

Mr. H. D. McMillan,

July 26, 1961.

Road Design Engineer.

EMBANKMENT INSTABILITY -

Materials & Research Section,

(Foundations Office).

Re: Queen Elizabeth Way, Welland River
Bridge Approaches - W.J. 61-F-70.
District 4.

W.P. 300 59-1

A foundation investigation has been asked for at the above mentioned site with the intention of finding out the reasons for the embankment instability and to recommend remedial measures. The time allowed for the investigation was extremely short and as a matter of fact, part of the field work is still underway while this memo is being written.

Three borings were completed. They were located as follows: B.H. 1 on the embankment shoulder, B.H. 2 on the middle of the slope, and B.H. 3 on the toe of the slope, all at Station 10 + 80. In all the borings a relatively soft clay layer was determined at some depth in the subsoil. The lowest shear strength, 212 p.s.f., was determined on a sample from B.H. 1, depth 37.5 ft., elev. 552.0. The value may be a little low because of some sample disturbance. Nevertheless, other shear strength values of this layer vary between 500 and 800 p.s.f. and a stability analysis using these values, indicates that this is a borderline case.

In B.H. 1, layers of organic matter were found in the embankment between elev. 576.0 and 569.0, and in B.H. 2, an approx. 2" thick layer of organic matter with practically no shear strength at all, was established at elev. 561.5, which would correspond to the original ground level.

The above findings point to two possible failure zones, one reaching deep into the subsoil, into the described soft clay layer, and the other much shallower, passing through the organic material in the fill (in the area of B.H. 1) and the possibly unstripped organic surface layer (in the area of B.H. 2) of the original ground.

cont'd. /s/ ...

Mr. H. D. McMillan,
Road Design Engr.

July 26, 1961.

From the deformation of the slope line it can be concluded that the sliding surface does not reach beyond the embankment toe. This would mean that either the failing of the subsoil beneath the embankment or the failing of the embankment, itself, is occurring, resulting in the described movement. These two assumptions are in accordance with the above described areas of low shear resistance.

For either of these movements, the placing of the balancing berm would be the most appropriate remedial measure. The berm should cover the lower part of the embankment slope that was pushed out as a result of the described movements. In this way, the resisting or balancing movements will be increased.

It is our recommendation that the embankment slope, extending for 20 ft. on each side of the clearly visible movement marks on the embankment top, be flattened to 3:1 and a berm be built having a width of 40 ft. and an end slope of 2:1. The slope of the berm top should be 20:1 to facilitate drainage. The berm height at contact with the embankment slope, should equal half the embankment height.

Because the beneficial effect of the berm will result from its weight, no special attention has to be given to proper compaction.

It will also be necessary to extend the existing culvert in accordance with the above recommendations.

AGS/mief

A. G. Starnac
A. G. Starnac,
SUPERVISING FOUNDATION ENGINEER

cc: Messrs. J. C. Thatcher
T. J. Kovich

Foundations Office
Gen. Files.

Mr. H. D. McMillan,
Road Design Engineer,

July 28, 1961.

SUPPLEMENTARY INFORMATION --

Materials & Research Section,
(Foundations Office).

EMBANKMENT INSTABILITY --

Re: Queen Elizabeth Way, Welland River
Bridge Approaches - W.J. 61-F-70.

District 4. W.P. 300-59-1

This is to detail and supplement our recommendations contained in the memo of July 26, 1961, regarding the above mentioned bridge approaches.

The berm should be built between Station 8 + 00 and 13 + 50, i.e., for a length of 550 feet on the left side of the centre line. The berm top should be 40 ft. wide.

A sketch showing the berm plan and cross section with all the necessary dimensions, is attached to this letter. The soil stratigraphy established by the recent drilling, is also shown on this sketch.

The function of the existing culvert is not clear and the flow path of the water could not have been established. Presently, there are on both sides, but predominantly on the east side of the culvert, a few feet of stagnant water. It is recommended that this water problem be investigated and proper drainage conditions be established.

AGS/MdeF
Attach.

A. G. Sternac,
SUPERVISING FOUNDATION ENGINEER

cc: Messrs. J. C. Thatcher
T. J. Kovich

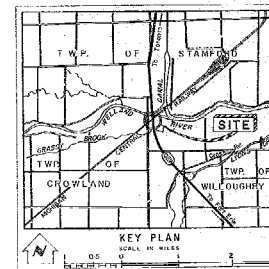
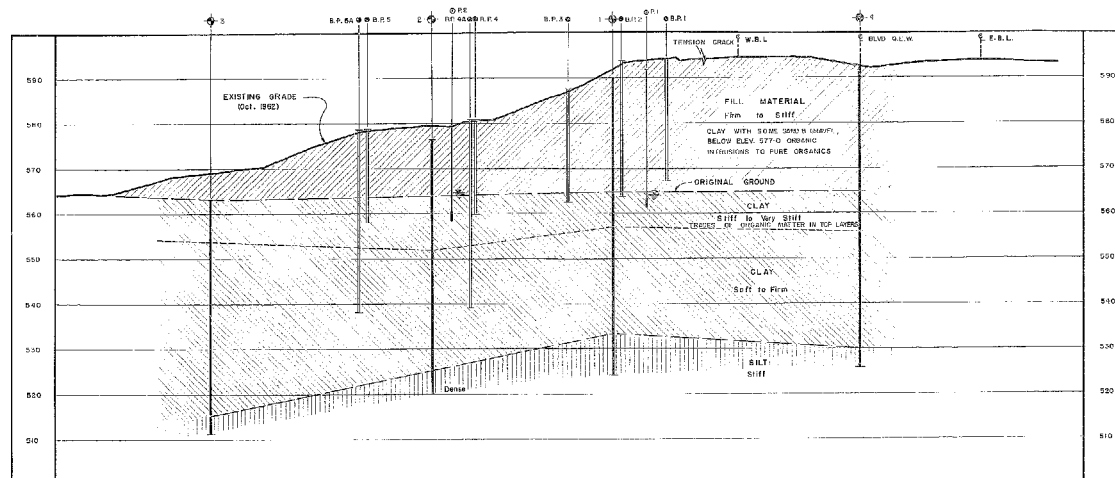
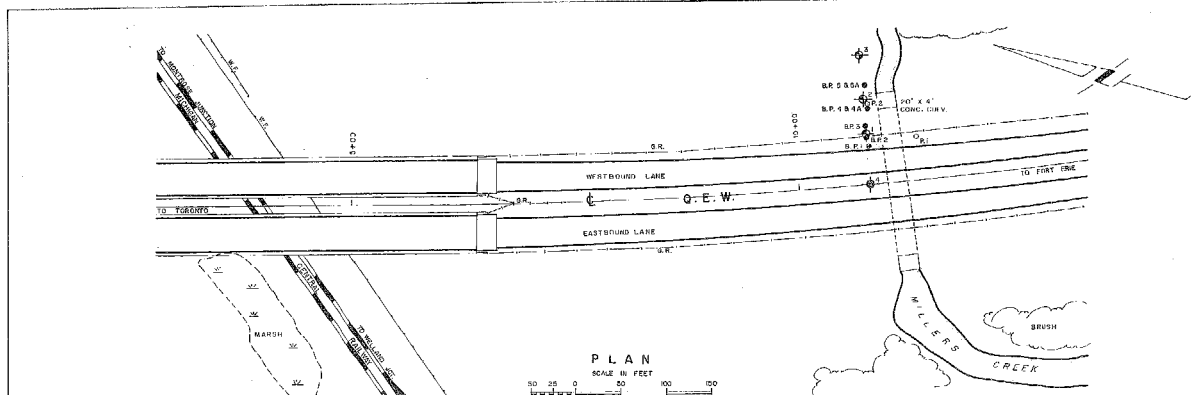
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W.P. 300-59-1

Q.E.W. AT

WELLAND RIVER

30M3-106



LEGEND				
●	Bore Hole			
○	Cone Penetration Hole			
⊙	Bore & Cone Penetration Hole			
+	Water Levels established at time of field investigation			
○	Stream Type Location			
○	Piezometer Location			

NO.	ELEVATION	STATION	CH-SET
P-1	571.7	11+38	47' L.E.
P-2	579.3	12+85	505' L.E.
B.P.1	575.3	10+00	47' L.E.
B.P.2	582.8	10+60	53' L.E.
B.P.3	585.8	10+80	55' L.E.
B.P.4	579.8	10+85	55' L.E.
B.P.5	575.0	10+85	55' L.E.
B.P.6	575.0	10+85	55' L.E.
1	583.0	10+80	45' L.E.
2	575.5	10+80	55' L.E.
3	561.0	10+80	55' L.E.
4	591.0	10+80	55' L.E.

NOTE
Two boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geophysical evidence and may be subject to considerable error.

NO.	DATE	DESCRIPTION
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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION - FOUNDATION SECTION

WELL AND RIVER BRIDGE APPROACH

KING'S HIGHWAY NO. Q.E.W. W.B.L. DIST. NO. 4
CO. WELLAND
TWP. WILLOUGHBY LOT. 10 CON. B.F.

INSTRUMENTATION OF APPROACH FILL

SURVEY NO. CH-100 WP. NO. 350-55-1 INSTRUMENT NO. 61-F-70B
DRAWN BY CH-100 DATE 6-1-70
DATE OCT. 31, 1970 SCALE NO. 1
APPROVED [Signature] CHECKED [Signature]
BY [Signature] DATE [Signature]

3043-106
SHEET NO.