Elm Creek TMDL Initial Scoping Document

1 Background

This goal of this document is to establish a common understanding of the watershed-wide Total Maximum Daily Load (TMDL) in the Elm Creek Watershed. The TMDL effort is intended establish a strong technical foundation for water resource management, such that different policy and technology-based implementation efforts can be integrated into a plan to restore impaired waters and protect unimpaired waters throughout the Elm Creek watershed.

To describe the linkage between the science, policy and technology components of this process, the TMDL is described below as five primary components: 1) collection and analysis of monitoring data; 2) modeling of the landscape, streams and lakes throughout the Elm Creek watershed; 3) translation of monitoring and modeling data into Wasteload and Load Allocations; 4) implementation and monitoring; and 5) summary and presentation of the TMDL.

Although written using "prescriptive" language (e.g., the TMDL will…), this is intended to be a working document that will be revised and updated multiple times throughout the TMDL process, based on feedback from the various stakeholders. Ultimately, the long-term success of the TMDL will be dependent on understanding/support at the local level. Please review the strategy outlined in the following sections and provide comments and suggestions as to how the TMDL process (and ultimate products) might be modified to best serve local-level decision-making and implementation.

Important Questions for the Stakeholder Group to Ultimately Resolve (not necessarily at the June 23rd meeting)

1) Is the monitoring data sufficient to effectively inform TMDL estimates throughout the watershed? If not, what do you feel needs to be clarified or added? *Note: following this initial inventory, the available monitoring data will be summarized for Stakeholder committee review*
2) If the proposed modeling approach is implemented, will you feel comfortable making decisions based on the outputs? If not, what would you suggest needs to be modified or clarified?
3) Should the TMDL allocations be described using an Individual, Categorical or Hybrid approach? If Categorical, who will serve as the "lead entity" to oversee implementation? *Note: the details of this decision will be expanded on in future stakeholder meetings*
4) Does the proposed report format provide sufficient detail to 1) meet MPCA and EPA requirements and 2) inform local-level management and implementation? If not, how would you like to see the final document modified?

2 Monitoring Data

Below is a summary of all known monitoring data for the Elm Creek watershed. The summary of "Existing Data Sources" is intended to describe the historical data (pre-2007) to which the current conditions and monitoring data can be compared. "New Data Collection" is intended to describe the data that has been (or is planned to be) collected since 2007. Data collected since 2007 will be used to conduct the TMDL condition assessments and modeling. If you know of additional data that has or will be collected, models that have been developed and/or reports that have been published, please provide a contact or reference so that they can be include in the TMDL analyses.

2.1 Existing Data Sources (before 2007)

- <u>Land Use</u>
  - *Historic*
    - City-specific parcel classification data
    - National Land Cover Dataset (NLCD): 1992 and 2001
    - City-specific parcel classification data
    - Minnesota Land Cover Classification System (MLCCS)
    - Metropolitan Council Land Use: 1990, 1997, 2000, 2005
    - National Agricultural Statistics Service (NASS) Crop Areas
    - Aerial Photographs: Hennepin County, United States Geologic Survey, Farm Service Agency
  - *Current*
    - Hennepin County Parcel Dataset
    - Maple Grove Impervious Dataset
  - *Anticipated (Future)*
    - 2030 Comprehensive Plans
- Soils
  - Hennepin County
  - Soil Survey Geographic (SSURGO) database
- <u>Hydrology</u>
  - *Flows*
    - USGS long-term monitoring gauge
    - Hennepin County (WOMP flow station)
    - TRPD (individual monitoring sites)
    - Maple Grove (individual monitoring sites - ?)
  - *Digitized Storm Sewers Maps*
    - Maple Grove
    - Plymouth
    - Other cities (?)
  - *Stormsheds (land areas draining to specific outfalls)*
    - Plymouth
    - Maple Grove (?)
    - Other cities (?)
  - *Technical Studies and Documents*
    - *Elm Creek Channel Study*
    - *Instream flows*

        - *Maple Creek study*
        - *Judicial ditch systems*

- <u>Water Chemistry</u>
    - USGS (Streams only)
    - TRPD (Lakes and Streams)
    - Maple Grove (Streams only)
    - CAMP (Lakes only)
    - MPCA (Lakes only)

- <u>Instream Habitat</u>
    - MPCA Routine Survey(s)
    - Elm Creek Channel Study

- <u>Instream/Lake Biota</u>
    - DNR Elm Creek Study
    - MPCA Routine Survey(s)
    - Rice Lake Studies
    - Fish Lake Studies
    - Weaver Lake (?)

2.2 *New Data Collection (after 2007)*

- <u>Land Use</u>
    - Land use confirmation ("windshield" surveys)

- <u>Hydrology</u>
    - USGS long-term monitoring gauge
    - Hennepin County (WOMP flow station)
    - TRPD (individual monitoring sites)
    - Maple Grove (individual monitoring sites - ?)

- <u>Water Chemistry</u>
    - TRPD (individual monitoring sites)
    - Maple Grove (individual monitoring sites - ?)
    - USGS long-term monitoring gauge

- <u>Instream/Wetland Habitat</u>
    - MPCA - Intensively Monitored Watershed Program
    - Hennepin County RiverWatch, SHEP, WHEP
    - TRPD

- <u>Instream/Lake/Wetland Biota</u>
    - MPCA - Intensively Monitored Watershed Program
    - Hennepin County RiverWatch, SHEP, WHEP
    - City of Champlin

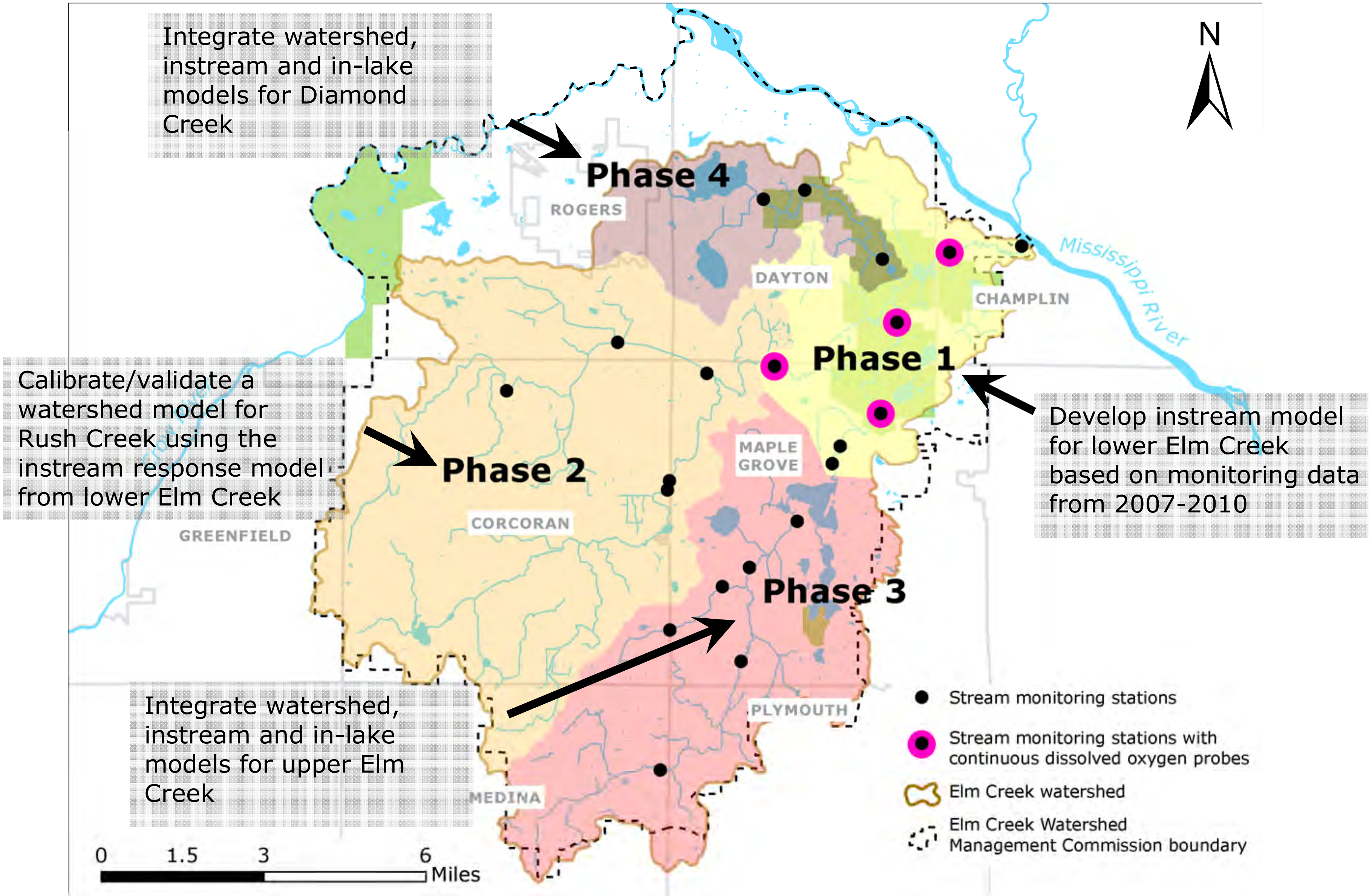
3 Modeling

A series of watershed and water quality models will be developed to: 1) determine the relative contribution of pollutants from different land areas; 2) identify how changes in water chemistry and stream morphology affect the biological health of Elm Creek; and 3) identify/prioritize different implementation efforts to restore water quality in Elm Creek. To accurately represent the physical, biological and chemical processes throughout the watershed, the TMDL modeling will be phased (as previously discussed). The general sequencing will be as follows:

1. Summarize all monitoring data and translate flow and concentration information into pollutant loads at various monitoring stations
2. Summarize and validate all land use data
3. Develop a standardized hourly precipitation file
4. Use pollutant loading estimates from monitoring data for lower Elm Creek to calibrate/validate an in-stream aquatic response model (i.e., isolate the relative impact of instream process on water quality)
5. Calibrate/validate a model to estimate instream erosion throughout Elm Creek
6. Develop an instream response model for the upstream tributaries based on the calibration scheme developed in lower Elm Creek
7. Utilize the instream response model(s) and instream erosion estimates to calibrate and validate a watershed model for Rush Creek
8. Utilize the watershed model to estimate pollutant loading to the individual lakes throughout the watershed
9. Develop in-lake response models for individual lakes that describes the relationship between watershed loading, internal loading and water quality
10. Utilize in-lake response models and average precipitation files to estimate average annual pollutant outflows
11. Utilize outflow data from upstream lakes, the instream response model, and instream erosion estimates to calibrate models for the downstream subbasins (repeated below major lakes)
12. Develop average land use pollutant loading estimates for the hydrologically connected portion of the Elm Creek WMO
13. Apply land-use-based pollutant loading estimates to the non-hydrologically-connected portions of the Elm Creek WMO (i.e., areas draining directly to the Mississippi River). *Note: TMDL estimates for land areas directly draining to the Crow River will be developed as part of the Crow River Watershed-wide TMDL and adopted by reference into the Elm Creek TMDL.*
14. Utilize the land use runoff predictions from the calibrated watershed model(s) to estimate Wasteload Allocations, Load Allocations and Load Reduction Goals

3.1 General Modeling Approach

The following section describes the general modeling approach and assumptions that will be made for the hydrologically connected portion of the Elm Creek watershed. Because the jurisdictional boundary of the Elm Creek WMO does not directly align with the hydrologic boundary of the Elm Creek watershed, model relationships between land use and water quality developed for the hydrologically-connected region of the Elm Creek watershed will be applied to the non-tributary areas (described below). *Note: TMDL estimates for land areas directly draining to the Crow River will be developed as part of the Crow River Watershed-wide TMDL and adopted by reference into the Elm Creek TMDL.*


Integrate watershed, instream and in-lake models for Diamond Creek
Phase 4
ROGERS
DAYTON
CHAMPLIN
Mississippi River
Phase 1
Calibrate/validate a watershed model for Rush Creek using the instream response model from lower Elm Creek
Develop instream model for lower Elm Creek based on monitoring data from 2007-2010
Phase 2
MAPLE GROVE
CORCORAN
GREENFIELD
Phase 3
Integrate watershed, instream and in-lake models for upper Elm Creek
PLYMOUTH
MEDINA
Stream monitoring stations
Stream monitoring stations with continuous dissolved oxygen probes
Elm Creek watershed
Elm Creek Watershed Management Commission boundary
0 1.5 3 6 Miles
N

3.1.1 Weather Data

All watershed and in-lake response models will be "driven" by various inputs for weather data (e.g., precipitation, wind speed, solar radiation, and pan evaporation). Weather data will be obtained from a 30-year record. Daily average precipitation data from 1980-2010 will be collected from the Rockford, MN cooperative observer station (COOP ID 217020) and disaggregated into hourly records, based on hourly intensity patterns observed at the Minneapolis-St. Paul (MSP) Airport weather station, or NEXRAD radar data, as appropriate. Any data gaps at the Rockford station will be filled with corresponding precipitation records from the nearest station (likely in Delano, Mound, Corcoran, Plymouth and Chanhassen, MN). The resulting hourly precipitation record will be used as the input file for all model analyses. Wind speed, solar radiation, and pan evaporation will be obtained from the most appropriate local source – most likely MSP and/or the Minnesota State Climatological Workgroup.

3.1.2 Pollutant Loading Estimates

All annual pollutant loads will be quantified from monitoring data using FLUX (US Army Corps of Engineers, version 2.11). FLUX is a basic estimation tool that quantifies total pollutant loading at specific monitoring sites by establishing a relationship between flow (cfs) and concentration. Flow-concentration relationships at individual sites are then combined with continuous flow records to estimate total pollutant loads at specific monitoring locations. A key component of FLUX analysis is the establishment of relationships between water level and flow (for monitoring sites where rating curves are developed) and flow and concentration. These relationships generally improve (i.e., variability around the load estimate is reduced) as the number of sampling events and sample size increase. For purposes of model development, FLUX analyses will be based on the most current and/or hydrologically-appropriate (channel morphology occasionally changes over time) rating curve, and final model calibration/validations will be based on the data set that represents the complete monitoring record.

For further detail regarding FLUX, see the following web link:
http://www.wes.army.mil/el/elmodels/emiinfo.html

3.1.3 Watershed Models

Watershed hydrology and pollutant runoff will be described using a combination of models to represent different land use types and ecological processes. The Soil Water Assessment Tool (SWAT) will serve as the primary watershed model and be used to integrate outputs from various land-use-specific models.

3.1.3.1 Agricultural Land Uses

SWAT will be used to represent agricultural land uses throughout the watershed. SWAT is a partially physically-based and partially empirically-based watershed model developed at the U.S. Department of Agriculture Agricultural Research Service (SWAT is currently supported by the Blacklands Research and Extension Center at Texas A&M University). SWAT was developed to model large agricultural watersheds and has been calibrated and validated to many watersheds in the United States and around the world.

For additional detail regarding SWAT modeling, see the following web link:
http://swatmodel.tamu.edu/

3.1.3.2 Urban Land Use

Urban land uses will be modeled using a combination of models. SWAT will be the primary model used to integrate urban land uses into the TMDL estimates. Within SWAT, urban land uses are represented using methods described by Driver and Tasker (USGS, 1988).

Existing Best Management Practices (BMPs) will be modeled in SWAT as an aggregate for each HRU (i.e., each urban HRU will be assigned a settling basin, which will be parameterized according to anticipated BMP removal efficiencies, based on design and literature observation). Street sweeping activities will be individually parameterized based on input from individual municipalities.

To validate (and if necessary, further calibrate) urban land uses within SWAT, outputs from urban HRUs will be compared with outputs from the Program for Predicting Polluting Particle Passage through Pits, Puddles, and Ponds (P8). A P8 model will be developed for 1-4 urban subbasins throughout the Elm Creek watershed for calibration and validation purposes. Outputs from P8 in the various subbasins will be compared to SWAT outputs according to total pollutant loads and flow volumes. Based on previous experience, SWAT estimates of pollutant loading from urban land uses correlate well (within 20% of observed values) with monitored data and prediction from urban-specific models (e.g., P8).

For additional detail regarding P8 modeling, see the following web link:
http://wwwalker.net/p8/

3.1.3.3 Transportation Corridors

Transportation corridors (county and state highways) will be modeled using a combination of models. SWAT will be the primary model used to integrate transportation corridors into the TMDL estimates. Dirt accumulation on roadways (and the corresponding nutrient load) will be estimated using the Source Loading and Management Model (SLAMM) and used to calibrate pollutant loads from roadway surfaces in SWAT. SLAMM calculates an initial roadway dirt loading (lbs/mile) based upon roadway surface area (impervious and right-of-way), roadway length, and average daily traffic volume. Nutrient loads from transportation corridors will then be routed through filter strips (to simulate nutrient removal of roadway BMPs) and the downstream drainage network. Nutrient removal in filter strips will be based on SLAMM model estimates of BMP removal efficiency and corresponding literature estimates (BMP removal efficiencies will likely be between ~15 and 20%). Road-specific BMPs will be identified and defined through consultation with representatives from the various road authorities.

For additional detail regarding SLAMM modeling, see the following web link:
http://wi.water.usgs.gov/slamm/

3.1.3.4 Wetlands

Wetland cannot be explicitly modeled in SWAT. Instead, on-channel wetlands will be modeled as "reservoirs" in SWAT. Each reservoir will be assigned to a subbasin and individually parameterized according to the normal surface area/volume (which corresponds to the bankfull conditions) and the emergency surface area/volume (which corresponds with maximum flooded conditions) to match the monitored hydrograph and water quality data. Each wetland complex will be parameterized with a number of days to return to the normal pool after exceeding the emergency pool volume. Depending on nutrient dynamics observed in wetland complexes, SWAT outputs may be further calibrated against a secondary model (e.g., AQUATOX).

3.1.4 Instream Models

3.1.4.1 Erosion

Instream erosion will be modeled using CONCEPTS.

> The National Sedimentation Laboratory has developed the CONservational Channel Evolution and Pollutant Transport System (CONCEPTS) computer model to simulate the evolution of

> incised streams and to evaluate the long-term impact of rehabilitation measures to stabilize stream systems and reduce sediment yield. CONCEPTS simulates unsteady, one-dimensional flow, graded sediment transport, and bank-erosion processes in stream corridors. It can predict the dynamic response of flow and sediment transport to instream hydraulic structures. It computes channel evolution by tracking bed elevation changes and channel widening. The bank erosion module accounts for basal scour and mass wasting of unstable cohesive banks. CONCEPTS simulates transport of cohesive and cohesionless sediments, both in suspension and on the bed, and selectively by size classes. CONCEPTS also includes channel boundary roughness varying along a cross section, for example due to varying vegetation patterns (USDA 2000).

For additional detail regarding CONCEPTS modeling, see the following web link: http://www.ars.usda.gov/Research/docs.htm?docid=5453

A CONCEPTS model will be developed to predict streambank erosion and TSS/TP delivery throughout the Elm Creek watershed. Streambank erosion will be calibrated and validated to field measurements at 3-5 sites throughout the watershed. CONCEPTS modeled outputs will then be input into corresponding stream reaches as point-sources of TSS and TP or used to calibrate the corresponding SWAT subroutines.

3.1.4.2 Instream Response

Instream response will be modeled using AQUATOX.

> AQUATOX is a PC-based ecosystem model that predicts the fate of nutrients, sediments, and organic chemicals in water bodies, as well as their direct and indirect effects on the resident organisms. AQUATOX simulates the transfer of biomass and chemicals from one compartment of the ecosystem to another. It does this by simultaneously computing important chemical and biological processes over time. AQUATOX simulates multiple environmental stressors (including nutrients, organic loadings, sediments, toxic chemicals, and temperature) and their effects on the algal, macrophyte, invertebrate, and fish communities. AQUATOX can help identify and understand the cause and effect relationships between chemical water quality, the physical environment, and aquatic life. It can represent a variety of aquatic ecosystems, including vertically stratified lakes, reservoirs and ponds, rivers and streams, and now estuaries (EPA 2009).

For additional detail regarding AQUATOX modeling, see the following web link: http://www.epa.gov/waterscience/models/aquatox/

Instream responses will initially be modeled in lower Elm Creek (Rice Lake to the Mississippi River confluence). Calibration and validation of lower Elm Creek will be based on pollutant loads observed throughout the monitoring datasets. Model relationships observed in lower Elm Creek will then be applied to stream reaches in upstream tributaries and used to calibrate watershed loading estimated by the SWAT model. Depending on instream conditions, sediment oxygen demand (SOD) calculated using AQUATOX (based on the 2001 DiTorro sediment digenesis model) may be compared with QUAL2K predictions, for calibration purposes.

3.1.5 Lake Models

Aquatic response in the individual lakes will be modeled using AQUATOX. Watershed inputs to individual lakes will be derived from 30-year average loads from the SWAT model. Internal loading will be incorporated into the aquatic response model using in-lake sediment chemistry data to populate the sediment digenesis subroutine in AQUATOX (based on DiTorro 2001). AQUATOX-based internal loading estimates will be compared to concurrent estimates using the Nürnberg anoxic sediment release model and biomass-based estimates of curlyleaf pondweed contributions (if present). If existing data is not sufficient to develop an AQUATOX model, a BATHTUB model may be developed as an alternate (particularly as it relates to internal loading).

3.2 Model Calibration and Validation

The goal of model calibration and validation is to provide an objective assessment of how well the models predict ecosystem condition so that decisions based on the model outputs can be made with a known degree of confidence. Thus, is important that the TMDL technical committee agree on a common set of criteria to evaluate the models.

Initially, calibration and validation of all models for the TMDL will be conducted using data from 2007-2010. Within the 2007-2010 data records, models will be independently calibrated and validated with two years of data. Calibration years will be selected to represent average precipitation conditions for the watershed. As the TMDL progresses, additional years of monitoring data will be added as either calibration or validation data sets. 2007-2009 have been relatively dry (as compared to annual averages), so calibration/validation years may be adjusted as more data is accumulated (e.g., if 2011 data is a better representative of regional averages, it may be used for calibration purposes).

Evaluation of model performance is generally based on a correspondence between model outputs and observed data and/or corresponding literature estimates. However, within this general calibration/validation framework there are a number of model outputs that can be used to assess model performance.

Are there specific model outputs that would be useful to technical committee members to better evaluate model calibration?

3.3 Quantifying Pollutant Loading Capacity

Pollutant loading capacity (i.e., the TMDL) will be quantified for all stressors. Pollutant loading capacity will be directly calculated for all stressors with established numeric criteria or standards (e.g., 40 ug/L phosphorus for deep lakes). For water quality standards that are influenced by multiple pollutants (e.g., DO and biotic impairment), quantification of pollutant loading capacity will be proceeded by a Stressor Identification process, following USEPA guidelines (stressor identification will be closely tied to the routine watershed-scale biological monitoring conducted by MPCA and the long-term contaminant data from the USGS gauging station). Following identification, pollutant loading capacity for individual stressors will initially be quantified based on literature estimates of pollutant threshold concentrations (e.g., chronic toxicity values) and corresponding model responses.

The method used to quantify pollutant loading capacity will vary depending on the waterbody type. For lakes, the in-lake aquatic response model (AQUATOX or BATHTUB) will be used to back-calculate the pollutant loading capacity that would be anticipated to correspond with unimpaired conditions. Pollutant loads to lakes will be quantified using annual averages and the summer growing season as the critical condition. For stream segments, pollutant loading capacity will also be quantified using the aquatic response model (AQUATOX or QUAL2K) to back-calculate loads that would be anticipated to correspond with unimpaired conditions. However, in streams, model back-calculation will be preceded by a load duration analysis to identify critical conditions (i.e., flow regimes that correspond to the most frequent violation of water quality standards). Depending on the seasonality of water quality impairments, TMDL estimates for streams may be broken up seasonally (i.e., specific critical conditions may require individual loading limits). Although load duration analysis alone has been used to develop loading capacity estimates in previous TMDLs, the aquatic response model approach will be used in Elm Creek to account for the potential overlapping contribution of different stressors for the DO and biological impairments and the potential seasonal differences in critical conditions for different stressors. For stressors that are not reliably modeled based on watershed processes (e.g., bacteria and chloride), loading capacity will likely be calculated using the load duration approach.

For further discussion of the load duration approach see:
http://www.epa.gov/owow/tmdl/duration_curve_guide_aug2007.pdf

Load reductions will be sequentially quantified from upstream to downstream to maximize implementation efficiency. For example, consider the relationship between phosphorus in headwater lakes and downstream reaches. Phosphorus loading to lakes is often the primary driver of water quality impairment. Similarly, phosphorus outflow from lakes has the potential to impact DO in downstream reaches. For implementation purposes, it is likely most efficient to 1) identify the phosphorus reductions necessary for the lake to meet water quality goals, 2) calculate the reduction in phosphorus outflow/loading to downstream reaches that will result from implementation efforts in the individual lakeshed, and 3) calculate any additional reductions necessary to achieve downstream water quality goals. For isolated lakes, load reductions will be calculated for the individual lakeshed.

3.4 Margin of Safety

The Margin of Safety (MOS) will be calculated following methodologies developed by Walker (2003). Following this methodology, MOS is calculated based on empirical assessments of variability and uncertainty in the monitoring data sets.

4 Wasteload Allocations, Load Allocations and Load Reduction Goals

The TMDL represents the total mass of pollutant that can be assimilated into a waterbody while continuing to meet the state water quality standards. For purposes of implementation, the TMDL is described as an equation with four different components: Waste Load Allocation (WLA); Load Allocation (LA); Margin of Safety (MOS); and Reserve Capacity (RC). The WLA represents pollutant loading from permitted sources such as permitted stormwater discharge from Municipal Separate Storm Sewer Systems (MS4s). The LA represents pollutant loading from non-permitted sources such as non-MS4 municipalities, atmospheric deposition and internal loading. A portion of the TMDL is allocated to the MOS to account for uncertainty associated with modeling estimates and environmental variation. The RC is the portion of the load that is set aside to account for future development.

$$TMDL = \sum WLA + \sum LA + MOS + RC$$

WLA = Wasteload Allocations
LA = Load Allocations
MOS = Margin of Safety
RC = Reserve Capacity

Wasteload and load allocations for TMDL are generally partitioned individually or categorically. Allocations and reduction goals will be assigned to all individual permitted discharges (if an individual allocation scheme is chosen; see below).

4.1 Permitted Discharges

Permitted discharges in the Elm Creek watershed will include all effluents regulated under Nation Pollutant Discharge Elimination System (NPDES) permits. NPDES permits throughout the watershed fall into three major categories, MS4, Construction and Industrial. All NPDES permits will be identified through a search of the MPCA point source database (i.e., the Data Desk).

4.1.1 Municipal Separate Storm Sewer Systems MS4

MS4 permits are required for most storm sewer systems in the Elm Creek watershed. MS4 permits currently identified in the Elm Creek watershed are: Champlin, Corcoran, Dayton, Hennepin County (roads and ditches), Maple Grove, Medina, Minnesota Department of Transportation, and Plymouth.

4.1.2 Construction

The construction stormwater WLA will be estimated based on a 10-year estimate of the median number of construction site acres present throughout the Elm Creek watershed. Ten-year median construction acres will be divided by the total watershed area to identify the percent watershed area anticipated to be in construction in any given year. The 10-year median construction percentage will be multiplied by the TMDL watershed load export to identify the construction WLA. The construction WLA will be subtracted from the TMDL value prior to allocating the remainder of the WLAs and LAs.

4.1.3 Industrial

Inclusion of industrial effluents into the TMDL will be dependent on the individual characteristics of the permit (i.e., not all effluent constituents will directly affect the TMDL calculations). For effluents that are directly pertinent to the TMDL, wasteload allocations will be determined as part of the overall allocation scheme (described below).

4.2 *Individual Allocations*

In many TMDLs, relative apportionment of the watershed load (the maximum allowable pollutant runoff) into LA and WLA is often based on percent land area and MS4 designation. Land areas that are regulated as part of an MS4 permit are assigned an allocation based on percent watershed area and included as a component of the WLA. For example, if community "A" represents 10% of the watershed area, it would be allocated 10% of the watershed load. All individual NPDES discharges would also be assigned WLA for pertinent effluent constituents. All land areas not regulated under an MS4 permit would be assigned an allocation based percent area and included as a component of the LA. Total LA would be determined by summing the watershed (non-permitted areas), atmospheric and internal LA estimates. Current (or existing) watershed loads would be determined using the watershed model(s) to back calculate the existing loads necessary to result in the corresponding instream and in-lake water quality conditions. All load reduction goals would be determined by subtracting the WLA or LA from the existing load. Individual allocation schemes are generally the "default" option for TMDL development.

4.3 *Categorical Allocations*

Under the categorical allocation scheme, the watershed load (the maximum allowable pollutant runoff) is identified as the single WLA target that corresponds with each listed impairment. Individual permitted entities are then responsible for demonstrating progress toward this common goal, such that the collective implementation efforts result in compliance with the WLA. For a TMDL to be developed using a categorical allocation scheme, it is generally required that the entities responsible for implementation possess/demonstrate sufficient capacity to coordinate and document implementation progress. The design of a categorical scheme would be developed in consultation with MPCA.

4.4 *Hybrid Allocation Schemes*

In some TMDLs, wasteloads and loads are allocated based on a hybrid between individual and categorical methods. For example, MS4 communities are a part of a categorical allocation and the road authorities and industrial effluents have individual allocations. The design of any hybrid scheme would be developed in consultation with MPCA.

4.5 *Scale of Allocations*

Allocations (i.e., WLAs and LAs) and the corresponding reduction goals will be described at three levels of resolutions. For regulatory purposes of the TMDL, all allocations and reductions will be described at the watershed scale that most closely aligns with the listed impairment (i.e., each impairment will have its own TMDL "equation"). Thus, allocations for impaired lakes would be calculated for the immediate lakeshed, allocations for impairments in Rush, Diamond and upper Elm Creeks would be calculated at the subwatershed scale, and allocations for lower Elm Creek would be calculated at the watershed scale. Within the specific subwatersheds, allocations will be further partitioned out among permitted entities (if individual allocations are chosen).

5 Implementation and Monitoring

5.1 Implementation

The goal of the implementation component of the TMDL is to identify a suite of policy and technology initiatives (i.e., BMPs) that will create and maintain a watershed condition (including in-lake and instream processes) that will support healthy (i.e., unimpaired) water resources throughout the Elm Creek watershed. An implementation plan will be constructed through the sequence of steps described below:

1) identify policy initiatives that will create/maintain a watershed that meets the TMDL goals
2) identify the anticipated scope and timeline for policy-based implementation (i.e., if a policy is enacted to be implemented during development/redevelopment efforts, how long will it take for this policy to affect a change in water resource condition?)
3) identify technology-based initiatives (e.g., stormwater retrofits) that complement/enhance policy-based initiatives
4) identify the timeline and funding mechanisms to implement technology-based initiatives
5) integrate implementation initiatives into the local watershed and surface water management plans (potentially as part of a CIP)

Recommendations for implementation of the TMDL will be based on an interpretation of the monitoring and modeling data. Initial prescription of implementation options will be based on literature estimates of BMP effectiveness/cost and the relative contribution of the proposed treatment area to the overall impairment. Implementation efforts will be adaptively managed over time based on observations from follow-up monitoring efforts (described below).

As described above, for implementation purposes, it is likely most efficient to 1) identify the reductions of individual stressors necessary for upstream lakes to meet water quality goals, 2) calculate the anticipated reduction in stressor outflow/loading to downstream reaches that will result from implementation efforts in the individual lakeshed, and 3) calculate any additional stressor reductions necessary to achieve downstream water quality goals.

5.2 Monitoring

To ensure effectiveness and efficiency of TMDL implementation, ongoing monitoring will be conducted. Monitoring will assess water resource condition, implementation progress and the efficacy of different policy and technology-based initiatives (where appropriate).

5.2.1 Condition monitoring

The goal of condition monitoring is to assess the long-term (decadal) changes in water resource health that correspond to different implementation activities. Condition monitoring will largely be based on the MPCA Intensive Watershed Monitoring (IWM) program. However, since the IWM program conducts assessments approximately every ten years, condition monitoring alone will not likely provide sufficient information to effectively track and adaptively manage TMDL implementation in the Elm Creek watershed.

5.2.2 Implementation Monitoring

Implementation progress will be monitored by tracking the establishment and/or construction of different BMPs. Implementation related to watershed loads from regulated MS4s (i.e., the WLAs) will be tracked by MPCA as part of permit compliance. However, the existing implementation monitoring conducted by MPCA does not cumulatively address efforts throughout the watershed (i.e., each MS4 has an individual permit) and does not include load reduction activities related to LA. To more effectively track implementation for the WLAs and LAs, a centralized entity often takes on oversight responsibility.

Is this central oversight responsibility something the Elm Creek Watershed Management Commission would be willing to take on?

5.2.3 Efficacy Monitoring

The goal of efficacy monitoring is to quantify the effectiveness of individual (or aggregations of) BMPs. Most BMPs are designed and evaluated based on their ability to individually treat a specific pollutant (e.g., phosphorus). However, the cumulative effect of BMP implementation on water resource health is often unknown at a watershed scale. To promote efficient and adaptive implementation, it may be beneficial to conduct more detailed, site-specific monitoring efforts to field-verify the benefits of different BMPs and more accurately assess the scale of implementation necessary to meet water quality goals.

5.3 Connecting the TMDL Recommendations with Watershed Planning

Since the TMDL is being developed at a watershed scale, it is important that it directly articulate with the local watershed plan – to avoid potential redundancy or conflict between local rules and TMDL requirements. Ideally, the TMDL requirements/recommendations will fit seamlessly together with the watershed plan, serving as a strong technical foundation to inform rule development, interagency collaboration, and BMP project prioritization throughout the watershed.

To evaluate alignment of the TMDL with the local watershed plan, it will be important to address the following questions:

1) If all of the land within the watershed was managed according to the current watershed rules, would the impaired waterbodies ultimately meet the TMDL goals? If not, how could the watershed rules be modified to achieve this result, and ultimately support TMDL implementation?
2) What triggers watershed rule compliance (e.g., development and/or redevelopment), and how long will it take for the watershed, or different subbasins, to come into compliance with the watershed rules?
3) If the time-frame for watershed-rule based TMDL implementation extends beyond the desired implementation timeline, what additional BMPs can be implemented to increase the pace of TMDL implementation? How should these BMPs be prioritized?
4) Since TMDL compliance is ultimately the responsibility of NPDES permit holders throughout the watershed, how can the watershed plan help support/coordinate these implementation efforts to maximize the benefit to the watershed?
5) Since the TMDL process only directly regulates permitted discharges, how can the watershed plan help facilitate TMDL implementation related to non-permitted runoff?

6 Final TMDL Document

The final TMDL will be presented in summary form, where the body of the TMDL text will summarize the TMDL for a general audience and the technical analyses underlying the TMDL will be summarized in appendices. The TMDL summary will correspond to the components required by EPA, including:

1) Background – This section will include a summary of: Location; 303d Listing Information; Appropriate Water Quality Standards/Numeric Targets; monitoring data
2) Loading Capacity – This section will include a summary of: the watershed, instream and in-lake modeling efforts; Stressor Identification; pollutant-specific estimates of loading capacity for each impaired lake and stream segment (likely summarized as separate tables for impaired lakes, unimpaired lakes and stream segments). Models will be summarized based on: overall capacity and rationale for use; general input parameters; major calibration adjustments from default values; major output parameters
3) Wasteload Allocation – This section will include a description of: the allocation scheme; final pollutant-specific, waterbody-specific allocations for each permit (likely summarized as one aggregate table, and a series of permit- or waterbody-specific tables)
4) Load Allocation – This section will include a description of: the allocation scheme; final pollutant-specific, waterbody-specific allocations for areas not covered under an NPDES permit (likely summarized as one aggregate table, and a series of entity- or waterbody-specific tables)
5) Margin of Safety – This section will include a summary of the MOS and the rationale for its development
6) Seasonal Variation – This section will include a summary of the monitoring data and description of how seasonal variation is included in the TMDL
7) Reasonable Assurances – This section will include a summary of state and local rules/regulations, and ongoing BMP efforts that will result in effective implementation of the TMDL
8) Monitoring – This section will include a summary of future monitoring by different stakeholder groups
9) Implementation Strategy – This section will include a summary/prioritization of different implementation options to cumulatively address water quality impairments throughout the watershed
10) Public Participation – This section will include a summary of all stakeholder meetings and public comments

All supporting technical information will be summarized in appendices. Appendices will include: 1) Monitoring Data Summary; 2) Watershed Modeling; 3) Instream Modeling; 4) In-lake Modeling; 5) Stressor Identification

The details of underlying the Implementation Strategy will be presented in a separate implementation plan.