

June 25, 2004

Mr. Steve Maude
Policy Analyst
Land Use Policy Branch
135 St. Clair Ave. W.
6th floor
Toronto ON M4V 1P5

Dear Mr. Maude:

**Re: Comments on Draft Oak Ridges Moraine Conservation Plan Guidance Documents
Water Budget Technical Guidance
Our File: P12, WR 047**

Thank you for providing staff of York Region with the opportunity to review the draft guidance document entitled "Water Budget Technical Guidance" in support of the Oak Ridges Moraine Conservation Plan (ORMCP) as prepared in May 2004. York Region staff previously submitted comments on other draft Guidance Documents to you on October 10, 2003 and on May 21, 2004.

With input from our partners at Lake Simcoe Region Conservation Authority (LSRCA), we are providing comments on the Water Budget Technical Guidance in consideration of the context of our previous responses. We trust that the Ministry of the Environment (MOE) has given due consideration to our comments regarding challenges, purpose and the value of our ongoing partnerships in watershed management.

Overall, this document continues the trend of overall improvement in style and consistency that we have observed as more of these documents have been received for review. The Water Budget Technical Guidance presents a much greater challenge due to the need to first establish a clear technical basis for understanding water budgets and then to create guidance that can be used effectively in the municipal planning process to achieve the desired objectives. At this time, York Region is concerned that this document places too much emphasis on the technical challenges of simply producing a water budget and does not provide adequate guidance for technical staff and municipal planning staff to develop effective planning policy.

As you are aware, and as outlined in the Water Budget Technical Guidance, York Region and our conservation authority partners (primarily Lake Simcoe Region Conservation Authority, and Toronto and Region Conservation Authority) have already begun work to address the requirements of water budgets. This work has included the development of a numerical

modelling tool that can be used to quantify a water budget. Our initial experience with this tool is the primary source of input to our comments. The basic tools that we have built to date and the process that is outlined in the Water Budget Technical Guidance have left substantial shortcoming in potential application for dealing with planning decisions. The following comments have been prepared jointly by York Region and LSRCA staff and reflect our initial experiences with the model and the challenges encountered in trying to apply the tools to solve the basic land-use planning issues that involve “water budgets”.

The Water Budget Technical Guidance provides a good technical and academic over view of the issues related to developing water budgets. As a general observation, the methods outlined are aimed at the process of quantifying a “water budget” but do not sufficiently focus on the issues surrounding applying the water budget concept to the planning process. We have attempted to provide comments with examples to illustrate this shortcoming and assist in improving this document for its intended use.

The comments have been organized into 6 categories:

- 1) Our Experience
- 2) Definitions
- 3) Objectives, Purpose and Expected Outcomes:
- 4) Process;
- 5) Scale;
- 6) Specific/Editorial

1) Our Experience:

As part of our ongoing efforts to address the requirements of the ORMCP, and in particular Clause 24 (7) that requires water budgets and conservation plans for the portion of The Regional Municipality of York that is served by the Yonge Street Aquifer, York Region and LSRCA have been working to create a water budget that is appropriate for use in the types of planning decision-making as implied by the ORMCP. This process has been very revealing as to some of the challenges that lie ahead and in particular, some challenges that are not anticipated or addressed in the Water Budget Technical Guidance.

The work that has been completed to date includes:

- Data compilation;
- Development of a regional-scale conceptual geological model;
- Development of a “digital geological model”;
- Development and calibration of a numerical groundwater flow model;
- Development of tools that will allow quantification of the components of the water budget in the numerical groundwater flow model.
- Preparation of a preliminary “Water Budget” for the Holland River Watersheds; and

- Discussions and planning for further application of the modelling tools to address issues to be discussed below.

Figures 1, 2 and 3 illustrate the method in which the water budget for the Holland River Watershed can be presented. Figure 1 provides a gross summary for the entire catchment and illustrates the amount of water received from precipitation and from subsurface lateral inflow and the amount of water removed as either discharge to wells, streams, or lakes or as subsurface lateral outflow. This figure is based on the model calibration that is intended to provide a steady-state representation of the current conditions as verified by available water elevation and stream flow data. Figures 2 and 3 provide a more detailed accounting of the water budget to show the input to and output from each layer in the geological system for the East and West Holland River catchments, respectively. Note that the units that flow is expressed in are not consistent between Figures 1 and Figures 2 and 3 at this time.

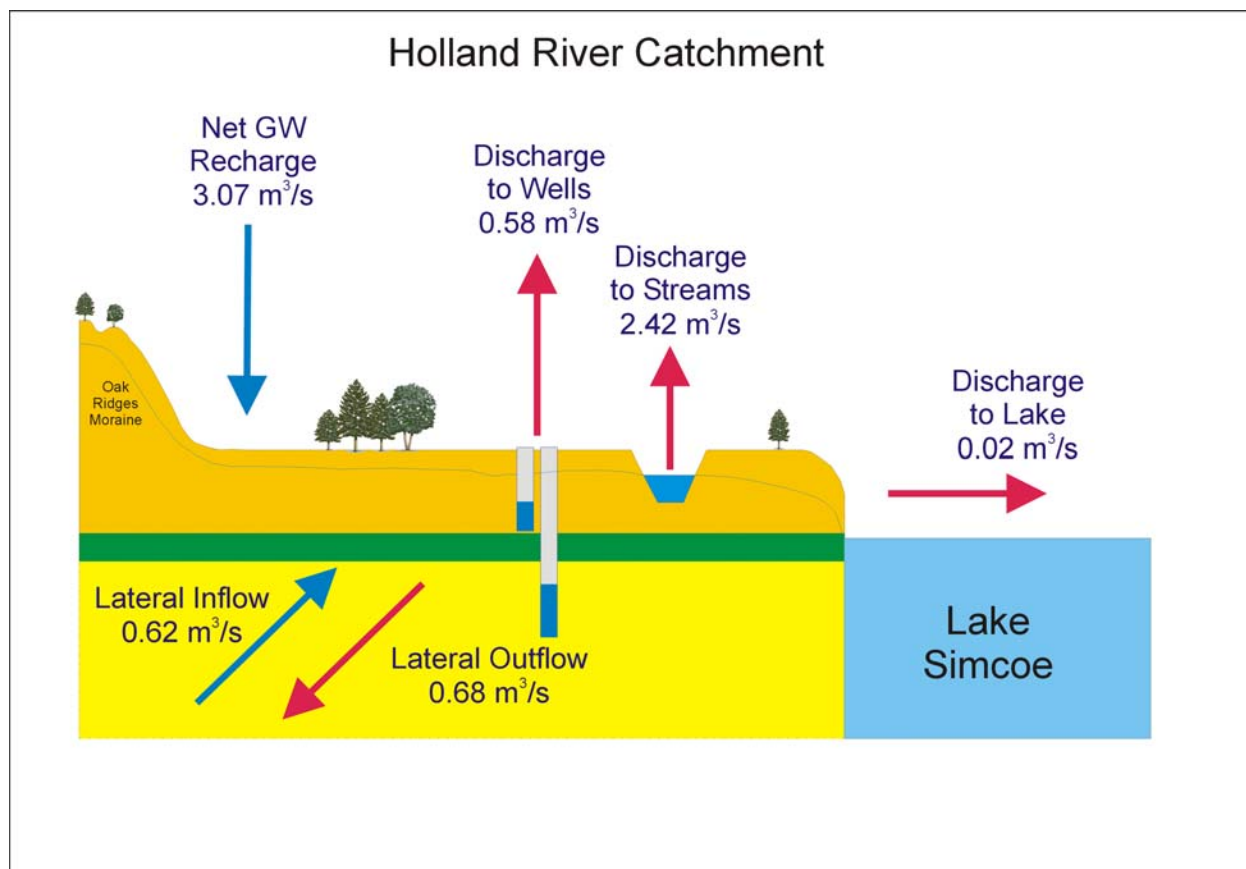


Figure 1 Net water budget for Holland River catchment.

Figures 2 and 3 are particularly effective as they illustrate well that water is moving in and out between layers and that there must be significant spatial variability in the water budget. A water balance is achieved on each of these figures in that the total water input equals the total output.

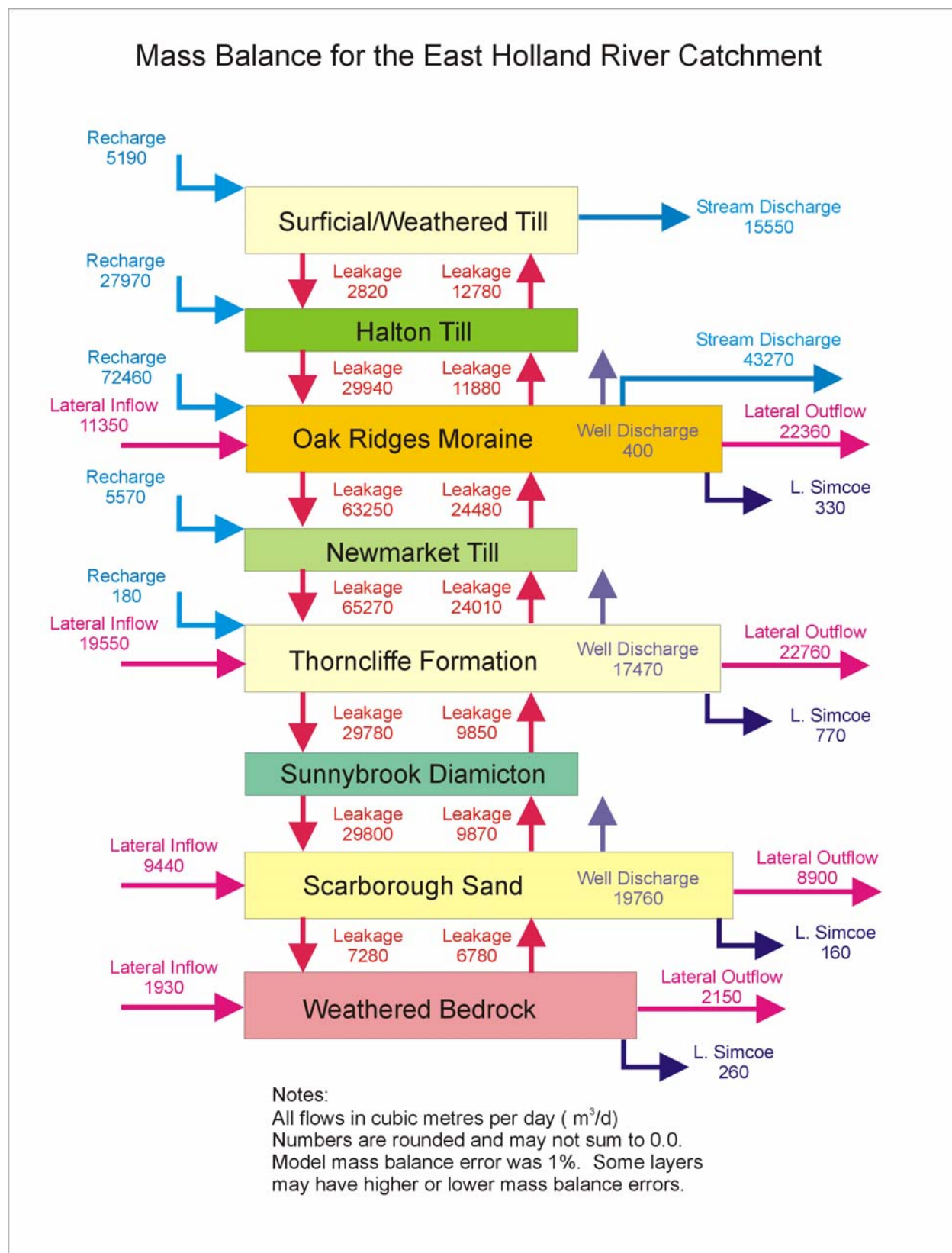


Figure 2 Detailed Water Budget (Mass Balance) for East Holland River Catchment

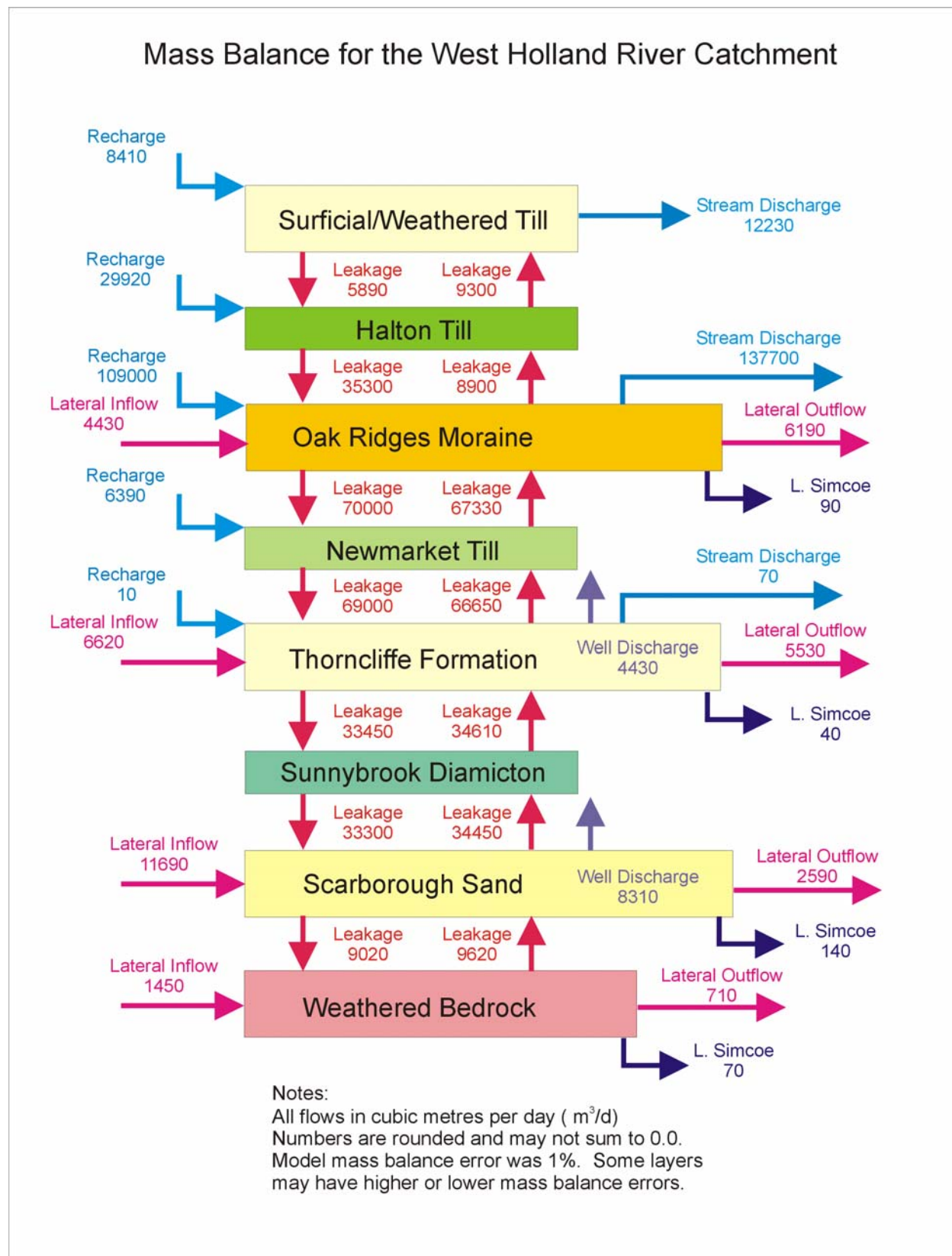


Figure 3 Detailed Water Budget (Mass Balance) for West Holland River Catchment

This product, in simple form or in detail form appears to match the expectations of the Water Budget Guidance Document.

Our next step was then to consider how we would apply this in making planning decisions, particularly within only the Oak Ridges Moraine area, which includes the headwaters of the watershed.

Some of the questions that arose included:

- Are the figures above (essentially a tabulated water budget) sufficient to make decisions regarding a proposed water taking or development?
- How do we make effective planning decisions on site-specific basis from this watershed-scale assessment?
- How can we distinguish the needs of applications involving changing on-site recharge from applications involving a water taking?
- How can we tell whether or where the system is currently under stress?
- How can we tell where and if development could proceed?
- How do we take into account the inherent variability in local budget over the entire watershed area?
- How do we determine how a development in the Oak Ridges Moraine Area would affect the health of the system downstream and, vice versa, how do we determine how a development downstream would affect the system in the Oak Ridges Moraine Area?
- How do we set a target for conservation planning from this information?
- How would we know when to absolutely say no to future development or to perhaps consider a development were additional work has been performed to an acceptable standard (to be defined with Guidance)?
- How do we identify a “trigger point” at which we would expect an onset of an undesirable condition?
- What types of maps could be generated to help with decision-making?
- How do we deal with managing the potential cumulative effects of smaller developments? Or, how much development can we allow (cumulatively)?
- What will a proponent need to do to gain approval after a watershed scale “budget” has been established? And by extension – what will the approving agencies need to see or know?
- What type of assessment process would need to be established to enable approvals to be granted efficiently?

From these questions, we also identified a list of “needs” that we will expect the Water Budget Technical Guidance process to deliver:

- 1) A process is required to clearly define the data collection needs (and scales) for calculation of water budgets.
- 2) A process is required to clearly define appropriate methods for calculating a water budget.

Much of this methodology is currently provided, however it assumes that numerical modelling is the only tool that can be used. It is appropriate that other methods can potentially be used based on the type and amount of data available, scale of the site, and capacity of the proponent. Guidance should be available to allow proponents to quantify water budgets and to allow reviewers to assess the adequacy of water budget estimates.

- 3) A process is required that will allow “Water Budgets” to be calculated for “Current”, “historical” and “future” scenarios. Comparisons of the output between scenarios will provide an indication of areas that could be considered to be currently under stress (compare current versus historical), or to assess the effects of future change (future versus current).

It is our expectation for York Region that the numerical groundwater flow model (and other similar hydraulic models of the watershed available to the conservation authorities) will provide the basis for evaluating these scenarios. From these results, information will be available to produce “summaries” (similar to Figures 1, 2 and 3) on a watershed or local scale of interest.

Clear guidance will be required to define what assumptions are valid for determining scenarios, scales of analysis (for different types of problems), and how to potentially monitor/verify predictions so that these assessments can be updated and refined in the future.

- 4) A process is required to appropriately and consistently create maps to identify areas that should be restricted from development or where efforts are required to meet conservation targets.
- 5) A process is required to assist in determining the appropriate scale of a water budget calculation.

For some applications, it may be appropriate for the water budget to be determined for only the area covered by the application. Others may require an area beyond the watershed (for example, a water taking application in a headwater that could potentially draw water from outside the watershed).

- 6) A process is required to provide guidance for dealing with development applications (that will likely result in a change in recharge) and for dealing with proposed water takings.

It is reasonable, that the municipalities and conservation authorities together can make good assessments of cumulative effects based on the approved development plans for the entire watershed. These could be readily updated as new information becomes available and could be used directly by the planners. This method would not work for approving a water taking (as there is currently no understanding of where it would be or how much is proposed to be taken).

- 7) Guidance is required to determine how to identify the current status of the receiving water bodies (streams, wetlands, etc), to predict the tolerance limits that would prevent loss of current function, and to monitor to ensure that undesirable effects do not occur.

Identification of the conditions that would see the “on-set” of an adverse effect is an important requirement for predictive modelling to assess what changes can be made in the watershed without changing the stream function. This should primarily be a field-oriented exercise.

- 8) Clear guidance is required in “lay-terms” to communicate the expected requirements of water budget analysis to the proponents, technical review agencies, planning agencies, and politicians.

In summary, our experience has shown that many challenges remain, both with the technical issues of how to determine the water balance, but also with developing an appropriate and practical policy for implementing the use of water budgets into the land use planning process and for future monitoring and review.

2) Definitions:

The Water Budget Document does a good job in describing the components of a “water budget” with appropriate discussion (although academic in focus) of how they should be derived. There is not, however, a clear definition of what is meant by a water budget and more importantly, how the water budget should be applied in the planning process.

In its simplest form a water budget can be considered to be the accounting for the identified elements of the water budget equation. This definition, which appears to be the assumption in the guidance document, does not really fulfil the needs for assessing historical, current or future stresses on the hydrologic cycle.

A better way to look at this is perhaps to extend the analogy of financial accounting. The concept of a water budget as outlined in the Water Budget Technical Guidance is more akin to a “Statement of Account”. At any time, this statement does not provide the owner of the account with an understanding of their capacity in terms of budgeting their future expenditures against their future income. A financial budget is considered to incorporate these future expenditures and incomes with the intent of achieving a balance (over a longer term). It is appropriate for us to think of a “water budget” more in these terms and either refer to the water budget accounting of an individual scenario (as defined in the Water Budget Technical Guidance) as a Water

Budget Account Statement or to refer to the entire concept that is similar to financial budgeting as a “Water Budget Management Plan”. The use of the “Water Budget Management Plan” approach would address the desire to capture “scenario analysis” as described above.

The term “water managers” is used in several places and should be more clearly defined. It is perhaps appropriate to identify the technical qualifications deemed necessary for an agency to establish valid water budgets and implement these into a planning framework.

Other definitions should also be provided to assist in clarifying the discussions. If many of these concepts were defined independently the text could more clearly address the intended objectives of the document without being bogged down with details. The Oak Ridges Moraine Conservation Plan and the Draft Provincial Policy Statement document from June 2004 provide good examples of basic definitions that would perhaps be appropriate to be included here (where relevant).

3) Objectives, Purpose and Expected Outcomes:

The Water Budget Technical Guidance does not provide sufficiently clear statements of objectives , purpose(s) expected outcomes for the various methods discussed in the document. These three concepts are more or less combined into one section (Section 1.1). Section 1.1 should be re-written to separate the technical aspects of determining a water budget from the land-use planning aspects of applying water budgets for decision making, and clearly outline what are the objectives, purpose and expected of this document and its relation to the planning process.

It is probably important that this document is intended to work on two levels. First to provide the technical agencies (Conservation authorities, Municipalities, and provincial ministries) with guidance on how to establish a planning decision framework that is based on water budget analysis. Further, the document should also provide guidance for continued reference by these agencies toward improving these studies and for proponents to provide suitable information to accompany future applications on which the agencies would be required to act.

Step 1 of Section 6 reintroduces the concepts of objective setting for individual water budget analysis problems. Given that this document is intended to provide process and guidance for carrying out these studies and establishing water budgets with a role in the planning process, perhaps more direction, ie. Tabulated options or flow charts, could be provided to help the non-technical audience in following through the process of need justification, goal setting, method/approach selection and identification of deliverables.

4) Process;

Section 6 provides an excellent summary of the water budget requirements in a concise and stepwise fashion. This style should be considered as the major focus of the document.

In consideration of the “needs list” identified above, a revised process should consider the following steps:

- a) Problem Scoping and Objective Setting
- b) Data Collection and Assessment
- c) Selection of Appropriate Approach
- d) Additional Data Collection (if necessary)
- e) Water Budget Accounting Process (application of approach)
- f) Scenario Analysis and Target Setting
- g) Development of a Water Budget Management Plan
- h) Development of a Conservation Plan
- i) Water Budget Management Plan Approvals
- j) Integration into Official Plans (at appropriate point)
- k) Implementation
- l) Monitoring and review

5) Scale

The issues of “scale” produce the most substantial challenges in producing effective planning guidance based on water budgets. The issues of scale are relevant on four levels:

- a) Scale of available data (accuracy, quantity, frequency);
- b) Scale of analysis;
- c) Scale of “impact assessment”;
- d) Scale of planning (or political) relevance.

Section 2.2 provides a discussion of the issues of “scale”. These discussions focus on “spatial and temporal” scale problems. In this discussion these both relate mainly to the above issue on scale of available data and the problem of setting the appropriate scale of analysis. The issues on what scale needs to be considered to conduct a valid assessment of potential impacts, or for dealing with various types of planning or political issues is not discussed.

As described above, it appears that it will be necessary to complete water budget analysis on regional (ie. Watershed), sub-regional (perhaps the portion of the watershed within the Oak Ridges Moraine), and local scales (site-specific). The tools that are being developed by York Region, and our partners, will allow for the accounting of the water budget equation at a variety of scales, however the accuracy of the assessment will only be as good as the data available. Hence, the degree of confidence in an assessment, especially the smaller scale analyses) could be highly variable in moving through a watershed.

Figure 3 can be used to illustrate an example of the inability to render an appropriate decision based on the currently available data. For example, let us assume that a proponent wished to develop a site in the West Holland River Catchment that required a water taking of 50 m³/day. If this were being withdrawn from the “Oak Ridges Moraine formation”, then this water taking would represent: 0.05% of the water being recharged into the Oak Ridges Moraine formation, and 0.03% of the water being discharged to streams. The proposed taking could also be expressed as 0.03% of the total recharge to the watershed and 0.03% of the total discharge to surface water. While this could be considered a small amount, there is no way to gauge whether the proposed water taking would be positioned to cause either a regional or a local effect on streams, or other well users.

6) Specific/Editorial

The following comments relate directly to individual sections of the Water Budget Technical Guidance:

S. 1.1 – See Item 3 above.

S. 1.2 – Are these items appropriate at this point of the document. The document should focus on defining what water budgets are and what the process is for working water budgets into a planning system. If what is presented currently is needed, it should perhaps be an appendix.

S. 1.3 – Perhaps this should be retitled to define the process (with input from Item 1 & 4 above). Some consideration must be given to be able to allow the person doing the assessment to choose what is the best method for the available data (modelling isn’t necessarily the only option for all problems/scales). Some simplification to set this up more as a step by step process would be more legible to the non-technical readers.

Moraine Considerations: The first statements here indicate that areas much larger than the Oak Ridges Moraine are necessary to close or balance the watershed. While it is an objective to ensure that the water budget/water balance is maintained within the entire watershed (and groundwatershed), in terms of application for solving planning-decision related problems, a process that also includes the ability to consider sub-watershed, user-defined areas, or the Oak Ridges Moraine Area will also be necessary. Of course, the entire function of the watershed and water course should continue to maintain a priority. It is also important to consider that water taking activities will be more likely to have effects that are either reflected further downstream (or upstream) in the watershed, or even outside of the watershed.

S. 1.4 This outline appears on Page 10. This should perhaps be moved up.

S. 2 This section is quite good, however its usefulness to the non-technical reader might be improved by some simplification to address better the needs of the planning community. One option would be to separate and provide more technical support in an appendix.

- A “change in storage” term is introduced in the basic water balance equation. This term does not necessarily apply in a strict water budget accounting for one “scenario” (as described above). It is important however, to have this term to be available for use in

- explaining the difference between “scenarios” or in preparation of the “Water Budget Management Plan”.
- Is the Surface Water Divide vs. Groundwater Divide appropriate at this point? Is this entire section relevant? Suggestion would be to move this to an issues section (perhaps in Section 1) and to rewrite to simplify and clarify what the issue means for the non-technical reader.
- S. 2.1 Components... It might be appropriate to start this section with the general water budget/water balance equation from the previous section (rather than referring back to it). Readability might be improved by making headings for each of the components, providing clearer definitions, and providing a link to how this could be relevant to the planning process. Long sections of narrative are very daunting to the reader.
- F. 4 Additional clarification may be beneficial. Recharge should be labelled (between the unsaturated zone and the saturated zone. Again, concepts/terms like interflow, etc. are highly technical and not necessarily needed by the less technical portion of the audience. Some of the suggestions provided to provide more options in the approach, would allow this type of reference to be focussed on the more detailed analysis scenarios.
- The detailed breakdown of the equations, while technically correct could perhaps be clarified in terms that a non-technical reader could appreciate more readily.
- S. 2.2 See comments in Item 3.
- S. 2.2.1 P. 3 – This is a very important point. This should be emphasized and used to build more process-oriented guidance.
- Does there need to be some discussion specifically on the issues and process for application of steady-state models to analyze and assess problems with temporal inputs. Climate change predictions are one of the main applications that will be expected from this process.
- F. 7 This figure is not clear in a black and white print-out.
- Sum. This section really is most significant to the data requirements or data assessment aspect of the process.
- S. 3 Suggest to expand this to “Quantification Options”. Modelling is only one of these, and numerical models are only one of the modelling options. There should be methods recommended for when insufficient data (or resources) is available to support the numerical modelling application on the local/detailed scale. A process to decide what approach is most relevant and how to determine when to use a model is required. Since at this time, the models are owned by the municipality/conservation authorities/province, and they are not readily available to proponents, the process must consider the options that a proponent would be faced with in order to challenge an existing planning decision (unless we are planning to make the modelling tools available for all – which is not practical at this time). At some point of local scale (i.e. individual lots), the currently available modelling tools are no longer appropriate.

- S. 3.2.1 Not sure how the whole discussion of Surface Water Models and Conjunctive models fits into the objective of the guidance document. Again, perhaps this material is more relevant to explain what is important and what it means and provide additional supporting details in an appendix.
- S.3.3,4 These sections should be revisited in context of above comments. Again, some clarification may be necessary for a non-technical audience. Overall format should be in the form of recommending a guidance/methodology and supporting the step-wise approach.
- S. 4. This section is most relevant on a technical level to provide the tolerances in the process to assess what either can or cannot be supported in the “water budget management plan”. It may be relevant to restructure the document a little to enable some of these comments to be placed in context of objective or target setting. The needs of the ecosystem ultimately provide the “maintenance target” to be protected by land use controls.

In the approach outlined above in Item 4, this section would encompass steps f) and g).

This section also provides a good opportunity to link in the long-term monitoring and review functions as outlined in Step 5 (Section 6). There must be some consideration of these in the modelling process (ie. In order to help to assess what is the extent of development that can be supported in the “Water Budget Management Plan”

We trust that these comments will be incorporated with others to develop a cohesive set of clear guidance documents.

Sincerely,

Lloyd Lemon, M.Sc., P. Geo.
Program Manager, Water Resources Protection

LAL/sp

Copy to: Barb Jeffrey, Planning and Development Services
Laura Atkins-Paul, Planning and Development Services
Don Goodyear, Lake Simcoe Region Conservation Authority
Don Ford, Toronto and Region Conservation Authority
Mike Walters, Lake Simcoe Region Conservation Authority
Sonya Meek, Toronto and Region Conservation Authority