



NUCLEAR WASTE MANAGEMENT ORGANIZATION SOCIÉTÉ DE GESTION DES DÉCHETS NUCLÉAIRES

Aggregate Resources Study Report - Southwestern Ontario Community Study



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This report has been prepared under contract to the NWMO. The report has been reviewed by the NWMO, but the views and conclusions are those of the authors and do not necessarily represent those of the NWMO.

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Aggregate Resources Study Report

Southwestern Ontario Community Study

Prepared for:

Nuclear Waste Management Organization & Municipality of South Bruce
NWMO Purchase Order Number 2001020

By:

Keir Corp

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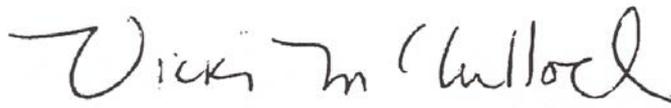
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List of Acronyms

APM	Adaptive Phased Management
DPRA	DPRA Canada Inc.
IA.....	Impact Assessment
MSB.....	Municipality of South Bruce
NWMO.....	Nuclear Waste Management Organization
OPG	Ontario Power Generation
OSSGA	Ontario Stone, Sand & Gravel Association
TOARC	The Ontario Aggregate Resources Corporation

1. Introduction

1.1 Background and Context

Since 2012, the Municipality of South Bruce (MSB) has been involved in a process of learning about the Nuclear Waste Management Organization's (NWMO) Adaptive Phased Management (APM) Project (the Project) for the long-term management of Canada's used nuclear fuel. The two remaining siting areas in the process are South Bruce Area and Ignace Area. The NWMO plans to complete all preliminary assessment work and to select one community/area to host the Project by 2023. Preliminary studies suggest that the Project can be implemented safely in the South Bruce area for a repository that will contain, and isolate used nuclear fuel from people and the environment for the long timeframes required.

Further detailed studies are required to fully assess the potential impacts of the Project in the community and regionally. Building on previous work, engagement completed to-date, and the MSB's 36 Guiding Principles, the NWMO and the MSB are working together to prepare a suite of community studies which will be shared broadly with the community. The list of socio-economic community studies is included in **Appendix A**. These studies were undertaken by the NWMO or MSB, with some being joint efforts. The MSB has retained consultants (the GHD team) to develop a number of studies and to peer review others developed by the NWMO and their consultants (the DPRA Canada Inc. (DPRA) team). The information acquired through these studies is expected to help South Bruce leadership and residents make informed decisions about whether the Project is a good fit for their community, and if they are willing to consider hosting it and under what circumstances and terms.

This *Aggregate Resources Study* is one of the community studies being prepared. This study is organized as follows:

- Purpose and Scope (**Section 1.3**)
- Methodology (**Section 2**)
- Existing Conditions (**Section 3**)
- Preliminary Analysis/Effects Assessment (**Section 4**)
- Conclusions and Limitations (**Section 5**)
- References (**Section 6**)

Note to Reader:

This and other community studies are preliminary and strategic in nature, all intended to identify possible consequences (e.g., to aggregate resources) in the South Bruce Area based on our current level of understanding of the Project. Using information known at this point in time, these community studies will describe a range of possible consequences that are the subject of specific and separate studies. For each possible consequence, potential options are offered to leverage opportunities and/or mitigate possible negative consequences/effects.

It is important to note that these community studies (developed collaboratively by the NWMO and the MSB) being investigated at this time are not the formal or final baseline or effects studies that will be part of the Impact Assessment (IA). Those studies will be completed at a later date if the Project is located in the area. However, these current studies will inform the effects studies that will be initiated at a later date.

These community studies are intended to support current dialogue between the MSB and the NWMO regarding a potential hosting agreement by:

- a) Exploring in more detail the questions, aspirations and topics of interest expressed by the community through the Guiding Principles approved by the MSB following the project visioning process completed in the community;
- b) Assisting the NWMO and the MSB in developing a deeper understanding of the community aspirations/values and to work with the MSB in identifying possible programs and commitments which ensure that the Project will be implemented in a manner that fosters the well-being of the community and area;
- c) Advancing learning and understanding on topics of interest to the neighboring areas; and
- d) Providing the community with information it has requested to help them make an informed decision in 2023.

The NWMO is committed to collaboratively working with the communities to ensure questions, concerns and aspirations are captured and addressed through continuous engagement and dialogue.

The NWMO will independently engage with the Saugeen Ojibway Nation to understand how they wish to evaluate the potential negative effects and benefits that the Project may bring to their communities.

1.2 Land Acknowledgement

It is acknowledged that the lands and communities discussed in this report are situated on the Traditional Territory of the Anishinabek Nation: The People of the Three Fires known as Ojibwe, Odawa and Pottawatomie Nations. The Chippewas of Saugeen and the Chippewas of Neyaashiinigmiing (Nawash), now known as the Saugeen Ojibway Nation, are the traditional keepers of this land and water. It is also recognized that the ancestors of the Historic Saugeen Métis and Georgian Bay Métis communities shared this land and these waters.

1.3 Purpose and Scope

- 1 Objectives for this study are described in the *Aggregate Resources Study Work Plan* (DPR, October 2021). The *Aggregate Resources Study* is one of several community studies. Its objective is to determine the demand for aggregate resources and maximum licensed extraction of aggregate resources in the study area of the Project over the identified time period. Aggregate resources are purpose extracted sand and stone materials to be used as a commercial input in construction or manufacturing.
- 2 The specific objectives for this study are:
 - Describe and quantify the existing aggregate resources and supply in the study area. This study quantified the licensed extraction capacity of the existing aggregate resources. This study did not quantify the remaining in-ground licensed aggregate reserves, as no published data is available to accomplish this.
 - Describe and quantify the existing demand for aggregate resources in the study area.
 - Describe and quantify the future aggregate demand requirements of the Project.
 - Note: This study is based on externally supplied aggregate resources, as opposed to internally supplied aggregates excavated from the potential Project Site.
 - Describe the future aggregate supply created by the Project.
 - Note: This study did not examine the impact of the Project on commercial aggregate supply. Excavated rock is a byproduct of mining and other onsite preparation activities. Excavated rock differs from aggregate supply onsite; the former represents what is actually mined from the potential Project Site, while the latter represents total potential aggregate capacity of the potential Project Site. Although there are aggregate resources on the potential Project Site that could be

supplied from the Project, at this time NWMO does not foresee using excavated rock material for outside commercial use.

- 3 This study deviates from the work plan with regards to:
 - Examination of baseline supply and existing sources does not include estimating the capacity remaining of aggregate sources and estimating aggregate made available through recycling operations. The reason for the deviation from the work plan is that this information was not available.
 - The method for calculating baseline supply. In the report, supply is based on licensed capacity compared to the work plan which proposed production rates. The reason for the deviation from the work plan is that information was not available on production rates.
 - Examination of Project effects does not include development of a supply forecast based on processing excavated materials from the Project. The reasons for the deviation from the work plan is that at this time NWMO does not foresee using excavated rock material for outside commercial use, information on the potential commercial suitability of the rock was not available and further study would be required.
- 4 Several other community studies have considered the findings of the previous draft or this final *Aggregate Resources Study*: the *Land Use Study*, *Local Traffic Study*, *Road Conditions Study*, and *Regional Economic Development Study*.
- 5 The MSB and the NWMO are jointly responsible for the completion of this *Aggregate Resources Study*.
- 6 This study was undertaken by Keir Corp, a sub-consultant to DPRA, the prime consultant to the NWMO on this study, with the support of Palmer Environmental ('Palmer').

1.3.1 Guiding Principles

The *Aggregate Resources Study* is relevant to MSB Guiding Principles (2020) #2, #6, #21, #30, and #31.

#2: "The NWMO must demonstrate to the satisfaction of the Municipality that sufficient measures will be in place to ensure the natural environment will be protected, including the community's precious waters, land and air, throughout the Project's lifespan of construction, operation and into the distant future."

#6: "The NWMO will minimize the footprint of the repository's surface facilities to the extent it is possible to do so and ensure that public access to the Teeswater River is maintained, subject to meeting regulatory requirements for the repository."

#21: "The NWMO, in consultation with the Municipality, will commit to implementing a business opportunities strategy that will provide opportunities for qualified local businesses to secure agreements that support the Project and that requires the NWMO to take all reasonable steps to create opportunities for qualified local businesses to benefit from the Project."

#30: "The NWMO will prepare a review of the existing and projected capacity of South Bruce's road network and will commit to providing appropriate funding for any required upgrades to the road network."

#31: "The NWMO will enter into a road use agreement with the Municipality that identifies approved transportation routes during construction and operation of the Project and ensures proper funding for maintenance and repair of municipal roads and bridges used for the Project."

The information in the *Aggregate Resources Study* contributes generally to these Principles.

1.3.2 Peer Review Approach

An earlier draft of this *Aggregate Resources Study Report* was reviewed by MSB consultants according to their Peer Review Protocol. The Peer Review Protocol provides for a collaborative approach to conducting the peer review, with peer review activity occurring throughout the execution of the study. The *Aggregate Resources Study* is a Joint Study, led by the NWMO. The NWMO has determined the spatial Study Area, developed data and inputs used to establish baseline conditions and conducted the assessment of the forecasted effects resulting from the Project.

The peer review has been carried out on the scope and framing of the study, data inputs, baseline conditions and the initial effects assessment.

This final *Aggregate Resources Report* reflects the comments provided by the MSB peer review consultants and subsequent discussions.

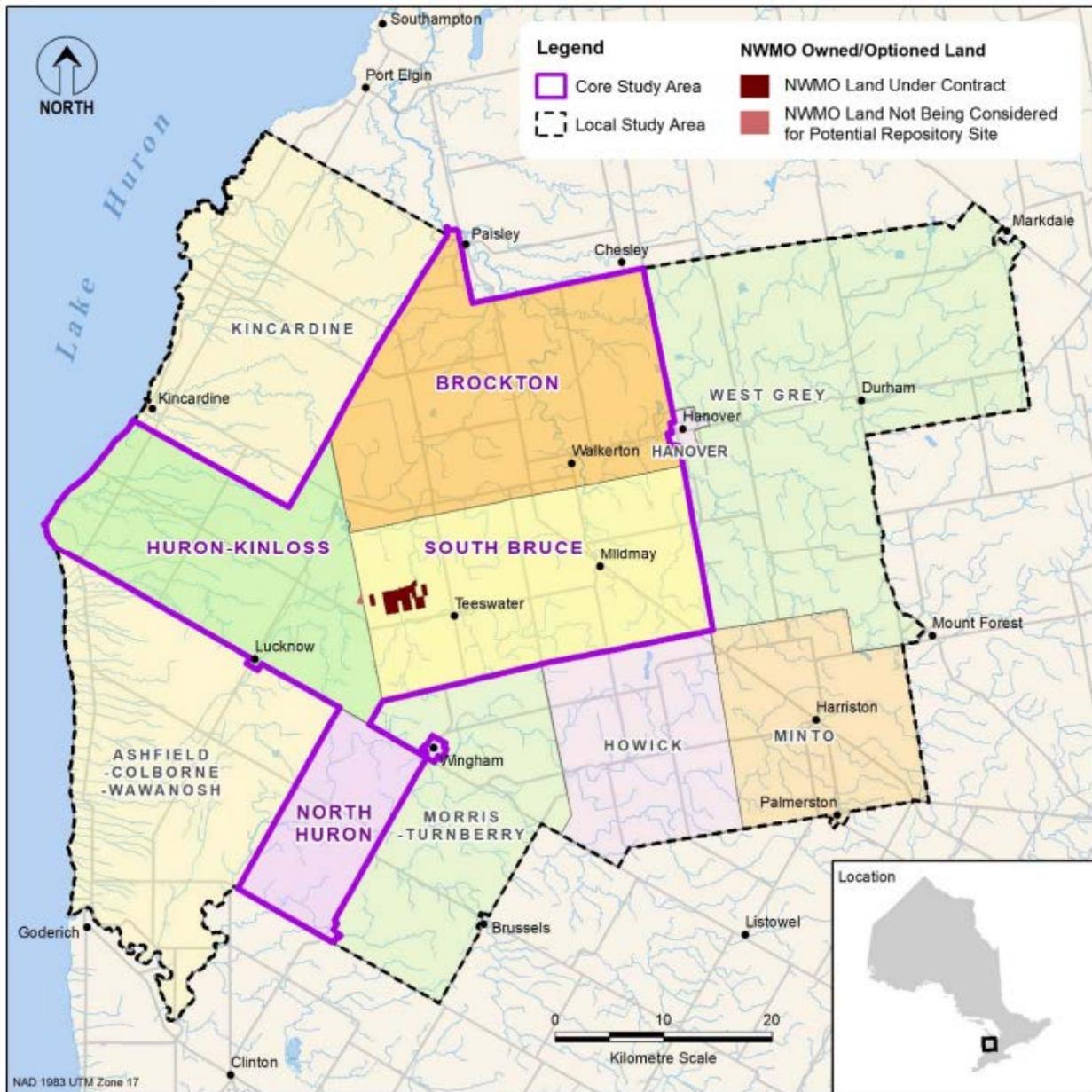
For the *Aggregate Resources Study*, the peer review was led by R.J. Burnside & Associates.

1.3.3 Spatial Boundaries

1. Three areas have been used to frame this study:
 - a. The MSB (including the communities of Teeswater, Mildmay and Formosa)
 - b. Core Study Area
 - c. Local Study Area
2. The MSB is the potential host municipality to the Project.
3. The Core Study Area (see Figure 1) adds the Municipality of Brockton (including Walkerton); the Township of Huron-Kinloss (including Ripley, Lucknow); and the Township of North Huron (including Wingham, Blyth).
4. The Local Study Area (see Figure 1.) builds on the Core Study Area, adding the Municipality of West Grey, the Township of Howick, the Municipality of Morris-Turnberry, the Town of Minto, the Municipality of Kincardine, and the Township of Ashfield-Colborne-Wawanosh¹.
5. The spatial boundaries used for this study deviate from the work plan, which did not specify three distinct study areas i.e., MSB, the Core Study Area and the Local Study Area. In addition, three municipalities identified in the preliminary spatial boundaries in the work plan have not been included in the study: the Town of Saugeen Shores, the Municipality of Arran-Elderslie, and the Town of Hanover.

¹ It is noted that the definitions of the Core Study Area and Local Study Area used for the *Aggregate Resources Study* are not identical to those used for economic studies (i.e., *Labour Baseline, Workforce Development, Housing Demand and Needs Assessment, Regional Economic Development*).

Figure 1: Study Areas



Source: (Palmer, 2022)

1.3.4 Temporal Boundaries

1. Four temporal boundaries define the critical horizons of the Project for this study.
 - a. Historical Demand - 2001 to 2020
 - b. Pre-Construction - 2021 to 2032
 - c. Site Preparation and Construction - 2033 to 2042
 - d. Operations - 2043 to 2088
2. Historical Demand is the historic period for which the baseline demand for aggregate across all three study areas is based. It spans from 2001 to 2020.
3. Pre-Construction is the period from 2021 to 2032, before the start of construction and the initial site preparation work. The Project has little impact on demand for aggregate during this time.
4. Site-Preparation and Construction spans from 2033 to 2042, with site preparation occurring in the first two years.
5. Operations run from 2043 to 2088. It should be noted that there is some continued construction activity with aggregate demand forecast for the initial few years of this phase (2043-2046).
6. The Municipality of South Bruce (metroeconomics, 2022) prepared base case ('without the Project') projections for population, housing, and employment for five local municipalities², including the four included in the Core Study Area of this *Aggregate Resources Study*. A corresponding set of incremental 'anticipated Project effects' projections for each of these demographics for the same municipalities was also prepared (metroeconomics, 2022) utilizing Municipality of South Bruce Project-related growth targets.
7. The temporal boundaries used for this study deviate from the work plan, which identified a current period (2016/2022) and near-term period (2023 to 2032), rather than the historical period (2001 to 2020) and pre-construction period (2021 to 2032) used for this study.

² The metroeconomics (2022) projections include South Bruce, Huron-Kinloss, Brockton (Bruce County), Morris-Turnberry and North Huron (Huron County); the Core Study Area for the *Aggregate Resources Study* does not include Morris-Turnberry, however, the metroeconomics data has been adjusted accordingly where it is used.

2. Methodology

2.1 General Approach

1. The general approach can be summarized in the following series of steps:
 - a. Collect secondary data and conduct a desktop-based analysis that identifies the baseline maximum licensed extraction supply of aggregate from existing licensed sources, and the baseline supply of aggregate from potential future unlicensed sources.
 - b. Collect baseline aggregate production data to forecast the baseline demand for aggregate.
 - c. Use the Project parameters/planning assumptions (NWMO 2021) to determine the Project requirement for aggregate across the different Project phases.
 - d. Conduct interviews with select knowledge holders to understand area aggregate production, trends, and issues.

2.2 Data Collection/Information Sources

1. The Ontario Aggregate Resource Council (TOARC) production data was used as the source for aggregate production data by municipality.
2. The Huron County Aggregate Resource Strategy was used to understand the context of supply and demand for Aggregate in the study area (Claire Dodds, 2005).

2.3 Knowledge Holder Interviews

1. Interviews were conducted with local aggregate and concrete producers to gain insight into the supply and demand of aggregate as well as issues with aggregate production in the study area.
2. The inventory of knowledge holders is set out in **Appendix B**. The key findings from the knowledge holder interviews are set out in **Appendix C**.
3. The rationale for who was interviewed was based on professional experience and knowledge of the types of organizations and individuals most likely to be accessible and able to provide insight into the characteristics of the aggregate industry.

2.4 Analysis

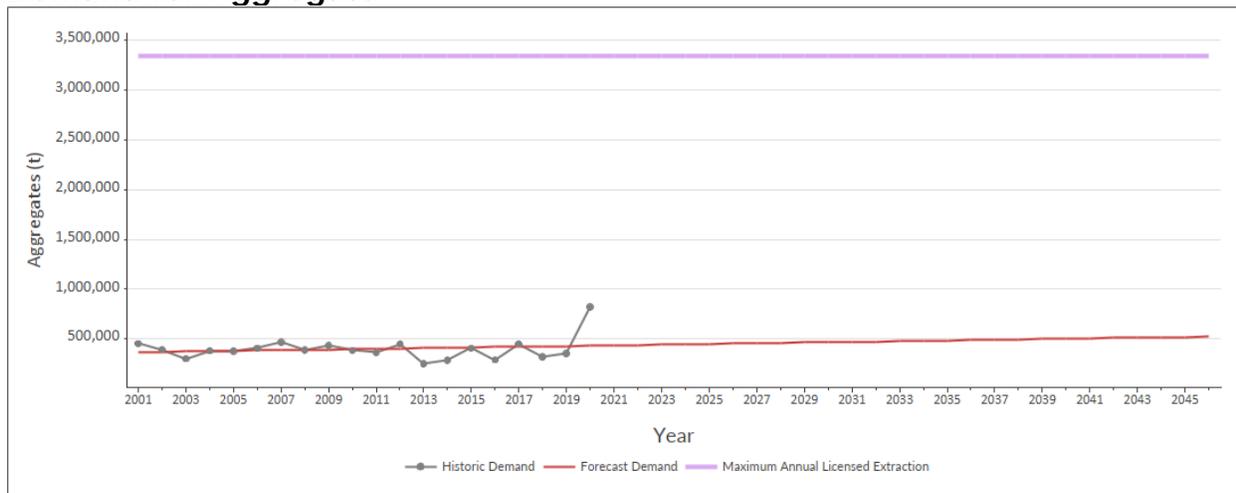
1. The framework for the analysis in this document is “Supply and Demand”.
2. The current and projected supply side of the equation was derived from desktop analysis of existing licensed aggregate producers and potential future sources of aggregate supply that had appropriate materials and were not constrained by ecological and other factors (Palmer, 2022).
3. The baseline demand side was derived from the TOARC reports on permit and license holder production statistics (The Ontario Aggregate Resource Council, 2022).
4. The incremental demand was derived from the Project aggregate requirements set out by NWMO in their release of project parameter/ planning assumptions information (NWMO, 2021).
5. Superimposing the Project demand for aggregate on the existing baseline demand and the supply side profiles provided the basis for assessing the area capacity to accommodate the Project.

3. Existing Conditions

3.1 Municipality of South Bruce

1. MSB is the proposed host municipality for the Project.
2. Within the Municipality there are 33 licenses for aggregate production.
3. Almost all of the aggregate licenses are inferred to be likely able to, or possibly able to produce all of the materials (concrete sand, bedding sand, concrete stone, granular A, and granular B) required by the Project (Palmer, 2022).
4. The maximum extraction allowable under existing licenses in MSB is 3,345,000 tonnes per year (Palmer, 2022).
5. Based on a linear regression on the 2001 to 2020 historic aggregate production data (The Ontario Aggregate Resource Council, 2022), baseline demand for aggregate in MSB is forecast to grow to 523,740 tonnes in 2046. The forecast baseline demand in 2046 represents 15.7% of the current maximum licensed production. This is depicted in Figure 2.

Figure 2: Municipality of South Bruce Maximum Licensed Extraction and Demand for Aggregate



Source: Keir using Palmer and TOARC data

- 6 Historic aggregate production in MSB can be highly variable between years. Between 2019 and 2020, demand for aggregate in South Bruce rose from 354,000 tonnes in 2019 to 824,000 tonnes in 2020. The reason for the significant increase in aggregate production in 2020 was that one pit operator was granted a one-time exception for gravel production in 2020 by MSB.
- 7 MSB has 14 undeveloped aggregate resources that are not constrained by zoning, or ecological constraints (**Appendix D, Figure 2**). These resources are estimated to have the potential to produce 114 million tonnes of aggregate (Palmer, 2022).
- 8 Table 1 compares the MSB base population and projected base demand for aggregates in the MSB. By 2046 the base population of MSB is projected to be about 140% of the 2021 population, while base tonnage aggregate demand is projected to be about 120% of 2021 levels.

Table 1: MSB Base Population and Projected Base Demand for Aggregates

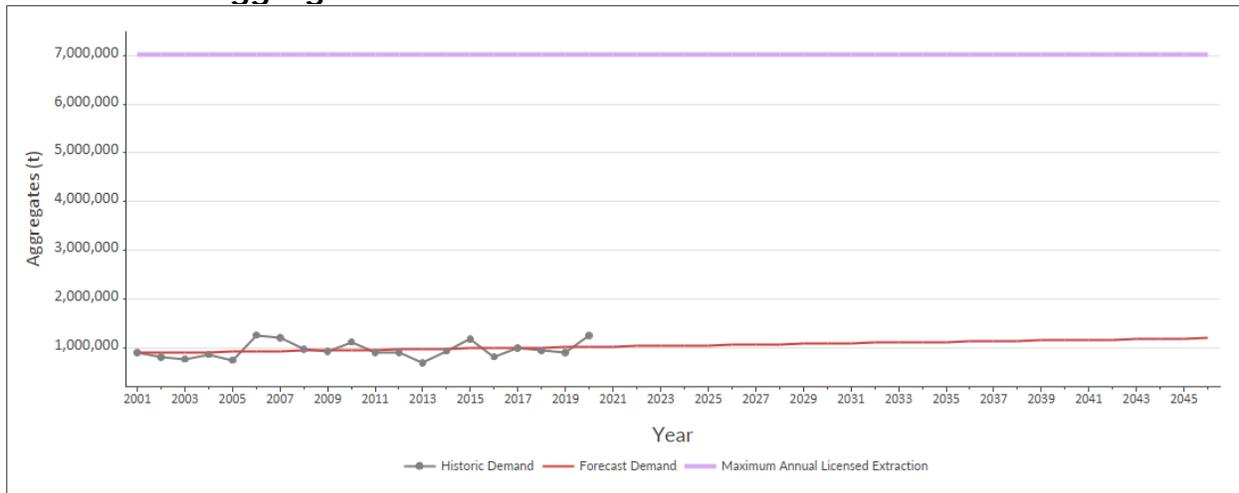
		2021	2031	2041	2046
Population	#	6,250	7,420	8,400	8,760
	% of 2021	100.0%	118.7%	134.4%	140.2%
Aggregates Demand	t	436,649	471,485	506,322	523,740
	% of 2021	100.0%	108.0%	116.0%	119.9%

Source: Keir using TOARC data and metroeconomics (2022)

3.2 Core Study Area

1. The Core Study Area for the *Aggregate Resources Study* is comprised of four municipalities: MSB, Brockton, Huron-Kinloss, and North Huron (see Figure 1, above).
2. The Core Study Area holds 65 licenses for aggregate production.
3. Almost all of the aggregate licenses are inferred to potentially be able to produce all of the materials (concrete sand, bedding sand, concrete stone, granular A, and granular B) required by the Project (Palmer, 2022).
4. The maximum extraction allowable under existing licenses in the Core Study Area is 7,020,000 tonnes per year. (Palmer, 2022)
5. Based on a linear regression on the 2001 to 2020 historic aggregate production data (The Ontario Aggregate Resource Council, 2022), baseline demand for aggregate in the Core Study Area is forecast to grow to 1,190,837 tonnes in 2046. The forecast baseline demand in 2046 represents 17.0% of the current maximum licensed production. This is represented in Figure 3.

Figure 3: Core Study Area Baseline Maximum Licensed Extraction and Demand for Aggregate



Source: Keir using Palmer and TOARC data

6. Although the volatility of aggregate production decreases when the production figures of several municipalities are combined, aggregate production can be quite variable year over year. Between 2005 and 2006 demand for aggregate in the Core Study Area rose from 743,000 tonnes in 2005 to 1,256,000 tonnes in 2006.

7. The Core Study Area has 49 undeveloped aggregate resource locations that are not constrained by zoning, or ecological constraints. These resource locations are estimated to have the potential to produce 264 million tonnes of aggregate (Palmer, 2022).
8. Table 2 compares Core Study Area base population and projected base demand for aggregates. By 2046 the base population of the four municipalities in the Core Study Area is projected to be about 139% of the 2021 population while base tonnage aggregate demand is projected to be about 117% of 2021 levels.

Table 2: Core Study Area Base Population and Projected Base Demand for Aggregates

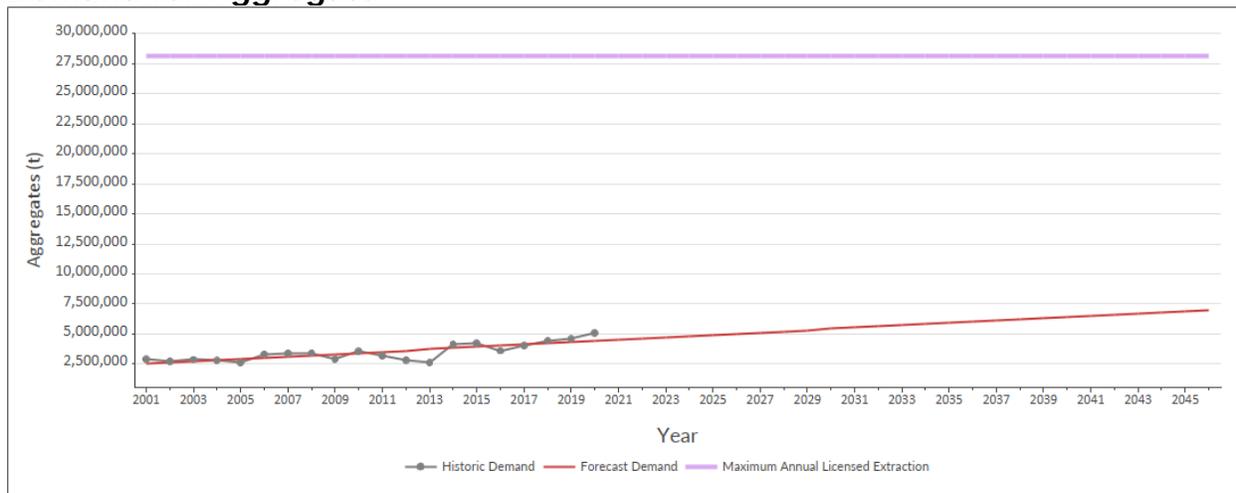
		2021	2031	2041	2046
Population	#	29,410	34,760	39,190	40,820
	% of 2021	100.0%	118.2%	133.3%	138.8%
Aggregates Demand	t	1,021,540	1,089,259	1,156,978	1,190,837
	% of 2021	100.0%	106.6%	113.3%	116.6%

Source: Keir using TOARC data and metroeconomics (2022)

3.3 Local Study Area

1. For the purposes of this study, the Local Study Area is comprised of the Core Study Area and six additional surrounding municipalities: Ashfield-Colborne-Wawanosh, Kincardine, West-Grey, Howick, Morris-Turnberry, and Minto (see Figure 1, above).
2. The Local Study Area holds 178 licenses for aggregate production.
3. Almost all of the individual aggregate licenses are potentially able to produce all of the materials (concrete sand, bedding sand, concrete stone, granular A, and granular B) required by the Project (Palmer, 2022).
4. The maximum extraction allowable under existing licenses in the Local Study Area is 28,150,000 tonnes per year. (Palmer, 2022)
5. Based on a linear regression on the 2001 to 2020 historic aggregate production data (The Ontario Aggregate Resource Council, 2022), baseline demand for aggregate in the Local Study Area is forecast to grow to 7,017,114 tonnes in 2046. The annual forecast baseline demand in 2046 represents 24.9% of the current annual maximum licensed production. This is represented in Figure 4.

Figure 4: Local Study Area Baseline Maximum Licensed Extraction and Demand for Aggregate



Source: Keir using Palmer and TOARC data

6. The greatest year-over-year increase in aggregate demand across the Local Study Area occurred between 2013 and 2014. Between 2013 and 2014 demand for aggregate in the Local Study Area rose from 2.6 million tonnes in 2013 to 4.2 million tonnes in 2014.
7. The Local Study Area has 161 undeveloped aggregate resources that are not constrained by zoning, or ecological constraints. These resources are estimated to have the potential to produce 2,216 million tonnes of aggregate (Palmer, 2022).

3.4 Aggregate Reserves

1. Data was not available to estimate the remaining licensed aggregate resource locations in the study area.
2. The Ontario Ministry of Natural Resources, TOARC, and the Ontario Sand, Stone, and Gravel Association were contacted. None of these organizations were able to provide information regarding the remaining in-ground licensed aggregate resource. Discussions were had with environmental consultants and geoscientists regarding resources for estimating aggregate reserves. They were not able to direct us to any available data.
3. The methodology used in the State of the Aggregate Resource in Ontario Study (SAROS) Paper 5 – Aggregate Reserves in Existing Operations (Golder Associates, 2009) involved reviewing imagery, site plans, and other information and estimating the extracted area to calculate the remaining resources in ground. The resources were not available to do this analysis for this community study.

4. Preliminary Analysis/Effects Assessment

4.1 Project Forecast Aggregate Requirement

1. The Project is forecast to use aggregates including sand (concrete sand and bedding sand) and gravel (concrete stone, granular A, and granular B) throughout site preparation to the end of operations. Table 3 provides the forecast demand for aggregate by material, by phase for the Project based on the NWMO's *Community Studies Planning Assumptions* report (2021).

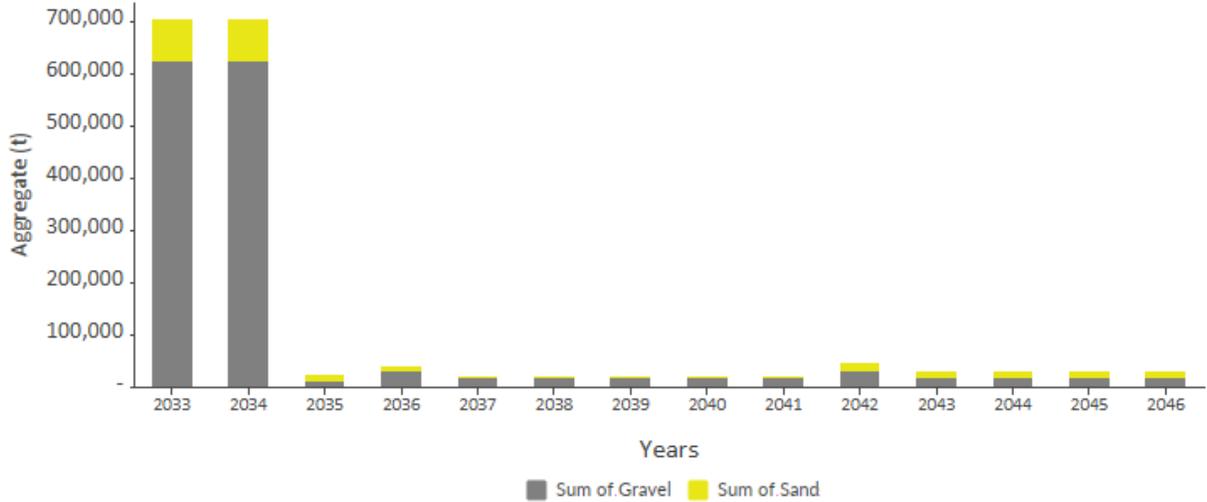
Table 3: Total Project Aggregate Demand by Phase (Tonnes)

		Gravel (t)				Sand (t)			Sum of Material
		Concrete Stone	Granular A	Granular B	Sum of Gravel	Concrete Sand	Bedding Sand	Sum of Sand	
Site Construction	Site Preparation	-	432,000	792,000	1,224,000	-	136,170	136,170	1,360,170
	Phase 1	45,600	-	-	45,600	36,960	-	36,960	82,560
	Phase 2	-	43,200	81,600	124,800	-	-	-	124,800
Operations	Site Construction Phase 3	67,200	-	-	67,200	55,440	-	55,440	122,640
	Operations	57,960	22,080	44,160	124,200	48,300	-	48,300	172,500
Total		170,760	497,280	917,760	1,585,800	140,700	136,170	276,870	1,862,670

Source: (NWMO, 2021)

2. Based on the timing of phases and the total aggregate requirement by phase, the forecast of aggregate by year is shown in Figure 5. The peak demand for aggregates is during site preparation. During site preparation the average demand for aggregate is approximately 700,000 tonnes per year. Less than 50,000 tonnes of aggregate a year are required over the remainder of the construction period. During the first 4 years of operations, just under 40,000 tonnes of aggregate are required per year; subsequently an inconsequential amount of aggregate is required annually during operations.

Figure 5: Project Forecast Aggregate Requirements by Year

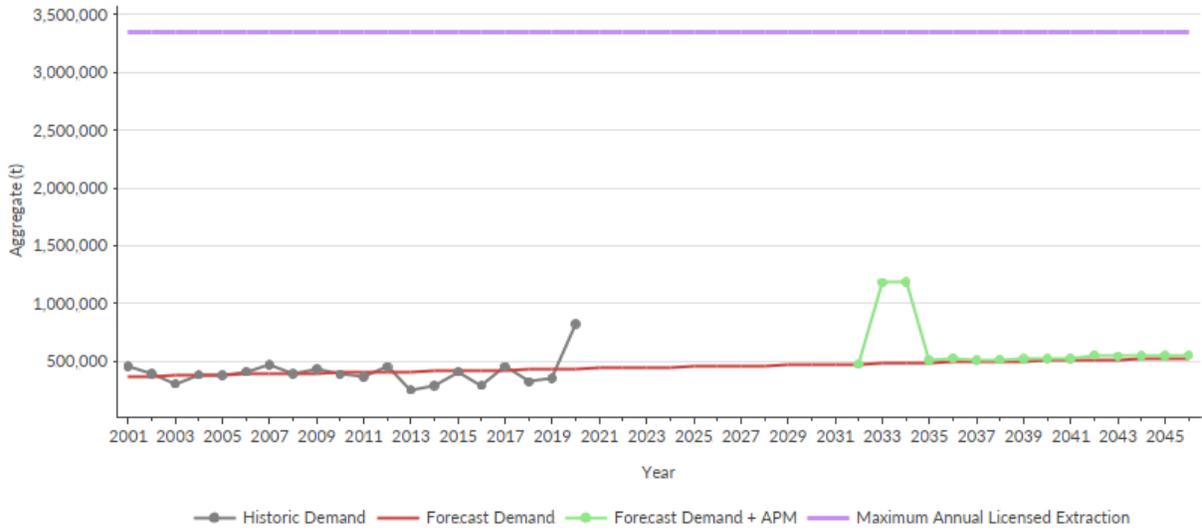


Source: Keir using NWMO Project Planning Assumptions (NWMO, 2021)

4.2 Impact of the Project on Aggregate Demand

1. The Project's site preparation stage during construction uses the most aggregate per year in 2033 and 2034.
2. The forecast peak demand for aggregate in MSB for the Project is 1,182,661 tonnes in 2034. This is an increase of 145% of the total baseline forecast demand for aggregate in MSB. If any new pits are required to meet this aggregate demand, permitting, and developing of the pits will need to take place before the aggregate is required. This increase is displayed in Figure 6.

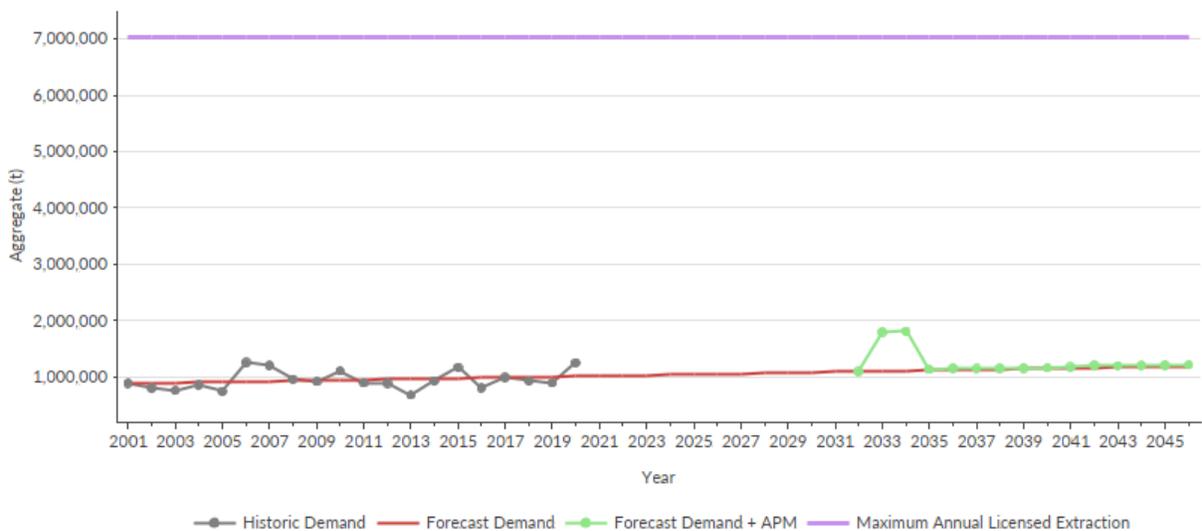
Figure 6: Impact of the Project on Aggregate Demand in MSB



Source: Keir using NWMO, Palmer and TOARC data

3. During the 2 years of site preparation, the forecast demand in MSB equals 35.4% of the total licensed capacity. This compares to a forecast baseline demand without the Project of 14.4% of the total licensed capacity currently available in the MSB.
4. The Project increases the demand for aggregate in the Core Study Area to 1,810,300 tonnes in 2034. This is an increase of 63.1% of the total forecast baseline demand for aggregate in the Core Study Area. This increase is displayed in Figure 7.

Figure 7: Impact of the Project on Aggregate Demand in Core Study Area

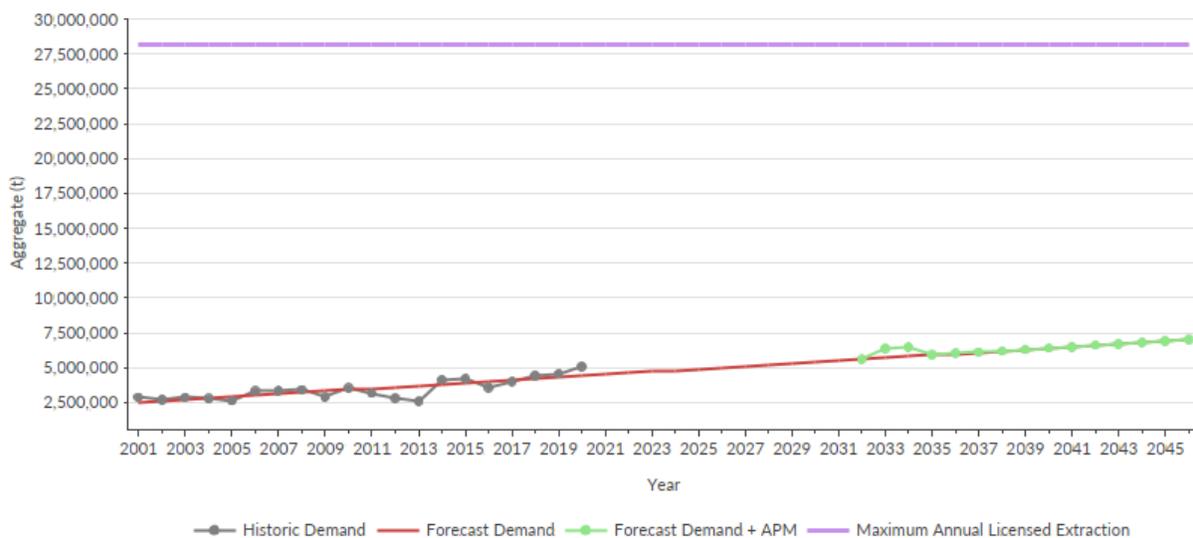


Source: Keir using NWMO, Palmer and TOARC data

5. During the 2 years of site preparation, the forecast demand in the Core Study Area equals 25.8% of the total licensed capacity. This compares to a forecast baseline demand without the Project of 15.8% of the total licensed capacity in the Core Study Area. The 10% increase in forecast demand over baseline for the Core Study Area during the 2 years of site preparation is less than the 21% increase in forecast demand over baseline for MSB.

6. The Project increases the demand for aggregate in the Local Study Area to 6,504,106 tonnes. This is an increase of 12.1% of the total forecast baseline demand for aggregate in the Local Study Area. This increase is displayed in Figure 8.

Figure 8: Impact of the on Aggregate Demand in Local Study Area



Source: Keir using NWMO, Palmer and TOARC data

7. During the 2 years of site preparation, the forecast demand in the Local Study Area equals 23.1% of the total licensed capacity. This compares to a forecast demand without the Project of 20.6% in the total licensed capacity in the Local Study Area compared to the baseline demand for aggregate. The 2.5% increase in forecast demand over baseline for the Local Study Area during the 2 years of site preparation is less than the 10% increase in forecast demand over baseline for the Core Study Area and the 21% increase in forecast demand over baseline for MSB.

4.3 Impact of the Project on Aggregate Supply

1. There are unconstrained, unlicensed, undeveloped surface aggregate resources located on the potential Project Site. This resource has been preliminarily estimated to consist of approximately 16.5 million tonnes of aggregate (Palmer, 2022).
2. Although some of the aggregate generated by the Project during construction may be used on site, NWMO emphasizes that no excavated material will be made available for outside commercial use. Therefore, the Project will not have an impact on commercial aggregate supply.
3. Even with the onsite use of aggregate material during construction, there will likely be excess extracted material that NWMO may be required to manage.

5. Conclusions and Limitations

Note to Reader

The potential investigations or possible studies identified in this section are presented by the authors to foster discussion only. They do not represent commitments or actions for the NWMO, the Municipality of South Bruce, or other parties. The final decisions on actions and commitments will be made at a future date.

1. Based on desktop research the existing licensed annual extraction capacity in the Municipality of South Bruce, the Core Study Area and the Local Study Area are more than adequate to meet the needs of the Project. No on-site validation was undertaken for this study.
2. There are only 2 years during site preparation (2033, 2034) where there is a large increase in the overall demand for aggregate related to the needs of the Project. This increase becomes less material the broader the geographic area used to supply the Project.
3. This report does not examine aggregate demands for the potential infrastructure improvements required in the 2021 to 2032 period, prior to site construction. Examination of “last mile” infrastructure requirements for aggregate could be considered as part of a future Impact Assessment process if the Project is located in the South Bruce Area.

4. This study does not forecast the remaining capacity of aggregate available under license. Forecasting the volume of aggregate remaining under existing licenses would require estimating the licensed area yet to be extracted and estimating the volume of aggregate remaining. Investigation on the status and relative level of availability of the MSB aggregate pits (33) could potentially be undertaken as part of a future Impact Assessment process through interviews or quantitative measurement if the Project is located in the South Bruce Area.
5. In light of the abundance of potential unlicensed aggregate resources within the study areas, it is likely that as need be, new additional aggregate licenses can be granted to meet demand well into the future.
6. This study assumes that aggregate licenses that are identified as potentially able to produce a quality of aggregate will be able to do so. Some of the aggregate resources under license are likely able to be more versatile in the quality of materials that they yield. Further study would be required to better forecast the quantities of aggregate available by quality.
7. The peak forecast of aggregate needs of the Project added to the forecast baseline demand for aggregate as a fraction of the total licensed extraction capacity is a relatively low percentage across each of the study areas. During the 2 years of site preparation, the forecast demand for aggregate in the MSB, the Core Study Area and Local Study Area equals 35.4%, 25.8% and 23.1% of the total licensed capacity for those respective areas. Even if some of the aggregate licenses are not able to produce all the qualities of material required for the Project, or if some of the licenses have exhausted all of their remaining supply for extraction by the time NWMO starts site preparation, a shortfall of licensed aggregate supply to meet both NWMO and baseline needs is extremely unlikely. It is believed that production will be able to meet demands of the Project.
8. Even if the unlikely situation were to occur whereby existing licensed aggregate supply had been exhausted or was unable to meet the material quality needs of the NWMO, there exists substantial unconstrained deposits of aggregate that could be licensed and developed to meet the NWMO's forecast requirement for aggregate.
9. This study did not consider that excavated rock may be removed from the potential Project Site in the future. Excavated material from the potential Project Site could potentially be made available for outside commercial use and thereby impact commercial aggregate supply. However, as noted above, at this time NWMO does not foresee using excavated rock material for outside commercial use. The quantification of excavated rock from the potential Project Site and its potential impact on commercial aggregate supply may be considered as part of a future Impact Assessment process if the Project is located in the South Bruce Area.

10. Releasing aggregate generated through construction of the Project onto the open market could have a negative commercial impact on other Core and Local Study Area providers of aggregate.
11. Notwithstanding the preceding however, aggregate generated through construction could be a valuable resource for projects that would not otherwise be possible. Possible offsite uses for aggregate that would not negatively impact the existing local and core market could include:
 - o Aggregate-intensive public projects that would not be viable if they were required to pay the market price for aggregate. These could include creation or enhancement of large trail networks, enhanced transportation routes for horses and buggies, and conservation projects for erosion control.
12. It is recommended that NWMO and MSB collaborate to determine the best use for extracted material generated during the Project, including usable aggregate.
13. At present, it is NWMO's plan to store all of the excavated rock material on site.

6. References

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Appendix A: List of Socio-Economic Community Studies

Study Name	Study Proponent	Lead Consultant
<i>Local Economic Development Study and Strategy</i>	MSB	MDB Insight (now Deloitte LLP)
<i>Economic Development Study on Youth</i>	MSB	MDB Insight (now Deloitte LLP)
<i>Local Hiring Effects Study & Strategy</i>	MSB	MDB Insight (now Deloitte LLP)
<i>Agriculture Business Impact Study</i>	MSB	MDB Insight (now Deloitte LLP)
<i>Fiscal Impact and Public Finance Study</i>	MSB	Watson & Associates Economists
<i>Tourism Industry Effects Study and Strategy</i>	MSB	MDB Insight (now Deloitte LLP)
<i>Housing Needs and Demand Analysis Study</i>	NWMO, MSB	Keir Corp.
<i>Labour Baseline Study</i>	NWMO	Keir Corp.
<i>Workforce Development Study</i>	NWMO	Keir Corp.
<i>Regional Economic Development Study</i>	NWMO	Keir Corp.
<i>Effects on Recreational Resources</i>	MSB	Tract Consulting
<i>Local/Regional Education Study</i>	NWMO, MSB	DPRA
<i>Land Use Study</i>	NWMO, MSB	DPRA
<i>Social Programs Study</i>	NWMO, MSB	DPRA
<i>Emergency Services Study</i>	NWMO	DPRA
<i>Vulnerable Populations Study</i>	NWMO	DPRA
<i>Community Health Programs and Infrastructure Study</i>	NWMO	DPRA
<i>Aggregate Resources Study</i>	NWMO, MSB	Keir Corp.
<i>Infrastructure Baseline and Feasibility Study</i>	NWMO	Morrison Hershfield
<i>Local Traffic Study</i>	NWMO	Morrison Hershfield
<i>Road Conditions Study</i>	NWMO	Morrison Hershfield

Appendix B: Inventory of Knowledge Holders Interviewed

The table below includes an inventory of Knowledge Holders interviewed in 2021 applicable to the *Aggregate Study*. Names have been excluded to respect the privacy of individuals.

Date	Knowledge Holder – Organization	Knowledge Holder – Title	Applicable Studies
11-Aug-21	Teeswater Concrete	President and CEO	<i>Local Traffic Effects Study</i> <i>Aggregate Resources Study</i>
12-Aug-21	Riley Aggregates	Owner	<i>Aggregate Resources Study</i>
02-Sep-21	Local developer	Local developer	<i>Aggregate Resources Study</i> <i>Housing Needs and Demand Analysis Study</i>
14-Oct-21	MSB Public Works	Operations Manager	<i>Road Conditions Study</i> <i>Local Traffic Effects Study</i> <i>Aggregate Resources Study</i>

Appendix C: Key Findings from Knowledge Holder Interviews Relevant to the Aggregate Resources Study Report

<p>Area Sand and Gravel Producers</p>	<ul style="list-style-type: none"> ▪ There is substantial aggregate in South Bruce and the Local Study Area. ▪ Some of the area pits are being depleted and new pits will need to be licensed. ▪ It takes considerable time to obtain a license for a new pit (i.e., between five and ten years). ▪ Hydrological studies and native species studies take at least 3 years, and if there is opposition to the site, timelines for approval increase dramatically. ▪ The quality of materials from the area is variable. There is a lot of dead sand (i.e., silt) and some stone is harder than others. ▪ A limited amount of limestone from the area is sold to cement companies. ▪ At times it can be quite difficult to obtain the best quality materials. Customers are becoming very demanding on the quality of materials they will accept (i.e., do not want dirt and fine material in granular A & B). Standards have been raised and are being enforced. ▪ Supply materials to municipalities, area contractors and individuals who are undertaking their own projects. ▪ In general, the area producers are not in competition with one another. ▪ Cedarwell is a large aggregate producer based outside of Hanover, but the company does not generally service the Teeswater area. ▪ Very difficult to find and hire both skilled and unskilled help. ▪ Have interest in supplying materials to NWMO but would need to know the materials, quality and quantity required.
<p>Area Concrete Producer</p>	<ul style="list-style-type: none"> ▪ Area Ready mix business was established in 1977. ▪ Head operation is in Teeswater with branch operations in Clinton and Tiverton. ▪ Customers are primarily in Bruce and Huron counties with smaller amounts of business in Grey and Perth counties. ▪ Cement is obtained from Ash Grove (Mississauga) or St Mary's. ▪ Operations have sufficient reserves of gravel, but some pits are being depleted. ▪ The Teeswater pit is exhausted, and materials have to be trucked in from other pits. ▪ On average 30 to 50 trucks loads (i.e., 30 tn per truckload) are produced at the Teeswater location per day.

	<ul style="list-style-type: none">▪ All aggregate in the area is river rock. Local pits are always used, with the only exception being the import of materials on occasion for surface asphalt.▪ The main customers in Bruce County are Bruce Power, the agricultural industry, and residential construction. In Huron County the focus is on the agricultural industry.▪ The supply of concrete to Bruce Power varies. Where higher density shielding is required, materials may have to be brought in from Quebec. In most other cases, however, local materials are used.▪ Standards for concrete are higher than other gravel applications such as roads. Materials generated on-site could potentially be used for other applications as long as it conforms with Provincial legislation.▪ Bringing a new pit into operation to support concrete production would take 5 to 10 years and building a new concrete plant would take up to 3 years.▪ One of the pits owned by Teeswater Concrete near the eastern borehole location could potentially host a concrete plant.▪ Current Teeswater concrete plant could supply the Project, thereby avoiding the necessity to build an on-site batch plant.
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Appendix D: Palmer Environmental Memorandum: NWMO Southwestern Ontario Aggregate Resources Study (May 2022)

Provided as a separate stand-alone document due to file size/format.