September 2014
WISCONSIN DEPARTMENT OF NATURAL RESOURCES

RICHFIELD DAIRY PROJECT

ENVIRONMENTAL IMPACT STATEMENT

Permit/Approval	File Number	Date of Issuance
WI Pollutant Discharge Elimination System (WPDES) Permit	WI-0064815-01-0	November 3, 2011
Plans and Specifications Approval-Production Area Structure/System Design	R-2011-0029	June 24, 2011 - Statutory approval November 3, 2011 Conditional approval modifying statutory approval
Plans and Specifications Approval-Groundwater Monitoring Plan	R-2012-0057	July 27, 2012-Conditional approval
Plans and Specifications Approval-Production Area Structure/System Design	R-2013-0180	October 7, 2013-Conditional approval of resubmitted plans (R-2011-0029) October 25, 2013-Revised Conditional approval October 28, 2013-2nd Revised Conditional approval
Conditional High Capacity Well Approval	01-3-0009	November 3, 2011 (modified on March 13, 2013)
WPDES Nutrient Management Plan	WI-00648	June 2, 2011
WPDES Construction Site Storm Water Runoff	WI-S067831-04	February 22, 2011 (extension granted January 27, 2014)

Environmental Impact Statement for Richfield Dairy

Introduction

In November 2011, the Wisconsin Department of Natural Resources (DNR) prepared an Environmental Assessment (EA) for the proposed Richfield Dairy facility pursuant to the Wisconsin Environmental Policy Act (WEPA), s. 1.11 Stats., and ch. NR 150, Wis. Adm. Code.

Interested parties sought judicial review of the adequacy of the EA. As a general matter, the Dane County Circuit Court found the EA to be adequate. However, the Court remanded the original EA to DNR on July 20, 2012, finding that the EA did not evaluate the effects of the high capacity wells at their approved pumping rate. In response to the Court's order, DNR prepared a Supplemental Environmental Assessment (SEA). The SEA included additional factual investigation to allow a reasonably informed preliminary judgment about the environmental effects of the high capacity wells operating at 72.5 million gallons per year (MGY), which is the rate requested by the Richfield Dairy in a revised high capacity well approval application. During a public review period on the SEA, the DNR received 183 comments concerning the Richfield Dairy SEA. The DNR carefully reviewed all comments and provided detailed responses to those comments as part of its March 12, 2013, WEPA compliance decision.

The Circuit Court had concluded that DNR's original EA and addendum evinced "sufficient consideration of the cumulative effects of the high capacity wells." The parties that sought judicial review of the EA appealed that portion of the court's ruling. The Court of Appeals, District IV, issued its decision on December 19, 2013 (2012AP1882). The Court of Appeals reversed the part of the Circuit Court's decision that concluded that DNR properly considered cumulative impacts and remanded the case, directing DNR to consider the cumulative effects of the two high capacity wells in conjunction with other high capacity wells.

On March 26, 2014, pursuant to the Court of Appeals decision, the Dane County Circuit Court issued a Supplemental Remand Order, directing DNR to consider the cumulative effects of the two high capacity wells, consistent with the Court of Appeals decision (case # 11CV3375).

The same parties that petitioned for judicial review of the EA also requested a contested case hearing regarding the permit and approvals for the proposed Richfield Dairy, including the high capacity well approval. During the time when the original EA was being challenged at the Court of Appeals, the contested case hearing proceeded, on June 24-28, August 19-23 and December 16-20, 2013. Because the Supplemental Remand Order was received by DNR following the close of the contested case hearing, this WEPA analysis includes some relevant information that became available at the hearing.

Since the Court's remand, Chapter NR 150 has been revised, and the new rule went into effect on April 1, 2014.

The department has decided, pursuant to s. NR 150.20(4)(b), Wis. Adm. Code, and s. NR 150.22(1)(f), Wis. Adm. Code (2013), to follow the Environmental Impact Statement (EIS) procedures as the best approach to achieve WEPA compliance for this action and to satisfy the Circuit Court's Supplemental Remand Order.

DNR received the decision in the contested case hearing, dated September 3, 2014. The Administrative Law Judge limited the approved maximum groundwater withdrawal amount for the property to 52.5 million gallons in any 365-day period. Since this environmental analysis was largely prepared before the decision in the contested case hearing was received, it evaluated the environmental impact of the high capacity wells operating at 72.5 MGY, such that the impacts from the Dairy's wells are overstated in this EIS.

Much of this document includes materials prepared for public review in the previous environmental analysis documents, as described above. In specific response to the Court's remand order, the area impacts and cumulative impacts sections of the analyses have been revised and may be found in Section IV.A.4 and Chapter V of this document.

Public Review of the EIS

The process for public comment will be conducted in a manner that will comply with both the current and 2013 versions of ch. NR 150. As such, the public review will follow the current procedures, as outlined in s. NR 150.30, Wis. Adm. Code, and the prior procedures, as outlined in ss. NR 150.22 and 150.23, Wis. Adm. Code (2013), with a 45 day comment period for the Draft EIS, as provided in s. NR 150.22(3)(d), Wis. Adm. Code (2013).

The Department web-site has all the current and previous documentation for this proposal at:

http://dnr.wi.gov/topic/agbusiness/cafo/richfielddairy.html

The comment period on this Draft EIS will close on November 10, 2014. Written comments should be addressed to:

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This information is a compilation of the environmental documents already produced by the Wisconsin Department of Natural Resources, the applicant, and materials received from other sources. Please see the references at the end of this document for a complete list.

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I Project Description

I.A Purpose, need & cost

The primary purpose of the Richfield Dairy project is to produce milk.

Milk Source Holdings, Inc. is proposing construction and operation of the Richfield Dairy, a large Concentrated Animal Feeding Operation (CAFO) in Adams County. The applicant currently owns four other permitted CAFO's – Tidy View Dairy (Outagamie County) with 7000 dairy cows (9400 animal units, or AU[1],) Omro Dairy (Winnebago County) with 2500 dairy cows (3500 AU), New Chester Dairy (Adams County) with 4300 dairy cows (6270 AU) and Rosendale Dairy (Fond du Lac County) with 8000 dairy cows (11,500 AU). Milk Source Holdings, Inc. received permits and approvals to operate this fifth CAFO dairy, Richfield Dairy.

The proposed dairy facility would house 4300 milking/dry cows and 250 steers for a total of 6270 AU. One milking/dry cow is equivalent to 1.4 AU or a 1,400 pound animal.

The project cost is estimated at $35 million. The facility expects to employ ~ 40 staff with an estimated annual payroll of $1.5 million.

I.B Project sites

I.B.1 Facility Location

The proposed Richfield Dairy facility would be located is the southeast corner of the intersection of 1st Drive and Cypress Avenue. Primary access to the facility would be from 1st Drive. Total site disturbance entails the conversion of 115 acres of existing cropland to farm buildings, production area and ancillary area.

[1] As defined in s. NR 243.03(5), Wis. Adm. Code, "Animal unit" means a unit of measure used to determine the total number of single animal types or combination of animal types…that are at an animal feeding operation." The measure is to compare differences of animal manure produced and the code defines the units by animal type. For this proposal, a cow is generally equivalent to 1.43 AU and a beef steer is 1.0 AU.

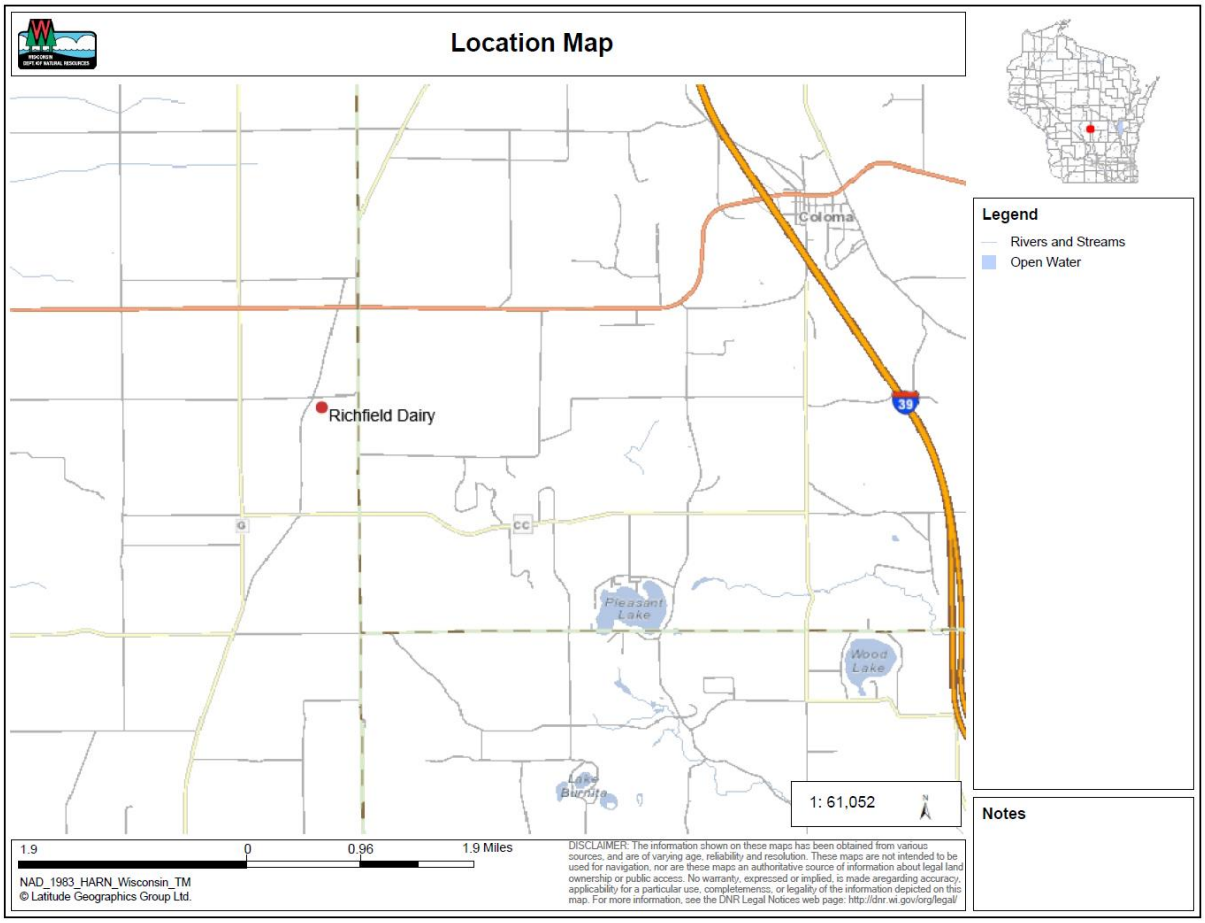


Figure 1 Richfield Dairy and Surrounding Local Roads

I.B.2 Land Spreading Locations

Richfield Dairy owns a total of 1,054.8 acres and has Nutrient Management Plan (NMP) subscription agreements for an additional 15,374.3 acres (see summary table below). Of those total acres, 1,044.8 of owned acreage and 15,247.5 of acreage under agreements are available for landspreading after various restricted areas have been accounted for. Thus, the farm has a total of approximately 16,292.4 acres of available spreading area.

Grower Name	Spreadable Acres
Richfield Dairy	1044.8
Bula-Gieringer Farms	1678.5
Diversified Seed Producers	1193.3
Coloma Farms	2660.1
Kevin Sigourney	1590.8
Marv Grefe Farms	1431.4
Tom Machan	221
Kendall Nichols	601.2
Heartland Farms Inc.	2913.7

I.B.3 High Capacity Well Locations

Two high capacity wells have been approved for the Richfield Dairy Operation. High Capacity Well Number 71786 is proposed to be constructed at Latitude 44 Degrees 0.308 Minutes and Longitude -89 Degrees 36.475 Minutes (SW ¼, NE ¼, S25, T18N, R7E). High Capacity Well Number 71787 is proposed to be constructed at Latitude 44 Degrees and 0.39 Minutes and Longitude -89 Degrees 36.466 Minutes (SW ¼, NE ¼, S25, T18N, R7E). If the locations of these wells are moved more than 660 feet from the proposed locations, Department approval is necessary prior to construction. The elevation of the proposed wells is 1080 feet above mean sea level (ft. msl). The wells will be constructed to a depth of about 350 feet.

I.C Constructed facilities

Proposed facility structures include a sand-bedded cross-ventilated freestall barn (416’x1232’), 80 stall milking parlor (106’x164’), livestock holding area (74’x194’), concrete feed storage pad (680’x765’), vegetated treatment area for precipitation runoff after collection of first flush (932’x348’), sweet corn silage bunker (658’x221’x12’height), High Density Polyethylene (HDPE) lined sweet corn silage attenuation basin (23,500 sq. ft.), manure processing building (92’x210’), concrete lined manure solids storage area (202’x384’x12’height), animal mortality storage facility (14’x24’), concrete lined waste storage pond (WSP) with cover (480’x400’x28’deep), uncovered concrete lined waste storage pond (480’x250’x15’deep), commodity shed (120’x300’), shop (60’x120’), two high capacity water wells, four storm water management ponds, five infiltration basins, Fuel Depot (24’x70’), weigh scale (12’x75’), potable water supply system, a domestic waste sewerage system and other lesser facilities. Total site disturbance entails the conversion of 115 acres of existing cropland to farm buildings, production area and ancillary area. See Figure 3 below.

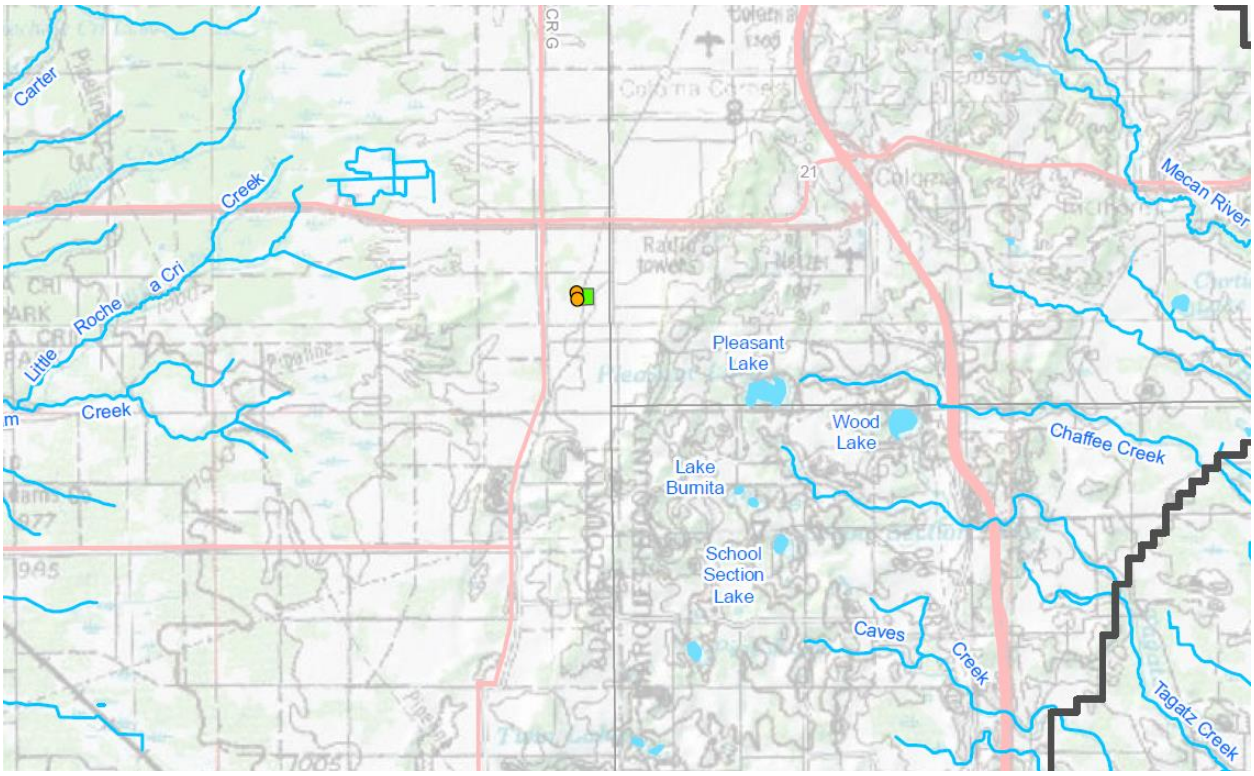


Figure 2 Richfield Dairy High Cap Well Locations & Surrounding Area

- Proposed High Capacity Well
- Proposed Dairy
- Model Domain

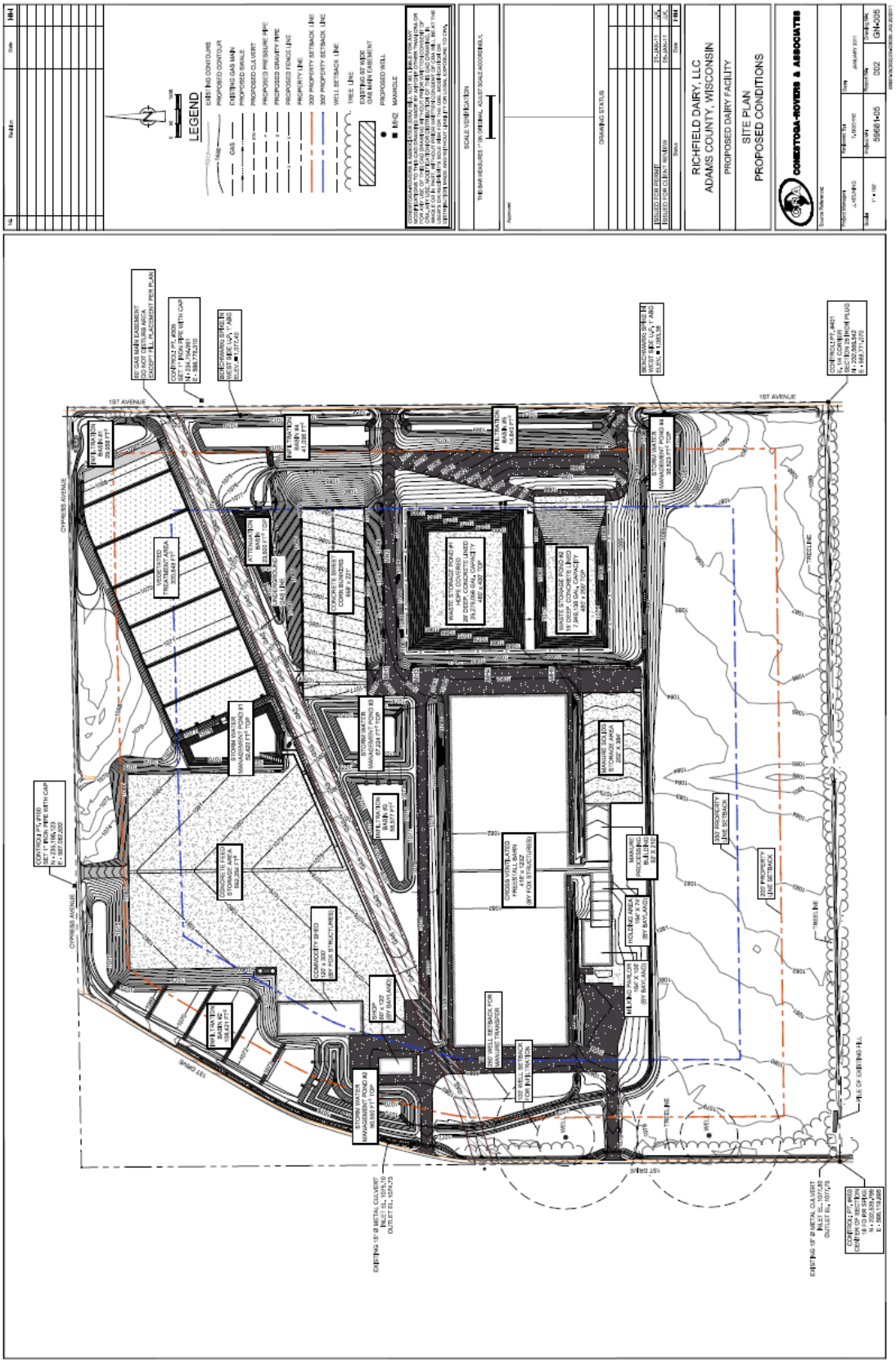


Figure 3 Production Site Layout

I.C.1 Buildings

Proposed facility structures, things constructed above ground, include a sand-bedded cross-ventilated freestall barn (416'x1232'), 80 stall milking parlor (106'x164'), livestock holding area (74'x194'), concrete feed storage pad (680'x765'), sweet corn silage bunker (658'x221'x12'height), animal mortality storage facility (14'x24'), commodity shed (120'x300'), shop (60'x120'), Fuel Depot (24'x70'), weigh scale (12'x75').

I.C.2 Manure management structures

Proposed manure management structures include a manure processing building (92'x210'), concrete lined manure solids storage area (202'x384'x12'height), concrete lined waste storage pond (WSP) with cover (480'x400'x28'deep), and an uncovered concrete lined waste storage pond (480'x250'x15'deep). Waste storage ponds (WSP #1 & #2), will have a combined design capacity of 33.2 million gallons (excluding freeboard), which represents approximately 205 days of storage for the proposed wastewater stream. WSP #1 will have a 6" thick concrete base with underlying 8" compacted clay liner which provides a secondary liner in the event of a concrete failure. An 8" clay liner will also be placed under the feed storage pad and manure solids storage area. WSP #2 includes a loading station for containment of any liquid spills while wastewater is being pumped to tanker trucks.

The proposed feed storage pad and manure solids storage area each have a surface to be constructed of concrete with water-stop installed at all joints, in addition to a soil liner component to be located immediately below (and in contact with) the concrete. This soil liner is classified as a "composite liner" as two or more liner components in direct contact with each other.

Approximately 8,552 tons and 59,266,555 gallons of manure and process wastewater will be generated annually on Site including liquid manure, normal precipitation on the sweet corn silage bunkers, sand and manure solids stacking surfaces and the surface of WSP #2, silage leachate and precipitation runoff from the feed pad surface. The waste storage system has a total useable capacity of 33,228,195 gallons. The Farm will have approximately 205 days of usable capacity for storage of liquid waste.

I.C.3 Other production operation structures

Other proposed structures include vegetated treatment area for precipitation runoff after collection of first flush (932'x348'), High Density Polyethylene (HDPE) lined sweet corn silage attenuation basin (23,500 sq. ft.), high capacity water wells, four storm water management ponds, five infiltration basins, potable water supply system, a domestic waste sewerage system and other lesser facilities.

Storm water runoff from the production area of the proposed Richfield Dairy facility will

be handled by a series of culverts, swales and diversions directing flow to the storm water detention ponds (the largest of which is sized to retain runoff from a 100-year storm event).

I.C.4 Roads

Two access driveways will be established off 1st Drive and will serve as the main access to the Site. Two additional driveways will be established off 1st Avenue and one off Cypress Avenue that will be used for seasonal activities including crop harvest and manure application. Internal driveways will be established on the Site to access the proposed facilities.

I.C.5 Wells

Milk Source Holdings, LLC/Richfield Dairy, submitted a high capacity well application to the Department of Natural Resources (DNR) on May 4, 2011 for the construction of two 500 gallon per minute (gpm) potable high capacity wells to be constructed to a depth of ~350 feet and cased into sandstone bedrock. A location map is found below; Well #1 refers to the South Well and Well #2 refers to the North Well.

One well would serve as the primary water supply well for dairy operations, while the other would function as a back-up well. The maximum total water use approved for the two wells is 72.5 million gallons per year. Water would be used year-round for animal watering and cleaning (about 84% of annual water use), and in summer for evaporative cooling of the barn (about 16% of annual water use). An existing irrigation well on the property would be abandoned prior to construction of the dairy's wells.

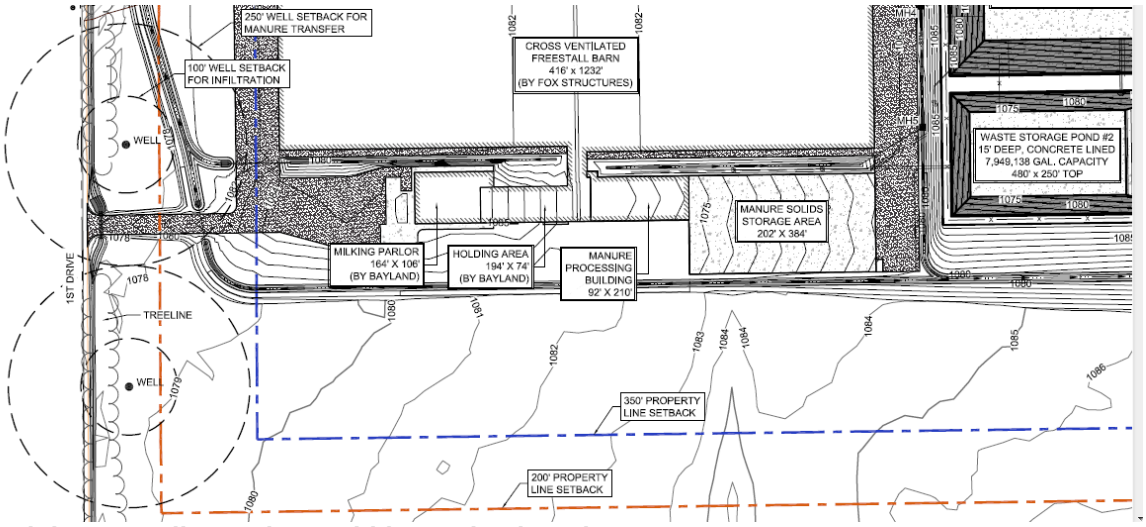


Figure 4 High Cap Well Locations Within Production Site

I.C.6 Storm water structures

The Richfield Dairy (Site) is approximately 152 acres in size while the disturbance area is approximately 117 total acres in size. See Figure 5 below. Construction activities will occur in four phases. All soil and erosion and sediment control measures, or Best Management Practices (BMP's), will be in place prior to major soil disturbances for each phase. All BMP's will be installed in accordance with the WDNR and USDA-Natural Resource Conservation Service (NRCS) Conservation Practice Standards (CPSs). It is anticipated that equipment fueling and on-Site storage will be conducted at the north side of the Site. Examples of BMP's proposed to be utilized are silt fence, tracking pads, temporary and permanent seeding, temporary sediment basins and ditches, ditch checks, and mulching. Permanent storm water management features will also be constructed; examples include; ponds, infiltration basins, vegetated treatment areas (VTA), and grassed swales.

Storm water BMPs were designed to control runoff quantity and quality. The plan meets or exceeds the requirements under s. NR 151.12, Wis. Adm. Code, for Peak Discharge Rate Control, Water Quality Treatment, Infiltration, Protective Areas, Fueling and Vehicle Maintenance Areas. Additionally, the Site provides runoff volume control measures such that runoff volumes from the 2-year, 25-year, and 100-year/24-hour rainfall events leaving the post-developed site at no greater than pre-development volumes. Further, conveyance facilities internal to the Site have been designed to provide both 25-year and 100 –year capacities ensure that runoff is collected and routed to the various storm water management features so that the desired performance standards can be met.

The facility referred to in the plans as "storm water management pond #1" will receive low concentration contaminated runoff from the feed pad (after leachate and a significant amount of first flush runoff is collected). The pond will have a concrete liner that meets the minimum design criteria for a manure storage facility, although the runoff is expected to have much lower concentration of nutrients than does manure.

Storm water management ponds #2, #3 and #4 will receive only storm water, such as runoff from building roofs, not in contact with feed materials or manure. These ponds will have earthen bottom, designed in accordance with Wisconsin Construction Standard 1001 Wet Detention Basins, intended to substantially prevent infiltration.

A VTA is required to be designed to maintain overland flow, so infiltration is not a primary means of treatment. For this reason a VTA must have a minimum 2 ft thickness of soil that is 20% fines (above groundwater and bedrock). However, the DNR acknowledges a VTA does still have potential for infiltration, but because there is significant first flush capture (0.15 inches of precipitation) the runoff is expected to contain relatively low concentration of nutrients. UW Madison field research is underway to help determine the effectiveness of VTAs in Wisconsin, and the NRCS 629 Standard that applies to VTAs is currently undergoing revision. So design and operating criteria for VTAs may change in the next 1-2 yrs. If infiltration is intended as a primary means of treatment, the system is regulated under ch. NR 214, Wis. Adm. Code. All feed leachate

and the 0.15 inches of first flush runoff will be collected and transferred to storage. Only the less contaminated remaining runoff (in excess of 0.15 inches of precipitation) will flow to the storm water management pond #1 and then to the VTA. A VTA is intended mainly as erosion control, including to hold back the small amount of feed solids that may pass through the system, but a grassed VTA will also consume some nutrients.

I.C.7 Domestic wastewater system structures

A private sewerage system is proposed at the facility for collection of all human waste pursuant to Adams County Private Onsite Wastewater Treatment System Ordinance. Prior to installation, Richfield Dairy will obtain the necessary permits from the Adams County Planning and Zoning Department.

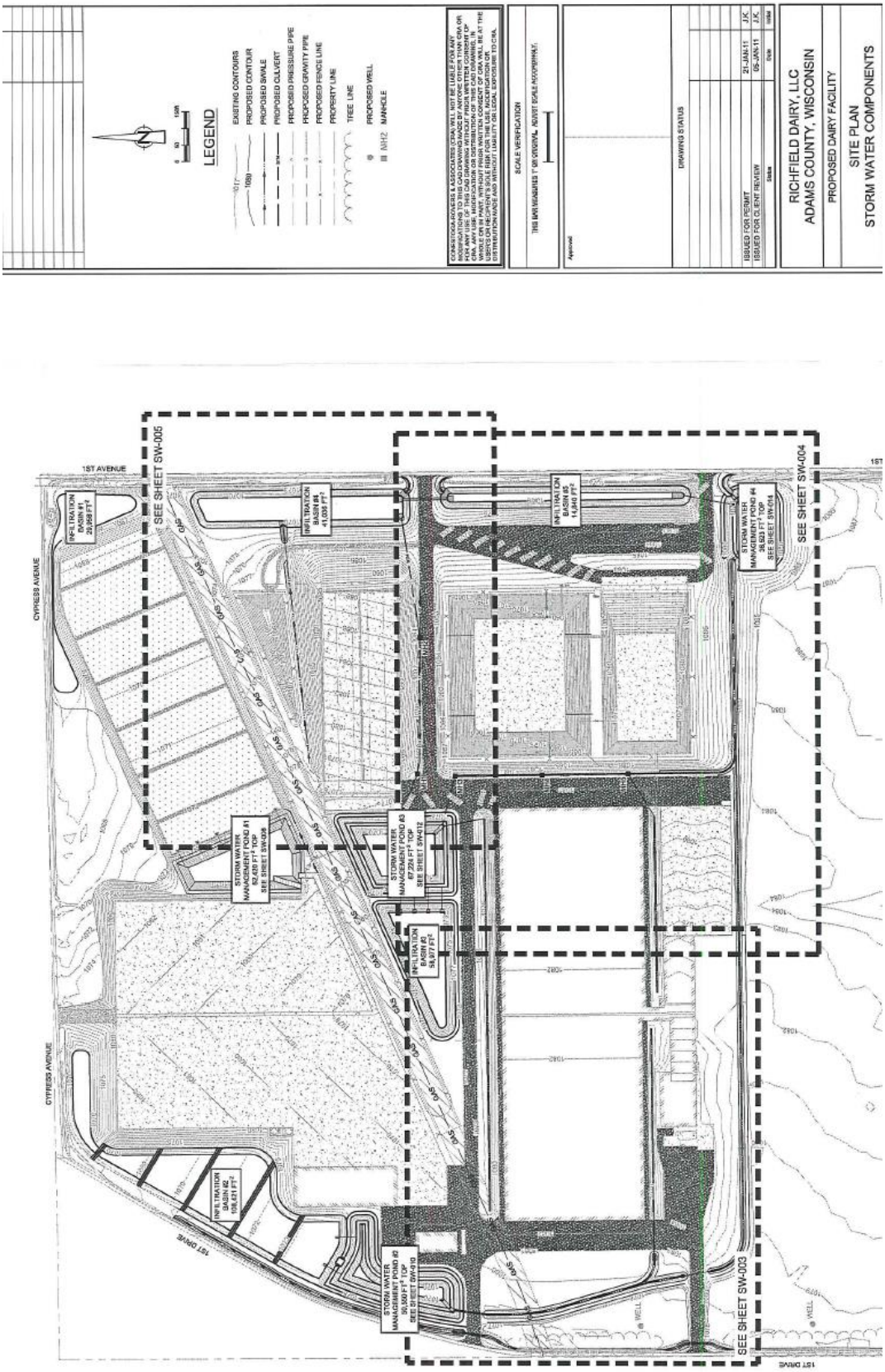


Figure 5 Storm Water Structures

I.D Environmental control & monitoring structures & equipment

I.D.1 Groundwater monitoring structures & equipment

Due to the porous nature of the sandy soils at the Richfield Dairy site and the potential for groundwater impacts associated with potential leakage from manure and process wastewater handling structures/systems at the site, the Department believes groundwater monitoring is warranted at the Richfield Dairy production area. Therefore, as part of its WPDES permit, the applicant is required to install water table monitoring wells in the production area. Richfield Dairy's monitoring plan calls for eight monitoring wells approximately evenly spaced around the perimeter of the facility.

Additionally, as part of the high capacity well approval, the applicant must install a minimum of one additional piezometer nested with a monitoring well downgradient of the high capacity wells. The applicant is required to collect monthly water level information from the monitoring wells and piezometer and submit collected information to the Department's Water Use Section on an annual basis.

Numeric groundwater modeling is the best tool available to predict water table drawdown and surface water impacts from groundwater withdrawals. However, impacts to surface water and groundwater cannot be fully understood until years of groundwater withdrawals have occurred. DNR made a preliminary judgment that the wells are not anticipated to cause significant adverse environmental effects based on the modeling submitted. However, given that the environmental effects are not completely certain, DNR included conditions in the approval to avoid significant adverse environmental impacts. The Wisconsin Supreme Court has held this to be an acceptable method to "control potential adverse environmental consequences through conditions that must be complied with to obtain approval." *State ex rel. Boehm v. DNR,* 174 Wis. 2d at 676.

The purpose of the water level monitoring is to identify any major discrepancy between the groundwater drawdowns modeled by SSPA and groundwater drawdowns related to actual pumping. In the case such a discrepancy was noted, the accuracy of the model predictions would need to be re-examined to determine if additional pumping restrictions would be appropriate to protect waters of the state. In the case of a decrease in water supply in nearby wells, water level monitoring could also help to demonstrate whether or not pumping from the Dairy was linked to adverse impacts.

I.E Operation

I.E.1 Production management

I.E.1.a Animals

The proposed dairy facility would house 4,300 milking / dry cows and 250 steers for a total of 6,270 AU. One milking/dry cow is equivalent to 1.4 AU – or a 1,400 pound animal.

I.E.1.b Animal housing & bedding

As proposed, a sand-bedded cross ventilated freestall barn (416’ x 1232’) would house 4,300 milking cows and dry cows and 250 steers.

I.E.1.c Animal feed, drugs & health

The steers at the site would allow the farm to minimize the amount of waste feed. While the cows must be fed a diet consisting of a particular mix of feed and protein additives for optimum milk production, the steers are able to consume the feed left over from the cows. This will eliminate the need to land spread approximately 300,000 pounds of feed per month and reduces fuel usage associated with the land application activities.

No hormones or antibiotics are used on animals prophylactically. Animals that are sick will be treated as needed, including the use of antibiotics.

I.E.1.d Products

Richfield Dairy estimates that the 4,300 milking cows will produce six semi-tanker loads of milk to market each day, for an annual total of 2,190 loads of milk. It is expected that most of this milk will be sold and used for fluid milk. There will be a continuous cycling of 250 beef steers at the site as the operation raises the animals from six months to approximately 16 months and then selling them for beef production.

I.E.2 Manure & other animal waste management & monitoring

I.E.2.a Manure collection system

Animal housing facilities (freestall barns) will be cleaned frequently to help reduce the amounts of odors generated from these facilities and prevent the buildup of manure. All manure and manure contaminated bedding from animal housing facilities will be transferred to the sand separation area. Wastes from the milking parlor will also be directed to the sand separation area. Manure is pumped through the indoor mini-sand settling lines to further remove fine sand and fine particles from the liquid waste stream. The liquid is pumped to rotary screens separators to separate the liquid effluent from the manure solids. The manure solids are dewatered and conveyed to an outdoor concrete stacking facility and re-used as a soil conditioner/fertilizer. The liquids are collected in the flush tank and re-circulated through the facility to flush flume lines. Overflow liquids are directed to WSPs. The sand separation system allows 90% of the sand to be reclaimed and reused as bedding within 60 days.

Richfield Dairy will produce approximately 59.3 million gallons of liquid manure and 8,552 tons of separated manure solids annually.

I.E.2.b Manure storage & treatment system

The combined annual estimated quantity of manure and process wastewater (including precipitation runoff) is 55.3 million gallons, plus an additional 8,552 tons of separated manure solids. Waste storage ponds (WSP #1 & #2), will have a combined design capacity of 33.2 million gallons (excluding freeboard), which represents approximately 205 days of storage for the proposed wastewater stream. WSP #1 will have a 6” thick concrete base with an underlying 8” compacted clay liner which provides a secondary liner in the event of a concrete failure. An 8” clay liner will also be placed under the manure solids storage area. WSP #2 includes a loading station for containment of any liquid spills while wastewater is being pumped to tanker trucks. After loaded, tanker trucks will then landspread on area farm fields in accordance with the DNR approved NMP.

WSP #1 receives wastewater from the overflow of WSP #2, wastewater from the attenuation basin, and wastewater directly from the manure processing building during removal of accumulated solids in WSP #2.

WSP #1 and WSP #2 have concrete bottoms designed to support a skid steer, payloader, or equivalent live load used for the removal for accumulated solid buildup.

WSP #1 and WSP #2 have concrete ramps into the bottom so that in the event that sand or manure solids build up in the bottom, equipment can be used to remove the sand or solids. Any sand or solids will be applied onto cropland according to the current

NMP. The floor in WSP #1 has been designed to facilitate heavy equipment. Equipment size into the bottom of WSP #2 will be limited to skidsteers and small tractors and spreaders.

Other than the use of sand separation technology, the operation has not proposed additional treatment of the manure and process wastewater.

The application includes a General Operations plan and Maintenance plan for manure storage structures.

I.E.2.c Manure spreading & disposal

Manure spreading & disposal will be completed according to the Richfield Dairy NMP and WPDES permit. The applicant has developed a NMP for the project, and the NMP must be amended over time, on at least an annual basis. All NMP amendments must be reviewed and approved by the Department. The Department has reviewed the NMP and has determined it to be in compliance with applicable federal criteria of the USDA Natural Resources Conservation Service (NRCS 590), and state requirements in chapter NR 243.

The NMP for Richfield Dairy reflects the following herd size and acreage: 4,300 milking/dry cows, 250 steers (combined 6,270 AU) and approximately 16,300 spreadable acres. Richfield Dairy currently owns 1,044.8 acres with 15,245.5 acres under formal agreements with other landowners. The approved NMP includes detailed maps of all the land spreading locations

The NMP addresses the application and budgeting of nutrients (e.g., manure and process wastewater) for plant production on field by field basis. The NMP describes, in specific detail, crops, tillage, nutrient application rates, locations, and methods implemented in order to protect surface water and ground water resources while maintaining the physical, chemical and biological condition of the soil.

The NMP accounts for all nutrient sources, including soil reserves, commercial fertilizer, manure, organic byproducts, and crop residues to ensure proper utilization and protect water quality. The NMP is written to ensure all manure and process wastewater applied to fields is incorporated into the soil as a fertilizer for plant uptake, thus significantly reducing the potential for nutrient pollution of surface or ground water.

The NMP describes how the following ch. NR 243 requirements will be met on a field-by-field basis:

- Applications near navigable waters, wetlands and their conduits [referred to as SWQMA restrictions in s. NR 243.14.(4)].

- Applications near private or community wells, direct conduits to ground water, and fields containing drain tiles [s. NR 243.14(2)(b)].

- Timing of manure and process wastewater [saturated soils, forecasted precipitation, frozen or snow covered ground, and areas of fields with depth to ground water of less than 24 inches [s. NR 243.14(2)(b)].

- Nutrient Crediting [s. NR 243.14(3)].

- Phosphorus-based nutrient management and managing for nutrient impaired waters [s. NR 243.14(5)].

- All fields managed to meet Tolerable Soil Loss (T) for the rotation [NRCS 590 V.A.2].

- Ephemeral field erosion is minimized or eliminated via BMPs (e.g., contour strips, filter strips, maintaining > 30% crop residue on soils after planting, and fall cover crops) [NRCS 590 V.C.1].

- All nutrient applications consistent with NRCS 590 nutrient management criteria (yield goals attainable under average conditions) and soil fertility recommendations found in UW-Extension Publication A2809 [NRCS 590 V.A.1].

By eliminating manure applications to high risk fields and applying manure and process wastewater to fields as a fertilizer for plant uptake only, the NMP and WPDES permit requirements significantly reduce the risk for nutrient pollution of surface or ground water caused by the project.

Compliance with all regulatory criteria is expected to reduce or eliminate most of the risk caused by the projects proposed manure spreading activity. The WPDES permit requires the NMP to be fully implemented at all times and for Richfield Dairy, Inc., to report periods of non-compliance with the permit. Should Richfield Dairy, Inc., fail to comply with the requirements outlined above (and below), it would be a violation of its permit and subject to department enforcement.

There are a number of ways the Department monitors a CAFO's compliance with its WPDES permit, including site visits/compliance inspections and review of submitted reports. The Department has committed to completing at least one full-operation inspection during each five-year permit term, typically during the last year of the permit term. Other inspections may occur on a more frequent basis due to specific issues at a given operation or in response to citizen complaints. That said, it is an ongoing challenge to ensure there is adequate staff and time to conduct these activities. The Department is continually working to find ways to increase the amount of time staff can spend on compliance and enforcement activities. DNR staff also regularly visit CAFO facilities as a result of citizen complaints, compliance issues or random site visits.

I.E.2.d Animal disposal & rendering

A 14 foot by 24 foot three-sided concrete and roofed mortality storage facility will store mortalities that will be disposed of through a mortality disposal company within 24 hours of a death event.

I.E.2.e Feed & silage storage & treatment

A leachate collection system is utilized to collect and treat the leachate and runoff coming from the feed storage pad. Leachate is collected in the leachate collection system and pumped into a 7,000 gallon precast septic tank, or approved equal. Eliminating the leachate reduces odors from the feed bunkers. Feed will be harvested at optimal moisture to minimize the potential for excessive leachate coming from stored feeds. Both the feed storage pad and the sweet corn storage pad have individual leachate collection systems. Designs indicate that the sweet corn pad has a below grade tile drainage system to further protect groundwater. Drain lines are installed around the perimeter and beneath the concrete slab. The drain tile lines lie on top of a 2-foot thick clay base. The clay layer will impede vertical movement of any leachate that seeps through the concrete. Any liquids will flow into the tile lines and gravity flow to a pump sump and be transferred into an attenuation basin for storage.

I.E.3 Transportation management

There would be traffic associated with the transportation of livestock, milk, feed, and manure. The following are estimates of truck traffic:

I.E.3.a Manure hauling

Nutrients (manure) – estimated 7,000 truckloads of manure leaving the facility yearly. Truck traffic will be the heaviest during the spring as the operation will apply most of its manure prior to spring planting.

I.E.3.b Feed hauling

Corn Silage and Haylage - approximately 3,500 truckloads annually.

Sweet Corn Silage – approximately 2,200 truckloads annually.

Protein and Feed Supplements – approximately 1,500 truckloads annually.

Note that corn silage and haylage harvest trucking occurs when the plant moisture and maturity is at specific harvest parameters; thus harvest times and days are highly dependent on the weather conditions and trends. Most other trucking will occur during business hours. Field bound truck routes will be the shortest distance to the field.

I.E.3.c Product (milk) hauling

Milk will be removed from the production area to a local dairy milk processor in semi-trailers (six (6) loads per day for an annual total of 2,190 loads).

I.E.3.d All trucking & commuting

Most truck traffic will occur during daylight hours. However, during crop harvesting, traffic will occur whenever necessary to bring in the crop. Vendors are instructed to follow standards related to truck routes and engine braking. “Courtesy to neighbors” signs will be installed at property exits to remind drivers. Driveways will be paved following construction.

I.E.4 Environmental control & monitoring

I.E.4.a Storm water control & monitoring

Conformance with the approved site-specific erosion control plan and storm water management plan is required. Erosion and sediment control BMPs and treatment devices must be installed and operated as indicated by the erosion control plan, storm water management plan and plan sheets.

The construction site storm water runoff permit requires that during construction weekly inspections of installed erosion and sediment controls are required. Inspections of erosion and sediment controls within 24 hours after a rainfall event of 0.5 inches or larger is required. Repair or replace erosion and sediment control BMPs as necessary within 24 hours of an inspection or notification indicating that repair or replacement is needed. Inspection records are retained on site.

Storm water runoff from the production area will be handled by a series of culverts, swales, and diversions directing flow to the four storm water detention ponds (the largest of which is sized to retain runoff from a 100-year storm event).

Additional information regarding storm water basins and the VTA is located in section IV.A.1.d.02.

I.E.4.b Air emission control & monitoring

The proposed facility may affect air quality and that odors will be generated. This is true for any size of animal livestock operation, even with successful air quality BMPs in place or with production methods which minimize air quality impacts. Similar to federal air emission reporting requirements, state air emission reporting requirements include the reporting requirements in ch. NR 445 and the annual air emission reporting requirements of ch. NR 438. Air emissions from animal feeding operations are not categorically exempt from these reporting requirements.

The proposed facility, as with any source of air pollution, is required to evaluate existing information and determine its air emissions, and comply with any air regulatory requirements that apply. The Department also believes it does not have the authority to require air quality monitoring.

Richfield Dairy plans to cover its main manure storage facility and exhaust emissions through a biofilter to minimize potential air emissions associated with manure storage. Covering manure storage is expected to reduce odors and air emissions associated with covered manure storages. It is uncertain how other uncovered manure storage, solids separation and storage, and subsequent land application will impact odor and air emissions overall. Land application BMPs identified by the Agricultural Waste Air Emissions Advisory Group in its December 13, 2010, report, include injection, followed by immediate and rapid incorporation (less than 12 hours), and band spreading.

Dust from gravel driveways may be generated during periods of high traffic during construction. The driveways will be maintained during the construction phase and watered as required to minimize dust. After construction, driveways will be paved with asphalt.

I.E.4.c Groundwater Monitoring Structures & Equipment

The proposed and finalized WPDES permit contains permit conditions that protect groundwater and surface water and are consistent with ch. NR 243, Wis. Adm. Code, the code that establishes permit requirements for CAFOs throughout the state. To address these unique site conditions for this operation, the Department also added the following site specific permit conditions within the permit.

For the production area:
The permittee has designed some production area structures above current design standards. However, given that the sandy soils present at the production area are porous in nature, there is an increased risk of groundwater impacts at the site. For this facility, additional monitoring requirements (groundwater monitoring wells, leak detection) are warranted to determine if manure and process wastewater structures/systems have been constructed and are operated properly. The following changes were made to the permit to reflect these concerns.

- Section 2, “Production Area Monitoring Requirements,” has been added to the permit requiring the installation and monitoring of groundwater monitoring wells for the production area. In addition, chemical monitoring of the leak detection systems installed underneath the Attenuation Basin and Sweet Corn Silage Bunkers is being required.

- A construction schedule (section 3.3 “Production Area Monitoring-Groundwater Monitoring Well Installation) has been added to the “Schedules” section of the permit outlining the timing of the required installation of groundwater monitoring wells at the production area.

- Section 4.2, “Groundwater Standard Requirements,” has been added to the Standard Requirements of the permit associated with the groundwater monitoring requirements.

As part of the high capacity well approval, the applicant must also install a piezometer (a deeper monitoring well with a short screened interval, completed in sandstone bedrock), nested with a monitoring well downgradient of the high capacity wells. This piezometer is in addition to the eight water table monitoring wells required in the WPDES permit. The applicant must collect monthly water level information from all of the monitoring wells and the piezometer and submit collected information to the Department’s Water Use Section on an annual basis.

Additional information can be found in Section I.D.1.

II Authorities & approvals

II.A Department of Natural Resources

The Department has the following authorities regarding this operation:

- WPDES Permits for Concentrated Animal Feeding Operations (CAFO), i.e. those operations with 1,000 AU or more, s. 283.31, Wis. Stats.

  A WPDES permit contains a number of restrictions designed to address potential water quality impacts from the proposed operation. Requirements include: (1) proper design, construction and operation of structures associated with manure and process wastewater handling at the site; (2) development and implementation of an emergency response plan; (3) restrictions on the amount, location, and timing of applications of manure and process wastewater through a nutrient management plan; (4) restrictions on runoff from animal housing, feed storage and manure storage facilities; (5) self-monitoring of production and land application areas; and (6) reporting of land application activities and results of animal production area inspections.

Operations covered under a WPDES permit are required to conduct: (1) daily inspections of water lines to discover and correct any significant leakage; (2) weekly inspections of storm water diversions and storage structures; (3) quarterly inspections of raw material storage areas (e.g., feed storage areas); and (4) periodic calibration and leak inspection of landspreading requirement. The Department evaluates the construction of structures related to manure handling in conjunction with potential water quality concerns to determine if additional monitoring is necessary.

- Storm water discharges from the Richfield Dairy construction site is regulated under ch. 283, Wis. Stats, ch. NR 216, Wis. Adm. Code, and in accordance with WPDES General Permit No. WI-S067831-3, Construction Site Storm Water Runoff. Permit coverage under WPDES General Permit No. WI-S067831-3 was granted on March 16, 2011 and renewed on January 27, 2014.

- Review and approval authority of manure storage facilities, transfer systems, feed storage and runoff control systems-- s. 281.16, Wis. Stats.

- Nutrient Management Plan review, ch. NR 243, Wis. Adm. Code, and NCRS technical standard 590

- High capacity well approvals are required for operations using 70 gallons/minute or more, s. 281.34, Wis. Stats. An approval for two high capacity wells was issued November 2011; a modified approval was issued March 2013.

  The current Conditional High Capacity Well Approval, dated March 13, 2013, limits the total withdrawal of the two high capacity wells to 72.5 million gallons per year. The approval also limits withdrawal from the two wells to 21.6 million gallons in any 30-day period and requires monthly water level monitoring from water table monitoring wells and one piezometer in the production area. Any increased withdrawal over the approved amount would require a new high capacity well application, subject to DNR approval.

  The 2013 well approval is a modification of an earlier approval issued in 2011. Richfield Dairy's 2011 high capacity well application requested a combined total pumping capacity of 1000 gallons per minute (gpm) or 525.6 million gallons per year (MGY) from its two wells. The November 2011 high capacity well approval restricted the maximum total gallons pumped from the two wells in any 365-day period to 131.2 million gallons. In information submitted for the preparation of the 2011 Environmental Assessment, Richfield Dairy had estimated its annual water use amount to be 52.5 MGY. On July 27, 2012, after re-evaluating water needs, Richfield Dairy requested that the total annual pumping withdrawal for the high capacity wells be limited to 72.5 million gallons per year. This is the annual pumping amount for which the current (2013) well approval was granted.

- Under chapter NR 812, EPA drinking water standards must be met for Non Transient, non-community wells. These are non-residential wells that serve the

same 25 people for more than 6 months/year.

- NR 809.04(48) Non-transient non- community water system means a non-community water system that regularly serves at least 25 of the same persons over 6 months per year. Examples of non-transient non-community water systems include those serving schools, day care centers and factories

- Air emission limitations from s. NR 415.04, Wis. Adm. Code, covering fugitive dust sources

- Air emission limitations from ch. NR 445, Wis. Adm. Code, regarding control of hazardous pollutants

- Odor control requirements may be imposed by order of the Department if it determines that a violation of s. NR 429.03 – Malodorous Emissions, Wis. Adm. Code, occurs.

- Under ch. NR 856, the dairy must register its water withdrawal and annually report its monthly water withdrawals. This is a state-wide requirement for all water users with the capacity to withdraw more than 100,000 gallons per day. (Note: Because the Great Lakes Compact defines that Great Lakes Basin based on the surface water divide and Richfield Dairy is west of that divide, within the Mississippi River Basin, the withdrawal is not considered a diversion under the Great Lakes Compact and does not require a water use permit.)

II.B Other Wisconsin agencies

The Department is not aware of any other state authorities.

II.C County & local

To the best of our knowledge Adams County requires:

- Construction Site Erosion Control and Storm water Management permit (ss. 17.09 and 17.10)—permit # SE-79 issued 9/8/08

- Conditional Use Permit for the operation with 500 or more AU

- Sanitary Permit

II.D Federal

USEPA - National Pollutant Discharge Elimination System (NPDES) Permits for Concentrated Animal Feeding Operations (40 CFR). This program is implemented through the Wisconsin DNR's delegation of the NPDES Permit program (WPDES).

III Existing environment

III.A Physical environment

III.A.1 Area

III.A.1.a Location & Size

The Richfield Dairy is located in Adams County in the Little Roche-A-Cri Creek watershed. The Little Roche-A-Cri Watershed has portions located in Adams, Waushara and Marquette Counties. The dairy is about 1.1 miles *west* of the subcontinental divide, in the Mississippi River basin. The dairy (and proposed wells) are about 0.4 miles *east* of the regional groundwater divide. Groundwater in the vicinity generally flows to the southeast.

Figure 6 Regional Watersheds

III.A.1.b Topography

Richfield Dairy is located in Adams County. Adams County is in the Wisconsin Central Plain, which is characterized by flat or gently undulating topography. This region is often referred to as the Central Sands region and/or the Central Sand Plain of Wisconsin. Relief is generally low except for occasional pinnacles and hills of sandstone such as Friendship Mound and Roche-A-Cri Mound.

The eastern edge of the dairy is less than one mile west of the Johnstown moraine, a north-south trending glacial feature that forms a narrow ridge rising as much as 120 feet

above the sand plains. West of the moraine, in the vicinity of the dairy, sediments were primarily deposited by Glacial Lake Wisconsin or glacial meltwater. Topography east of the ridge that forms the edge of the moraine is hummocky; this terrain formed as the result of the collapse of sediments deposited on glacial ice. There are a number of seepage lakes in the hummocky moraine. These lakes have no surface water outlet or inlet, and water levels are controlled to a large degree by the elevation of the water table.

III.A.1.c Soils

The predominant soil types within the area of the Richfield Dairy facility consists of Billett Sandy Loam and Coloma Sand. The Billett series consists of deep, well drained soils on outwash plains. The soils formed in loamy and sandy outwash deposits. The Coloma series consist of deep, somewhat excessively drained, rapidly permeable soils on outwash plains and moraines. The soils formed in sandy glacial till or outwash plains and moraines. There are no documented karst areas in Adams County.

Recharge rates in the vicinity of the property are relatively high because of the coarse-grained surficial sediments. Average annual precipitation based on the last 30-years of record at the Hancock Agricultural Research Station, located about 9 miles north-northeast of the dairy, is about 31 inches per year and about one-quarter to one-third of precipitation is estimated to infiltrate into the subsurface and recharge the groundwater aquifers (Mechenich and others, 2009; Bradbury and others,1992).

III.A.1.d Geology

Bedrock geology in the Central Sands near Richfield Dairy consists of Cambrian sandstone of the Mount Simon formation overlying an impermeable basement of Precambrian igneous and metamorphic rock. The Mount Simon Formation is generally a well-rounded, medium-grained sandstone. The sandstone bedrock surface is very irregular with a number of sandstone mounds extending to the surface in the area. In the vicinity of the Richfield Dairy its thickness is estimated to be about three hundred feet. A variety of generally sandy Pleistocene materials overlie bedrock. Unconsolidated deposits are estimated to be 170 feet thick in the vicinity of the dairy.

The Richfield Dairy facility would be located in a broad, flat outwash plain bordered on the west by the Wisconsin River and on the east by the Johnstown Moraine, a north-south-trending ridge about 1 mile to the east of the facility. The outwash deposits are sand and gravel overlying silty and clayey lacustrine deposits laid down in old glacial Lake Wisconsin. East of the terminal moraine, topography is hummocky and surficial geology is generally more variable than within the sand plain. Glacial deposition was the source of the unconsolidated materials, which generally consist of sandy tills interbedded with finer-grained materials.

III.A.1.e Hydrography & surface water quality & quantity

Wetlands

Mapped wetlands in the vicinity of Richfield Dairy are shown in Figure 11. The mapped wetland nearest to the dairy is approximately 1.5 miles northwest of the proposed wells. This wetland is categorized as a grazed emergent/wet meadow and is part of the eastern edge of a large wetland complex adjacent to the unnamed headwater streams of Little Roche a Cri Creek. The wetland complex is a mix of forested, scrub/shrub, and emergent/wet meadow wetlands. The Little Roche a Cri wetlands are located in an area of concentrated irrigation (6 irrigation wells within 1 mile of the wetland area nearest to the dairy), and there is likely to be existing wetland drawdown from current groundwater withdrawals in the area (discussed in Section V.A.3).

Several wetlands near Pleasant Lake, about 2.8 miles east of the dairy site, were considered during the course of the environmental review for this project. The largest and most diverse of the Pleasant Lake wetlands is adjacent to Turtle Bay, in the southwest corner of the lake. The Turtle Bay wetland has an area of 0.75-1 acre. The wetland has been present since before the 1930s and was dredged at some point in the past (spoil piles are present adjacent to the wetland). The wetland is connected to the main body of the lake by a shallow, linear channel, which was also apparently dredged in the past. The Turtle Bay wetland is fed by groundwater, as is all of Pleasant Lake. The wetland supports a diverse community of wetland flora (tussock sedges, bullrushes, blue-flag iris, chara, etc.) and fauna (insects, frogs, turtles, waterfowl). Fish, including Banded Killifish, a state Special Concern species, are found in the Turtle Bay wetland, as well as in other parts of the lake. Eurasian Water Milfoil, an invasive species, is found in the open-water section of the wetland.

Two other small wetlands near Pleasant Lake were also evaluated, one at Camp Fairwood on the south side of the lake, and one on the north side of the lake ("Duck Box"). The Camp Fairwood wetland is a naturally formed, ephemeral pond, approximately 65 feet wide. Based on ordinary high water mark, the pond's maximum annual water depth is approximately 30 inches in spring and declines throughout the remainder of the year. The main plant species is reed canary grass (an invasive), although native plant species are also present. Wildlife (ducks, frogs, turtles) makes use of the wetland habitat. The Duck Box wetland is a small dredged pond on the north side of the lake, dominated by reed canary grass. Waterfowl and frogs make use of the wetland. Both wetlands appear to receive groundwater inputs but naturally dry down during the course of the year.

The other wetland area that was evaluated in connection with the Richfield Dairy review is adjacent to the Chaffee Creek spring pond. The pond is discussed in the following section. The wetland adjacent to the spring pond is a high quality, intact calcareous fen with several fen indicator species present, including tufted hair grass, a state Special Concern species. Calcareous fens are a rare, groundwater-dependent wetland type with highly alkaline soil conditions. Under the Wisconsin Rapid Assessment Methodology, the current condition of the Chaffee Creek spring pond wetland is exceptional.

Springs

A large spring is located 3.5 miles east of the proposed well site, at the headwaters of Chaffee Creek. The Chaffee Creek spring is the only large spring (>1 cfs) mapped within 5 miles of the proposed Richfield Dairy. The spring pond is located within a steep-sided valley, with numerous seeps along the northern hillslope. Groundwater seeps from the hillslope above the elevation of the pond and also discharges as boils within the 2.5-acre spring pond. Fish species found in the spring pond include Brook Stickleback, Least Darter (a Special Concern species), Northern Redbelly Dace, and Mud Minnow.

The Wisconsin Springs Inventory estimated the spring's flow to be approximately 2 cubic feet per second (cfs), in August, 1963. In July of 2003, flow at a monitoring station roughly 3,800 feet downstream of the headwater spring was 1.2 cfs. Springs in general naturally experience a wide range of flow, so it is not possible to estimate changes in the typical flow over time based on only two measurements.

The Chaffee Creek spring pond is the only large spring mapped in the area and the only spring specifically reviewed. However, DNR's analysis of impacts to surface waters also assumed that the streams and seepage lakes in the area are groundwater-fed (small springs and seepages), even if no concentrated springs are mapped. The Department is aware that the fisheries and water quality of nearby streams depend on groundwater flow to maintain habitat for thermally sensitive fish species and macro-invertebrates, and that lake chemistry is dependent on groundwater inputs. These factors were considered during the review of potential impacts.

Streams

The following streams are located within five miles of the proposed wells:
Unnamed headwaters of Little Roche-A-Cri Creek (~2.5-2.9 miles northwest and west), Little Roche-A-Cri Creek (4.6 miles west-northwest), Fordham Creek (4.5 miles west-southwest), Chaffee Creek (3.5 miles east), and Tagatz Creek (3.5 miles southeast). All of the named streams are Class I or II trout streams; Little Roche-A-Cri and Fordham Creeks are Exceptional Resource Waters, and Chaffee and Tagatz Creeks are Outstanding Resource Waters. The streams are categorized as either cool-cold or cold, and water levels fluctuate seasonally.

Little Roche a Cri Creek is a clear, hard water stream that has a predominantly sand bottom. Flow is generally in a westerly direction toward Castle Rock Lake. The portion of the stream above Friendship Lake and below State Highway 21 is classified trout water. Historical records from 1979 and 1963 show that navigable water was found within about a mile up or downstream of Highway 21 (4.8-5.5 miles from the dairy). Healthy populations of brook trout were found at Cypress Avenue (sec.25, T18N R6E) in 2010, and trout migration further upstream is likely. The dominant species is brook trout, although brown and rainbow trout are also present. Fish surveys conducted at Highway 21 in 2003 and 2012 classified the stream's coldwater Index of Biotic Integrity (IBI) as fair and very poor, respectively. (Note that 2012 was a hot, dry summer.) Little Roche a Cri Creek's principal water sources are groundwater seepage and springs and marsh drainage. The stream has over 2,400 acres of adjoining wetland, mostly at the

upper end of the stream. Beaver and muskrat are present. Mallard and wood ducks nest along the stream. DNR habitat improvement efforts have included over 350 acres of land purchases, overhead cover installation, and brushing of stream banks.

Fordham Creek is one of the finest Class I trout stream in Adams County, and is unique in that it supports naturally-reproducing populations of brook, brown, and rainbow trout. The stream is a small, westerly-flowing tributary to Little Roche a Cri Creek fed by groundwater seeps and springs and wetland drainage. Siltation and sedimentation are existing problems throughout the stream, resulting in the loss of spawning substrate for fish as well as the loss of valuable pool cover. Several DNR habitat improvement efforts have been completed on Fordham Creek; these have included land purchases of about 50 acres, installation of overhead cover, and brushing the streambank to narrow the channel.

Chaffee Creek is a long, low-gradient cold stream which originates in a large spring pond near Pleasant Lake and flows generally easterly to join the Mecan River. The stream has very good water quality and generally flows over sand. Chaffee Creek is a Class I trout stream over most of its length, including the headwater area. Trout were observed just downstream of the spring pond during an August 2013 site visit.

Tagatz Creek is a long stream with moderate gradient which originates from spring ponds in the terminal moraine south of Pleasant Lake and drains southeasterly to the Montello River. Tagatz Creek is a Class I trout stream.

Lakes

Pleasant Lake is a seepage lake with no surface water inlet or outlet. The lake is located at the border of Waushara and Marquette Counties, about 2.5 miles southeast of the proposed dairy site and 2.8 miles southeast of the dairy's proposed high capacity wells. It is located in an elevated moraine area, higher in elevation than the proposed dairy site, and has a relatively small surface watershed drainage area. Groundwater enters the lake from the west and north and exits to the east and south, feeding the headwaters of Chaffee and Tagatz Creeks.

Pleasant Lake has historically-reported maximum depths of 23.4 feet (June 2012 bathymetry survey), 24 feet (July 1964 bathymetry survey, level recorded during a period of drought), and 30 feet (1996 Lake Management Plan, level recorded during a period of unusually high water). Pleasant Lake has an average depth of 15 feet.

Because Pleasant Lake's water budget is dominated by groundwater, it is relatively well-buffered (pH > 8, alkalinity >100 mg/L) and experiences good water clarity for the most part (average summer water clarity between 8-13 feet from 2009-13; Figure 6, https://dnrx.wisconsin.gov/swims/public/reporting.do?type=11&action=post&format=html&stationNo=703057. The lake typically stratifies during the open water season, though occasionally experiences overturn in late summer, leading to minor algae blooms. Aquatic vegetation is most abundant in the 3 - 5 foot depth zone, and consists primarily of submerged species, dominated by muskgrass (*Chara sp.*) (data provided by UW Stevens Point). Emergent vegetation and submerged species in the nearshore zone

(less than 3 feet) are likely limited due to historical water level fluctuations and shoreland development and associated human activities.

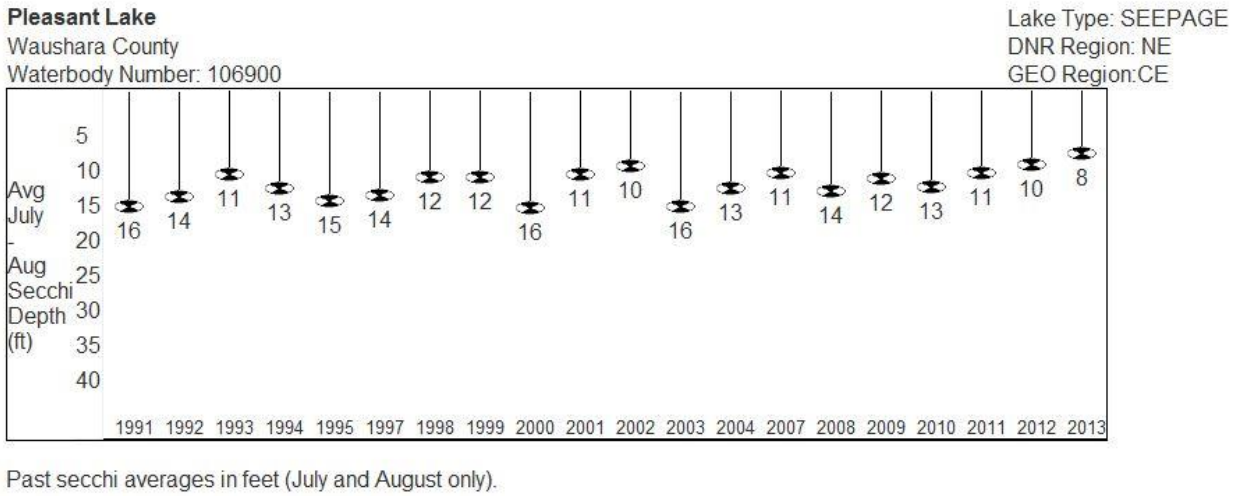


Figure 7 Pleasant Lake Water Clarity Readings 1991-2013

A 1996 Pleasant Lake Management Plan identified several parts of the Pleasant Lake shoreline as "Sensitive Areas". These areas include Turtle Bay (southwest bay), the south shoreline, and the sand and gravel bar extending from the north shore, which provide important spawning and feeding grounds for the lake's fishery. A seining survey was conducted on Pleasant Lake in August of 2013. The most common fish species present (more than 100 individuals caught) were bluntnose minnow, largemouth bass, bluegill, and banded killifish. The banded killifish is a state Special Concern species and is described in Section III.A.1.h. In all, 129 individuals of the killifish were caught during the 2013 seining survey, including 112 adults and 17 young of year. The species was found throughout the lake; the highest concentration of adults and young was found at the sandy point on the north side of the lake.

Based on analysis of air photos from 1992, 2005, 2010, and 2011, Pleasant Lake has a surface area of 130.4-136.7 acres. A 1964 lake survey estimated a lake surface area of 126.5 acres (representing the lake area during drought conditions prior to large-scale irrigation pumping in the area). Evaluation of the bathymetry of Pleasant Lake and historical air photos indicates that for historically-observed lake levels, a one-foot change in lake elevation results in a change of 2 to 5.3 acres in the surface area of the lake.

Water levels in Pleasant Lake are generally an expression of the elevation of the water table. Historic recorded lake levels are shown in Figure 7. For the period of 1964-2012, measured lake levels have varied by 5.5 feet. The oldest recorded lake level was relatively low (979.61 in 1964). The recorded maximum lake level was 983.75 feet MSL on 7/18/1994; the minimum recorded level was 978.27 feet MSL on 8/3/2007. For 1964-1994, a period during which irrigation pumping was less prevalent than at present, recorded lake levels varied by 4.1 feet. This amount of variation over a period of several decades is typical of a groundwater seepage lake in Wisconsin. On a seasonal basis, water level fluctuations in Wisconsin seepage lakes typically vary by an average

of 1.4 feet (Novitski & Devaul; House). The lake level record for Pleasant Lake includes four years with multiple water level measurements, including several measurements for 2012 submitted by the Dairy. These show annual variability ranging from 0.49 to 0.86 feet (5.9 to 10.3 inches). The measurements were not collected to represent maximum and minimum lake levels, but suggest that the seasonal water level fluctuation in Pleasant Lake could be between 6 inches and 1 foot.

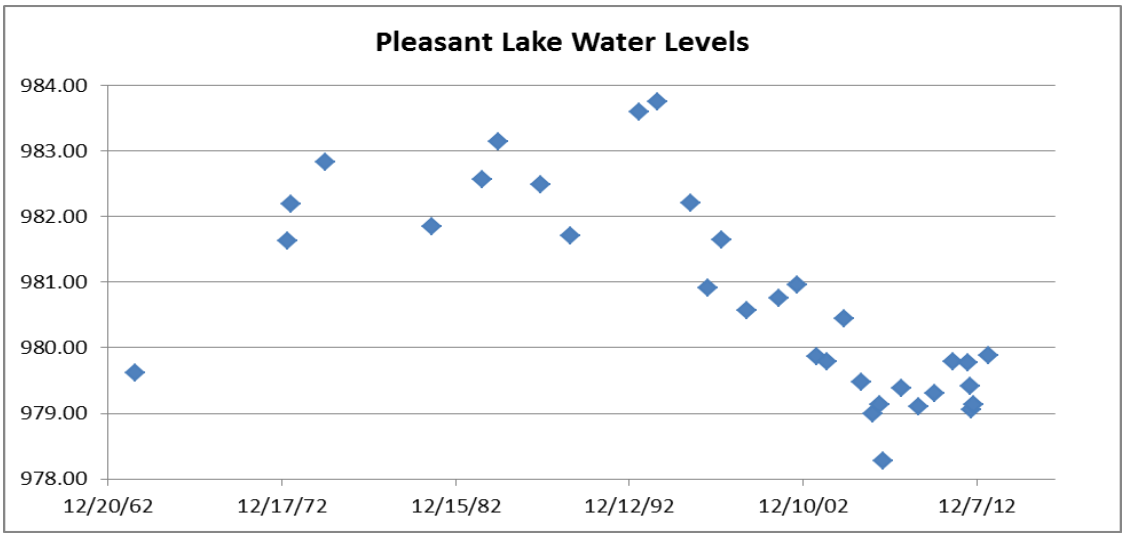


Figure 8 Pleasant Lake Historic Water Levels 1962-2012

Lake Burnita is a 10.5-13.5-acre seepage lake 3.7 miles southeast of the proposed dairy. The maximum depth of Lake Burnita is reported to be 8 feet, and a 1963 water body description reports that the lake experiences winterkill and fluctuating water levels. There is no historical water level record available for Lake Burnita. A reasonable estimate of mean lake depth is between four and five feet, based on regression analysis of depth data from other lakes in Wisconsin.

III.A.1.f Groundwater quantity & quality

Regional Groundwater Flow and Quantity

The proposed dairy is located on the eastern edge of a relatively flat plain with coarse-grained surface sediments deposited by glacial meltwater streams. The plain is bounded to the east by the Johnstown Moraine, a ridge that represents the westernmost extent of glaciation during the last phase of Wisconsin-age glaciation (Mickelson and others, 2011) and forms the surface water divide between the Mississippi River and Lake Michigan basins. Richfield Dairy is roughly 0.4 miles east of the Mississippi River/Lake Michigan *groundwater* divide, and groundwater at the site generally flows in a southeasterly direction (Figure 9). The aquifer is highly productive and consists of 150-200 feet of sand and gravel overlying about 300 feet of sandstone bedrock of the Cambrian Mount Simon Formation.

Based upon soil borings taken in May 2010, unsaturated conditions were encountered

at depths of up to 32 feet below the ground surface. Construction information from nearby wells indicates that the depth to water at Richfield Dairy is 35-40 feet below ground surface.

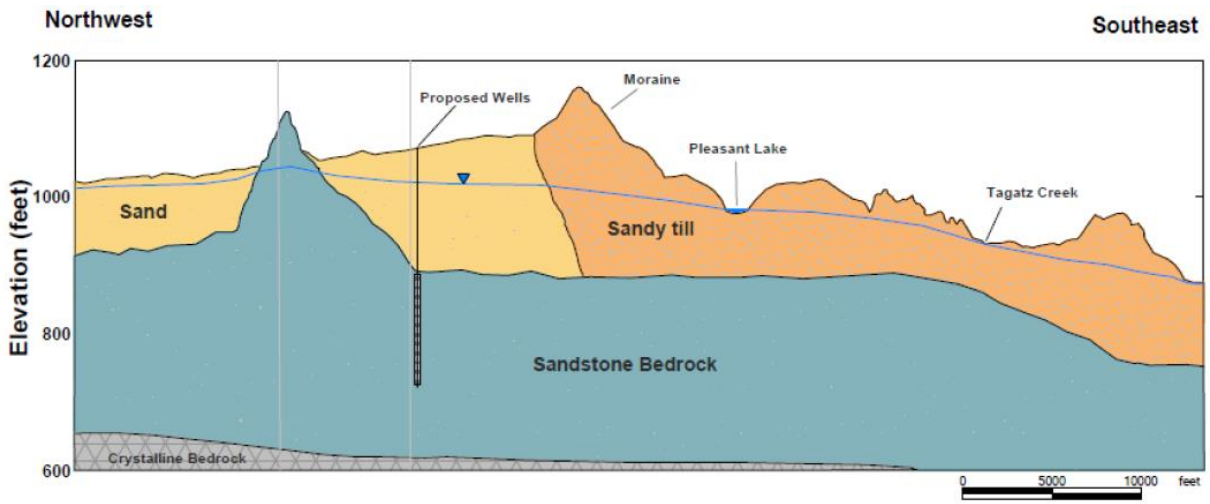


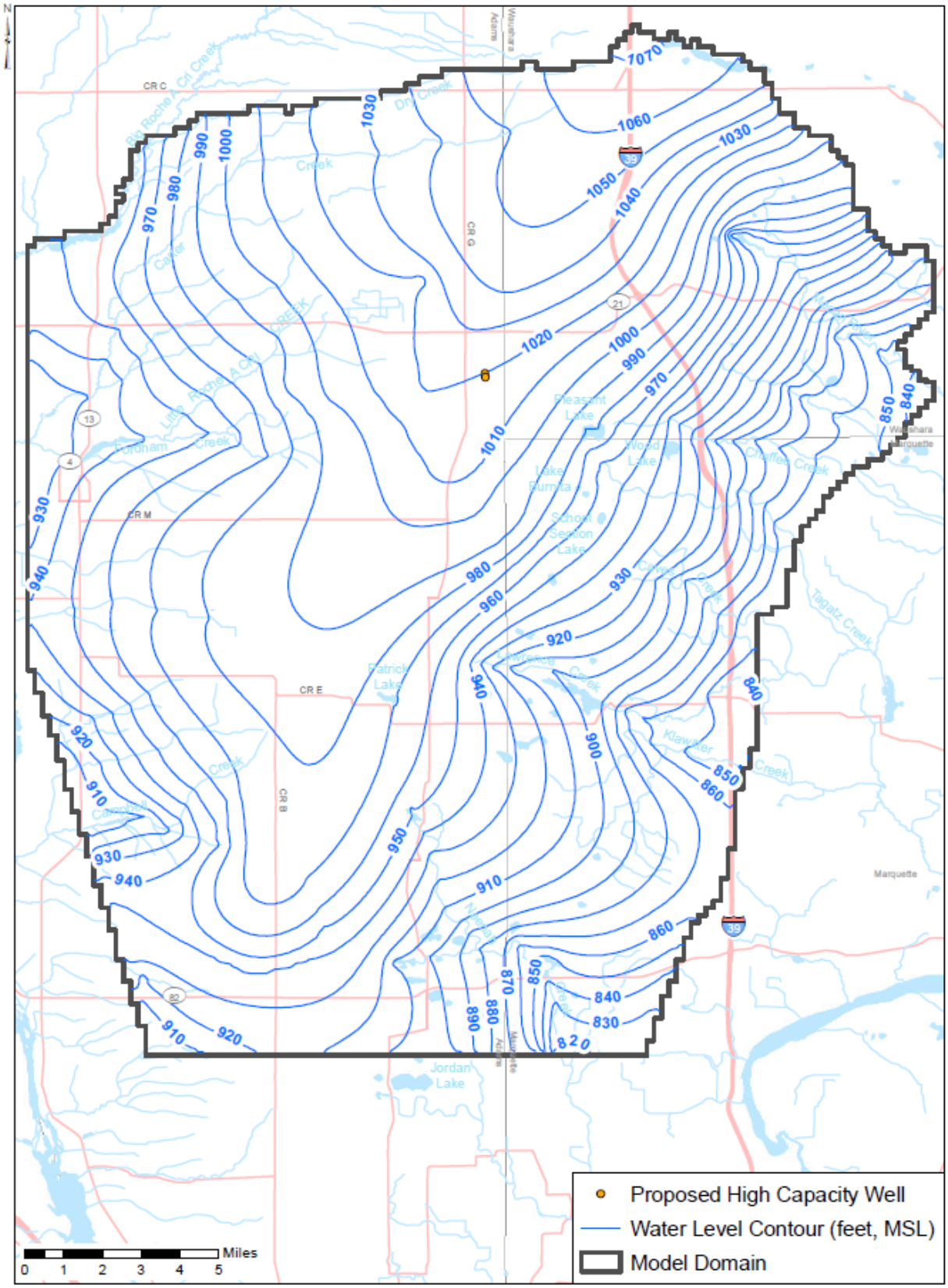
Figure 9 Regional Geology

Groundwater is extensively used in the Central Sands region for irrigated agriculture, and this use has expanded significantly within the last twenty years. Within five miles of the Richfield Dairy property, there are 114 wells with a pumping capacity over 70 gpm, most of which are irrigation wells with capacities of 900-1200 gpm. The majority of the high capacity wells are located in a narrow band on the relatively flat plain just west of the terminal moraine. The amount of water applied to irrigated lands varies based on soil type, crop, and climate conditions, but it is estimated to be as much as fourteen inches per year. Some of the applied irrigation water infiltrates back to the water table as a result of the coarse-grained soils, while the remainder either evaporates or is transpired by crops. On-going research at the University of Wisconsin suggests that irrigation results in an average of 2 inches in recharge reduction compared with perennially vegetated lands (Kraft and others, 2012).

In Adams County, total groundwater pumping for irrigation in 1979 was estimated to be 1.5 billion gallons per year. By 2005, groundwater pumping for irrigation had increased more than tenfold to 17 billion gallons per year. Total groundwater recharge in Adams County is estimated to be about 100 billion gallons per year; therefore, at 2005 pumping rates, about 17 percent of total recharge is being captured by the irrigation pumping.

Recent studies by researchers at the University of Wisconsin-Stevens Point (Kraft and others 2011; and Kraft and Mechenich 2010) have suggested that groundwater use for irrigated agriculture in the Central Sands region has resulted in observable declines in groundwater levels and lake levels and declines in base flow of headwater streams in the region. In the vicinity of the proposed dairy, the effect of irrigated agriculture on groundwater levels has been estimated to be about a two foot decline in groundwater levels relative to those that existed prior to 1980 (Kraft, 2010). These existing

reductions are supported by groundwater modeling from SSPA, which predicts irrigation-related baseflow reductions of between 1% and 30% on various stream reaches in the region (Table 2), an average 0.7 feet of water level drawdown at Pleasant Lake, and 2.8 feet of existing water table drawdown in the vicinity of the dairy facility.



Note: Water levels calculated with groundwter model described in section 5.

Figure 10 Groundwater Contours near Richfield Dairy

Regional Groundwater Quality

Groundwater quality in the area is considered between fair to good. Samples taken within the township of Richfield had detectable levels of atrazine and other pesticides. Nitrate levels are high in many wells with 24% exceeding the Enforcement Standard threshold of 10 mg/l (ppm).

The rating of "fair to good" is from the Central Wisconsin River Basin plan and is based on a numeric ranking based on available nitrate and pesticide data and land use. Ranking is used to determine basin wide water quality improvement goals. Groundwater quality varies from location to location within the basin. Groundwater in Adams County has high levels of nitrate in agricultural areas.

Below are three tables summarizing groundwater sample analyses for nitrate in wells located near the production site and land application sites. The analyses are from the DNR's GRN database and the UW Stevens Point Center for Science and Education Lab. No data from the proposed production site itself exists. Well water quality varies in the area of the proposed production facility and land application sites – as it does across the Central Wisconsin River basin and the state, in some locations in the area exceeding the enforcement standard. Tables show the most recent nitrate sample analytical results for each well sampled between 1/1/2000) and 9/1/2011 (some wells had multiple samples over several years). Samples represent analyses done over multiple years and through all different seasons. To get an accurate assessment of nitrate concentrations at the production site and near land application sites, monitoring wells would have to be appropriately installed and sampled quarterly.

Transient Non-community wells, such as restaurants, are required to treat water if nitrate levels exceed 20 ppm under the Safe Drinking Water Act. If sample analytical results for a well exceed federal Maximum Contaminant Levels (MCLs), DNR will require them to post notices and in some circumstances will require a well owner to replace a well or install appropriate treatment. Exceedences of MCLs, especially for widespread contaminants like nitrate, unfortunately occur all over the state and especially in agricultural areas where soils are thin or permeable and groundwater occurs close to the land surface.

The sample analyses show that about 16% of the private well samples collected from wells near the production area and land application sites, exceeded the Enforcement Standard of 10ppm. Of those analyses, about 7% were greater than 20 ppm. Sample analytical results from transient community well samples, serving restaurants and churches for example, showed that almost 6% exceeded the Maximum Contaminant Level for nitrate of 10 ppm. It is unknown how many of these transient community wells have been required to treat for nitrate so results are skewed.

Private Wells (DNR)						
Township	Range	No. of well samples	No. <PAL (2 ppm)	No. >=PAL, <ES	No. >=ES (10 ppm)	No.>=20 ppm
20	8	13	5	5	3	2
19	8	28	5	14	9	6
18	8	33	8	19	6	5
14	8	47	24	21	2	0
20	7	9	6	2	1	0
19	7	19	8	7	4	2
18	7	9	2	4	3	1
17	7	15	5	4	6	3
15	7	65	33	29	3	1
14	7	38	15	19	4	2
13	7	23	7	16	0	0
18	6	55	36	17	2	0
15	6	61	35	19	7	1
14	6	77	37	35	5	2
18	5	40	9	25	6	3
15	5	40	22	14	4	0
Total		572	257	250	65	28

Transient Noncommunity wells (DNR)						
Township	Range	No. of well samples	No. <PAL (2ppm)	No. >=PAL, <ES	No. >=ES (10ppm)	No.>=20 ppm
20	8	7	3	4	0	0
19	8	4	0	2	2	1
18	8	3	2	1	0	0
14	8	11	4	7	0	0
20	7	5	2	0	3	2
19	7	0	0	0	0	0
18	7	0	0	0	0	0
17	7	0	0	0	0	0
15	7	14	12	1	0	0
14	7	8	4	3	1	0
13	7	30	10	20	0	0
18	6	13	13	0	0	0
15	6	5	4	1	0	0
14	6	34	13	19	2	0
18	5	9	3	5	1	0
15	5	18	13	5	0	0
Total		161	83	68	9	3

Private wells (Center for Watershed Science and Education)						
Township	Range	No. of well samples	No. <PAL	No. >=PAL, <ES	No. >=ES	No.>=20 ppm
20	8	13	5	3	5	4
19	8	38	8	15	15	8
18	8	25	8	11	6	3
14	8	11	6	4	1	0
20	7	25	10	3	12	4
19	7	14	6	3	5	3
18	7	22	8	8	6	2
17	7	23	3	8	12	3
15	7	98	66	18	14	5
14	7	16	6	6	4	2
13	7	9	5	3	1	0
18	6	69	47	17	5	1
15	6	18	10	5	3	1
14	6	49	29	19	1	0
18	5	61	28	20	13	9
15	5	2	1	0	1	0
Total		493	246	143	104	45

Table 1 Regional Well Data

III.A.1.g Air quality

Animal agricultural operations generate odors and air pollutants. When localized and insignificant, these odors and air pollutants pose few problems. If enough animals are concentrated together in a small area, air emissions may cause human health and environmental concerns.

Airborne contaminant emissions emitted from CAFO's or other types of animal agricultural operations, include gases and particles. Air quality concerns have focused primarily on ammonia (NH_3), hydrogen sulfide (H_2S), two toxic air pollutants, as well as odors, particulate matter (PM), volatile organic compounds (VOC), and greenhouse gases (GHG). Diesel exhaust PM emissions from semi-trucks, manure spreading, and other miscellaneous farm operations could also be associated with animal agricultural operations.

Emergency generators, other stationary diesel or biogas engines and other combustion sources, such as dryers, will emit pollutants, too. Criteria pollutants (oxides of nitrogen (NOx); carbon monoxide (CO); and sulfur dioxide (SO2)) and incomplete products of combustion are also emitted and formed from the combustion of diesel, biogas or other fuels.

In addition to primary emissions, certain air pollutants are formed through chemical processes in the atmosphere known as secondary formation processes. The secondary pollutants have significant effects. Ammonia reacts with SO2 and nitrogen oxides (NOx) to form PM2.5. VOC and NOx react to form ozone. Nitrogen containing compounds such as ammonia and NOx result in increased nutrient loading and acidification of soils and waters.

Both quantity and the types of air contaminant emissions from animal agricultural operations are challenging to estimate, making off-site air quality impacts difficult to predict. This is due to diurnal and seasonal temperature variation, varying number and type of animal species present (which may change over time), type of housing and manure handling system, feed type, and chosen management practices.

Large amounts of nitrogen are excreted in the production of all animal feces, including dairy, and most excess nitrogen is in a form that is easily transformed into ammonia. Most ammonia is produced when the urea contained in urine comes in contact with the urease enzyme contained in feces (also on barn floors and in soil). Much smaller amounts of ammonia are produced during the decomposition of feces. Nitrogen occurs as both unabsorbed nutrients in animal feces and as either urea (mammals) or uric acid (poultry) in urine.

After contaminants are generated, they can be emitted through animal housing ventilation systems (if used) or emitted from any number of sources including

animal housing and production areas, feed preparation and storage, manure management/storage facilities, mortality composting, land application sites and dispersed by atmospheric processes. Air contaminant travel distance varies due to size of particles, weather conditions and surrounding topography and vegetation. These variations make it challenging to form a clear picture of the expected emissions and emission-related effects from animal agricultural operations.

Regulatory dispersion modeling is predicated on the steady-state nature of the release. Gaussian plume models have been developed to replicate monitored concentrations attributed to industrial or commercial operations, for example a large industrial boiler for generating steam and/or electricity. The release of farm emissions comes from locations (i.e. barns, lagoons) that are unlike a smoke stack. These “fugitive” emissions are able to be modeled, but there is more uncertainty associated with establishing release parameters. The time-varying nature of farm emissions is even more difficult to model. Regulatory models generally assume steady-state emission generation. This implies that over the course of one hour, the emission rate will not significantly change, and that any changes from hour-to-hour are under the control of the operator. Farm emissions vary between hours, within a given hour, and more importantly this variation is chaotic and unpredictable.

Despite the variability of emissions from animal agricultural operations, the nitrogen balance (and ammonia as a part of the balance) has been studied extensively in dairy operations which have integrated cropping systems. Nitrogen excretion from animals varies based on nitrogen feed rates, the nutritional needs of the dry or lactating cows, and how much nitrogen ends up in milk. In Wisconsin and elsewhere, research points to an average annualized total nitrogen loss of 15 percent from freestall housing and losses of incoming nitrogen into uncovered manure storage from 10 to 30 percent loss of nitrogen as ammonia. Estimates based on farm component ammonia losses are presented in the table below. Wisconsin DNR is currently working with an agricultural waste advisory group to examine and recommend beneficial practices that reduce ammonia and hydrogen sulfide air emissions and will work for Wisconsin farms.

The facility is proposing practices which are expected to mitigate air emissions. This includes a floating geomembrane waste facility storage cover combined with a biofilter treating exhaust air from under the cover. Covering the waste facility storage with a properly designed geomembrane cover may reduce air emissions and odors by 90% from the waste storage facility. Appropriate land application techniques should be combined with waste facility storage covers to ensure that air contaminants (and beneficial nutrients) which are prevented from volatizing with waste facility covers are not lost during the land application process.

III.A.1.h Flora/Fauna/Rare Species

See Central Sand Plains Ecological Landscape:
http://dnr.wi.gov/topic/landscapes/index.asp?mode=detail&Landscape=7

Although there are no rare or endangered species near the Richfield Dairy, some Special Concern species are found in water bodies evaluated as part of the Richfield Dairy EIS. Special Concern species are those species about which some problem of abundance or distribution is suspected but not yet proved. The main purpose of this category is to focus attention on certain species before they become threatened or endangered. There are no laws regulating use, possession or harvesting of Special Concern species.

Banded killifish is a state Special Concern species present in Pleasant Lake (See also section III.A.1.e). Banded killifish are not actively tracked in the Natural Heritage Inventory, the database DNR uses to identify sensitive species during environmental reviews. However, according to DNR records, banded killifish were identified in Pleasant Lake in 1999. Twenty-five individuals were identified in the lake in November, 2012, and 129 individuals were caught during a 2013 seining survey. During the seining survey, killifish were found at almost all stations around Pleasant Lake. The banded killifish generally prefers clear water of bays and quiet backwaters of large lakes and medium to large streams with sparse to no vegetation over gravel, sand, silt marl, clay detritus, or cobble. Spawning occurs from June through mid-August. Threats to the species include artificial water level stabilization, invasive species (such as Eurasian Water Milfoil and Curly-leaf Pondweed), non-point source pollution, habitat destruction due to boating (wave energy), aquatic plant control, and shoreline clearing. Many of these are existing concerns at Pleasant Lake.

Two Special Concern species were observed in the headwater area of Chaffee Creek, 3.5 miles east-southeast of the Richfield Dairy. Tufted Hairgrass was observed in the calcareous fen adjacent to the spring pond. This species grows in wet, sandy, or calcareous soils. In addition, Least Darter was observed in the Chaffee Creek spring pond. Least Darter is a fish species that generally prefers clear, warm, quiet waters of overflow ponds, pools, lakes and streams over substrates of gravel, silt, sand, boulders, mud or clay with dense vegetation or filamentous algal beds. Spawning occurs from late April into July.

III.A.2 Production site & immediate vicinity

III.A.2.a Location & Size

The Richfield Dairy (Site) is approximately 152 acres in size while the disturbance area is approximately 117 total acres in size. The land was used for agricultural crops. The proposed Richfield Dairy facility would be located is the southeast corner of the intersection of 1st Drive and Cypress Avenue. The proposed dairy facility would house 4300 milking/dry cows and 250 steers for a

total of 6270 AU. One milking/dry cow is equivalent to 1.4 AU or a 1,400 pound animal.

III.A.2.b Topography

Prior to construction, the site was used for agricultural fields. The topography of the project site is a relatively flat plain.

Elevations at the site range from about 1,090 feet above mean sea level (MSL) in the southeast portion of the property to about 1,070 feet above MSL along the northern boundary of the property. The eastern edge of the dairy is less than one mile west of the Johnstown moraine, a north-south trending glacial feature that forms a narrow ridge rising as much as 120 feet above the plain. This ridge represents the westernmost extent of glaciation during the last phase of Wisconsin-age glaciation (Mickelson and others, 2011). The proposed dairy is located on the eastern edge of a relatively flat plain with coarse grained surface sediments deposited by glacial meltwater streams.

III.A.2.c Soils

Soils are consistent with surrounding landscape. See III.A.1.c. Soils

More soil information can be found at: http://websoilsurvey.nrcs.usda.gov/

III.A.2.d Geology

Geology is consistent with surrounding landscape. See section III.A.1.d. Geology

III.A.2.e Hydrography & surface water quality & quantity

III.A.2.e.01 Wetlands

The aerial photo layer of the spreading restriction map shows no evidence of a wetland (Wisconsin state waters) located within the property boundary. Instead, the map shows evidence of a cropped field.

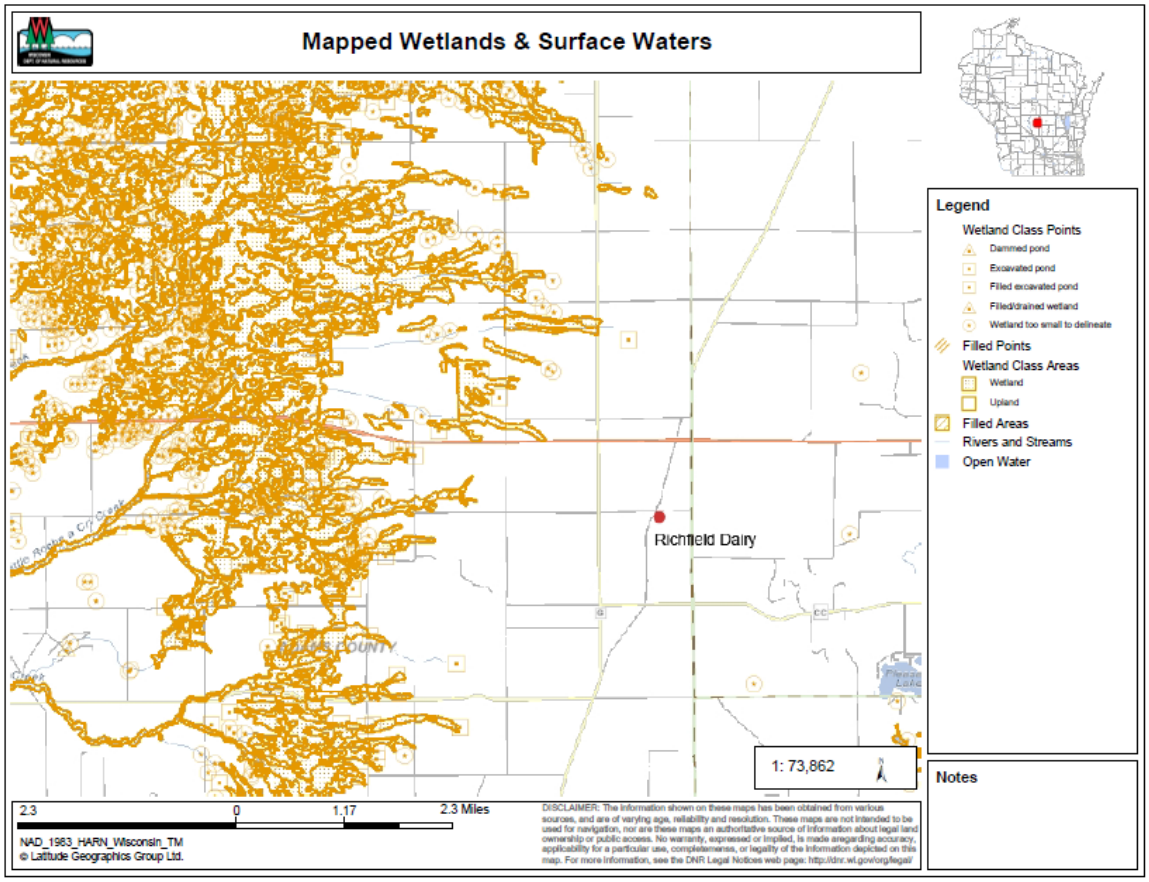


Figure 11 Wetlands & Surface Waters near Richfield Dairy

III.A.2.e.02 Surface water

The farm site is located in the Little Roche a Cri watershed. No waterways are present at the immediate farm site. Therefore, no Outstanding Resource Waters (ORW) or Exceptional Resource Water (ERW) resource waters will be directly affected. See Figure 11 above.

Livestock at the proposed Richfield Dairy facility will be confined within roofed buildings. Manure generated within these buildings will be transferred to a storage facility, long-term nutrient impacts on wetlands and surface waters from the cattle housing area are not expected.

Proposed manure storage and runoff control facilities at the proposed operation must be built in accordance with currently accepted engineering standards to minimize the risks of ground and surface water contamination. Plans and specifications for proposed facilities must be reviewed and approved by Department staff prior to construction.

Current regulations require that there be no discharge of pollutants from any manure storage facilities, outdoor animal lots, composting and leachate

containment systems, milking center wastewater treatment/containment systems, raw material storage areas, or other area of the operation to navigable waters, except in the event of a 25-year, 24-hour rainfall event, or chronic rainfall event. In addition, current regulations prohibit (1) overflow of manure storage facilities, (2) direct runoff from a feedlot or stored manure to waters of the state, (3) unconfined manure piles/stacks in water quality management areas, and (4) unlimited access by livestock to waters of the state in locations where high concentrations of animals prevent maintenance of adequate sod cover.

WPDES permitted CAFO facilities are required to adhere to very stringent requirements. The Department believes the permit as issued complies with ch. NR 243 and provides an adequate level of water quality protection. The Richfield Dairy facilities have been designed in a manner that exceeds NRCS Technical Standards to further reduce the potential of leaching. The manure storage facilities were also designed to exceed the 180-day storage capacity requirement, which also includes additional freeboard capacity to capture a twenty-five year rain event and prevent an overflow. It is important to note that an allowed overflow discharge to surface waters from the production area is very unlikely given the conditions contained within the WPDES permit. In addition, the only allowable land application discharges of manure, process wastewater or associated pollutants (e.g. nitrogen, phosphorus) from Richfield Dairy to surface waters are discharges of agricultural storm water (those discharges that occur after compliance with ch. NR 243, the WPDES permit and an approved nutrient management plan) which are not subject to WPDES regulation.

For WQBELs for the production area, for any authorized discharge, the permit requires compliance with state water quality standards and ground water standards. This satisfies the requirements in s. 283.13(5), Stats. Also, the Department has added language that prohibits any discharges from the production area to a 303(d) listed water (Reference Section 1.1 below). As for the land application areas, the Department cannot apply WQBELs to agricultural storm water runoff.

III.A.2.f Groundwater quality & quantity

Two high capacity wells have been approved for the Richfield Operation. Both high capacity wells will be constructed to a depth of ~350 feet. Based on well construction reports in the area, the static groundwater level at the site is 35-40 feet below ground surface. Both the surficial sand and gravel aquifer and the sandstone aquifer, where the dairy wells will be completed, are highly productive.

The two planned manure storage facilities will be designed to meet appropriate USDA- NRCS design standards to ensure that groundwater impacts do not occur, and the proposed facility will have to meet these guidelines as well.

Quantity

One high capacity irrigation well exists on the proposed Richfield Dairy facility property. As a condition of the Dairy's high capacity well approval, the existing well would be abandoned prior to facility construction. Based on reported pumping for 1978-1980, 1982-1989 and 2007-2014, the historical average pumpage of the existing irrigation well is 40.6 million gallons per year (MGY). The lack of pumping data for 1981 and 1990-2006 reflects the fact that owners of high capacity wells were not required to report pumping data during that period. Pumping for the most recent period of record-keeping (2007-2013) averaged 57.3 MGY.

On an *annual* basis, the dairy's maximum approved groundwater withdrawal of 72.5 MGY constitutes a 26% increase over past pumping for the 2007-2013 period, or a 79% increase over the average for all years on record.

Under Ch. NR 142, Wis. Adm. Code, water losses from dairy farming are assumed to be 90%, while water losses from irrigation are assumed to be 70%. Past annual water loss from the irrigation well (for years with records) has averaged 28.4 MGY. Water loss for the proposed wells could be up to 65.3 MGY at the maximum approved annual pumping rate.

Quality

The two planned manure storage facilities will be designed to meet appropriate USDA-NRCS design standards to ensure that groundwater impacts do not occur, and the proposed facility will have to meet these guidelines as well.

WPDES permitted CAFO facilities are required to adhere to very stringent requirements. The Department believes the permit as issued complies with ch. NR 243 and provides an adequate level of water quality protection. The Richfield Dairy facilities have been designed in a manner that exceeds NRCS Technical Standards to further reduce the potential of leaching. The manure storage facilities were also designed to exceed the 180-day storage capacity requirement, which also includes additional freeboard capacity to capture a twenty-five year rain event and prevent an overflow. It is important to note that an allowed overflow discharge to surface waters from the production area is very unlikely given the conditions contained within the WPDES permit. In addition, the only allowable land application discharges of manure, process wastewater or associated pollutants (e.g. nitrogen, phosphorus) from Richfield Dairy to surface waters are discharges of agricultural storm water (those discharges that occur after compliance with ch. NR 243, the WPDES permit and an approved nutrient management plan) which are not subject to WPDES regulation.

As previously noted, the two proposed Waste Storage Ponds, feed storage pad and separated manure solids stacking area, will have an 8" compacted clay liner in addition to a concrete base. The sweet corn feed pad consists of a 24" compacted clay liner under an 8" drainage layer which is under 8-inches of

concrete. The applicant has not yet determined where the estimated ~32,000 cubic yards of clay needed for these structures will be acquired. Richfield Dairy will follow any natural resource laws that may pertain to how and where the clay is obtained.

For WQBELs for the production area, for any authorized discharge, the permit requires compliance with state water quality standards and ground water standards. This satisfies the requirements in s. 283.13(5), Stats. Also, the Department has added language that prohibits any discharges from the production area to a 303(d) listed water (Reference Section 1.1 below). As for the land application areas, the Department cannot apply WQBELs to agricultural storm water runoff.

1.1 Production Area Discharge Limitations

The permit for the project requires that the permittee comply with the livestock performance standards and prohibitions in ch. NR 151. In accordance with s. NR 243.13, the permittee may not discharge manure or process wastewater pollutants to navigable waters from the production area, including approved manure stacking sites, unless all of the following apply:

Precipitation causes an overflow of manure or process wastewater from a containment or storage structure.

The containment or storage structure is properly designed, constructed and maintained to contain all manure and process wastewater from the operation, including the runoff and the direct precipitation from a 25-year, 24-hour rainfall event for this location (**Adams County – 4.7 inches**).

The production area is operated in accordance with the inspection, maintenance and record keeping requirements in s. NR 243.19.

The discharge complies with surface water quality standards. For all new or increased discharges to an ORW or ERW, any pollutant discharged shall not exceed existing levels of the pollutant immediately upstream of the discharge site. For any new or increased discharge to other fish and aquatic life waters, the discharge shall not cause a significant lowering of water quality under chapter NR 207, Wis. Adm. Code.

A permittee may not discharge any pollutants from the production area to a 303(d) listed surface water if the pollutants discharged are related to the cause of the impairment, unless the discharge is allowed under a EPA approved TMDL.

All structures shall be designed and operated in accordance with ss. NR 243.15 and NR 243.17 to control manure and process wastewater for the purpose of complying with discharge limitations established above and groundwater standards.

The permittee may not discharge pollutants to navigable waters under any circumstance or storm event from areas of the production area, including manure stacks on cropland, where manure or process wastewater is not properly stored or contained by a structure.

Production area discharges to waters of the state authorized under this permit shall comply with water quality standards, groundwater standards and may not impair wetland functional values.

NOTE: Wastewater treatment strips, grassed waterways or buffers are examples of facilities or systems that by themselves do not constitute a structure.

III.A.2.g Air quality

Production site air quality similar to Area air quality information can be located in Section III.A.1.g.

III.A.2.h Flora & Fauna

The immediate project area and proposed land spreading sites are existing cropland and would be expected to provide habitat primarily for common vegetative species acclimated to farm operations.

III.A.2.i Rare Species

The Department conducted an on-site review within the project area where the facility is to be constructed as well as at all road access locations. No lupine was found at these locations. The site review focused on the specific area where construction activities would occur. Land spreading sites were not reviewed for Lupine, as the proposed land use for these fields will remain for agricultural crop production.

III.A.3 Manure spreading/irrigation sites

III.A.3.a Location & Size

Richfield Dairy owns a total of 1,054.8 acres and has NMP subscription agreements for an additional 15,374.3 acres (see summary table, Section I.B.). Of those total acres, 1,044.8 of owned acreage and 15,247.5 of acreage under agreements are available for landspreading after various restricted areas have been accounted for. The farm has a total of approximately 16,292.4 acres of available spreading area after various restricted areas have been accounted for. Detailed maps and other documents that describe manure spreading locations (fields) and sizes (acreage) are in the Richfield Dairy Nutrient Management Plan (NMP).

No applications are planned during frozen or snow covered ground conditions. Eleven fields, totaling 831 spreadable acres, are listed in the NMP for winter spreading of liquid or solid manure. These fields were evaluated and found to be in compliance with NR 243.14 (6-8) winter spreading requirements.

The nutrients from Richfield Dairy's manure and process wastewater are meant to replace, not add, to the nutrients that are placed on area crop fields. Fields previously not covered under an NMP that receive Richfield Dairy manure will be covered under an NMP. The associated nutrient budgeting that goes along with an NMP, particularly under NR 243 and a WPDES permit, may result in decreased nutrient loading to area surface waters and groundwater. The Department is obligated by law to review a given proposal to determine if the proposal can meet the standards and any prescribed conditions of a permit or approval. If a proposal can meet permit requirements, we are obligated by law to issue the permits and approvals.

The Richfield Dairy NMP depicts crop rotations with 25% of acres having perennial forage crops. The NMP shows only 4% of the 16,429 acres is planned for alfalfa/perennial forage crop. The remaining 96% is planed with annual crops such as corn grain, corn silage, potato, winter wheat, snap beans and sweet corn. If such crops receive liquid or solid manure, the manure is planned to be immediately incorporated or injected.

Monitoring under 283.55(1) applies to end-of-pipe discharges. Because of the unpredictable nature of field runoff and the difficulty in obtaining representative samples, the CAFO WPDES permit program relies on implementation of BMPs in lieu of discharge monitoring.

III.A.3.b Topography

Topography is consistent with surrounding landscape. See III.A.1.b. Topography

III.A.3.c Soils

Soil wind erosion within the Central Sands area is a concern. The Department does not have regulatory authority to address wind erosion. However, the introduction of alfalfa crops into the cropping rotation will result in a reduction of wind erosion within those specific fields.

Nitrogen containing compounds are generated during the manure application process and will result in an increased nutrient loading to soils, acidification of soils and groundwater above current conditions. However, the Richfield Dairy NMP contains several required nutrient / manure management practices that, taken together, help reduce the risk for nutrient loading above crop fertility needs

and further reduces the rate, scope and/or frequency of soils and water acidification. These practices include requirements to regularly test all crop fields for soil P, K, and pH levels and plan appropriate management practices to prevent over application of nutrients. Practices include lime applications to reduce soil acidification, immediate incorporation or injection of liquid manure, regular calibration of spreading equipment to ensure that application rates reflect the UW recommendations for crops selected and the planned application of manure in the spring, prior to crop establishment. Spring application prior to crop establishment on highly permeable soils reduces the risk for N mineralization and leaching from applied manure as opposed to fall manure applications. The NMP also includes detailed manure spreading and soil restriction maps of all fields covering more than 16,000 spreadable acres, including field and map verification procedures to ensure that all manure spreading setbacks are properly followed and s. 243.14 prohibited areas (shallow groundwater, conduits to groundwater) are followed or avoided when fields are utilized for manure application.

III.A.3.d Geology

See section III.A.1.d.

III.A.3.e Hydrography & surface water quality & quantity

Waterways and wetlands are present within the vicinity of the 16,292.4 acres of available spreading area. Streams within 0.5 miles of spreading sites include Big Roche a Cri Creek, Carter Creek, Little Roche a Cri Creek, Fordham Creek. Mason Lake, an impoundment of the South Branch of Neenah Creek, is also within 0.5 miles of spreading sites.

The land application of manure on area cropland poses the greatest risk of environmental impact if it is not done properly. Impacts from nutrient loadings, biochemical oxygen demand and ammonia are water quality concerns with surface waters. Since this operation will require coverage under a WPDES permit due to its size, landspreading of its manure is regulated in accordance with a Department approved NMP. The NMP can be an effective tool to proactively address possible problems that would otherwise be associated with poor manure landspreading activities. Following conditions in the NMP for setback distances, appropriate application rates, timing and record keeping should result in direct benefits to the environment.

It is not clear if wetlands shown adjacent to field boundary are conduits to surface waters and require 300 ft SWQMA boundary spacing because it is not clear the wetland on the map discharges *via channelized flow* to navigable waters. NR 243.03(14) defines conduits to navigable water to mean a natural and man-made

area or structure that discharges to a navigable water *via channelized flow* (italics added by DNR).

For the land application areas, the WPDES permit establishes application restrictions and BMPs designed to keep pollutants on the land. Through permit coverage, all land application activities must be done in conformance with a nutrient management plan. In most cases, once a parcel of cropland comes under a chapter NR 243 based nutrient management plan, there will likely be a reduction of pollutant runoff from that parcel of land. This is due to the fact that cropland not previously covered under a nutrient management plan will, through permit coverage, become subject to more (water quality) protective management practices required by the WPDES permit program. Manure applications cannot exceed crop need and must be made in a responsible manner. Facilities must observe manure application set back requirements from private wells, conduits to groundwater and within defined surface water quality management areas (SWQMS). Manure applications are restricted during snow covered and frozen ground conditions. In addition to these stringent requirements, the proposed operation will be applying nitrogen contained in manure (where the nitrogen is less mobile than is true for liquid commercial fertilizer).

III.A.3.f Groundwater quantity & quality

Quantity
The majority of the land spreading area is on irrigated agricultural land. There are approximately 150 existing or approved irrigation wells on land proposed for manure spreading. No change in groundwater use for irrigation is anticipated due to the Richfield Dairy project.

Quality
According to driller construction reports, groundwater depth near the production area and land application sites varies between 1 and 192 feet below the ground surface with 89% of the wells showing static water level in wells at 10 feet or greater below the ground surface. It indicates that there may be shallow groundwater in areas near land application sites. Under NR 243, there must be a two foot separation between the ground surface where manure is applied and groundwater as measured in a hole dug just prior to manure application. There is debate over whether this separation is adequate to protect groundwater in all circumstances. Research on this topic is ongoing.

The Department agrees that the Richfield Dairy NMP depicts planned manure spreading on many fields that contain sandy, highly permeable soils. These soils, in general, have a higher risk for leaching of nitrates and other pollutants to groundwater.

With respect to groundwater contamination, in general, commercial N has a higher risk for leaching nitrate nitrogen into groundwater than manure. Currently, commercial N is used to meet all crop nutrient needs for all acres within the Richfield Dairy NMP and it cannot be confirmed if this commercial N is being applied consistent with an NRCS 590 standard NMP and UW crop recommendations.

III.A.3.g Air quality

Air qualities for manure spreading/irrigation locations are similar to Section III.A.1.g.

III.A.3.h Flora

Provided manure land-spreading is limited to existing croplands and application practices avoid increased nutrient loading to surface waters (see *III.A.3.e.—Hydrography & surface water quality & quantity)*, no serious threat to sensitive resources in the vicinity would be expected. Therefore, long-term significant impacts on terrestrial animals and vegetation are not expected.

III.A.3.i Fauna

Provided manure land-spreading is limited to existing croplands and application practices avoid increased nutrient loading to surface waters (see *III.A.3.e.—Hydrography & surface water quality & quantity)*, no serious threat to sensitive resources in the vicinity would be expected. Therefore, long-term significant impacts on terrestrial animals and vegetation are not expected.

Further, the immediate project area and proposed land spreading sites are existing cropland and would be expected to provide habitat primarily for common animal species acclimated to farm operations. Since the farm and land spreading sites are currently used for agriculture, the proposed land use will not change significantly as a result of the issuance of the WPDES permit.

III.A.3.j Rare species

Provided manure land-spreading is limited to existing croplands and application practices avoid increased nutrient loading to surface waters, no serious threat to sensitive resources in the vicinity would be expected. Therefore, long-term significant impacts on terrestrial animals and vegetation are not expected.

The immediate project area and proposed land spreading sites are existing

cropland and would be expected to provide habitat primarily for common animal species acclimated to farm operations. Occasional visits/use by mobile rare species such as whooping crane or bald eagle may occur but will not be negatively impacted by such use.

The Department conducted an on-site review within the project area where the facility is to be constructed as well as at all road access locations. No lupine, habitat for the federally listed Karner Blue Butterfly, was found at these locations. The site review focused on the specific area where construction activities would occur. Land spreading sites were not reviewed for Lupine, as the proposed land use for these fields will remain for agricultural crop production.

III.B Socioeconomic environment

III.B.1 Area

III.B.1.a Land use

The main land uses in the Town of Richfield are agriculture, rural residential, and recreational.

III.B.1.b Transportation

The physical appearance of the site will change and activity level, noise, traffic, etc. at the farm and surroundings (roads, etc.) will be greater.

III.B.1.c Zoning

Many parcels near and around the proposed Richfield Dairy are zoned agricultural.

III.B.1.d Economy

The area's economy will change through an estimated 40 jobs created (projected $1.5M annual payroll) and an increase in the area's tax base from farm improvements. It is also estimated that $16M will annually enter the local economy as a result of added business such as the purchase of services, equipment and feed.

III.B.1.e Property values & taxes

Real estate values, particularly for those residential properties near the operation, may decrease. Impacts to tourism are difficult to predict and will depend on which, if any, impacts (odors, noise, traffic) occur in areas where people recreate. The statewide EA for a general WPDES permit for dairy CAFOs did not find adverse impacts of CAFOs on tourism. Reference: http://dnr.wi.gov/runoff/pdf/ag/Large_Dairy_CAFO_GP-Envrionmental_Assessment.pdf

The value of housing is based on both the value of the land and the value of the buildings and other improvements to the land. Between 1940 and 2000, median home values in Wisconsin increased from $33,600 to $112,000. Generally, Wisconsin housing values have been consistent with national trends. Land values have gone up primarily due to general demand, but also due to the demand for vacation property. Residential improvements have also increased in value because of increasing house sizes and building quality, both for new houses and for renovations. (Housing Megatrends, UW Extension)

III.B.1.f Visual

The existing viewshed in the area is flat vast open farmland with the moraine ridge visible to the east.

III.B.2 Production site

III.B.2.a Land use

The production site will change from cropland to a confined feeding operation; however, remaining agricultural.

III.B.2.b Zoning

No zoning changes (currently A-1 agricultural) will be required for the new farm and operation.

III.B.2.c Archaeological & Historical

No historical, archeological or other cultural resources are known to be present at the farm site or expected to be impacted.

III.B.2.d Noise & Visual

The physical appearance of the site will change and the activity level, noise and traffic at the farm and surrounding roads will be greater. While the use of the site will remain agricultural, the construction phase of the project will be most noticeable to neighbors located within a one-mile radius of the facility site. At the time Richfield Dairy becomes operational, odors from the facility will also be more noticeable to neighbors. Residents not located within the immediate vicinity of the facility may notice odors on a less frequent basis, particularly during the spring or fall period when the manure storage facility is agitated and the manure is land applied to area fields.

III.B.3 Manure spreading/irrigation sites

III.B.3.a Land use

Since the farm and landspreading sites are currently used for agriculture the proposed land use will not change significantly as a result of the issuance of the WPDES permit.

IV Environmental Effects

This chapter of the EIS presents an analysis of the extent of short–term and long–term environmental effects including secondary effects that may result from the proposed action.

IV.A Physical environment

IV.A.1 Production site

IV.A.1.a Production site Topography

Changes to topography for construction activities involved moving existing material around on the site to provide a level surface for construction.

IV.A.1.b Production site Soils

For construction activities, topsoil at the site was stripped and stockpiled, then used for finish grading and landscaping at the site. There was no need to bring additional topsoil from off-site.

IV.A.1.c Production site Geology

The Geology of the site will not change.

IV.A.1.d Production site Hydrography & surface water quality & quantity

IV.A.1.d.01 Production site Wetlands

No wetlands are present at the immediate farm site.

IV.A.1.d.02 Production site Surface water

The Richfield Dairy (Site) is approximately 152 acres in size while the disturbance area is approximately 117 total acres in size. The land is currently used for irrigated agriculture. Irrigation would cease with facility construction. The large amount of impervious surfaces at site post-development will decrease the amount of precipitation infiltration into the soil. Instead of infiltrating, most of the precipitation will be directed to storm water detention basins, where some of

the water will infiltrate into the soil. The relative proportion compared to pre-development conditions has been calculated by the Dairy but is not precisely known.

It is the intent of the WPDES permit for Richfield Dairy to avoid impacts to human health and exceedences of groundwater and surface water quality standards. There are a number of standard WPDES permit conditions as well as additional restrictions specific to Richfield Dairy that provide additional levels of water quality protection beyond what is required of operations that do not require coverage under a WPDES permit. These restrictions have been adopted in part, in response to practices that have resulted in impacts in the past. While these restrictions and the WPDES permit do not completely eliminate the risk for impacts, they significantly reduce the potential for such impacts to occur.

In accordance with s. NR 243.13, Wis. Adm. Code, the permittee may not discharge manure or process wastewater pollutants to navigable waters from the production area, including approved manure stacking sites, unless all of the following apply:

- Precipitation causes an overflow of manure or process wastewater from a containment or storage structure.
- The containment or storage structure is properly designed, constructed and maintained to contain all manure and process wastewater from the operation, including the runoff and the direct precipitation from a 25-year, 24-hour rainfall event for this location (Adams County – 4.7”).
- The production area is operated in accordance with the inspection, maintenance and record keeping requirements in s. NR 243.19, Wis. Adm. Code.
- The discharge complies with groundwater and surface water quality standards.

The Department believes the permit as issued complies with ch. NR 243 and provides an adequate level of water quality protection. The Richfield Dairy facilities have been designed in a manner that exceeds NRCS Technical Standards to further reduce the potential of leaching. The manure storage facilities were also designed to exceed the 180-day storage capacity requirement, which also includes additional freeboard capacity to capture a twenty-five year rain event and prevent an overflow. It is important to note that an allowed overflow discharge to surface waters from the production area is very unlikely given the conditions contained within the WPDES permit. In addition, the only allowable land application discharges of manure, process wastewater or associated pollutants (e.g. nitrogen, phosphorus) from Richfield Dairy to surface waters are discharges of agricultural storm water (those discharges that occur after compliance with ch. NR 243, the WPDES permit and an approved nutrient management plan) which are not subject to WPDES regulation.

Storm water basins

The facility referred to in the plans as “storm water management pond #1” (see Section I.C.6) will receive low concentration contaminated runoff from the feed pad (after leachate and a significant amount of first flush runoff is collected). The pond will have a concrete liner that meets the minimum design criteria for a manure storage facility, although the runoff is expected to have much lower concentration of nutrients than does manure.

Storm water management ponds #2, #3 and #4 will receive only storm water, such as runoff from building roofs, not in contact with feed materials or manure. These ponds will have earthen bottom, designed in accordance with Wisconsin Construction Standard 1001 Wet Detention Basins, intended to substantially prevent infiltration.

A VTA is required to be designed to maintain overland flow, so infiltration is not a primary means of treatment. As part of the DNR’s review, Richfield Dairy’s VTA was required to have a minimum 2 ft thickness of soil that is 20% fines (above groundwater and bedrock). However, the DNR acknowledges a VTA does still have potential for infiltration. Because there is significant first flush capture (0.15 inches of precipitation) the runoff is expected to contain relatively low concentration of nutrients. All feed leachate and the 0.15 inches of first flush runoff will be collected and transferred to storage. Only the less contaminated remaining runoff (in excess of 0.15 inches of precipitation) will flow to the storm water management pond #1 and then to the VTA.

Leachate and manure collection and storage

See Section I.E. – Operations for additional information

The Department does not claim that the requirements of a WPDES permit, including the requirement to develop and implement an NMP, will guarantee that water quality will not be impacted. The proposed designs of the facilities and systems exceed minimum design standards and are expected to protect groundwater and surface water to the extent required by law, meaning the production site is not expected to cause exceedance of groundwater or surface water standards. While it is still possible such an event could occur, the DNR acknowledges the need to balance the level of protection with what is deemed likely and reasonable, particularly in light of codified requirements in ch. NR 243. Only limited data exists on failure rates of manure storage impoundment liners, but the data indicates some level of protection above the minimum is appropriate for higher risk sites, such as this one. The DNR believes an appropriate level of additional protection is provided by the proposed designs. In addition, the Department has added a requirement for the permittee to conduct leak detection and groundwater monitoring as part of the WPDES permit.

Richfield Dairy has developed an emergency response plan and employee training plan to address potential spills, storage facility overflows, and other unexpected events from both the CAFO production area and land application areas. This plan was reviewed as part of the WPDES permit process. The advance planning associated with an emergency response plan can help to minimize or altogether avoid environmental impacts associated with unexpected problems.

IV.A.1.e Production site Groundwater quality & quantity

The impacts from the Dairy's wells are overstated as the Dairy have been limited to withdrawing 52.5 MGY per the ALJ decisions dated September 3, 2014.

Groundwater quality

The proposed Richfield Dairy is located in a region with very productive groundwater aquifers. The aquifers consist of glacial sands and gravels that are estimated to be up to 170 feet thick at the property and underlying Cambrian-age sandstones of the Mt. Simon Formation that are estimated to be about 300 feet thick at the property. This region is often referred to as the Central Sand region and/or the Central Sand Plain of Wisconsin.

Because of the porous nature of the sandy soils at the Richfield Dairy site and the potential for groundwater impacts associated with potential leakage from manure and process wastewater handling structures/systems at the site, groundwater monitoring is warranted at the Richfield Dairy production area. The DNR recommends that groundwater around the manure storage lagoons be monitored for leaking using monitoring wells constructed as per chapter NR 141, Wis. Adm. Code.

The permittee has designed some production area structures above current design standards. The proposed designs of the facilities and systems exceed minimum design standards and are expected to protect groundwater and surface water to the extent required by law, meaning the production site is not expected to cause exceedance of groundwater or surface water standards.
Richfield Dairy has designed the manure storage facilities to exceed the 180-day storage capacity requirement, which also includes additional freeboard capacity to capture a twenty-five year rain even and prevent an overflow. However, given that the sandy soils present at the production area are porous in nature, there is an increased risk of groundwater impacts at the site. The Department has added a requirement for the permittee to conduct leak detection and groundwater monitoring as part of the WPDES permit. The monitoring requirements are warranted to determine if manure and process wastewater structures/systems have been constructed and are operated properly.

Additional information can be found IV.A.4.b.

Groundwater quantity

Whenever a well is operated, an area of localized groundwater drawdown develops. This “cone of depression” is a radial zone around the well in which groundwater levels drop from pre-pumping level. The size of the zone of groundwater decline is related to the geologic conditions, the pumping rate of the well, and the duration of pumping. The Dairy plans to pump groundwater year-round, with pumping limited to an annual average of 138 gpm, which equates to 72.5 MGY, and limited to 21.6 million gallons in any 30-day period. Pumping rates are expected to be somewhat higher during the summer (up to 250 gpm) for cooling and slightly lower during the remainder of the year.

Modeling from SSPA (described in Section IV.A.4.b) predicts that the long-term water table drawdown at the production site will be 1.2 feet. Drawdown at the nearest existing private well, approximately 400 feet west of the dairy wells, is expected to be 1.4 feet. Both drawdown levels are for pumping at the maximum annual rate. For the immediate vicinity of the dairy, including the nearby private well, water table drawdown for the maximum approved *monthly* pumping rate was also assessed using the Theis analytical method. The Theis method is useful to analyze water table drawdown over relatively short distances and time periods in relatively homogeneous aquifer systems like the one near the dairy production area.[2] The Theis method indicates that for the maximum approved monthly pumping limit of 21.6 million gallons, drawdown at the production well is expected to be 31.3 feet, and drawdown at the private well is expected to be 4.8 feet. By comparison, for 30 days of pumping at the maximum approved *annual* pumping rate, drawdown at the production well is predicted to be 8.6 feet, and drawdown at the nearby private well is predicted to be 1.3 feet.

The other high capacity wells in the area also cause water table drawdown in the vicinity of the dairy productions area. SSPA modeling estimates that existing irrigation wells in the vicinity have cumulatively caused a steady state water table drawdown of 2.8 feet at the dairy site. Because irrigation pumping is seasonal, actual water table drawdowns in the vicinity would be greater than average during the summer months and lower during winter months.

[2] Note: The Theis method utilizes several assumptions which make it an inappropriate tool for analyzing drawdown at distances more than several thousand feet or time periods greater than a couple months. For example, Theis assumes zero recharge to the aquifer and cannot account for aquifer heterogeneity or water received from or lost to surface water features. Errors due to these limitations increase with increased analysis time and with distance from the pumping well.

IV.A.1.f Production site Air quality

Animal agricultural operations generate odors and air pollutants. When localized and insignificant, these odors and air pollutants pose few problems. If enough animals are concentrated together in a small area, air emissions may cause human health and environmental concerns.

Airborne contaminant emissions emitted from CAFO's or other types of animal agricultural operations, include gases and particles. Air quality concerns have focused primarily on ammonia (NH_3), hydrogen sulfide (H_2S), two toxic air pollutants, as well as odors, particulate matter (PM), volatile organic compounds (VOC), and greenhouse gases (GHG). Diesel exhaust PM emissions from semi-trucks, manure spreading, and other miscellaneous farm operations could also be associated with animal agricultural operations.

Emergency generators, other stationary diesel or biogas engines and other combustion sources, such as dryers, will emit pollutants, too. Criteria pollutants (oxides of nitrogen (NOx); carbon monoxide (CO); and sulfur dioxide (SO2)) and incomplete products of combustion are also emitted and formed from the combustion of diesel, biogas or other fuels.

In addition to primary emissions, certain air pollutants are formed through chemical processes in the atmosphere known as secondary formation processes. The secondary pollutants have significant effects. Ammonia reacts with SO2 and nitrogen oxides (NOx) to form PM2.5. VOC and NOx react to form ozone. Nitrogen containing compounds such as ammonia and NOx result in increased nutrient loading and acidification of soils and waters.

Both quantity and the types of air contaminant emissions from animal agricultural operations are challenging to estimate, making off-site air quality impacts difficult to predict. This is due to diurnal and seasonal temperature variation, varying number and type of animal species present (which may change over time), type of housing and manure handling system, feed type, and chosen management practices.

Regulatory dispersion modeling is predicated on the steady-state nature of the release. Gaussian plume models have been developed to replicate monitored concentrations attributed to industrial or commercial operations, for example a large industrial boiler for generating steam and/or electricity. The release of farm emissions comes from locations (i.e. barns, lagoons) that are unlike a smoke stack. These "fugitive" emissions are able to be modeled, but there is more uncertainty associated with establishing release parameters. The time-varying nature of farm emissions is even more difficult to model. Regulatory models generally assume steady-state emission generation. This implies that over the course of one hour, the emission rate will not significantly change, and that any changes from hour-to-hour are under the control of the operator. Farm

emissions vary between hours, within a given hour, and more importantly this variation is chaotic and unpredictable.

Despite the variability of emissions from animal agricultural operations, the nitrogen balance (and ammonia as a part of the balance) has been studied extensively in dairy operations which have integrated cropping systems. Nitrogen excretion from animals varies based on nitrogen feed rates, the nutritional needs of the dry or lactating cows, and how much nitrogen ends up in milk. In Wisconsin and elsewhere, research points to an average annualized total nitrogen loss of 15 percent from freestall housing and losses of incoming nitrogen into uncovered manure storage from 10 to 30 percent loss of nitrogen as ammonia. Estimates based on farm component ammonia losses are presented in the table below. Wisconsin DNR is currently working with an agricultural waste advisory group to examine and recommend beneficial practices that reduce ammonia and hydrogen sulfide air emissions and will work for Wisconsin farms.

The facility is proposing practices which are expected to mitigate air emissions. This includes a floating geomembrane waste facility storage cover combined with a biofilter treating exhaust air from under the cover. Covering the waste facility storage with a properly designed geomembrane cover may reduce air emissions and odors by 90% from the waste storage facility. Appropriate land application techniques should be combined with waste facility storage covers to ensure that air contaminants (and beneficial nutrients) which are prevented from volatizing with waste facility covers are not lost during the land application process.

Wisconsin's fugitive dust rule, s. NR 415.04, Wis. Adm. Code, establishes general limitations on fugitive dust and sets specific precautions for limiting fugitive dust emissions. Examples of fugitive dust from Richfield Dairy include particulate from grain and feed handling and dust from truck traffic. Richfield Dairy will reduce the impact of roadway dust through their plan to apply water to unpaved roads during construction and then to pave roadways with asphalt.

The proposed facility, as with any source of air pollution, is required to evaluate existing information and determine its air emissions, and comply with any air regulatory requirements that apply. The Department also believes it does not have the authority to require air quality monitoring.

IV.A.1.g Production site Flora

Impacts to the flora at the production site should be minimal since the site has been constructed on land that was formerly used to grow agricultural crops. The flora acclimated to these land use practices, agricultural crops and weedy annual and perennial plants, are capable of tolerating these disturbed conditions. In the short-term, the land use change at the CAFO site will not alter the associated flora significantly in the surrounding area since the primary land use in the area is

agricultural based. Over the long-term, agricultural crops will still be a dominant in the area in addition to the associated weeds as agriculture is the dominant type of land use in the immediate and surrounding area of the CAFO.

IV.A.1.h Production site Fauna

The presence of Richfield Dairy will tend to maintain the rural, agricultural character of this area as rural residential development would likely not occur in this area. Agricultural open lands do support common species of wildlife. Occasional visits/use by mobile rare species such as whooping crane or bald eagle may occur but will not be negatively impacted by such use.

The potential greatest impact to wildlife species would be the occurrence of a large manure spill at the facility. Manure spill impacts may include: high ammonia concentration, high phosphorous concentration, bacterial contamination, oxygen depletion, nutrient enrichment which promotes excessive vegetative growth which can eventually lead to oxygen depletion by aerobic organisms breaking down the decaying vegetation.

IV.A.1.i Production site Rare species

No impacts to listed species are expected as the NHI query indicated that no rare species were present within the project area or surrounding 1-mile radius.

IV.A.2 Sand and soil borrow and disposal sites

All fill and topsoil for this project grading and construction was obtained from within the construction site. Topsoil will be removed prior to construction, temporarily stockpiled at two sites within the property boundary during construction, and then used on site as needed. It is anticipated that all stockpiled topsoil will be used at the farm site. Appropriate erosion control measures will be taken to ensure that any runoff from exposed and stockpiled materials do not result in this material leaving the construction site.

IV.A.3 Manure spreading/irrigation sites

IV.A.3.a Manure spreading/irrigation sites-Topography

Manure spreading sites (fields) listed in the Richfield Dairy NMP are not expected to have any direct or long term effects on topography. Short term effects to field topography, however, will occur during spring or fall tillage or manure application activity (i.e. incorporation).

To address negative effects to topography caused by manure spreading, the NMP requires implementation of erosion controls to ensure all fields managed to meet Tolerable Soil Loss (T) for the rotation [NRCS 590 V.A.2]. Ephemeral field erosion is minimized or eliminated via BMPs (e.g., contour strips, filter strips, maintaining > 30% crop residue on soils after planting, and fall cover crops) [NRCS 590 V.C.1].

IV.A.3.b Manure spreading/irrigation sites- Soils

According to driller construction reports, groundwater depth near the production area and land application sites varies between 1 and 192 feet below the ground surface with 89% of the wells showing static water level in wells at 10 feet or greater below the ground surface. It indicates that there may be shallow groundwater in areas near land application sites. Under NR 243, there must be a two foot separation between the ground surface where manure is applied and groundwater as measured in a hole dug just prior to manure application. There is debate over whether this separation is adequate to protect groundwater in all circumstances. Research on this topic is ongoing.

The Department agrees that the Richfield Dairy NMP depicts planned manure spreading on many fields that contain sandy, highly permeable soils. These soils, in general, have a higher risk for leaching of nitrates and other pollutants to groundwater.

Manure spreading sites (fields) listed in the Richfield Dairy NMP are not expected to have any short or long term negative effects to soils because the project is required to comply with its NMP and WPDES permit requirements. These requirements are written to protect the physical, chemical and biological condition of the soil.

The NMP has been reviewed by the Department and determined to be in compliance with applicable NRCS 590 criteria and all NR 243 requirements. The NMP addresses the application and budgeting of nutrients (e.g., manure and process wastewater) for plant production and soil fertility on a field by field basis.

The NMP describes, in specific detail, crops, tillage, nutrient application rates, locations, and methods implemented in order to protect surface water and ground water resources while maintaining the physical, chemical and biological condition of the soil. The NMP requires implementation of soil erosion controls to ensure:

- All fields managed to meet Tolerable Soil Loss (T) for the rotation [NRCS 590 V.A.2].

- Ephemeral field erosion is minimized or eliminated via BMPs (e.g., contour strips, filter strips, maintaining > 30% crop residue on soils after planting, and fall cover crops) [NRCS 590 V.C.1].

- All nutrient applications consistent with NRCS 590 nutrient management criteria (yield goals attainable under average conditions) and soil fertility recommendations found in UW-Extension Publication A2809 [NRCS 590 V.A.1].

The NMP accounts for all nutrient sources, including soil reserves, commercial fertilizer, manure, organic byproducts, and crop residues to ensure proper utilization and protect water quality.

The NMP also describes liquid manure and process wastewater from the milking parlor will be pumped from storage lagoons into manure spreaders, and land applied. The project estimates manure applications will occur twice a month, for 3-4 day periods in May, July, October and November. This spreading will occur in spring before planting and fall after harvest or after harvest of alfalfa, wheat or other crops. In fall and spring, liquid manure will be injected as much as possible, or incorporated within 48 hours of application, whichever is safer. Incorporation will be completed using a disk till. In the summer, liquid manure is top dressed on alfalfa and applications will also occur on fields after wheat harvest.

The Richfield Dairy NMP contains several required nutrient / manure management practices that, taken together, help reduce the risk for nutrient loading above crop fertility needs and further reduces the rate, scope and/or frequency of soils and water acidification. These practices include requirements to regularly test all crop fields for soil P, K, and pH levels and plan appropriate management practices to prevent over application of nutrients. Practices include lime applications to reduce soil acidification, immediate incorporation or injection of liquid manure, regular calibration of spreading equipment to ensure that application rates reflect the UW recommendations for crops selected and the planned application of manure in the spring, prior to crop establishment. Spring application prior to crop establishment on highly permeable soils reduces the risk for N mineralization and leaching from applied manure as opposed to fall manure applications. The NMP also includes detailed manure spreading and soil restriction maps of all fields covering more than 16,000 spreadable acres, including field and map verification procedures to ensure that all manure spreading setbacks are properly followed and s. 243.14 prohibited areas (shallow groundwater, conduits to groundwater) are followed or avoided when fields are utilized for manure application.

The NMP currently shows 98% of fields with planned manure applications have a calculated phosphorus index less than 1. Other planned fertilizer application rates and amounts, and applicable second year nutrient credits from manure and

legume sources are currently included in the NMP on a field specific basis, to prevent over application of nutrients.

Approximately 95% of fields in NMP are comprised of sandy, highly permeable soils and fields. Sand soils, by definition, have a much lower soil erosion risk and corresponding P delivery risk to surface waters compared to silt loams or silt-clay loam or loess type soils found in other parts of the state because they infiltrate water rapidly. Given these facts, if cooperating growers follow different nutrient application rates or practices than shown in NMP, these changes may increase P Index calculation scores on some fields, but the department does not believe such changes will increase PI scores significantly to result in exceeding PI of 6 on any field in NMP.

Richfield Dairy is required to ensure the manure is applied at rates that do not exceed UW crop recommendations. Failure to revise plan with actual manure test concentration or achievable manure hauling rates may result in farm exceeding UW crop recommendations (for N or P).

Following UW nutrient application recommendations helps prevent over-application of nutrients and helps protect surface and ground waters of the state from environmental degradation. The underlying goal of the recommendations is to apply enough nutrients to the crop for optimum (not maximum) growth throughout the season. Because crop nutrient demands are not uniform throughout the growing season, an adequate supply must be available during the period of peak demand. The program defines the “critical” level as the cutoff between optimum and high soil test levels. The critical level determination within the UW recommendations is based upon the probability of yield increase to applied nutrients. If nutrient supply exceeds the critical soil test level, there is an increased risk of mobile nutrients moving into groundwater and surface water.

The UW crop recommendations were adopted by the department as regulatory/discharge limits via adoption of NR 151 and NR 243 performance standards. The standards are referenced within the proposed WPDES permit and all CAFO permitted farms must demonstrate compliance with these criteria. The UW recommendations are based upon years of peer reviewed agronomy/crop fertility, nutrient management and water quality research completed by UW faculty - http://www.soils.wisc.edu/extension/dir.php & http://www.soils.wisc.edu/soils/staff.php - at various UW Ag research stations - http://www.ars.wisc.edu/ - throughout the state, including the central sands region.

The UW Nitrogen (UW N) rate recommendations for corn are based upon soil organic matter, soil texture, growing degree days and yield potential of the soil. Please note corn for grain or corn for silage crops represent 30% of total acres within Richfield NM plan; all these acres have planned manure applications to meet corn crop needs using MRTN method. Recommendations for other crops

are based upon soil organic matter and yield goal. The N recommendations are supported by field studies where crop responses to various rates of nitrogen have been measured on soils typically used for production of various crops. N recommendations vary according to crop to be grown, soil characteristics and yield potential, and soil organic matter content. The UW N recommendations are not written to maximize crop production.

The UW N recommendations contain a specific section entitled: Managing nitrogen to avoid losses. This section explains nitrogen rate, nitrogen credits and soil test nitrate recommendations assume BMPs will be used to control nitrogen losses. The following BMPs are described in detail in this section to control nitrogen losses: (1) Nitrogen Rate, (2) Nitrogen Source, and (3) Nitrogen Timing. Many of these same BMPs will be used during manure applications planned by Richfield Dairy (e.g., following MRTN for all corn crop acres in plan; taking credit for manure and previous legume crops, applying manure in spring before crop establishment vs. fall application, regular testing of all manure sources applied to fields).

In addition, the NMP is required to include regular manure sampling (2x/month) and soil sampling (1x/4years) to determine appropriate application rates. It also contains requirement for revising the NM plan with this information on, at least, an annual basis. All NM plans and revisions must be developed and/or approved by a certified crop consultant.

The March 2014 Richfield Dairy NMP has been received by the Department. The only change in the NMP includes the spreading of liquid manure by New Chester Dairy onto 16 fields within the Richfield Dairy NMP. Reports within the Richfield Dairy NMP summarize the specific fields, amounts, application timing and method of the New Chester Dairy liquid manure applications (copies of reports available upon request). The applications of the New Chester Dairy liquid manure to the Richfield Dairy fields followed the practices within the 2014 New Chester Dairy NMP, which includes revised practices for applications of liquid manure in late summer or fall on sandy soils.

IV.A.3.c Manure spreading/irrigation sites- Hydrography & surface water quality & quantity

<u>Quality</u>
WPDES permitted CAFO facilities are required to adhere to stringent requirements. The Department believes the permit as issued complies with ch. NR 243 and provides an adequate level of water quality protection.

While discharges are allowed under the WPDES permit, the restrictions in the WPDES permit and Richfield Dairy's NMP are designed to minimize potential

impacts and ensure that groundwater and surface water quality standards are met.

The WPDES permit establishes application restrictions and BMPs designed to keep pollutants on the land. Through permit coverage, all land application activities must be done in conformance with a NMP. In most cases, once a parcel of cropland comes under a chapter NR 243 based NMP, there will likely be a reduction of pollutant runoff from that parcel of land. This is due to the fact that cropland not previously covered under a NMP will, through permit coverage, become subject to more (water quality) protective management practices required by the WPDES permit program. Manure applications cannot exceed crop need and must be made in a responsible manner. Facilities must observe manure application set back requirements from private wells, conduits to groundwater and within defined surface water quality management areas (SWQMS). Manure applications are restricted during snow covered and frozen ground conditions.

Richfield Dairy NMP (section 8.3) contains detailed field and map verification procedures that require the farm to check each field and map before planned manure spreading for any restricted or prohibited features, including conduits to navigable waters that may reside within or be adjacent to field boundaries. If found, spreading maps are required to be amended and such areas be avoided or have applicable setbacks followed during manure spreading (NOTE: if wetlands are found to be conduits to the stream via channelized flow, 25 foot setbacks – with injection or immediate incorporation - are required according to restriction map legend). Failure to complete these procedures may result in the department citing farm for WPDES permit violations related to NMP implementation and meeting NR 243 general and specific land spreading requirements.

Detailed information related to Richfield Dairy's NMP is located in section IV.A.3.b.

<u>Quantity</u>
The manure spreading/irrigation areas for the Richfield Dairy are located in existing agricultural fields, and most of these fields currently receive irrigation water from high capacity wells. No change in groundwater use on these fields is expected. As such, no surface water quantity changes are expected due to the manure spreading activities.

IV.A.3.d Manure spreading/irrigation sites- Groundwater quality & quantity

Groundwater quality

Central Sand Plains are vulnerable to groundwater contamination from agricultural chemicals. The threat to groundwater can be lessened if pest management and nutrient management strategies are used by all farmers. Managing manure according to a nutrient management plan as required under a CAFO permit will limit nitrate inputs to groundwater. It is assumed that lower application rates will result in less nitrate inputs to groundwater. Site specific groundwater monitoring of land application sites over a long period would be required to determine trends in nitrate concentration in response to nutrient management plans.

The DNR does not expect the proposed production site or land application sites to cause groundwater quality standards to be exceeded, or exacerbate (make worse) exceedences of groundwater quality standards that may already exist. The nitrate concentration in groundwater will reduce more slowly if nitrogen continues to be added to surface soils, by land application of either manure or liquid chemical fertilizer. However, nitrogen added via manure application is less leachable than nitrogen added via liquid chemical fertilizer.

According to driller construction reports, groundwater depth near the production area and land application sites varies between 1 and 192 feet below the ground surface with 89% of the wells showing static water level in wells at 10 feet or greater below the ground surface. It indicates that there may be shallow groundwater in areas near land application sites. Under NR 243, there must be a two foot separation between the ground surface where manure is applied and groundwater as measured in a hole dug just prior to manure application.

The Richfield Dairy NMP depicts planned manure spreading on many fields that contain sandy, highly permeable soils. These soils, in general, have a higher risk for leaching of nitrates and other pollutants to groundwater.

The permit as issued complies with Ch. NR 243 and provides an adequate level of water quality protection. Information on permit conditions that protect water quality can be found throughout this document. These permit conditions may actually reduce nutrient loading to groundwater and surface waters in the area. The risk for manure applications to cause contamination of groundwater or surface waters, via groundwater recharge, is effectively reduced by the following factors:

Manure vs. Commercial Fertilizer Properties

- In general, commercial N fertilizers have a higher risk for leaching nitrate nitrogen into groundwater than manure in sandy soils. Currently, commercial N is used to meet all crop nutrient needs for all acres within the Richfield Dairy NMP. Most of these N applications are currently not being applied consistent with the NRCS Standard and UW crop recommendations.
- Manure is primarily an organic source of N. Organic N is not immediately plant available (and leachable) and acts as a slow release fertilizer source for plants. Manure organic N must be converted by soil bacteria to a form that is immediately plant available (ammonium and nitrate). Ammonium-N does not bind tightly to soil particles, is highly soluble in water and leaches readily. Ammonium nitrogen can, under optimum conditions, quickly change to nitrate nitrogen (warm, moist, well aerated soils and with pH of 6.5 – 7.0).
- Conversion of manure organic N to plant available forms of N requires correct soil temperature (>50 degrees, ideal between 70-75 degrees) correct soil moisture and correct soil oxygen to occur. Conversion of organic N, however, is not an immediate or rapid process. It converts slowly over time during the crop growing season allowing for the applied N from manure to be utilized by established crops. This is key factor when considering risks for manure to cause N leaching into groundwater.

Timing and Method of Manure Application

- The Richfield dairy NMP shows that the timing of all planned manure applications occur in the spring or early summer months. All spring manure applications are planned within a short period (approximately 2 weeks) prior to crop establishment. All spring applied manure will be incorporated immediately. No manure applications are planned for fall or winter months. Applying manure N just before crop establishment in the spring, lowers the risk for N conversion and nitrate N leaching into groundwater, as manure, by definition, is a slow release N source compared to commercial fertilizer N (immediately plan available) sources. Incorporating manure immediately after application will help to further retain applied nutrients within the root zone of target crops. Established alfalfa crops are planned to receive surface manure applications in summer months without incorporation.

Irrigation

- The need for irrigation of sandy soils (and corresponding higher risk for leaching of applied nutrients) during spring months is less likely, or will not occur altogether, for the following reasons: in general, moisture levels found within sandy soils is adequate for crop establishment during spring months from snow/ice melt off, typical rainfall during spring months and lower soil and air temperatures versus summer months when higher soil

and air temperatures and less rainfall can dry out sand soils at faster rates/frequency and, thus, require irrigation for crop growth/development.

Sand Soil properties and Organic Matter

- Because sandy soils have less organic matter they retain less water compared to medium and fine textured soils. Without adequate moisture in sandy soil, conversion of manure organic N to inorganic plant available N is less likely or rapid compared to commercial N fertilizers.
- Manure applications to sandy soils will, over time, help improve sandy soil structure with more organic matter. More organic matter helps a soil, particularly sands, retain more water and this ability helps reduce the risk for leaching nutrients into groundwater. In addition, the Richfield Dairy NMP also has planned crop rotations that will help create more organic matter than current crops grown in the area, such as potato, sweet corn and snap beans. These crops include corn silage, corn grain, winter wheat and alfalfa. These crops all have large root systems that help increase organic matter in sandy soils, over time.

More Stringent and Enforceable Nutrient Management Regulations / Practices

- Some groundwater resources in proximity to Richfield Dairy fields are currently impaired for nitrates and a majority source for such impairment are current agricultural land use/activities. Richfield Dairy will be required, via WPDES permit and NR 243, to meet more stringent nutrient management requirements than current agricultural activities on the 16,429 acres within their NMP. Current agricultural activities in the area either do not have a NMP or do not follow the requirements of a NRCS 590 NMP. Nor are growers in the area required, by state regulations, to have a WPDES permit that regulates how, where and when they apply nutrients (commercial fertilizer) to their fields and discharge to waters of the state. Richfield Dairy proposed WPDES requires this farm to not only develop and implement the NMP, but also meet strict recordkeeping and reporting requirements. The land spreading and nutrient management practices and procedures as well as recordkeeping and reporting requirements within the NMP are all enforceable conditions via the proposed WPDES permit. Because Richfield Dairy is required to meet higher regulatory and recordkeeping standards for nutrient management than current growers in the area, the department believes fewer nutrients will enter groundwater than under current agricultural land use conditions.

Current Groundwater Conditions and Agricultural Land Use

- The department evaluated existing groundwater well sampling data for 2000-2011 years within each township and range that contained fields listed within Richfield Dairy NM plan. We found 16% (N= 169/1065) of all private well samples showed nitrate contamination above the enforcement standard of 10mg/L and 6% (N= 73/1065) exceeded 20mg/L. This amount

of contamination reflects current land use in the area (which is dominated by row crop agriculture. These operations either do not have NM plans or do not follow NRCS 590 NM plan requirements. No growers in the area use manure - a slow release organic based source of N to meet crop fertility. Bacterial sampling of private wells was also evaluated, but not considered relevant because sampling was completed only at time of well drilling and not after that time; the department does not consider these results representative of current levels of bacteria in these wells.

Compliance Record of Three Existing CAFO Farms that Applied Manure to Sands

- The department evaluated the compliance record of three existing CAFO permitted farms (Central Sands, Gordondale Farms and Ostrowski Farms) who have repeatedly applied liquid manure, over multiple years, to fields with sandy, highly permeable soils. We found no direct or circumstantial evidence that these three farms have caused any nitrate and bacterial contamination of drinking water wells, groundwater or lakes or streams from repeatedly applying manure to fields with sand soils over the multiple years they have applied manure to sand soils.

Pathogen Movement Risk associated with Sands

- The Department evaluated the risk for movement of pathogens (defined as bacteria, viruses and parasites that cause disease) within sand soils to groundwater associated with manure applications planned by Richfield Dairy. Land application of manure can contaminate groundwater with pathogens where *groundwater is vulnerable to contamination* and *where conditions allow pathogens to survive and sometimes thrive*. The unsaturated zone (the upper soil and sediment layers that have some water in pore spaces) can play an important role in slowing down pathogen transport and survival. This factor must be considered when determining the vulnerability of the aquifer to contamination, particularly with sands. Sand soils do not support ideal conditions for pathogen survival because they, by definition, have low organic matter and low moisture levels. Pathogens move easily in groundwater when pores and fractures in soil are full of water (referred to as saturated flow). Sands, compared to other soils, do not have fractures and do not support conditions for saturated flow, due to physical and permeability properties.
- In general, sand soils provide some filtering/attenuation of pathogens due to their physical and high oxygen content properties; aerobic decomposition of pathogens is more possible with sands vs. other soil types, provided conditions for pathogen movement is reduced or minimized. The department has experience with using sands in storm water and wastewater treatment systems for pollutant removal, including some pathogens. Sands have been used as part of on-site septic systems design to reduce risk for pathogen movement and to increase pathogen attenuation.

- Shallow depth to groundwater represents a higher risk to groundwater contamination from pathogens. Accordingly, the department evaluated static water levels for private groundwater well sampling data (2000-2011 years) for all wells located within each township and range that contained fields listed within Richfield Dairy NMP. For all private wells, the static water level, at time of construction, was found to be greater than 10 feet in depth. This measured distance to groundwater demonstrates there is an unsaturated zone between the field surface and groundwater. This zone helps reduce the risk for pathogen delivery to groundwater, especially when compared other soil types in the state that currently receive manure from CAFO farms and have known corresponding static water levels that are close to or at the surface (0-5 feet) or soils with shallow bedrock properties (karst). Last, the department recognizes that many factors, environmental and those specific to each species, control the survival and movement of pathogens once they reach groundwater and the interaction of pathogens with groundwater and aquifer materials is complex and not well understood.

Richfield Dairy NMP Requirements and Procedures

- The department approved NMP for Richfield Dairy has several items that help reduce risks for groundwater contamination, including:
  1. Procedures for evaluating fields before, during and after applications for restricted or prohibited features, to follow correct setbacks from restricted areas (i.e., wells, wetlands, streams or lakes) and to determine if any manure runoff occurs and for taking immediate corrective action if manure or process wastewater runoff, ponding is identified.
  2. Planned manure applications are set to not exceed crop nutrient budgets determined in accordance with NRCS 590 standard, UW crop recommendations, the WPDES permit and s. NR 243.14. All manure applications are required to be based upon current manure and process wastewater analyses, soil tests, and other sources of nutrients applied to a field.
  3. All spring manure applications are planned within approximately 2-weeks prior to crop establishment and followed by incorporation of applied manure. No manure applications are planned for fall or winter months. Applying manure just before crop establishment in the spring, lowers the risks for N conversion and then N leaching into groundwater, as manure, by definition, is a slow release N source compared to commercial fertilizer N (immediately plant available) sources.
  4. Second year credits are calculated for manure, legumes and other planned nutrient sources applied to fields.
  5. Daily recordkeeping of all manure and process wastewater applications to fields to track what was actually applied vs. planned.

6. Regular collection and analysis of representative samples of land applied manure and process wastewater.
7. Reviewing and amending the NMP on, at a minimum, annual basis to reflect any changes in operations over the previous year (including incorporation of previous years amendments to actual crops grown, nutrients applied, nutrient concentrations, etc.) and include projected changes for upcoming year.
8. Cover crops are planned on 145 out of 224 (65%) of fields; primarily following early harvest potato or sweet corn crops. Cover crops not only help control soil erosion, but also help scavenge residual nitrogen and prevent nutrient pollution of both surface and groundwater and help build soil organic matter, over time.
9. Procedures for manure applications to fields with high potential for N leaching to groundwater, soil temperature, application rate and timing restrictions. Such procedures require Richfield Dairy to either apply manure in the spring, or measure soil temperatures on fields and delay fall applications of manure until soil temperatures fall below 50 degrees F. All manure applications in NMP are planned for spring and early summer. No applications of manure are planned in late summer, fall or winter.

Other Conditions within the WPDES Permit

- The WPDES permit contains several restrictions that require Richfield Dairy to manage manure and also apply manure and process wastewater to fields in a manner that reduces risks for groundwater contamination. The restrictions include, but are not limited to:
  1. Manure and process wastewater applications may not cause fecal contamination of a well.
  2. Manure and process wastewater may not be applied within 100 ft of direct conduits to groundwater and within 100 ft of private wells.
  3. Land application practices shall maximize use of available nutrients for crop production, prevent delivery of manure or process wastewater to waters of the state, and minimize loss of nutrients and other contaminants to waters of the state to prevent exceedences of groundwater and surface water quality standards. Practices shall retain land applied manure and process wastewater on the soil they are applied with minimal movement.
  4. Land application practices shall not exceed crop nutrient budgets determined in accordance with NRCS 590 standard, WPDES permit and s. NR 243.14 and shall be based upon manure and process wastewater analyses, soil tests, as well as other sources of nutrients applied to a field.
  5. Manure or process-wastewater may not be applied to saturated soils, nor pond on application sites.
  6. Construct and then maintain at least 180 days of liquid manure storage.

7. The NMP shall be reviewed and amended on an annual basis to reflect any changes in operations over the previous year (including incorporation of previous year's amendments to actual crops grown, nutrients applied, etc) and include projected changes for upcoming year.
8. No surface applications of manure and process wastewater on frozen or snow covered ground, except in emergency.
9. Collect and analyze representative samples of land applied manure and process wastewater and use such sample results to guide application rates of manure and process wastewater to fields.

Groundwater Quantity

The manure spreading/irrigation areas for the Richfield Dairy are located in existing agricultural fields, and most of these fields currently receive irrigation water from high capacity wells. No change in groundwater use on these fields is expected. As such, no groundwater quantity changes are expected due to the manure spreading activities.

For additional information on groundwater quantity environmental effects refer to section IV.A.4.b.

IV.A.3.e Manure spreading/irrigation sites- Air quality

Wisconsin Administrative Code requires all sources of air emissions to regulate objectionable odors (s. NR 429.03, Wis. Adm. Code). This rule establishes general limitations on objectionable odor, defines the tests for what constitutes objectionable odor, and sets abatement or control requirements. Richfield Dairy has developed an odor management plan that identifies management practices that will be followed to reduce odor issues. These measures include conserving water and notifying neighbors before agitating or spreading manure.

IV.A.3.f Manure spreading/irrigation sites- Flora

If the nutrient management plan is implemented correctly impacts to the flora should be minimal since the acreage being used for land spreading is currently active agricultural land. These areas should continue to be cropped in conjunction with land spreading at appropriate times. Any changes in vegetation are not expected to be significant as a result of land spreading manure. With the addition of the manure, weedy species that thrive in high nutrient environments may increase but would likely be eliminated through the process of preparing the fields for future crops.

IV.A.3.g Manure spreading/irrigation sites- Fauna

Richfield has contracted to use over 16,200 acres of land for the project. Preserving and protecting Adams County agricultural land base will provide habitat to those wildlife species that have evolved and adapted to this particular land use. This open landscape is very important to wildlife species such as northern harrier, upland sandpiper and short-eared owl. Loss of agricultural land would have negative consequences to wildlife species such as ring-necked pheasant, white-tailed deer, vesper sparrow, mourning dove, horned lark and killdeer. Wildlife primary use of agricultural fields is for foraging for food, such as insects, weed seeds and waste grains.

The immediate project area and proposed land spreading sites are existing cropland and would be expected to provide habitat primarily for common animal species acclimated to farm operations. Since the farm and land spreading sites are currently used for agriculture, the proposed land use will not change significantly as a result of the issuance of the WPDES permit.

IV.A.3.h Rare species

There should be no impacts to any listed species found to occur within the project areas as the lands do not support the habitat or land conversion has already occurred through decades of farming.

IV.A.4 Area Impacts

IV.A.4.a Area Hydrography & surface water quality & quantity

<u>Surface Water Quality</u>
The potential for impacts on the water resources of the region from Richfield Dairy largely depends on the management of manure from cow to crop. The agricultural fields that will receive manure as part of the Dairy's nutrient management plan already receive manure and fertilizers. The nutrient management plan for the dairy will provide a level of manure management equal to or better than the current level of management on these fields.

Additional information can be found in section IV.A.1.d.

Potential water resource impacts associated with manure management are described in Section IV.A.3.c.

Surface Water Quantity

General Discussion

The impacts from the Dairy's wells are overstated as the Dairy has been limited to withdrawing 52.5 MGY per the ALJ decision dated September 3, 2014.

For the purposes of the environmental analysis, DNR considered the impacts of the Dairy's wells (this section), and the past, present and reasonably foreseeable cumulative impacts to water resources within the area influenced by Richfield Dairy's proposed high capacity wells (Section V.A.3). This review considered the potential environmental impacts to the wetlands, streams, lakes, and springs described in section III.A.1.e.

Groundwater Models

Potential impacts to surface waters were evaluated by primarily relying on two numerical groundwater models submitted to DNR. Numerical groundwater modeling is currently the best tool available for evaluating the long-term effects of groundwater withdrawals in a large, complex system. The two models used for the review were 1) a regional model of the Central Sands, modified to predict impacts from Richfield Dairy's wells, submitted by George Kraft of the University of Wisconsin-Stevens Point (referenced as the "Kraft" or "UWSP" model) and 2) a site-specific model created by S.S. Papadopulos & Associates and submitted by Richfield Dairy (referenced as the "SSPA" model). DNR evaluated the numerical depletion amounts predicted in the models to determine whether operation of the proposed wells would result in environmental impacts to the various surface water resources.

SSPA Model:

Richfield Dairy provided DNR with numerical groundwater modeling results and an evaluation of the effects of groundwater pumping on surface water and groundwater in the vicinity of the proposed wells (S.S. Papadopulos & Associates, 2012).

The *MODFLOW* model provided by SSPA is based on the calibrated regional groundwater model of the Central Sands developed by Mechenich and others (2009), with site-specific refinements. Model grid spacing ranged from 125 feet in the vicinity of the Dairy to 1000 feet near the boundaries of the model. The site-specific model was constructed with model layers for the upper sand and gravel aquifer (2 model layers) and for the lower sandstone aquifer (1 model layer). Hydraulic conductivity in the upper aquifer was zoned to reflect different geology east and west of the terminal moraine and modified to produce the best representation of actual conditions using *PEST* parameter estimation software. Pleasant Lake and Lake Burnita were modeled using the *MODFLOW* lake package. High capacity wells with pumping data for the period of 2007-2011 were included in the model. Pumping from existing irrigation wells was explicitly

modeled, with an annual average irrigation water loss of 20% (actual water losses are much higher during the irrigation season, and low during the rest of the year). In effect, the modeled net recharge reduction from existing irrigation wells was approximately 2 inches per year on irrigated acreage. Two inches of recharge reduction is similar to the change in recharge from non-irrigated to irrigated conditions identified in work by Kraft and others, 2012. For the purposes of the model, the proposed Dairy wells were assumed to have 100% water loss.

The SSPA model was run under three scenarios: background conditions (no pumping), current conditions (pumping from all existing irrigation wells), and existing irrigation pumping plus 72.5 MGY withdrawal from the Dairy. The first two scenarios were run at steady state (infinite time). The simulation of the effects of pumping at Richfield Dairy was run in a transient mode, which allows observation of the effects of pumping over time.

SSPA's "current conditions" scenario incorporates high capacity wells active in 2011 that had available pumping records, generally for 2007-2011. However, in the northern half of the model domain (an area of about 200 square miles), where Richfield Dairy and potentially-impacted surface waters are located, roughly 13 high capacity wells appear to be missing from the analysis. Nine of these wells are irrigation wells, two are Coloma's municipal wells, and one is an artesian well supplying water to a fish farm. The added pumping from these wells would increase total pumping in the northern part of the model by 7%. Because of this, actual cumulative impacts from wells installed through 2011 should also be slightly greater than modeled. In addition, twelve new high capacity wells have been approved in the Little Roche a Cri, Fordham, Chaffee, and Tagatz Creek watersheds between 2012 and present. Pumping from these wells will also increase cumulative impacts over the modeled amount.

The "current conditions" model scenario was run using a steady state simulation. It depicts impacts that would exist if the system were given infinite time to equilibrate. In reality, some wells were installed recently, and not all impacts have manifested themselves at water bodies distant from the pumping. Additional calculations from SSPA indicate that, currently, Pleasant Lake and Chaffee Creek are experiencing approximately 83% of the total impact of wells existing in 2011, and Fordham Creek is experiencing 89% of the total impact. (Charles Andrews contested case hearing testimony, June 25, 2013 and December 16, 2013)

During the Richfield Dairy pumping scenario, no water withdrawal was simulated from the existing irrigation well on the property, because this well would be abandoned prior to operation of the Dairy wells. Model results were reported at 5 and 25 years of operation. DNR's evaluation of impacts focused on the 25-year pumping scenario. After 25 years of pumping, the modeled system had equilibrated until groundwater drawdown was no longer increasing significantly with time (see graph of Pleasant Lake drawdowns modeled over time, p. 17 of

SSPA, 2012). Stream depletion was also near steady state, with 84% or more of the Dairy's pumping derived from surface water rather than aquifer storage.

UWSP Model:

Dr. George Kraft submitted a numerical groundwater model of impacts to Pleasant Lake and area streams from the Richfield Dairy wells. The model is a version of the modeling referenced in Kraft & Mechenich (2010), which has been calibrated and peer reviewed. Model results were submitted for the dairy's initial expected annual average groundwater pumping of 52.5 MGY and at 131.2 MGY, the initially-approved pumping rate.

The model was run until steady state conditions developed. Drawdown results were linear with pumping rate, so DNR also evaluated Pleasant Lake drawdown predicted by the UWSP model for the dairy's currently-approved pumping rate of 72.5 MGY.

In the UWSP model, existing irrigation pumping was modeled as a 2-inch reduction in recharge on irrigated acreage, and individual existing wells are not explicitly modeled. Lakes were represented as outcroppings of the water table, which is roughly the case for seepage lakes in this area. Because of the regional scale of the base model, headwater areas of streams were not always represented realistically (for example, the model shows dry cells where flow is actually present in the headwaters of Chaffee Creek). All the streams of concern are headwater streams, so using the UWSP model to evaluate stream impacts was problematic. DNR used the UWSP model to evaluate impacts on Pleasant Lake from existing wells and the proposed dairy wells, and also to check whether the SSPA model results were realistic.

<u>Wetlands (described in section III.A.1.e)</u>

The SSPA model predicts that a water table drawdown of less than 1 inch will occur at the Little Roche a Cri headwater wetlands after 25 years of pumping at Richfield Dairy. Any alteration to groundwater regimes will have an effect on groundwater-dependent wetlands and exacerbate any wetland conversion that has already occurred due to existing pumping; however, the effects are not expected to be significant for drawdowns of less than one inch.

The Pleasant Lake wetlands (Turtle Bay, Camp Fairwood, Duck Box) were evaluated to determine if the projected ~2-inch drawdown would significantly affect their functional values and overall wetland quality. Potential impacts to wetlands were reviewed based on the current morphology and water regime of the wetlands; the review considered human use, wildlife habitat, fish and aquatic life, shoreline protection, storm and floodwater storage, water quality, and groundwater processes. Based on existing conditions, the calculated two inch

drawdown caused by the proposed Richfield Dairy's wells will not significantly change the current condition of the wetlands near Pleasant Lake.

The Turtle Bay wetland is in the southwest corner of Pleasant Lake. The wetland is connected to the lake and includes an open-water component that was apparently created or enlarged by past dredging. The wetland currently supports a diverse community of plants and animals; it is also documented to have a population of Eurasian Water Milfoil, an undesirable invasive. Because Pleasant Lake fluctuates naturally, the species present are adapted to fairly large changes in water level. A decrease of two inches in the level of the lake over 25 years would gradually expose less than a foot of lake bed beyond current conditions. Thus, the projected drawdown associated with the dairy is not expected to impact the current state of the wetland. An August, 2013 on-site evaluation by DNR staff supports this conclusion.

The wetland at Camp Fairwood is an ephemeral pond roughly 500 feet south of Pleasant Lake. SSPA modeling predicts long-term drawdown due to the Dairy's wells to be 1.6 ± 0.26 inches. DNR evaluated whether this amount of drawdown would impact the function of the wetland as habitat for the flora and fauna currently utilizing it. The free-floating plant species present and the timing of the pond's natural dry down period (in late June) are both indicative of water depths much greater than 1.6-2 inches. Therefore, the potential drawdown would not have a negative effect on the flora and fauna utilizing the wetland.

The Chaffee Creek calcareous fen is currently an intact, high-quality wetland. Drawdown of 0.25 inches from the Dairy's wells after 25 years is modeled by SSPA. Based on review of the site's current plant community and topography, the DNR's determination is that an additional 0.25 inches of drawdown will not significantly change the hydrology or plant species composition of the wetland. A gradual decrease in water level on this scale would likely cause the calcareous fen to shift slightly downslope, by less than a couple of feet, with fen plants becoming established on the exposed spring pond margin.

<u>Springs (described in section III.A.1.e)</u>

SSPA model results show that around 15% of the Dairy's total pumping would be diverted from the Chaffee Creek headwater area. This is essentially in agreement with George Kraft's modeling, which estimated that 11% of the water pumped by the Dairy would be diverted from Chaffee Creek (Kraft, October 7, 2011 letter to Eric Ebersberger).

For the purposes of analyses of flow reduction impacts to the spring, spring flows were based on available information, including past flow measurements, modeling results, and flow measurements for Chaffee Creek at County Highway CH, less than 1 mile downstream of the headwater spring, available from 2005 to present. Average spring flow is estimated to be about 1.7-1.8 cfs.

Flow reduction caused by the Richfield Dairy at the Chaffee Creek headwater/spring area is modeled to be around 0.05 cfs, and water table drawdown is modeled to be 0.25 inches. This represents 2.9% of Chaffee Creek's headwater baseflow of 1.7 cfs (baseflow from the SSPA model scenario that included existing pumping impacts). The 0.05 cfs reduction can also be stated as 3.5% of the average measured flow (1.8 cfs) minus the modeled irrigation impacts (0.33 cfs).

Ch. NR 820 states that "the Department may not approve a proposed high capacity well if it is predicted to result in a reduction in flow from a spring such that the spring does not flow at one cfs or greater at least 80% of the time or that will reduce the average annual flow from a spring by greater than 20%." The predicted flow reduction of 0.05 cfs, or 3-4%, does not meet these criteria for denying a high capacity well application. The level of flow reduction and water table drawdown predicted will not adversely impact the fish habitat or the species in the Chaffee Creek spring pond or associated wetland area.

Streams (described in section III.A.1.e)

The trout streams whose headwaters are within 5 miles of Richfield Dairy are Little Roche a Cri, Fordham, Chaffee, and Tagatz Creeks. Groundwater withdrawal from the Dairy will slightly decrease groundwater flow to headwater areas of nearby streams and may cause a corresponding slight reduction in trout zone length. SSPA provided model results for flow reduction at locations with available flow data, and in the headwater areas of trout streams near the Dairy. The modeled baseflow reductions after 25 years of pumping ranged from 0.01-0.1 cfs, or 0.3%-2.9% of modeled streamflow[3] (Table 2). Any changes in stream length due to the Dairy are small enough that modeled stream lengths are unchanged from background conditions. Given the small amount of flow reduction, the degree of change that could be reasonably expected would not be significant to the health of the stream or fishery.

[3] Note that percent reductions are taken from modeled baseflow in the SSPA scenario including irrigation pumping. In Supplemental Environmental Assessment Table 1, percentages were taken from average measured flows. The reason for the change in calculation method here is because measured flows were not available for most headwater reaches.

Streams Near Richfield Dairy (within 5 miles)				Baseflow reduction due to Richfield Dairy	
Stream	Location	Avg Measured Flow (cfs)	Modeled Baseflow (cfs)	cfs	%
Little Roche a Cri	Unnamed Trib (Sec 19-20 T18N R7E)	NA	0.9	0.01	0.7%
	Ditches (Sec 16 + 9 T18N R7E)	NA	5.7	0.05	0.9%
	10th Ave.	34	35.1	0.10	0.3%
Fordham	6th Ct.	NA	1.8	0.02	1.0%
Chaffee	CTH CH	1.8	1.7	0.05	2.9%
	CTH JJ	14	14.3	0.06	0.4%
Tagatz	4th Ave.	NA	4.8	0.05	1.0%
	near Westfield	7.6	6.0	0.06	1.0%

Other Streams in Model Domain (> 5 miles from Richfield Dairy)				Baseflow reduction due to Richfield Dairy	
Stream	Location	Avg Measured Flow (cfs)	Modeled Baseflow (cfs)	cfs	%
Campbell	CTH A	2.4	2.3	0.00	0.0%
Carter	CTH G	2.5	3.3	0.01	0.3%
Lawrence	at Eagle	20	17.5	0.01	0.1%
	near Westfield	16	14.7	0.01	0.1%
Mecan R.	CTH GG	13	12.3	0.01	0.1%
Neenah	CTH G	0.8	1.0	0.00	0.1%
	CTH A	>42	31.4	0.00	0.0%
Schmudlack	4th Ave.	1.2	2.0	0.00	0.2%
S Br Wedde	CTH JJ	7	2.2	0.01	0.3%

Table 2 Streamflow Reductions due to Richfield Dairy Pumping (SSPA model)

Lakes (described in section III.A.1.e)

Pleasant Lake is the lake that is expected to experience the greatest impact from the Richfield Dairy wells. Modeled predictions of water level drawdown at the lake were submitted by George Kraft and by SSPA (2012). Both models predicted drawdown of about 2 inches. (Kraft predicted steady state drawdown at Pleasant Lake to be about 2.2 inches, and SSPA predicted the 25-year drawdown to be 1.6 ± 0.26 inches).

The effect of the Dairy's pumping on Pleasant Lake will be a continuous small reduction in water level imposed over the hydrograph of the lake (seasonal, annual, and decadal water level fluctuations). It is very likely that Pleasant Lake is currently experiencing water level declines of a foot or or more due to existing irrigation pumping. Two inches of drawdown represent about 5.5% (4-11%) of additional impact of the entire hydrograph using Kraft's existing drawdown estimate of 3 feet (1.5-3.8 ft.).

As described in Section III.A.1.e, Pleasant Lake experiences natural seasonal water level fluctuations of approximately 0.5 to 1 foot and year-to-year fluctuations of several feet. The natural existing water level fluctuations indicate that lake ecology is adapted to changes in lake level of several feet and is unlikely to be extremely sensitive to small water level changes. The Department considered this and other factors (potential changes in lake volume, loss of groundwater input, surface area, and existing vegetation) to determine the significance of the projected drawdown.

Changes in the lake volume and surface were assessed using the minimum recorded water level as a baseline. The modeled drawdown would constitute a percent change in lake surface area and volume of less than 2%. (Evaluation of the bathymetry of Pleasant Lake and historical air photos indicates that for historically-observed lake levels, a one-foot change in lake elevation results in a change of 2 - 5.3 acres in the surface area of the lake.)

Reductions in groundwater inputs to a seepage lake have the potential to impact water quality, chemistry, temperature, and aquatic life, including aquatic vegetation and fisheries. The Department evaluated data regarding lake morphometry, water budget, water chemistry, aquatic and nearshore vegetation, and historic lake levels to determine whether the projected ~2 inches of additional drawdown and 1.5% reduction in groundwater inflow to Pleasant Lake could result in significant impacts. The projected water level drawdown represents a small percentage change in lake area and volume. Therefore, changes in lake clarity, temperature or dissolved oxygen concentrations due to changes in lake depth are unlikely. Because Pleasant Lake's water budget is dominated by groundwater and well-buffered, the expected change in groundwater input is small enough that no measureable changes to lake chemistry or clarity are expected.

Department staff reviewed information on aquatic vegetation gathered by UW Stevens Point investigators. Pleasant Lake currently supports little emergent vegetation of the type that would be most susceptible to small changes in lake level. Shoreline ecology has been significantly altered by existing human development. It is not expected that the lake's plant communities will experience significant changes due to pumping from the proposed wells. Because habitat (chemistry/temperature/vegetation) will not be significantly altered, it is not expected that there will be any impacts to the fishery, including

the banded killifish, a state Special Concern species found in Pleasant Lake (discussed in Sections III.A.1.e and III.A.1.h). It is very unlikely that the projected drawdown due to operation of the dairy's wells would result in measurable changes or significant impacts to aquatic plant life, wildlife, or water temperature.

DNR wetland staff evaluated the impact of the projected ~2-inch reduction in lake level on wetlands adjacent to Pleasant Lake, as described in the Wetlands section, above. This review concluded that the projected drawdown would not result in adverse changes to current conditions of the wetland areas or shallow areas of Pleasant Lake and would not likely cause Turtle Bay to be permanently cut off from Pleasant Lake.

IV.A.4.b Area Groundwater quality & quantity

Groundwater quality

Groundwater quality in the area is generally considered fair to good. However, nitrate levels are high in many wells, with 24% exceeding the Enforcement Standard threshold of 10 mg/l (ppm). Due to the preexisting nitrate issue at the site, the high capacity well application indicates that the dairy wells will be completed in the sandstone bedrock aquifer.

According to driller construction reports, groundwater depth near the production area and land application sites varies between 1 and 192 feet below the ground surface with 89% of the wells showing static water level in wells at 10 feet or greater below the ground surface. It indicates that there maybe shallow groundwater in areas near land application sites. Under NR 243, there must be a two foot separation between the ground surface where manure is applied and groundwater as measured in a hole dug just prior to manure application.
The Richfield Dairy NMP depicts planned manure spreading on many fields that contain sandy, highly permeable soils. These soils, in general, have a higher risk for leaching of nitrates and other pollutants to groundwater.

Increased concentrations of nitrates in the groundwater throughout the area are not likely to occur as a result of the issuing a permit to Richfield Dairy. Richfield Dairy will be required, via WPDES permit and NR 243, to meet more stringent nutrient management requirements than current agricultural activities on the over 16,000 acres within their NMP. Current agricultural activities in the area either do not have a NMP or do not follow the requirements of a NRCS 590 NMP, including UW crop recommendations. Nor are growers in the area required, by state regulations, to have a WPDES permit that regulates how, where and when they apply nutrients (commercial fertilizer) to their fields and discharge to waters of the state. The Richfield Dairy proposed WPDES permit requires the farm to not only develop and implement the NMP, but also meet strict record keeping and reporting requirements. The land spreading and nutrient management

practices and procedures as well as record keeping and reporting requirements within the NMP are all enforceable conditions via the proposed WPDES permit. Richfield Dairy is required to meet higher regulatory and recordkeeping standards for nutrient management than current growers in the area.

It is the intent of the WPDES permit for Richfield Dairy to avoid impacts to human health and exceedences of groundwater and surface water quality standards. There are a number of standard WPDES permit conditions as well as additional restrictions specific to Richfield Dairy that provide additional levels of water quality protection beyond what is required of operations that do not require coverage under a WPDES permit. These restrictions have been adopted in part, in response to practices that have resulted in impacts in the past. While these restrictions and the WPDES permit do not completely eliminate the risk for impacts, they significantly reduce the potential for such impacts to occur.

There are a number of existing WPDES permitted facilities located within the Central Sands. The Department evaluated the compliance record of three existing CAFO permitted farms (Central Sands, Gordondale Farms and Ostrowski Farms) who have repeatedly applied liquid manure, over multiple years, to fields with sandy, highly permeable soils. The Department found no direct or circumstantial evidence that these three farms have caused any nitrate and bacterial contamination of drinking water wells, groundwater or lakes or streams from repeatedly applying manure to fields with sand soils over the multiple years they have applied manure to sand soils.

Additional information regarding the facilities NMP can be located in section IV.A.3.b.

Groundwater Quantity

The sand and gravel and sandstone aquifers in the area of the Richfield Dairy are each highly productive, and the aquifer is generally unconfined. Water level drawdown per volume of water pumped is low. The proposed project area has a relatively high water table (around 35 feet below ground surface) and a high groundwater recharge rate. Due to these factors, large quantities of groundwater are readily available.

Water withdrawals associated with the proposed wells do not pose a risk of significant adverse impacts to neighboring wells if operated at the maximum annual rate of 72.5 MGY and 30-day maximum rate of 21.6 million gallons.

Additional information is located in Section IV.A.1.e.

IV.A.4.c Area Air quality

According to 2002 National Emission Inventory data, Wisconsin contributed 14% of all dairy-related ammonia emissions in the United States.

The maximum air concentrations expected from Richfield Dairy will occur along the property line, and the magnitude of the impact will decrease with distance. Due to the fugitive nature of the emissions combined with the short release heights of the barn fans, the impact of the air emissions from Richfield Dairy should be indistinguishable from background conditions within 10 kilometers from the site.

Ammonia emissions can contribute to secondary formation of $PM_{2.5}$ (particulate matter with 2.5 micrometer diameter or less) through complex chemical reactions taking place over several hours. $PM_{2.5}$ concentrations may increase in the area around Richfield Dairy, but the fugitive nature of the emissions combined with the short release heights will minimize the long-range transport.

Agriculture in general, and livestock operations in particular, are anthropogenic sources of greenhouse gas (GHG) emissions with well-established links to climate change. The July 2008 report of the Governor' Task Force on Global Warming reports that the agriculture sector is responsible for 9% of 2003 state greenhouse gas emissions. A 2006 report by United Nation's Food and Agriculture Organization states that the production of livestock contributes nearly 18% of worldwide GHG emissions through the production of commercial fertilizer, the production of grain for feed, land use changes, transportation emissions, and the direct emission of greenhouse gasses by animals, animal waste, and other production processes. The Governor's Task Force report includes several recommended policies for the agriculture sector on reducing GHG emissions. Among these recommendations are nutrient and manure management to reduce emissions of nitrous oxides and methane, and the production, capture and use of animal methane.

IV.A.4.d Area Flora

Direct impacts to the local area should be minimal since the majority of the lands are used for agriculture or are woodlands. The dominant flora in the area is comprised of common agricultural crops, associated weeds, and mixed woodlands. If the nutrient management plan is implemented properly, short-term effects to the flora should be negligible since management practices such as land spreading manure will occur on lands currently used for agricultural purposes and additional long-term significant impacts to the area flora are not expected.

IV.A.4.e Area Fauna

Richfield Dairy will be utilizing existing croplands that will protect and preserve the local agricultural land base. With the majority of Adams County being woodlands, long-term significant impact to local wildlife is not expected.

IV.A.4.f Area Rare species

There should be no impacts to any listed species found to occur within the project areas as the lands do not support the habitat or land conversion has already occurred through decades of farming.

Three state Special Concern species: Banded Killifish, Least Darter, and Tufted Hair Grass, are found in areas evaluated for environmental impacts due to water quantity reductions. DNR staff evaluated Turtle Bay and other shallow wetland areas of Pleasant Lake and concluded that the predicted water level reduction would not negatively impact habitat or aquatic life, including banded killifish. Fisheries staff also notes that it is likely that shoreline development and habitat degradation may have already had some impact on the species. Least darter and tufted hair grass are found in the vicinity of the Chaffee Creek spring pond/wetland. No significant impacts to either of these species are expected (see Sections III.A.1.e, III.A.1.j, and IV.A.4.a).

IV.B Socioeconomic environment

IV.B.1 Production site

IV.B.1.a Land use

The land use at the production site has changed from open agricultural land, to more intensive industrial agriculture use.

IV.B.1.b Zoning

There are no required or planned changes to current zoning as a result of this project.

IV.B.1.c Prime farmlands

No impact. Contact with the Adams County Land and Water Conservation Department revealed that prime farmland has not been identified in or near the project location.

IV.B.1.d Archaeological & Historical

There should be no effects or impacts on any archaeological or historical resources due to the project. There are no known resources on the production site or adjacent lands.

IV.B.1.e Light

Since the production site was changed from agricultural fields to a large CAFO, there will be significantly more lighting at this site which was not present in the past. This is needed to provide for safe operation during non-daylight times.

IV.B.1.f Noise

Normal operations will be conducted Monday through Friday with some activities taking place on the weekends during harvest time. Whenever possible, transportation will occur during daylight hours, unless unavoidable due to weather, the needs of the animals, or an emergency.

There would be additional noise and dust associated with the transportation of livestock, milk, feed, and manure. Truck traffic will be especially heavy during in the spring as the operation applies most of its manure and process wastewater prior to planting of crops and during crop harvest. There will also be some applications of manure that occur during the fall. Most truck traffic will occur during daylight hours. However, during crop harvesting, traffic will occur whenever necessary to bring in the crop. Vendors are instructed to follow standards related to truck routes and engine braking. Courtesy to neighbors' signs will be installed at property exits to remind drivers.

IV.B.1.g Visual

Because of the scale of the proposed operation, the physical changes at the site due to converting agricultural fields to animal housing, manure storage and process wastewater storage, and feed storage represented a change from the

open agricultural row crop landscape. While agricultural in function, Richfield Dairy appears to be an industrial site.

The production site facilities are visible from 1st Drive, Cypress Avenue, and 1st Avenue.

IV.B.2 Manure spreading/irrigation sites

IV.B.2.a Land use

Agriculture is the current land use at all of fields used by Richfield Dairy for manure spreading. The project will continue agricultural land use at these locations.

The Department has reviewed the NMP and determined it to be in compliance with applicable NRCS 590 criteria and all NR 243 requirements. Additional information regarding the NMP can be found in Section IV.A.3.b.

The project's manure spreading activities will increase the risk for the negative socioeconomic impacts listed immediately above to people who live or work nearby manure spreading sites. Compliance with the NMP and manure spreading requirements listed above is expected to reduce or eliminate most negative socioeconomic environmental impacts caused by the project.

IV.B.2.b Zoning

The Department did not complete a detailed review to assess potential zoning changes associated with the projects manure application fields. The Richfield Dairy NMP contains maps and other documents that describe manure spreading locations (fields) and sizes (acreage). Richfield Dairy will be utilizing existing croplands that will protect and preserve the local agricultural land base however it is the local government's jurisdiction and expertise to make legal zoning determinations.

IV.B.2.c Archaeological & Historical

Land application of manure, or other normal or routine agricultural practices would not normally cause adverse impacts or effects to existing archaeological or historical resources. Any proposed activities of this nature related to either farm or the NMP would be reviewed by the Department.

IV.B.2.d Light

The size and scope of the projects manure spreading activities may require an increase in artificial lighting above current conditions.

IV.B.2.e Noise

The size and scope of the projects proposed manure spreading activities will increase truck traffic and corresponding noise and decibel levels above current conditions. However, the Department did not complete a review, nor was information submitted by Richfield Dairy to determine specific decibel level changes associated with the projects manure application activities. Because no review was completed, the Department cannot specifically assess how much direct, secondary, or short and long term noise and decibel level changes the project may have.

IV.B.2.f Visual

Little to no change to the visual condition of the landscape is expected at the manure spreading sites. Some minor improvements to driveways may be needed for some fields to allow for adequate manure spreading equipment access.

IV.B.3 Local community

IV.B.3.a Community features

IV.B.3.a.01 Municipal & non-community public wells

The nearest public utility well is the Village of Coloma Well #1 (BH502). The village well is 4.8 miles northeast of the proposed Richfield Dairy wells. SSPA modeling predicts that after 25 years of pumping at 72.5 MGY, water table drawdown at Well #1 will be 1-2 inches; this would not impair the water supply to the Village of Coloma Well #1. (Predicted drawdown of 10 feet or more in a public utility well after 30 days of continuous pumping from a proposed high capacity well would indicate reduced availability of groundwater to a public utility well, under s. NR 812.09(4)(a), Wis. Adm. Code.)

IV.B.3.a.02 Schools

No direct impacts to either the Adams-Friendship Area Schools from Richfield Dairy operations are anticipated.

IV.B.3.a.03 Hospitals, clinics & nursing homes

The hospitals and clinics would treat any accidents directly related to the Richfield Dairy operations. No impacts to nursing homes are anticipated.

IV.B.3.a.04 Parks & recreation areas & facilities

No direct impacts to local area recreational are anticipated.

IV.B.3.b Local roads and use

IV.B.3.b.01 Description

Once Richfield Dairy is fully operational there will be a yearly additional of an estimated 14,890 heavy trucks coming or going from Richfield Dairy. The application did not estimate additional passenger car and light truck traffic or the amount and size of additional farm equipment using the local road system.

Much of the heavy truck traffic will be seasonal. Hauling of corn and hay silage, sweet corn silage, and manure will be done when the crops are ripe, or the fields available for manure application. This short-term increase in traffic will have more effect on the crash rate than the routine, day to day, traffic.

The addition of approximately 14,890 heavy trucks a year, plus additional large farm machinery will accelerate wear and deterioration of the local road system. This will conceivably place a financial burden on the county and town to repair or reconstruct the roads.

IV.B.3.b.02 School bus routes

Local school districts will likely bus routes that overlap with the haul routes and landspreading routes of the Richfield Dairy. There is a potential for safety conflicts with the additional truck traffic that will be introduced as a result of this dairy operation.

IV.B.3.b.03 Safety

Once Richfield Dairy is fully operational there will be an estimated additional 14,890 heavy trucks coming or going from Richfield Dairy. The application did not estimate additional passenger car and light truck traffic or the amount and size of additional farm equipment using the local road system.

IV.B.3.b.04 Emergency vehicles

Accidents and incidents on Richfield Dairy farmland may result in more ambulance and fire response services being utilized.

IV.B.3.c Residential neighbor wells

There are 5 known private residences within a mile of the Richfield dairy facility, with the nearest private well approximately 400 feet from the proposed high capacity wells. Potential impacts to private wells related to the project are water level drawdowns related to the operation of the dairy's high capacity wells and groundwater contamination (nitrate or bacteria) from manure either at the facility or at the manure spreading sites.

Quantity

For the maximum approved monthly pumping limit of 21.6 million gallons, drawdown at the nearest private well would be 4.8 feet. For 30 days of pumping at the maximum approved annual pumping rate, drawdown at the nearest well is predicted to be 1.3 feet. These drawdown amounts were derived using the Theis analytical method (see also Section IV.A.1.e). Numeric groundwater modeling by SSPA indicates that the long-term drawdown at the nearest well due to the dairy's water withdrawals to be roughly 1.5 feet. Drawdown amounts decrease with distance away from the high capacity wells, so all of the more distant private wells will experience lesser levels of drawdown.

Existing high capacity irrigation wells in the area also cause water table drawdown in the vicinity of the dairy productions area. SSPA modeling estimates that existing irrigation wells in the vicinity have cumulatively caused a steady state water table drawdown of 2.8 feet at the dairy site. Because irrigation pumping is seasonal and irrigation wells are relatively close, actual water table drawdowns from irrigation would be greater than average during the summer months and lower during winter months.

Based on DNR staff experience with private wells, drawdowns of less than five feet are not expected to cause significant changes in well function. There may be cases where a smaller drawdown could cause impacts, but for wells constructed according to legal standards, this would be rare. If the modeled water level drawdown associated with the Dairy wells pumping at the maximum approved annual pumping rate (1.5 feet after 25 years) is added to existing pumping effects (2.8 feet), drawdown is still less than five feet. Therefore, no impairment of well function is likely.

However, if water use by one landowner causes unreasonable harm by lowering the groundwater table, such that a neighboring landowner's use of the

groundwater is affected, the adversely impacted landowner could attempt to resolve the conflict by bringing a civil suit. {See *State v. Michels Pipeline Construction, Inc*., 63 Wis.2d 278 (1974)}. The high capacity well approval includes language stating that issuance of the approval does not relieve the well owner from any liability for claims brought by nearby landowners related to potential harm to their water supplies.

Quality

Groundwater in Adams County has high levels of nitrate in agricultural areas. Limiting the amount of commercial fertilizer, manure and other sources of nitrogen to the level needed by crops will limit the amount of nitrate reaching groundwater over the long term. DNR recommends that owners of private wells near the facility and spreading sites have their wells inspected and sampled for baseline drinking water quality and that the well is tested annually for nitrate and bacteria or if there is a change in the taste or smell of the water.

IV.B.4 Area

IV.B.4.a Demographics

The proposal should have little overall effect on demographics of the local area or Adams County. The economic stimulus of project construction and operation may result in new households in the county and/or surrounding area.

Employment

Richfield Dairy proposes to employ 40 people with a projected annual payroll of $1.5 million and an increase in the area's tax base from farm improvements. It is also estimated that $16 million will annually enter the local economy as a result of added business such as the purchase of services, equipment and feed.

IV.B.4.b Land use

The development of large scale dairy operations, or other CAFOs, often can result in a variety of real or perceived land use conflicts. Significant issues include (U of MN Generic EIS on Animal Agriculture, 1999):

- Environmental concerns (odor, air and water pollution, manure handling and storage),
- human health concerns,
- nuisances (ag use versus non-ag-use, large versus small),
- differing rural aesthetics,
- threat to traditional rural culture,

- use of land for agriculture versus use for tourism/recreation,
- fear of property value reduction,
- fear of rural “brownfields” (contaminated sites that cannot be reused for other purposes without significant cleanup).

Some of these issues may be addressed by developing or updating a land use plan and zoning ordinance to head off land use conflicts in the future. Environmental and human health issues can be avoided or minimized by adherence to appropriate permit conditions.

IV.B.4.c Transportation

See section IV.B.3.b.

IV.B.4.d Zoning

No zoning changes (currently A-1 agriculture) will be required for the new farm operation. Since the farm and land spreading sites are currently used for agriculture the proposed land use will not change significantly as a result of this operation. In the long term the presence of Richfield Dairy may result in fewer parcels being rezoned or given conditional use permits to allow non-compatible use.

IV.B.4.e Economy

There will be a positive short-term impact to contractors and vendors during construction of Richfield Dairy. Anticipated construction costs are $35 million.

The applicant provided the following information:
Long-term positive impacts will be generated by wages for the 40 employees with an estimated annual payroll of $1.5 million. The dairy’s annual operating budget will add another $16 million in economic activity to vendors, suppliers, and maintenance contractors over the length of operation. Several studies presented in the Pew Commission study on Industrial Farm Animal Production indicate that local purchasing patterns of large dairy operations in Wisconsin result in declining rural communities, and the percentage of dairy feed purchased locally decreased as herd size increased. So, while the dairy may add significantly to the economy in Wisconsin, there may be little or no positive impact on the local economy other than wages and field crops.

The applicant provided information from the Wisconsin Milk Marketing Board which found a 7x multiplier effect on dairy investments. The applicant claims that each dairy cow generates more than $20,000 a year in economic activity. At this

rate, with 4,300 cows, the annual economic impact of Richfield Dairy would be about $86 million.

IV.B.4.f Property values & taxes

Property values of the farm facility itself will go up due to the physical improvements to the site, and should hold that value as long as the farm is in operation and is maintained.

Property values on adjacent residential parcels may decrease due to proximity to the farm operation and associated concerns about odor, noise, traffic, groundwater degradation, viewscape, etc. If the farm is properly managed and uses the best available technologies for dealing with waste and odor the drop in value may be short-term. (Purdue Extension).

The tax base in the area may go up in response to the increase in property values and improvements at the production site. Property values may also go up for parcels used for growing crops and application of manure. The value nearby residential property may go down due to the close proximity of the dairy. On a large scale there may be little or no change in the tax base due to the presence of the dairy. (Purdue Extension)

IV.B.4.g Agriculture

A new CAFO will operate on what used to be a 152-acre crop field in an existing agricultural area. Richfield Dairy owns or has agreements for land spreading manure and process wastewater on 16,429 acres, which are generally located within a five mile radius of the farm site.

This project involves construction of a new farm in an existing agricultural area. The majority of land in the township is farmed for crops. Crops will continue to be grown to provide feed for animals. The farm animals being brought onto this site will generate a large volume of manure. Disposal of this manure will provide for an alternative to purchasing commercial fertilizers to enhance the soil and grow crops. The NMP will require certain conditions be met for land application of that manure. Those requirements include separation distances from water resources and other land features to ensure increased protection of water resources. Since not all farms have NMPs, this should result in more protection of water quality conditions.

IV.B.4.h Archaeological & historical

Land application of manure, or other normal or routine agricultural practices would not normally cause adverse impacts or effects to existing archaeological or historical resources. Adverse impacts that would trigger further investigation would those activities which would entail extensive soil disturbance or excavation in areas of recorded sites, or ones that would impact significant historic structures. Any proposed activities of this nature related to either farm expansion or the NMP will be reviewed by the Department.

V Evaluation

V.A Cumulative effects

V.A.1 Industry

There are currently two other WPDES permitted CAFO facilities located within a 12 mile radius of the proposed Richfield Dairy. Burr Oak Heifers (formerly known as Optiz Custom Heifers) is located approximately one mile south of the proposed Richfield Dairy while New Chester Dairy is located approximately 12 miles to the southwest.

There is a trend in the livestock industry towards larger-scale facilities of this kind. Large scale operations have rapidly become an economic necessity due to changing pricing structures and the need to reduce capital inputs while maximizing production. Economies of scale associated with CAFOs have allowed producers to increase production without increasing costs. If numerous projects of this type are proposed in this area, there is a concern that the land base available for landspreading manure could be overwhelmed and would make a number of such projects nonviable, primarily with respect to costs associated with hauling manure long distances for landspreading. NMPs submitted to the DNR by Burr Oak Heifers and New Chester Dairy demonstrate that there is currently an adequate land base available for land application of all of the manure and process wastewater that is to be generated by these operations. The Department is not aware of additional projects of this type in the vicinity in which the availability of land for manure application would be inadequate.

Any proposed future projects will be examined at the appropriate time. With each new operation or expansion proposed, cumulative effects such as impacts from manure landspreading activities are considered. Unless these facilities are poorly sited or concentrated in a small area, the cumulative impacts to the environment should not be significant.

V.A.2 Manure management

The basis of the WPDES permit program is to require CAFOs such as Richfield Dairy to implement BMPs to avoid or minimize potential impacts to the environment, including surface water quality and quantity. This is accomplished through (1) the review of structures and systems associated with manure and process wastewater storage/handling (2) the review of an operation's Nutrient Management Plan that details how, when, where and in what amounts manure and process wastewater from the operation will be landspread, (3) issuance of a WPDES permit that outlines operational requirements for the storage, handling and land application of manure and process wastewater, and (4) review and oversight of the CAFO once it is operating, which includes conducting oversight inspections and pursuing enforcement action when needed to obtain permit compliance and address water quality impacts.

CAFOs are not allowed to discharge pollutants from the CAFO production area (e.g., manure and process wastewater storage structures, feed storage areas, animal housing areas) to navigable waters except under certain conditions where additional protection for surface waters is provided. In order to prevent discharges and protect surface waters, the means of collecting manure and process wastewater, leachate, and runoff from feed storage areas along with runoff and storm water from impervious surfaces were designed to meet or exceed the applicable regulatory requirements.

The NMP has been reviewed by the Department and determined to be in compliance with applicable NRCS 590 criteria and all ch. NR 243 requirements. The NMP addresses the application and budgeting of nutrients (e.g., manure and process wastewater) for plant production and soil fertility on a field by field basis.

The NMP describes, in specific detail, the crops, tillage, nutrient application rates, locations, and methods implemented in order to protect surface water and ground water resources while maintaining the physical, chemical and biological condition of the soil. The NMP accounts for all nutrient sources, including soil reserves, commercial fertilizer, manure, organic byproducts, and crop residues to ensure proper utilization and protect water quality.

Strict adherence to the NMP and WPDES Permit will minimize the risk of a manure discharge to surface waters and groundwater. All of the potential impacts on water quality, habitat, and biological communities described in Section IV will not be increased above current conditions if there are no new acute or chronic releases of manure associated with the activities of Richfield Dairy.

V.A.3 Surface water & Groundwater

For the purposes of its environmental analysis, DNR considered the impacts of the Richfield Dairy wells (section IV.A.4.a), and the past, present and reasonably foreseeable cumulative impacts to water resources within the area influenced by Richfield Dairy's proposed high capacity wells. This review considered the potential environmental impacts to the wetlands, streams, lakes, and springs described in section III.A.1.e. Resources used for this evaluation included groundwater modeling results and evaluations of the impacts of irrigation pumping for the entire Central Sands region by Kraft and Mechenich (2010) and Kraft et al. (2012), modeling of cumulative impacts in the area around the proposed wells by SSPA, Department records regarding nearby high capacity wells and groundwater withdrawal capacity, and records of historic changes to water bodies. The Department also considered expert witness testimony presented at the contested case hearing regarding the potential impacts from the high capacity wells, since the hearing was held prior to the time this document was prepared.

As described in section III.A.1.f, the proposed dairy is located in an area with a high concentration of irrigated agriculture (114 high capacity irrigation wells within five miles). Unlike the dairy, which will pump groundwater year-round at rates of around 100-250 gpm, irrigated agriculture requires very high rates of seasonal pumping during the summer months (600-1200 gpm) with no operation for about eight months of the year. For water bodies that are near the irrigation wells, this means that most impacts occur during or shortly after irrigation (late summer/early fall), with an opportunity for water levels to recover during the remainder of the year. At distances of several miles from the irrigation pumping, these seasonal peaks of drawdown are damped to a more or less constant drawdown, similar to the effect from the dairy (Barlow and Leake, 2012, p. 28).

Groundwater modeling and observations of various water bodies indicate that a reduction in water quantity has occurred due to the high volume of irrigation and other water withdrawals in the Central Sands region, including the proposed Richfield Dairy well locations.

The addition of the Richfield Dairy wells, or any additional water withdrawal in the area, will increase existing stresses on the availability of groundwater to supply surface water bodies. The effects of this type of cumulative reduction in groundwater availability include decreased flow and increased temperature in headwater streams, and lowered lake levels in nearby lakes (such as Pleasant Lake).

<u>Wetlands (described in section III.A.1.e)</u>

Existing water table drawdown is present at all of the wetlands reviewed for this EIS: the Little Roche a Cri Creek headwater wetlands, the three wetlands near

Pleasant Lake, and the Chaffee Creek calcareous fen wetland east of Pleasant Lake.

The Little Roche a Cri wetlands are located in an area of concentrated irrigation (6 irrigation wells within 1 mile), so wetland impacts from existing groundwater withdrawals in the area are likely. SSPA modeling predicts water table drawdowns due to existing pumping to be 0.5-1 foot at the Little Roche a Cri headwater wetlands. Predicted drawdown is 0.7 feet on the west end of Pleasant Lake (Turtle Bay wetland), and 0.25 feet in the vicinity of the Chaffee Creek spring pond (calcareous fen wetland). UWSP groundwater modeling indicated drawdowns similar to those predicted by SSPA (Kraft and Mechenich, 2010, figure VII-3). UWSP statistical analyses indicated a somewhat greater drawdown near Pleasant Lake, up to 1.5 feet.

The degree of impact a drawdown causes a wetland depends on several factors, including a wetland's morphology, soil properties, water regime, and plant community. For groundwater-dependent wetlands, a steady-state water table drawdown on the scale of the predicted drawdown is likely to cause stress to existing wetland plant communities or loss of wetland function if water levels decline below the root zone.

The Little Roche a Cri wetlands are in an area of high water table and are very likely to be groundwater dependent. The existing drawdown of 0.5 to 1 foot has likely resulted in significant changes to some of the wetlands in that area. Changes that have likely occurred include conversion of wetland type (wet and sedge meadow to shrub and forested wetland) and conversion from wetland to upland, causing local impacts to wildlife, aquatic life, and overall groundwater processes.

The existing drawdown of about 0.7 feet in the vicinity of Pleasant Lake has likely resulted in some changes to the Turtle Bay, Camp Fairwood, and Duck Box wetlands, including an earlier dry-down period for the Camp Fairwood and Duck Box wetlands, increased exposure of pond/lake bed, decreased area and volume of standing water, and plant community migration. However, site reviews at the Pleasant Lake wetlands indicate that existing drawdown has not significantly affected the functional values or quality of the wetlands, due largely to their morphology and water regime.

While some cumulative drawdown impacts (0.25 feet) are predicted at the Chaffee Creek spring pond, the current condition of the calcareous fen wetland is exceptional under the Wisconsin Rapid Assessment Methodology. Based on the current site conditions, the functional values and overall wetland quality do not appear to have been affected by groundwater pumping activities to date. Future increases in irrigation pumping and the resulting decrease in water level and groundwater inflow could result in significant changes to wetland ecology.

Springs (described in section III.A.1.e)

Based on its proximity to high numbers of irrigation wells, it is probable that the Chaffee Creek spring has experienced flow reductions in the last 50 years. SSPA modeled flow reductions of 0.33 cfs due to the cumulative impacts of existing irrigation pumping in the headwaters of Chaffee Creek. This is 18% of the model-calculated baseflow of 1.7 cfs. This reduction is also discussed in the Stream Impacts section, below. Water table drawdown of about 0.25 feet (3 inches) was modeled at the wetland/spring pond due to existing pumping. As mentioned in the wetland section, above, these reductions do not appear to have caused significant environmental changes in the spring pond or associated wetlands.

Streams (described in section III.A.1.e)

Base flow amounts in the streams of the Central Sands region, including those closest to Richfield Dairy, have been reduced to varying degrees by groundwater withdrawals, mainly for irrigation purposes (Kraft and Mechenich, 2010). Base flow reductions are a concern due to loss of habitat for aquatic species. Decreased groundwater inflow results in warmer stream temperatures, causing stress for the cold-water species, including trout, which are found in the cold or cool-cold streams in the Central Sands. In addition, reduced flows can eliminate spawning substrate through increased sedimentation and generally decrease habitat space for fish and other aquatic life. For example, the tops of overhead habitat structures initially installed significantly below anticipated low-flow water levels have been exposed in mid to late summer in recent years.

SSPA modeling results quantify reductions in average streamflow from existing irrigation pumping (Table 3). For the stream reaches that were assessed, baseflow reduction due to existing irrigation pumping ranged from 1-30%[4], with the highest percent reductions in headwater areas of streams.

One approach to determining whether flow reduction could cause significant impacts is the method currently used by the state of Michigan (Hamilton and Seelbach, 2011). That method assesses the significance of impacts based on changes in projected suitability for fish populations with changes in baseflow for several different stream types. The Michigan model is used as one tool in Wisconsin, along with DNR staff experience, expertise and professional judgment, to guide determinations of whether a certain amount of flow reduction is likely to be significant to a particular stream. Using the Michigan methodology, the modeled cumulative impacts to the headwater reaches of all of the streams

[4] Note that percent reductions are taken from modeled baseflow. In Supplemental Environmental Assessment Table 3, percentages were taken from average measured flows. The reason for the change in calculation method here is because measured flows were not available for most headwater reaches.

near Richfield Dairy (Table 3.A), as well as many of the more distal streams (Table 3.B), would be considered significant.

A

Streams Near Richfield Dairy (within 5 miles)				Baseflow reduction due to existing pumping	
Stream	Location	Avg Measured Flow (cfs)	Modeled Baseflow (cfs)	cfs	%
Little Roche a Cri	Unnamed Trib (Sec 19-20 T18N R7E)	NA	0.9	0.07	8.0%
	Ditches (Sec 16 + 9 T18N R7E)	NA	5.7	0.76	13.2%
	10th Ave.	34	35.1	1.81	5.2%
Fordham	6th Ct.	NA	1.8	0.40	22.0%
Chaffee	CTH CH	1.8	1.7	0.33	19.3%
	CTH JJ	14	14.3	0.47	3.3%
Tagatz	4th Ave.	NA	4.8	0.28	5.9%
	near Westfield	7.6	6.0	0.47	7.9%

B

Other Streams in Model Domain (> 5 miles from Richfield Dairy)				Baseflow reduction due to existing pumping	
Stream	Location	Avg Measured Flow (cfs)	Modeled Baseflow (cfs)	cfs	%
Campbell	CTH A	2.4	2.3	0.2	8.7%
Carter	CTH G	2.5	3.3	1.0	30.3%
Lawrence	at Eagle	20	17.5	0.5	2.9%
	near Westfield	16	14.7	0.4	2.7%
Mecan R.	CTH GG	13	12.3	0.3	2.4%
Neenah	CTH G	0.8	1.0	0.2	20.0%
	CTH A	>42	31.4	0.4	1.3%
Schmudlack	4th Ave.	1.2	2.0	0.2	10.0%
S Br Wedde	CTH JJ	7	2.2	0.1	4.5%

Table 3 Streamflow reductions due to cumulative impacts of existing pumping (SSPA model).

The impacts discussed above would occur under steady-state, average conditions. Impact evaluations and permitting decisions are typically based on this type of low-average baseflow condition rather than absolute minimum flows. Flow in streams is lower in drought years. Irrigation pumping also increases in

dry years, so drought tends to intensify the cumulative impacts of pumping. Depending on the distance from the pumping wells to the water body of concern, this increased pumping impact may be felt during or after the drought period. As an example of how stream flow changes during drought conditions, Little Roche-a-Cri Creek at 10th Avenue experienced a 9% decrease in flow in 2007, a moderate drought year, compared to average measured baseflow. In the same year, Chaffee Creek at County Highway CH experienced an 83% flow reduction from an average flow of 1.8 cfs to a minimum flow of 0.3 cfs. These measured decreases reflect both natural and pumping-related reductions.

Lakes (described in section III.A.1.e)

Pleasant Lake is the lake located closest to Richfield Dairy, about 2.8 miles from the proposed high capacity wells. Lake level records show that the lake has experienced a decline in water levels over the past two decades, from high water levels in the mid-1990s to a historic low level in summer of 2007 (water level change of 5.5 feet). Water levels observed in 2007 were similar to those observed during a period of sustained drought in the 1950s and in 1964. The recent downward trend may be slightly exaggerated because lake levels in the 1990s were atypically high and lake levels in the 1950s-1960s were very low, but even accounting for this, lake level records suggest that water level decline over the last 2 decades is on the order of several feet.

Climate or other factors could be the cause of some portion of the observed decline. A 2014 study of Wisconsin lake levels reported recent water level declines on the order of 1-2 feet, starting in the late 1990s (Watras et al., 2014). The declines were observed both in small lakes in northern Wisconsin and in Lake Michigan and Lake Superior (that is, they appear to be regional in nature). It is therefore likely that some part of the decline observed at Pleasant Lake is climate-driven.

However, based on statistical analysis by Kraft and Mechenich (2010) and groundwater modeling by Kraft and Mechenich (2010, 2011) and by SSPA (2012), approximately 1-3 feet of the observed water level decline in Pleasant Lake in recent years could be attributed to existing groundwater pumping.

There is some evidence that the water level declines have caused adverse impacts to the lake and lake users. Lower water levels have led to difficulty in reaching navigable water. Compared to other seepage lakes in the area with less recreational use and riparian development (e.g. Wolf Lake, Portage Co, and Patrick Lake, Adams Co), vegetation is sparse to non-existent in the areas exposed by lower water levels. In addition, heavy recreational use of the lake may be contributing to loss of vegetation in shallow areas and increased turbidity due to lower water conditions. However, there is no evidence that water clarity or water quality has changed significantly due to lower water levels. Secchi disk

readings were comparable during times of relatively high water (mid-1990's), and times of relatively low water (mid to late 2000's). Water clarity in 2012 and 2013 was relatively low, but this could be due to unusually warm water temperatures which led to increased algal growth.

Summary

Modeled groundwater table drawdowns due to cumulative impacts are approximately 2.5 feet in the vicinity of the Richfield Dairy, 1-3 feet at Pleasant Lake and its adjacent wetlands, and 0.5-1 foot at the Little Roche a Cri headwater wetlands. Stream depletion at headwater streams in the vicinity of the dairy are modeled to be 8-13% (Little Roche a Cri Creek), 22% (Fordham Creek), 19% (Chaffee Creek), and 6% (Tagatz Creek) relative to steady state baseflow (SSPA). Kraft and Mechenich (2010) calculated stream depletion on a similar scale (1.5-15%). Other streams within the SSPA model domain but not in areas directly affected by the dairy had modeled reductions in baseflow of up to 30%. DNR Fisheries staff are concerned about the cumulative impacts of existing pumping on stream health for several of the streams in the model area.

Future impacts

In three watersheds near the project, groundwater modeling predicted that the Richfield Dairy wells could cause stream baseflow reductions of 1% or more: Fordham/Little Roche a Cri Creek, Chaffee Creek, and Tagatz Creek. These watersheds were analyzed to identify their potential for future expansion of irrigation-dependent agriculture (Figure 12).

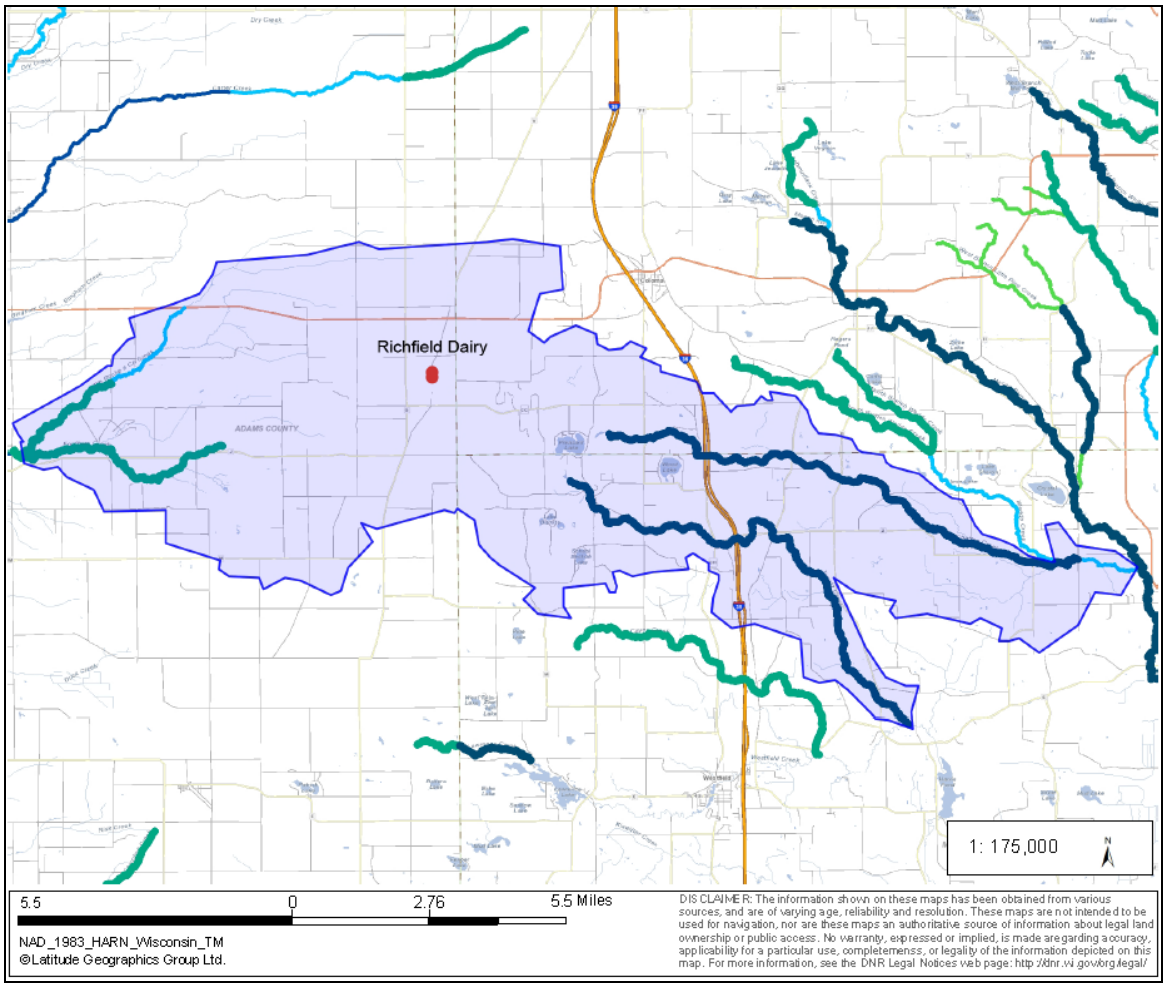


Figure 12 Future Impacts Analysis Area - Fordham/Little Roche a Cri Creek, Chaffee Creek, and Tagatz Creek Watersheds

Potentially arable lands within the three watersheds were identified by excluding areas where agriculture is impossible or highly unlikely (lakes, wetlands, publicly owned lands, municipalities, conservation easements, and tribal lands). Using these criteria, roughly 81% of the 61,000 acres in the three watersheds was deemed to be potentially arable.[5]

The U.S. Department of Agriculture's 2013 Crop Data Layer shows that 38% of land in the area of the analysis is currently being farmed. Most of the current cropland is densely concentrated in a north-south swath west of the Johnstown Moraine near the proposed Richfield Dairy, with the remainder in pockets throughout the watersheds.

Using a calculation based on the pumping capacity of existing wells in the three-watershed study area, the Department determined that approximately 59% of the

[5] This analysis did not exclude steep hill slopes, poor agricultural soils, or land covered by roads or rivers. As a result, the potential for future agriculture is likely overestimated.

current agricultural land is currently irrigated (22% of the total potential arable land).

Within the study area, approximately 7,618 acres of current cropland could become irrigated with the installation of a high capacity well and irrigation system; this would constitute a 70% increase over current irrigated acres. In addition, approximately 30,914 acres could be irrigated if all existing non-agricultural land cover was converted to cropland, a 183% increase over current irrigated acres.

Watershed	Total Watershed Area	Potential Irrigable Area		Current Agricultural Land		Currently Irrigated (Estimate)	
	Acres	Acres	% of Total Acres	Acres	% of Potential Ag Land	Acres	% of Current Ag Land
Fordham - Little Roche a Cri Creek	30,916	26,051	84.3%	11,688	44.9%	9,088	77.8%
Chaffee Creek	16,039	11,011	68.7%	3,556	32.3%	1,277	35.9%
Tagatz Creek	14,047	12,381	88.1%	3,285	26.5%	546	16.6%
Total	61,002	49,443	81.1%	18,529	37.5%	10,911	58.9%

Table 4 Current and Potential Irrigated Agriculture

Since 1958, WDNR approved 131 high capacity wells in the three-watershed area at an average rate of 2.38 per year. These wells range in capacity from 125 gallons per minute to 1400 gpm; most of the wells are for crop irrigation. The mean pump capacity of approved high capacity wells is 790 gpm.

The annual rate of applications for new wells within the watersheds ranged from a high of 17 in 1984 to no new well applications in multiple years. Recent well approval rates within the study area are: 4 high capacity wells approved in 2012, 5 in 2013, and 3 in 2014 as of July 1. As of July 1, 2014, there are also three applications for high capacity wells within the study area pending review.

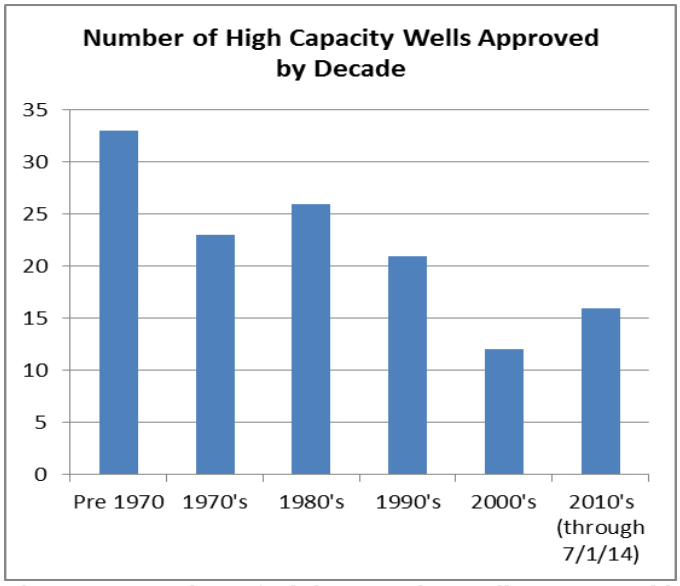


Figure 13 Number of High Capacity Wells Approved by Decade

Time Period	# of Well Approvals
Pre 1970	33
1970's	23
1980's	26
1990's	21
2000's	12
2010's (through 7/1/14)	16
Total	131

Given the existence of ample land available for the expansion of irrigated agriculture, especially in the Chaffee and Tagatz Creek watersheds, it is reasonable to anticipate that the Department will continue to receive applications for new irrigation wells at a rate similar to the last two decades. The higher-than-average rate of new applications in the last several years may be part of an increasing trend that will continue into the future, and/or may be the result of high crop prices and several recent dry growing seasons in the region.

There is currently one other CAFO permitted within the three-watershed region used for the future impact analysis (Burr Oak Heifers, formerly Opitz Custom Heifers, less than one mile south of the Richfield Dairy Site). New Chester Dairy, another permitted CAFO in the area, is approximately 9 miles south of Richfield Dairy but is outside of the watersheds identified as potentially impacted by Richfield Dairy's wells. It is difficult to determine if other CAFOs would locate within the region. Many factors affect the ability of a CAFO to locate near other CAFOs (e.g., size of the CAFOs, actual available farming acreage, other non-CAFO farms in the area). It is possible that one or more additional CAFOs could be sited within the future impact study area. WPDES permits require that CAFOs obtain adequate acreage to land apply manure and process wastewater in accordance with a Nutrient Management Plan that reflects the requirements of ch. NR 243 and the permit, regardless of the location or size of an operation.

If additional acres within the three-watershed region were irrigated (for a CAFO or other agricultural use) or if additional groundwater withdrawals occurred for

other reasons (such as industrial, municipal or commercial use), the impacts on surface waters within the region would depend on where the high capacity wells were located and how much groundwater was pumped. The anticipated future increases in groundwater withdrawals would add to stresses on surface water features, but additional groundwater modeling would be necessary to more specifically predict the future impacts of any proposed withdrawals. Existing groundwater modeling and statistical analyses show that water levels and stream baseflows in parts of all three watersheds, mainly headwater areas, have been reduced by existing groundwater withdrawals. Additional stresses from future withdrawals would tend to exacerbate those impacts. Withdrawals that reduce groundwater levels more than 12 inches below the soil surface will convert a wetland area to a non-wetland area. In flat areas that are temporarily saturated or ponded with groundwater, drawdown of only two to three inches may lower the water table enough to convert herbaceous wetlands (wet and sedge meadows) to shrub/forested wetlands. In other areas, a larger drawdown would be necessary before a wetland would be converted to a different wetland type. The wetlands that are at most risk for losing wetland function are in the Little Roche a Cri headwater area. Future drawdowns could also cause resources that are currently in good condition, such as the Chaffee Creek spring pond/calcareous fen, to experience changes in plant and animal species assemblages, decreasing their functional values.

In addition to ecological changes to surface waters, lowered water levels in seepage lakes such as Pleasant Lake could further decrease recreational opportunities. In streams, decreased groundwater inputs that resulted in significant impacts to trout populations would diminish their value for fishing.

V.A.4 Economics

Property values of CAFO facilities will go up due to the physical improvements to the site, and should hold that value as long as a farm is in operation and is maintained. The value of land needed for raising crops, and perhaps more importantly, acreage needed for manure spreading may increase due to the demand for suitable sites close to a CAFO.

The tax base in local areas may go up in response to the increase in property values and improvements at production sites. Property values may also go up for parcels used for growing crops and application of manure. The value of nearby residential properties may go down due to the close proximity of CAFO's. On a large scale there may be little or no change in the tax base due to the presence of CAFO's (Purdue Extension Guide AY-318-W http://www.ansc.purdue.edu/cafo/).

Property values on adjacent residential parcels may decrease due to proximity to the farm operation and associated concerns about odor, noise, traffic,

groundwater degradation, viewscape, *etc.* If a farm is properly managed and uses the best available technologies for dealing with waste and odor the drop in value may be short-term (Purdue Extension Guide AY-318-W http://www.ansc.purdue.edu/cafo/).

The value of housing is based on both the value of the land and the value of the buildings and other improvements to the land. Between 1940 and 2000, median home values in Wisconsin increased from $33,600 to $112,000. Generally, Wisconsin housing values have been consistent with national trends. Land values have gone up primarily due to general demand, but also due to the demand for vacation property. Residential improvements have also increased in value because of increasing house sizes and building quality, both for new houses and for renovations. (Housing Megatrends, UW Extension)

A 2003 study of property values in Berks County, Pennsylvania sheds some light on the effects of CAFOs on nearby residential properties. The following summary is from the executive summary of the report (Ready and Abdalla, 2003, *The Impact of Open Space and Potential Local Disamenities on Residential Property Values in Berks County, Pennsylvania.* Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University. See: http://landuse.aers.psu.edu/study/BerksLandUseShort.pdf).

> *"Several potential local disamenities were found to have a negative impact on nearby house prices. Of the potential local disamenities investigated, the impact of landfills on house price was largest, and extended the farthest (up to 3200 meters). A landfill located 800 meters from a house decreases that house's sale price by an estimated 6.9%. The impact of a large-scale animal production facility (over 200 animal equivalent units or aeu's) on house price was about one half to two thirds as large as that from a landfill (4.1% at 800 meters), and did not extend as far (up to 1600 meters). The impacts on house price from mushroom production and from the regional airport were much less (0.4% and 0.2%, respectively, at 800 meters). The impact from high traffic roads was small, and extended only a short distance. No significant impact was found for sewage treatment plants. Additional analysis attempted to investigate whether different types of animal production facilities had different impact on nearby house prices. Differences in the impact due to differences in the size of the operation (number of aeu's) were not statistically significant. Further, medium-sized production facilities (200 to 300 aeu's) were found to have a statistically significant negative effect on house prices when considered apart from larger facilities. Similarly, the impact did not vary significantly by species (poultry, swine, and beef/dairy). An analysis of proximity of animal production facilities and residential properties showed that the density of single family homes around animal production facilities was lower than the average for rural parts of the county. An implication is that some potential for conflicts is avoided due to the way in which these land uses are located on the land.*
>
> *The total impact on surrounding house prices was calculated for a landfill, the regional airport, and an animal production facility. The average impact on the value of 3342 houses located within 3200 meters was $2442 (all values are in*

2002 dollars). The total impact on all houses was $8,162,000, which is 2.6% of the assessed value of the affected properties. The average impact of the regional airport on 2256 houses located within 1600 meters of the airport runway and its flight paths was $104, and the total impact on the value of these properties was $235,000, or 0.1% of the assessed value of the affected properties. This calculation does not include 2391 properties located near the airport within the City of Reading. The average impact of a single animal production facility on 119 single family residences located within 1600 meters of the facility $1,803. The total impact on all 119 houses is $215,000, or 1.7% of the assessed value of the affected houses. These figures are intended as illustrations, and should not be considered averages for similar facilities. The impact from any given landfill, airport, or animal production facility will depend on the number of houses located near the site, and on the market value of those houses absent the facility."

There are typically positive short-term economic effects to contractors and vendors during the construction phase of CAFOs.

Long-term positive effects are also generated by wages and additional economic activity with vendors, suppliers, and maintenance contractors over the length of CAFO operations.

Several studies presented in the Pew Commission study on Industrial Farm Animal Production indicate that local purchasing patterns of large dairy operations in Wisconsin result in declining rural communities, and the percentage of dairy feed purchased locally decreased as herd size increased. So, while large dairies may add significantly to the economy in Wisconsin, there may be little or no positive impact on local economies other than those resulting from wages and field crops.

A recent CAFO applicant provided information from the Wisconsin Milk Marketing Board which found a 5x multiplier effect on dairy investments. The applicant claims that each dairy cow generates more than $17,000 a year in economic activity (Rosendale Dairy WPDES permit application).

The tendency for dairy farming operations to become larger (and some to enlarge to the point they must be permitted as CAFOs) in order to remain economically viable, may help to maintain the dairy-based economies of the state."

V.B Degree of risk or uncertainty

The requirements of a WPDES permit, including the requirement to develop and implement an NMP, will not guarantee that water quality will be protected from impacts. The proposed designs of the facilities and systems exceed minimum design standards and are expected to protect groundwater and surface water to the extent required by law, meaning the production site is not expected to cause

exceedance of groundwater water or surface water standards. While it is still possible such an event could occur, the DNR acknowledges the need to balance the level of protection with what is deemed likely and reasonable, particularly in light of codified requirements in ch. NR 243. Only limited data exists on failure rates of manure storage impoundment liners, but the data indicates some level of protection above the minimum is appropriate for higher risk sites, such as this one. An appropriate level of additional protection is provided by the proposed designs. In addition, the Department has added a requirement for the permittee to conduct leak detection and groundwater monitoring as part of the WPDES permit.

V.C Degree of precedence

All future projects will be evaluated by their own specific adverse and beneficial impacts. There are other similarly sized operations in Wisconsin. Each individual project is considered separately based on its own merits. In fact, permitting dairy CAFO's has become a fairly common practice and the Department has prepared an environmental assessment that was signed in April 2011 associated with the creation of a CAFO WPDES general permit for Dairy CAFOs with 1000 to 5720 AU.

The Department considered issues that fall under its regulatory authority, as well as broader issues, as part of this analysis. The project is not known to conflict with plans or policy of local, state, or federal agencies. The operation will need to apply for and receive the appropriate approvals from all involved agencies prior to operating. Permitting this operation would not foreclose future options for taking necessary actions to protect the environment (i.e., revocation, modification of the permit or approvals). Through enforcement of the WPDES permit, the Department has a means to avoid or address possible environmental impacts associated with the operation.

V.D Degree of controversy

This proposal has generated a high level of public controversy. State and local residents have expressed concerns about the environment such as possible air and water quantity/quality issues. The public has also expressed concerns over socio-economic issues such as property values, wells (both quantity and quality), flora, fauna, air quality, animal treatment issues, the trend towards large-scale farming in the state, impacts larger-scale farming may have on the viability of smaller operations and concerns of smaller operations and non-farming rural inhabitants regarding changes in the agricultural landscape associated with CAFOs.

Legal challenges to the environmental review process have focused on cumulative impacts of groundwater withdrawals in the central sands and the potential impacts of the proposed high capacity wells for the dairy on those watershed conditions and local resources. On March 26, 2014, pursuant to the Court of Appeals decision, the Dane County Circuit Court issued a Supplemental Remand Order, directing DNR to consider the cumulative effects of the two high capacity wells, consistent with the Court of Appeals decision (case # 11CV3375).

In response to the Court remand order, the department has provided additional information in this EIS relative to cumulative impacts, including an evaluation of the cumulative impacts of past, present and reasonably foreseeable high capacity wells in the region.

VI Alternatives

VI.A Department Alternatives

VI.A.1 Department review of plans & specifications for proposed structures

The Department's alternatives for review of plans and specifications for a CAFO are as follows:

- Deny the plans and specifications for the design of the proposed facilities based on water quality concerns and require resubmittal of plans and specifications.

- Approve the plans and specifications for the design of the proposed facilities without conditions.

- Approve the plans and specifications for the design of the proposed facilities, but with conditions requiring additional components to the facilities' design or operation based on water quality concerns.

The Department has reviewed the proposed project plans and specs and issued the following approvals: WPDES CAFO Permit No. WI-0064815-01-0; WPDES Plans and Specifications Approvals R-2011-0029, R-2012-0057 and R-2013-0180; WPDES Nutrient Management Plan WI-00648; WI-S067831-3 Construction Site Storm Water Runoff; and Conditional High Capacity Well Approvals for high capacity wells 71786 and 71787 on high capacity property No. 01-03-0009.

VI.A.2 Department WPDES permit review

The WPDES permit program is intended to protect water quality by setting operational requirements and then monitoring and enforcing compliance with permit conditions. Within the constraints of the Department's existing WPDES permitting authority for CAFOs, the Department has limited alternatives to the issuance of a WPDES permit for the operation. Possible options include:

VI.A.2.a Deny issuance of the WPDES permit

Denial of the permit would require that Richfield Dairy either not populate its operation with animals or that it populate the operation with fewer than 1,000 AU. This would eliminate or reduce potential impacts (less noise, dust, light issues, traffic, odor and air emissions and potential for pathogen impacts on area groundwater and surface waters) and maintain the quality of the human environment more closely to its current state. If the operation were to populate the operation below the WPDES permit threshold level, land application of manure and process wastewater from the site would not be subject to the more stringent requirements of NR 243, allowing, for example, applications of liquid manure on frozen or snow-covered ground. In addition, there would not be the potential economic benefits and water quality benefits associated with nutrient management planning on acreage planned to receive Richfield Dairy manure and process wastewater.

Within the constraints of the Department's existing permitting authority for CAFOs, the Department has limited alternatives to the issuance of a WPDES permit for the operation. Based on the information available, the Department was not able to justify denial of the proposed WPDES permit for the operation since it was expected that the operation will be able to comply with the conditions of the proposed permit and not cause an exceedance of water quality standards. The Department could have required more stringent conditions in the permit if it had determined such conditions were necessary to protect water quality. The Department used the information collected as part of the environmental analysis as well as part of the public comment period associated with the issuance process of a WPDES permit to makes its final determination on issuance of the permit and to determine if additional restrictions in the permit are necessary. The WPDES permit for Richfield Dairy (WI-0064815-01-0) was issued on November 3, 2011. The permit is currently being adjudicated.

VI.A.2.b Include additional water-quality based restrictions as part of the WPDES permit

Ch. NR 243, Wis. Adm. Code, was revised in July of 2007 to require certain BMPs to protect groundwater, surface waters and wetlands for all operations

covered under a WPDES permit. The Department does have authority to require more restrictive BMPs on a case-by-case basis where these practices are deemed necessary to provide additional levels of groundwater quality protection. The Department has limited authority to require more restrictive practices as it relates to surface water quality protection.

The proposed and finalized WPDES permit contains permit conditions that protect groundwater and surface water and are consistent with ch. NR 243, Wis. Adm. Code, the code that establishes permit requirements for CAFOs throughout the state. (See Section I.E.4.c for site specific permit conditions)

VI.A.2.c Require manure/process wastewater treatment

See Section I.E.2 and I.E.4.

VI.A.3 Department high capacity well review

The Department's alternatives for review of the high capacity well application are:

1) Deny the application for high capacity well(s) based on probable significant adverse environmental impacts to waters of the state that cannot be avoided by placing conditions on the construction or use of the well(s).
2) Approve the application for high capacity well(s) without conditions.
3) Approve the application for high capacity well(s) with conditions designed to avoid significant adverse environmental impacts to waters of the state.

The selected alternative is to approve the high capacity well application with conditions to avoid significant adverse environmental impacts. Approval conditions are described in sections I.E.4.c and II.A.

VI.B Applicant alternatives

VI.B.1 Production site

Richfield Dairy has indicated that they reviewed three alternatives as part of its decision to build at the proposed site:

<u>(1) No build</u>

According to information provided by Richfield Dairy, the "No build" alternative would not have provided for economic development, additional employment opportunities, or tax revenue at the local and state levels.

(2) Expand at one of its existing facilities

With current manure handling technologies and the need to secure additional cropland, expansion was determined to be not feasible. Future improvements in manure handling technologies and the ability to secure additional cropland may allow expansion at these sites in the future.

(3) Select a location other than the proposed site

Richfield Dairy has indicated that they have investigated sites in both northeast and north central Wisconsin. Other sites were eliminated due to presence of other large dairies, lack of available cropland for feed production or manure application, topography or other reasons.

VI.B.2 Manure spreading sites

Based on Department review of the operation's nutrient management plan, the operation has submitted a plan that complies with the water quality based restrictions in NR 243. The operation could voluntarily implement additional BMPs, particularly related to land application of manure and process wastewater in order to address potential water quality, air, odor and other potential impacts on the environment. The NMP Richfield Dairy has submitted includes some BMPs which go beyond NR 243 requirements. Examples include:

- Not surface applying solid manure on frozen or snow-covered ground. Solid manure sources are going to be mixed and stored with liquid manure. No manure is planned for application (surface applied or otherwise) during frozen or snow-covered conditions.

- The operation has identified certain soil types with highly permeable characteristics (e.g., gravel) within two feet of the surface and has chosen not to apply to these soils.

Other practices proposed to be used by the operation such as primarily using injection or incorporation within 48 hours of application when applying manure and process wastewater will help to minimize odors associated with land application activities.

VI.B.3 Operations

The applicant considered moving the wells to a different location in order to minimize the potential impact to waters of the state. This alternative was not chosen because of the uncertainty of finding a feasible site where overall impacts would be lessened relative to the current site.

VI.B.4 Other environmental management & monitoring

The DNR included WPDES requirements for groundwater monitoring around the manure storage lagoons using monitoring wells constructed as per chapter NR 141, Wis. Adm. Code. The WPDES permit also requires a leak detection monitoring system for the Attenuation Basin and Sweet Corn Silage Bunkers.

Given that the sandy soils present at the production area are porous in nature, the Department recognizes there is an increased risk of groundwater impacts at the site. The Department believes that additional monitoring requirements (groundwater monitoring wells, leak detection) were warranted to determine if manure and process wastewater structures/systems have been constructed and are operated properly. The following changes were made to the permit to reflect these concerns.

- Section 2, “Production Area Monitoring Requirements,” has been added to the permit requiring the installation and monitoring of groundwater monitoring wells for the production area. In addition, chemical monitoring of the leak detection systems installed underneath the Attenuation Basin and Sweet Corn Silage Bunkers is being required.
- A construction schedule (section 3.3 “Production Area Monitoring-Groundwater Monitoring Well Installation) has been added to the “Schedules” section of the permit outlining the timing of the required installation of groundwater monitoring wells at the production area.
- Section 4.2, “Groundwater Standard Requirements,” has been added to the Standard Requirements of the permit associated with the groundwater monitoring requirements.

For land application areas:
The Department has added three conditions to section 1.6.3, “Additional Nutrient Management Plan Requirements,” designed to provide information on timing of incorporation and planting following manure and process wastewater applications on highly permeable soils and to address applications of materials with low solids content on highly permeable soils.

It is also recommended that the Dairy inventory all wells near their operations and provide the residents information on DNR well testing and inspection recommendations.

VII Reference Materials

Environmental Assessment and Addendum, certified on November 1, 2011. Supplemental Environmental Assessment, certified on March 12, 2013. http://dnr.wi.gov/topic/agbusiness/cafo/richfielddairy.html

Andrews, Charles., 2013. Contested case hearing testimony, June 25, 2013 and December 16, 2013)

Barlow, P.M., and Leake, S.A., 2012, Streamflow depletion by wells – Understanding and managing the effects of groundwater pumping on streamflow: U.S. Geological Survey Circular 1376, 84 p.

Hamilton, D.A. and P.W. Seelbach, 2011. Michigan's Water Withdrawal Assessment Process and Internet Screening Tool. Michigan Department of Natural Resources. Fisheries Special Report 55, Lansing.

House, Leo B., 1985, Stage Fluctuations of Wisconsin Lakes, USGS Information Circular No. 49, Wisconsin Geological and Natural History Survey, 84 pp.

IPS Environmental and Analytical Services, 1996, Phase I Pleasant Lake Management Plan, Waushara County, Wisconsin: Report to Pleasant Lake Improvement Corporation.

Kraft, G. K., D. Mechenich and J. Haucke. 2012, Information Support for Groundwater Management in the Wisconsin Central Sands, 2009-2011. Report to the Wisconsin Department of Natural Resources in Completion of Project NMA00000253. Center for Watershed Science and Education, University of Wisconsin – Stevens Point / Extension.

Kraft, G., K. Clancy, and D. Mechenich, 2012. Irrigation Effects in the Northern Lake States: Wisconsin Central Sands Revisited. Ground Water Vol. 50 (2):308-318.

Kraft, G.J. and D.J. Mechenich, 2010, Groundwater Pumping Effects on Groundwater Levels, Lake Levels, and Streamflows in the Wisconsin Central Sands. Report to the Wisconsin Department of Natural Resources in Completion of Project NMI00000247. Center for Watershed Science and Education, University of Wisconsin – Stevens Point / Extension.

Mechenich, D., G. Kraft, and K. Clancy, 2009. Technical Memorandum #11. Groundwater Flow Model for the Wisconsin Central Sands. University of Wisconsin-Stevens Point.

Mickelson, D., L. Maher, S. Simpson, 2011. Geology of the Ice Age National Scenic Trail. University of Wisconsin Press.

Novitski, R.P., and R.W. Devaul, 1978. Wisconsin Lake Levels – Their Ups and Downs. U.S. Geol. Surv. and Wisc. Geol. and Natural History Survey, 11 pp.

S.S. Papadopulos & Associates, Inc., 2012. Evaluation of Groundwater Pumping for Richfield Dairy, LLC. July 27 Report.

S.S. Papadopulos & Associates, Inc., 2013a, Response to DNR Request for Additional Information, February 12, 2013.

S.S. Papadopulos & Associates, Inc., 2013b, Response to DNR Request for Additional Information on Irrigation Water Use, February 25, 2013.

Watras, C. J., J. S. Read, K. D. Holman, Z. Liu, Y.-Y. Song, A. J. Watras, S. Morgan, and E. H. Stanley (2014), Decadal oscillation of lakes and aquifers in the upper Great Lakes region of North America: Hydroclimatic implications, Geophysical Research Letters, 41, 456–462, doi:10.1002/2013GL058679.