APPENDIX H

DETERMINATION OF CULVERT PEAK DESIGN FLOW

Tributary Area & Runoff Calculations

Condition: 10 Year Return Period **(using HIGHER "R" values)** **Date:** 14-Apr-05
Location: Catchment area affecting new sewage lagoon access Rd **P.O.C.** New Culvert

Area No.	Cover or Dev. State	Approx. Grade (%)	Area (m^2)	Area (ha)	R*	A X R	Comments:
5	Undeveloped	8	19838	1.98	0.50	0.9919	Relatively flat. Silt-like soil
6	Undeveloped	25	38582	3.86	0.85	3.2794	Fairly Steep, No storage
7	Undeveloped	30	79812	7.98	0.70	5.5869	Moderate slope, with storage
8	Undeveloped	9	52582	5.26	0.60	3.1549	Moderate slope, with storage
9	Undeveloped	6	73192	7.32	0.60	4.3915	Moderate slope, with storage
10	Undeveloped	7	153084	15.31	0.60	9.1850	Moderate slope, with storage
		∑Areas=	417089	41.71	Total ∑AXR=	26.5896	

* R values were estimated using Table 2-26 "Watershed Characteristics for Determining Runoff Coefficient..." (U.S. Soil Conservation Service)

Tc=Ts + Tr where,

Ts=Saturation Time (Inlet Time)
Tr=Running or system flow time

NOTE: For frozen or highly impervious surfaces, the value for Ts is near zero (0).

Method of Tr determination: Overland Flow Nomograph
Drop from Remote Point to Outlet: **85** m (From Topographic Map) Average Slope (%) = 6.7
Length of Overland Travel: **1270** m (AutoCAD drawing - Figure 6)
Time Correction Factor: **1** (For Bare Earth)

Tr = **13** minutes (Overland Flow Nomograph)

Preliminary check: Velocity (average) = L/t 1.628 m/s

CALCULATED FLOW (Qc):

Qc = (A · R · I) / 360 = (Total AR · I) / 360

Return Period: **10 years**
Drainage Area: **41.7** (AutoCAD drawing - Figure 6)
Total AR: **26.6** (See above)
Running Time (Tr): **13** (Overland Flow Nomograph - attached)
Saturation time (Ts): **2** (near 0 for frozen/impervious surfaces)
Concentration Time (Tc): **15** (minutes)
Intensity: **16** (mm/hr) - IDF curves for Cape Dorset

$$Q_{10} = \frac{26.6 \times 16}{360} \qquad Q_{10} = 1.1818\ m^3/s$$

DESIGN FLOW:

$Qd = Q_{10} \cdot (1+A\%)(1+R\%)(1+I\%)(FOS)$

Where: FOS 0.10
A%= 0.05
R%= 0.20
I%= 0.05

Q_d= 1.72 m^3/s

Catchment Area for culvert calcs (Total: 41.7 ha)

Watershed Characteristics

TABLE 2-26. WATERSHED CHARACTERISTICS FOR DETERMINING RUNOFF COEFFICIENT IN THE RATIONAL FORMULA

(Source: U.S. Soil Conservation Service)

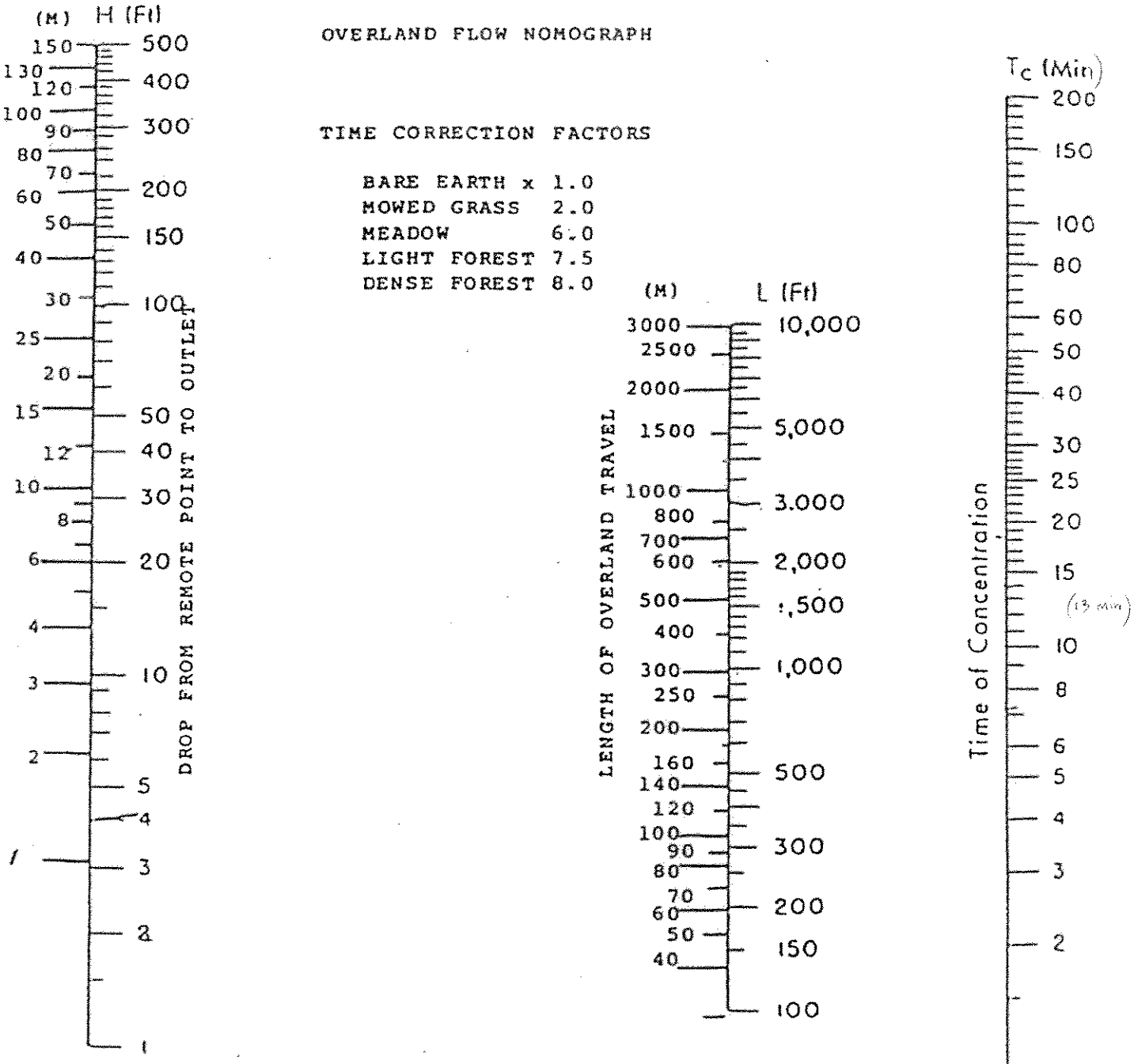
[For each watershed characteristic in left column select appropriate descriptive box; add four numerical values given in parentheses to obtain runoff coefficient as a percentage.]

Designation of watershed characteristics	Runoff-producing characteristics			
	100 extreme	75 high	50 normal	25 low
(A) Relief	(40) Steep, rugged terrain, with average slopes generally above 30%	(30) Hilly, with average slopes of 10 to 30%	(20) Rolling, with average slopes of 5 to 10%	(10) Relatively flat land, with average slopes of 0 to 5%
(B) Soil infiltration	(20) No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity	(15) Slow to take up water; clay or other soil of low infiltration capacity, such as heavy gumbo	(10) Normal; deep loam with infiltration about equal to that of typical prairie soil	(5) High; deep sand or other soil that takes up water readily and rapidly
(C) Vegetal cover	(20) No effective plant cover; bare or very sparse cover	(15) Poor to fair; clean-cultivated crops or poor natural cover; less than 10% of drainage area under good cover	(10) Fair to good; about 50% of drainage area in good grassland, woodland, or equivalent cover; not more than 50% of area in clean-cultivated crops	(5) Good to excellent; about 90% of drainage area in good grassland, woodland, or equivalent cover
(D) Surface storage	(20) Negligible; surface depressions few and shallow; drainage-ways steep and small; no ponds or marshes	(15) Low; well-defined system of small drainage-ways; no ponds or marshes	(10) Normal; considerable surface-depression storage; drainage system similar to that of typical prairie lands; lakes, ponds and marshes less than 2% of drainage area	(5) High; surface-depression storage high; drainage system not sharply defined; large flood-plain storage or a large number of lakes, ponds or marshes

* Note: Areas are defined on Figure 6

Area # 5	Area # 6	Area # 7	Area # 8	Area # 9	Area # 10
(A): 20	(A) 30	(A): 30	(A): 20	(A): 20	(A): 20
(B): 5	(B): 20	(B): 10	(B) 10	(B) 10	(B): 10
(C): 20	(C): 20	(C): 20	(C): 20	(C): 20	(C): 20
(D): 5	(D): 20	(D): 10	(D): 10	(D): 10	(D): 10
50	90	70	60	60	60

Cape Dorset (05-4319-2000)
New sewage treatment lagoon Road - Culvert Design.



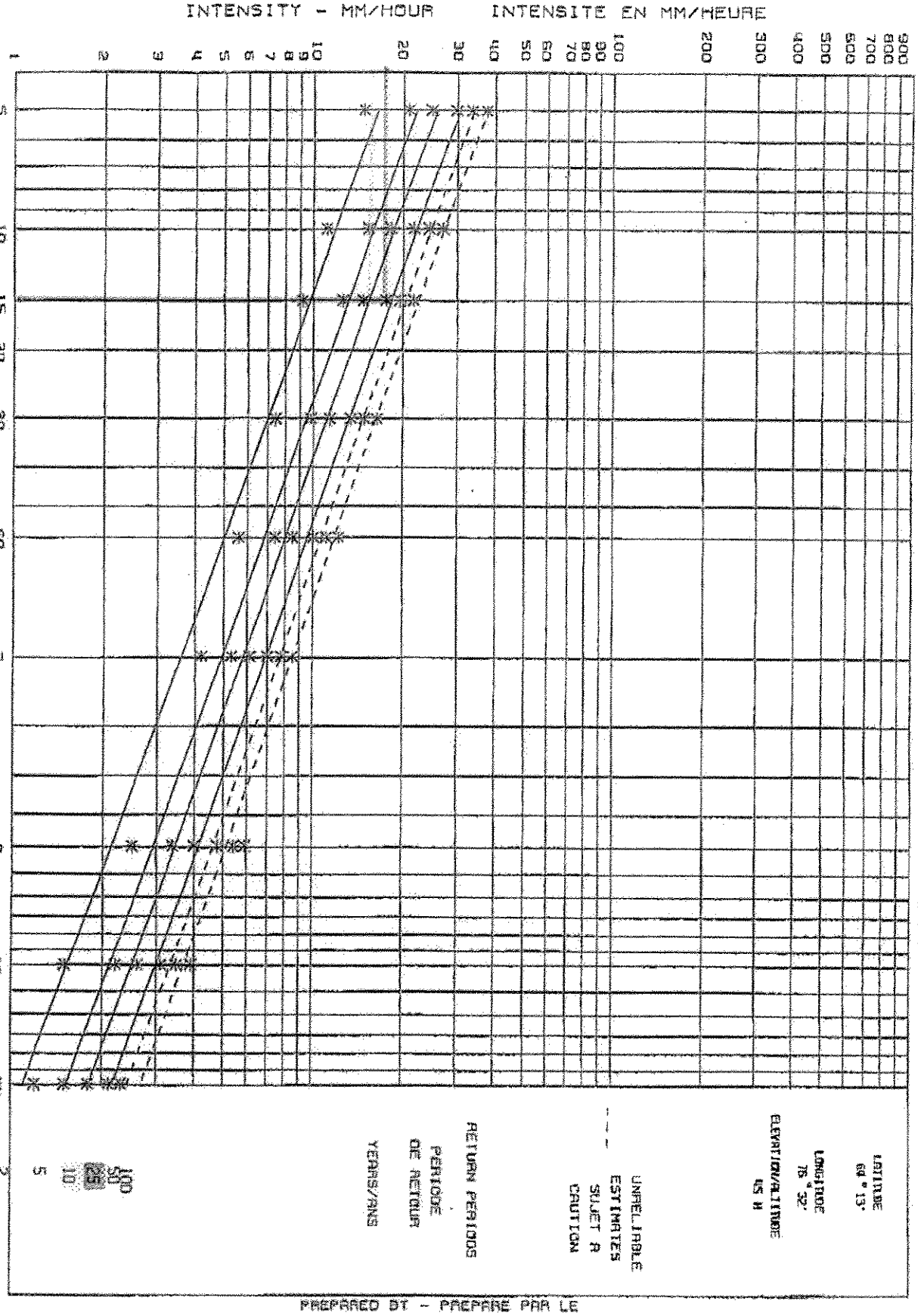
OVERLAND FLOW CORRECTION FACTOR NOMOGRAPH

SHORT DURATION RAINFALL INTENSITY-DURATION FREQUENCY DATA FOR- CAPE DORSET AIRPORT NWT

DONNEES SUR L'INTENSITE, LA DUREE ET LA FREQUENCE DES CHUTES DE PLUIE DE COURTE DUREE A

GUMBEL-METHOD OF MOMENTS BASED ON RECORDING RAIN GAUGE DATA FOR THE PERIOD- 1971 - 1990 17 YEARS/AN

METHODE DES MOMENTS BASEES SUR LES DONNEES DU PLUVIOGRAPHES POUR LA PERIOD



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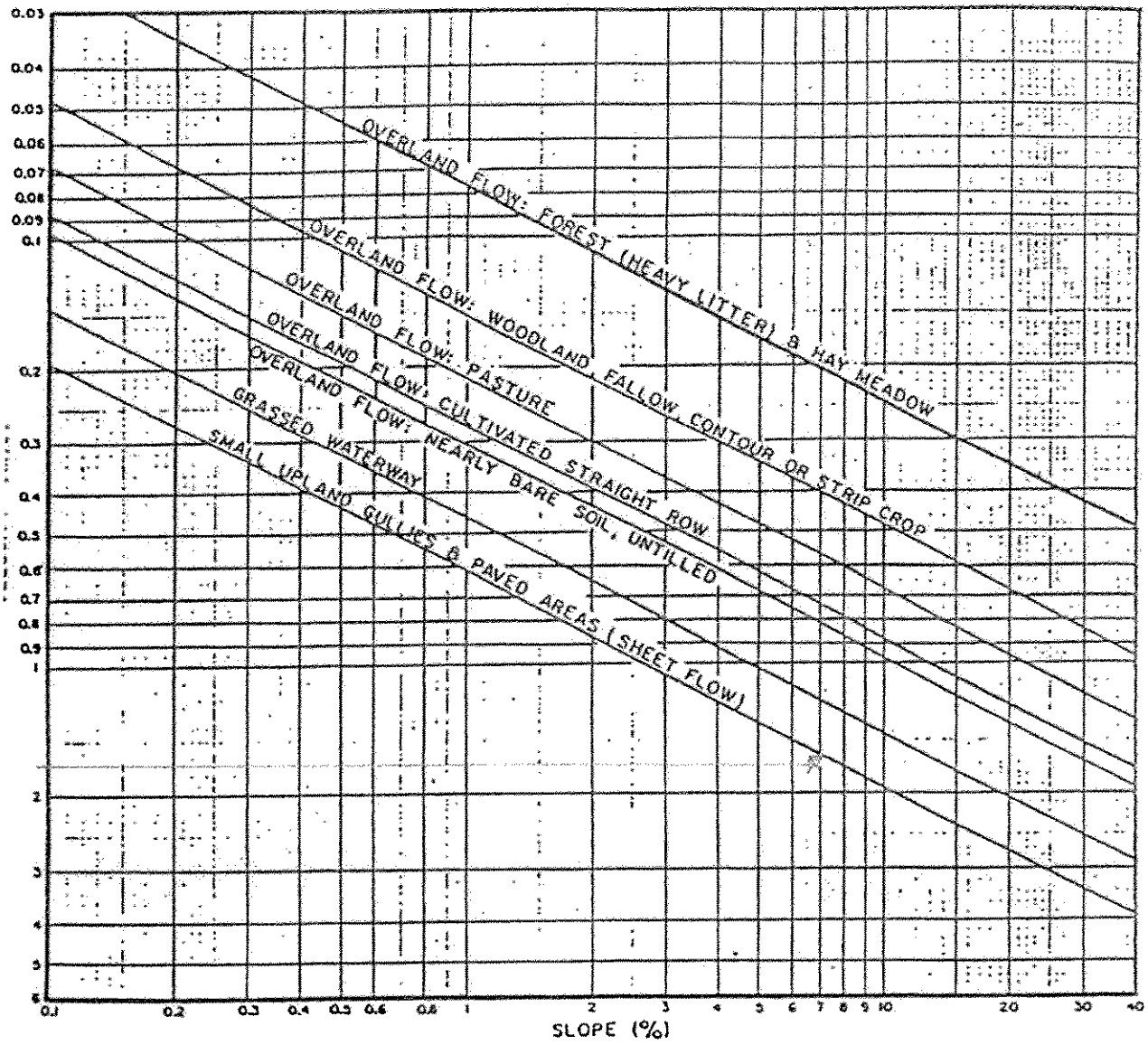
SERVICE DE L'ENVIRONNEMENT ATMOSPHERIQUE - ENVIRONNEMENT CANADA



(~ 6.7% slope)

OVERLAND FLOW SURFACE VELOCITY NOMOPGRAPH

DILLON CONSULTING

PROJECT	Cape Dorset Sewage Treatment System
TITLE	Lake - P and Lagoon Site Catchment Areas
PROJECT NUMBER	05-4319-2000
DATE	May 05
FIGURE NUMBER	K

APPENDIX I

ORGANIC LOADING CALCULATIONS

Year	Population	MACA Predicted Sewage Production (L/d)	BOD (mg/L)	Organic Loading (Kg/d)	Lagoon Area (ha)	Areal Organic Loading (Kg/ha/d)
2000	1213	1.40E+05	625	87	3.1	28
2001	1240	1.43E+05	625	90	3.1	29
2002	1268	1.47E+05	625	92	3.1	30
2003	1298	1.52E+05	625	95	3.1	31
2004	1327	1.56E+05	625	97	3.1	31
2005	1354	1.60E+05	625	100	3.1	32
2006	1382	1.64E+05	625	102	3.1	33
2007	1412	1.68E+05	625	105	3.1	34
2008	1441	1.73E+05	625	108	3.1	35
2009	1471	1.77E+05	625	111	3.1	36
2010	1501	1.82E+05	625	114	3.1	37
2011	1536	1.87E+05	625	117	3.1	38
2012	1570	1.92E+05	625	120	3.1	39
2013	1600	1.97E+05	625	123	3.1	40
2014	1632	2.02E+05	625	126	3.1	41
2015	1662	2.07E+05	625	129	3.1	42
2016	1692	2.12E+05	625	132	3.1	43
2017	1726	2.17E+05	625	136	3.1	44
2018	1757	2.22E+05	625	139	3.1	45
2019	1793	2.28E+05	625	142	3.1	46
2020	1829	2.34E+05	625	146	3.1	47
2021	1848	2.37E+05	625	148	3.1	48
2022	1879	2.42E+05	625	151	3.1	49
2023	1910	2.47E+05	625	155	3.1	50
2024	1941	2.53E+05	625	158	3.1	51
2025	1971	2.58E+05	625	161	3.1	52
2026	2002	2.63E+05	625	164	3.1	53

APPENDIX J

LETTER TO HUNTERS AND TRAPPERS ASSOCIATION

April 14, 2005

Qavaroak Qatsiya
Chairperson
Aiviq HTA
P.O. Box 300
Cape Dorset, Nunavut
X0A 0C0

Dear Qavaroak,

At our recent meeting, the Nunavut Wildlife Management Board (NWMB or Board) reviewed your application for funding for *Fish lakes and Rivers Restoration* project. The project was approved for funding in the amount of $29,216, subject to the following conditions:

1. The proponent should be encouraged to seek other sources of funding. This should be confirmed in writing.

2. Funding should be conditional on clarification of the budget line items A- $9,000 for 2 hunters/boat owners for 6 trips
   B- Specify what is included in the 5K in-kind from the HTO

3. Funding should be conditional on the Aiviq HTO being up to date and in satisfactory standing with NWMB for receiving regular funding from NWMB.

Conditions must be met before a contribution agreement will be established. The deadline for meeting these conditions is **30 June, 2005**. If you do not fulfil these conditions by that date, funding will not be provided for this year and a new application must be submitted for next year. Please let us know if you anticipate any problems in meeting this deadline.

Once you have met these conditions, a contribution agreement will be forwarded to the HTA for your review and signature.

I wish you success with this project.

Yours sincerely,

Josée Galipeau
A/Director Wildlife Management

cc. QWB
DFO Iqaluit