

## Applied Research on Source Water Protection Issues in the Aggregate Industry; Phase I Findings

The Ontario Ministry of Natural Resources  
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The Ontario government passed the *Clean Water Act* June 4, 2007, which will result in the creation of source water protection plans in every major watershed in the province. The Ontario Stone, Sand and Gravel Association (OSSGA) supported a research study by the Ministry of Natural Resources into the role that aggregate extraction and processing plays in the protection of vital drinking water sources, and participated in a multi-stakeholder steering committee. This review highlights key findings of the study from the industry perspective.

This first phase of the research study concentrated on the review of some 87 published sources of Canadian and international information, including those jurisdictions where source water protection studies have already been undertaken, and where the aggregate industry has also been addressed. Of particular importance are those that contain a scientific assessment of the industry's performance.

Although many of the jurisdictions examined in the study have concerns about the aggregate industry, and some have put controls and policies in place regarding source water protection, there is almost no documented scientific evidence that the extraction and processing of stone, sand and gravel represents a threat to drinking water sources.

***Many jurisdictions, from country to county, have concerns with respect to the extraction industry but in most cases the findings of studies presented do not indicate an actual negative impact from the aggregate extraction operation itself. The concern was more often the control of land use during and after extraction. (p. 26)***

***... more than 300 sand and gravel mines operating in the State mine aggregate below the water table. In its experience, no such mining activity has ever resulted in the contamination of a drinking water supply ... a comprehensive review of the scientific literature, field interviews with water supply managers, and an examination of case studies from New Hampshire, Ohio and New York, concluded that they had "found no scientific documentation containing evidence that excavating gravel above or below the water table was detrimental to an underlying aquifer". (p. 52; State of New York Department of Environmental Conservation, April 2005.)***

With the exception of large-scale quarry dewatering, which is generally the subject of more detailed investigation and controls, the effects of aggregate extraction either above

or below the water table are found to be very minor and localized, and therefore of limited consequence to the yield of any nearby drinking water supplies. On the other hand, post-extraction lakes offer the potential to increase aquifer storage and enhance yields. As a result many jurisdictions permit aggregate operations adjacent to water supply wells.

*Case history studies that do assess cumulative impacts do not appear to show impacts to the groundwater system at a subwatershed scale although local impacts were observed on a site specific basis. (p. 9)*

*Reviews of case history data from a cluster of gravel pits located in a glacial outwash channel in the Mill Creek subwatershed Puslinch Township did not show any apparent impacts, on a subwatershed scale, on the groundwater flow system but did demonstrate local modifications to the groundwater flow system. The local modifications to the flow system and water balance do not appear to result in measurable impacts on a larger scale. Studies are continuing within the subwatershed. The major change that has taken place is an increase in aquifer storage due to the creation of lakes as a result of below water table extraction. (p. 60)*

The research also revealed little evidence of any water quality effects related to normal aggregate extraction and processing activities, and no documented cases of any drinking water supply being contaminated. More important is the control of adjacent land uses to make sure that urban, industrial and agricultural contaminants do not run into pits and quarries where they could gain access to groundwater aquifers. This sort of run-off can usually be re-directed with grading and berms at the perimeter of the site. The discharge of water from quarries mainly represents a concern regarding suspended sediments, and is one that is easily resolved with proper sediment removal. Deep quarries must also be designed in such a way to ensure that naturally poor groundwater is not captured and discharged to a drinking water source.

*Available literature indicates that there are limited documented instances of water quality impacts on groundwater quality as a result of normal operational activities. There were no documented cases of contamination of a municipal well from regular operation activities during aggregate extraction. (p. 53)*

*Controls are in place to properly handle and store fuels on-site and the literature search did not indicate there were water quality issues as a result of fuel spills. (p. 11)*

*...study by the Minnesota Department of Natural Resources concluded that the physical effects of blasting did not alter the local well water quality... (p. 51)*

*Existing literature does not show any documented instances of groundwater quality impacts from ancillary uses, such as asphalt plants, at aggregate extraction sites. (p. 54)*

Where the documents did find water protection issues in relation to the aggregate industry, they were most often associated with the after-use of pits and quarries as housing developments or landfill sites. OSSGA contends that these should be dealt with separately and distinctly in source water protection plans since they represent a different range of issues from the extraction and processing of stone, sand and gravel. A similar approach can be taken with ancillary land uses such as asphalt and ready-mix concrete plants, where necessary.

Future stages of the research study are proposed to examine actual Ontario case histories where aggregate extraction and processing occur in the vicinity of drinking water supplies, to verify the findings in the literature review and to determine if there is any further scientific research that is needed. OSSGA supports and encourages the continuance of this essential research. Some of the issues where there appears to be gaps in the current research study include:

- The extent that large-scale quarry dewatering can influence the shape of wellhead capture zones, and thereby alter the other land uses that fall within that zone.
- The significance that extraction of material above or into an aquifer has in terms of the “filtration” this provides to any contaminants that may enter the pit or quarry from spills or from adjacent land uses.
- The implications of using fertilizers and pesticides during the pit or quarry rehabilitation process.

OSSGA supports and encourages the continuance of this essential research.

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