DRAFT REPORT

ENVIRONMENTAL IMPACT ASSESSMENT: PROPOSED SLAUGHTERHOUSE WASTE COMPOSTING FACILITY; SILVER CREEK, B.C.

Prepared for:

Spa Hills Farm Ltd.
2219 Yankee Flats Road
Salmon Arm, BC
V1E 4616

Prepared by:

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Project 0210-001.01

July 2009

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July 20, 2009

Reference: **0210-001.01**

Spa Hills Farm Ltd.
2219 Yankee Flats Road
Salmon Arm, BC
V1E 4616

***Attention*:** Mr. Jake Mitchell [redacted]

Re: Environmental Assessment - Slaughterhouse Waste Composting Facility; 2219 Yankee Flats Road, Silver Creek, B.C.

Summit Environmental Consultants Ltd. ("Summit") is pleased to provide this **draft report** that presents the results of the Environmental Impact Assessment for the proposed composting facility at 2219 Yankee Flats Road near Silver Creek, B.C. The draft has also been distributed to the members of the local community who requested a copy, and is available on our web site.

The report concludes that there is low potential for residual environmental effects that are detectable beyond the property line, assuming that the facility is built according to the current plan and the recommended mitigation and monitoring procedures are followed. On the key issue of odour, the planned "multiple barrier" approach to odour control indicates low risk of objectionable odours being detected off-site, but odour control depends on proactive and effective management. Key steps are processing the waste while it is still cool, aeration, biofilter placement and regular checking to ensure adequate coverage, and keeping the building doors closed except during transfers of material in and out.

We look forward to your comments on the draft report. Please contact me if you have any questions.

Yours truly,

Summit Environmental Consultants Ltd.

Hugh Hamilton, Ph.D., P.Ag.
Senior Environmental Scientist

cc Mr. Jim Tessaro, Ministry of Agriculture & Lands.

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LIST OF ACRONYMS

ALC	Agricultural Land Commission
ALR	Agricultural Land Reserve
BSE	Bovine spongiform encephalopathy
C	Carbon
CEAA	Canadian Environmental Assessment Act
CEAA	Canadian Environmental Assessment Agency
CFIA	Canadian Food Inspection Agency
C:N ratio	Carbon to nitrogen ratio
CSRD	Columbia Shuswap Regional District
EIA	Environmental Impact Assessment
MAL	Ministry of Agriculture and Lands
MOE	Ministry of Environment
MPN	Most Probable Number
N	Nitrogen
OMRR	Organic Matter Recycling Regulation
SRM	Specified Risk Materials
SRMMP	Specified Risk Materials Management Program

1.0 INTRODUCTION

1.1 PROJECT BACKGROUND

Spa Hills Farms Ltd. ("Spa Hills Farm") is proposing to construct and operate a composting facility on their farm at 2219 Yankee Flats Road, near the small community of Silver Creek, about 14 kilometres south of Salmon Arm, B.C. (Figure 1.1). The composting facility will be in a covered building with a concrete floor and would process slaughterhouse waste from Riverside Natural Meats (Riverside) in Silver Creek, which is a government inspected abattoir. No specified risk materials (SRM)[1] will be included in the waste. Riverside currently produces 450 tonnes of non-SRM waste per year. Spa Hills Farm is anticipating similar volumes in the future, but will design the composting system to handle up to 600 tonnes per year to ensure that seasonal variation in the waste volume can be processed.

Spa Hills Farm has applied for partial project funding under the Canada-British Columbia Specified Risk Material Management Program (SRMMP) to develop the proposed slaughterhouse waste composting facility. The SRMMP is a federal-provincial funding program that assists the B.C. cattle and meat processing industries to adapt to new regulations that prevent the use of SRMs in animal feed, pet food, or fertilizers (Canada/British Columbia 2009). Subprogram C of SRMMP is a program to encourage regional and community-based solutions for slaughterhouse waste management in B.C. Although part of SRMMP, Subprogram C includes support for facilities that exclusively handle **non-SRM** as well as facilities that deal with SRM waste. Proponents who wish to establish slaughterhouse waste management facilities, including composting facilities, can apply through Subprogram C for partial funding to assist with facility start-up. Subprogram C requires that an Environmental Impact Assessment (EIA) be completed as part of the application process for funding. The EIA is to include a public consultation process. The results of the EIA and the associated consultation process are considered by SRMMP when determining if the proposed project will be funded.

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[1] In animals older than 30 months, SRMs are the skull, brain, trigeminal ganglia (nerves attached to the brain), spinal cord, dorsal root ganglia (nerves attached to the spinal cord), eyes, and tonsils. In animals under 30 months of age, SRMs are only a section of the distal ileum.

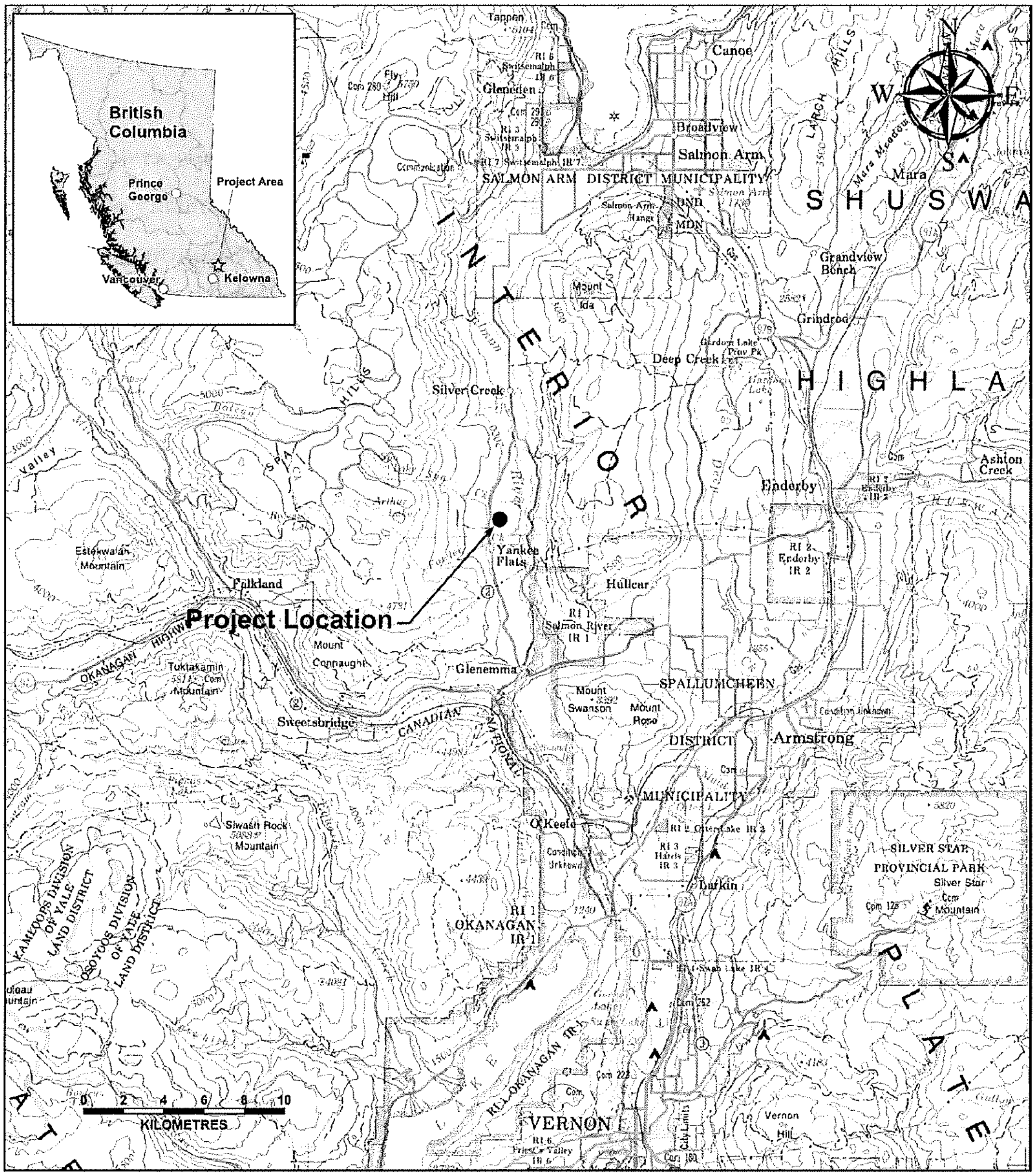


Figure 1.1 Location of Spa Hills Farm.

In May 2009 Spa Hills Farm retained Summit Environmental Consultants Ltd. ("Summit") to complete the EIA for the proposed composting facility on their farm, and to coordinate the public consultation process. This report presents the results of the EIA and provides recommendations for mitigation and monitoring if the project proceeds.

1.2 SCOPE OF THE PROJECT

1.2.1 Project Overview and EIA Scope

The proposed composting facility will be an aerated static pile system located inside a 251 square metre (2,700 square feet) building on the Spa Hills Farm property, adjacent to the existing chicken barns and other farm buildings. The waste material will be picked up from Riverside's refrigerators once or twice per week depending on production and trucked the eight kilometre distance to Spa Hills Farm. The waste will be mixed with the bulking agent (wood chips or straw) in a mixing wagon on a concrete pad then immediately moved inside for composting. The compost will be covered with a layer of finished compost and wood chips to both insulate the pile and act as a biofilter to control odour. When finished, the compost will be moved outdoors next to the building and covered with CompostexR fabric for curing and storage. The finished compost is tested and then applied to agricultural fields on the Spa Hills Farm property. Additional detail on the proposed composting facility and the process are provided in Section 1.3.

The scope of the project for the EIA is from the time the waste is picked up from Riverside until the finished compost is applied to Spa Hills Farm's fields. The EIA considers the potential effects of the project during the construction and operational periods. The composting facility will operate as a full-time, on-going business. However, the EIA also considers project decommissioning, in the event that Spa Hills Farm elects sometime in the future to cease the planned composting business.

1.2.2 Assessment Methods

The EIA methods were consistent with the assessment process that would be required under the *Canadian Environmental Assessment Act* (CEAA) for projects with a similar scope. It is important to note that the Spa Hills Project would not normally trigger an EIA under either CEAA or the *B.C. Environmental Assessment Act* based on the proposed scale of the operation. The EIA is being completed to meet the SRMMP Subprogram C requirements. Composting facilities in B.C like the one proposed for Spa Hills Farm are regulated by the Organic Matter Recycling Regulation (OMRR) of the *Environmental Management Act* (see Section 1.3.7). Spa Hills Farm will notify the Ministry of Environment (MOE) that they intend to begin composting as per OMRR requirements, if they are successful in receiving funding from SRMMP.

The methods used to conduct the assessment included

- Assembly and review of existing information, including but not limited to aerial photographs, topographic maps, surficial geology map, climate data, aquifer and water well maps, wildlife reports, and socio-economic reports.
- Discussion with the designer of the composting system, Dr. John Paul, P.Ag. of Transform Compost Systems Ltd. of Abbotsford, B.C. This was to ensure a solid understanding of the planned system.
- A field reconnaissance completed on May 15, 2009 by the core members of the EIA team – Hugh Hamilton, P.Ag., Ruth McDougall, P.Ag., and Melanie Piorecky, P.Ag.
- Discussions with the proponent, Mr. Jake Mitchell of Spa Hills Farm, to review planned operation procedures and the current farm operation.
- A public Open House held on June 17, 2009 that was aimed at identifying key areas of potential concern in the local community (see Section 2.2).
- Discussions with representatives of the Ministry of Environment (MOE), Ministry of Agriculture and Lands (MAL), and the Columbia Shuswap Regional District (CSRD).
- Determination of Valued Ecosystem Components (VECs) – the environmental components with some potential to be affected by the project.
- Data analyses;

- Environmental effect summary (see Section 4.3. for approach); and
- Preparation of this report.

In this report the potential for effects are discussed at four spatial scales: 1) Footprint – the 0.08 ha are occupied by the actual facility; 2) Site – Spa Hills Farm property; 3) Local Study Area - the area shown on Maps 1 and 2 which is intended to include the Salmon River below the site, the lower reaches of Spa and Fowler Creeks, and residential properties within 1.5 of Spa Hills Farm's boundaries, and 4) Regional Study Area – the Salmon River watershed.

1.3 PROJECT DESCRIPTION

1.3.1 Location and Proponent

Spa Hills Farm is located at 2219 Yankee Flats Road, approximately 14 km south of Salmon Arm, B.C. (Figure 1.1), at 50°32'00'' North latitude and 119°22'10'' West longitude. Yankee Flats Road runs roughly parallel to the Salmon River Valley on the west side, and the site of the composting facility is on the east-facing slope. The composting building will be built adjacent to the existing farm buildings and access will be by existing roads and laneways (Map 1). Photographs 1 and 2 show the planned site for the facility. The farm is within Electoral Area D of the Columbia Shuswap Regional District (CSRD). The nearest First Nation reserve to the site is Salmon River IR#1 of the Splats'in First Nation (Spallumcheen Indian Band). IR#1 is about five km from the site at its closest point

Spa Hills Farm is a working chicken and beef farm, owned and operated by the Mitchell family. Mr. Jake Mitchell has primary responsibility for the composting operation. If the project proceeds, the Mitchells plan to cease commercial beef production and focus on chickens. They would retain a small beef herd (<10 animals) for use by family and friends. The finished compost would replace the beef manure that is currently applied to the fields on the farm. Chicken manure will continue to be applied to the forage/grazing land.

Spa Hills Farm is audited annually under the national On Farm Food Safety Assurance Program as well as the BC Bio-security Program. The auditing programs are national and provincial standards to ensure all growers are following good production practices as well as bio-security guidelines to ensure the quality of the product as well as overall consumer confidence. An e-mail from Mr. Brian Hoven, Auditor with the B.C. Chicken Marketing Board, describing Spa Hills Farm's chicken operations is provided in Appendix B. According to Mr. Hoven, Mr. Mitchell "not only follows good farming practices and the formal program requirements but as well keeps in mind animal welfare and environmental issues in his everyday tasks".

1.3.2 Construction Schedule and Materials

If approved, construction of the facility would begin as soon as September 2009 and be completed no later than the end of March, 2010. Construction would likely be completed within about 6-8 weeks, and composting would begin about one month later.

Construction materials will include concrete, wood, siding, pre-fabricated windows and doors, roofing materials, and miscellaneous materials associated with standard construction practices (e.g. fasteners, wiring, light bulbs, etc.) Power will be supplied to the building. The composting equipment will include a mixing wagon, truck, a small loader, blowers for aeration, and the automatic monitoring and control system (temperature and moisture probes, timers, and switches).

Photograph 1 Composting facility site (foreground) with view to south.

Photograph 2 Composting site (foreground) with view to east. Note seasonal pond.

1.3.3 Process Description

Slaughter waste composition

The primary feedstock for the proposed compost facility will be non-SRM slaughter waste from Riverside Natural Meats in Silver Creek B.C. The facility will also use wood waste from local wood producers as a bulking agent and carbon source. The facility will not accept any other feedstock materials including slaughter waste from other facilities or other types of waste. The only other materials used in the composting process will be bulking agent type materials required to optimize composting conditions. These will include various types of wood waste such as hog fuel, sawdust, shavings and wood chips, depending on price and availability. Straw, finished compost from the facility and manure or manure:bedding mixtures from the farm's livestock and poultry may also be used in the compost facility. For cattle, the SRM from Spa Hills Farm's animals cannot be processed in the composting facility (Schmidt, pers. comm. 2009) but can continue to be processed in the existing manure composting piles (as per the Agricultural Waste Control Regulation). The ratio of wood waste to feedstock to obtain the optimum carbon to nitrogen ratio (C:N ratio) will be developed as part of the composting plan developed to meet OMRR requirements.

The waste stream from Riverside Natural Meats will consist of non-SRM waste from the plant and will include waste from beef and dairy cattle, hogs and sheep. SRM waste (specified risk material), which includes those parts of the carcass where the bovine spongiform encephalopathy (BSE) prion would be expected to be found if present in the animal, will be handled as a separate waste stream at the slaughter plant and will be disposed of separately. The separation of SRM from non-SRM waste in the plant is done under the supervision of a Canadian Food Inspection Agency (CFIA) inspector. In addition, the SRM waste is dyed a purple colour to minimize the potential for it to be mixed with non-SRM waste.

Note that between 1993 and June 12, 2009 a total of 20 cases of BSE in cattle have been reported in all of North America; 17 in Canada and 3 in the U.S. (Center for Disease Control & Prevention 2009). According to Statistics Canada (2009), there are 13.2 million head of cattle in Canada, so the probability that prions would be present in any non-SRM is extremely low.

The non-SRM slaughter waste, consisting of wastes generated during the slaughter of livestock and during carcass cutting and wrapping, will be made up of soft tissue, fat and bones from the cutting floor; and stomachs, rumen and rumen contents, heads, hoofs and some large and small bones from the kill floor. In 2008 the plant generated 451 tonnes of non-SRM waste, and it is expected that a similar volume will be generated by the plant in 2009 and into the future. In 2008, 45% of the waste was generated during the September through December period, the peak period of slaughter activity for small slaughter plants. It is expected that this seasonal peak will be a yearly occurrence.

Storage and transportation of waste

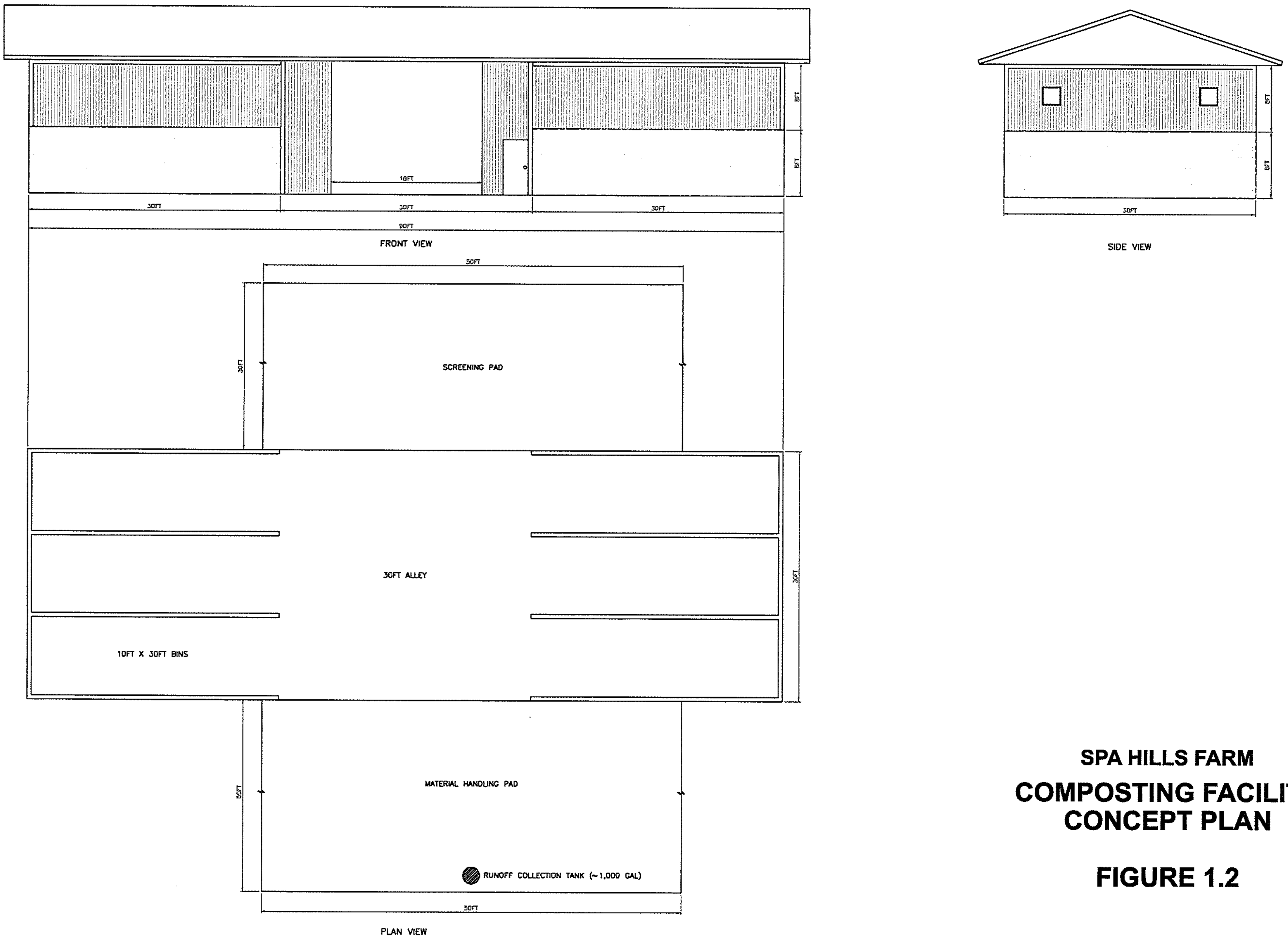
The waste will be stored at the plant and will be picked up once or twice per week from the plant and transported to the composting site by Mr. Mitchell, owner of the composting facility. The waste will be stored in 45-gallon barrels at the plant in a 30' by 20' (9 m by 6 m) refrigerated storage facility. Frequency of removal will depend on waste production and kill numbers at the plant. It is expected that twice weekly pickup will be required during the fall months and once weekly pickup will be the norm during the rest of the year, but volumes will dictate frequency.

Storage of the waste in the refrigerated building at the slaughter plant will ensure that the waste is 'fresh' at the time of pickup and thus that there will be no off-odours from the waste during transportation or during blending of the waste with bulking agent prior to putting it into the indoor compost bins (see below). Mr. Bill Meikle, owner of Riverside Meats, indicated that there is currently no odour from stored waste when it is picked up by the hauler (Meikle, pers. comm. 2009).

The slaughter waste will be hauled in the barrels to the compost facility in a dump truck with a solid bottom and a rubber dam along the tailgate to ensure there is no leakage of liquid from the box during transport. The barrels will be emptied into the mixing wagon at the composting facility using a bobcat type loader. Barrels will then be cleaned and disinfected prior to being reused for waste storage.

Facility design

The proposed composting facility will be a bin-style system with in-floor aeration (Figure 1.2). Design and equipment supply will be by Transform Compost Systems Ltd. of Abbotsford, B.C. (see www.transformcompost.com). The facility will be constructed with a concrete floor throughout, and with the aeration channels set into the floor. The aeration channels will also act as a leachate collection system. Bin walls will be constructed of concrete, and it is anticipated that the facility will have six (6) bins sized to accommodate the expected volume of slaughter waste plus the required amount of bulking agent. The aeration



SPA HILLS FARM

COMPOSTING FACILITY CONCEPT PLAN

FIGURE 1.2

JULY 2009

blowers will be automatically controlled so that aeration is provided at regular intervals and when required. The receiving and mixing area will also be on a concrete base. The entire facility will be enclosed in a building (Figure 1.2). Ventilation will be installed for the safety of workers.

Composting process

At the proposed facility the slaughter waste will be composted using an aerated static pile system. With this system, which is particularly well suited to potentially odiferous wastes, feedstocks are blended well together and placed in a bin or pile where they are left for a period of time until all odour causing constituents have been degraded (the primary composting phase, normally 3 to 5 weeks). During the primary composting phase, the compost piles are aerated by mechanical blowers to ensure that they remain aerated throughout, and are not disturbed until the primary phase is complete. This minimizes the potential for release of odours from the piles. In contrast, with a windrow composting system, the piles or windrows must be turned frequently in the first several weeks of composting to maintain aerobic conditions throughout the pile. Typically, aerated static piles are covered with a biofilter layer of finished compost or clean wood waste material during the primary composting phase to absorb any odours that might escape the pile. Because piles are not disturbed for several weeks after formation, the biofilter layer stays in place during the period when odours are most likely to occur and acts as an odour absorbing layer.

The following is a brief description of the composting process at the proposed facility.

<u>Pre-treatment:</u> when the slaughter waste is brought to the compost facility, it will be emptied directly into a large mixer wagon which will mix and chop the material. The appropriate volume of bulking agent (wood waste or similar carbon-rich material) will be added and the materials blended well together. The mixer wagon will blend the materials and chop the bones and heads into pieces less than 6 inches (15 cm) in size. Immediately after mixing, the blended material will be loaded by a small loader (e.g. Bobcat) into one of the compost bins.

Composting phase: The material will remain for 3-4 weeks in the primary bin during which aeration will be provided as required, additional moisture will be added to the material if required to optimize conditions for composting, and compost temperatures will be recorded daily. After this initial composting phase, the compost will be remixed and transferred to a second bin for a further 2-3 weeks of composting (secondary composting phase). Aeration and moisture will be supplied as required during this phase.

Curing: after 6 weeks of active composting, the material will be transferred to a properly constructed outdoor curing area for an additional several months of maturing prior to the material being land applied. The compost will be screened either before or after curing, at the discretion of Mr. Mitchell. Screened out material (bone chunks and larger particle size wood waste) will be reused in the composting process as bulking agent (to create air spaces in the pile). These larger pieces will eventually break down through the repeated process.

End use of compost

The proposed compost facility will produce Class A compost. Compost meeting Class A standards under the OMRR can be freely distributed without any further regulatory requirements. Mr. Mitchell has indicated that he does not intend to sell or otherwise distribute the compost off his property; he plans to utilize all of the compost on his own farm land.

The proposed end use for the slaughter waste compost is as a fertilizer and soil amendment on land owned by Mr. Mitchell. Mr. Mitchell is proposing to plant wheat on much of his cleared land, and to use the compost to fertilize the land. The annual production from the proposed facility is expected to be approximately 390 tonnes of finished compost. The bulk density of finished compost is approximately 0.5 tonnes per cubic metre, so the annual production by volume will be about 780 m^3.

To provide the nutrient requirements of a crop of wheat, the appropriate application rate is in the range of 37 tonnes of compost per hectare. Thus approximately 11 hectares of crop land will be required per year to utilize all of the compost produced by the facility (see Section 4.1.4 for assessment of soil application rate). Mr. Mitchell plans to grow approximately 75 acres (30 hectares) of wheat and to pasture his cattle on the remaining 50 acres (20 hectares) of cleared land. With this land base, Mr. Mitchell should be able to utilize the compost on his land base indefinitely since the compost will be applied one year in three (see Section 4.1.4).

Because the slaughter waste will be chopped into smaller pieces prior to composting, it is expected that most bones will break down during composting. Any residual bone chunks will be screened out of the finished compost and re-composted.

1.3.4 Hazardous and Waste Materials

The hazardous materials that will support the composting process are limited to fuel and lubricants used for the trucks, loader, mixing wagon, and tractor that will be used to move feedstock and compost. As a working farm, these materials are already present at Spa Hills Farm. There is an existing above-ground storage tank for fuel, while the other potentially hazardous materials are stored indoors. The operators will follow all applicable health and safety requirements for compost operations in B.C.

1.3.5 Operational Requirements

No new roads will be needed to provide access to the composting facility. The truck that will bring in the feedstock can access the mixing pad from the existing gravel farmyard and lanes. Water and power lines are currently in place to within about 20 m of the proposed site. The operators live on-site, so no additional parking is needed.

Given the size of the operation, Mr. Mitchell anticipates that equipment will be operating at the compost facility only one day a week; up to two days during the autumn. It will therefore be possible to limit working hours to weekdays. Farm machinery already operates on site, so negligible additional equipment noise is expected since the bulk of the composting operations will occur indoors.

One return truck trip between the farm and Riverside is anticipated per week in the January to August period, increasing to twice per week in the autumn. The route when full will be Haines Road to Salmon River Road to Yankee Flats Road. The small increase in truck traffic for the facility will be partly offset by reduced driving associated with the Mitchell's reduced cattle operation.

1.3.6 Decommissioning

The proposed composting facility is intended to operate as an on-going business, so there are no current plans to cease operations and decommission the site. However, if operations were to cease because of a lack of suitable waste material, the remaining material would be composted to completion and utilized according to the requirements of OMRR. The building and equipment would then be thoroughly cleaned.

1.3.7 Regulatory Requirements, Legislation and Permits

The compost facility will be required to adhere to the requirements of the Organic Matter Recycling Regulation (OMRR) which regulates the composting of most organic materials in B.C. Slaughter waste is an acceptable compost feedstock under the OMRR[2]. The OMRR has a number of requirements to ensure that composting facilities are protective of the environment (air, surface water and groundwater). It requires that compost facilities have a leachate collection system that will ensure that no leachate or runoff from the compost impacts surface or groundwater. It requires that each facility has an odour control plan that describes how odours from the compost will be controlled. It requires that a personnel training program be provided to staff at the facility to ensure that staff understand the basics of composting, how to run the facility and how to troubleshoot if necessary. It also sets out process and quality requirements for two different classes of compost, Class A and Class B, and what testing and monitoring is required to meet the requirements of each. Distribution requirements for each class are also given. The OMRR requires that a qualified professional write plans and specifications for the compost facility that outline how the facility and process will meet the requirements of the OMRR, and that the professional sign off on the facility when it is operational. The proposed facility will be designed to comply with all OMRR requirements.

Leachate control system for the facility: The proposed compost facility will be built with a concrete floor and will be enclosed in a building. There will be no runoff from the active compost because the facility will be enclosed. Any leachate from active compost piles will be contained by draining through the aeration channels to an in-ground storage tank and will be recycled onto actively composting material (See Section 4.1.1 for more detail). The mixing and storage pads will also be constructed of concrete and designed so that runoff would be collected in an underground storage tank (Figure 1.2)

Odour control in the proposed facility: There are several process and facility design aspects that will minimize and control odours as follows.

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The facility will have an enclosed receiving area so that if there are any unpleasant odours from the waste prior to it being blended with wood waste, the mixing wagon can be moved into the building. However, the waste will be refrigerated when picked up, and significant odours are not expected when received. Waste will be mixed and placed immediately into compost bins.

The composting process involves aeration of the bins through a blower system which delivers air when required through in-floor aeration. The provision of air as required (based on maintaining optimum temperatures in the pile) will maintain aerobic conditions within the compost piles. Unpleasant odours from compost piles normally develop under anaerobic conditions when anaerobic microbial populations flourish. The design will incorporate a

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[2] See http://www.env.gov.bc.ca/epd/epdpa/mpp/omrreg.html

biofilter layer on the top of each bin of material during the primary composting phase; this will absorb odours that escape from the pile.

The compost facility will be enclosed in a building. The process controls outlined above are designed to be sufficient to control odours; however, air exhausted from the building can be filtered or otherwise treated prior to discharge into the environment to provide additional odour control (see Section 4.1.3).

Regulatory Testing and Monitoring:

The proposed facility and composting process will meet OMRR requirements for the production of Class A compost. Class A compost must be produced in a system that provides active aeration, either by manual turning of compost piles or by mechanical aeration of piles. The proposed facility will have an automatically-controlled blower system with in-floor aeration channels.

To meet OMRR Class A standards, Spa Hills Farm will be required to maintain records of compost temperatures during the active composting phase to demonstrate that each bin of compost has met the OMRR Class A time and temperature requirements for pathogen destruction and vector attraction reduction. The system will be equipped with temperature probes connected to a computer which will automatically record temperatures in each bin at selected intervals. As well, Mr. Mitchell will be conducting compost sampling annually to demonstrate that the compost has met the Class A pathogen and trace element standards. This sampling will consist of seven (7) discrete samples collected from stockpiled finished compost just prior to land application.

The following summarizes the OMRR requirements for Class A compost from an aerated static pile system.

Process & Quality Criteria	OMRR Section	Requirements
Pathogen reduction	Schedule 1; Section 4(b)	• The pile must be insulated and maintain a temperature of at least 55°C for 3 consecutive days
Vector reduction	Schedule 2; Section 2	• Compost must be treated for at least 14 days • Average & minimum pile temperatures must be 45 and 40°C respectively • Final C:N ratio between 15:1 and 35:1 • Compost must stay in curing pile for 21 days and must not re-heat on its own
Pathogen reduction limits	Schedule 3; Section 1, 3, 5	• Fecal coliform levels must be <1,000 MPN/gm of solids (dry weight basis) • Seven (7) samples per 1,000 tonnes dry weight must be obtained. Fecal coliform limits must not be exceeded in any of the seven samples.
Quality criteria	Schedule 4; Section 1	• Upper limits for specified total metal concentrations must not be exceeded.
Sampling	Schedule 5	• Seven (7) samples per 1,000 tonnes dry weight must be obtained. If 1,000 tonnes is not produced in a year, the pile must be sampled once per year.
Record keeping	Schedule 6	• Temperature must be recorded every day and kept for 36 months • Lab analyses results must be retained for 36 months • Regulatory officials can ask to see the records at any time

OMRR Environmental Impact Study: OMRR requires than an Environmental Impact Study (EIS) and report be completed for facilities with an annual capacity of 20,000 tonnes or more. Spa Hills Farm will not compost more than 600 tones per year, and therefore an EIS is not required under OMRR. As noted earlier, this report was required to meet SRMMP funding requirements only.

Approval for changes to the size of the operation: Spa Hills Farm intends to notify MOE of their intent to compost at least 90 days prior to beginning operations, as required by OMRR. The notification must include the specified design capacity, which will be 600 tonnes per year. Riverside currently generates about 450 tonnes per year of non-SRM waste, and designing for 600 tonnes ensures that seasonal variation can be handled. Spa Hills has no plans to take waste from another source, or to sell the farm in the foreseeable future. Any plan to increase the capacity by more than ten percent will require a new notification, and would require the preparation of new plans and specifications.

The other constraint on operation size is zoning. Composting is acceptable in the Agricultural Land Reserve (ALR) as long as all compost is used on the farm (see Section 3.3.1), but approval would be needed from the Agricultural Land Commission (ALC) and CSRD to expand to a size where the Spa Hills Farm land base could not handle the volume of finished compost.

Current Composting Operations: Spa Hills current composting of manure and mortalities is regulated under the BC Agricultural Waste Control Regulation of the *Environmental Management Act*, which allows organic waste generated on the farm to be composted and used as fertilizer. This will not change if the commercial composting operation goes ahead.

1.4 SEPARATION OF SRM AND NON-SRM WASTE

This section describes the procedures followed at all slaughterhouses in Canada, including Riverside, to separate the non-SRM waste from SRMs The SRM identified tissues are removed at the slaughter plant under the supervision of a CFIA inspector who also inspects each carcass for disease and anything unusual (not related to BSE). The SRM is then stained a distinctive colour (e.g. purple) and handled separately from the non-SRM waste in the plant. In animals under 30 months of age, SRM is considered to be only a section of the distal ileum. In cattle older than 30 months, it is the skull, brain, trigeminal ganglia (nerves attached to the brain), spinal cord, dorsal root ganglia (nerves attached to the spinal cord), eyes, and tonsils. This is based on current scientific understanding of the location of prions at various ages of animals.

Compost generated from non-SRM may be applied to agricultural land, including grazing land (Raymond, pers. comm. 2009; based on Greenwood 2009).

2.0 PUBLIC CONSULTATION AND FIRST NATION LIAISON

2.1 CONSULTATION/LIAISON PROCEDURES

The consultation process for the proposed Spa Hills Farm composting facility was primarily intended to inform nearby residents (within about 1.5 km radius of the site) and residents of the Silver Creek area about the project and 2) to identify potential issues of environmental concern that would be addressed in the EIA. The steps that were taken prior to the preparation of the EIA draft report included the following.

- Mr. Mitchell either telephoned or visited his immediate neighbours on at least one occasion to tell them about the proposal and answer any questions.
- A public open house was held at the Silver Creek Community Hall on June 17, 2009 between 6:30 and 8:30 p.m. The open house was advertized in the two local newspapers that are understood to be widely read by the local community – the Lakeshore News and the Salmon Arm Observer Market News. The advertisement (Appendix A) appeared in both papers on the two Fridays that preceded the event - June 5 and June 12. Both Mr. Mitchell and Summit telephoned the immediate neighbours to remind them of the open house. Messages were left if the residents could not be reached.
- Any telephone call or emails that were received from the community by Summit were responded to, generally to provide the person with additional information on the project.

The June 17 meeting was organized as in an open house format, with a number of poster displays arranged around the room. Copies of a two-page Key Design Features fact sheet Appendix A) were made available to all attendees. Attendees were asked to sign in to record the numbers that attended, and to fill out a comments form (Appendix A). A number of attendees indicated a wish to spend some additional time and sent their comments to Summit later by email. The contact information for the EIA project manager was made available at the sign-in desk for anyone that wanted it.

Attending the open house to answer questions were the proponent (Jake Mitchell), the compost system designer (Dr. John Paul, P.Ag.), two members of the EIA team (Hugh Hamilton, P.Ag. and Ruth McDougall, P.Ag.), and a representative of MAL and SRMMP Program C (Jim Tessaro). Also attending in an observer capacity was Ms. Barbara John of the Ministry of Environment in Kamloops and Mr. Rene Talbot, CSRD Area D Director. Both of these individuals answered questions from the public in attendance.

A total of 50 people signed the sign-in form. About 5-10 others did not sign in, so it is estimated that approximately 55-60 people attended the open house. Mr. Mitchell received calls from several nearby residents who could not attend the open house, and the Key Design Features sheet was forwarded to these individuals.

After the meeting ended the group met to record any verbal comments that had been received. The written comments that were received were filed for use in this report, as were all subsequent emails and phone records that were received by Summit. The issues that were raised are summarized in Section 2.3.

An initial version of this draft report was reviewed by MAL and Mr. Mitchell to ensure the report represents SRMMP and the planned operation correctly. This second draft report has been forwarded to the members of the public that have asked to review it and made available on Summit's web site. Any comments received will be outlined in the final report, and addressed as well as possible in the EIA.

A second public meeting will be scheduled for August or early September 2009 to present the EIA findings and obtain community feedback. It will be in a "Question and Answer" format to allow all participants the opportunity to hear the questions and responses. Issues not previously raised will be considered in the final EIA report.

2.2 FIRST NATION LIAISON

Ms. Loretta Eustache, Land and Title Director of the Splats'in Nation (Spallumcheen Indian Band), was contacted by phone and by email on June 10, 2009 and informed of the project. Additional information was forwarded on July 19, 2009.

2.3 SUMMARY OF ISSUES IDENTIFIED

The issues identified during the consultation process are listed below, arranged into two categories; environmental issues and social-economic-community issues. The sections of the report where the issues are addressed are in brackets at the end of each point.

Environmental Issues:

- Groundwater contamination due to leachate generated by the compost or if too much finished compost is applied to the land. (4.1.1)
- Surface water pollution from contaminated groundwater flowing to the Salmon River. (4.1.2)
- General environmental effects of increased development pressure on the Salmon River Valley. (4.1.2, 4.7)
- Odour and potential health issues related to odour. (4.1.3)
- Release of contaminants to the air (4.1.3).
- Capacity of the land base at Spa Hills Farm to be able to handle the volume of compost produced each year (1.3.3, 4.1.4).
- Soil erosion and the transfer of contaminants in runoff (4.1.2, 4.1.4).
- The process may not generate Class A compost. If the compost is not Class A, clarification was requested as to the way that the class B compost would be handled. (1.3.3, 1.3.7)
- Separation of SRM waste from non-SRM waste at Riverside, and safeguards to prevent SRMs from entering the compost stream. (1.4)
- How SRMs from Spa Hills Farms own cattle mortalities are handled. (1.3.3, 1.4)
- Potential for inadequate heat to be generated in the piles in the winter. (1.3.3, 5.0)

- Noise (4.1.8).
- Transfer of disease to wildlife, especially ruminants (including deer and elk) (4.1.6).

Social-Economic-Community Issues:

- Lack of direct provincial government involvement in monitoring or inspection of the compost facility (1.3.7; 5.0).
- The introduction of a commercial/industrial operation into what is now an agricultural and rural/residential area. (4.1.7)
- Potential effects on property values near the composting facility. (4.1.7)
- Traffic volumes and safety, and effects of increased traffic on the physical condition of Yankee Flats Road (4.1.9)
- The potential for the facility to expand and/or to begin to accept waste from non-local sources. (1.3.7)
- Continuity if the Mitchell family sells the farm to someone not from the local area (1.3.7).
- Compliance with local bylaws. (3.3.1, 4.1.7)
- Need for a dispute resolution process if odour becomes an issue. (4.1.3)
- Local composting facilities may not be appropriate and that a regional incineration facility would be preferred.

A number of the comments received indicated the following positive aspects of the proposed composting operation:

- It will bring down the cost of slaughtering.
- It will help Riverside to remain in business and to hire local people.

Of the written comments that have been received to date, seven indicated that they were in favour of the project, three indicated they were in favour but listed one or more areas of concern, six indicated they were opposed to the project (and gave reasons), one listed a number of concerns but did not indicate opposition or support, and one asked a question.

Several persons indicated that they would like information on any current slaughter composting operations and possibly contact the operators or neighbours of existing systems. A slaughter waste composting demonstration trial was completed in the B.C. Interior, and the results are available on the Internet (Sylvis 2008). A slaughter composting facility is in operation at Rainer Custom Cutting in Darfield, B.C. (North Thompson River Valley), which is an on-farm, family-owned, slaughtering and meat cutting business.

3.0 ENVIRONMENTAL BASELINE DESCRIPTION

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

The closest climate stations operated by Environment Canada to the site are located in Armstrong (20 km away) and at the Salmon Arm airport (19 km)[3]. Table 3.1 summarizes the climate normal data for these stations. The Silver Creek area is characterized by warm summers and moderately cool winters. Like most of the B.C. Southern Interior, potential evapotranspiration exceeds precipitation by a significant amount between May and September, and there is a significant soil moisture deficit in summer. At the Salmon Arm station the maximum 24-hour precipitation on record was 48 mm in January 1990. Environment Canada (2008) indicates that this was the 100-year return interval storm. The ClimateBC model (Wang 2006) was used to estimate the value of selected climate variables at the site. The average annual precipitation at the site is estimated by the model to be 516 mm, which is a little less than the average of the Armstrong and Salmon Arm stations. The average July and January model temperatures are 17.3°C and -5.5°C respectively, which are slightly cooler than either climate station.

Intensity-Duration-Frequency (IDF) data has been obtained for the Salmon Arm airport station (Table 3.2). Figure 3.1 is a plot of the precipitation received over events up to 24

[3] A volunteer-run weather station exists in Silver Creek as well. To be conservative, this assessment considers precipitation at Salmon Arm, since Salmon Arm receives more precipitation than Silver Creek.

hours in duration for the 2, 5, 10, 25, 50, and 100-year return interval storms. The shape of the curves indicate that even for the largest events a significant proportion of the total precipitations falls in the first hour, then the intensity declines over time.

Wind speed and direction data are not collected at either the Salmon Arm Airport or Armstrong North climate stations. Local observations noted by Mr. Mitchell and other local residents at the Open House indicate that the predominant wind direction is from southwest to northeast, essentially down slope from the upper Fowler Creek watershed. However, wind direction is reportedly quite variable and the wind can blow from any direction.

The Canadian Wind Energy Atlas is an on-line tool developed by Environment Canada that allows the user to obtain modelled wind speed and direction data for any location in Canada by entering the latitude and longitude (Environment Canada 2009). Table 3.3 presents the results obtained for the coordinates of the Spa Hills Farm site. Figure 3.2 is the annual wind rose diagram. The results indicate that the wind is most commonly from the south (21% of the time on average), but it also blows relatively frequently from the north and southeast. Annual average wind speed is estimated as 2.8 metres per second (m/s). Seasonal averages are 3.6 m/s in winter, 2.6 m/s in spring, 2.1 m/s in summer, and 3.0 m/s in fall (Environment Canada 2009).

Table 3.1 Climate normals for selected variables – Armstrong and Salmon Arm.

	Armstrong North (Station # 1160485)	Salmon Arm Airport (Station # 1166R45)
July Average temperature (°C)	18.7	18.6
January Average temperature (°C)	-5.2	-4.0
Total annual precipitation (mm)	487.8	669.1
Total rainfall (mm)	360.0	487.0
Total annual snowfall (mm)	127.9	182.1
Extreme daily precipitation (mm)	38.1 (March 1973)	48.0 (January 1990)
Average no. days per year with rainfall >10 mm	8.8	12.7
Average degree days/year above 15°C	321.5	314.0

Table 3.2 Rainfall Intensity-Duration Frequency Values – Salmon Arm Airport.

Event duration	Return Period Rainfall Amounts (mm)						
	2 year	5 year	10 year	25 year	50 year	100 year	No. Years in record
5 min.	3.9	5.4	6.5	7.8	8.8	9.7	36
10 min.	5.6	8.0	9.6	11.6	13.1	14.6	36
15 min	6.5	9.3	11.2	13.5	15.3	17.0	36
30 min.	7.8	12.9	16.3	20.6	23.8	27.0	36
1 hour	9.5	15.9	20.1	25.4	29.4	33.3	37
2 hour	11.7	18.1	22.4	27.8	31.7	35.7	37
6 hours	16.7	23.2	27.4	32.9	36.9	40.9	36
12 hours	20.9	27.6	32.1	37.7	41.9	46.1	35
24 hours	26.2	33.5	38.3	44.4	48.9	53.3	37

Data from 1964-2004. Source: Environment Canada (2008).

Table 3.3 Wind direction by season – Canadian Wind Energy Atlas model.

Direction	Degrees from East	Percent of time				
		Annual	Spring	Summer	Fall	Winter
North	90	12%	12%	14%	11%	8%
	60	6%	6%	7%	5%	4%
	30	4%	4%	4%	4%	3%
East	0	3%	4%	5%	3%	3%
	330	5%	5%	6%	5%	4%
	300	10%	9%	10%	9%	8%
South	270	21%	20%	17%	21%	23%
	240	11%	10%	8%	11%	13%
	210	8%	8%	6%	9%	12%
West	180	5%	5%	4%	6%	6%
	150	6%	7%	9%	6%	5%
	120	10%	11%	10%	10%	10%

Source: Environment Canada (2009) http://www.windatlas.ca/en/index.php

Figure 3.1 Precipitation Intensity-Duration-Frequency curves – Salmon Arm airport.

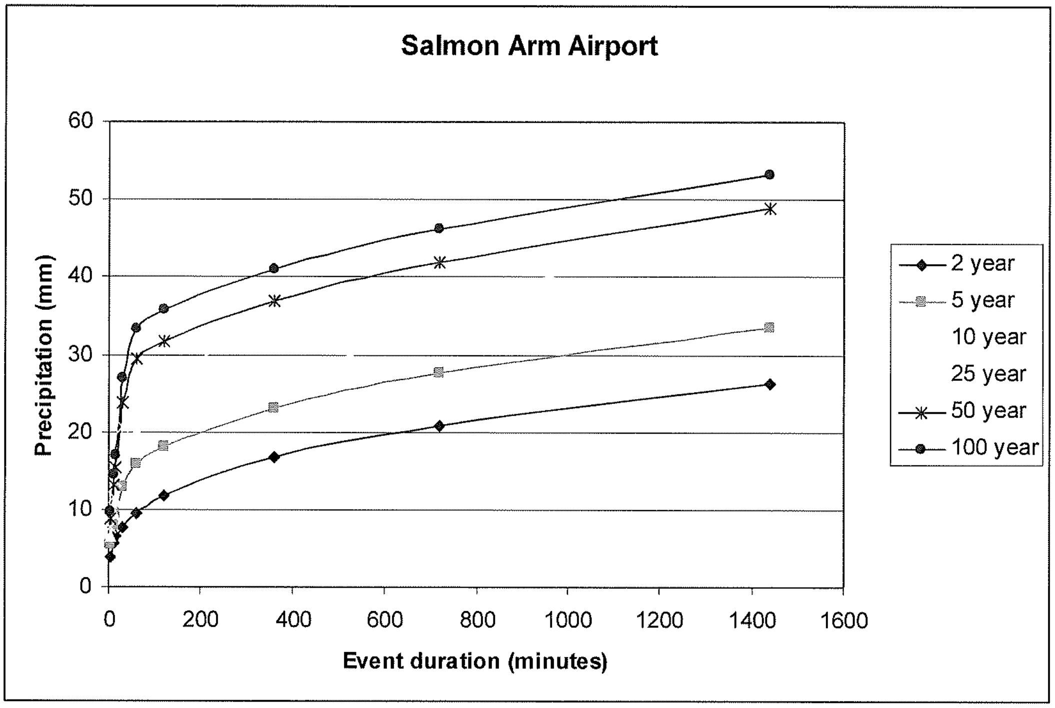
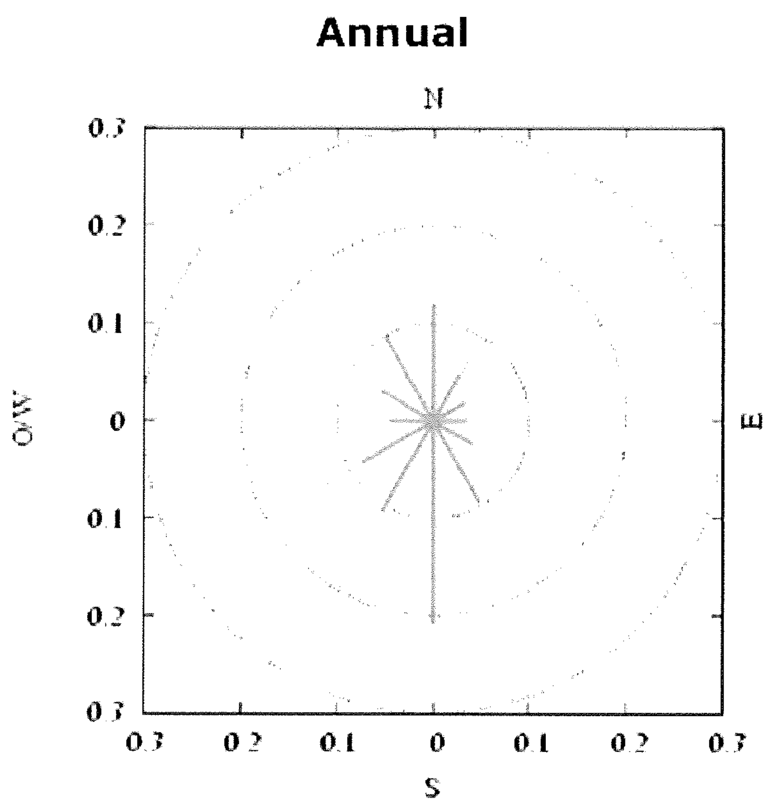


Figure 3.2 Annual wind rose diagram for 50.533 north latitude, 119.367 west longitude.



Source: Environment Canada (2009).

Note: Each concentric ring represents 10% of the time.

3.1.2 Geology and Soils

The composting site and the agricultural fields on the Spa Hills Farm property are located on collapsed lacustrine deposits (Geologic Survey of Canada 1978). These are lake-bottom deposits that contained ice in the latter stages of the Fraser Glaciation. When the ice melted it created the characteristic rolling terrain featuring ridges and kettled depressions. The surficial materials include silt, sand, clay, and minor gravel. Clay lenses appear to create perched water tables in the depressions, as indicated by the presence of small seasonal ponds (Photograph 2).

3.1.3 Groundwater and Wells

A search of available aquifer and water well data was completed using the B.C. Water Resources Atlas. Two aquifers are mapped as being present in the bottom of the Salmon River Valley approximately 1.1 km down slope from the composting site (Figure 3.3); an upper aquifer and a lower aquifer separated by a confining layer. The aquifer characteristics are provided in Table 3.4. Both aquifers are comprised of sand and gravel. The upper aquifer (0097) is rated as having high vulnerability to contamination because it would be affected by surface water during high flows on the Salmon River. The lower aquifer (0098) is rated as having low vulnerability because of the presence of the overlying confining layer that limits infiltration of water from above. The lower aquifer is rated has having high productivity; which when combined with its low vulnerability, makes it the preferred source for domestic water supply.

An examination of the well logs for the wells in the Salmon Valley aquifers indicate that most wells are shallow, and are likely completed in the upper aquifer. Note that it is only recently that well drillers have been required to submit well logs to the MOE for inclusion in the database, and there may be other wells in the area that are not shown on Figure 3.3 and Map 2 (green circles).

There are no wells on Spa Hills Farm because the farm obtains all its water from surface water (Section 3.1.4). There are well logs for two wells drilled into the hillslope north and northwest of Spa Hills Farm, north of the gully at the end of Spa Hills Farm's property and upslope from the valley aquifers (Map 2 – Well tags #70211 and #82461). These wells are likely indicative of conditions on Spa Hills Farm based on the information on the surficial geology map (Geologic Survey of Canada 1978). The lithology information for these wells is provided in Table 3.4. Both well logs include clay layers above the static level (water table) observed in the wells when they were drilled. The static level was 141 feet below ground surface in #70211 and 295 feet in #82461.

3.1.4 Surface Water and Water Licences

The proposed composting site is 1.2 km due west of the Salmon River at an elevation of 550 m above sea level (asl) (Map 1). The Salmon River below the site is at an elevation of about 421 m. Spa Creek, which is a Salmon River tributary, flows in a general west to east direction about 710 m north of the site. The nearest tributaries south of the site are Stephen Creek (about 650 m distance) and Fowler Creek (about 1.3 km distance). None of these tributaries are gauged, but are understood to carry little flow outside the spring runoff period. No other water bodies are located in the vicinity of the site.

Figure 3.5 shows the monthly average flows in the Salmon River at Falkland and near the mouth at Salmon Arm (Water Survey of Canada 2009). Gauging stations have also been operated by Water Survey of Canada above Fowler Creek and near Silver Creek, but not long enough to generate reliable statistics. The hydrologic regime of the Salmon River is typical of other Southern Interior streams, dominated by spring snowmelt. However, there is a small secondary peak in the autumn in response to cooler weather and fall rains, and a reduction in irrigation volumes.

A search of registered water licenses in the study area was completed using the Ministry of Environment database. Spa Creek has a total of 19 licenses (Table 3.5) and Fowler Creek has

Table 3.3 Salmon River valley aquifer characteristics.

Characteristic	Upper Aquifer	Lower Aquifer
Aquifer name	Salmon River Valley Unconfined	Salmon River Valley Confined
Aquifer Tag/Number	0097	0098
Descriptive location	Falkland to SW of Salmon Arm	Lower Salmon River Valley
Materials	Sand & gravel	Sand & gravel
Classification	IIA	IIC
Demand	Moderate	Moderate
Productivity	Moderate	High
Vulnerability	High	Low
Aquifer ranking value	13	12
Area	35.8 km^2	96.5 km^2
Water use	Multiple	Multiple

Table 3.4 Wells logs for Wells #70211 and #82461.

Well Tag 70211 (Static level 141 feet)		**Well Tag 82461 (Static Level 295 feet)**	
0-20 ft.	Clay & rocks	0-35 ft	Clay & boulders
20-50 ft.	Sand & boulders	35-150 ft.	Clay
60-100 ft.	Sand	150-320 ft.	Sand stone
100-110 ft.	Blue clay & rock	320-340 ft.	Sand
110-135	Sand & boulders		
135-155 ft.	Sand & gravel		
155-159 ft.	Bedrock		

See Map 2 for locations.

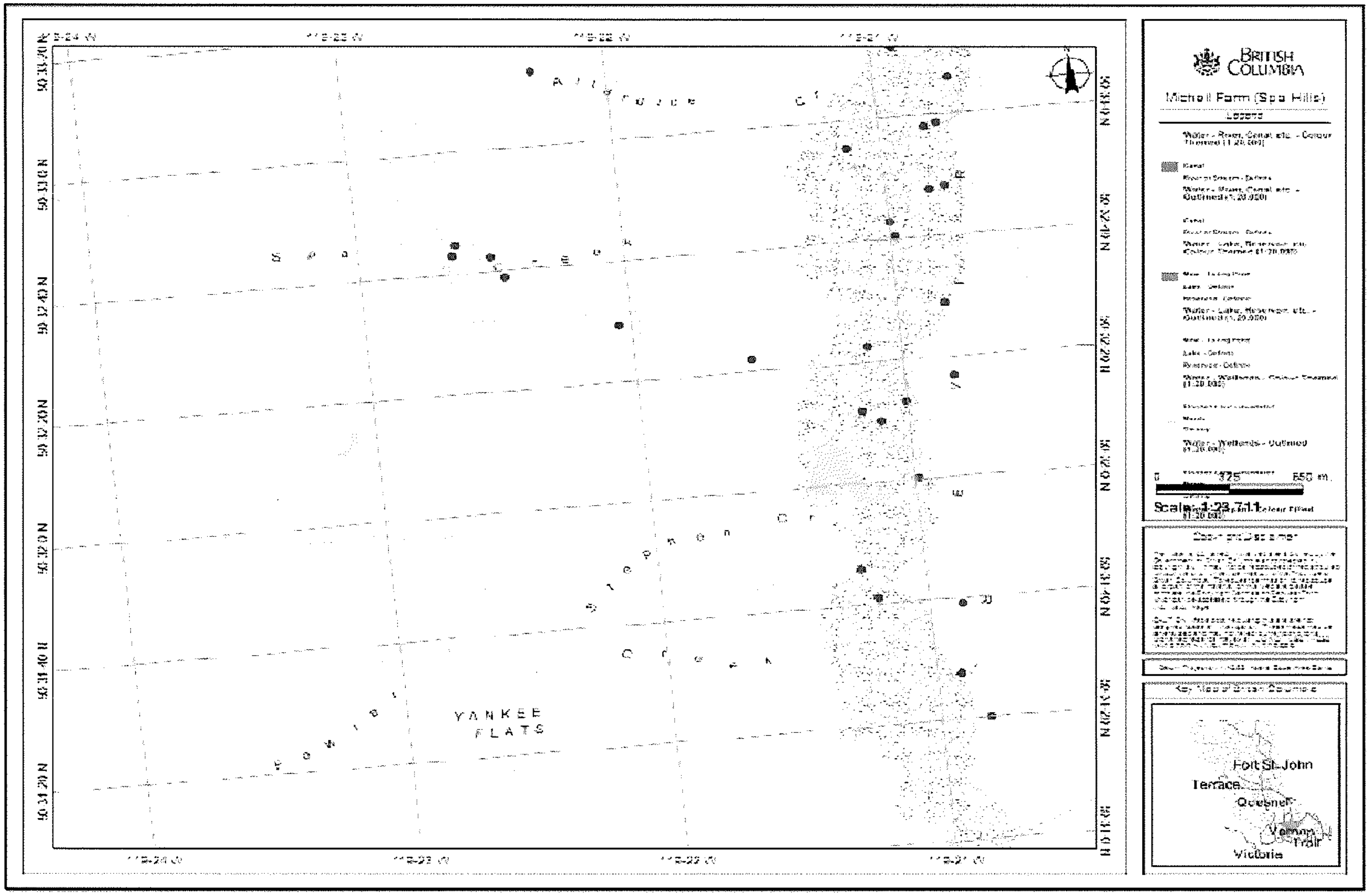


Figure 3.4 Aquifers and water wells near Spa Hills Farm (Source: Ministry of Environment 2009).

eight (Table 3.6), while Salmon River has seven licenses between Fowler Creek and a point about one kilometer below Spa Creek (Table 3.7). Map 2 shows the locations of the licenses points-of-diversion (yellow circles). Many of the licenses are for combined domestic and irrigation use, but there are also licenses for stock watering, storage, and fisheries conservation.

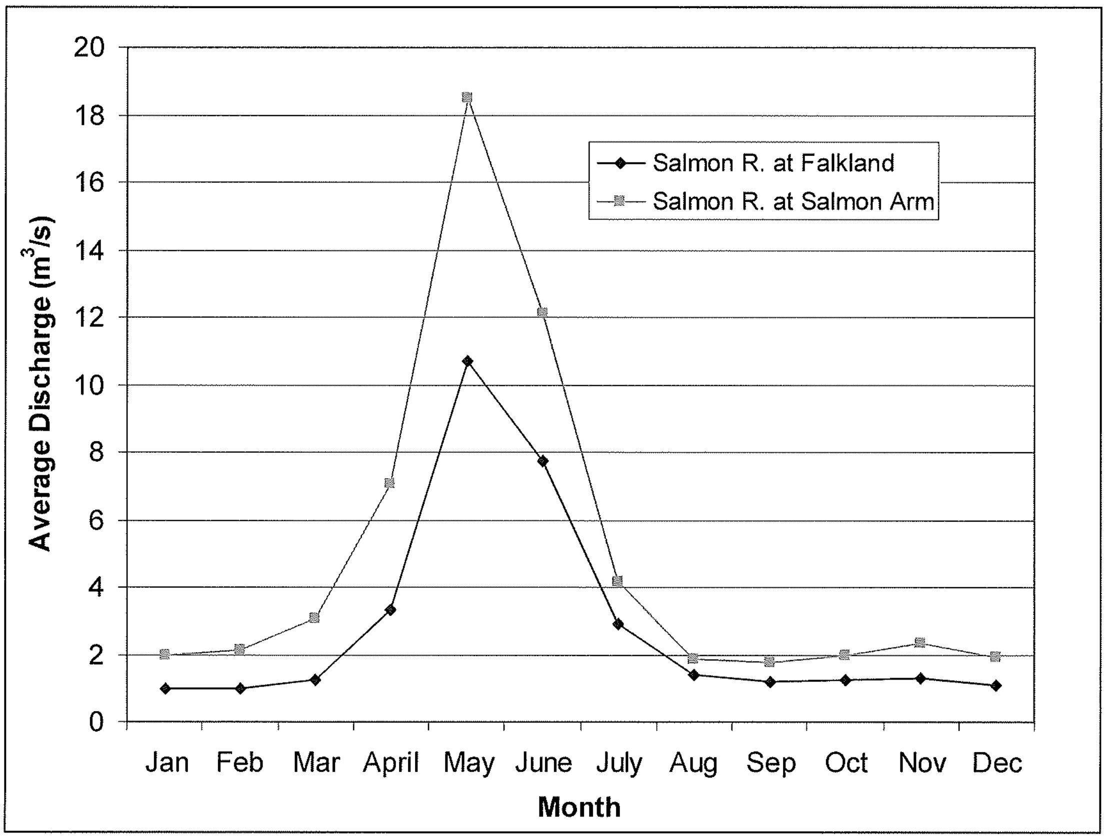


Figure 3.5 Monthly average streamflows in the Salmon River.

Table 3.5 Water licenses on Spa Creek.

Licence No	WR Map/ Point Code	Purpose	Quantity	Units	Licensee	Priority Date
C025174	3728 FF (PD50015)	Irrigation	42	AF	SCHENKEL U. & SCHENKEL-GAMPER M.	19580925
"	3728 QQ (PD50016)	Irrigation	42	AF	SCHENKEL U. & SCHENKEL-GAMPER M.	19580925
C025175	3728 GG (PD50011)	Storage	42	AF	SCHENKEL U. & SCHENKEL-GAMPER M.	19580925
C048422	3728 P4 (PD50012)	Domestic	500	GD	CHERUSS HOLDINGS INC	19750624
C068569	3728 F (PD50013)	Domestic	500	GD	SPA HILLS FARM INC	19120710
"	"	Irrigation	51	AF	SPA HILLS FARM INC	19120710
"	"	Stockwatering	3000	GD	SPA HILLS FARM INC	19120710
C068570	3728 F (PD50013)	Domestic	500	GD	SPA HILLS FARM INC	19120710
"	"	Irrigation	3.5	AF	SPA HILLS FARM INC	19120710
C068571	3728 F (PD50013)	Irrigation	26	AF	SPA HILLS FARM INC	19120710
C068572	3728 F (PD50013)	Domestic	500	GD	SPA HILLS FARM INC	19120710
"	"	Irrigation	10	AF	SPA HILLS FARM INC	19120710
C068573	3728 F (PD50013)	Irrigation	28	AF	SPA HILLS FARM INC	19300712
C068574	3728 F (PD50013)	Irrigation	60	AF	SPA HILLS FARM INC	19471126
F011764	3728 FF (PD50015)	Irrigation	30.75	AF	WEIJS LEONARD & PETRONELLA	19310708
"	3728 QQ (PD50016)	Irrigation	30.75	AF	WEIJS LEONARD & PETRONELLA	19310708
F016926	3728 FF (PD50015)	Domestic	1000	GD	WEIJS LEONARD & PETRONELLA	19471227
"	"	Irrigation	40	AF	WEIJS LEONARD & PETRONELLA	19471227
"	3728 QQ (PD50016)	Domestic	1000	GD	WEIJS LEONARD & PETRONELLA	19471227
"	"	Irrigation	40	AF	WEIJS LEONARD & PETRONELLA	19471227
F016927	3728 GG (PD50011)	Storage	40	AF	WEIJS LEONARD & PETRONELLA	19471227
F016955	3728 GG (PD50011)	Storage	30.75	AF	WEIJS LEONARD & PETRONELLA	19340915
F016958	3728 GG (PD50011)	Storage	60	AF	SPA HILLS FARM INC	19471126
F017314	3728 QQ (PD50016)	Domestic	500	GD	SCHENKEL U. & SCHENKEL-GAMPER M.	19490510
F068565	3728 GG (PD50011)	Storage	67.2	AF	SPA HILLS FARM INC	19340915

Units: AF – acre/feet; GD – gallons/day; CS – cubic metres/second

Table 3.5 Water licenses on Spa Creek (continued).

Licence	WR Map/	Purpose	Quantity	Units	Licensee	Priority
F068566	3728 GG (PD50011)	Storage	3.3	AF	SPA HILLS FARM INC	19340915
F068567	3728 GG (PD50011)	Storage	20.9	AF	SPA HILLS FARM INC	19340915
F068568	3728 GG (PD50011)	Storage	8.6	AF	SPA HILLS FARM INC	19340915

Units: AF – acre/feet; GD – gallons/day; CS – cubic metres/second

Table 3.6 Water licenses on Fowler Creek.

Licence No	WR Map/ Point Code	Purpose	Quantity	Units	Licensee	Priority Date
C113299	3728 WW (PD50001)	Domestic	500	GD	ANDERSON JAMES C	19550727
F006749	3728 VV (PD49999)	Irrigation	45	AF	ANDERSON JAMES C	19130616
"	"	Stockwatering	500	GD	ANDERSON JAMES C	19550727
C115550	3728 E (PD50000)	Domestic	500	GD	MILNES KENNETH A & E MARY	19620903
"	"	Irrigation	39.66	AF	MILNES KENNETH A & E MARY	19620903
C068448	3728 E (PD50000)	Domestic	500	GD	MOUNTAIN MEADOW CONTRACTING LTD	19120629
"	"	Irrigation	55.83	AF	MOUNTAIN MEADOW CONTRACTING LTD	19120629
C068371	3728 VV (PD49999)	Irrigation	17	AF	SHAW SPRINGS OSTRICH RANCH INC	19541005
C068373	3728 VV (PD49999)	Domestic	500	GD	VANDENBORN PAUL W & SHARON L	19541005
C068370	3728 VV (PD49999)	Irrigation	26	AF	VANDENBORN PAUL W & SHARON L	19120604
C068372	3728 VV (PD49999)	Irrigation	42.33	AF	VANDENBORN PAUL W & SHARON L	19541005

Units: AF – acre/feet; GD – gallons/day; CS – cubic metres/second

Table 3.7 Water licenses on the Salmon River in the local area (south to north).

Licence No	WR Map/ Point Code	Purpose	Quantity	Units	Licensee	Priority Date
F042965	3728 G3 (PD49978)	Irrigation	14.2	AF	Sagmoen, W. & E.	1964/05/15
C117113	3728 (PD76716)	Conservation – use of water	3	CS	Fisheries & Oceans Canada	2003/02/18
C037313	3728 Q3 (PD49979)	Irrigation	20	AF	Pellikaan, J. & Meeres, N.	1970/01/15
C042874	3728 G4 (PD49980)	Irrigation	6	AF	Mast, K.A. & L.D.	1948/01/16
C044553	3728 L4 (PD49981)	Irrigation	8.8	AF	Flucke, G. & C.	1948/01/16
C023037	3728 XX (PD49982)	Irrigation	30	AF	Flucke, G. & C.	1955/09/20
C044552	3728 XX (PD49982)	Irrigation	5.2	AF	Nims, S.	1948/01/16

Units: AF – acre/feet; GD – gallons/day; CS – cubic metres/second

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Biogeoclimatic Zones and Vegetation

Spa Hills Farm is located in an area that is transitional between the Interior Douglas Fir biogeoclimatic zone, Very Dry Hot Okanagan Variant (IDFxh1) and the Montane Spruce biogeoclimatic zone, Dry Mild Thompson Variant (MSdm2) (Ministry of Forests 2003).

The site of the composting facility has been cleared of natural vegetation and used as a farm since approximately 1912 (the priority date for a number of the water licenses held by Spa Hills Farm). The composting site footprint is on the edge of an existing parking area but extends out onto a field that is presently used for forage production.

There are areas with open forest on three sides of Spa Hills Farm (Map 1), and a gully with tree cover that runs in a northeast direction away from the barn area. Tree species on adjacent properties include Douglas fir (*Pseudotsuga menziesii*), Ponderosa pine (*Pinus ponderosa*), lodgepole pine (*Pinus contorta*), trembling aspen (*Populus tremuloides*), and black cottonwood (*Populus balsamifera*) (in the gully). Shrubs include Saskatoon (*Amelanchier alnifolia*) and snowberry (*Symphoricarpos albus*). Cattle appear to graze in the areas of open forest affecting the ground cover, but pinegrass and agronomic species are present.

3.2.2 Wildlife and Wildlife Habitat

The project site is an open agricultural field adjacent to existing barns, and presently provides little in the way of wildlife habitat except for small mammals like mice and voles and the birds that hunt these species. However the surrounding forests and gullies are likely used by a range of species that occasionally utilize the farm fields. Mammals potentially present on farm fields include mule deer, white-tailed deer, elk, black bear, coyote, cougar, Columbian ground squirrel, and deer mouse (Pojar et al. 1991). Birds include American kestrel, mountain bluebird, pileated woodpecker, Clark's nutcracker, pine grosbeak, blue grouse, spruce grouse, barred owl, and Stellar's jay. Moist areas in nearby gullies may provide habitat for Pacific treefrog, long-toed salamander, and rubber boa.

3.2.3 Fish and Fish Habitat

There are no streams, ponds, lakes or wetlands within 500 m of the proposed composting site.

Down slope from the site is the Salmon River, which is known to provide habitat for a range of fish species including sockeye salmon, Chinook salmon, coho salmon, pink salmon, rainbow trout, kokanee, mountain whitefish, dace, suckers, and others (Freshwater Fisheries Society of BC 2009). There are no records of fish presence in either Spa Creek, Stephen Creek, or in Fowler Creek (FFSBC 2009). However, Spa Creek possibly contains rainbow trout since it originates from Spa Lake.

3.3 HUMAN ENVIRONMENT

3.3.1 Existing Land Use – Site and Neighbouring Areas

As noted earlier, Spa Hills Farm is a working chicken and beef farm. The Mitchells are experienced in handling waste organic matter (manure and occasional mortalities) and currently compost that material in open piles on the north side of their chicken barn complex. The compost is created by blending the manure with wood waste (chips, shavings, and/or sawdust) and covering the pile with a layer of wood waste. Chicken and beef cattle mortalities are placed in the compost piles when they occur and are then covered. The current composting operations meet the requirements of the B.C. Agricultural Waste Control Regulation of the *Environmental Management Act* (Part 8, Section 24).

Spa Hills Farm is bordered on all sides by agricultural or rural residential properties. The nearest neighbour is located 550 m away from the proposed composting site, and there are approximately 12-14 residential properties within one kilometre of the site.

MOE has published guidelines on appropriate buffer distances for composting operations (Table 3.8) (Forgie et al. 2004). The proposed Spa Hills Farm facility meets all these guideline minimums.

Distance from the composting site to:	Suggested minimum buffer zone distance (metres)*
Property line	15-30
Residential area	400 to 1000
Hospitals	800 to 2000
Tourist Areas	400 to 1000
Farm	100
Commercial or industrial area	100 to 300
Private well or other potable water source	150
Wetlands, ponds, lakes, streams, etc.	150-300
Subsurface drainage pipe or drainage ditch discharging to a natural water course	30
Water table (seasonal high)	0.6-1.5
Bedrock	0.6-1.5

Source: Forgie et al. (2004). * Any CSRD bylaw would take precedence over these guidelines.

Table 3.8 Suggested minimum composting facility buffer zone distances in B.C.

The Spa Hills Farm property is zoned Rural (R) by the CSRD. Agriculture is a permitted use in areas zoned as R (CSRD 2008). The farm is in the BC Agricultural Land Reserve (ALR), but the adjoining properties to the north are not (Agricultural Land Commission 2008). According to the Agricultural Land Reserve Use, Subdivision and Procedure Regulation of the *Agricultural Land Commission Act*, the production, storage and application of Class A compost in compliance with OMRR is a designated farm use activity if all the compost produced is used on the farm. On-farm composting is not specifically addressed in the Salmon Valley Land Use By-law, but is considered acceptable as long as the finished compost is not offered for sale (Beaching, pers. comm. 2009), consistent with the Agricultural Land Reserve Use, Subdivision and Procedure Regulation.

As noted above, a number of the residential properties near the site would be considered as rural residential properties rather than commercial farms.

3.3.2 Proximity to Public Institutions

The closest public institutions are near Silver Creek, about four to six kilometres north of the proposed composting site. They include the Silver Creek Elementary School, senior's centre, church, and community hall.

3.4 VALUED ECOSYSTEM COMPONENTS

Valued ecosystem components (VEC) are defined under CEAA as the environmental element of an ecosystem that is identified as having scientific, social, cultural, economic, historical, archaeological or aesthetic importance (Canadian Environmental Assessment Agency 2009). The value of an ecosystem component may be determined on the basis of scientific concern or cultural, social or economic goals. Based on the description of the baseline environment presented in Sections 3.1 to 3.3, the VECs considered in this assessment are groundwater quality and quantity, surface water quality and aquatic life, odour and air quality, soil quality, soil pathogens, wildlife and wildlife habitat, land use (on-site and neighbouring properties), acoustic environment, and traffic/road safety.

The assessment results are presented in Section 4.1, mitigation procedures to avoid or minimize effects are summarized in Section 4.2, and a summary of effects for each VEC is presented in Section 4.3, based on the assumption that the mitigation practices are implemented.

4.0 ENVIRONMENTAL EFFECTS, MITIGATION AND RESIDUAL IMPACTS

4.1 PREDICTION OF ENVIRONMENTAL EFFECTS

4.1.1 Groundwater Quality and Quantity

The proposed composting system at Spa Hills Farm has been designed to prevent the entry of leachate or pad runoff into the soils and groundwater. The design has incorporated a "multiple barrier" approach, consistent with the systems used by Interior Health Authority and other water quality protection agencies in Canada. The elements of the groundwater protection strategy planned for the project are:

- All operations – mixing, composting, and screening of finished compost, will take place on a poured concrete pad. The mixing will occur in a mixing wagon.
- The pad will be contoured so that any runoff will flow to an underground storage tank that is sized based on local precipitation data (see below). The collected mixing pad runoff and leachate will be re-cycled back into the compost to maintain optimum moisture levels.
- Composting will occur indoors, so no precipitation will be in contact with the compost until it is finished.
- As a relatively small commercial operation, Spa Hills Farm will only be mixing compost one or two days a week. If there is sufficient rainfall to cause a concern about runoff or to potentially saturate the mix, the operators can cease mixing and cover the material until the rainfall slows down or stops.
- The waste material will be blended with the bulking agent, which in addition to providing the carbon source acts to absorb liquid.

- Any leachate that drains from the material during the composting process will be collected in the aeration channels in the floor and routed to the underground storage tank for re-cycling.

These factors combine to indicate negligible risk that compost leachate or pad runoff would reach groundwater and flow towards down-gradient receptors – the Salmon River and the water wells located in the valley bottom (including well #82461 – Map 2). The risk of leachate moving towards these receptors is further limited by the presence of clay in the underlying sediments (Sections 3.1.2 and 3.2.3).

The planned area of the mixing pad is 2,500 square feet or 232.3 m^2 (Figure 1.2). A reasonable approach to stormwater management for this site would be based on retaining the 1 in 2 year return interval (i.e. average annual peak storm), 12 hour precipitation event. From Table 3.2, this is 20.9 mm at the Salmon Arm airport. The runoff volume is therefore:

$$232.3 \text{ m}^2 \times 0.0209 \text{ m} = 4.86 \text{ m}^3 \text{ (1,068 Imperial gallons).}$$

Precipitation at the Salmon Arm airport is about 30% higher than the ClimateBC model estimate for the site, so a 1,000 gallon concrete tank is adequate to contain the water washed from the pad during that event. For larger storms, the initial flush of material from the pad would still be contained by the tank, and any excess runoff would contain lower concentrations of any organic material that is present on the pad surface. The pad would be constructed so that the excess is discharged across a rock apron to dissipate energy, then is allowed to filter through the vegetated ground surface next to the pad. Note that the 50-year return interval storm produces only about double the average annual peak storm rainfall (Table 3.2), so a similar volume (about 5 m^3) would run off the pad as would be contained. This volume is very small compared to the volume that would be infiltrating into the farm fields below the site (e.g. if 20 mm of rain infiltrates into 10 hectares, the volume entering the soil is 2,000 m^3), and would not produce detectable changes in groundwater quality.

The key mitigation steps for protecting groundwater quality are:

- As planned, do all compost mixing on the concrete pad (Figure 1.2). Cease mixing if rainfall exceeds a drizzle and cover the waste material.
- Regular inspections of the concrete pads and floor, and repair of any cracks.
- Keeping the mixing pad clean and free of excess debris.
- Regular inspection of the in-ground tank to ensure it is free of leaks (e.g. by marking 1 centimetre intervals inside the tank and checking that the level does not drop. Consider annual pressure testing).
- Pumping out the tank after rainfall events and re-cycling it back to the fresh compost, to ensure adequate capacity if a major precipitation event comes along. If the tank fills completely from a major storm, pump out any excess liquid and take it to the Salmon Arm wastewater treatment plant for treatment, since the composting process would not need this volume to maintain the correct moisture levels.
- Taking due care with fuel and lubricants for the equipment, including proper storage. Spill kits should be kept on hand and any leaks or spills of fuel or other contaminants promptly cleaned up.

The combination of the facility design, the management strategy, the clay content of the underlying soils, and the distance to receptors (wells and water bodies) indicates low potential for effects on groundwater quality.

4.1.2 Surface Water Quality and Aquatic Life

As described in Section 4.1.1, there is negligible chance for compost leachate to reach the Salmon River or any of its tributaries. Therefore no effects on surface water quality are expected, and no effects on fish or other forms of aquatic life from changes in water quality will occur if the leachate and pad runoff are contained. Similarly, no effects on the water users that have licenses on the Salmon River are expected. All of the licensed points-of-diversion on both Spa and Fowler Creeks are located up-gradient of the composting site (Map 2).

When the compost is applied to the farm fields, it is to be disked into the soil as soon as possible to minimize the potential for it to be eroded and carried downslope. In addition to incorporating the compost into the soil, disking opens up the soil and enhances infiltration; thereby limiting surface runoff generation.

Finished compost typically has a relatively high carbon to nitrogen ratio (about 15:1-20:1) (Chiumenti et al. 2005) compared to soils, where the median is about 12:1 (Brady and Weil 1999). This means that adding compost to soil does not immediately increase the amount of plant-available nitrogen (i.e. nitrate-N, nitrite-N, and ammonium-N) in the soil, since soil microbes utilize some of the N when breaking down the organic matter and the crop utilizes the rest. The N in compost is mostly in organic form and is released slowly, to the benefit of the crop. There is some potential for repeated compost applications to build up soil nitrate[4] to the point where some leaching below the rooting zone is possible. However, the amount of compost produced under Spa Hills' proposal would see it being applied to agricultural land once every three years (Note: This is addressed in more detail in Section 4.1.4 below). Therefore there is low potential for nitrate leaching below the rooting zone to occur. Monitoring is recommended to confirm that this is actually the case (see Section 4.1.4 for details).

4.1.3 Odour and Air Quality

Odour

The potential for obnoxious odours is the concern that was most commonly raised during the open house and in other communications with the local community. As described in Section 3.1.1, winds in the Spa Hills Farm area are variable but flows from the south (±30° deviation from south) appear to be most common. This indicates that odours, if generated, could be detected in the residences located on Watson Road, between about 550 to 800 m distance. Odours from compost are generally caused by the release of gaseous compounds from the

[4] Nitrate-N exists in the soil solution as an anion and tends not to bind with the pre-dominantly negatively charged clay and organic matter particles. Ammonium-N, the other main form of available N, is a cation and tends to remain bound in the soil.

pile to the atmosphere. Under aerobic conditions, most of the gaseous releases are as carbon dioxide. Under anaerobic conditions, methane and hydrogen sulphide are the primary gaseous emissions, but odour causing compounds such as volatile fatty acids, reduced sulphur compounds (e.g. hydrogen sulphide, dimethyl sulphide, and mercaptans), aldehydes, and nitrogen compounds (e.g. ammonia, amines) can be released (Forgie et al. 2004; Chiumenti 2005). This is why maintaining aerobic condition is critical in composting operations.

Like the approach to groundwater protection, the planned design for the Spa Hills compost facility includes more than one technological approach to odour control:

- The slaughterhouse waste material will be refrigerated when picked up, and will be processed immediately after it arrives on site. Riverside's owner reports that there is no odour when the material is picked up by the current trucking firm (Meikle, pers. comm. 2009). The processing includes shredding the waste and blending it with the bulking agent (wood chips or straw) before moving it to the indoor composting bins. The material will be processed immediately on arrival at the facility.
- Both the active composting and the curing will take place indoors. The doors of the building will be closed except for when compost is moving in or out.
- The bulking agent absorbs moisture, which would be more readily evaporated if in a free state. The bulking agent will include enough larger particles to provide adequate porosity for aeration.
- Mixing will take place during normal working hours – Monday to Friday, between 830 and 4:30, and only one day per week during most of the year; two days per week during peak periods in the fall.
- After the blended compost is moved into the indoor bins it will be covered with a 15-30 cm thick "biofilter" layer comprised of finished compost or clean wood waste. Microbes in the biofilter layer degrade odour compounds, typically achieving 90% removal of odour-causing compounds or better (Geesing and Paul 2009). A B.C. Interior demonstration trial with slaughter waste completed near Merritt in 2006 found only a "very faint odour" from a compost pile covered with wood waste as the biofilter and "no

discernable odour" from a second pile covered with feedlot bedding (Sylvis 2008). The slight odour from the first pile was thought to be escaping through the pathways created by the temperature probes inserted in the pile.

- The piles are aerated, which avoids the need to turn the pile. Odour release is common when compost is turned early in other composting processes (Chiumenti et al. 2005), which is one of the factors why the aerated static pile design was selected here.
- Aeration also significantly minimizes the creation of anaerobic conditions. The microbial processes that produce odours in compost dominate when conditions are anaerobic because the microbes must use reduced carbon, nitrogen, and sulphur compounds as electron acceptors when degrading organic matter, all of which produce objectionable odours (Geesing and Paul 2009). Some level of odour is generated in aerobic piles because small pockets with anaerobic conditions still exist, but mechanical aeration significantly reduces the number of these anaerobic pockets.
- The automated temperature monitoring system will ensure that the correct temperature (>55°C and <70°C) for odour control is maintained by automatically adjusting airflow.
- The concrete floor and pad will drain to an underground storage tank, avoiding standing water that may have been in contact with the feedstock or compost.
- There is a generator at the farm already that will be used to keep the aeration system running in the event of a power outage (see Section 4.6).
- The operators (the three Mitchell families) live on-site and will be able to monitor for the presence of odours on evenings and weekends, unlike a "9 to 5" operator. They will also be able to monitor for the presence of odours in the early morning or evening. If odours are detected, steps will be taken to reduce them to non-detectable levels by increasing the thickness of the biofilter or adjusting the aeration.

To summarize, the planned facility and operating procedures are adequate to control odours and includes some built-in redundancy, so the potential for objectionable odours to be carried beyond the property line depends on how closely the odour control management strategies are followed. Key will be making sure the waste is refrigerated, processing it and moving it indoors promptly, ensuring the correct C:N ratio (25:1-40:1), ensuring sufficient pile porosity to allow air flow, promptly covering the piles with the biofilter layer, biofilter management, optimizing moisture and oxygen conditions, and monitoring.

It is important to note that, as a chicken and beef operation, odours are currently generated on occasion at Spa Hills Farm. The most common occurrence is when the chicken manure is applied to the agricultural fields. Mr. Mitchell reports that neighbours have informed him that they can detect when chicken manure is being applied, but feel that odour levels are consistent with standard farming practices. However, the perception that odours are unpleasant or objectionable could increase if nearby residents feel they are subjected to multiple odour sources. Again, the plan to reduce the size of their beef herd means that one of the existing odour sources is being removed, somewhat off-setting any increase in odour potential.

From the discussions regarding the proposed project, the neighbours appear to have a fair degree of tolerance for conventional agricultural smells (e.g. from the existing chicken and beef operation at Spa Hills and from other nearby farm operations), but are very likely to perceive new odours in a negative way. Odour alone, if strong or persistent enough, can produce health symptoms in some individuals (Chiumenti et al. 2005), but the odour concentration at which this occurs varies widely among individuals. The planned use of multiple techniques for odour control and the well-ventilated nature of the site suggest low risk that odours would progress to the point of producing health symptoms, but Spa Hills should maintain close communication with the neighbours and carry out regular odour monitoring to minimize effects on the local community. If odours are detected by either the Mitchells or by neighbours, steps should be taken immediately to modify the management practices to stop odours. If odours persist, consideration of additional odour control methods should be given. These include an activated carbon absorber through which the air in the building is ventilated, a wet scrubber, and the use of counteractants, neutralizing agents, and oxidizing agents (Geesing and Paul 2009).

Overall, it is likely that if the system is operated according to the current plan, there is a very low probability of detectable composting odour at neighbouring properties at any time; and little chance odour would be noticed beyond about 100 m distance under proper management.

The composting plan that will be prepared to facilitate OMRR notification will include details on management responses in the event that odour becomes detectable beyond the immediate operational area.

Other Air Quality

Dust: Dust may be generated during the screening process, from the storage piles of finished compost, and from vehicles accessing the site on the unpaved laneways on the farm. The distance between the compost facility and the nearest neighbours (at least 550 m) indicates low potential for dust to be a concern if the operators take adequate care to control it at source. Water is available (not leachate) at the site and can be used to moisten the finished compost during screening and storage, and to control dust on the lanes. Dust can be further avoided by screening only during calm conditions. Fugitive dust will not be generated from the active compost piles because they are indoors.

Chemical compounds: Except for the odour compounds discussed above, few chemical pollutants are discharged to air from agricultural and food waste composting (Geesing and Paul 2009).

Bioaerosols: Bioaerosols are tiny organisms such as fungi, bacteria, and viruses that are attached to water vapour or very small dust particles (Geesing and Paul 2009). Bacteria cells generally do not survive in air, but other microorganisms can persist. Since the bioaerosols are attached to particles, they would settle to the ground as they move away from the source or origin, or be intercepted by trees and shrubs. Again, composting indoors, not turning the piles, and the use of the covering biofilter layer significantly reduces the potential for these compounds to be carried away from the site.

4.1.4 Soil Quality

Spa Hills Farm intends to utilize the finished compost from the proposed facility to fertilize cereal crops (mainly wheat) grown on their land. As described earlier in Section 1.3.3 of this report, the recommended application rate of finished compost to fertilize cereal crops is 37 tonnes of compost per hectare (as produced basis). This is based on the following assumptions:

- 2% total nitrogen (approximately) in finished compost (wet basis);
- 15% of the nitrogen in plant-available forms and thus crop-available in the year of application (the remainder will become part of the soil's pool of organic nitrogen);
- The crop of wheat will require 110 kg plant-available N per hectare.

These assumptions are based on the best information available about the nitrogen content of slaughter waste compost (Sylvis 2008) and nitrogen dynamics of composts in general.

Based on these assumptions, Spa Hills can fertilize approximately 11 hectares of his land each year, and plans to plant approximately 30 hectares of wheat. At the proposed application rate, the land base will receive an application of compost every three years. It is expected that the crops grown on the land will utilize the nutrients provided in the compost, and that compost can be safely applied to the land base every three years.

The principal benefits of the slaughter waste compost to Spa Hill's land will be provision of organic matter and nutrients to the soil. The compost is expected to supply all of the major macro and micro nutrients, and particularly nitrogen, which is the nutrient which is required in the greatest amount by crops. This is also the nutrient that is of most concern environmentally if applied in excess to the land base; the nitrate form of nitrogen can leach out of the surface soil into the subsoil and subsequently enter groundwater if amounts substantially in excess of crop uptake are applied to the land. To ensure that over-application of nutrients, particularly nitrogen, is not occurring, it is recommended that Mr. Mitchell conduct basic soil monitoring for the first three years of compost application. This would involve collecting soil samples in the fall from the land that received compost either in spring of the year or the previous fall and monitoring the levels of nitrogen, phosphorus and potassium and other nutrients to ensure they are not in excess. This should be done by a professional agrologist with expertise in soil fertility assessment. Baseline sampling (i.e. before the first compost application) is suggested to obtain comparative data.

Nitrogen in the nitrate form can also be leached out of the rooting zone (the top layer of soil where plant roots are mainly found) by excess irrigation. It is recommended that after an application of compost to the land, or application of any other nitrogen source such as manure or fertilizer, care is taken to ensure that the irrigation rate supplies only the amount of water required to wet the rooting zone.

If fall soil monitoring of receiving sites shows that soil nutrient levels are normal following an application of compost at the recommended rate, the annual monitoring can cease after three years. If soil nutrient levels are found to be elevated to a level of concern, the agrologist will recommend an appropriate reduction in application rate to bring nutrient applications more in line with crop requirements. The soil monitoring should be repeated after three cycles (9 years if sites receive compost only 1 year in 3) to assess whether there has been nitrate build-up.

The application of the compost to Mr. Mitchell's land base is not anticipated to result in other soil or groundwater issues. The compost will have very low levels of trace metals, pathogens (see Section 4.1.5), and other contaminants because of its composition and the requirements of the composting process under OMRR (i.e. temperature >55°C for an extended period). In summary, it is expected that the incorporation of the finished compost into the soils on the wheat fields will be significantly more beneficial than detrimental to the land base on the farm.

4.1.5 Potential for Residual Pathogens in Soils

The majority of pathogenic microorganisms are killed when the compost temperature reaches 55°C. At this temperature only thermophilic (heat loving) microorganisms survive. Table

4.1 shows the effect of temperature on the destruction of common pathogens. In most cases destruction is complete within a few hours. Under OMRR, the pile temperature must be sustained at >55°C for three consecutive days to produce Class A compost, which is a significant factor of safety. In addition, it must be tested for fecal coliform[5] bacteria and the counts in all samples (7 per 1,000 m^3 or 7 annually if production is less than 1,000 m^3) must be <1,000 MPN[6]/100 g before the compost can be applied to the land. This is within the range found naturally in soils and only a small portion of what is found in raw manure, which can range from 10,000 to 150,000 MPN/100 g. The compost will be disked into the soil the same day, minimizing its potential to be moved by surface erosion.

In addition to pathogenic bacterial agents, composting has been shown to remove over 99.9% of *Poliovirus* within five minutes when the temperature is 47°C (Abiola 2009). Most parasites and their eggs and cysts are destroyed during composting. The cysts of *Entamoeba histolytica*, eggs of *Ascaris lumbricoides* (round worm) and *Taenia saginata* (tape worms) are destroyed in compost within 2 hours (Abiola 2009).

A research project on the feasibility of composting "non-green" waste (includes animal parts and dead animals) in Oregon found that the time and temperature requirements were met in the low-technology (windrows and passive aeration piles) processes, despite operating in rainy outdoor conditions (Tetra Tech 2002). The Oregon temperature requirements for pathogen and vector reduction are essentially the same as B.C. All systems tested reduced pathogen indicator organisms (fecal coliform and *Salmonella*) to levels below the applicable regulation limits. The fecal coliform limit is 1,000 MPN/g, the same as B.C.

In the B.C. Interior, a slaughter waste demonstration project was conducted near Merritt in 2006 (Sylvis 2008). The slaughter waste was mixed with wood waste and composted outside. One was covered with wood waste and one with feedlot bedding. Both temperatures

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[5] Fecal coliform is a family of bacteria that includes *E. coli* as well as a number of other species.
[6] Most probable number (MPN)

consistently met the OMRR temperature requirements. Testing upon completion found a geometric mean of 103.13 MPN/gram.

These results indicate strong probability of similar results at Spa Hills if the time and temperature requirements are met.

4.1.6 Wildlife and Wildlife Habitat

There will be negligible potential for direct effects on wildlife and habitat because the project footprint is a combination of existing farmyard and a field that is utilized for forage production and grazing. The total footprint, building plus pads, is about 0.065 ha (7,000 square feet). It is at least 500 m distance from any natural areas, and more than 650 m from any stream or wetland riparian areas where wildlife might congregate.

Table 4.1 Effect of temperature on pathogen destruction.

Pathogen	**Destruction Conditions**
Salmonella sp.	One hour at 55°C; 15-20 minutes at 60°C
Salmonella typhosa	30 minutes at 55°C; 20 minutes at 60°C
Escherichia coli	One hour at 55°C; 15-20 minutes at 60°C
Brucella abortus & Brucella suis	One hour at 55°C; three minutes at 62°C
Mycobacterium tuberculosis var. hominis	15-20 minutes at 65°C
Entamoeba histolytica (cisti)	Few minutes at 45°C; Few seconds at 55°C

Source: Chiumenti et al. 2005.

Compost has the potential to attract wildlife. OMRR includes vector reduction requirements to minimize attraction by birds, rodents, and other species. This includes covering the compost (here with the biofilter layer and by composting indoors) and ensuring that the temperature requirements are met so the compost is properly finished, thereby breaking down food materials and limiting odour. At Spa Hills, the composting will take place indoors and the lowest eight (8) feet of the walls will be concrete, thus limiting wildlife entry to the facility. The planned leachate control system will also reduce attractants. Beyond producing Class A compost, the key strategies to minimizing wildlife interaction include keeping the doors closed when not processing compost and general good housekeeping practices on the outdoor pads.

Deer and occasionally elk are known to feed on agricultural fields in the Yankee Flats area. The finished compost will be applied to farmland and disked into the soil soon after. There is very low risk of pathogens passing to deer or elk from the finished compost because of the temperature requirements during composting (Section 4.1.5) and because the compost is generated only from non-SRM waste. Disking the finished compost into the soil further reduces potential for any pathogens, if present, to pass to wildlife.

4.1.7 Land Use

As described in Section 3.3.1, the composting operation is a permitted land use in the Agricultural Land Reserve, and is therefore acceptable to the CSRD as long as the finished compost is used on Spa Hills Farm. Since the waste that will be processed is an agricultural by-product, the composting facility is generally consistent with the existing agricultural land use on the farm.

Despite this, concerns have been raised during the consultation that the planned composting operation will affect the rural character of the local area by introducing a commercial/industrial operation, albeit one that is an approved farm use in the ALR. The proposed operation will have a low profile because it will generate very limited additional traffic on local roads (see Section 4.1.8), there will be no signs at the property entrance to indicate it exists, and the building will not look significantly different than other farm buildings at Spa Hills Farm. Therefore the key to land use compatibility with neighbours is odour control (Section 4.1.3). Odour, if detectable, is the factor that could affect nearby land owners' enjoyment of their properties, and potentially indirectly influence property values.

Effects on property prices from industrial odours have been studied in other sectors, but there is little information specifically about composting. Winstrand (2009) examined effects of oil refinery odours on housing prices, concluding that there are negative effects but that they are marginal. Effects were increased, however, if the oil refinery was also visible. In general, proximity to sources of pollution can affect house prices, but many other factors can influence whether or not an effect occurs, the area affected, and the magnitude of any effect (Boyle and Kiel 2001).

Spa Hills Farm's proposed composting system and management practices are adequate to avoid off-site detection, so odour-related land use impacts to nearby properties are expected to be negligible because livestock and other farm operations are common in the Salmon River Valley. If odour is detectable, effects on land use could result in affected areas even if odour events are short-lived. This would likely be limited to about a one kilometre radius of the composting site, but this depends on the concentration and composition of odorous compounds at the source, and wind conditions. Again, the planned technology and management systems are adequate to control odour, and land use effects are not expected. Visual screening (e.g. with trees) and not identifying the site with signs are suggested as further means to limit effects on land use.

4.1.8 Acoustic Environment (Noise)

The proposed size and scale of the composting operation will result in mobile equipment (truck, mixer, loader) operating on-site for typically less than about 4-6 hours per week. These operations can be scheduled during the normal working day (i.e. 8:30 am to 4:30 pm), and some of the activity takes place indoors. The aeration system will operate more or less continuously, but is indoors.

The nearest off-farm residences are between 550 m and 800 m away. Given the predominantly indoor location of the compost operations and the distance to neighbours, noise from the composting operation is unlikely to be distinguishable from the baseline situation. This assumes that operations only take place during the normal working hours noted above, and the equipment is properly maintained (i.e. mufflers).

4.1.9 Traffic and Road Safety

Based on the size of the operation (about 450 tonnes/year; not to exceed 600 tonnes/yr) only one return truck trip between the farm and Riverside is anticipated per week in the January to August period, increasing to twice per week between September and mid-December. The route from Riverside to Spa Hills Farm when the truck is full will be Haines Road (0.5 km) to Salmon River Road (1.5 km) to Yankee Flats Road (6 km), totalling approximately 8 kilometres. From gate to gate the trip will take about 10-12 minutes.

No traffic count data were located either Salmon River Road or Yankee Flats Road (most publically available data are for numbered highways in B.C.) Both roads are travelled on a regular basis by farm, logging, and commercial trucks, and the increase of one or two round trips a week is not expected to be detectable compared to current conditions. The small increase in truck traffic for the facility will be partly offset by reduced driving associated with the Mitchell's reduced cattle operation.

One resident of Yankee Flats expressed concern over safety associated with the truck turning left from Yankee Flats Road into Spa Hills Farm. Again, the risk of accident is low given the number of trips per week. Nevertheless, the operator should use a high level of care when turning and when in transit between Riverside and the farm. Environmental effects of accidents are discussed in Section 4.6.

4.2 SUMMARY OF MITIGATION MEASURES

This section summarizes the environmental protection and mitigation measures that will be employed at the Spa Hills Farm composting facility.

4.2.1 Waste Source and System Design

- No SRM waste will be accepted. There is only one source of waste – Riverside Natural Meats in Silver Creek.
- System design must meet all OMRR requirements. It will be designed by a qualified professional (Dr. John Paul, P.Ag. of Transform Compost Systems) and a written plan will be prepared. MOE must be notified 90 days in advance of beginning composting.
- The system will employ a "multiple barrier" approach to prevent leachate or pad runoff from infiltrating into the soil and potentially moving to groundwater (Section 4.1.1). This includes conducting all operations on a concrete pad, composting indoors, leachate collection through the in-floor aeration channels, and a 1,000 gallon in-ground tank to collect any leachate.
- The truck that carries the waste from Riverside to the compost facility will have a solid bottom and sealed tailgate to prevent leakage.
- Odour control will also be based on "multiple barriers" (Section 4.1.3). The critical technologies are 1) composting indoors, 2) use of mechanical aeration to avoid the need to turn the pile and to minimize the potential for anaerobic conditions, and 3) use of a 15-30 cm thick biofilter layer to cover the compost.
- The system employs an automated system that controls the air flow to the pile in response to electronic temperatures probes that are inserted in the piles. Pile temperatures are recorded and saved to a dedicated computer.
- All of the finished compost will be used as a fertilizer on Spa Hills Farm's fields. There is adequate field area in cereal (primarily wheat) to allow a one year in three application schedule.
- Consider planting a row of trees on the south and east sides of the composting facility to serve as a visual buffer. The trees may also help to trap dust and any bioaerosols

produced from the composting operation, but will take some time to be effective. Fast-growth, sterile (non-suckering) hybrid poplars may be suitable for this purpose.

4.2.2 Operational Procedures

- A copy of the composting plan must be kept on-site. All operations staff must be fully trained in the plan.
- The waste material will be refrigerated when picked up and processed (mixed with the bulking agent) and moved indoors promptly.
- As planned, limit pick-up to a maximum of two trips per week.
- Processing will be scheduled to avoid rainy days by considering the weather forecast. If rainfall exceeds a drizzle the processing will cease and any partially mixed compost covered with an impermeable tarp until the rain stops (Note: The slaughter waste will be in covered barrels at this point).
- The fresh compost will be covered with the biofilter layer immediately.
- Aeration will start immediately.
- Pile temperature will be monitored by electronic probes connected to the computerized operation system. Air flow will be adjusted automatically.
- Care must be taken to optimize the blend of bulking agent and waste material to ensure the correct C:N ratio, moisture, and pile porosity to achieve the target pile temperature.
- Record keeping must follow OMRR requirements. The composting records must be kept on-site and available for review by MOE personnel.
- The leachate collection tank should be checked regularly and the liquid recycled back to the compost piles to optimize pile moisture using a pump and hose (so it can be directed to the pile with some precision). It should not be allowed to accumulate beyond about 10% full to maintain capacity in case of a sudden rainfall event.
- All operating equipment will be maintained in good condition.
- A spill kit will be kept on site. Any spills of fuels or other liquids from equipment will be cleaned up right away.

As discussed earlier, the technology for effective odour control will be in place if the design described in Sections 1.3.3 and 4.1.3 are implemented. However, preventing disagreeable odours from crossing the property line will require rigorous adherence to the specified management practices and monitoring. Key steps are processing the waste while it is still cool, biofilter placement and regular checking to ensure the coverage is adequate, and keeping the building doors closed except during transfers of material in and out (Note: the doors would be opened for some period of time before workers enter the building to reduce carbon dioxide build-up). A procedure for registering any complaints, including follow-up with the neighbours who issue the complaint is recommended (Section 5.0).

4.2.3 Monitoring

Recommended monitoring procedures are outlined below in Section 5.0.

4.3 PROJECT IMPACT SUMMARY

The projected environmental effects of the proposed composting project have been summarized according to the nature and direction of effect, magnitude, spatial extent, timing, duration, reversibility/irreversibility, and likelihood of occurrence. The summary criteria are based on the framework presented in CEAA and other federal guidelines (e.g. Hegmann et al. 1999; Transport Canada 2008), and the SRMMP Program C guidelines

Direction of Effect	The degree to which an effect on a valued environmental component will worsen or improve as the action proceeds; i.e., adverse, beneficial or neutral.
Nature of Effect	Direct - An effect in which the cause-effect relationship has no intermediary effects. Indirect - An effect in which the cause-effect relationship (e.g., between the project's impacts and the ultimate effect on a VEC) has intermediary effects.
Magnitude	A measure of how adverse or beneficial an effect may be. • Negligible: Effect not detectable beyond the footprint. • Low: Effect is detected only slightly above baseline levels • Moderate: Effect is detectable but does not exceed regulatory standards or guidelines

	• High: Effect exceeds regulatory standards or guidelines
Spatial Extent	As defined in Section 1.2.2: 1) Footprint 2) Site 3) Local Study Area, and 4) Regional Study Area.
Timing of Effect	The timing of the effect is construction (limited to construction period), operational (occurs more or less continuously as long as operations proceed), or delayed (there is a lag).
Duration of Impacts	The period of time in which an effect on a valued ecosystem component may exist or remain detectable. • Occasional – less than once per week, for up to 2 hours; • Short term – lasts up to several days, with longer time between events; • Regular – happens frequently, but there are gaps between events; • Continuous – happens consistently
Reversibility/Irreversibility	The degree to which an effect would persist if composting ceases and the site is decommissioned.
Likelihood of Occurrence	The degree of certainty of an event occurring. Either low (<30% probability), moderate (30-60% probability) or high (>30% probability)

The impact ratings for all VECs are summarized in Table 4.2. All effects are considered reversible if Spa Hills Farm stops composting and decommissions the site, so reversibility/irreversibility is not included in Table 4.2.

Table 4.2 Environmental impact summary assuming implementation of mitigation strategies.

Valued Ecosystem Component	**Direction and Nature of Effect**	**Magnitude**	**Spatial extent**	**Timing of Effects**	**Duration of Effects**	**Likelihood if Mitigation Strategy Implemented**
Groundwater quality	Adverse/Direct	Negligible	Local study area	Operational	Short term	Low
Surface water quality & Aquatic life	Adverse/Indirect	Negligible	Local study area	Construction (if spills) & Operational	Short term	Low
Odour/Air Quality	Adverse/Direct	Low to Moderate	Local study area	Operational	Occasional	Low
Soil quality	Beneficial	Medium	Site	Operational	Continuous	High
Soil pathogens	Adverse/Direct	Negligible	Site	Operational	Short term	Low
Wildlife/Wildlife habitat	Adverse/Direct	Low	Footprint	Operational	Regular	Low
Land use	Adverse/Indirect	Low	Local study area	Operational	Continuous	Low
Noise	Adverse/Direct	Low	Local study area	Operational	Occasional	Low
Traffic/Road Safety	Adverse/Direct	Low	Local study area*	Operational	Occasional	Low

* Local Study Area for the VEC is the roads between Riverside and the farm.

4.4 ESTIMATED RESIDUAL EFFECTS

Residual environmental impacts are those that remain after all reasonable mitigation procedures are implemented. The management and mitigation plans for the Spa Hills composting facility are sufficient to reduce residual environmental effects to negligible levels if implemented correctly. Odours may not be completely avoidable, especially during start-up while systems are being fine tuned. However, prolonged periods of unpleasant odour can be prevented with the equipment and techniques that have been selected for the project, as long as the operators consistently apply good management practices. There is some uncertainty associated with this projection, however, since management plays such an important role in odour control.

4.5 EFFECTS OF THE ENVIRONMENT ON THE PROJECT

The composting facility will be located on a site that has low risk from natural hazards. It is not located on or near a floodplain, and would not be affected by floods. Risks from wildfire are low because it is located in an open area that is at least 350 m distant from continuous forest, and there is a reliable source of water. Finally, there is negligible risk of landslide or terrain instability because the facility will be built on a level area.

4.6 EFFECTS OF ACCIDENTS AND MALFUNCTIONS

Accidents during regular operations with potential environmental effects include traffic accidents during the 8 km drive between Riverside and the farm, accidental spills of waste when it is being either on- or off-loaded from the truck, and spills of fuel or other fluids from mobile equipment. In the case of a road accident or large spill, the potential effect on the environment is low because the volume of waste would be relatively small (about 12 m^3) and it would be possible to clean it up within a short period. Also, it would still be cool from refrigeration while in transit. As part of the overall composting flan, Spa Hills should have a response plan prepared in the event of an accident or spill. This should include having at least two persons that can be called for assistance and having a quantity of clean wood chips on hand that can be brought out to the accident location to cover the waste. The waste should be transferred to another truck as soon as possible and either taken to the composting facility or returned to Riverside.

To handle small leaks and spills (including leaks from the truck if the seal doesn't work), a spill kit should be carried in the truck at all times, and any spills cleaned up promptly. The waste absorbent material must be placed in a closed container.

The equipment malfunction with the most serious potential environmental implications is a power outage if it lasts more than several hours, since the blowers are necessary to keep the piles from going anaerobic and causing disagreeable odours. Spa Hills Farm will have a contingency plan for power outages, including an alternative power source such as the existing generator they use for their chicken barns. Extra wood chips should be on hand to increase the thickness of the biofilter.

Since three Mitchell family households live on the property, power outages or other forms of equipment failure will be noticed relatively quickly compared to many compost facilities, where the operators are not on-site evenings and weekends. This will help to limit the duration of conditions that could have environmental effects.

4.7 CUMULATIVE ENVIRONMENTAL EFFECTS

Cumulative environmental effects are the effects on the environment that result from effects a project when combined with those of other past, existing, and imminent projects and activities (Canadian Environmental Assessment Agency 1994). These may occur over a certain period of time and distance, but are often considered at the scale of the Regional Study Area. Cumulative effects are generally only considered in EIAs for the residual (non-mitigable) effects of a project.

As outlined in Section 4.4, the residual effects for most of the VECs addressed in this report are projected to be negligible based on the size of the operation, its location, and the design and mitigation plans that will be followed. The potential for odour generation is the VEC with some potential for cumulative effects. This is because effects could be detected off the property if not adequately controlled at source, and because odours are generated on occasion by the current Spa Hills chicken operation, particularly when the manure is spread on farm land, and by other farms in the area. Most people who choose to live in agricultural areas are tolerant of agricultural smells if associated with good farm practices. It would be new odours, particularly strong, offensive, or persistent odours, which would create a cumulative effect in combination with the existing odours.

The likelihood that odour will constitute a cumulative environmental effect depends on the timing, magnitude and frequency of odour events. Given the key elements of the design (aeration, composting indoors, and a biofilter), the distance to residences, and the size of the operation (9-18 tonnes per week), any odour events are expected to be relatively short-lived. It is understood that manure odours are also relatively short-lived, so the cumulative effect of the proposed composting facility is expected to be small. As with the impact projection for odour on its own, this conclusion has a moderate degree of uncertainty.

5.0 MONITORING REQUIREMENTS AND FOLLOW-UP

The Organic Matter Recycling Regulation requires the following for monitoring:

1. Records are to be kept for each batch documenting when it was started, the conditions during composting and curing (including daily temperature), and when it was finished. The records must be available for viewing by the Ministry of Environment.
2. Pile temperatures must be recorded each day. Temperature is one of the criteria that determines if the compost is Class A or B.
3. The finished compost must be tested for carbon to nitrogen ratio, fecal coliform bacteria, and selected metals to verify what Class of compost has been produced. Testing at Spa Hills will occur annually since less than 1,000 m^3 of finished compost will be produced each year.

The required monitoring must be done by the composting system operator. However, MOE and the ALC can request the monitoring data at any time, and MOE would respond to complaints. Contravention of the requirements of OMRR is liable on conviction to a fine of up to $200,000 (Section 32).

If the compost is Class A it can be applied to the farm land without the need for additional studies or plans. If it is Class B, a Land Application Plan must be prepared by a qualified professional agrologist. This typically requires assessing the chemical and microbiological characteristics of the compost and the receiving soil, and developing a site-specific plan for incorporating the Class B compost to land, including the appropriate application rate. If the compost is not with Class A or Class B, it cannot be applied to agricultural land and must be taken to a licensed landfill.

In addition to the OMRR requirements, the following is recommended as part of good composting practice.

4. Regularly inspect the biofilter layer to ensure it is functioning (i.e. odour should not be detectable within 50 m of the facility).
5. Regularly inspect the concrete floor and pads regularly and repair any cracks.
6. Regularly inspect the leachate collection system and tank to ensure there are no leaks.
7. Install a wind gauge to measure wind speed and direction at the site. This will help to understand the conditions responsible for odour complaint generation, if any.
8. Conduct basic soil monitoring for the first three years of compost application. This would involve collecting soil samples in the fall from the land that received compost either in spring of the year or the previous fall and monitoring the levels of nitrogen, phosphorus and potassium and other nutrients. This is to ensure that the application rate recommended in this report is appropriate and that there is negligible potential for above-background nitrate levels below the rooting zone. This should be done by a professional agrologist with expertise in soil fertility assessment.

9. The operators should periodically walk around the property boundaries in the early morning or evening to check for odour migration. Early morning and late evening are common times for odour effects (Forgie et al. 2004).
10. Records of any complaints about odour should be kept on specially designed forms that include the date and time, the name and address of the person registering the complaint, the person's description of the type and strength of odour, weather conditions at the time of the complaint (including wind data if a wind monitor with datalogger is installed), and the response (e.g. increased biofilter thickness, etc.) The complainant should be informed as soon as possible about the action that was taken, and this discussion included in the incident record.

6.0 CONCLUSIONS

Spa Hills Farms is proposing to construct and operate a composting facility at 2219 Yankee Flats Road, near the community of Silver Creek. The composting facility will be in a covered building with a concrete floor and would process slaughterhouse waste from Riverside Natural Meats in Silver Creek. No SRMs will be included in the waste. Riverside currently produces 450 tonnes of non-SRM waste per year, which is currently shipped to Alberta for disposal. Similar volumes are anticipated in the future, but Spa Hills Farm will design the composting system to handle up to 600 tonnes per year to ensure adequate capacity to meet Riverside's seasonal variation. The facility will be regulated under the B.C. Organic Matter Recycling Regulation, which set standards for environmental protection, monitoring, record keeping, and compost quality. The composting process will be designed to produce Class A compost, which can be applied without restriction to farm land.

The EIA for the proposed facility was completed to satisfy the requirements for funding set by SRMMP Program C. The proposed size of the facility is relatively small, and therefore does not require an EIA for any regulatory reason. Based on the planned location, the proposed scale of the operation, the system design, and the planned operating procedures; there appears to be low potential for detectable impacts to the environment beyond the immediate project area (i.e. the project footprint and approximately 100 m distance). This conclusion assumes that the mitigation procedures listed above in Section 4.2 are implemented. The application of finished compost will be of benefit to the agricultural soils on the property. The project will also reduce costs for Riverside and the meat producers that rely on Riverside, and reduce the vehicular emissions associated with the current practice of trucking the waste to Alberta.

Any projection of environmental impact is associated with some degree of uncertainty. For the majority of VECs addressed in this report, the level of uncertainty in the projected environmental impact is low. For odour, however, there is some level of uncertainty for the magnitude (low) and duration (occasional) projections (Table 4.2). This is because the control of odour depends to a significant extent on management practices. **The design, selected technology, and management plan for the project are sufficient to prevent off-site odours**, but the operators will need to be vigilant to prevent unpleasant or obnoxious odours from reaching the property line. The neighbours appear to have a fair degree of tolerance for conventional agricultural smells (e.g. from the existing chicken and beef operation at Spa Hills and from other nearby farm operations), but are likely to perceive new odours in a negative way. Odour alone, if strong or persistent enough, can produce health symptoms in some individuals. The planned "multiple barrier" approach to odour control and the well-ventilated nature of the site suggest low risk that odours would be detectable at those levels, but Spa Hills should maintain close communication with the neighbours and carry out regular odour monitoring to minimize effects on the local community.

Overall, it is likely that if the system is operated according to the current plan, there is a very low probability of detectable composting odour at neighbouring properties at any time; and little chance odour would be noticed beyond about 100 m distance under proper management. Key steps are processing the waste while it is still cool, aeration, biofilter placement and regular checking to ensure the coverage is adequate, and keeping the building doors closed except during transfers of material in and out. A procedure for registering and addressing any complaints, including follow-up with the neighbours who issue the complaint is recommended.

7.0 REFERENCES

Abiola, A. 2009. Destruction of Pathogens and Parasites during Composting: Fact Sheet. Composting Technology Centre, Old College. Alberta. On-line at http://www.oldscollege.ca/schools/ocsi/CTC/publications-fact-sheets.htm

Agricultural Land Commission. 2008. Index map – Columbia Shuswap Regional District. Available of the CSRD web site.

Beaching, S. 2009. Personal communication (telephone with H. Hamilton). Planner, Columbia Shuswap Regional District. June 15, 2009.

Boyle, M. A. and K. A. Kiel. 2001. A survey of house price hedonic studies of the impact of environmental externalities. Journal of Real Estate Literature, 9(2):117–144.

Brady and Weil 1999. The Nature and Properties of Soils. 12th edition. Prentice Hall Inc. Upper Saddle River, NJ.

Canada and British Columbia. 2009. Process Guidelines – Canada-BC Specified Risk Material Management Program (SRMMP). Adjudications of Applications for Community and Regional Projects – SRMMP Subprogram C. February 5, 2009.

Canadian Environmental Assessment Agency. 1994. Reference Guide: Addressing Cumulative Environmental Effects. Ottawa.

Canadian Environmental Assessment Agency 2009. On-line glossary of terms. http://www.ceaa-acee.gc.ca

Center for Disease Control and Prevention. 2009. Bovine Spongiform Encephalopathy web page. Department of Health and Human Services. Atlanta, GA. http://www.cdc.gov/ncidod/dvrd/bse/index.htm

Chiumenti, A. and five others. 2005. Modern Composting Technologies. J.G. Press Inc. Emmaus, PA. 97 pp.

Columbia Shuswap Regional District (CSRD). 2008. Salmon Valley Land Use Bylaw 2500. http://www.csrd.bc.ca/

Environment Canada. 2008. Intensity-Duration-Frequency Precipitation Data. National Climate Data and Information Archive. On-line at: http://www.climate.weatheroffice.ec.gc.ca/prods_servs/index_e.html.

Environment Canada. 2009. Canadian Wind Energy Atlas. On-line at: http://www.windatlas.ca/en/index.php

Forgie, D., L. Sasser and M. Neger. 2004. Compost Facility Requirements Guideline: How to Comply with Part 5 of the Organic Matter Recycling Regulation. BC Ministry of Environment. On-line at www.env.gov.bc.ca/epd/codes/omr/pdf/compost.pdf

Freshwater Fisheries Society of BC. (FFSBC) 2009. FishWizard Database. On-line at http://www.fishwizard.com/

Geesing, D. and J. Paul. 2009. Compost Facility Operator Manual: A compost facility operator training course reference and guide. Transform Compost Systems Ltd. Abbotsford.

Geologic Survey of Canada. 1974. Surficial Geology - Shuswap Lake (west of 6th Meridian). 1:126,720 scale map. Accompanies Memoir 380 by R.J. Fulton.

Greenwood, Dr. P. 2009. Memorandum: The Use of Composted Prohibited Material on Pasture Land. Canadian Food Inspection Agency. May 1, 2009.

Hegmann, G., C. Cocklin, R. Creasey, S. Dupuis, A. Kennedy, L. Kingsley, W. Ross, H. Spaling and D. Stalker. 1999. Cumulative Effects Assessment Practitioners Guide. Prepared for the Canadian Environmental Assessment Agency by AXYS Environmental Consulting Ltd. Calgary.

Meikle, Bill. 2009. Personal communication (telephone with R. McDougall). Owner, Riverside Natural Meats. Silver Creek.

Ministry of Forests. 2003. Biogeoclimatic Ecosystem Classification Zone/Subzone Map – Salmon Arm Forest District. 1:250,000 scale. Research Branch. Victoria.

Pojar, J., Klinka, K., and Meidinger, D. V. 1991. .Biogeoclimatic ecosystem classification in British Columbia. Ministry of Forests. Victoria.

Raymond, M. 2009. Personal communication (e-mail to H. Hamilton). Waste Management Technician, B.C. Ministry of Agriculture and Lands. Abbotsford. July 9, 2009.

Schmidt, O. 2009. Personal communication (comments on an earlier version of draft report). Environmental Soils Specialist, B.C. Ministry of Agriculture and Lands. Abbotsford. July 13, 2009.

Sylvis. 2008. Slaughter Waste Composting Demonstration Trial – OMRR Compost Quality Assessment. Prepared for BC Investment Agriculture Foundation. Victoria. www.iafbc.ca/funding_available/.../LWTI-31_Land_Application.pdf

Statistics Canada. 2009. Cattle Statistics. Ottawa. http://www.statcan.gc.ca/pub/23-012-x/2008002/aftertoc-aprestdm1-eng.htm

Tetra Tech Inc. 2002. Commercial Food Waste Composting Study Project Report. Prepared for: Oregon Department of Environmental Quality, Land Quality Division, Solid Waste Program. http://www.deq.state.or.us/lq/sw/compost/foodwastestudy.htm

Wang, T., A Hamann, S. Aitken and D. Spittlehouse. 2006. ClimateBC Web Version: A program to generate climate normal data for genecology and climate change studies in British Columbia. Ministry of Forests. http://genetics.forestry.ubc.ca/cfgc/ClimateBC

Winstrand, J. 2009. The Effects of a Refinery on Property Values – The Case of Sweden. University of Uppsala, Department of Economics. Working Paper 2009:10.

APPENDIX A

Open House Advertisement and Materials

20/07/2009

NOTICE OF OPEN HOUSE

An **OPEN HOUSE** is being held to discuss a **small-scale compost facility** proposed to be operated at Spa Hills Farms, 2219 Yankee Flats Road, near Silver Creek, B.C. The compost facility will handle slaughterhouse waste; but no Specified Risk Materials (brain and spinal cords) will be processed or stored on site. The compost facility will be completely enclosed in a building with a concrete floor and will produce Class A compost.

The purpose of the open house is to obtain local input into the environmental impact assessment for the small-scale compost facility.

Open House
Date: Wednesday, June 17th, 2009
Location: Silver Creek Hall
Time: 6:00 pm – 8:00 pm

For more information, please contact Hugh Hamilton of Summit Environmental Consultants at (250)545-3672.

SPA HILLS FARM INC. COMPOSTING FACILITY

2219 Yankee Flats Road

KEY DESIGN FEATURES

Waste Source & Rationale

- **Only local slaughterhouse waste will be processed – it will all come from Riverside Natural Meats in Silver Creek, B.C.**
- **No Specified Risk Materials (SRMs) will be included in the waste stream**
- **Riverside's waste is currently trucked to Alberta. The Spa Hills composting facility will reduce costs for both Riverside and local farmers**
- **Riverside currently produces about 450 tonnes of non-SRM waste per year (2008). A similar amount is expected in the future – about half between September & December**
- **The waste is refrigerated and will be processed immediately. Likely one pick-up per week January-August; two per week September-December**

Composting System

- **Spa Hills Farm currently produces chicken and beef – the Mitchell family is experienced with handling organic waste including composting & land application**
- **Trucking via dump truck with solid bottom and sealed tailgate to prevent leakage. Trucking distance is 7 kilometres (1-way)**
- **The composting facility will be designed by Transform Compost Systems Ltd. – one of Canada's leading compost design & supply companies (**www.transformcompost.com**)**
- **"Class A" compost will be produced (as defined by B.C. Organic Matter Recycling Regulation)**
- **Composting will take place indoors under cover (roof and walls on all four sides). The site is adjacent to existing barns**
- **The compost building will have a concrete floor and the first 8' of the walls will be concrete block – there will be no drainage to underlying soils (see next page)**

SPA HILLS FARM INC. COMPOSTING FACILITY
KEY DESIGN FEATURES (continued)

- **Waste will be well mixed with wood chips, sawdust or straw and placed in six bins for composting**
- **Process is "Aerated Static Pile" - Compost will be aerated with an in-floor aeration system to promote microbial activity**
- **Probes in the compost piles monitor temperature & moisture – aeration system comes on automatically to control compost process**

Runoff/Leachate/Odour Control and Compost Use

- **Runoff from mixing pad and leachate from the aeration channels will be collected in a tank and re-cycled**
- **Compost will be aerated during primary composting phase – this avoids the need to turn the pile, which can release odours**
- **Compost piles are covered with biofilter layer – clean wood waste or finished compost. Microbes in biofilter degrade odour compounds**
- **Finished compost will be applied to Spa Hills Farms' fields as a soil amendment & plowed in. Expected annual production 390 tonnes**

APPENDIX B

Letter of Reference from BC Chicken Marketing Board Auditor

Hugh Hamilton

From: Brian Hoven [brianhoven@BCChicken.ca]
Sent: June 21, 2009 10:04 PM
To: Hugh Hamilton
Subject: Spa Hill Farms = Jake Mitchell

Letter of Reference

I am employed by the BC Chicken Marketing Board as a service representative and auditor. The BC Chicken Marketing Board is responsible for managing the supply and production of broiler chicken in the Province and has established General Orders as rules or requirements that growers must follow to ensure an equitable system for all licensed growers. Part of these General Orders include a requirement that all licensed farms undergo an annual on farm audit under the national On Farm Food Safety Assurance Program as well as the BC Biosecurity Program. The auditing programs are national and provincial standards to ensure all growers are following good production practices as well as biosecurity guide lines to ensure the quality of the product as well as overall consumer confidence.

My duties entail me or a fellow staff member to travel to all the farms on an annual basis. The Mitchell farm was first audited by me in December 2004 and it was most clear at that time that this farm was well managed and had been practicing many of the program requirements for years prior to the implementation of the auditing requirement. The farm was clean, well run and provided a good environment for growing chicken. Any program requirements not met were quickly put into place. Since that time, I have personally attended the farm several times while auditing and have always found Jake to be keen, responsible and one that takes pride in running a good clean operation. Jake not only follows good farming practices and the formal program requirements but as well keeps in mind animal welfare and environmental issues. The farm remains compliant with both auditing programs.

In my opinion this farmer has the knowledge, maturity, responsibility and the drive to be successful. I have no hesitation in recommending Jake for any agriculture practice or task.

Brian W. Hoven

Service and Inspection Representative

BC Chicken Marketing Board