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WORK PLAN
FOR AN
ENVIRONMENTAL SITE ASSESSMENT OF
THE WHITE PASS PETROLEUM PRODUCTS
PIPELINE AND ASSOCIATED
INFRASTRUCTURE

Submitted to:

White Pass Transportation Limited
P.O. Box 4070
Whitehorse, Yukon
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DISTRIBUTION:

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1.0 INTRODUCTION

Yukon Pipelines Limited, a White Pass Transportation Limited (White Pass) subsidiary, is in the process of decommissioning the pipeline and associated facilities located in British Columbia and the Yukon Territory. The pipeline and associated infrastructure was built in 1942 by the U.S. Army along the right-of-way of the White Pass and Yukon Route Railroad as illustrated in Figure 1. White Pass purchased the pipeline in 1962 and was granted approval from the NEB to operate the pipeline to transport petroleum products (e.g., gasoline, diesel and fuel oil) from the point of connection at the international border with Alaska near Fraser, B.C. (mile post 20.7) to Whitehorse, Yukon (mile post 110). As part of the decommissioning planning process, White Pass retained Golder Associates Ltd. (Golder) to conduct an Environmental Site Assessment (ESA) and assist with environmental restoration work.

1.1 Scope of Work Plan

This report presents a Work Plan for conducting a phased ESA for three the main components of the petroleum distribution system located in British Columbia and the Yukon Territory, namely:

1. the Petroleum Products Pipeline from Mile 20.7 to Mile 110;
2. the Upper Tank Farm site in the City of Whitehorse; and
3. the Pump Station site in Carcross at Mile 67

This Work Plan is structured to address the planning needs of White Pass and the requirements of the National Energy Board (NEB). First, as part of this introduction section, available site-specific background information is reviewed to develop the background and context for the ESA work. Next, our understanding the project requirements and principal objectives of the ESA program are discussed in Section 2 and a technical work plan for conducting the Phase 1 and 2 ESA is presented in Section 3. A management work plan is outlined in Section 4 and a preliminary cost estimate for the initial tasks of the ESA program are presented in Section 5.

1.2 Relevant Background Information

The following list of documents provide information on site characteristics from previous operational records, observations made during site reconnaissance and in some cases, previous ESA programs:

Whitehorse Upper Tank Farm Site

1. *Letter report for Test Hole Drilling and Aquifer Testing White Pass Upper Tank Farm for Yukon Territorial Government*, Hydrogeological Consultants Ltd., January 5, 1991, (Appendix 1).

2. *Screening level phase I ESA of the Whitehorse Upper Tank Farm and the former White Pass fuelling facilities at the Whitehorse Airport*; Golder Associates Ltd., October 1994;

3. *Report on an Inspection of the Deactivated Skagway, Alaska to Whitehorse Yukon Petroleum Products Pipeline*, National Energy Board, June 1995, (Appendix 2).

Petroleum Products Pipeline Right-of-Way (mp 20.7 to mp 110)

1. *Report on an Inspection of the Deactivated Skagway, Alaska to Whitehorse Yukon Petroleum Products Pipeline*, National Energy Board, June 1995, (Appendix 2).

2. *Draft, Screening Level Phase I ESA, Golder, December 1994, (Appendix III).*

3. Environmental Site Assessment of an historical release of petroleum products from the White Pass petroleum pipeline at Mile 6 of the White Pass and Yukon Route Railroad near Skagway, Alaska (November 1995); and

4. Environmental Site Assessment and Excavation of an approved burn pit located at mile 49 of the White Pass and Yukon Route Railroad near Graves B.C. (October 1995).

Carcross Pump Station Site

1. *Report on an Inspection of the Deactivated Skagway, Alaska to Whitehorse Yukon Petroleum Products Pipeline*, National Energy Board, June 1995, (Appendix 2).

Based on the information contained in these background reports, there are a number of areas of potential environmental concern (APEC) that become the focus for this Phased ESA program.

1.3 Areas of Potential Environmental Concern

A preliminary list of areas of potential environmental concerns (APEC) has been inferred from background data. The principal data sources for the selection of APEC includes the screening level ESA of the Whitehorse Upper Tank Farm conducted in October 1994 by Golder and the pipeline inspection report conducted in May 1995 by the Nation Energy Board (NEB). Where appropriate, the location of each APEC is illustrated on Figures 2 and 3 and described below.

Whitehorse Upper Tank Farm

APEC 1	Former Pump Station with 1000 gallon above ground engine fuel tank
APEC 2	Pump House, with inlet meter and product densitometer
APEC 3	Truck Loading and Unloading Rack
APEC 4	Booster Pump (s)
APEC 5	Yard Piping
APEC 6	Shed and oil change pit
APEC 7	Yard Valves
APEC 8	Keylock and Pump near Tank 117
APEC 9	Area of historical Herbicide use
APEC 10	Truck Unloading Manifold
APEC 11	Aboveground Tanks suspected of historical release(s) or significant staining: Tanks 104, 103, 105, 106, 107, 108, 110, 111, 114, 116, 117, 120, 123 and 124.

Petroleum Products Pipeline Right-of-Way (mp 20.7 to mp 110)

APEC 12	Staining on the Pipe and the Ground at a Flange Connection on a Valve at Alaska Highway Kilometre 1478
APEC 13	Mile Post 90.1: 78,000 litre leaded gasoline spill in 1985
APEC 14	Mile Post 29.9: Localized Area of Hydrocarbon Odours in area of

	Gasoline Spill in 1987
APEC 15	Mile Post 42: 70,000 litre on Leaded Gasoline Spilled in 1987
APEC 16	Valve Sites
APEC 17	Location of 57 Historical Reported Spills that have reportedly been remediated

Carcross Pump Station Site

APEC 18	Soil Staining Near Concrete Building Foundation
APEC 19	Tank and Yard Piping

The phased environmental site assessment program described in this work plan was designed to evaluate the risks to human health and environment of historical activities related to the petroleum transport and storage activites at each of the above-listed APEC.

1.4 Project Requirements

Our understanding of the project requirements is based on discussions with Mr. Tom King, Whitepass and NEB staff, review of the NEB document entitled: "*Guidelines For Filing Requirements Part VII: Environmental, Socio-economic and Lands Information Required to be filed by an Applicant for Authorization to Construct, Operate and Abandon Pipelines Pursuant to Sections 52, 58 or 74 of the National Energy Board Act*", review of previous work on the subject sites, and a review of records from our in-house files.

According to NEB guidelines, an application to abandon the operation of a pipeline which results in facilities being permanently removed from service must include a description of:

1. the methods to be used for the site assessment; these methods must be consistent with the Canadian Council of Ministers of the Environment (CCME) guidelines, criteria and requirements;

2. the methods to be used for the cleanup of any contaminants found on site;

3. the methods used for the disposal of all equipment and all wastes including specific disposal sites; and

4. the methods to be used to restore the land to a condition similar to the surrounding environmental and consistent with the current site uses.

We understand that all petroleum products have been removed from the infrastructure associated with the pipeline (i.e., the pipeline, tanks and pumps) and that the ESA will be conducted concurrent with the dismantling of the infrastructure during the weather window in 1996.

1.5 Objectives of ESA

A Phase I and II environmental site assessment constitutes a detailed review of historical activities followed by an intrusive investigation wherein potential contaminant sources, migration pathways and receptors are identified and delineated. Subsequent phases of the ESA involve remedial investigation and planning and implementation.

The objectives of the Phase I and II ESA study described in this work plan are:

1. By conducting a detailed review of historical records, interviews and site reconnaissance determine how past activities may have impacted the environmental at various locations throughout the sites;

2. Based on an analysis of the historical review, develop a list of areas of potential environmental concern and potential contaminants of concern that will be further investigated;

3. Prioritize the sites on the basis of risk to the environment, indentifying sites requiring immediate remedial actions, those requiring further assessment and those in which no further assessment is necessary;

4. Where appropriate and warranted, further investigate and characterize soil and groundwater contamination in areas of potential environmental concern (i.e., 19 APECs have been identified at this stage) as well as any additional areas identified during the Phase I ESA or by the project manager; the investigations will provide estimates of the extent of contamination and determine the presence or absence of free-phase hydrocarbon contamination;

5. Gather information on site characteristics to allow a preliminary environmental risk assessment to be conducted for each site, whereby the source areas, pathways, and receptors of potential concern are identified and assessed. In particular, determine direction and estimate the rate of groundwater flow and evaluate the probability of off-site migration of contaminated groundwater or free-phase product; and

6. Develop a data base for planning future investigations and/or remediating those areas that do not meet regualtory criteria.

1.6 Geological Setting

Soil conditions underlying the Whitehorse Upper Tank Farm and the Carcross Pump Station consist primarily of alluvium (sands and gravels) and glacial deposits. Within the Yukon, the soil conditions underlying the pipeline are also primarily alluvium and glacial deposits. However, between Carcross, Yukon and Bennett B.C. the pipeline is underlain primarily by coarse structural fill (i.e., blast rock) or bedrock.

2.0 TECHNICAL WORK PLAN

2.1 NEB Requirements and Approach

2.1.1 NEB Requirements

NEB's "Guidelines for Filing Requirements" require that the methods to be used for an environmental site assessment must be consistent with the following reports of the Canadian Councile for Ministers of the Environment (CCME):

1. Interim Canadian Environmental Quality Criteria for Contaminated Sites (CCME, 1991b);

2. National Classification System for Contaminated Sites (CCME, 1992);

3. Guidance Manual on Sampling, Analysis, and Data Management for Contaminated Sites, Volume I and II (CCME, 1993); and

4. Subsurface Assessment Handbook for Contaminated Sites (CCME, March 1994)

As discussed in a subsequent section of this work plan, our recommended strategies and approach have been developed to help refine the investigation and subsurface exploration tasks.

2.1.2 Approach

Our investigative approach considers the general objective of White Pass as well as the NEB requirements. We propose to undertake the investigation in two phases. During Phase I, additional data on historical site activities will be obtained and reviewed, site health and safety training and planning will be implemented, screening-level soil vapour surveys (where appropriate) will be conducted, and where appropriate, an initial, limited subsurface exploration program will be executed. Based on the findings of the Phase I assessment, additional, more detailed subsurface investigations and data collection will be undertaken as Phase II of the ESA program. Specific strategies for each component of the petroleum distribution system are discussed below.

Pipeline and Carcross Pump Station

Soil vapour surveys are expected to be successful in areas where permeable fills and native deposits are present as these materials are expected to readily conduct volatile fuel vapours and thus allowing simple detection using shallow probes. Where soil conditions permit, shallow hand augering and soil sampling will be conducted to assess residual hydrocarbon concentrations in soils. In areas of finer grained soil and shallower depths to the water table the hollow stem auger drilling method will be used.

We have observed the Carcross Pump Station and the pipeline between Mile Post 20 (the BC-Alaska border) and 49 as part of previous related studies for White Pass and are satisfied that for these portions of the site afford reasonable access for mobile drilling and/or test pit excavating equipment. Access to the remainder of the pipeline will be assessed during the reconnaissance task of the Phase I ESA.

Whitehorse Upper Tank Farm

We have examined the Whitehorse Upper Tank Farm as part of previous studies for White Pass and are satisfied that the site affords reasonable access for mobile drilling

and/or test pit excavating equipment. Further, we have selected the air rotary with casing drilling method in areas of coarse sands, gravels and cobbles. The air rotary drilling method will be used as it provides a rapid, cost-effective investigative technique for deep holes in coarse granular soils. The air rotary drilling method was also used previously by others on the Whitehorse Upper Tank Farm at the north-west end of the site.

Following receipt of laboratory analyses, a detailed environmental assessment report will be compiled. The report will summarise the findings of the investigation and provide an assessment of the potential contamination sources at the site. If appropriate, a remedial strategy will be developed using the results of the Phase I ESA. Our general approach to remedial planning is to use a risk-based strategy to identify the need and urgency for recommending remedial measures and to define site-specific clean-up criteria. Using this approach, several remedial options, are assessed and a cost-effective risk management strategy is developed.

2.2 Detailed Methodology

2.2.1 Pre-Investigation Preparation

Phase I Environmental Site Assessment

For the Phase I ESA, Golder proposes to undertake the study generally following the approach followed by practicing environmental professionals in B.C. and Yukon. The scope and approach of a Phase I ESA undertaken by Golder generally follows that outlined in CSA Z768-94 which includes two main tasks as described briefly below.

Task 1 - Site History, Background Data Collection and Evaluation.

Golder will review and evaluate pertinent available data to investigate historical uses of the tank farm, pump station and pipeline right-of-way and properties immediately surrounding these sites, and to identify known and potential sources of contamination. Where warranted and available, Golder will utilize the following sources of information:

- historical aerial photographs, and site maps or other plans obtained by Golder;

- discussion with regulatory review agencies regarding the subject sites and properties adjacent to the site;
- interviews with former long-term employees of White Pass who have knowledge of the operational activities of the pipeline system and tank farm and pump station; and
- other pertinent documents supplied by White Pass, or others.

The information gained through this review of historical information will also help to guide the subsequent tasks and focus the site reconnaissance which is described below.

Task 2 - Site Reconnaissance

Golder will conduct a site reconnaissance of the subject sites and surrounding properties using a field checklist. The reconnaissance will be completed to visually corroborate indications of possibly hazardous material contamination uncovered during the review of historical information and interviews. Golder will also gather visual evidence of other potential contamination problems that may exist at the site and where applicable, on accessible adjacent sites including, but not limited to, the following:

- underground storage tanks and supply lines;
- hazardous material and hazardous waste storage or disposal areas including sumps, pits, ponds and landfills;
- barren or discoloured unpaved surface conditions, including signs of dead and stressed vegetation;
- electrical transformers and capacitors, where applicable;
- maintenance areas;
- evidence of recent and historical spills.

A reference plan will be prepared for each area of the site that will be used to identify areas of potential environmental liabilities. These areas and other pertinent observations will be photographed and each photograph will be referenced on the plan and included in the Phase I report.

Review of Screening Level Phase I Environmental Site Assessment and Other Related Information

The data collected by Golder and others on the site will be compiled and reviewed. As some of these reports were prepared by members of the project team, this task will involve only general familiarization of the site. In addition, we will contact the local, provincial, territorial and federal environmental agencies and/or local property owners of adjacent facilities with underground tanks and/or on-going investigation or remedial programs to obtain additional subsurface information. This will be used to develop a list of potential contaminants of concern, refine the conceptual hydrostratigraphic model of soil and groundwater conditions at each site and where necessary, to modify proposed depths and/or locations of monitoring wells or boreholes. As discussed previously, the assessment of potential environmental concerns will incorporate a qualitiative evaluation of risks to human health and the environment at each site.

Health and Safety

A Health and Safety Plan will be finalised during the pre-investigation preparation task. This process will be streamlined by modifying our existing health and safety plan used on other active petroleum sites in British Columbia and the Yukon to address local conditions. White Pass safety instructions will be incorporated into our Health and Safety Plan.

All members of the proposed project field investigation team have completed Golder's in-house 40-hour OSHA health and safety training course. For estimation purposes, we have assumed that any additional direction on health and safety issues related to White Pass's requirements will take place on-site or in Whitehorse just before the start of field investigation.

Site Reconnaissance with NEB & Whitepass Representatives

A site reconnaissance tour with a White Pass and NEB representatives that are familiar with the pipeline operation will be held at the start of the project. The purpose of the site inspection would be to discuss the project, to obtain and review data files that may pertain

to the project, and to confirm project constraints, proposed investigation sites and site requirements to conduct the soil vapour and borehole drilling programs.

Site Physical Characteristics

Following the review of existing data and the site inspection a description (or hydrogeological model) of the physical characteristics of the site will be developed. This model will include available information on local soil and hydrogeological conditions and surface water flow. The model would then be used to refine the proposed borehole drilling program

2.2.2 Stage 1 Field Investigation

Whitehorse Upper Tank Farm

Borehole Drilling

Immediately following the data review and site reconnaissance, we propose a drilling, soil sampling and groundwater monitoring well installation program for the Whitehorse Upper Tank Farm. The purpose of this program is to assess general soil and groundwater conditions at the Whitehorse Upper Tank Farm.

Figure 2 shows the approximate locations where the proposed boreholes and monitoring wells will be located at the Whitehorse Upper Tank Farm. All drilling will be performed using air rotary (with casing) drilling method.

Soil samples will be collected in glass soil sample jars and visually examined for the presence of hydrocarbon or other signs of contamination. All descriptions will be recorded and logged in the field.

To further assess the presence of hydrocarbon product, field shake tests may be performed. This screening procedure consists of placing approximately 5 grams if soils in a jar with 25 millilitres of water, and shaking for approximately 30 seconds. Hydrocarbon product, if present, is evidenced by coating the sides of the container, and/or forming layers or shines on the water.

The soil will be screened using the dry headspace method, which employs a portable organic vapour monitor (OVM) equipped with a photoionization detector (PID) to determine total organic vapour concentrations.

Boreholes not completed as monitoring wells will be grouted to surface with an impermeable backfill (*i.e.* Hole-plug™) or a non-shrinking cement-bentonite mixture. Depending on location, a concrete surface seal or cold asphalt patch will be placed at ground surface.

Groundwater Monitoring Well Installation

Where monitoring wells are installed, flush-mount surface completions (if within 5 metres of roadways or track) will be constructed. Each well will be constructed using individually wrapped, 51 mm (2 inch) in diameter Schedule 40 PVC pipe. The pipe will be threaded and the monitors will be completed without using any glues or solvent which might compromise the quality of water samples. All wells will be sand packed and a bentonite seal will be installed above the sand in accordance with Golder protocols. A typical well completion detail is presented as Figure 4. Because the site is in operation, we recommend flush mount steel covers concreted in place. Typical well completion details will be the same as that followed for the existing wells on the site (details of these are available, if required).

Well Development and Response Testing

Upon well completion, each well will be appropriately developed by purging, and then monitored with an interface probe and an OVM to determine the presence of hydrocarbon vapours, the presence and thickness of any free product, and the depth to groundwater. In wells without product, response testing will be performed to estimate aquifer properties and horizontal hydraulic conductivity. The rising head method will be used, whereby a volume of water is rapidly removed and recovery monitored with time. Depending on the response observed, recovery will be monitored using either an electric water-level tape or a pressure transducer. Data will be interpreted using commercially available software (AQTESOLV).

Groundwater Sampling

Groundwater sampling will proceed in accordance with established Golder protocols after a period of stabilisation (one week minimum). In wells without floating hydrocarbons, each well will be purged of at least three well volumes and monitored for temperature, pH, conductivity and dissolved oxygen until stability, prior to obtaining representative samples. Samples will be appropriately preserved in laboratory-supplied bottles and in the case of dissolved metals, will be field-filtered using disposable 0.45 µm filter apparatus prior to placement in acidified, labelled containers in a cooler on ice.

Surveying & Water level Monitoring

Golder will conduct an elevation and location survey for all boreholes completed with monitoring wells, and relevant structures. Water levels and free-product thickness (if present) will be measured in each well. An electric water level meter will be used to monitor water levels and an interface probe will be used to measure free-product thickness.

Groundwater Chemistry

Soil and groundwater samples obtained from the borehole drilling and groundwater monitoring programs will be submitted to a qualified laboratory for chemical analyses. Selected groundwater samples will be analyzed for the potential contaminants of concern that will likely include the following list of parameters:

BTEX (benzene, toluene, ethylbenzene and xylenes) and Volatile Extractable Petroleum hydrocarbons (VEPH)

PAH (polycyclic aromatic hydrocarbon), Light petroleum hydrocarbons (LEPH) and Heavy petroleum Hydrocarbons (HEPH)

VOC (volatile organic compounds)

CCME Metals

Herbicides at selected sites

Pipeline and Carcross Pump Station

Soil Vapour Survey

The anticipated sandy shallow soils underlying a portion of the Pipeline and Carcross Pump Station sites provide an opportunity to make effective use of soil vapour screening techniques in some areas. A soil vapour survey is proposed to identify potential hydrocarbon release locations and where permeable soils extend to the water table (within 5 m of the ground surface), to map the lateral extent of any product plumes identified. We anticipated that soil vapour screening will be limited to specific relatively low-lying areas along the pipeline line where the watertable is within 5 m of the ground surface and historical releases have been reported or are suspected.

The most successful and cost-effective strategy involves a combination of on-site organic vapour and carbon dioxide and oxygen monitoring of the soil gases to determine zones of both high organic vapours and of active *in situ* biodegradation. Old hydrocarbon spills commonly remain active in soils as they slowly degrade, with subsequent oxygen consumption and carbon dioxide production. Confirming *in situ* degradation using portable field instruments also provides important input that can be used in future for the selection of remedial options, or for a baseline risk assessment.

At each soil vapour location, a 12 mm diameter, hollow steel vapour probe will be installed to approximately 0.6 m to 0.9 m below grade. Soil vapours will then be withdrawn by vacuum into a Tedlar™ bag and immediately screened in the field using an organic vapour monitor (OVM) equipped with a photoionization detector (PID) as well as screened for carbon dioxide and oxygen concentrations. The probe will be removed and each probe hole grouted to surface at the completion of testing.

Soil vapour concentrations will be plotted as data are acquired, and used to assess the presence of potential contaminant source areas. Such areas may then provide information to modify proposed borehole and/or monitoring well locations.

To confirm the vapour concentrations and quantify the chemicals present, we propose to obtain glass "bomb" samples at several locations exhibiting elevated vapours, for

submission to the analytical laboratory. Soil vapour samples will be analyzed for TEH and BTEX.

Shallow Soil Sampling

Immediately following the soil vapour survey, we propose a limited shallow soil sampling and chemical analyses program using a hand auger. The purpose of the shallow soil sampling program is to assess general soil conditions in areas of historical spills, elevated organic soil vapour concentrations and/or staining along the pipeline and at the Carcross Pump Station.

Soil samples will be collected in glass sample jars and visually examined for the presence of hydrocarbon or other signs of contamination. All descriptions will be recorded and logged in the field.

To further assess the presence of product, field shake tests and screened using the dry headspace method (as described earlier) may be performed

Soil Chemistry

Soil samples obtained from the hand auger sampling program will be submitted to a qualified laboratory for chemical analyses of the potential contaminants of concern (PCOC) that have been identified during the background review. Selected soil samples will be analyzed for a range of parameters that will likely include:

BTEX & VEPH
PAH, LEPH & HEPH
VOCs
CCME Metals
herbicides at selected sites

QA/QC Chemistry

In addition to the above, for Quality Assurance purposes approximately 10% of all samples for major parameters (PAH, LEPH & HEPH, BETX, & VEPH and metals) will

be submitted as blind duplicates. In addition, a trip blank is proposed for VOCs. All sampling will be performed in accordance with Golder protocols. Analytical laboratories routinely conduct 10% laboratory replication and 10% to 20% reference standard samples with each sample batch.

2.2.3 Stage II Field Investigation Program

Whitehorse Upper Tank Farm

Following the compilation, and interpretation of the soil and groundwater data collected during the Stage I Investigation program, a detailed test pit excavation and borehole drilling program will be developed and implemented at the Whitehorse Upper Tank Farm. The purpose of the detailed investigation program is to define the nature and extent of any petroleum products detected during the first stage of the field investigation. The number and location of the proposed test pits, boreholes and groundwater monitoring wells will be determined following the Stage I Investigation Program.

Test Pit Excavation Program

A test pit excavation program will be conducted to assess soil condition and delineate the areal and lateral extent of residual hydrocarbon product in the upper 3 m to 5 m of the soil profile. Test pits will be excavated in potential "source" areas where surface staining and/or historical petroleum product release(s) may have occurred. We anticipate that at lease four test pits will be excavated from each APEC. An abundant number of soil samples will be collected from each test pit for field screening of organic vapours using the dry head space technique. Selected soil samples will also be submitted for chemical analyze based on field observations and the results of the field organic vapour monitoring.

Stage II Bore Hole Drilling Program

All drilling will be performed using the air rotary (with casing) method, which provides continuous soil samples. Soil samples will be collected in glass soil sample jars and visually examined for the presence of hydrocarbon or other signs of contamination. All descriptions will be recorded and logged in the field. To further assess the presence of

product, field shake tests may be performed. The soil will be screened using the dry headspace method to determine total organic vapour concentrations. Boreholes not completed as monitoring wells will be grouted to surface with an impermeable backfill

Stage II Groundwater Monitoring Well Installation, Development, Testing and Sampling Program

Where monitoring wells are installed, flush-mount surface completions (if within 5 metres of roadways or track) will be constructed. Each well will be constructed, developed tested and sampled using the same method and procedures employed for the Stage I Investigation Program. Golder will conduct an elevation and location survey for all boreholes completed with monitoring wells. Water levels and free-product thickness (if present) will be monitored in each well.

Soil and Groundwater Chemistry

Soil and groundwater samples obtained from the borehole drilling and groundwater monitoring programs will be submitted to a qualified laboratory for chemical analyses. Selected groundwater samples will be analyzed for the PCOCs, including:

BTEX & VEPH
PAH, LEPH and HEPH
VOC
Herbicides
CCME metals

Pipeline and Carcross Pump Station

Test pit excavation

A limited test pit excavation program will be conducted to assess soil condition and delineate the vertical and lateral extent of residual hydrocarbon product in the upper 3 m to 5 m of the soil profile. Test pits will be located in accessible areas where organic vapour anomalies have been identified with the soil vapour survey and/or residual hydrocarbons were identified during the shallow hand auger sampling program. Test pits will also be excavated in potential "source" areas where surface staining and/or historical petroleum product release(s) may have occurred. We anticipate that at least four test pits

will be excavated from each APEC. An abundant number of soil samples will be collected from each test pit for field screening of organic vapours using the dry head space technique. Selected soil samples will also be submitted for chemical analysis based on field observations and the results of the field organic vapour monitoring.

Borehole Drilling and Monitoring Well Installation

All drilling in the pipeline and Carcross Pump Station area will be performed using the hollow stem auger method, which provides continuous soil samples. Soil samples will be collected in glass soil sample jars and visually examined for the presence of hydrocarbon or other signs of contamination. All descriptions will be recorded and logged in the field. To further assess the presence of product, field shake tests may be performed. The soil will be screened using the dry headspace method to determine total organic vapour concentrations. Boreholes not completed as monitoring wells will be grouted to surface with an impermeable backfill.

Where monitoring wells are installed, flush-mount surface completions (if within 5 metres of roadways or track) will be constructed. Each well will be constructed, developed, tested and sampled using the same method and procedures employed for the Stage I Investigation Program. Golder will conduct an elevation and location survey for all boreholes completed with monitoring wells. Water level and product thickness will be measured in each well.

Groundwater Chemistry

Soil and groundwater samples obtained from the borehole drilling and groundwater monitoring programs will be submitted to a qualified laboratory for chemical analyses. Selected groundwater samples will be analyzed for the PCOC.

2.2.4 Comparison of Analytical Results With CCME Criteria and Site Classification

Following completion of the Stage 1 and Stage 2 field investigation programs all analytical results will be tabulated and compared with CCME Interim Canadian Environmental Quality Criteria. The site would then be classified using the CCME National Classification System for Classification of Contaminated Sites.

2.2.5 Off-Site Migration Assessment

A detailed assessment of the probability of off-site migration of contaminants will be conducted using the on-site soil vapour, soil and groundwater data obtained during the site investigation. If required, predictive groundwater flow and contaminant transport models will be used to estimate potential concentrations of contaminants that may have migrated off-site.

2.2.6 Remedial Planning Investigations

At the completion of the Stage 1 and Stage 2 Field Investigation programs, Golder will analyse the data with respect to the applicable criteria to assess the need for remediation. This assessment will be conducted within a risk analysis framework as discussed previously. In areas where remediation may be required, Golder will assess the level of uncertainty in the volume estimates and determine if there are locations where additional remedial investigation would significantly decrease the uncertainty. In areas where contaminant plumes have been identified and the extent of contamination is not fully defined, additional investigations may be recommended.

2.2.7 Report Preparation

A report will be prepared that includes an assessment of all data and where applicable, a conceptual hydrostratigraphic model of groundwater flow and contaminant transport. The report will specifically address each area of potential concern and identify those areas requiring remediation.

If necessary, a separate letter report will be prepared describing potential environmental risks, and a brief evaluation of remedial options. Those areas or facilities requiring immediate attention will also be identified, together with cost-effective solutions for mitigation.

3.0 MANAGEMENT WORK PLAN

3.1 Corporate Qualifications

Golder Associates is a Canadian-based, employee-owned consulting engineering firm operating throughout Canada with sister companies in the United States, Europe, and Australia, all of which specialise in the geosciences, including full service environmental assessment and remediation design, geotechnical engineering and hydrogeology. A brief description of the organization and a copy of the corporate brochure is included in Appendix IV.

3.2 Project Team

3.2.1 Qualifications of Project Team

Our environmenal assessment and remedial planning team is experienced and highly qualified in the areas of site characterization, hydrogeology, hydrocarbon assessment and remediation. Further, Golder Associates has successfully completed hundreds of geotechnical and environmental projects throughout the Yukon and Northern British Columbia since the late 1960s. Among the completed projects that are particularly relevant to the subject site are:

- Screening level phase I ESA of the Whitehorse Upper Tank Farm and the former White Pass fuelling facilities at the Whitehorse Airport (October 1994);
- Environmental Site Assessment of an historical release of petroleum products from the White Pass petroleum pipeline at Mile 6 of the White Pass and Yukon Route Railroad near Skagway, Alaska (November 1995);
- Environmental Site Assessment and Excavation of an approved burn pit located at mile 49 of the White Pass and Yukon Route Railroad near Graves B.C. (October 1995);
- Phase I, II and III ESA and Remediation of the Former Motorways site located on 2nd in Whitehorse (June 1995). *This site was used for industrial purposes for over 80 years and was remediated to the CCME residential/parkland land use criteria*; and

- Geotechnical investigation for a proposed warehouse at the Hillcrest Industrial Park located immediately adjacent to the Whitehorse Upper Tank Farm (November 1977).

As described in the following, Golder will provide White Pass with a credible assessment of site conditions and environmental issues that will withstand technical scrutiny, and that will provide a sound basis for remedial planning, if warranted.

The following personnel will be responsible for the day-to-day project management and execution and will be directly accountable to White Pass for the successful execution of the project. CVs for the project team are included in Appendix V.

Brian Conlin, P. Eng.
Project Director, Review Principal

As Project Director and Review Principal for the project, Brian will co-ordinate the work, liaise with White Pass's Project Manager and retain overall corporate responsibility for the project. He will participate in the initial site reconnaissance and kick-off meetings, will provide overall review of the interim and final reports, and will provide advice to Mr. Hamilton, Golder's Project Manager throughout the project. Mr. Conlin has over 18 years of consulting experience and is a registered professional engineer in British Columbia and the Yukon Territory.

Brian has participated in this capacity for all of the recent projects conducted for Whitepass and others related to the petroleum distribution activities of Whitepass in B.C., Yukon and Alaska. He also we project director for a project with Environment Canada for the Rainy Hollow Pump Station emergency response in 1994. This site is located near the B.C. - Alaska border and has many similarities to several aspects of this project.

As a Principal & Vice President of Golder Associates Ltd. and Group Leader of the Environmental Division, Brian will also ensure that the study produced fulfils all of NEB's requirements, and is to a standard acceptable to White Pass. He will also ensure that corporate resources are supplied to the project in a timely and efficient manner.

Gary Hamilton, P. Geo. (B.C.)
Project Manager

As Project Manager, Gary will be responsible for co-ordinating project execution, meeting deadlines and ensuring delivery of the reports to White Pass. In addition, he will oversee the field investigation work and participate in the data analysis and report preparation. Specific responsibilities will include:

- Review of progress on a daily basis
- Review of project budget on a weekly basis
- Liaison with the Project Director and White Pass with respect to schedule and budget items
- Expedite the submission of all documents in a timely fashion
- Ensure that all team members are fulfilling their responsibilities in concert with the overall project effort
- Clearly identify and agree beforehand the need for and extent of any work that may be recommended beyond the scope of work

Gary is a Senior Hydrogeologist with over ten years of experience in environmental investigations, hydrogeology and contaminant assessment. He has successfully planned and implemented investigations requiring co-ordination of technical disciplines and sub-contractors. His direct relevant experience includes his role as Project Manager for the assessment and remediation of the former White Pass Motorways site in Whitehorse. He has also conducted several Phase II field investigations on projects throughout B.C. and the Yukon.

Guy Patrick, P. Eng.
Technical Advisor

Guy will be a resource person to the project team on contaminant hydrogeological issues. He will liaise with the Project Manger and Project Director with respect to specialised

technical matters, and will ultimately review the final document with a focus on technical content and supportable conclusions.

Guy is a Senior Hydrogeologist and Principal with Golder Associates Ltd. in Burnaby, B.C., where he provides technical review for environmental investigations and remedial projects across North America. He currently serves as Project Director for three Rail Yard sites in B.C. His work experience includes Superfund projects in California and Massachusetts, and environmental site assessments in Ontario, Manitoba, Alberta and British Columbia. Mr. Patrick obtained a B.Sc. in Microbiology in 1977 and B.A.Sc. in Regional Systems Engineering in 1981 from the University of Regina, Saskatchewan, and an M.Sc. in Contaminant Hydrogeology from the University of Waterloo, Ontario in 1986. He is a registered professional engineer in B.C. and Yukon Territory.

3.3 Project Management and Communication

In order to promote smooth project execution, close management and communication are required. Timely communication with White Pass can be facilitated via telephone and fax, and/or through E-Mail if available.

Routine reporting and communication will be as follows:

- Start-up meeting with White Pass and NEB (if required)
- Bi-Weekly (orWeekly if requested) progress reports (1 page via fax)
- Detailed progress report after Stage 1 field investigation
- Detailed progress report after Stage 2 field investigation
- Final Report
  Remediation options report (if necessary).

3.4 Project Schedule

The overall project schedule will be dependent on site accessibility for the field work. We are committed to negotiating a project schedule which is amenable to White Pass. We understand that the tentative schedule is to have the project completed by the end of the summer, 1996. In order to meet this target date we have assumed March 11, 1996 start date, the time-line requirements are presented on the Project Schedule on Figure 5.

Given the timing, and allowing for a normal laboratory turn-around time of two weeks, a total elapsed time of twenty four weeks are projected for completion of this project.

4.0 COST ESTIMATE

An estimate of the project expenditures for the assessment and planning phases of this project are included under separate cover. A detailed breakdown of the projected expenditures to completed authorized project tasks will be provided for review and approval of White Pass throughout the project.

5.0 CLOSING COMMENTS

We trust that this work plan is adequate for your current needs. Should you have any questions or need any further information please call. In the meantime, we look forward to our continued participation in projects that address environmental issues for Whitepass' operations in B.C., Yukon and Alaska.

GOLDER ASSOCIATES LTD.

Gary Hamilton, P. Geo. (B.C.)
Senior Hydrogeologist

B.H. Conlin
Brian H. Conlin, P. Eng.
Principal, Environmental Division

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962-1818
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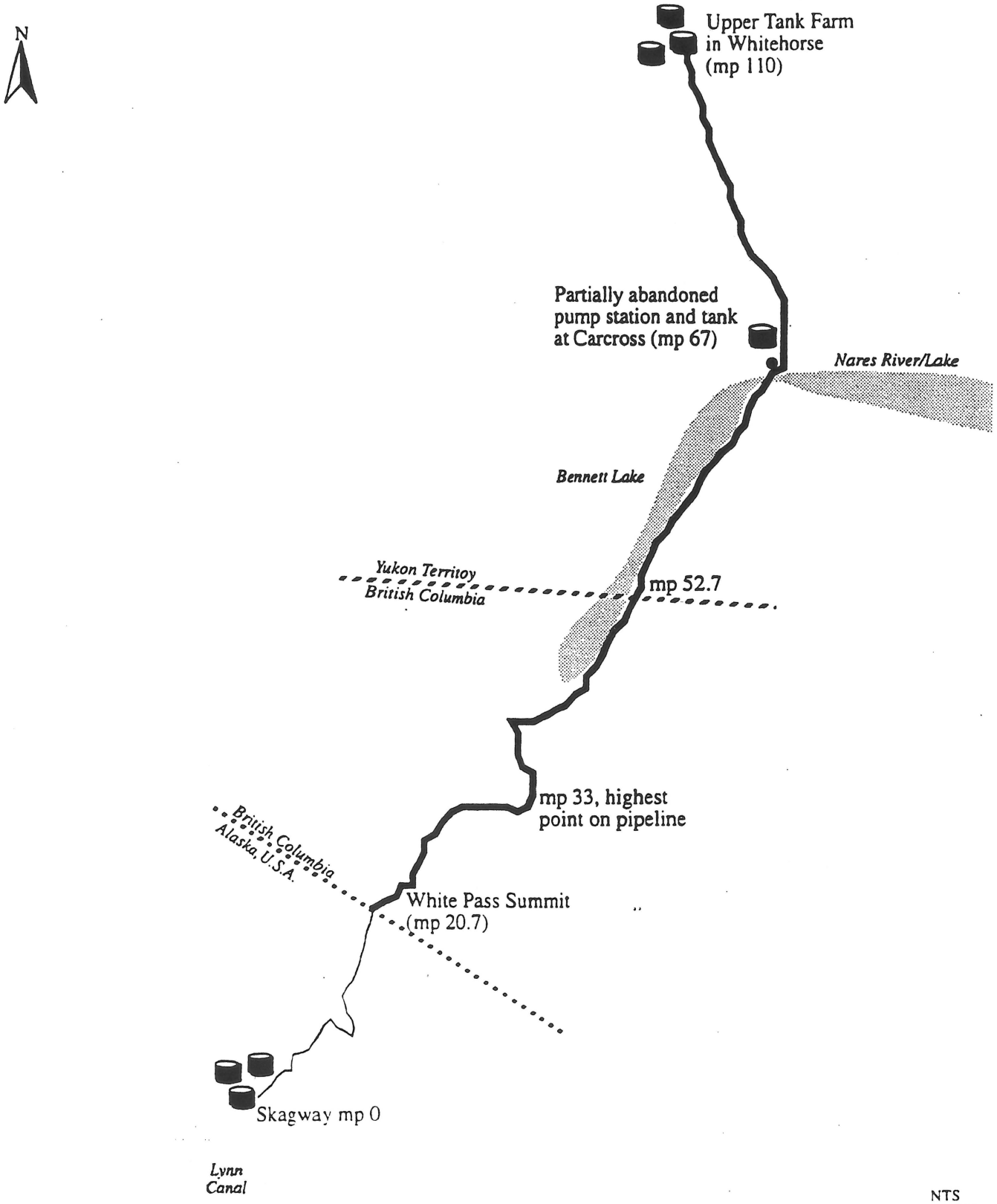

NTS
June 1995

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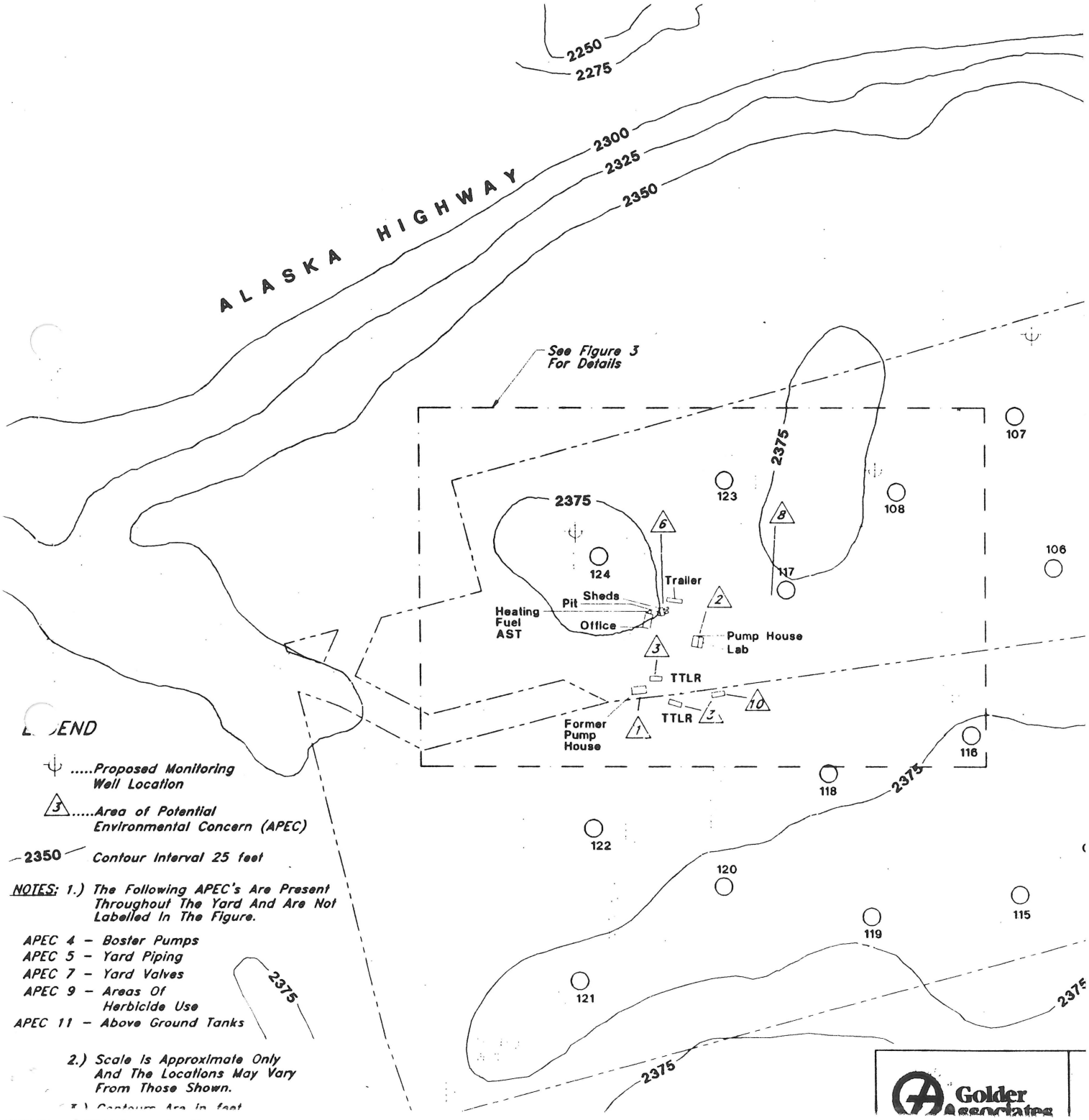
THE YUKON PIPELINE

Figure 1

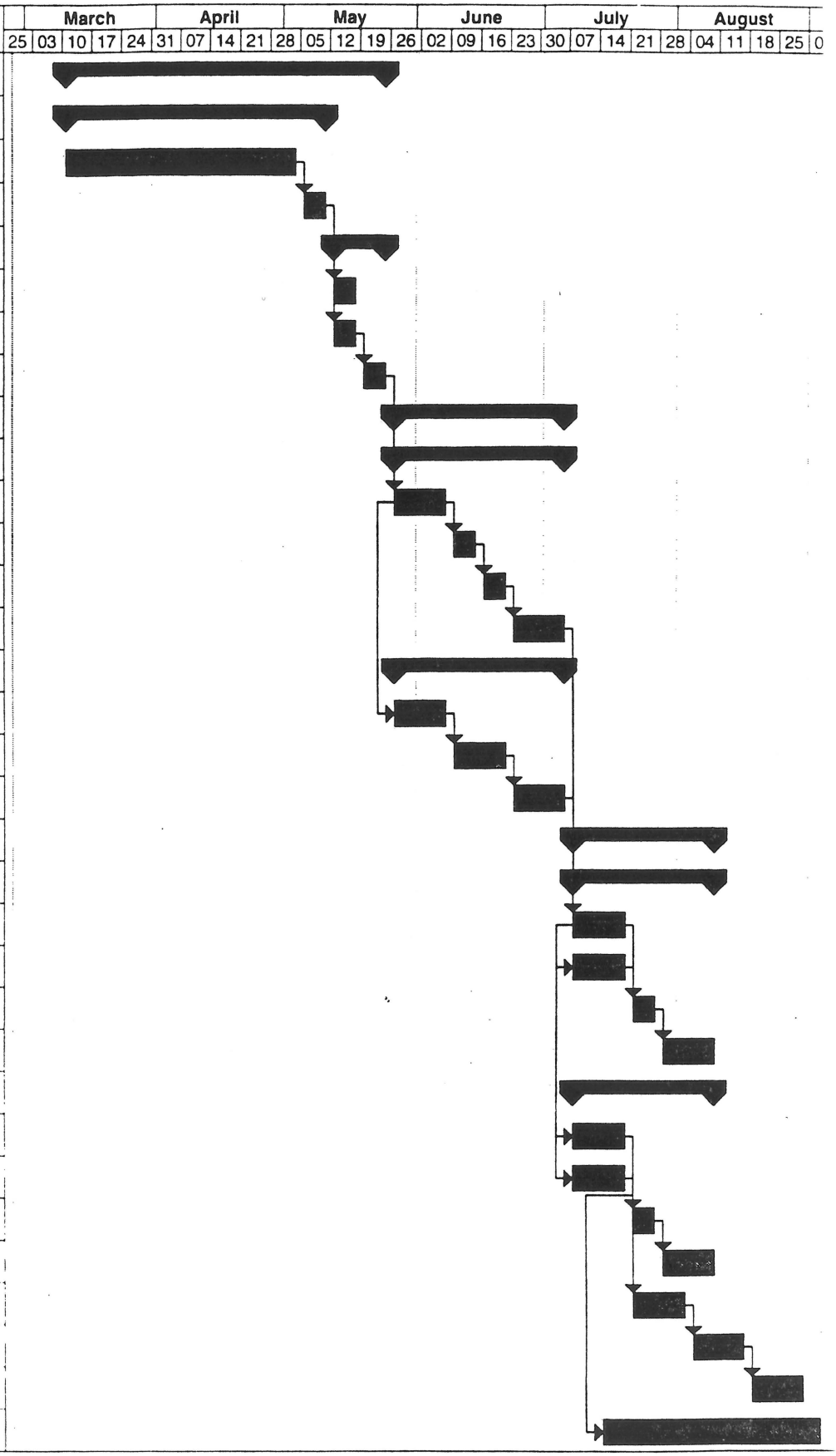

ALASKA HIGHWAY
2250
2275
2300
2325
2350
See Figure 3
For Details
2375
107
123
108
106
124
Trailer
Pit
Sheds
Heating
Fuel
AST
Office
117
Pump House
Lab
TTLR
TTLR
Former
Pump
House
116
118
122
120
115
119
121
LEGEND
.....Proposed Monitoring Well Location
.....Area of Potential Environmental Concern (APEC)
2350 Contour Interval 25 feet
NOTES: 1.) The Following APEC's Are Present Throughout The Yard And Are Not Labelled In The Figure.
APEC 4 - Boster Pumps
APEC 5 - Yard Piping
APEC 7 - Yard Valves
APEC 9 - Areas Of Herbicide Use
APEC 11 - Above Ground Tanks
2.) Scale Is Approximate Only And The Locations May Vary From Those Shown.
Golder Associates

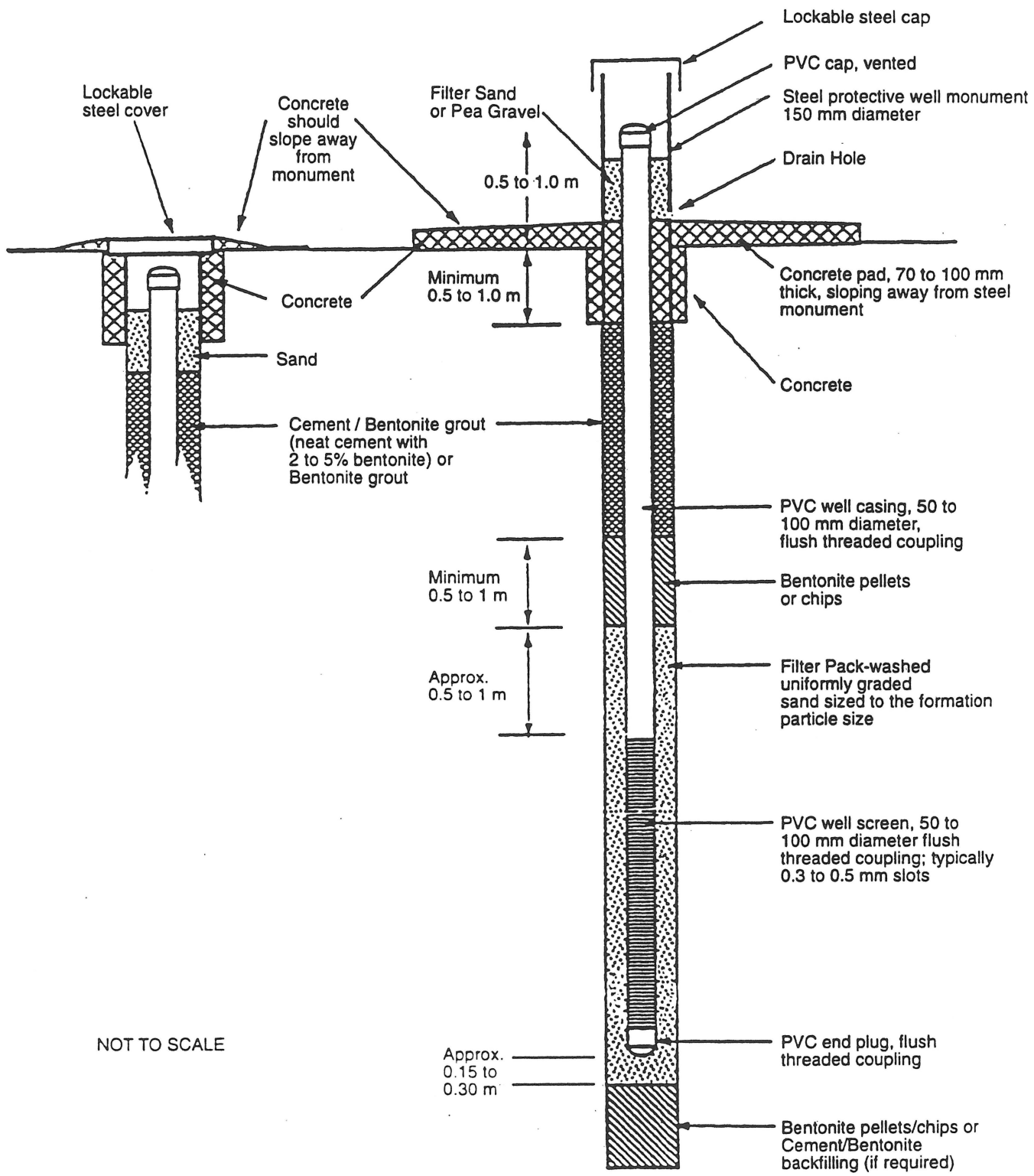
96/02/27

PROJECT SCHEDULE for ENVIRONMENTAL SITE ASSESSMENT
WHITE PASS PIPELINE, CARCROSS PUMP STATION and WHITEHORSE UPPER TANK FARM

FIGURE
962-181

Task	Task Name
5000	**PRE-INVESTIGATION PREP.**
5010	**Phase I Environmental Site Assess.**
5011	History, Data Collection & Eval.
5012	Site Reconnaissance
5020	**Review Existing Data**
5030	Health & Safety
5040	Site Inspection
5050	Site Physical Characteristics
5100	**STAGE I FIELD INVESTIGATION**
5110	**Whitehorse Upper Tank Farm**
5111	Drilling & Well Installation
5112	Development, Testing & Sampling
5113	Surveying & Water Level
5114	Groundwater Chemistry
5120	**Pipeline & Carcross Pump Station**
5121	Soil Vapour Survey
5122	Shallow Soil Sampling
5123	Soil Chemistry
5200	**STAGE II FIELD INVESTIGATION**
5210	**Whitehorse Upper Tank Farm**
5211	Test Pit Excavation Programme
5212	Drilling & Well Installation
5213	Development, Testing & Sampling
5214	Soil & Groundwater Chemistry
5220	**Pipeline & Carcross Pump Station**
5221	Test Pit Excavation
5222	Drilling & Well Installation
5223	Development, Testing & Sampling
5224	Soil & Groundwater Chemistry
5300	**COMPARE CCME CRITERIA**
5400	**OFF-SITE MIGRATION ASSESSMENT**
5500	**REMEDIAL PLANNING**
5600	**REPORT PREPARATION**





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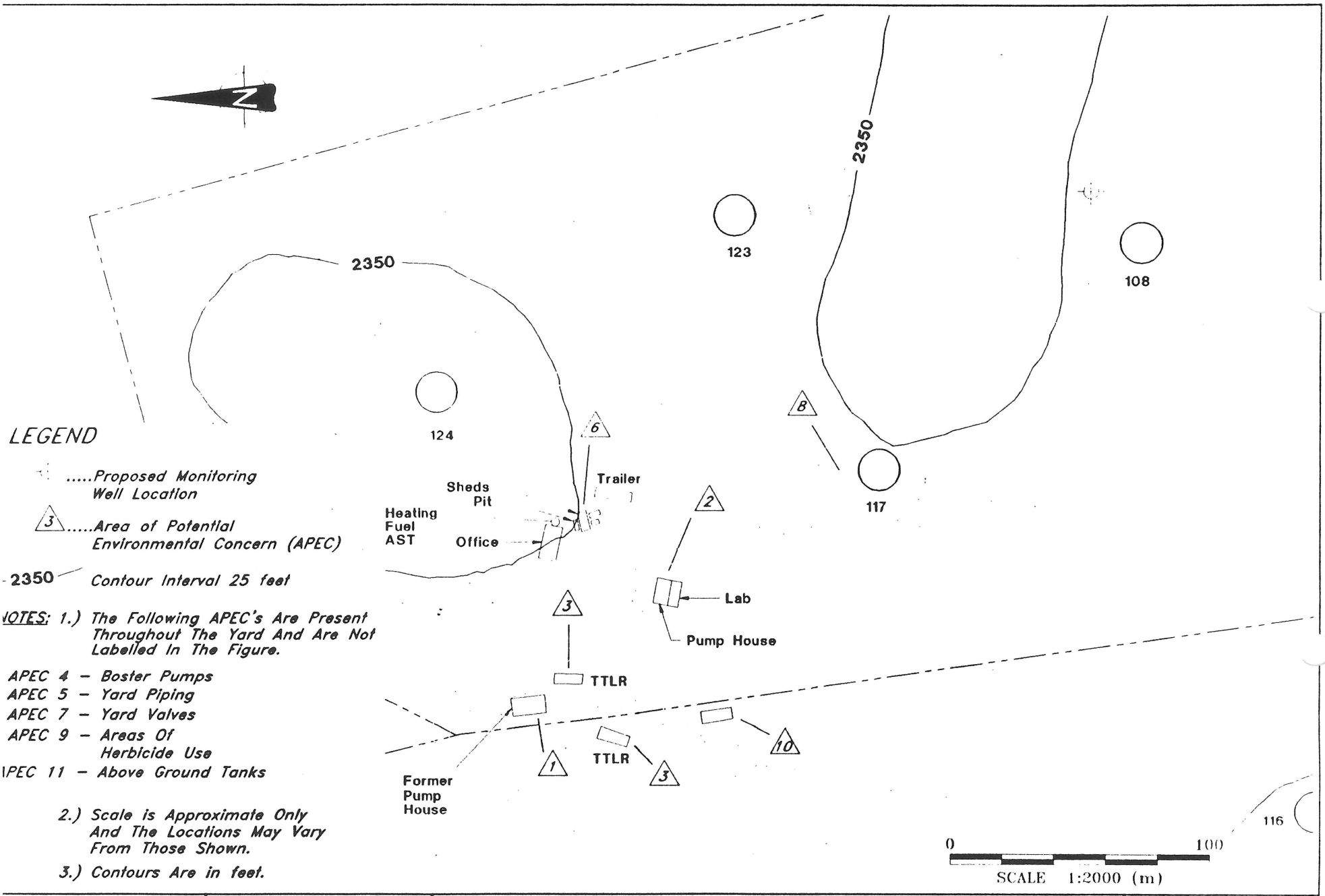
TYPICAL MONITORING WELL INSTALLATION

Figure **4**



LEGEND

.....Proposed Monitoring Well Location

3 .....Area of Potential Environmental Concern (APEC)

2350 Contour Interval 25 feet

NOTES: 1.) The Following APEC's Are Present Throughout The Yard And Are Not Labelled In The Figure.

APEC 4 – Boster Pumps
APEC 5 – Yard Piping
APEC 7 – Yard Valves
APEC 9 – Areas Of Herbicide Use
APEC 11 – Above Ground Tanks

2.) Scale is Approximate Only And The Locations May Vary From Those Shown.

3.) Contours Are in feet.

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awn: S.S.S
eviewed: G.H.

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AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

Figure 3