

**OVERVIEW DOCUMENT #3:  
CONSTRUCTION OF THE RHVP**

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**A. Introduction**

1. The Red Hill Valley Parkway was constructed by the City of Hamilton, and opened to the public on November 17, 2007. Overview Document #3 will address the construction of the RHVP, beginning in the pre-construction phase to its completion. Overview Document #3 will largely be organized in chronological order, but some events will be grouped together, slightly out of chronological order, where doing so promotes clarity and ease of understanding.

2. Commission Counsel has endeavoured to confirm the names, organization, and position(s) held by the individuals referenced in this Overview Document. This information is provided in the body text where each individual is first referenced.<sup>1</sup> A complete list of the individuals and their respective information can be found at Appendix A of Overview Document #3.

3. The facts contained in Overview Document #3 have not been tested for their truth. Commission Counsel and the participants may call evidence from witnesses at the Inquiry that casts doubt on the truthfulness or accuracy of the content of the documents underlying this Overview Document. The participants will also be able to make submissions regarding what, if any, weight should be given to any of these documents.

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<sup>1</sup> Where more than one position is held by an individual within the time frame covered in this Overview Document, the information in the body text will reflect the position held at the time of first reference. For a complete list of all positions held by all individuals referenced in Overview Document #3, see Appendix A.

**B. Brief history of the LINC and RHVP to 2002**

4. A brief summary of the history of the LINC and RHVP was set out in a Project Update to Mayor and City Council from Chris Murray (Director, Red Hill Valley Project, Public Works, Hamilton), dated September 2, 2002, as follows:<sup>2</sup>

- The Red Hill Creek Expressway had been in various stages of planning, construction and operation since the 1950s.
- In 1977, the Region of Hamilton-Wentworth took over the area municipalities' responsibility for major arterial roads including the Red Hill Creek Expressway.
- In 1985, the joint Ontario Municipal Board and Environmental Assessment Board approved the Expressway and ordered all relevant approvals/permits to be issued by provincial agencies.
- In 1987, the Ontario Cabinet approved funding for the project.
- In 1990, the Region initiated physical Expressway construction in Red Hill Valley at TH&B, Queenston Avenue and King Street. Later that year, Provincial funding was withdrawn by the NDP for the north-south leg of the project but not the east-west. All efforts then shifted to the east-west.
- In 1993, the NDP retained David Crombie to develop a more ecologically sound alternative solution to the Red Hill Valley Expressway. The resulting proposal involved building a four-lane controlled access arterial along the Valley, employing cut and cover design where possible, and connecting this new roadway to a four-lane Woodward Avenue. The Region dismissed the proposal citing environmental, transportation and financial concerns.
- In 1995, the Progressive Conservatives reinstated funding for the north-south Expressway.
- In 1997, the LINC opened 18 months ahead of schedule and approximately \$20 million under budget.
- In 1997, the Minister of Environment and Energy issued the Region a declaration order that supported their impact assessment process that is aimed at reducing the environmental and social consequences of the Expressway design approved in 1985.
- In 1997/98 the Region completed the Red Hill Creek Watershed Plan and circulated a series of draft technical/summary reports for government/public comment.
- In 1999, the federal government subjected the Expressway to a Panel Review under the Canadian Environmental Assessment Act (CEAA). The Region initiated a judicial

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<sup>2</sup> [HAM0031690\\_0001](#) at image 5

- review application, challenging the federal government's attempt to re-plan a project that was effectively under construction.
- In 2001 (November), the federal appeal court upheld the Region's (City's) legal position that it's too late to apply the CEAA to this project.
  - In 2002 (January), the federal government announced it would not pursue the case to the Supreme Court.
5. Gary Moore (Senior Project Manager, East-West North-South Transportation Corridor Project, Region of Hamilton-Wentworth) was involved in the Red Hill Valley Project (comprising what would become the LINC and the RHVP) as a Hamilton employee since May 1988.<sup>3</sup>
6. Golder was involved periodically in the Red Hill Valley Project since at least 1990.<sup>4</sup> However, Ludomir Uzarowski (Principal, Pavement and Materials Engineering, Golder) (mentioned extensively in Overview Document #3) did not join Golder until 2003.<sup>5</sup>
7. Dufferin was the mainline paving contractor for the LINC. It was the low bidder for the LINC mainline paving contracts RHW97-226 (Upper Wellington to Dartnall Road) and RHW97-225 (Mohawk/Golf Links to Upper Wellington).<sup>6</sup> The LINC opened in 1997.
8. In 1999, Dufferin completed an extension to the LINC, which opened on July 5, 1999. Prior to the opening of the LINC Extension, the LINC only went as far east as

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<sup>3</sup> [HAM0021277\\_0001](#); also [HAM0015982\\_0001](#) (September 9, 1988, letter from Mr. Moore re "Pavement Design North-South Freeway") and [HAM0000123\\_0001](#) at image 111

<sup>4</sup> [HAM0000130\\_0001](#)

<sup>5</sup> [GOL0000401](#)

<sup>6</sup> [HAM0018013\\_0001](#)

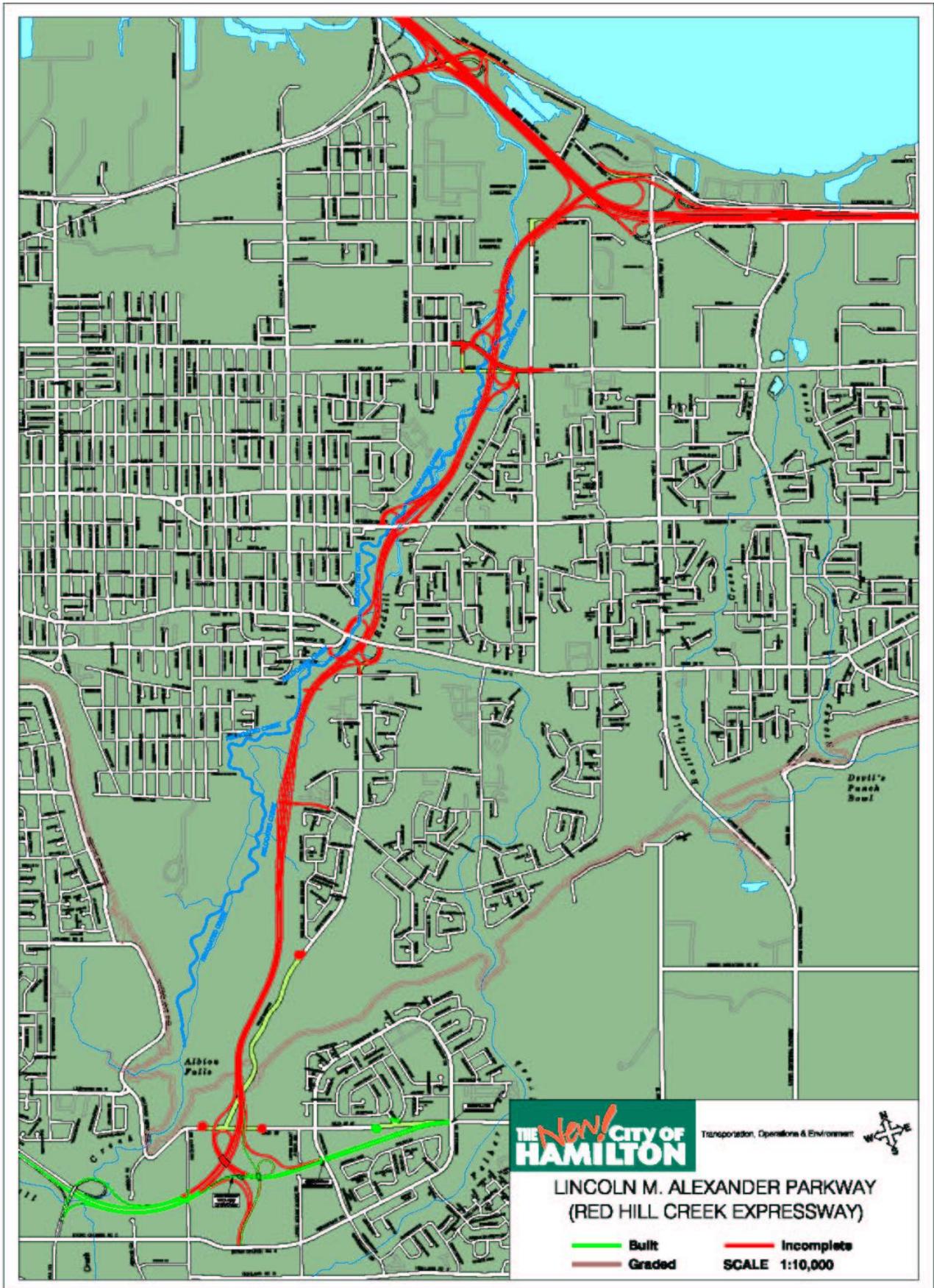
Dartnall Road. The LINC Extension lengthened the LINC eastwards from Dartnall Road to Pritchard Road.<sup>7</sup>

9. Mr. Murray's September 2, 2002, Project Update to the Mayor and City Council contained a map illustrating the boundaries between the completed LINC (including the 1999 extension) and the RHVP which was still to be built.<sup>8</sup> That map is reproduced on the following page, with the completed LINC in green, and the still to be constructed RHVP in red:

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<sup>7</sup> [HAM0002402\\_0001](#)

<sup>8</sup> [HAM0031690\\_0001](#) at image 2



**C. 1997 and 1999 friction testing on the LINC**

10. In 1997, JEGEL conducted pavement friction testing on the LINC between Highway 403 and Dartnall Road. JEGEL provided the results provided to Mr. Moore (then Manager, Special Project Office, Region of Hamilton-Wentworth).<sup>9</sup>

11. JEGEL used the British Pendulum Skid Tester (ASTM E 303) to measure frictional resistance by way of a British Pendulum Number (BPN), and the Sand Patch test method (ASTM E 965) to measure surface macrotexture. The JEGEL report dated November 4, 1997, stated that “BPN values greater than 50 generally indicate a pavement capable of providing adequate frictional resistance properties for normal traffic conditions”, and concluded:

The initial results of British Pendulum testing indicate BPN values ranging from 62 to 75, which is considered to be very good. Sand Patch surface texture depths ranged from 0.28 mm to 0.70 mm, which is considered to be fair. At this time, the BPN and texture depth values for both the steel slag and non steel slag sections are similar (Table 2). As the traffic and environment 'wear' and 'polish' the pavement surface, the BPN numbers are expected to decrease. The changes in texture depths are dependent on hot-mix materials and properties. A substantial increase in texture depth, over time, may be indicative of a ravelling pavement surface.<sup>10</sup>

12. JEGEL conducted further friction testing on the LINC in 1999, again using the British Pendulum Skid Tester and the Sand Patch test method to measure surface macrotexture. The JEGEL report dated July 12, 1999, addressed to Mr. Moore, re-iterated that BPN values greater than 50 generally indicate a pavement capable of providing adequate friction resistance properties, and summarized the testing results as follows:

1. 1999 BPN values are generally good, but have decreased by about 10 to 15 percent.

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<sup>9</sup> [HAM0018540\\_0001](#) attaching [HAM0018541\\_0001](#), [HAM0018542\\_0001](#), [HAM0018543\\_0001](#), and [HAM0018544\\_0001](#)

<sup>10</sup> [HAM0018541\\_0001](#)

2. 1999 Sand Patch surface texture depths have increased by about 18 to 37 percent.
3. Steel slag aggregate asphalt concrete sections have about equal skid resistance (BPN) as non-steel slag aggregate asphalt concrete sections.
4. Steel slag aggregate asphalt concrete sections have slightly less textural depth than non-steel slag aggregate asphalt concrete sections indicating slightly higher resistance to wear caused by the traffic and environment.<sup>11</sup>

13. On July 20, 1999, JEGEL sent Mr. Moore an excerpt from the “Pavement Design and Management Guide” respecting “Friction Measurement and Methods”, which briefly explained the phenomenon of skidding, skid resistance, microtexture and macrotexture, and the various methods and devices used to measure friction.<sup>12</sup> The article stated:

#### 2.6.1 Friction Measurement and Methods

The phenomenon of skidding involves a very complex interrelationship between pavement factors, vehicle factors (mainly the tires and brakes), environmental and driving factors. Nevertheless, a great deal of progress has been made in understanding the phenomenon and in developing measurement techniques and evaluation procedures.

The resistance to skidding on a road surface is largely determined by the microtexture of the surface aggregate, as illustrated in Figure 2.11. It is a function of aggregate mineralogy and the interaction with traffic and climatic factors. Without such microtexture, there would be little wet frictional resistance. By comparison, clean, dry road surfaces have a high resistance because tires can keep in close contact with the road surface. However, when the surface is wet, the water film acts as a lubricant. In this situation, drainage routes provided by the macrotexture, together with the tire tread, helps to get rid of most of the water. But penetration of the remaining film of water is only possible if there is sufficient microtexture (i.e., sharp edges to allow high pressure buildups as the tire passes over).<sup>13</sup>

#### ***D. Expressway Implementation Committee / Parkway Implementation Committee***

14. On March 22, 2002, a staff report to the Mayor and Members of the Committee of the Whole prepared by Mr. Murray and submitted by Peter Crockett (General Manager, Transportation, Operations & Environment, Hamilton) recommended establishment of an

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<sup>11</sup> [HAM0061641\\_0001](#) attaching [HAM0061642\\_0001](#), [HAM0061643\\_0001](#), [HAM0061644\\_0001](#), [HAM0061645\\_0001](#), [HAM0061646\\_0001](#), [HAM0061647\\_0001](#), [HAM0061648\\_0001](#). The JEGEL February 15, 1999 proposal for the work to Mr. Moore is at [HAM0061639\\_0001](#) attaching [HAM0061640\\_0001](#)

<sup>12</sup> [HAM0010056\\_0001](#) at image 3, attached to [HAM0010055\\_0001](#)

<sup>13</sup> [HAM0010056\\_0001](#) at image 3, attached to [HAM0010055\\_0001](#)

Expressway Implementation Committee consisting of four to six members of City Council to work with staff on the implementation of the detailed design, construction and monitoring phase of the RHVP.<sup>14</sup>

15. On April 2, 2002, City Council established the Expressway Implementation Committee and appointed seven councillors (Sam Merulla (Ward 4, Hamilton), David Mitchell (Ward 11, Hamilton), Anne Bain (Ward 9, Hamilton), Chad Collins (Ward 5, Hamilton), Larry Di Ianni (Ward 10, Hamilton), Tom Jackson (Ward 6, Hamilton), Dave Braden (Ward 14, Hamilton)) to it.<sup>15</sup>

16. On or before June 29, 2005, the Expressway Implementation Committee was renamed the “Parkway Implementation Committee”.<sup>16</sup>

### ***E. RHVP Project Charter and organization***

17. The March 25, 2003, RHVP “Project Charter 1st Version” set out the roles and responsibilities of the Hamilton staff involved in the RHVP planning and construction as follows:<sup>17</sup>

#### 8. Project Organization

##### 8.1. Executive Sponsor

This Project is sponsored by Peter Crockett, General Manager of the Public Works Department. As sponsor, Mr. Crockett champions the Project within the organization. His tasks include the monitor and control of progress at a strategic level, as well as, securing the necessary investment. He delegates authority to the Project Director to ensure objectives are achieved, yet still provides advice and guidance as necessary.

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<sup>14</sup> [HAM0002572\\_0001](#)

<sup>15</sup> [HAM0002578\\_0001](#) at image 3

<sup>16</sup> [HAM00020593\\_0001](#) at image 1

<sup>17</sup> [HAM0010101\\_0001](#) at images 9-11

## 8.2. Project Director

As the Director, Chris Murray is fundamentally accountable for the cost effective and timely completion of the Project and provides the interface between project ownership and delivery. His role includes the initiation, planning, execution and control of the total Project effort within the guidelines agreed to in the Project Charter. Chris is responsible for the leadership of the Team, reporting of progress to the Sponsor and other senior management levels and Committees, as well as coordination with any related works within the City of Hamilton. His fiscal duties include obtaining the requisite approval of funding for the Project and maintaining control of its expenditures. All change control and decision-making authority for the operation of the Project on a day-to-day basis rests with the Director.

## 8.3. Project Team

The Team takes its direction from the Project Director and is comprised of Gary Moore [Manager of Design], Catherine Bianco [Communications Officer], Michele Braun [Administrative Assistant], Marco Oddi [Senior Project Manager], and Jennifer DiDomenico [Program Support Analyst].

### 8.3.1. Roles and responsibilities

Gary Moore, Manager of Design - Gary heads the technical arm of the Team. One of his primary responsibilities is the management and administration of the consultant team establishing the preliminary engineering and design blueprint for the Project. He is charged with developing a design that will meet the terms for any (government) project approvals or permits that are required. The Manager of Design must also develop the construction staging for the road, as well as the associated works for both the realignment of Red Hill Creek and the storm water management systems. Furthermore; he will manage the initiation, evaluation and award of construction tenders and monitor the progress within each contract.

Catherine Bianco, Communications Officer - Catherine's mission is to anticipate and provide information to the various stakeholders of this Project and to leverage opportunities to demonstrate the uniqueness of the Project to interested parties and the media. She assists the Director in managing the information exchange between the Project Office and, in particular, individuals or groups. Her job is to ascertain what is of interest to each particular stakeholder and provide factual information quickly. Communication takes place through meetings and correspondence with individuals or groups, as well as through the Project website, e-mail and newsletters.

Michele Braun, Administrative Assistant - Her role is to provide confidential administrative support to the Director. Michele ensures cohesion within the Project office by filtering any correspondence (received via regular mail, e-mail, phone messages, etc.) to appropriate persons, organizing appointments, making necessary arrangements for meetings and maintaining the Director's schedule. She assists in the maintenance of confidential and information filing systems and responds to Freedom of Information inquiries related to the Project.

Marco Oddi, Senior Project Manager - This position reports to the Manager of Design as part of the technical arm on the Project. Marco's duties are to provide assistance in the management and administration of the design and construction services for the delivery of the various facets of the Project, which include road, water and wastewater infrastructure, including facilities from preliminary engineering to final detailed design, together with the tendering and construction administration of the work. He will also assist Gary to provide

leadership to subordinate staff and consultants engaged in the delivery and direction of services related to the Project.

Jennifer DiDomenico, Program Support Analyst - Acting as an Executive Assistant to the Director, she manages the administration of the Project office. One of the principal duties is to conduct research and provide the pertinent information needed to make informed decisions and keep the Project Director abreast of issues. Likewise, the Analyst will assist in developing the capital and annual budgets, conducting financial impact analysis on new or emerging issues to better manage cost projections and recommend corrective actions. Another facet of this role is to identify issues and trends voiced by citizens and groups, and develop mechanisms or strategies to address these by implementing appropriate systems and action plans for tracking issues.

#### 8.4. Project Committees

Two groups were organized as advisory bodies on this Project. The Red Hill Creek Expressway Implementation Committee (EIC) [political representation] and the Technical Advisory Committee (TAC) [corporate representatives] serve to monitor the progress of this endeavor and provide key inputs and decisions where necessary. [See Appendix B for a list of members.] They provide overall strategic guidance to the Project and high-level advice and support to the Director.

#### ***F. Decision to use SMA, Golder Feasibility Study, and the CTAA Paper***

18. Meeting Notes dated June 19, 1999, titled “Regional Municipality of Hamilton Wentworth, Red Hill Creek Expressway Management Plan”, list the attendees as Mr. Moore, Cassandra Bach (Environmental Planning Assistant, Regional Municipality of Hamilton-Wentworth), and Bob Hodgins (President, Ecoplans), and stated, among other things under “Design Criteria”, that “Pavement is SMA, shoulders will be fully paved.”<sup>18</sup>

19. In October 1999, Hamilton placed SMA on Burlington Street between Victoria Avenue and Wellington Street. A 2002 CTAA paper co-authored by Mr. Moore stated that:

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<sup>18</sup> [HAM0019342\\_0001](#)

- (a) The purpose of the placement was “to evaluate the use of SMA to mitigate rutting in high traffic areas and to assess the potential of SMA for use on a proposed multi-lane expressway” (the RHVP).<sup>19</sup>
- (b) The MTO performed skid resistance testing on this SMA placement using its ASTM E274 Brakeforce Unit, obtaining average measurements (by lane) between FN44 and FN51 in November 1999 and May 2000;<sup>20</sup> and
- (c) Hamilton also had British Pendulum conducted on this SMA placement, obtaining average measurements of 67 in February 2000, and 69 in May 2002.<sup>21</sup>

20. On February 25, 2003, Mr. Moore emailed Mr. Murray “the latest version” of the RHVP “Preliminary Design Report”.<sup>22</sup> At pages 14 and 15, the Preliminary Design Report indicated that, unlike for the LINC, Hamilton was considering using SMA for the RHVP surface layer asphalt:

An HL8-HD is being considered for the binder course asphalt. This is the same mix that was used successfully on the Lincoln M. Alexander Parkway (LMAP) portion of the expressway project. Modified HL1 or an SMA (Stone Mastic Asphalt) are being considered for the surface or wearing course asphalt mixes. The modified HL-1 mix was used on the LMAP and continues to perform under heavy traffic. However the SMA mix is a stone-on-stone, binder rich surface mix that provides quality rutting and cracking resistance. When compared to normal dense graded hot-mix asphalt or Portland cement concrete surfaces, SMA is quieter according to a number of studies. Research in Germany, the U.K., Italy, and the United States have shown a 2-5 dB(A) drop in road noise when SMA is compared to other types of road surface. (A 3 dBA drop is equivalent to doubling the distance to the source of the noise. SMA has also been shown to have improved surface texture and skid resistance characteristics. The SMA is a 5-8% premium in cost over the HL-1 mix. The

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<sup>19</sup> [GOL0001567](#) at image 4

<sup>20</sup> [GOL0001567](#) at images 8 and 10

<sup>21</sup> [GOL0001567](#) at images 8 and 9

<sup>22</sup> [HAM0050706\\_0001](#) attaching [HAM0050707\\_0001](#)

value of noise reducing asphalt pavement versus increased the cost will be assessed later in the design phase.

21. Dr. Uzarowski and Vince Aurilio (Technical Director – Field Engineer, OHMPA) of the Ontario Hot Mix Producers Association (OHMPA), co-authored a paper presented at the Canadian Technical Asphalt Association (CTAA) conference in Montreal in November, 2004, titled “Perpetual Asphalt Pavements”.<sup>23</sup> This paper explained the concept of perpetual pavements including examples of practical application in Ontario (such as Highway 406), and included references to using SMA or other asphalt mixes as the surface course of a perpetual pavement. It stated by way of introduction:

Traditionally, flexible i.e., hot-mix asphalt pavements, have been designed to last 20 years. The typical life cycle involves a program of routine maintenance and a major rehabilitation treatment every 18 to 25 years. With the rapidly increasing traffic volumes on all roadways, provincial road agencies and larger municipalities are looking for ways to extend effective road service life so as to minimize the disruptions to normal traffic operations, the associated driver delays and inconvenience during road rehabilitation works. The desired strategy for road maintenance can be summed up as, “Get in - get out quickly – stay out!” Clearly, huge benefits would accrue in terms of sustainability and value for infrastructure investment, if the life of flexible pavements could be doubled, say to 50 years.<sup>24</sup>

22. On January 11, 2005, Mr. Moore met with Dr. Uzarowski and discussed the paving of the RHVP. Among other things, Mr. Moore raised using SMA. Dr. Uzarowski’s notes from that meeting state: “SMA – Gary wants to use” and “70,000 veh/day”.<sup>25</sup> Arising from that meeting, on January 13, 2005, Dr. Uzarowski sent Mr. Moore a proposal “to carry out a feasibility study on using perpetual pavement on the Red Hill Valley Expressway in

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<sup>23</sup> [GOL0003343](#) attached to [GOL0003342](#)

<sup>24</sup> [GOL0003343](#) at image 3

<sup>25</sup> [GOL0007403](#) at image 2

Hamilton in 2005.”<sup>26</sup> The next day, January 14, 2005, Mr. Moore gave Dr. Uzarowski permission to proceed with the study.<sup>27</sup>

23. On January 25, 2005, Mr. Moore sent a fax to Golder stating "*Per your request here are copies of Geotechnical Reports for the North/South Freeway, for your information and use*", indicating he was attaching five different geotechnical reports.<sup>28</sup>

24. On January 27, 2005, Hamilton Purchasing sent the purchase order to Golder for its feasibility study on using perpetual pavement.<sup>29</sup>

25. Mr. Moore, Dr. Uzarowski, Michael Maher (Principal, Pavement and Materials Engineering, Golder) and Mr. Aurilio wrote a “Paper Offer” Abstract with a date of February 28, 2005, for the Canadian Technical Asphalt Association 50<sup>th</sup> Annual Conference titled: “Sustainable Pavements – Making the Case for Longer Design Lives for Flexible Pavements”, which stated:

This paper will consider some aspects of perpetual pavement sustainability based on a practical application of the concept on the Red Hill Creek Expressway project in the City of Hamilton, Ontario. This high profile modern urban expressway is considered to be the largest municipal road project in Canada with an estimated cost of \$ 400 Million. The City of Hamilton has decided that given the projected traffic volumes, which will be as high as 100,000 vehicles per day, the conventional wisdom of designing for a 20 year pavement life may not be acceptable. Thus, a detailed life cycle costing analysis has been undertaken to compare perpetual pavement design to a conventional deep strength asphalt pavement option. The advanced asphalt technology and materials used in the perpetual pavement design will allow the pavement structure to last 50 years with only periodic surface course replacements and without any major pavement rehabilitation. The associated benefits of delivering a highly durable and safe pavement surface and avoiding major shut-downs of the expressway, (the surface course replacements can be completed

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<sup>26</sup> [HAM0050787\\_0001](#) attaching [HAM0050788\\_0001](#)

<sup>27</sup> [GOL0003772](#)

<sup>28</sup> [GOL0004956](#) (the five referenced geotechnical reports are not attached to the fax)

<sup>29</sup> [GOL0004955](#)

during single lane closures at night), are in keeping with the City's desire to be a leader in the application of sustainable design solutions for public infrastructure.<sup>30</sup>

26. On February 24, 2005, Dr. Uzarowski emailed Mr. Moore about the "Red Hill Creek Expressway Perpetual Pavement", asking for unit costs of various asphalt products including three types of SMA, for use in Golder's study. On March 2, 2005, Mr. Moore replied, providing costs for some items.<sup>31</sup>

27. On March 16, 2005, Mr. Moore and Dr. Uzarowski met to discuss both the pavement for the RHVP, including the use of SMA, and the potential Canadian Technical Asphalt Association paper.<sup>32</sup>

28. On March 17, 2005, Mr. Moore emailed Dr. Uzarowski respecting the Golder perpetual pavement study, stating:

Here is the quantity breakdown for the granular and asphalt as requested.

Here is a plan as well.

Let me know if you need anything else.<sup>33</sup>

29. On July 21, 2005, Scott Stewart (General Manager, Public Works, Hamilton) emailed Mr. Crockett, Mr. Murray and Nancy Clark (Administrative Assistant to the General Manager, Public Works, Hamilton): "our submission for the Top Ten Roads and Bridges" in Roads & Bridges magazine. The attached "Roads & Bridges Application" was

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<sup>30</sup> [GOL0000021](#) at image 2; also [GOL0004953](#)

<sup>31</sup> [GOL0004952](#)

<sup>32</sup> [GOL0007403](#) at image 7

<sup>33</sup> [HAM0050797\\_0001](#) attaching [HAM0050798\\_0001](#) and [HAM0050799\\_0001](#)

about the RHVP and listed “Flexible-Perpetual pavement design with SMA surface” as the pavement type.<sup>34</sup>

30. According to Dr. Uzarowski’s notes, on June 28, 2005, Mr. Moore and Dr. Uzarowski discussed perpetual pavement specifications and cost effectiveness.<sup>35</sup>

31. On July 22, 2005, Dr. Uzarowski emailed Mr. Moore a cost comparison of conventional deep strength and perpetual pavement alternatives for the mainline RHVP using a life cycle cost analysis. Dr. Uzarowski concluded that over a 70-year period the perpetual pavement option, using SMA as the surface course, would be less expensive.<sup>36</sup>

He also stated in relation to the Canadian Technical Asphalt Association paper:

I am working currently on the CTAA paper. A comparison of the conventional deep strength and perpetual pavement designs, including LCCA, forms the core of the paper. I would appreciate if you could review the revised data and let me know if you want me to make any changes.

32. On July 27, 2005, Mr. Moore responded to Dr. Uzarowski’s email with revised granular and asphalt quantities and prices, including for SMA.<sup>37</sup>

33. On August 5, 2005, Dr. Uzarowski emailed a draft of the Canadian Technical Asphalt Association paper on sustainable pavements to Mr. Aurilio and Dr. Maher, asking them to review.<sup>38</sup> The paper listed Mssrs. Uzarowski, Maher, Moore, and Aurilio as its authors and was titled: “Sustainable Pavements – Making the Case for Longer Design Lives for Flexible Pavements”. The pavement options compared in the paper (perpetual

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<sup>34</sup> [HAM0020576\\_0001](#) attaching [HAM0020577\\_0001](#)

<sup>35</sup> [GOL0007403](#) at images 13-14

<sup>36</sup> [GOL0003356](#) attaching [GOL0003357](#) and [GOL0003358](#)

<sup>37</sup> [HAM0050812\\_0001](#) attaching [HAM0050813\\_0001](#) and [HAM0050814\\_0001](#)

<sup>38</sup> [GOL0003366](#) attaching [GOL0003367](#), [GOL0003368](#), [GOL0003369](#), [GOL0003370](#), [GOL0003371](#)

pavement versus conventional deep strength) both used SMA for the surface course, and the draft paper stated:

Traditionally, flexible (i.e. hot mix asphalt) pavements have been designed to last 20 years. The typical life cycle involves a program of routine maintenance and a major rehabilitation treatment every 18 to 25 years. With the rapidly increasing traffic volumes on urban arterial roadways, provincial road agencies and larger municipalities are looking for ways to extend effective road service life so as to minimize the disruptions to normal traffic operations and the associated driver delays and inconvenience during road rehabilitation works. The desired strategy for road maintenance can be summed up as, “Get in - get out quickly – stay out!” Clearly, huge benefits would accrue in terms of sustainability and value for infrastructure investment, if the life of flexible pavements could be increased to 50 years or more. Recognizing the inherent economic, social and environmental value of this innovative design, the Ministry of Transportation Ontario (MTO) initiated a trial project in 2003 to incorporate a perpetual pavement approach [1 and 2]. This project is the twinning of a 5.2 km section of Highway 406, near Thorold, Ontario. An overview of perpetual asphalt pavement approach with practical designs and analysis is given in a CTAA 2004 technical paper [1]. The City of Hamilton has decided to use the perpetual pavement concept on their major infrastructure project.<sup>39</sup>

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Both pavement design alternatives incorporate Stone Mastic Asphalt (SMA) as the surface course mix. SMA is considered to have improved skid resistance and offer some noise reduction [8] when compared with conventional hot-mix asphalt mixes. This mix type also offers superior rutting resistance, fatigue endurance and durability.<sup>40</sup>

34. This paper listing Mssrs. Uzarowski, Maher, Moore, and Aurilio as its authors titled: “Sustainable Pavements – Making the Case for Longer Design Lives for Flexible Pavements” was published by the CTAA as part of its November 5-8, 2006, Annual Conference.<sup>41</sup> It is unclear which of the authors presented the paper at the conference.<sup>42</sup>

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<sup>39</sup> [GOL0003367](#) at image 6. Until the fourth last sentence, this paragraph is word for word from [GOL0003343](#), being the 2004 CTAA paper by Dr. Uzarowski and Mr. Aurilio referred to earlier. Their 2004 CTAA paper is cited at footnote [1] in this paragraph and at image 16.

<sup>40</sup> [GOL0003367](#) at image 11

<sup>41</sup> [GOL0003367](#)

<sup>42</sup> [MTO0028926](#) at image 3 indicates that at the conference: “City of Hamilton made a case study for the use perpetual pavement based on environment impact study.”

35. On September 7, 2005, Marco Oddi (Senior Project Manager, Red Hill Valley Project, Public Works, Hamilton) emailed Mr. Moore asking that he: “Please confirm the proposed pavement structure for the N-S section, i.e. asphalt depth & type for each lift”.

Mr. Moore replied same day:

Based on the original design, a total of 160mm of asphalt was planned. The new 'perpetual' pavement design is

40 mm SMA surface course

100 mm HL-8 (HS) binder course (or superpave equivalent)

80 mm rich bottom layer asphalt

220 mm total asphalt depth

In areas where "A" has already been placed the granular base thickness will be reduced by 60 mm to accommodate the additional asphalt thickness while maintaining the original final profile grade. In areas where Granulars have not yet been placed, granular subbase depths will be reduced by 60 mm.

Okee dokee? <sup>43</sup>

36. On September 28, 2005, Mr. Moore and Dr. Uzarowski discussed finishing “Phase 1” and a possible “Phase 2” of the perpetual pavement project.<sup>44</sup> On October 7, 2005, Mr. Moore and Dr. Uzarowski further discussed Phase 2 of the perpetual pavement project, including mix requirement and specification development for “Superpave, SMA, and RBL” (Rich Bottom Layer).<sup>45</sup>

37. On October 12, 2005, Dr. Uzarowski emailed Donna Walsh (Facilities Manager, Golder) the “Perpetual Pavements Feasibility Study” for the RHVP (dated “August 2005”

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<sup>43</sup> [HAM0050815\\_0001](#)

<sup>44</sup> [GOL0007403](#) at image 17

<sup>45</sup> [GOL0007403](#) at images 18-21; [GOL0007398](#) at image 37

on the first page), and appendixes.<sup>46</sup> The study showed a life cycle cost advantage to the perpetual pavement option over deep strength pavement, both using SMA for the surface course asphalt.

38. On November 19, 2005, Dr. Uzarowski's notebook contains a note that states:

1) Hamilton – Paving on Lincoln Alexander Parkway –

SMA 12/5 & Ground Rubber

Modified Mix

3 hrs<sup>47</sup>

39. On November 22, 2005, Dr. Uzarowski submitted a Golder cost estimate proposal to Mr. Moore dated titled "Perpetual Pavement, Phase 2". The estimate included: "pavement and asphalt consultations including detailed corrections in the projects documentation, updates to the current HMA paving specifications and development of new required paving specification, any mix design reviews, and assisting in preparation of tender documents for the pavement works." The cost estimate for Golder's Phase 2 was \$15,500 plus GST.<sup>48</sup> On November 25, 2005, Mr. Moore emailed Dr. Uzarowski back, and stated:<sup>49</sup>

Hi Ludomir. Your proposal for the Perpetual Pavement design and associated tender preparation is acceptable. What do you need to get started. We are planning to go to tender in March so the specs, etc. need to be done by late February. That doesn't leave a lot of time when you take out Christmas. Let me know. I will issue a PO today.

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<sup>46</sup> [GOL0003747](#) attaching [GOL0003748](#), [GOL0003749](#), [GOL0003750](#), [GOL0003751](#), [GOL0003752](#)

<sup>47</sup> [GOL0007398](#) at image 51

<sup>48</sup> [HAM0050819\\_0001](#) attaching [HAM0050820\\_0001](#); also [HAM0000267\\_0001](#)

<sup>49</sup> [GOL0003767](#)

40. On the same day, November 25, 2005, Mr. Moore signed the City Procurement Award / Purchase Order Requisition Form applicable to the November 25, 2005, Golder cost estimate for the Perpetual Pavement Phase 2 work, in the amount of \$18,000 plus taxes.<sup>50</sup>

41. At the December 9, 2005, Parkway Implementation Committee meeting, Mr. Murray made a presentation indicating that the RHVP project would require an estimated budget addition of \$13,000,000. Mr. Moore and Mr. Stewart were present at the meeting. Composition of the Committee in attendance was shown as Councillors Braden, Phil Bruckler (Ward 9, Hamilton), Collins, Merulla, Mitchell, Maria Pearson (Ward 10, Hamilton), with “Regrets” by Mayor Di Ianni and Councillors Jackson and Brian McHattie (Ward 1, Hamilton).<sup>51</sup>

42. On January 26, 2006 Councillor Braden emailed Mr. Murray about concerns he had with asphalt deterioration on the LINC and asked how that would be addressed on the RHVP. Mr. Murray replied same day, suggesting the topic should be addressed at the next Parkway Implementation Committee meeting. After some internal back and forth about the LINC and RHVP not involving Councillor Braden, Mr. Murray copied in Mr. Moore who replied on February 6, 2006, to Mr. Murray, Wray Oakes (Manager, Roads Operations & Maintenance, Operations & Maintenance Division, Public Works, Hamilton), Bryan Shynal (Director, Operations & Maintenance Division, Public Works, Hamilton),

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<sup>50</sup> [HAM0000268\\_0001](#)

<sup>51</sup> [HAM0007681\\_0001](#) at images 2, 5 and [HAM0007682\\_0001](#)

Bryan Towers (Contract Co-ordinator, Road Operations & Maintenance, Operations & Maintenance Division, Public Works, Hamilton), and Mr. Oddi:<sup>52</sup>

Gentlemen, We will be using an SMA mix on the north-south Expressway surface. We will be using premium aggregates, premium polymer-modified asphalt cement and following the most stringent rules for paving. As we did when we built the Linc. The asphalt mixes that went into the LINC were state of the art at the time. The DFC used premium aggregates and we have skid tests for the first few years that showed little difference if any between the steel slag and the DFC. The cracking that is out there is not map cracking due to low asphalt content but transverse thermal cracking and longitudinal joint cracking. This is normal wear and tear that is usually addressed by crack sealing maintenance. There is little or no profile degradation or rutting. There are a couple of areas of settlement of transverse trenches but little or no segregation or ravelling. The fact that we designed the road so that there are no drainage structures ( i.e. manholes or chambers ) in the pavement has helped reduce further pavement degradation due to differential heaving. All in all the pavement is in good condition and should only require the requisite and expected resurfacing in the 12 -15 year time period from initial paving. Hope this clarifies the issues. Thanks

43. On March 7, 2006, Mr. Moore gave a presentation to the Parkway Implementation Committee. The minutes referred to Mr. Moore describing how the paving tender would be released in April 2006, that "new pavement technology/materials" will be used, and that "the roadway will be utilizing perpetual pavement which will reduce the future need for full road bed replacement". The minutes did not mention SMA. The minutes recorded that Mr. Moore, Mr. Stewart, Mayor Di Ianni and Councillors Braden, Bruckler, Collins, Merulla, Mitchell, Jackson, and Pearson attended the meeting, with "regrets" by Councillor McHattie.<sup>53</sup>

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<sup>52</sup> [HAM0050827\\_0001](#)

<sup>53</sup> [HAM0007695\\_0001](#)

44. On March 31, 2006, in the RHVP Monthly Information Update, Mr. Murray advised City Council that the RHVP paving contract was expected to be tendered by the end of April 2006.<sup>54</sup>

45. On April 10, 2006, Dr. Uzarowski emailed Mr. Moore the Golder “Draft Perpetual Pavement Design Study, Phase 2” by Dr. Uzarowski dated March 2006 and the Special Provisions specifications for hot mix asphalt, including SMA, referred to therein. The draft study stated that the original conventional deep strength pavement design was done by Peto MacCallum and Soil Mat Engineers and recommended a perpetual pavement design. In the email Dr. Uzarowski stated:<sup>55</sup>

Please find attached draft specifications for the Red Hill Valley Expressway HMA paving project for your review and comments. In Golder, we have had extensive discussion about the paving on this project. As this project is big, bigger than most of MTO projects, we think that the ERS specification will work better than the OPSS 310 (even with modification as included in the City of Hamilton Special Provision 5). I will call you to discuss it.

46. On April 18, 2006, Dr. Uzarowski emailed Mr. Moore asking for a budget increase for RHVP Perpetual Pavement Design Study Phase 2. Dr. Uzarowski asked for an additional budget of \$7,000, and stated: “we have decided to use the approach significantly different than those of MTO in terms of the RBM and other layer specifications. The RBM in particular required an extensive literature review and a careful specification development”. On April 19, 2006, Mr. Moore replied to Dr. Uzarowski, and agreed to increase the RHVP Phase 2 budget by \$7,000.<sup>56</sup>

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<sup>54</sup> [HAM0007709\\_0001](#) at image 2

<sup>55</sup> [GOL0003739](#) attaching [GOL0003740](#), [GOL0003741](#), [GOL0003742](#), [GOL0003743](#), [GOL0003744](#), [GOL0003745](#), [GOL0003746](#)

<sup>56</sup> [HAM0000277\\_0001](#)

47. The recommended design for the perpetual pavement in Golder’s “Draft Perpetual Pavement Design Study” was:<sup>57</sup>

	<b>PERPETUAL PAVEMENT DESIGN (mm)</b>
SMA 12.5	40
SP 19.0	50
Superpave SP 25.0	70
SP 19.0 Rich Bottom Mix Layer	80
Granular A Base	150
Subbase, Granular B Type II	390
Total Pavement Thickness	780
Structural Number (SN)	173

**G. RHVP grading contract awards and RHVP/QEW Interchange**

48. Hamilton awarded the grading portion of RHVP mainline construction in four separate tenders and contract awards, as follows:

- (a) Contract PW-04-238 (Mud Street Interchange to Greenhill) to Aecon on May 14, 2004;<sup>58</sup>
- (b) Contract PW-04-239 (Greenhill to north of Queenston) to Dufferin on May 14, 2004;<sup>59</sup>
- (c) Contract PW-04-241 (South of Barton to Nash Road) to Dufferin on October 18, 2004.<sup>60</sup> The low bid received, from Dufferin, was approximately \$15.5 million higher than staff expected, which put the project over budget and

<sup>57</sup> [GOL0003741](#) at image 2 attached to [GOL0003739](#)

<sup>58</sup> [HAM0020032\\_0001](#)

<sup>59</sup> [HAM0020028\\_0001](#)

<sup>60</sup> [HAM0002817\\_0001](#) attached to [HAM0002816\\_0001](#)

required staff to request a budget increase for the overall project from \$399.5 million to \$415 million.<sup>61</sup>

- (d) Contract PW-05-242 (“Mainline Structures and Creek Alignment North of C.N.R.” - the northernmost section that runs to the QEW interchange) to Dufferin on August 22, 2005.<sup>62</sup>

49. On March 31, 2005, the MTO paid the remaining \$50.62 million of its \$106.75 million RHVP funding commitment to the City.<sup>63</sup>

50. The MTO, not Hamilton, was responsible for the design and construction of the RHVP/QEW Interchange, where the RHVP was to connect at its north end with the QEW.<sup>64</sup>

51. In May 2005, Hamilton officially changed the name of the “Red Hill Creek Expressway” to the Red Hill Valley Parkway.<sup>65</sup>

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<sup>61</sup> [HAM0002787\\_0001](#)

<sup>62</sup> [HAM0007651\\_0001](#)

<sup>63</sup> [MTO0000086](#) at image 1

<sup>64</sup> [MTO0000086](#)

<sup>65</sup> [MTO0000086](#) at image 1

**H. RHVP paving tender and award**

52. On April 25, 2006, Hamilton released the notice of tender for contract PW-06-243 (RHV) Mainline Paving – Mud Street Interchange to QEW Interchange<sup>66</sup> and the tender itself.<sup>67</sup> The tender had a closing date of May 25, 2006.

53. A meeting was scheduled for April 26, 2006 for Mr. Moore, Dr. Uzarowski, Mr. Oddi, and F. Evan Wilson (Senior Consultant, Transportation, Stantec) to review the RHVP asphalt specifications.<sup>68</sup>

54. The paving specifications for the pavement materials in the tender included:

- (a) SMA 12.5 incorporating PG 70-28 asphalt cement surface course on mainline and SP 12.5 FC2 incorporating PG 70-28 asphalt cement surface course on ramps.<sup>69</sup>
- (b) No Reclaimed Asphalt Pavement (RAP) allowed in SMA or SP 12.5 FC2.<sup>70</sup>
- (c) SMA Specification OPSS 1151 November 2004, Material Specification for Superpave and Stone Mastic Asphalt Mixtures.<sup>71</sup>

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<sup>66</sup> [HAM0003013\\_0001](#)

<sup>67</sup> [DUF0002533.001](#) plus Parts A, B, C, and D at [DUF0002534.001](#), [DUF0002535.001](#), [DUF0002536.001](#), [DUF0002537.001](#)

<sup>68</sup> [HAM0020781\\_0001](#)

<sup>69</sup> [DUF0002533.001](#) at images 91-92 (page 3-5 and 3-6). See also [DUF0002534.001](#) at images 53 and 59.

<sup>70</sup> [DUF0002533.001](#) at image 92 (page 3-6)

<sup>71</sup> [DUF0002533.001](#) at image 92 (page 3-6)

- (d) OPSS 1101 November 2002, Material Specification for Performance Graded Asphalt Cement.<sup>72</sup>
- (e) OPSS 1003 November 2004, Material Specification for Aggregates – Hot Mix Asphalt.<sup>73</sup>
- (f) OPSS 1001 November 2005, Material Specifications for Aggregates, General.<sup>74</sup>
- (g) Surface Smoothness Requirements.<sup>75</sup>
- (h) Acceptance of Hot Mix Asphalt by Visual Inspection of Segregation.<sup>76</sup>
- (i) Hot Mix Asphalt Paving Requirements (including aggregate gradation and asphalt cement content and testing, and compaction requirements).<sup>77</sup>

55. Hamilton also issued Addendum No.1 to Contract No.PW-06-243 dated May 10, 2006, requiring approval of a trial section prior to placement of SMA or RBM. It stated:

**Trial Section**

Prior to placing any Stone Mastic Asphalt (SMA) or Rich Bottom Mix (RBM) on the contract, the Contractor shall demonstrate to the Contract Administrator the ability to successfully carry out the batching, placement procedures and compaction of SMA and RBM according to this specification by placing trial sections. The Contract Administrator will test each trial section for material properties, compaction and mat appearance.

Each trial section shall consist of about 75 tonnes of material with the lift thickness the same as that identified in the pavement design. The Contractor shall propose the location

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<sup>72</sup> [DUF0002533.001](#) at image 92 (page 3-6)

<sup>73</sup> [DUF0002533.001](#) at image 92 (page 3-6)

<sup>74</sup> [DUF0002533.001](#) at image 93 (page 3-7)

<sup>75</sup> [DUF0002533.001](#) at image 97 to 111 (page 3-11 to 3-25)

<sup>76</sup> [DUF0002533.001](#) at image 111 to 114 (page 3-25 to 3-28)

<sup>77</sup> [DUF0002533.001](#) at image 114 to 118 (page 3-28 to 3-32)

of the trial section to the Contract Administrator for approval. The Contractor shall give the Contract Administrator a minimum of 2 business days notice prior to placing the trial section.

The trial section shall be scheduled a minimum of 3 business days prior to commencement of the main paving. The main paving cannot proceed until approval is given by the Contract Administrator based on the trial section outcome.

Provided the trial sections meets the requirements of this specification, the trial section shall be considered acceptable and paid for based on the contract item unit rates. Otherwise, the Contractor shall be required to repeat additional trial sections until the material meets the requirements of this specification. The Contractor shall be responsible for all costs associated with the repair, removal, or replacement of an unacceptable trial section, including material, testing and management of surplus materials in accordance with the requirements of OPSS 180.<sup>78</sup>

56. On June 26, 2006, Mr. Stewart and Joseph Rinaldo (General Manager, Finance and Corporate Services, Hamilton) submitted a Staff Report, which was prepared by Mr. Murray, to the Mayor and Members of the Committee of the Whole.<sup>79</sup> That report summarized issues that had arisen with the paving tender and bids over the preceding month, stating:

Mainline Paving Contract

Contract PW-06-243(RHV) for Mainline Paving Mud Street – QEW Interchange was tendered on April 25, 2006 and closed May 25, 2006. Due to similar bid irregularities found in all three submissions, the City issued on June 12, 2006 a post tender addendum which provided each contractor an opportunity to either take no action, correct the irregularity in their current bid or submit a new bid. This post tender addendum was issued by Purchasing in conjunction with Legal. The lowest bid was received from Dufferin Construction Company in the amount of \$30,323,391.13 which is approximately \$7.9 Million higher than staff expected (i.e. \$26.3 Million low bid (net of tax & contingency) versus \$18.4 Million estimate). At the June 21, 2006 Corporate Administration Committee, representatives from both Dufferin and Lafarge presented their views on the post tender addendum process. In the case of Lafarge they were questioning the fairness of the approach and offered arbitration as a way to address apparent bid irregularities. Committee considered this suggestion but concluded the process was fair and recommend awarding the Paving contract to the lowest bidder.

The increased costs are attributable to a number of factors which include the rising price of asphalt concrete, petroleum and its related products, and additional concrete and steel required for bridge works. The estimate for the paving contract was last updated in July 2005 example is the price of asphalt (as taken from the Asphalt Price Index, Ontario Hot

<sup>78</sup> [HAM0051398\\_0001](#) at images 1-2 attached to [HAM0051396\\_0001](#). Also attached are the other three Addendums issued: [HAM0051399\\_0001](#), [HAM0051400\\_0001](#), [HAM0051401\\_0001](#)

<sup>79</sup> [HAM0032279\\_0001](#)

Mix Producers Association) which was \$285.50 in June 2005 and in June 2006 it is \$433.80. This 52% increase translates to approximately \$1,000,000 in additional expenses for this item alone. This is consistent with the overall trend in the commodity market which is reflected in higher costs. Additionally, the tender includes resurfacing works at King and Queenston Street bridge crossings which were completed approximately 15 years ago when started in the Valley. This \$400,000 cost will be reimbursed next year by the Capital Planning and Implementation division of Public Works who would normally undertake such work. Excluding this item from the contract would likely result in a higher cost and extend the duration of construction beyond the Fall of 2007. Finally the tender also includes \$2 Million in contingencies which as stated before staff will continue to manage.

All totalled, this contract includes the placing of granular, hot mix paving, curb and gutter, barriers, electrical, structures, illumination, signage, restoration of recreational features, and some landscaping. This work is scheduled to commence as soon as the contract is awarded and will continue until the Fall of 2007 when the roadway is expected to be open to traffic.<sup>80</sup>

57. On June 29, 2006, Mr. Oddi emailed various parties, including Dufferin, that the pre-construction meeting for the mainline paving would take place on July 13, 2006.<sup>81</sup>

58. On July 12, 2006, the Committee of the Whole of City Council recommended awarding the RHVP mainline paving contract PW-06-243 (RHV) to Dufferin as low bidder.<sup>82</sup>

59. On July 13, 2006, Mr. Oddi gave Dufferin Notice to Proceed with the paving contract commencing July 17, 2006, and to be completed by October 26, 2007.<sup>83</sup> The pre-construction meeting for the paving contract took place that day, attended by representatives of Hamilton, the Hamilton Fire Department, Dufferin, Golder, Stantec, Phillips, TransNorthern Pipeline, Horizon Utilities, and Dougan & Associates. The meeting

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<sup>80</sup> [HAM0032279\\_0001](#) at image 6

<sup>81</sup> [GOL0005392](#)

<sup>82</sup> [HAM0020893\\_0001](#) at image 5

<sup>83</sup> [HAM0007761\\_0001](#)

minutes indicated that Golder would be setting up their testing facility to provide QA testing.<sup>84</sup>

60. On July 28, 2006 Golder submitted a proposal to Philips, the Contract Administrator, outlining its “scope of work pertaining to the requested laboratory and field testing inspection services for the mainline paving” of the RHVP.<sup>85</sup> It stated, in part:

We understand that Golder will perform the required testing and evaluation of the asphalt mixes for all stages of the paving process. The following is a breakdown of the stages and the testing and inspection services required for each stage:

Prior to the start of asphalt paving

- Material and mixture pre-qualification testing and document review

During mainline asphalt paving

- Monitoring of contractors paving operation
- Sampling of asphalt materials
- Compaction testing of placed asphalt mat (nuclear densometer)
- Sampling of asphalt core samples for compaction testing
- Laboratory testing of asphalt, asphalt cement and aggregate samples
- Smoothness testing of surface course lift
- Review of field and laboratory test results to determine compliance with project specifications
- Attending site meetings as required
- Summary reports<sup>86</sup>

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<sup>84</sup> [HAM0007760\\_0001](#) at image 3

<sup>85</sup> [GOL0000396](#). This revised an earlier version dated July 12, 2006 at [GOL0000397](#)

<sup>86</sup> [GOL0000396](#) at image 2

***I. Pavement Sustainability Plan for RHVP and LINC***

61. On September 21, 2006, Agnieszka Bevan (Project Manager, Infrastructure Management & Pavement Engineering, Stantec) emailed Richard Andoga (Senior Project Manager, Infrastructure Programming, Asset Management, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works, Hamilton) “the draft version of the pavement portion” of the “Pavement Sustainability Plan” for the RHVP and LINC.<sup>87</sup> The draft stated:

Pavement Safety 2.1.1

Pavement surface condition and skid resistance contribute to the safety characteristics of the pavement section. Wet surface accidents may occur because of the lack of skid resistance (low friction) or because of the existence of some safety related distresses, such as rutting.

Pavement safety is usually evaluated in terms of the ability of the pavement surface to provide adequate skid resistance, or surface friction, to minimize the possibility of slipperiness of the vehicles. Although pavement safety is primarily evaluated in term of skid resistance, other components such as rutting and roughness should be considered in the overall framework of safety.

Pavement skid resistance measurements are typically empirical. Therefore, results from any given procedure or devise to evaluate the skid resistance of the pavement has to be interpreted in terms of the standard testing methods.

Pavement skid resistance would typically deteriorate over time due to pavement surface weathering. Therefore, since skid resistance constitutes a safety concern, it is recommended that pavement skid resistance be evaluated on regular basis to identify areas of potential hazard, such that remedial measures to improve the skid conditions of the pavement surface could be implemented.

.....

Skid Resistance 2.2.1

The main purpose of the skid resistance testing is to identify the areas with low skid resistance that may affect public safety. It is recommended to perform skid resistance testing every 1 - 2 years.

ASTM E274 is the most widely used method for measuring the skid resistance, using a calibrated locked-wheel skid trailer. Based on the current market prices, the estimate for

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<sup>87</sup> [HAM0037750\\_0001](#) attaching [HAM0037751\\_0001](#)

the probable cost for performing a skid resistance testing along the LINC and the RHVP is approximately \$5,000.<sup>88</sup>

62. These recommendations respecting skid resistance testing were included in the final Hamilton “Lincoln Alexander Parkway and Red Hill Valley Project Sustainability Plan” dated October 11, 2007, which recommended that skid resistance testing should take place every two years and that there should be a surface condition survey every year.<sup>89</sup>

***J. RHVP pre-paving asphalt mix and aggregate selection and approval***

63. On December 12, 2006, RHVP paving construction meeting #4 took place. The minutes stated: "Dufferin has yet to submit their asphalt mix designs to Golder for review. Dufferin has questions regarding the asphalt specifications and was asked to forward a letter to Golder summarizing their concerns."<sup>90</sup> Also on December 12, 2006, Dufferin wrote to Philips with numerous questions respecting clarification about the Rich Bottom Mix (“RBM”) specifications and instructions in the paving contract.<sup>91</sup>

64. On January 16, 2007, Nicholas Dietrich (Project Engineer, Dufferin) wrote to Walter Maranzan (Contract Administrator, Philips) stating:

Dufferin Construction Company (DCC) is still awaiting your response to our letter dated December 12, 2006 regarding clarification to the asphaltic concrete mix designs for the above noted project. At this time, all mix design activities and submissions are on hold pending a response to the items we require clarified.

DCC wishes to advise that subsequent delays in clarifying the outstanding items indicated in our initial letter will result in delays in our ability to provide the owner with the required mix designs for review as required by the contract. These delays may also significantly impact our anticipated construction schedule with regards to asphalt placement.

<sup>88</sup> [HAM0037751\\_0001](#) at images 4,6 attached to [HAM0037750\\_0001](#)

<sup>89</sup> [HAM0000320\\_0001](#) at image 31 and Attachment A images 99 and 101

<sup>90</sup> [HAM0007828\\_0001](#) at image 1

<sup>91</sup> [GOL0001809](#)

At this time DCC is awaiting your response, Please do not hesitate to contact the undersigned should you require any additional information regarding this issue.<sup>92</sup>

65. On January 18, 2007, Mr. Dietrich wrote to Mr. Maranzan attaching a letter from Trow (Dufferin's asphalt mix design consultant) regarding concerns with "rutting resistance requirements as it relates to the Rich Bottom Mix (RBM)" asphalt.<sup>93</sup> On the same day, January 18, 2007, J. Wade O'Leary (Manager, Asphalt, Dufferin) forwarded Dufferin's December 12, 2006, letter to Phillips to Dr. Uzarowski.<sup>94</sup>

66. On March 20, 2007:

(a) RHVP paving construction meeting #5 took place. The minutes stated:

Dufferin expects to have some of the mix design submissions ready today for Golders review. The outstanding mix designs should be ready for submission by the end of next week.

Dufferin has hired Trow as their Asphalt Consultant for the Mainline Paving Contract.

Trow indicated there had been some problems achieving the Rich Bottom Mix's endurance test. The material had been falling well short of the design specification.

Golder said they would look into the information being submitted, but that this design of asphalt was intended specifically to provide excellent fatigue resistance.<sup>95</sup>

(b) Vincent Gangaram (Laboratory Supervisor, Dufferin) wrote to Mr. Maranzan stating:

Reference: Approval of DEMIX-Varannes Trap Rock Aggregate

Dear Mr. Maranzan,

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<sup>92</sup> [DUF0001997.01](#)

<sup>93</sup> [DUF0001995.01](#) attaching [DUF0001996.01](#)

<sup>94</sup> [GOL0001808](#) attaching [GOL0001809](#)

<sup>95</sup> [HAM0007868\\_0001](#) at image 2

Dufferin Construction is seeking approval to use an externally sourced crushed trap-rock in the Superpave 12.5 FC2 and SMA Mixes. The source is DEMIX Varennes' Quarry located in Quebec and not currently listed on the Ministry of Transportation Ontario's Designated Sources List —DSM.

This aggregate is used as a reference aggregate by the Ministry of Transportation Quebec for the CPP Test - Skid Resistance and on several asphalt paving projects including Picardy Street in Varennes.

Please find attached physical test data submitted by DEMIX. Your prompt response will be highly appreciated to ensure a timely completion of aforementioned mix designs.<sup>96</sup>

- (c) Mr. Maranzan then faxed the March 20, 2007 Dufferin letter to Dr. Uzarowski, stating: "Please find attached a copy of: Approval to use DEMIX-Varennes trap rock aggregate for the Superpave and SMA mixes."<sup>97</sup>
- (d) Dr. Uzarowski wrote on the March 20 fax from Mr. Maranzan attaching the Dufferin letter and test results (handwriting reproduced in part):

Mike,

What is the required frequency of testing? Some of the test results are pretty old.

Is Demix certified to carry out the testing? I understand that this is the manufacturer.<sup>98 99</sup>

67. On March 23, 2007, Golder (Dr. Uzarowski and Michael Navarra (Materials Engineer-in-Training, Golder)) sent a memo to Philips (Mr. Maranzan) and Hamilton (Mr. Oddi) regarding review of aggregate physical properties for use in Superpave 12.5 FC2 and SMA mixes, stating:

<sup>96</sup> [GOL0004872](#), attaching [GOL0004873](#), [GOL0004874](#), [GOL0004875](#), [GOL0004876](#)

<sup>97</sup> [GOL0004871](#) attaching [GOL0004872](#), [GOL0004873](#), [GOL0004874](#), [GOL0004875](#), [GOL0004876](#)

<sup>98</sup> [GOL0004877](#) attaching [GOL0004878](#), [GOL0004879](#), [GOL0004880](#), [GOL0004881](#), [GOL0004882](#).

<sup>99</sup> In addition to Dr. Uzarowski's handwritten notes actually quoted from in Overview Document #3, other handwritten notes by him documenting his activities with respect to the RHVP paving in 2007 are found at [GOL0001597](#) at images and [GOL0007410](#) at images 3 and 16

As requested, Golder Associates Ltd. has carried out a review of the trap rock aggregates physical properties from DEMIX Varennes' Quarry submitted by Dufferin Construction on March 20, 2007.

The contractor would like to use these aggregates in the Superpave 12.5 FC2 and SMA mixes for the paving of the Red Hill Valley Project (RHVP). As the aggregate source is not listed on the MTO's Designated Source Material (DSM) list, the above aggregates to be approved for use in the RHVP must meet the aggregate requirements specified in the OPSS standards, including method of testing and specifications.

The submitted aggregate physical properties were compared with the OPSS 1003 (November 2004) specification. Our comments are as follows:

- In Accordance to section 1003.07.02.02, the laboratories conducting the aggregate physical property and consensus testing must hold valid CCIL Type D certification. Additionally, in order to conduct the required gradation and materials finer than 75 µm by washing testing, the laboratory must also have a valid CCIL Type C certification. The testing laboratory should also be a participant of the Annual MTO Proficiency Sample
- The aggregate physical test data must be no older the 14 months at the time of submission. The test data for the petrographic analysis of the crushed trap rock – 5-14 mm classified is dated May 27, 2005. More recent test data is required to be submitted.
- In order for the coarse and fine aggregate to be considered for the use in SP 12.5 FC2 and SMA mixes, on the RHVP project, all properties specified in OPS 1003 should be tested and the requirements should be met. This should include the percentage of flat and elongated particles, be tested in accordance with LS 608 (or ASTM 4791), that at a ratio of 5:1 should not exceed 15%.
- The contractor must submit the required quality control chart records for the aggregate physical properties specified in OPS 1003, and describe the method(s) used to monitor the quality of the aggregate.

Based on our review, the aggregates from DEMIX Varennes' Quarry are currently not considered acceptable for use on this project.<sup>100</sup>

68. Also on March 23, 2007, Golder (Dr. Uzarowski & Mr. Navarra) wrote to Philips (Mr. Maranzan) stating that the mix designs Golder received from Dufferin on March 22, 2007, for Superpave 19, 25, and 19 RBM asphalt mixtures, did not include documentation

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<sup>100</sup> [GOL0000248](#)

required according to the project specifications and mix property verification will not be carried out until a complete package for each individual mix is submitted.<sup>101</sup>

69. Dr. Uzarowski's notes of a meeting with Mr. Moore on March 26, 2007, stated:

- 1 Meeting with Gary Moore
  - resurfacing project
  - fatigue testing
  - warm asphalt
  - additional budget <sup>102</sup>

70. On March 27 and 28, 2007, Dr. Uzarowski consulted Prof. Carl Monismith (Professor, Transportation Engineering, Department of Civil and Environmental Engineering, University of California, Berkeley) and Prof. John Harvey (Professor, Department of Civil and Environmental Engineering, University of California, Davis) as well as Jim Martin (President/Executive Director, Asphalt Pavement Association of California), in relation to enhancing fatigue endurance in pavement design through the use of Rich Bottom Mix ("RBM") and the requirements for the RBM mix.<sup>103</sup> Dr. Uzarowski's notes on March 27 and 28 state:

[March 27]

- 6) Dufferin Construction (905) 961-2228  
 Wade O'Leary (905) 971-4308  
 Paul Janicas            Andy?

- 1) Mike
- 2) Gary – repeat, RHVP – Tom Kaz, budget Section 17 Upper Wentworth

Technical Memorandum  
 Carl Monismith  
 510-665-3560 <sup>104</sup>

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<sup>101</sup> [GOL0004868](#)

<sup>102</sup> [GOL0007397](#) at image 12

<sup>103</sup> [GOL0002610](#), [GOL0002611](#) attaching [GOL0002612](#), [GOL0002613](#)

<sup>104</sup> [GOL0007397](#) at images 14-15

[March 28]

- 1) RHVP – fatigue testing  
- talked to Marco <sup>105</sup>

71. On March 29, 2007, Paul Janicas (Senior Quality Control Lab Supervisor, Dufferin) wrote to Mr. Maranzan respecting “SP 19.0 Rich Bottom Mix (RBM) Performance Testing”. Mr. Janicas advised that: “Upon completion of the fatigue endurance performance testing for this mix, Trow [Dufferin’s asphalt mix design consultant] has brought to our attention that the requirement of 7M cycles, tested between 250 - 750 micro strains, to failure is unachievable with the current contract requirements”, and requested that the SP 19.0 RBM mix design be approved for production.<sup>106</sup>

72. On April 5, 2007, Mr. Moore emailed Mr. Murray and Gerry Davis (Director, Capital Planning & Implementation, Public Works, Hamilton), stating:

The perpetual pavement design we have adopted for the north-south RHVP is leading edge pavement design. Although deep strength pavements have been around for several years, ( the DVP just passed 35 years without any rehab except resurfacing ) designing using predictable stain parameters and specialized pavement mixes is relatively new. They are being used around the world, including the US and Europe. ( Even China is using perpetual pavement design for their new highways ) . The MTO planned two for this year but they have been delayed. Ours will be the first in Ontario and one of the first in Canada. It is important that this pavement placement is documented and the performance monitored. It is important that the City is recognized as leader in sustainable technology, as noted in the paper we presented this year at the Canadian Technical Asphalt Association Conference and as per our new Departmental "Strat Plan".

Pavement basically fails either from the top down or the bottom up. Top down cracking can be prevented by the choice of mixes and material properties such as the hardness of the aggregate and type of asphalt cement. It can be remedied by simply shaving off the surface course mix and resurfacing. This is a relatively economical and simple restoration. Bottom up cracking is associated with pavement fatigue. This is not as simple to address. To prevent it, requires total attention to the entire depth of the pavement system and how it is assembled. The perpetual pavement design is based on reducing the strains on the lower levels of asphalt binder. It would be easy to simply place a "thick enough" pavement to reduce these strains, but that would not always be economical. The "technology and

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<sup>105</sup> [GOL0007397](#) at image 15

<sup>106</sup> [DUF0002118.01](#) attaching [DUF0002119.01](#)

engineering" is used to determine with some degree of accuracy, the thickness and the type of asphalt to used to get an economical pavement that will prevent the bottom up cracking.

The monitoring would consist of "weight-in-motion" sensors under both the north and southbound lanes as well as a set of strain gauges placed at various levels in the pavement system and a monitoring station. The strain gauges tell whether the pavement is reacting as designed. The "weight-in-motion" sensors count the vehicle and give the axle loading which allows us to track and relate the stress applied to the strain recorded. This is extremely important in the prediction of long term pavement performance and hence the asset management of the facility. But it is also important to other designers and potential users of a system of Perpetual Pavements.

The costs associated with this are 3 fold 1) hardware; 2) installation 3) monitoring. The weight-in-motion sensors are about \$100K for a set of 2. The Strain sensors are in the \$75K neighbourhood per set. Only one set is required ( either under the north or south bound lanes ). Monitoring and data analysis over a multi-year period could be \$30-40k initially and \$2-3K annually.

Golder are interested as they are the designers. The Ontario Hot Mix Producers Association have said they could consider funding in the neighbourhood of \$20,000. The University of Waterloo, through CPATT ( Centre for Pavement and Transportation Technology ) could match funding x2 if the contribution from Industry exceeded \$50,000.

The MTO has been approached through the industry side but has not shown an interest in contributing any cash. We have already set aside the money for the weight in motion sensors from our own accounts as this supports both Asset Management and Traffic section initiatives. So ideally we would be looking for the Strain sensor station costs and a portion of the analysis and monitoring costs. The being involved in and having authored the results of this study could be valuable from business promotion view for both the consultant and the industry. So we maybe able to squeeze that area a little harder. If we get into bed with the CPATT we may lose all leverage of information ownership. That leaves the reason for my memo.

Are we prepared to go it alone or do we want to raise this with MTO at our up coming meeting ? How do we get a contribution from MTO? and how much would being asking for?

Comments? Do we need to meet? <sup>107</sup>

73. On April 20, 2007, Trow issued Hot Mix Aggregate Test Data for SMA and SP12.5 FC2, sourced from Demix Varennes Quarry.<sup>108</sup>

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<sup>107</sup> [HAM0050948\\_0001](#)

<sup>108</sup> [DUF0002031.01](#) and [DUF0002035.01](#)

74. On April 23, 2007, Mr. Janicas emailed Dr. Uzarowski referring to following up on an April 13 meeting, and attaching a letter dated April 23, 2007, along with SMA and other asphalt aggregate test results by Trow for Dufferin.<sup>109</sup> The letter stated:

The proposed Surface course aggregates from Quebec (Demix) have been tested for physical properties in a CCIL certified laboratory. Attached are the results which conform to all the requirements of the contract. DCC requests that these aggregates be approved for use in the SMA and 12.5 FC2 mixes.

Dufferin also requests that the fine Aggregate used in both the SMA and 12.5 FC2 be obtained from different sources from the coarse aggregates.<sup>110</sup>

75. On April 30, 2007, Dr. Uzarowski replied by memo to Mr. Janicas' April 23, 2007 email.<sup>111</sup>

76. On April 30, 2007, Mr. Janicas wrote to Dr. Uzarowski about asphalt and aggregate issues and stated:

Please provide a response to our proposed plan and intended Aggregate sources for the SMA and 12.5 FC2 mixes at your earliest possible convenience as DCC needs to commence both of this mix designs.<sup>112</sup>

77. On April 30, 2007, Mr. Janicas emailed Dr. Uzarowski with respect to Dufferin's quality plan for physical testing of the Demix Aggregates for use on the RHVP.<sup>113</sup> He stated:

The asphalt cement content is 4.0% for the SP 25.0 R15.

In addition, I would like to add the following comments:

- As per our phone conversation Dufferin Construction (DCC) would like to clarify our Quality Plan for Physical Testing of the Demix Aggregates (proposed aggregate source

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<sup>109</sup> [GOL0001768](#) attaching [GOL0001769](#) and [GOL0001770](#)

<sup>110</sup> [GOL0001769](#)

<sup>111</sup> [GOL0000256](#)

<sup>112</sup> [GOL0002350](#)

<sup>113</sup> [DUF0001990.01](#) attaching [DUF0001991.01](#) and [DUF0001992.01](#)

from Varennes Quarry in Quebec). DCC intends to follow MTO's SP 110 F12 subsection 1003.07.01.02 Stockpile Method:

"Test data shall be obtained from samples taken from stockpiled material to be used in the Work. Each aggregate shall meet the appropriate physical property requirements of "the contract.

"One set of test results demonstrating conformance of the aggregates in stockpile with the physical property requirements of this special provision shall be completed for each quantity, or part thereof, of HMA produced according to the following schedule:

- for the first 20,000 tonnes of HMA produced;
- for the next 20,000 tonnes of HMA produced; and
- for each 40,000 tonnes of HMA produced thereafter.

This testing schedule is to be repeated whenever aggregate is produced from a new source or a new bench in a quarry, or whenever a significant change in production and/or aggregate occurs."

- Also, as requested, below is a list of proposed aggregates for both the SMA and 12.5 FC2:

- 1) Main Course Aggregate: 12.5 mm Stone - Demix Varennes Quarry
- 2) Secondary Coarse Aggregate (if required): Chips – Demix Varennes Quarry
- 3) Main Fine Aggregate: Modified Sand - Aecon Marmora Quarry
- 4) Screenings (if required): Blend Sand - Aecon Marmora Quarry

Attached are the historical physical test result for both the Modified and Blend sands from the Aecon Marmora Quarry (new samples are currently being tested). Physicals for the 12.5mm Stone and chips have already been submitted.

Please provide a response to our proposed plan and intended Aggregate sources for the SMA and 12.5 FC2 mixes at your earliest possible convenience as DCC needs to commence both of this mix designs.

78. On May 2, 2007, Mr. Janicas emailed Dr. Uzarowski stating:<sup>114</sup>

Dufferin Construction Company (DCC) would like to retract our request to Blend Premium sources for the SMA and the 12.5FC2.

DCC intends to use both the coarse and fine aggregate from the same source (Demix Varennes Quarry - Traprock). Our quality plan still applies as indicated on the e-mail sent April 30, 2007.

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<sup>114</sup> [GOL0001766](#)

Please advise if this aggregate is acceptable for both mixes as soon as possible as we need to begin our mix designs.

Also, please advise on the status of all other mix designs.

79. On May 7, 2007, Mr. Janicas wrote to Mr. Maranzan stating:

After reviewing Golder Associates correspondence from April 30, 2007, Dufferin Construction Company (DCC) would like to reiterate the points discussed on the meeting called on April 13, 2007.

DCC understood the following:

1. Under current contract specifications, an SP 19.0 Rich Bottom Mix (RBM) could not produced, which would achieve the 7 million cycles for fatigue endurance testing.
2. To enhance the fatigue properties, the Performance Grade Asphalt Cement (PGAC) would be upgraded from 64-28 to 70-28 (the contractor was instructed to depart from the prescribed method).
3. A price difference per tonne of Asphalt Cement (AC), between the 64-28 and the 70-28, would be submitted and evaluated by the City for approval following the completion of the new design.
4. At Golder's request, the approximate amount of polymer in the 70-28 would be identified.
5. In an effort to save time, the upgraded RBM with PGAC 70-28 would be adjusted appropriately to compensate for airvoids, and then tested for fatigue endurance only. It was understood that it would not be tested for dynamic modulus or rut resistance. Also, the original SP 19.0 (virgin mix which the RBM is based on) with the 64-28 would not be retested.
6. When the fatigue endurance testing was completed and submitted for the RBM with the 70-28, the City of Hamilton was to evaluate and compare the performance of the two RBM mixes (70-28 vs 64-28) and advise on which grade of AC was to be used.

Should the City of Hamilton have a different understanding of what was discussed and agreed too, please advise.<sup>115</sup>

80. The minutes of the May 8, 2007, RHVP paving construction meeting No.7 set out agreements on numerous paving issues, including:

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<sup>115</sup> [DUF0001982.01](#)

a) The physical properties of the Quebec Trap Rock are all acceptable. Dufferin is to test the physical properties for all granulars in the SMA and FC2 every 5000 tonnes. Dufferin will carry out trials to determine the best rock chip size for the asphalt mix design and will report which will be used. <sup>116</sup>

81. On May 8, 2007 Dr. Uzarowski wrote to Mr. Janicas, Mr. Oddi, and Mr. Maranzan, with mix design verification results. <sup>117</sup> He stated:

Please find attached the results of the Superpave 19.0 – 15% RAP and Superpave 25.0 – 15% RAP mix design verification. The aggregates meet the specified requirements. Both Superpave mixes do not meet the volumetric requirements and are not acceptable.

82. On May 9, 2007, Mr. O’Leary emailed Dr. Uzarowski, Philips, Mr. Oddi, and Mr. Janicas (as well as other Dufferin representatives), stating:

This is a brief e-mail to notify all stakeholders, and as a follow-up to yesterday’s meeting, that the fatigue endurance for the Rich Bottom Mix (RBM) will not be complete for another four to six weeks. In advance Dave Hainer has spoken with Marco at the City of Hamilton, and it was agreed that Dufferin Construction Company (DCC) may proceed with our current schedule (using the RBM with the PGAC 70-28), with the results of the trial to follow for information purposes. Further regarding the up-grade in performance grade asphalt cement (PGAC), it was agreed during the above mentioned conversation that DCC will use the PGAC 70-28 at an increased cost to the City.

In addition to the above, it is DCC’s understanding following yesterday’s meetings that all mix designs submitted to date satisfy the contract requirements and are approved for use on this project. <sup>118</sup>

83. On May 11, 2007, Dr. Uzarowski responded and disagreed with Mr. O’Leary’s assertion that Hamilton had accepted the mix designs, stating:

Your understanding that all Superpave mix designs submitted to date met the specified requirements are accepted is incorrect. As it was clearly stated in the meeting and in an email dated May 08/2007, the Superpave 19 - 15 % RAP and Superpave 25 - 15 % RAP mixes did not meet the volumetric requirements. There was a large difference in the mix air voids (due to different maximum and bulk densities) and automatically the VFA’s were too high. It was agreed that Golder and Trow will run a correlation, but as of today, the

<sup>116</sup> [HAM0007883\\_0001](#) at image 2

<sup>117</sup> [GOL0001868](#) with attached test results at [GOL0001869](#) and [GOL0001870](#)

<sup>118</sup> [GOL0002370](#)

mixes are not accepted. You can reach me on my cell (the number is given below) today to discuss it.<sup>119</sup>

84. On May 11, 2007, Mr. O'Leary responded and reiterated his view that the mix designs satisfied the contract requirements:

Again, it is DCC's understanding following Tuesday's meeting that all mix designs submitted to date satisfy the contract requirements. Furthermore given that this project is an end result specification, it was understood that the contractor could proceed with caution and as such Golder's concerns were identified.

Regarding the inter-laboratory correlations, it was our understanding that the purpose of this activity was to identify the root cause of the anomaly as DCC was confident with Trow's results. Specifically, historical records indicate that the sources identified in our mixes are reflective of the densities reported by Trow.

Wednesday May 9th DCC delivered specimens for comparative testing, please update on the status of your testing.<sup>120</sup>

85. On May 17, 2007, David Hainer (Site Superintendent, Dufferin) wrote to Mr. Oddi, stating:

Re: Warranty on Asphalt on "Part A" of City of Hamilton Contract # PW-06-243 (RHV)

DUFFERIN JOB NO. 9115 CONTRACT NO. PW-06-243 (RHV)

Marco,

As stated previously, Dufferin Construction Company (DCC) cannot warranty any of the asphalt placed which was constructed on material placed by others. This is due to unknown quality of granular placed prior to DCC commencing work on this contract. The location which will not be the responsibility of DCC can generally be defined as the area just South of Greenhill Structure to the South limits of the contract. Should you require any additional information regarding this issue, please do not hesitate to contact the undersigned.<sup>121</sup>

86. On May 22, 2007, Dr. Uzarowski wrote to Philips, Mr. Oddi, and Mr. Janicas (and others at Dufferin), stating:

Please find attached the asphalt mix verification results of the SP 19, Category E and SP 19 RBM mixes. The SP 19, Category E mix meets the specified requirements and the SP

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<sup>119</sup> [DUF0001979.01](#)

<sup>120</sup> [DUF0001979.01](#)

<sup>121</sup> [DUF0001932.01](#)

19 RBM mix meets the air voids requirements. The mix design for the SP 19 RBM mix is acceptable.

Please note that, as stated in our email dated May 8, 2007, the SP 19 – 15% RAP and SP 25 – 15% RAP mixes did not meet the volumetric requirements and their mix designs are not accepted.<sup>122</sup>

**K. RHVP paving, testing, and further mix and aggregate selection & approval**

87. Dr. Uzarowski's notes dated May 28, 2007, stated:

1) RHVP paving

4 samples for extraction  
 SP25 1 - plant mix  
 SP19 RBM3 – 2 test strip  
 1 pl

RBM test strip

- Mix design – accepted
- Field densities – low – edge, compaction to be improved, use mix design MRD
- Air voids – borderline
- ac content – borderline
- SP 25 – volumetrics are OK

Marco

Letter to DCC.<sup>123</sup>

88. On May 29, 2007, Dufferin commenced paving, starting with Rich Bottom Mix Base Course Asphalt and Superpave 25.0 Binder Course.<sup>124</sup>

89. On May 31, 2007, Mr. Janicas emailed Dr. Uzarowski and Mr. Oddi, respecting “SP19.0 RBM – Compaction”, stating:

Ludomir,

Attached are the compaction results for the cores taken on May 30, 2007 representing the May 29, 2007 paving of the SP 19.0 RBM.

<sup>122</sup> [GOL0003160](#) attaching [GOL0003161](#), [GOL0003162](#)

<sup>123</sup> [GOL0007397](#) at image 37-38

<sup>124</sup> [HAM0007895\\_0001](#) at image 2

Also, a comparison between the actual lab compaction versus our nuclear densometer readings is included in this summary.

Please note that the average compaction for the main line paving at the center of the lane is 96.0% (actual compaction), and the edge lane compaction average (unconfined edges) is 94.2%.

We discovered that the BRD offset for our nuclear densometer is +0.007 and the average Maximum Relative Density (MRD) for the Days production (5 plant samples and 6 cores) is 2.519.

As discussed in the field on May 23, 2007 (day of the RBM test strip) we concluded that taking the average MRD for the days production provides a more accurate compaction result.

Dufferin Construction Company (DCC) expects that Golders will use the days average production MRD when calculating the field compaction.

Also, an offset for the field density readings (Bulk Relative Densities) should be applied if there is a large discrepancy between Golders nuclear densometer readings versus the actual Bulk Relative Densities from the compaction cores tested in Golders laboratory.

DCC would like to stress that the compaction achieved on May 29, 2007 for the SP 19.0 RBM is what will typically be seen day to day.

As noted on several occasions the requirement of 97% minimum field compaction will be very difficult to achieve.

Therefore, DCC requires that any concerns regarding these typical compaction results be identified immediately.

Also, as identified on our May 8, 2007 site meeting, DCC discovered that the cores had some fractures in the coarse aggregate (damage) at the lower compaction results.<sup>125</sup>

90. Dr. Uzarowski's notes on June 4, 2007 indicated:

- 5) site inspection on RHVP project
  - did not allow paving against the bridge at a 28+500 – granular base was moving – talked to Water, Peter, Joe, James and Dave
  - asked Joe DCC to apply proper tack to the joint – it was too light
  - Andro to inspect the site ready for paving before DCC starts
  - discussed check cracking in SP25 mat with Paul Janicas – he suggested SP25 mix JMF adjustment (+3% 19 mm stone -3% sand); indicated this to Marco Oddi – we will meet tomorrow morning to discuss. Andro to take cores.<sup>126</sup>

<sup>125</sup> [DUF0001974.01](#) attaching [DUF0001975.01](#)

<sup>126</sup> [GOL0007410](#) at image 3

91. On June 4, 2007, the Public Works Committee thanked Mr. Murray for his contributions in the Public Works Department and wished him well in his new role as Director of Housing.<sup>127</sup> The Committee's Report 07-009 stated:

(ii) Recognition of Chris Murray, Acting Director, Red Hill Valley Project

The Committee recognized and thanked Chris Murray, Acting Director of the Red Hill Valley Project, for all of his efforts and contributions during his career in the Public Works Department, and wished him well in his new duties as Director of Housing for the Community Services Department.

92. On June 5, 2007, Mr. Murray sent an RHVP Information Update to the Mayor and City Council.<sup>128</sup> Mr. Murray provided an update on the status of the paving of the RHVP and explained that the project involved perpetual pavement:

Paving – In late May, paving work on the mainline of the Parkway commenced. Currently, this work is being carried out on the southbound lanes. The interesting fact about the paving work is that it involves using perpetual pavement, which Hamilton is the first municipality in Canada to use. Perpetual pavement is a richer, stronger asphalt mix that is designed to last indefinitely and eliminates bottom up cracking problems that would require a total reconstruction of a road bed experienced in other parts of the City. Perpetual pavement can withstand traffic loads of up to 100,000 vehicles per day, only costs less than 1% of the total Red Hill budget, and is expected to save the City \$1.6 million in maintenance costs over the next 50 years. As well, the surface asphalt will be a Stone Mastic Asphalt that will improve skid resistance and lower noise generation. The paving work is expected to continue over the summer and early fall months, with completion to occur before the opening in November.

93. The June 12, 2007 minutes of paving construction meeting No.8 recorded discussions regarding mix designs, material testing, and paving progress, among other things:

a) Mix Designs

Golder has approved Dufferin's RBM and SP 25.0 asphalt mix designs.

Golder verbally approved Dufferin's SP 19.0 asphalt mix design. Written approval is forthcoming.

Golder has not approved Dufferin's HL8 asphalt mix design.

<sup>127</sup> [HAM0038088\\_0001](#) at image 4

<sup>128</sup> [HAM0032478\\_0001](#)

## b) Material Testing

Golder indicated the RBM mix was performing satisfactorily despite compaction results that were below specifications.

Golder is pleased with the performance of the “tweaked” SP 25.0 as surface cracking is no longer occurring.

The City and Golder are pleased with Dufferin’s effort to improve the asphalt field results.

## c) Progress

Since Dufferin began paving on May 29, they have managed to place the following tonnages of asphalt:

- Rich Bottom Mix Base Course Asphalt – 19,360 tonnes
- Superpave 25.0 Binder Course – 11,074 tonnes <sup>129</sup>

94. A June 13, 2007, City slide deck titled ‘Red Hill Valley Project “More Than A Road”’, stated:

## PAVING

- Commenced in late May.
- Currently on southbound lanes.
- Use of perpetual pavement, first municipality in Canada.
- Richer, stronger asphalt mix eliminates bottom up cracking problems.
- Perpetual pavement can withstand traffic loads of up to 100,000 vehicles per day.
- Surface asphalt will be a Stone Mastic Asphalt
- SMA improves skid resistance and lower noise generation<sup>130</sup>

95. In Summer 2007, the OHMPA published its “Asphaltopics” magazine, which contained an article titled: “Perpetual Pavements: Twenty Years in the Making.” This article provided information on the RHVP, an overview of Mr. Moore's involvement with the RHVP project, and discussed the change from the original pavement design to a perpetual pavement design with SMA. The author of the article is not identified in the

<sup>129</sup> [HAM0007895\\_0001](#) at image 2

<sup>130</sup> [HAM0032482\\_0001](#) at image 8. There is no attribution as to the source of the information in this slide deck or to whom or if it was presented. This is one of more than 100 slide decks in the Inquiry database with the Relativity “Author” field populated as “JAN Kelley Marketing”, the “Custodian” as “City File Share”, and the “Date Created” being 10/15/2002.

published version.<sup>131</sup> Dr. Uzarowski reviewed the paper before publication and provided a comment to Mr. Moore on June 14, 2007.<sup>132</sup> The article opened with the following:

It was with mixed emotions that Gary Moore watched the paving crews start working on The Red Hill Valley Expressway in June. As Moore said: "I have been working on this project since May 1988 and twenty years is long enough on any project."

But there is a bright side. The perpetual project is being built with, appropriately enough a perpetual pavement - the first of its kind in Ontario.

96. On June 19, 2007, Dr. Uzarowski emailed a draft Golder proposal draft respecting instrumentation and data collection on the RHVP pavement to Mr. Moore.<sup>133</sup> On June 20, 2007, Mr. Moore approved the Golder proposal and authorized Dr. Uzarowski to proceed immediately as "The Contractor will be placing material in the northbound lanes through the proposed site by early July."<sup>134</sup>

97. On June 22, 2007, Mr. Janicas emailed to Dr. Uzarowski the Superpave 12.5 SMA mix design for the RHVP asphalt surface course.<sup>135</sup> The mix design included aggregates from the Demix Varennes Quarry in Quebec. Mr. Janicas stated in his email:

Attached is the SMA mix design with following materials:

12.5mm stone : Demix Varennes Quarry

Screenings: Demix Varennes Quarry

Filler: EC King Dolomite

PGAC 70-28: Bitumar

Cellulose Fiber: Hi- Tech Asphalt Solutions

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<sup>131</sup> [HAM0021277\\_0001](#)

<sup>132</sup> [GOL0003373](#) attaching [GOL0003374](#); [GOL0003372](#); [GOL0002933](#)

<sup>133</sup> [GOL0003759](#) attaching [GOL0003760](#), [GOL0003761](#), [GOL0003762](#), [GOL0003763](#)

<sup>134</sup> [GOL0002433](#)

<sup>135</sup> [GOL0001630](#) attaching [GOL0001631](#)

These materials have already been delivered to your laboratory in Whitby.

Please note, that the mix design does not include the Dynamic Modulus testing. This testing will be completed within the next few weeks.

As there is no specification limits for this testing, Dufferin Construction Company (DCC) expects that a review of this mix design will commence as soon as possible.

Please notify us immediately if there are any issues as any delays in the approval of this mix will impact the project schedule.

Also, if a plant sample is required for the approval, please advise us.

98. On June 28, 2007, Mr. Janicas emailed Dr. Uzarowski the SMA dynamic modulus test results for the SMA and asked him to “please advise on the status of your mix design approvals for the SMA and the three Marshall mixes submitted.”<sup>136</sup>

99. Dufferin’s Superpave 12.5 FC2 mix design was dated June 28, 2007, and also included aggregates from the Demix Varennes Quarry in Quebec.<sup>137</sup>

100. The July 10, 2007, RHVP Site Meeting No.9 paving construction minutes indicated that the participants addressed the outstanding mix design approvals, the status of material testing, and the progress of paving:

## **2. Asphalt Issues**

### **a) Outstanding Mix Designs Approvals**

Golder indicated that after only a quick glance the SMA mix design appears to be satisfactory. Golder will provide written confirmation of their analysis.

Dufferin would like to pave a SMA test strip either late this week or early next week if possible.

Golder will provide Dufferin with the SMA test results no later than Thursday afternoon and would like to be present for the test strip paving.

Dufferin indicated they would prefer to pave the SMA test strip at Mud Interchange E-N Ramp. Also, Dufferin suggested that the 40 mm SMA test strip be longer than the RBM test strip.

Golder is currently carrying out testing of the FC2 mix designs.

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<sup>136</sup> [GOL0001624](#) attaching [GOL0001625](#)

<sup>137</sup> [DUF0002385.01](#)

**b) Material Testing**

Golder requested that Dufferin produce a trial batch of SMA for the field labs to work out testing correlation differences.

Golder indicated the vibratory roller currently being used by Dufferin is likely too heavy for SP19.0 and SMA pavement layers.

**c) Progress**

Since Dufferin began paving on May 29, they have managed to place the following tonnages of asphalt:

- Rich Bottom Mix Base Course Asphalt – 30,945 tonnes
- Superpave 25.0 Binder Course – 24,810 tonnes
- Superpave 19.0 Binder Course – 17,180 tonnes

Dufferin anticipates Monday, July 30<sup>th</sup> to be the date SMA paving commences.<sup>138</sup>

101. On July 17, 2007, Mr. Janicas emailed Dr. Uzarowski and Mr. Oddi about ignition oven test results, physical property testing on the aggregates delivered, and “microdeval” test results:

As per our conversation today, below is a detail of the current status of the SMA.

A concern was expressed over the percent breakdown discovered during the ignition oven testing (@30%). Dufferin Construction Company (DCC) understands that is not what is typically seen. However, it is not a requirement of the contract, that these aggregates meet a specific maximum loss during the ignition oven testing.

We have procured samples for physical property testing to determine the suitability of the aggregates delivered. DCC will share these results with Golders to help evaluate the aggregates.

Also, aggregates are currently being tested at Golders for microdeval. Please forward these results as soon as they become available.

It is DCC's understanding that if the aggregates continue to meet the physical requirements of Contract that the SMA mix design will be approved for production on the City of Hamilton project PW-06-243.

In addition, please provide us with the status of the Marshall designs and the SP 12.5 FC2.<sup>139</sup>

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<sup>138</sup> [GOL0001617](#) at images 2-3. Dr. Uzarowski's notes from the meeting, incorrectly dated July 9, are at [GOL0007410](#) at image 12

<sup>139</sup> [DUF0001966.01](#)

102. On July 18, 2007, Mr. Janicas wrote to Dr. Uzarowski to provide the physical test results for the aggregates:

Attached are physical property test results from Construction Testing Asphalt Lab Ltd for the Demix Aggregates. All attributes were tested except for the Freeze Thaw and Petrographic which are still pending.

It is our understanding that the Micro-Deval was the attribute in question due to the breakdown discovered in the Ignition Oven Testing.

The results indicate that the materials delivered from the Demix quarry meet the requirements of the Micro-Deval Abrasion Loss.

With the above mentioned results meeting the contract requirements, are the SMA and 12.5FC2 Mixes approved for production on the City of Hamilton PW-06-243 Contract?

If, after reviewing these results, there is still a question of the suitability of the aggregates please advise Dufferin Construction Company immediately and a meeting with all the stakeholders involved will be convened at the earliest possible opportunity.<sup>140</sup>

103. On the same day, July 18, 2007, Dr. Uzarowski forwarded Mr. Janicas' email internally at Golder to Andro Delos Reyes (Senior Pavement & Materials Geotechnical Technologist, Golder) and John Watkins (Associate, Laboratory Supervisor, Ontario Region Laboratory Group, Golder) asking for comment, and Mr. Delos Reyes replied:<sup>141</sup>

The micro-deval test result is way below the max required.

I would not be surprised if the freeze-thaw would indicate the same, the Pet number is a different story.

From these numbers, the material seems to be acceptable for use. As I mentioned before, only when the aggregate is subjected to high temp (400C and up) and that's when the material starts to breakdown.

Will the pavement experience this high temp, I guess not.

104. Dr. Uzarowski's notes on July 18, 2007 stated:

2) RHVP 4 hrs

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<sup>140</sup> [GOL0001763](#) attaching [GOL0001764](#)

<sup>141</sup> [GOL0001753](#)

## 6) instrumentation

Tom 847 910 3785 cell  
Whiman 847 972 3280 desk

Daniel Fleury – Quebec DOT

Very good aggregates – used in HMA, one of the best aggregates.

High volume < 15% MD  
< 35 LA <sup>142</sup>

105. On July 23, 2007:

- (a) Mr. Hainer emailed Philips and Mr. Oddi regarding concerns expressed about use of Demix Aggregates in the SMA and FC2 surface courses, and laying down an SMA test strip, stating:

Subject SMA-Aggregate Concerns

Walter,

Please see the attached correspondance regarding the concerns of the aggregate which are to be used in the FC2 and SMA surface course mixes.

As you are aware we still have the test strip for the SMA scheduled for this upcoming Wednesday and trust that the documents below will satisfy the concerns verbally identified.

Should there still be concerns on this matter after reviewing this information please call me at your earliest convenience so we can arrange a meeting to resolve this matter. <sup>143</sup>

- (b) Mr. Delos Reyes emailed Dr. Uzarowski internally at Golder on those issues, stating:

Just to remind you, trial strip (SMA) this coming wednesday.

Also if you are going to issue written approval (with reservation) for the SMA mix design, please include the SP19 mix design (we've already given the verbal approval during the regular monthly meetings), just to confirm it in writing. <sup>144</sup>

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<sup>142</sup> [GOL0007410](#) at image 17

<sup>143</sup> [DUF0001965.01](#); Although the email states that correspondance is attached, and the image indicates four attachments, there are no attachments to this document.

<sup>144</sup> [GOL0001750](#)

- (c) Mr. Janicas emailed Philips and Mr. Oddi regarding prior use of Demix Aggregates by the Quebec Ministry of Transportation, stating:

In addition to the information submitted this morning, below are examples of Ministry of Transportation of Quebec contracts where the Varennes Quarry Traprock were used in an asphalt surface pavement.

- 1) 2004- Highway 132 (De Montbrun)
- 2) 1995-1999 -Highway 30 - resurfacing, 10,000 - 20,000 te/yr using the EB10S mix design.
- 3) 2003 - 5330-03-0616 - Monte de Picardie

Please do not hesitate to contact us if you have any questions. <sup>145</sup>

106. On July 24, 2007, Mr. Janicas emailed Philips and Mr. Oddi attaching further Demix Aggregates test results for use in the SMA and FC2 surface courses, stating:

Subject Varennes Demix Aggregates - SMA & 12.5 FC2

Gentlemen,

Construction Testing Asphalt Lab Ltd. has completed the remaining physical testing (freeze thaw and petrographic analysis) for the delivered aggregates from the Varennes quarry (Demix).

The test results show that the aggregates continue to meet the specified physical requirements.

The results are attached for you review.

Please note, that these results will represent the first 5,000 te of hot mix produced (SMA & 12.5 FC2) with these aggregates as per Golder's email dated May 8, 2007. <sup>146</sup>

107. On July 25, 2007, Dufferin placed an SMA test strip.<sup>147</sup> Dr. Uzarowski's notes from that date state:

- 1) RHVP

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<sup>145</sup> [DUF0001964.01](#)

<sup>146</sup> [DUF0001959.01](#) attaching [DUF0001960.01](#), [DUF0001961.01](#), [DUF0001962.01](#), [DUF0001983.01](#)

<sup>147</sup> [GOL0001750](#) and [GOL0001736](#)

- SMA test strip
- invoices
- aggregate for SMA & SP12.5 FC2 <sup>148</sup>

108. On July 26, 2007, Mr. Delos Reyes emailed Dr. Uzarowski attaching photos of the RHVP SMA cores from the SMA test strip placed on July 25, stating: "Thickness is thinner than required. There seems to be some sort of aggregate breakdown."<sup>149</sup>

109. On July 27 2007, Mr. Delos Reyes emailed Dr. Uzarowski attaching the RHVP SMA test strip results laid July 25, stating: "Air voids is low, DCC got 6.22 on their AC but seems to be higher on AV( 3.1), which does not jibe with their test result on trial plant mix."<sup>150</sup> On the same day, Dr. Uzarowski met on site with Dufferin and Hamilton to inspect the SMA test strip. Dr. Uzarowski's notes respecting the July 27, 2007 site meeting indicated:

- 2) RHVP
  - SMA test strip (completed on Wednesday) has failed
  - Visit to Hamilton
- 4) Meeting on site:
  - Inspecting SMA test strip
  - Checking SMA results
  - Meeting with Marco Oddi, James DCC, Andro & LU
    - showing results & of cores
    - test strip is rejectable – because of gradation failed on 4.75 mm, v. low lab. voids (1.7%, min spec 4) & low compaction. <sup>151</sup>

110. On July 31, 2007, Mr. Delos Reyes emailed Dr. Uzarowski, attaching the SMA nuclear density compaction test results for the SMA test strip, and stated: "They are

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<sup>148</sup> [GOL0007410](#) at image 19

<sup>149</sup> [GOL0001736](#) attaching [GOL0001737](#), [GOL0001738](#), [GOL0001739](#), [GOL0001740](#), [GOL0001741](#), [GOL0001742](#), [GOL0001743](#)

<sup>150</sup> [GOL0001734](#)

<sup>151</sup> [GOL0007410](#) at image 20, [GOL0007408](#) at image 60

proceeding ahead tomorrow on SMA. SP12.5 looks OK (compaction wise and mat texture)".<sup>152</sup>

111. Also on July 31, 2007, Dr. Uzarowski emailed Mr. Janicas, Mr. Oddi, and Philips, attaching SMA test results (including those Mr. Delos Reyes had emailed to him that day), and stated:

Please find attached the results of the laboratory testing of the SMA plant sample obtained during the test strip on July 25, 2007 and the test strip compaction results. As discussed at a meeting with representatives of the City of Hamilton and Dufferin Construction on Friday, July 25, 2007, the mix did not meet the specified requirements; the laboratory air voids at Ndesign and the percentage of the material passing the 0.075 mm sieve are in the rejectable zones. The Superpave gyratory cylinders prepared with this mix were presented at the meeting; they look much richer and finer than the cylinders prepared with the SMA trial batch mix that met the specified requirements. Also, the SMA compaction results were in the rejectable zone at a number of locations. The test strip is not acceptable. We recommend that a new test strip be completed.

We understand that Dufferin Construction intends to place the SMA mix on the main line tomorrow. Dufferin Construction should be aware that the test strip has not been approved and the paving will be at their entire risk.<sup>153</sup>

112. Mr. Delos Reyes replied to Dr. Uzarowski the same day and stated:

For correction, 4.75mm sieve rejectavble zone not 0.075mm.

SP12.5 looks good, only a bit rich in texture, initial compaction results above 93% range.<sup>154</sup>

113. Dr. Uzarowski's notes respecting July 31, 2007, stated:

Judy Pretty  
Anil Viriani (416) 235 3533  
Chris Raymond 235 4677  
John Blair (416) 235 3546  
Chris Rogers cell #  
Chris phone # 235 3735  
SMA - traprock

<sup>152</sup> [GOL0001639](#) attaching [GOL0001640](#)

<sup>153</sup> [GOL0003082](#) attaching [GOL0003083](#) and [GOL0003084](#)

<sup>154</sup> [GOL0001636](#) attaching [GOL0001637](#) and [GOL0001638](#)

LU + IB 10) RHVP – Andro

- SMA
- Letter
- How to lay

Bitumar – is it acid modified or polymer

SMA – interim decision to use only selected prime aggr. – from Ontario

Trap Rock – 7 sources – 3 or 4 can be used

Aecon, MRT, Lafarge Brockville Dolomitic sandstone

In the contract they should have

old, they probably can carry over jobs

Dave Carter – QA officer I Acid modification <sup>155</sup>

114. Also on July 31, 2007, Dr. Uzarowski called Chris Raymond (Senior Bituminous Engineer, Bituminous Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division, MTO) respecting concerns with the use of Demix Varennes aggregates in the RHVP SMA. The following day, August 1, 2007, Mr. Raymond sent an email to Becca Lane (Senior Pavement Design Engineer, Pavements & Foundations Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division, MTO), Kai Tam (Manager, Bituminous Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division, MTO), and Chris Rogers (Manager, Soils and Aggregate Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division, MTO) reporting on the call as follows:

Becca et al:

I received a call yesterday (Tuesday Aug 31st) [sic] from Ludamir U. of Golder Associates. He had heard a rumour that the Ministry no longer allows Ontario Trap Rock in SMA. I informed Ludamir that the Ministry has had concerns with early life friction in some SMA pavements. In response to these concerns the Ministry is continues to investigate early life friction and has formed MTO-Industry task groups to discuss the issue the last two winters. As an interim measure the Ministry has developed a short list of acceptable SMA aggregates which are communicated through special provision (313S45

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<sup>155</sup> [GOL0007410](#) at image 21

and now 110F12). The Special provisions do not currently list Ontario Trap Rock. Also in SWR we look at the cost implications of the limited SMA aggregate sources in the area to determine if SP 12.5 FC2 should be the surface course on potential SMA projects. Action has also been taken on carry over contracts to ensure acceptable early life friction.

Ludamir expressed concern regarding the proposed use of SMA on a City of Hamilton project (Red Hill Creek Expressway) where the contractor has submitted a mix design using a Quebec source (Demix Varennes) – the aggregate is not on the Ministry's DSM. Ludamir indicated he was going to follow up with Chris Rogers regarding the background of this source. A possible outcome is that the City of Hamilton could make a request for friction testing.<sup>156</sup>

115. On August 1, 2007, Dr. Uzarowski emailed Philips, Mr. Janicas, and Mr. Oddi, to correct his email of the previous evening, stating:

I would like to correct an error in the previous email. The SMA test strip sample was in the rejectable zone on material passing 4.75 mm sieve not 0.075 mm.<sup>157</sup>

116. Dr. Uzarowski's journal entry on August 1, 2007, stated:

1) RHVP  
- test strip SMA 4<sup>158</sup>

117. Golder conducted compaction testing on the SMA placed by Dufferin on August 1,<sup>159</sup> and August 3, 2007.<sup>160</sup>

118. Dr. Uzarowski's notes from August 2 and 3, 2007, state:<sup>161</sup>

[August 2, 2007]

1) RHVP – inspected SMA & FC2 & lab

[August 3, 2007]

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<sup>156</sup> [MTO0001265](#). This and subsequent communications within the MTO around this issue are dealt with in Overview Document #4

<sup>157</sup> [GOL0003081](#)

<sup>158</sup> [GOL0007408](#) at image 62

<sup>159</sup> [GOL0001718](#)

<sup>160</sup> [GOL0001717](#)

<sup>161</sup> [GOL0007410](#) at image 22

1) RHVP SMA S1 6.24  
 S2 5.85  
 S3 5.91  
 S4 5.60

2 trips to Hamilton

119. On August 8, 2007, Dr. Uzarowski emailed Mr. Oddi, along with Philips and Mr. Delos Reyes, regarding his concerns about low compaction:

Could you please call me on my cell at 905-441-6044? There are quite a few locations where the SMA compaction is low, some are even below 91%. We are concerned about these locations. Low compaction is almost a constant issue with the SMA paving. I suggest that we carry out additional nuke compaction testing at these locations in the presence of contractor's representative and then decide what to do. The feasible alternative would be to reduce the payment based on percent compaction.<sup>162</sup>

120. On August 9, 2007, Mr. Oddi emailed Mr. Hainer, Peter Gamble (Manager, Plants, Equipment and Technology, Dufferin), and James Wharrie (Construction Coordinator, Dufferin), stating:

This correspondence confirms that the Varennes DEMIX aggregates have been approved for use in the SMA and Superpave 12.5 FC2 surface course asphalt mixes on the Red Hill Valley Parkway mainline paving project. The trial batches for both mix designs met the specified requirements.

If you have any questions, please call me.<sup>163</sup>

121. On August 13, 2007, Dufferin completed the SMA paving on the RHVP.<sup>164</sup>

122. On August 15, 2007, Mr. Delos Reyes emailed SMA compaction test results from August 11 and 13, 2007, showing compaction as acceptable.<sup>165</sup>

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<sup>162</sup> [GOL0003079](#); compaction results themselves for SMA placed on August 7, 2007 at [GOL0001714](#) attached to [GOL0001713](#)

<sup>163</sup> [DUF0002741.01](#): Mr. Gamble then forwarded Mr. Oddi's email to Mr. Gangaram.

<sup>164</sup> [GOL0001698](#). See also [GOL0003126](#), August 31, 2007 confirming SMA paving completed on that date.

<sup>165</sup> [GOL0001683](#) attaching [GOL0001684](#) and [GOL0001695](#)

123. On August 20, 2007, Dr. Uzarowski emailed Mr. Oddi, copying Mssrs. Janicas, Gamble, Rick Triemstra (Paving Contracts Estimator, Dufferin), Hainer, Wharrie, Gangaram, Ronald Abdul (Laboratory Supervisor, Dufferin), and Delos Reyes, along with Philips, regarding Golder's review of the submitted mix designs for Superpave 12.5 FC2 and HL 3 HS.<sup>166</sup>

124. Also on August 20, 2007, Dr. Uzarowski emailed Mr. Watkins and Mr. Delos Reyes, respecting not having received SMA extraction/gradation testing reports, stating:<sup>167</sup>

We haven't received the reports for the SMA extraction/gradation testing for almost three weeks. The SMA is completed and we have to report the results to the client if we want to be paid for the testing. Could you please check the progress and make sure that we will get the reports ASAP? We have a monthly meeting with the client, CA and Dufferin tomorrow at 9:00 am and I am sure that this will be one of the questions.

125. On August 21, 2007, early in the morning, Jeremy Rose (Asphalt Laboratory Supervisor/Manager, Whitby Office, Golder) emailed Dr. Uzarowski 32 "Hot Mix Asphalt Test Reports" for SMA and SP12.5 FC2.<sup>168</sup> Shortly thereafter, not having received Mr. Rose's email to Dr. Uzarowski, Mr. Watkins replied to Dr. Uzarowski's August 20, 2007, email, copying Mr. Delos Reyes and Mr. Rose, stating: "Jeremy was finishing off all the

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<sup>166</sup> [DUF0002552.01](#)

<sup>167</sup> [GOL0006551](#)

<sup>168</sup> 32 test reports: [GOL0001643](#) attaching [GOL0001644](#), [GOL0001645](#), [GOL0001646](#), [GOL0001647](#), [GOL0001648](#), [GOL0001649](#), [GOL0001650](#), [GOL0001651](#), [GOL0001652](#), [GOL0001653](#), [GOL0001654](#), [GOL0001655](#), [GOL0001656](#), [GOL0001657](#), [GOL0001658](#), [GOL0001659](#), [GOL0001660](#), [GOL0001661](#), [GOL0001662](#), [GOL0001663](#), [GOL0001664](#), [GOL0001665](#), [GOL0001666](#), [GOL0001667](#), [GOL0001668](#), [GOL0001669](#), [GOL0001670](#), [GOL0001671](#), [GOL0001672](#), [GOL0001673](#), [GOL0001674](#), [GOL0001675](#)

reports yesterday and you should have them first thing this morning. My apologies for not getting them to you sooner.”<sup>169</sup>

126. On August 21, 2007, RHVP paving construction meeting No.10 took place beginning at 9am, attended by Dr. Uzarowski and Mr. Delos Reyes for Golder, Mr. Oddi for the City, and Mssrs. Hainer, Wharrie and Brandon Dodds (Project Engineer, Dufferin) for Dufferin.<sup>170</sup> The site meeting minutes state:

**1. The actions from the previous meeting minutes of July 10, 2007 were reviewed and the following points were noted:**

- *Dufferin forwarded the rock chip trial results to Golder and has since completed all SMA paving.*
- *Dufferin will submit a letter to The City indicating the additional cost for the change to PGAC 70-28 in the RBM.*
- *Dufferin has submitted a quotation for the walking trail signage.*
- *Dufferin has submitted a quotation for the Escarpment Bridge expansion joints.*
- *Golder has completed their analysis and provided written confirmation indicating the SMA mix design is satisfactory.*
- *Golder has completed their analysis and provided written confirmation indicating the SP 12.5 FC2 mix design is satisfactory.*
- *Dufferin has produced a trial batch of SMA for field lab correlation.*
- *Golder has completed traffic sensor installation for the mainline northbound lanes north of Queenston.*
- *Golder restated that the unstable area of pavement within the Mud Interchange Ramp S-W continue to be monitored.*
- *Golder confirmed that all damaged SP19 shoulders had been repaired to their satisfaction.*
- *Dufferin has submitted a traffic control plan for the milling and paving operations at Mt. Albion Rd, Lawrence Rd, King St and Queenston Rd.*
- *Dufferin has submitted a quotation for the Lawrence Rd sanitary manhole work.*
- *Dufferin will notify The City once the slopes near Manhole 1 and 1A are ready for hydroseeding.*
- *Dufferin has removed the steel plates covering the Barton S-E/W catchbasins.*

**2. Asphalt Issues**

**a) Mix Approval of HL-3 (HS)**

Golder indicated the HL-3 (HS) mix and aggregates meet all design requirements.

Dufferin will pave all HL-1 mainline shoulders with the approved HL-3 (HS) asphalt mix at the HL-1 unit price.

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<sup>169</sup> [GOL0006551](#)

<sup>170</sup> [HAM0007913\\_0001](#) and [GOL0001619](#)

**b) Material Testing**

Golder indicated the King S-E/W Ramp surface course asphalt is cracked due to over-compaction. Replacing certain areas along this ramp will be necessary.

Golder indicated there could be a potential ponding issue near Queenston Rd (approx. Sta. 26+450) where repairs may be necessary.

Golder has completed the surface smoothness profiling and the results of the testing were satisfactory.

**c) Progress**

All of the mainline paving has been completed with the exception of the HL-1 shoulders from north of the Escarpment Bridge to the Landfill Bridge.

Mt. Albion Rd, Lawrence Rd, King St, Queenston Rd and the Landfill Bridge have yet to be paved.

127. In the afternoon of August 21, 2007, Dr. Uzarowski and Mr. Delos Reyes exchanged a series of emails respecting the SMA test results that Mr. Rose had sent to Dr. Uzarowski early that morning before the construction meeting, expressing concern and some uncertainty about whether the results pertained to SMA or FC2 asphalt:

- (a) At 3:15pm Dr. Uzarowski forwarded Mr. Rose's 7:13am email and 32 attachments to Mr. Delos Reyes, stating: "Do you have these results? I see all of them to be FC2. Have you received the SMA?"<sup>171</sup>
- (b) At 3:17pm Dr. Uzarowski emailed Mr. Delos Reyes again stating: "Disregard the previous email. SMA was there too."<sup>172</sup>

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<sup>171</sup> [GOL0003093](#) attaching [GOL0003094](#), [GOL0003095](#), [GOL0003096](#), [GOL0003097](#), [GOL0003098](#), [GOL0003099](#), [GOL0003100](#), [GOL0003101](#), [GOL0003102](#), [GOL0003103](#), [GOL0003104](#), [GOL0003105](#), [GOL0003106](#), [GOL0003107](#), [GOL0003108](#), [GOL0003109](#), [GOL0003110](#), [GOL0003111](#), [GOL0003112](#), [GOL0003113](#), [GOL0003114](#), [GOL0003115](#), [GOL0003116](#), [GOL0003117](#), [GOL0003118](#), [GOL0003119](#), [GOL0003120](#), [GOL0003121](#), [GOL0003122](#), [GOL0003123](#), [GOL0003124](#), [GOL0003125](#)

<sup>172</sup> [GOL0003092](#)

- (c) At 3:25pm Mr. Delos Reyes replied to Dr. Uzarowski's 3:15pm email, stating: "no, these were not sent to me, this is the first time am seeing them."<sup>173</sup>
- (d) At 3:45pm Dr. Uzarowski replied to Mr. Delos Reyes' 3:25pm email, copying Mr. Watkins, stating:<sup>174</sup>

What can we do now? How should we inform the client that 9 out of 28 SMA samples are rejectable if the SMA paving has been finished some time ago and the plant and the aggregate are already gone? What happened with the mix produced on August 14? Why is it so fine on 9.5 and 4.75 sieves? Where was it paved? Or, was is a sampling error? Should we recommend payment reduction for this area(s)?

- (e) At 3:56pm Dr. Uzarowski replied to his own 3:45pm email to Mr. Delos Reyes and Mr. Watkins, stating:<sup>175</sup>

Please double check the results before sending. There are number of errors and samples marked as SMA are definitely SP 12.5 FC2.

- (f) At 4:54pm Mr. Delos Reyes replied to Dr. Uzarowski's 3:56pm email, stating: "As discussed, nothing will pass thru me that does not make sense."<sup>176</sup>

128. The parties have produced 114 RHVP SMA test reports for testing conducted in August 2007 during and after the laying of the SMA mainline surface course.<sup>177</sup>

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<sup>173</sup> [GOL0001676](#) and [GOL0002030](#)

<sup>174</sup> [GOL0002030](#)

<sup>175</sup> [GOL0002030](#)

<sup>176</sup> [GOL0002030](#). However, there are no further communications pertaining to the issue in the Inquiry database.

<sup>177</sup> Listed by DocDate order: [GOL0004352](#), [GOL0004353](#), [GOL0004355](#), [DUF0002374.01](#), [DUF0002405.01](#), [DUF0002406.01](#), [DUF0002407.01](#), [DUF0002408.01](#), [DUF0002409.01](#), [GOL0004349](#), [GOL0004350](#), [GOL0004351](#), [GOL0000076](#), [GOL0000077](#), [GOL0000078](#), [GOL0000079](#), [GOL0001717](#),

129. On August 31, 2007, Andy Bateman (Editor, Rock to Road) of “Rock to Road” magazine emailed Dr. Uzarowski, stating:

Ludomir,

Good to talk to you.

Look forward to getting Gary's paper.

Also, please review the following for accuracy:-

The new freeway also incorporates sophisticated performance and monitoring systems. In the right hand (slow) northbound lane, performance sensors will measure pressure and moisture content in the sub grade, temperatures in all asphalt lifts and both longitudinal and transverse strains in various lifts. In the southbound lanes, sensors of a weight in motion system will measure traffic count, wheel load and traffic speed, as well as stresses applied to the pavement by wheel loads.

For a number of years now, this project has been the “baby” of Ludomir Uzarowski, pavement and materials specialist with Golder Associates. Uzarowski completed the project’s feasibility study, pavement design and asphalt paving specifications, with Golder also completing quality assurance.

This is Canada's first pavement that has been both designed & constructed as a perpetual pavement.<sup>178</sup>

130. Later on August 31, 2007, Dr. Uzarowski responded to Mr. Bateman, stating:

My corrections are marked below. I also attached the Word version of the CTAA paper (there may be some minor changes in the final version but I don’t have it with me right now). Could you please also send a copy of your article to Gary Moore from the City of Hamilton for review? Gary is the soul of this project in the City and without him this project

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[GOL0001718](#), [GOL0001723](#), [DUF0002420.01](#), [DUF0002421.01](#), [DUF0002422.01](#), [GOL0004980](#), [GOL0004981](#), [GOL0004982](#), [GOL0004983](#), [GOL0001714](#), [DUF0002423.01](#), [DUF0002424.01](#), [GOL0000080](#), [GOL0000081](#), [GOL0000082](#), [GOL0000083](#), [GOL0001712](#), [DUF0002425.01](#), [GOL0001705](#), [GOL0001707](#), [DUF0002360.01](#), [DUF0002410.01](#), [DUF0002411.01](#), [DUF0002426.01](#), [DUF0002427.01](#), [DUF0002428.01](#), [DUF0002429.01](#), [DUF0002430.01](#), [DUF0002412.01](#), [DUF0002413.01](#), [DUF0002414.01](#), [DUF0002415.01](#), [GOL0000200](#), [DUF0002416.01](#), [DUF0002417.01](#), [GOL0005370](#), [GOL0005371](#), [GOL0005372](#), [GOL0005373](#), [GOL0005374](#), [GOL0001684](#), [GOL0001685](#), [GOL0005368](#), [GOL0005369](#), [GOL0000039](#), [DUF0002361.01](#), [DUF0002418.01](#), [DUF0002419.01](#), [GOL0005359](#), [GOL0005360](#), [GOL0005361](#), [GOL0005362](#), [GOL0005364](#), [GOL0005365](#), [GOL0005366](#), [GOL0005363](#), [GOL0005367](#), [GOL0003088](#), [GOL0003089](#), [GOL0000091](#), [GOL0000102](#), [GOL0000103](#), [GOL0000202](#), [GOL0001650](#), [GOL0001651](#), [GOL0001653](#), [GOL0001654](#), [GOL0001655](#), [GOL0001656](#), [GOL0001657](#), [GOL0001658](#), [GOL0001659](#), [GOL0001660](#), [GOL0001661](#), [GOL0001662](#), [GOL0001665](#), [GOL0001666](#), [GOL0000041](#), [GOL0004331](#), [GOL0004332](#), [GOL0004333](#), [GOL0004334](#), [GOL0004335](#), [GOL0004336](#), [GOL0004337](#), [GOL0004338](#), [GOL0004339](#), [GOL0004340](#), [GOL0004341](#), [GOL0004342](#), [GOL0004343](#), [GOL0004344](#), [GOL0004345](#), [GOL0004346](#), [GOL0004347](#), [GOL0004348](#)

<sup>178</sup> [GOL0002934](#)

would have never materialized. He is a Director of Engineering. His phone number is 905-546-2424 ext. 2382. I am still trying to talk to some people from MTO to clarify that trial issue.<sup>179</sup>

131. The September 18, 2007, RHVP paving construction site meeting No.11 minutes stated under the heading "Asphalt Issues":<sup>180</sup>

a) Remaining Paving

Dufferin will complete asphalt milling and base crack repairs of King westbound lanes early next week with the HL-1 paving to follow on Thursday or Friday.

Dufferin estimated 11 days worth of paving would be necessary to complete all work.

b) Conduits for Sensors

Golder has submitted drawings to The City, Philips and Dufferin indicating the necessary duct installations.

Installation of the sensors will be carried out by the supplier.

Installation of the electrical components will be carried out by Weinmann.

c) Deficiencies

Golder has forwarded a list of deficient asphalt locations to Dufferin for repair.

All deficient areas of SMA surface course are to be repaired with Superpave 12.5 FC2 surface course.

132. The October 9, 2007, RHVP paving construction site meeting minutes No.12 stated:

2. Asphalt Issues

a) Schedule for Remaining Work

Dufferin indicated that all outstanding paving should be completed by the end of the week. Dufferin hopes to have a crew available later today.

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<sup>179</sup> [GOL0003375](#) attaching [GOL0003376](#); see also [GOL0003378](#) and [GOL0002935](#) for further communications about being provided with a copy of the issue when it comes out, and indicating that the publication was Rock to Road.

<sup>180</sup> [GOL0001792](#) at image 2 and [HAM0007923\\_0001](#) at image 2

## 7. Progress For The Next Month

Dufferin indicated the following work is scheduled to take place during the next month:

- \* Dufferin will complete all outstanding work as well as deficiencies prior to the opening of the expressway
- \* Dufferin will schedule a final inspection of the CSO Facility with JM Structural, Philips and MRC.

## 8. New Business

Golder indicated that OHMPA has postponed their skid resistance testing due to unfavourable weather.

OHMPA has requested permission to carryout multiple profilographs of the expressway between Queenston and Greenhill using different pieces of equipment on October 23, 2007.

Golder indicated that the mainline sensor installation will begin on Friday, October 19, 2007 and be supervised by the supplier.<sup>181</sup>

### **L. RHVP friction testing by MTO**

133. On October 16, 2007, the MTO conducted friction testing on the RHVP.<sup>182</sup> This topic, including the initiation and organization of the testing, the results, and communications following the testing, is dealt with in Overview Document #4.

### **M. OHMPA "Pave In" on the RHVP and Hamilton RHVP Safety Audit**

134. On October 1, 2007, Bonnie Irwin (Administrative Assistant, OHMPA) of the Ontario Hot Mix Producers' Association ("OHMPA") sent an invitation to all OHMPA Members 'to join us on the Red Hill Valley Expressway in Hamilton [on October 23, 2007] to look at Ontario's first municipal Perpetual Pavement. There is No Charge!', Mr. Moore was involved in arranging the event and Dr. Uzarowski delivered a presentation at it.<sup>183</sup>

<sup>181</sup> [HAM0007935\\_0001](#) and [GOL0001797](#)

<sup>182</sup> [MTO0002227](#) attaching [MTO0002228](#) and [MTO0002229](#)

<sup>183</sup> [HAM0032544\\_0001](#); [MTO0029473](#) attaching [MTO0029474](#); [GOL0003407](#)

135. On October 15, 2007, Dr. Uzarowski and Cindy Gonsalves (Manager, Administration and Events, OHMPA) emailed one another about the RHVP demonstration scheduling and logistics. Sandy Brown (Technical Director, OHMPA) was included in the emails.<sup>184</sup>

136. On October 23, 2007, the OHMPA visit and demonstration on the RHVP titled “Perpetual Pavement Pave-in & Inertial Profiler Demo” respecting the RHVP took place.<sup>185</sup>

137. Mr. Oddi emailed an appointment for October 24, 2007 (the day following the OHMPA Pave-in, to Mr. Moore, Hart Solomon (Manager, Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works, Hamilton), Jerry Parisotto (Manager, Construction, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works, Hamilton), and Bill Weaver (District Superintendent, District 1, Roads & Maintenance, Operations, Operations & Maintenance Division, Public Works, Hamilton), stating:<sup>186</sup>

Subject: RHVP Safety Audit

We did a similar audit prior to the LINC opening. Hart, can you please see if Brian Malone is available.

We will depart from the City Centre and pick up a sandwich on the way. I have booked the City van which can accommodate 11 people. Please let me know if we should invite anyone else.

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<sup>184</sup> [GOL0003407](#)

<sup>185</sup> [GOL0003406](#)

<sup>186</sup> [HAM0038201\\_0001](#)

**N. RHVP opening**

138. On November 3, 2007, the Red Hill Valley Parkway Official Opening Ceremony took place in the Red Hill Bowl.<sup>187</sup>

139. On November 5, 2007, Mr. Stewart emailed the Public Works Committee Members of City Council (and possibly all City Councillors and their Support Staff), attaching two articles in the Summer 2007 edition of the OHMPA Asphalttopics magazine respecting the RHVP.<sup>188</sup> The first article was the one discussed above as having been written in June 2007.<sup>189</sup> Mr. Stewart wrote:

Public Works Committee Members:

As we celebrated the official opening ceremony for the Red Hill Valley Parkway this past weekend, I'm pleased to share two articles that were recently published about the Public Works Department in a construction industry trade publication called Asphalttopics.

The first article profiled the Red Hill Valley Parkway as the first municipal 'perpetual pavement' (designed to last almost indefinitely) project to be built in Ontario. Gary Moore, Director of Engineering Services in our Capital Planning and Implementation division, who has worked on the Project for 20 years, was interviewed in the article. The perpetual pavement will save more than \$1.6 million over a 50-year period and will significantly reduce emissions to the environment since fewer cars will be caught up in road maintenance delays.

The Public Works Department was profiled in a second article as one of the most progressive cities in the province when it comes to managing its roads. The article references several Hamilton projects that are using new technology to improve our road network, including:

- Perpetual pavement on the Red Hill Valley Parkway,
- Cold-in-place recycling in 2006 including the reuse of the existing surface course on a stretch of Old Highway 5
- This year's trial of foamed asphalt for a rehabilitation project along Regional Road 20

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<sup>187</sup> [HAM0032560\\_0001](#)

<sup>188</sup> [HAM0021276\\_0001](#) attaching [HAM0021277\\_0001](#)

<sup>189</sup> [GOL0003373](#) attaching [GOL0003374](#); [GOL0003372](#); [GOL0002933](#)

. Side-by-side trial of warm asphalt versus hot mix asphalt along Garth Street from Stone Church Road to the Linc

With your support, the Public Works Department is once again leading by example and continuing on the path to positioning Hamilton as a centre of innovative and environmental excellence.

I have attached the articles should you wish to review them in full. As always, please feel free to contact me if you have any questions.

140. On November 16, 2007, Dufferin provided the City with Notification of Substantial Completion of the mainline RHVP paving contract and the Certificate of Substantial Performance is issued.<sup>190</sup>

141. On November 17, 2007, the RHVP opened to the public.<sup>191</sup>

142. On November 23, 2007, Hamilton certified that Dufferin had substantially performed Contract PW-06-243, the RHVP paving contract, on November 16, 2007.<sup>192</sup>

143. On December 7, 2007, Dr. Uzarowski emailed Tanya McKenna (Traffic Technologist, Traffic Planning & Community Services, Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works, Hamilton) and Gary Kirchknopf (Supervisor, Traffic Planning & Community Services, Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works, Hamilton), attaching a Class by Speed Traffic Report for RHVP, which indicated that approximately two-thirds of RHVP users drove at 90km/hr and above.<sup>193</sup>

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<sup>190</sup> [DUF0001937.01](#) and [DUF0002185.01](#)

<sup>191</sup> [HAM0021284\\_0001](#) attaching [HAM0021285\\_0001](#); [HAM0021286\\_0001](#)

<sup>192</sup> [HAM0007949\\_0001](#)

<sup>193</sup> [GOL0003722](#) attaching [GOL0003733](#)

144. On December 12, 2007, Mr. Moore and Dr. Uzarowski spoke at the OHMPA Fall Seminar on: “The Red Hill Expressway – Canada’s First Municipal Perpetual Pavement Designed from the Ground Up”.<sup>194</sup> On March 25, 2008, Mr. Aurilio asked Mr. Moore if he could use the slides from their OHMPA presentation, and Dr. Uzarowski replied that Mr. Aurilio could use any of his slides and instructed his assistant to make them available to Mr. Aurilio.<sup>195</sup>

145. The January 3, 2008 Dufferin “Project Close Out Meeting” document stated:

[at p.4 beside “OWNER ISSUES”]:

“Quality of stone Part A” and “Letter into City for Warranty”

[at p.4 under “LESSONS LEARNED”, beside “B. What went wrong?”]:

“-[80000] Q.C. (TROW)”<sup>196</sup>

146. On February 4, 2008, Mr. Oddi emailed Dennis Billings (Head, Geotechnical Engineering Section, Central Region, Provincial Highways Management Division, MTO) with the subject line “Red Hill Valley Parkway – Stone Mastic Asphalt”.<sup>197</sup> The email stated:

The Red Hill Valley Parkway (RHVP) is a seven kilometre, four lane, 90km/h controlled access parkway. Given the truck climbing lane and weaving sections, there is essentially seven kilometres at three lanes and seven kilometres at two lanes. Stone Mastic Asphalt (SMA) 12.5 with PG 70-28 was used as the mainline surface course with HL1 on the partial depth shoulders. Superpave 12.5 FC2 with PG 70-28 was used as the surface course on the ramps and ramp shoulders.

<sup>194</sup> [GOL0002947](#) at image 3 and [MTO0020689](#). There is no presentation in the Inquiry database.

<sup>195</sup> [GOL0003387](#) and [GOL0003386](#). There is no presentation in the Inquiry database.

<sup>196</sup> [DUF0002020.01](#)

<sup>197</sup> [MTO0038567](#)

The SMA and Superpave 12.5 were placed in echelon using a material transfer vehicle. Attached are pictures of the SMA placement in the southbound direction, north of the Greenhill Avenue interchange.

A 280 tonne SMA trial section was placed on the W-S ramp of the Mud Street interchange. The trial section met the contract specifications and was left in place. The tender quantities for the SMA and Superpave 12.5 FC2 were 16,494 tonnes and 9,552 tonnes, respectively, for a total of 26,046 tonnes. The actual quantities were 12,809.68 tonnes of SMA and 12,278.41 tonnes of Superpave 12.5 FC2, for a total of 25,088.09 tonnes. Please note that the SMA was only \$1.00/tonne more than the Superpave 12.5 FC2.

If you have any questions, please call me.

147. In or about September 21-24, 2008, Mr. Moore and Dr. Uzarowski presented two papers at the 2008 Annual Conference of the Transportation Association of Canada.<sup>198</sup>

The two papers were:

- (a) “Innovative, Comprehensive Design and Construction of Perpetual Pavement on the Red Hill Valley Parkway in Hamilton”, by Mr. Moore, Dr. Uzarowski, and Mr. Gamble;<sup>199</sup> and
- (b) “Sustainable Pavements – Making the Case for Longer Design Lives for Flexible Pavements”, by Mr. Moore and Dr. Uzarowski.<sup>200</sup>

148. Mr. Moore’s, Dr. Uzarowski’s, and Mr. Gamble’s “Innovative, Comprehensive Design and Construction of Perpetual Pavement on the Red Hill Valley Parkway in Hamilton” paper contained the following statements, among others:

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<sup>198</sup> [GOL0003417](#) attaching [GOL0003418](#); [MTO0004712](#). The conference and those presentations were attended by MTO representatives Becca Lane, Joseph Ponniah, Chris Raymond, Li Ningyuan, Susanne Chan, and Roxanne Medendorp ([MTO0014973](#) attached to [MTO0014972](#)).

<sup>199</sup> [HAM0013032\\_0001](#) and [HAM0015515\\_0001](#). A draft with tracked revisions is at [HAM0000328\\_0001](#). Mr. Moore revised Dr. Uzarowski’s draft and emailed the revisions to Dr. Uzarowski on May 20, 2008 ([GOL0007417](#) attached to [GOL0007416](#)).

<sup>200</sup> [MTO0000111](#) (earlier versions August 31, 2007, at [GOL0003376](#) attached to [GOL0003375](#), and August 5, 2005 at [GOL0003367](#) attached to [GOL0003366](#)).

Perpetual or long -life asphalt pavements are designed and constructed from the bottom up to provide a structure having very long useable life with a renewable asphalt surface. The wearing surface can be resurfaced with minimal traffic disruption. Bottom -up design and construction recognizes that all the layers act in concert to determine the useful life and failure mode of a pavement. The key is to design a pavement structure that will effectively prevent bottom -up cracking. Recent improvements in material technology include the Performance Graded Asphalt Cement system, better aggregates, use of polymers and fibers in asphalt mixes, Superpave mix design methodology and SMA mixes. These improvements as well as more advanced pavement design methodologies allows obtaining a very long-term performance from asphalt pavement structures (greater than 50 years) while replacing periodically (approximately every 14 to 17 years) only the surface (top 25 to 50 mm) of the pavement.

A comprehensive approach is required to design a perpetual pavement. This paper presents the approach used to design an innovative perpetual pavement on the Red Hill Valley Parkway in Hamilton, Ontario. This approach included a feasibility study including life cycle cost analysis, detailed pavement design and the development of paving specifications, asphalt mixes mechanistic properties testing. Some construction related issues are also presented.<sup>201</sup>

149. The paper also contained the diagrams and photos reproduced on the following page.<sup>202</sup>

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<sup>201</sup> [HAM0013032\\_0001](#) at image 4

<sup>202</sup> [HAM0013032\\_0001](#) at image 7

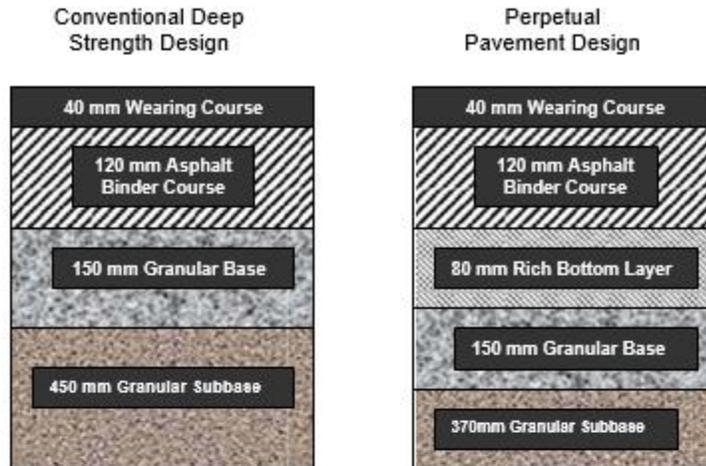


Figure 1. Comparison of conventional deep strength and perpetual pavement structures designed for the Red Hill Valley Parkway.

As part of the perpetual pavement mix designs, the mechanistic properties of the SMA 12.5, Superspave 19 and Superspave 25 and RBM mixes were determined. When these mechanistic properties were available, the perpetual pavement design was verified using elastic theory and the Bisar [14] program. Figure 2 shows the asphalt part of the pavement structure constructed on the Red Hill Valley Parkway and used in the analysis.



Photograph 2. The asphalt pavement structure on the main line of the Red Hill Valley Parkway.

150. Mr. Moore and Dr. Uzarowski's paper titled "Sustainable Pavements – Making the Case for Longer Design Lives for Flexible Pavements", stated:

Traditionally, flexible (i.e. hot-mix asphalt) pavements have not been designed to last for a significant period of time before a major reconstruction or repair. The typical life cycle involves a program of routine maintenance and a major rehabilitation treatment every 18 to 25 years. With the rapidly increasing traffic volumes on urban arterial roadways, provincial road agencies and larger municipalities are looking for ways to extend the effective road service life so as to minimize the disruptions to normal traffic operations and the associated driver delays and inconvenience during road rehabilitation works. The desired strategy for road maintenance can be summed up as "Get in - get out quickly - stay out!" Clearly, huge benefits would accrue in terms of sustainability and value for infrastructure investment if the life of flexible pavements could be increased to 50 years or more. Recognizing the inherent economic, social and environmental value of this design concept, The City of Hamilton decided in 2006 to use the perpetual pavement concept on their major infrastructure project. the Ministry of Transportation of Ontario (MTO) initiated a trial project in 2003 to incorporate a perpetual pavement approach [2, 3].<sup>203</sup>

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Both pavement design alternatives incorporate Stone Mastic Asphalt (SMA) as the surface course mix. SMA is considered to have improved skid resistance and offers some noise reduction [8] when compared with conventional hot-mix asphalt mixes. This mix type also offers superior rutting resistance, fatigue endurance and durability.<sup>204</sup>

#### **O. Parkway Implementation Committee 2008-2009**

151. The Parkway Implementation Committee held a meeting on November 10, 2008.<sup>205</sup> Councillors Brad Clark (Ward 9, Hamilton), Collins, Jackson and Merulla attended. The draft minutes include the following notation:

##### 3.0 Construction Update

J. DiDomenico informed Committee that the MTO has reviewed its contract schedule and anticipates that construction of the final ramp off the QEW onto the RHV Parkway will be complete by mid-December. This information will be posted on the RHVP website so as to update the general public. There was some discussion by Committee as to the impacts that have been caused to the neighbourhoods and roads along the detour due to the delayed ramp opening. Committee was informed that as requested last meeting, the

<sup>203</sup> [MTO0000111](#) at image 4. This paragraph is almost word for word identical to [GOL0003367](#) (at image 4) which was a draft circulated with Vince Aurilio as author in 2005 discussed above, and with [GOL0003343](#) being the 2004 CTAA paper by Dr. Uzarowski and Mr. Aurilio also discussed above (the 2004 paper is cited at footnote [2] in this paragraph and at image 3)

<sup>204</sup> [MTO0000111](#) at image 8. This paragraph is identical to [GOL0003367](#) (at image 9) being the 2004 CTAA paper by Dr. Uzarowski and Mr. Aurilio also discussed above

<sup>205</sup> [HAM0032819\\_0001](#)

rehabilitation of Woodward Avenue was being advanced in the capital budget program to 2010.<sup>206</sup>

152. On April 24, 2009, Jennifer DiDomenico (Manager, Business Support Services, Capital Planning & Implementation, Public Works, Hamilton) emailed Mr. Solomon, and indicated that she would be presenting at a meeting of the Parkway Implementation Committee the following week.<sup>207</sup>

153. On July 28, 2009, Ms. DiDomenico emailed John McLennan (Manager, Risk Management, Corporate Services, Hamilton) enclosing the November 10, 2008 minutes and noted that "PIC's mandate is nearing completion; no regular meetings scheduled."<sup>208</sup>

154. The agenda of the October 21, 2009 Parkway Implementation Committee meeting included the review of minutes from meetings on May 11, 2009 and June 17, 2009.<sup>209</sup> This agenda also includes an item for discussion "Disposition of PIC".<sup>210</sup>

***P. RHVP papers and presentations to 2012***

155. In addition to the papers and presentations described in the course of the chronological narrative above, Dr. Uzarowski and Mr. Moore were involved in a number of other papers and presentations respecting the RHVP construction and related issues.

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<sup>206</sup> [HAM0032819\\_0001](#) at image 2

<sup>207</sup> [HAM0032797\\_0001](#). The City has not produced minutes of this meeting if it occurred.

<sup>208</sup> [HAM0032818\\_0001](#) attaching [HAM0032819\\_0001](#)

<sup>209</sup> [HAM0039580\\_0001](#). The City has not produced minutes of these meetings.

<sup>210</sup> [HAM0039580\\_0001](#)

156. Dr. Uzarowski and Mr. Moore published a second article in “Rock to Road” on January 2, 2009, titled: “Perpetual’ pavement helps Hamilton meet goals for Red Hill Valley Project”.<sup>211</sup>

157. Dr. Uzarowski, Mr. Moore, and Imran Bashir (Pavement and Materials Engineer, Golder), published a 2009 paper with the CTAA titled: “Initial Analysis of In-Situ Pavement Response on RHVP in Hamilton”.<sup>212</sup> They also appear to have published a similar but shorter paper titled: “Verification of Pavement Design Methodologies Using Measured In-Situ Response on an Urban Highway”.<sup>213</sup>

158. Dr. Uzarowski, Mr. Moore, Vimy Henderson (Pavement and Materials Engineer, Golder), and Michael Halloran (Project Manager, Transportation Engineering, Region of Waterloo) prepared a paper titled “Construction of Durable Longitudinal Joints - The Courage to use Innovations Pays Off” for the 2009 Annual Conference of the Transportation Association of Canada.<sup>214</sup> A similar paper titled “Innovative Approach to Construction of Durable Longitudinal Joints”, was credited to Dr. Uzarowski, Mr. Moore, Mr. Halloran, and Susan Tighe (Professor, Department of Civil Engineering, University of Waterloo).<sup>215</sup>

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<sup>211</sup> [HAM0010464\\_0001](#). An article of the same title was published in the November-December 2008 issue of “Aggregates & Roadbuilding” magazine, and it may be the same publication ([HAM0032765\\_0001](#), and [GOL0003419](#) attaching [GOL0003420](#))

<sup>212</sup> [GOL0001573](#) (beginning at image 14). Also [MTO0000108](#) and [HAM0051206\\_0001](#)

<sup>213</sup> [MTO0000109](#). The MTO has another paper by Uzarowski and Maher as well: [MTO0000115](#)

<sup>214</sup> [GOL0002954](#). Also [MTO0000112](#) and [HAM0051206\\_0001](#)

<sup>215</sup> [HAM0000745\\_0001](#) attached to [HAM0000744\\_0001](#)

159. Dr. Uzarowski, Mr. Moore, and Dr. Maher, were authors of a paper titled: “Designing High Traffic Volume Urban Motorways to Maximise Sustainability”.<sup>216</sup>

160. Dr. Uzarowski, Mr. Moore, and Dr. Henderson, were authors of a 2011 paper and presentation at the International Conference on Managing Pavement Assets in Santiago, Chile, titled: “Using Instrumentation Data on an Active Highway for Pavement Management”.<sup>217</sup>

161. On February 29, 2012, Dr. Uzarowski delivered a lecture to the Canadian Geotechnical Society - Southern Ontario Group (Toronto Group), titled “Perpetual Pavements on the Red Hill Creek Valley Parkway in Hamilton – Design, Construction, Monitoring and Sustainability”.<sup>218</sup>

**Q. RHVP Awards**

162. The RHVP itself or the overall Red Hill Valley Project were the subject of a number of awards over the years. Typically, the parties who received the awards submitted an application.<sup>219</sup>

163. The awards included (in chronological order):

- (a) 2003 Transportation Association of Canada Environmental Project of the Year.<sup>220</sup>

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<sup>216</sup> [RHV0000589](#) and [GOL0003883](#). It is unclear when this paper was completed and/or published.

<sup>217</sup> [HAM0000375\\_0001](#) and [HAM0000377\\_0001](#), [MTO0000114](#), [GOL0003392](#).

<sup>218</sup> [MTO0007502](#)

<sup>219</sup> The Inquiry database contains records of a number of awards applied for but for which there is no record of the award being made.

<sup>220</sup> [HAM0032884\\_0001](#) at image 13; [HAM0021277\\_0001](#) at image 2 (states the award was 2005, not 2003)

- (b) 2005 Canadian Construction Association's Environmental Achievement Award. Hamilton and Dufferin made a joint submission and were named the winners on March 16, 2006.<sup>221</sup>
- (c) 2007 Consulting Engineers of Ontario Award of Merit to Hamilton and Phillips Engineering for Environmental Infrastructure (the 7km reconstruction of Red Hill Creek). Awarded June 6, 2007.<sup>222</sup>
- (d) 2008 Project of the Year Award in the "Major Multi-Discipline Project Category" by the Hamilton Engineering Institute. Presented to Mr. Moore and Mr. Oddi on behalf of Hamilton at the annual Engineering Week Gala on March 1, 2008.<sup>223</sup>
- (e) 2009 Ontario Consulting Engineering Willis Chipman Award by the Consulting Engineers of Ontario for "Perpetual Pavement – Red Hill Valley Parkway, Hamilton".<sup>224</sup> Awarded to Golder and presented on June 2, 2009, at the Chateau Laurier Hotel in Ottawa. Golder paid for Mr. Moore and his wife to attend, specifically: return airfare Toronto to/from Ottawa for two (\$538.30), two nights hotel at the Chateau Laurier (\$350.00 plus taxes), and tickets for the event.<sup>225</sup>

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<sup>221</sup> [HAM0032194\\_0001](#)

<sup>222</sup> [RHV0000545](#)

<sup>223</sup> [HAM0000329\\_0001](#)

<sup>224</sup> [GOL0003468](#) attached to [GOL0003467](#)

<sup>225</sup> [GOL0006764](#) attaching [GOL0006765](#); [GOL0006754](#). [HAM0058896\\_0001](#) is the applicable Hamilton Code of Conduct Policy approved June 6, 1995.

**R. Appendix A: Individuals Referenced in Overview Document #3**

Last Name	First Name	Organization	Position(s) <sup>226</sup>
<b>Abdul</b>	Ronald	Dufferin	Laboratory Supervisor
<b>Andoga</b>	Richard	City of Hamilton	<b>Senior Project Manager</b> , Infrastructure Programming, Asset Management, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works
<b>Aurilio</b>	Vince	OHMPA	Technical Director - Field Engineer
<b>Bach</b>	Cassandra	City of Hamilton	Environmental Planning Assistant, Regional Municipality of Hamilton-Wentworth
<b>Bain</b>	Anne	City of Hamilton	Councillor, Ward 9
<b>Bashir</b>	Imran	Golder	Pavement and Materials Engineer
<b>Bateman</b>	Andy	Rock to Road	Editor
<b>Bevan</b>	Agnieszka	Stantec Consulting Ltd.	Project Manager, Infrastructure Management & Pavement Engineering
<b>Billings</b>	Dennis	MTO	<b>Head</b> , Geotechnical Engineering Section, Central Region, Provincial Highways Management Division
<b>Braden</b>	Dave	City of Hamilton	Councillor, Ward 14
<b>Brown</b>	Sandy	OHMPA	Technical Director
<b>Bruckler</b>	Phil	City of Hamilton	Councillor, Ward 9
<b>Clark</b>	Brad	City of Hamilton	Councillor, Ward 9
<b>Clark</b>	Nancy	City of Hamilton	<b>Administrative Assistant to the General Manager</b> , Public Works
<b>Collins</b>	Chad	City of Hamilton	Councillor, Ward 5
<b>Crockett</b>	Peter	City of Hamilton	<b>General Manager</b> , Transportation, Operations & Environment (pre-2003)  <b>General Manager</b> , Public Works (2003-2004)  <b>Commissioner</b> , Planning and Public Works, Regional Municipality of Halton (2004 onwards)

<sup>226</sup> Only positions held during the time covered by Overview Document #3 are included in Appendix A. Commission Counsel has created a separate document that includes the complete list of all positions held by all individuals referenced in Overview Documents #2 - #10, which is included in Overview Document #1 at Appendix A.

Last Name	First Name	Organization	Position(s) <sup>226</sup>
<b>Davis</b>	Gerry	City of Hamilton	<b>Director</b> , Capital Planning & Implementation, Public Works (until 2009)  <b>General Manager</b> , Public Works (2009 onwards)
<b>Delos Reyes</b>	Andro	Golder	Senior Pavement & Materials Geotechnical Technologist
<b>Di Ianni</b>	Larry	City of Hamilton	Councillor, Ward 10 (until November 2003)  Mayor of Hamilton (2003-2006)
<b>DiDomenico</b>	Jennifer	City of Hamilton	<b>Manager</b> , Business Support Services, Capital Planning & Implementation, Public Works
<b>Dietrich</b>	Nicholas	Dufferin	Project Engineer
<b>Dodds</b>	Brandon	Dufferin	Project Engineer
<b>Gamble</b>	Peter	Dufferin	Manager, Plants, Equipment and Technology
<b>Gangaram</b>	Vincent	Dufferin	Laboratory Supervisor (January 19, 2004 to March 30, 2007)  Senior Laboratory Supervisor (Asphalt) (April 2, 2007 to April 4, 2008)
<b>Gonsalves</b>	Cindy	OHMPA	Manager, Administration and Events
<b>Hainer</b>	David	Dufferin	Site Superintendant
<b>Halloran</b>	Michael	Region of Waterloo	Project Manager, Transportation Engineering
<b>Harvey</b>	John	University of California, Davis	Professor, Department of Civil and Environmental Engineering
<b>Henderson</b>	Dr. Vimy	Golder	Pavement and Materials Engineer
<b>Hodgins</b>	Bob	Ecoplants Limited	President
<b>Irwin</b>	Bonnie	OHMPA	Administrative Assistant
<b>Jackson</b>	Tom	City of Hamilton	Councillor, Ward 6
<b>Janicas</b>	Paul	Dufferin	Senior Quality Control Lab Supervisor (until 2007)  Plant Superintendant (2007 onwards)
<b>Kirchknopf</b>	Gary	City of Hamilton	<b>Supervisor</b> , Traffic Planning & Community Services, Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works

Last Name	First Name	Organization	Position(s) <sup>226</sup>
Lane	Becca	MTO	<b>Senior Pavement Design Engineer</b> , Pavements & Foundations Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division
Maher	Dr. Michael	Golder	Principal, Pavement and Materials Engineering
Maranzan	Walter	Philips Engineering	Contract Administrator
Martin	Jim	Asphalt Pavement Association of California	President/Executive Director
McHattie	Brian	City of Hamilton	Councillor, Ward 1
McKenna	Tanya	City of Hamilton	<b>Traffic Technologist</b> , Traffic Planning & Community Services, Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works
McLennan	John	City of Hamilton	<b>Manager</b> , Risk Management, Corporate Services
Merulla	Sam	City of Hamilton	Councillor, Ward 4
Mitchell	David	City of Hamilton	Councillor, Ward 11
Monismith	Carl	University of California, Berkeley	Professor, Transportation Engineering, Department of Civil and Environmental Engineering
Moore	Gary	City of Hamilton	<b>Senior Project Manager</b> , East-West North-South Transportation Corridor Project, Region of Hamilton-Wentworth (1988-1993)  <b>Manager</b> , Special Project Office, Region of Hamilton-Wentworth (1993-2000)  <b>Manager</b> , Design, Capital Planning & Implementation, Public Works (2001-2009)  <b>Manager</b> , Design, Red Hill Valley Project, Public Works (2002-2007)  <b>Director</b> , Engineering Services, Environment & Sustainable Infrastructure Division, Public Works (2009-2018)
Murray	Chris	City of Hamilton	<b>Director</b> , Red Hill Valley Project, Public Works
Navarra	Michael	Golder	Materials Engineer-in-Training

Last Name	First Name	Organization	Position(s) <sup>226</sup>
<b>Oakes</b>	Wray	City of Hamilton	<b>Manager</b> , Road Operations & Maintenance, Operations & Maintenance Division, Public Works
<b>Oddi</b>	Marco	City of Hamilton	<b>Senior Project Manager</b> , Red Hill Valley Project, Public Works (2003-2007)  <b>Senior Project Manager</b> , Construction Management, Construction, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works
<b>O'Leary</b>	J. Wade	Dufferin	Manager, Asphalt
<b>Parisotto</b>	Jerry	City of Hamilton	<b>Manager</b> , Construction, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works
<b>Pearson</b>	Maria	City of Hamilton	Councillor, Ward 10
<b>Raymond</b>	Chris	MTO	<b>Senior Bituminous Engineer</b> , Bituminous Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division (2004-2007)  <b>Senior Pavement Design Engineer</b> , Pavements & Foundations, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division (2007-2009)
<b>Rinaldo</b>	Joseph	City of Hamilton	<b>General Manager</b> , Finance and Corporate Services
<b>Rogers</b>	Chris	MTO	<b>Manager</b> , Soils and Aggregate Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division
<b>Rose</b>	Jeremy	Golder	Asphalt Laboratory Supervisor/Manager, Whitby Office
<b>Shynal</b>	Bryan	City of Hamilton	<b>Director</b> , Operations and Maintenance Division, Public Works
<b>Soloman</b>	Hart	City of Hamilton	<b>Manager</b> , Traffic Engineering & Operations, Engineering Services, Environment & Sustainable Infrastructure Division, Public Works
<b>Stewart</b>	Scott	City of Hamilton	<b>General Manager</b> , Public Works
<b>Tam</b>	Kai	MTO	<b>Manager</b> , Bituminous Section, Materials Engineering & Research Office, Highway Standards Branch, Provincial Highways Management Division
<b>Tighe</b>	Dr. Susan	University of Waterloo	Professor, Department of Civil Engineering

Last Name	First Name	Organization	Position(s) <sup>226</sup>
<b>Towers</b>	Bryan	City of Hamilton	<b>Contract Co-ordinator</b> , Road Operations & Maintenance, Operations & Maintenance Division, Public Works
<b>Triemstra</b>	Rick	Dufferin	Paving Contracts Estimator
<b>Uzarowski</b>	Dr. Ludomir	Golder	Principal, Pavement and Materials Engineering
<b>Walsh</b>	Donna	Golder	Facilities Manager
<b>Watkins</b>	John	Golder	Associate, Laboratory Supervisor, Ontario Region Laboratory Group
<b>Weaver</b>	Bill	City of Hamilton	<b>District Superintendent, District 1</b> , Roads & Maintenance, Operations, Operations & Maintenance Division, Public Works
<b>Wharrie</b>	James	Dufferin	Construction Coordinator
<b>Wilson</b>	F. Evan	Stantec Consulting Ltd.	Senior Consultant, Transportation