

**GROUND WATER DISCHARGE PERMIT UGW05004
STATEMENT OF BASIS**

**Schreiber Foods, Inc.
Schreiber Foods Cheese Plant
Smithfield, Utah**

June 15, 2012

Facility Description

Schreiber Foods, Inc. operates a cheese manufacturing plant at 2180 West 6550 North in Amalga, Utah near the center of the Amalga Barrens area. The Amalga Barrens area encompasses about 5,000 acres of wetlands, alkali mudflats, scrub grasslands, and grain fields situated in the middle of the Cache Valley. The Cache Valley is a 70 mile by 25 mile mountain valley straddling the Utah-Idaho border and in Pleistocene times was the bed of ancient Lake Bonneville. Soil surveys completed in 1913 identified over 1,500 acres of wetlands in the Barrens, consisting of springs, open water, marsh, and extensive alkali mudflats. The Barrens drains into Clay Slough, which in turn flows south into Cutler Reservoir on the Bear River.

Schreiber is proposing to construct an evaporation wetland area on the southern portion of the 110-acre land application site. The evaporation wetland area will serve as additional storage and disposal for the treated wastewater through evaporation and percolation into the soil. The evaporation wetland area will be constructed on the southern 75 acres of the land application site. A wetland delineation conducted by Bio-West showed that approximately 35.2 acres of the 75 acres is naturally occurring wetlands. Earthen berms will be constructed around the perimeter of each natural wetland area to prevent any wastewater from entering the natural wetlands and being discharged into any surface water. Approximately 39.8 acres of upland area will be flooded to an average depth of approximately one foot using treated wastewater from cell 4 of the lagoon treatment system. Because of the natural slope of the land, water depths will range from one (1) to 24 inches.

Hydrogeology

Regional - Cache Valley is filled with alluvial fan and pluvial lake deposits and is bordered by the Bear River Range to the east and the Wellsville Range, Junction Hills, and Malad Range to the west (Hintze, 1988). The Schreiber property is covered by Holocene to Uppermost Pleistocene sedimentary deposits of silt, clay, and minor sand from alluvial (flowing water), lacustrine (lake), or paludal (marsh) processes younger than Lake Bonneville deposits (Solomon, 1999). These younger deposits commonly overlay, grade into, and consist of older reworked Lake Bonneville deposits. Typical thickness of these fine-grained deposits is three (3) to 10 feet (Solomon, 1999). The underlying Lake Bonneville sediments consist of silt, clay, and minor fine-grained sand.

The estimated maximum thickness of this layer is approximately 50 feet (Solomon, 1999). Underlying the Lake Bonneville sediments are 600 to over 1,000 feet of fluvial and lacustrine sediments (Robinson, 1999). These deposits consist mostly of silt and clay, but do contain some layers of sand and fine gravel (Robinson, 1999). These sediments contain the major aquifers of the Cache Valley (Bjorkland and McGreevy, 1971).

Bjorkland and McGreevy (1971) indicate that groundwater occurs in confined, perched, and unconfined aquifers in Cache Valley. The confined portion of the principal aquifer is typically overlain by a shallow unconfined aquifer (Bjorkland and McGreevy, 1971). Robinson (1999) identified eight distinct hydrostratigraphic units within Cache Valley, four of which are important to this investigation. The upper confining layer, identified as B-1, is an aquitard composed primarily of clay, silt, and sand of Lake Bonneville deposits less than 100 feet thick. Underlying the B-1 aquitard is the upper confined aquifer (A-1), which is about 30 feet thick and composed of gravel to cobbles interbedded with sand and silt with discontinuous clay lenses. Water from this aquifer is typically high in iron and not used for domestic supply. The third underlying layer is the lower confining layer, (B-2), which is an aquitard approximately 30 feet thick composed of thickly bedded clay and thin gravel lenses near the valley margins (Robinson, 1999). Underlying B-2 aquitard is the lower confined aquifer (A-2), which is up to 1,340 feet thick and composed of gravel and sand with discontinuous silt and clay lenses. Ground water from this aquifer is typically good, and this layer is the major aquifer in Cache Valley (Robinson, 1999) usually identified as the principal aquifer.

Anderson and others (1994), Kariya and others (1994), and Bjorkland and McGreevy (1971) indicate that ground water flow in the principal aquifer near the subject properties is to the southwest. This flow direction matches the overall topography in the area. Recharge occurs from infiltration of precipitation, seepage from streams, and subsurface inflow from both consolidated and unconsolidated deposits. Recharge occurs mainly as runoff from the adjacent mountains infiltrates into the coarse unconsolidated deposits (i.e., alluvial fans) at the margins of the valley (Kariya and others, 1994). Anderson and others (1994) show the subject property is located within a discharge zone of the principal aquifer.

Local - There is scant information published for the shallow, unconfined aquifer in Cache Valley. This aquifer may be comprised of the B-1 aquitard of Robinson (1999) or younger post-Lake Bonneville deposits. Based on numerous wells drilled in the shallow unconfined aquifer in Cache Valley, the direction of ground water flow typically mirrors the topographic gradient of the land surface and the flow direction in the principal aquifer. Depth to ground water in two monitoring wells on the 110-acre land application site ranges from two (2) to seven (7) feet below ground surface. Depth to ground water in three monitoring wells on the 160-acre land application site ranges from two (2) to 10 feet below ground surface.

Based on soil classification samples collected during monitoring well installations on the 160-acre land application site (Section 5.1), sediments in the area are composed primarily of clay and silt. The typical porosity of silt ranges from 35 to 50% and the porosity of clay ranges from 33 to 60% (Fetter, 1994). However, the hydraulic conductivity of clay ranges from 10^{-9} to 10^{-6} centimeters per second (cm/s) and the hydraulic conductivity of silt ranges from 10^{-6} to 10^{-4} cm/s (Fetter, 1994).

Robinson (1999) considered the B-1 layer to be a very low-permeability aquitard. Because of the very low permeability of this aquitard layer, there is probably little to no hydraulic connection between the shallow, unconfined aquifer in the area and the deeper aquifers. If there is a connection between the shallow, unconfined aquifer and the deeper aquifers, it is probably an upward flow of ground water from the deeper aquifers to the shallow, unconfined aquifer due to its location within the regional ground water discharge area. This is supported by numerous flowing wells and springs in this area.

Surface Water

The Amalga Barrens encompasses about 5,000 acres of wetlands, alkali mudflats, scrub grasslands, and grain fields situated in the middle of the ground water discharge area of Cache Valley. Soil surveys completed in 1913 identified over 1,500 acres of wetlands in the Barrens area, consisting of springs, open water, marsh, and extensive alkali mudflats. The Barrens area drains into the ephemeral flowing Clay Slough, which in turn flows south into Cutler Reservoir. The shallow, unconfined aquifer is probably hydraulically connected to surface waters in the area. Recharge of the shallow, unconfined aquifer in the area occurs primarily from infiltration of precipitation and unconsumed irrigation water and seepage from canals and streams (Kariya and others, 1994).

Ground Water Quality

Total dissolved solids (TDS) concentrations in this part of Cache Valley are naturally high (Lowe and others, 1994). Ground water in the principal aquifer for most of Cache Valley has TDS concentrations below 500 milligrams per liter (mg/L). However, ground water in the principal aquifer in the northwestern part of Cache Valley has TDS concentrations between 500 and 750 mg/L, and the area southwest of Amalga has ground water TDS concentrations between 750 and 1,000 mg/L (Lowe and others, 1994). Robinson (1999) identified TDS concentrations as high as 1,200 mg/L in the principal aquifer near the Barrens. Bio-West could not locate published information on typical TDS concentrations in the shallow unconfined aquifer in the area. However, Bio-West has documented TDS concentrations as high as 44,000 mg/L in monitoring well MW-2 on the 110-acre land application site, while TDS concentrations in the other monitoring wells on both land application sites range from 8,500 to 18,000 mg/L.

Downgradient monitoring wells installed on the 110-acre and 160-acre land application sites show minimal impacts from the application of treated wastewater for irrigation. This implies the area of influence affected by the application of treated wastewater is essentially confined to the areas that are irrigated with the treated wastewater.

Ground Water Classification - The uppermost shallow ground water at the site is naturally high in TDS. In accordance with UAC R317-6-3.5 and ground water quality data provided in Appendices II of the permit application, ground water in this location is Class IV Saline Ground Water. As required in Part I.G.2 of the permit, an accelerated background monitoring program will be completed by the Permittee to collect data for calculating well-specific background ground water quality concentrations. After securing Director-approval of the Accelerated Background Monitoring Report, background concentrations will be adjusted in accordance with the reopener provision in Part IV.N.2 of the permit.

Class IV Protection Levels - In accordance with UAC R317-6-4.5, Class IV saline ground water will be established to protect human health and the environment at the discretion of the Director. However, in the interest of protecting Cutler Reservoir from discharges of nutrients via ground water flow, consideration will be given to more stringent protection levels in monitoring wells near the reservoir.

Compliance Monitoring Program - A quarterly compliance monitoring program will commence when use of the evaporation wetlands is approved. The following key leakage parameters were selected for compliance monitoring:

- Ammonia as N,
- Chloride,
- Dissolved phosphorus,
- Nitrate + nitrate as N,
- Total dissolved solids (TDS), and
- Total Phosphorous

In addition, samples will be analyzed for the following major ions:

- Bicarbonate,
- Carbonate,
- Calcium,
- Magnesium,
- Potassium, and
- Sodium.

Best Available Technology (BAT)

Evaporation Upland Area – Delineated wetlands in the Evaporation Upland Area will be isolated from the land application of treated wastewater with berms constructed with a hydraulic conductivity less than or equal to 1.0×10^{-7} cm/sec.

BAT Performance Monitoring

Best available technology monitoring will include the installation and monitoring of six new monitoring wells in addition to three wells previously installed at the project site. Installation details and well logs of the three installed wells are included in Appendix E of the permit application (DWQ-2012-001395).

Compliance Schedule Items

Accelerated Background Ground Water Monitoring Report - The Permittee shall submit an accelerated background ground water monitoring report for Executive Secretary approval 60 days after the accelerated background monitoring program has been completed in accordance with the following requirements:

- a) At least eight (8) samples will be collected for each compliance monitoring well and parameter over a one year period at a quarterly sampling frequency utilizing the procedures outlined in the approved Water Quality Sampling Plan and Quality Assurance Project Plan.
- b) Each sampling event will include independent grab samples for each compliance monitoring well.
- c) Samples will be analyzed for all parameters listed in Part I.G.2 of the permit.
- d) All data for each well and parameter will be validated and the following statistical calculations will be performed and reported:
 - Mean concentration,
 - Standard deviation, and
 - Mean concentration plus 2 standard deviations.

Water Quality Sampling Plan and Quality Assurance Project Plan - The Permittee submitted a Water Quality Sampling Plan and Quality Assurance Project Plan with the permit application. These plans will be incorporated as an enforceable Appendix of the permit and shall be updated or modified as required by the Executive Secretary. The revised plans will be submitted for approval, within 60 days following receipt of notice from the Executive Secretary that updates or revisions to the plan are required.

Final Conceptual Closure Plan and Duty to Reapply - The Permittee shall submit a final conceptual closure plan at least 180 days prior to the expiration date of this permit. Also to be submitted at this time will be a reapplication for the ground water discharge permit which will include an updated operational plan describing the proposed operational and closure activities to occur in the next five-year term of the permit. The Permittee shall resubmit the plan with 60 days of receipt of notice from the Executive Secretary and correct any deficiencies noted in the agency review.

Permit Application Documents

The following documents are considered part of the ground water quality discharge permit application and will be kept as part of the administrative file.

1. Schreiber Foods, Inc. Groundwater Discharge Permit Application, March 14, 2012, submitted by Bio-West (DWQ-2012-001395).
2. Schreiber Foods, Inc. Proposed Evaporation Wetlands Predesign Report, March 21, 2012, submitted by (DWQ-2012-001379).
3. Schreiber Foods, Inc. Groundwater Discharge Permit Application Completeness Review Comments Response Letter, May 14, 2012, submitted by Bio-West (DWQ-2012-001719).