Granular Resource Requirements for Proposed Mackenzie Valley Pipelines:

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SECTION 5.

TECHNICAL PANEL "C"

TYPICAL BORROW MATERIALS USAGE

NORMAN WELLS PIPELINE BORROW MATERIALS USAGE

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This paper presents an overview of IPL's business, a brief description of our system, our long range program and how it eventually will affect our activity in the north, and a description of construction of the Norman Wells pipeline.

I'll throw out the essence of my crystal ball and what I think the projected use would be if we extended our pipeline further north. I'll discuss a little bit of the evolution of my numbers and it's up to debate after that. I have a very poor resource for numbers in that we don't have anything in our archives. We're pretty silent right now in northern pipeline development.

IPL is in the business of transporting liquid petroleum products. They are transported from western Canada to points in the mid-western United States around the Chicago area, and on into western Ontario, Sarnia and Toronto area. Three pipeline systems extend out of Edmonton, the smallest of which is a 16-inch line. A 20-inch line carries refined products, NGLs and condensates, and transports them to markets within western Canada and on into Ontario. A 24-inch line and a 34-inch line extend from Edmonton to Superior, Wisconsin and they take the remainder of the crude products. From Superior, a 30-inch pipeline travels north of Lake Superior and a 34-inch goes south. They all meet again at Sarnia and extend east to Toronto and Montreal.

The capacity of our system in Cromer, Manitoba, which would be at peak pumping capacity, is about 1.4 million barrels/day. Forecasts for 1996 estimate about a 120,000 barrel/day shortfall which would exceed our sustainable pumping capacity. What's notable about that statement is that this forecast increase in crude volumes does not include an increase in northern crude deliveries. Conventional crudes, from non-frontier sources, projected price is likely to remain quite steady which would discourage any further extension of our system northward from Norman Wells.

The Norman Wells pipeline and the system facilities consist of a buried, 12-inch diameter pipeline, extending from Norman Wells south for 868 km to Zama, Alberta (Figure 1).

The question is will now attempt to answer is: What were the granular requirements for the construction and maintenance of the Norman Wells pipeline?

Engineered slopes required granular volumes of about 17,000 m^3, as a calculated number. There were 155 designed slopes and where the design called for less than 7°, we would go with the selected backfill. In terms of facilities, there are 48 valve sites along the Norman Wells system and 40 are in the NWT. Small volumes of granular material for fill are associated with valve sites locations.

The Norman Wells Pump Station is constructed on a rocky surface which has been levelled using shales from the Norman Wells quarry. Going further south, the pad for the construction camp at KP78 (Bear Rock), used hauled rock, about 500 m^3. Most of the concrete involved in the construction of the Wrigley Station was on-site granular. Another maintenance base, at KP447 near Camsell Bend also had on-site granular. The Mackenzie Pump Station was built on a mudstone base. Some surficial rock was brought in for a walking surface but again not for structural requirements.

The mainline construction camps were the biggest users of granular. However, this gravel was as recoverable, since it was repurchased and used for remedial works on our slopes. Granular material was also used at our stockpile sites. The purpose of stockpiles is for pipeline temporary storage and that granular is also recoverable. Pipe stockpile sites were only used north of Willowlake River. Some of the river crossings required rock rip rap and we also developed aggregate for the construction of river weights, about 100 m^3 total. This summarizes the borrow needs for the construction phase of the Norman Wells pipeline.

After commencement of pumping operations in May 1985, a fair amount of granular was used, although it

didn't have to be granular, for re-roaching the pipeline ditch. In 1986, there was approximately 35 km of subsided ditch which was re-roached. Figures for 1986 and 1987 were unavailable although about 500 m^3 was used to repair slopes near Fort Norman.

Norman Wells crude has a very light viscosity and therefore we can bury and don't have to insulate it. Typically, Norman Wells crude flows around 0° but I don't have detailed information about the crude types north of Norman Wells.

Note: The text of this presentation has been transcribed from an audio-tape recording of the workshop presentations. If necessary, we would suggest that the reader verify the accuracy of these comments with the presenter.

Figure 1. Norman Wells to Zama Pipeline Route