Voluntary Use and Exposure Information Profile
Perfluorooctanesulfonyl fluoride (POSF)

I. CHEMICAL IDENTIFICATION

Chemical Name: Perfluorooctanesulfonyl fluoride (POSF)
CAS Number: 307-35-7

II. COMPANY IDENTIFICATION

Company Name: 3M

Site Location: 22614 Route 84 North
Cordova, IL 61242

10746 Innovation Road
Cottage Grove, MN 55016

1400 State Docks Road
Decatur, AL 35601

Technical Contact: W.A. Weppner
Phone: 651/733-6374
Address: 3M Center, Building 236-1B-10
St. Paul, MN 55144

III. ON-SITE ACTIVITIES

CAS #	Mfg. (1997)	Imported
307-35-7*	> 1MM & < 10MM lbs.	0

Estimate the amount of subject chemical distributed off-site: 10% Exported

*Submitted in 1998 TSCA IUR.

Narrative Description and Process Flow Schematic:

3M Company utilizes a process known as Simons Electro-Chemical Fluorination (ECF) to synthesize organofluorine molecules. In this process, organic feedstocks are dispersed in liquid, anhydrous hydrogen fluoride, and an electric current is passed through the solution, causing the hydrogen atoms on the molecule to be replaced with fluorine. The predominant components of the products created by this process have the same carbon skeletal arrangement as the feedstock used, but with all of the hydrogen atoms replaced by fluorine. However, fragmentation and rearrangement of the carbon skeleton can also occur and significant amounts of cleaved, branched and cyclic structures may be formed. The degree of fluorination of the organic feedstock is also dependent upon the specific carbon chain length of the feedstock and parameters of the ECF process such as electrical current and the length of time the process is run. It is possible to synthesize fully fluorinated or perfluoroorganic molecules where all of the hydrogen atoms of the hydrocarbon feedstock have been replaced by fluorine atoms. Using these perfluoroorganic molecules as basic building blocks, unique chemistries can be created by further reactions with functionalized hydrocarbon molecules.

3M has produced sulfonyl based fluorochemicals commercially for over 40 years using the ECF process. A basic building block of such products and the highest production volume fluorochemical 3M manufactures is perfluorooctanesulfonyl fluoride (POSF). The starting feedstock for this reaction is 1-octanesulfonyl fluoride.
(Reaction 1)

Reaction 1

$$C_8H_{17}SO_2F + 17\,HF \xrightarrow[\text{ECF}]{\text{Energy}} C_8F_{17}SO_2F + 17\,H_2$$

1-Octanesulfonyl fluoride Perfluorooctanesulfonyl fluoride

The electrochemical fluorination process yields about 35%-40% straight chain (normal) POSF, and a mixture of biproducts and waste of unknown and variable composition comprised of the following:

1) higher and lower straight-chain homologs, i.e., n-$C_nF_{2n+1}SO_2F$, e.g., $C_6F_{13}SO_2F$, $C_7F_{15}SO_2F$, $C_9F_{19}SO_2F$ which comprise about 7% of the process output

2) branched-chain, perfluoroalkylsulfonyl fluorides with various chain lengths, about 18-20% of the output

3) straight-chain, branched, and cyclic (non-functional) perfluoroalkanes and ethers, which comprise about 20-25% of the output

4) "tars" (high molecular weight fluorochemical byproducts) and other byproducts, including molecular hydrogen, which comprise about 10-15% of the output.

Because of slight differences in process conditions, raw materials, and equipment, the mixture produced by the electrochemical fluorination process varies somewhat from lot-to-lot and from plant-to-plant. The product that results from electrochemical fluorination is thus not a pure chemical but rather a mix of isomers and homologues. The commercialized POSF derived products are a mixture of approximately 70% linear POSF derivatives and 30% branched POSF derived impurities.

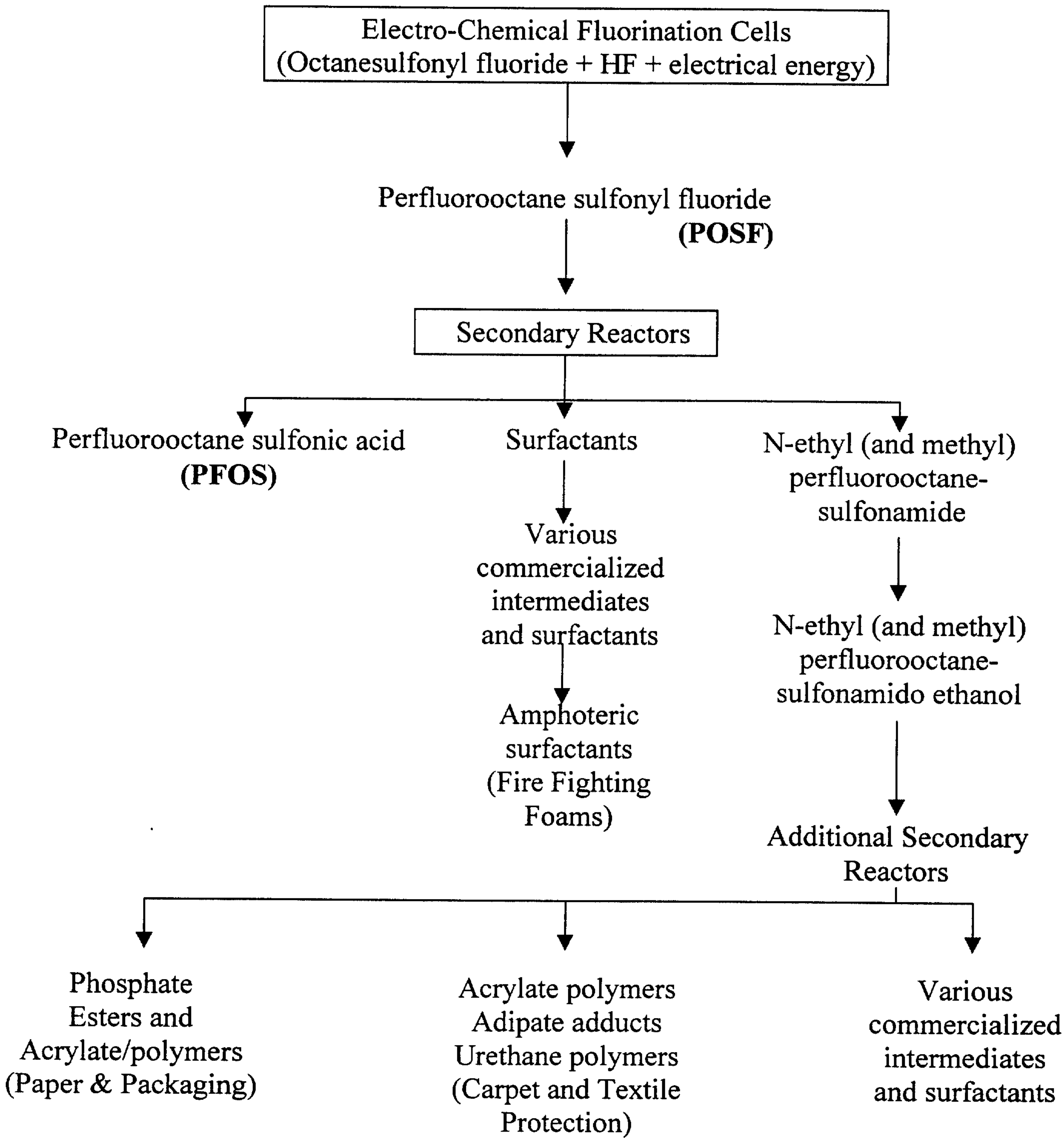
During production, byproducts and waste products are formed. The volatile waste products, such as perfluoromethane, have been vented to the atmosphere in the past, but plans are being implemented to capture and destroy these releases by thermal oxidation over the next few years. The tars have been landfilled in a hazardous waste landfill in the past, but are all currently being incinerated at an in-house or external hazardous waste incinerator. The byproducts, many of which are incompletely fluorinated with hydrogen atoms still present, can be recycled back into the ECF process or are partially degraded in stabilization processes and discharged to controlled, in-house, wastewater treatment systems. The treatment sludge associated with the ECF process has been either landfilled or land-incorporated in the past, but all of this treatment sludge is being landfilled off-site since early 1998.

POSF is itself a commercially viable product, but is primarily an important intermediate in the synthesis of substances used in many other 3M fluorochemical products. The majority is used to produce functionally derivatized fluorochemicals and high molecular weight polymeric products.

Unique chemistries can be created by derivatizing POSF through the sulfonyl fluoride moiety of the molecule using conventional hydrocarbon reactions. POSF is reacted with methyl or ethyl amine to produce either N-methyl or N-ethylperfluorooctanesulfonamide (MeFOSA or EtFOSA). Some of the MeFOSA and EtFOSA is isolated to be used as intermediates to be reacted to form other materials. The majority of the MeFOSA and EtFOSA is not isolated and subsequently reacted with ethylene carbonate to form either N-methyl or N-ethylperfluorooctane sulfonamido ethanol. These are the principal building blocks of the 3M product lines.

The following block flow diagram describes the process discussed above.

BLOCK FLOW DIAGRAM



IV. SITE RELEASE AND TRANSFER INFORMATION FOR TRI CHEMICALS

Not applicable.

V. SITE RELEASE AND TRANSFER INFORMATION FOR NON-TRI CHEMICALS

While analytical methods have improved over time, large variability still exists for certain matrices and compounds, so data available for this report is mostly of a qualitative nature. Although limited monitoring data exists, most emission and waste estimates are based upon process models and engineering calculations. Engineering calculations, however, have limitations with respect to fluorochemicals because fluorochemical losses were not always included in the analysis of each intermediate step.

The accuracy of the emissions data submitted varies due to several factors. Batch process systems are difficult to measure due to quickly changing process conditions, venting pressures and difficulty in isolating processes to take measurements. Additionally, the unique characteristics of these compounds cause them to behave differently from conventional compounds, and physical chemical data properties are not available for all intermediate reaction steps in the past.

A. ON-SITE AIR RELEASES

ALL PLANTS – Fugitive emissions may occur from vacuum charging from drums, sampling from reactors, drumming of product/intermediate, flaking monomer, drying operations. Materials may be handled in a molten or solid state; vapors are produced from molten material.
Industrial Hygiene monitoring has been conducted for some compounds and is detailed later in this document. Some minor amounts of these compounds have been detected as fugitive emissions during Industrial hygiene exposure testing, but do not contribute significantly to overall site emissions.

DECATUR, ALABAMA ONLY: Fugitive emission data is available for electrochemical cell buildings, wastewater fugitive air emissions, and fugitive emissions from wastewater sludge. Data for the cell buildings is based on engineering calculations using standard emission factors. Wastewater fugitive data is based on test results which show the presence of POSF. Sludge emission data is based on engineering calculations of the amount of POSF in the sludge. The C8 sulfonyl compound fugitive air emissions have been significantly reduced since 1997 as a result of reduction of wastewater discharges of materials containing these compounds. Additional reductions are planned.

Decatur, AL

	Estimated Total Annual Releases (lbs.)	Estimated % Accuracy of Estimate (optional)	# days/years release occurs
Fugitive – (non-point)	< 28,000 in 1997 < 1700 in 1999		250

Stack (point)

Engineering calculations and models of process vent emissions are used for estimates of point source emissions.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)	# days/years release occurs
	5000		250

Cordova

POSF-based products are no longer manufactured in Cordova. Stack point emission estimates are based upon existing process models and engineering calculations from the facility. Fugitive emissions may have occurred during some handling steps but have not been quantified.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)	# days/years release occurs
Fugitive (non-point)	No data available.		
Stack (point)	<1		<10 in 1997

Comments:

Cottage Grove

Emission estimates are based upon existing process models and engineering calculations from the facility. Fugitive emissions may have occurred during some handling steps but have not been quantified.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)	# days/years release occurs
Fugitive (non-point)	<1		< 100
Stack (point)	<1		< 100

Comments:

B. WATER RELEASES FROM SITE

Decatur, AL

The data presented is part of wastewater testing conducted in 1998, since the individual compounds of interest were not analyzed in the 1997 wastewater material balance due to method availability and initial program focus. The 1998 data has not been adjusted for production levels in 1997, since most production remained at similar levels. POSF was measured on an infrequent basis because of analytical difficulties. When it was analyzed in wastewater effluent, it was not detected.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)
Water releases:	0 in 1999	

Number of days/year release occurs: 250

Receiving Water Name: Baker's Creek at the junction with the Tennessee River

NPDES Number: ALD004023164

Comments:

Cordova, IL

Engineering calculations were used to estimate the amount of material discharged to wastewater. The amount of material discharged to the river was determined through use of existing removal efficiency testing results from another facility.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)
Water releases:	< 10	

Number of days/year release occurs: <5 times in 1997. POSF-based products no longer produced in Cordova.

Receiving Water Name: Mississippi River

NPDES Number: IL0003140

Comments:

Cottage Grove, MN

Engineering calculations were used to estimate the amount of material discharged to wastewater. The amount of material discharged to the river was determined through use of existing removal efficiency testing results from another facility.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)
Water releases:	0	

Number of days/year release occurs:

Receiving Water Name:

NPDES Number:

Comments:

C. ON-SITE LAND RELEASES

Decatur, AL

The land treatment of Decatur sludge was discontinued in early 1998. Sludge is now transported to an offsite landfill, after passing through a thickener and a sludge press. An impoundment was used in 1997 as part of the wastewater treatment operation but is now only used for back-up operation.

Levels of POSF in the sludge were estimated from engineering calculations.

	Estimated Total Annual Releases (lbs.) (1997)	Estimated % Accuracy of Estimate (optional)
Landfill	0	
Land Treatment/Land Amendment	26,000 – No longer used	
Surface Impoundments	No data available/No longer used	
Underground Injection	0	
Other (specify):		

Comments:

Cordova, IL

Less than 10 pounds total of all compounds per year are released to wastewater treatment (see wastewater section) from process. The amount of material discharged to land treatment was determined through the use of testing results from another facility.

The sludge formed in the primary clarifier is most likely to contain the insoluble sulfonated materials. This sludge is removed and incinerated. The sludge impoundments are lined.

The use of POSF containing materials has been discontinued at Cordova so these releases have also been discontinued.

	Estimated Total Annual Releases (lbs.) (1997)	**Estimated % Accuracy of Estimate** (optional)
Landfill	0	
Land Treatment/Land Amendment	< 10	
Surface Impoundments	0	
Underground Injection	0	
Other (specify):	0	

Comments:

Cottage Grove, MN

Sludge from the Cottage Grove facility is sent to an off-site industrial landfill

	Estimated Total Annual Releases (lbs.) (1997)	**Estimated % Accuracy of Estimate** (optional)
Landfill	0	
Land Treatment/Land Amendment	0	
Surface Impoundments	0	
Underground Injection	0	
Other (specify):		

Comments:

D. OFF-SITE TRANSFERS

Decatur, AL

Process wastewaters are managed in an on-site wastewater treatment facility and are not sent to the POTW.

D1. Transfer to Publicly Owned Treatment Works (POTW)

Number of days/year the release occurs:

Annual Transfer (lb): 0

Estimated % Accuracy of Transfer Estimate (optional) (%):

POTW Name:
Street Address:
City: **Country:**
State: **Zip Code:**
NPDES Number:

Comments:

Cordova, IL

Process wastewaters are managed in an on-site wastewater treatment facility and are not sent to the POTW.

D1. Transfer to Publicly Owned Treatment Works (POTW)

Number of days/year the release occurs:

Annual Transfer (lb): 0

Estimated % Accuracy of Transfer Estimate (optional) (%):

POTW Name:
Street Address:
City: **Country:**
State: **Zip Code:**
NPDES Number:

Cottage Grove, MN

Process wastewaters are managed in an on-site wastewater treatment facility and are not sent to the POTW.

D1. Transfer to Publicly Owned Treatment Works (POTW)

Number of days/year the release occurs:

Annual Transfer (lb): 0

Estimated % Accuracy of Transfer Estimate (optional) (%):

POTW Name:
Street Address:
City: **Country:**
State: **Zip Code:**
NPDES Number:

Comments:

D2. TRANSFERS TO OTHER OFF-SITE LOCATIONS

General Waste Information: There is limited information by CAS number for compound specific reporting and off-site transfers cannot be readily verified. Rather, wastes are classified by halogen content, regulatory waste codes, physical properties and non-specific fluorochemical categories. Where wastes are tracked by CAS number, the amounts have been included.

Decatur, AL

A review of plant records regarding waste disposal locations for Decatur fluoride-containing (not CAS number specific) wastes indicates that 70% is disposed through incineration at various off-site locations and approximately 30% is landfilled at a hazardous waste landfill. Incineration is now the primary disposal method for these materials.

	Estimated Total Annual Releases (lbs.)	Estimated % Accuracy of Estimate (optional)
Incineration:	No specific CAS number data available.	
Wastewater Treatment (Excluding POTW)	0	
Underground Injection	0	
Hazardous Waste (RCRA Subtitle C) landfill	No specific CAS number data available.	
Other Landfill	No specific CAS number data available..	
Recycle or Recovery	0	
Unknown or Other	0	

Comments:

Cordova, IL

Cordova wastes that contained POSF were all incinerated. Wastes included some off-spec product, empty bags and empty drums and contained the compounds is residual amounts. These products are no longer made at Cordova.

	Estimated Total Annual Releases (lbs.)	**Estimated % Accuracy of Estimate (optional)**
Incineration:	No specific CAS number data available..	
Wastewater Treatment (Excluding POTW)	0	
Underground Injection	0	
Hazardous Waste (RCRA Subtitle C) landfill	0	
Other Landfill	0	
Recycle or Recovery	0	
Unknown or Other	0	

Comments:

Cottage Grove, MN

Cottage Grove facility utilizes incineration for all their drummed wastes.

Sludge from the Cottage Grove facility is sent to an industrial landfill.

	Estimated Total Annual Releases (lbs.)	Estimated % Accuracy of Estimate (optional)
Incineration:	6490	
Wastewater Treatment (Excluding POTW)	0	
Underground Injection	0	
Hazardous Waste (RCRA Subtitle C) landfill	0	
Other Landfill	0	
Recycle or Recovery	0	
Unknown or Other		

Comments:

VI. ON-SITE WORKPLACE EXPOSURE

3M Company, Specialty Materials Manufacturing Division, Cordova, IL

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

	Days/Year			
Hours/Day	<10	10-100	100-250	>250
<.25				
.25-1	1			
1-8	5			
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical (307-51-7) is produced as a by-product in the electrochemical fluorination process for 307-51-7. Employees take quality samples during the fluorination process. The liquid product containing 3% 307-35-7 is piped to a process vessel where it is washed and then drained into drums. The washed, drummed material is shipped to 3M Cottage Grove. Employees also perform turnaround maintenance on fluorination equipment.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

   There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

   Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

   Local exhaust ventilation is used at the drum tops during draining and sampling. Both room dilution ventilation and local exhaust ventilation is scrubbed. Production and work-up rooms are negatively pressured with respect to other parts of the building.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

   During sampling, fluorination equipment turnaround, and drumming tasks, employees wear supplied air-fed fully encapsulating suits with attached butyl gloves and rubber boots.

   Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

3M Company, Specialty Materials Manufacturing Division, Cottage Grove, MN

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

	Days/Year			
Hours/Day	<10	10-100	100-250	>250
<.25	14	16		
.25-1	14	16		
1-8	20	8		
>8				

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

The chemical (307-35-7) is a clear liquid. The chemical is handled as a raw ingredient in its pure form (95-100%), and as a component in other raw materials at concentrations typically < 5%. After initial processing of raw materials containing 307-35-7, the chemical may be carried over as a trace material (typically < 1%) into a variety of other materials during subsequent manufacturing steps. Workers may be exposed to 307-35-7 during collection of quality samples from drums, vacuum charging the material from drums into reactors, or during draining of materials from reactors into drums or other containers.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

   There is no chemical-specific personal industrial hygiene monitoring data or area/source monitoring data for this specific material at this facility. For most areas of the facility, recent qualitative assessment of potential exposure to this material under 3M's ongoing industrial hygiene program indicates a low exposure potential to this material.

   Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program is based on the concept of task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

   Local exhaust ventilation is used at drum top and reactor openings during sampling, charging, and draining activities. Vacuum charging of materials from drums is a standard practice. General room air provides for dilution of airborne materials.

5. **Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:**

   During sampling and charging of pure (95%) 307-35-7, workers use full facepiece air-purifying respirators with organic vapor/acid gas cartridges, rubber gloves (butyl or neoprene), and a two-piece or one-piece full body acid suits The type of personal protective equipment used may vary (may be downgraded) for materials containing 307-35-7 as a trace ingredient; exact PPE used depends on the hazard posed by the main ingredient and specifications of the process operating standard.

   Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

3M Company, Specialty Materials Manufacturing Division, Decatur, AL

This information will assist EPA in characterizing the number of workers potentially exposed and the magnitude, frequency, and duration of potential exposure. When providing monitoring data, ensure that data is linked with worker activities described in question 2.

1. **Estimate the number of workers potentially exposed routinely to the subject chemical for each of the exposure duration times. If a worker is involved in more than one activity, enter only his/her most typical activity in the table. Don't count a worker more than once. The total number in the table should equal the total number of workers potentially exposed.**

	Days/Year			
Hours/Day	<10	10-100	100-250	>250
<0.25				
0.25-1	12		24	
1-8	21	32	12	
>8	4		8	

2. **Describe the routine worker activities to which the workers in question 1 are exposed: sampling, removal of filter cake, and drumming of liquids, manufacture an article, etc. For these activities, describe the physical state of the subject chemical (liquid, gas, particulate, or aerosol, etc.) and, if in a mixture, the chemical's concentration:**

   Operating fluorination cell system (closed), sampling, drumming, charging, and equipment maintenance activities (change pipe, flange, valve, filter, pump or sight glass); perfluorooctanesulfonyl fluoride is handled as a liquid; exposure is by inhalation or direct skin contact; material concentration ranges up to 80%.

   Wastewater treatment operations: collecting and analyzing QC samples, operating filter press, monitoring process, and maintenance activities; perfluorooctanesulfonyl fluoride exposure is typically to vapors; concentration in waste stream typically less than 2%.

3. **Provide industrial hygiene monitoring data, if available, with a brief description of the sampling method and exposure scenario monitored, e.g., describe the specific worker activities performed by the individuals monitored. For privacy considerations, please do not include any personal identifiers such as a worker's name or social security number with any data submitted to EPA.**

Personal sampling for perfluorooctanesulfonyl fluoride vapor is currently (late 1999 to present) done with evacuated canisters with analysis by GC-MS. Previous sampling had employed silica gel acid mist tubes and XAD-4 tubes with GC-ECD analysis. Perfluorooctanesulfonyl fluoride was found to hydrolyze on sorption tubes resulting in an underestimate of exposure. See attached table for air sample results.

There has been area/source air monitoring data and/or surface wipe sampling data collected for this material at the plant. Area/source sample results and/or surface wipe sample results are used to identify areas with employee exposure potential as part of exposure assessment under 3M's industrial hygiene program and are not measurements of actual employee exposures. Hence, they are not included with this submission. Prior to 1999, these samples were considered to be semi-validated.

The sample results of any air monitoring are compared to 3M's voluntary exposure guideline (EG) of 0.1 mg/m3 (milligrams of fluorochemical per cubic meter of air) for various fluorochemical compounds, including compounds covered in this submittal. The EG is an 8-hour time-weighted average (TWA) personal breathing zone exposure chosen to minimize potential for uptake.

Each 3M plant that produces sulfonated fluorochemicals has an industrial hygienist on staff and is supported by a corporate industrial hygiene group. 3M's industrial hygiene program focuses on task-based exposure assessment and control. Exposures are identified and assessed qualitatively and/or quantitatively. Qualitative assessments are performed by an industrial hygienist. Quantitative assessments include task-based personal sampling for certain, specific fluorochemicals and/or source or area sampling. The results of the assessments support decisions on exposure control. Engineering controls are preferred, but personal protective equipment may be used on an interim basis or when effective engineering control is not feasible.

Air Sampling Data for 307-35-7

Job Classification	Sample number	Concentration (mg/m3)	Minimum (mg/m3)	Maximum (mg/m3)	Geometric Mean	Geometric Standard Deviation
		Totals →	<0.07	34.4	0.4	7.5
Chemical Operator Building 3	95-042*	0.24				
	96-028*	0.43				
	96-053*	0.07				
	96-067*	0.1				
	96-071*	1.12				
	97-124	0.12				
Team Leader Building 3	98-098*	0.18				
	98-481*	34.436				

* The value for this sample is one of several fluorochemical analytes collected on the sample.

Samples are all personal breathing zone samples taken over the duration of a specific task.

4. **Briefly describe the engineering controls used to minimize exposure to this chemical:**

Area surveys using FTIR are performed to identify sources such as system leaks. Perfluorooctanesulfonyl fluoride is transferred using closed piping (where possible) from reactor vessels to other containers. Vacuum charging of perfluorooctanesulfonyl fluoride or perfluorooctanesulfonyl fluoride-containing materials from drums is a standard practice. Local exhaust ventilation hoods are situated at significant point sources such as at drum bungs when drumming. Some drumming operations are done in an enclosed ventilation chamber. General room air provides for dilution of airborne perfluorooctanesulfonyl fluoride. Operator control rooms are segregated from process areas and provided separate room air ventilation.

5. Briefly list the personal protective equipment your workers regularly wear to prevent exposure of this chemical:

Specific personal protective equipment is indicated on written operating procedures used by process operators.

Respiratory protection: Tasks with significant exposure potential (charging, drumming, some maintenance tasks) are performed using positive pressure, pressure demand full face supplied air respirators. Tasks with moderate exposure potential (short term sampling from taps or drums, and some maintenance tasks) are performed using full face air-purifying respirators with organic vapor cartridges and P100 prefilters.

Hand protection: All tasks identified as having potential for hand contact require neoprene (Scorpio) or nitrile industrial gloves.

Body protection: Neoprene suits (primarily for hydrogen fluoride exposure potential) are used in fluorochemical cell areas for tasks identified as having exposure potential. Exposure significant tasks in other areas use one or two-piece PVC suits.

Foot protection: Tasks identified as posing a significant foot exposure potential require chemical resistant boots.

Comments: (This section is available to clarify the responses given. Attach additional pages if desired.)

Current exposures are less than those measured in the recent past. Significant sources have been identified and eliminated. In 1998 an extensive area air sampling of the production areas was performed. Areas with higher levels of perfluorooctanesulfonyl fluoride were investigated further using FTIR to identify sources of perfluorooctanesulfonyl fluoride. Eliminated sources include a leaking pipe flange in a process area and vapors from an open chemical sewer. In addition, the ventilation system in the primary production building (3) is in the process of being upgraded.

The fluorochemical hazard communication program was improved upon in 1998. This has resulted in improved exposure avoidance behaviors among production employees and better use of protective equipment requirements.

VII. CHEMICAL END USES

A. END USE AS AN INTERMEDIATE CONSUMED TO MAKE OTHER CHEMICALS

A1. On-Site Use as a Intermediate:

	Product chemical class or product chemical (Include CAS number if appropriate)	% of total volume of subject chemical manufactured or imported
1.	Perfluorooctanesulfonyl fluorides (POSF) are used as an intermediate to make consumer and commercial upholstery and carpet protectors and cleaners.	2%
2.	Perfluorooctane sulfonylamido ethyl acetate CAS #2991-51-7 POSF is used as an intermediate to make a household cleaner.	< 0.5%
3.	N-methylperfluorooctylsulfonamide CAS #31506-32-8 POSF is used as an intermediate to make polymers in protective treatments for nonwoven materials.	< 1.0%
4.	N-methylperfluorooctylsulfonamido ethanol CAS #24448-09-7 POSF is used as an intermediate to make polymers in protective treatments for Carpet, upholstery and leather materials.	36%
5.	N-methylperfluorooctanesulfonamido ethyl acrylate CAS #25268-77-3 POSF is used as an intermediate to make Consumer carpet protectors.	< 1.0%
6.	N-ethylperfluorooctylsulfonamido ethanol CAS #1691-99-2 POSF is used as an intermediate to make polymers in protective treatments for carpet, upholstery, apparel and leather products. It is also consumed in products manufactured for surfactants and coating additives.	48%

7.	N-ethylperfluorooctylsulfonamide CAS #4151-50-2 POSF is an intermediate consumed in the Production of surfactants, powder additives, Foam tape and insecticide.	< 1.0%
8.	Fluorinated alkyl amine oxide CAS #178094-69-4 POSF intermediate consumed in the production of foamer for use in fire fighting foams.	< 1.0%
9.	Fluoroalkyl Quaternary Ammonium CAS #38006-74-5 POSF intermediate consumed in the production of surfactants for the mining and oil well industries.	< 1.0%

As reported in Part III, p.2

A2. Off-Site Use as an Intermediate

	Product chemical class or product chemical (Include CAS number if appropriate)	**% of total volume of subject chemical manufactured or imported**
1.	Exported.	< 10%

As reported in Part III, p.2

B. END USES OTHER THAN AS A CONSUMED INTERMEDIATE

Use Number 1 of 1

Description of Chemical End Use: Used as a reactive intermediate in the synthesis of a foamer for use in fire fighting foams. These products are designed for primary use by fire fighting professionals. CAS 307-35-7 would be present in the final product as a low level residual.

Percent of total manufactured or imported volume going to this use: ≤ 1 ±

If used in a mixture check appropriate box to indicate weight fraction. Average values are acceptable:

- X <1% 600 – 1200 ppm)
- ___ 1-30%
- ___ 30-60%
- ___ 60-90%
- ___ >90%

Check all physical forms of the chemical during this use:

- ___ Aerosol
- ___ Dry Powder
- ___ Pellets or large crystals
- ___ Water or solvent – wet solid
- ___ Gas or vapor
- X Liquid solution
- ___ Other (Explain)