Hot In-Place Asphalt Recycling Pilot Project

In 2019, through a Council resolution and a Finance and Administration Committee resolution a total of $1,511,000 was designated to be used for a Hot In-Place Recycling (HIR) Asphalt Project. Staff retained a Geotechnical Consultant experienced in HIR to assist in determining suitable road sections, perform asphalt material testing, and provide recommendations for roads to be treated, and provide specifications for tender documents.

A total of 77 lane km of road sections have been identified as suitable for HIR and of these, asphalt material testing has been completed on 32 lane km. The Geotechnical Consultant will provide recommendations for final selection of road sections based on the asphalt material testing results.

Staff requests authority to proceed with the tendering and construction of this project and to adjust the final locations of the road sections as may be required by tender submissions and geotechnical testing.

Background

Following previous discussions with Council regarding Hot In-Place Recycled Asphalt (HIR) technology, staff retained Wood Environment & Infrastructure Solutions (Wood) in association with PNJ Engineering Inc (PNJ) to provide their expertise and leadership in asphalt recycling technology.

The MTO used Hot In-Place Recycling in many contracts between 1987 and 2003 however the HIR industry in Ontario diminished due to unsuccessful bidding at that time. When the mill and pave option consistently outbid the HIR contractors, HIR equipment left the province and the Ministry stopped including HIR as an option in their resurfacing contracts. The Ministry has recently been including HIR as an alternative in their contract documents in an effort to reestablish HIR in Ontario. Due to improvements in technology and experience with HIR, this treatment is now becoming a competitive alternative to milling and paving with new asphalt.

HIR can be described as an on-site, in-place method that rehabilitates deteriorated asphalt pavements and thereby minimizes the use of new materials. Basically, this process consists of four steps:

1. Softening of the asphalt pavement surface with heat;
2. Scarification and/or mechanical removal of the surface material;
3. Mixing of the material with recycling agent (rejuvenator), asphalt binder, or new mix; and,
4. Laydown and paving of the recycled mix on the pavement surface.

The specifications for the recycled hot mix product are identical to those of virgin hot mix asphalt (HMA), although softer grades of virgin asphalt cement are used to overcome the oxidation and hardening of the asphalt cement in the recycled asphalt product (RAP). The design of the recycled mix is also influenced by the method by which the RAP was removed from the road surface. If the RAP is removed by cold milling, the cutting action of the teeth results in an increase in the aggregate fines content and a reduction in the stone content. However, adjustment in the operation of the milling machine and the use of split virgin coarse and fine aggregates instead of a single graded aggregate may alleviate most of the problems associated with aggregate degradation.

In selection of road candidates to be considered for HIR, pavements need to be free of major structural distress such as structural cracking and excessive rutting. Asphalt material testing of candidate road sections includes tests for asphalt cement content, asphalt cement penetration, and air voids to ensure compatibility with the proposed treatment.

Analysis

The execution of the HIR Pilot Project included the following work:

- Desktop review including:
    - Review of current data for collector and arterial roads including pavement condition data, roughness, structural cracking, nonstructural cracking, and rutting;
    - Review roads identified for upcoming treatment in the City's pavement management program;
    - Review of geotechnical information;
    - Review of MTO documents;
    - HIR reports prepared for other municipalities;
    - Contract documents and specifications from municipalities;
    - Federal Highway Administration publications;
- Inspect selected roads from desktop review in the field;
- Prepare list of candidate roads deemed to be in appropriate condition for HIR treatment;
- Identify sections of the roads for asphalt material coring/testing and possible inclusion for proposed HIR treatment;
- Review asphalt material testing results;
- Provide final recommendations for HIR locations and advise Council;
- Upon Council approval, prepare and issue tender, award construction and complete resurfacing work in 2020.

Candidate roads determined to be suitable for HIR are indicated in Table 1. Sections of these candidate roads indicated in Table 2 were selected for field coring and asphalt material testing for the purpose of determining compatibility of asphalt for HIR. We anticipate that approximately 25 lane km can be resurfaced with HIR within the current budget. This quantity may be reduced by the costs associated with removal of crack sealing as this will be a field decision made by our consultant during the HIR construction process.

Table 1 – Selected Candidate Roads Suitable for HIR treatment

Road	From	To	Length (km)	Lane Km
MR35	Notre Dame Street East - Azilda	Big Nickel Road (MR34)	8.5	34.0
Kingsway	Falconbridge Road	Hwy 17 Bypass	4.4	21.3
Radar Road (MR85)	Skead Road	Pine Ridge Street	9.4	18.8
Bancroft Drive	Kingsway	Bellevue Ave	1.5	3.0
			23.8	77.1

Table 2 – Road Sections Proposed for HIR Pilot Project

Road	From	To	Length (km)	Lane Km
MR35	Clarabelle Road	Big Nickel Road (MR34)	2.3	9.2
Kingsway	Falconbridge Road	Levesque Street	2.7	12.8
Radar Road (MR85)	Skead Road	Pine Ridge Street	3.7	7.4
Bancroft Drive	Kingsway	Bellevue Avenue	1.5	3.0
			10.2	32.4

Wood/PNJ will prepare a report, which will provide a summary of the desktop review, field reviews, road candidate selection, asphalt material testing, and recommendations for the road sections selected for the proposed HIR treatment. This report, including

recommendations, is summarized in the presentation to council "Hot In-Place Recycling Pilot Project", dated July 7, 2020.

Next Steps

Should council choose to proceed with the work, it will be tendered to be completed this construction season. The limits of the work indicated in Table 2 may need to be altered as required for budgetary purposes depending on contract prices or determination of suitability of asphalt materials. Any alterations to the project limits will be within the candidate roads indicated in Table 1.

At the conclusion of the project, staff will report back to council in 2020 to summarize the results of the pilot project and provide recommendations for consideration of HIR in 2021 budget deliberations.

Conclusion

Hot In-Place Recycled Asphalt treatment technology has been successfully used for extending asphalt life in other locales and could become an additional treatment option for our road asset management strategy. This pilot project will help determine if HIR is a cost effective strategy within our community when considering factors such as existing road structure/asphalt material conditions and available contractors and equipment.

Approximately 77 lane km have been identified as candidate roads which are in suitable condition for HIR treatment and geotechnical testing of approximately 32 lane km is in progress to determine suitability of the existing asphalt for the proposed treatment. We estimate approximately 25 lane km could be resurfaced within the available 2020 funds.

A tender document is ready to be issued to obtain competitive pricing for the pilot project. Staff is prepared to identify final treatment locations within the candidate road sections based on tendering response and geotechnical recommendations.

Resources Cited

Operations HIR report dated October 21, 2019
https://agendasonline.greatersudbury.ca/index.cfm?pg=feed&action=file&agenda=report&itemid=2&id=1346

Operations HIR presentation dated October 21, 2019
https://agendasonline.greatersudbury.ca/index.cfm?pg=feed&action=file&attachment=27808.pdf

CC2019-189 June 11, 2019 council resolution for $700k funding from gas tax
https://agendasonline.greatersudbury.ca/index.cfm?pg=feed&action=file&agenda=report&itemid=14&id=1324

FA2019-120 December 16, 2019; $811,000 funding from the 2020 budget deliberations (Finance and Administration Committee Resolution).
https://agendasonline.greatersudbury.ca/?pg=agenda&action=navigator&id=1543&itemid=rec