Developing Guidelines for the Rehabilitation of Aggregate Extraction Sites in Prime Agricultural Areas

Case Study 5 | Progressive Agricultural Rehabilitation of an Active Aggregate Extraction Site



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Case Study 5: Progressive Agricultural Rehabilitation of an Active Aggregate Extraction Site

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Background

With urban and rural development on the rise, there is a growing need for aggregate resources, such as sand and gravel, to build public and private infrastructure.[1] At the same time, population growth and urbanization are putting pressure on agricultural production and agricultural land.[2] It is critical to protect and sustainably manage both aggregate and agricultural resources. However, high-quality aggregate resources are often found within prime agricultural areas or specialty crop areas.[3] As such, the aggregates and agriculture industries must work together to sustainably manage resources.

The Ontario Provincial Policy/Planning Statements (PPS)[4] outline the provincial government's land use planning policies for both the aggregates and agricultural industries.[5] While the PPS (2024) requires prime agricultural areas be protected for long-term use; it allows planning authorities to "permit non-agricultural uses in prime agricultural areas for extraction of minerals, petroleum resources and mineral aggregate resources".[6] In prime agricultural areas, on prime agricultural land, aggregate extraction is permitted as an interim land use only if the impacts to the agricultural system are mitigated and minimized as recommended by an agricultural impact assessment (AIA) and the site is rehabilitated back to an agricultural condition upon completion of extractive activities. The PPS (2024) defines agricultural condition as "a condition in which substantially the same areas and ***same average soil capability*** for agriculture is restored".[7] For specialty crop areas, the PPS (2024) requires that "the same range of specialty crops common in the areas can be achieved, and where applicable, the microclimate on which the site and surrounding area may be dependent for specialty crops will be maintained and restored". The only time that an aggregate extraction site does not have to be rehabilitated back to an agricultural condition is when the depth of aggregate extraction makes rehabilitation "unfeasible", typically due to extraction below the water table.[8]

The Aggregate Resources Act (ARA) includes requirements for the rehabilitation of aggregate extraction sites, including those in prime agricultural

[1] Ministry of Natural Resources. (2025). Aggregate resources. *Government of Ontario*, https://www.ontario.ca/page/aggregate-resources

[2] Brooks, T. (2022). Ontario farmland under intense pressure. *Ontario Federation of Agriculture (OFA)*, https://ofa.on.ca/newsroom/ontario-farmland-under-intense-pressure/; Spoelstra, D. (2024). We must protect farmland for the sake of future generations. *Ontario Federation of Agriculture (OFA),* https://ofa.on.ca/newsroom/we-must-protect-farmland-for-the-sake-of-future-generations/

[3] Ontario Farmland Trust. (2020). The Impacts of Aggregate Mining on Farmland. *Ontario Farmland Trust,* https://ontariofarmlandtrust.ca/2020/07/02/the-impacts-of-aggregate-mining-on-farmland/

[4] The Ontario Provincial Planning Statement was released in 2024, replacing the Ontario Provincial Policy Statement (PPS 2020) and the A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2019). Previous versions of the Policy Statement include PPS 1997, 2005, 2014.

[5] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf ; Ministry of Municipal Affairs and Housing. (2020). Provincial Policy Statement. *Government of Ontario*, https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf ; Government of Ontario. (2020). A Place to Grow: Growth Plan for the Greater Golden Horseshoe. *Government of Ontario,* https://files.ontario.ca/mmah-place-to-grow-office-consolidation-en-2020-08-28.pdf. Penaud, A., Holy, K., Lemay, M. A., Fullerton, C. (2026). Policy Timeline – the Intersection of Agriculture and Aggregates. VISTA Science and Technology.

[6] Ministry of Municipal Affairs and Housing. (2020). Provincial Policy Statement. *Government of Ontario*, https://files.ontario.ca/mmah-provincial-policy-statement-2020-accessible-final-en-2020-02-14.pdf

[7] *Ibid*.

[8] *Ibid*.

areas on prime agricultural land.[9] The ARA states that every licensee/permittee has the duty to rehabilitate the site by performing "progressive and final rehabilitation of the site in accordance with the Act".[10]

Rehabilitation of a site is typically discussed in the operational plan and rehabilitation plan, each of which represent separate elements of the site plan. Rehabilitation plans include rehabilitation notes, which outline the steps that will be carried out to restore the site to an agricultural condition with the same average soil capability in accordance with the PPS. Rehabilitation notes may also be included in the operational plan, which describes progressive rehabilitation and recommendations from technical reports, such as an AIA. The site plans, including rehabilitation plan and operational plan, must comply with provincial standards and once approved are legally-binding.[11] Aggregate operators cannot deviate from the plans without approved amendments.[12] Site plans are the only enforceable documents governing aggregate operations.

Detailed rehabilitation plans that incorporate best management practices are critical for effective rehabilitation. However, research and guidance on best practices for rehabilitation of aggregate extraction sites in prime agricultural areas is limited. To increase clarity on best practices, it is important to understand industry norms, common concerns, and recommendations from stakeholders and government agencies related to rehabilitation of aggregate extraction sites located in prime agricultural areas.

This case study report is the fifth in a series of case studies analyzing records related to licence applications for aggregate extraction sites located in prime agricultural areas, on prime agricultural land, or speciality crop areas that will be rehabilitated back to an agricultural condition. The case studies seek to identify rehabilitation best practices, common challenges in preparing aggregate applications and rehabilitation plans and recurring recommendations regarding rehabilitation back to an agricultural condition as required by the PPS. The case studies are a part of a broader research project developing evidence-based guidelines for rehabilitation of aggregate extractions sites located in prime agricultural areas in Ontario (Appendix A). Common industry terms are defined in Appendix B - Glossary of Terms.

[9] Government of Ontario. Aggregate Resources Act. (2021). *Government of Ontario, E-laws,* https://www.ontario.ca/laws/statute/90a08

[10] *Ibid*.

[11] Ministry of Natural Resources and Forestry. (2020). Aggregate Resources of Ontario: Site Plan Standards. *Government of Ontario,* https://files.ontario.ca/mnrf-aggregate-resources-of-ontario-site-plan-standards-2020-en-2021-03-18.pdf; The Ministry of Natural Resources and Forestry (MNRF) was the official title of The Ministry at the time that the site plan standards were published. The Ministry's official title was changed to the Ministry of Natural Resources (MNR) in June 2024.

[12] Government of Ontario. (2024). Applications to amend licences, permits, and site plans under the Aggregate Resources Act. *Government of Ontario. https://www.ontario.ca/files/2024-09/mnr-amendment-policy-june-2024-en-2024-09-12.pdf;*

Case Study Introduction

This case study report focuses on the rehabilitation plan and progressive rehabilitation outcomes of an active aggregate extraction site on prime agricultural land in Ontario. The site was initially licenced under the Aggregate Resources Act (ARA) in the late 2000s. In the early 2010s, the aggregate operator was approved for a second licence to expand extraction to an adjacent property. Shortly thereafter, the two licences were amalgamated to one, resulting in a new (amalgamated) site plan that governed extraction and rehabilitation activities across the combined area.

Site Records

This case study report draws upon documents pertaining to agricultural rehabilitation across the amalgamated licence, including:

- The amalgamated site plan approved under the ARA
- A Natural Technical Report, which included a soil survey submitted with the application to expand extraction to an adjacent property[13]
- Annual Compliance Assessment Reports (CARs) submitted to Ministry of Natural Resources (MNR)
- An MNR inspection report for the amalgamated site
- A successful application for an Ontario Stone, Sand and Gravel Association (OSSGA) Progressive Rehabilitation award

Site Features and Conditions

The site represents a Class A, Category 3 licence, which allows for mineral aggregate extraction above the water table. The amalgamated site included a licence area of ~95 ha and an extraction area of ~70 ha. The licence allowed the aggregate operator to extract a maximum of 1,000,000 tonnes annually. Apart from a small woodlot (~5 ha), the site was designated as a prime agricultural area in both the regional official plan and the local township's official plan. The site was also recognized as a mineral aggregate resource area by MNR and by the regional and municipal plans.

A soil survey completed as part of the Natural Technical Report determined that more than 90% of the site was Class 1-3 agricultural lands. This included ~80% Class 1, ~5% Class 2 and ~5% Class 3 lands. According to the Ontario Ministry of Agriculture, Food and Agribusiness (OMAFA), Class 1 soils have the highest soil capability for agriculture, with "no significant limitations in use for crops."[14] Class 1 soils are "well drained and have good nutrient and water holding capability."[15] This aligns with findings from the soil survey, which characterized the site as being "well-drained, with sandy loam over gravelly subsoil materials". The soil survey also concluded that "most on-site surface water is sheet water that permeates into the subsoil layers". No standing or flowing water bodies were reported at the site, and there was no evidence of agricultural drainage tile or irrigation infrastructure.

[13] Soil surveys are typically included in an Agricultural Impact Assessment (AIA). AIAs are currently required to be submitted with licence applications for aggregate extraction sites located within prime agricultural areas. This policy requirement was not in effect when the aggregate operator applied for the licence application, however a soil survey was prepared as part of a Natural Technical Report.

[14] Ministry of Agriculture, Food, and Agribusiness. (2024). Soil capability for agriculture in Ontario. *Government of Ontario,* https://www.ontario.ca/page/soil-capability-agriculture-ontario#:~:text=The%20soil%20capability%20class%20represents%20the%20potential,are%20generally%20feasible%20on%20similar%20soils%20elsewhere

[15] *Ibid.*

Given that the site was located on prime agricultural land within a prime agricultural area, the licence was granted on the condition that the site would be restored to an agricultural condition, as per the requirements of the PPS.[16] Aggregate resources have been extracted from the site for nearly two decades and rehabilitation is in progress in accordance with the site plan. A local farmer, who owns a portion of the site, has been collaborating on the rehabilitation. Prior to extraction, the site produced cash crops, including corn, wheat, and soybeans. Areas of the site not currently being extracted continue to be farmed.

[16] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

Agricultural Rehabilitation

According to the amalgamated site plan, the pit floor (~55 ha) would be rehabilitated to an agricultural land use. This included the portion of the site that was licenced in the 2000s and the expansion lands that were licenced in the 2010s. The remaining ~15 ha of the amalgamated site, which included side slopes and setbacks, would be rehabilitated to a natural environment condition.[17]

This section reports the findings of the analysis of the rehabilitation notes listed in the approved, amalgamated site plan (Table 1) and recommendations made in the soil survey to enhance rehabilitation outcomes (Table 2).

Progressive Rehabilitation

The amalgamated site plan organized extraction and rehabilitation activities into nine operational phases. Three phases, located in the initial licence area, have already been extracted and are designated for aggregate processing and shipping. According to the amalgamated site plan, these phases would remain in operation until processing and shipping activities were no longer required, after which they would be rehabilitated in accordance with the approved rehabilitation plan. Within the remaining six phases, extraction would proceed sequentially from one phase to the next, with rehabilitation undertaken progressively as phases were completed. The operational plan specified that rehabilitation would "need to be completed within one full growing season of the beginning of excavation in the next phase".

Rehabilitation Notes

The rehabilitation practices summarized in Table 1 must be carried out across all nine operational phases, with the exception of rehabilitation monitoring activities, which were only required for the three operational phases designated for processing and shipping.

[17] Natural environment rehabilitation has been excluded from this analysis, as the focus of this report is agricultural rehabilitation.

Table 1. Rehabilitation notes in the amalgamated site plan. Certain information is paraphrased for readability.

Rehabilitation Practices	Rehabilitation Notes
General Rehabilitation Notes	• It is intended that the rehabilitated pit floor will have a minimum of 2.0 m of medium above the water table, including 1.5 m of aggregates and 0.5 m of subsoil and topsoil.
Slope	• All extraction faces shall be sloped and graded to no steeper than 3:1, accomplished by backfilling with clean compacted fill material obtained from within the area to be extracted. To enhance slope rehabilitation, clean inert fill may be imported to facilitate the establishment of 3:1 horizontal to vertical slopes on the pit faces. • The licensee must ensure that clean inert fill is tested at the source before it is deposited on site to ensure that the material meets the Ministry of the Environment's (MOE) parameters under Table 1 of the MOE's Soil Ground Water and Sediment Standards for use under part XV.1 of the Environmental Protection Act. Sampling results will be provided to MNR upon request. Where the imported material is not being placed within 1.5 m of the surface, the criteria under Table 1 for sodium absorption ratio and electrical conductivity do not have to be met.
Topsoil/Subsoil Storage and Management	• As excavation is opened, topsoil and subsoil are to be stripped and stockpiled in separate berms and preserved for use during rehabilitation. • Where possible, topsoil and subsoil stripped from current extraction areas will be placed onto areas undergoing rehabilitation. • Long term soil stockpiling and berming should be kept to a minimum. • Screening and storage berms are to be covered with 50 mm minimum topsoil, graded to slopes of 3:1, seeded and maintained. Interim seeding will be legume-grass mixture with mulch in accordance with Ontario standard specification OPSS 572 or equal. • 0.2 m of topsoil and 0.3 m minimum of subsoil shall be replaced in their natural sequence on pit slopes and the pit floor and graded and cultivated in preparation for seeding. • Soil compaction shall be alleviated by deep chisel plowing or ripping the pit floor to a minimum depth of 0.5 m prior to the application of soil. The subsoil horizon should be chisel plowed or ripped prior to replacement of the topsoil. • The reapplication of soil materials should be accomplished under dry soil conditions using wide-tracked equipment to minimize soil compaction.
Vegetation Information	• Rehabilitated pit floor areas and slopes not being naturalized shall be seeded with a grass/legume seed mixture, preferably including alfalfa. • A cover crop of oats or rye grass may be applied in the initial year to help prevent erosion. • Grass/legume cropping, preferably including alfalfa, should continue for 3 to 4 years to improve soil structure and add fertility. • Cover crops should be disk plowed in the spring as green manure to add organic matter. • Row crops in rotation with legume/grass mixtures should begin in years 4 or 5.

Fertilizer Applications	• Fertilizer (5-20-20) or equal may be applied on the areas to be seeded.
Drainage	• All surface drainage will be internal through infiltration into the rehabilitated pit floor.
Monitoring Rehabilitation	• The licensee will retain a soil scientist during the completion of initial floor rehabilitation to conduct an annual inspection of progressive rehabilitation conditions and methods, to identify problems or deficiencies and make recommendations for effective soil rehabilitation. Copies of an annual report will be provided to MNR, and the regional and local municipality. This condition applied only to three operational phases located within the initial licence area, which will be used for processing and shipping activities.
Best Management Practices	• Use best management agricultural practices appropriate for the area, climate and site conditions.

Soil Survey Recommendations

A soil survey was completed as part of the Natural Technical Report submitted with the licence application to expand aggregate operations to the adjacent property. Several recommendations were made to enhance agricultural rehabilitation outcomes across the site (Table 2).[18] These included implementing best practices for preserving soil structure and soil organic matter, such as minimizing soil mixing, limiting the duration of soil storage, and reducing soil compaction and erosion. The soil survey also recommended incorporating cover crops into the rehabilitation plan to build soil organic matter and soil structure following the re-establishment of soil layers during progressive rehabilitation. A post-rehabilitation management plan was also recommended, as well as continued use of general best management practices. Most of the recommendations were fully incorporated into the amalgamated site plan (Table 2). Recommendations related to minimizing soil storage and compaction, were partially adopted (Table 2).

[18] Recommendations for agricultural rehabilitation are typically included in an Agricultural Impact Assessment (AIA). AIAs are currently required to be submitted with licence applications for aggregate extraction sites located within prime agricultural areas. This policy requirement was not in effect when the aggregate operator applied for the licence application, however a soil survey was prepared as part of a Natural Technical Report, which included recommendations for rehabilitation. Penaud, A., Holy, K., Lemay, A., Fullerton, C. (2026). Policy Timeline – the Intersection of Agriculture and Aggregates. *VISTA Science and Technology*.

Table 2. Extent of adoption of soil survey agricultural rehabilitation recommendations in the amalgamated site plan. Certain descriptions are paraphrased for readability.

Recommendation	Description	Adoption
Minimizing Soil Mixing	The topsoil, subsoil, and overburden should be stripped, moved, and stored separately. Intermixing of the soil materials should not occur or be kept to a minimum.	**Adopted.**
Minimizing Soil Storage	The most critical step to the success of rehabilitation to agriculture is the conservation of topsoil materials. The main reason for topsoil conservation is that these materials are high in organic matter when compared with underlying soil horizons, which relates to higher natural fertility and water-holding capacity. In an ideal progressive restoration plan, the topsoil materials are stripped from a natural area and moved directly to an area of rehabilitation without significant time spent stockpiled. The quality of topsoil materials deteriorates over time in storage due to changes in soil organisms (fungi and bacteria). Apply a progressive rehabilitation plan to prevent the degradation of the topsoil materials. Progressive rehabilitation allows for direct movement of soil from the natural state to an area of restoration, without the intermediate stockpiling step other than for berming.	**Partially Adopted.** The site plan uses suggestive language when detailing recommendations pertaining to soil storage. The site plan stated that “where possible”, topsoil and subsoil stripped from extraction areas would be placed on areas undergoing rehabilitation, and that long term stockpiling and berming “should” be minimized.

Minimizing Soil Compaction	Soil materials should be moved under appropriate weather conditions. Surface soils are easily damaged when wet. The reapplication of soil materials should be accomplished in dry soil conditions and through the use of equipment that does not cause excessive soil compaction. Ideally, the soil materials should be reapplied with wide-tracked crawler bulldozers. During the restoration of the soil profile, each horizon should be chisel plowed to release soil compaction prior to the placement of the next horizon. Once the soil materials have been replaced, the pit floor should be deep chisel plowed or ripped to release compaction from the heavy extraction equipment.	**Partially Adopted.** Recommendations to only move soil materials under dry conditions were adopted. Deep chisel plowing or ripping prior to the application of soil was adopted. However, the site plan did not specify whether this would be carried out again once all the soil materials are replaced.
Erosion Control	Strip small areas as necessary for the advancement of extraction. The stripping of ground cover and subsurface soils leaves the exposed area prone to erosion.	**Adopted.**
Planting Cover Crops	Upon completion of reapplication of the soil materials, the area should be seeded to a cover crop to control surface soil erosion. Oats or rye grasses are appropriate cover crops to use while establishing a legume/grass cover. There should be a minimum of 2.0 m of soil over the groundwater levels to provide for adequate plant growth. It may be necessary to stone pick the field prior to seeding the first crops. On slopes of 5:1 or greater, the use of hydroseeding and mulch materials may be required. Cover crops should be disc plowed in the spring as a green manure to add organic matter to the surface soils.	**Adopted.**

Post-Rehabilitation Management Program	Create a post-rehabilitation management program to accommodate a five-year plan for the restoration of the soils.	**Partially Adopted.** The site plan stated that an annual inspection would be carried out by a soil scientist; however, this condition is only applicable to three of the nine operational phases of the site located within the initial licence area, which will be used for processing and shipping activities.
Use of Best Management Practices	Use best management agricultural practices as appropriate for the area, climate, and conditions.	**Adopted.** This recommendation was implemented; however, specific best management practices were not listed.

Rehabilitation Status and Outcomes

Progressive rehabilitation is currently underway. According to annual CARs submitted to MNR, just over 20% of the pit floor has been restored to an agricultural condition over a period of 10 years. In accordance with the amalgamated site plan, agricultural rehabilitation has been carried out in phases, with three operational phases out of nine marked as complete. "The farmer who owns and farms the land has been closely involved in the rehabilitation process and was able to produce cash crops in the first year that progressive rehabilitation was completed."[19] Soybeans and corn have been grown in rotation on the rehabilitated areas for seven years.

According to the rehabilitation award application, progressive rehabilitation to an agricultural condition has been achieved through various rehabilitation techniques, some of which were documented in the amalgamated site plan and other practices that were not included in the site plan (Table 3).

Table 3. Comparison of rehabilitation techniques listed in the site plan versus techniques listed in the application for a progressive rehabilitation award. This includes techniques included and not included in the amalgamated site plan. Bolded words represent edits to site plan notes in the application.

Techniques Listed in Site Plan	Techniques Identified in the Award Application
• Careful separation of topsoil, subsoil, and overburden during stripping operations. • The replacement of ~0.3 m of subsoil and ~0.2 m of topsoil to the pit floor areas once it was graded and compaction alleviated. • Deep chiseling/ripping of the pit floor to a depth of 0.5 m and chisel plowing the subsoil prior to the placement of topsoil. • Grading the pit floor. • Reuse and reapplication of stripped soil materials as part of progressive rehabilitation. • Movement of soils under dry conditions.	• The creation of access ramps in the side slopes for farm equipment. • Additional grading of some areas located outside of the limit of extraction to improve slope conditions and add additional areas suitable for crop production. • The use of organic manure to improve soil characteristics and nutrients. • Grading of the pit floor **to create a very flat area with drainage directed to the southeast**. • Immediate relocation of soils and overburden from stripped areas to areas undergoing rehabilitation.

The rehabilitation award application suggested that the techniques used to rehabilitate the site resulted in successful outcomes. According to the aggregate operator, there have been no issues with stoniness or drainage following rehabilitation activities. The use of "careful soil handling techniques and best management practices carried out by the farmer have allowed the farmer to immediately begin producing cash crops with little to no impact to annual yields."[20] The aggregate operator did not provide measurements of annual yields to validate this statement. The award application also noted that some parts of the licence area located outside of the extraction limit have been graded to a flatter slope to

[19] Anon. (n.d.) Application for Progressive Rehabilitation Award. *Ontario Stone, Sand and Gravel Association (OSSGA).*

[20] *Ibid.*

"add additional areas suitable for crop production". The award application did not list the size of the additional areas undergoing agricultural rehabilitation.

Some rehabilitation practices listed in the site plan were not reported to have been carried out at the site in the rehabilitation award application or the CARs. There was no record of soil testing or agricultural monitoring, because this condition is only applicable to three operational areas of the pit which have not yet begun progressive rehabilitation. These phases are currently reserved for aggregate processing and shipping. Furthermore, there was no mention in the award application nor the CARs of planting cover crops. Although cover cropping was not discussed, CARs submitted to MNR indicated compliance with all progressive rehabilitation notes listed in the site plan.

A recent MNR inspection report confirmed that progressive rehabilitation had been completed in three operational phases on the pit floor and that rehabilitation has now begun in the fourth phase. Compliance with specific rehabilitation notes was not assessed as the inspection focused on other components of the site plan, such as fuel storage, setback locations, and fencing.

Discussion

Analysis of the amalgamated site plan, the application for a rehabilitation award, annual CARs and an inspection report from MNR provided insights into how progressive rehabilitation activities evolved over time at the site.

This section discusses the findings of the analysis in the context of three key themes:

- Vague and Ambiguous Language
- Loss of Prime Agricultural Land
- Timelines and Timeliness of Rehabilitation

Vague and Ambiguous Language

Suggestive language was used several times in the amalgamated site plan, especially when discussing agricultural best practices such as cover cropping. The soil survey recommended the use of cover cropping to control erosion and increase soil organic matter during progressive rehabilitation. Although this recommendation was incorporated into the site plan, it was framed using non-prescriptive language: a cover crop of oats and rye "may be" applied, and that grass/legume cropping "should" continue for 3-4 years to improve soil fertility and soil structure. Because terms like "may be" and "should" are suggestive, they cannot be legally enforced through a site plan.

Loss of Prime Agricultural Land

The soil survey prepared with the licence application classified just over 90% of the site as prime agricultural land. This means that roughly 65 of the 70 ha of extraction area are prime agricultural land. However, only the pit floor (~55 ha) will be rehabilitated to an agricultural condition. The side slopes and setbacks will be rehabilitated to a natural environment condition. As a result, ~10 ha of prime agricultural land will be lost through the operation.

Although the application for a rehabilitation award stated that "some areas" located outside of the limit of extraction have been graded to "add additional areas suitable for crop production", there was no mention of how much additional area would be restored for crop production. There was also no mention of these efforts in annual CARs, nor in the MNR inspection report.

Timelines and Timeliness of Rehabilitation

Both timelines and timeliness of agricultural rehabilitation activities emerged as key themes. Specific parameters surrounding timelines and timeliness appear to have positively affected progressive rehabilitation outcomes at the site.

The amalgamated site plan specified that rehabilitation would "need to be completed within one full growing season of the beginning of excavation in the next phase", apart from three of the nine phases, which would be reserved for aggregate processing and shipping until shipping is "no longer required". The analysis of annual CARs confirmed that the aggregate operator was following the timelines set out for progressive rehabilitation. Except for the first year of extraction, each annual CAR report showed an increase in the total area of land that has been progressively rehabilitated.

In addition to following a strict timeline for progressive rehabilitation, the aggregate operator has prioritized timeliness in other aspects of rehabilitation, including soil management. The soil survey recommended that since "the quality of topsoil materials deteriorates over time in storage due to changes in soil organisms", topsoil materials should be removed directly from extraction areas to areas being rehabilitated "without significant time spent stockpiled or in berms". This recommendation was added to the site plan, and the application for a rehabilitation award confirmed that this had been carried out with "immediate relocation of soils from stripped areas to areas undergoing rehabilitation." The award application stated that direct use of topsoil for rehabilitation has "allowed the farmer to immediately begin producing cash crops with little to no impact to annual yields."

Conclusions

This case study report analyzed the rehabilitation plans and progressive rehabilitation outcomes of an active aggregate extraction site located within a prime agricultural area in Ontario. The site represented an amalgamated licence under the ARA, which combined two separate licences into one, forming a larger area for extraction and comprehensive rehabilitation. Progressive rehabilitation of the pit floor is currently underway, and over one-fifth of the site has been restored to an agricultural condition. A local farmer who owns a portion of the site has been involved in progressive rehabilitation activities and is currently growing soybeans and corn on areas that have undergone successful rehabilitation. This case study report drew upon an analysis of the amalgamated site plan, a Natural Technical Report which included a soil survey prepared for the pit expansion application, annual CARs, an MNR inspection report and a successful application for an OSSGA progressive rehabilitation award.

Several best practices were included as rehabilitation notes in the site plan, such as notes to help minimize soil mixing, soil storage, and soil compaction. The site plan also included specific timelines in which rehabilitation activities would be carried out and outlined a sequence for cover cropping activities to improve soil organic matter and soil structure following progressive rehabilitation. All these best practices were recommendations made in the soil survey prepared as part of the Natural Technical Report.

Analysis of annual CARs and the application for a rehabilitation award determined that, while certain best practices outlined in the site plan were implemented, others were not. The award application confirmed that soil layers (topsoil and subsoil) were carefully separated, that soils were only moved under dry conditions to minimize impacts to soil structure and soil compaction, and that soils stripped from extraction areas were utilized immediately in rehabilitation to minimize soil storage. Both the award application and CARs confirmed compliance with rehabilitation timelines outlined in the site plan. However, there was no evidence of cover cropping, despite there being rehabilitation notes pertaining to cover cropping in the site plan. Exclusion of cover cropping during progressive rehabilitation could be the result of vague and ambiguous language which is difficult to enforce. Vague language, including terms like “may be”, “should”, and “preferably” were used to describe cover cropping activities.

While progressive rehabilitation has reportedly resulted in timely restoration of the pit floor to an agricultural condition, it is important to note that the pit side slopes and setbacks, which includes prime agricultural land will not be rehabilitated to an agricultural condition, but to a natural environment condition. Because of this, ~10 ha of prime agricultural land will be lost to aggregate extraction activities.

Appendix A: Project Information

This case study report is a part of a broader research project: **Developing Evidence-based Guidelines for the Rehabilitation of Aggregate Extraction Sites in Prime Agricultural Areas in Ontario**. The overall goal of this project is to develop practical, evidence-based guidelines for rehabilitating aggregate extraction sites on agricultural land. Specifically, the project will:

- Identify key soil health properties and indicators that support rehabilitation to agricultural land uses;
- Evaluate evidence-based rehabilitation best practices for building and maintaining soil health that supports productive agricultural land;
- Assess recurring challenges related to rehabilitation in licence applications, site plans, rehabilitation plans and agricultural impact assessments for sites on agricultural land; and
- Develop standard protocols for demonstrating and confirming rehabilitation measures are in place.

The rehabilitation of pits and quarries is not only mandated; it is a vital step in the sustainable management of aggregate resources in the province. Moreover, the quick return of these sites to an agricultural condition post-extraction is critical for minimizing the loss of productive farmland. This loss not only affects food security directly but also underscores the importance of expedited rehabilitation efforts.

The PPS (2024) requires that prime agricultural areas be protected for long-term use.[21] It allows the extraction of aggregates in prime agricultural areas, on prime agricultural land and specialty crop areas as an interim land use, stipulating that extraction sites must be returned to an agricultural condition. For prime agricultural areas, agricultural condition is defined as "a condition in which substantially the same areas and same average soil capability for agriculture is restored". For specialty crop areas, the PPS (2024) requires that "the same range of specialty crops common in the areas can be achieved, and, where applicable, the microclimate on which the site and surrounding area may be dependent for specialty crops will be maintained or restored". The PPS (2024) further requires that both progressive and final rehabilitation must be carried out.

For sites where rehabilitation to an agricultural condition is required, the collective results of this project will:

- Reduce delays and uncertainty in the approval process and minimize revisions of applications, site and rehabilitation plans and technical reports by adding clarity and transparency to the commenting and approval process.
- Lead to enhanced consistency and efficiency of the licence commenting and approval process.
- Provide all stakeholders with access to an evidence-based set of parameters/ indicators and common/standard language and approaches for inclusion in site and rehabilitation plans and technical reports.

[21] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf ; Penaud, A., Holy, K., Lemay, A., Fullerton, C. (2025). Policy Timeline – the Intersection of Agriculture and Aggregates. *VISTA Science and Technology*.

- Allow OMAFA (and other review and commenting agencies) to provide timelier, more consistent reviews and enhanced guidance to applicants on, 1) what constitutes rehabilitation to an agricultural condition and same average soil capability for agriculture and; 2) the details to include in applications, site and rehabilitation plans and relevant technical reports to fully describe how sites will be returned to an agricultural condition.
- Lead to improved, more consistent rehabilitation of sites in prime agricultural areas and specialty crop areas and increased compliance.

Appendix B: Glossary of Terms

Aggregate Resources Act (ARA): Legislation that directs the management of aggregate resources in Ontario; controls and regulates aggregate operations on Crown and private lands; enforces the rehabilitation of land from which aggregates have been extracted; and works to minimize adverse impacts to the environment in respect to aggregate operations.[22] Mechanisms utilized to enforce the ARA include aggregate licences and site plan documents. The Ministry of Natural Resources (MNR) is responsible for the administration of aggregate licences and enforcing the ARA. While the ARA governs aggregate extraction, the aggregate industry must also comply with provincial planning policies (e.g., the PPS and the Greenbelt Plan) and municipal policies.

Agricultural Condition: In prime agricultural areas, agricultural condition is defined as "a condition in which substantially the same areas and same average soil capability for agriculture will be maintained, restored or enhanced."[23] In specialty crop areas, agricultural condition is defined as "a condition in which substantially the same areas and same average soil capability for agriculture are restored, the same range and productivity of specialty crops common in the area can be achieved, where applicable, the microclimate on which the site and surrounding area may be dependent for specialty crop production will be maintained, restored or enhanced."[24]

Agricultural Impact Assessment (AIA): An "evaluation of potential impacts of non-agricultural uses on the agricultural system. The assessment recommends ways to avoid or if avoidance is not possible, minimize and mitigate adverse impacts."[25]

Canada Land Inventory (CLI) for Agriculture: An inventory and "interpretative system used to assess the effects of climate and soil characteristics on the limitations of land for growing common field crops."[26] The system evaluates soil productivity, the range of common field crops that can be grown on specific soil classes, and management best practices to support the conservation of soils for field crop production.[27]

Comprehensive Rehabilitation: A "rehabilitation of land from which mineral aggregate resources have been extracted that is coordinated and complementary, to the extent possible, with the rehabilitation of other sites in an area where there is a high concentration of mineral aggregate operations."[28] Comprehensive rehabilitation is often proposed for pit expansions, which enables adjacent licenced pits to be rehabilitated to a uniform post-extraction land-use (e.g., agriculture).

Greenbelt Plan: The Greenbelt Plan (2017) is a land-use planning framework established under the Greenbelt Act to provide protection to agricultural lands, natural heritage sites and water resources in Ontario's Greater Golden Horseshoe region.[29] The plan includes the Protected Countryside, Urban River Valleys, and lands within the Niagara Escarpment Plan, Oak Ridges Moraine Conservation Plan and Parkway Belt West Plan areas. The plan works alongside the PPS to ensure sustainable resource use and environmental and agricultural preservation.

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[22] Government of Ontario. (2021). Aggregate Resources Act. *Government of Ontario, E-laws,* https://www.ontario.ca/laws/statute/90a08

[23] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

[24] *Ibid*.

[25] *Ibid*.

[26] Ministry of Agriculture, Food, and Agribusiness. (2024). Soil capability for agriculture in Ontario. Government of Ontario, https://www.ontario.ca/page/soil-capability-agriculture-ontario#:~:text=The%20soil%20capability%20class%20represents%20the%20potential,are%20generally%20feasible%20on%20similar%20soils%20elsewhere.

[27] Ministry of Agriculture, Food, and Agribusiness. (2024). Soil capability for agriculture in Ontario. *Government of Ontario,* https://www.ontario.ca/files/2024-08/omafa-soil-capability-for-agriculture-in-ontario-en-2024-08-15.pdf

[28] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

[29] Government of Ontario. (2017). Greenbelt Plan. *Government of Ontario,* https://files.ontario.ca/greenbelt-plan-2017-en.pdf

Growth Plan for the Greater Golden Horseshoe: Growth Plan for the Greater Golden Horseshoe (2019), was a provincial plan for the Greater Golden Horseshoe region of Ontario, which spans much of Southern Ontario, including the western boundaries of Lake Ontario, Lake Simcoe, the Georgian Bay area of Lake Huron and the eastern boundary of Lake Erie. Under the Growth Act, this provincial plan set out the regulatory framework for land-use planning policies in the Greater Golden Horseshoe. The plan worked alongside the Provincial Policy Statement (2020), until the PPS came into effect in 2024.[30]

Mineral Aggregates Resources: Gravel, sand, clay, earth, shale, stone limestone, dolostone, sandstone, marble and granite suitable for construction, manufacturing and maintenance purposes.[31]

Overburden: All material laying between the subsoil and the workable mineral aggregate deposit. "Many sand and gravel deposits in Ontario do not contain overburden material – engineers often use the term to refer to material lying above the workable deposits, including topsoil and subsoil."[32]

Prime Agricultural Areas: "Regions where prime agricultural lands predominate. This includes areas of prime agricultural lands and associated Canada Land Inventory Class 4 through 7 lands, and additional areas with a local concentration of farms which exhibit characteristics of ongoing agriculture."[33] "Prime agricultural areas may be identified by a planning authority based on provincial guidance or informed by mapping obtained from the Ontario Ministry of Agriculture, Food and Agribusiness and the Ontario Ministry of Rural Affairs or any successor to those ministries."[34]

Prime Agricultural Land: Defined as land with high capability for agriculture, including specialty crop areas and Canada Land Inventory Class 1, 2, and 3 lands.[35]

Progressive Rehabilitation: Rehabilitation that is done in phases along with extraction. Before proceeding to the next extraction phase, rehabilitation must be completed in areas of the site where aggregate resources have been removed. Required under the ARA.[36]

Provincial Policy/Planning Statement (PPS): The Provincial Planning/Policy Statement, is issued under the authority of the Ontario Planning Act. The PPS consists of policies that stipulate the use and development of land, including agricultural and aggregate land uses. The PPS (2024) replaced PPS (2020) and A Place to Grow: A Growth Plan for the Greater Golden Horseshoe (2019). Previous versions of the PPS include 1997, 2005 and 2014.[37]

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[30] A Place to Grow: Growth Plan for the Greater Golden Horseshoe. (2019) *Government of Ontario,* https://files.ontario.ca/mmah-place-to-grow-office-consolidation-en-2020-08-28.pdf

[31] Government of Ontario. (2021). Aggregate Resources Act. *Government of Ontario, E-laws,* https://www.ontario.ca/laws/statute/90a08

[32] Mackintosh, E. E. and Mozuraitus, E. J. (1982). Aggregates and the Aggregate Industry: Industrial Mineral Background Paper 3. *Ministry of Natural Resources,* https://toarc.com/wp-content/uploads/2019/02/Agri_Aggre.pdf

[33] Ministry of Agriculture, Food, and Agribusiness (2026). Land Evaluation and Area Review (LEAR) and Agricultural Land Evaluation System (ALES) methodologies. *Government of Ontario,* https://www.ontario.ca/page/land-evaluation-and-area-review-and-agricultural-land-evaluation-system-methodologies

[34] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

[35] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

[36] OSSGA (2022). Rehabilitation 101: A Primer. https://ossga.com/publications/news/rehabilitation_101_a_primer/

[37] Open Council. (2024). Ontario Provincial Planning Statement (PPS) tells municipalities how to handle growth and development. (2024). Open Council. https://opencouncil.ca/provincial-planning-statement/. Clark, A., Holy, K., Lemay, A., Fullerton, C. (2025). Policy Timeline – the Intersection of Agriculture and Aggregates. VISTA Science and Technology.

Ripping: A remedial approach utilized to alleviate soil compaction and promote root penetration, infiltration and development of soil structure on rehabilitated lands.[38] It is recommended that ripping be constrained to the depth of each soil horizon (i.e., topsoil or subsoil) to minimize mixing soil layers.[39]

Soil Capability: The suitability of soils for growing field crops. Higher soil capability aligns with higher Canada Land Inventory (CLI) classes.[40]

Soil Health: The "ability of soil to support crop growth without becoming degraded or otherwise harming the environment". Soil health includes physical, chemical and biological components, as outlined by the OMAFA.[41]

Specialty Crop Area: Areas within the agricultural system whereby specialty crops, such as tender fruits (e.g., peaches, cherries, plums), grapes, vegetable crops, greenhouse crops and crops from agriculturally developed organic soil predominate.[42] According to the PPS (2024), specialty crop areas are typically the result of:

- "Soils that have suitability to produce specialty crops, or lands that are subject to special climatic conditions, or a combination of both;
- Farmers skilled in the production of specialty crops; and
- A long-term investment of capital in areas such as crops, drainage, infrastructure and related facilities and services to produce, store, or process specialty crops."[43]

Stripping: A process of removing the topsoil, subsoil and overburden material located above mineral aggregate deposits. Prior to extraction, soil studies can be utilized to identify the depths of each soil zone and inform a stripping plan to minimize mixing of soil layers.[44]

Subsoil: The zone immediately beneath the topsoil, which may extent to a depth of 1 m or more. "Under natural conditions, the subsoil is often well structured and contains numerous plant roots… In summer drought periods, plants may obtain much of their moisture requirements from this zone."[45]

Topsoil: The uppermost zone of the soil, often darker in colouration due to the accumulation of organic matter. "On arable agricultural lands, it is normally restricted to the depth of cultivation, which is about 15 to 30 cm."[46]

[38] Ministry of Agriculture, Food and Rural Affairs. (2018). Draft Agricultural Impact Assessment (AIA) Guidance Document. *Government of Ontario*, https://www.ontario.ca/files/2024-04/omafra-agricultural-impact-assessments-en-2024-04-03.pdf

[39] *Ibid*.

[40] Ministry of Agriculture, Food and Agribusiness. (2024). Soil Capability for Agriculture in Ontario. *Government of Ontario,* https://www.ontario.ca/files/2024-08/omafa-soil-capability-for-agriculture-in-ontario-en-2024-08-15.pdf

[41] Ministry of Agriculture, Food and Agribusiness. (2024). New Horizons: Ontario's Agricultural Soil Health and Conservation Strategy. *Government of Ontario*, https://www.ontario.ca/files/2024-04/omafra-new-horizons-ontarios-agricultural-soil-health-and-conservation-strategy-en-2024-04-04.pdf

[42] Ministry of Municipal Affairs and Housing (2024). Provincial Planning Statement. *Government of Ontario*, https://www.ontario.ca/files/2024-10/mmah-provincial-planning-statement-en-2024-10-23.pdf

[43] *Ibid.*

[44] Ministry of Agriculture, Food and Rural Affairs. (2018). Draft Agricultural Impact Assessment (AIA) Guidance Document. *Government of Ontario,* https://www.ontario.ca/files/2024-04/omafra-agricultural-impact-assessments-en-2024-04-03.pdf

[45] Mackintosh, E. E. and Mozuraitus, E. J. (1982). Aggregates and the Aggregate Industry: Industrial Mineral Background Paper 3. *Ministry of Natural Resources,* https://toarc.com/wp-content/uploads/2019/02/Agri_Aggre.pdf

[46] *Ibid.*

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