



# Cape Christian Cleanup

## Operations and Maintenance Manual

### Bio-treatment Area (Windrows)

#### version1.1

*QESin 2007P6*  
*September 2009*

## 1.0 Introduction

This manual was developed to present operational and maintenance procedures related to the biological treatment of Type B<sup>1</sup> contaminated soils at Cape Christian, as requested in Part E, Item 2 of the Water License (1BR-LOR0813) issued by the Nunavut Water Board.

### 1.1 Feasibility of Alternative Disposal Methods

Typically hydrocarbon contaminated soils in northern Canada are treated by means of landfarming. However, space constraints, soil quantity and machinery availability onsite impose the adoption of a different approach in order to successfully treat the Cape Christian soils within the allotted time frame to the desired remediation levels.

An *ex situ* method is being used to biologically treat the Type B soils at Cape Christian. The hydrocarbon contaminated soils are being bio-treated by way of windrows. This method maximizes the exposed surface area, enhancing natural aeration and thus accelerating the decontamination of the soil by passive means; making it the most cost effective method feasible for the desired remediation levels.

### 1.2 Site Description and Location

The Bio-treatment Area is located north of the Beach AST (refer to Figure 1), as specified in the Specifications. The Area had been selected based on the required soil treatment capacity, distance to the contaminated soils, and proper surrounding drainage to prevent ponding, seepage and surface run-off into the biological treatment area.

Generally, windrows are long layers of material having a width that allows mixing with hydraulic shovels and allows passive aeration to favour aerobic biological degradation. The windrows can be 1.5 to 2 m high and 4 m wide. A contact water collection system surrounds the perimeter of the Bio-treatment Area. Refer to Figure 2 for an as-built drawing of the bio-treatment facility.

---

<sup>1</sup> *Type B Soil* means soil contaminated with hydrocarbons in which the primary petroleum product present in the soil as determined by laboratory analysis consists of fuel oil and/or diesel fuel and /or gasoline.

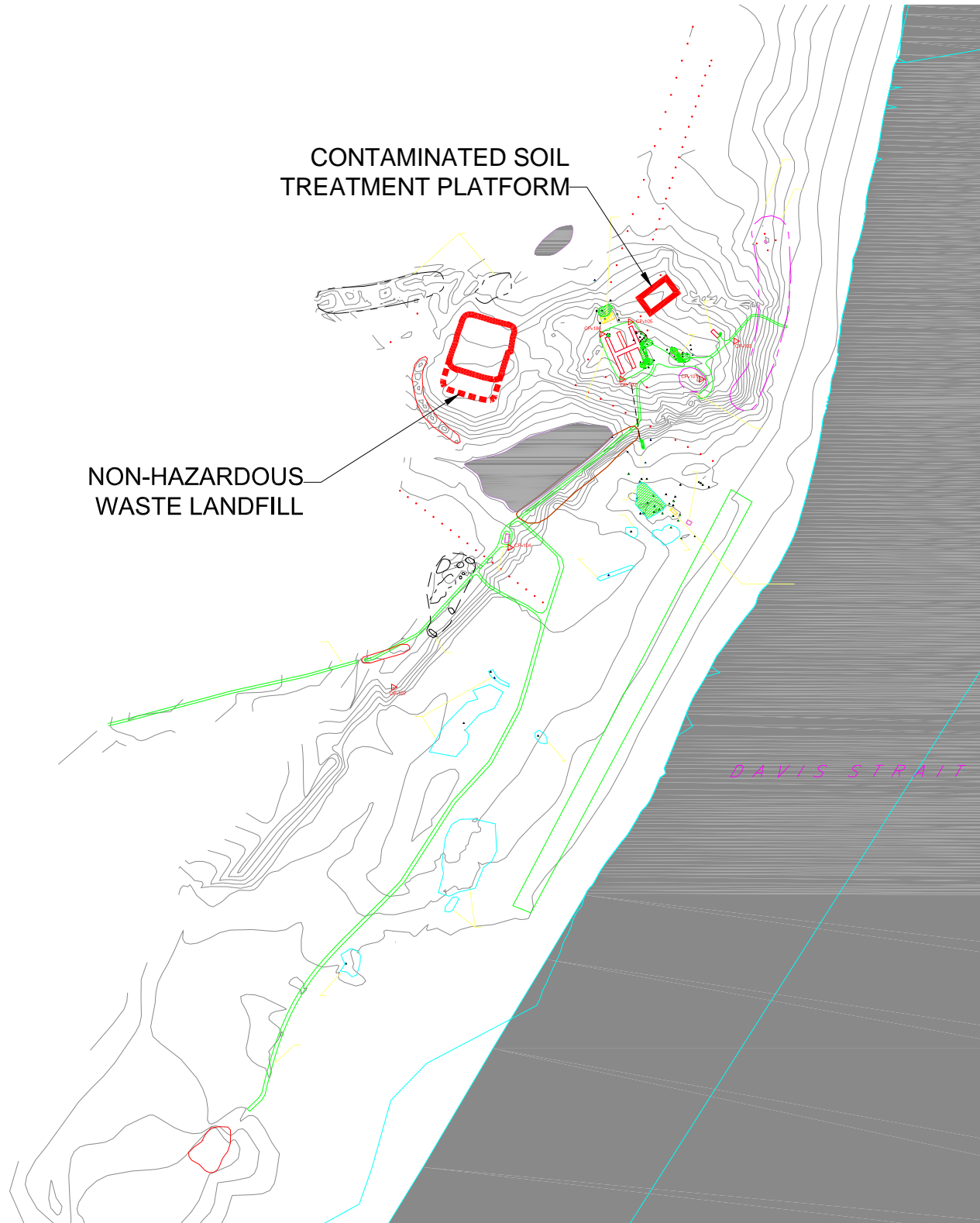
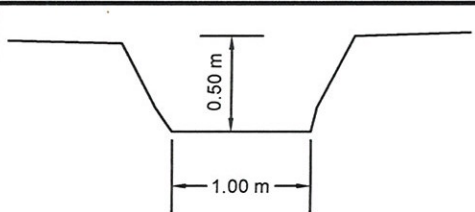
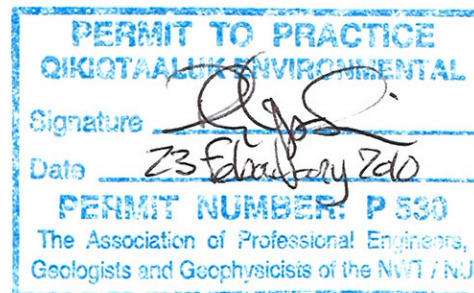
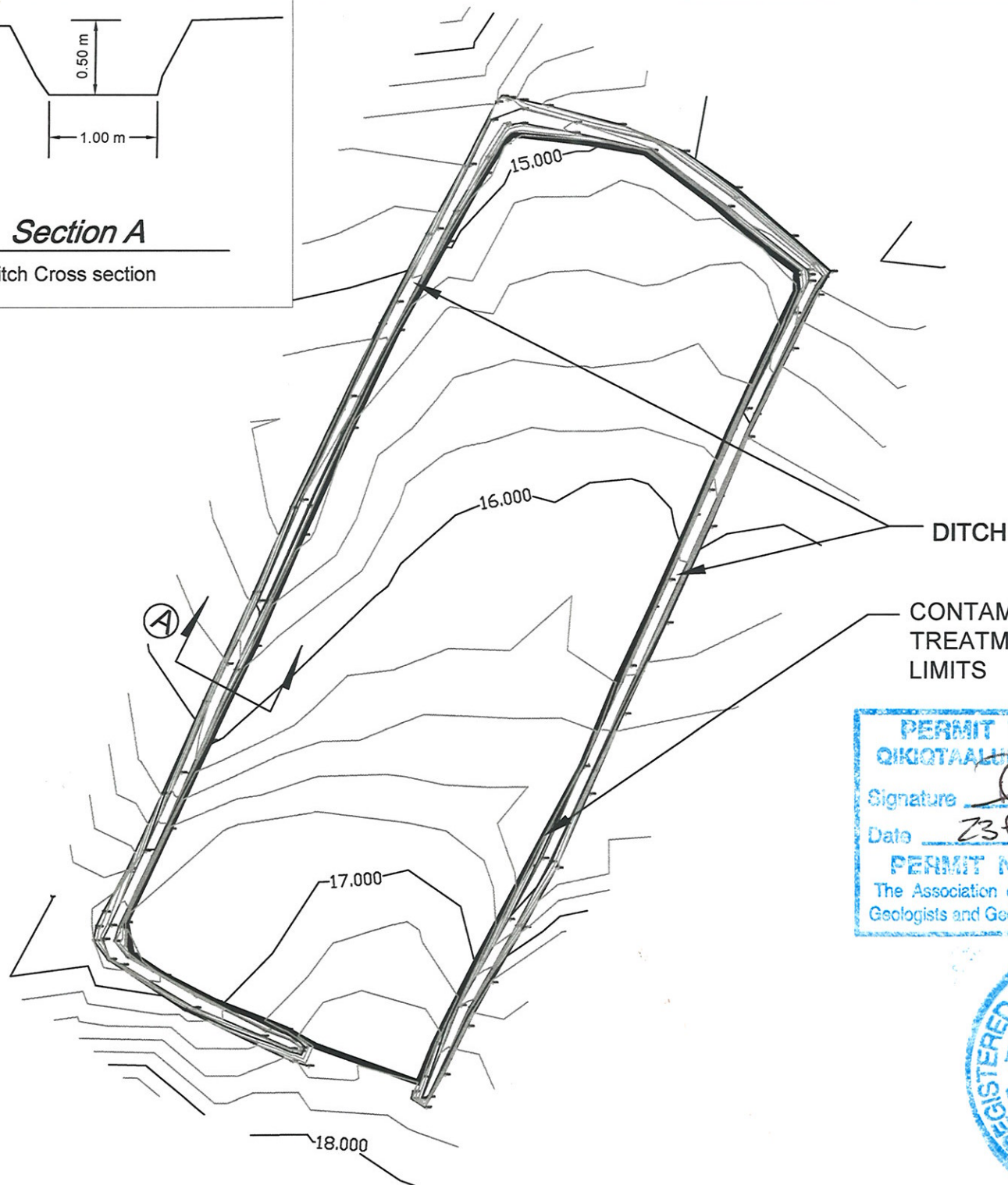


Figure 1 : LOCATION OF BIO-TREATMENT AREA (WINDROWS) FOR CONTAMINATED SOILS



## Section A

Ditch Cross section



Qikiqtaaluk Logistics  
Inc.

General Notes - Notes Générales:

Legend - Légende:

No.	DATE	REVISION	REVISION	APPR.



QIKIQTAAALUK ENVIRONMENTAL

SCALE - ECHELLE

NOT TO SCALE

PROJECT - PROJET

CAPE CHRISTIAN REMEDIATION PROJECT

© Qikiqtaaluk Logistics Inc 2010

TRADE - METIER

SITING

DATE

2010-02-04

SUBJECT - SUJET

AS-BUILT DRAWING OF THE CONTAMINATED SOIL TREATMENT PLATFORM

PRODUCTION

CONCURRENCE - ASSENTMENT

DESIGNED

ETUDIE

PHILIPPE SIMON

DRAWN

DESSINE

GREG JOHNSON

CHECKED

VERIFIE

PHILIPPE SIMON

CO-ORDINATION

REVIEWED - REVU

DWG. NO. - DESSIN NO.

2010-QESin 2007PS-01

## 2.0 Equipment List

The following equipment is required to operate the Bio-treatment:

- 1 x Caterpillar 320 excavator
- 1 x Caterpillar D250E Rock Truck

## 3.0 Personnel

Sanexen (sub-contractor – Soil Remediation Specialist) has the overall responsibility for the construction, operation, maintenance and decommissioning of the Bio-treatment Area. The daily operation and maintenance of the Bio-treatment Area is the responsibility of the Site Superintendant.

## 4.0 Operational and Maintenance Procedures

These procedures must be carried out frequently to ensure smooth operation of the Bio-treatment Area.

### 4.1 Basic Operations and Maintenance Procedures

- Daily visual inspection of the perimeter contact water collection system and after any precipitation event, to ensure overflow has not occurred and that the system has not been damaged. Repair embankments, ditches and sump as needed.
- Place contaminated soils in windrows no higher than 2 meters or wider than 4 meters. Do not compact soils in place (detrimental to biological treatment of soils).
- Remix the windrows, using a hydraulic excavator equipped with a backhoe, twice a week or as directed by Sanexen.
- Clean and remove soil lumps and particles on the bucket tracks and mixing devices after every use. Dispose of the soil collected from cleaning activities with other contaminated soil in Bio-treatment Area.
- Mitigate against the tracking of contaminated soil out of the Bio-treatment Area.

### 4.2 Bio-treatment Process Calibration

Qikiqtaaluk Logistics will sample stockpiled contaminated soils newly excavated and soils in the Bio-treatment area in order to verify existing conditions as well as to confirm and/or calibrate treatment process requirements. Composite sample

obtained from five discrete soil samples with similar characteristics (hydrocarbons concentrations, type of soil, etc.) will be analysed for:

- F1 and F2 concentrations
- Soil pH and temperature
- Moisture content

In accordance with the QA/QC plan all the samples will be sent on a weekly basis to an accredited laboratory, while 50% of the samples will be duplicated and sent to the Engineer's laboratory for verification.

#### *4.3 Record Keeping*

Records are to be kept to assist in planning, evaluating the effectiveness of the treatment system and the creation of reports.

As a minimum, the following information should be recorded daily:

- Nature and volumes of soil placed in the Bio-treatment Area
- Dates when windrows were re-mixed
- Dates and volume of contact water added to the windrows
- Equipment usage
- Modifications to the treatment
- All analytical procedures and results (e.g. baseline, soil, contact water, groundwater)

During contaminated soils treatment activities, a contaminated soils treatment operation report will be submitted to the Engineer, including the following information:

- volume of excavated contaminated soils;
- schedule of treatment process activities;
- results of the visual inspection program;
- effluent and contaminated soils test results, including the results of the baseline sampling and analytical program;

Special precautions should be taken by workers involved in the operation and maintenance of the Bio-treatment Area:

- Hands are to be washed frequently, as a minimum after work and before eating or smoking
- Work gloves and boots should be worn at all times while performing work activities. Work clothes and boots should not be worn inside the Camp.
- Reflective safety vests and hard hats should be worn when working around heavy equipment

The proper management of runoff will prevent erosion, minimize the production of contact water, and prevent it from leaving the Bio-treatment Area in an uncontrolled fashion. By providing ditches, swails and a continuous grade away from the Landfarm, surface runoff will be diverted away. On the other hand, the contact water collection system surrounding the perimeter of the Bio-treatment Area will collect the water that does come into contact with the contaminated soil in a sump and prevent it from escaping into the tundra.

At a minimum, contact water collected in the perimeter collection system shall be sampled and tested prior to the end of each field season. In compliance with Part D, Item 12 of the Water License, a representative composite sample is to be composed from a minimum of 5% of the total volume to be released from the Final Discharge Point of the Bio-treatment Area (LOR-4). Qikiqtaaluk Logistics will be responsible for all testing associated with the treatment or disposal of the contact water.

The Bio-treatment contact water shall meet the following Wastewater Discharge Limits stipulated in the water license in Part D, Item, prior to being released onto land to a location at least thirty (30) metres distance from the ordinary high water mark of any adjacent water body, where direct flow into a water body is not possible and no additional impacts are created:

- pH - 6 to 9
- Oil and Grease – 5 000 µg/L
- Arsenic (total) – 100 µg/L
- Cadmium (dissolved) – 10 µg/L
- Chromium (dissolved) – 100 µg/L







*Date Modified: 23-02-2010*