Screening Hazard Assessment of Current Use Hydraulic Fracturing Chemicals

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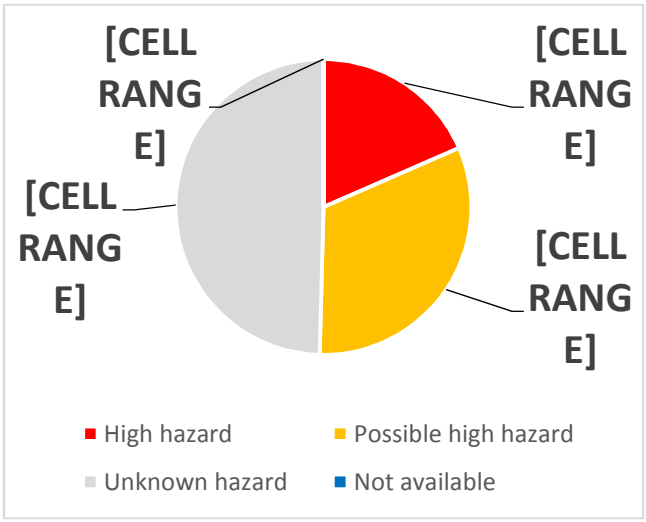
Summary

Chemical hazard screening data were assembled for over 600 chemicals identified in current use in U.S. hydraulic fracturing operations in 2013. The hazard results for each chemical were summarized via a scoring system (the Wercs GreenScreen List Translator Tool) and compared with use statistics for additives from over 6,500 well completions in 2013. Results reveal that nearly 50% of chemicals in current use are high hazard or possible high hazard substances. The remaining 50% represent substances with little coverage in regulatory databases and represent a gap in readily available hazard data. This hazard data gap limits the ability of regulators and other stakeholders to assess the dangers of hydraulic fracturing and related environmental emissions in their communities.



Introduction

Hydraulic fracturing (HF), or fracking, for the recovery of unconventional gas and oil deposits has undergone a remarkable expansion. Rapid increases in well numbers and the expansion of drilling activity in proximity to densely populated areas, for example in the Marcellus Shale, have raised concerns about potential environmental and human health impacts of drilling, hydraulic fracturing and related production activities.

HF operations utilize a wide variety of chemical additives to facilitate the extraction of oil, natural gas and gas liquids. Additives control the properties of the injected fluid (gelling agents, breakers, emulsifiers, viscosifiers, friction reducers), modify the formation or fractures and their penetrability (acids, wetting agents, shale stabilizers, fluid loss additives), and also protect equipment (scale and corrosion inhibitors). While chemical additive concentrations in HF fluids are typically low, often less than one percent by weight, the high volumes used require large quantities of additives, often in the thousands or tens of thousands of pounds or gallons for a single fracture event.

A given site may undergo repeated and varied fluid/chemical injections for many fracture events over the course of well development. These operations require regular deliveries by truck of additives, perhaps for months, and often in concentrated form. The transport, handling, surface mixing and injection of these fluids offer multiple opportunities for accidental releases and human or environmental exposures.

During and after the HF process, and for weeks, months, or years into the production phase, so-called “produced” water or “flowback” water is recovered from the well. This wastewater contains a dilute, but highly diverse mix of returned chemical additives, their transformation, reaction and degradation products, and formation water chemicals (including salts and naturally occurring radioactive materials).

This wastewater may be treated onsite or delivered by truck or pipeline to offsite wastewater treatment facilities. Treated wastewater may be released to surface waters, or recycled for further well development. In some regions, oil and gas wastewater are used without treatment for land or road surface application as deicers, or for dust control. Wastewater may also be injected into underground disposal wells.

Given the large numbers and amounts of chemicals employed in oil and gas production and the multiple potential exposure pathways, it is essential that the hazards of the chemicals associated with HF be thoroughly understood and communicated to stakeholders. Unfortunately, a patchwork of regulatory disclosure provisions and requirements for trade secret protection have led to an incomplete picture of which chemicals are used, where, and in what quantities. Lists developed by non-governmental organizations (NGOs), and state and federal regulators or agencies typically include many hundreds of unique chemicals [1-4]. However, even when chemicals are identified, their human health and environmental impact are often poorly understood due to the lack of toxicity data (the "hazard data gap").

To address this hazard data gap, over a hundred organizations filed a petition in 2011 to the Toxic Substances Control Act (TSCA), in part requesting that the United States Environmental Protection Agency (EPA) issue a call for health and safety information of fracking fluid chemicals. In response to the petition, EPA agreed to issue a rulemaking under TSCA sections 8(a) and 8(d) to require manufacturers and processors of chemicals used in the fracking process to submit data on chemical substances and mixtures used in hydraulic fracturing. In addition, the agency agreed to require reporting of exposure data and any known studies on adverse health effects and safety concerns associated with those chemicals. To date, however, EPA has proposed no such rules, resulting in increasing public concern regarding the health impacts of fracking fluids and their constituents.

In response to this growing public concern, there have been some collaborative efforts to increase the transparency of HF chemical use. In particular, a group of non-governmental organizations, regulators, industry associations and individual companies have developed the FracFocus Chemical Disclosure Registry. The registry has emerged as the predominant disclosure tool for industry chemical use, populated with reports submitted to FracFocus by well operators or their agents for each fracking operation [5]. These reports include information about HF additives and their chemical constituents, though these may be masked by claims of confidential business information or trade secret. The concentrations of chemicals used may also be reported, among other well parameters. It is not clear whether any operators disclose chemicals used for the drilling and production phases in FracFocus well reports. These reports do not provide specific information on chemical hazards of the additives or chemicals employed, however, reports include a row demarking two separate chemical groupings, e.g., "Ingredients shown above are subject to 29 CFR 1910.1200(i) and appear on Material Safety Data Sheets (MSDS). Ingredients shown below are Non-MSDS."

Identifying hazards of chemicals is typically a time-consuming and labor-intensive process requiring searches of multiple databases or lists at national or international agencies, e.g., the Hazardous Substances Data Bank [6] or Australia's National Industrial Chemicals Notification and Assessment Scheme [7]. Most of these resources were developed independently and historically have categorized chemicals by different assessment schemes. As a result, it can be challenging to collectivize these data and interpret them in a unified fashion.

Once obtained, chemical hazard data have a variety of beneficial uses:

- agencies can use hazard data to identify and prioritized analytes for regulatory monitoring and assessment programs, such as air, groundwater, or wastewater effluent monitoring;
- first responders can be better prepared for chemical hazards during emergency response;
- operators can use hazard data to inform the selection of supplier products via preferred additive lists or hazard-based additive specifications;
- chemical suppliers can use hazard data to guide development of environmentally preferable products;
- NGOs and the general public can become better informed on the hazards posed by chemicals in their communities.

The utility of chemical hazard and risk assessments depends on the quality and completeness of the available hazard data. Missing data can skew results, depending on whether and how data gaps are addressed in a comparative assessment methodology or algorithm. This paper presents summarized hazard data for current use HF chemicals and assesses the state of the hazard data gap.

Methods

A variety of researchers, groups and regulatory authorities have compiled lists of chemicals used in oil and gas extraction [1-4]. However, given the rapid advances in HF technology, chemical use patterns are evolving rapidly. The FracFocus registry provides a continually updated source of information on chemical use and associated well reports with information on suppliers, operator, well location, additive trade names and purpose. A mock-up of a well report appears in Figure 1.

Unfortunately, the FracFocus registry allows downloads of data only on an individual well basis and in PDF format. To facilitate analysis of FracFocus data, SkyTruth, a non-governmental organization, has developed a process that automatically "scrapes" data from well reports as they are submitted to FracFocus [8]. The scraped data are consolidated in comma-separated-value delimited files available at their website, http://frack.skytruth.org. The "blended" data files found there contain nearly all the information provided on individual well reports. As noted on the SkyTruth website, data entry errors in the original reports will carry into the SkyTruth data. The scraping process itself introduces additional textual errors or field shifts. For example, a multi-word supplier name may be inadvertently split into multiple database rows.

Chemical Use Data Sources

Chemical use data was extracted from a SkyTruth "blended data" file downloaded August 13, 2013 at http://frack.skytruth.org/fracking-chemical-database/frack-chemical-data-download. The comma-separated-value file was imported to Microsoft Access 2013. A variety of search and replace operations were used to correct obvious data entry errors in CAS numbers (validated by the associated chemical names). Analysis was limited to data from wells for 2013 fracking operations. The dataset used here includes well reports from January through May, 2013, with submissions biased towards larger numbers at earlier dates. A representative display of data from the Access database appears in Figure 2. For example, "Fracture Date" from a well report (e.g., see Figure 1) is identified in a database field labeled "fracture_date."

Hydraulic Fracturing Fluid Product Component Information Disclosure

Fracture Date	3/19/2013
State:	Ohio
County:	Any
API Number:	XXXXXXXXX
Operator Name:	Natty Gas Resources Corporation
Well Name and Number:	MyWell 4505
Longitude:	-000.74617
Latitude:	00.35048
Long/Lat Projection:	NADXX
Production Type:	Oil
True Vertical Depth (TVD):	10,932
Total Water Volume (gal)*:	1,677,519

Hydraulic Fracturing Fluid Composition:

Trade Name	Supplier	Purpose	Ingredients	Chemical Abstract Service Number (CAS #)	Maximum Ingredient Concentration in Additive (by mass)**	Maximum Ingredient Concentration in HF Fluid (by mass)**	Comments
Fresh Water	Operator				100.00	97.87711	Density = 8.340
HYDROCHLORIC ACID 10-30	SupplierA		Hydrochloric acid	7647-01-0	30.00	0.56667	
XX-9	SupplierA	Biocide	Tributyl tetradecyl phosphonium chloride	81741-28-8	10.00	0.00214	
YYY-XX	SupplierA	Additive	Ammonium salt	Confidential Business Information	60.00	0.01861	
AAA-BBB	SupplierA				100.00	0.00000	Not Found in DB
TTT SCALE INHIBITOR	SupplierA	Scale Inhibitor	Polyacrylate	Confidential Business Information	60.00	0.00239	
RRR BREAKER	SupplierA	Breaker	Sodium persulfate	7775-27-1	100.00	0.00576	
HHH-BB99	SupplierA	Breaker	Crystalline silica, quartz	14808-60-7	30.00	0.00031	
			Walnut hulls	Mixture	100.00	0.00105	
Ingredients Listed Below This Line Are Part of the Fluid Composition Provided by SupplierA Which Do Not Appear On the Material Safety Data Sheets (MSDS)							
			2,7-Naphthalenedisulfonic acid, 3-hydroxy-4-(4-sulfor-1-naphthalenyl) azo -, trisodium salt	915-67-3			
			2,7-Naphthalenedisulfonic acid, 5-(acetylamino) -4-hydroxy-3-(2-methoxyphenyl) azo -, disodium salt	6625-46-3			
			Acetic acid	64-19-7			
			Alcohols, C12-16, ethoxylated	68551-12-2			
			Amine Salts	75-57-0			
				593-81-7			
				12125-02-9			

* Total Water Volume sources may include fresh water, produced water, and/or recycled water

** Information is based on the maximum potential for concentration and thus the total may be over 100
Ingredient information for chemicals subject to 29 CFR 1910.1200(i) and Appendix D are obtained from suppliers Material Safety Data Sheets (MSDS)

v2.5

Figure 1. Mock-up of a FracFocus well report PDF file. Fictitious names have been used, however, the format is representative of those available at the FracFocus website.

r_seqid	pdf_seqid	api	fracture_date	state	county	operator	well_name	production_type	latitude	longitude	datum
37433	36789	43-013-51278-00-00	11/7/2012	Utah	Duchesne	Bill Barrett Corp	Lc Tribal 16H-19-45	Oil	40.11265	-110.49888	NAD27
37433	36789	43-013-51278-00-00	11/7/2012	Utah	Duchesne	Bill Barrett Corp	Lc Tribal 16H-19-45	Oil	40.11265	-110.49888	NAD27
37433	36789	43-013-51278-00-00	11/7/2012	Utah	Duchesne	Bill Barrett Corp	Lc Tribal 16H-19-45	Oil	40.11265	-110.49888	NAD27

true_vertical_depth	total_water_volume	published	c_seqid	row	trade_name	supplier	purpose	ingredients	cas_number	additive_concentration
6256.0	None	2013-01-05 22:53:	1208489	1	ScaleSorb 3, (25# pail)	Baker Hughes	Scale Inhibitor	Amino Alkyl Phosphonic Acid	Trade Secret	30.0
6256.0	None	2013-01-05 22:53:	1208490	2				Crystalline Silica: Quartz (SiO2)	14808-60-7	1.0
6256.0	None	2013-01-05 22:53:	1208491	3				Diatomaceous Earth, Calcined	91053-39-3	100.0

hf_fluid_cor	comments	cas_type
None	SmartCare Proc	proprietary
None		valid
None		valid

Figure 2. A sampling of several complete lines from the Access database used in this study. Field names are shown in the top row. The database width is split in three parts (left-to-right splits top-to-bottom for this figure.

Current Use Chemical List

A list of chemicals was generated by identifying unique Chemical Abstract Services registration numbers (CAS numbers) in the "cas_number" field. This list of unique CAS numbers provided the primary identification of chemicals for later hazard assessment (described below). All CAS numbers were validated using a check-digit procedure as described on the Chemical Abstract Services website [9]. Format validity does not guarantee that a given CAS number/chemical exists for commercial sale, however, the check digit test helps sort out clearly erroneous values. A variety of other entries may appear in the "cas_number" field. These include indications of withheld information, e.g., "Confidential Business Information," "CBI," "Trade Secret," or "N/A." Occasional operator data entry or scraping errors may lead to misplaced data in the "cas_number" field, e.g., concentration values or chemical names. These errors occurred at low frequency and no attempt was made to correct them.

Identifying Frequency of Use

A chemical may be listed repeatedly in any given well report if the same chemical is included in multiple additives. As a surrogate measure of use, each occurrence of a unique CAS number in the dataset was counted as one "use." "Uses" were counted for each unique CAS number across all wells in the 2013 dataset. As chemicals are used in different concentrations, this "use" figure cannot be equated to a volume or mass use, however, it provides some measure of the extent of use of any individual chemical.

Chemical Hazard Data

The hazard data gap is widely acknowledged in the conversation over the need for chemical regulatory reform. While regulators and agencies have long made data from chemical assessments available to the public, often through partnerships with industry, such as the High Production Volume Challenge Program, formats and hazard coverage vary widely. Data are dispersed on many websites in unique formats and often with unique ranking systems, such as IARC, NTP or EPA carcinogenicity designations. A recent change in chemical hazard information has come via the widespread adoption of the Globally Harmonized System (GHS) of classification and labeling of chemicals. Unified hazard communication in the "language" of GHS simplifies the merging of evaluations from multiple sources, but it can still be a laborious process to assemble data from multiple sources for even one chemical. Processing this information for hundreds of chemicals or more is a daunting task.

The GreenScreen® List Translator from Clean Production Action is an effort to marry data from disparate sources into a common chemical hazard classification [10]. GreenScreen® criteria are closely aligned with the GHS classification scheme and informed by experiences from comparative hazard assessment, such as, the US Environment Protection Agency's Design for the Environment Alternatives Assessment methodology [11]. The List Translator is based on chemical assessments from specified national and international sources of hazard data, e.g., the United States EPA, the European Chemicals Agency (ECHA), various international agency GHS-based evaluations, California's Prop 65 list, and NGO "red" lists, among others. The List Translator methodology groups these data into hazard classes or "levels-of-concern" for individual endpoints. For example, carcinogenicity is classified as High, Moderate or Low depending on the source data. For example, a GHS category 1 carcinogen specified in a European Union harmonized classification (an "authoritative" source) would be identified as a High level-of-concern. Data for a wide range of hazard endpoints, e.g., mutagenicity, reproductive toxicity, acute aquatic toxicity, persistence, etc., are similarly classified via endpoint-specific rules. A compendium of GreenScreen® version 1.2 source lists is presented in Appendix A. Additional specifics on the classification scheme are presented at the Clean Production Action website [10].

LT Score	GreenScreen® Benchmark Equivalency	Derivation
LT-1	Benchmark 1	A LT-1 chemical score is based on clear agreement among authoritative lists that it is a Chemical of High Concern and is likely to be a Benchmark 1 chemical using the full GreenScreen® method.
LT-P1	Possible Benchmark 1	A LT-P1 chemical score translates to Possible BM1 and reflects the presence of the chemical on Screening A or B lists and some uncertainty about the classification for key endpoints. Further research is needed to determine if the chemical is indeed a GreenScreen® Benchmark 1
LT-U	Unknown Benchmark	A LT-U chemical score indicates that there is insufficient information to provide a Benchmark score for the chemical. That can be a good sign. Typically, only hazardous chemicals are found on authoritative and screening lists. However, lack of presence on hazard lists can also mean that the chemical has not been well tested. Therefore the resulting conclusion using the List Translator is that the Benchmark U score is Unknown pending full GreenScreen® review. A full GreenScreen® assessment is needed to determine if a chemical is a Benchmark 2, 3 or 4.

Table 1. Definitions of List Translator categorizations. Benchmark scores refer to classifications from in-depth hazard assessments based on the GreenScreen® for Safer Chemicals methodology [10].

Following the individual hazard endpoint classifications, the List Translator provides a logic to establish an overall hazard score for a chemical. Chemicals score as either LT-1, LT-P1 or LT-U, Table 1. “LT” refers to the evaluation via the List Translator scheme. “1” indicates the highest level of concern consistent with REACH “substances of very high concern” categorizations, PBT chemicals, and the like. LT-P1 indicates that there are high hazard attributes consistent with an LT-1 score, but that the data come from “screening” lists where assessments may be based on, for example, limited experimental data or QSAR modeling results and in the absence of high-quality GLP laboratory toxicity testing (cf., the “authoritative” EU harmonized classification for carcinogenicity described above, which follow an elaborate multi-stakeholder approval process). LT-U indicates insufficient data for classification as LT-1 or LT-P1. LT-U may result from the lack of data, or from moderate- or low-hazard attributes. In nearly all cases, the LT-U score is attributable to the lack of adequate hazard data.

To facilitate hazard assessment, new internet-based tools are available that automate the collection of hazard information required for the List Translator scheme: the Wercs GreenScreen® List Translator Tool [12], and the Pharos Chemicals and Materials Library [13]. In both systems, CAS numbers are used to uniquely identify chemicals for assessment. While these are fee-based services, they provide a level of quality control and, more importantly, updating schemes to capture changes in classifications or data in the underlying sources.

The List Translator contains eighteen hazard endpoints, Table 2. Endpoints are grouped into categories (the vertical labels in Table 2) used during scoring that designate how individual endpoint “levels-of-concern” lead to the LT scores described in Table 1. Two endpoints, neurotoxicity and systemic toxicity are evaluated for both single- and repeat-exposure data and appear separately in the Wercs implementation output. In addition to the main endpoints, a catchall “PBTs and other…” category contains data for hazards used in some PBT-assessment schemes.

Group I	Carcinogenicity (C)
	Mutagenic / Genotoxicity (M)
	Reproductive Toxicity (R)
	Dev. and Neuro. Dev. Toxicity (D)
	Endocrine Activity (E)
Group II	Acute Mammalian Toxicity (AT)
	Systemic Toxicity (ST)
	Neurotoxicity (N)
	Skin Irritation / Corrosivity (IrS)
	Eye Irritation Corrosivity (IrE)

Group II*	Skin Sensitization (SnS)
	Respiratory Sensitization (SnR)
	Systemic Toxicity-Repeat Exp
	Neurotoxicity-Repeat Exp
Eco	Acute Aquatic Toxicity (AA)
	Chronic Aquatic Toxicity (CA)
Fate	Persistence (P)
	Bioaccummulation Potential (B)
Phys	Reactivity (Rx)
	Flammability (F)
	PBTs and other mixed hazard endpoints

Table 2. Hazard endpoints as organized in the Wercs GreenScreen® List Translator Tool. The vertical grouping labels are used as part of the overall scoring process.

The Wercs' implementation of the List Translator is used to assess the chemicals in this study. The Wercs organization locates and assembles the hazard data, assigns hazard levels (H, M, L, etc.) and a final score following the Clean Production Action methodology (i.e., designated lists, hazard classifications and scoring logic). List Translator version 1.2 source lists appear in Appendix A. Some typical Wercs List Translator chemical evaluations appear in Table 3. The entry for n-butyl glycidyl ether is assessed as LT-1, or a Benchmark 1 chemical. The score is driven by the high levels of concern in Group I endpoints mutagenicity and reproductive toxicity, with the bold font indicating supporting "authoritative" data source lists. Trideceth-2 is scored as LT-P1. P1 indicates a possible Benchmark 1 chemical, with the P assigned due to the use of "screening" data source lists for this case (indicated by the italic font for *M* and *Yes*). LT-P1 assessments warrant further investigation, as additional data (such as might be obtained via a full GreenScreen® assessment) may more definitively confirm or refute the list-based hazard classification. The remaining three chemicals had insufficient data to warrant classification as LT-1 or LT-P1 and are listed as LT-U (unknown). The *Yes* in the ethylene/va copolymer listing indicates that some limited data was found on one or more screening list sources relevant to PBT characterization.

The chemical examples in Table 3 are illustrative of the widely acknowledged chemical hazard data gap. Of the many tens-of-thousands of chemicals in commerce, only a small subset have undergone full safety evaluations. When a chemical is discovered to have some significant toxicity, it may draw further attention and more complete evaluation (e.g., n-butyl glycidyl ether). Otherwise, chemicals may be widely used with little or no hazard assessment by agencies or regulators. The absence of hazard data is effectively a license for use without restriction. Recently, data are becoming more broadly available for many chemicals via the REACH registration process, but these data are not yet provided through commercial database products, apart from specific agency hazardous chemical listings.

While List Translator scores are themselves "screening" results, i.e., based on incomplete information and with associated uncertainty, they are useful for prioritizing chemicals for further investigation or assessment. For example, LT-P1 or LT-U chemicals could be selected for further evaluation of hazards. Chemicals that have been evaluated by List Translator sources and shown to produce moderate to low hazards should have a matching M or L level-of-concern for any given endpoint. A blank cell entry indicates no data found on any authoritative or screening list. While this does not mean that no data exists at all, it suggests that little or no attention has been given to the chemical by any of a wide range

GreenScreen™ List Translator Tool																								
			Group I Human					Group II Human					Group II* Human				Ecotox.		Fate		Physical		PBTs etc
Chemical	% Formulation	List Translator Score	Carcinogenicity (C)	Mutagenic / Genotoxicity (M)	Reproductive Toxicity (R)	Dev. and Neuro Dev. Toxicity (D)	Endocrine Activity (E)	Acute Mammalian Toxicity (AT)	Systemic Toxicity (ST)	Neurotoxicity (N)	Skin Irritation / Corrosivity (IrS)	Eye Irritation Corrosivity (IrE)	Skin Sensitization (SnS)	Respiratory Sensitization (SnR)	Systemic Toxicity-Repeat Exp	Neurotoxicity-Repeat Exp	Acute Aquatic Toxicity (AA)	Chronic Aquatic Toxicity (CA)	Persistence (P)	Bioaccummulation Potential (B)	Reactivity (Rx)	Flammability (F)	PBTs and other mixed hazard endpoints
Chemical Formulation																							
Pentasodium aminotrimethylene phosphonate (2235-43-0)	1	LT-U																					
1-Propanol, zirconium(4+) salt (23519-77-9)	1	LT-U																					
n-Butyl glycidyl ether (BGE) (2426-08-6)	1	LT-1	**M**	**H**	**H**			**M**	**M**		*H*		*M or H*		*H*		*M or H*					**H**	*Yes*
Ethylene/va copolymer (24937-78-8)	1	LT-U																					*Yes*
Trideceth-2 (24938-91-8)	1	LT-P1						*M*															*Yes*

Table 3. Typical Wercs GreenScreen® List Translator Tool output. The various hazard endpoints appear horizontally labeled at the top of the table. Chemicals assessed are listed individually in separate rows. The Wercs database generates a chemical name based on the CAS numbers entered for evaluation. "% Formulation" is generally used to specify concentration in a mixture. In this case, these were uniformly assigned a value of 1%. % Formulation does not affect the chemical hazard data displayed. Individual hazards are assigned levels, including very Low (vL), Low (L), Moderate (M), High (H) and very High (vH). A bold font indicates that the assessment was based on "authoritative" source lists. An italicized font indicates that the assessment was based on "screening" source lists, which some attending uncertainty. The PBT column contains a simple Yes or No indicating that the chemical may meet the specifications for some PBT classification schemes. An empty (blank) cell indicates that no hazard data were found in any of the List Translator sources for that endpoint.

of regulatory or other assessment programs. As these programs are likely to select high priority, better known hazardous chemicals, the absence of data is no assurance of low hazard.

Beyond the basic score, the ***completeness*** of the List Translator hazard endpoint data provides a quantification of the hazard data ***gap***. To assess this gap, a simple count is made for entries in the endpoint categories of the Wercs output. Data present for all categories will receive a maximum data gap count of 20. No available data will give a data gap count of 0. The PBT category often duplicates data in other categories and is not used in calculation of the data gap count. It should be noted that low count numbers can still lead to LT-1 classification. A potent carcinogen with good supporting experimental data will score as LT-1 regardless of what is known about other endpoint hazards. A high data gap count means that data exists for many hazard endpoints, indicating thorough investigation by one or many List Translator sources.

Results

The FracFocus well report data, as captured for 2013 operations by SkyTruth, contain approximately 6,500 fracture events in twenty states, Table 4. Texas dominates the activity, followed by hundreds of well fractures for North Dakota, Oklahoma, Pennsylvania, Colorado, Utah, California, Wyoming and New Mexico. Smaller numbers were reported in eleven additional states. Due to unknown circumstances, well-type for Pennsylvania wells were all listed as "N/A." These numbers reflect reported drilling activity rather than actual drilling activity due to the time lag of reporting. The dataset includes many instances of multiple fracking events (indicated by different fracking dates) at a single well site (designated in the dataset by industry standard API numbers).

The chemicals disclosed for each of these events, identified by use of unique CAS numbers, are reported along with a chemical name and use frequency in Appendix B. The current list includes 652 unique CAS numbers, including over 150 not included in previous lists, e.g., the EPA Hydraulic Fracturing Progress Report released in 2012 [1]. These new entries may perhaps be due to new reporting requirements (which vary by state) or the use of new chemical formulations. As mentioned in the Methods section, "use" is determined by counting each occurrence of an individual CAS number in the dataset. For the 652 valid CAS numbers, over 185,000 total "uses" were quantified from the 2013 well reports. This number does not include a significant number of additional uses for chemicals that were not identified by CAS number, often listed only with CBI or Trade Secret designations. The top ten chemicals by frequency of use appear in Table 5.

A summary of results from the List Translator classifications appear in Table 6 and Figure 3. Of the full chemical list, 645 were included in the List Translator Tool database (water was excluded). The remaining seven chemicals were not found and may represent either new chemicals, erroneous CAS number entries, or substances not yet assessed for the List Translator database. Of the 645 chemicals in the database, approximately 18% were categorized as LT-1 (GreenScreen® Benchmark 1 chemicals), suggesting strong data to support a very high level of hazard either to humans or to the environment. These include known carcinogens, e.g., dibromoacetonitrile (3252-43-5), formaldehyde (50-00-0) and mixed xylenes (o-, m-, p- isomers) (1330-20-7) and other well-known hazardous substances as noted in previous HF chemical lists [2]. An additional approximately 32% are LT-P1 (*possible* Benchmark 1 chemicals). These 300-plus chemicals are strong candidates for elimination or very restricted use, based on known or suspected hazards.

State	Well Type				Row Total
	Blank	Gas	N/A	Oil	
Alaska				8	8
Arkansas	10	24			34
California	5			230	235
Colorado	41	182		98	321
Kansas	4	4		37	45
Louisiana	10	53		6	69
Mississippi		1		2	3
Montana	2			48	50
New Mexico	3	43		135	181
North Dakota	55	1		469	525
Ohio	41	24		1	66
Oklahoma	122	134		217	473
Pennsylvania	3	13	360		376
South Dakota				1	1
Texas	464	574		2,525	3,563
Utah	13	99		166	278
Virginia	1	1			2
Washington		1			1
West Virginia	20	10			30
Wyoming	43	77		90	210
Grand Total	**837**	**1,241**	**360**	**4,033**	**6,471**

Table 4. Distribution of wells by type and by state for the 2013 dataset. New FracFocus reporting does not include well type data and may appear in the "Blank" count. "N/A" appears exclusively in the Pennsylvania data. Overall well count numbers are dominated by oil drilling activity in Texas.

Chemical Name	CAS#	Uses
Water	7732-18-5	17,467
Quartz	14808-60-7	13,258
Methanol	67-56-1	8,962
Distillates, petroleum, hydrotreated light	64742-47-8	6,388
Hydrochloric acid	7647-01-0	5,089
Ethylene glycol	107-21-1	4,508
Isopropanol	67-63-0	4,405
Sodium chloride	7647-14-5	4,221
Diammonium peroxydisulfate	7727-54-0	3,700
Guar gum	9000-30-0	3,612

Table 5. The top ten chemicals by frequency of use. Water is widely used as a "carrier" or "base" fluid, however, it is also often listed in the "Hydraulic Fracturing Fluid Composition" report section.

LT-1	LT-P1	LT-U	Count
119	206	320	645

Table 6. Counts of chemical in the various List Translator classes. 645 chemicals were included in the Wercs GreenScreen® List Translator Tool database. The remaining seven chemicals were not found in the database.

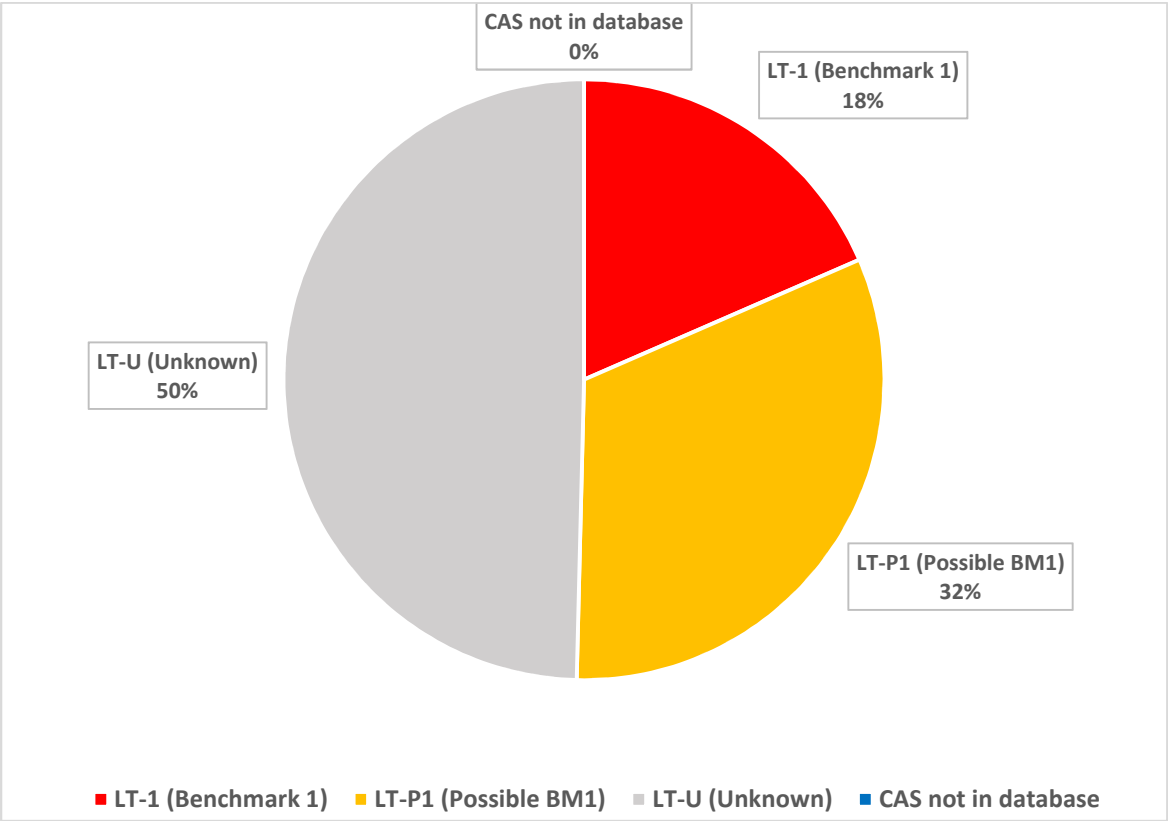


Figure 3. Distribution of List Translator scores for chemicals used in 2013. Approximately 50% of the chemicals were high hazard or potentially high hazard substances. Another 50% were classified as "unknown," reflecting primarily a lack of available hazard data.

The third List Translator category LT-U warrants some additional descriptive information. Recall that the LT-U classification can derive either from known lower levels-of-concern or from gaps in the availability of hazard data. Figure 4 illustrates the availability of hazard endpoint data for the LT-U chemical list. As discussed in the Methods section, any data entry in an endpoint cell (the H, M or L, etc., of the hazard data in Table 3) adds one to the data count. In reality, this single determination may come from multiple sources, but full chemical assessment requires total endpoint coverage. There is little additional value in having multiple determinations of, say, carcinogenicity, especially if it comes at the expense of testing for other hazards. Again, a high count indicates a greater amount of hazard information, with a maximum possible value of 20 in this study. Low counts suggest that a chemical has been little studied by List Translator sources. Many LT-U chemicals had no hazard endpoint classifications whatsoever.

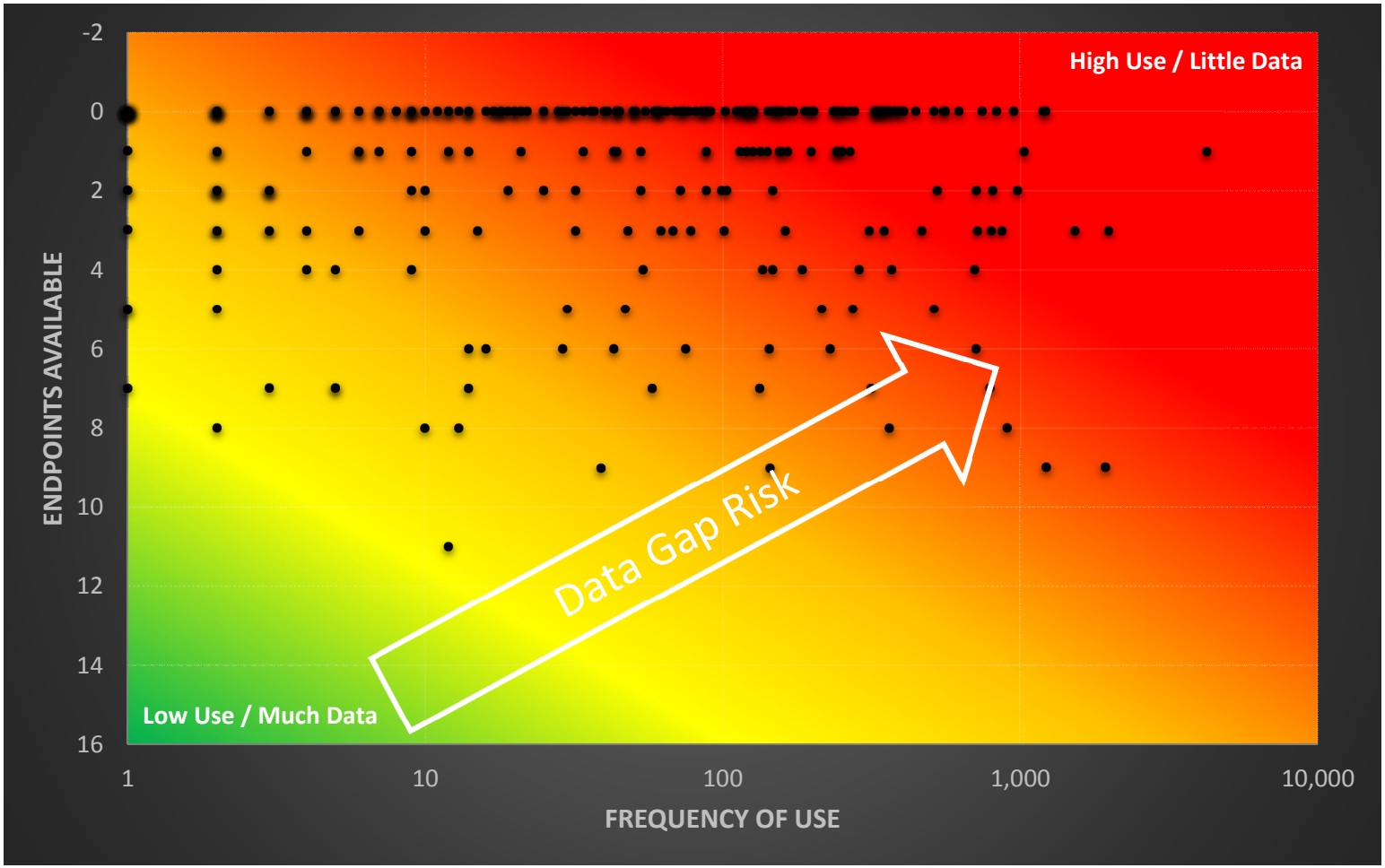


Figure 4. Count of List Translator hazard endpoint entries versus use frequency for the over 300 LT-U chemicals. The maximum possible count is 20 for this assessment. Frequency of use varied widely and is graphed on a logarithmic scale. The chart is shaded to indicate the relative risk of hazard due to the **hazard data gap**. Red shading suggests high risk graded to green shading for low risk. Chemicals with much hazard data or chemicals that are used infrequently would have low data gap risk. Chemicals with very little available hazard data and frequent use warrant a red, high hazard shading. Many points are bunched at one and zero "Endpoints Available," suggesting no coverage in regulatory databases. [The -2 value for ENDPOINTS AVAILABLE has no physical meaning and is used only to expand the axis for viewing.]

Discussion

The data available via the FracFocus database (and made accessible due to the efforts of SkyTruth) offer an important opportunity to assess the status of chemical use by the oil and gas extraction industry. The list in Appendix B contains over 600 chemicals, and of these, more than 200 unique chemicals were used 100 or more times across the nearly 6,500 fracture events. This translates to hundreds of thousands of chemical handling events, from delivery to dilution through recovery and wastewater disposal. Full hazard assessment of this large list of frequently used chemicals stands would be a much needed, but expensive and time-consuming effort.

The large number of overall uses, some 185,000 (not including undisclosed chemical uses) for the approximately 6,500 wells suggests an average of 20-30 chemicals per fracture event. While not explored for this study, these data offer the opportunity to investigate some of the variables that may affect chemical use. The geological diversity of formation types may drive use patterns of more or less hazardous chemicals and in greater or fewer numbers.

The List Translator results indicate that up to 50 or more percent of current use chemicals pose significant or possible hazards to human health or the environment. The remaining 50 percent, while not indicating high hazard, were largely unclassified due to gaps in available data rather than to measurements or results suggesting low hazards. The results of Figure 4 illustrate there are little or no hazard data in List Translator sources for chemicals used thousands or tens-of-thousands of times in 2013 HF operations.

Conclusions

Absence of data for so many chemicals is indicative of the critical need for reform of chemical regulation in the United States. Unfortunately, the best available automated screening tools rely on databases of assessments by a relatively small list of sources. Chemical assessments in these sources have been biased to the best known and most severely toxic chemicals or to high production volume chemicals, leaving few or no resources to evaluate the remaining long list of chemicals in commerce.

A further concern is that some recently reported industry schemes to screen chemicals rely on automated databases based on similar (or identical) resources to those supporting the Wercs GreenScreen® List Translator Tool. While screening methods are to be praised, there is a need to properly penalize data gaps and missing data to ensure that chemicals hazards be known before use and possible exposure to workers, the general public or the environment. In addition, many screening methods employed by industry suffer from a lack of transparency and a peer-review process to assess the adequacy of the conclusions concerning toxicity of chemicals widely deployed within the oil and gas industry.

The EPA's Study of Hydraulic Fracturing and Its Potential Impact on Drinking Water Resources is developing similar data. Chemical structure datasets and EPA hazard data compilations, modelling results, etc., may inform the current poor state of HF chemical hazard awareness and bring some additional rigor to risk assessments of oil and gas extraction.

Acknowledgements

The authors have utilized data from an unpublished study submitted to the EPA Docket [15]. That work was funded by Clean Production Action and managed by Dr. Lauren Heine. The hazard data from that study were fully updated for this analysis.

References

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Appendix A

Clean Production Action's GreenScreen version 1.2 specified lists. These lists are used by the Wercs to create the online GreenScreen List Translator Tool used in this study. The Authoritative and Screening categories are used within the scoring decision logic. In general, authoritative sources trump screening sources. Among source list categories, the most conservative hazard assignment is used for classification.

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
AOEC	Authoritative	Association of Occupational and Environmental Clinics (AOEC) Exposure Code List	Sensitization (respiratory including asthma)
Boyes-N	Screening	A list of the chemicals for which NIOSH or OSHA have established workplace exposure standards on the basis of effects on the nervous system is presented in Table 25.1 (adapted from Ref. 26).	Reproductive and Developmental Toxicity including Developmental Neurotoxicity, Neurotoxicity
CEPA	Screening	Canadian Environmental Protection Act, 1999 (CEPA 1999): CEPA Toxic	All human health and environmental toxicity and fate endpoints
DOT	Authoritative	US Department of Transportation Hazardous Materials Regulations	Acute Mammalian Toxicity, Irritation/Corrosivity, Flammability, Reactivity
DSL	Screening	Canadian Environmental Protection Act, 1999 (CEPA), Summary of Government of Canada Categorization Decisions for Substances on the Domestic Substance List (DSL), September 2006.	PBT, Health Effects

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
EPA-AMT	Authoritative	US Environmental Protection Agency. 2001. *Consolidated List* of Chemicals Subject to the Emergency Planning and Community Right-To-Know Act (EPCRA) and Section 112(4) of the Clean Air Act (CAA). NOTE: Green Screen is only referring to the list of chemicals from EPCRA Section 302.	Acute Mammalian Toxicity
EPA - C	Authoritative	US Environmental Protection Agency (EPA), National Center for Environmental Assessment, Integrated Risk Information System (IRIS) Database	Carcinogenicity
EU CMR (1)	Authoritative	Regulation on the Classification, Labelling and Packaging of Substances and Mixtures (CLP), EC 1272/2008 and subsequent amendments. Originally published in ECB, Annex I of Directive 67-548-EEC and subsequent amendments/adaptations, known as the Dangerous Substances Directive (DSD) or Directive on Dangerous Substances (DDS).	Carcinogenicity, Mutagenicity/Genotoxicity, Reproductive Toxicity, Developmental Toxicity
EU CMR (2)	Authoritative	Regulation on the Classification, Labelling and Packaging of Substances and Mixtures (CLP), EC 1272/2008 and subsequent amendments. [Conversion of CMR list from 67-548-EEC(Categories 1-3) to GHS Categories (Category 1A, 1B, 2)]	Carcinogenicity, Mutagenicity/Genotoxicity, Reproductive Toxicity, Developmental Toxicity

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
EU ED	Screening	European Union Priority List of suspected endocrine disruptors (prioritized for further testing). Chemicals prioritized by the European Union for testing for endocrine disruption. DHI. 2007. Study on Enhancing the Endocrine Disruptor Priority List with a Focus on Low Production Volume Chemicals.	Potential Endocrine Disruptor
EU H-Statements	Authoritative	European Union List of Chemicals and their assigned GHS Hazard Statement is included in the Regulation on the Classification, Labelling and Packaging of Substances and Mixtures (CLP), EC 1272/2008 and subsequent amendments.	Carcinogenicity, Mutagenicity/Genotoxicity, Reproductive Toxicity, Developmental Toxicity, Acute Mammalian Toxicity, Systemic Toxicity/Organ Effects, Neurotoxicity, Sensitization, Irritation/Corrosivity, Flammability, Reactivity, Acute Aquatic Toxicity, Chronic Aquatic Toxicity, Ecotoxicity
EU PBT	Authoritative	European Union, European Chemicals Bureau, European Chemical Substances Information System (ESIS) PBT list	PBT and vPvB: Persistence, Bioaccumulation and any of the following: ecotox and/or human tox
EU R-Phrases	Authoritative	EU Risk-Phrases published in the Regulation on the Classification, Labelling and Packaging of Substances and Mixtures (CLP), EC 1272/2008 and subsequent amendments. Originally published in ECB, Annex I of Directive 67-548-EEC and subsequent amendments/adaptations, known as the Dangerous Substances Directive (DSD) or Directive on Dangerous Substances (DDS).	Carcinogenicity, Mutagenicity/Genotoxicity, Reproductive Toxicity, Developmental Toxicity, Acute Mammalian Toxicity, Systemic Toxicity/Organ Effects, Neurotoxicity, Sensitization, Irritation/Corrosivity, Flammability, Reactivity, Acute Aquatic Toxicity, Chronic Aquatic Toxicity, Ecotoxicity

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
EU SVHC	Authoritative	European Union Substances of Very High Concern	Carcinogenicity; Mutagenicity/Genotoxicity; Reproductive Toxicity; Developmental Toxicity; PBT: Persistence, Bioaccumulation, and ecotoxicity and/or human toxicity; vPvB: very persistent and very bioaccumulative, other serious concerns (e.g. Endocrine Activity)
G&L	Screening	Grandjean, P & PJ Landrigan. 2006. "Developmental neurotoxicity of industrial chemicals." The Lancet, v368: 2167-2178. List of 201 Chemicals known to be neurotoxic in humans.	Reproductive and Developmental Toxicity
IARC	Authoritative	International Agency for Research on Cancer (IARC), Agents Reviewed by the IARC Monographs	Carcinogenicity
MAK	Authoritative	MAK Commission of Germany; Occupational Toxicants and MAK Values: Annual Thresholds and Classifications for the Workplace	Carcinogenicity, Reproductive and Developmental Toxicity including Developmental Neurotoxicity, Sensitization
NIOSH-C	Authoritative	National Institute of Occupational Safety and Health Carcinogen List	Carcinogenicity
NTP-OHAaT	Authoritative	US National Institutes of Health, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), Office of Health Assessment and Translation (Formerly the Center for the Evaluation of Risks to Human Reproduction). Expert Panel Reports & Monographs on Reproductive and Developmental Toxicity.	Reproductive and Developmental Toxicity

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
NTP-RoC	Authoritative	US National Institutes of Health, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), Report on Carcinogens (ROC)	Carcinogenicity
NWMP Priority	Authoritative	US Environmental Protection Agency (EPA), National Waste Minimization Program, Priority Chemicals. This list superseded the USEPA National Waste Minimization Program Priority PBT List (a sub-set of this list).	List is mostly PBT's but provides info on other HH effects of the chemical as well. PBT includes Persistence, Bioaccumulation and any of the following: ecotox and/or human tox
OR P3	Screening	Oregon Department of Environmental Quality (DEQ) Priority Persistent Pollutant (P3) List, required in Senate Bill 737	PBT: Toxicity and Persistence and/or Bioaccumulation; Toxicity includes Aquatic Toxicity and/or Toxicity to Humans
OSPAR	Mixed	OSPAR Convention For The Protection of the Marine Environment of the North-East Atlantic, List of Chemicals for Priority Action and List of Substances of Possible Concern	Persistence, Bioaccumulation, Acute Aquatic Toxicity, Chronic Aquatic Toxicity, Carcinogenicity, Mutagenicity, Reproductive/Developmental Toxicity, Chronic mammalian toxicity, Endocrine Disruption
PIC	Authoritative	Prior Informed Consent (PIC) Convention, Annex III, from the 1998 Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	All human health and environmental toxicity and fate endpoints

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
Prop 65	Authoritative	State of California Environmental Protection Agency, Office of Environmental Health Hazard Assessment (OEHHA) California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act Of 1986) Chemicals Known to the State to Cause Cancer or Reproductive Toxicity	Carcinogenicity, Reproductive and Developmental Toxicity including Developmental Neurotoxicity
Stockholm	Authoritative	United Nations Environment Programme (UNEP), Stockholm Convention Secretariat Stockholm Convention on Persistent Organic Pollutants (POPs)	Persistence, Bioaccumulation and any of the following: ecotox and/or human tox
TEDX	Screening	The Endocrine Disruptor Exchange (TEDX) List of Potential Endocrine Disruptors	Endocrine Activity
TRI PBT	Authoritative	US Environmental Protection Agency (EPA), Toxics Release Inventory (TRI) Program, "TRI PBT Chemical List"	Persistence, Bioaccumulation, Acute Aquatic Toxicity
WA PBT	Screening	State of Washington, Department of Ecology, Chapter 173-333 WAC Persistent Bioaccumulative Toxins	Persistence, Bioaccumulation and any of the following: ecotox and/or human tox
WHMIS	Screening	Workplace Hazardous Materials Information System: Controlled Product as defined by the hazard criteria set out in Part IV of the Controlled Product Regulations (Canada)	Carcinogenicity, Mutagenicity/Genotoxicity, Reproductive and Developmental Toxicity, Sensitization, Systemic Toxicity/Organ Effects, Irritation/Corrosivity, Reactivity, Flammability

Abbreviation	List Type	List Name	Associated Green Screen Hazard Endpoints
GHS - [COUNTRY]*	Screening	Refers to country-specific lists of chemicals classified using the Globally Harmonized System of Classification and Labeling. As of Sept 2011 the countries with published lists include the European Union, Japan, Korea, and New Zealand. Additional GHS country-specific classifications will be added as they become available. The EU country specific list is displayed separately as "EU H-statements". All others fall into this category.	All endpoints including human health, ecotoxicity, fate and physical hazard endpoints.
GHS - Japan	Screening	Japanese List of Chemicals and their assigned GHS Classification.	All endpoints including human health, ecotoxicity, fate and physical hazard endpoints.
GHS - Korea	Screening	Korean List of Chemicals and their assigned GHS Classification.	All human health and physical hazard endpoints.
GHS - New Zealand	Screening	New Zealand List of Chemicals and their assigned GHS Classification.	All endpoints including human health, ecotoxicity, fate and physical hazard endpoints.
SIN	Screening	International Chemical Secretariat (ChemSec) Substitute it Now (SIN) List; SIN List 2.0 Available 2011	Carcinogenicity; Mutagenicity/Genotoxicity; Reproductive Toxicity; Developmental Toxicity; PBT: Persistence, Bioaccumulation, and ecotoxicity and/or human toxicity; vPvB: very persistent and very bioaccumulative, other serious concerns (e.g. Endocrine Activity)
VwVwS	Screening	German Federal Environment Agency, Administrative Regulation on the Classification of Substances hazardous to waters into Water Hazard Classes (Verwaltungsvorschrift wassergefahrdende Stoffe - VwVwS)	Any combination of the following: Acute Toxicity, Systemic Toxicity/Organ Effects, Carcinogenicity, Reproductive Toxicity, Developmental Toxicity, Acute Aquatic Toxicity, Chronic Aquatic Toxicity, Persistence, Bioaccumulation. Any combination results in Classification of 0-3.

Appendix B

List of unique Chemical Abstract Services registration numbers ("CAS_#") with name ("Name"), count of uses ("Uses"), count of hazard endpoint determinations ("Hazard Data") and the List Translator score ("Score") for chemicals used in HF additives in 2013 (as described in the Methods section).

CAS_#	Name	Uses	Hazard Data	LT Score
10025-69-1	Stannous chloride dihydrate	10	3	LT-U
10028-22-5	Ferric sulfate	3	3	LT-P1
10035-04-8	Calcium dichloride dihydrate	3	2	LT-U
10039-54-0	Hydroxylamine sulfate (2:1)	1	11	LT-P1
100-41-4	Ethylbenzene	6	11	LT-1
10043-01-3	Aluminum sulfate	1	5	LT-P1
10043-35-3	Boric acid	632	10	LT-1
10043-52-4	Calcium chloride	701	4	LT-U
100-44-7	Benzyl chloride	372	12	LT-1
1004542-84-0	Sodium bromosulfamate	6	-	-
10049-04-4	Chlorine dioxide	203	11	LT-1
100-97-0	Methenamine	1,221	9	LT-U
101033-44-7	Zirconium,tetrakis[2-[bis(2-hydroxyethyl)amino-kN]ethanolato-kO]-	81	0	LT-U
10124-31-9	Phosphoric acid, ammonium salt	1	1	LT-P1
10125-13-0	Cupric chloride dihydrate	273	5	LT-U
10192-30-0	Ammonium bisulfite	72	6	LT-P1
10222-01-2	2,2-Dibromo-3-nitrilopropionamide	970	4	LT-P1
102-71-6	Triethanolamine	362	8	LT-U
10361-65-6	Phosphoric acid, triammonium salt	12	1	LT-P1
10377-60-3	Magnesium nitrate	229	5	LT-1
104-40-5	4-Nonylphenol	49	4	LT-P1
104-55-2	3-Phenylprop-2-enal	419	7	LT-P1
104-76-7	2-Ethyl-1-hexanol	545	8	LT-P1
10476-85-4	Strontium chloride	2	2	LT-U
10486-00-7	Sodium perborate tetrahydrate	601	8	LT-1
10555-76-7	Sodium metaborate tetrahydrate	235	0	LT-U
10604-69-0	Ammonium acrylate	152	0	LT-U
106-22-9	6-Octen-1-ol, 3,7-dimethyl-	3	2	LT-U
106-24-1	Geraniol	3	6	LT-P1
106-25-2	2,6-0ctadien-1-ol, 3,7-dimethyl-,	3	0	LT-P1
106-65-0	Dimethyl succinate	2	2	LT-P1
1067-12-5	Methanol, phosphinylidynetris-	2	0	LT-U
106-89-8	Epichlorohydrin	64	13	LT-1
106-97-8	Butane	2	5	LT-1

CAS_#	Name	Uses	Hazard Data	LT Score
106-99-0	1,3-Butadiene	2	9	LT-1
107-15-3	Ethylenediamine	62	9	LT-1
107-19-7	Propargyl alcohol	2,069	10	LT-P1
107-21-1	Ethylene glycol	4,508	11	LT-P1
107-22-2	Glyoxal	26	11	LT-1
107-89-1	Acetaldol	3	2	LT-U
107-98-2	1-Methoxy-2-propanol	2	8	LT-U
108-10-1	4-Methyl-2-pentanone	211	10	LT-1
108-24-7	Acetic anhydride	512	8	LT-1
108-32-7	Propylene carbonate	422	3	LT-P1
108388-79-0	Benzenemethanaminium, N,N-dimethyl-N-[2-[(1-oxo-2-propenyl)oxy]ethyl]-, chloride, polymer with 2-propenamide and N,N,N-trimethyl-2-[(1-oxo-2-propenyl)oxy]ethanaminium chloride	1	0	LT-U
108-67-8	1,3,5-Trimethylbenzene	5	6	LT-1
108-83-8	Diisobutylketone	9	5	LT-1
108-88-3	Toluene	30	14	LT-1
108-95-2	Phenol	58	12	LT-1
109-55-7	3-(Dimethylamino)-propylamine	89	7	LT-P1
110-17-8	Fumaric acid	32	3	LT-U
110-44-1	Sorbic acid	2	3	LT-U
110-91-8	Morpholine	2	11	LT-1
111-30-8	Glutaraldehyde	2,153	12	LT-1
1113-55-9	2-Bromo-3-nitrilopropionamide	111	0	LT-U
11138-66-2	Corn sugar gum	183	0	LT-P1
111-40-0	Diethylenetriamine	178	7	LT-P1
111-42-2	Diethanolamine	414	11	LT-1
111-46-6	Diethylene glycol	708	6	LT-U
111560-38-4	2-Propenoic acid, ethyl ester, polymer with ethenyl acetate and 2,5-furandione, hydrolyzed, sodium salt	17	0	LT-U
111-76-2	2-Butoxyethanol	1,935	9	LT-U
111-87-5	1-Octanol	133	7	LT-U
1119-40-0	Dimethyl glutarate	2	1	LT-P1
1120-21-4	Undecane	78	3	LT-U
1120-24-7	Decyldimethylamine	61	0	LT-P1
1120-36-1	1-Tetradecene	88	2	LT-U
112-03-8	N,N,N-Trimethyloctadecan-1-aminium chloride	1	0	LT-U
112-15-2	2-(2-Ethoxyethoxy)ethyl acetate	25	0	LT-U
112-24-3	Triethylenetetramine	3	9	LT-P1
112-27-6	Triethylene glycol	141	2	LT-P1

CAS_#	Name	Uses	Hazard Data	LT Score
112-30-1	1-Decanol	143	6	LT-U
112-34-5	2-(2-Butoxyethoxy)ethanol	43	6	LT-U
112-40-3	Dodecane	32	2	LT-P1
112-57-2	Tetraethylenepentamine	3	5	LT-P1
112-80-1	Oleic acid	147	2	LT-U
112-88-9	1-Octadecene	88	1	LT-U
112926-00-8	Silica gel, cryst. -free	653	1	LT-P1
112945-52-5	Silica, amorphous, fumed, cryst.-free	2	2	LT-U
113184-20-6	Zirconium, hydroxylactate sodium complexes	8	0	LT-U
113221-69-5	2-Propenoic acid, ethyl ester, polymer with ethenyl acetate and 2,5-furandione, hydrolyzed	17	0	LT-U
115-07-1	1-Propene	8	-	-
1184-78-7	N,N-Dimethyl-methanamine-N-oxide	51	0	LT-U
119345-03-8	Benzene, 1,1'-oxybis-, tetrapropylene derivs., sulfonated	85	0	LT-U
119345-04-9	Benzene, 1,1'-oxybis-, tetrapropylene derivs., sulfonated, sodium salts	142	0	LT-U
119-36-8	Methyl salicylate	14	3	LT-P1
119-65-3	Isoquinoline	29	3	LT-P1
12008-41-2	Disodium octaborate	1	3	LT-U
12045-78-2	Potassium borate tetrahydrate	37	0	LT-U
12125-01-8	Ammonium fluoride	23	7	LT-P1
12125-02-9	Ammonium chloride	1,460	8	LT-P1
121-43-7	Trimethyl borate	90	5	LT-P1
12173-60-3	Illite	18	0	LT-U
12174-11-7	Attapulgite	321	3	LT-1
12179-04-3	Boron sodium oxide pentahydrate	20	4	LT-1
121888-68-4	Bentonite, benzyl(hydrogenated tallow alkyl) dimethylammonium stearate complex	3	-	-
122-20-3	Triisopropanolamine	14	6	LT-U
12280-03-4	Disodium octaborate tetrahydrate	19	2	LT-U
123-01-3	Dodecylbenzene	1	0	LT-U
123-17-1	4-Nonanol, 2,6,8-trimethyl-	1	0	LT-U
123-73-9	(E)-Crotonaldehyde	3	10	LT-1
123-91-1	1,4-Dioxane	170	9	LT-1
124-04-9	Hexanedioic acid	58	7	LT-U
124-38-9	Carbon dioxide	6	1	LT-U
124-68-5	2-Amino-2-methylpropan-1-ol	102	4	LT-1
126-92-1	Sodium ethasulfate	5	0	LT-P1
126950-60-5	Alcohols, C12-14-secondary	3	0	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
126-96-5	Sodium diacetate	2	3	LT-P1
127036-24-2	Poly(oxy-1,2-ethanediyl), alpha-undecyl-omega-hydroxy-, branched and linear	1	0	LT-U
127-08-2	Potassium acetate	198	1	LT-U
127087-87-0	Poly(oxy-1,2-ethanediyl)-nonylphenyl-hydroxy branched	940	3	LT-P1
127-09-3	Sodium acetate	157	1	LT-U
129-17-9	Acid blue 1	8	1	LT-P1
129898-01-7	2-Propenoic acid, polymer with sodium phosphinate, sodium salt	62	0	LT-U
1300-72-7	Sodium xylenesulfonate	3	1	LT-P1
1302-27-8	BLACK MICA	44	0	LT-U
1302-74-5	Corundum (Aluminum oxide)	75	6	LT-U
1302-76-7	Kyanite	165	1	LT-U
1302-78-9	Bentonite	7	0	LT-U
1302-93-8	Mullite	251	1	LT-U
1303-86-2	Boric oxide	130	5	LT-1
1303-96-4	Borax	266	9	LT-1
1305-62-0	Calcium hydroxide	30	5	LT-U
1305-79-9	Calcium peroxide	162	3	LT-U
1309-37-1	Iron(III) oxide	512	5	LT-U
1309-38-2	Magnetic iron oxide	6	0	LT-U
1309-42-8	Magnesium hydroxide	98	0	LT-P1
1309-48-4	Magnesium oxide	104	1	LT-P1
1310-14-1	Goethite (Fe(OH)O)	44	0	LT-U
1310-58-3	Potassium hydroxide	2,889	5	LT-1
1310-73-2	Sodium hydroxide	3,330	5	LT-1
1313-82-2	Sodium sulfide	1	6	LT-P1
1314-60-9	Antimony pentoxide	3	4	LT-1
1317-60-8	Hematite	6	1	LT-U
1317-65-3	Limestone	25	0	LT-U
1317-71-1	Olivine	22	0	LT-U
1317-80-2	Rutile (TiO2)	28	0	LT-U
1318-16-7	Bauxite	55	0	LT-U
1319-33-1	Ulexite	391	0	LT-U
1327-36-2	Aluminum silicate	9	0	LT-P1
1330-20-7	Xylenes	97	13	LT-1
1330-43-4	Boron sodium oxide	722	5	LT-1
1332-58-7	Kaolin	44	1	LT-U
1332-77-0	Potassium borate	194	0	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
1333-73-9	Sodium borate	91	0	LT-U
1335-26-8	Magnesium peroxide	40	0	LT-U
1336-21-6	Ammonium hydroxide	277	8	LT-1
1338-41-6	Sorbitan stearate	50	0	LT-P1
1338-43-8	Sorbitan, mono-(9Z)-9-octadecenoate	1,431	0	LT-P1
1341-49-7	Ammonium hydrogen difluoride	24	6	LT-1
1343-88-0	Magnesium silicate	22	0	LT-U
1344-28-1	Aluminum oxide	491	6	LT-1
13446-12-3	Ammonium hydrogen phosphonate	30	0	LT-U
13446-34-9	Manganese Chloride Tetrahydrate	2	2	LT-U
13463-67-7	Titanium dioxide	444	3	LT-1
13478-10-9	Iron (II) chloride	2	3	LT-U
13492-26-7	Phosphonic acid, dipotassium salt	1	0	LT-U
13533-05-6	2-Propenoic acid, 2-(2-hydroxyethoxy)ethyl ester	1	0	LT-U
13598-36-2	Phosphonic acid	369	4	LT-U
136793-29-8	Polymer of 2-acrylamido-2-methylpropanesulfonic acid sodium salt and methyl acrylate	30	0	LT-U
13709-94-9	Potassium metaborate	742	0	LT-U
138-22-7	Butyl lactate	60	3	LT-P1
13840-56-7	Boric acid (H3BO3), sodium salt	120	1	LT-1
138879-94-4	1,2-Ethanediaminium, N, N'-bis[2-[bis(2-hydroxyethyl)methylammonio]ethyl]-N,N'bis(2-hydroxyethyl)-N,N'-dimethyl-,tetrachloride	240	0	LT-U
139-08-2	Tetradecyldimethylbenzylammonium chloride	137	3	LT-P1
139-13-9	Nitrilotriacetic acid	4	4	LT-1
139-33-3	Ethylenediaminetetraacetic acid, disodium salt	79	2	LT-P1
140-01-2	Pentasodium pentetate	3	0	LT-P1
141-43-5	Ethanolamine	160	12	LT-1
141-53-7	Sodium formate	141	1	LT-U
141-78-6	Ethyl acetate	5	7	LT-U
142-31-4	Sodium octyl sulfate	4	2	LT-P1
142-87-0	Sodium decyl sulfate	4	2	LT-P1
143-18-0	Potassium oleate	147	4	LT-U
14452-57-4	Magnesium peroxide	101	3	LT-U
144-55-8	Sodium bicarbonate	188	0	LT-U
14464-46-1	Cristobalite	469	2	LT-1
14807-96-6	Talc	242	1	LT-U
14808-60-7	Quartz	13,258	3	LT-1
150-38-9	Trisodium ethylenediaminetetraacetate	80	1	LT-P1
150-76-5	4-Methoxyphenol	1	5	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
15220-87-8	Propylene pentamer	266	0	LT-U
153568-80-0	Benzenemethanaminium, N,N-dimethyl-N-[2-[(1-oxo-2-propenyl)o xy]ethyl]-, chloride, polymer with N,N-dimethyl-N-2-propenyl-2-propen-1- aminium chloride	1	0	LT-U
154518-36-2	Alcohols, C9-11-iso-, C1o-rich, ethoxylated propoxylated	7	0	LT-U
15468-32-3	Crystalline silica, tridymite	19	3	LT-1
15529-67-6	Sodium zirconium lactate	1	0	LT-U
15619-48-4	1-Benzylquinolinium chloride	45	0	LT-U
15821-83-7	Propylene glycol butyl ether	354	0	LT-U
15827-60-8	Phosphonic acid, [[(phosphonomethyl)imino]bis[2,1-ethanediylnitrilobis(methylene)]]tetrakis-	3	0	LT-P1
1589-47-5	2-Methoxy-1-propanol	1	5	LT-1
16887-00-6	Chloride	61	0	LT-U
174206-15-6	Zirconium, chloro hydroxy lactate oxo sodium complexes	4	0	LT-U
17593-73-6	Glycine, N-(carboxymethyl)-, disodium salt, monohydrate	9	0	LT-U
1760-24-3	N-[3-(Trimethyoxysilyl)propyl]-1,2-ethan ediamine	25	0	LT-P1
1762-95-4	Thiocyanic acid, ammonium salt	127	5	LT-P1
18016-19-8	Sodium maleate (1:x)	17	0	LT-U
18472-87-2	D&C Red 28	1	0	LT-U
18662-53-8	Nitrilotriacetic acid trisodium monohydrate	8	2	LT-1
19019-43-3	Trisodium ethylenediaminetriacetate	127	0	LT-U
1934-21-0	Acid yellow 23	61	0	LT-P1
19549-80-5	2-Heptanone, 4,6-dimethyl-	9	0	LT-U
197980-53-3	Zirconium, 1,1'-((2-((2-hydroxyethyl)(2-hydroxypropyl)amino)ethyl)imino)bis(2-propanol) complexes	1	0	LT-U
2190-04-7	1-Octadecanamine, acetate (1:1)	10	0	LT-U
22042-96-2	Phosphonic acid, [[(phosphonomethyl)imino]bis[2,1-ethanediylnitrilobis(methylene)]]tetrakis-, sodium salt	9	0	LT-P1
2207-98-9	Sulfuric acid, monohexyl ester, sodium salt	4	0	LT-U
2228-95-7	New Zealand assigned name pending	4	0	LT-U
2235-43-0	[Nitrilotris(methylene)]tris-phosphonic acid pentasodium salt	58	0	LT-P1
23519-77-9	1-Propanol, zirconium(4+) salt	11	0	LT-U
2426-08-6	Butyl glycidyl ether	85	11	LT-1
24937-78-8	Vinyl acetate ethylene copolymer	15	0	LT-P1
24938-91-8	Poly(oxy-1,2-ethanediyl), alpha-tridecyl-omega-hydroxy-	9	3	LT-P1
25038-54-4	Policapram (Nylon 6)	2	1	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
25038-72-6	Vinylidene chloride/methylacrylate copolymer	254	0	LT-U
25068-38-6	Phenol, 4,4'-(1-methylethylidene)bis-, polymer with 2-(chloromethyl)oxirane	27	5	LT-1
25085-02-3	Acrylamide/ sodium acrylate copolymer	116	2	LT-P1
25085-34-1	Styrene acrylate copolymer	8	0	LT-U
25085-75-0	Formaldehyde, polymer with bisphenol A	6	1	LT-P1
25085-99-8	2,2'-[propane-2,2-diylbis(4,1-phenyleneoxymethylene)]dioxirane	6	2	LT-P1
25167-67-3	Butylene	2	2	LT-U
25265-71-8	Dipropylene glycol	2	3	LT-P1
25322-68-3	Polyethylene glycol	1,026	1	LT-U
25322-69-4	Polypropylene glycol	43	1	LT-U
25446-78-0	Ethanol, 2-[2-[2-(tridecyloxy)ethoxy]ethoxy]-, hydrogen sulfate, sodium salt	8	0	LT-P1
25987-30-8	2-Propenoic acid, polymer with 2-propenamide, sodium salt	370	2	LT-P1
25988-97-0	Methanamine-N-methyl polymer with chloromethyl oxirane	1	1	LT-P1
26006-22-4	Ethanaminium, N,N,N-trimethyl-2[(2-methyl-1-oxo-2-propen-1-yl0oxy]-, methyl sulfate 91:1), polymer with 2-propenamide	65	1	LT-P1
26027-38-3	Polyoxyethylene(10)nonylphenyl ether	94	3	LT-P1
26038-87-9	Monoethanolamine borate (1:x)	277	0	LT-U
2605-79-0	N,N-Dimethyldecylamine oxide	121	0	LT-U
26062-79-3	2-Propen-1-aminium, N,N-dimethyl-N-2-propenyl-, chloride, homopolymer	1	1	LT-P1
26100-47-0	Ammonium acrylate-acrylamide polymer	166	0	LT-P1
2610-11-9	Direct red 81	4	0	LT-U
26172-55-4	5-Chloro-2-methyl-3(2H)-isothiazolone	229	7	LT-P1
26264-06-2	Benzenesulfonic acid, dodecyl-, calcium salt	60	4	LT-P1
26266-58-0	Sorbitan, tri-(9Z)-9-octadecenoate	83	1	LT-P1
2634-33-5	1,2-Benzisothiazolin-3-one	164	6	LT-1
26635-93-8	Poly(oxy-1,2-ethanediyl), .alpha.,.alpha.'-[[(9Z)-9-octadecenylimino]di-2,1-ethanediyl]bis[.omega.-hydroxy-	85	2	LT-P1
2673-22-5	Butanedioic acid, sulfo-, 1,4-ditridecyl ester, sodium salt	77	0	LT-U
2682-20-4	2-Methyl-3(2H)-isothiazolone	229	6	LT-U
26836-07-7	Dodecylbenzenesulfonic acid, monoethanolamine salt	74	0	LT-U
2687-96-9	1-Dodecyl-2-pyrrolidinone	23	4	LT-P1
27176-87-0	Dodecylbenzene sulfonic acid	411	6	LT-P1
27306-78-1	Poly(oxy-1,2-ethanediyl), alpha-methyl-omega-(3-	1	0	LT-P1

CAS_#	Name	Uses	Hazard Data	LT Score
	(1,3,3,3-tetramethyl-1-((trimethylsilyl)oxy)-1-disiloxanyl)propoxy)-			
27401-06-5	2-Propenoic acid, 2-methyl-, polymer with octadecyl 2-methyl-2-propenoate	3	0	LT-U
2783-94-0	Ci 15985	53	1	LT-U
28205-96-1	2-Propenoic acid, 2-methyl-, polymer with 2-propenoic acid, sodium salt	20	0	LT-U
28208-80-2	2-Propenoic acid, polymer with ethene, zinc salt	2	0	LT-U
2836-32-0	Glycolic acid sodium salt	550	0	LT-U
29316-47-0	Formaldehyde polymer with 4,1,1-(dimethylethyl)phenol and methyloxirane	363	0	LT-U
29638-69-5	Potassium antimonate	54	4	LT-1
3012-65-5	Ammonium citrate (2:1)	2	0	LT-U
30704-64-4	Formaldehyde, polymer with 4-(1,1-dimethylethyl)phenol, 2-methyloxirane and oxirane	5	0	LT-U
30846-35-6	Formaldehyde, polymer with 4-nonylphenol and oxirane	130	0	LT-P1
31726-34-8	Poly(oxy-1,2-ethanediyl), alpha-hexyl-omega-hydroxy	200	0	LT-U
3252-43-5	Dibromoacetonitrile	236	2	LT-1
32612-48-9	Ammonium (lauryloxypolyethoxy)ethyl sulfate	6	3	LT-U
3327-22-8	1-Propanaminium, 3-chloro-2-hydroxy-N,N,N-trimethyl-, chloride	343	3	LT-P1
34004-36-9	1-Propanaminium, 2,3-dihydroxy-N,N,N-trimethyl-, chloride	342	0	LT-U
34398-01-1	Poly-(oxy-1,2-ethanediyl)-alpha-undecyl-omega-hydroxy	119	0	LT-U
3452-07-1	1-Eicosene	87	0	LT-U
34590-94-8	Propanol, 1(or 2)-(2-methoxymethylethoxy)-	136	4	LT-P1
34690-00-1	Phosphonic acid, [[(phosphonomethyl)imino]bis[6,1-hexanediylnitrilobis(methylene)]]tetrakis-	3	0	LT-P1
35249-89-9	Ammonium glycolate	1	0	LT-U
35429-19-7	Polyquaternium-15	8	1	LT-P1
35585-58-1	Sodium borate decahydrate	20	0	LT-U
35657-77-3	Phosphonic acid, [[(phosphonomethyl)imino]bis[6,1-hexa nediylnitrilobis(methylene)]]tetrakis-, sodium salt	67	0	LT-P1
36089-45-9	2-Propenoic acid, 2-ethylhexyl ester, polymer with 2-hydroxyethyl 2-propenoate	50	0	LT-U
37251-67-5	Oxirane, methyl-, polymer with oxirane, monodecyl ether	14	0	LT-U
37288-54-3	Endo-1,4-.beta.-mannanase.	40	0	LT-U
3734-67-6	C.I. Acid red 1	73	0	LT-U
37971-36-1	2-Phosphono-1,2,4-butanetricarboxylic acid	3	2	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
38011-25-5	Disodium ethylenediaminediacetate	127	0	LT-U
38193-60-1	Acrylamide-sodium-2-acrylamido-2-methlypropane sulfonate copolymer	202	0	LT-U
3844-45-9	FD&C Blue no. 1	53	2	LT-U
39346-76-4	Carboxymethyl guar gum, sodium salt	5	0	LT-P1
397256-50-7	2-Propenoic acid, polymer with sodium ethanesulfonate, peroxydisulfuric acid, disodium salt-initiated, reaction products with tetrasodium ethenylidenebis (phosphonata)	69	0	LT-U
40139-72-8	Benzenesulfonic acid, dodecyl-, compound with N-(2-aminoethyl)-1,2-ethanediamine	85	0	LT-U
40404-63-5	Formaldehyde, polymer with 4-nonylphenol and phenol	6	0	LT-U
4067-16-7	Pentaethylenehexamine	3	5	LT-P1
42615-29-2	Alkylbenzenesulfonate, linear	34	0	LT-U
471-34-1	Carbonic acid calcium salt (1:1)	60	0	LT-U
4719-04-4	1,3,5-Triazine-1,3,5(2H,4H,6H)-triethanol	97	4	LT-1
486-66-8	7-Hydroxy-3-(4-hydroxyphenyl)-4-benz opyrone	12	1	LT-P1
497-19-8	Sodium carbonate	185	4	LT-U
50-00-0	Formaldehyde	648	14	LT-1
50-21-5	Lactic acid	48	3	LT-U
5064-31-3	Glycine, N,N-bis(carboxymethyl)-, trisodium salt	418	5	LT-1
50-70-4	D-Glucitol	32	0	LT-U
51198-15-3	Guar gum, carboxymethyl ether	5	0	LT-P1
51200-87-4	4,4-Dimethyloxazolidine	102	4	LT-P1
5131-66-8	1-Butoxy-2-propanol	369	5	LT-P1
515-98-0	Ammonium lactate	7	1	LT-U
51838-31-4	Polyepichlorohydrin, trimethyl amine quaternized	51	0	LT-U
52-51-7	2-Bromo-2-nitropropane-1,3-diol	241	7	LT-1
526-73-8	1,2,3-Trimethylbenzene	5	4	LT-U
532-32-1	Sodium benzoate	2	2	LT-U
5329-14-6	Sulfamic acid	54	4	LT-U
5332-73-0	3-Methoxypropylamine	1	5	LT-U
533-74-4	Dazomet	401	8	LT-P1
54076-97-0	N,N,N-Trimethyl-2[1-oxo-2-propenyl]oxy ethanaminimum chloride, homopolymer	1	1	LT-P1
540-97-6	Cyclohexasiloxane	34	2	LT-P1
541-02-6	Cyclopentasiloxane	33	2	LT-1
5421-46-5	Acetic acid, mercapto-, monoammonium salt	21	1	LT-U
5470-11-1	Hydroxylamine hydrochloride	27	9	LT-P1
55566-30-8	Tetrakis(hydroxymethyl)phosphonium sulfate	774	3	LT-P1

CAS_#	Name	Uses	Hazard Data	LT Score
556-67-2	Octamethylcyclotetrasiloxane	42	7	LT-1
55845-06-2	Formaldehyde, polymer with nonylphenol and oxirane	1	0	LT-P1
55965-84-9	Mixture, 3(2H)-isothiazolone, 5-chloro-2-methyl- with 2-methyl-3(2H)-isothiazolone	11	4	LT-1
56449-46-8	Poly(oxy-1,2-ethanediyl), alpha-hydro-omega-hydroxy-, (9Z)-9-octadecenoate	325	0	LT-U
56-81-5	Glycerin, natural	798	3	LT-U
56-86-0	Glutamic acid	18	0	LT-U
56-93-9	Benzyltrimethyl ammonium chloride	9	4	LT-U
57-13-6	Urea	72	2	LT-U
57-50-1	Sucrose	28	0	LT-U
57-55-6	1,2-Propanediol	806	2	LT-U
577-11-7	Docusate sodium	89	5	LT-P1
584-08-7	Carbonic acid, dipotassium salt	866	3	LT-U
5877-42-9	4-Ethyloct-1-yn-3-ol	9	0	LT-U
590-29-4	Formic acid, potassium salt	472	0	LT-P1
593-81-7	N,N-Dimethylmethanamine hydrochloride	405	0	LT-U
5989-27-5	D-Limonene	93	7	LT-1
5989-81-1	.alpha.-D-Glucopyranose, 4-O-.beta.-D-galactopyranosyl-, monohydrate	89	0	LT-U
60-24-2	2-Mercaptoethanol	620	7	LT-P1
60828-78-6	alpha-[3.5-dimethyl-1-(2-methylpropyl)hexyl]-omega-hydroxy-poly(oxy-1,2-ethandiyl)	2	0	LT-U
61723-83-9	Poly(oxy-1,2-ethanediyl), a-hydro-w-hydroxy-, ether with D-glucitol (2:1), tetra-(9Z)-9-octadecenoate	165	0	LT-P1
61788-46-3	Amines, coco alkyl	36	6	LT-1
61788-62-3	Amines, dicoco alkylmethyl	154	0	LT-P1
61789-40-0	1-Propanaminium, 3-amino-N-(carboxymethyl)-N,N-dimethyl-, N-coco acyl derivs., inner salts	5	3	LT-P1
61789-76-2	Dioco alkylamine	36	0	LT-P1
61789-77-3	Quaternary ammonium compounds, dicoco alkyldimethyl, chlorides	309	1	LT-P1
61790-12-3	Fatty acids, tall-oil	620	0	LT-U
61790-33-8	Amines, tallow alkyl	3	5	LT-1
61790-53-2	Kieselguhr	13	3	LT-1
61790-85-0	Ethoxylated N-(tallow alkyl)trimethylene diamines	3	3	LT-U
61791-08-0	Fatty acids, coco, reaction products with ethanolamine, ethoxylated	125	0	LT-U
61791-12-6	Castor oil, ethoxylated	252	0	LT-U
61791-14-8	Ethoxylated coconut oil alkyl amine	309	1	LT-P1
61791-26-2	Amines, tallow alkyl, ethoxylated	311	5	LT-P1

CAS_#	Name	Uses	Hazard Data	LT Score
61791-29-5	Fatty acids, coco, ethoxylated	124	0	LT-P1
61791-44-4	Ethanol, 2,2'-iminobis-, N-tallow alkyl derivs.	3	1	LT-P1
61827-42-7	Poly(oxy-1,2-ethanediyl), .alpha.-isodecyl-.omega.-hydroxy-	267	1	LT-U
62010-10-0	Zirconium oxide sulfate	2	0	LT-U
62-53-3	Aniline	1	14	LT-1
62-56-6	Thiourea	10	10	LT-1
62649-23-4	Poly (acrylamide-co-acrylic acid), partial sodium salt	444	0	LT-U
627-93-0	Dimethyl adipate	2	1	LT-U
629-50-5	Tridecane	32	2	LT-U
629-59-4	Tetradecane	30	1	LT-P1
629-73-2	1-Hexadecene	88	1	LT-P1
63148-52-7	Siloxanes and silicones, dimethyl,	60	0	LT-U
63148-62-9	Dimethyl polysiloxane	134	1	LT-U
631-61-8	Ammonium acetate	634	1	LT-P1
63428-86-4	Poly(oxy-1,2-ethanediyl), alpha-sulfo-omega-(hexyloxy)-, ammonium salt (1:1)	1	0	LT-U
63428-92-2	Formaldehyde polymer with methyl oxirane, 4-nonylphenol and oxirane	366	0	LT-U
637-39-8	Ethanol, 2,2',2''-nitrilotris-, hydrochloride	151	0	LT-U
63800-37-3	Sepiolite	88	1	LT-U
6381-77-7	Sodium erythorbate (1:1)	511	0	LT-U
64-02-8	Ethylenediaminetetraacetic acid tetrasodium salt	705	3	LT-P1
6410-41-9	C.I. Pigment Red 5	104	2	LT-P1
64-17-5	Ethanol	2,343	9	LT-1
64-18-6	Formic acid	718	9	LT-1
64-19-7	Acetic acid	2,569	8	LT-1
64366-70-7	Oxirane, methyl-, polymer with oxirane, mono(2-ethylhexyl) ether	8	0	LT-P1
64425-86-1	Alcohols, C13-15, ethoxylated	34	1	LT-U
64476-38-6	apatite-group minerals	44	0	LT-U
64741-44-2	Distillates, petroleum, straight-run middle	3	7	LT-P1
64741-67-9	Residues, petroleum, catalytic reformer fractionator	90	3	LT-1
64741-68-0	Naphtha, petroleum, heavy catalytic reformed	5	2	LT-1
64741-85-1	Raffinates, petroleum, sorption process	107	2	LT-P1
64741-88-4	Petroleum distillates, solvent-refined heavy paraffinic	2	5	LT-1
64742-46-7	Distillates, petroleum, hydrotreated middle	25	2	LT-1
64742-47-8	Distillates, petroleum, hydrotreated light	6,388	4	LT-P1
64742-48-9	Naphtha, petroleum, hydrotreated heavy	209	6	LT-1
64742-52-5	Distillates, petroleum, hydrotreated heavy naphthenic	4	3	LT-1

CAS_#	Name	Uses	Hazard Data	LT Score
64742-53-6	Distillates, petroleum, hydrotreated light naphthenic	11	2	LT-1
64742-54-7	Distillates, petroleum, hydrotreated heavy paraffinic	11	1	LT-1
64742-55-8	Distillates, petroleum, hydrotreated light paraffinic	716	1	LT-1
64742-65-0	Distillates, petroleum, solvent-dewaxed heavy paraffinic	7	1	LT-1
64742-88-7	Solvent naphtha (petroleum), medium aliph.	11	3	LT-P1
64742-89-8	Solvent naphtha (petroleum), light aliphatic	2	4	LT-1
64742-94-5	Solvent naphtha, petroleum, heavy arom.	1,403	4	LT-P1
64742-95-6	Solvent naphtha, petroleum, light arom.	21	3	LT-1
64742-96-7	Solvent naphtha, petroleum, heavy aliph.	234	1	LT-P1
64743-02-8	Alkenes, C>10 .alpha.-	329	0	LT-U
65071-95-6	Tall oil, ethoxylated	129	4	LT-P1
65545-80-4	Poly(oxy-1,2-ethanediyl), alpha-hydro-omega-hydroxy-, ether with alpha-fluoro-omega-(2-hydroxyethyl)poly(difluoromethylene) (1:1)	14	0	LT-U
65-85-0	Benzoic acid	12	6	LT-P1
65997-17-3	Fiberglass	155	1	LT-U
65997-18-4	Chemical frits (containing lead)	38	9	LT-1
6625-46-3	C.I. Acid violet 12, disodium salt	72	0	LT-U
66402-68-4	Calcined bauxite	67	3	LT-P1
66455-14-9	Ethoxylated C12-13 alcohols	2	3	LT-U
66455-15-0	Ethoxylated C10-14 alcohols	158	0	LT-U
67-03-8	Thiazolium, 3-[(4-amino-2-methyl-5-pyrimidinyl) methyl]-5-(2-hydroxyethyl)-4-methyl- chloride, monohydrochloride	12	1	LT-P1
67254-71-1	Alcohols, C10-12, ethoxylated	324	0	LT-U
67-48-1	Choline chloride	975	2	LT-U
67-56-1	Methanol	8,962	9	LT-1
67-63-0	Isopropanol	4,405	10	LT-1
67-64-1	Acetone	101	9	LT-P1
67701-32-0	Glycerides, C14-18 and C16-18-unsaturated mono- and di-	65	0	LT-U
67762-90-7	Siloxanes and Silicones, di-Me, reaction products with silica	103	2	LT-U
68002-97-1	C10-C16 ethoxylated alcohol	466	3	LT-U
68036-95-3	Oxirane, methyl-, polymer with oxirane, ether with (chloromethyl)oxirane polymer with 4,4'-(1-methylethylidene)bis[phenol]	5	1	LT-P1
68037-74-1	Siloxanes and silicones, di-Me, polymers with Me silsesquioxanes	2	0	LT-U
68081-81-2	Benzenesulfonic acid, C1o-16-alkyl derivatives, sodium salts	41	0	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
68081-98-1	Sulfuric acid, mono-C14-18-alkyl esters, sodium salts	1	0	LT-P1
68-11-1	Thioglycolic acid	169	7	LT-1
68-12-2	N,N-Dimethylformamide	792	13	LT-1
68123-18-2	Phenol, 4,4'-(1-methylethylidene)bis-, polymer with (chloromethyl)oxirane, methyloxirane and oxirane	89	1	LT-P1
68130-15-4	Guar gum, carboxymethyl 2-hydroxypropyl ether, sodium salt	55	0	LT-U
68131-39-5	Ethoxylated C12-15 alcohols	17	3	LT-P1
68131-40-8	C11-15-Secondary alcohols ethoxylated	59	3	LT-P1
68131-71-5	Triethanolamine polyphosphate ester	129	0	LT-P1
68131-72-6	Polyphosphoric acids, esters with triethanolamine, sodium salts	20	0	LT-U
68139-30-0	1-Propanaminium, N-(3-aminopropyl)-2-hydroxy-N,N-dimethyl-3-sulfo-, N-coco acyl derivs., inner salts	120	1	LT-U
68139-75-3	Fatty acids, C18-unsaturated, dimers, polymers with diethylenetriamine and tall-oil fatty acids	45	0	LT-U
68140-01-2	Amides, coco, N-[3-(dimethylamino)propyl]	89	0	LT-P1
68155-09-9	Amides, coco, N-[3-(dimethylamino)propyl], N-oxides	1	2	LT-P1
68155-20-4	Amides, tall-oil fatty, N,N-bis(hydroxyethyl)	811	0	LT-P1
68155-37-3	1-(Alkyl* amino)-3-aminopropane *(42%C12, 26%C18, 15%C14, 8%C16, 5%C10, 4%C8)	12	0	LT-U
68171-29-9	Ethanol, 2,2',2''-nitrilotris-, tris(dihydrogen phosphate) (ester), sodium salt	1	0	LT-U
68187-17-7	Sulfuric acid, mono-C6-10-alkyl esters, ammonium salts	3	0	LT-U
68299-02-5	Triethanolamine hydroxyacetate	1	0	LT-U
68308-89-4	Fatty acids, C18-unsaturated, dimers, ethoxylated propoxylated	50	0	LT-U
68334-30-5	Fuels, diesel	4	3	LT-P1
68391-01-5	Quaternary ammonium compounds, benzyl-C12-18-alkyldimethyl, chlorides	26	5	LT-P1
68410-62-8	Naphthenic acid ethoxylate	338	0	LT-U
68412-54-4	Poly(oxy-1,2-ethanediyl),alpha-(4-nonylphenyl)-omega-hydroxy-,branched	320	3	LT-P1
68424-85-1	Quaternary ammonium compounds, benzyl-C12-16-alkyldimethyl, chlorides	1,048	4	LT-P1
68425-67-2	Boric acid, compound with 2-aminoethanol	26	0	LT-P1
68439-45-2	Ethoxylated C6-12 alcohols	115	4	LT-P1
68439-46-3	Ethoxylated C9-11 alcohols	165	4	LT-P1
68439-50-9	Ethoxylated C12-14 alcohols	234	3	LT-P1
68439-51-0	Ethoxylated propoxylated C12-14 alcohols	741	4	LT-P1
68439-57-6	Sulfonic acids, C14-16-alkane hydroxy and C14-16-alkene, sodium salts	62	3	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
68442-77-3	2-Butenediamide, (2E)-, N,N'-bis[2-(4,5-dihydro-2-nortall-oil alkyl-1H-imidazol-1-yl)ethyl] derivs.	173	0	LT-U
68476-34-6	Fuels, diesel, no. 2	1	2	LT-P1
68477-31-6	Distillates, petroleum, catalytic reformer fractionator residue, low-boiling	1	2	LT-1
68527-49-1	Thiourea, polymer with formaldehyde and 1-phenylethanone	1,188	0	LT-U
68551-12-2	Ethoxylated C12-16 alcohols	1,522	3	LT-U
68584-22-5	Benzenesulfonic acid, C10-16-alkyl derivs.	197	4	LT-P1
68584-25-8	Benzenesulfonic acid, C1o-16-alkyl derivatives, compounds with Triethanolamine	4	1	LT-P1
68584-27-0	Benzenesulfonic acid, C10-16-alkyl derivs., potassium salts	4	0	LT-U
68585-34-2	.alpha.-Alkyl (C1o-16) .omega.-hydroxypoly (oxyethylene) sulfate, sodium salt	70	2	LT-P1
68585-36-4	Alkyl (C1o-14) oxypoly (ethyleneoxy) ethyl phosphate	19	0	LT-U
68603-42-9	Coconut oil acid/Diethanolamine condensate (2:1)	315	4	LT-1
68603-67-8	Amines, polyethylenepoly-, reaction products with benzyl chloride	10	0	LT-U
68607-28-3	Quaternary ammonium compounds, (oxydi-2,1-ethanediyl)bis[coco alkyldimethyl, dichlorides	59	0	LT-U
68647-72-3	Terpenes and Terpenoids, sweet orange-oil	215	5	LT-U
68647-77-8	Amides, tallow, N-[3-(dimethylamino)propyl],N-oxides	5	0	LT-U
68648-81-7	Benzenesulfonic acid, mono-C10-16 alkyl derivs., compds. with 2-propanamine	5	0	LT-U
68648-87-3	Benzene, C10-16-alkyl derivs.	105	1	LT-P1
68649-29-6	Oxirane, methyl-, polymer with oxirane, mono-C10-16-alkyl ethers, phosphates	7	0	LT-U
68649-44-5	Ethanol, 2-amino-, reaction products with ammonia, by-products from, phosphonomethylated	4	0	LT-U
68891-29-2	Polyethylene glycol mono-C8-10-alkyl ether sulfate ammonium	21	0	LT-U
68909-18-2	1-(Phenylmethyl)pyridinium Et Me derivs., chlorides	28	0	LT-U
68909-34-2	Zirconium, acetate lactate oxo ammonium complexes	158	0	LT-U
68919-39-1	Natural gas condensates	4	2	LT-1
68937-55-3	Siloxanes and Silicones, dimethyl, 3-hydroxypropyl methyl, ethoxylated propoxylated	50	0	LT-U
68951-67-7	Ethoxylated C14-15 alcohols	559	0	LT-U
68953-58-2	Quaternary ammonium compounds, bis(hydrogenated tallow alkyl)dimethyl, salts with bentonite	829	0	LT-U
68956-56-9	Hydrocarbons, terpene processing by-products	126	1	LT-U
68956-79-6	Quaternary ammonium compounds, C12-18-alkyl[(ethylphenyl)methyl]dimet hyl, chlorides	4	1	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
68966-36-9	Amines, polyethylenepoly-, ethoxylated, phosphonomethylated	29	0	LT-U
68989-00-4	Quaternary ammonium compounds, benzyl-C10-16-alkyldimethyl, chlorides	117	1	LT-P1
68990-47-6	Fatty acids, tall-oil, reaction products with diethylenetriamine, maleic anhydride, tetraethylenepentamine and triethylenetetramine	48	0	LT-P1
69418-26-4	Ethanaminium, N,N,N-trimethyl-2-[(1-oxo-2-propenyl)oxy]-,chloride, polymer with 2-propenamide	37	1	LT-P1
69-53-4	Ampicillin	4	4	LT-U
7006-59-9	Ethanaminium, 2-hydroxy-N,N-bis(2-hydroxyethyl)-N-m ethyl-, chloride (1:1)	147	0	LT-U
70142-34-6	Octadecanoic acid, 12-hydroxy-, polymer with .alpha.-hydro-.omega.-hydroxypoly(oxy-1,2-ethanediyl)	65	1	LT-P1
70161-44-3	Glycine, N-(hydroxymethyl)-, monosodium salt	2	0	LT-U
70714-66-8	Phosphonic acid, [[(phosphonomethyl)imino]bis[2,1-ethanediylnitrilobis(methylene)]]tetrakis-, ammonium salt (1:x)	14	0	LT-U
70750-07-1	Formaldehyde, polymer with N1-(2-aminoethyl)-1,2-ethanediamine, benzylated	73	1	LT-P1
70851-08-0	Amides, coco, N-[3-(dimethylamino)propyl], alkylation products with sodium 3-chloro-2-hydroxypropanesulfonate	13	0	LT-U
71011-25-1	Quaternary ammonium compounds, benzyl (hydrogenated tallow alkyl)dimethyl, bis(hydrogenated tallow alkyl) dimethylammonium salt with bentonite	48	1	LT-P1
71050-62-9	2-Propenoic, polymer with sodium phosphinate	172	0	LT-P1
71-23-8	1-Propanol	5	-	-
71-36-3	1-Butanol	144	9	LT-U
71-43-2	Benzene	1	14	LT-1
71-48-7	Cobalt(II) acetate	4	8	LT-1
7173-51-5	Didecyldimethylammonium chloride	789	7	LT-U
72-17-3	Propanoic acid, 2-hydroxy-, monosodium salt	1	2	LT-U
72480-70-7	Tar bases, quinoline derivatives, benzyl chloride-quaternized	350	0	LT-U
73049-73-7	Tryptone	102	0	LT-U
7360-44-3	Aluminum, (acetato-O)dihydroxy-	2	2	LT-P1
73772-46-0	1-Propanaminium, N-(carboxymethyl)-N,N-dimethyl-3-[(1-o xooctyl)amino]-, inner salt	1	0	LT-U
7398-69-8	Dimethyldiallylammonium chloride	59	0	LT-P1
7440-38-2	Arsenic	1	10	LT-1
7440-67-7	Zirconium	1	7	LT-U
7446-09-5	Sulfur dioxide	131	10	LT-1

CAS_#	Name	Uses	Hazard Data	LT Score
7446-19-7	Zinc sulfate, monohydrate	12	4	LT-P1
7446-70-0	Aluminum chloride	6	11	LT-P1
7447-39-4	Copper(II) chloride	225	8	LT-P1
7447-40-7	Potassium chloride	711	2	LT-U
74-84-0	Ethane	1	2	LT-U
74-87-3	Methyl chloride	97	10	LT-1
7487-88-9	Magnesium sulfate	12	0	LT-U
74-98-6	Propane	3	3	LT-U
75-07-0	Acetaldehyde	141	13	LT-1
75-12-7	Formamide	64	4	LT-1
75-21-8	Ethylene oxide	141	17	LT-1
75-28-5	Isobutane	3	5	LT-1
75-31-0	Isopropylamine	5	7	LT-U
75-50-3	Trimethylamine	404	7	LT-1
75-57-0	Tetramethylammonium chloride	624	1	LT-P1
75673-43-7	3,4,4-Trimethyloxazolidine	102	0	LT-U
75-91-2	tert-Butyl hydroperoxide	213	10	LT-P1
7601-54-9	Trisodium phosphate	136	4	LT-U
7631-86-9	Silica	883	2	LT-P1
7631-90-5	Sodium bisulfite	315	7	LT-U
7631-95-0	Sodium molybdate	12	1	LT-U
7631-99-4	Sodium nitrate	16	8	LT-1
7632-00-0	Sodium nitrite	50	9	LT-1
7632-04-4	Sodium peroxoborate	19	6	LT-1
7632-05-5	Sodium phosphate	5	0	LT-U
7632-50-0	Ammonium citrate (1:1)	1	0	LT-U
7646-79-9	Cobaltous chloride	2	12	LT-1
7647-01-0	Hydrochloric acid	2	-	-
76471-41-5	New Zealand assigned name pending	1	0	LT-U
7647-14-5	Sodium chloride	4,221	1	LT-U
7647-15-6	Sodium bromide	114	1	LT-U
7664-38-2	Phosphoric acid	311	7	LT-1
7664-39-3	Hydrogen fluoride	9	11	LT-1
7664-41-7	Ammonia	16	11	LT-P1
7664-93-9	Sulfuric acid	149	9	LT-1
7681-11-0	Potassium iodide	73	5	LT-P1
7681-38-1	Sodium hydrogen sulfate	25	2	LT-U
7681-52-9	Sodium hypochlorite	256	8	LT-1
7681-57-4	Sodium metabisulfite	39	9	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
7681-82-5	Sodium iodide	369	5	LT-P1
7699-43-6	Zirconium oxychloride	29	7	LT-P1
7705-08-0	Ferric chloride	16	6	LT-U
7722-76-1	Ammonium phosphate	309	2	LT-P1
7722-84-1	Hydrogen peroxide	231	11	LT-1
7727-21-1	Potassium persulfate	10	8	LT-U
7727-37-9	Nitrogen	115	0	LT-U
7727-54-0	Diammonium peroxydisulfate	3,700	11	LT-P1
7732-18-5	Water	17,467	0	LT-U
7757-69-9	Carbonic acid, magnesium salt	2	0	LT-U
7757-82-6	Sodium sulfate	1,214	0	LT-U
7757-83-7	Sodium sulfite	99	2	LT-U
7758-19-2	Sodium chlorite	825	9	LT-P1
7758-29-4	Triphosphoric acid, pentasodium salt	6	1	LT-U
7758-87-4	Tricalcium phosphate	10	2	LT-U
7758-89-6	Copper(I) chloride	10	5	LT-P1
7758-98-7	Copper sulfate	8	13	LT-P1
7758-99-8	Copper (II) sulfate pentahydrate (1:1:5)	12	11	LT-U
7772-98-7	Sodium thiosulfate	348	3	LT-U
7772-99-8	Tin(II) chloride	29	6	LT-U
7775-09-9	Sodium chlorate	1	6	LT-P1
7775-19-1	Sodium metaborate	1	1	LT-U
7775-27-1	Sodium persulfate	900	8	LT-U
7778-53-2	Phosphoric acid, tripotassium salt	4	3	LT-U
7778-80-5	Potassium sulfate	14	1	LT-U
7782-63-0	Iron(II) sulfate heptahydrate	13	4	LT-1
7783-18-8	Ammonium thiosulfate	21	2	LT-P1
7783-20-2	Ammonium sulfate	162	3	LT-P1
7786-30-3	Magnesium chloride	241	1	LT-U
7786-81-4	Nickel sulfate	2	12	LT-1
7789-20-0	Deuterium oxide	13	1	LT-P1
7789-38-0	Sodium bromate	235	9	LT-P1
77-89-4	Acetyltriethyl citrate	37	0	LT-P1
7789-75-5	Calcium fluoride	2	1	LT-U
7791-18-6	Magnesium chloride hexahydrate	9	0	LT-U
77-92-9	Citric acid	1,972	3	LT-U
78-21-7	Morpholinium, 4-ethyl-4-hexadecyl-, ethyl sulfate	68	1	LT-P1
78330-19-5	Alcohols, C7-9-iso-, C8-rich, ethoxylated	126	0	LT-U
78330-20-8	Alcohols, C9-11-iso-, C10-rich, ethoxylated	121	0	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
78330-21-9	Alcohols, C11-14-iso-, C13-rich, ethoxylated	393	0	LT-U
78330-23-1	Alcohols, C11-14-iso-, C13-rich, ethoxylated propoxylated	2	0	LT-U
78-40-0	Triethyl phosphate	287	4	LT-U
78-70-6	Linalool (ex bois de rose, synthetic)	3	7	LT-U
78-73-9	Choline bicarbonate	9	0	LT-U
78-83-1	2-Methyl-1-propanol	13	8	LT-U
78-96-6	1-Amino-2-propanol	2	4	LT-U
79-06-1	Acrylamide	152	13	LT-1
79-10-7	Acrylic acid	1	11	LT-1
79-14-1	Glycolic acid	14	6	LT-P1
79-21-0	Peracetic acid	69	10	LT-1
79-33-4	L-Lactic acid	1	3	LT-P1
8001-26-1	Linseed oil	12	0	LT-U
8001-54-5	N-Alkyldimethylbenzyl ammonium chloride	14	7	LT-U
8001-79-4	Castor oil	61	0	LT-U
8002-05-9	Petroleum	7	8	LT-1
8002-09-3	Pine oils	68	3	LT-U
8002-43-5	Lecithin	89	0	LT-P1
8002-74-2	Paraffin waxes and Hydrocarbon waxes	15	3	LT-U
80-05-7	Bisphenol A	3	8	LT-P1
8007-43-0	Sorbitan, (9Z)-9-octadecenoate (2:3)	139	1	LT-P1
80-08-0	Benzamine, 4,4'-sulfonylbis-	2	5	LT-U
8008-20-6	Kerosine (petroleum)	5	5	LT-P1
8013-01-2	Yeast extract	4	-	-
8028-48-6	Orange terpenes	9	0	LT-P1
8031-18-3	Fuller's earth	25	0	LT-U
8032-32-4	Ligroine	9	10	LT-1
8042-47-5	White mineral oil, petroleum	242	0	LT-U
8050-09-7	Rosin	2	7	LT-1
8052-41-3	Stoddard solvent	3	10	LT-1
81741-28-8	Tributyltetradecylphosphonium chloride	525	2	LT-U
81-88-9	Rhodamine B	1	7	LT-1
82469-79-2	1,2,3-Propanetricarboxylic acid, 2-(1-oxobutoxy)-, trihexyl ester	9	0	LT-U
84133-50-6	Alcohols, C12-14-secondary, ethoxylated	310	3	LT-U
85409-23-0	Alkyl* dimethyl ethylbenzyl ammonium chloride *(50%C12, 30%C14, 17%C16, 3%C18)	18	0	LT-U
867-56-1	Propanoic acid, 2-hydroxy-, monosodium salt,	9	0	LT-P1
870-72-4	Methanesulfonic acid, hydroxy-, monosodium salt	140	0	LT-P1

CAS_#	Name	Uses	Hazard Data	LT Score
87246-72-8	1-Deoxy-1-[methyl(1-oxododecyl)amino]-D-glucitol	7	0	LT-U
872-50-4	N-Methyl-2-pyrrolidone	25	8	LT-1
89-65-6	Isoascorbic acid	1	0	LT-U
9000-30-0	Guar gum	3,612	4	LT-P1
9000-70-8	Gelatin	14	0	LT-U
9002-84-0	Polytetrafluoroethylene	9	1	LT-U
9002-85-1	Polyvinylidene chloride	11	0	LT-U
9002-98-6	Polyethyleneimine	57	1	LT-P1
9003-04-7	2-Propenoic acid, homopolymer, sodium salt	135	2	LT-P1
9003-05-8	Polyacrylamide	33	1	LT-P1
9003-06-9	2-Propenoic acid, polymer with 2-propenamide	167	0	LT-U
9003-11-6	2,2'-[propane-1,2-diylbis(oxy)]diethanol	159	2	LT-P1
9003-29-6	Polybutene	2	1	LT-P1
9003-35-4	Phenol, polymer with formaldehyde	1,407	2	LT-P1
9003-39-8	Polyvinyl pyrrolidone	2	1	LT-P1
9004-32-4	Cellulose, carboxymethyl ether, sodium salt	335	0	LT-U
9004-34-6	Cellulose	4	3	LT-1
9004-67-5	Methyl cellulose	18	0	LT-P1
9004-77-7	Polyethylene glycol monobutyl ether	43	1	LT-P1
9004-96-0	Poly(oxy-1,2-ethanediyl), .alpha.-[(9Z)-1-oxo-9-octadecenyl]-.omega.-hydroxy-	160	1	LT-P1
9004-99-3	Polyethylene glycol stearate	3	0	LT-P1
9005-25-8	Starch	14	0	LT-P1
9005-64-5	Polysorbate 20	68	0	LT-P1
9005-65-6	Sorbitan, mono-(9Z)-9-octadecenoate, poly(oxy-1,2-ethanediyl) derivis.	863	0	LT-P1
9005-67-8	Sorbitan, monooctadecenoate, poly(oxy-1,2-ethanediyl) derivis.	123	0	LT-P1
9012-54-8	Cellulase	89	1	LT-P1
9014-01-1	8ubtilisins (proteolytic enzymes)	47	5	LT-U
9014-93-1	Poly(oxy-1,2-ethanediyl), .alpha.-(dinonylphenyl)-.omega.-hydroxy-	16	0	LT-U
9016-45-9	Poly(oxy-1,2-ethanediyl), .alpha.-(nonylphenyl)-.omega.-hydroxy-	1,151	6	LT-1
90218-35-2	Benzenesulfonic acid, dodecyl-, branched, compds. with 2-propanamine	1	1	LT-P1
9025-56-3	Hemicellulase enzyme concentrate	378	0	LT-U
9043-30-5	Isotridecanol, ethoxylated	717	3	LT-U
9046-01-9	Polyethylene glycol tridecyl ether phosphate	155	2	LT-P1
9051-89-2	1,4-Dioxane-2,5-dione, 3,6-dimethyl-, (3R,6R)-, polymer with (3S,6S)-3,6-dimethyl-1,4-dioxane-2,5-dione and	121	0	LT-U

CAS_#	Name	Uses	Hazard Data	LT Score
	(3R,6S)-rel-3,6-dimethyl-1,4-dioxane-2,5-dione			
9063-06-3	0xirane, methyl-, polymer with oxirane, monomethyl ether	3	0	LT-P1
91053-39-3	Diatomaceous earth, calcined	948	0	LT-U
910644-97-2	2-Propenoic acid, ammonium salt, polymer with 2-propenamide, sodium salt	36	0	LT-U
91-20-3	Naphthalene	1,451	11	LT-1
915-67-3	2,7-Naphthalenedisulfonic acid, 3-hydroxy-4-[2-(4-sulfo-1-naphthalenyl) diazenyl] -, sodium salt (1:3)	245	1	LT-U
91-63-4	Quinaldine	9	2	LT-U
92908-33-3	Ulexite (CaNaH12(B03)5.2H20), calcined	112	0	LT-U
93-83-4	9-0ctadecenamide, N,N-bis(2-hydroxyethyl)-,	12	1	LT-U
93858-78-7	2-Phosphonobutane-1,2,4-tricarboxylic acid, potassium salt (1:x)	1	0	LT-U
94266-47-4	Citrus extract	328	0	LT-U
95077-05-7	Unknown	7	-	-
95-63-6	1,2,4-Trimethylbenzene	869	8	LT-P1
98072-94-7	Ilmenite (fetio3), conc. - Natural ilmenite ore is concentrated by selective removal of impurities, chiefly iron, to yield a product enriched in titanium dioxide. The process consists of an optional	18	0	LT-U
98-82-8	Benzene, (1-methylethyl)-	4	11	LT-1