HS Jansen and Sons Farms Ltd - Action Plan 2017

General items from May 2016 PAO		
Action Item	**Rationale**	**Completion Date or Explanation**
1. Ensure adequate and safe manure storage facilities. Maintain and keep in good working order the side slopes and pond edges of effluent storage structures.	Ensure sufficient storage for manure produced and integrity of storages	P. Eng. assessment of storages as part of EIA indicated there is sufficient storage capacity for 7 months of effluent and solids, and storages are sound. Slopes and edges will be maintained as required in 2017.
2. Drainage management measures required to ensure manure does not leave property or enter groundwater.	Ensure no runoff of manure into surface water or penetration to groundwater.	Manure application setbacks from Deep Creek are stipulated in 2017 NMP. Application rates are designed to meet crop nitrogen requirements and minimize residual nitrate in fall. Soil moisture monitoring limits irrigation water to top 60cm of soil to prevent downward movement of nitrates.
3. Remedial measures required to ensure manure does not leave property boundaries, enter surface water or impact wells.	Ensure manure remains on property within surface layer of soil.	Manure application setbacks from roads, Deep Creek and wells are

		stipulated in the 2017 NMP.
4. Soil, surface and groundwater monitoring to demonstrate effectiveness of implemented strategies	Demonstrate that implemented strategies have prevented impacts on surface and groundwater.	As outlined below, HS Jansen will sample all wells on his property in 2017, monitoring wells 3x and other wells once. They will conduct post-harvest soil testing on all fields over the aquifer in fall 2017 to 90 cm.
5. Map of fields, wells etc.		Maps are found in the 2017 NMP.
6. 2017 Nutrient Management Plan		Submitted May 24, 2017
7. Schedule for implementation of Action Items		Found throughout document.

Items arising from the 2017 EIA		
Action Item	**Rationale**	**Completion Date or Explanation**
Manure management and storage		
1. Construct a new screen and silo storage system for solids	Increase capacity of current system to meet current and future demand	Summer 2017
2. Create a separate recycled grit storage or re-use area off the slab	Ensure contaminants are not re-introduced.	Summer 2017
3. Cover compost facility	Prevent precipitation from entering process and creating excess leachate.	Cover not required. Any leachate is collected and moved to lagoon.
Manure supply infrastructure		
1. Install a pipeline breach monitoring device to quickly identify pipe failures. Include shutoff criteria at the pump station. Develop contingency plan which includes procedures and protocols to follow if there is an incident. Farm must stock spill mitigation kits. Train staff in spill response and document training. Review contingency plan with staff twice per year.	Quickly identify pipe failures and shut off flow if there is a pressure drop.	Pipeline breach monitoring device and shutoff: Summer 2017 Contingency plan and training: by December 2017
2. Ensure all mainline installations are approved by a Certified Irrigation Designer.		No further extensions to mainline are planned at this time.
3. Manure and storm water management system (i.e. ditches, gutters, storm main) inspections must be completed monthly. Inspection dates, findings and resulting actions must be reported in the annual summary report.		Monthly during 2017.

Nutrient management and crop selection		
1. Continue to use a qualified person to prepare an annual Nutrient Management Plan. The NMP must be designed to meet an agronomic balance that does not exceed zero for each crop and field receiving nutrients from fertilizer or manure. Must account for all on-farm, imported and exported nutrient sources on HS Jansen and Sons Farm Ltd. including compost and irrigation water. Must incorporate recommendations from 2016 Ministry of Agriculture post-harvest nitrate study.	Ensure nutrient applications are determined by a qualified person and are based on crop requirements and soil test results, and include all forms of nutrients on farm.	QP Ruth McDougall prepared the 2017 NMP with input from Doug Macfarlane, Certified Crop Advisor. NMP designed to meet agronomic balance of zero for all crops and fields receiving nutrients. NMP accounted for all nutrient sources generated on farm and imported and exported, including irrigation and compost. NMP incorporated recommendations from 2016 PH nitrate study.
2. Ensure operational nutrient applications are made in consultation with the crop advisor.	Same as above.	Doug Macfarlane, CCA directs nutrient applications at the farm. Nutrient applications are approved by QP Ruth McDougall.
3. Include nitrate additions in irrigation water when calculating nitrogen application rates.	Some irrigation wells have detectable nitrate levels. This may be contributing excess nitrate to soil on irrigated fields which requires a reduction in provision of nitrogen in other sources such as manure.	Included in 2017 NMP.
4. Conduct annual post-harvest soil testing on all fields over Hullcar aquifer to 900 mm using Kowalenko recommendations to assess residual levels. Sampling to be completed within 2 weeks of final crop harvest	Fall soil nitrate levels critical for assessing the accuracy of the nitrogen application rate during the preceding growing season and are used to fine-tune application rate for the following year.	Fall 2017

on each field. Soil samples must be collected to 0-15, 15-30, 30-60 and 60-90 cm depth.		
5. Reduce the nitrogen application rate in manure in 2017 on fields that had residual nitrate in fall 2016 in the medium or higher environmental risk category. Lower 2018 manure application rates on fields that remain in the medium or higher environmental risk category.	Fields in the medium and high environmental risk category had excess nitrate-N in fall suggesting that application in manure or release from soil was higher than crop requirements. There is a risk of over-winter leaching below crop rooting depth of some residual N.	Included as part of calculating crop nitrogen requirements in 2017 NMP.
6. Participate fully in the BC Ministry of Agriculture benchmark study if it is continued in 2017.	Benchmark study results will provide information on how much overwinter nitrate leaching occurs in the Hullcar area, and how fall, winter and spring precipitation and temperature affects nitrate movement.	Fall 2017
7. Apply nutrients based on the field and crop specific recommendations from the annual NMP prepared by the Professional Agrologist. Agricultural waste may be applied to land only for the purpose of soil conditioning or fertilization and the rate of such application must not exceed the rate required to meet the agronomic nitrogen balance for the growth of the relevant crop in that field as per the guidance of a NMP prepared by a QP.	Ensure application rates of manure are agronomic.	Throughout the 2017 growing season.
8. Maintain records of all nutrients applied to lands (dates of application, type or form of nutrient and amounts applied) and provide to Director on request.	Provide evidence that manure and other nutrient application rate recommendations from NMP were followed.	2017 as requested.
9. Install additional flow meters on the liquid manure distribution system to confirm application rates.	Confirm accuracy of manure application rates.	Summer 2017
10. Test the liquid manure for nutrient content at least 3 times during the growing season, use current manure N data to calculate application rates. The manure must be tested prior to spring and fall manure applications and application rates of manure adjusted based on the nitrogen content of	Improve accuracy of manure application rate calculations.	Sampled in March and May 2017. Will be sampled once in fall. Spring 2017 data used in calculating manure application rates in NMP.

manure. Soil to be tested in fall after crop harvest and residual soil nitrate-N values used to determine application rate of nutrients on each field in following year. Pre-sidedress nitrogen application recommendations to be made based on soil tests done at the appropriate stage of corn growth, normally in June.		Fall manure data will be used to confirm fall 2017 manure applications.
11. Continue to export separated solids off the Hullcar aquifer fields unless there is insufficient liquid manure to meet crop nitrogen requirements. Apply solids to off-site fields that are nutrient or organic matter deficient.	Remove approximately 20% of the nitrogen from the manure off the Hullcar aquifer fields in separated solids.	Ongoing. Discussed in 2017 NMP. Solids are all applied to fields in the Lavington area. Fields are deficient in organic matter.
12. No inorganic nitrogen fertilizer should be used on fields overlying the Hullcar aquifer unless insufficient manure is available to meet crop demands or manure cannot be applied to a field. Nitrogen fertilizer applications should be made in consultation with the crop advisor.	Use manure to meet all crop nitrogen requirements first before using other sources to ensure there is sufficient land to use manure.	Stipulated in 2017 NMP.
13. Irrigate fields based on data from soil moisture monitors.	Ensure excess irrigation water not applied.	Ongoing.
14. Install soil moisture monitors on more fields over aquifer 103.	Optimize irrigation rates on all fields and eliminate over-irrigation.	Summer-fall 2017, depending on ARDCORP funding.

Groundwater		
1. Sample monitoring wells MW 1S, MW 1D, MW 3 AND MW 5 for total N, TKN, nitrate-N, nitrite-N and ammonia-N three times per year for two years (March, July and November). Sampling must be undertaken by trained personnel and as per the BC Field Sampling Manual. Documentation to include in the Annual Summary Report includes description of the well purging technique; observations and standard field parameter measurements from well purging to stabilization; laboratory certificates; quality assurance/quality control; and chain of custody records.	Assess variations in nitrate-N concentrations over time	Will sample 3 times in 2017 (March, July and November) and will reassess frequency for future years. Data will be provided to MoE in the Annual Summary. Annual Summary will be posted at Hullcar Hall.
2. Continue to record soil moisture monitoring data		Ongoing
3. Complete a study to further assess the flux of nitrate-N through the unsaturated zone using nested lysimeters.	Determine amount of nitrate-N moving below the 90 cm soil sampling depth and when this occurs.	Will undertake this if funding is available from ARDCORP in 2017.
4. Sample domestic wells to the south of the field of concern for nitrogen parameters to help delineate the southern extent of the nitrate plume.	The southern extent of the nitrate-N plume is not known. This would help to delineate how far south the plume goes.	HS Jansen will sample all of their wells in 2017 for nitrogen parameters. Data will be included in the 2017 Annual Summary.
5. Report the results of MW 1S and MW 1D to owners of neighbouring properties as per requirements of CSR.	Ensure neighbours are aware of elevated nitrates in the vicinity of these wells.	Neighbours are aware of elevated nitrates in these wells, and the information is available online in the EIA.

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