UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

JUL 02 1999

Dr. Helen L. Penrod
Merck & Company, Inc.
P.O. Box 7
Elkton, Virginia 22827

Re: Merck Stonewall Plant
Statement of Basis

Dear Dr. Penrod:

Enclosed is a copy of the Statement of Basis for your facility. The Statement of Basis contains EPA's preliminary selection of remedies for the Merck Stonewall Facility.

The public will have an opportunity to comment on the preliminary selection discussed in the Statement of Basis from July 1 to July 31, 1999. A public meeting on EPA's proposed remedies will be held if sufficient public interest indicates that a meeting would be valuable for distributing information and communicating ideas.

If you have any questions, please feel free to contact me at 215-814-3433.

Sincerely,

Estena A. McGhee

Estena A. McGhee, Project Manager
RCRA General Operations Branch

Enclosure

cc: Robert Greaves (3WC23)
Betty Ann Quinn (3WC11)
Joel Hennessy (3WC11)
Yvette Hamilton-Taylor (3RC23)
Howard Freeland (VADEQ)
Leslie Romanchik (VADEQ)
Dr. C.F. Vencill (Merck & Co., Inc.)
Robert Hyde (Merck & Co., Inc.)

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION III

STATEMENT OF BASIS

MERCK & CO., INCORPORATED
ELKTON
ROCKINGHAM COUNTY, VIRGINIA

U.S EPA, REGION III
STATEMENT OF BASIS
MERCK, INCORPORATED
ROCKINGHAM COUNTY, VIRGINIA

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STATEMENT OF BASIS FOR PROPOSED CORRECTIVE MEASURES
UNDER RCRA SECTION 3008(h)

MERCK & CO., INCORPORATED
ELKTON, ROCKINGHAM COUNTY, VIRGINIA

I. Introduction

This Statement of Basis ("SB") explains the proposed corrective measure alternatives for remediating soil and groundwater contaminated with volatile and semivolatile organic compounds at the Merck & Co., Inc. ("Merck"), Stonewall Plant, ("Facility") located in Elkton, Rockingham County, Virginia. This document summarizes the corrective measure alternatives that the United States Environmental Protection Agency ("EPA") and Merck have evaluated under an Administrative Consent Order ("Order" or "Consent Order"), entered into between EPA and Merck on October 30, 1989, Docket Number RCRA-III-027-CA, pursuant to Section 3008(h) of the Resource Conservation and Recovery Act ("**RCRA**")[1], as amended, 42 U.S.C. Section 6928(h).

In accordance with the Order, Merck completed the tasks described in the EPA-approved RCRA Facility Investigation ("RFI") Workplan and then completed a Corrective Measures Study ("CMS"). The purpose of the RFI was to determine fully the nature and extent of any releases of hazardous wastes or hazardous constituents from the Facility. The CMS evaluated corrective measure alternatives to address contamination identified during the RFI. EPA approved the CMS on May 7, 1999.

This document describes the corrective measure alternatives considered for the Facility, presents EPA's preferred corrective measure alternative and explains EPA's rationale for selecting that alternative. This document also summarizes information that can be found in greater detail in the workplans and reports submitted by the Facility to EPA during the RFI. To gain a more comprehensive understanding of the RCRA activities that have been conducted at the Facility, EPA encourages the public to review these documents, which are found in the Administrative Record. The Administrative Record is located at the **Rockingham Public Library**.

EPA will address all comments submitted in response to its proposed remedy described in this Statement of Basis. EPA will make a final remedy decision and issue a Final Decision and Response to Comments after information submitted during the public comment period has been considered.

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[1] Words and abbreviations set forth in **bold** italicized type are further defined in the Glossary attached hereto.

EPA may modify the proposed corrective measure alternative or select other alternatives based on new information and/or public comments. Therefore, the public is encouraged to review and comment on the alternatives described in this document and/or any additional options not previously identified and/or studied. The public may participate in the remedy selection process by reviewing the documents contained in the Administrative Record and submitting written comments to EPA during the public comment period.

II. Proposed Corrective Measures

EPA's proposed corrective measure at the Facility is summarized as follows:

- Area Of Concern ("AOC") North - Enhanced biodegradation of shallow contaminated groundwater through a process called biosparging.
- AOC South - Enhanced biodegradation of contaminated soils through a process called bioventing.
- Skimmer Pond - Cleanup of groundwater through monitored natural attenuation.
- Solvent Burning Pits - Cleanup of groundwater through monitored natural attenuation.
- Waste Pits - Cleanup of groundwater through monitored natural attenuation.
- Sanitary Landfill - Installation of a RCRA Subtitle C hazardous waste cap on the sanitary landfill, groundwater monitoring, and recovery of a floating layer of hydrocarbon which is often referred to as light nonaqueous phase liquid (**LNAPL**) as needed from wells located around the landfill.
- Groundwater - Compliance with Federal groundwater cleanup standards (Table 9.1 of CMS- attached hereto as Table I) for the Facility by:

    1) Monitoring of the groundwater between the Landfill and the South Fork of the Shenandoah River to determine whether natural attenuation processes are remediating that portion of the groundwater plume.

2) Continued operation of the Facility's current groundwater extraction program[2] which extracts approximately 9.7 million gallons per day (MGD) from the aquifer.

- Surface Water - Conduct a surface water monitoring program to verify that Federal surface water quality standards are met.

- Notification of the existence of the capped landfill to any future owners.

A more detailed discussion of the proposed remedy is set forth in Section IX, below.

III. Facility Background

Merck is located in northwestern Virginia, approximately two miles southwest of the town of Elkton, Rockingham County. The Facility lies in the Shenandoah Valley, just southeast of the South Fork of the Shenandoah River. Massanutten Mountain is about 4 miles northwest of the Facility and the Blue Ridge Mountains are about two miles to the southeast. The Facility is bounded by Rt. 340 to the east and south, by the South Fork of the Shenandoah River to the North, and by Rt. 642 to the West. The Facility is relatively flat and gradually slopes north-northeast toward the River.

Merck began operations at the Facility in 1941. Prior to that time the land was undeveloped. The Facility includes a pharmaceutical laboratory and manufacturing facilities that produce animal and human health care products. The Facility is supported by a wastewater treatment plant, a solvent recovery operation, a power plant with co-generation facilities, and a permitted sanitary landfill. The Facility has been operated continuously by Merck since 1941.

The Landfill occupies seven acres located in the northeastern corner of the Facility. Prior to 1980, various production wastes, including organic and inorganic chemicals from the Facility were disposed of in the Landfill. Merck property borders the Landfill on all sides.

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[2]The groundwater extraction program includes two well fields: the exterior wells and the interior wells. The exterior well field is comprised of seven wells (wells M5-M11). The interior well field consists of three pumping wells (wells M2-M4). The current pumping system has been responsible for both the current distribution of chemicals and for stabilization of contaminant movement throughout most of the aquifer.

IV. Previous Investigations

On April 4, 1984 and May 31, 1985 Merck sampled its monitoring wells at the Facility. Samples showed elevated levels of volatile organic compounds which include carbon tetrachloride, benzene, ethyl ether, and xylene in the groundwater. Forty-five monitoring wells and piezometers were constructed under earlier phases of the groundwater monitoring effort at the Facility.

V. Summary of the RCRA Facility Investigation

Pursuant to the Order, Merck investigated eighteen **solid waste management units ("SWMUs")** for releases of hazardous waste and hazardous constituents and evaluated Facility specific conditions and characteristics that could affect potential contaminant migration. The SWMUs identified in the RFI were the Solid Waste Incinerator, Past Trash Incinerator, Waste Treatment Sludge Incinerator, Ash Lagoon, Spill Pond, Spill Tank, Ammonia Pits, Waste Treatment System, Waste Recycling Operations, East Landfarm, West Landfarm, Effluent Spray Area, Landfill, Accumulation Areas, Container Storage Pad, RCRA Registered Storage Building, Above Ground Storage Tanks, Underground Storage Tanks and Waste Pits.

Additionally, EPA acknowledged that Merck had voluntarily conducted the interim measures listed in List A.1 of the Order, and that Merck initiated and would complete the interim measures listed in List A.2 of the Order, attached hereto as Tables II and III, respectively.

Based on the findings of the RFI, several SWMUs were combined into common AOCs. (See Figure 1 for locations of all SWMUs.) AOC North includes solvent recovery (#3), small tank area E of Building 81D N (#29), small tank area E of Building 81D S (#30), factory 4 solvent recovery tanks (#34), and the chemical sewer (#59). AOC South includes the accumulation area B (#19), small tank area W of Building 21 (#33), small tank area N (#37), small tank area E of Building 21 (#38), elevated soil gas near Building 23 (#40), small tank area W of Building 23N (#43), small tank area W of Building 23S (#44), small tank area E of Building 23 (#45), S tank farm (#46), small tank area NE of Building 21D (#49), large tank area #1 by RR gate (#50), small spill area near container area A (#56), and small spill area E of Building 21 (#57). The Landfill AOC includes the past trash incinerator (#14) and the elevated soil gas area near SW corner of landfill (#63). The Waste Pits AOC includes Buildings 82 and 83, waste pits S (#25), Buildings 82 and 83 waste pits NW (#26), and Buildings 82 and 83 waste pits NE (#27). The Skimmer Pond AOC contains the skimmer pond (#6). The solvent burning pits AOC contains the solvent burning pits (#23).

EPA has determined that the principal sources of contamination to the groundwater are AOC North, AOC South, the Sanitary Landfill, Waste Pits AOC, Skimmer Pond AOC and Solvent Burning Pits AOC. See Figure 2.

The RFI activities conducted by Merck pursuant to the Order included:

- field mapping;
- fracture trace analysis;
- a series of bedrock well installations (MW-21 through MW-36) to assess the horizontal extent of contamination;
- passive testing to characterize the groundwater flow system in the bedrock aquifer;
- aquifer tests to collect hydraulic data;
- development of a Facility specific numerical groundwater flow model;
- review of historical aerial photographs to identify locations where waste disposal was evident; use of ground penetrating radar (GPR) to determine locations for sampling in surveyed areas; screening of the shallow subsurface soils for volatile organic compounds; source area verification by investigating each SWMU or spill;
- source area characterization;
- determination of the extent of waste associated with the landfill unit;
- performance of river water and sediment sampling;
- quarterly VOC and Appendix IX sampling; and
- identification of offsite receptors.

A. Groundwater Investigation

The groundwater investigation conducted by Merck as part of the RFI at the Facility included: 1) expansion of the groundwater monitoring network; 2) collection of hydrogeologic data from the subsurface to assess the environmental setting; 3) characterization of the groundwater flow system in the bedrock aquifer; 4) performance of aquifer tests to collect hydraulic data; and 5) development of a plant specific numerical groundwater flow model.

Two groundwater systems exist beneath the Facility - the overburden zone of saturation and the carbonate bedrock aquifer. The overburden consists of three general types of material: (1) alluvium/colluvium; (2) cobbles with silt and/or clay, and (3) residuum. The thickness and occurrence of these materials depends upon variation in depositional environment and degree of bedrock weathering. The overburden is extremely heterogeneous. The bedrock under the Facility is comprised primarily of dolomite and limestone of the Elbrook Formation. Limestone and shale beds of the Rome Formation underlie the Elbrook Formation and are penetrated by wells in the eastern portion of the Facility. Significant voids and cavernous features have

developed in the Elbrook Formation due to solutioning processes. Sinkholes have developed in the northern portion of the Facility.

The overburden zone is variably saturated. The hydraulic gradient is generally downward except in locations very near the South Fork of the Shenandoah River. Groundwater flow in the overburden is discontinuous and generally related to precipitation events that locally recharge the bedrock aquifer through this zone.

The bedrock aquifer under the Facility is comprised of the upper 400 feet of the Elbrook Formation. Regional groundwater flow is toward the Shenandoah River, although most of the groundwater entering the Facility is captured by two onsite pumping systems. The sources of groundwater to the interior well system are mountain recharge and local recharge. The sources of groundwater to the exterior well system are primarily mountain recharge, and to a lesser degree, induced recharge from the River. Groundwater flows primarily through the more transmissive fractures and bedding plane structures. Approximately 9.7 million gallons per day (MGD) of groundwater are used by Merck for process, potable, and noncontact cooling water at the Facility.

The RFI investigation required the installation of fifteen shallow bedrock monitoring wells (MW-21 through MW-36) to assess the horizontal extent of contamination. Five sets of cluster wells (DM-17, HE-6, MW-4, MW-37, and MW-38) were constructed to evaluate both groundwater flow and quality at discrete depths. See Figure 1. Nine landfill piezometers were also installed as overburden/bedrock pairs. Five pairs (LP-1 through LP-5) were installed on the west side of the Landfill and four pairs (LP-6 through LP-9) were installed on the east side of the Landfill. The overburden piezometers were screened at the base of the overburden layer. The bedrock piezometers were screened approximately 950 feet above mean sea level **(MSL)** to intercept the top of the water column. All wells were surveyed to provide coordinates for horizontal location and vertical elevation.

Six AOCs have been identified: Landfill, AOC North, AOC South, Skimmer Pond, Solvent Burning Pits and Waste Pits. The original sources of contaminant releases from AOC North, AOC South, Skimmer Pond, and the Solvent Burning Pits have been eliminated through the upgrade of Merck facilities and improvement in the Facility's waste management practices. However, residual contamination consisting of volatile constituents benzene, diethylbenzene, ethylbenzene, toluene, and xylene and the semivolatile constituent alpha picoline can be found in these latter four areas and are the major contaminants of concern. The Landfill was not sampled directly.

The distribution of chemicals in groundwater show two major areas of groundwater contamination under the Facility. In the south, the South Tank Farm area (AOC South) is

believed to have contributed significant levels of contamination to groundwater. In the northern portion of the Facility, groundwater contamination is attributed primarily to the Landfill and the Solvent Recovery Area (AOC North). In addition to dissolved constituents in the groundwater, LNAPL was found in a localized area immediately north of the landfill. The extent of this LNAPL was determined to be over an area of approximately 100 feet by 100 feet. There are no contaminants detected in the water supply used for process and drinking water (the exterior well system) at the Facility. The interior well system captures the bulk of the contaminated groundwater. Some contaminated groundwater in the vicinity of the Landfill enters the South Fork of the Shenandoah River. With this exception, groundwater contamination is confined to the aquifer under the Facility by the pumping of the interior well system.

B. Soil Investigation

Ground penetrating radar (GPR) was used as a reconnaissance tool to determine locations for sampling activities. GPR was employed to delineate and identify trenches and buried waste pits. The GPR results were used as indirect evidence in the RFI to identify trenches and buried waste pits and to identify source areas of contamination.

Historical aerial photographs were used to identify locations where waste disposal was evident. The photographs, dated from 1941-1984, document several historical waste management units.

A total of 454 soil gas samples were collected across the Facility. The sampling pattern was concentrated around Solid Waste Management Units (SWMUs), Treatment, Storage and Disposal Units (TSDs), and spill areas. A total of twenty-seven chemical parameters, which included acetone, benzene, ethylbenzene, toluene, xylene, and chloroform, were analyzed during this survey.

C. Surface Water and Stream Sediment Investigation

Surface water and sediment samples were taken to evaluate the impact of current and historical Facility operations on the South Fork of the Shenandoah River. Ten locations were sampled for river water and river sediment. The river water samples were collected at a depth of approximately one foot above the river bed. Sediment samples were collected to a depth of up to 0.5 feet below the river bed surface. A sample was also collected at the **NPDES** outfall to evaluate the influence of this permitted discharge on river water and sediment quality.

Results of river water samples collected indicated that the quality of river water adjacent to and downstream of Merck met Maximum Contaminant Levels **(MCLs)** for all chemicals

sampled, which included benzene, toluene, phenol, ethyl ether, and acrylonitrile. All river water contaminant concentrations are lower than recommended Ambient Water Quality Criteria (AWQC) for the protection of aquatic life or other ecological screening values, as found in VSWMR §9VAC25-260-140 and 40 CFR §131.11.

D. Drinking water-wells in the vicinity of the Facility

The town of Elkton withdraws water for its municipal drinking water supply from a well about two miles northeast of the Facility. Additionally, there are approximately 49 private ground water wells within a quarter mile of the Facility that use groundwater for drinking water and other domestic purposes. Since none of these wells are downgradient of the Facility it is unlikely that they would be affected by releases from Merck.

All potable water within the Merck Facility is supplied by on-site wells. The primary and secondary potable drinking water wells are located outside of the plume of contaminated groundwater. On-site wells are routinely tested to assure that consumption of drinking water from these wells does not pose a threat to human health.

E. Ecological Investigation

An Ecological Risk Assessment was conducted at the Facility to determine whether chemical constituents detected at the Facility pose a potential current or future risk to ecological receptors. The assessment considered risks to receptors in four areas: the South Fork of the Shenandoah River, the East Landfarm, the Landfill, and the West Landfarm. A simple food web model was used to assess the potential for ecological risks to terrestrial animals via ingestion and exposure to contaminated soils and food. No potential harmful effects were found to occur to terrestrial herbivores based on the analysis of Chemicals of Potential Concern (**CPCs**) within the top five feet of surface soil. In addition, there was no evidence of any pollution related changes to the organisms living on the river bottom along a five-mile stretch of the river sampled. Surface water concentrations were compared to federal and state aquatic criteria and no exceedances were observed.

VI. Interim Measures

Prior to its signing of the Consent Order, Merck had voluntarily conducted the Interim Measures (IMs) listed in Table II.

Pursuant to the Consent Order, Merck conducted additional Interim Measures (IMs) that included removing five underground tanks and replacement with new tanks that included

secondary containment. In addition, the Landfill surface was regraded to reduce rainwater infiltration and enhance leachate control.

Other IMs included LNAPL recovery at well DM-01 (the RFI determined that this LNAPL is emanating from a source within the sanitary landfill) since September 1997. An oil-absorbant sock is being used to recover LNAPL at the well. LNAPL thickness measured in May 1998 at one piezometer was 0.06 ft. Merck will continue LNAPL recovery at DM-01 until the installation of the landfill cap. A contingency plan for removal of LNAPL will be developed during corrective measures implementation.

VII. Summary of Facility Risks

The human health risk assessment describes the selection of CPCs at the Facility, exposure pathways, toxicity criteria, and risk characterization. A total of 65 chemicals (see Table I) were selected as CPCs for the Human Health Baseline Risk Assessment based on screening procedures that included background comparison, risk-based concentrations, frequency of detection, and relative risk contribution factors. With the exception of alpha picoline, n-nitrosodimethylamine, and PCB-1254, all of the CPCs are volatile organic compounds. Exposure pathways associated with current land use of the study area do not present an unacceptable risk to human health as long as the Merck continues to prevent the expansion of the groundwater plume toward onsite potable supply wells. The only scenario that presented an unacceptable risk was the hypothetical, worst-case scenario in which groundwater from the interior of the Facility or from under the Landfill was used as a potable water supply.

VIII. Scope of Corrective Action

EPA's proposed corrective measures at the Merck Stonewall Facility are listed in Section II of this SB. Based on the findings set forth in RFI, EPA has determined that soil and groundwater contamination exists at the Facility. Areas of concern include the Landfill, AOC North, AOC South, the Skimmer Pond, the Solvent Burning Pits and the Waste Pits.

IX. Summary of Alternatives

Pursuant to the Consent Order, Merck prepared a Corrective Measures Study ("CMS") in which it evaluated and recommended several corrective measure alternatives for remediation of contamination at the Facility. EPA considered the alternatives in the CMS as a basis for the proposed remedy for the Facility. (Table IV shows a summary of each AOC's characteristics and major hazardous constituents).

STATEMENT OF BASIS FOR PROPOSED CORRECTIVE MEASURES
UNDER RCRA SECTION 3008(h)
MERCK & CO., INCORPORATED
ELKTON, ROCKINGHAM COUNTY, VIRGINIA

A. Landfill

Alternative 1: VDEQ Sanitary Landfill Cap

Installation of a VDEQ Sanitary Landfill Cap designed to meet Virginia Solid Waste Management Regulation §9 VAC 20-80-250E which includes expanding the existing 2-foot soil cover (hydraulic conductivity of $1x10^{-5}$centimeters/second) over the entire surface of the landfill. A 6-inch sand layer would be added over the soil cover. The sand layer would have a hydraulic conductivity of $1x10^{-3}$ cm/sec. The two layers, in combination with an overlying 18-inch vegetative layer, would have a hydraulic conductivity less than that of the natural subsoils. The cap would be a total of four feet thick, with the surface and sides extended beyond the surface of the landfill. The sides of the cap would be graded and compacted in order to channel runoff away from the surface and to control erosion.

Alternative 2: RCRA Subtitle C Cap and Light Non-Aqueous Phase Liquid (LNAPL) monitoring with monitored natural attenuation

A RCRA cap will be designed and installed to meet the requirements of RCRA Subtitle C (40 CFR Part 264.310) for hazardous waste landfills. Structural requirements for the cover include at least a double liner system. The cover must include a top liner made of geomembrane and a composite bottom layer system. Additionally, it must require minimum maintenance, promote drainage, minimize erosion, accommodate settling, and have permeability less than or equal to that of the landfill's natural subsoil.

The long-term groundwater monitoring program will include specifications for the locations and frequency of LNAPL monitoring. If additional LNAPL is detected a contingency plan for removal of LNAPL will be developed and implemented under the CMI.

Monitored natural attenuation will be used for treatment of groundwater contaminants for the portion of the plume under the Landfill that discharges to the South Fork of the Shenandoah River. Samples of river surface water and sediment will be obtained to insure that there will be no negative impacts on human or ecologic receptors. A monitoring program will be designed as part of the Corrective Measures Implementation Program in accordance with Office of Solid Waste and Emergency Response (OSWER) guidance[3]. The purpose of the monitoring is to

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[3]OSWER guidance document, "Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites," Directive Number 9200.4-17P, April 21, 1999.

verify that natural attenuation will remediate the plume to the groundwater cleanup levels. Performance monitoring will continue as long as contamination remains above cleanup levels deemed acceptable by the Agency.

The costs, as estimated by Merck in the CMS, for the two alternatives described above that were considered for the Landfill are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	$3,495,000	$42,250
2	$5,700,000	$42,250

B. AOC North

Alternative 1: No action

Alternative 1 calls for no further action. Under this alternative, the AOC would be left in its current state and no measures would be taken for control or mitigation of the residual contamination present. During the RFI Merck removed its underground storage tanks (USTs) and made repairs to the chemical sewer and its secondary containment. The current groundwater extraction system captures and contains the residual contamination in the soil and groundwater at AOC North.

Alternative 2: Biosparging

Alternative 2 is biosparging which promotes the biological transformation of the residual contaminants to harmless chemical constituents. This alternative directly addresses the in-situ remediation of the contaminants in the soil which is the primary source of contamination in this location. Biosparging is a variation of current air sparging technology. Air sparging involves two mechanisms working alone or together, volatilization and biogradation. The objective of biosparging is to maximize the in-situ biostimulation of the microbial populations in the saturated zone beneath the Facility, while minimizing the volatilization of these contaminants into the unsaturated zone. Biosparging would escalate the degradation of contaminants present in both the saturated and unsaturated soils while reducing concentrations of contaminants in the overburden. A sparging well will be used to inject air into the saturated zone beneath and/or within the areas of contamination. This injected air will provide oxygen for biostimulation of microbial populations within the saturated interval.

Alternative 3: Overburden Water Extraction

Alternative 3 consists of the extraction of contaminated groundwater for subsequent removal of the contaminants. Localized capture and removal of the contaminants would allow for the continued solubilization into the groundwater of compounds absorbed onto soils within the saturated zone. Concentrations of contaminants in groundwater would be actively reduced and would allow for localized control of groundwater migration. The overburden water extracted would be treated prior to discharge to the Shenandoah River and the treated effluent would meet Federal NPDES and State (Virginia Pollution Discharge Elimination Standards) limits.

The costs, as estimated by Merck in the CMS, for the alternatives considered for AOC North as described above are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	N/A	N/A
2	$1,026,000	$26,675
3	$1,914,150	$143,750

C. AOC South

Alternative 1: No action

Alternative 1 calls for no action. Under this alternative, the AOC would be left in its current state and no measures would be taken for control or mitigation of the residual contamination present. USTs have been removed and above ground tanks with secondary containment measures have been installed.

Alternative 2: Bioventing

Bioventing is the process of aerating subsurface soils to stimulate in-situ biological activity and promote bioremediation. Bioventing is designed to maximize biodegradation of aerobically biodegradable compounds.

This alternative promotes the biological transformation of the contaminants to harmless chemical constituents and addresses the in-situ remediation of unsaturated soil. Bioventing would promote the degradation of residual soil contamination. This alternative would be designed in accordance with documentation from completed and successful bioventing projects

and field studies.

Alternative 3: Soil Vapor Extraction

Alternative 3 would remove contaminants by the physical processes of volatilization and diffusion. This alternative would provide residual source control through the reduction in concentration of contaminants in the unsaturated zone. Volatilization and biodegradation would be the primary removal mechanisms by which this would be achieved. This alternative would be designed in accordance with documentation from completed and successful bioventing projects and field studies.

The costs, as estimated by Merck in the CMS, for the alternatives considered for AOC South as described above are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	N/A	N/A
2	$584,475	$18,335
3	$1,160,325	$82,200

D. Skimmer Pond

Alternative 1: No Action

Under this alternative, the skimmer pond would be left in its current state and no measures would be taken for control or mitigation of the residual contamination present.

Alternative 2: Capping

Alternative 2 provides for the installation of a RCRA Subtitle C cap which would provide a physical barrier to infiltration, reduce contaminant leaching, and eliminate the danger of accidental human exposure to the contents of the AOC.

Alternative 3: Excavation and Disposal

Alternative 3 is the excavation and disposal of contaminated soils. The excavation of the contaminated soils, refilling, and landscaping of the AOC would require construction of a barrier

to protect worker health and safety. This alternative would need to be completed prior to closing the Landfill.

Alternative 4: Monitored Natural Attenuation

Alternative 4 calls for monitored natural attenuation. Monitored natural attenuation is the reliance on a variety of physical, chemical, or biological processes, which act without human intervention to reduce contaminants. This can be achieved within the context of a carefully controlled and monitored site cleanup approach. Monitored natural attenuation is used to achieve site-specific remedial objectives within a timeframe that is reasonable compared to those offered by other more active methods. The timeframe for complete restoration of the groundwater with natural attenuation cannot be predicted. Merck is proposing that this alternative can be implemented concurrrently with the initiation and completion of the remedies at AOC North and AOC South. Additional remedies shall be evaluated and, if appropriate, one will be selected if data collected during the remediation indicate that this unit continues to be a source of contamination to the aquifer.

The costs, as estimated by Merck in the CMS, for the alternatives considered for the Skimmer Pond are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	N/A	N/A
2	$296,250-397,000	$18,175-24,550
3	$1,450,000-21,450,000	None
4	Contingent remedy - cost unknown	

E. Solvent Burning Pits

Alternative 1: No Action

Under this alternative, the solvent burning pits would be left in their current state and no measures would be taken for control or mitigation of the residual contamination present.

Alternative 2: Capping

Alternative 2 provides for the installation of a RCRA Subtitle C cap which would provide a physical barrier to infiltration, reduce contaminant leaching, and eliminate the danger of accidental human exposure to the contents of the AOC.

Alternative 3: Excavation and Disposal

Alternative 3 is the excavation and disposal of contaminated soils. The excavation of the contaminated soils, refilling, and landscaping of the AOC would require construction of a barrier to protect worker health and safety. This alternative would need to be completed prior to closing the Landfill.

Alternative 4: Monitored Natural Attenuation

Alternative 4 calls for monitored natural attenuation. Monitored natural attenuation is the reliance on a variety of physical, chemical, or biological processes which act without human intervention to reduce contaminants. This can be achieved within the context of a carefully controlled and monitored site cleanup approach. Monitored natural attenuation is used to achieve site-specific remedial objectives within a timeframe that is reasonable compared to those offered by other more active methods. The timeframe for complete restoration of the groundwater with natural attenuation cannot be predicted. Merck is proposing that this alternative can be implemented concurrrently with the commencement and completion of the remedies at AOC North and AOC South. Additional remedies shall be evaluated and, if appropriate, one will be selected if data collected during the remediation indicate that this unit continues to be a source of contamination to the aquifer.

The costs, as estimated by Merck in the CMS, for the alternatives considered for the Solvent Burning Pits are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	N/A	N/A
2	$296,250-397,000	$18,175-24,550
3	$1,450,000-21,450,000	None
4	Contingent remedy - cost unknown	

F. Waste Pits

Alternative 1: No Action

Under this alternative, the waste pits would be left in their current state and no measures would be taken for control or mitigation of the residual contamination present.

Alternative 2: Capping

Alternative 2 provides for the installation of a RCRA Subtitle C cap which would provide a physical barrier to infiltration, reduce contaminant leaching, and eliminate the danger of accidental human exposure to the contents of the AOC.

Alternative 3: Excavation and Disposal

Alternative 3 is the excavation and disposal of contaminated soils. The excavation of the contaminated soils, refilling, and landscaping of the AOC would require construction of a barrier to protect worker health and safety. This alternative would need to be completed prior to closing the Landfill.

Alternative 4: Monitored Natural Attenuation

Alternative 4 calls for monitored natural attenuation. Monitored natural attenuation is the reliance on a variety of physical, chemical, or biological processes, which act without human intervention to reduce contaminants. This can be achieved within the context of a carefully controlled and monitored site cleanup approach. Monitored natural attenuation is used to achieve site-specific remedial objectives within a timeframe that is reasonable compared to those offered by other more active methods. The timeframe for complete restoration of the groundwater with natural attenuation cannot be predicted. Merck is proposing that this alternative can be implemented concurrrent with the commencement and completion of the remedies at AOC North and AOC South. Additional remedies shall be evaluated and, if appropriate one will be selected if data collected during the remediation indicate that this unit continues to be a source of contamination to the aquifer.

The costs, as estimated by Merck in the CMS, for the alternatives considered for the waste pits as described above are as follows:

Alternative	Capital Cost	Annual Operational & Maintenance Costs
1	N/A	N/A
2	$296,250-397,000	$18,175-24,550
3	$1,450,000-21,450,000	None
4	Contingent remedy - cost unknown	

X. Summary of EPA's Proposed Remedy Selections

The remedy proposed in this SB is one that best meets the four general standards (overall protection, attainment of media clean-up standards, source control, and compliance with waste management standards) for corrective measures and the five remedial decision factors (long-term reliability, reduction in toxicity, mobility or volume, short term effectiveness, and implementability and cost).[4] EPA has reviewed each corrective measure alternative using the four general standards and five remedial decision factors .

The following discussion outlines EPA's determination for the remedies proposed at the Facility.

A. Landfill

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effective-ness	Implement-ability	Cost	Best Alternative Selection
Alternative #1 VDEQ Sanitary Landfill Cap	X	N/A	X	X	X	X	X	X	Capital $3,495,000 Annual O&M $42,250	
Alternative #2 RCRA Subtitle C Cap	X *	N/A	X *	X *	X *	X *	X *	X	Capital $5,700,000 Annual O&M $42,250	X

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

[4]The criteria used to analyze the proposed remedy is set forth in OSWER guidance document, "Guidance on RCRA Corrective Action Decision Documents" Directive Number 9902.6, February 1991.

As discussed in Section IXA above, there are two alternatives being considered for the Landfill remediation. Both of these alternatives would provide for the overall protection of human health and the environment. The criterion "attainment of media clean-up standards" is not applicable to the Landfill cap alternatives because the cleanup standards are applicable to for groundwater, and do not apply to the landfill. Instead the design of a landfill cap must comply with VDEQ standards (VSWMR §9 VAC 20-80-250E) for Sanitary Landfill Cap for Alternative 1 or the RCRA Subtitle C program, 40 CFR 264 for Alternative 2. The long- term groundwater monitoring program will be developed to verify that natural attenuation will remediate the plume under the landfill for the portion of the plume discharging to the South Fork of the Shenandoah River. Table I includes a summary of the cleanup standards for groundwater chemicals of concern. The standards include MCLs as defined in the Safe Drinking Water Act 42 U.S.C. §300g-1 and alternate concentration limits (ACLs). ACLs were developed for those specified contaminants which do not currently have promulgated standards. The same EPA methodolgy used to calculate MCLs was used to calculate ACLs. Further discussion on the methodolgy used in the derivation of ACLs can be found in Appendix E of the CMS. Controlling the sources of releases is accomplished by compliance with the structural requirements specified in the applicable regulations stated above. Compliance with standards for management of wastes is met by compliance with all applicable federal, state and local regulations during corrective measures implementation to ensure that the waste is managed in a protective manner.

By capping the Landfill, the groundwater divide beneath the Landfill shifts slightly toward the River so that more of the contaminant plume is captured and less is discharged to the River. Based on findings presented in the RFI Report, the Landfill is clearly a major source of groundwater contamination. A RCRA cap should be the final remedy because it is more effective at reducing the mobility of waste than a sanitary landfill cap. Additionally, the landfill is releasing very high concentrations of contaminants as evidenced by the analytical results from the liquid sample taken at well DM-01. In addition to the LNAPL, the grab water sample from well DM-01 contained 400 ppb (parts per billion) methylene chloride, 15,000 ppb chloroform, 2,400 ppb 1,1,2,2-tetrachloroethane, 1,700 ppb trichloroethene, 4,000 ppb benzene, 8,100 ppb chlorobenzene, and 2,900 ppb of xylene. This groundwater exceeds the toxicity characteristic for benzene, chloroform, and trichloroethene. These high concentrations support an alternative that calls for minimizing the amount of leachate generated from the Landfill to the greatest extent practicable, which would be achieved with the use of a RCRA cap.

B. AOC North

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effectiveness	Implement-ability	Cost	Best Alternative Selection
Alternative #1 No Action	X	N/A, No soil clean-up criteria	No	N/A	Not evaluated	Not evaluated	Not evaluated	Not evaluated	Not evaluated	
Alternative #2 Biosparging	X *	X *	X	X*	X*	X	X	X *	Capital $1,026,000 Annual O&M $26,675	X
Alternative #3 Overburden Water Extraction	X	X	X	X	X	X	X	X	Capital $1,914,150 Annual O&M $143,750	

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

Biodegradation through biosparging at AOC North will take advantage of natural biodegradation of residual soil contamination. Pilot scale field tests that were conducted by Merck at the Facility during the CMS confirm that biosparging will be an effective corrective measure at AOC North. Degradation of contaminants will result in remediation to groundwater cleanup standards. Additionally, there are no standards for management of waste that apply to the no action alternative.

C. AOC South

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effectiveness	Implement-ability	Cost	Best Alter-native Selection
Alternative #1 No Action	X	N/A, No soil clean-up criteria	No	N/A	Not evaluated	Not evaluated	Not evaluated	Not evaluated		
Alternative #2 Bioventing	X*	X	X	X*	X *	X	X	X*	Capital $584,475 Annual O&M $18,335	X
Alternative #3 Soil Vapor Extraction	X	X	X	X	X	X	X	X	Capital $1,160,325 Annual O&M $82,200	

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

Bioventing at AOC South will promote the degradation of residual soil contamination. Pilot scale tests that were conducted by Merck at the Facility during the CMS confirm that bioventing will be an effective corrective measure at AOC South. The implementation of alternatives 2 and 3 would facilitate achievement of groundwater standards as discussed above and listed in Table I by enhancing the degradation of residual soil contamination.

D. Skimmer Pond

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effectiveness	Implement-ability	Cost	Best Alter-native Selection
Alternative #1 No Action	X	N/A	No	N/A	X	No	No	X		
Alternative #2 Capping	X	N/A	X	X	X	X	X	X	Capital $296,250-$397,000 Annual O&M $18,175-$24,550	
Alternative #3 Excavation and Disposal	X	N/A	X	X	X	X	X	X	Capital $1,450,000-31,450,000 Annual O&M None	
Alternative #4 Monitored Natural Attenuation	X	N/A	X*	X*	X	X*	X	X*	N/A	X

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

The skimmer pond will use monitored natural attenuation for a period of time concurrent with the performance of the remedy at AOC North and AOC South. A contingent remedy will be implemented if, after the remediation phase of AOC North and AOC South, this unit continues to be a source of contamination. Clean-up standards apply to groundwater and do not apply to the soil, because total potential carcinogenic risk does not exceed the range 1E-04 to 1E-06 for soil.

E. Solvent Burning Pits

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effectiveness	Implement-ability	Cost	Best Alter-native Selection
Alternative #1 No Action	X	N/A	No	N/A	X	No	No	X		
Alternative #2 Capping	X	N/A	X	X	X	X	X	X	Capital $296,250-$397,000 Annual O&M $18,175-$24,550	
Alternative #3 Excavation and Disposal	X	N/A	X	X	X	X	X	X	Capital $1,450,000-31,450,000 Annual O&M None	
Alternative #4 Monitored Natural Attenuation	X	N/A	X*	X*	X	X*	X	X*		X

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

The solvent burning pits will use monitored natural attenuation for a period of time concurrent with the performance of the remedy at AOC North and AOC South. A contingent remedy will be implemented if, after the remediation phase of AOC North and AOC South, this unit continues to be a source of contamination. Clean-up standards apply to groundwater and do not apply to the soil, because total potential carcinogenic risk does not exceed the range 1E-04 to 1E-06 for soil.

F. Waste Pits

	Overall Protection	Attainment of Media Clean-Up Standards	Controlling Source of Releases	Complying with Standards for Management of Waste	Long-Term Reliability and Effectiveness	Reduction of Toxicity, Mobility or Volume of Waste	Short-Term Effectiveness	Implement-ability	Cost	Best Alte-rnative Selection
Alternative #1 No Action	X	N/A	No	N/A	X	No	No	X		
Alternative #2 Capping	X	N/A	X	X	X	X	X	X	Capital $296,250-$397,000 Annual O&M $18,175-$24,550	
Alternative #3 Excavation and Disposal	X	N/A	X	X	X	X	X	X	Capital $1,450,000-31,450,000 Annual O&M None	
Alternative #4 Monitored Natural Attenuation	X	N/A	X*	X*	X	X*	X	X*		X

X- meets criterion
X * - best meets criterion
N/A- not applicable, because no clean-up standards exist for this alternative

The waste pits will use monitored natural attenuation for a period of time concurrent with the performance of the remedy at AOC North and AOC South. A contingent remedy will be implemented if, after the remediation phase of AOC North and AOC South, this unit continues to be a source of contamination. Clean-up standards apply to groundwater and do not apply to the soil, because total potential carcinogenic risk does not exceed the range 1E-04 to 1E-06 for soil.

EPA's proposed corrective measures for the Merck Facility are as follows:

Facility-wide Groundwater:

- Continuation of the Facility's current groundwater extraction program
- Monitored natural attenuation for the portion of the plume from the Landfill that discharges to the Shenandoah River
- Implementation of a performance monitoring system to determine the effectiveness of natural attenuation
- Achievement of cleanup standards listed in CMS Table 9.1 (MCLs and calculated ACLs)-attached hereto as Table I.

STATEMENT OF BASIS FOR PROPOSED CORRECTIVE MEASURES
UNDER RCRA SECTION 3008(h)
MERCK & CO., INCORPORATED
ELKTON, ROCKINGHAM COUNTY, VIRGINIA

Sanitary Landfill:

- Installation of a RCRA cap (Alternative 2)
- Groundwater monitoring

AOC North:

- Biosparging with performance monitoring (Alternative 2)

AOC South:

- Bioventing with performance monitoring (Alternative 2)

Skimmer Pond:

- Monitored natural attenuation/contingent remedy (Alternative 4)

Solvent Burning Pits:

- Monitored natural attenuation/contingent remedy (Alternative 4)

Waste Pits:

- Monitored natural attenuation/contingent remedy (Alternative 4)

Groundwater remediation will be obtained by the continued extraction of groundwater by existing onsite production wells. These wells will be operated to (1) prevent contamination of potable water supplies, (2) reduce the mass of contaminants in groundwater to cleanup levels in conjunction with natural attenuation, and (3) prevent unacceptable impact to the South Fork of the Shenandoah River.

Based on information currently available, the proposed remedies provides the best balance of tradeoffs among the alternatives with respect to the evaluation criteria. The proposed remedies satisfies the following criteria:

- Be protective of human health and the environment
- Control the sources of release so as to reduce or eliminate, to the maximum extent practicable, further releases that may pose a threat to human health and the environment

- Attain the media cleanup standards
- Comply with applicable standards for management of wastes.

XI. Public Participation

On July 1, 1999, EPA placed an announcement in the Daily News Record to notify the public of EPA's preferred corrective measures alternative and of the location of the Administrative Record. Copies of this Statement of Basis will be mailed to anyone who requests a copy. The Administrative Record, including this Statement of Basis, is available for review during business hours at the following locations:

U.S. Environmental Protection Agency
Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103
Telephone Number: (215) 814-3433
Attn: Mrs. Estena A. McGhee (3WC23)

and

Rockingham Public Library
45 Newman Avenue
Harrisonburg, Virginia 22801
Telephone Number: (540) 434-4475

EPA is requesting comments from the public on the corrective measure alternatives evaluated in this document and on EPA's proposed corrective measure alternatives. The public comment period will last thirty (30) calendar days beginning July 1, 1999 and ending July 31, 1999. Comments on, or questions regarding, EPA's preliminary identification of a preferred corrective measure alternative may be submitted to:

Mrs. Estena A. McGhee (3WC23)
U.S. EPA, Region III
1650 Arch Street
Philadelphia, PA 19103
(215) 814-3433
FAX (215) 814-3113

STATEMENT OF BASIS FOR PROPOSED CORRECTIVE MEASURES
UNDER RCRA SECTION 3008(h)
MERCK & CO., INCORPORATED
ELKTON, ROCKINGHAM COUNTY, VIRGINIA

Following the thirty (30) day public comment period, EPA will hold a public meeting on EPA's preferred corrective measure if sufficient public interest indicates that a meeting would be valuable for distributing information and communicating ideas. After evaluation of the public's comments, EPA will prepare a Final Decision Document and Response to Comments which identifies final selected remedy. The Response to Comments will address all significant written comments and any notable oral comments generated at the public meeting. This Final Decision Document and Response to Comments will be made available to the public. If, on the basis of such comments or other relevant information, significant changes are proposed to be made to the corrective measures alternative identified by EPA in this Statement of Basis, EPA may seek additional public comments.

Upon consideration of public comments, EPA will select a final remedy for the Facility. The final remedy will be implemented using available legal authorities, including but not limited to RCRA Section 3008(h), 42 U.S.C. 6928(h).

7-2-99
Date

John A. Armstead, Director
Waste & Chemicals Management Division
EPA Region III

GLOSSARY

AWQC - Ambient Water Quality Criteria

CPC - Chemicals of Potential Concern

LNAPL - Light Non-Aqueous Phase Liquid, a floating layer of hydrocarbon

Maximum Contaminant Level (MCL) - the MCL reflects health factors and is the maximum permissible level of a contaminant in water delivered to any user of a public water system.

MGD - million gallons/day

MSL - Mean sea level

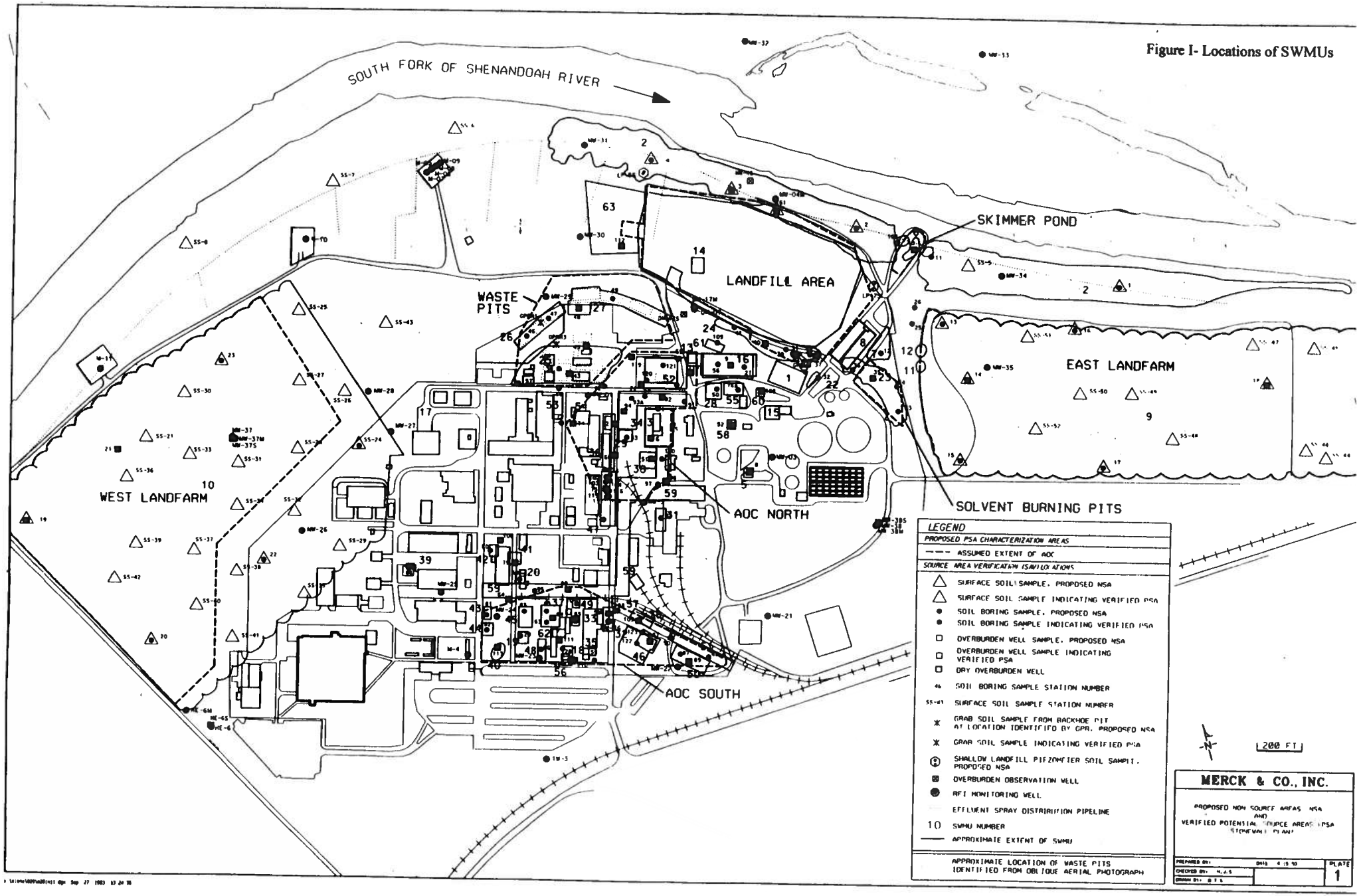
NPDES - National Pollution Discharge Elimination Standards

RCRA - Resource Conservation and Recovery Act, which was enacted in 1976 and amended in 1984, and directed EPA to develop and implement a program to protect human health and the environment from improper hazardous waste management practices. The program is designed to control the management of hazardous waste from its generation to its disposal.

Rockingham Public Library - Library where the Administrative Record is located, 45 Newman Avenue, Harrisonsburg, Virginia 22801 540-434-4475

Solid Waste Management Unit (SWMU) - includes any unit used for the collection, source separation, storage, transportation, transfer, processing, treatment or disposal of solid waste, including hazardous wastes, whether such facility is associated with facilities generating such wastes or otherwise.

Figure I- Locations of SWMUs



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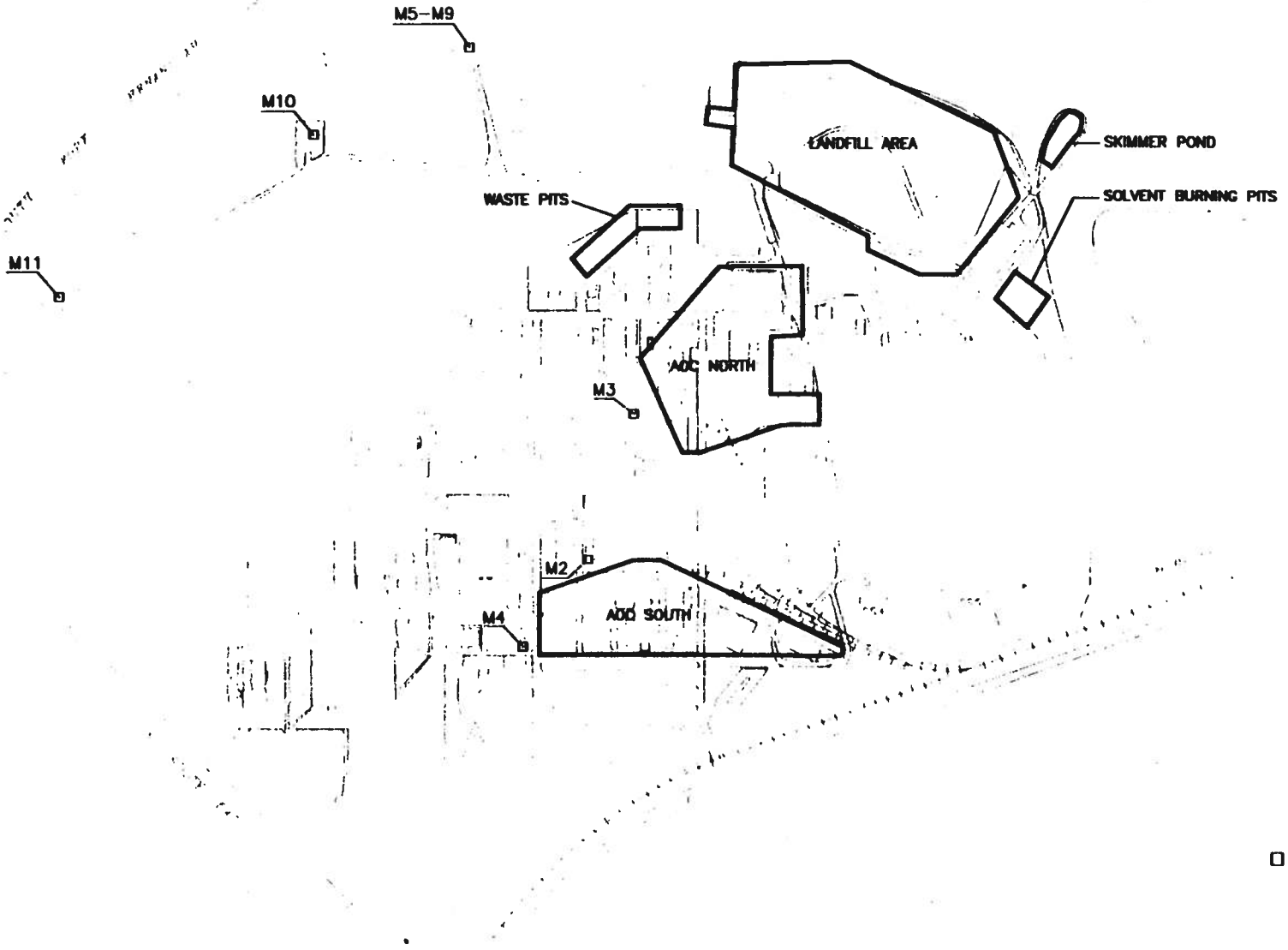

Figure 2- Locations of AOCs

AR350020

GeoTrans / Nittany Geoscience

RFI STONEWALL PLANT

MERCK & CO., INC.

Table I- Summary of clean-up standards for groundwater chemicals of potential concern (COPC)

COPC Compound	MCL (ug/L)	ACL (ug/L)	Compliance Area
Acetone	--	700	Sitewide
Acetophenone	--	700	Sitewide
Alpha Picoline	--	49	Sitewide
Aniline	--	1.23	Sitewide
Bis(2-ethylhexyl)Phthalate	6	--	Sitewide
Trihalomethanes(total) (chloroform, bromoform & bromodichloromethane)	100	--	Sitewide
Carbon Tetrachloride	5	--	Sitewide
4-Chloroaniline	--	28	Sitewide
Chloromethane	--	0.538	Sitewide
1,2-Dibromo-3-chloropropane	--	0.005	Sitewide
1,4-Dichlorobenzene	75	--	Sitewide
3,3'-Dichlorobenzidine	--	0.0156	Sitewide
Trans-1,4-Dichloro-2-butene	--	NC	Sitewide
1,2-Dichloroethane	5	--	Sitewide
cis-1,3-Dichloropropene	--	2.1	Sitewide
Diethylbenzene	--	84	Sitewide
Ethyl Ether	--	1400	Sitewide
Methacrylonitrile	--	0.7	Sitewide
4-Methyl-2-Pentanone	--	560	Sitewide
4-Methylphenol	--	35	Sitewide
3-Methylphenol	--	350	Sitewide
N-Nitrosodiphenylamine	--	1.43	Sitewide
N-Pentane	--	63700	Sitewide
1,4-Phenylenediamine	--	42	Sitewide
Pyridine	--	7	Sitewide
Tetrachloroethene	5	--	Sitewide
Toluene	1000	--	Sitewide
1,2,4-Triclorobenzene	70	--	Sitewide
1,1,2-Trichloroethane	5	--	Sitewide
Vinyl Chloride	2	--	Sitewide
Benzene	5	--	Sitewide and Landfill
Chlorobenzene	100	--	Sitewide and Landfill

Table I- Summary of clean-up standards for groundwater chemicals of potential concern (COPC) (con't)

COPC Compound	MCL (ug/L)	ACL (ug/L)	Compliance Area
cis-1,2-Dichloroethene	70	–	Sitewide and Landfill
trans-1,2-Dichloroethene	100	–	Sitewide and Landfill
2,4-Dimethylphenol	–	140	Sitewide and Landfill
Ethylbenzene	700	–	Sitewide and Landfill
Naphthalene	–	280	Sitewide and Landfill
p-Nitroaniline	–	21	Sitewide and Landfill
Nitrobenzene**	–	1.25	Sitewide and Landfill
o-Nitroaniline	–	0.42	Sitewide and Landfill
Phenol	–	4200	Sitewide and Landfill
1,1,2,2-Tetrachloroethane	–	0.035	Sitewide and Landfill
o-Toluidine*	–	10	Sitewide and Landfill
Trichloroethene	5	–	Sitewide and Landfill
Xylene	10000	–	Sitewide and Landfill
Arsenic	50	–	Sitewide
Barium	2000	–	Sitewide
Chromium	100	–	Sitewide
Cobalt	–	420	Sitewide
m- Cresol	–	350	Sitewide
p-Cresol	–	35	Sitewide
Cyanide	200	–	Sitewide
Famphur*	–	0.5	Sitewide
Methylene Chloride	5	–	Sitewide
Nickel	100	–	Sitewide
Silvex (2,4,5-TP)	50	–	Sitewide
Thallium	2	–	Sitewide
Vanadium	–	49	Sitewide

Notes: MCL - maximum contaminant levels (EPA, April, 1999)
ACL - alternate concentration limits
*ACL is equal to laboratory limit of quantitation (background)
**ACL is equal to VDEQ ACL

Table II- Interim Measures voluntarily completed prior to Order

- Constructed a new raw material drum storage building to provide secondary containment, weather protection, and separate storage for incompatible, containerized raw materials.

- Installed twenty monitoring wells to evaluate potential impact on groundwater from sanitary landfill operations.

- Constructed nine PCB transformer containment pads to provide secondary protection against a transformer release entering the soil or water systems.

- Constructed new wastewater treatment system to provide enhanced treatment of plant wastewater. The 6.4 million gallon system includes improved equalization and secondary treatment methods to increase treatment efficiency.

- Purchased HAZMAT response vehicle and provided trained personnel to readily and more effectively respond to a chemical incident.

- Removal of 118 underground storage tanks and replacement with above ground units with secondary containment systems to prevent potential groundwater contamination.

- Constructed 15 truck unloading containment pads to provide secondary release protection during unloading operations.

- Constructed 18 rail car unloading containment pads to provide secondary release protection during unloading operations.

- Constructed two 300,000 gallon spill containment tanks to provide secondary protection against a plant release entering a nearby river.

- Constructed a new trash incinerator to reduce quantity of waste to be landfilled.

- Constructed a new sludge incinerator to eliminate land application of the biological sludge from the waste treatment operation.

- Constructed container storage pads to provide secondary release protection for containerized new and used oil.

- Constructed a new RCRA container storage building to provide secondary containment, weather protection, and separate storage for incompatible hazardous materials.

Table III- Interim Measures to be completed in Order

- Removal of 5 additional underground tanks and replacement with new tanks with secondary containment.
- Regrading surface of landfill to reduce rainwater infiltration and enhance leachate control.

Table IV- Summary of AOC Characteristics

AOC	Area (sq ft)	Volume (cu yd)	Estimated Contaminant Mass (lb)	Major Constituents	Contaminant Location	Potential Remedial Options
AOC North	280,000	220,000	270,000	xylene diethylbenzene ethylbenzene toluene acetone alpha picoline formaldehyde benzene	saturated soil	No Action Biosparging Overburden Water Extraction
AOC South	270,000	200,000	400,000	alpha picoline xylene ethylbenzene toluene diethylbenzene benzene chlorobenzene formaldehyde	unsaturated soil	No Action Bioventing Soil Vapor Extraction
Waste Pits	15,000	21,000	57,000	diethylbenzene formaldehyde pyrene xylene phenanthrene fluoranthene benzene	unsaturated soil	No Action Capping Excavation and Disposal
Solvent Burning Pits	20,000	14,000	14,000	xylene ethylbenzene tetrachloroethane n-pentane benzene	saturated soil	No Action Capping Excavation and Disposal
Skimmer Pond	15,000	11,000	50	carbon tetrachlonde chlorobenzene xylene chloroform	saturated soil	No Action Capping Excavation and Disposal
Landfill	500,000	280,000 waste 370,000 soil	Not estimatable	xylene ethylbenzene n-pentane aniline n-nitrosodiphenylamine formaldehyde benzene	unsaturated soil and saturated soil	VDEQ Sanitary Cap RCRA Cap