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## **VIA E-MAIL**

October 12, 2016  
File No.: 144930052

Qulliq Energy Corporation  
PO Box 250  
Iqaluit, NU  
X0A 0H0

**Attention: Mr. Maurice Guimond, Environmental Specialist**

Dear Mr. Guimond:

**Reference: Technical Response - Government of Nunavut Department of the Environment  
Concerns on Remedial Work at the Impacted Soil Hot Spot Location, QEC  
Properties in Baker Lake, Nunavut**

## **1 INTRODUCTION**

Qulliq Energy Corporation (QEC) received an email from the GN Department of Environment (DOE) on October 5, 2016 outlining several concerns of community members and DOE regarding environmental remediation work recently completed at QEC's properties in Baker Lake, Nunavut.

Nunami Stantec Limited (Nunami) is pleased to provide QEC with this technical briefing note to address concerns raised in DOE's email communication.

## **2 BACKGROUND**

Nunami was retained by QEC in 2015 to conduct a human health and ecological risk assessment (HHERA) of the Baker Lake Former Plant Site, the Ministry of Transport (MOT) Compound Site, Federal and Territorial Government Former Tank Farm, and the Baker Lake Shoreline Area located in Baker Lake, NU (the "Site").

Nunami subsequently completed a Remedial Options Feasibility Analysis (ROFA) for the remediation of selected areas identified during the HHERA. The ROFA consisted of a review of potential remedial options for the impacted soil "hot spot" identified from the preliminary HHERA. Based on Nunami's review, the recommended remedial option for the impacted soil "hot spot" at location TP33/MW3 was to excavate the impacted soil, place the soil in an engineered containment cell constructed on site and landfarm the soil to reduce the petroleum hydrocarbon concentrations to an acceptable level.

October 12, 2016

Attention: Mr. Maurice Guimond, Environmental Specialist

Page 2 of 5

**Reference: Technical Response - Government of Nunavut Department of the Environment Concerns on Remedial Work at the Impacted Soil Hot Spot Location, QEC Properties in Baker Lake, Nunavut**

## 2.1 Fieldwork Summary

Nunami completed fieldwork onsite from September 22 to September 29, 2016, involving several tasks associated with the remediation of hydrocarbon impacted soils in the vicinity of the TP33 area (Hot Spot).

The Hot Spot remediation involved the construction of a geomembrane lined landfarm cell on the former gravel fuel tank storage pad located adjacent to the old QEC Power Plant site. Prior to any work proceeding on the cell, background soil samples of the foot print of the proposed cell location were collected and analyzed for the presence of hydrocarbons. The soil in the TP33 area was excavated laterally in each direction to previously established excavation limits and vertically to the permafrost layer to a depth of approximately 2 m below ground level. Confirmatory soil samples were collected from the boundaries of the excavation and the excavation was then backfilled to grade with clean, imported granular fill.

The excavated soil was placed in the landfarm cell and then covered with a polyethylene tarp to prevent rainwater infiltration, and thus potential leachate generation. In addition, the tarp will mitigate potential odour concerns arising from the soil within the landfarm cell. Gravel fill and rubber tires were used to hold down the edges of the tarp. Temporary snow fencing has been shipped to the site and the contractor is currently installing the stabilization posts for the fence. Once the temporary fence is in place, there will be a 1.2-meter barrier surrounding the landfarm cell area. A permanent chain link fence is to be constructed during the spring/summer of 2017.

## 3 RESPONSE TO POINTS RAISED IN DOE EMAIL

Nunami has reviewed the key points identified by the GN DOE and has provides the following response. The detailed design of the landfarm cell and field construction has addressed the key points raised by the GN DOE as described below.

### 3.1.1 Liner

***DOE Comment:*** *The Liner Specifications have not been sent to the DOE. We would like to ensure that the facility does not present a leak risk. Please send us information regarding the liner type and thickness by 01 Nov 16.*

The liner used to construct the cell is a linear low density reinforced (LLDP) 36 mil polypropylene which was welded prior to shipment. This enabled the liner to be installed as one continuous sheet at the site, with no field welding requirements. The dimensions of the landfarm cell are approximately 20 m x 20 m.

The liner extended along the bottom of the cell and up and over the containment berms in all directions. Photos of the cell construction are included below. The material is approved for use in the containment of hydrocarbon impacted soils.

October 12, 2016

Attention: Mr. Maurice Guimond, Environmental Specialist

Page 3 of 5

**Reference: Technical Response - Government of Nunavut Department of the Environment Concerns on Remedial Work at the Impacted Soil Hot Spot Location, QEC Properties in Baker Lake, Nunavut**

Following placement of the soil in the landfarm cell, the soil was completely covered using a 12 mil high density polyethylene geomembrane. A copy of the Product specifications for both the bottom liner and cover tarp are attached in Appendix A.



Photo 1 – Liner installed over base and berms



Photo 2 – Soil in-place in pile being shaped



Photo 3 – Hot Spot TP 33 infilled and final graded



Photo 4 – Cell tarped with fill and tire ballast

October 12, 2016

Attention: Mr. Maurice Guimond, Environmental Specialist

Page 4 of 5

**Reference: Technical Response - Government of Nunavut Department of the Environment Concerns on Remedial Work at the Impacted Soil Hot Spot Location, QEC Properties in Baker Lake, Nunavut**

### **3.1.2 Inspection**

**DOE Comment:** *The facility is to be inspected every two weeks. These should verify that no damage has occurred and water in the facility is not at risk of overflowing the berm. A log must be kept of these inspections.*

QEC personnel based in Baker Lake will conduct biweekly inspections of the landfarm cell and will monitor levels of water accumulation. QEC will maintain an inspection log and this document can be forwarded to DOE if required. Nunami anticipates that leachate generation will be minimal since the landfarm soil is covered to prevent rainwater infiltration.

### **3.1.3 Water management**

**DOE Comment:** *A contingency plan should be created in case of excess water being impounded. This water can be transferred to proper containers for storage, or be treated and discharged.*

As noted previously, the landfarm is covered therefore potential leachate generation would be minimal. Nevertheless, should water accumulate in the landfarm cell, samples will be collected for laboratory analysis. If the water contains elevated concentrations of petroleum hydrocarbons, the water will be removed and contained in drums. Nunami has an on-site water treatment system that will be commissioned in 2017. Any stored water from these operations would be treated during commissioning of the water treatment system in late spring/summer 2017.

### **3.1.4 Discharges**

**DOE Comment:** *Any water or soil being discharged from the facility are to be tested and results submitted to the DOE for approval. Water must meet the DOE Guideline attached. Soil must meet the CCME Criteria appropriate for the land use of the location deposited.*

Soil or water will not be disposed of or be discharged from the system without first being analyzed to ensure compliance with the appropriate GN Remedial Criteria and the results will be forwarded to DOE for approval to dispose/discharge.

### **3.1.5 Odours**

**DOE Comment:** *The community has expressed a concern over the location of the facility as it is in close proximity to high use areas such as a playground. It should be noted that the QEC did not engage with stakeholders before the construction; such a process might have identified such issues in order to try and prevent them. QEC is expected to be sensitive to the concerns of the community moving forward and make adjustments as necessary.*

October 12, 2016

Attention: Mr. Maurice Guimond, Environmental Specialist

Page 5 of 5

**Reference: Technical Response - Government of Nunavut Department of the Environment Concerns on Remedial Work at the Impacted Soil Hot Spot Location, QEC Properties in Baker Lake, Nunavut**

QEC will be sensitive to the concerns of the community; the soil is now covered and will remain that way apart from periodic removal of the cover during the summer to facilitate nutrient addition and turning over of the soil aeration purposes. During these periods, odours will be closely monitored with adjustments to the field operations as required.

#### **4 CLOSURE**

Should you have any questions or require additional clarification on any element of this submission, please feel free to contact any of the undersigned.

Sincerely,

Nunami Stantec Limited



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## **APPENDIX A:**



# NovaLiner™ 12

## 5.2 OZ GEOMEMBRANE

# INTERTAPE POLYMER GROUP®

## TECHNICAL DATA SHEET

### DESCRIPTION

A medium weight fabric incorporating a new coating recipe designed to improve toughness and abrasion resistance.

### FABRIC SPECIFICATIONS

Weave: Woven black HDPE scrim  
Coating: LDPE, 1.75 mil average each side (41.5 g/m<sup>2</sup>/side)  
Color: Black or colored coatings available  
Weight: 5.2 oz/yd<sup>2</sup> (176 g/m<sup>2</sup>) +/- 5%

### ROLL SPECIFICATIONS

Cores: 4 inch I.D. or 5 inch I.D. available  
Width: Up to 144 inches (-0, +0.5) as ordered  
Length: Minimum 500 yds/roll; up to 1000 yds/roll

*These values are typical data and are not intended as limiting specifications.*



intertape polymer group®

100 Paramount Drive, Suite 300 | Sarasota, FL 34232 | USA

Customer Service: 800.IPG.8273 | 800.474.8273

Technical Service (Canada): 800.565.4533

Technical Service (US): 800.565.1450

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### PERFORMANCE PROPERTIES

The following data are typical values based on ASTM standard tests. This data should not be considered specification.

<b>Thickness</b> ASTM D1777	Nominal 12 mil (0.30 mm), ± 10%
<b>Grab Tensile (N)</b> ASTM D7004	MD 180 lb (800) / TD 125 lb (555)
<b>Strip Tensile (N/5cm)</b> ASTM D7003	MD 140 lb/in (1243) / TD 100 lb/in (888)
<b>Tongue Tear (large scale) (N)</b> ASTM D5884	MD 50 lb (222) / TD 50 lb (222)
<b>Mullen Burst</b> ASTM D751	275 psi (1894 kPa)
<b>MVTR</b> ASTM E96 Proc. BW	0.42 g/m <sup>2</sup> ·24hr (0.06 perms)
<b>Hydraulic Conductivity (Permeability)</b> Calculated from MVTR	0.88 x 10 <sup>-12</sup> cm/s
<b>Hydrostatic Resistance</b> ASTM D751	130 psi (900 kPa)
<b>Puncture Resistance</b> ASTM D4833	76 lb / 338 N
<b>Carbon Black Content</b> ASTM D4218	2.79%
<b>Dimensional Stability</b> ASTM D1204	MD -3.60% / TD -2.42%
<b>Low Temperature Flex</b> ASTM D2136	MD&TD: Pass @ -40°C (-40°F)
<b>Seam Strength (shear), min.</b> ASTM D7747	Seam shear should be >80% of the strip tensile of the base fabric
<b>Seam Strength (peel), min.</b> ASTM D413	3 lb/in / 27 N/5cm
<b>Accelerated UV Weathering</b> ASTM G151 ASTM G154	>90% strength retention after 2000 hrs exposure @ 0.77 W/m <sup>2</sup> /nm, or 1200 hrs exposure @ 1.35 W/m <sup>2</sup> /nm <sup>1</sup> Q.U.V [A-340 Lamps]; 8 hrs UV @ 60°C; 4hrs condensation @ 50°C

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EFFECTIVE: 2/14

Please contact your IPG representative for warranty details.



# DURA•SKRIM® KQ36B & KQ45B

Scrim Reinforced Polypropylene - NSF/ANSI Standard 61 Certified

R A V E N

## Product Description

DURA•SKRIM® KQ36B and KQ45B are flexible polypropylene reinforced geomembranes achieved by incorporating high levels of ethylene propylene rubber into polypropylene with a dense scrim reinforcement for excellent dimensional stability and puncture resistance. In addition the K-Series reinforcement provides unmatched tear and tensile strengths. DURA•SKRIM® KQ36B and KQ45B polypropylene membranes do not contain plasticizers that can leach out and hinder long-term flexibility and performance. DURA•SKRIM® KQ36B and KQ45B provide outstanding resistance to environmental stress cracking even in elevated temperatures and chemical environments.

## Product Use

DURA•SKRIM® KQ36B and KQ45B are used in a wide variety of applications that require a unique combination of mechanical toughness, excellent flexibility, and environmental resistance. DURA•SKRIM® KQ36B and KQ45B polypropylene geomembranes also offer a high-friction angle reducing concerns for side slope stability. The DURA•SKRIM®, KQ36B & KQ45B are certified under the NSF/ANSI Standard 61, Drinking Water System Components - Health Effects.



## Size & Packaging

DURA•SKRIM® KQ36B and KQ45B are available in a variety of widths and lengths to meet the project requirements. Large diameter mill rolls are available to assure an efficient seaming process. Factory welded panels are accordion folded and tightly rolled on a heavy-duty core for ease of handling and time saving installation.

# DURA•SKRIM®



Containment Liner

## Product

## Part #

DURA•SKRIM .....	KQ36B
DURA•SKRIM .....	KQ45B

## APPLICATIONS

Waste Lagoon Liners	Remediation Covers
Floating Covers	Landfill Caps
Fish Hatchery Liners	Farm Pond Liners
Modular Tank Liners	Canal Liners
Tunnel Liners	Disposal Pit Liner
Remediation Liners	Water Containment Ponds
Earthen Liners	Heap Leach Liner
Interim Landfill Covers	



# DURA♦SKRIM® KQ36B & KQ45B

Scrim Reinforced Polypropylene - NSF/ANSI Standard 61 Certified

PROPERTIES	TEST METHOD	DURA♦SKRIM KQ36B		DURA♦SKRIM KQ45B	
		Minimum Roll Averages	Typical Roll Averages	Minimum Roll Averages	Typical Roll Averages
APPEARANCE		Black			
THICKNESS	ASTM D5199	32 mil	36 mil	40 mil	45 mil
WEIGHT LBS/MSF, (OZ/YD <sup>2</sup> )	ASTM D751	146 (21.0)	156 (22.5)	186 (26.8)	197 (28.4)
CONSTRUCTION		dense scrim reinforced polypropylene			
*PLY ADHESION - LBS/IN	ASTM D6636	20 or FTB	22 or FTB	25 or FTB	27 or FTB
TENSILE STRENGTH - LBS/IN	ASTM D7003	166 MD 155 TD	184 MD 172 TD	175 MD 145 TD	194 MD 161 TD
TENSILE ELONGATION AT BREAK % (FILM BREAK)	ASTM D7003	632 MD 460 TD	703 MD 511 TD	606 MD 654 TD	673 MD 727 TD
TENSILE ELONGATION AT BREAK % (SCRIM BREAK)	ASTM D7003	30 MD 30 TD	34 MD 32 TD	30 MD 30 TD	32 MD 33 TD
TONGUE TEAR STRENGTH - LBF	ASTM D5884	160 MD 171 TD	178 MD 190 TD	148 MD 158 TD	165 MD 176 TD
GRAB TENSILE - LBF (SCRIM BREAK)	ASTM D7004	242 MD 243 TD	269 MD 270 TD	271 MD 264 TD	301 MD 294 TD
GRAB TENSILE ELONGATION AT BREAK %	ASTM D7004	25 MD 25 TD	31 MD 33 TD	25 MD 25 TD	29 MD 34 TD
HIGH PRESSURE OIT (HPOIT)	ASTM D5885	450 min	900 min	450 min	900 min
PUNCTURE RESISTANCE - LBF	ASTM D4833	100	111	106	118
MAXIMUM USE TEMPERATURE		180° F		180° F	
MINIMUM USE TEMPERATURE		-70° F		-70° F	

\*Raven modified QC procedure

Hydraulic conductivity values are derived from permeability data. KQ36 =  $1.39 \times 10^{-9}$  cm/sec, and KQ45 =  $1.11 \times 10^{-9}$  cm/sec.



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Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at [www.RavenEFD.com](http://www.RavenEFD.com)



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