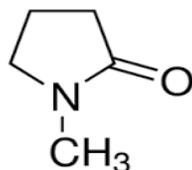


**Preliminary Information on Manufacturing, Processing,
Distribution, Use, and Disposal:**

N-Methylpyrrolidone (NMP)

CASRN: 872-50-4



February 2017

Support document
for Docket EPA-HQ-OPPT-2016-0743

This document provides a preliminary public summary of available information collected by EPA's Office of Pollution Prevention and Toxics (OPPT) in the Office of Chemical Safety and Pollution Prevention (OCSPP) on the manufacturing (including importing), processing, distribution in commerce, use, and disposal of this chemical. This is based on existing data available to EPA, including information collected under the Chemical Data Reporting rule, Toxic Release Inventory, information from other Agency databases, other U.S. Government agencies, publicly available information from states, and a review of published literature. In addition, the document includes information reported to EPA by producers and users of the chemical in the United States and in other countries.

This preliminary use information and any additional use information received in the docket by March 15, 2017 will inform efforts to develop the scope of the chemical risk evaluation required under section 6(b)(4) of the Toxics Substances Control Act, and will inform any risk management efforts following risk evaluation.

Mention of trade names in this document does not constitute endorsement by EPA. To verify products or articles containing this chemical currently in commerce, EPA has identified several examples. Any lists are provided for informational purposes only. EPA and its employees do not endorse any of the products or companies.

This document does not contain confidential business information (CBI).

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Docket: EPA-HQ-OPPT-2016-0743

MANUFACTURING, PROCESSING AND USE

1. Manufacturing (Including Importing)

For the 2016 Chemical Data Reporting (CDR) period, data reported indicate that 33 sites in the United States manufacture (including import) NMP¹. The total volume (in lbs.) of NMP manufactured (including imported) in the United States in 2012 was 164,311,844; in 2013: 168,187,596; in 2014: 171,095,221; in 2015: 160,818,058.

According to information reported to the 2015 Toxics Release Inventory (TRI), 389 facilities reported for NMP². Of these, 8 facilities reported domestic manufacture, 7 facilities reported import, 153 facilities reported processing, and 289 reported other uses (some sites reported in multiple categories)³. According to TRI, in 2015, 3,043,625 lbs. of NMP were transferred offsite to landfills and/or other treatment/disposal facilities, 5,063,992 lbs. were disposed or released on site for a total of 8,107,617 lbs. of on an off-site disposal or other releases to air, water, and land.

Manufacturing Process

NMP can be manufactured using different methods. Several references describe two of the methods for manufacturing NMP.

- 1) Harreus et al describes the typical method of large-scale manufacture of NMP, by reacting butyrolactone with an excess of pure or aqueous methylamine in a high pressure tube

¹ Manufacturers (including importers) are required to report under CDR if they meet certain production volume thresholds, generally 25,000 lb or more of a chemical substance at any single site. Reporting is triggered if the annual reporting threshold is met during any of the calendar years since the last principal reporting year. In general, the reporting threshold remains 25,000 lb per site. However, a reduced reporting threshold (2,500 lb) now applies to chemical substances subject to certain TSCA actions. <https://www.epa.gov/chemical-data-reporting/how-report-under-chemical-data-reporting>

² A facility must report to the TRI program if it meets all three of the following criteria: 1) is in a specific industry sector, 2) employs 10 or more full-time equivalent employees, and 3) manufactures, processes, or otherwise uses a [TRI-listed chemical](#) in quantities above applicable threshold levels for a given chemical in a given year. <https://www.epa.gov/toxics-release-inventory-tri-program/basics-tri-reporting>

³ The term "process" in the context of CDR and TRI means the preparation of a chemical substance or mixture, after its manufacture, for distribution in commerce—
(A) in the same form or physical state as, or in a different form or physical state from, that in which it was received by the person so preparing such substance or mixture, or
(B) as part of an article containing the chemical substance or mixture.
<http://uscode.house.gov/view.xhtml?path=/prelim@title15/chapter53&edition=prelim>

The term "otherwise use" under TRI means any use of an EPCRA Section 313 chemical, including an EPCRA Section 313 chemical contained in a mixture or other trade name product or waste, that is not covered by the terms manufacture or process. See the definition of "otherwise use" for additional details on applicability of otherwise use with regard to disposal, stabilization, and treatment for destruction. https://www.epa.gov/sites/production/files/2016-01/documents/ry_2015_tri_reporting_forms_and_instructions.pdf

reaction. Harreus states “the reaction is exothermic and often run under adiabatic conditions with reactor temperatures in the range of 250-400 degrees Centigrade. The resulting product mixture is decompressed and distilled. The NMP yield is normally more than 97%.”

http://onlinelibrary.wiley.com/doi/10.1002/14356007.a22_457.pub2/abstract;jsessionid=52B5FB0A52B4A4067F738CFF35BCBAAF.f04t02.

- 2) Johnson-Matthey Process Technologies describes a similar manufacturing process. NMP is produced by reacting gamma-butyrolactone (GBL) and monomethylamine (MMA), which are products of butanediol and methylamines processes respectively. <

<http://davyprotech.com/what-we-do/licensed-processes-and-core-technologies/licensed-processes/nmp/specification/>> The process flowsheet is found at the Johnson-Matthey

website.

- 3) Mitsubishi produces NMP from maleic Anhydride in an integrated manufacturing process at their Mizushima plant.

<http://www.m->

[kagaku.co.jp/english/products/business/chemical/c4/details/1194577_3207.html](http://www.m-kagaku.co.jp/english/products/business/chemical/c4/details/1194577_3207.html)

Other methods identified include a non-petroleum-based multi-step process that converts succinic acid into NMP, identified by researchers at the Pacific Northwest National Laboratory (http://iic.pnnl.gov/abstract/nacs/o_113.pdf), and manufacture of NMP through carbonylation of allylamine (Ullman’s Encyclopedia of Industrial Chemistry, Harreus Albrecht L et al).

Methods of manufacturing may depend on the specifications for the end use. For example, higher purities of NMP may be required for electronic applications.

2. Processing

The processing of NMP includes:

- Petrochemical processing, including acetylene recovery from cracked gas, extraction of aromatics and butadiene, gas purification (removal of carbon dioxide (CO₂) and hydrogen sulfide H₂S)), and lube oil extraction
- Reaction medium for the manufacture of high-temperature polymers such as polyethersulfones, polamideimides and polyaramids
- Solvent for acrylic and epoxy resins, polyurethane paints, waterborne paints or finishes, printing inks, synthesis/diluent of wire enamels, coalescing agent
- Solvent and/or co-solvent for liquid formulations of agricultural chemicals
- Pharmaceutical manufacturing and processing.

The table below draws on CDR data to identify the types of processing of the chemical, including processing NMP as a reactant, incorporation into formulation, mixture or reaction products, incorporation into an article, and repackaging.

Table 1: Overview of NMP Processing (2012 CDR)

Industrial Sector (Based on North American Industry Classification System (NAICS))	Industrial Function	Type of Processing
Adhesives and sealant chemicals	Processing-incorporation into formulation, mixture or reaction product	Solvent for Adhesives and sealant chemicals
Solvents (for cleaning or degreasing)	Use-non-incorporative activities	Solvents (for cleaning or degreasing)
Solvents (for cleaning or degreasing)	Processing-incorporation into formulation, mixtures or reaction	Solvents (for cleaning or degreasing)
Solvents (which become part of product formulation or mixture)	Processing-incorporation into formulation, mixture or reaction product	Solvents (which become part of product formulation or mixtures)
Plating agents and surface treating agents	Processing-incorporation into formulation, mixture or reaction	Plating agents and surface treating agents
Processing aids, not otherwise listed	Use-non-incorporative activities	Processing aids, not otherwise, listed.
Solvents (which become part of product formulation or mixture)	Processing-incorporation into article	Solvents (which become part of product formulation or mixture)
Processing aids, specific to petroleum production	Use-non-incorporative activities.	Processing aids, specific to petroleum production
Paint additives and coating additives not described by other categories	Processing-incorporation into formulation, mixture or reaction product	Paint additives and coating additives not described by other categories.
Painting and Coating Manufacturing	Solvents (which become part of product formulation or mixture)	Processing-incorporation into formulation, mixture or reaction product
Processing aids, not otherwise listed	Use-non-incorporative activities	Processing aids, not otherwise listed.
Intermediates	Processing as a reactant	Intermediates
Printing Ink Manufacturing	Paint additives and coating additives not described by other categories	Processing-incorporation into formulation, mixture or reaction
Paint additives and coating additives not described by other categories	Processing-incorporation into article	Paint additives and coating additives not described by other categories

3. Products and Articles

EPA has identified the following examples. This list is provided for informational purposes only. EPA and its employees do not endorse any of the products or companies.

Table 2. List of Products

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
Adhesive/Seam Sealer			
Azek Adhesive	Adhesive	>85	https://azek.com/docs/technical/AZEK_adhesive_2015_SDS_sheet.pdf -
MSP Seam Sealer	Automotive seam sealer	< 1 trade secret	http://multimedia.3m.com/mws/mediawebserve?mwsId=SSSSSuUn_zu8I00xl8mxOx2BNv70k17zHvu9IxtD7SSSSS-- -
ALBERDINGK U 801	Binding agent	5 - 6	http://www.alberdingkusa.com/fileadmin/pdf/s/us_u_801_s.pdf
D9100, D9100SW, D9180	Pressure sensitive adhesive	<0.3	http://catalog.berryplastics.com/catalog-images/410_D9180_11162011.pdf
THERMOSET MA-511	Adhesive	1	http://www.lord.com/sites/default/files/THERMOSET%2520MA-511_0.pdf
DSB 1520 Adhesive Lubricant	Adhesive lubricant	Not specified	http://www.dsbrown.com/Resources/Bridges/Delast/B_DPPS_DSB1520_SDS_v012.pdf
Cleaner/Remover/Solvent (grout, resin, mold, foam, gasket cleaner/remover/solvent)			
3M Sky Restore by Elixair Cured Sealant Remover	Sealant remover	20 - 30	http://www.unionesadhesivas.com/wp-content/uploads/2014/06/MSDS-3M-SkyRestore.pdf
LOCTITE SF 75326 CLEAN UP	Solvent	60 - 100	http://hybris.cms.henkel.com/henkel/msdspd?country=US&language=EN&matnr=234979
Napa Mac's All Parts Washer Solvent	Cleaner	1 - <3	https://partimages.genpt.com/partimages/71667_1.pdf
RaLex Oven Cleaner	Cleaner	1 – 5	http://prestige2007.com/images/554MSDS%20oven%20cleaner.pdf
BORE CLEANING FOAM, BCF-3	Aerosol foaming bore cleaner	4.5	https://www.krollcorp.com/files/forms/msdsBoreCleaningFoamBCF-3-07A.pdf
CR-10 Gun Barrel Cleaner	Gun barrel cleaner	Not specified	https://www.barnesbullets.com/files/2014/12/Barnes-Bullets-CR102.pdf
CHEM-CREST 121	Cleaner (industrial)	90 – 95	http://www.crest-ultrasonics.com/wp-content/uploads/2013/06/msds-chem-crest-121.pdf
CircuitWorks Conformal Coating Remover Pen	Cleaner (electronics)	5 – 7	http://www.alliedelec.com/m/d/7d9ecba03559bcf269db7ee80a9c5a28.pdf
S-6032A Immersion Cleaner	Solvent	60 – 80	http://www.crystal-clean.com/compliance/MSDS/S-6032A%20Superior%20Immersion%20Cleaner%20Revision%2001-16-14.pdf
OIL - BASED STAINLESS STEEL CLEANER & POLISH	Stainless steel cleaner and polish	1 -5	https://lakeland.edu/PDFs/MSDS/1800/Array%20Stainless%20Steel%20Cleaner%20(US%20Chemical)%207-7-2012.pdf
Aerosol Stainless Steel Polish	Aerosol metal cleaner/ protector	Not specified	https://resources.cleanitsupply.com/MSDS/AERO SOL%20STAINLESS%20STEEL%20POLISH.PDF

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
Epoxy Grout Film Remover	Film remover	30 – 60	https://miraclesealants.com/msds/c_egfr.pdf
Pura Insulation Remover	Insulation remover	90 – 100	http://www.idi-insulation.com/wp-content/uploads/2015/10/Pura_Insulation_Remover_MSDS.pdf
Mothers Leather Cleaner	Car care	<1	http://www.homedepot.com/catalog/pdfimages/fd/fd715fc1-0055-48cb-9fd6-29609b78185b.pdf
Slide Bulk Resin Remover	Resin remover mold cleaner	30 – 50	https://www.milacron.com/wp-content/uploads/2016/03/419bulk-Resin-Remover-Mold-Cleaner-SDS.pdf
Dynasolve CU-6	Polyurethane remover	40 - 60	http://www.mccind.com/pdf_msds/SDS%20-%20%20Dynasolve%20CU-6%20.pdf
Green Bean Clean	Cleaner	25 - 50	http://www.daytonsuperior.com/docs/default-source/msds-documents/308468_-_green_bean_clean_(usa).pdf?sfvrsn=8
Foam & Resin Cleaner TLS 77	Foam and resin cleaner	41	http://www.tlspecialty.com/sds/Foam_&_Resin_Cleaner_TLS_77%20SDS.pdf
Gasket Remover	Gasket remover	10 - 20	https://www.wisesafetyenv.com/sds/CRC%20IND-Gasket%20Remover-03017-SDS.PDF
Slide Resin Remover Aerosol	Aerosol resin remover	35 – 40	https://www.slideproducts.com/datasheets/pdfs/Slide-41914-Resin-Remover-OSHA-GHS-SDS.pdf
Gunk HydroSeal II Heavy Duty Parts Cleaner	Parts cleaner	2	http://www.rscbrands.com/products/msds/HS3.pdf
Jasco Green Paint Brush Cleaner	Paint brush cleaner	< 5	http://www.iasco-help.com/uploads/documents/QJGBC430_SDS-808.9.pdf
Goof Off Super Glue Remover	Super glue removal	19.7	http://www.gooffproducts.com/uploads/general/GO_Super_Glue_Rmvr_FG677_MSDS.pdf
Power Charge	Solvent laundry detergent	30 – 40	http://www.unxinc.com/85349727/1050.pdf
B.G. Air Intake System Cleaner	Air intake system cleaner	15 – 40	http://www.bgfleming.com/products/msds/206.pdf
WallGlide TileFoam Plus	Tile cleaner	1 – 5	https://servicemasterportal.s3.amazonaws.com/safety_data/28074.pdf
Sprayway	Home maintenance cleaner	15 - 25	https://householdproducts.nlm.nih.gov/cgi-bin/household/brands?tbl=brands&id=19038052
Reclaimed NMP	Solvents and other uses	99.5	http://www.veolianorthamerica.com/en/our-services/waste-services/n-methylpyrrolidone-sale?gclid=CJ7kml_PutECFYs6gQodj4QMEQ
Coating/Resin/Paint/Rust Inhibitor/Wood Finisher/Sealant			
BYK-410	Rheology additive, coating thickener	48 - 49	http://www.palmerholland.com/Assets/User/Documents/Product/41535/1353/MITM02282.pdf
United Coatings Kymax Coating	PVDF fluoropolymer resin	1 – 5	http://www.gaf.com/Commercial_Roofing_Systems/Liquid_Applied_Roofing/Roof_Coatings/UNITED_COATINGS_Kymax_Coating/United_Coatings_Kymax_Coating.pdf
Buckeye Arena 200	Wood floor coating	1 – 5	http://www.buckeyeinternational.com/media/Arena2005171.pdf
MT Concrete Seal	Concrete floor coating	1 - < 3	https://www.hillyard.com/Images/MSDS/MSDSHILO0492.pdf
Isolflex 760 Lockcoat Aromatic Part A	Coating	3	http://www.lymtal.com/msds/if760ar_msds.pdf - Two MSDSs - only 1 with NMP

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
Vara HD Spar Varnish Semi-Gloss VA	Top coat/varnish	1 – 2.5	http://www.homedepot.com/catalog/pdfimages/c5/c59d2d20-deaa-476a-894e-c7befda3a539.pdf -
Staticide Premium ESD Paint	Paint for concrete	4 – 7	http://www.aclstaticide.com/safety_datasheets/5700SDS_16.pdf -
Hydrophilic Coating Formula B	Hydrophilic coating	< 2.5	http://coatings2go.com/wp/wp-content/uploads/2015/03/Formula_B-_all_versions1_n.pdf -
Marine Instant Galvanize	Coating	< 0.3	http://www.crcindustries.com/faxdocs/msds/6054.pdf -
Formgard TJ 450	Rust inhibitor for steel	CBI	http://www.nox-crete.com/wp-content/uploads/2014/03/FORMGARD-TJ-450-SDS.pdf -
Zar Exterior Water Based Polyurethane - All Gloss Levels	Wood finish varnish	3 – 7	http://www.zar.com/wp-content/uploads/Zar-Exterior-Water-Based-Polyurethane-All-Gloss-Levels-SDS.pdf -
Minwax Polyacrylic Water-Based Protective Finish Clear Gloss	Clear gloss protective finish	1.71	http://www.minwax.com/document/SDS/en/US/027426155558 -
BonaSport Super Sport	Wood gym floor finish	< 5	https://www.bona.com/Global/Countries/United%20States/MSDS/Bona%20Supersport%20Finish%20MSDS.pdf -
Skybond® 705 Polyimide Resin	Polyimide Resin	60 - 63	http://www.istusa.com/pdf/msds/SB/IST_Skybond_705_SDS.pdf -
Bright Zinc-It® Instant Cold Galvanize	Coating	< 0.3	https://www.reynoldsonline.com/ASSETS/DOCUMENTS/ITEMS/EN/CRCC18414_MSDS.pdf -
MIL-DTL-64159B Type II/III Component B, Catalyst	Touch-up military paint	1 - 5	http://www.milspray.com/assets/files/sds/MIL-DTL-64159B%20Type%20II-III%20-%20Component%20B%20Catalyst%20(SCI).pdf
HD 8820	Polyimide coating for semi-conductor industry	<1	https://wcam.engr.wisc.edu/Public/Safety/SDS%20-%20GHS/SDS%20E-COPY/Polyimide%20HD-8820.pdf
KBS RustSeal	Rust preventive	0 - 1	https://www.winzerusa.com/ecat/msds/891_1802_7.pdf
Gloss Topcoat Concentrate/TC-1	Top-coating	9 - 10	http://advleather.com/MSDS-TC-1.pdf
BOB WB URETHANE/ACRYLIC SEALER	Sealer	1 - 5	http://www.spec-west.com/uploads/3/Spec_West/MSDS/BOB_MS_DS.pdf
LIQUID 2 POWDER	Powder coating surface preparation	<1	http://www.powderbuythepound.com/pdf/MSDS%20L20.pdf
STOPGAP F76 RESIN	Component of epoxy resin based system	<1	http://www.f-ball.com/wp-content/uploads/safety.f76-resin.en.pdf
DUPLI-COLOR® Clear Truck Bed Coating (Aerosol)	Aerosol	0.28	http://s7d9.scene7.com/is/content/GenuinePartsCompany/3133889pdf?SPDF\$
Polyurethane Curative WC-788 Part B-180	Polyurethane curative	.129	https://bjbenterprises.com/media/wysiwyg/pdfs/Water-Clear-Shore-D/WC-788_Part_B-180.pdf
PETTIT VIVID GREEN 1361	Paint	Not specified	http://doc.jamestowndistributors.com/userportal/pdfs/MSDS/Pettit/Pettit_Vivid_1361_Green_SDS.pdf

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
Stripe Orange Fluorescent (Solvent)	Solvent for paintings and coatings	.36	http://www.seymourpaint.com/wp-content/uploads/2014/11/20-957-SDS.pdf
Cosmetics/Personal Care Products			
All or 1 Artificial Nail Remover - Various (Lemon, Orange, Lemon Extracts, Orange Oil)	Nail polish remover/solvent	N/A	safecosmetics.cdph.ca.gov Under CAS 872-50-4
Blonde Bombshell	Hair styling product	N/A	safecosmetics.cdph.ca.gov Under CAS 872-50-4
Clear Action Day Treatment	Skin moisturizer	N/A	safecosmetics.cdph.ca.gov Under CAS 872-50-4
Korres Abyssinia Oil Mascara Various	Mascara	N/A	safecosmetics.cdph.ca.gov Under CAS 872-50-4
TexasLash Mascara	Mascara	N/A	http://www.cargocosmetics.com/texaslash-mascara.html >
Proactivator Nail Bonder	Nail adhesive	N/A	safecosmetics.cdph.ca.gov Under CAS 872-50-4
5 Second Stop Fungus Nail Treatment	Fungus nail treatment	N/A	http://www.5secondnail.com/ https://www.amazon.com/Second-Nail-Stop-Fungus-Treatment/dp/B001KYQG3U#customerReviews . http://www.ewg.org/skindeep/product/465807/5_Second_Stop_Fungus_Nail_Treatment/
DARIYA Salon De Pro Hair Manicure Speedy Dye, No. 4 Light Brown, 0.5 Pound	Hair dye	N/A	https://www.amazon.com/DARIYA-Salon-Manicure-Speedy-Light/dp/B000V2F3AE/ref=sr_1_18_a_it?ie=UTF8&qid=1485278275&sr=8-18&keywords=methyl+pyrrolidone
LOMBOK Mastic LPP treatment 1000ml	Hair treatment	N/A	https://www.amazon.com/LOMBOK-Mastic-treatment-1000ml-Korea/dp/B00JFITJRS/ref=sr_1_36_a_it?ie=UTF8&qid=1485278476&sr=8-36&keywords=methyl+pyrrolidone
Dyes and Inks			
Silver Conductive Ink – Standard	Silver conductive ink for 3D printable electronics	<15	http://p4.zdassets.com/hc/theme_assets/638849/200059206/Voxel8_conductivesilverink_SDS.pdf Note: Listed as “Cyclic amide”
CN816Series	Inkjet printing	<5	http://h22235.www2.hp.com/hpinfo/globalcitizenship/environment/productdata/Countries/us/lf_cn816series_us_eng_v08.pdf
FR-1 RED CONCENTRATE	Dye	97 – 98	http://www.advanced-plastics.com/msds/D61_150223%20SDS.pdf
LEATHER FINISH BLACK W-3000	Leather dye	2 – 5	http://www.suedeproducts.com/MSDS/BLACK%20W-3000.pdf
HPS-108AE1 High Performance Silver Ink	Commercial ink (Nano)	0 – 5	http://store.novacentrix.com/v/vspfiles/assets/images/HPS-108AE1%20High%20Performance%20Silver%20Ink.pdf –

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
JP-K81 Printing Ink	Printing ink	1 – 5	http://www.hitachi-america.us/supportingdocs/forbus/inkjetprinters/msds/english/ink_types/hitachi-material-safety-data-sheet-jp-k81-printing-ink.pdf
Thinner 2732	Ink thinner	30 – 60	http://baltimoreprintstudios.com/wp-content/uploads/2012/06/msds_retarder_thinner_nazdar.pdf
Grout			
Quartz-Lock™ Grout, Product #120120	Tile grout	1.47	http://www.greenbuildingsupply.com/core/media/media.nl?id=43507&c=772072&h=25f7a394e628431cc9bc
Miscellaneous			
Nycast Type 6 Cast Nylon and Type 12 Cast Nylon	Cast nylon (industrial use)	<5	http://www.alro.com/datapdf/plastics/plasticsmsds/sds_castnylon.pdf
ALL-WEATHER Plastic Ear Tag Marker	Weather-resistant marker for polyurethane tags	10 -20	http://www.markal.com/assets/1/7/aw_plastic_ear_tag_white_medtip.pdf
Leather Repair Compound	Filler	4	https://leathermagic.com/wp-content/uploads/LthrRepCompoundMSDS.pdf
AQUACREME	Glazing material	2.1	http://fauxfx.com/SDS/aquacremeghssds.pdf
Buckeye Equity	Buffing floor finish enhancer	<1	http://www.buckeyeinternational.com/media/Equity5108.pdf
BYK-410	Foam stabilizers	30 - 60	http://www.sfm.state.or.us/CR2K_SubDB/MSDS/BYK_410.PDF
Pesticides			
MATADOR	Herbicide	Not specified	https://s3-us-west-1.amazonaws.com/www.agrian.com/pdfs/Matador_MSDS2.pdf
LONGRANGE	Parasiticide	30	https://www.henryscheinvet.com/Content/SDS/045372.pdf
Bayluscide 20% Emulsifiable Concentrate; Bayluscide Emulsifiable Concentrate Lampricide	Niclosamide ethanolamine salt mixture; clonitralide mixture	64 – 68	http://www.glf.org/sealamp/sop2015/app/app%20f%20SDS%20Bayluscide%2020%20percent%20Emulsifiable%20Concentrate.pdf
Tekko Pro	Insect growth regulator	20	http://www.domyownpestcontrol.com/msds/Tekko_Pro_MSDS.pdf
SUBDUE GR	Granular fungicide	<5	http://www.kellysolutions.com/erenews/documentsubmit/KellyData%5CAK%5CPesticide%5CMMSDS%5C100%5C100-794%5CSUBDUE_GR_4_15_2016_1_57_13_PM.pdf
Enforcer Formula 777 E.C. Weed Killer	Weed killer	1 – 5	https://sds.zepinc.com/ehswww/zep/result/direct_link.jsp?P_LANGU=E&P_SYS=2&P_SSN=11337&C001=MSDS&C002=US&C003=E&C013=1048552&C123=SDS*
Prentox CFT Legumine Fish Toxicant	Piscicide	10	http://www.zoecon.com/-/media/files/zoecon-us/product%20labels/sds/cft%20legumine%20fish%20toxicant%20sds.pdf
Sergeants PetArmor Plus	Dog flea and tick	20 – 40	https://householdproducts.nlm.nih.gov/cgi-bin/household/brands?tbl=brands&id=19049008

Trade name	Use of the product	% by weight of chemical	Link to references, SDS or industry information
Paint Stripper/Graffiti Remover			
Safety Strip 5896B	Industrial strength stripper	< 80	http://www.brulin.com/cmsassets/file/msds/331022_msd.pdf
Peel Away 5 Soy Based	Soy based paint stripper	25 – 30	https://www.dumondchemicals.com/pdf/MSDS/Peel_Away_5_Soy_Based.pdf
HCS 401 Ink Remover	Ink remover	1 – 60	http://www.progressive-recovery.com/wp-content/uploads/2016/03/HCS-401-INK-REMOVER-12-15-2015-No-PRI-.pdf
Photo Resist (usually Printed Circuit Board Manufacturing)			
Remover PG	Photoresist	Not specified	https://louisville.edu/micronano/files/documents/safety-data-sheets-sds/copy_of_RemoverPG.pdf
Remover PG Photoresist Remover	Photoresist Remover	>99	http://www.binghamton.edu/nano/documents/ghs_removerpg_rev0.pdf
Sealant/Leak Sealant			
Enviroseal Acrylic Sealer	Floor Sealant Acrylic	0.1 - < 1.0	http://www.state.in.us/idoc/penproducts/files/SDS_US_English_-_FL-2126-D_ENVIROSEAL_ACRYLIC_SEALERwHMIS.pdf
Rohper LSPR Leak Seal Clear	Aerosol leak sealer	.1 – 1	http://www.rustoleum.com/MSDS/ENGLISH/267453.pdf
Turtle Wax 2 in 1 Headlight Cleaner & Sealant	Automotive headlight sealant and cleaner	0.2	https://www.turtlex.com/docs/default-source/msds-english/msds-consumer/t43
Soldering Flux			
TSF 6522 TACKY SOLDERING FLUX TSF 6522 TACKY SOLDERING FLUX	Soldering flux	1 - 2.5	http://www.kester.com/DesktopModules/Bring2mind/DMX/Download.aspx?Command=Core_Download&EntryId=1169&language=en-US&PortalId=0&TabId=96
Wood Preservative			
MP400-EXT	Wood preservative for utility poles	<1	http://www.kellysolutions.com/erenewals/documentssubmit/KellyData%5COK%5Cpesticide%5CMSDS%5C75341%5C75341-14%5C75341-14_MP400_EXT_3_3_2016_9_54_21_AM.pdf

Table 3: List of Articles

Trade name	Use of the article	% by weight of chemical	Link to references, SDS or industry information
Lithium Ion Battery	Lithium ion battery	0 – 1	http://www.officedepot.com/pdf/msds/469830.pdf
Nycast Type 6 Cast Nylon and Type 12 Cast Nylon	Cast nylon industrial use	<5	http://www.alro.com/datapdf/plastics/plasticsmsds/sds_castnylon.pdf
Arts/Crafts/ Variety Packs (numerous)	Children's arts and crafts products (Gels, Creams, Powders, Liquids, Adhesives, synthetic fragrances)	5000-10000 ppm NMP	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Report/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
easy-graft CLASSIC (biolinker portion)	Dental bone graft substitute	85	http://us.guidor.com/media/guidor_Pdfs/SDS_easy-graftCLASSIC_V02.pdf

Trade name	Use of the article	% by weight of chemical	Link to references, SDS or industry information
Children's Sportswear, Clothing and Underwear various	Children's sportswear, clothing and underwear various	<500 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Dolls/Soft Toys Various	Dolls/soft toys various	500-1000 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Children's Footwear	Children's footwear	<100 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Children's Belts/Braces/Cumberbunds Various	Children's belts/braces/cumberbunds various	100 – 500 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Baby Feeding/Bibs Various	Baby feeding/bibs Various	<100 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Children's Clothing/ Dresses/ Trousers/ Shorts/Bodysuits Various	Children's clothing/ dresses/ trousers/ shorts/bodysuits Various	<100 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber
Children's Bedding Various	Blankets/throws	< 100 ppm	Reported to State of Washington under the Children's Safe Product Act https://fortress.wa.gov/ecy/cspareporting/Reports/ReportViewer.aspx?ReportName=ChemicalReportByCASNumber

Note: In January 2017, EPA proposed restrictions on the use of NMP in commercial and consumer paint and coating removal (82 FR 7464).

4. Distribution (Includes Retailers)

Based on information reported to TRI for 2015, ten facilities manufacture NMP for sale or distribution. Based on information reported to CDR for 2016, seven facilities manufacture NMP for wholesale and retail trade.

Because of the wide variety of NMP uses and NMP-containing products and articles, distribution of NMP also varies depending on the use, product or article.

NMP can be purchased directly through online retailers, through chemical distributors and through a variety of retailers and businesses depending on the NMP-containing product or article. Industrial and commercial users may purchase through chemical distributors – online or directly from suppliers such as industrial supply stores. Distribution of products and articles to commercial businesses and consumers may be through online purchasing or again directly from retailers.

For example, adhesive remover such as Goof Off SuperGlue Remover can be purchased online, at HomeDepot and through many other supply stores (<http://www.homedepot.com/p/Goof-Off-4-oz-Super-Glue-Remover-FG677/204055736>). Adhesives with NMP, whether for commercial, construction or consumer use, may be purchased online, at hardware or arts/crafts stores or through commercial distributors. For example, Azek Adhesive is found in the store at Lowe's and Home Depot as well as online.

EPA also identified an NMP product, (greater than 95% NMP), produced from recycling NMP, for sale online.

Source: http://www.veolianorthamerica.com/en/our-services/waste-services/n-methylpyrrolidone-sale?gclid=CJ7kmL_PutECFYs6gQodj4QMEQ.

5. Use

NMP is an effective solvent used in a wide variety of industrial, commercial and consumer uses (Harreus et al., 2011). NMP has an extensive array of industrial, commercial and consumer uses, past and potential, including:

- Solvent for resins, waxes, paints/coatings, arts/crafts, adhesives, acetylene, industrial cleaning, consumer cleaning products, mold cleaning (including agricultural molds), polyurethane processing;
- Chemical extraction of acetylene, BTX and butadiene, synthetic resin surface coating solvent, reaction solvents (PPS, polyimide, etc);
- Adhesives, bioadhesives and sealants in a wide variety of commercial, consumer and children's products;
- Pipe cement;
- Cleaning agent for equipment, surfaces, tanks, floors, walls, laundry and laundry spot remover;
- Metal finishing;
- Wood preservative ingredient;

- Printed circuit board manufacturing, semiconductor parts cleaning, semiconductor photo-resist thinner, color filter photo-resist thinner;
- Wax/flux/polymeric residue removal;
- Lithium battery manufacturing;
- Dehydration of natural gas;
- Spinning agent for PV;
- Lube oil processing;
- Petrochemical processing;
- Spinning agent for PVC;
- Chemical intermediate;
- Pigment dispersant and dyes (such as shoe colorant);
- Automotive mold cleaning and automotive metal parts cleaning;
- Printing, printing inks (lithographic and screen) and print cleaning;
- Optical plastic lens manufacturing equipment cleaning;
- Cosmetic products;
- Skin penetration enhancer;
- Textiles and clothing;
- Adjuvant for slimicides in food contact paper;
- Solvent in food contact polysulfone and PES resins;
- Pharmaceutical and agricultural chemical manufacturing solvent, cleaning, extraction;
- Veterinary pharmaceuticals;
- Laboratory uses;
- Synthesis of Vitamin E precursors;
- Hydraulic Fracking.

Source: Ash, Michael and Irene. Specialty Chemicals Source Book. 4th edition vol 2. 2009, EU Annex XV Restriction Report NMP

https://echa.europa.eu/documents/10162/13641/nmp_annex_xv_report_en.pdf

Mitsubishi Chemicals cites the following industrial and commercial uses for NMP:

- Electronics: Wax/flux removal, Burr removal, Electronics Parts Cleaning, Semiconductor Parts Cleaning, Solvent for Lithium Battery Manufacturing, Semiconductor Photo-Resist Thinner, Color Filter Photo-Resist Thinner
- Automotive: Mold Cleaning, Metal Parts Cleaning
- Chemical: Extract agent (acetylene, BTX, butadiene), Synthetic resin surface coating solvent, Reaction solvents (PPS, polyimide, etc.), Equipment washing.
- Optical: Plastic Lens manufacturing equipment cleaning
- Pharmaceutical and Agricultural Chemicals: Water-soluble solvent, Cleaning, Extraction.

Source: <http://www.m->

[kagaku.co.jp/english/products/business/chemical/c4/details/1194577_3207.html](http://www.m-kagaku.co.jp/english/products/business/chemical/c4/details/1194577_3207.html)

NMP has also been reported to be used in hydraulic fracking. The April 2011 Report of the U.S. House of Representatives Committee on Energy and Commerce Minority Staff on *Chemicals Used in Hydraulic Fracking* identified at least one NMP-containing product used in hydraulic fracking.

Source:

http://www.conservation.ca.gov/dog/general_information/Documents/Hydraulic%20Fracturing%20Report%204%2018%2011.pdf.

Use at Industrial Sites

As mentioned above, NMP is widely used as a solvent in chemical and chemical processing, electronics, as well as in wide variety of industries, including manufacturing of solvents, pesticides, paints, coatings, auto, pharmaceuticals, adhesives and other product formulations. Uses of NMP in fracking have been identified but not well characterized.

The functional uses of NMP at industrial sites include:

- Solvent uses (which become part of product formulation or mixture)
- Coatings as ingredient in both solvent and water based coatings including wire coatings
- Processing agent and incorporation into a formulation, mixture or reaction product
- Processing agent and incorporation into an article
- Processing as a reactant
- Paint additives and coating additives not described by other categories
- Electronics: cleaning agent for silicon wafers, photoresist stripper, auxiliary in printed circuit board technology
- Paint and coating removal (brush, spray, and immersion)
- Heated solvent and/or paint remover
- Non-incorporative activities
- Industrial and domestic cleaning: component in paint strippers and degreasers (e.g. removal of oil, fat and soot from metal surfaces and carbon deposits and other tarry polymeric residues in combustion engines)

Commercial Uses

Commercial uses are wide and varied. They include:

- Automotive/autobody sectors (autobody painting, wheel stripping, antique auto restoration, ground vehicle maintenance)
- Cleaning (floor stripping, equipment cleaning, tank cleaning among others)
- Furniture refinishing
- Specialized cleaning in optics
- Electronic/computer manufacturing uses (printed circuit board manufacturing, defluxing/semiconductors)
- Lithographic/silk screen printing
- Art restoration and conservation
- Nail salon uses (in remover)

- Construction and building uses (coatings, paints, adhesives, binders, sealants and removers including edge bead remover, waterproofing)
- use of NMP-containing products by professional contractors of all kinds
- Graffiti removal by municipalities, transit agencies and commercial real estate managers
- Laboratory uses including as a reagent.

Consumer Uses

While many products that contain NMP seem to be intended for industrial and commercial uses, NMP is found in a variety of products used by consumers including:

- Paints
- Paint strippers
- Furniture strippers
- Cleaners (for oven cleaning, floor/surface cleaning and floor stripping)
- Adhesives (general)
- Leather treatments
- Adhesives for arts/crafts, children's arts/crafts, hobby products
- Surfactants and other uses in Personal Care Products (mascara, hair dye, hair treatment, nail treatment)
- Clothing/Footwear (children's clothing, footwear, accessories)
- Textiles/Bedding

The Washington Department of Ecology Safer Children's Products Database lists 53 children's products reported by manufacturers to contain NMP.

Some pet care products including flea treatments may contain NMP. NLM's Household Products database lists a dog flea treatment containing 20-40% NMP.

6. Disposal of Waste and Recycling/Recovery

Recycling and Recovery

Veolia North America advertises on Amazon selling "N-Methyl-2-pyrrolidone For Sale" stating the company "recovers solvent from industrial processes across the United States at its four locations in Azusa, CA, Henderson, CO, West Carrollton, OH and Middlesex, NJ." Veolia states that its "reclaimed solvents are typically 99.5% minimum purity and much more competitively priced than virgin solvents."

Source: <http://www.veolianorthamerica.com/en/our-services/waste-services/n-methylpyrrolidone-sale>

Disposal of Waste

According to TRI, in 2015, 8,107,617 lbs. of NMP were disposed or released, including 5,063,992 lbs. of NMP released or disposed onsite and 3,043,625 lbs. of NMP released or disposed offsite.

Of the onsite releases of 5,063,992 lbs, 3,623,299 lbs. were primarily released to onsite Underground Injection Control (UIC) Class 1 wells and another 1,440,593 lbs. to onsite releases to air from point sources or fugitive sources and surface water.

Of the offsite TRI releases or disposal of 3,043,625 lbs. reported in 2015, 2,789,548 lbs. were released to offsite landfills, RCRA Subtitle C landfills or UIC Class 1 wells located offsite, and 254,077 lbs. were released offsite through other land disposal, waste brokers, storage and land treatment.

In terms of handling and disposal, NMP is classified as a combustible liquid and should be stored in approved safety containers, properly labeled as to their contents and hazard.

Source: <http://infohouse.p2ric.org/ref/30/29008.pdf>.

Safety Data Sheets for NMP frequently indicate, "While this material is not specifically defined or listed by RCRA rules, it is recommended that disposition of material be done in accordance with Federal, Regional, State, Provincial and/or local rules and regulations."

Source: <http://amdg.ece.gatech.edu/msds/solvents/N-methyl-2-pyrrolidone.pdf>

The International Chemical Safety Card under the "Spillage Disposal" Section offers the following guidance: "Collect leaking and spilled liquid in sealable containers as far as possible. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Personal protection: filter respirator for organic gases and vapours."

Source: <https://www.cdc.gov/niosh/ipcsneng/neng0513.html>.

USEFUL TYPES OF INFORMATION

This document presents a summary of information currently available to EPA on this chemical. To more fully characterize the manufacturing, processing, distribution, disposal, and use of this chemical, and to inform the development of the scoping document for this chemical, EPA is interested in obtaining information on:

- the functional uses for this chemical;
- what types of products contain this chemical;
- which industry sectors use this chemical;
- what volume of the chemical is used;
- which uses have been discontinued or phased out;
- exposure scenarios for this chemical; and
- in which articles this chemical is found.

APPENDIX: SOURCES CONSULTED

- U.S. EPA *Chemical Inventory*
<https://www.epa.gov/tsca-inventory>
- U.S. EPA *ChemView*
<https://java.epa.gov/chemview>
- TRI P2 information
<https://www.epa.gov/toxics-release-inventory-tri-program/pollution-prevention-p2-and-tri>
- U.S. EPA *HPV HC* (access through Chemical Data Access Tool – CDAT)
https://java.epa.gov/oppt_chemical_search/
- U.S. EPA *HPVIS* and *HPV HC* (access through Chemical Data Access Tool – CDAT)
https://java.epa.gov/oppt_chemical_search/
- DfE Alternatives Assessments
<https://www.epa.gov/saferchoice/design-environment-alternatives-assessments>
- Safer Chemical Ingredients List
<https://www.epa.gov/saferchoice/safer-ingredients>
- Green Chemistry awards
<https://www.epa.gov/greenchemistry/presidential-green-chemistry-challenge-winners>
- Greener products and services
<https://www.epa.gov/greenerproducts/identify-greener-products-and-services>
- Pollution Prevention
<https://www.epa.gov/p2/pollution-prevention-case-studies>
<https://www.epa.gov/p2/grant-programs-pollution-prevention#sra>
<https://www.epa.gov/p2/pollution-prevention-tools-and-calculators>
- U.S. EPA *InertFinder*
<https://iaspub.epa.gov/apex/pesticides/f?p=101:1:>
- U.S. EPA *Pesticide Chemical Search*
<https://iaspub.epa.gov/apex/pesticides/f?p=CHEMICALSEARCH:1:0::NO:1::>
- U.S. EPA *Endocrine Disruptor Screening Program*
<https://www.epa.gov/ingredients-used-pesticide-products/endocrine-disruptor-screening-program-tier-1-assessments>
- U.S. EPA *Hazardous Waste*
<https://www.epa.gov/hw/learn-basics-hazardous-waste#regulations>
- U.S. EPA *Superfund chemical data matrix*
<https://www.epa.gov/superfund/superfund-chemical-data-matrix-scdm-query>
- U.S. EPA *Hazardous Air Pollutants*
<https://www.epa.gov/haps/initial-list-hazardous-air-pollutants-modifications>
- U.S. EPA *Significant New Alternatives Policy (SNAP)*
<https://www.epa.gov/snap>
- U.S. EPA *Volatile Organic Compounds*
<https://www.epa.gov/indoor-air-quality-iaq/technical-overview-volatile-organic-compounds#definition>
- U.S. EPA *Toxic and priority pollutants under the Clean Water Act*
<https://www.epa.gov/eg/toxic-and-priority-pollutants-under-clean-water-act#toxic>

- U.S. EPA *Contaminant Candidate list under the Safe Drinking Water Act*
<https://www.epa.gov/ccl/contaminant-candidate-list-3-ccl-3#chemical-list>
- U.S. EPA *IRIS Assessment*
<https://cfpub.epa.gov/ncea/iris2/atoz.cfm>
- U.S. EPA *SRS*
https://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/substancesearch/search.do
- U.S. EPA *Chemical and Product Categories (CPCat) Database*
<https://actor.epa.gov/cpcat/faces/home.xhtml>
- U.S. National Library of Medicine *ChemIDplus*
<https://chem.sis.nlm.nih.gov/chemidplus/>
- U.S. National Library of Medicine *Hazardous Substance Data Bank (HSBD)*
<https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
- U.S. Department of Health & Human Services *Household Products Database*
<https://hpd.nlm.nih.gov/index.htm>
- OSHA *Chemical Hazards and Toxic Substances*
<https://www.osha.gov/SLTC/hazardoustoxicsubstances/index.html>
- NIOSH Workplace Safety and Health Topics *Chemicals*
<http://www.cdc.gov/niosh/topics/chemical.html>
- NIOSH *Pocket Guide to Chemical Hazards*
<http://www.cdc.gov/niosh/npg/npgdcas.html>
- CPSC *Chemicals*
<http://www.cpsc.gov/en/Research--Statistics/Chemicals/>
- CPSC *FHSA*
<https://www.cpsc.gov/Business--Manufacturing/Business-Education/Business-Guidance/FHSA-Requirements/>
- Food and Drug Administration *List of Databases*
<http://www.fda.gov/ForIndustry/FDABasicsforIndustry/ucm234631.htm>
- NTP (National Toxicology Program) *Substances studied by NTP*
<http://ntpsearch.niehs.nih.gov/?e=True&ContentType=Testing+Status>
- Department of Energy *Protective Action Criteria Database*
<http://energy.gov/ehss/protective-action-criteria-pac-aegls-erpgs-teels-rev-29-chemicals-concern-may-2016>
- California Department of Toxic Substances Control *Toxics in Products*
<http://www.dtsc.ca.gov/PollutionPrevention/ToxicsInProducts/index.cfm>
<http://www.dtsc.ca.gov/SCP/CandidateChemicalsList.cfm>
<http://www.dtsc.ca.gov/SCP/WhatIsAPriorityProduct.cfm>
- California Office of Environmental Health Hazard Assessment *Proposition 65*
<http://oehha.ca.gov/proposition-65/chemicals>
<http://oehha.ca.gov/proposition-65/proposition-65-list>
- California Office of Environmental Health Hazard Assessment *Biomonitoring*
<http://biomonitoring.ca.gov/chemicals>
- California *permissible exposure limits for chemical contaminants*
https://www.dir.ca.gov/title8/5155table_ac1.html

- California *hazardous substance list*
<https://www.dir.ca.gov/title8/339.html>
- California *Safe Cosmetics Program – list of chemical agents known or suspected to cause cancer or developmental or other reproductive harm.*
<http://www.cdph.ca.gov/programs/cosmetics/Pages/default.aspx>
<https://safecosmetics.cdph.ca.gov/search/Default.aspx>
- Maine *chemicals of high concern*
<http://www.maine.gov/dep/safechem/highconcern/>
- Massachusetts *Toxics Use Reduction Act (TURA) (link includes a link to Higher hazard substances list)*
<http://www.mass.gov/eea/waste-mgmt-recycling/toxics/toxic-use-reduction/toxics-use-reduction-act/>
- Massachusetts *Complete list of TURA chemicals*
<http://www.mass.gov/eea/agencies/massdep/toxics/tur/toxics-use-reduction-act-tura-reporting-and-fees.html>
- Lowell Center for Sustainable Production *Chemical, Policy and Science Initiative*
<http://www.chemicalspolicy.org/chemicalspolicy.us.state.database.php>
- Minnesota Department of Health *Toxic Free Kids Act Chemicals of High Concern*
<http://www.health.state.mn.us/divs/eh/hazardous/topics/toxfreekids/highconcern.html>
- Michigan *Environmental Health Topics*
http://www.michigan.gov/mdhhs/0,5885,7-339-71548_54783_54784_74881-13050--,00.html
- New Hampshire *Regulated Toxic Air Pollutants*
<http://des.nh.gov/organization/commissioner/legal/rules/documents/env-a1400.pdf>
- New Jersey *Right to Know Hazardous Substances*
<http://web.doh.state.nj.us/rtkhsfs/rtkhsf.aspx>
- Oregon *Priority Persistent Pollutants (in water)*
<http://www.deq.state.or.us/wq/SB737/>
- Oregon *Pollutant Profiles*
<http://www.deq.state.or.us/wq/SB737/docs/LegRpAtt420100601.pdf>
- Oregon *Reducing Toxics in Oregon*
<http://www.oregon.gov/deq/Pages/ToxicsReduction.aspx>
- Oregon *Chemicals of Concern for Children’s Health*
<http://public.health.oregon.gov/HealthyEnvironments/HealthyNeighborhoods/ToxicSubstances/Pages/childrens-chemicals-of-concern.aspx>
- Pennsylvania Department of Labor and Industry *Hazardous Substance List*
<http://www.pacode.com/secure/data/034/chapter323/chap323toc.html>
- Rhode Island *Air Resources – Air Toxics*
http://www.dem.ri.gov/pubs/regs/regs/air/air22_08.pdf
- Vermont *Chemical Disclosure Program for Children’s Products*
<http://www.healthvermont.gov/enviro/chemical/cdp.aspx>
- Washington *Chemicals of High Concern to Children*
<http://www.ecy.wa.gov/programs/hwtr/rtt/cspa/chcc.html>
- Washington *Children’s Safe Products Act*
<http://apps.leg.wa.gov/RCW/default.aspx?cite=70.240>

- Washington Department of Labor & Industries *SHARP Publications*
<http://www.lni.wa.gov/Safety/Research/Pubs/default.asp>
- National Conference of State Legislatures
<http://www.ncsl.org/research/environment-and-natural-resources/state-chemical-statutes.aspx>
- Canada *Chemicals Portal*
<http://chemicalsubstanceschimiques.gc.ca/index-eng.php>
- EU *ECHA website*
<https://echa.europa.eu/>
- Australia *NICNAS Chemical Information*
<https://www.nicnas.gov.au/chemical-information>
- Japan *Chemical Risk Information Platform (CHIRP)*
http://www.nite.go.jp/en/chem/chrip/chrip_search/systemTop
- OECD *eChemPortal*
http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en
- Stockholm Convention on Persistent Organic Pollutants
<http://chm.pops.int/TheConvention/ThePOPs/ListingofPOPs/tabid/2509/Default.aspx>
<http://chm.pops.int/TheConvention/ThePOPs/ChemicalsProposedforListing/tabid/2510/Default.aspx>
- WHO IPCS (UN)
<http://www.who.int/ipcs/en/>
- Other – worker protection information
<http://www.dguv.de/ifa/gestis/gestis-internationale-grenzwerte-fuer-chemische-substanzen-limit-values-for-chemical-agents/index-2.jsp>
- DeLima Associates *Consumer Product Information Database (CPID)*
<https://www.whatsinproducts.com/chemicals/index/1>
- SRC *FatePointers Search Module PHYSPROP*
<http://esc.syrres.com/fatepointer/search.asp>
- Product and company websites