

# **Environmental Assessment Registration**

**Copper Creek Golf Course**

**Submitted By:**

**Leroy Barker**

**March 3, 2008**

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**Appendix A J.D.P. Environmental Assessment**

**Appendix B Topographic Map of the Area**

**Appendix C Preliminary Drawing of Golf Course**

## **1.0 Name of Undertaking:**

Environmental Assessment Registration Document for Copper Creek Golf Course subject of Crown Lands Application No. 131727.

## **1.0 Proponent:**

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## **2.0 The Undertaking:**

### **3.1. Nature of the Undertaking**

#### *3.1.1. Golf Course*

An eighteen hole golf course will be developed along the south side of the saltwater body of Baie Verte at the Town of Baie Verte. The fairways will be cleared to within 50 feet of the bank to the saltwater body of Baie Verte. All greens and tees will be situated at least 50 meters from any water body.

The vegetation will be thinned and pruned to the top of the riverbank. The deadwood in the fairways will be piled and burned. Roots and stumps will be buried on site and will form portions of the finished areas of the golf course. Existing soil on site is gravelly loam and is considered as being suitable for the development of a golf course. At this time it is unknown as to whether or not it will be required that the soil be screened and modified to facilitate the growth of grass. The area of golf course is at the base of a 700' mountain and every hole has at least one small stream that can be gravity fed to the golf course.

Due to local climatic conditions, it is not expected that great quantities of water will be required for the golf course. At this time, the required volumes of water have not been calculated by the Proponent. A 50 meter buffer zone of thinned vegetation will remain between the developed areas of the site and the bank of the bay.

Fertilizers, herbicides and pesticides will be used on the greens and tees. The application of these materials will depend on golf course conditions. Analysis of surface areas will be conducted after the surfaces have been created to determine what materials and amounts are to be applied. For example, phosphorus may or may not be required, in order to bring levels up to acceptable norms. Yearly fertilizer application will begin in late May.

Best Turf Management practices will be utilized to maintain optimum soil conditions for turf growth. Fertilizer management practices will be aimed at minimizing leaching losses and optimizing the use of nutrients. The following practices will minimize fertilizer leaching: close regulation of irrigation, soil testing to identify nutrient requirements and optimize nutrient use, the use of slow release fertilizers and the timing of fertilizer application in relation to active plant uptake and potential runoff events. Nitrogen and phosphorus will be the main fertilizers to be considered. Studies have shown leaching losses of nitrogen to be negotiable.

Integrated Pest Management practices will be utilized. These practices include the proper establishment of soil and turf, regular soil testing, the minimization of soil compaction, controlled irrigation and proper mowing heights. These practices reduce the likelihood of pest problems. Pesticide selection will include the least mobile, the least toxic and the least of persistence. Pesticides are applied when conditions merit, rather than on a predetermined basis.

There is soil on site, which will be stockpiled during construction. The existing material on site may or may not be screened and augmented with a medium in order to create suitable golf course finished surfaces. Generally, cleared areas will be seeded to obtain a growth of grass at the end of summer periods. Hydro seeding is not contemplated. Hydro seeding contains a tackifier which acts to minimize the potential for erosion.

Greens may have a 10" to 12" root zone of 80% sand and 20% peat moss, which may set on top of a herringbone pattern sub-drainage system, if required, with 4" perforated pipe and 4" of gravel. Greens may have a minimum grade of 2.5%. Vegetation may be bent grass. Subsurface irrigation will be provided with 2 1/2 " underground piping and sprinkler heads approximately 60 feet apart.

Tee decks may have a 6" to 8" root zone of one part topsoil and one part sand. Tees may have a maximum drainage of 1.25%. Vegetation may be blue grasses, rye and fescue. 2 1/2" underground piping with sprinkler heads may be provided.

Primary roughs will have limited irrigation from tee and fairway sprinklers. Vegetation may be blue grasses, rye and fescue.

Bunkers may have concave shapes and sub-drainage.

Fairways will have a minimum 2% slope. A largely 3" diameter subsurface fairway irrigation system may be installed with sprinkler heads approximately 90 feet apart. Piping sizes increase to 4" and 6".

There will be no development of gravel pits on site. There will be no removal of soils below the water table.

A club house and maintenance building will have to be constructed. This will be combined into one structure which will measure 20' x 40'.

### **3.2 Purpose/Rationale/Need for the Undertaking**

This new development will enhance tourism production on the Baie Verte Peninsula and expand other economic opportunities within the region. With the growing population and the fact that \$170,000.00 has already been invested in this project, we feel this will be a feasible project. Currently, there are no other golf course developments in this region; however the popularity of the sport and supporting tourism infrastructure in the region will complement and warrant this development with a high yield. This location is strategically located because there are no other golf courses within a two hour drive time in an easterly or westerly direction.

## **3.0 Description of the Undertaking:**

### **4.1. Geographical Location**

The project is located in Baie Verte on the North East coast of Newfoundland. The town of Baie Verte is located at Latitude-Longitude: 49° 56' 00" N - 56° 11' 00" W. The Town of Seal Cove is located 14 kilometres to the southwest and the Town of Ming's Bight is located 11 kilometres to the north. The golf course site is located on the south side of the salt water body of Baie Verte and near the head of the bay. The nearby road is known as South Shore Drive.

### **4.2. Physical Features: Develop Eighteen Hole Golf Course**

The site bounds the south side of the saltwater body of Baie Verte. The area of the site will be approximately 45 acres. The bank rises from the bay of Baie Verte approximately 30 to 40 feet. The land then gently slopes up approximately 30' over the width of the golf course. In general, golf course holes will parallel the bank of the river. The tide goes out leaving an exposed bottom at the head of the bay.

The soil is gravel and loam. Bedrock has not been detected on the site. There are no perched water tables on the site. Spruce, fir and birch grow in this forested area. This is merchantable timber approximately 50' in height.

The adjacent lands are undeveloped woodlands. There are no known archaeological sites, forest management preserves, protected water supply areas, provincial parks, or seabird sanctuaries near the site. The site is not under native land claim.

The site of the new construction has not been previously developed.

The site is habitat for wildlife (rabbits, moose, grouse, songbirds, waterfowl, hawks, foxes, partridge and squirrel).

Rare vascular plants have not been collected in the area.

The site is not considered as being habitat for rare, threatened or vulnerable species of bird.

### **4.3. Construction**

**4.3.1** This development will commence subject to approval dates and issuance of Crown Title in a phase system.

Phase 1.	Consists of site preparation of all eighteen holes, preparation of driving range, removal and disposal of all vegetation, and grubbing on driving range.
Phase 2.	<p><i>Driving Range</i> – vegetation removal, moderate tree spacing and grubbing, disposal of waste brush and timber, irrigation/drainage ditching on surrounding perimeter, construction of portable tee off platform, preparation of driving range for topsoil distribution and seeding.</p> <p><i>Golf Course</i> – beautification/vegetation removal and tree spacing surrounding all identified holes in this phase, site preparation and landscaping of scenic vistas along the holes for seating areas, removal and disposal of stump age. Waste brush and timber, removal and disposal of rock and undesirable materials on holes, prepare holes for primary distribution of topsoil, screen and stockpile and distribute prime topsoil over fairways, stake out and prepare tees and greens for seeding and irrigation. Establishing remaining holes as operational on temporary greens.</p>

Construction of this project will conclude once all the previous phases have been completed. Each phase will be completed on an individual time frame and will be scheduled according to regular construction periods once the necessary approvals have been granted.

#### **4.3.2 Potential Construction Pollutants**

The following are some potential construction pollutants that should be considered and monitored for evaluation and control:

- airborne emissions and dust created by construction equipment
- solid waste materials
- fuel and lubricant spills from construction equipment
- increased run off owing to vegetation removal
- noise from construction equipment
- application of fertilizers and pesticides

#### **4.3.3. Mitigation**

- 4.3.3.1. We will obtain building permits from the Town of Baie Verte
- 4.3.3.2. We will secure a permit under Section 48 of the Water Resources Act from the Water Resources Division, Department of Environment for an alteration to a water body.
- 4.3.3.3. Workers will be under supervision. The supervisor is responsible to ensure that all work is carried out in accordance with the Provincial Occupational Health & Safety Act and its Regulations. The supervisor is to consult and cooperate with the Occupational Health and Safety Committee.
- 4.3.3.4. Licensed applicators only, will apply herbicides and pesticides. Only properly trained, educated and certified personnel will purchase and apply chemicals. Applicators will be certified under Provincial regulations and /or in accordance with the most stringent recommendations of material suppliers. Untrained summer students and casual workers will not utilize these chemicals.

4.3.3.5. We will secure a licence for purchase, storage and use of pesticides from the Pesticide Control Section of the Pollution Prevention Division.

4.3.3.6. Herbicides, Pesticides and Fungicides will be stored in accordance with the Warehousing Standards of the Crop Protection Institute of Canada. The various aspects of the design which are required to be in compliance with the Standards include: Siting, Site Location, Layout, Safety, Packaging, Labels, Signs, Handling of Damaged Goods, Storage Procedures and Methods, Bulk Storage and Handling, Training, Handling of Hazardous Waste, Transportation and Insurance.

4.3.3.7. We will secure (from the supplier) and follow the requirements of the Material Safety Data Sheets for Herbicides, Pesticides and Fungicides. General recommendations for applicators include:

- A) Recycle pesticide rinsate or field applied diluted rinsate in adjoining areas.
- B) Never dispose of pesticide wastes in or near a body of water.
- C) Handle all pesticides and wash equipment away from water or other potable water sources.
- D) Triple rinse or pressure rinse pesticide containers as soon as they are empty.
- E) Do not reuse containers unless they are specifically designed for that purpose.
- F) Do not draw water into equipment or containers used to hold, mix or apply pesticide unless a proper air gap is present or a back flow presented is used.
- G) Don't wash or clean any pesticide application containers or equipment within 30 meters (100 feet) of an open body of waste or storm sewer system.
- H) Maintain a 15 meter buffer between application areas and watercourses.
- I) Monitor application rates and keep up to date records including materials applied and active ingredient, application dates, area and rate and total amount of fertilizer used.
- J) A 6 hour period following the application of pesticides is all that is required for maximum efficiency in pest control. Application should be made during a time which has a low probability of rainfall within this time period.
- K) Consider adopting and customize an Integrated Pest Management program for the golf course. The elements of such a program include:
  - Planning and managing turf to prevent organisms from becoming pests.
  - Identification of potential turf pests.
  - Monitoring populations of pests, beneficial organisms and all other relevant environmental factors.
  - Establishment of damage/action threshold.
  - Application of cultural, physical, biological, behavioural and chemical control measures to maintain pest populations below threshold levels.

4.3.3.8. Waste receptacles will be installed at all active areas for use by construction crews. The proponent will ensure that all lunch waste and empty oil containers are recovered and disposed of appropriately. All waste materials, associated with the construction and operation will be disposed at an approved waste disposal site.

4.3.3.9. Evaluation of the effects and efficiency of pest control measures used. There are various Integrated Pest Management programs which will be utilized such as The Canadian Audubon Cooperative Sanctuary Program.

4.3.3.10. Manage fuels and lubricants on site.

- A) Avoid fuel spills.
- B) Repair equipment with lubricant leaks.
- C) Storage of fuels is to comply with provincial storage regulations.

4.3.3.11. Burning vegetation may result in complaints from residents. We will control the amount of burning and conduct the burning under conditions unlikely to lead to complaints. In the event of complaints, chip, truck or otherwise dispose of brush, wood and roots. Off-site disposal of organic materials, while not contemplated within the current scope of the work, would if it occurs, require a disposal site approved by the Town of Baie Verte.

4.3.3.12. Burn only when the prevailing wind is away from residential areas.

4.3.3.13. Secure a Burning Permit and a Cutting Permit from:  
Forest Resources and Agrifoods  
P.O. Box 220  
Springdale, NL A0J 1T0  
Phone: 709-673-3821  
Fax: 709-673-4525

4.3.3.14. Workers are to wear safety equipment and follow the instructions of manufacturers respecting safety when utilizing power and heavy equipment. Workers will be supervised by a qualified supervisor. Worker safety is to be priority of the work supervisor.

4.3.3.15. The supervisor of construction will be trained in First Aid and emergency procedures.

4.3.3.16. A baseline water sample will be collected, in the bay adjacent the site of the proposed golf course. Test for residuals of herbicides, pesticides, fungicides and fertilizers before an initial application of these materials is made and test water yearly. While it is not anticipated that water quality will be degraded, it will be useful to have baseline data available for future reference, if required. Have the laboratory compare water quality sampling with CCME Guidelines (Interim Canadian Environmental Quality Criteria for Contaminated Sites), and Canadian Drinking Water Quality Guidelines.

4.3.3.17. The Pesticide Applicator will be licensed.

#### 4.3.4. Operation

The golf course will operate during daylight hours, however the driving range will be developed with night lighting so that the facility can be utilized as a social gathering during summer evening hours.

##### 4.3.4.1 *Potential Sources of Operating Pollutants*

The significance of potential impacts as follows:

0=none, 1=low, 2=moderate, 3=high, 4=unknown

Impacts are indicated as positive (+) or negative (-).

Resource	Significance	Description
Ground Water Quality and Quantity	0	No Impact.
Surface Water	-1	Surface water quality has potential to be degraded.
Rivers & Lakes	-1	Silt has potential to degrade water quality. There will be a vegetated buffer between the golf course holes in Baie Verte. The potential for silt to enter these watercourses is marginal.
Valued Ecosystems	0	None Noted.
Marine Waters	-1	Marine waters have potential to be degraded by residuals of fertilizers, herbicides and pesticides.
Wetlands	0	There are no wetlands on site.
Soils	+1	Stripped soils will be re-vegetated.
Geology/Geophysics	0	Not applicable
Air Quality	-1	Burning brush can degrade air quality with smoke and dust.
Weather/Climate	0	Not applicable
Vegetation	+1	The quality of vegetation on site will be improved.
Wildlife and Birds	+1	Breeding habitat for birds may be increased on site with the introduction of more edge vegetation. Edge vegetations tend to include hardwoods which form nesting habitat for birds.
	-1	The clearing may be conducted during the nesting season for songbirds (May to the end of the first week in July). This should have minimal effect as the woods are primarily softwood.

Endangered Species (COSWIC)	0	None Noted
Noise	0	No impact.
Cumulative Ecological Effects	+1	Hardwood vegetation will be retained, increasing breeding habitat for birds. Wildlife habitat will be increased with thinning of woods, increased edge vegetation and an upgraded quality of vegetation.
Community/Social Service	+1	The golf club may be utilized by the community.
Health & Safety	-1 -1	The use of power and heavy equipment is a potential safety hazard for workers. The use of pesticides is a potential safety hazard for workers.
Land Use	+3	Undeveloped lands will be developed.
Municipal Services	0	Not applicable.
Native Lands	0	The area is not subject to native land claims.
Navigation	0	Not applicable.
Economics	+3	Employment will be provided.
Local/Regional Planning	0	No impact.
Cumulative Sociological Effects	+1	The project will make the community a more desirable place to live.
Other	-1	Residential homeowners may become irritated by the smoke and dust from burning brush.

#### 4.3.4.2 Potential Causes of Resource Conflicts

There are no significant Resource conflicts with the proposed development as indicated in the table above.

#### 4.3.5 Occupations

This section will be broken down in two separate key areas, construction and operation of the proposed development. However, to date the proponent has consulted the expertise of J.D.P Environmental to consult on this development and their assessment is included in appendix A.

During the construction the following positions will be required:

Facility Manager	1
Golf Course Architect Consultant	1
Heavy Equipment Operator	1
Truck Driver	1
Labourers	5-10

Operational Occupation requirements:

Facility Manager	1
Office Manager	1
Operations & Maintenance Staff	1-3
Pro Shop Supervisor	1
Pro Shop Technician	1
Golf Instructor(s)	1+
Snack Bar Staff	2

*Operational positions may fluctuate pending market demand.*

*The proponent will make every effort to employ local residents. Age and gender equity will be considered.*

## **4.0 Approval of the Undertaking:**

The required area for the proposed golf course is subject to Crown Lands Application No. 131727. In accordance with Crown Lands referral process, before the application can continue, remaining approval must be received from the Department of Environment. All other departments required for Crown Lands approval have concluded a favourable response at this time. Other permits required for this undertaking may include; permit to cut and burn timber from Forest Resources and Agrifoods Newfoundland Forest Service, Municipal Permit to Operate from the Town of Baie Verte, Permit to use pesticides from Environment and Labour. Support of this undertaking has been formally expressed from the Town of Baie Verte, Baie Verte and Area Chamber of Commerce and the Dorset Trail Tourism Association in writing. These letters can be found in Appendix E.

## **5.0 Schedule:**

The proponent would like to initiate construction of the golf course once Crown Lands provides Leroy Barker with approval of the application and issues the appropriate title. In order to have the project close to completion by summer of 2009, construction must commence in the spring of 2008.

Under these circumstances the proponent would like to see the environmental assessment process completed as soon as possible.

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Date

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Signature of Chief Executive Officer

## **Appendix A**

***J.D.P. Environmental***

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Halifax, Nova Scotia  
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Phone #: (902) 471-4556  
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Phone #: (709) 532-4502 (r)  
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February 16, 2000

**Attention: Ed**

**RESEARCH NOTES**

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**Re: Develop Nine Hole Golf Course,  
Bay Verte,  
AKA: Copper Creek 2000 Inc.**

The following are research notes regarding the use of herbicides, pesticides and fertilizers on golf courses and a guide to understanding their use in golf course management. Golf course management programs should be developed to minimize the use of chemicals and to obtain optimum turf quality.

Worker safety is also an important issue regarding chemicals. Ensure that unlicensed persons such as summer students and casual workers do not handle same.

**RESEARCH NOTES**

- a. Bibliographical research has been conducted. The potential for an environmental impact to occur has been reviewed. Summary notes from pertinent bibliographical research are provided herein to facilitate an understanding of this potential environmental impact of herbicides, pesticides and fertilizers:
  - i. The fate of pesticides applied to golf courses are in general affected by six processes:

Solubilization by water. Water solubility is an indicator of the mobility of a pesticide.

Sorption by soil mineral and organic matter. Pesticides absorb or adsorb to soils. Soils containing silt, clay and organic matter provide a richly sorptive environment.

Degradation by soil microorganisms. The persistence of a pesticide is expressed in terms of the half-life. Half-life values are calculated in the laboratory. Degradation rates are influenced by: pesticide concentrations, temperature, soil water content, pH, oxygen status, prior pesticide use, soil fertility and microbial populations.

Chemical degradation and photo-decomposition.

Volatilization and evaporation. Volatilization increases with temperature and with air movement. Volatilization rates are lower in the late afternoon or early evening.

Plant uptake. Plants can absorb pesticides. Grasses with higher rates of transpiration can reduce the leaching of water-soluble pesticides.<sup>1</sup>

ii. Proper pesticide selection, selecting a pesticide that poses the least threat of rapid leaching and runoff and is relatively non-persistent is an important consideration.<sup>2</sup>

iii. Compared to agricultural crops, turfgrass systems:

Reduce runoff.

Increase adsorption on leaves, thatch, and soil organic matter.

Maintain high microbial and chemical degradation rates.

Reduce percolation due to an extensive root system, greater plant uptake, and high transpiration rates.<sup>3</sup>

iv. The properties of various pesticides and the potential for surface and sub-surface losses has been summarized in comparative research.<sup>4</sup>

<sup>1</sup> Kenna, Dr. Michael P., Director USGA Green Section Research, "What Happens to Pesticides Applied to Golf Courses", *USGA Green Section Record*, United States Golf Association, January February 1996, 3.

<sup>2</sup> Kenna, Dr. Michael P. 4

<sup>3</sup> Kenna, Dr. Michael P. 4

<sup>4</sup> Kenna, Dr. Michael P. 6-7

- v. The fate of pesticides and nitrogen in turfgrass systems has been researched and research projects have been summarized.<sup>5</sup>
- vi. Best management practices for turfgrass require simultaneous looking at the interactions between soils, turfgrass, turfgrasses, irrigation amounts, pesticides and fertilizers.<sup>6</sup>
- vii. Leaching studies indicate that between 0.3% and 1.71% of nitrates leach through turfgrass.<sup>7</sup>
- viii. Volatilization rates for pesticides range between 0.5% and 1%.<sup>8</sup>  
Leachate levels for pesticides on golf courses are less than maximum containment levels permitted for potable water (70 ppb). This water, in turn, entering in to a stream would be diluted by a factor of tens of thousands.<sup>9</sup>
- ix. Many pesticides are strongly adsorbed in the thatch layer where they remain until they are microbiologically degraded.<sup>10</sup>
- x. Regulatory agencies have demanded that some golf courses initiate environmental monitoring programs for various agricultural chemicals, including pesticides as a condition for being allowed to begin operation or to remain in business.<sup>11</sup>
- xi. Volatilization of insecticides is greatest when solar radiation, temperature and wind speed are the greatest.<sup>12</sup>
- xii. A potential detrimental effect of fertilizer usage is the contamination of surface water and groundwater (Bagogh and Walker 1992). Eutrophication of surface waters, the

<sup>5</sup> Henna, Dr. Michael F., 8

<sup>6</sup> Yates, Dr. Marylynn V., Department of Soil and Environmental Sciences, University of California, Riverside, "The Fate of Pesticides and Fertilizers in a Turfgrass Environment", USGA Green Section Record, United States Golf Association, January February 1995, 10

<sup>7</sup> Yates, Dr. Marylynn V., 12

<sup>8</sup> Yates, Dr. Marylynn V., 12

<sup>9</sup> Smith, Dr. Al, University of Georgia, Griffin, Georgia, "Potential Movement of Pesticides Following Application to Golf Courses", USGA Green Section Record, United States Golf Association, January February 1995, 13

<sup>10</sup> Snyder, Dr. G.H. and Cigar, Dr. J.L., University of Florida, "Pesticide Mobility and Persistence in a High Sand-Content Green", USGA Green Section Record, United States Golf Association, January February 1995, 16

<sup>11</sup> Snyder, Dr. G.H., 17

<sup>12</sup> Cooper, Dr. R.J., Clark, Dr. J.M., and Murphy, Dr. K.C., "Volatilization and Dissoluble Residues Are Important Avenues of Pesticide Fate", USGA Green Section Record, United States Golf Association, January February 1995, 22

proliferation of aquatic plants is caused by a surplus of available nutrients.<sup>13</sup>

- xiii. In recent studies, Joo et al. (1992) investigated the volatilization of nitrogen-15 labeled urea when applied to turfgrass. When irrigation did not follow the liquid urea application, 50% of the volatilization occurred within 7 days after the urea application. Starrett (1992) showed that less than 1% of the applied urea volatilized when a liquid urea application was followed with irrigation.<sup>14</sup>
- xiv. It has been claimed that leaching of surface applied fertilizer is responsible for nitrate in the groundwater in some urban areas.<sup>15</sup>
- xv. There are management practices that the golf course superintendent has control over that can minimize the potential movement of fertilizers through the soil profile. Among these practices is the control of fertilizer application rates.<sup>16</sup>
- xvi. Proper irrigation practices can also lead to reduced nutrient losses. Nitrogen volatility losses can be reduced to negligible amounts by light watering immediately after application. Also, losses due to leaching can be reduced to negligible amounts by light watering immediately after irrigation.<sup>17</sup>
- xvii. Pesticides degrade more rapidly in turfgrass than typically reported for other agronomic systems.<sup>18</sup>
- xviii. Nitrogen leaching profiles are related to application rate and are strongly modified by the rooting medium and frequency of nitrogen application made to immature turf. The concentration of nitrate leaching from pure sand rooting medium is much greater than nitrate leaching from sand rooting medium modified with peat moss.<sup>19</sup>

<sup>13</sup> Starrett, Dr. S.K., and Christians, Dr. N.E., Engineer and Turfgrass Specialist, Iowa State University, "Nitrogen and Phosphorus Fate When Applied to Turfgrass in Golf Course Fairway Condition", USGA Green Section Record, United States Golf Association, January February 1995, 23

<sup>14</sup> Starrett, Dr. S.K., 23

<sup>15</sup> Starrett, Dr. S.K., 23

<sup>16</sup> Starrett, Dr. S.K., 24

<sup>17</sup> Starrett, Dr. S.K., 24

<sup>18</sup> Horst, Dr. G.L., Shea, Dr. P.J., and Christians, Dr. N., University of Nebraska and Iowa State University, "Pesticide Degradation Under Golf Course Fairway Conditions", USGA Green Section Record, United States Golf Association, January February 1995, 28

<sup>19</sup> Braaten, Dr. Stanton E., and Stahnke, Dr. Gwen K., Washington State University, Puyallup Research and Extension Center, "Leaching of nutrients from Sand Putting Greens", USGA Green Section Record, United States Golf Association, January February 1995, 31

ix. Turf is an excellent system to minimize leaching of pesticides and nutrients. However, a turfgrass system is highly managed, and even the best system can give poor results if poorly managed. Conversely, a poor system can often give good results when managed well.<sup>20</sup>

xx. The high level of organic matter associated with a turf contributes to a correspondingly high level of organic activity. Clippings, verdure and thatch account for 69% to 92% of recovered nitrogen.<sup>21</sup>

xxi. Nitrogen applied to a dense, well-maintained turf is rapidly utilized by the turf, with little chance of downward N mobility.<sup>22</sup>

xxii. The best approach is to choose pesticides that have little chance of reaching groundwater. New pesticides being developed for the market generally have much better environmental characteristics than older pesticides, which tend to be more persistent.<sup>23</sup>

xxiii. The golf course industry has been and still is targeted for criticism regarding pesticide use and fertilizer use. The research presented here indicates that much of this criticism is misdirected. Turf, as a system, has a high level of microbial activity which, combined with the large amount of surface organic matter, creates a unique environment that minimizes the possibility of substantial downward movement of agrochemicals.<sup>24</sup>

xxiv. Newly seeded turf or other stands with very low shoot density, that is grown on very sandy soil is susceptible to pesticide leaching, assuming other factors important to pesticide leaching are present.<sup>25</sup>

b. Densely turfed sites, even on straight sand, are not likely to be subject to pesticide leaching.<sup>26</sup>

<sup>20</sup> Branhام, Dr. Bruce, Millner, Dr. Eric, Ricks, Dr. Paul, Michigan State University, "Potential Groundwater Contamination from Pesticides and Fertilizers Used on Golf Courses, USGA Green Section Record, United States Golf Association, January February 1995, 33

<sup>21</sup> Branhams, Dr. Bruce, 35

<sup>22</sup> Branhams, Dr. Bruce, 36

<sup>23</sup> Branhams, Dr. Bruce, 37

<sup>24</sup> Branhams, Dr. Bruce, 37

<sup>25</sup> Petrovic, Dr. A. Martin, Cornell University, "The Impact of Soil Type and Precipitation on Pesticide and Nutrient Leaching from Fairway Turf", USGA Green Section Record, United States Golf Association, January February 1995, 40

<sup>26</sup> Petrovic, Dr. A. Martin, 41

### CONCLUSIONS

The following conclusions have been drawn from the above noted research:

1. Overview recommendations for land management practices are as follows:
  - a. Only properly trained, educated and certified personnel are to purchase and apply chemicals.<sup>27</sup> Applicators are to be certified under Provincial regulations and/or in accordance with the most stringent recommendations of material suppliers.
  - b. Materials are to be stored in a building designed in accordance with the Warehousing Standards<sup>28</sup> of the Crop Protection Institute of Canada. The various aspects of the design which are required to be in compliance with the Standards include: Siting, Site Location, Layout, Safety, Packaging, Labels, Signs, Handling of Damaged Goods, Storage Procedures and Methods, Bulk Storage and Handling, Training, Handling of Hazardous Waste, Transportation and Insurance.
  - c. General recommendations for applicators include:
    - i. Recycle pesticide rinsate or field applied diluted rinsate in adjoining areas.
    - ii. Never dispose of pesticide wastes in or near a body of water.
    - iii. Handle all pesticides and wash equipment away from water or other potable water sources.
    - iv. Triple rinse or pressure rinse pesticide containers as soon as they are empty.
    - v. Do not reuse containers unless they are specifically designed for that purpose.
    - vi. Do not draw water into equipment or containers used to hold, mix, or apply pesticide unless a proper air gap is present or a back flow preventer is used.
    - vii. Don't wash or clean any pesticide application containers or equipment within 30 metres (100 feet) of an open body of water or storm sewer system.<sup>29</sup>

<sup>27</sup> Leach, Jay, the Alberta Golf Superintendents Association, "Setting the Record Straight", *Green Master*, February/March 1996, 14.

<sup>28</sup> Crop Protection Institute of Canada, "Warehousing Standards", 21 Four Seasons Place, Suite 627, Etobicoke, Ontario, M9B 6J8, Phone #: (416) 622-9771, Fax #: (416) 622-6764, January 1993, 1.

<sup>29</sup> Leach, Jay, the Alberta Golf Superintendents Association, "Setting the Record Straight", *Green Master*, February/March 1996, 11.

- viii. Maintain a 15 meter buffer between application areas and watercourses.
- ix. Monitor application rates and keep up-to-date records including materials applied and active ingredient, application dates, area and rate and total amount of fertilizer used.<sup>30</sup>
- x. Adopt and customize an Integrated Pest Management program for the golf course. The elements of such a program include:
  - Planning and managing turf to prevent organisms from becoming pests.
  - Identification of potential turf pests.
  - Monitoring populations of pests, beneficial organisms and all other relevant environmental factors.
  - Establishment of damage/action threshold.
  - Application of cultural, physical, biological, behavioral and chemical control measures to maintain pest populations below threshold levels.
  - Evaluation of the effects and efficacy of pest control measures used.<sup>31</sup>
- xi. Good management of turf practices reduce the potential for pests. The management practices include:
  - Proper irrigation practices.
  - Maintaining balanced nutrition.<sup>32</sup>
  - Application of pesticides at the proper time of day.<sup>33</sup>
- xii. There are various Integrated Pest Management programs which may be utilized such as The Canadian Audubon Cooperative Sanctuary Program.<sup>34</sup>

<sup>30</sup> Leach, July, 14

<sup>31</sup> Charbonneau, Pam, Ontario Ministry of Agriculture, Food and Rural Affairs, "Integrated Pest Management for Turf", *Landmark*, August 1995, 8

<sup>32</sup> Charbonneau, Pam, 8

<sup>33</sup> Charbonneau, Pam, 24

<sup>34</sup> Charbonneau, Pam, Ontario Ministry of Agriculture, Food and Rural Affairs, "Integrated Pest Management for Turf - Getting Started", *Landmark*, October/November 1995, 22

- ix. A 6 hour period following the application of pesticides is all that is required for maximum efficacy in pest control. Application should be made during a time which has a low probability of rainfall within this time period.<sup>35</sup>
- x. Proper pesticide selection, selecting a pesticide that poses the least threat of rapid leaching and runoff and is relatively non-persistent is an important consideration.<sup>36</sup>
- xi. Best management practices for turfgrass require simultaneous looking at the interactions between soils, turfgrass, turfgrasses, irrigation amounts, pesticides and fertilizers.<sup>37</sup>
- xii. There are management practices that the golf course superintendent has control over that can minimize the potential movement of fertilizers through the soil profile. Among these practices is the control of fertilizer application rates.<sup>38</sup>
- xiii. Proper irrigation practices can also lead to reduced nutrient losses. Nitrogen volatility losses can be reduced to negligible amounts by light watering immediately after application. Also, losses due to leaching can be reduced to negligible amounts by light watering immediately after application.<sup>39</sup>
- xiv. The best approach is to choose pesticides that have little chance of reaching groundwater. New pesticides being developed for the market generally have much better environmental characteristics than older pesticides, which tend to be more persistent.<sup>40</sup>

#### AVAILABLE DOCUMENTATION

If your golf course is interested in implementing an Integrated Pest Management Program, or wishes further information, the following can be provided:

Koop, Dr. C. Everett, "Scare Tactics on Pesticides Mislead the Public", Green Master.

<sup>35</sup> Smith, Dr. A.L. 14

<sup>36</sup> Kenn, Dr. Michael F., 4

<sup>37</sup> Yates, Dr. Marylyn V., Department of Soil and Environmental Sciences, University of California, Riverside, "The Fate of Pesticides and Fertilizers in a Turfgrass Environment", USGA Green Section Record, United States Golf Association, January February 1995, 10

<sup>38</sup> Starrett, Dr. S.K., 24

<sup>39</sup> Starrett, Dr. S.K., 24

<sup>40</sup> Brunham, Dr. Bruce, 37

Leach, Jay, the Alberta Golf Superintendents Association, "Setting the Record Straight", Green Master, February/March 1996, 14-15.

Charbonneau, Pam, Ontario Ministry of Agriculture, Food and Rural Affairs, "Integrated Pest Management for Turf", Landmark, August 1995, 8-24.

Charbonneau, Pam, Ontario Ministry of Agriculture, Food and Rural Affairs, "Integrated Pest Management for Turf - Getting Started", Landmark, October/November 1995, 22-25.

Eskelson, Dan., "Implementing IMP Strategies", Golf Course Management, February 1992, 68-75.

Kenna, Dr. Michael P. Director USGA Green Section Research, "What Happens to Pesticides Applied to Golf Courses", USGA Green Section Record, United States Golf Association, January February 1995, 1-9.

Yates, Dr. Marylynn V., Department of Soil and Environmental Sciences, University of California, Riverside, "The Fate of Pesticides and Fertilizers in a Turfgrass Environment", USGA Green Section Record, United States Golf Association, January February 1995, 10-12.

Smith, Dr. Al, University of Georgia, Griffin, Georgia, "Potential Movement of Pesticides Following Application to Golf Courses", USGA Green Section Record, United States Golf Association, January February 1995, 13-14.

Snyder, Dr. G.H. and Cisar, Dr. J.L., University of Florida, "Pesticide Mobility and Persistence in a High-Sand-Content Green", USGA Green Section Record, United States Golf Association, January February 1995, 15-18.

Cooper, Dr. R.J., Clark, Dr. J.M., and Murphy, Dr. K.C., "Volatilization and Dislodgeable Residues Are Important Avenues of Pesticide Fate", USGA Green Section Record, United States Golf Association, January February 1995, 19-22.

Starrett, Dr. S.K., and Christians, Dr. N.E., Engineer and Turfgrass Specialist, Iowa State University, "Nitrogen and Phosphorus fate when applied to Turfgrass in Golf Course Fairway Condition", USGA Green Section Record, United States Golf Association, January February 1995, 23-25.

Horst, Dr. G.L., Shea, Dr. P.J., and Christians, Dr. N., University of Nebraska and Iowa State University, "Pesticide Degradation Under Golf Course Fairway Conditions", USGA Green Section Record, United States Golf Association, January February 1995, 26-28.

Brauen, Dr. Stanton E., and Stahnke, Dr. Gwen K., Washington State University, Puyallup Research and Extension Center, "Leaching of Nitrate from Sand Putting Greens", USGA Green Section Record, United States Golf Association, January February 1995, 29-32.

Branham, Dr. Bruce, Millner, Dr. Eric, Rieke, Dr. Paul, Michigan State University, "Potential Groundwater Contamination from Pesticides and Fertilizers Used on Golf Courses, USGA Green Section Record, United States Golf Association, January February 1995, 33-37.

Perovic, Dr. A. Martin, Cornell University, "The Impact of Soil Type and Precipitation on Pesticide and Nutrient Leaching from Fairway Turf", USGA Green Section Record, United States Golf Association, January February 1995, 38-41.

Linde, Douglas T., Watschke, Dr. Thomas L., Borger, Jeffrey A., Pennsylvania State University, "Transport and Runoff and Nutrients from Fairway Turfs", USGA Green Section Record, United States Golf Association, January February 1995, 42-44.

Bowman, Dr. Daniel C., Devitt, Dr. Dale A., Miller, Wally W., University of Nevada, Reno, "The Effect of Salinity on Nitrate Leaching from Turfgrass", USGA Green Section Record, United States Golf Association, January February 1995, 45-49.

Crop Protection Institute of Canada, "Warehousing Standards", 21 Four Seasons Place, Suite 627, Etobicoke, Ontario, M9B6J8, Phone #: (416) 623-9771, Fax #: (416) 622-6764, January 1993.

This information is in addition to the environmental assessment report.

Thank you.

*J.D.P. Environmental*  
*Jim Purves*  
James Purves, B.Arch., M.N.S.A.A.

cc: Len Paddock, Fax #: (709) 673-5823

## **Appendix B**

**Government of Newfoundland & Labrador**  
**Department of Environment & Conservation**



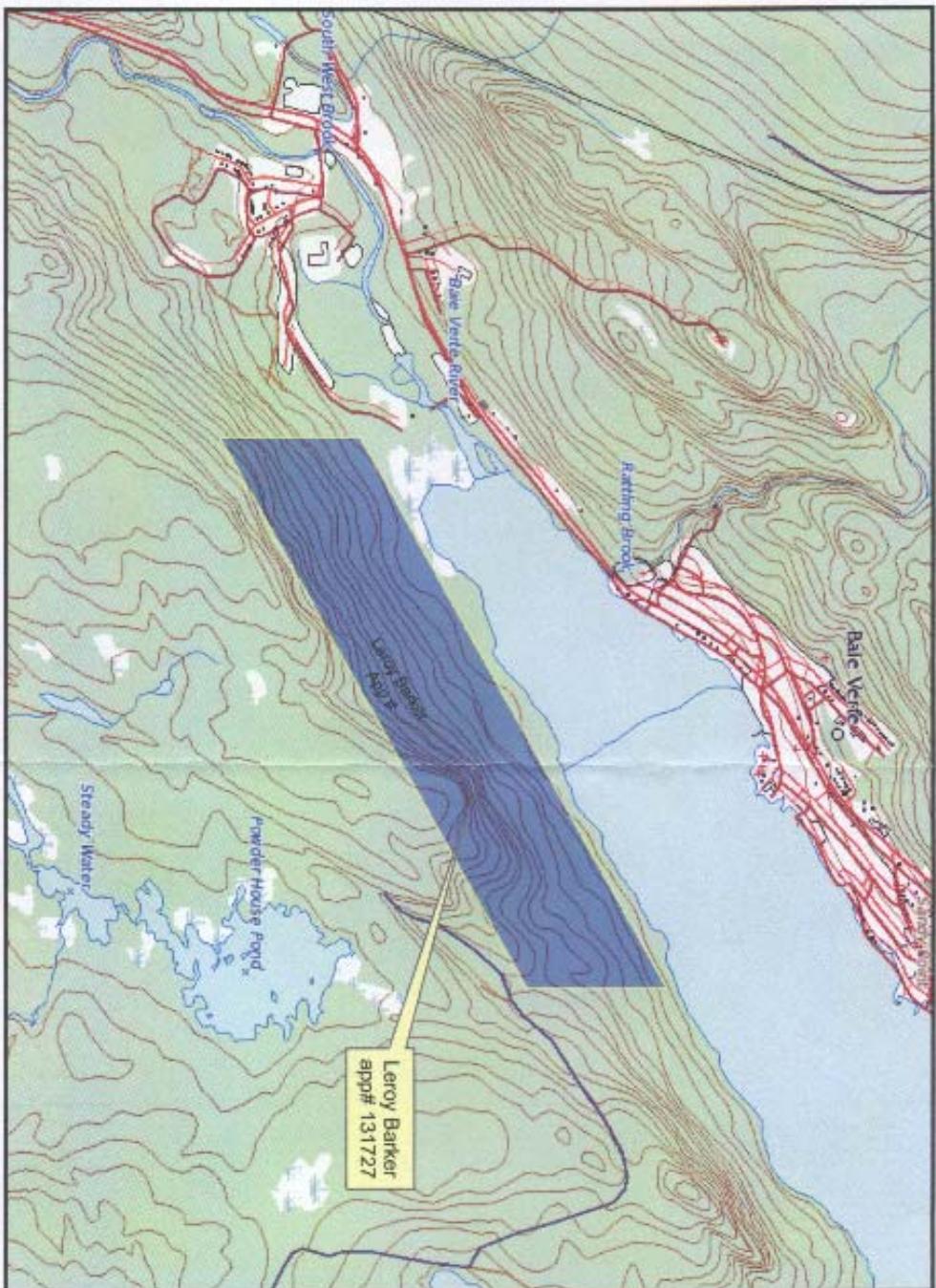
**NOTE TO USERS**

The information on this map was compiled from land surveys registered in the Crown Lands Registry.

Since the Registry does not contain information on all land ownership within the Province, the information depicted cannot be considered complete.

The boundary lines shown are intended to be used as an index to land titles issued by the Crown. The accuracy of the plot is not sufficient for measurement purposes and does not guarantee title.

Leroy Barker  
app# 131727



Users finding any errors or omissions on this map sheet are asked to contact the Crown Titles Mapping Section, Howley Building Higgins Line, St. John's Newfoundland.

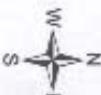
Some titles may not be plotted due to Crown Lands volumes missing from the Crown Lands registry or insufficient survey information.

Users can also contact the Crown Titles Mapping Section by fax or telephone as listed below.

Fax - 729-3221  
Telephone - 729-0061

Scale 1:25,000

**Crown Lands Division**



0 2500 5000 12500 15000 25000  
Metres

## **Appendix C**