



J D MOLLARD AND ASSOCIATES LIMITED

CONSULTING CIVIL ENGINEERS AND ENGINEERING GEOLOGISTS



Prepare D I Nature 6th 1. KiA Hull KiA Attn.

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COMPILATION INVENTORY OF GRANULAR MATERIAL RESOURCES INFORMATION WITHIN CAMERON HILLS AREA

1.0 TERMS OF REFERENCE FOR STUDY

- To review known aerial photographic studies and associated reports of the two study areas.
- Identify potential granular resource materials from the information sources researched.
- Provide copies (non-reduced) of existing maps (photomosaic base, wherever possible) or air photos with 2-3 reference points in UTM or Lat/Long which delineate potential granular resource materials.
- Provide a table or deposit summary which includes, where possible, information on the landform, potential volume of granular material, an indication of geological constraints (i.e. frozen or unfrozen, possible massive bodies of ice) and any additional comments.
- · Prepare a brief report on each of the study areas.

2.0 PROSPECT VS DEPOSIT

This study extracts information from existing airphoto mapping studies (circa 1960-1993) done for other clients by J D Mollard and Associates Limited and centered in northern Alberta and the Northwest Territories. Only a few of these office airphoto-mapped prospects have been field-checked by ourselves though many may have been field checked by other private companies or government agencies. Accordingly, source areas shown on the inventory maps in this study are not classified specifically as a prospect (unproven airphoto-mapped prospect area) or as a deposit (a mapped prospect that has been field checked and proven positive

respect the presence of aggregate). Rather, we have simply regarded all site areas as undifferentiated and called them prospects in our inventory tables. 1)

3.0 UTM COORDINATES OF PROSPECTS AND DEPOSITS

Where a prospect area is small a single UTM coordinate only is shown in the inventory table. Where a prospect covers a larger area, and where the approximate shape of the prospect area can be meaningfully shown on the NTS maps, then either 2 or 3 UTM coordinate locations are shown in order to define the location.

4.0 LANDFORM

Many of the prospect landforms in the study area are complex, hence more than one landform type may be shown in the inventory table. For example, there are many esker-kame complexes where these two landforms occur together within a single mapped prospect area. Similarly there may be eskers that have outwash aprons associated with them. In these cases both landforms will be shown against the prospect number in the inventory table.

5.0 SURFACE TOPOGRAPHY OF PROSPECT OR DEPOSIT

The surface topography of prospect areas shown in inventory tables is derived mainly from the known common topography of the specific landform in question; this

For purposes of this study the word prospect will be used in the remainder of this report to discuss all numbered site-areas.

because the present study is done without aid of reexamination by stereoscopic viewing. For this reason the surface topographies shown for the various prospects should be regarded as approximate.

Where more than one surface topography is shown in the inventory tables there may be two discrete topographic reliefs present. For example, an esker-kame complex would be shown as being a ridge and a hill. Similarly, a sloping beach ridge may be shown as a ridge and a slope.

It is difficult to define the probable landform topography precisely but this column in the tables will at least give the user an approximate "feel" of the landscape forms in the prospect area.

6.0 ESTIMATE OF PROSPECT SIZE

A PROSPECT SIZE column is shown on the inventory table of each NTS sheet. Prospects are simply categorized as to order-of-magnitude; this rather than attempting to make a more precise estimate -- an estimate that one would have to attempt without the aid of stereoscopic airphoto examination.

Categories used: (M3):

Small - tens of thousands to hundreds of thousands Medium - hundreds of thousands to millions Large - millions to tens of millions

7.0 COMMENTS COLUMN IN INVENTORY TABLES

The last column in the inventory tables marked COMMENTS is needed only occasionally. There are a few landforms such as beaches that are not shown in the inventory table format and these are noted under this column. As well, where the landform is uncertain or no record of landform is available in the old studies, then this fact is noted.

8.0 EXPECTED PERMAFROST CONDITIONS

We do not have precise data with respect to permafrost on any of the prospects shown in this study; nor, most likely, will anyone. But we can group the prospects into zones and say something about the probability of permafrost conditions being present in each of those zones. Further, the chance of permafrost conditions being present — particularly in the continuous and widespread discontinuous permafrost zones (north of the Cameron Hills area and mainly in the Izok Lake corridor) — is a function of tree cover and organic cover conditions, sun exposure and aspect, and finally, topography.

In general, we can say the following about the probability of permafrost conditions being present in granular prospects in the Cameron Hills region:

Location: Between the south end of the study area near the Cameron Hills and the Fort Providence/Great Slave Lake latitude

This area lies within the southern fringe of the permafrost region. The presence of permafrost in this zone is expected to be very spotty and discontinuous. In this

region particularly, permafrost presence will depend on tree cover and organic cover thickness, exposure to the sun (<u>i.e.</u> south- vs north-facing) and depth of overburden over the potential granular deposit. The southerly-facing slopes of eskers, kames, and ice-contact prospects are expected to nearly all be permafrost-free within this zone. Flat-lying prospects such as outwash, if covered by trees and/or a thick organic layer, may well house some permafrost conditions.

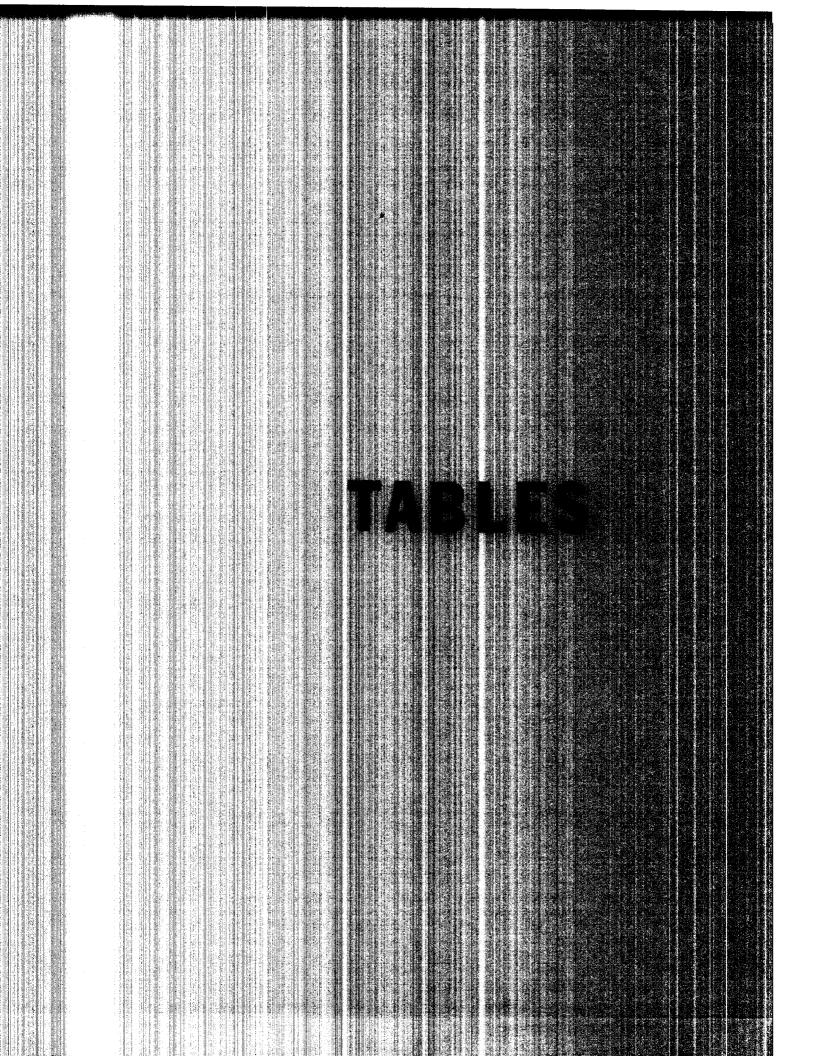


TABLE I SUMMARY OF GRANULAR PROSPECTS

,	NTS 84 L ZONE IIV																	
 	113 <u>07 L</u>		G.E.		GIÇ					CLIE	EAC	T TO	2000	APHY	ח	F PO	SIT	SHEET 1 of 1
1			92	1						300	PACE	101	-06R	APHI	_	E PO S I Z	Ē, ,	
ROSPECT	UTM			lsh	Ice-contact deposit	e C		Cone or fan								Ε		COMMENTS
205	GRID	Esker	Kame	Outwash	epc	Terroce	Delta	ne o	Talus	Ridge	=	Plain	Slope	Bench	Small	Medium	Large	
9		Es	중	õ	25	Te	De	ပိ	10	Ri	Hill	PIG	Sic	Be	Srr	Me	۲۵	
ı	MQ1652			×								X			Х			Doubtful over shale
	MQ1752 MQ1850																	
2	MQ1654			×								X			X			Doubtful over shale
3	MQ1655 MQ0455	ļ		ļ						X			X	 	×			
	MQ0756 MQ1055									`			^		^			Lateral moraine(pockety sand and gravels)
4	MQ0155 MQ0556									X			X		×			Lateral moraine (pockety sand and gravels)
5	MQ0957 MQ1963			X								X			×			· - · - · · · · · · · · · · · · · · · ·
6	MQI 864			×								^ X		ļ	×			
Ľ.	MQ1965											^			$\lfloor \hat{\ } vert$			
7	MQ1272			X								X			X			
8	MQ1274 MQ1275			X								X			×			
9	MQ2280			Х		X						X		X	×			
10	MQ2180			X		X						Х		X	X			
11	MQ2080			х		Х						X		X	X			
12	MQ2181			X		X						Х		Х	X			
13	MQ2081			X		X						X		X	X			
14	MQ2083			X		X						X		X	X			
15	MQ2185			X		X						X		X	X			
16	MQ2186			X		×						X		X	×			
17	MQ2287			X		X						X		X	X			
18	MQ2188			X		X						X		X	X			
19	MQ2189			X		X						Х		X	X			
20	MQ2191			X		X						×		X	X			
21	MQ2192]	X		X						X		Х	X			
22	MQ2092			X		X						X			X			
23	MQ2193			×]	X]					X			X			
24	MQ2194			X		X						X			X			
25	MQ2293			×		X						X		X	X	[
26	MQ2294			X		X						X		X	X]	
27	MQ2295			X		X						X		X	X			
28	MQ2195			×		×						X		Х	X			
			ļ															
												[]		

TABLE 2 SUMMARY OF GRANULAR PROSPECTS

	NTS 84 M ZONE IIV																	
<u> </u>	115 84 M	<u> </u>								I						<u> </u>	CIT	SHEET 1 of 2
	Υ		GE	OLO	GIC		OFOR			SUR	FACE	TOF	POGR	APHY	L	SIZ	SIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or tan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
1	MS4303		X	1							X							
2	MS4103		Х								X							
3	MS4003		X								Х							
4	MS4204		Х								Х							
5	MS4304		X	1							X							
6	MS3805 MS3706 MS3907					X						×		×		X		
7	MS4207		X								X				X			
8	MS4107					Х						X		X	X			
9	MS4313																	Landform unknown
10	MS4214 MS4314		×								X							Spotty karnes mixed with hummocky moraine
11	MS3903 MS3905 MS4105 MS4107 MS4305 MS4308		×								×							Spotty kames mixed with hummocky moraine
12	LR9758 LR9859														×			Landform uncertain
13	LR6993 LR7191														×			Landform uncertain
14	LS6201 LS6203														X			Landform uncertain
15	LS6007 LS6107														X			Landform uncertain
16	LS 6509 LS 6708 LS 7009			×													×	
17	LS7III			X											X			
18	LS7310 LS7511			×												x		
19	LS7513 LS7714			X													X	
20	LS5730			X		X						X		X	X			
21	LS5 6 33			X		X						X		X	X			
22	LS5144			X		Х						X		X	Χ			
23	LS4348			X		×						X		X	X			
24	LS4352			X		<u> </u>						X		Χ	X			
25 26	MR1679 MS1812			,X								X			X	X		
27	MS1909			X								X				X		
28	MS 2109 MS 2309			X								×				^	X	
29	MS2508			X								×				X		

TABLE 2 SUMMARY OF GRANULAR PROSPECTS

	NTS 84M ZONE IIV													0115573 -1 3				
 	115 04 W		0.5							0110			2000	A (2) A (П	F DO	SITI	SHEET 2 of 2
-	<u> </u>		GE	OLO	GIC I		J- OF			SUR	PACE	101	OGR	APHY		E PO: SIZ	Ĕ'	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
30	MS 26 07			X								X			×			
31	MS 3911 MS 4012			×								×			×			
32	MS 4311			X								Х			×			
33	MS 3908			X								Х			X	-		
34	MS3508			X								X			X	_		
35	MS 3608			X								X			X			
36	MS 33 06			X								X			X			
37	MS 3306			X								X			X			
38	MS 3305			X								X		-	X			
39	MS 3305	-		X								X			x			
40	MS 3404			X								X			X			
41	MS 3504			X								X			x			
42	MS3304			X								X			×			
43	MS 3206			X								X			×			
44	MS3104	 -		X								X			X			
45	M S 3003			X								X			Х			
46	MS3204			X			-					X			X			
47	MS2804		-	X	_		_					X			X			
48	MS 2503			×								X			X			
49	MS 2600			X								X			X			
				 											-			
														-				

TABLE 3 SUMMARY OF GRANULAR PROSPECTS

NI NI	TC DA N				NE_													
N	TS_84 N	_	GE		GIC I			- M		9110	EACE	TOE	OGB	APHY	DI	E PO	SIT	SHEET 1 of 3
 			ع ت	010			71.01			308	TACE	. 101	JUK	APTIY		E POS SIZ	Ē,	
PROSPECT	UTM GRID	Esker	Кате	Outwash	Ice-contact deposit	Terroce	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
l	MS4413 MS4515 MS4817		×								×						×	Kames in hummocky moraine environment
2	MS4407 MS4409 MS4610		×			×					×			X			×	Two landforms in this area of Cameron Hills
3	MS9212 MS9314			×								×			X			
4	MS9415 MS9516			X								X			X			
5	MS9614 MS9717			X								×				×		Prospects and known
6	MS9617 MS9619			X								×				×		deposits from 3 to 21 are all sandy to
7	MS9316 MS9518			×								×				×		gravelly outwash
8	MS9418 MS9520			X								×				×		located along the Hay River between
9	MS9722 MS9824			×								X			×			Meander River and 60th parallel.
10	MS9825		<u> </u>	X								X			X			Overburden depth
11	MS9926 MS9928			×								X			X			variable. Many ope n pits already
12	MS9931			X								X			X			exist along this reach of Hay River
13	MS9832			X								X			X			or ridy in iver
14	NS1049			X								X			Х			
15	NS0849			X								X			X			
16	NSO850 NSO950			X								×			X			
17	NS 1151			X								Х			Х			
18	MR5946 MR5948			х								X				×		
19	MR6959 MR6961 MR7262 MR7464 MR7666 MR7869 MR7972 MR8174 MR8278 MR8381 MR8584 MR8889 MR8991 MR9092 MR9193											×					X	
20	MR9094 MR9195			×								X			X			
21	MR9096 MR9197			×								X			X			

TABLE 3 SUMMARY OF GRANULAR PROSPECTS

N	TS 84 N			ZO	NE_	IIV												SHEET 2 of 3
			GE	OLO	GIC		FOF	M		SUR	FACE	TOF	OGR	APHY	DI	E PO: SIZ	SIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
22	MR 554 I MR 5642			X								X			×			
23	MR5845 MR5748			×								×			×			
24	MR5850			X								X			X			
25	MR6141 MR6045 MR6050 MR6152 MR6355 MR6758			×								×					×	
26	MR8885 MR8786 MR8986			×								×			×			
27	MR9295 MR 9297			×								X			×			
28	MR8997 MR8999 MS8901 MS8903			X								×				X		
29	MS8905 MS9109 MS9212			×								×			×			
30	MS9622 MS9724			×								X				×		
31	MS9921 NS0023 NS0125			×								×				×		
32	NSO511 NSO815 NSO919 NS1022 NSO814			×								×			×			
33	MS9625 MS9728 MS9929 MS9932			x								X			×			
34	NSO026 NSO128 NSO131			X								×				×		
35	MS 9935			X								X			Х			
36	MS 9936 NS 0342			×								X			X			
37	MS9939 NSO044			×								X				×		
38	NSO445 NSO647 NSO948 NS1149 NS1251			×								×					X	
39	NS1350 NS1451			×								×			X			

TABLE 3 SUMMARY OF GRANULAR PROSPECTS

٨	TS 84 N			ZO	NE_	ΠV			*									SHEET 3 of 3
			GE	010	GIC		DFOF	RM		SUR	FACE	TOF	POGR	APHY	D	E PO S I Z	ŞIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Stope	Bench	Small	Medium	Large	COMMENTS
40	NR 3940		X				 			X	Х				×			
41	NR5141		X												×			
42	NR5641		X							X	Х				×			
43	NR 3150 NR 3353		×							×	×				X			
44	NR4852		X							Χ	Х				X			·
45	NR5153		X							X	X.				X			
46	NR5252		X							X	X				X			
47	NR5251		X							X	Х				×			
48	NR5351		X							×	Х				X			
49	NR 4358		×							X	X				X			
50	NR 3558		X							X	X				×			
51	NR3356		X							X	Х				×			
52	NR 3258		X							X	X				×	_		
53	NR3360		Х							X	Х				X			
54	NR 3763		X							X	Х				×			
55	NR4663			X								X			 	X		
56	NR 4966		X							X	Х			<u> </u>	X			
57	NR4270 NR4372 NR4574 NR4675		x												×			
58	NR 3757 NR 3759			×								×				×		
59	NR5344 NR5544			×								×				×		

TABLE 4 SUMMARY OF GRANULAR PROSPECTS

N1	TS 85 C				NE_													SHEET 1 of 3
	13 63 6	Γ-								CLID	EACE	TO	2000	APHY	D	F POS	SIT	3REE 1 1 01 3
			GE	OLO	GIC I					50K	PACE	101	OGR	APHY		E POS S I Z	Ė	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	Hill	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
_	NSI 553		 	X								×			Х			
2	NSII5I			×								Х			Х			(?) May be dunes
3	NS0554			X								X			X			
4	NS0956			X	-							X			X			
5	NS1058			X	<u> </u>							X			X			
6 7	NS0959			X								X		<u> </u>	X			
8	NS1658		-	X	-				-			X		-	X			
9	NS1861			×	 							×			×			
10	NS1761			×								×		-	X			
10	NS1761	-		<u>x</u>			-					×			x			
12	NS1464				 	×	-			-		×		×	X			
13	NS1365 NS1568			 ^								×	×		×			Beach ridge ?
14	NS1772	 		×		<u> </u>				ļ		×			X			
15	NSI 471 NSI 275 NSI 779			 								×	×			×		Beach ridge ?
16	NS1478						1								X			Beach ridge ?
17	NSI379 NSI281											×	X		×			Beach ridge ?
18	NS2075 NS2176			×		×						×		X	X			
19	NS2677			×			<u> </u>					X			×			
20	NS2678		 	X	1		 		-			X			×			
21	NS2678			X								X			×			
22	NS2680			X								X			X			
23	NS2681			X								X			X			
24	NS2581 NS2683			×		×						×		X		×		
25	NS2582			X		X						Х		Х		X		
26	NS2583			X								X			×			
27	NS2381			×			L					X			X			
28	NS2482			X								Х			X			
29	NS2382			X						<u> </u>		X			X			
30	NS2483			X								X	-		X			
31	NS2383	<u> </u>	<u> </u>	X	ļ				 			X			X			
32	NS2783			X								X			×			
33	NS2884	<u> </u>		X		<u> </u>	<u> </u>	ļ				X		<u> </u>	X			
34	NS2986			X								X		ļ	×			
35	NS3186	ļ	ļ	X			ļ		ļ			X		<u> </u>	×			
36	NS3286			X						ļ		X	ļ	ļ	X			
37	NS3487			X		ļ	ļ		ļ	ļ		X		ļ. <u></u>	X			
38	NS3287	 	<u> </u>	X								X		ļ	X			
39	NS3188	<u> </u>		X	<u> </u>		L					X	l		X			

TABLE 4 SUMMARY OF GRANULAR PROSPECTS

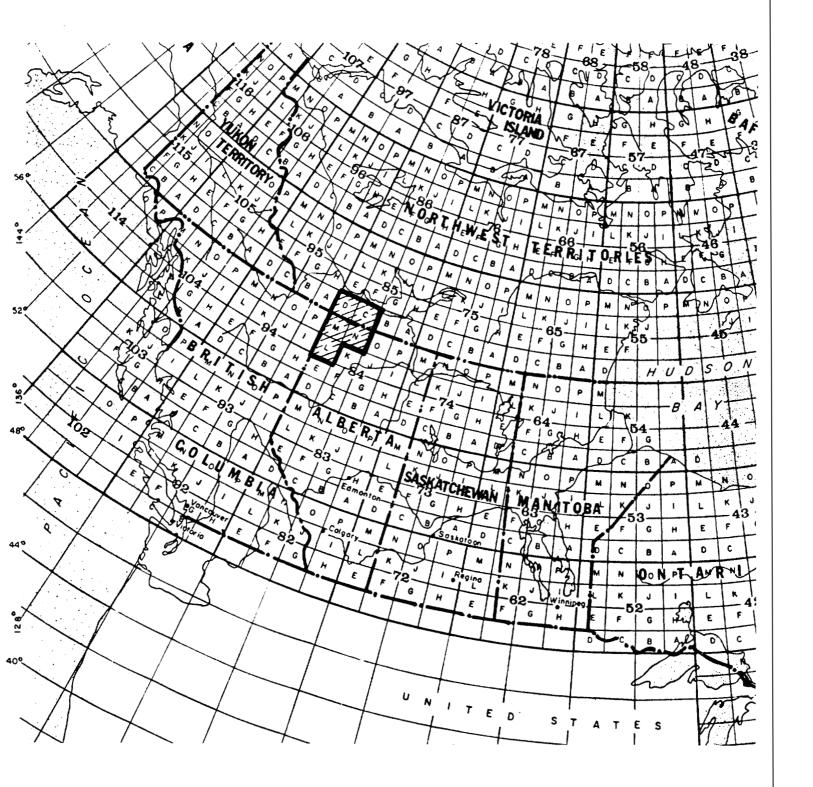
N	TS 85 C			ZO	NE_	Ш						,						SHEET 2 of 3
			ĢΕ	OLO	GIC		OFOR	RM		SUR	FACE	E TO	OGR	APHY	D	E PO	ŞIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
40	NS3289		 	Х								X			×			
41	NS3389			Х								Χ			X			
42	NS3589			X								Х			Х			
43	NS3491			X								X	ļ	ļ	X			
44	NS3494 NS3496			X		×						×				×		
45	NS3595			X		X						X			X			
46	NS3696			X		X									X			
47	NS3696			X		X									X			
48	NS3796			X		X									X			
49	NS3797			X		X								 	X			
50	NS3798 NS3898		<u> </u>	×		X							<u> </u>		X	X		
52	NT3700			X		×									X	^		
53	NT3701			×														
54	NT3400			X		×						Х			X			
55	NT5501			<u> ^</u>								×	X		×			Beach ridge
56	NT5402 NT4801			-											X			
	NT4702											X	×		^			Beach ridge
57	NT3706			X		X								X				
58	NT4108 NT4209			×		X								X				
60	NT4807 NT5006			×								×			×			
61	NT5509 NT5311			:								X	X		×			Beach ridge
62	NT5109 NT4812											×	×			x		Beach ridge
63	NT4914			х		Х						X		X				
64	NT5018					X								X	X			
65	NT5119					X								Х	Х			
66	NT5019					X								X	Х			
67	NT4819 NT4722											×	×		x			Beach ridge
68	NT4716											X	Х		Х			Beachridge
69	NT4714 NT4517											×	×				X	Beach ridge
70	NT4617 NT4519											×	×			×		Beach ridge
71	NT4518 NT4419				-							×	X		X			Beach ridge
72	NT4221								ᅦ			×	X		X		\neg	Beach ridge
73	NT4019 NT3721 NT3523											×	×				×	Beach ridge

TABLE 4 SUMMARY OF GRANULAR PROSPECTS

N	TS 85 C				NE_												- '	SHEET 3 of 3
			GE		GIC	LAN		RM		SUF	FACE	E TOP	POGR	APHY	D	E PO	ŞIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terrace	Delta	Cone or fan	Talus	Ridge	Hill	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
74	NT3326 NT3128 NT2931											×	×				×	Beach ridge
75	NT2835 NT2637											×	×			×		Beach ridge
76	NT2537 NT2538											×	X		X			Beach ridge
77	NT2438 NT2340											×	×		×			Beach ridge
78	NT2240 NT2242											x	×		X			Beach ridge
79	NT2245 NT2148 NT2045 NT1948								And the state of t			×	X				X	Beach ridge
80	NT1647											X	X		X			Beach ridge
81	NT1747 NT1548 NT1349											X	X				×	Beach ridge
82	NT 1249 NT 1159 NT 1053											×	×		×			Beach ridge
83	NT0852 NT0555											X	×		X			Beach ridge
84	MT9754											Х	X		X			Beach ridge
85	MT9954 MT9656											×	×			×		Beach ridge
86	NS5498 NS5399 NT5301 NT5203																×	Beach ridge

TABLE 5 SUMMARY OF GRANULAR PROSPECTS

N	TS <u>85</u> D			ZO	NE_	IIV												SHEET 1 of 1
			GE	OLO	GIC		OFOR	RM		SUF	FACE	TOP	POGR	APHY	D	E PO:	SIT	
PROSPECT	UTM GRID	Esker	Kame	Outwash	Ice-contact deposit	Terroce	Delta	Cone or fan	Talus	Ridge	ніп	Plain	Slope	Bench	Small	Medium	Large	COMMENTS
	LS4957		1	!		X						X		X	×			
2	LS4557					X						X		X	×			
3	LS3461 LS3564 LS3567			×		×						×		X		X		
4	LS3669 LS3770			×		×						×		X	×			
5	L\$3872 L\$3973			×		X						X		X		×		
6	L\$4174 L\$4176			X		X						X		×	X			
7	LS4277 LS4379			×		×						×		×	X			
8	LS4580			Х		X						×		X	X			
9	L\$4380			X		X						X		X	X			
	L\$4582 L\$458 3			×		X						X		X	×			
12	LS4784			X		X						X		X	X			
13	LS4885			X		X						X		X	×			
14	L\$3691 L\$3990	×								X						×		
15	LS3893 LS3992 LS4091	×								X						X		



CAMERON HILLS AREA

KEY MAP SHOWING STUDY AREA AND NTS SHEETS

J.D. Mollard and Associates Limited October, 1993 FIGURE 1