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CONT. No. 71-77

W. O. No. _____

STR. SITE No. _____

HWY. No. Brantford Expwy.

LOCATION Brantford Expressway #2

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. _____

REMARKS: ① documents to be unfolded
before microfilming

GENERAL

The Functional Planning Report for the Brantford Expressway #2 was formally accepted by the City of Brantford and the Department of Highways on September 23, 1968. The Report was prepared by Damas and Smith Limited, Consulting Engineers and Planners, under the direction of the Technical Advisory Committee of the City of Brantford and Department members.

Organization

The Design, Property Purchase, Construction and Maintenance of the Brantford Expressway #2 are cost-shared between the Department of Highways and the City of Brantford on a 75% - 25% basis. Property purchase is by the City, while the Department undertakes Design, Construction and Maintenance. Co-ordination of all facets of the development of the Expressway is by a Technical Advisory Committee (T.A.C.), served in turn by various Sub-Committees, as described under Acknowledgements prior to Page 1 of the Functional Planning Report.

Following the acceptance of the Report by both partners, the Department's Road Design Office was assigned the work of preparing detailed drawings and documents for contracts. This work was divided into two phases - the Pre-Design and Detailed Design, with a separate staff doing each phase, but with full co-ordination and exchange of information. Pre-Design consists of studying the Expressway, service

roads, arterials, side streets and structures with regard to alignment, grade, property costs, basic drainage to a stage where feasibility can be proved, pavement widths, lane development, cross-section, foundation and soils conditions requirements, studying utility relocation schemes and completing the detailed geometric design to develop an approved detailed solution. To achieve this the ultimate Expressway design had to be considered even though the immediate and more exact purpose of the pre-design group was to prepare the ground work for the 1st stage contract (W.P. 70-68-01, 2, 3). The ultimate pavement layout and grade were calculated within the limits of the first project and the adjoining parts of the Expressway were also considered for basic alignment and drainage studies. The purpose of this study is to ensure that any minor alternatives to the final design have been investigated, recorded and rejected for reasons of poor economy, operation, co-ordination, etc. Detailed Design consists of using the detailed terms of reference established by Pre-Design in order to prepare Contract Drawings, Detailed Estimates of Work, Specifications, Special Provisions and Cost Sharing Forms which are submitted for Department and City approvals in a tender called by D.H.C. Head Office. This Field Inspection Report is a summary and reference to the work completed so far by Pre-Design at the stage when detailed design will commence.

Alignment

The alignment adopted by Road Design coincides with that shown in the Functional Planning Report except at the Mount Pleasant Street intersection. Here a compound $1^{\circ} 15'$ curve spiralling into a $4^{\circ} 30'$ curve has been replaced by a direct $3^{\circ} 30'$ curve with common tangents at both ends. The study of the advantages and disadvantages of the Functional Report alignment versus the Road Design alignment has been complex and very prolonged, but basically the reasons for the change are as follows:

1. A direct single-element curve is considered superior from an operating point of view. AASHC recommend that "caution should be exercised in the use of compound circular curves", and that where they are used R_1 should not be more than 150% of R_2 .
In our case, R_1 is three times R_2 , and although this has been largely tempered in the Functional Plan by use of a long spiral between the elements, the direct curve is preferable if feasible.
2. The single element curve locates centreline up to 54 ft. south of the Functional Planning alignment at Mount Pleasant Street, and up to 100 ft. north-east of the Report alignment at a point approx. 1,600 ft. west. It must be emphasized that the tangent to the east of this curve system (Stas. 89 to 95) is unchanged in location so that maximum use can be made of the abandoned L. E. & N property.

(Actually, as will be described in a following section of this Design Report, property has been required on both sides of the L. E. & N. line along the tangent). Because of the southward shift at Mount Pleasant, centreline is moved that much farther away from the largest establishment in the area, namely the John Noble Home for the Aged, and property damage and noise levels can be reduced. Although a retaining wall will still be required on this corner, due to the grade difference, its length is reduced by half, and damage to the Home's parking lot substantially reduced.

3. The Road Design alignment shortens the Expressway by 70 ft. which represents a proportionate cost of approximately \$12,000.
4. It was noted that spiral lengths used in the Functional Planning Report do not agree with D.H.C. standards as set out in the Department's "Geometric Design Standards Manual" which recommends a maximum length of 300 ft. This maximum has therefore been adhered to, with the beneficial result that a spiral curve with its attendant variable crossfall problems has been removed from the deck of the Market St. bridge.

Median Width

The matter of median width is closely tied in with the foregoing discussion on alignment, and is a complex subject. At Mount Pleasant Street, the Expressway begins its transition (going westwards) from a 70-design-speed freeway to a 60-design major arterial, with a consequent change in median width from 50 ft. to 17 ft. However, the Functional Planning Report makes this transition in the 70-design section, between Mount Pleasant Street and the Grand River, and this has some drawbacks.

The Mount Pleasant Street intersection is to be developed in four stages. Stage A will be a 'T' intersection as shown in drawing 93 on page 144 of the Functional Planning Report; Stage B will be a cross-intersection as shown in the body of page 50; Stage C will be a grade separation as shown in inset on page 50; and Stage D (which will affect only the Expressway) will be the extension of the freeway to a new directional interchange approx. 1,500 ft. west of Mount Pleasant (pages 155, 156 of the Functional Planning Report). The 50 ft. median on the Expressway properly provides for a future widening from four through lanes to six (See Functional Planning Report page 74 and discussion on page 75). It has been considered essential that the fourth stage development provide for this 50 ft. median throughout the section east of Mount Pleasant St. where the ultimate development coincides with the initial stage. An overlay type of comparison has been made between the Functional Planning Report (Stage B)

construction and this fourth stage development (page 156), and it was noted that the conversion from one to the other would entail pavement widening not only on all four edges of the Expressway lanes but also at a skew to the lane lines for the ultimate development. Another effect of the Functional Planning Report's median transition would be to place the centre bridge pier of the Stage 3 Mount Pleasant Bridge in a narrow median, requiring difficult protection treatment unless the widening to 50 ft. as described above was made at the same time. With a 50 ft. median at the bridge there will also be sufficient flexibility to be able to adjust the skew of the Stage C bridge to Stage D alignment, which may not be quite the same. We have therefore designed the median to taper in width along the length of the long curve immediately west of Mount Pleasant Street. This results in a median width change from 17 ft. to 44 ft. at Mount Pleasant, which keeps the median width on the 70-design section at or close to the optimum.

The increase in median width has increased first and second stage property damage by the approx. 27 ft. extra taken, at a property cost increase of approx. \$69,000 over ten years. These properties will have to be taken anyway at Stage "C" (grade separation). The advantages offsetting this cost are (a) reduced taking at the south side of the John Noble Home, (b) easier and cheaper bridge construction for the future grade separation and (c) easier and less expensive Expressway widening in the future. It is assumed that

future Expressway widening will be simultaneous with development to Hwy. 53 west link as shown on pages 155, 156 of the Functional Planning Report.

Staging

Staging at Mount Pleasant Street will be as described above under "Median Width". The work of the first contract at this intersection will be similar to the layout shown on page 144 of the Functional Planning Report. The E-N ramp will be built in its final location, and the S-E ramp in the first stage will be approximately 60 ft. north-west of its ultimate location due to the two lane width of the Expressway. Neither of the ramps on the west side of Mount Pleasant Street are part of this first Stage "A" project, thus there will be sufficient room to permit normal earth cut construction adjacent to the John Noble Home within the property requested for ultimate construction. In one place, either the side slopes will have to be steeper than 2:1, or we will have to use the 10' construction easement but since the height of cut is less than 7 ft. it is felt that suitable staked sodding will hold the slope for the intervening period. Stage "B" construction which includes the western ramps, will require the construction of a retaining wall in front of the John Noble Home, as shown on page 50 of the Functional Planning Report. Because of the future retaining wall and its effect on ramp visibility, a slightly higher standard of design than the Functional Planning Report's has been adopted for the N-W ramp,

which results in a net property taking from the John Noble Home slightly greater than the original on Mount Pleasant Street, and somewhat less than the Functional Planning requirements on the south side of the Home, and, as stated above, half the length of the wall.

South of the Expressway on Mount Pleasant Street, property taking is greater than that indicated in the Functional Planning Report due to the alignment shift southwards and due to the wider median. In the south-east quadrant, property taking will be staged in that the requirements for the Stage A tee intersection are much less than for the Stage B cross-intersection. The M. Campbell house at 152 Mount Pleasant Street for example, could remain for Stage A (although access fairly close to a bullnose would be more difficult) whereas the house itself would be affected by Stage B and access to Mount Pleasant would be denied. Similar conditions on a lower scale will apply to the W. Grieg and J. Pokov properties immediately to the south. It is proposed nevertheless, to acquire title to such properties to fit ultimate development and stage the possession by leasing until the ultimate stage of development occurs.

All necessary pavement construction on Mount Pleasant Street will take place under "Stage A", except for changes required during grade lowering in Stage 'E'.

At Market Street interchange which will be the eastern terminus of

the first stage, the layout will be similar to that shown in drawing 94 on page 144 of the Functional Planning Report, except for (a) deletion of the short direct right-angle leg to Eagle Avenue from Ramp W-NS and (b) realignment of Market Street north of the Expressway to a reverse curve designed to get back to existing alignment south of the T.H. & E. Railway tracks. Change (a) is due to the steep (9%) grade required for this leg and its eventual deletion which gave rise to some queries in regard to its purpose - TAC approved its deletion at the March 16/70 meeting; and Change (b) is in order to introduce a staging of the alignment which will enable the City to readily build the eventual grade separation at the T.H. & E. and also to avoid any reconstruction at the railway crossing in the first stage - the latter change was approved by Mr. R. Middleton, City Engineer, on Nov. 5/69.

An extensive study of the staging at the Market and Erie Streets bridges was undertaken. The Functional Planning Report recommends (p. 145) that both Market St. structures be completed with the first project. The reason for this was apparently that it was felt better to detour Market Street for bridge construction only once, although the second bridge (See p. 125) would not be used for about ten years. Schemes for splitting the eastbound and westbound traffic further west were developed: these had the advantages of using both bridges, improving the approach and visibility to the restricted speed zone for eastbound traffic and cutting down on temporary construction.

However a problem developed with the "Second Stage Construction" (p. 125 of Functional Planning Report) where it was not possible to carry two-way traffic on the Market Street bridge and provide tolerable deceleration and visibility for the W-N,S ramp. A solution was eventually worked out such that the northern Market Street bridge only would be built in the first project, but that it would be widened on the median side by 12 ft. to provide for the ramp. Between 1980 and 1995, according to the Functional Planning Report (pages 130 to 141) this extra 12 ft. would not be used, but at the first stage beyond the planning period, which is reckoned to be Expressway pavement widening to six through lanes, its presence would again be warranted. The southern Market Street bridge will not be built until required, at the "Third Stage Construction". In addition, it has been decided to split the eastbound and westbound movement in the "Second Stage" further east, between Erie Avenue and Murray Street, so that only one bridge on Erie Street will be required for the "Second Stage Construction". Cost savings on the deferment of the bridges and their approaches is \$45,550 plus the investment of the ultimate widening of the Market N. bridge. A beam-type of construction will be used for the Market Street bridge, so that closure of Market Street will be only occasional and for an hour or two at a time. See below under "Traffic".

City Arterials - Mount Pleasant Street

As indicated above, widening on Mount Pleasant Street will be included in the first, or "Stage A" project. The northern part of Mount Pleasant Street, between Colborne Street and a point approximately 100 ft. north of the John Noble Home northern entrance, was rebuilt in 1969 by the City to a curved four-lane section with a pavement width, (excluding gutter aprons) of 41.6 ft. and a centreline offset of about 4 ft. west of the original alignment. Under the Expressway contract, this junction section will be tapered out to a 45 ft. pavement with four 11.25 ft. lanes (giving 46 ft. face-to-face of curbs) through the Expressway intersection southwards to Clench Avenue. South of Clench the pavement will taper down to the existing 20 ft. over a distance of approximately 700 ft. bringing the limit of construction to Charles Street, two blocks south of Clench.

It is recommended that an urban section be used north of the Expressway and within the confines of the intersection on the south side. However, south of the Expressway intersection a rural cross-section exists at present, the area is not highly developed, and there is adequate room, so that a rural type of section should be constructed, with 8 ft. gravel shoulders. Property has been requested to fit this.

The alignment of Mount Pleasant has been shifted slightly (approx. 4.5 ft.) westwards on the parallel section near Clench Ave.; this has been done to enable a smooth alignment transition

at the tapers at the south end and to cut down on entrance damage on the east side where most of the private entrances are situated, and to line up with existing construction by the City north of the Expressway.

The grade of Mount Pleasant has been set to provide for a widening and resurfacing type of construction south of the Expressway. Close to the intersection itself the grade line is affected in two stages by the Expressway superelevation. Under Stage 'A' Mount Pleasant St. grade is lowered about 12 ft. at the L.E.N.R. tracks. Under Stage 'B' it is lowered an additional 1 ft. north of the Expressway, and raised approximately 3 ft. south of the Expressway in order to accommodate the superelevation on the Expressway at that Stage. See discussion below under "Mount Pleasant St. intersection".

City Arterials - Market Street

Market Street alignment has been altered to a $9^{\circ} 30'$ curve at the Expressway and a reverse 10° curve between that and the T.H. & B. tracks. The result is that (a) all construction under the Expressway agreement is confined to south of the tracks, thereby eliminating Expressway involvement with the Canadian Transport Commission for relocation of a railway crossing, (b) shortening the amount of reconstruction on Market St., and (c) enabling the City to build the future subway at this location far more easily, since road detours would not be required. At the future time of subway construction,

Market St. alignment will revert to one similar to that shown on page 56 of the Functional Planning Report. The future 7° curve crosses the First Stage 9° 30' curve very close to the Expressway centreline so that there is very little difference between the two lines at the bridge and so that when the City rebuilds Market St. North they will have the option of either (a) rebuilding the entire curve down to close to the Eagle Ave. intersection knowing that the then existing bridge will fit the 7° alignment within inches or else (b) building the 7° curve southwards only as far as the hamp N, S-W terminal and making a non-standard connection at that point to the 9° 30' curve. Although not ideal geometrically, alternative (b) would be quite satisfactory in appearance, and with a bridge and a major intersection at the point of curve change, and a 30 m.p.h. speed limit, would operate satisfactorily as well.

The southern section of Market Street is designed exactly as shown in the Functional Planning report. All properties on the east side of Market between Eagle and the Expressway are being taken, so that the west side and the entrances on that side are being preserved.

The grade on Market Street remains close to the existing, but due to the curvature, superelevation has been applied at or close to a highway 40 m.p.h. design standard (normal city practice is to provide only reverse crown or no superelevation at all). This superelevation improves safety and facilitates the junction of the 4.8% grade N, S-W hamp. The grade on Market Street is slightly

higher at the Expressway than shown in the Functional Planning Report, in order to improve entrances. It is also controlled by the limiting 5% gradient criterion for Ramp N,S-W.

City Arterials - Erie Avenue

As the subject of a Design Report which was approved by T.A.C. on October 1, 1969, Erie Street's grade is to be raised to match the existing profile. This design report established that the savings on not rebuilding Erie Street more than compensated for the higher Expressway grade and consequent increased Expressway property. Net savings were approximately \$136,000. The most important features of this change were (a) complete savings of property damage on Erie Avenue - with the Functional Report scheme five businesses would be affected with the lowered grade to the extent that access from the street would be denied and damages would be severe enough to warrant buy-out in some cases, (b) lowering of the Erie Street grade would adversely affect existing underground utilities, (c) an extra 70,000 cu. yd. of Expressway earth fill, (d) introduction of retaining walls to save property at Red and White Grocery and at Sunoco Service Station. The revised arrangement now is that no construction at all will be done on Erie Avenue except for curb and gutter under the Expressway bridges.

Mount Pleasant Street Intersection

Much study was carried out on this intersection in order to come up with a satisfactory compromise between the rising Expressway superelevation and the falling Mount Pleasant Street grade which are in conflict. The problem only exists in "Stage B" and subsequent construction, since on "Stage A" the Expressway ends and will not be superelevated.

On Mount Pleasant Street the restricting criterion is visibility. With a design speed of 40 m.p.h. minimum stopping sight distance is 275 ft. To achieve this, a marked "dip" in the Mount Pleasant profile, similar to that shown on page 51 of the Functional Planning Report, has to be built. Because of increased Expressway superelevation and increased median width the amplitude of the dip is increased to 5.5 ft. from 4.6 ft. and the reverse grade on Mount Pleasant is increased to between 2.5% and 3% across the Expressway lanes. This results in a grade raise of up to about 3 ft. south of the Expressway, together with the 12 ft. cut in grade at the abandoned railway tracks. Visibility is satisfactory with this Mount Pleasant profile, especially with a signalized intersection in the minimum point which tends to reduce operating speeds. Superelevation on the Expressway has been decreased to 2% for eastbound traffic (i.e., going from 60-design to 70-design) and to 3% for westbound traffic (i.e., going from 70-design to 60-design). This results in a decrease of maximum safe speed from 66 m.p.h. to 60 m.p.h. and 62 m.p.h. respectively; again these conditions are occurring in a signalized intersection which tends to reduce operating speeds and therefore increase the safety of this condition.

Expressway Grade

As described above under "City Arterials - Erie Avenue" the Expressway grade has been raised at Erie Avenue by approx. 6.5 ft. This results in a raise of approx. 5.0 ft. at Market Street and a 0.8% gradient instead of a 0.6% gradient down to the Murray Street interchange. The Grand River Bridge is only affected by having its east end raised slightly.

The effect of this grade raise will be to necessitate retaining walls on the north side at the Erie Avenue approaches. Retaining wall cost, which has been considered in the net savings realized by keeping Erie at its present grade, is approximately \$19,000.

As indicated above under "Mount Pleasant Street Intersection" the Expressway superelevation rate under Stage II will be dropped to 3% and 2% at the intersection for westbound and eastbound traffic respectively - it is felt that this is both permissible and advantageous due to the signalized intersection with its lower operating speed and starting and stopping movements.

DESIGN CRITERIA

The Design Criteria for the sections of the Expressway covered by this Report are listed on page 37 of the Functional Planning report. No changes to these have been suggested except:

- (a) Median width - due to long term staging, width will be greater than 17 ft. immediately west of Mount Pleasant.

(See above under "Median Width")

- (b) The shoulders on the Grand River Bridge are set by the Bridge Office and are those for a long structure, i.e., 5 ft. left and right, instead of the normal 6 ft. and 10 ft.

CONTRACT LIMITS

Detailed Contract Limits will be set by the Detailed Design group. However, approximate limits will be as follows:

- Expressway - West end of Mount Pleasant Street,
Station 128+00.
- Mount Pleasant St. - Station 2+78 (limit of City construction)
Station 22+30 (just south of Charles St.)
- Market St. - T.H. & B. tracks, Station 11+40
270 ft. south of Eagle Avenue intersection.

Widening of Eagle Ave. between the Market St. intersection and Erie Street, but not including the Erie Street intersection, will be part of the first contract.

A temporary connection will be made for 270 ft. on Ontario Street south of Eagle Ave. The Functional Planning Report does not detail this temporary connection on its drawing on page 144. Due to high through volumes, opposing central left turn lanes will be installed on Ontario-Market as shown in Exhibit 5. Regional Traffic has recommended this measure due to the possibility of the occasional northbound left-turning vehicle causing severe back-up and congestion on Ontario St.

PROPERTY

As stated on page 1, property for this Brantford Expressway is purchased by the City, and the Property Sub-Committee meets in Brantford twice a month on the average to administer and co-ordinate the requesting, title searching, surveying, appraising, expropriating, purchasing, managing and eventual disposing of properties. Requests are initiated either at an advanced stage by reason of a request for information from the owner or a property coming on the market; when needed, the property requests are initiated by Road Design.

To date, all properties required for the first contract have been requested. Utility easements are required on the north side just east of Mount Pleasant, on the south side between Catharine and the River, and an easement at owners' cost for a new telephone duct to cross the River through the Expressway bridge curos. Construction easements are required for retaining wall construction adjacent to the Erie St. Bridge which is however, not part of this project.

The Lake Erie and Northern Railway has been abandoned west of the River. However, this Railway Company is striving to reinstate their line and intend to object to our expropriation by a Hearing of Necessity.

DRAINAGE

General

The purpose of the Pre-Design group of Road Design regarding Drainage is to study available outlets, calculate preliminary quantities and decide upon the most flexible and economical drainage scheme. Exact positioning of catchbasins and sizing of culverts and sewers will be calculated by Detail Design.

The following information was gathered to assist in the Pre-Design study:

1. Photogrammetry drainage study showing existing catchment areas, natural water course, storm sewers and description of soil type and terrain type.
2. City storm sewers descriptions, pipe sizes and invert elevations.
3. City Estimates of future run-off factors for catchment areas to be developed, for use in calculating oversizing.

The Pre-Design drainage is for ultimate Expressway development, i.e., to the extent shown on the plans of the Functional Planning Report. Drainage design is based on the principle of maximum use and salvage of existing facilities. Detailed Design will establish how much of the ultimate Expressway development drainage is required for the initial (Stage "A") construction (as per page 121 of Functional Planning Report).

Catchment Areas

North and west of Bell Lane drainage is north to the L'Auouigny Creek and does not affect first stage construction. (Catchment Area L)

South of Bell Lane drainage is to an outlet crossing the L.E.N.R. 500 ft. west of Mount Pleasant and crossing Mount Pleasant 500 ft. south of Clench Avenue. See Exhibit #1, Outlet #1, (Catchment Area A)

In the vicinity of Catherine Ave. a separate outlet to the River originates at the Expressway just west of Catherine Ave. (Outlet #2) (Catchment Area B)

The Catherine Ave. catchment area which drains approx. 4,000 ft. of Catherine and its side streets, outlets via a 54" storm crossing the Expressway at Catherine Ave. and outletting into the River at Outlet #3. (Catchment Area C)

The River itself is protected by a dike which is approximately at Elev. 611 on the west bank. Outlet #2 passes through the dike about 900 ft. south of the Expressway by a 24" C.S.P. with no control devices. Outlet #3 is a 54" concrete pipe with manually controlled gate valves in the dike.

East of the River Catchment Area "E" drains Market St. and Erie Ave. into a 21" trunk sewer which outlets into the River 450 ft. south of the Expressway in Outlet #4. This same sewer also drains an area from the south bounded roughly by Erie St., Cayuga St., Rose and Eagle.

Area "A"

Expressway drainage will be by open ditch, with the median outletting to either side ditch by laterals. The Expressway being in cut between Mount Pleasant and Bell Lane, it will intercept some drainage into this area. This combined with increased paved areas would result in overcharging outlet (#1). Therefore part of the large area draining into this from north of the Expressway will be intercepted, so that the residual runoff in the outlet will be less than the present conditions.

The balance of Area "A" drainage will be carried by a storm sewer and culvert system through the Mount Pleasant St. intersection into the Expressway north ditch.

Area "B"

This is a small area comprising the disused gravel pits on and south of the Expressway. They drain by means of a 30-in. C.S.P. under a private entrance at the corner of Catherine and Graham, along an open ditch to a 24-in. C.S.P., through the dike about 900 ft. south of the Expressway. Use of this outlet was considered, but it was felt that (a) the outlet would have to be rebuilt due to its present small size and (b) that it was better to use an existing outlet with flood control devices on it. Hence, Outlet #2 for Area "B" will not be used, and none of Area "B" will be intercepted by the Expressway drainage.

Area "C"

This area drains via various tributaries to two arms which meet at the Expressway at Catherine Ave. A 24" storm sewer from the Helen Ave. area is intercepted by the Expressway ditch at Sta. 97, and a 48" sewer crosses the Expressway on Catherine Ave. This 48" sewer has its outlet via an existing 54" sewer which would be under the Expressway pavement and will therefore be relocated into an easement adjacent to the southern right-of-way line. Expressway drainage will be a continuing ditch with the median draining to the south side. From Sta. 100, which is the low point, to Sta. 109 the Expressway right-of-way ditches flow contrary to the grade, i.e., towards the River. At Sta. 109 it is proposed to outlet the Expressway drainage into the outlet for the 54" sewer. It is anticipated that this outlet will have to be rebuilt to provide the necessary extra capacity. This will be done at Expressway cost, but the valve control will continue to be a City maintenance responsibility; thus the City's safeguarding of their own flood areas will automatically protect the Expressway ditch.

Area "E"

As far as the Expressway is concerned, the west side of Erie St. will be the catchment area limit - areas east of that drain towards Murray St. interchange and the Mohawk canal. Expressway drainage will again be by open ditch. The south ditch from Erie St. will drain by culvert under Ramp W-N,S, thence into a short sewer under Market St., thence in the south ditch to approximately Sta. 119 where it is carried by sewer or culvert under the Expressway to a new

outlet in the north ditch of the Expressway through the dike. An automatic flap valve type of control supplemented by a manual control is recommended for this outlet. The north end of realigned Market St. will drain to an open ditch on the west side, thence to the Expressway north ditch and to the new outfall described above. This outfall will be at approximate elevation of 652, which is the highest that can be achieved and get under Market St.

The existing City sewer running down Market St. will be relocated to the east to pass under the Expressway bridge on the west side of the new pavement. This relocation will be reconnected into a 21" City sewer running parallel to and about 400 ft. north of Eagle Ave. west of Market. The outfall for this 21" sewer is through the dike about 480 ft. south of Expressway centreline, and it is equipped with a manually controlled gate valve similar to the 54" outlet across the river. This 21" outlet will be independent of the Expressway, i.e., no Expressway right-of-way drainage will discharge into it. The outlet of this City sewer is so low that the river is frequently high enough to make it inoperable. At such times pipe capacity storage is used, and also pumping. The Design proposals for drainage here are very similar to those mentioned in the Functional Planning Report, page 103.

It is expected that an Expressway outlet (beside the north-east corner of the Grand River Bridge) at elevation 652 would back up due to high river levels on an average of one day every 1.2 years, based on past experience.

The summit of the Expressway grade is close to the Market St. bridge so that median drainage is away from Market St. in both directions. To avoid excessively deep catchbasins, the median ditch at the east end of the Grand River structure should be either outlet through the abutment wall or else by a separate shallow sewer system directly to the north ditch.

Since none of the Expressway-constructed storm sewers will be intercepting City areas subject to a future increase in runoff, it is anticipated that there will be no oversizing charges applied to sewer construction for this project. If the City elects to have their relocated sewers (i.e., the 24" south of Stas. 100-109 and the 18" down Market Street) increased in size for any reason they will be liable for the increased cost.

UTILITIES

The location, size, invert levels etc. of all utilities have been given by each utility company and have been marked on a 40' - 1" plan. The utility companies have submitted plans for relocating their facilities to comply with Expressway alignment and grade. Cost estimates for relocation have been submitted by the utility companies. The Property Sub-Committee has co-operated in obtaining easements adjacent to the right-of-way for the utility companies - some of these easements are at Expressway cost, some at utility company cost, depending on the L.H.C. policy applicable in each particular case. (See Property Section)

The following is a summary of the proposed relocation by the individual companies.

P.U.C. Hydro

Mt. Pleasant Intersection

The existing distribution plant on the east side of Mt. Pleasant St. will be removed and a new plant constructed clear of the Expressway, crossing the same at 54+00. This line will be aerial and will reconnect with the existing line 200 ft. south of the Expressway, and 550 ft. north of the Expressway, at Graham Ave. This utility will be subject to two stage relocation, because of four houses north of Clench on the east side of Mount Pleasant which are required for the X-intersection development of the Mount Pleasant crossing but which will remain for the initial Stage "A" development. The existing line on Graham Ave. west of Tuxedo St. within Expressway limits will be removed and a short line service provided to property on the S.W. corner of Tuxedo St. and Graham Ave. The existing line on Graham Ave. will be removed in the area of the turning basin, and its function replaced by direct service from the relocated distribution plant which will run along the south side of Graham Ave.

St. Catharine Ave. to Grand River (100+00 - 112+00)

The single phase 4KV on the East side of Catharine Ave. will be removed from the Expressway right-of-way. A feeder line will then have to be built from the nearest supply pole on Brunswick St. to Catharine Ave.'s northern turnaround to replace

the existing service. The single phase 4KV within the Expressway right-of-way will be removed between Catharine Ave. and Stinson St. and also on Stinson St. This area will be serviced from a new feeder line again from Brunswick St. A portion of the line on the East side of Gilkison St. will be removed and the area in question will still be serviced from the remaining line on Stirton St. and Stinson St.

Market St. & Eagle Ave.

The existing overhead line on the west side of existing Market St. will be removed between Erie Ave. and Eagle Ave. An overhead line will be reconstructed along the West side of relocated Market St. from Eagle Ave. to the south limits of the Expressway and two 4" ducts will be used under the overpass to service the area in question. The overhead line on Eagle Ave. will be reconstructed clear of the pavement on the south side of Eagle Ave. The existing two 4" diameter ducts on the north side of C.W. Smith Motors will be extended to the West limits of the Market St. right-of-way.

Gas Mains

Mt. Pleasant St.

The existing gas main on the east side of Mt. Pleasant St. is in the way of the proposed excavation and will be abandoned. The major portion of this line was constructed in 1920 and due to the age and the shallow depth does not warrant relocation or lowering. Therefore the abandoned line will be replaced with

1,175 ft. of new 2" diameter main (IP welded and coated) placed east of Mt. Pleasant St. and crossing the Expressway sufficiently far east of Mount Pleasant so that it will not interfere with future grade separation construction.

Catharine Ave. to Stinson St.

The 6" ϕ gas main located from the west side of Catharine St. and to the east side of Stinson St. is within the Expressway right-of-way and will be abandoned. The abandoned gas main will be replaced by a new 6" ϕ gas main located on the utility easement south of the Expressway.

A 4" ϕ gas main on the east side of Catharine St. and within the Expressway will be abandoned. The area serviced by the abandoned line is within the Expressway limits and no replacement of service is therefore necessary. A 10" ϕ main at Stinson St. will also be replaced by a new encased 10" ϕ main encased in the same location.

The Stirton Ave. area is presently serviced by a 4" ϕ main which will also be abandoned within the Expressway limits. Service will be provided by the new 10" ϕ main in conjunction with a new distribution regulator station required to reduce pressure. The regulator station will be installed at the corner of Brunswick St. and Catharine Ave.

The portion of 1 1/4" ϕ line within the Expressway right-of-way at Stirton Ave. will be abandoned as the area in question can be serviced by the remaining line.

South Market St.

The 4" ϕ I.P. main on the east side of South Market St. will be abandoned and service will be provided by a new 4" diameter encased steel main (I.P. welded and coated) east of relocated Market St. (Sta. 123+00).

A temporary 1" ϕ I.P. main will be constructed to service the houses on the east side of Market north of Eagle if these are tenanted after utility relocation. An existing 4" line on Eagle Ave. will be relocated into the border on the south side.

Water Mains

Mt. Pleasant St.

The existing 6" ϕ watermain on Mt. Pleasant St. will be abandoned where it crosses the Expressway right-of-way. The abandoned main will be replaced by a 6" ϕ main located approximately 100 ft. east of Mt. Pleasant St. clear of existing houses and this main will be encased to the ditch lines on either side of the Expressway ramps. It will be necessary to run 275 ft. of 1" ϕ copper line to provide service to the residences in the south-west quadrant due to the relocation of the 6" ϕ main. The portion of 6" ϕ main north of Graham Ave. will be lowered where required.

Graham Ave. to Tuxedo St.

A part of the existing 6" ϕ C.I. water main on Graham St. will be lowered between Mt. Pleasant St. and the Expressway right-of-way. The 6" ϕ main crossing the Expressway will be abandoned and be replaced by a 6" ϕ main located on the utility easement north

of the Expressway and crossing the Expressway opposite Tuxedo St. The water main will be encased under the Expressway pavement and to the ditch line on either side of the pavement.

Catharine Ave.

The existing 8" ϕ transite main on the west side of Catharine Ave. will be removed within the Expressway limits and replaced with an 8" ϕ ductile pipe within the Expressway limits. The portion of this pipe under the Expressway will be encased within the ditch lines. 140 ft. of 18" ϕ casing is to be added at P.U.C. cost to allow for a future water main in this area (Sta. 100+35).

Market St.

A new hydrant will be installed in front of C.W. Smith Motors at P.U.C. cost and 420 ft. of 6" ϕ C.I. main on Market St. will be abandoned. Replacement will not be required since the area serviced is within the Expressway limits. An existing 4" ϕ main will be plugged at the intersection of Eagle Ave. and Ontario St. and 300 ft. of this main will be abandoned. The area in question will be serviced by a 6" ϕ asbestos cement main placed on the west side of the abandoned 4" ϕ main, since the latter will be under future pavement. Temporary service to the Pepsi-Cola building in the south-west quadrant will be provided.

Bell Telephone

Mt. Pleasant St.

A 1,300 ft. section of a 4 duct conduit on Mt. Pleasant St. will be abandoned and a 1,600 ft. section of aerial cable removed. These lines will be replaced by an 8 duct conduit and cables on the east side of Mt. Pleasant St. The new service will cross the Expressway about 100 ft. east of Mount Pleasant St. so as to be clear of future fill construction.

The existing Bell and T.V. cable to the John Noble Home will be replaced by a new cable connecting with the existing cable beyond (i.e. north of,) the Mt. Pleasant St. reconstruction limits.

Mt. Pleasant St. - Catharine Ave.

The overhead line from Tuxedo St. to Harold St. on Graham Ave. will be removed since the homes at the end of this line can be serviced from Tuxedo St.

Catharine Ave. to Market St.

As previously outlined in the property section of this report, the Expressway Authority will negotiate for a 15 ft. Bell easement between Catharine Ave. and Market St. for new service and therefore at Bell cost. The easement will house 18 P.V.C. cables. Conduits will also have to be provided in the Grand River North Structure to house these cables.

At the Market St. interchange a short section of Bell aerial will require removal where it crosses the W-N,S ramp. A short section of buried cable at the rear of Smith Motors within the Expressway right-of-way will also require removal.

Sanitary (Sewers)

Mt. Pleasant St.

The sanitary sewers on Mt. Pleasant St. will not interfere with construction, except for adjustment of manholes near the Graham Ave. intersection.

Catharine Ave.

A portion of the 14" ϕ sewer located on Catharine Ave. is located within the Expressway right-of-way and will be replaced by a 24" sewer in approximately the same location. The existing 24" ϕ sanitary sewer from Catharine St. easterly is within the Expressway right-of-way and will be replaced by 820' of 27" ϕ sanitary sewer on a flatter grade located in the utility easement south of the Expressway.

Market St.

The existing 12" diameter sanitary sewer located within the Expressway limits station 119+30 to Market St. will be replaced by a 21" ϕ sanitary sewer located adjacent to the north property line of the Expressway, and will underpass the Expressway along Market St. The 12" siphon sewer under the River just north of the Expressway is not affected.

The City has not indicated a definite proposal for treatment of the 24" sanitary sewer located 300 ft. north of Eagle Avenue, but preliminary study indicates that all that is required for this project is the height adjustment of the manhole halfway between Market and Erie and a check into the pipe strength and its tolerance to an additional 15 ft. of cover (it is approx 20 ft. deep now.)

The above is a description of the work to be carried out in connection with the various utilities. The details regarding cost sharing, oversizing etc. will be worked out at following meetings of the Utilities Sub-Committee.

RAILWAY NEGOTIATIONS

There will be no railway crossings on Work Project 70-68-01. However, the abandoned right-of-way of the Lake Erie and Northern Railway is being absorbed between Catharine Avenue and about 1,000 ft. west of Mount Pleasant. Recently the L.E.N.R. have discovered a possible need for this line and are trying to reinstate it; they will thus object to our expropriation, and have called for a Hearing of Necessity.

The Toronto, Hamilton and Buffalo railway crossing of Market Street will be just beyond the north limit of contract (by design).

SCILS

A preliminary pavement design report was completed on 5th of August 1969.

As 62% of grading will be fill, considerable earth borrow will be required, viz, approximately 46,000 cu. yds. for grading to the ultimate cross section. The earth borrow will probably only be available from outside the City limits. Due to construction staging and frost susceptibility and moisture conditions of cut material, considerable waste of cut material is anticipated thereby increasing the need for earth borrow. Granular sub-base and base course material are available from large commercial sources between Brantford and Paris, west of Hwy. #2 in the Mount Vernon Area.

Other possible sources of materials are the Brantford Indian Reserve, and pits off Oakhill Drive. The pavement selection committee have decided on a flexible pavement type. A conventional design (5 1/2" H.M., 9" base, 15" sub-base) is recommended, with an alternative of deep strength design (6" H.M., 6" base, 12" sub-base) which could be considered in areas of good sub-base. The estimated cost of the Deep-strength is \$104.39 per lineal foot compared to \$101.31 per foot for conventional design.

The above figures represent costs incurred over a 20 year period, including maintenance, capital construction and interest charged on capital construction costs.

Pre-design cross-sections have assumed the conventional pavement type with total construction depth of 29 1/2".

Foundation Reports for the Grand River Bridge and the Market Street Bridge were received on February 27/70. The soils report for the project will be issued by the end of May, 1970.

STRUCTURES

Grand River Bridge

D.H.C.'s current Long Structure shoulder width criteria have been applied to this bridge. This means that right and left shoulder widths are both 5 ft. instead of the Functional Planning Report's 10 ft. and 6 ft. respectively. This achieves a savings of approx. \$75,000 at the expense of full shoulders across the bridge. As stated in the Functional Planning Report, only the northern (westbound) bridge will be built under this Work Project. Therefore this bridge will, as originally planned, be carrying two-way traffic for the first two stages.

The northern bridge contains the acceleration lane from the N, S-W ramp. In the first stage construction (page 121 of the Functional Planning Report) only one lane of each direction of traffic will use the bridge; in the second stage there will be two lanes westbound, one of them speed-change, and one eastbound; in the third and subsequent stages there will be three westbound lanes, one of them speed-change; and in the ultimate development (beyond the Functional Planning period) the bridge will be widened on the median side to provide four lanes - three through and one speed-change. See Exhibit 2.

Variable crossfall on a bridge is a difficult problem to deal with in construction - either the cross fall of the whole bridge should vary uniformly or else the variation should be moved off the bridge deck. This applies chiefly on bridges with a variable cross-section width such as this one. Bridge Office has therefore requested, and Road Design has agreed to accept 2% crossfall on the bridge deck, including shoulders, throughout the deck. This means that the westbound speed-change lane (WBSCL) will have crossfall slightly lower than ideal, but for similar reasons that a lower superelevation rate can be tolerated on the Expressway at Mount Pleasant intersection, a lower superelevation rate than standard can be tolerated here (top of 5% grade on a ramp).

The Bridge preliminary drawing will be published about the end of May 1970. Use of a New Jersey type barrier shape of parapet wall has been approved. This parapet wall provides an equivalent width of shoulder on a narrower bridge than conventional design with a curb, and has superior safety characteristics.

Market Street Bridge

As stated above on page 9, it has been decided to build only the north bridge under this project. A study was undertaken by the Pre-Design group to utilize the south bridge for east-bound traffic. This scheme assumed that both Market Street bridges would be built in the first stage, as recommended on page 140 of the Functional Planning Report. This scheme had the advantage of less temporary construction of ramp connections

and a better visibility approach to the 29° curve of Ramp W-N/S, but was somewhat deficient in lateral clearances to the east median corner of the Grand River Bridge and the west median corner of the Market South bridge. It has been decided to adopt the sequence of construction and lane development shown in Exhibit 3.

Being a short structure, D.H.C. Bridge Office criteria call for carrying the full width shoulder across the bridge. Again, a New Jersey type barrier parapet wall will be used.

TRAFFIC

Traffic on Mount Pleasant Street can be handled with split construction, due to the considerable widening, during the lowering of the grade with the removal of the LENR tracks. In the third stage construction (Mt. Pleasant X-intersection) the further lowering of Mount Pleasant can be accommodated by means of a detour on the west side on the line of the ramps. Traffic signals warrants on completion of the Stage 'A' tee intersection are uncertain since we do not have projected traffic volumes. It is therefore recommended that they not be erected, but that the duct work for them be installed at this time.

At Market Street the bridge will be either steel beam or prestressed concrete beam design. This means that except for a few intermittent hours over a period of about a week, Market Street need not be closed for construction. When it

is closed, it is proposed to use Eagle Ave. and Erie Ave. as a detour. No strengthening or other work will be required on Erie Ave. because of this.

Traffic signals are warranted and will be installed at the intersection of Eagle and Market; however at the Ramp N S-W terminal they are not fully warranted, and construction in the first phase here will be restricted to the placing of underground duct work.

INTERSECTIONS

The Functional Planning Report does not detail any treatment for the first stage construction at the Eagle-Market intersection. As can be seen from pages 121, 141 and 145 of the Report, Market Street will not be extended south of Eagle Ave. until the fifth stage - i.e., maybe twenty years hence. A problem exists with Ontario Street (which is the street into which Market St. feeds) being only 30 ft. wide. It is proposed to provide three 10 ft. lanes with the centre one a northbound left-turn storage. This will oppose a similar configuration southbound on Market Street, where the 10 out of 500 approx. vehicles per hour in 1991 will be in a separate left-turn storage lane. On Market Street, the left turn lane will be delineated with singling median; on Ontario Street, it will be zone-painted, since Ontario Street will not otherwise be reconstructed in the first stage. See Exhibit 5.

At the Eagle-Erie intersection, construction calls only for the narrowing of Eagle Ave. (it is being converted to a one-way street). The intersection is presently signalized. Since Erie Street is not affected, the existing signals will remain as is, except for a minor relocation in the south-west corner.

The development of the Mount Pleasant Street intersection is a complex subject which has been dealt with above under "General - Mount Pleasant St. Intersection", page 14.

FENCING

Six-foot height chain-link security fence will be erected one foot the Expressway side of the controlled-access limit or right-of-way line. At bridges, the fence goes up the slope of the approach to meet the abutment at the point where the top of fence is at the same level as the top of the parapet wall; the fence meets the abutment wingwall at as close to a right-angle as possible. No gates are required in the fence for this project.

Because of stage construction, no chain-link fence will be erected on this project east of Market Street.

GUIDE RAIL

The stipulations of the L.H.C. "Guide Rail Policy" Manual will be adhered to for this project. Three cable guide rail, Standard LL913, will be used west of the Grand River where fills are over 10 ft. in height, and will be transitioned into

LD909-B Steel Beam Guide Rail at the west approach to the Grand River Structure. Between Grand River and Erie Street bridges, steel beam guide rail with channel will be used on the Expressway and on the two ramps built under this project.

Guide rail posts will be installed at turning basins on Graham Avenue and Catharine Avenue.

SEEDING, SODDING AND TOPSOIL

Due to the rural nature of the terrain, it is expected that there will be a surplus of topsoil on this project. Any surplus should be stockpiled, possibly immediately east of the Market Street W-N,S ramp, for use on the next project Market St. to Mary St., where topsoil will undoubtedly be deficient.

Grass areas on Mount Pleasant St. and Market St. will be sodded. 2:1 or steeper side slopes will be stake sodded. All other grass areas will be seeded.

CURB AND GUTTER

A special curb and gutter - to - New Jersey Barrier transition section will be used at Bridge approaches; the details of the design are being developed by Head Office Standards Section. Part of the transition will be constructed on the abutment wingwalls as part of the bridge.

Curb-and-gutter will be used only at intersections for delineation purposes, and at structure approaches for the same purpose.

As a general criterion, Type 'B' will be used on Market Street (built up sections, with sidewalk), Type 'A' on the Mount Pleasant Street intersection, and gutter type 'D' on the Expressway at overpass approaches.

Between the Grand River Bridge and Market Street special attention must be paid to splined shoulder grades in order to avoid too great a length of curve and gutter on the 400 ft. between bridges on too flat a gradient.

CROSS-SECTION

The Functional Planning Report's cross-section of the Expressway at "Mount Pleasant Street to Murray-Mohawk Street" will be modified for First Stage construction as shown in Exhibit 4 for northern lanes construction only. A necessary change has been to move the crown one lane further away from the median, due to the ten-year period of two-way traffic on this section. Earth grading only will be carried out for the southern lanes.

Future median drainage will be by off-take ditches through the future grade where warranted.

Shoulders will be surface treated on the Expressway, and paved on ramps. Mount Pleasant St. shoulders will be gravel. Market Street shoulder on the east side will be surface treated due to curvature and heavier traffic. A gutter will be warranted on the east side; it will be located between the pavement and the shoulder.

See Exhibits 2 and 3 for bridge cross-sections. On the Grand River Bridge, the shoulder crossfall will be 2% to facilitate construction on a non-constant width bridge.

SIDEWALK

The sidewalk on the west side of Market Street will be rebuilt to L.H.C. Standard DL-503 with a 6 ft. width (present walk is 6 ft. wide). The walk in front of Nos. 1 to 11 Ontario Street (west side just north of Eagle Avenue) does not need to be rebuilt.

On Mount Pleasant Street, a 4 ft. DL-503 sidewalk will be built on the east side to replace the present walk. This will be continued south to Clench Avenue. The City will be invited to extend the walk south of there and include the work in this project.

ILLUMINATION

Both Mount Pleasant Street and Market Street are illuminated at present, and thus, in accordance with the L.H.C. policy stated in Circular 68-013 Part A (1) (c), illumination of these streets will be included in this project. Memorandums from the Regional Traffic Engineer concerning the extent of illumination on the Expressway are on file.

SCHEDULING

The Pre-Design phase is completed with the publication of this Report. Preliminary Bridge plans will be available approximately June 5/70. The Soils Report is expected by May 29/70. Detailed bridge design and detailed Road Design will be completed roughly simultaneously by Nov. 16/70. Utility relocation proposals are complete now: relocation agreements will be made in the near future to enable physical work to be completed in summer and fall of 1970.

PAVEMENT SELECTION

The Preliminary Pavement Design Report was approved September 10/69. It states: "Preliminary soils data indicate that frost-susceptible materials and saturated conditions will be encountered over most of this project. Fill materials will have to be controlled because of moisture conditions and handling properties. Conventional pavement design (i.e. 5 1/2" Hot Mix over 9" + 15" granular base) is recommended because of the above and anticipated lower cost. As an alternative, Deep Strength design (i.e. 8" Hot Mix over 6" + 12" granular base) could be considered. The estimated cost of Deep Strength is slightly higher than the recommended Conventional design. The use of curb and gutter and paved shoulders will be kept to a minimum lowering the justification for Deep Strength design." The Pavement Selection Committee approved the above recommendations, but allowed Deep Strength if detailed soils information shows improved conditions and if the economics justify it.

SPECIAL PROVISIONS

These are Special Specifications additional to those normally included in every D.H.C. contract. On this project, Special Provisions will be required for, among other things:

Restrictions on Open Burning during clearing operations.

Restrictions on Hours of Work, particularly for noisy operations such as pile driving.

Instructions on disposal of unsuitable surplus earth materials.

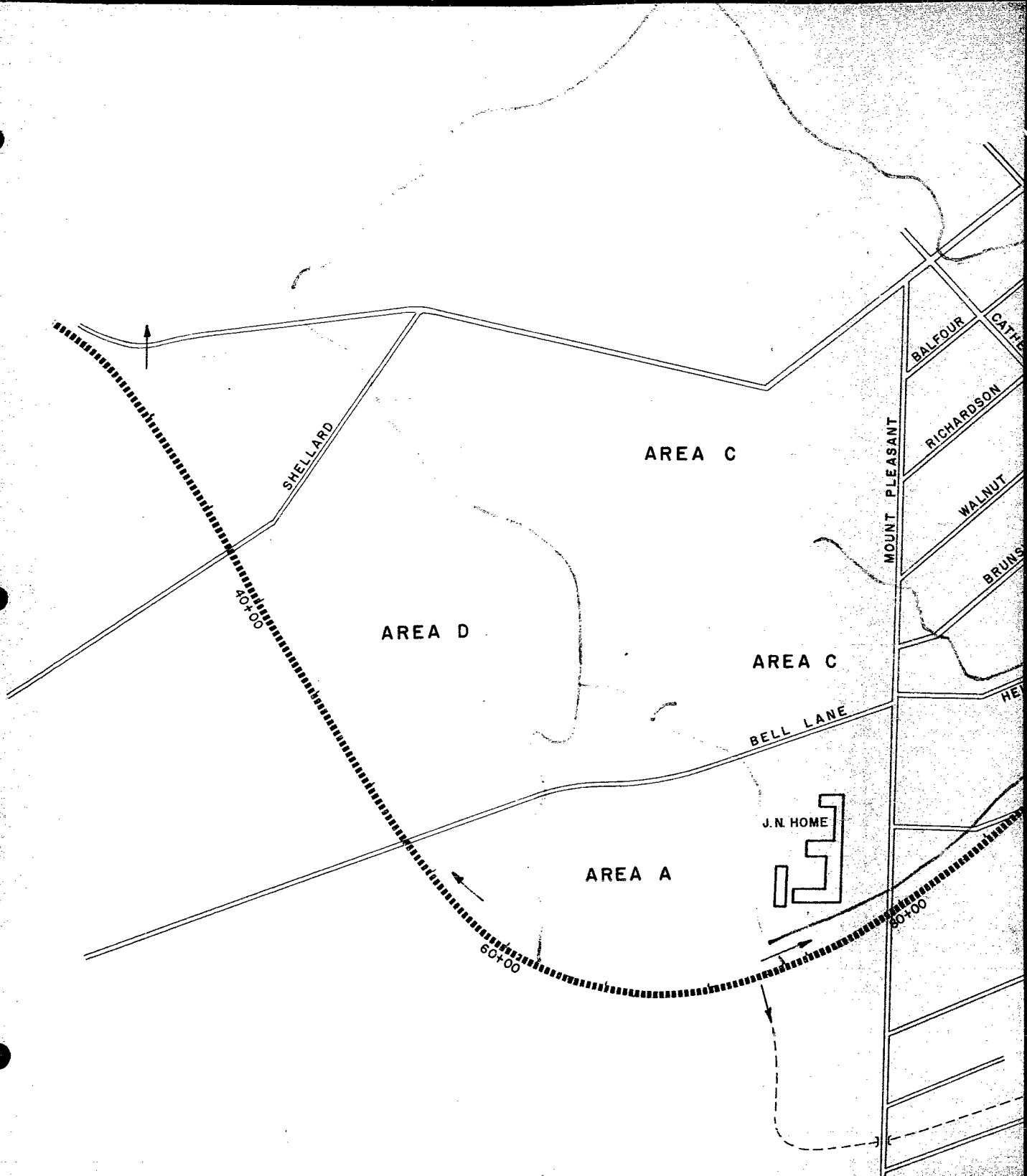
Restoration of private entrances affected by construction.

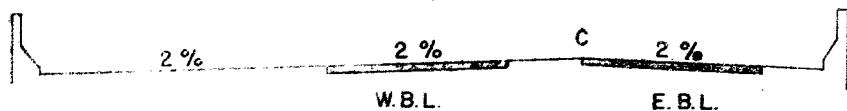
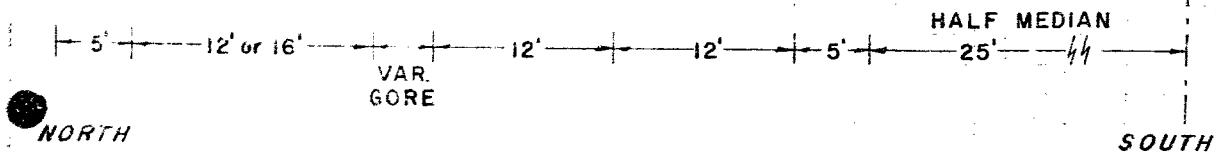
Removal of abandoned underground utilities.

ESTIMATE OF COST

Tender & Materials	\$ 954,300.00	
Structures	880,600.00	
Sundry	135,400.00	(includes reloc. of Utilities)
Engineering 1%	275,000.00	
Contingencies 3%	<u>55,000.00</u>	2,300,300.00
Property (this stage only)	<u>407,200.00</u>	
	<u>2,707,500.00</u>	

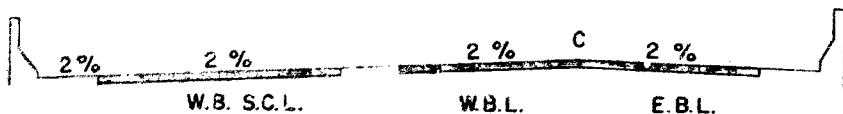
Estimate in Functional Report = \$ 3,023,680.00



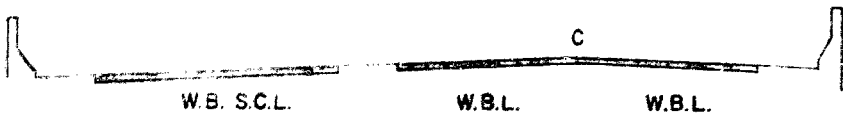


STAGE

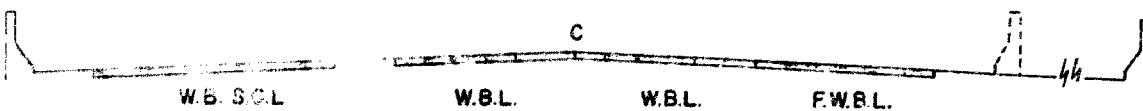
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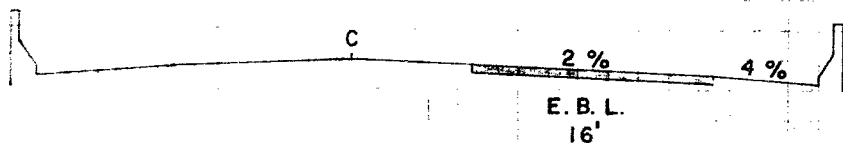
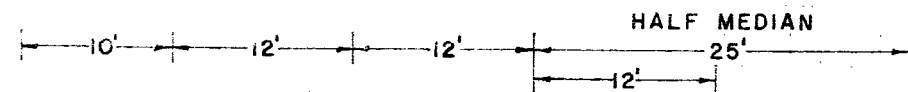
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GRAND RIVER BRIDGE NORTH STRUCTURE

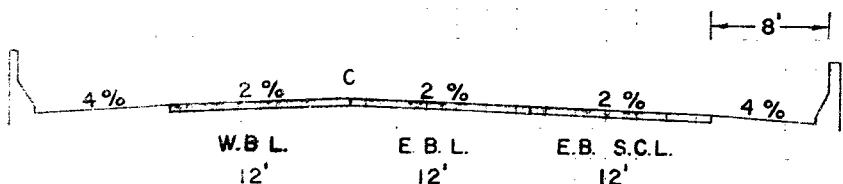
NORTH

SOUTH

STAGE



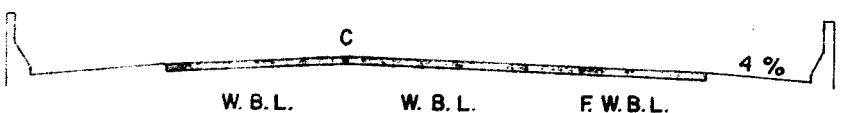
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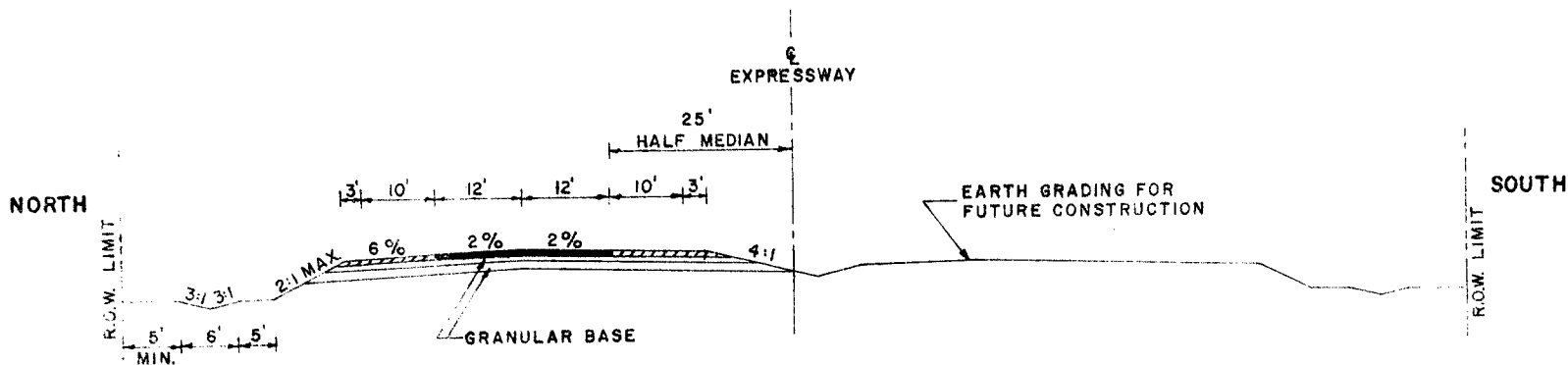


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MARKET STREET BRIDGE NORTH STRUCTURE



MOUNT PLEASANT STREET TO MARKET STREET

EXHIBIT N^o 4

