

GOOCRE'S No.

40I14-031

DEPARTMENT OF HIGHWAYS ONTARIO  
MEMORANDUM

73-11017  
Cont. 79-20

To: Mr. W. Zonnenberg,  
Regional Design Engineer,  
London.

FROM: Materials and Testing,  
London.

ATTENTION:

DATE: March 13, 1972.

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 89-69-01 and -02, Highway #3N,  
St. Thomas Expressway, from St. Thomas  
West Limit Westerly to Highway #4,  
4.1 Miles, London District.

RECEIVED  
BRIDGE PLANNING

MAR 15 1972

SOUTHWESTERN REGION

Attached is the soils design report for the above proposed grading and drainage project, W.P. 89-69-01, and follow-up granular base and hot mix paving project, W.P. 89-69-02. Under separate cover we are forwarding soils profile ST.E 2L-2, showing the soils data, gradeline and tentative recommendations.

As for the in-city portion of the expressway, a four lane facility is proposed with a 50 foot median increasing to a 74 foot median west of Wellington Road. At grade intersections are presently proposed at Wellington Road and Highway #4 with future development of interchanges at these locations. Structures are to be constructed at the C.N.R. Spurline and North Edgeware Road. The construction of the Highway #126 structure with this project is yet to be decided.

The Road Design gradeline has not been altered. It is assumed that the large amount of fill required on this project will be obtained from adjacent W.P. 88-69-01.

The subsoils throughout consist of light to medium clays at or close to the optimum moisture conditions. Occasional short lengths of wet clays may be encountered but these can be utilized for fill with adequate grading controls.

The approved pavement design for this project is a 15" full depth asphalt structure, which will require the construction of a firm earth subgrade.

Granular "C" sources are located south of St. Thomas, a haul of about 5 - 7 miles. Granular "A" sources are found at Byron, Komoka and north of London, hauls of about 13, 18 and 18 miles respectively.

JGF:hp

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*J. G. Forster*  
J. G. FORSTER,  
SENIOR SOILS ENGINEER.

## SOILS DESIGN REPORT

4.1 Miles

Highway #3N.

St. Thomas Expressway. St. Thomas  
West Limits Westerly to Highway #4,  
W.P. 89-69-01 and -02. Proposed  
Grading, Drainage, Granular Base and  
Paving Projects.

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<u>Soils Profile</u>	<u>Survey Profile</u>	<u>Station to Station</u>	<u>Township</u>
	C-95-17	294 + 00 to 434 + 40	Southwold
S.T.E. 2L2	C-120-16	434 + 40 = 100 + 00 to 172	Yarmouth

General Data.

This report will include comments and recommendations for both W.P. 89-69-01 (grading and drainage project) and W.P. 89-69-02 (granular base and paving project). The roadway will be constructed to provide for two 24 ft. paved lanes, with 6 ft. and 10 ft. inside and outside shoulders respectively. Provision for a 74 ft. median west of Wellington Road with a 50 ft. median east of Wellington Road is planned. Grade separations are proposed at the C.N.R. Spurline (W.P. 89-69-05 and -06), North Edgeware Road (W.P. 89-69-01) and Highway 126 (W.P. 89-69-03), with at grade intersections proposed at Highway #4 and Wellington Road.

At this time the construction of Highway #126 structure and interchange under W.P. 89-69-01 is in doubt. It is quite possible that this work will be deleted and will be done some time in the future when the construction of Highway #126 is programmed.

### Investigation.

The field work was carried out in September and November of 1971. Most of the boreholes were drilled, using a power auger where accessible, while a hand auger was used on the remaining sites. Borings were taken at intervals of 200 ft. in fill sections and at intervals of 100 to 150 ft. in cut sections, and to a depth of approximately 4 ft. below top of the pavement grade.

Samples were taken for laboratory analysis and these results, together with the boring data has been plotted on the soils profile.

Borings were also carried out along the proposed widening on Highway #4 and Edgeware Road in conjunction with the above investigation. Borings for the grade separations and subsequent reports were prepared by the Foundation Section.

### Soils Data.

Located within the Physiographic Region referred to as the "Mount Elgin Moraines", the basic soil type is mapped as "Conover Loam" and "Conover Clay Loam" both soil types being a light to medium clay.

During the period prior to and during the investigation, there was very little rainfall, and as a result all subsoils were in a very dry condition. A typical medium clay had approximately 31 percent clay and 38 percent very fine sand and silt content, with an in-situ moisture content of just above 12 percent, while the optimum moisture is about 16 percent. The heavy clays in the cut from Station 152 to Station 164 had an in-situ moisture content of 26.2 percent, while the optimum moisture is 25.6 percent.

Borings on the approaches to the C.N.R. Spurline indicated that the underlying subsoils consist of light to medium clay till which were quite firm, with no foundation problems evident.

Earth Borrow.

Preliminary grading estimates by Functional Planning indicates that approximately 650,000 cubic yards of borrow will be required. Much of this material may be available from W.P. 88-69-01, however, as noted in the report for this latter length, some material is not available due to the saturated condition of the material. Should additional material be required from borrow sources, borings within the length from Highway #4 to Wellington Road indicated that the clay materials in this area are generally suitable for earth fill.

A check of earth stockpiles located at the Ford Plant, revealed that there is considerable topsoil mixed throughout the stockpile, and as a result it is not advisable to use this source for fill material.

Granular Materials.

Sources suitable for Granular "C" are located in the area northeast of Union.

A brief description of sources is as follows.

(i) Oxford #2 (Lots 8 & 9, Con. 4, Twp. of Yarmouth).

A commercial source, containing an estimated 100,000 cubic yards sand suitable for Granular "C" but grades coarse for HL products.

(ii) Rickman #1 (Lot 11, Con. 5, Twp. of Yarmouth).

Contains an estimated quantity of 25,000 cubic yards, suitable for Granular "C", but too fine and dirty for HL.

(iii) Haight (Elgin Construction, Lot 9, Con. 4, Twp. of Yarmouth).

Requires further testing for quantity, but may contain material suitable for Granular "C".

Sources suitable for Granular "A" are scarce in the St. Thomas area, with any coarser areas, being borderline and generally small. As a result, the likely sources for Granular "A" include pits in the Byron area (Riverside Construction and Walmsley Pits). Other sources are located at Komoka and London, where aggregates for hot mix can also be obtained.

#### Recommendations.

For convenience, recommendations are being forwarded under Part "A", W.P. 89-69-01, and Part "B", W.P. 89-69-02.

#### Part "A" (W.P. 89-69-01) Grading and Drainage.

1. Grading to provide for 15" of pavement structure is recommended in all cuts and fill construction on the through lanes of the expressway.

2. Depth of Topsoil.

Removal of topsoil within 48" of top of pavement grade is recommended, in both fill sections and where topsoil is encountered in excavation operations.

For estimating purposes, assume 9 inches as the average depth of topsoil to be stripped.

3. Culverts.

No foundation problems are anticipated at culvert sites, since clay tills were encountered at all drainage sites. Foundation borings at grade separations indicated that the upper 10 ft. is quite dense.

4. Earth Excavation and Disposition of Materials.

No problems are foreseen in the excavation of proposed cut sections, since all materials were dry and should provide excellent fill material.

Since fill material may come from W.P. 88-69-01, much of this material

/5.

is at or above optimum moisture and as a result considerable effort will be required by the contractor to properly compact the material, in order to provide a stable grade for the full depth asphalt.

It is expected that no transition point treatment will be necessary at cut/fill transitions. However, these locations should be examined at the time of construction to ensure that a firm grade is constructed.

5. Cut and Embankment Slopes.

Construction to the normal cut and fill slope standards should present no problems, and no special treatment of cut slopes is foreseen.

The water pond at Station 419 ± will be located partially under the west bound lane. Should the pond be relocated slightly to the north, backfill to the portion underlying the road should consist of clay type materials. This will involve removal of the water by pumping prior to placing the clay fill and possibly removal of any soft and saturated material prior to placing the backfill

Part "B" (W.P. 89-69-02) - Granular Base and Paving.

1. Depth and Type of Pavement.

Provide for 15" of asphalt, with the binder course consisting of HL 5 and the surface course consisting of HL 1.

The following depths of HL are to be placed (See Figure 1).

Lower binder course - 5".

Middle binder course - two at 3-1/2".

Upper binder course - 1-1/2".

Surface course - 1-1/2".



2. Culvert and Structure Backfill.

Granular "C" is recommended as backfill where applicable.

3. Intersections.

(i) Wellington Road.

Borings along the existing edge of pavement revealed that there is approximately 24" of pavement structure, consisting of 3" of asphalt over 21" of granular materials, with the subsoils consisting of medium clay.

Provision for 9" of hot mix and 6" of Granular "A" is recommended along the Expressway taper to the bullnose. Conventional pavement design is recommended from this point, including the widening of Wellington Road, consisting of 3-3/4" of hot mix pavement (1-1/2" HL 3 surface course and 2-1/4" HL 5 binder course) 6" of Granular "A" and 14" of Granular "C" (granular placed full width). The top of pavement in the widening along Wellington Road should match the level of the existing pavement.

(ii) Highway #4.

Borings along Highway #4, encountered approximately 7" of asphalt over a variable depth of granular (7" - 18"), underlain by a light to medium clay which was wet from Station 152 to Station 158 (right of centreline).

Provision for 9" of hot mix paved level with the existing surface, and 6" of Granular "A" is recommended for the widening taper for the Expressway and also for the widening on Highway #4. This design is compatible with the widening carried out north of County



Road #11 on Highway #4, except that resurfacing of the existing road was carried out and the 9" of asphalt included the 3" of resurfacing.

Resurfacing of the existing pavements on Highway #4 and Wellington Road is not being recommended, since existing performance is fair to good, and the above construction will eventually be superseded by grade separations and interchanges. Should consideration be given to resurfacing the existing pavement, within the limits of the widening, then widening depths may have to be altered.

4. Shoulder Construction.

Provision for Granular "A", placed full width is recommended on full depth pavement construction. Should the shoulders be paved, removal of the upper 3-3/4" of granular is recommended to provide for 1" sand asphalt course, 1-1/4" HL 5 binder course and 1-1/2" HL 3 surface course.

5. Pavement Structure (Edgeware Road).

Fill approaches to the new structure will likely consist of clay type materials. The following depths of material for the grade raise should be followed:

Grade raises greater than 27" - 9" Granular "C" plus 6" Granular "A"  
plus earth fill.

Grade raises 9" to 27" - Granular "C" and 6" Granular "A".

Grade raises less than 9" - All Granular "A".

All granular should be placed full width.

The minimum pavement design should consist of the following:

1-1/2" HL 5, 6" Granular "A" and 9" of Granular "C", with the

granular placed full width.

6. Foundation Reports.

Foundation reports have been issued for all proposed structure located within the limits of the project.

The investigations indicated that the subsoil is such that it will safely support the approach embankments constructed with 2:1 side slopes. Care should be taken to ensure that no bouldery fill is placed within the limits where piles will be driven.

All topsoil and any soft organic materials should be removed in accordance with the pertinent standards within the construction area.

March, 1972.

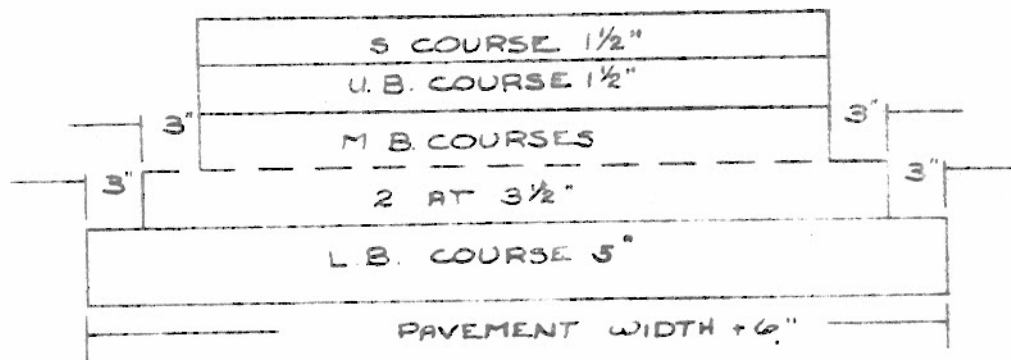
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COURSE THICKNESS & STAGGER

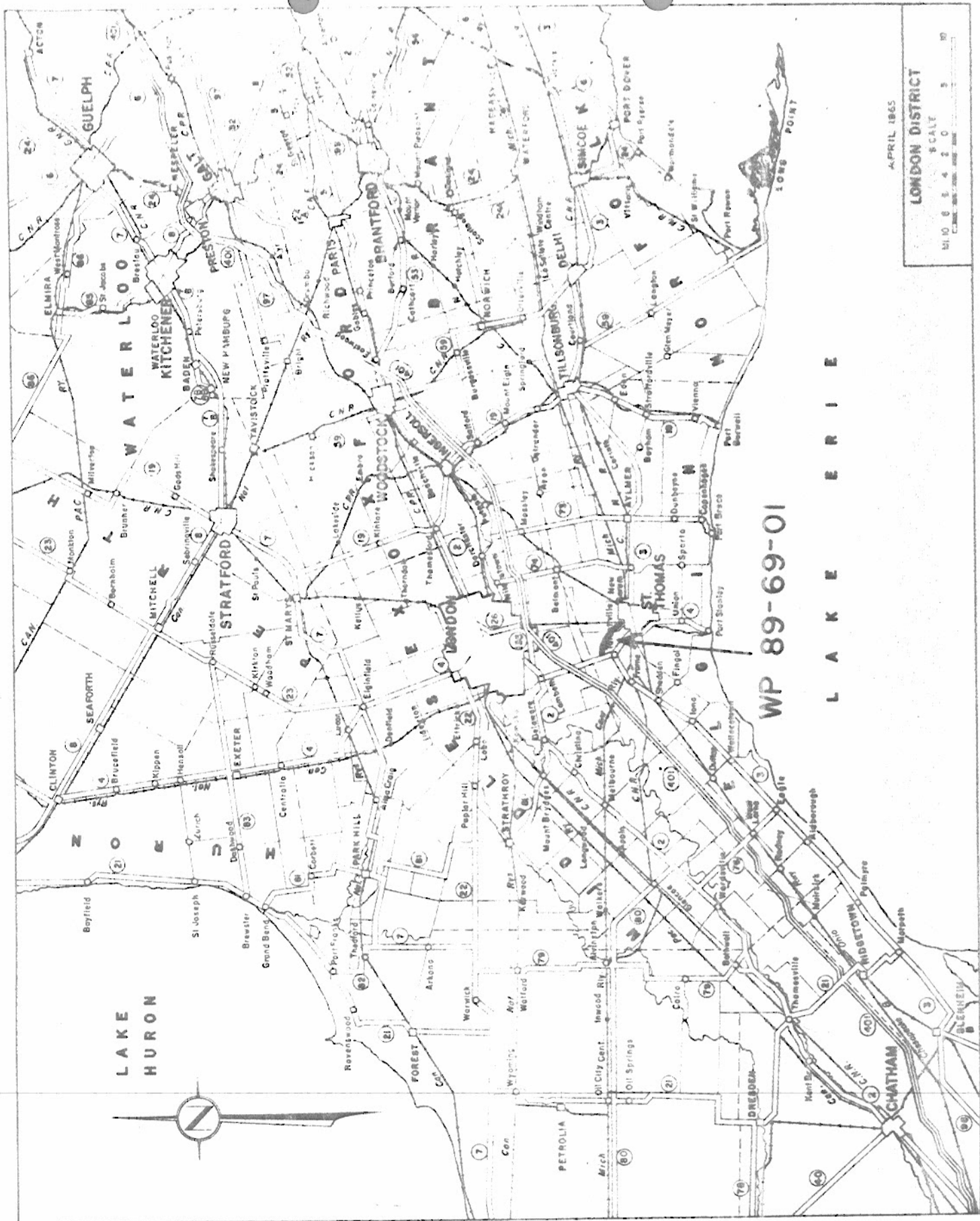
FOR

FULL DEPTH ASPHALT PAVEMENT



LEGEND

S: SURFACE  
U. B: UPPER BINDER  
M. B: MIDDLE BINDER  
L. B: LOWER 1



APRIL 1965

LONDON DISTRICT

SCALE

1:100,000

WP 89-69-01

L A K E E R I E