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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME
(NICNAS)**

FULL PUBLIC REPORT

Polymer in Revolution

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**Director
NICNAS**

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FULL PUBLIC REPORT**Polymer in Revolution****1. APPLICANT AND NOTIFICATION DETAILS**

APPLICANT(S)

BASF Australia Ltd, ABN: 62 008 437 867

Kororoit Creek Road

Altona VIC. 3018

Nuturf Pty. Ltd., ABN: 30 000 425 927

Unit B2 Lidcombe Business Park 3-9 Birnie Avenue

Lidcombe, N.S.W.

NOTIFICATION CATEGORY

Polymer of Low Concern

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication:

Identity details

Polymer details

Import volume

Alternative trade name

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Variation to the schedule of data requirements is claimed as follows:

Water Solubility

Particle Size Distribution

Melting Point

Density

Flammability Limits

Autoignition Temperature

Explosive Properties

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None

NOTIFICATION IN OTHER COUNTRIES

Canada, China, Korea, Philippines, PMN to USA in September 2002

2. IDENTITY OF CHEMICAL

MARKETING NAME(S)

Polymer in Revolution

3. COMPOSITION

PLC CRITERIA JUSTIFICATION

Contains no moderate/high concern functional groups.

*Criterion**Criterion met
(yes/no/not applicable)*

Molecular Weight Requirements	Yes
Functional Group Equivalent Weight (FGEW) Requirements	Yes
Low Charge Density	Yes
Approved Elements Only	Yes
Stable Under Normal Conditions of Use	Yes
Not Water Absorbing	Yes
Not a Hazard Substance or Dangerous Good	Yes

The notified polymer meets the PLC criteria.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

The product will be imported by sea as a component of two separate products: 1) A liquid product, which contains <90% of the notified polymer; and 2) a granular product, which contains <10% of the notified polymer.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	1-10	10-20	< 50	< 50	< 50

USE

The formulations containing the notified polymer are applied to bowling and golf greens as a surfactant for optimisation of grass root zone moisture and maintenance of turf performance.

5. PROCESS AND RELEASE INFORMATION

5.1. Operation Description

No manufacture or reformulation of the product containing the notified polymer will occur in Australia.

Transport and Storage

The liquid product containing the notified polymer will be transported in 2 x 10 litre plastic bottles within an outer fibreboard carton and/or 208 L plastic drums. The granular product will be imported in a heavy-duty paper sack with an inner plastic lining (pack size 22.7 kg).

The imported products will be transported by road to the main distributor warehouse (in N.S.W.) and subsequently distributed to sales branch warehouses around Australia as required.

End Use

The product will be used at both bowling greens and golf course greens (not the whole golf course). The notified polymer can be applied in two ways:

- 1) The liquid product containing the notified polymer is decanted manually to a feeder tank/reservoir for the boom-sprayer. The product is further diluted by water at the dilution rate recommended on the label; and
- 2) The granulated product is added to a rotary granule spreader by manual pouring.

In both cases the products are applied to the golf course greens and/or bowling greens using a boom-sprayer and rotary granule spreader for the liquid and granular product, respectively.

6. EXPOSURE INFORMATION

6.1. Summary of Occupational Exposure

Transport and Storage

During transport and storage, workers are unlikely to be exposed to the notified polymer except when packaging is accidentally breached.

Application

Workers may be exposed to the liquid or granular formulation containing the notified polymer when opening the container/paper sack, loading (<100% notified polymer) into the applicant equipment, and in the case of using the boom sprayer mixing the formulation containing the notified polymer with water. The main routes of exposure are ocular and dermal. Exposure to dust generated from the granules may occur.

Applicators are expected to wear goggles or a facial splash shield, chemical resistant gloves, coveralls or long sleeved shirt, long pants, and shoes.

During boom spraying the spray nozzles are directed downwards towards the turf and hence direct exposure to spray aerosols is minimised and is likely to occur at low concentrations of the notified polymer

During granular spreading, workers are expected to wear skin and eye protection as specified on the label. The applicator automatically spreads the granules around the turf; hence workers are not expected to come into contact with the granules unless during intentional handling of the granules.

6.2. Summary of Public Exposure

The notified polymer will not be sold to the public. The notified polymer is for industrial use only. However, potential exposure to the public will be widespread due to the end-use pattern on golf courses and bowling greens.

Negligible exposure to the notified polymer by the public is predicted during normal application operations. This is because the products containing the notified polymer will be typically used once a month at each end site when the public are not using the turf/green - so limiting public exposure to the notified polymer.

Water contamination is not expected as the products containing the notified polymer are sprayed on to the bowling and golf course greens and not into watercourses. Residual polymer will be recycled through the boom sprayer or rotary spreader.

6.3. Summary of Environmental Exposure

6.3.1. Environmental Release

The product containing the notified polymer will be imported and no reformulation of the product will occur in Australia. Thus there will be no environmental exposure associated with this process.

The product is used as a surfactant designed specifically for optimisation of grass root zone moisture and maintenance of turf performance. Release of the notified polymer from this use is considered to be extensive as a result of its use on golf course greens or bowling greens. In the case of incidental spillage, such spillage will be contained and soaked up with absorbent material before being disposed of by incineration or landfill by approved operators. Small spills will be flushed away. For the granular material, this will be swept up and disposed of by incineration or approved landfill.

It is estimated that the maximum residues in the empty drums and small plastic bottles will amount to approximately 1%. It is expected that the drums and plastic bottles will be rinsed out and the rinsate will be added to the boom sprayer tank. It is estimated that the maximum residues in the empty paper sack will be about 1% and that these paper sacks will be disposed of by landfill.

Based on application rates as recommended by the notifier and the concentration of the notified polymer in the products, it is estimated that the application rates correspond to approximately 150 g notified polymer/100 m² for both formulations. This is equivalent to 15 kg notified polymer/ha.

According to the submitted labels, the products are applied monthly and irrigation should be applied before the next mowing to enhance product movement into the soil.

6.3.2. Environmental Fate

The notified polymer can be described as a modified alkylated polyol. It is soluble in water and considered only partially biodegradable. On the basis of water solubility, the notified polymer is likely to be mobile in soils, and should work its way into the grass root zone and below (see, however, comments on the Ready Biodegradation test below). The notified polymer should not hydrolyse (due to the lack of suitable functionality) but is expected to slowly degrade into oxides of carbon and water. Incineration of the notified polymer will result in the generation of water vapour and carbon dioxide. The notified polymer's high molecular weight will preclude absorption across biological membranes and thus it is unlikely to bioaccumulate.

7. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa	Clear to slightly hazy colourless liquid with a slight odour.
Melting Point/Glass Transition Temp	-7 °C (liquid product containing the notified polymer)
Density	1020 kg/m ³ at 23°C (liquid product containing the notified polymer).
Water Solubility	Soluble or miscible up to 5% by weight in the mixture The notified polymer and de-ionised water were weighed to obtain mixtures of different concentrations and stirred for 15 minutes. The solubilities of the different concentrations were assessed visually. After 24 h at 22-24°C the mixtures were found to be clear up to 5% by weight of the polymer (those of 3.4 and 4.8% were initially opaque and cloudy respectively). At higher concentrations the mixtures were very cloudy (up to 20%) or cloudy (up to 25% by weight). Above these levels the mixtures were clear at all times. These results indicate that the polymer is soluble or miscible up to 5% by weight in the mixture. Emulsions occurred thereafter, with miscibility above 25% by weight.
Reactivity	Stable under normal environmental conditions.
Degradation Products	None under normal conditions of use.

8. HUMAN HEALTH IMPLICATIONS

8.1. Toxicology

No toxicological data were submitted.

8.2. Human Health Hazard Assessment

The notified polymer meets the PLC criteria and can therefore be considered to be of low hazard.

9. ENVIRONMENTAL HAZARDS

9.1. Ecotoxicology

The following toxicological studies were submitted:

<i>Endpoint</i>	<i>Result and Conclusion</i>
Ready Biodegradability (Modified Sturm test - OECD 301B).	The notified polymer is considered only partly biodegradable and eliminated.

Fish Toxicity [derived from literature (Madsen <i>et al.</i> , 2000)]	LC50 >100 mg/L
Aquatic Invertebrates Toxicity [derived from literature (Madsen <i>et al.</i> , 2000)]	EC50 >100 mg/L
Algal Toxicity [unicellular green algae (<i>Desmodesmus subspicatus</i>)] (EEC Directive 92/69/EEC and DIN 38412 Part 9).	EC50 >100 mg/L

9.1.1. Discussion of observed effects

A full test report is available for the Ready Biodegradation test, which was performed as a combination dissolved organic carbon (DOC) removal/CO₂ evolution test. This allows both the prediction of biodegradation and abiotic removal such as adsorption to sludge. The notified polymer degraded 30-40% within the 28 days' test duration, not meeting the 60% pass level even though the 10 days window (60% reached within 10 days of reaching 10%) is not applicable due to it being a surfactant. This is in line with the literature which indicates the high molecular weight of the copolymers increases the time needed for biodegradation, which proceeds by terminal attack only (Madsen *et al.*, 2000). The reference substance (aniline) was >60% biodegraded after 14 days (about 85%), thus validating the test, and the inhibition control was >25% degraded (about 36%), indicating the test substance is not inhibitory to microorganisms at a test concentration of 34 mg/L. Finally DOC removal was 50-60% after 28 days, indicating that some of the notified polymer had been removed by adsorption in addition to being degraded.

A two-page summary of the notified polymer's toxicity to algae was provided. The notified polymer's toxicity to algae was determined in the concentration range 0.01-100 mg/L and indicated an EC50 >100 mg/L in comparison with the untreated control after 72 h exposure. The EC10, EC50 and EC90 were all >100 mg/L based on the inhibition of the cell division of the algae, with no inhibition (maximum of -3.82%) observed at up to 100 mg/L. The NOEC is 100 mg/L.

The toxicities to fish and aquatic invertebrates are based on literature values for block copolymers similar to the notified modified alkylated polyol (Madsen *et al.*, 2000). This reference indicates such polymers are some of the least toxic types of non-ionic surfactants. In spite of their limited biodegradability, such polymers are generally not considered to cause adverse effects in aquatic environments at concentrations <100 mg/L.

9.2. Environmental Hazard Assessment

The available toxicity data indicate that the notified polymer is not expected to be toxic to fish, aquatic invertebrates and algae at a level of 100 mg/L. Based on the acute toxicity data for algae, with the NOEC = 100 mg/L, and taking into consideration an assessment factor of 100, the PNEC is determined to be 100 mg/L/100 = 1 mg/L.

10. RISK ASSESSMENT

10.1. Environment

The potential environmental risk from the end use of the notified polymer could arise from spray drift or run-off from golf course and bowling greens and effects on soil dwelling organisms. Runoff of the notified polymer may expose water bodies to the toxic effects of the notified polymer in the case of rainfall events. For the present application, the worst case treatments are expected to be to golf course greens with runoff likely going into storage dams and water features.

Aquatic risk

As the liquid product is applied by boom sprayer, there is a likelihood of spray drift that may find its way to a greenside water feature despite the expected coarse spray droplets. At the rate of 15 kg/notified polymer/ha, a direct over spray over a single pond of 30 cm depth would result in an EEC of 5 mg/L. Since there is ground application only this situation is unlikely, and taking into account a worst case of 10% spray drift the EEC is determined to be 0.5 mg/L. The risk quotient Q is calculated as shown in Table 1.

Golf greens make up a small proportion of the overall course. Assuming that the average size of a golf

course is 10 ha with 18 greens each of 600 m² (on average), the area of the course that could potentially be treated with the notified polymer is 10800 m² (10.8% of total area). Within the course there are likely to be localised catchment areas, and assuming 5 greens lying within the 3 ha catchment area around a single pond of 0.5 ha are treated, this would result in an average treated area of 0.3 ha (0.06 ha/green). Assuming a worst case, after application of the notified polymer [0.15 kg notified polymer/100 m²] to turf (3000 m² of a 3 ha catchment area), 10% runs off into a 30 cm deep water body with a surface area of 0.5 ha, the expected environmental concentration (EEC) is 0.27 mg/L (0.15 kg X 30/5000 X 0.30 X 1000 L). The risk quotient arising from this is summarised in Table 1.

Table 1: Risk quotient in run-off scenario for the notified polymer

Species	Test duration	PNEC (mg/L)	Risk quotient (Q = EEC/PNEC) at 10% run-off	Risk quotient (Q = EEC/PNEC) at 10% spray drift
Fresh water unicellular alga (<i>Scenedesmus subspicatus</i>)	72 h	1 mg/L	Q = 0.27	Q = 0.5

Both Q values are <1, indicative of an acceptable risk under both run-off and spray drift scenarios. It is likely that residues in run-off would be at a lower percentage, or diluted to a greater extent than this. Consequently, it is assessed that the risk of harmful effects from run-off and spray drift is acceptable. Thus there is unlikely to be an environmental risk to aquatic organisms under the proposed use pattern.

Risk to soil organisms

Due to the use of these types of modified polyols primarily in laundry detergents, the notifier indicated that testing in the soil compartment was not considered relevant or necessary. Consequently no toxicity data was submitted by the notifier for the risk assessment of the notified polymer in soil. If it is assumed the notified polymer is mixed evenly in the top 10 cm of soil, at an application rate of 15 kg/ha the concentration in soil, assuming a soil density of 1.4 kg.m³, is 10.7 mg/kg soil.

This is a relatively high soil concentration. However, since the notified polymer is of low toxicity to aquatic organisms, it may be assumed that the toxicity to soil dwelling organisms, particularly to the relatively insensitive earthworm, is also likely to be low. No effects were noted on micro-organisms in the Ready Biodegradation test above at 34 mg/L. Further, only relatively small areas of a golf course are expected to be treated, expected to contain a relatively narrow range of soil dwelling organisms, and any adverse impacts are likely to be overcome by re-colonisation from non-treated areas once levels of the notified polymer dissipate. Thus the notified polymer is unlikely to pose an unacceptable environmental risk to soil dwelling organisms.

10.2. Occupational Health and Safety

Considering that the notified polymer is considered to be of low hazard and that workers involved loading, mixing and application will wear personal protective equipment, exposure to the notified polymer is not expected to be of occupational health and safety concern.

The product containing the notified polymer will be used outdoors and not in an enclosed space, therefore, any potential inhalation exposure will be minimal. Additionally, the boom spray is close to the turf below head height with the worker operating the sprayer in front of the boom sprayer so further minimising any potential inhalation/dermal/ocular exposure.

10.3. Public Health

The products containing the notified polymer will not be available to the public. Members of the public may make dermal or ocular contact with products containing the notified polymer only under specific circumstances, i.e., during the spraying of bowling or golf greens although during normal use and handling of the notified polymer this is assessed as highly unlikely.

The risk to public health is assessed as low because the notified polymer is present at relatively

low concentrations (liquid product is diluted 1 in 43 parts with water, granular product contains <10% notified polymer) and given the notified polymer's high molecular weight is not expected to cross biological membranes and so be absorbed.

11. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

11.1. Environmental Risk Assessment

The notified polymer is not considered to pose a risk to the environment based on its reported use pattern

11.2. Human Health Risk Assessment

11.2.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

11.2.2. Public health

There is No Significant Concern to public health when used in the proposed manner.

12. MATERIAL SAFETY DATA SHEET

12.1. Material Safety Data Sheet

The notifier has provided MSDS as part of the notification statement. The accuracy of the information on the MSDS remains the responsibility of the applicant.

13. RECOMMENDATIONS

CONTROL MEASURES

Occupational Health and Safety

- No specific engineering controls, work practices or personal protective equipment are required for the safe use of the notified polymer itself, however, these should be selected on the basis of all ingredients in the formulation.
 - Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.
- In the interest of occupational health and safety, the following guidelines and precautions should be observed for use of the notified polymer as introduced and during application as [polymer in Revolution]:
 - Adequate induction and training programs for ground maintenance staff on the correct handling of the notified polymer as introduced and the use of application equipment.
 - Do not breathe spray
 - Avoid direct exposure to spray drift
 - Wear suitable protective clothing, gloves and eye protection
 - If dust is generated, wear a dust mask
- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified polymer are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

Disposal

- The notified polymer should be disposed of by incineration or landfill.

Emergency procedures

- Pick up spills with suitable absorbent material. Dispose of absorbed material in accordance with regulations.

13.1. Secondary Notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

- (1) Under subsection 64(1) of the Act; if
 - the notified polymer is introduced in a chemical form that does not meet the PLC criteria.

or

- (2) Under subsection 64(2) of the Act:
 - if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

Reference:

Madsen T *et al* (2000) Environmental and Health Assessment of Substances in Household Detergents and Cosmetic Detergent Products. Environment Project No. 615, CETOX, Danish EPA.
<http://www.mst.dk/udgiv/publications/2001/87-7944-596-9/pdf/87-7944-597-7.pdf>