



THE CORPORATION OF THE TOWNSHIP OF TINY

Meeting Date: February 28, 2019

Moved by:

Cathy Gordon

Carried:

4-0

Seconded by:

[Signature]

Defeated:

Signed:

[Signature]

WHEREAS the Committee of the Whole considered Confidential Planning & Development Report PD-018-19 regarding the Teedon Pit Extension Application by CRH Canada Group Inc.,

AND WHEREAS the matter was forwarded to the February 28, 2019 Regular Meeting of Council due to its time sensitive nature;

NOW THEREFORE BE IT RESOLVED THAT staff be directed to provide comments to the Ministry of Natural Resources and Forestry as outlined in the peer review letters, to be included on the March 11, 2019 Committee of the Whole Meeting in anticipation of the March 25, 2019 comment deadline;

AND THAT Confidential Report PD-018-19, including appendices, be made public in nature.



Tiny
TOWNSHIP OF / CANTON DE

THIS ITEM WENT

FEB 28 2019

TO COMMITTEE
OF THE WHOLE

CONFIDENTIAL
PLANNING & DEVELOPMENT REPORT PD-018-19

TO: Mayor Cornell and Members of Council

FROM: Shawn Persaud, Director of Planning & Development
Tim Leitch, Director of Public Works

DATE: February 28, 2019

RE: Application: Teedon Pit Extension
Aggregate Resources Act Application
Owner(s)/Applicant(s): CRH Canada Group Inc.
Legal Description: North Part of Lot 80, Concession 1 O.S.
(Appendix 1)
Municipal Address: 2 Darby Road
File: '19/D05 (DS #62762)
Roll No. 1-029-00

RECOMMENDATION:

It is recommended that:

1. Council receive this report and attached peer review letters as information; and,
2. Council direct staff to provide comments to the Ministry of Natural Resources and Forestry as outlined in the peer review letters.

BACKGROUND:

On January 22, 2019, the Township received notification of the Aggregate Resources Act (ARA) application entitled "Teedon Pit Extension" (Appendix 2) made to the Ministry of Natural Resources and Forestry (MNR). In addition, the Township received a package from the applicant which included the following studies/reports:

- Summary Statement Report, dated January 2019, prepared by Brian Zeman, MHBC Planning (Appendix 3).
- Natural Environment Level 1 and 2 Technical Report, dated January 2019, prepared by Goodban Ecological Consulting Inc.

- Acoustic Assessment Report, dated January 2019, prepared by Theakston Environmental
- Hydrogeological Assessment, dated January 8, 2019, prepared by GHD
- Stage 1 and 2 Archaeological Assessment Report, dated May 2011, prepared by The Central Archaeology Group Inc. and letter dated June 24, 2011 from the Ministry of Tourism and Culture stating that the Ministry concurs with the recommendations of the report that there are no further archaeological concerns for the subject property.
- Site Plans dated January 2019, prepared by Brian Zeman, MHBC Planning of the Existing Features, Operational Plan, Rehabilitation Plan, and Cross Sections.

It is noted that this ARA application submission was the first opportunity for the Township to review the amended gravel pit expansion proposal. The amended proposal is identical to the proposal currently in front of the Local Planning Appeal Tribunal (LPAT) for the Planning Act applications for the Official Plan Amendment and Zoning By-law Amendment. The LPAT agreed to permit the applicant to move forward with the ARA application in order to consolidate the hearing to deal with all matters under the Planning Act and ARA.

ANALYSIS:

Severn Sound Environmental Association (SSEA) have peer reviewed the Natural Environment Level 1 and 2 Technical Report on behalf of the Township. They have provided a peer review letter dated February 19, 2019 (Appendix 4), which summarizes their comments.

R. J. Burnside & Associates Limited (Burnside), Township Engineering Consultant, have peer reviewed the Engineering assessments on behalf of the Township. As a result, we have received three peer review letters.

Peer Review Letter dated February 15, 2019 from Mr. Dave Hopkins, P. Geo., Burnside with comments related to the Hydrogeological Assessment (Appendix 5), which can be summarized as follows:

1. The GHD assessment was prepared to document the water table elevation so that the pit floor elevation can be established. Eight additional monitoring wells were installed at the Teedon Pit in 2018 to better characterize the subsurface hydrogeological conditions and to allow additional monitoring of the water table.
2. The hydrogeological assessment completed by GHD does provide some additional information on the geology in the vicinity of the sump pond/wash pond, however there is no discussion on how water levels in the ponds relate to levels in the local aquitard, the Newmarket Till and the Upper Thorncliffe.

3. The GHD Assessment does not address the Burnside February 24, 2016 Recommendation 1, 3 and 4 and partially addresses Recommendation 2.
4. The following additional information is required for Burnside to complete their peer review:
 - A table showing the dates that the manual water level data was collected and hydrographs showing the results for each well;
 - Borehole logs for the wells so that the geology can be seen at each location. Based on the cross sections, it appears that the sump pond/wash pond is effectively isolated from the underlying aquifer. The borehole logs would assist us with the interpretation of the extent of the silt and clay aquitard;
 - A “regional” cross section that includes the reported depths of the wells reportedly impacted by previous operations at the quarry;
 - The Monitoring program to include monthly manual monitoring and that AWLR’s be installed so that the peak spring water levels in 2019 can be captured and used to confirm that the proposed Teedon Pit Extension pit floor elevation is 1.5 m above the high-water table;
 - Installation of an additional monitoring well between MW9-18 and MW8-18 to provide data on the water table as there are no other wells on the Teedon Pit Extension property that are completed in the sand aquifer. Similarly, an additional well should be installed along the eastern edge of the proposed extraction area. Wells on the Teedon Pit to the south should be included in the monitoring program;
 - The Monitoring program include provisions to modify operations in the event the pit floor is less than 1.5 m above the water table; and
 - Additional data to be collected using AWLR’s to confirm the water table elevation until the Teedon Pit Extension begins operations. Water level collection only began in June 2018 and may have missed peak spring water levels.

Peer Review Letter dated February 15, 2019 from Mr. Henry Centen, P. Eng., P. Geo., Burnside with comments related to traffic impact (Appendix 6), which can be summarized as follows:

1. The Teedon Pit Extension is to be operated in conjunction with the existing Teedon Pit ARA Licence No. 3670 and use the existing entrance/exit.
2. There will be no increase in extraction, or in trucks, since the existing Teedon Pit is currently licensed for 600,000 tonnes per annum.

3. The haul route is to be north on Darby Road to Highway 93, which is the same haul route as the existing Teedon Pit.
4. The alignment of Darby Road has a sharp bend at its intersection with CR93 and the sight distances at this intersection are limited by the horizontal alignment on CR93.
5. The Acoustic Report notes a potential 20 trucks incoming and 20 trucks outgoing from the pit during the worst peak hour, although no basis is given for this estimate.
6. The following additional information is required for Burnside to complete their peer review:
 - A Traffic Impact Study (TIS) to determine the impacts on Darby Road and on the CR93 intersection; and
 - The traffic operations at the intersection of Darby Road / CR93 should be confirmed in the TIS. Safety issues (collision history) should be reviewed for the haul route (and intersection) to determine if there have been any incidents from the existing pit operations.

Peer Review Letter dated February 18, 2019 from Mr. Rafay Sohail, B.A. Sc. And Mr. Derek Flake, P. Eng., Aercoustics Engineering Limited with comments related to the Acoustic Assessment and proposed hours of operation (Appendix 7).

1. The purpose of a noise study is to demonstrate the feasibility of the proposed operation to comply with the applicable noise guidelines.
2. The nighttime sound level limits are based on a predictable worst case hour during the period between 7:00 pm and 7:00 am. This means that shipping operations from 5:00 am to 7:00 am would meet the Ministry sound level limits provided the worst case nighttime hour was modeled correctly, which appears to be the case based on Aercoustics' review.
3. CRH plans to load and ship materials from the pit starting at 5:00 am. The nighttime sound level limits are based on a predictable worst-case hour during the period between 7:00 pm and 7:00 am. This means that shipping operations from 5:00 am to 7:00 am would meet the Ministry sound level limits provided the worst-case nighttime hour was modeled correctly, which appears to be the case based on Aercoustics' review.
4. A scenario with 15 trucks idling close to the entrance of the pit was modelled and it was found to have the potential to cause an objectionable noise impact.
5. The following additional information is required for Aercoustics to complete their peer review:
 - The operator should confirm that a 10 m high working face, which was modeled in all worst-case scenarios that forms an integral part of the noise

control design, can be maintained at all times and is feasible in the context of the planned front-end loader sizes, according to safety (working face structure) and labour laws (i.e. permitted height above the top of extended bucket);

- Restrictions on the number of permitted equipment and maximum sound level permitted should be incorporated in the licensing document;
- Modelling parameters for the surrounding foliage such as height of trees and elevation of the ground relative to the existing topography at each point of the foliage object should be provided;
- Confirmation that the noise reduction due to foliage is reasonable; and
- There are acoustic barrier requirements and other noise controls outlined in the noise study which apply to the existing Licence. It should be confirmed whether requirements and noise controls will be implemented on the existing Licence and whether they will be feasible to implement and/or enforce.

It is recommended the comments outlined in the peer review letters be provided to the MNRF as the Township's formal comments on the ARA application.

FINANCIAL IMPLICATIONS:

Costs associated with the peer review are cost recoverable from the owner.

Legal costs are the responsibility of the Township.

RELATIONSHIP TO STRATEGIC PLAN:

- Deliver Efficient and Exceptional Municipal Services
- Healthy Environment and Sustainable Community Planning

CONCLUSION:

It is recommended that staff work with the Township peer review consultants to provide comments to the Ministry of Natural Resources and Forestry as outlined in the peer review letters attached to this Report.

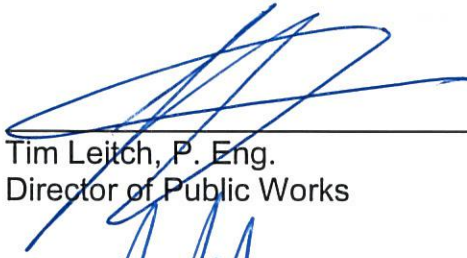
Respectfully,

Report prepared and submitted by:



Shawn Persaud, BA, MCIP, RPP
Director of Planning and Development

Financial Implications Reviewed by:



Tim Leitch, P. Eng.
Director of Public Works

Report approved by:



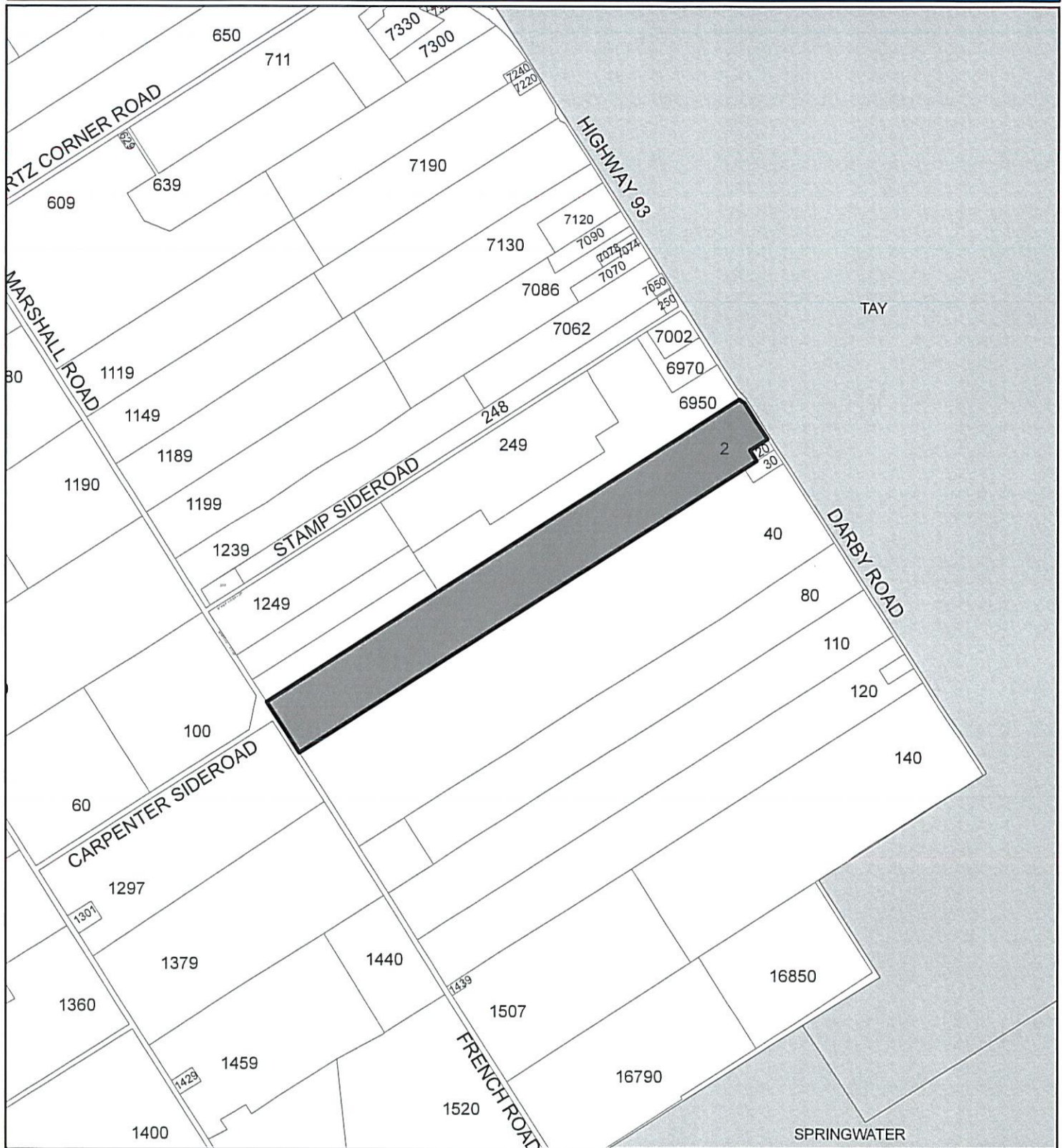
Doug Taylor, Director of Finance and
Administration/Treasurer



Doug Luker, CAO

Attachments:

- Appendix 1: Subject Property Map
- Appendix 2: Notification Letter
- Appendix 3: Summary Statement
- Appendix 4: SSEA Peer Review Letter
- Appendices 5-7: Engineering Peer Review Letters



Scale: 1:20,000

0 95 190 380 570 760 950 Meters



Coordinate System: NAD 1983 UTM Zone 17N
 Projection: Transverse Mercator
 Datum: North American 1983
 False Easting: 500,000.0000
 False Northing: 0.0000
 Central Meridian: -81.0000
 Scale Factor: 0.9996
 Latitude Of Origin: 0.0000
 Units: Meter



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 Copyright County of Simcoe Land Information Network Cooperative © LINC 2014. Produced (in part) under licence from © Teranet Enterprises Inc. and its suppliers all rights reserved, and Members of the Ontario Geospatial Data Exchange.
 This map is not a plan survey.
 For information call (705) 526-4204 or visit www.tiny.ca



Map Legend

-  Subject Property
-  Parcel Fabric

*All drawings are representations and not guaranteed for accuracy

OVERVIEW MAP





CRH Canada Group Inc.
2300 Steeles Ave W, 4th floor
Concord, Ontario
L4K 5X6 Canada

T. 905-761-7100
F. 905-761-7200

www.crhcanada.com

January 18, 2019

Ms. Kim Benner
District Planner

Ministry of Natural Resources and
Forestry
Midhurst Office
2284 Nursery Road
Midhurst, ON L9X 1N8

Mr. Shawn Persaud,
Director of Planning & Development

Township of Tiny
130 Balm Beach Road West
Tiny, ON L0L 2J0

Mr. David Parks
Director of Planning, Development & Tourism

County of Simcoe
1110 Highway 26
Midhurst, ON L9X 1N6

Chief Guy Monague & Council

Beausoleil First Nation
11 Ogemaa Miikaan
Christian Island, ON
L9M 0A9

Chief Rodney Noganosh & Council

Mnjikaning First Nation
5884 Rama Road, Suite 200
Rama, ON
L3V 6H6

Georgian Bay Métis Council

355 Cranston Crescent
P.O. Box 4
Midland, ON
L4R 4K6

Chippewas of Georgina Island First Nation

Chief Donna Big Canoe & Council
R.R.2, P.O. Box 12
Sutton West, ON
L0E 1R0

Delivered via email to:

inquiries@williamstreatiesfirstnations.ca

RE: Proposed Teedon Pit Extension

Aggregate Resources Act Category 3, Class A Licence Application (Pit Above Water) North ½ of Lot 80, Concession 1, W.P.R, and Part of Original Road Allowance between Lots 80 & 81, Concession 1, W.P.R, Township of Tiny, County of Simcoe

CRH Canada Group Inc. (CRH) is the landowner of the subject lands referenced herein/ above and has assumed responsibility for the Aggregate Resources Act (ARA) application on behalf of Cedarhurst Quarries and Crushing Limited. CRH is pleased to submit the required documentation in support of an Aggregate Resources Act Category 3, Class A Licence application (Pit Above Water) on lands legally described North ½ of Lot 80, Concession 1, W.P.R, and Part of Original Road Allowance between lots 80 & 81, Concession 1, W.P.R, Township of Tiny, County of Simcoe. The area proposed to be licensed is 15.3 hectares and the proposed extraction area is 13.5 hectares.



CRH Canada Group Inc.
2300 Steeles Ave W, 4th floor
Concord, Ontario
L4K 5X6 Canada

T. 905-761-7100
F. 905-761-7200
www.crhcanada.com

The proposed pit is referred to as the Teedon Pit Extension (formerly the proposed Sibthorpe Pit). The Aggregate Resources Act application was originally submitted and deemed complete by the Ministry of Natural Resources and Forestry on April 13, 2012. The formal 45 day Aggregate Resources Act review period was delayed to allow for the commencement of the agency and public review associated with Planning Act applications that were filed with the Township of Tiny in 2012 to permit the proposed pit.

Since the applications were submitted there has been extensive agency and public review that has resulted in changes to the applications. The original application was to license 42.6 ha of which 39.0 hectares was proposed for extraction. In 2013, the proposed extraction area was reduced from 39.0 hectares to 30 hectares.

CRH is proposing to further reduce the licence area to 15.3 hectares and the extraction area to 13.5 hectares. This is a 64% reduction of the licence area and 65% reduction in the extraction area compared to the application that was submitted in 2012.

The Teedon Pit Extension is proposed to be operated in conjunction with the existing Teedon Pit (ARA Licence No. 3670) and utilize the existing entrance/exit. The proposed maximum combined tonnage for the two pits is 600,000 tonnes per annum which is the current tonnage limit permitted for the existing Teedon Pit. As a result, the proposed Teedon Pit Extension will not result in any increase in permitted annual tonnage or truck traffic.

The enclosed application package includes the following (2 copies for MNRF):

1. Aggregate Resources Act Summary Statement, Proposed Teedon Pit Extension, MHBC, (January, 2019);
2. Hydrogeological Assessment, GHD, (January, 2019);
3. Level 1 and 2 Natural Environment Technical Report and Environmental Impact Study, Goodban Ecological Consulting, (January, 2019);
4. Acoustical Impact Assessment, Theakston Environmental, (January, 2019);
5. Archaeological Assessment, The Central Archaeology Group Inc., (May 2011);
6. Ministry of Tourism and Culture Clearance letter, (June 24, 2011); and
7. Aggregate Resources Act Site Plans, MHBC, (January, 2019).

Also enclosed are copies of Form 1 (Landowner Notice) and Form 2 (Notice of Information Session) for this application. Forms 1 and 2, combined with the above noted technical reports and Aggregate Resources Act Site Plans constitute the updated application package.



CRH Canada Group Inc.
2300 Steeles Ave W, 4th floor
Concord, Ontario
L4K 5X6 Canada

T. 905-761-7100
F. 905-761-7200
www.crhcanada.com

As noted in the enclosed Form 1, the last day for written objections/comments to the licence application can be filed is March 25, 2019. Written notices of objection are to be served upon the Applicant Cedarhurst Quarries and Crushing Limited (c/o CRH) and the Ministry of Natural Resources and Forestry and must state the reasons for the objection. As per the enclosed Form 2, a public information session will be held on March 5, 2019 from 4 p.m. to 7 p.m. at:

Wyebbridge Community Centre
8340 County Road 93
Tiny, ON
L0K 2E1

This package has been delivered to the agencies indicated on page 1 of this letter in advance of the ARA 45 day process to provide additional time for review.

Please do not hesitate to contact the undersigned should you have any questions or require further information.

Respectfully submitted,

A handwritten signature in blue ink, appearing to read "J. Ferri", is placed below the text "Respectfully submitted,".

Jessica Ferri, MCIP, RPP
Manager, Policy and Planning
CRH Canada Group Inc.
jessica.ferri@ca.crh.com

cc. Robert Herbst, MNRF
Kevin Mitchell, CRH Canada Group Inc.
Brian Zeman, MHBC

Aggregate Resources Act

Form 1 – Notice of Application for a Licence (Proposed Teedon Pit Extension)

I, Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.):

2300 Steeles Avenue West, 4th Floor
Concord, ON L4K 5X6

Hereby give notice that an application has been made for a Category 3, Class A, Pit Above Water to excavate aggregate from a pit of 15.3 hectares, located in:

North ½ of Lot 80, Concession 1, W.P.R &
Part of Original Road Allowance between lots 80 and 81, Concession 1, W.P.R
Township of Tiny
County of Simcoe

Application is for: an expansion to the established Teedon Pit (ARA Licence: 3670).

Annual Tonnage Condition applied for is: 600,000 tonnes / annum in combination with the existing Teedon Pit (ARA Licence: 3670).

A detailed site plan and report(s) for the proposal may be examined at the Township of Tiny office or at the District Office of the Ministry of Natural Resources and Forestry.

Any person(s) wishing to object to this application must send, in writing, their objection with reason(s) to the **Applicant** and to the district office of the **Ministry of Natural Resources and Forestry** at the addresses below. Note: E-mail submissions are acceptable however they must contain the objector's complete postal mailing address where a response can be delivered. **E-mail objections which do not contain a postal address will not be considered acceptable.**

The Applicant: Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.)
2300 Steeles Avenue West, 4th Floor
Concord, ON L4K 5X6
Jessica.ferri@ca.crh.com

MNRF: Ministry of Natural Resources and Forestry, Midhurst District
2284 Nursery Road
Midhurst, ON, L9X 1N8
MidhurstAgg@ontario.ca

The last day on which objections may be filed with the **Applicant** and **Ministry** is: the 25th day of March, 2019.

Note: All information in respect to this application including written objections, the names and addresses of any objector(s) is available for public review for the purpose of this application under the Aggregate Resources Act. In submitting a written objection an objector consents under the Freedom of Information and Protection of Privacy Act to its disclosure for purposes of the application.

Pour des renseignements en français, composer le (705) 725-7541.

Aggregate Resources Act

Form 2 - Notice of Public Information Session (Proposed Teedon Pit Extension)

I, Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.):

2300 Steeles Avenue West, 4th Floor
Concord, ON L4K 5X6

Hereby give notice that a Public Information Session will be held on:

March 5, 2019 from 4 p.m. – 7 p.m. at:

Wyebridge Community Centre
8340 County Road 93
Tiny, ON
L0K 2E1

The purpose of the Information Session is to present, to the public, the details of the application for a Category 3, Class A, Pit Above Water.

The location of the proposed pit is:

North ½ of Lot 80, Concession 1, W.P.R &
Part of Original Road Allowance between lots 80 and 81, Concession 1, W.P.R
Township of Tiny, County of Simcoe

Pour des renseignements en français, composer le (705) 725-7541.

Loi sur les ressources en agrégats
Formulaire 1 – Avis de demande de permis

Je, Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.):

2300 Steeles Avenue West, 4e étage
Concord, ON L4K 5X6

donne avis par les présentes qu'une demande de Catégorie 3 – permis de catégorie A, pour l'exploitation d'un puits dans le but d'extraire des agrégats à une distance non inférieure à 1,5 mètre au-dessus du niveau de la nappe souterraine établie a été présentée

pour extraire des agrégats d'un puits de 15,3 hectares, situé à :

Partie du lot 80, concession 1 W.P.R. & Partie de l'indemnité de route initial entre les lots 80 et 81, concession 1 W.P.R., Canton de Tiny, Comté de Simcoe

La demande vise : l'extension du puits d'extraction Teedon de CRH (ARA Licence: 3670).

Le tonnage annuel demandé est de: 600,000 tonnes par an en combinaison avec le puits d'extraction de Teedon existant (ARA Licence: 3670).

Un plan d'implantation détaillé et un, ou plusieurs, rapports sur la proposition peuvent faire l'objet d'un examen au bureau du canton de Tiny ou au bureau de district du Ministère des Richesses naturelles et des Forêts.

Toute personne qui désire s'opposer à la présente demande doit faire parvenir par écrit son opposition et les motifs de celle-ci à **l'auteur de la demande et au bureau du Ministère des Richesses naturelles et des Forêts** local ou de district à l'adresse ci-dessous. Remarque : Les soumissions par courriel sont acceptées. L'auteur de l'opposition doit inclure l'adresse postale complète à laquelle il souhaite recevoir une réponse. **Les courriels ne contenant pas d'adresse postale ne seront pas acceptés.**

L'auteur de la demande : Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.)
2300 Steeles Avenue West, 4th Floor
Concord, ON L4K 5X6
Jessica.ferri@ca.crh.com

MRNF : Ministère des Richesses naturelles et des Forêts, district de Midhurst
2284 Nursery Road
Midhurst, ON, L9X 1N8
MidhurstAgg@ontario.ca

La date limite pour présenter une opposition à **l'auteur de la demande** et au **ministère** est :
le 25 mars 2019.

Note : Tous les renseignements concernant la présente demande, y compris les oppositions écrites, le nom et l'adresse de tout opposant, sont soumis à l'examen du public aux fins de la présente demande, conformément à la Loi sur les ressources en agrégats. La personne qui formule une opposition écrite consent à sa divulgation aux fins de la demande en vertu de la Loi sur l'accès à l'information et la protection de la vie privée.

Loi sur les ressources en agrégats
Formulaire 2 – Avis de séance publique d'information

Je, Cedarhurst Quarries and Crushing Limited (c/o CRH Canada Group Inc.):

2300 Steeles Avenue West, 4e étage
Concord, ON L4K 5X6

donne avis, par les présentes, qu'il y aura une séance publique d'information le:

le 5 mars 2019, à partir de 16h – 19h à:

Centre communautaire de Wyebridge
8340 County Road 93
Tiny, ON
L0K 2E1

Le but de la séance d'information est de présenter au public les détails de la demande d'un(e)

Catégorie 3 – permis de catégorie A, pour l'exploitation d'un puits dans le but d'extraire des agrégats à une distance non inférieure à 1,5 mètre au-dessus du niveau de la nappe souterraine établie

Le site proposé pour le puits d'extraction est :

Partie du lot 80, concession 1 W.P.R. & Partie de l'indemnité de route initial entre les lots 80 et 81, concession 1 W.P.R, Canton de Tiny, Comté de Simcoe



KITCHENER
WOODBRIDGE
LONDON
KINGSTON
BARRIE
BURLINGTON

AGGREGATE RESOURCES ACT **SUMMARY STATEMENT**

TEEDON PIT EXTENSION

North ½ of Lot 80, Concession 1, W.P.R &
Part of Original Road Allowance between Lots 80 & 81,
Concession 1, W.P.R
Township of Tiny, County of Simcoe

Date:

January, 2019

Prepared for:

Cedarhurst Quarries and Crushing Limited

Prepared by:

**MacNaughton Hermsen Britton Clarkson Planning
Limited (MHBC)**

113 Collier Street

Barrie ON L4M 1H2

T: 705 728 0045 Ext. 226

F: 705 728 2010

Our File 9061CZ

1.1 Aggregate Resources Act Summary Statement Proposed Teedon Pit Extension

CRH Canada Group Inc. (CRH) is the landowner of the subject lands referenced herein and has assumed responsibility for the Aggregate Resources Act application on behalf of Cedarhurst Quarries and Crushing Limited. The application is for a Category 3, Class A licence (above water) under the Aggregate Resources Act ("ARA") for a property located at the North ½ of Lot 80, Concession 1, W.P.R, and Part of the original road allowance between Lots 80 & 81, Concession 1, W.P.R, Township of Tiny, County of Simcoe. The area proposed to be licensed is 15.3 hectares and the proposed extraction area is 13.5 hectares

The Teedon Pit Extension is proposed to be operated in conjunction with the existing Teedon Pit (ARA Licence No. 3670) and utilize the existing entrance/ exit. The proposed maximum combined tonnage for the two pits is 600,000 tonnes per annum which is the current tonnage limit permitted for the existing Teedon Pit.

The complete Licence application consists of the following:

1.1.1 Site Plans

The Site Plans provide details of existing features, the operational plan, progressive rehabilitation, planned final rehabilitation and cross-sections of existing conditions and planned final rehabilitation of the site. The site plans are included in the application package.

1.1.2 Technical Reports

The following sections fulfill the study requirements of the Aggregate Resources Act:

| | |
|---------------|---|
| 2.2.1 & 2.2.2 | Natural Environment Level 1 and 2 Technical Report, Goodban Ecological Consulting; |
| 2.2.3 & 2.2.4 | Archaeological Assessment, The Central Archaeology Group Inc.; |
| 2.2.6 | Noise Impact Study, Theakston Environmental; |
| 2.2.7 | Each report includes the qualifications and experience of the individual (s) that have prepared the report. |

In addition to the required studies GHD completed a Hydrogeological Assessment to determine the location of the water table at the site.

1.1.3 Summary Statement: Required Information

The following sections are structured to provide information required under the Provincial Standards Version 1.0 for a Class A, Category 3 Aggregate Resources Act Summary Statement.

1.1.3.1 Planning and Land Use Considerations – Standard 2.1.1

The proposed Teedon Pit Extension is designated “Greenlands and “Rural” in the County of Simcoe Official Plan. An Official Plan Amendment is not required to permit the proposed pit.

The proposed Teedon Pit Extension is designated “Rural”, “Mineral Aggregate Resources Two” and “Environmental Protection Two” in the Township of Tiny Official Plan and zoned “Rural” in the Township of Tiny Zoning By-law 06-100. Township of Tiny Official Plan Amendment and Zoning By-law Amendment applications have been submitted to the Township to permit the proposed pit.

From a land use perspective the propose pit:

1. Represents the wise use and management of resources;
2. Contains approximately 10 million tonnes of a sand and gravel resource that has been mapped by the Province as a sand and gravel deposit of primary significance;
3. Aggregate extraction is an established use in the area and the application is located directly adjacent to the existing Teedon Pit;
4. The operation is appropriately designed, buffered and/or separated from sensitive land uses to minimize impacts;
5. CRH owns additional lands to the east and west that provide additional buffer to adjacent lands.
6. Water resources will be monitored and protected from potential impacts. The proposed extension will not adversely impact surrounding wells;
7. There will be no negative impact to significant natural features. Avoidance and/ or mitigation measures will be utilized to protect adjacent natural heritage features;
8. The application is located on Class 7 soils, the proposed extension is not considered to be in a prime agricultural area and does not contain prime agricultural land;
9. The proposed extension will utilize the existing entrance/ exit onto an established haul route and there will be no increase to truck traffic as a result of the extension; and
10. There are no significant cultural heritage resources on site.

1.1.3.2 Agricultural Classification of the Proposed Site – Standard 2.1.2

The proposed Teedon Pit Extension is mapped as Class 7 soils. Class 7 soils are not considered prime agricultural soil. The Provincial agricultural mapping does not identify the proposed extension lands as being within a prime agricultural area.

The subject site is not within a Prime Agricultural Area or on Prime Agricultural Land and therefore rehabilitation back to agriculture is not required, however the pit floor will be rehabilitated back to agriculture.

1.1.3.3 Quality and Quantity of Aggregate On-site– Standard 2.1.3

The *Aggregate Resources Inventory Paper* prepared by the Ministry of Natural Resources and Forestry identifies the subject site as a primary sand and gravel deposits. This resource area contains a high-quality aggregate that can be used for most road-building and construction projects. Within the proposed extraction there is approximately 10 million tonnes of aggregate resources.

The proposed Teedon Pit Extension is:

- Identified as a “Sand and Gravel Resource Area” in the County of Simcoe Official Plan (Schedule 5.2.1); and
- Designated as a “Mineral Aggregate Resource II” in the Township of Tiny Official Plan. The “Mineral Aggregate Resource II” designation applies to areas of primary and secondary mineral aggregate resources.

1.1.3.4 Main Haulage Routes – Standard 2.1.4

Material from the Teedon Pit Extension is proposed to be transported to market from the existing Teedon Pit (ARA Licence No. 3670) entrance/ exit located on Darby Road. Truck traffic will use the existing haul route to travel north along Darby Road to Highway 93.

1.1.3.5 Progressive and Final Rehabilitation – Standard 2.1.5

Rehabilitation of the site will be progressive, and the site will be rehabilitated to forested side slopes with the pit floor being rehabilitated to an agricultural field. See Page 3 of 4 of the ARA Site Plans.

1.1.3.6 Surface Water – Standard 2.1.6

Based on-site specific field work there are no drainage channels or other surface water features on-site. Given the hydrogeologic setting and that the proposal will remain above the water table, there is no potential impact to groundwater and surface water features in the area or between watersheds.

1.1.3.7 Ground Water Elevation – Standard 2.1.7

A Hydrogeologic Assessment has been prepared by GHD. The water table on-site is approximately 236.5 to 237.5 masl. Extraction at the proposed Teedon Pit Extension will remain 1.5 metres above the established water table.

Respectfully submitted,

MHBC



Brian Zeman, BES, MCIP, RPP
President



Severn Sound Environmental Association

489 Finlayson St, PO Box 460, Port McNicoll ON L0K 1R0

Phone (705) 534-7283 | Fax (705) 534-7459

Email: MHudolin@severnsound.ca Website: www.severnsound.ca

February 19, 2019

Shawn Persaud
Director of Planning & Development
Corporation of the Township of Tiny
130 Balm Beach Road West
Tiny ON L0L 2J0

Dear Mr. Persaud,

**RE: Natural Environment Level 1 and 2 Technical Report for
Proposed Teedon Pit Extension, 2 Darby Rd, Township of Tiny**

In response to your request, the Severn Sound Environmental Association (SSEA) has reviewed the following information related to the Proposed Teedon Pit Extension:

- Natural Environment Level 1 and 2 Technical Report (NETR), prepared by Goodban Ecological Consulting Inc., dated January 2019, received electronically at the SSEA office on January 23, 2019.
- Site Plan drawings, prepared by MHBC Planning Urban Design & Landscape Architecture, dated January 2019, received electronically at the SSEA office on January 23, 2019.

The SSEA understands that the other reports related to this proposal, including the Hydrogeological Assessment, Acoustic Assessment, and Archaeological Assessment are being peer reviewed by others. The following natural heritage comments on the NETR and Site Plans are offered.

General comments

1. The SSEA was not consulted on the Terms of Reference, scope of work or field work that was required for the NETR.
 - a. The NETR provides new and updated information from the previous Environmental Impact Statement/Natural Environment Level 1 and 2 Technical Report (2011) and supplemental information prepared at that time by The Lindsay Environmental Services Group for the previous owners.

- b. The NETR provides details regarding Ecological Land Classification (ELC) and vegetation and wildlife surveys. The time of year, weather conditions and methodology/protocols for ELC, vegetation surveys, and early morning and nocturnal breeding bird survey were appropriate.

Significant Woodlands, Species At Risk and Significant Wildlife Habitat

Natural heritage information and guidance documents and guidelines are periodically amended or updated.

2. In 2017, the SSEA conducted a mapping exercise to identify Significant Woodlands in the municipality. Through this desktop work, the woodland that extends onto the subject lands was mapped as Significant. Figure 5 of the NETR provides a recommended Significant Woodland boundary based on site-specific field work; this refined boundary is acceptable to the SSEA.
3. Table 2 of the NETR lists Species At Risk (SAR) with potential to occur in the study area. Since this table does not include endangered bats, it is not clear that SAR bats and their habitat (e.g., snags/cavity trees suitable for bat roosting or maternity sites) were considered in the preparation of the NETR, and clarification or additional information may be required. The SSEA defers to the Ministry of Natural Resources and Forestry (MNR) on issues related to the Endangered Species Act, and understands that MNR will be reviewing the proposal.
4. The NETR references the MNR's Significant Wildlife Habitat Technical Guide (2000), and indicates that the Significant Wildlife Habitat (SWH) Criteria Schedules for Ecoregion 6E (MNR 2015) were also consulted. The SWH Ecoregion Schedules provide specific criteria for identifying *candidate* and *confirmed* SWH. Clarification is required regarding the following types of SWH:
 - a. Amphibian Breeding Habitat (Woodland) – according to the NETR, swamp community SWDM4a is within approximately 120 m of the proposed extraction area (see Figure 5), and several amphibian species including wood frog, spring peeper and gray treefrog were documented on site (section 5.4). As per the SWH Ecoregion Schedule, if these amphibians are present in sufficient numbers, the wetland plus a 230m radius of woodland area would be considered SWH and the NETR would have to address any potential negative impacts. The NETR does not discuss whether or not this area qualifies as *candidate* or *confirmed* SWH, and further information is required.
 - b. Woodland Area-Sensitive Bird Breeding Habitat – area-sensitive bird species were documented in the NETR at station 3 and 4 (see Attachment E, Point Count Data Summary), however these station locations were not included in the SWH mapping shown on Figure 8. Further explanation is required.

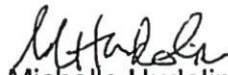
Forest Edge Management and Rehabilitation Tree Planting

5. The NETR details tree cutting/clearing timing for two zones. The SSEA supports tree cutting restrictions to avoid harming migratory and non-migratory breeding birds and their nests, and the proposed timing is acceptable to SSEA.

6. Planting as proposed for Forest Edge Management should include follow-up survival assessments of planted stock. Replacement planting should be undertaken, if necessary due to poor stock survival.
7. Survival assessments for rehabilitation tree planting of setbacks and side slopes:
 - a. Survival assessments should be done at years one, two and five (free-to-grow assessment), as is currently the practice of tree planting agencies like Trees Ontario/Forests Ontario, rather than just in the first and second year after planting as indicated in the NETR.
 - b. The bullet regarding replacement planting if survival is less than 60% should be modified to indicate that 60% survival of each species is required to ensure post-planting species diversity.
8. The SSEA would like to be provided with information on the projected timing of extraction for the site. If extraction is anticipated to be a considerable ways off, then management of forested areas on site may be appropriate; in addition, the species proposed for use in rehabilitation planting should be re-assessed at a later date, to ensure that they are still appropriate and practical for climate and site conditions, according to the best available information at that time.

If you have any questions, please contact me.

Sincerely,



Michelle Hudolin

Wetlands & Habitat Biologist



February 15, 2019

Via: Email

Timothy Leitch, P.Eng.
Director Public Works
Township of Tiny
130 Balm Street West
Tiny ON N0L 2J0

Dear Mr. Leitch:

**Re: Teedon Pit Extension
Review of GHD Hydrogeological Assessment
Township of Tiny, County of Simcoe, Ontario
Project No.: 300031221.0000**

1.0 Introduction

The Township of Tiny (Township) retained R.J. Burnside & Associates Limited (Burnside) to review the January 8, 2019 Hydrogeological Assessment prepared by GHD for the Teedon Pit Extension.

CRH Canada Group Inc. is the owner of the subject lands and has assumed responsibility for the approval of the Teedon Pit Extension on behalf of Cedarhurst Quarries and Crushing Ltd. The new aggregate pit (Sibthorpe) is immediately adjacent to the existing Teedon Pit.

Following a review of the hydrogeological assessments previously completed for the site, Burnside provided the following recommendations by letter dated February 24, 2016:

1. The current condition of nearby domestic wells should be established, including the well depth and condition of the casing/screen, and the well yield and general water quality. The work should be completed by the proponent using an independent qualified consultant.
2. The monitoring network at the Teedon Pit should be expanded to include a staff gauge in the wash pond, a nested well with screens completed at a variety of depths (to monitor change in gradients during use of the wash pond), along with a number of wells completed in the aquifer(s) that are used by domestic wells in the area. A professional geoscientist (or equivalent) should be present during the drilling of the wells to describe the geology and select the intervals for monitoring well completion.

3. The proponent should provide additional information such as cross sections to confirm that the monitoring wells are completed at similar depths as domestic wells in the area and will provide the necessary information to confirm that aquifers used by domestic wells are not being adversely impacted by the use of the well or wash pond on-site.
4. An appropriate on-site monitoring network will eliminate the need for on-going monitoring of domestic wells.

2.0 GHD Assessment

The GHD letter report was prepared to document the water table elevation so that the pit floor elevation can be established. Eight additional monitoring wells (MW5-18, MW6R-18, MW6-18, MW7-18, MW8-18, MW9-18, MW10-18S, and MW10-18D) were installed at the Teedon Pit in 2018 to better characterize the subsurface hydrogeological conditions and to allow additional monitoring of the water table. There were no borehole logs included with the report, however, the monitoring well completion details were provided in Table 1 of the report and the geology at some of the well locations were shown on the two cross sections included with the report. The monitoring well locations were included on Figure 1, which is included as an attachment to this letter. Only MW9-18 is located within the proposed extraction area.

The new monitoring wells installed on the Teedon Pit Extension property are MW8-18, MW9-18, MW10-18S, and MW10-18D. Several wells were installed in the vicinity of the silt pond/sump pond including MW6-18 and MW6R-18, which are completed at two different depths in the sand. GHD completed manual water level measurements between June 3, 2009 and October 10, 2018. Automatic Water level Recorders (AWLR's) were installed and collected water level data between October 19, 2010 and October 30, 2018.

The Alpha Environmental Services (AES) Assessment was based on four (4) monitoring wells (MW1-09, 16440 [decommissioned], MW1, and MW4) located at the Teedon Pit and an adjacent domestic well (25425). AES used water table elevation data from these wells to establish the water table for the Teedon Pit Extension lands. Only one monitoring well (MW1-09) was located on the Teedon Pit Extension property at this time.

The GHD Assessment does not address the Burnside February 24, 2016 Recommendation Nos. 1, 3 and 4 and partially addresses Recommendation No. 2.

3.0 Burnside Comments

The hydrogeological assessment completed by GHD does provide some additional information on the geology in the vicinity of the sump pond/wash pond, however there is no discussion on how water levels in the ponds relate to levels in the local aquitard, the Newmarket Till and the Upper Thorncliffe.

The addition of the new wells improves the understanding of the geology on the existing pit site and in the proposed pit extension area. To complete our review, we ask that the following additional information be provided:

- A table showing the dates that the manual water level data was collected and hydrographs showing the results for each well;

- Borehole logs for the wells so that the geology can be seen at each location. Based on the cross sections, it appears that the sump pond/wash pond is effectively isolated from the underlying aquifer. The borehole logs would assist us with the interpretation of the extent of the silt and clay aquitard; and
- A "regional" cross section that includes the reported depths of the wells reportedly impacted by previous operations at the quarry.

The recommendations from the GHD report are provided below in italics along with Burnside's comments/recommendations.

1. *In order to confirm that the maximum depth of extraction for the Teedon Pit Extension is no closer than 1.5 m above the established ground water table the water levels at monitoring wells MW1-09, MW8-18, MW10D-18, and MW5-18 shall be monitored quarterly and the water level at monitoring well MW9-18 shall be monitored quarterly until it is removed for extraction.*

Burnside Comment

Only MW9-18 is in the proposed Teedon Pit Extension extraction area. MW10D-18 is installed in silt and will not provide any information on the water table in the sand or impacts due to water taking from PW1-09. The water table data (Figure 4) suggests a possible groundwater divide at the site with OW5-18 located to the east of the divide. MW5-18 is located several hundred metres southeast of the proposed extraction area at a similar depth to PW1-09. As a result, monitoring of MW5-18 may provide some indication of pumping impacts due to MW 1-09, but may not be representative of water table conditions in the extraction area. In addition, the cross section suggests that the east side of the sump pond maybe be completed in sand and as a result, the water table in the area may be influenced by water levels in the pond.

Burnside recommends that manual monitoring be done at least monthly and that AWLR's be installed so that the peak spring water levels in 2019 can be captured and used to confirm that the proposed Teedon Pit Extension pit floor elevation is 1.5 m above the high-water table.

2. *The water level measurements shall be compared to the maximum depth of extraction on the site plans. In the event the water level data indicates the maximum depth of extraction is less than 1.5 m above the established groundwater table, the maximum depth of extraction shall be adjusted accordingly to maintain the 1.5 m depth.*

Burnside Comment

Burnside recommends that an additional monitoring well be installed between MW9-18 and MW8-18 to provide data on the water table as there are no other wells on the Teedon Pit Extension property that are completed in the sand aquifer. Similarly, an additional well should be installed along the eastern edge of the proposed extraction area. Wells on the Teedon Pit to the south should be included in the monitoring program.

3. *The operator shall maintain a record of the ground water levels to confirm the maximum depth of extraction remains 1.5 m above the established water table.*

Burnside Comment

The Monitoring program should include provisions to modify operations in the event the pit floor is less than 1.5 m above the water table.

4. *The ARA site plans shall identify the pit floor as 1.5 m above the established water table elevations based on groundwater contours shown on Figure 5.*

Burnside Comment

Burnside recommends that additional data be collected using AWLR's to confirm the water table elevation until the Teedon Pit Extension begins operations. Water level collection only began in June 2018 and may have missed peak spring water levels.

Should you have any questions, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited



Dave Hopkins, P.Geo.
Senior Hydrogeologist
DH:rm

Enclosure(s) Figure 1: Hydrogeologic Cross Section Locations



February 15, 2019

Via: Email

Timothy Leitch, P.Eng.
Director of Public Works
Township of Tiny
130 Balm Street West
Tiny ON N0L 2J0

Dear Mr. Leitch:

**Re: Teedon Pit Extension
Traffic Impact Peer Review
Township of Tiny, County of Simcoe, Ontario
Project No.: 300031221.0000**

1.0 Introduction

The Township of Tiny (Township) retained R.J. Burnside & Associates Limited (Burnside) to review the January 2019 Aggregate Resources Act Summary Statement and Site Plans prepared by MacNaughton Hermesen Britton Clarkson Planning Limited (MHBC) and for the Teedon Pit Extension.

CRH Canada Group Inc. (CRH) is the owner of the subject lands and has assumed responsibility for the approval of the Teedon Pit Extension on behalf of Cedarhurst Quarries and Crushing Ltd. The new aggregate pit (formerly known as the Sibthorpe Pit) is immediately adjacent to the existing Teedon Pit.

CRH are proposing to reduce the licence area to 15.3 hectares and the extraction area to 13.5 hectares, which represents a 64% reduction of the licence area and 65% reduction in the extraction area when compared to the application submitted in 2012 (originally 42.6 hectares).

2.0 Traffic Impact Assessment

The Aggregate Resources Act Summary Statement and Cover Letter did not include a Traffic Impact Study; however, it did include the following traffic-related information:

- The Teedon Pit Extension is to be operated in conjunction with the existing Teedon Pit ARA Licence No. 3670 and use the existing entrance/exit.
- The Teedon Pit Extension Aggregate Resources Act Application proposes that the combined tonnage for the two pits be 600,000 tonnes per annum.
- There will be no increase in extraction, or in trucks, since the existing Teedon Pit is currently licensed for 600,000 tonnes per annum.

- The expansion area is estimated to have 10M tonnes for extraction.
- The haul route is to be north on Darby Road to County Road (CR) 93, which is the same haul route as the existing Teedon Pit.
- The Acoustic Report notes a potential 20 trucks incoming and 20 trucks outgoing from the pit during the worst peak hour, although no basis is given for this estimate.

Burnside Comment

To determine the impacts on Darby Road and on the CR 93 intersection, we recommend that a Traffic Impact Study (TIS) be provided. It is acknowledged that the licensed extraction rate and truck volumes are not proposed to increase, however the length that the pit will be in operation will change. Based on the extraction volume available, it will take an additional 17 years of operation to exhaust the supply (assuming the existing pit is near the end of its life). This should be a consideration in determining the revised Traffic Impact.

The alignment of Darby Road has a sharp bend at its intersection with CR93. The sight distances at this intersection are limited by the horizontal alignment on CR93. The traffic operations at the intersection of Darby Road / CR93 should be confirmed in the TIS. Safety issues (collision history) should be reviewed for the haul route (and intersection) to determine if there have been any incidents from the existing pit operations.

Should you have any questions, please contact the undersigned.

Yours truly,

R.J. Burnside & Associates Limited



Henry Centen, P.Eng.
Senior Transportation Engineer
HC:rm

Enclosure(s)



Aercoustics Engineering Ltd.
1004 Middlegate Road, Suite 1100
Mississauga, ON L4Y 0G1

Tel: 416-249-3361
Fax 416-249-3613
aercoustics.com

February 18, 2019

Aercoustics Project #: 12115.01

Township of Tiny

130 Balm Street West
Tiny, Ontario
N0L 2J0

ATTN: Timothy Leitch, Director of Public Works

CC: Cecil Gratix, R.J. Burnside & Associates Limited
Nicholas Sylvestre-Williams, Aercoustics

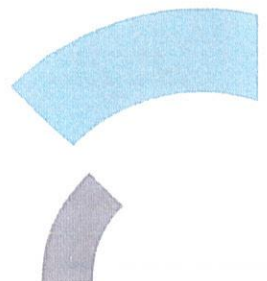
Subject: Peer Review for Teedon Pit Extension
AAR prepared by F.H. Theakston Environmental Control
Aercoustics Project #: 12115.01

Aercoustics Engineering Ltd. (Aercoustics) was retained by R.J. Burnside to conduct a peer review of the Acoustic Assessment Report prepared by Theakston Environmental (Theakston). In 2017, CRH Canada Group Inc. (CRH) acquired the Teedon Pit and the its extension lands and proposed a smaller extraction area of 13.5 hectares from the original 42.6 hectares. The report prepared by Theakston serves to model noise sources in the Teedon Pit extension based on the new extraction area.

Aercoustics previously conducted peer reviews dated August 8, 2013 and September 13, 2013 of Theakston's acoustic assessment reports for the Teedon Pit Extension. Aercoustics received an updated report entitled "Acoustic Assessment Report" (Report No. 18442) dated January 2019. The report includes Appendices A-F and a response to peer review letter dated June 19, 2013.

The purpose of our peer review is to provide our opinion on whether the report satisfactorily addresses the environmental noise impact issues. The purpose of a noise study is to demonstrate the feasibility of the proposed operation to comply with the applicable noise guidelines.

Having reviewed the report along with the Operational Plan and reference Appendices, Aercoustics agrees with the general conclusions, noise source sound levels, assessment criteria, and noise control design presented. However, the following concerns and comments are provided:



1. A minimum 10 m high working face was modeled in all worst-case scenarios which forms an integral part of the noise control design. The operator should confirm that this working face can be maintained at all times and is feasible in the context of the planned front-end loader sizes, according to safety (working face structure) and labour laws (i.e. permitted height above the top of extended bucket).
2. The noise controls presented in the Operational Plan do not include the restrictions on the number of permitted equipment and maximum sound level permitted as per the terms of analysis in the noise study. These should be incorporated in the licensing document.
3. Modelling parameters for the surrounding foliage such as height of trees and elevation of the ground relative to the existing topography at each point of the foliage object should be provided. Further, foliage is considered significant for coniferous trees or a large woodlot of mixed coniferous and deciduous trees; this is typically confirmed with a site visit. Ultimately, please confirm that the noise reduction due to foliage is reasonable.
4. There are acoustic barrier requirements and other noise controls outlined in the noise study which apply to the existing licence. It should be confirmed whether requirements and noise controls will be implemented on the existing licence and whether they will be feasible to implement and/or enforce.

Aeroustics was asked by the Township to provide comments on the proposed hours of operation. It is understood that CRH plans to load and ship materials from the pit starting at 5:00 am. The nighttime sound level limits are based on a predictable worst-case hour during the period between 7:00 pm and 7:00 am. This means that shipping operations from 5:00 am to 7:00 am would meet the Ministry sound level limits provided the worst-case nighttime hour was modeled correctly, which appears to be the case based on the review.

In Aeroustics' experience, the loading of material within a pit, setback from residences, does not generally drive noise complaints. Truck passes can cause a disturbance if they pass closely by a dwelling. Truck idling near a dwelling is also known to be a source of disturbance.

Truck idling near dwellings commonly occurs because of trucks arriving to site prior to the hours of operation. If trucks are permitted to enter the pit earlier, rather than forced to wait and line up on Darby Road, this concern would be minimized.

A simplistic noise impact calculation is presented to describe trucks arriving to site early and not being permitted to enter. A scenario with 15 trucks idling close to the entrance of the pit was modelled. Based on an assumed sound power of 99 dBA for a regular idling truck, the sound pressure level from 15 trucks at a distance of 60 m is predicted to be over

65 dBA. This is a conservative prediction because it assumes direct line of sight between all trucks and the nearest dwelling, and it assumes all 15 trucks are at a 60 m distance. A single truck is predicted to result in 53 dBA from 60 m away. To summarise, truck idling on the road outside the pit property has the potential to cause an objectionable noise impact.

Closure

Aeroustics generally agrees with the conclusion of the Theakston report, provided the above comments are addressed.

Sincerely,

AERCOUSTICS ENGINEERING LIMITED



Rafay Sohail, B.A.Sc.



Derek Flake, P.Eng.