Qikiqtaaluk environmental

REMEDIATION WORK PLAN IQALUIT AIRPORT

HYDROCARBON CONTAMINATED SOILS FROM THE TC LANDFARMS AND ARSENIC CONTAMINATED SOILS

Privileged and confidential document presented to

sintra INC.

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FINAL SPECIFICATIONS

VERSION 1.1

August 25th, 2014

O/Ref.: QE14-214-8

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ABBREVIATIONS

AANDC: Aboriginal Affairs and Northern Development Canada

CCME: Canadian Council of Ministers of Environment

GN: Government of Nunavut

HDPE: High Density PolyEthylene

PID: Photo Ionization Detector

1. INTRODUCTION

The following specifications are for the removal of contaminated fill that was used as backfill at the Iqaluit airport. Following the placement of the contaminated soils Aboriginal Affairs and Northern Development Canada, and the Nunavut Water Board has determined that they cannot be used as fill without having authorisation from the Nunavut Water Board. These soils are required to be excavated and placed in a lined containment area until such time as their fate is determined by the authorities having jurisdiction and the Owner of the contaminated soil and the operator of the airport.

2. CONSTRUCTION OF A CONTAINMENT AREA

2.1 Preparation of the Area

2.1.1. The approximate location of the containment area is shown in figure 1 in Appendix A. The exact location will be field fitted to ensure that all of the required restrictions for operations at the airport are met.

2.1.2. The base of the area where the containment cell will be constructed will be levelled and have any rocks larger than 2" and any others that may pierce the membrane removed.

2.1.3. The surface that the membrane will be installed on must be compacted sufficiently to support the weight of the contaminated soil.

2.1.4. The area should not be below the surrounding grade to ensure that water will not pool or pond in the area where the containment cell will be constructed.

2.1.5. Water must be able to drain away from the area where the containment cell is constructed, should any materials be stockpiled around the containment cell.

2.2 Construction of the Containment Berms

2.2.1. The containment berms should be constructed in lifts of no more than 300 mm until design height is met and compacted to a minimum 95 percent of Maximum Dry Density in accordance with ASTM D698.

2.2.2. The details of the construction of the berms are shown in figure 2 of Appendix A. The containment berms should be constructed using materials that respect the following:

The granular gill should be well-graded sand and gravel.

2.2.3. The slopes of the berms should be no greater than 1.5 long to 1 high

2.2.4. Containment berms will have the same elevation all around the containment area to ensure that no contact water can escape from the containment area.

2.2.5. The base of the containment area will be levelled as shown in figure 1.

2.3 Installation of the Membrane

2.3.1. All surfaces to be covered by membrane must be free of any rocks with sharp edges that can pierce the membrane. The surface that the membrane will be installed on must be compacted sufficiently to support the weight of the contaminated soil.

2.3.2. A layer of geotextile that meets the specifications of the geotextile referenced in clause 2.3.7 is to be installed under the membrane. The geotextile must be installed before the membrane is laid down. The geotextile must be installed under the supervision of an experienced geomembrane installer.

2.3.3. To preserve the integrity of the geomembrane, only foot traffic or ATV's are permitted on the membrane until a sufficient layer of fill material has been placed to ensure that the machines do not damage the membrane.

2.3.4. The membrane needs to be installed by a Master Seamer who is trained in the installation of HDPE geomembrane and certified to weld the geomembrane panels together in such a way as to ensure that they remain water tight throughout the life of the storage area. The Master Seamer should have installed and seamed a minimum of 500,000 m^2 of HDPE Geomembrane. The geomembrane must respect the specifications of the geotextile referred to in clause 2.3.7.

2.3.5. Once the membrane has been installed a layer of geotextile, that meets the specifications of the geotextile referenced in clause 2.3.7, is required to protect the geomembrane.

2.3.6. The geotextile and the geomembrane should be keyed into the top of the berm as shown in figure 2 of Appendix A to ensure that it remains in place.

2.3.7. The geomembrane and the geotextile used for the construction of the containment area are provided by Sintra Inc. The geomembrane and Geotextile was purchased from Solmax, the Geomembrane is SOLMAX 460-5000 and made of HDPE, and the Geotextile is Nilex 4516E.QE has reviewed the specifications of the geomembrane and the geotextile and have found them to meet the needs for the containment cell. Should any additional geomembrane or geotextile be required QE will provide the following geomembrane and geotextile purchased from Géosynthétiques ZTG Inc., the Geomembrane is manufactured by Agru America and is a HDPE Micro Spike® Liner, and the geotextile is manufactured to specifications prepared by ZTG and is type W200.

3. EXCAVATION AND PLACEMENT OF THE CONTAMINATED SOILS IN THE CONTAINMENT AREA

3.1 Removal of the Clean Fill over the Contaminated Fill

3.1.1. The work will start by stripping off the layer of clean fill that was placed over the contaminated soils.

3.1.1.1. Since 150 to 300 mm have been layered over the contaminant, the first 100 to 250 mm will be stripped off and shall be considered as clean soil.

3.1.1.2. The remaining 50 mm would be added to the containment cell.

3.1.1.3. The clean fill will be stockpiled and reused on the site.

3.1.2. The clean cover material will only be removed from an area large enough to be excavated each day to keep a 150 mm cover to avoid exposing the contaminated soil before it can be excavated.

3.2 Excavation of Contaminated Soils and the last 50 mm of clean soil

3.2.1. Contaminated soils should be excavated through the entire thickness of the contaminated soils until the elevation of the natural ground is obtained by verification through survey.

3.2.2. A Photo Ionization Detector (PID MiniRAE) will be used on site as a preliminary test to see if all hydrocarbon contaminated soils has been removed. Confirmatory testing by laboratory analysis is still required for area clearance.

3.2.3. The excavation of the contaminated soil should proceed through the entire width of the contaminated soil either from the apron to the outer edge or the reverse.

3.2.4. Contaminated soil should not be excavated in strips over the entire length.

3.3 Placement of the Contaminated Soils in the Storage Area

3.3.1. Hydrocarbon contaminated soils

3.3.1.1. The contaminated soil needs to be placed thick enough to ensure that the ground pressure from the heavy equipment operating on it will not cause any rocks to puncture the membrane.

3.3.1.2. The manufacturer of the membrane should be contacted to determine the maximum ground pressure that the membrane can support and calculations

should be done to determine the thickness of soil required to ensure that this maximum ground pressure is not exceeded.

3.3.1.3. The soil should be placed up to the bottom of the slope of the berm, but should not go up the slope of the berm.

3.3.1.4. The soil should be placed with side slopes that are no greater than 1.5 long to 1 high.

3.3.1.5. The soil is not required to be compacted during placement

3.3.2. Arsenic contaminated soils

3.3.2.1. The arsenic contaminated soil will be placed in the containment cell only once all hydrocarbon contaminated soils have been placed in the containment cell.

3.3.2.2. The arsenic contaminated soils will be placed in such a manner as to ensure that they are completely segregated from the hydrocarbon contaminated soils.

3.3.2.3. If the arsenic contaminated soils are not able to be completely segregated from the hydrocarbon contaminated soils, then a section of 6 mil polyethylene sheeting must be placed so that is starts a minimum of 1 m from the edge of the hydrocarbon contaminated soil pile and goes up the slope of the hydrocarbon contaminated soils to the top of the arsenic contaminated soil pile. The polyethylene sheeting should cover the top of the arsenic contaminated soil pile a minimum of 1 m in from the hydrocarbon contaminated soil pile.

3.3.2.4. The soil should be placed with side slopes that are no greater than 1.5 long to 1 high.

3.3.2.5. The contaminated soil is not required to be compacted during placement

4. CONFIRMATORY SAMPLING OF THE AREA WHERE CONTAMINATED SOILS WERE REMOVED

4.1 Confirmatory Testing

4.1.1. At the end of each work day the area where contaminated soil has been removed will be divided into a grid with squares that measure 50 m by 50 m.

4.1.2. Each square will then be sampled using a composite sample, by taking a sample from the midpoint between the center of the square and each corner, and a sample from the middle of the square, and mixing them together, as shown in figure 3 of Appendix A. A sample of the mixed soil will then be taken and sent to the laboratory for analysis.

4.1.3. Every 10 samples will require a duplicate sample to be selected at random from the samples collected that day. Should less than 10 samples be collected then a minimum of 1 duplicate sample is required per day.

4.1.4. Analysis for the soils will only be performed only for the contaminants of concern (BETX and F1-F4 for hydrocarbon contaminated soils and arsenic only for the soils contaminated with arsenic)

4.1.5. Once the results show that the square sampled respects the CCME and GN guidelines for the contaminant of concern then the area will be considered remediated and no further actions are required.

4.1.6. Should the laboratory results show that there is contamination remaining in a square that does not respect the CCME and GN guideline value for the contaminant of concern, then additional soils will be excavated and the square will be retested.

4.1.6.1. Paragraph 4.1.5 will be repeated until laboratory analysis shows the square to be remediated or until the authorities having jurisdiction agree that all of the contaminated soil that was placed on the existing ground prior to the placement of the contaminated soil has been removed.

4.1.6.2. Should any pre-existing contamination be found then the authorities having jurisdiction will be contacted for direction.

4.1.7. Once all of the contaminated soils have been removed the area will be reshaped or regraded so that no pooling or ponding of water may occur

5. INSTALLATION OF MONITORING WELLS

5.1. A monitoring well will be installed at the mid-point of each side of the containment cell

5.2. Monitoring wells shall be installed to a depth of 3.5 meters below ground level unless bedrock is encountered at less than 0.7 metres from the surface, in which case the depth of installation can be reduced to 2.4 m below ground level.

5.3. If not installed in bedrock:

5.3.1. The hole for the monitoring well shall be drill to a diameter of 6 to 8".

5.3.2. The monitoring wells will be secured in place using a 0.8 m thick section of grout in the base if not installed in bedrock.

5.3.3. The bottom 1 m section of pipe will be solid stainless steel

5.3.4. The following 2 meters of pipe will be slotted stainless steel

5.3.5. The follow 1 metre section of pipe will be solid and will project out of the ground a minimum of 0.6 m.

5.3.6. The monitoring well pipe shall have a diameter of 1.5".

5.3.7. The entire length of the slotted section of the monitoring well pipe shall be covered with a filter sock and a watertight cap shall be installed in the bottom of the pipe.

5.3.8. Once the pipe is placed filter sand will be used to fill the hole around the pipe from a depth of 0.2 m below the slotted pipe section to a height of 0.2 m above the slotted pipe section.

5.3.9. A bentonite plug will be installed in the remainder of the hole to ground level.

5.3.10. A well casing will be installed to protect the monitoring well. The well casing will measure 6" in diameter and be a minimum of 1.2 meters in height.

5.3.10.1. The well casing cap shall be lockable and have a lock installed immediately following the installation of the monitoring well.

5.3.11. Soil shall be mounded around the outside of the well casing to ensure that water drains away from the casing and does not collect around the well.

5.3.12. Benonite will be placed around the exterior of the well casing to a depth of 0.3 m to further prevent the infiltration of surface water into the monitoring well.

5.4. For monitoring wells installed in bedrock the following applies:

5.4.1. The hole for the monitoring well shall be drill to a diameter of 6 to 8".

5.4.2. The bottom 2 meters of pipe will be slotted stainless steel.

5.4.3. The follow 1 metre section of pipe will be solid and will project out of the ground a minimum of 0.6 m.

5.4.4. The monitoring well pipe shall have a diameter of 1.5".

5.4.5. The entire length of the slotted section of the monitoring well pipe shall be covered with a filter sock.

5.4.6. Once the pipe is placed filter sand will be used to fill the hole around the pipe from bottom to a height of 0.2 m above the slotted pipe section.

5.4.7. A bentonite plug will be installed in the remainder of the hole to ground level.

5.4.8. A well casing will be installed to protect the monitoring well. The well casing will measure 6" in diameter and be a minimum of 1.2 meters in height.

5.4.8.1. The well casing cap shall be lockable and have a lock installed immediately following the installation of the monitoring well.

5.4.9. Soil shall be mounded around the outside of the well casing to ensure that water drains away from the casing and does not collect around the well.

5.4.10. Benonite will be placed around the exterior of the well casing to a depth of 0.3 m to further prevent the infiltration of surface water into the monitoring well.

6. DECOMMISSIONING OF THE MONITORING WELLS IN THE CONTAMINATED SOIL LAY DOWN AREA

6.1. The plastic monitoring well pipes must be removed.

6.2. The monitoring well holes will be filled with sand and a bentonite plug will be placed in the top 6” of the pipe.

7. COVERING OF THE CONTAMINATED SOIL

6.1. An impermeable tarp will be used to cover the contaminated soils to prevent them from coming into contact with water from rainfall or snow.

6.2. The membrane will be one continuous piece that will extend from the outside bottom of one berm to the outside bottom of the opposite berm.

6.3. The tarp shall be constructed of a Coated Woven Polyethylene (CWPE) equivalent to an Inland ITL12 or equivalent, or a Solmax 810 High Density PolyEthylene (HDPE), or equivalent.

6.4. The tarp will be installed by unrolling it from the roll that it was shipped on and unfolded in sections.

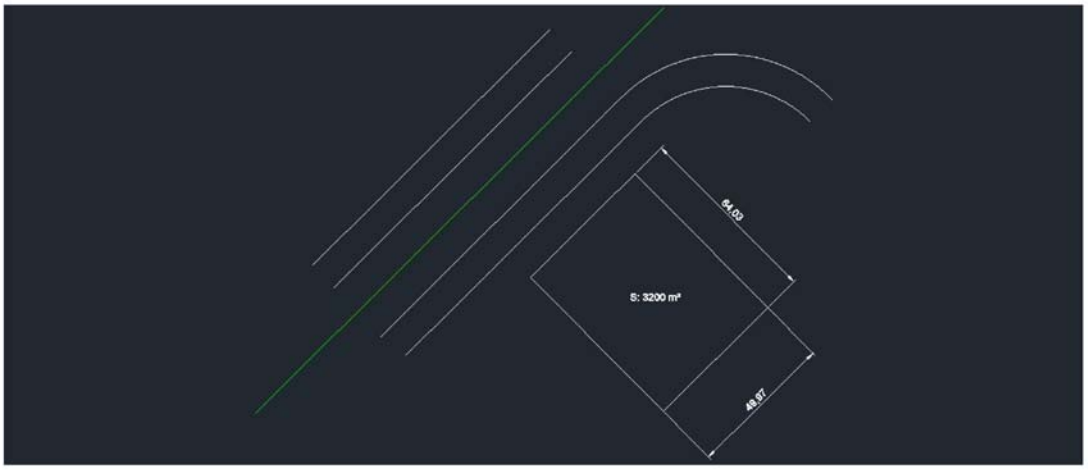
6.4.1. The tarp shall be installed only when the wind speed is low enough to ensure that the tarp will remain in place while it is unrolled.

6.5. The tarp shall be secured by sand bags that will be placed at maximum spacing of every 3 m over the entire surface of the tarp as it is unfolded.

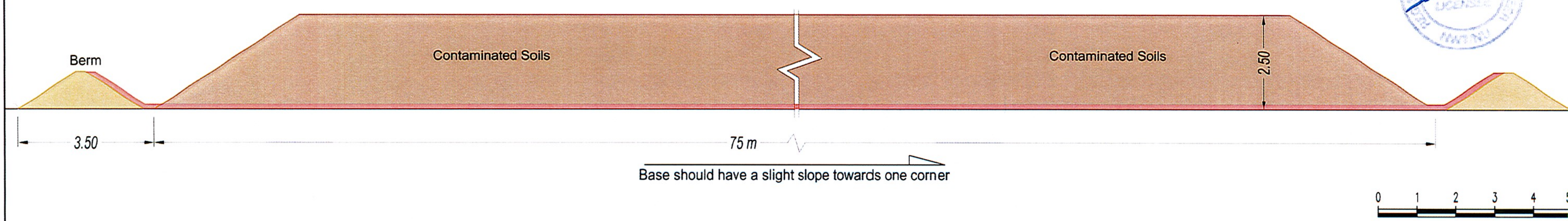
6.6. The edge of the tarp shall be secured in place by keying it into the ground or by sandbags placed at a maximum of 1 m apart over the entire perimeter of the tarp around the containment cell.

Figure 1: The Approximate Location of the Containment Area

Coordinate	***North***	***South***	Description
1	7069831.418	522288.713	*Interior Corner of Cell*
2	7069785.923	522333.774	*Interior Corner of Cell*
3	7069750.743	522298.292	*Interior Corner of Cell*
4	7069796.221	522253.201	*Interior Corner of Cell*

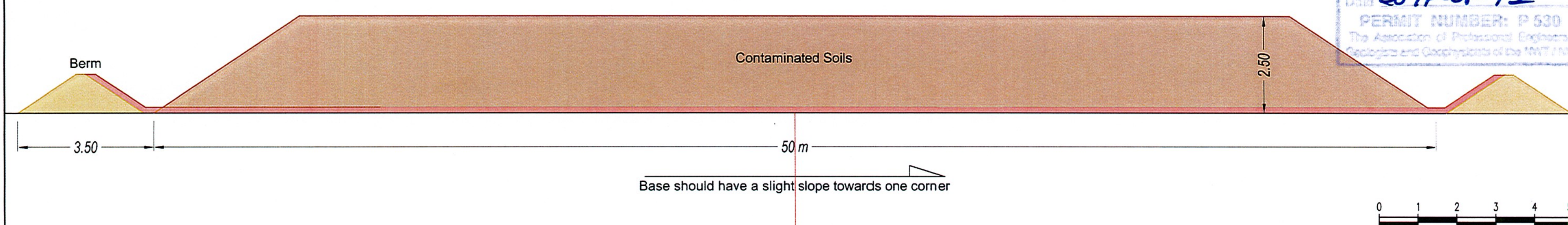


CONTAMINATED SOIL INSTALLATION
(Side View-Length)

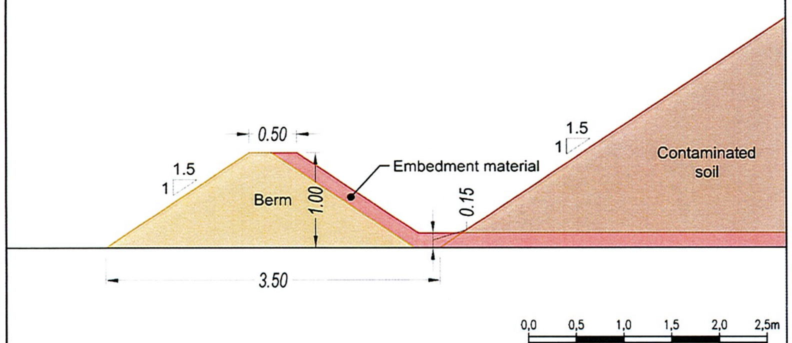


CONTAMINATED SOIL INSTALLATION
(Side View-Width)

PERMIT TO PRACTICE
QIKIQTAALUK ENVIRONMENTAL
Signature
Date 2014-08-12
PERMIT NUMBER: P 530
The Association of Professional Engineers, Geologists and Geophysicists of the NWT / NU



BERM DETAILS



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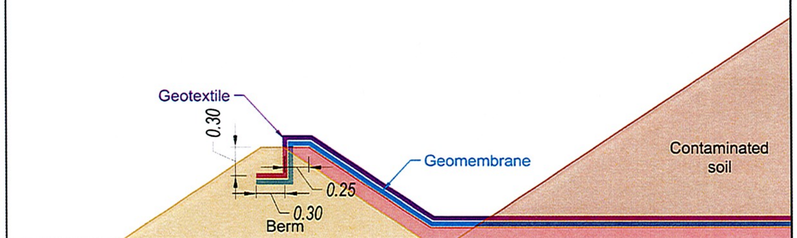
GEOMEMBRANE INSTALLATION DETAILS



CONFIDENTIAL

Figure 2
Cross Sections

Presented to:
sintra INC.

Property located at:
Iqaluit Airport

Scale: As Shown	Design date: 2014-07-31		Revision date: 2014-07-31
Drawn by: J. Bergeron	Verified by: G. Johnson		Approved by: S. Laberge
Project no.: QE14-214-8	Drawing no.: QE14-214-8-01	Layout: A	Geodetic reference: None / None

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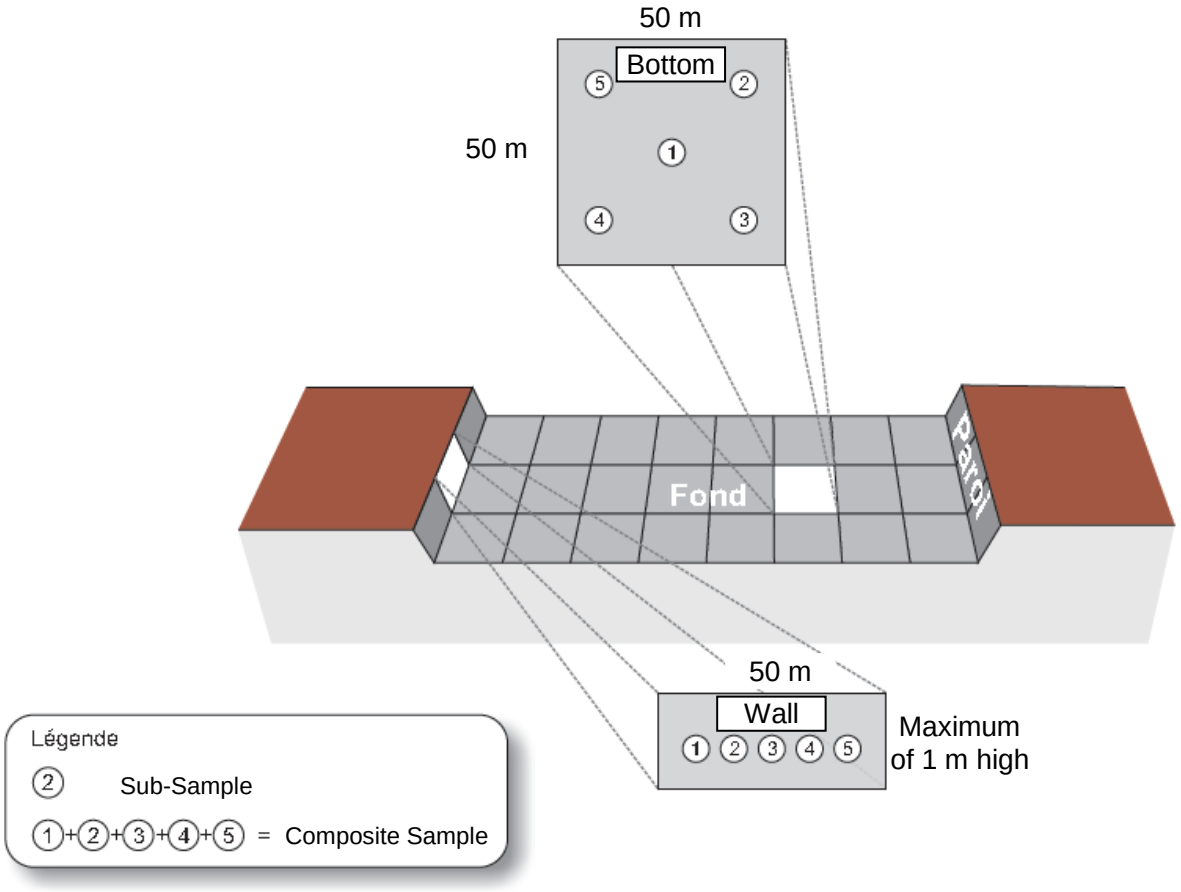

Figure 3: Example of Composite Confirmatory Sample