

MEMORANDUM

Via E-mail and U.S. Mail

DATE: November 6, 2019

TO: Joseph Maez, III, PE
TRITAN CONSULTANTS

FROM: Robert O. Anderson, PE, CFM, WRS
R.O. ANDERSON ENGINEERING, INC.

SUBJECT: SUMMARY OF CONCEPTUAL DESIGN FOR SINCLAIR FAMILY FARMS
RECIRCULATING VERTICAL FLOW CONSTRUCTED WETLANDS

As we have been discussing, the following paragraphs provide a summary of the conceptual design for the wastewater treatment system to serve this proposed use in Douglas County, NV.

Project Description:

The Applicant, Sinclair Family Farms, has submitted a Special Use Permit request to Douglas County to operate a commercial, USDA meat harvest and process facility at 876 Centerville Road, Gardnerville, Nevada. Under the restrictions of Douglas County's land use code, the facility will be limited to processing not more than 60 large animals (e.g. beef, goat, lamb and swine) per week.

The facility is located on a 59.6-acre parcel that is zoned Agricultural, 19-acre (A-19). The proposed use is allowed within this zoning district subject to the issuance of a Special Use Permit.

Existing structures include a single-family dwelling, a mobile home, pump house, calf shed, bunk house, storage sheds, pole barn, milk barn, and various accessory agricultural structures and equipment related to dairy farming and cattle operations. The former use at the project site was the Storke Family dairy, which at times operated with as many as 200 head of dairy cows. To the extent practical, the Applicant intends to use the existing buildings, corrals and loading areas; however, modifications to these buildings/facilities will be made as necessary to accommodate the specific needs of the proposed use.

Portions of the project site are located within a FEMA-designated Special Flood Hazard Area AO-1 (1-foot depth), and the remainder of the site is located within the Unshaded 'X' zone (minimal flooding) as shown on Flood Insurance Rate Map (FIRM)

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Mr. Joe Maez
November 6, 2019
Page 2 of 7

32005CO245G, Douglas County, NV, date January 20, 2010. Since adoption of the FIRMs, Douglas County by and through Carson Water Subconservancy District, has prepared a two-dimensional water model (HEC-RAS) of the Carson River and its tributaries. The results of this modeling effort were submitted to and are currently being reviewed by FEMA. During their review, FEMA has directed Douglas County to use this new model as the best available information for the floodplains of the river. A comparison of the mapping of the FIRM and the new model suggest that there are substantial changes to the probable limits of flooding at this site. That is, areas now shown to be within the Special Flood Hazard area on the listed FIRM will not be within the primary flood zone if or when the results of updated hydraulic modelling are adopted. The location of the proposed treatment elements have been planned based on the results of the new hydraulic modeling to be generally located outside of the Special Flood Hazard Area, or an area that can readily be protected from flood flows in the 1%-chance of exceedance (100-year) flood event.

The topography at the site is very slight - generally less than 1-percent.

The nearest public wastewater treatment plant is Minden-Gardnerville Sanitation District (MGSD), which is located about 3.75 miles north of the project site. This property is not, however, within MGSD's service area. The nearest publicly maintained sewer main is located about 1.1 miles east of the project site. That sewer main is maintained by Gardnerville Ranchos General Improvement District (GRGID). The project site is not within GRGID's service area either.

Operational Considerations and Waste Management

Solid Waste Removal - Solid wastes produced during the harvest and processing (e.g. offal and viscera, blood, hides, etc.) all have market value and will, therefore, be collected and removed from the site on a routine and regularly occurring basis, usually at weekly intervals. Storage of these items will necessarily include means of preventing spoilage prior to hauling which will reduce or prevent the potential production of odors. Slaughter is expected to occur only once per week within a single 24-hour period, with the rest of the week being reserved for processing, curing, and packaging. Temperature control and operational cleanliness are both required not only to comply with routine and regularly scheduled inspections as well as to achieve and maintain facility certification, but also to ensure the required quality of the product produced. On occasion, a limited amount of animal hides may be saved by the Owner. These hides will be cleaned (biodegradable material such as fat and meat will be removed), salted, and stored within the barn under a covered roof. The salting of the cleaned hides will preserve them without odor while they are kept onsite prior to delivery to a hide company for final tanning.

Mr. Joe Maez
November 6, 2019
Page 3 of 7

Manure Handling: Animal refuse (manure) accumulation is expected to occur primarily within the areas used to off-haul and house the animals prior to slaughter. Animals will only be kept onsite for up to a maximum of 24 hours per week, with some animals arriving the day of slaughtering. Further, only 60 animals may be processed each week. With this limited duration of quantity of animals onsite, the amount of time available for manure accumulation is very limited. In addition, the animal holding areas, which will be limited to the site barn and corral areas, will be cleaned within 24 hours of slaughter. Manure will be stockpiled onsite to achieve enough dryness so that it may be used as pasture fertilizer via land application which will also occur onsite. This is consistent with and common practice in existing agricultural facilities throughout Carson Valley.

Flow Estimates

Employee Bathroom - The project contemplates the improvement of an existing bathroom to accommodate the employees working at the facility. A maximum of five (5) employees are anticipated. Per the USEPA's *Onsite Wastewater Treatment Systems Manual*, Table 3-4, a typical range of flow per employee in an industrial building is listed at 7-16 gallons per day (GPD) per employee. Using the higher end of this range at 16 GPD per employee, it is anticipated that up to about 80 gallons per day of domestic wastewater will be produced. Therefore a 1,000-gallon septic tank will be enough to handle all domestic wastewater flows generated by the employee bathroom facilities. It is proposed that the domestic wastewater would be treated and disposed of separate from the meat processing waste stream. The proposed location of the septic system and elevated mound needed to treat and dispose of this domestic waste generated by the employee bathroom is shown on the Conceptual Site Plan.

Design Flow Estimate: The daily volume of water that will reach the wastewater treatment system will vary based on the number and types of animals processed during any given day. At Table 3.5 Wastewater Generation Rate from Meat Processing¹, summarized estimated ranges of wastewater generated per each animal type for both slaughterhouses and packinghouses. For cattle, hogs and sheep these estimates ranged from 185 – 265 gals/animal, 42 – 61 gals/animal, and 26 – 40 gals/animal, respectively. For conceptual design purposes, we have used an average daily flow of about 1,200 gallons per day (GPD). This is based on 60 animals per week at an average water volume per animal of 100 gallons.

Permit Requirements and Wastewater System Design Parameters:

¹ Waste Treatment in the Food Processing Industry, Banks and Wang, September 29, 2005.
Y:\Client Files\2782\2782-003\Documents\Memo T J Maez Summary of Conceptual Design.Final.docx

Mr. Joe Maez
November 6, 2019
Page 4 of 7

1. NDEP Permit Requirements: The proposed recirculating vertical flow constructed wetlands (RVFCW) wastewater treatment system will require application to and approval of a discharge permit from the Nevada Division of Environmental Protection - Bureau of Water Pollution Control (NDEP-BWPC) prior to construction. The system will be required to meet the discharge permit water quality limits to allow the commercial discharge of treated wastewater from the facility. This permit will (likely) include limits on both the quantity (e.g. gallons per month/year, maximum day allowable flow, etc.) and quality (e.g. maximum allowable concentrations of fecal coliform, BOD5, and/or ammonia). It is expected that the permit terms will dictate at a minimum that the wastewater treatment system achieve the following limits: BOD5 = 30 mg/l; and, TSS = 30 mg/l.

An Operations and Maintenance manual will be prepared for the system to provide guidance on the proper operation and key maintenance requirements needed to ensure that the system operates effectively, and effluent quality meets the permit limits. The permit terms will likely provide regular (annual or semiannual) testing and monitoring requirements to verify that the system performance is within the allowable limits of the discharge permit.

2. Recirculating Vertical Flow Constructed Wetland Treatment: The RVFCW system itself will provide greater treatment levels and is anticipated to achieve superior-quality effluent than traditional onsite sewage disposal systems (OSDS) that are routinely approved within Carson Valley for both commercial and residential applications. This is the result of providing alternating conditions of aerobic and anaerobic processes within the treatment system and substantially longer retention times than traditional OSDS processes due to the recirculation of flow within the system as opposed to more traditional systems that are essentially "single-pass" or once-through treatment systems. Additionally, the system will allow for evapotranspiration of the water as well as agronomic reuptake of nutrients (i.e. plant growth) which will reduce nitrogen in the effluent. The treated water will then be disposed of downstream of the RVFCW in a traditional mounded sand filter which will provide a final level of treatment, acting as an effluent polishing process prior to percolation into the-ground. This will further improve the effluent over more traditional mound type systems that are in place throughout the Carson Valley.
3. Grease Interceptor Sizing: Because the use includes the handling of animal fats, offal and hides, a grease trap has been added to capture and handle these waste products that enter the waste stream. The holding/settling tanks are a combination of standard grease interceptors and septic tanks. These tanks will be buried below grade with covered access ports for periodic removal of

Mr. Joe Maez
 November 6, 2019
 Page 5 of 7

accumulated solids via a vacuum truck. These are identical to tanks used for individual sewage disposal systems (septic systems) and grease interceptors used for restaurants and other commercial facilities. The means of solids removal via pumping by vacuum trucks is similarly identical to other facilities that are in place and routinely permitted throughout Carson Valley. Using the average daily flow of 1,200 GPD (0.8 GPM), and a peaking factor of 10, yields a peak flow rate of about 8 GPM. A 300-gallon (30 x peak flow rate (GPM)) gravity grease interceptor has been selected.

4. Septic Tank Sizing – Employee Bathroom: The existing building includes a domestic wastewater component from the employee bathroom that will serve the facility. A maximum of five (5) employees are anticipated. Per the USEPA's *Onsite Wastewater Treatment Systems Manual*, Table 3-4, a typical range of flow per employee in an industrial building is listed at 7-16 gallons per day (GPD). Using the higher end of this range at 16 GPD per employee, it is anticipated that up to about 80 gallons per day of domestic wastewater will be produced. Therefore a 1,000-gallon septic tank will be enough to handle all wastewater flows generated from the employee bathroom facility. Effluent from this septic tank will be disposed of using an elevated mound system in accordance with Nevada Administrative Code².

5. Meat Processing Sedimentation (Septic) Tanks: To be most effective, the waste stream must receive primary treatment in advance of the RVFCW cell. This is accomplished by installation of sedimentation tank(s) of the proper size. Design guidance documents recommend sizing the sedimentation tanks for a minimum of 48 hours (two days) of detention time. Using the Design Flow of 1,200 GPD, the minimum septic tank volume would be 2,400 gallons. The design, therefore, includes two 1,500-gallon septic tanks constructed in series to achieve the minimum detention time.

6. Surface Area Required: The *state of Indiana, Indiana State Department of Health* recommends a minimum bottom area of 1.0 square feet per gallon per day (1 SF/GPD)³ of design flow.⁴ By comparison, for domestic wastewater treatment, Purdue University recommends using a minimize area of 0.48 SF/GPD for RVFCW. For conceptual design purposes, the concentration of the influent BOD is expected to range from 1,200 mg/l to 3,000 mg/l. Applying the

² NAC 44.839 Elevated Mound System: Design Criteria

³ Indiana State Department of Health – *Indiana Standards for Subsurface Constructed Wetland Treatment Technology*, August 6, 2018.

⁴ Purdue University, *Recirculating Vertical Flow Constructed Wetlands for Treating Residential Wastewater*, January 2008.

Mr. Joe Maez
 November 6, 2019
 Page 6 of 7

recommended area requirement yields a total surface area of 1,350 SF for the constructed wetland cells. Two cells will be used to achieve this sizing requirement, which will allow one cell to be taken off-line temporarily for maintenance purposes without closing the business operations. The cells will each, therefore, be about 600 square feet (1,200/2) in area. The Indiana State Department of Health further recommends that the length-to-width ratio be set at 2:1⁵. Each of the proposed cells will, therefore, be 20 feet wide by 40 feet long (800 SF each), which provides an actual bottom area of almost 1.3 SF/GPD.

7. Dosing Tanks/Effluent Pump Station: The dosing tanks are small pump stations set below grade with access covers for operation and maintenance of the pumping systems. The pumping system will deliver the process water to the wetlands for treatment, as well as to the final disposal field which will consist of a covered and elevated mound with a buried sand filter for final polishing prior to percolation (disposal). Again, this process is identical to other systems, both residential and commercial, that are routinely permitted and constructed throughout Carson Valley.

The dosing of the constructed wetlands will be scheduled using an electronic timer set to occur about 10 times per day, or a little more than once per hour during the working days. The average dosing volume will be about 120 gallons. It has been well-documented that the water quality of the effluent from the RVFCW is improved significantly with repeated dosing.

To improve reduction of organics through the treatment process, the RVFCW will be equipped to divert and return as much as 50% of the effluent from each cell to either the lowest septic tank or the effluent pump station. Recirculating these flows will ensure that the water quality discharge permit requirements can be achieved.

8. Disposal - Elevated Mound Sand Filter (Winter)/Land Application (Irrigation Season): The final treatment and disposal of the effluent will be accomplished by land application during the irrigation season (April 1 – September 30) when effluent from the RVFCW can be mixed with the Applicant's irrigation water for the small pasture areas around the existing facilities. During the remaining months when ambient temperatures prevent plant uptake, the effluent will be pumped to a single elevated mound sand filter for further polishing. Soil trenches were excavated at the site to determine probable depth to seasonal high

⁵ Indiana State Department of Health – Indiana Standards for Subsurface Constructed Wetland Treatment Technology, August 6, 2018.

Mr. Joe Maez
November 6, 2019
Page 7 of 7

ground water and perform percolation tests. Two percolation tests were performed in the preferred location of the elevated mound (north of the ranch buildings but south of the Rocky Slough). The percolation rate determined during these tests was 120 minutes per inch. Based on these results, and the average design flow (1,200 GPD), the mound will be about 60 feet wide by 100 feet long. Effluent will be delivered to the sand filter by a standard pressure distribution system to ensure that the effluent is distributed across the entire basal area of the filter.

Conclusion:

Based on the above-described conceptual design, it is expected that the proposed treatment system will consistently achieve the expected discharge permit terms of 30 mg/l BOD5 and 30 mg/l TSS.

An updated Alternate Site Plan depicting the proposed configuration of the system components described above is attached.

(End of Memorandum)

