Memorandum

Ecologically Significant Groundwater Recharge Areas in TRCA Jurisdiction: Updated Mapping

September 2019

Introduction:

An Ecologically Significant Groundwater Recharge Area (ESGRA) can be defined as an area of land that is responsible for replenishing groundwater systems that directly support sensitive areas like coldwater streams and wetlands (Greenbelt Plan, 2017). The protection of groundwater-dependent ecologically sensitive areas depends, in part, on understanding where on the landscape the groundwater comes from and taking steps to ensure the recharge function of these areas is protected (Figure 1). ESGRAs are identified using regional-scale modelling to predict where groundwater recharge at a given location will emerge or "discharge" within ecologically sensitive areas.

Mapping ESGRAs and protecting the groundwater recharge function they provide helps to ensure the streams and wetlands they are connected to continue to support important ecological functions, including provision of habitat for groundwater-dependent plants and wildlife. ESGRAs are an important component of watershed planning and are included in the definitions of significant groundwater recharge areas in the *Growth Plan for the Greater Golden Horseshoe* (Growth Plan) (2019) and *Greenbelt Plan* (2017). The term is also considered as part of the criteria for groundwater recharge in TRCA's *Stormwater Management Criteria* (2012). Mapping of ESGRAs can be used to inform decisions around municipal growth through the land use and infrastructure planning processes.

The current mapping exercise is the first time TRCA has comprehensively identified ESGRAs using a robust, scientific, and defensible approach. The results of this exercise will be critical to informing municipal comprehensive reviews and watershed plans. This memo provides a high-level overview of the purpose of mapping ESGRAs, and the provincial, municipal, and conservation authority policies and applications that this mapping informs.

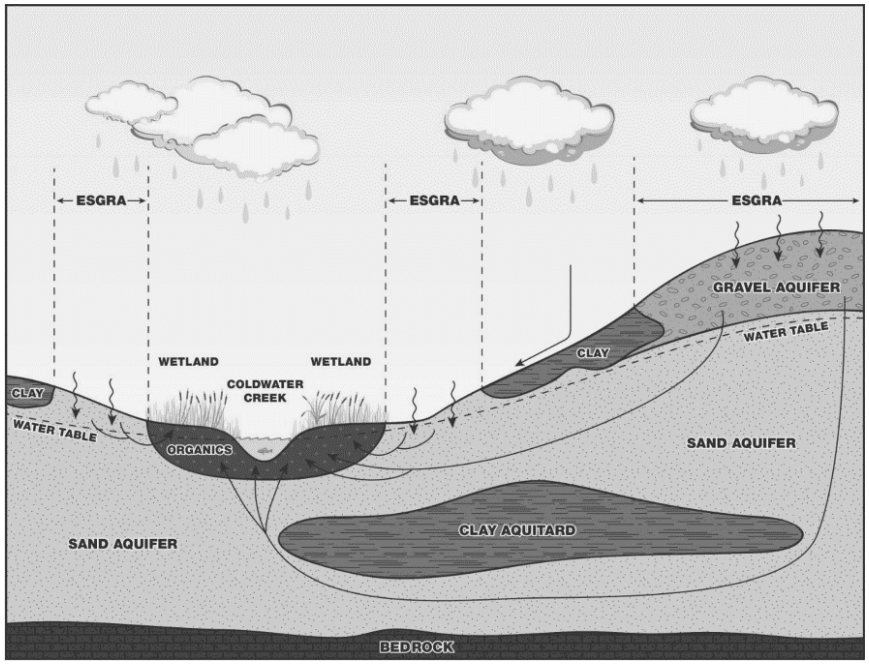

Figure 1: Conceptual drawing of Ecologically Significant Groundwater Recharge Areas in a landscape context

Background

The ability to establish hydrogeological connections between areas of land and groundwater-supported ecosystems has been enhanced by significant improvements in understanding of regional-scale hydrogeology. As part of Source Water Protection, water budget models were developed for many watersheds in southern Ontario in the mid-2000s. These water budget models provided the knowledge and the modelling framework necessary for a more detailed assessment of groundwater-dependent ecosystems. In 2012, Lake Simcoe Region Conservation Authority (LSRCA) completed ESGRA modelling and mapping for the western Lake Simcoe drainage basin; LSCRA subsequently completed mapping for most of the remainder of the drainage basin over 2013-2015. Central Lake Ontario Conservation Authority (CLOCA) completed ESGRA modelling and mapping for their entire jurisdiction in 2014.

TRCA also completed limited ESGRA mapping as part of the Rouge River and Humber River watershed plans in 2007 and 2008. The mapping was included as part of TRCA's *Stormwater Management Criteria* (2012) to refer to areas where TRCA's groundwater recharge criteria (outlined in Policy Context below) should be applied. This mapping relied on expert knowledge and judgement based on hydrogeological studies and contemporary understanding of the Oak Ridges Moraine, in combination with known coldwater streams and wetlands identified by ecologists. However, the modelling and mapping was only ever undertaken for the Humber River and Rouge River watersheds, and so provided incomplete coverage for the TRCA jurisdiction.

Building on these precedents, TRCA contracted the Oak Ridges Moraine Groundwater Program (ORMGP) to complete modelling using the same methodology used by LSRCA and CLOCA (known as reverse particle tracking) for the watersheds of TRCA jurisdiction. Using the model outputs, TRCA staff developed a methodology for mapping ESGRAs that maximizes the protection of groundwater-dependent ecosystems while minimizing the area of the watershed that is covered by ESGRAs. The details of this methodology are outlined in a separate technical memo. This updated mapping supersedes the version of the map appearing in the 2012 *Stormwater Management Criteria* and uses a methodology that is consistent with neighbouring conservation authorities.

Policy Context

Under the Growth Plan, municipalities are required to undertake watershed planning to inform the protection of water resources and decisions around planning for growth. Both the Growth Plan and the *Greenbelt Plan* require municipalities to identify and protect the features, areas, and functions of the Water Resource System, of which ESGRAs are one type of area.

TRCA's *Living City Policies* (LCP; 2014) align with provincial policies' and plans' watershed management approach to protecting the Water Resource System and managing development impacts. With respect to water resources management, the LCP asks proponents of development and infrastructure to meet SWM criteria including water balance. For implementation guidance on these policies, the LCP refers proponents of development and infrastructure to TRCA's *Stormwater Management Criteria*. Within the *Stormwater Management Criteria*, section 6.2.1 outlines criteria for development and infrastructure applications within three types of important recharge area, one of which is ESGRAs. The criteria require that proponents "maintain pre-development groundwater recharge rates and appropriate distribution, ensuring the protection of related hydrologic and ecologic functions." The document states that the criteria "represent a minimum requirement that may be superseded by the results of further studies and local constraints", and that proponents should consult with TRCA staff concerning the site-specific criteria to be applied.

Mapping

TRCA staff developed a methodology to map ESGRAs in TRCA watersheds using outputs from the updated regional groundwater model developed by the ORMGP staff in 2018. The TRCA mapping methodology, as outlined in a separate technical memo, is an efficient solution that maximizes the protection of groundwater-dependent ecosystems (definition provided in technical memo) while minimizing the area covered by ESGRAs.

A technical committee comprising TRCA staff from Development & Engineering Services (Hydrogeology & Source Water Protection, Watershed Planning & Reporting), Policy Planning (Research & Knowledge Management, Provincial & Regional Policy), ITM (Geomatics), as well as representatives from ORMGP and Credit Valley Conservation, was assembled to discuss various mapping scenarios. The committee reached a unanimous decision to endorse the ESGRA mapping scenario shown in Figure *2*. Some spatial statistics describing the areas designated as ESGRAs in this mapping scenario are presented in Table 1.

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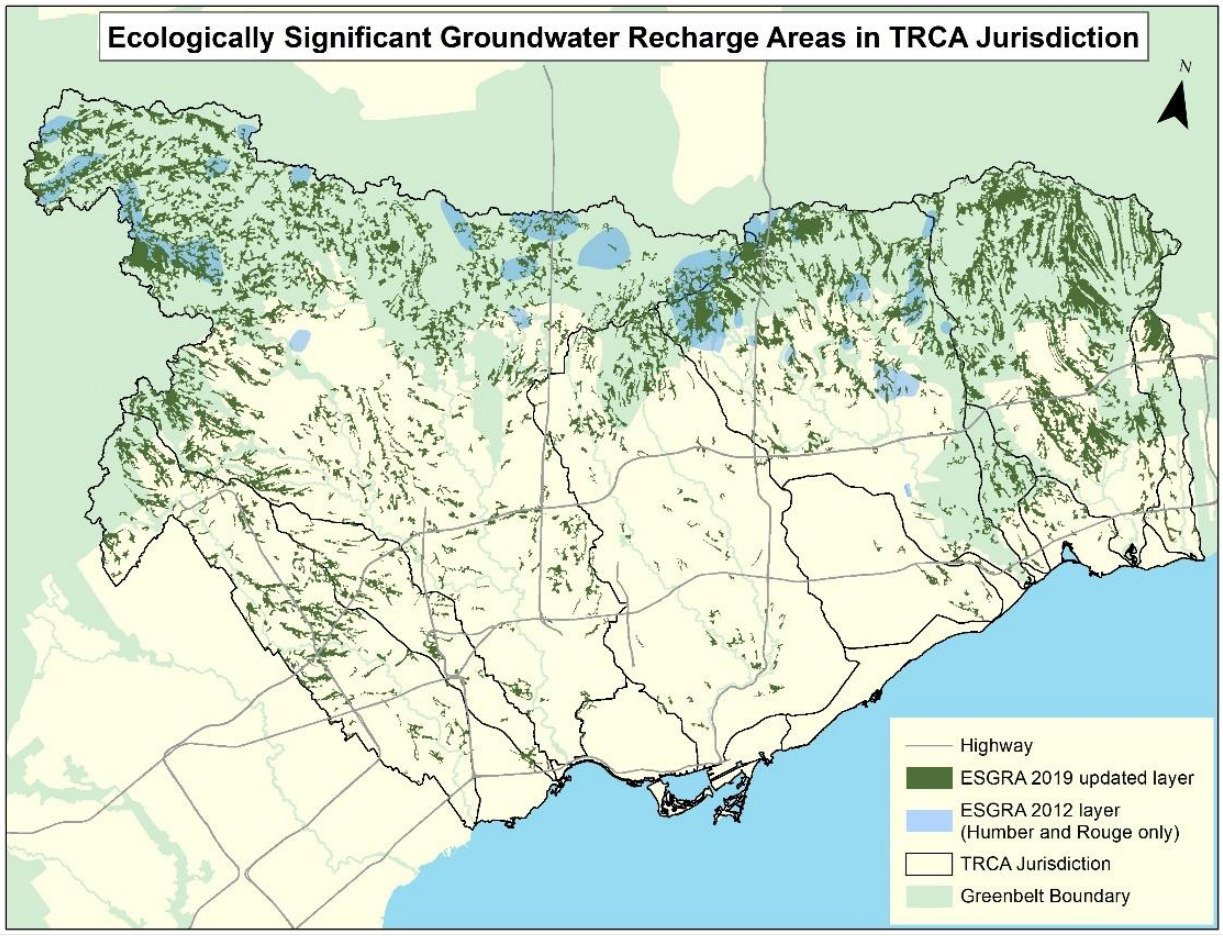

Figure 2*: Map of areas in TRCA watersheds designated as ESGRAs using the approach endorsed by the TRCA technical committee. Note that the 2012 ESGRA mapping which the 2019 mapping supersedes was completed only for the Humber River and Rouge River watersheds.*

Table 1: Spatial statistics for areas in TRCA watersheds designated as ESGRAs in the preferred mapping scenario

ATTRIBUTE	VALUE
ESGRA total area	34,849 ha
Area as proportion of TRCA jurisdiction	14.0 %
Minimum ESGRA polygon size	5 ha
Proportion of groundwater-dependent ecosystem* recharge areas protected *as defined in technical memo	95.4 %
Overlap with Oak Ridges Moraine Conservation Plan area	40.5 %
Overlap with Greenbelt Plan area	62.4 %
Overlap with 2017 natural cover* layer *all areas of the landscape with natural vegetative cover	29.4 %
Overlap with TRCA Terrestrial Natural Heritage System	38.7 %
Overlap with other provincial and municipal natural heritage system designations* *includes Natural Core and Natural Linkage areas of the ORMCP and Greenbelt Plan, as well as Rouge National Urban Park, in addition to other categories of municipal or provincial natural heritage designations	46.4 %
Overlap with Significant Groundwater Recharge Areas (SGRAs)	56.2

Applications

The ESGRA mapping layer has the following applications to municipal planning processes and TRCA's strategic objectives, in addition to other potential applications:

- **Watershed planning:** to define the Water Resource System (in conjunction with other layers) and inform targets and criteria for development and infrastructure within watersheds. ESGRA mapping will allow municipalities to determine appropriate policies to protect these areas, as well as the other features and areas that comprise the Water Resource System.
- **Review of development and infrastructure proposals:** to update the mapping contained in the *Stormwater Management Criteria* document to use ESGRAs as a screening tool for development and infrastructure proposals. Development and infrastructure proposals within areas mapped as ESGRAs will need to demonstrate appropriate mitigation strategies to maintain pre-development groundwater recharge rates.
- **Natural heritage system planning and restoration:** to inform plans for the strategic restoration of natural systems (e.g. *Integrated Restoration Prioritization*) and management of lands in a way that considers benefits to ecosystems dependent on groundwater.
- **Prioritizing stormwater infrastructure retrofit opportunities:** to inform plans for retrofitting stormwater infrastructure to provide for enhanced infiltration and recharge, where appropriate and where opportunities exist (e.g. through *Sustainable Neighbourhood Action Plans*).

Next Steps

The Research & Knowledge Management (R&KM) team will consult with members of TRCA Senior Leadership Team to discuss the applications of the ESGRA mapping layer, particularly with regards to review of development and infrastructure proposals. Assuming SLT is prepared to endorse this mapping approach, R&KM and the Watershed Planning & Reporting (WPR) team will communicate the technical methodology to municipal partners. Some of our municipal partners have already requested meetings to discuss the results of the ESGRA mapping (e.g. Peel, Toronto). The regional municipalities of Peel and Durham are both currently updating their regional groundwater models, with the intent to also complete mapping of ESGRAs. The adoption of the TRCA methodology would ensure that a consistent approach to ESGRA mapping is used across TRCA jurisdiction while also demonstrating value to our municipal partners.

TRCA Development & Engineering staff have stated that they believe that our existing policy framework is sufficient for TRCA review of development and infrastructure applications using the updated ESGRA mapping presented here. Through consultation with our municipal partners, we will review any additional policy instruments that may be needed for implementation at the municipal level.