

## TURF WARS: SPORTS TURF AS A HAIL AND THE CHALLENGE FOR LOCAL GOVERNMENT

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### Introduction

Under Section 30 of the Resource Management Act (RMA), Canterbury Regional Council (Environment Canterbury) is required to maintain a database of sites which are known to have been used for hazardous activities. Hazardous activities are defined by the Ministry for the Environment (MfE) on the Hazardous Activities and Industries List (HAIL) and recently “Sports Turf” was added to the list because of the potential application of persistent pesticides and other sports turf treatment chemicals. The HAIL does not specify the types of sports turf that are included within this definition and therefore ambiguity exists around which type of sports turf should be included on Environment Canterbury’s database (Listed Land Use Register). Types of sports turf include:

- Golf courses;
- Bowling greens;

- Public sports fields;
- Parks;
- School sports grounds;
- Tennis courts;
- Cricket pitches; etc.

### **Objective of the Study**

The objective of the study was to investigate sport turf practices and to identify which sports turf sites justify their inclusion on the HAIL.

### **Scope of Work**

To provide specialist knowledge of the sports turf industry and its practices, Geoscience Consulting (NZ) Ltd teamed with Renovate Turf Consultants who provided a detailed insight into past and current practices used to manage sports fields. The study included:

- Definition of sports turf including a list of the types of sites where turf is maintained;
- Identification of potential contaminants which could have been used for the different sports use type;
- Prioritisation of the types of site identified; and
- Identification of sources of information to allow site identification.

### **Definition of Sports Turf**

For this study “sports turf” is defined as:

*“A playing surface for a particular sport that features grasses which have been selected and managed such that they provide a resilient, close knit surface and playing characteristics appropriate for that particular sport.”*

The study focused on natural sports turf as opposed to artificial turf which requires less chemical management and is a relatively recent addition to the sports turf industry.

## **Principles of Natural Sports Turf Management**

It is the aim of turfgrass management to maximise the health of the plant such that it is capable of tolerating wear from the type of use that is unique to the sport. To achieve this, the various stages of the lifecycle of the surface need to be considered and each have their own management requirements, including:

- Establishment of the site involving frequent fertiliser application, irrigation, mowing, weed and disease control;
- Continued management including;
  - Weed control;
  - Fertiliser application;
  - Moss and algae control;
  - Pest control; and
  - Disease control.

Note that the actions above are tailored to the type of surface being provided and the sport being played. Demands are placed on the sports turf manager to ensure that the sports turf is not only suitable for the sport but is also aesthetically appealing.

## **Chemicals Used for the Management of Sports Turf**

Treatment chemicals were split into the following groups:

- Currently used:
  - Herbicides, algaecides and moss control;
  - Fungicides;
  - Insecticides; and
  - Growth regulators.
- Historically used:
  - Organochlorine pesticides;
  - Organophosphates;
  - Heterocyclic organic compounds;
  - Triazine herbicides;
  - Bipyridinium herbicides; and

- Other banned persistent organic pollutants (POPs).

### **Sports Turf Chemical Use in Canterbury**

A number of sports clubs and district councils were contacted in the Canterbury area for information on the use of chemicals on different playing surfaces. Requests were made for the types of grass which are present, chemicals used, application rates and the occurrence of any particular problems.

Information returned was variable in quality and volume, and only recent data was provided due to either lack of historic records or the time to access that information. In general, the following was indicated:

- Bowling Greens – Comprise mainly maniototo weed and chemical treatment is dependent on problems encountered;
- Golf Courses – Different grasses for different playing surfaces, rough made up of Paddock grass, and greens / fairways use Fescue, Poa or Bent grasses. Treatment is related to identified problems and products available;
- Councils – District Councils are responsible for the management of a wide variety of playing surfaces including rugby, football, tennis, croquet, hockey, cricket and open park land. Grass species used are generally amenity turf ryegrass blends. Application of chemicals is associated with identified problems using currently available products. The following were reported to have been used:
  - Pesticides: Diazinon, Suscon Green, Diazol, Endosulphan, Namacure and Chlorpyrifos;
  - Herbicides: Triclopyr, Pichloram, Versitil, 2-4D Dicamber, MCPA (2-methyl-4-chlorophenoxyacetic acid);
  - Fungicides: Pentachlorophenol (PCPs) would have been used 10-15 years ago especially in areas of fine turf (golf greens, fairways and bowls) for moss removal. Fungicides are still applied but no names were given.

## Environmental Fate of the Chemicals

The table below considers the major pathways in which chemicals used on a site may be transported and their likely fate:

**Table 1: Summary of pathways, the possible fate and potential risks from the application of sport turf treatment chemicals**

Potential transport mechanism	Potential fate of the chemical	Potential risk
Air	Spray drift during application and volatilisation once applied.	Risk to site users considered high if site is used directly following application. Risk of inhalation would reduce relatively quickly with time. Concentration of chemical in application would also have an impact on the risk. Area immediately surrounding the sports turf surface could be impacted with spray drift and therefore adjacent sites should be considered.
Surface Water	Spray drift directly into surface water courses. Runoff into local surface water courses following a rain event or over application / irrigation.	High risk of impact to surface water adjacent to the sports turf if rain event or irrigation follows application. Impact severity would depend on the chemical used, concentration and application. Risk may reduce with time as chemicals either volatilise, naturally break down or become less mobile through absorption to the soil. Further downstream impacts could also be seen dependant on the factors indicated above.
Groundwater	Leaching of chemical through soils and into underlying groundwater.	Risk dependant on the chemical's solubility, soil infiltration / absorption characteristics, application concentration, depth and sensitivity of the groundwater. Migration could lead to off-site impacts or contamination of drinking water sources.
Soil	Many sports turf chemicals have low solubility and an affinity to bind with soil particles.	Greatest risk from direct contact with treated soils or inhalation of dust generated from impacted soil. Level of risk is directly related to chemical used, application rate and concentrations, and time since last application.

Table 1 highlights that the level of risk posed by the chemicals is dependent on the chemical used, the application rate and methodology, the concentration and the potential exposure to the chemical. Exposure to the chemical could impact the surrounding environment and humans through direct contact with the treated soil or inhalation of the dust. Ingestion of the soil is not considered to be a significant exposure route given the use of the site as sports turf. The impact on the surrounding environment of the chemicals typically used on sports turf is also difficult to assess due to the diverse environments where sports turf sites are situated.

**Risk Ranking**

A list of current and historically used sport turf chemicals was prepared. The perceived hazard that these chemicals may pose was ranked by calculating the ratio between the toxicity of a chemical (LD<sub>50</sub> in mammals) and its reported persistence in the environment.

Not unexpectedly, the risk ranking indicated that chemicals which may have been used on the sites in the past, but are now banned, were determined to have the highest risk. A number of chemicals that were identified during discussions with one sports turf groundsman as being currently or recently been in use, also returned high rankings and these included endosulphan, diazanon and chlorpyrifos.

To put the risk from the chemicals into perspective, a number of potential scenarios were developed which considered how site users (identified as the receptor most at risk) could be exposed to the contamination if present. Sports which include direct skin contact with the soils such as rugby and football were considered to pose the most risk. Chemical usage on golf courses and bowling greens may be greatest when compared to other natural turf surfaces, but the exposure risk is likely to be lower as there is limited direct skin contact with the soils at those sites. Table 2 provides further information on the scenarios developed:

**Table 2: Sports turf ranked in order of potential exposure risks**

Risk rank	Sports turf use considered	Scenario on which risk is assumed
1	Public and school natural turf sports fields (multi-purpose including rugby, football, cricket)	Includes sports where contact with turf / soil is very likely and exposure times are maximised due to soil becoming attached to the receptors’ skin. Receptors include children and adults.

<b>Risk rank</b>	<b>Sports turf use considered</b>	<b>Scenario on which risk is assumed</b>
2	General public reserves or open spaces used for various non-specified sporting activities including children's play areas	Contact is likely, although the amount of soil becoming attached to the receptor is likely to be less than category 1. Receptors include children and adults.
3	Golf courses	Likely to have more intensive use of chemicals to achieve cosmetic objectives, but contact potential and exposure times are low.
4	Lawn bowling greens	Same intensity of chemical use as lawn tennis, but contact potential is low due to sports clothing worn, however exposure times could be high due to the frequency of the number of games being played.
5	Lawn tennis courts	Similar chemical usage as lawn bowl, contact potential is moderate but exposure times are low. Very few lawn tennis clubs exist in Canterbury.
6	Horse racing tracks	Lowest intensity of chemical use, contact potential and exposure times.

### **Challenges for Local Government**

The banning of endosulphan in New Zealand in 2008 by the predecessor to the Environmental Protection Authority, and the concerns repeatedly raised from some regional councils and the Green Party, seemed to be the catalyst for sports turfs being added to the HAIL under persistent pesticide use. However, until now, there has been virtually no guidance available on which types of turfs have been subject to the application of hazardous substances and how regional and district councils should manage the risk posed by these sites.

In commissioning the scoping study, Environment Canterbury sought clarity around the issue in order to develop a strategy for the identification of these sites and a robust justification for why they should be included on the Listed Land Use Register.

The main challenges for regional councils are:

- Identifying where sports turf sites are, and recording them on their HAIL or contaminated sites databases.

- Effective risk communication with owners and users of turf sites, especially where there are particularly sensitive users e.g. children.
- Managing discharge and land use activities through regional plan rules on these potentially contaminated sites, including having consideration for the impact of spray drift from sports turfs on adjacent sites.
- Supporting their territorial authorities by providing specialist expertise and advice where necessary in order to help territorial authorities meet their responsibilities.

However, it is territorial authorities who perhaps face the greatest challenges. They are bound by their function under the RMA to prevent or mitigate the adverse effects of the use or development of contaminated land, and therefore must consider the impact that soil disturbance or removal might have under the National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health (NES). Furthermore, they must consider the on-going suitability of sports turf sites, and whether they are fit for purpose.

The parks and reserves departments of the city and district councils are often responsible for the establishment and upkeep of sports fields and there is work to be done to raise awareness amongst frontline staff of councils, and in the wider turf industry, regarding the use of hazardous substances on these sites, and the requirements of the NES.

If the land use was to change on these sites, then investigation work following MfE Contaminated Land Management Guidelines should be undertaken to assess the suitability of the land according to its proposed end use. Consideration will also have to be given to disposal routes for soil during sports field development work (e.g. upgrading drainage and irrigation) as the soil will unlikely be classed as clean-fill due to the potential presence of hazardous substances. This again would instigate the requirement for investigation prior to site works and potential consent requirements as required by the NES.

### **Conclusion of the Sports Turf Study**

Based on the information presented and the difficulties in obtaining reliable data on historical chemical application practices, it was concluded that all sports turf sites have potentially been treated with hazardous chemicals. Therefore residual contamination may

exist from persistent pesticides which could cause the soils to be hazardous to the site end users. Essentially, sports turfs can be viewed as *potentially* contaminated sites.

However, this study indicates that sites are generally not regularly treated with pesticides, insecticides, fungicides and herbicides unless there is a problem, making it virtually impossible to apply a one-size-fits-all approach, instead necessitating analysis on a site-by-site basis. Although it is considered that sufficiently detailed information is unlikely to be available for historical chemical applications to rule chemicals in or out of the investigation, a preliminary environmental site investigation may identify past issues for a site where treatment was necessary, or that the site has never been subject to problems and therefore not treated.

There may be a strong argument for further intrusive investigation of specific types of sports turf (e.g. school playing fields) before regional councils identify these sites on their registers. However, on the basis on this study it would seem that each turf must be investigated on a site-by-site basis, due to the uncertainty around actual pesticide use.

It is important to note that while the chemicals used to treat natural sports turf have the potential to be harmful; in most instances it is possible that the risk posed to humans is low given the residual concentrations likely to be present, and the exposure time to the contamination.

The local sports field is a focal point for community events and central to the wellbeing of New Zealanders. In a nation devoted to sport, in particular field sports, it is crucial that local government get a handle on this issue quickly and manage the identification, investigation and management of these sites sensitively and pragmatically.

## **References**

Environment Canterbury Regional Council, Jan 2013: Report No. R12/115. Prepared for Environment Canterbury by Geoscience Consulting (NZ) Ltd and Renovate Turf Consultants.

Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations, 2011.