CHEMICAL MANUFACTURERS ASSOCIATION

COURTNEY M. PRICE
VICE PRESIDENT
CHEMSTAR

March 21, 2000

Charles M. Auer, Director
Chemical Control Division
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

Re: HPV Challenge Program

Dear Mr. Auer:

The Chemical Manufacturers Association Toluenediamine (TDA) & Dinitrotoluene (DNT) Panel[1] was very disappointed by EPA's letter dated January 5, 2000, which denied the Panel's request to have four DNT isomer specific CAS numbers designated as "no longer HPV." These CAS numbers are 602-01-7 (2,3-DNT); 606-20-2 (2,6-DNT); 610-39-9 (3,4-DNT); and, 619-15-8 (2,5-DNT). The Panel believes that this decision was based on an incomplete understanding of the DNT industry and would like to provide additional information to support the claim that these chemicals are not HPVs. The Panel would also like to suggest a meeting with you and your staff to discuss this information and to resolve this issue.

The following points support the Panel's assertion that these chemicals are not High Production Volume Chemicals and should not be subject to either the HPV voluntary program or a TSCA HPV test rule.

1) None of these four chemicals is produced separately in commerce and their presence on the HPV list is due to past reporting practices. The Panel represents all of the major domestic producers of dinitrotoluene and none of its members reported any of these DNT isomer-specific CAS numbers on the 1998 IUR report nor do any intend to produce these CAS numbers in the future.

2) The only form of DNT that is manufactured and used in commerce is commercial or technical grade DNT, which is represented by CAS number 25321-14-6. The Panel is sponsoring this CAS number under the HPV Challenge Program (see Attachments A and B; letters from C. Price to C. Browner re: TDA & DNT Panel HPV commitment). Separately evaluating each isomer under the HPV program will not result in a better understanding of the adverse health or safety implications of dinitrotoluene.

[1] Members of the Toluenediame and Dinitrotoluene Panel are: Air Products and Chemicals, Inc., BASF Corporation, Bayer Corporation, Lyondell Chemical Company, and Rubicon, Inc.

3) EPA has previously acknowledged in the July 2, 1996, draft final report entitled, *Use and Exposure Profile for 2,4-Dinitrotoluene (2,4-DNT)* that dinitrotoluene is "manufactured, processed, and used in the form of technical grade dinitrotoluene (TDNT). TDNT is approximately 80% of 2,4,-DNT, 20% 2,6-DNT, and minor amounts of 2,5- DNT, 2,3-DNT, and 3,4-DNT." The report further states, "Although 2,4-DNT is usually the preferred isomer, it is not cost effective to separate the other isomers from 2,4-DNT." This report was written for EPA by Radian Corporation (EPA Contract No. 68-D3-0013) and Versar Inc (EPA Contractor No. 68-D4-0092) and presented to OECD for consideration in the SIDS Assessment of 2,4-DNT (See Attachment C and D).

4) Technical grade DNT (mixed-isomers) is only produced and used in highly controlled situations at a small number of facilities. It is used as an intermediate in the production of other chemicals and the potential for exposure is extremely small.

5) 2,4-DNT, the predominant isomer of technical grade DNT, has already been sponsored by Germany under the OECD SIDS program. The chemical was reviewed at SIAM 3 and the SIAR was published in November 1997 with the recommendation of "low priority for further work." (See Attachment D).

Please contact Andrew Jaques, the TDA & DNT Panel Manager, if you have any questions about the Panel's request to designate these isomer-specific DNT CAS numbers as "no longer HPV." Mr. Jaques can be reached at 703-741-5627 or Andrew_Jaques@cmahq.com. Mr. Jaques will contact your office in the near future to discuss the possibility of a meeting to further review this information.

Sincerely yours,

Courtney M. Price
Vice President, CHEMSTAR

cc: Barbara Leczynski, EPA – OPPTS

Attachment A

CHEMICAL MANUFACTURERS ASSOCIATION

COURTNEY M. PRICE
VICE PRESIDENT
CHEMSTAR

March 15, 1999

Carol Browner, Administrator
U.S. Environmental Protection Agency
P.O. Box 1473
Merrifield, VA 22116

Attn: Chemical Right-to-Know Program

Dear Ms. Browner:

The Chemical Manufacturers Association Toluenediamine (TDA) & Dinitrotoluene (DNT) Panel will serve as an industry consortium to coordinate activities for four chemicals under the HPV Chemical Challenge Program ("Program"). The CAS numbers are as follows:

HPV Challenge Voluntary Commitment

Chemical	CAS #	ICCA	Start Year
TDA Family			
Toluene-ar,ar-diamine	25376-45-8	X	2001
Toluene-2,3-diamine	2687-25-4		2001
Toluene-3,4-diamine	496-72-0		2001
DNT Family			
Toluene, ar,ar-dinitro-	25321-14-6	X	2001

Two of the above listed chemicals are also on the International Council of Chemical Association (ICCA) list of chemicals and ultimately may be sponsored by consortia outside the United Stated. Panel Members may seek international cooperation under the ICCA program with foreign producers of these chemicals. Accordingly, data presentation and any needed testing for these two chemicals may occur through the ICCA and OECD programs. If this becomes the case, the Panel will notify the U.S. Environmental Protection Agency and modify the Panel's commitment accordingly.

There are currently five companies that are members of the Toluenediamine & Dinitrotoluene Panel. They are: Air Products Chemical Company, Bayer Corporation, BASF Corporation, ICI Americas/Rubicon, and Lyondell Chemical Company. Each member of the Panel has provided a separate commitment letter to the HPV Challenge Program for the specific toluenediamine and dinitrotoluene CAS numbers that it manufactures and is committing to under the Program. If, for any reason, this voluntary

initiative will not be undertaken by the TDA & DNT Panel, then any express or implied commitments to the HPV Challenge Program will devolve to the manufacturers and importers of the relevant chemicals.

The TDA & DNT Panel and its member companies understand that sponsorship entails: (1) assembling and reviewing available test data, (2) developing and providing test plans for each of the sponsored chemicals, and where needed, (3) conducting additional testing in the time frame established by the HPV Challenge Program. The test data and any other study information that the Panel will provide under the Program will be made publicly available in the form of "robust summaries" as contemplated in the *Framework for Voluntary Testing of High Production Volume (HPV) Chemicals* (10/8/98).

Correction to HPV Challenge List for Dinitrotoluene (DNT)

In the Panel's review of the dinitrotoluene CAS numbers on the HPV list, we have identified a situation where several CAS numbers representing DNT have been placed on the HPV Challenge List. Our understanding is that only one type of DNT -- Commercial DNT or toluene, ar,ar–dinitro, CAS number 2532-14-6 -- is currently being produced. It is the only CAS number that the Panel's members reported on the 1998 TSCA Inventory. Therefore, the Panel requests that the following CAS numbers be removed from the HPV Challenge List:

Chemical	CAS #
Toluene, 2,3-dinitro-	602-01-7
Toluene, 2,6-dinitro-	606-20-2
Toluene, 3,4-dinitro-	610-39-9
Toluene, 2,5-dinitro-	619-15-8

Please feel free to contact Andrew Jaques, the TDA & DNT Panel Manager; if you have any questions about the Panel's commitment or our request for delisting certain DNT CAS numbers. Mr. Jaques can be reached at 703-741-5627 or Andrew_Jaques@cmahq.com.

Sincerely yours,

Courtney M. Price
Vice President, CHEMSTAR

cc: Charles Auer, EPA – OPPTS

Attachment B

CHEMICAL MANUFACTURERS ASSOCIATION

COURTNEY M. PRICE
VICE PRESIDENT
CHEMSTAR

November 30, 1999

Carol Browner, Administrator
U.S. Environmental Protection Agency
P.O. Box 1473
Merrifield, VA 22116

Attn: HPV Challenge Program

Dear Ms. Browner:

The Chemical Manufacturers Association Toluenediamine (TDA) & Dinitrotoluene (DNT) Panel volunteered on March 15, 1999, to serve as an industry consortium to coordinate activities for four CAS numbers under the HPV Chemical Challenge Program (see attached letter dated March 15, 1999 from C. Price to C. Browner). The Panel is now writing to: (1) determine the status of a previous request to remove CAS numbers from the HPV Challenge Program list and to request the removal of one additional CAS number from the HPV Challenge Program; and (2) alter its sponsorship of commercial TDA (CAS # 25376-45-8) in light of new information regarding the sponsorship of this chemical under the OECD SIDS Program.

I. Request to Delist DNT Isomers

In its March 15, 1999, commitment letter, the TDA & DNT Panel asked that several CAS numbers be removed because they are no longer reported on the TSCA IUR and the Panel is unaware of any producer who plans to use these CAS numbers in the future. The Panel has not yet received a response from EPA on this request and is trying to determine its status. The following is the complete list of CAS numbers that the Panel is requesting to be removed from the HPV Challenge List:

Chemical	CAS #
Toluene, 2,3-dinitro-	602-01-7
Toluene, 2,6-dinitro-	606-20-2
Toluene, 3,4-dinitro-	610-39-9
Toluene, 2,5-dinitro-	619-15-8
Toluene-2,6-diamine	823-40-5

It is the Panel's understanding that EPA will remove CAS numbers from the HPV Challenge list if they are no longer reported and if no companies plan on using them in the future. The Panel believes that all of these CAS meet these criteria. The Panel is

aware of only three companies that reported dinitritoluene on the TSCA 1998 Inventory; all three are current members of the Toluenediamine & Dinitrotoluene Panel. They are Air Products Chemical Company, Bayer Corporation, and ICI Americas/Rubicon. None of these companies reported the above five CAS numbers for DNT on their 1998 IUR and none of these companies plan to use these CAS numbers in the future. As the Panel discussed in its March 15, 1999 letter, these CAS numbers are no longer used because companies report DNT production under CAS number 25321-14-6, commercial or technical DNT. Commercial DNT is a mixture of several isomers of DNT and is the only form of DNT that is produced in commerce. These isomers are not isolated and the Panel believes that their CAS numbers are on the HPV list due to previous reporting practices on the 1990 TSCA Inventory.

The Panel is also requesting that the CAS number for 2,6-toluenediamine – 823-40-5 – be removed from the HPV list. The Panel believes that it represents the entire U.S. production for TDA. None of the Panel members produce 2,6-TDA; rather they produce commercial or technical TDA (CAS # 25376-45-8) which contains several isomers of TDA, including 2,6-TDA. There was some initial confusion over this point because one Panel member – Lyondell Chemical (formerly ARCO Chemical) – initially reported 2,6-TDA on its 1998 IUR. It is the Panel's understanding that this was in error and that Lyondell has sent a letter to EPA clarifying it did not produce 2,6- TDA and that its IUR should not include 2,6-TDA. Again, the Panel believes that there are no companies that produce 2,6-TDA and none that plan to do so in the future. Therefore the Panel requests that 2,6-TDA (CAS #823-40-5) also be removed from the HPV Challenge list.

II. Commercial TDA Sponsored under OECD SIDS

The TDA & DNT Panel has recently learned that Germany has expanded its sponsorship of 2,4-TDA (CAS #95-80-7) under the OECD SIDS Program to include commercial TDA (CAS # 25376-45-8), which the Panel has previously volunteered under the HPV Program. Because sponsorship in OECD should exempt this CAS number from the HPV Challenge Program, the Consortium now respectfully withdraws its commitment to handle this CAS number under the HPV Challenge Program.

Please feel free to contact Andrew Jaques, the TDA & DNT Panel Manager, if you have any questions about the Panel's request to delisting these CAS numbers or its HPV commitment. Mr. Jaques can be reached at 703-741-5627 or Andrew_Jaques@cmahq.com.

Sincerely yours,

Courtney M. Price
Vice President, CHEMSTAR

cc: Charles Auer, EPA – OPPTS
Barbara Leczynski, EPA -OPPTS

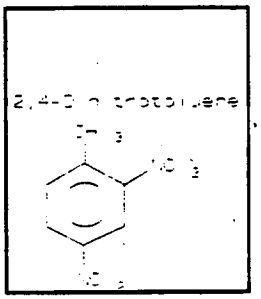
1.0 CHEMICAL OVERVIEW

2,4-DNT is used primarily as an intermediate in the production of TDI. 2,4-DNT is manufactured as part of a mixture which is approximately 80% 2,4-DNT and is called technical grade dinitrotoluene (TDNT). The current production volume of TDNT at one site in the U.S. is 48.6 million kg/yr, although in 1982 national production was estimated to be 330 million kg/yr. This report will focus on 2,4-DNT but where data were not available for 2,4-DNT such as production volumes, monitoring data, and releases, data are presented for TDNT rather than 2,4-DNT.

1.1 Chemical Structure and Properties

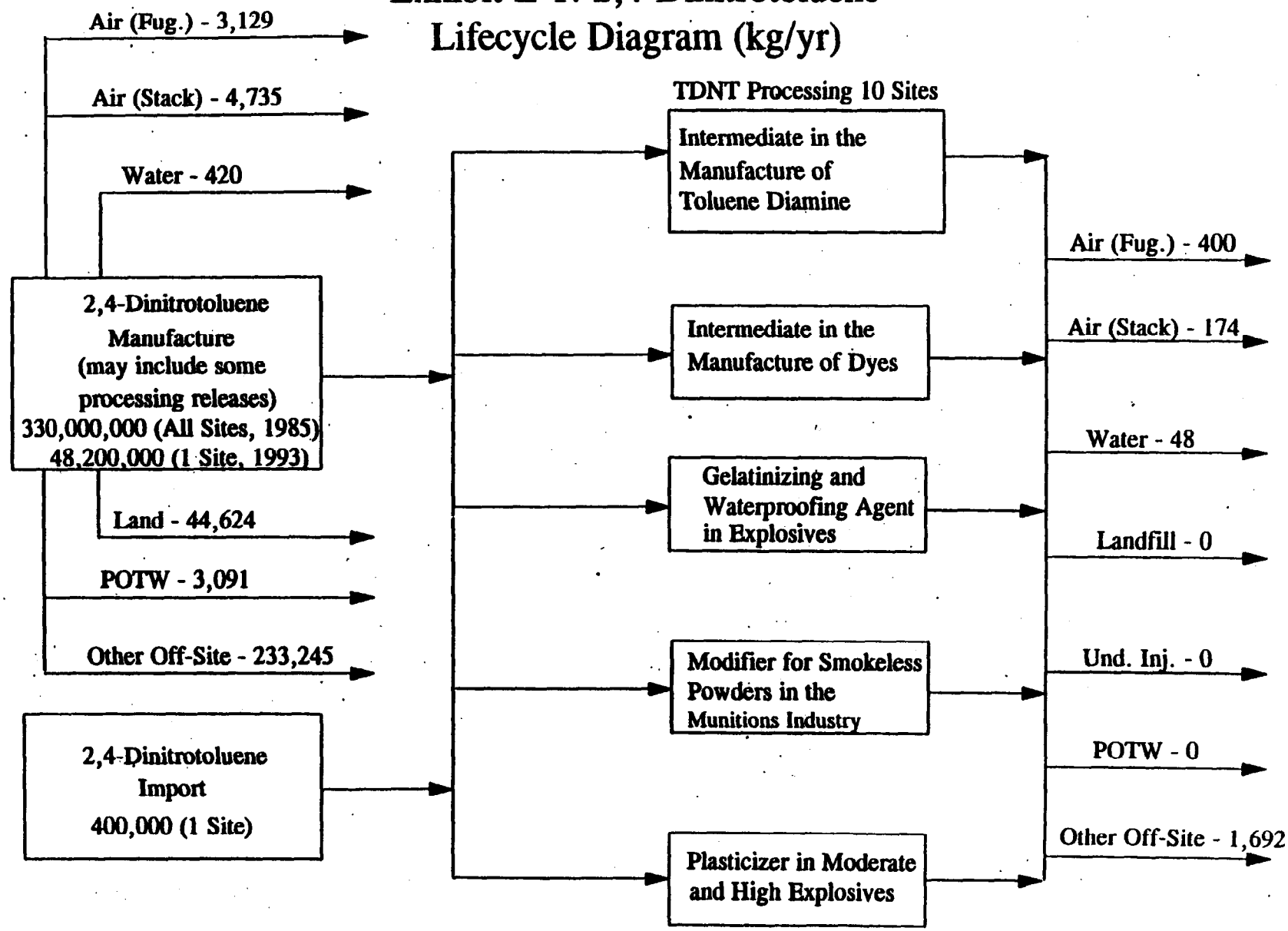
2,4-Dinitrotoluene
[1-Methyl-2,4-dinitrobenzene]
[2,4-DNT]

CAS No. [121-14-2]



Molecular Formula:	$C_7H_6N_2O_4$	(EAB, 1995b)
Physical State:	Solid at 25°C, 1 atm	(EAB, 1995b)
Vapor Pressure:	1.47×10^{-4} mm Hg at 25°C 1 mm Hg at 102.7°C	(EAB, 1995b) (MSDS, 1994)
Flash Point (Open cup):	207°C	(CHRIS, 1985)
Boiling Point:	300°C at 1 atm	(EAB, 1995b)
Melting Point:	70.5°C	(EAB, 1995b)

Exhibit E-1: 2,4-Dinitrotoluene Lifecycle Diagram (kg/yr)



Note: Production volume and releases are for TDNT. The source for the release data is the 1993 TRI.

Use and Exposure Profile for 2,4-Dinitrotoluene (2,4-DNT)
Draft Final

July 2, 1996

Submitted to:

U.S. Environmental Protection Agency
Office of Pollution Prevention and Toxics
401 M Street, S.W.
Washington, DC 20460

Submitted by:

Radian Corporation
2455 Horsepen Road, Suite 250
Herndon, Virginia 22071

EPA Contract No. 68-D4-0092
Work Assignment No. 1-06

and

Versar Inc.
6850 Versar Center
Springfield, VA 22151

EPA Contract No. 68-D3-0013
Work Assignment No. 2-44

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LIST OF EXHIBITS

LIST OF EXHIBITS (Continued)

EXPOSURE PROFILE SUMMARY

This report contains estimates of exposures and releases of 2,4-Dinitrotoluene (2,4-DNT), associated with its manufacturing, processing, and use, and will be used to assist EPA's Office of Pollution Prevention and Toxics (OPPT) in its chemical risk screening process. This report also contains data voluntarily submitted by one of the four manufacturing sites through coordination with the Chemical Manufacturers Association (CMA) and the Synthetic Organic Chemical Manufacturers Association (SOCMA). The report was provided to manufacturers of 2,4-DNT for review through the CMA Panel for 2,4-DNT. One comment was received from DuPont which indicated that they terminated manufacture of 2,4-DNT in 1991 (Dastur, 1995). This version of the profile incorporates this comment. No other comments were received and no other changes were made to the revised draft version.

There are four sites in the U.S. which manufacture 2,4-DNT. Dinitrotoluenes are manufactured, processed, and used in the form of technical grade dinitrotoluene (TDNT). TDNT is approximately 80% of 2,4-DNT, 20% 2,6-DNT, and minor amounts of 2,5-DNT, 2,3-DNT, and 3,4-DNT. Although 2,4-DNT is usually the preferred isomer, it is not cost effective to separate the other isomers from 2,4-DNT. Much of the release and exposure information presented in this report is on TDNT. Data from the Toxics Release Inventory (TRI) provided the starting point for estimating environmental exposures for TDNT.

TDNT is used primarily as an intermediate in the production of toluene diamine (TDA) which is used to produce toluene diisocyanate (TDI). The current production volume of TDNT at one site in the U.S. is 48.6 million kg/yr. The production volume of TDNT in the U.S. was estimated to be 330 million kg/yr in 1982, the most recent year total U.S. production data were available.

Exposures and Releases Associated with Manufacturing

This section contains the estimates of exposures and releases associated with manufacturing. Information on the methods, sources, and assumptions and a discussion of the uncertainties are contained in the body of the report.

2,4-DNT as a mixture of TDNT is manufactured by the nitration of toluene in a nitric and sulfuric acid mixture. This nitration produces mononitrotoluenes which are nitrated again in a stronger acid solution to produce dinitrotoluenes. 2,4-DNT is manufactured as part of a mixture which is approximately 80% 2,4-DNT and is called technical grade dinitrotoluene (TDNT). TDNT manufacturing releases from the five manufacturing sites, as reported in the 1993 TRI, are approximately 281,000 kg/yr, with 3% released to air, <1% released to water, 15% released to underground injection, and 82% released off site (including Publicly Owned Treatment Works (POTWs)). These releases potentially include processing releases since TDNT is also processed at all of the manufacturing facilities. TRI does not distinguish between manufacturing and other releases for each facility.

Estimates of potential general population exposures resulting from TDNT manufacturing releases to air may reach a maximum of 51 milligrams (mg)/person/yr. Releases to water potentially may expose individuals to a maximum of 8.0 mg/person/yr. Aquatic organisms may be exposed to TDNT concentrations as high as 70 µg/L under low stream flow conditions.

Based on one industry submittal, approximately eighty-eight workers are exposed to TDNT during manufacturing at that facility. NIOSH estimates the total

number of workers during manufacture and various uses as 1,300. Based on monitoring data, estimated potential inhalation dose rates are:

- Operator: 1-4 mg/person/day;
- Maintenance Personnel: 1-2 mg/person/day; and
- Laboratory Technician: 1-2 mg/person/day.

Based on limited data, bounding estimates of potential dermal dose rates also have been estimated for manufacturing workers:

- Operator: negligible;
- Maintenance Personnel: 1,300 - 3,900 mg/day; and
- Laboratory Technician: negligible.

These exposure estimates do not take into account the use of personal protective equipment (PPE) or engineering controls. Actual exposures may be lower if PPE are used and maintained.

Exposures and Releases Associated With Processing and Use

This section contains the estimates of exposures and releases associated with processing and use. Information on the methods, sources, and assumptions and a discussion of the uncertainties are contained in the body of the report.

TDNT is processed/used as an intermediate in the production of TDI and other minor uses. Ten known facilities process/use TDNT domestically (including four that also manufacture TDNT). TDNT processing and use releases from six processing and use sites, as reported in the 1993 TRI, are approximately 2,300 kg/yr, with 25% released to air, 2% released to water, 0% released to land, and 73% released off site (including POTWs). This release estimate does not include processing and use releases from facilities that manufacture TDNT.

Estimates of potential general population exposures resulting from processing and use releases to air may reach a maximum of 17 mg/person/yr. Releases to water may expose individuals to a maximum of 1.1×10^{-2} mg/person/yr of TDNT through ingestion of drinking water. Aquatic organisms may be exposed to concentrations as high as 0.12 μg/L under low stream flow conditions.

The number of processing and use workers exposed to TDNT and the amount of TDNT to which they are exposed is unknown. Because monitoring data was not available for processing and use facilities, inhalation exposures were estimated based on conformance with OSHA PELs. Potential inhalation dose rates for all processing and use personnel are estimated to be 15 mg/person/day.

Based on modeling estimates, potential dermal dose rates (bounding estimates) have been estimated to be negligible for processing and use workers. These exposures do not take into account the use of PPE or engineering controls.

Consumer exposure to 2,4-DNT through use of products and materials is not expected based on the current known uses of 2,4-DNT.

Exhibit E-1 presents a Lifecycle diagram which summarizes the uses and estimated releases of 2,4-DNT.

Attachment C

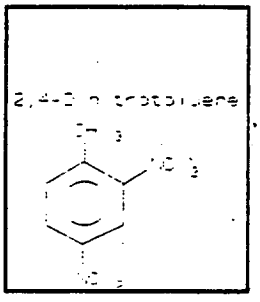
1.0 CHEMICAL OVERVIEW

2,4-DNT is used primarily as an intermediate in the production of TDI. 2,4-DNT is manufactured as part of a mixture which is approximately 80% 2,4-DNT and is called technical grade dinitrotoluene (TDNT). The current production volume of TDNT at one site in the U.S. is 48.6 million kg/yr, although in 1982 national production was estimated to be 330 million kg/yr. This report will focus on 2,4-DNT but where data were not available for 2,4-DNT such as production volumes, monitoring data, and releases, data are presented for TDNT rather than 2,4-DNT.

1.1 Chemical Structure and Properties

2,4-Dinitrotoluene
[1-Methyl-2,4-dinitrobenzene]
[2,4-DNT]

CAS No. [121-14-2]



Molecular Formula:	$C_7H_6N_2O_4$	(EAB, 1995b)
Physical State:	Solid at 25°C, 1 atm	(EAB, 1995b)
Vapor Pressure:	1.47×10^{-4} mm Hg at 25°C 1 mm Hg at 102.7°C	(EAB, 1995b) (MSDS, 1994)
Flash Point (Open cup):	207°C	(CHRIS, 1985)
Boiling Point:	300°C at 1 atm	(EAB, 1995b)
Melting Point:	70.5°C	(EAB, 1995b)

Density:	1.3208 g/cm^3	(CRC, 1982)
Solubility in H_2O:	0.270 mg/L at 25°C	(EAB, 1995b)
Molecular Weight:	182.14 g/mole	(EAB, 1995b)
Log K_{ow}:	1.98	(EAB, 1995b)
Log K_{oc}:	2.56	(EAB, 1995b)
Bioconcentration Factor:	26.50	(EAB, 1995b)
Henry's Law Constant:	3.97×10^{-7} atm·m^3/mole	(EAB, 1995b)

1.2 Predicted Environmental Fate

Removal during secondary wastewater treatment: Overall removal is predicted to be negligible based on the expected poor biodegradability of 2,4-DNT during wastewater treatment. Negligible to low removal via volatilization (i.e., stripping) or sorption to sludge is expected (EAB, 1995b).

Biodegradation: 2,4-DNT is expected to undergo ultimate biodegradation in aerobic environmental settings within a period of weeks, although the process may be slower under some conditions. Ultimate biodegradation under anaerobic conditions is expected to proceed within a period of weeks to months. Primary anaerobic biodegradation via nitro reduction is expected to proceed within days (EAB, 1995b).

Hydrolysis: Aromatic nitro compounds are not susceptible to hydrolysis (EAB, 1995b).

Sorption to soil and sediment: Moderate to low sorption to soil and sediment is predicted based on the K_{oc} value (EAB, 1995b).

Migration to ground water: Negligible migration to ground water is expected, if 2,4-DNT is reduced to aniline. Reduction to aniline is likely under anaerobic conditions wherein aniline may bond covalently to soil (EAB, 1995b).

Volatilization: Volatilization of 2,4-DNT is expected to be slow to negligible based on its low Henry's Law Constant. Estimated volatilization half lives from natural waters are on the order of months (EAB, 1995b).

Atmospheric oxidation: Atmospheric oxidation of 2,4-DNT is expected to be slow based on a predicted half-life on the order of weeks for vapor phase reaction with hydroxyl radical (EAB, 1995b).

1.3 Regulatory Standards and Other Guidelines

Occupational Exposure Standards

The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for technical grade dinitrotoluene (TDNT), which is 80% 2,4-DNT and 20% 2,6-DNT, is 1.5 mg/m^3 as an 8-hour time-weighted average (TWA). The established National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) for TDNT is 1.5 mg/m^3 as a 10-hour TWA and the Immediately Dangerous to Life and Health (IDLH) level is 50 mg/m^3. The American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) for TDNT is 0.15 mg/m^3 as an 8-hour TWA. All three of these exposure limits also have a "skin" notation mentioned for TDNT. This "skin" notation refers to the potential contribution to the overall exposure by the percutaneous route, including mucous membranes and eyes, by contact with the chemical. The NIOSH REL and the ACGIH TLV also note that TDNT is a potential carcinogen.

Federal Environmental Standards

2,4-DNT is included on the following lists:

- The Toxic Release Inventory (TRI) (TDNT and 2,6-DNT are also TRI chemicals);
- Clean Water Act priority pollutants;
- Reportable Quantities (RQ), under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (RQ=10 lbs);
- Resource Conservation and Recovery Act U and K wastes (U105, K025, K111);
- Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profile List; and
- OPPT Master Testing List.

2,4-DNT is not included on any of the following lists:

- Hazardous air pollutants in the Clean Air Act Amendments (CAAA);
- Section 602 of the CAAA;
- Safe Drinking Water Act contaminants; and
- Threshold Planning Quantities (TPQ) under the Superfund Amendments and Reauthorization Act (SARA), list of Extremely Hazardous Substances.

2,4-DNT is on the Toxic Substances Control Act (TSCA) Chemical Inventory list, has a TSCA Section 8(e) Submission, and is included in the TSCA Test Submission (TSCATS) database (MSDS, 1994).

1.4 Chemical Economics Summary

There are three domestic producers of TDNT, with four production sites (1993 TRI). National production of TDNT, which is presented in Exhibit 1-1, was estimated to be 330 million kg/yr in 1982 (CMR, 1985). More recent national production volumes were not available from the TRI data, HSDB, MSDS, the Merck Index, the 1995 SRI Directory of Chemical Producers, or the Mannsville Chemical Products Synopsis. Exhibit 1-1 presents current TDNT production sites. Exhibit 1-2 presents reported TDNT uses. Additional information on the processing and use of 2,4-DNT as an isomer of TDNT is described in Section 3.0.

Exhibit 1-1
Domestic Producers of TDNT

Company	Location	Manufacturing Volume (million kg/yr)	Source
Miles, Inc.	New Martinsville, WV	unknown	(1993 TRI)
Miles, Inc.	Baytown, TX	unknown	(1993 TRI)
Rubicon, Inc.[1]	Geismar, LA	48,600,000[2]	(Rubicon, 1995)
Air Products	Pasadena, TX	unknown	(1993 TRI)
TOTAL		330,000,000	(CMR, 1985)

[1]Rubicon, Inc. is a subsidiary of ICI Americas, Inc.
[2]Manufacturing volume includes 429,000 kg/yr that were imported.

Exhibit 1-2
Reported Uses of TDNT

Product	Estimated Use Volumes (% of total)[1]	Form	Source
Intermediate in the Manufacture of Toluene Diamine	99%	N/A	HSDB, 1995
Intermediate in the Manufacture of Dyes	<1%	N/A	HSDB, 1995
Gelatinizing and Waterproofing Agent in Explosives	<1%	unknown	HSDB, 1995
Modifier for Smokeless Powders in the Munitions Industry	<1%	unknown	HSDB, 1995
Plasticizer in Moderate and High Explosives	<1%	unknown	HSDB, 1995

N/A - Not Applicable

[1]The most recent total use volume percentages were found in the Production/Exposure Profile (PEP) of 2,4-and 2,6-Dinitrotoluene (OTS, 1987). The one industry submittal (Rubicon, 1995) indicated 100% use of TDNT in the production of toluene diamine.

2.0 MANUFACTURE

TDNT is manufactured by four facilities in the United States. Exhibit 1-1 lists the manufacturers. One manufacturer has voluntarily reported process, release, or occupational exposure information to EPA.

Mixed isomers of 2,4- and 2,6-dinitrotoluene are produced by reacting toluene with nitric acid in a sulfuric acid medium. The process is conducted in two steps. Mononitrotoluene is produced, then further nitrated to dinitrotoluene in stirred tank reactors. The dinitrotoluene and sulfuric acid are then separated so that the sulfuric acid may be re-used in the process. All vents from the nitrators and separator are combined, vapor balanced, and routed to the atmosphere in a single vent header. Because the vapor pressure of 2,4-DNT at the plant operating temperatures is very low, only minimal emissions emanate from this vent.

The crude DNT (mixed isomers) is then processed into the final product by a multi-step washing process utilizing water and ammonia-water. The water is used to wash away any residual acids in the crude DNT, and ammonia-water is used to neutralize any acids still remaining in the product DNT. A final water wash is used to remove any neutralization products (salts) from the product DNT. Final product DNT is stored in a product storage tank which vents to the atmosphere. Again, emissions and exposure to 2,4-DNT are very minimal due to its low vapor pressure at operating and storage temperatures.

The spent wash water is processed to recover any DNT in the recovery tanks and the effluent extractor. Solvent extraction is used to chemically partition DNT into the organic solvent for subsequent re-use in the reactor train. The extracted wastewater, which contains essentially no DNT, is then stored in a series of tanks and pumped into the effluent treatment and disposal system. Because of the limited solubility of DNT in water and the low vapor pressure, negligible quantities of DNT are emitted from these atmospheric tanks.

Spent sulfuric acid from the crude DNT/acid separator is reconcentrated by evaporating excess water to increase the acid strength. Because the spent acid contains residual mixed isomers of DNT, it is first steam stripped to remove any organics which might be present. About 99 percent of the 2,4-DNT in the spent acid is removed by the stripping process and recycled to the manufacturing train. The organic-free spent acid is then reconcentrated to its original strength for re-use in the manufacturing train. Because the acid is steam stripped prior to its concentration, only minimal emissions of 2,4-DNT are detected in the concentrator vent.

Dinitrotoluene is processed and used as TDNT. Although 2,4-DNT is usually the preferred isomer, it is not cost effective to separate the other isomers from 2,4-DNT. Exhibit 2-1 presents the process chemistry for this process. Exhibit 2-2 presents a process flow diagram from Rubicon, Inc. (Rubicon, 1995).

Exhibit 2-1
2,4-DNT Process Chemistry

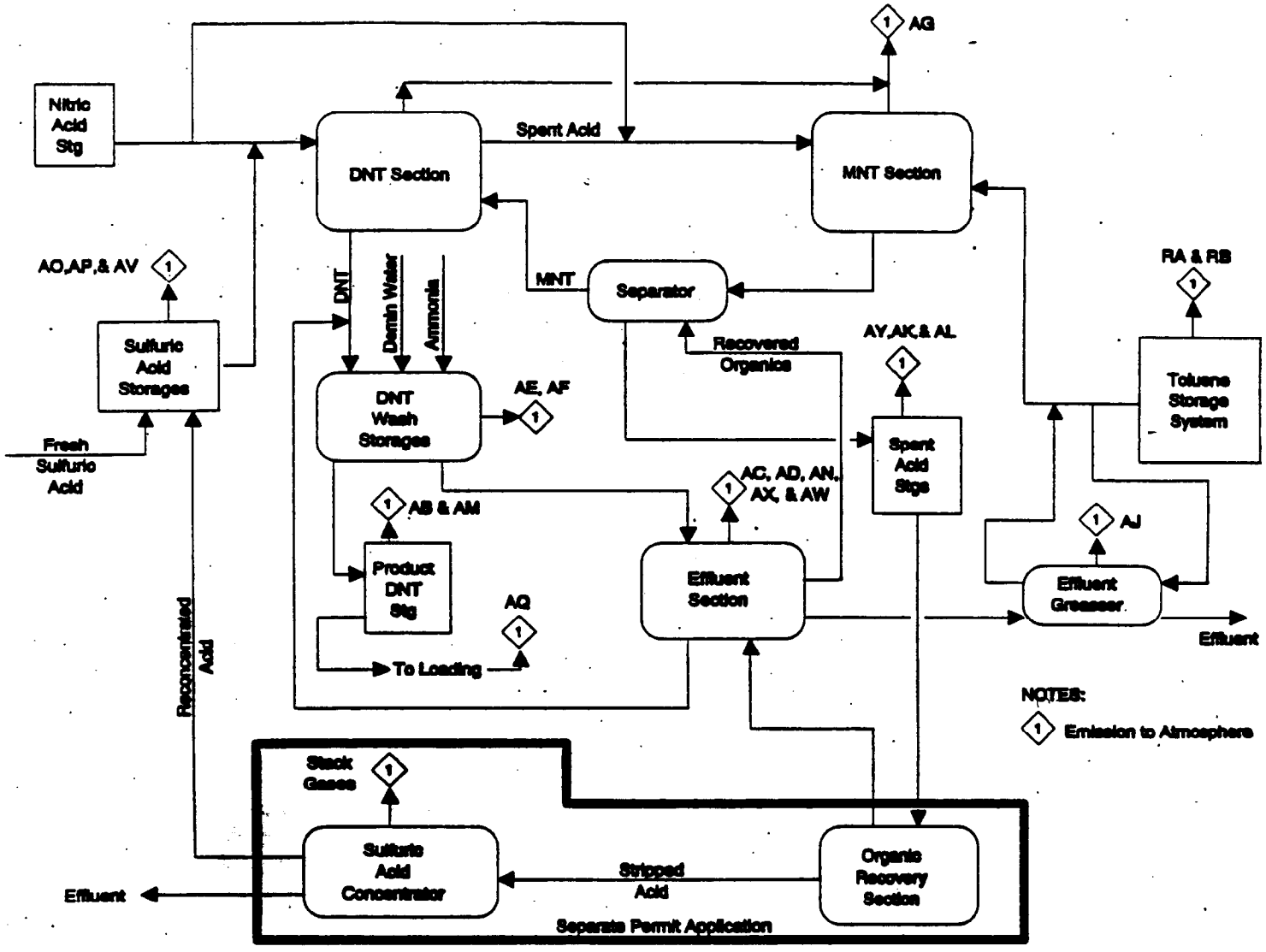
$$\text{Toluene} + HNO_3 + H_2SO_4 \text{ -------> Mononitrotoluenes}$$

$$\text{Mononitrotoluenes} + HNO_3 + H_2SO_4 \text{ -------> Dinitrotoluenes}$$

2.1 Releases and Resulting Environmental Concentrations

Estimates of environmental releases from TDNT manufacturing facilities are based on the 1993 TRI. Exhibits 2-3, 2-4, 2-5, and 2-6 present estimates of environmental releases to various media for TDNT. One manufacturer (Miles, Inc. at

Exhibit 2-2: Rubicon 2,4-DNT Process Flow Diagram



New Martinsville, WV) reported releases under 2,4-DNT and three manufacturers reported releases under TDNT. The manufacturing releases reported under 2,4-DNT (Miles, New Martinsville, WV) have been modified for this report as TDNT releases by multiplying 2,4-DNT releases by 1.25.

Exhibit 2-3
Estimated Annual Air Releases of TDNT from Manufacturing Facilities

Facility	Fugitive Releases		Stack Releases		Source/Basis
	kg/yr	days/yr	kg/yr	days/yr	
Miles, Inc - New Martinsville, WV[1]	1,048	N/A	18	N/A	1993 TRI
Miles, Inc - Baytown, TX	1,182	N/A	454	N/A	1993 TRI
Rubicon, Inc - Geismar, LA	35	365	4,227	329	1993 TRI; Rubicon, 1995
Air Products - Pasadena, TX	864	N/A	21	N/A	1993 TRI
Total	3,129		4,720		

N/A - Data not available
[1]Reported TRI releases as 2,4-DNT and releases were modified and presented as TDNT releases.

Exhibit 2-4
Estimated Annual Water Releases of TDNT from Manufacturing Facilities After On-Site Treatment

Facility	Water Release Quantity		Source/Basis
	kg/yr	days/yr	
Miles, Inc. - New Martinsville, WV[1]	170	N/A	1993 TRI
Miles, Inc. - Baytown, TX	114	N/A	1993 TRI
Rubicon, Inc. - Geismar, LA	0	N/A	1993 TRI
Air Products - Pasadena, TX	0	N/A	1993 TRI
Total	284		

N/A - Data not available
[1]Reported TRI releases as 2,4-DNT and releases were modified and presented as TDNT releases.

Exhibit 2-5
Estimated Annual On-Site Land Releases of TDNT from Manufacturing Facilities

Facility	Type of Unit	Release Quantity (kg/yr)	Source
Miles, Inc. - New Martinsville, WV	—	0	1993 TRI
Miles, Inc. - Baytown, TX	—	0	1993 TRI
Rubicon, Inc. - Geismar, LA	Underground Injection	44,545	1993 TRI
Air Products - Pasadena, TX	—	0	1993 TRI
Total		44,545	

Exhibit 2-6
Estimated Other Transfers of TDNT to Off-Site Locations from Manufacturing Facilities

Facility	Type of Transfer	Amount (kg/yr)	Source
Miles, Inc. - New Martinsville, WV	—	0	1993 TRI
Miles, Inc - Baytown, TX	Incineration/Thermal Treatment	114	1993 TRI
	Transfer to Waste Broker	114	
	Energy Recovery	114	
Rubicon, Inc. - Geismar, LA	Incineration/Thermal Treatment	1,273	1993 TRI
Air Products - Pasadena, TX	POTW	3,091	1993 TRI
	Incineration/Thermal Treatment	223,500	
	Landfill/Disposal	86	
Total		228,292	

Exhibits 2-7 and 2-8 present "what-if scenario"[1] estimates of the TDNT concentrations in ambient air and surface water that may result from on-site releases to air and water, respectively. These environmental concentrations were estimated using procedures from the Guidelines for Completing the Initial Review Exposure Report (EAB, 1995a). Ambient air concentrations were estimated using simple, conservative atmospheric dispersion models. Surface water concentrations were estimated using site-specific receiving stream flow data and a simple instream dilution model. Details on the procedures used and assumptions made are provided in the following paragraphs.

Exhibit 2-7
Estimated Environmental Concentrations of TDNT Resulting from Releases to Air from Manufacturing

Facility	Ambient Air Concentrations[1] (mg/m^3)	
	Fugitive[2]	Stack[3]
Miles, Inc. - New Martinsville, WV	5.1E-03	NR
Miles, Inc - Baytown, TX	5.8E-03	1.3E-06
Rubicon, Inc. - Geismar, LA	1.7E-04	1.2E-05
Air Products - Pasadena, TX	4.2E-03	NR

[1]Ambient air concentrations are estimated maximum annual average concentrations.
[2]Source: Versar, 1992 (Assumes receptor is located 100 meters downwind from a source with a release height of 3 meters).
[3]Source: EAB, 1995a (Assumes receptor is located 1,000 meters downwind from a source with an effective stack height of 30 meters).
NR - Negligible or no releases reported.

[1]A "what-if scenario" assesses potential exposure under a set of hypothetical conditions or under a set of conditions for which actual exposure parameter data are incomplete or nonexistent. The calculated exposures are not intended to provide information about how likely the combination of exposure parameter values might be in the actual population or approximately how many, if any, persons might actually be subjected to the calculated exposure (EPA, 1992).

Exhibit 2-8
Estimated Environmental Concentrations of TDNT Resulting from Releases to Water from Manufacturing

Facility	NPDES No.[1]	Reach No.[1]	Surface Water Concentrations[2] (µg/L)	
			Harmonic Mean[3]	7Q10[4]
Miles. Inc. - New Martinsville. WV	WV0005169	05030201051	1.7E-02	8.1E-02
Miles. Inc - Baytown, TX	TX0002798	12040203002	4.8E+00	5.7E+01
Rubicon. Inc. - Geismar. LA	--	--	NR	NR
Air Products - Pasadena. TX	TX0052591	12040104017	1.6E+01	7.0E+01

[1]NPDES Permit Nos. and Reach Nos. were obtained from Versar (1995).
[2]Surface water concentrations were calculated assuming that the releases presented in Exhibit 2-4 occur at the same rate for 250 days per year.
[3]Estimated harmonic mean flows were obtained from Versar (1995). The harmonic mean flow is recommended as the design stream flow for assessing exposures to carcinogens and noncarcinogens which manifest human effects after long-term exposure (EAB, 1995a).
[4]7Q10 flows (i.e., the lowest 7-consecutive day average flow recurring every 10 years) were obtained from Versar (1995). 7Q10 flows are recommended for assessing potential chronic aquatic toxicity effects (EAB, 1995a).
NR - Negligible or no releases reported.

Maximum annual average ground level air concentrations that may result from fugitive releases to air were predicted for those facilities with reported fugitive releases of 23 kg per year or greater; fugitive releases less than 23 kg per year are assumed to typically result in negligible exposures (EAB, 1995a). The air concentrations were predicted using the PMN PLUME Model (Versar, 1992), a computerized version of Turner's sector averaging form of the Gaussian algorithm (Turner, 1970) that is referenced in EAB (1995a). Concentrations were predicted for a receptor located at the facility fenceline (assumed to be 100 meters downwind). Neutral atmospheric stability, an average wind speed of 5.5 m/sec, and wind direction toward the receptor 25% of the year were assumed. Because all of the release sources for a given facility were assumed to be within 100 meters of each other, all emissions were assessed as coming from a single representative stack assumed to be 3 meters in height.

Maximum annual average ground level air concentrations that may result from stack releases to air were predicted for those facilities with reported stack releases of 200 kg per year or greater; stack releases less than 200 kg per year are assumed to typically result in

negligible exposures (EAB, 1995a). The air concentrations were predicted using a procedure in EAB (1995a) that estimates concentrations using an empirical relationship between release amount and maximum annual average concentration that is based on Industrial Source Complex - Long Term (ISCLT) modeling of emissions from a hypothetical facility with a stack height of 30 meters, a stack diameter of 1.5 meters, and an exit velocity of 5 m/sec. The hypothetical facility was modeled using actual meteorological data that produces high concentrations because of persistent wind directions in the area. The human receptor is assumed to be located 1,000 meters downwind from the stack because the ISCLT modeling showed that maximum concentrations occurred at this distance.

Surface water concentrations were calculated using site-specific receiving stream flow data obtained from Versar (1995) and a simple dilution modeling approach (EAB, 1995a). For the Air Products and Chemicals, Inc. facility which releases wastewater to a POTW, negligible removal of the TDNT was assumed during treatment at the POTW. Complete dilution of the chemical releases by the entire stream flow was assumed but the effects of in-stream degradation processes (e.g., hydrolysis) and removal processes (e.g., volatilization) were not addressed. It is acknowledged that any chemical substance discharged to surface waters will undergo some degree of degradation (i.e., biological or physical) or removal (i.e., transfer to sediments, suspended particulates, biota or air). However, determining the extent of this degradation/removal on reducing instream chemical concentrations before the possibility that a drinking water or fish ingestion scenario occurs will, however, be site-specific for most substances. This requires site-specific data (e.g., stream velocity and depth, distance to drinking water intake, suspended solids concentration, etc.) that were not compiled for this screening-level assessment.

2.2 General Population Exposures

Based on the "what-if scenario" environmental concentrations presented in Exhibits 2-7 and 2-8, inhalation and drinking water exposures were predicted for TDNT and are presented in Exhibits 2-9 and 2-10, respectively. (Note: the definition of a "what-if scenario" is presented in Section 2.1). It is acknowledged that some drinking water treatment processes will be effective in reducing concentrations of some chemicals found in raw water. However, because the effectiveness of drinking water treatment is chemical-specific and process-specific (data which were not compiled for this screening-level assessment), the predicted drinking water exposures assume no removal of TDNT during any drinking water treatment that may be employed to treat the water prior to its use by consumers.

Exhibit 2-9
Estimated General Population Inhalation Exposures Resulting from Releases from the Manufacture of TDNT

Facility	Potential Inhalation Dose Rates (mg/person/yr)	
	Fugitive[1]	Stack[2]
Miles, Inc. - New Martinsville, WV	4.5E+01	NR
Miles, Inc - Baytown, TX	5.1E+01	1.2E-02
Rubicon, Inc. - Geismar, LA	1.5E+00	1.1E-01
Air Products - Pasadena, TX	3.7E+01	NR

[1]Source: Versar, 1992 (Assumes inhalation rate of 1 m^3/hr, 24 hours/day, 365 days/year).
[2]Source: EAB, 1995a (Assumes inhalation rate of 1 m^3/hr, 24 hours/day, 365 days/year).
NR - Negligible or no releases reported.

Exhibit 2-10
Estimated General Population Drinking Water and Fish Ingestion Exposures Resulting from Releases from the Manufacture of TDNT

Facility	Potential Ingestion Doses Rates[1] (mg/person/yr)		
	Surface Water	Groundwater	Fish
Miles. Inc. - New Martinsville. WV	8.3E-03	NR	NA
Miles. Inc - Baytown, TX	2.4E+00	NR	NA
Rubicon. Inc. - Geismar. LA	NR	NR	NR
Air Products - Pasadena. TX	8.0E+00	NR	NA

[1]Potential dose rates calculated assuming a daily ingestion of 2 liters of water and 16.9 grams of fish.
NR - Negligible or no releases reported.
NA - Potential dose rate was not estimated because exposure via fish ingestion is negligible for organic substances, such as 2,4-DNT, with Bioconcentration Factor (BCF) values less than 100.
NM - Negligible migration to groundwater is expected.

2.3 Occupational Exposure

2,4-DNT was not included in the NIOSH National Occupational Exposure Survey (NOES). However, NIOSH has estimated that 1,300 workers are potentially exposed to TDNT during the manufacture of TDNT, in the production of munitions, and in the synthesis of toluenediamine, an intermediate in the production of polyurethane (NIOSH, 1985). The number of workers exposed to 2,4-DNT only during the manufacture of TDNT is not available.

Inhalation Exposure

TDNT is molten at room temperature. An industry submission from a manufacturer indicates that exposure could occur for workers engaged in the following activities: operations, maintenance, and laboratory analysis (Rubicon, 1995).

Engineering controls are in place at the manufacturing site to minimize worker exposure. Rubicon (1995) reported the use of Strahman type valves for collecting QC samples, double mechanical seals on pumps, and laboratory hoods.

In addition to the engineering controls, workers reportedly use a variety of Personal Protective Equipment (PPE). At Rubicon (1995), workers wear uniforms which are supplied and laundered by the company, chemical resistant gloves and boots, and chemical goggles. During maintenance activities where there is a potential for splash, a chemical resistant suit is worn.

Data on the number of workers potentially exposed were supplied voluntarily by one TDNT manufacturer. The estimated total number of manufacturing workers exposed in the industry was based on these industry submittals. Exhibit 2-11 presents information on types of workers, number of workers, and exposure duration for workers in TDNT manufacturing. Monitoring data for TDNT were supplied by Rubicon. Only personal monitoring samples were used. Exhibit 2-12 is a summary of monitoring data submitted by Rubicon.

Monitoring data are available from the OSHA Compliance Information System (OCIS). This is a database of exposure monitoring measurements which has been gathered at selected industrial sites in order to determine compliance with PELs. The use of this data is still being evaluated. The OCIS summary report for TDNT is not available. The raw data are presented in Appendix A.

Exhibit 2-11
Submitted Data on Number of Workers and Exposure Duration for TDNT Manufacturing

Facility	Type of Worker	Number of Workers[1]	Exposure Durations Reported		Personal Protective Equipment
			Hours/Day	Days/Year	
Rubicon, Inc. Geismar, LA	Operators	23	>8	10-100	Chemical resistant gloves & boots, chemical goggles
	Maintenance Personnel	1	<0.25	10-100	Chemical resistant gloves & boots, chemical goggles, chemical resistant suit
		5	<0.25	100-250	
		8	1-8	10-100	
		11	1-8	100-250	
		2	1-8	>250	
	Laboratory Technicians	36	1-8	>250	Chemical resistant gloves & boots, chemical goggles
		2	>8	10-100	

[1]The breakdown of number of workers by job title was obtained through personal communication with Tom Harbourt of Rubicon, Inc.

Exhibit 2-12
Summary of Industry-Submitted Occupational Monitoring Data for TDNT Manufacturing

Company, Location, Year of Sampling	Type of Worker[1]	Number of Samples	Reported Airborne Concentrations (ppm)[2]	Personal Protective Equipment and Engineering Controls
Rubicon, Inc. Geismar, LA, 1988-1994	Operators	60	0.00 - 0.05	Chemical resistant gloves & boots, chemical goggles, Strahman type valves for collecting QC samples, double mechanical seals on pumps
	Maintenance Personnel	35	<0.01 - <0.03	Chemical resistant gloves & boots, chemical goggles, chemical resistant suit, double mechanical seals on pumps
	Laboratory Technicians	45	<0.01 - <0.03	Chemical resistant gloves & boots, chemical goggles, laboratory hood

[1]Job descriptions provided in the monitoring data were grouped as follows: operators (nitrations, SAC, DNT, technicians), maintenance (instrument and maintenance technicians and laborers), laboratory (lab tech).
[2]Personal samples were collected on a 0.8 micron metricel filler and chromosorb 101 tube. Sample is desorbed in monochlorobenzene and analyzed by gas chromatography for TDNT.

Exhibit 2-13 provides estimates of airborne concentrations and potential inhalation dose rates. These concentrations and potential dose rates were calculated based upon the industry-submitted occupational monitoring data in Exhibit 2-12.

Exhibit 2-13
Estimated Occupational Inhalation Exposures Associated with the Manufacture of TDNT

Type of Worker	Number of Workers/Hours per Day/Days per Year	Airborne Concentrations (mg/m^3)	Potential Inhalation Dose Rate[1,2,3] (mg/person/day)
Operator	23 / >8 / 10-100	0.0 - 0.4	1 - 4
Maintenance Personnel	1 / <0.25 / 10-100 5 / <0.25 / 100-250 8 / 1-8 / 10-100 11 / 1-8 / 100-250 2 / 1-8 / >250	<0.1 - <0.2	<1 - <2
Laboratory Technician	36 / 1-8 / >250 2 / >8 / 10-100	<0.1 - <0.2	<1 - <2

[1]Assumes the medium work inhalation rate of 1.25 m^3/hr (CEB, 1991).
[2]Assumes the maximum number of hours in a range.
[3]Assumes no use of PPE and that the chemical is 100% concentrated (CEB, 1991). Actual exposures may be less than estimated if PPE is properly selected, used, and maintained.

Dermal Exposure

Possible activities where dermal contact could occur are in process operation, maintenance, and laboratory sampling. Dermal exposure is assumed to be negligible during most manufacturing operations because TDNT is manufactured and transferred as a molten solid; a significant skin burn would result from dermal contact. Dermal contact with the solid crystalline material can occur during clean-up and maintenance which involve removal of solid deposits (Rubicon, 1995).

The OPPT Chemical Engineering Branch's Dermal Exposure Assessment Method was used to develop bounding estimates of the potential amount of a chemical remaining on a worker's skin (usually expressed in terms of mg/day) and available for absorption, after the worker completes various common industrial activities (CEB, 1991). The

method links assumptions based on crude experimental data contained in a study which measured amounts of different materials remaining on the skin after completion of various degrees of exposure with estimates of exposed skin surface area (Versar, 1984; Popendorf, 1982). The method also assumes that a single contact with the chemical results in exposure for a complete work day and that no dermal protection, such as gloves, is used by the worker to limit exposure. Therefore, the method generates estimates of potential dermal exposure only for the subpopulation of workers that does not use dermal protection. Typical factors for calculation of dermal exposure based on the experimental data are provided in Appendix B.

Some maintenance personnel may be expected to have two hand incidental contact with solid crystalline TDNT. Exhibit 2-14 presents estimated occupational dermal exposures for standard worker activities at TDNT manufacturing facilities. This exposure estimate assumes no dermal protection and that the chemical is 100% concentrated; however, Rubicon states that chemical resistant uniforms, gloves, boots, and goggles are used. This PPE, if properly selected, maintained, and used, may limit dermal exposure.

Exhibit 2-14
Estimated Occupational Dermal Exposures Associated with the Manufacture of TDNT

Type of Worker	Number of Workers/Hours per Day/Days per Year	Potential Dermal Dose Rate[1] (mg/person/day)
Maintenance Personnel	2 / 1-8 / 10-100	1,300 - 3,900

[1]Assumes no use of PPE and that the chemical is 100% concentrated (CEB, 1991). Actual exposures may be less than estimated if PPE is properly selected, used, and maintained.

3.0 PROCESSING AND USE

The majority of uses for 2,4-DNT are listed below:

- Intermediate in the manufacture of toluene diamine;
- Intermediate in the manufacture of dyes;
- Gelatinizing and waterproofing agent in explosives;
- Modifier for smokeless powders in the munitions industry; and
- Plasticizer in moderate and high explosives.

3.1 Releases and Resulting Environmental Concentrations

Exhibit 3-1 summarizes the available release data for TDNT from the 1993 TRI. Several of the manufacturers are also processors but releases could not be divided between manufacturing releases and processing releases. Releases are presented but were assumed to be all manufacturing releases. The 1993 TRI releases for Radford Army Ammunition Plant, Miles, Inc. (New Martinsville site), Olin Corp. Lake City Army Ammunition Plant, and First Chemical Corporation are reported as 2,4-DNT releases. These 2,4-DNT releases were converted to TDNT releases by multiplying the 2,4-DNT releases by 1.25.

Exhibit 3-2 presents the estimated environmental concentrations of TDNT that may result from those facilities which reported fugitive releases of 23 kg or more per year and/or stack releases of 200 kg or more per year. Exhibit 3-3 contains the estimated environmental concentrations of TDNT from all water releases. Ambient air concentrations were estimated using simple, conservative atmospheric dispersion models (EAB, 1995a; Versar, 1992). Surface water concentrations were estimated using site-specific receiving stream flow data (Versar, 1995) and a simple dilution modeling approach (EAB, 1995a). See Section 2.1 for more details on the environmental concentration modeling.

Exhibit 3-1
TRI Data for TDNT (lb/yr)

Site Name	City	State	Fugitive[1]	Stack[1]	Water	Underground Injection	Landfill	POTW	Other off-Site
Radford Army Ammunition Plant[3]	Radford	VA	0	0	25	0	0	0	13
Miles Inc.[2,3]	New Martinsville	WV	2,306	39	374	0	0	0	0
Olin Corp. Lake City Army Ammunition Plant[3]	Independence	MO	0	0	0	0	0	0	0
First Chemical Corporation[3]	Pascagoula	MS	1	3	0	0	0	0	375
Air Products and Chemicals, Inc.[2]	Pasadena	TX	1,900	47	0	0	0	6,800	491,890
BASF Corporation	Geismar	LA	880	380	38	0	0	0	2,090
Rubicon, Inc.[2]	Geismar	LA	77	9,300	0	98,000	0		2,800
Miles, Inc.[2]	Baytown	TX	2,600	999	250	0	0	0	750
Olin Corporation	Lake Charles	LA	0	0	43	0	0	0	1,244
Milan Army Ammunition Plant	Milan	TN	0	0	0	0	0	0	0
MANUFACTURING TOTAL			6,883	10,385	624	98,000	0	6,800	495,440
PROCESSING TOTAL			881	383	106	0	0	0	3,722

[1]Totals for Air Releases used maximum values of ranges.
[2]According to the TRI report, this is a manufacturer and a processor. Since TRI does not distinguish between manufacturing, processing, or use releases for each facility, releases at facilities that manufacture and process TDNT were considered manufacturing releases. Some of these releases may be due to processing and use.
[3]Releases were reported as releases of 2,4-DNT in the 1993 TRI, but were converted to releases of TDNT for this table by multiplying 2,4-DNT releases by 1.25.

Exhibit 3-2
Estimated Environmental Concentrations of TDNT Resulting from Releases to Air from Processing and Use

Facility	City	State	Ambient Air Concentrations[1] (mg/m³)	
			Fugitive[2]	Stack[3]
Radford Army Ammunition Plant	Radford	VA	NR	NR
Olin Corporation Lake City Army Ammunition Plant	Independence	MO	NR	NR
First Chemical Corporation	Pascagoula	MS	NR	NR
BASF Corporation	Geismar	LA	1.9E-03	NR
Olin Corporation	Lake Charles	LA	NR	NR
Milan Army Ammunition Plant	Milan	TN	NR	NR

[1]Ambient air concentrations are estimated maximum annual average concentrations.
[2]Source: Versar, 1992 (Assumes receptor is located 100 meters downwind from a source with a release height of 3 meters).
[3]Source: EAB, 1995a (Assumes receptor is located 1,000 meters downwind from a source with an effective stack height of 30 meters).
NR - Negligible or no releases reported.

Exhibit 3-3
Estimated Environmental Concentrations of TDNT Resulting from Releases to Water from Processing and Use

Facility	City	State	NPDES No.[1]	Reach No.[1]	Surface Water Concentrations[2] (µg/L)	
					Harmonic Mean[3]	7Q10[4]
Radford Army Ammunition Plant	Radford	VA	VA0000248	05050001009	6.9E-03	1.9E-02
Olin Corporation Lake City Army Ammunition Plan	Independence	MO	--	--	NR	NR
First Chemical Corporation	Pascagoula	MS	--	--	NR	NR
BASF Corporation	Geismar	LA	LA0002950	08070100001	8.3E-05	2.8E-04
Olin Corporation	Lake Charles	LA	LA0005347	08080206033	2.3E-02	1.2E-01
Milan Army Ammunition Plant	Milan	TN	--	--	NR	NR

[1]NPDES Permit Nos. and Reach Nos. were obtained from Versar (1995).
[2]Surface water concentrations were calculated assuming that the releases presented in Exhibit 3-1 occur at the same rate for 250 days per year.
[3]Estimated harmonic mean flows were obtained from Versar (1995). The harmonic mean flow is recommended as the design stream flow for assessing exposures to carcinogens and noncarcinogens which manifest human effects after long-term exposure (EAB, 1995a).
[4]7Q10 flows (i.e., the lowest 7-consecutive day average flow recurring every 10 years) were obtained from Versar (1995). 7Q10 flows are recommended for assessing potential chronic aquatic toxicity effects (EAB, 1995a).
NR - Negligible or no releases reported.

3.2 General Population Exposure

Based on the environmental release data presented in Exhibit 3-1 and the corresponding "what-if scenario" estimates of environmental concentrations presented in Exhibits 3-2 and 3-3, inhalation and drinking water exposures were predicted and are presented in Exhibits 3-4 and 3-5.

Exhibit 3-4
Estimated General Population Inhalation Exposures Resulting from Releases from the Processing and Use of TDNT

Facility	City	State	Potential Inhalation Dose Rates (mg/person/yr)	
			Fugitive[1]	Stack[2]
Radford Army Ammunition Plant	Radford	VA	NR	NR
Olin Corporation Lake City Army Ammunition Plant	Independence	MO	NR	NR
First Chemical Corporation	Pascagoula	MS	NR	NR
BASF Corporation	Geismar	LA	1.7E+01	NR
Olin Corporation	Lake Charles	LA	NR	NR
Milan Army Ammunition Plant	Milan	TN	NR	NR

[1]Source: Versar, 1992 (Assumes inhalation rate of 1 m^3/hr, 24 hours/day, 365 days/year).
[2]Source: EAB, 1995a (Assumes inhalation rate of 1 m^3/hr, 24 hours/day, 365 days/year).
NR - Negligible or no releases reported.

Exhibit 3-5
Estimated General Population Drinking Water and Fish Ingestion Exposures Resulting from Releases from the Processing and Use of TDNT

Facility	City	State	Potential Ingestion Doses Rates[1] (mg/person/yr)		
			Surface Water	Ground Water	Fish
Radford Army Ammunition Plant	Radford	VA	3.4E-03	NR	NA
Olin Corporation Lake City Army Ammunition Plant	Independence	MO	NR	NR	NR
First Chemical Corporation	Pascagoula	MS	NR	NR	NR
BASF Corporation	Geismar	LA	4.1E-05	NR	NA
Olin Corporation	Lake Charles	LA	1.1E-02	NR	NA
Milan Army Ammunition Plant	Milan	TN	NR	NR	NR

[1]Potential dose rates calculated assuming a daily ingestion of 2 liters of water and 16.9 grams of fish.
NR - Negligible or no releases reported.
NA - Potential dose rate was not estimated because exposure via fish ingestion is negligible for organic substances, such as 2,4-DNT, with BCF values less than 100.

3.3 Occupational Exposure

The number of workers exposed to TDNT at processing and use facilities was not available in the NOES database. Neither inhalation nor dermal monitoring data are available to characterize the occupational exposures to TDNT expected during TDNT processing and use. Since monitoring data specific to TDNT processing are not available, inhalation exposures were estimated based on the TDNT OSHA PEL.

Inhalation Exposure

Workplace inhalation exposures to over three hundred chemicals are regulated by OSHA PELs. The PEL for allyl chloride is listed in Table Z-1 of the OSHA General Industry Air Contaminants Standards (29 CFR 1910.1000). Employers may comply with OSHA PELs with the use of engineering controls, such as local exhaust ventilation, or with chemical protective equipment, such as respirators. Based on the OSHA PEL of 1.5 mg/m^3 for TDNT, and assuming that the workers breathe at a rate of 1.25 m^3/hr for an 8 hour day, inhalation exposure is estimated to be 15 mg/day. This approach presents an estimate of the

potential inhalation dose (as a high end estimate), assuming compliance with the OSHA PEL as an 8-hour time weighted average for general industry. The potential inhalation dose estimates do not take into account respiratory protection or engineering controls that may be used by industry to mitigate inhalation exposures (closed vent systems and remote process operations).

In the absence of monitoring data, potential occupational inhalation exposures may be estimated by assuming that facilities are in compliance with the OSHA PELs for OSHA-covered chemicals. OSHA PELs are applicable to the General Industry only. In addition, there are currently different standards with different requirements and PELs for Shipyards, Marine Terminals, Longshoring, Construction and Agriculture.

PELs are usually expressed in terms of time weighted average (TWA) concentrations that must not be exceeded in any 8-hour work shift of any 40-hour work week. A TWA is based on exposure averaged over an 8-hour period and is calculated to allow for excursions above the exposure level provided they are compensated by equivalent excursions below the exposure level during the workday. The estimated exposure is the total amount of substance to which a worker can be exposed per 8 hour day whether the exposures are for short duration at high concentrations or long duration at low concentrations. There is no need to compensate the value for periods of time the worker is involved in activities that do not result in exposure. Potential inhalation dose rates for TDNT are presented in Exhibit 3-6.

Exhibit 3-6
Estimated Occupational Inhalation Exposures Associated with the Processing and Use of TDNT

Type of Worker	Airborne Concentration (mg/m^3)	Potential Inhalation Dose Rate[1,2,3] (mg/person/day)
Operators and Samplers	1.5	15
Maintenance Personnel	1.5	15
Product Loaders	1.5	15

[1]Assumes the medium work inhalation rate of 1.25 m^3/hr (CEB, 1991).
[2]Assumes an 8-hour work day.
[3]Assumes no use of PPE and that the chemical is 100% concentrated (CEB, 1991). Actual exposures may be less than estimated if PPE is properly selected, used, and maintained.

Dermal Exposure

Possible activities where dermal contact could occur are in process operation, sampling, maintenance, and product loading. Dermal exposure is assumed to be negligible and infrequent during normal processing and use operations because TDNT is manufactured and transferred as a molten solid; a significant skin burn would result from dermal contact. Dermal contact with the solid crystalline material could occur, but it is expected that these contacts would be intermittent and incidental to the particular operation (i.e., clean-up and maintenance may involve removal of solid deposits where dermal contact is likely). No information is available on gloves or protective equipment used by processing and use facilities. Exposures may be less if gloves are properly selected, used, and maintained.

4.0 CONSUMER EXPOSURE

Consumer exposure to 2,4-DNT is expected to be negligible. When 2,4-DNT is used in the manufacture of toluene diisocyanate or dyes, it is consumed on site at a processing facility. 2,4-DNT is not expected to be present in detectable concentrations in end products where 2,4-DNT was an intermediate. The only end uses where 2,4-DNT is not consumed as an intermediate involve explosives. Consumers will most likely not be exposed to 2,4-DNT through these end uses. No formulations in the Source Ranking Database, a list of products and their chemical constituents, contain 2,4-DNT as a component (Versar, 1994).

5.0 UNCERTAINTIES AND/OR DATA NEEDS

This reports provides preliminary estimates of environmental releases, occupational exposures, and general population exposures associated with the manufacturing, processing, and use of TDNT. These estimates are primarily based on limited information provided by manufacturers and/or literature which may not be representative of all TDNT releases and exposures. In addition, many estimates were developed using conservative screening models or assumptions. Given these uncertainties, this report and the estimates provided should be considered preliminary and subject to revision as improved information and/or estimation techniques become available.

5.1 Environmental Release Uncertainty

Uncertainty regarding TDNT manufacturing, processing and use are associated with the use of 1993 TRI data. All of the manufacturing sites listed in TRI also process TDNT and some of the reported releases at these sites may be due to processing and use. Since TRI does not distinguish between manufacturing, processing, or use releases for each facility, it is unknown how much of these releases are due to manufacturing releases. This may overestimate manufacturing releases and underestimate processing releases. Since this information is not up-to-date, it may not accurately reflect current releases. However, manufacturing, processing, and use releases may be overestimated because maximum values were used when release ranges were reported in TRI. There is additional uncertainty involved because this report is written for 2,4-DNT, but in many places, data on TDNT is presented as a surrogate for data on 2,4-DNT.

5.2 Environmental Concentrations Uncertainty

Maximum annual average air concentrations were estimated using dispersion models with generic default assumptions rather than site-specific meteorological and physical stack/vent data. The generic default assumptions used are primarily conservative in nature. Therefore, the estimated concentrations should be considered to be "what-if scenario"[2] estimates rather than as known points on the distribution of actual environmental concentrations.

Surface water concentrations were estimated using site-specific stream flow data. However, potentially operative site-specific degradation and removal processes were not modeled and releases were assumed to occur at a constant rate on each day of release throughout the year. Thus, although these estimates are based on more site-specific data than are the estimates of ambient air concentrations, the estimates are considered "what-if scenario" estimates.

5.3 General Population Exposure Uncertainty

General population annual exposure estimates conservatively assumed that human exposure would occur on each day of release during the year and, for air releases, it was assumed that the human receptors would be exposed to the maximum estimated concentrations. These conservative assumptions, when coupled with the uncertainty associated with the estimated environmental concentrations, indicate that the exposures are considered to be "what-if scenario" exposure estimates.

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[2]See Sections 2.1 and 3.1 for the definition of the "what-if scenario".

5.4 Occupational Exposure Uncertainty

Uncertainties related to manufacturing, processing, and use occupational exposures include the following:

- The actual effectiveness of respiratory protection and other PPE in controlling exposures is unknown;
- Sampling and analytical methods for the monitoring data are not evaluated;
- Monitoring data were only available from one facility;
- Dermal PPE was not taken into account; and
- The dermal exposure model is based on limited data and has uncertainty associated with it.

5.5 Consumer Exposure Uncertainty

Consumer exposure to 2,4-DNT through use of products and materials is not expected based on the known current uses of 2,4-DNT.

6.0 REFERENCES

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Appendix A

OSHA has compiled a survey of workplace exposure concentrations into the OSHA Compliance Information System (OCIS). Information available includes individual sampling results through 1994. Results can be searched by company name, SIC code, CAS number or sampling type (area vs. personal). Lab sampling results are presented in Table 1. These results do not identify the activity of the exposed worker. This data may be used as monitoring data to calculate potential inhalation exposures although the use of this data is still being evaluated. This data has not been incorporated into the RM1 reports but is provided for reference.

Table 1

Lab Sampling Results

COMPANY	RG	AREA	SDATE	CSHO	RESULTS[1]	PEL
OLIN CHEMICALS	03	0380	06/15/82	R8688063	Not Released	
OLIN CHEMICALS	03	0480	06/15/82	R8688063	Not Released	
OLIN CHEMICALS	03	0480	06/15/82	R8688063	Not Released	
OLIN CHEMICALS	03	0480	06/15/82	R8688063	Not Released	
OLIN CHEMICALS	03	0480	06/15/82	R8688063	Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
OSHA LAB	MO		09/02/83		Not Released	
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	N
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	N
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	N
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	B
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	B
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	B
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	L
DIV OF STATE LABS ARIZON			08/09/89	ARCHAR	0.000000	L
M.R. HARRISON & CUYAHOGA			03/13/85	F0640	0.000000	J
M.R. HARRISON & CUYAHOGA			03/13/85	F0640	0.000000	J
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	B
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	N
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	B
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	N

Lab Sampling Results (Continued)

COMPANY	RG	AREA	SDATE	CSHO	RESULTS[1]	PEL
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	L
AUSTIN INDUSTRIAL, INC.			07/18/86	B9941	0.000000	N
ST. OF NEW HAMPSHIRE			11/21/94	F0762	0.000000	
ST. OF NEW HAMPSHIRE			11/21/94	F0762	0.000000	

[1]Units of the results are mg/m^3 for air samples and % of total for bulk samples.

Air:
B = None detected
C = <0.5 PEL
D = <0.5 and < PEL
E = > or = PEL
F = Detected, no PEL
H = Not analyzed
L = Blank analyzed
N = Sampled in series - results combined with another sample
T = PAT sample

Wipe:
B = None detected
G = Detected
H = Not analyzed
M = Blank analyzed

Other (BULK):
H = Not analyzed
J = Analyzed

Asbestos:
K = <0.1 fiber/cc

Appendix B

The following is from the CEB Engineering Manual, issued February 28, 1991.

Typical Factors for Calculation of Dermal Exposure

Activity	Typical Examples	S[a] (cm^2)	Q[b] (mg/cm^2)	Resulting typical contact[c] (mg)
Routine immersion, 2 hands	• Handling wet surfaces • Filling/dumping containers of powders, flakes, granules • Spray painting	1,300	5-14	6,500 to 18,200
Routine contact, 2 hands	• Maintenance/manual cleaning of equipment • Unloading filter cake • Changing filter • Filling drum with liquid	1,300	1-3	1,300 to 3,900
Routine contact, 1 hand		650	1-3	650 to 1,950
Incidental contact, 2 hands	• Connecting transfer line • Weighing powder/ scooping/mixing (i.e., dye weighing)	1,300	1-3	1,300 to 3,900
Incidental contact, 1 hand	• Sampling • Ladling liquid/bench scale liquid transfer	650	1-3	650 to 1,950

[a] Popendorf and Leffingwell 1982. S is surface area of contact.
[b] Versar 1994. Q is quantity typically remaining on skin.
[c] These estimates also must be adjusted by the concentration of the chemical in the mixture and the percent of the hand exposed if this is less than what would be typical. Concentrations that change over time due to evaporation or other factors also should be accounted for.

Attachment D

Screening Information Data Set
SIDS
for High Production Volume Chemicals

Organisation for Economic Co-operation and Development

OECD Initial Assessment

Processed by IRPTC
International Register of Potentially Toxic Chemicals

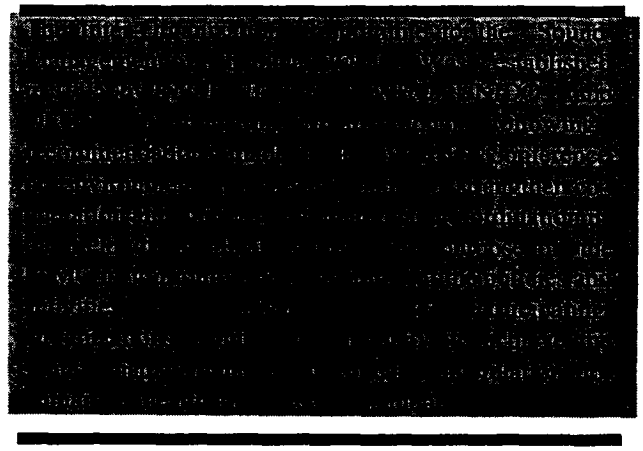
VOLUME 4
part 1

A Contribution to IPCS
International Programme on Chemical Safety

November 1997

UNITED NATIONS
New York and Geneva, 1997

This publication is a contribution to the Inter-Organization Programme for the Sound Management for Chemicals (IOMC).



UNEP CHEMICALS (IRPTC)
November 1997

FOREWORD

Since 1988, the Member countries of the Organisation for Economic Co-operation and Development (OECD) have been working with one another and with their chemical industry to systematically investigate High Production Volume (HPV) existing chemicals. The objective of the work is to undertake an initial assessment of the risk posed by these chemicals to human health and the environment. The set of data elements needed for this exercise has been entitled the "Screening Information Data Set" or SIDS. Based on the SIDS and additional information when it is available, countries make a decision as to whether HPV chemicals should be considered as: (i) of low priority for further work, (ii) warranting special attention due to specific properties or effects, (iii) candidates for any further information gathering or testing, or (iv) candidates for further in-depth review with a view to possible risk reduction action.

The SIDS initial assessments of chemicals prepared by OECD Member countries are discussed in a forum comprising experts from government and industry nominated by OECD Member countries as well as experts nominated by the International Programme on Chemical Safety (IPCS) for other countries. This process results in initial assessments that are widely acceptable. The SIDS project leads to assessments which are less comprehensive in nature than the IPCS risk assessment contained in the Environmental Health Criteria (EHC) documents but can be regarded as an important complement.

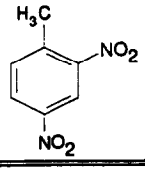
The OECD Council Decision-Recommendation on the Co-operative Investigation and Risk Reduction of Existing Chemicals [C(90)163/Final of 31 January 1991] requested the International Register of Potentially Toxic Chemicals (IRPTC) of the United Nations Environment Programme (UNEP) to make the information obtained from the co-operative investigation of existing chemicals available worldwide. Therefore UNEP chemicals has produced this document from the SIDS initial assessment reports.

OECD and UNEP chemicals are pleased to make available this document as a contribution to IPCS. The information is provided as an indication of the current state of knowledge of these chemicals based on the SIDS, but does not presume to be comprehensive. The co-operating organizations in IPCS (UNEP, ILO, WHO) and OECD disclaim all liability for direct or consequential damages resulting from the use of the SIDS Initial Assessment data.

Hardcopy and machine-readable versions of this information can be obtained from UNEP Chemicals in Geneva:

The Director UNEP Chemicals
Case Postale 356
CH-1219 Châtelaine/Genève
Switzerland
Telefax +41-22-797 34 60

SIDS INITIAL ASSESSMENT PROFILE

CAS NO	121-14-2
CHEMICAL NAME	2,4-Dinitrotoluene
STRUCTURAL FORMULA	

RECOMMENDATION OF THE SPONSOR COUNTRY

[X] presently of low priority for further work

[ ] requiring further information to assess identified concerns

[ ] candidate for in-depth risk assessment with a view to possible risk reduction activities

SHORT SUMMARY WHICH SUPPORT THE REASONS FOR THE RECOMMENDATIONS

The production volume of 2,4-Dinitrotoluene (2,4-DNT) is ca. 140,000 t/a in Germany and ca. 264,000 in the USA. The worldwide production is estimated at ca. 850000 t/y. Nearly the entire production volume is used as intermediate in chemical synthesis. The only direct use known is as additive in explosives. 2,4-DNT can be regarded as "inherently biodegradable" with low to moderate bioaccumulation.. The most sensitive environmental species to 2,4-DNT is the crustacean *Daphnia magna* (21d-NOEC = 0.04 mg/l).
The derived aquatic PNEC is 4 µg/l.
The substance is harmful with oral administration (acute LD50 = 400 - 1954 mg/kg bw). It is mutagenic in the Ames test and in in vivo tests on mammals. The NOEL for repeated dose toxicity is 0.57 - 0.71 mg/kg bw/day (2-year study). No teratogenic effects were recorded and impairment of fertility were observed at doses which also cause other effects.
The highest aquatic local PEC due to production and processing was estimated to be 1.66 µg/l in Germany and 56 µg/l for a production site in the USA. For the PEC calculation (for production and processing plants plants without exposure information), the default values defined in the EU *Technical Guidance Documents on Risk Assessment for New and Existing Substances* are used (data about the discharges via waste water are not available for production and processing plants outside of Germany). For a production plant with an unknown site location a PEC_{local} of 245 µg/l and for a processing plant a PEC_{local} of 570 µg/l is calculated.
The EHD for inhalational exposure is estimated at <0.071 mg/kg bw.
Consumer exposure is not to be expected.
In conclusion, there is currently no risk to be expected to the environment or to humans for the 3 known production and processing sites in Germany. For a known production site in the USA, 2,4-DNT represents presently a risk for the aquatic compartment. A comparison of the predicted environmental concentrations for a production and a processing site (plants without exposure information, hypothetical unknown site location with a hypothetical capacity 1000 t/y) and the predicted no-effect concentration for aquatic ecosystems indicates that a risk of damage to aquatic ecosystems is to be expected.

IF FURTHER WORK IS RECOMMENDED, SUMMARISE ITS NATURE

Site specific exposure data have to be improved for all production and processing sites.

FULL SIDS SUMMARY

CAS-NO.: 121-14-2			PROTOCOL	RESULTS
PHYSICAL CHEMICAL				
2.1	Melting Point		NA	69.9 °C
2.2	Boiling Point		NA	319.5 °C (at kPa)
2.3	Density		NA	1286 kg/m^3
2.4	Vapour Pressure		NA	$7.9 \cdot 10^{-6}$ kPa at RT°C
2.5	Partition Coefficient (Log Pow)		NA (exp.)	1.98
2.6 A	Water solubility		NA	166 mg/l at °C
B	pH		/	at °C
	pKa		/	
2.12	Oxidation : Reduction potential		/	mV
ENVIRONMENTAL FATE / BIODEGRADATION				
3.1.1	Photodegradation		calc. (Atkinson)	In air $T_{1/2}$ = 71 days
3.1.2	Stability in water (Photodegr.)			$T_{1/2}$ = 6.5 - 20 days
3.2	Monitoring data			In air = / mg/m^3 In surface water = 0.1 - 2.0 µg/l In soil/sediment = 0.01 - 0.07 µg/g In biota = / µg/g
3.3	Transport and Distribution		calculated (fugacity level 1 type)	In water ca. 98 %
3.5	Biodegradation		NA	not readily biodegradable inherently with adapted inoculum

FULL SIDS SUMMARY (cont)

CAS-NO.: 121-14-2		SPECIES	PROTOCOL	RESULTS
ECOTOXICOLOGY (lowest effect concentrations only)				
4.1	acute/prolonged toxicity to fish	Lepomis macrochirus	EPA-660/3-75-009	LC_{50} (96 hr) = 12.8 mg/l
4.2	acute/prolonged toxicity to aquatic invertebrates (daphnia)	Daphnia magna	EPA-660/3-75-009	EC_{50} (24 hr) = 22 mg/l
4.3	toxicity to aquatic plants e. g. algae	Microcystis aeruginosa	EPA (1971)	TLV (96 hr) = 0.05 mg/l
4.4	toxicity to microorganisms	Uronema parduczi	NA	TLV (20 hr) = 0.55 mg/l
4.5.1	chronic toxicity to fish	Lepomis macrochirus	NA	TLV (8 w) = 0.05 mg/l
4.5.2	chronic toxicity to aquatic invertebrates (daphnia)	Daphnia magna	UBA (1984)	NOEC (21 d) = 0.04 mg/l
4.6.1	toxicity to soil dwelling organisms	Folsomia candida	BBA (1991)	EC_{10} (33 d) = 2.8 mg/kg
4.6.2	toxicity to terrestrial plants	Lactuca sativa	OECD 208	EC_{50} (14 d) = 4.9 mg/kg
TOXICOLOGY				
5.1.1	acute oral toxicity	rat	NA	LD_{50} = 400 mg/kg
5.1.2	acute inhalation toxicity	/	/	LC_{50} = mg/m^3
5.1.3	acute dermal toxicity	rat	NA	LD_{50} = >2500 mg/kg
5.4	repeated dose toxicity	rat (CD)	(2-year study)	NOEL= 0.57 - 0.71 mg/kg
5.5	genetic toxicity in vitro			
	bacterial test (gene mutation)	S. typhimurium	Ames test	+ (with metabolic activation) + (without metabolic activation)
	non-bacterial in vitro test (chromosomal abberations)	CHO K1		- (with metabolic activation) - (without metabolic activation)
5.6	genetic toxicity in vivo	rat (Fischer)		positive
5.8	toxicity to reproduction	/	/	NOEL = mg/kg (general toxicity) NOEL = mg/kg (rep. tox. parental) NOEL = mg/kg (rep. tox. F1)
5.9	developmental toxicity / teratogenicity	/	/	NOEL = mg/kg (general toxicity) NOEL = mg/kg (pregnancy/litter) NOEL = mg/kg (foetal data)
5.11	experience with human exposure			

OECD HIGH PRODUCTION VOLUME CHEMICALS PROGRAMME - PHASE 2

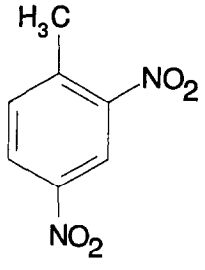
SIDS INITIAL ASSESSMENT REPORT

2,4-DINITROTOLUENE (CAS No. 121-14-2)

1. IDENTITY

2,4-Dinitrotoluene	CAS No. 121-14-2
Synonyms:	1-Methyl-2,4-dinitro-benzene 2,4-DNT
Empirical formula:	$C_7H_6N_2O_4$

Structural formula:



2. EXPOSURE

The chemical was discussed at SIAM 3. As there were only few data concerning exposure from other member countries it was decided to include a generic exposure scenario. Besides, the substance was included in the OECD information gathering activities. A summary of the responses is given as annex. The information received was mainly qualitative. The United States delivered the paper *Use and exposure Profile for 2,4-Dinitrotoluene* containing actual production and exposure information. These data has been included in the SIAR.

2.1 General discussion

Dinitrotoluenes are manufactured by dinitration of toluene which yields approximately a ratio of 80:20 of 2,4- and 2,6-DNT, respectively. 2,4-DNT is also produced by mononitration of p-nitrotoluene. Mononitration of o-nitrotoluene leads to a 67:33 mixture of 2,4- and 2,6-DNT.

Approximately 140,000 metric tons of 2,4-DNT are annually produced by 2 companies at 3 sites in the former Federal Republic of Germany. There are five sites in the USA which produced ca. 264,000 metric tons of 2,4-DNT in 1982. Ca. 850,000 t/y, primarily 2,4- and 2,6-isomeric mixtures and a smaller amount of pure 2,4-DNT, are manufactured on a worldwide basis.

The dinitrotoluenes are no end products and are almost entirely processed further. DNT is used to make toluylenediamine (ca. 99%) which is converted to toluylenediisocyanate (TDI), a starting component for polyurethane production. DNT also serves as a starting material for dyes.

Moreover DNT is used as an additive in explosive preparations because of its gelling and water-repelling properties as well as because of its explosive potential. There is no information on possible quantities used for this purpose in Germany. In Finland, < 300 t/y are used in the production of explosives.

2.2 Environmental exposure

2.2.1 General

The here presented exposure assessment is limited to the known production and processing sites in Germany and the USA as well as to few measured environmental concentrations.

Production and subsequent processing of DNT result in an emission of DNT into sewage. All sewage is said to be subjected to biological treatment in Germany. The rates of elimination in purification plants vary between 95 and 97% for 2,4-DNT. Release into effluent for the 3 production and processing plants amounted to about 3.2 t in 1994/95 for 2,4-DNT. Furthermore about 25 kg/y are released into the atmosphere.

The 2,4-DNT producing releases from the five production sites in the USA are approximately 232 t/y, with 3 % released to air, < 1 % released to water, 15 % released to land, and 82 % released off site (including Publicity Owend Treatment Works). Ten known facilities process 2,4-DNT (including four that also produce 2,4-DNT). 2,4-DNT processing releases for six processing sites in the USA are approximately 2.3 t/y with 25 % released to air, 2 % released to water, 0 % released to land, and 73 % released off site (including Publicity Owned Treatment Works). This release estimate does not include processing releases from facilities that produce 2,4-DNT.

In the EU *Technical Guidance Documents on Risk Assessment for New and Existing Substances* a generic exposure scenario for the release of intermediates during production and processing into surface water is proposed (Use Category Document "Intermediates"). A release factor of 0.3 % for the production and 0.7 % for the processing into the sewage and subsequent purification in a STP is assumed. Data about the discharges via waste water are not available for production and processing plants outside of Germany, therefore the default values are used. The release for a production plant (hypothetical unknown site location with a hypothetical capacity 1000 t/y) amounted to 3 t/y and for a processing plant (hypothetical unknown site location with a hypothetical capacity 1000 t/y) to 7 t/y.

There are no monitoring data available for 2,4-DNT in the river Rhine (Germany). Only 2,6-DNT was measured at concentrations between <0.02 and 0.20 µg/l in the river Rhine in 1987 (10 samples). In the river Main (Germany), 2,4-DNT was detected in 101 of 170 samples (detection limit 0.1 µg/l) between July 1984 and December 1987 (90-percentile = 0.52 µg/l).
In the Grand Calumet River (USA), sediment concentrations were determined; 10 samples from 10 different locations were taken between October 1988 and May 1990. The

concentrations in the whole sediment were <0.01 - 0.07 mg/kg dw and 0.1 - 1.7 µg/l in the pore water.

2.2.2 Environmental fate

2,4-DNT has a water solubility at room temperature of 166 mg/l and a vapour pressure of 7.9 x 10^{-3} Pa at 20 °C. Its calculated Henry constant amounts to 0.088 Pa x·m^3/mol. Volatilization from surface waters will not occur to a significant extent.

Bioconcentration factors have been determined experimentally (after 4 days of exposure) for several aquatic organisms:

	BCF
Selenastrum capricornutum	2507
Daphnia magna	13
Lumbriculus variegatus	58
Lepomis macrochirus	4 - 78

Based on these results, the bioaccumulation is low to moderate for fish and very high only for algae. It is not clear though, whether the compound has been accumulated or only adsorbed on the cells. In case of adsorption, this could indicate a high potential to accumulate on suspended matter or sediment of surface waters. Furthermore in a leaching test in soil, no 2,4-DNT was leached through a 35 cm long soil column (three different soils) in 2 days.

Although the partition coefficient Log Pow of 2 does not suggest a significant potential for geoaccumulation, based on the above described results, 2,4-DNT cannot be considered to be mobile in soil. With a molecular topology/fragment contribution method (1), the Koc is estimated at 364 l/kg.

Based on its physico-chemical properties, the preferred environmental compartment of 2,4-DNT is the hydrosphere. According to the distribution model by Mackay (Fugacity model, level 1) 98% of 2,4-DNT emitted into the environment will be found in the hydrosphere at an equilibrium distribution.

In aqueous solution, 2,4-DNT is biologically inherently biodegradable with adapted inoculum only. Anaerobically, 2,4-DNT is degradable in the presence of certain additional energy sources e.g. methanol; primary degradation reached up to 100 % in 14 days in this case. In the US-EPA test, without additional energy source, no anaerobic degradation was recorded.

In artificial soil, the primary degradation was determined to be 50 % after 7 days (90% after 191 days). There is no indication that 2,4-DNT is metabolized to 2,4-Toluylendiamine.

Elimination rates in waste water treatment plants have been determined for industrial plants (chemicals industry). The measured removal rates ranged between >88% and 99.15%. As no engineering information is available on those plants, the results cannot be extrapolated onto other treatment plants.

Hydrolytic degradation is not to be expected.

Direct photodegradation of 2,4-DNT in water has been experimentally determined (quantum yield = $2.0(\pm 0.47)10^{-3}$). With regard to the geographical conditions in Germany, the half-life of 2,4-DNT at the surface layer of a natural water body reaches 20 days. The half-life due to photochemical-oxidative degradation in the atmosphere is estimated to be about 71 days.

Although probably rather slow, the main elimination process for 2,4-DNT in the environment would be biodegradation.

2.2.3 Exposure assessment

Of the three production and processing sites in Germany, two are located near the river Rhine and one located near the river Schwarze Elster (eastern Germany). Based on the effluent concentration data provided by the producers, a local concentration in surface water during the emission episode is estimated.

- the low streamflow (10th percentile) of the river Rhine amounts to ca. 1040 and 1055 m^3/s, resulting in a **PEC_{local} of 0.09 µg/l and 0.02 µg/l** for 2 production and processing plants (the elimination due to adsorption onto suspended matter can be neglected).
- the low streamflow of the river Schwarze Elster amounts to ca. 1,4 m^3/s, resulting in a **PEC_{local} of 1.66 µg/l** for 1 production and processing plant.

The environmental concentrations for the USA were estimated using procedures from the Guidelines for Completing the Initial Review Exposure Report (EAB, 1995). Ambient air concentrations were estimated using simple, conservative atmospheric dispersion models. Surface water concentrations were estimated using site-specific receiving steam flow data and a simple instream dilution model.

The ambient air concentration (producing releases from four production sites in the USA) are **0.14 to 4.6 µg/m³**. For one processing site the ambient air concentration is **1.5 µg/m³** .

The local concentration in surface water during the emission episode are **0.064 to 56 µg/l** for four production sites in the USA and **0.0002 to 0.1 µg/l** for the processing (from three sites in the USA) of 2,4-DNT.

For the other PEC calculations (for production and processing plants without exposure information), the default values defined in the EU *Technical Guidance Documents on Risk Assessment for New and Existing Substances* are used:

- release factor during production is 0.3 % and 0.7 % during processing
- production plant with a capacity of 1000 t/y (unknown site location) and processing plant with a capacity of 1000 t/y (unknown site location)
- effluent discharge rate of STP is 2000 m^3/d
- fraction of emission directed to water by STP is 49 %
- dilution factor is 10

For a production plant with an unknown site location a **PEC_{local} of 245 µg/l** and for a processing plant a **PEC_{local} of 570 µg/l** is calculated.

As only a few point source emissions exist, there is no need for the determination of regional concentrations.

2.3 Consumer exposure

None, used solely as intermediate or precursor.

2.4 Exposure via the Environment

The highest exposure to the general population via the environment would be expected through drinking water processed from surface water. Based on the physical chemical properties of 2,4-DNT, a significant removal during processing is not to be expected. Therefore, as a worst case hypothesis, the concentration in drinking water may be assumed to be **1.66 µg/l** (the highest estimated exposure of the aquatic environment in Germany).

2.5 Workplace exposure

Probable exposure route

As the production and processing of dinitrotoluenes occurs in closed plants, workplace exposure can be ruled out. >99% of the quantity produced is passed through pipelines to the processing plant, <1% is filled into barrels. While the product is being filled the exhaust is removed by vacuum suction and disposed of. Inhalational uptake is considered to be the main route of exposure. Skin contact is of very little relevance.

Measured values at the workplace (Bayer AG): <0.05 mg/m^3 (all isomers)

Estimated human dose (EHD): < 0.0071 mg/kg bw, employing the following calculation model:

$$\frac{\text{respiratory volume (10m}^3\text{) x exposure (< 0.05 mg/m}^3\text{)}}{\text{body weight (70 kg)}}$$

3. TOXICITY

3.1 Human toxicity

a) Acute toxicity

With oral administration in animal experiments, 2,4-DNT is harmful (LD50 oral rat, mouse 400 - 1954 mg/kg bw). The predominant effect is methemoglobinemia.

b) Repeated dose toxicity

In the mouse, rat and dog, oral uptake of 2,4-DNT is especially toxic to the blood, liver, kidney, testes and CNS. The NOEL for 2,4-DNT in subchronic studies (13-26 weeks) is <34-50 mg/kg bw for the rat, 140 mg/kg for the mouse and 5 mg/kg for the dog. In a chronic experiment in rats, the NOEL for 2,4-DNT with 2% 2,6-DNT was 0.57-0.71 mg/kg bw/day.

c) Genotoxicity

The substance is mutagenic in the Ames test and in in vivo tests on mammals. The negative results in in vitro tests with mammalian cells seem to depend on the missing enzymes of the intestinal bacterial flora.

d) Carcinogenicity

The results of long-term animal experiments investigating the carcinogenic potential of 2,4-DNT allow no definite conclusion. In the liver tumor initiation-promotion test, 2,4-DNT showed only a tumour promoting effect.

e) Reproductive toxicity

No teratogenic effects of the substance were observed in rats and in mice. However, there are indications of impairment of fertility at doses which also cause other effects (see b:Repeated dose toxicity). Epidemiological studies on fertility effects are not conclusive.

f) Toxicokinetics and Metabolism

In animal experiments 2,4-DNT is excreted rapidly (within one day), mainly in the urine. A comparative study on the metabolism in rats shows dermal adsorption to play a minor role (5-7% of the applied dose).

g) Other effects

2,4-DNT is not irritating to skin and eye and is not sensitizing in animals

h) Human cases

In cases of DNT poisoning, central nervous symptoms and effects on the cardiovascular system and gastrointestinal tract were observed. Indications of impaired male fertility in workers subjected to a mixed exposure of technical DNT (0.006 -0.4 mg/m^3) and diaminotoluene were not confirmed by other studies (DNT concentrations 0.02 - 0.9 mg/m^3).

A study on workers in the explosives industry reported no symptoms after exposure to DNT concentrations ranging from not detectable to 2.68 mg/m^3.

An epidemiological study on workers having contact with DNT between 1940 and 1959 gave no indication of a carcinogenic effect in humans.

3.2 Ecotoxicity

3.2.1 Aquatic organisms

The following ecotoxic effect concentrations, corresponding to the aquatic compartment, are available:

a) Toxicity to fish

The acute toxicity results (96h-LC50) range from 12.8 to 36.1 mg/l for different species. Results from a chronic toxicity test with the acute most sensitive species are also available:

Bluegill (*Lepomis macrochirus*) effect: growth inhibition	8w-TLV	0.05 mg/l

b) Toxicity to invertebrates

Water flea (*Daphnia magna*)	24h-EC50	22 - 38 mg/l
effect: immobilisation	48h-EC50	30.4 - 38.3 mg/l
(several tests)	96h-EC50	23.9 mg/l
effect: reproduction rate	21d-EC40	0.5 mg/l
(different tests)	21d-NOEC	0.04 mg/l
Oligochaete (*Lumbriculus variegatus*)	96h-LC50	47.2 mg/l

c) Toxicity to algae

Green algae (*Scenedesmus subspicatus*)	48h-E_BC50	3.0 mg/l
effect: growth inhibition	48h-$E_\mu C50$	6.3 mg/l
Green algae (*Selenastrum capricornutum*) effect: growth inhibition	96h-EC37	0.9 mg/l
Green algae (*Scenedesmus quadricauda*) effect: growth inhibition	8d-TLV	2.7 mg/l
Blue-green algae (*Microcystis aeruginosa*)	96h-TLV	0.05 mg/l
effect: growth inhibition	8d-NOEC	0.13 mg/l
(different tests)		
Blue-green algae *(Anabaena flos-aqua)* effect: growth inhibition	14d-EC23	0.9 mg/l

d) Toxicity to protozoae

Entosiphon sulcatum effect: inhibition of cell reproduction	72h-TLV	0.98 mg/l
Uronema parduczi effect: inhibition of cell reproduction	20h-TLV	0.55 mg/l

e) Toxicity to bacteria

Pseudomonas putida effect: reduction of O_2 consumption	30min-NOEC	57 mg/l
Pseudomonas putida effect: inhibition of cell reproduction	16h-TLV	50 mg/l

3.2.2 Terrestrial organisms

a) Toxicity to plants

Three different plants were tested in an acute growth test according to OECD GL 208 in different soils and in an aqueous nutrient solution (effect: growth reduction):

Avena sativa	humic sand	14d-EC50	35 mg/kg dw
	loam	14d-EC50	46 mg/kg dw
	aqueous solution	14d-EC50	5.3 mg/l
Lactuca sativa	humic sand	14d-EC50	10 mg/kg dw
	loam	14d-EC50	4.9 mg/kg dw
	aqueous solution	14d-EC50	2.1 mg/l
Lycopersicon esculentum	humic sand	14d-EC50	13 mg/kg dw
	loam	14d-EC50	5.8 mg/kg dw
	aqueous solution	14d-EC50	2.1 mg/l

Further test results are available:

Brassica rapa effect: growth reduction (test performed with a 4:1 mixture of 2,4-DNT and 2,6-DNT respectively)	14d-EC50	6.5 mg/kg dw
Avena sativa effect: growth reduction	14d-EC50	61 mg/kg dw

b) Toxicity to invertebrates

Earthworm (*Eisenia fetida*)	14d-LC50	536 mg/kg dw
Earthworm (*Eisenia fetida*) (test performed with a 4:1 mixture of 2,4-DNT and 2,6-DNT respectively)	14d-LC50	668 mg/kg dw
Collembola (*Folsomia candida*)	24h-LC50	42.8 mg/kg dw
effect: reproduction rate	34d-EC10	3.2 mg/kg dw
effect: mortality of parental organism	34d-EC10	2.8 mg/kg dw

Furthermore with carabidae (*Poecilius cupreus*) significant effects on the feeding rate were determined at a soil concentration of 50 mg/kg dw and with lycosidae (*Pardosa sp.*) significant effects on the feeding rate were determined after 14 days at a soil concentration of 5 mg/kg dw.

c) Toxicity to microorganisms

Significant inhibition of the dehydrogenase activity of natural soil microflora were determined with concentrations of 5 mg/kg dw and 50 mg/kg dw, even after 28 days incubation.

4. INITIAL ASSESSMENT / RISK CHARACTERISATION

4.1 Human toxicity

Workplace

The estimated human dose (EHD) of <0.0071 mg/kg bw at the workplace is very low. The safety factor on the basis of the lowest NOEL (0.57 mg/kg in a 2-year study) is:

$$\frac{0.57 \text{ mg/kg bw}}{<0.0071 \text{ mg/kg bw}} = > 80$$

The NOEL of 0.57 mg/kg for oral uptake in animal experiments corresponds to a human dose of 4 mg/m^3 by inhalation (assuming 100% absorption, a human body weight of 70 kg, and a respiratory volume of 10 m^3 in 8 hours). The dinitrotoluenes have a lower air-saturation concentration, however (about 1 mg/m^3 at 20°C).

Exposure through skin contact can be excluded except in the case of accidents. The uptake of a quantity of the substance capable of causing chronic damage is not to be expected, since the dermal absorption is so low.

According to present scientific opinion, effective thresholds for mutagenic and carcinogenic substances can only be given in rare cases. Since such a calculation also does not appear possible in the case of 2,4-DNT, based on present data, a residual risk cannot be ruled out, even with low exposure.

Consumer Area

2,4-Dinitrotoluenes are used exclusively as intermediates or precursors. They thus undergo complete chemical conversion and cannot be further cleaved from products. Under this precondition, no exposure occurs in the consumer area.

Exposure through the Environment

At an introduction of < 25 kg/year, a quantitatively relevant human dose via the atmosphere can be excluded. Exposure of the population via the hydrosphere is considered to be minimum, even assuming the concentration in drinking water to be equal to the concentration in surface water i.e. 1.66 µg/l. With 2 l drinking water/person/day, the daily dose would be 3.32 µg/person = 0.047 µg/kg bw. Compared to the exposure at the working place, the exposure through the environment is negligible.

4.2 Assessment of environmental hazards

Aquatic compartment

Data from long-term tests for three trophic levels are available. As it is common international practice (see EU *Technical Guidance Documents on Risk Assessment for New and Existing Substances*) the lowest effect value is used for an environmental hazard assessment. For 2,4-DNT the lowest value was determined for *Daphnia magna*: 21 d NOEC = 0.04 mg/l. According to the *Technical Guidance Documents on Risk Assessment for New and Existing Substances*, the safety factor **F is 10,** as long-term tests have been performed with fish, daphnids and algae. Almost the same NOEC-values could be derived for them. Only for some species of algae and protozoa there are other threshold limit values which are higher than 0.04 mg/l. They show the species dependent differences in sensitivity but they do not qualify the assessment result.

With the lowest long-term NOEC of 0.04 mg/l and the highest PEC of 1.66 µg/l for a known production and processing site in Germany:

$$\textbf{PNEC} = \frac{40\ \mu g/l}{10} = \textbf{4 µg/l}$$

$$\textbf{PEC/PNEC} = \frac{1.66\ \mu g/l}{4\ \mu g/l} = \textbf{0.415}$$

As PEC/PNEC < 1 for a known production and processing site in Germany, 2,4-DNT represents presently no risk for the aquatic compartment. All sewage is said to be subjected to biological treatment in Germany.

With the PNEC of 4 µg/l and the highest PEC of 56 µg/l for a known production site in the USA:

$$\textbf{PEC/PNEC} = \frac{56\ \mu g/l}{4\ \mu g/l} = \textbf{14}$$

As PEC/PNEC > 1 for a known production site in the USA, 2,4-DNT represents presently a risk for the aquatic compartment. For the other known sites of production and processing of 2,4-DNT in the USA the PEC/PNEC is < 1 and there is no risk for the aquatic compartment.

For the PEC calculation (for production and processing plants without exposure information), the default values defined in the *Technical Guidance Documents on Risk Assessment for New and Existing Substances* are used. For a production plant with an unknown site location a **PEC_{local} of 245 µg/l** and for a processing plant a **PEC_{local} of 570 µg/l** is calculated.

$$\textbf{PEC/PNEC} = \frac{245\ \mu g/l}{4\ \mu g/l} = \textbf{61.25} \qquad \textbf{PEC/PNEC} = \frac{570\ \mu g/l}{4\ \mu g/l} = \textbf{142.5}$$

As PEC/PNEC >> 1 for the unknown production and processing site without exposure information, 2,4-DNT represents presently a risk for the aquatic compartment. These exposure scenario are based on default values and no specific information on exposure are available.

Sediment

Concentrations of up to 1.7 µg/l have been measured in the sediment pore water from the Grand Calument River (USA). The only benthic organism which has been tested with 2,4-DNT is the oligochaete *Lumbriculus variegatus*. A 96h-LC50 of 47.2 mg/l was determined. A PNEC cannot be derived with this value alone. Nevertheless, a ratio Q of effect concentration and environmental concentration can be calculated:

$$Q = \frac{47200}{1.7} = \text{ca. } 27800$$

Although internationally agreed safety factors are presently not available, the high value of Q does not suggest a risk for the sediment compartment.

Terrestrial compartment

According to the available data, 2,4-DNT presents a high toxicity towards higher plants and towards invertebrates of the soil compartment. The lowest determined acute EC50 for plants was 4.9 mg/kg *(Lactuca sativa)*. EC50-values of other species are in the same range or one order of magnitude higher. The lowest chronic EC10 for invertebrates was 2.8 mg/kg dw for a Collembola whereas the earthworm is much less sensitive. As explained for the aquatic compartment the lowest effect value is used for the assessment. As long-term toxicity tests are available for two trophic levels (invertebrates and microorganisms), a safety factor of **F = 50** is proposed (2):

$$\textbf{PNEC} = \frac{2800 \text{ µg/kg dw}}{50} = \textbf{56 µg/kg dw}$$

The industrial use pattern does not suggest a significant exposure of the terrestrial compartment. The emission volume into the atmosphere of 25 kg/y at the known production/processing sites does not suggest a significant exposure of soil through atmospheric deposition.

There are no measured values concerning the presence of 2,4-DNT in the terrestrial compartment available. Only its use as an additive in explosive preparations suggests a possible contamination of soil at special sites.

5. CONCLUSIONS AND RECOMMENDATIONS

Human toxicity

Human exposure to DNT is very low. Whereas, in earlier years, symptoms of poisoning were described for exposed workers, corresponding effects are not anticipated at the currently estimated human dose at the workplace of <0.0071 mg/kg. However, a residual risk cannot be excluded with certainty, even at low exposures, due to the mutagenic properties in animal experiments.

Ecotoxicity

A comparison of measured environmental concentrations, the predicted environmental concentrations from the 3 known production and processing sites in Germany (based on site specific exposure data) and the predicted no-effect concentration for aquatic ecosystems, based on long-term tests, indicates that no risk of damage to aquatic ecosystems is to be expected.

For a known production site in the USA, 2,4-DNT represents presently a risk for the aquatic compartment.

For the PEC calculation (for production and processing plants without exposure information), the default values defined in the *Technical Guidance Documents on Risk Assessment for New and Existing Substances* are used (data about the discharges via waste water are not available for production and processing plants outside of Germany). A comparison of the predicted environmental concentrations for a production and a processing site (capacity 1000 t/y) and the predicted no-effect concentration for aquatic ecosystems indicates that a risk of damage to aquatic ecosystems is to be expected. Site specific exposure data have to be improved for all production and processing sites.

Although 2,4-DNT showed rather high toxicity towards terrestrial organisms, the only conceivable exposure to the soil compartment would be through the use of explosives.

References

1. Meylan W., Howard P.H. & Boethling R.S.: "Molecular Topology/Fragment Contribution Method for Predicting Soil Sorption Coefficients", Environ. Sci. Technol., Vol. 26, No. 8, 1992.

2. Technical Guidance on Risk Assessment for New and Existing Substances in the Context of Commission Regulation; Draft October 1994.

Use and Exposure Profile for 2,4-DNT, U.S. Environmental Protection Agency, February 2, 1996.

EXTRACT FROM IRPTC LEGAL FILE

File: 17.01 LEGAL **rn: 300599**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: CAN Type: REG

Subject	Specification	Descriptor
AIR	OCC	TLV

TWA: 1.5 mg/m3; skin absorption. Prescribed by the Canada Occupational Safety and Health Regulations, under the Canada Labour Code (administered by the Department of Employment and Immigration). The regulations state that no employee shall be exposed to a concentration of an airborne chemical agent in excess of the value for that chemical agent adopted by ACGIH (American Conference of Governmental Industrial Hygienists) in its publication entitled: "Threshold Limit Value and Biological Exposure Indices for 1985-86". The regulations also state that the employer shall, where a person is about to enter a confined space, appoint a qualified person to verify by means of tests that the concentration of any chemical agent or combination of chemical agents will not result in the exposure of the person to a concentration in excess of the value indicated above. These regulations prescribe standards whose enforcement will provide a safe and healthy workplace.

Entry Date: OCT 1994 Effective Date: 24 MAR 1994

Amendment: CAGAAK, CANADA GAZETTE PART II, 128 , 7 , 1513 , 1994

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File: 17.01 LEGAL **rn: 302937**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: CAN Type: REG

Subject	Specification	Descriptor
USE	OCC	RQR
STORE		
LABEL		

Ingredient Disclosure List - Concentration: 1% weight/weight. The Workplace Hazardous Materials Information System (WHMIS) is a national system providing information on hazardous materials used in the workplace. WHMIS is implemented by the Hazardous Products Act and the Controlled Products Regulations (administered by the Department of Consumer and Corporate Affairs). The regulations impose standards on employers for the use, storage and handling of controlled products. The regulations also address labelling and identification, employee instruction and training, as well as the upkeep of a Materials

Safety Data Sheet (MSDS). The presence in a controlled product of an ingredient in a concentration equal to or greater than specified in the Ingredient Disclosure List must be disclosed in the Safety Data Sheet.

Entry Date: APR 1991 Effective Date: 31 DEC 1987

Amendment: CAGAAK, CANADA GAZETTE PART II, 122 , 2 , 551 , 1988

****

File: 17.01 LEGAL **rn: 400800**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: CSK Type: REG

Subject	Specification	Descriptor
AIR	OCC	MAC

TWA: 1.0 MG/M3, CLV: 2.0 MG/M3

Entry Date: DEC 1991 Effective Date: MAR 1985

Title: DIRECTIVE NO. 46/1978 ON HYGIENIC REQUIREMENTS ON OCCUPATIONAL ENVIRONMENT
Original: HPMZC*, HYGIENICKE PREDPISY MINISTERSTVA ZDRAVOTNICTVI CSR(HYGIENIC REGULATIONS OF MINISTRY OF HEALTH OF CSR), 39 , , , 1978
Amendment: HPMZC*, HYGIENICKE PREDPISY MINISTERSTVA ZDRAVOTNICTVI CSR(HYGIENIC REGULATIONS OF MINISTRY OF HEALTH OF CSR), 58 , , , 1985

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File: 17.01 LEGAL **rn: 401417**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: CSK Type: REG

Subject	Specification	Descriptor
CLASS		CLASS

This substance is classified as poison.

Entry Date: AUG 1994 Effective Date: FEB 1992

Title: GOVERNMENT PROVISION NO. 192 ON POISONS AND ANOTHER SUBSTANCES HARMFUL TO HUMAN HEALTH
Original: SZCSR*, SBIRKA ZAKONU CESKOSLOVENSKE SOCIALISTICKE REPUBLIKY(COLLECTION OF THE LAW OF CZECHOSLOVAK SOCIALIST REPUBLIC), , 42 , 1217 , 1988
Amendment: SZCFR*, SBIRKA ZAKONU CESKE A SLOVENSKE FEDERATIVNI REPUBLIKY (COLLECTION OF THE LAW OF CZECH AND SLOVAK FEDERAL REPUBLIC), , 6 , 153 , 1992

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File: 17.01 LEGAL **rn: 500761**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: DEU Type: REC

Subject	Specification	Descriptor
AQ		CLASS
USE	INDST	RQR

This substance is classified as very hazardous to water (water-hazard class: wgk 3). (the different classes are: wgk 3 = very hazardous; wgk 2 = hazardous; wgk 1 = slightly hazardous; wgk 0 = in general not hazardous.) The classification forms the basis for water-protection requirements for industrial plants in which water-hazardous substances are handled.

Entry Date: JAN 1995

Title: Administrative Rules Concerning Substances Hazardous To Water (Verwaltungsvorschrift Wassergefaehrdende Stoffe)
Original: GMSMA6, Gemeinsames Ministerialblatt, , 8 , 114 , 1990

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File: 17.01 LEGAL **rn: 700609**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: IND Type: REG

Subject	Specification	Descriptor
MANUF		RQR
SAFTY		RQR

STORE		RQR
IMPRT		RQR

These rules define the responsabilities of occupiers of any industrial activity in which this toxic and hazardous substance may be involved. These responsabilities encompass: (a) assessment of major hazards (causes, occurrence, frequency); (b) measures to prevent accidents and limit eventual impairment to human health and pollution of the environment; (c) provision of relevant factual knowledge and skills to workers in order to ensure health and environmental safety when handling equipments and the foregoing chemical; (d) notification of the competent authorities in case of major accidents; (e) notification of sites to the competent authorities 3 months before commencing; (f)preparation of an on-site emergency plan as to how major accidents should be coped with; (g) provision of competent authorities with information and means to respond quickly and efficiently to any off-site emergency; (h) provision of information to persons outside the site, liable to be affected by a major accident; (i) labelling of containers as to clearly identify contents, manufacturers, physical, chemical and toxicological data; (j) preparation of a safety data sheet including any significant information regarding hazard of this substance and submission of safety reports to the competent authorities; (k) for the import of a hazardous chemical to India, importers must supply the competent authorities with specified information regarding the shipment. (applies to dinitrotoluene)

Entry Date: SEP 1992 Effective Date: 27 NOV 1989

Title: THE MANUFACTURE, STORAGE AND IMPORT OF HAZARDOUS CHEMICALS RULES. 1989
Original: GAZIN*, THE GAZETTE OF INDIA, 787 , , , 1989

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File: 17.01 LEGAL **rn: 805298**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: JPN Type: REG

Subject	Specification	Descriptor
CLASS		CLASS
LABEL		RQR
SALE		RSTE

This substance and its preparations are designated as deleterious substances.

Entry Date: JUN 1993 Effective Date: DEC 1991

Title: POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW
Amendment: JPPDL*, POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW

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File: 17.01 LEGAL **rn: 1121838**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: RUS Type: REG

Subject	Specification	Descriptor
AIR	AMBI	PSL

0.004 MG/M3 1X/D

Entry Date: SEP 1985 Effective Date: DEC 1983

Amendment: OBUAV*, ORIENTIROVOCHNYE BEZOPASNYE UROVNI VOZDEISTVIA (OBUV) ZAGRAZNIAIUSHCHIKH VESHCHESTU V ATMOSFERNOM VOZDUKHE NASEKENNYKH MEST (TENTATIVE SAFE EXPOSURE LIMITS (TSEL) OF CONTAMINANTS IN AMBIENTAIR OF RESIDENTIAL AREAS), 2947-83 , , , 1983

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File: 17.01 LEGAL **rn: 1122855**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: RUS Type: REG

Subject	Specification	Descriptor
AQ	SURF	MAC
		CLASS

0.5 mg/l Hazard Class: II

Entry Date: JUL 1990 Effective Date: 1 JAN 1989

Amendment: SPNPV*, SANITARNYE PRAVILA I NORMY OKHRANY POVERKHNOSTNYKH VOD OT ZAGRIAZNENIA (HEALTH REGULATION AND STANDARDS OF SURFACE WATER PROTECTION FROM CONTAMINATION), 4630-88 , , , 1988

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File: 17.01 LEGAL **rn: 1307143**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: dinitrotoluene,2,4-
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
AIR	EMI	RQR

Summary - From a list of pollutants judged to be hazardous for which emission standards will be developed.

Entry Date: SEP 1991 Effective Date: 1985

Title: CLEAN AIR ACT, 112--NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS
Original: FEREAC, FEDERAL REGISTER, 50 , , 46290 , 1985
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 61 , 1 , 1990

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File: 17.01 LEGAL **rn: 1309260**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: DINITROTOLUENE,2,4-
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
CLASS	INDST	RQR
AIR	EMI	RQR
AQ	EMI	RQR

10 (4.54); Summary - Releases of this hazardous substance, in quantities equal to or greater than its reportable quantity (rq), reported as ølbs (kg), are subject to reporting to the national response center under the comprehensive environmental response, compensation, and liability act. (#)- rq is subject to change.

Entry Date: SEP 1991 Effective Date: 1990

Title: CERCLA: LIST OF HAZARDOUS SUBSTANCES AND REPORTABLE QUANTITIES
Original: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 302 , 4 , 1990

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File: 17.01 LEGAL **rn: 1311034**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: DINITROTOLUENE,2,4-
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
AQ		RQR

Summary - This substance is included on a list required of the EPA by the CWA section 304 of conventional pollutants requiring maximum daily effluent limitations.

Entry Date: NOV 1991 Effective Date: 1981

Title: CLEAN WATER ACT (WATER QUALITY ACT OF 1987 INFORMATION AND GUIDELINES)
Original: XCODE*, UNITED STATES CODE, 33 , , 1314 , 1990
Amendment: XCODE*, UNITED STATES CODE, 33 , , 1314 , 1990

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File: 17.01 LEGAL **rn: 1313142**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: dinitrotoluene,2,4-
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
TRNSP		CLASS
AQ	EMI	RQR
AQ	GRND	RQR
AQ	MARIN	RQR

10 (4.54) LBS (KG); Summary - For purposes of section 311 of the clean water act the following hazardous substances in quantities given shall not be discharged into or upon the navigable waters of the united states or adjoining shorelines, waters of the contiguous zone, or outer deep waters which may affect natural resources belonging to the united states.

Entry Date: SEP 1991 Effective Date: 1986

Title: REPORTABLE QUANTITIES OF HAZARDOUS SUBSTANCES; CLEAN WATER ACT, SECTION 311
Original: FEREAC, FEDERAL REGISTER, 51 , , 34547 , 1986

Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 117 , 3 , 1991

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File: 17.01 LEGAL **rn: 1324107**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
AQ	GRND	MONIT
AQ	GRND	MXL

summary - This list is required only for ground-water monitoring at RCRA land based hazardous waste disposal units. This final rule will require that an analysis of all the constituents of this list be performed on the ground water taken from wells surrounding those units. This analysis takes place when ground-water contamination is first detected, and then again once per year 40 cfr 264. When a listed constituent is found to be present a background value must be set in compliance with 40 cfr 264.98(h)(2) unless otherwise stated.

Entry Date: SEP 1991 Effective Date: 1987

Title: LIST (PHASE 1) OF HAZARDOUS CONSTITUENTS FOR GROUND-WATER MONITORING FINAL RULE: INCLUDING MAXIMUM CONCENTRATION OF CONSTITUENT: FOR GROUNDWATER PROTECTION.
Original: FEREAC, FEDERAL REGISTER, 52 , , 25947 , 1987
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 264 , , 1990

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File: 17.01 LEGAL **rn: 1325279**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REC

Subject	Specification	Descriptor
SAFTY	OCC	MXL
USE	OCC	MXL

200 mg/m3 /dinitrotoluene/

Entry Date: OCT 1991 Effective Date: JUN 1990

Title: POCKET GUIDE TO CHEMICAL HAZARDS
Original: XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 110, 1990
Amendment: XPHPAW, US PUBLIC HEALTH SERVICE PUBLICATION, 90 , 117 , 110 , 1990

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File: 17.01 LEGAL **rn: 1332247**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: benzene,1-methyl-2,4-dinitro-
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
WASTE	INDST	CLASS
STORE		RQR
TRNSP	REMOV	RQR

Summary - This chemical, if discarded, must be treated as an acute hazardous waste. Acute hazardous wastes regulations are more restrictive for exclusion. Any residue of this chemical labeled as acutely hazardous and remaining in a container, or an inner liner removed from a container, is considered a hazardous waste if discarded unless triple rinsing or other cleaning measures are taken (40 cfr 261.33e).

Entry Date: JAN 1992 Effective Date: 1980

Title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
Original: FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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File: 17.01 LEGAL **rn: 1332365**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
WASTE	INDST	CLASS

STORE		RQR
TRNSP	REMOV	RQR

Summary - This chemical, if discarded, must be treated as an acute hazardous waste. Acute hazardous wastes regulations are more restrictive for exclusion. Any residue of this chemical labeled as acutely hazardous and remaining in a container, or an inner liner removed from a container, is considered a hazardous waste if discarded unless triple rinsing or other cleaning measures are taken (40 cfr 261.33e).

Entry Date: JAN 1992 Effective Date: 1980

Title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: DISCARDED COMMERCIAL CHEMICAL PRODUCTS, OFF-SPECIFICATION SPECIES, CONTAINER RESIDUES, AND SPILL RESIDUES THEREOF.
Original: FEREAC, FEDERAL REGISTER, 45 , , 78541 , 1980
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 33 , 1990

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File: 17.01 LEGAL **rn: 1333017**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
WASTE		MPC
AQ		MPC
AQ	GRND	MPC

0.13 mg/l.; Summary - this chemical is a contaminant contained in water which may not exceed the given concentration when extracted by the procedure described in 40 cfr 261 APP II. This applies to wastes disposed of in such a manner as to allow the contaminants listed to lea ch into ground water or run off into surface waters.

Entry Date: JAN 1992 Effective Date: 1990

Title: RCRA-RESOURCE AND CONSERVATION RECOVERY ACT: MAXIMUM CONCENTRATION OF CONTAMINANTS CHARACTERISTIC OF EXTRACTION PROCESS (EP) TOXICITY.
Original: FEREAC, FEDERAL REGISTER, 55 , , 11862 , 1990
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 261 , 24 , 1990

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File: 17.01 LEGAL **rn: 1336199**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
AIR	EMI	RQR
SOIL	EMI	RQR
AQ	EMI	RQR
MANUF	EMI	RQR

Summary - Facilities that exceeded a manufacturing, importation, or processing threshold of 25,000 lbs or the use of 10,000 lbs for this chemical must report to EPA any releases of the chemical (or category chemical) to air, land, water, potw, underground injection, or off site transfer. This regulation covers standard industrial classification (SIC) codes 20-39 only).

Entry Date: OCT 1991 Effective Date: 1987

Title: SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT, TITLE III. EPCRA SECTION 313 LIST OF TOXIC SUBSTANCES
Original: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988
Amendment: CFRUS*, CODE OF FEDERAL REGULATIONS, 40 , 372 , 65 , 1988

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File: 17.01 LEGAL **rn: 1338058**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REG

Subject	Specification	Descriptor
AQ	DRINK	CLASS

summary - An EPA known or anticipated contaminant which may require regulation under the safe drinking water act of 1988 section 1412(b)(3)(a).

Entry Date: OCT 1991 Effective Date: 1988

Title: SDWA PRIORITY LIST OF DRINKING WATER CONTAMINANTS
Original: FEREAC, FEDERAL REGISTER, 53 , , 1892 , 1988
Amendment: FEREAC, FEDERAL REGISTER, 56 , , 1473 , 1991

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File: 17.01 LEGAL **rn: 1340194**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: USA Type: REC

Subject	Specification	Descriptor
AIR	OCC	TLV

Time Weighted Avg (TWA) 1.5 mg/m3, skin /dinitrotoluene/; summary - This threshold limit value is intended for use in the practice of industrial hygiene as a guideline or recommendation in the control of potential health hazards.

Entry Date: DEC 1991 Effective Date: 1989

Title: THRESHOLD LIMIT VALUES
Original: ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS, , , 11 , 1989
Amendment: ACGIH*, AMERICAN CONFERENCE OF GOVERNMENT INDUSTRIAL HYGIENISTS, , , 11 , 1991

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File: 17.01 LEGAL **rn: 1450135**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: EEC Type: REG

Subject	Specification	Descriptor
CLASS		CLASS
LABEL		RQR
PACK		RQR

Class: T - Toxic; toxic by inhalation, in contact with skin and if swallowed (r 23/24/25). Danger of cumulative effects (r 33). Label: T - Toxic; toxic by inhalation, in contact with skin and if swallowed (r 23/24/25); Danger of cumulative effects (r 33); (keep locked up and out of the reach of children (s 1/2)); after contact with skin, wash immediately with plenty of... (to be specified by the manufacturer) (s 28); wear suitable gloves (r 37); in case of accident or if you feel unwell, seek medical advice immediately (show the label where possible) (s 45). Applies to dinitrotoluene isomers. It must be stated on the label whether the substance is a specific isomer or a mixture of isomers.

Entry Date: AUG 1994 Effective Date: JAN 1994

Title: COUNCIL DIRECTIVE 67/548/EEC OF 27 JUNE 1967 ON THE APROXIMATION OF THE LAWS, REGULATIONS AND ADMINISTRATIVE PROVISIONS RELATING TO THE CLASSIFICATION, PACKAGING AND LABELLING OF DANGEROUS SUBSTANCES
Original: OJEC**, OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES, 196 , , 1 , 1967
Amendment: OJEC**, OFFICIAL JOURNAL OF THE EUROPEAN COMMUNITIES, L 13 , , 1 , 1994

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File: 17.01 LEGAL **rn: 1647168**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: IMO Type: REC

Subject	Specification	Descriptor
TRNSP	MARIN	CLASS
LABEL		RQR
PACK		

Hazard Class: 6.1 = poisonous substance. Packing group: II = medium danger (I=great danger - III=minor danger). (applies to dinitrotoluenes, solid or liquid and molten). UN Nos. 2038; 1600.

Entry Date: SEP 1994 Effective Date: 1991

Title: INTERNATIONAL MARITIME DANGEROUS GOODS CODE (IMDG CODE)
Amendment: !IMCOC*, INTERNATIONAL MARITIME DANGEROUS GOODS CODE, 26-91 , , 10076 , 1991

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File: 17.01 LEGAL **rn: 1744727**

Systematic name: Benzene,1-methyl-2,4-dinitro-
Common name: 2,4-dinitrotoluene
Reported name: 2,4-dinitrotoluene
Cas no: 121-14-2 RTECS no: XT1575000
Area: UN Type: REC

Subject	Specification	Descriptor
TRNSP		CLASS
LABEL		

PACK		

Hazard Class: 6.1 = Toxic substance. Packing group: II = medium danger. Packing method: M. (applies to dinitrotoluenes). UN No. 2038.

Entry Date: SEP 1994 Effective Date: 1993

Title: RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS
Amendment: !UNTDG*, UN TRANSPORT OF DANGEROUS GOODS, RECOMMENDATION PREPARED BY THECOMMITTEE OF EXPERTS ON THE TRANSPORT OF DANGEROUS GOODS, , , 19 , 1993

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