



Imperial Oil

ConocoPhillips



Shell Canada

ExxonMobil

Application for Approval of the Mackenzie Gathering System

Volume 2: Engineering Design

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National Energy Board

Submitted by:
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PREFACE

**APPLICATION TO THE
NATIONAL ENERGY BOARD FOR APPROVAL
OF THE MACKENZIE GATHERING SYSTEM
VOLUME 2: ENGINEERING DESIGN****EXECUTIVE SUMMARY****P.1.1 PROPONENTS**

The proposed Mackenzie gathering system includes:

- gathering pipelines, comprised of four laterals that connect the anchor fields, located at Niglintgak, Taglu and Parsons Lake, to the Inuvik area facility
- the Inuvik area facility, which contains facilities for processing natural gas and associated natural gas liquids (NGLs)
- a 476-km-long NGL pipeline from the Inuvik area facility to Norman Wells. Between the Inuvik area facility and Norman Wells, the NGL pipeline will share the same right-of-way as the Mackenzie Valley pipeline, which will transport the gas from the Inuvik area facility to northwestern Alberta.

The gathering system proponents are:

- Imperial Oil Resources Ventures Limited
- ConocoPhillips Canada (North) Limited (ConocoPhillips)
- ExxonMobil Canada Properties (ExxonMobil)
- Shell Canada Limited (Shell)

The proponents are required to consider arctic and subarctic environmental and topographic factors when evaluating, engineering, designing, constructing and operating the gathering system. They are also required to choose the most suitable route for the gathering and NGL pipelines. In developing the engineering design plans, the proponents considered engineering, environmental, safety and cost factors. In addition, the views, concerns and suggestions of the affected stakeholders along the proposed route were regularly sought and considered. In some cases, the route was altered to accommodate these concerns.

P.1.2 ARCTIC ENGINEERING

The gathering system will be built in an arctic and subarctic environment. The gathering and NGL pipelines will be buried for most of their length and will encounter areas of both continuous and discontinuous permafrost over the entire length. Heat transfer, geotechnical and structural engineering factors were considered in evaluating construction options and materials. Before developing engineering, design and route options for the gathering system, material needs, stresses and tolerances were analyzed and evaluated. Data on climate, ground temperatures, topography and specific terrain conditions were gathered. The

P.1.2 ARCTIC ENGINEERING (cont'd)

information collected was used for pipeline, facilities, construction and operations planning.

P.1.3 SYSTEM DESIGN

The gathering system has been designed to deliver about 32 Mm³/d of natural gas and associated NGLs to the Inuvik area facility in summer and about 36 Mm³/d in winter. The NGL pipeline will be capable of transporting about 3,900 m³/d from the Inuvik area facility to Norman Wells. Design alternatives for both the gathering and NGL pipelines were evaluated. Evaluation methods included using a variety of simulation programs and models that analyzed the materials and designs according to geotechnical, process and hydraulic characteristics.

P.1.4 DESIGN BASIS

Design and construction of the gathering and NGL pipelines involves meeting the requirements of users and understanding the characteristics of the specific types of terrain, including watercourse crossings, and ambient conditions that will be encountered along the pipeline route.

The gathering and NGL pipelines and associated facilities, including the Inuvik area processing facility, pipeline interconnections, block valves, pigging facilities and meter stations, were evaluated and designed. Specific characteristics, including the materials, design parameters, manufacture, special operating and performance features, and installation and construction needs, were examined. Various construction techniques for watercourse crossings were also evaluated, particularly those that might require special attention.

P.1.5 ROUTE AND SITE SELECTION

The gathering pipelines will generally be routed within a 1-km-wide corridor. For 475 km of its 476 km length, the NGL pipeline will be routed in the same right-of-way as the gas pipeline. The objectives of the route and facilities site selection process included avoiding sensitive environmental and cultural areas, reducing disturbances to communities and the landscape, satisfying engineering and construction requirements, and minimizing costs.

Route and site selection for the gathering system began in 2001. The preliminary routes selected have since been reassessed as a result of field investigations and community input. In evaluating the suitability of many of the route segments, the proponents studied alternatives to the proposed route that were suggested by local inhabitants, and the route was altered in some cases. The original route was adjusted in response to community concerns and input. Additional refinements to the route might be made before construction starts.

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