From: Gregory D. Smith [GDSmith@RSOInc.com]
Sent: Friday, October 17, 2008 4:54 PM
To: Elizabeth Ullrich
Cc: Michael_Spinazzola@bd.com
Subject: BD Caribe (Cayey): MDC Calculations
Attachments: oledata.mso; ATT00001.txt; ATT00002.txt; MDCR calculation.xls

Dear Ms. Ullrich,

This email is to follow-up our phone conversation regarding the MDCR and MDC calculations used in the BD Caribe (Cayey) radiological survey report.

Following is a sample calculation that we used following the MARRSIM formulas (also see excerpt of our response at the end of this email):

Sample Calculation:

MDCR = d' x sqrt(bkg counts in the observation interval) x (60/observation interval)
MDCR = d' x sqrt(252 cpm x 1/60) x (60 (s/min)/(1 s))
= 1.38 x sqrt(252/60) x (60)
= 169.69 cpm

The units cancel leaving cpm,
if one allows that the units inside the radical cancel and the units for 60/observation interval are s/min/s = 1/m.

I have also attached an excel spreadsheet that we used to examine the MARRSIM MDCR formulas and the calculated MDCR values shown in the MARRSIM Table 6.6. The values for Ei and probe area can be changed to calculate the scanMDC for the survey meters used.

p	0.25
Ei	**0.16**
Es	0.5
probe area	**15**

The spreadsheet is protected but with no password.

Regarding the Static MDC:

K for our calculations was only the 4 Pi efficiency. No other correction factors were used.

Thank-you,

Gregory D. Smith, CHP
RSO, Inc.

410-792-7444 x322

MDCR

The MDCR and the scanMDC were determined using equations taken from NUREG-1575 Chapter 6. Specifically 6-8, 6-9 and 6-10.

Equation 6-8

Equation 6-9

The value for d' used was 1.38 and the value of for i was 1 s and b_i is the number of background counts in the interval.

The estimated minimum count rate that is detectable by scanning in an area with a background of 252 cpm, assuming that the contamination is under the probe for 1 s and using the value for d' from the example in NUREG-1575 of 1.38, the MDCR is 170 cpm (net).

Sample Calculation:

MDCR = d' x sqrt(252 cpm x 1/60) x (60 (s/min)/(1 s))
1.38 x sqrt(252/60) x 60
169.69

The MDCR for the survey meters used is shown in the following table:

Table 1. Table of the MDCR for survey meters used.

Survey Meter	Detector or Probe	Typical Background (cpm)	Index of Sensitivity (d')	Observation Interval (*i*)	MDCR
Ludlum 16 Ratemeter	Ludlum 44-9	40	1.38	1 s	70 cpm
Ludlum 2221 Scaler/Ratemeter	Ludlum 43-68	250	1.38	1 s	170 cpm
Ludlum 2221 Ratemeter Scaler/Ratemeter	Ludlum 43-37	900	1.38	1 s	320 cpm

E-mail Properties

Mail Envelope Properties (00a101c9309a$7dff25e0$2c6ea8c0)

Subject: BD Caribe (Cayey): MDC Calculations
Sent Date: 10/17/2008 4:54:55 PM
Received Date: 10/17/2008 4:54:55 PM
From: Gregory D. Smith

Created By: GDSmith@RSOInc.com

Recipients:
Elizabeth.Ullrich@nrc.gov (Elizabeth Ullrich)
Tracking Status: None
Michael_Spinazzola@bd.com (Michael_Spinazzola@bd.com)
Tracking Status: None

Post Office:
RSO000807

Files	Size	Date & Time
MESSAGE	52343	10/17/2008
oledata.mso	3219	
ATT00001.txt	204	
ATT00002.txt	204	
image005.gif	597	
image006.gif	933	
MDCR calculation.xls	19520	

Options
Expiration Date:
Priority: olImportanceNormal
ReplyRequested: False
Return Notification: False

Sensitivity: olNormal
Recipients received: