CONFIRMATION OF COMPLIANCE

DATED: the 19th of Oct, 1998.

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
for the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City", respectively)

In this Confirmation of Compliance the following words shall have the following meanings:

"Contaminants" means those substances existing on or under the Lands hereinafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Lands" means Lot 269 False Creek Plan LMP30397.

"Provincial Standards" means, with respect to the Lands, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada, pertaining to Contaminants in relation to the use of the Lands for residential purposes, utilities and facilities incidental thereto and all associated utilities as more particularly described in development permit DE401730.

The Province does hereby confirm to the Approving Officer and to the City that subject to the requirements set out in Appendix "i" attached hereto that there is compliance with the Provincial Standards with respect to the Lands.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

Cassie J. Doyle, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Developments Ltd.
900 - 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

APPENDIX "i"

Confirmation of Compliance dated the 19th Oct 1998
For Lot 269 False Creek Plan LMP30397
(Parcel 4 – Lots ABC) (the "Confirmation of Compliance")

The Confirmation of Compliance is subject to the following conditions:

1. As the Lands are subject to in situ management of soils containing Contaminants at concentrations in excess of the applicable legal standards within British Columbia for residential use.

   (a) The surface cover material on the Lands exterior to the existing building on the Lands must be maintained.

2. Pertinent information with respect to the Lands will be placed and maintained on any Site Registry established by the Province pursuant to the provisions of the Waste Management Act and any amendments thereto.

Capitalized terms utilized in this Appendix "i" shall have the same meaning ascribed to the same term in the Confirmation of Compliance.

PACIFIC PLACE REMEDIATION PROJECT
MEMORANDUM

To: D.J. Clark, P.Eng., Project Manager, Pacific Place Remediation Project

From: D.R. Livingstone, P.Eng.
Golder Associates Ltd.

Date: September 10, 1998

File: 932-1801/0450coc

RE: SUPPORT INFORMATION FOR CONFIRMATION OF COMPLIANCE
PARCEL 4, LOTS ABC, PACIFIC PLACE

1.0 INTRODUCTION

The purpose of this memorandum is to provide support information for the issuance of a "Confirmation of Compliance" for Parcel 4, Lots ABC on the Pacific Place site in Vancouver, B.C. The Parcel is indicated on the Key Plan, Figure 1. The legal description of the site is:

- Lot 239, False Creek Plan LMP 33307

The remediation standards that apply to Parcel 4, Lots ABC are the Contaminated Sites Regulations[1] (CSR). In the course of site excavation for construction, all fill material encountered and found to contain concentrations above the generic numerical standards for Residential Land use (Schedule 4 and 5 of the CSR) was disposed of at an appropriate landfill.

2.0 CONFIRMATION OF COMPLIANCE

In our opinion, the excavation of the upper fill materials within Parcel 4, Lots ABC, has rendered the site suitable for the intended residential and commercial use, in

[1] Contaminated Sites Regulations (CSR), B.C. Reg 375/96, effective April 1, 1997.

accordance with the risk assessment and risk management approach described in the Remedial Plan.

The Remedial Plan (*"Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7"*, September 1993) risk assessment, accepted by B.C. Environment for areas of Pacific Place with contaminant concentrations above Level B of the Pacific Place Standards (similar to the Residential land use criteria of the CSR), concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (for example, 0.5 metres of clean sand) was placed as a permanent separation barrier above the existing sub-soils.

A total of 108,527 m^3 of soil was excavated for construction of which 104,354 m^3 was Residential Fill quality, 3,770 m^3 was Industrial Fill quality (B+), and 403 m^3 was Industrial Waste. These results are consistent with the findings of the field investigations (Soils Remediation Group 1992 and Pacific Place Remediation Project 1997) and those referenced in the Remedial Plan and risk assessment completed for the Pacific Place site.

The report on previous results of field investigations (RFI) has described the extent of groundwater contamination within Parcel 4 [see Phase 1 and Phase 2, Parcels 1, 2, 2E, 4, 5A, 6W, and 6E (Overall Site) – Results of Field Investigation report (SRG, June 1992)]. Within the area of Parcel 4 Lots ABC, the groundwater likely to be collected by the building drains meets the False Creek Discharge Standards.

The analysis of ten groundwater seepage samples obtained from the excavation between May and October, 1997, indicated that only pH and total suspended solids were consistently above the False Creek Discharge Standards. The high pH and suspended solids were related to the excavation and grouting activities. On two occasions, individual metals marginally exceeded the False Creek Discharge Standards but this is likely associated with the high suspended solids in the water, associated with the excavation activities.

The information presented in the following sections supports these opinions.

3.0 BACKGROUND

3.1 Historical Land Use and Results of Field Investigations

The Pacific Place site was host to a variety of industrial activities between the late 1890s and the mid 1980s, as summarized in Figure 2. Historical activities at the west side of Parcel 4 include railway lands which occupied the area after infilling of False Creek was completed in the 1930s. Further infilling of shallow granular soils was completed in the mid-1980s in preparation for Expo'86.

3.1.1 Applicable Field Investigations

The following soil and contamination descriptions are derived from the previous Phase 1 and 2 field investigation reports (SRG; August 1989 and June 1992) and supplementary sampling of the area carried out during February 1997. The chemical results in previous investigations and remedial plans were interpreted with respect to the Level B (residential standard) in the Pacific Place Standards (MOE 1990) which are similar to the CSR generic numerical standards for Residential Land use.

3.1.2 Soil Description

The fill material on Parcel 4 is comprised of "recent" granular fill approximately 0.4 to 0.8 metres in thickness, underlain by "old" fill about five to eight metres thick. The total fill thickness ranges from about six to nine metres. The recent fill, comprised primarily of sand and gravel, was used for grading in preparation for Expo'86. The old fill is comprised of silty sand and gravel which is relatively free of staining and odours, but has varying amounts of construction-related debris such as brick, wood, concrete and metal. Areas containing abandoned Expo services were backfilled with large amounts of sand.

Zones or layers of "suspect" fill are found within the old fill. These suspect zones may contain contaminants with concentrations above Level B. Industrial debris, such as scrap metal, brick and wood was used to infill the False Creek shoreline, and is found in varying quantities throughout this fill zone. The black-stained soil layers vary in thickness from 0.5 to 1 metre and are interpreted to represent the former ground surface occupied by railway lines.

3.1.3 Soil Contamination Overview

When preparing the *"Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7"* (SRG, August 1992) the Pacific Place site was divided into Areas of Environmental Concern (AEC's), based on historical activities and the type of chemical parameters present. Results of the Phase 1 and 2 investigations and the supplementary sampling programs indicated that soil having chemical concentrations in excess of the Level B standards for residential land use is limited to distinct suspect zones or layers within the fill material. The chemical parameters and concentrations found in the suspect soils of each AEC are the result of former industrial activities. The AEC boundaries are shown in Figure 3 and the AEC's relevant to the excavation activities are described below.

The summary of soil contamination provided below is based on conditions found throughout the particular Area of Environmental Concern (AEC) during the Phase 1 and 2 Field Investigations. Extensive infilling (1 to 2 metres) of the Pacific Place site with granular material was conducted in 1983 and 1984 in preparation for Expo '86. Results of various investigations have indicated that the "Expo" fill contains chemical concentrations below the Level B standards. Therefore, the soil contamination described below has been found below the surface layer of "Expo" fill.

AEC 8 - Railway Lands

AEC 8 encompasses the area primarily used as railway lands. Contamination present in this area is considered to be randomly distributed, and generally associated with a discontinuous black or dark stained layer representing the former ground surface. Concentrations of chemical parameters within this layer (metals, PAH) are typically elevated above background levels and may exceed Level B or Level C standards.

AEC 14 - Infilled Shoreline

AEC 14 is located at the west end of the shoreline development. This area was formerly a lumber yard. PAH concentrations exceeding Level B were found in the southwest end of the AEC, near former coal bunkers and a cinder pit located on neighbouring railway lands. The PAH contamination appeared to be associated with coal fragments and black staining in the soil. Metals contamination may also be present near Parcel 2, associated with metal debris found along the shoreline.

3.2 Remedial Plan

3.2.1 General

The remedial plan pertaining to Parcel 4, Lots ABC, included a human health risk assessment and an evaluation of remedial alternatives. The remedial plan report, entitled "*Remedial Plans for Parcels 1, 4, 5A, 5B, 6A, 6C and 7*" was issued by the Pacific Place Remediation Project Group in September 1993. A copy of the relevant sections of the Remedial Plan is included in Appendix I.

The Remedial Plan recommended Option 1, the removal of soils necessary for development, and the risk assessment and risk management of soils left in place following excavation. Two classes of soils left in place were considered for the risk assessment: suspect soils and non-suspect (bulk fill) soils. The majority of the soils within 0.5 metres of the present surface of the site consist of non-suspect, bulk fill soils that do not contain contaminants above either the Pacific Place Level B Standards or the CSR Residential Land Standards.

3.2.2 Human Health Risk Assessment

Because in situ management of some of the fill materials was contemplated during the remedial planning stage, a quantitative human health risk assessment was performed to estimate the potential human health risks arising from exposure to the Principal Contaminants of Concern (PCOC) at Parcel 4. For fill materials with contaminants above the residential standards, the risk assessment assumed the potential for direct contact between persons and the contaminated soils. In some areas of this Parcel, the potential for human health risks were identified if direct contact between receptors and contaminants such as metals or non-volatile organics could occur. The risk assessment concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (e.g., 0.5 metres of residential fill) remained as a separation barrier above the existing contaminated soils.

Under the CSR, certain contaminants may exceed the Residential Land use criteria that do not exceed the Pacific Place Level B Standards and therefore were not specifically included in the risk assessment. For metals and non-volatile organic contaminants (the PCOCs at this Site) the remedial measures involve covering of this soil with either

concrete or residential fill quality soil that cut off any potential exposure. Therefore, the conclusion of the original risk assessment that the site is suitable for residential use does not change.

3.2.3 Groundwater

The fill materials remaining within Parcel 4, Lots ABC, are not expected to constitute a significant source of groundwater contamination. The field investigations did not indicate groundwater contaminants of concern at this site.

4.0 EXCAVATION AND REMEDIATION ACTIVITIES

4.1 Soils Management Procedures

The results of the Phase 1 and 2 and Supplementary Field Investigations, in combination with the Remedial Plan, were used to develop the soils and groundwater management procedures for the building excavation at Parcel 4, Lots ABC. The report is entitled "*Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4ABC Quayside Neighbourhood, Pacific Place*", (PPRPG; April 22, 1997) and are referred to as the Soils Management Procedures (SMP). The SMP outlines the general soil and groundwater handling, testing and reuse or disposal procedures that were followed during the excavation for building construction.

4.2 Excavation

Excavation activities commenced at Parcel 4ABC in April 1997. The work included excavation of Lots ABC for the purposes of building construction. All excavation was complete as of August 1997.

Monitoring of the excavation was conducted by PPRP field technicians, who were responsible for directing the segregation and testing of all excavated soil in accordance with the SMP. The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated.

A total of approximately 108,527 m^3 of soil was excavated. Residential Fill quality soils (approximately 104,354 m^3) were excavated and reused as cover material at the Nelson Road landfill in Richmond, B.C. and used as backfill along the Parcel 4 shoreline walkway (approximately 2,135 m^3). Approximately 3,770 m^3 of Industrial Fill quality soil was transported to either 8910 River Road (2,548 m^3) or 9714 River Road (1,040 m^3), both in Delta, B.C., or is being held in Parcel 1 (182 m^3) pending use as fill in George Wainborn Park. Industrial Waste soils (403 m^3) were placed for storage in Parcel 1, pending use as fill for George Wainborn Park.

4.3 Fill Remaining and Confirmatory Closure Sampling

Following the removal of fill material to the building final grade, a total of 11 till samples (7 discretes and 4 composites) were taken at locations indicated on Figure 4. Chemical analysis for PAH, and metals determined that the till samples were well below the Residential Land use Standards in the CSR. Therefore, all contaminated soil has been removed from the bottom of the excavation. However, contaminated material remains in the walls of the excavation between the sheetpiling and the property line.

Approximately 600 m^3 of fill remains on the site between the sheetpile and the property line on the south side of the site, adjacent to Marinaside Crescent, as shown in Figure 5. Samples of the soil removed from the excavation adjacent to the sheetpile indicate that of the 600 m^3 of fill remaining, about 200 m^3 would be classified as Industrial Fill. The majority of the fill is between 0.5 and 5.0 metres below the ground surface existing during the excavation.

4.4 Groundwater

During the excavation, groundwater collected in the excavation was sampled and discharged to the storm sewer. Samples of excavation water were sampled and analysed for the parameters in the False Creek Discharge Standards.

The analysis of ten groundwater seepage samples obtained from the excavation between May and October 1997, indicated that only pH and total suspended solids were consistently above the False Creek Discharge Standards. The high pH and suspended solids were related to the excavation and grouting activities and are not considered

contaminants of concern for the site. On two occasions, individual metals marginally exceeded the False Creek Discharge Standards but this is likely associated with the high suspended solids in the water, and therefore associated with the excavation activities. The pH and suspended solids values will likely decrease once the building is completed and proper drainage established.

5.0 MONITORING REQUIREMENTS

In our opinion, based on the results of the soil and water sampling, no groundwater monitoring should be required for this building.

6.0 LIMITATIONS OF REPORT

The Pacific Place Remediation Project group has undertaken sampling and analysis programs and a risk assessment approach that have been reviewed and approved by B.C. Environment. This program has followed the standard of care expected of professionals undertaking similar work in British Columbia at the time the work was undertaken, and under similar conditions. No other warranty is expressed or implied.

The risk assessment/risk management approach has been employed in the remediation of Parcel 4, Lots ABC. The risk assessment completed for Parcels 4, Lots ABC, was based on the shallow soil conditions existing prior to construction, and conservatively assumed residential/recreational land use. Any subsequent excavations or disturbances in areas where potentially contaminated fill material remains, which would result in human exposure to these soils, may render the conclusions of the risk assessment invalid and should be reviewed.

If new information is generated by others and becomes available to B.C. Environment, the Pacific Place Remediation Project Group and the undersigned should be contacted to review the results or modification plans, and to provide an opinion as to the findings and their implications on the Confirmation of Compliance Certificate issued for Parcel 4, Lots ABC.

PER:

D.R. Livingstone, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

Reviewed by:

B.H. Conlin, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

DRL/BHC
932-1801/0450

cc: K. Rosenberg, Sandwell Inc.
C. McIver, Fraser & Beatty
Golder File 932-1801/0450coc

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REFERENCES

Soils Remediation Group, 1989a, Pacific Place Soils Remediation Program - Overall Site Operations Plan, Historical Use and Data Collection Program. Draft Report Prepared for the BC Ministry of the Environment. February 1989.

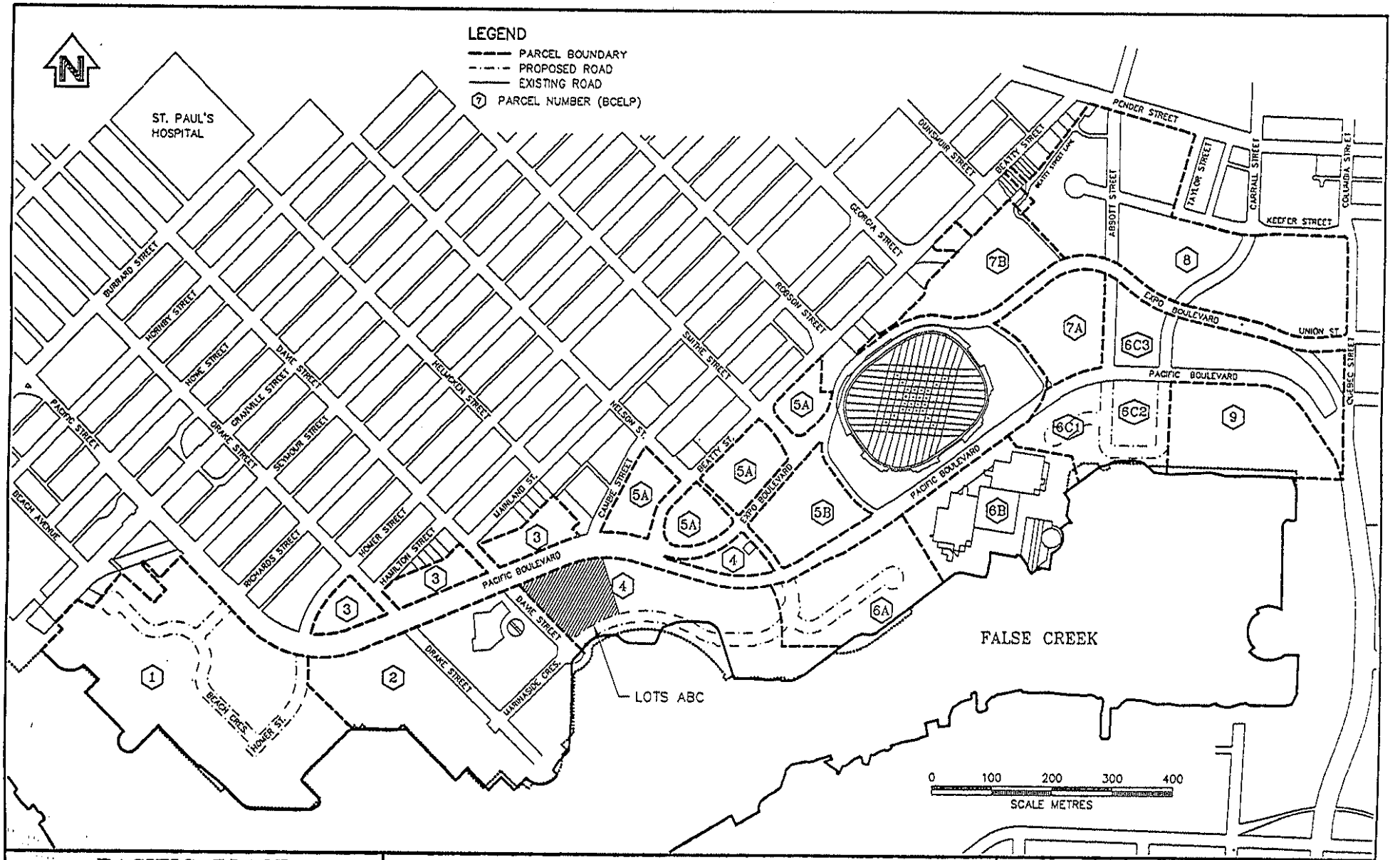
Soils Remediation Group, August 1989b, Pacific Place Soils Remediation Program - Overall Site Results of Field Investigations. Prepared for the BC Ministry of the Environment. First Draft August 1989.

Soils Remediation Group, 1991a, Pacific Place Soils Remediation Program - Overall Site Final Phase 2 Operations Plan. Prepared for the BC Ministry of the Environment, February 1991.

Soils Remediation Group, 1992, Pacific Place Soils Remediation Program – Phase 2 Results of Field Investigations for Parcels 1, 2 , 2E, 4, 5A, and 6E (Overall site). Prepared for BC Environment. Final Report June 1992.

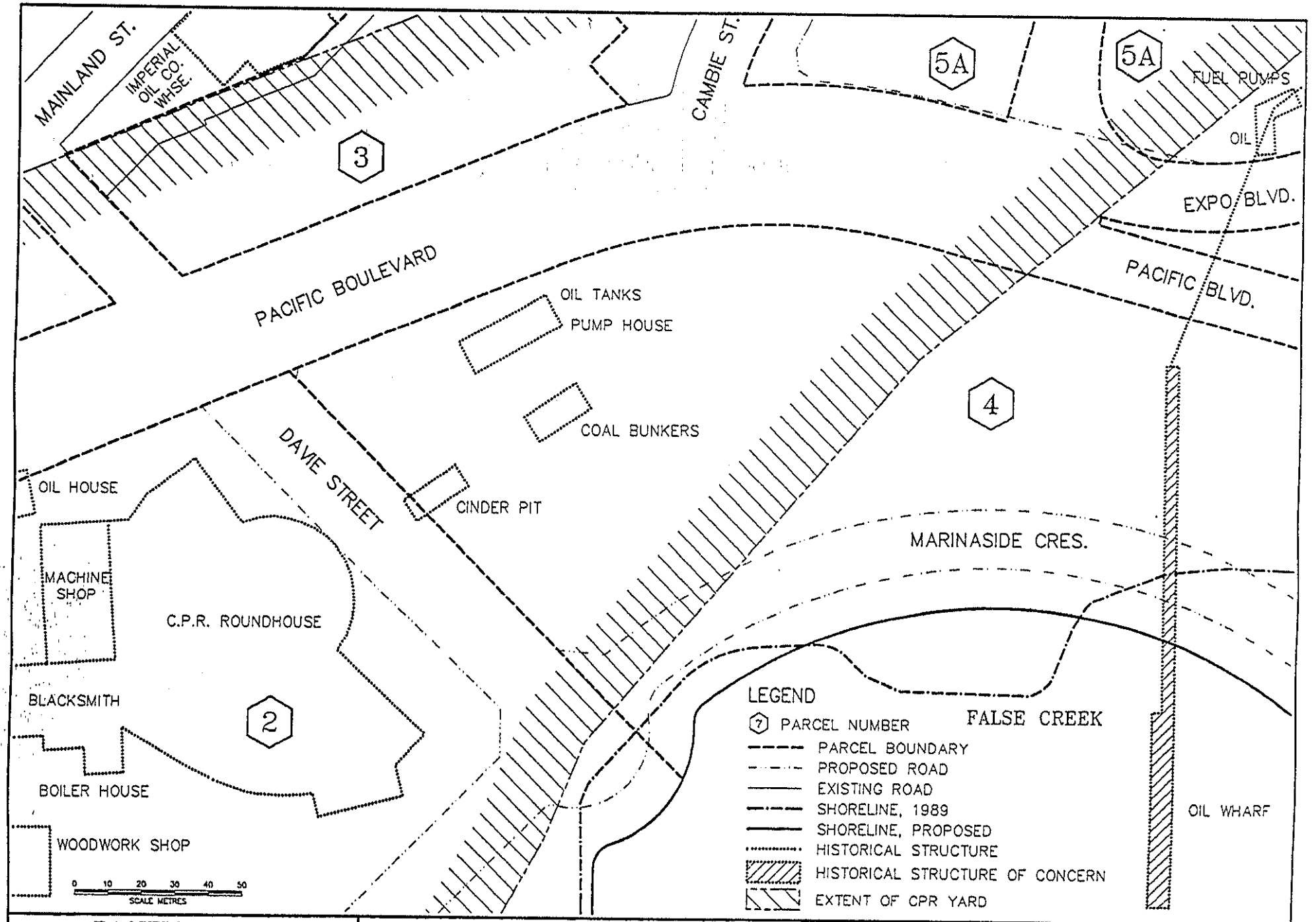
Pacific Place Remediation Project Group, 1993, Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7. Prepared for BC Environment, September 1993.

Pacific Place Remediation Project, 1997, Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor Parcel 4 ABC-Quayside Neighbourhood Pacific Place. Prepared for BC Environment, April 22, 1997.



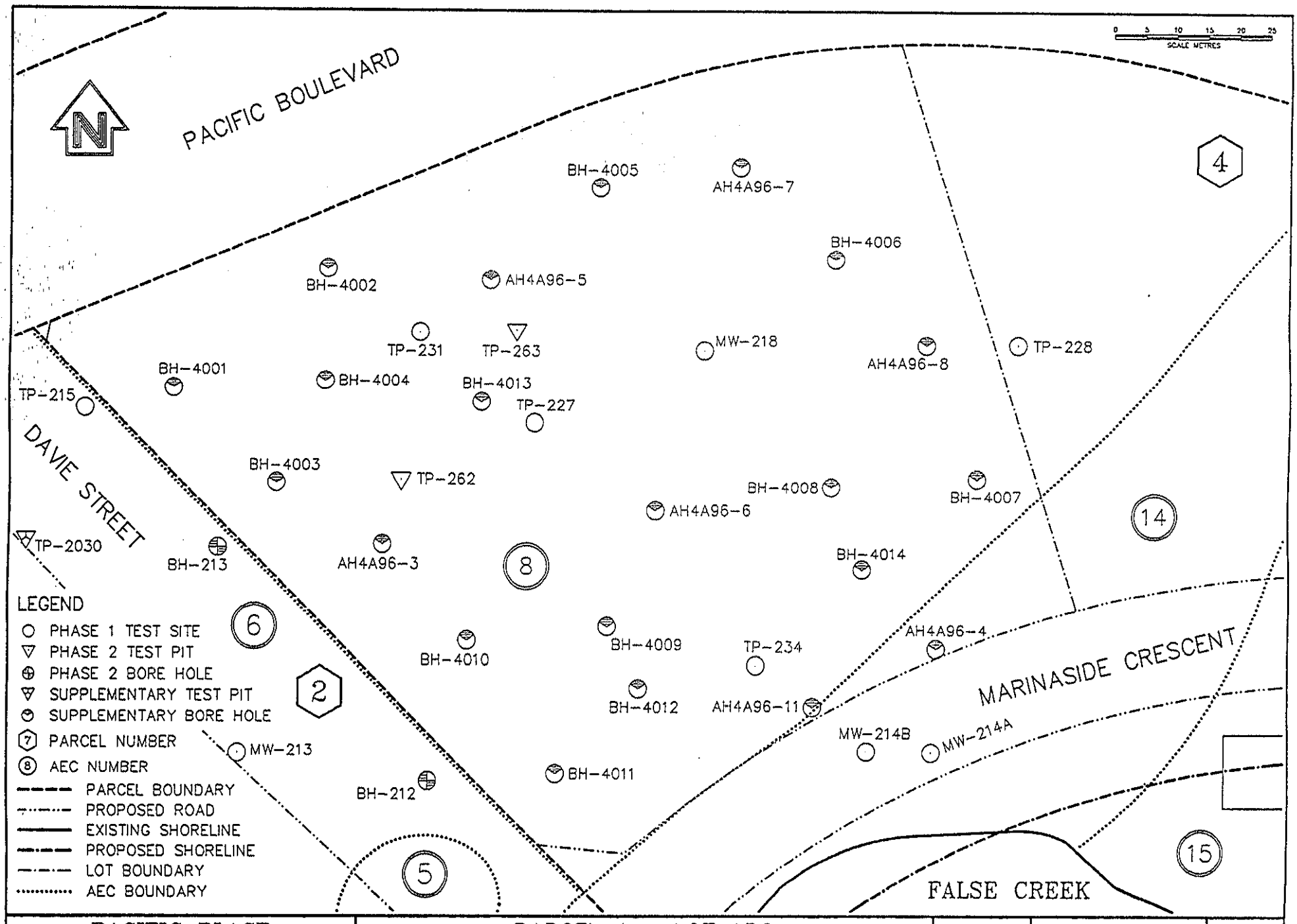
PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOTS ABC KEY PLAN	DRWN: NFT	REV: 0	SCALE: 1:6000
		DATE: 25 MAR 97		FIGURE: 1

CAD FILE: D:\PPRP\PP001676.DWG PLOT: 1832, 25 MAR 97



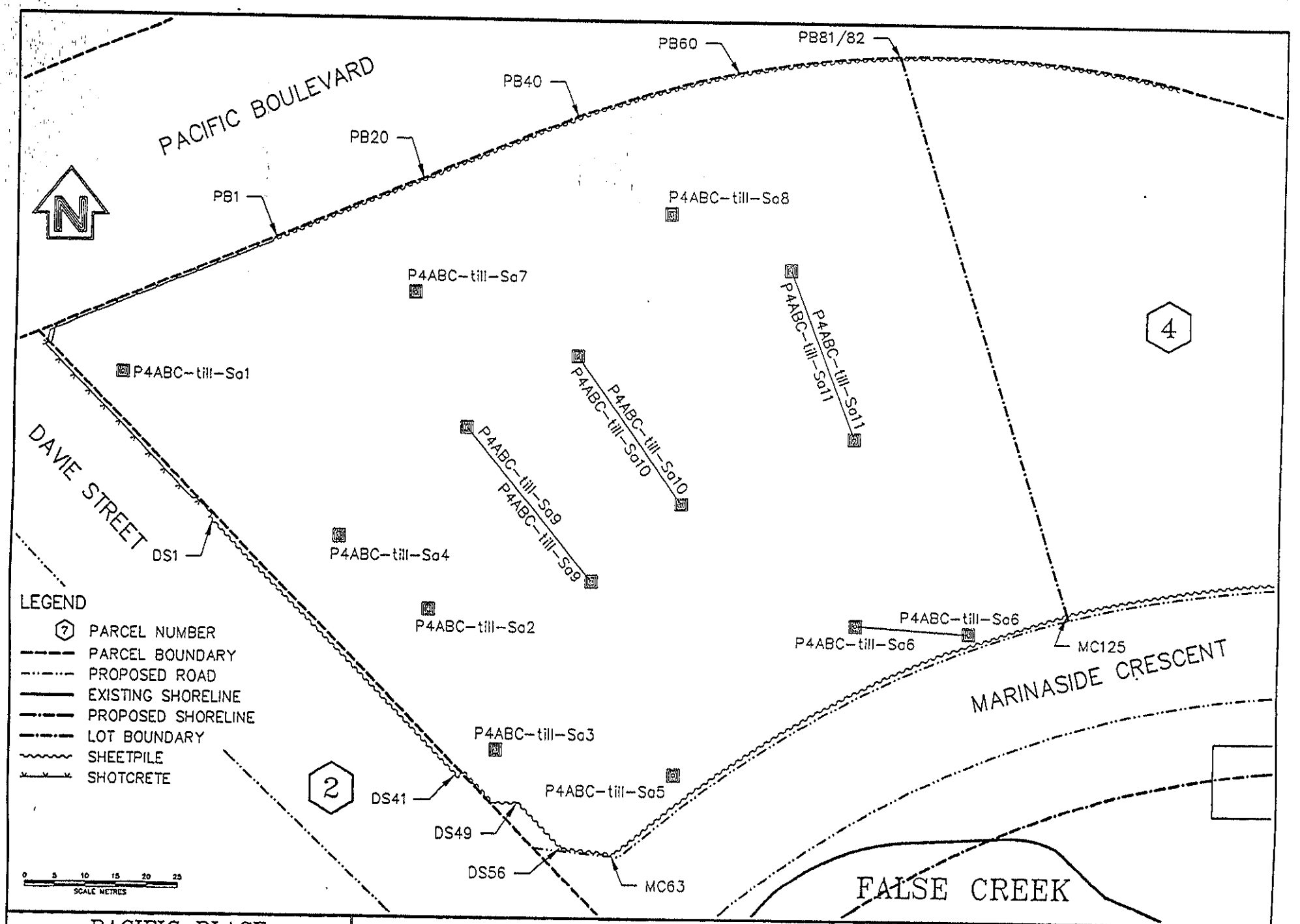
PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOTS ABC HISTORICAL LAND USE SUMMARY	DRWN: NFT	DATE: 26 MAR 97	REV: 1
		SCALE: 1:1500	FIGURE: 2	

CAD FILE: C:\PPRP\PP001677.DWG PLOT: 1311, 04 SEP 98



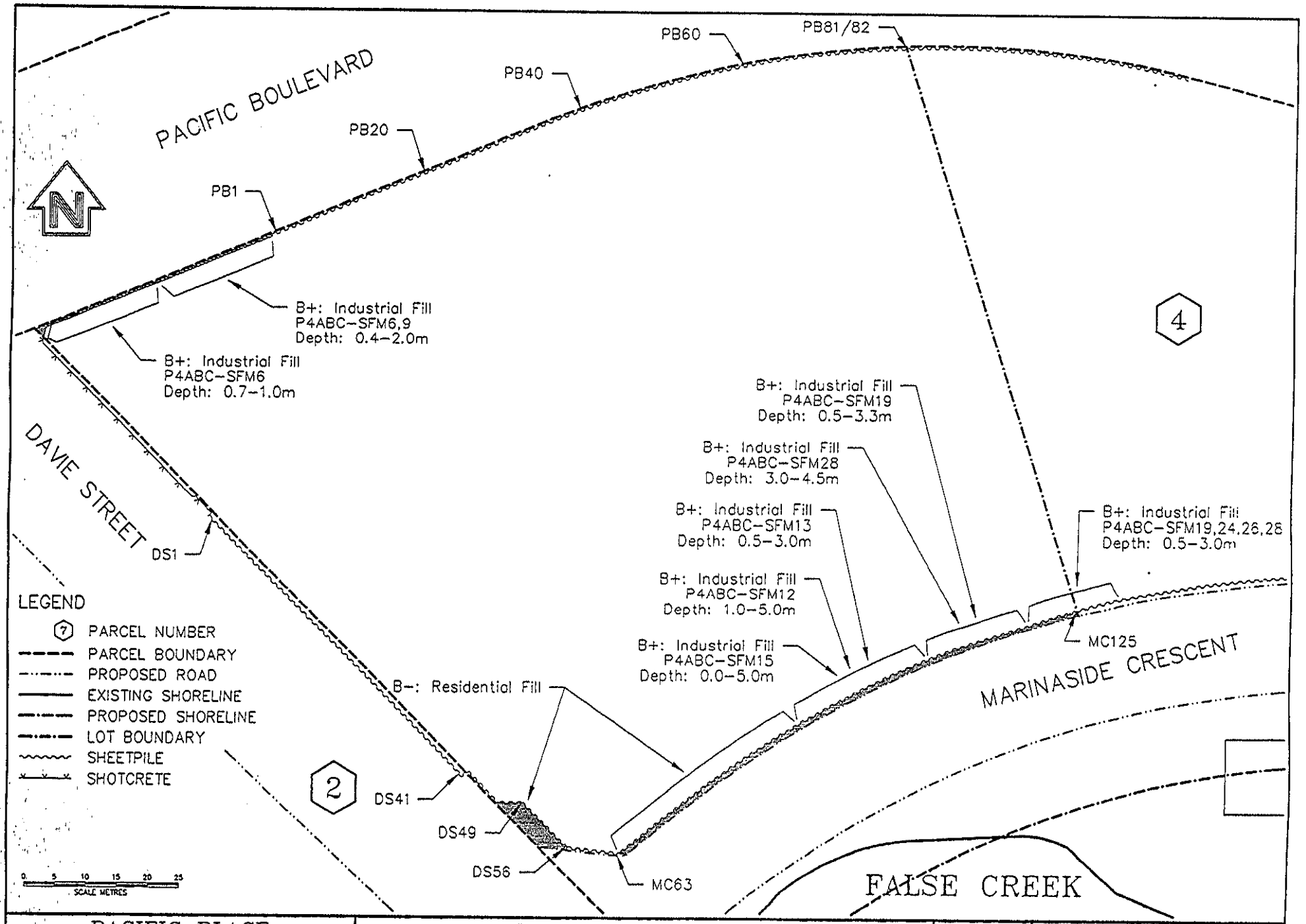
PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT ABC TEST LOCATIONS & AEC's	DRWN: NFT	DATE: 26 MAR 97	REV: 1
		SCALE: 1:800	FIGURE: 3	

CAD FILE: D:\PPRP\PP001678.DWG PLOT: 1525, 27 MAR 97



PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT ABC CONFIRMATORY TILL SAMPLE LOCATIONS	DRWN: NFT	DATE: 04 SEP 98	REV: 0
		SCALE: 1:800	FIGURE: 4	

CAD FILE: C:\PPRP\PP001759.DWG PLOT: 1849, 03 SEP 98



PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT ABC CLASSIFICATION OF MATERIAL LEFT INSITU	DRWN: NFT	DATE: 04 SEP 98	REV: 0
		SCALE: 1:800	FIGURE: 5	

C:\P-FILE: C:\PPRP\PP001760.DWG PLOT: 1538, 04 SEP 98

PACIFIC PLACE

SOILS REMEDIATION PROGRAM

REMEDIAL PLAN

FOR

PARCELS 1, 4, 5A, 5B, 6A, 6C (WEST HALF) AND 7

FINAL DRAFT

AUGUST 1992

VOLUME 2 OF 3

(REMEDIAL PLANS FOR INDIVIDUAL PARCELS)

Prepared By:

SOILS REMEDIATION GROUP

For:

BC ENVIRONMENT

2.0 PARCEL 4

2.1 GENERAL

Parcel 4 is situated in the central portion of the Pacific Place site at the foot of the Cambie Street Bridge. It is bordered by Parcels 2, 5A/5B and 6A to the west, north and east, respectively (Figure 2-1), and by False Creek to the south. Parcel 4 has a total land area of about 5.4 hectares, 96% of which has been reclaimed from False Creek by way of shoreline infilling (Figure 2-2). The total volume of fill material present within the parcel is on the order of 310,000 cubic metres[3].

Known historical land uses which likely resulted in the contamination of and/or deposition of fill material on Parcel 4 include an oil wharf, sawmills and lumber yards, a paint shop and work shops, railway sidings and associated activities, and a wood preservative dip tank operation.

Seven areas of potential environmental concern (AEC) have been identified on Parcel 4, based on the known historical land use and on delineation sampling conducted during Phases 1 and 2 of the SRG field investigations (Figure 2-3):

AEC 8 - Railway Lands (part)
AEC 14 - Infilled Shoreline
AEC 15 - Oil Wharf Area
AEC 17 - Fuel Pipeline Area
AEC 18 - Wood Preservative Dip Tank Area
AEC 19 - Lumber Yard (Part)
AEC 20 - Cambie Street On-ramp

The soil contamination, groundwater and soil vapour conditions associated with the above AEC are summarized in Sections 2.2, 2.3 and 2.4. Section I of this volume presents detailed AEC descriptions, while results of the Phase 1 and Phase 2 field investigations are presented in the RFI reports by SRG (1989c and 1992). It should be noted that the area presently referred to as Parcel 4 (in this Remedial Plan) was previously designated by CPDL as Parcel 2E and part of Parcel 4 and is so referenced in the RFI reports.

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3 Volume estimates do not include fill volume within 10 metres of the crest of the present shoreline, due to lack of data within this area.

2.2 SOIL CONTAMINATION

Parcel 4 encompasses a former embayment of False Creek that has been reclaimed using heterogeneous fill material, varying in thickness from 6 to 13 metres. The fill generally consists of silty sand to sandy gravel, with zones of demolition debris such as brick, wood, concrete, rock, coal and metal fragments, and extensive deposits of woodwaste ranging from sawdust and woodchips to large timbers.

A large portion of the fill material in Parcel 4 has been found to be extensively contaminated (above Level C), primarily due to the former presence of a chlorophenol (wood preservative) dip tank operation (AEC 18) and an oil wharf (AEC 15). Within AEC 18, concentrations of chlorophenols, PAH, LAH and some metals (mercury, copper and zinc) exceed the Level B (residential land use) and Level C (commercial/industrial land use) standards between depths of 0.5 to 6.5 metres below present ground surface. A limited zone of soil having chlorophenol concentrations in excess of the revised Special Waste guideline (60 ppm) is present adjacent to Pacific Blvd. N. Contamination in AEC 18 is identifiable in the field on the basis of black staining, and sweet musty solvent or oily/creosote odours.

Within AEC 15, concentrations of PAH and several metals (arsenic, copper, lead, nickel, tin and zinc) exceed the Level B and Level C standards in samples of the fill material, collected between depths of about 0.5 to 7 metres. Some concentrations of cadmium were also found to exceed Level B in this zone. Elevated concentrations of organic indicator parameters (oil & grease, TEH and LAH), some in excess of the Level C standards (where applicable), were also present in some samples. Contamination in AEC 15 is generally associated with black stained, woodwaste or debris zones and/or pockets having oily, solvent or creosote odours.

AEC 19 is considered to be an area having zones of moderate (Level B to C) contamination, based on the results of field investigations reported to date. In the northern portion of this AEC, concentrations of PAH in excess of the Level B and Level C standards were measured in some samples between depths of about 1 to 7 metres. The zone of elevated concentrations (generally black-stained with an oily or creosote odour) tends to become deep (7 to 10 metres) with proximity to False Creek. Small pockets of fill having metals concentrations exceeding the Level B and C standards are also present; these are typically associated with fill having significant debris content and black staining.

The estimated in-place volumes of fill expected to exceed the Level B standards in the Parcel 4 AEC with moderate to extensive contamination are:

	Level B to C	Level C to Special Waste	Special Waste
AEC 15 *	20,650m^3	5,000m^3	1,500m^3
AEC 18 *	3,800m^3	2,950m^3	300m^3
AEC 19**	36,000m^3	3,200m^3	800m^3

* Volumes calculated based on results of delineation sampling.

** Volumes estimated based on frequency of Level B, Level C and Special Waste exceedances in black-stained soil volume.

Although no testing was conducted on the portion of Parcel 4 designated as AEC 17, it is expected that a limited volume of fill may be contaminated with hydrocarbons (diesel, oil, solvents, etc.) from the former fuel pipelines.

The remainder of Parcel 4 is expected to have relatively low or random levels of contamination, based on limited available data. AEC 14, a zone of repeated shoreline infilling, was tested at 4 locations; PAH concentrations (associated with oily staining and coal fragments) in excess of the Level B standards were measured in only 2 samples.

In AEC 8, random concentrations of metals and organic parameters, with rare exceedances of the Level B standards (i.e. oil & grease), are typical. The frequency of samples exceeding the Level B standard for one or more parameter is approximately 4%.

No elevated concentrations of chemical parameters were found in AEC 20, beneath the Cambie Street on-ramp.

Estimated in-place volumes of fill expected to exceed the Level B standards (in the less extensively or randomly contaminated areas of Parcel 4) are:

	Level B to C	Level C to Special Waste
AEC 8	3,100m^3	0m^3
AEC 14	1,400m^3	0m^3
AEC 17	1,700m^3	300m^3

2.3 GROUNDWATER

2.3.1 Hydrostratigraphic Units

From the results of the field investigations conducted to date on Parcel 4, three main hydrostratigraphic units have been identified.

- **Surficial fill material**, comprised of sandy silt to sandy gravel, debris (including brick, concrete and metal fragments) and a continuous woodwaste zone at the base of the fill on the eastern half of Parcel 4. The total fill thickness ranges from approximately 6 to 8 metres (increasing to the north) in the west portion of the parcel, and from about 6 to 13 metres (increasing to the south and southwest) in the eastern portion. The woodwaste zone varies in thickness from about 2 to 6 metres (generally increasing to the south) in the eastern portion of the parcel. The hydraulic conductivity of the fill material ranges from about 10^{-7} to 10^{-3} m/s, with higher values being representative of coarse granular fill or woodwaste.

- **Native sediments** comprised of a clayey silt/silty sand units, underlying the fill zone. These deposits are variable in thickness (absent to 9 metres) and have a hydraulic conductivity on the order of about 10^{-7} to 10^{-6} m/s.

- **The till unit** underlying the entire Pacific Place site, which has a hydraulic conductivity varying from approximately 10^{-9} to 10^{-7} m/s.

2.3.2 Groundwater Flow

The water table is located within the fill zone, at a depth of about 2.5 to 4 metres below present ground surface; it is located at greater depths toward the shoreline.

Under present conditions, the fill zone is the primary hydrostratigraphic unit of groundwater flow, with an estimated flux of 10,700 m^3/year to False Creek; flow is essentially horizontal. Groundwater also flows to a lesser extent (approximately 2,900 m^3/year) through the underlying silty sands. Details of groundwater modelling in this portion of the site are presented in Appendix E-1.

The principal direction of flow is to the south towards False Creek; groundwater flow from the western and eastern portions of Parcel 4 converges at the central shoreline area before discharging to False Creek (Figure 2-4).

Water levels in the higher permeability fill present near the shoreline of False Creek are likely affected by tidal fluctuations. While no specific monitoring of tidal effects has been conducted in Parcel 4, it is anticipated that maximum effects will be on the order of 0.5 metres near the shoreline.

2.3.3 Groundwater Contamination

Within Parcel 4, elevated concentrations of several chemical parameters are present in the groundwater (Figures 2-5 through 2-8). Parameters which were found to exceed the False Creek standards include oil and grease (10 to 800 mg/L in the eastern portion of the parcel), ammonia (2 to 16 mg/L, associated with woodwaste and shoreline areas), total PAH (20 to 530 µg/L near the oil wharf) and chlorophenols (up to 350 µg/L in the immediate vicinity of the former dip tank).

The total estimated pre-development PAH loading from Parcel 4 (and to a lesser extent, 6A) is approximately 11 kg/year.

2.4 SOIL VAPOUR

High soil vapour and combustible gas concentrations were detected within AEC 19, and were associated with degradation of the significant woodwaste within the fill zone of Parcel 4. Concentrations ranging from 45 to 100% of the lower explosive limit (LEL) were present at the northeast (MW-231) and southwest (MW-404A) portions of AEC 19 respectively.

Organic vapours (in the hundreds of ppm range) associated with the hydrocarbon contamination on AEC 15 and 18 were also measured during the field investigations.

2.5 RESULTS OF HUMAN HEALTH RISK ASSESSMENT

As discussed in Section 6 (Volume 1), no risks to human health, in excess of the Pacific Place standards, were found to be associated with the shallow soil which is to be left in-place following the proposed development. Shallow soils in the areas known to be extensively contaminated will be excavated for development.

2.6 DEVELOPMENT PLANS

Multi-storey residential dwellings, with some retail facilities, are planned for about 80% of Parcel 4. A park is planned for the east end of the parcel, and a bicycle path and pedestrian walkway will line the shoreline. A roadway and utility corridor is also proposed for the central area. Extensive excavation to an elevation of -2.7 metres geodetic (for subgrade structures) will take place to the south of Pacific Boulevard, while relatively minor excavation to +1.2 metres geodetic is planned for the small portion of Parcel 4 to the north of Pacific Blvd. (Figure 2-9). A public marina will be located in False Creek adjacent to the parcel. Boat launching will be available at the park located at the east end of the parcel.

2.7 IMPLICATIONS OF DEVELOPMENT

2.7.1 Effect of Development on Soil Contamination

Excavation for development of Parcel 4 will involve removal of fill and native materials to elevations of -2.7 metres geodetic to the south of Pacific Blvd. S. (PBS), and to 1.2 metres geodetic to the north of PBS. No excavation is presently planned for the southeastern end of the parcel.

The development of Parcel 4, as presently proposed, will require the excavation and removal of about 178,000 cubic metres of in-place fill and approximately 36,000 cubic metres of in-place native sediments and till. Excavation will take place primarily in AEC 14, 15, 18 and 19. Approximately 30,000 cubic metres of the excavated fill material is expected to have average concentrations between the Level B and C standards, 6,200 cubic metres between Level C and Special Waste, and 2,000 cubic metres in excess of the Special Waste criteria (expressed as in-place volumes).

The woodwaste zone having elevated concentrations of methane at the north end of Parcel 4 may be partially excavated for development.

2.7.2 Effect On Groundwater

Approximately 57% of the existing fill will be removed, including approximately 56% (by volume) of in-place soils estimated to exceed the Level B standards south of PBS. However, only about 33% of the soils exceeding the Level B standards in the dip tank area (AEC 18) will be excavated; approximately 4,750m^3 of soil expected to exceed the Level B, C or Special Waste standards (for chlorophenols, PAH and LAH) will remain following development. This will serve as a continuing source of groundwater contamination which, if left in place, may necessitate long-term treatment of groundwater collected from the building drains.

The building foundations will key into the base of fill materials and will cut off flow to False Creek. When the buildings are completed, an average of approximately 12,000 m^3/year from Parcel 4 and 15,000m^3/year (6.3 IGM) originating from False Creek will be collected from the building drains installed in the fill. Post-development flux to False Creek through the native sediments will be approximately 1,500m^3/year.

Details of the groundwater modelling completed for Parcel 4 are presented in Appendix E-1.

Groundwater seepage into most construction excavations within Parcel 4 will likely contain elevated concentrations of ammonia and organic parameters.

2.7.3 Conclusions

- Fill exceeding Level B for chlorophenols/PAH in the dip tank area north of PBS, that would remain following excavation for development, will serve as a source of groundwater contamination after development. As this will necessitate long-term groundwater treatment if left in-place, removal of the additional contaminated fill should be considered.

- Treatment of groundwater seepage into excavations during construction will likely be required. General chemical parameters of concern will likely include oil & grease, ammonia, PAH and chlorophenols (north of PBS). Locally, treatment for aluminum, lead, mercury and zinc in the groundwater may be necessary.

- Appropriate measures to eliminate the build-up of methane in subgrade structures should be implemented in the north portion of Parcel 4 or where woodwaste content is significant.

2.8 EVALUATION OF REMEDIAL OPTIONS FOR SOIL

2.8.1 Option 1 - Excavation for Development

Option 1 addresses the treatment and disposal requirements of soil that will be excavated as part of the development of the parcel. Approximately half of the soil on Parcel 4 that has been identified as having average contaminant concentrations above the Level B standards will be excavated as part of the site development. Approximately one quarter of the total amount of fill excavated from the site for development is expected to contain contaminant concentrations above the Level B standard. Unregulated disposal will likely be appropriate for the remaining fill.

As discussed in Section 8.0 (Volume 1), a number of remedial measures and technologies were evaluated for the contaminated soil on the Pacific Place site. Based on this evaluation, disposal in an industrial landfill is recommended for the Level B to C soil, and disposal in an authorized landfill is recommended for the Level C to Special Waste soil.

The risk assessment performed for Parcel 4 shows that no risk to human health is associated with the soil that would remain in-place following the excavation for site development. Therefore, no remedial measures to reduce the potential for human exposure to soil contamination are required.

The volume of contaminated soil that will be excavated from the site (including excavation swell factor) under Option 1 is summarized below:

Level B to C soil - 38,000 cubic metres

Level C to Special Waste soil - 7,700 cubic metres

Special Waste Soil - 2,500 cubic metres (Section 2.9)

It should be noted that all known accessible Special Waste will be excavated as part of the planned development. However, small pockets of inaccessible Special Waste PAH will remain at depths up to 10 metres near the Parcel 4 shoreline in AEC 19. As a result, BC Environment will require that the waste be registered, that an in situ management facility be approved prior to construction, and that a long-term monitoring program be conducted. Additional measures, as described in Section 4.11.3 (Volume 1), may also be applicable to Parcel 4.

Significant quantities of woodwaste would remain in AEC 19 following development. The woodwaste is located in the northeastern section of AEC 19, in Parcel 6A adjacent to Parcel 4. Elevated concentrations of methane measured in this area of the site indicate that the potential for methane migration into the structures on Parcel 4 exists.

Option 1 includes the installation of a passive soil gas venting system along the border of Parcels 4 and 6A during the building construction. The system would consist of horizontal piping in a gravel filled trench, with a vertical discharge pipe located at one or both ends. This relatively simple construction will provide a preferential flow path for the gas. The system could be converted to an active extraction system if sufficient quantities of gas are recovered.

The estimated order of magnitude costs for remediation of the Level B to Special Waste soil on Parcel 4 under Option 1 is shown below. (Costs associated with the excavated Special Waste are given in Section 2.9). The costs are divided into the normal construction costs (excavation, hauling, etc.) that would be incurred by the owner/ developer, and the incremental costs B.C. Environment will incur because of the contaminants present. The gas venting costs are also included in the B.C. Environment costs. Only the total costs are shown below. A breakdown of the costs for Option 1 is shown in Table 2-1.

2.14 COMPARISON OF REMEDIAL COSTS

The total order of magnitude cost to B.C. Environment, in 1992 dollars, for remediation of the Level B, C and Special Waste contamination at Parcel 4 under each of the three options is presented below. Annual costs, such as groundwater treatment under Option 1 and quarterly monitoring for Options 1 and 2 are not included.

Option 1

Landfill disposal of soil between Levels B and C	$1,200,000
Landfill disposal of soil between Level C and Special Waste	$1,200,000
Incineration of Special Waste organics	$1,200,000
Passive methane venting system installation	$ 10,000
Total estimated BC Environment remediation cost for Level B, C and Special Waste soil under Option 1	**$3,610,000**

Considering the accuracy of this estimate is plus or minus 50 percent, the total cost to B.C. Environment for the remediation of Parcel 4 under Option 1 is estimated to range from $1,800,000 to $5,400,000.

Option 2

Landfill disposal of soil between Levels B and C	$1,400,000
Landfill disposal of soil between Level C and Special Waste	$1,680,000
Incineration of Special Waste organics	$1,200,000
Passive methane venting system installation	$ 10,000
Total estimated B.C. Environment remediation cost for Parcel 4 under Option 2	**$4,290,000**

Considering the accuracy of this estimate is plus or minus 50 percent, the total cost to B.C. Environment for the remediation of Parcel 4 under Option 2 is estimated to range from $2,100,000 to $6,400,000.

Option 3

Landfill disposal of soil between Levels B and C	$1,420,000
Landfill disposal of soil between Level C and Special Waste	$1,740,000
Incineration of Special Waste organics	$1,200,000
Passive methane venting system installation	$ 10,000
Total estimated B.C. Environment remediation cost for Parcel 4 under Option 3	**$4,370,000**

Considering the accuracy of this estimate is plus or minus 50 percent, the total cost to B.C. Environment for the remediation of Parcel 4 under Option 3 is estimated to range from $2,200,000 to $6,500,000.

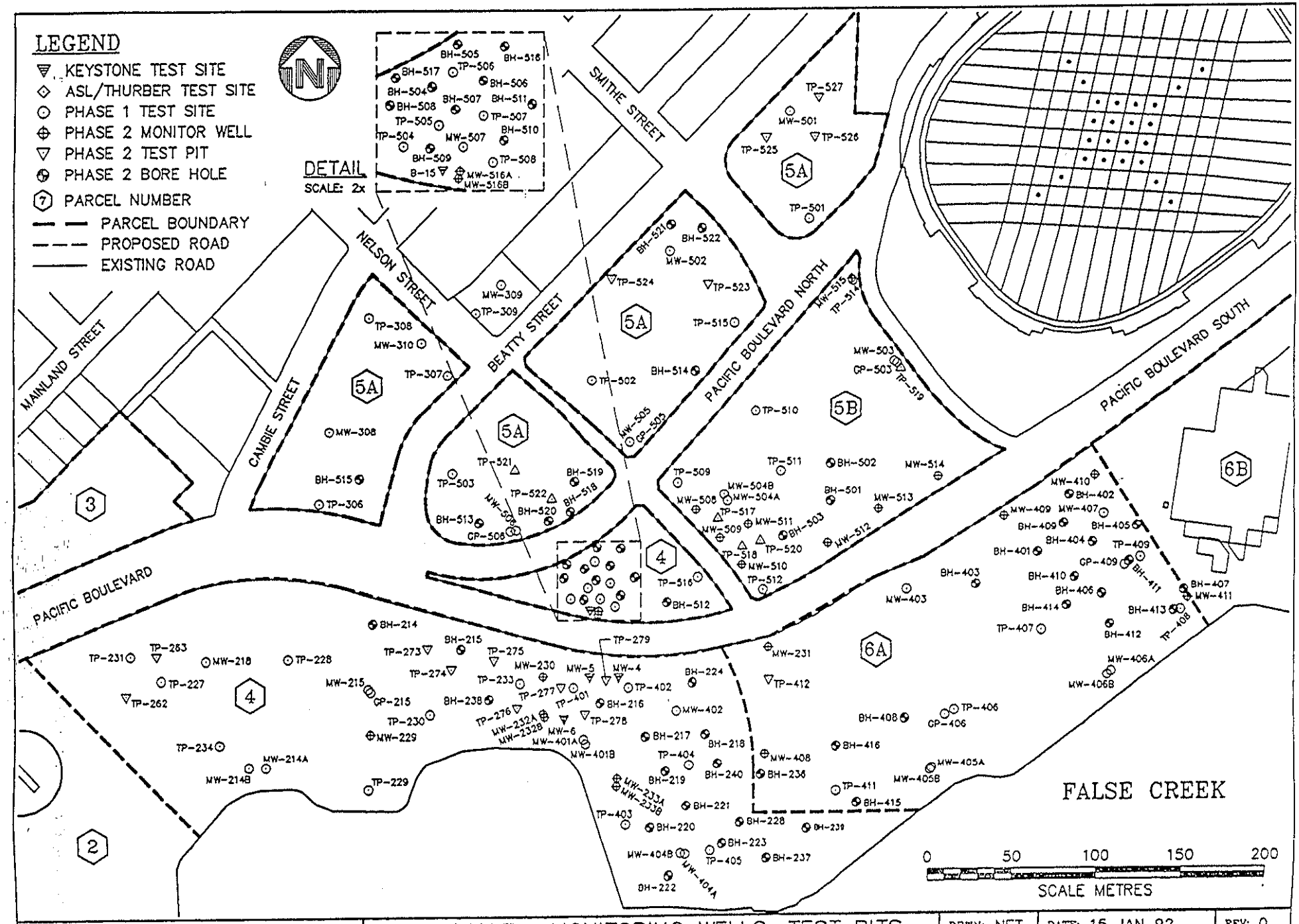
2.15 RECOMMENDED REMEDIAL OPTION

Option 1 provides for proper disposal of only the contaminated soil excavated for site development, and for the installation of a passive methane venting system. However, the primary source of groundwater contamination would remain in-place, likely requiring long-term water treatment.

Option 2 includes the excavation, treatment and disposal of contaminated soil within the development excavation, as well as the removal of the primary source of groundwater contamination within the parcel, thereby reducing potential impacts to False Creek and reducing annual costs incurred by B.C. Environment for treatment of the building drain effluent. The methane venting system is also included under Option 2.

Option 3 results in complete removal of the accessible contaminated soil that exceeds the Level B standards. This is not required for protection of human health and the environment, as this is achieved by Option 2. The passive methane venting system will still be necessary under Option 3.

Based on the evaluation of these three options the SRG recommends to B.C. Environment that Option 2 be implemented for the remediation of Parcel 4.



PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	BOREHOLES, MONITORING WELLS, TEST PITS PARCELS 4, 5A, 5B, 6A	DRWN: NFT	DATE: 15 JAN 92	REV: 0
		SCALE:	FIGURE: 2-1	

CAD FILE: \RG\PP001182.DWG PLOT: 0943 - 28 JAN 92

LETTER OF ASSURANCE

DATED: The 5th day of March 1999

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
For the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City", respectively)

In this Letter of Assurance the following words shall have the following meanings:

"Approved Shoreline Utilities" has the meaning ascribed to 'Approved Shoreline Utilities' in the Shoreline Remediation Agreement;

"Approved Shoreline Works" has the meaning ascribed to 'Approved Shoreline Works' in the Shoreline Remediation Agreement;

"Contaminants" means those substances existing on or under the Lands hereafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Provincial Standards" means:

(i) with respect to the Shoreline Area, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada; and

(ii) with respect to the Approved Shoreline Works and Approved Shoreline Utilities, compliance with the requirements of all applicable legal standards within British Columbia, including applicable legal standards of the Federal Government of Canada in relation to the Approved Shoreline Works and Approved Shoreline Utilities pertaining to Contaminants.

in relation to the use of the Shoreline Area in accordance with the provisions of the Shoreline Agreement.

"Shoreline Area" means:

firstly, those portions of road below the high water mark more particularly outlined in red on the plan attached as Appendix "i" hereto which plan was deposited in the Vancouver Land Title Office and assigned number Plan LMP13010;

secondly, that portion of Lot 223, False Creek, Plan LMP13010 below the high water mark more particularly outlined in red on the plan attached as Appendix "i" hereto; and

thirdly, that portion of Lot 224 False Creek, Plan LMP13010 below the high water mark more particularly outlined in red on the plan attached as Appendix "i" hereto.

"Shoreline Remediation Agreement" means the agreement between the Province and the City made as of the 1st day of November, 1993 in respect, inter alia, of the Shoreline Area, a copy of which is attached hereto as Appendix "ii".

Whereas the Approved Shoreline Works and the Approved Shoreline Utilities have been completed by Pacific Place Holdings Ltd., its subsidiary Pacific Place Developments Ltd. or Concord Pacific Group Inc., the Province does hereby confirm to the Approving Officer

and to the City, that to the best of the Province's knowledge, the Shoreline Area as contemplated by the Shoreline Remediation Agreement does comply with Provincial Standards in respect to the use of the Shoreline Area as contemplated by the Shoreline Remediation Agreement. The Approving Officer and the City each acknowledge that in providing this Letter of Assurance that:

(i) the Province has not carried out any testing or sampling of soil or water on or under the Shoreline Area; and

(ii) the basis for providing this Letter of Assurance is the investigation, testing and sampling of soil and water on or under lands adjacent to or in reasonable proximity to the Shoreline Areas as detailed in the report attached as Appendix "iii" hereto.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Ministry of Environment, Lands and Parks

Cassie J. Doyle, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Holdings Ltd.
900 – 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

cc: Concord Pacific Group Inc.
900, 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

SUBDIVISION PLAN OF
1) LOT 154 FALSE CREEK PLAN 21403
2) PART OF LOT 156 EXCEPT PORTIONS IN PLANS 21735 , LMP12037 AND LMP12038 FALSE CREEK PLAN 21458
3) LOT A DISTRICT LOT 5632 PLAN 21672
4) PART OF THAT PART OF DISTRICT LOT 541 IN REFERENCE PLAN 11156 EXCEPT
A) PART IN REFERENCE PLAN 14790 B) PART IN STATUTORY RIGHT OF WAY PLAN 17513
C) PORTIONS IN PLANS 20124, 20128, 20129, 20186, 20319, 20357, 20421
20821, 23011, 23018, 23019, 23020, 23025, 23026, 23027 AND LMP10733
5) PART OF DISTRICT LOT 4674 PLAN 6107 EXCEPT PLAN 20421
6) PART OF DISTRICT LOT 5059 EXCEPT PARTS IN PLANS 20319 AND LMP10733
7) PART OF DISTRICT LOT 5605 PLAN 6108 EXCEPT A) PORTIONS IN REFERENCE PLAN 2437 AND
PLANS 20128, 20129, 20186, 20421, 23027 AND LMP10733
8) PART OF DISTRICT LOT 5673 EXCEPT PLAN 21425
9) CLOSED ROAD IN REFERENCE PLAN LMP 13009
ALL OF GROUP 1 NEW WESTMINSTER DISTRICT

PLAN LMP 13010

THE PARCELS SHOWN HEREON ARE TO BE CITED HEREINAFTER AS:
LOTS 223 TO 237 INCLUSIVE
FALSE CREEK
PLAN LMP 13010

SCALE 1 : 1000

INTEGRATED SURVEY AREA NO. 31 (VANCOUVER)

LEGEND

DAVIE STREET
PACIFIC BOULEVARD
HAMILTON STREET
CAMBIE STREET
NELSON STREET
BEATTY STREET
SMITHE STREET
ROBSON STREET
STADIUM ROAD WEST
PACIFIC BOULEVARD NORTH
PACIFIC BOULEVARD SOUTH
LANE
ROAD
BLK 76
PT. D.L. 541
PART D.L. 5605
PART D.L. 5059
REM. D.L. 2850
D.L. 5632
D.L. 5673
FALSE CREEK
SEE DETAIL A
SEE DETAIL B
SEE DETAIL C
SEE DETAIL D
SEE DETAIL E
SEE DETAIL F
SEE DETAIL G
DETAIL A
DETAIL B
DETAIL C
DETAIL D
DETAIL E
DETAIL F
DETAIL G
REM. 156
THIS PLAN LIES WITHIN THE GREATER VANCOUVER REGIONAL DISTRICT

AREAS 4 & 5A SHORELINE REMEDIATION AGREEMENT

THIS AGREEMENT made as of the 15 day of November, 1993,

BETWEEN:

HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA, represented by the Minister of Environment, Lands and Parks, Parliament Buildings, Victoria, British Columbia, V8V 1X4

(the "Province")

AND:

CITY OF VANCOUVER, a municipal corporation, having offices at 453 West 12th Avenue, Vancouver, British Columbia, V5Y 1V4

(the "City")

WHEREAS:

A. The Shoreline Area (as hereinafter defined) has been dedicated to the City as street as part of the development of a portion of Pacific Place, known as Areas 4 and 5A (as hereinafter defined), by Concord Pacific Developments Ltd. ("Concord Pacific");

B. The Province will apply the approach outlined in the British Columbia Standards for Managing Contamination at the Pacific Place Site on the Shoreline Area, being a portion of Areas 4 and 5A which allows Contaminants (as hereinafter defined) to remain on the Shoreline Area, and the Province will issue to the City a Letter of Assurance (as hereinafter defined) with respect thereto;

C. The City has agreed with Concord Pacific to accept dedication of the Shoreline Area on condition, inter alia, that the Province provides to the City

certain assurances and indemnities in respect of the Contaminants and any future remediation requirements, all as hereinafter set forth.

NOW THEREFORE THIS AGREEMENT WITNESSES THAT in consideration of the covenants and agreements set forth below and other good and valuable consideration (the receipt and sufficiency of which is hereby acknowledged and agreed to by the parties), the parties agree as follows:

ARTICLE I
DEFINITIONS

1.1 In this Agreement, unless the context otherwise requires:

(a) "Additional Remedial Work" means all those necessary steps, acts and physical works required to be attended to, constructed and installed, by the Province and any alteration, maintenance, repair, reconstruction or replacement required to be made to the Remedial Work (as hereinafter defined) if:

(i) the Provincial Standards shall change and such change requires any owner or occupier of the Shoreline Area or the Street Extensions to comply with same to ensure that the Provincial Standards are so complied with; or

(ii) the Provincial Standards compel the Province or any owner or occupier of the Shoreline Area or the Street Extensions to undertake such steps, acts and physical works to ensure continued compliance with the Provincial Standards; or

(iii) the City decides to carry out, construct, install, maintain, repair, reconstruct or replace the Approved Shoreline Works or the Approved Shoreline Utilities (as each is hereinafter defined);

(b) "Approved Shoreline Utilities" means any systems of wires, conduits, ducts, poles, lines, mains and pipes, including all necessary attachments and fittings in connection therewith, for the purpose of

collecting, distributing, supplying, discharging, carrying out and transporting water, sanitary sewerage and storm sewerage, and carrying electrical energy, steam energy and gas and all telecommunication, telephone and cable utilities, as the same may be repaired and replaced from time to time, servicing development on Areas 4 and 5A and located on the Shoreline Area, provided the foregoing services are customarily provided by the public or private utility company or authority in their ordinary course of business as of the date first written above;

(c) "Approved Shoreline Works" means:

(i) the shoreline protection works, seawall walkway and related support structures, piles, fill, facilities, amenities and ancillary facilities, constructed and installed on the Shoreline Area, as the same are defined in the Shoreline Protection Works Agreement of even date herewith, between the City and Concord Pacific, including any repair, maintenance, reconstruction thereof and replacement thereto, provided that any such reconstruction or replacement is in the same form and same location as that originally constructed or installed; and

(ii) such alterations, replacements, additions, attachments or modifications of or to the shoreline protection works and seawall walkway described in Section 1.1(c)(i) above, including structures such as piers and landings, as are consistent with, in the nature of or serve to enhance the aforesaid seawall walkway, provided that the installation or construction of the same does not cause major disturbance to the seabed of the Shoreline Area;

(d) "Areas 4 and 5A" means those certain parcels or tracts of lands situate, lying and being in the City of Vancouver, Province of British Columbia, shown outlined in bold black on the Subdivision Plan - Areas 4 and 5A (as hereinafter defined), which certain lands include the Shoreline Area and those parcels described as Lots 223 to 237, inclusive, False Creek, Plan LMP13010;

(e) "Contaminants" means those substances existing on or under Areas 4 and 5A as of May 11, 1988, which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada;

(f) "Development Plan" means the form of development of Areas 4 and 5A, including the Shoreline Area, set forth and contained within that certain by-law (the "By-Law") (being a By-Law to amend By-Law No. 3575, the Zoning and Development By-Law), rezoning Areas 4 and 5A from BCPED B.C. Place/Expo District to CD-1 Comprehensive Development District, together with the Approved Shoreline Works and the Approved Shoreline Utilities serving development on Areas 4 and 5A;

(g) "Letter of Assurance" means a letter of assurance to be issued by the Province following completion of the Approved Shoreline Works and Approved Shoreline Utilities, together with completion of the Remedial Work, and to be issued following completion of any Additional Remedial Work which Letter of Assurance will provide that, to the best of the Province's knowledge, the Shoreline Area meets Provincial Standards.

(h) "Provincial Standards" means:

(i) with respect to the Shoreline Area, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada; and

(ii) with respect to the Approved Shoreline Utilities, compliance with the requirements of all applicable legal standards within British Columbia, including applicable legal standards of the

Federal Government of Canada in relation to the Approved Shoreline Utilities;

(i) "Remedial Work" means all those steps, acts and soil and groundwater remediation and all those physical works, improvements, facilities, features and associated equipment which Concord Pacific is required to perform, design, construct or install in respect of or on the Shoreline Area to ensure compliance with Provincial Standards pursuant to an Agreement of even date herewith between Concord Pacific and the Province, a copy of which is attached as Schedule "A" hereto;

(j) "Shoreline Area" means that portion of Areas 4 and 5A which was dedicated to the City as street upon deposit in the Vancouver/New Westminster Land Title Office of the Subdivision Plan (hereinafter defined) being primarily the portion of street situate between the high water mark and the toe of the slope of the Approved Shoreline Works (as hereinafter defined) and is outlined in red on the copy of the Subdivision Plan attached as Schedule "B" hereto but excluding any portion of street which is or may become New Lands as that term is defined in the Soils Agreement dated May 11, 1988 between the Province and Concord Pacific; and

(k) "Subdivision Plan - Areas 4 and 5A" means the plan of subdivision for Areas 4 and 5A certified by Gary Sundvick, B.C.L.S. on October 15, 1993, marginally numbered 93341-1, Revision 3, and deposited in the Vancouver/New Westminster Land Title Office under No. LMP13010, a photo-reduced copy of which is attached hereto as Schedule "B".

ARTICLE II
ACKNOWLEDGEMENTS AND APPLICATION OF AGREEMENT

2.1 The City acknowledges to the Province that it is aware of the presence of Contaminants on or under the Shoreline Area as of the date of this Agreement, which Shoreline Area will be the subject of Remedial Work performed by Concord Pacific pursuant to that Agreement referred to in Section 1.1.(i), and which Shoreline Area may be the subject of Additional Remedial Work all in accordance

with the terms of this Agreement, and that the covenants of the Province to do Additional Remedial Work and to indemnify the City apply only to the Approved Shoreline Works and the Approved Shoreline Utilities. The Province agrees that it will take reasonable steps to cause Concord Pacific to carry out the Remedial Work as set forth in the Agreement referred to in Section 1.1(i).

2.2 The City agrees that no claim for compensation shall be made by the City, or any person claiming through the City, in any form as a result of the City not being able to use the Shoreline Area for all purposes which other lands dedicated to the City, or designated as roads pursuant to the Vancouver Charter, may be used.

2.3 The Province covenants and agrees that with respect to the Shoreline Area, the Province shall only indemnify the City pursuant to Article VI, and shall carry out Additional Remedial Work if the City undertakes the Approved Shoreline Works and/or the Approved Shoreline Utilities.

ARTICLE III
INSTALLATION, MAINTENANCE AND REPAIR OF APPROVED SHORELINE WORKS AND APPROVED SHORELINE UTILITIES

3.1 The Province and the City acknowledge that the maintenance and repair of the Approved Shoreline Works and the Approved Shoreline Utilities are also the subject of a separate agreement made between the parties and Concord Pacific as of even date, entitled Utilities Design Agreement (Quayside Document #9).

3.2 The Province covenants and agrees that it shall carry out all Additional Remedial Work pursuant to Article IV required to accommodate the installation, construction, repair, maintenance, replacement or reconstruction of the Approved Shoreline Works and the Approved Shoreline Utilities.

3.3 The City agrees that, prior to any major reconstruction or replacement of the Approved Shoreline Works or the Approved Shoreline Utilities, or prior to construction or installation of that portion of the Approved Shoreline Works described in section 1.1(c)(ii), where, in the reasonable opinion of the City, any such work may have an impact on the Contaminants or the Remedial Works, or may

require the Province to perform Additional Remedial Work, the City shall submit details of such work to the Province for its consideration and review.

3.4. A submission under section 3.3 shall be in writing and shall be accompanied by maps, plans, schedules, and such other documents or reports as the Province may reasonably require to show the proposed work in sufficient detail to allow the Province to conduct a full evaluation of the impact on the Contaminants and the Remedial Work. Provided however that in the event that testing or additional testing for Contaminants is required, the Province shall carry out such testing at its cost.

3.5 Before commencing the required Additional Remedial Work pursuant to section 3.2, the Province shall have a reasonable period of time to review the submission referred to in section 3.3 based on the nature and complexity of the undertakings required, in order to provide advice on whether any Additional Remedial Work may be necessary. The Province shall provide to the City, in a timely way, and in any event no later than ninety (90) days, or some longer period that may be mutually acceptable, following receipt of a submission pursuant to section 3.3, its schedule with respect to performance of the Additional Remedial Work, in order that the City may prepare its construction schedules and carry out the necessary work. The schedule prepared by the Province shall be mutually acceptable to the Province and the City and address, inter alia, the matter of the need for, and the duration of, any closures of, or interruptions in use to, any Approved Shoreline Works or Approved Shoreline Utilities in order to accommodate Additional Remedial Work performed by the Province, and the matter of timing of commencement and completion of any Additional Remedial Work by the Province. In preparing and approving the schedule, the Province and the City shall take into account and consider the total costs associated with any closure of or interruption in use to any Approved Shoreline Work or Approved Shoreline Utility and shall attempt to minimize the financial obligations imposed on the Province pursuant to this Agreement to the extent reasonably possible.

3.6 Save as provided in section 3.7, in the event the City fails to consult and obtain the input from the Province as hereinbefore set forth prior to commencing any reconstruction or replacement of the Approved Shoreline Works or the Approved Shoreline Utilities, or prior to construction or installation of that

portion of the Approved Shoreline Works described in section 1.1(c)(ii), resulting in significant additional costs being incurred by the Province in carrying out any Additional Remedial Work under the terms of this Agreement, where the City could reasonably have anticipated that its failure to consult would lead to such significant additional costs being incurred by the Province, such additional costs shall be for the sole account of the City.

3.7 Notwithstanding the provisions contained in this Article III, the Province covenants and agrees with the City that, with respect to the Approved Shoreline Works or the Approved Shoreline Utilities, where, in the reasonable opinion of the City's City Engineer, an emergency exists where there is immediate danger to the public, the environment, or any Approved Shoreline Works or Approved Shoreline Utility, the handling of which would necessitate the performance of Additional Remedial Work by the Province, and the said City Engineer does not, in his reasonable opinion, have sufficient time to obtain the advice of the Province as provided in this Article III, then:

(a) the City may take such action in respect of the Contaminants as it considers necessary in respect of an emergency;

(b) all costs and expenses incurred by the City in respect of emergency action taken shall be paid by the Province to the City, forthwith upon written request from the City for payment; and

(c) the Province shall perform, if possible and if requested by the City's City Engineer during an emergency, or, if not, upon resolution of an emergency, all such Additional Remedial Work as the proper resolution of the emergency and the proper treatment of affected Approved Shoreline Works and Approved Shoreline Utilities may warrant.

3.8 A decision by the City to carry out any work with respect to the Approved Shoreline Works and/or the Approved Shoreline Utilities, including construction, installation, replacement, reconstruction and repair thereof, shall not be the subject of arbitration pursuant to Article VII.

ARTICLE IV
FUTURE CONTAMINANT CLEAN UP

4.1 The Province shall undertake all Additional Remedial Work at its sole cost and expense.

4.2 The Province shall perform all Additional Remedial Work in a timely manner and in accordance with schedules established and agreed by the City and Province, and the Province shall perform any such Additional Remedial Work with as little disruption to the use of the Approved Shoreline Works and the Approved Shoreline Utilities as is reasonable given the nature, extent and expense of the Additional Remedial Work and the time period, if any, set out in the law establishing the Provincial Standards.

4.3 The City shall co-operate with the Province to ensure that any Additional Remedial Work can be completed by the Province in accordance with this Agreement and the law.

4.4 The City acknowledges that it may be necessary to close the Shoreline Area, the Approved Shoreline Works or the Approved Shoreline Utilities from time to time in whole or in part to perform the Additional Remedial Work and, subject only to emergency, any such closures will be agreed and established by the schedules developed between the City and the Province, subject to applicable regulatory requirements governing the Additional Remedial Work.

4.5 The City agrees that no claim for compensation shall be made in any form whether pursuant to Article VI or otherwise, as a result of any such closure or any interruption in use of any Approved Shoreline Work or Approved Shoreline Utility; provided however this agreement shall not restrict the City's rights pursuant to Article VII.

4.6 The City shall provide to the Province reasonable and necessary access to the Shoreline Area for the performance of Additional Remedial Work and for any and all construction, maintenance, repair, replacement, reconstruction, monitoring and testing of the Remedial Work or Additional Remedial Work, the

Contaminants and all other things required to be done by the Province pursuant to this Agreement.

ARTICLE V
COVENANTS OF THE PROVINCE

5.1 Subject to the terms and conditions contained in this Agreement, the Province covenants with the City that the presence of Contaminants on the Shoreline Area or the performance of any Remedial Work or Additional Remedial Work by the Province, except during preparation of the remedial plan, and until completion of the actual performance of the Remedial Work or the Additional Remedial Work, shall not interfere with the use and enjoyment of the Shoreline Area, the Approved Shoreline Works and the Approved Shoreline Utilities.

5.2 The Province hereby covenants with the City that following completion of the Remedial Work, and any Additional Remedial Work, the Shoreline Area will, to the best of the Province's knowledge, comply with Provincial Standards and the Province shall, following completion and review of the Approved Shoreline Works and the Approved Shoreline Utilities and completion of the Remedial Works by Concord Pacific, and also upon completion of any Additional Remedial Works, issue a Letter of Assurance in respect of the Shoreline Area.

5.3 If, as between the Province and the City, a dispute should arise as to whether a substance which is defined as a threat to the public health or the environment under any applicable laws in the Province of British Columbia, including any applicable legal standards established by the Federal Government of Canada, existed on or under Areas 4 and 5A as of the 11th day of May, 1988 and is therefore a Contaminant within the context of this Agreement, it shall be the obligation of the Province, with the cooperation of the City (provided that no financial expenditures shall be required of the City), to establish that the substance was deposited on Areas 4 and 5A subsequent to the 11th day of May, 1988.

5.4 The obligation of the Province established by Section 5.3 shall enure for the benefit of the City only, and without limiting the generality of the foregoing, no other person, corporation, partnership, party, joint venture, organization,

government or other entity, or a legal or other representative of any of the foregoing, can take advantage of the requirement therein contained whether in contract or tort.

5.5 The Province covenants and agrees that, should the City be threatened with a prosecution or action which alleges that the Provincial Standards have not been met and the Province maintains that the standard in issue is not an applicable legal standard within the definition of Provincial Standards, the Province will undertake the defence of such action or prosecution or reimburse the City for all costs, expenses, including legal fees and disbursements, fines and penalties incurred by the City or any of its employees in defending such action or prosecution.

ARTICLE VI
INDEMNITY

6.1 If, and to the extent that the City (which for the purpose of this Article VI includes its officials, officers or employees) suffers loss or damage directly, or from any claims against it or its officials, officers or employees by third parties, in either case attributable to the presence of Contaminants on or under the Shoreline Area and without the negligent intervening act of the City, where the City could reasonably have anticipated the consequences of such act, the Province shall, subject to the provisions of this Article, indemnify and save harmless the City and its officials, officers and employees from and against any and all loss, damages, suits, penalties, costs, liability and expenses (including but not limited to those attributable to reasonable investigation and legal fees and disbursements incurred) suffered by the City.

6.2 In addition to the indemnity contained in Section 6.1, the Province agrees to indemnify and save harmless the City and its officials, officers and employees from and against all loss, damages, suits, penalties, costs or liability (including those attributable to reasonable investigations and legal fees and disbursements incurred) suffered by the City by virtue of any indemnity provided by the City pursuant to Section 6.6, provided such loss, damage, suit, penalty, cost or liability (including those attributable to reasonable investigation and legal fees and disbursements incurred) would otherwise have been payable by the Province to the

City pursuant to Sections 6.1 and 6.3, had the City suffered such loss, damage, suit, penalty, cost or liability contemplated by Section 6.1.

6.3 Notwithstanding anything to the contrary contained in this Article:

(a) the benefit of the indemnity contained in Sections 6.1 and 6.2 shall enure to the benefit of the City only;

(b) such indemnification shall not extend to, and the Province shall not be liable for, any such loss or damage to the extent it results or arises from the deposits or discharge of contaminants, being other than the Contaminants, on or in the Shoreline Area after May 11, 1988 but such indemnification shall extend to Contaminants that have migrated on to the Shoreline Area from Contaminants contained on Areas 4 and 5; and

(c) this indemnity shall not apply to losses, damages, suits, penalties, costs, liabilities or expenses assumed by the City under any agreement or undertaking of any kind except as specifically authorized pursuant to Section 6.6.

6.4 Subject to its rights under this Agreement, the City, in using the Shoreline Area, shall at all times act in good faith as would a reasonably prudent owner or occupier of the Shoreline Area acting without the benefit of the indemnity herein granted.

6.5 The City, upon being advised of a claim, action or possible claim or action by any third party, which may result in the Province having liability pursuant to the foregoing indemnity, shall forthwith provide written notice of any such claim or action to the Province with full particulars thereof.

6.6 No admission, offer, promise, payment or indemnity shall be made or given by or on behalf of the City without the written consent of the Province, provided that the City may grant an indemnity to an officer or employee of the City or to members of its Council or to a public service organization (as defined in

subsection 180(1) of the Vancouver Charter) pursuant to subsection 180(4) of the Vancouver Charter.

6.7 The Province shall be entitled to take over and conduct in the name of the City the defence or settlement of any claim or action or to prosecute in the name of the City or for its own benefit any claim.

6.8 The Province shall have full discretion in the conduct of any proceedings and in the settlement of any claim or action and the City agrees that no such claim or action shall be settled by it without prior consultation and consent from the Province, provided such consent is not delayed or unreasonably withheld.

6.9 The City shall fully co-operate with the Province and provide any and all information, reports and studies in its possession or under its control in respect of any claim or possible claim or action and assist the Province in the carriage of any defence or settlement of any claim or action or prosecution of any claim or action.

ARTICLE VII
ARBITRATION

7.1 Subject only as set forth in Section 3.8, in the event of any dispute between the Province and the City, with respect to the terms of this Agreement, including the failure of the City, in the opinion of the Province, to observe and perform any of the covenants and agreements contained herein on the part of the City to be observed and performed, or the failure of the Province, in the opinion of the City, to observe or perform any of the covenants and agreements contained herein on the part of the Province to be observed or performed, then either the Province or the City (as the case may be) may deliver to the other party hereto a notice in writing (the "Dispute Notice") which shall give full particulars of the matter in dispute.

7.2 If by the 60th day (the "Settlement Date") following the receipt by the other party of the Dispute Notice, the Province and the City, are unable to resolve the matters specified in the Dispute Notice, then, in each instance, the matter shall be determined by arbitration.

7.3 The arbitration panel, unless the parties otherwise agree, shall be comprised of three arbitrators, one to be named by the Province and one to be named by the City within 60 days after the Settlement Date and the two arbitrators thus chosen shall, within 15 days after their appointment, select a third arbitrator; provided however, that the parties may by agreement submit the matter to a single arbitrator.

7.4 If the Province or the City neglects or refuses to name its arbitrator within the time hereinbefore limited or to proceed with the arbitration, then the arbitrator named by the other party shall proceed to determine the matter to be determined.

7.5 The parties hereto shall submit the particulars of the matter to be arbitrated to the other party and the arbitrator(s) not later than 15 days following the appointment of the arbitrator(s).

7.6 The arbitrator(s) shall determine the matter to be arbitrated and shall have the authority to give directions, and, subject to the terms of this Agreement, to assess damages, including monetary penalties, interest and costs of arbitration.

7.7 The decision of the arbitrator(s) shall be made no later than 45 days after their appointment unless extended by written agreement of the parties, and such decision shall be final and binding on both the Province and the City.

7.8 In the event that the Province or the City fails to comply with and abide by the decision of the arbitrator(s) within 60 days of receiving such decision, or within such other time as the arbitrator(s) may direct, the other party shall be entitled to apply to a court of competent jurisdiction for an order converting the decision of the arbitrator(s) into an enforceable judgment of the Court.

7.9 Any matter referred to arbitration pursuant hereto shall be deemed to be submitted to arbitration under the Commercial Arbitration Act, or any successor legislation in effect from time to time, except insofar as such act or legislation is contrary to the provisions of this section.

ARTICLE VIII
NOTICE

8.1 Any written notice or document to be served upon or given to the Province or the City pursuant to this Agreement shall be sufficiently served and given if delivered or mailed, prepaid and registered:

(a) in the case of the Province, addressed to:

The Province of British Columbia
Ministry of Environment, Lands and Parks
Parliament Buildings
Victoria, British Columbia
V8V 1X4;

(b) in the case of the City, addressed to:

City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

Attention: City Clerk

With a copy to: City Manager

8.2 If a notice is mailed, then the date of receipt shall be deemed to be seven days after the date of mailing.

8.3 Any party may, by notice in writing to the other, specify another address for service of notices under this Agreement, and where another address is specified under this section, notices shall be mailed to that address in accordance with this Article.

ARTICLE IX
NO ASSIGNMENT

9.1 This Agreement cannot be assigned in whole or in part by the City and remains in full force and effect for only so long as the City is the owner in fee-simple of the Shoreline Area or any portion thereof.

ARTICLE X
MISCELLANEOUS

10.1 No term, condition, covenant or other provision herein shall be considered to have been waived by the Province or the City unless such waiver is expressed in writing by the Province or the City. The waiver by the Province or the City of any breach by the City or the Province, of any term, condition, covenant or other provision herein shall not be construed as, or constitute, a waiver of any further or other breach by the Province or the City of the same of any other term, condition, covenant or other provision, and the consent or approval of the Province to any act by the City requiring the consent or approval of the Province shall not be considered to waive or render unnecessary consents or approvals to any subsequent same or similar act by the City.

10.2 Subject to Article VII, no remedy conferred upon or reserved to the Province or the City is exclusive of any other remedy herein or provided by law, but such remedy shall be cumulative and shall be in addition to any other remedy herein or hereafter existing at law, in equity or by statute.

10.3 Time shall be of the essence of this Agreement.

10.4 The parties acknowledge that all schedules referred to in this Agreement form an integral part of this Agreement.

10.5 The City acknowledges and agrees with the Province:

(a) that the Province is under no obligation, express or implied, to provide financial assistance in any way or contribution to the costs of servicing, creating and developing any portion of the Shoreline Area other than arising out of the performance of any Additional Remedial Work; and

(b) nothing in this Agreement shall constitute the City, the agent, joint venturer or partner of the Province, or give the City any authority or power to bind the Province in any way.

10.6 In this section and the following Section 10.7 the words 'Acts' and 'Regulations' have the meaning attributed to them in the Interpretation Act as at the date first above written. The Province warrants to the City that all Acts, Regulations, approvals or other requirements necessary to make this Agreement and each and every of the provisions contained herein binding on the Province, according to the tenor thereof, have been passed or complied with, as the case may be, and that each and every provision of this Agreement is binding on the Province as of the date of this Agreement hereinbefore set forth.

10.7 The City warrants to the Province that all acts, regulations, approvals or other requirements necessary to make this Agreement and each and every of the provisions contained herein binding on the City, according to the tenor thereof, have been passed or complied with, as the case may be, and that each and every provision of this Agreement is binding on the City as of the date of this Agreement as hereinbefore set forth.

ARTICLE XI
INTERPRETATION

11.1 In this Agreement, unless the context otherwise requires, the singular includes the plural and the masculine includes the feminine gender and a corporation.

11.2 The captions and headings contained in this Agreement are for convenience only and are not to be construed as defining or in any way limiting the scope or intent of the provisions hereof.

11.3 This Agreement shall be interpreted according to the laws of the Province of British Columbia.

11.4 Where there is a reference to an enactment of the Province of British Columbia in this Agreement, that reference shall include a reference to any subsequent enactment of the Province of British Columbia, of like effect, and unless the context otherwise requires, all statutes referred to herein are enactments of the Province of British Columbia.

11.5 Wherever the Province in this Agreement is authorized or empowered to do or perform any act, matter or thing, such act, matter or thing may be done or performed on behalf of the Province by the Minister of Environment, Lands and Parks, the Deputy Minister of Environment, Lands and Parks or any person designated or authorized by either of them so to do or perform any such act, matter or thing.

11.6 If any section of this Agreement or any part of a section is found to be illegal or unenforceable, that part or section, as the case may be, shall be considered separate and severable and the remaining parts or sections, as the case may be, shall not be affected thereby and shall be enforceable to the fullest extent permitted by law.

IN WITNESS WHEREOF the parties have executed this Agreement effective on the day written above.

SIGNED on behalf of HER MAJESTY THE QUEEN IN RIGHT OF THE PROVINCE OF BRITISH COLUMBIA by the Minister of Environment, Lands and Parks, or his duly authorized representative in the presence of:

Signature

COLIN J. McIVER
Barrister & Solicitor
FRASER & BEATTY

Address

[illegible] Georgia Street
[illegible] C. V6E 4P8

Occupation

TOM GUNTON
DEPUTY MINISTER

THE COMMON SEAL of THE CITY OF VANCOUVER was hereunto affixed in the presence of:

C/S

Authorized Signatory
TERRANCE R. BLAND

Authorized Signatory

Province of
British Columbia

OFFICE OF THE
DEPUTY MINISTER

Ministry of
Environment,
Lands and Parks

Parliament Buildings
Victoria
British Columbia
V8V 1X5

SCHEDULE "A"

November __, 1993

Concord Pacific Developments Ltd.
#900-1090 West Pender Street
Vancouver, BC
V6E 2N7

Attention: Dugal Purdie, President
Concord Pacific Management Ltd.

Dear Sirs:

Pacific Place - Soils Remediation Program -
Remedial Work - Shoreline Area

The Province has entered into an agreement of even date with the City of Vancouver (the "City") entitled the Areas 4 and 5A Shoreline Remediation Agreement (the "Shoreline Remediation Agreement") pursuant to which the Province provides certain assurances, covenants, and indemnities to the City as detailed therein in respect of the Shoreline Area (as defined in the Shoreline Remediation Agreement). The Province agreed to enter into, execute and deliver the Shoreline Remediation Agreement to the City on the condition that Concord Pacific Developments Ltd. ("Concord Pacific") covenant and agree to the Province as follows:

1. Concord Pacific will carry out and perform all the Remedial Work as defined in the Shoreline Remediation Agreement on the Shoreline Area (as defined in the Shoreline Remediation Agreement) including those steps, acts and physical work, improvements, alterations or amendments in respect of the Approved Shoreline Works and the Approved Shoreline Utilities (as each is defined in the Shoreline Remediation Agreement) on the Shoreline Area so that the Shoreline Area complies with Provincial Standards (as defined in the Shoreline Remediation Agreement);

2. Concord Pacific will undertake prior to, during and following construction, any and all necessary investigations or other testing that may be required by the Province on the Shoreline Area to enable the Province to issue the Letter of Assurance (as defined in the Shoreline Remediation Agreement) to the City;

3. Concord Pacific will provide the Province with all designs, drawings, structural plans and other engineering details as may be requested by the Province prior to the construction and installation of the Approved Shoreline Works and the Approved Shoreline Utilities for review by the Province with a view to ensuring the Approved Shoreline Works and the Approved Shoreline Utilities will be constructed and installed in such a manner that the Provincial Standards will be complied with; and

4. Concord Pacific will undertake and perform all those steps, acts and construction procedures as recommended by the Province including, if necessary, amending and altering the design and construction materials utilized in the Approved Shoreline Work and the Approved Shoreline Utilities to ensure that the Shoreline Area and each of the Approved Shoreline Works and the Approved Shoreline Utilities will comply with Provincial Standards.

We confirm that the Province will not require Concord Pacific to construct or install improvements or other physical works or make any alterations or changes to the Approved Shoreline Works and the Approved Shoreline Utilities required to be performed or undertaken by Concord Pacific which are intended to form part of the remediation of that portion of the Lands (as defined in the Soils Agreement dated May 11, 1988 between the Province and Concord Pacific (the "Soils Agreement")) upland of the Shoreline Area or any New Lands as that term is defined in the Soils Agreement.

If the above accurately reflects the agreement reached with Concord Pacific we would ask that you execute this letter agreement in the space provided by the duly authorized signatories and return same to our office.

Yours very truly,

Tom Gunton
Deputy Minister

The above terms and conditions are hereby agreed to effective the ___ day of November, 1993

CONCORD PACIFIC DEVELOPMENTS LTD.

Per: _____
Jon Markoulis

Per: _____
Dugal Purdie

2) PART OF LOT 156 EXCE RTIONS IN PLANS 21735 , LMP12037 AND LMP12038 FALSE CREEK PLAN 21458
3) LOT A DISTRICT LOT 56 AN 21872
4) PART OF THAT PART OF DISTRICT LOT 541 IN REFERENCE PLAN 11156 EXCEPT
A) PART IN REFERENCE PLAN 14790 B) PART IN STATUTORY RIGHT OF WAY PLAN 17513
C) PORTIONS IN PLANS 20124, 20128, 20129, 20186, 20319, 20357, 20421
20821, 23011, 23018, 23019, 23020, 23025, 23026, 23027 AND LMP10733
5) PART OF DISTRICT LOT 4674 PLAN 6107 EXCEPT PLAN 20421
6) PART OF DISTRICT LOT 5058 EXCEPT PARTS IN PLANS 20319 AND LMP10733
7) PART OF DISTRICT LOT 5605 PLAN 6108 EXCEPT A) PORTIONS IN REFERENCE PLAN 2437 AND
PLANS 20128, 20129, 20186, 20421, 23027 AND LMP10733
8) PART OF DISTRICT LOT 5673 EXCEPT PLAN 21425
9) CLOSED ROAD IN REFERENCE PLAN LMP _ _ _ _
ALL OF GROUP 1 NEW WESTMINSTER DISTRICT

LOTS 223 TO 237 INCLUSIVE
FALSE CREEK
PLAN LMP _ _ _ _

SCHEDULE "B"

PACIFIC PLACE REMEDIATION PROJECT
MEMORANDUM

To: D.J. Clark, P.Eng., M.M. Dillon, Project Manager

From: D.R. Livingstone, P.Eng. and
R. Zapf-Gilje, Ph.D., P.Eng.
Golder Associates Ltd.

Date: January 27, 1999

File: 932-1801/0440

RE: SUPPORT INFORMATION FOR LETTER OF ASSURANCE - PARCEL 4/6A SHORELINE WALKWAY, PARK AND SLOPE, PACIFIC PLACE

1.0 INTRODUCTION

The purpose of this memorandum is to provide support information for the issuance of a "Letter of Assurance" for the Shoreline Walkway, Park and Slope which forms part of "Parcel 4/6A" of the Pacific Place site in Vancouver, B.C. The Shoreline Walkway, Park and Slope are indicated in the Key Plan, Figure 1 and Detailed Plan, Figure 2. The legal description of the site is:

- that portion of False Creek Plan LMP 13010 between the historical high water mark and the present toe of the seawall slope.

This memorandum addresses two areas of construction:

- those portions of the Parcel 4/6A shoreline walkway, road, and Coopers Park that lay south (seaward) of the high water mark present in 1988; and

- the slope of fill material from the shoreline walkway to the toe of the fill slope below the water surface.

As of November 1998, all remedial works related to the seawall and park construction had been completed.

We understand that a Letter of Assurance may be issued by the Minister of Environment, Lands, and Parks when the remedial works have been completed. Upon completion of the construction, the Shoreline Walkway, Park, and Slope are to be dedicated to the City of Vancouver.

The remediation standards that apply to Parcel 4/6A Shoreline Walkway, Park, and Slope are the Contaminated Sites Regulations[1] (CSR). In the course of construction of the seawall, all fill material excavated and found to contain concentrations above the numerical standards for Residential Land use (Schedule 4 and 5 of the CSR) was disposed of at an appropriate landfill. Only upper fill materials in the Shoreline Walkway, Park, and Slope were excavated and some fill material having concentrations above the Residential and/or Commercial Standards may remain in-place at various depths below grade within the Shoreline Walkway, Park, and Slope.

The basis for providing this Support Information is the investigation, testing, and sampling of soil and water on or under lands adjacent to or in reasonable proximity to the Shoreline Walkway, Park, and Slope and the monitoring and testing of soils excavated from the Shoreline Walkway, Park, and Slope during construction of the seawall. However, the PPRP group has not carried out any *in situ* testing or sampling of soil or water on or under the Shoreline Walkway, Park, and Slope and excavations were not conducted along the entire length of the Shoreline Walkway, Park, and Slope.

2.0 LETTER OF ASSURANCE

In our opinion, the construction of the Parcel 4/6A Shoreline area, including the removal of upper fill materials and fill material extending into False Creek, along with the placement of imported granular subgrade, topsoil, grass, asphalt paving, concrete sidewalks, brick pavers, and/or a minimum of a 0.75 metre cover layer of erosion resistant rip rap and cobble over the existing fill soils between the high

[1] Contaminated Sites Regulations (CSR), B.C. Reg 375/96, effective April 1, 1997.

water line and the toe of the slope has rendered this area suitable for the intended recreational use, in accordance with the human health risk assessment and risk management approach described in the Remedial Plan.

The Remedial Plan ("*Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7*", September 1993) risk assessment, accepted by B.C. Environment for areas of Pacific Place with contaminant concentrations above Level B of the Pacific Place Standards (similar to the Residential land use criteria of the CSR), concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (for example, 0.75 metres of rip rap) was placed as a permanent separation barrier above the existing sub-soils.

From excavations on and near the Site, 300 m^3 of Industrial Fill quality soil was removed from the site. The remainder of the fill materials excavated were Residential Fill quality. There was no Industrial or Special Waste removed from this area and, on the basis of the absence of observed Special Waste in either the boreholes or the excavations, no Special Waste is expected in this area. These results are consistent with the findings of the field investigations (Soils Remediation Group 1992 and Pacific Place Remediation Project 1997) and those referenced in the Remedial Plan and risk assessment completed for the Pacific Place site.

The report on previous results of field investigations (RFI) has described the extent of groundwater contamination within Parcel 4 and 6A [see Phase 1 and Phase 2, Parcels 1, 2, 2E, 4, 5A, 6W, and 6E (Overall Site) – Results of Field Investigation report (SRG, June 1992)]. The RFI indicated that *in situ* groundwater concentrations of PAH and oil and grease were elevated relative to the False Creek Discharge Standards in the Parcel 4 portion of the shoreline walkway. Because the majority of the fill material at the development lots landward of the Shoreline Walkway, Park, and Slope will be removed, the source zones of potential groundwater contamination hydraulically upgradient of the Parcel 4/6A Shoreline Walkway, Park, and Slope will be reduced. While small zones of contaminated soils that were not excavated for development will continue to be potential sources of groundwater contamination, the estimated groundwater flux and mass loading of contaminants to False Creek from Parcel 4 was predicted to be reduced by an order of magnitude compared to pre-development levels, due to the presence of the buildings and

foundation drains upgradient of the Parcel 4/6A Shoreline Walkway, Park, and Slope. In our opinion, the excavation of contaminated soils in the upgradient areas will meet the objectives of the Remedial Plan - significantly reducing the potential for adverse environmental effects on False Creek.

The information presented in the following sections supports these opinions.

3.0 BACKGROUND

3.1 Historical Land Use and Results of Field Investigations

Historical activities along the Parcel 4 Shoreline Walkway, Park, and Slope include railway lands, sawmills, and former oil loading wharf (Figure 3). These industries occupied the area after infilling of False Creek was completed in the 1930's. Further infilling of the shoreline was completed in the mid-1980s in preparation for Expo'86.

The entire Shoreline Walkway, Park, and Slope of Parcel 6A was formerly within False Creek until this area was infilled in the 1980s.

The sampling locations referenced in the above reports are shown on Figure 2. It should be noted that sampling was not conducted at any location seaward of the high water line.

3.1.1 Applicable Field Investigations

The following soil and contamination descriptions are derived from the previous Phase 1 and 2 field investigation reports (SRG; August 1989 and June 1992) and supplementary sampling of the area. The chemical results in previous investigations and remedial plans were interpreted with respect to the Level B (residential standard) in the Pacific Place Standards (MOE 1990) which are similar to the CSR generic numerical standards for Residential Land use.

3.1.2 Soil Description

The fill material on Parcel 4 is comprised of "recent" ("Expo fill") granular fill approximately 0.4 to 0.8 metres in thickness, underlain by "old" fill approximately 5 to 8

metres thick. The total fill thickness ranges from 6 to 9 metres. The recent fill, comprised primarily of sand and gravel, was used for grading in preparation for Expo'86. The "old" fill was placed prior to Expo'86 and is comprised mainly of silty sand and gravel with interspersed zones of contaminated fill. The suspect fill in these zones consists of residential quality fill, industrial fill, and industrial waste.

Residential quality fill (0 to 5m depth) consists of varying amounts of sand, gravel, and silt, with trace black staining, and occasionally trace brick, cobbles and construction debris. Industrial fill (0 to 5 m depth) is made up of silty sand and gravel, with trace to some black staining (some oily/greasy), trace wood debris and trace construction debris. Industrial waste (0.3 to 3 m depth) consists of sand and gravel, with some black staining, some red brick (occasionally), and trace construction debris.

3.1.3 Soil Contamination Overview

The descriptions of soil contamination are based partly on test locations and partly based on conditions found throughout the particular Area of Environmental Concern (AEC) in which Parcel 4/6A Shoreline Walkway, Park, and Slope is located (Figure 2). The AEC's are areas where similar historical land use occurred, thus, it is likely that similar contamination concerns will apply to these areas.

Results of the soil sample analysis, conducted during the Phase 1 and 2 investigations on Parcel 4/6A Shoreline indicate that the soil having concentrations in excess of the Level B standards for residential land use is limited to distinct zones in the fill material not including recent Expo fill material.

The summary of soil contamination provided below is based on conditions found throughout the particular AEC's during the Phase 1 and 2 Field Investigations. Extensive infilling (1 to 2 metres) of the shoreline area with granular material was conducted in 1983 and 1984 in preparation for Expo'86. Results of various investigations have indicated that the "Expo" fill contains chemical concentrations below the level B standards. Therefore, the soil contamination described below has been found beneath the surface layer of "Expo" fill.

- **AEC 14 - Infilled Shoreline**

AEC 14 is located at the west end of the shoreline development. This area was formerly a lumber yard. PAH concentrations exceeding Level B were found in the south-west end of the AEC, near former coal bunkers and a cinder pit located on neighbouring railway lands. The PAH contamination appeared to be associated with coal fragments and black staining in the soil. Metals contamination may also be present near Parcel 2, associated with metal debris found along the Parcel 2 shoreline.

- **AEC 15 - Oil Wharf Area**

A former oil wharf occupied the central portion of Parcel 4 between the 1930s to the late 1950s. Level C and Special Waste levels of PAH and oil & grease have been found in this area, associated with black oily staining and hydrocarbon and/or solvent odours. Only one Level B exceedance of chlorophenols was found in 25 samples analyzed in AEC 15. Metals concentrations were also found to exceed Level C standards in zones of poor quality fill containing debris or staining.

- **AEC 19 - Lumber Yards**

The east portion of Parcel 4 and the west end of Parcel 6A was formerly occupied by lumber yards and saw mills from the early 1900s until 1985. Level C exceedances of PAH and metals have been found in black-staining soil layers, thought to be the former ground surface.

- **AEC 25 - Recently Placed Fill**

AEC 25 encompasses the entire Parcel 6A shoreline and the east end of Parcel 4. Until the early 1980s, this area was within False Creek. In 1983 and 1984, the area was infilled with dredged sediments in preparation for Expo'86. No Level B exceedances were found in the upper 5 metres, and the fill is expected to be free of contamination.

3.1.2 Groundwater Characteristics

Groundwater discharging from Parcel 4/6A to False Creek was found to flow primarily through the fill zone; the flow direction was observed to be controlled by the surface of

the underlying till and native sediments. Water levels in the high permeability fill materials present in the Shoreline Walkway, Park, and Slope were affected by tidal fluctuations.

It was concluded in the RFI for the area that the PCOC in groundwater in the Parcel 4/6A - Shoreline Walkway, Park, and Slope were limited to total PAH and oil and grease. Total PAH concentrations were found to range up to about 160 µg/L, which is above the current False Creek standard of 20 µg/L. Oil and grease concentrations ranged up to 585 mg/L, which exceeds the current False Creek standard of 10 mg/L.

3.2 Remedial Plan

3.2.1 General

The remedial plan pertaining to Parcel 4/6A, of which the walkway portion of the Shoreline Walkway, Park, and Slope is part, included a human health risk assessment and an evaluation of remedial alternatives. The remedial plan report, entitled "*Remedial Plans for Parcels 1, 4, 5A, 5B, 6A, 6C, and 7*" was issued by the Soils Remediation Group in September 1993 and subsequently approved by BC Environment. A copy of the relevant sections of the Remedial Plan is included in Appendix I.

3.2.2 Human Health Risk Assessment

Because in situ management of some of the fill materials was contemplated during the remedial planning stage, a quantitative human health risk assessment was performed to estimate the potential human health risks arising from exposure to the Principal Contaminants of Concern (PCOC) at Parcel 4. For fill materials with contaminants above the residential standards, the risk assessment assumed the potential for direct contact between persons and the contaminated soils. In some areas of the Parcel, the potential for human health risks were identified if direct contact between receptors and contaminants such as metals or non-volatile organics could occur. The risk assessment concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (e.g., 0.5 metres of residential fill) remained as a separation barrier above the existing contaminated soils.

Under the CSR, certain contaminants may exceed the Residential Land use criteria that do not exceed the Pacific Place Level B Standards and therefore were not specifically included in the risk assessment. For metals and non-volatile contaminants (the PCOCs at this Site) the remedial measures involve covering of this soil with either concrete or non-contaminated soil that cut off any potential exposure. Therefore, the conclusion of the original risk assessment that the site is suitable for residential use does not change.

3.2.3 Groundwater

The Remedial Plan indicated that fill materials remaining within the Shoreline Walkway, Park, and Slope were not expected to constitute a significant source of groundwater contamination.

3.3 Soils Management Procedures

The results of the Phase 1 and 2 and Supplementary Field Investigations, in combination with the Remedial Plan, were used to develop the soils and groundwater management procedures for the building excavation at Parcel 4, Lots ABC. The report is entitled "*Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4ABC Quayside Neighbourhood, Pacific Place*", (PPRPG; April 22, 1997) and are referred to as the Soils Management Procedures (SMP). The SMP outlines the general soil and groundwater handling, testing and reuse or disposal procedures that were followed during the excavation for building construction.

4.0 EXCAVATION AND CONSTRUCTION

Excavation activities commenced at the Parcel 4/6A shoreline on November 25, 1993. The work included excavation for a marketing building and excavation of Parcel 4/6A Shoreline for the purposes of making a park and bicycle pathway. The excavation took place in three phases. The first phase, in the Fall of 1993, consisted of excavation for foundations and utilities for the marketing building. The second phase, from January 1996 to January 1997, incorporated the excavation and realignment of the new seawall. Excavations in this area were advanced to the low tide elevation. The third and final phase, from the Fall 1996 to the Spring 1997, included removal of the marketing building

(including significant excavation of the area beneath the former location of the marketing building) and final construction of the shoreline walkway. All excavation was complete as of April 25, 1997.

Monitoring of the excavation was conducted by PPRP field technicians, who were responsible for directing the segregation and testing of all excavated soil in accordance with the SMP. Residential quality soils were used as cover material either on other Parcels or at the Nelson Road Landfill in Richmond, B.C. Approximately 300 m^3 of commercial/industrial quality soil was transported to the Remedicon site in Delta, B.C. or the Nelson Road Landfill.

4.1 Fill Remaining and Confirmatory Closure Sampling

Samples taken from the stockpiles generated during excavation of P4/6A Shoreline and earlier excavations at the former location of the Concord Pacific Presentation Centre (the location of which is noted on Figure 4) are considered representative of the fill remaining *in situ*. The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated. Excavated zones which generated stockpiles that exceeded the Urban Parkland criteria are shown in Figure 4. These zones are inferred to be areas where contamination exists, below or beside the Shoreline Walkway, Park, and Slope.

4.2 Groundwater

Excavation and construction activities were primarily conducted during periods of low tide. During high tide, the area was inundated with large quantities of sea water that was drained or pumped out of the excavation prior to continuing to remove soils. Therefore, dewatering of the excavation for pumping to a storm sewer was not conducted and no sampling was conducted.

4.3 Seawall and Shoreline Construction

The Shoreline Walkway, Park, and Slope has been developed primarily as a pedestrian walkway and the "Shoreline Walkway, Park, and Slope" is now a walkway with erosion resistant rock from the toe of the walkway retaining structure to the toe of the slope in

False Creek. The walkway retaining structure is comprised of simple concrete retaining wall. Sections from the seawall plans are presented in Figures 5A, 5B, 5C and 5D. These sections indicate that a minimum of 0.75 m of rip rap and cobbles was placed on top of the existing fill soils. In many areas, the existing fill soils were removed for geotechnical reasons and either sub-grade structural fill was added or rip rap was placed. Because of these construction methods, a layer of imported fill has been placed that provides a physical barrier between potential contaminants in older fill materials at depth and users of the Shoreline Walkway, Park, and Slope.

4.4 Fill Material Remaining Within the Shoreline Walkway, Park, and Slope

The analytical results of soils within 20 metres of the shoreline were presented in the Soils Management Procedures (PPRP, 1995) prepared for the Parcel 4/6A Shoreline. Of 27 test pits and boreholes advanced during the Phase 1, Phase 2 and Supplementary investigations, 12 samples contained one or more parameter (copper, lead, tin, zinc, oil and grease and/or PAH), in concentrations above the Level C Standards (similar to the CSR Commercial Standards) and 13 samples contained one or more parameter above the Level B (but below Level C) Standards. Results of the excavated stockpile testing indicated that excavated soils from both seawall construction and areas adjacent to the seawall contained parameters in excess of the Level B Standards. Based on these results, and assuming a heterogeneous fill zone that is characterized by randomly occurring zones of contamination, it is likely, but not confirmed, that concentrations in excess of the Level B Standards for recreational land use remain at the subject area. These contaminated zones, if present, will likely be random, isolated pockets of fill material associated with the historical land uses. Based on the absence of Special Waste concentrations in the samples, we infer that the fill does not likely contain Special Waste.

5.0 MONITORING REQUIREMENTS

The surface cover material (granular subgrade, asphalt, concrete and paving bricks) on the seawall and rip rap to the toe of the slope, forms a physical barrier that, if maintained, will provide protection against human exposure to contaminated fill material that remains within the Shoreline Walkway, Park, and Slope. Any future excavations in this area should be conducted with due consideration for the areas of environmental concern (as

described in the remedial plan) and the subsurface conditions, including the potential to encounter contaminated materials.

Based on the groundwater results obtained in the investigation and construction phases, specific groundwater monitoring for the Parcel 4/6A Shoreline Walkway, Park, and Slope is not recommended.

6.0 LIMITATIONS OF REPORT

The basis for providing this Support Information is the investigation, testing, and sampling of soil and water on or under lands adjacent to or in reasonable proximity to the Shoreline Walkway, Park, and Slope and the monitoring and testing of soils excavated from the Shoreline Walkway, Park, and Slope during construction of the seawall. However, the PPRP group has not carried out any *in situ* testing or sampling of soil or water on or under the Shoreline Walkway, Park, and Slope.

The Pacific Place Remediation Project group has undertaken sampling and analysis programs and a risk assessment approach that have been reviewed and approved by B.C. Environment. This program has followed the standard of care expected of professionals undertaking similar work in British Columbia at the time the work was undertaken, and under similar conditions. No other warranty is expressed or implied.

The human health risk assessment and risk management approach has been employed in the remediation of Parcel 4/6A, which includes the areas adjacent to (landward) but does not include the Shoreline Walkway, Park, and Slope. The risk assessment completed for Parcel 4/6A was based on the shallow soil conditions existing prior to construction, and conservatively assumed residential/recreational land use. Any subsequent excavations or disturbances in areas where potentially contaminated fill material remains, which would result in human exposure to these soils, may render the conclusions of the risk assessment invalid and should be reviewed.

If new information is generated by others and becomes available to B.C. Environment, or if the upper fill materials are to be removed or significantly modified such that the underlying fill materials may be exposed or contacted, the Pacific Place Remediation

Project Group and the undersigned should be contacted to review the results or modification plans, and to provide an opinion as to the findings and their implications on the Letter of Assurance issued for the Parcel 4/6A Shoreline Walkway, Park, and Slope.

PER: _____
D.R. Livingstone, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

PER: _____
R. Zapf-Gilje, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

DRL/RZG

cc. K. Rosenberg, Sandwell Inc.
C. McIver, Fraser and Beatty
Golder File 932-1801/0440.5

R:\ENVIROS\93\932-1801\0440SHOR\0440LOA.doc

REFERENCES

Soils Remediation Group, 1989a, Pacific Place Soils Remediation Program - Overall Site Operations Plan, Historical Use and Data Collection Program. Draft Report Prepared for the BC Ministry of the Environment. February 1989.

Soils Remediation Group, August 1989b, Pacific Place Soils Remediation Program - Overall Site Results of Field Investigations. Prepared for the BC Ministry of the Environment. First Draft August 1989.

Soils Remediation Group, 1991a, Pacific Place Soils Remediation Program - Overall Site Final Phase 2 Operations Plan. Prepared for the BC Ministry of the Environment, February 1991.

Soils Remediation Group, 1991b, Pacific Place Soils Remediation Program – Parcel 2 Remedial Plan. Prepared for BC Environment. December 1991.

Soils Remediation Group, 1992, Pacific Place Soils Remediation Program – Phase 2 Results of Field Investigations for Parcels 1, 2 , 2E, 4, 5A, and 6E (Overall site). Prepared for BC Environment. Final Report June 1992.

Pacific Place Remediation Project Group, 1993, Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7, Prepared for BC Environment, September 1993.

Pacific Place Remediation Project, 1995, Parcels 4 & 6A Shoreline Development Groundwater and Soils Management Procedures for the Construction Manager, Contractor, and Pacific Place Remediation Project Group, Prepared for BC Environment, October 8, 1995.

APPENDIX I

PARCEL 4/6A REMEDIAL PLAN

(PORTIONS PERTINENT TO THE SHORELINE WALKWAY, PARK, AND SLOPE)

LEGEND

PARCEL BOUNDARY

PROPOSED ROAD

EXISTING ROAD

(7) PARCEL NUMBER (BCELP)

N

ST. PAUL'S HOSPITAL

BURRARD STREET
HORNBY STREET
HOWE STREET
DAVIE STREET
GRANVILLE STREET
SEYMOUR STREET
HELMCKEN STREET
SMITHE STREET
NELSON ST.
ROBSON STREET
GEORGIA STREET
DUNSMUIR STREET
BEATTY STREET
BEATTY STREET LANE
PENDER STREET
TAYLOR STREET
CARRALL STREET
COLUMBIA STREET
KEEFER STREET
ABBOTT STREET
QUEBEC STREET
EXPO BOULEVARD
UNION ST.
PACIFIC BOULEVARD
PACIFIC STREET
DRAKE STREET
BEACH AVENUE
RICHARDS STREET
HOMER STREET
HAMILTON STREET
MAINLAND ST.
CAMBIE STREET
REATTY ST.
MARINASIDE CRES.
BEACH CRES.
HOMER ST.

7B 8 7A 6C3 5A 6C2 6C1 9 5A 5A 5A 5B 6B 3 3 3 4 4 6A 1 2

FALSE CREEK

1989 SHORELINE

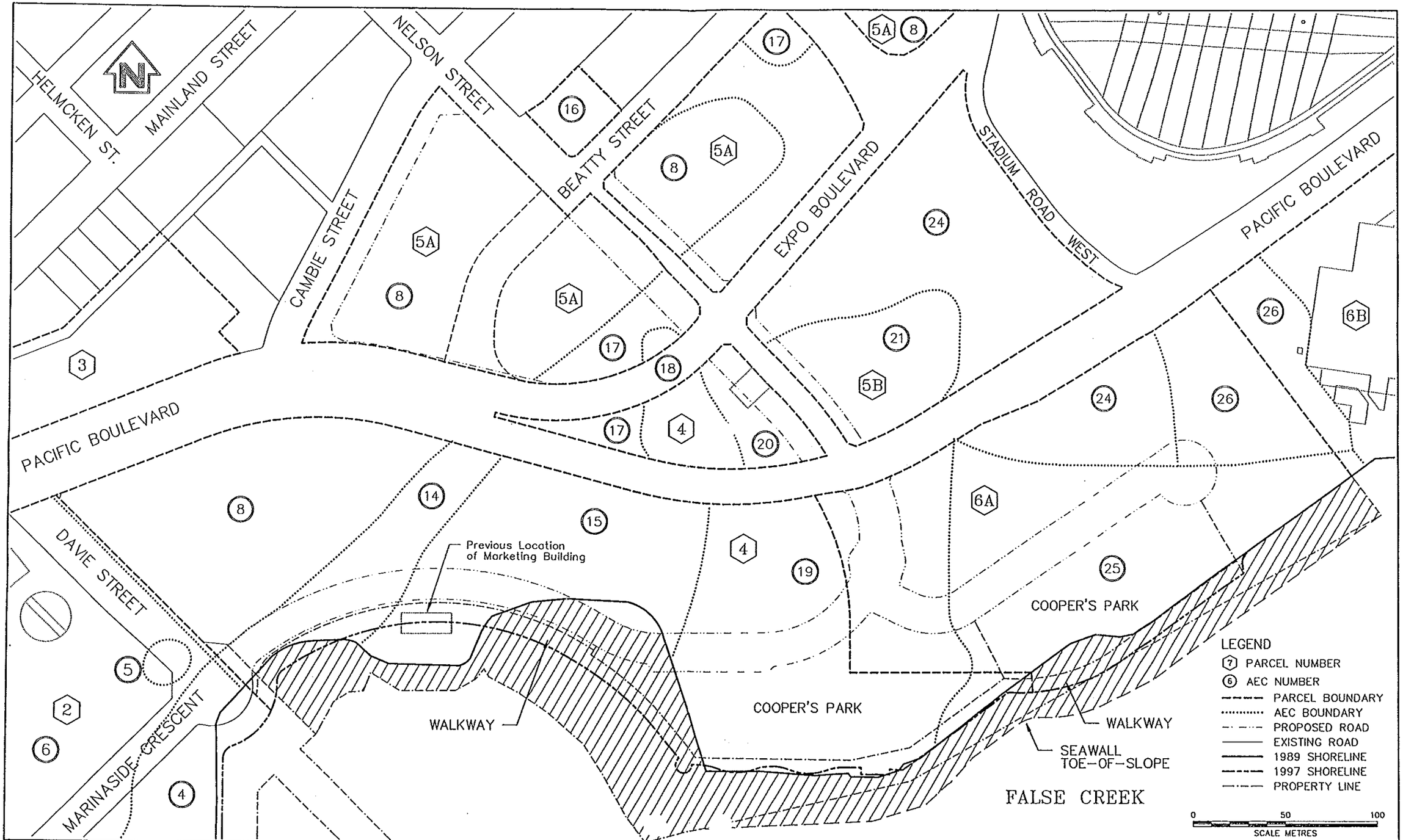
SHORELINE AREA

0 100 200 300 400
SCALE METRES

PACIFIC PLACE REMEDIATION PROJECT	PARCELS & 6 – SHORELINE KEY PLAN	DRWN: NFT	REV: 1
		DATE: 11 AUG 97	FIGURE: 1

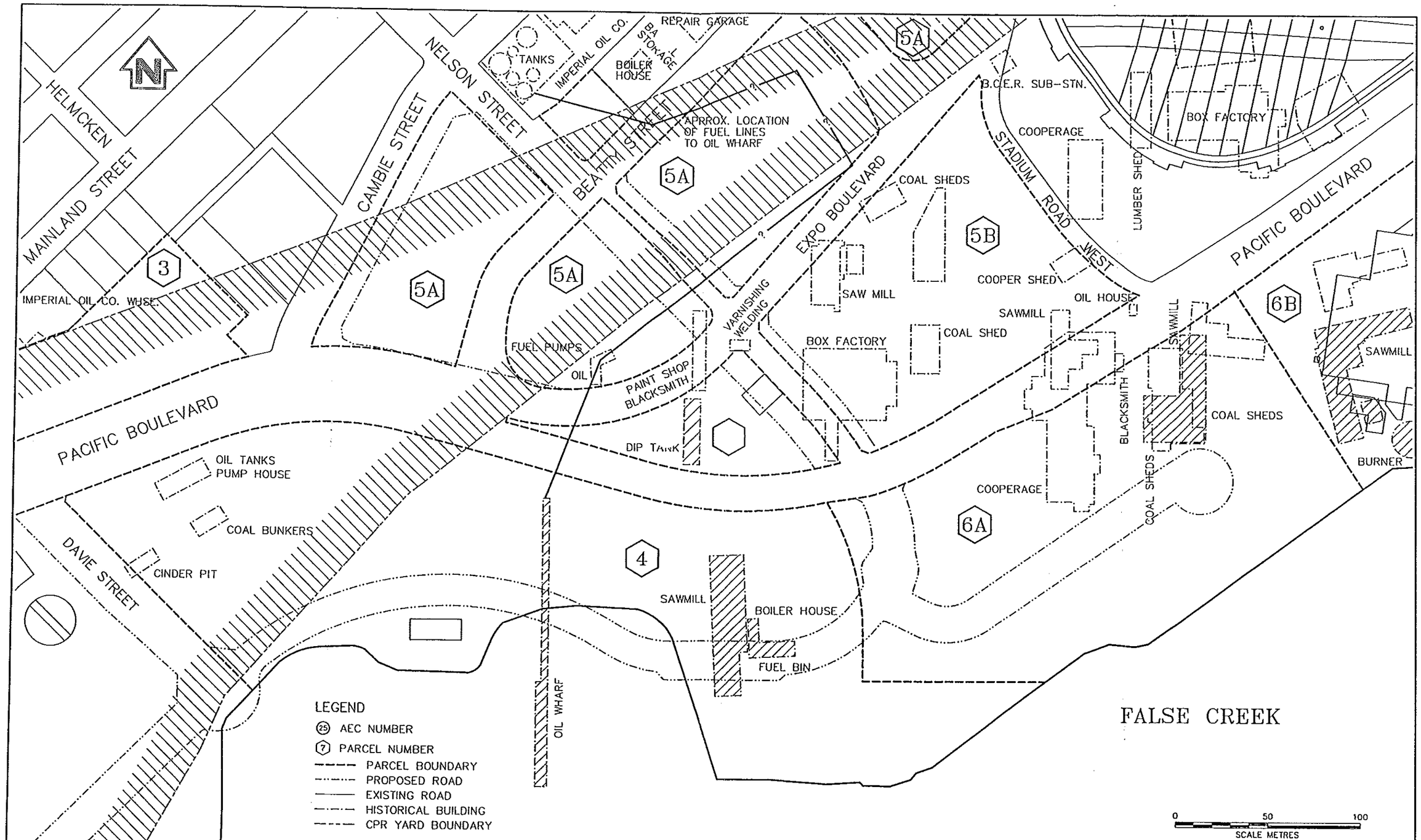
SCALE: 1:6000

CAD FILE: C:\PPRP\PP001698.DWG PLOT: 1144, 21 JAN 99



PACIFIC PLACE REMEDIATION PROJECT	PARCELS 4 & 6A – SHORELINE SITE PLAN & AEC's	DRWN: NFT	REV: 1	SCALE: 1:2000
		DATE: 11 AUG 97	FIGURE: 2	

CAD FILE: C:\PPRP\PP001696.DWG PLOT: 1132, 21 JAN 99

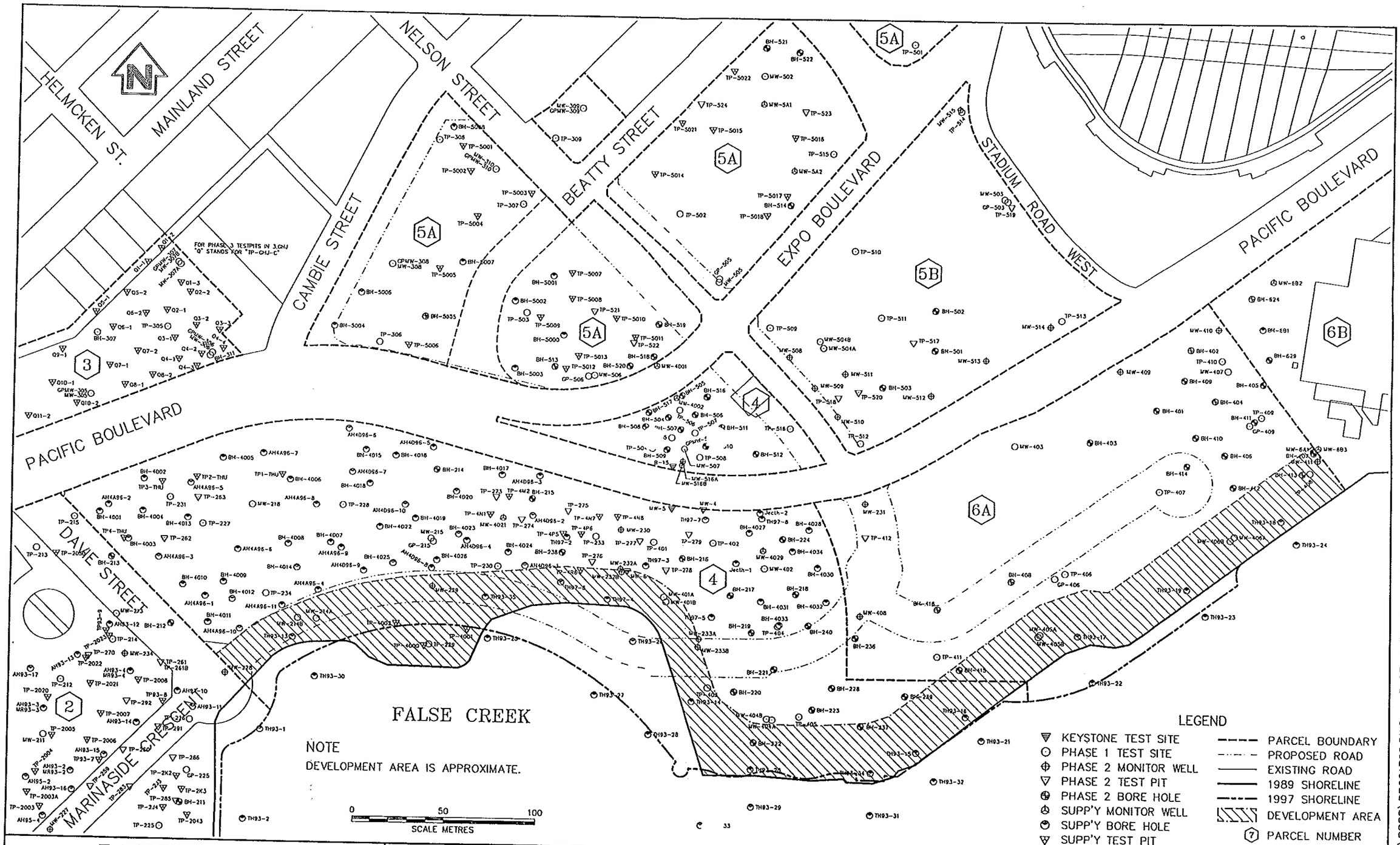


PACIFIC PLACE REMEDIATION PROJECT

PARCELS 4 & 6A
SUMMARY OF HISTORICAL ACTIVITIES

DRWN: NFT	REV: 3	SCALE: 1:2000
DATE: 09 DEC 93	FIGURE: 3	

CAD FILE: C:\PPRP\PP001440.DWG PLOT: 1657, 19 FEB 97

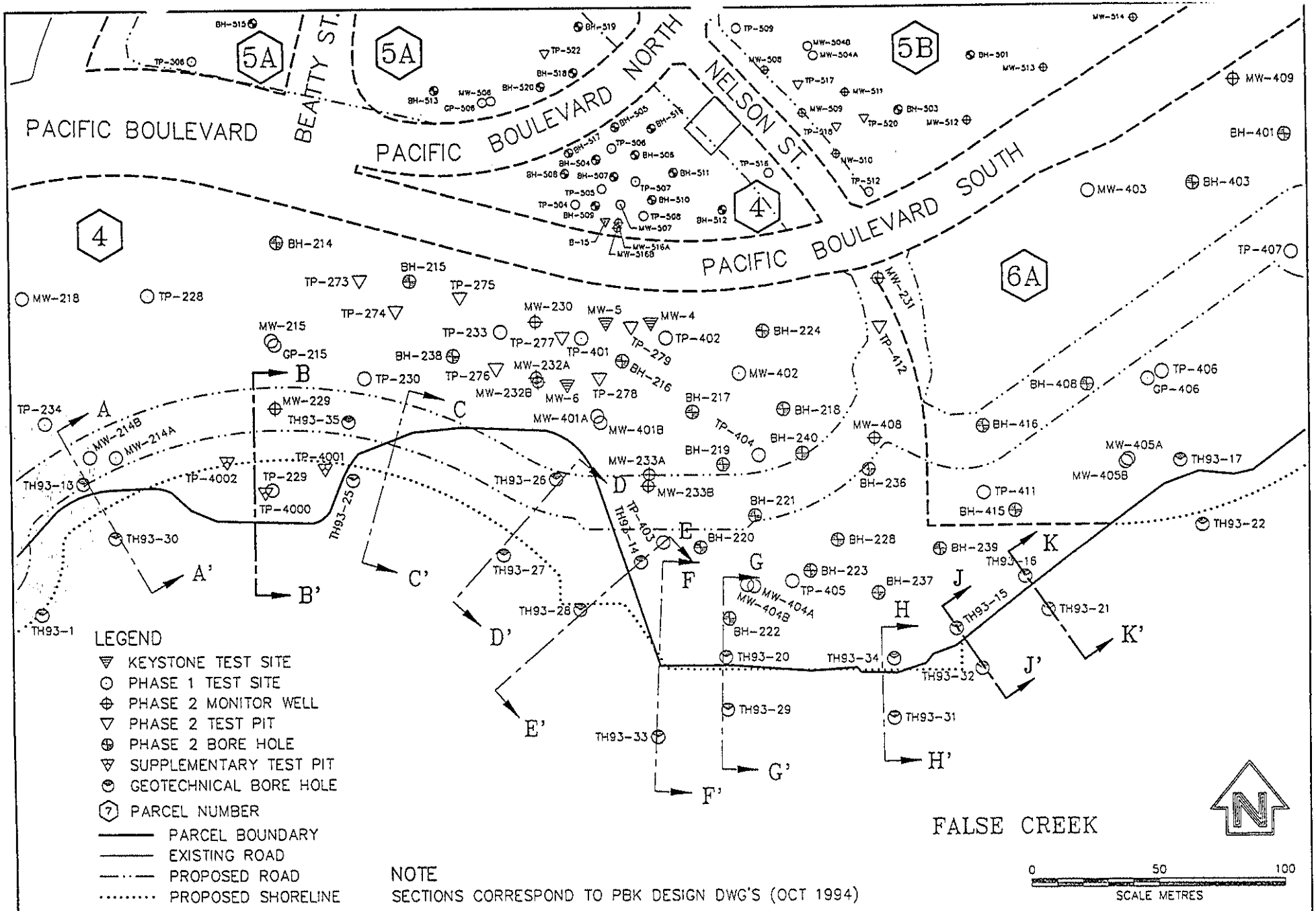


PACIFIC PLACE REMEDIATION PROJECT

PARCELS 4 & 6A – SHORELINE TEST SITE LOCATIONS & DEVELOPMENT AREA

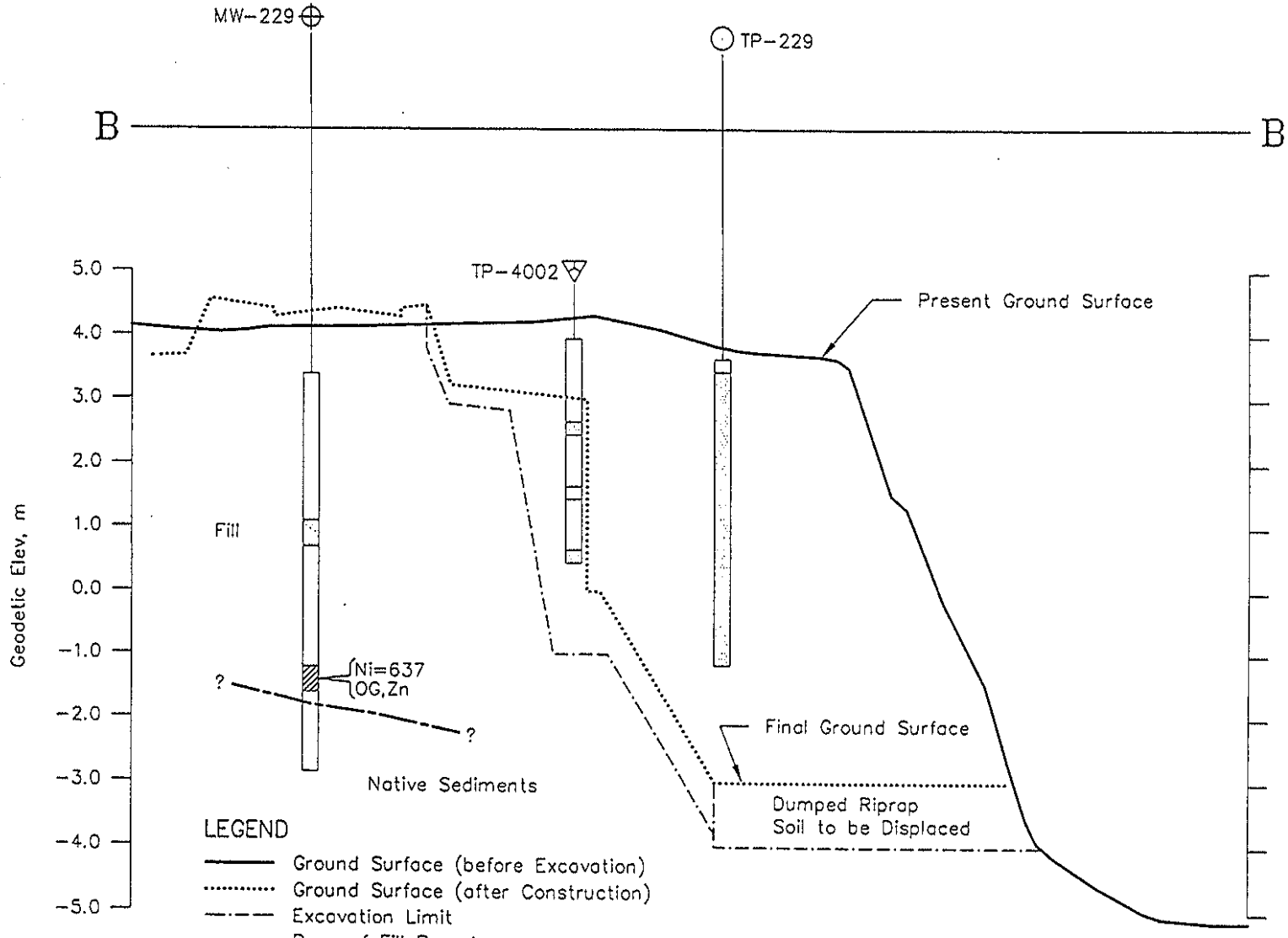
DRWN: NFT	REV: 0	SCALE: 1:2000
DATE: 20 JAN 99	FIGURE: 4	

CAD FILE: C:\PPRP\PP001762.DWG PLOT: 1453, 20 JAN 99



PACIFIC PLACE REMEDIATION PROJECT	PARCELS 4 & 6A – SHORELINE SOIL SECTION KEY PLAN	DRWN: NFT	DATE: 16 DEC 93	REV: 5
		SCALE: 1:2000	FIGURE: 5A	

CAD FILE: C:\PPRP\PP001414.DWG PLOT: 1158, 21 JAN 99

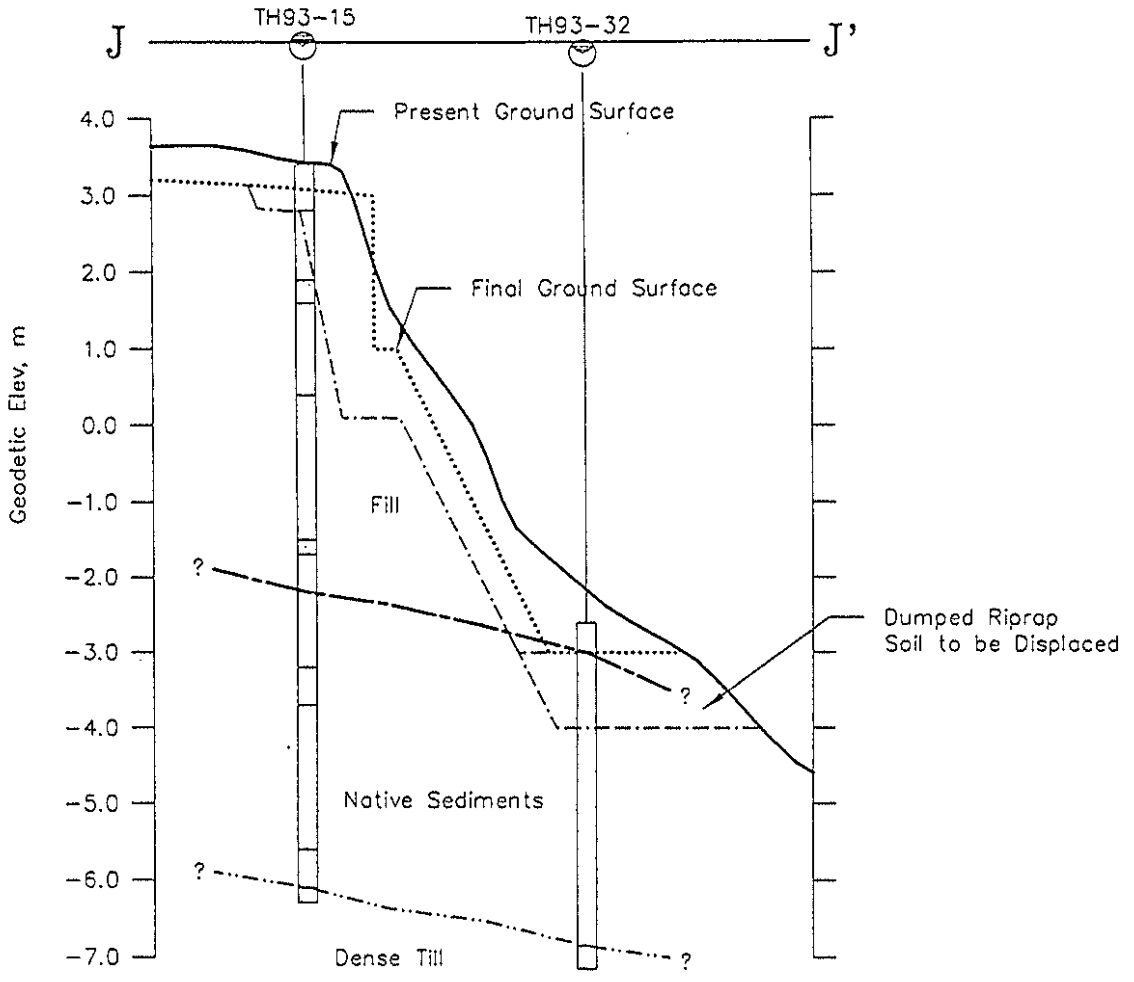


NOTE

Drawing based on data from Phases 1, 2 and 3, and on PBK design drawings (Oct 1994).
Actual conditions may vary from those shown.

PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – SHORELINE SOIL SECTION B–B'	DRWN: NFT	V. SCALE: 1:100	REV: 4
		DATE: 13 DEC 93	H. SCALE: 1:500	FIG: 5B

CAD FILE: C:\PPRP\PP001441.DWG PLOT: 1136, 04 OCT 95



LEGEND

- Ground Surface (before Excavation)
- Ground Surface (after Excavation)
- Excavation Limit
- Base of Fill Boundary
- Till Boundary
- < Level B
- Level B – Level C
- Level C – Special Waste
- Special Waste

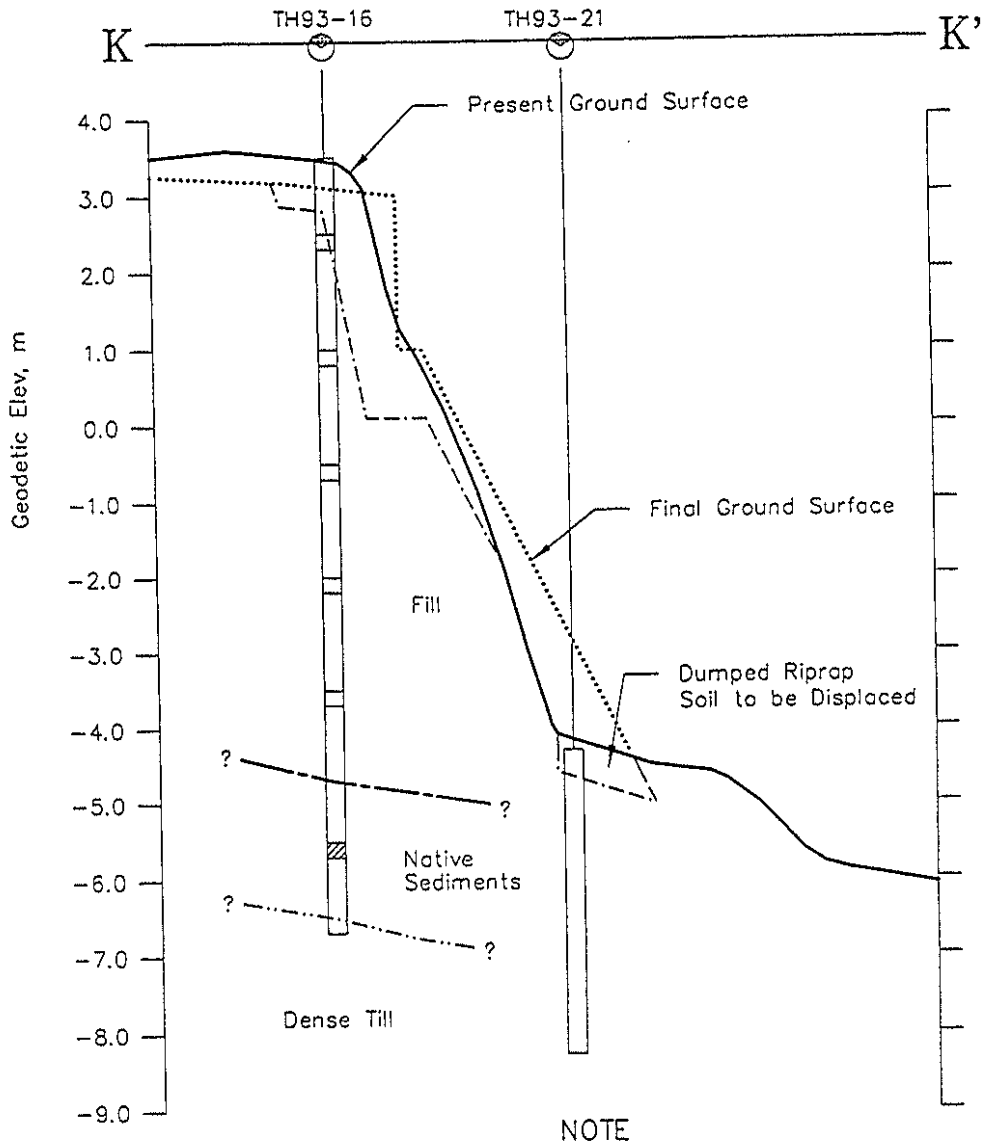
NOTE

Drawing based on data from Phases 1, 2 and 3. and on PBK design drawings (Oct 1994).

Actual conditions may vary from those shown.

PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – SHORELINE SOIL SECTION J–J'	DRWN: NFT	V. SCALE: 1:100	REV: 4
		DATE: 13 DEC 93	H. SCALE: 1:500	FIG: 5C

CAD FILE: C:\PPRP\PP001442.DWG PLOT: 1138, 04 OCT 95



LEGEND

- Ground Surface (before Excavation)
- Ground Surface (after Excavation)
- Excavation Limit
- Base of Fill Boundary
- Till Boundary
- < Level B
- Level B – Level C
- Level C – Special Waste
- Special Waste

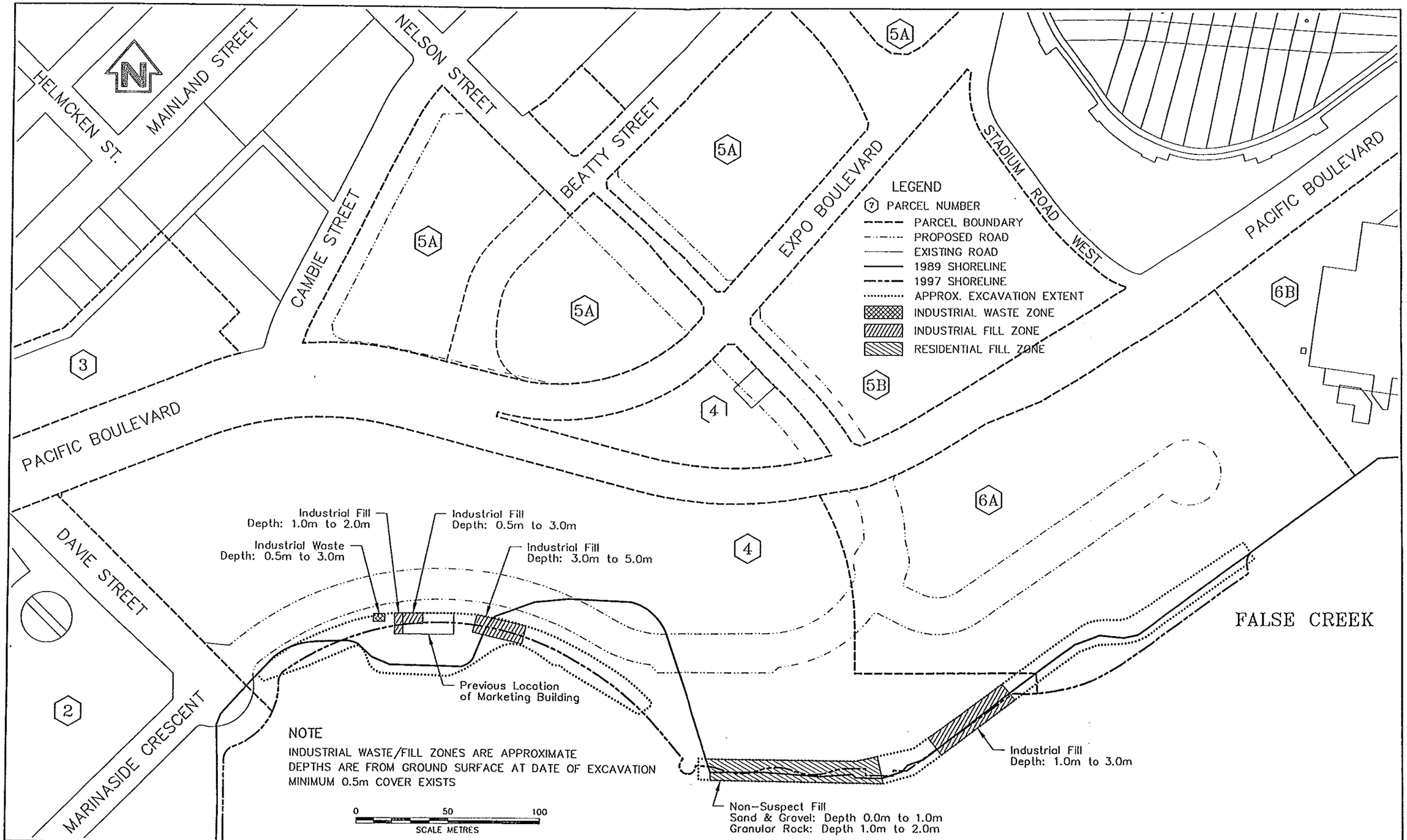
NOTE

Drawing based on data from Phases 1, 2 and 3, and on PBK design drawings (Oct 1994).

Actual conditions may vary from those shown.

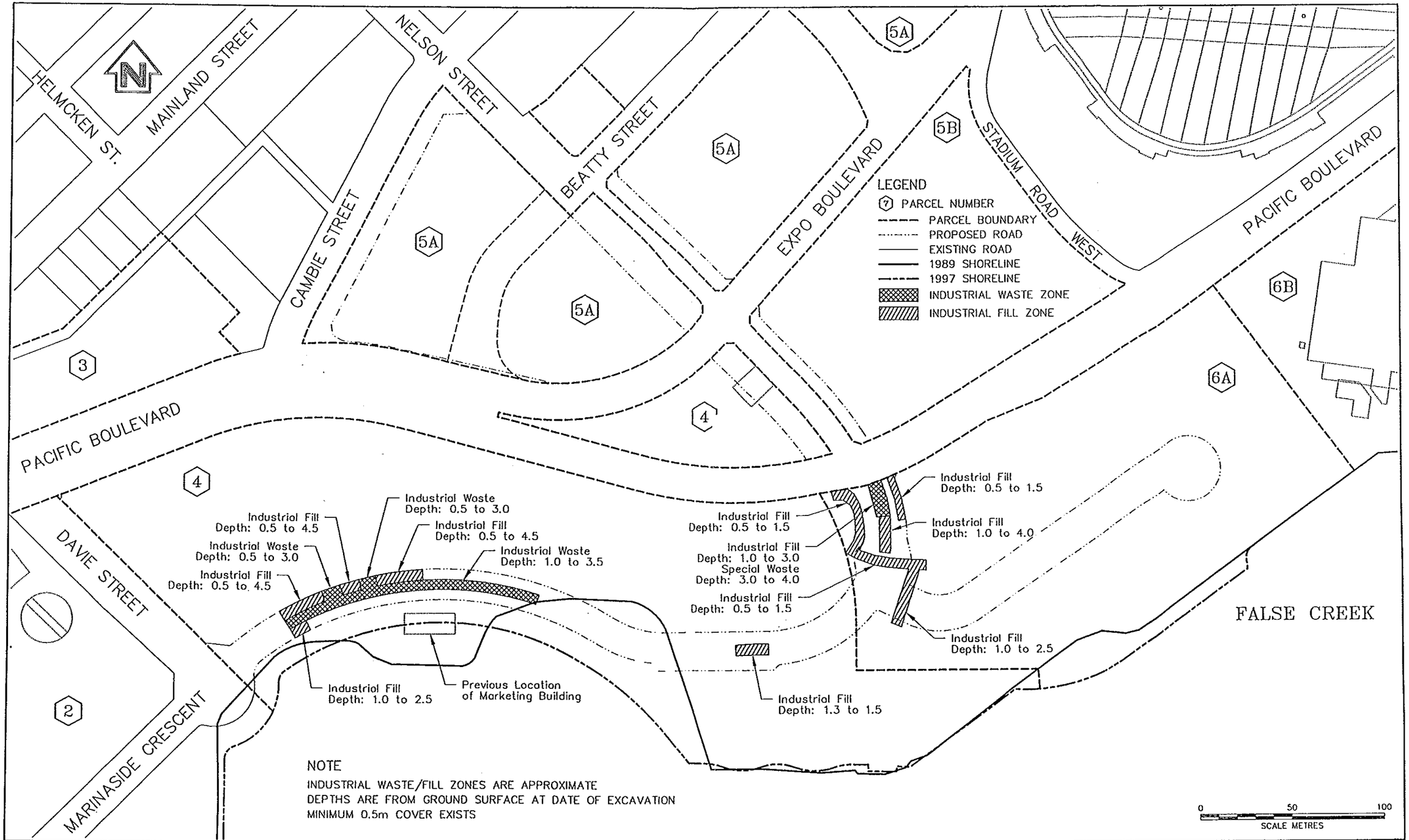
PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – SHORELINE SOIL SECTION K–K'	DRWN: NFT	V. SCALE: 1:100	REV: 2
		DATE: 12 SEP 95	H. SCALE: 1:500	FIG: 5D

CAD FILE: C:\PPRP\PP001596.DWG PLOT: 1127, 04 OCT 95



PACIFIC PLACE REMEDIATION PROJECT	PARCELS 4 & 6A – SHORELINE LOCATION OF INDUSTRIAL SOILS REMAINING INSITU	DRWN: NFT	REV: 4	SCALE: 1:2000
		DATE: 08 AUG 97	FIGURE: 6	

CAD FILE: C:\PPRP\PP001695.DWG PLOT: 1341, 20 JAN 99



NOTE

INDUSTRIAL WASTE/FILL ZONES ARE APPROXIMATE
DEPTHS ARE FROM GROUND SURFACE AT DATE OF EXCAVATION
MINIMUM 0.5m COVER EXISTS

PACIFIC PLACE REMEDIATION PROJECT	PARCELS 4 & 6A – ROADS & UTILITIES LOCATION OF INDUSTRIAL SOILS REMAINING INSITU	DRWN: NFT	REV: 0	SCALE: 1:2000
		DATE: 08 AUG 97	FIGURE: 7	

CAD FILE: D:\PPRP\PP001697.DWG PLOT: 1216, 23 SEP 97

CONFIRMATION OF COMPLIANCE

DATED: the 12th day of March, 1999.

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
for the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City" respectively)

In this Confirmation of Compliance the following words shall have the following meanings:

"Contaminants" means those substances existing on or under the Lands hereinafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Lands" means those portions of streets more particularly outlined in red and marked "Road" on the subdivision plan a reduced copy of which is attached as appendix "i" hereto which plan was deposited in the New Westminster/Vancouver Land Title Office under No. LMP13010.

"Provincial Standards" means, with respect to the Lands, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada, pertaining to Contaminants in relation to the use

of the Lands as streets (as defined in the Vancouver Charter) and for the construction, installation, operation and maintenance of utilities as constructed and installed on March 10, 1999.

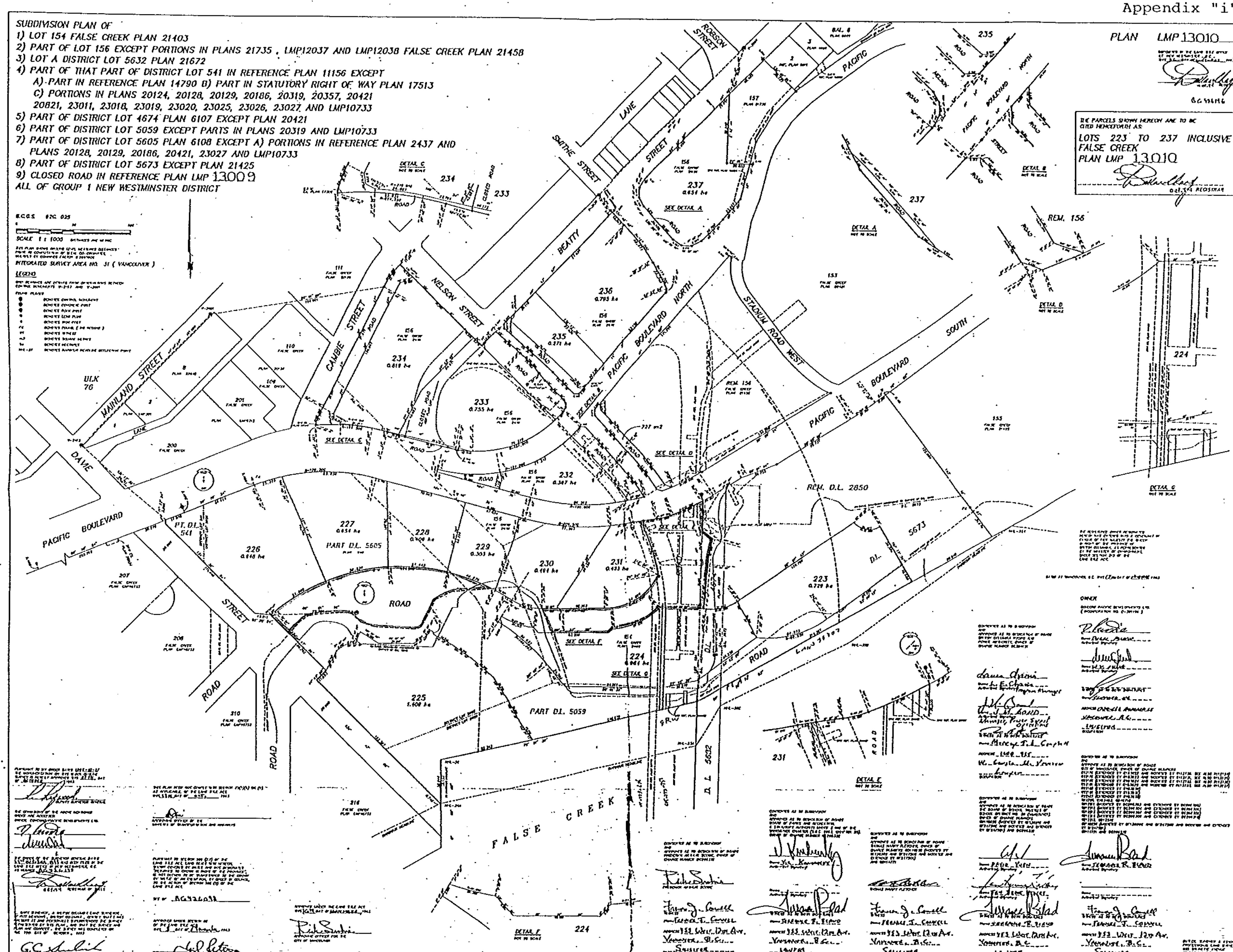
The Province does hereby confirm to the Approving Officer and to the City that there is compliance with the Provincial Standards with respect to the Lands.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

Cassie J. Doyle, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Holdings Ltd.
900 - 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

cc: Concord Pacific Group Inc.
900 – 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6


SUBDIVISION PLAN OF
1) LOT 154 FALSE CREEK PLAN 21403
2) PART OF LOT 156 EXCEPT PORTIONS IN PLANS 21735 , LMP12037 AND LMP12038 FALSE CREEK PLAN 21458
3) LOT A DISTRICT LOT 5632 PLAN 21672
4) PART OF THAT PART OF DISTRICT LOT 541 IN REFERENCE PLAN 11156 EXCEPT
A) PART IN REFERENCE PLAN 14790 B) PART IN STATUTORY RIGHT OF WAY PLAN 17513
C) PORTIONS IN PLANS 20124, 20128, 20129, 20186, 20319, 20357, 20421
20821, 23011, 23018, 23019, 23020, 23025, 23026, 23027 AND LMP10733
5) PART OF DISTRICT LOT 4674 PLAN 6107 EXCEPT PLAN 20421
6) PART OF DISTRICT LOT 5059 EXCEPT PARTS IN PLANS 20319 AND LMP10733
7) PART OF DISTRICT LOT 5605 PLAN 6108 EXCEPT A) PORTIONS IN REFERENCE PLAN 2437 AND
PLANS 20128, 20129, 20186, 20421, 23027 AND LMP10733
8) PART OF DISTRICT LOT 5673 EXCEPT PLAN 21425
9) CLOSED ROAD IN REFERENCE PLAN LMP 13009
ALL OF GROUP 1 NEW WESTMINSTER DISTRICT
PLAN LMP 13010
THE PARCELS SHOWN HEREON ARE TO BE CITED HENCEFORTH AS:
LOTS 223 TO 237 INCLUSIVE
FALSE CREEK
PLAN LMP 13010
INTEGRATED SURVEY AREA NO. 31 (VANCOUVER)
LEGEND
ROBSON STREET
SMITHE STREET
LANE
BEATTY STREET
NELSON STREET
CAMBIE STREET
MAINLAND STREET
DAVIE STREET
PACIFIC BOULEVARD
PACIFIC BOULEVARD NORTH
PACIFIC BOULEVARD SOUTH
STADIUM ROAD WEST
ROAD
CLOSED ROAD
FALSE CREEK
DETAIL A
DETAIL B
DETAIL C
DETAIL D
DETAIL E
DETAIL F
DETAIL G
SEE DETAIL A
SEE DETAIL C
SEE DETAIL D
SEE DETAIL E
SEE DETAIL G
REM. 156
REM. 154
REM. D.L. 2850
PART D.L. 5605
PART D.L. 5059
PT. D.L. 541
D.L. 5673
D.L. 5632
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THIS PLAN LIES WITHIN THE GREATER VANCOUVER REGIONAL DISTRICT

PACIFIC PLACE REMEDIATION PROJECT
MEMORANDUM

To: D.J. Clark, P.Eng., Project Manager, Pacific Place Remediation Project

From: B.H. Conlin, P.Eng. &
D.R. Livingstone, P.Eng.
Golder Associates Ltd.

Date: March 10, 1999

File: 932-1801/0470

RE: SUPPORT INFORMATION FOR CONFIRMATION OF COMPLIANCE PARCEL 4, ROADWORKS AND UTILITIES , PACIFIC PLACE

1.0 INTRODUCTION

The purpose of this memorandum is to provide support information for the issuance of a "Confirmation of Compliance" for Parcel 4, Roadworks and Utilities, on the Pacific Place site in Vancouver, B.C. The Parcel is indicated on the Key Plan, Figure 1. The legal description of the site is:

- that portion of the Road above the high water mark as indicated on False Creek Plan LMP 13010.

The area does not include that portion of the Road included in the Support Information dated August 11, 1997.

The remediation standards that apply to Parcel 4, Roadworks and Utilities, are the Contaminated Sites Regulations (CSR) Commercial Land Use Standards (BCE 1997).

2.0 CONFIRMATION OF COMPLIANCE

In our opinion, the excavation of the upper fill materials within the Parcel 4 Roadworks and Utilities Area (Figure 1), and the placement of imported granular subgrade, asphalt paving, concrete sidewalks and/or brick pavers, has rendered the site suitable for the intended use as a roadway, in accordance with the risk assessment and risk management approach described in the Remedial Plan.

The Remedial Plan ("*Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7*", September 1993) risk assessment, accepted by B.C. Environment for areas of Pacific Place with contaminant concentrations above the formerly referenced Level B of the Pacific Place Standards (similar to the Residential Land Use Standard of the currently referenced CSR), concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (for example, 0.5 metres of residential fill) was present as a permanent separation barrier above the contaminated sub-soils.

About 3,700 m^3 of soil was excavated for the roadworks and utilities, of which 2,300 m^3 was Residential Fill quality, 950 m^3 was Industrial Fill quality, 350 m^3 was Industrial Waste, and 70 m^3 was classified as Special Waste based on lead leaching above the Special Waste criteria. These results are consistent with the findings of the field investigations (Soils Remediation Group 1992 and Pacific Place Remediation Project 1995) and those referenced in the Remedial Plan and risk assessment completed for the Pacific Place site.

Prior to development of Parcel 4, *in situ* groundwater concentrations of PAH, oil and grease, and ammonia were found to be elevated relative to the False Creek Discharge Standards. Because the majority of the fill material at the development lots will ultimately be removed, the source zones of potential groundwater contamination located hydraulically upgradient of the Parcel 4 Roadworks and Utilities Area will be reduced. While small zones of contaminated soils that were not excavated for development will continue to be potential sources of groundwater contamination, the estimated groundwater flux and mass loading of contaminants to False Creek from Parcel 4 is predicted to be reduced by an order of magnitude compared to pre-development levels, due to the presence of the buildings and foundation drains. In our opinion, the

construction of the buildings and drains, will meet the objectives of the Remedial Plan - significantly reducing the potential for adverse environmental effects on False Creek from the subject area.

The information presented in the following sections supports these opinions.

3.0 BACKGROUND

3.1 Historical Land Use and Results of Field Investigations

The Pacific Place site was host to a variety of industrial activities between the late 1890s and the mid-1980s, as summarized in Figure 2. Historical activities along the Parcel 4 shoreline area include railway lands, sawmills, and a former oil loading wharf. These industries occupied the area after infilling of False Creek was completed in the 1930's. Further infilling of the shoreline was completed in the mid-1980's in preparation for Expo'86.

3.1.1 Applicable Field Investigations

The following soil and contamination descriptions are derived from the previous Phase 1 and 2 field investigation reports (SRG; June 1992). The chemical results in previous investigations and remedial plans were interpreted with respect to the then relevant Level B residential standard in the Pacific Place Standards (MOE 1990) which are similar to the currently applicable CSR generic numerical standards for Residential land use (BCE 1997).

3.1.2 Soil Description

The fill material on Parcel 4 is comprised of "recent" granular fill approximately 0.4 to 0.8 metres in thickness, underlain by "old" fill about 5 m to 8 m thick. The total fill thickness ranges from about 6 to 9 metres. The recent fill, comprised primarily of sand and gravel, was used for grading in preparation for Expo '86. The old fill is comprised of silty sand and gravel which is relatively free of staining and odours, but has varying amounts of construction-related debris such as brick, wood, concrete and metal. Areas containing abandoned Expo services were backfilled with large amounts of sand.

Zones or layers of "suspect" fill are found within the old fill. These suspect zones may contain contaminants with concentrations above the Residential Land use Standard. Industrial debris, such as scrap metal, brick and wood was used to infill the False Creek shoreline, and is found in varying quantities throughout this fill zone. The black-stained soil layers vary in thickness from 0.5 to 1 metre and are interpreted to represent the former ground surface occupied by railway lines.

3.1.3 Soil Contamination Overview

When preparing the *"Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7"* (SRG, August 1992) the Pacific Place site was divided into Areas of Environmental Concern (AEC's), based on historical activities and the type of chemical parameters present. Results of the Phase 1 and 2 investigations and the supplementary sampling programs indicated that soil having chemical concentrations in excess of the Level B standards for residential land use is limited to distinct suspect zones or layers within the fill material. The chemical parameters and concentrations found in the suspect soils of each AEC are the result of former industrial activities. The AEC boundaries are shown in Figure 3 and the AEC's relevant to the excavation activities are described below.

The summary of soil contamination provided below is based on conditions found throughout the particular Area of Environmental Concern (AEC) during the Phase 1 and 2 Field Investigations. Extensive infilling (1 to 2 metres) of the Pacific Place site with granular material was conducted in 1983 and 1984 in preparation for Expo'86. Results of various investigations have indicated that the "Expo" fill contains chemical concentrations below the Level B standards. Therefore, the soil contamination described below has been found below the surface layer of "Expo" fill.

AEC 14 - Infilled Shoreline

AEC 14 is located at the west end of the shoreline development. This area was formerly a lumber yard. PAH concentrations exceeding Level B were found in the southwest end of the AEC, near former coal bunkers and cinder pit located on neighbouring railway lands. The PAH contamination appeared to be associated with coal fragments and black staining in the soil. Metals contamination may also be present near Parcel 2, associated with metal debris found along the shoreline.

AEC 15 - Oil Wharf Area

A former oil wharf occupied the central portion of Parcel 4 between the 1930s to the late 1950s. Level C and Special Waste levels of PAH and oil & grease have been found in this area, associated with black oily staining and hydrocarbon and/or solvent odours. Metals concentrations were also found to exceed Level C standards in zones of poor quality fill containing debris or staining. Only one Level B exceedance of chlorophenols was found in 25 samples analyzed in AEC 15.

AEC 19 - Lumber Yards

The east portion of Parcel 4 and west end of Parcel 6A was formerly occupied by lumber yards and saw mills from the early 1900s until 1985. Level C exceedances of PAH and metals have been found in black-stained soil layers, thought to be the former ground surface.

3.2 Remedial Plan

3.2.1 General

The remedial plan pertaining to Parcel 4, Roadworks and Utilities Area, included a human health risk assessment and an evaluation of remedial alternatives. The remedial plan report, entitled "*Remedial Plans for Parcels 1,4,5A,5B,6A,6C and 7*" was issued by the Pacific Place Remediation Project Group in September 1993. A copy of the relevant sections of the Remedial Plan are included in Appendix I.

3.2.2 Human Health Risk Assessment

Because in situ management of some of the fill materials was contemplated during the remedial planning stage, a quantitative human health risk assessment was performed to estimate the potential human health risks arising from exposure to the Principal Contaminants of Concern (PCOC) at Parcel 4. For fill materials with contaminants above the residential standards, the risk assessment assumed the potential for direct contact between persons and the contaminated soils. In some areas of this Parcel, the potential for human health risks were identified if direct contact between receptors and contaminants such as metals or non-volatile organics could occur. The risk assessment

concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (e.g., 0.5 metres of residential fill) remained as a separation barrier above the existing contaminated soils.

Under the CSR, certain contaminants may exceed the Residential Land use criteria that do not exceed the Pacific Place Level B Standards and therefore were not specifically included in the risk assessment. For metals and non-volatile organic contaminants (the PCOCs at this Site) the remedial measures involve covering of this soil with asphalt, concrete, or residential fill quality soil that cut off potential exposure. Therefore, the conclusion of the original risk assessment that the site is suitable for residential use does not change.

3.2.3 Groundwater

The fill materials present within the Roadworks and Utilities Area were not expected to constitute a significant source of groundwater contamination. The field investigations for the Remedial Plan indicated that the historical groundwater contaminants of concern at this site were oil and grease, ammonia, cyanide, chlorophenols, and PAH.

4.0 EXCAVATION AND REMEDIATION ACTIVITIES

4.1 Soils Management Procedures

The results of the Phase 1 and 2 Field Investigations, in combination with the Remedial Plan, were used to develop the soils and groundwater management procedures for the roadworks and utilities excavation at Parcel 4. The report is entitled "*Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4 Quayside Neighbourhood Roadworks and Utilities Pacific Place*", (PPRPG; February 20, 1997) and are referred to as the Soils Management Procedures (SMP). The SMP outlines the general soil and groundwater handling, testing and reuse or disposal procedures that were followed during the excavation for building construction.

4.2 Excavation

Excavation activities commenced on Parcel 4 Roadworks and Utilities Area, in March 1997. The work included excavation at the shoreline and at Lots DE, for the purposes of installing roadworks and utilities. All excavation was complete as of January 1999.

Monitoring of the excavation was conducted by PPRP field technicians, who were responsible for directing the segregation and testing of all excavated soil in accordance with the SMP. About 3,700 m^3 of soil was excavated for the roadworks and utilities, of which 2,300 m^3 was Residential Fill quality, 950 m^3 was Industrial Fill quality, 350 m^3 was Industrial Waste, and 70 m^3 was classified as Special Waste based on lead leaching above the Special Waste criteria.

Residential Fill quality soils were reused as cover material at the Nelson Road landfill in Richmond. Industrial Fill quality soil was disposed of at the landfill at 8910 River Road landfill in Delta. The Special Waste soil was disposed of at the West Edmonton Landfill, in Edmonton, Alberta.

The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated. Excavated zones which generated stockpiles that exceeded the RL or IL standards are shown in Figure 4.

4.3 Confirmatory Closure Sampling

Samples taken from the stockpiles generated during roadworks and utilities excavation on Parcel 4 are considered representative of the fill remaining *in situ*. The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated. The location of the soils encountered during the excavation that exceeded the Residential Land use Standards is indicated on Figure 4. These zones are inferred to be areas where contamination exists, below or beside the Roadworks and Utilities Area.

4.4 Groundwater

There were no significant amounts of groundwater encountered during the excavation for roadworks and utilities on Parcel 4. As a result no dewatering or chemical analysis was required.

5.0 MONITORING REQUIREMENTS

The surface cover material (concrete, granular backfill and existing Expo fill) provides protection against exposure to potentially unacceptable health risks from contaminated fill material that may remain within the roads and utilities segment. Any future excavations on the site should be conducted with due consideration for the areas of potential environmental concern (as described in the remedial plan) and subsurface conditions.

Although no potential impacts have been identified as being associated with groundwater in the vicinity of the Roadworks and Utilities Area, consideration should be given to the inclusion of this area in any monitoring program subsequently developed for the *in situ* management of contaminants in Parcel 4.

6.0 LIMITATIONS OF REPORT

The Pacific Place Remediation Project group has undertaken sampling and analysis programs and a risk assessment approach that have been reviewed and approved by B.C. Environment. This program has followed the standard of care expected of professionals undertaking similar work in British Columbia at the time the work was undertaken, and under similar conditions. No other warranty is expressed or implied.

The risk assessment/risk management approach has been employed in the remediation of Parcel 4, Roadworks and Utilities Area. The risk assessment completed for Parcel 4, Roadworks and Utilities Area, was based on the shallow soil conditions existing prior to construction, and conservatively assumed residential/recreational land use. Any subsequent excavations or disturbances in areas where potentially contaminated fill material remains, which would result in human exposure to these soils, may render the conclusions of the risk assessment invalid and should be reviewed.

If new information is generated by others and becomes available to B.C. Environment, the Pacific Place Remediation Project Group and the undersigned should be contacted to review the results or modification plans, and to provide an opinion as to the findings and their implications on the Confirmation of Compliance Certificate issued for Parcel 4, Roadworks and Utilities Area.

PER:

D.R. Livingstone, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

Reviewed by:

B.H. Conlin, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

DRL/BHC

cc: C. McIver, Fraser & Beatty
K. Rosenberg, Sandwell Inc.
Golder File 932-1801/0470coc

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REFERENCES

Soils Remediation Group, August 1989b, Pacific Place Soils Remediation Program - Overall Site Results of Field Investigations. Prepared for the BC Ministry of the Environment. First Draft August 1989.

British Columbia Standards for Managing Contamination at the Pacific Place Site, Ministry of Environment, Waste Management Program, May 2, 1990. (MOE 1990)

Soils Remediation Group, 1992, Pacific Place Soils Remediation Program – Phase 2 Results of Field Investigations for Parcels 1, 2, 2E, 4, 5A, and 6E (Overall site). Prepared for BC Environment. Final Report June 1992.

Pacific Place Remediation Project Group, 1993, Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7, Prepared for BC Environment, September 1993.

Pacific Place Remediation Project, 1995, Parcels 4, 5A & 5B - Phase 1 - Roadworks and Utilities, Groundwater and Soils Management Procedures for the Remediation Construction Manager, Contractor and Pacific Place Remediation Project Group, Prepared for BC Environment, February 14, 1995.

Pacific Place Remediation Project, 1997, Parcel 4 Roadworks and Utilities SMP - Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4 Quayside Neighbourhood Roadworks and Utilities Pacific Place; Prepared by the PPRP, February 20, 1997.

Contaminated Sites Regulation BC Reg 375/96 pursuant to the Waste Management Act, BCE 1997

APPENDIX "ii"

Confirmation of Compliance dated the 12th day of March, 1999 for those portions of the streets more particularly outlined in red and marked "Road" on the Subdivision Plan LMP13010 a reduced copy of which is attached as appendix "i" to the Confirmation of Compliance (the "Lands") (the "Confirmation of Compliance")

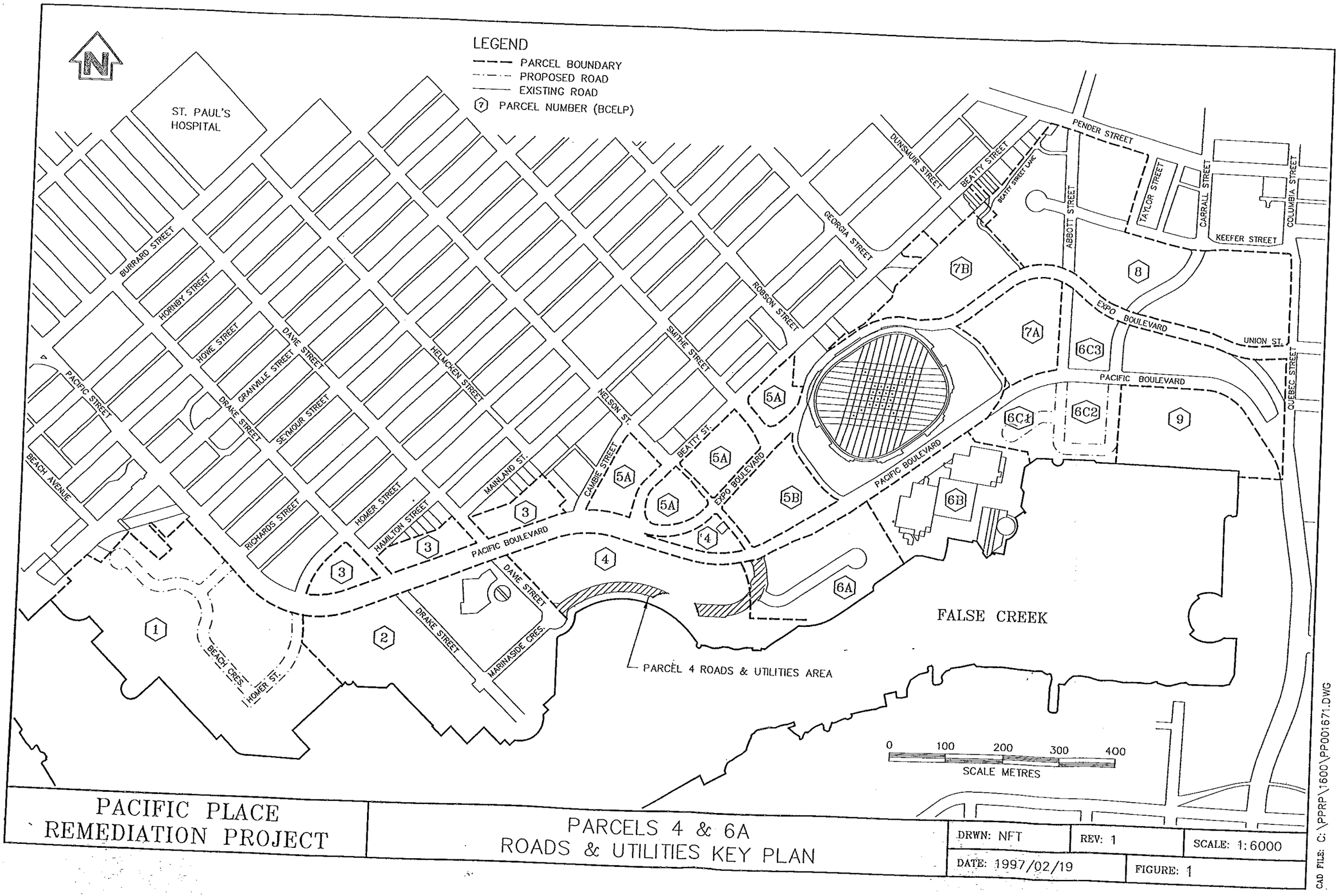
The Confirmation of Compliance is subject to the following conditions:

1. As the Lands are subject to in situ management of soils containing Contaminants at concentrations in excess of the applicable legal standards within British Columbia for use of the Lands as streets (as defined in the Vancouver Charter):

   (a) The surface cover material on the Lands must be maintained.

2. Pertinent information with respect to the Lands may be placed and maintained on any Site Registry established by the Province pursuant to the provisions of the Waste Management Act and any amendments thereto.

Capitalized terms utilized in this Appendix "ii" shall have the same meaning ascribed to the same term in the Confirmation of Compliance.



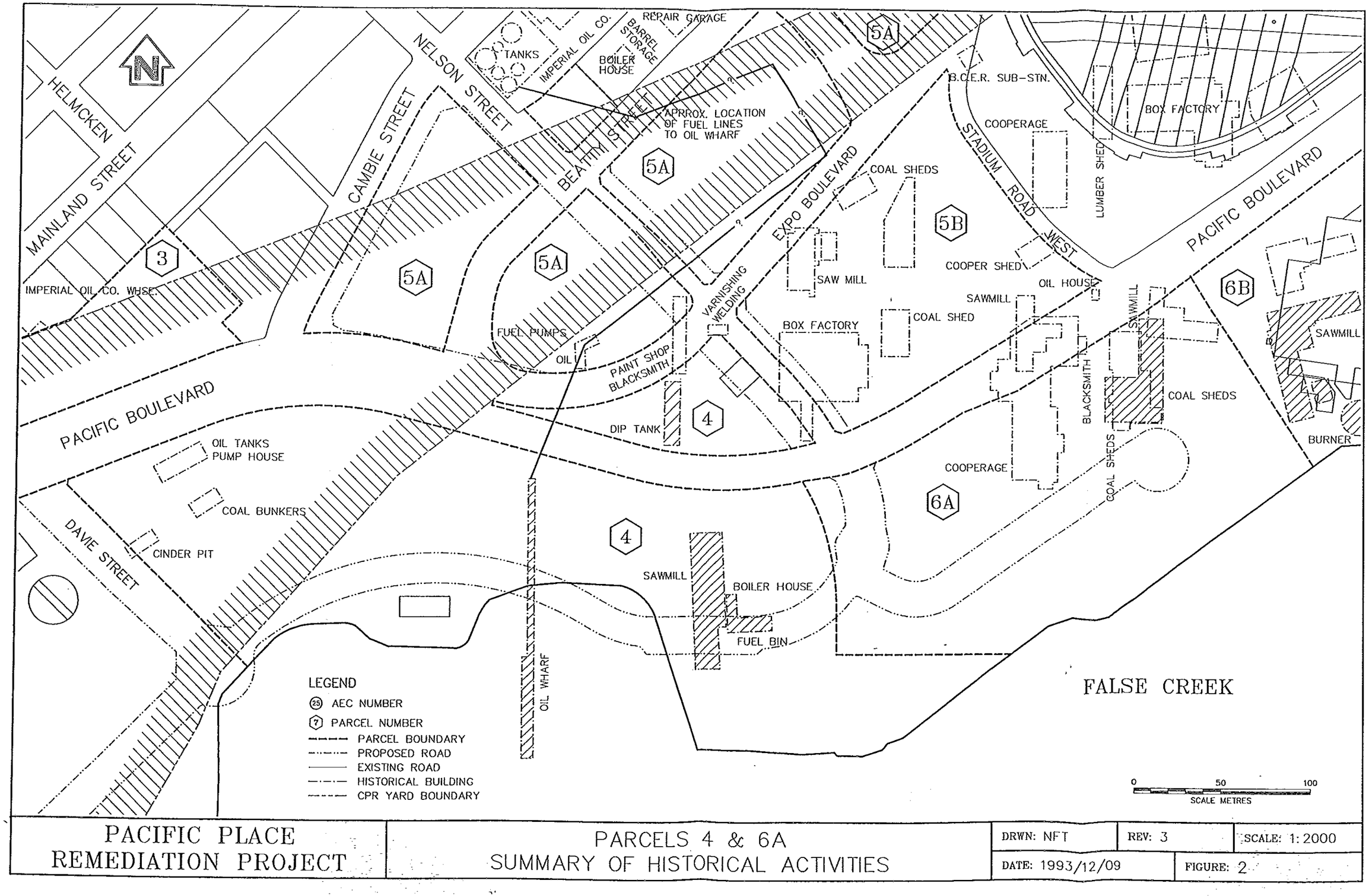
PACIFIC PLACE
REMEDIATION PROJECT

PARCELS 4 & 6A
ROADS & UTILITIES KEY PLAN

DRWN: NFT	REV: 1	SCALE: 1:6000
DATE: 1997/02/19	FIGURE: 1	

PLOT: 1999/03/10, 1720

CAD FILE: C:\PPRP\1600\PP001671.DWG



PACIFIC PLACE
REMEDIATION PROJECT

PARCELS 4 & 6A
SUMMARY OF HISTORICAL ACTIVITIES

DRWN: NFT	REV: 3	SCALE: 1:2000
DATE: 1993/12/09	FIGURE: 2	

PLOT: 1997/02/19,1657

CAD FILE: C:\PPRP\1400\PP001440.DWG

PLOT: 1999/03/10, 1724

CAD FILE: C:\PPRP\1600\PP001672.DWG

PACIFIC PLACE REMEDIATION PROJECT

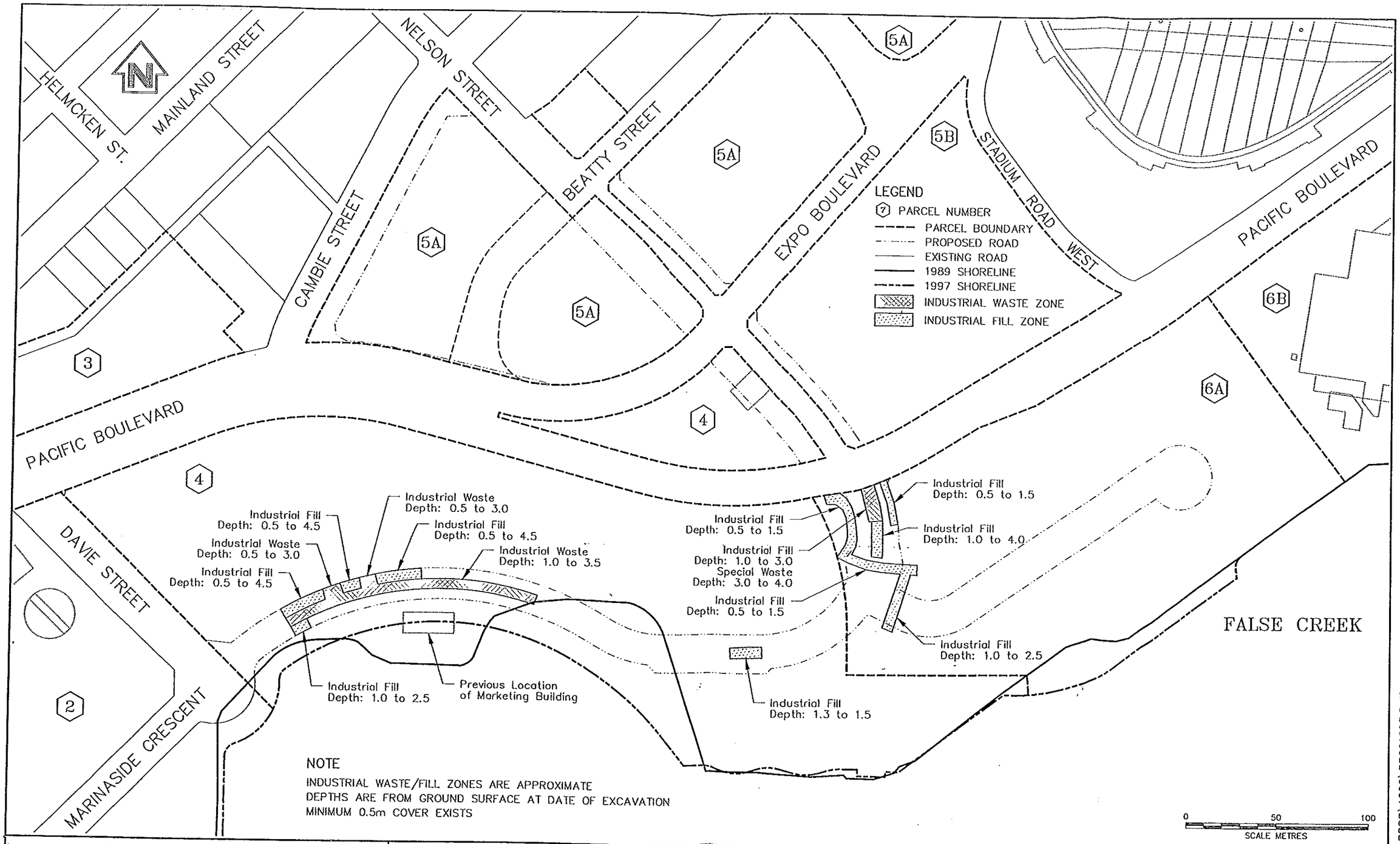
PARCEL 4 – ROADS & UTILITIES TEST SITE LOCATIONS & AEC BOUNDARIES

DRWN: NFT	REV: 1	SCALE: 1:1500
DATE: 1997/02/19	FIGURE: 3	

LEGEND

- KEYSTONE TEST SITE
- PHASE 1 TEST SITE
- PHASE 2 MONITOR WELL
- PHASE 2 TEST PIT
- PHASE 2 BORE HOLE
- SUPP'Y MONITOR WELL
- SUPP'Y TEST PIT
- SUPP'Y BORE HOLE
- (7) PARCEL NUMBER
- (18) AEC NUMBER
- PARCEL BOUNDARY
- PROPOSED ROAD
- EXISTING ROAD
- EXISTING SHORELINE
- PROPOSED SHORELINE
- AEC BOUNDARY
- ROADS & UTILITIES AREA

0 10 20 30 40 50 75
SCALE METRES



NOTE

INDUSTRIAL WASTE/FILL ZONES ARE APPROXIMATE
DEPTHS ARE FROM GROUND SURFACE AT DATE OF EXCAVATION
MINIMUM 0.5m COVER EXISTS

PLOT: 1997/09/23, 1216

CAD FILE: C:\PPRP\1600\PP001697.DWG

PACIFIC PLACE REMEDIATION PROJECT	PARCELS 4 & 6A – ROADS & UTILITIES LOCATION OF INDUSTRIAL SOILS REMAINING INSITU	DRWN: NFT	REV: 1	SCALE: 1:2000
		DATE: 1997/08/08	FIGURE: 4	

APPENDIX I

PARCEL 4/6A REMEDIAL PLAN

(PORTIONS PERTINENT TO THE ROADWORKS AND UTILITIES)

2.0 PARCEL 4

2.1 GENERAL

Parcel 4 is situated in the central portion of the Pacific Place site at the foot of the Cambie Street Bridge. It is bordered by Parcels 2, 5A/5B and 6A to the west, north and east, respectively (Figure 2-1), and by False Creek to the south. Parcel 4 has a total land area of about 5.4 hectares, 96% of which has been reclaimed from False Creek by way of shoreline infilling (Figure 2-2). The total volume of fill material present within the parcel is on the order of 310,000 cubic metres[3].

Known historical land uses which likely resulted in the contamination of and/or deposition of fill material on Parcel 4 include an oil wharf, sawmills and lumber yards, a paint shop and work shops, railway sidings and associated activities, and a wood preservative dip tank operation.

Seven areas of potential environmental concern (AEC) have been identified on Parcel 4, based on the known historical land use and on delineation sampling conducted during Phases 1 and 2 of the SRG field investigations (Figure 2-3):

AEC 8 - Railway Lands (part)
AEC 14 - Infilled Shoreline
AEC 15 - Oil Wharf Area
AEC 17 - Fuel Pipeline Area
AEC 18 - Wood Preservative Dip Tank Area
AEC 19 - Lumber Yard (Part)
AEC 20 - Cambie Street On-ramp

The soil contamination, groundwater and soil vapour conditions associated with the above AEC are summarized in Sections 2.2, 2.3 and 2.4. Section I of this volume presents detailed AEC descriptions, while results of the Phase 1 and Phase 2 field investigations are presented in the RFI reports by SRG (1989c and 1992). It should be noted that the area presently referred to as Parcel 4 (in this Remedial Plan) was previously designated by CPDL as Parcel 2E and part of Parcel 4 and is so referenced in the RFI reports.

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3 Volume estimates do not include fill volume within 10 metres of the crest of the present shoreline, due to lack of data within this area.

The estimated in-place volumes of fill expected to exceed the Level B standards in the Parcel 4 AEC with moderate to extensive contamination are:

	Level B to C	Level C to Special Waste	Special Waste
AEC 15 *	20,650m^3	5,000m^3	1,500m^3
AEC 18 *	3,800m^3	2,950m^3	300m^3
AEC 19**	36,000m^3	3,200m^3	800m^3

* Volumes calculated based on results of delineation sampling.

** Volumes estimated based on frequency of Level B, Level C and Special Waste exceedances in black-stained soil volume.

Although no testing was conducted on the portion of Parcel 4 designated as AEC 17, it is expected that a limited volume of fill may be contaminated with hydrocarbons (diesel, oil, solvents, etc.) from the former fuel pipelines.

The remainder of Parcel 4 is expected to have relatively low or random levels of contamination, based on limited available data. AEC 14, a zone of repeated shoreline infilling, was tested at 4 locations; PAH concentrations (associated with oily staining and coal fragments) in excess of the Level B standards were measured in only 2 samples.

In AEC 8, random concentrations of metals and organic parameters, with rare exceedances of the Level B standards (i.e. oil & grease), are typical. The frequency of samples exceeding the Level B standard for one or more parameter is approximately 4%.

No elevated concentrations of chemical parameters were found in AEC 20, beneath the Cambie Street on-ramp.

Estimated in-place volumes of fill expected to exceed the Level B standards (in the less extensively or randomly contaminated areas of Parcel 4) are:

	Level B to C	Level C to Special Waste
AEC 8	3,100m^3	0m^3
AEC 14	1,400m^3	0m^3
AEC 17	1,700m^3	300m^3

The principal direction of flow is to the south towards False Creek; groundwater flow from the western and eastern portions of Parcel 4 converges at the central shoreline area before discharging to False Creek (Figure 2-4).

Water levels in the higher permeability fill present near the shoreline of False Creek are likely affected by tidal fluctuations. While no specific monitoring of tidal effects has been conducted in Parcel 4, it is anticipated that maximum effects will be on the order of 0.5 metres near the shoreline.

2.3.3 Groundwater Contamination

Within Parcel 4, elevated concentrations of several chemical parameters are present in the groundwater (Figures 2-5 through 2-8). Parameters which were found to exceed the False Creek standards include oil and grease (10 to 800 mg/L in the eastern portion of the parcel), ammonia (2 to 16 mg/L, associated with woodwaste and shoreline areas), total PAH (20 to 530 µg/L near the oil wharf) and chlorophenols (up to 350 µg/L in the immediate vicinity of the former dip tank).

The total estimated pre-development PAH loading from Parcel 4 (and to a lesser extent, 6A) is approximately 11 kg/year.

2.4 SOIL VAPOUR

High soil vapour and combustible gas concentrations were detected within AEC 19, and were associated with degradation of the significant woodwaste within the fill zone of Parcel 4. Concentrations ranging from 45 to 100% of the lower explosive limit (LEL) were present at the northeast (MW-231) and southwest (MW-404A) portions of AEC 19 respectively.

Organic vapours (in the hundreds of ppm range) associated with the hydrocarbon contamination on AEC 15 and 18 were also measured during the field investigations.

The woodwaste zone having elevated concentrations of methane at the north end of Parcel 4 may be partially excavated for development.

2.7.2 Effect On Groundwater

Approximately 57% of the existing fill will be removed, including approximately 56% (by volume) of in-place soils estimated to exceed the Level B standards south of PBS. However, only about 33% of the soils exceeding the Level B standards in the dip tank area (AEC 18) will be excavated; approximately 4,750m^3 of soil expected to exceed the Level B, C or Special Waste standards (for chlorophenols, PAH and LAH) will remain following development. This will serve as a continuing source of groundwater contamination which, if left in place, may necessitate long-term treatment of groundwater collected from the building drains.

The building foundations will key into the base of fill materials and will cut off flow to False Creek. When the buildings are completed, an average of approximately 12,000 m^3/year from Parcel 4 and 15,000m^3/year (6.3 IGM) originating from False Creek will be collected from the building drains installed in the fill. Post-development flux to False Creek through the native sediments will be approximately 1,500m^3/year.

Details of the groundwater modelling completed for Parcel 4 are presented in Appendix E-1.

Groundwater seepage into most construction excavations within Parcel 4 will likely contain elevated concentrations of ammonia and organic parameters.

2.7.3 Conclusions

- Fill exceeding Level B for chlorophenols/PAH in the dip tank area north of PBS, that would remain following excavation for development, will serve as a source of groundwater contamination after development. As this will necessitate long-term groundwater treatment if left in-place, removal of the additional contaminated fill should be considered.

Level B to C soil - 38,000 cubic metres

Level C to Special Waste soil - 7,700 cubic metres

Special Waste Soil - 2,500 cubic metres (Section 2.9)

It should be noted that all known accessible Special Waste will be excavated as part of the planned development. However, small pockets of inaccessible Special Waste PAH will remain at depths up to 10 metres near the Parcel 4 shoreline in AEC 19. As a result, BC Environment will require that the waste be registered, that an in situ management facility be approved prior to construction, and that a long-term monitoring program be conducted. Additional measures, as described in Section 4.11.3 (Volume 1), may also be applicable to Parcel 4.

Significant quantities of woodwaste would remain in AEC 19 following development. The woodwaste is located in the northeastern section of AEC 19, in Parcel 6A adjacent to Parcel 4. Elevated concentrations of methane measured in this area of the site indicate that the potential for methane migration into the structures on Parcel 4 exists.

Option 1 includes the installation of a passive soil gas venting system along the border of Parcels 4 and 6A during the building construction. The system would consist of horizontal piping in a gravel filled trench, with a vertical discharge pipe located at one or both ends. This relatively simple construction will provide a preferential flow path for the gas. The system could be converted to an active extraction system if sufficient quantities of gas are recovered.

The estimated order of magnitude costs for remediation of the Level B to Special Waste soil on Parcel 4 under Option 1 is shown below. (Costs associated with the excavated Special Waste are given in Section 2.9). The costs are divided into the normal construction costs (excavation, hauling, etc.) that would be incurred by the owner/ developer, and the incremental costs B.C. Environment will incur because of the contaminants present. The gas venting costs are also included in the B.C. Environment costs. Only the total costs are shown below. A breakdown of the costs for Option 1 is shown in Table 2-1.

As no human health risk in excess of the Pacific Place standards was identified for the remainder of Parcel 4, no potential risk is expected along the shoreline. Therefore, no remedial measures to reduce the potential for human exposure to contaminants are expected to be necessary along the shoreline.

Prior to construction, a detailed soils management plan for the contractor will be developed to define soils management procedures that will ensure safe handling and disposal of the soils during construction along the shoreline. Excavations in any suspected contaminated areas may require specific remedial consideration including installation of temporary barriers to limit contamination of False Creek during the excavation process, collection of seep water from excavations into a settling tank or basin, and testing prior to discharge.

As limited data are available for the shoreline, reconnaissance sampling and soils testing at excavation sites prior to and during development will be completed in order to identify the need for any exposure control measures and to determine the disposal requirements of any excavated soil. Certain areas may not be easily sampled prior to development because of the existing materials (rip rap, etc.).

2.12 MONITORING REQUIREMENTS

Under Options 1 or 2, monitoring of the site following development will be required. Although a potential human health risk has not been identified with leaving contaminants in-place, the presence of low concentrations of semi-volatile constituents in the soil would necessitate conducting regular ambient air monitoring under Option 1.

Some limited amounts of inaccessible Special Waste will remain in-place at depths up to 10 metres on the parcel following development (under all three options). BC Environment will likely require that monitoring of the waste be conducted to ensure that no significant releases to the environment occur.

As detectable concentrations of methane have been found in the soil, monitoring for the presence of methane is recommended under all three options. The monitoring for methane is necessary to determine if the passive venting is sufficient, or if an active system would be needed.

5.0 PARCEL 6A

5.1 GENERAL

Parcel 6A is situated to the south of B.C. Place Stadium and southwest of the Plaza of Nations (Figure 5-1). It is bordered to the north by Pacific Blvd. S., to the west by Parcel 4, and to the south by False Creek. The total area of the parcel is approximately 3.4 hectares; this entire area was reclaimed from False Creek via shoreline infilling (Figure 5-2). The total volume of fill material (based on available borehole information) to within 10 metres of the crest of the shoreline is estimated to be about 210,000 cubic metres. A substantial portion of this volume consists of material dredged from False Creek in the early to mid-1980's and deposited for construction of Expo.

Other historical activities which may have resulted in the deposition or contamination of fill within Parcel 6A include sawmills and lumber processing industries, a cooperage (barrel making) factory with blacksmith shop, and coal storage.

Four areas of potential environmental concern (AEC) have been defined/delineated on Parcel 6A, as follows (Figure 5-3):

AEC 19 - Lumber Yards (part)
AEC 24 - Mixed Industrial Area (part)
AEC 25 - Recently Placed Fill
AEC 26 - Lumber Industries Area

It should be noted that limited study was conducted on AEC 24 and AEC 25.

Soil contamination, groundwater and soil vapour conditions within the above AEC are outlined in Sections 5.2, 5.3 and 5.4 below. Detailed descriptions of the AEC are given in Section I of this volume of the Remedial Plan. Results of the field investigations conducted on Parcel 6A (formerly referred to by CPDL as part of Parcel 4) are presented in their entirety in the Phase 1 and 2 overall site RFI reports by the SRG (1989e and 1992).

5.2 SOIL CONTAMINATION

The fill zone of AEC 26 was found to be extensively contaminated with metals, PAH, and other organics indicated by elevated oil & grease, TEH and LAH concentrations. Arsenic, copper, lead, tin and zinc concentrations exceeding the Level B and Level C standards were detected in some samples collected from the debris zone (generally black-stained) between depths of about 1.5 to 7 metres. Level B exceedances of cadmium and mercury were also found in this area.

5.3 GROUNDWATER

5.3.1 Hydrostratigraphic Units

The three main hydrostratigraphic units on Parcel 6A are as follows:

- **Heterogeneous fill material**, comprised of mainly sand with some gravel and trace to some silt and clay, with demolition debris and woodwaste at depth. Just south of Pacific Blvd., the fill is comprised of sands and gravels with variable amounts of silt and clay. Prominent zones of woodwaste also occur at the eastern boundary of the Parcel. The thickness of the fill ranges from about 5 to 11 metres, increasing toward the shoreline of False creek. The hydraulic conductivity is typically on the order of 10^{-5} to 10^{-3} m/s, generally increasing toward the shoreline.

- **Native sediments** comprised of silty sand to clayey silt, which are overlain by the fill. Silty sand is generally present just south of Pacific Boulevard; the unit tends to grade into clayey silt towards False Creek, south of the original shoreline. The thickness of the native sediments is not well defined.

- **Sandy silt to silty sand till** underlying the native sediments, having a hydraulic conductivity on the order of 10^{-9} to 10^{-7} m/s.

5.3.2 Groundwater Flow

The water table is situated within the fill zone of Parcel 6A, at a depth of about 4 to 5 metres below the existing ground surface. The primary unit for groundwater flow is the relatively permeable fill; flow is generally to the south and southeast toward False Creek.

The estimated pre-development groundwater flux to False Creek (Figure 5-4), determined using a groundwater model described in Appendix E-1 (Volume 3), is approximately 4,900 m^3/year through the fill zone, and on the order of 70m^3/year through the native sediments beneath the fill.

5.6 DEVELOPMENT PLANS

A shoreline park, together with a bicycle path and pedestrian walkway, are presently planned for the southern portion of Parcel 6A. Multi-storey residential condominiums/townhouses will cover most of the northern portion, and a roadway and associated service corridor will cross through the central part of the Parcel, roughly parallel to Pacific Blvd. South (PBS) and the False Creek shoreline. Excavations to an elevation of -1.35 metres geodetic are planned for subgrade structures immediately south of PBS; the remaining excavations will extend to 0.0 metres geodetic (Figure 5-8).

5.7 IMPLICATIONS OF DEVELOPMENT

5.7.1 Effect of Development on Soil Contamination

Excavation for development of Parcel 6A will result in the removal of an estimated of 58,000 cubic metres (27%) of in-place fill material and about 2,000 cubic metres of native soils for the construction of subgrade parking structures and foundations. Approximately 21% or 12,300 cubic metres of in-place fill exceeding Level B will be excavated.

5.7.2 Effect of Development on Groundwater

According to the present development plans, foundations will extend to an elevation of -1.35 metres geodetic immediately south of Pacific Boulevard, and 0.0 metres geodetic along the central area of the Parcel. The effect of development will be the interception and redirection of groundwater flow by the buildings and associated perimeter drains. The total groundwater flux to False creek is expected to be reduced by approximately two thirds, to about 1,700m^3/year, through both the fill and native sediment zones (Appendix E-1 Volume 3).

Although a majority of the metals - contaminated fill will be removed as part of development, it is expected that hydrocarbon-contaminated fill will remain in place below and to the south of the excavation area on Parcel 6A. This fill could serve as a long-term source of groundwater contamination which will discharge to False Creek.

5.10 CONCEPTUAL IMPLEMENTATION

The remediation of Parcel 6A will be performed in conjunction with the development of the parcel. Supplementary sampling (e.g. in AEC 26) may take place prior to remediation. During the excavation for site development, soil known or suspected of containing contaminants above the Level B standards will be segregated (based on visual, olfactory, and vapour monitoring observations, as well as available data), stockpiled and sampled. The results of the laboratory analyses of the samples of the stockpiled material will be used to determine the disposal requirements for the soil. A detailed excavation plan will be developed for AEC 26 based on the available database and any supplementary sampling information.

Much of the soil excavated from the remainder of site is not expected to contain contaminants at concentrations above the Level B standards. However, during the excavation of these areas (AEC 24 and 25), suspicious soil (i.e. black stained or odourous) will be segregated and stockpiled for sampling and analyses. Non-stained, non-odourous bulk fill will likely be suitable for disposal with no or minimal additional testing.

The procedures that will be used during the development and remediation of Parcel 6A will be described in detail in a Groundwater and Soils Management Procedures document, which will be prepared prior to the initiation of the site development.

5.11 SHORELINE

Based on the data from the adjacent AEC, contamination along the shoreline is expected to be primarily randomly distributed. However, the data from the southeast corner of AEC 26 suggests that hydrocarbon contamination, as indicated by LAH, may be present along a small portion of the shoreline.

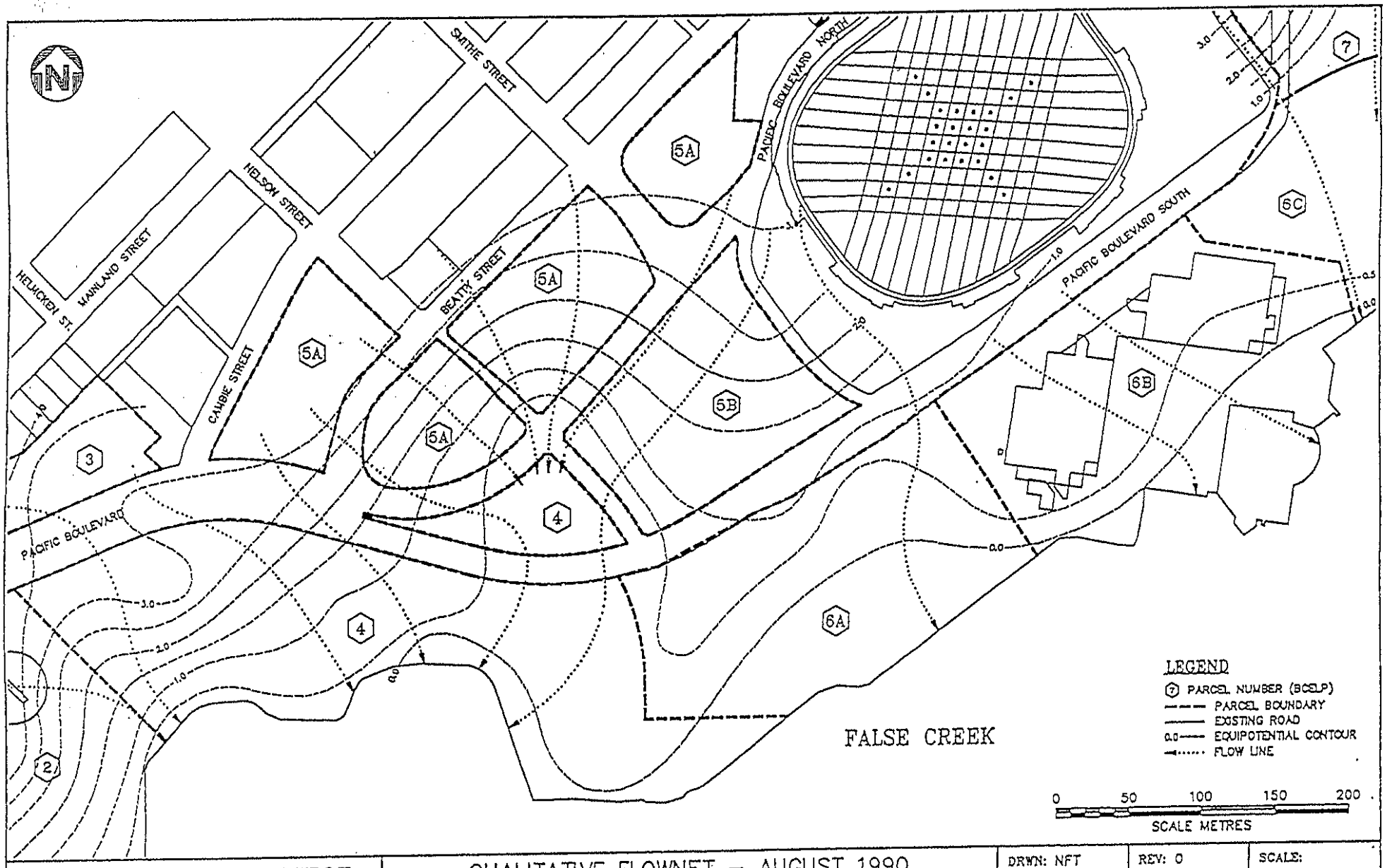
The risk assessment performed for Parcel 6A did not indicate that a risk to human health in excess of the Pacific Place standards exists. Assuming the same contaminants are present along the shoreline as in the adjacent AEC, a potential human health risk is not likely to be present along the shoreline. Therefore, additional measures to reduce or eliminate the potential for human exposure should not be necessary.

development will serve as a long term source of groundwater contamination, resulting in potential impacts to False Creek.

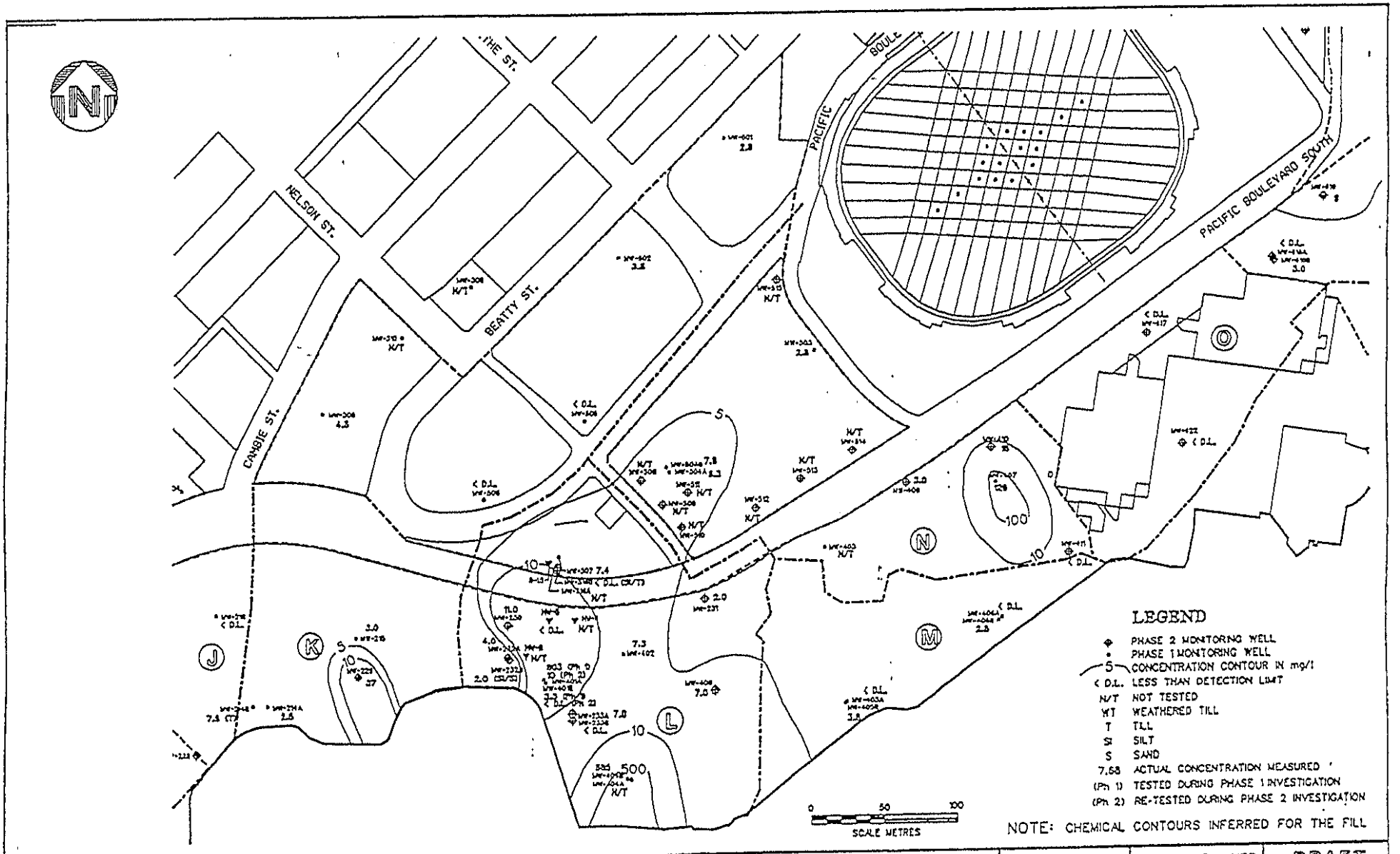
Option 3 provides for removal of all the accessible contaminated soil that exceeds the Level B standards. Removal of the additional contaminated soil will significantly reduce the potential for groundwater contamination and any associated impacts on False Creek. Implementation of Option 3 would also eliminate the need for in-situ management of Special Waste, and that the long-term requirements associated with such management.

Based on a technical evaluation of the two options, the SRG recommends to B.C. Environment that Option 3 be implemented for the remediation of Parcel 6A.

Option 3 is the logical recommendation to provide protection of the environment. However, due to the uncertainty regarding the proposed future use of the parcel (in light of the rezoning of the Parcel proposed by the developer), it may be prudent to defer the decision on the most appropriate remedial option until the development plans for Parcel 6A have been finalized. It may be possible to incorporate a groundwater extraction and treatment system into the development of the parcel, resulting in a more cost effective method of preventing potential impacts to False Creek.



PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	QUALITATIVE FLOWNET – AUGUST 1990 CENTRAL (2 OF 3)	DRWN: NFT	REV: 0
		DATE: 12 DEC 91	FIGURE: 2–4



PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	OIL & GREASE CONCENTRATION IN GROUNDWATER CENTRAL (2 OF 3)	DRWN By: TH	REV. No. 2 NFT	DRAFT
		DATE: 6 NOV 90	FIGURE: 2-6	

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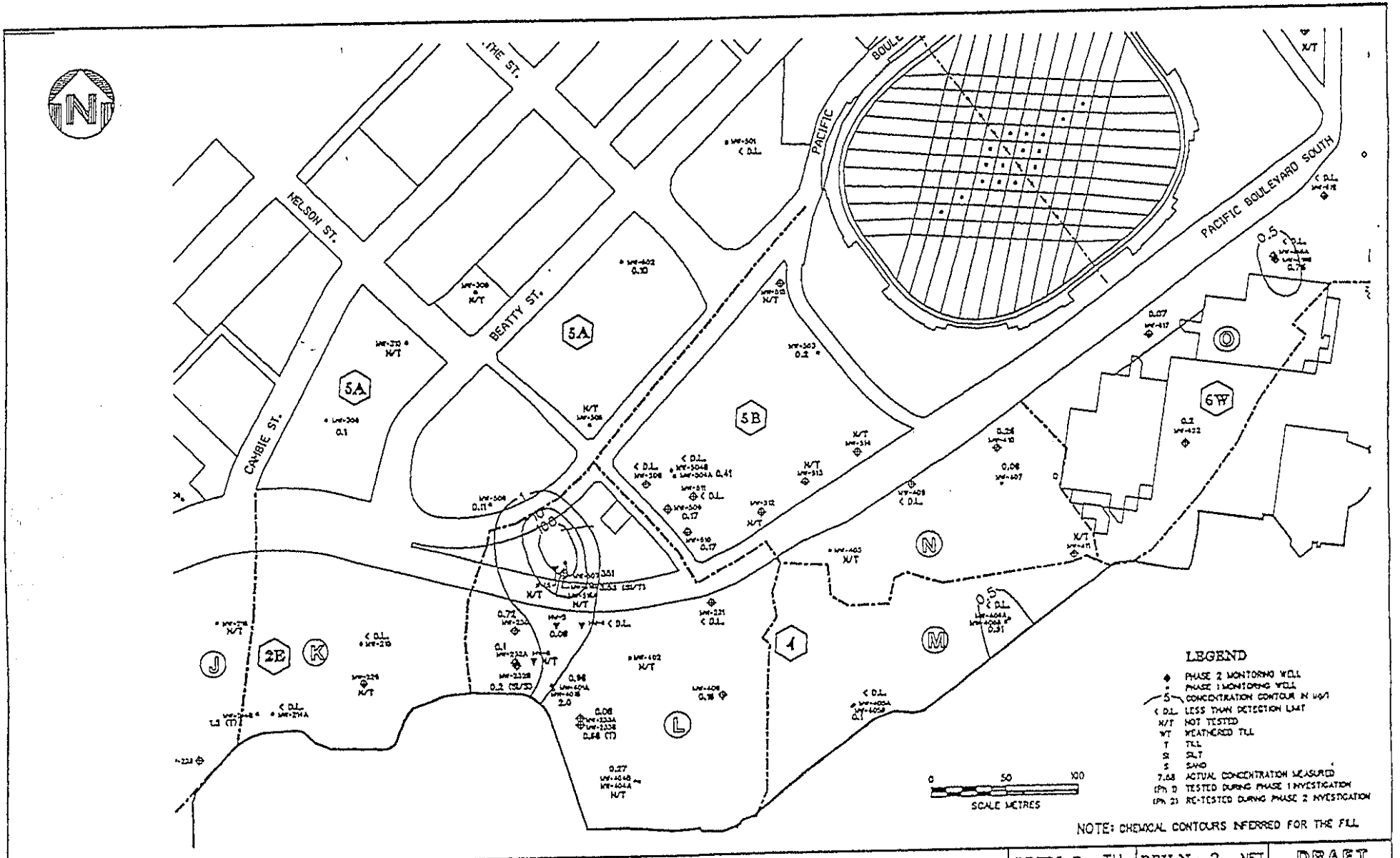

PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	TOTAL CHLOROPHENOLS CONCENTRATION IN GROUNDWATER - CENTRAL (2 OF 3)	DRWN By: TH | REV. No: 2 NFT	DRAFT
		DATE: 9 NOV 90	FIGURE: 2-8

(4H)

CONFIRMATION OF COMPLIANCE

DATED: the 3rd of May, 1999.

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
for the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City", respectively)

In this Confirmation of Compliance the following words shall have the following meanings:

"Contaminants" means those substances existing on or under the Lands hereinafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Lands" means Lot 272 False Creek Plan LMP39586.

"Provincial Standards" means, with respect to the Lands, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada, pertaining to Contaminants in relation to the use of the Lands for residential purposes, utilities and facilities incidental thereto and all associated utilities as more particularly described in development permit DE403063

The Province does hereby confirm to the Approving Officer and to the City that subject to the requirements set out in Appendix "i" attached hereto that there is compliance with the Provincial Standards with respect to the Lands.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

C. J. Doyle

Cassie J. Doyle, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Developments Ltd.
900 - 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

PACIFIC PLACE REMEDIATION PROJECT
MEMORANDUM

To: D.J. Clark, P.Eng., Project Manager, Pacific Place Remediation Project

From: D.R. Livingstone, P.Eng.
Golder Associates Ltd.

Date: April 13, 1999

File: 932-1801/0462

RE: SUPPORT INFORMATION FOR CONFIRMATION OF COMPLIANCE
PARCEL 4, LOT H, PACIFIC PLACE

1.0 INTRODUCTION

The purpose of this memorandum is to provide support information for the issuance of a "Confirmation of Compliance" for Parcel 4, Lot H on the Pacific Place site in Vancouver, B.C. The Parcel is indicated on the Key Plan, Figure 1. The legal description of the site is:

- Lot 272, False Creek Plan LMP 39586

The remediation standards that apply to Parcel 4, Lots H are the Contaminated Sites Regulations (CSR, BCE 1997).

2.0 CONFIRMATION OF COMPLIANCE

In our opinion, the excavation of the majority of the fill materials and the presence of more than 0.5 metres of uncontaminated granular fill above potentially contaminated soil on the eastern portion of Parcel 4, Lot H, has rendered the site suitable for the intended residential use, in accordance with the risk assessment and risk management approach described in the Remedial Plan.

The Remedial Plan (*"Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7"*, September 1993) risk assessment, accepted by B.C. Environment for areas of Pacific Place with

APPENDIX "i"

Confirmation of Compliance dated the 3rd May, 1999
For Lot 272 False Creek Plan LMP 39586
(Parcel 4 – Lot H) (the "Confirmation of Compliance")

The Confirmation of Compliance is subject to the following conditions:

1. As the Lands are subject to in situ management of soils containing Contaminants at concentrations in excess of the applicable legal standards within British Columbia for residential use.

   (a) The surface cover material on the Lands exterior to the existing building on the Lands must be maintained.

2. Pertinent information with respect to the Lands will be placed and maintained on any Site Registry established by the Province pursuant to the provisions of the Waste Management Act and any amendments thereto.

3. The owner of the Lands must monitor the methane and hydrogen sulfide ventilation systems to ensure they are functioning properly including monitoring of the concentrations of gases in the sumps and ventilation pipes.

Capitalized terms utilized in this Appendix "i" shall have the same meaning ascribed to the same term in the Confirmation of Compliance.

contaminant concentrations above the formerly referenced Level B of the Pacific Place Standards (similar to the Residential land use criteria of the currently referenced CSR), concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (for example, 0.5 metres of residential fill) was placed as a permanent separation barrier above the existing sub-soils.

About 28,000 m^3 of soil was excavated for construction of which about 20,000 m^3 was stockpiled for sampling and chemical analysis. The material not stockpiled (8,500 m^3) was classified as Residential Fill and shipped directly off-site for re-use as fill. Of the material stockpiled, about 8,000 m^3 was Residential Fill quality, 11,000 m^3 was Industrial Fill quality, and 1,100 m^3 was Industrial Waste. These results are consistent with the findings of the field investigations (Soils Remediation Group 1992 and Pacific Place Remediation Project 1998) and those referenced in the Remedial Plan and risk assessment completed for the Pacific Place Site. In the course of site excavation for construction, all fill material excavated and found to contain concentrations above the generic numerical standards for Residential Land use (Schedule 4 and 5 of the CSR) was disposed of at an appropriate landfill.

The report on previous results of field investigations (RFI) has described the extent of groundwater contamination within Parcel 4 [see Phase 1 and Phase 2, Parcels 1, 2, 2E, 4, 5A, 6W, and 6E (Overall Site) – Results of Field Investigation report (SRG, June 1992)]. During the excavation of Parcel 4H, water quality was measured on 13 occasions between July 14, 1998 and November 25, 1998. Following completion of the building foundations, the water collected by the perimeter and underslab drains was sampled on 4 occasions between December 18, 1998 and February 15, 1999. Based on the findings of the sampling, the groundwater likely to be collected by the building drains meets the False Creek Discharge Standards. The groundwater collected was found to contain other compounds of concern not associated with Contaminants including dissolved methane and hydrogen sulphide.

Prior to and during the excavation, the presence of soil gases including methane and hydrogen sulphide was detected. There was no indication that Contaminants were the source of the hydrogen sulphide. The gases appeared to be associated with the

degradation of the wood fill material in an environment containing sulphate. The sulphate is a naturally occurring substance associated with sea water and marine sediments (that are native silts under the fill). The owner of the building installed a soil vapour ventilation system under the slab, venting to outside the building at roof level. A building perimeter vent system was installed just below the low permeability fills about 1.5 metres below site grade and vents into the landscaping around the building. The soil vapour venting system will assist in the removal of these soil gases. Potential contaminants on the site were not found to be associated with soil gas, however, the ventilation system installed would also assist in the removal of any contaminant soil gases generated.

The information presented in the following sections supports these opinions.

3.0 BACKGROUND

3.1 Historical Land Use and Results of Field Investigations

The Pacific Place site was host to a variety of industrial activities between the late-1890s and the mid-1980s, as summarized in Figure 2. Historical industrial activity on Parcel 4H involved the wood products industry that included saw and planing mills. Infilling of False Creek began in 1903 and occurred at various times until the mid-1980's when shallow infilling with granular soils was completed in preparation for Expo'86.

3.1.1 Applicable Field Investigations

The following soil and contamination descriptions are derived from the previous Phase 1 and 2 field investigation reports (SRG; August 1989 and June 1992) and supplementary sampling of the area carried out during February 11 and 12, 1998. The chemical results in previous investigations and remedial plans were interpreted with respect to the then relevant Level B residential standard in the Pacific Place Standards (MOE 1990) which are similar to the currently applicable CSR generic numerical standards for Residential Land use (BCE 1997).

3.1.2 Soil Description

The fill material on Parcel 4H is comprised of "recent" granular fill approximately 0.3 to 2 metres in thickness, underlain by fill consisting of "old" silty sands and gravels 4 to 5 metres thick, which is underlain by 1 to 4.5 metres of woodwaste debris (increasing in depth to the south). The total fill thickness ranges from about six to eight metres. The recent fill, comprised primarily of sand and gravel, was used for grading in preparation for Expo '86. Areas containing abandoned Expo services were backfilled with large amounts of sand.

3.1.3 Soil Contamination Overview

When preparing the *"Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7"* (SRG, August 1992) the Pacific Place site was divided into Areas of Environmental Concern (AEC's), based on historical activities and the type of chemical parameters present. Results of the Phase 1 and 2 investigations and the supplementary sampling programs indicated that soil having chemical concentrations in excess of the Level B standards for residential land use is limited to distinct suspect zones or layers within the fill material. The chemical parameters and concentrations found in the suspect soils of each AEC are the result of former industrial activities. The AEC boundaries are shown in Figure 3 and the AEC's relevant to the excavation activities are described below.

The summary of soil contamination provided below is based on conditions found throughout the particular Area of Environmental Concern (AEC) during the Phase 1 and 2 Field Investigations. Extensive infilling (1 to 2 metres) of the Pacific Place site with granular material was conducted in 1983 and 1984 in preparation for Expo '86. Results of various investigations have indicated that the "Expo" fill generally consists of clean sand and gravel fill and meets the Level B standards. Therefore, the soil contamination described below has been found below the surface layer of "Expo" fill.

AEC 19 Lumber Yards

AEC 19 encompasses an area that was primarily occupied by lumber yards, saw mills and fuel (coal) storage sheds. Contamination exceeding the Residential and Industrial criteria for PAH and metals is mainly associated with shallow black-stained layers which are discontinuous throughout the AEC. Woodwaste debris in the form of woodchips and

rough cut wood, generally lies on the bottom 1 to 4.5 metres at the base of fill through the AEC. Some exceedances of the Residential criteria were noted in the non-stained samples.

3.2 Remedial Plan

3.2.1 General

The remedial plan pertaining to Parcel 4, Lot H, included a human health risk assessment and an evaluation of remedial alternatives. The remedial plan report, entitled "*Remedial Plans for Parcels 1, 4, 5A, 5B, 6A, 6C and 7*" was issued by the Pacific Place Remediation Project Group in September 1993. A copy of the relevant sections of the Remedial Plan is included in Appendix I.

The Remedial Plan recommended Option 1, the removal of soils necessary for development, and the risk assessment and risk management of soils left in place following excavation. Two classes of soils left in place were considered for the risk assessment: suspect soils and non-suspect (bulk fill) soils. The majority of the soils within 0.5 metres of the present surface of the site consist of non-suspect, bulk-fill soils that do not contain contaminants above either the Pacific Place Level B Standards or the CSR Residential Land Standards.

3.2.2 Human Health Risk Assessment

Because in situ management of some of the fill materials was contemplated during the remedial planning stage, a quantitative human health risk assessment was performed to estimate the potential human health risks arising from exposure to the Principal Contaminants of Concern (PCOC) at Parcel 4. For fill materials with contaminants above the residential standards, the risk assessment assumed the potential for direct contact between persons and the contaminated soils. In some areas of this Parcel, the potential for human health risks were identified if direct contact between receptors and contaminants such as metals or non-volatile organics could occur. The risk assessment concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (e.g., 0.5 metres of residential fill) remained as a separation barrier above the existing contaminated soils.

Under the CSR, certain contaminants may exceed the Residential Land use criteria that do not exceed the Pacific Place Level B Standards and therefore were not specifically included in the risk assessment. For metals and non-volatile organic contaminants (the PCOCs at this Site) the remedial measures involve covering of this soil with asphalt, concrete, or residential fill quality soil that cut off potential exposure. Therefore, the conclusion of the original risk assessment that the site is suitable for residential use does not change.

3.2.3 Groundwater

The fill materials remaining within Parcel 4, Lot H, were not expected to constitute a significant source of groundwater contamination. The field investigations for the Remedial Plan indicated that the historical groundwater contaminants of concern at this site were oil and grease, ammonia, chlorophenols, and PAH.

4.0 EXCAVATION AND REMEDIATION ACTIVITIES

4.1 Soils Management Procedures

The results of the Phase 1 and 2 and Supplementary Field Investigations, in combination with the Remedial Plan, were used to develop the soils and groundwater management procedures for the building excavation at Parcel 4H. The report is entitled "*Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4H Quayside Neighbourhood, Pacific Place*", (PPRPG; February, 1999) and are referred to as the Soils Management Procedures (SMP). The SMP outlines the general soil and groundwater handling, testing and reuse or disposal procedures that were followed during the excavation for building construction.

4.2 Excavation

Excavation activities associated with sheetpile driving commenced at Parcel 4H in July 1998. Following installation of the sheetpiles, bulk excavation of the fill on the site was conducted for the purposes of building construction. All excavation was complete as of January 1999.

Monitoring of the excavation was conducted by PPRP field technicians, who were responsible for directing the segregation and testing of all excavated soil in accordance with the SMP. The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated.

A total of approximately 28,000 m^3 of soil was excavated. Residential Fill quality soils that were predominantly mineral soils (approximately 12,000 m^3) were excavated and reused as fill at Ballantyne Pier, 1777 Bayshore Drive, and the Parcel 1 Roadway. Where soils classified as Residential Fill contained more than about 10% wood waste they were disposed of at the Robert Brown Landfill in Delta, BC or the Ecowaste Landfill in Richmond, BC. Approximately 11,000 m^3 of Industrial Fill (contaminants: metals, polycyclic aromatic hydrocarbons [PAH] and pentachlorophenol [PCP]) soil was disposed of at the Robert Brown Landfill in Delta (about 5,500 m^3) or, for Industrial Fill containing more than about 30% woodwaste, the Ecowaste Landfill in Richmond (about 5,500 m^3). Industrial Waste soils (about 1,100 m^3 contaminated with volatile petroleum hydrocarbons and PCP) were placed for storage in Parcel 1, pending use as fill for George Wainborn Park.

4.3 Confirmatory Closure Sampling and Fill Remaining

Following the removal of fill material to the building final grade, six till samples were taken at the locations indicated on Figure 5. Chemical analysis for PAH, and metals determined that five of the six the till samples were below the Residential Land use Standards in the CSR. The till sample from the south side contained PAH above the RL Standard and is classified as Industrial Fill. This material was black stained.

Under the building footprint and within the sheetpile walls, there were two areas of wood waste fill remaining at the completion of the excavation, as shown on Figure 6. About 25 m^3 of Industrial Waste woodwaste fill remains in the north-east corner and about 50 m^3 of Industrial Fill remains in the south-west corner of the site. On the east side of the Site, an eight metre wide strip of land is designated as Statutory Right of Way for the Cambie Street Bridge approach. Based on the observations in the excavation and the investigation programs, about 3,000 m^3 of fill remains in that area. In the fill about 1,000 m^3 is estimated to be Residential Fill quality, about 1,000 m^3 Industrial Fill quality mineral soil and about 1,000 m^3 of Industrial Fill quality woodwaste. Woodwaste is

inferred to be present to the north, east, and south sides of the property at thicknesses ranging from 1.5 m in the north, to 3 m in the south-east, and 4 m in the south portion of the site. The woodwaste is about 4 m below ground surface and is within the groundwater zone.

4.4 Groundwater

During the excavation of Parcel 4H, water quality was measured on 13 occasions between July 14, 1998 and November 25, 1998. Sample analyses indicated that toxicity, as measured by the acute trout bioassay (LC50) did not meet the criteria of 100% on two occasions, July 14 and July 22. The water was subsequently directed to the sanitary sewer under a permit (number SC980239) issued to Van Maren Construction by the City of Vancouver on July 13, 1998. Toxicity analyses in August and September indicated that the excavation water met the False Creek Standards. Due to concerns about odours from the excavation water, the sulphide levels were measured and found to exceed the sanitary sewer discharge limits. In September the water was redirected to the storm sewer. While excavation water was discharged to the storm sewer, only one parameter exceeded the applicable standard: zinc in a sample obtained on November 25, 1998. Elevated zinc had not been observed in the discharge on any other sample occasion.

Following completion of the building foundations, the water collected by the perimeter and underslab drains was sampled on four occasions between December 18, 1998 and February 15, 1999. The results of the analyses are included in Table 1. Based on the findings of the sampling, the groundwater collected by the building drains meets the False Creek Discharge Standards. The groundwater collected has been found to contain other compounds of concern not associated with Contaminants including dissolved methane and hydrogen sulphide.

4.5 Soil Gas

Prior to and during the excavation, the presence of soil gases including methane and hydrogen sulphide was detected. During the sheet pile anchor installation, minor explosions behind the sheet pile were noted when anchor holes were cut through the sheet pile. It was inferred that this was the result of an explosion of methane that collected

behind the sheetpiles. There was no indication that Contaminants were the source of either the methane or hydrogen sulphide.

The methane is produced mainly from the degradation of the woodwaste and since the majority of the woodwaste was excavated, the majority of the methane generation source was removed during the building excavation. The woodwaste fill material on the east side of the side and the two small areas of woodwaste under the building will continue to be potential sources of methane. The hydrogen sulphide gas appeared to be associated with the degradation of the wood fill material in an environment containing sulphate. The sulphate is a naturally occurring substance associated with sea water and marine sediments (that are native silts under the fill).

The developer and owner of the building installed a soil vapour ventilation system under the slab, venting to outside the building at roof level. A building perimeter vent system was installed just below the low permeability fills about 1.5 metres below site grade and vents into the landscaping around the building. The soil vapour venting system will assist in the removal of these soil gases. Potential contaminants on the site were not found to be associated with soil gas, however, the ventilation system installed would also assist in the removal of any contaminant soil gases generated.

5.0 MONITORING REQUIREMENTS

In our opinion, based on the results of the soil and water sampling, no continued groundwater monitoring for contaminants should be required for this building.

Although not the responsibility of the Pacific Place Remediation Project Group, it is important that provisions be made by the owner for regular monitoring of the methane and hydrogen sulphide ventilation systems to ensure they are functioning properly. This should include monitoring of the concentrations of gases in the sumps and ventilation pipes to ensure the concentrations of the gases do not exceed safe levels.

6.0 LIMITATIONS OF REPORT

The Pacific Place Remediation Project group has undertaken sampling and analysis programs and a risk assessment approach that have been reviewed and approved by B.C.

Environment. This program has followed the standard of care expected of professionals undertaking similar work in British Columbia at the time the work was undertaken, and under similar conditions. No other warranty is expressed or implied.

The risk assessment/risk management approach has been employed in the remediation of Parcel 4, Lot H. The risk assessment completed for Parcels 4, Lot H, was based on preventing direct contact with contaminated soil by providing a barrier of shallow soil that existed prior to construction. Any subsequent excavations or disturbances in areas where potentially contaminated fill material remains, which would result in human exposure to these soils, may render the conclusions of the risk assessment invalid and should be reviewed.

If new information is generated by others and becomes available to B.C. Environment, the Pacific Place Remediation Project Group and the undersigned should be contacted to review the results or modification plans, and to provide an opinion as to the findings and their implications on the Confirmation of Compliance Certificate issued for Parcel 4, Lot H.

PER:

D.R. Livingstone, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

Reviewed by:

R. Zapf-Gilje, Ph.D., P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

DRL/BHC

cc: K. Rosenberg, Sandwell Inc.
C. McIver, Fraser & Beatty
Golder File 932-1801/0462COC

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Contaminated Sites Regulation BC Reg 375/96 pursuant to the Waste Management Act, BCE 1997

TABLE 1: RESULTS OF WATER ANALYSIS - PARCEL 4, LOT H - STORM SEWER DISCHARGE

Class	Parameter	Sample Date	Sanitary Standard * Day Comp (mg/L)	False Cr. Standard ** (mg/L)	PB132-sump 98\12\18 (mg/L)	PB132-sump 99\01\14 (mg/L)	PB132-sump 99\01\22 (mg/L)	P4H-sump 99\02\15 (mg/L)
Total Metals	Aluminum		50		<1.0	1.4	<1.0	<1.0
	Antimony				<2	<1	<2	<2
	Arsenic		1		<1.0	<0.5	<1.0	<1.0
	Barium		5		0.4	0.3	0.5	0.5
	Beryllium				<0.05	<0.03	<0.05	<0.05
	Bismuth				--	--	--	--
	Boron		50		3.0	1.7	2.0	2.0
	Cadmium		0.2		<0.10	<0.05	<0.10	<0.10
	Calcium				377	263	346	356
	Chromium		4	0.5	<0.10	<0.05	<0.10	<0.10
	Cobalt		5		<0.10	<0.05	<0.10	<0.10
	Copper		2		<0.1	0.2	<0.1	<0.1
	Iron		10		1.9	2.9	0.4	0.4
	Lead		1		<0.5	<0.3	<0.5	<0.5
	Lithium				<0.10	0.09	<0.10	<0.10
	Magnesium				825	538	734	749
	Manganese		5		1.43	1.15	1.53	1.57
	Mercury		0.05	0.001	<0.00005	<0.00005	<0.00005	<0.00005
	Molybdenum		1		<0.3	<0.2	<0.3	<0.3
	Nickel		2		<0.5	<0.3	<0.5	<0.5
	Phosphorus				--	--	--	--
	Potassium				--	--	--	--
	Selenium				<2	<1	<2	<2
	Silicon				--	--	--	--
	Silver		1		<0.10	<0.05	<0.10	<0.10
	Sodium				6580	4190	5720	6040
	Strontium				--	--	--	--
	Thallium				<2	<1	<2	<2
	Tin		5		<0.3	<0.2	<0.3	<0.3
	Titanium				--	--	--	--
	Vanadium				<0.3	<0.2	<0.3	<0.3
	Zinc		3		0.06	0.11	<0.05	<0.05
Dissolved Metals	Aluminum			0.5	<1.0	<0.5	<1.0	0.3
	Antimony				<2.0	<1.0	<2.0	<0.2
	Arsenic			0.1	<1.0	<0.5	<1.0	<0.1
	Barium			1	0.40	0.26	0.50	0.08
	Beryllium				<0.05	<0.03	<0.05	<0.005
	Bismuth				--	--	--	--
	Boron			10	2.0	1.7	2.0	0.3
	Cadmium			0.05	<0.10	<0.05	<0.10	<0.01
	Calcium				371	260	344	37
	Chromium				<0.10	<0.05	<0.10	<0.01
	Cobalt			0.1	<0.10	<0.05	<0.10	<0.01
	Copper			0.1	<0.10	<0.05	<0.10	<0.01
	Iron				1.6	1.4	<0.3	0.2
	Lead			0.1	<0.50	<0.30	<0.50	<0.05
	Lithium				<0.10	0.06	<0.10	<0.01
	Magnesium				804	535	734	34
	Manganese				1.40	1.06	1.52	0.47
	Mercury				<0.00005	<0.00005	<0.00005	<0.00005
	Molybdenum			0.5	<0.30	<0.20	<0.30	<0.03
	Nickel			0.5	<0.50	<0.30	<0.50	<0.05
	Phosphorus				--	--	--	--
	Potassium				--	--	--	--
	Selenium				<2.0	<1.0	<2.0	<0.2
	Silicon				--	--	--	--
	Silver				<0.10	<0.05	<0.10	<0.01
	Sodium				6270	4190	5740	450
	Strontium				--	--	--	--
	Thallium				<2.0	<1.0	<2.0	<0.2
	Tin			0.5	<0.30	<0.20	<0.30	<0.03
	Titanium				--	--	--	--
	Vanadium				<0.30	<0.20	<0.30	<0.03
	Zinc			0.2	<0.05	<0.03	<0.05	0.01

(cont)

TABLE 1 (cont): RESULTS OF WATER ANALYSIS - PARCEL 4, LOT H - STORM SEWER DISCHARGE

Class	Parameter	Sample Date	Sanitary Standard * Day Comp (µg/L)	False Cr. Standard ** (µg/L)	PB132-sump 98\12\18 (µg/L)	PB132-sump 99\01\14 (µg/L)	PB132-sump 99\01\22 (µg/L)	P4H-sump 99\02\15 (µg/L)
PAH's	Acridine				<0.05	<0.05	<0.05	<0.05
	Acenaphthene				0.55	0.38	0.70	0.72
	Acenaphthylene				<0.05	<0.05	<0.05	<0.05
	Anthracene				<0.05	<0.05	<0.05	<0.05
	Benzo(a)anthracene				<0.05	<0.05	<0.05	<0.05
	Benzo(a)pyrene				<0.01	0.01	0.01	<0.01
	Benzo(b)fluoranthene				<0.05	<0.05	<0.05	<0.05
	Benzo(ghi)perylene				<0.05	<0.05	<0.05	<0.05
	Benzo(k)fluoranthene				<0.05	<0.05	<0.05	<0.05
	Chrysene				<0.05	<0.05	<0.05	<0.05
	Dibenzo(ah)anthracene				<0.05	<0.05	<0.05	<0.05
	Fluoranthene				<0.05	<0.05	<0.05	<0.05
	Fluorene				0.08	0.07	0.09	0.10
	Indeno(123-cd)pyrene				<0.05	<0.05	<0.05	<0.05
	Naphthalene				0.81	0.33	0.65	0.69
	Phenanthrene				0.06	0.08	0.06	0.09
	Pyrene				<0.05	0.06	<0.05	<0.05
	Total PAH's +		50	20	1.5	0.9	1.5	1.6
CP's	Total Trichlorophenols			6	<2.0	<2.0	<2.0	<2.0
	Total Tetrachlorophenols		50	6	<0.6	<0.6	<0.6	<0.6
	Pentachlorophenol		50	6	<0.2	<0.2	<0.2	<0.2
Non-halogenated VOC's	Benzene		15	15	<0.5	--	--	--
	Ethylbenzene		15	15	<0.5	--	--	--
	Toluene		15	15	<0.5	--	--	--
	meta- & para-Xylenes		50	50	<0.5	--	--	--
	ortho-Xylenes		50	50	<0.5	--	--	--
	Total Xylenes		50	50	<1.0	--	--	--
	Total BETX				<2.5	--	--	--
	LAH (c5-c9)				<100	--	--	--
VOC's	Chloroform				--	--	--	--
	Methylene Chloride				--	--	--	--
	1,1,1-Trichloroethane				--	--	--	--

(cont)

TABLE 1 (cont): RESULTS OF WATER ANALYSIS - PARCEL 4, LOT H - STORM SEWER DISCHARGE

Class	Parameter	Sample Date	Sanitary Standard * Day Comp (mg/L)	False Cr. Standard ** (mg/L)	PB132-sump 98\12\18 (mg/L)	PB132-sump 99\01\14 (mg/L)	PB132-sump 99\01\22 (mg/L)	P4H-sump 99\02\15 (mg/L)
	Mineral Oil & Grease		15		<5	--	--	--
	Oil & Grease		150	10	--	--	--	--
	Ammonia			15	1.42	--	--	--
	Total Suspended Solids		600	‡ 20	4	--	--	--
	WAD Cyanide		1	0.1	<0.005	--	--	--
	Total Cyanide		1		--	--	--	--
	Free Cyanide				--	--	--	--
	Total Phenols		1		--	--	--	--
	Total Organic Carbon				--	--	--	--
	pH (pH units)		5.5 - 9.5	6.5 - 8.5	6.80	6.80	7.24	6.93
Other	Conductivity (µS/cm)				27500	22600	32800	27700
	Temperature (°C)		<65 °C		13.1	11.2	12.4	12.4
	Bicarbonate				--	--	--	--
	Chloride		1500		--	--	--	--
	Sulphate		1500		--	--	--	--
	Sulphide		1		--	--	--	--
	TEH (c10-c30)				10.0	6.0	10.0	16.8
	VPH (c6-c11)				--	--	--	--
	EPH (c10-c18)				<0.1	--	--	--
	EPH (c19-c31)				--	--	--	--
	5 hour Biochem.Oxy.Demand		500		--	--	--	--
	Chemical Oxygen Demand				--	--	--	--
	Dissolved Oxygen				--	--	--	--
	96 hour LC-50 (%)		50 #	100	--	--	--	--
	Abietic Acid				--	--	--	--
	Chlorodehydroabietic Acid				--	--	--	--
	Dehydroabietic Acid				--	--	--	--
	Dichlorodehydroabietic Acid				--	--	--	--
Resin Acids	Isopimaric Acid				--	--	--	--
	Levopimaric Acid				--	--	--	--
	Neoabietic Acid				--	--	--	--
	Pimaric Acid				--	--	--	--
	Sandaracopimaric Acid				--	--	--	--

Notes:

1. * Minimum from "Greater Vancouver Sewerage and Drainage District Sewer Use Bylaw No. 164" or "City of Vancouver Sewer Use Regulation Bylaw No. 5320"
2. ** "Standards for Discharges Not from a Special Waste Facility Direct to False Creek or Storm Sewer"
3. + Total of PAH compounds listed
4. -- Not tested
5. ‡ 60 mg/L for excavation and dewatering operations
6. # Criteria taken from "Standard for Discharges Directed to Municipal or Industrial Effluent Treatment Works (Special Waste Management Act, Schedule 1.2)" Highlighted only if less than 100%.
7. Minimum exceedances are boxed.

LEGEND

PARCEL BOUNDARY

PROPOSED ROAD

EXISTING ROAD

(7) PARCEL NUMBER (BCELP)

N

ST. PAUL'S HOSPITAL

BURRARD STREET
HORNBY STREET
HOME STREET
GRANVILLE STREET
DAVIE STREET
DRAKE STREET
HELMCKEN STREET
SEYMOUR STREET
NELSON ST.
SMITHE STREET
ROBSON STREET
GEORGIA STREET
DUNSMUIR STREET
BEATTY STREET
BEATTY STREET LANE
PENDER STREET
ABBOTT STREET
TAYLOR STREET
CARRALL STREET
KEEFER STREET
COLUMBIA STREET
QUEBEC STREET
EXPO BOULEVARD
UNION ST.
PACIFIC BOULEVARD
PACIFIC STREET
BEACH AVENUE
RICHARDS STREET
HOMER STREET
HAMILTON STREET
MAINLAND ST.
CAMBIE STREET
BEATTY ST.
MARINASIDE CRES.
BEACH CRES.
HOMER ST.

7B 8 7A 6C3 6C1 6C2 9 5A 5B 6B 6A 4 3 2 1

FALSE CREEK

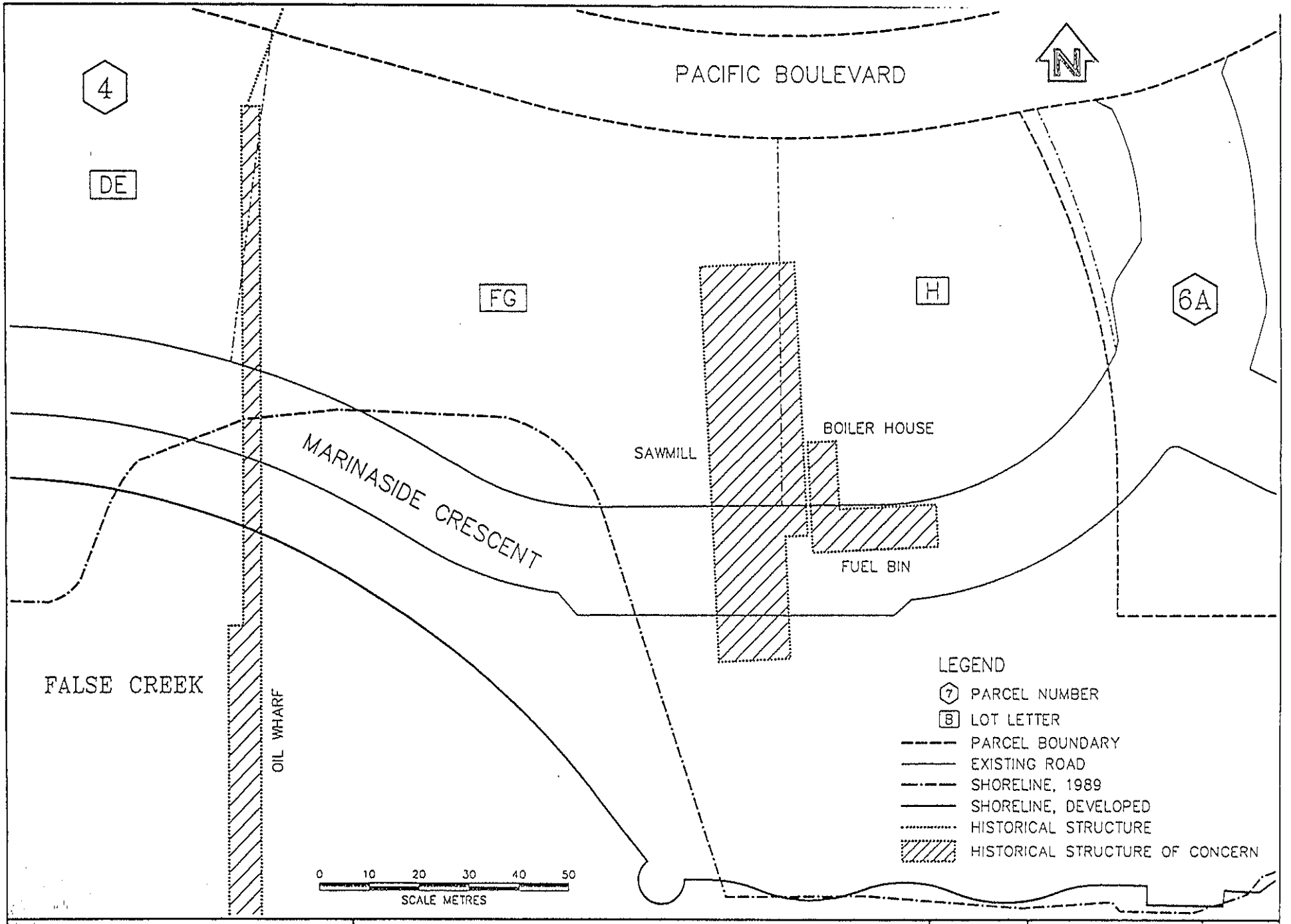
LOT H

0 100 200 300 400
SCALE METRES

PLOT: 1999/03/08, 1225

CAD FILE: C:\PPRP\1700\PP001746.DWG

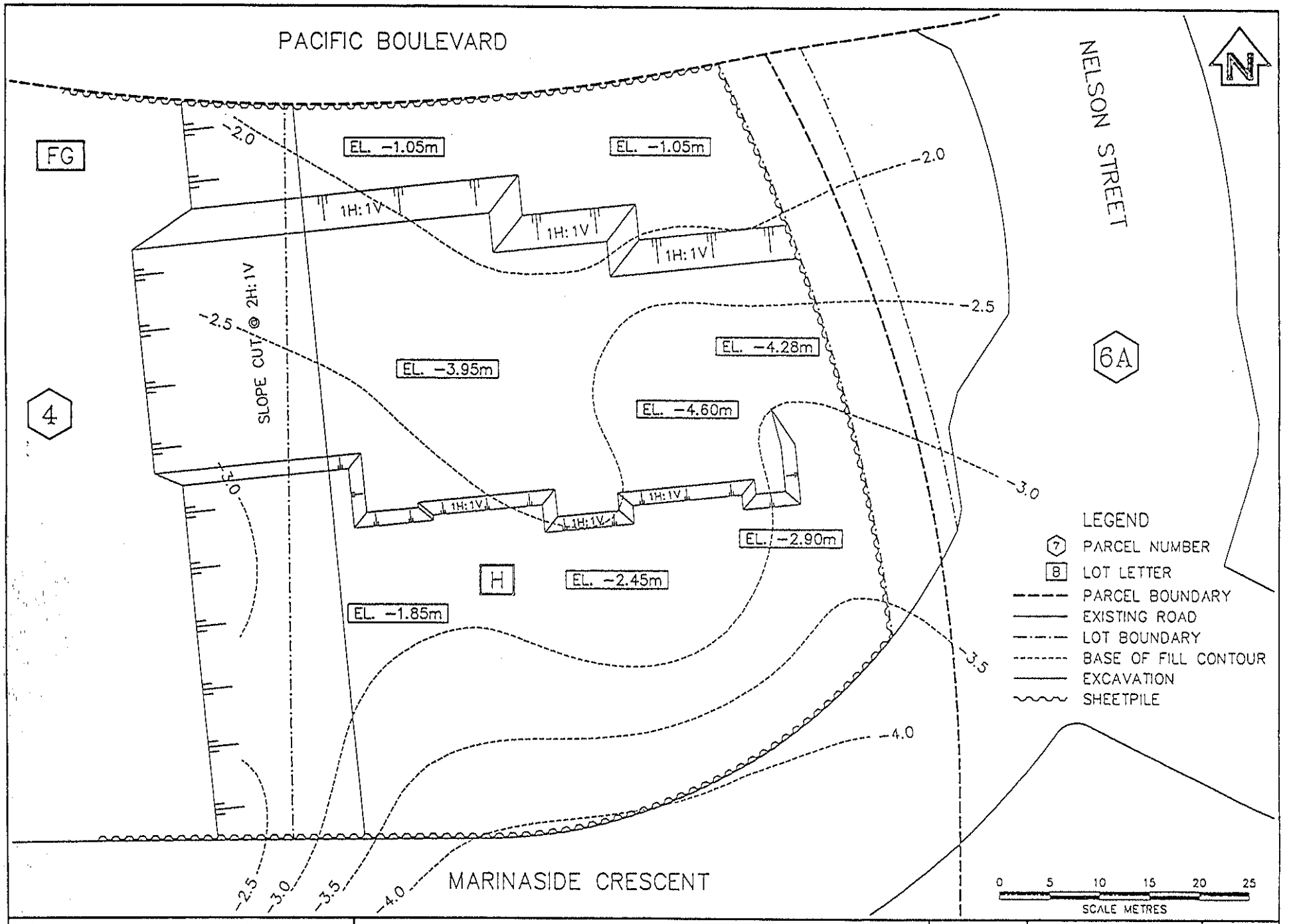
PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT H KEY PLAN	DRWN: NFT	REV: 0
		DATE: 1998/04/08	FIGURE: 1
			SCALE: 1:6000



PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT H HISTORICAL LAND USE SUMMARY	DRWN: NFT	DATE: 1998/04/08	REV: 1
		SCALE: 1:1000	FIGURE: 2	

CAD FILE: C:\PPRP\1700\PP001748.DWG

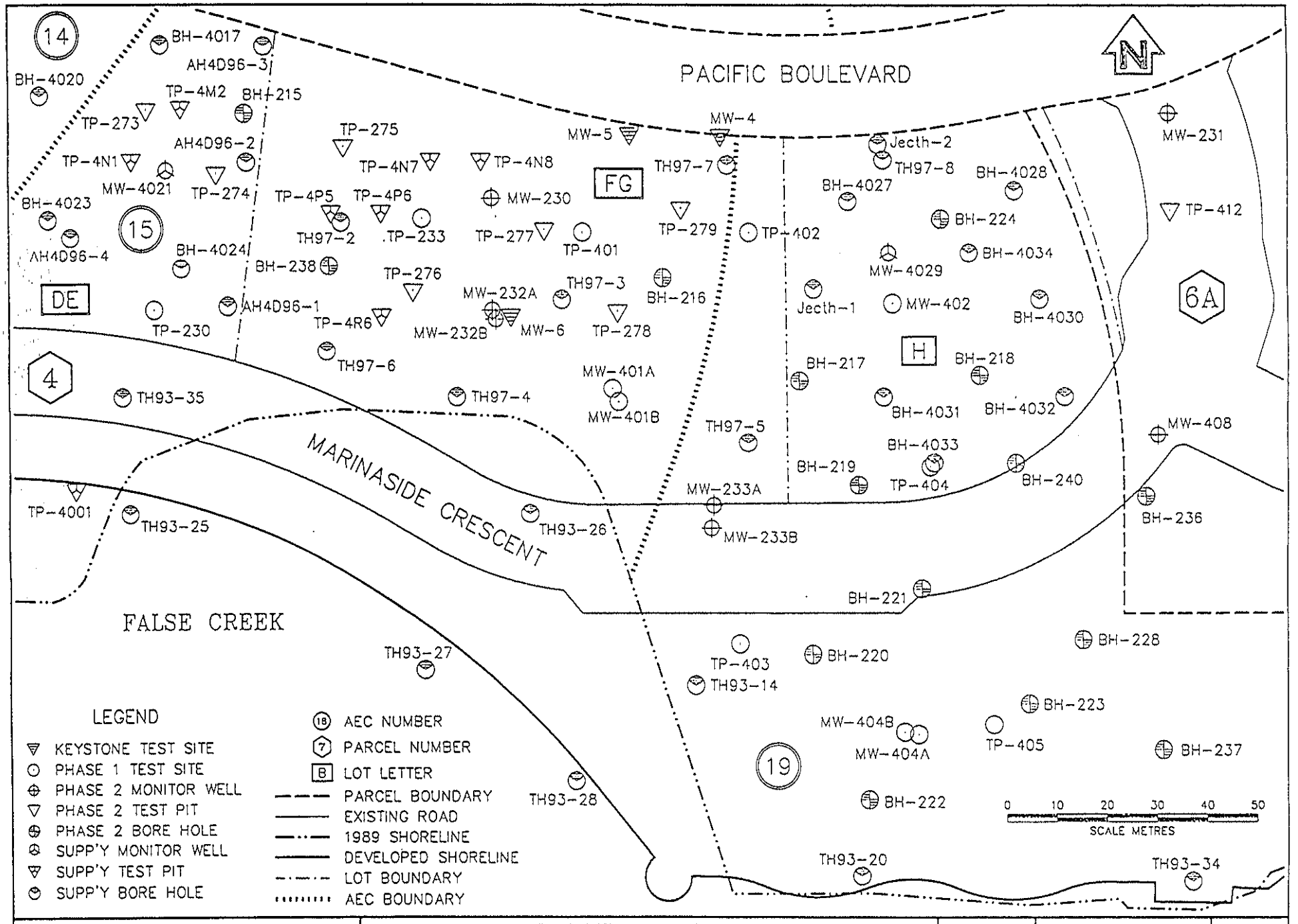
PLOT: 1999/03/05, 1500



PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT H CONSTRUCTION EXCAVATION PLAN	DRWN: NFT	DATE: 1998/04/23	REV: 1
		SCALE: 1:500	FIGURE: 3	

CAD FILE: C:\PPRP\1700\PP001750.DWG

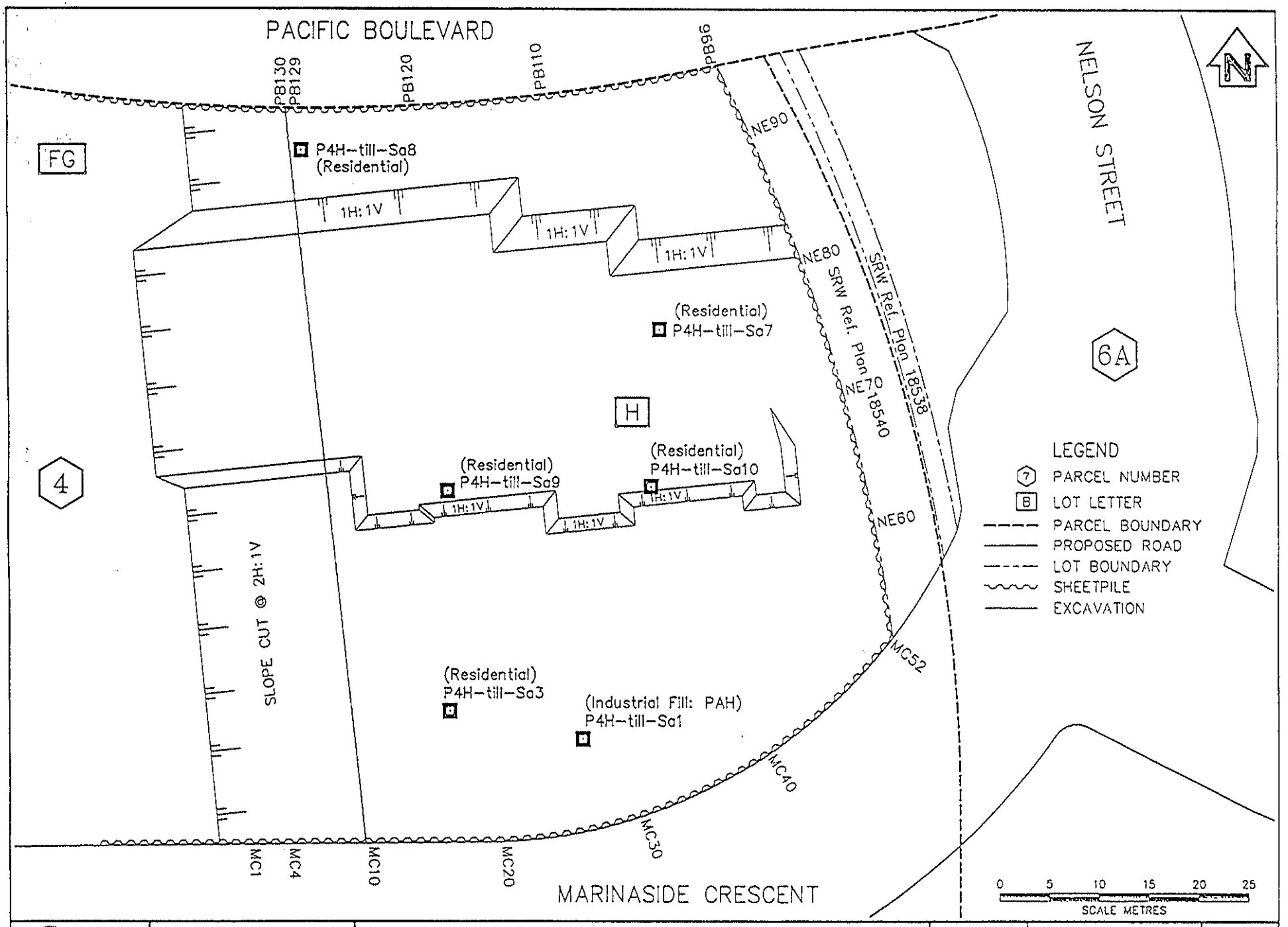
PLOT: 1999/03/05, 1511



PACIFIC PLACE REMEDIATION PROJECT	PARCEL 4 – LOT H TEST SITE LOCATIONS & AEC's	DRWN: NFT	DATE: 1998/04/08	REV: 2
		SCALE: 1:1000	FIGURE: 4	

CAD FILE: C:\PPRP\1700\PP001747.DWG

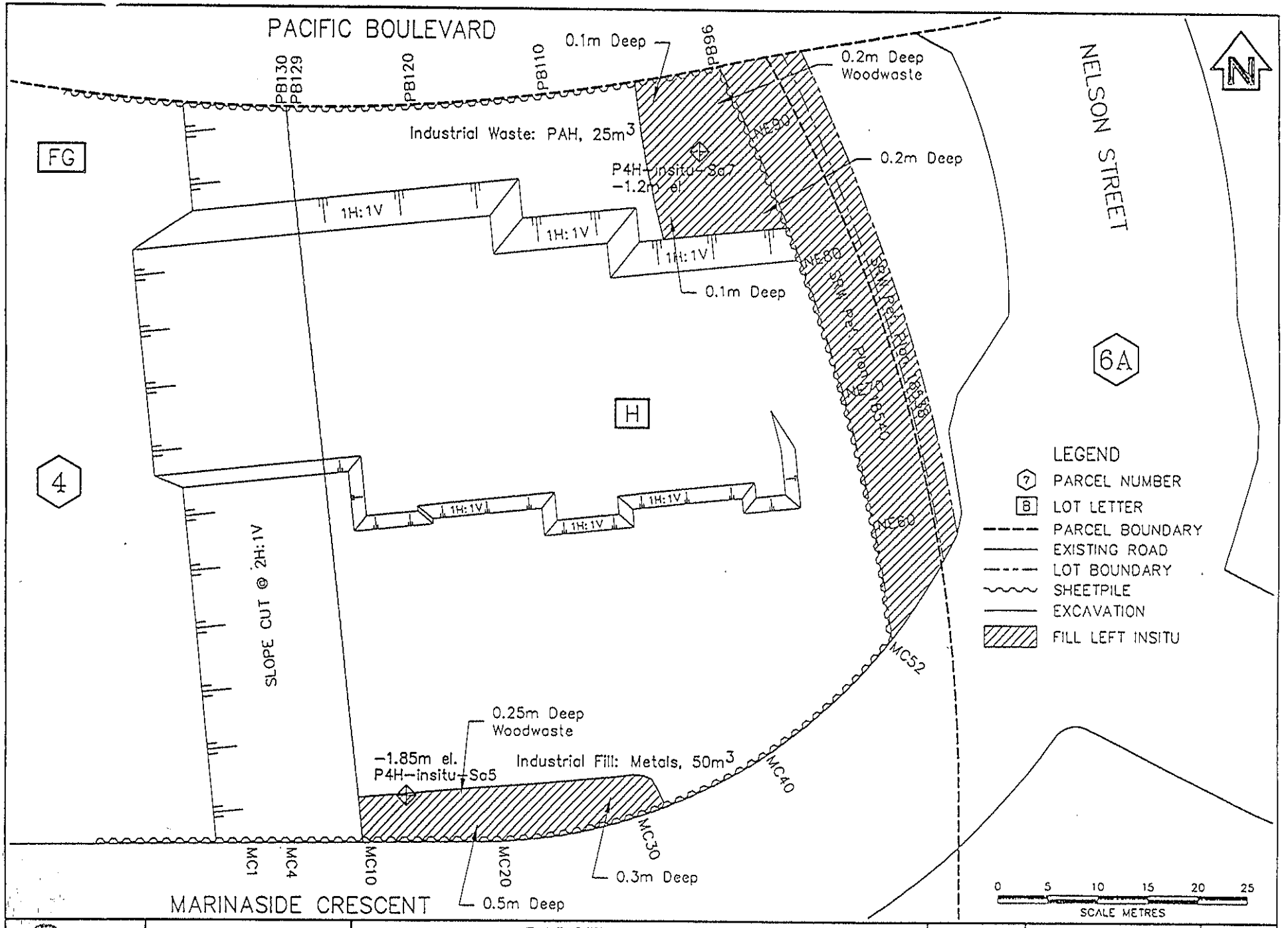
PLOT: 1999/03/05, 1454



Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOT H – CONFIRMATORY TILL SAMPLE LOCATIONS & RESULTS	DRWN: NFT	DATE: 1999/02/19	REV: 1
			SCALE: 1:500	FIGURE: 5	

CAD FILE: C:\PPRP\1700\PP001772.DWG

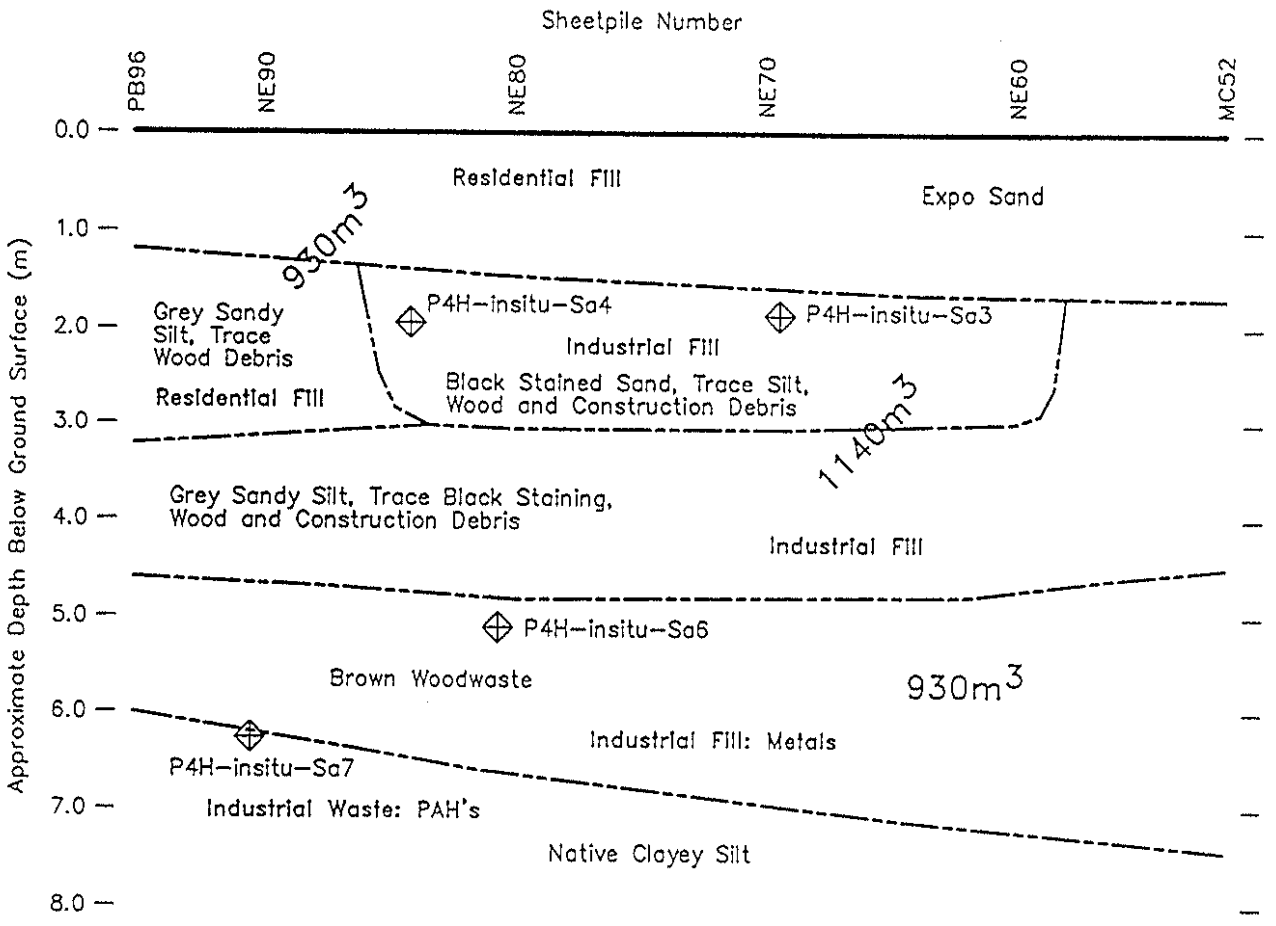
PLOT: 1999/04/13, 1331



Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOT H CLASSIFICATION OF MATERIAL LEFT INSITU	DRWN: NFT / DATE: 1999/02/19 / REV: 1 SCALE: 1:500 / FIGURE: 6	

CAD FILE: C:\PPRP\1700\PP001771.DWG

PLOT: 1999/04/13, 1326



0 5 10 15 20 25

SCALE METRES

Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOT H EAST ELEVATION: MATERIAL LEFT INSITU	DRWN: NFT	DATE: 1999/03/18	REV: 0
			SCALE: 1:400	FIGURE: 7	

CAD FILE: C:\PPRP\1700\PP001775.DWG

PLOT: 1999/04/13, 1332

2.0 PARCEL 4

2.1 GENERAL

Parcel 4 is situated in the central portion of the Pacific Place site at the foot of the Cambie Street Bridge. It is bordered by Parcels 2, 5A/5B and 6A to the west, north and east, respectively (Figure 2-1), and by False Creek to the south. Parcel 4 has a total land area of about 5.4 hectares, 96% of which has been reclaimed from False Creek by way of shoreline infilling (Figure 2-2). The total volume of fill material present within the parcel is on the order of 310,000 cubic metres[3].

Known historical land uses which likely resulted in the contamination of and/or deposition of fill material on Parcel 4 include an oil wharf, sawmills and lumber yards, a paint shop and work shops, railway sidings and associated activities, and a wood preservative dip tank operation.

Seven areas of potential environmental concern (AEC) have been identified on Parcel 4, based on the known historical land use and on delineation sampling conducted during Phases 1 and 2 of the SRG field investigations (Figure 2-3):

AEC 8 - Railway Lands (part)
AEC 14 - Infilled Shoreline
AEC 15 - Oil Wharf Area
AEC 17 - Fuel Pipeline Area
AEC 18 - Wood Preservative Dip Tank Area
AEC 19 - Lumber Yard (Part)
AEC 20 - Cambie Street On-ramp

The soil contamination, groundwater and soil vapour conditions associated with the above AEC are summarized in Sections 2.2, 2.3 and 2.4. Section I of this volume presents detailed AEC descriptions, while results of the Phase 1 and Phase 2 field investigations are presented in the RFI reports by SRG (1989c and 1992). It should be noted that the area presently referred to as Parcel 4 (in this Remedial Plan) was previously designated by CPDL as Parcel 2E and part of Parcel 4 and is so referenced in the RFI reports.

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3 Volume estimates do not include fill volume within 10 metres of the crest of the present shoreline, due to lack of data within this area.

2.2 SOIL CONTAMINATION

Parcel 4 encompasses a former embayment of False Creek that has been reclaimed using heterogeneous fill material, varying in thickness from 6 to 13 metres. The fill generally consists of silty sand to sandy gravel, with zones of demolition debris such as brick, wood, concrete, rock, coal and metal fragments, and extensive deposits of woodwaste ranging from sawdust and woodchips to large timbers.

A large portion of the fill material in Parcel 4 has been found to be extensively contaminated (above Level C), primarily due to the former presence of a chlorophenol (wood preservative) dip tank operation (AEC 18) and an oil wharf (AEC 15). Within AEC 18, concentrations of chlorophenols, PAH, LAH and some metals (mercury, copper and zinc) exceed the Level B (residential land use) and Level C (commercial/industrial land use) standards between depths of 0.5 to 6.5 metres below present ground surface. A limited zone of soil having chlorophenol concentrations in excess of the revised Special Waste guideline (60 ppm) is present adjacent to Pacific Blvd. N. Contamination in AEC 18 is identifiable in the field on the basis of black staining, and sweet musty solvent or oily/creosote odours.

Within AEC 15, concentrations of PAH and several metals (arsenic, copper, lead, nickel, tin and zinc) exceed the Level B and Level C standards in samples of the fill material, collected between depths of about 0.5 to 7 metres. Some concentrations of cadmium were also found to exceed Level B in this zone. Elevated concentrations of organic indicator parameters (oil & grease, TEH and LAH), some in excess of the Level C standards (where applicable), were also present in some samples. Contamination in AEC 15 is generally associated with black stained, woodwaste or debris zones and/or pockets having oily, solvent or creosote odours.

AEC 19 is considered to be an area having zones of moderate (Level B to C) contamination, based on the results of field investigations reported to date. In the northern portion of this AEC, concentrations of PAH in excess of the Level B and Level C standards were measured in some samples between depths of about 1 to 7 metres. The zone of elevated concentrations (generally black-stained with an oily or creosote odour) tends to become deep (7 to 10 metres) with proximity to False Creek. Small pockets of fill having metals concentrations exceeding the Level B and C standards are also present; these are typically associated with fill having significant debris content and black staining.

The estimated in-place volumes of fill expected to exceed the Level B standards in the Parcel 4 AEC with moderate to extensive contamination are:

	Level B to C	Level C to Special Waste	Special Waste
AEC 15 *	20,650m³	5,000m³	1,500m³
AEC 18 *	3,800m³	2,950m³	300m³
AEC 19**	36,000m³	3,200m³	800m³

* Volumes calculated based on results of delineation sampling.

** Volumes estimated based on frequency of Level B, Level C and Special Waste exceedances in black-stained soil volume.

Although no testing was conducted on the portion of Parcel 4 designated as AEC 17, it is expected that a limited volume of fill may be contaminated with hydrocarbons (diesel, oil, solvents, etc.) from the former fuel pipelines.

The remainder of Parcel 4 is expected to have relatively low or random levels of contamination, based on limited available data. AEC 14, a zone of repeated shoreline infilling, was tested at 4 locations; PAH concentrations (associated with oily staining and coal fragments) in excess of the Level B standards were measured in only 2 samples.

In AEC 8, random concentrations of metals and organic parameters, with rare exceedances of the Level B standards (i.e. oil & grease), are typical. The frequency of samples exceeding the Level B standard for one or more parameter is approximately 4%.

No elevated concentrations of chemical parameters were found in AEC 20, beneath the Cambie Street on-ramp.

Estimated in-place volumes of fill expected to exceed the Level B standards (in the less extensively or randomly contaminated areas of Parcel 4) are:

	Level B to C	Level C to Special Waste
AEC 8	3,100m³	0m³
AEC 14	1,400m³	0m³
AEC 17	1,700m³	300m³

2.3 GROUNDWATER

2.3.1 Hydrostratigraphic Units

From the results of the field investigations conducted to date on Parcel 4, three main hydrostratigraphic units have been identified.

- **Surficial fill material**, comprised of sandy silt to sandy gravel, debris (including brick, concrete and metal fragments) and a continuous woodwaste zone at the base of the fill on the eastern half of Parcel 4. The total fill thickness ranges from approximately 6 to 8 metres (increasing to the north) in the west portion of the parcel, and from about 6 to 13 metres (increasing to the south and southwest) in the eastern portion. The woodwaste zone varies in thickness from about 2 to 6 metres (generally increasing to the south) in the eastern portion of the parcel. The hydraulic conductivity of the fill material ranges from about 10^{-7} to 10^{-3} m/s, with higher values being representative of coarse granular fill or woodwaste.

- **Native sediments** comprised of a clayey silt/silty sand units, underlying the fill zone. These deposits are variable in thickness (absent to 9 metres) and have a hydraulic conductivity on the order of about 10^{-7} to 10^{-6} m/s.

- **The till unit** underlying the entire Pacific Place site, which has a hydraulic conductivity varying from approximately 10^{-9} to 10^{-7} m/s.

2.3.2 Groundwater Flow

The water table is located within the fill zone, at a depth of about 2.5 to 4 metres below present ground surface; it is located at greater depths toward the shoreline.

Under present conditions, the fill zone is the primary hydrostratigraphic unit of groundwater flow, with an estimated flux of 10,700 m^3/year to False Creek; flow is essentially horizontal. Groundwater also flows to a lesser extent (approximately 2,900 m^3/year) through the underlying silty sands. Details of groundwater modelling in this portion of the site are presented in Appendix E-1.

The principal direction of flow is to the south towards False Creek; groundwater flow from the western and eastern portions of Parcel 4 converges at the central shoreline area before discharging to False Creek (Figure 2-4).

Water levels in the higher permeability fill present near the shoreline of False Creek are likely affected by tidal fluctuations. While no specific monitoring of tidal effects has been conducted in Parcel 4, it is anticipated that maximum effects will be on the order of 0.5 metres near the shoreline.

2.3.3 Groundwater Contamination

Within Parcel 4, elevated concentrations of several chemical parameters are present in the groundwater (Figures 2-5 through 2-8). Parameters which were found to exceed the False Creek standards include oil and grease (10 to 800 mg/L in the eastern portion of the parcel), ammonia (2 to 16 mg/L, associated with woodwaste and shoreline areas), total PAH (20 to 530 µg/L near the oil wharf) and chlorophenols (up to 350 µg/L in the immediate vicinity of the former dip tank).

The total estimated pre-development PAH loading from Parcel 4 (and to a lesser extent, 6A) is approximately 11 kg/year.

2.4 SOIL VAPOUR

High soil vapour and combustible gas concentrations were detected within AEC 19, and were associated with degradation of the significant woodwaste within the fill zone of Parcel 4. Concentrations ranging from 45 to 100% of the lower explosive limit (LEL) were present at the northeast (MW-231) and southwest (MW-404A) portions of AEC 19 respectively.

Organic vapours (in the hundreds of ppm range) associated with the hydrocarbon contamination on AEC 15 and 18 were also measured during the field investigations.

2.5 RESULTS OF HUMAN HEALTH RISK ASSESSMENT

As discussed in Section 6 (Volume 1), no risks to human health, in excess of the Pacific Place standards, were found to be associated with the shallow soil which is to be left in-place following the proposed development. Shallow soils in the areas known to be extensively contaminated will be excavated for development.

2.6 DEVELOPMENT PLANS

Multi-storey residential dwellings, with some retail facilities, are planned for about 80% of Parcel 4. A park is planned for the east end of the parcel, and a bicycle path and pedestrian walkway will line the shoreline. A roadway and utility corridor is also proposed for the central area. Extensive excavation to an elevation of -2.7 metres geodetic (for subgrade structures) will take place to the south of Pacific Boulevard, while relatively minor excavation to +1.2 metres geodetic is planned for the small portion of Parcel 4 to the north of Pacific Blvd. (Figure 2-9). A public marina will be located in False Creek adjacent to the parcel. Boat launching will be available at the park located at the east end of the parcel.

2.7 IMPLICATIONS OF DEVELOPMENT

2.7.1 Effect of Development on Soil Contamination

Excavation for development of Parcel 4 will involve removal of fill and native materials to elevations of -2.7 metres geodetic to the south of Pacific Blvd. S. (PBS), and to 1.2 metres geodetic to the north of PBS. No excavation is presently planned for the southeastern end of the parcel.

The development of Parcel 4, as presently proposed, will require the excavation and removal of about 178,000 cubic metres of in-place fill and approximately 36,000 cubic metres of in-place native sediments and till. Excavation will take place primarily in AEC 14, 15, 18 and 19. Approximately 30,000 cubic metres of the excavated fill material is expected to have average concentrations between the Level B and C standards, 6,200 cubic metres between Level C and Special Waste, and 2,000 cubic metres in excess of the Special Waste criteria (expressed as in-place volumes).

The woodwaste zone having elevated concentrations of methane at the north end of Parcel 4 may be partially excavated for development.

2.7.2 Effect On Groundwater

Approximately 57% of the existing fill will be removed, including approximately 56% (by volume) of in-place soils estimated to exceed the Level B standards south of PBS. However, only about 33% of the soils exceeding the Level B standards in the dip tank area (AEC 18) will be excavated; approximately 4,750m^3 of soil expected to exceed the Level B, C or Special Waste standards (for chlorophenols, PAH and LAH) will remain following development. This will serve as a continuing source of groundwater contamination which, if left in place, may necessitate long-term treatment of groundwater collected from the building drains.

The building foundations will key into the base of fill materials and will cut off flow to False Creek. When the buildings are completed, an average of approximately 12,000 m^3/year from Parcel 4 and 15,000m^3/year (6.3 IGM) originating from False Creek will be collected from the building drains installed in the fill. Post-development flux to False Creek through the native sediments will be approximately 1,500m^3/year.

Details of the groundwater modelling completed for Parcel 4 are presented in Appendix E-1.

Groundwater seepage into most construction excavations within Parcel 4 will likely contain elevated concentrations of ammonia and organic parameters.

2.7.3 Conclusions

- Fill exceeding Level B for chlorophenols/PAH in the dip tank area north of PBS, that would remain following excavation for development, will serve as a source of groundwater contamination after development. As this will necessitate long-term groundwater treatment if left in-place, removal of the additional contaminated fill should be considered.

- Treatment of groundwater seepage into excavations during construction will likely be required. General chemical parameters of concern will likely include oil & grease, ammonia, PAH and chlorophenols (north of PBS). Locally, treatment for aluminum, lead, mercury and zinc in the groundwater may be necessary.

- Appropriate measures to eliminate the build-up of methane in subgrade structures should be implemented in the north portion of Parcel 4 or where woodwaste content is significant.

2.8 EVALUATION OF REMEDIAL OPTIONS FOR SOIL

2.8.1 Option 1 - Excavation for Development

Option 1 addresses the treatment and disposal requirements of soil that will be excavated as part of the development of the parcel. Approximately half of the soil on Parcel 4 that has been identified as having average contaminant concentrations above the Level B standards will be excavated as part of the site development. Approximately one quarter of the total amount of fill excavated from the site for development is expected to contain contaminant concentrations above the Level B standard. Unregulated disposal will likely be appropriate for the remaining fill.

As discussed in Section 8.0 (Volume 1), a number of remedial measures and technologies were evaluated for the contaminated soil on the Pacific Place site. Based on this evaluation, disposal in an industrial landfill is recommended for the Level B to C soil, and disposal in an authorized landfill is recommended for the Level C to Special Waste soil.

The risk assessment performed for Parcel 4 shows that no risk to human health is associated with the soil that would remain in-place following the excavation for site development. Therefore, no remedial measures to reduce the potential for human exposure to soil contamination are required.

The volume of contaminated soil that will be excavated from the site (including excavation swell factor) under Option 1 is summarized below:

SPECIAL WASTE

Owner/Developer Costs

Incineration of Special Waste organics	$ 75,000
Total estimated owner/developer construction cost for Special Waste soil	$ 75,000

B.C. Environment Costs

Incineration of Special Waste organics	$1,200,000
Total estimated B.C. Environment remediation cost for Special Waste soil	**$1,200,000**

2.10 CONCEPTUAL IMPLEMENTATION

The procedures that will be used during the development and remediation of Parcel 4 will be described in detail in a Groundwater and Soils Management Procedures document (SMP), that will be prepared prior to the initiation of the site development.

Detailed contaminant excavation plans for AEC 15, AEC 18 and AEC 19 will be developed as part of the SMP, based on the existing database. Some supplementary sampling may be included as part of the SMP.

During excavation for site development in areas having random contamination (i.e. AEC 14, AEC 8) suspect fill exhibiting staining, hydrocarbon odour or having a significant debris or woodwaste content will be segregated, stockpiled and sampled. The results of the laboratory analyses of the stockpile samples will be used to determine the disposal requirements of the soil. Non-stained non-odorous bulk fill can likely be disposed of without further testing.

2.11 SHORELINE

Although zones of extensive soil contamination are present on Parcel 4, the contaminants in the soil near the shoreline are primarily located at depth. As discussed in Section 5 (Volume 1), it is inferred that contamination in the proposed Shoreline Development is not likely to be exposed during the development.

As no human health risk in excess of the Pacific Place standards was identified for the remainder of Parcel 4, no potential risk is expected along the shoreline. Therefore, no remedial measures to reduce the potential for human exposure to contaminants are expected to be necessary along the shoreline.

Prior to construction, a detailed soils management plan for the contractor will be developed to define soils management procedures that will ensure safe handling and disposal of the soils during construction along the shoreline. Excavations in any suspected contaminated areas may require specific remedial consideration including installation of temporary barriers to limit contamination of False Creek during the excavation process, collection of seep water from excavations into a settling tank or basin, and testing prior to discharge.

As limited data are available for the shoreline, reconnaissance sampling and soils testing at excavation sites prior to and during development will be completed in order to identify the need for any exposure control measures and to determine the disposal requirements of any excavated soil. Certain areas may not be easily sampled prior to development because of the existing materials (rip rap, etc.).

2.12 MONITORING REQUIREMENTS

Under Options 1 or 2, monitoring of the site following development will be required. Although a potential human health risk has not been identified with leaving contaminants in-place, the presence of low concentrations of semi-volatile constituents in the soil would necessitate conducting regular ambient air monitoring under Option 1.

Some limited amounts of inaccessible Special Waste will remain in-place at depths up to 10 metres on the parcel following development (under all three options). BC Environment will likely require that monitoring of the waste be conducted to ensure that no significant releases to the environment occur.

As detectable concentrations of methane have been found in the soil, monitoring for the presence of methane is recommended under all three options. The monitoring for methane is necessary to determine if the passive venting is sufficient, or if an active system would be needed.

5.0 PARCEL 6A

5.1 GENERAL

Parcel 6A is situated to the south of B.C. Place Stadium and southwest of the Plaza of Nations (Figure 5-1). It is bordered to the north by Pacific Blvd. S., to the west by Parcel 4, and to the south by False Creek. The total area of the parcel is approximately 3.4 hectares; this entire area was reclaimed from False Creek via shoreline infilling (Figure 5-2). The total volume of fill material (based on available borehole information) to within 10 metres of the crest of the shoreline is estimated to be about 210,000 cubic metres. A substantial portion of this volume consists of material dredged from False Creek in the early to mid-1980's and deposited for construction of Expo.

Other historical activities which may have resulted in the deposition or contamination of fill within Parcel 6A include sawmills and lumber processing industries, a cooperage (barrel making) factory with blacksmith shop, and coal storage.

Four areas of potential environmental concern (AEC) have been defined/delineated on Parcel 6A, as follows (Figure 5-3):

AEC 19 - Lumber Yards (part)
AEC 24 - Mixed Industrial Area (part)
AEC 25 - Recently Placed Fill
AEC 26 - Lumber Industries Area

It should be noted that limited study was conducted on AEC 24 and AEC 25.

Soil contamination, groundwater and soil vapour conditions within the above AEC are outlined in Sections 5.2, 5.3 and 5.4 below. Detailed descriptions of the AEC are given in Section I of this volume of the Remedial Plan. Results of the field investigations conducted on Parcel 6A (formerly referred to by CPDL as part of Parcel 4) are presented in their entirety in the Phase 1 and 2 overall site RFI reports by the SRG (1989e and 1992).

5.2 SOIL CONTAMINATION

The fill zone of AEC 26 was found to be extensively contaminated with metals, PAH, and other organics indicated by elevated oil & grease, TEH and LAH concentrations. Arsenic, copper, lead, tin and zinc concentrations exceeding the Level B and Level C standards were detected in some samples collected from the debris zone (generally black-stained) between depths of about 1.5 to 7 metres. Level B exceedances of cadmium and mercury were also found in this area.

Concentrations of PAH were generally observed to be between Level B and C, with occasional Level C exceedances of individual PAH compounds. Elevated oil & grease and LAH concentrations, some indicative of pockets of Special Waste, are also present.

Elevated TEH and LAH concentrations, including free product hydrocarbon tentatively identified as motor oil, was detected in the southeast corner of AEC 26. Although limited data is available to the east of Parcel 6A, the preliminary delineation of the contamination suggests that hydrocarbons extend onto Parcel 6B, the former B.C. Enterprise Centre property (now referred to as the Plaza of Nations). Data suggest the contamination affects virtually all of AEC 26.

AEC 24 is expected to have random concentrations of metals and PAH within the fill (4 to 6.5 metres in thickness) due to the former mixed industrial land uses. However, only one discrete sample collected from AEC 24 was found to exceed Level B (for individual PAH compounds). On the basis of the limited testing conducted in this area and data collected in AEC having similar land uses, an estimated 10% of the total fill is expected to have average concentrations in excess of the Level B standards.

AEC 19 is considered a zone of moderate contamination; however, the majority of the contaminations in AEC 19 is located in Parcel 4 (Section 2, Volume 2), with minor amounts remaining at depths up to 10 metres in Parcel 6A. No volume of contaminated soil has therefore been included below as the estimated volume was included in the Parcel 4 Remedial Plan discussion.

Results of the limited field investigations conducted on AEC 25, an area comprised (at surface) of recently dredged sediments from False Creek, indicate that the fill material has low concentrations of all parameters analyzed, and no exceedances of the Level B standards. On this basis, it is assumed that no definable volume of soil within the AEC will have average concentrations in excess of Level B.

The estimated volumes of in-place contaminated fill present in Parcel 6A are as follows:

	Level B to C	Level C to Special Waste	Special Waste
AEC 24	2,900m^3	0m^3	0m^3
AEC 25	0m^3	0m^3	0m^3
AEC 26	9,400m^3	12,350m^3	250m^3

5.3 GROUNDWATER

5.3.1 Hydrostratigraphic Units

The three main hydrostratigraphic units on Parcel 6A are as follows:

- **Heterogeneous fill material**, comprised of mainly sand with some gravel and trace to some silt and clay, with demolition debris and woodwaste at depth. Just south of Pacific Blvd., the fill is comprised of sands and gravels with variable amounts of silt and clay. Prominent zones of woodwaste also occur at the eastern boundary of the Parcel. The thickness of the fill ranges from about 5 to 11 metres, increasing toward the shoreline of False creek. The hydraulic conductivity is typically on the order of 10^{-5} to 10^{-3} m/s, generally increasing toward the shoreline.

- **Native sediments** comprised of silty sand to clayey silt, which are overlain by the fill. Silty sand is generally present just south of Pacific Boulevard; the unit tends to grade into clayey silt towards False Creek, south of the original shoreline. The thickness of the native sediments is not well defined.

- **Sandy silt to silty sand till** underlying the native sediments, having a hydraulic conductivity on the order of 10^{-9} to 10^{-7} m/s.

5.3.2 Groundwater Flow

The water table is situated within the fill zone of Parcel 6A, at a depth of about 4 to 5 metres below the existing ground surface. The primary unit for groundwater flow is the relatively permeable fill; flow is generally to the south and southeast toward False Creek.

The estimated pre-development groundwater flux to False Creek (Figure 5-4), determined using a groundwater model described in Appendix E-1 (Volume 3), is approximately 4,900 m^3/year through the fill zone, and on the order of 70m^3/year through the native sediments beneath the fill.

5.3.3 Groundwater Contamination

Elevated concentrations of ammonia (1 to 10 mg/L) are present in groundwater in the vicinity of the extensive woodwaste zones at the eastern end and western edge of the Parcel (Figure 5-5). These are likely a result of the degradation of organic matter (especially woodwaste) within the fill. Oil & grease concentrations in excess of the False Creek standards (10 to over 100 mg/L) were also measured in AEC 26 (Figure 5-6). Locally, slightly elevated PAH concentrations (10 to 15 µg/L) are also present (Figure 5-7). The estimated PAH loading from Parcels 4 and 6A (majority from Parcel 4) is 11 kg/year.

5.4 SOIL VAPOUR

Concentrations of combustible gas, identified as primarily methane, were found to range from 10 to 82% of the lower exposure limit along the eastern edge of the parcel (AEC 26). Along the western end of the parcel, combustible gas concentrations up to 100% or the LEL have been detected. These levels are likely the result of the decomposition of organic matter within the fill (i.e., woodwaste and hydrocarbon contamination).

Preliminary data indicating elevated soil concentrations of total extractable hydrocarbons suggested the potential for volatile organic compounds (VOC). Specifically, an area in the southeastern portion of AEC 26 where a limited amount of apparently free product was encountered was considered to be an area potentially having elevated concentrations of VOC. However, subsequent soil gas sampling, in conjunction with an investigation of Parcel 6B, did not detect the presence of volatile organics in the soil gas.

5.5 RESULTS OF HUMAN HEALTH RISK ASSESSMENT

As discussed in Section 6 (Volume 1), no risk to human health in excess of the Pacific Place standards has been identified associated with the shallow randomly contaminated soil that would remain in-place following the development of the site. Shallow extensively contaminated soil (in AEC 26) will be removed as part of development and no potential human exposure pathway exists for the remaining contamination.

5.6 DEVELOPMENT PLANS

A shoreline park, together with a bicycle path and pedestrian walkway, are presently planned for the southern portion of Parcel 6A. Multi-storey residential condominiums/townhouses will cover most of the northern portion, and a roadway and associated service corridor will cross through the central part of the Parcel, roughly parallel to Pacific Blvd. South (PBS) and the False Creek shoreline. Excavations to an elevation of -1.35 metres geodetic are planned for subgrade structures immediately south of PBS; the remaining excavations will extend to 0.0 metres geodetic (Figure 5-8).

5.7 IMPLICATIONS OF DEVELOPMENT

5.7.1 Effect of Development on Soil Contamination

Excavation for development of Parcel 6A will result in the removal of an estimated of 58,000 cubic metres (27%) of in-place fill material and about 2,000 cubic metres of native soils for the construction of subgrade parking structures and foundations. Approximately 21% or 12,300 cubic metres of in-place fill exceeding Level B will be excavated.

5.7.2 Effect of Development on Groundwater

According to the present development plans, foundations will extend to an elevation of -1.35 metres geodetic immediately south of Pacific Boulevard, and 0.0 metres geodetic along the central area of the Parcel. The effect of development will be the interception and redirection of groundwater flow by the buildings and associated perimeter drains. The total groundwater flux to False creek is expected to be reduced by approximately two thirds, to about 1,700m^3/year, through both the fill and native sediment zones (Appendix E-1 Volume 3).

Although a majority of the metals - contaminated fill will be removed as part of development, it is expected that hydrocarbon-contaminated fill will remain in place below and to the south of the excavation area on Parcel 6A. This fill could serve as a long-term source of groundwater contamination which will discharge to False Creek.

5.7.3 Conclusions

- No risk to human health has been identified associated with the shallow soils that will remain in-place following the development.
- Organic-contaminated soil not excavated for development in AEC 26 may serve as a long-term potential source of groundwater contamination which may impact False Creek.
- Some fill in AEC 26, having elevated combustible gas concentrations and organic vapours, will not be removed as part of development, hence monitoring of this area will be necessary if the fill is left in-place.

5.8 EVALUATION OF REMEDIAL OPTIONS FOR SOIL

5.8.1 Option 1 - Excavation for Development

Option 1 consists of the removal of only those soils that will be excavated as part of the development of the parcel. At Parcel 6A, the majority of the soil proposed for excavation in AEC 24 and 25 does not contain definable zones with concentrations in excess of the Level B standards. Unregulated disposal is appropriate for the majority of the soil excavated from these AEC. However, a limited percentage of the total fill excavated from AEC 24 (south half) is expected to have average concentrations between the Level B and C standards, and will require disposal in an industrial landfill, as discussed in Section 8 (Volume 1).

A major portion of the fill excavated from AEC 26 for the site development is expected to contain contaminant concentrations that exceed the Level B standards. Disposal in an industrial landfill is required for the soil containing concentrations between Level B and C, and disposal in an authorized landfill is required for the soil containing concentrations between Level C and Special Waste.

The risk assessment performed for Parcel 6A indicates that no risk in excess of the Provincial standards is associated with the soil that will remain in-place following the site development. Therefore, additional remedial measures to reduce or eliminate the potential for human exposure to the remaining contamination are not required.

5.10 CONCEPTUAL IMPLEMENTATION

The remediation of Parcel 6A will be performed in conjunction with the development of the parcel. Supplementary sampling (e.g. in AEC 26) may take place prior to remediation. During the excavation for site development, soil known or suspected of containing contaminants above the Level B standards will be segregated (based on visual, olfactory, and vapour monitoring observations, as well as available data), stockpiled and sampled. The results of the laboratory analyses of the samples of the stockpiled material will be used to determine the disposal requirements for the soil. A detailed excavation plan will be developed for AEC 26 based on the available database and any supplementary sampling information.

Much of the soil excavated from the remainder of site is not expected to contain contaminants at concentrations above the Level B standards. However, during the excavation of these areas (AEC 24 and 25), suspicious soil (i.e. black stained or odourous) will be segregated and stockpiled for sampling and analyses. Non-stained, non-odourous bulk fill will likely be suitable for disposal with no or minimal additional testing.

The procedures that will be used during the development and remediation of Parcel 6A will be described in detail in a Groundwater and Soils Management Procedures document, which will be prepared prior to the initiation of the site development.

5.11 SHORELINE

Based on the data from the adjacent AEC, contamination along the shoreline is expected to be primarily randomly distributed. However, the data from the southeast corner of AEC 26 suggests that hydrocarbon contamination, as indicated by LAH, may be present along a small portion of the shoreline.

The risk assessment performed for Parcel 6A did not indicate that a risk to human health in excess of the Pacific Place standards exists. Assuming the same contaminants are present along the shoreline as in the adjacent AEC, a potential human health risk is not likely to be present along the shoreline. Therefore, additional measures to reduce or eliminate the potential for human exposure should not be necessary.

Prior to construction, a detailed soils management plan for the contractor will be developed to define soils management procedures that will ensure safe handling and disposal of the soils during construction along the shoreline. Excavations in any suspected contaminated areas may require specific remedial consideration, including installation of temporary barriers to limit contamination of False Creek during the excavation process, collection of seep water from excavations into a settling tank or basin, and testing prior to discharge.

As limited data is available for the shoreline, reconnaissance sampling and soils testing at excavation sites prior to and during development will be conducted to identify the need for any exposure control measures and to determine the disposal requirements of any excavated soil. Certain areas may not be easily sampled prior to development because of the existing materials (rip rap, etc.)

5.12 MONITORING REQUIREMENTS

As some Special Waste would remain in situ under Option 1, a long-term monitoring program would be implemented. The potential for exposure to the contamination is very low due to the depth of the contamination. However, monitoring of groundwater quality discharging to False Creek would likely be necessary.

Under Option 1, ambient air monitoring of the site following development will be required. The presence of hydrocarbon in the soil remaining after site development necessitates conducting regular ambient air monitoring. Monitoring for the presence of methane will also be necessary under Options 1 and 3 to evaluate the effectiveness of the passive venting system.

Monitoring during construction will be performed using portable field instruments. The monitoring will be conducted in accordance with the health and safety plan prepared for the site work.

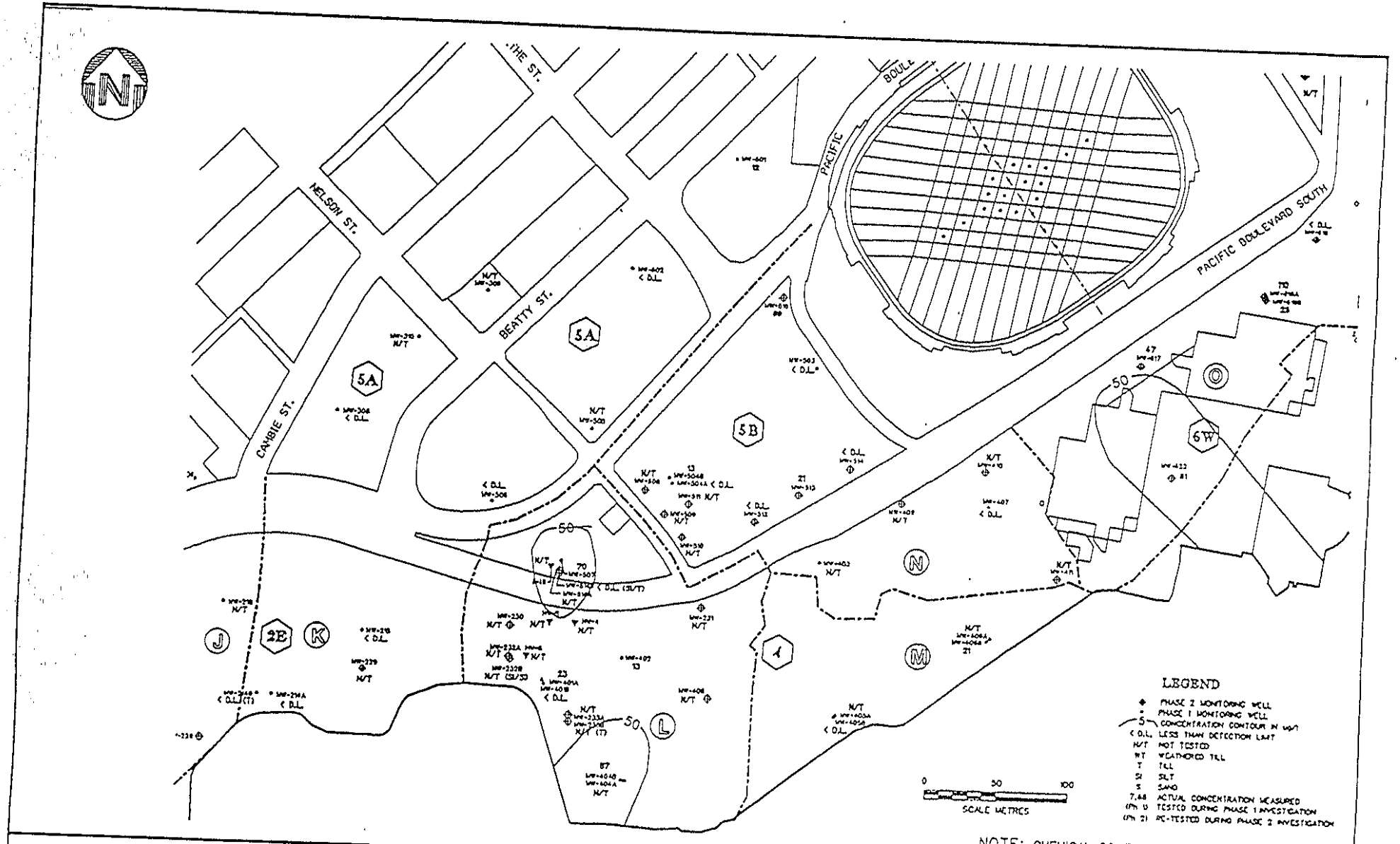
Ambient air monitoring following development should consist of the collection of time-series ambient air samples on a quarterly basis for the first two years. Ambient air samples should be collected in the subgrade parking structures, since the compounds present at the site tend to accumulate in low areas when in a gaseous state. If no significant concentrations of methane or LAH are detected during this period, then the frequency can be reduced. It is estimated that the ambient air monitoring for Parcel 6A will cost approximately $20,000 annually for the first two years.

development will serve as a long term source of groundwater contamination, resulting in potential impacts to False Creek.

Option 3 provides for removal of all the accessible contaminated soil that exceeds the Level B standards. Removal of the additional contaminated soil will significantly reduce the potential for groundwater contamination and any associated impacts on False Creek. Implementation of Option 3 would also eliminate the need for in-situ management of Special Waste, and that the long-term requirements associated with such management.

Based on a technical evaluation of the two options, the SRG recommends to B.C. Environment that Option 3 be implemented for the remediation of Parcel 6A.

Option 3 is the logical recommendation to provide protection of the environment. However, due to the uncertainty regarding the proposed future use of the parcel (in light of the rezoning of the Parcel proposed by the developer), it may be prudent to defer the decision on the most appropriate remedial option until the development plans for Parcel 6A have been finalized. It may be possible to incorporate a groundwater extraction and treatment system into the development of the parcel, resulting in a more cost effective method of preventing potential impacts to False Creek.



NOTE: CHEMICAL CONTOURS INFERRED FOR THE FILL

PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	TOTAL CYANIDE CONCENTRATION IN GROUNDWATER CENTRAL (2 OF 3)	DRWN By: TH	REV. No: 2 NFT DRAFT
		DATE: 9 NOV 90	FIGURE: 2-9

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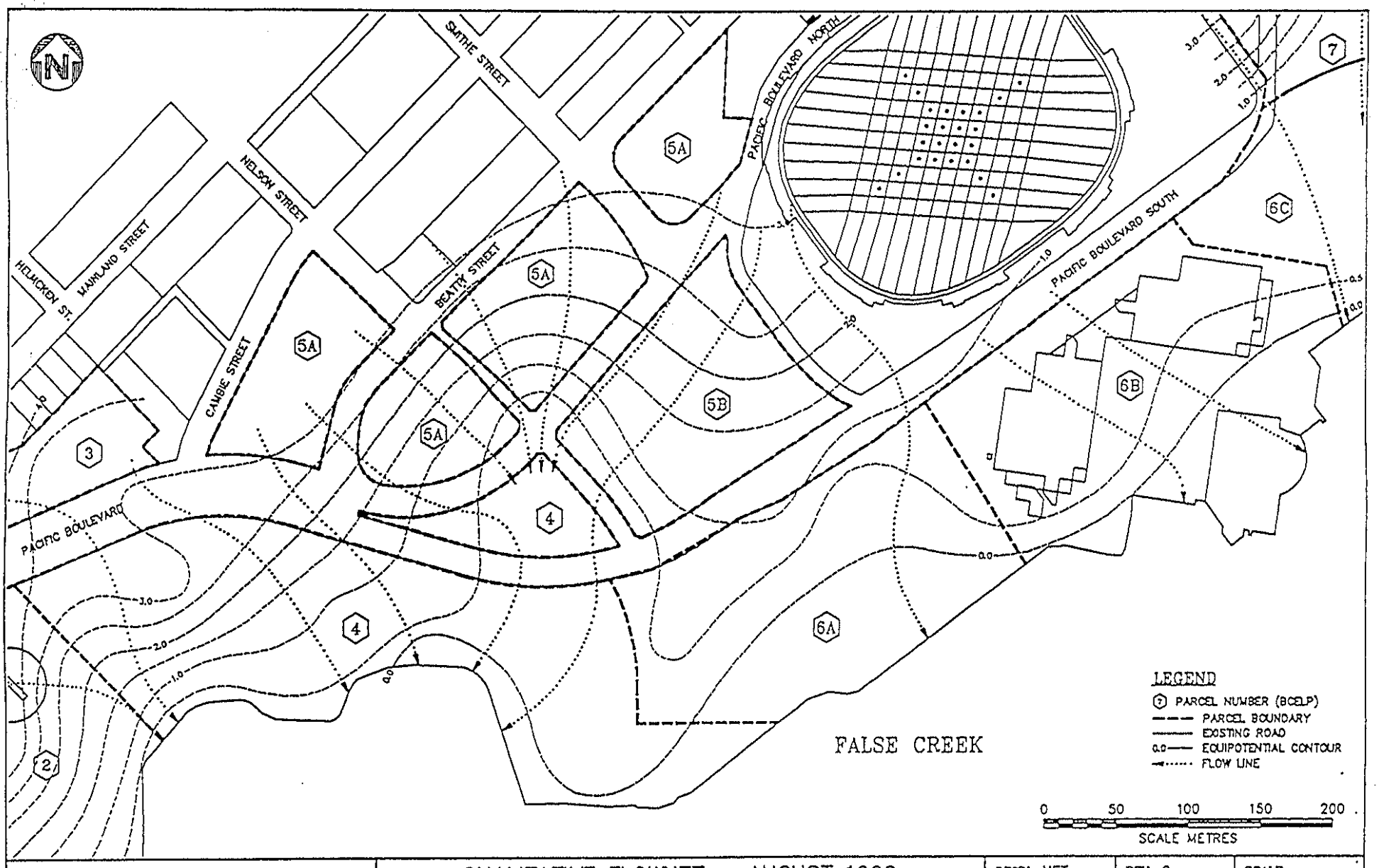
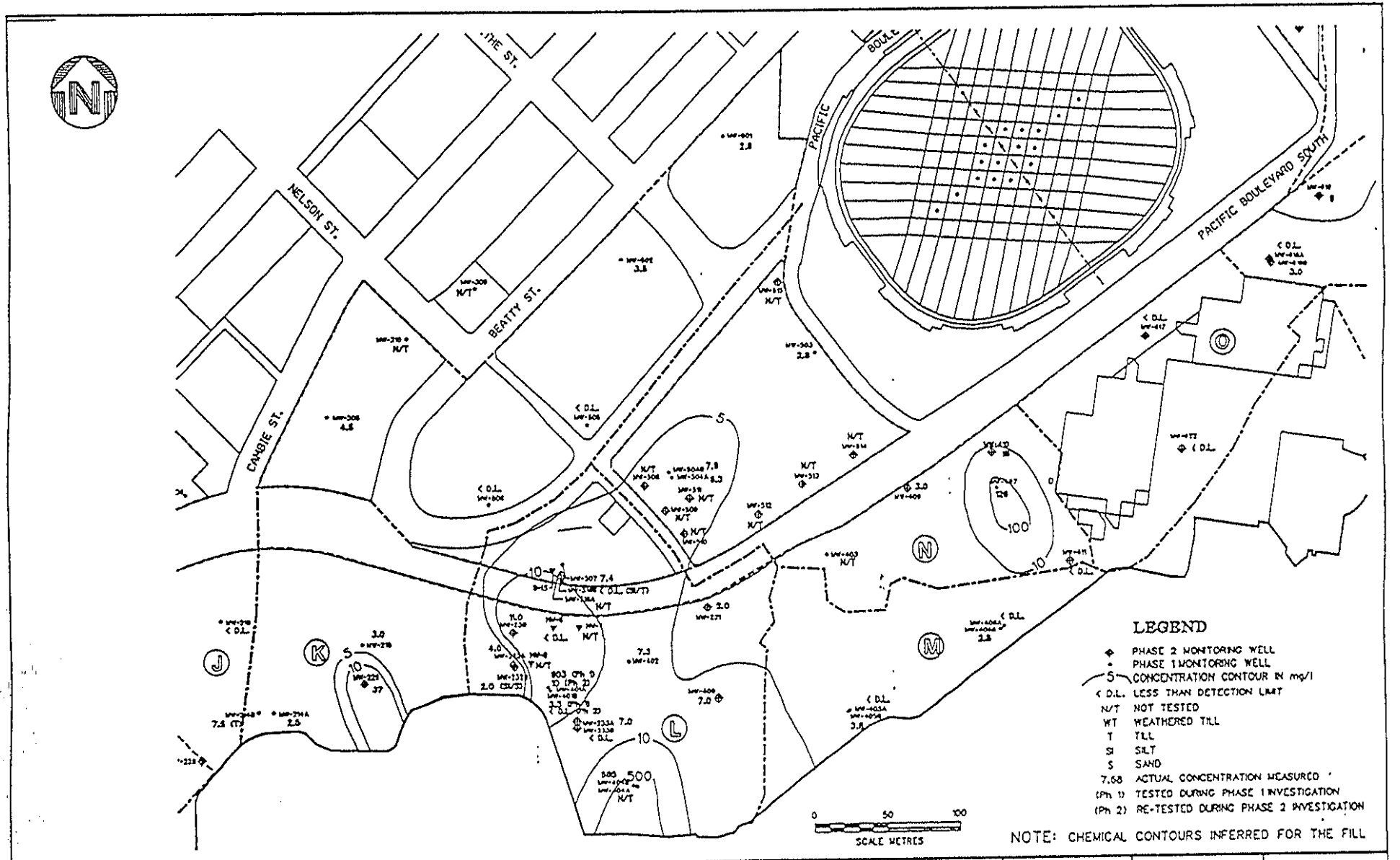


PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	QUALITATIVE FLOWNET – AUGUST 1990 CENTRAL (2 OF 3)	DRWN: NFT	REV: 0	SCALE:
		DATE: 12 DEC 91		FIGURE: 2–4

CAD FILE: C:\SRC\PP001139.DWG PLOT: 1955 – 27 JAN 92

215-1



PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	OIL & GREASE CONCENTRATION IN GROUNDWATER CENTRAL (2 OF 3)	DRWN BY: TH	REV. No 2 NFT	DRAFT
		DATE: 6 NOV 90	FIGURE: 2-6	

J-512

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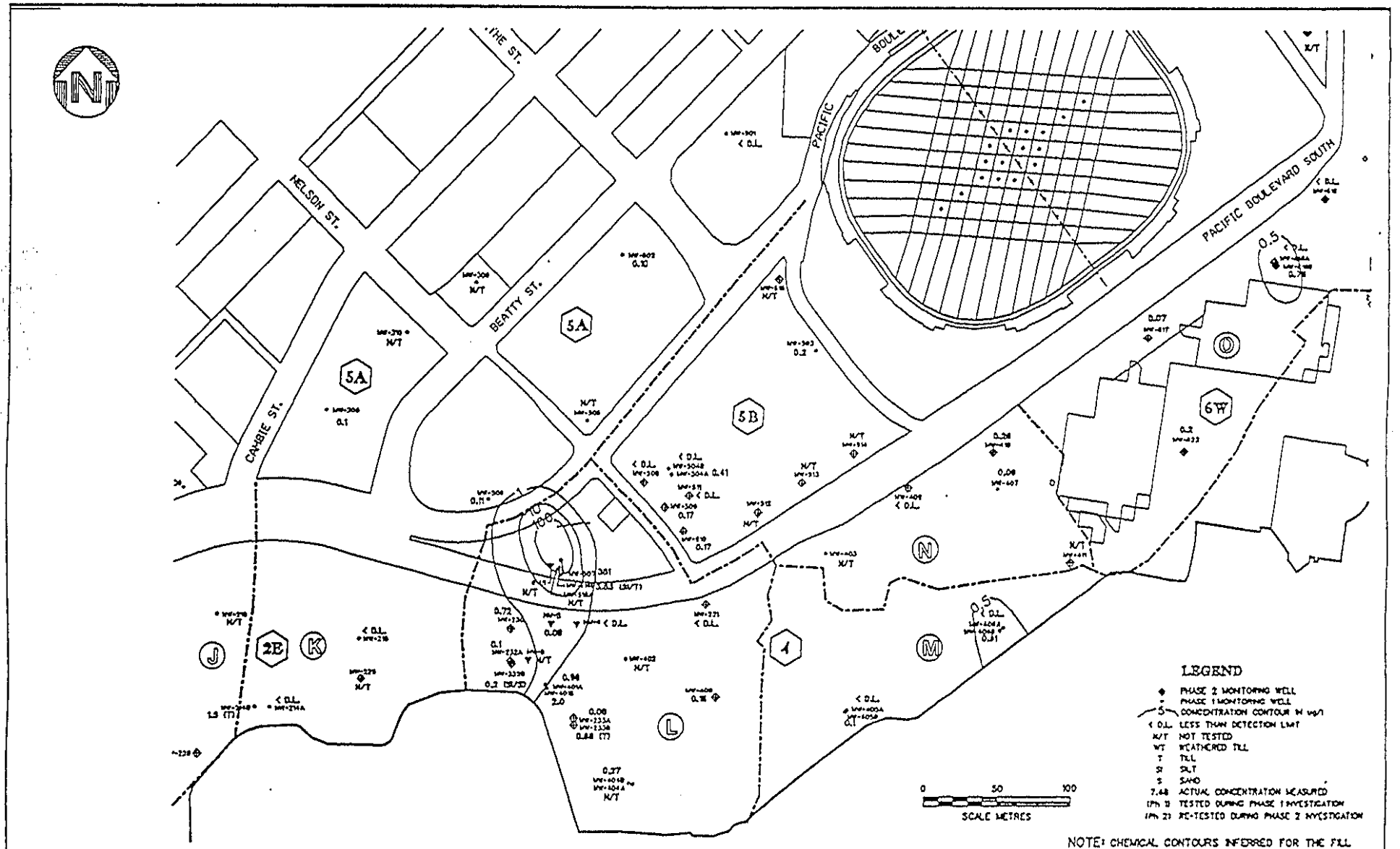

PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	TOTAL CHLOROPHENOLS CONCENTRATION IN GROUNDWATER - CENTRAL (2 OF 3)	DRWN BY: TH	REV.No: 2 NFT DRAFT
		DATE: 9 NOV 90	FIGURE: 2-8

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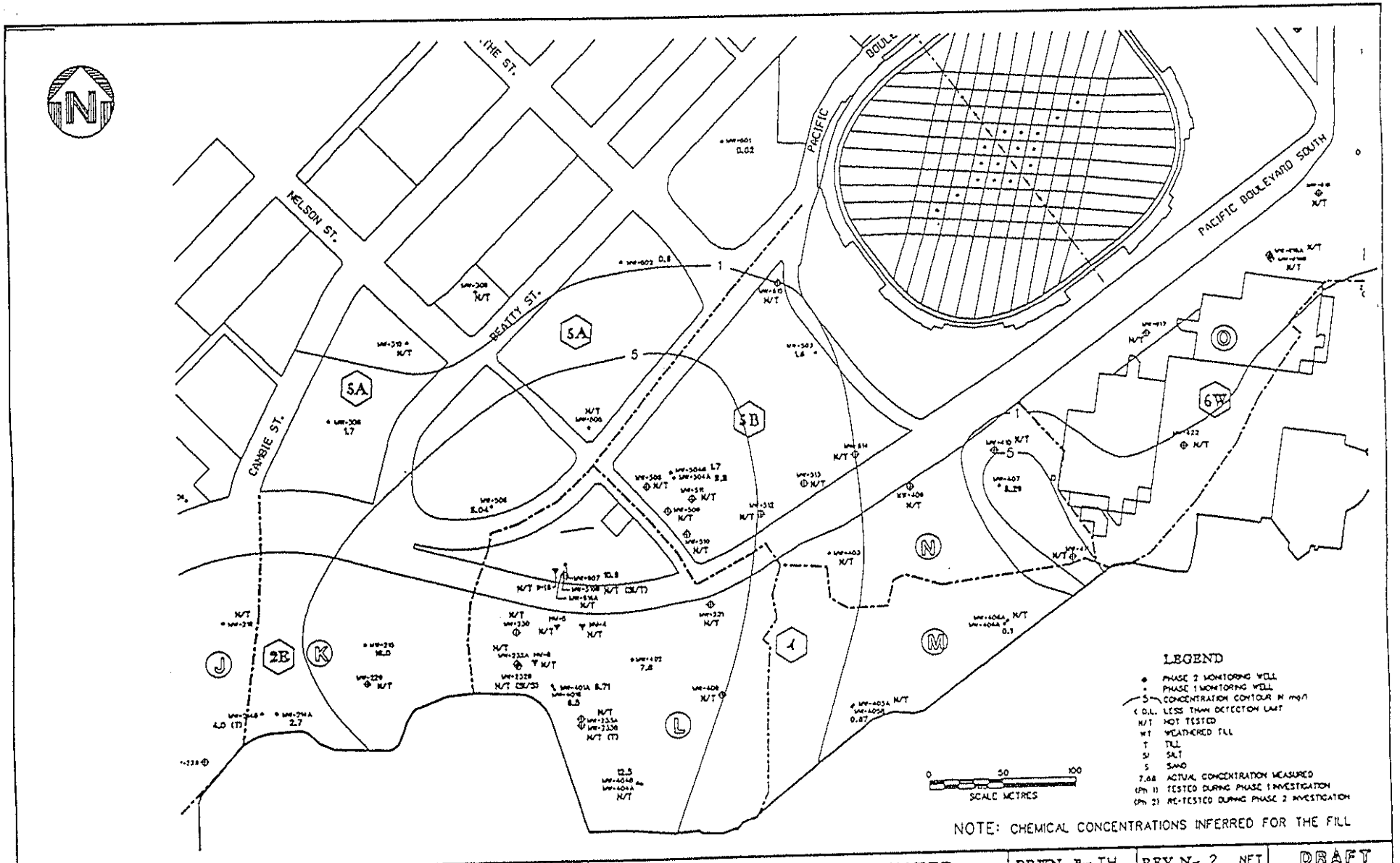
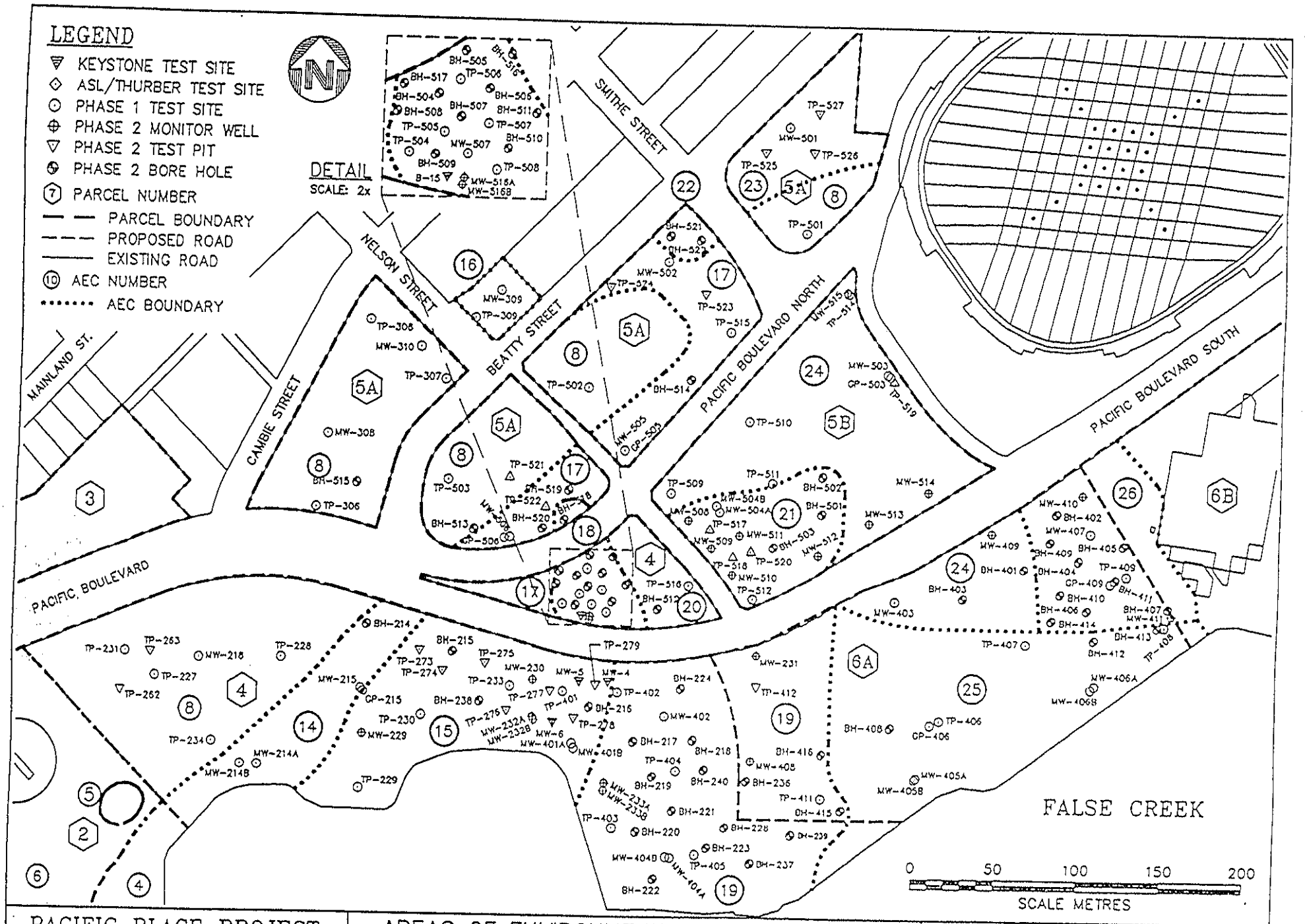
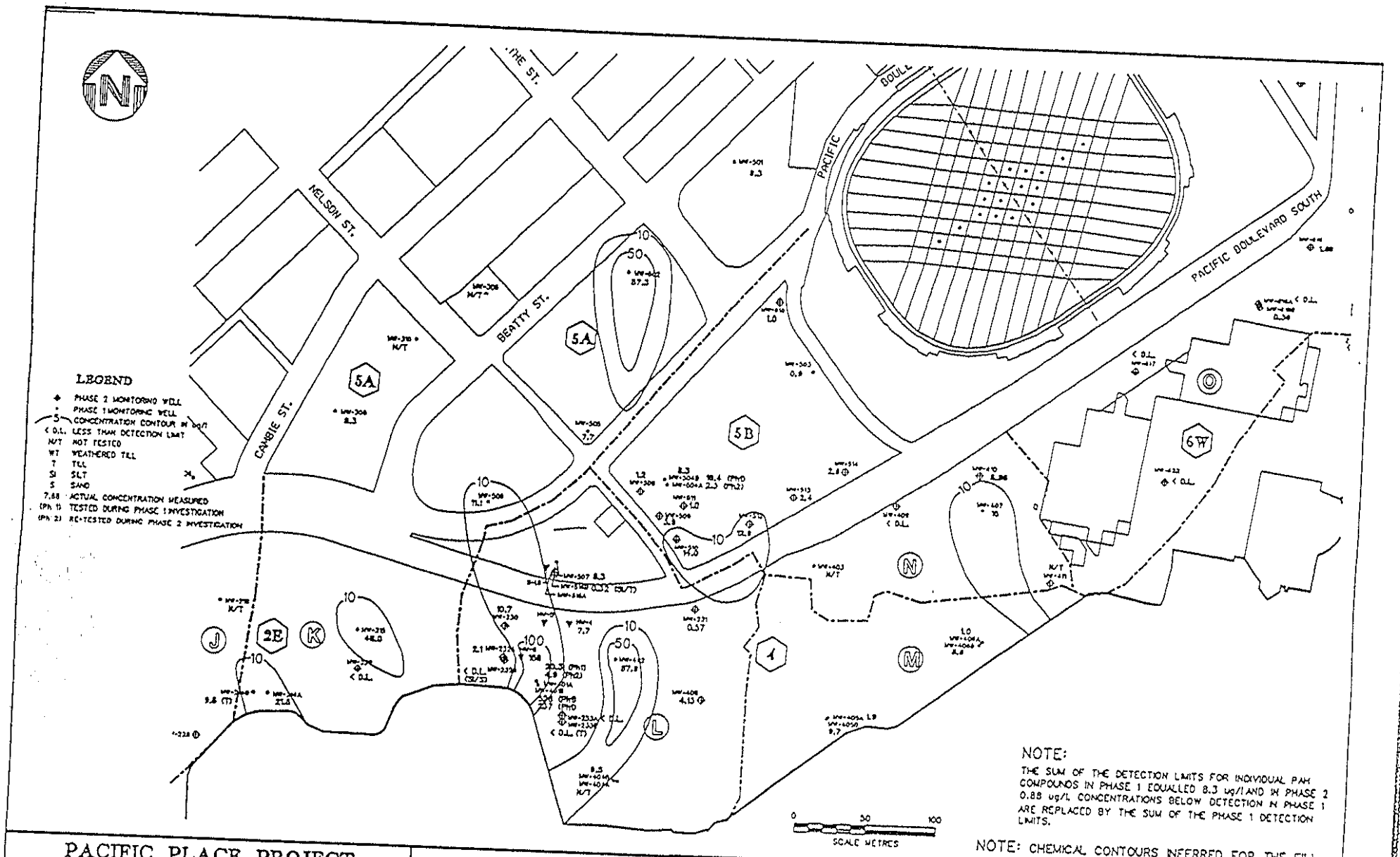


PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	AMMONIA CONCENTRATION IN GROUNDWATER CENTRAL (2 OF 3)	DRWN BY: TH	REV. No: 2 NFT	DRAFT
		DATE: 6 NOV 90	FIGURE: 2-5	



PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	AREAS OF ENVIRONMENTAL CONCERN (AEC) PARCELS 4, 5A, 5B, 6A	DRWN: NFT	DATE: 16 JAN 92
		SCALE:	FIGURE: 2-3
			REV: 0



NOTE:
THE SUM OF THE DETECTION LIMITS FOR INDIVIDUAL PAH COMPOUNDS IN PHASE 1 EQUALLED 8.3 ug/l AND IN PHASE 2 0.88 ug/l. CONCENTRATIONS BELOW DETECTION IN PHASE 1 ARE REPLACED BY THE SUM OF THE PHASE 1 DETECTION LIMITS.

NOTE: CHEMICAL CONTOURS INFERRED FOR THE FILL

PACIFIC PLACE PROJECT SOILS REMEDIATION GROUP	TPAH CONCENTRATION IN GROUNDWATER CENTRAL (2 OF 3)	DRWN By: TH	REV. No: 2 NFT
		DATE: 8 NOV 90	DRAFT FIGURE: 2-7

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CONFIRMATION OF COMPLIANCE

DATED: the 10 September, 1999.

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
for the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City", respectively)

In this Confirmation of Compliance the following words shall have the following meanings:

"Contaminants" means those substances existing on or under the Lands hereinafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Lands" means Lot 270 False Creek Plan LMP39586.

"Provincial Standards" means, with respect to the Lands, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada, pertaining to Contaminants in relation to the use of the Lands for residential purposes, utilities and facilities incidental thereto and all associated utilities as more particularly described in development permits DE402423, DE402990 and DE403360.

The Province does hereby confirm to the Approving Officer and to the City that subject to the requirements set out in Appendix "i" attached hereto that there is compliance with the Provincial Standards with respect to the Lands.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

Derek Thompson, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Developments Ltd.
900 - 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

APPENDIX "i"

Confirmation of Compliance dated the 10 September 1999
For Lot 270 False Creek Plan LMP39586
(Parcel 4 – Lots DE (the "Confirmation of Compliance")

The Confirmation of Compliance is subject to the following conditions:

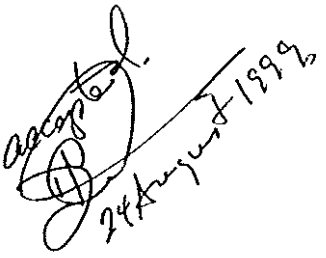
1. As the Lands are subject to in situ management of soils containing Contaminants at concentrations in excess of the applicable legal standards within British Columbia for residential use.

   (a) The surface cover material on the Lands exterior to the existing building on the Lands must be maintained.

2. Pertinent information with respect to the Lands will be placed and maintained on any Site Registry established by the Province pursuant to the provisions of the Waste Management Act and any amendments thereto.

Capitalized terms utilized in this Appendix "i" shall have the same meaning ascribed to the same term in the Confirmation of Compliance.

PACIFIC PLACE REMEDIATION PROJECT
MEMORANDUM



To: D.J. Clark, P.Eng., Project Manager, Pacific Place Remediation Project

From: D.R. Livingstone, P.Eng.
Golder Associates Ltd.

Date: July 14, 1999

File: 932-1801/0460coc

RE: SUPPORT INFORMATION FOR CONFIRMATION OF COMPLIANCE PARCEL 4, LOTS DE, PACIFIC PLACE

1.0 INTRODUCTION

The purpose of this memorandum is to provide support information for the issuance of a "Confirmation of Compliance" for Parcel 4, Lots DE on the Pacific Place site in Vancouver, B.C. The Parcel is indicated on the Key Plan, Figure 1. The legal description of the site is:

- Lot 240, False Creek Plan LMP 30397

The remediation standards that apply to Parcel 4, Lots DE are the Contaminated Sites Regulations[1] (CSR). In the course of site excavation for construction, all fill material encountered and found to contain concentrations above the generic numerical standards for Residential Land use (Schedule 4 and 5 of the CSR) was disposed of at an appropriate site.

2.0 CONFIRMATION OF COMPLIANCE

In our opinion, the excavation of the upper fill materials within Parcel 4, Lots DE, has rendered the site suitable for the intended residential and commercial use, in

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[1] Contaminated Sites Regulations (CSR), B.C. Reg 375/96, effective April 1, 1997.

accordance with the risk assessment and risk management approach described in the Remedial Plan.

The Remedial Plan (*"Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7"*, September 1993) risk assessment, accepted by B.C. Environment for areas of Pacific Place with contaminant concentrations above Level B of the Pacific Place Standards (similar to the Residential land use criteria of the CSR), concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (for example, 0.5 metres of clean sand) was placed as a permanent separation barrier above the existing sub-soils.

A total of 55,650 m^3 of soil was excavated for the Parcel 4DE construction of which 45,660 m^3 was Residential Fill quality, 4920 m^3 was Industrial Fill quality (B+), and 4657 m^3 was Industrial Waste. The excavation included some soil from the adjacent parcel, Parcel 4FG from which 413 m^3 of Special Waste (due to leachable lead) was removed. These results are consistent with the findings of the field investigations (Soils Remediation Group 1992 and Pacific Place Remediation Project 1997) and those referenced in the Remedial Plan and risk assessment completed for the Pacific Place site.

The report on previous results of field investigations (RFI) has described the extent of groundwater contamination within Parcel 4 [see Phase 1 and Phase 2, Parcels 1, 2, 2E, 4, 5A, 6W, and 6E (Overall Site) – Results of Field Investigation report (SRG, June 1992)]. Within the area of Parcel 4 Lots DE, the groundwater likely to be collected by the building drains was found to comply with the False Creek Discharge Standards.

The analysis of ten groundwater seepage samples obtained from the excavation between November 1998 and February 1999, indicated that only total suspended solids were consistently above the False Creek Discharge Standards. The suspended solids were related to the excavation and grouting activities.

The information presented in the following sections supports our opinion that the remedial actions completed have rendered the subject site suitable for residential and commercial use, in accordance with the Remedial Plan.

3.0 BACKGROUND

3.1 Historical Land Use and Results of Field Investigations

The Pacific Place site was host to a variety of industrial activities between the late 1890s and the mid 1980s, as summarized in Figure 2. Historical activities at the west side of Parcel 4 include railway lands which occupied the area after infilling of False Creek was completed in the 1930s. Further fill placement over the surface using granular soils was completed in the mid-1980s in preparation for Expo'86.

3.1.1 Applicable Field Investigations

The following soil and soil contamination descriptions are derived from the previous Phase 1 and 2 field investigation reports (SRG; August 1989 and June 1992) and supplementary sampling of the area carried out during February 1997. The chemical results in previous investigations and remedial plans were interpreted with respect to the Level B (residential standard) in the Pacific Place Standards (MOE 1990) which are similar to the CSR generic numerical standards for Residential Land use.

3.1.2 Soil Description

The fill material on Parcel 4 is comprised of "recent" granular fill approximately 0.4 to 0.8 metres in thickness, underlain by "old" fill about five to eight metres thick. The total fill thickness ranges from about six to nine metres. The recent fill, comprised primarily of sand and gravel, was used for grading in preparation for Expo'86. The old fill is comprised of silty sand and gravel which is relatively free of staining and odours, but has varying amounts of construction-related debris such as brick, wood, concrete and metal. Areas containing abandoned Expo services were backfilled with large amounts of sand.

Zones or layers of visibly stained or odorous materials, referred to as "suspect" fill, are found within the old fill. These suspect zones may contain contaminants with concentrations above Level B. Industrial debris, such as scrap metal, brick and wood was used to infill the False Creek shoreline, and is found in varying quantities throughout this fill zone. The black-stained soil layers vary in thickness from 0.5 to 1 metre and are interpreted to represent the former ground surface occupied by railway lines.

3.1.3 Soil Contamination Overview

When preparing the *"Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7"* (SRG, August 1992) the project team divided the Pacific Place site into Areas of Environmental Concern (AEC's), based on historical activities and the type of chemical parameters present. Results of the Phase 1 and 2 investigations, and the supplementary sampling programs, indicated that soil having chemical concentrations in excess of the Level B standards for residential land use is limited to visually distinct zones or layers within the fill material. The chemical parameters and concentrations found in the suspect soil of each AEC are the result of former industrial activities. The AEC boundaries are shown in Figure 3 and the AEC's relevant to the excavation activities at Parcel 4DE are described below.

The summary of soil contamination provided below is based on conditions found throughout the particular Area of Environmental Concern (AEC) during the Phase 1 and 2 Field Investigations. As discussed above, extensive infilling (1 to 2 metres) of the Pacific Place site with granular material was conducted in 1983 and 1984 in preparation for Expo '86. Results of various investigations have indicated that the "Expo" fill contains chemical concentrations below the Level B standards. Therefore, the soil contamination described below has been found below the surface layer of "Expo" fill.

AEC 8 - Railway Lands

AEC 8 encompasses the area primarily used as railway lands. Contamination present in this area is considered to be randomly distributed, and generally associated with a discontinuous black or dark stained layer representing the former ground surface. Concentrations of chemical parameters within this layer (metals, PAH) are typically elevated above background levels and may exceed the RL or IL Standards.

AEC 14 - Infilled Shoreline

AEC 14 is located at the west end of the shoreline development. This area was formerly a lumber yard. PAH concentrations exceeding RL standards were found in the southwest end of the AEC, near former coal bunkers and a cinder pit located on the adjacent railway lands. The PAH contamination appeared to be associated with coal fragments and black staining in the soil.

AEC 15 – Oil Wharf Area

AEC 15 is located on the east half of Parcel 4 DE. An oil wharf was located on this area of the shoreline. It was assumed that oil lines from the Imperial Oil Co.'s tank farm at the corner of Cambie Street and Nelson Street, ran underground to a connection at this wharf. Hydrocarbon and PAH contamination was found to be fairly extensive within woodwaste and black-stained debris zones across this AEC, with concentrations exceeding the CL/IL and Special Waste standards. Metals concentrations exceeding CL/IL standards were also found in these debris zones. One sample also exhibited leachable lead concentrations above the Special Waste standards.

3.2 Remedial Plan

3.2.1 General

The remedial plan pertaining to Parcel 4, Lots DE, included a human health risk assessment and an evaluation of remedial alternatives. The remedial plan report, entitled "*Remedial Plans for Parcels 1, 4, 5A, 5B, 6A, 6C and 7*" was issued by the Pacific Place Remediation Project Group in September 1993. A copy of the relevant sections of the Remedial Plan is included in Appendix I.

The Remedial Plan recommended Option 1, the removal of soils necessary for development, and the risk assessment and risk management of soils left in place following excavation. Two classes of soils left in place were considered for the risk assessment: suspect soils and non-suspect (bulk fill) soils. The majority of the soils within 0.5 metres of the present surface of the site consist of non-suspect, bulk fill soils that do not contain contaminants above either the Pacific Place Level B Standards or the CSR Residential Land Standards.

3.2.2 Human Health Risk Assessment

Because in situ management of some of the fill materials was contemplated during the remedial planning stage, a quantitative human health risk assessment was performed to estimate the potential human health risks arising from exposure to the Principal Contaminants of Concern (PCOC) at Parcel 4. For fill materials with contaminants above the residential standards, the risk assessment assumed the potential for direct contact

between persons and the contaminated soils. In some areas of this Parcel, the potential for human health risks were identified if direct contact between receptors and contaminants such as metals or non-volatile organics could occur after development. The risk assessment concluded that exposure to the Principal Contaminants of Concern (PCOC) would not result in an unacceptable risk to human health provided sufficient cover (e.g., 0.5 metres of residential fill) remained as a separation barrier above the existing contaminated soils.

Under the CSR, certain contaminants may exceed the Residential Land use criteria that do not exceed the Pacific Place Level B Standards and therefore were not specifically included in the risk assessment. For metals and non-volatile organic contaminants (the PCOCs at this Site) the remedial measures involve covering of this soil with either concrete or residential fill quality soil that cut off any potential exposure. Therefore, the conclusion of the original risk assessment that the site is suitable for residential use does not change.

3.2.3 Groundwater

The fill materials remaining within Parcel 4, Lots DE, are not expected to constitute a significant source of groundwater contamination. The field investigations did not indicate groundwater contaminants of concern at this site.

4.0 EXCAVATION AND REMEDIATION ACTIVITIES

4.1 Soils Management Procedures

The results of the Phase 1 and 2 and Supplementary Field Investigations, in combination with the Remedial Plan, were used to develop the soils and groundwater management procedures for the building excavation at Parcel 4, Lots DE. The report is entitled "*Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor, Parcel 4DE Quayside Neighbourhood, Pacific Place*", (PPRPG; April 27, 1998) and is referred to as the Soils Management Procedures (SMP). The SMP outlines the general soil and groundwater handling, testing and reuse or disposal procedures that were followed during the excavation for building construction.

4.2 Excavation

Excavation activities commenced at Parcel 4DE in November 1998. The work included excavation of Lots DE for the purposes of building construction. All excavation was complete as of March 1999.

Monitoring of the excavation was conducted by PPRP field technicians, who were responsible for directing the segregation and testing of all excavated soil in accordance with the SMP. The results of chemical analyses for each stockpile were presented in stockpile reports, which reference the excavation areas where the soil was generated.

A total of approximately 55,650 m^3 of soil was excavated. Residential and Industrial Fill quality soil (approximately 45,660 m^3 of Residential, 4,920 m^3 of Industrial) were excavated and reused as fill for the Ballantyne Pier development at the foot of Heatley Street in Vancouver. Industrial Waste soil (4,657 m^3) was placed for storage in Parcel 1, pending use as fill for George Wainborn Park.

For the construction of the ramp into the site and provision for an unshored excavation slope, some soil was excavated from the adjacent Parcel 4FG, east of Parcel 4DE. Of the soil excavated from Parcel 4FG, 413 m^3 was classified as Special Waste due to leachable lead. The Special Waste was stabilized with phosphoric acid to render it non-hazardous and transported to the Waste Management landfill in Edmonton, Alberta for disposal as industrial waste. There was no Special Waste found of Parcel 4DE

4.3 Fill Remaining and Confirmatory Closure Sampling

Following the removal of fill material to the building final grade, a total ten discrete till (or native soil) samples were taken at locations indicated on Figure 4. Chemical analysis for PAH and metals determined that the till and native soil samples were below the Residential Land use Standards in the CSR with the exception of chromium in three samples. The concentrations of chromium at Sa 4, Sa 6, and Sa 7 were 63 µg/g, 64 µg/g, and 64 µg/g, respectively and exceeded the CSR RL Standard of 60 µg/g. The results are well below the concentrations specified in the Pacific Place Standards (250 µg/g for total chromium) and were not associated with contaminated soils excavated from the site. The soil would be classified as suitable for Industrial Land Use under the CSR numeric

standards. The risk assessment for the Site considered the presence of metal contamination, including chromium, in soil that would be inaccessible for contact by humans. Based on the results of that risk assessment and the location of the chromium beneath the parking floor slab, it is our opinion that the concrete floor slab provides an effective barrier against exposure to persons and that additional control measures are not required.

Approximately 700 m^3 of fill remains on the site between the sheetpile and the property line on the south side of the site, adjacent to Marinaside Crescent, as shown in Figure 5. Samples of the soil removed from the excavation adjacent to the sheetpile indicate that of the 700 m^3 of fill remaining, about 100 m^3 would be classified as Industrial Fill and 50 m^3 would be classified as Waste. The contaminants of concern are metals and PAH. The majority of the fill is between 0.5 and 6.5 metres below the ground surface existing during the excavation. The risk assessment for the Site considered the presence of metal and PAH contamination in soil that would be inaccessible for contact by humans. Based on the results of that risk assessment, it is our opinion that the barrier provided by at least 0.5 metres of clean cover is effective and that no additional control measures are required for the soil along the property line.

4.4 Groundwater

During the excavation program, groundwater collected in the base of the excavation was sampled and discharged to the storm sewer. Samples of excavation water were sampled and analysed for the parameters specified in the False Creek Discharge Standards.

The analysis of five groundwater seepage samples obtained from the excavation between December 1998 and February 1999, indicated that only total suspended solids were consistently above the False Creek Discharge Standards. The high suspended solids concentrations were related to the excavation activities and are not considered contaminants of concern for the site. The suspended solids values will likely decrease once the building is completed and building perimeter drainage established.

5.0 MONITORING REQUIREMENTS

In our opinion, based on the constructed works and the results of the soil and water sampling, no additional monitoring should be required for this building.

6.0 LIMITATIONS OF REPORT

The Pacific Place Remediation Project group has undertaken sampling and analysis programs and a risk assessment approach that have been reviewed and approved by B.C. Environment. This program has followed the standard of care expected of professionals undertaking similar work in British Columbia at the time the work was undertaken, and under similar conditions. No other warranty is expressed or implied.

The risk assessment/risk management approach has been employed in the remediation of Parcel 4, Lots DE. The risk assessment completed for Parcels 4, Lots DE, was based on the shallow soil conditions existing prior to construction, and conservatively assumed residential/recreational land use. Any subsequent excavations or disturbances in areas where potentially contaminated fill material remains, which would result in human exposure to these soils, may render the conclusions of the risk assessment invalid and should be reviewed.

If new information is generated by others and becomes available to B.C. Environment, the Pacific Place Remediation Project Group and the undersigned should be contacted to review the results or modification plans, and to provide an opinion as to the findings and their implications on the Confirmation of Compliance Certificate issued for Parcel 4, Lots DE.

PER:

D.R. Livingstone, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

Reviewed by:

B.H. Conlin, P.Eng.
Golder Associates Ltd.
Pacific Place Remediation Project Group

DRL/BHC
932-1801/0450

cc: K. Rosenberg, Sandwell Inc.
C. McIver, Fraser & Beatty
Golder File 932-1801/0460coc

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Soils Remediation Group, 1989a, Pacific Place Soils Remediation Program - Overall Site Operations Plan, Historical Use and Data Collection Program. Draft Report Prepared for the BC Ministry of the Environment. February 1989.

Soils Remediation Group, August 1989b, Pacific Place Soils Remediation Program - Overall Site Results of Field Investigations. Prepared for the BC Ministry of the Environment. First Draft August 1989.

Soils Remediation Group, 1991a, Pacific Place Soils Remediation Program - Overall Site Final Phase 2 Operations Plan. Prepared for the BC Ministry of the Environment, February 1991.

Soils Remediation Group, 1992, Pacific Place Soils Remediation Program – Phase 2 Results of Field Investigations for Parcels 1, 2 , 2E, 4, 5A, and 6E (Overall site). Prepared for BC Environment. Final Report June 1992.

Pacific Place Remediation Project Group, 1993, Remedial Plan for Parcels 1, 4, 5A, 5B, 6A, 6C and 7. Prepared for BC Environment, September 1993.

Pacific Place Remediation Project, 1997, Groundwater and Soils Management Procedures for the Construction Manager, Pacific Place Remediation Project Group, and Contractor Parcel 4 DE-Quayside Neighbourhood Pacific Place. Prepared for BC Environment, April 27, 1998.

LEGEND

- PARCEL BOUNDARY
- PROPOSED ROAD
- EXISTING ROAD
- (7) PARCEL NUMBER (BCELP)

ST. PAUL'S HOSPITAL

BURRARD STREET
HORNBY STREET
HOWE STREET
DAVIE STREET
GRANVILLE STREET
SEYMOUR STREET
HELMCKEN STREET
SMITHE STREET
NELSON ST.
ROBSON STREET
GEORGIA STREET
DUNSMUIR STREET
BEATTY STREET
BEATTY STREET LANE
PENDER STREET
ABBOTT STREET
TAYLOR STREET
CARRALL STREET
KEEFER STREET
COLUMBIA STREET
QUEBEC STREET
EXPO BOULEVARD
UNION ST.
PACIFIC BOULEVARD
PACIFIC STREET
DRAKE STREET
BEACH AVENUE
RICHARDS STREET
HOMER STREET
HAMILTON STREET
MAINLAND ST.
CAMBIE STREET
BEATTY ST.
MARINASIDE CRES.
BEACH CRES.
HOMER ST.
LOTS DE
FALSE CREEK

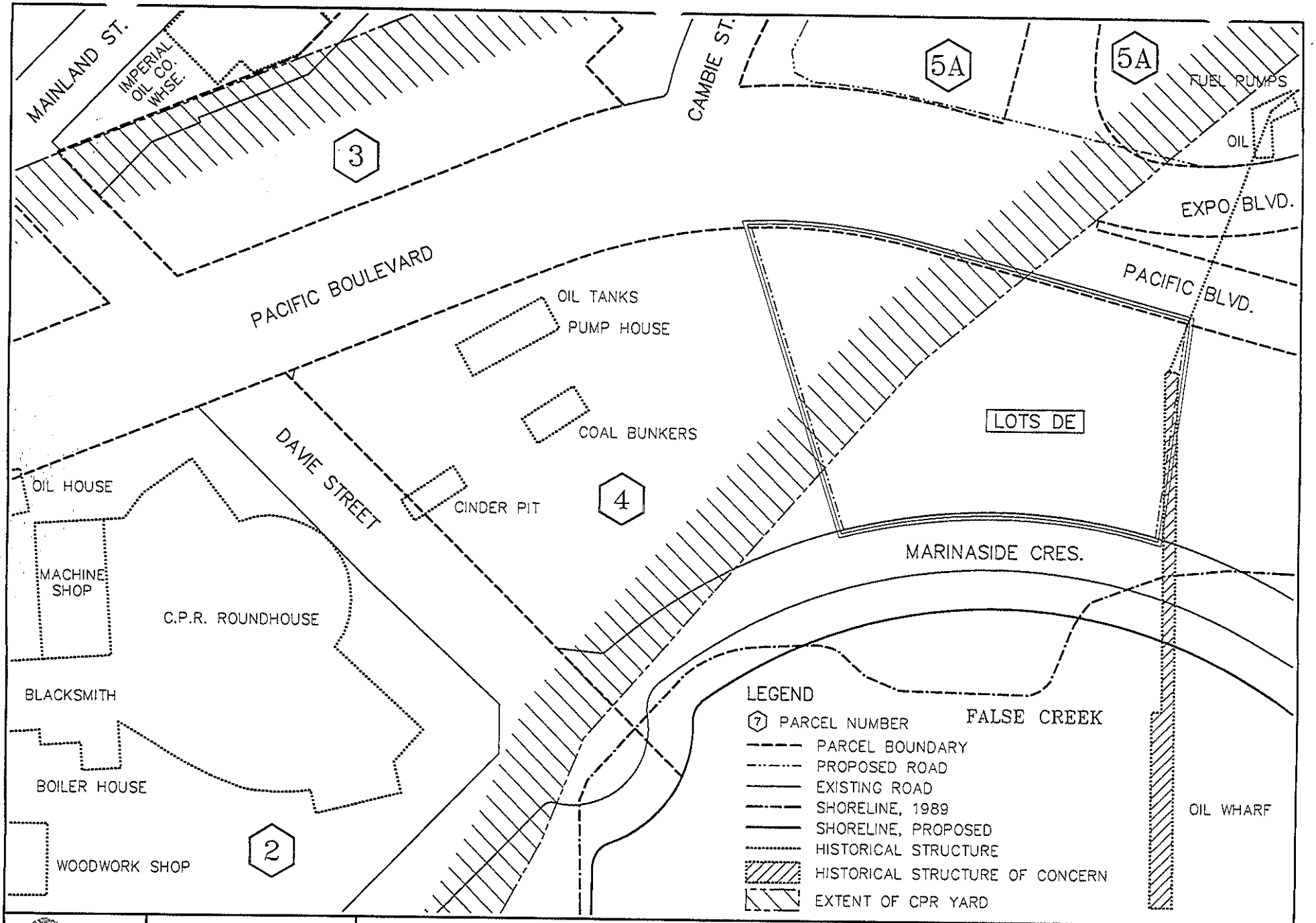
7B 8 7A 6C3 6C1 6C2 9 5A 5B 6B 6A 4 3 2 1

0 100 200 300 400
SCALE METRES

PLOT: 1999/06/25,1350

CAD FILE: C:\PPRP\1700\PP001743.DWG

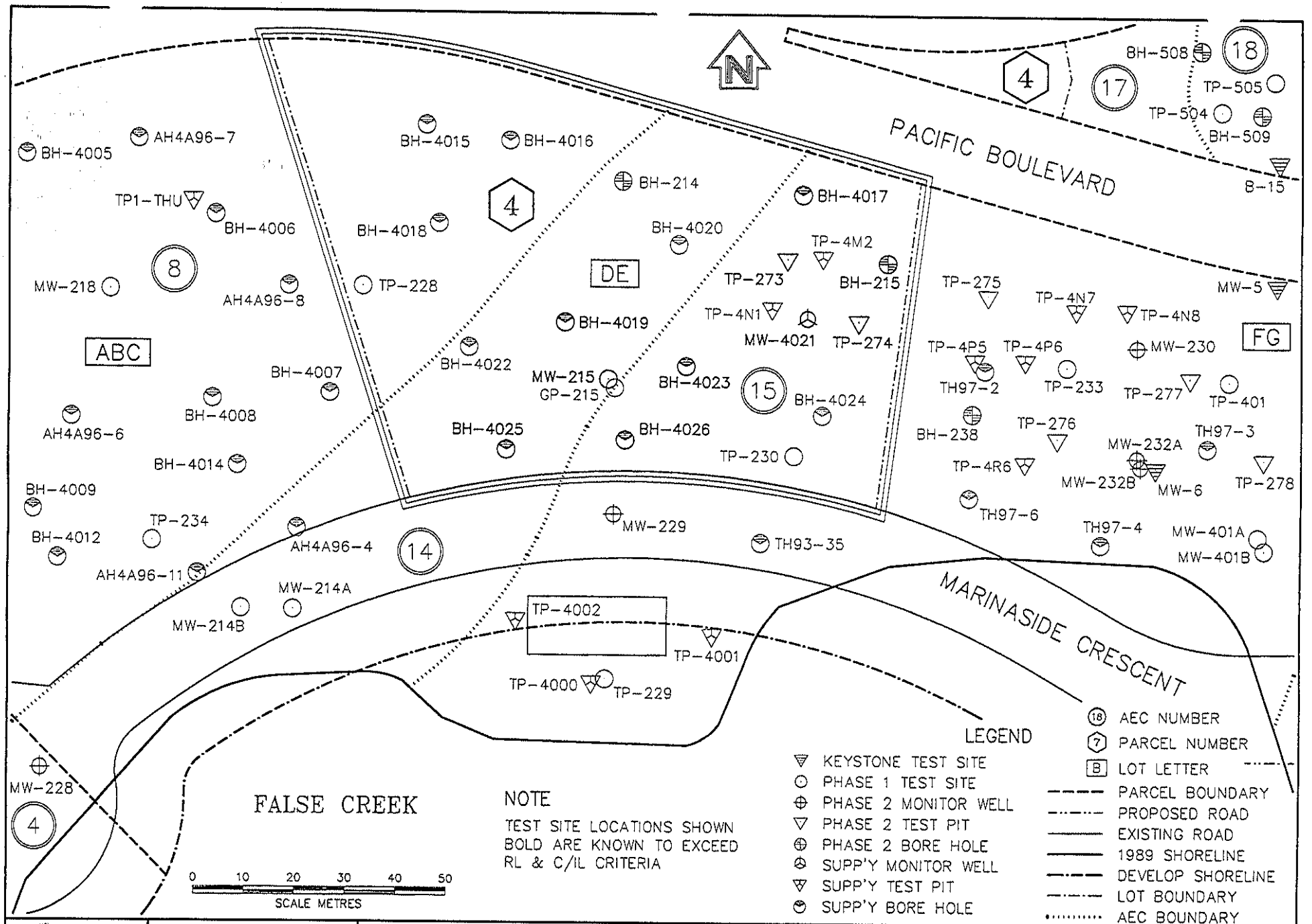
Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOTS DE KEY PLAN	DRWN: NFT / REV: 1 / SCALE: 1:6000 / DATE: 1998/03/30 / FIGURE: 1



Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOTS DE HISTORICAL LAND USE SUMMARY	DRWN: NFT	DATE: 1998/03/30	REV: 2
			SCALE: 1:1500	FIGURE: 2	

CAD FILE: C:\PPRP\1700\PP001744.DWG

PLOT: 1999/03/05, 1447



Golder Associates

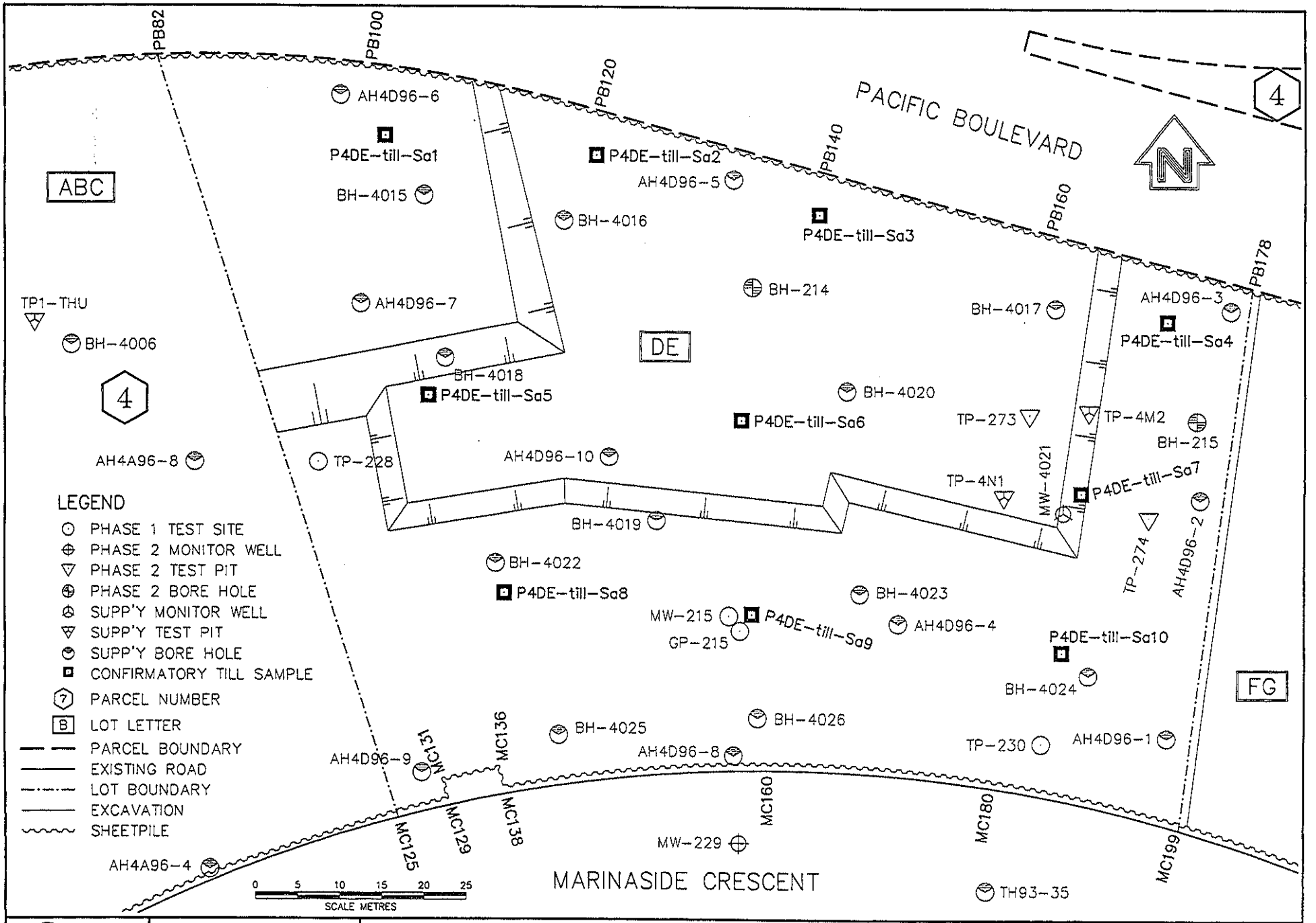
PACIFIC PLACE
REMEDIATION PROJECT

PARCEL 4 – LOTS DE
TEST SITE LOCATIONS & AEC's

DRWN: NFT	DATE: 1997/11/18	REV: 4
SCALE: 1:1000	FIGURE: 3	

CAD FILE: C:\PPRP\1700\PP001718.DWG

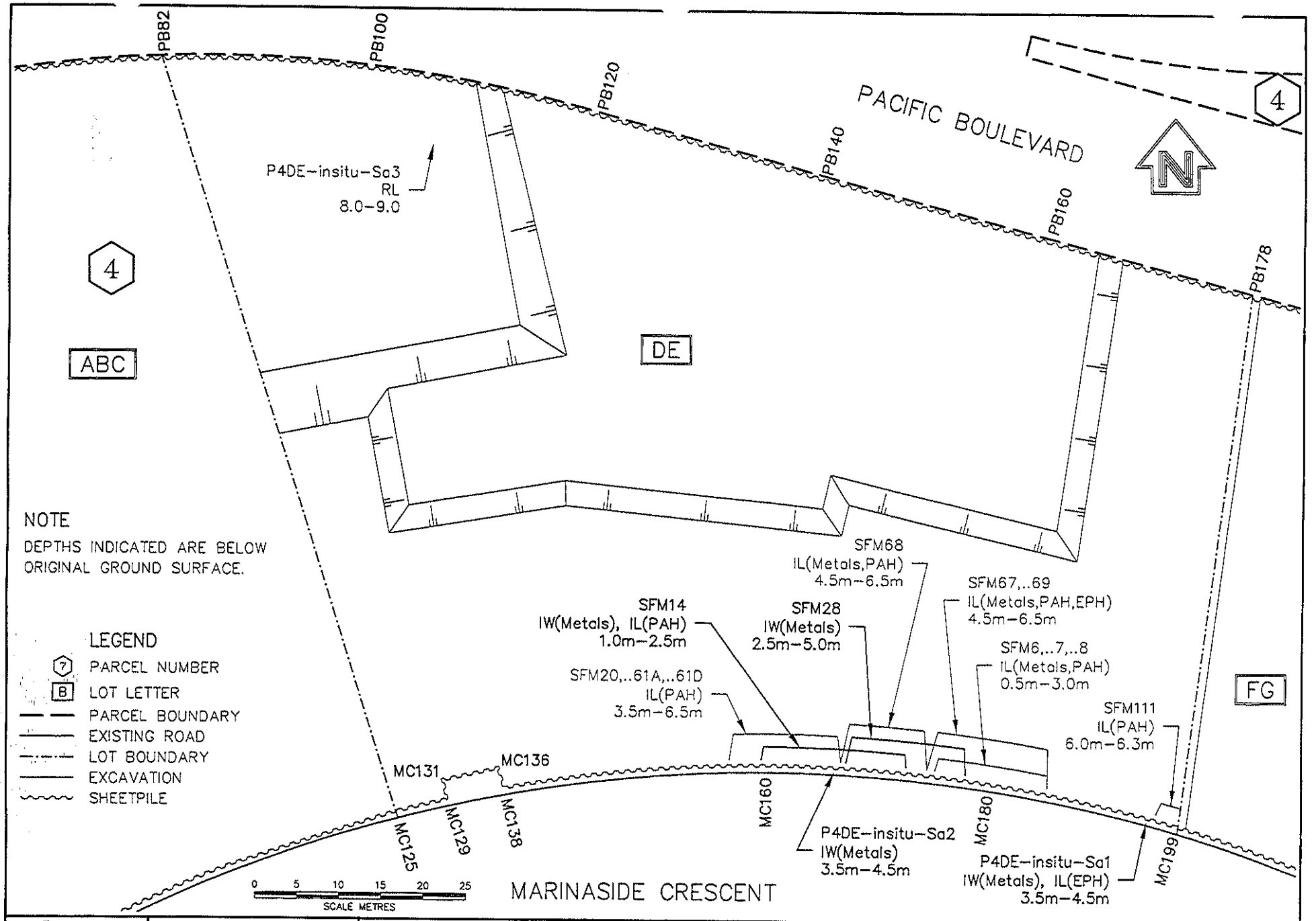
PLOT: 1999/03/05, 1437



Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOTS DE CONFIRMATORY TILL SAMPLE LOCATIONS	DRWN: NFT	DATE: 1999/02/19	REV: 3
			SCALE: 1:600	FIGURE: 4	

CAD FILE: C:\PPRP\1700\PP001773.DWG

PLOT: 1999/07/14, 1130



Golder Associates	**PACIFIC PLACE** REMEDIATION PROJECT	PARCEL 4 – LOTS DE FILL REMAINING INSITU & INSITU SAMPLES	DRWN: NFT	DATE: 1999/06/24	REV: 1
			SCALE: 1:600	FIGURE: 5	

CAD FILE: C:\PPRP\1700\PP001793.DWG

PLOT: 1999/06/25, 1130

PACIFIC PLACE

SOILS REMEDIATION PROGRAM

REMEDIAL PLAN

FOR

PARCELS 1, 4, 5A, 5B, 6A, 6C (WEST HALF) AND 7

FINAL DRAFT

AUGUST 1992

VOLUME 2 OF 3

(REMEDIAL PLANS FOR INDIVIDUAL PARCELS)

Prepared By:

SOILS REMEDIATION GROUP

For:

BC ENVIRONMENT

2.0 PARCEL 4

2.1 GENERAL

Parcel 4 is situated in the central portion of the Pacific Place site at the foot of the Cambie Street Bridge. It is bordered by Parcels 2, 5A/5B and 6A to the west, north and east, respectively (Figure 2-1), and by False Creek to the south. Parcel 4 has a total land area of about 5.4 hectares, 96% of which has been reclaimed from False Creek by way of shoreline infilling (Figure 2-2). The total volume of fill material present within the parcel is on the order of 310,000 cubic metres[3].

Known historical land uses which likely resulted in the contamination of and/or deposition of fill material on Parcel 4 include an oil wharf, sawmills and lumber yards, a paint shop and work shops, railway sidings and associated activities, and a wood preservative dip tank operation.

Seven areas of potential environmental concern (AEC) have been identified on Parcel 4, based on the known historical land use and on delineation sampling conducted during Phases 1 and 2 of the SRG field investigations (Figure 2-3):

AEC 8 - Railway Lands (part)
AEC 14 - Infilled Shoreline
AEC 15 - Oil Wharf Area
AEC 17 - Fuel Pipeline Area
AEC 18 - Wood Preservative Dip Tank Area
AEC 19 - Lumber Yard (Part)
AEC 20 - Cambie Street On-ramp

The soil contamination, groundwater and soil vapour conditions associated with the above AEC are summarized in Sections 2.2, 2.3 and 2.4. Section I of this volume presents detailed AEC descriptions, while results of the Phase 1 and Phase 2 field investigations are presented in the RFI reports by SRG (1989c and 1992). It should be noted that the area presently referred to as Parcel 4 (in this Remedial Plan) was previously designated by CPDL as Parcel 2E and part of Parcel 4 and is so referenced in the RFI reports.

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3 Volume estimates do not include fill volume within 10 metres of the crest of the present shoreline, due to lack of data within this area.

2.2 SOIL CONTAMINATION

Parcel 4 encompasses a former embayment of False Creek that has been reclaimed using heterogeneous fill material, varying in thickness from 6 to 13 metres. The fill generally consists of silty sand to sandy gravel, with zones of demolition debris such as brick, wood, concrete, rock, coal and metal fragments, and extensive deposits of woodwaste ranging from sawdust and woodchips to large timbers.

A large portion of the fill material in Parcel 4 has been found to be extensively contaminated (above Level C), primarily due to the former presence of a chlorophenol (wood preservative) dip tank operation (AEC 18) and an oil wharf (AEC 15). Within AEC 18, concentrations of chlorophenols, PAH, LAH and some metals (mercury, copper and zinc) exceed the Level B (residential land use) and Level C (commercial/industrial land use) standards between depths of 0.5 to 6.5 metres below present ground surface. A limited zone of soil having chlorophenol concentrations in excess of the revised Special Waste guideline (60 ppm) is present adjacent to Pacific Blvd. N. Contamination in AEC 18 is identifiable in the field on the basis of black staining, and sweet musty solvent or oily/creosote odours.

Within AEC 15, concentrations of PAH and several metals (arsenic, copper, lead, nickel, tin and zinc) exceed the Level B and Level C standards in samples of the fill material, collected between depths of about 0.5 to 7 metres. Some concentrations of cadmium were also found to exceed Level B in this zone. Elevated concentrations of organic indicator parameters (oil & grease, TEH and LAH), some in excess of the Level C standards (where applicable), were also present in some samples. Contamination in AEC 15 is generally associated with black stained, woodwaste or debris zones and/or pockets having oily, solvent or creosote odours.

AEC 19 is considered to be an area having zones of moderate (Level B to C) contamination, based on the results of field investigations reported to date. In the northern portion of this AEC, concentrations of PAH in excess of the Level B and Level C standards were measured in some samples between depths of about 1 to 7 metres. The zone of elevated concentrations (generally black-stained with an oily or creosote odour) tends to become deep (7 to 10 metres) with proximity to False Creek. Small pockets of fill having metals concentrations exceeding the Level B and C standards are also present; these are typically associated with fill having significant debris content and black staining.

2.3 GROUNDWATER

2.3.1 Hydrostratigraphic Units

From the results of the field investigations conducted to date on Parcel 4, three main hydrostratigraphic units have been identified.

- **Surficial fill material**, comprised of sandy silt to sandy gravel, debris (including brick, concrete and metal fragments) and a continuous woodwaste zone at the base of the fill on the eastern half of Parcel 4. The total fill thickness ranges from approximately 6 to 8 metres (increasing to the north) in the west portion of the parcel, and from about 6 to 13 metres (increasing to the south and southwest) in the eastern portion. The woodwaste zone varies in thickness from about 2 to 6 metres (generally increasing to the south) in the eastern portion of the parcel. The hydraulic conductivity of the fill material ranges from about 10^{-7} to 10^{-3} m/s, with higher values being representative of coarse granular fill or woodwaste.

- **Native sediments** comprised of a clayey silt/silty sand units, underlying the fill zone. These deposits are variable in thickness (absent to 9 metres) and have a hydraulic conductivity on the order of about 10^{-7} to 10^{-6} m/s.

- **The till unit** underlying the entire Pacific Place site, which has a hydraulic conductivity varying from approximately 10^{-9} to 10^{-7} m/s.

2.3.2 Groundwater Flow

The water table is located within the fill zone, at a depth of about 2.5 to 4 metres below present ground surface; it is located at greater depths toward the shoreline.

Under present conditions, the fill zone is the primary hydrostratigraphic unit of groundwater flow, with an estimated flux of 10,700 m^3/year to False Creek; flow is essentially horizontal. Groundwater also flows to a lesser extent (approximately 2,900 m^3/year) through the underlying silty sands. Details of groundwater modelling in this portion of the site are presented in Appendix E-1.

2.5 RESULTS OF HUMAN HEALTH RISK ASSESSMENT

As discussed in Section 6 (Volume 1), no risks to human health, in excess of the Pacific Place standards, were found to be associated with the shallow soil which is to be left in-place following the proposed development. Shallow soils in the areas known to be extensively contaminated will be excavated for development.

2.6 DEVELOPMENT PLANS

Multi-storey residential dwellings, with some retail facilities, are planned for about 80% of Parcel 4. A park is planned for the east end of the parcel, and a bicycle path and pedestrian walkway will line the shoreline. A roadway and utility corridor is also proposed for the central area. Extensive excavation to an elevation of -2.7 metres geodetic (for subgrade structures) will take place to the south of Pacific Boulevard, while relatively minor excavation to +1.2 metres geodetic is planned for the small portion of Parcel 4 to the north of Pacific Blvd. (Figure 2-9). A public marina will be located in False Creek adjacent to the parcel. Boat launching will be available at the park located at the east end of the parcel.

2.7 IMPLICATIONS OF DEVELOPMENT

2.7.1 Effect of Development on Soil Contamination

Excavation for development of Parcel 4 will involve removal of fill and native materials to elevations of -2.7 metres geodetic to the south of Pacific Blvd. S. (PBS), and to 1.2 metres geodetic to the north of PBS. No excavation is presently planned for the southeastern end of the parcel.

The development of Parcel 4, as presently proposed, will require the excavation and removal of about 178,000 cubic metres of in-place fill and approximately 36,000 cubic metres of in-place native sediments and till. Excavation will take place primarily in AEC 14, 15, 18 and 19. Approximately 30,000 cubic metres of the excavated fill material is expected to have average concentrations between the Level B and C standards, 6,200 cubic metres between Level C and Special Waste, and 2,000 cubic metres in excess of the Special Waste criteria (expressed as in-place volumes).

- Treatment of groundwater seepage into excavations during construction will likely be required. General chemical parameters of concern will likely include oil & grease, ammonia, PAH and chlorophenols (north of PBS). Locally, treatment for aluminum, lead, mercury and zinc in the groundwater may be necessary.

- Appropriate measures to eliminate the build-up of methane in subgrade structures should be implemented in the north portion of Parcel 4 or where woodwaste content is significant.

2.8 EVALUATION OF REMEDIAL OPTIONS FOR SOIL

2.8.1 Option 1 - Excavation for Development

Option 1 addresses the treatment and disposal requirements of soil that will be excavated as part of the development of the parcel. Approximately half of the soil on Parcel 4 that has been identified as having average contaminant concentrations above the Level B standards will be excavated as part of the site development. Approximately one quarter of the total amount of fill excavated from the site for development is expected to contain contaminant concentrations above the Level B standard. Unregulated disposal will likely be appropriate for the remaining fill.

As discussed in Section 8.0 (Volume 1), a number of remedial measures and technologies were evaluated for the contaminated soil on the Pacific Place site. Based on this evaluation, disposal in an industrial landfill is recommended for the Level B to C soil, and disposal in an authorized landfill is recommended for the Level C to Special Waste soil.

The risk assessment performed for Parcel 4 shows that no risk to human health is associated with the soil that would remain in-place following the excavation for site development. Therefore, no remedial measures to reduce the potential for human exposure to soil contamination are required.

The volume of contaminated soil that will be excavated from the site (including excavation swell factor) under Option 1 is summarized below:

2.14 COMPARISON OF REMEDIAL COSTS

The total order of magnitude cost to B.C. Environment, in 1992 dollars, for remediation of the Level B, C and Special Waste contamination at Parcel 4 under each of the three options is presented below. Annual costs, such as groundwater treatment under Option 1 and quarterly monitoring for Options 1 and 2 are not included.

Option 1

Landfill disposal of soil between Levels B and C	$1,200,000
Landfill disposal of soil between Level C and Special Waste	$1,200,000
Incineration of Special Waste organics	$1,200,000
Passive methane venting system installation	$ 10,000
Total estimated BC Environment remediation cost for Level B, C and Special Waste soil under Option 1	**$3,610,000**

Considering the accuracy of this estimate is plus or minus 50 percent, the total cost to B.C. Environment for the remediation of Parcel 4 under Option 1 is estimated to range from $1,800,000 to $5,400,000.

Option 2

Landfill disposal of soil between Levels B and C	$1,400,000
Landfill disposal of soil between Level C and Special Waste	$1,680,000
Incineration of Special Waste organics	$1,200,000
Passive methane venting system installation	$ 10,000
Total estimated B.C. Environment remediation cost for Parcel 4 under Option 2	**$4,290,000**

Based on the evaluation of these three options the SRG recommends to B.C. Environment that Option 2 be implemented for the remediation of Parcel 4.

Province of
British Columbia
Ministry of
Environment,
Lands and Parks

BC Environment

Pacific Place Remediation Project
Suite 130, 10691 Shellbridge Way
Richmond, British Columbia
V6X 2W8

TO: Jon O'Riordan

FROM: Dave Clark

SUBJECT: Confirmation of Compliance - Parcel 4, Lots DE

DATE: 30 August 1999

FILE: 99-6234

Jon

I have attached the Confirmation of Compliance (CoC) document pertaining to Lots DE, Parcel 4 at Pacific Place.

The remediation of the lots was completed in accordance with the remedial plan approved in 1993 (*Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7)*. As had been contemplated at the time of approval, some impacted soils remain in situ. These soils do not represent an unacceptable level of risk to human health or the environment. The CoC will be filed on the site registry in accordance with the Contaminated Sites Regulation.

The CoC must be signed by the deputy minister in accordance with the Soils Agreement 1988. Six copies are attached for execution. Once signed all copies should be returned to our office for distribution to appropriate parties.

D.J. Clark, P.Eng.
Project Manager

BRITISH COLUMBIA

→ Kerri - do we have a regional file that corresponds to ? Thx.

Victoria File: 26255-01/14-4
SITE No: 980

November 14, 2000

Darrel Desjardin
Vancouver Port Authority
1900 Granville Square
200 Granville Street
Vancouver BC V6C 2P9

Dear Darrel Desjardin:

Re: Pacific Place Area 4 Water Lot (BERC File No. CPR3004B023).

Documentation reviewed:

- *Addendum to Final Report - Investigation of Sediment Quality and Aquatic Habitat for Area 4 marina- False Creek.* prepared by Pacific Place Remediation Project, September 29, 2000;
- *Concord Pacific Group Inc. letter dated September 29, 2000;*
- *BERC letter dated September 15, 2000;*
- *BEERC letter dated June 29, 2000; and*
- *Investigation of Sediment Quality and Aquatic Habitat for Area 4 marina- False Creek,* prepared by Pacific Place Remediation Project, March 2000.

The Ministry is generally satisfied with the recommendations and conclusions of the Pacific Place Remediation Project (PPRP) reports. Concord is to be commended for their efforts in redesigning the proposed marina to reduce the number of piles and therefore the impacts associated with construction. Likewise, PPRP have given considerable thought to mitigation measures and the effects of propeller wash in their submission.

As previously stated, the ministry recognizes that the potential contamination of False Creek as a whole needs to be addressed. Our Ministry, the federal Department of Fisheries and Oceans and Environment Canada, in conjunction with the property owners in and around False Creek need to develop a joint strategy on

Ministry of Environment, Lands and Parks
Pollution Prevention & Remediation Branch
Environmental Remediation & Integrated Pest Management Section
Mailing Address:
PO Box 9342 Stn Prov Govt
Victoria BC V8W 9M1
Telephone: (250) 356-0557
Facsimile: (250) 387-9935
Location:
3rd Floor, 2975 Jutland Road
Victoria BC

how to deal with the various cleanup issues. The Ministry is satisfied with Concord's subsidiary Pacific Place Holdings Ltd.'s commitment (letter dated September 29, 2000) to participate as a member in any watershed approach to addressing water and sediment quality in False Creek.

A couple of minor points are suggested that could have added further support to Pacific Place Remediation Project 's case. No doubt further efforts to identify the source of the PAHs could also be suggested, but are not at this point critical to warrant a delay in the Concord Pacific project.

Yours truly,

Mike Macfarlane
Regulatory Toxicologist
Contaminated Site Remediation Unit

cc: Doug Walton, BCE - Victoria
John Ward, BCE - Victoria
Alan McCammon, BCE- Surrey
Doug Pope, BCE-Surrey
Mike Wilcox, BCE-Surrey

Specific Comments:

The Ministry's water quality criteria for "turbidity" as cited in the Addendum is incorrect. Where background turbidity is in the range of 8 to 50 NTU, changes above background should not exceed **5NTU** (not 50NTU) above background.

It is notable that Figure 3 of the Addendum shows that the Area 4 sediments have a higher composition of low and high molecular weight PAHs than the two sediment sample stations near the Heather Street CSO. Whether this is reflective of particle size distributions and PAH partitioning to finer grain sediments is uncertain, though this might provide an additional explanation for the noted concentrations. Further assessment of PAH fingerprinting would have aided in explaining the PAH levels in sediments of Area 4. Anthracenedione has been found in diesel exhaust and urban particulate matter and has been shown to accumulate in marine sediments (Boxall and Maltby, 1995[1]). No doubt further efforts to identify the source of the PAHs could be suggested but are not at this point critical to warrant a delay in the Concord Pacific project.

The report should also have included the draft GVRD sediment data collected in False Creek. Darrel, I would like Ron Macdonald, (GVRD) to send us the False Creek data even if it is draft.

The matter of particle size as a confounding factor in toxicity observed with *E. estuarius* is deserving of further consideration. Additional inquiries could have been made with other laboratories routinely testing with this species, could have been included. Likewise, PPRP could have tested their hypothesis using clean sediments.

[1] Boxall, A.B.A and L.Maltby, 1995. The Charaterization And Toxicity Of Sediments Contaminated With Road Runnoff. *Wat. Res. Vol.* 29 No.9 pp 2043-2050

CONFIRMATION OF COMPLIANCE

DATED: the 14th day of March, 2001

FROM: HER MAJESTY THE QUEEN In Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

(hereinafter called the "Province")

TO: APPROVING OFFICER
for the City of Vancouver
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

AND TO: CITY OF VANCOUVER
453 West 12th Avenue
Vancouver, British Columbia
V5Y 1V4

(hereinafter called the "Approving Officer" and the "City", respectively)

In this Confirmation of Compliance the following words shall have the following meanings:

"Contaminants" means those substances existing on or under the Lands hereinafter described as of May 11, 1988 which are defined as a threat to the public health or the environment under any applicable laws, regulations or requirements in the Province of British Columbia, including any applicable laws, regulations or requirements of the Federal Government of Canada.

"Lands" means Lot 271 False Creek Plan LMP39586.

"Provincial Standards" means, with respect to the Lands, compliance with the requirements of all applicable legal standards within the Province of British Columbia, including any applicable legal standards of the Federal Government of Canada, pertaining to Contaminants in relation to the use of the Lands for residential purposes, utilities and facilities incidental thereto and all associated utilities as more particularly described in development permit DP403987.

The Province does hereby confirm to the Approving Officer and to the City that subject to the requirements set out in Appendix "i" attached hereto that there is compliance with the Provincial Standards with respect to the Lands.

HER MAJESTY THE QUEEN in Right of the Province of British Columbia as represented by the Minister of Environment, Lands and Parks

ORIGINAL SIGNED BY

Derek Thompson, Deputy Minister for the Ministry of Environment, Lands and Parks

cc: Pacific Place Developments Ltd.
900 - 1095 West Pender Street
Vancouver, British Columbia
V6E 2M6

APPENDIX "i"

Confirmation of Compliance dated the ___ day of March, 2001
For Lot 271 False Creek Plan LMP 39586
(Parcel 4 F/G) (the "Confirmation of Compliance")

The Confirmation of Compliance is subject to the following conditions:

1. As the Lands are subject to in site management of soils containing Contaminants at concentrations in excess of the applicable legal standards within British Columbia for residential use.

(a) The surface cover material on the Lands exterior south of the existing building on the Lands must be maintained.

2. Pertinent information with respect to the Lands will be placed and maintained on any Site Registry established by the Province pursuant to the provisions of the Waste Management Act and any amendments thereto.

Capitalized terms utilized in this Appendix "i" shall have the same meaning ascribed to the same term in the Confirmation of Compliance.

TO: Jon O'Riordan

~~FROM:~~ Dave Clark

SUBJECT: Confirmation of Compliance - Parcel 4 Lots FG

DATE: March 8, 2001

FILE: 00-7555

Jon,

I have attached the Confirmation of Compliance (CoC) document pertaining to Parcel 4FG at Pacific Place.

The remediation of the lots was completed in accordance with the remedial plan approved in 1993 (*Remedial Plan for Parcels 1,4,5A,5B,6A,6C and 7)*. As had been contemplated at the time of approval, some impacted soils remain in situ. These soils do not represent an unacceptable level of risk to human health or the environment. The CoC will be filed on the site registry in accordance with the Contaminated Sites Regulation.

The CoC must be signed by the deputy minister in accordance with the Soils Agreement 1988. Six copies are attached for execution. Once signed all copies should be returned to our office for distribution to appropriate parties.

D.J. Clark, P.Eng.

AMC

COPY

BRITISH COLUMBIA

Ministry of Water, Land and Air Protection

Environmental Management Branch
Contaminated Sites Program

MEMORANDUM

Telephone: 604-582-5280
Facsimile: 604-584-9751

File: 26255-01/14-1/14-2/14-4
Site: 956/973/980

December 9, 2003

To: Brian Clarke
Director, Crown Contaminated Site Program
Ministry of Sustainable Resources Management
PO Box 9361 Stn Prov Govt
Victoria BC V8W 9M2

From: Alan McCammon
Assistant Director, Contaminated Sites Program
Environmental Management Branch
Ministry of Water, Land and Air Protection

RE: Discharge of Restrictive Covenant BK370893, Lots 1-129 False Creek, Group 1, New Westminster District, Plan BCS

The Ministry of Water Land and Air Protection received the attached package for the discharge of a restrictive covenant (Section 215 Covenant BK370893) for a site within the Pacific Place development. The covenant is in favour of Her Majesty the Queen as represented by the Minister of Environment Lands and Parks. It was placed on the site in 1996 (i.e. prior to the Contaminated Sites Regulation) to address contamination that was left *in-situ* prior to the sale of the property to Concord Pacific Holdings Ltd. The covenant required that development at the site must conform to the development permit but that the covenant would not extend to strata lots created pursuant to an approved development plan.

So as not to confuse the distinct roles and responsibilities of SRM and WLAP regarding this site (specifically, as former land owner and regulator, respectively), I believe it is more appropriate that SRM consider (and execute, if warranted) the request for discharge of the restrictive covenant . Consequently, I am forwarding the attached documents for your consideration. They

include the request from McCarthy Tétrault LLP, as the agent for Concord Pacific Holdings Ltd., three (3) copies of the discharge, a copy of the restrictive covenant, and a copy of the Confirmation of Compliance report for the site. If you have any questions, please contact me at (604) 582-5280.

Alan McCammon
Assistant Director, Contaminated Sites Program

Attachment

cc. Dennis Doyle, Ministry of Attorney General

harris/map
i:\epd\emb\cs program\sites\waterford (pacific place)\srm letter1.doc

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada | Canada

Brad Reshetylo

Close Window

A/Manager, Sustainable Development Strategy

Public Works and Government Services Canada
Vancouver

800 Burrard Street, Room 641

Vancouver, British Columbia
Canada
V6Z 2V8

Telephone:
(604) 666-1232
Fax:
(604) 666-5159

X.400:
/C=CA/ADMD=GOVMT.CANADA/PRMD=GC+PWGSC.TPSGC/O=PAC/S=Reshe
C=CA;ADMD=GOVMT.CANADA;PRMD=GC+PWGSC.TPSGC;O=PAC;S=Reshe

E-mail: brad.reshetylo@pwgsc.gc.ca

Creation Time: 2006-02-24 06:27:03
Last Modified Time: 2006-07-29 06:08:17

Position within Government of Canada organizational hierarchy

- Government of Canada
- Public Works and Government Services Canada
- PACIFIC REGION
- Real Property Services Branch Directorates
- Professional and Technical Services
- Environmental Services
- Vancouver

****
*** MULTI TX/RX REPORT ***
****

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TRANSACTION OK (1) 6044300672
(2) 6048737963
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BRITISH COLUMBIA

Date: AUG - 2 2006

Victoria File: 26250-20/8213
Regional File: 26250-20/8213
SITE 8213

VIA FAX ONLY: 604-430-0672 and 604-873-7963

Keystone Environmental Ltd.
Suite 320 - 4400 Dominion Street
Burnaby, BC V5G 4G3
Attention: Lori Larsen

City of Vancouver
453 West 12th Avenue
Vancouver, BC V5Y 1V4
Attention: Neil McCreedy

Dear Madame/Sir:

Re: Site Profile Submission – Subdivision Application
700 Hamilton Street, Vancouver
PID: 008-724-512

This letter is in response to the proponent's request for release of the above-referenced municipal subdivision application. According to our records, there is an outstanding requirement for a preliminary site investigation, as outlined in our 16 April 2003 site profile decision letter. We understand that, pursuant to the *Vancouver Charter*, or the *Land Title Act* in the case of subdivision, this decision will suspend approval of the subject application, or other future applications for the site identified in section 40 of the *Environmental Management Act*, until:

- the proponent has applied for, and obtained, one of the following *Environmental Management Act* instruments, as applicable: a determination that the site is not a contaminated site, a voluntary remediation agreement, an approval in principle of a remediation plan or a certificate confirming the satisfactory remediation of the site, and provided a copy of the instrument to the Council or its delegate as per sections 571B.(2)(c), (f) or (g) of the *Vancouver Charter* or approving officer as per sections 85.1(2)(c), (f) or (g) of the *Land Title Act*; or

****
*** TX REPORT ***
****

TRANSMISSION OK

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BRITISH COLUMBIA

Date: AUG - 2 2006

Victoria File: 26250-20/8213
Regional File: 26250-20/8213
SITE 8213

VIA FAX ONLY: 604-430-0672 and 604-873-7963

Keystone Environmental Ltd.
Suite 320 - 4400 Dominion Street
Burnaby, BC V5G 4G3
Attention: Lori Larsen

City of Vancouver
453 West 12th Avenue
Vancouver, BC V5Y 1V4
Attention: Neil McCreedy

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BRITISH COLUMBIA

Date: AUG -2 2006

Victoria File: 26250-20/8213
Regional File: 26250-20/8213
SITE 8213

VIA FAX ONLY: 604-430-0672 and 604-873-7963

Keystone Environmental Ltd.
Suite 320 - 4400 Dominion Street
Burnaby, BC V5G 4G3
Attention: Lori Larsen

City of Vancouver
453 West 12th Avenue
Vancouver, BC V5Y 1V4
Attention: Neil McCreedy

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700 Hamilton Street, Vancouver
PID: 008-724-512

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Ministry of Environment
Environmental Protection Division
Environmental Management Branch
Land Remediation
Mailing/Location Address:
10470 152 Street
SURREY BC V3R 0Y3
Telephone: (604) 582-5200
Facsimile: (604) 584-9751
http://www.gov.bc.ca/env

- the Council or its delegate or approving officer, as appropriate, has received notice from the ministry, pursuant to section 571B.(2)(d) of the *Vancouver Charter* or section 85.1(2)(d) of the *Land Title Act*, that the Council or its delegate or approving officer may approve a specific application under this section because, in the opinion of the director, the site would not present a significant threat or risk if the specific application were approved.

Based on the information provided, we are prepared to provide the necessary release so that the approving officer may proceed with approval of the subdivision application. To that end, please accept this letter as notice pursuant to section 85.1 (2)(d) of the *Land Title Act*, that the approving officer may approve the subdivision application under this section because, in the opinion of the director, the site would not present a significant threat or risk if the subdivision application were approved, provided that:

1. The proponent retains a qualified environmental consultant to identify, characterize and appropriately manage any soil and/or water of suspect environmental quality encountered during any excavation work at the site; and

2. The site owner agrees to indemnify and save harmless the Crown and her employees against all loss, damages, costs, actions, suits and claims arising from any contamination remaining on-site.

The above opinion is restricted to threat or risk associated with contamination.

Please also be advised of the following:

- The ministry recommends that the proponent review all aspects of the government's contaminated sites legislation and supporting guideline documents and protocols to ensure that all required information is collected and documented during investigation and where necessary, remediation of the site;

- In cases of site demolition, we recommend that a survey of building materials and equipment be undertaken to identify any materials that require special management;

- Fees are applicable for the ministry's contaminated sites services, pursuant to section 9 of the Contaminated Sites Regulation. Information on the government's contaminated sites legislation and supporting guideline documents and protocols as well as a Contaminated Sites Services Application Form can be obtained from the ministry's contaminated sites web page located at: http://www.env.gov.bc.ca/epd/epdpa/contam_sites/index.html;

- Please be advised that under the authority of the *Environmental Management Act*, all applications eligible under Protocol 6 shall be submitted as roster submissions by an approved professional. For further clarification of application eligibility please see http://www.env.gov.bc.ca/epd/epdpa/contam_sites/updates/index.html ; and

- Those persons undertaking site investigations and remediation at contaminated sites in British Columbia are required to do so in accordance with the requirements of the *Environmental Management Act* and regulations (e.g. Contaminated Sites Regulation, Hazardous Waste Regulation, etc.). The ministry considers these persons responsible for identifying and addressing any human health or environmental impacts associated with the contamination.

Decisions of a director may be appealed under part 8 of the *Environmental Management Act.*

Please contact the undersigned at 604-582-5357 if you have any questions about this letter.

Sincerely,

Kerri Skelly
for Director, *Environmental Management Act*

cc: Brad Reshetylo, Public Works and Government Services Canada, FAX: 604-666-5159

Barry Savage, Concord Pacific Group Inc., 900 – 1095 West Pender Street, Vancouver, V6E 2M5

File No.: 26250-20/8213 SiteID_8213

Request for Release

Checklist — Land Remediation Section

Common Name: CBC Building
Address: 700 Hamilton Street, Vancouver

Date Received: 2006/07/26

Corresponding Procedure		Date
	Assessment of Site Profile X Site profile satisfactorily complete Existing File Records? X yes File: _8213 Caseworker: _____ ❒ no Processing Requirements ☒ SITE record created ❒ Orthographic photo printed – Latitude/Longitude determined Trigger for Site Profile ❒ Site decommissioning ☐ Demolition Permit ❒ Zoning ☒ Subdivision ❒ Development Permit ☐ Other o Variance Recommended Decision X Investigation Required ☐ LGA 946.2(2)(d) ☒ LTA 85.1(2)(d) ❒ No Investigation Required ☐ VC 571B(2)(d) Schedule 2 Activities: G2 – Automotive repair, salvage or wrecking.	

Additional Notes (1)(2)

(1) Telephone conversation records and other processing information.
(2) If caseworker exists for the file; caseworker to briefly review and summarize site history, status, outstanding requirements if any, etc.

HISTORY:

The site footprint covers an entire city block with the majority of the space used for the Canadian Broadcasting Building. A portion of the site is to be subdivided, sold and redeveloped. A gas station previously existed on the site. A final determination was obtained for the portion of the site to be sold. Investigation was conducted to ensure contamination was not migrating offsite from the remaining portion of the site. Neil McCreedy confirmed on August 1, 2006 that the City of Vancouver supports release of the subdivision application.

RECOMMENDATION:

Release of the subdivision application based on the final determination and investigation of the remaining portion of the site.

RATIONALE:

Will assist with development timelines.

Prepared by _____Kerri Skelly_ Date: _August 2, 2006__

06/07/28

Discussion w/ Linda Kwan, City of Vancouver, to see whether they have any concern with release of the subdivision application.

She will confirm w/ Neil McCready on acceptance of the release.

Vince.

NEIL MCCREEDY CONFIRMED SUPPORT OF RELEASE AUG. [redacted], 2006

July 26, 2006

File Number: 9155-01 (1.0)

KEYSTONE
ENVIRONMENTAL

BC Ministry of Environment
2nd Floor
#10470 - 152nd Street
Surrey BC V3R 0Y3

Facsimile Number: 604 930-7119

RECEIVED
JUL 28 2006
LOWER MAINLAND REGION

Keystone Environmental Ltd.
Suite 320 4400 Dominion St.
Burnaby BC V5G 4G3
Telephone 604 430 0671
Facsimile 604 430 0672
keyinfo@keystoneenviro.com
www.keystoneenviro.com

Attention: Vince Hanemayer

Dear Sir:

Reference: Site Profile Submission – Additional Information
700 Hamilton Street, Vancouver, BC
Regional File: 26250-20/8213
Victoria File: 26250-20/8213
SITE ID 8213

The following additional information is to be used when evaluating the Site Profile submitted for 700 Hamilton Street and forwarded to you by the City of Vancouver as prescribed by the Vancouver Charter and CSR Regulation.

The submission of the Site Profile is for the purposes of subdivision of the land parcel that comprises 700 Hamilton Street so that a small portion of the southern end of the block can be ceded back to the City of Vancouver for road allowance. Currently there is a development application for a residential tower which will occupy the current parking lot at the southern third of the 700 Hamilton Street block. The developer wished to ensure that there would be no delays to his project and he obtained a Final Determination for the residential tower. As this residential development was not going to entail the subdivision of the parcel, the Final Determination was applied to the footprint of the airspace parcel for the residential tower development. For the upcoming subdivision of road allowance from the land parcel, land to be ceded is a small sliver of land that lies within the footprint of the airspace parcel and is covered by the Final Determination that was issued.

Please note the following items regarding this Site Profile submission:

- The land parcel which comprises 700 Hamilton Street, excluding the southern portion for which there is a Final Determination, is currently occupied by the

CBC building. The construction of this building in the mid to early 1970's saw the excavation of soil to approximately three stories below grade. Any potential soil contamination that may have existed from the former presence of a gasoline service station(s) (in existence from circa 1935 through to circa 1970 at the north end of the 700 Hamilton block) would have been removed during the construction of the building.

- Based on the current existence of subgrade levels within the CBC Building, any potential impact from the historical presence of a gasoline service station(s) on the north end of the block has been removed. Currently there is no evidence that there is off-site contamination from these former gasoline station(s).
- There are no plans to change the current use of the northern two thirds of the Site which is occupied by the CBC building.
- The pending development on the southern third of the Site, the portion which has received a Final Determination, will be residential towers with possible commercial use at grade. The use of this portion of the Site is not expected to change from the development plan in the near future.

These findings are based on a review of the following reports.

- *Report of Findings, Preliminary Site Investigation Stage 1 and Stage 2, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated December, 2005;
- *Report of Findings, Stage 1 and 2 Preliminary Site Investigation, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated March, 2002;
- *Report of Findings, Preliminary Site Investigation Stage 1, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated May, 2001; and,
- *Geotechnical Report, Proposed Additions to CBC Building, 700 Hamilton Street, Vancouver, B.C.* prepared by Geopacific Consultants Ltd. and dated May 9, 2001.

Based on the information presented in the above listed reports and a site inspection conducted by Keystone Environmental Ltd. in June 2006 of the CBC Building (northern two thirds of 700 Hamilton Street block) and surrounds, Keystone Environmental Ltd. concludes:

1. There is a low potential that constituents of concern are present in the whole of the 700 Hamilton block soil and/or groundwater at concentrations in excess of the

applicable standards provided in the British Columbia *Contaminated Sites Regulation* (CSR), and further investigation is not warranted.

2. There is no evidence of off-Site contamination present from the former and current uses of the Site; and,
3. The future intended use of the Site is the CBC Building and a residential tower development.

Please take this information under consideration as you review the Site profile. If you have any questions, please call me at (604) 430-0671.

Sincerely,
Keystone Environmental Ltd.

Lori C. Larsen, P.Ag.
Senior Project Manager

cc: Peter Arbuckle - MKT/Arkle development management inc.
Barry Savage – Concord Pacific Group

File Path: I:\9100-9199\9155\Correspondence\915501 060725 Additional Info for MOE re Site Profile.doc

CITY OF VANCOUVER
COMMUNITY SERVICES GROUP
Licences and Inspections
Environmental Protection

FAX

TO:	Kerri Skelly Ministry of Environment Contaminated Sites Program	FROM:	Linda Kwan Analyst 873-7733.
FAX:	604.584.9751	DATE:	July 18, 2006
PHONE:		PAGES:	9, including this cover
SUBJECT:	700 Hamilton Street - Subdivision		

Hi Kerri:

I'm forwarding the site profile for the above referenced site for your comments.

A final determination for the south portion of 700 Hamilton Street was finalized on June 20, 2006 (MoE Regional File: 26250-20/8213). However there is no final determination with respect to the north portion of the referenced site and the subdivision pertains to the entire site. The CBC building occupies the north portion of the site.

Thank you.

Yours truly,

Linda Kwan
Analyst
301 - 456 West Broadway
Phone: 604.873.7733
Fax: 604.873.7963

/lk

Discussion w/ Lori Larson. 06/07/25.
Site reconnaissance of 700 Hamilton
- no evidence of contamination under existing building.
- site developed in 1970s w/ multiple floors of under ground.
- Lori advised that based on Keystone's investigations, any contamination associated w/ former land use (ie 1970s service stns) has not migrated off-site. She will provide a letter confirming this.
Vince.

mkt · arkle *development management inc.*

July 4, 2006

Fax to: (604) 873-7963

Mr. Neil McCreedy
City of Vancouver
Manager, Environmental Protection Branch

Re: Application to Subdivide Block 57, D.L.541, Plan 13168 at 700 Hamilton Street.

Dear Neil:

Further to the letter of June 1, 2006 from P. Judel regarding the above captioned Subdivision Application, please find attached:

1. Copy of Final Determination related to the Southerly position of the subject property.

2. A Site Profile related to the balance of the property.

We trust these meet your requirements such that your department can sign-off on the above application. Should that not be the case I would appreciate your calling me at (604) 669-9400

Regards,

Peter Arbuckle

PA/sz

cc: David Murphy, Subdivision and Strata Title Co-ordinator (Fax: 604-873-7060)
Alison Hisginson (Fax: 604-873-7060; Cover letter only)

#1460 - 1188 West Georgia Street, Vancouver, B.C. V6E 4A2 Canada
Tel: (604) 669-9400 Fax: (604) 669-9410
www.mktarkle.ca *mktinc@axion.net*

SCHEDULE 1
Site Profile
(All Information Must be Provided and All Questions Answered) (Version 3.0)

I. CONTACT IDENTIFICATION

A. Name of Site Owner:

Last _____ First ___ Middle Initial(s) . (and/or, if applicable)
Company Canadian Broadcasting Corporation
Owner's Civic Address 747 Bute Street
City Vancouver Province/State BC
Country Canada Postal Code/ZIP _____

B. Person Completing Site Profile (Leave blank if same as above):

Last Larsen First Lori Middle Initial(s) C (and/or, if applicable)
Company Keystone Environmental

C. Person to Contact Regarding the Site Profile:

Last Larsen First Lori Middle Initial(s) C (and/or, if applicable)
Company Keystone Environmental

Mailing Address Suite 320, 4400 Dominion Street
City Burnaby Province/State BC
Country Canada Postal Code/ZIP V5G 4G3
Telephone (604) 430 - 0671 Fax (604) 430 - 0672

II. SITE IDENTIFICATION

Please attach a site location map

IF Legally Titled, Registered Property -

Please note this Site Profile only references the existing CBC building which is present on the northern two thirds of the registered parcel. The remainder of the parcel has a Final Determination, described by a metes and bounds description in that Determination, The Determination indicates the soil and groundwater meets residential land use and aquatic life standards respectively.

Site Street Address (if applicable) 700 Hamilton Street

City Vancouver Postal Code _____

PID numbers and associated legal descriptions. ***Attach an additional sheet if necessary.***

PID	Legal Description
008-724-512	BLOCK 57 DISTRICT LOT 541 PLAN 13168

Total number of titled parcels represented by this site profile is: 1

SCHEDULE 1
Site Profile

(Version 3.0)

IF Untitled Crown Land

1) PIN numbers and associated Land Description. ***Attach an additional sheet if necessary.***

PIN	Land Description

Total number of untitled crown land parcels represented by this site profile is:_____

OR

2) Coordinates (using the North American Datum 1983 convention) for the centre of the site:
Latitude: Degrees 49 Minutes 16 Seconds 44.8
Longitude: Degrees 123 Minutes 6 Seconds 52.8

Please attach a map of appropriate scale showing the boundaries of the site.
(and, if available)

Crown land file numbers. ***Attach an additional sheet if necessary.***

_____ _____ _____ _____ _____

III. COMMERCIAL AND INDUSTRIAL PURPOSES OR ACTIVITIES

Please indicate below, in the format of the example provided, which of the industrial and commercial purposes and activities from Schedule 2 have occurred or are occurring on this site.

EXAMPLE

Schedule 2 Reference	Description
E1	appliance, equipment or engine repair, reconditioning, cleaning or salvage
F10	solvent manufacturing or wholesale bulk storage

Please print legibly. Attach an additional sheet if necessary

Schedule 2 Reference	Description
F5	PETRO. PROD. DISPENSE FACILITY, INC. SERVICE STATION/CARDLOT
F7	PETROLEUM OR NATURAL GAS PRODUCT OR PRODUCED WATER STORAGE IN ABOVE GROUND OR UNDERGROUND TANKS

SCHEDULE 1
Site Profile

(Version 3.0)

VII	TANKS OR CONTAINERS USED OR STORED		
	Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):	**YES**	**NO**
A.	Underground fuel or chemical storage tanks? **(Please see end notes)**	yes	
B.	Above ground fuel or chemical storage tanks? **(Please see end notes)**	yes	

VIII	SPECIAL (HAZARDOUS) WASTES OR SUBSTANCES		
	Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):	**YES**	**NO**
A.	PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored? **(Please see end notes)**	yes	
B.	Waste asbestos or asbestos containing materials such as pipe wrapping, blown-in insulation or panelling buried?		no
C.	Paints, solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres? **(Please see end notes)**	yes	

IX	LEGAL OR REGULATORY ACTIONS OR CONSTRAINTS		
	To the best of your knowledge are there currently any of the following pertaining to the site (please mark the appropriate column opposite the question):	**YES**	**NO**
A.	Government orders or other notifications pertaining to environmental conditions or quality of soil, water, groundwater or other environmental media?		no
B.	Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from other environmental conditions?		no
C.	Government notifications relating to past or recurring environmental violations at the site or any facility located on the site?		no

X ADDITIONAL COMMENTS AND EXPLANATIONS

(Note 1: Please list any past or present government orders, permits, approvals, certificates and notifications pertaining to the environmental condition, use or quality of soil, surface water, groundwater or biota at the site.

Note 2: If completed by a consultant, receiver or trustee, please indicate the type and degree of access to information used to complete this site profile. Attach extra pages, if necessary):

Please note that the south portion of this Site already has a Final Determination that the Site meets residential and aquatic life standards. The type and degree of access to information used to complete this site profile were taken from PSI 1 and PSI 2 reports completed by Keystone Environmental for the south portion of the Site. A Site reconnaissance of the CBC Building with interviews with Site personnel was undertaken specifically for this Site Profile. In all the following sources were utilized:

- a review of available historic records including city street directories, fire insurance maps, land use maps, the British Columbia MOE on-line Site Registry, and a current title search;
- a site reconnaissance to observe Site conditions which may indicate the potential presence of contamination;
- a comparison of previous analytical data to current standards;

- interviews with individuals knowledgeable about the Site in question; and
- the drilling of boreholes and/or monitoring wells on-Site, and collection of soil and groundwater samples.

The information marked on this Site Profile is to be interpreted with the additional information as noted below. Each notation refers to a specific Site Profile Section as indicated by the number preceding the note.

VIIA Underground gasoline, heating oil and waste oil tanks formerly existed (or potentially exigted) on-Site prior to the 1970s. However, soil and groundwater analytical results from the southern portion of the registered parcel indicate that potential constituents of concern are not present in the soil and groundwater samples analyzed at levels exceeding the applicable standards. As well, the majority of the Site has been excavated approximately three stories below grade to construct the existing CBC building, a geomagnetic survey of the southern portion of the Site did not identify evidence of potential USTs, and there was no evidence of potential USTs remaining on-Site (after the 1970s) observed during previous investigations.

VIIB Two diesel ASTs currently exist on-Site to fuel a back-up electricity generator. These tanks are double walled, have secondary containment (The main storage tank in the basement is located in a concrete room with a sill at the door way and does not have a floor drain. The day tank is located on concrete on the fifth floor). The diesel tanks that have been located in the CBC building since the 1970s are not known to have leaked . There are no observable pathways to the soil or groundwater beneath the Site.

VIIIA Pole mounted PCB-containing electrical transformers potentially existed on-Site prior to the construction of the CBC building in the 1970s. However, evidence indicating that these potential transformers released PCBs were not encountered. No PCB containing transformers were noted during the Site reconnaissance

VIIIC The CBC Props Department formerly stored paint and thinners in four litre containers that in total likely contained more than 205 litres. The paint was; however, used and stored in a concrete room with a concrete floor. The paint stored was primarily latex based and when clean up of painting gear was done there was/is a particulate separator used in conjunction with a sump prior to wash water being disposed to the sewer system.

SCHEDULE 1
Site Profile

(Version 3.0)

XI. SIGNATURES

The person completing the site profile states that the above information is true, based on the person's current knowledge as of the date completed.

Signature of person completing site profile

Date completed: (YY-MM-DD) 06-06-29

XII. OFFICIAL USE

Local Authority

Reason For Submission *(Please check one or more of the following)*

Subdivision Application ☒ **Zoning Application** ☐ **Development Permit** ☐ **Variance Permit** ☐ **Demolition Permit** ☐ **Soil Removal** ☐

Date received:	Local Government contact:	Date Submitted to Site Registrar:	Date forwarded to BC Environment Manager:
July 4/06	Name Linda Kwan Agency City of Vancouver ~~Environmental Protection~~ Address #301 - 456 W. Broadway Vancouver, BC V5Y 1R3 Telephone 604.873.7733 Fax 604.873.7963		July 18/06

BC Environment Manager

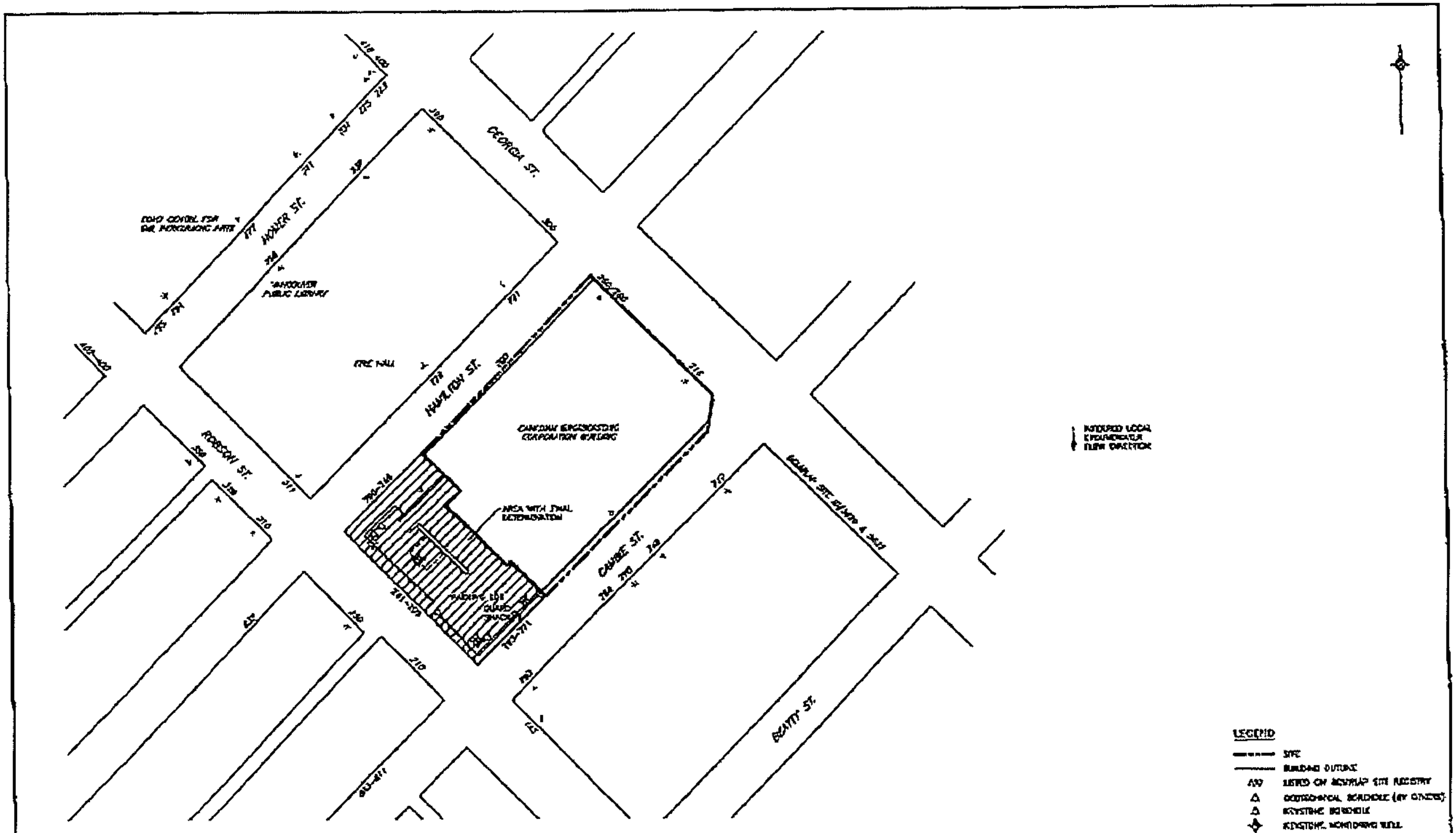
Reason For Submission *(Please check one or more of the following)*

Under Order ☐ **Site Decommissioning** ☐ **Foreclosure** ☐

Date received:	Assessed by: Name Region Telephone Fax If site profile entered, SITE ID #	Investigation Required? YES NO	Decision date:

Site Registrar

Date received:	Entered onto site registry by:	SITE ID #:	Entry date:



KEYSTONE ENVIRONMENTAL	NOTE: THIS DRAWING IS FOR GENERAL INFORMATION ONLY. LOT BOUNDARIES AND FEATURES ARE APPROXIMATE. SCALE: 1:1500(approx.)	700 Hamilton Street Parking Lot, Vancouver, B C; Concord Pacific Group Inc.; REVISION No. 00; DATE June 2006; PROJECT No. 8745-01	Figure 9 Site Profile CBC Building

BRITISH COLUMBIA

COPY

REGISTERED MAIL

Regional File: 26250-20/8213
Victoria File: 26250-20/8213
SITE ID 8213

June 20, 2006

Mr. Chris Gillham
Concord Pacific Group Inc.
900 – 1095 West Pender Street
Vancouver, BC V6E 2M5

Dear Mr. Gillham:

Re: Final Determination – South Portion of 700 Hamilton Street

Please find enclosed a final determination for the lands referenced above.

In addition to the conditions provided in Schedule "B" of the final determination please be advised of the following:

1. Information about the site will be included in the site registry established under the *Environmental Management Act.*

2. The provisions of this final determination are without prejudice to the right of the director to make orders or to require additional remediation measures as the director may deem necessary in accordance with applicable laws. Nothing contained in this final determination will in any way restrict or impair the director's power in this regard.

3. Groundwater wells that are no longer required shall be properly decommissioned in accordance with the *Water Act's* Groundwater Protection Regulation.

This final determination is a decision that may be appealed under Part 8 of the *Environmental Management Act.*

Ministry of Environment
Environmental Protection Division
Environmental Management Branch
Land Remediation Section
Mailing Address:
PO Box 9342 Stn Prov Govt
Victoria BC V8W 9M1
Phone: (250) 387-9513
Fax: (250) 387-9935
Location:
3rd Floor, 2975 Jutland Road
Victoria BC

If you require clarification of any aspect of the final determination, please contact the undersigned at (250) 387-9513.

Yours truly,

W. David Lockhart
Contaminated Sites Officer
Land Remediation Section

Enclosure

cc: Hank Uyeyama, City of Vancouver
Kerri Skelly, Ministry of Environment, Surrey
Kenneth A. Evans, P.Eng., c/o Keystone Environmental Ltd., Burnaby

BRITISH COLUMBIA

Ministry of Environment

FINAL DETERMINATION

(Pursuant to Section 44 of the *Environmental Management Act*)

I have made a final determination that the lands identified below **are not** a contaminated site. The information provided indicates that the site contains concentrations of substances that do not exceed Contaminated Sites Regulation prescribed standards for ***residential land*** **soil use** and ***aquatic life*** **water use.**

The lands covered by this final determination are located at the southwestern end of 700 Hamilton Street and are more particularly known and described as:

a portion of Block 57, District Lot 541, Plan 13168 described as:

Commencing at the most Southerly corner of Lot 57 District Lot 541 Plan 13168, thence 316°17'30" for a distance of 79.26 metres, more or less to the most Westerly corner of said Lot 57, thence 44°45'30" following in the Westerly limit of said Lot 57 for a distance of 43.60 metres, thence 134°45'30" for a distance of 21.77 metres, thence 224°45'30" for a distance of 9.65 metres, thence 134°45'30" for a distance of 27.05 metres, thence 44°45'30" for a distance of 1.78 metres, thence 134°45'30" for a distance of 30.42 metres, more or less to a point of intersection with easterly limit of said lot 57, thence 224°46'30" following in the Easterly limit of said Lot 57 for a distance of 37.85 metres, more or less, to the point of commencement, said area containing 0.304 ha, more or less.

as depicted in sketch plan of proposed airspace parcel over a portion of lot 57, Plan 13168

PID: a portion of 008-724-512

Approximate centre of the lands *

Latitude:	49°	16'	39.20"	* Using the NAD (North American Datum)
Longitude:	123°	6'	54.70"	1983 convention

June 20/06

Date Issued

Doug Walton

For Director, *Environmental Management Act*

SITE Identification Number 8213

Recommended by an approved professional, Kenneth A. Evans, P.Eng.

A site plan is attached as Schedule "A" to this final determination. Conditions are provided in Schedule "B". The substances evaluated against the standards specified above are listed in Schedule "C".

This final determination is based upon the recommendation provided under Section 15 (5) of the Contaminated Sites Regulation by Kenneth A. Evans, P.Eng., a member of the roster of approved professionals, in his letters to the ministry dated June 8, 2006, and February 10, 2006, regarding review of the following documents:

- *Report of Findings, Preliminary Site Investigation Stage 1 and Stage 2, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated December, 2005;
- *Report of Findings, Stage 1 and 2 Preliminary Site Investigation, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated March, 2002;
- *Report of Findings, Preliminary Site Investigation Stage 1, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated May, 2001; and
- *Geotechnical Report, Proposed Additions to CBC Building, 700 Hamilton Street, Vancouver, B.C.* prepared by Geopacific Consultants Ltd. and dated May 9, 2001.

The final determination is based on the most recent information provided to the ministry regarding the specified lands. I, however, make no representation or warranty as to the accuracy or completeness of this information. I expressly reserve the right to change or substitute different requirements where circumstances warrant.

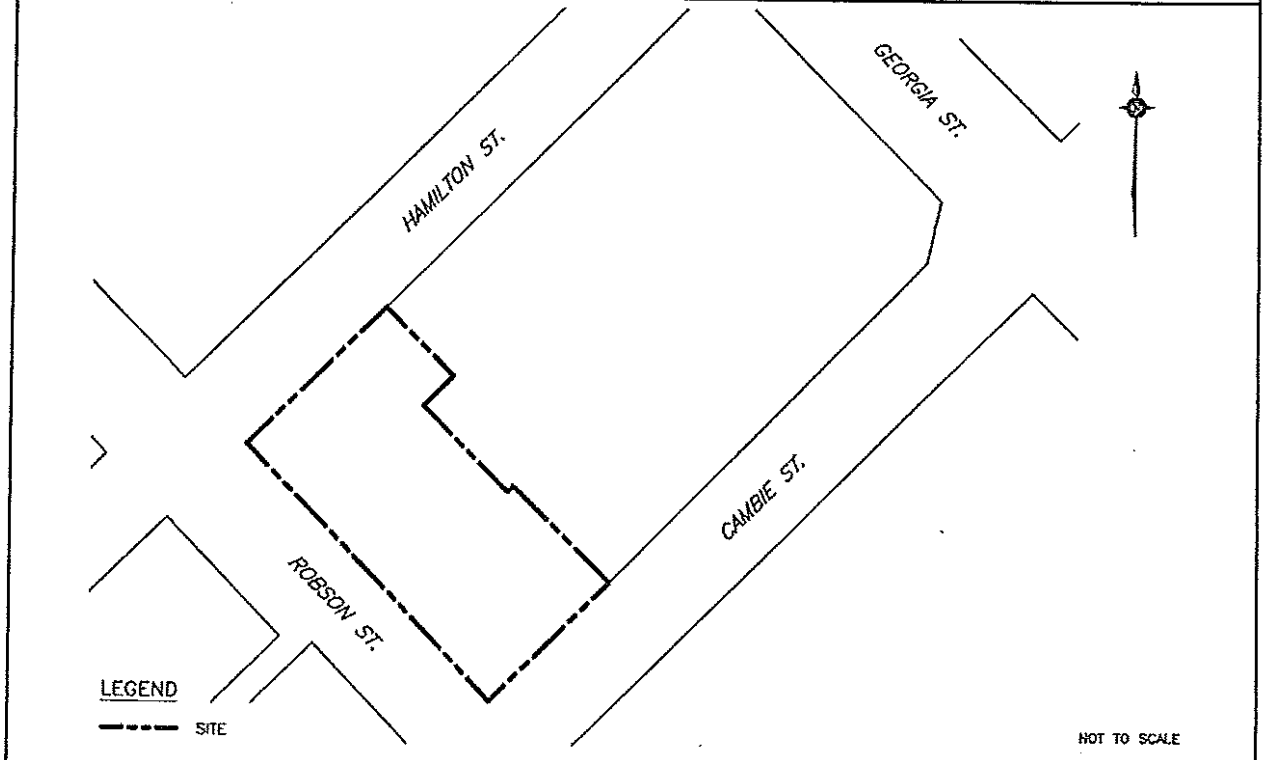
This final determination should not be construed as an assurance that there are no hazards present on the site described above.

June 20/06
Date Issued

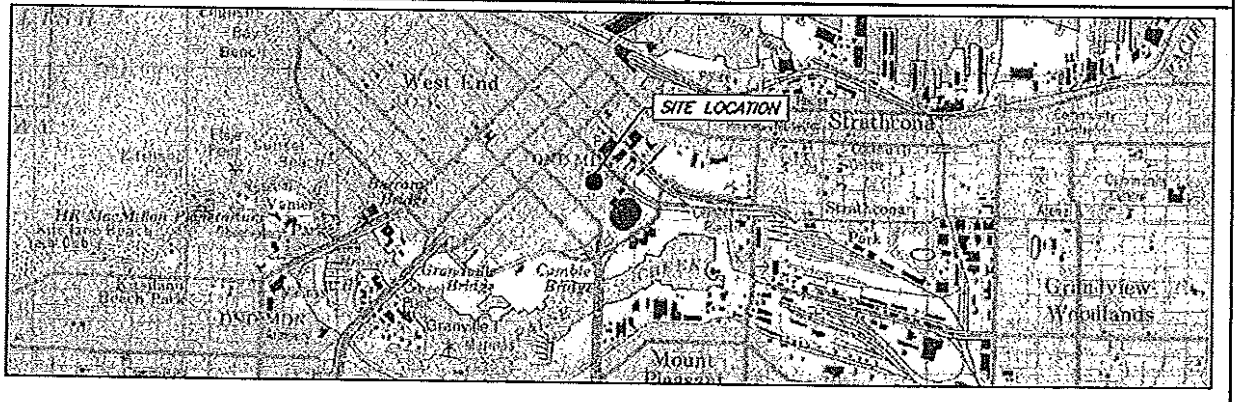
Doug Walton
For Director, *Environmental Management Act*

Schedule "A"

Site Plan



Location Map



June 20/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

SITE Identification Number 8213
Recommended by an approved professional, Kenneth A. Evans, P.Eng.

Schedule "B"

Conditions

1. A qualified environmental consultant shall be available to identify, characterize and appropriately manage any environmental media of suspect quality which may be encountered during any future subsurface work at the site.

June 20/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

Schedule "C"

Substances evaluated in soil:

- Antimony, barium, beryllium, cobalt, molybdenum, nickel, selenium, silver, tin, vanadium, arsenic, cadmium, chromium, copper, lead, mercury and zinc;
- VPHs, LEPHs, HEPHs;
- Chloroform, dichloroethane (1,1-, 1,2-), dichloroethene (1,1-, 1,2-), 1,2-dichloropropane, 1,3-dichloropropene (cis and trans), carbon tetrachloride, trichlorethane (1,1,1-, 1,1,2-), tetrachloroethylene, and trichloroethylene;
- 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene;
- Styrene, benzene, ethylbenzene, toluene and xylene;
- Benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-c,d]pyrene, naphthalene, phenanthrene, pyrene, and benzo[a]pyrene.

Substances evaluated in groundwater:

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc;
- Methyl tertiary butyl ether, VPH_w, $LEPH_w$, VH_{w6-10} and EPH_{w10-19};
- 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, monochlorobenzene, 1,2-dichloroethane, tetrachloroethylene, and trichloroethylene;
- Benzene, ethylbenzene, styrene, and toluene;
- Acenaphthene, acridine, anthracene, benzo[a]anthracene, benzo[a]pyrene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene and quinoline.

June 20/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

SITE Identification Number 8213
Recommended by an approved professional, Kenneth A. Evans, P.Eng.

BRITISH COLUMBIA

COPY

NF

REGISTERED MAIL

Victoria File: 26250-20/8213
Regional File: 26250-20/8213
SITE ID: 8213

April 7, 2006

Mr. Chris Gillham
Concord Pacific Group Inc.
900 – 1095 West Pender Street
Vancouver, BC V6E 2M5

Dear Mr. Gillham:

Re: Preliminary Determination – South Portion of 700 Hamilton Street

Please find enclosed a preliminary determination for the lands referenced above.

In addition to the conditions provided in Schedule "B" of the preliminary determination, please be advised of the following:

1. Information about the site will be included in the site registry established under the *Environmental Management Act.*

2. The provisions of this preliminary determination are without prejudice to the right of the director to make orders or to require additional remediation measures as the director may deem necessary in accordance with applicable laws. Nothing contained in this preliminary determination will in any way restrict or impair the director's power in this regard.

3. Please be aware that on November 1, 2005, the provisions for closing and deactivating wells, including monitoring wells, under the *Water Act's* Ground Water Protection Regulation came into effect.

Ministry of Environment
Environmental Protection Division
Environmental Management Branch
Land Remediation Section
Mailing Address:
PO Box 9342 Stn Prov Govt
Victoria BC V8W 9M1
Phone: (250) 387-9513
Fax: (250) 387-9935
Location:
3rd Floor, 2975 Jutland Road
Victoria BC

If you require clarification of any aspect of the preliminary determination, please contact the undersigned at (250) 387-9513.

Yours truly,

W. David Lockhart
Contaminated Sites Officer
Land Remediation Section

Enclosure

cc: Hank Uyeyama, City of Vancouver
Kerri Skelly, Ministry of Environment, Surrey
Kenneth A. Evans, P.Eng., c/o Keystone Environmental Ltd., Burnaby

BRITISH COLUMBIA

Ministry of Environment

PRELIMINARY DETERMINATION

(Pursuant to Section 44 of the *Environmental Management Act*)

I have made a preliminary determination that the lands identified below **are not** a contaminated site. The information provided indicates that the site contains concentrations of substances that do not exceed Contaminated Sites Regulation prescribed standards for ***residential land*** **soil use** and ***aquatic life*** **water use.**

The lands covered by this preliminary determination are located at the southwestern end of 700 Hamilton Street and are more particularly known and described as:

a portion of Block 57, District Lot 541, Plan 13168 described as:

Commencing at the most Southerly corner of Lot 57 District Lot 541 Plan 13168, thence 316°17'30" for a distance of 79.26 metres, more or less to the most Westerly corner of said Lot 57, thence 44°45'30" following in the Westerly limit of said Lot 57 for a distance of 43.60 metres, thence 134°45'30" for a distance of 21.77 metres, thence 224°45'30" for a distance of 9.65 metres, thence 134°45'30" for a distance of 27.05 metres, thence 44°45'30" for a distance of 1.78 metres, thence 134°45'30" for a distance of 30.42 metres, more or less to a point of intersection with easterly limit of said lot 57, thence 224°46'30" following in the Easterly limit of said Lot 57 for a distance of 37.85 metres, more or less, to the point of commencement, said area containing 0.304 ha, more or less.

as depicted in sketch plan of proposed airspace parcel over a portion of lot 57, Plan 13168

PID : a portion of 008-724-512

Approximate centre of the lands *

Latitude:	49°	16'	39.20"	* Using the NAD (North American Datum)
Longitude:	123°	6'	54.70"	1983 convention

April 7/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

SITE Identification Number 8213
Recommended by an approved professional, Kenneth A. Evans, P.Eng.

A site plan is attached as Schedule "A" to this preliminary determination. Conditions are provided in Schedule "B". The substances evaluated against the standards specified above are listed in Schedule "C".

This preliminary determination is based upon the recommendation provided under Section 15 (5) of the Contaminated Sites Regulation by Kenneth A. Evans, P.Eng., a member of the roster of approved professionals, in his/her letter to the ministry dated February 10, 2006, regarding review of the following documents:

- *Report of Findings, Preliminary Site Investigation Stage 1 and Stage 2, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated December, 2005;
- *Report of Findings, Stage 1 and 2 Preliminary Site Investigation, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated March, 2002;
- *Report of Findings, Preliminary Site Investigation Stage 1, Canadian Broadcasting Corporation Parking Lot, 700 Hamilton Street, Vancouver, B.C.* prepared by Keystone Environmental Ltd. and dated May, 2001; and
- *Geotechnical Report, Proposed Additions to CBC Building, 700 Hamilton Street, Vancouver, B.C.* prepared by Geopacific Consultants Ltd. and dated May 9, 2001.

This is to advise that I will consider written submissions received within 30 days of receipt of this preliminary determination before a final determination is made.

In accordance with the *Environmental Management Act* I will notify all persons with a registered interest in the subject site once a final determination is made.

The preliminary determination is based on the most recent information provided to the ministry regarding the specified lands. I, however, make no representation or warranty as to the accuracy or completeness of this information. I expressly reserve the right to change or substitute different requirements where circumstances warrant.

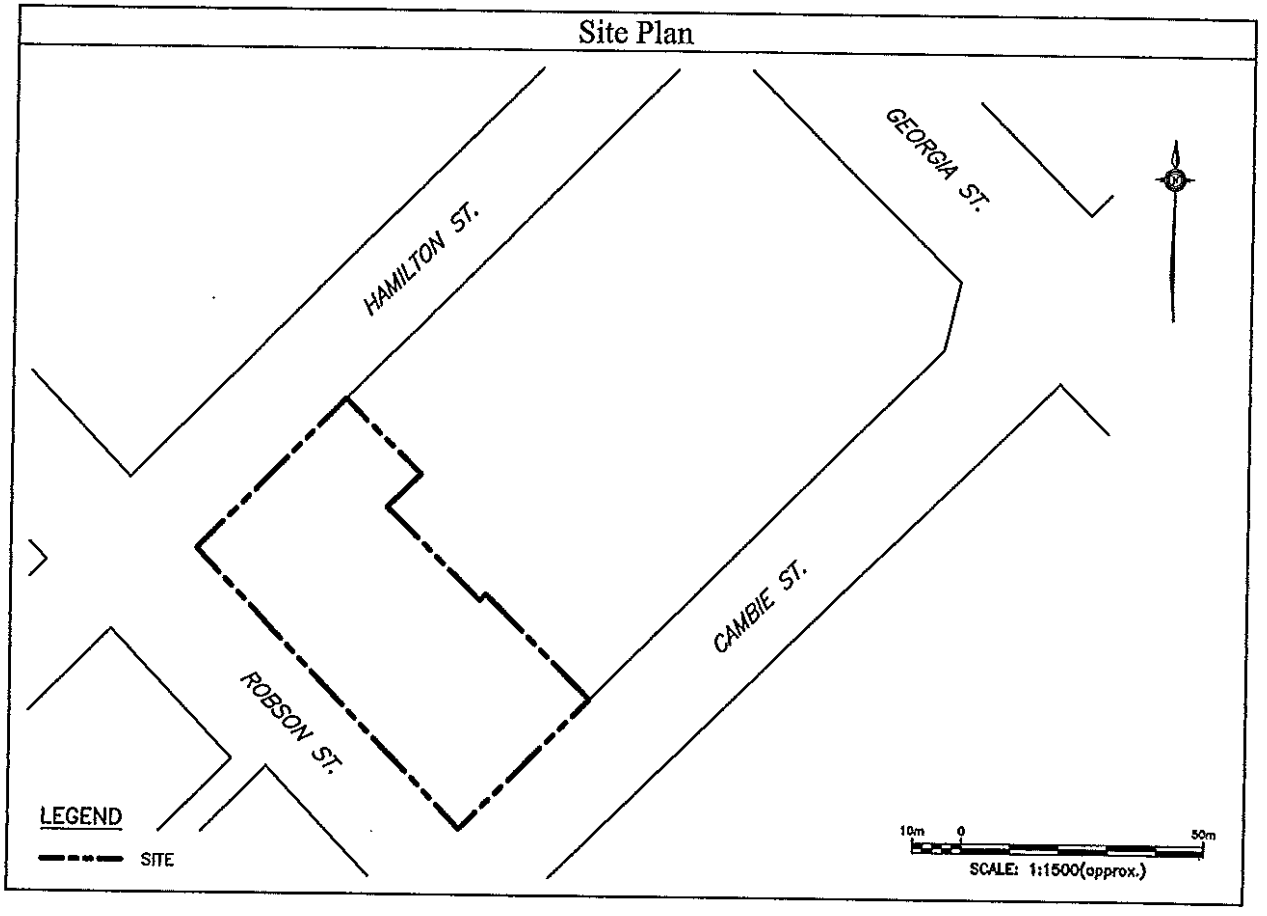
This preliminary determination should not be construed as an assurance that there are no hazards present on the site described above.

April 7/06
Date Issued

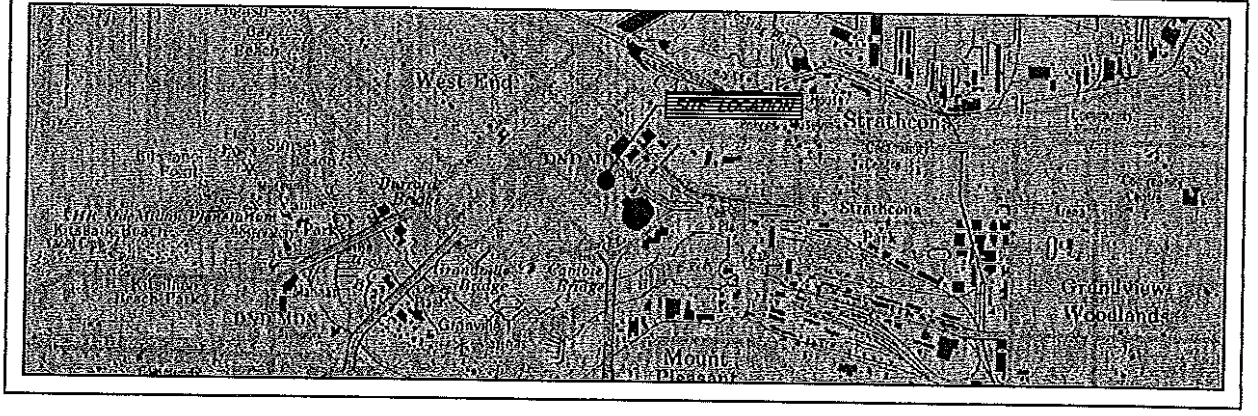
Doug Walton
For Director, *Environmental Management Act*

Schedule "A"

Site Plan



Location Map



April 7/06
Date Issued

Doug Walton
For Director, Environmental Management Act

SITE Identification Number: 8213
Recommended by an approved professional, Kenneth A. Evans, P. Eng.

Schedule "B"

Conditions

1. A qualified environmental consultant shall be available to identify, characterize and appropriately manage any environmental media of suspect quality which may be encountered during any future subsurface work at the site.

April 7/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

SITE Identification Number 8213
Recommended by an approved professional, Kenneth A. Evans, P.Eng.

Schedule "C"

Substances evaluated in soil:

- Antimony, barium, beryllium, cobalt, molybdenum, nickel, selenium, silver, tin, vanadium, arsenic, cadmium, chromium, copper, lead, mercury and zinc;
- VPHs, LEPHs, HEPHs;
- Chloroform, dichloroethane (1,1-, 1,2-), dichloroethene (1,1-, 1,2-), 1,2-dichloropropane, 1,3-dichloropropene (cis and trans), carbon tetrachloride, trichlorethane (1,1,1-, 1,1,2-), tetrachloroethylene, and trichloroethylene;
- 1,2-dichlorobenzene, 1,3-dichlorobenzene, and 1,4-dichlorobenzene;
- Styrene, benzene, ethylbenzene, toluene and xylene;
- Benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, dibenz[a,h]anthracene, indeno[1,2,3-c,d]pyrene, naphthalene, phenanthrene, pyrene, and benzo[a]pyrene.

Substances evaluated in groundwater:

- Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, titanium, uranium and zinc;
- Methyl tertiary butyl ether, VPH_w, $LEPH_w$, VH_{w6-10} and EPH_{w10-19};
- 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, monochlorobenzene, 1,2-dichloroethane, tetrachloroethylene, and trichloroethylene;
- Benzene, ethylbenzene, styrene, and toluene;
- Acenaphthene, acridine, anthracene, benzo[a]anthracene, benzo[a]pyrene, chrysene, fluoranthene, fluorene, naphthalene, phenanthrene, pyrene and quinoline.

April 7/06
Date Issued

Doug Walton
For Director, *Environmental Management Act*

SITE Identification Number 8213
Recommended by an approved professional, Kenneth A. Evans, P.Eng.

BRITISH COLUMBIA

VANCOUVER 2010

IT'S OUR TIME TO SHINE

Date: APR 14 2005

Victoria File:
Regional File: 26250-20/8213
SITE ID: 8213

VIA FAX ONLY: 604 873-7963

City of Vancouver
453 West 12 Avenue
Vancouver, BC

Attention: Hank Uyeyama

Dear Sir:

Re: Development Permit Application
700 Hamilton Street, Vancouver
PID: 008-724-512

Thank you for contacting the Ministry of Water, Land and Air Protection for further advice in connection with the above-referenced site. This letter is in response to your fax sent 13 April 2005 regarding a recent development permit application.

According to our records, there is an outstanding requirement for a preliminary site investigation for the subject property, as outlined in our site profile decision letter of 16 April 2003. We understand that, pursuant to the *Vancouver Charter*, or the *Land Title Act* in the case of subdivision, this decision will suspend approval of the subject application, or other future applications for the site identified in section 40 of the *Environmental Management Act*, until:

- the proponent has applied for, and obtained, one of the following *Environmental Management Act* instruments, as applicable: a determination that the site is not a contaminated site, a voluntary remediation agreement, an approval in principle of a remediation plan or a certificate confirming the satisfactory remediation of the site, and provided a copy of the instrument to the Council or its delegate as per sections 571B.(2)(c), (f) or (g) of the *Vancouver Charter* or approving officer as per sections 85.1(2)(c), (f) or (g) of the *Land Title Act*; or

- the Council or its delegates or approving officer, as appropriate, has received notice from the ministry, pursuant to section 571B.(2)(d) of the *Vancouver Charter* or section 85.1(2)(d) of the *Land Title Act*, that the Council or its delegate or approving officer may approve a

Ministry of Water, Land and Air Protection
Environmental Protection Division
Environmental Management Branch
Contaminated Sites Program
Mailing/Location Address:
10470 152 Street
SURREY BC V3R 0Y3
Telephone: (604) 582-5200
Facsimile: (604) 584-9751
http://www.gov.bc.ca/
http://www.gov.bc.ca/wlap/

specific application under this section because, in the opinion of the director, the site would not present a significant threat or risk if the specific application were approved.

Please also be advised of the following:

- The ministry recommends that the proponent review all aspects of the government's contaminated sites legislation and supporting guideline documents and protocols to ensure that all required information is collected and documented during investigation and where necessary, remediation of the site;

- In cases of site demolition, we recommend that a survey of building materials and equipment be undertaken to identify any materials that require special management;

- Fees are applicable for the ministry's contaminated sites services, pursuant to section 9 of the Contaminated Sites Regulation. Information on the government's contaminated sites legislation and supporting guideline documents and protocols as well as a Contaminated Sites Services Application Form can be obtained from the ministry's contaminated sites web page located at: http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/index.html.

- Effective November 1, 2004, and under the authority of the new *Environmental Management Act,* all applications eligible under Protocol 6 shall be submitted as roster submissions by approved professionals. For further clarification of application eligibility, please see http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/updates/index.html.

- Those persons undertaking site investigations and remediation at contaminated sites in British Columbia are required to do so in accordance with the requirements of the *Environmental Management Act* and regulations (e.g. Contaminated Sites Regulation, Hazardous Waste Regulation, etc.). The ministry considers these persons responsible for identifying and addressing any human health or environmental impacts associated with the contamination.

Decisions of a director may be appealed under part 8 of the *Environmental Management Act.*

Please contact the undersigned at (604) 582-5357 if you have any questions about this letter.

Sincerely,

Kerri Dundas

Kerri Dundas
Contaminated Sites Officer

Mailed

cc: Brad Reshetylo, Public Works and Government Services Canada, FAX: (604) 666- 0645

****
*** ERROR TX REPORT ***
****

TX FUNCTION WAS NOT COMPLETED

TX/RX NO	2078
CONNECTION TEL	6046666645
SUB-ADDRESS	
CONNECTION ID	
ST. TIME	04/19 08:34
USAGE T	00'00
PGS.	0
RESULT	NG

0 #018

mailed - can't get through.

BRITISH COLUMBIA

VANCOUVER 2010

IT'S OUR TIME TO SHINE

Date: APR 14 2005

Victoria File:
Regional File: 26250-20/8213
SITE ID: 8213

VIA FAX ONLY: 604 873-7963

City of Vancouver
453 West 12 Avenue
Vancouver, BC

Attention: Hank Uyeyama

Dear Sir:

Re: Development Permit Application
700 Hamilton Street, Vancouver
PID: 008-724-512

Thank you for contacting the Ministry of Water, Land and Air Protection for further advice in connection with the above-referenced site. This letter is in response to your fax sent 13 April 2005 regarding a recent development permit application.

According to our records, there is an outstanding requirement for a preliminary site investigation for the subject property, as outlined in our site profile decision letter of 16 April 2003. We understand that, pursuant to the *Vancouver Charter*, or the *Land Title Act* in the case of subdivision, this decision will suspend approval of the subject application, or other future applications for the site identified in section 40 of the *Environmental Management Act*, until:

- the proponent has applied for, and obtained, one of the following *Environmental Management Act* instruments, as applicable: a determination that the site is not a contaminated site, a voluntary remediation agreement, an approval in principle of a

****
*** MULTI TX/RX REPORT ***
****

TX/RX NO	2052	
INCOMPLETE TX/RX		
TRANSACTION OK	(1)	6048737963
ERROR	(2)	6046669681 — correct # is 666-6645

BRITISH COLUMBIA

VANCOUVER 2010

IT'S OUR TIME TO SHINE

Date: APR 14 2005

Victoria File:
Regional File: 26250-20/8213
SITE ID: 8213

VIA FAX ONLY: 604 873-7963

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453 West 12 Avenue
Vancouver, BC

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- the proponent has applied for, and obtained, one of the following *Environmental Management Act* instruments, as applicable: a determination that the site is not a contaminated site, a voluntary remediation agreement, an approval in principle of a remediation plan or a certificate confirming the satisfactory remediation of the site, and provided a copy of the instrument to the Council or its delegate as per sections 571B.(2)(c), (f) or (g) of the *Vancouver Charter* or approving officer as per sections 85.1(2)(c), (f) or (g) of the *Land Title Act*; or

- the Council or its delegates or approving officer, as appropriate, has received notice from the

CITY OF VANCOUVER
COMMUNITY SERVICES
Licences and Inspections Department
Inspections Division

FAX TRANSMISSION

April 13, 2005 at 1:41pm

To:	Kerri Dundas	**Fax:**	(604) 582 - 5334
Organization:	MWLAP	**Phone:**	
From:	Hank Uyeyama, Environmental Protection Officer	**Fax:**	604.873.7963
Organization:	Community Services	**Phone:**	604.873.7732
Subject:	700 Hamilton Street (790 Hamilton) - Site # 8213		

Number of Pages being Transmitted: 1

Original to Follow: No

Reply to the Attention of: Hank Uyeyama

Message:

The site profile for the above site for a development application was forwarded to the Ministry for review on January 15, 2003. That development application has been withdrawn. We received a new development application for alterations and additions to the existing CBC building and the development of the southern portion of the site with a mixed-use development containing retail and townhouse at grade with 2 residential towers above. We are seeking further advice on the new development application. If you have any qustions, please contact me at (604) 873 - 7732.

Thank you

Hank

BRITISH COLUMBIA

Date: APR 16 2003

Your File:
Our File: 26250-20/8213
SITE 8213

VIA FAX ONLY: (604) 666-9681

Public Works and Government Services Cananda
641-800 Burrard Street
Vancouver, BC V6Z 2V8

Attention: Brad Reshetylo

Dear Brad Reshetylo:

This letter is to acknowledge receipt of a satisfactorily completed site profile pertaining to the above-referenced site. In accordance with section 7(1) of the Contaminated Sites Regulation the ministry requires that you submit for our review a preliminary site investigation report for the subject site. Please be advised that investigations and remediation shall continue until you have applied for, and obtained, one of the following *Waste Management Act* instruments, as applicable: a determination that the site is not a contaminated site, an approval in principle of a remediation plan or a certificate confirming the satisfactory remediation of the site.

Please also be advised of the following:

- preliminary site investigations are defined under section 58 of the Contaminated Sites Regulation. Please note that fees are applicable for the ministry's contaminated sites services, pursuant to section 9 of the Contaminated Sites Regulation. A Contaminated Sites Services Application Form can be obtained from the ministry's contaminated sites web page located at http://wlapwww.gov.bc.ca/epd/epdpa/contam_sites/index.html. Please ensure you complete the right-hand column of Part E: Key Information Requirements table prior to submitting your application;

- in general, the ministry is not opposed to issuance of permits which will facilitate investigation and remediation of potentially contaminated sites. In cases of site demolition, we recommend that a survey of building materials and equipment be undertaken to identify any materials that require special management;

Ministry of Water, Land and Air Protection
Regional Operations
Lower Mainland Region
Mailing/Location Address:
10470 152 Street
SURREY BC V3R 0Y3
Telephone: (604) 582-5200
Facsimile: (604) 582-5334

- the ministry recommends that you review all aspects of the government's contaminated sites legislation and supporting guideline documents and protocols to ensure that all required information is collected and documented during investigation of the site; and

- those persons undertaking site investigations and remediation at contaminated sites in British Columbia are required to do so in accordance with the requirements of the *Waste Management Act* and regulations (e.g. Contaminated Sites Regulation, Special Waste Regulation, etc.). The ministry considers these persons responsible for identifying and addressing any associated human health or environmental impacts associated with the contamination.

Decisions of a manager may be appealed under part 7 of the *Waste Management Act.*

Please contact the undersigned at (604) 582-5377 to advise the ministry of your schedule to prepare and submit the required report and to answer any questions you may have about this letter.

Yours truly,

Vince Hanemayer M.Eng., P.Eng.
Assistant Regional Waste Manager

kd/

cc: Hank Uyeyama, City of Vancouver, FAX: (604) 873-7963

File No.: 26250-20/ 8213 Site ID: 8213

Site Profile Processing

Regional Checklist

Contaminated Sites Section
Lower Mainland Region

Common Name: CBC BROADCASTING

Date Received: 2003/01/15

Address: 700 HAMILTON ST, VANCOUVER

Decision Required by: 2003/02/24

Corresponding Procedure		Date
	Assessment of Site Profile ☑ Site profile satisfactorily complete Existing File Records? ☐ yes File: _____ Caseworker: _____ ☑ no Processing Requirements ☑ SITE record created ☑ Orthographic photo printed – Latitude/Longitude determined Recommended Decision ☐ No Investigation Required ☑ Investigation Required (DSI/PSI/draft GD#4/custom) Comments - LEFT VOICEMAIL APR. 7/03 FOR BR OF PUBLIC WORKS TO OBTAIN INFO. ABOUT SITE (WHERE FORMER GAS STATION WAS LOCATED, WHERE DEVELOPMENT TO TAKE PLACE) - AS OF APR. 15/03 NO RESPONSE. Prepared by: KERRI DUNDAS Date: APR. 7/03 Reviewed by: Tina Hemenway Date: Apr. 15/03 Noted by: _____ Date: _____ File Prepared by: _____ Date: _____	APR. 7/03

Additional Notes (1)(2)

(1) Telephone conversation records and other processing information.
(2) If caseworker exists for the file; caseworker to briefly review and summarize site history, status, outstanding requirements if any, etc.

CITY OF VANCOUVER
COMMUNITY SERVICES
Licences and Inspections Department
Inspections Division

FAX TRANSMISSION

January 15, 2003 at 1:45PM

To:	Kerri Dundas	**Fax:**	(604) 582 - 5334
Organization:	MWLAP	**Phone:**	
From:	Hank Uyeyama, Environmental Protection Officer	**Fax:**	604.873-7963
Organization:	Community Services	**Phone:**	604.873-7732
Subject:	700 Hamilton Street		

Number of Pages being Transmitted:	8
Original to Follow:	No
Reply to the Attention of:	Hank Uyeyama

Message:

I am forwarding a site profile for the above subject site for your review. The site profile is for Development Application. Following is the project description: to construct a 400,000 sq. ft. addition to the existing CBC building to provide: (1) retail use at grade on Robson Street, (2) office use in 2 storeys along most of Hamilton Street, (3) a 24 storey office tower for Public Works and Government Services Canada on the Robson Street section of the site, (4) four levels of underground parking under the new tower portion of the site, (5) alterations to the existing CBC building and (6) improved public realm treatment on the CBC portion of the site.

If you have any questions, please contact me at (604) 873 - 7732.

Regards Hank

453 West 12th Avenue Vancouver BC V5Y 1V4 ☎ 604.873.7601 Fax: 873.7100
www.city.vancouver.bc.ca

Notes/Instructions:

Persons preparing a site profile *must* complete Section I, II and III, answer all questions in sections IV through IX, and sign section XI. If the site profile is not satisfactorily completed, it will not be processed under the *Waste Management Act* and the Contaminated Sites Regulation. Failure to complete the site profile satisfactorily may result in delays in approval of relevant applications and in the postponement of decisions respecting the property.

The person completing this site profile is responsible for the accuracy of the answers. Questions must be answered *to the best of your knowledge.*.

Section 27 (1) of *the Freedom of Information and Protection of Privacy Act* requires that provision of personal information concerning an individual must be authorized by that individual. Persons completing the site profile on behalf of the site owner must be authorized by the site owner.

One (1) site profile may be completed for a site comprised of more than one titled or untitled parcel, but individual parcels must be identified.

If the property is legally surveyed, titled and registered, then all PID numbers (Parcel IDentifiers - Land Title Registry system) must be provided for *each* parcel as well as the appropriate legal description.

If the property is untitled Crown land (no PID number), then the appropriate PIN numbers (Parcel Identification Numbers - Crown Land registry system) for each parcel with the appropriate land description should be supplied.

If a PID or PIN number is *not* available for the site, a latitude and longitude (accurate to 0.5 of a second using North American Datum established in 1983) of the centre of the site is required. Also, please attach an accurate map, containing latitude, longitude and datum references, which shows the boundaries of the site in question. Please use the largest scale map available.

If available, the Crown Land File Number for the site should also be supplied.

Anything submitted in relation to this site profile will become part of the public record and may be made available to the public through the Site Registry as established under the *Waste Management Act*.

Under section 26.3 of the *Waste Management Act*, corporate and personal information contained in the site profile may be made available to the public through the Site Registry. Should you have questions concerning the collection of this information, contact your local BC Environment office or the Site Registrar, BC Environment, Pollution Prevention & Remediation Branch, Box 9342 Stn Prov Govt, Victoria, BC V8W 9M1. Telephone: 1-250-387-4441. Fax: 1-250-387-9935.

All Information Must be Provided and All Questions Answered

I CONTACT IDENTIFICATION

A. Name of Site Owner: GOVERNMENT OF CANADA

Last _____ First _____ Middle Initial(s) _____ (and/or, if applicable)

Company Canadian Broadcasting Corporation

Owner's Civic Address 747 Bute Street

City Vancouver Province/State B. C.

Country Canada Postal Code/ZIP _____

B. Person Completing Site Profile (Leave blank if same as above):

Last Rechetylo First Brad Middle Initial(s) S (and/or, if applicable)

Company Public Works & Government Services Canada

C. Person to Contact Regarding the Site Profile:

Last Rechetylo First Brad Middle Initial(s) S (and/or, if applicable)

Company Public Works & Government Services Canada

Mailing Address 641-800 Burrard Street

City Vancouver Province/State B C

Country Canada Postal Code/ZIP V6Z 2V8

Telephone (604) 775-5116 290-1755 Fax (604) 666-9681

II SITE IDENTIFICATION

Please attach a site location map

STAGE 1 and 2 PSI ATTACHED

IF Legally Titled, Registered Property

Site Street Address (if applicable) 200 Hamilton Street

City Vancouver Postal Code

PID numbers and associated legal descriptions. *Attach an additional sheet if necessary.*

PID	Legal Description
008-724-512	Southern third of Block 52, District Lot 541, Plan 12168

Total number of titled parcels represented by this site profile is: 1

IF Untitled Crown Land

1) PIN numbers and associated Land Description. *Attach an additional sheet if necessary.*

PID	Legal Description

Total number of untitled crown land parcels represented by this site profile is:

OR

2) Coordinates (using the North American Datum 1983 convention) for the centre of the site:

Latitude: Degrees 49 Minutes 16 Seconds 47.8
Longitude: Degrees 123 Minutes 6 Seconds 48.7

49 16 44.78
123 6 52.79

Please attach a map of appropriate scale showing the boundaries of the site;

(and, if available)

Crown land file numbers. ***Attach an additional sheet if necessary.***

III COMMERCIAL AND INDUSTRIAL PURPOSES OR ACTIVITIES

Please indicate below, in the format of the example provided, which of the industrial and commercial purposes and activities from Schedule 2 have occurred or are occurring on this site.

EXAMPLE

Schedule 2 Description

Reference

~~E1 appliance, equipment or engine repair, reconditioning, cleaning or salvage~~
~~F10 solvent manufacturing or wholesale bulk storage~~

Please print legibly. Attach an additional sheet if necessary

Schedule 2 Description

Reference

~~appliance, equipment or engine repair, reconditioning, cleaning or salvage~~
~~solvent manufacturing or wholesale bulk storage~~

F5 Petroleum product dispensing facilities including service station and cardlocks

IV	**AREAS OF POTENTIAL CONCERN**		
	Is there currently or to the best of your knowledge has there previously been on the site any (please mark the appropriate column opposite the question):	YES	NO
A.	Petroleum, solvent or other polluting substance spills to the environment greater than 100 litres?		X
B.	Residue left after removal of piled materials such as chemicals, coal, ore, smelter slag, air quality control system baghouse dust?		X
C.	Discarded barrels, drums or tanks?		X
D.	Contamination resulting from migration of substances from other properties?		X
V	**FILL MATERIALS**		
	Is there currently or to the best of your knowledge has there previously been on the site any deposit of (please mark the appropriate column opposite the question):	YES	NO
A.	Fill dirt, soil, gravel, sand or like materials from a contaminated site or from a source used for any of the activities listed under Schedule 2?		X
B.	Discarded or waste granular materials such as sand blasting grit, asphalt paving or roofing material, spent foundry casting sands, mine ore, waste rock or float?		X
C.	Dredged sediments, or sediments and debris materials originating from locations adjacent to foreshore industrial activities, or municipal sanitary or stormwater discharges?		X
VI	**WASTE DISPOSAL**		
	Is there currently or to the best of your knowledge has there previously been on the site any landfilling, deposit or dumping of the following materials (please mark the appropriate column opposite the question):	YES	NO
A.	Materials such as household garbage, mixed municipal refuse, or demolition debris?		X
B.	Waste or byproducts such as tank bottoms, residues, sludge, or flocculation precipitates from industrial processes or wastewater treatment?		X
C.	Waste products from smelting or mining activities, such as smelter slag, mine tailings, or cull materials from coal processing?		X
D.	Waste products from natural gas and oil well drilling activities, such as drilling fluids and muds?		X
E.	Waste products from photographic developing or finishing laboratories; asphalt tar manufacturing; boilers, incinerators or other thermal facilities (e.g. ash); appliance, small equipment or engine repair or salvage; dry cleaning operations (e.g. solvents); or automobile and truck parts cleaning or repair?		X

VII	**TANKS OR CONTAINERS USED OR STORED**		
	Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):	YES X	NO
A.	Underground fuel or chemical storage tanks?	X	
B.	Above ground fuel or chemical storage tanks?	X	
VIII	**SPECIAL (HAZARDOUS) WASTES OR SUBSTANCES**		
	Are there currently or to the best of your knowledge have there been previously on the site any (please mark the appropriate column opposite the question):	YES	NO X
A.	PCB-containing electrical transformers or capacitors either at grade, attached above ground to poles, located within buildings, or stored?		X
B.	Waste asbestos or asbestos containing materials such as pipe wrapping, blown-in insulation or panelling buried?		X
C.	Paints, solvents, mineral spirits or waste pest control products or pest control product containers stored in volumes greater than 205 litres?		X
IX	**LEGAL OR REGULATORY ACTIONS OR CONSTRAINTS**		
	To the best of your knowledge are there currently any of the following pertaining to the site (please mark the appropriate column opposite the question):	YES	NO X
A.	Government orders or other notifications pertaining to environmental conditions or quality of soil, water, groundwater or other environmental media?		X
B.	Liens to recover costs, restrictive covenants on land use, or other charges or encumbrances, stemming from contaminants or wastes remaining onsite or from other environmental conditions?		X
C.	Government notifications relating to past or recurring environmental violations at the site or any facility located on the site?		X

X ADDITIONAL COMMENTS AND EXPLANATIONS

(Note 1: Please list any past or present government orders, permits, approvals, certificates and notifications pertaining to the environmental condition, use or quality of soil, surface water, groundwater or biota at the site.

Note 2: If completed by a consultant, receiver or trustee, please indicate the type and degree of access to information used to complete this site profile. Attach extra pages, if necessary):

XI SIGNATURES

The person completing the site profile states that the above information is true, based on the person's current knowledge as of the date completed.

Signature of person completing site profile — Date completed: (YY-MM-DD) JANUARY 15, 2003

XII OFFICIAL USE

Local Authority

Reason For Submission *(Please check one or more of the following)*

Soil Removal ☐ Subdivision Application ☐ Zoning Application ☐ Development Permit ☒ Variance Permit ☐ Demolition Permit ☐

Date received:	Local Government contact :	Date Submitted to Site Registrar:	Date forwarded to BC Environment Manager:
JANUARY 15, 2003	Name HANK UYEYAMA Agency CITY OF VANCOUVER Address 453 WEST 12TH AVE. VANCOUVER V5Y 1V4 Telephone (604) 873-7732 Fax (604) 873-7963		JANUARY 15, 2003

BC Environment Manager

Reason For Submission *(Please check one or more of the following)*

Under Order ☐ Site Decommissioning ☐ Foreclosure ☐

Date received:	Assessed by:	Investigation Required?	Decision date:
	Name _____ Region _____ Telephone _____ Fax _____ If site profile entered, SITE ID # _____	YES NO	

Site Registrar

Date received:	Entered onto site registry by:	SITE ID #:	Entry date:

Property Information

Property Addresses

Property Address No.

Lot Number

Tie Lines

Property/Lot Lines

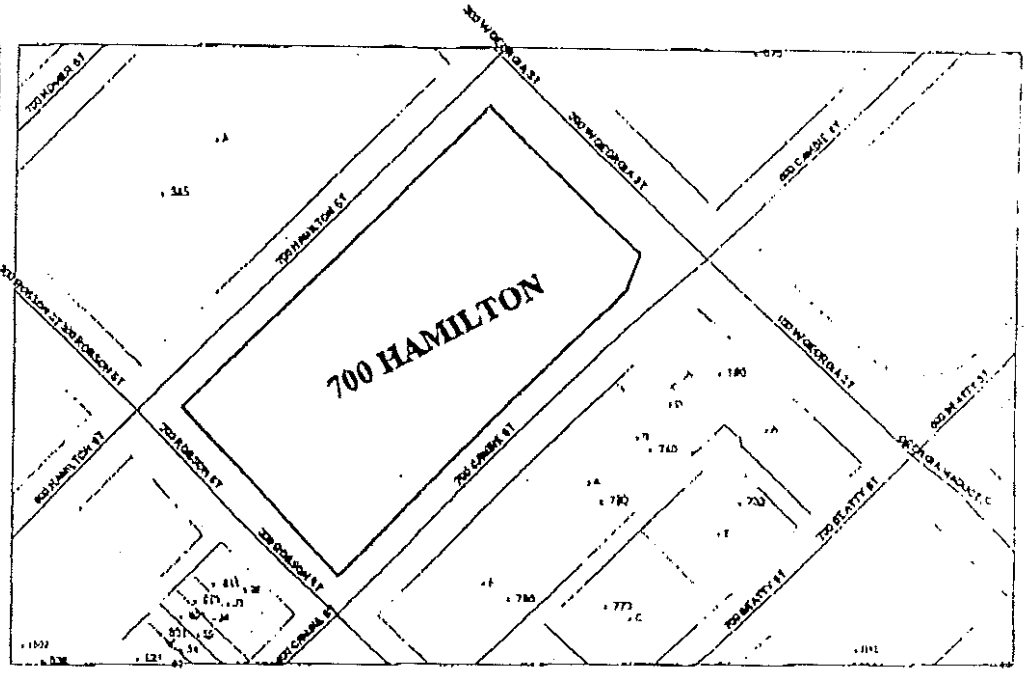
Lot Line

Property Line

Private Encroachment

City Streets Network

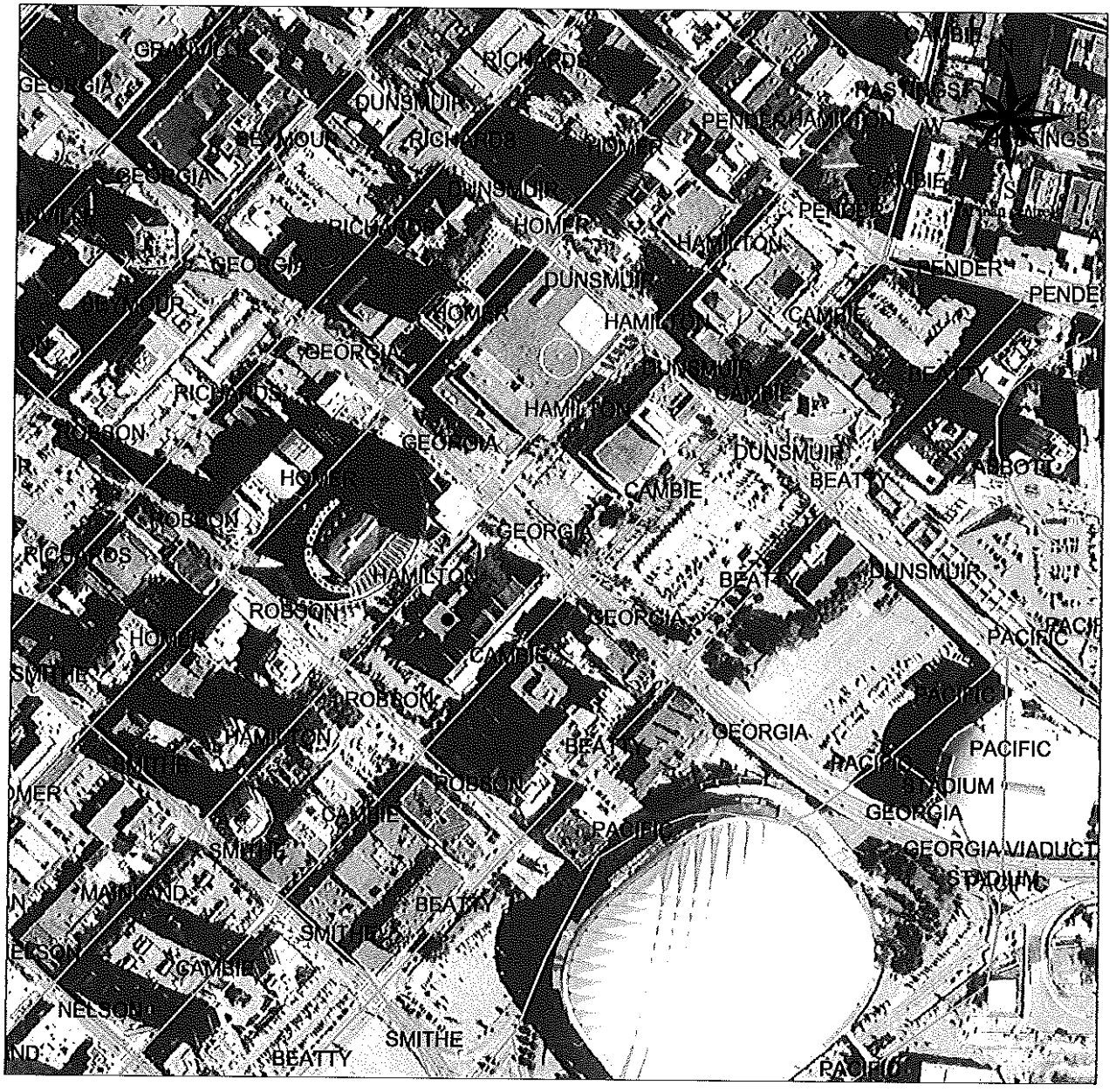
Shore Lines and Sea



SCALE 1 : 2,613

200 0 200 400 600

FEET



1:5,100,.00

50 0 50 Meters

SITE ID: 8213
700 Hanmilton Street, Vancouver

Latitude: 49/16/44.78
Longitude: 123/6/52.79

Date of Photo: Summer 1999

Ministry of Land,
Water and Air Protection
Lower Mainland Region
April 2, 2003

BRITISH COLUMBIA