

REPORT ON
RESEARCH UNDER THE
ENVIRONMENTAL-SOCIAL
PROGRAM
NORTHERN PIPELINES

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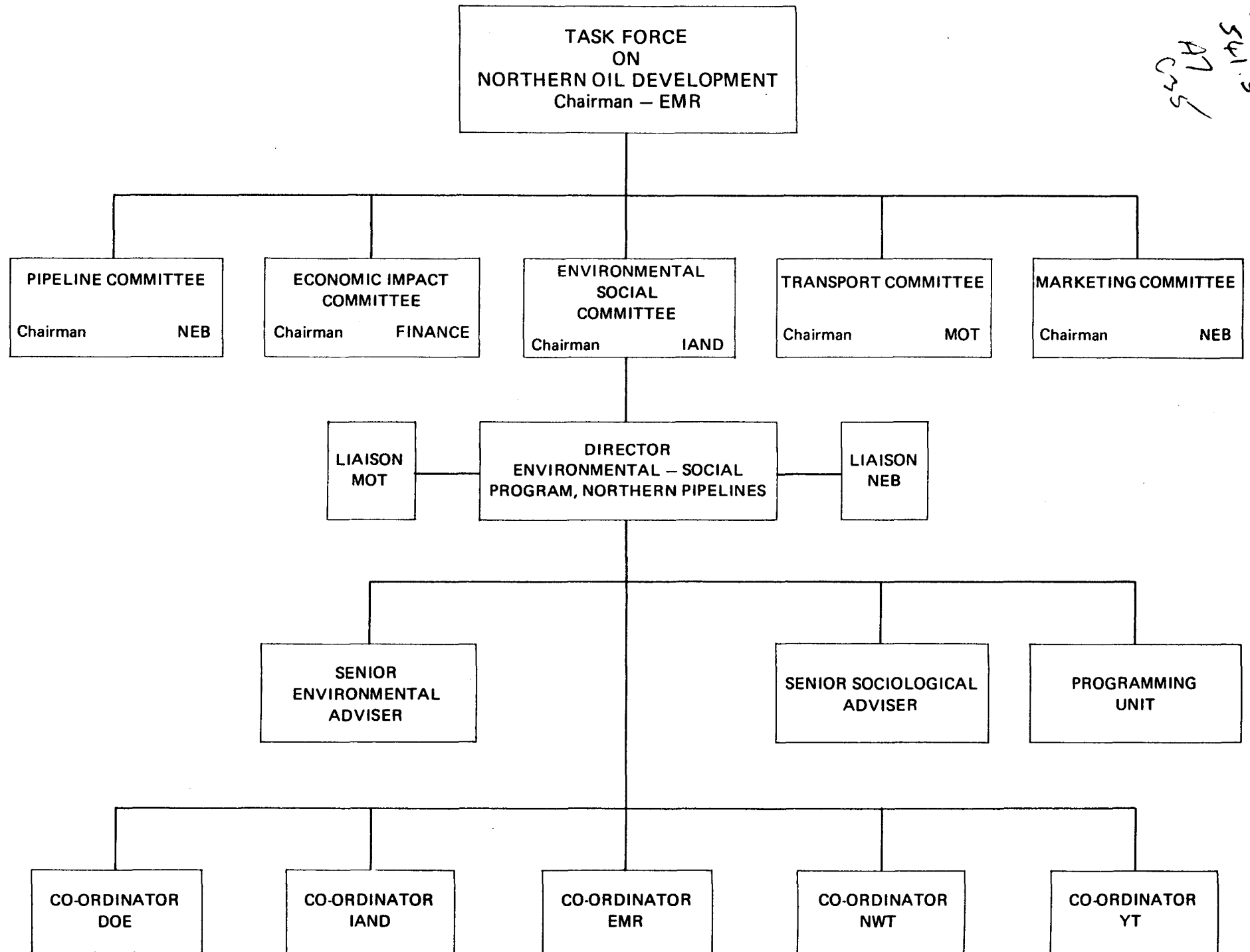


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INTRODUCTION

The Environmental-Social Program functions under the general direction of the Environmental-Social Committee of the federal government's Task Force on Northern Oil Development. The Program was developed to co-ordinate on-going research in various federal government departments on the environmental-social aspects of proposed northern pipelines. Pipeline-related projects from the Department of Energy, Mines and Resources, the Department of the Environment, and the Department of Indian Affairs and Northern Development have been identified and the work is being co-ordinated through the Program. Many existing projects have been expanded and accelerated and new research projects started to look into areas that were not being adequately covered.

The Program now involves the Department of Indian Affairs and Northern Development, the Department of Energy, Mines and Resources, the Department of the Environment, the Ministry of Transport, the National Energy Board and the Governments of the Northwest Territories and the Yukon Territory. The funds for the individual projects, with minor exceptions, are provided for in the budget of the responsible departments or agencies.

The following project reports provide a summary of northern pipeline-related studies undertaken in 1971-72. This work covers a range of disciplines of interest to anyone concerned with potential oil and gas pipelines from the North. These studies were undertaken to establish a context for the development of

government policy. Further details and results of these studies will be published throughout the life of the Environmental-Social Program for distribution to interested members of the public.

For further information on any of the projects contact the Director of the Program or the appropriate responsible Co-ordinator:

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1. Project Title: Evaluation of line pipe and pipeline steel.

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2. Objectives: (1) To evaluate available line pipe of Canadian and foreign manufacture, with special reference to its performance under Arctic conditions.

(2) To develop higher strength line pipe adapted to Arctic service.

3. Location: Testing is being done in Ottawa.

4. Progress to Date:

The planning of the assessment project was based on past experience in the investigation of pipe line failures and on knowledge acquired regarding the climatic, installation and operational conditions for the service envisaged. In addition to the standard metallurgical characteristics, it was considered necessary that information be obtained on the residual stress distribution in the fabricated pipe, on its dynamic toughness at low temperatures and its resistance to stress-corrosion cracking, and on the weldability of the pipe with particular respect to the making of girth welds in the field. The planning also included a restricted number of

full-scale burst tests for correlation with laboratory data, and the application of fracture mechanics concepts to the establishment of realistic acceptance criteria for northern line pipe.

It is expected that the pipe will be of the order of 48 in. diameter, with a wall thickness in excess of $\frac{1}{2}$ in. and will be supplied in lengths of about 40 feet. Individual lengths are therefore being procured essentially on this basis. One length of pipe, representing current commercial production, was obtained from the Steel Co. of Canada for comparison purposes. Three lengths, considered to be potentially suitable for use in the North, were obtained from different Japanese pipe mills. Samples of an experimental grade were also obtained from the International Nickel Co. Other Canadian and European suppliers have been contacted. Visual examination and non-destructive inspection of the parent metal and seam weld of some of the pipes has been completed and residual stresses induced by processing have been measured. A metallurgical test program to provide data on property variation along and around the pipe has been prepared and is underway. Weldability studies, using two test techniques, have been made on two of the candidate materials, and the longitudinal weld in the International Nickel pipe has been assessed. A method for simulating welding practices in making a circumferential (field) weld in large-diameter pipelines has been developed.

The planning of the steel development project was based on a study of suitable strengthening techniques and an estimate of the probable metallurgical requirements for northern line pipe. It was considered that direct quenching on the run-out from the hot mill, followed by tempering, was

the most promising procedure. Attention is being concentrated on a low-carbon steel, with and without some alloying elements. A special ingot mould was designed to permit direct rolling in the laboratory without a forging operation, and a direct-quenching facility is being installed on the rolling mill.

5. Proposed 1972-73 Program

Continue investigations as outlined above.