

Request for Proposals CMB 20151214

**Proposal for
2016-2017 Pavement Surface Condition
Surveys**

Prepared for:

**Ministry of Transportation and
Infrastructure
British Columbia**



DYNATEST CONSULTING, INC.
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UNITED STATES OF AMERICA
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February 10, 2016

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1 LETTER OF TRANSMITTAL

David Hosick
Manager, Bridge Information System
Ministry of Transportation and Infrastructure – Construction & Maintenance Branch
940 Blanshard St. Victoria B.C. V8W 3E6
P.O. Box 9850 – Stn Prov. Govt. Victoria B.C. V8W 9T5

Reference: CMB 20151214 – 2016-2017 Pavement Surface Condition Surveys.

Mr. Hosick,

Dynatest Consulting Inc. and Superior City Services Ltd. (SCS) are pleased to submit this proposal to provide pavement surface condition data collection consulting services to the British Columbia Ministry of Transportation and Infrastructure (MOTI). Our firm comes with significant pavement engineering expertise, an extensive resume of successfully-completed similar projects, and state-of-the-art pavement evaluation equipment and software.

We understand the British Columbia MOTI has identified several services that are to be performed under this RFP, including (1) to conduct a network level pavement surface condition survey for 18,115 km distributed in two years of data collection; (2) to provide an accurate high quality method of data collection to be able to monitor the condition of the road network; (3) to link the measured pavement distresses for each section to the MOTI's GIS maps, and (4) to develop a summary report containing surface distress ratings, transverse profiles/rut depths, roughness, and forward right of way images. The contract will include the option to extend into calendar years 2018 and 2019 when approximately 18,000 Km additional lane-km will be surveyed.

The Dynatest Consulting Team has the necessary equipment, experienced personnel, and engineering expertise to meet and exceed all of the requirements set forth in the RFP. Dynatest is a world-renowned pavement consulting engineering firm. *We were the 2015 top-ranked firm for providing pavement management plans implementation and Pavement Condition Index (PCI) inspection services by the US Army Corps of Engineers, and we were recently awarded a five-year contract to provide these services throughout the Department of Defense (DoD).* Within the last year alone, we have performed similar services for several agencies including the Bismarck-Mandan MPO, ND; City of Indianapolis, IN; City of Alexandria, VA; City of Wichita Falls, TX; City of Hamilton, OH; several military installations; Prince George's County, MD, and California Department of Transportation (Caltrans).

Since 2001, we have also performed the annual TxDOT (Texas) Pavement Management Information System (PMIS) pavement surface condition survey which consists of inspecting 92,000 miles of TxDOT managed roadways annually. *The TxDOT PMIS pavement condition survey is the largest annual pavement condition survey on earth, and we have delivered on-time and within budget every year we have been under contract with TxDOT.* We fully understand these types of projects, and we are confident that we can provide a high-quality, cost-effective pavement condition data collection program to the MOTI.

Our proposed Project Manager, Alvaro Ulloa-Calderon, Ph.D., P.E., has extensive experience performing pavement evaluation for local government agencies. s.22
s.22

As with any other project, our approach to estimating costs is a transparent process. If awarded this project, we will be willing to extend to the MOTI our consulting services rates which have been recently reviewed and approved by the US Army Corps of Engineers. We are also eager to interview with the MOTI, should the MOTI decide to hold shortlist interviews for this project.

We believe that The Dynatest Consulting Team can exceed the expectations of the MOTI. The approach we propose is based on four principles: (1) Commitment to work closely with MOTI staff to ensure that all pavement condition data collection goals are met; (2) Quality supported by our track record – we are consultants to several State, County and local agencies; (3) Return on investment – we understand the ultimate goal of a pavement condition data collection program is to assist an agency in acquiring high quality pavement condition data that will assist the agency in best allocating its limited pavement M&R budget and justifying additional M&R funding needs, when necessary; and (4) Extensive pavement management experience and expertise – we have conducted pavement condition surveys, implemented/updated pavement management plans, and provided pavement engineering expertise for:

- | | | |
|-------------------------|--|------------------------------|
| ✓ CALTRANS | ✓ TxDOT – <i>Largest annual pavement condition survey in the world – more than 1,000,000 miles surveyed!</i> | ✓ Frisco, TX |
| ✓ Orange County TA, CA | | ✓ Prince George's County, MD |
| ✓ County of Ventura, CA | | ✓ Wichita Falls, TX |
| ✓ County of Alameda, CA | ✓ Alexandria, VA | ✓ Anchorage, AK |
| ✓ Cook County, IL | ✓ Indianapolis, IN | ✓ 30+ DoD Installations |

Thank you for this opportunity to provide our proposal. This proposal is valid for 90 days. Please do not hesitate to contact us in case of any questions or concerns.

DYNATEST CONSULTING INC.

Sincerely,

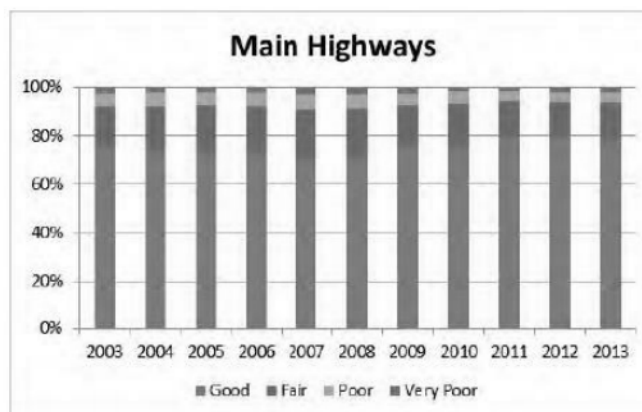


Alvaro Ulloa-Calderon, Ph.D., P.E.
Project Manager
+1 805 648-2230
AUlloa@dynatest.com

Dynatest Consulting Inc.

2 UNDERSTANDING OF THE SCOPE OF SERVICES

The British Columbia MOTI has requested proposals from pavement engineering consulting firms to conduct a pavement surface condition data collection for a total of 18,115 km distributed in 2016 and 2017. The successful completion of this project will enable the MOTI to *better assess the condition of its roadway pavements, optimize the expenditure of its existing maintenance and rehabilitation (M&R) funding, and effectively justify its future funding needs*. The Dynatest Consulting Team will make certain that this critical project is a success for the MOTI. Our proposal will illustrate how The Dynatest Consulting Team – working closely with the MOTI – can achieve these objectives.



A total of 9,063 and 9,052 lane-km will need to be surveyed in 2016 and 2017, respectively. A summary report containing surface distress ratings, transverse profiles/rut depths, roughness, and forward right of way images will be submitted to the MOTI following the 2015 Pavement Surface Condition Rating Manual. In addition, GIS maps containing pavement distresses information for both highways and side roads will be delivered to the MOTI. Dynatest will provide all necessary information and results to the MOTI so that quality assurance can be undertaken in the most efficient and transparent manner. We are confident that our team has the pavement expertise, practical project experience, and local presence necessary to make this project a huge success.

3 TEAM KNOWLEDGE AND EXPERIENCE

3.1 Dynatest Consulting Inc.



Dynatest Consulting has provided pavement consulting engineering services and products to the global community since 1978. We are an established company with an excellent reputation in the industry. We pride ourselves on our unique combination of in-house analytical expertise and practical, in-the-field capabilities that enable us to successfully perform many different types of projects and provide practical solutions for a wide array of clients.

For over 37 years, Dynatest Consulting has provided pavement management solutions to State, City and local agencies as well as the Department of Defense. Our most common pavement engineering and consulting services include:

- Pavement management plan implementations and updates
- Pavement condition evaluations - manual and automated
- On-call pavement engineering, evaluation, and management support
- Pavement nondestructive structural testing and analysis
- Pavement friction and roughness testing
- Customized analysis and reporting for engineering projects
- Training in pavement engineering and management principles and practices

Dynatest Consulting has more than fifteen (15) pavement condition inspectors and more than fifty-five (55) total employees located in the United States. Our project staff and inspectors have worked for several agencies, and always successfully accomplish a project regardless of the location. Furthermore, we have significant pavement management and engineering expertise Worldwide in Denmark, EMEA, ASIA, UK, and Brazil; including seven offices in the United States located in Westland, Michigan; Chicago, Illinois; Lemoyne, Pennsylvania; Starke, Florida; Austin and College Station, Texas, Alpharetta, GA, and Ventura and Sacramento, California. With the available resources and offices ready to commit to this project, the Dynatest Team is in full capacity to provide the required services to the MOTI.

Dynatest has the unique advantage of being the manufacturer of its own equipment. Therefore, any state-of-the-art equipment troubleshooting, maintenance or repairs will be conducted in-house with available experts ready to undertake the most complicated tasks in the most effective way.

Dynatest Consulting Corporate Information

Firm Name: **Dynatest Consulting Inc.**
www.dynatest.com

Primary Office
Locations:

**California Office –
Corporate Headquarters**
165 South Chestnut Street
Ventura, California 93001
Phone: (805) 648-2230
Fax: (805) 648-2231

**Georgia Office –
Production and Support Center**
11415 Old Rosewell Road, Suite 100
Alpharetta, GA 30009
Phone: (904) 964-3777
Fax: (904) 964-3749

Age of Firm: **Dynatest Consulting Inc. has been in business for over 37 years. We are a California Corporation and were incorporated in 1978.**

3.2 Superior City Services Limited.



Superior City Services Limited (SCS) was founded in 1963 with the current owners since 1989. SCS has provided services to contractors and municipalities in British Columbia and Alberta with a variety of equipment and expertise. SCS has approximately 50 employees which includes management, IT staff, equipment operators, Field Service supervisors, mechanics and Administrative staff. In the last 7 years SCS has performed several contracts to repair sewers throughout the Vancouver area. These contracts require a significant level of training and certification where SCS has a proven record to complete assignments with technical depth. SCS fleet includes 6 vector trucks, 23 sweeper trucks, 6 water trucks, 6 sewer line CCTV trucks, 2 sewer grouting trucks, and 7 cars and pick-ups.

3.3 Local Presence and Previous Work with BC MOTI

Superior City Services, Ltd. (SCS), our assistant project manager, is conveniently located in the province of British Columbia in Surrey, B.C. The Dynatest Consulting Team would like to grow our relationship with the MOTI by providing the best consulting services.



4 TEAM REFERENCES

Note: More references are available upon request!

4.1 California Department of Transportation

Dynatest collected pavement distress, roughness, rut, faulting, curvature, grade and GPS data on approximately 1,500 lane miles on non-State highway segments throughout Southern California. The data was used for entry into the Highway Performance Monitoring System (HPMS), which is a federally mandated inventory system and planning tool, designed to assess the nation's highway system. HPMS is used as a management tool by State and Federal governments and local agencies to analyze the system's condition and performance. Dynatest reported the data for a tenth of a mile interval. The project was successfully completed ahead of schedule.

Mr. Philip Tohme served as the project manager and project engineer. Mr. Tohme coordinated all tasks of the project, provided monthly updates, performed QC/QA on a regular basis, and submitted a final report to the client. Approximate budget: \$200,000.

Dynatest Project Manager:	Philip Tohme, PE
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Client:	Caltrans Mr. Harinder Hans Division of Transportation System Information 1120 N Street, MS 38 Sacramento, CA (916) 653-4822 e-mail: harinder.han@dot.ca.gov
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Performance Period	July 2013 – June 2014
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4.2 Nova Scotia Transportation & Infrastructure Renewal, Canada

Dr. Alvaro Ulloa-Calderon provided pavement engineering, Falling Weight Delfectometer (FWD) and roadway evaluation training in Canada for the Nova Scotia Highway Construction Department. Training included the best practices of using the FWD, pavement rehabilitation design using the Mechanistic-Empirical pavement design methodology by means of Dynatest ELMOD 6.0 software.

Recently, Dr. Ulloa-Calderon is the project manager of an on-going on-call consulting agreement between Dynatest and Nova Scotia Transportation & Infrastructure Renewal. The objective of this agreement is for Dynatest to provide engineering assistance in pavement evaluation, backcalculation of layer moduli, preparing and reviewing test plans and data analysis.

Dynatest Project Manager: Alvaro Ulloa-Calderon, Ph.D., PE.

Client: Nova Scotia Transportation & Infrastructure
Renewal
Adam Marlin, P.Eng.
Pavement Management Engineer
Highway Construction Services
Email: adam.marlin@novascotia.ca
Phone: 902-478-0196



Performance Period July 2013 – Present

4.3 Automated PCI Surveys at Military Installations

Dynatest Consulting has extensive experience with MicroPAVER and both manual and semi-automated PCI surveys. Within the last five years, and as a sub consultant to firms operating under the auspices of the US Army Corps of Engineers, CERL, Dynatest has performed over twenty MicroPAVER and PCI related projects for various DOD installations, including:

Fort Campbell (340 miles)	Fort Dix (160 miles)
Charleston NWS (150 miles)	Lakehurst NAS (115 miles)
Fort Riley (110 miles)	McGuire AFB (95 miles)
Fort McCoy (90 miles)	Charleston AFB (74 miles)
Cape Canaveral AFS (60 miles)	Patrick AFB (40 miles)
Adelphi ARL (10 miles)	

The semi-automated PCI surveys were conducted with Dynatest's PCSS, which is equipped with laser line-scan pavement imaging system, high-definition Right of Way (ROW) cameras, inertial measurement unit (for highway geometrics), and a seven (7) laser profiler for measurement of pavement roughness and rutting.

In addition, Dynatest has developed its own software; Dynatest Explorer - Dynatest Rating Module (DE-DRM) for evaluating pavement distresses using high-resolution pavement images. DE-DRM provides the user with a graphical representation and with the ability to edit all data sets collected with the PCSS, including pavement images, ROW images, pavement profile measurements (IRI and RN), rutting, pavement geometry and GPS readings.

Dynatest's experienced pavement technicians use DE-DRM to measure, record and rate pavement distresses in accordance with the distress definitions described in ASTM D6433. Pavement distress data are compiled into XML files for direct import into MicroPAVER.

Dynatest Project Manager:	Kurt Keifer, PhD, PE
Client:	US ARMY CORPS OF ENGINEERS (ERDC-CERL) 4144 E. Grand Canyon Dr. Chandler, AZ 85249 M. Y. (Mo) Shahin, Ph.D., P.E. mo@myshahin.com (217) 369-0609
Performance Period:	2012 to Present

5.4 City of Redlands, California

Dynatest Consulting - in association with Converse Consultants were selected to complete the Phase I&II Pavement Maintenance and Rehabilitation Strategies Plan for 236 lane-miles of the City of Redlands roadway network. Dynatest successfully determined the most-cost effective pavement rehabilitation strategies based on the existing pavement and supporting subgrade layer moduli, traffic-induced loads, traffic characteristics, and environmental conditions. Dynatest conducted Falling Weight Deflectometer (FWD) measurements on the entire City's requested set of streets. The analyses were based on the Dynatest measured load-deflection data coupled with the pavement layer thicknesses provided by Converse Consultants.

At the end of the project Dynatest provided the draft analysis report including a pavement maintenance and rehabilitation decision tree having the City's most common M&R techniques for each pavement condition. In addition, pavement construction specifications were reviewed and developed. Pavement analysis and design training, including Dynatest Elmod 6.0 software, was provided for the City.

Dynatest Project Manager:	Philip Tohme, PE, and Alvaro Ulloa-Calderon, Ph.D., PE.
Client:	Mr. Goutam Dobey, PE Associate Civil Engineer, Municipal Utilities and Eng. Dpt. 35 Cajon St, Suite 15A Redlands, CA 92373 (909) 798-7698 gdobey@cityofredlands.org
Performance Period:	July 2013 to Present



5.5 Snohomish County, Washington

Dynatest was retained by the County to perform annual StreetSaver pavement condition surveys on the County's roadway network, which consists of over 1,500 miles. The pavement condition surveys are performed during the summer months and the collected data are formatted for import into the County's pavement management system.

Dynatest Project Manager: Kurt A. Keifer, PhD, PE
 Client: Ms. Joyce Barnes, Engineer II
 Department of Public Works
 3000 Rockefeller Avenue M/S 607
 Everett, Washington 98201
 Tel: (425) 388-3488 Ext. 4530
 Joyce.barnes@snoco.org



Performance Period: July 2013 to 2018

5.6 San Manuel Band of Mission Indians, City of Highland, CA

The objective of this project was to determine pavement rehabilitation strategies based on the existing pavement and supporting subgrade layer moduli, traffic-induced loads, and environmental conditions. The structural analyses were based on mechanistic-empirical pavement design principles and FWD measurements, and considered a 10 and 20-year design period.

Pavement maintenance, rehabilitation or reconstruction alternatives were provided for each of the evaluated streets. The alternatives include preventive maintenance, mill and overlay, complete removal and replacement of the existing asphalt concrete (AC) layer, and reconstruction with aggregate base (AB) underlying the hot mixed asphalt (HMA) layer.

Dynatest was a sub-consultant to EMG Corp.

Dynatest Project Manager: Alvaro Ulloa-Calderon, PhD, P.E.
 Client: Erik Piller
 Vice President
 EMG Corp
 2121 North California Blvd., Suite 290
 Walnut Creek, CA 94596
 Phone: +1 800 733-0660 ext. 2704

Performance Period: October 2014 to November 2014

5.7 City of Burnaby, British Columbia

Superior City Services Ltd., was retained in 2009 by Burnaby for Lateral Inspection and Grouting Infiltration to flush and video, launch CCTV lateral lines from main connection. This project also included, grouting, interface grouting for sanitary sewer lines including cutting protruding service and grouting.

SCS Superintendent Raymond Ng
 Client: Mr. Bill Lowrie
 Director, Engineering
 4949 Canada Way
 Burnaby, BC, V5G 1M2
 (604) 294-7073



Performance Period: 2009-2014

5.8 The Corporation of the MOTI of North Vancouver

Superior City Services Ltd., was retained by the Corporation of the MOTI of North Vancouver for the ITT.102.13 Sanitary Sewer Rehabilitation and Grouting project to flush and video, grouting for sanitary sewer lines, mainline and lateral services including cutting protruding services.

SCS Superintendent	Raymond Ng
Client:	Mr. Marco Cusano (604) 990-3862
Performance Period:	2013-2014

5.9 City of Campbell River Tender 754

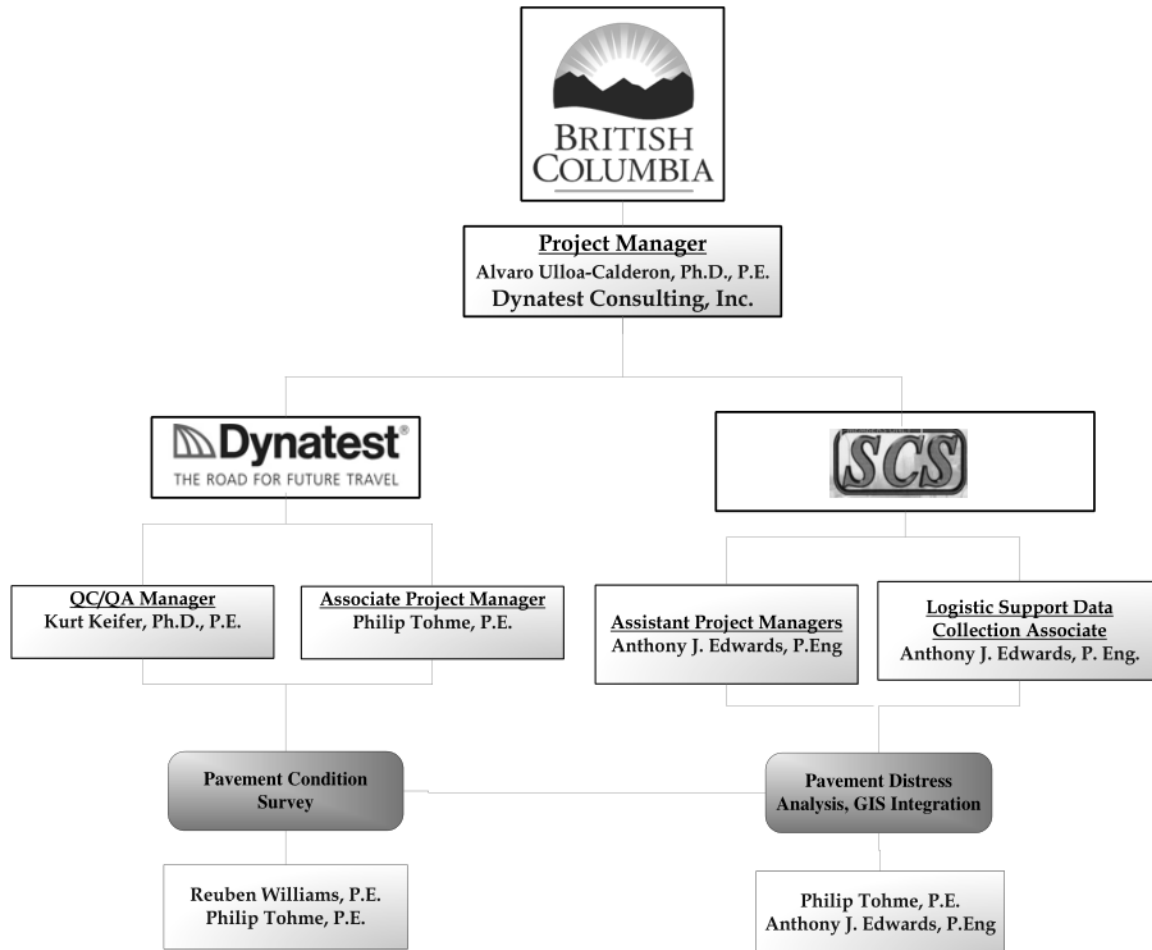
Superior City Services Ltd., was retained by the City of Campbell River Tender 754 for the 2013 Chemical Grouting of Mainline Sewer Joints, Laterals & TPRs to flush and video, mainline and lateral services for grouting and trenchless point repairs for sanitary sewer lines including cutting protruding service.

SCS Superintendent	Raymond Ng
Client:	Mr. Marek Pawlowski, A.Sc.T Pawlowski, Pawlowski & Associates Contract Consultant British Columbia Chapter of NASTT (604) 227-9549
Performance Period:	2013



5 PROJECT TEAM

Project Organization Chart



Dynatest Consulting Team Key Personnel

Note: The Dynatest Consulting Team works on a variety of projects. The appropriate resources will be assigned to the project to ensure an on-time delivery.

Alvaro Ulloa, PhD, PE shall serve as project manager and project engineer. He will be the principle contact with the MOTI and responsible for the quality of the project. Dr. Ulloa will work closely with the MOTI to review and confirm the objectives and key requirements of the project, scope of the project, major deliverables and key milestones, resources that will be needed, and the project schedule with key delivery dates. Dr. Ulloa will be responsible for the daily activities of the project, attending meetings, scheduling project tasks, coordinating field operations, analyzing data, and submitting reports. Dr. Ulloa will work closely with the other team members on all project tasks.

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Philip Tohme, PE will serve as the associate project manager. He will assist Dr. Ulloa with overall Quality Control/Quality Assurance (QC/QA) for this project and in all tasks on an as needed basis.

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Anthony J. Edwards, P. Eng will serve as the associate project manager from Superior City Services and will provide local logistic support to The Dynatest Consulting Team. He will assist Dr. Ulloa with the pavement distress data collection and route planning. In addition, he will serve as the main Canadian PE responsible for the project.

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Kurt A. Keifer, PhD, PE is the senior/partner engineer that shall serve as the QC/AQ manager and will be responsible for overseeing all aspects of this project. Dr. Keifer will work closely with Dr. Ulloa to review and confirm the objectives and key requirements, overall scope of the project, major deliverables, key milestones, resources required, and the project schedule.

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Reuben Williams, P.E., will be responsible for the data collection routing and planning of the project and will be assisting with the automated data collection task. Mr. Williams will work closely with Dr. Ulloa in reviewing the pavement inventory, GIS data, and will also assist on an as-needed basis during all stages of the project.

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Technicians and Operators: Dynatest has over twenty (20) trained and experienced pavement condition inspectors. It is estimated that a two-person crew will operate the PCSS for data collection and two or three technicians will be used for the distress rating.

6 METHODOLOGY

The Dynatest Consulting Team understands the technical and managerial requirements of pavement surface condition survey projects. We are confident that we have the experience and qualified personnel to meet and exceed the expectations of the MOTI, which include:

- Performing a Pavement Surface Condition Survey of the MOTI's 18,115 lane-kilometers distributed between 2016 and 2017.
- Establishing and executing a proactive, collaborative QC/QA program that will ensure that high quality pavement condition data is collected and reported to the MOTI.
- Communicating regularly with the MOTI Project Manager
- Submit a summary report containing surface distresses, transverse profiles, continuous rut depth measurements, roughness, stations, georeferenced properties of each evaluated parameter, and high-definition right of way images. All data will be submitted following the British Columbia MOTI's 2015 Pavement Surface Condition Rating Manual.

6.1 Project Work Flow

A proposed work flow diagram for this project is presented below.

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Project Work Flow Diagram.

6.1.1 State-of-the-art condition survey methodology

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6.2 Scope of Services

We understand the MOTI has identified several services that are to be performed under this RFP, including: (1) to conduct a network level pavement surface condition survey for 18,115 km distributed in two years of data collection; (2) to provide an accurate high quality method of data collection to be able to monitor the condition of the road network; (3) to link the measured pavement distresses for each section to the MOTI's GIS maps, and (4) to develop a summary report containing surface distress ratings, transverse profiles/rut depths, roughness, and forward right of way images.

The Dynatest Consulting team has identified the following tasks needed to successfully accomplish this project.

Task 1 – Project Management and Kickoff Meeting with the MOTI

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Task 2 –Network Definition

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Task 3 – Pavement Condition Data Collection with Dynatest PCSS.

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Task 4 – Data Integration with GIS System

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Overall Project Quality Control and Quality Assurance (QC/QA)

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Management/Resolution of Key Issues

The Dynatest Team has identify and accounted for the following potential issues to effectively deliver this project on-time and within budget:

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Proposed Deliverables

The Dynatest Team will submit the following revised products:

- 1) *Data Files:* s.21
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2) *Right-of-way-images (ROW)*: s.21
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3) *GIS Shapefiles*: s.21
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4) *Report*: s.21
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7 PROPOSED FEE

The Dynatest Consulting Team understands the technical and managerial requirements of pavement condition evaluations. The proposed fee, in Canadian Dollars is shown below:

Task No.	Description	2016 Price (Canadian Dollars)	2017 Price (Canadian Dollars)
1	Project Management and Kickoff Meeting	s.21	
2	Network Definition & Inventory/Maps Review		
3	Pavement Condition Data Collection and Analysis		
4	Data Integration with GIS System		
5	Reporting		
Total Estimate/year			
Total Price 2016/2017			

2016 and 2017 Survey			
Description	Lane Km	Unit Price	Cost
Survey & Reporting		s.21	
a) Highways	11,911		
b) Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for additional work			
Mobilization:	400		
Total Price (2016 and 2017):			
2018 and 2019 Survey			
Description	Lane Km	Unit Price	Cost
Survey & Reporting		s.21	
a) Highways	11,911		
b) Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for additional work			
Mobilization:	400		
Total Price (2018 and 2019):			

8 PROJECT WORK SCHEDULE

Project Tasks	2016/2017									
	March	April	May	June	July	August	September	October	November	December
1. Kick-Off Meeting	s.21									
2. QC/QA										
3. MOTI Quality Audit Before Data Collection										
3. Network Definition										
4. Pavement Condition Data Collection										
5. Pavement Surface Rating										
6. Data Integration with GIS System										
7. Draft Report Submission										
8. MOTI Audit of Contractor Initial Submission										
9. Final Report Submission										

9 VALUE ADDED SERVICES

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9.1 Dynatest Equipment and Resources

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10 RESUMES

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Letter of Transmittal - Executive Summary

February, 8th 2016

Mr. David Hosick - Manager, Bridge Information System
Ministry of Transportation and Infrastructure - Construction & Maintenance Branch,
Physical Address: 940 Blanshard St. Victoria B.C. V8W 3E6
Mailing Address: P.O Box 9850 - Stn Prov. Govt. Victoria B.C. V8W 9T5
Email: David.Hosick@gov.bc.ca

SUBJECT: Request for Proposal - 2016-2017 Pavement Surface Condition Surveys RFP # CMB 20151214

Dear Mr. Hosick,

In response to the Request for Proposal - 2016-2017 Pavement Surface Condition Surveys RFP # CMB 20151214, Engineering Consulting Group (ECG) stands ready to serve the British Columbia Ministry of Transportation and Infrastructure (BCMOT) with unsurpassed engineering services provided through seasoned staff, state-of-the-art technologies, and a proven track record of delivering successful projects on time and to the highest quality standards.

ECG provides unmatched skills with many years of international experience collecting and analysing pavement and inventory data. Our quality, cost, and schedule control measures will result in timely and successful completion of the BCMOT's assignment.

We are confident that we have a powerful team and the technology required to provide the pavement surface condition survey services. Provided below, it is a summary of why we are the best choice for BCMOT presented in the same outline as the evaluation criteria:

Company knowledge and experience performing similar services

We began collecting pavement data in 1990, and, world-wide, we collect pavement data and inventory from more than 60,000 km per year. We have the capacity and experience to deliver projects on time to the highest quality standards. We have the expertise and technology to deliver outstanding service in pavement engineering. We understand the different types of pavements and their functional characteristics; have in-house developed technology to collect pavement data, analyze it and determine the structural condition in order to select the most economical preservation, maintenance or rehabilitation response.

Project Team

ECG recognizes that the success of a project depends on staff capabilities, effective project management and communication. We assure you that the appropriate talent and physical resources are committed to every project. ECG provides an in-house multi-disciplinary staff of professionals who are recognized specialists in their areas of expertise. ECG will complete the proposed pavement surface data collection without the use of any sub-consultants, and will utilize qualified professional staff with extensive experience in large, complex pavement surface condition data and roadway imaging jobs.

Our project team has superb technical training and academic backgrounds and is uniquely qualified to assist BCMOT in this endeavour, having successfully provided similar services to over 100 clients over the past decade. We are confident that the extensive experience of our project team, coupled with ECG's pavement and asset management capabilities, will exceed the stated goals of the project, ultimately resulting in improved asset management and long-term infrastructure conditions for BCMOT.

ECG will serve this project from our office in Santa Ana, California. Over 80 staff including engineers, field operators, data processing analysts and customer and administrative staff will support the team for BCMOT. Summary biographies of key personnel and an organizational chart are provided in this proposal.

Methodology

The project methodology presented is standard practice for our data collection services as part of our integral management system that includes quality, health and safety, innovation and environmental policies. The BCMOT project will be managed according to the project methodology described and based on the Guide to the Project Management Body of Knowledge (PMBOK) by the Project Management Institute.

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Management/resolution of key issues

s.21

2016/17 and 2018/19 survey price

Bid unit prices in Canadian dollars for the delivery of the services are provided below

<i>Years 2016 and 2017 survey Total Cost</i>	s.21
<i>Years 2018 and 2019 survey Total Cost</i>	

We thank you for the opportunity to submit our proposal and we look forward to further discussions with you regarding this assignment. Should you have any questions or need additional information, please contact me at our office (+1)714-398-7150 or by email at adavies@ecg.engineering

Respectfully submitted,

Engineering Consulting Group (ECG)

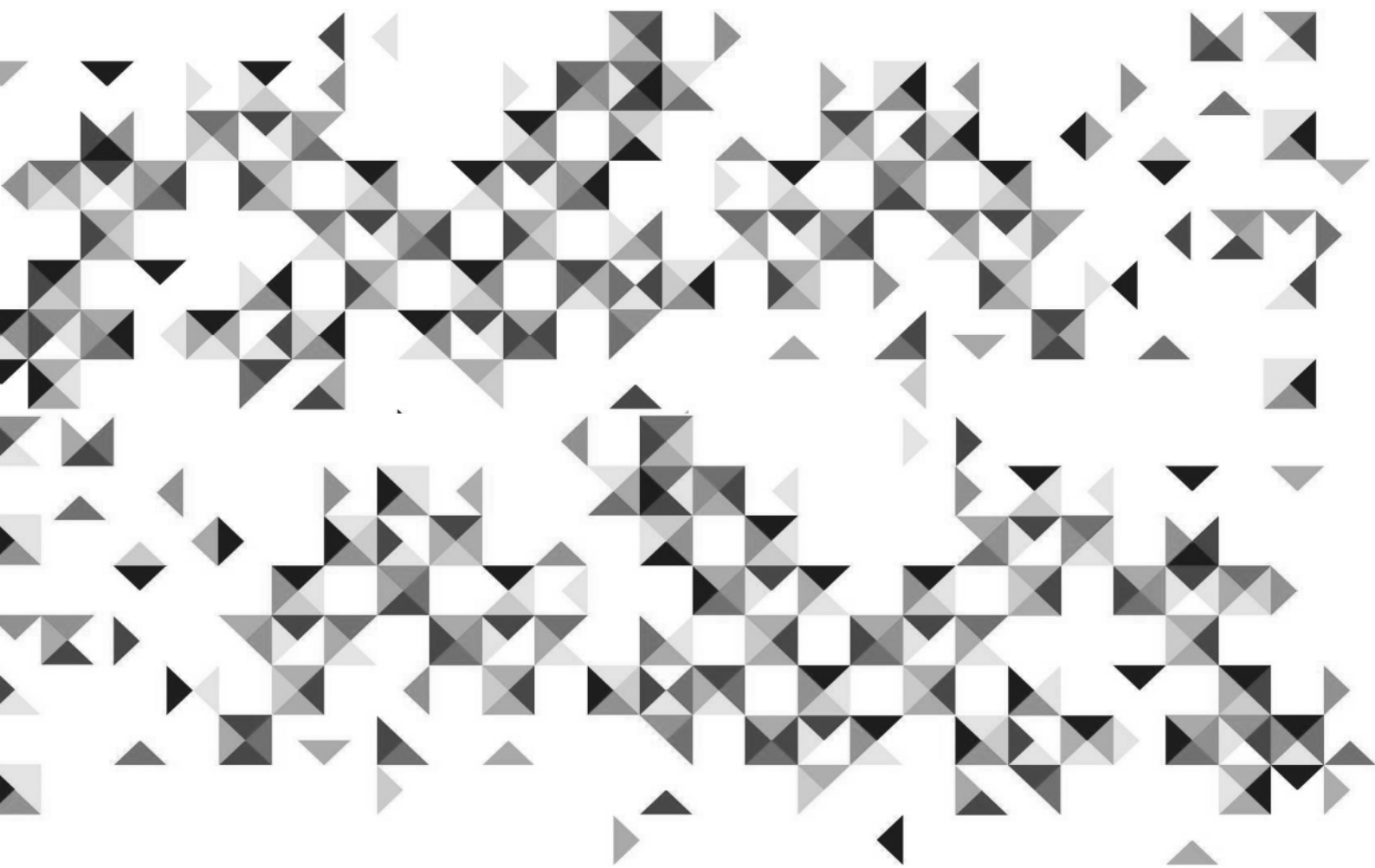
Andrew Davies, Vice President ECG

Request for Proposal for 2016–2017 Pavement Surface Collection Surveys

**British Columbia Ministry of Transportation
and Infrastructure
(BCMoT)**

RFP # CMB 20151214

February 2016



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Proposal done by Victor Frutos-Juarez

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1. Engineering Consulting Group (ECG)

1.1 Overview

Dedicated to balancing the needs of the natural and built environment, Euroconsult was founded in 1968, with the goal of providing worldwide first-class multidisciplinary engineering consultancy services, where the interests of our clients come first.

In October 2014, Euroconsult was listed in the Spanish Alternative Equity Market (MaB) in order to access the securities market easily and efficiently while underpinning an expansion process. As part of the strategic growth, in February 2015, Euroconsult acquires the world-renowned engineering consultancy firm PROES. In autumn 2015, Euroconsult was rebranded into as Engineering Consulting Group (ECG).

Our worldwide staff of more than 1000 technical professionals – comprised of civil engineers and project managers, MEP (mechanical, electrical, and plumbing) engineers, structural engineers, architects, and construction managers – are committed to excellence.

With 22 offices located around the world, we have a truly global reach, and believe that it is our local presence that helps us to deliver innovative solutions to our clients taking into account local factors such as culture, legislation, climate and materials. Since 2011 we are established in the United States operating from our office in Greater Los Angeles, California under the name of ECG.

ECG's mission is to satisfy the needs of its customers through comprehensive engineering services, offering the latest technology and professional experience, with a level that allows it to maintain its high standards of quality, independence and innovation while complying with all current standards. Our core strength is the in-house developed state of the art technologies that underpins our multi-disciplined teams of experts. We aim to provide our clients with the best economical and technical engineering solutions throughout the life span of projects from the development phase, through design engineering and construction management, to surveying and asset management.

ECG's success is grounded in an infrastructure based upon shared resources, creating optimum utilization of staff and technical capabilities, streamlining communication while maximizing service efficiency. Through the application of practical, innovative, collaborative and internationally tested solutions, we deliver outcomes that benefit our clients and the wider community. All of this coupled with our commitment to research, development and innovation with an allocation about 8% of our annual funds.

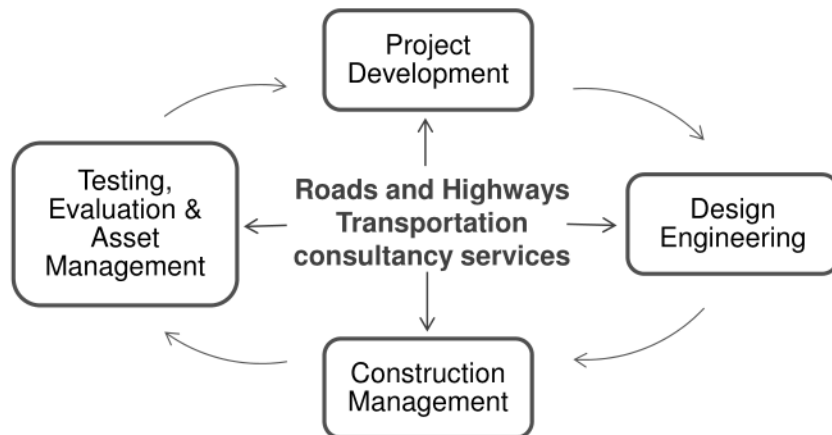
We provide engineering consultancy services in several markets and serve multiple sectors including roads and highways, rail infrastructure, bridges, airports, harbors, tunnels, etc. Our team in California has experience with both public and private projects ranging in scale and value from small interventions to multi-million dollar developments.

Our work ranges from mega-projects that shape an entire region to smaller, local projects that define a community. Since 2002, we have collaborated in more than 2,500 projects in 58 countries, helping our clients to solve many distinctive and challenging issues. In our business, our professionals are creative, collaborative and environmentally and socially conscious. As experienced technical practitioners and programme managers, we are keenly aware of our clients' needs and the importance of our actions on the communities in which we live and work. Our culture encourages technical excellence and professional development while maintaining the highest ethical standards.

The evidence is in our delivery. We are working on complex mass transit assignments, for example Haramain High Speed Rail in Saudi Arabia or the AVO Highway in Chile with challenging construction tunnels. In the past, we have taken a leading role in the delivery

of Terminal T4 International Barajas Airport, Madrid (Spain), Highway 407 East extension in Toronto (Canada), US-460 Highway in Virginia (USA) or Lyndon B. Johnson (LBJ) Highway in North of Dallas, Texas, (USA).

Although our project experience is vast, in the United States ECG is focused on roads and highway engineering where we offer a holistic approach and have extensive skills and experience to meet all project phase requirements for transportation projects, and have worked with private and public clients so we understand budget and time constraints. We have helped local authorities as the Texas and Nevada Department of Transportation, and currently the Maryland Department of Transportation.



The ECG team members are experts in the industry, both on a technical level and in working with governmental agencies. We pay close attention to project schedule and costs while balancing the need to ensure conformance with local and industry standards in a cost effective manner.

Growing urbanization is putting greater pressure on infrastructure. Roads and highways are essential to ensure mobility of goods and people. New infrastructure is needed and the existing infrastructure requires maintenance or upgrades. At a time when public spending is under pressure, to choose where and how to invest is critical. Choosing the partner that will help you to deliver your goals is also vital. We provide the data, technology and expertise required to help owners examine the condition of their existing assets and explore how their life-span can be extended, with targeted maintenance schedules, refurbishment or upgrades. Dramatic changes in technology have transformed the surveying profession and produced some very real advantages: increased productivity, a wider variety of services, a higher-quality of work product and creative solutions for clients. ECG is at the forefront of these advances in surveying technology by using laser measurement equipment and high-definition cameras; in such way that in a single-stop for clients we can collect the data, process and analyse this, and engineer cost effective and sustainable solutions for pavements. ECG provides a unique combination of know-how and technological tools to support the roadway engineering needs of BCMOT.

1.2 Competitive advantages

Holistic approach in the engineering design, construction and asset management of transportation infrastructure:

- International involvement in large infrastructure projects;
- Extensive experience with managing interaction between the many different stakeholders with an interest in projects. Stakeholders include other consultants, contractors, concessionaries, authorities, utility owners, interest groups, and local residents;
- In-depth experience to create innovative, economical and sustainable solutions to meet our clients' varied briefs;

- Leaders in the development of technologies for surveying, operations and maintenance (asset management) thanks to our in-house Research, Development and Innovation team;
- Proven expertise with quality control and testing within our laboratories.

2. Statement of Qualifications

As infrastructure costs rise, we are increasingly helping owners examine the condition of their existing assets and explore how their life-span can be extended, with targeted maintenance schedules, refurbishment or upgrades. Our goal is to ensure that the British Columbia Ministry of Transportation and Infrastructure (BCMoT) has the confidence in ECG to successfully complete the project described in the Request for Proposal (RFP) # CMB 20151214. BCMOT has expressed the need to select the most qualified vendor based on their experience, knowledge and comprehensive approach to meet the needs described in the RFP.

ECG's pavement management expertise encompasses over 25-years of experience in data collection of both surface and sub-surface pavement data, pavement management, pavement design, evaluation and materials testing. Our international experience with large and small clients, whom have different needs and requirements, keeps ECG as one of the global leaders in pavement and asset management solutions. ECG is committed and dedicated to provide tailored pavement management solutions for each client's unique requirements.

ECG's holistic services within roads and highways, offers unique value to clients. We are able to gather first-hand feedback through the collection and processing of pavement data during the in-use cycle of infrastructures, and provide better future solutions in the design of new pavement structures. Our engineers have managed large and small projects around the world for both public and private entities helping to extend the life of infrastructure systems by monitoring existing roadway conditions, identifying deficiencies, and prioritizing roadwork.

ECG is global leader in the development of pavement and asset management services. With our in-house Research, Development and Innovation team; we offer a wealth of experience with state-of-the-art technologies and methods through our Testing, Evaluation and Asset Management capabilities for the collection of roadway and inventory data for the use by Departments of Transportation.

Our research is regularly disseminated through publications, conferences and taking active part in a number of industry research organisations and committees such as the Transportation Research Board (TRB).

ECG is experienced with a variety of pavement management software packages. Our experience includes developing condition listings, condition maps, work plans, budget optimization, and maintenance and rehabilitation alternatives for clients. Moreover, we develop pavement processing software, asset inventory software, and web-viewing tools to access, share, analyse, and report on collected data, video and images.

Our researched, developed and manufactured pavement and inventory survey mobile systems are able to collect the full spectrum of infrastructure information in a single pass at highway speeds.

Our scope of services includes, but it is not limited to:

- Paved and unpaved roadway inspections
- Pavement monitoring and surveying including measuring and analyzing road surface characteristics such as surface regularity (IRI), texture (MPD), patching, splitting, friction, deflection calculation, road surface thicknesses, etc;
- Structural evaluations with falling weight deflectometer;
- Roads safety management, audits and inspections by measuring the retroreflection and luminance measurements of road markings and signaling and skid resistance measurement for pavements;
- Inventory of existing elements within roads and highways: safety barriers, signalling, sidewalks, ramps, guardrails etc;

- Work plans, budget analysis, and network condition reporting;
- Pavement management implementations;
- Data migration of pavement management data and pavement management updates;
- Operations and maintenance;
- Conservation planning;
- Refurbishment studies;
- Surveying of foundations and structures through static and dynamic testing;
- Geographic information system services.

We started to collect pavement data back in 1990, and globally we collect more than 60,000km per year with our pavement and inventory survey mobile systems. We have the capacity and experience to deliver projects on time and to the highest quality standards and with competent technical engineering performance. Moreover, ECG will provide a dedicated project manager for BCMOT project and we authorize the manager to make decisions in real time, resulting in fewer delays and better operations.

As a full service asset management organization, ECG offers tremendous value to clients as the collected and processed data will enhance and maximize each client's ability to make confident roadway management decisions, leading to improved network condition through early invention and efficient maintenance to extend the performance life of all roads, and a better understanding of how to best allocate maintenance funding.

3. Compliance with Project Requirements

We have thoroughly reviewed the RFP as well as the evaluation process. In the remainder of this document, ECG illustrates our understanding of the scope, and the accomplishment of the requirements.

ECG understands that the British Columbia Ministry of Transportation and Infrastructure (BCMOT) is seeking an organization to collect surface pavement condition data for highways and side roads throughout the Province of British Columbia (Canada) in the summers of 2016 and 2017. Over these two years approximately 18,115 Km will be surveyed.

In brief, the assignment aims to collect data to achieve two main goals while ensuring that the collected data is accurate, repeatable, and of consistent quality and integrity from year to year:

- Surface pavement condition data will be delivered to the Ministry in 50-metre intervals. Surface pavement condition includes surface distress (cracking and defects) roughness as per the International Roughness Index (IRI) protocols, and rut depths.
- Single forward-looking images of the right-of-way will be collected every 10-metres.

All raw data will need to be reduced and summarized according to BCMOT's requirements put forth in the 2015 Pavement Surface Condition Rating Manual. The Manual documents the technical specifications that guide the data collection and quality assurance requirements for Ministry network level and project level, manual pavement surface condition surveys for surface distress, roughness, and rut depths.

Deliverables include shape and data files, right way digital images and a project summary report that will contain information about the methodology and the Quality Control and Assurance procedures followed and their results.

The initial contract will be for two years with the option to renew for an additional two years of surveying and reporting (2018 and 2019). It is also understood that optional work may arise from this assignment as determined by BCMOT. This may include pavement geometry, or highway asset management inventory data extraction.

ECG will be responsible for all aspects of the field operations including scheduling of the services, contact with BCMOT personnel, data integrity, calibration and the safety of the operation for both field operators and the public.

ECG provides unmatched skills, experience and technology coupled with innovation, leadership and attentive customer service to provide outstanding long-term value for BCMOT. Our quality, cost, and schedule control measures will result in timely and successful completion of the BCMOT's project.

4. Prior Experience

ECG has built its reputation by constantly providing a high level of service to its clients. We strive for hard working to deliver the unique needs, objectives and expectations of our clients, and then to exceed these requirements with on-time, responsive, effective and efficient performance. ECG is focused on continual improvement of both our internal procedures as well as the value we can add to projects. Clients return to ECG because we are honest about our behaviour, we communicate with persistently transparency, and we are committed to the success of every project.

Furthermore, ECG has a demonstrated record of accomplishment and the experience of successfully providing the services that are described in this solicitation on time, to the highest quality standards, with competent technical engineering performance and with multi-function pavement evaluation equipment systems formed by sophisticated on-board systems and instrumentation. We started to collect pavement data back in 1990, and globally we collect an average of more than 60,000km per year with our pavement and inventory survey mobile systems. The list below shows some of the contracts executed for the Spanish Department of Transportation:

Project	Year	Kilometres
TT-004/09 Pavement Distress Data Collection Pavement/Infrastructure Survey	2011-2014	90.000
TT-003/09 Survey and Processing of Surface (i.e. roughness) and Structural Characteristics (i.e. high deflections and curvature radius of pavements)	2010-2013	45.500
TP-007/07 Survey and Post-processing of Retro-reflection of Horizontal Marks	2009-2012	170.000
TP-003/07 Data Collection and Analysis of Surface (i.e. roughness) and Structural Characteristics (i.e. high deflections and curvature radius of pavements)	2008-2011	83.000
TT-002/07 Data Collection and Analysis of Surface (i.e. roughness) and Structural Characteristics (i.e. high deflections and curvature radius of pavements)	2008-2010	35.250
TT-005/07 Survey and Analysis of Retro-reflection of Vertical Signs	2008-2009	15.000
TP-007/05 Survey and Post-processing of Retro-reflection of Horizontal Marks	2007-2009	110.250

Project	Year	Kilometres
TP-008/05 Automated Data Collection, Inventory & Analysis of Pavement Distress	2006-2008	27.600
TP-013/02 Survey and Post-processing of Retro-reflection of Horizontal Marks	2004-2006	20.500
TT-013/03 Survey and Processing of Surface (i.e. roughness) and Structural Characteristics (i.e. high deflections and curvature radius of pavements)	2004-2006	36.000

In the United States, we have recently finish two contracts as explained below:

Eagle Ford Shale Project, Texas Department of Transportation

Location Texas, United States

Brief Project Description and ECG 's Role:

“Collection of data for 328 centerline miles of roadway to capture mailboxes, guardrails and pavement condition using high-speed and high-resolution digital 3D cameras.

ECG performed a complete pre-construction pavement assessment and video inventory. All work was performed within contract and time guidelines. The interface to the pavement assessment data provided the user with an intuitive portal to viewing and analyzing the pavement condition.” (Bill Toothill, Director of Technology, DBi)

Contract #	WOC #	Contract Start (Month/Year)	Contract Complete (Month/Year)
NA	NA	03/14	07/14
ECG Services Contract/WOC Amount (including as amended)			Confidential
Client Name	DBI Services		
Address	100 North Conahan Drive Hazleton, Pennsylvania 18201 United States		
Project Manager	Mr. Bill Toothill		
Email	btoothill@dbiservices.com		
Phone #	+1 570 954 7986		

Internal Data Collection System for Roadway Video and LiDAR imagery

Location Nevada, United States

Brief Project Description and ECG 's Role:

The Roadway Systems Division of the Nevada Department of Transportation (NDOT) decided to embark on a new internal data collection effort for roadway video and LiDAR imagery. NDOT purchased to ECG the following equipment systems and services to be installed in a state vehicle:

- Two (2) cameras Prosilica GIGE Model GT2450 by Allied Vision Tech with a resolution of 2448x2050. One forward facing, one 45-degree right.
- Internal Measurement Unit (IMU) and realtime differential GPS corrector by Applanix POS LV Model 220.
- Distance Measurement Unit (DMI) Rod 420 by HeidenHai.
- Set of two sensors (2) mobile LiDAR sensors Model HDL-32 by Velodyne
- ECG data collection software and viewer with Applanix SmartBase TM Post Processing Module

Contract #	WOC #	Contract Start (Month/Year)	Contract Complete (Month/Year)
NA	NA	05/15	09/15
ECG Services Contract/WOC Amount (including as amended)			Confidential
Client Name	Roadway Systems Nevada Department of Transportation		
Address	1263 S. Stewart St. Carson City, Nevada 89712 United States		
Project Manager	Mr. Lawrie Black		
Email	lblack@dot.state.nv.us		
Phone #	+1 775-888-7726		

The following pages show a list of projects and contract services performed by ECG within that last five years that are comparable to the services requested by BCMOT. Our references will attest to the quality of our staff and our work.

Pavement Surface Condition Surveying and Measurement of the Roads Force Coefficient of Various Sections of Spain's Highway Network

Location Spain

Brief Project Description and ECG 's Role:

ECG has been providing pavement and asset data collection for the Spanish Department of Transportation since 1990. The contract here referenced had a duration of 5 years with an approximate total collection of 90,000-lane km of highway and county roads in in addition to other non-continuous road sections.

ECG's equipment systems collected skid resistance with the use of SCRIM (Sideway-force Coefficient Routine Investigation Machine). The collected data was used to design the preservation and maintenance program of the Spanish roadway network.

Contract #	WOC #	Contract Start (Month/Year)	Contract Complete (Month/Year)
TT-004/09	NA	05/10	05/14
ECG Services Contract/WOC Amount (including as amended)			\$ 2,773,480 USD

Client Name	Ministerio de Fomento
Address	Paseo de la Castellana, 67, Nuevos Ministerios. 28071, Madrid Spain
Project Manager	Mr. Julio José Vaquero García
Email	
Phone #	+34 91 597 8787

Automated Data Collection, Inventory & Analysis of Pavement Distress

Road of the Mountain Range. Section 2: Ciudad de Dios-Cajamarca-Chiple, Cajamarca-Trujillo & DV. Chilete-Emp. PE-3N

Location Peru

Brief Project Description and ECG 's Role:

ECG provided pavement and asset data collection services for this project in Peru. ECG deployed equipment systems with the purpose of delivering pavement deflection, longitudinal profile and calculated IRI, rutting, surface distress data and pavement video, high-definition right-of-ray, and right-photolog-video, GPS and elevation data, texture, and roadway geometry.

The recommendations in relation to pavement rehabilitation were provided in accordance with AASHTO Guide for Design of Pavement Structures (AASHTO, 1993) and his has the Highway Development and Management Tool (HDM-4).

Contract #	WOC #	Contract Start (Month/Year)	Contract Complete (Month/Year)
NA	NA	07/14	10/14
ECG Services Contract/WOC Amount (including as amended)			\$984,998.92 USD
Client Name	Concesionaria Vial Sierra Norte S.A.		
Address	Oficina Registral de Lima. Partida 13219105. RUC 20557644416 Av. Victor Andrés Belaúnde 181, Of. 302, San Isidro, Lima 27 Peru		
Project Manager	Mr. Jesús Viadero Canales		
Email			
Phone #	+51 1 442 1135		

Automated Data Collection, Inventory & Analysis of Pavement Distress

Servicing initial actions and Pavement Maintenance Plan on Road No. 21: Nueva Palmira–Road No. 2 section and on Road No. 27: Road No. 2–Road No. 3 section

Location Uruguay

Brief Project Description and ECG 's Role:

ECG provided pavement and asset data collection services for almost 800-lane km for this project. ECG deployed equipment systems with the purpose of delivering pavement deflection, longitudinal profile and calculated IRI, rutting, surface distress data and pavement video, high-definition right-of-way, and right-photolog-video, GPS and elevation data, texture, and roadway geometry.

The recommendations in relation to pavement rehabilitation were provided in accordance with AASHTO Guide for Design of Pavement Structures (AASHTO, 1993) and has the Highway Development and Management Tool (HDM-4).

Contract #	WOC #	Contract Start (Month/Year)	Contract Complete (Month/Year)
NA	NA	12/14	02/15
ECG Services Contract/WOC Amount (including as amended)			\$ 213,925 USD
Client Name	Sacyr Concessions		
Address	Paseo de la Castellana, 83- 85 28046, Madrid Spain		
Project Manager	Jesús Viadero Canales		
Email			
Phone #	+51 1 442 1135		

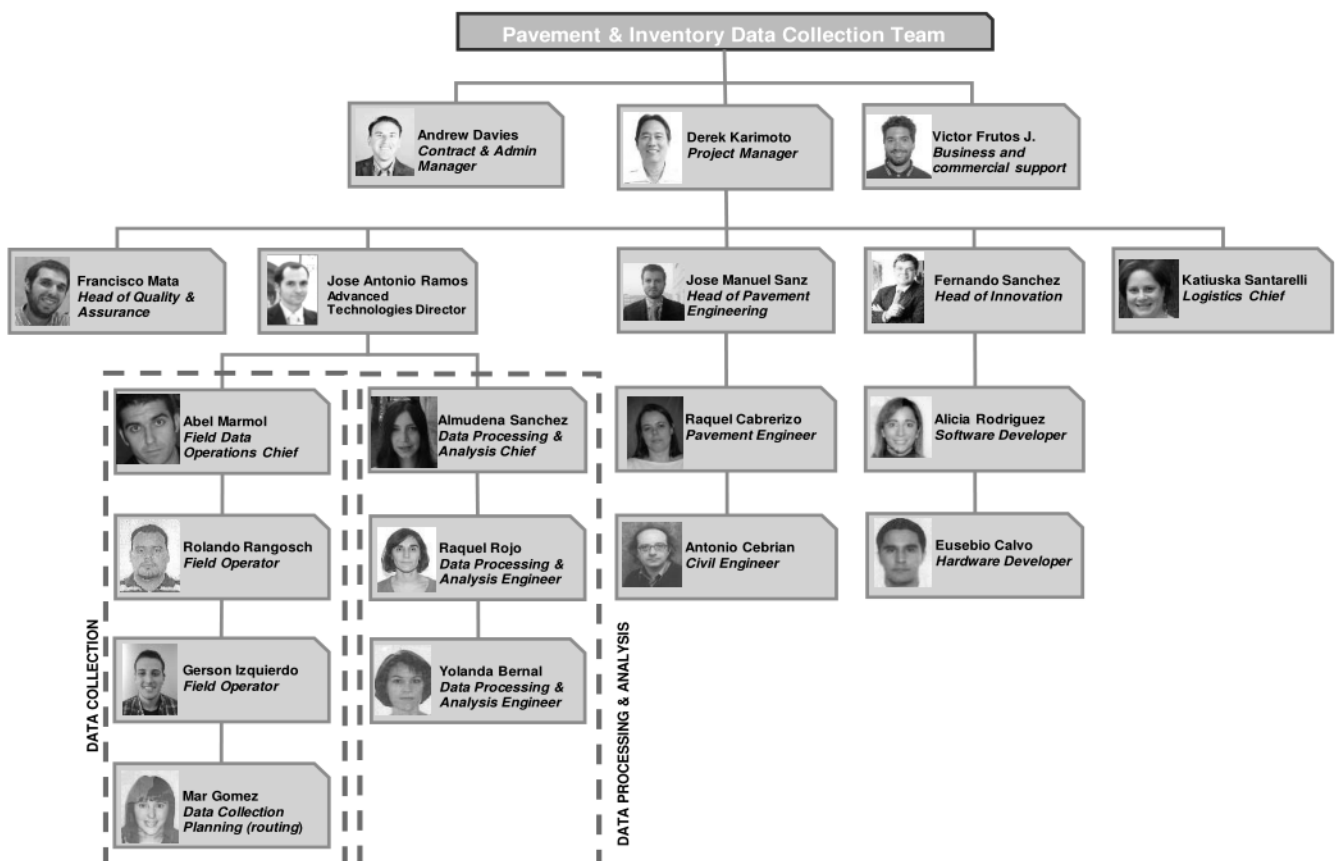
5. Project Team

5.1 Organizational Chart

ECG recognizes that the success of a project depends on staff capabilities, effective project management and communications. We assure you that the appropriate talent and physical resources are committed to every project. ECG provides an in-house multi-disciplinary staff of professionals who are recognized specialists in their areas of expertise.

The organization chart below shows the key members of the project team and their respective positions for the BCMOT project. Our project team has superb technical training and academic backgrounds, and is uniquely qualified to assist BCMOT in this endeavour, having successfully provided similar services to over 100 clients over a decade. We are confident that the extensive experience of our project team, coupled with ECG's pavement and asset management capabilities, will exceed the stated goals of the project, ultimately resulting in improved asset management and long-term infrastructure conditions for BCMOT.

ECG will serve this project from our office in Santa Ana, California. Over 80 staff including engineers, field operators, data processing analysts and customer and administrative staff will support the team for BCMOT. Summary biographies of key personnel are presented after our organizational chart.



5.2 Key Project Team Members and Roles

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5.3 Sub-Contractors

s.21

5.4 Statement of Availability and Project Involvement

s.21

6. Project Management Methodology

The following section provides an overview of the project approach and methodology that ECG will be used in order to accomplish the work described by BCMOT. These procedures are standard practice for our data collection services and part of our integral management system that includes quality, health and safety, innovation and environmental policies.

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6.1 Project initiation

s.21

6.1.1 Development of Project Charter

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s.21

6.2 Project Planning

6.2.1 Project Management Plan

s.21

6.2.2 Definition of Scope

s.21

6.2.3 Development of Schedule

s.21

6.2.4 Project Cost Management

s.21

s.21

6.2.5 Human Resource Management Plan

s.21

6.2.6 Project Communications Management

s.21

6.2.7 Risk Management Plan

s.21

6.3 Executing Process

s.21

6.3.1 Direct and Manage Project Work

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6.3.2 Project Kick-off Meeting

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6.3.3 Field Data Collection

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6.3.4 Data Processing

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6.3.5 Data Delivery

s.21

6.4 Project Close-out

6.4.1 Close Project

s.21

s.21

6.5 Monitoring and Control Process

s.21

6.5.1 Monitor and Control Project Work

s.21

6.5.2 Monitor and Control Scope

s.21

6.5.3 Monitor and Control Schedule

s.21

6.5.4 Monitor and Control Costs

s.21

6.5.5 Change Requests

s.21

6.5.6 Control quality

s.21

6.6 Project Quality Management

s.21

s.21

6.6.1 Quality Management Plan
s.21

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6.6.2 Perform Quality Assurance

s.21

7. Pavement Surface Condition Survey: Proposed Solutions

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7.1 s.21

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8. Management Resolution of Key Issues

Project issues are identified, managed and resolved throughout the project in order for the project to be successful. ECG's issue/risk management plays an important role in maintaining project stability and efficiency throughout the project lifecycle. It addresses obstacles that can hinder project success and/or prevent our project team from achieving its goals. Our approach to risk management has been identified and further discussed in section 6.2.7 of this document. The purpose of risk management is to identify and document these issues and to resolve them by reviewing and carefully considering all relevant information.

In principle, the corrective actions taken during quality control will vary depending on the type of problem found, the suspected or known cause of the issue, and whether the problem is thought to be isolated or systemic. Within this RFP, BCMOT has requested to provide explanation of how EC will manage the two following identified risks.

- Data cannot be collected when snow or rain covers the roads. How does the proponent manage this risk?

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- If a Proponent failed quality assurance testing for a blind site, what action(s) would they take?

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9. Bid Unit Prices

Bid unit prices in Canadian dollars for the delivery of the services are broken-down in the following tables as requested by BCMOT. By services, the following is understood:

- The assignment aims to collect data to achieve two main goals while ensuring that the collected data is accurate, repeatable, and of consistent quality and integrity from year to year:
- Surface pavement condition data will be delivered to the Ministry in 50-metre intervals. Surface pavement condition includes surface distress (cracking and defects) roughness as per the International Roughness Index (IRI) protocols, and rut depths.
- Single forward-looking images of the right-of-way will be collected every 10-metres.
- All raw data will need to be reduced and summarized according to BCMOT's requirements put forth in the 2015 Pavement Surface Condition Rating Manual.
- Deliverables include shape and data files, right way digital images and a project summary report.

s.21

Years 2016 and 2017 survey

Description	Lane Km	Unit Price	Cost
Survey & Reporting		s.21	
a) Highways	11,911		
b) Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for Mobilization:	400		
Total Cost:			

Years 2018 and 2019 survey

Description	Lane Km	Unit Price	Cost
Survey & Reporting		s.21	
a) Highways	11,911		
b) Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for Mobilization:	400		
Total Cost:			

10. Payment schedule

The table below shows our indicative fee schedule for the indicated deliverables. s.21
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11. Additional Collection Data Elements

11.1 s.21

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11.3 Asset Inventory

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11.4.2 s.21

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11.5 s.21

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Appendix 1: Provisions of Agreement

Client and Consultant agree that the following provisions shall be part of their agreement:

1. This agreement shall be binding upon the heirs, executors, administrators, successors and assigns of Client and Consultant.
2. This agreement shall not be assigned by either Client or Consultant without the prior written consent of the other.
3. This agreement contains the entire agreement between Client and Consultant relating to the project and the provision of services to the project. Any prior agreements, promises, negotiations or representations not expressly set forth in this agreement are of no force or effect. Subsequent modifications to this agreement shall be in writing and signed by both Client and Consultant.
4. Consultant's waiver of any term, condition, or covenant, or breach of any term, condition, or covenant, shall not constitute the waiver of any other term, condition, or covenant, or breach of any other term, condition, or covenant.
5. If any term, condition, or covenant of this agreement is held by a court of competent jurisdiction to be invalid, void or unenforceable, the remaining provisions of this agreement shall be valid and binding on Client and Consultant.
6. This agreement shall be governed by and construed in accordance with the laws of the State of California.
7. Consultant shall only act as an advisor in all governmental relations.
8. All plans, drawings, specifications, models and other materials prepared or furnished pursuant to this agreement, shall, upon receipt of payment due in full, become the property of Client for use solely in connection with this Project. Reproducible copies of all plans, drawings and specifications and all other such materials shall, to the extent not previously delivered, be promptly delivered to Client as a condition precedent to Consultant's final payment. All plans, drawings, specifications and other such materials may be used by Client, in whole or in part, or in modified form, for the completion of development, construction, marketing, maintenance, repair, use and occupancy of the Project. If Client modifies, or permits such modifications by others, the plans, drawings, specifications, or other such materials, or uses the plans, drawings, or specifications on other projects, or other than in connection with the rights set forth in this agreement, without Consultant's prior written consent, Client shall, to the extent permitted by law, indemnify, defend and hold harmless the Consultant against liability for claims arising out of such modification or other use of the plans, drawings, or specifications.
9. Upon request, Client shall execute and deliver, or cause to be executed and delivered, such additional instruments, documents, governmental fees and charges which are necessary to perform the terms of this agreement.
10. Consultant makes no representations concerning soil conditions, and he is not responsible for any liability that may arise out of the making or failure to make soil surveys, or sub-surface soil tests, or general soil testing, or anything generally included in a geotechnical engineer's scope of services.
11. Client agrees not to use or permit any other person to use plans, drawings, or other work product prepared by Consultant, which plans, drawings, or other work product are not final and which are not signed and stamped or sealed by Consultant. Client agrees to be liable and responsible for any such use of non-final plans, drawings or other work product not signed and stamped or sealed by Consultant and waives liability against Consultant for their use. Client further agrees that final plans, drawings or other work product are for the exclusive use of Client and may be used by Client only for the project described on the face hereof. Such final plans, drawings or other work product may not be changed nor used on a different project without the written authorization or approval by Consultant. If Consultant's work product exists in electronic or computerized format, or is transferred in electronic or computerized format, the stamp, seal and signature shall be original and may not be a computer generated copy, photocopy or facsimile transmission of the original.
12. Notwithstanding any other provisions of this agreement, Client and Consultant may:
 - a. Terminate this agreement at any time for any reason whatsoever and without prejudice to any other right or remedy, without cause, upon seven days written notice by Client to Consultant. Upon such

termination, anything herein to the contrary notwithstanding, Consultant shall be entitled to receive an amount commensurate with the services performed by Consultant together with Reimbursable Expenses incurred and authorized Additional Services performed prior to termination.

b. In case of termination of this agreement, Consultant shall also be entitled to receive, within sixty days after the date of termination, compensation then due it for Additional Services and Reimbursable Expenses and amounts based on special Consultant fees then due.

c. Payment by Client to Consultant of any monies pursuant to Paragraph a shall not bar Client from any and all remedies it may otherwise have against Consultant for any failure of Consultant to perform its services in accordance with this agreement.

13. If the scope of services to be provided by Consultant pursuant to the terms of this agreement include the preparation of grading plans but exclude construction staking services, Client acknowledges that such staking services normally include coordinating civil engineering services and the preparation of as-built drawings pursuant to Uniform Building Code Chapter 70 or local grading ordinances and Client will be required to retain such services from another Consultant or pay Consultant pursuant to this agreement for such services as extra work in accordance with the provisions herein.

14. Consultant shall be entitled to immediately, and without notice, suspend the performance of any and all of its obligations pursuant to this agreement if Client files a voluntary petition seeking relief under the United States Bankruptcy Code or if there is an involuntary bankruptcy petition filed against Client in the United States Bankruptcy Court, and that petition is not dismissed within fifteen (15) days of its filing. Any suspension of services made pursuant to the provisions of this paragraph shall continue until such time as this agreement has been fully and properly assumed in accordance with the applicable provisions of the United States Bankruptcy Code and in compliance with the final order of judgment issued by the Bankruptcy Court.

15. This agreement shall not be construed to alter, affect or waive any lien or stop notice right which the Consultant may have for the performance of services pursuant to this agreement.

16. Client may, at any time or from time to time and for any reason, direct Consultant to suspend, stop or interrupt the Work or any portion thereof for a period of time. Such direction shall be in writing and shall specify the period during which the Work is to be stopped. Consultant shall resume the Work upon the date specified in such direction or upon such other date as Client may thereafter specify in writing. Said suspension, stoppage or interruption shall be recognized as an unavoidable delay, entitling Consultant to an extension of time, unless such suspension, stoppage or interruption results from the negligent acts or omissions of Consultant or its Consultants. If payment of the Consultant's invoices is not maintained on a forty-five (45) calendar day current basis by the Client, the Consultant may by fourteen (14) calendar day written notice to the Client suspend further work until payment is restored to a current basis. Suspension for any reason exceeding forty-five (45) calendar days shall, at the Consultant's option make this agreement subject to renegotiation or termination, as provided for elsewhere in this agreement. Any suspension shall extend the time schedule for performance in a manner that is satisfactory to both the Client and Consultant.

17. In event of any dispute between Client and Consultant as to the percentage of work completed or the absence of supporting documentation, Client shall only be obligated to pay the amount not in dispute and the remainder promptly upon final resolution of the dispute.

18. All fees and other charges will be billed every four weeks and shall be due at the time of billing. Bills paid after thirty (30) days will be delinquent and Client agrees to pay a monthly late payment charge on the unpaid balance of one and one-half percent (1.5%) per month. A notice of lien may be filed at the Consultant's option. Client agrees to pay for services completed regardless of the outcome of any escrow, loan or other transaction.

19. If Consultant, pursuant to this agreement, produces plans, specifications, or other documents and/or performs field services, and such plans, specifications, and other documents and/or field services are required by one or more governmental agency, and one or more such governmental agency changes its ordinances, policies, procedures or requirements after the date of this agreement, the additional office or field services thereby required shall be paid for by Client as extra services.

20. In the event Consultant's fee schedule changes, due to any increase in costs such as granting of wage increases and/or other employee benefits to field or office employees due to terms of any labor agreement, or rise in the cost of living, a percentage increase shall be applied to all remaining compensation.

21. Client agrees that if Client requests services not specified pursuant to the scope of services description within this agreement, Client agrees to pay for all such additional services as extra work.
22. Client acknowledges that the design services performed pursuant to this agreement are based upon field and other conditions existing at the time these services were performed. Client further acknowledges that field and other conditions may change by the time project construction occurs and clarification, adjustments, modifications and other changes may be necessary to reflect changed field conditions. If the scope of services pursuant to this agreement does not include construction staking services by Consultant for this project, or if subsequent to this agreement Client retains other persons or entities to provide such staking services, Client acknowledges that such staking services will be performed by others and Client agrees to release Consultant from all liability arising from or resulting from the performance of such staking services by other persons or entities except to the extent such claims are caused by the errors or omissions of Consultant; and from any and all claims arising from or resulting from clarification, adjustments, modifications or other changes which may be necessary to reflect field or other conditions except to the extent such claims are caused by the errors or omissions of Consultant.
23. Client shall pay the costs of plan checking and inspection fees, zoning and Appendixation fees, assessment fees, soils engineering fees, soils testing fees, aerial topography fees, and all other fees, permits, bond premiums, title company charges, blueprints and reproductions, and all other charges not specifically covered by the terms of this agreement.
24. Consultant is not responsible for delay caused by activities or factors beyond Consultant's reasonable control, including but not limited to, delays by reason of strikes, lockouts, work slowdowns or stoppages, accidents, acts of God, failure of Client to furnish reasonably timely information or approve or disapprove of Consultant's services or work product promptly, faulty performance by Client or other contractors or governmental agencies. When such delays beyond the Consultant's reasonable control occur, Client agrees that Consultant is not responsible in damages nor shall Consultant be deemed to be in default of this agreement.
25. Consultant shall not be liable for damages resulting from the actions or inactions of governmental agencies including, but not limited to, permit processing, environmental impact reports, dedications, general plans and amendments thereto, zoning matters, Appendixations or consolidations, use or conditional use permits, project or plan approvals, and building permits. The Client agrees that it is the responsibility of the Client to maintain in good standing all governmental approvals and permits and to apply for any extensions thereof.
26. If any action at law or equity, including an action for declaratory relief, is brought to enforce or interpret the provisions of this agreement, the prevailing party shall be entitled to reasonable attorneys' fees, which fees may be set by the court in the same action or in a separate action brought for that purpose, in addition to any other relief to which he may be entitled.
27. Client agrees that in the event Client institutes litigation to enforce or interpret the provisions of this agreement, such litigation is to be brought and adjudicated in the appropriate court in the county in which the project is located, and Client waives the right to bring, try or remove such litigation to any other county or judicial district.
28. Consultant makes no representation concerning the estimated quantities and probable costs made in connection with maps, plans, specifications, reports or drawings other than that all such costs are estimates only and actual costs will vary. It is the responsibility of the Client to verify costs.
29. Client acknowledges that Consultant is not responsible for the performance of work by third parties including, but not limited to, the construction contractor and its subcontractors.
30. Services performed by the Consultant under this agreement will be conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the profession currently practicing in the same locality under similar conditions. No other representation, expressed or implied, and no warranty or guarantee is included or intended in this agreement, or in any report, opinion, document or otherwise.
31. Estimates of land areas provided under this agreement are not to be considered precise unless Consultant specifically agrees to provide the precise determination of such areas.
32. In the event the Client agrees to, permits, authorizes, constructs or permits construction of changes in the plans, specifications, and documents or does not follow recommendations or reports prepared by Consultant pursuant to this agreement, which changes are not consented to in writing by Consultant, Client acknowledges that the changes and their effects are not the responsibility of Consultant and Client agrees to release Consultant from all liability arising from the use of such changes.
33. Client agrees that in accordance with generally accepted construction practices, construction contractor will be required to assume sole and complete responsibility for job site conditions during the course of construction of the project, including safety of all persons and property; that this requirement shall be made

to apply continuously and not be limited to normal working hours, and Client further agrees to release Consultant from all liability, real or alleged, in connection with the performance of services on this project, except liability arising from the errors or omissions of Consultant. Neither the professional activities of the Consultant, nor the presence of the Consultant or his employees and subcontractors, shall be construed to imply the Consultant has any responsibility for methods of work performance, superintendence, sequencing of construction, or safety in, on or about the job site.

34. In the event Client discovers or becomes aware of changed field or other conditions which necessitate clarification, adjustments, modifications or other changes during the construction phase of the project, Client agrees to notify Consultant and engage Consultant to prepare the necessary clarifications, adjustments, modifications or other changes to Consultant's services or work product before construction activities commence or further activity proceeds. Further, Client agrees to have a provision in construction contracts for the project which requires the contractor to notify Client of any changed field or other condition so that Client may in turn notify Consultant pursuant to the provisions of this paragraph.

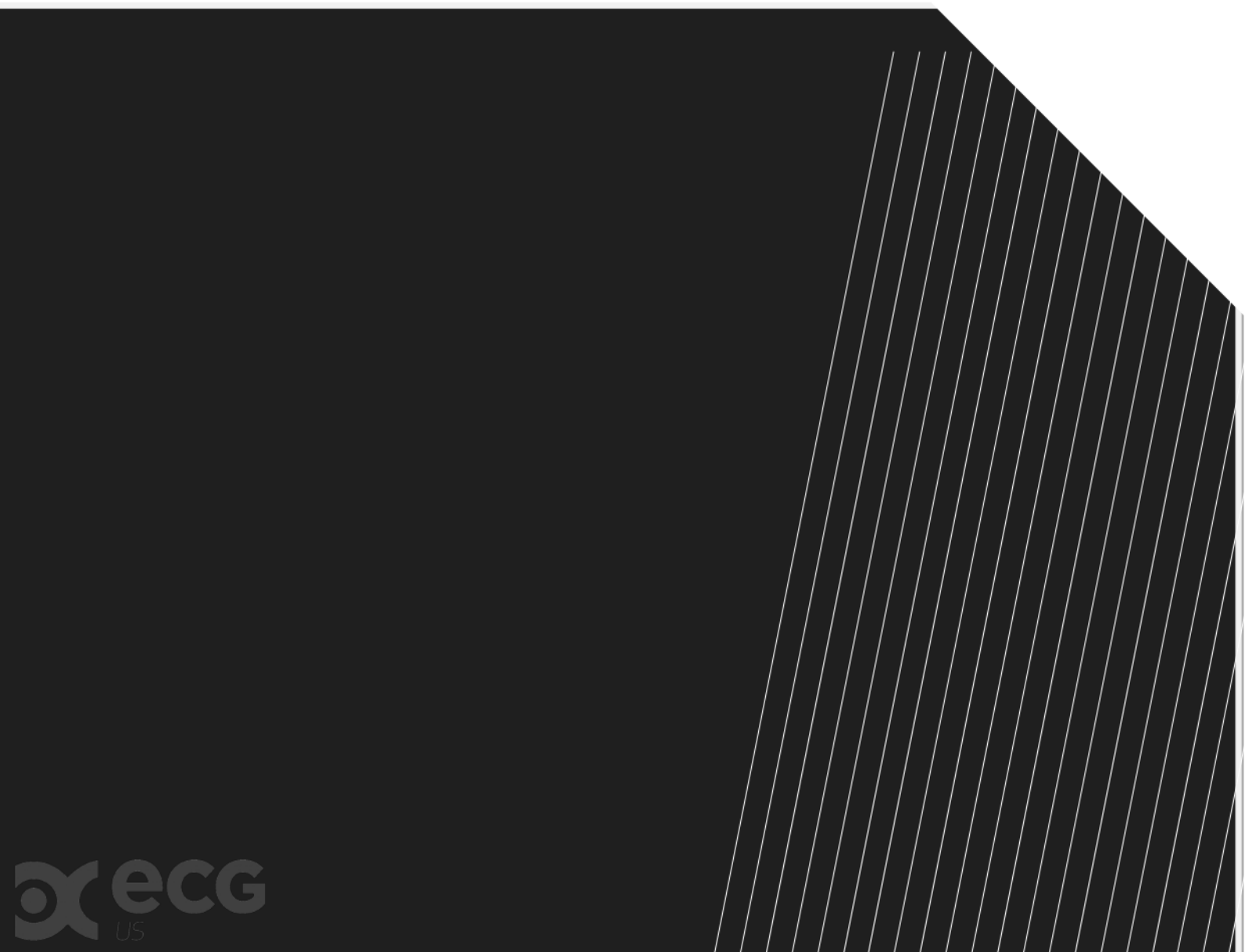
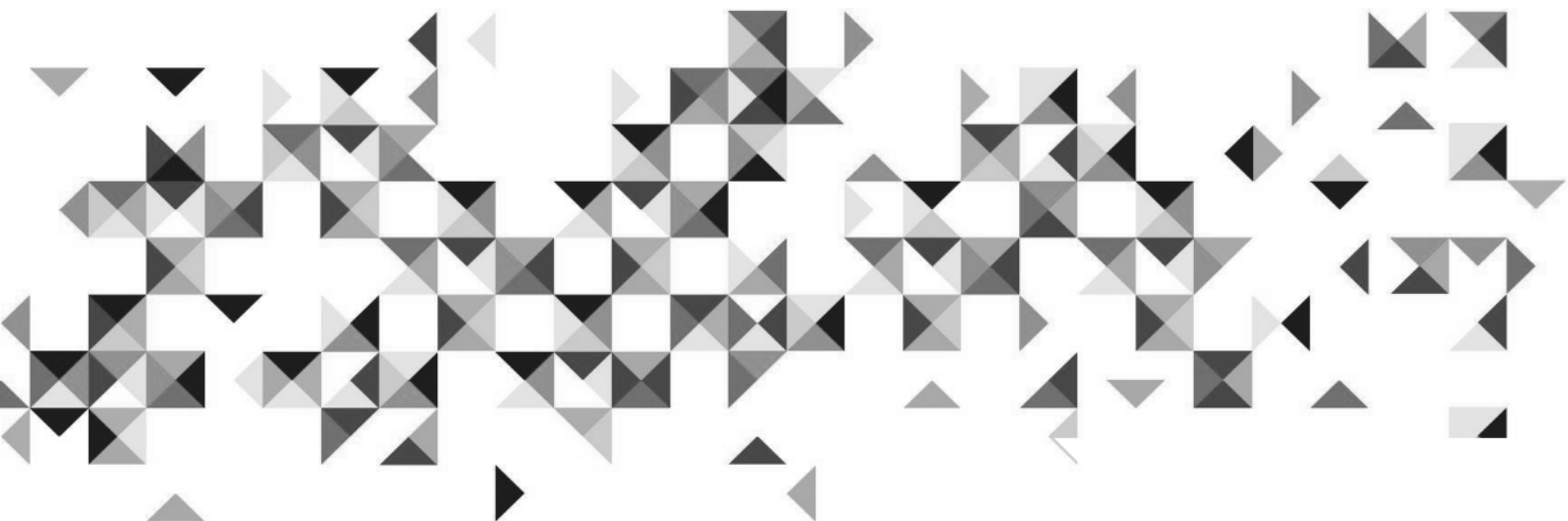
35. Client agrees to limit the liability of Consultant, its principals and employees, to Client and to all contractors and subcontractors on the project, for any claim or action arising in tort or contract, to the sum of \$50,000 or Consultants fee, whichever is greater.

36. a) Notwithstanding any other provision of this agreement and except for provisions of (b), if a dispute arises regarding Consultant's fees pursuant to this contract, and if the fee dispute cannot be settled by discussions between Client and Consultant, both Client and Consultant agree to attempt to settle the fee dispute by mediation through the American Arbitration Association (or other mediation service) before recourse to arbitration. If mediation does not resolve the fee dispute, such dispute shall be settled by binding arbitration in accordance with the Construction Arbitration Rules of the American Arbitration Association, and judgment upon the award rendered by the Arbitrator(s) may be entered in any court having jurisdiction thereof.

b. Subdivision (a) does not preclude or limit Consultant's right to elect to perfect or enforce applicable mechanics lien remedies.

37. Consultant hereby states and Client hereby acknowledges that Consultant has no professional liability insurance for claims arising out of the performance or failure to perform professional services related to the investigation, detection, abatement, replacement, use or specification, or removal of products, materials or processes containing asbestos, asbestos cement pipe, and or any other hazardous material.

38. Client acknowledges that Consultant's scope of services for this project does not include any services related in any way to asbestos and/or hazardous materials. Should Consultant or any other party encounter such materials on the job site, or should it in any other way become known that such materials are present or may be present on or adjacent to the job site, Consultant may at its option, terminate or suspend work on the project until such time as Client retains a specialist to abate and/or remove the asbestos or hazardous materials and warrant that the job site is free from any hazard which may result from the existence of such materials.





Ministry of
Transportation
and Infrastructure

PROPOSAL FOR

2016-2017 Pavement Surface Condition Surveys

FEBRUARY 10, 2016 – 2:00 PM PST
RFP NUMBER: CMB 20151214
COPY 1 OF 2



Tetra Tech
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APPENDICES

Appendix A: Team Resumes
 Appendix B: Equipment Overview and Specifications
 Appendix C: Project Profiles

ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
APEGBC	Association of Professional Engineers and Geologists of British Columbia
ASTM	American Society for Testing and Materials
AT	Alberta Transportation
BC CoR	British Columbia Certificate of Recognition
BC MoTI	BC Ministry of Transportation and Infrastructure
CSC	Continuous Spatial Calibration Technology
DMI	Distance Measurement Instrument
DRP	Data Reference Point
dTIMS	Deighton Total Infrastructure Management System
FWD	Falling Weight Deflectometer
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GPS/DGPS	Global Positioning System/Differential Global Positioning System
ICC	Integrated Cybernetics Corporation
IMU	Inertial Measurement Unit
IRI	International Roughness Index
LCMS	Laser Crack Measurement System
LiDAR	Light Detection and Ranging
LWP	Left Wheel Path
MRN	TransLink Major Road Network
NRC	National Research Council
PCI	Pavement Condition Index
PDI	Pavement Distress Index
POS	Positioning and Orientation System
PSP	Pavement Surface Profiler
QA/QC	Quality Assurance and Quality Control
QMS	Quality Management System
ROW	Right-of-Way
RPMS	Roadway Pavement Management System
RWP	Right Wheel Path
TAC	Transportation Authority of Canada

SUMMARY OF KEY PROPOSAL FEATURES

Located in Western Canada, Tetra Tech has successfully provided high quality, automated, non-destructive data collection services on more than 750,000 km of federal, provincial, and municipal roadways since 1992. A desire to provide cost-effective, accurate, and correctly referenced data was the foundation on which our pavement data collection services were developed. Key Agency projects that demonstrate this experience are:

- Alberta Transportation (AT) - collected over 35,000 km/year totalling over 525,000 km between 2001 and 2015 (and have been awarded on option year extension in 2016).
- Saskatchewan Ministry of Highways and Infrastructure (SMHI) - collected over 28,000 km between 2012 and 2014.
- BC Ministry of Transportation and Highways (the Ministry) - collected over 40,000 km on three previous provincial network data collection contracts completed during the periods from 2005 - 2006, 2007 - 2009, and 2010 - 2011.

Tetra Tech understands that the results of these condition assessments are necessary to the Ministry's business processes and will be used to establish the current network status, an essential input for the Province's Roadway Pavement Management System (RPMS).

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The Ministry updated the Pavement Surface Condition Rating Manual in December 2015 and no longer allows windshield surveys for surface condition data collections. The Ministry will accept either video-based or Laser Crack Measurement System (LCMS)-based methodologies.

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The following proposal document provides information and detailed specifications that demonstrate how this technology will meet or exceed the Ministry's requirements.

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Quality Assurance (QA) and Quality Control (QC)

The Pavement Surface Condition Rating Manual (Fifth Edition, 2015) describes the Ministry's QA specifications. Tetra Tech understands the importance of the Ministry's QA requirements and provides the details of our Methodology to meet Pre-Qualification, Progress Reports, Network Collection QA, Mid-Point and Final Re-Qualification Testing requirements in Section 3.3 of the proposal document.

Tetra Tech's comprehensive quality management plan for this assignment will ensure project deliverables meet or exceed client objectives. Section 3.4 "Tetra Tech Quality Control" describes our QC processes and how they ensure we are successful in meeting the Ministry's QA requirements, and how we manage our internal QC from data collection through process and delivery including:

- Equipment Calibration/Verification.
- Data Verification.
- Personnel Training.
- Real-Time Data Quality Monitoring.
- Daily field data collection logistics and Field QC.
- Post-Processing QC.

Tetra Tech Project Team

Tetra Tech's team will be a key component to the success of this project. With more than 100 man-years of experience with pavement condition data collection projects across Canada, Tetra Tech's team includes knowledgeable and experienced professionals familiar to the Ministry. The key project personnel have extensive and varied experience working as a team to deliver very large network level pavement data collection projects across Western Canada.

We believe our past experience and knowledge of BC climate, roadways and geographic conditions, and project requirements differentiates our team from other service providers. ^{s.22}, will be our dedicated Project Manager for this project. Other key project members are named in the proposal along with a description of their roles, years of experience and past applicable experience.

Our extensive experience with the Ministry's pavement distress rating methodology will ensure that all project deliverables comply with the requirements specified in the BC Pavement Surface Condition Rating Manual (Fifth Edition, 2015).

1.0 TETRA TECH KNOWLEDGE AND EXPERIENCE

1.1 INTRODUCTION



In response to the Request for Proposals (RFP CMB 20151214) issued by British Columbia Ministry of Transportation and Infrastructure (the Ministry) for the 2016-2017 Pavement Surface Condition Surveys, Tetra Tech EBA Inc. (Tetra Tech) is pleased to submit this response document. Our proposal will show that Tetra Tech is the right choice for the Ministry in achieving the objective of this project, to provide data collection and condition rating services for the provincial road network.

Tetra Tech has successfully worked with the Ministry on a variety of projects including three previous provincial network data collection contracts completed in the period from 2005 through 2011. Tetra Tech understands that the results of these condition assessments will be used to establish the current network status, as well as provide input into the Province's Roadway Pavement Management System (RPMS).

1.2 CORPORATE BACKGROUND

1.2.1 Consultant Profile

Tetra Tech provides a broad range of engineering and scientific consulting services to the transportation, energy, mining, and development sectors throughout Western Canada.

Formerly known as EBA Engineering Consultants Ltd. that was originally founded by Dr. Elmer Brooker in 1966, the multi-disciplinary company has since grown, now providing services to domestic and foreign markets. Our clients are served by 800 employees comprised of engineers, scientists, technologists, and support staff operating from 15 offices located throughout British Columbia, Alberta, Saskatchewan, Yukon, the Northwest Territories, and Ontario, with our head office in Edmonton, Alberta. In 2010, EBA's holding company was acquired by Tetra Tech Inc. of Pasadena, CA. While the ownership of the company has changed, Tetra Tech EBA remains a Canadian company focussed on creating and delivering better solutions to our clients.



A values-based consulting engineering and sciences company, Tetra Tech focusses on the transportation, mining, energy, and development sectors and is registered with APEGBC. Over the last 40 years, we have grown to provide a diverse range of consulting services in western and northern Canada. A strong belief in our core values drives us to be a world-class team in everything we do, and to support the development and careers of our employees, while improving the communities in which we work. We are proud of our ability to create and deliver better solutions to our clients.

TETRA TECH CORE VALUES

- ✓ *Our Reputation is Paramount*
- ✓ *We Believe in the Individual*
- ✓ *We Succeed as a Team*
- ✓ *We Each Take Ownership For What We Do*
- ✓ *We Innovate*
- ✓ *We Improve our Communities*

1.2.2 Consultant Qualifications and Experience Performing Similar Services

Tetra Tech has provided automated non-destructive pavement data collection services to the transportation industry since 1992. Our mandate to collect and provide accurately referenced quality data was the foundation on which our pavement data collection services were developed. Tetra Tech has the technology resources, including software and electrical engineering, to complete this data collection assignment and the pavements engineering resources to ensure the quality and value of the data.

Tetra Tech's Transportation Infrastructure Technologies group, responsible for roadway data collection, has successfully collected and reported correctly referenced and accurate roadway condition data on more than 750,000 km of federal, provincial/state, municipal, rural roadways, and airports. Growing consistently since inception, the core staff of the Transportation Infrastructure Technologies group has been with Tetra Tech for more than 15 years.

Our pavement data collection experience has been gained from a user's perspective. We recognise that the integrity of the collected data is critical for operation and maintenance decisions made by our clients, pavement engineers, or others. The foundation of Tetra Tech's pavement data collection services is our ability to collect accurately referenced quality data on a timely basis. Due to our previous experience collecting network and project level pavement condition data for the Ministry, our project team members are experienced in the wide variety of BC-specific linear and spatial referencing systems and the BC network deliverable requirements. All of our field operators and office staff are trained in the use of our comprehensive automated field-based data quality assessment and reporting tools.

All post-processing, analysis, QA/QC, and reporting operations will be accomplished using Tetra Tech's experienced staff and our proprietary automated roadway condition analysis and reporting tools. s.21

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. At Tetra Tech we seek to innovate and pride ourselves on developing efficient and cost-effective client specific in-house solutions, rather than generic solutions and deliverables.

We have consistently demonstrated our commitment to location referencing integrity and data quality on our past data collection projects. We will deliver data only after our internal Quality Management Plan procedures have confirmed its suitability. s.21

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Understanding client pavement management needs permits incorporating innovative practices and techniques and, when appropriate, added value services. As is demonstrated in this proposal, Tetra Tech will continue to improve the quality and value of roadway data collection through innovation, as well as the efficient and cost-effective delivery of properly referenced and accurate data.

Table 1.2.2-1 highlights some of the data collection projects completed by Tetra Tech within Western Canada.

Table 1.2.2-1: Tetra Tech Data Collection Projects - Western Canada

Organization	Pavement Asset Management System	Data Collection	Total Collected Length (km)	Name	Title	Phone
Provincial Ministries						
Alberta Transportation	-	2001-2015	525,000	Jerome Hetu	Acting Director, Highway Geomatics	780.415.1053
Saskatchewan Ministry of Highways and Infrastructure	-	2012-2014	28,000	Marissa Nelson-Jones	Senior Contracts Engineer, Technical Standards Branch	306.787.4953
BC Ministry of Transportation	-	2005-2006 2007-2009 2010-2011	42,000	Rodrigo Disegni	Senior Manager, Rehabilitation and Construction	250.953.3074
Transportation and Municipal Authorities						
City of Camrose	2015	2015	200	Grant Egerdie	Director Finance	780.672.4428
City of Saskatoon	2014	2003, 2014	1,400	Mitchell Parker	Asset Preservation Manager for Roadways	306.986.0878
City of Abbotsford	2004, 2006, 2009, 2013, 2014	2006, 2009, 2013, 2014	2,000	Tyler Bowie	Project Engineer	604.864.5514
City of Thunder Bay	-	2015	800	Mike Vogrig	Project Engineer	807.625.4321
City of Coquitlam	1998, 2000, 2007, 2010, 2014	1998, 2000, 2007, 2010, 2014	500	Eugene Motha	Project Planner	604.933.6210
TransLink	2002, 2008, 2011, 2014	2002, 2008, 2011, 2014	4,800	Vikki Kwan	Program Manager	778.375.7804
The City of New Westminster	2006, 2011, 2014	2006, 2011, 2014	540	Vedran Hrbacek	Project Technician	604.527.4546
City of Surrey	2000, 2003, 2004, 2007, 2008, 2010, 2015	2000, 2003, 2004, 2007, 2008, 2010, 2015	4,000	Ross Burkholder	Project Manager	604.591.4290
The Corporation of Delta	2000, 2004, 2006, 2011	2000, 2004, 2006, 2011	1,100	Heather Cumbridge	Project Technologist	604.952.3818
District of North Vancouver	2009	2009, 2015	750	Mike Clarke	Supervisor Engineering Services and Construction	604.990.3835
District of West Kelowna	2008, 2015	2008, 2015	800	Chris Anderson	Roads and Contract Supervisor	778.797.8842
Fraser Transportation Group - South Fraser Perimeter Road	2014, 2015	2014, 2015	90	Ian Galsworthy	Project Engineer	778.383.1970

1.3 PROJECT UNDERSTANDING

The Ministry maintains a provincial road network consisting of approximately 16,950 lane-kilometres of primary highways, 9,950 lane-kilometres of secondary highways, and 16,500 lane-kilometres of side roads. The Ministry has implemented a comprehensive pavement asset management program, the *Roadway Pavement Management System (RPMS)*, to monitor and maintain the overall health of the highway network. A key input to the RPMS is accurate pavement condition data. Currently, the Ministry collects network level pavement surface condition data that includes surfaces distress ratings, pavement roughness, wheel path rut depths, spatial roadway alignment, and digital right-of-way (ROW) images. This network data is collected on a cyclical basis according to road classification.

Tetra Tech has specific experience with this project, having provided network level data collection services to the Ministry from 2005 to 2011. During that time, Tetra Tech worked with the Ministry to improve the location referencing of the RPMS data. These improvements included the identification of differences between the Ministry-maintained provincial network centreline alignment and the actual alignment, the verification of RPMS highway landmark chainages, and the development of methods to enable the import of digital ROW images into Ministry databases.

The current assignment requires the collection, processing, and reporting of pavement surface condition data on portions of the paved road network in the Province of British Columbia. The data to be collected includes geo-spatial position (GPS) data, pavement surface distress, roadway roughness (IRI), transverse profile (wheel path ruts), and digital ROW images. Reported data will consist of correctly formatted pavement condition data files, ROW images every 10 m, and a detailed written project report. All data collection and reporting activities will be undertaken in compliance with the Ministry's Pavement Surface Condition Rating Manual - Fifth Edition December 2015 (BC Rating Manual).

The Ministry intends to award a two-year contract for provincial data collection programs in the calendar years 2016 and 2017 with an option to extend the contract for a further two years (2018 and 2019). In each calendar year for the term of the contract, a combination of Primary Highways, Secondary Highways, and Side Roads will be surveyed totalling approximately 9,000 kilometres (representing a maximum of approximately 36,000 kilometres). The roads to be surveyed in each year are listed in Schedule A of the RFP. A summary of the contract survey lengths by road classification is shown below (reproduced from the RFP).

Total kilometres of Road Network Functional Classes to be surveyed in each year of the first contract:

	2016	2017	Total
Highways			
route type - P	3,418	3,292	6,710
route type - S	2,273	2,512	4,786
route type - L	238	177	415
Side Roads			
side roads	3,133	3,071	6,204
Grand Total	9,063	9,052	18,115

1.4 CORPORATE REFERENCES

Detailed information for some of our corporate references and projects similar in nature to the scope outlined in the RFP is provided in the following section.

1.4.1 Project History / Highlights of Relevant Projects

The following table lists three completed data collection projects with technical requirements and scopes similar to the scope of the BC provincial data collection assignment. Each relevant project description includes a brief description of our role and responsibilities. These projects were successfully completed by Tetra Tech's Transportation Infrastructure Technologies group, including many of the key staff proposed for the delivery of 2016-2017 and 2018-2019 BC Pavement Surface Condition Surveys.

Table 1.4.1-1: Proponent - Project Team References

ALBERTA TRANSPORTATION - INTEGRATED DATA COLLECTION CONTRACTS

- **Name and Title of Contact Person:** Jerome Hetu, Acting Director, Highway Geomatics
- **Address:** Floor 3, Twin Atria Building, 310, 4999 - 98 Avenue, Edmonton, AB
- **Telephone Number:** 780.415.1053
- **Email:** Jerome.Hetu@gov.ab.ca
- **Description of the Work Performed:** Tetra Tech has been providing diverse network level data collection services to Alberta Transportation since 1997. Most recently, we have completed a three-year contract (2013 - 2015) and have been awarded an option year extension (2016). Annually, Alberta collects approximately 38,000 lane-km of comprehensive pavement condition data on the entire provincial highway network.

Tetra Tech's services include the collection, post-processing, analysis and reporting of accurate and referenced pavement inventory, and condition data at the network level. Alberta network data collection includes roughness (IRI), wheel path ruts, automated pavement distress, roadway geometric parameters, side-slope/ditch depth measures, corridor clearance, overhead feature inventory, digital ROW and panoramic imagery and survey grade LiDAR.

The IRI and wheel path rut measures are collected using ASTM E950/AASHTO M-328 compliant high speed inertial profilers. Automated pavement distress data is collected using full lane width LCMS technology. High density, survey grade right-of-way LiDAR data and multiple optically aligned digital image data is collected continuously using a Trimble MX8 cross-plane LiDAR system. All data is collected in a single pass using one of Tetra Tech's integrated PSP data collection platforms.

- **Team Members:** Darel Mesher, Tim Neufeld, Chris Coram, Benjamin Bock, David Firbank, Richard Hebert, Paul Brissette

Table 1.4.1-1: Proponent - Project Team References

SASKATCHEWAN HIGHWAYS - PROVINCIAL DATA COLLECTION CONTRACT

- **Name and Title of Contact Person:** Marissa Nelson-Jones, Senior Contracts Engineer
- **Address:** 240 Henderson Drive, Regina, SK
- **Telephone Number:** 306.787.4953
- **Email:** Marissa.NelsonJones@gov.sk.ca
- **Description of the Work Performed:** Tetra Tech was contracted to provide data collection services to Saskatchewan Ministry Highways & Infrastructure (SMHI) from 2012 through 2014. SMHI collects pavement inventory and condition data on the provincial highway network annually. Tetra Tech's services included the network level collection, post-processing, analysis and reporting of accurate and referenced pavement inventory, and condition data. SMHI pavement condition includes roughness (IRI) (collected using ASTM E950/AASHTO M-328 compliant high speed inertial profilers), and wheel path ruts (collected using a full lane width LCMS technology). Although not part of the original scope of the data collection contract, Tetra Tech provided SMHI with automated distress data on specific projects using LCMS data collected during the annual program. All data were collected in a single pass using one of Tetra Tech's integrated PSP data collection platforms.

Prior to providing SMHI with provincial data collection services, Tetra Tech assisted SMHI with their annual provincial pavement condition assessment program by providing expert guidance and support for Ministry personnel operating Ministry-owned data collection platforms during the period from 2003 through 2011. This assistance included best practice guidelines for inertial profiler operation and profiler validation/verification using Class I reference profile sites. Tetra Tech also developed SMHI-specific data post-processing and analysis software for the automated and accurate post-processing and referencing of provincial pavement condition data.
- **Team Members:** Darel Mesher, Chris Coram, Benjamin Bock, Richard Hebert, Paul Brissette

MANITOBA INFRASTRUCTURE AND TRANSPORTATION - LCMS DISTRESS PILOT PROJECT

- **Name and Title of Contact Person:** Nicole Fleury, Director, Infrastructure Programs and Asset Management
- **Address:** 1630 - 215 Garry St, Winnipeg, MB
- **Telephone Number:** 204.945.5010
- **Email:** Nicole.Fleury@gov.mb.ca
- **Description of the Work Performed:** Tetra Tech completed a pilot project to evaluate automated pavement distress technology for Manitoba Infrastructure & Transportation (MIT) in 2015. The project assessed the ability of LCMS-based automated pavement distress measurement to replicate MIT's existing pavement distress rating system. The MIT pavement distress methodology is based on the manual rating of gauge sites for each highway inventory section. The pilot project required the development of MIT method specific post-processing routines to convert the standard LCMS distress rating outputs into the unique distress parameters required for MIT's pavement management system. The post-processing routines were developed for and evaluated on data collected on 10 representative highway inventory sections specifically selected by MIT (approximately 140 lane-kilometers). All data were collected in a single pass using one of Tetra Tech's integrated PSP data collection platforms.

The objective of the assignment was to adapt standard LCMS distress outputs obtained from manufacturer-supplied libraries to meet the specific formats and distress processing rules required by the MIT pavement management system. MIT pavement distress types include cracking (longitudinal, transverse, alligator, block), raveling, distortion, potholes, and pickouts.
- **Team Members:** Darel Mesher, Tim Neufeld, Chris Coram, Benjamin Bock, Derek Law

In case the Ministry would like more information on our capabilities for providing comparable services, as noted in the RFP, we have provided two additional corporate references in Table 1.4.1-2 that further highlight pertinent Tetra Tech project experience.

Table 1.4.1-2: Proponent - Project Team References - Additional

TRANSLINK - PAVEMENT CONDITION AUDITS

- **Name and Title of Contact Person:** Vikki Kwan, Program Manager
- **Address:** 1600 - 4720 Kingsway, Burnaby, BC
- **Telephone Number:** 778.375.7804
- **Email:** Vikki.Kwan@translink.ca
- **Description of the Work Performed:** Since 2002, Tetra Tech has been assisting TransLink with their tri-annual pavement condition audits by conducting data collection, processing and analysis for more than 1,200 lane-km of Major Road Network (MRN) roads in the Lower Mainland. TransLink funding for MRN roads is linked to pavement performance standards, requiring the maintenance of roads at an acceptable serviceability level. The TransLink performance measuring standards establish minimum Pavement Condition Index (PCI) and maximum International Roughness Index (IRI) levels. The PCI (following ASTM D6433) and IRI are measured every three years and municipal funding for road rehabilitation and routine maintenance is provided if the minimum performance standards are achieved.

Tetra Tech's mandate was to obtain accurate and referenced condition information for auditing purposes. Pavement distress and IRI are collected in both directions of travel in accordance with ASTM Standard D6433 - *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*. During data collection, 10 pavement distress types were recorded, with three levels of severities and five extent levels (density). The through-the-windshield distress data was collected semi-automatically using an event keyboard by an operator. The pavement roughness (IRI) data was collected by high speed ASTM E950/AASHTO M328 inertial profiler. All data collection was completed in a single pass, using one of Tetra Tech's integrated PSP vehicles. The data was post-processed, and PCI and IRI were calculated for each 50 metre segment in the network and reported to TransLink.
- **Team Members:** David Firbank, Tim Neufeld, Paul Brissette, York Law

FRASER TRANSPORTATION GROUP - SOUTH FRASER PERIMETER ROAD CONCESSION, PAVEMENT DATA COLLECTION, ASSESSMENT AND DEVELOPMENT OF A PAVEMENT MANAGEMENT PROGRAM

- **Name and Title of Contact Person:** Ian Galsworthy, Project Engineer
- **Address:** 1100 Melville Street, Vancouver, BC
- **Telephone Number:** 778.383.1970
- **Email:** igalsworthy@sftg.ca
- **Description of the Work Performed:** Tetra Tech was retained by the Fraser Transportation Group to develop and implement a 25-year Operations, Maintenance and Rehabilitation Pavement Management program for the 160 lane-km SFPR highway corridor concession in 2014. The SFPR pavement management program was designed to meet the annual performance monitoring and hand back requirements. A GIS-based asset inventory and condition database was developed to predict future condition and performance of roadway assets. The project database was defined following pavement condition and structural adequacy data collection in 2014.

Pavement condition data included pavement surface distress (*BC MoTI Pavement Surface Condition Rating Manual based*), pavement roughness (IRI), wheel path rut depths, and digital images. Structural adequacy was determined using Falling Weight Deflectometers (FWD). Pavement performance will continue to be evaluated annually and the maintenance and rehabilitation program will be updated correspondingly.
- **Team Members:** David Firbank, Chris Coram, Tim Neufeld, Benjamin Bock, Paul Brissette

2.0 PROJECT TEAM

Tetra Tech proposes a highly qualified, established, and experienced team to successfully provide all of the required deliverables for this assignment to the utmost satisfaction of the Ministry. Our project team consists of staff located in Western Canada with extensive experience in Data Collection, Pavement Management, and Pavement Engineering.

One of the keys to the success of this assignment are the qualifications and experience of the project team. With more than 100 man-years of experience with pavement condition data collection projects across Canada, Tetra Tech's team includes knowledgeable and experienced professionals familiar to the Ministry. 's.21

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The key project personnel have extensive and varied experience working as a team to deliver large pavement data collection and pavement management projects. Our past experience and intimate knowledge of local conditions and project requirements differentiates our team from other service providers. Tetra Tech's pavement data collection services have been developed on our ability to collect quality data, referenced accurately, and the adherence to project schedules. Our field data collection operators are experienced in a wide variety of agency-specific linear and spatial referencing systems and network deliverable requirements. All post-processing, analysis, QA/QC, and reporting operations will be accomplished using Tetra Tech's experienced staff and our proprietary pavement condition assessment tools.

The **dedicated Project Manager** for this project is Mr. David Firbank, AScT, in this role, David's commitment includes full-time availability to the Ministry. Mr. Firbank is based in Tetra Tech's Vancouver office, providing the Ministry with convenient and local access, as required, throughout the duration of the project s.22

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Mr. Chris Coram, M.Sc., will fulfill the role of assistant project manager. Chris was

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is identified s.22

during the field collection. The remaining team members are based either in Tetra Tech's Vancouver or Edmonton offices. Resumes providing detailed relevant experience are included in Appendix A.

Key project team members have undertaken PSMJ Resources Inc.'s Engineering Project Management training and Tetra Tech's internal project management training. This comprehensive project management training ensures the understanding that project success critically depends upon skillful development, management, and monitoring of work plans, critical path schedules, and resources. Tetra Tech's Quality Management System (QMS) principles (based on ISO 9001 standards) will be incorporated into every aspect of this project to help meet the Ministry's objectives. The QMS trains employees in diverse and discipline-specific work methods and procedures with the intent of developing a quality driven culture to effectively and consistently deliver reliable solutions.

An Organization Chart is provided on the next page and is followed by an overview of our proposed key project team members, along with their roles, years of experience, and similar past applicable experience (Table 2.0-1).



FEATURE

- ✓ *Tetra Tech proposes a highly qualified and established team to provide all required deliverables for this assignment*



BENEFIT TO THE MINISTRY

- ✓ *All key project team members have successfully worked together to deliver numerous similar data collection programs*
- ✓ *Team composed entirely of in-house staff with no external sub-contractors*

ORGANIZATION CHART

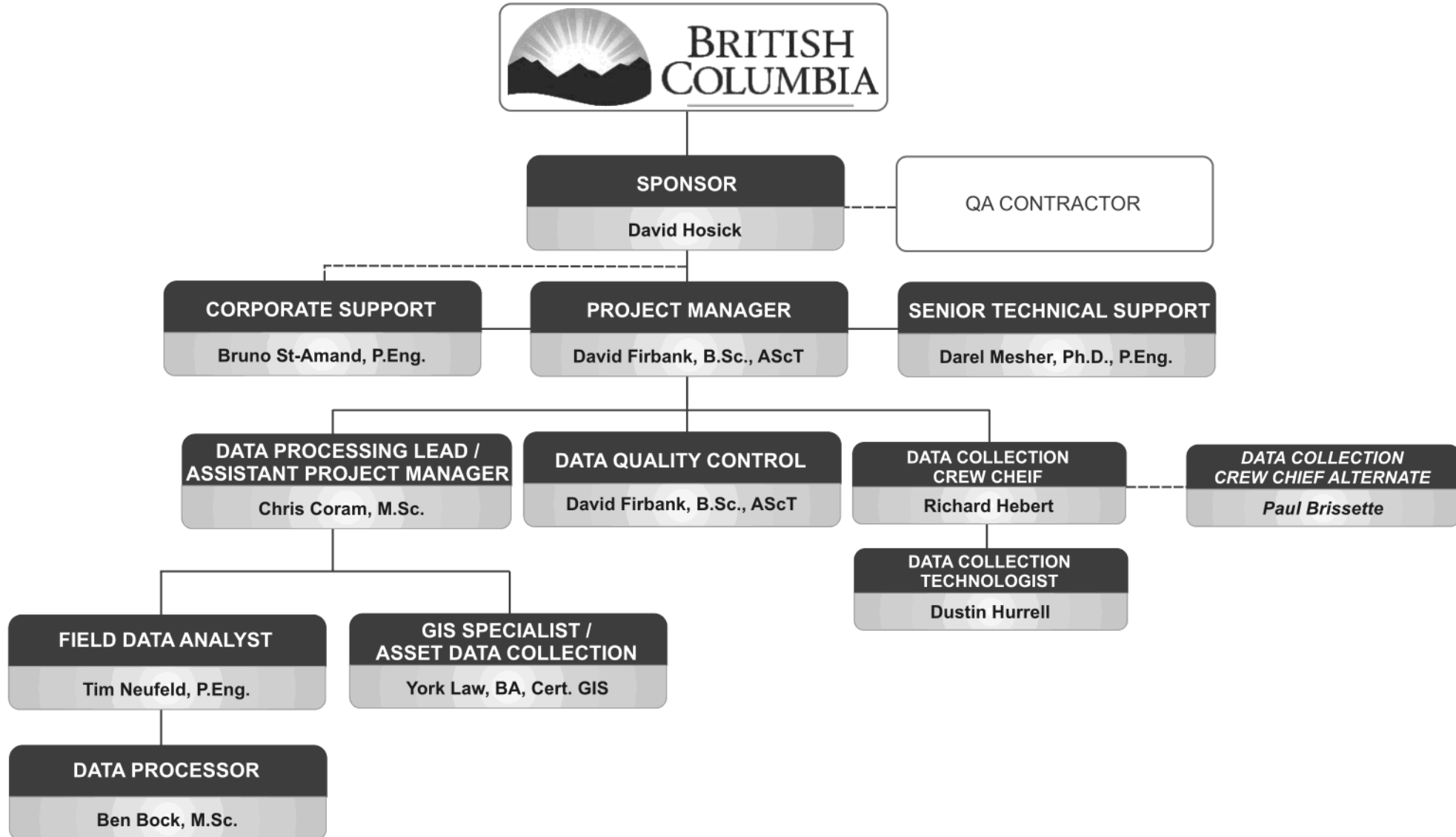


Table 2.0-1: Key Personnel
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Page 129 to/à Page 131

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3.0 METHODOLOGY

Although windshield based semi-automated pavement distress surveys were used as part of the provincial data collection programs prior to 2012, Tetra Tech understands that the Ministry will no longer accept this distress collection methodology. s.21

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3.1 SURVEY EQUIPMENT

The BC Provincial data collection project requires the simultaneous collection of five distinct roadway data measures: longitudinal profile, transverse profile, pavement distress, forward ROW images, and location referencing. s.21

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All of the data collection subsystems in the PSP-7000 meet or exceed the specifications detailed in the Ministry's Rating Manual and the technical requirements for this assignment s.21
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3.2 DATA COLLECTION AND PROCESSING TECHNIQUE

3.2.1 Data Collection Protocols

Tetra Tech's field data collection protocols are generally derived from the guidelines outlined in the Transportation Association of Canada (TAC) report "Standardization of IRI Data Collection and Reporting in Canada" (September 2001). We have found that these guidelines provide a foundation for all data collection activities and not just the collection of IRI and rut. They include acceptable limits and procedures for a variety of fundamental automated survey operations such as dead-starts and stops, vehicle acceleration/deceleration, pre-roll and post-roll distances, and preferred roadway and climatic conditions. s.21

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3.2.1.1 s.21

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As an integral part of the data collection process, Tetra Tech's provincial roadway network definition database ensures all data segments are surveyed from the correct limits. Any discrepancies in any aspect of the data collection operation are flagged in the field by the onboard GIS survey application, requiring immediate assessment and resolution by the operator; or in more difficult cases, the exception will be reported to the project manager to provide guidance on a resolution before leaving the site. An accurate network database is a critical requirement for the data collection process. s.21

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3.2.1.2 s.21

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3.2.1.3 s.21

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3.2.1.4 s.21

Tetra Tech's inertial profiler field data collection protocols are derived from the TAC IRI data collection guidelines. These guidelines include acceptable limits and procedures for a variety of fundamental automated survey operations such as dead-starts and stops, vehicle acceleration/deceleration, pre-roll and post-roll distances, and preferred roadway and climatic conditions. The PSP vehicle's longitudinal profile and IRI capabilities are provided by an inertial profiling system, which is ASTM E950 and AASHTO M 328 compliant. s.21

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Deliverables

The deliverables for IRI and rut depth measures will be tabular datasets in both CSV and DBF formats conforming to the table definition on page 65 of the 2015 Pavement Surface Condition Rating Manual. Specifically, the deliverable tables will include:

- Highway reference data: Route Type, Number, Aux ID, Contract Area, Direction, Area Manager and Sub Area.
- FROM and TO chainage (consistent with the Master List referencing system).
- Tested lane number.
- Survey date.
- Left wheel path (LWP) IRI.
- Right wheel path (RWP) IRI.
- LWP Rut (average and maximum).
- RWP Rut (average and maximum).
- Latitude, Longitude and Elevation of the FROM and TO locations.

3.2.1.5 s.21

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Deliverables

The deliverables for surface distress will be tabular datasets at 50 m intervals in both CSV and DBF formats conforming to the table definition on page 64 of the BC Rating Manual. Specifically, the deliverable tables will include:

- Highway reference data: Route Type, Number, Aux ID, Contract Area, Direction, Area Manager and Sub Area.
- FROM and TO chainage (consistent with the Master List referencing system).
- Tested lane number.

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3.2.2 Digital Imagery

3.2.2.1 s.21

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3.3 QUALITY ASSURANCE VALIDATION / NETWORK DATA COLLECTION

Field data collection will be scheduled between June and August each year. The field testing program will commence following completion of the pre-qualification process on a number of Ministry established validation sites. The details of the pre-qualification survey program will be determined following contract award. The survey of the highway networks will commence immediately following the successful completion of the pre-qualification process and after receiving Ministry approval.

During the field data collection surveys, Tetra Tech will establish ongoing communications between our field crew and the Ministry's QA contractor to provide ongoing feedback on program progress. At the conclusion of each testing day, the field crew will inform the QA contractor of the roadways tested. If the QA contractor advises the crew that a blind verification site has been tested, the field crew will process the data for the blind verification site and promptly forward it for QA contractor verification.

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Surveys will be conducted in a single direction, as specified in the Ministry inventory database (typically northbound and eastbound). The program will also include a limited number of divided highway sections requiring testing in both directions. All data collection activities will be conducted with a focus on data quality (with regard to weather, surface debris, survey speed, sun angle, etc.), referencing details (startpoint, endpoint, section length, etc.), and survey safety (surveys conducted within posted speed limits).

3.3.1 Contractor Pre-Qualification

The Ministry will establish a number of verification sites to pre-qualify data collection contractor equipment for both accuracy and repeatability. Typically, provincial verification sites are reasonably located geographically, to allow sequential surveys. Historically, verification sites were 500 m in length with a 250 m lead-in section. Tabular data of the Automated data collection results will be compared to manual ground truth data collected for each site in 50 m intervals. This manual data includes roadway roughness (IRI), transverse profile (wheel path rut), and surface distress. The sites are typically representative of a wide variety of distress types, pavement deterioration, and pavement surface types found within the provincial highway network. During pre-qualification, The Ministry representatives will have the opportunity to verify the ROW camera angles.

With reporting intervals at 50 m intervals for a 500 m long verification site, Tetra Tech understands that the pre-qualification acceptance requirements are:

Description	Accuracy	Repeatability
IRI	±10% of Class 1 IRI	0.1 mm/m StdDev for IRI of five runs
Rut	±3 mm of manual survey	±3 mm StdDev for rut depth of five runs
Distress	±1 PDI value of manual survey	±1 StdDev for PDI of five runs

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3.3.2 Progress Reports

Following successful pre-qualification, regular progress reports will be provided to the Ministry representative during network data collection. These reports will occur on Monday, Wednesday, and Friday and will include a spreadsheet listing of each road section and length surveyed since the last progress report, along with 15 to 20 digital images for review.

3.3.3 Network Collection Quality Assurance

Quality Assurance tests are conducted during the network collection via periodic validation of data against manually collected blind sites scattered throughout the province. Validation procedures and requirements are the same as those required to pass the pre-qualification testing.

3.3.4 Mid-Point and Final Re-Qualification Testing

At the approximate mid-point and conclusion of the network surveys, the initial pre-qualification sites will be retested following the same procedures used for the pre-qualification QA testing and acceptance.

3.3.5 Safety

Tetra Tech regards the safety of both the public and our employees as paramount in the daily operation of our business. We have safety policies and procedures to ensure a safe working environment for our employees and those affected by our field activities. Our safety culture emphasizes awareness and adherence to safe work practices through the understanding, acceptance, and support of those practices.

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Tetra Tech will obtain any necessary permits for operating a test vehicle in the province of British Columbia and will comply with provincial regulations for the operation of motor vehicles, as well as those specific to the operation of instrumented data collection vehicles on provincial roads. Survey activities will be conducted at posted speed limits. Operator survey setup, vehicle/equipment inspections, and data archive and transfer operations will be conducted safely away from the travelled lanes. Peak travel time surveys will be avoided on major routes, especially in the Greater Vancouver area.

3.4 TETRA TECH QUALITY CONTROL

3.4.1 Quality Management Plan

A comprehensive quality management plan for this assignment will be based on Tetra Tech's Quality Management System (QMS) whose principles (derived from ISO 9001 standards) were developed to meet or exceed client objectives. Our quality-driven culture, supported by the QMS, familiarizes and trains employees in diverse work methods and procedures and provides the tools to continuously monitor and effectively deliver reliable solutions on a consistent basis, with client satisfaction as our key objective. Deficient field data not detected until the

post-processing or reporting phases introduces the potential for sub-standard client deliverables, which is unacceptable. Significant components of our Roadway Data Collection Quality Management Plan are detailed below.

3.4.2 Data Verification

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Through this appreciation and understanding, Tetra Tech is committed to providing the Ministry with cost-effective and high quality data collection.

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3.4.3 Personnel Training

All Tetra Tech field operators undergo continuous and comprehensive training for equipment and field operations. This corporate operator training is documented and requires renewal on a regular basis (typically every two to three years).

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Field training for mobile data collection operators includes safe vehicle operations and impact to the travelling public (including Defensive Driving, Drive Change, Work Safe OH&S Training, Hazard Assessment and Control, Flagperson Traffic Control). Field staff also receive training on critical data handling, data protection and management, and field data analysis operations.

3.4.4 Real-Time Data Quality Monitoring

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3.4.5 Equipment Calibration / Verification

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3.4.6 Daily Equipment Calibration / Verification

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3.4.7 Daily Field Data Collection Logistics

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3.4.8 Ongoing Field QC

Tetra Tech's Quality Management Plan ensures maximum field data quality through field crew training and the field deployment of proprietary Quality Control (QC) software tools. These tools analyze all collected data from each survey pass for completeness and quality. The comprehensive analysis allows exhaustive data integrity verification for all surveys and is conducted daily. The field-based verification allows operators to identify invalid sensor data, missing files, data omissions, data anomalies or outliers requiring immediate investigation and the possible re-survey prior to departing the area.

3.4.9 Post-Processing Quality Control

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3.5 POST-PROCESSING OF THE DATA

Following data collection, the raw data will be returned to our Edmonton office for post-processing. All data will be transferred to our data servers for analysis and a secure permanent backup will be created.

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3.6 REPORTING

All IRI, rut, distress and digital images will only be submitted after rigorous internal quality control standards have been met. All deliverables will conform to the file naming conventions and file structure formats specified in the 2015 BC Rating Manual.

IRI/RUT data and Surface Distress data will be delivered in CSV and DBF database files, summarized in 50 m intervals, with field names and sizes as defined in Section 7.6 of the 2015 BC Rating Manual.

Forward-looking digital images will be delivered as JPEG images at 10 m intervals, with file and folder names as specified in Section 7.7 of the 2015 BC Rating Manual. During image post-processing, each JPEG image will be given a header listing the highway, linear chainage, and spatial coordinates (latitude, longitude, and elevation), the lane number, and the date and time at which the image was captured. An image database, in ESRI shape file format with attributes as specified in Section 7.7.9 of the 2015 BC Rating Manual, will be provided to facilitate the loading of images into the Ministry's RPMS and digital image database.

It is understood that the Ministry will conduct an internal quality audit after the initial pavement condition data files and digital image datasets have been submitted. Following this quality audit, Tetra Tech will make any changes required by the Ministry and submit revised pavement condition and digital image datasets, if required. This final data submission will be delivered to the Ministry within one month of the receipt of the Ministry's comments.

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3.7 SURVEY AND DATA SUBMISSION SCHEDULE

Data collection will commence with a pre-qualification survey program on several verification sites identified by the Ministry representative. It is expected that these sites will be located to allow efficient re-testing during the data collection program. Following award of the contract, these surveys will be scheduled at a mutually convenient time for the Ministry, the external QA contractor, and Tetra Tech.

The production data collection surveys will commence following the completion of the pre-qualification process. Daily production rates are expected to be variable due to a combination of climatic conditions, survey section lengths, roadway location, and functional class. s.21

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Tetra Tech’s project manager and survey crew chief will develop a data collection schedule for the year’s survey program. This schedule will be provided to the Ministry and the external quality assurance contractor at least three weeks prior to the pre-qualification survey program. Our proposed work plan for 2016/2017 based on the pre-qualification surveys conducted in the first week of June, is shown in Table 3.7-1.

Table 3.7-1: Proposed Project Schedule

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3.8 PROPOSED DELIVERABLES

3.8.1 Data Files

- Surface distress data file in both CSV and DBF format.
- Rut depth/roughness data file in both CSV and DBF format.

3.8.2 Right-of-Way Images

- Digital images of the right of way view.
- CSV file providing data regarding each image.

3.8.3 Shape Files

- ArcGIS shape file of numbered highways.
- ArcGIS shape file of side roads.

3.8.4 Issued for Use Report

- Two printed copies.
- One digital PDF copy:
 - Description of the methodology used
 - Description of the QA/QC procedures followed and their results
 - Lists the name, number and final kilometres surveyed for each highway
 - Lists the contract deliverables provided
 - Includes a listing of special event kilometre locations
 - Includes a listing of any problems encountered
 - Makes recommendations for future improvement for the delivery of these contract services.

4.0 MANAGEMENT / RESOLUTION OF KEY ISSUES

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5.0 PAYMENT SCHEDULE

Table 5.0-1 represents Tetra Tech's proposed payment schedule based upon key project milestones identified in the RFP.

Table 5.0-1: Proposed Payment Schedule
s.21

6.0 BID UNIT PRICES

Tetra Tech's bid unit prices are presented below.

Table 6.0-1: Bid Unit Prices - 2016 and 2017 Survey

Description	Lane Km	Unit Price	Cost
Survey & Reporting			
Highways	11,911	s.21	
Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for additional work Mobilization	400		
Total Price (2016 and 2017):			

Table 6.0-2: Bid Unit Prices - 2018 and 2019 Survey (extension)

Description	Lane Km	Unit Price	Cost
Survey & Reporting			
Highways	11,911	s.21	
Side Roads	6,204		
Total Lane Km	18,115		
Unit Price for additional work Mobilization	400		
Total Price (2018 and 2019):			

7.0 ADDITIONAL SERVICES

Tetra Tech's PSPs have additional integrated data collection technology that falls outside of the requirements described by the Ministry in the RFP. We have used these technologies to provide services and data solutions that other agencies have found valuable. This section provides some optional services that may be useful to the Ministry.

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7.2 s.21

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8.0 CLOSURE

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

Respectfully submitted,
Tetra Tech EBA Inc.



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APPENDIX A: TEAM RESUMES

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APPENDIX B: EQUIPMENT OVERVIEW AND SPECIFICATIONS

Page 166 to/à Page 172

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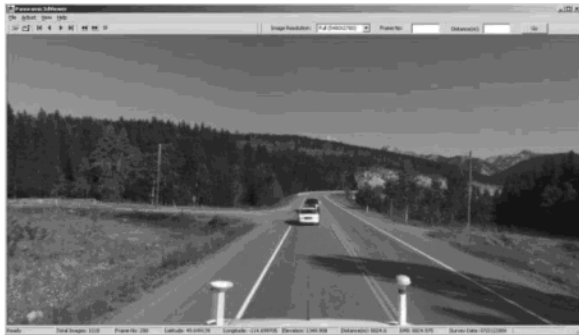
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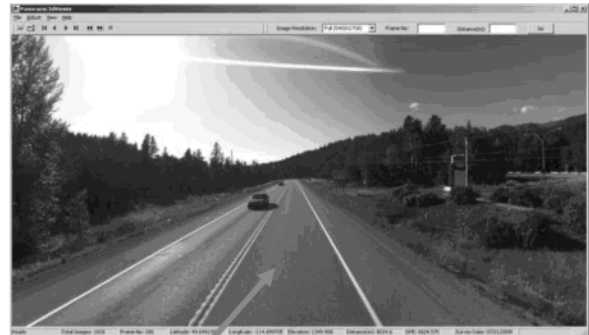
Sample Panoramic Image Dataset

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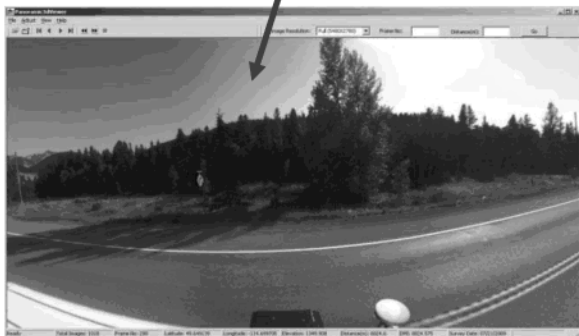
Rear View



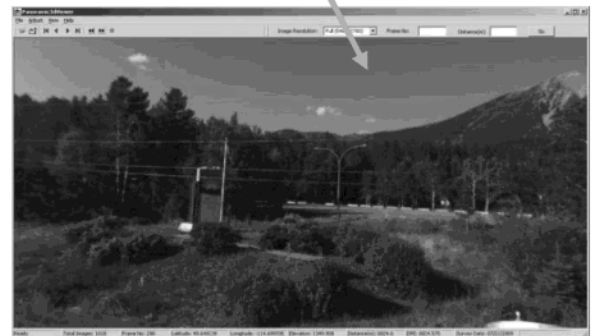
Front View



Original Acquired Spherical 3D Panoramic Image



Driver's Side View



Zoomed Passenger Side View

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Withheld pursuant to/removed as

s.21

APPENDIX C: PROJECT PROFILES

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s.21

PROPOSAL FOR
2016-2017
Pavement Surface Condition Surveys

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