# memo

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**Date** | June 1, 2009

**To** | BCWD Board of Managers

**cc** | Karen Kill, BCWD Administrator

**From** | Jennifer Olson, PG and Camilla Correll. PE

**Regarding** | Groundwater Dependent Natural Resource Management Plan developed for the Fen on Mike Regan's Property

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**Background**

On November 12, 2007 the BCWD Board of Managers approved the scope to develop a Groundwater Dependent Natural Resource Management Plan (GDNRMP) for the fen which is located on Mike Regan's property. This is the first GDNRMP developed in the BCWD. Having adopted its revised rules in May of 2007, the BCWD Board of Managers was interested in developing a GDNRMP to protect a smaller, well defined fen that had come to the Board's attention during a prior permit application submittal and to evaluate the level of analysis required to develop a GDNRMP for a resource of this size. As a result, the objectives of the project (as stated in the scope) were as follows:

- Identify the groundwatershed to the resource within the surficial water table
- Develop standards to protect the resource under future development scenarios
- Serve as a template for future GDNRMPs

The deliverables for this project include the following:

1. The *Groundwater Dependent Natural Resource Management Plan for the Fen* addresses the first two objectives identified above; it identifies the groundwatershed to the resource within the surficial water table and develops standards to protect the fen under future development scenarios. This is the document that the BCWD will provide to the landowner, Mike Regan. Standards identified in this plan for the protection of the resource will supersede or be in addition to the standards set forth in the BCWD's current Rules and Regulations.

2. The Guidance Document for the development of Future Groundwater Dependent Natural Resource Management Plans (attached).

3. This memorandum which identifies specific recommendations for BCWD activities related to the protection and management of the fen as well as recommendations for the development of a groundwater monitoring program which will facilitate the development of future GDNRMPs.

**Recommendations for BCWD Consideration**

The recommendations presented in this memorandum for on-going protection and management of the fen (and other groundwater dependent natural resources located in the BCWD) are presented under the following headings:

- Improvements in the Contributing Drainage Area to the Fen

- Monitoring Plan
- Education Plan
- Coordination with Grant and the VBWD
- Incorporation of GDNRMP into Existing Rules and Regulations
- Acquisition of the Fen through the Land Conservation Program
- Evaluate Applicability Requirements for Rule 2.2(f)
- Future Watershed Wide Groundwater Monitoring Activities

## 1. Improvements in the Contributing Drainage Area to the Fen

The BCWD may want to consider repairing the breach of the old street car line which allows surface water runoff from the south to enter the fen. This action could help to restore portions of the fen and could reduce the size of the management area. A small feasibility study may be needed to understand the potential impacts of a repair.

## 2. Monitoring Plan

A monitoring plan should be part of any management plan to ensure that the BCWD standards and efforts are effectively protecting the resource. The following monitoring program has been specifically developed for the fen. It is the intention that the BCWD lead the monitoring program for the fen with permission and cooperation from the landowner and future permit applicants.

The purpose of monitoring would be to establish a baseline of data on the quality and hydrology of the fen and ensure the fen is being protected and maintained as development occurs in the future. A monitoring program should also provide data on the effectiveness of the Groundwater Dependent Natural Resource Management Plan (GDNRMP) developed for the fen and assist with identifying revisions in the future (if needed). In addition, monitoring of a groundwater dependent resource over the long term will allow the BCWD to monitor the effects of climate change on these resources and anticipate potential impacts to these and other similar resources.

To achieve the objectives stated above, it is recommended that monitoring of the fen be conducted at following five distinct time periods: upon adoption of the GDNRMP (to establish baseline conditions), pre- development, during development, post-development, and in the future (long-term monitoring). Each of these time periods is described in more detail below. The timing and frequency of monitoring activities are identified in each of the specific monitoring plan component descriptions in Tables 1-3.

### *Baseline Monitoring*

Baseline monitoring should occur prior to further development in the management area. Monitoring will entail collection of data to form a baseline dataset on existing quality and hydrology. A minimum of two years of data collection is recommended, depending on climatic conditions. Ideally, one of the years will be near average conditions.

### *Pre-development Monitoring*

Assuming a lag in time between baseline data collection and development, pre-development monitoring will be conducted periodically to ensure no significant changes to the baseline dataset.

### *Development Monitoring*

During construction of any proposed development, more frequent monitoring should take place to ensure that there are no significant effects on the fen or the buffer as a result of development activity.

***Post-Development Monitoring***

Following any construction activities, monitoring should continue to determine if there is a measureable effect on the fen as a result of the change in land use. Post-development monitoring should then be conducted to determine if there are any measurable impacts on the fen for 5 years following completion of development.

***Long-term Monitoring***

Monitoring of this resource and its water table into the future will provide a record to track the effects of changing climatic conditions and land use practices in the watershed. Given the closed-nature of this system (small surface watershed and groundwatershed), it has the potential to be a good indicator of the impact climate change may have on other groundwater dependent natural resources. By evaluating the impact climate change has to resources like the fen, the BCWD is proactively evaluating the need for adaptive management strategies. What is an appropriate method for managing a resource today may not be the case in the next 20 to 50 years. These adaptive management strategies will likely play a role in how the BCWD continues to manage Brown's Creek, a much larger and more complex groundwater dependent natural resource. Long-term monitoring will provide the District with the information it needs to track changes to the fen over time and to aid in understanding the relationship of climate change and groundwater dependent resources in the BCWD.

The following are descriptions of the specific monitoring plan components, followed by a table outlining the monitoring components recommended for each distinct time period defined above.

*Plant Community Monitoring*

A vegetation monitoring plan will entail the collection of plant species data to provide baseline information on existing plant community composition, and then be used to measure future changes in land use and their potential degradation effects to the fen.

The line-intercept method will be used to quantitatively evaluate the vegetation of the fen. A total of five transects will be sampled at permanent locations within the fen. Field work will be performed in mid to late June to document percent cover of plant species in each vegetative layer along the fixed transects and points. Photo documentation will be provided of each strata (surficial, herbaceous, and tree/shrub) and square meter plots. Data will be entered into a database and diversity will be calculated and expressed on a whole plot basis and then normalized to 100% cover. The jurisdictional wetland boundary should also be checked at the time of plant inventory to document and determine any variations from existing wetland conditions.

In addition, each year at the time of the plant survey, the location and presence of exotic and invasive species will be mapped using a sub-meter accuracy GPS unit. This will allow documentation and comparison of invasive plant species populations, and an annual assessment of an increase or decrease in size and number of sites. Based on this assessment, a plan will be created and implemented to control any exotic and/or invasive species populations in the fen. Bryophyte surveys (mosses) should also be conducted periodically. Table 1 presents the suggested monitoring components for each period.

Table 1. Plant Community Monitoring

| | Vegetation Evaluation | Exotic and Invasive Species Mapping | Bryopphyte Survey |
|---|---|---|---|
| **Baseline** | Once | Once | Once |
| **Pre-development Monitoring** | Every 5 years | Every 5 years | Every 5 years |
| **Development Monitoring** | Once prior to beginning of construction activities, once following completion of activities | Once prior to beginning of construction activities, once following completion of activities | None |
| **Post-development Monitoring** | Annually | Annually | Once during 2nd year of post-development monitoring |
| **Long Term Monitoring** | Every 5 years | Every 5 years | Every 5 years |

*Surface Water Monitoring*

In the case of the fen, there are very few known surface water contribution points to the fen resource. Visual observations of surface water flow patterns should be recorded when on-site. Surface water flow patterns should be visually inspected in the spring during snowmelt and during the summer or fall periodically. Flow measurements should be taken at the breach along the old street car line to identify the volumetric contribution of water coming from this area under different flow regimes. This will aid in determining if the breach should be repaired.

During grading and construction activities, if new surface water discharges to the fen are observed, immediate response is needed to stop all surface discharges and flows should be measured or estimated.

Water quality should also be evaluated periodically. Samples should be taken from at least 4 different sites within the wetland complex. Monitoring parameters should include temperature, conductivity, pH, bacteria, a full suite of cations and anions or at a minimum the following: alkalinity, hardness, calcium, magnesium, sodium, potassium, sulfate, bromide, nitrogen species, orthophosphorus, soluble reactive phosphorus, total phosphorus, and chloride. Samples should also periodically include heavy metals and pesticides. Field measurements including temperature, pH, and conductivity of surface water should be recorded by all field crews when conducting different aspects of the monitoring program. Table 2 presents the suggested monitoring components for each period.

Table 2. Surface Water Monitoring

| | Observe surface water flow conditions | Measure inflows at breach | Water Quality Sampling |
|---|---|---|---|
| **Baseline Monitoring** | 6-8 times per year, at least twice during spring snowmelt and summer rainfall each | 6-8 times per year, at least twice during spring snowmelt and summer rainfall each | 6-8 times per year, at least 2 samples should include heavy metals and pesticides |
| **Pre-development Monitoring** | Every 5 years, observe over a range of hydrologic regimes | None | Every 5 years |
| **Development Monitoring** | Frequently during construction (daily or weekly) | Frequently during construction (daily or weekly) | 6-8 times per year, at least 2 samples should include heavy metals and pesticides |
| **Post-development Monitoring** | Annually, observe over a range of hydrologic regimes | None | None |
| **Long Term Monitoring** | Every 5 years, observe over a range of hydrologic regimes | None | Every 5 years |

*Groundwater Monitoring*
A shallow monitoring well should be installed adjacent (upstream) to the fen to monitor shallow groundwater levels and chemistry. Monitoring well installation will entail agreement between the well owner (BCWD) and the property owner and access agreements. This well could be incorporated into the DNR Observation Well network, and funding for installation may be available from the DNR or MPCA.

Water levels should be monitored periodically in the well. Water chemistry should also be monitored at this well periodically. Monitoring parameters should include temperature, conductivity, pH, a full suite of cations and anions or at a minimum the following: alkalinity, hardness calcium, magnesium, sodium, potassium, sulfate, bromide, nitrogen species, total phosphorus and chloride. Samples should also be evaluated periodically for heavy metals, bacteria, and pesticides. These parameters will allow tracking of anthropogenic effects in the shallow groundwater system and aid in determining the source of any measured contamination. Sampling of groundwater should follow the protocols within the MPCA Groundwater Monitoring and Assessment Program Field Manual.

An inventory of groundwater discharge points and seepage areas with elevations should be conducted to identify how the shallow groundwater system responds to changes in climatic conditions and land use. Discharge points should be monitored for chemistry and discharge should be estimated, if possible.

Table 3 presents the suggested monitoring components for each period. Additional monitoring may be needed if inconsistent measurements are found.

Table 3. Groundwater Monitoring

| | **Groundwater Level Measurements** | **Groundwater Quality Analysis** | | **Inventory Discharge points** | **Discharge Points Analysis** |
|---|---|---|---|---|---|
| | | **Chemistry** | **Metals, pesticides, and bacteria** | | |
| **Baseline** | Bi-weekly | 6-8 samples annually | Twice annually | Quarterly | Quarterly for field parameters and chemistry |
| **Pre-development Monitoring** | Monthly | Twice annually | none | Annually | Annually for field parameters only |
| **Development Monitoring** | Weekly | 6-8 samples annually | Twice annually | Quarterly | Quarterly for field parameters and chemistry |
| **Post-development Monitoring** | Monthly | Twice annually | Annually | Annually | Annually for field parameters |
| **Long Term Monitoring** | Monthly | Twice annually | none | Every 5 years | Every 5 years for field parameters and chemistry |

*Precipitation Monitoring*
A manual read precipitation gage should be placed near the site to record daily rainfall totals. It is anticipated that the Indian Hills Golf Course could provide these data as part of the statewide High Spatial Density Precipitation Network in MN. Precipitation monitoring should begin during baseline monitoring and continue through long-term monitoring.

*Public Use Monitoring*
Visual inspection of the fen and buffer should be conducted semi-annually to identify and monitor any public and recreational use in the fen and its buffer. Unauthorized public use of the fen and its buffer provide the potential for degradation to the fen and include such activities as ATVs, footpaths, vegetation

trampling, and others. Public use monitoring should begin during baseline monitoring and continue through long-term monitoring.

### 3. Education Plan

In an effort to minimize the impacts associated with human activity, the BCWD should work with the municipality, land owner, and any future homeowners association to develop an education and outreach plan that will raise awareness of the value of natural communities and processes essential to fen health and sustainability. This education and outreach plan may contain the following components:

- The development and presentation of public presentations and workshops for local government staff, elected officials, and citizens. This should include discussion of management strategies such as the implementation of more frequent road sweeping to reduce the amount of road dust that could potentially blow into the fen or the application of herbicides in the road right-of-way and practices that homeowners can incorporate the will protect and sustain the fen.

- The distribution of materials through city newsletters, local newspapers, and/or direct mailings educating citizens about healthy household habits for clean water and protection of the fen such as correct application of fertilizers, benefits of landscaping with native vegetation, safe washing and/or maintenance practices for vehicles, household waste disposal techniques, and proper swimming pool maintenance practices.

- The development of a kiosk or display for a public area associated with the residential development or potential golf course that could be incorporated with walking trail along the perimeter of the fen or could be placed in the Golf Course Club House. This kiosk or display would illustrate the functions and values of the fen as well as the sources of groundwater contributions to the resource and best management practices that should be used.

- The development of an operation and maintenance plan for golf course operations, if this land use is proposed. This effort will require close collaboration between the watershed district and the golf course superintendent.

### 4. Coordination with Grant and the VBWD

One of the main tenants of the GDNRMP is to minimize the impact of development within the contributing drainage area to the fen. One of the tools which will be important in assisting the landowner to achieve these goals is Low Impact Development (LID) or Better Site Design (BSD). Given the City of Grant's current zoning regulations, it will be difficult to apply these tools. In an effort to provide flexibility for the landowner, the BCWD should consider presenting the GDNRMP developed for the fen to the City of Grant for joint adoption.

During the development of the GDNRMP for the fen, the BCWD Administrator and EOR met with John Hanson, the VBWD Administrator, to discuss the need for coordination between the two watershed districts. As the figures in the GDNRMP illustrate, a portion of the management area for the fen lies in the VBWD. Given that the VBWD is currently re-evaluating and revising its Rules and Regulations and that volume control will be the main concern for this portion of the management area, it will be important for the BCWD to continue discussing the impacts of this GDNRMP with the VBWD as it goes through its rule amendment process.

### 5. Incorporation of GDNRMP into Existing Rules and Regulations

Once the BCWD Board of Managers adopts the GDNRMP for the fen, it will be important to determine how the existing Rules and Regulations need to be modified to incorporate this plan.

### 6. Acquisition of the Fen through the Land Conservation Program

The best way to protect a groundwater-dependent natural resource is to avoid any and all development within the surface watershed and groundwatershed to the resource. The BCWD understands that there needs to be a balance between development and natural resource management, hence the development of Rule 2.8 *Groundwater Dependent Natural Resource Management Plans.* Given the relatively small surface watershed and groundwatershed to the fen, it has been suggested by the Technical Advisory Group that the BCWD consider this area for the developing Land Conservation Program. The District could consider acquiring fee title or conservation easement on all or a portion of the property containing the fen and the 100-foot buffer to ensure its preservation for future generations. A conservation strategy is being developed for this area by Steve Hobbs of Minnesota Conservation Consulting.

### 7. Evaluate Applicability Requirements for Rule 2.2 (f)

During the development of the GDNRMP for the fen, an issue with the requirements of Rule 2.2 (f) was discovered. As currently stated, Rule 2.2 (f) triggers a required permit if there is land disturbance of 5,000 square feet or more within the surface water contributing area of a GDNR. A permit is not triggered if this same land disturbance occurs outside of the surface water contributing drainage area but within the groundwatershed of the GDNR. Since it is likely that the groundwatershed and the management area for any GDNR would extend beyond the surface water contributing area, there could be activities within these areas that would impact the resource but not trigger the Rule. As a result, it is recommended that a cursory groundwatershed for each of the District's mapped GDNRs be identified based on available groundwater data and couple this information with the contributing drainage area (based on two-foot topographic data) to develop preliminary management areas. These preliminary management areas would be based on available contour data (both surface and groundwater) and local knowledge of the resources. Identification of these preliminary management areas would serve to focus the District's monitoring program and help to prioritize which resources will be evaluated within a GDNRMP. It is particularity important to develop a preliminary management area for Brown's Creek, as this may include all or most of the potential management areas for the remaining GDNRs in the District. It is not anticipated that these preliminary management areas would have any additional regulations or requirements beyond the current Rules until such time that a GDNRMP is developed. It is anticipated that these management areas would be refined as additional groundwater data are collected.

If the BCWD decides that the intent of Rule 2.2f is to protect the entire management area to the resource, the Rule would need to be modified to reference the management area in place of the contributing drainage area. This decision could be made following the delineation of the preliminary management areas.

### 8. Future Watershed Wide Groundwater Monitoring Activities

The development of the GDNRMP for the fen was based on available data that included site specific datasets on groundwater elevations (collected as part of a previous development plan) within the groundwatershed, in addition to local well data, nearby lake and wetland data, and information provided by the VBWD on the Sunnybrook Lake area and a nearby monitoring well. To facilitate the development of future groundwater dependent natural resource management plans, the District should consider evaluating the quality and quantity of data within potential management areas (see item 7) to identify areas where limited data exist. This cursory look would identify gaps in monitoring data within critical

areas and help to focus District resources on collecting priority information. This information could also help to identify which resource could potentially be evaluated next. A watershed wide monitoring plan could then be developed for these areas that would provide the information needed to evaluate future impacts of development on the GDNRs of the BCWD.

**Action Items:**

1. Discuss the recommendations presented in this memorandum and authorize EOR to develop a scope of services for those recommendations the BCWD would like to move forward with. The following action outlines the possible next steps related to this GDNRMP:

    a. Improvements in Contributing Drainage Area to the Fen – Authorize EOR to develop a scope to conduct a small feasibility study to evaluate the potential impacts of repairing the breach of the old street car line.

    b. Monitoring Plan – Seek permission from landowner to conduct monitoring. If permission is granted, authorize EOR to develop a scope to conduct baseline monitoring for the fen, as described under item 2 of this memo.

    c. Education Plan – Authorize EOR and Angie Hong, EMWREP, to develop a scope for a pre-development education and outreach plan for the fen. Revisit education needs in future if development proposed.

    d. Coordination with Grant and VBWD – Discuss the recommendations presented in this memorandum and direct the Administrator to proceed with the next steps. Schedule joint meeting/workshop with Grant City Council.

    e. Acquisition of Fen through Land Conservation Program – Review land conservation strategy when developed.

    f. Incorporation of GDNRMP into Existing Rules and Regulations – Authorize legal counsel to determine process and scope to incorporate the GDNRMP for the fen into the existing Rules and Regulations.

    g. Evaluate Applicability Requirement in Rule 2.2 (f) – Authorize EOR to develop a scope to delineate preliminary management areas for each of the District's GDNRs.

    h. Future Groundwater Monitoring Activities – Authorize EOR to develop a scope to put a District-wide groundwater monitoring plan together for implementation in 2010.

**ATTACHMENT**

Groundwater Dependent Natural Resource Management Plan Guidance

# Groundwater Dependent Natural Resource Management Plan Guidance

This guidance has been developed to guide the development of future groundwater dependent natural resource management plans. It is anticipated that the BCWD will prepare the plans which will then be applied to permitted activities. The following guidance section addresses specific data that should be collected and summarized within any future Plan. It is important to note that this guidance has been developed for resources that do not include Brown's Creek or its connected natural resource communities. Brown's Creek will likely require additional data and evaluation to complete a comprehensive GDNRMP.

## A. Site Evaluation

A site evaluation should take place that is specifically designed to provide the relevant information related to identification and protection of the GDNR. Site evaluation elements include the following:

1. Resource summary. A brief description for the resource should be included with location and map and groundwater dependence of resource.

2. Resource protection goal. A goal of nondegradation or improvement of resource should be stated.

3. Site history. Any relevant history related to the site including past land uses, land cover, or alterations.

4. Topography and geomorphology. These should be reviewed and summarized. Geomorphology can be obtained from the North Washington Groundwater Study (EOR, 2003).

5. Soils and geology. A summary of the soils and geology (both surficial and bedrock units) should be included. Geologic data should be obtained from the Minnesota Geologic Survey.

6. Wetland or resource delineation with map.

7. Description of resource.
   a. Site visit summary. A site visit should be conducted and data should be collected to verify the status of the resource as a GDNR. The site visit should include BCWD staff and managers, property owners, a plant ecologist with experience identifying groundwater seepage areas, and a groundwater hydrologist. The site visit will need to take place when all of the relevant data can be collected. This is typically early summer through fall. The following data should be collected on site:
      - Site photographs
      - Plant species inventory (dominant plant species, level of invasive plant species, quality of existing vegetation)
      - Groundwater discharge or seepage areas, location, elevation, estimated discharge flow if applicable
      - Bryophyte survey if resource is identified as a fen.
      - Basic chemistry including temperature, conductivity, and pH of groundwater discharge areas.
      - Surface water drainage patterns.

   b. Plant communities. A survey of the plant communities should be summarized in detail including vegetation dependent on groundwater seepage.

c. Surface water hydrology. The entire contributing surface water drainage area to the GDNR should be delineated based on two foot topography and knowledge of stormwater structures and conveyance systems. Limited stormwater structure data can be obtained from the BCWD. Basic information about the drainage area should be summarized including area, land uses, land cover, structures, and other drainage characteristics. Land cover data can be obtained from the DNR MLCCS database.

d. Groundwater hydrology. A discussion on local and regional groundwater flow patterns as obtained from the North Washington County Groundwater Study and other available data sources including on-site soil borings, regional lake data, and County Well Index should be included. Analysis of these data should result in discussion on aquifers contributing groundwater to the resource and the groundwatershed to the resource, as well as maps and data to support findings. The following steps should be taken to determine and map the source of groundwater to the GDNR.

    1. Assemble and review relevant data on groundwater in the project area from the North Washington County Groundwater Study (these data can be obtained directly from the BCWD). County Well Index, surface water elevations, topography, streams and other available data.
    2. Collect shallow groundwater data associated with soil boring data on the site. At a minimum, three water table elevations are needed on the site.
    3. Interpret data to determine groundwater sources to the resource and provide mapping and written documentation.
    4. Delineate the groundwatershed area to the resource based on the available data and hydrogeologic interpretation.

e. Management Area. The management area should be defined and mapped, based on a combined surface and groundwatershed.

## B. Define Potential Impacts to the Resource

A summary of the potential impacts to the resource as a result of proposed development should be evaluated and discussed. Design changes should be made to eliminate as many potential impacts as possible to the resource.

1. A summary of potential direct impacts should be developed. At a minimum, the following potential impact areas should be evaluated:

    a. Filling and Construction Activities
    b. Erosion and Sedimentation
    c. Plant Community Impacts
    d. Fire Suppression
    e. Fluctuations in Groundwater Levels
    f. Infrastructure (e.g. sanitary sewer, storm sewer, and water mains)
    g. Water System Improvements (e.g. water supply wells and private wells)
    h. Road Modifications
    i. Public Use

2. A summary of potential indirect impacts should be developed. At a minimum, the following potential impact areas should be evaluated:
   a. Groundwater Use
   b. Groundwater Recharge
   c. Stormwater Runoff
   d. Road Spray
   e. Land Use Change

## C. Management Area Modeling

In most cases, the parameters of interest when analyzing the potential impact of future development on a groundwater dependent resource will include the contribution to the resource of surface water runoff volume, groundwater volume, thermal load, and the load of sediment and nutrients under current and future conditions. A hydrologic model or series of appropriate calculations should be used to determine the effect of any proposed development on the resource.

To evaluate the impact of future land use changes, a model will be needed that can model both surface and groundwater contributions to the resource, for example the Soil & Water Assessment Tool (SWAT). The SWAT model can be used to understand the potential changes in groundwater recharge, or groundwater and surface water contribution to a resource as a result of future development and quantify the amount of stormwater infiltration that will be needed under a proposed/developed scenario to protect the groundwater dependent resource.

Models that are more limited in scope are also useful and could be used if it is known that the resource of interest is most sensitive to one factor. For example, the P8 model can be used to estimate phosphorus and sediment loads in urban areas that include stormwater management facilities. A hydrologic/hydraulic model such as SWMM or HydroCAD can be used to estimate surface runoff rates and volumes resulting from a series of measured rainfall events, or single design events. It is understood that local calibration data will likely be unavailable for the majority of these models, and therefore a thorough discussion of the model input and documentation on the model will be required.

The following items should be included in a GDNRMP:

- Summary of modeling work and associated documentation and
- A detailed (or relative) water budget for both surface and groundwater flow contributions to the resource.