Grande-Prairie to Alaska Microwave System 1961

Ralph Cameron Ottawa On 2017



R. D. CAMERON

TORONTO, ONT.

ENGINEERING DEPARTMENT

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EMPIRE 8-6071 EXT. 287

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CN Telecommunications Engineering Dept. 1960

Chief Engineer

Asst. Chief Engineer

Radio	Equipment	-Outside Plant	Power
VHF/UHF	Audio	Cable installation	Lines
CNR mobiles	Channelizing	Voice/TV-studio	
Generators/			
Microwave		Site surveys	-roads
Standby			
LP Broadcast		Pole line Mt	tce



Grande Prairie-Alaska Microwave System

Construction commenced in 1960 Completed in 1961

Turnkey fixed price of \$25 million Canadian portion connected Colorado Springs to Clear Alaska

CN Telecommunications was prime contractor RCA Victor Montreal supplied MM-600 6Ghz microwave Dominion Bridge fabricated towers Butler Buildings used System comprised 42 microwave sites Grande Prairie AB- Yukon/Alaska border is 1310mi/2096Kms

Highest site in Highway- 8 Mile Creek elevation 5552ft. Total length of tower sections- 9160ft.

Purpose of the system

-Provide a back up communication system from Colorado Springs to Clear Alaska in event of Pacific cable being lost. System was contracted to CNTelecommunications by the U.S.SignalCorps for \$25 million.

It was a turn-key system and part of the BMEWS(Ballistic Missle Early Warning System)

Grande-Prairie-Alaska Microwave Route Map



Distances on the Alaska Highway

Grand Prairie Ab-Dawson Creek B.C.	131kms
Dawson Creek B.CFt. Nelson B.C.	455kms
Ft.Nelson B.C. –Watson Lake Y.T.	513kms
Watson Lake Y.TWhitehorse Y.T.	438kms
Whitehorse Y.THaines Jct Y.T.	154kms
Haines Jct Y.T Beaver Creek Y.T.	291kms
Beaver Creek Y.T Tok Jct Ak	<u>176kms</u>

Total 2156 kms



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	12) +)))	Summit Pass	34.6	264.0			MM (4s,12s) V	120	40	2		
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Summit Pass	58 37 53	Steamboat	34.6	84.0	5473	340	MM (5,13) V	240	40			*
	124 4) 11	Eight Mile Creek	37.9	313.0			MM (4,12) V	110	40			
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	1)4 11 02	Canyon Mountain	36.0	318.0			MM (5,13) H	130	40			
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		Squanga Creek	29.4	313.5			MM (5s,13s) V	90	40			
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		Atick Creek	22.6	302.5			MM (4s,12s) H	290	40			· ·
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		McKinnon	27.3	274.0			MM (5,13) V	100	40			
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Grande Prairie-Alaska Microwave System-1961

Site Name	Elevation(Ft)	Tower Height(Ft)	Path Length(Ft)
101 Grande Prairie	2200	225	29.0
102 Valhalla	2745	235	27.5
103 Keeping	2990	245	25.2
104 Dawson Creek	2540	360	22.2
105 Pine Valley	2647	325	33.8
106 Coffee Creek	2901	275	31.1
101 Blueberry	3140	285	24.0
102 Townsend Creek	3410	295	22.6
103 Atick Creek	4129	165	28.0
104 Minaker River	4057	215	35.7
105 Bougie Creek	2147	225	26.7
106 Big Beaver Creek	1582	345	26.0

113 Fort Nelson	1488	315	38.2
114 Steamboat Mtn	3615	230	34.6
115 Summit Pass	5473	340	37.9
116 Eight Mile Creek	5552	355	39.5
117 Mould Creek	3407	250	23.5
118 Geddes Creek	2950	100	24.8
119 Oregon Lake	2710	370	28.9
120 Hyland River	2870	225	18.0
121 Watson Lake	3012	300	27.3
122 McKinnon	2830	350	23.5
123 Rancheria River	2870	345	19.7
124 Freer Creek	3320	300	7.7

125 Shilsky Lake	4520	225		24.3	
126 McNaughton	4108	200		21.5	
127 Hazel	3320	275	37.5		
128 Teslin	3549	100			29.4
129 Squanga Creek	2557	265		9.2	
130 Seaforth Creek	3213	155	20.9		
131 Tagish	3973	3	145		36.0

Grande-Prairie – Alaska Microwave System-1961

Site 132	Name Canyon Mtn	Elevation (Ft) 4243	Tower Height (Ft) 145	Path Length (Mi) 8.3
133	Whitehorse	2370	50	13.8
134	Laberge	3495	265	31.0
135	Mendenahall	2734	275	12.9
136	Champagne	2435	240	35.0
137	Paint Mtn	4525	30	28.0
138	Boutellier	3370	100	32.0
139	Burwash	2834	270	35.0
140	Don Jek River	2813	345	41.8
141	Horse Camp Hill	4575	205	38.9
142	Mt.Dave**	3005	100	40.2

** Connection to Alaska Communication System-Beaver Creek Canada/U.S. Border

Site Selection Criteria

Topographic Maps- 1:50,000 , contours south of **Ft.Nelson-50ft**, remainder of system-100ft.

Practicability Survey- If good radio path, proximity to power, practical tower heights. Performed by CNT Engineers, RCA Victor and Racey MaCallum & Assoc.

Photogrammetry- Obstruction investigation done by Shaw Photogrammetric Services of Hull,P.Q. Refined original work done by the Army SurveyEst. Tree heights as well defined heights of peaks /obstructions to +/- 5 or 10 ft.

Site Selection Criteria-cont'd

Survey- Data obtained for civil work as well as site elevations and coordinates, accurate to 5ft.

Final Profile- Once determined from above data- tower heights may be calculated, based on 4/3 earth's radius.(example)

Antenna Heights- generally chosen based on clearance over all obstructions will be at least 0.6 First Fresnel zone clearance at K=0.8. This may be modified if reflections are expected. Reflections are either minimized by causing the reflecting point to appear at one end or by utilizing obstructions to block the reflected ray.

Suspected reflections are investigated using K=infinity.

BASED ON 4/3 EARTH RADIUS



Fresnel Zone Clearance





Also used Quadruplexors (4 cavity tunable Filters) to provide Selectivity. One Filter per transmit Path and one per Receive path.



Dawson Creek B.C.

ALASKA HEGHWAT HOUSE

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Peace River Bridge -55.4Km-2100ft long

























Observations

Followed highway-leap frogged Failures < 0.0001%/year 6Ghz – first in Canada Interconnecting dissimilar systems No snow tires No break generators,1 Hz at 60Hz **Airfare Toronto-Whitehorse-\$260** ³/₄ ton Fargo+ camper **Grande** Prairie building Antenna aiming **B.C.**band monitoring

Otter Falls- 20 miles off Hwy Tagish Mtn wolf Mile 351.2-opical illusion? Flat tires-cause-Rancheria-Bailey bridge **RCA** vehicle vs VIP vehicle-Summit Pass Accident Another flat tire-mile 1188.5-Snag Armchair Supt.CNR-Site 135 or 138 Diesel fuel

6Ghz feeders –waveguide presurized Dry nitrogen to eliminate moisture

Ice covers protect W/G from falling ice No break generators where no local power

Order wire for inter site communications Supervisory control system- doors, temp.

Two aerial tramways by Norwegian company Buildings on permafrost had temp sensors. RCA Victor Montreal: Greg Bayliss, Engineering Mgr Dan Mercek -Engr John Elvidge-Engr Ron Saunders- Antenna erection, technician Marc Lopionowski-Engr Dean Colis-Engr **Bill Davidson-Engr Bob Williamson-Engr** Ken Gordon-Engr **Bill Fosty-Engr Bob Smith-Engr** Mo Allan-Tech **Bob Vincent-Tech** Ken Jensen-Engr. Pat Cicciu-Tech Marcel Labelle-Tech **Roland Grenier-Engr** Andre Roscynski-Engr Leo Arsenault-Engr Jack Garrison-Tech CNTelecommunications C.J.Bridgland, General Radio Engineer J.S. Ford, Asst Chief Engineer Anthony Pichota, Asst. Radio Engr. John Rice, Engr. Radio Alan Hodgins, Technologist, Radio Ed Marek, technologist, Radio Alan Bentley, Engr., Radio Frank Takasaki, Engr Outside Plant

	Robert Pegrum, Engr, Radio(did tests at Mt. Dave)
	Douglas Umbach, Technologist, Equipment Group
	Kenneth R.Rolison, Power Engr, Equipment Group
:	J.S.Grossman, Gen. Outside Plant Engr.
	Alfred Monohan, Civil Engr, Outside Plant
	William McKernan, Civil Engr, Outside Plant
	Mike Chappell, Engr, Equipment Group
	Bert.T.Power, Engr, Outside Plant
	Lloyd Lacombe, Equipment Group
	Glenn Snowdon, Engr, Equipment Group
	Roy Stephenson, Engr, Equipment Group
	Dave Gillis, Engr, Equipment Group
	Bob Sutton-CNT Vehicle Repair Service, Whitehorse
	Bill Thompson, CNT, Vehicle Repair Service, Whitehorse
CNT Whitehorse	John P. Spencer
	Ray Ganton
	Walter Horoscoe
	Alex McKenzie
CN Railways -Edmo	nton
-	Don Ross, Project Engr
	Gord Everson, Radio Maintainer
	John Burns ?
	Dave Dunbar, CN Investigations Dept.
	Jim Paige ?
	Bill McDermid ?
Western Electric /Ala	aska Communication System-Sgt. Bill Quinlan
	G.T.Coker
	Lt.Leyrer
	K.L McCall
	G.L.Miguet
Norwegian Aerial Tr	amway Company- Lars Abelseth, Trondheim Norway.
	Carl Lange 0r Langer, Sr.Engr(former
	Olympic skier