



To: William Tigert, CAO
Town of Ingersoll
130 Oxford Street
Ingersoll, ON N5C 2V5

Date: May 25, 2017

c: Peter Klaassen, Vice President
Solid Waste Ontario – Tetra Tech

Jack Coop and Joel Farber, Partners
Fogler, Rubinoff LLP

Memo No.: TRANS

From: Paul Steel, M.Eng., P.Eng.

Tetra Tech File: SWM.SWOP03434-01

Subject: Review Comments for Walker Environmental Group Inc.’s Traffic Study Assessment Work Plan (dated January 13, 2017) and other Pertinent Documents
Walker Environmental Group Inc. – Southwestern Landfill Proposal

1.0 INTRODUCTION

As part of the ongoing consultation process for the Walker Environmental Group Inc.’s (WEG) Southwestern Landfill Proposal, various work plan documents have been prepared by individual consultants retained by WEG to address the Approved Amended Terms of Reference (dated May 10, 2016) that govern the development of the proposed landfill. To assist the Town of Ingersoll (the Town) in their response to these various work plans and to ensure that the Town’s needs are adequately addressed as the landfill development proceeds, Tetra Tech Canada Inc. (Tetra Tech) has been retained by the Town as one of their panel of experts. This memo documents the findings from a review of the Traffic Study Assessment Work Plan prepared by HDR Corporation on behalf of WEG, dated January 13, 2017.

The findings presented are intended to provide the Town with an opportunity to seek further clarification from WEG specific to the proposed approach to be undertaken as part of the traffic study assessment. These findings also take into consideration a review of various documents, beyond the work plan, that are available from WEG and other sources. As such, some of the findings presented are specific to the traffic study’s work plan and should be addressed within the next revision, whereas other findings are for WEG and adjacent municipalities to consider and to comment on, where appropriate. Such commentary will enhance the understanding of the landfill’s operation for all interested parties. The intended outcome of provision of these findings is to allow WEG to further refine their work plan such that it provides a better reflection of the Town’s requirements and minimizes the overall impact to the Town and others as the landfill proceeds forward. It may also provide an opportunity for other parties to address items that may not be the sole responsibility of WEG.

2.0 WORK PLAN REVIEW COMMENTS – SPECIFIC TO TRAFFIC

This section presents various questions and/or points of clarification that the Town may wish to present to WEG. It also presents certain points that the Town may wish to consider providing a formal position towards to ensure their needs can properly be represented to WEG.

The following documents published by or available from WEG were reviewed. Documents from other sources were also reviewed as indicated.

Walker Environmental Group

- Traffic Study Assessment Work Plan, Southwestern Landfill Proposal Environmental Assessment, January 13, 2017
- Updated Draft Technical Work Plan Summary – Traffic, Southwestern Landfill Environmental Assessment (undated)
- Approved Amended Terms of Reference, Southwestern Landfill Proposal, May 10, 2016
- Facility Characteristics Assumptions, Southwestern Landfill Proposal Environmental Assessment, January 3, 2017
- CLC Consultation Paper – Identification of the Preferred Alternatives, Southwestern Landfill Environmental Assessment, October 26, 2016
- CLC Consultation Paper – Haul Route Alternative Methods, Southwestern Landfill Environmental Assessment, August 24, 2016
- Transcript of Recording, Southwestern Landfill Environmental Assessment, CLC Meeting # 24, January 25, 2017

Other Sources

- General Guidelines for the Preparation of Traffic Impact Studies, Ministry of Transportation, December 2009
- County of Oxford, Transportation Master Plan Study, May 19, 2009

Points of Discussion and/or Clarification

Approved Amended Terms of Reference

1. The Approved Amended Terms of Reference (Page 43) notes that the inclusion of ‘the Emergency Detour Routes as a traffic contingency’ was also done so in response to input from interested parties and CLC members. The initial Traffic Study Assessment Work Plan noted that ‘a contingency plan will be prepared, which will identify feasible alternative route(s) to the site in the event of Highway 401 road closures. Emergency Detour Routes will be considered in the development of the Contingency Plan’. The revised draft for this work plan subsequently removed this statement, but provided no indication as to how this specific item is to be addressed other than information will be obtained from the Ministry of Transportation Ontario (MTO).
 - The work plan should, as a minimum, review the Emergency Detour Routes for Highway 401 as noted in the Terms of Reference to appease the input already received in this regard. The work plan should also identify any special conditions or considerations that should be made in the event that an emergency detour is put in place, i.e., that only the designated routes are to be followed to ensure the integrity of the local road network for other road users.
2. As noted in Table 5 of the Approved Amended Terms of Reference (Page 46), one of the comments received from a local interested party relates to the accelerated deterioration of the roads with increased truck use. The revised Traffic Study Assessment Work Plan identifies pavement structure conditions and studies/reports to be collected and observed as part of the field data collection. There appears to be no indication within the work plan as to how this data is to be used and how such concerns will be addressed.
 - The work plan should indicate how the pavement structure data is to be used and whether there is any intention to address concerns related to accelerated pavement deterioration as part of the scope of the assessment. In addition, the minimum acceptable pavement condition should be agreed upon between the appropriate municipality and WEG to ensure that any future rehabilitation is assigned to the appropriate party.

3. As part of the addenda to the Approved Amended Terms of Reference, Point 8 notes that WEG will ‘work cooperatively with the MTO on any further assessment that they wish to carry out’. The revised Traffic Study Assessment Work Plan seems to only note that a meeting will be held with MTO to convey and discuss public concerns regarding the operations of Highway 401 between County Road 6 and the ONroute service centre (Ingersoll Travel Plaza) and that the ramp operations are to be analyzed using the Highway Capacity Manual.
 - To be consistent with the addenda, the work plan should be flexible to allow for more than just completing an analysis of the ramp operations. It is expected that weaving analysis between the interchange ramp and service centre ramp may be required to confirm whether an increase in traffic to the landfill site may adversely affect operating conditions between these facilities. It may also be prudent to review the ramp terminal intersections and their expected operations in conjunction with the ramp operations to appease MTO requirements.

Updated Draft Technical Work Plan Summary

4. In the section titled Key Updates to Traffic Technical Work Plan in the Updated Draft Technical Work Plan Summary (Page 2 of 4), it is noted that the ‘traffic forecasts for the landfill will be based on approximately 163 inbound trucks per day of various sizes...’. There is no other mention of the inclusion of other vehicles and/or outbound movements.
 - The forecasts should also include any outbound movements from the landfill as well as address the demands from other vehicles that will access the landfill on a typical day, not just the 163 inbound waste trucks.
 - The actual design vehicle (classification of truck) to which any improvements to the existing road infrastructure will need to accommodate should be defined.
5. In the section titled Key Community Input Provided to Technical Experts in the Updated Draft Technical Work Plan Summary (Page 2 of 4), four bullets are listed with key input items raised by various community parties. The work plan is silent regarding whether these items and any others that have been or will be provided are to be specifically addressed within the context of the traffic study, as part of another component of the approval submission, or not at all.
 - Since four specific items are included as part of the work plan summary, it could be interpreted or misconstrued that the traffic study will seek to address these items. The means to address the various key community inputs should be provided that will allow the various parties raising concerns to understand the process to receive an adequate response.
6. One of the key community input items referenced in Point 5 above relates to the need to ‘review existing County traffic studies on County Road 6 (specifically southbound traffic). Since the focus of the study will be on the proposed (or primary) haul route with inbound (loaded) trucks largely travelling north (northwest) along the route, it would seem that there are some concerns that exist for those vehicles travelling outbound (unloaded) from the landfill. The other three bullets provide more context regarding the concerns raised by the community.
 - It would be beneficial to expand upon the concerns related specifically with southbound traffic travelling along the haul route to ensure that such concerns are addressed to the satisfaction of not only those making the observation, but to all parties involved. It is anticipated that this item was raised based on the findings documented in the County of Oxford Transportation Master Plan Study (2009), which noted that the link selected by WEG as its primary haul route (County Road 6) is the only link ‘east of Ingersoll, north of Highway 401...where the volume exceeds’ the road capacity in the southbound direction. The addition of vehicles using this link from the proposed landfill may only compound such capacity issues.

7. The proposed methodology in the Updated Draft Technical Work Plan Summary (Page 1 of 4) notes the use of 'traffic impact study guidelines of the County of Oxford and the Ministry of Transportation'. However, within the list of Key Guidance Documents/Standards (Page 3 of 4) to be consulted the only reference made to the County of Oxford relates to their road design criteria.
 - The work plan should reference any applicable documents and/or guidelines published by the County of Oxford that will be consulted beyond the road design criteria already listed. Alternatively, the reference to such guidelines from the County of Oxford should be corrected, if made in error.
8. Referring to Page 34 of the County of Oxford Transportation Master Plan Study (2009), and expanding upon Point 6 above, the County's master plan also notes 'the preliminary conclusion of a capacity deficiency on Oxford Road 6 east of Ingersoll should be considered further in an environmental assessment study, which would also examine the needs of both local and through traffic in the urban area as a whole.' There is no reference to either this transportation master plan or any follow up study within the Updated Draft Technical Work Plan Summary that may have been completed to further assess this issue as noted in the County's master plan.
 - Additional sources of information, data and analyses such as those contained in the County of Oxford Transportation Master Plan Study (2009) and any follow up studies would prove to be relevant sources of key guidance that should be cited in the work plan. It may be that no such follow up analyses have been completed; however, this should be confirmed prior to advancing with any analysis for the landfill.
 - Given the findings noted in the County's master plan, it would appear that any improvements to County Road 6 should be identified as part of a larger study that considers local and through traffic in the urban area as a whole, i.e., not in isolation. Although it is recognized that the traffic study for the proposed landfill needs to focus on a finite corridor, there may be opportunities to improve the surrounding network as a whole that should be addressed prior to a significant development such as the landfill progressing. Some of the capacity pressures noted in the County's master plan specific to southbound traffic may be alleviated elsewhere by enhancing alternative route options. This may present alternative routing scenarios for WEG besides the proposed haul route and/or provide more credence for this route option if existing capacity constraints can be adequately addressed that are not compounded by the proposed landfill. The need to conduct and advance an environmental assessment study would be determined by municipal government(s), not WEG.
9. The proposed haul route seeks to establish a private road access from an existing field entrance onto County Road 6. The Traffic Study Assessment Work Plan indicates that 'the study area for the traffic assessment will be based on the preferred haul route, which consists of access from Highway 401 via County Road 6 interchange, north on County Road 6, and then west onto a private road into the landfill.' Beyond this description and other references to the Highway 401 interchange at County Road 6, there are limited details regarding those intersections that will specifically be analyzed as part of the traffic assessment. Page 10 notes the sight distance at the site entrance is a proposed indicator/measure to gauge the potential for traffic collisions. The site entrance is proposed to be located in the northwestern corner of the site at Road 64/35 Line. Similarly, the calculated collision rate 'at all study intersections' is also a proposed indicator/measure to gauge the potential for traffic collisions. In addition there are several references to 'key intersections'. One of the assumed key intersections will be on County Road 6 where the private road access is to be established.
 - The work plan should identify the various 'key intersections' that will be analyzed to allow interested parties to comment on their applicability as well as to identify other possible intersections that should be included in the assessment.
 - The County of Oxford defines specific requirements for the management of accesses onto their road network. These requirements are included in Section 4 of the County of Oxford Transportation Master Plan Study (2009), which largely conform to national guidelines published by the Transportation Association of Canada. The traffic assessment should specifically address the appropriateness of the proposed location

for the establishment of the private road access into the landfill to ensure that it meets the requirements set out in the County's policy documents. Specific items of interest are the need to limit the number of accesses onto county roads (arterials) since land access is a secondary consideration, provision of shared access to the adjacent lands from what is being defined as a private access, the driveway alignment in relation to a nearby entrance on the opposing side of County Road 6, and sight distance requirements due to the presence of the backslope along the west ditch of County Road 6. The proposed private road access is also located at the end of an auxiliary lane along northbound County Road 6 that could be impacted by any turning lane requirements. This section of County Road 6 is also part of the Emergency Detour Route for Highway 401 that may introduce additional stipulations for access management that should be addressed.

- Similar considerations should be made, where appropriate, for other key intersections to be assessed.
10. The Traffic Study Assessment Work Plan provides a set of working assumptions regarding future land uses (both community based and industry focused) that are to be used to guide the forecasting of traffic volumes along the proposed haul route. These working assumptions (Page 13 of the work plan) were identified by WEG; however, in the Transcript of Recording for the CLC Meeting No. 24 held on January 25, 2017, part of the discussion recording notes that 'one of the things we are doing, we will meet with Carmeuse, Lafarge and Federal White, to find out what they're plans are for the next 20 years, regarding tonnage, rehabilitation, all those types of things and those will be incorporated in the final Land Use Planning Forecast' (refer to Page 55 of 130).
- It will be important to document the final land use plans and assumptions as part of finalizing the work plan for the traffic study. All assumptions regarding community and industry growth should be vetted through and agreed upon by the appropriate parties to substantiate the baseline conditions. The traffic forecasting will rely on the accuracy and relevance of these assumptions.

Transcript of Recording – CLC Meeting No. 24

11. The Transcript of Recording for the CLC Meeting No. 24 notes that a portion of the discussion related to cumulative impacts associated with additional truck traffic onto County Road 6 and possible impacts from the frequent shunting of rail cars. Concerns were expressed regarding the potential queuing that can occur at the at-grade crossing, which could be compounded by traffic accessing the proposed landfill. Some options were raised regarding possible improvements that could be considered for the intersection between County Road 6 and Beachville Road, as well as grade separation of the railway. The response to the option for grade separation was documented as 'if the assessment points that far, that extreme, then we'll consider it but it's too early, too premature to tell at this time'.
- The need to provide any kind of grade separation for roads, railway, watercourses etc. can make any project cost prohibitive. One of the options ruled out from the feasibility screening documented in the CLC Consultation Paper was Route 1; the rationale for such was 'major upgrades to the bridge are cost prohibitive'. With the potential for the proposed haul route to require grade separation of the railway crossing, this may render this route option to also be cost prohibitive and/or bring Route 1 back into the list of those to be re-evaluated against the criteria and indicators.

Facility Characteristics Assumptions (Revision 02)

12. The Facility Characteristics Assumptions (Revision 02) notes that 'secondary haul routes for any local deliveries will follow the most appropriate County roads' (Page 3). In addition, the Updated Draft Technical Work Plan Summary (Page 2 of 4) advises of the analysis that will be undertaken 'along the primary haul route (and secondary roads if applicable).'
- It is recognized that these secondary routes may be subject to change based on the origin of the local deliveries; however, in order to analyze such, WEG must either make some assumptions or already have at its disposal an idea as to these origins. In a similar vein to Point 9, it would be beneficial for the work

plan to identify which secondary roads could form a part of the analyses to allow interested parties to comment on their applicability as well as to identify other possible routes that could be considered in the assessment.

13. The Facility Characteristics Assumptions (Revision 02) indicates that subject to approvals, 'construction is projected to commence in 2020, and landfilling to commence in 2023' (Page 10). With this in mind, the horizon years chosen to meet MTO requirements have been identified as 2023, 2028 and 2033 (Updated Draft Technical Work Plan Summary, Page 2 of 4). Volumes have been estimated (noted in Point 4) for the operations phase of the landfill, which are assumed to remain constant throughout the landfill's lifecycle. However, the proposed site development stages noted in the Facility Characteristics Assumptions (Page 2) indicates a five year cycle from one stage to the next (four stages in total) at maximum filling rates. The assumptions also state that 'additional equipment will be required during construction and closure phases which are expected to occur up to 8 months per year' (Page 13).
 - The work plan should confirm the intent to maintain a consistent number of vehicle trips from the landfill for each of the horizon years being analyzed or identify where any discrepancies could occur. Likewise, the work plan should comment on whether or not an overlap from any construction activities and associated vehicle trips can be expected beyond those specifically listed in the Traffic Study Assessment Work Plan, i.e., additional vehicles are required to access the landfill as part of the closure of one stage and the preparation of the subsequent stage beyond the regular operational requirements. Given the length of time that this can be expected to occur, the traffic volume estimates may need to be revised. It may also be prudent to consider undertaking a sensitivity analysis that confirms capacity thresholds or triggers for further upgrades and whether any staging can be implemented to delay any major capital expenditures where applicable.
14. The Facility Characteristics Assumptions (Revision 02) notes that 'seasonality of traffic assumptions are not considered in the above estimates' (Page 11), referring to the traffic volume estimates and trips per day. One of the points of discussion recorded in the Transcript of Recording for the CLC Meeting No. 24 (Page 54 of 130) raised a concern regarding the seasonal variations in traffic volumes and trip types that can be expected within the study area. County Road 6 serves summer recreational demands with vehicles heading to the lake areas and in wintertime due to vehicles rerouting to avoid Highway 401.
 - To appease the feedback received specific to seasonal fluctuations, it may be prudent to consider a separate analysis beyond the typical peak hour periods. Any variations to the traffic volumes previously estimated that account for seasonal demands should be documented.
15. The Facility Characteristics Assumptions (Revision 02) provide staffing requirements specific to full-time personnel required for landfill operations (Page 13). It is assumed that the 15 personnel trips per day itemized in the Traffic Study Assessment Work Plan are attributed to this staffing requirement.
 - The documents reviewed appear to be silent on the possibility of part-time or seasonal staffing requirements, which could alter the number of personnel trips per day. Any revisions required to the traffic volume estimates to account for staffing demands should be reflected in the work plan.

Other Points for Consideration

General

16. There are multiple sources of information provided by WEG in support of their application and approval process; however, interested parties have to pull this information together from the various sources to gain a comprehensive understanding as to how, what and why certain decisions have been made.

- Whether through completion of the traffic study or by some other means, it would be beneficial to have one document that can be referenced instead of multiple that documents the process from start to finish, specific to traffic related items.

Use of Long Combination Vehicles

17. An item that does not appear to be noted in any of the available documentation is the possibility of considering the use of larger trucks to transport the waste from the regional transfer stations to the landfill. Many provinces allow longer combination vehicles to operate on certain corridors in an attempt to increase the efficiency and reduce operating costs associated with goods movement.
 - This possibility should be investigated further to determine whether this may be a valid option to increase efficiencies while reducing the net number of trucks and trips on the surrounding road network. Such a consideration would need to ensure there is no deterioration in the safety performance, level of service, travel delay or other pertinent traffic metrics. This should be done in conjunction with defining the design vehicle for the traffic analyses.

Establishing a Transportation Plan

18. Point 1 above discussed the Emergency Detour Routes in place for the Highway 401 corridor adjacent to the Town and Point 11 above noted concerns regarding the frequent shunting of rail cars across County Road 6. In the documents reviewed, the topic of establishing an emergency access and an emergency access route specific to the landfill does not seem to be discussed.
 - Given the recent sensitivity regarding a lack of emergency egress from communities within Canada, it may be prudent for WEG to consider specific ingress and egress routes for the landfill beyond the proposed haul route and site entrance documented in the various traffic related documents. It is recognized that this may already be something that WEG is in the process of addressing, but it isn't necessarily something that has been discussed in the available documentation reviewed to date that focus on traffic related items. In addition, with the proposed landfill in close proximity to the Town, WEG should consider development of a transportation plan, for approval by the Town and/or the Ministry, which specifically speaks to the response requirements for emergencies and/or events that can be prone to landfill development.
 - Although it may be prudent for WEG to consider specific ingress and egress routes for the landfill beyond the proposed haul route and site entrance documented in the various traffic related documents, it may be appropriate for the Town (and other adjacent municipalities) to work with WEG to establish a transportation plan (in the absence of a current plan) that specifically addresses any emergency response requirements for emergencies and/or events that can be prone to landfill development. For example, large volumes of methane gas and other combustibles can be generated or accumulated through improper disposal of waste, and through improper treatment can lead to nearby residences having to be evacuated. Establishing an emergency plan to identify detour routes for road closures, railway crossing blockages, evacuation needs and maintaining adequate first responder access may be needed.

Confirming Minimum Acceptable Requirements

19. In the Updated Draft Technical Work Plan Summary, a list of Key Guidance Documents/Standards (Page 3 of 4) notes the use of 'road design criteria for the Town of Ingersoll and the County of Oxford'.
 - The Town may wish to use this as an opportunity to guide the way in which their road design criteria is applied as part of the traffic study and beyond through to implementation, if applicable. In lieu of such criteria or since the County's network may be impacted greater than the Town's, the Town and County should confirm the minimum acceptable standards that WEG will need to adhere to with respect to road infrastructure improvements and possible triggers to implement such improvements.

- WEG should consider whether there any current bylaws or known restrictions that are currently in place or could be put into effect that might improve the situation for neighbouring municipalities, i.e., time restrictions for large/heavy waste vehicles travelling through municipal boundaries, road bans, or alternatively whether the Environmental Assessment Act approval should impose conditions to the same effect.

Working Assumptions – Future Land Uses

20. The Traffic Study Assessment Work Plan provides a set of working assumptions regarding future land uses (both community based and industry focused) that are to be used to guide the forecasting of traffic volumes along the proposed haul route. These working assumptions (Page 13 of the work plan) were identified by WEG and provided to the consultant responsible for the traffic study.

- Supporting documentation of these assumptions as stated by WEG regarding the Lafarge Woodstock Quarry, the Carmeuse operations and the population/employment growth should be confirmed and documented through peer review and/or consultation with the relevant municipalities/parties. Any known variances from the stated assumptions could influence the rate at which traffic volumes are expected to grow along the proposed haul route and alter the analysis findings.

Traffic Control Scheme

21. The current traffic control scheme at County Road 6 and Beachville Road is a four-way stop. This may or may not be adequate to address the future traffic volumes from background traffic growth and landfill development, which will be assessed as part of the traffic study. Some improvement to this control scheme is expected as will be defined from the analyses to be completed by WEG.

- Once specific intersection improvements have been identified through the appropriate analyses, WEG should consult with the adjacent municipalities to confirm whether the proposed improvements are acceptable to these municipalities based on their experience, concerns, and observations with similar improvement implementation elsewhere.

3.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of Town of Ingersoll and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than Town of Ingersoll, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this report is subject to the terms and conditions stated in Tetra Tech Canada Inc.'s Services Agreement.

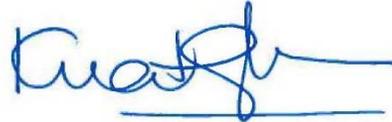
4.0 CLOSURE

We trust this technical memo meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.



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/bvb

Attachment (1): Resume

EXPERIENCE SUMMARY

Mr. Steel is a transportation engineer that leads Tetra Tech Canada's transportation planning initiatives. He is responsible for the pursuit and delivery of projects for public and private sector clients. His expertise is in the area of functional planning, roadway safety and geometric design, and traffic operations.

Mr. Steel has presented his work at national conferences including the Transportation Association of Canada (TAC), The Canadian Institute of Transportation Engineers (CITE) and ITS Canada. He has participated as a reviewer, presenter and moderator. He is the Past President of the Institute of Transportation Engineers Southern Alberta Section Executive and past board member with CITE.

RELEVANT EXPERIENCE

A few of the projects recorded in this work experience present expanded scopes to highlight particular features of the project and overall, provide more details.

A sample of recent projects completed or near completion where Mr. Steel's role included project manager, primary author, technical lead, peer reviewer, public consultation lead or a combination.

PROJECTS SPECIFIC TO LANDFILL DEVELOPMENT

- Traffic Signal Optimization, Comox Valley Waste Management Centre, Cumberland BC: peer report review for the implementation of a traffic control measure to manage single file traffic operations along the landfill access road.
- Transportation advisor for the license renewal and proposed expansion of a private landfill company, including consultation with the local road authority to address access concerns. Concerns related to queue spill back and parking on an adjacent highway, and inadequate access requirements. Lead engineer for the traffic impact assessment and technical advisor to the design team to address site layout, circulation and truck accommodation.
- Traffic Impact Assessment, Beaver Regional Waste Landfill, Ryley, AB: addressed the expected impact to the existing road infrastructure along Highway 854 and Highway 14 from the construction of a proposed storage facility at the landfill.
- Intersection Analysis at Highway 9:10/Range Road 9-4, access to Youngstown Regional Landfill, AB: determine the future requirements for the main landfill access as part of highway geometric and safety improvements.
- Traffic Count Program, Calgary, AB: managed a program to assist an urban landfill owner to understand the frequency of traffic to/from the landfill site to address local resident concerns related to large truck movements.
- Intersection Analysis and Queue Length Determination, Regional Municipality of Wood Buffalo Landfill Access Road at Highway 63:10: analyzed the intersection performance and the buildup of queues entering and exiting the regional landfill; recommendations provided to improve the operation and wait time at the scales.
- Site Layout, Fox Creek Landfill, AB: provided transportation advice regarding the site layout and traffic flow through the landfill to enhance operations and safety.

TRAFFIC IMPACT ASSESSMENTS (TIA) AND TRAFFIC OPERATIONS ANALYSES

Recent assessments completed where Mr. Steel's role included project manager, assistant project manager, primary author, technical lead, peer reviewer or a combination of these roles.

- TIA and Transportation Operations Plan – Saskatchewan Joint Use Schools Project, July 2015 to September 2016

EDUCATION

M.Eng., Civil Engineering with International Studies, Heriot-Watt University, Edinburgh

AREA OF EXPERTISE

Corridor planning
 Functional planning
 Road safety engineering
 Preliminary engineering
 Public consultation
 Technical writing and presenting
 Project management

REGISTRATIONS/ AFFILIATIONS

Member, Association of Professional Engineers and Geoscientists of Alberta (APEGA)
 Member, Professional Engineers Ontario (*pending*)
 Member, Association of Professional Engineers and Geoscientists of Saskatchewan (APEGS)
 Member, Institute of Transportation Engineers (ITE)
 Past President, Southern Alberta Section, Institute of Transportation Engineers
 Local Arrangements Committee, 2013 Canadian Institute of Transportation Engineers (CITE) Annual Conference

OFFICE

Calgary, AB

YEARS OF EXPERIENCE

13

CONTACT

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- Expanded Scope: developed operational plans for four sites in Saskatoon and one in Martensville that incorporated the City of Saskatoon's requirements for school site operational plans. A meeting was held with the City of Saskatoon to understand their particular requirements to address transit and school bus servicing, site access and layout constraints, parking and loading requirements, pick-up and drop-off needs, accommodation and desire line path considerations for bike and walking students, and to establish school zones and traffic control device (signage) planning. This work also involved coordinated reviews of architectural plans developed by the contractors teams assigned to design and build the five individual school sites within a compressed timeframe. Design reviews and input was required at strategic points in the project to ensure schedule adherence for the various development permits the contractor required to allow progression from foundation design onwards. Several iterations of the design were reviewed as input was provided as part of developing operations plans, specifically addressing parking demand and site circulation, transit stop coordination with on-street parking, and minimizing exposure of pedestrians and cyclists to vehicle parking lot paths.
- Mr. Steel was the transportation planning lead overseeing project coordination between the traffic consultant and design team, while meeting with the municipalities to address scoping and individual site requirements. He visited comparable school sites in the general project areas to gain an understanding of specific municipal requirements and applications of best practices for traffic control, parking layouts and circulation etc. that would ultimately influence project recommendations. Given the time restrictions associated with this work, quick responses to action requests were provided by having at least two senior engineers on staff assigned to the project that could respond independently to meet contractor demands.
- TIA – Saskatchewan School Bundle Project: assessed three sites in Regina, four in Saskatoon, one in Warman, one in Martensville. Included site access reviews, parking supply and demand requirements for onsite and off-site, and measures to encourage alternate modes of transportation. Included student and staff mode surveys at an existing joint-use site to assist with trip generation for these proposed sites around the province.
- TIA – Alberta Schools Alternative Procurement IV Project: peer reviewer of four sites; three in Edmonton and one in St. Albert.
- TIA – Sister Alphonse Academy K-9 School and Joseph M Demko K-9 School Transportation Assessment, St. Albert: performed intersection analysis to determine operational constraints and required improvements with three future roundabout locations within St. Albert to manage the impact from two proposed school sites
- TIA – Northwest Recreation Centre, Calgary: senior reviewer of the impact analysis and report prepared for this future recreation facility. Assessment reviewed transit, cycling and pedestrian requirements, parking demand and access requirements since the proposed spacing did not meet City guidelines.
- TIA – Great Plains IV Industrial Area, Calgary: project engineer assisting with the data collection and initial analyses of this brownfield site adjacent to a key skeletal road in southeast Calgary.
- TIA – Suncor Energy, Meadow Lake Project, near Fort McMurray: this study reviewed the access requirements of workers arriving to the project site via private vehicle as well as bus operations. Two intersections were analyzed. Future infrastructure plans were considered to account for the twinning of Highway 63 and the possible realignment of the primary site access road.
- TIA – Gravel Pit Operations along Range Road 33, Parkland County and Lac Ste. Anne County: this study was undertaken to investigate the issues and possible impacts at local road and four-lane divided (twinning) highway intersections due to the additional traffic from two gravel pit operations.
- TIA – Proposed Development of Olds-Didsbury Airport: reviewed expansion plans of the airport to determine future transportation infrastructure requirements to support the proposed commercial growth of the airside lands.
- TIA – Prins Mobile Home Park, West of Brooks: this study addressed the future roadway requirements to support the expansion of this residential area on the outskirts of Brooks.
- TIA – MEG Energy Corp., Christina Lake Regional Project: quantified the impact to Highway 881 and the project site access to address a cumulative effect from MEG's expansion plans as well as an adjacent plant site for another resource developer. This project site is located in an area with intensified development opportunities and future expansion plans. The assessment provided recommendations to support future upgrades of the intersections reviewed in support of the expansion plans.
- TIA – Athabasca Oil Sands Corporation (AOSC) Tests, Pilots and Commercial Projects: undertaken to analyze the Highway 63 corridor and future accesses north of Fort McMurray, and to provide recommendations associated with gaining future access to project sites. The assessment provided support to the application of AOSC projects.
- TIA – Proposed LNG Facility in Sturgeon County: reviewed the expected impacts at several roadway intersections in the vicinity of the proposed site.
- TIA – Beaver Regional Waste Landfill, Highway 854 North of the Village of Ryley: addressed the impacts of the traffic generated from the proposed truck storage facility at the Beaver Regional Waste Landfill to adjacent network including the intersections of Highway 854 and Highway 14.

- Traffic Signal Optimization, Comox Valley Waste Management Centre, Cumberland, BC: peer report review for the implementation of a traffic control measure to manage single file traffic operations along the landfill access road.
- Transportation advisor for the license renewal and proposed expansion of a private landfill company, including consultation with the local road authority to address access concerns. Concerns related to queue spill back and parking on an adjacent highway, and inadequate access requirements. Lead engineer for the traffic impact assessment and technical advisor to the design team to address site layout, circulation and truck accommodation.
- Intersection Analysis at Highway 9:10/Range Road 9-4, access to Youngstown Regional Landfill, AB: determine the future requirements for the main landfill access as part of highway geometric and safety improvements.
- Combined Traffic Impact and Safety Review, Pepper's Gas Station, Highway 28, Waskatenau, AB
- Dewdney Road and Pinkie Road Level of Service Analysis, Regina
- Caronport Access and Highway 1 Level of Service Analysis, Caronport, SK
- Intersection Analysis and Queue Length Determination, Regional Municipality of Wood Buffalo Landfill Access Road, AB
- Analysis of three intersections along Highway 628 adjacent to the municipal boundaries of Spruce Grove and Stony Plain
- Analysis of two intersections along Highway 628 adjacent to Edmonton within Strathcona County
- Intersection analysis at Highway 563 and Springbank Road/Old Banff Coach Road at Calgary

FUNCTIONAL PLANNING STUDIES

- Highway 16 and Highway 316 Future Interchange Control Circle Determination, Clavet, SK, September 2015 to January 2017
 - Purpose: identify the future interchange configuration and right-of-way footprint that will adequately address the surrounding rural municipality's growth plan expectations.
 - Scope: traffic volume projections, assignment, distribution and analysis; develop conceptual interchange configurations that meet design standards; deliver Ministry presentations and progress reports; develop a high-level footprint plan to guide development and the next steps of work.
- Spectra Energy Dewdney Terminal Access Planning Study, Regina, November 2015 to June 2016
 - Purpose: identify the future intersection location to ensure that the City of Regina and the Saskatchewan Ministry of Highways and Infrastructure standards are met to the satisfaction of both parties. The need to relocate the existing intersection is due to its proximity to the Regina Bypass.
 - Scope: review road authority standards; work with two authorities to find a location that satisfies access management requirements at opening day and in the future; facilitate various meetings between the proponent and road authorities to establish a preferred location; intersection analysis; prepare study report documenting discussions, analyses and recommendations.
 - Resolutions: held several meetings individually and collectively with the three parties involved to establish a location for the realignment of this access that satisfies proximity to the future Dewdney Avenue interchange while meeting the City's spacing requirements from a key arterial roadway.
- Estevan Functional Interchanges Study, SK, January 2013 to August 2015
 - Purpose: evaluate options at four future interchange locations along the Estevan Truck Route.
 - Scope: coordinate geotechnical, environmental and historical resource overviews; undertake traffic volume analysis and projections; lead the option development and evaluation of service and system interchanges; facilitate public and private stakeholder engagement activities; make municipal Council presentations; identify capital costs; establish an implementation plan to guide fiscal spending.
 - Resolutions: facilitated meetings with stakeholders to address many previous unresolved concerns regarding the economic impacts and access needs.
- Highway 1 and the Pilot Butte Interchange Functional Planning Study, SK, November 2011 to January 2014
 - Purpose: define the future interchange configuration that addresses safety and operation concerns that accommodates an area experiencing rapid growth while minimizing land requirements.
 - Scope: develop and evaluate interchange options; develop functional plans; establish a traffic model to address various surrounding development plans; deliver a stakeholder consultation plan including two open houses, municipal Council presentations and several meetings with a local First Nation for Reserve status land acquisition; document analyses and findings in a study report. Recommendation: Diverging Diamond Interchange.
 - Resolutions: worked with the local communities and businesses to understand concerns and present an option that would address those concerns to their satisfaction while working with other stakeholders to minimize impacts; public media documented the support from these efforts.

- Award recipient:
 - ✓ Brian Eckel Award of Merit, 2014 from the Association of Consulting Engineering Companies – Saskatchewan.
 - ✓ Excellence in Innovation, 2014 from Tetra Tech Canada Inc.

ROAD SAFETY AUDITS

Recent audits completed where Mr. Steel's role included lead auditor, auditor, peer reviewer or a combination of these roles.

- Highway 2, Highway 53 and Highway 795 in and around Ponoka, **preliminary engineering (planning) stage** audit of more than 38 km of divided and undivided roads (31 km on the national highway system/CANAMEX corridor). April 2016
 - Focused on the safety performance of the highways, intersections and associated road work with respect to cross-section, operations, pavement markings, roadside hazards and turnouts, ground-mounted and overhead signage, traffic control, pedestrian facilities and connections.
 - Identified improvements to the laning, signage, markings and hazards associated with four interchanges and one overpass along Highway 2 (CANAMEX corridor) as well as improving the acceleration and deceleration facilities for these interchanges.
 - Included assistance with the proposed conversion of a full cloverleaf layout to a partial cloverleaf design at Highway 2/ Highway 53.
- Highway 63:11:12, \$150 million interchange at Highway 686:20 (Parsons Access Road), Fort McMurray – multiple audits performed at the **detailed design stage** (on various design iterations) and at the **pre-opening stage**. Interchange construction is part of the future freeway conversion of Highway 63 to the north of Fort McMurray. Individual audit completion ranges between January 2011 and November 2015
 - Stage 1 configuration including two loop ramps and C-D road, two signalized intersections (one at a ramp terminal and the other along the service road network), a pedestrian and vehicle underpass, high load ramps for over-dimensional vehicles.
 - Ultimate stage configuration: similar configuration to Stage 1 but with the addition of directional ramps to eliminate the ramp terminal intersection; included discussion on the appropriateness of median crossover access controls (gates, fixed barriers, etc.).
 - Hybrid configuration with a reduced footprint and single loop ramp, signalized intersection on the Highway 63 in close proximity to start/end of ramps for development access.
 - Detailed design option 9B (Stage 1) with a single loop ramp, C-D roads, high load ramps for over-dimensional vehicles, bus on shoulder operations, signalized intersection on the Highway 63 for development access.
 - Pre-opening audit focused on signage and lighting specifically at decision points, barrier placement (median and roadside), clear zones, pavement markings, and erosion control devices within the ditches.
- Rosevear Road River Crossing, Yellowhead County, AB – lead auditor for the future river crossing and associated highway and local road alignment improvements; **detailed design stage** audit. March 2015
- Highway 9:10 (12 km west of Highway 884 to Youngstown – 11 km in length) and Highway 36:12 (3 km south of Highway 586 to 19 km north of Highway 586 – 22 km in length), asphalt rehabilitation and other work, **pre-opening stage** audit. November 2013
 - Focused on compliance of recently adopted safety enhancements including shoulder rumble strips, identifying roadside hazards, and intersection conspicuity and guidance.
- Independent review of third party road safety audit report – Highway 63:12 near Mildred Lake, senior reviewer of report. November 2013
- Northern Calgary High Load Staging Area Planning Study – project manager for the functional planning study and lead designer of the staging area. Independent audit team completed a **planning stage** audit of the functional design; prepared response report to the audit findings. December 2012
- Highway 791:08 (2 km south of Highway 587 to 0.5 km south of Highway 590 – 14 km in length), final stage paving and other works, **detailed design stage** audit. March 2012
 - Focused on the safety performance of the highway and intersections with respect to cross-section, pavement markings, roadside features, signage, rumble strip placement, traffic control and illumination.
- Highway 856:02 (Forestburg to Highway 13 – 14.5 km in length), final stage paving and other works, **detailed design stage** audit. March 2012
 - Focused on the safety performance of the highway and intersections with respect to cross-section, pavement markings, roadside features, signage, rumble strip placement, traffic control and illumination.

- Highway 899:06 (18 km south of Highway 12 to Highway 12 – 18 km in length), final stage paving and other works, **detailed design stage** audit. March 2012
 - Focused on the safety performance of the highway and intersections with respect to cross-section, pavement markings, roadside features, signage, rumble strip placement, traffic control and illumination.
- Lead workshop facilitator for the City of Edmonton – ‘Introduction to Road Safety Audits’ with two case studies. December 2011
 - Tetra Tech held a standing agreement to conduct road safety audits with the City of Edmonton between 2011 and 2013. By way of introducing the City of Edmonton project managers to road safety audits, a workshop was prepared and delivered outlining the process and benefits of road safety audits, as well as providing two case studies for participants to familiarize themselves with the process (**detailed design and pre-opening stages**); case studies included:
 - ✓ 97 Street between 125A Avenue and 127 Avenue, Edmonton; railway overpass and piers between driving lanes.
 - ✓ Highway 14 and Main Street, Town of Wainwright; intersection upgrades.
- Expanded Scope: in the absence of the project lead, Mr. Steel was required to coordinate the development of a workshop for City of Edmonton staff responsible for individual project delivery within a range of transportation disciplines: planning, design, operations, road safety etc. This workshop was integral in advancing the knowledge of City staff in the road safety audit process as well as understanding the benefits of completing such audits, specifically the return on investment by reducing the potential for higher severity collisions on the road network for all road users, not just passenger vehicles. Mr. Steel worked with the City to create learning materials and case studies that could be used in the workshop setting as well as back in the office on actual projects. One of the critical outcome of this workshop besides the dissemination of knowledge, was the desire to advance several road safety audits by varying departments when previous contracts held by others resulted in no audit assignments being made. The City has continued to require audits on select projects to reap the benefits that such work can bring.

IN-SERVICE ROAD SAFETY REVIEWS

Recent reviews completed where Mr. Steel's role included primary author, technical lead, peer reviewer or a combination of these roles.

- Highway 658:02 from Highway 43 (km 0.00) to Blue Ridge (km 7.20), April 2017
 - Expanded Scope: this highway corridor is used by a large number of logging trucks and other resource development that travel through the small urban community of Blue Ridge in north-central Alberta. At the request of the province, a safety review was conducted to address perceived safety issues specific to the initial seven kilometres given high truck traffic volumes and a narrow roadway width. A review of the collision data for this corridor did not identify any specific safety concerns as demonstrated in the data other than an over-representation of vehicle-animal collisions. The study was adapted to look beyond just those collisions reported over the review period (an objective review that reacts to issues) and take the approach of a subjective proactive approach to identify areas of potential safety and future conflict concerns, with recommendations made to address the short-term, mid-term and long-term perspectives. A quick delivery turnaround was required to allow the province to program any short-term improvements within the next available rehabilitation program. Of note regarding this project is the reduced posted speed along the corridor due to the horizontal alignment of the highway, its narrow (and at times lack of) shoulders, several skewed intersections and a railway crossing located on a 7.1% vertical slope. All of these factors were reviewed as part of establishing a multi-year program for the province to address road safety related concerns.
 - Mr. Steel lead all efforts of the project to allow the tight timelines to be met, completing the site observations, collision analysis, identification of safety related issues (objective and subjective), development of collision countermeasures and proposed corridor enhancements. He was the primary author of the report documenting the methodology and analyses completed.
- Alaska Highway km 133 to km 968 – Site specific reviews of four locations ranging between 10 km and 16 km in length, northern BC to the Yukon; intent: to address known safety issues, collision prone sections and identify areas of higher risk.
- Review of five isolated intersections/corridors within the North Central Region and eight within the Central Region, AB; intent: to address occurrence of collisions and recommend appropriate mitigation specific to the existing safety performance.
- Highway 29:10 – Highway 29 and Highway 41, North of Elk Point, unique triangle intersection; intent: review the safety and operation of the intersection and identify improvements to justify a revision to the current treatment.
- Combined Traffic Impact and Safety Review, Pepper's Gas Station, Highway 28, Waskatenau, AB; intent: to address near misses, operational issues and known safety performance concerns associated with long weekend traffic and future development of the commercial site.
- Highway 2:32 southbound to eastbound off-ramp, interchange at Airport Road, east of Edmonton International Airport; intent: to address safety and operational concerns associated with queuing traffic entering a roadway with sight distance restrictions.

- Highway 16:02 through the Town of Hinton; intent: recommended safety enhancements at various intersections and along the divided corridor through the entire town limits.
- Highway 63:01 through the Hamlet of Grassland intent: recommended safety enhancements at various intersections and along the corridor including the parking of vehicles within the highway right-of-way.
- Red Light Violations Study; Highway 43:16 in Whitecourt, two intersections: West Mountain Road/Mill Road and 51 Street.
- Completed over 80 assessments for Alberta Transportation.

POLICY DEVELOPMENT

Recent projects completed or under significant completion where Mr. Steel's role included project manager, primary or contributing author, technical lead, peer reviewer or a combination of these roles.

- Capital Plan and Offsite Levy Development – Lac Ste. Anne County, Alberta, May 2014 to ongoing
 - Confirm the core road network within the County, identify capital plan expenditures for road and bridge improvements through prioritization and evaluation of all core roads, and Council presentation for adoption of capital plan improvements and expenditures.
 - Develop an offsite levy bylaw for future development considerations within the County for approval by Council and adoption by administration.
 - Utilize a GIS platform for information dissemination, specifically identifying the critical roads within the County reviewed as part of the plan development, highlighting sections of County road to be upgraded within the capital plan, prioritization and expected year of need.
 - Update the County's General Municipal Servicing Standards to reflect current industry practices.
- Commercial Safety Rest Area Project – Alberta Transportation, June 2016 to ongoing
 - Review of 16 locations along the highest priority corridors within the province.
 - Promote project to engineering community through conference proceedings and presentations.
 - Develop engineering guidelines/standards for highway commercial area implementation; one of the lead authors specifically responsible for:
 - ✓ Network systems analysis.
 - ✓ Needs assessment.
 - ✓ Site selection philosophy and criteria.
 - ✓ Site development requirements including parking demand and layout, roadway engineering requirements and accommodation of commercial vehicles.
 - Coordinated the analysis of truck GPS data to understand truck use and patterns in close proximity to the various locations along the study corridors for the purpose of determining where future safety rest areas may be located to enhance the safety of the corridors for the trucking industry and allow operators to better meet truck regulations regarding hours of operation
- Traffic Signal Warrants and Policy Development – Technical Standards Branch, Saskatchewan Ministry of Highways and Infrastructure, November 2015 to October 2016
 - Jurisdictional scan and interviews with selected North America jurisdictions with similar environmental conditions.
 - Document review of current and proposed practice changes.
 - Develop traffic signal policy statements to guide the application of signals and determine location compatibility.
 - Establish warrant procedures based on peak hour traffic volumes, crash experience, signal coordination and capacity analysis.
 - ✓ Present considerations for future warrant development.
 - Calibration check of policy statements and warrant procedures at four location determined by the Ministry that encompass a variety of environmental conditions.
 - Report preparation, workshop coordination and delivery.