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Executive Summary

This Interim Report presents an update on the continuing development and operation of the Construction Owners Association of Alberta (COAA) Benchmarking System designed to assess the performance of Alberta major projects. The developments in Phase 2 are an extension to the Phase 1 benchmarking system which was built on the collective expertise of COAA and the Construction Industry Institute (CII) at the University of Texas in Austin and funded by COAA with assistance from Alberta Finance and Enterprise (AFE), a department of the provincial government of Alberta.

There are currently 17 industry partners who are providing project data for the COAA benchmarking database. These industry partners include owner organizations (industrial and pipeline) and contractor organizations. Each industry partner designates professionals who will be responsible for data input and retrieval of information from the benchmarking database. Reports and data files containing only individual industry partner project or company data are confidential and will not be published. All data published and presented must reflect the aggregate of at least 10 projects from 3 separate industry partners.

The ongoing development in Phase 2 has included a new database system developed by CII, improved key reports and a new feature, data mining which offers our COAA members the opportunity to explore metrics, criteria and variables to improve project performance. Samples of these features are presented in section 2.3 in this report.

A snapshot of project performance, engineering productivity and construction productivity is presented in section 2 comparing projects from Phase 1 and Phase 2. This snapshot indicates a trend to smaller projects in Alberta and an increase in the number of pipeline and well site projects as compared to large SAGD projects.

From 2001 to 2012, a team of professionals from the Schulich School of Engineering at the University of Calgary (UofC) has worked as volunteers with the COAA Benchmarking Committee and the Construction Industry Institute (CII) at the University of Texas in Austin. The UofC team officially began work on the COAA Benchmarking Project in March 2012 under the COAA, industry partners, National Science and Engineering Research Council (NSERC) and Alberta Government funding agreements.

One of the key responsibilities of the UofC, as a partner with COAA and CII, is to research how the benchmarking system may be improved. One area, in particular, is how to effectively benchmark pipeline projects. Research on pipeline projects was conducted by a graduate student in the Schulich School of Engineering at the University of Calgary during 2012 and completed in the first quarter of 2013. The graduate student completed his thesis and will graduate in June 2013 with an MSc degree. The student will present recommendations on the effective benchmarking of pipeline projects to the COAA Benchmarking Committee. The committee will then determine how these recommendations may be implemented in the benchmarking system.

At the completion of Phase 2 development in 2014, the COAA benchmarking team will prepare Alberta Report #2 which will present a summary and analysis of the benchmarking data collected on completed Alberta projects in the COAA benchmarking database. The plan is to publish Alberta Report #2 at the COAA Best Practices Conference in Edmonton in May 2014.
1. Introduction

1.1. COAA Benchmarking Phase 2 Development

Following the completion of Phase 1 of the Construction Owners Association of Alberta (COAA) Benchmarking system, COAA analyzed the results of the benchmarking activities and determined that there was a need for new metrics and modifications to current metrics to expand performance measurements tailored to projects in Alberta. As a result, COAA embarked on Phase 2 development to expand and extend the system to add new metrics for pipeline and well-site projects and to add new metrics for engineering and construction. New user interfaces, customized reporting and enhanced data analysis are also part of Phase 2 development. In an effort to develop local support capability for the benchmarking system, COAA invited a team of professionals from the Schulich School of Engineering at the University of Calgary to participate in Phase 2. COAA further plans to increase the number of industry partners that participate in and use the benchmarking system.

This Interim Report presents an update on the continuing development and operation of the COAA Benchmarking System designed to assess the performance of Alberta major projects. Phase 2 development continues and will be completed in 2014. The plan is to publish Alberta Report #2 at the COAA Best Practices Conferences in Edmonton in May 2014. Alberta Report #2 will present a summary of the project assessments completed since the database was first developed in 2006.

1.2. University of Calgary joins the COAA Benchmarking Team

From 2001 to 2012, a team of professionals from the Schulich School of Engineering at the University of Calgary (UofC) has worked as volunteers with the COAA Benchmarking Committee and CII. The UofC team officially began work on the COAA Benchmarking Project in March 2012 under the COAA, industry partners, NSERC and Alberta Government funding agreements. The UofC team was asked to develop their ability to support the COAA members using the benchmarking system. This support includes training and assisting the industry partners to gather project data and to analyze the benchmarking information. The UofC team also was invited to conduct research into specific areas of the benchmarking system with the goal of identifying enhancements, additions and modification to add value for users of the benchmarking system.

1.3. COAA Benchmarking Team Responsibilities

1.3.1. COAA Benchmarking Committee

- Provide oversight and management of the COAA Benchmarking System
- Create policies and procedures for the ongoing development and operation of the COAA benchmarking system
1.3.2. **Construction Industry Institute (CII)**
- Manage access to the COAA and CII benchmarking databases to protect the security and quality of the data contained in these databases
- Operate and maintain the benchmarking systems
- Extend, revise and update the benchmarking systems

1.3.3. **Schulich School of Engineering Team University of Calgary (UofC)**
- Review, validate and verify projects in the benchmarking database
- Recruit new industry partners participating in the benchmarking database
- Assist industry partners with data collection and project input to the database
- Conduct research including:
  - Benchmarking system components and features
  - Pipeline projects
  - Well Site and Well Pad projects
  - Training for industry partners
    - The UofC team has offered training sessions to all industry partners in large groups, in small groups within a company or one-on-one with professionals from our industry partners
    - We continue to offer and present training as required and requested by industry partners in a variety of formats and locations
2. COAA Benchmarking Phase 2 Progress

2.1. Industry Participation

2.1.1. Industry Partners

There are currently 17 industry partners who are providing project data for the COAA benchmarking database. These industry partners include owner organizations (industrial and pipeline) and contractor organizations.

A number of professionals from these industry partners continue to play an important role in their participation in the COAA Benchmarking System including:

Sanat Doshi, Shell Canada  
Sean Fujikawa, Suncor  
Greg Sillak, ConocoPhillips  
Mohammad Afzal, Devon Energy  
Keerthi Sundaresan, Laricina Energy  
Greg Taylor, Nexen  
Manish Gupta, Statoil Canada  
Kevin McDowell, Syncrude  
Alex Midwinter and Gordon Pethrick, TransCanada Pipelines

2.1.2. Roles and Responsibilities

Each industry partner designates professionals who will be responsible for data input and retrieval of information from the benchmarking database. Professionals have assigned roles and responsibilities according to a hierarchy as described below.
2.1.2.1. Benchmarking Manager (BMM)

A BMM is the key person who:

- Manages the industry partner’s benchmarking efforts
- Sets benchmarking goals
- Determines the internal benchmarking hierarchy
- Coordinates the benchmarking efforts of the industry partner

2.1.2.2. Benchmarking Associate (BA)

BAs are responsible for:

- Data submission and retrieval of information from the benchmarking database
- BAs receive training to become familiar with the benchmarking system and to learn how to:
  - Collect meaningful project data
  - Verify the completeness and accuracy of the data
  - Input project data into the system
  - Retrieve and interpret benchmarking information from the system

2.1.2.3. Project Manager (PM)

PMs are responsible for:

- Work with project teams
- Collect and review data for selected projects
- Submit projects to a Benchmarking Associate

2.1.2.4. COAA Benchmarking Code of Conduct and Confidentiality Policy

- Project data from industry partners are considered confidential
- Access to project data is limited to the CII and UofC teams
  - All persons with access to project data sign confidentiality agreements and abide by COAA confidentiality policies
- Data provided for research purposes has all confidential identifiers removed
- Reports and data files containing only individual industry partner project or company data are confidential and will not be published
- All data published and presented must reflect the aggregate of at least 10 projects from 3 separate industry partners
2.2. Alberta Projects in the COAA Benchmarking Database (March 2013)

<table>
<thead>
<tr>
<th>Project Types</th>
<th># of Projects</th>
<th>Completed Projects Submitted as of March 31 2013</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Phase 1</td>
<td>Phase 2</td>
</tr>
<tr>
<td></td>
<td>Owner</td>
<td>Contractor</td>
</tr>
<tr>
<td>Oil Sands Upgrading</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>Oil Sands SAGD</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>Natural Gas Processing</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Oil Sands Mining</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Pipeline</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Cogeneration</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Oil Refining</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Oil and Gas Exploration</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Gas Distribution</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>44</td>
<td>21</td>
</tr>
</tbody>
</table>

Table 1. Completed Projects in COAA Benchmarking Database

It is important to get more projects from Contractors to get more data for both engineering and construction productivity metrics. COAA has a goal to increase the participation of industry partners in benchmarking over the next period.

![Number of Submitted Projects at Completion (US Cdn, in 2011)](image)

Figure 1. Project Size ($Cdn)

Although the number of projects completed has increased in Phase 2, these projects are smaller in size ($Cdn) from the projects submitted in Phase 1. This may indicate that the larger projects we saw in Phase 1, are now being broken into smaller pieces possibly based on the fact that smaller projects seem to have better performance than large projects. Further analysis and assessment of these projects will provide project data that will assist COAA members to improve project performance.
The change to traditional Design-Bid-Build in Phase 2 projects has been accompanied by a higher percent of engineering complete before construction starts than in Phase 1 projects.

In Phase 2, brownfield projects (29%) have increased from Phase 1 (<4%). Phase 2 projects are now being delivered in greater numbers (65%) in the traditional design-bid-build arrangement. Lump sum construction contracts are now being used in Phase 2 (29%), which is a distinct change from Phase 1 where all contracts were cost reimbursable.
2.3. COAA Performance Assessment System

2.3.1. Project Types in COAA Benchmarking Database

The types of projects in the COAA benchmarking database include:

<table>
<thead>
<tr>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Upstream (Oil Exploration/Production)</strong></td>
<td>Oil Sands SAGD</td>
<td>Cogeneration</td>
</tr>
<tr>
<td></td>
<td>Oil Sands Mining/Extraction</td>
<td>Central Plant Processing Facilities</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pad and Gathering</td>
</tr>
<tr>
<td><strong>Downstream</strong></td>
<td>Oil Sands Upgrading</td>
<td>Oil Sands Mining</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Central Plant Processing Facilities</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>Natural Gas Processing</td>
<td>Naptha Hydrotreater Unit</td>
</tr>
<tr>
<td><strong>Pipelines</strong></td>
<td></td>
<td>Hydrogen Plant</td>
</tr>
<tr>
<td><strong>Well Sites / Well Pads</strong></td>
<td></td>
<td>Utilities and Offsite</td>
</tr>
</tbody>
</table>

Table 2. Project Types in COAA Benchmarking database

2.3.2. Performance and Productivity Metrics

**Project Performance Metrics:**

- Cost
- Schedule
  - Cost and Schedule performance metrics evaluate the amount of variation from planned cost and schedule estimates at sanction
  - These performance metrics are further segregated to address five primary phases of capital project execution
    - Cost and Schedule Factors portray the proportion of total project time and money expended during each phase of the project
- Safety
- Change
- Rework
  - Safety, change and rework are measured in terms of overall project performance at completion based on Canadian practices
Productivity Metrics

- These metrics are defined as ratios of work hours to quantities
- For these metrics, a lower productivity rate is generally preferred

1. Engineering Productivity

- Engineering Productivity metrics are defined as actual engineering work hours per Issued for Construction (IFC) quantities which is the number of actual direct work hours required to design a particular unit of work
- Engineering Productivity metrics are captured for significant work activities for the following design disciplines:
  - Concrete
  - Structural Steel
  - Piping
  - Electrical
  - Instrumentation
  - Equipment

2. Construction Productivity

- Construction Productivity metrics are defined as actual direct work hours required to install a unit quantity
- Construction Productivity metrics are captured for significant work activities for the following disciplines:
  - Concrete
  - Structural Steel
  - Piping
  - Electrical
  - Instrumentation
  - Equipment
  - Module installation
  - Insulation
  - Scaffolding

2.3.3. Glossary of Terms

A Glossary of Terms is provided with the COAA Benchmarking System to provide industry partners with a common understanding of the description and definition of data elements, metrics and other items. These terms, descriptions and definitions were developed by the benchmarking committee in an attempt to have all data elements, metrics and other project information being comparable across projects. Benchmarking of project performance can only be made if the data is collected and captured in a similar manner for all projects to allow for a true comparison of like elements.
2.3.4. COAA Key Report

Figure 5. COAA Key Report

The COAA Key Report is a standardized presentation of a single project's performance data in comparison with the most similar projects available in the COAA benchmarking database. This Key Report consists of a number of sections, including general information about the project, a legend, general metrics (e.g., cost, schedule, etc.), engineering productivity metrics, and construction productivity metrics. For pipeline and well site/pad projects, performance regarding additional, specific metrics is also provided. A complete Key Report is provided after the project is submitted and validated, whereas a similar in-progress Key Report is available at any time after a user begins entering data.
2.3.5. COAA Data Miner

The COAA Data Miner, which can be seen in Figure 6, was launched in May 2012 at the COAA Best Practices Conference. This followed several years of development at CII to create a first-of-its-kind data mining engine for capital project benchmarking. There are two critical reasons why this approach to benchmarking data visualization has been so successful:

1. Data can be seen in a user-defined format. This is atypical since other benchmarking outlets process the data using proprietary models and present charts and results in the format of their choosing. The COAA Data Miner is different. The user starts by selecting a primary metric of interest and a quartile chart appears in color. This chart includes all projects in the combined COAA and CII database containing the specific metric. Then, the user can begin a process of ‘filtering’ the comparison cohort by:

   a. Criteria (far left of Figure 6 – includes contract type, project type, etc.)
   b. Variables (not metrics, but continuous variables such as percentage of modularization, percent of design completed prior to mobilization, etc.)
c. Metrics (second row of Figure 6 – a primary metric of interest can be ‘filtered’ by a specific range of a second metric. For example, cost growth can be shown only for projects with a specific range of changes)
d. Cost (lower right corner of Figure 6 – user defined range of projects’ costs)
e. Year (lower right corner of Figure 6 – user defined range of projects’ midpoint of their construction phase)

Arrows (see arrow pointing to second, blue quartile of figure) are used to indicate the specific metric value of a project that a COAA member has entered into the database. All projects entered can be selected in a window on the right side of Figure 6.

2. Aggregate data can be seen for any metric contributed by any COAA or CII member company. Prior to the COAA/CII Data Miner, benchmarks were only available for similar projects submitted by a specific member (i.e. contractors could only see contractor projects, owners could only see owner projects, and metrics were only reported when questions were answered for a specific project). While this can be viewed as a weakness of the COAA Key Report, the advantage of the Key Report is the standardized comparison across all COAA projects. The advantage of being able to mine both owner and contractor-submitted metrics from any project type provides an added level of insight about current and future projects that, before the Data Miner, was unavailable.

2.3.6. Access to CII Global Benchmarking Data

The relationship between COAA and CII provides a unique set of synergies, especially through the global benchmarking of capital projects. For 18 years, CII has been developing a worldwide database primarily due to the location of CII members’ projects. Now, with relationships such as the one between CII and COAA, the reach of CII benchmarking has expanded – not just to Alberta and Canada, but to other areas of the world through other industry groups and universities as well.

All COAA benchmarking participants are now able to compare their projects both with other similar projects in the same region (i.e. Alberta), but also to similar projects in other regions via the Data Miner access to CII’s global benchmarking database. One criterion in the COAA Data Miner section defines specific regions/locations, including Asia, Africa, Australia, North America, and South America. North America is further classified as United States (again subdivided into another four regions), Canada (i.e. Eastern and Western Canada), Mexico, Caribbean and Central America. Industry reports like this report will continue to be published in order to compare COAA projects to projects in other countries/regions and to promote cross-learning.
3. Alberta Projects Performance Assessment

3.1. Statistical Technique to Analyze Projects

In addition to descriptive analyses presented and available in project key reports, various statistical techniques are used to analyze projects residing in both COAA and CII databases. Primarily, box and whisker plots are used to portray descriptive statistics for both databases. Where used, box and whisker plots also incorporate a variety of test statistics including the standard T-test or Analysis of Variance (ANOVA) techniques, depending on the number of comparison groups and distribution of sample variances. Figure 7 provides an example of a Box and Whisker plot and associated terminology.

- **Mean** refers to the arithmetic average of a set of values, which is the sum of the variable value divided by the number of samples.
- **Median** is the number separating the higher half of a sample from the lower half. Median is equivalent to the second quartile (Q2).
- **First Quartile (Q1)** is also called as the 25th percentile or lower quartile which refers to the threshold below which 25% of the sample have observed value(s).
- **Third Quartile (Q3)** indicates the 75th percentile and delineates the highest 25% of data.
- **Interquartile Range (IQR)** refers to the range between the first quartile and the third quartile. Observations that are >1.5 IQR above Q3 or below Q1 are considered to be outliers that are not included in statistical analyses.

![Sample Box and Whisker Diagram](image)
3.2. Project Performance

 Owners’ priorities seem to have changed in Phase 2 projects – Cost over Schedule. Figure 8 shows improved Cost Growth in Phase 2 projects while Figure 9 shows higher Schedule Growth in Phase 2 projects. Although this sample is small, the trend to Cost being the main driver over Schedule is emerging. Further analysis of a larger sample of projects is necessary.
This small sample may be indicating a trend to improved Cost Growth for Lump Sum contracts but more data from a larger sample of projects is needed to verify this trend.

Again, Lump Sum contracts may be one of the reasons for improved Construction Cost Growth in Phase 2 projects but more data from a larger sample is needed.
Figure 12. Construction Indirect Cost/Total Project Cost

We see a small (4%) improvement in Construction Indirect Cost in Phase 2 but a larger sample of projects is needed to verify that a trend has emerged.

<table>
<thead>
<tr>
<th>Project Impacts</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td>WEATHER/CLIMATE</td>
<td>-1.40</td>
<td>-1.50</td>
</tr>
<tr>
<td>AVAILABILITY OF SKILLED LABOUR</td>
<td>-1.35</td>
<td>-1.17</td>
</tr>
<tr>
<td>MATERIALS AVAILABILITY COST</td>
<td>-0.87</td>
<td>-0.67</td>
</tr>
<tr>
<td>SITE CONDITIONS</td>
<td>-1.00</td>
<td>-0.67</td>
</tr>
<tr>
<td>PROJECT COMPLEXITY</td>
<td>-0.80</td>
<td>0.00</td>
</tr>
<tr>
<td>REGULATORY REQUIREMENTS</td>
<td>-0.33</td>
<td>0.80</td>
</tr>
<tr>
<td>PROJECT TEAM EXPERTISE</td>
<td>-0.53</td>
<td>1.33</td>
</tr>
<tr>
<td>CORE PROJECT TEAM TURNOVER</td>
<td>-1.50</td>
<td>1.50</td>
</tr>
<tr>
<td>USE OF OFFSHORE ENGINEERING</td>
<td>-0.31</td>
<td>-0.71</td>
</tr>
<tr>
<td>QUALITY OF FIELD LEVEL SUPERVISION</td>
<td>-1.15</td>
<td>0.50</td>
</tr>
<tr>
<td>AMOUNT OF SCHEDULED OVERTIME</td>
<td>-0.26</td>
<td>-0.50</td>
</tr>
<tr>
<td>AMOUNT OF UNPLANNED OVERTIME</td>
<td>-2.26</td>
<td>-1.25</td>
</tr>
<tr>
<td>CRAFT LABOUR SKILL</td>
<td>-1.63</td>
<td>0.50</td>
</tr>
<tr>
<td>ENGINEERING LABOUR SKILL</td>
<td>-1.00</td>
<td>-0.50</td>
</tr>
<tr>
<td>BUSINESS/MARKET CONDITIONS</td>
<td>-2.02</td>
<td>-1.00</td>
</tr>
<tr>
<td>COORDINATION WITH PLANT SHUTDOWN</td>
<td>-1.36</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Table 3. Factors impacting Project Cost (Phase 1) and Performance (Phase 2)
[-5: Highly Negative, 0: As Planned, 5: Highly Positive]
3.3. Engineering Productivity

**Figure 13. Engineering Productivity by Project Size ($Cdn)**

Larger projects in Alberta seem to have improved Engineering Productivity.

**Figure 14. Effect of % Engineering Completed before Construction Start**

Average Ratio of Actual/Estimated Peak Construction Workforce

- Phase I: 1.29
- Phase I & Phase II: 1.26
Figure 15. Comparison of Structural Steel Engineering Productivity
Work Hours/Metric Tonne

Small improvement in Alberta but productivity in the U.S. has decreased in Phase 2.

Figure 16. Comparison of Piping Engineering Productivity
Work Hours/Linear Metre

Weighted mean of productivity is similar in Alberta and the U.S. even with the project size being much larger in Alberta. We need a bigger sample of projects to verify similarities.
3.4. Construction Productivity

Figure 17. Construction Productivity by Project Size ($Cdn)

(♦ Mean Value   ▲ Mean Value weighted by project size)

Again we see small changes in productivity but we need a bigger sample to verify a trend.

Figure 18. Construction Indirect Cost Growth by Project Size ($Cdn)

There has not been much change in Construction Indirect Cost Growth from Phase 1 to Phase 2. We need to have more projects from Contractors in order to get more data for both construction and engineering productivity.
Figure 19. Comparison of Concrete Construction Productivity
Work Hours/Cubic Metre

Figure 20. Comparison of Structural Steel Construction Productivity
Work Hours/Metric Tonne
(♦ Mean value  ◊ Mean value weighted by project size)

Project size does not seem to affect Construction Productivity in these trades but we need more projects from Contractors to get more data for construction productivity metrics.
4. Path Forward

4.1. Continuing Research

In collaboration with our industry partners, the UofC team will continue to conduct research into the COAA benchmarking system in areas including:

- Quality control for the data input process including instructions, descriptions and validation processes and techniques
- Alternate methods and techniques to input project data
- Additional data elements and metrics to measure specific characteristics of industrial projects not currently measured in the benchmarking system including:
  - Activities and methods used by our engineering and construction contractors
  - Evaluation of direct and indirect work
  - Evaluation of offsite fabrication including modularization
  - Identification and evaluation of best practices
- Expand and extend data elements and metrics for oil and gas production sites including well sites and well pads
- Evaluation of alternate productivity measurements and techniques
- Customized reporting of benchmarking data
- Updated glossary of terms and definitions
- Templates and checklists to assist users with data collection for projects during execution
- Benchmarking challenges – reluctance to benchmark, barriers to benchmarking, availability of data, lack of resources, organizational policies
- Recommend changes and modifications to improve and enhance the COAA benchmarking system and present to COAA and CII by May 2014

4.2. Pipeline Project Research

One of the key responsibilities of the University of Calgary as a partner with COAA and CII is to conduct research into how pipeline projects should be benchmarked. Research into pipeline projects was conducted by a graduate student in the Schulich School of Engineering at the University of Calgary during 2012 and completed in the first quarter of 2013. The graduate student completed his thesis and will graduate in June 2013 with an MSc degree. Our gratitude is extended to the industry professionals and members of the COAA Benchmarking Committee who took time out of their busy schedules to participate in interviews and surveys to provide the information that was necessary for the successful conclusion of the research study. Recommendations on the benchmarking of pipeline projects will be presented to the COAA Benchmarking Committee. The committee will determine how these recommendations may be implemented in the benchmarking system.

4.2.1. Objectives of pipeline research

- Pipeline projects, due to their characteristics and nature, are categorized differently than heavy industrial projects. These characteristics include the length of the pipes in addition to the vast area they cover and also different regulatory processes that pipeline projects follow in order to obtain necessary permits.
Moreover, the sensitivity of these projects requires special consideration. Several pipeline projects have been either delayed or stopped due to environmental impact concerns, hazardous risks, and public resistance. These specific characteristics, impact factors, and environmental risks create a pressing need for benchmarking of these projects.

The purpose of the current research project is to expand and extend the previous benchmarking system, focusing on activities and methods utilized by engineering, procurement, and construction (EPC) owners and contractors to design and build the pipeline projects.

4.2.2. Results of pipeline research

- Definition of a pipeline project
  - A pipeline moves products or raw materials in pipe from point A to point B which is outside the battery limit and needs right of way

- Two categories of pipeline projects
  - Large Pipeline – >20 inch diameter
  - Small Pipeline – <20 inch diameter

- Customized questionnaire and metrics
  - Large pipeline – 53 metrics
  - Small pipeline – 25 metrics

4.2.3. Presentation of results of pipeline research

- Recommendations for additions, revisions and changes to the performance assessment of pipeline projects will be presented to the COAA Benchmarking Committee for review and implementation in the benchmarking system

4.3. Alberta Report #2

In collaboration with COAA and CII, the UofC team will prepare Alberta Report #2 to present a summary and analysis of the benchmarking data collected on completed Alberta projects in the COAA benchmarking database. We plan to publish Alberta Report #2 in May 2014 at the COAA Best Practices Conference in Edmonton.

4.4. COAA Benchmarking Committee Vision

- Make the COAA website the central depository of information related to benchmarking
  - Benchmarking page
  - Reports
  - Updates
- Continuation of the Benchmarking program after Phase 2
- Continued alliance with CII and the University of Calgary
- More industry partners participating in benchmarking
- More industry partners working with the available information
- Satisfy the ultimate goal of contributing to a meaningful/ measurable improvement in the productivity being experienced on industrial projects in Alberta