

Comments on the Appeal by the Taiwan Sugar Corporation of the Denial of a Development Proposal for A Farrow-to-Finish Hog Operation In the County of Forty Mile, Alberta, Canada

By Dr. William J. Weida  
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the Denial of a Development Proposal for A Farrow-to-Finish  
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## Introduction

The July 24, 2000 letter from DGH Engineering that appeals the decision by the County of Forty Mile to deny the application of the Taiwan Sugar Corporation (TSC) for a large hog facility contains a number of statements of the following nature:

...there is no evidence or fact before the Commission from which it could properly conclude that the proposed development by the Applicant will interfere with County amenities or neighbouring properties, will produce excessive odour from any source or will create any potential for surface or ground water contamination.<sup>1</sup>

The original application prepared by DGH Engineering for TSC was a collection of statements and contentions the majority of which were supported neither by credible data nor by peer reviewed scientific research. It cited a very small number of references, most of which were very old and outdated. In contrast, the opponents of the proposed TSC hog ILO presented the board with hundreds of pages of sound, peer reviewed studies supported by hundreds of scientific and governmental studies.

At the end of the hearing on the original application, I was approached by members of DGH Engineering who wanted to know where these scientific and governmental studies could be found. The representatives from DGH Engineering seemed to be totally unfamiliar with the relevant literature in the field. TSC has now retained a second group of engineers in an attempt to present a more credible analysis as a companion study to this appeal. However, the July 24 appeal letter still contains the same unsubstantiated statements and unwarranted conclusions that made the original application such an unconvincing document. The following paper is devoted to these statements.

As was the case during the initial hearing, the rebuttal statements in this paper will be based on scientific studies and governmental data. I respectfully request the appeal board to hold DGH Engineering to the same standard concerning their statements.

## **DGH Statement 1:**

The Commission ruled that "the proposal would interfere unduly with the existing amenities of the County and materially interfere with the use, enjoyment and value of neighbouring properties".

This statement is purely speculative and not supported by the facts of the Application.<sup>2</sup>

This assertion by DGH is at variance with the conclusions of a large amount of credible research in this area. DGH's contentions are supported by no evidence. The Commission's conclusion that " the proposal would interfere unduly with the existing amenities of the County and materially interfere with the use, enjoyment and value of neighbouring properties" is supported by sound, peer reviewed scientific and governmental research. For example:

In 1999 Chapin and Boulind found that the effects of large hog farms are far reaching. Besides the odor and gases, nearby residents must cope with an increasing number of flies, rats, and other scavenging animals. Improperly managed manure wastes and pre-slaughterhouse carcasses threaten water quality. The close proximity of humans to these facilities raises concerns that infectious diseases may cross over from hogs to humans. In addition, new evidence indicates that the use of antibiotics in industrial swine production can contribute to the increase of antibiotic resistance in human pathogens.<sup>3</sup>

A new study of 1,106 rural communities by Gómez and Zhang of Illinois State University found that large hog farms tend to hinder rural economic growth at the local level.. All models in the study indicated an inverse relationship between hog production concentration and retail spending in local communities. Economic Growth rates were 55% higher in areas with conventional hog farms as opposed to those with larger hog operations in spite of the fact that economic growth rates had been almost identical in all the studied communities before the advent of larger hog operations in the 1990s. Data in the study also showed that communities with heavy hog concentration suffered larger population losses than those with conventional hog operations. According to the authors, the results of this study suggest that without public policy to protect rural communities, the most probable outcome is the continuing decline of rural communities in the future as the size agriculture and livestock production units continue to increase.

A recent study by Palmquist, Roka and Vulkina (1998) shows that large hog operations tend to depress the sales value of nearby homes and real estate.<sup>4</sup> An eighteen month study of 75 rural land transactions near Premium Standard's hog operations in Putnam County, Missouri that was conducted by the departments of Agricultural Economics and Rural Sociology at the University of Missouri found an average \$58 per acre loss of value within 3.2 kilometers (1.5 miles) of the facilities. This study primarily evaluated farmland without dwellings. These findings were confirmed by a second study at the University of Missouri-Columbia by Hamed, Johnson, and Miller that found that proximity to a hog ILO does have an impact on property values. Based on the averages of collected data, loss of land values within 3 miles of a hog ILO would be approximately \$2.68 million (US) and the average loss of land value within the 3-mile area was approximately \$112 (US) per acre.<sup>5</sup>

These findings were further substantiated by a Sierra Club study that found that tax adjustments by county assessors in at least eight states lowered property taxes for neighbors of factory farms. As Table 1 shows, local property tax assessments were lowered in Alabama, Illinois, Iowa, Kentucky, Maryland, Michigan, Minnesota and Grundy County, Missouri. Grundy County has lowered some residents' taxes by up to 30% due to their close proximity to the corporate hog operations of Continental Grain.

Table 1--Property Tax Reductions In Areas Around ILOs

<u>Area</u>	<u>Amount of Reduction</u>	<u>Reduction In Value Of:</u>
Grundy Co, MO	30%	
Mecosta Co, MI	35%	dwellings only
Changed to	20%	total property (land and structures)
Midland Co, MI	20%	
DeWitt Co, IL	30%	now rescinded
McLean Co, IL	35%	
DeKalb Co, AL	base reassessment, variable rates	
Renville Co, MN	base reassessment, variable rates	dwellings only
Humbolt Co, IA	20-40%	dwellings only--now rescinded
Frederick Co, MD	10%	now reduced to 5%
Muhlenberg Co, KY	18%	dwellings only

Radius of reduction varied, up to 2 miles. All were for hogs except Muhlenberg, for chickens.

Source: Property Tax Reductions, scott.dye@sfsierra.sierraclub.org, March 13, 2000

All of these studies, as well as a large number of studies submitted during the original hearing, contradict DGH Engineering's contention that the Commission's ruling that "the proposal would interfere unduly with the existing amenities of the County and materially interfere with the use, enjoyment and value of neighbouring properties" is " purely speculative and not supported by the facts." DGH presents no credible evidence in support of its contention while significant numbers of peer reviewed scientific and governmental studies support every aspect of the Commission's ruling. DGH's contention in this case is clearly without merit.

## **DGH Statement 2:**

In Item 2(b) the Commission identified as an issue "Excessive odour from liquid manure application."

It is universally accepted that pipeline transportation and direct subsurface injection of liquid manure slurries is, for all practical purposes, an odour-free operation.<sup>6</sup>

Actual field tests on injection odour were conducted in Iowa in 1998 by Iowa State University. The researchers found that injecting manure resulted in odour reductions of as little as 50% and never greater than 75% compared to broad-cast applications.<sup>7</sup>

Thus, injection of manure is not odour free and DGH's contention that this "fact" is universally accepted is wrong. The Commission's ruling that there could be "Excessive odour from liquid manure application" is supported by the Iowa State university research while DGH's contention is not supported by any credible source and is without merit.

## **DGH Statement 3:**

In Item 2c the Commission identified as an issue "The potential for surface and groundwater contamination by liquid manure storage, conveyance and application".

The direct injection of liquid manure into soil on cropland at rates consistent with agronomic fertilizer use is universally accepted as the best management practice for the elimination of potential contamination of surface and groundwater from animal manure.<sup>8</sup>

As opposed to DGH's statement, injection of liquid manure is only acceptable in areas where pathways to the underlying groundwater do not exist. Hundreds of improperly closed wells in the area around Foremost were identified in the documents presented during the initial hearing. In this statement, DGH has attempted to avoid the issue of improperly closed wells in the area of manure injection while the Commission has rightly identified this as a likely source of groundwater contamination. In this area, both scientific research and governmental policy are firmly on the side of the Commission's ruling. For example, based on a number of scientific studies, the US Department of Agriculture's Agricultural Waste Management Field Handbook states specifically that

(n) Presence of abandoned wells and other relics of past use

The site and its history should be surveyed for evidence of past use that may require special design considerations.... If an abandoned well exists on the site, special efforts are required to determine if the well was sealed according to local requirements. An improperly sealed well can be a direct pathway for contaminants to pollute an aquifer. Other remnants of human activity, such as old foundations, trash pits, or filled-in areas, require special design or site relocation.<sup>9</sup>

The Field Handbook also stresses that caution is necessary because openings formed after initial deposition or formation of the soil enable contaminants to move to the groundwater with little attenuation (reduction) or filtration.<sup>10</sup>

DGH's contention that liquid manure application in a area riddled with improperly closed wells is universally accepted is simply wrong. The Commission's ruling that there is "The potential for surface and groundwater contamination by liquid manure storage, conveyance and application" is supported by both scientific studies and current government policy in the United States.

**In addition to these statements in DGH's July 24 appeal letter, the following statements were made by DGH engineering on behalf of TSC in its July 6 response to the AAFRD review of their initial proposal:**

### **DGH Supplementary Document Statement 1:**

#### Calculation of Nutrients in Hog Manure

The use of phytase to reduce phosphorus is well documented. Several references supporting a 30% reduction are included. Phytase will be used in all diets at TSC.<sup>11</sup>

This statement is perhaps the most cleverly constructed and also the most disingenuous statement in all the documents presents by DGH. Read carefully, the statement does not say that the use of phytase will result in a 30% reduction in phosphorus excretions--it only says that several references have supported such a percentage reduction. However, DGH then uses the 30% reduction in phosphorus excretions in all of its acreage requirement calculations as if it was a firm, guaranteed reduction and DGH never references other studies that have found that the amount of reduction is significantly less than 30%. In fact, 30% reductions in phosphorus excretion occurred only in a small minority of the research reports on phytase. Those reductions occurred in laboratory conditions and they were heavily dependent on specific feed types and application rates. The following research studies provide a more balanced view of the potential reductions that researchers have experienced:

(a) Harper, Zhang, and Kornegay, of the Virginia Polytechnic Institute and State University, Blacksburg, USA, estimated that 500 U/kg of phytase released .96 g of P for grower-finisher pig utilization and reduced fecal P excretion by 21%.<sup>12</sup>

(b) Harper, Kornegay, and Schell, also of the Virginia Polytechnic Institute and State University, Blacksburg, USA, found in a second study that phytase reduced fecal phosphorus excretion by 21.5%.<sup>13</sup>

(c) Ragland, Orban, Cline, Sutton, and Adeola of Purdue University state only that the results of three experiments suggest that phytase would have an environmental benefit of reducing phosphorus concentrations in manure.<sup>14</sup>

(d) Nasi, Partanen, and Piironen, in a study done by the Department of Animal Science, University of Helsinki, Finland, found that the addition of phytase improved absorption of phosphorus by 21% in a barley-soy bean meal diet and 29% in a maize-soy bean meal diet.<sup>15</sup>

(e) Simoes and Guggenbuhl, in a French study, found that when used in animal feed, phytase decreased the phosphorus concentration in feces between 13 and 33%.<sup>16</sup>

(f) Kemme, Radcliffe, Jongbloed, and Mroz, in a study by the Institute for Animal Science and Health (ID-DLO), Department of Nutrition of Pigs and Poultry, Lelystad, The Netherlands, concluded that phytase enhanced total P apparent total tract digestibility by an average of 18.1 percent. Digestibility of phosphorus was lower in pigs housed in pens than in pigs housed in metabolic crates and they noted that estimates of total P digestibility using pigs in metabolic crates are lower than estimates in practice.<sup>17</sup>

(g) Yi, Kornegay, Ravindran, Lindemann, and Wilson, of the Virginia Polytechnic Institute and State University, Blacksburg, USA, found that fecal P excretion (grams per day) decreased as microbial

phytase was added ( $P < .01$ ) and increased with added P ( $P < .01$ ). In comparison to the results with the .32% aP diet, fecal P excretion decreased 25 to 50% by the addition of phytase.<sup>18</sup>

In sum, there is no firm, standard rate for phosphorus reductions in hog excreta with phytase use. DGH Engineering's implication that a rate of 30% would result in the proposed TSC operation is highly speculative and its calculations of spreadable acreage requirements--all of which are based on the assumption that a firm 30% reduction in phosphorus can be achieved--are not supported by any credible evidence. Based on the predominance of research results, a lower percentage of reduction in phosphorus excretion appears to be warranted. This implies that all of DGH Engineering's calculations of spreadable acreage understate the amount required for phosphorus.

## DGH Supplementary Document Statement 2:

### Well security

While we do not deny that abandoned wells pose a risk to aquifers, we do take exception to the linkage of the TSC project to this issue. With manure application by subsoil injection at agronomic rates, the risk of groundwater contamination is no different than from inorganic fertilizer. The Taiwan Sugar proposal certainly does not increase the environmental risk due to abandoned wells.<sup>19</sup>

The statements by DGH Engineering that "with manure application by subsoil injection at agronomic rates, the risk of groundwater contamination is no different than from inorganic fertilizer" and that "the Taiwan Sugar proposal certainly does not increase the environmental risk due to abandoned wells" indicate an astounding level of ignorance about the content of animal manure. In fact--and in direct contradiction of the claims by DGH engineering--a large number of diseases are present in animal manure. These diseases are not present in inorganic fertilizers. Table 2 shows that the potential presence of 25 different diseases in animal manure make this form of fertilizer very different from the inorganic chemicals that are used as crop fertilizer.

Table 2, Diseases and organisms spread by animal manure

<u>Disease</u>	<u>Responsible organism</u>	<u>Disease</u>	<u>Responsible organism</u>
Bacterial		Viral	
Salmonella	Salmonella sp	New Castle	Virus
Leptospirosis	Leptospiral pomona	Hog Cholera	Virus
Anthrax	Bacillus anthracis	Foot and Mouth	Virus
Tuberculosis	Mycobacterium tuberculosis	Psittacosis	Virus
	Mycobacterium avium		
Johnes disease	Mycobacterium paratuberculosis	Fungal	
Brucellosis	Brucella abortus	Coccidioidomycosis	Coccidoides immitis
	Brucella melitensis	Histoplasmosis	Histoplasma capsulatum
	Brucella suis	Ringworm	Various microsporium and trichophyton
Listeriosis	Listeria monocytogenes	Protozoal	
Tetanus	Clostridium tetani	Coccidiosis	Eimeria sp.
Tularemia	Pasturella tularensis	Balantidiasis	Balatidium coli.
Erysipelas	Erysipelothrix rhusiopathiae	Toxoplasmosis	Toxoplasma sp.
Colibacillosis	E.coli (some serotypes)		
Coliform mastitis	E.coli (some serotypes)	Parasitic	
Metritis		Ascariasis	Ascaris lumbricoides
		Sarcocystiasis	Sarcocystis sp.
Rickettsial			
Q fever	Coxiella burneti		

Source: Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, p. 3-13, 3-14.

As opposed to DGH's claim, pathogens present in hog manure and not in inorganic chemicals could be transported to ground water supplies through the large number of improperly sealed wells in the Foremost region. In addition to these problems, studies released in 1999 found that

(a) Swine herds are a potential animal reservoir for Swine Hepatitis E Virus and this virus is present in fields to which manure has been applied and in water waste from these fields. Swine Hepatitis E Virus may persist in the environment for at least 2 weeks and possibly longer.<sup>20</sup>

(b) A broad profile of chemical and microbial constituents are present in both ground and surface water proximal to large-scale swine operations--chemical (pesticides, antibiotics, heavy metals, minerals, and nutrients) and microbial (*Escherichia coli*, *Salmonella sp.*, *Enterococcus sp.*, *Yersinia sp.*, *Campylobacter sp.*, *Cryptosporidium parvum*) contaminants were present.<sup>21</sup>

(c) Antibiotics are present in waste generated at confined animal feeding operations and may be available for transport into surface and ground water.<sup>22</sup>

These data and scientific and governmental studies directly contradict the contention by DGH that " the risk of groundwater contamination is no different than from inorganic fertilizer." In fact, it has been established beyond any reasonable doubt that the use of animal manure for fertilizer carries with it not only all the contamination issues associated with inorganic fertilizers but also a large number of additional pollution and health concerns. DGH's unsubstantiated statement is supported by no credible source.

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<sup>1</sup> Letter From Dennis Hodgkinson, DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 24, 2000.

<sup>2</sup> Letter From Dennis Hodgkinson, DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 24, 2000, p. 2.

<sup>3</sup> Chapin, Amy R. and Boulind ,Charlotte M., Environmental and Public-Health Risks Associated with Industrial Swine Production, 1999 USGS AFO Meeting, Session B, Fort Collins, CO., September, 1999, <http://water.usgs.gov/owq/AFO/proceedings/afo/index.html>.

<sup>4</sup> Palmquist, R.B., F.M Roka, and T. Vukina. 1997. "Hog operations, environmental effects, and residential property values," *Land economics*, 73, 114-124.

<sup>5</sup> Mubarak, Hamed, Johnson, Thomas G., and Miller, Kathleen K., The Impacts of Animal Feeding Operations on Rural Land Values, Report R-99-02, College of Agriculture, Food and Natural Resources, Social Sciences Unit, University of Missouri – Columbia, May 1999, <http://www.cpac.missouri.edu>.

<sup>6</sup> Letter From Dennis Hodgkinson, DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 24, 2000, p. 3.

<sup>7</sup> Powers, W. J., " Strategies to Reduce Odors During Land Application", Odor Control for Livestock Systems, Department of Animal Science, Iowa State University, Ames 50011-3150, 1999, p. 171, 174.

- <sup>8</sup> Letter From Dennis Hodgkinson, DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 24, 2000, p. 3.
- <sup>9</sup> Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, Chapter 7.
- <sup>10</sup> Agricultural Waste Management Field Handbook, United States Department of Agriculture Soil Conservation Service, April, 1992, Chapter 7.
- <sup>11</sup> Response to AAFRD Review of June 12, 2000 by Dr. R. McKenzie and Mr. Allan Howard, Dr. Joann Whalen, et al., DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 6, 2000, p. 2.
- <sup>12</sup> Harper, A. F., Zhang, Z. and Kornegay, E. T., Phytase supplementation of low phosphorus growing-finishing pig diets, American Society of Animal Science, Western Meeting, July 29-August 1, 1997.
- <sup>13</sup> Harper, AF, Kornegay, ET, and Schell, TC, Phytase supplementation of low-phosphorus growing-finishing pig diets improves performance, phosphorus digestibility, and bone mineralization and reduces phosphorus excretion, *J Anim Sci* 1997 Dec;75(12):3174-86.
- <sup>14</sup> Ragland, D., Orban, J. I., Cline, T. R., Sutton, A. L. and Adeola, O., Performance of pigs fed varying levels of calcium in low-phosphorus phytase-and cholecalciferol-supplemented diets, American Society of Animal Science, Midwestern Section--1998 Meeting, March 16-18, 1998.
- <sup>15</sup> Nasi M, Partanen K, and Piironen J , Comparison of *Aspergillus niger* phytase and *Trichoderma reesei* phytase and acid phosphatase on phytate phosphorus availability in pigs fed on maize-soybean meal or barley-soybean meal diets, *Arch Tierernahr* 1999;52(1):15-27.
- <sup>16</sup> Simoes, Nunes C and Guggenbuhl, P., Effects of *Aspergillus fumigatus* phytase on phosphorus digestibility, phosphorus excretion, bone strength and performance in pigs, *Reprod Nutr Dev* 1998 Jul-Aug;38(4):429-40.
- <sup>17</sup> Kemme, PA, Radcliffe, JS, Jongbloed, AW and Mroz, Z, Factors affecting phosphorus and calcium digestibility in diets for growing-finishing pigs, *J Anim Sci* 1997 Aug;75(8):2139-46.
- <sup>18</sup> Yi, Z, Kornegay, ET, Ravindran, V, Lindemann, MD, and Wilson, JH, Effectiveness of Natuphos phytase in improving the bioavailabilities of phosphorus and other nutrients in soybean meal-based semipurified diets for young pigs, *J Anim Sci* 1996 Jul;74(7):1601-11.
- <sup>19</sup> Response to AAFRD Review of June 12, 2000 by Dr. R. McKenzie and Mr. Allan Howard, Dr. Joann Whalen, et al., DGH Engineering Ltd., 12 Aviation Boulevard, St. Andrews, Manitoba, Canada, R1A 3N5 to Mr. Dale Brown, Secretary to the Development Appeal Board, County of Forty Mile No. 8, Box 160, Foremost, AB, July 6, 2000, p. 13.
- <sup>20</sup> Yuory , V., Karenyi, Nelson, Moyer, Mary, Gilchrist, J.R. and Naides, Stanley J., Swine Hepatitis E Virus Contamination in Hog Operation Waste Streams--An Emerging Infection?, 1999 USGS AFO Meeting, Session C, Fort Collins, CO., September, 1999, <http://water.usgs.gov/owq/AFO/proceedings/afo/index.html>.
- <sup>21</sup> Campagnolo, Enzo R., Currier, Russell W., Meyer, Michael T., Kolpi, Dana, Thu, Kendall, Esteban, Emilio and Rubin, Carol S., Investigation of the Chemical and Microbial Constituents of Ground and Surface Water Proximal to Large-Scale Swine Operations, 1999 USGS AFO Meeting, Session C, Fort Collins, CO., September, 1999, <http://water.usgs.gov/owq/AFO/proceedings/afo/index.html>.
- <sup>22</sup> Meyer, Michael T., Bumgarner, J.E., Daughtridge, J.V., Kolpin, Dana, Thurman, E.M. and Hostetler, K.A., Occurrence of Antibiotics in Liquid Waste at Confined Animal Feeding Operations and in Surface and Ground Water, 1999 USGS AFO Meeting, Session D, Fort Collins, CO., September, 1999, <http://water.usgs.gov/owq/AFO/proceedings/afo/index.html>.