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WESTMOUNT PARK PLAYING FIELDS



DESKTOP REVIEW OF THE POTENTIAL ENVIRONMENTAL AND HUMAN HEALTH IMPACTS FOR PLANNED SYNTHETIC OUTDOOR SOCCER SURFACES IN WESTMOUNT, QUEBEC

GOLDER ASSOCIATES LTD.
Montreal, Quebec

presented to the City of Westmount
on February 23, 2007



Westmount

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REPORT ON

**DESKTOP REVIEW OF THE POTENTIAL
ENVIRONMENTAL AND HUMAN HEALTH
IMPACTS FOR PLANNED SYNTHETIC OUTDOOR
SOCCER SURFACES IN WESTMOUNT, QUÉBEC**

Submitted to:

City of Westmount
Public Works Department
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Westmount, Québec H3Z 2L2

DISTRIBUTION:

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2 Copies: Golder Associates Ltd., Montréal, Québec

February 2007

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February 23, 2007

06-1222-317

CONFIDENTIAL

City of Westmount
Public Works Department
1 Bethune Street
Westmount, Québec H3Z 2L2

Attention: Mr. Andrew Duffield

**RE: DESKTOP REVIEW OF POTENTIAL ENVIRONMENTAL AND HUMAN
HEALTH IMPACTS FOR PLANNED SYNTHETIC OUTDOOR SOCCER
SURFACES IN WESTMOUNT, QUÉBEC**

Dear Mr. Duffield:

We are pleased to present to you the report pertaining to the above-mentioned project.

Should you have any questions or comments concerning this report, please contact us.

GOLDER ASSOCIATES LTD.

Christine Guay, M. Sc.
Biologist
Project Manager

CG/mft/hc

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Certified **ISO 9001:2000**

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) has been mandated by the City of Westmount to conduct a desktop review of the environmental and human health impacts of the planned installation of an artificial outdoor soccer surface in Westmount, at the corner of Academy Street and Park Place Street.

The City of Westmount is considering replacing the natural grass of two soccer playing fields with a durable synthetic surface south of Westmount Park. It is Golder's understanding that some residents of the City of Westmount have expressed concerns on the potential environmental and/or health risks of this proposal.

The objective of this report is to provide an opinion on the potential environmental and human health impacts associated with outdoor synthetic playing fields, based on a review of physical and chemical data, a literature review and site visits of synthetic playing fields located in other municipalities.

1.1 Format of the Report

The report has been organized as follows:

- Section 2 describes the methodology of this desktop review.
- Section 3 summarizes the City's project as well as the description of the selected site for the project.
- Section 4 presents the general characteristics of several synthetic turf products. This section also describes the chemical and physical properties of the key compounds present in these products.
- Section 5 summarizes the site visits and interviews; and
- Section 6 provides opinions on several questions and concerns expressed by the public. These opinions are based on the literature and documentation review as well as the above-mentioned sections.

2.0 METHODOLOGY

Review Of The Physical And Chemical Data For Different Types Of Synthetic Turf: Brochures provided by the manufacturers/suppliers were used to describe the composition of various types of synthetic turfs. Material Safety Data Sheets (MSDS) for these products were reviewed to identify the physical and chemical properties of the main chemical constituents.

Identification of Concerns and Potential Issues: The main questions and concerns related to health or the environment from the Westmount citizens and from other sources were listed and summarized. These questions and concerns were used to focus subsequent tasks.

Literature Review: A review of the existing and available information on synthetic turf and its key compounds was performed. Only scientific and peer-reviewed documents were considered reliable and were used to gather information for the assessment of the environmental and human health potential impacts.

Site Visits and Interviews: Site visits were made at two playing fields with comparable synthetic soccer surfaces: Dollard-des-Ormeaux (Parc Dollard-des-Ormeaux) and Kirkland (Parc des Bénévoles). The purpose of the site visits was to collect information on comparable examples including positive and negative aspects through interviews with persons responsible for managing the playing fields.

Qualitative Assessment of the Potential Environmental and Human Health Impacts Associated with the City of Westmount's Project of Using Synthetic Turf: Information gathered through the literature and documentation review as well as the site visits and interviews was used to prepare an opinion based on the identified public concerns and potential issues.

3.0 CITY'S PROJECT AND SELECTED SITE

3.1 Summary Description of the City's Proposed Project

The playing fields of Westmount Park have been used by athletes of all ages since the 1920's. In the past years, demands from users have increased. For example, in the last seven years, the number of young players, aged between four and sixteen has almost doubled. According to the City of Westmount, with high utilization rates, grass may be unable to grow and regenerate and the quality of the playing surface degrades. Consequently, the City forbids access to the playing fields periodically during the summer months and limits public usage to approximately 20 hours by week. To respond to the community needs, the City of Westmount proposes to replace the natural grass in the two playing fields adjacent to Academy Street with synthetic turf (see Figure 1). All other grass covered areas would remain unchanged.

The main reasons why the City of Westmount is considering adding a synthetic surface to the two playing fields are as follows:

- synthetic grass is very durable and long-lasting;
- the level of public use of the playing fields can be increased (i.e., more hours, all weather conditions)
- the quality of the surface is high with no holes, bumps or hummocks;
- limited maintenance is required to achieve a high quality playing field; and;
- it is cost-effective solution for the long-term management of the playing fields.

3.2 Site Description

The site of the proposed project is south of Westmount Park, next to Academy Street, at the same location as the existing soccer playing fields. It comprises two soccer fields of 45 x 90 m each, for a total area of 8 100 m². Westmount Park, which is adjacent to the site, is a large park (approximately 10.5 hectares) with green spaces, many trees, floral landscaped areas, a pond, pathways and bicycle paths. The Park also contains several buildings and sports installations for soccer, tennis, baseball, etc. Surrounding the Park, there is a school and residential zone.

Westmount Park shelters many floral species (e.g., trees, shrubs) and animal species (e.g., birds, small mammals, etc.) that are typically found in an urban park setting. Existing wildlife would be adapted to human activity, and would likely not be disturbed by sports activities at the Park.

The closest surface water body from the Site (with the exception of the pond directly in the Westmount Park) is the Lachine canal located at 1.5 km southeast of the Site. Based on Carte hydrogéologique de l'Île de Montréal et des Îles Perrot et Bizard (1978), groundwater is anticipated to flow southeast at an approximate depth of 5 to 6 m. It should be noted, however, that the direction of local groundwater flow can be influenced by the presence of underground utilities and underground building structures. The hydrogeological formation under the Subject property is considered to be a Class III, i.e., hydrogeological formation that cannot constitute a source of drinking water, as defined by the "ministère du Développement durable de l'Environnement et des Parcs" (MDDEP) (1999).

4.0 GENERAL PHYSICAL AND CHEMICAL CHARACTERISTICS OF SELECTED SYNTHETIC TURF

Many different synthetic turf products are currently available on the market. They are designed for various sports. Synthetic turf producers can reproduce natural grass characteristics and allow various sport activities to be enjoyed on a durable and low maintenance surface.

The types of products considered by the City of Westmount are applicable for use at soccer fields. Table 1 below presents the main characteristics of selected synthetic turf products available in the Montreal Region. The objective is not to recommend one or more products in particular, but to identify their key components and characteristics in order to evaluate potential risks for the human health and the environment.

In general, the ingredients present in synthetic turf products are similar between brands. There are three main ingredients: fibres, infill and backing.

Fibres are the green filaments, which imitate the look and feel of natural grass. They are made of polyethylene (PE) monofilament or fibrillated fibres. According to Polyloom Corporation of America (2006), PE fibres are odourless, stable when exposed to heat and light; they have negligible solubility in water, and are not listed as carcinogens or potential carcinogens.

Infill is the layer with black rubber particles (recycled or not) with or without silica sand. Rubber particles are stable, insoluble and have a faint rubber odour. Based on the MSDS, rubber is not listed as carcinogen and no health hazards have been identified, except that it contains fine fibres that could cause irritation if there is direct skin contact, eye contact or inhalation. For one of the products (Mondo Turf PF), there is the option to choose High Density (HD) rubber granules instead of conventional crumb rubber. This component is odourless and pale (not black). According to the manufacturer, because of the pale colour of the rubber, this product has the advantage of lower surface temperatures during summer months over conventional crumb rubber products.

Silica sand is a pale sand particle that is frequently found on beaches. According to the MSDS, it is a stable, odourless product, and the routes of exposure are skin contact, ingestion or inhalation. Skin contact with silica sand can cause abrasion, rashes, cuts or sores. Eye contact can result in tearing and irritation. Inhalation may cause irritation to the upper respiratory track. The inhalation of very fine silica dust can present a health concern; however, the type of sand that would be used at the playing fields would contain very low levels of fine particles (i.e., 0.005% less than 10 µm particle size). (Target Product Ltd., 2005).

The backing keeps the fibres together. Backing is made of fabrics like polypropylene, polyurethane, urethane, etc. It may have one or more layers, depending on the product.

**Table 1
Main Characteristics of Selected Synthetic Turf Products**

Description of the Parts	Products (Manufacturers)					
	Duo Series 1 (FieldTurf)	Prestige XT60 (FieldTurf)	Omnigrass (Sportexe)	Power Blade (Sportexe)	MondoTurf PF (Mondo group)	Astroplay (Astroturf)
Fibre compounds	Polyethylene fibres classic series or monofilament series	Monofilament and fibrillated fibres UV inhibitors added to polyethylene mix	LSR Silt-Film Polyethylene	Monofilament Polyethylene	Parallel fibrillated fibres UV-stabilized Polyethylene	Polyethylene and monofilament fibres Nylon fibres “Root Zone” “Alphasan” antimicrobial technology
Infill compounds	Silica sand Ambiant rubber Cryogenic rubber	Layer of silica sand Recycled rubber granules	100% Ground SBR rubber particles.	100% Rubber Or 70% Rubber and 30% Sand	Performance High Density (HD) rubber granules Or Rubber and sand	Rubber infill
Backing compounds	Combination of permeable woven and non-woven polypropylene fabrics	Not mentioned	1 st layer: Polyback, FLW, Duraback, and Q-web. 2 nd layer: Urethane	1 st layer: Polyback, FLW, Duraback, and Q-web. 2 nd layer: Urethane	A multi-layer first backing and a heavy Polyurethane second backing.	Pad options (elastic layer or foam pad)

5.0 SUMMARY OF THE SITE VISITS AND INTERVIEWS

Ms. Maryse Forest-Tremblay from Golder visited two parks where synthetic turf playing fields are currently used in the Montreal region:

- Parc Dollard-des-Ormeaux (Dollard-des-Ormeaux)
- Parc des Bénévoles (Kirkland)

During these visits, the persons responsible for managing the playing fields were interviewed. Ms. Forest-Tremblay met Mr. Neil Semenchuck in Kirkland and Mr. Keith Malette in Dollard-des-Ormeaux (DDO). The interview summary sheets are presented in Appendix A for each site.

We observed no indication of a negative impact on the environment around the fields or deterioration of the product over time such as discolouration, degradation or specific odour of the product. In general, it has been reported that the drainage system is effective and that maintenance requirements are low. For maintenance, a mechanical system is used that consists of a small tractor with a brush and a comb. No chemical products are used. No evidence of injury, allergy or discomfort due to synthetic playing field was reported during the interviews. The person responsible for the DDO Park mentioned temperature of the playing field surface rises during hot summer days and indicated that a sprinkling system was installed to cool the playing field. The surface remains clean with regular maintenance and gulls are the only animals that frequent the playing field. At both sites, the park managers indicated that they were very satisfied with the performance of the synthetic turf product used at these playing fields.

6.0 QUALITATIVE ASSESSMENT OF HEALTH AND ENVIRONMENTAL IMPACTS

The City of Westmount has provided Golder with a list of concerns and questions expressed by general public. Several of these concerns relate to potential environmental or health impacts from the use of synthetic turf at the two playing fields. This section presents several key questions based on the concerns expressed by the general public, and for each question provides an opinion based on technical information collected during the literature review, site visits and interviews at similar sites.

6.1 Are Ground-Up Tires Safe for Children?

We did not find any publication specifically evaluating the safety of the rubber particles found in synthetic turf products. However, two publications were found that evaluate the risks associated with the use of recycled tire crumbs as a playground surface under children's play structures (Birkholz *et al.*, 2003; Anderson *et al.*, 2006). Both studies conclude that no evidence exists to suggest that adverse health effects would occur through the intended use of the product. However, the study completed in 2006 does indicate that information/knowledge gaps do exist and additional scientific studies should be completed.

According to Birkholz *et al.*, 2003, children could only be exposed to the rubber particles via skin contact and ingestion. They indicate that inhalation of volatile compounds is not a plausible route of exposure since no volatile compounds are expected to remain in the shredded material. Their qualitative assessment of the two retained pathways concluded that health hazards were low since the gastrointestinal tract would be inefficient at extracting chemicals found in the tire crumbs, and that the skin surface would form an effective barrier against chemical absorption. Tests were also conducted to evaluate the potential carcinogenicity of the product and the tests concluded that the products were not genotoxic and ,therefore, unlikely to be carcinogenic.

Anderson *et al.*, 2006 publication indicates that there were no reported symptoms or adverse health effects in children that used the playgrounds consisting of recycled tire crumbs as playground surface, but they conclude that additional investigation is needed

with regard to latex allergy for short-term dermal exposure and the potential release of respirable particles during regular use of the product.

6.2 What Are the Impacts of Dust Produced during Installation of the Field?

No specific information was available regarding this issue. The impacts will likely depend on the quantity and size of dust particles and on the method used by the supplier to install its product. Considering that the product would be installed by the supplier any measures required to protect workers would be implemented.

6.3 What Effect Does the Synthetic Turf Have on Injuries?

A study from Meyers & Barnhill (2004) compared the incidence, causes and severity of game-related injuries for high-school football players between a synthetic turf and natural grass over a five year period. They concluded that “*although similarities existed between FieldTurf and natural grass over a 5-year period of competitive play, both surfaces also exhibited unique injury patterns that warrant further investigation*”.

6.4 Will The Synthetic Turf Generate More Radiant Heat than a Natural Field?

According to the literature and to our interviews, it seems possible.

Mr. Malette from DDO reported higher temperatures during hot summer days and mentioned that a sprinkling system was installed on the playing field to cool down the field when needed. However, in Kirkland, Mr. Semenchuck reported no difference in temperature between natural grass and synthetic turf.

McNitt & Petrunak (2006) reviewed data on surface temperature of synthetic turf playing surfaces and evaluated the effect of irrigation on surface temperatures. They indicated that synthetic fields warm up quickly on clear sunny days but also cool down rapidly when the sun is not shining. They cited studies showing surface temperatures rising up to 35 to 60°C higher than natural grass. Irrigation dramatically reduces the surface temperature; however, in their limited testing they found that the reduction in temperature is short term.

6.5 Will The Radiant Heat Generated by the Synthetic Surface Affect the Groundwater?

It is unlikely. Although, significant rises in temperature have been reported for synthetic turf in the literature, the effects of the temperature on the groundwater will have been attenuated by its depth underneath the playing field (see section 3.2).

6.6 Will the Run-Off Water from the Synthetic Field Impact the Groundwater?

In the publication from Birkholz *et al.*, 2003 mentioned earlier, environmental risks of leachate from tire crumbs were also evaluated. They exposed several aquatic organisms to the leachates in standard toxicity tests. Leachate from fresh crumbs was toxic to all species tested, but when using leachate from 3-month old crumbs, the toxicity was reduced by 59%. They concluded that the leachate could present a risk to the environment if the tire crumbs are relatively fresh and if the leachate is not diluted, but *“given that undiluted runoff is not likely and that three months is an outside estimate of the duration of toxicity, it is doubtful that the tire crumb would present a significant risk of contamination in receiving waters or groundwater.”*

Once again, no publications were found specifically addressing impacts to groundwater. However, based on the published toxicity tests results of leachate from tire crumbs/shreds and the expected large dilution of the run-off water by rain or snowmelt, we believe that it is unlikely that the run-off water from the synthetic turf will impact groundwater quality.

Sheehan *et al.* (2006) evaluated the risks to aquatic ecosystems posed by tire shred fill in roads. It should be noted that the context of this study is different from the current project because the tire shreds are buried in the soils (above or below the groundwater levels depending on the sites) and the tire shreds have different physical characteristics than the rubber particles in the synthetic turf: they can be bigger (up to 7.6 cm) and substantial quantities of steel belts are present and exposed. They reported low concentrations of volatile organic compounds, semi-volatile organic compounds and metals (particularly iron and manganese) in the water quality analyses when tire shred fill was placed above the water table. Toxicity tests with aquatic organisms showed no

adverse effects caused by leachates collected from tire shreds above the water table. They concluded that precipitations infiltrating through the tire shred fill are unlikely to leach substantial amounts of chemicals from the shred.

It is important to note that groundwater is not used as a potable water supply in Westmount and the nearest natural surface water body to the park is the Lachine Canal located approximately 1.5 km from the planned playing fields. Given that the low potential leachability of the rubber infill material, the large distance to the nearest surface water body and the lack of reliance on groundwater as a drinking water supply, impacts to the health of local residents or aquatic life are not expected.

6.7 What Are the Long-Term Ecological Effects?

No publication was found to address this issue.

Ecological receptors could be exposed to potential chemicals from the synthetic turf via ingestion or direct contact in the case of aquatic receptors exposed to run-off water. For aquatic receptors, when considering the toxicity test results described above and the dilution of the run-off water before entering the park's pond or the Lachine Canal, it is unlikely that the tire particles present a significant risk. For the small mammals and birds, no information is available to evaluate the risk to them.

It should be noted that the use of fertilizers on natural grass also has effects on the environment. No comparison of the type and magnitude of these effects have been made.

7.0 CONCLUSION

The advantages of using recycled tires in road construction, landfills, playgrounds, synthetic sport surfaces, artificial reefs, etc. have been highlighted by many authors including the US EPA.

Very few scientific publications are available regarding the environmental and human health risks and impacts specifically associated with the use of synthetic turf. Nevertheless, the information currently available indicates that the risks for the human health and the environment are negligible associated with the planned installation of an artificial outdoor soccer surface in Westmount.

8.0 LIMITATIONS AND CLOSURE

As indicated in the proposal, the current study is not a Risk Assessment or an Environmental Impact Assessment as per the Quebec regulations and guidelines. The assessment and conclusion of this report are limited by the amount and the quality of publicly available information on the products. No chemical, physical or toxicological testing were performed part of this study. In addition, there were very few peer reviewed publications on synthetic turf associated with potential environmental and/or human health effects.

Should you have any questions please do not hesitate to contact us.

Yours truly,

GOLDER ASSOCIATES LTD.

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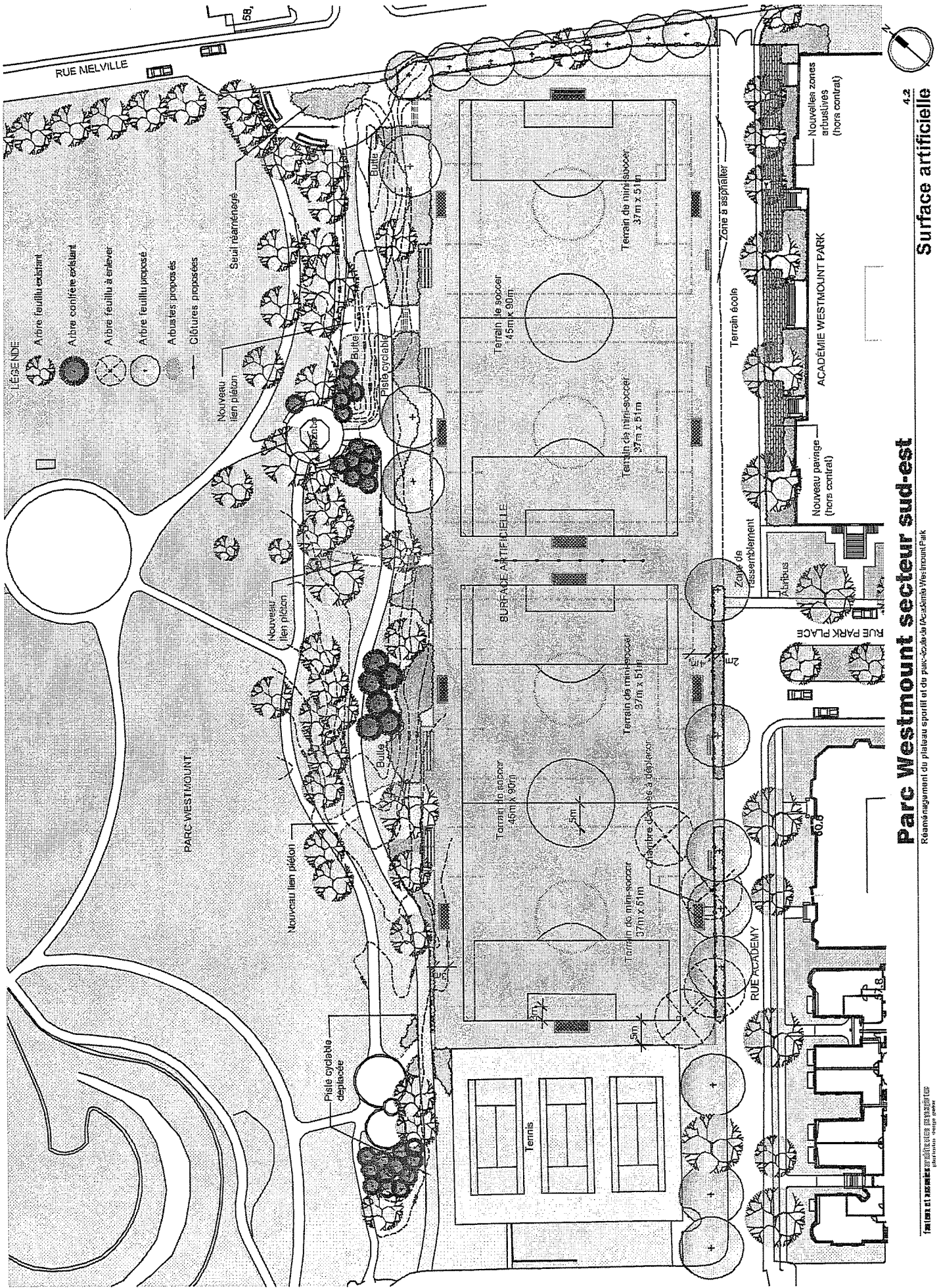
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Parc Westmount secteur sud-est

Réaménagement du plateau sportif et du parc 52-58 de l'Académie WestmountPak

4.2 Surface artificielle

Échelle: 1:500
 Date: 08.01.2015
 N°: 12-2015-001
 Ville: Westmount

PROJET DE RÉAMÉNAGEMENT DU PLATEAU SPORTIF
 RÉAMÉNAGEMENT DU PLATEAU SPORTIF ET DU PARC 52-58 DE L'ACADÉMIE WESTMOUNTPAK
 ARCHITECTURE: [unreadable]
 PAYSAGISME: [unreadable]

APPENDIX A

SITE VISIT AND INTERVIEW SHEETS

SITE VISIT AND INTERVIEW: DOLLARD-DES-ORMEAUX (DDO)

Location: DDO Park, at the corner of Salaberry and Lake, DDO.
Date of Site Visit: Nov. 28, 2006

Representative: Keith Malette, Division Manager – Sports and Recreation, DDO

Interviewer: Maryse Forest-Tremblay (Golder Associates Ltd.)

Synthetic Turf Product: OMNIGRASS **Installation Date:** June 2005

General Use

- Mostly used to play football, soccer and rugby.
- Used between early April and late November (could start in the middle of March).
- Main advantages reported:
 - The synthetic playing field is always in great condition, allowing play in all weather conditions;
 - Utilization time optimized (field used for 1257 hours in 2006 as compared to average of 400 hours for natural playing field);
 - Allows other natural fields to remain in great condition for soccer games; and
 - Maintenance is really easy and requires little effort.
- Main inconveniences reported:
 - Heat on hot summer days (54-57°C on synthetic field VS 38-40°C on grass field);
 - Attracts gulls; and
 - Some complaints of residents because of lighting.

Environmental Issues

- Nothing abnormal has been observed; no discolouration, no degradation and no specific odour of the product;
- No specific observation or remarks about a lot of rubber particles outside the playing field have been reported, but some particles are found in athletes' shoes ; and
- Drainage is really efficient and water never accumulates on the synthetic surface.

Human Health Issues

- No accidents or incidents have been noted linked to the higher temperature; and
- No more accidents have been noted on the synthetic grass compared to natural grass.

Maintenance

- The maintenance effort is approximately 15 to 30 minutes every 2 or 3 weeks;
- There is a brush and a comb to install at the back of a little tractor, to unpack the rubber particles, and remove wastes;
- No chemical products are added for cleaning;
- No mould, fungi or any sanitary problems have been reported; and
- It is important to keep frequent maintenance to prevent risks of injuries (more risk if the fibres are flattened).

Other comments

- The playing field is fenced, the fence is locked and it is forbidden to smoke on the site.
- In general, no animals are present on the site excepted gulls, which seem to have adopted the synthetic field.
- A sprinkler system has been installed this summer on the playing field to cool it down when it is really hot. It has only been used once since it was installed.
- Football players really like synthetic surfaces for practices and matches, while soccer players like to practice on synthetic but prefer to play games on natural fields.



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SITE VISIT AND INTERVIEW: KIRKLAND

Location: Parc des Bénévoles, on chemin Ville-Marie, Kirkland.
Date of Site Visit: Nov. 28, 2006

Representative: Neil Semenchuck, Director of Culture, Sports, Recreation and Social Development, Kirkland

Interviewer: Maryse Forest-Tremblay (Golder Associates Ltd.)

Synthetic Turf Product: **FIELDTURF, PRESTIGE XT60**
Installation Date: Summer 2004

General Use

- Mostly used to play football and soccer.
- Used between early May and late November.
- Main advantages reported:
 - Maintenance is really easy and requires little effort;
 - The playing field is always in great condition; and
 - Utilization time optimized; it is possible to play in all weather conditions.
- Main inconvenience reported:
 - No inconvenience has been reported by Mr. Semenchuck and he has not received any complaint by athletes or residents.

Environmental Issues

- Nothing abnormal has been observed; no discolouration, no degradation and no specific odour of the product;
- No specific observations or remarks about a lot of rubber particles outside the playing field have been reported, but some particles are found in the shoes of athletes; and
- Drainage is really efficient and water never accumulates on the synthetic surface.

Human Health Issues

- No significant increase in temperature has been observed on the synthetic playing field (compared to natural grass), even on hot summer days; and
- No more accidents have been noted on the synthetic grass compared to natural grass.

Maintenance

- The maintenance effort is approximately half a day, two times in a season;
- There is a brush and a comb to install at the back of a little tractor, to unpack the rubber particles and remove wastes such as gums, cigarettes butts, etc.;
- No chemical products are added for cleaning; and
- No mould, fungi or any sanitary problems have been reported.

Other comments

- The playing field is fenced, usually unlocked.
- There are no specific rules related to the synthetic surface.
- In general, no animals are present on the site excepted gulls, which seem to have adopted the synthetic field.
- Some individuals tried to ignite a fire on the synthetic field, and it made a small hole, with a melted spot. It was easily and quickly replaced.



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