File No: NA/706

June 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

RED GS 3848

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA
Telephone: (61) (02) 9577-9514 FAX (61) (02) 9577-9465

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

RED GS 3848

1. APPLICANT

Clariant (Australia) Pty Ltd of 675-685 Warrigal Road CHADSTONE VIC 3148 has submitted a limited notification statement in support of their application for an assessment certificate for RED GS 3848.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data, details of the polymer composition, purity and impurities, formulation of notified chemical into products and analytical methods and spectral data have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name: Red GS 3848
Nylosan Red FGS
Nylosan Red FGS SGR

Method of Detection and Determination and Spectral Data

Reports with ^{1}H NMR, UV/Visible Absorption and IR (Infrared) spectrometric data were submitted for the identification of the notified substance.

HPLC analysis and gas chromatography determined the organic composition of the notified substance, including the main component and by-products.

The inorganic composition of the notified substance was determined by ion chromatography and argentometric titration. Water content was determined by the Karl Fischer titration method.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	Red granules
Melting Point:	Decomposition of the product above 250°C
Density:	1.44 g/cm^3 at 21°C
Vapour Pressure:	3.9 x 10^{-25} Pa at 25°C (extrapolated)
Water Solubility:	380 mg/L at 20°C
Partition Co-efficient (n-octanol/water):	log P_{ow} -1.6
Hydrolysis as a Function of pH:	> 1 year at 25°C at pH 4.0 > 1 year at 25°C at pH 7.0 > 1 year at 25°C at pH 9.0
Adsorption/Desorption:	No test data available
Dissociation Constant:	No test data available
Flash Point:	Not applicable
Autoignition Temperature:	253°C
Surface Tension:	61.4 mN/m at 22ºC

Particle Size Distribution:

< 2 µm	0.9% (by weight)
2 – 5 µm	3.1%
5 – 10 µm	4.3%
10 – 20 µm	6.0%
20 – 50 µm	7.0%
50 – 63 µm	0.5%
63 – 250 µm	67.1%
> 250 µm	11.1%

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines (European Commission, 1992a), (OECD, 1995-1996) at facilities complying with OECD Principles of Good Laboratory Practice. Full test reports were submitted by the notifier.

The maximum water solubility of the notified chemical was determined to be 380 mg/L at 20°C using the flask and HPLC column elution method (OECD TG 105).

The notified chemical was found to be hydrolytically stable at 25°C and within the environmental pH range of 4-9, by OECD TG 111.

The partition coefficient log P_{OW} of the notified chemical between n-octanol and water was estimated to be -1.6 at 20°C by the flask shaking method (OECD TG 107).

Adsorption/desorption data were not provided. The notifier indicated that the test was unnecessary given the notified chemicals low environmental release and its low likelihood of entering the soil. Also, given that the notified chemical has a low partition coefficient (-1.6) and contains nitrogen atom substituents, it would be expected to bind strongly to silicates in soils. It is not expected to bind to organic matter (Dragun J, 1988).

A dissociation constant was not provided. The notifier expects some dissociation since the notified chemical has a low water solubility and since it is a sodium salt. It would be difficult to estimate an overall dissociation constant for the notified chemical since it contains secondary and tertiary amine groups as well as phenol groups (pKa ~ 10) and two sulphonic acids groups (pKa < 2).

4. PURITY OF THE CHEMICAL

Degree of Purity:	>60%
Toxic or Hazardous Impurities:	None
Additives/Adjuvants:	None in notified chemical

5. USE, VOLUME AND FORMULATION

The notified chemical is an azo dye. It will not be manufactured in Australia but will be imported by air or sea transport from Clariant (Switzerland) Ltd, as a major component of Nylosan Red FGS SGR. Imports of the notified chemical are projected to be up to one tonne per annum for the first five years.

Nylosan Red FGS SGR is in the form of red-brown granules and will be packed in 25kg fibreboard boxes lined with plastic. The product will be used industrially by dyehouses for

dyeing wool and synthetic polyamide fibres by the exhaust dyeing method. Evidence has been submitted by the notifier to show that the dye has a fixation performance of >98%. It will not be available for use by the public.

The notifier indicates that the dyestuff will be used at 6 dyehouses.

6. OCCUPATIONAL EXPOSURE

Both the notified chemical and Nylosan Red FGS SGR have a low vapour pressure and are fine granules with the particle size mostly within the inspirable range (~8% is of respirable size, that is, < 10 μm). The notified chemical is in a non-dusting formulation. However, the effectiveness of the non-dusting additive was not provided. Therefore, the main routes of exposure to the dyestuff will be skin contact (both in dry and wet form) and inhalation of airborne aerosols.

Workers who will handle Nylosan Red FGS SGR (dyestuff) include transport workers, store workers and dyehouse workers.

Transportation
Upon arrival of the consignment (1 to 4 times per annum), workers at the receiving air or sea freight terminal will load the 25kg packages onto trucks for delivery to the Clariant warehouse. These workers will be attired with protective equipment. This is not stated, but likely to be overalls and gloves. Transport workers are unlikely to be exposed to the dyestuff unless the package is breached.

Repackaging
The notifier states that two store workers will handle the packaged product and two dye plant operators may be involved in repackaging of the dyestuff at the Clariant warehouse. The store workers duties include forklift handling of palletised packages and manual handling of individual packages. The maximum exposure for these workers is estimated as one hour, four times per year.

Occasionally, packages of the dyestuff may need to be split into smaller volumes for customers. This involves opening and re-sealing of packages and weighing of dye quantities. Two operators may be involved in this activity with exposure estimated at 30 minutes, twelve times per year. During these operations, weighing will be conducted at a weighing station that is equipped with an exhaust hood to capture dusts and workers will wear skin, eye and respiratory protection that meets the relevant Australian Standard.

End Use
Weighing and Mixing
The packs of Nylosan Red FGS SGR are distributed from the Clariant warehouse to six different dyehouses. The notifier estimates that at each dye house, a store worker and a dye operator will have potential exposure to the dyestuff.

The dye store worker is responsible for weighing the dye; the dye packages are opened and the dyestuff (approximately 2kg) is manually scooped into a weighing receptacle. Weighing

occurs at a ventilated workstation, which will capture airborne particles. As hazardous substances are also weighed at this stage, the notifier states that store workers will already be wearing skin, eye and respiratory protection that meets the relevant Australian Standard. The notifier has estimated a maximum exposure time of 30 minutes, 12 times per annum for this activity.

A dye operator will add the weighed dye batch to water in an open tank for dissolution. At this stage other dyes may be added. The dye solution is then either poured manually via a delivery chute into the dyeing machine or poured into a holding tank for pumping into the dyeing machine. The maximum estimated exposure time for this activity is 15 minutes, 50 times per annum. Skin contamination to the notified chemical in solution may occur during these operations.

Dyeing
Dyeing and fixation occur within enclosed, sealed dye machines. At this stage dye operators are involved in controlling valves to pump dyes into the machines and to remove wastewater at the end of the process. The notifier reports that these workers have no contact with dyes during this process.

Drying
Damp fabric after dyeing contains the dye in an inaccessible form as it is fixed (fixation rate of 98%) to the fabric fibres. Remaining, unfixed dye (<1ppm), is washed away in the rinse water, during the dyeing process. The damp dyed fabric exits from the dye machine in a continuous loop or onto a roller beam and enters a hydroextractor to remove the bulk of the moisture before final drying on open frames. Worker exposure to any remaining, unfixed dye present on the fabric is expected to be negligible.

The notifier states that at each of the above stages, workers will be wearing protective equipment. Prevention of skin and inhalation exposure to the dyestuff in dry or wet form for store workers and dye operators will only be achieved by the use of protective gloves, clothing, footwear, safety goggles and respiratory protection (half face respirators) that complies with the corresponding Australian Standards, in addition to the *in situ* engineering controls.

7. PUBLIC EXPOSURE

There is little potential for exposure of the public to the notified chemical, as it is not available for retail sale. The public will only come into contact with the notified chemical in finished articles made from dyed wool and synthetic polyamide fibres. At this stage the notified chemical is fixed to fibres and causes a negligible risk to public health and the sponsor states that there have been no reports of adverse effects to humans in industrial use overseas.

8. ENVIRONMENTAL EXPOSURE

Release

The bulk of the dye will become chemically fixed to textiles, and in this state is not expected to impact on the environment.

The major environmental exposure to dye will come from effluent discharge from dyehouses and their wastewater treatment systems. Other releases will be limited to traces remaining from repacking operations, clean up of spills, and from trace residues in empty packaging.

All clean up of spills and disposal of empty packaging should be carried out according to the Material Safety Data Sheet (MSDS).

- Fate

The bulk of the dye will become chemically fixed to the wool and polyamide fibres with a fixation performance of 98%, while the remainder would be rinsed into wastewater. The fate of the majority of the notified substance is linked with the fate of the textile and in this state is not expected to impact on the environment. Eventually the textile will enter the waste disposal stream for either recycling or disposal as waste in landfill. Once in the landfill sites movement of the chemical by leaching is not expected because of its low water solubility and expected high binding affinity to soil.

Dye normally released in water as effluent from the dyehouse is expected to be the major source of environmental exposure. The dye may either partition to sediment, as expected, or stay in the aqueous compartment. Any dye that binds to the sludge during the waste treatment process would be disposed of through incineration or landfill. Incineration is the preferred option because of the moderate water solubility and potential mobility of the material. Incineration of the dye will produce oxides of carbon, nitrogen and sulfur, together with sodium salts in the ash and a small amount of hydrogen chloride. Disposal by landfill will be at a secured site, so the risk of leaching to the water table is significantly reduced.

The dye was found to be slightly biodegradable. When measured as dissolved organic carbon (DOC)(OECD TG 301F) and expressed as percentage elimination, biodegradation was 13.9% over the 28-day exposure to micro-organisms from a domestic sewage treatment plant (Wurthrich V, 1994b). The dye's inherent biodegradability was a mean of 11.8% after 28 days according to the test procedure OECD TG 302C (Modified MITI Test, ([Gruztner I , 1995 #27]).

Although the dye is not readily biodegradable, the potential for bio-accumulation is low due to the low partition coefficient (log P_{OW} -1.6) and moderate water solubility of the substance. Hydrophilic dyes with log $P_{OW} < 3$ have been shown not to bio-accumulate (Yen CP Perenich TA Baughman GL, 1991). Also, biological membranes are not permeable to chemicals of very large molecular size, therefore bio-accumulation of the notified chemical, with a molecular weight of 870, is not expected (Anliker R Moser P Poopinger D, 1988) , (Gobas FAPC Opperhuizen A Hutzinger O, 1986).

Residues that persist after sewage treatment will enter marine and freshwater environments from city and country wastewater treatment systems, respectively in solution. The concentrations are expected to be very low because of the very high fixation rate in the initial process and the expected movement to sediment/sludge and the high dilution rates in the release processes. A possible route of entry of the dye to the sediment is by the precipitation of its calcium salts, as several calcium salts of sulphonic dyes are known to be insoluble at modest concentration (Weber EJ, 1991). Degradation of such dyes in sediment water systems proceeded with a half-life of 2-16 days. Accordingly, no significant increase in dissolved concentrations over time is predicted, while residues bound to sediment are expected to undergo reductive degradation.

9. EVALUATION OF TOXICOLOGICAL DATA

Tests were performed according to EEC/OECD test guidelines (European Commission, 1992b), (OECD, 1995-1996) at facilities complying with OECD Principles of Good Laboratory Practice.

The purity of the test substance used in the following studies is greater than 60%.

9.1 Acute Toxicity

Summary of the acute toxicity of RED GS 3848

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	> 2 000 mg/kg	(Daamen PAM, 1993)
acute dermal toxicity	rat	> 2 000 mg/kg	(Crouch CN, 1994)
skin irritation	rabbit	Non irritating	(Arcelin G, 1994b)
eye irritation	rabbit	Slight irritant	(Arcelin G, 1994a)
skin sensitisation	guinea pig	Non sensitising	(Daamen PAM, 1994)

9.1.1 Oral Toxicity (Daamen PAM, 1993)

Species/strain:	Rat/Wistar
Number/sex of animals:	5/sex
Observation period:	15 days
Method of administration:	Oral, gavage, 10 mL/kg bodyweight
Test method:	OECD TG 401 – limit test; EC Directive 92/69/EC
Clinical observations:	No treatment related findings
Mortality:	nil
Morphological findings:	no treatment related findings
LD_{50}:	> 2 000 mg/kg bodyweight
Result:	the notified chemical was of very low acute oral toxicity in rats

9.1.2 Dermal Toxicity (Crouch CN, 1994)

Species/strain:	Rat/HanIbm:WIST (SPF)
Number/sex of animals:	5/sex
Observation period:	15 days
Method of administration:	2 000 mg test article/kg bodyweight (4.0mL test substance dilution/kg bodyweight) applied via a syringe to the dorsal shorn skin and covered with semi – occlusive dressing for 24 hours
Clinical observations:	no clinical signs of toxicity during observation periods; minimal to slight body weight loss in one male and one female during the first week
Mortality:	nil
Macroscopic examination:	no organ abnormalities
Test method:	OECD TG 402 – limit test; EC Directive 92/69/EC
Comment:	red discolouration of the skin at the application site was evident after removal of the dressing on Day 2 in all animals

	and persisted until study termination
LD_{50}:	> 2 000 mg/kg
Result:	the notified chemical was of low dermal toxicity in rats

9.1.3 Inhalation Toxicity

Acute inhalation studies have not been conducted for the notified chemical. Claims were made and accepted for variation of schedule requirements for this toxicological end point on the basis that the substance is a super granulated preparation which is designed to be low dusting.

9.1.4 Skin Irritation (Arcelin G, 1994b)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	1 male, 2 female
Observation period:	3 days
Method of administration:	0.5 g of test material applied to intact, shorn dorsal skin and held under semi occlusive dressing for 4 hours
Test method:	OECD TG 404, EC Directive 92/69/EC
Comment:	red discolouration of the skin at the application site was evident throughout the study, the study authors indicate this did not interfere with the evaluation of skin reactions; grade 0 for erythema and grade 0 for oedema was recorded across all animals for each of the observation periods (1, 24, 48 and 72 hours post exposure)
Result:	the notified chemical was non-irritating to the skin of rabbits

9.1.5 Eye Irritation (Arcelin G, 1994a)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	1 male, 2 female
Observation period:	7 days
Method of administration:	0.1 g of the test substance was instilled in the conjunctival sac of the left eye of each rabbit, the right eye remained untreated and served as the control
Test method:	OECD TG 405, EC Directive 92/69/EC

Draize scores of unirrigated eyes:

				Time after instillation										
Animal	***1 hour***			***1 day***			***2 days***			***3 days***			***7 days***		
Cornea	No corneal effects observed.														
Iris	No iridial effects observed.														
Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***
1	*	1	-	0	0	-	0	0	-	0	0	-	0	0	-
2	*	1	-	1	0	-	1	0	-	1	0	-	0	0	-
3	*	1	-	1	0	-	1	0	-	1	0	-	0	0	-

[1] see Attachment 1 for Draize scales
o = opacity a = area r = redness c = chemosis d = discharge.
* conjunctivae not visible, red to dark red discolouration.

Comment: red to dark red staining of the conjunctivae of the treated eyes by the test substance was observed in the first 48 hours post exposure; no iridial or corneal effects were observed.

Result: the notified chemical was slightly irritating to the eyes of rabbits

9.1.6 Skin Sensitisation (Daamen PAM, 1994)

Species/strain: Guinea pig/Himalayan albino

Number of animals: test group: 20 females
control group: 10 females

Test method: OECD TG 406 –Magnusson & Kligman Maximisation Test, EC Directive 92/69/EC

Induction procedure: test animals:
Day 1: three pairs of intradermal injections (0.1 mL) into the dorsal skin of the scapular region:

- Freund's complete adjuvant (FCA) 1:1 in water for injection
- the test substance, 1% w/w in physiological saline
- the test substance at 2% w/w emulsified in a 1:1 mixture of FCA and water for injection;

Day 7 – the clipped scapular area was rubbed with 10%

	sodium dodecyl sulphate in petrolatum using a spatula; Day 8 – non-woven patch impregnated with the test substance (0.5mL of a 50% w/w in distilled water) applied to the scapular area and held under occlusive dressing for 48 hours; control animals: treated similarly to the test animals omitting the notified chemical from the intradermal injections and topical application
Challenge procedure:	test and control animals: Day 22: the shorn flank of each animal was treated with 0.05 mL of test substance (50%, 20% and 10% w/w test substance in distilled water), using Square chambers and held under semi-occlusive dressing for 24 hours
Rechallenge procedure:	test and control animals: Day 28: the shorn contralateral flank of each animal was treated with 0.05 mL of test substance (50%, 25% and 10% w/w test substance in distilled water), using Square chambers and held under semi-occlusive dressing for 24 hours
Mortality:	one test group animal was found dead on Day 14 without previously showing adverse clinical signs, at necropsy this animal was found to have clotted blood in the abdominal cavity

Challenge outcome:

Challenge concentration	Test animals		Control animals	
	24 hours*	***48 hours****	***24 hours***	***48 hours***
First Challenge				
10%	**1/19	0/19	0/10	3/10
25%	0/19	0/19	0/10	5/10
50%	1/19	1/19	1/10	5/10
Second Challenge				
10%	0/19	2/19	0/10	1/10
25%	1/19	2/19	0/10	1/10
50%	1/19	2/19	0/10	1/10

* time after patch removal
** number of animals exhibiting positive response

Comment:

Test animals:
1st challenge – two, zero and one animal showed redness in response to the 50%, 25% and 10% concentrations respectively, one animal also showed swelling in response to the 50% concentration; red/pink discolouration at the site of application made skin reading difficult in all experimental animals;
2nd challenge – two experimental animals showed red spots in response to the 50%, 25% and 10% concentrations respectively; the majority of test substance treated sites showed a red/pink discolouration, which made skin reading difficult;

Control animals:
1st challenge – five, five and three animal showed redness in response to the 50%, 25% and 10% concentrations respectively, one animal also showed swelling in response to the 25% and 10% concentrations; red/pink discolouration at the site of application made skin reading difficult in all experimental animals;
2nd challenge – one animal showed red spots in response to the 50%, 25% and 10% concentrations respectively; the majority of test substance treated sites showed a red/pink discolouration, which made skin reading difficult;

Histology:
similar skin reactions microscopically, in the experimental (50% concentration) and the control groups;

Conclusion:
skin reactions observed in the test animals were similar to

	those of control group animals and it is considered that the 50% concentration of the test substance did not induce a sensitisation reaction
Result:	the notified chemical was not sensitising to the skin of guinea pigs

9.2 Repeated Dose Toxicity (Dotti A Luetkemeir H Biedermann Pappritz G, 1994)

Species/strain:	Rat/HanIbm:WIST (SPF)
Number/sex of animals:	5/sex/low and mid dose group; 10/sex/control and high dose group
Dose/ Method of Administration/ Study Duration:	0, 50, 200 & 1 000 mg/kg bw/day (10mL/kg bw) of the test substance administered by gavage for 28 consecutive days; 14 day recovery (treatment free) period for control and high dose animals
Test method:	OECD TG 407

Clinical observations:

No clinical signs of reaction to treatment were noted. Food consumption and bodyweight gain were unremarkable. Ophthalmoscopic examinations revealed persistent pupillary membranes in two control animals and in one mid dose female and corneal opacity in one female of the high dose group. However, these findings were not considered treatment related. The death of a female rat of the high dose group on Day 28, following blood collection, was considered to be incidental and unrelated to treatment.

Clinical chemistry/Haematology/Urinalysis

Haematology and urinalysis results were unremarkable both at the end of the treatment period and the recovery period. Clinical biochemistry results displayed no changes of toxicological significance. However, statistically significant increases in aspartate aminotransferase (ASAT) and alanine aminotransferase (ALAT) levels were recorded in high dose females and significantly increased total protein levels in high dose males at the end of the treatment period. Increased ASAT and total protein levels persisted in the respective high dose animals during the recovery period.

Organ weights:

No treatment related findings.

Macroscopy/Microscopy:

No treatment related findings.

Result:
The No Observed Adverse Effect Level (NOAEL) is 1 000 mg/kg/day based on the absence of systemic toxicity or pathological effects at this level.
The No Observed Effect Level (NOEL) is 200 mg/kg/day based on the findings of increased ASAT and total protein in high dose group animals

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (Wollny HE, 1996)

Strains:	TA 1535, TA 1537, TA 98 and TA 100
Concentration range:	0, 33.3, 100, 333.3, 1 000 and 5 000 μg/plate, each concentration was tested in triplicate in two independent experiments, Experiment 1 was conducted as a plate incorporation assay, Experiment 2 was performed as a pre-incubation assay; appropriate strain specific positive control reference substances were used
Metabolic activation system:	liver fraction (S9 mix) from rats pretreated with phenobarbital and β-naphtoflavone
Test method:	OECD TG 471
Comment:	In experiment 1, moderate toxicity was observed in strains TA 1537 and TA 98 at higher concentrations of test substance in the presence and absence of metabolic activation; Overall, no significant increase in revertant colony numbers was observed in any strain either in the presence or absence of metabolic activation; concurrent positive controls used in the test induced marked increases in the frequency of revertant colonies and the activity of the S9 fraction was found to be satisfactory
Result:	the notified chemical did not show evidence of mutagenic activity in the bacterial strains tested

9.3.2 Chromosomal Aberration Assay in Chinese Hamster V79 Cell Line (Volkner W, 1996)

Cells:	Chinese Hamster V79 cell line
Metabolic activation system:	liver fraction (S9 mix) from rats pretreated with Aroclor 1254

Concentrations and Study Design:
Each concentration was tested in duplicate in two independent experiments, with chromosomes prepared 18- or 28-hours after start of treatment, as follows:

Experiment 1,
without metabolic activation:
treatment time = 18 hours, 3, 10, 30 µg/mL;
treatment time = 28 hours, 10 µg/mL;
positive control: 0.6 mg/mL ethylmethanesulfonate;

with metabolic activation:
treatment time = 18 hours, 1, 3, 30 µg/mL;
treatment time = 28 hours, 30 µg/mL;
positive control: 0.93 µg/mL cyclophosphamide;

Experiment 2,
without metabolic activation:
treatment time = 18 hours,10 µg/mL;
treatment time = 28 hours, 10, 30, 60, & 100µg/mL;
positive control: 0.6mg/mL ethylmethanesulfonate;

with metabolic activation:
treatment time = 18 hours, 3, 10, 30 µg/mL;
treatment time = 28 hours, 10 µg/mL;
positive control: 0.93 µg/mL cyclophosphamide;

Test method:	OECD TG 473

Comment:
Precipitation was observed at all test doses.
The mitotic indices were not reduced after treatment with the highest evaluated concentrations in the presence of metabolic activation.
The test substance did not cause any significant increases in the proportion of aberrant cells, at any dose level, or treatment time in the presence or absence of metabolic activation.
Positive controls used in the test caused marked increases in the proportion of aberrant cells and the activity of the S9 fraction was found to be satisfactory.

Result:
The notified chemical was not considered to be clastogenic under the conditions of this chromosomal aberration test

9.4 Overall Assessment of Toxicological Data

The notified chemical has very low acute oral toxicity (LD_{50} > 2 000 mg/kg) and low dermal toxicity (LD_{50} > 2 000 mg/kg) in rats. Acute inhalation studies have not been conducted for the notified chemical and claims were made and accepted for variation of schedule requirements for this toxicological end point, on the basis that the substance is a super granulated preparation which is designed to be low dusting. In rabbits, the notified chemical was not a skin irritant but a slight eye irritant. The notified chemical was not sensitising to guinea pig skin. The notifier reports that a number of cases of respiratory tract allergy have been traced to the sensitising effect of halogenated heterocyclic compounds inhaled in dust form, and that a similar risk cannot be ruled out for the notified chemical.

In a 28 day repeat oral dose study, the notified chemical did not exhibit evidence of systemic toxicity or pathological effects in rats. Increased ASAT levels persisted throughout the recovery period in high dose females, however, no toxicological significance is associated with these findings. The NOEL is determined at 200 mg/kg/day based on the increased ASAT and total protein levels in high dose group animals. The NOAEL is 1 000 mg/kg/day based on the absence of systemic toxicity or pathological effects at this level.

The notified chemical revealed no mutagenic activity in a bacterial test system or *in vitro* chromosome aberration test.

Based on the data submitted the notified chemical would not be classified a hazardous substance under the NOHSC *Approved Criteria for Classifying Hazardous Substances*.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has supplied the following ecotoxicity studies (Table 1). The tests were performed in compliance with OECD/EEC Test Methods and according to OECD Principles of Good Laboratory Practices.

Table 1: Ecotoxicity Test Results

Test	*Species*	*Test concentrations (nominal) mg/L*	*Results (Nominal) mg/L*
Acute Toxicity (Static Test) (OECD TG 203)	Carp (*Cyprinus carpio*)	100	96 h LC_{50} > 100
Acute Toxicity - Immobilisation (Static Test) (OECD TG 202 part I)	Water Flea (*Daphnia magna*)	24, 47 & 100	48 h EC_{50} > 36
Chronic Toxicity - Immobilisation (Static Test) (OECD TG 202 part II)	Water Flea (*Daphnia magna*)	1, 3.2, 10, 32 & 100	22 d NOEC = 1.8 22 d LOEC = 5.9
Growth Inhibition - Growth (μ) & Biomass (b) (Static Test) (OECD TG 201)	Green Algae (*Scenedesmus subspicatus*)	1, 3.2, 10, 32 & 100	<u>Experiment A</u> $E\mu C_{50}$ = 51.8 E_bC_{50} = 22.1 LOEC = 22.8 <u>Experiment B</u> $E\mu C_{50}$ = 47.7 E_bC_{50} = 13.8
Respiration Inhibition (OECD TG 209)	Activated Sludge - Aerobic Waste Water Bacteria	3.2, 10, 32, 50 & 100	3 h IC_{50} > 100

Fish (Bogers M, 1993a)

A limit test, performed in accordance with the test guidelines, demonstrated that the notified substance had no toxic effects on the test fish up to a nominal concentration of 100 mg/L. As such, the only concentration tested in the definitive study was 100 mg/L.

In the control and the test nominal concentration of 100 mg/L (measured 81-91 mg/L) all except one fish survived until the end of the test. The 96h LC_{50} for carp exposed to Red GS 3848 was greater than the nominal concentration of 100 mg/L. The report notes that the test medium was turbid and coloured dark red by the test substance, indicating that the notified dye may not have dissolved completely.

Aquatic Invertebrates (Bogers M, 1993b)

A limit test, performed in accordance with the test guidelines, demonstrated that the notified substance induced significant immobilisation of *Daphnia magna* up to a nominal concentration of 100 mg/L. This corresponded with measured concentrations of 45 to 81 mg/L. However, this effect on the mobility of *Daphnia magna* was probably due to mechanical obstruction of the ability to swim, caused by the presence of substance deposits. Under measured concentrations ranging from 24 to 47 mg/L after 48 hours exposure no immobilisation of *Daphnia magna* was observed. Hence, the EC_{50} was determined to be > 36 mg/L, the average exposure concentration.

The influence of Red GS 3848 on the reproduction and survival rate of *Daphnia magna* was investigated in a 22-day semistatic test.

1. Survival of Adults: In the control the survival rate of adult daphnia was 90 % after 22 days. At a nominal test concentration of 32 mg/L the survival rate decreased to 70% and at the highest nominal test concentration of 100 mg/L all daphnia were dead by day 9 of observation.

2. Reproduction rate: The first young daphnia released from their adult parents were recorded in the control and the nominal test concentrations of 1.0 to 10.0 mg/L by day 9 of observation. At a nominal test concentration of 32.0 mg/L the first young were observed by day 12. At the highest nominal test concentration of 100 mg/L no offspring were produced.

Taking into account the survival rates and the reproduction rates of the test animals (calculated on the basis of the alive offspring), the highest concentration of Red GS 3848 tested without significant toxic effects (NOEC) was determined to be 1.8 mg/L. The lowest concentration tested with significant toxic effects (LOEC) was determined to be 5.9 mg/L.

Algae (Memmert U, 1994)

The influence of Red GS 3848 on the growth of the green algae *Scenedesmus subspicatus* was investigated in a 72 hour static test, in two experimental parts:

1. Part A: the algae grew in test media with suspended dyestuff in Erlenmeyer flasks, each placed in a black cylinder. The cylinders were covered with glass dishes, containing untreated test water.

2. Part B: the glass dishes above the cylinders contained the coloured test media suspensions without algae. In the Erlenmeyer flasks below, the algae grew in test water without dyestuff, however, under changed light conditions due to the filter effect of the coloured test media in the glass dishes above.

The results of both experimental parts A and B are nearly identical (Table 1), which demonstrates that the observed growth inhibition effect of Red GS 3848 on *Scenedesmus subspicatus* was due to the indirect effect of light absorption in the test media. Thus, the notifier claimed on this basis that a real toxic effect of Red GS 3848 on algal cells could be excluded up to the highest tested nominal concentration of 100 mg/L.

However, it should be noted that for environmental purposes, growth inhibition whether due to either chemical or physical factors, is still of relevance. Algistatic effects may still lead to an undesirable environmental impact if exposure is continuous. Therefore, the calculated and determined EC_{50}s for algae should not be disregarded and the notified chemical can be considered as slightly toxic to algae.

Microorganisms (Wurthrich V, 1994a)

The inhibitory effect of the notified substance on aerobic wastewater bacteria (activated sludge from a domestic wastewater treatment plant) was investigated in a respiration test. The notified substance showed practically no toxic effects, with the respiration rate not inhibited when exposed to the test concentrations over the exposure period of 30 minutes, with a final 3 hour $IC_{50} > 100$ mg/L.

Conclusion

The ecotoxicity data for the notified substance indicates that it is practically non-toxic to fish, and microorganisms, and slightly toxic to aquatic invertebrates and algae.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard from the dye, when fixed to wool and synthetic polyamide fibre textiles is rated as low.

The notifier has specified that 6 dyehouses will use the notified dye. An estimation of the Predicted Environmental Concentration (PEC) is provided in the following table for a typical dying process based on 100 kg of fabric in 1500 L of water. This has been expanded from that provided in the submission.

Process or Dilution Factor	***100 kg of Fabric***
Concentration of Nylosan Red FGS used	0.5% (max)
Concentration of notified substance	0.25%
Dye fixation rate	98%
Notified substance used per batch	0.5 kg
Quantity of wash water	7500 L
Quantity of notified substance in wash water	10 g
Effluent concentration in dye-specific wash-water	0.7 mg/L
Dilution factor in dyehouse by other wash-water	1:70
Influent concentration	0.01 mg/L
Dilution factor in sewage treatment plant	1:10
Concentration balance in effluent from sewage treatment plant	1 μg/L
Dilution factor in receiving waters (river)	1:2
PEC in receiving waters	0.5 μg/L
Safety factor (EC_{50}/PEC) for exposure to most sensitive aquatic organism, *Daphnia magna* (48 h EC_{50} > 36 mg/L)	64000

Based on an annual import quantity of up to 1000 kg of the notified chemical and a dye fixation rate of 98%, up to 20 kg of the dye will be required to be processed through either industrial or sewerage waste water treatment systems over 6 different sites. The calculations above assume that no dye is removed in treatment of the different waste effluents and represent the worst case scenario for dyehouses in rural areas. Dilution factors would be considerably greater in sewage treatment plants and receiving waters (ocean) for city areas.

The only other source of environmental contamination is from accidental spills and disposal of packaging. The MSDS contains sufficient information to enable clean-up operations to limit the environmental exposure and, therefore, limit the environmental effects.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Assessment of Toxicological Hazard

The notified chemical, an azo dye, will be imported as a component of a non-dusting solid product, Nylosan Red FGS SGR. The identity of the other ingredients in Nylosan Red FGS SGR was not disclosed; however, the label states they are non-hazardous. The chemical has very low vapour pressure and the formulation presented has a high percentage (>90%) of particles beyond the respirable size range of 0 to 10 μm.

In support of their application for an assessment certificate the notifier provided toxicological studies. The notified chemical has very low acute oral toxicity (LD_{50} > 2 000 mg/kg) and low dermal toxicity (LD_{50} > 2 000 mg/kg) in rats. Acute inhalation studies have not been conducted for the notified chemical and claims were made and accepted for variation of schedule requirements for this toxicological end point, on the basis that the substance is a super granulated preparation which is designed to be low dusting. In rabbits, the notified chemical was not a skin irritant but a slight eye irritant.

The notified chemical was not sensitising to guinea pig skin. The notifier reports that a number of cases of respiratory tract allergy have been traced to the sensitising effect of halogenated heterocyclic compounds inhaled in dust form, and that a similar risk cannot be ruled out for the notified chemical. This warning is also contained in the notifier's MSDS for Nylosan Red FGS SGR.

In a 28 day repeat oral dose study, the notified chemical did not exhibit evidence of systemic toxicity or pathological effects in rats. Increased ASAT and total protein levels persisted throughout the recovery period in high dose females; however, no toxicological significance is associated with these findings. The NOEL is determined at 200 mg/kg/day based on the increased ASAT and total protein levels in high dose group animals. The NOAEL is 1 000 mg/kg/day based on the absence of systemic toxicity or pathological effects at this level.

The notified chemical revealed no mutagenic activity in a bacterial test system or *in vitro* chromosome aberration test.

Based on the toxicological data submitted the notified chemical would not be classified a hazardous substance under the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999).

The notifier reports that to date, no occurrences are known of injuries or diseases that are related to workers having been exposed to the notified chemical (or Nylosan Red FGS SGR).

Occupational Health and Safety

The potential for respiratory sensitisation is of concern, however, the notified chemical has low vapour pressure and is presented in a low dusting form. Consequently, during normal industrial use, inhalation exposure is expected to be low and skin contamination is expected to be the main route for occupational exposure.

Air/Sea Freight Terminal Workers and Drivers

The health risk for freight workers and drivers is expected to be negligible as long as the package remains intact and repeated exposure does not occur. The MSDS recommends that spillage of Nylosan Red FGS SGR should be collected mechanically in a manner that avoids generating dust. Personnel involved in a clean-up should wear suitable eye, respiratory and skin protective equipment.

Storeworkers and Dye Operators

Storeworkers and dye operators have potentially the highest exposure to the notified chemical. The potential for respiratory sensitisation dictates that effective control measures operate in the weighing and blending areas. The notifier states that local exhaust ventilation is provided at the weighing station. Inhalation toxicity data are not available for the notified chemical. The chemical is produced as a granule, reportedly in a non-dusting formulation. However, as no further details were provided, it must be assumed that dust may be generated. As there is potential for inhalation exposure, the level of dust in the workplace should be controlled to as low as reasonably achievable. Given that atmospheric monitoring cannot be related to the health effects anticipated, that is, respiratory sensitisation, personal protective equipment is required to be worn. Good hygiene and work practices are required in these areas to minimise the generation and subsequent settling of dusts on work surface areas and floors; this is also recommended in the MSDS for Nylosan Red FGS SGR. The notifier indicates that workers will be wearing respiratory protection[1], gloves, and overalls to minimise exposure, therefore the risk of adverse health effects for these workers is expected to be low.

Health surveillance for workers involved in these activities may identify early adverse effects and will allow for preventive measures to be enacted to prevent further adverse effects. The MSDS for Nylosan Red FGS SGR recommends that sensitised workers should be moved to another workplace.

After dyeing, the notified chemical is fixed (fixation rate of 98%) to the textile fibres. Residual, unfixed dye (<1ppm), is washed away in the rinse water, during the dyeing process. Under these circumstances the notified chemical is essentially unavailable for skin contamination and exposure and any subsequent risk of adverse health effects is expected to be negligible.

Public Health

There is negligible potential for public exposure to the notified chemical arising from its use by dye houses for dyeing wool and synthetic polyamide fibres. There will be public contact with the notified chemical when incorporated into dyed wool and synthetic fibres, but at this stage the notified chemical is fixed to fibres and causes a negligible risk to public health.

[1] Although not specifically mentioned by the notifier, a half-face respirator is appropriate.

13. RECOMMENDATIONS

To minimise occupational exposure to RED GS 3848 the following guidelines and precautions should be observed:

- Workers receive regular education and training on handling techniques, good hygiene practices and potential adverse health effects associated with hazardous substances used in dyeing.

- As potential for respiratory sensitisation exists the notifier's MSDS should be provided to the authorised medical practitioner responsible for health surveillance in the workplace. Sensitised persons should be transferred to another workplace.

- A copy of the MSDS should be easily accessible to all employees.

- Respiratory protection to conform to Australian/New Zealand Standard 1715-1994 (Standards Australia/Standards New Zealand, 1994a): *Use and Maintenance of Respiratory Protective Devices* and Australian/New Zealand Standard 1716-1991(Standards Australia/Standards New Zealand, 1994b): *Respiratory Protective Devices*.

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337(Standards Australia/Standards New Zealand, 1992) and industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987). Impermeable gloves or mittens should conform to AS 2161 (Standards Australia, 1998) and all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994c).

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly and in accordance with the recommendations listed in the notifier's MSDS;

If the conditions of use are varied from the notified use, greater exposure of the public to the product may occur. In such circumstances, further information may be required to assess the hazards to public health.

14. MATERIAL SAFETY DATA SHEET

The MSDS for RED GS 3848 was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

Anliker R Moser P Poopinger D. (1988). Bioaccumulation of Dyestuffs and Organic Pigments in Fish. Relationships to Hydrophobicity and Steric Factors. *Chemosphere*, **17,** 1631-1644.

Arcelin G. (1994a). Primary Eye Irritation Study with RED GS 3848 in Rabbits. Research and Consulting Company Ltd.: Itingen.

Arcelin G. (1994b). Primary Skin Irritation Study with RED GS 3848 in Rabbits. Research and Consulting Company Ltd.: Itingen.

Bogers M. (1993a). 96-hour Acute Toxicity Study in the Carp with RED GS 3848. NOTOX B.V: 's-Hertogenbosch.

Bogers M. (1993b). Acute Toxicity Study in the *Daphnia magna* with RED GS 3848. NOTOX B.V: 's-Hertogenbosch.

Crouch CN. (1994). Assessment of Acute Dermal Toxicity with RED GS 3848 in Rats. Research and Consulting Company Ltd.: Itingen.

Daamen PAM. (1993). Assessment of Acute Oral Toxicity with RED GS 3848 in the Rat. NOTOX BV: 's-Hertogenbosch.

Daamen PAM. (1994). Conatct Hypersenitivity to RED GS 3848 in the Albino Guinea Pig (Maximisation Test). NOTOX B.V: 's-Hertogenbosch.

Dotti A Luetkemeir H Biedermann Pappritz G. (1994). Sub Acute 28-Day Oral (Gavage) Toxicity with RED GS 3848 in the Rat. Research and Consulting Company Ltd.: Itingen.
Dragun J. (1988). *The Soil Chemistry of Hazardous Materials*.

European Commission. (1992a). European Commission Directive 92/69/EC , Annex V, Part A Methods for Determination of Physico-Chemical Properties: Brussels.

European Commission. (1992b). European Commission Directive 92/69/EC , Annex V, Part B: Brussels.

Gobas FAPC Opperhuizen A Hutzinger O. (1986). Bioconcentration of Hydrophobic Chemicals in Fish: Relationship with Membrane Permeation. *Environmental Toxicology and Chemistry*, **5,** 637-646.

Memmert U. (1994). Toxicity of RED GS 3848 to *Scenedesmus subspicatus* in a modified algal growth inhibition test for dyestuffs. RCC Umweltchemie GmbH.: Rossdorf.

NOHSC. (1994). *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*. Australian Government Publishing Service: Canberra.

NOHSC. (1999). *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]*. Australian Government Publishing Service, Canberra.

OECD. (1995-1996). *OECD Guidelines for the Testing of Chemicals on CD-Rom*. Organisation for Economic Co-operation and Development, (OECD).: Paris.

Standards Australia. (1987). *AS 2919-1987, Australian Standard Industrial Clothing*. Standards Australia: Sydney.

Standards Australia. (1994). *AS 1336-1994, Australian Standard Eye protection in the Industrial Environment*. Standards Australia: Sydney.

Standards Australia. (1998). *AS/NZS 2161.2:1998, Australian/New Zealand Standard Occupational Protective Gloves Part 2: General Requirements*. Standards Australia and Standards New Zealand: Sydney/Wellington.

Standards Australia/Standards New Zealand. (1992). *AS/NZS 1337-1992, Australian/New Zealand Standard Eye Protectors for Industrial Applications*. Standards Australia and Standards New Zealand: Sydney/Wellington.

Standards Australia/Standards New Zealand. (1994a). *AS/NZS 1715-1994, Australian/New Zealand Standard Selection, Use and Maintenance of Respiratory Protective Devices*. Standards Australia and Standards New Zealand: Sydney/Wellington.

Standards Australia/Standards New Zealand. (1994b). *AS/NZS 1716-1994, Australian/New Zealand Standard Respiratory Protective Devices*. Standards Australia and Standards New Zealand: Sydney/Wellington.

Standards Australia/Standards New Zealand. (1994c). *AS/NZS 2210-1994, Australian/New Zealand Standard Occupational Protective Footwear*. Standards Australia and Standards New Zealand: Sydney/Wellington.

Volkner W. (1996). Chromosome Aberration Assay in Chinese Hamster V79 Cells *in vitro* with RED GS 3848. Cyotest Cell Research GMBH & Co.: Robdorf.

Weber EJ. (1991). Studies of Benzidine-Based Dyes in Sediment-Water Systems. *Environmental Toxicology and Chemistry*, **10,** 609-618.

Wollny HE. (1996). *Salmonella typhimurium* Reverse Mutation Assay with RED GS 3848. Research and Consulting Company Ltd.: Itingen.

Wurthrich V. (1994a). Assessment of the Acute Toxicity of RED GS 3848 on Aerobic Waste Water Bacteria. RCC Umweltchemie AG: Itingen.

Wurthrich V. (1994b). Ready Biodegradability: Manometric Respirometry Test for RED GS 3848. RCC Umweltchemie AG: Itingen.

Yen CP Perenich TA Baughman GL. (1991). Fate of Commercial Disperse Dyes in Sediments. *Environmental Toxicology and Chemistry*, **10,** 1009 - 1017.

Attachment 1

The Draize Scale for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
		Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
Diffuse beefy red	3 severe	Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe