A RESIDENTIAL SUBDIVISION
in
SHUNIAH, ONTARIO.

by

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B.A.Sc. (Civil Engineering)

A Thesis Presented to the Faculty of
Graduate Studies in Partial Fulfillment
of the Requirements for the Degree
Master of Science (Community Planning)

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PREFACE

This thesis presents a design for an actual subdivision in Shuniah, Ontario. Unfortunately, sufficient time has not been available to secure all the information required for a complete design. Nevertheless, though incomplete, the following design has been developed further than the majority of designs for existing registered subdivisions. Although modifications are expected, it is anticipated that these modifications will be minor and that this design will be used as a suitable guide for the final plans.

Grateful acknowledgment is extended to the many persons who have so kindly assisted in the preparation of this thesis.

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PART I

SELECTION OF THE SITE

"I strongly recommend that every developer make a careful market analysis of the needs of his community before he developes a new area for sale."

-- J. C. Nichols

PART I

SELECTION OF THE SITE

The most desirable arrangement for the selection of a residential site involves a thorough preliminary study not only by the developer but also by the planner. In this particular case, the developer purchased the land without previously consulting the planner. Consequently, the planner's chief problem was that of designing a residential subdivision for a given site. However, the developer's experienced staff performed considerable preliminary investigation and the property was not purchased on pure speculation. The subsequent study of the site from a planner's point of view indicated that the design problems were numerous, but that the purchase was justified.

The area chosen for residential development is shown coloured in red on the accompanying Drawing No. 1, entitled "The Site Plan." Although this land lies within the Municipality of Shuniah, it is economically and socially influenced by both the Lakehead cities of Port Arthur and Fort William. At present, the Municipality of Shuniah has no taxable industries, having been developed essentially as a residential area serving the two Lakehead cities. Therefore, the taxes on houses in Shuniah are unusually high, although the owners are partially compensated by the natural amenities of the municipality.

As may be seen from the site plan, the property lies adjacent to the west boundary of Port Arthur, and approximately midway latitudinally between Port Arthur and Fort William. Presently, the site is more accessible from Port Arthur than from Fort William; however when the unoccupied land between the two cities is developed, as expected with the coming of the St. Lawrence Seaway, then the site will become an integral part of the metropolitan area.

Oliver Road extends along the north boundary of the site and is, therefore, its closest thoroughfare. Cars using this main highway should reach central Port Arthur within ten or fifteen minutes and public transportation should not require much more time. Presumably, the chief commercial, recreational and business areas for the region will remain readily accessible in central Port Arthur and central Fort William. This site is not large enough to be classified as a "neighbourhood" which is normally governed in size by the population required to support an elementary school; that is, from 3,000 to 5,000 persons. Therefore, this subdivision need not provide all neighbourhood facilities such as schools, churches, shopping centres and recreational services.

An elementary school now exists north of Oliver Road a few hundred yards west of the site. Because of this, a school area need not be planned for this development, although one or two lots may be reserved for nursery schools. The exact locations of existing churches with respect to the site are not known, but the most common denominational churches should be readily available either by car or by transit vehicles. Consideration should, however, be given to the building of one or two churches within the development.

The area is bounded on the north by Oliver Road and by an undeveloped parcel of land. Oliver Road has recently become a provincial highway and the width of its right-of-way has been extended, although plans are not yet available indicating the new limits. The small parcel of undeveloped land enclosed by Oliver Road, the McIntyre River and the site is an integral part of the whole area, but, unfortunately, could not be obtained and incorporated into the over-all plan. While it is unlikely that this land will be developed by an undesirable industry, it may be sold for some commercial use such as tourist cabins or a shopping centre.

The northern portion of the east boundary of the site borders on a new collegiate campus which should be an attractive amenity with well designed buildings and large open greens. The southern portion of the east boundary borders on undeveloped land in the City of Port Arthur which has been zoned as "residential."

The complete length of the southern boundary is adjacent to a registered subdivision. Although this registered subdivision is but slightly developed, it should eventually become a high class residential area. A golf course extends along the full length of the western boundary of the site. The future land use of the golf course is unknown, but it may be sold in the near future for development because of the expected increase of land values in Shuniah. Therefore the properties bordering the site should be quite desirable and should provide the proposed neighbourhood with a "good address".

The site is not well situated with respect to available utility services. A watermain extends from central Port Arthur along Oliver Road to the city limits. Negotiations are now proceeding between Shuniah and Port Arthur for the extension of this main to service the built up portions of Shuniah. It is as yet unknown whether the watermain is of adequate size to supply the desired flow. If this plan is adopted, the water system in Shuniah will have the serious disadvantage of being dependent upon a single watermain as a source of supply. Thus, if the watermain on Oliver Road should be closed for any purpose (eg. break), then the complete water supply to Shuniah would cease.

With regard to other utilities, sanitary sewage disposal appears to be the most serious problem for the area. Existing trunk sewers are not within feasible extension distance to the area and an on-site treatment plant seems the best disposal solution.

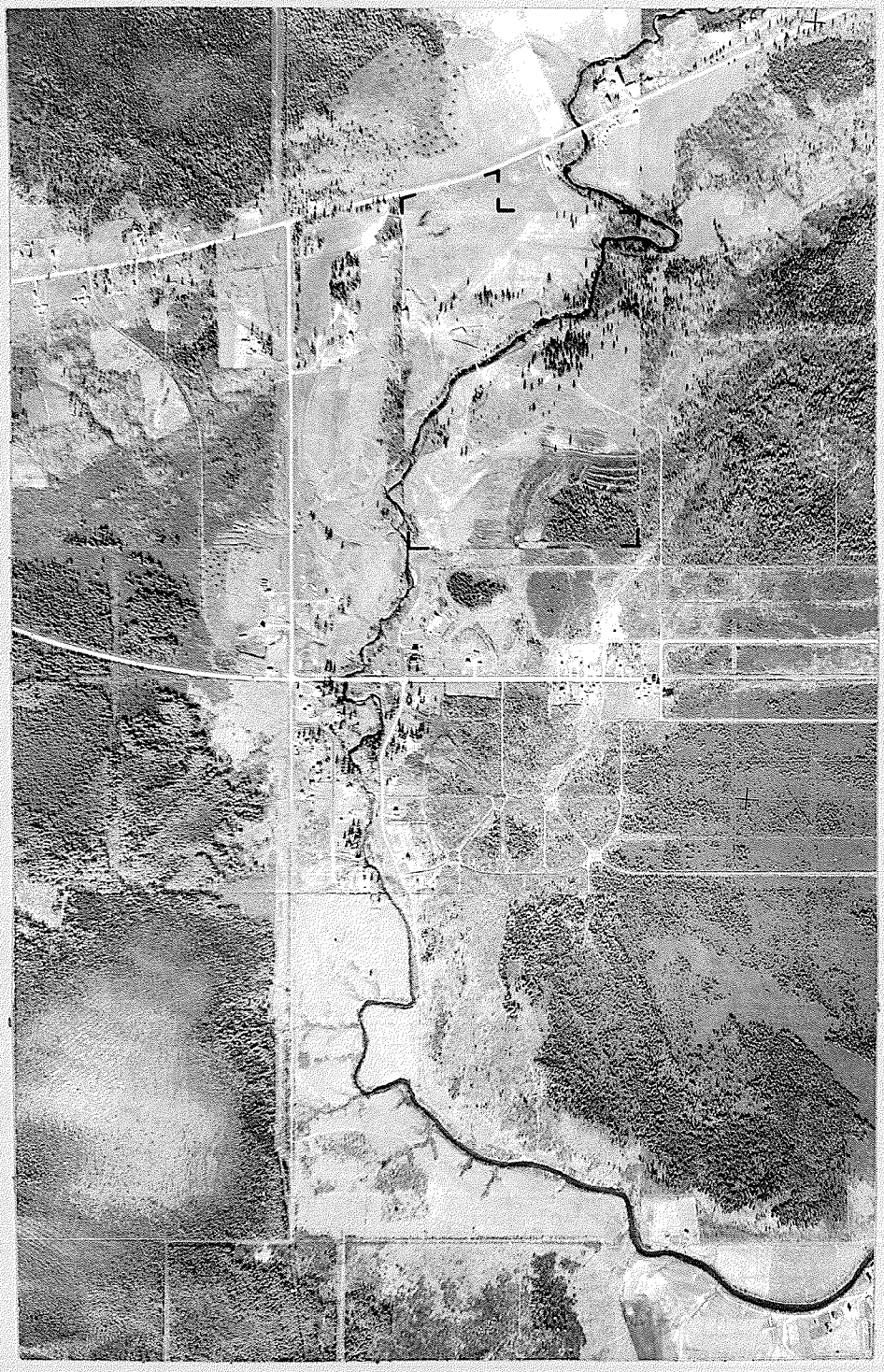
The removal of storm water should be a minor problem as the run-off can quickly drain into the McIntyre River which traverses the site. Public supply of domestic gas is not expected. The extension of telephone and electrical services should offer no difficulty. It is expected that Port Arthur will supply maintenance services, garbage removal, police and fire protection until Shuniah is itself financially able to supply these services.

The site appears satisfactory from the viewpoint of safety and health. Minimum dangers should result from traffic flows on the site as no thoroughfares are foreseen. One or two minor collector streets will be required to serve the minor residential streets. At present, the locality has no railways or industries which produce distracting noise or obnoxious odours. The development of such disturbances is not expected, although their prevention cannot be guaranteed. Aeroplanes may generate the most troublesome noise, but this type of noise should not be worse than that occurring in the average modern city. The existing Fort William airport lies about four miles to the southwest. The most dangerous feature of the site will likely be the McIntyre River along which proper safety precautions should be taken, particularly during flood periods.

From a topographical aspect, the site is almost ideal for residential development. See Drawing No. 2, entitled "The Topographic Map." The total land fall from the highest to the lowest point on the site is approximately 75 feet. Most of the land

slopes gently towards the south and so provides excellent insolation. Portions of the land are too steep for economical development, but will provide pleasant variety in the landscape. Approximately 90 percent of the site is buildable land which should require only a small amount of street and lot grading. The top soil on the site should provide an excellent base for landscaping, if properly protected. Outcrops of rock are not apparent except at various points along the river bank. The approximate depth of bedrock should be established before the completion of final plans and the start of construction. Major depressions or swamp areas do not exist, although a number of small pockets are apparent on the topographic map. These minor depressions may be either filled or properly drained. A few large trees stand in the areas indicated on the topographic map. Most of these trees should be protected and saved for future landscaping.

The Municipality of Shuniah has no zoning by-laws or master plan. All development, to date, has been residential. A few short building by-laws act as the only control of development. Assuming that no public water supply or sanitary sewers will be provided, these call for a minimum lot size of 15,000 square feet. The property has been purchased at a reasonable price with no legal encumbrances. Consequently, registration of the subdivision should not be retarded by legal difficulties.



Aerial Photograph of the Site.

The accompanying aerial photograph of the site indicates its present appearance. (The corners of the property are marked with black lines.) The few wood-frame buildings which stood on the land have been removed. The small bridge which spans the McIntyre River is a temporary structure only suitable for light traffic. Rough earth roads are the only means of access to the site.

PART II

DESIGN CRITERIA

"A layout cannot be planned
without a thorough knowledge
of the physical features of
the site and its surroundings."

-- H. Spence-Sales

PART II

DESIGN CRITERIA

The developer stipulated that the site be planned as a completely residential area for single family houses, with the exception of a few neighbourhood facilities. The minimum price of a house, not including land, is expected to be about $15,000 with the owners, therefore, in the upper income bracket. In keeping with this class of house, the developer desires the lots to be relatively large, especially in the areas with the greatest amenities.

A discussion of other controlling criteria follows:

A. Streets

The site is well situated with respect to major thoroughfares. Convenient access is possible to either Oliver Road on the north or to Eleventh Avenue on the south. Eleventh Avenue runs eastward through the registered subdivision into Port Arthur. (See the Site Plan). No traffic is expected on the site which does not have its destination within the neighbourhood. However, two collector streets, one running north-south and the other east-west, are necessary for local traffic. One or two traffic outlets should be provided on all sides. The centre-lines of access streets to the south must be properly correlated with the registered subdivision, Plan No. M-40. The pattern of streets should encourage economy in the installation and maintenance of public utilities.

The maximum street grades should be eight percent with ten percent permissible for short distances. The maximum grade at

intersections should not be greater than six percent. It may be assumed that driveways and garages will be used for long-term parking. Therefore, a pavement width of 26 feet should be ample on the minor residential streets to permit normal two-way traffic flow; parking on one side of the street may be allowed during slack traffic periods. A width of 36 feet should be sufficient for the collector streets to provide excellent two-way service at all times, even with the occasional vehicle temporarily parked on the street. The widths of the rights-of-way for the streets were initially set as 50 feet for minor streets and 66 feet for collector streets. The length and width of sidewalks should be designed on a basis of pedestrian use. Therefore, sidewalks may not be required on both sides of all streets, and in some cases may not be required at all.

The accompanying Drawing No. 3, entitled "Street Cross-sections," indicates the initial and final layouts suggested for street pavement and underground utilities on both the minor and the collector streets. The initial cross-sections (i.e. the first and third diagrams on Drawing No. 3) show no provision for sidewalks and indicate the use of side ditches for storm runoff. Short culverts in the ditches will be necessary for each driveway. The final cross-sections (i.e. the second and forth diagrams) incorporate both sidewalks and underground drainage. The sidewalks are not adjacent to the curbs but are located two feet from the lot lines. The sidewalks so situated have the following advantages. Firstly,

a green buffer strip separates vehicular traffic from the pedestrians. Since children will undoubtedly play with mobile toys on the sidewalks, the green strip will afford some protection from traffic danger. Secondly, the set-back sidewalks, unlike the curb sidewalks, will not require driveway cuts which are particularly dangerous for pedestriansduring icy conditions. And thirdly, the green strip offers ample space for the installation of underground utilities and the surface planting of trees.

Straight curbs are indicated on the cross-sections, but rolled curbs may be more desirable for flexibility in locating the driveways. If rolled curbs are used, they should be modified to straight curbs at the pedestrian crossings for safe stepping purposes.

All underground utilities are clear of the street pavement on one side or the other and therefore should be more accessible and easier to maintain without interrupting traffic flow. Both the sanitary sewer and the electrical conduit have been placed on the opposite side of the street from the watermain for special reasons. The sanitary sewage may contaminate the water supply and stray currents from the electrical conduits may electrolyze the metal water pipe. Service connections from either side of the street to the underground utilities will vary in length. When both sides of the street are at the same elevation, the longer house connection controls the depth of sewer. However, when one side of the street is higher than the other, the depth of the sewer is controlled by

the length of the connection to the lower house. Therefore, the sewer should be laid on the lower side to decrease the length of the connection and so minimize the depth of excavation.

B. Public Buildings.

Many public buildings, such as schools, social centres, shopping centres, churches, health centres and local administration centres may be located in a residential subdivision. Of these, a minor shopping centre located near Oliver Road and one or two churches are the only public buildings considered for construction on the site. An elementary school already exists in the locality. The church and school annexes should suffice temporarily for social and health centres until the time when the municipality is adequately developed to warrant the construction of special buildings.

C. Parks and Playgrounds.

Large green areas, in the form of the collegiate campus to the east and the golf course to the west, will likely bound the site for some time. The collegiate, will presumably endure for a period no shorter than the lifetime of the proposed subdivision. However, the continued existence of the golf course is extremely doubtful. Part of the site near the river is too steep for economical development and may be classified as unbuildable land. This unbuildable land occupies about ten percent of the whole area. Five percent of the land area is the usual amount reserved for public use.

Because of the adjacent green areas and because of the large amount of unbuildable land suitable for a park, additional playground areas do not seem justified. Ample playground facilities are available near the site and the proposed large lots should eliminate the need for tot-lots.

The McIntyre River is a natural and beautiful amenity which should be accessible to all local residents. Therefore, easements of at least 15 to 20 feet have been planned for pathways along both sides of the river. These narrow rights-of-way will not only provide direct pedestrian approach to any point along the river but also unite the larger green areas into a more attractive entity.

D. Public Utilities.

As previously mentioned, few of the utilities are readily available to service the site. Those known to exist may be seen on the Topographic Map, Drawing No. 2. While the deficiency of services may be a serious problem in the development of a subdivision, the presence of services may be just as troublesome if they have not been properly designed for extension.

A separate discussion with respect to each utility service will clarify the design problems.

1. Water Distribution System.

The water supply may be procured by a number of methods. Firstly, the existing watermain on Oliver Road may be extended

from the boundary of Port Arthur to the site. Secondly, a public system may be used in conjunction with a source of supply from a centrally located deep well. Thirdly, a deep well on every lot may supply each private house.

The first and second methods would involve a complete network of public watermains. This public system has a number of advantages over the privately owned deep wells. If a private water supply and sewage disposal system occurs on each lot, then the minimum lot size permissible is 15,000 square feet. A public water system with private sewage disposal reduces the minimum size of lot to 7,500 square feet. Private deep wells may not satisfy domestic demands and are susceptible to pollution. The public system normally provides an ample supply of water which can be cheaply purified if necessary. The individual deep wells provide negligible fire protection whereas a public system with hydrants generally satisfies the requirements of the Canadian Fire Underwriters and reduces fire protection rates.

If the main supply of water is obtained from Port Arthur, the installation of a central deep well would be advisable as a standby. If deep wells become the main source of supply, then two or more would be necessary to assure a constant flow. These standby installations can also supplement the main source of supply during peak domestic demands and emergencies.

The most dependable and probably the cheapest source of water would occur if the public system on the site was an integral part of the Port Arthur system. While this arrangement may not be

possible immediately, it is almost certain to be feasible in the near future with the continued expansion of the Lakehead region. A local distribution system with a central deep well installed at this time could be easily and cheaply incorporated into a larger system at a later date; whereas, private deep wells on each lot could not be included in a public system and would therefore become a complete financial loss.

2. Sanitary Sewerage System.

Undoubtedly the most difficult utility problem for the site will be that of sanitary sewage disposal. This particular aspect was studied in some detail and letters were written regarding the problem to the Municipality of Shuniah, the Provincial Department of Planning and Development, the Provincial Department of Health and to a few private concerns. A number of alternatives for sewage disposal emerged from this study.

The best solution would be the direct connection of the sewerage system on the site to a trunk sewer extended from either Port Arthur or Fort William. In this method, the sewage would eventually be discharged into Lake Superior. This proposition is not feasible until the time when the intermediate area between the site and the lake is sufficiently developed to warrant the installation of a trunk sewer.

Another solution for the disposal of sewage would involve

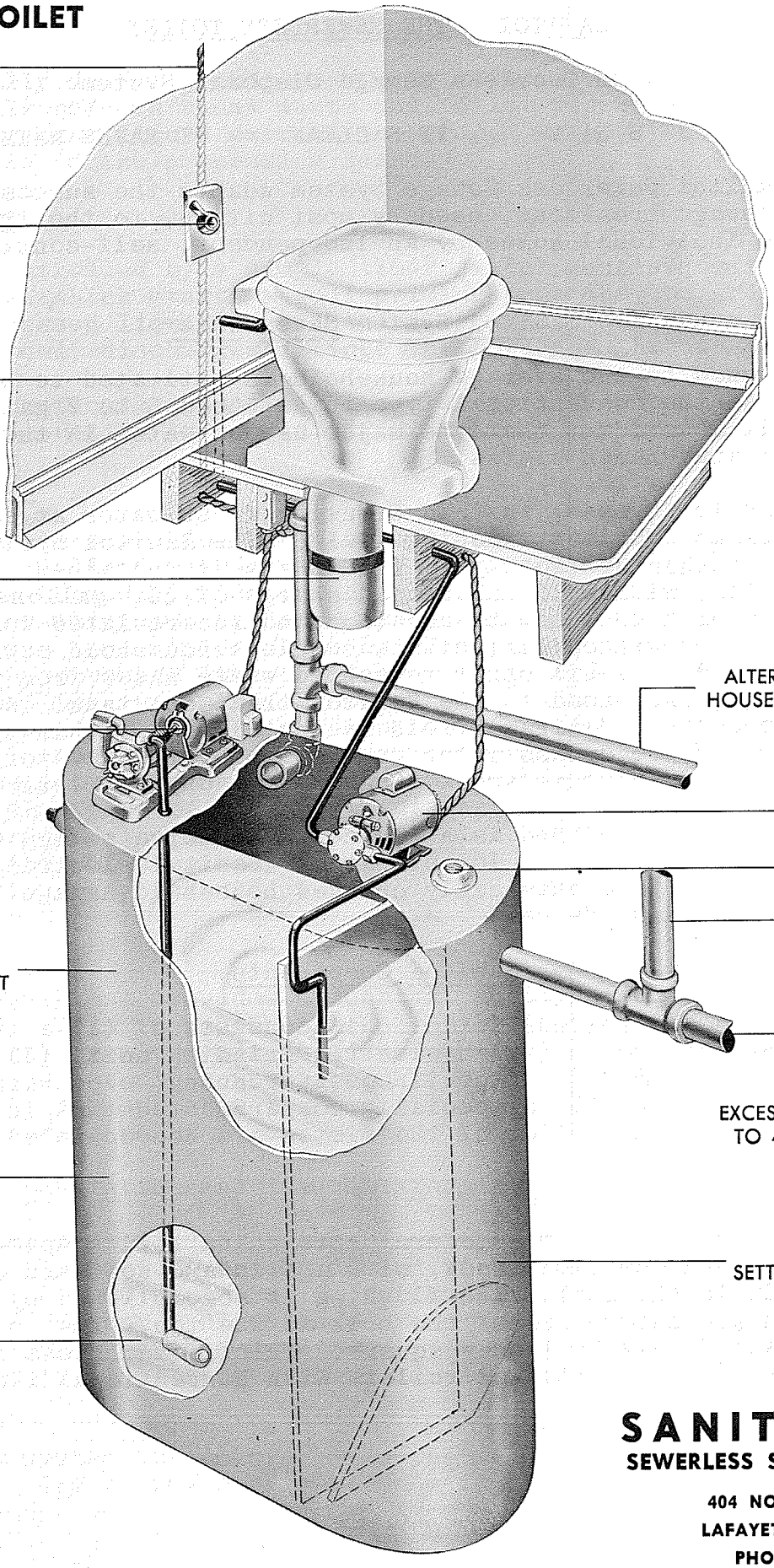
a municipal treatment plant located at a point farther downstream from the site. Such a treatment plant would not only serve this subdivision but likely the whole of Shuniah. This latter proposal does not appear practical at this time as the Municipality of Shuniah is probably not in the position to finance wholly or even partially the trunk sewers and treatment plant required for this installation. Lagooning might be an easy and economical alternative to the treatment plant, but this method has not been sufficiently tried and proven in Canada, so that acceptance by the Department of Health is doubtful.

The most reasonable solution for sewage disposal seems to be a local treatment plant on the site. The best location for this plant would be near the lowest part of the site so that sewage would flow by gravity from all points. The outfall for the treated effluent would extend into the McIntyre River. To protect the river from pollution, the Department of Health suggests a complete secondary treatment of sewage involving screening, clarifying, filtering, digesting, drying and chlorinating. If a trunk sewer is later extended to the site, then this local sewerage system could be conveniently connected and the small treatment plant abandoned.

The method of sewage disposal by private septic tanks should only be considered as a last resort. Septic tanks have a number of serious disadvantages. Disturbances often occur through troublesome leakages and obnoxious odours. As the surrounding area developes and the density of population increases, this disposal

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IT'S SAFE IT'S CLEAN IT SAVES WATER

The Sanitoi Sewerless Sewage System adapts the successful aerobic method of sewage treatment, used by most cities, to the treatment of sewage from individual homes by an independent, self-contained unit installed on the premises.

Sanitoi System Saves Water

Water used by the average household is estimated to be 150 gallons each day. As the conventional type toilet uses 5 to 7 gallons at each flushing, it is evident that the major use of water in the modern home is to carry away human wastes.

The Sanitoi System, instead of using fresh water at each flushing, recirculates an odorless flushing fluid. The Sanitoi System may be operated in either of two ways: (1) as a self-contained, closed-circuit system, with only an initial charge of 250 gallons of water which is rendered odorless by aeration and recirculated for flushing, or (2) as an integrated part of the complete household sewage and drainage system with all other household waste water from plumbing fixtures being processed in the Sanitoi treatment tank. A small underground disposal and drainage field is installed for this type of system to take care of the excess water coming from bath, lavatory, laundry, and sink. This excess is about 50 gallons a day of clear water.

Sanitoi was developed as a device to conserve water. It substitutes a little electricity for a lot of water. Sanitoi electrically, mechanically, physically, and chemically changes household sewage to odorless, harmless carbon dioxide gas.

Sanitoi Components

The Sanitoi Sewerless Toilet unit consists of (1) a toilet bowl with conventional seat, (2) an electric grinding unit, (3) a motor-driven flushing pump, (4) a continuously-running, electrically-driven aeration device, and (5) a specially compartmented tank in which the treatment and clarification of the wastes are accomplished.

Toilet Bowl

The toilet itself is a modern white china bowl - splash proof, frost proof, and overflow proof, with a standard seat and cover. No water stands in the bowl. The flushing is accomplished by fluid supplied to the inside rim of the bowl at the top. The bowl occupies a floor area of only 20 inches square. This is much less floor space than required by conventional toilets with conventional flushing tanks attached.

Grinder Unit

The electrically driven grinding unit is attached to the bowl below floor level. It reduces human waste and toilet paper to small particles. The flushing liquid carries the ground waste from the bowl and the grinder unit to the processing tank.

Flushing Fluid Pump

Flushing is controlled by a simple timer switch mounted on the wall near the toilet bowl which starts a self priming pump and the grinder. The pump draws processed liquid for flushing from the tank up to the rim of the toilet bowl, discharges it into the bowl and through the grinder.

The timer automatically shuts off the grinder and pump when the grinding-flushing operation is completed.

Waste Treatment Tank

The compartmented tank, in which the odorless treatment process takes place, is specially designed. It may be placed inside the house, in the basement, or buried outside in the ground. Second floor location of the toilet is possible; two toilets may be connected to one tank. The dimensions of the tank are 60" high by 27" by 44", and it is similar in appearance to an "obround" fuel oil tank. It is made of steel, coated with a heavy coal tar rust-proofing compound inside and out, and warranted for 20 years. The drainage pipe size between the tank and grinder is critical, and must be one and one-quarter inches in diameter; no more and no less. It carries the waste that has come through the grinder unit into that part of the treatment tank where turbulence, aeration, and vigorous agitation occurs. Particle free flushing fluid is drawn off from the settling compartment of the tank. A breather pipe from the tank carries away exhaust air.

Aeration Equipment

The Sanitoi equipment provides a constant supply of oxygen in the solution in the tank liquid. This is accomplished by bubbling air through the tank liquid so that oxygen from the air is dissolved in the liquid in the aeration compartment. An air compressor driven by a small electric motor running continuously accomplishes the aeration. The air is released in the bottom of the tank through a porous stone.

Sanitation and Health Information

Analysis of the tank liquid in the "flow-through system" shows the pH to be 8.0. The biochemical oxygen demand of the effluent from the system is approximately 20 ppm. Solids in the tank aeration compartment range from 1000 to 6000 ppm. Dissolved oxygen in the tank is maintained at 2.5 to 8.0 ppm. The bacteria counts on effluent from the system comoare favorably with those of conventional complete-treatment sewage plants.

In the closed system the chlorides in the tank liquid present no operation porblem. The nitrogenous compounds in the system do not effect the operation.

General Information

The Sanitoi System is an assembly of proven and tested component parts, made by established manufacturers of plumbing equipment. The parts have been selected for dependable operation requiring a minimum of attention. The system's reliability compares favorably with that of a modern refrigerator. The Sanitoi System,when installed by licensed dealers and not abused, is guaranteed by the installer to function as a waste disposal system.

The electric power requirements of the system vary. They approximate that of a 100 watt light bulb burning continuously.

Chemicals are not used in the operation of the system. The system treats ALL the waste of the average family and guests every 24 hours. Soaps, detergents, or greases in the usual quantities do not harm the system.

The system does not attract flies, insects, or vermin.

The treatment tank does not have to be placed directly beneath the grinder unit. However, the top of the tank must be at least 6 inches below the bottom of the grinder unit.

If the system is installed on a flow through basis, with a subsoil drainage field, the size of the field is much reduced as compared with the absorption field for an ordinary septic tank because the liquid discharged is clear and much less in volume. Consequently this system can be used to advantage in locations where the soil conditions and high ground water make the use of septic tanks with tile fields prohibitive. The liquid in the Sanitoi System is not septic. The Sanitoi System is a completely different method of sewage disposal from that of the well-known septic tank and absorption field.

The in-place cost of the Sanitoi System competes with the cost of conventional septic tank sewage systems. See your Sanitoi Dealer for costs of the Sanitoi System installed.

SANITOI SYSTEM MAINTENANCE

Servicing of the Sanitoi equipment - generally not more than once a year - is done by a licensed Sanitoi Dealer in your community. Motors, pumps, and aerators are then inspected to assure satisfactory operation. Under normal use the Sanitoi System requires less maintenance than a con ventional toilet and septic tank disposal system.

The toilet bowl is cleaned in the usual way and no more often than a conventional bowl.

The system is not designed for the disposal of garbage, sanitary napkins, or trash that cause difficulty in a standard toilet. Temporary interruption to electric service of the grinder, flushing pump, and aerator motors will render the system inoperative only for the lengt of time of power failure.

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method would have to be abandoned completely in favour of a more satisfactory public sewerage system. The septic tank installation requires a certain amount of maintenance for satisfactory service and a large adequate open space for a tile disposal field. A new method for a sewerless sewage system has been invented in the United States and is patented and sold exclusively by Sanitoi, Inc. (A brochure explaining this installation is included herein.) While this system eliminates or minimizes the tile field required for septic tanks, it too, has a number of serious disadvantages. Since the treatment process depends upon electrically operated equipment, the installation will not function if a power shut-off or mechanical break-down occurs. Moveover, there are some limitations to the sort of sewage which the system will treat. The Sanitoi installation is more expensive than the septic tank system, but of the two, it appears to be the more desirable.

3. Storm Drainage System.

The problems on the site resulting from storm drainage are not expected to be too complicated. A main trunk sewer for storm water is not required as the McIntyre River can adequately receive the surface runoff. All portions of the site are naturally tributary to the McIntyre River so that any storm drainage system may be based upon gravity flow. The worst runoff difficulties may result from erosion on steeper slopes or from increased flows from higher ground towards the site. The former problem may be overcome

by such methods as terracing, baffles and lined water-courses. The best solution for the latter problem cannot be determined at the present time because the quantity and direction of exterior flows towards the site are unknown. However, it may be possible to intercept these exterior flows by special ditches or underground conduits which would carry this excess runoff directly to the river.

Various drainage methods may be used to control storm runoff. Separate storm drainage and sanitary sewerage systems are preferable to a combined system, since the sanitary sewage will have to be treated on the site or elsewhere. A separate underground system for storm water involves the installation of catchbasins, manholes and sewer pipe with the outfalls emptying into the McIntyre River. A separate surface system would involve the use of ditches and culverts. Ditches could be located along special lot-line easements or along the side of the street pavement as indicated on the Street Cross-sections, Drawing No. 3. In this development, the surface system may be justified until the municipality is sufficiently developed to afford an underground system. A satisfactory solution to the drainage problem might involve a combination of both surface and underground installations.

Old time residents in the locality have never known the McIntyre River to overflow its banks, although high water levels occur regularly. The McIntyre River serves a comparatively undeveloped catchment area which extends northwest of the site for about 16 miles. If the future runoff characteristics of the catchment area remain similar to those in the past, then the maximum flood level

should not exceed any previously experienced. However, if the land is developed, especially in an urban form, the amount of storm runoff will increase noticeably. How much future development will take place in this catchment area is indefinite but some will undoubtedly occur. The effect of any new development upon the rate of storm flow is greatest where the time of runoff is the least. Thus, any urban development along the McIntyre River basin will greatly increase the storm runoff immediately downstream. Since future improvement just north of Oliver Road is quite possible, the maximum flood levels through the site can be expected to rise.

4. Electrical and Telephone Distribution Systems.

In most new subdivisions, the extension of electrical and telephone services generally presents little difficulty. The proposed subdivision is similar in this respect. At present a minor electrical distribution line traverses the northern section of the site in an east-west direction. (See Drawing No. 2). Consequently, electrical service should be readily available, although the pole line may have to be relocated and adapted to the subdivision pattern.

For aesthetic purposes, the pole lines may be situated along rear lot-line easements. Better still, through the use of underground conduits, the pole lines can be eliminated entirely leaving lamp-posts and manhole covers as the only surface installations visible.

E. Lots.

The Provincial Department of Planning and Development recommends the following minimum sizes of building lots for one family houses:

- 5,000 square feet, when a public water supply and sanitary sewer are provided.
- 7,500 square feet, when a public water supply but no sewers are provided.
- 15,000 square feet when neither a public water supply or sanitary sewer are provided.

In this proposed subdivision, it is expected that both these services will be provided, although slight doubt exists regarding the provision of sanitary sewers. For this reason, the minimum size of lots for the preliminary design has been set at 7,500 square feet.

The Department further suggests that 100 feet be used as a minimum depth of lot and 50 feet as a minimum width. House set-backs have been recommended at 20 feet on the front and 15 feet on the side. For the preliminary design, the minimum depth of lot was assumed at 125 feet and the minimum width at 60 feet. A small amount of earth moving on the lots will be necessary, the need for more may become apparent after the final street grading.

PART III

PRELIMINARY DESIGN

"Civic design strives for both functional and aesthetic accomplishment. The end product of civic design is a composition based on an original concept...."

-- V. J. Kostka

PART III PRELIMINARY DESIGN

(See Drawing No. 2 and Drawing No. 4 entitled "The Preliminary Subdivision Plan.")

The initial stage in the preliminary design involved the classification of the land as buildable or unbuildable. All of the unbuildable land occurs along the McIntyre River towards the northeast corner of the property. Most of the unbuildable land is so classified because it has a slope greater than ten percent. Land steeper than this is generally considered uneconomical for building, servicing and landscaping. A portion of the area east of the river in the northwest is very low and would be exceedingly difficult to serve with sanitary sewers functioning by gravity flow. A sanitary sewerage system for this low area would require either exceptionally deep sewers or a pump installation. Another steep bank does exist on the north side of the river, and portions are over ten percent in slope. However, this bank is not extensive and relatively few lots will require special house orientation and landscaping.

The next stage in preliminary designing involved the location of access streets. The access to the north is limited to 750 feet along Oliver Road. The access streets to the east and west were located in the southern part of the site at positions approximately midway between Oliver Road and Eleventh Avenue. This arrangement provides for a minor collector street approximately half way between these major thoroughfares. The western access street should not be opened unless the developers are assured that the street will never become a major thoroughfare serving an area

larger than that now occupied by the golf course. Access to the south is limited to the three streets provided by the existing registered subdivision. Since two locations are sufficient, the middle street was ignored. This decision will not injure the lay-out of the registered subdivision.

Since some doubt remains regarding the eventual use of most of the land at the periphery of the site, all exterior lots were backed upon the boundaries. These lots were given a minimum depth of 150 feet so that buffer strips of trees can be provided along the boundary if desired. The lots backing upon Oliver Road have an approximate depth of 170 feet to allow for extending the width of Oliver Road and providing an adequate buffer strip.

Only one vehicular bridge is being considered across the McIntyre River at present. This has been located as far south as possible to approximate a position midway between the existing bridges on Oliver Road and on Eleventh Avenue. Moreover, in this southernmost position, the bridge reduces to a minimum the unusable triangle of land between the river and the west boundary. The street pattern must converge towards the bridge. This in turn, provides the best arrangement for gravity flow of storm runoff and sanitary sewage towards the lowest portion of the site in the southwest corner. In general, all the streets have been situated parallel to natural drainage for runoff purposes. This arrangement is most noticeable in the northern portion where the streets were located down the draws. Cross intersections were minimized

in favour of T - intersections which are safer because they reduce both speed and traffic flow.

Lots were backed along the river in preference to fronting for several reasons. Firstly, a river-side street and its ensuing utilities would only serve lots on one side, thereby becoming uneconomical. Secondly, during severe river floods, the street and utilities might become unusable or badly damaged. Little damage should occur with lots backing upon the river. Thirdly, with the use of river-side pathways, the natural amenities of the river will be retained.

The dotted lines in the northeast corner of the Preliminary Subdivision Plan indicate the possible extension of the street from the south either towards the west and via another bridge or towards the east and the collegiate. This proposed extension may never be economically feasible.

A number of pedestrian rights-of-way 20 feet wide provide access to the river park. It is assumed that most residents in the northern portion will often walk to the shopping centre by way of the park. The southern portion is considered too far for pedestrian shopping so that special rights-of-way have not been provided.

On the basis of this initial plan, preliminary profiles of the street centre-lines were plotted to visualize the finished street grades and the depth of sewer inverts. Study of the profiles indicated that satisfactory street grades and sewer depths could be obtained. These preliminary profiles closely resemble the final

PART IV

FINAL DESIGN

"A home is not a detached unit but a part of a neighbourhood, which in turn is part of a town; and the good quality of the home usually depends at least as much on its surroundings as on its design and construction. Hence the vital importance of ground planning and control of the development of neighbourhoods."

-- Thomas Adams

PART IV

FINAL DESIGN

A. The Property Line Plan.

(See Drawing No. 4 entitled "The Property Line Plan")

With the acceptance of the street pattern as proposed on the preliminary plan, the next stage of the design involved the precise calculations of the street centre-lines. These computations established the exact angles and dimensions necessary for additional design and for land survey.

A qualified Ontario land surveyor produced a traverse around the property, although it was not closed in the field. Therefore, after the corner angles were adjusted to those shown on the plan, the north and east boundaries were accurately computed on the basis of the given dimensions for the south and west boundaries. The north side was adjusted from the approximate distance of 1,791.4 ± 5 feet, given by the land surveyor, to the distance of 1,791.6 feet. Similarly, the east side was corrected from 2,532.8 ± 5 feet to 2,534.5 feet.

Most of the points of intersections for the street centre-lines were located with respect to the boundaries on the basis of the angles and dimensions set for the lots and the streets. A few of the points were located by scaling their approximate positions and using the scaled dimensions as precise measurements in the computations. For simplicity in calculations and plotting, the main points along the street centre-lines were

computed by the grid system with the southwest corner arbitrarily fixed at 5,000.0 feet North and 5,000.0 feet East and the western boundary arbitrarily bearing true north. The resulting co-ordinates are not recorded herein, as they are not necessary for future reference and were used only for the precise plotting of the detailed plans. However, all centre-line data which are essential for future calculations and surveying have been recorded on the Property Line Plan.

The centre-line data include information pertaining to the points of intersections, the curves and the tangents. All dimensions have been computed to the nearest tenth of a foot and all the angles to the nearest minute. The minimum centre-line curve radius, at points other than street intersections, has been assumed at 100 feet to encourage smooth and safe traffic flow. The north end of Street "B" has not been accurately tied to Oliver Road. The chainage of 8 + 41 ± has been scaled and will have to be checked later in the field. The north end of Street "H", at station 29 + 42.6, is a "dead-end". This street has been terminated at the river park, but it may be extended as previously mentioned or produced as a tote road to a small parking lot within the park. The chief purpose of the dead-end is to utilize the land to the east in the form of two lots.

B. Street profiles.

(See Drawing No. 6 entitled "Street Profiles").

Once the street-centre lines were accurately computed, they were plotted by co-ordinates on a working drawing of the contour plan. By scaling the location of the two foot contours along the centre-lines, sufficient data were obtained to plot the existing ground line profiles for each street. With reference to the ground line profiles, finished street grades were established and vertical curves computed. In producing the finished profile, the grades were kept as close as possible to the original ground line. Such procedure diminishes the amount of earthwork required and promotes easier access to the individual lots. Earthwork is unavoidable, and in this case the maximum cut at centre-line is six feet and the maximum fill seven feet. The maximum grade occurs for a short length at eight percent on Street "A". This grade should not hinder modern vehicles, even in winter time. Although the maximum grades at intersections were kept as low as possible, a grade of five and a half percent was unavoidable on Street "A" in order to minimize the depth of cut. The minimum grade incorporated in the scheme, exclusive of the bridge crossing, was set at 0.48 percent. This minimum slope should produce non-settleable velocities of storm runoff in either side ditches or gutters.

The finished or existing grades of access streets outside the property are not known. Therefore the profiles may have to be modified slightly in the field to meet the existing profiles

of exterior streets. The critical points to consider are the intersection of Street "B" with Oliver Road and the extension of Street "F" into the existing subdivision.

C. The Modified Topographic Map.

(See Drawing No. 7 entitled "The Modified Topographic Map")

This stage in the design is uncommon and rather unique. The original contour plan was modified to indicate the finished landscape after street grading. Although the primary purpose of this plan was to provide a visual impression of the modified site, it was found that the plan was invaluable as a reference for the remaining stages of the design.

The original topographic map was modified in the following manner. Firstly, on the basis of the finished profile, the revised two-foot contours were plotted along the centre-lines of the streets. Secondly, the contours were drawn perpendicular to the centre-lines to represent the street width. The width of 35 feet, an average of the proposed cross-sections, was drawn on all streets for both cut and fill. Although this width is not precise, it retains the same degree of accuracy as the original map. Thirdly, and lastly, the modified contours were adjusted along the sides of the streets to tie in with the original contours.

The modified topographic plan is exceedingly useful. The plan clearly indicates, when compared to the original plan,

the additional earthwork required to grade the streets and improve the landscape.

The street grading will form a number of unnatural depressions and knolls which should be filled in or cut off respectively. Of the two, the depressions are the more serious problem because they function as catchbasins in which water will collect and become stagnant. On the modified topographic map, all the troublesome depressions, either natural or man-made, have been marked by the letter "F", denoting fill. Awkward lot access is the chief disadvantage of knolls and for that reason they might be cut down. The need for such excavation will be more apparent after the preliminary street grading. In most instances, minor knolls improve the amenities of a subdivision.

The modified topographic map proved a valuable aid in the subsequent design of lot sizes, utility services, house orientation and landscaping. All these features were visually clarified by superimposing a tracing of the modified plan over the working drawings.

D. The Final Subdivision Plan.

(See Drawing No. 8 entitled "The Final Subdivision Plan").

This plan is similar to the Preliminary Plan, Drawing No. 4, except that it provides more information and has incorporated the revised data. In comparing the two plans, it will be noted that the lots along the north end of Street "A" and along Street "B" are small in size except on the corners. These lots were

minimized because the northwest corner of the site is relatively flat and offers no major amenities. Large lots have been fronted along the remaining streets north of the river because of amenities either in the natural form of the river or in the man-made form of the street crescents. The side boundaries for the lots enclosed by Street "C" have been altered to straight alignment. However, due to the unusual shape of the block enclosed by Streets "A", "B" and "C" it was necessary to stagger the side boundaries.

In the southern portion of the site large lots front upon Street "F" and Street "G". Small lots front upon the remaining streets except on the corners where the lots have been enlarged to provide for street set-back on two sides. In the over-all design, the alignments of rear and side lots were considered at all times with respect to future easements for utility use. The rear boundaries of the lots along the river were set back to provide for pedestrian access. Further, these rear lot lines were kept straight to simplify the lot calculations and surveying.

Rights-of-way, 20 feet wide, have been provided for pedestrian and utility use. The right-of-way between lots 55 and 85 gives pedestrian access to the park and may also provide for a watermain to a public well located in the park area. Pedestrians are expected to use the rights-of-way along lots 65, 75, 98 and 125 for safe access to the shopping centre away from the dangers of vehicular traffic. A foot-bridge is envisaged across the McIntyre River in line with the right-of-way between lots 97 and 98. As mentioned earlier, special pedestrian rights-of-way have not been

provided in the southernmost section of the site as this area is considered too far for normal pedestrian shopping. The right-of-way between lots 108 and 109 has been established to serve as an outlet for either the sanitary sewage or the storm runoff or both.

The few dimensions on the final subdivision plan indicate the basic lot sizes, especially for the interior lots of the blocks. The precise calculation of lot size and areas is extremely involved and is usually performed by a registered land surveyor, but with the help of this plan and the property line plan calculations should be simplified and any changes should be slight.

All streets on the final subdivision plan have been shown with 66 foot rights-of-way, but the provincial authorities may insist upon larger widths for the collector streets. The plan is flexible enough to incorporate such revisions by maintaining the street centre-lines and decreasing the lot depths. This change would require some modification of the interior lot lines to maintain the minimum lot sizes.

E. Water Distribution System.

(See Drawing No. 9 entitled, "Water Distribution System and Sanitary Sewerage System).

This plan and the following two utility plans are not final detailed designs. Preliminary calculations and planswere developed to the extent indicated herein only to solve the major

utility problems common to this site. The utility plans should serve as a guide for the final plans and specifications provided by qualified consultants.

Drawing No. 9 indicates the proposed extension of the watermain from Port Arthur to the site. The location of a central water well has also been suggested, although this particular site may later prove unfeasible. If the initial source of supply is obtained from deep wells, there should be little difficulty in finding one or more adequate sources within the confines of the site. The plan shows the watermains on the opposite side of the street from the sanitary sewers for reasons previously mentioned when referring to the cross-sections. However, with the permission of the Provincial Health Department, both of these services may be laid in a common trench, thus decreasing the costs of installation.

Tentative locations for gate valves and 6 inch hydrants are also shown on the plan. The number of valves may be increased or decreased according to the final plans and specifications. Normally each hydrant has a separate gate valve, especially when connected to feeder mains. However, gate valves may be left off hydrants connected to minor mains, but a portion of the street system will have to be shut off for any hydrant maintenance. It is assumed that each hydrant will serve an area within a radius of 250 feet. The combined pattern of light circles around each hydrant gives an indication of the fire protection for the site. Areas lying outside the circles are presumed inadequately protected.

Care should be taken in the final location of hydrants so that they will not interfere with access or service to the lots.

On the assumption that each lot will have a population of four persons and that the maximum hourly demand will be based on the approximate rate of 250 imperial gallons per capita per day, then the maximum flow for the site will be approximately 0.6 cubic feet per second (c.f.s.) On the basis of Hazen and Williams coefficient of friction equal to 100, then an 8 inch watermain will handle this flor of 0.6 c.f.s. with a head loss in the main of three feet per 1,000 feet and a velocity of 1.7 feet per second (f.p.s.) Similarly, for this same flow of 0.6 c.f.s. a 6 inch main will have a head loss of 10 feet per 1,000 feet and a velocity of 3.0 f.p.s. Both these flow conditions are satisfactory.

A master plan of the combined water system for Port Arthur and Shuniah is non-existent. So therefore, the sizes of watermains which are indicated on the plan have been chosen with the intention that they will be eventually incorporated into a larger system. Minor feeder mains, 8 inch in size, have been provided in either direction across the site. The minimum size of any main serving a hydrant is 6 inches. Short lengths of 2 inch pipes are suggested for the two crescents and the north end of Street "H". Various fittings have been schematically shown on the plan. Of these, special attention should be given to the pro-

vision of temporarily capped fittings which will provide future connection to neighbouring properties.

F. Sanitary Sewerage System.

(See Drawings No. 6 and No. 9).

Drawing No. 9 shows the proposed layout of the sanitary sewerage system and Drawing No. 6 shows the tentative elevations of the sewer inverts with respect to the finished street profiles.

As mentioned previously, consideration was given in the design of the street profiles to produce adequate grades and minimum depths for the sanitary sewer. A glance at the profiles indicates that in most cases the grades of the proposed sanitary sewers parallel the grades of the finished streets. Final drawings for the construction of the sanitary sewers should be plotted on the basis of a larger scale than is shown here: eg. say one inch equals 40 feet horizontally and one inch equals four feet vertically.

For the sanitary sewer design, the maximum hourly rate of flow is assumed to be approximately 200 imperial gallons per capita per day. Infiltration is very indeterminate and depends upon soil conditions, water table, the type of sewer pipe and the quality of workmanship. Considerably less infiltration should be expected if asbestos-cement pipe is used in place of the normal concrete sewer pipe. For the purposes of preliminary calculationsit has been assumed that the infiltration rate is the same as the domestic flow.

Thus, the total hourly maximum flow is approximately 400 imperial gallons per capita per day. For a total population of about 1,300 this amounts to a maximum flow of 0,96 c.f.s. No sewer on the site, with the exception of the influent pipe to the treatment plant, should be expected to receive more than about two-thirds of this flow, or 0.65 c.f.s. The minimum size of the sewers should not be less than 8 inches and the minimum velocity to prevent undue settlement should not be less than 2.5 feet per second. An 8 inch pipe flowing full with this minimum velocity carries 0.87 c.f.s. which is greater than the 0.65 c.f.s. expected in any street sewer. While an 8 inch pipe appears sufficient under these conditions, consideration should be given to the eventuality of serving higher ground outside the site; in which case it may be prudent to provide for a major trunk sewer at this time.

All sewer grades indicated on the profile are sufficient to provide adequate velocities when sewers are flowing half full or more. However, the upper ends of the system with low maximum flows may have to be flushed out periodically.

The man holes have been located on a basis of both the plan and the profiles. Unusual conditions arise and optimum distances of about 300 feet between manholes or minimum invert depths of about nine feet are not always practicable. On the plan, arrows have been superimposed upon the sewers to indicate the direction of sewage flow. As may be seen, all sewers eventually flow by gravity to lots 108 and 109 near the lowest part of the

site. Rough preliminary calculations indicate that these two lots should be more than sufficient in providing building and buffer space for the construction of a sanitary sewage treatment plant. Depending on the layout of the plant one lot size may be adequate. Such a plant should provide complete secondary treatment and if properly operated should not become a nuisance.

With the sewage treatment plant located on the lots suggested, a major sewer problem may occur in obtaining satisfactory gravity flow from the northern portion of the site across the McIntyre River. The method of crossing the river will depend upon the elevations of the river bottom and such information is not available at this time. Therefore the following alternatives may be considered:

Alternative "A", as indicated on the plan, proposes a sewer along the same alignment as the bridge. The profile of Street "E" indicates that sufficient head loss is available between Street "A" and Street "F" for gravity flow. If the bottom of the river is high enough, then the best arrangement would involve a pipe on an even grade as shown on the profile. If the bottom of the river is too low for the former arrangement, then the inverts of the sewer crossing the river may be lowered to the desired levels. However, this would necessitate an equivalent lowering of the sewer along Street "F" from Street "E" to the proposed treatment plant. This latter method might increase the excavation costs greatly, especially if rock is encountered.

Otherwise, if the river bottom is too low for normal flow conditions, an inverted siphon may be used. This latter arrangement is not as satisfactory as the former, because of the possibility of clogging due to settlement and the difficulty of maintenance, but it would diminish any additional excavation on Street "F".

Alternative "B", indicated on the plan, is suggested only as a last resort to Alternative "A". In this arrangement, the sewers would drain by gravity with minimum cover to the lowest point of the portion north of the river. A relatively short section of sewer could be lowered to a satisfactory elevation under the river and drain directly into the sump of the treatment plant. Special easements would have to be provided across the back of lots 110 and 111.

No sewage flow is expected in either direction along Street "J" and therefore no manhole has been provided at the intersection of this street with Street "H", although it may easily be added if required. For this layout, special mention should be given to the service of lot 105. This lot is much lower than the proposed finished profile of the street and it does not seem justifiable to lower the sewer an additional 8 feet just to service this lot. Two solutions may be considered. Firstly, the elevation of the house may be raised sufficiently for a normal service to the street sewer. Secondly, a special connection could

service this lot directly to the treatment plant sump through special easements across lots 106 and 107.

Proper consideration should be given to the final elevations of all houses to assure that they will be properly served by the sanitary sewers. Those lots marked with an "X" are especially in need of this consideration. In the final designs, the elevations of the houses may be raised or the sewer inverts may be lowered or both. The minimum depth of sewers has been taken at nine feet. The final decisions on house and sewer grades should be based upon economics and aesthetics and should be left to the discretion of the developer and architects.

G. Storm Drainage System.

(See Drawing No. 10 entitled "Surface Storm Drainage System and Underground Electrical System" and Drawing No. 11 entitled "Underground Storm Drainage System and Overhead Electrical System").

Two alternatives have been proposed for the storm drainage system. One method involves surface installation and the other underground installation. Drawing No. 10 illustrates the proposed surface method. In conjunction with this plan, Drawing No. 3 shows the initial cross-sections of the streets and the proposed side ditches. The direction of flow in the ditches is indicated by arrows on Drawing No. 10. The dotted rectangles re-

present the proposed location of the main culverts on the streets. The suggested flows along the lot lines may be piped in preference to open ditches upon the discretion of the developer and the lot owners. Minor ditches along lot lines and small culverts under access roads have not been shown on the plan.

The underground storm drainage system is illustrated on Drawing No. 11. Most of the storm sewers have been sloped in the direction of the natural or the modified drainage flow, so that a minimum of excavation can be expected. Since the storm sewer grades are not as critical as those for the sanitary sewer, they have not been plotted on the street profiles. On the plan, small arrows pointing in the direction of flow have been superimposed upon the sewers. Single arrows along the centre-line of the streets indicate the direction of gutter flow towards the catch-basins.

For this design, the catchbasins have been separated by the optimum distance of 300 to 400 feet. In almost all instances, the catchbasins connect directly to manholes rather than to sewers thus reducing the maintenance problems. The over-all system has been divided into a number of smaller systems which flow independently into the McIntyre River. This arrangement not only reduces the length of sewers but also reduces the maximum size of sewers.

H. Electrical and Telephone Distribution Systems.

(See Drawing No. 10 and Drawing No. 11).

Emphasis has not been placed upon the telephone system since, in most instances, it can be incorporated into or considered similar to the electrical system. Therefore, the following layouts of the electrical system will serve as suitable guides for the design of the telephone system.

The overhead electrical system is shown on Drawing No. 11. With few exceptions, the pole lines have been restricted to special easements along the rear lot lines. This arrangement should improve the beauty of the street where the decorative landscaping is usually concentrated. Normally, poles at bends greater than 10 degrees or at terminal points will require guy-lines. Care has been taken to locate bends in the pole-lines so that the guy wires will run into undeveloped land or along lot lines. Overhead wires will cross the back yards of lots 167, 168, 232 and 233, but these wires should not prohibit the normal use of these lots.

If the overhead electrical and telephone systems are adopted, it is suggested that the lines parallelling the river be placed underground in conduits to maintain the natural amenity of the riverside area.

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The underground electrical system is illustrated in plan on Drawing No. 10 and in cross-section on Drawing No. 13. Some overhead

pole lines have been proposed across the park and at the periphery of the site. These pole lines may be changed to underground conduits if the alteration is warranted on an aesthetic basis. The main transmission line across the site may be incorporated into the domestic conduit running down Street "C", up Street "A" and across a special lot line easement to the existing pole-line. Tentative locations of transformer pits are indicated by the small squares. Each transformer should serve from six to eight houses.

The chief disadvantage of the underground electrical system as compared to the overhead system is its high cost of installation, although maintenance costs should be less. For a residential neighbourhood of this calibre, the ratio of the cost of an underground system to an overhead system would be about four to one. However, in this subdivision, the alternative systems are so designed that the underground system is about three-quarters the length of the overhead system. Thus the cost ratio of four to one decreases to three to one. For lot widths of 65 to 80 feet and for houses valued at approximately $15,000, the cost per house for an overhead system will be in the order of $150. Therefore, the approximate cost per house for the underground system will be about $450 or $300 more than the cost of the overhead system. Presumably, the owners of houses valued so highly would gladly pay this relatively small additional cost to enhance the beauty of the landscape by eliminating the unsightly features of the pole-lines.

I. The Landscape.

(See Drawing No. 12 entitled "The Landscape Plan").

This final plan illustrates some of the major features which influence the appearance of the landscape. The precise details should be decided by structural and landscape architects. The pavement has been shown on the plan with width of 36 feet on collector streets and 26 feet on minor streets. Initially, only two access streets will serve the site, one to Oliver Road and the second to the south. The pavement on the other access streets should not be laid to the boundary until more information is available regarding the extension of the streets into adjacent property. The final sidewalk requirements are left to the discretion of the developer and municipality. Nevertheless, sidewalks have been shown on both sides of the streets, although some may never be constructed.

The street lighting is an item of considerable importance in the landscape. The structural appearance and setting of lamp-posts can either add to or detract from the overall effect. The primary purpose of street lighting is the provision of better night visibility for the pedestrians and vehicular drivers, especially at the intersections where the two cross. The provision of adequate light is important, but over-designing or improper designing may result in glare disturbing the house residents.

A number of houses have been drawn with broken lines on the plan to indicate that the lots have alternative uses. The three lots west of the shopping centre may be combined for a church site. This would eliminate the two houses which face the shopping centre. A church so located would act as a desirable buffer between the residential and commercial areas. The lot immediately to the south of the shopping centre may be needed for additional parking space. The two lots near the southwest corner are tentatively proposed for construction of the sewage treatment plant.

Major landscape features for the park areas are sketched on the plan. A pattern of pathways and a foot-bridge are proposed. The trees drawn along the boundaries of the site are suggested buffers, whereas, the tree groups illustrated within the site already exist. Future landscaping of the park will depend greatly upon the availability of maintenance service. For this development, minimum public or private maintenance is expected. Consequently, landscaping should be in the most natural form to create a pleasant effect with the least up-keep. The growth of the trees will suppress dust, reduce noise and provide shade and seclusion.

Individual house set-back and orientation is suggested on the plan. Undoubtedly modifications will result with the detailed design of each house, but under no circumstance should the individual house be considered as a detached entity. All houses should be related to one another and to the natural features of the landscape.

Attractive enclosures can be created by varying the house set-backs and arranging clusters of trees.

The ground around the house requires as much intelligent planning as the building receives. Lot landscaping should be based upon use and up-keep. Co-operation of neighbours may result in the over all landscaping of large areas such as blocks. The lot is divided into four main areas, the public, the private, the garden and the service. Development of the private and garden areas is chiefly dependent upon the wants of the house inhabitants. Privacy and sunlight are required for both these areas. The public area should be no larger than is necessary for aesthetic purposes. The size of the public area is governed by the set-back of the house, which in turn, is governed primarily by the noise of traffic. Therefore, house set-back or front yard depth should be measured in relation to the pavement curb and not the street right-of-way. The service area should be inconspicuous and should not intrude upon private areas. Proper provision should be made within this area for the storage of garbage, tools, screens, etc.

The subdivision requires a protective covenant of basic restrictions which would provide the maximum control for the benefit of the community with the least restrictions on private rights. The covenant should be drafted by thoroughly qualified persons in collaboration with the developer and the municipality.

The following list contains the recommended provisions to be incorporated into the covenant:

a) Control use of land.

b) Architectural control of building.

c) Minimum side-yard and set-back regulations.

d) Prohibition of nuisances.

e) Restriction of temporary buildings.

f) Minimum lot sizes.

g) Limitation of size of structure by cost or area or both.

h) Reservation of utility easements.

i) Other relevant clauses.

This thesis deals primarily with the physical design of a residential subdivision in which the social aspects have been considered only to the extent where they influence the physical aspects. The ultimate goal in planning, however, is the improvement of the well-being of the citizens which is achieved when a true community spirit prevails. The physical design is the major step in the accomplishment of this goal. It is hoped that the developer and the municipality will support the provision of those facilities that enable the attainment of a socially self contained community.

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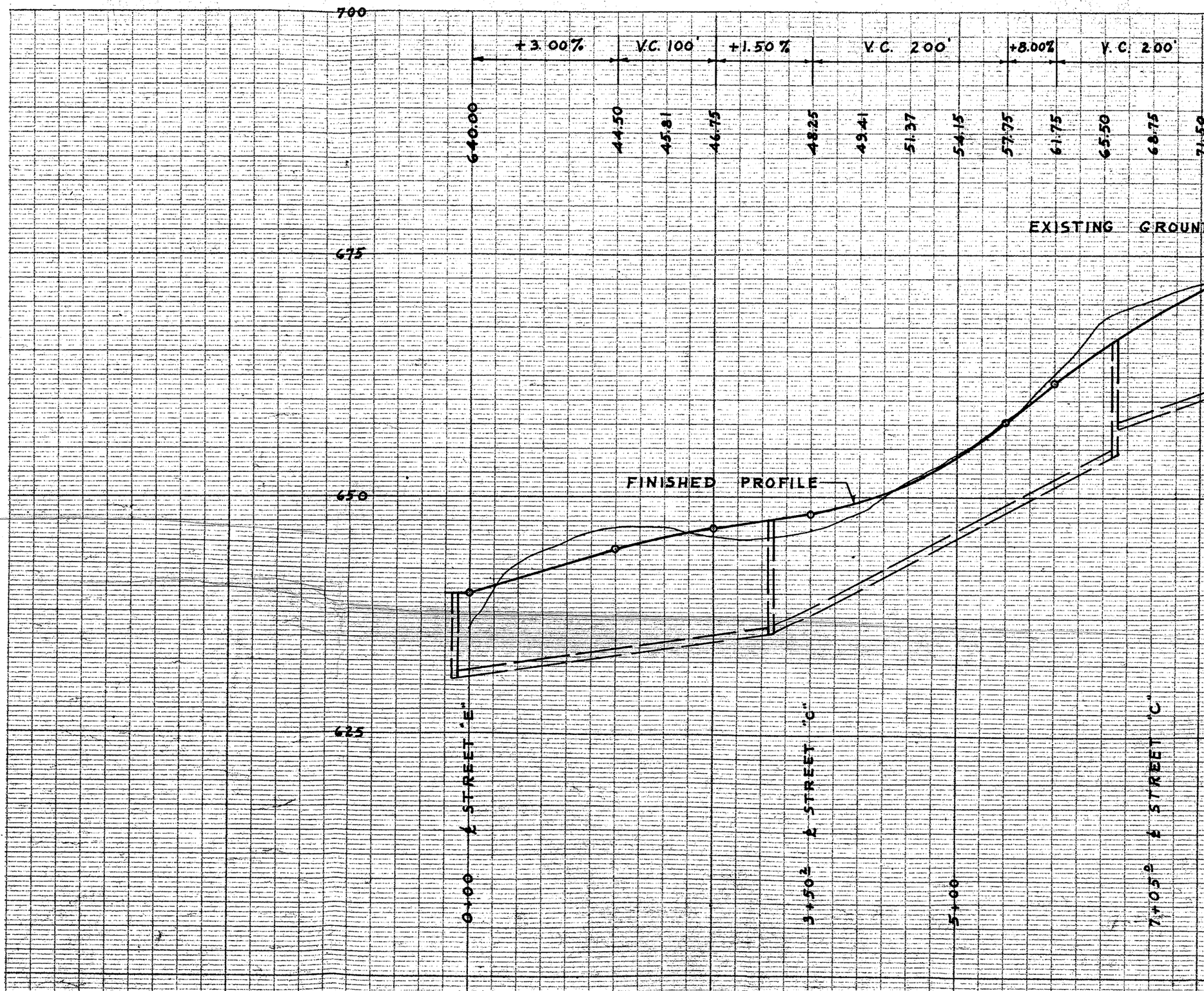
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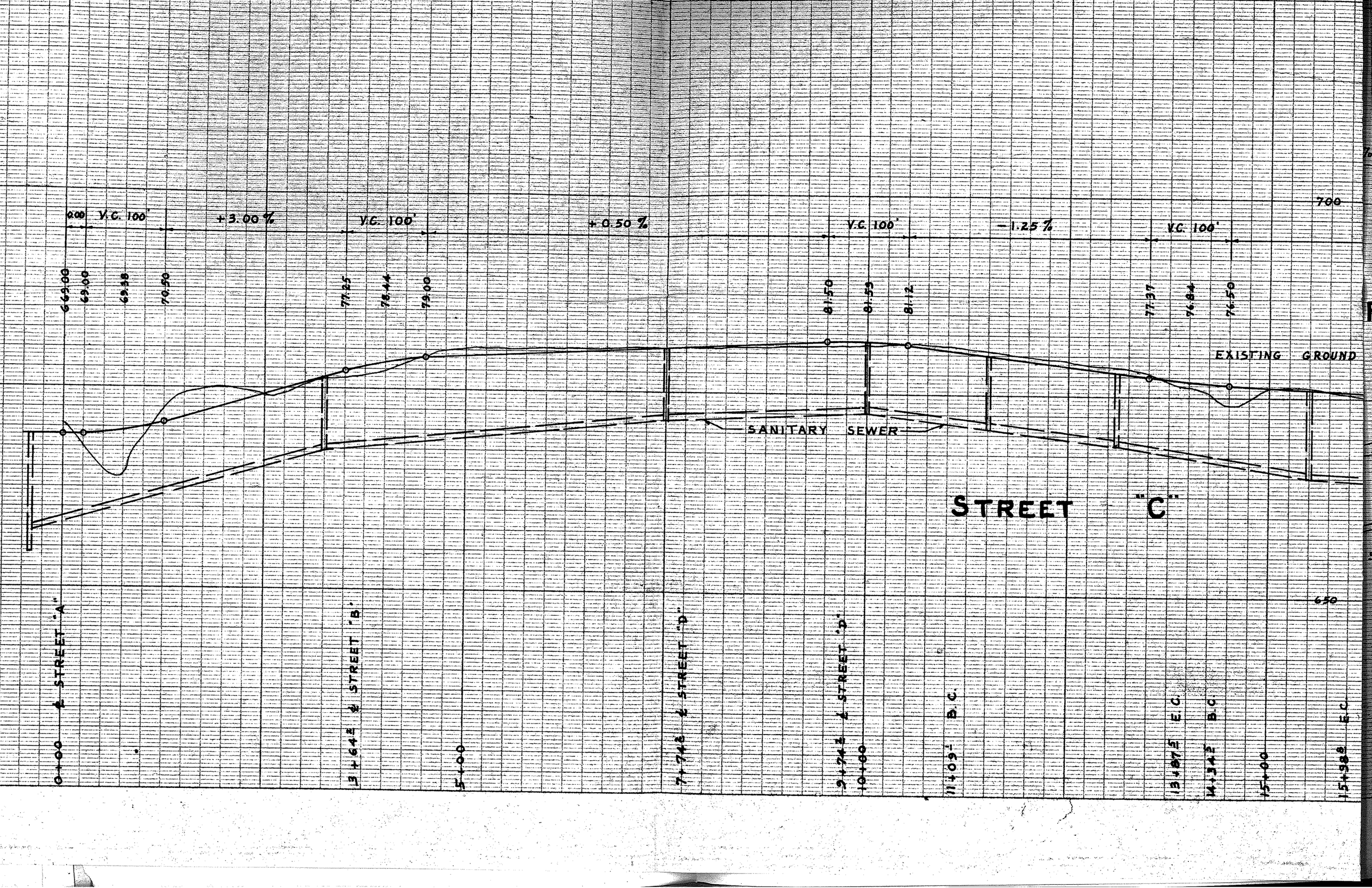
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700
675
650
625
+3.00%
V.C. 100'
+1.50%
V.C. 200'
+8.00%
V.C. 200'
640.00
44.50
45.81
46.75
48.25
49.41
51.37
54.15
57.75
61.75
65.50
68.75
EXISTING GROUN
FINISHED PROFILE
0+00 ℄ STREET "E"
3+50 ℄ STREET "D"
5+00
7+03.5 ℄ STREET "C"


V.C. 100'
+3.00 %
V.C. 100'
+0.50 %
V.C. 100'
-1.25 %
V.C. 100'
69.00
69.00
69.38
70.90
77.25
78.44
79.00
81.50
81.59
81.12
77.37
76.84
76.50
EXISTING GROUND
SANITARY SEWER
STREET "C"
700
650
0+00 ℄ STREET "A"
13+64± ℄ STREET "B"
5+00
7+74± ℄ STREET "D"
9+74± ℄ STREET "D"
10+00
11+09± B.C.
13+87± E.C.
14+34± B.C.
15+00
15+98± E.C.

700

682.53

FINISHED GRADES

675

650

17+18.8 ℄ STREET "B"

+ 0.82 %

STREET "B"

EXISTING GROUND LINE

FINISHED PROFILE

SANITARY SEWER

0+00 ℄ STREET "C"

5+00

6+01.2 ℄ STREET "A"

V.C. 100'

+4.50%

V.C. 50'

0.00%

700

82.73

83.60

85.39

87.64

88.48

88.76

88.76

FINISHED GRADES

PROFILE MAY HAVE TO BE ADJUSTED TO NEW HIGHWAY GRADE

8+41± ℄ OLIVER ROAD

675

650

680.62

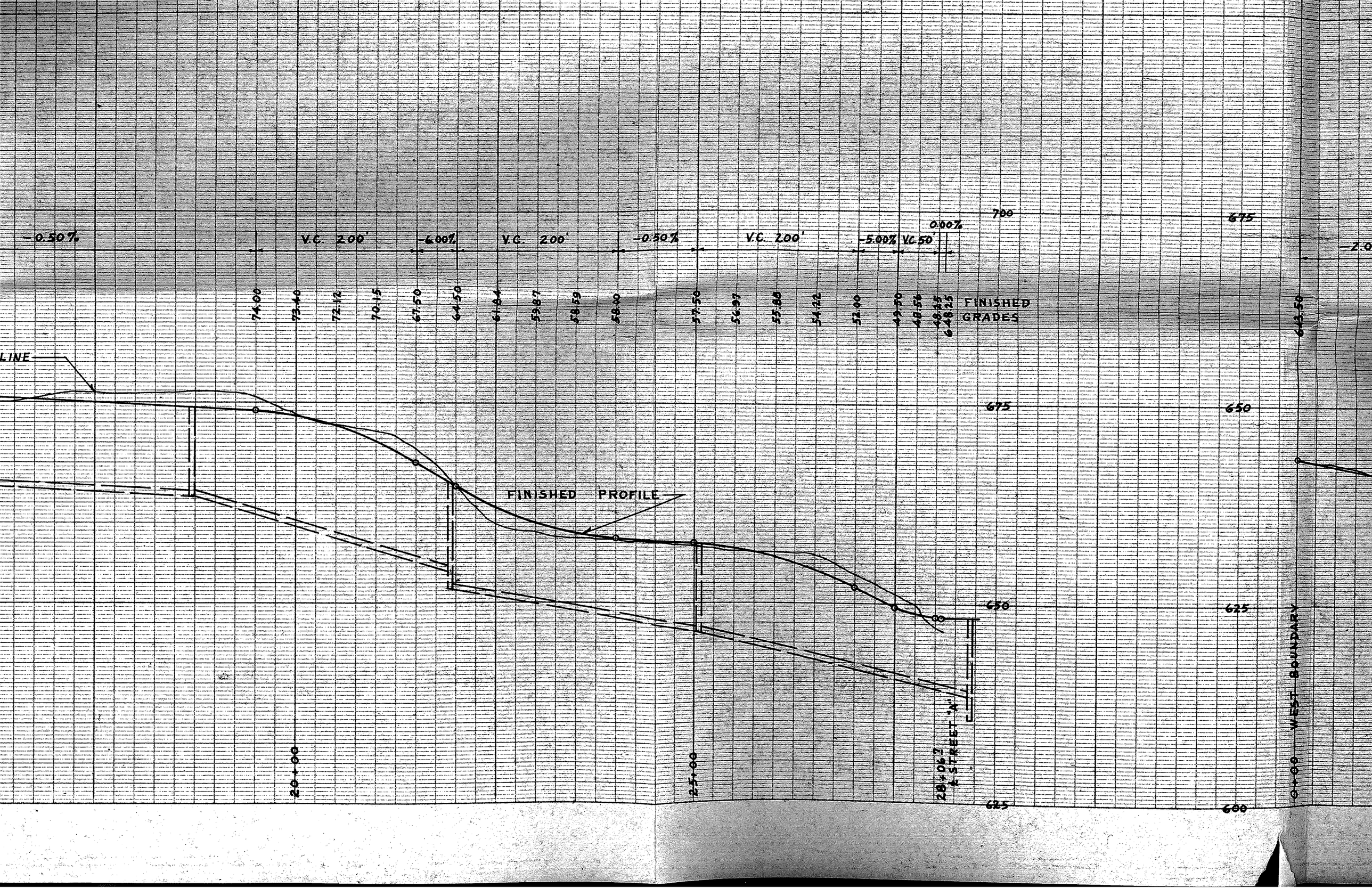
FINIS

STR

0+00 ℄ STREET "C"

0+42.2

B.C.


-0.50%
V.C. 200'
-4.00%
V.C. 200'
-0.50%
V.C. 200'
-5.00%
V.C. 50'
0.00%
74.00
73.40
72.12
70.15
67.50
64.50
61.84
59.87
58.59
58.00
57.50
56.97
55.88
54.22
52.00
49.50
48.56
49.25
48.25
FINISHED GRADES
FINISHED PROFILE
LINE
700
675
650
625
600
675
650
625
20+00
25+00
28+06.7
"A" STREET
0+00 WEST BOUNDARY
643.50

+0.50%

-1.78%

V.C. 50'

82.25
82.23
81.92
81.51

FINISHED GRADES

SHED PROFILE

EXISTING GROUND LINE

EET "D"

SANITARY SEWER

700

675

650

625

3+56 ± E.C.

3+98 ± ℄ STREET "C"

+2.00%

V.C. 100'

+0.50%

V.C. 100'

-0.50%

629.25

33.25
34.06
34.50

37.00
37.12
37.00

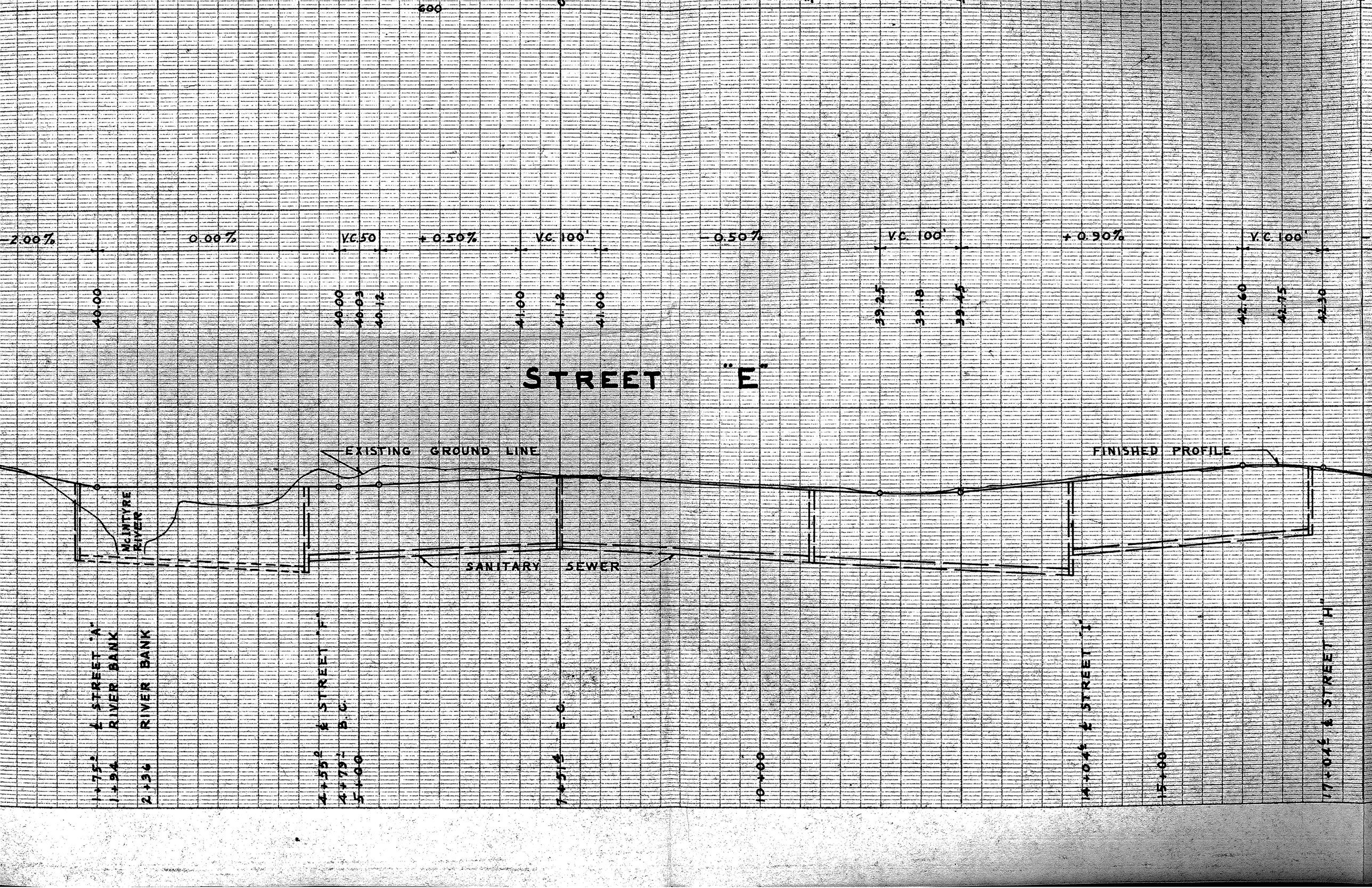
EXISTING GROUND LINE

0+00 ℄ STREET "F"

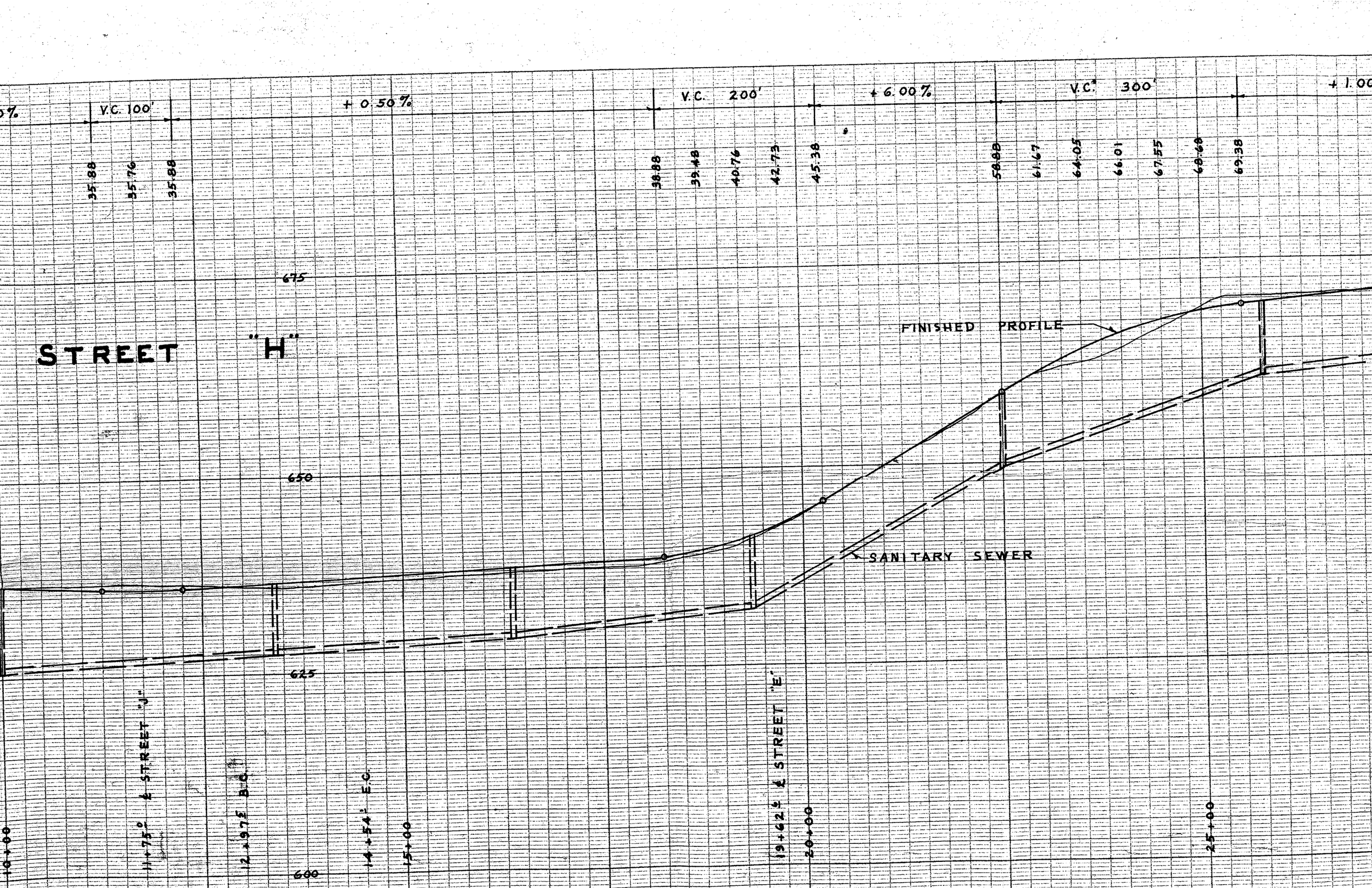
3+08 ± ℄ STREET "I"

5+00

10+00


STREET "E"
-2.00%
0.00%
V.C. 50
+0.50%
V.C. 100'
-0.50%
V.C. 100'
+0.90%
V.C. 100'
40.00
40.00
40.03
40.12
41.00
41.12
41.00
39.25
39.18
39.45
42.60
42.75
42.30
EXISTING GROUND LINE
FINISHED PROFILE
McINTYRE RIVER
SANITARY SEWER
1+75 ℄ STREET "A"
1+94 RIVER BANK
2+36 RIVER BANK
4+55 ℄ STREET "F"
4+79 B.C.
5+00
7+51 E.C.
10+00
14+04 ℄ STREET "J"
15+00
17+04 ℄ STREET "H"

STREET "H"


+ 0.50%
V.C. 100'
+ 6.00%
V.C. 200'
V.C. 300'
+ 1.00
35.88
35.76
35.88
38.88
39.48
40.76
42.72
45.38
58.88
61.67
64.05
66.01
67.55
68.68
69.38
675
650
625
600
FINISHED PROFILE
SANITARY SEWER
11+75.0 ℄ STREET "J"
12+97.2 BC
14+54.1 EC
15+00
19+42.2 ℄ STREET "E"
20+00
10+00
25+00

5+00

5+33 ± B.C.

6+06 ± E.C.

7+40 ± B.C.

8+02 ± E.C.

9+30 ± STREET "E"

10+00

10+92 ± B.C.

12+75 ± E.C.

12+86 ± STREET "G"

14+88 ± STREET "G"

15+00

16+41 ± B.C.

18+87.5 E.C.

20+00

SANITARY SEWER

GROUND LINE

FINISHED PROFILE

STREET "F"

+1.50% V.C. 200'

+0.65% VC 100'

+2.50%

+0.69%

V.C. 200'

-1.65%

V.C. 200'

G 200'

29.00

30.37

32.50

34.73

36.41

37.55

38.15

40.12

40.62

41.70

46.70

47.84

48.75

49.43

49.89

52.13

52.84

54.28

56.14

59.32

62.50

V.C. 200' | + 6.00 % | V.C. 300' | + 1.00 %

39.48 | 40.76 | 42.73 | 45.38 | 58.88 | 61.67 | 64.05 | 66.01 | 67.55 | 68.68 | 69.38 | 673.31 | 634.54

700 675 675 650 650 625 625 600

FINISHED PROFILE

EXISTING GROUND LINE

SANITARY SEWER

9+42.5 ℄ STREET "E"

0+00

5+00

7+82.5 ℄ STREET "F"

9+42.5

0+00 ℄ STREET "H"

2+00.61 P.C.

STREET "F"

5+00
5+33 B.C.
6+06 E.C.
7+40 B.C.
8+02 E.C.
9+30 E STREET "E"
10+00
10+97 B.C.
12+75 E.C.
12+88 E STREET 'G'
14+88 E STREET "G"
15+00
16+41 B.C.
19+97.5 E.C.
20+00

SANITARY SEWER

GROUND LINE

FINISHED PROFILE

c. 200'
+5.00%
V.C. 200'
+0.65%
V.C. 100'
+2.50%
V.C. 200'
+0.69%
V.C. 200'
+6.50%

29.00
30.37
32.50
34.73
36.41
37.55
38.15
40.12
40.68
41.70
46.70
47.84
49.75
49.43
49.89
52.13
52.84
54.28
56.44
59.32
62.50

DRAWING No. 6

695

+0.18%

640.84 ℄ FINISHED GRADES

STREET "I"

650

STREET "J"

650

FINISHED PROFILE

EXISTING GROUND LINE

E

730' between ℄

SANITARY SEWER

625

625

3+57.2 E.C.

5+00

9+47.1 B.C.

10+00

11+03.2 E.C.

13+12.2 ℄ STREET "E"

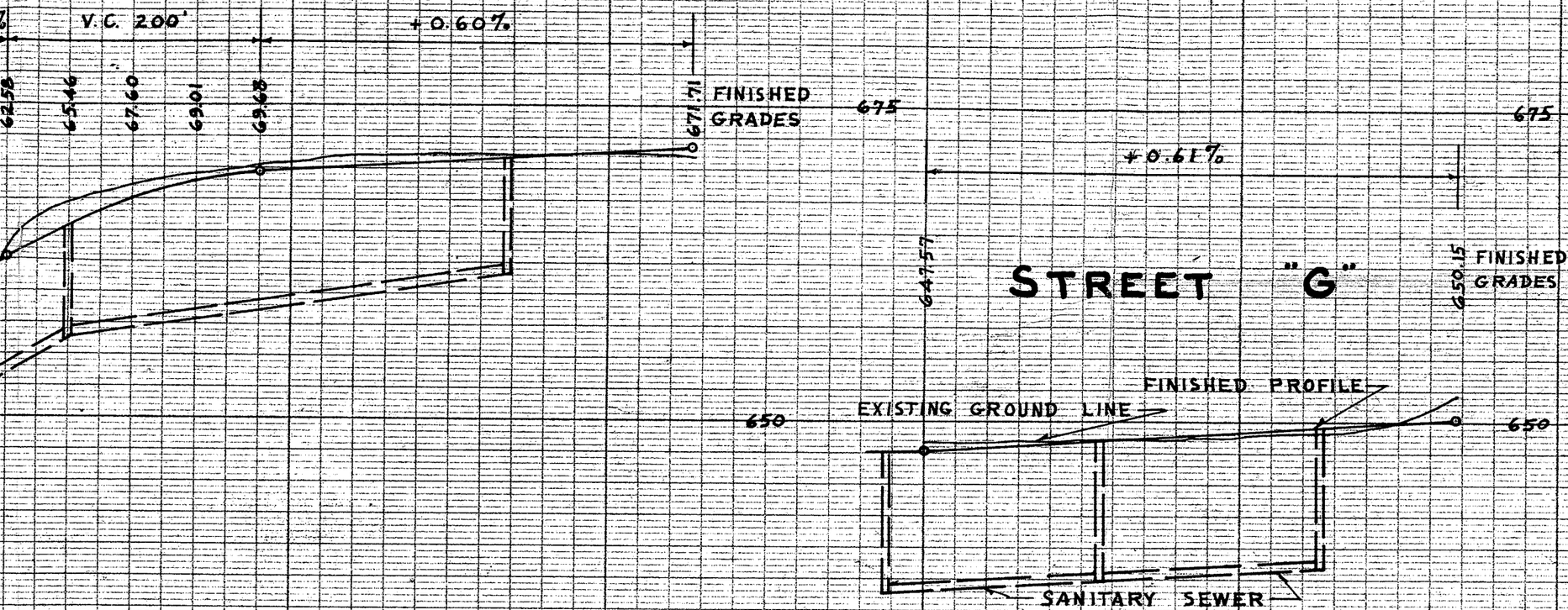
600

0+00 SOUTH BOUNDARY

1+75.2 ℄ STREET "H"

600

700



STREET "G"

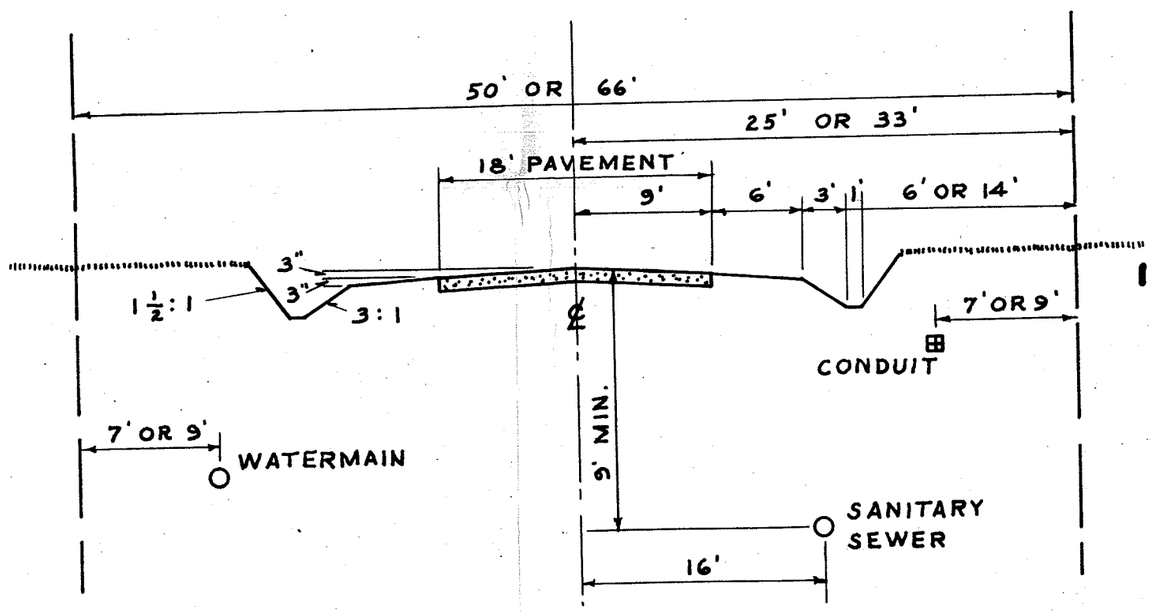
NOTE: EXISTING GROUND LINES TAKEN FROM CONTOUR PLAN

SCALE: 1" = 100' HORIZONTALLY
1" = 10' VERTICALLY

STREET PROFILES

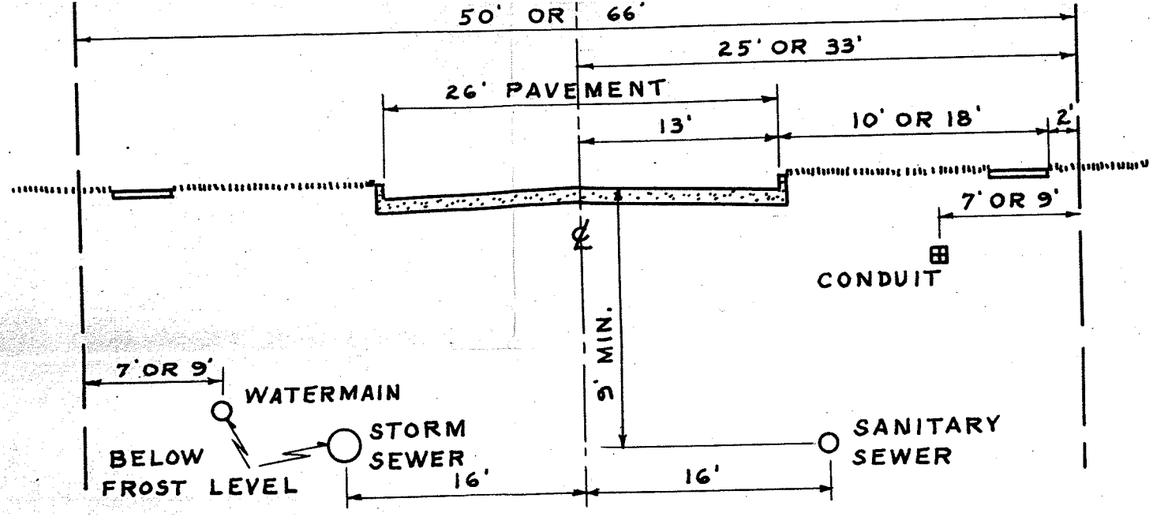
RKJ

STREET CROSS-SECTIONS

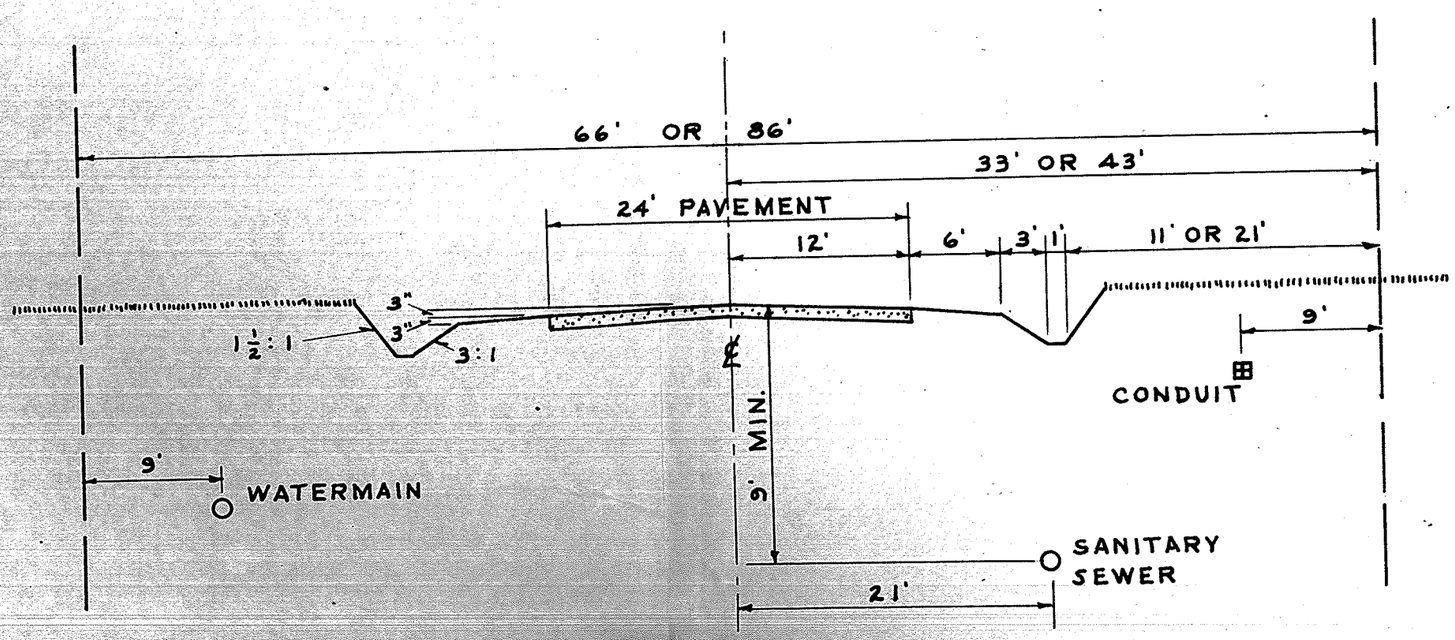


MINOR STREET

INITIAL CROSS-SECTION

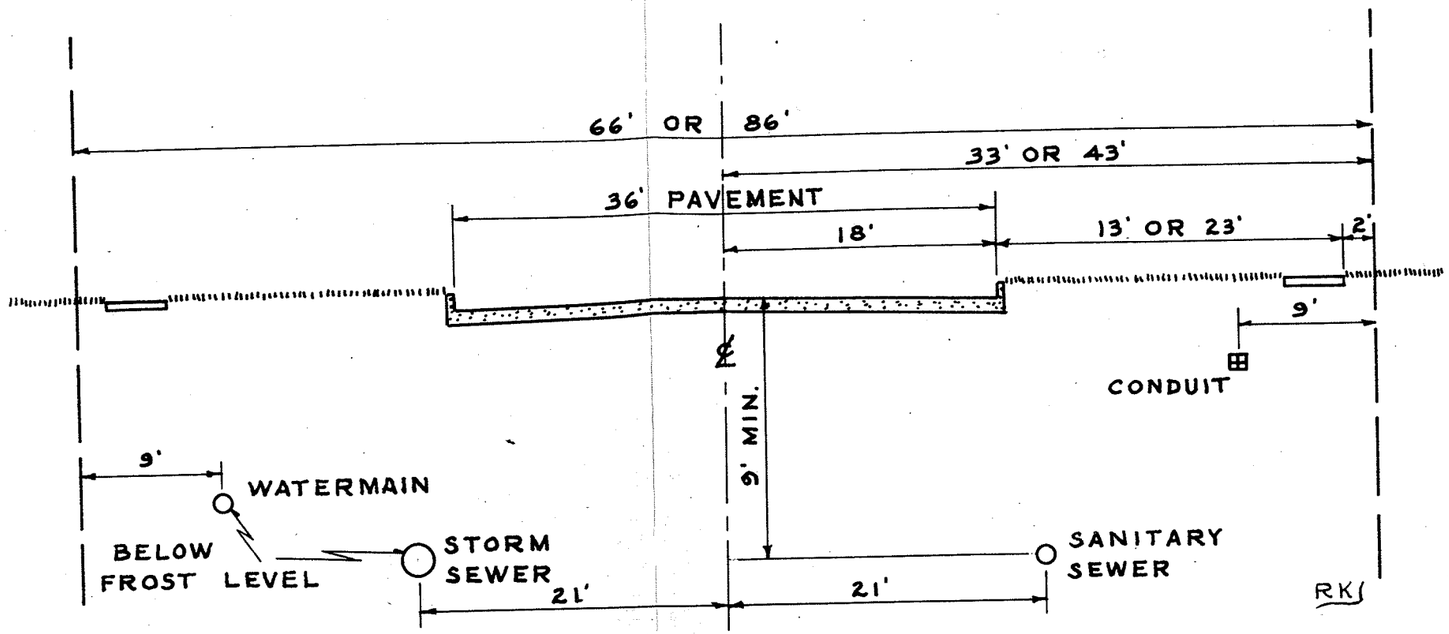


MINOR STREET
FINAL CROSS-SECTION



COLLECTOR STREET
INITIAL CROSS-SECTION

COLLECTOR STREET



COLLECTOR STREET
FINAL CROSS-SECTION

DRAWING No. 3

A RESIDENTIAL SUBDIVISION
IN
SHUNIAH, ONTARIO

DWG. No.	TITLE
1	THE SITE PLAN
2	THE TOPOGRAPHIC MAP
3	STREET CROSS-SECTIONS
4	THE PRELIMINARY SUBDIVISION PLAN

5	THE PROPERTY LINE PLAN
6	STREET PROFILES
7	THE MODIFIED TOPOGRAPHIC MAP
8	THE FINAL SUBDIVISION PLAN
9	WATER DISTRIBUTION SYSTEM AND SANITARY SEWERAGE SYSTEM
10	SURFACE STORM DRAINAGE SYSTEM AND UNDERGROUND ELECTRICAL SYSTEM
11	UNDERGROUND STORM DRAINAGE SYSTEM AND OVERHEAD ELECTRICAL SYSTEM
12	THE LANDSCAPE PLAN

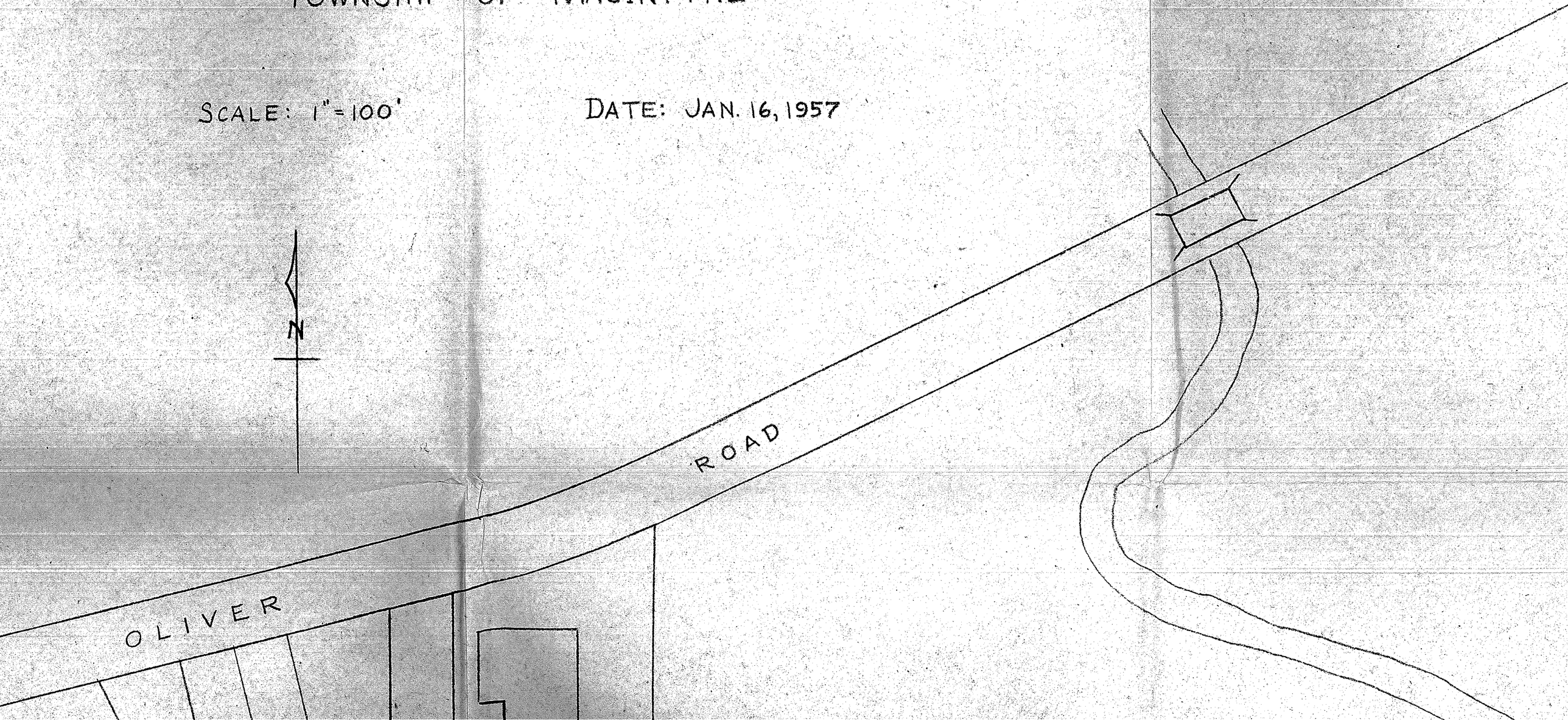
R. K. Jamieson

UNIVERSITY OF MANITOBA
APRIL, 1957

PRELIMINARY SUBDIVISION PLAN
OF
PART OF N.W. ¼ SECTION 50
TOWNSHIP OF MACINTYRE

SCALE: 1" = 100'

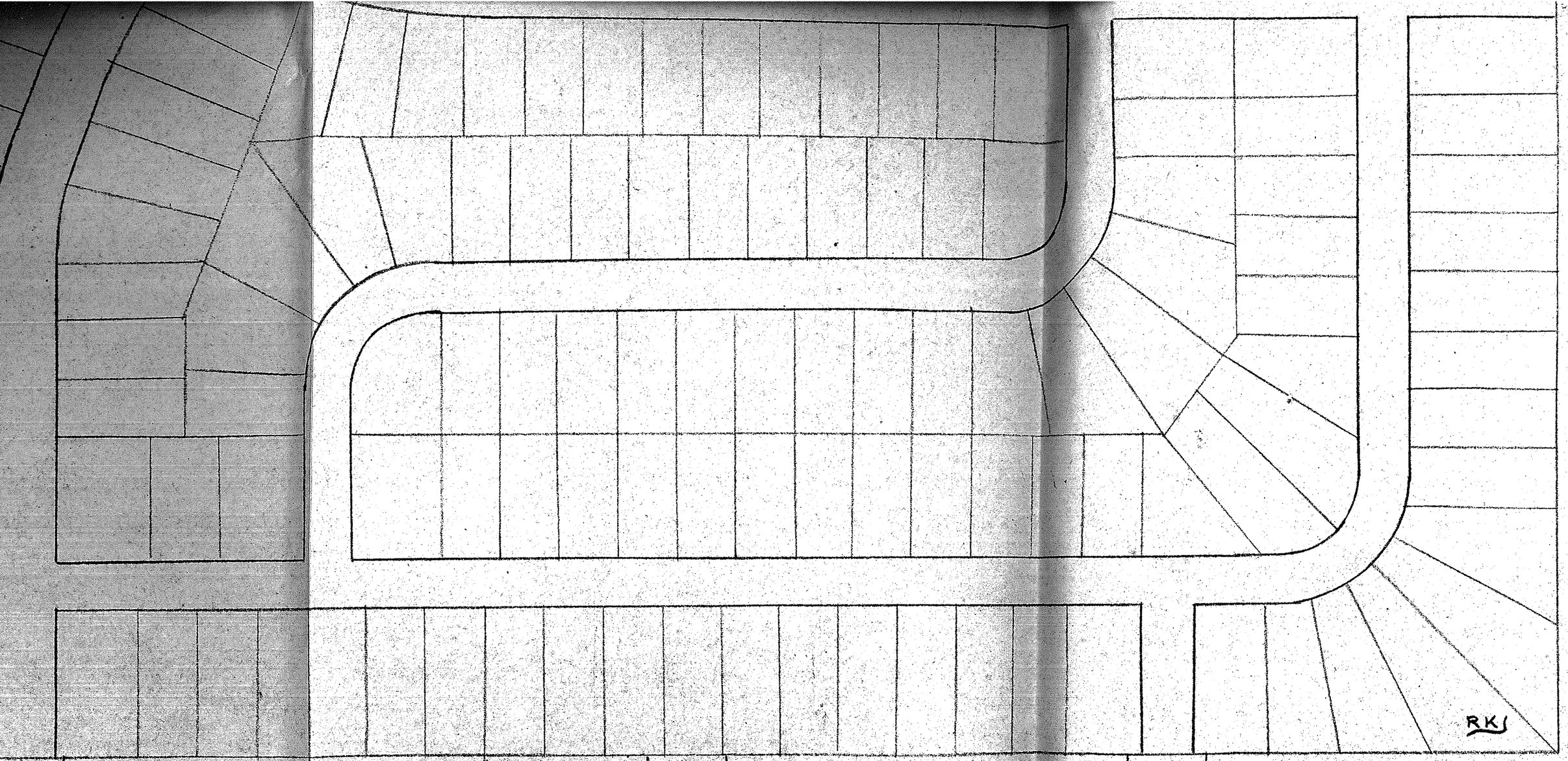
DATE: JAN. 16, 1957



SHOPPING
CENTRE

RIVER

MACINTYRE



EXISTING SUBDIVISION

REG. PLAN M-40

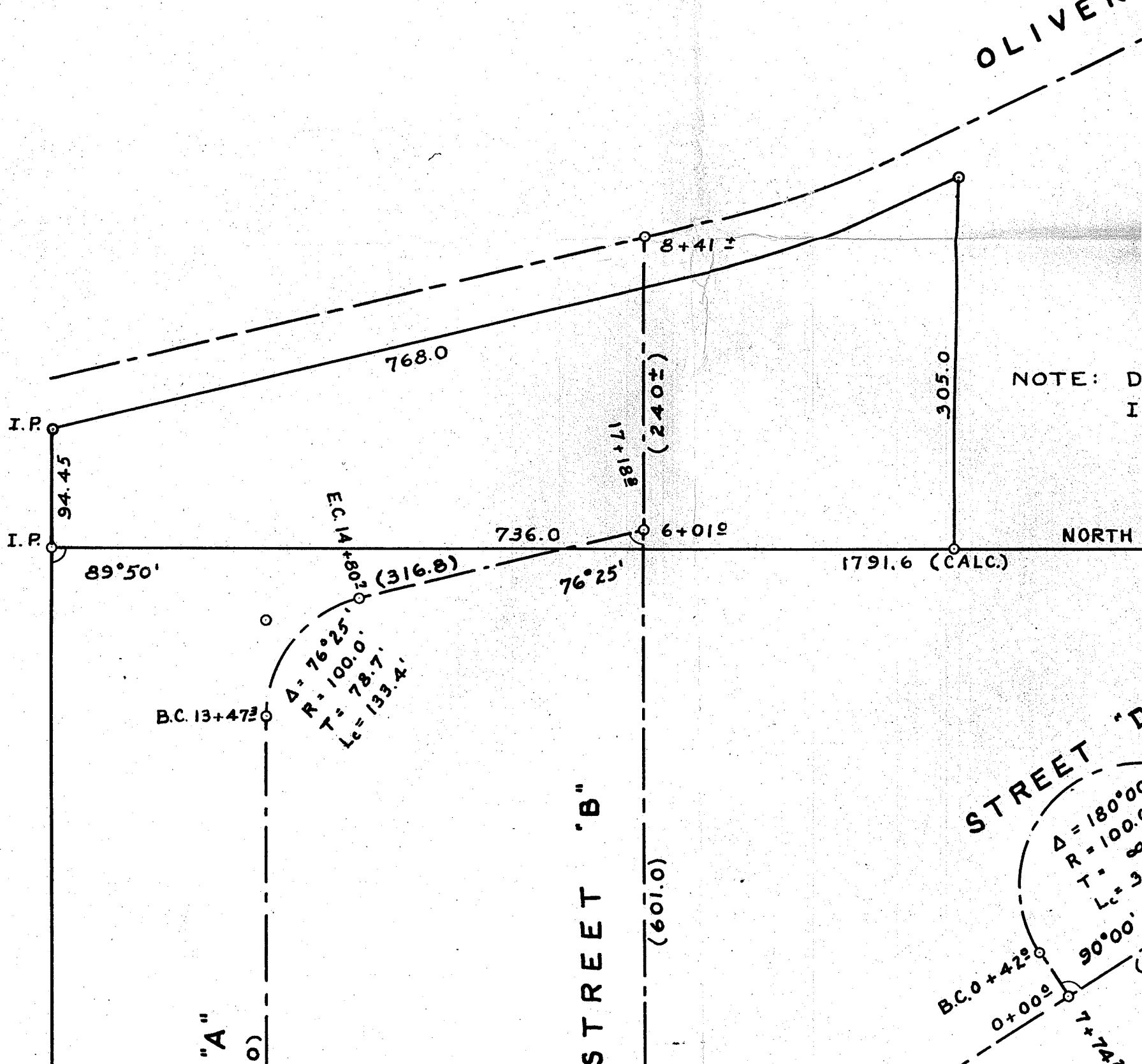
DRAWING No. 4

THE PROPERTY LINE

SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



NOTE: D
I

GOLF COURSE

1065.0

2550.8

1485.8

0+00

90°00'

(175.0)

90°00'

STREET

"F"

B.C. 5+33

E.C. 6+02

Δ = 20°56'
R = 200.0'
T = 36.9'
Lc = 73.1'

(202.1)

B.C. 7+40

Δ = 17°48'
R = 200.0'
T = 31.3'
Lc = 62.1'

E.C. 8+02

(160.0)

B.C. 4+79

A+55

(280.0)

90°00'

(261.9)

9+30

(165.9)

B.C. 10+97

Δ = 50°58'
R = 200.0'
T = 95.3'
Lc = 177.9'

Δ = 39°02'
R = 400.0'
T = 141.8'
Lc = 272.3'

E.C. 3+57

E.C. 7+51

(108.0) 0+00

B.C. 0+53

EC 12+75

12+88

90°00'

(200.0)

90°00'

14+88

E.C.

Δ = 180°00'
R = 100.0'
T = ∞
Lc = 314.2'

STREET "G"

STREET

(72

(350.2)

1+75

0+00

128°41'

3+50

28+06

57°44'

(354.8)

7+05

0+00

57°44'

(364.2)

57°44'

0+00

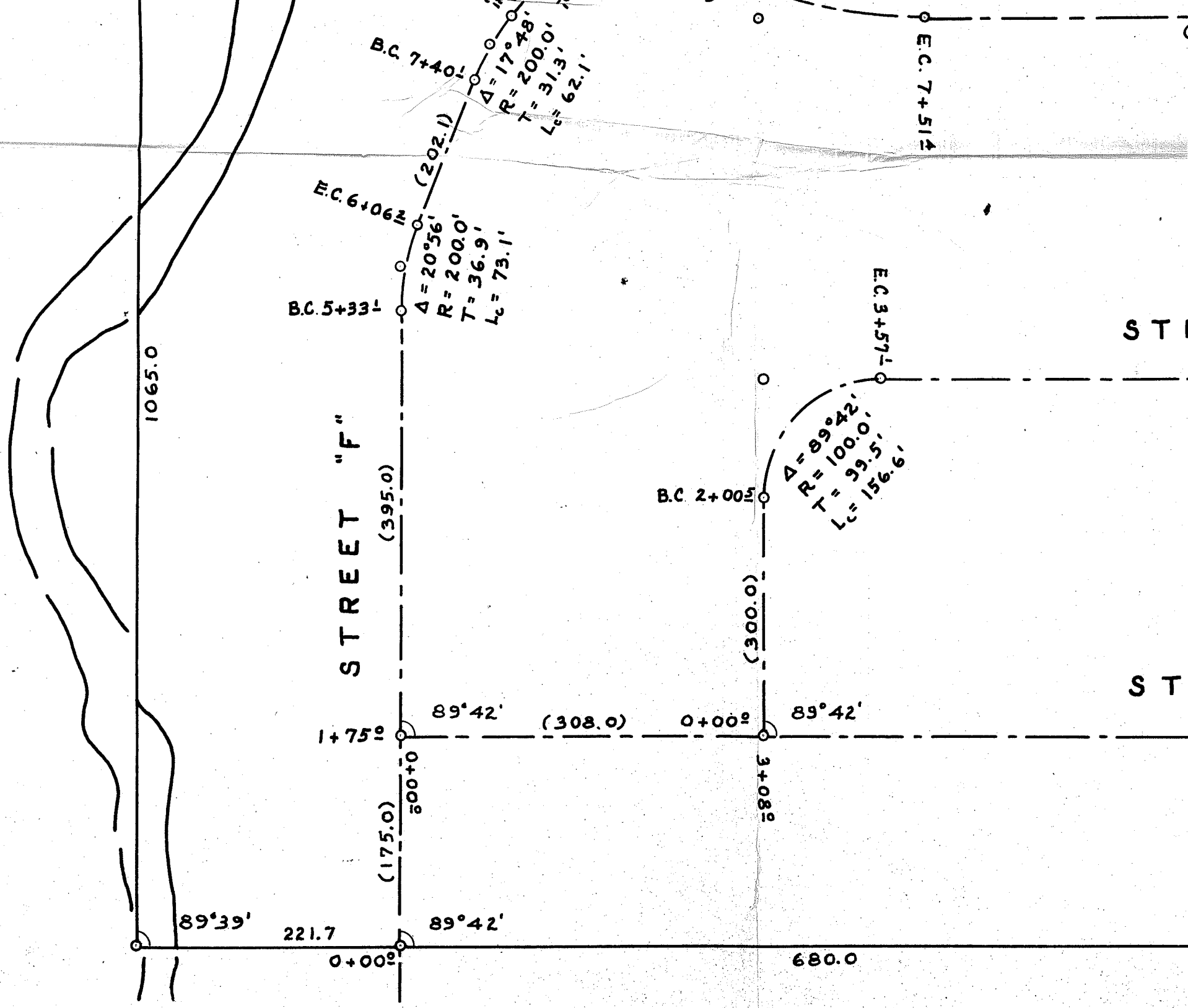
(410.0)

STREET "C"

(1295.0)

STREET "C"

MCINTYRE


B.C. 7+40±
Δ = 17°48'
R = 200.0'
T = 31.3'
Lc = 62.1'
(202.1)
E.C. 6+06±
Δ = 20°56'
R = 200.0'
T = 36.9'
Lc = 73.1'
B.C. 5+33±
E.C. 7+51±
E.C. 3+57±
Δ = 89°42'
R = 100.0'
T = 99.5'
Lc = 156.6'
B.C. 2+00±
1065.0
STREET "F"
(395.0)
(300.0)
(175.0)
89°42'
(308.0)
1+75±
0+00±
89°42'
3+08±
89°39'
221.7
89°42'
0+00±
680.0
S T
S T
REGISTERED SUBDIVI

PLAN

ROAD

COLLEGIATE

STANCES BETWEEN "POINTS OF
ITERSECTION" SHOWN IN BRACKETS

LIMIT OF S.W $\frac{1}{4}$ SECTION 50

1055.6

90°13'

B.C. 11+09± (410.4)

E.C. 3+56±

3+98±

9+74±

Δ = 132°56'
R = 120.0'
T = 275.5'
Lc = 278.4'

(409.6)

E.C. 13+87±

B.C. 14+34±

4.2'

90°00'

200.0)

Δ = 47°04'
= 200.0'
87.1'
164.3'

STREET "I"

STREET "E"

STREET "F"

RIVER

STREET "H"

B.C. 18+41

E.C. 19+97±

B.C. 20+84±

E.C. 22+07±

B.C. 23+62±

E.C. 25+52±

E.C. 15+98±

Δ = 89°42'
R = 100.0'
T = 99.5'
Lc = 156.6'

Δ = 35°08'
R = 200.0'
T = 63.3'
Lc = 122.6'

Δ = 54°34'
R = 200.0'
T = 103.2'
Lc = 190.5'

(789.0)

(308.0)

(795.0)

(452.4)

(250.0)

(321.5)

(115.0)

(160.0)

(608.0)

(820.0)

(175.0)

(300.0)

89°42'

11+03±

12+04±

13+12±

14+20±

17+04±

18+79±

19+62±

25+64±

27+82±

29+42±

783.0

1751.5

2534.5 (CALC.)

EET "E"

795.0)

89°42'

14+04±

13+12½

(300.0)

89°42'

19+62±

(175.0)

89°42'

18+79±

17+04±

(308.0)

E.C. 11+03?

Δ= 89°42'
R= 100.0'
T= 99.5'
Lc= 156.6'

(608.0)

EET "I"

(789.0)

B.C. 9+47±

783.0

E.C. 14+54±

Δ= 89°42'
R= 100.0'
T= 99.5'
Lc= 156.6'

REET "H"

(867.0)

1+75±

89°42'

11+75±

(222.0)

B.C. 12+97±

STREET "J"

(175.0)

89°42'

397.0

90°18'

1793.7

495.0

0+00±

RKJ

SION PLAN M-40

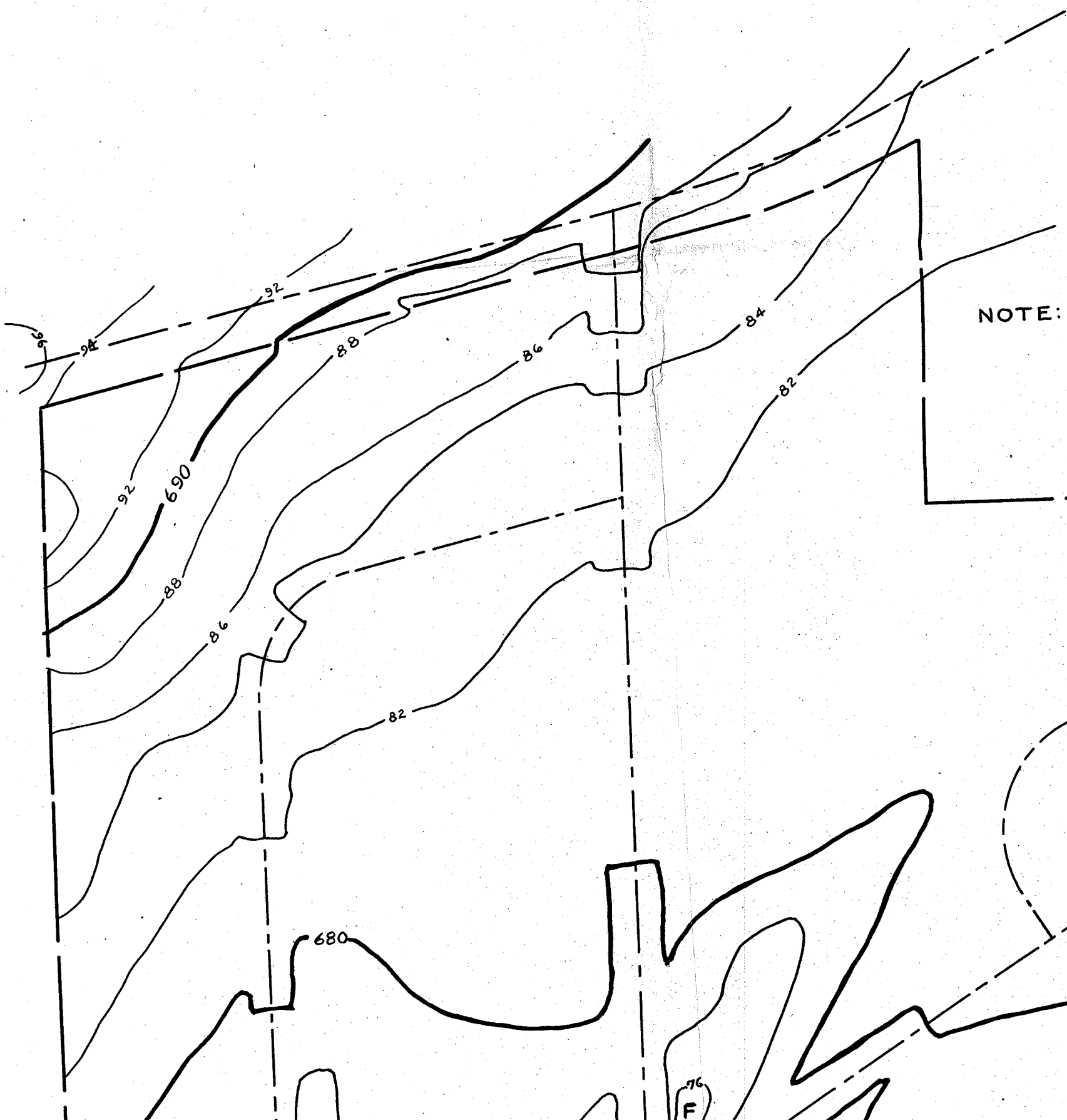
DRAWING No. 5

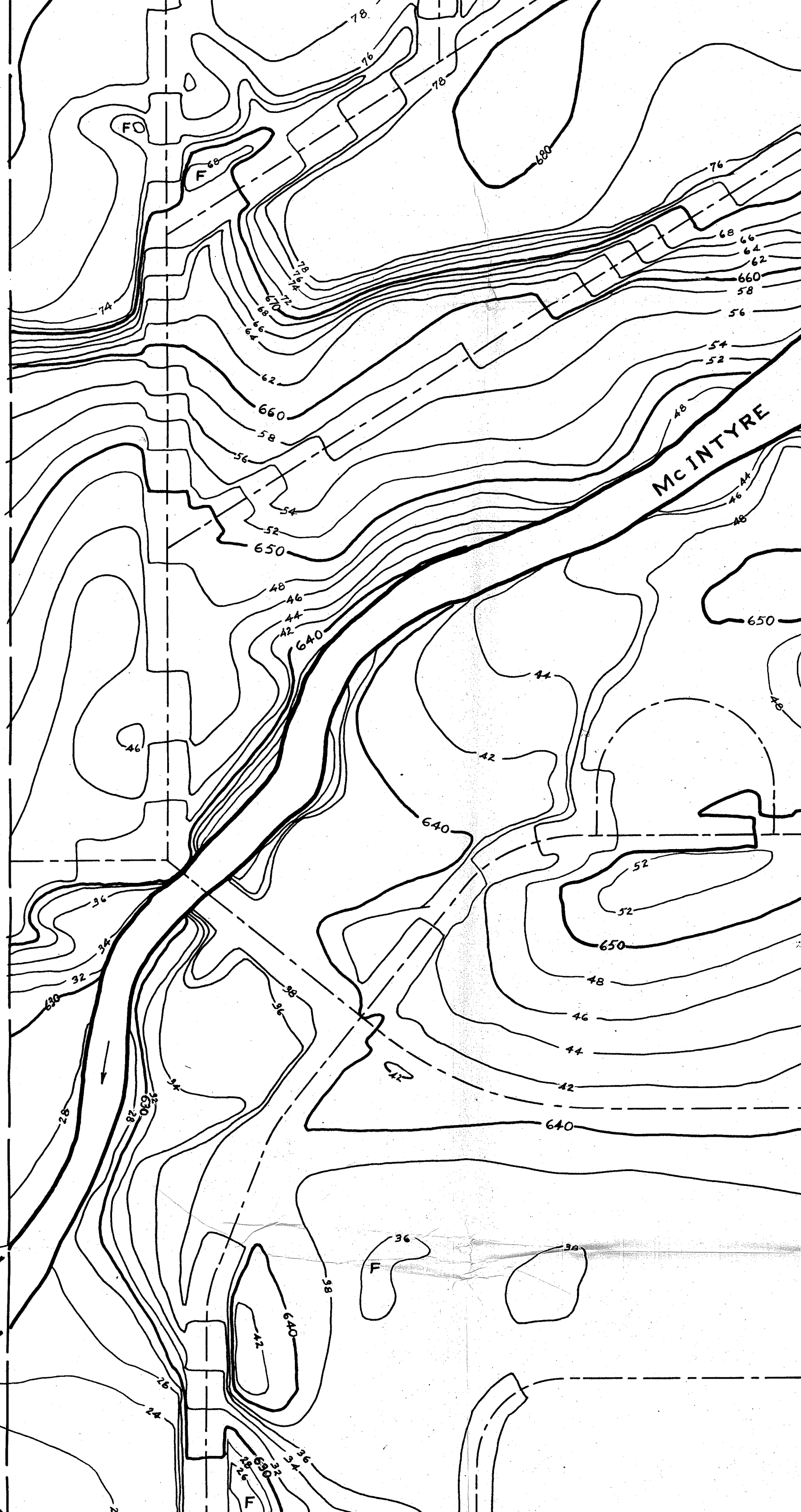
THE MODIFIED TOPOGRAPH

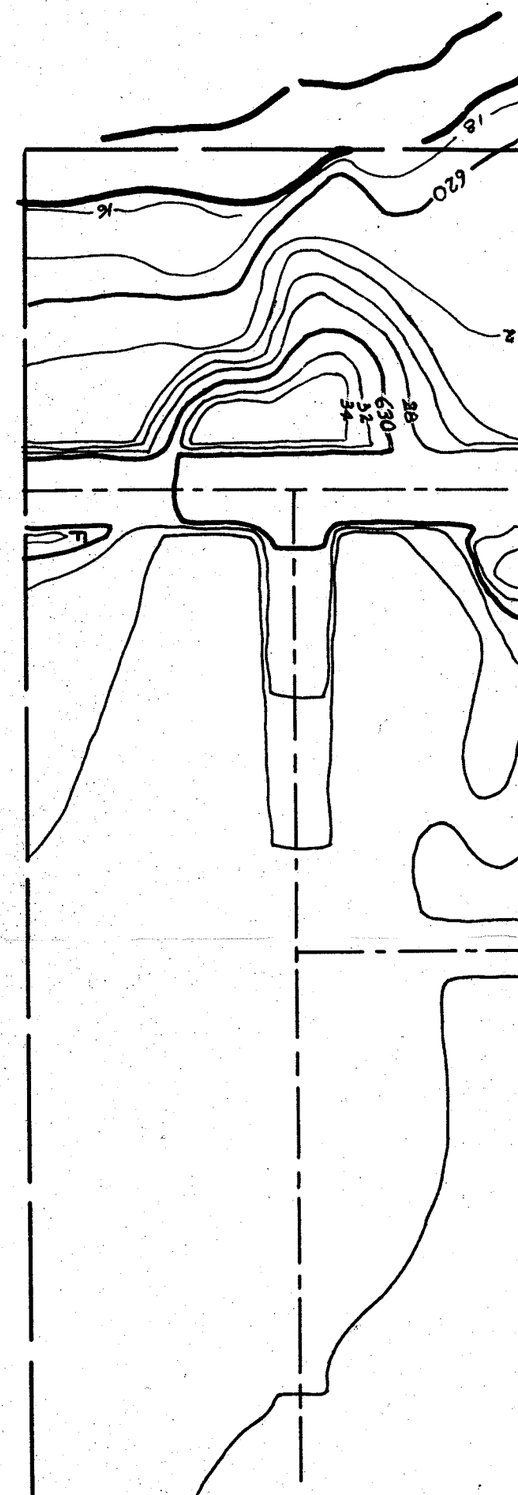
SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



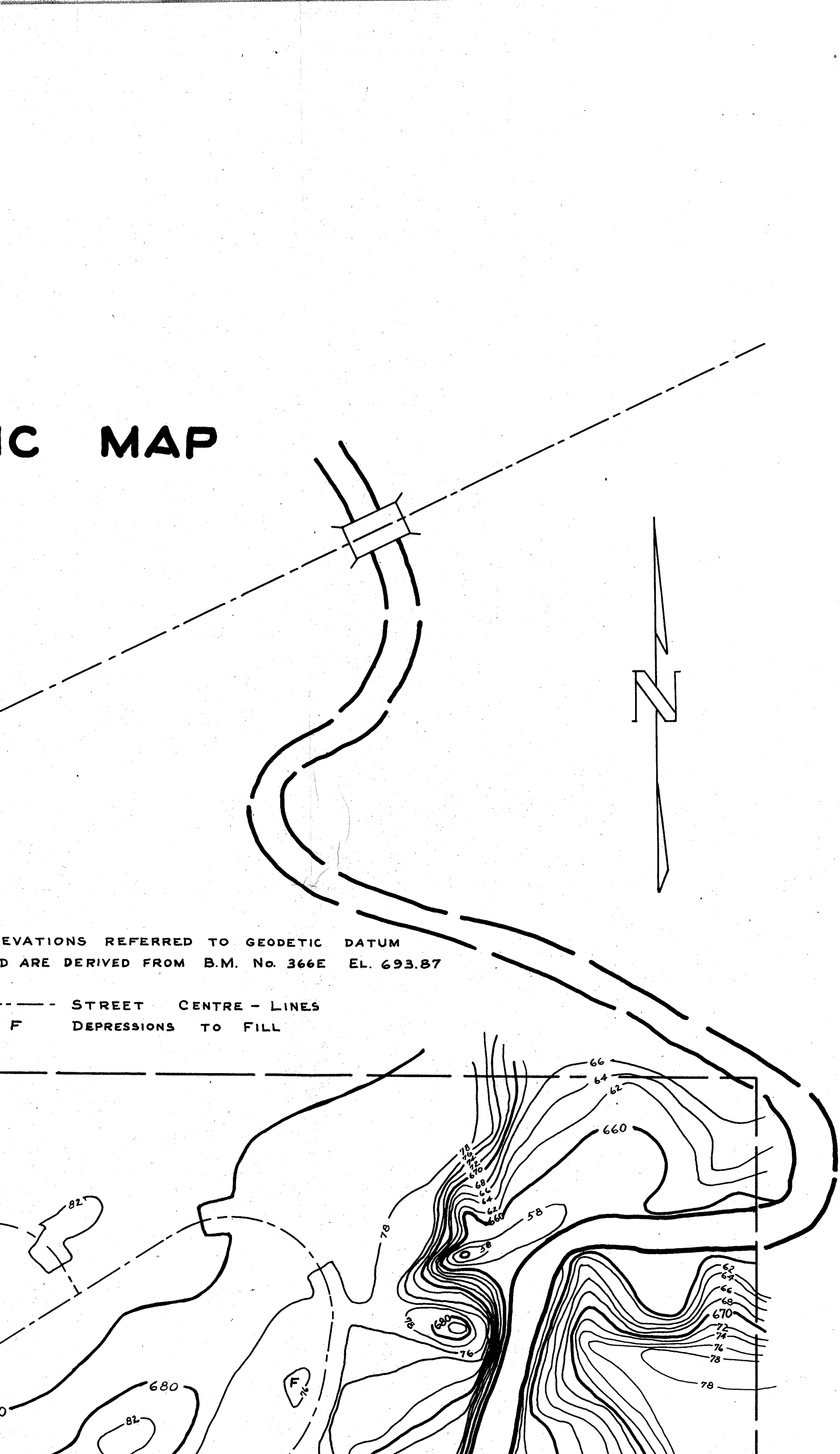

MCINTYRE
F
F
F
680
670
660
650
640
630
78
76
74
72
68
66
64
62
58
56
54
52
48
46
44
42
38
36
34
32
28
26

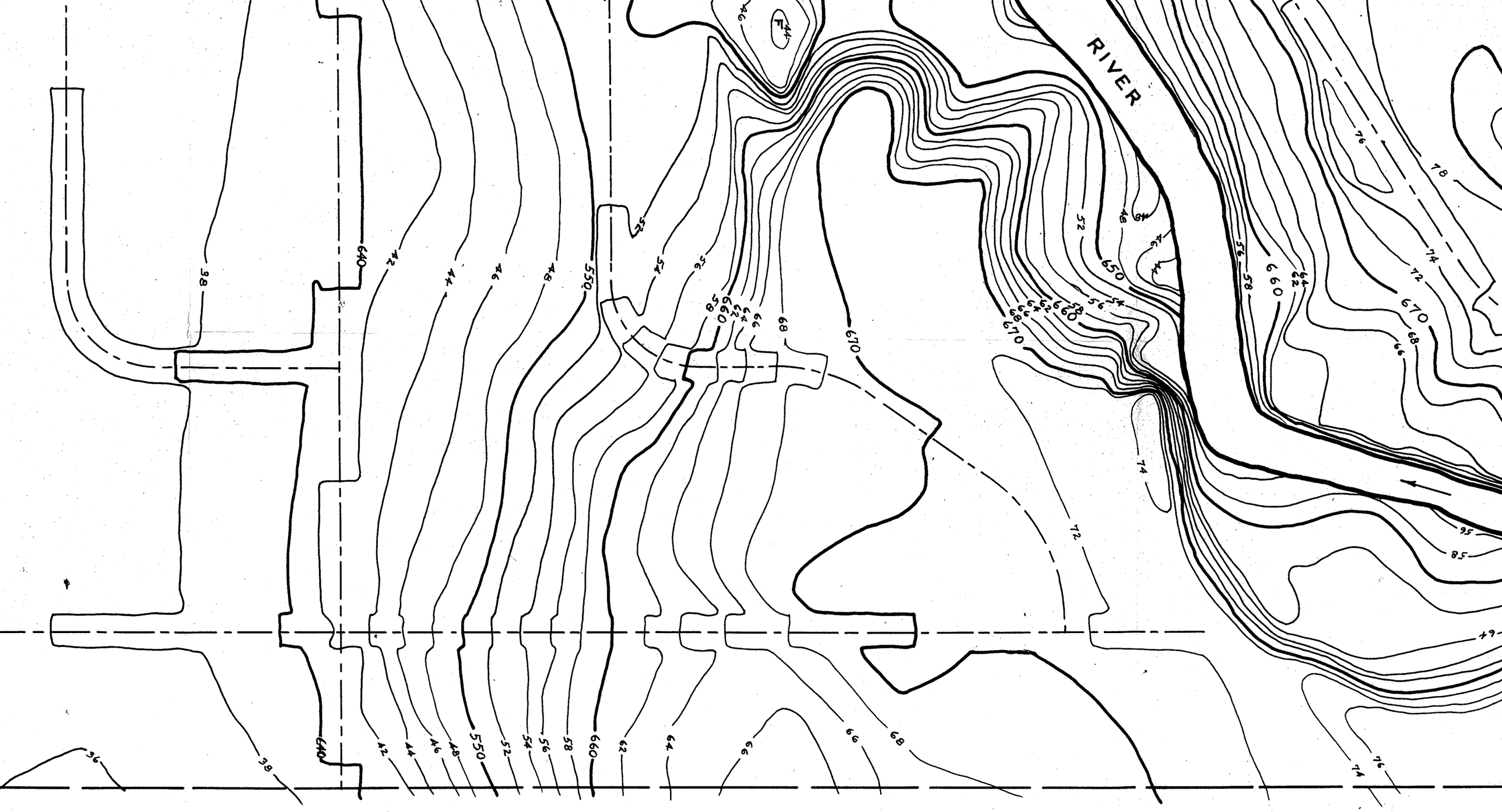

18
620
16
2
28
630
32
34

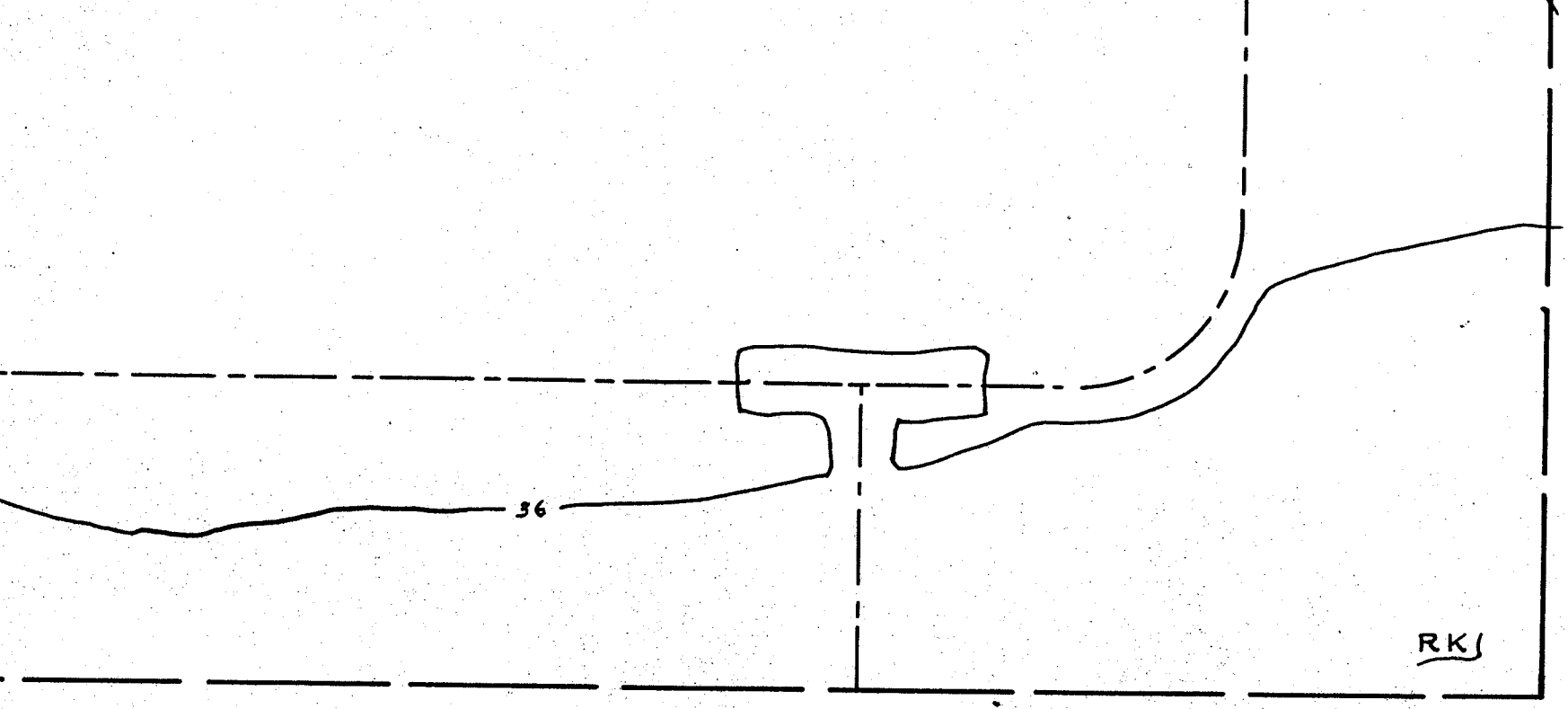
IC MAP

EVATIONS REFERRED TO GEODETIC DATUM
D ARE DERIVED FROM B.M. No. 366E EL. 693.87

---- STREET CENTRE - LINES
F DEPRESSIONS TO FILL




RIVER
640
550
660
670
650
680
690
700
710
720
730
740
750
760
770
780
790
800
810
820
830
840
850
860
870
880
890
900
910
920
930
940
950
960
970
980
990
1000
1010
1020
1030
1040
1050
1060
1070
1080
1090
1100
1110
1120
1130
1140
1150
1160
1170
1180
1190
1200
1210
1220
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1670
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DRAWING No. 7

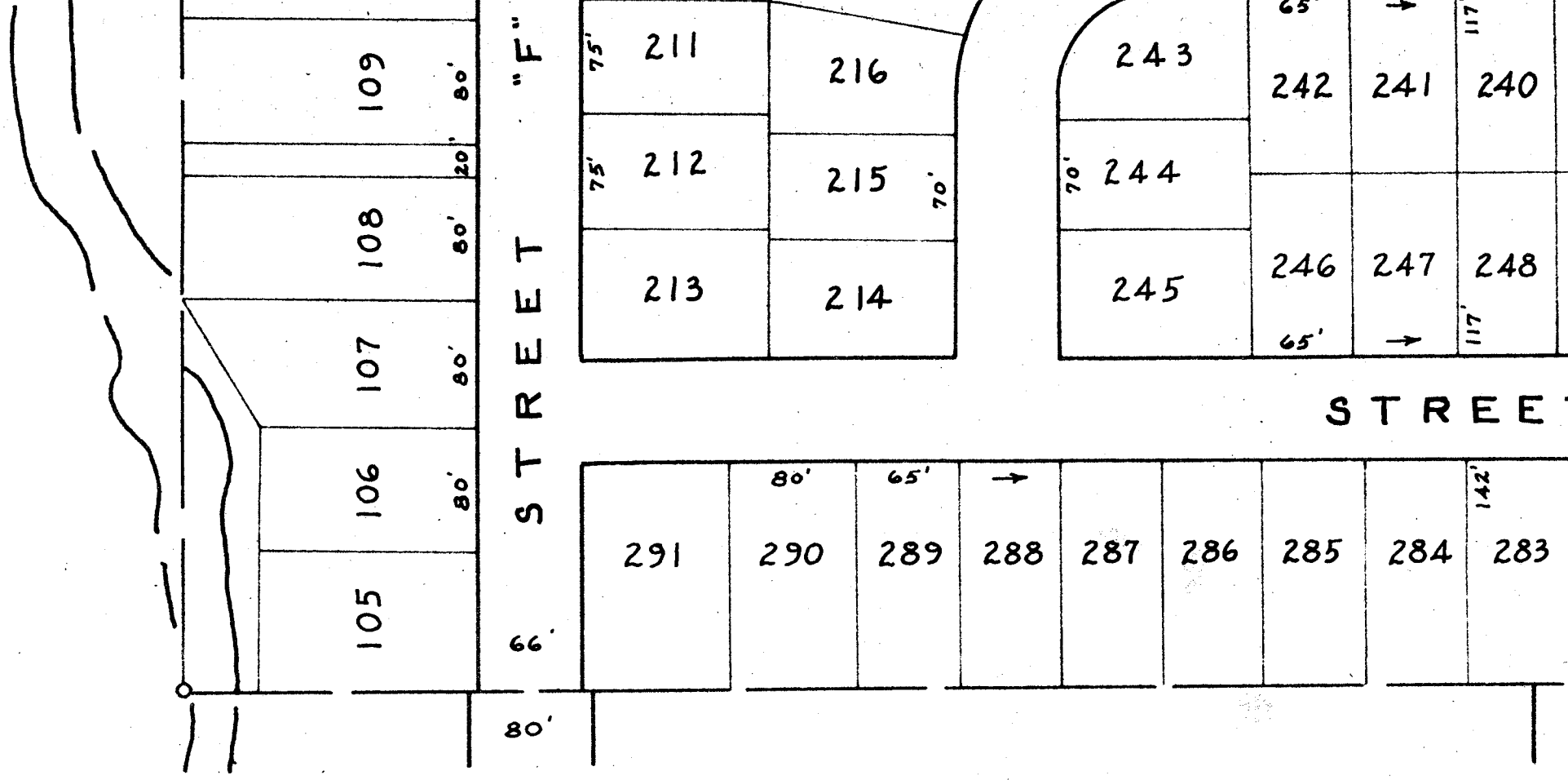
THE FINAL SUBDIVISION

SCALE IN FEET

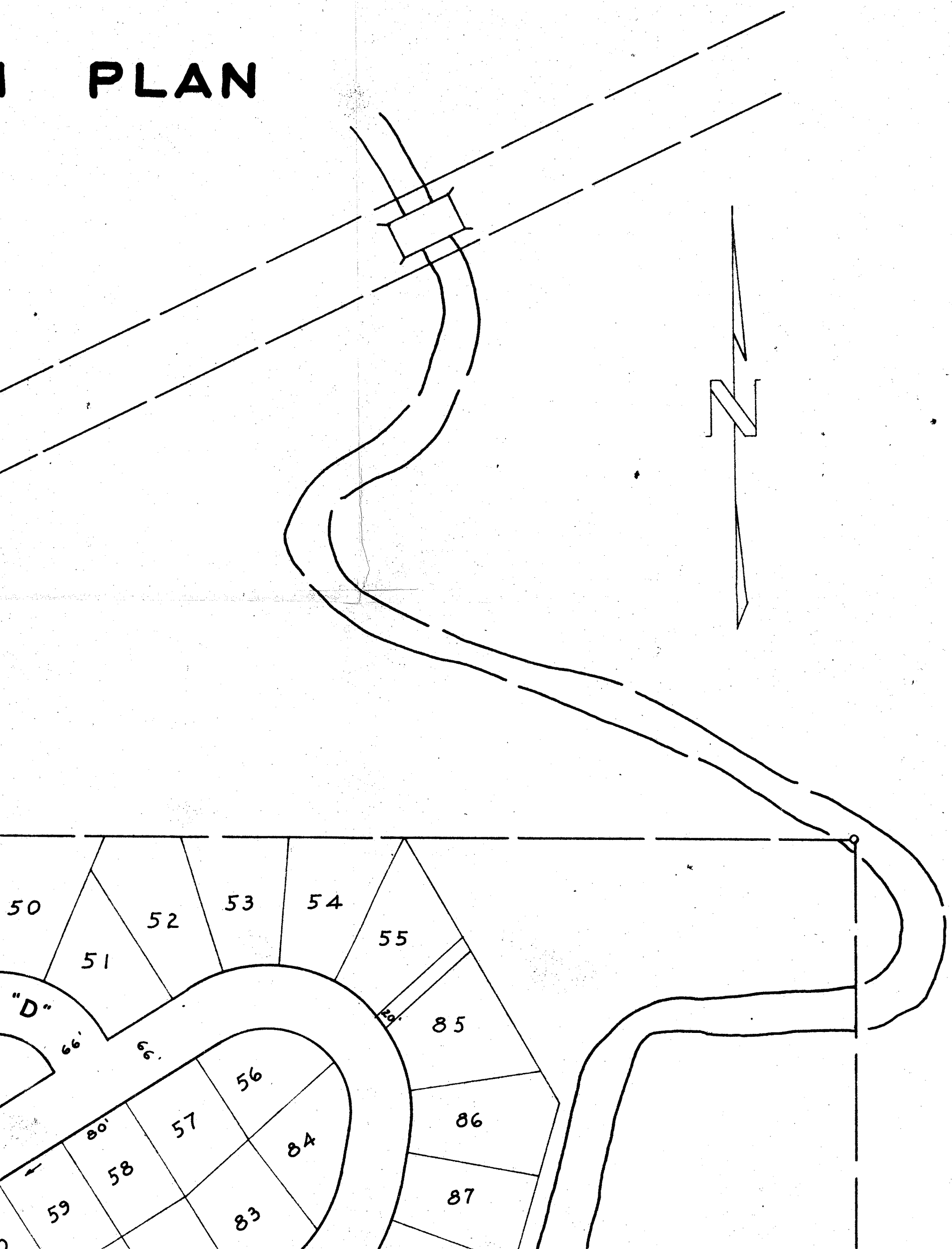
0 100 200 300 400 500

100 FEET TO 1 INCH

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"A" STREET
STREET
STREET
STREET
Mc INTYRE
STREET "G"
STREET
65'
66'
80'
90'
142'
117'
20'
75'
121'


109
80'
20'
108
80'
107
80'
106
80'
105
STREET "F"
66'
80'
75'
211
216
75'
212
215
70'
213
214
243
242
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240
70'
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248
65'
117'
STREET
291
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287
286
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284
283
80'
65'
142'

PLAN



80 81 82 80' 88 89 90 91 92 93 94 "C" RIVER

135 136 137 134 133 132 131 130 125 126 127 128 129 20' 80' 80' 66' 141 142 143 144 138 139 140 175 176 174 173 172 171 170 169 70' 65' 117' 117' 66' "H" STREET

177 178 179 180 181 182 183 184 185 186 187 188 189 190 70' 65' 142' 142' 65'

REET "F"

149 148 147 146 145 160 161 162 163 164 165 166 167 168 80' 65' 65'

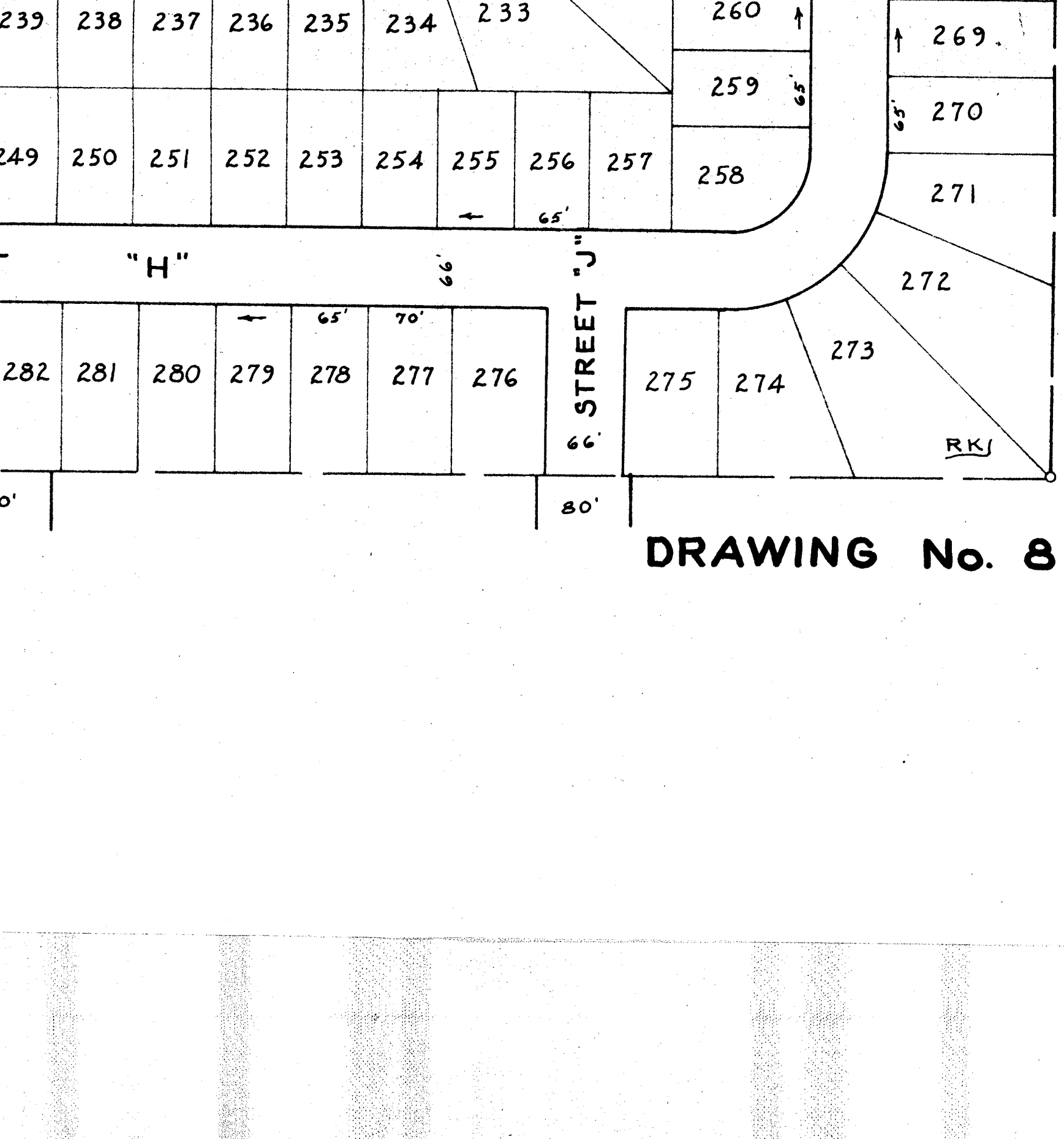
T "E" 66'

99 198 197 196 195 194 193 192 191 70' 65'

224 225 226 227 228 229 230 231 232 233 263 262 261 260 117' 117' 65' 65'

"I" 66'

264 265 266 267 268 142' 142' 65'


239
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"H"
66'
STREET "J"
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70'
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66'
80'

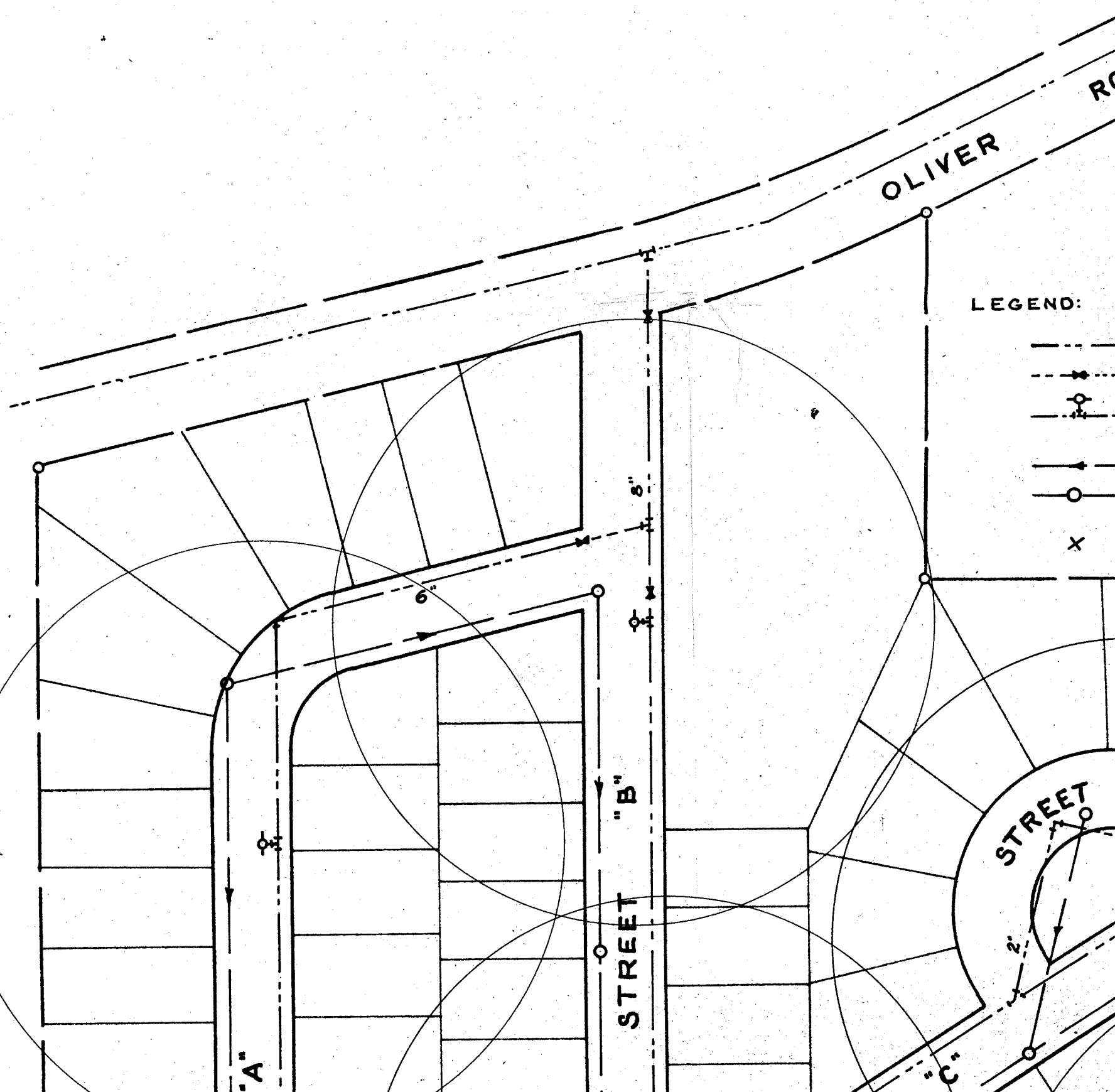
DRAWING No. 8

WATER DISTRIBUTION SY
AND
SANITARY SEWERAGE SY

SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



STREET

STREET

6"

8"

8"

6"

STREET

6"

8"

6"

MC INTYRE

8"

8"

8"

"B"

ALTERNATIVE "A"

6"

STREET

6"

2"

2"

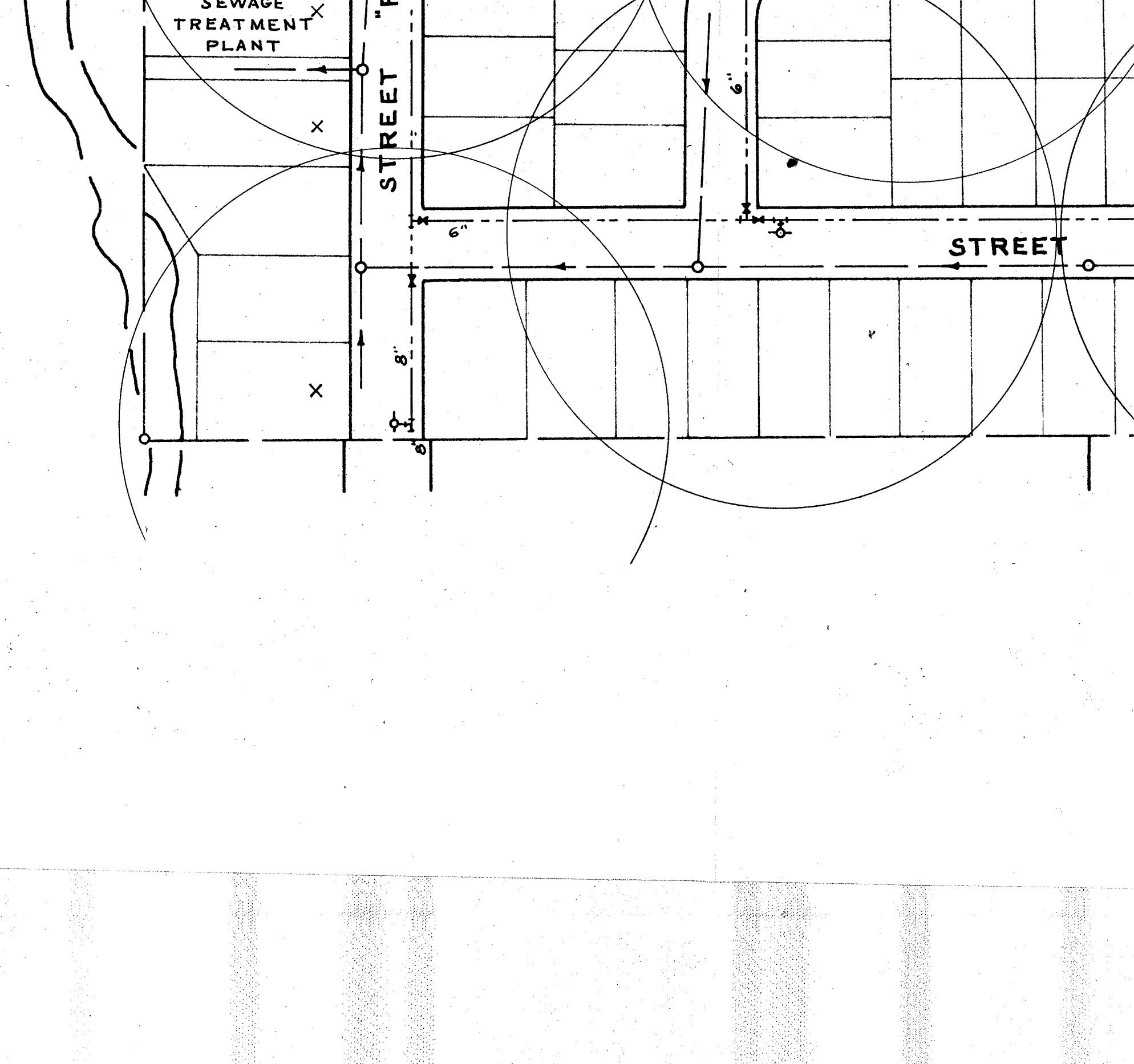
6"

8"

8"

6"

PROPOSED


SEWAGE
TREATMENT
PLANT
STREET
6"
6"
STREET
8"
8"

STEM

STEM

EXISTING WATERMAIN IN PORT ARTHUR

PROPOSED WATERMAIN

AD

WATERMAIN
GATE VALVE
FIRE HYDRANT

SANITARY SEWER
MANHOLE

LOW LOT WITH RESPECT TO STREET GRADE

PROPOSED CENTRAL WATER WELL

6"

"D"

2"

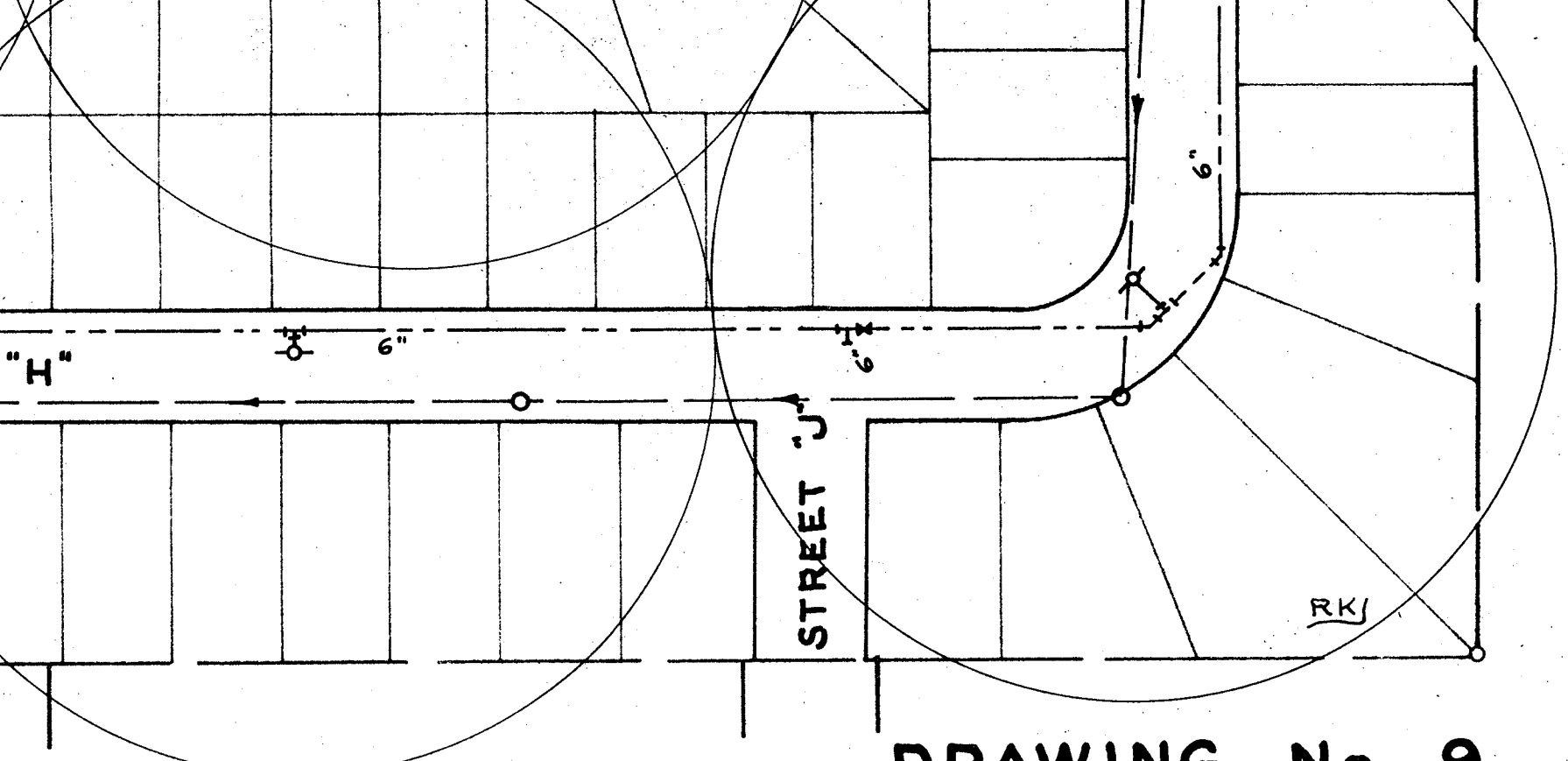
STREET "H"

STREET "F"

STREET "E"

STREET "I"

RIVER



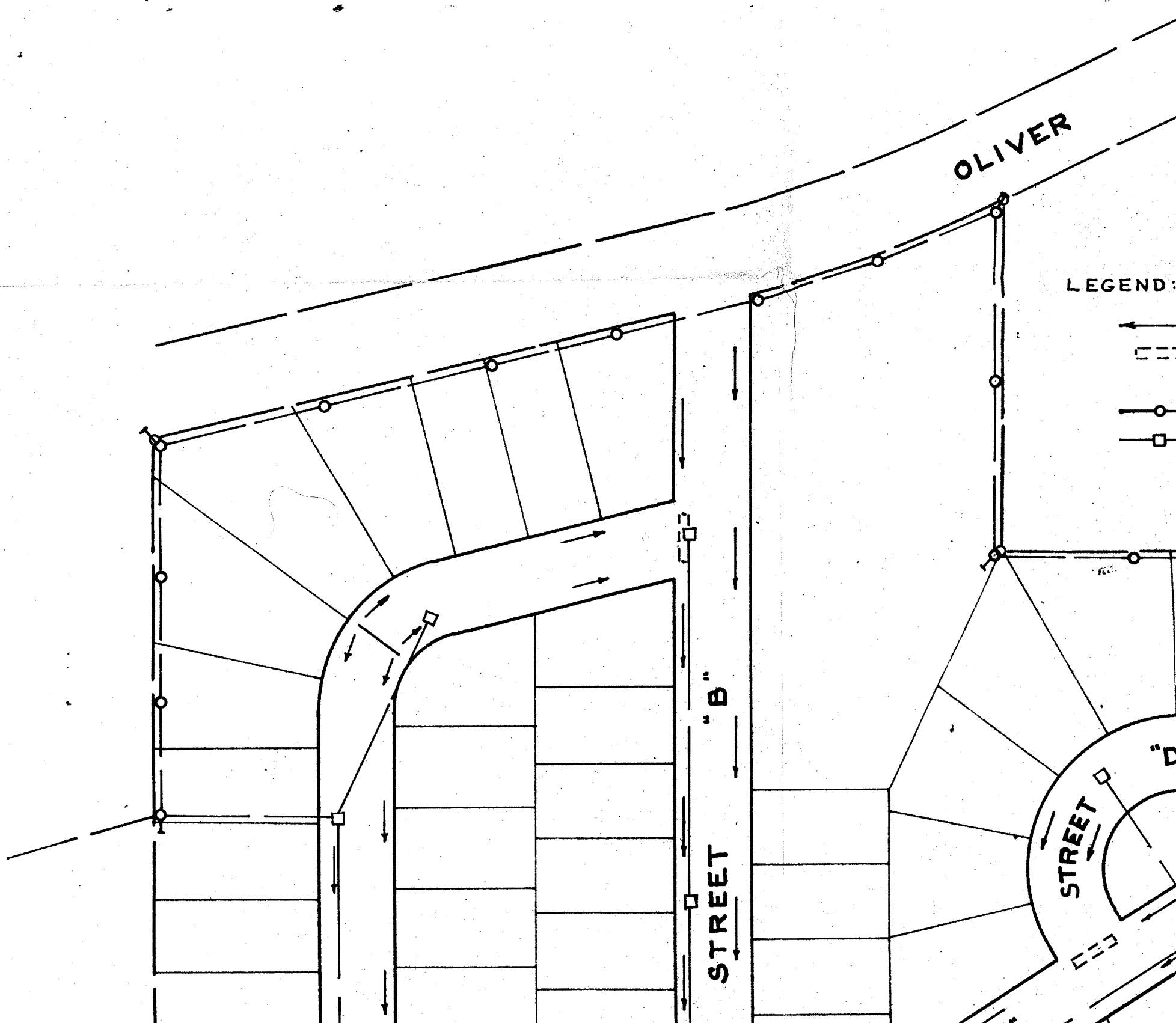
DRAWING No. 9

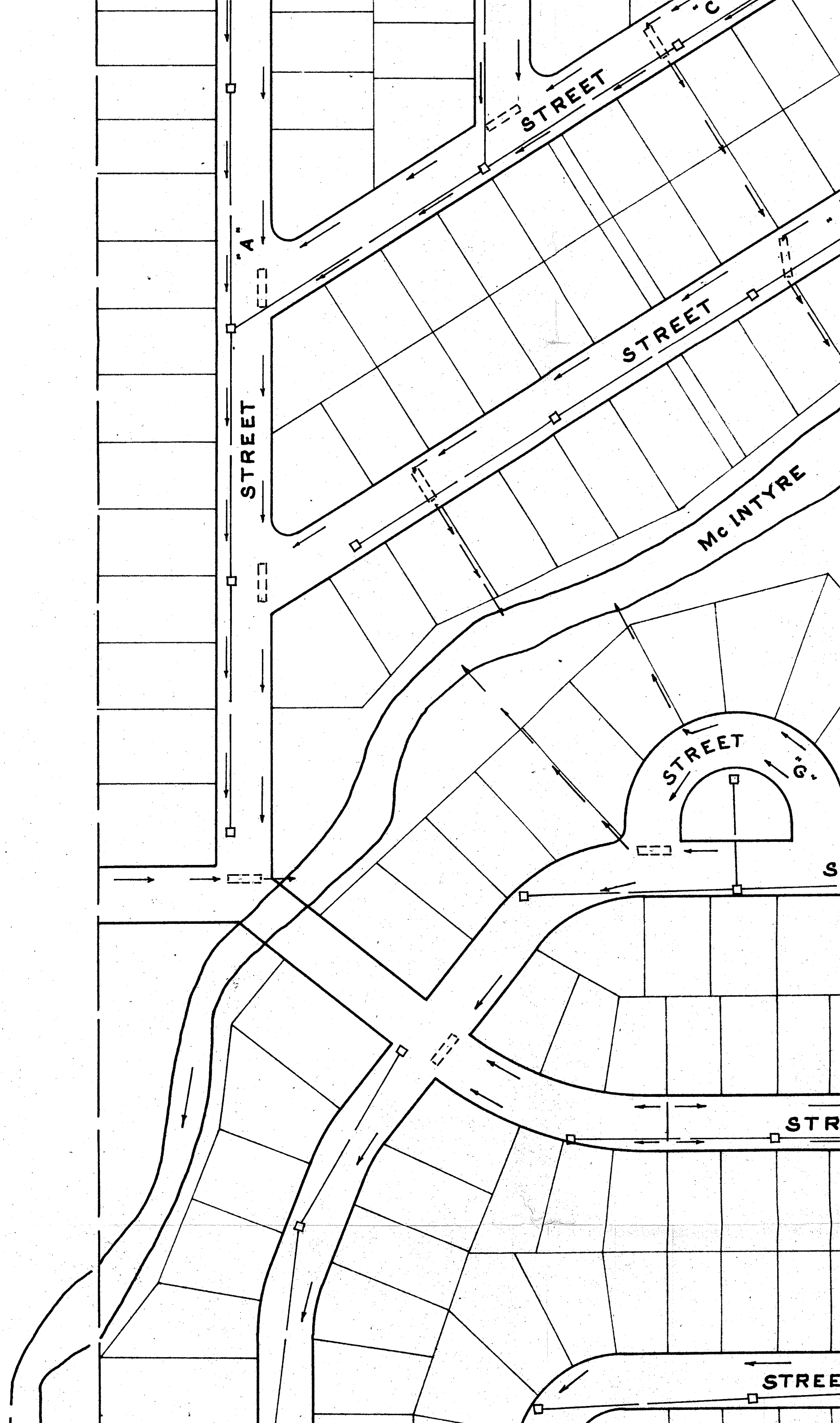
SURFACE STORM DRAINAGE AND UNDERGROUND ELECTRICAL

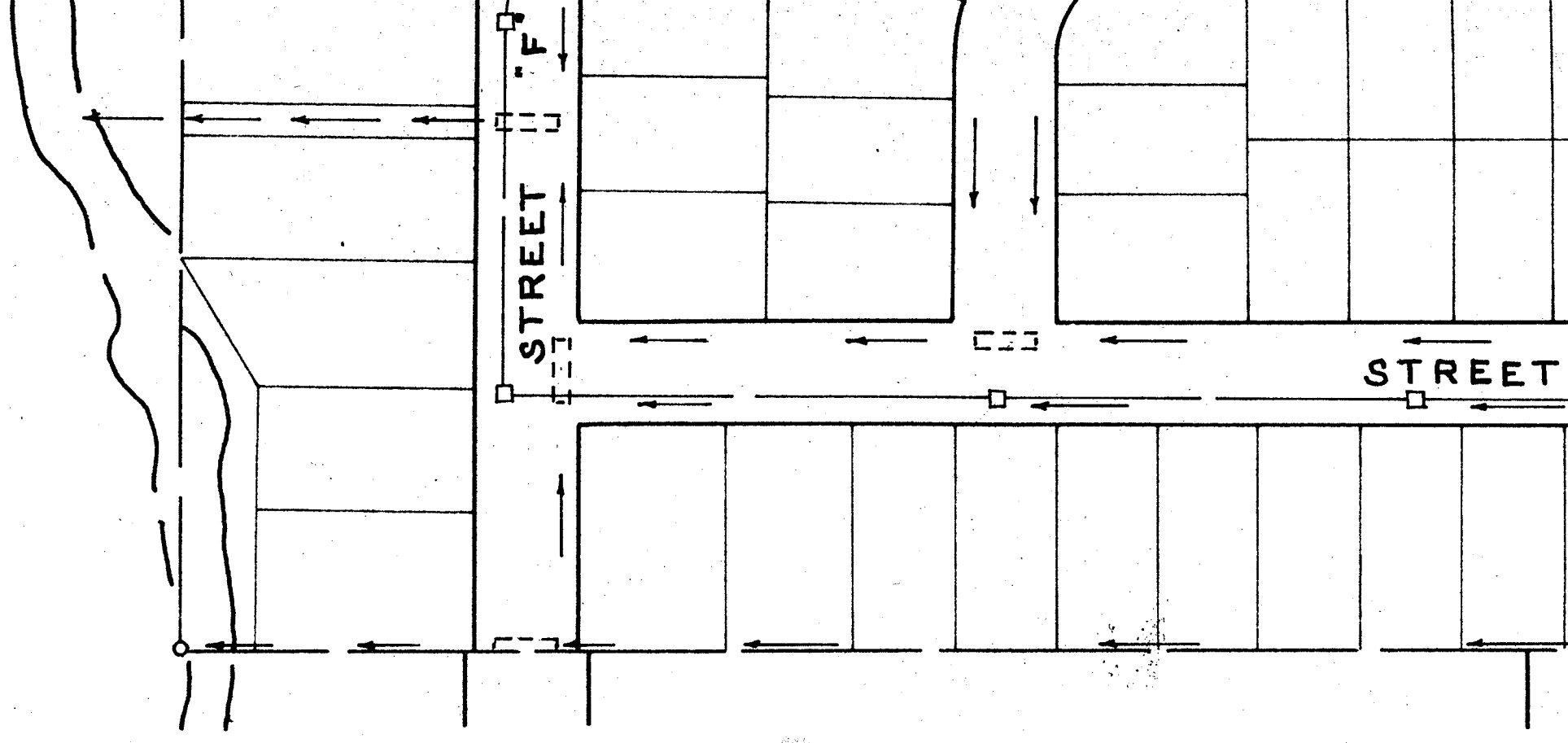
SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH




STREET
"A"
STREET
STREET
Mc INTYRE
STREET
G.
STR
STREE


STREET "F"
STREET

SYSTEM

ROAD

N

FLOW IN STORM DITCH

STREET CULVERT

OVERHEAD ELECTRICAL SYSTEM

UNDERGROUND ELECTRICAL SYSTEM

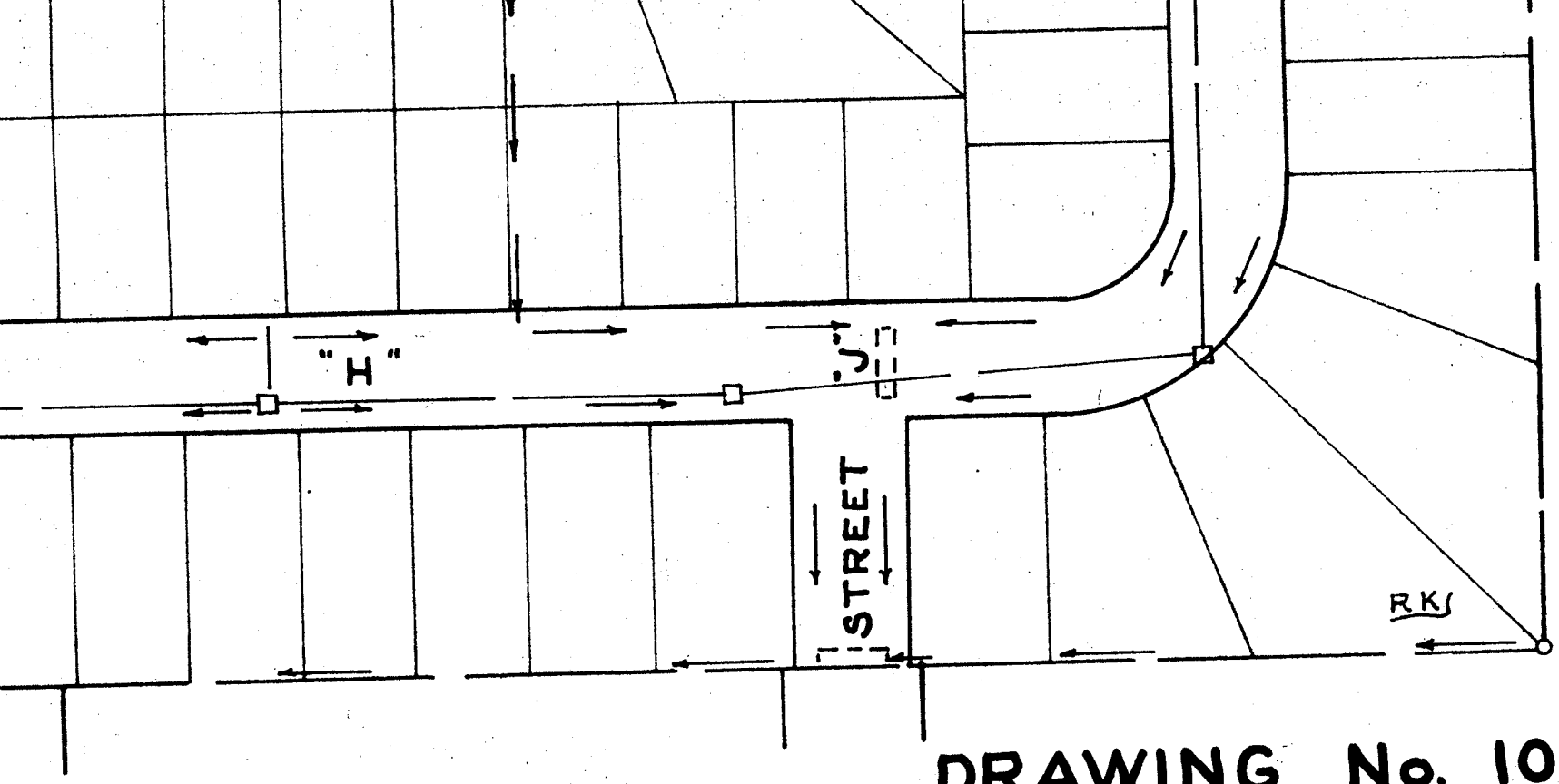
"I"

STREET "E"

STREET "F"

RIVER

STREET "H"



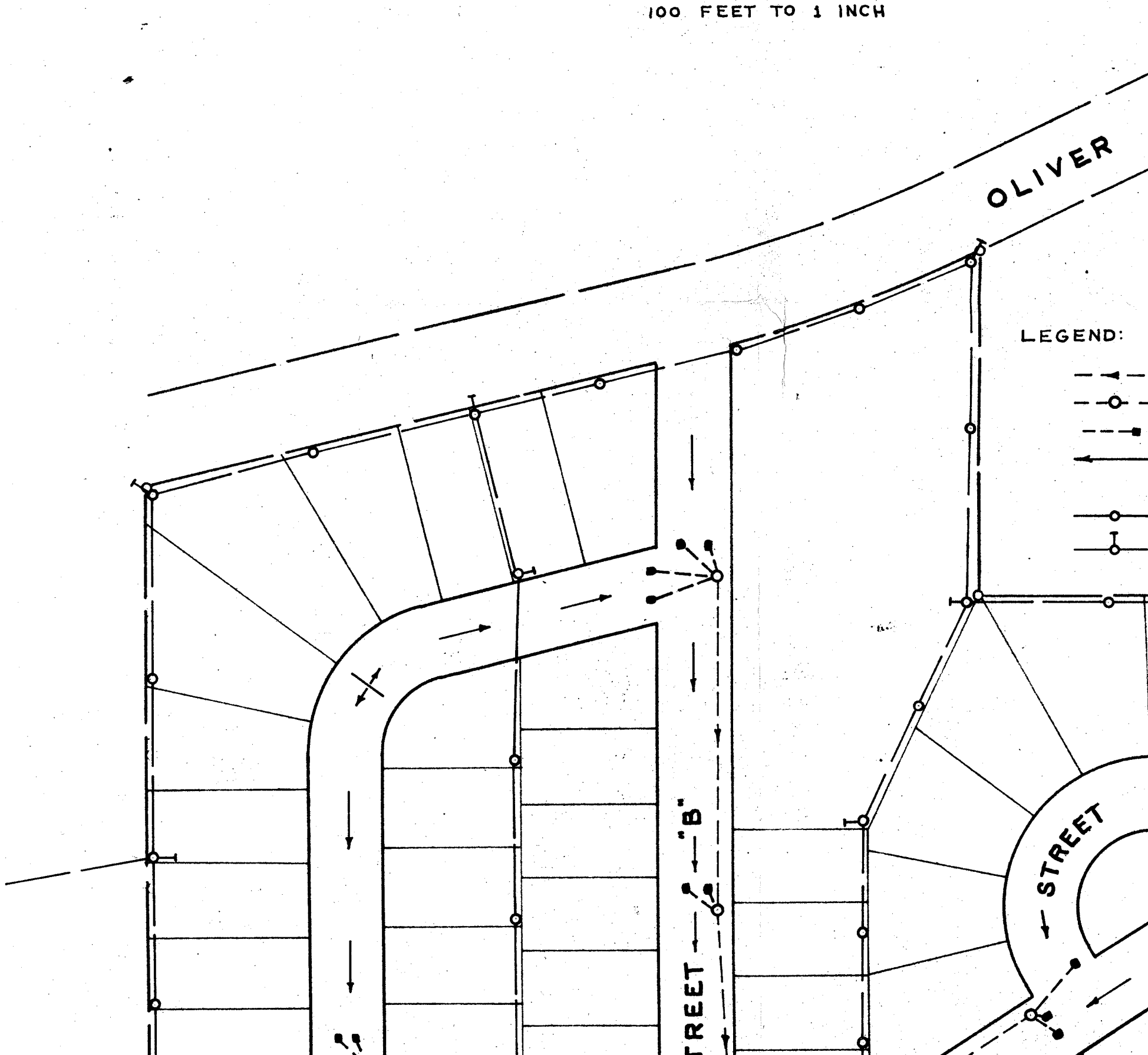
DRAWING No. 10

UNDERGROUND STORM DRAINAGE
AND
OVERHEAD ELECTRICAL SY

SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



STREET

"A"

STREET

"C"

STREET

STREET

RIVER

McINTYRE

STREET

"G"

STR

STREE


STREET
"F"
STREET

SYSTEM

YSTEM

ROAD

N

STORM SEWER
MANHOLE
CATCHBASIN
DIRECTION OF GUTTER FLOW

OVERHEAD ELECTRICAL SYSTEM
GUY WIRE ON POLE

"D"

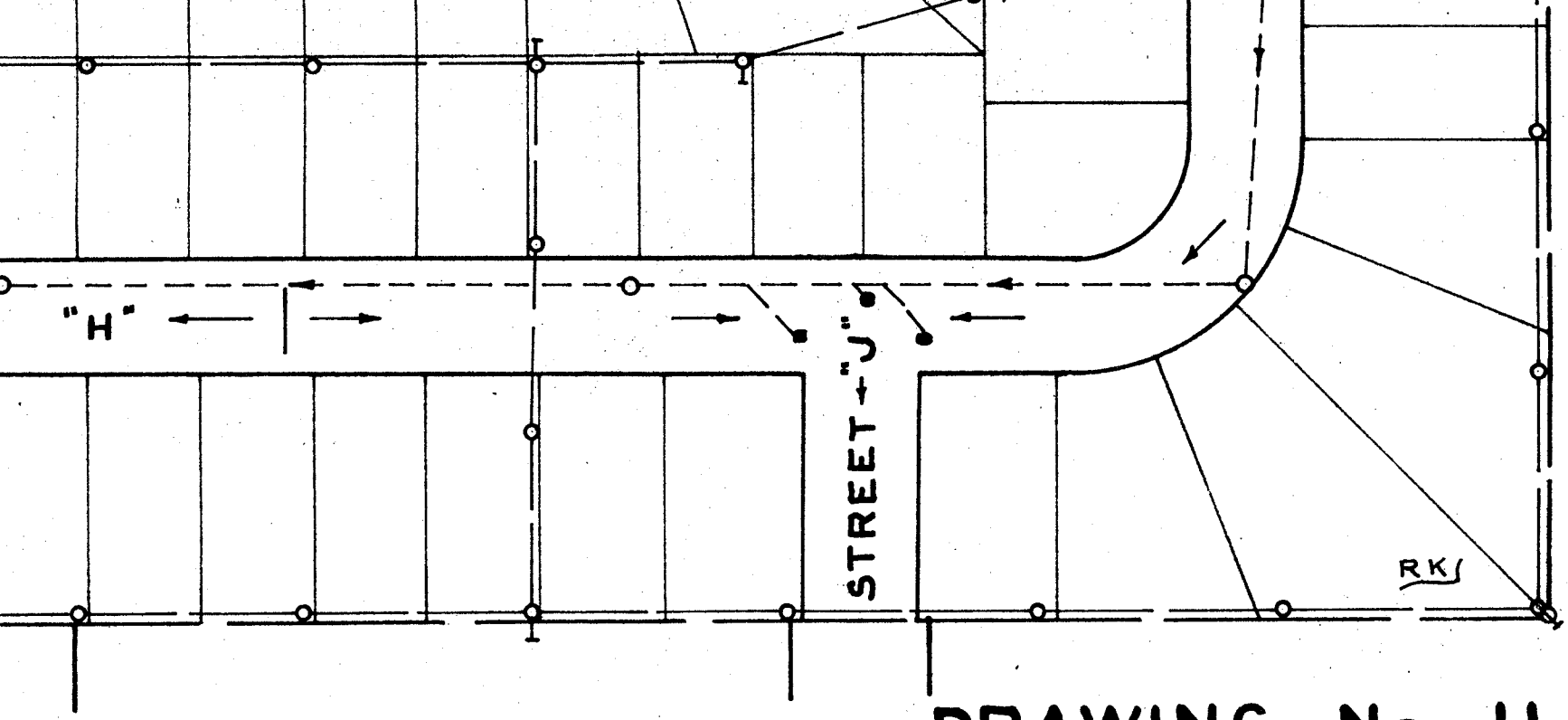
STREET "H"

"C"

STREET "F"

STREET "E"

"I"



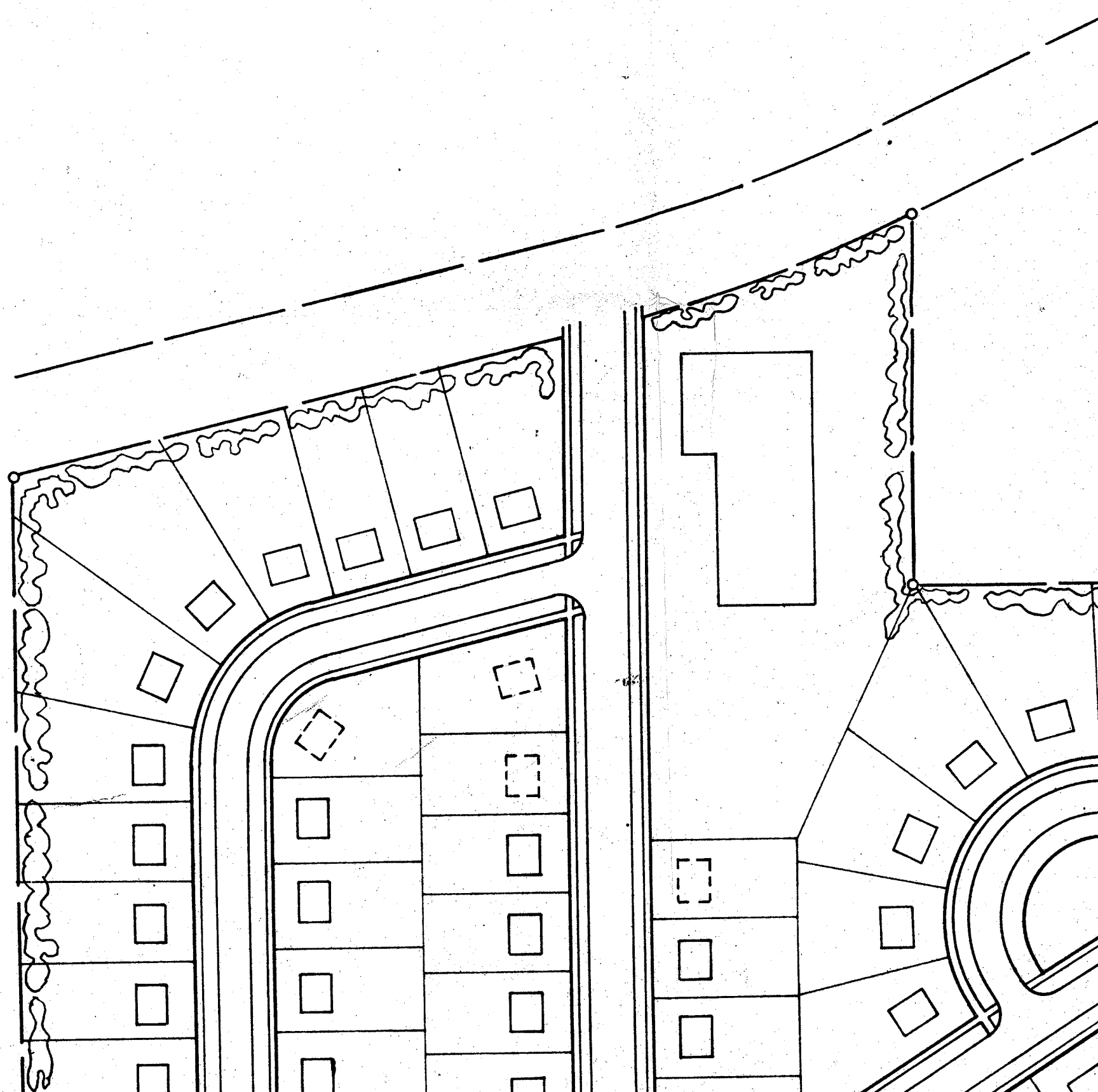
DRAWING No. 11

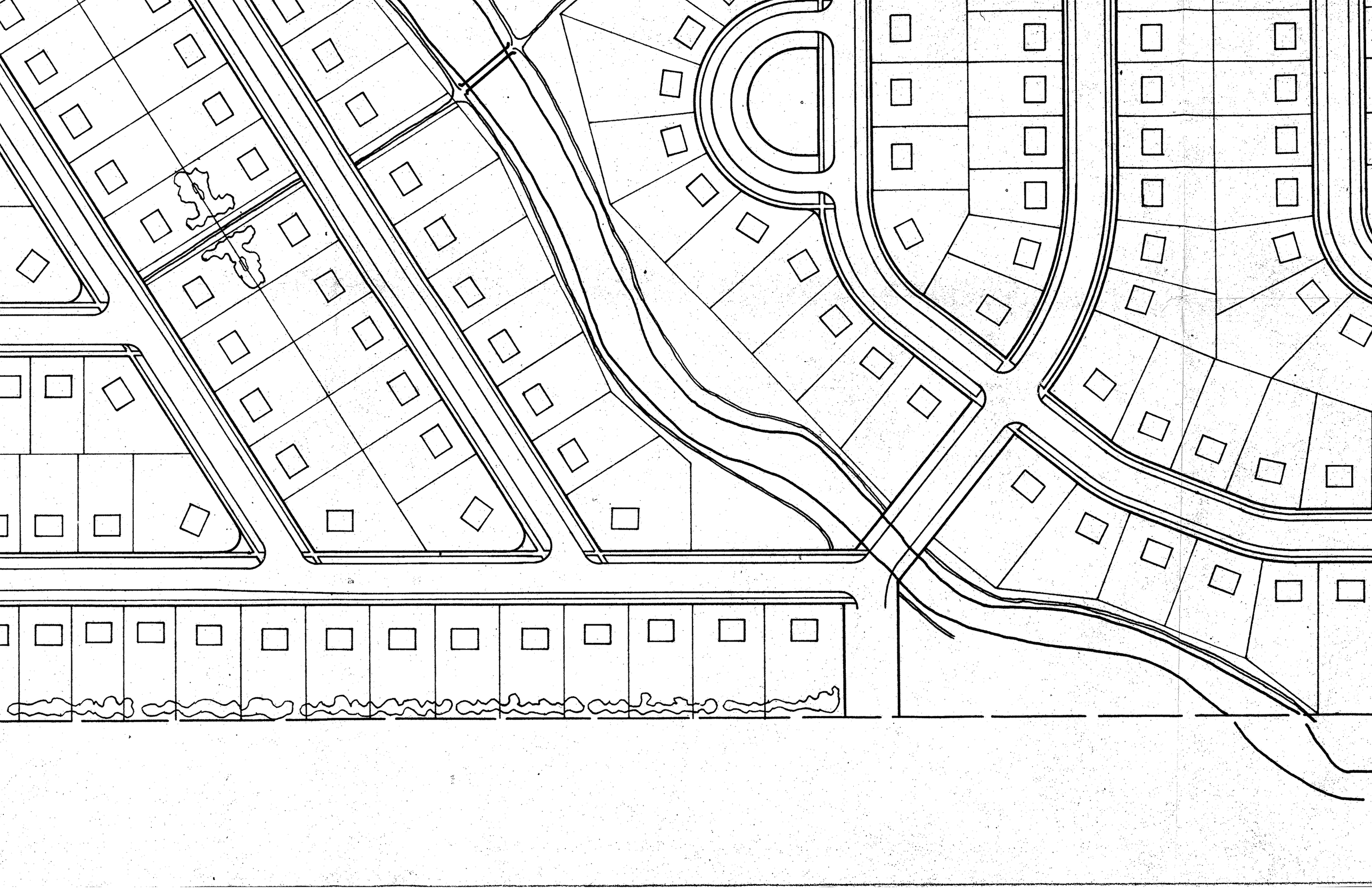
THE LANDSCAPE PLAN

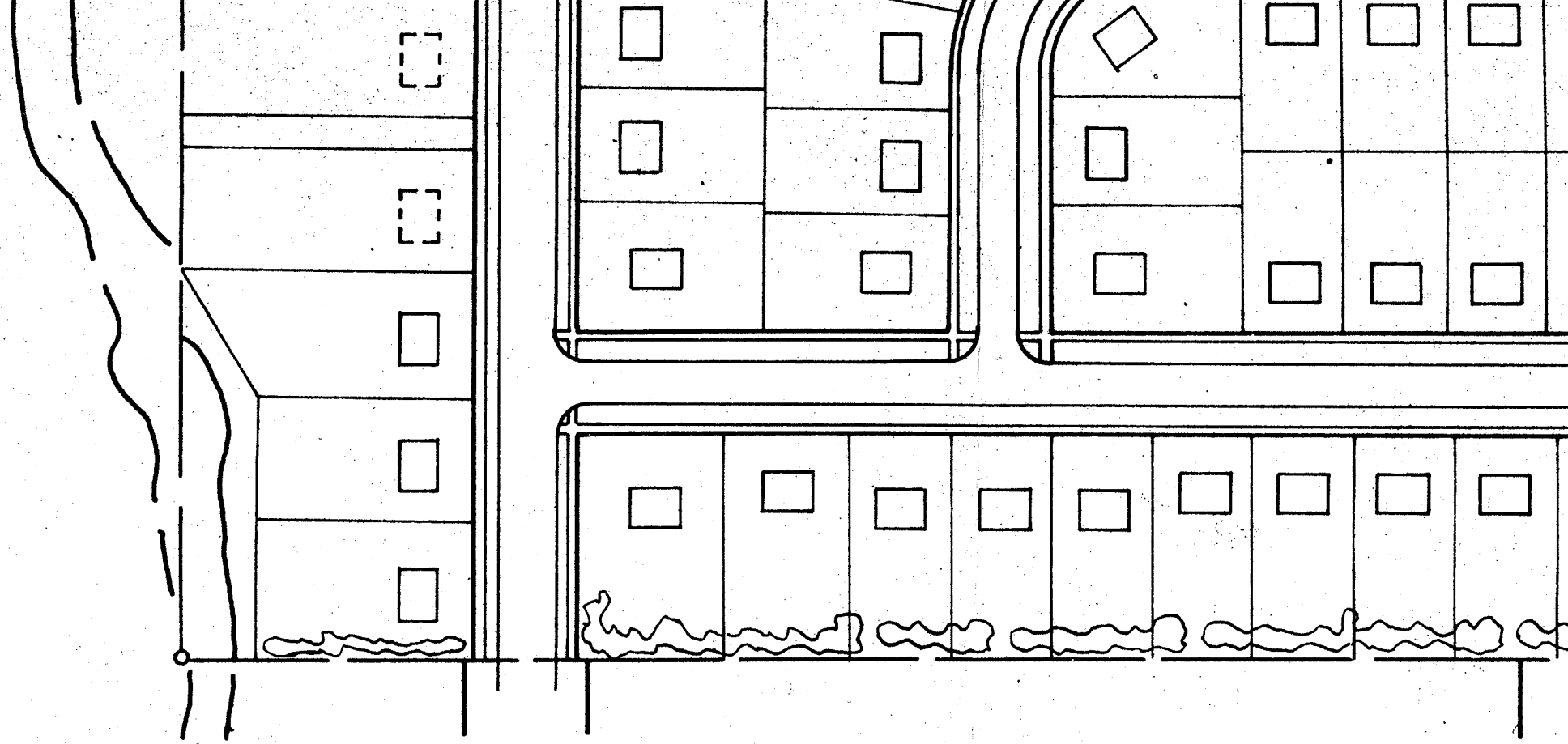
SCALE IN FEET

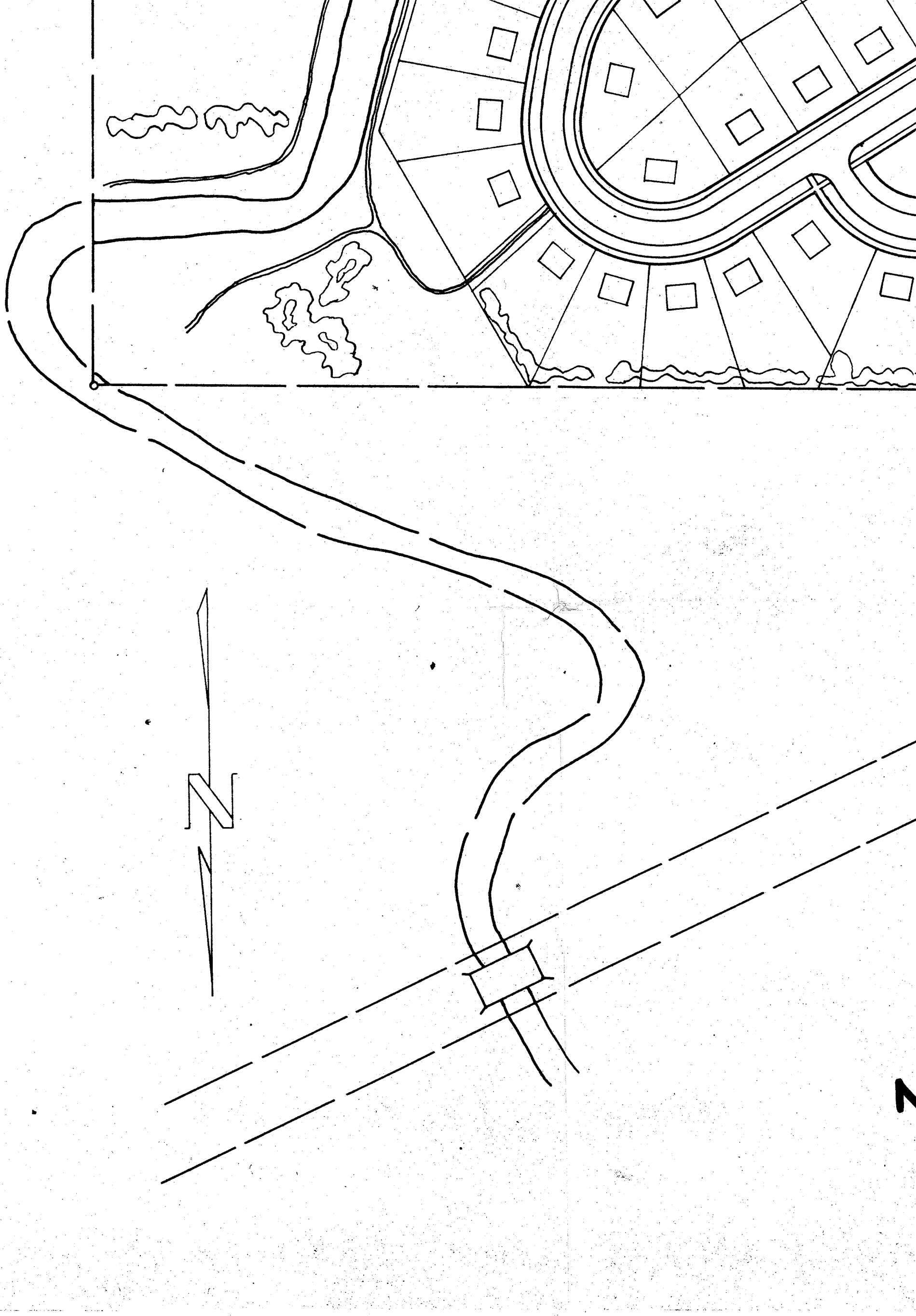
0 100 200 300 400 500

100 FEET TO 1 INCH







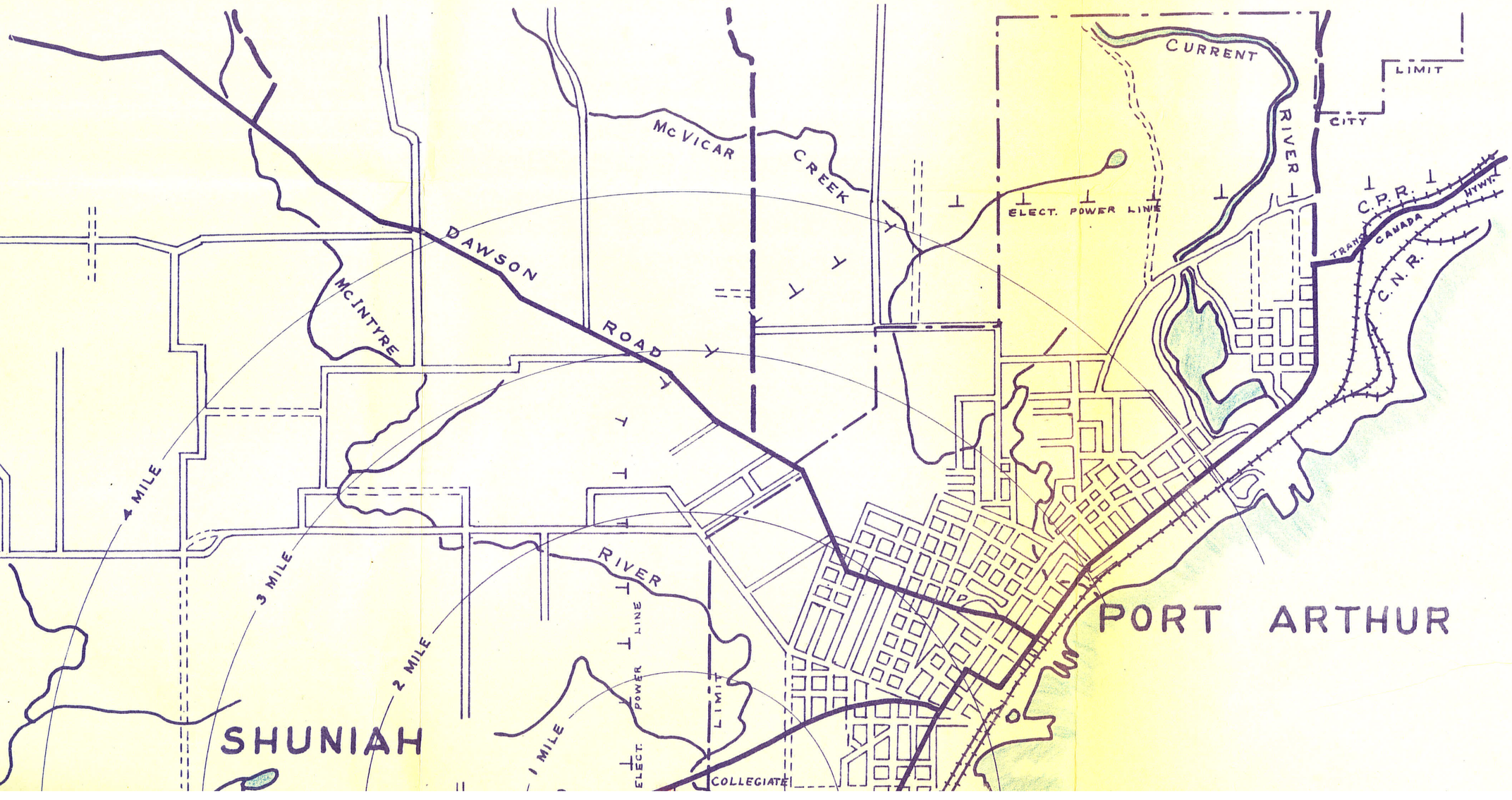


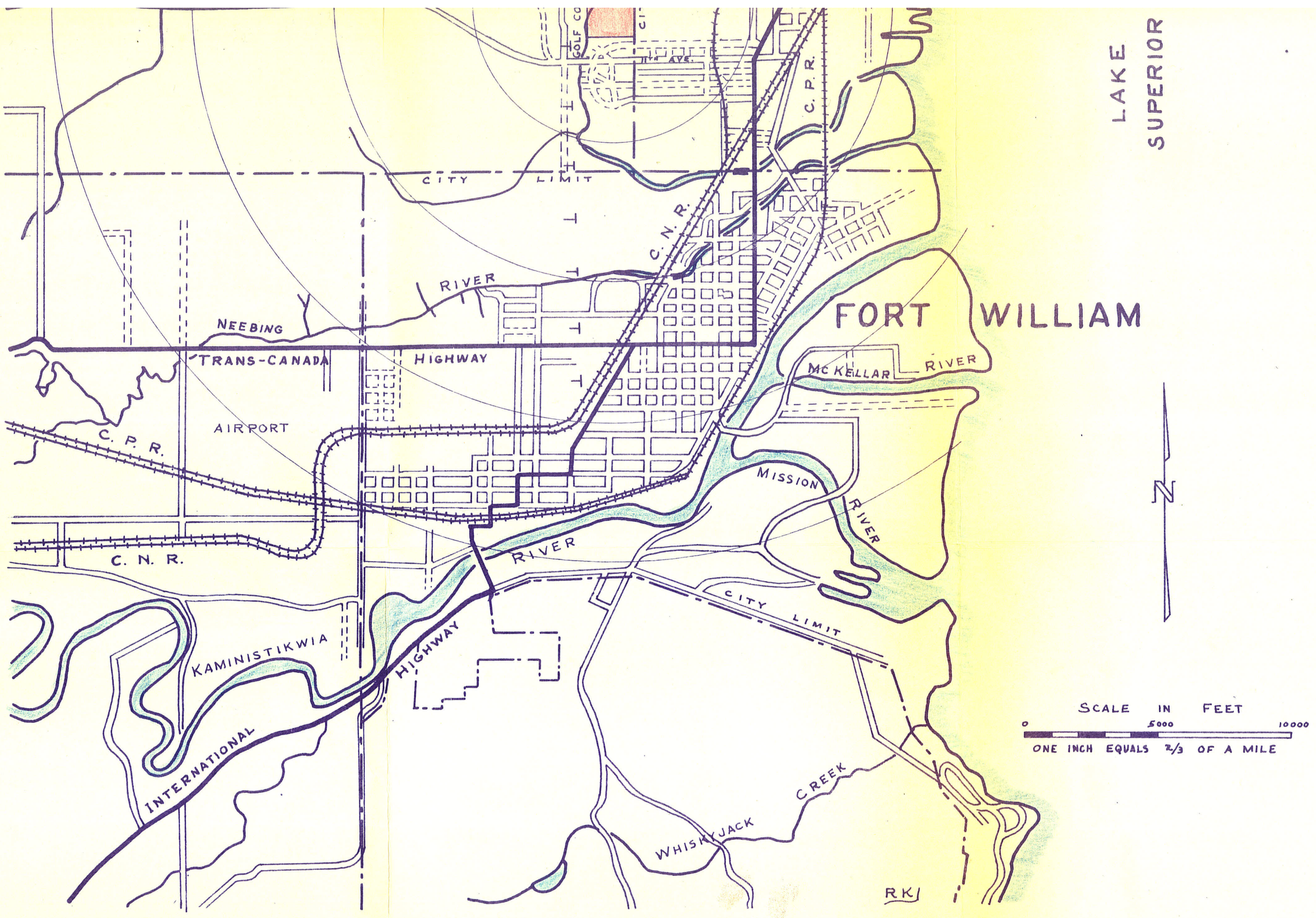




DRAWING No. 12

THE SITE PLAN




LAKE
SUPERIOR
FORT WILLIAM
CITY LIMIT
C.N.R.
C.P.R.
RIVER
NEEBING
TRANS-CANADA
HIGHWAY
AIRPORT
C.P.R.
C.N.R.
MCKELLAR
RIVER
MISSION
RIVER
RIVER
CITY LIMIT
KAMINISTIKWIA
HIGHWAY
INTERNATIONAL
WHISKYJACK
CREEK
RKJ
N
SCALE IN FEET
0
5000
10000
ONE INCH EQUALS 2/3 OF A MILE

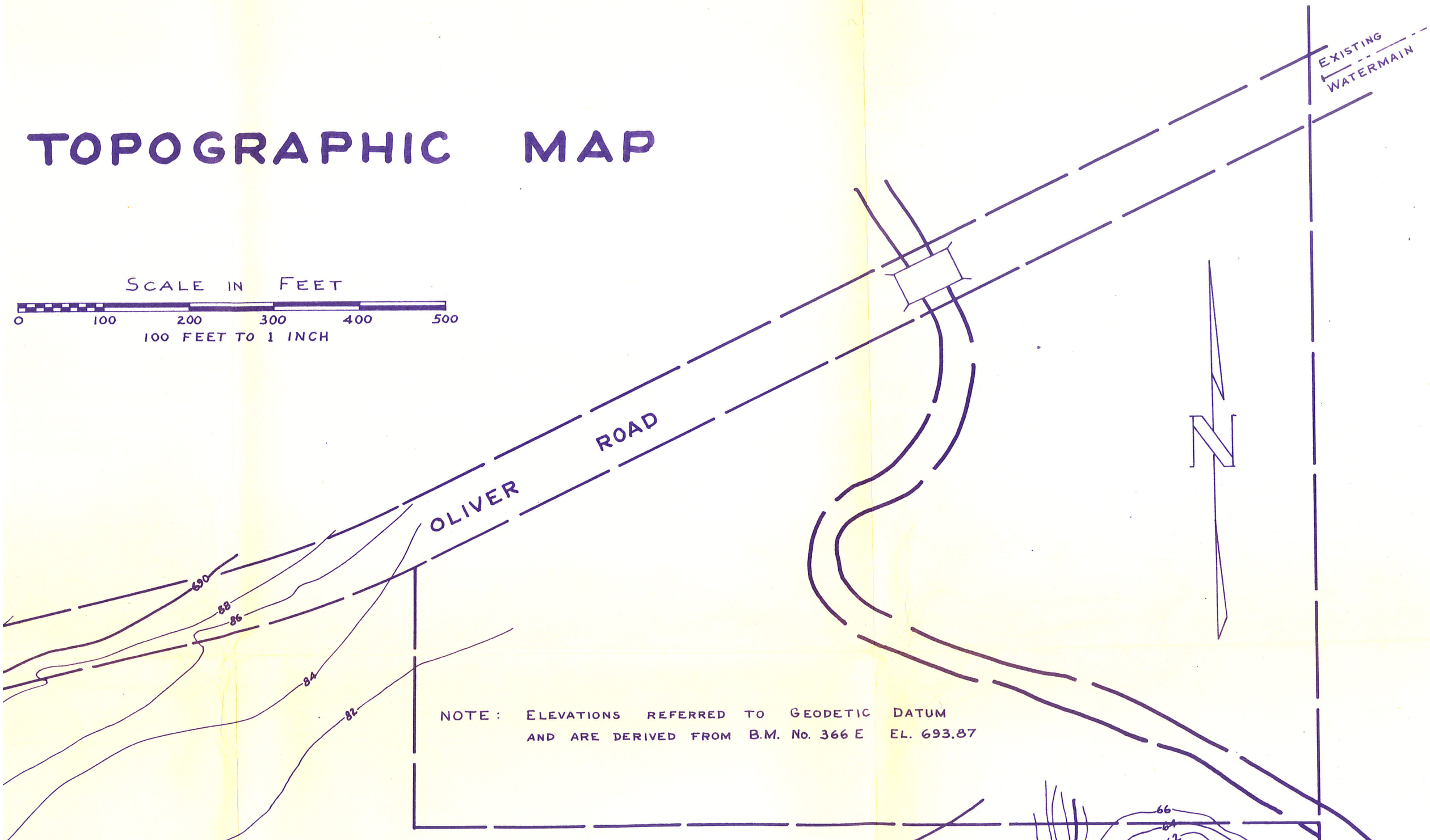
DRAWING No. 1

TOPOGRAPHIC MAP

SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



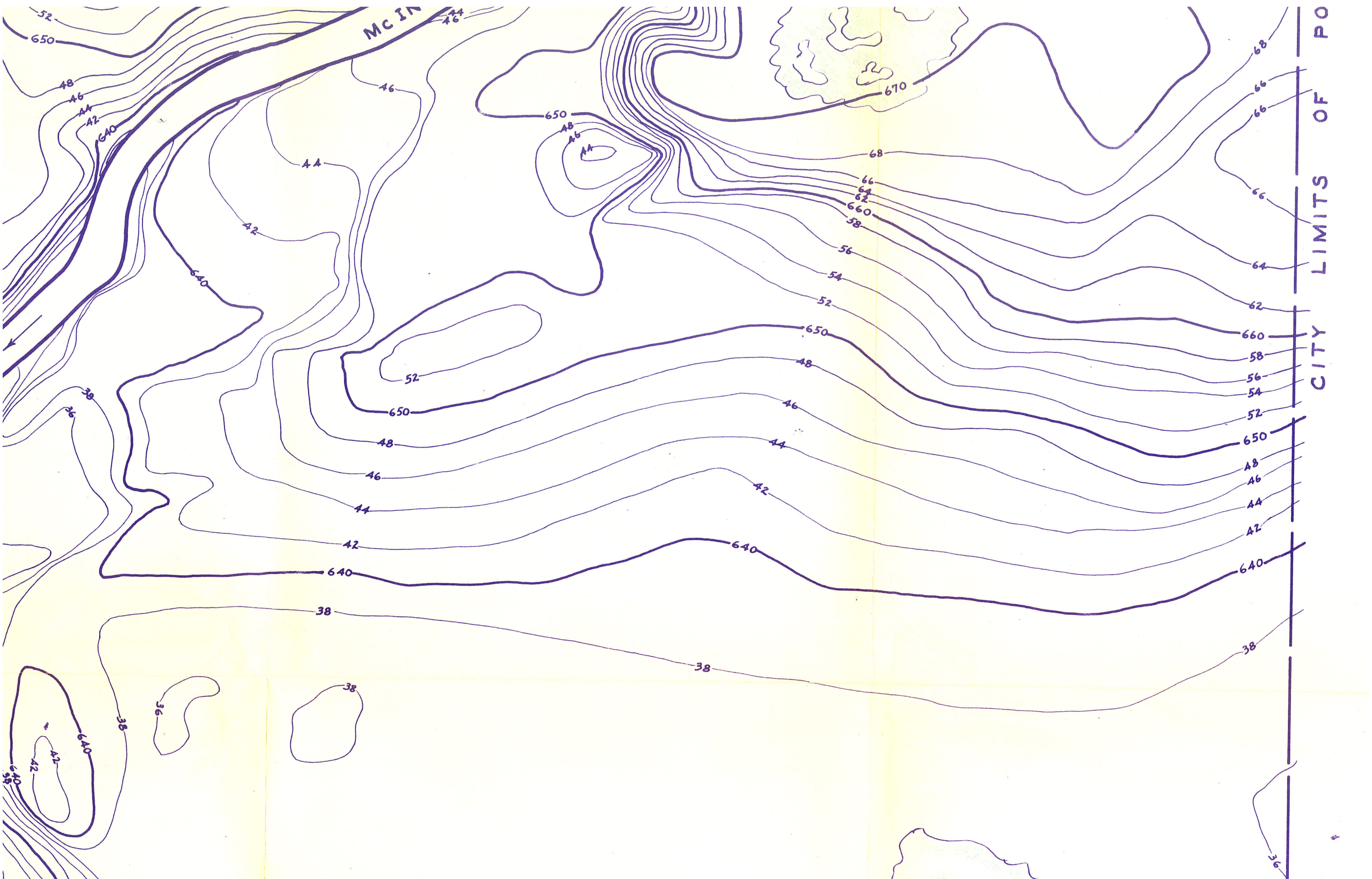
NOTE: ELEVATIONS REFERRED TO GEODETIC DATUM
AND ARE DERIVED FROM B.M. No. 366 E EL. 693.87

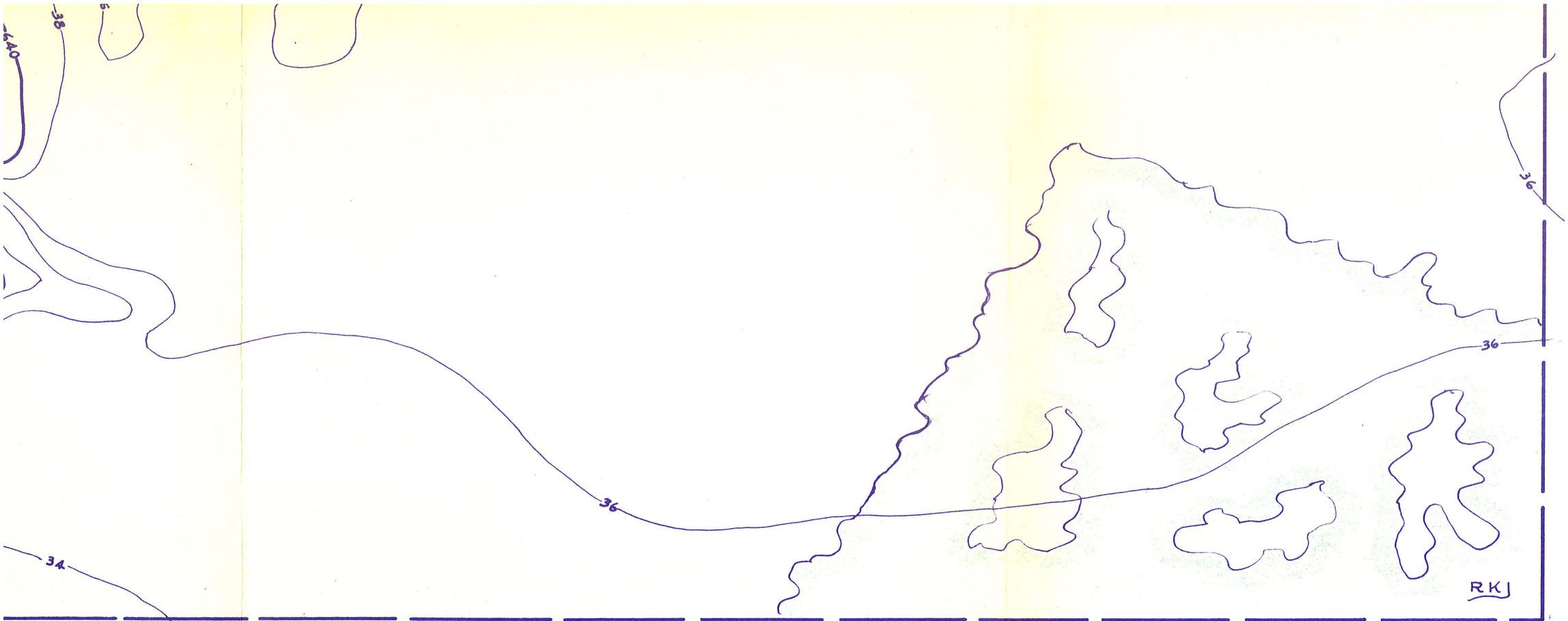
HYDRO ELECTRIC POWER COMMISSION

RIVER

MC INTYRE

PORT ARTHUR


McIN
CITY LIMITS OF PO
650
48
46
44
42
640
52
38
36
68
66
64
62
660
58
56
54



REGISTERED SUBDIVISION

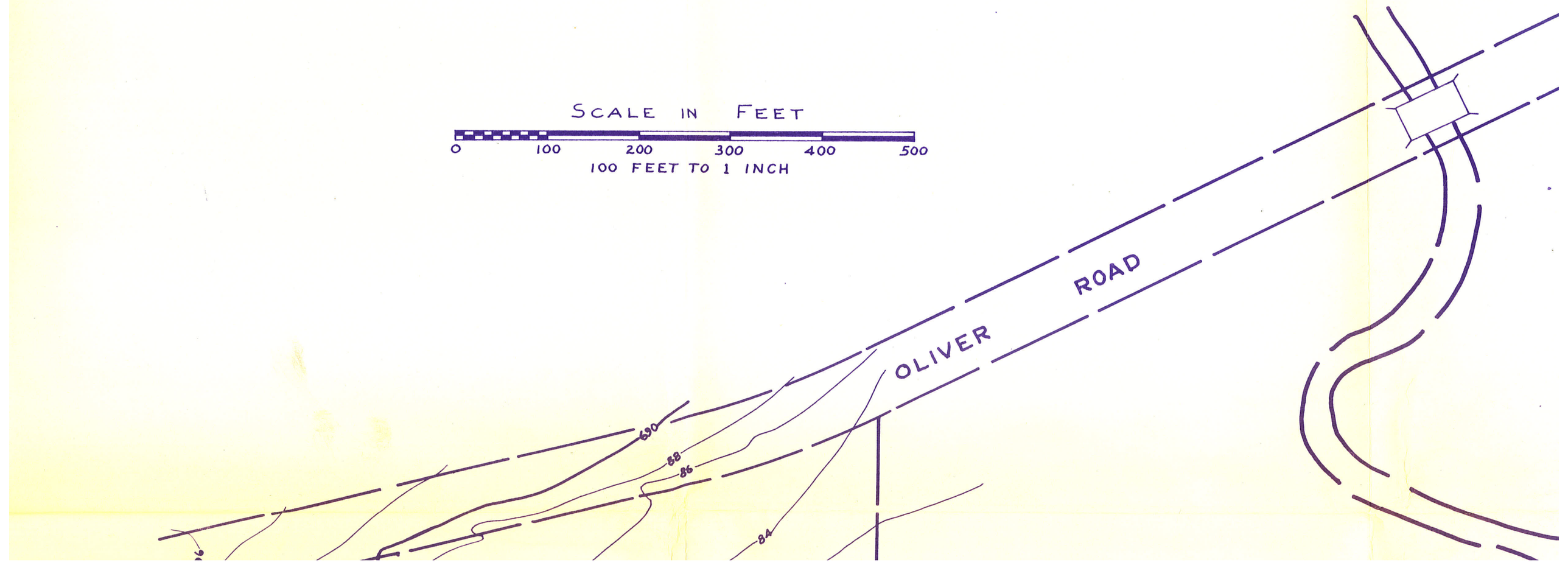
DRAWING No. 2

THE TOPOGRAPHIC MAP

SCALE IN FEET

0 100 200 300 400 500

100 FEET TO 1 INCH



NOTE: ELEVATIONS REFERRED TO GEODETIC DATUM
AND ARE DERIVED FROM B.M. No. 366 E EL. 693.87

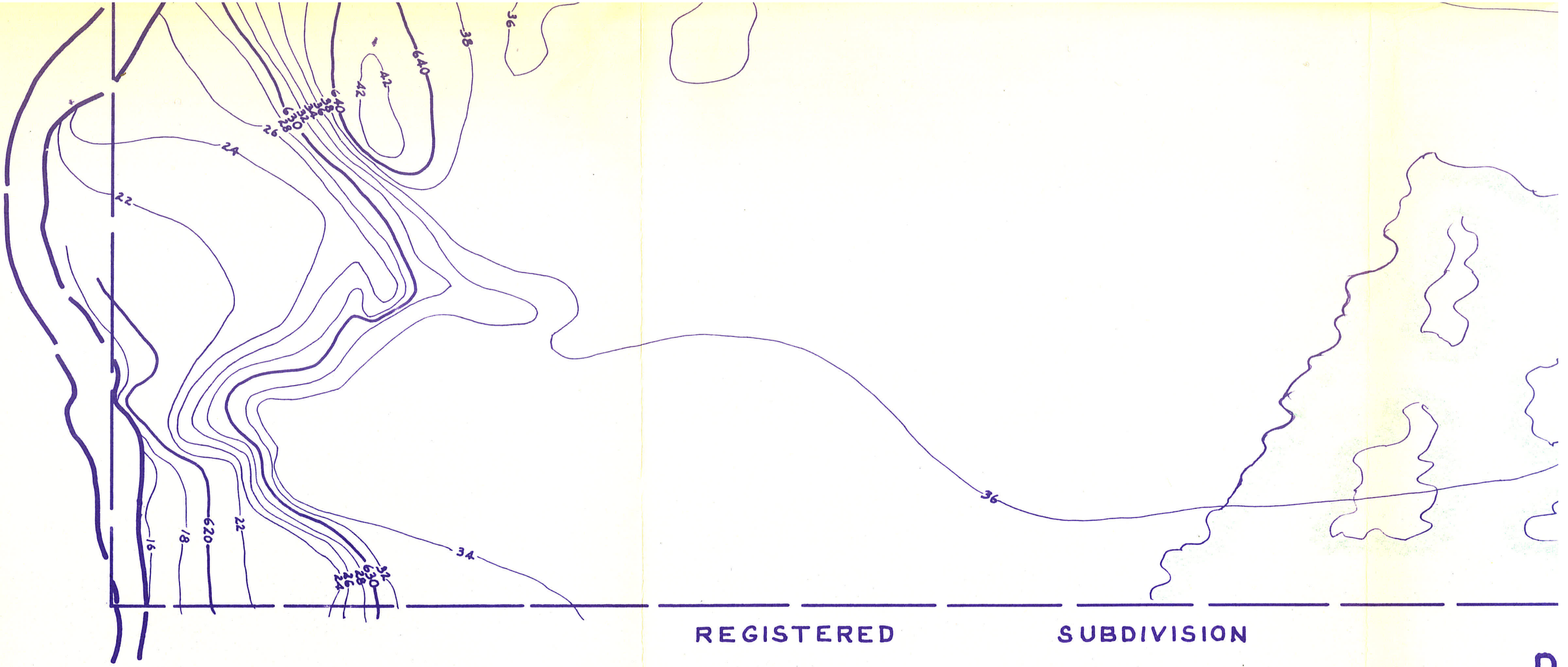
HYDRO ELECTRIC POWER COMMISSION

GOLF COURSE

McINTYRE

RI

64 62 660 58 56 54 52 650 48 46 44 42 640 42 640 38 36 34 32 630 34 32 630 28 26 38 36 38 38 52 650 48 46 44 42 640 38 54 56 58 660 62 64 66 68 670 670 650 48 46 44 68 66 64 62 660 58 56 54 52 650 48 46 44 42 640 38



REGISTERED SUBDIVISION

D