OFFICE AIRPHOTO ROUTE SELECTION AND TERRAIN MAPPING OF COMPETING #3 HIGHWAY ROUTES BETWEEN RAE AND YELLOWKNIFE, NWT FOR GOVERNMENT OF NORTHWEST TERRITORIES

J D MOLLARD AND ASSOCIATES LIMITED

CONSULTING CIVIL ENGINEERS AND ENGINEERING GEOLOGISTS

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OFFICE AIRPHOTO ROUTE SELECTION AND TERRAIN MAPPING OF COMPETING #3 HIGHWAY ROUTES BETWEEN RAE AND YELLOWKNIFE, NWT FOR GOVERNMENT OF NORTHWEST TERRITORIES

Prepared for:
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Attention: J. Bunge

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PREFACE: TERMS USED IN STUDY

- Main corridor route: GNWT's proposed route, Rae to Yellowknife.

- GNWT (mod.): a modification of GNWT's proposed route. This line routing is based on the premise that you may wish to stay near the existing #3 highway for access reasons. The line is shown on Figure 2 as a solid black line with km posts shown every 5 kms. Where this black line is not present on Figure 2 we do not have an alternative to show and we are in agreement with your routing on these segments. You may wish to consider only certain segments of this alternative routing (to your own line) because of other reasons not available to us.

- **CROW LINE**: a dashed line appears on each Figure 1 mosaic having the words CROW LINE on it. This is simply a straight line Rae to Yellowknife.

- **"CROW LINE" Route**: the most northerly route that leaves the main corridor route at about km 285 and follows the faultline drainage channel that exists here. This route is almost on a straight line ("as the crow flies") between Rae and Yellowknife (*see* line marked CROW on the 1:60,000 Figure 1 mosaics).

- **Lakeshore Route**: the route that leaves the main corridor route at approximately km 293, dips south to a corridor adjacent the lakeshore, and joins the main GNWT route again at about km 323.

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1.0 PURPOSE OF STUDY

Purpose of study is to provide additional terrain data to assist in the decision-making process with respect to route location for the proposed new #3 highway between Rae and Yellowknife, NWT.

2.0 TERMS OF REFERENCE

The following excerpt, taken from a J. Bunge letter dated December 14, 1994, follows:

- Terrain mapping of the "existing" corridor alignment selected for the reconstruction of Highway 3 by GNWT, determination of "rock" and "non-rock" length percentages, and selection of alternative route alignment(s) where appropriate.
- Terrain mapping of the alternative lakeshore corridor alignment selected by the GNWT, determination of "rock" and "non-rock" length percentages, and selection of alternative route alignment(s) where appropriate.
- The cost of this work is estimated at:
  - a) existing corridor analysis $17,000
  - b) lakeshore corridor analysis 8,000
    Total price.............................$25,000
    plus
  - c) out-of-pocket costs including airphoto purchase to be billed at cost

Although the terms of reference did not state that we do take-off terrain summaries (rock versus non-rock percentages) on new alternatives shown on large-scale airphotos, this should be done. Terrain along two alternative segments were summarized: one at the west end and one at the east end, as shown in Table 1 and Table 2. You may wish to have someone in your office summarize terrain on the remaining route segments we examined and terrain mapped on the 1:20,000 airphotos. We did a rough take-off tally of terrain along one northern route on the 1:60,000 scale airphotos for comparison. However, it must be realized that terrain identification and their measurements are not nearly as accurate as those lengths taken from large-scale airphotos, which show terrain in greater detail.

3.0 PEOPLE CONTACTED DURING OUR STUDY

During the course of our airphoto study and mapping process, we talked to several people with experience in road construction in Precambrian Shield terrain. Among those we had telephone discussions with were John Bunge, John Bowen, Don MacLeod, and Ernie Bies. Some of the ideas and considerations documented in Section 11.0 are a result of those discussions. The result of these discussions may or may not be helpful to you. Nevertheless, I wanted to include them in the report. We thought it was important that we have a good understanding of construction difficulties associated with the project before we carried out our stereoscopic airphoto mapping.

4.0 TERRAIN AND MATERIALS

- **Relief**

Much of the bedrock occurring along route alternatives studied is expected to have relief in the order of 2 to 8 metres, and occasionally more (*see* Figure 3).

In some areas (*e.g.*, west of Yellowknife some 15 to 20 kilometres), bedrock, although elevated relatively high above the muskeg and silt surface, tends to be plateau-like. In these areas it may be easier to set a gradeline that does not involve the large rock cuts one encounters where the terrain consists of "islands" of bedrock. This latter type of bedrock topography involves rock cuts having large excavation quantities unless one is able to follow sidehill construction.

Slopes on much of the bedrock terrain on this project fall in the 2-6 percent range, which is relatively gentle.

- **Stratigraphy**

Stratigraphy in overburden segments, especially in lower bedrock terrain, is expected to consist of relatively shallow (1 to 3 metres) dirty sand and gravel below a thin moss cover. In areas of high relief bedrock, the overburden is likely much deeper, and may be up to 30 metres or more locally. Soil materials below the surficial organic mantle are lacustrine and alluvial in origin, and typically occur in thin silty and very fine sandy layers a few centimetres thick (communication from John Bowen).

- **Texture**

Overburden material in low relief bedrock terrain consists of dirty sand and gravel, with perhaps a somewhat coarser lag at the contact of soil material over bedrock. Overburden materials in high relief terrain tend to be composed mainly of silt and very fine sand.

- **Permafrost**

In the deeper overburden areas, ground ice in permafrost is most dominant in the top 3 or 4 metres below the organic mantle. But permafrost also occurs within the organic mantle itself. The ice percentage can range from 10 to 50 percent (communication from John Bowen).

5.0 FACTORS CONSIDERED WHEN STEREOSCOPICALLY EXAMINING AIRPHOTOS SHOWING ALTERNATIVE ROUTE SEGMENTS

- Overall route length (directness)
- Individual segment length
- Relief on bedrock and related excavation quantities
- Rock and non-rock lengths
- Ability of terrain to accommodate sidehill construction

- Steepness of rock where sidehill construction anticipated and blasting aspect
- Permafrost conditions
- Anticipated depth of muskeg and underlying mineral soils in overburden segments
- Scenic route aspect of lakeshore route

6.0 TERRAIN MAPPING LEGEND
(From 1:60,000 Figure 1 Mosaics)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_u (green)	Undulating lower relief (mostly less than 2 m amplitude and 1 to 6% slopes) ice-abraded granitic bedrock. Includes mostly shallow (commonly 1 m or so) frozen (permafrost) and unfrozen generally thin peat and dominantly "dirty" granular material and subordinately silt and very fine sand in scattered irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Percentage length of surficial overburden soil material in this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10%.

O_u (red) Overburden soil materials consist of variable thickness (from less than 1 m, to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.

W_s (blue) Shallow ponded water, active floodplains, and higher water table areas.

S_g (brown) Sand and gravelly sand. Includes glacio-lacustrine, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain. Locally wind-modified in uniform sand areas.

7.0 TERRAIN MAPPING LEGEND (From 1:20,000 Figure 2 Mosaics)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude and commonly 3 to 6 percent slopes) ice-abraded granitic bedrock (*see* comments 1 and 2). Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude and 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit.

In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (*Figure 1*).[1 2]

W_s (blue) Shallow ponded water, floodplains, and higher water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.

S_g (brown) Sand and gravelly sand. Includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

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[1] Consult Figure 1 for location of R_h segments as they relate to comments on overburden thickness. Figure 2 mosaics also show R_h, but the R_h designation on Figure 2 large scale mosaics refers more to the expected attainable centreline gradeline amplitude of the constructed grade than to corridor macro topography of existing ground line. Thus, the R_h locations in Figure 1 may be a better guide to use when generalizing about areas that are expected to have deeper overburden conditions.

[2] Because Figure 1 shows macro topography while Figure 2 shows gradeline relief that we feel can be achieved along a selected R.O.W., the mapping colors and therefore corresponding map units shown on Figures 1 and 2, do not necessarily match up with respect to location.

8.0 COLOR CODES FOR FIGURE 1 AND FIGURE 2 MOSAICS

The color code for each of the six terrain units used in the terrain mapping shown in Figures 1 and 2 mosaics is noted below each symbol in the TERRAIN LEGENDS (Sections 6.0 and 7.0, above). Note that the terrain legend for the 1:60,000 mosaics (Figure 1) and the 1:20,000 mosaics is different. Legends are attached to each mosaic sheet as well as occurring in this report.

- **Repeatability of Colored Map-Units in Fig. 1 *vs* Fig. 2**

Note the comments regarding repeatability of terrain map units (Figure 1 *vs*. Figure 2) at the bottom of the legend in Section 7.0. Also note that mapping in Figure 1 mosaics tends to be much less detailed than in the Figure 2 mosaics because of the two different scales. It is not possible to identify narrow overburden areas located in fractures in bedrock at the Figure 1 airphoto scale. This is important when comparing percent rock at the different airphoto scales. It also emphasizes the desirability of studying large-scale photography on what are likely to be competitive route locations.

9.0 TERRAIN MAPPING AND TERRAIN SUMMARIES

Terrain summaries obtained from mapping along the GNWT-selected route and some alternative segments are shown in Table 1. A summary sheet of terrain data and unit lengths appears at the front of Table 1. The summary sheet shows terrain unit kileages associated with each route combination along GNWT-selected route, the lakeshore route terrain unit totals, and a comparison of routes at the east end (km 305 to Yellowknife).

10.0 DISCUSSION OF ROUTE ALTERNATIVES

- **GNWT-Selected Between Km 242.6 (Rae) And Km 329.6 (Yellowknife)**

We studied different sets of stereoscopic airphotos showing your proposed routing along what we call the main route corridor. This routing generally follows the corridor in which the present #3 highway is located. Although I agree with the locations of many segments of the proposed GNWT route you sent us, I also show several alternative segments where I believe your routing might be improved locally -- *e.g.*, where I expect there is more rock. I show these alternative segments on Figure 2 mosaics. These alternatives are shown with a thin black line marked GNWT (*mod*. for modified). Where no thin black line is shown on Figure 2, my route matches the GNWT route -- and I have no reason for changing it.

Time did not permit terrain typing the GNWT (mod.) alternative segments along the main corridor. (*See* comments in Section 13.0 and 14.0.)

- **JDM&A Northern Alternative Route Km 242.4 (Rae) To Km 254.4 At The Stagg River**

We show a northern alternative route leaving km 242.4 and heading northeasterly along terrain that appears to traverse more rock than the main corridor route. I located this route segment to end at the Stagg River bridge. The reason for ending it here is that terrain east of the Stagg River and to the north of the main route corridor looks very wet. As well, we felt you may want to salvage the Stagg River bridge in any new route alignment. Moreover, the alternative routes we examined east of the Stagg River, and that lie more to the north, must come back south to join the main corridor routing. One does not reduce the kileage significantly by crossing the Stagg River east of km 252/253 on this northerly alternative (Figure 1, sheet 1 of 8). Accordingly, our preferred route comes back to the main corridor routing west of the Stagg River bridge, where there is a higher percentage of rock lengths. One can also use the existing bridge. The length penalty for following this northerly alternative route is about 1.7 kilometres compared to the GNWT-selected main corridor route. But it has 64.7 percent rock along it compared to 54.6 percent along the main corridor routing. Once you have photogrammetric data on these alternatives, an in-depth cost analysis will help in making a selection. The preferred route may be a "saw-off" situation: the north route being longer, but having a higher percentage of rock. Operating costs also need to be factored into a final decision.

- **JDM&A Northern Alternative Route From Approximately Km 284 (Take-Off Point From The Main Corridor) To Yellowknife**

This alternative routing segment lies generally along and adjacent to a long drainage depression that probably follows an old eroded fault zone. It is a routing that John Bunge said GNWT had also identified and had done some previous work on. We located an alternative route here before we were aware that it had been looked at by GNWT. We believe it is one of the better route alternatives from the standpoint of percent rock. It appears also to traverse shallower overburden soil deposits. This corridor is not covered by 1:20,000 scale photography. Accordingly, we were able to examine it in 1:60,000 scale photography only. Jack mapped the terrain types along this alternative on the 1:60,000 mosaics (Figure 1). Jack made a preliminary tally of rock and non-rock on this alternative, and estimates roughly 70% rock and 30% non-rock. The figure for rock ignores shallow patches of soil and fillings in eroded rock fractures (<u>see</u> terrain legend for Figure 1). The amount of R_h and R_u rock sections are nearly equal. It does appear from the airphotos that there is more bedrock on this route. But it is misleading to compare the percentage rock on terrain mapped from 1:60,000 and 1:20,000 airphotos.

An advantage of this northeasterly alternative (Km 285 to Yellowknife) is that it follows the so-called "Crow line," and thus encompasses savings from both construction length and operating cost. We understand this route must compete against a lakeshore alternative. We include it for comparison purposes; and we think it deserves further study.

- **Alternative Competing Segments On The East Portion Of The Main Corridor (GNWT) Route <u>And</u> The More Northerly (Fault-Line) Route**

If the lakeshore route is abandoned and the northerly route looks competitive, a decision must be made regarding routing of a new highway on the segment 25 km west of Yellowknife.

We estimate the route into Yellowknife along the northern alternative is about 2 1/2 kms shorter than the competing route alternative it separates from, which is the main route corridor going into Yellowknife. Because of the shortness, the operating cost will be lower on the northern alternative as well. (*See* Figure 1 for location of these alternative segments.) Terrain for this comparison is summarized in Table 1.

- **Lakeshore Route**

We have carefully examined your selected route along this corridor, and agree with your route location over almost its entire length. You will notice short segments where we have suggested alternative routes; and there are not many. Also, there may be a slight difference in routing along the central selection of the lakeshore segment. Here we have moved the route north slightly to avoid crossing higher relief, including a few deeper valleys. In doing this, some lake scenic value may be sacrificed, and we recognize this possibility.

A relatively good-looking route corridor involves an extension of your lakeshore route before joining the existing highway. You have said there are lagoon works located in this area. As a result, you may have to eliminate these farther-east route alternatives. Accordingly, we pretty well followed your routing back to the main corridor around km 322.7.

11.0 CONSTRUCTION CONSIDERATIONS

We felt we should take into account as much construction information as possible during our stereoscopic airphoto studies. This is because a detailed location that considers bedrock topography may well control the route location. The following items relate to the construction phase, and were kept in mind during our office airphoto study:

- Minimum drilling and excavation depths in bedrock; greater than 1 metre is preferred.
- Excavate overburden materials *vs.* the "build-over" concept. We assumed segments having a metre or so of overburden would be candidates for excavation and rock-on-rock construction.
- In most cases the organic (peat) mantle in soil overburden segments will be very thin, often less than 1 metre.
- Fibre content of organic material overlying silt and very fine sand will be a factor in fill support in overburden segments.
- Drilling along with ground-penetrating radar techniques will be used to define overburden depths prior to construction (communication from John Bowen).
- Cross-drainage needs to be given high priority. We expect you will install a high frequency of culverts to avoid (or, at least, minimize) the risk of water backing against fill sections.
- Consider short bridge construction at "W" areas (water, floodplain, thaw pond). We expect these segments to be mainly permafrost-free.
- Rock quarrying for extra fill quantities will be obtained within the R.O.W.
- In many locations we expect it may be more economical to incur some overhaul from quarry sources having high faces -- rather than blasting shallow bedrock.

- Shrinkage factors for fills are expected to be approximately 1.2 for unconsolidated materials and 0.9 for bedrock.

- Rock fill materials are expected to possess better insulating values (preservation of permafrost) than unconsolidated materials because of a high void ratio in the rockfill.

- We have assumed sidehill construction may be used whenever rock excavation and fill quantities as well as overhaul can be reduced. We understand that it may be desirable to take sidehill cuts where one can obtain greater than a metre or so blasting depth on the upside of the cross-section (*i.e.*, steeper sidehill sections may be preferred where one must use this cross-section).

- We have assumed that in many locations a centreline location in R_u, is preferable to a centreline location in R_h for two reasons:
  1) rockwork quantities will be less
  2) the risk of encountering deep overburden between rock outcrops will be less.

- Recovery rates for material blasted in R_h terrain may be 1 1/2 to 2 X better than those for R_u terrain, where R_u blasting is carried out in less than 1 metre of cut (communication from John Bowen).

- Desirable minimum fill depths in overburden segments (in order to slow permafrost thaw) is a couple of metres (J. Bowen, Don MacLeod).

- Stereoscopic airphoto examination of the Stagg River floodplain indicates that some permafrost thaw has already occurred along the existing #3 highway here. In addition, salvage of the existing bridge may present arguments for retaining the present crossing site as part of the new proposed #3 routing.

- We are aware that construction of the new #3 highway on centreline of the existing #3 will cause in-service traffic problems. Therefore, we have included existing segments in our alternative routes only where a significant length of existing bedrock terrain can be incorporated. In these areas reconstruction may consist of widening the R.O.W. rather than gradeline elevation change.

12.0 GEOMETRIC STANDARDS

Table 3 lists standards that GNWT intends to use during reconstruction of #3 highway. In locating alternative segments along the GNWT-selected main corridor route, we have used a set of curves that have a scale of 1:20,000. Curves used are mostly less than $D=3^{\circ}$, with the occasional $D=4^{\circ}$ curve (*e.g.*, at the Stagg River). I include a few Xerox sheets with curves shown. You can look at these curves and see how they were used in establishing the horizontal alignment of routings.

13.0 SUGGESTIONS FOR FURTHER WORK

Your project scheduling will have a bearing on what you wish to do, based in part on information in this report. We have been given to understand that construction of a new highway between Rae and Yellowknife might conceivably cost as much as $90 million. As a consequence, one wants to be confident that they have selected the best route alignment, all things considered.

We also understand that the GNWT Department of Transportation has already collected a good deal of information on competing route alternatives. In addition, it is clear that ROW topography and bedrock occurrence are major route location control and cost factors -- especially the amount of bedrock, thin soil material over bedrock, the topography on these sections, and the amount of ice-rich and mineral soil. Also, during the course of our recent airphoto study, we concluded that bedrock relief was difficult to estimate accurately from 1:60,000 stereoscopic airphotos.

With these considerations in mind -- and realizing that we do not have the necessary data and knowledge that personnel in the GNWT Department of Transportation possess -- we believe the following undertakings, and the sequence in which they are carried out, require careful consideration and assessment:

- Photographing a preferred main corridor centreline at scale 1:10,000, assuming that it is favored over a competing lakeshore route. (If there is no clear preference, one may consider the cost of photographing both routes at 1:10,000, although we strongly suspect this may not be necessary. One must judge cost and other considerations when making this decision.)

- Mosaicking every other print (odd or even airphoto numbers) in some convenient length (about 5 ft, or 1.5 m) to produce a set of strip mosaics. In this way, entire route alignments can be viewed readily in stereoscopic airphotos. If the airphoto interpreter has a full set of stereoscopic prints, he or she can study and evaluate greatly exaggerated bedrock relief from viewing odd or even airphoto stereopairs.

- Photographing a preferred northern route corridor centreline at scale of 1:10,000, again mosaicking every other print to develop a set of strip mosaic alignment sheets that can be viewed and terrain typed, as above. At a scale of 1:10,000, a single airphoto shows 1.14 km of terrain on each side of the photo centreline, or a 2.28-km width. For, say, a 90-km-long route, the area is 205.2 km^2. At 1:10,000 scale, there are 1.8 airphotos/$mile^2$, or 0.6944 airphotos/km^2. This equates to roughly 143 airphotos for each 90-km-long route alternative that is photographed at 1:10,000.

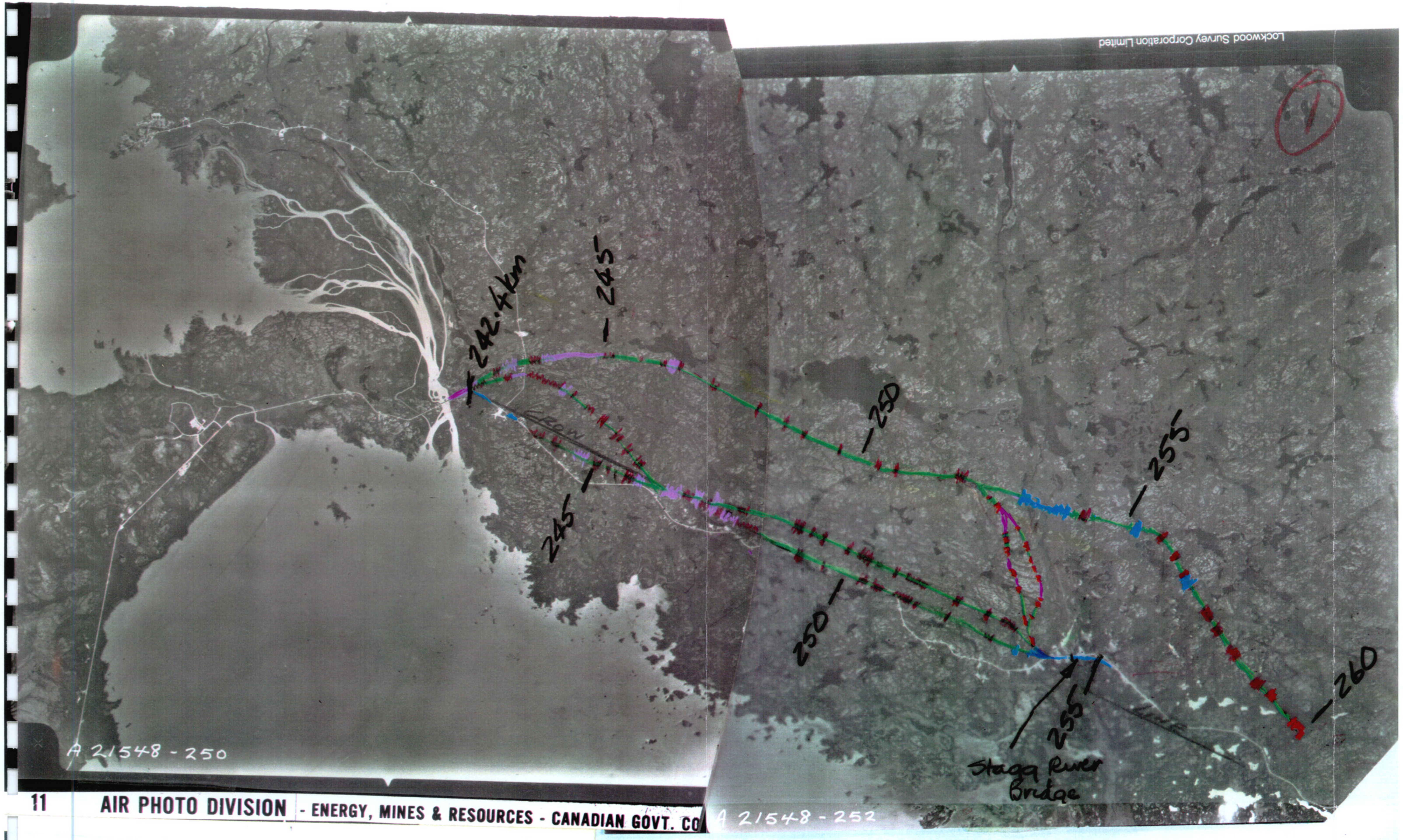
- Mapping terrain across the full width of each strip mosaic, and identifying an airphoto-based preferred ROW, in order to guide obtaining topography for balancing cut and fill quantities, so far as this is desirable.

- Obtaining good topography (reliable and small-contour interval) along competing routes, using NORTECH or other competing firms that provide good quality topographic maps. Scale of topographic maps should match the terrain-typed 1:10,000 strip mosaics, so that all surface material outlines (different classes of bedrock and overburden material) can be transferred on to alignment sheets showing topography -- or, alternatively, on the strip mosaics on to which the topography has been transferred.

- Once good and reliable control has been achieved on the surface material detail and topographic detail, computer-generated programs that balance cuts and fills, other factors considered, can be carried out. Detailed cost comparison of competing routes or alternative competing segments can then be made.

No doubt you will have thoughts of your own, which vary with the above suggestions. However, in light of the very high cost of constructing a new highway having a 40-year life, and considering vehicle traffic and highway maintenance costs, we think the cost of developing this sort of information is worth estimating and assessing in light of the total highway cost, and possible savings that might accrue. Again, you may have some of this information in hand.

FIGURES



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_u (green)	Undulating lower relief (mostly less than 2 m amplitude and 1 to 6% slopes) ice-abraded granitic bedrock Includes mostly shallow (commonly 1 m or so) frozen (prmafrost) and unfrozen generally thin peat and dominantly "dirty" granular material and subordinately silt and very fine sand in scattered irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Percentage length of surficial overburden soil material in this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10%.
O_u (red)	Overburden soil materials consist of variable thickness (from less than 1 m to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.
W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
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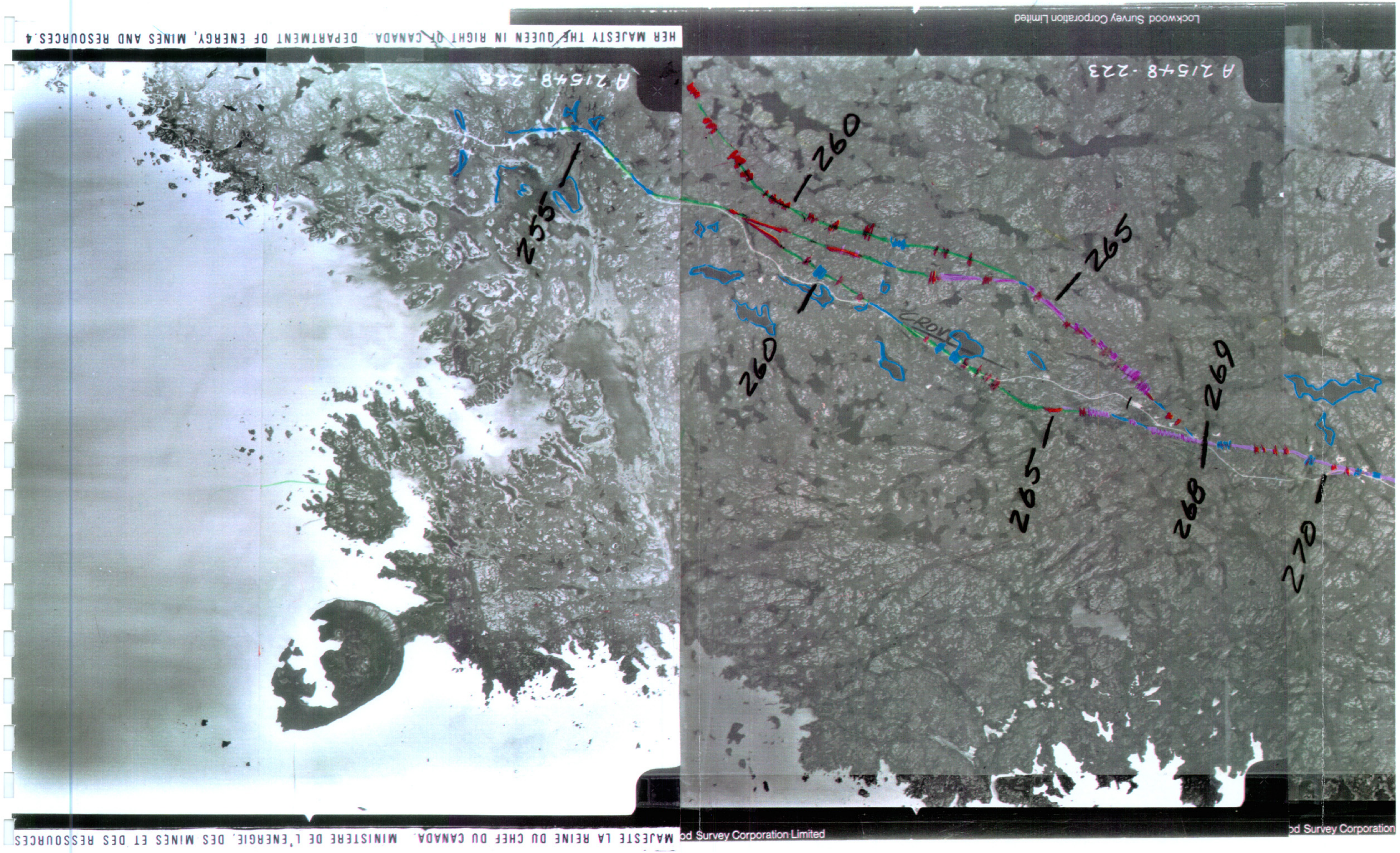
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J.D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 1 of 8



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W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
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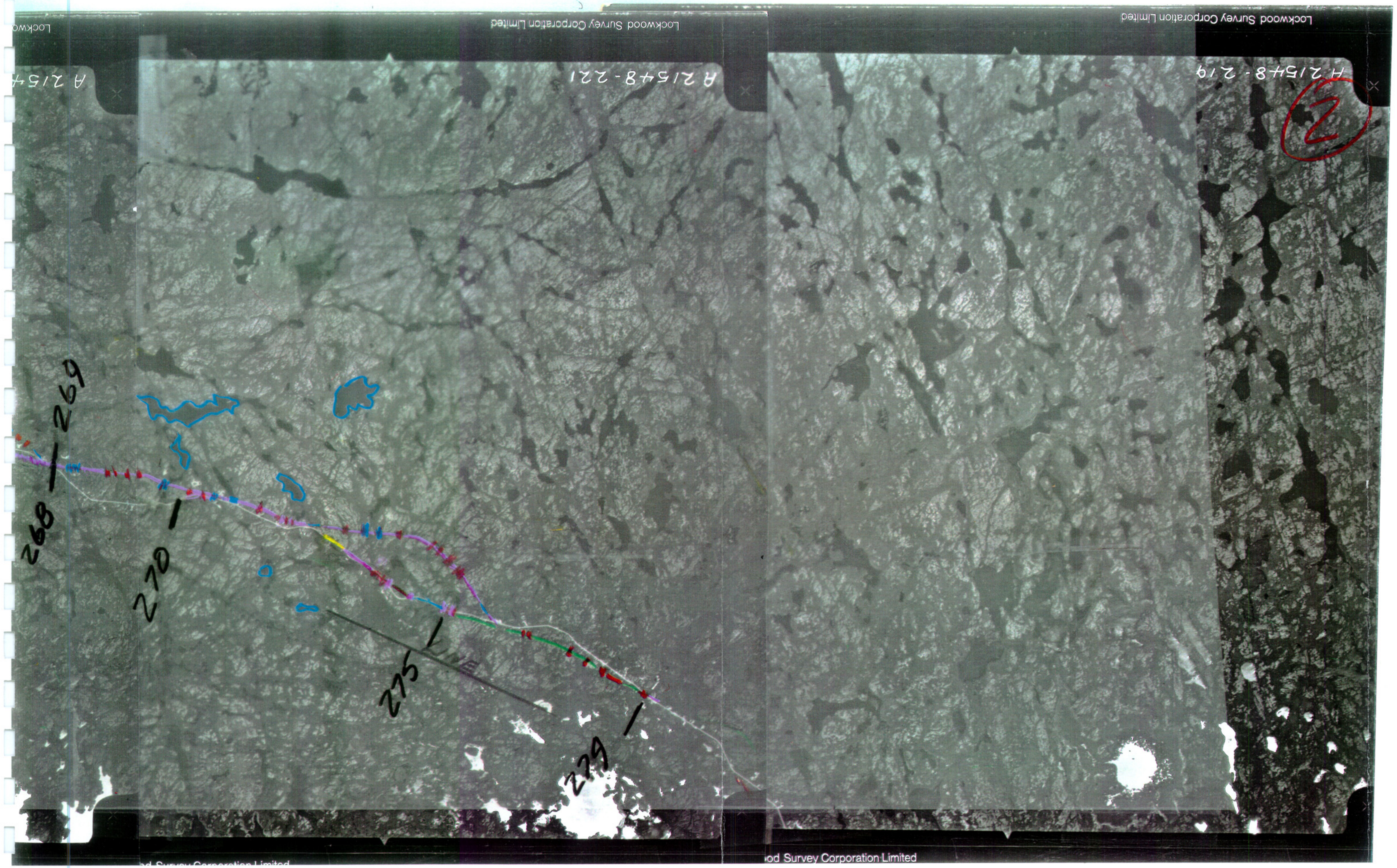
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J.D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 2 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

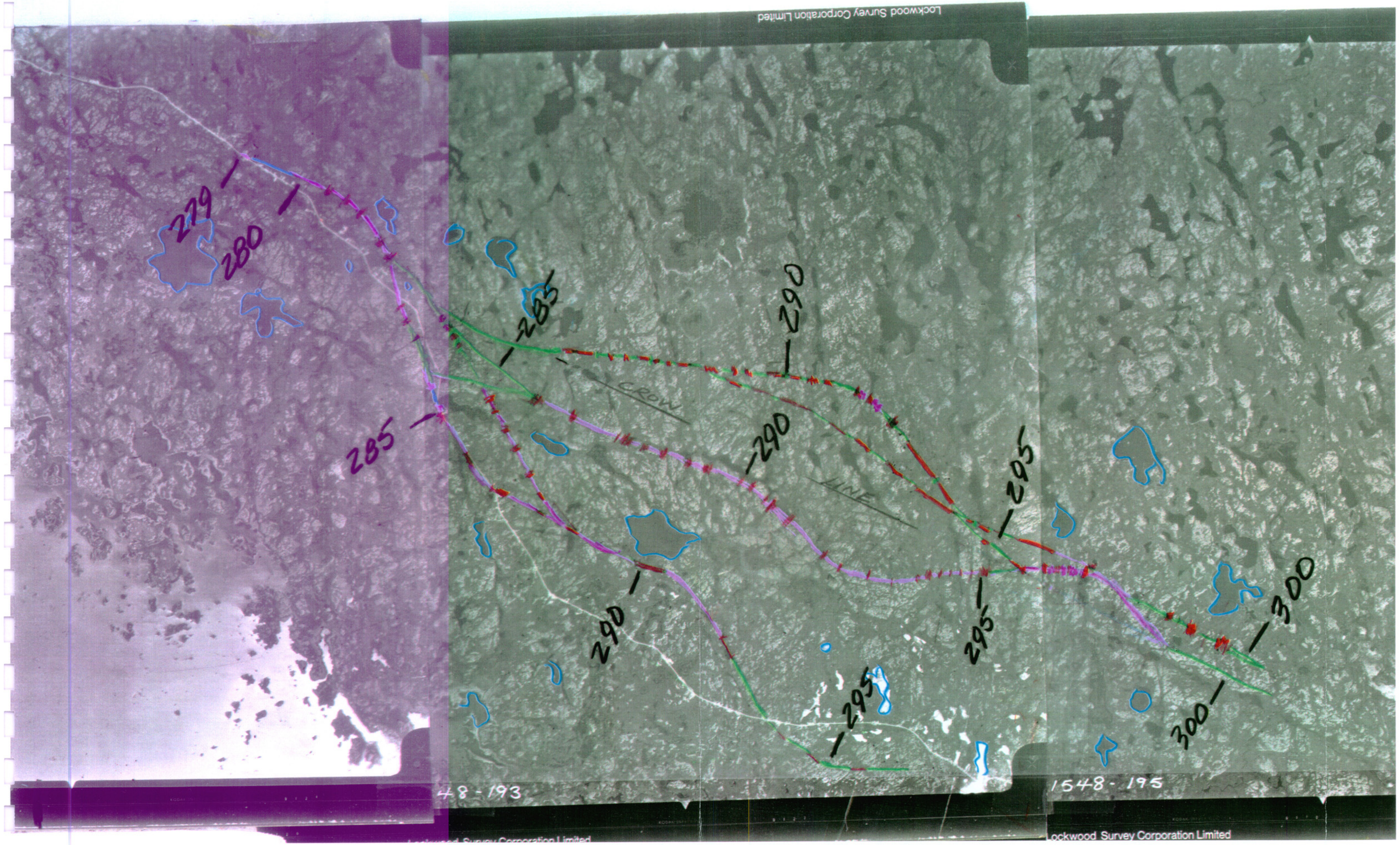
Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_u (green)	Undulating lower relief (mostly less than 2 m amplitude and 1 to 6% slopes) ice-abraded granitic bedrock Includes mostly shallow (commonly 1 m or so) frozen (prmafrost) and unfrozen generally thin peat and dominantly "dirty" granular material and subordinately silt and very fine sand in scattered irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Percentage length of surficial overburden soil material in this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10%.
O_u (red)	Overburden soil materials consist of variable thickness (from less than 1 m to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.
W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
S_g (brown)	Sand and gravelly sand. Includes glacio-lacustrine, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain. Locally wind-modified in uniform sand areas.

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J. D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 3 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
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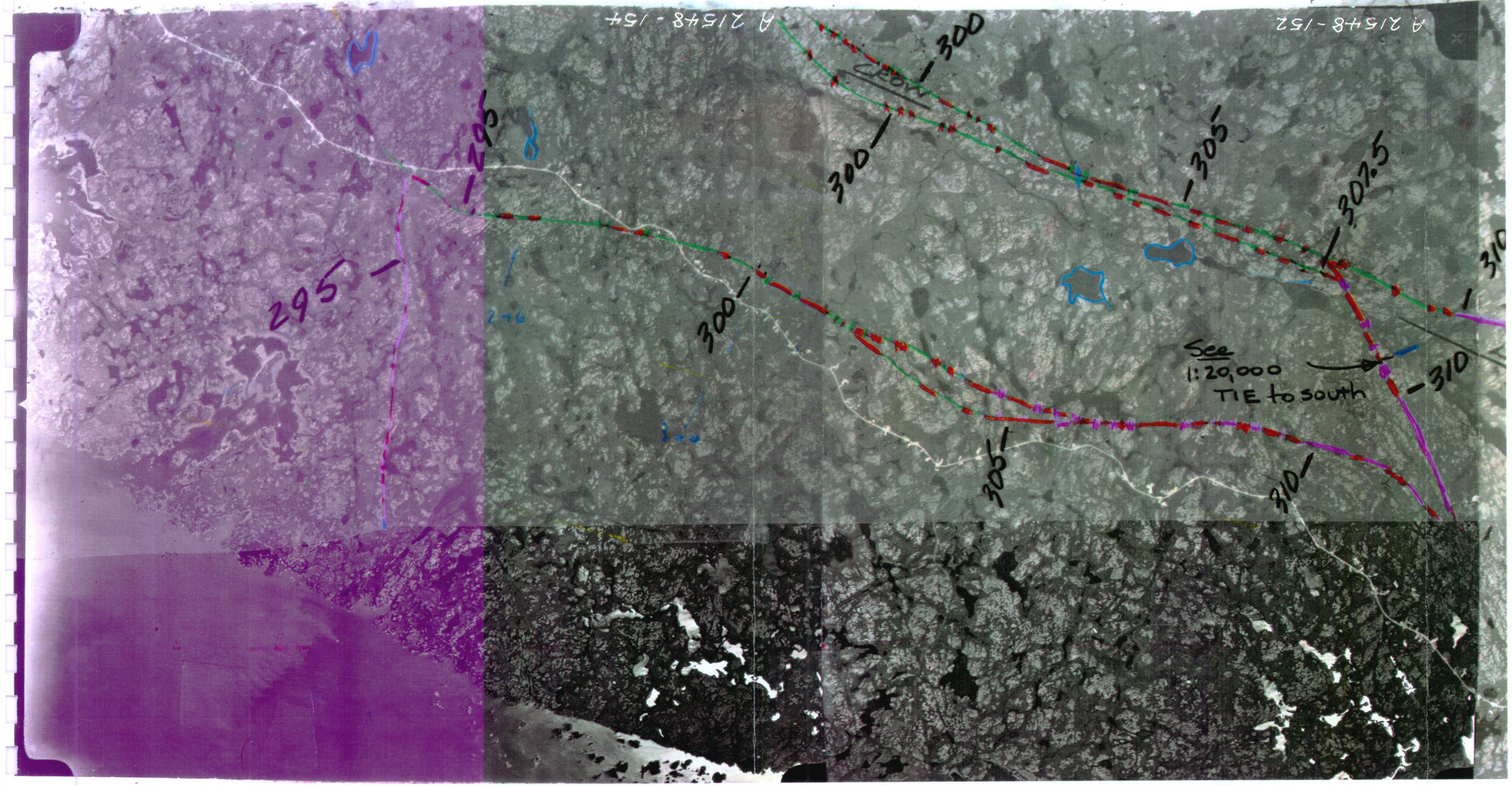
TERRAIN MAPPING ALONG GNWT– SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE–YELLOWKNIFE

0 1 2 3 4 5 6 km

J. D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 4 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
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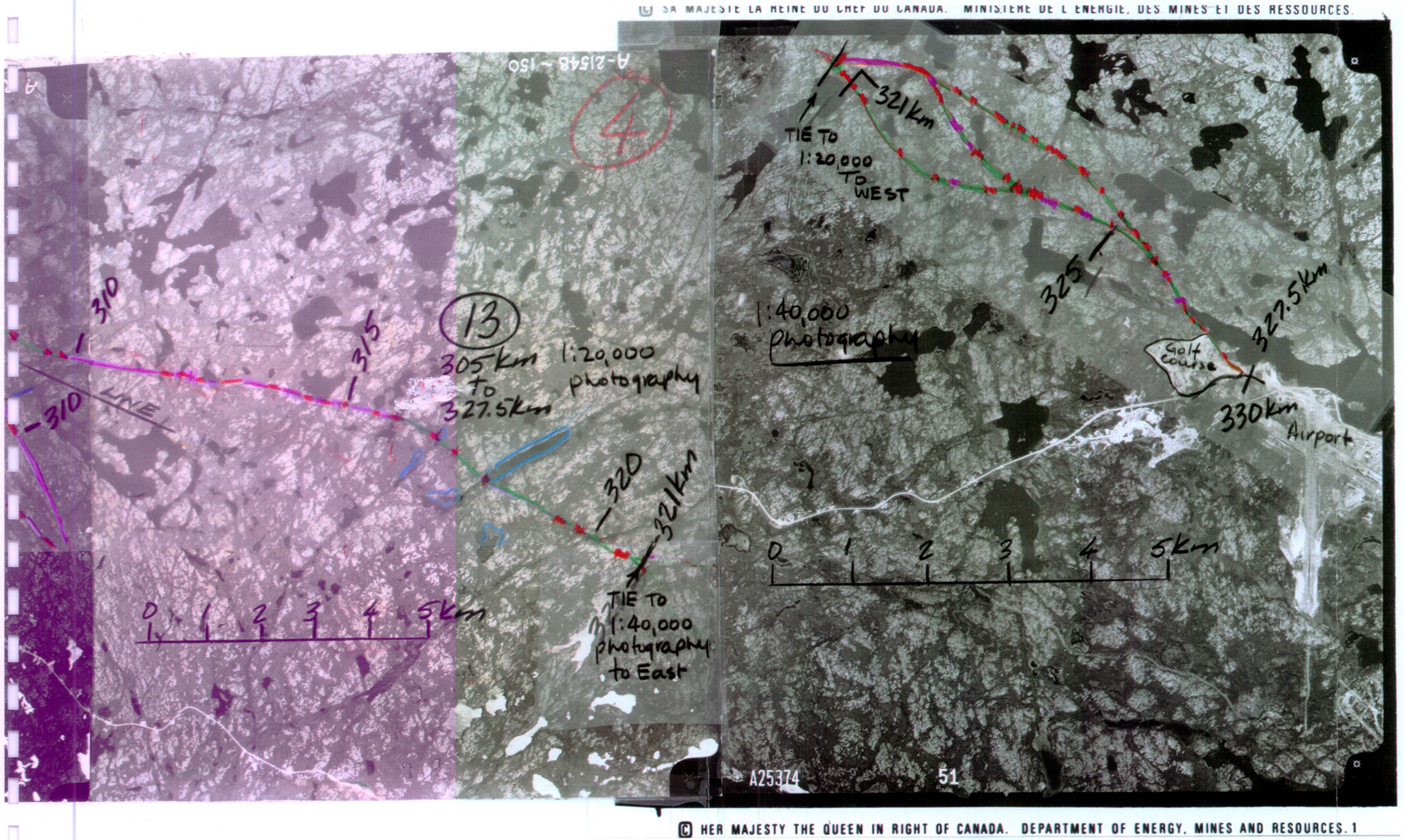
R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10%.
O_u (red)	Overburden soil materials consist of variable thickness (from less than 1 m to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.
W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
S_g (brown)	Sand and gravelly sand. Includes glacio-lacustrine, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain. Locally wind-modified in uniform sand areas.

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J.D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 5 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
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R_s (yellow)	Sloping sidehill granitic bedrock, typically ranging from 2 to 10%.
O_u (red)	Overburden soil materials consist of variable thickness (from less than 1 m to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.
W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
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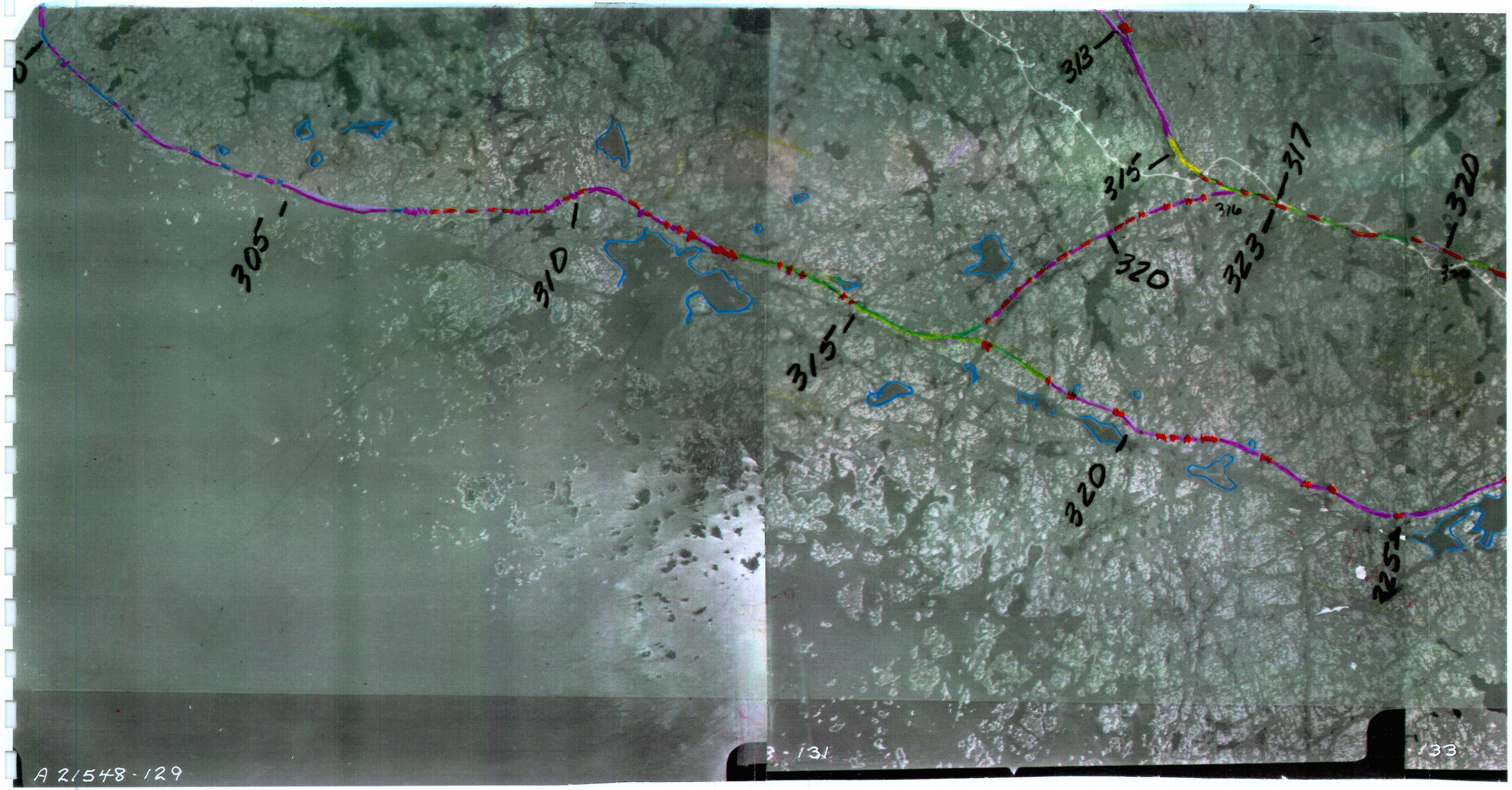
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J. D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 6 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
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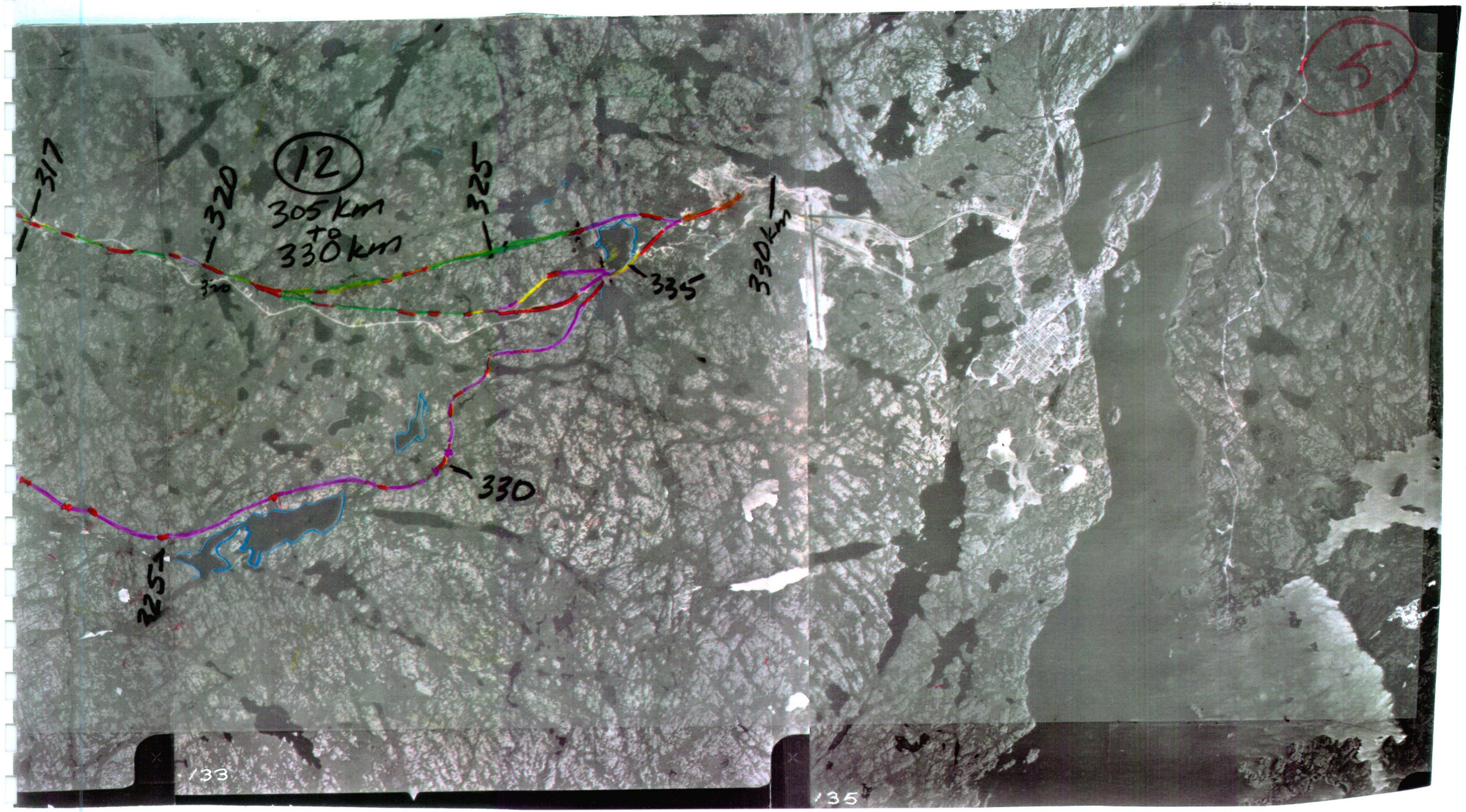
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J.D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 7 of 8



TERRAIN MAPPING LEGEND
(from 1:60,000 scale airphoto interpretation)

Symbol	Description
R_h (mauve)	Hummocky higher relief (mostly 2 to 8 m amplitude and commonly 3 to 6% slopes) ice-abraded granitic bedrock. Including scattered patches of mostly moderately shallow (generally less than to 4 m and commonly less than 2 m) frozen (permafrost) and unfrozen peat and lacustrine and alluvial (waterlaid) silt and very fine sand occurring in deeper irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Dirty granular deposits are expected in shallower patches of overburden soil material in the more elevated bedrock areas. The waterlaid silt and very fine sand deposits may or may not overlie a thin discontinuous lag of gravel and boulders resting on bedrock. Percentage length of surficial (overburden soil) material within this terrain unit typically varies from 20 to 40%, averaging about 30%.
R_u (green)	Undulating lower relief (mostly less than 2 m amplitude and 1 to 6% slopes) ice-abraded granitic bedrock Includes mostly shallow (commonly 1 m or so) frozen (prmafrost) and unfrozen generally thin peat and dominantly "dirty" granular material and subordinately silt and very fine sand in scattered irregular-shaped patches and in linear depressions that follow eroded fractures in bedrock. Percentage length of surficial overburden soil material in this terrain unit typically varies from 20 to 40%, averaging about 30%.
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O_u (red)	Overburden soil materials consist of variable thickness (from less than 1 m to over 30 m), undifferentiated frozen and unfrozen peat and dominantly waterlaid silt and very fine sand below level to gently sloping depressions between bedrock exposures. These surficial deposits may or may not overlie a thin, discontinuous lag of gravel and boulders resting on bedrock.
W_s (blue)	Shallow ponded water, active floodplains, and higher water table areas.
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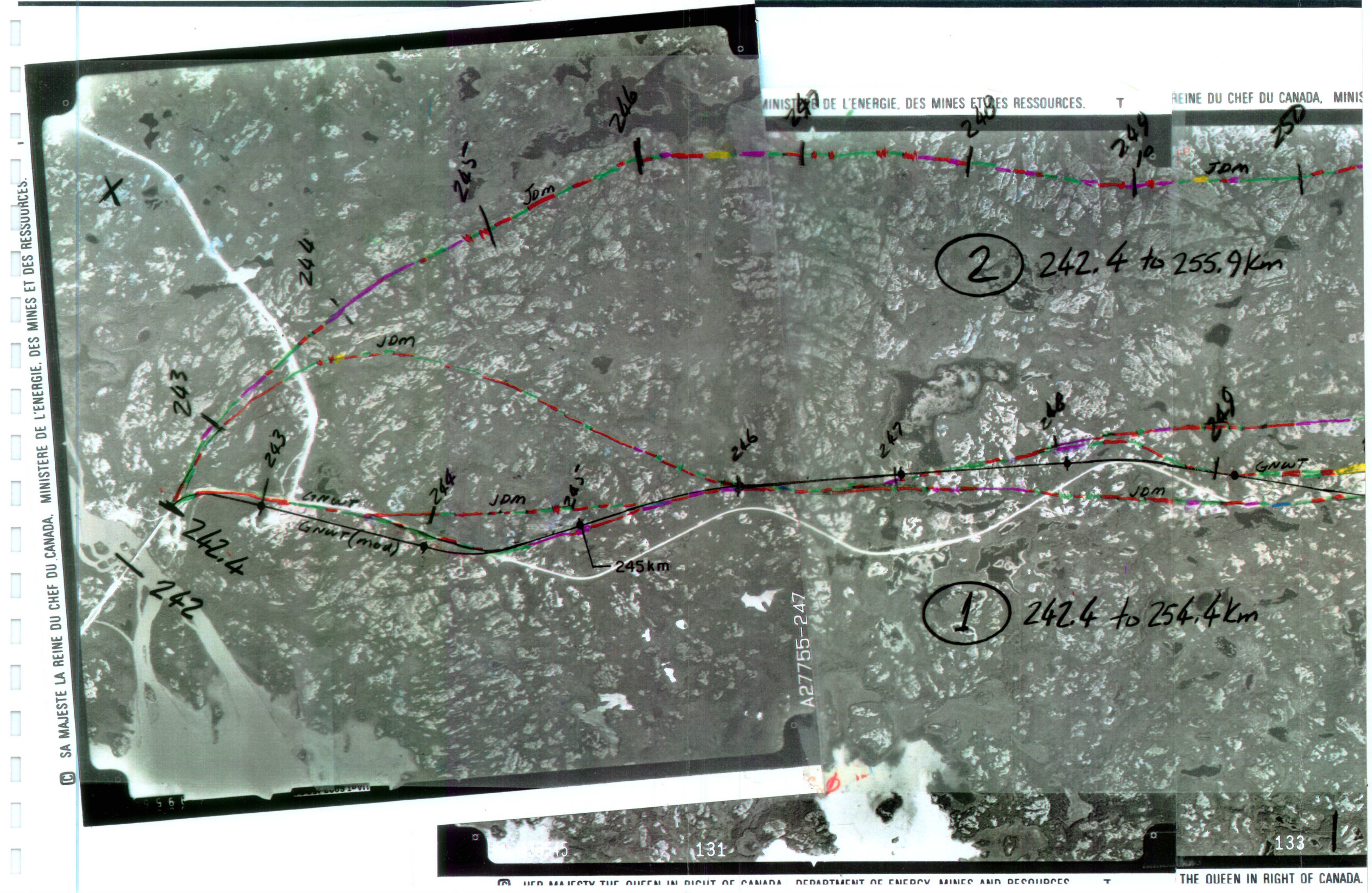
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 1 2 3 4 5 6 km

J. D. Mollard and Associates Limited
January, 1995

FIGURE 1
SHEET 8 of 8



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

Because Figure 1 shows macro topography, while Figure 2 shows gradeline relief that we feel can be achieved along a selected R.O.W., the mapping colors shown on Figures 1 and 2 do not necessarily match up with respect to location.

ROUTE DESCRIPTIONS

GNWT	Proposed route forwarded to use by GNWT (terrain mapped)
GNWT(Mod.)	Route generally follows proposed GNWT route but includes possible route variations for your consideration and study. (Not terrain mapped.) Nearly all 3° curves used occasionally 4°. May wish to select only certain segments of these alternatives.
JDM	Other alternative route segments located and terrain mapped for analysis and comparison purposes (terrain not tallied because of time constraints).

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

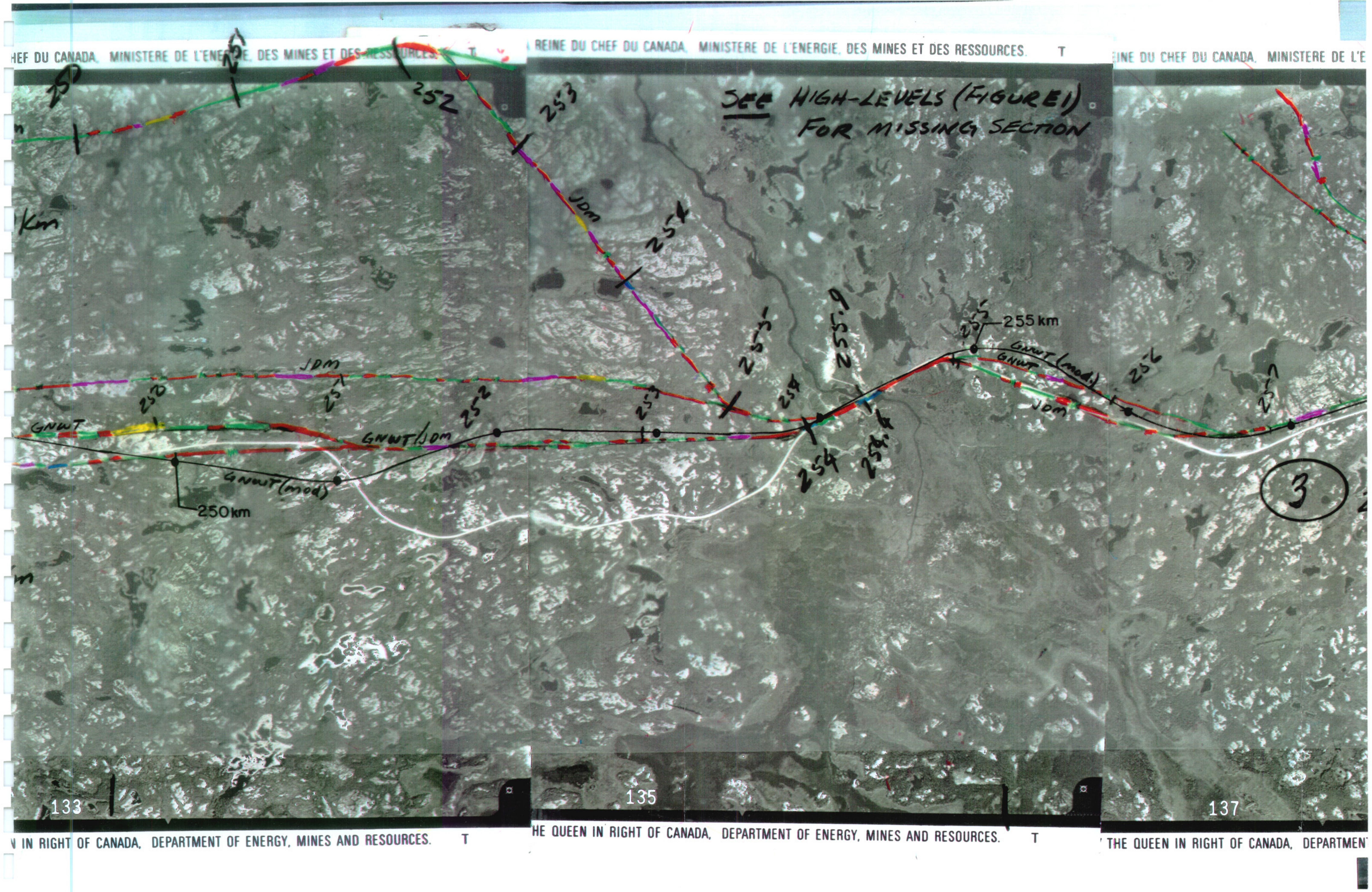
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 1 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). [1]
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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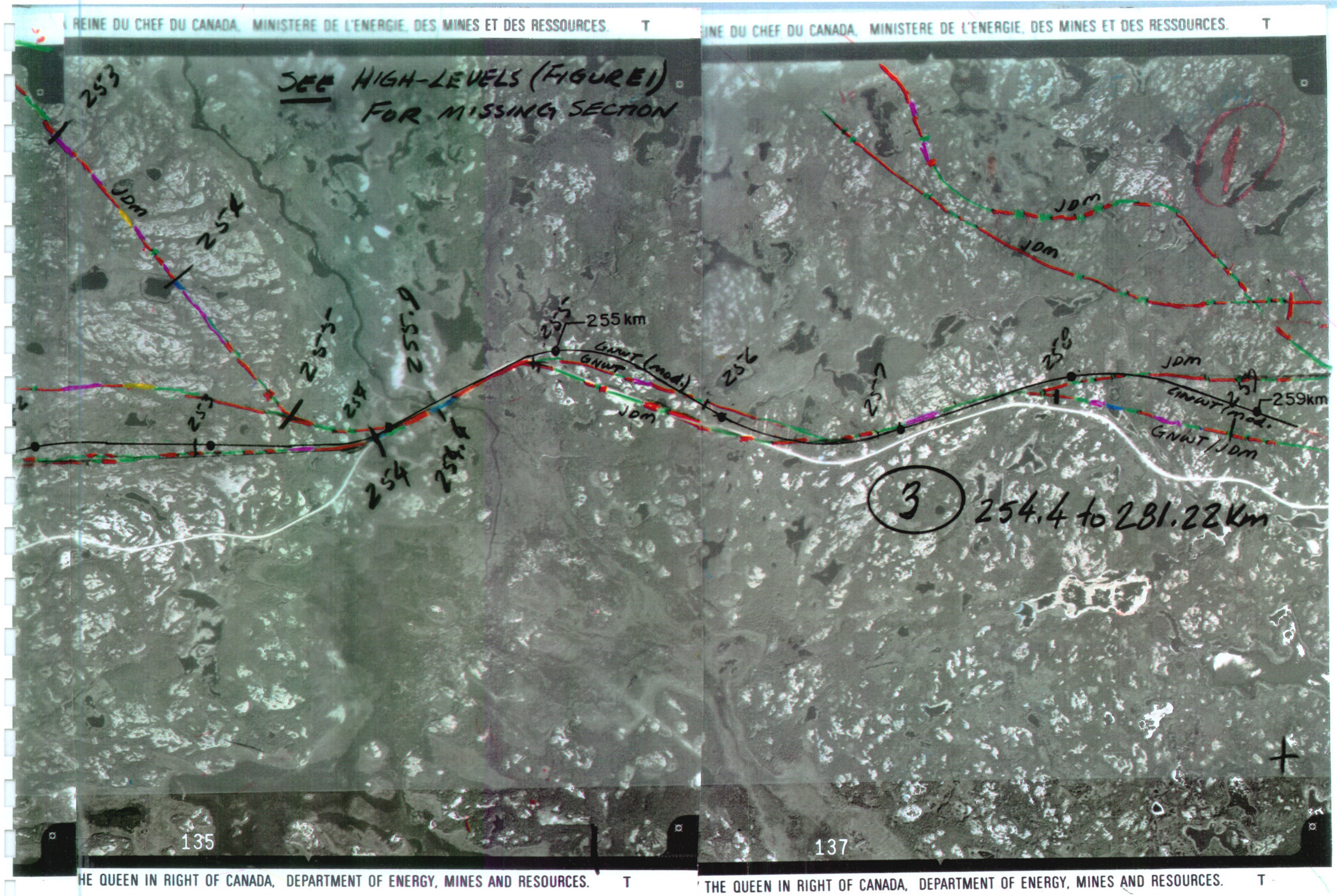
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

SHEET 2 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
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S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

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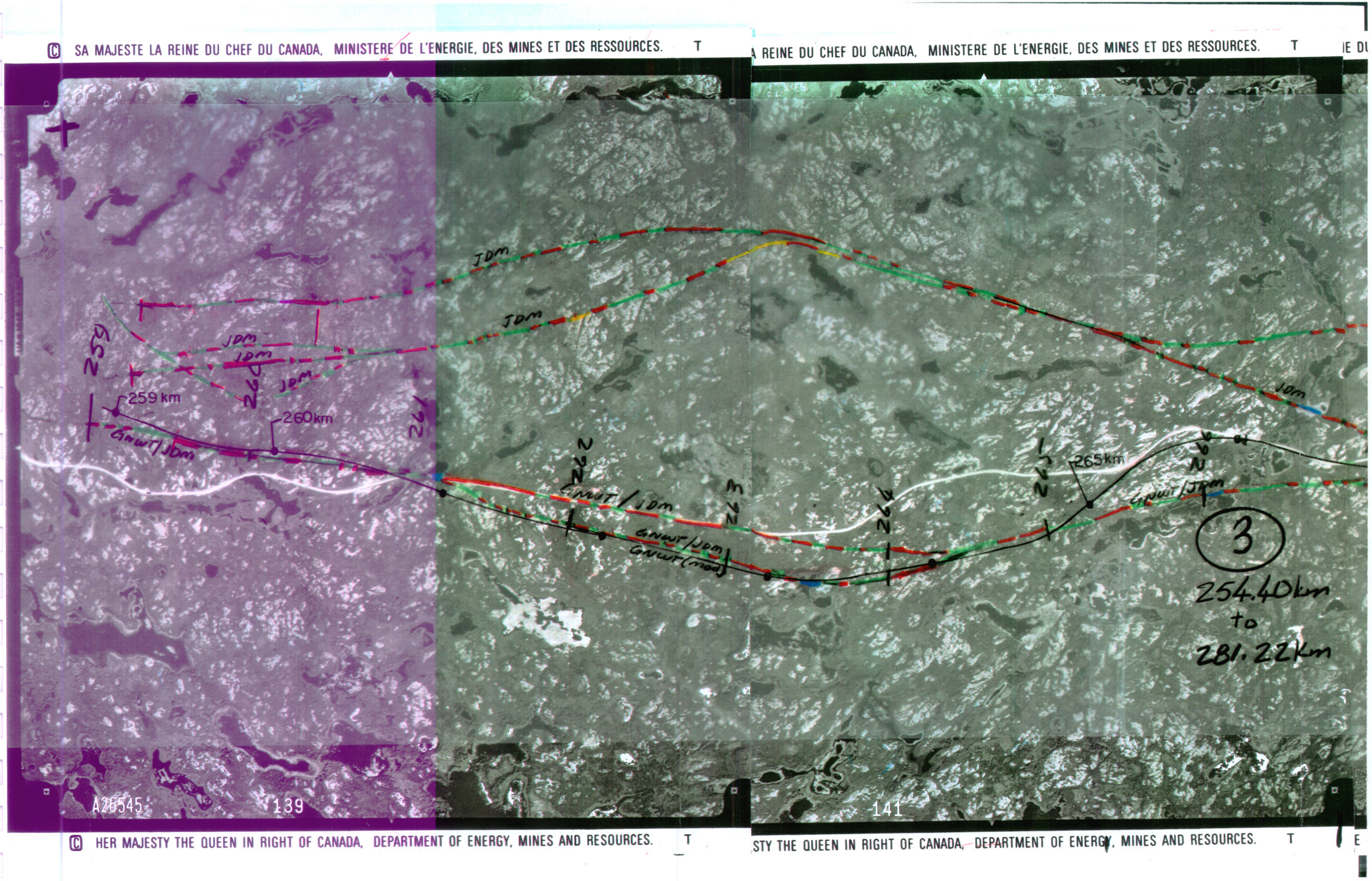
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

SHEET 3 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). [1)]
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

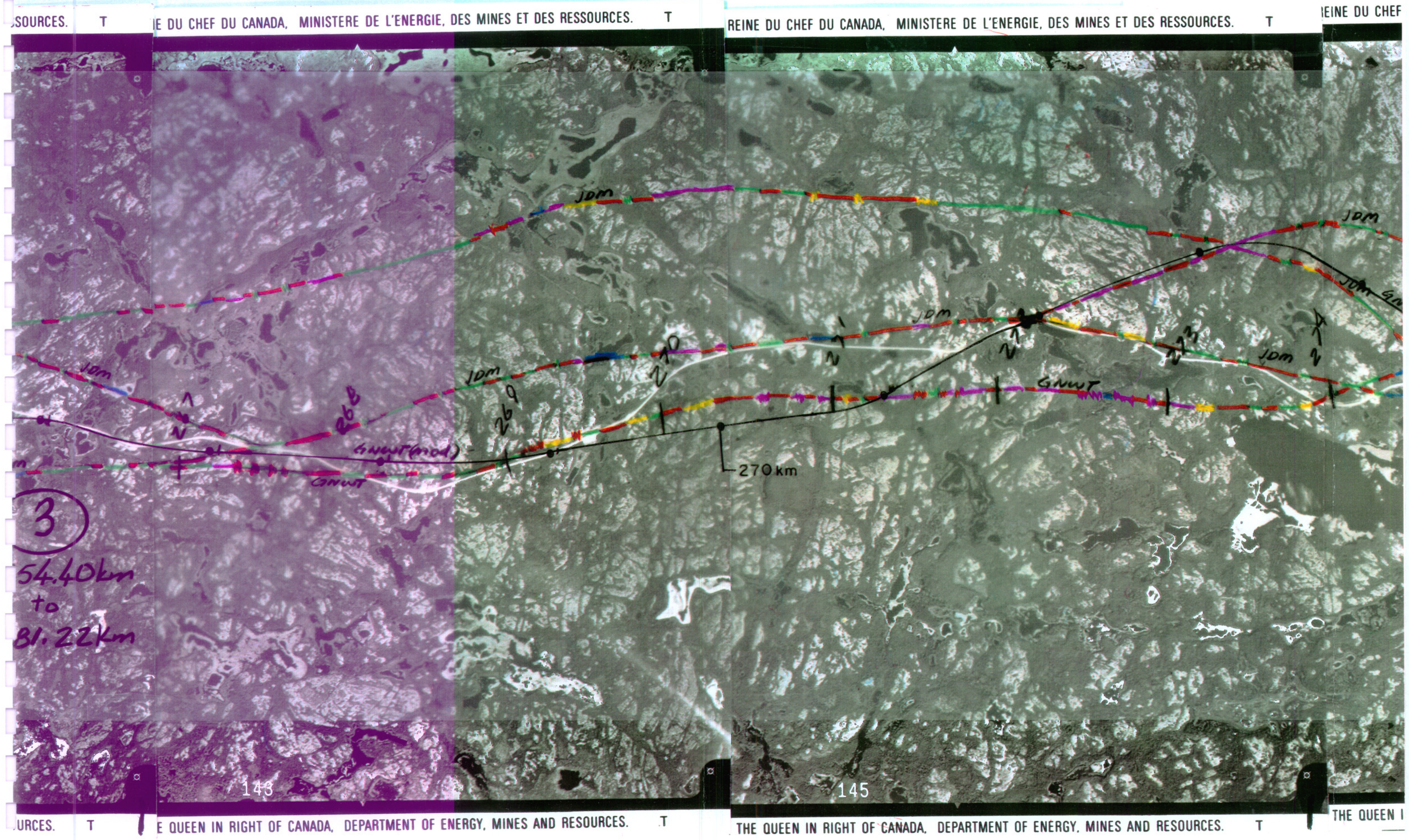
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 4 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). [1)]
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

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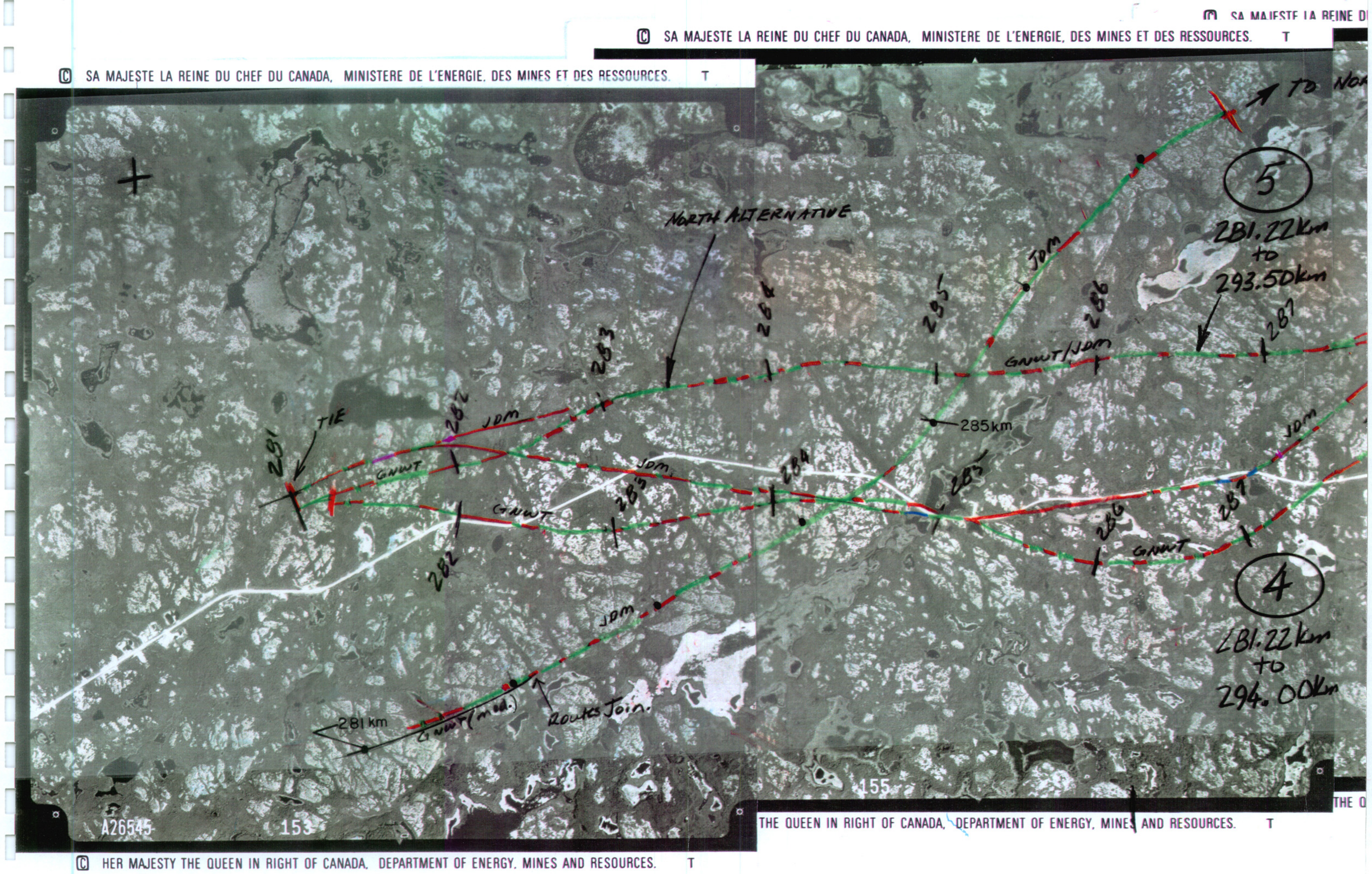
FIGURE 2

SHEET 5 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

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0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

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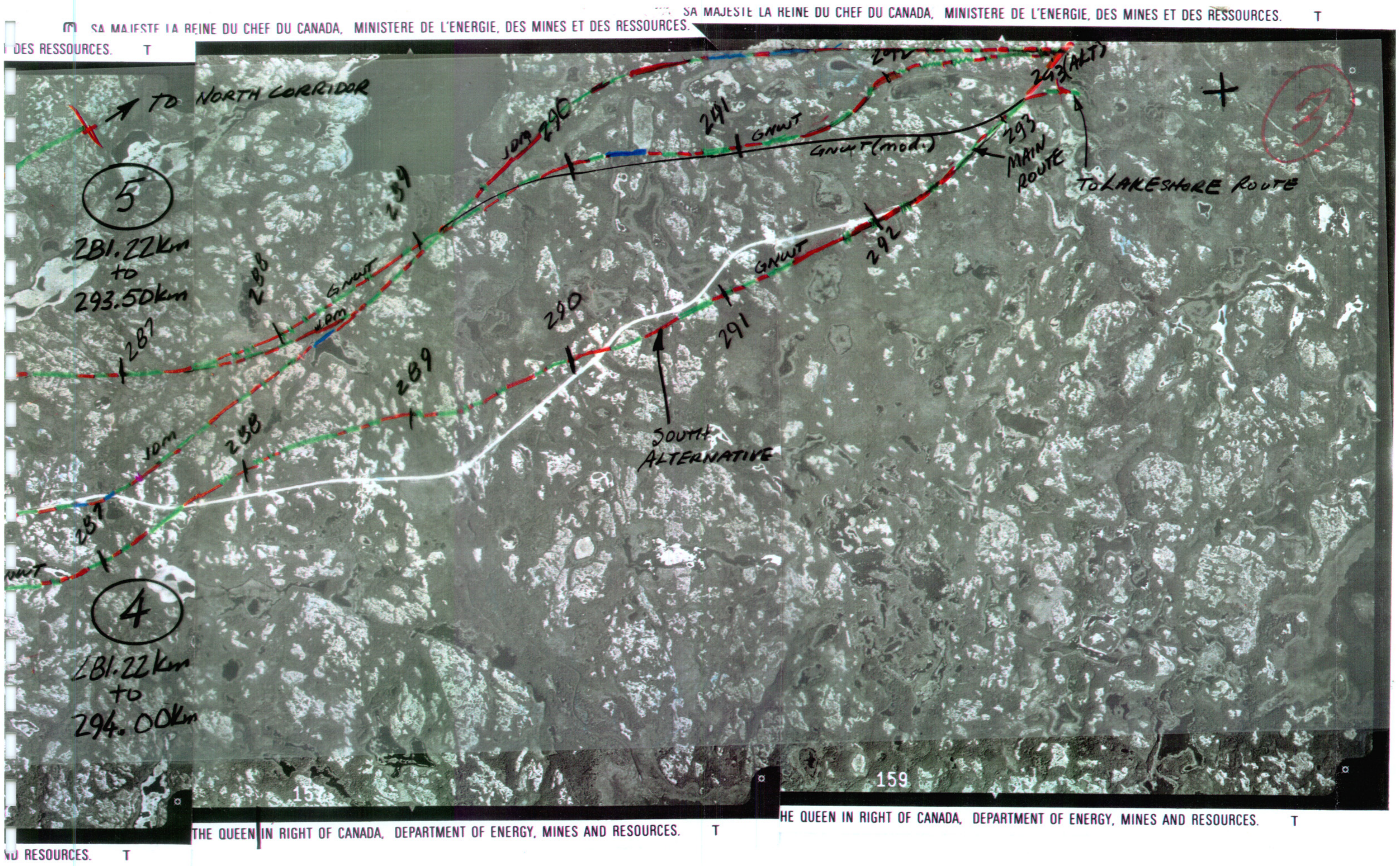

TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

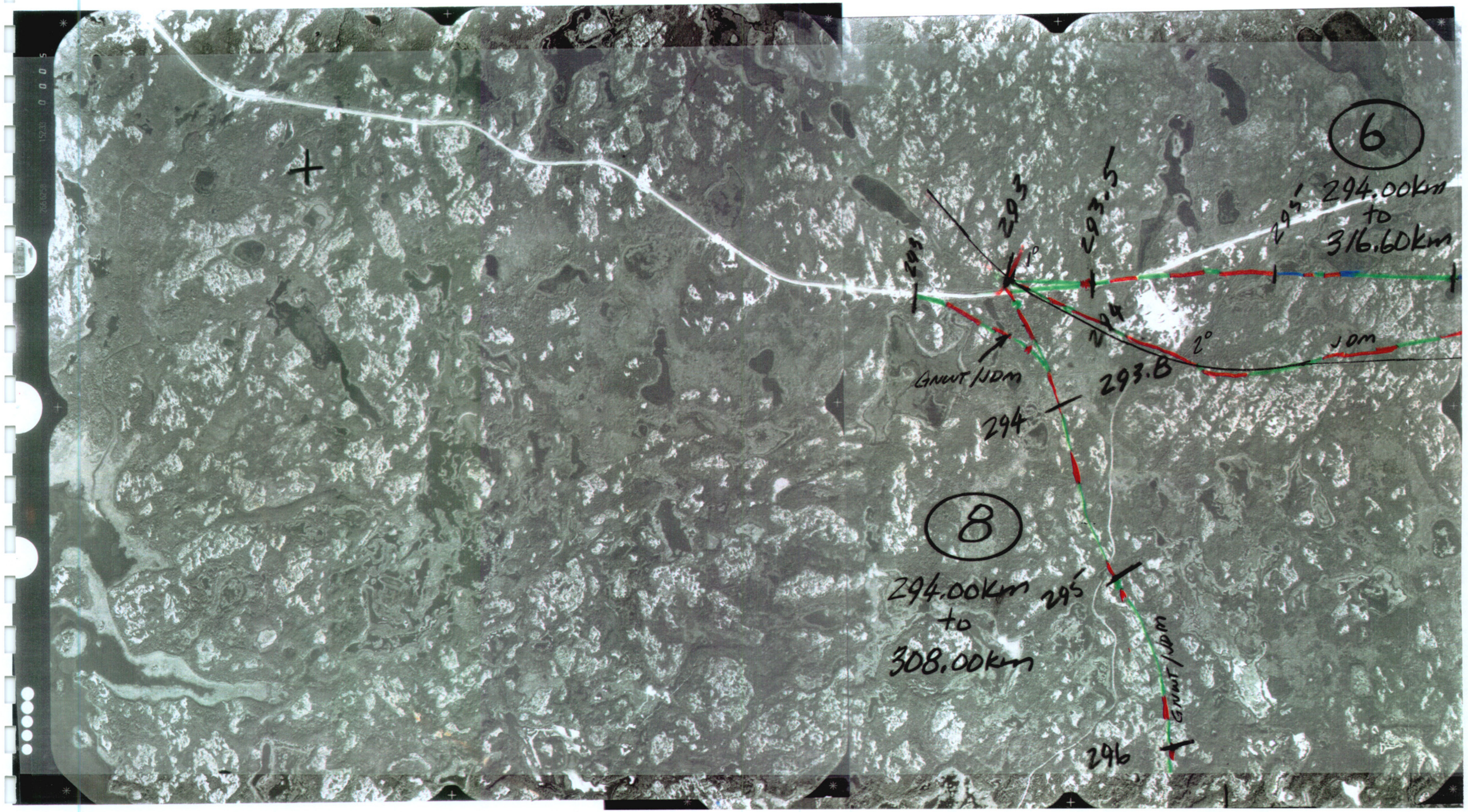
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 8 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
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TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

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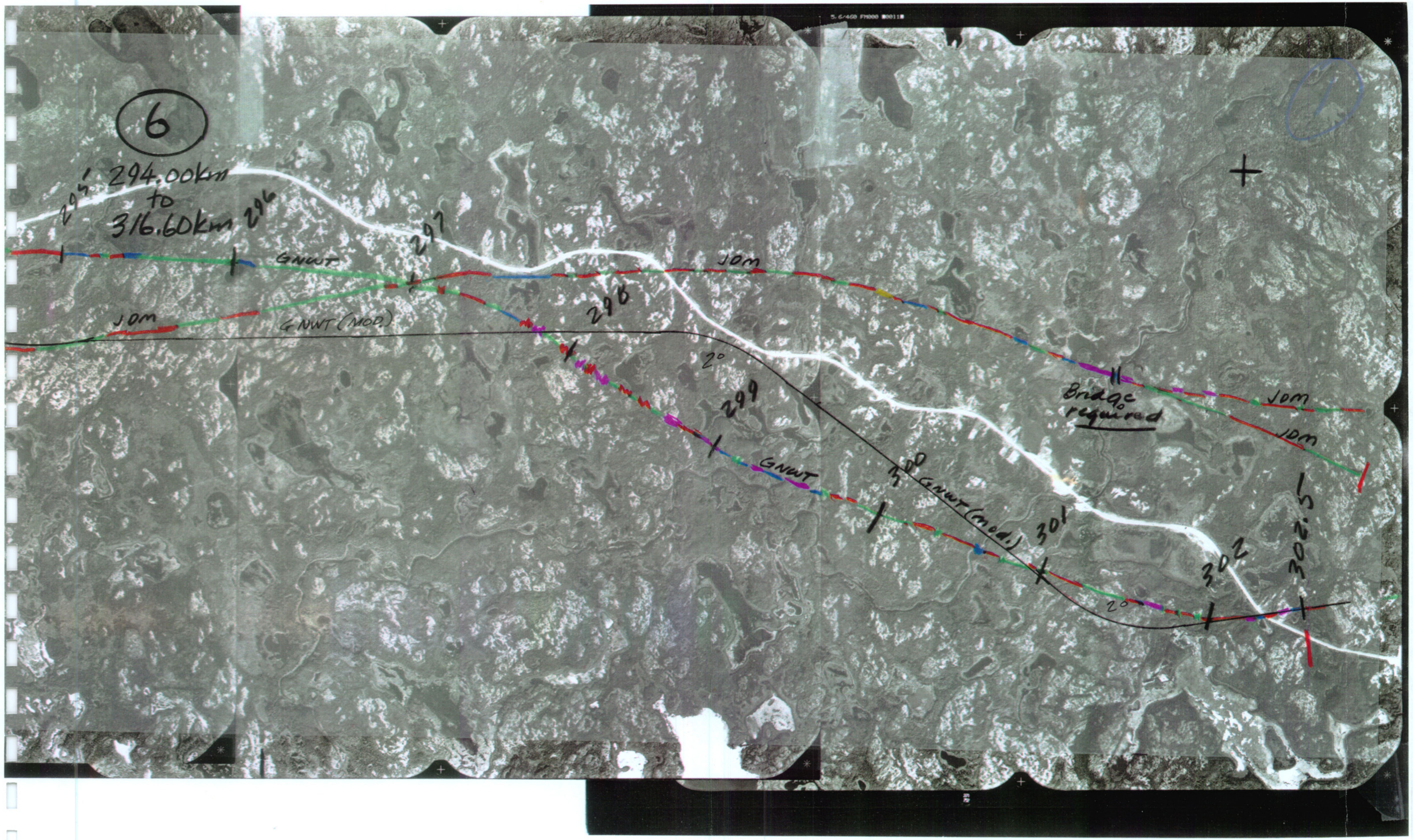

TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
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R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
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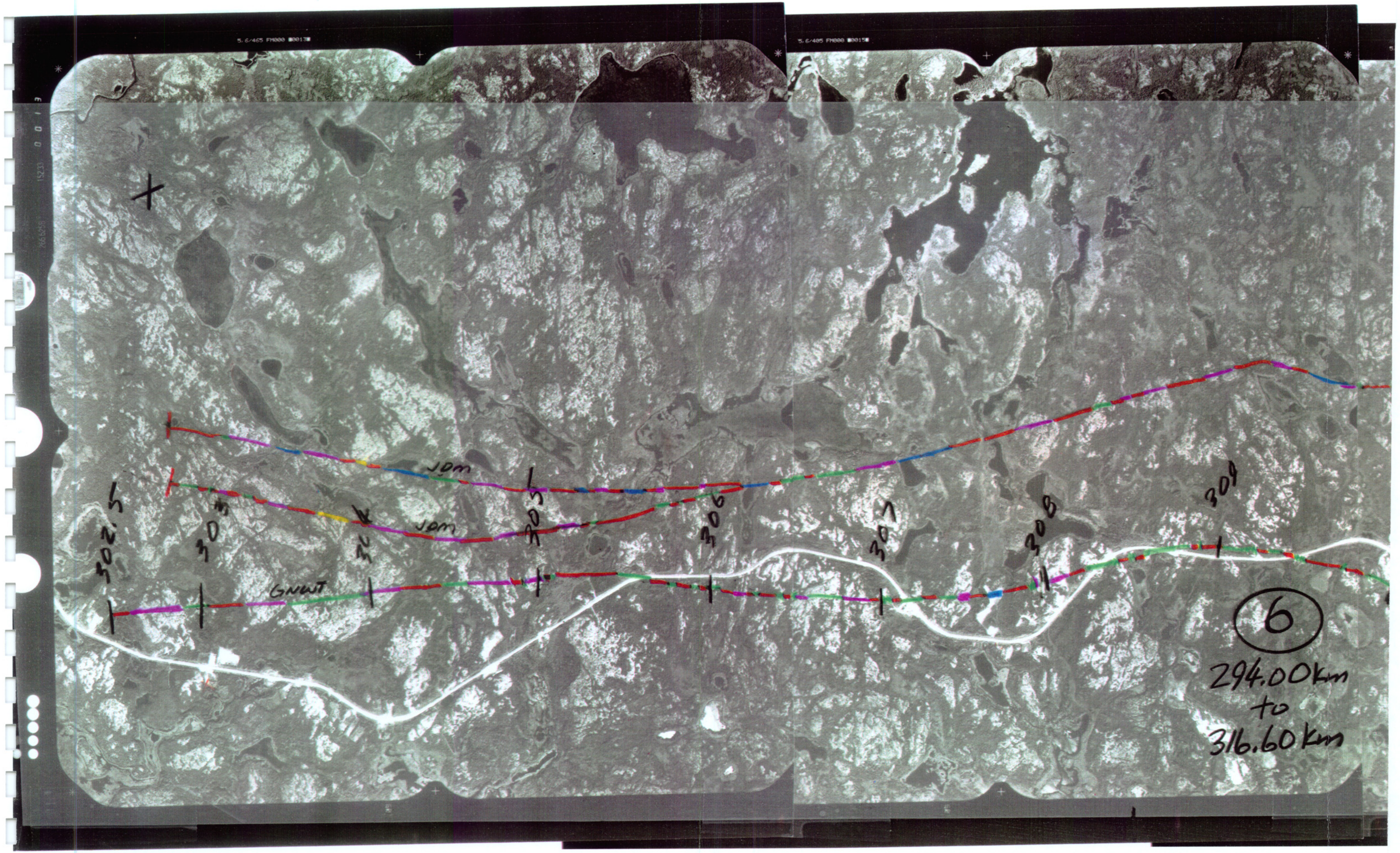
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 10 of 21



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R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
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0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

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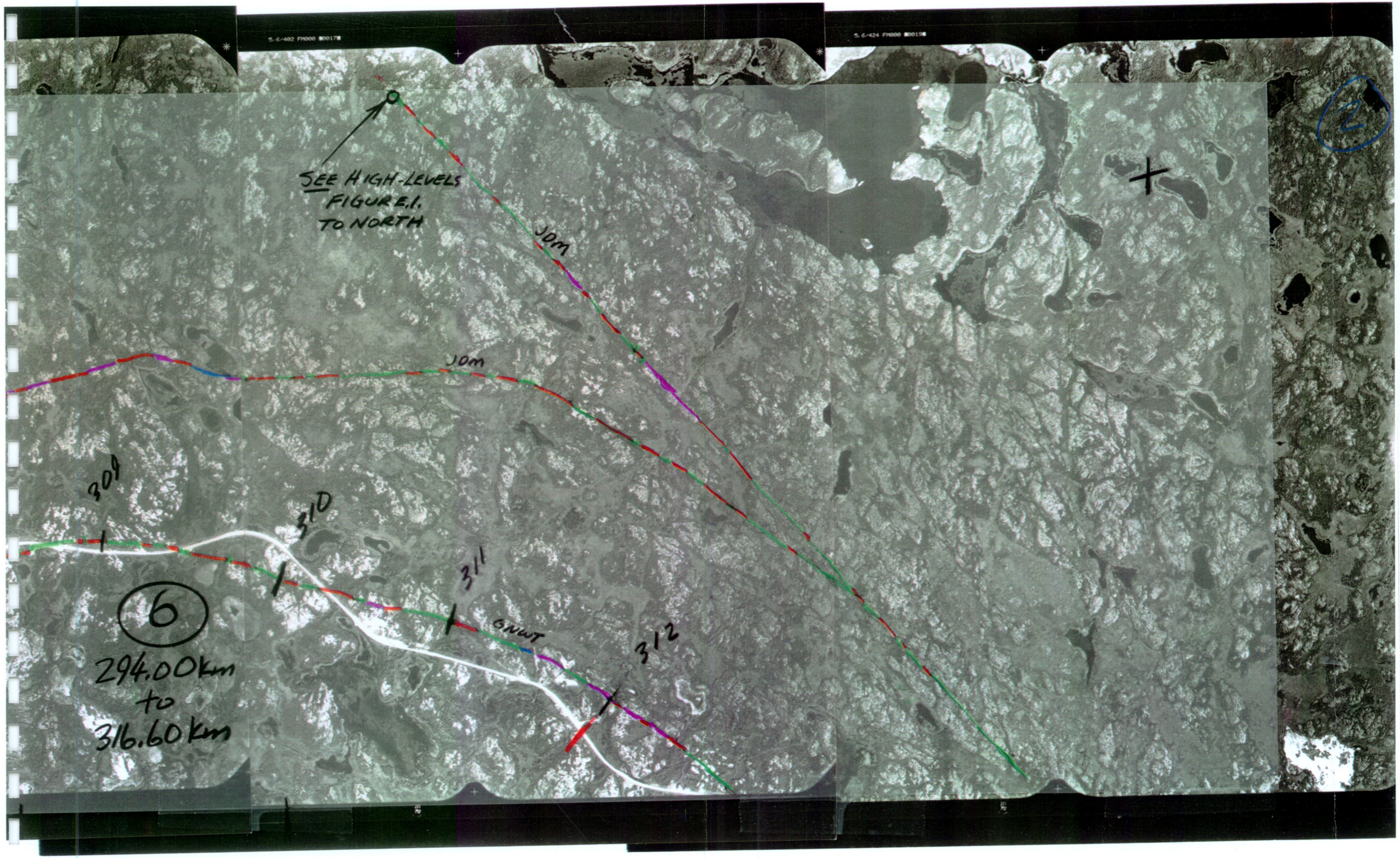
FIGURE 2

SHEET 11 of 21



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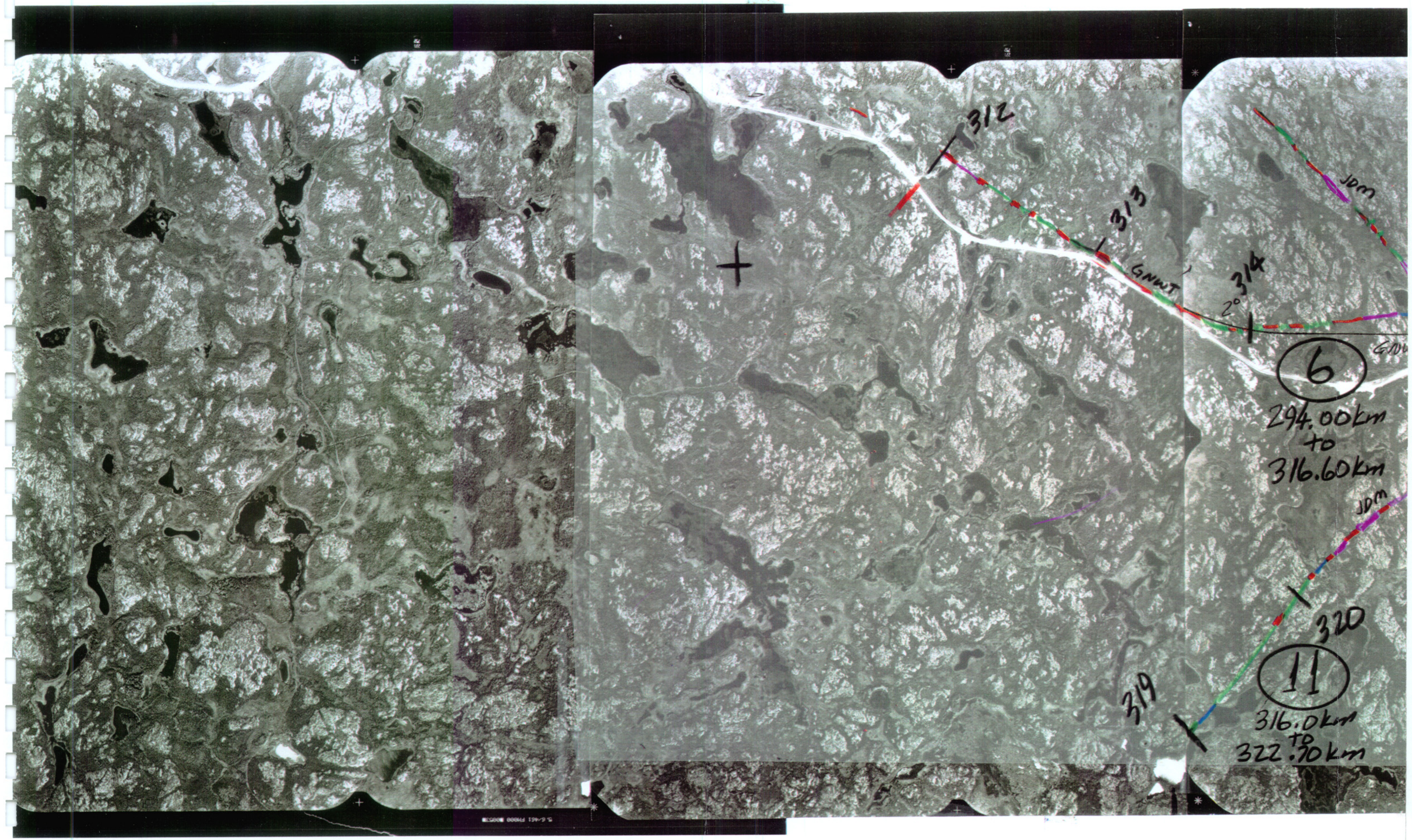
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 12 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

Because Figure 1 shows macro topography, while Figure 2 shows gradeline relief that we feel can be achieved along a selected R.O.W., the mapping colors shown on Figures 1 and 2 do not necessarily match up with respect to location.

ROUTE DESCRIPTIONS

GNWT	Proposed route forwarded to use by GNWT (terrain mapped)
GNWT(Mod.)	Route generally follows proposed GNWT route but includes possible route variations for your consideration and study. (Not terrain mapped.) Nearly all 3° curves used occasionally 4°. May wish to select only certain segments of these alternatives.
JDM	Other alternative route segments located and terrain mapped for analysis and comparison purposes (terrain not tallied because of time constraints).

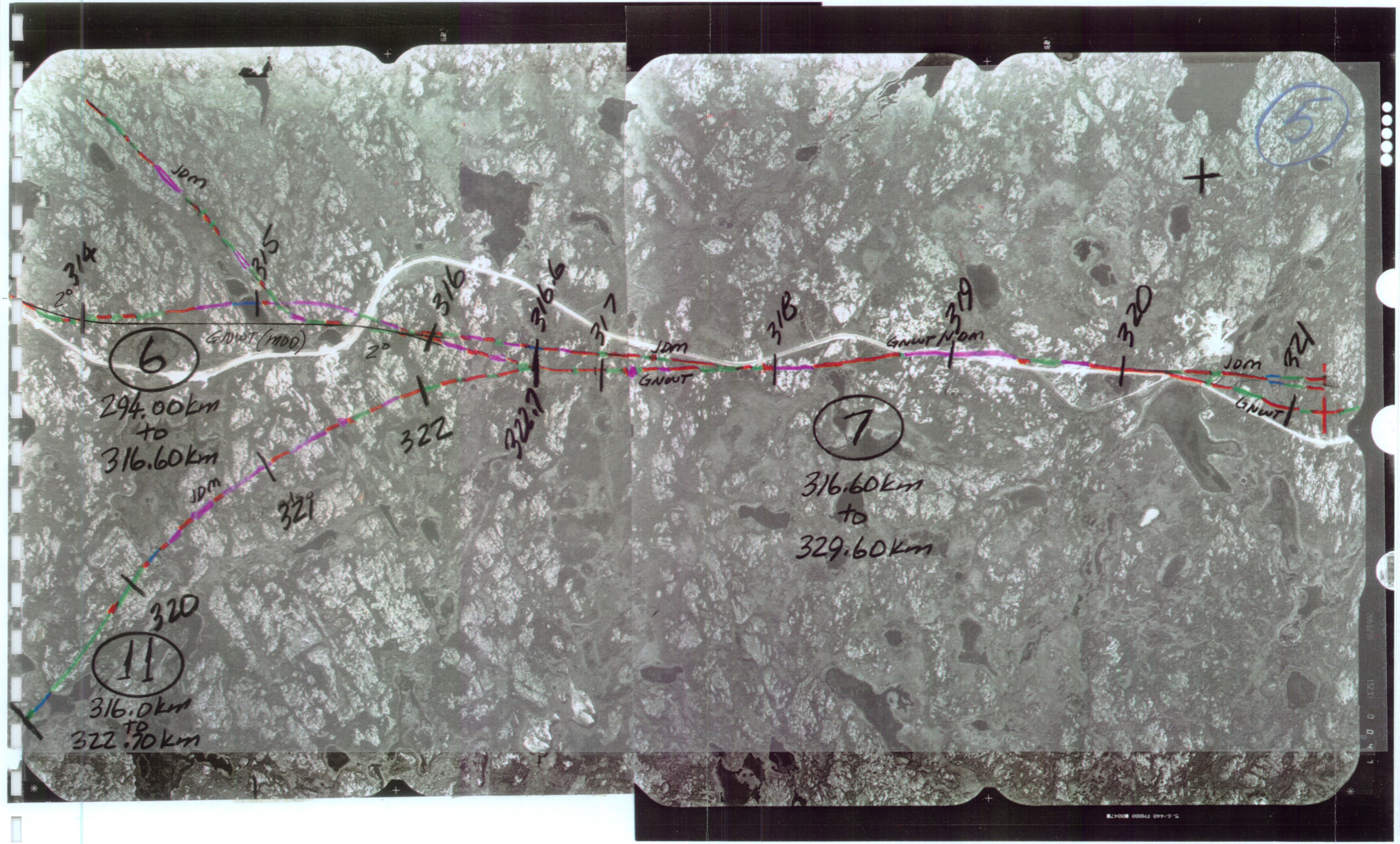
TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

SHEET 13 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

Because Figure 1 shows macro topography, while Figure 2 shows gradeline relief that we feel can be achieved along a selected R.O.W., the mapping colors shown on Figures 1 and 2 do not necessarily match up with respect to location.

ROUTE DESCRIPTIONS

GNWT	Proposed route forwarded to use by GNWT (terrain mapped)
GNWT(Mod.)	Route generally follows proposed GNWT route but includes possible route variations for your consideration and study. (Not terrain mapped.) Nearly all 3° curves used occasionally 4°. May wish to select only certain segments of these alternatives.
JDM	Other alternative route segments located and terrain mapped for analysis and comparison purposes (terrain not tallied because of time constraints).

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No.3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

SHEET 14 of 21

TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

Because Figure 1 shows macro topography, while Figure 2 shows gradeline relief that we feel can be achieved along a selected R.O.W., the mapping colors shown on Figures 1 and 2 do not necessarily match up with respect to location.

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TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

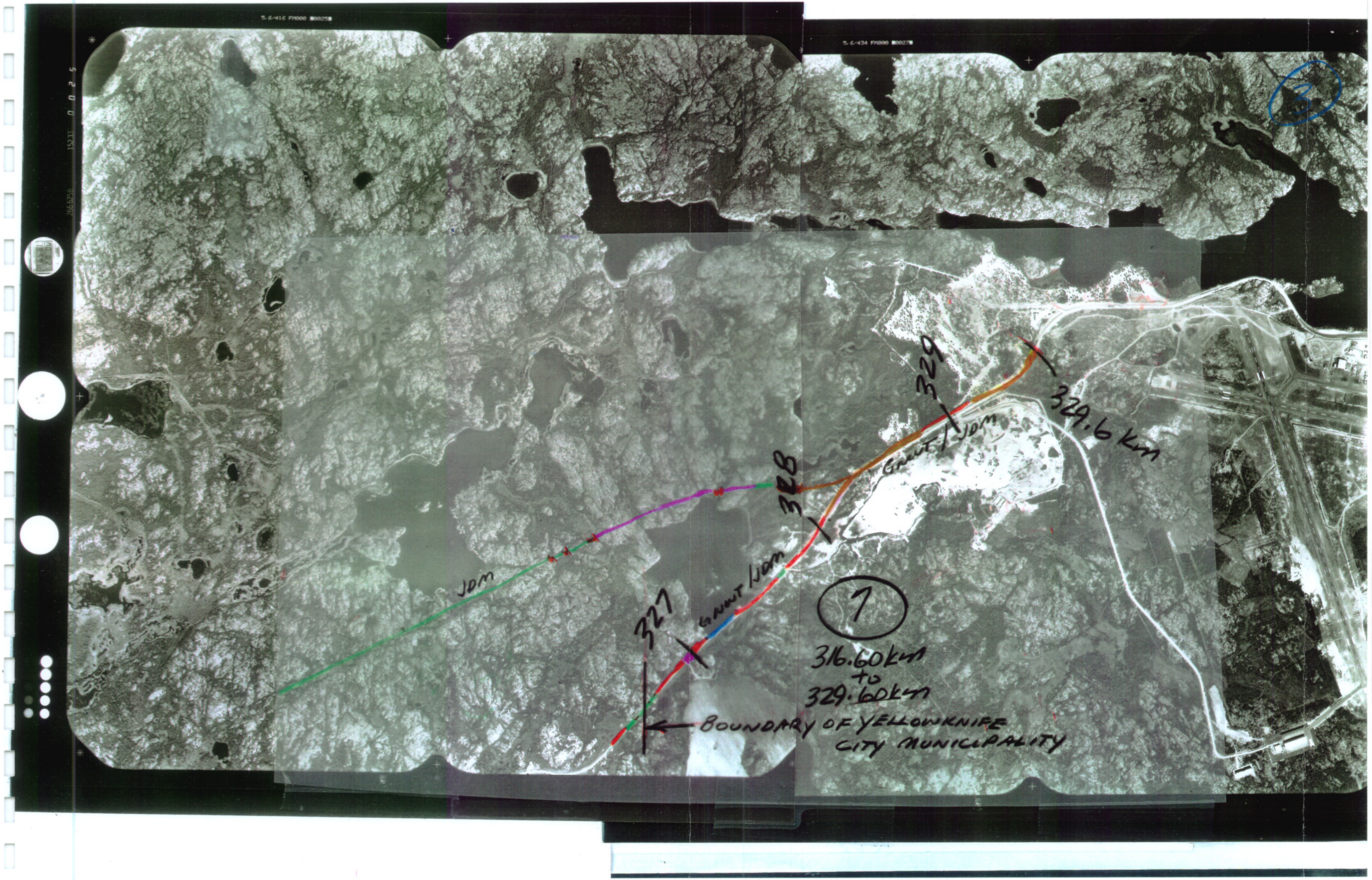
0 500 1000 1500 2000m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 15 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief. In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit. In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). 1)
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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JDM	Other alternative route segments located and terrain mapped for analysis and comparison purposes (terrain not tallied because of time constraints).

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

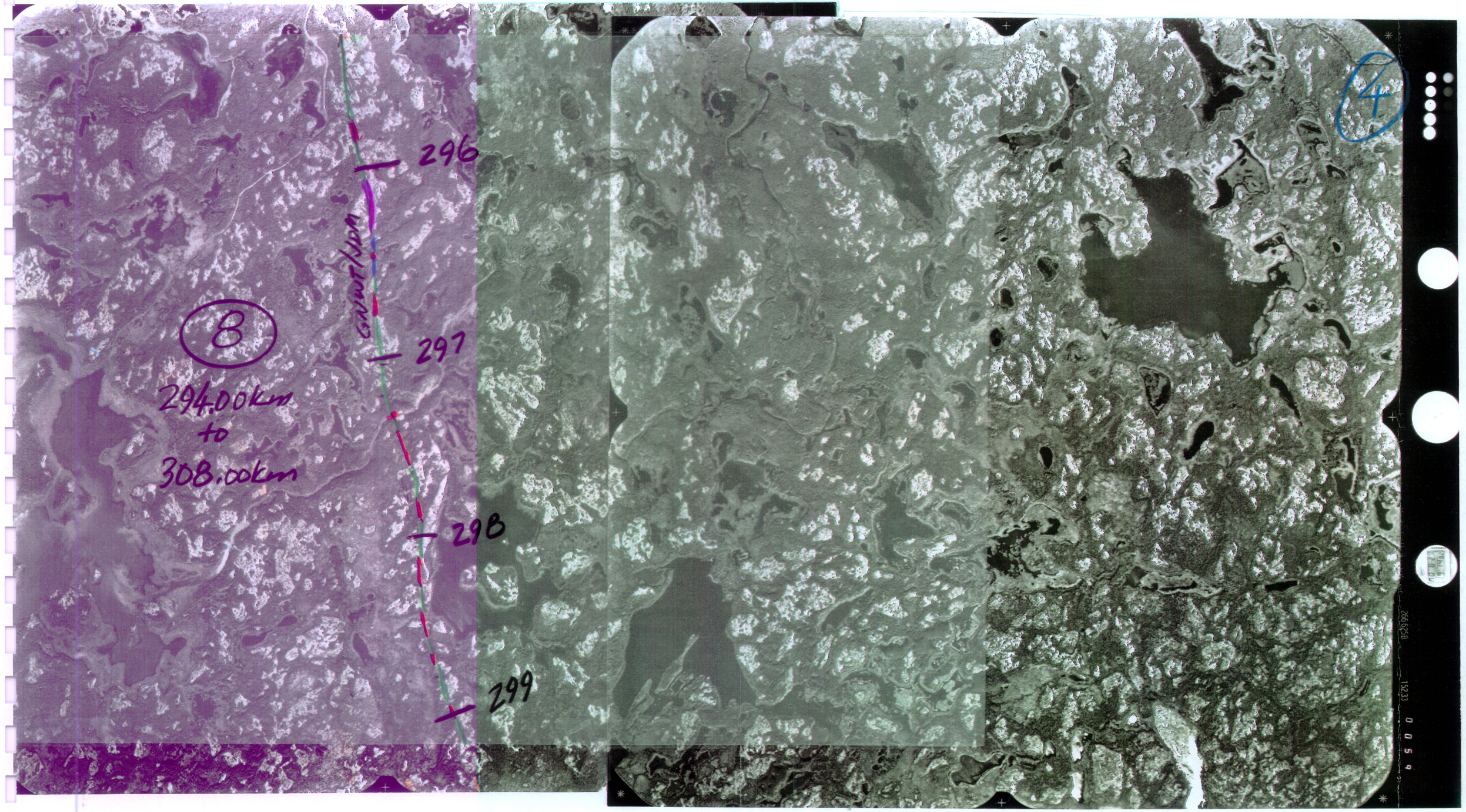
0 500 1000 1500 2000 m

J.D. Mollard and Associates Limited

January, 1995

FIGURE 2

SHEET 16 of 21



TERRAIN MAPPING LEGEND
(FOR 1:20,000 MOSAICS)

Symbol	Description
R_h (mauve)	Hummocky higher relief (commonly 2 to 8 m amplitude with 3 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_u (green)	Undulating lower relief (commonly around 2 m amplitude with 1 to 6 percent slopes) ice-abraded granitic bedrock. Ribbons of peat over lacustrine and alluvial (waterlaid) silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
R_s (yellow)	Sloping sidehill granitic bedrock slopes are expected to range from 2 to 10 percent. Ribbons of peat over lacustrine and alluvial waterlaid silt and fine sand, often too narrow to map, occur in linear depressions that follow eroded fractures in bedrock.
O_u (red)	Overburden soil materials are variable in thickness. Thickness of overburden (peat and underlying soil material) is largely related to bedrock relief.
	In lower relief (2 m) bedrock terrain, overburden thickness between bedrock exposures is expected to be thin, typically consisting of a very shallow organic cover (commonly moss 10 - 12 cm thick) underlain by dirty sand and gravel a metre or so thick over bedrock. Accordingly, this overburden cross-section is characteristically associated with the R_u terrain unit.
	In higher relief (5 to 8 m) bedrock terrain, the overburden between bedrock exposures can be highly variable in thickness (1 to 30 m), consisting of an organic cover of a metre or so and underlain by interbedded silt and very fine sand, the upper 3 or 4 metres of which contains up to 50 percent ground ice in permafrost locations. A thin, discontinuous lag of gravel and boulders may occur at the overburden over bedrock contact. This overburden situation is more common in the R_h terrain segments identified in the small-scale mosaics (Figure 1). [1]
W_s (blue)	Shallow ponded water, floodplains, and high water table areas. Permafrost is expected to be thawed in most of these areas, although some ice may remain, depending on the frequency of flooding.
S_g (brown)	Sand and gravelly sand that includes glacial-lake, glaciofluvial, alluvial, and wave-reworked shore deposits occurring on level to gently sloping terrain.

1) Consult Figure 1 for segments of R_h as it relates to comments on overburden thickness. Figure 2 mosaics also show R_h; but this designation on Figure 2 large scale mosaics relates more to centreline profile amplitude than to corridor macro topography. Thus, the Figure 1 R_h locations may be a better guide to use when generalizing about areas expected to have thicker overburden conditions.

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JDM	Other alternative route segments located and terrain mapped for analysis and comparison purposes (terrain not tallied because of time constraints).

TERRAIN MAPPING ALONG GNWT-SELECTED ROUTE IN CONNECTION WITH RECONSTRUCTION OF PROPOSED No. 3 HIGHWAY RAE-YELLOWKNIFE

0 500 1000 1500 2000m

J.D. Mollard and Associates Limited
January, 1995

FIGURE 2

SHEET 17 of 21

TABLES

TABLE 1

SUMMARY
AND
DETAIL OF TERRAIN UNIT LENGTHS
FOR
GNWT-SELECTED MAIN CORRIDOR AND LAKESHORE ROUTES
AND
VARIOUS ALTERNATIVE SEGMENTS

254-40 to 281.22 (SEC 3)

Km 270.00	Rh	Ru	Rs	Ou	W
" .10				0.10	
" .30			0.20		
" .55				0.25	
" .63	0.07				
" .75				0.12	
" .83	0.08				
" .90				0.07	
271 .00	0.10				
" .05				0.05	
" .10			0.05		
" .15				0.05	
" .20		0.05			
" .30				0.10	
" .50	0.20				
" .58				0.08	
" .65		0.07			
" .70				0.05	
" .75	0.05				
" .80				0.05	
" .95	0.15				
272 .00				0.05	
272 .15	0.15				
" .22				0.07	
" .36	0.14				
" .50				0.14	
" .60	0.10				
" .70					0.10
" .80	0.10				
" .90				0.10	
" .95	0.05				
273 .00				0.05	
" .15	0.15				
" .30			0.15		
" .50				0.20	
" .58		0.08			
" .68				0.10	
" .80		0.12			
" .90			0.10		
274 .00				0.10	
" .03		0.03			
" .10				0.07	
" .30		0.20			
" .40				0.10	
" .50					0.10
" .52				0.02	
" .60		0.08			
" .70				0.10	
" .80	0.10				
" .83				0.03	
" .90	0.07				
" .95				0.05	
275 .02	0.07				
" .15				0.13	
276 .00	0.85				
" .15				0.15	
" .40		0.25			
" .48				0.08	
" .50		0.02			
" .55				0.05	
" .80		0.25			
" .90				0.10	
277 .23		0.33			
" .28				0.05	
" .42		0.14			
7.42	2.43	1.62	0.50	2.66	0.20

Km 277.42	Rh	Ru	Rs	Ou	W
" .50				0.08	
" .56		0.06			
" .62				0.06	
" .82		0.20			
278 .16				0.34	
" .26		0.10			
" .36				0.10	
" .42		0.06			
" .48				0.06	
" .51		0.03			
" .55				0.04	
" .65	0.10				
" .98				0.33	
279 .03		0.05			
279 .18				0.15	
" .25	0.07				
" .38				0.13	
" .50	0.12				
" .58				0.08	
" .69		0.11			
" .73				0.04	
" .86		0.13			
280 .05				0.19	
" .20	0.15				
" .25				0.05	
" .56	0.31				
" .60		0.04			
" .68				0.08	
" .70		0.02			
" .76				0.06	
" .82		0.06			
" .98				0.16	
281 .22		0.24	(SOUTH ALT)		
3.80	0.75	1.10		1.95	

(SEC 4) SOUTH ROUTE 281.22 to 294.00

Km 281.22	Rh	Ru	Rs	Ou	W
" .30				0.08	
" .33		0.03			
" .40				0.07	
" .75		0.35			
" .85				0.10	
282.00		0.15			
" .35				0.35	
" .40		0.05			
" .52				0.12	
283.00		0.48			
" .05				0.05	
" .22		0.17			
" .49				0.27	
" .53		0.04			
" .60				0.07	
" .80		0.20			
" .90				0.10	
284.15		0.25			
" .25				0.10	
" .49		0.24			
" .55				0.06	
" .80		0.25			
285.00				0.20	
" .15		0.15			
" .25				0.10	
" .55		0.30			
" .60				0.05	
" .70		0.10			
" .78				0.08	
" .86		0.08			
286.05				0.19	
" .25		0.20			
" .35				0.10	
" .60		0.25			
" .65				0.05	
" .70		0.05			
" .90				0.20	
287.05		0.15			
5.83		3.49		2.34	

Km 287.05	Rh	Ru	Rs	Ou
287.10				0.05
" .20		0.10		
" .30				0.10
" .60		0.30		
" .80				0.20
" .90		0.10		
288.05				0.15
" .10		0.05		
" .13				0.03
" .16		0.03		
" .20				0.04
" .55		0.35		
" .60				0.05
" .70		0.10		
" .75				0.05
" .80		0.05		
289.00				0.20
" .05		0.05		
" .15				0.15
" .28		0.13		
" .30				0.02
" .33		0.03		
" .36				0.03
" .42		0.06		
" .50				0.08
" .60		0.10		
" .75				0.15
" .80		0.05		
" .84				0.04
290.00		0.16		
" .25				0.25
" .45		0.20		
" .70				0.25
" .90		0.20		
291.00				0.10
" .05		0.05		
" .10				0.05
" .20		0.10		
" .30				0.10
" .46		0.16		
" .75				0.29
292.00		0.25		
" .35				0.35
" .40		0.05		
" .60				0.20
" .80		0.20		
" .90				0.10
293.20		0.30		
" .35				0.15
" .38		0.03		
" .45				0.07
" .95		0.50		
294.00				0.05
6.95		3.65		3.30

(SEC5) NORTH ROUTE 281.22 to 293.50

Km 281.22	Rh	Ru	Rs	Ou	W
281.50				0.28	
" .80		0.30			
282.00				0.20	
" .15		0.15			
" .35				0.20	
" .58		0.23			
" .70				0.12	
" .78		0.08			
" .80				0.02	
" .90		0.10			
" .95				0.05	
283.00		0.05			
" .05				0.05	
" .50		0.45			
" .60				0.10	
" .67		0.07			
" .75				0.08	
" .80		0.05			
" .88				0.08	
284.05		0.17			
" .10				0.05	
" .20		0.10			
" .30				0.10	
" .45		0.15			
" .55				0.10	
285.10		0.55			
" .20				0.10	
" .32		0.12			
" .44				0.12	
" .52		0.08			
" .65				0.13	
" .85		0.20			
286.10				0.25	
" .40		0.30			
" .45				0.05	
" .73		0.28			
" .83				0.10	
" .90		0.07			
287.00				0.10	
" .25		0.25			
" .40				0.15	
" .60		0.20			
" .68				0.08	
" .70		0.02			
" .75				0.05	
" .80		0.05			
288.00				0.20	
" .02		0.02			
" .06				0.04	
" .10		0.04			
" .18				0.08	
" .20		0.02			
" .26				0.06	
" .32		0.06			
" .38				0.06	
" .55		0.17			
" .63				0.08	
" .66		0.03			
" .80				0.23	
" .95		0.06			
289.00				0.05	
7.78		4.42		3.36	

Km 289.00	Rh	Ru	Rs	Ou	W
289.15		0.15			
" .20				0.05	
" .40		0.20			
" .52				0.12	
" .60		0.08			
" .68				0.08	
" .80		0.12			
290.10				0.30	
" .20		0.10			
" .46					0.26
" .55				0.09	
" .65		0.10			
" .80				0.15	
" .95		0.15			
291.15				0.20	
" .30		0.15			
" .65				0.35	
" .70		0.05			
" .85				0.15	
" .90		0.05			
292.05				0.15	
" .15		0.10			
" .20				0.05	
" .35		0.15			
" .40				0.05	
" .55		0.15			
" .60				0.05	
" .65		0.05			
" .70				0.05	
" .90		0.20			
" .95				0.05	
.98		0.03			
293.00				0.02	
.45		0.45			
.50				0.05	
4.50		2.28		1.96	0.26

294.00 to 316.6 (SEC 6)

Km 294.00	Rh	Ru	Rs	Ou	W
294.10		0.10			
" .25				0.15	
" .42		0.17			
" .60				0.18	
" .70		0.10			
295.00				0.30	
" .15					0.15
" .20				0.05	
" .25		0.05			
" .36				0.11	
" .45					0.09
296.00		0.55			
" .12					0.12
297.15		1.03			
" .20				0.05	
" .30		0.10			
" .43				0.13	
" .52		0.09			
" .65					0.13
" .70				0.05	
" .80	0.10				
" .91		0.11			
298.00				0.09	
" .05		0.05			
" .10	0.05				
" .15		0.05			
" .25	0.10				
" .32		0.07			
" .42				0.10	
" .46		0.04			
" .55				0.09	
" .65		0.05			
" .75	0.10				
" .85				0.10	
" .90					0.05
299.03	0.13				
" .10					0.07
" .15		0.05			
" .20					0.05
" .30	0.10				
" .42					0.12
" .60	0.18				
" .65					0.05
" .70		0.05			
" .85				0.15	
300.20		0.35			
" .35				0.15	
" .40		0.05			
" .60				0.20	
" .65					0.05
" .75				0.10	
" .90		0.15			
" .95				0.05	
301.03		0.08			
7.03	0.76	3.29		2.10	0.88

Km 301.03	Rh	Ru	Rs	Ou	W
301.25				0.22	
" .50		0.25			
" .58				0.08	
" .61					0.03
" .71	0.10				
" .74		0.03			
" .80				0.06	
" .83		0.03			
" .92				0.09	
" .96		0.04			
302.20				0.24	
" .25	0.05				
" .30					0.05
" .36				0.06	
" .43	0.07				
" .50					0.07
" .60				0.10	
" .90	0.30				
303.03		0.13			
" .25				0.22	
" .50	0.25				
304.00		0.50			
" .20	0.20				
" .40				0.20	
" .56		0.16			
" .80	0.24				
" .88				0.08	
" .90		0.02			
305.02	0.12				
" .06				0.04	
" .10		0.04			
" .45				0.35	
" .62		0.17			
" .72				0.10	
" .78		0.06			
" .88				0.10	
" .90		0.02			
" .95				0.05	
306.05		0.10			
" .15				0.10	
" .20	0.05				
" .25				0.05	
" .30		0.05			
" .40				0.10	
" .45		0.05			
" .50				0.05	
" .60	0.10				
" .80		0.20			
" .95	0.15				
307.00				0.05	
" .06		0.06			
" .10				0.04	
" .25		0.15			
" .35				0.10	
" .48		0.13			
" .55	0.07				
" .65				0.10	
" .75					0.10
" .90				0.15	
" .95		0.05			
308.12	0.17				
7.09	1.87	2.24		2.73	0.25

(7)

294.00 to 316.6 (SEC 6)

Km 308.12	Rh	Ru	Rs	Ou	W
308·22				0.10	
" ·42		0.22			
" ·48				0.06	
" ·52		0.04			
" ·56				0.04	
" ·85		0.29			
" ·88				0.03	
" ·90		0.02			
309·00				0.10	
" ·20		0.20			
" ·25				0.05	
" ·35		0.10			
" ·40				0.05	
" ·50		0.10			
" ·68				0.18	
" ·70		0.02			
" ·82				0.12	
310·00		0.18			
" ·10				0.10	
" ·20		0.10			
" ·45				0.25	
" ·50		0.05			
" ·60	0.10				
" ·70				0.10	
311·00		0.30			
" ·15				0.15	
" ·40		0.25			
" ·50					0.10
" ·70	0.20				
" ·85		0.15			
312·00	0.15				
" ·10				0.10	
" ·25	0.15				
" ·30				0.05	
" ·46		0.16			
" ·52				0.06	
" ·58		0.06			
" ·62				0.04	
" ·76		0.14			
" ·85				0.09	
313·00		0.15			
" ·10				0.10	
" ·20		0.10			
" ·40				0.20	
" ·55		0.15			
" ·72				0.17	
" ·90		0.18			
" ·92				0.02	
" ·96		0.04			
314·00				0.04	
" ·08		0.08			
" ·15				0.07	
" ·22		0.07			
" ·30				0.08	
" ·50		0.20			
" ·65				0.15	
" ·85	0.20				
315·00					0.15
6.88	0.80	3.33		2.50	0.25

Km 315.00	Rh	Ru	Rs	Ou	W
315·05				0.05	
" ·60	0.55				
" ·70		0.10			
" ·80	0.10				
" ·85				0.05	
" ·90		0.05			
316·05				0.15	
" ·20	0.15				
" ·35				0.15	
" ·45	0.10				
" ·50				0.05	
" ·60		0.10			
1.60	0.90	0.25		0.45	

316.60 to 329.60 (SEC 7)

Km 316.60	Rh	Ru	Rs	Ou	W	Sg
" .85				0.25		
" .88		0.03				
317.00				0.12		
" .10		0.10				
" .20	0.10					
" .25		0.05				
" .30				0.05		
" .40	0.10					
" .55				0.15		
" .75		0.20				
" .85				0.10		
" .95		0.10				
318.00				0.05		
" .20	0.20					
" .70				0.50		
" .73		0.03				
319.40	0.67					
" .46				0.06		
" .64		0.18				
" .80	0.16					
320.50				0.70		
" .53		0.03				
" .65				0.12		
" .83		0.18				
321.05				0.22		
" .15		0.10				
" .32				0.17		
" .35		0.03				
" .42				0.07		
" .44		0.02				
" .50				0.06		
" .80		0.30				
322.10				0.30		
" .55		0.45				
" .60				0.05		
" .70		0.10				
" .80				0.10		
" .90		0.10				
" .95				0.05		
323.00		0.05				
323.08				0.08		
" .18		0.10				
" .25				0.07		
" .32	0.07					
" .50				0.18		
" .52		0.02				
" .60				0.08		
" .80		0.20				
" .95				0.15		
324.05		0.10				
" .10				0.05		
" .13	0.03					
" .30		0.17				
" .35	0.05					
" .40				0.05		
" .45		0.05				
" .50				0.05		
" .70	0.20					
" .85				0.15		
" .90		0.05				
325.00				0.10		
8.40	1.58	2.74		4.08		

Km 325.00	Rh	Ru	Rs	Ou	W	Sg
" .20			0.20			
" .30				0.10		
" .40		0.10				
" .50				0.10		
" .60		0.10				
" .65				0.05		
" .70		0.05				
326.10				0.40		
" .25		0.15				
" .40				0.15		
" .65		0.25				
" .90				0.25		
327.00	0.10					
" .10				0.10		
" .35					0.25	
" .65				0.30		
" .70		0.05				
328.05				0.35		
" .40						0.35
" .80						0.40
329.10				0.30		
" .60						0.50
4.60	0.10	0.70	0.20	2.10	0.25	1.25

LAKE ROUTE 294 to 308 (SEC 8)

Km	Rh	Ru	Rs	Ou	W	Sg
•						
293.00	NORTH ROUTE TIE TO					
" .12				0.12		
" .20		0.08				
" .40				0.20		
" .60		0.20				
" .80				0.20		
•						
•						
293.00	SOUTH ROUTE TIE TO LA					
" .15		0.15				
" .40				0.25		
" .48		0.08				
" .56				0.08		
" .66		0.10				
" .70				0.04		
" .85		0.15				
294.00				0.15		
•						
•						
•						
•						
294.00	LAKE ROUTE 294					
" .05				0.05		
" .25		0.20				
" .45				0.25		
" .90		0.45				
295.00				0.10		
" .06		0.06				
" .12				0.06		
" .70		0.58				
" .84				0.14		
296.00		0.16				
" .38	0.38				0.07	
" .45						
" .48				0.03		
" .56					0.08	
" .65		0.09				
" .78				0.13		
297.30		0.52				
" .33				0.03		
" .40		0.07				
" .60				0.20		
" .80		0.20				
" .90				0.10		
298.10		0.20				
" .28				0.18		
" .40		0.12				
" .55				0.15		
" .65		0.10				
" .70				0.07		
" .95		0.25				
299.00				0.05		
" .45		0.45				
" .55						0.10
" .58				0.03		
" .75						0.17
" .95		0.20				
300.08				0.13		
	0.38	4.06		2.22	0.15	0.27

Km 300.08	Rh	Ru	Rs	Ou	W	Sg
300.12		0.04				
" .18				0.06		
" .22		0.04				
" .32				0.10		
" .38		0.06				
" .42				0.04		
" .50		0.08				
" .60						0.10
" .62		0.02				
" .72				0.10		
" .80					0.08	
" .85		0.05				
301.00						0.15
" .15				0.15		
" .25					0.10	
" .30		0.05				
" .40				0.10		
" .45		0.05				
" .50				0.05		
" .57		0.07				
" .60				0.03		
" .63		0.03				
" .70				0.07		
" .75		0.05				
" .85					0.10	
302.00		0.15				
" .06				0.06		
" .16					0.10	
" .18		0.02				
" .20				0.02		
" .30		0.10				
" .32				0.02		
" .50		0.18				
" .55						0.05
" .60		0.05				
" .70						0.10
" .75		0.05				
" .80						0.05
303.00		0.20				
" .08						0.08
" .20		0.12				
" .30						0.10
" .33	0.03					
" .50					0.17	
" .54						0.04
" .56		0.02				
" .60						0.04
" .72		0.12				
" .78						0.06
" .92		0.14				
304.00						0.08
" .20		0.20				
" .28						0.08
" .35		0.07				
" .53						0.18
" .60		0.07				
" .70				0.10		
" .90			0.20			
305.00						0.10
	0.03	2.03	0.20	0.90	0.55	1.21

LAKE ROUTE 294 to 308 (SEC 8)

Km 305.00	Rh	Ru	Rs	Ou	W	Sg
305.10		0.10				
" .18	0.08					
" .20		0.02				
" .25				0.05		
" .50		0.25				
" .56						0.06
" .78		0.22				
305.85				0.07		
306.95		1.10				
307.00				0.05		
" .05		0.05				
" .12	0.07					
" .55		0.43				
" .70				0.15		
" .85	0.15					
308.00				0.15		
	0.30	2.17		0.47		0.06

LAKE ROUTE 308 to 316.00 (SEC 9)

Km 308.00	Rh	Ru	Rs	Ou	W	Sg
308.00		SOUTH ROUTE A				
" .15			0.15			
" .22		0.07				
" .30				0.08		
" .42		0.12				
" .55			0.13			
" .67	0.12					
" .80				0.13		
" .85		0.05				
309.00					0.15	
" .15		0.15				
" .25				0.10		
" .30		0.05				
" .40				0.10		
" .45		0.05				
" .50				0.05		
" .72		0.22				
" .80	0.08					
" .83		0.03				
" .93	0.10					
310.00		0.07				
" .20	0.20					
" .40				0.20		
" .65	0.25					
" .80				0.15		
" .90		0.10				
311.10				0.20		
" .33		0.23				
" .40				0.07		
" .50		0.10				
" .62				0.12		
" .70		0.08				
" .80				0.10		
" .86		0.06				
312.00				0.14		
" .20	0.20					
" .35				0.15		
" .60		0.25				
" .70					0.10	
" .75	0.05					
" .85				0.10		
" .90		0.05				
313.00				0.10		
313.05		0.05				
" .60	0.55					
" .62		0.02				
" .68				0.06		
" .70		0.02				
" .88	0.18					
" .92				0.04		
314.00		0.08				
" .05				0.05		
" .25	0.20					
" .30				0.05		
" .35	0.05					
" .40				0.05		
" .66	0.26					
" .76				0.10		
" .80		0.04				
" .85				0.05		
" .95		0.10				
315.18				0.23		
" .28		0.10				
" .35				0.07		
" .50		0.15				
" .55				0.05		
316.00		0.45				
	2.24	2.69	0.28	2.54	0.25	

(SEC 11) LAKE ROUTE 316.00 to 322.7

Km 316.00	Rh	Ru	Rs	Ou	W	Sg
" .05		0.05				
" .10				0.05		
" .15		0.05				
" .28				0.13		
" .68		0.40				
" .85	0.13					
317.15		0.30				
" .20				0.05		
" .48		0.28				
" .60				0.12		
" .73		0.13				
" .85	0.12					
" .93				0.08		
318.00		0.07				
" .10				0.10		
" .20	0.10					
" .30				0.10		
" .45	0.15					
" .55				0.10		
" .70	0.15					
" .75		0.05				
" .80				0.05		
319.00		0.20				
" .05		0.05				
" .20					0.15	
" .77		0.57				
" .85				0.08		
320.10		0.25				
320.15				0.05		
" .25					0.10	
" .30				0.05		
" .40	0.10					
" .50				0.10		
" .65	0.15					
" .70				0.05		
321.02	0.32					
" .15				0.13		
" .40	0.25					
" .48				0.08		
" .51	0.03					
" .55				0.04		
" .65		0.10				
" .73				0.08		
" .85	0.12					
322.00				0.15		
" .10		0.10				
" .20				0.10		
" .23		0.03				
" .40				0.17		
" .46		0.06				
" .58				0.12		
322.20		0.12				
	1.62	2.85		1.98	0.25	

LAKE ROUTE 308.00 to 316.20 (NORTH ALTERNATE)
(SEC 10)

Km 308.00	Rh	Ru	Rs	Ou	W	Sg
" .15	0.15		NORTH ROUTE			
" .25				0.10		
" .28		0.03				
" .38				0.10		
" .40		0.02				
" .60	0.20					
" .63		0.03				
" .95				0.32		
309.00		0.05				
" .10	0.10					
" .20				0.10		
" .30		0.10				
" .35				0.05		
" .40		0.05				
" .50				0.10		
" .70		0.20				
" .80				0.10		
310.00		0.20				
" .08				0.08		
" .25		0.17				
" .35				0.10		
" .40		0.05				
" .50				0.10		
" .65		0.15				
" .70				0.05		
" .90		0.20				
311.00				0.10		
" .05		0.05				
" .30				0.25		
" .40		0.10				
" .48	0.08					
" .55				0.07		
" .65		0.10				
" .70				0.05		
" .85	0.15					
" .95				0.10		
312.00		0.05				
" .15				0.15		
" .35	0.20					
" .50				0.15		
" .75		0.25				
" .85					0.10	
" .90	0.05					
313.10				0.20		
" .35		0.25				
" .48	0.13					
" .68		0.20				
" .83	0.15					
" .88				0.05		
" .95		0.07				
314.00				0.05		
" .10		0.10				
" .13				0.03		
" .30		0.17				
" .35				0.05		
315.10		0.75				
" .20				0.10		
" .30		0.10				
" .40				0.10		
" .55		0.15				
" .60				0.05		
316.20		0.60				
	1.06	4.16		2.70	0.10	

(SEC 12) ROUTE 305.00 to 330.00km

Km 305.00	Rh	Ru	Rs	Ou	W	Sg
305.20		0.20				
" .40				0.20		
" .60		0.20				
" .80				0.20		
306.00		0.20				
" .30				0.30		
" .60		0.30				
" .70				0.10		
307.10		0.40				
" .30				0.20		
" .50		0.20				
308.00				0.50		
" .20	0.20					
" .70				0.50		
" .80	0.10					
309.00				0.20		
" .20	0.20					
" .50				0.30		
" .70	0.20					
310.00				0.30		
312.60	2.60					
" .80				0.20		
314.70	1.90					
315.60			0.90			
" .70				0.10		
" .80		0.10				
" .90				0.10		
316.30		0.40				
" .50				0.20		
" .60		0.10				
" .80				0.20		
317.00		0.20				
" .20				0.20		
" .50		0.30				
" .70				0.20		
318.30		0.60				
" .70				0.40		
319.40		0.70				
" .50				0.10		
320.00	0.50					
" .30				0.30		
" .80		0.50				
321.40				0.60		
" .90		0.50				
322.10				0.20		
323.00		0.90				
" .20				0.20		
" .40		0.20				
" .90				0.50		
326.50		2.60				
" .60				0.10		
327.60	1.00					
328.00				0.40		
" .30	0.30					
" .50						0.20
329.00				0.50		
330.00						1.00
25.00	7.00	8.60	0.90	7.30		1.20

(SEC 13) ROUTE 305 to 327.5 Km

Km 305.00	Rh	Ru	Rs	Ou	W	Sg
305.20		0.20				
" .40				0.20		
" .60		0.20				
" .80				0.20		
306.00		0.20				
" .30				0.30		
" .60		0.30				
" .70				0.10		
307.10		0.40				
" .30				0.20		
" .50		0.20				
" .90				0.40		
308.70		0.80				
" .80				0.10		
309.40		0.60				
" .50				0.10		
" .60		0.10				
" .80				0.20		
311.50	1.70					
" .70				0.20		
" .80	0.10					
312.00				0.20		
" .20	0.20					
" .30				0.10		
" .60	0.30					
313.00				0.40		
" .50	0.50					
" .70				0.20		
314.10	0.40					
" .30				0.20		
" .50	0.20					
" .70				0.20		
" .90	0.20					
315.00				0.10		
" .50	0.50					
" .60				0.10		
" .80	0.20					
316.00				0.20		
" .60		0.60				
" .80				0.20		
317.00		0.20				
" .20				0.20		
" .80		0.60				
318.00				0.20		
319.30		1.30				
" .50				0.20		
" .60		0.10				
" .80				0.20		
320.50		0.70				
" .70				0.20		
321.00		0.30				
" .10				0.10		
" .20		0.10				
" .30				0.10		
322.00		0.70				
" .10				0.10		
" .50		0.40				
" .60				0.10		
" .70		0.10				
" .80	0.10					
17.80	4.40	8.10		5.30		

Km 322.80	Rh	Ru	Rs	Ou	W	Sg
323.30		0.50				
" .40				0.10		
" .50		0.10				
" .60				0.10		
" .70		0.10				
324.00				0.30		
" .20	0.20					
" .40		0.20				
" .50				0.10		
" .60	0.10					
" .90		0.30				
325.00				0.10		
" .60		0.60				
" .70				0.10		
" .80		0.10				
236.00				0.20		
" .30		0.30				
" .40	0.10					
" .50				0.10		
" .60		0.10				
" .70				0.10		
327.00		0.30				
" .10				0.10		
" .50						0.40
4.70	0.40	2.60		1.30		0.40

TABLE 2

SUMMARY
OF
ROCK/NON-ROCK PERCENTAGES
ALONG

1) GNWT-SELECTED MAIN CORRIDOR ROUTE (FIGURE 2)
2) GNWT-SELECTED LAKESHORE SEGMENT (FIGURE 2)
3) JDM&A ALTERNATIVE ROUTE SEGMENT KM 242.4-
   KM 255.9 (FIGURE 2)
4) JDM&A ALTERNATIVE SEGMENT APPROXIMATELY KM 305
   TO YELLOWKNIFE (FIGURE 1, 1:60,000 MOSAICS)

TABLE 2
ROCK/NON-ROCK PERCENTAGES ON VARIOUS RATE SEGMENTS (FROM FIGURE 2 MOSAICS)

ROUTE SEGMENT DESCRIPTION	LENGTH OF ROCK TERRAIN (KMS)	TOTAL ROUTE SEGMENT LENGTH (KMS)	PERCENTAGE ROCK	PERCENTAGE NON-ROCK
GNWT-selected main corridor route (using GNWT south alternative segment commencing km 281) (*See* figure 2 mosaics)	47.18	87.2	54.1	45.9
GNWT-selected main corridor route (using north alternative segment commencing near km 281) (*See* Figure 2 mosaics)	46.74	86.7	53.9	46.1
GNWT-selected lakeshore route (*See* Figure 2 mosaics)	51.86	93.3	55.6	44.4
JDM&A alternative route segment km 242.6 to km 255.9 (northerly alternative) (*See* Figure 2 mosaics)	8.74	13.5	64.7	35.3
JDM&A alternative segments from approximately km 305-330 versus km 305-327.5 (*See* Figure 1 high-level mosaics)	15.6 15.5	25.0 22.5	66.0[3] 68.8	34.0 31.2

[3] Percentages may be elevated somewhat because of take-off from Figure 1 at the 1:60,000 scale as opposed to 1:20,000 scale. At the 1:60,000 scale the short muskeg segments cannot be mapped. But the two figures, 66.0 and 68.8, should still provide a good comparison in a relative sense, there being little difference in bedrock terrain percentage.

TABLE 3

GEOMETRIC STANDARDS

TABLE 3

GEOMETRIC STANDARDS

DESIGN PARAMETERS

In view of its role as the road to the Territorial capital and the main artery for the resupply effort to activities and communities north of Yellowknife, Highway 3 is classified as Rural Arterial Undivided (RAU 100). Reconstruction of the highway will meet the following standards: *(current characteristics in italics)*

Design Speed: 110 km/hr (posted speed of 100 kph) *(90 km/hr)*
Lane width: 3.5 m *(<3.5 m)* Shoulder width: 1.5 m *(0)*
Total useable width (ultimate): 10.0 m *(<7.0 m)*
Formation width at AST surface: 11.9m
Closest obstruction @ 13.5 m min. from centreline *(4.0 m)*
Maximum grade: 6%; Minimum k (sag/crest): 55/85
Maximum superelevation: 6% Desirable: 4% *(7-12%)*
Crossfall: 3% Sideslopes: 3:1
Ditch cross-slope: 10:1 Ditch width 5.0m

Minimum curve radius: 530 m Desirable: 1000+ m *(<250 m)*
Minimum sight distance: 330 m Desirable: 430 m *(<170 m)*

Depth of base (<20mm crush): 75mm
Depth of sub-base (<60mm crush): 200mm

The existing road has an excessive number of curves as a consequence of its alignment to avoid rock outcrops along the route. With reconstruction, the design alignment will reduce the number and severity of the curves and maximize the length built on rock to provide a stable base for the paved surface.

END OF REPORT