equal. Basin OW-7	Waste Pond OW-8	North Plant OW-9	Nylon OW-10	Nylon OW-11	Boundary OW-12	Boundary OW-18	Boundary OW-20
TDS	132	120	138	120	132	126	218	183	172	113	118	126
COD	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TOC (mgC/l)	<1	8	17.5	6.8	24.1	<1	10	<1	1	<1	<1	<1
TSS	35	2	4	<1.0	2	10	46	11	<1	23	6	4
Ammonia	<0.1	<0.1	0.2	<0.1	<0.1	0.2	<0.1	0.3	<0.1	<0.1	<0.1	<0.1
pH	6.81	7.0	6.2	6.15	4.7	6.65	7.2	6.3	5.9	7.05	6.6	6.98
Conductance	89	143	355	135	165	240	279	142	260	90	129	183
Chloride	0.6	2.4	10	4.0	16.0	6.0	10	4	9.0	1.1	4.0	0.9
Fluoride	0.24	0.16	0.32	0.24	<0.1	0.28	0.36	0.32	0.19	0.28	0.28	0.20
Nitrate	1.2	0.03	1.13	0.5	0.37	0.1	0.38	0.52	1.3	0.41	0.30	0.19
TKN	<0.1	<0.1	0.4	0.4	0.7	0.5	0.3	1.4	0.5	<0.1	<0.1	<0.1
Oil and Grease*	61.5	2.1	299	44.9	<2	43.7	<2	<2	<2	64	<2	<2
Phosphorus	0.18	0.05	0.11	0.12	0.44	0.47	0.17	1.35	0.15	0.31	0.92	0.10
Sulfate	12	4	33.8	12.7	35.3	6.3	8.5	15	3.9	8	54.8	20
Aluminum	7.1	0.33	0.60	0.46	<0.01	1.2	9.3	5.5	0.27	3.7	10.3	0.72
Barium	0.1	0.09	0.062	<0.01	<0.01	0.11	<0.01	0.05	0.07	0.1	0.04	0.10
Boron	<0.2	<0.2	0.17	0.05	0.02	0.06	<0.2	0.046	<0.2	<0.2	<0.2	<0.2
Cobalt	<0.1	<0.1	<0.01	0.07	0.06	<0.01	0.01	0.04	<0.01	<0.1	<0.01	<0.1
Iron	1.29	0.42	0.27	0.28	0.08	0.46	2.27	3.98	0.37	0.98	7.5	0.21
Magnesium	3.2	3.6	1.4	0.55	4.3	4.8	1.42	3.8	8.86	4.1	0.09	4.3
Molybdenum	<0.01	<0.01	<0.1	<0.1	<0.1	<0.1	0.04	<0.1	<0.1	<0.01	<0.01	<0.01
Manganese	0.11	0.08	0.03	0.02	0.15	0.05	0.03	0.08	<0.01	0.08	0.09	0.02
Tin	<1.0	<1.0	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1.0	0.11	<1.0
Titanium	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.02	0.1	0.1	<0.1	0.19	<0.1
Antimony	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.01	<0.1	<0.1	<0.1
Arsenic	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01
Beryllium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01
Cadmium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01
Chromium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Copper	0.02	0.01	0.01	<0.01	0.01	0.01	<0.01	0.06	0.01	0.02	0.15	<0.01
Lead	<0.01	0.05	0.10	0.14	0.15	0.07	<0.01	<0.01	0.13	<0.01	<0.01	<0.01
Mercury(ug/l)	<0.5	<0.5	1.43	<0.5	<0.5	1.07	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nickel	0.02	0.02	0.03	<0.01	0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.05	0.01
Selenium	0.02	<0.01	<0.01	0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01
Silver	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.04	<0.01	<0.01	<0.01	<0.01
Thallium	<0.1	<0.1	<0.01	<0.1	<0.1	<0.01	<0.01	0.01	<0.01	<0.1	<0.01	<0.1
Zinc	0.05	0.02	0.04	0.04	0.03	<0.01	0.09	0.02	0.01	0.02	0.88	0.04
Phenols(ug/l)	1.96	<1.0	4.62	4.09	8.87	<1.0	22.8	6.75	9.41	<1.0	16.3	<1.0
Total Volatiles	ND	1.06	5.2	ND	0.88	ND	0.23	ND	ND	ND	ND	ND
Acids	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Base Neutrals	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pesticides/PCB's	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

All Analyses mg/l Except as Noted
ND - None Detected (<10 ug/l)
* - Oil and Grease - Suspected Contamination From Drilling
(Several Samples)

WP:JSD-.4

TABLE 3
PLANT WIDE
GROUNDWATER QUALITY DATA
VOLATILE ORGANICS

Well	Chloroform	1-1 Dichloroethane	1-1 Dichloroethylene	1-1-1 Trichloroethane	Trichloroethylene	1-2 Trans Dichloroethylene
OW-3d	ND	ND	ND	ND	ND	ND
OW-4d	0.10	ND	0.34	0.09	0.52	ND
OW-5s	ND	ND	1.77	2.61	0.84	ND
OW-6d	ND	ND	ND	ND	ND	ND
OW-7s	ND	0.04	0.73	0.04	0.07	ND
OW-8s	ND	ND	ND	ND	ND	ND
OW-9d	0.23	ND	ND	ND	ND	ND
OW-10d	ND	ND	ND	ND	ND	ND
OW-11d	ND	ND	ND	ND	ND	ND
OW-12d	ND	ND	ND	ND	ND	ND
OW-18d	ND	ND	ND	ND	ND	ND
OW-20d	ND	ND	ND	ND	ND	ND

All Analyses - mg/l
ND - None Detected (<0.01 mg/l)
OW - Observation Well

WP:JSD-.6