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GEOCRES No. 3165-157

DIST. 9 REGION

W.P. No. 11-81-05

CONT. No. 93-62

W. O. No.

STR. SITE No.

HWY. No. 17

LOCATION Service Rd. Adjacent to Hwy 17

No of PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

G.I.-30 SEPT. 1976

(613) 545-4751

Mr. D. Kimmett
Head, Planning & Design
Eastern Region, Kingston

November 17, 1989

FROM: Regional Geotechnical Section
Eastern Region, Kingston

RE: W.P. 11-81-01, Champlain Street
Highway # 17

Several meetings had been held in the months of October and November 1989 between the Regional Geotechnical, Planning & Design and Construction Sections/Office to discuss the feasibility of using rock borrow in lieu of earth borrow. The following are found:

1. Construction - Placing of rock borrow can be carried out in inclement weather with no deterimental effect to the final product. It is beneficial to this project where the construction completion date is critical.

2. Environmental - Rock borrow will minimize the potential contamination of the watercourse at the culvert locations.

3. Property - verbal recommendation was received from the Foundation Section that if rock borrow is used, the fill slope along the Service Road only can be reduced to 1.5:1 instead of the earth slope of 2:1. This will minimize the property concerns as well as the culverts length.

4. Cost - The use of rock borrow ($ 4.05 per tonne) will be approximately $ 60,000.00 more expensive than the earth borrow ($ 3.25 per tonne). This cost difference is considered insignificant out of this multi-million dollar project.

Based on the above findings, it is recommended that rock borrow be used in this project.

The usage of the acceptable and unacceptable earth material generated from the cuts within this project limits will be determined after the final cross-section, construction staging, etc. have been reviewed.

Should you require further information/clarification, please contact this section.

Original Signed
by

Samuel Cheng
Head, Geotechnical Section

SC/dka
c.c.: E. Zavitski
M. Devata ✓

memo

To: File   83.11.14

Re: WP 11-81-05
Service Road

Sam Chang of E.R. Probert called to ask if 1.5:1 slopes with berms ok if rock fill used instead of 50% fill.

M. Quatt and O. Quinlan reviewed conditions and agreed that it would be OK. It is noted that berms are still required.

M. Quatt advised Sam Chang.

O. Quinlan
Sr. Res. Eng.

memorandum

Ontario

To: Mr. T.W. Murphy
Head, Geotechnical Section
Eastern Region

Date: 1989 04 11

GEOCRES # 31G5-157

Attn: D. McLay

From: Foundation Design Section
Room 315, Central Building

RE: Jeanne D'Arc Boulevard Extension
WP 11-81-05 ~~W.P. 89-11002~~, Site N/A
District 9, Ottawa CONT 93-62

Further to your request for recommendations for the design of the proposed extension of Jeanne D'Arc Boulevard:

It is our understanding that M.T.O. will design and construct (on behalf of the municipality) an extension for Jeanne D'Arc Boulevard extending from approximately 1200 m east of Champlain Avenue, easterly to Naven Road (estimated 2 km). The extensions will be roughly parallel to and 600 m north of Hwy 17, skirting the edge of the Ottawa River flood plain. The extension will require cuts up to 3 m deep at some areas and fills up to 8 m high over existing valleys.

During our site visit of March 6, 1989, we agreed that, due to scheduling constraints and the time that would be required to conduct a foundation investigation, the recommendations for this project would be based on existing subsurface information along the adjacent Hwy. 17.

Based on the existing subsurface information, the material beneath the proposed extension route is expected to be composed of firm to stiff clay with very high sensitivity. The thickness of this deposit is expected to be over 10 m. Where it is above the prevailing groundwater table, the clay has an upper 3 m slightly desiccated crust with undrained shear strengths in the order of 80 kPa, plastic limits of 20%, liquid limits of 60% and moisture contents of 40%. Below the crust the undrained shear strength drops to 40 kPa, then increases proportionally with depth to 80 kPa within 10 m of the surface. This zone has plastic and liquid limits similar to the crust, but water contents in the order of 50%. The clay is underlain by limestone bedrock dipping towards the east. The bedrock is typically overlain by a thin layer of sand which is charged with relatively high artesian pressure. The upper 1 m of material in the valleys is often very soft and contains organics.

.../2

It is proposed to construct the embankments with the more desiccated crust portion of the native clay deposit. Historically, this material has been used to construct the Hwy. 17 embankments in this area. Although the clay is not a preferred construction material because of its high plasticity and poor drainage characteristics, it has performed adequately as a fill material except for some surficial stability and settlement problems. However, with this type of material compaction will be important. Normally, for clays such as this with plasticity indices over 7%, moisture content is restricted to 3% over optimum as defined by Proctor requirements.

Stability analyses in terms of both total and effective stresses were carried out for typical embankment geometries for W.P. 11-81-01 (B) and have been referenced for embankment design at the Jeanne D'Arc Boulevard site. Based on these analyses, 2H:1V slopes up to 6 m high will be stable against deep-seated failure. For slope heights in excess of 6 m, berms will be required with widths as illustrated in Figure 1. If the embankments are constructed with cohesive material, the surface of the slopes should be treated with 1 m thick granular blankets consisting of rock fill or suitable free-draining granular material. This treatment is illustrated in Figure 2. These recommendations apply to both cuts and fills in excess of 3 m high.

Settlement analyses have been carried out for W.P. 11-81-01 (B) and based on these calculations settlements along the proposed extension are expected to be in the order of 6% of the fill height. Since it is proposed to preload the extension for a period of 1 year before paving, these settlements are not expected to pose a problem.

Since the clay is extremely sensitive, to the extent that its remolded strength is often less than 10% of its undisturbed strength, the material should be disturbed as little as possible during construction. This is especially important below the crust zone. Hence, consideration should be giving to minimizing cuts while planning the grade for the extension.

In view of the anticipated soft conditions in valleys, it is recommended that the upper 1 m of the valley floor should be subexcavated and replaced with rock fill or free-draining granular material. This rock fill/granular material should extend for all fills below the prevailing groundwater elevation and a minimum of 1 m above the natural ground surface in order to facilitate drainage.

If there are any questions, please advise.

D.H. Dundas

D.H. Dundas, P. Eng.
Senior Foundation Engineer

DHD/ms

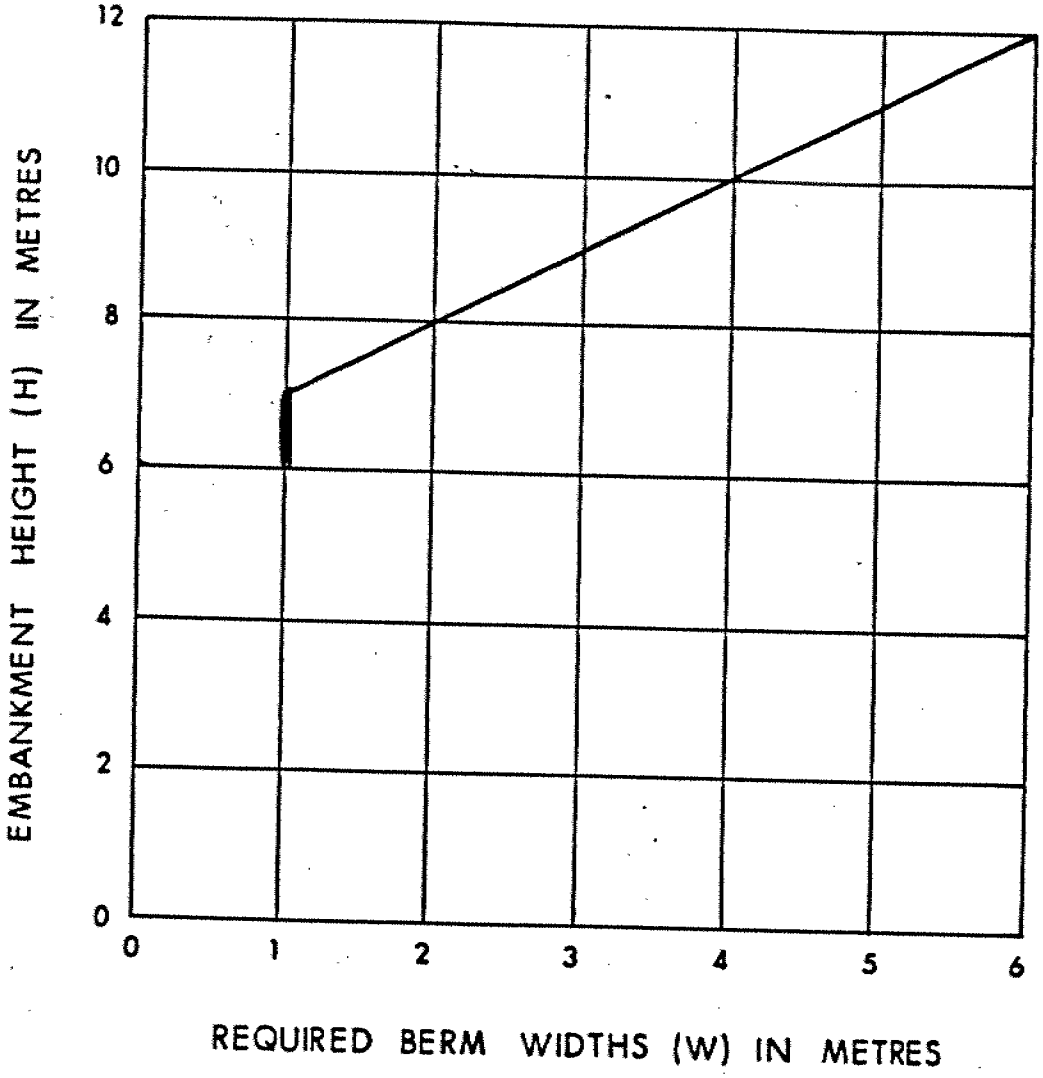
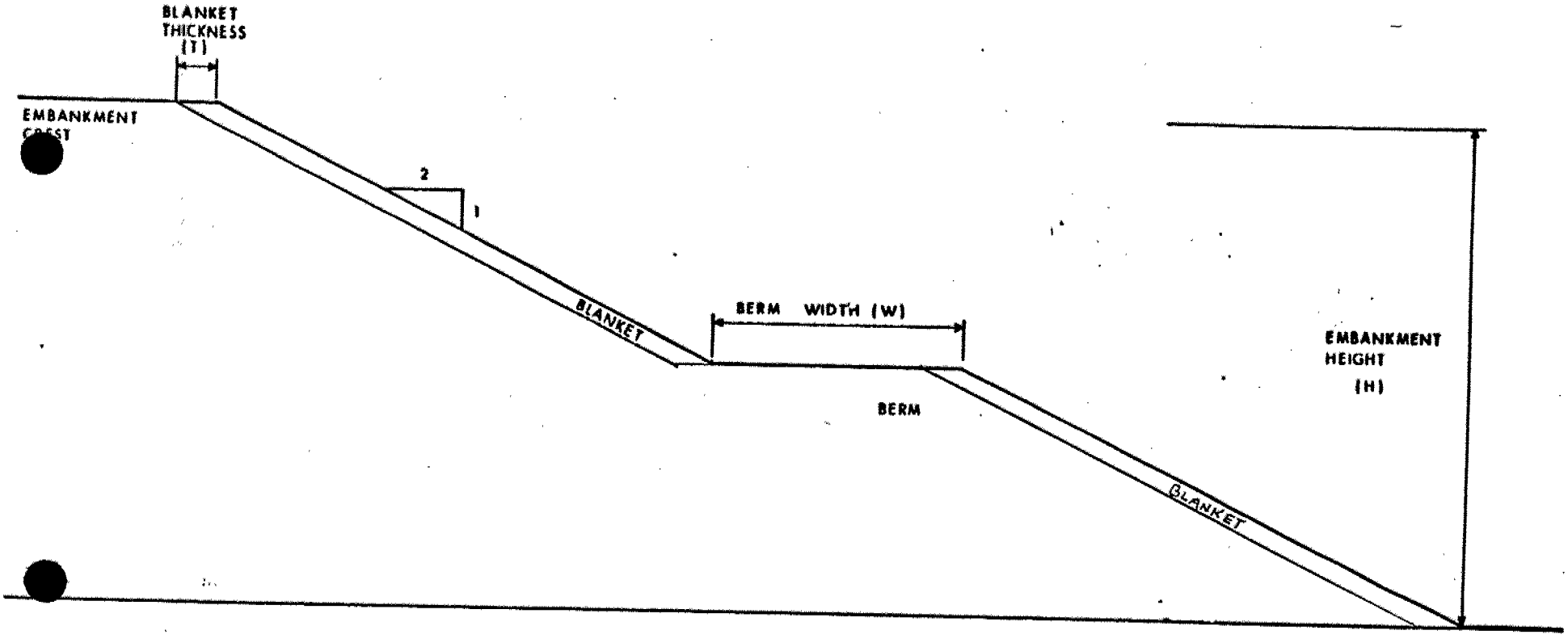

EMBANKMENT HEIGHT (H) IN METRES
12
10
8
6
4
2
0
0
1
2
3
4
5
6
REQUIRED BERM WIDTHS (W) IN METRES

FIG 1



RECOMMENDED EMBANKMENT GEOMETRY

FIGURE 2