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August 28, 2008

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Ontario Ministry of the Environment
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Dear Mr. Taylor

RE: Category 3 Permit To Take Water Application Findlay Creek Village Subdivision Site, Future Stages, Ottawa (Gloucester) Ontario
(EBR 010-4134)

Thank you for providing the September 5, 2008 extension for comments on this application.

Prior to retirement, I was a botanist and wetland expert for the Canadian Museum of Nature. As part of my research on the Leitrim Wetlands, I spent a great deal of time inventorying the vascular plants of the wetland, studying aerial photographs (from 1945 to 2000), scrutinizing topographic maps dating back to 1863, observing the mosaic of plant communities and collecting plant specimens for the National Herbarium of Canada. I wrote three scientific articles and co-authored a fourth on this remarkable ecosystem. (Copies available upon request).

The very complex, highly bio-diverse, Provincially Significant Leitrim Wetland is a truly unique and irreplaceable fragment of our natural heritage. The Canadian Wildlife Service (1993) stated that: "The Leitrim Wetland is clearly an area of outstanding ecological significance."

This Permit should **not** be issued for the following reasons:
a) the wetland water budget is unknown;
b) the hydrogeology of the wetland is poorly understood;
c) plant communities within the "protected" part of the PSW have already been damaged as a result of issuances of PTTWs;
d) the critical water levels of the overburden and bedrock have already been negatively impacted as a result of issuances of PTTWs;
e) the Leitrim Wetland is highly sensitive to drainage;
f) development in part of a wetland usually negatively impacts the remainder

g) the pumping will likely result in the acceleration of toxic materials originating from the Gloucester Landfill.
h) development of wetland areas releases greenhouse gases contributing to climate change;
i) destruction of potential habitat for SARA and Ontario Endangered Species Act 2007 (OESA 2007) animals; and
j) the drainage required for the Southwestern Future Stage will likely negatively impact the wetland on the federal lands west of Albion Road.

A. Water Budget

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In a 1990 report Golder Associates Ltd.* **correctly** stated: " In order to provide protection to the valuable resources of the wetland, it is necessary to understand the water budget of the watershed supplying both the surface and subsurface flows which have resulted in the botanical and wildlife communities observed". This report, which formed the basis for various approvals for development within the wetland, used assumptions, derived from inadequate studies, to produce conclusions that were misleading with respect to the understanding of the water budget.

The Golder Associates report concluded, on page 16, that :"The total groundwater flux into the wetland area is estimated to be about 2000 cubic metres a day". This is equivalent to 2,000,000 litres of water a day. The May 2008 Permit To Take Water (Number 0816-7E7L95) issued by the Ministry of the Environment, indicates that 32,400,000 million litres a day could be required to control surface water drainage. This is over **16 times more than Golder's 1990 estimates of water entering the wetland area on Tartan lands.** A previous PTTW permit for the Kelly Farm Drive area allowed the removal of up to 51,580,000 litres a day - **over 25 times the estimated total groundwater flux.**
Obviously Golder's calculations were horribly wrong and **no one knows** what the actual water budget for the wetland is. How can one claim to be protecting the Leitrim Wetland when the hydrogeology is so poorly understood?

* October 1990 report to Tartan Development Corporation entitled HYDROGEOLOGICAL INVESTIGATION LEITRIM VILLAGE LANDS GLOUCESTER, ONTARIO, by Golder Associates Ltd.

B. Hydrogeology

The complex hydrogeology of the Leitrim Wetland is poorly understood. In the LEITRIM DEVELOPMENT AREA FEDERAL ENVIRONMENTAL SCREENING REPORT 1996, prepared for the National Capital Commission by Cumming Cockburn limited it is stated: "Groundwater flux into the Leitrim Wetland was estimated previously by Golder (1990) with most of this flow occurring through the sand, gravel and peat deposits along the south side of the wetland". Suggestions of significant ground water flow from the bedrock into the overburden, by environmentalists and independent experts, were summarily dismissed by the consultants.

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Example 1.
In the Minutes of a meeting at the NCC dated MARCH 1, 1995, Mr. Smolkin of Golder stated in response to a question about the possible negative impacts, on the wetland, of excavating in the fractured bedrock: "The bedrock will not have a significant impact due to the thickness of the relatively low permeability material which overlies the bedrock. This material will act to minimize the effects of the bedrock and as such the hydraulic properties of the bedrock would have negligible contribution to recharge of the wetland...".

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Example 2

In the 1996 Environmental Screening Report, in response to my comments, it is stated: "Mr. --------- also stated that "deep-seated upwelling" in the wetland is indicative of upward groundwater flow. Although groundwater discharge to the wetland area from the granular ridge area has been demonstrated, the evidence indicates that the discharge is within the sandy zone above and not from the bedrock itself as implied by ----------. As well, the main components of the development are at a distance from the main discharge areas and, as a result there will be no impact on natural groundwater discharge".

The Groundwater Elevations figures in the April 2008 Findlay Creek Groundwater Monitoring report clearly demonstrate that **the consultants assumptions were wrong, that the bedrock and overburden were hydraulically linked and that the bedrock was supplying a substantial amount of water to the overburden.**
In a March 5, 2008 meeting, MOE representatives acknowledged this fact.

Note: The likelihood of hydraulic connectivity between the bedrock and overlying till (upwelling from bedrock) was previously acknowledged by the proponent's consultants. In the 1999 REPORT ON BASELINE MONITORING PROGRAM, GROUNDWATER AND SURFACE WATER REGIMES, LEITRIM DEVELOPMENT AREA, CITY OF GLOUCESTER, ONTARIO prepared by Cumming Cockburn Limited and Golder Associates for the City of Gloucester, the report states on page 12: "it should also be noted that the difference between the groundwater level in the overburden and in the bedrock in bore hole 97-2 was very consistent over the monitoring period, even during periods when the actual water levels were varying by up to about 0.7 metres. This consistent difference between the two groundwater levels is likely indicative of a hydraulic connection between the overburden and the bedrock".

Even Transport Canada supports the case for deep upwelling from bedrock: "It is likely that the 1,4-dioxane found in the till layer above the bedrock within the deep aquifer originates from the bedrock below.....The presence of 1,4-dioxane in till over 800 metres down-gradient of the Special Waste Compound suggests that till is not the path of least resistance being followed by the 1,4-dioxane plume. Also, the upward vertical gradients in effect in the deep aquifer are more consistent with the contamination moving from the bedrock to the till rather than vice versa".

Golder apparently underestimated the inflow of water along the western boundary of the Tartan lands.

Golder's 1990 report (HYDROGEOLOGICAL INVESTIGATION LEITRIM VILLAGE LANDS GLOUCESTER, ONTARIO) "the groundwater flux (Q) into the wetland area along the west part of the south property boundary is about 1950 cubic metres a day" and: " the groundwater flux through the west property boundary is calculated to be about 50 cubic metres per day". Now 50 cubic metres is only 50,000 litres , a rather small amount considering the geology of the area and some of the Transport Canada reports. According to Golder's 1990 report, this determination was based on very little actual data collection and a lot of assumption -"The hydraulic conductivity of 4×10^{-4} centimetres per second is on average representative of the geologic materials which appear on Section B-B and which are therefore assumed to represent geologic conditions along the western boundary."

During the October 15, 2001 - February 15, 2002 period, Headwater Environmental Services Corporation conducted a geoprobe investigation, for Transport Canada, on the Tartan lands adjacent to Albion Road. Twenty four sites were probed and fourteen permanent bedrock and eight overburden wells were installed.

The subsequent Subsurface Monitoring Program Report, Gloucester Landfill Site, Spring/Summer/Fall 2002, dated August 25, 2003, contained some interesting information indicating that a significant amount of water is entering the wetland area on the Tartan lands from the west:
"Key findings of the 2002 subsurface monitoring program include the determination of groundwater flow patterns in the deep and shallow aquifers out beyond Albion Road. These patterns suggest higher hydraulic gradients and therefore possibly higher groundwater flow rates in the area of Albion Road and further to the east. The patterns also suggest a possible groundwater funneling effect east of Albion Road."

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Some Background Information

Early in the Leitrim Wetland saga, people had concerns about the consultants' hydrological reports. In 1994 Environment Canada hired a very qualified wetland hydrologist, Dr. W. K. Nuttle, to review the proponent's consultants' reports. Dr. Nuttle summed up the deficiencies as follows:

> "The hydrologic analysis to assess the water table drawdown within the remaining wetland is flawed. No consideration has been given to the very real possibility that the bedrock at the site is hydraulically active and that the wetland and base flow to Findlay Creek are sustained by recharge coming from the bedrock. Both the magnitude and extent of drawdown in the wetland could be greater than predicted, and the mitigation of drawdown by construction of a barrier to lateral groundwater flow out of the wetland will not perform as planned".

and

> " Insufficient information has been collected by the proponents to characterize the pre-existing hydrological conditions in the wetland. Extrapolations from these limited data to describe present and future conditions under development, based on simulation models and intuition are highly uncertain and possibly completely wrong. Lack of adequate pre-project hydrologic data renders it impossible to limit impacts on the wetland by setting objective, quantitative performance goals for the project, These problems will continue unless the proponent institutes continuous hydrologic monitoring in the core wetland".

In 2000, Dr. Frederick A. Michel (Associate Professor, Earth Sciences, Carleton University), Dr. G. Clarke Topp (one of Canada's most respected soil physicists) and Mr. Michael Woodley (B.Sc., B.Ed., M.Sc., P. Geol.) - expressed the serious concern that the proposed Leitrim stormwater management system (**including the Tartan by-pass ditch**) would cause excessive water loss from the remainder of the Leitrim wetland. Their comments echoed those of Dr. Nuttle. The opinions of these scientists were supported by government soils reports. Even Natural Resources Canada had grave reservations about the stormwater system when asked in 2002-2003 to review the consultants' plans for the Department of Fisheries and Oceans Canadian Environmental Assessment Act Screening Report for this project.. This report was released in 2003 and was severely criticized by scientists and environmentalists.

The independent experts' concerns of excessive water leakage from the proposed stormwater pond were validated in 2004, when the proponent, apparently after some testing, decided to move **both** the Tartan and Remer stormwater ponds out of the actual wetland. The necessity to relocate these ponds also proved that the conclusion of the 2003 DFO CEAA Screening Report - " DFO is of the opinion that

after the implementation of mitigation measures, the Leitrim External Storm System is not likely to cause significant adverse environmental effects" - was unreliable.

C. Damage to Plant Communities as a Result of Issuances of PTTWs

Back flooding of a significant part of the "protected" part of the Leitrim Wetland (see attached Figures a , b & c) has destroyed or damaged many plant communities. Among the casualties were a stand of 120 year old cedars and many Regionally Significant plants. Some of the rare plants which were restricted to this part of the wetland were obliterated, thereby reducing the biodiversity of the ecosystem. Improper installation of a culvert, at least four feet above the base of a tributary stream, was the cause for the back flooding. Although the culvert was removed, a new one was not installed at the proper level - in the channel of the tributary stream - and an earthen dam continues to hold back the water.

Other Leitrim Wetland plant communities located to the north and east of the "protected" part of the wetland have been destroyed by bulldozing and urban development. A number of species of Regionally Significant plants, that occurred only in these unprotected parts of the wetland were obliterated, adding to the loss of biodiversity.

Note: It appears that even the proponent had doubts about the ability of its design to maintain pre-construction water levels in the wetland. In early 2003, while reviewing documents obtained from Environment Canada through an ATIP request, I noted a most disturbing mitigation scheme proposal from the proponent to "prevent dewatering of the core wetland" (e-mail from Environment Canada to Andy Smith dated August 30, 2002). The proposal involved "storing water behind a berm and access road on the northern boundary of the wetland .....and a berm on the eastern boundary of the wetland". According to the e-mail, "Environment Canada has not received specific information from the proponent on the expected extent and duration of this flooding, but flooding up to a depth of 0.7 metres (and up to 1.5 m. for a shorter duration) appears possible in portions of the area west of the core wetland boundary on the east side."

In a February 2, 2003 letter to the Minister of the Environment with a copy to the DFO Minister, I warned "Although some of the marsh plants, such as cattails, will likely survive the flooding, plants in other community types will most likely perish from any prolonged flooding.....As the scientists at CWS are aware, a slight raise in water table (a couple of inches) can kill many wetland plants such as cedar trees.....Much of the proposed area to be flooded is NOT inundated with water in the spring. The water table is generally below the soil surface. Therefore, flooding will be disastrous to the plant communities inhabiting these areas".

D. Maintenance of Critical Pre-construction Water levels

The only way to guarantee the long-term survival of the provincially significant Leitrim Wetland and Findlay Creek is to maintain pre-construction water table levels. One of the conditions of approval by DFO was the **maintenance** of pre-construction water levels within the remainder (within the berm) of the Leitrim Wetlands. This was clearly restated in the DFO Minister's April 22, 2005 letter to Elizabeth May: "The purpose of the monitoring program is primarily to assist with the preparation of guidelines that will ensure water levels in the Leitrim Wetland are maintained". As independent experts and government soils reports have implied, this will likely be impossible. The extreme difficulty of maintaining pre-construction water levels has been corroborated by:
a) the back flooding of the "protected" wetland due to berm construction by the developer; and

b) the lowering of both the average overburden and bedrock water levels in the eastern part of the wetland (as indicated in **Figures 9 - 13** in the 2008 ground water monitoring document).

Based on the long-term decline in water levels in parts of the Leitrim Wetland following drainage schemes circa 1920 (see item D.), I would expect to see an ongoing decline in both the average overburden and bedrock water levels.

E. The Leitrim Wetland is a sloped, discharge wetland, highly sensitive to drainage

The Leitrim wetland is both a sloped and a discharge wetland (a wetland whose existence is dependent on seepage and/or upwelling of ground water) and consequently very sensitive to drainage as evidenced by its historic reduction in size and widespread water table lowering following agricultural drainage . **Such evidence from the wetland itself casts serious doubt on the prediction of a sustainable "protected" wetland.** In fact, one of the proponent's consultants, Cumming Cockburn, in a 1991 report, cited an instance of dramatic lowering of the water table in the wetland about 85 years ago. This was based on cores they had extracted from old Larch trees - one hundred and eighty years of tiny annual rings were followed by substantially larger ones indicating drier conditions (i.e. drop in soil water levels). They had some inkling as to the cause for they remark: "One possible scenario might have involved surrounding drainage efforts connected with agricultural activities -- for example changes to local groundwater table elevations, and the nature of groundwater upwelling". As no major climatic changes occurred at that time, the most plausible explanation for a drop in the overall water table is the deepening of Findlay Creek and various drainage enhancements completed *ca.* 1920. **The water table lowering extended for at least 300 metres south of Findlay Creek.** The old Larch trees which were cored are about 250 metres south of Findlay Creek

The high *Ksat (permeability)* readings reported in Dr. Clarke Topp's 2007 hydraulic conductivity study explains, to a large degree, why so much of the water table in the wetland was quickly lowered following the drainage works circa 1920.

An equal or, more likely, greater area will probably suffer water table lowering due to the ongoing and proposed urban development within the 1989 wetland boundaries. This will result in the loss of wetland functions, changing plant communities, diminishment of biodiversity, peat wastage and the release of large amounts of "greenhouse" gases. It is very possible that the Leitrim Wetland will, over the long term, be destroyed.

As indicated by the Larch tree growth ring analysis by Cumming Cockburn Ltd., the open fen area where these trees were growing had a stable water level for at least 180 years. The drainage enhancements circa 1920 initiated extensive water table lowering in the wetland. It was still in progress as late as 1988-89, as indicated by the ongoing shrinkage of the open fen, when additional ditches dug by Tartan further aggravated the situation. Such a state of affairs contradicts the claim that sufficient surface and groundwater was entering the wetlands to maintain it.

As T.C. Winter**, an expert hydrologist with the U.S. Geological Survey states: "Draining water from groundwater discharge areas initially increases groundwater discharge because the hydraulic head gradients are increased. A detrimental impact that is likely to result is that the increased gradients could increase seepage rates from nearby wetlands, and, ultimately, cause a regional lowering of the water table. It is also probable that the plant communities would change in a groundwater discharge wetland that is drained". **This is exactly what happened to the Leitrim Wetland following the drainage enhancements *ca.* 1920.**

** A Conceptual Framework for Assessing Cumulative Impacts on the Hydrology of Nontidal Wetlands: Environmental Management Vol. 12, No.5, pp. 605 - 620.

F. Development on Part of a Wetland Usually Negatively Impacts the Remainder

As concluded by T. C. Winter in A Conceptual Framework for Assessing Cumulative Impacts on the Hydrology of Nontidal Wetlands**: “Because the hydrologic system is a continuum, any modification of the continuum will impact contiguous parts. Therefore, modification of the hydrologic system is a self-perpetuating process, because the solution to one problem generally creates a problem for the contiguous area, which in turn must be modified. The seriousness of the impact commonly is related to scale. One well or one landscape modification generally has only local effects, but multiple modifications or development can have extensive impacts”. Considering the size and position of the proposed development (within lowest parts of the wetland), extensive negative impacts should be expected.

** Environmental Management, Vol. 12, No.5, pp. 605 -620.

There are two such examples of urban development in wetlands that were originally part of the Leitrim Wetland complex. One is located in the western part of Blossom Park, the other in the Windsor Park area. Both developments destroyed large parts of the respective wetlands resulting in water table lowering, extensive peat wastage and severe wetland degradation.

G. Pumping and in-ground infrastructure will likely accelerate the migration of toxic material

Figure 4 in Golder's Technical Study shows the area of influence of the water taking which encompasses all of the Leitrim Wetland west of Albion Road, including the federally-owned portion, and part of the Gloucester Landfill.
On page 13 it states: "One of these sources consists of a former special waste compound and former municipal landfill. There are two contaminated groundwater plumes that originate from this area: the Municipal waste Plume (MWP) and the Special Waste Plume) According to Franz Environmental Inc. (Franz 2003) the chemical compounds from these plumes are within the shallow and deep capture zones of a remediation system along Delzotto Avenue, with the exception of 1,4-dioxane".
Since a number of toxic chemicals were found on Tartan lands, the claim that: "all of the chemical compounds from these plumes are within the shallow and deep capture zones of a remediation system, with the exception of 1,4-dioxane" is somewhat misleading.

Also on page 13:
"Monitoring conducted by Transport Canada has indicated that the 1,4 dioxane plume has migrated approximately 300 metres east of Albion Road. 1,4 dioxane was detected in wells to the east of Albion Road with screened intervals ranging from 3.0mbgs to 14.7 mbgs. The highest concentration of 1,4-dioxane measured during the sampling events in 2003 and 2006 was more than 1,700 times less than the site-specific risk-based criterion established during the Area Wide Risk Assessment (Franz,2003) and Supplemental Risk Assessment (Franz, 2002)".
Golder's claim of very low concentrations of 1,4-dioxane should be carefully evaluated. During the Geoprobe Investigation on the Tartan lands in the fall of 2001, a sample of water containing

over 8,000 ppb 1,4-dioxane, as well as other pollutants was obtained. Prior to the AWRA done by Franz, the acceptable level of 1,4-dioxane was 65 ppb. Franz's conclusion that a level of 50,000 ppb 1,4-dioxane would not pose an unacceptable risk to human, animal or ecosystem health is questionable. This level of pollution is many, many times the levels found to be acceptable by other jurisdictions. Few jurisdictions have guidelines for 1,4-dioxane, but non-potable water in Washington State should be less than 7 ppb, and in California less than 3 ppb.

One should **retain some skepticism** when assessing the conclusions of risk assessments as a risk assessment done for the Sidney Tar Ponds, one of Canada's most contaminated sites, indicated that there was **no risk**, even though nearby yards were heavily contaminated and the people in the area had elevated incidences of cancer and birth defects.

Also on page 13
"Despite the high solubility of 1,4-dioxane, the migration of the contaminant plume due to temporary groundwater pumping is considered unlikely to be affected due to the shallow nature of the proposed servicing (in overburden) anticipated for the northwestern and southwestern future stages in comparison to the depth of the groundwater plume. In addition, the low concentration of 1,4-dioxane reduces any risk associated with potential migration".

Since 1990 environmentalists and independent experts have expressed concerns about migrating toxic materials from the Gloucester Landfill Site. Transport Canada in a letter dated November 23, 2000, stated:
"It is our understanding that groundwater levels will not be lowered in the Leitrim Wetlands area. Provided this is true, there is no anticipated affect on the migration of the plumes at the Gloucester Landfill site. However, if the water table were in fact lowered, the rate of migration could be accelerated."

As various documents indicate, the water table will likely be lowered due to drainage for the Findlay Creek Village subdivision.

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Example 1
Even Transport Canada admits to the possibility of increased groundwater loss from the federal lands:

> **" The lowering of the water table in this part of the subdivision east of Albion Road may possibly accelerate the groundwater flow beneath the Albion Road from the west.....This could result in an average increase in groundwater flow rates from west to east across Albion Road by a factor of up to 1.4. The selective lowering of groundwater levels in the west part of the subdivision may also result in groundwater being increasingly funneled into this part of the development".**

(Quote from letter to Andy Smith, DFO, from Transport Canada, dated March 6, 2002).

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Example 2
The documentation supporting the latest PTTW application states, on page 9, that excavation for serving along Albion Road will extend 1.0 to 1.5 metres below the original grade. Figure 1 of this report shows an extensive network of servicing trenches in the Southwestern Future Stage which usually act as drains. There will probably be drains, below the foundation level, to keep the basements and sump pump holes dry. Also, if I recall correctly, there was in one of the reports dealing with the AWRA, a statement indicating that water levels would be lowered to 1.5 metres below the basements.

Note: At the PTTW Open House on Wednesday night (August 6, 2008), Mr. Smolkin essentially stated that:
a) they would be adding 1.5 to 2 metres of fill on the land adjacent to Albion Road;
b) the foundations for the houses would be at grade level; and
c) therefore they would not be lowering the water table in the area.
I found statement c) to be quite misleading.

Some background info

A number of toxic materials have been found in the water beneath the Tartan lands. These are thought to have migrated from the nearby former City of Gloucester landfill and Special Waste Compound [1] which are on federal lands about 1000 metres northwest of the Tartan lands. Among the toxics detected are ether, tetrahydrofuran, toluene, m,p-xylene, propene, 2-methylpropene, trimethylbenzene isomer, tetramethylbenzene and 1,4 dioxane [2.] 1,4 dioxane, a suspected carcinogen, has migrated at least 300 **metres** east of Albion Road.
Independent experts (including two engineers who worked on the site) and environmentalists have expressed concerns that this material will eventually get into both the stormwater management system and Findlay Creek, and possibly seep (via VOCs) into the basements of future homes on the Tartan lands. Independent experts have described the Area Wide Risk Assessment (AWRA), prepared for Transport Canada, as being seriously flawed.
It is interesting to note that Transport Canada [3] in 2002 acknowledged that:

> "All groundwater from the site would be expected to enter the Findlay Creek system prior to reaching Bank Street".

In effect, a lot of the groundwater from the Gloucester Landfill Site and Special Waste Compound is discharging and upwelling in the proposed subdivision area east of Albion Road.

1 The Special Waste Compound from 1969 to 1980 was used for the disposal of federal laboratory, university and hospital hazardous wastes. The wastes consisted primarily of organic solvents. It has been estimated that perhaps 130 tonnes of these chemicals were disposed of in the Special Waste Compound.

2 Geoprobe Investigation at the Gloucester Landfill (October 15, 2001 - February 15, 2002) see pages 63 & 73.

3 Subsurface Monitoring Program Report, Gloucester Landfill Site, Spring/Summer/Fall 2002, see page 6.

NOTE: The **actual extent** of the 1,4-dioxane plume is **unknown** due to the limited number of wells. Considering the unpredictable nature of water movement in fractured bedrock, the plume could be much larger.

H. Release of Greenhouse Gases Due to Loss of Wetland Areas

Dr. Nigel Roulet of the Centre for Climate Change Research, McGill University, concluded that all land-use changes involving wetlands result in large emissions of carbon dioxide, methane and nitrous oxides - all “greenhouse” gases. Shouldn't the MOE be acting to reduce "greenhouse" gases rather than supporting unsustainable development that promotes climate change?

Part of Findlay Creek Village is being constructed on land evaluated as the Provincially Significant Leitrim Wetland by the OMNR in 1989.A number of documents clearly indicate that a significant portion of the evaluated 313-hectare Provincially Significant Wetland will be destroyed by the

proposed development.

Examples:
a) An 1991 Cumming Cockburn Limited report entitled Planning for Leitrim, An Integrated Approach - Vol.1: Environmental Analysis, prepared for the Corporation of the City of Gloucester, indicated that:"(74 hectares) of the wetland will be lost in the proposed development".

b) In response to the 1991 Cumming Cockburn report, Environment Canada stated in 1993 that:

> "The Leitrim Wetland is clearly an area of outstanding ecological significance.....We consider the resultant loss of wetland area and function to be a MAJOR PERMANENT NEGATIVE IMPACT and recommend that the entire wetland be protected and that an adjacent zone of 120 m be secured around the wetland".

c) A 1993 Department of Fisheries and Oceans letter stated: "As we understand it, Tartan Homes Development's proposal will result in a 20% loss (74 hectares) of what is known as the Leitrim Wetland".

d) A 1996 letter from Environment Canada expressed concern "for the portion of the Leitrim Wetland to the north which will be impacted by the proposed Phase 1 Development. A substantial portion of the existing wetland will be destroyed by that development proposal". The letter goes on to state: " This apparently presumes that a much smaller wetland area compared to the existing one will be "maintained" after substantial losses of area to the proposed Phase 1 and 2 developments".

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I. Destruction of Potential SARA and OESA 2007 Species Habitat

The May 15, 2006, Version 4, Final CEAA Screening Report for the North-South LRT Project stated that three species at risk turtles - **Spiny Softshell, Spotted Turtle and Blanding's Turtle** - had been recorded in the general vicinity of the LRT alignment. The LRT alignment borders the western part of the Leitrim Wetland.

In 2006 Blanding's Turtle, *Emydoidea blandigii*, a federally and provincially threatened species (SARA, OESA 2007), was discovered within the 1863 boundary of the historic Leitrim Wetland at Lester Road, immediately west of the old CPR tracks. The 2006 Screening Report states on page 70: "some areas of open water observed within the Greenbelt Sector of the study corridor, particularly surrounding Lester Road. This area may have the potential to serve as marginal habitat for Blanding's Turtle. The Albion Road (Leitrim) Wetland also has potential to serve as suitable habitat". The Blanding's Turtle was found at the Lester Road site in 2006, **afte**r the Screening Report was published. (A specimen was also noted basking in the same area on the 21st of May 2007 by a qualified naturalist).
As the Blanding's Turtle has been found within the historic boundaries (1863) of the Leitrim Wetland and observed along Sawmill Creek, which also originates within this wetland complex, one should apply the precautionary principale and assume that this rare species is potentially distributed throughout the area encompassed by the historic wetland.

In May 2007. Gabriel Blouin-Demers, PhD, Associate Professor, Department of Biology, University of

Ottawa , visited the Leitrim Wetland and concluded that:
a) "the larger beaver ponds in the Leitrim Wetland complex would be suitable for Blanding's turtles"; and
b) "The fact that there are sightings of Blanding's turtles in the immediate vicinity of the Leitrim wetland complex indicates that the wetland could be inhabited by Blanding's turtles".
In the summer of 2007 a resident of Findlay Creek village came across a strange looking turtle near the berm adjacent to the damaged "protected" wetland. The resident called the South Nation Conservation Authority (SNCA) to report the sighting. An SNCA official visited the person at the wetlands with a poster of Turtle species in hand. The resident indicated that it was a Spiny Softshell, a species listed as **Threatened** in the SARA and OESA 2007.
The large cattail marsh, located in the Southwestern Future Stage, where site alterations are taking place, has extensive areas of shallow, open water - potential Blanding's Turtle and Spiny Softshell habitat.

As habitat loss is the primary reason for these turtles being threatened, an approval of this PTTW could ultimately harm a potential population of these rare reptiles.

J. Drainage for South Western Future Stage Will Likely Negatively Impact the Federally-owned Part of the Leitrim Wetland

It is very likely that the infrastructure - drains, sanitary sewers and stormwater sewers - installed during water taking episodes will result in a lowering of the water table on the federally-owned part of the wetland.

The Subsurface Monitoring Program Report, Gloucester Landfill Site, Spring/Summer/Fall 2002, dated August 25, 2003, indicated that a significant amount of water is probably entering the wetland area on the Tartan lands from the federally-owned lands to the west:
"Key findings of the 2002 subsurface monitoring program include the determination of groundwater flow patterns in the deep and shallow aquifers out beyond Albion Road. These patterns suggest higher hydraulic gradients and therefore possibly higher groundwater flow rates in the area of Albion Road and further to the east. The patterns also suggest a possible groundwater funneling effect east of Albion Road."
Even Transport Canada admits to the possibility of increased groundwater loss from the federal lands:

> **" The lowering of the water table in this part of the subdivision east of Albion Road may possibly accelerate the groundwater flow beneath the Albion Road from the west.....This could result in an average increase in groundwater flow rates from west to east across Albion Road by a factor of up to 1.4. The selective lowering of groundwater levels in the west part of the subdivision may also result in groundwater being increasingly funneled into this part of the development".**

(Quote from letter to Andy Smith, DFO, from Transport Canada, dated March 6, 2002).

ADDITIONAL COMMENTS

1. Generally, the trigger elevations are **too low**. They should not be lower than the water levels for the usual dry period between July-September 2004. (Better still if there are records for the same period in 2003 or 2002). Otherwise negative impacts to the wetland are to be expected.

2. The back flooding caused by the berm could be distorting/masking the actual drop in the water levels in the wetland. The November 16, 2007 Application for a PTTW document admits that the back flooding caused by the presence of the berm "may have reduced the groundwater level drawdown observed at overburden monitors located west of the berm (BH03-7B, BH03-08B, BH03-09B, and BH 97-2B) during the 2005 and 2006 groundwater control events". What would have happened if the outlet level was where it should have been - in the original channelized tributary stream rather than about four feet above it?
As most of the overburden monitoring wells are located close to the berm, shouldn't there be other monitoring wells at least 100 metres beyond the back flooding zone to:
a) offset any masking/distortion in the overburden wells caused by the back flooding; and
b) determine if there is draw down of the water levels at some distance from the berm?

3. The groundwater monitoring obligations under the approved EMP are **ludicrous** in light of past long-term periods (decades) of water table decline in large parts of the wetland following the drainage works circa 1920.

4. T. C. Winter's article, A Conceptual Framework for Assessing Cumulative Impacts on the Hydrology of Nontidal Wetlands**,** Environmental Management Vol. 12, No. 5, pp. 605 - 620, contains a number of pertinent observations:
"Because of the general lack of comprehensive long-term studies of groundwater movement near wetlands, it must be concluded that the field verification needed for understanding the interaction of wetlands and groundwater is minimal. Most knowledge is based on theoretical studies. The field studies that have been done are generally short term and do not include the entire watershed of the wetland. the complexity of spatial and temporal changes in water movement, together with the impropriety of making generalized assumptions is documented by...".
"the scientific foundation for understanding wetland hydrology is very weak. The topic has not attracted the attention of many hydrologists; therefore, field studies have been few and most have not been comprehensive. Most hydrologic information relative to wetlands has been based largely on theoretical studies of generalized settings, on scattered field studies, and on hydrologic intuition".
"Drainage lowers the hydraulic head at the wetland site, initially increasing groundwater gradients, which increases groundwater discharge to the site. However, over a long period of time groundwater levels generally decline with drainage"
"Draining water from groundwater discharge areas initially increases groundwater discharge because the hydraulic head gradients are increased. A detrimental impact that is likely to result is that the increased gradients could increase seepage rates from nearby wetlands, and, ultimately, cause a regional lowering of the water table. It is also probable that the plant communities would change in a groundwater discharge wetland that is drained".

5. The water encountered by the construction company during excavation of the extension of Findlay Creek, in the fall of 2007, was not just surface water from the wetland area to the south. Naturalists noted water bubbling up in the 1988-89 Tartan ditch in the marsh area, indicating upwelling. Similar artesian activity has been observed in excavations near the radar dome west of Albion Road. The deeper substrate flows could be more complicated in this area being a possible confluence of several different water flows originating **in the large body of Ice Contact Stratified Drift** that is adjacent to the western and south western part of the wetland, apparently underlying it in places. Transport Canada's statements support upwelling/discharge into the area east of Albion Road and suggest substantial water flows from the west.

6. The excavation (trench) for the stormwater sewer might act as a wetland drain. In places this trench

was about 20 feet deep and about 15 feet wide at the bottom. According to my observations **south** of Findlay Creek, the excavation was in **fractured** bedrock for at least 800 metres. (Part of the excavation is close to the 1989 OMNR PSW boundary).
The stormwater sewer was covered with sandy gravel, a rather permeable material. The consultant confirmed that there would be no impermeable stops (to prevent water flow) put in the section of the trench where bedrock was present. The bedrock disappears to the east and south of the splitter-manhole, a structure that is located on the east side of Findlay Creek, east of Bank Street. The contractor was supposed to place clay stops in the "lower permeability overburden layer" for the last 100 metres before the stormwater pond.

However, **the overburden layer is Grenville till**, a permeable, sandy and stony glacial deposit. Water has been observed flowing out of this material into the excavation for the stormwater pond. Considering that the water flowing alongside the stormwater sewer pipe will be under some gravitational pressure by the time it reaches the splitter-manhole, it seems highly improbable that clay stops in the till would prevent water flow into the storm water pond.

Natural Resources Canada, as quoted in the 2006 DFO Screening Report, once again raises questions about water flow through the till with concerns that water will move from Findlay Creek via the till into the stormwater pond - "Historic data suggests that base flows could be lower and soils more heterogeneous than anticipated, thus the impact of groundwater flow from Findlay Creek to the SWMP could be greater than expected".

There is also the real possibility that water will flow into the stormwater sewer through various joints. (Observations at the splitter-manhole in 2006 before the stormwater pond was finished suggested a substantial leakage from the joints).

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In conclusion the Category 3 Permit To Take Water Application should be refused as it would likely cause additional, severe degradation of the Provincially Significant Leitrim Wetland.

Yours sincerely,

Albert W. Dugal