

DRAINAGE ASSESSMENT REVISITED

E.P. DRIES, P. ENG.

H.H. TODGHAM, P. ENG. O.L.S., (RET)

INTRODUCTION

"Drainage Assessment Revisited" seems like rather a strange name for the title of a paper on drainage assessment but I'm sure that a few of you in the room will recall that it was 19 years ago, at the Drainage Engineer's Conference in 1969, that Ross Irwin persuaded me to do a paper on drainage assessment entitled "Distributing the Cost". Since that time, The Drainage Act 1962-63 has been superseded by The Drainage Act 1975 and although none of the changes in the Act have resulted in any changes in the basic principles of assessing the cost, some of the details have changed. When I spoke on this topic in 1969, my talk was based on the practices that had developed over the previous 75 years, largely as a result of decisions handed down by the Courts, and I believe that the 1969 talk was generally accepted by most of the practising Engineers as being reasonable, as well as by the Ontario Drainage Tribunal when it came into being in 1975. Today, I would like to review with you the methods of drainage assessment as I believe they now stand. Following my review of the principles, Ed Dries will look at a sample drainage assessment that incorporates many of these principles.

The major differences between The Drainage Act 1975, under which we now operate and the old Drainage Act 1962-63 are these:

1. What were previously principles relating to "benefit assessment" have now been codified as follows:

Section 1(1) "Benefit" means the advantages to any lands, roads, buildings or other structures from the construction, improvement, repair or maintenance of a drainage works such that it will result in a higher market value or increased crop production or improved appearance or better control of surface or subsurface water, or any other advantages relating to the betterment of lands, roads, buildings or other structures;

and

Section 22 Lands, roads, buildings, utilities or other structures that are increased in value or are more easily maintained as a result of the construction, improvement, maintenance or repair of a drainage works may be assessed for benefit.

2. A new category of assessment known as "Special Benefit" has been introduced and defined:

Section 1(28) "Special Benefit" means any additional work or feature included in the construction, repair or improvement of a drainage works that has no effect on the functioning of the drainage works;

and

Section 24 The Engineer may assess for special benefit any lands for which special benefits have been provided by the drainage works.

3. "Block Assessments" have been introduced to deal with the situation where there is a large number of small properties in a built-up area:

Section 25(1) The Council of the local Municipality may direct the Engineer to assess as a block, a built-up area designated by the Council, and the sum assessed therefor may be levied against all the rateable properties in the designated area pro rata on the basis of the assessed value of the land and buildings.

4. While The Drainage Act 1962-63 provided that the increased cost of a drainage work caused by the existence of the works of a public utility was to be assessed against the utility, it left to the Engineer the matter of apportioning the cost of road bridges and culverts. The present Act provides that Road Authorities as well as public utilities shall be assessed for all the increase of cost of the drainage works caused by the existence of the works of the public utility or Road Authority:

Section 26 In addition to all other sums lawfully assessed against the property of a public utility or Road Authority under this Act, and notwithstanding that the public utility or Road Authority is not otherwise assessable under this Act, the public utility or Road Authority shall be assessed for and shall pay all the increase of cost of such drainage works caused by the existence of the works of the public utility or Road Authority.

Certainly, these changes have not altered the basic test for all drainage assessments:

"Is it fair to all concerned?"

ESTIMATE OF COST

Basic to any drainage assessment is the preparation of a realistic cost estimate since it is this estimated cost that is to be assessed by the Engineer against those properties that are liable for assessment.

Estimating the cost of a drainage works is really not much different from estimating the cost of any other type of construction. The costs of all the works set out in the Plan, Profile and Specification are to be included, of course. The Engineer must then add to these costs of the physical work the fees of the Engineer for the report, for his attendance at meetings such as the consideration of the report, and for the supervision of construction. Also to be included are overhead items such as Municipal Board Fees and interest but not Clerk's fees or the cost of Council meetings. These items are all simply estimates and when the various pieces of work have been done, it may turn out that the final costs will be slightly higher or slightly lower, although it is hoped that the Engineer has been reasonably accurate in his estimating.

While the Engineer would probably not include such items in his original Estimate of Cost it's interesting to note, in passing, that costs of appeals to the Court of Revision and to the Ontario Drainage Tribunal can properly be charged against the drainage area (Section 73(1)). This even applies to the costs of appeals to the Referee although, if the reason for the appeal was that the Municipality was at fault in its procedure, it might be that the Referee would direct that the costs should go against the Municipality itself instead of the drainage area.

There is one item included in the estimated cost of the drainage works, however, which is not really an estimate. I refer to the Allowances which the Engineer must fix under the provisions of The Drainage Act, and I should like to say just a few words about them, at this point:

ALLOWANCES

Allowances are dealt with under Sections 29 to 33 of The Drainage Act. These sections set out the five things for which the Engineer shall provide Allowances and under these sections he is required to determine the amounts of the Allowances to be paid to each owner concerned. These Allowances are for:

1. Land required for the project (Section 29).
2. Damages, if any, to property, lands and crops caused by the disposal of excavated material (Section 30).
3. Private drains incorporated into the drainage works (Section 31).
4. Compensation in lieu of continuing the drainage works to a sufficient outlet (Section 32).
5. Loss of access resulting from the work (Section 33).

It is absolutely essential that these Allowances be realistic and I cannot over-emphasize this. It has been suggested that on certain occasions some Allowances have been grossly inflated in order to buy the co-operation of an owner who might otherwise have fought a particular drainage scheme. While this may seem to be a good answer to a difficult problem, the practice is obviously most unfair to the other owners and, in my opinion, it is also quite unethical.

In this matter of Allowances, there are a few words of caution that I should like to give:

Section 29 -

An Allowance is usually paid for whatever land may be required to construct a new ditch but many Engineers make no Allowances for land if they are simply widening an existing one or installing a tile. When an Allowance of this type is made, it is usually for the market value of the land or, sometimes, it may be for a multiple of the assessed value, adhering to whatever practice the Municipality follows in buying land for road widening. It is under this Section that allowances should be paid to provide the contractor with a right of access from the road to the working corridor along the drain. It should be noted that the ownership of the land does not change hands and this Allowance is purely to cover the use of the part of the property required for the drainage works.

Section 30 -

If your report is being made after the crops have been planted and if you are sure that the work will proceed at once and the crops already in will be destroyed, it certainly makes sense to pay for the full value of the crop in the disposal area, less the cost of harvesting it. However, if the work will not be done until next year, the owner should know better than to plant crop in the disposal area, so the Allowance should only be enough to compensate him for part of the profit that he will lose from having this piece of land out of production for one season, together with reduced crop production until the owner is able to restore the fertility of the land in the disposal area. Diminishing crop losses over a four or five year period are probably not unreasonable. I might say, in this regard, that it is usually better to spread the excavated material over a fairly wide strip so that the farmer can plow it down and get it back into cultivation as easily as possible, rather than leave the material piled deeply in a narrow strip where it will interfere with the flow of surface water and make the operation of farm machinery difficult.

Section 31 -

Care must be taken in determining the value of a private drain incorporated into the work. If it is an old tile, it may have outlived its usefulness and thus have little actual value. If it is an open ditch, the ditch may be grown up with brush or trees and the cost of removing these may offset much of the saving due to the reduced quantity of excavation. Usually, the Allowance for a private drain is a nominal one unless it happens that the owner has just recently dug a ditch of the required size in a suitable location, in which case payment of the actual cost would probably be justified.

Section 32 -

The compensation paid in lieu of taking the drain to a sufficient outlet is ordinarily not more than the market value of the land that will be subject to increased flooding. If the land has always flooded naturally, an Allowance should be paid only for that part that will be worse off after the drain has been built than it was in a state of nature. Another thing to remember about this is that once an Allowance has been paid to the owners of land for this purpose, the owners may find it difficult, at a later date, to persuade the Municipality to provide drainage to the property. This could prove to be a serious handicap in the future, for some properties, and the Engineer should give serious consideration to these consequences before he decides to make an Allowance for this purpose.

Section 33 -

Generally, if an access bridge or culvert or a farm bridge or culvert is required to be constructed, replaced, or enlarged, under Section 18 of The Drainage Act the Engineer shall provide for this to be done as part of the work on the drain. However, if a bridge or culvert is not required for the time being, at least, an Allowance for loss of access must be made and this Allowance should only be enough to pay for any increased loss of access caused by the drainage works. If this is a completely new ditch, the loss of access will be substantial but, even so, the maximum Allowance that should be made is the market value of the land cut off from the rest of the farm or the cost of installing a crossing whichever is the lesser. In the case of enlarging an old ditch, the Allowance for loss of access should only be that amount by which the cost of constructing a crossing is increased by the work of enlargement in case the owner should wish later on to install a crossing. The Allowance for loss of access (except in the case of a new ditch) should not be the full cost of installing a bridge or culvert.

I think it is quite obvious that any or all of the five types of Allowances could be paid in the case of the original construction of a drainage works. Probably, any or all except the Allowance for private drains could be paid when a drain is being improved but the amount of Allowance would be related only to the amount of the improvement. It is questionable, however, if any of the Allowances other than those related to the disposal of material should be paid when the work on the drain is simply one of repair or maintenance.

DISTRIBUTION OF COST, OR, ASSESSMENT

Once all of the costs have been added together and a total estimated cost is determined, under Section 8(c) of The Drainage Act, the Engineer must make an assessment of this cost against the lands and roads liable to be assessed. At this point, I should like to make it quite clear that my remarks today have to do strictly with the methods that have been used in our office over the past years for distributing the cost of drainage works. As I mentioned earlier, I believe that these methods or others similar to them are in general use throughout the Province but that is no guarantee that they are followed by all the Drainage Practitioners in Ontario.

It has been said on many occasions that the Engineer must follow proper principles of assessing the cost of the work, otherwise he does not comply with the requirements of The Drainage Act and he thereby leaves his whole report open to attack. Perhaps one of the best examples of not following proper principles of assessment is dealt with by Referee Clunis in November 1967 in his Reasons for Judgement in a case known as Anderson et al vs. Township of Thurlow:

In essence, the report provided for the repair of an existing drain some 3½ miles in length, together with the construction of a 3 mile long branch emptying into it. Every owner of land fronting on either the existing Main Drain or the Branch was assessed for benefit at a flat rate of \$6.00 per acre of land, regardless of any other consideration - whether it lay near the mouth or at the head of the work. The only test seemed to be whether or not a farm abutted the work and apparently no attention was paid to the effect that the work would have on any particular parcel. Referee Clunis concluded that this was such a completely erroneous method that he could not suggest any amendments to correct it and so he set the report aside.

What, then, are the proper principles of assessment?

The first and foremost criteria are that drainage assessments must be based on an examination of the area by the Engineer and on his independent judgement. In his well known book, "The Drainage Acts," Proctor quotes the late Mr. Justice Street who said:

"The legislature did not intend that the sums to be assessed against the lands affected by drains constructed under these clauses should be governed by arrangements made between the Councils of adjoining Townships, but endeavoured to secure that they should be fixed in each case by a sworn professional man upon his own skill and judgement.

. . . The Engineer acting under these sections is exercising functions of a judicial nature, and is bound to apportion the cost of the work amongst the different parcels of land receiving benefit from it, strictly according to the benefits derived, according to the best of his skill, judgement and ability; each person and Municipality charged with a portion of the cost is entitled to the advantage of his unbiased judgement."

There are several sections of The Drainage Act that set out what the Engineer must do in making his assessment. I think all but Sections 21 to 26 inclusive are reasonably straightforward and I therefore intend to concentrate on the actual distribution of cost under these sections.

There are two distinct and separate ways of distributing the estimated cost of a drainage works:

1. Pro Rata Assessment

By "Pro Rata Assessment" we mean that the estimated cost is divided among all the properties in exactly the same proportion as the cost was divided under the last previous report and bylaw. To make such an assessment, one takes the Assessment Schedule from the last report and "pro rates" the present estimated cost over all of the properties shown in the old bylaw. If a particular parcel paid, say, 12% of the cost the last time, it would be assessed 12% of the cost this time. Usually, this method may be used only if the following five conditions exist:

- (1) The work is strictly the repair of an existing municipal drain.
- (2) The work covers the same length of the drain as the last previous report and bylaw.
- (3) The work to be done is similar in all respects to the work under the previous report - for instance, there are no bridges or culverts not covered in the last report nor are there any new areas to be rip-rapped or any new surface water inlets.
- (4) The conditions and land use in the watershed have not changed since the last report.
- (5) The Engineer who made the previous report and assessment was knowledgeable and experienced.

If all five of these conditions exist, a "pro rata" assessment may be justified but if any of the five conditions are missing, however, this method is quite improper. Occasionally, the pro rata method may not be valid even though all five conditions do exist. Here, again, the Engineer must exercise his judgement to decide whether or not it is reasonable to use this method.

2. New Assessment

If the pro rata method is not appropriate then an entirely new assessment must be worked out.

Section 21 of The Drainage Act sets out three types of assessment to be considered:

Benefit,

Outlet Liability,

Injuring Liability.

BENEFIT

To assess for Benefit there must be a particular benefit to the lands assessed, not just some probable, general benefit to all of the lands in the locality. Benefit can relate to lands, roads, buildings, utilities or structures and just what is to be considered as a "Benefit" is set out in The Drainage Act both under the Definition contained in Section 1 as well as in Section 22. These matters to be considered are as follows:

- (a) Higher market value
- (b) Easier maintenance
- (c) Increased crop production
- (d) Improved appearance
- (e) Better control of surface or subsurface water
- (f) Any other advantages relating to the betterment of the lands, roads, buildings or other structures.

Specifically, some of the things that might be considered under these categories are:

1. Taking away from the land more quickly the water which falls upon it -- that is, direct drainage.
2. Confining to a channel water from upstream lands which might otherwise spread over low parts of the property in question.
3. Cutting off the natural flow of surface water from adjoining lands and stopping it from coming onto the land in question -- usually known as "cutoff".
4. Removing and disposing of brush and dead trees and generally cleaning up the ditch both to increase its efficiency and improve its appearance.
5. Re-grading the drain banks and repairing any erosion or wash-ins that may have occurred along the bank.
6. Placing rip-rap at points that might be subject to erosion from the flow of water in the drain, in order to reduce future maintenance.
7. Draining off the waters of a swamp or slough and making the land pleasanter to live on or making it possible to farm it.

8. Installing a pump to lower the water level in the drain, thereby providing more depth of outlet for adjoining subsurface drainage systems which would in turn lower the water table in the adjoining land.

I am sure there are many other considerations that each of you has already encountered.

If any of these improvements to the drain or the adjoining land will be brought about by the proposed drainage works then each parcel of land that is so affected may be assessed under the heading of "Benefit" a certain amount for each improvement it will receive. The obvious question now, of course, is how do you actually handle the dollars, but we shall discuss this later.

SPECIAL BENEFIT

The requirement to assess for "Special Benefit" is contained in Section 24 of The Drainage Act. "Special Benefit" is defined in Section 1(28) as meaning "any additional work or feature included in the construction, repair or improvement of the drainage works that has no effect on the functioning of the drainage works". While anything that you do in a drain is bound to have some affect on the way it operates, I believe that this matter of Special Benefit is intended to relate to those aspects of the project that are not intended to make the drain function better as a drain.

Some fairly common examples of this are:

Farm and access culverts,

Lawn Piping,

Relocation or realignment of the drain -- either on private lands or along a road,

Surface water inlets -- rock chutes or pipes,

Tile outlet pipes.

In all cases, the cost of these features may be assessed entirely against the adjoining land as a "Special Benefit" or it may be assessed partly to the adjoining land as a "Special Benefit" and partly to the upstream properties as an outlet assessment. The cost of providing farm and access culverts is almost always divided between the adjoining property and the upstream lands whereas the cost of installing surface water inlets is usually assessed as Special Benefit against the adjoining property because they do nothing to improve the operation of the channel as a drain but they prevent the washing out of the drain banks and, thereby, relieve the adjoining owner of his responsibility for wash-ins, under Section 80 of The Drainage Act.

OUTLET AND INJURING LIABILITY

Let's now move on to look at the two liabilities -- "outlet" and "injuring" that are dealt with in Section 23 of The Drainage Act. While The Drainage Act seems to deal with these two liabilities on a virtually equal basis, those that have been involved with municipal drainage for any length of time know that virtually every drainage assessment deals with outlet liability but very, very seldom is injuring liability ever mentioned. Perhaps an explanation of this is overdue. To understand the difference between the two kinds of liability, I would refer you to the case of Orford vs. Aldborough. In September of 1911, Referee Henderson rendered his Decision which was upheld the following year by the Ontario Court of Appeal. In his Decision, Referee Henderson had this to say:

"It may be convenient shortly to state the practical distinction between injuring and outlet liability, in view of the fact that many lawyers and most Engineers complain of difficulty understanding it. Where lands can be more effectively drained after the construction of the drainage work than before, because they will then have an outlet which they did not have before, they are assessable for outlet liability. Where lands are effectively drained but where their waters are not taken to a sufficient outlet so that legally speaking they have no outlet at all, and the drainage work will give them a sufficient outlet, they are again assessable for outlet liability. The test is that, in order to enable an assessment for outlet liability, the drainage work must be necessary, in fact or law, to enable or improve the cultivation or drainage of the land assessed.

"Where in the course of his examination, the Engineer finds lands suffering injury from water brought from upper lands by artificial means, and his proposed work will pick this water up and carry it to a sufficient outlet, he can assess for injuring liability the lands from which the water causing the damage is so artificially brought. This is usually on pretty much the same state of affairs as the second kind of outlet liability, but from the opposite point-of-view, the test now being the existence of injured lands seeking relief, not higher lands seeking outlet."

Interestingly enough, the wording of the sections of the Act dealing with injuring liability and outlet liability was almost identical in 1911 to the wording of the present Act.

In the early 1900's there were a number of Court cases that involved assessments for injuring liability and it seems that it was generally held that, as outlined above, in order to assess for injuring liability, the Engineer must be able to show clearly that downstream lands were being injured by water being drained by artificial means. Because this was often difficult to establish, Engineers increasingly avoided the use of the heading "injuring liability" with the result that the number of drainage reports containing assessments for this in the last 40 years or so has been very small. Assessments that might possibly be made under the heading of "Injuring Liability" are now usually included as part of the "Outlet Liability" assessment and, as far as I know, this seems to have been accepted by the Courts.

To assess for "outlet liability", then, an Engineer must be able to show that either:

- (a) The lands can be more effectively drained after completion of the work than before because they will have an outlet they did not have before, or
- (b) The work is necessary in order to carry the drain to a "sufficient outlet" so that the water can be discharged safely and will do no injury to lands or roads.

It is important to observe that Section 23(1) says "lands and roads that use a drainage works as an outlet, or for which..... an improved outlet is provided either directly or indirectly may be assessed for outlet liability." Here there are two significant points:

- 1. The Engineer can assess not only lands already using the drain but also those for which an improved outlet is provided, whether the owner actually makes use of it right now, or not.
- 2. The Engineer can assess not only the lands directly connected to the drain but also those indirectly connected and these may lie some distance away from the proposed work.

It is also important to observe that Section 23(3) says "the assessment for outlet liability shall be based upon the volume and rate of flow of the water artificially caused to flow.... into the drainage works from the lands and roads liable for such assessments."

The key words here are:

"Volume"

"Rate of Flow"

"Artificially caused to flow"

An understanding of this section is essential to making a proper assessment of cost of a drainage work. The Engineer can assess only for the water "artificially caused to flow" and not for water which flows naturally from the land. The speed with which the water is made to run off the land is a factor so that completeness of a property's drainage system now or in the future must be considered. Since volume is also a factor, the area draining and the percentage of rainfall that runs off a particular property must also be taken into account.

It is interesting to note in the case of Caradoc vs. Ekfrid (Ontario Appeal Reports Volume 24, Page 576) Referee E.N. Britton, Q.C., in discussing "outlet liability" says:

"The per acre assessment of all lands for which the drainage work will be an improved outlet, and charging such lands according to the cost of the part of the work used or that will be used by them is a proper way to arrive at the amount that the Township should be called upon to contribute. It is quite impossible to make the assessment absolutely correct. The amount of evaporation and absorption cannot be measured and determined as to enable the Engineer to say how much less water one lot within the drainage area further away from the drainage work will send than another lot nearer to the work."

BLOCK ASSESSMENTS

It seems that, more and more, as urban areas expand out into farmlands that are served by existing municipal drains, or as The Drainage Act is used to construct drainage projects that affect urban land as well as farmland, assessments are required to be made against blocks of built-up properties. If, say, six blocks each with 12 built-up lots are located within a drainage watershed, prior to the 1975 Drainage Act, this would require some 72 separate assessments, as well as the assessments on the streets. Often, these were outlet assessments only and this produced a lot of extra work for the Clerk as well as for the Engineer in working out the individual assessments.

To deal with this problem, Section 25 was introduced and this permits the Council to direct the Engineer to assess the built-up area as a block designating what part of the assessment is to be charged against the roads in the area and what part is to be charged against the private properties. The Clerk then divides the private property portion among all of the rateable properties within the designated block on the basis of the assessed value of the lands and buildings within the block.

While there is no requirement that this provision be used in all cases of built-up areas, it can certainly be a handy tool in many situations.

INCREASE IN COST DUE TO PUBLIC UTILITIES AND ROADS

Prior to the passing of The Drainage Act 1975, the manner of assessing a road for any increase in cost that it might cause to a project (such as the need for a new culvert or bridge) was at the discretion of the Engineer. However, The Drainage Act 1975 included a provision (Section 26) requiring that Road Authorities as well as public utilities be assessed and must pay all the increase of cost of any drainage works caused by the existence of the works of the Road Authority or public utility, as the case may be.

It should be noted that this section does not provide that the public utility or Road Authority is to pay the increase in the estimated cost but, rather, it speaks of "all the increase of cost" which I believe means the actual increase of cost. Further, it is the increase of cost "caused by the existence of the works of the public utility or Road Authority". The significance of this section, of course, is that some provision must be made in the report to permit the Clerk to calculate the increase in the actual cost of the project caused by the public utility or road so that this increase may be charged to the appropriate authority.

IN SUMMARY

If you had to assign specific dollar values to each of the considerations that we have just reviewed, as they affect each property, it would be a very difficult job. Fortunately, this is not required since we need only to apply enough total assessment to recover the cost of the work. This means that a property may actually derive value from a drainage project to the extent of, say, \$10,000 because its market value may be increased by this amount as a result of the work but we may assess it only, say, \$2200 because that is all we have to collect as this property's share of the total cost of the work. What this means is that when you make up an assessment schedule, you do not enter in it the full value of the "Benefit" and "Outlet" that each farm receives but, rather, a smaller figure that reflects the appropriate share of the total "Benefit" and "Outlet" received by all of the properties put together. To be able to do this, of course, you have to determine which of all the possible factors are considerations and whether they affect one property more than another. It therefore becomes a matter of determining the relative value of the project to each property that is to be assessed. For example, if the market value of one property will be increased twice as much as that of another, then, obviously, its benefit assessment will be twice as great; similarly, if the volume and rate of flow of the water artificially caused to flow from one property is three times as great as from another, then the outlet assessment should be three times as great also. So you see, it becomes a matter of "relatives" rather than "absolutes" and the ultimate test for any Schedule of Assessment is this:

"Is it fair to all concerned? Can I compare the assessments on any two properties (either neighbouring or in remote parts of the watershed) and say that, relatively speaking, they are being fairly charged for the value they will derive?"

AS TO METHOD

Let's suppose that we have decided on the work to be done and we have estimated the cost. How exactly do we go about Distributing the Cost? I prefer to divide the total length of the work into several logical sections that may vary anywhere from 300 to 1000 metres in length. Then, I determine the cost of the work on each of these sections, including both the cost of construction as well as the cost of allowances and overhead. After separating out any Special Benefit items and any Section 26 items, I divide the cost of each section among those properties that are entitled to be assessed for it, partly as Benefit and partly as Outlet, having in mind the various considerations we have already talked about. This, of course, is the whole point of this paper. How, indeed, do you take the number of dollars that you estimate as the cost of the work on a section of the drain and decide exactly how many of these dollars should be assessed against each property affected by this section? Frankly, the method of doing this is not easy to explain in words and for this reason we have prepared an example to demonstrate it as this seems to be the best approach. In preparing this example, we have tried to introduce as great a variety of situations as possible and we hope it will be helpful to you.

Before Ed Dries takes over to review the example with you, there are some Rules that almost always apply (although I admit there may be a few exceptions) and this may be a good time to list them:

1. You cannot assess a property for any part of the cost of work that is done upstream from it (unless this happens to be some type of cutoff or diversion, but this is a special case).
2. You cannot assess a property for Benefit for work done some distance downstream although you can assess it for Outlet Liability on this work.
3. You cannot assess for Benefit lands that are not reasonably close to the drain. (Usually those assessed for Benefit are abutting the drain or, perhaps, one farm removed.)
4. You would not normally make Benefit assessments on an area or acreage basis but, rather, on the basis of "Benefit to be Derived" by each property. While the frontage of a property along the drain may have some bearing on its assessment, the area of the property seldom has.
5. You cannot assess those lands in the watershed which have a natural drainage of their own. (These are usually the highlands toward the outer edge of the watershed).
6. You cannot assess those lands that are too low to make any use of the work such as gravel pits, marl beds, etc.
7. You cannot assess Riparian owners (that is, those whose land abuts unimproved sections of a natural watercourse). However, once part of a natural watercourse has been artificially improved under an organized scheme, the owners abutting the improvement lose this amunity.

8. You can assess a Railway (The Railways Act, Section 273) for the increase in cost of the proposed drainage works caused by the construction and operation of the Railway.

9. You must assess public utilities and Road Authorities (The Drainage Act, Section 26) for the increase in the actual cost of the proposed drainage works caused by the existence of the works of the public utilities or Road Authorities. The Bell Telephone Company, TransCanada Pipelines, and other utilities holding Federal charters take the position that they are not subject to The Drainage Act since it is a Provincial Act, and it appears that they are correct in this.

10. Allowances are made for the purpose of compensating a property owner for losses that he will suffer as a result of the work that is to be carried out on a drain. Care must be taken, therefore, to ensure that Allowances and Assessments are not combined in such a way in the report that an owner will incorrectly conclude that the only cost to him on the project will be the amount remaining after he subtracts his Allowances from his Assessment. Although this remainder (or "Net Assessment" as it is sometimes called) may be the owner's cost in dollars to be paid out, the real cost to him is this "Net Assessment" plus his losses due to the performance of the work (which losses should equal the amount of his Allowances), and the figure that results from this calculation is, of course, the amount of the Assessment against the property.

11. Although grants are presently being paid by the Minister of Agriculture and Food on drainage assessments on privately-owned agricultural land, neither The Drainage Act nor the Courts have ever indicated that the Engineer is entitled to consider the matter of who may receive grants and who may not when he prepares his assessment on a drainage works. Because the amount of grant and whether or not it is paid are both at the discretion of the Minister, an Engineer who considered the possible grant amounts in making his Assessment and then found himself before a Court would probably have great difficulty in persuading the Court that his Assessment should be upheld.

12. Care must be taken in assessing lands covered with bush and trees. If the situation is such that, once the drain is in place, the property owner will be able to clear the bush and cultivate the land, then the property should be assessed in the same way as land already under cultivation. However, if there are restrictions such as a county tree-cutting bylaw or a woodlot management agreement with the Ministry of Natural Resources, or if the bush is owned by a conservation authority, clearing and cultivation are probably not possible and this must be considered in making the assessment.

Up until now we have been discussing laws, generalities, rules, and so on and many of these have been rather abstract. Let us turn now to some specifics and examine with Ed Dries the example that has been prepared to demonstrate the actual process of Distributing the Cost of a drainage works.

**AN EXAMPLE OF DISTRIBUTING THE ESTIMATED COST
OF A DRAINAGE WORKS
UNDER THE DRAINAGE ACT**

The Irwin Drain and Branch is a purely imaginary drain that has been developed solely for the purpose of illustrating as many different situations as possible that one is likely to encounter in distributing the cost of a drainage works. It is similar to the example which was presented to the Conference for Drainage Engineers in 1969 and is included in the proceedings of that year. There are certain things about this drain, and certain assumptions that have been made, which may not appear to be compatible with nature, and it may be noted that the cost estimates are not as realistic as they might be. However, it should be remembered that the object of this example is to illustrate the method of distributing costs.

All practising Drainage Engineers should be familiar with a publication supplied by the Association of Professional Engineers of Ontario entitled "Guideline for Services of the Engineer acting under The Drainage Act". This publication sets out in detail the scope of the work which an Engineer is expected to perform. The preparation of a comprehensive, equitable distribution of the project costs amongst the affected properties is an integral part of a good report.

In making any drainage assessment, it is important to make a thorough examination of the property on the ground. In this example, that is not possible and therefore we will provide some of the background facts which will influence the assessment of costs. The following assumptions have been made:

a) The initiating Municipality:

- the Township has received a request for the repair and improvement of the Irwin Drain
- the Township has received a properly signed Petition for the drainage of the SE $\frac{1}{4}$ of Lot 8, Concession 2 and the W $\frac{1}{2}$ of Lot 8, Concession 3

b) Instruction to Engineer:

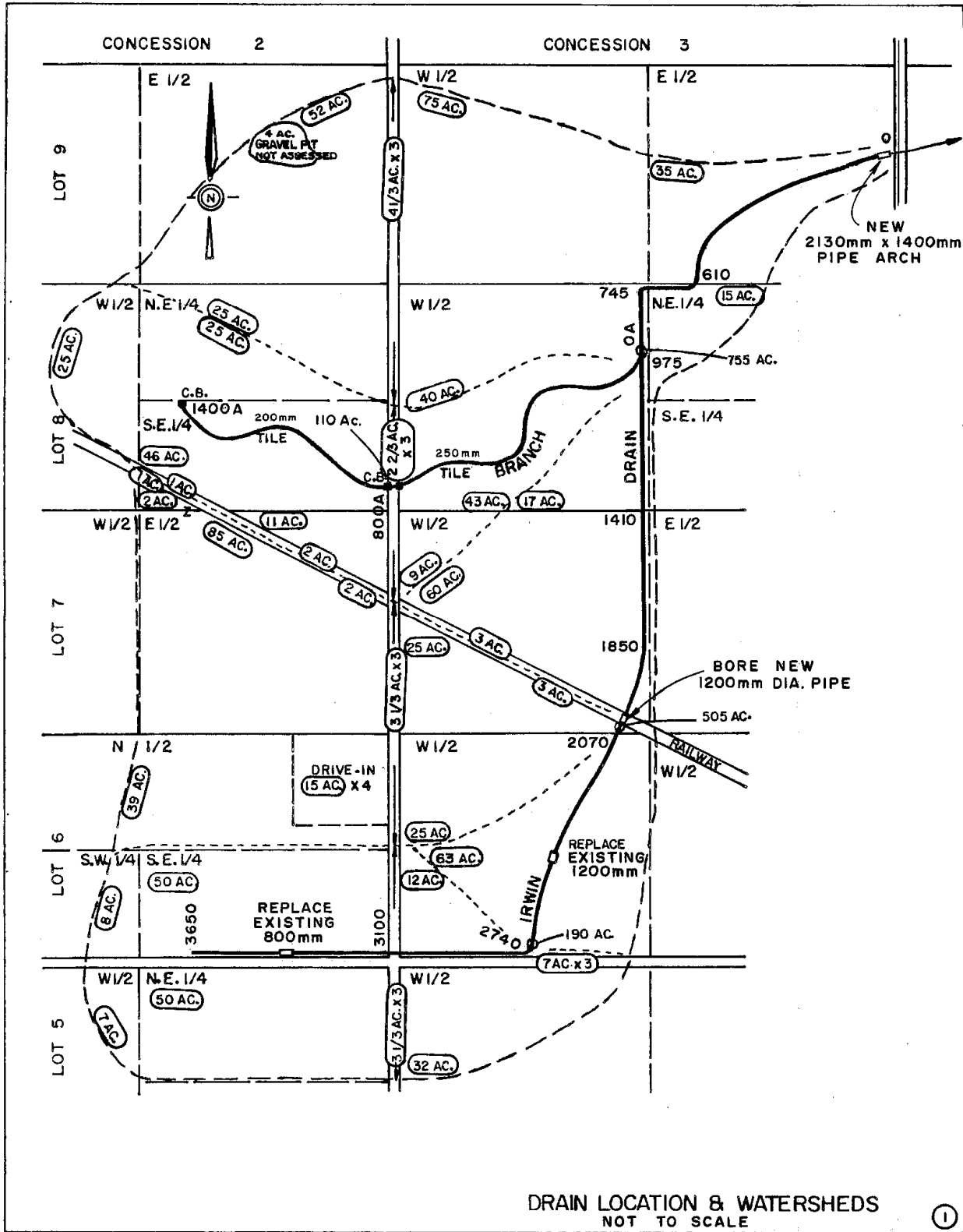
- make an examination and prepare a report for the repair and improvement of the Irwin Drain under Section 78 of The Drainage Act
- make an examination of the area described in the Petition and prepare a report under Section 4 of The Drainage Act

c) Examination of Records:

- the Irwin Drain is an existing open municipal drain which was originally constructed under the provisions of The Drainage Act and last repaired and improved under the provisions of The Drainage Act in accordance with a report prepared in 1968. The Drain commences at a point on the north side of the 5-6 Sideroad in the SE¼ of Lot 6, Concession 2, and continues downstream to an outlet into a large, natural watercourse at the 3-4 Concession Road in Lot 9.
- the location of the Irwin Drain and the lands affected by it is as shown in Figure 1
- there is no existing municipal drain serving the lands described in the Petition

d) Examination in the Field:

- the land is rather flat south of the railway and becomes a bit more rolling in the downstream reaches. The natural fall is to the northeast
- the Irwin Drain is approximately 1.1 metre deep throughout its length and significant sediment deposits in the channel bottom obstruct several of the existing private tile outlets. A similar soil type exists throughout the watershed
- there is a gravel pit in the E½ of Lot 9, Concession 2. The floor of the pit is significantly below the normal ground elevation and no water is pumped from this gravel pit onto the adjacent properties.
- there is a drive-in theatre in the N½ of Lot 6, Concession 2. The property is graded, large areas are covered with asphalt, and it is well drained in a northerly direction to a private ditch which conveys the flows easterly along the 6-7 lot line to the Irwin Drain.
- approximately 1 acre of land is cut off by the drain in the most southwesterly corner of Lot 7, Concession 3
- there is medium to heavy brush in the drain in the W½ of Lot 6 and Lot 7 in Concession 3
- two areas of severe bank erosion resulting from uncontrolled surface water discharge were evident in the W½ of Lot 7, Concession 3



- ten lateral tile were found discharging into the drain from the SE $\frac{1}{4}$ of Lot 6, Concession 2. None of the existing tile had suitable outlet pipes
- the farm culvert in the E $\frac{1}{2}$ of Lot 9, Concession 3 was found to be deficient in condition, end area, surface width, and end wall treatment. It was not installed under any previous report under the provisions of The Drainage Act
- the existing corrugated steel farm culvert in the W $\frac{1}{2}$ of Lot 6, Concession 3 was found to be adequate in end area, top width, and end wall treatment although it was found to be structurally inadequate. This culvert had been installed under a previous report under The Drainage Act
- the existing corrugated steel access culvert in the SE $\frac{1}{4}$ of Lot 6, Concession 2 was known to be installed under a previous report although it was found to be structurally inadequate and deficient in top width
- the pipe beneath the Railway was found to be grossly deficient in end area and depth
- a shallow natural swale was observed to exist across the SE $\frac{1}{4}$ of Lot 8, Concession 2 and the W $\frac{1}{2}$ of Lot 8, Concession 3. These lands were row-cropped and the alignment of the shallow swale was rather irregular

e) Discussion with Affected Parties at On-Site Meeting:

- all of the owners along the Irwin Drain wish the open channel to be excavated to a depth which will provide suitable outlet for existing and future tile drainage systems.
- the owner of the E $\frac{1}{2}$ of Lot 9, Concession 2, has requested the installation of a suitably sized all-weather crossing over the drain on this property
- the railway is not interested in installing a new culvert beneath its tracks and prefers that the Township carry out this work as part of the project along with the rest of the work on the drain
- the owners of the W $\frac{1}{2}$ of Lot 6, Concession 3 and the SE $\frac{1}{4}$ of Lot 6, Concession 2 have requested that their culverts be repaired or improved
- the owners of the SE $\frac{1}{4}$ of Lot 8, Concession 2, and the W $\frac{1}{2}$ of Lot 8, Concession 3 request the installation of a tile along the shallow swale which meanders across these properties

- the 2-3 road allowance north of the railway is in need of drainage improvements and the Road Superintendent would like to direct his road drainage systems to a legal outlet into the proposed Branch Drain

f) Engineering Recommendations:

- since all the owners in the drainage area expressed a keen interest in proceeding with the work and the property owners within the petitioning area are determined to proceed with the installation of a tile, we recommend that both the new construction and the repair and improvement on the existing drain be incorporated into a single report
- in response to the Petition, we recommend the installation of a tile along the alignment of the shallow swale, a catch basin will be provided at the head of the drainage works and at each side of the 2-3 Concession Road to provide a point of outlet for road drainage systems. Corrugated steel pipe will be installed across the 2-3 Concession Road in lieu of clay tile
- we recommend the existing open portion of the Irwin Drain be deepened by varying amounts of up to 500 mm from the head of the drain in the SE $\frac{1}{4}$ of Lot 6, Concession 2, to the point of outlet at the west side of the 3-4 Concession Road in Lot 9, Concession 3.
- we recommend that two rock chutes be installed on the west bank of the drain in the W $\frac{1}{2}$ of Lot 7, Concession 3 where uncontrolled surface water discharge has resulted in severe erosion of the bank
- we recommend the installation of suitable tile outlet pipes on the ten lateral tiles which discharge into the drain in the SE $\frac{1}{4}$ of Lot 6, Concession 2.
- we recommend that the existing farm crossing at Station 20 in the E $\frac{1}{2}$ of Lot 9, Concession 3 be removed and replaced with a new 12 m length of 2130 mm x 1400 mm corrugated steel pipe arch
- we recommend that the existing farm culvert in the W $\frac{1}{2}$ of Lot 6, Concession 3 be removed and replaced with a 10 m length of 1200 mm diameter corrugated steel pipe
- we recommend that the existing access culvert in the SE $\frac{1}{4}$ of Lot 6, Concession 2, be removed and replaced with a 10 m length of 800 mm diameter corrugated steel pipe
- we recommend that a new 1200 mm diameter smooth-wall steel pipe be installed beneath the Railway in the W $\frac{1}{2}$ of Lot 7, Concession 3

Estimate of Cost:

Section 8(1) of The Drainage Act clearly indicates that the report must contain an estimate of the total cost of the project. The estimated cost of this project is as follows:

Brushing	\$ 1,600.00
Excavation and levelling of open drain	8,800.00
Farm Culvert Construction (E½ Lot 9, Con 3)	
- pipe material	4,300.00
- backfill material	825.00
- installation and placement	1,075.00
- end treatment	1,800.00
Farm Culvert Reconstruction (W½ Lot 6, Con 3)	
- pipe materials	1,200.00
- backfill material	450.00
- installation and placement	550.00
- removal of existing	100.00
- end treatment	600.00
Access Culvert Reconstruction (SE¼ Lot 6, Con 2)	
- pipe material	600.00
- backfill material	375.00
- installation and placement	375.00
- removal of existing	100.00
- end treatment	450.00
Railway Crossing	
- pipe materials	3,000.00
- installation	6,000.00
Rock Chutes (2 locations)	
- supply and installation (10t)	350.00
Tile Outlet Pipes (10)	
- pipe materials	250.00
- installation	250.00
Seeding	3,650.00

786 m of 250 mm dia. tile	
- materials	5,400.00
- installation	4,900.00
590 m of 200 mm dia. tile	
- materials	2,900.00
- installation	2,950.00
Tile Outlet Pipe	
- material	100.00
- installation	50.00
Catch Basin (Sta. 1400A)	
- materials	300.00
- installation	300.00
2-3 Concession Road Crossing	
- pipe materials	500.00
- backfill materials	525.00
- installation	550.00
Catch Basins (Sta. 796, Sta. 780)	
- materials	600.00
- installation	700.00
Allowances under Sections 29 and 30	
- damages	3,950.00
- severance	50.00
Survey, Plans, Report and Inspection	}
Assistance and Expenses	}
Meetings to Consider Report	}
Interim Financing	}
Incidentals and Contingencies	}
	9,025.00
TOTAL ESTIMATED COST	\$ 69,500.00

The estimate of cost should contain a detailed breakdown of all the items of work which are to be undertaken as well as all other costs which may be included as part of the cost of the work on the drain. A detailed estimate of the project costs provides the affected ratepayers with a better understanding of how the costs were arrived at. Further, a sufficient level of detail at this stage may simplify the preparation of the Tender Documents when the project goes to construction.

Breakdown of Estimated Cost:

The first step in distributing the Total Estimated Cost is to divide the drainage works into several convenient sections, each having a length of approximately 500 m to 1000 m. It is helpful to select the section limits to coincide with physical barriers in the watershed such as roads or railways and at junctions with Branch Drains. The division of the drainage works into sections is illustrated on Figure No. 2 labelled "Division of Cost".

We then calculate the Total Estimated Cost of the work within each section including a proportion of the incidental costs to the project.

In this case, the Main Drain was divided into four sections and the Branch Drain into two sections as shown on Figure 2. From the Estimate of Cost, each item is listed in the section in which the work is done and ultimately the total cost of the project on a section by section basis is developed as shown in the following table. Dividing the costs in this manner provides a clear indication of where the major components of the cost lie relative to the rest of the drain. It also ensures that a downstream owner will not be liable for components of the cost which lie upstream on the drainage works.

MAIN BRANCH

<u>Sta-Sta</u>	<u>Exc.</u>	<u>Culverts</u>	<u>Erosion Protection</u>	<u>Brush</u>	<u>Seeding</u>	<u>Allowances</u>	<u>Sub Total</u>	<u>Inc.</u>	<u>Total</u>
0-975	\$2380	\$ 8000	\$	\$	\$ 975	\$ 760	\$12115	\$1810	\$13925
975-2070	2630	9000	350	1000	1095	905	14980	2235	17215
2070-2740	1610	2900		600	670	520	6300	940	7240
2740-3650	<u>2180</u>	<u>1900</u>	<u>500</u>		<u>910</u>	<u>715</u>	<u>6205</u>	<u>925</u>	<u>7130</u>
	\$8800	\$21800	\$ 850	\$1600	\$ 3650	\$ 2900	\$39600	\$5910	\$45510

BRANCH DRAIN

	<u>Tile</u>	<u>Outlet Pipe Catch Basin</u>	<u>Road Crossing</u>	<u>Allowances</u>	<u>Sub Total</u>	<u>Inc.</u>	<u>Total</u>
0-800A	\$10300	\$ 150	\$ 2875	\$ 625	\$13950	\$2080	\$16030
800A-1400A	<u>5850</u>	<u>600</u>		<u>475</u>	<u>6925</u>	<u>1035</u>	<u>7960</u>
	\$16150	\$ 750	\$ 2875	\$1100	\$20875	\$3115	\$23990

In addition to the work being carried out purely and simply for "Drainage Purposes" there may be certain items of work which are being done within particular sections which may have no effect on the functioning of the drainage works. The Engineer may choose to assess these works as a "Special Benefit" against specific properties. In order that these extra works may be properly considered in making the assessments, the cost of the extra work must be determined.

In this example, these works include the installation of farm and access culverts in the drain and the installation of specific erosion protection works or tile outlet pipes. Because these items of work have been specifically identified in the Estimate of Cost and shown in the Breakdown of Estimated Costs, the value of these items of work are readily available.

Further, the works recommended in this example cross the property of a Public Utility and a Road Authority and these works result in an increase in cost to the project as a whole. This increase in cost must be assessable against the Public Utility or Road Authority under Section 26 of The Drainage Act but must be specifically calculated such that only the increase in cost is assessable against the Public Utility or Road Authority. This is detailed in the following table entitled "Breakdown of Special Benefit Assessment".

BREAKDOWN OF SPECIAL BENEFIT ASSESSMENT

Railway Crossing

Supply and Install Culvert	\$ 9000.00
Additional Engineering & Contingencies	<u>900.00</u>
Total Cost	\$ 9900.00
Less Normal Cost	<u>100.00</u>
Increase in Cost to Railway	\$ 9800.00

Road Crossing

Supply and Install Pipe	\$ 1575.00
Supply and Install Catch Basins	1300.00
Additional Engineering & Contingencies	<u>225.00</u>
Total Cost	\$ 3100.00
Less Normal Cost	<u>300.00</u>
Increase in Cost to Road	\$ 2800.00

It should be noted that the increase in assessable cost includes additional engineering and contingency costs which should accurately reflect the actual cost of these items relative to the specific works. Also, the normal cost of the work, which represents the cost which would have been incurred had the utility or road allowance not been present, is estimated and subtracted from the total cost.

Provision must be made in the report which directs the municipality to tender these works as separate items so that the actual cost of construction of these specific works will be known. This actual cost must then be used by the Clerk in the final calculation of the actual increase in cost to be assessed against the Road Authority or Public Utility.

Area to be Assessed:

It is extremely important to accurately define the area affected by the drainage works so that all of the lands are properly assessed. If it has not been done already the watershed boundary of the entire drainage area should be clearly defined. Further, the interior watersheds which may be associated with Branch Drains or private drainage systems within the watershed should also be defined. The area within these sub-watersheds should be established as shown on Figure No. 2.

One technique which we apply to simplify the assessment process is one of converting all the lands within the watershed to "equivalent acres". This may be defined as the number of acres obtained by multiplying the actual acres in a parcel by a factor that recognizes the volume and rate of flow of water artificially caused to flow from that parcel under consideration in comparison with the volume and rate of flow of water artificially caused to flow from a typical acre of agricultural land within the watershed. In this example, we illustrate the actual area of the non-agricultural properties and the appropriate factor which is applied to adjust it to an equivalent agricultural status. As an example, the area of the drive-in theatre in Lot 6, Concession 2, is 15 acres. It is recognized that the runoff generated from this area is four times greater than the runoff generated from an equivalent area of agricultural land and therefore a factor of 4 is applied to the actual area and the property is assessed on an equivalent basis of 60 agricultural acres.

The method of using "equivalent acres" is useful as it allows the Engineer to recognize that the volume and rate of flow of water artificially caused to flow differs with different land uses, soil types, and surface conditions. This method brings the entire area within a watershed to a common denominator and simplifies the application of outlet assessments. Some parcels of land, such as the W½ of Lot 6, Concession 3 in this example, may drain in several different directions and the area which is drained in each direction must be determined and shown on the Plan. When this is done, the number of "equivalent acres" within each of the interior watersheds is calculated and from this, the number of acres which uses each section of drain is determined and shown on the Plan, beginning at the upstream end and continuing downstream to the outlet. In this example, we see that there are 190 equivalent acres using the drain at Station 2740. At Station 2070, the number of equivalent acres using the drain is increased to 505 acres and by Station 975 the number of equivalent acres is 755. This of course includes all the area drained by the Branch Drain.

Division of Cost of Each Section Into Benefit & Outlet:

To this point, the total estimated project cost has been divided between the costs associated with the construction of the Main Drain and the costs associated with the construction of the Branch Drain. The detailed assessment of cost for each will be approached separately and a separate Schedule of Assessment should be prepared for each. The assessed property owners will more readily appreciate exactly what they are being assessed for and maintenance costs on either the Main Drain or the Branch Drain can be more readily assessed in the future.

Each of these major works has been broken down into sections and the cost of each section has been determined. Each section cost must now be broken down further to determine how much of the cost will be assessed as Benefit, Outlet, or Special Benefit. It is at this stage that the Engineer must exercise good judgement in this initial distribution of the cost within each section.

We recommend that this process be commenced at Section 1 at the outlet of the drain and the section splits be established in successive sections going upstream. A summary of the section splits on the Main Drain and Branch Drain are as follows:

MAIN DRAIN

SECTION 1 (Sta. 0 to Sta. 975)

Adjoining Lands - Benefit	\$ 1105
- Direct Outlet	<u>945</u>
	\$ 2050 (35%)
Upstream Lands - Outlet 755 ac @ \$5.13/Ac.	<u>3875</u> (65%)
	\$ 5925
Farm Culvert - Special Benefit (80%)	\$ 6400
- Outlet 1000 ac @ \$1.60/Ac.	<u>1600</u>
	\$13925

SECTION 2 (Sta. 975 to Sta. 2070)

Adjoining Lands - Benefit	\$ 3155
- Direct Outlet	<u>375</u>
	\$ 3530 (50%)
Upstream Lands - Outlet 505 ac @ \$7.00/Ac.	<u>3535</u> (50%)
	\$ 7065
Rock Chute - Special Benefit	\$ 350
Railway Crossing - Special Benefit	<u>9800</u>
	\$17215

SECTION 3 (Sta. 2070 to Sta. 2740)

Adjoining Lands - Benefit	\$ 2760
- Direct Outlet	<u>280</u>
	\$3040 (70%)
Upstream Lands - Outlet 190 ac @ \$6.84/Ac.	<u>1300</u> (30%)
	\$ 4340
Farm Culvert - Special Benefit (50%)	\$ 1450
- Outlet 220 ac @ \$6.59/Ac.	<u>1450</u>
	\$ 7240

SECTION 4 (Sta. 2740 to Sta. 3650)

Adjoining Lands - Benefit	\$ 4500
- Direct Outlet	<u>230</u>
	\$ 4730(100%)
Access Culvert - Special Benefit (50%)	\$ 950
- Outlet 70 ac @ \$13.57/Ac.	950
Tile Outlet Pipes - Special Benefit	<u>500</u>
	\$ 7130

BRANCH DRAIN

SECTION 1A (Sta. 0A to Sta. 800A)

Adjoining Lands - Benefit	\$ 6125
- Direct Outlet	<u>1775</u>
	\$ 7900 (60%)
Upstream Lands - Outlet 110 ac @ \$47.77/Ac.	<u>5255</u> (40%)
	\$13155
Road Crossing - Special Benefit	\$ <u>2875</u>
	\$16030

SECTION 2A (Sta. 800A to Sta. 1400A)

Adjoining Lands - Benefit	\$ 6200
- Direct Outlet	<u>1760</u>
	\$ 7960(100%)

In developing these section splits, we start with the total section cost which has been previously calculated. In the case of Section 1, that cost is \$13,925.00. We then subtract from this amount that portion of the cost which will be assessed as a Special Benefit against any of the assessable properties within that section. In this particular case, 80% of the cost of the farm culvert or \$6,400.00 will be assessed as a Special Benefit against one of the properties and the remainder of the cost of the culvert installation will be assessed against the upstream lands at a rate of \$1.67/acre.

The remainder, being \$5,925.00 must now be distributed as between the adjoining lands or those lands which immediately abut this section of the drain and the upstream lands or those lands which lie upstream of the section and are provided outlet through it. At this point, the Engineer must ask himself some basic questions such as "what is the work being done for" and, "what properties will be affected by this work and how".

This division of the cost is one of the most critical. The Engineer must exercise good judgement based on his experience and first hand knowledge of the field conditions and the effects of the proposed work on the drainage area. In the case of Section 1 of the Main Drain, it was our view that the adjoining lands should be liable for 35% of the cost of the work through this section while 65% of the cost should be assessed against all the upstream lands which depend on this section of the drain for a sufficient legal outlet. On this basis, \$2,050.00 would be assessed against the adjoining lands and \$3,875.00 would be assessed against the upstream lands. Since the number of acres which outlet through this section are known, the outlet rate to be assessed against the upstream lands can be simply calculated to be \$5.13/acre.

It is our understanding that a number of assessment appeals which have been dealt with by the Ontario Drainage Tribunal have resulted from the reluctance of the Engineer to appropriately assess the upstream lands for the value of outlet provided through lower lands. However, it should also be noted that with each successive section split, the portion of the cost assessed as outlet liability against the upstream lands generally decreases until the upper-most section is arrived at in which case there are no additional lands upstream to be assessed for outlet liability.

Conversely, the portion of each section cost which is assessed to the adjoining lands generally increases on a section by section basis as we progress upstream. Ultimately, at the most upstream section, the entire section cost is assessed against the adjoining lands.

Assessment of Benefit & Direct Outlet Against Each Property:

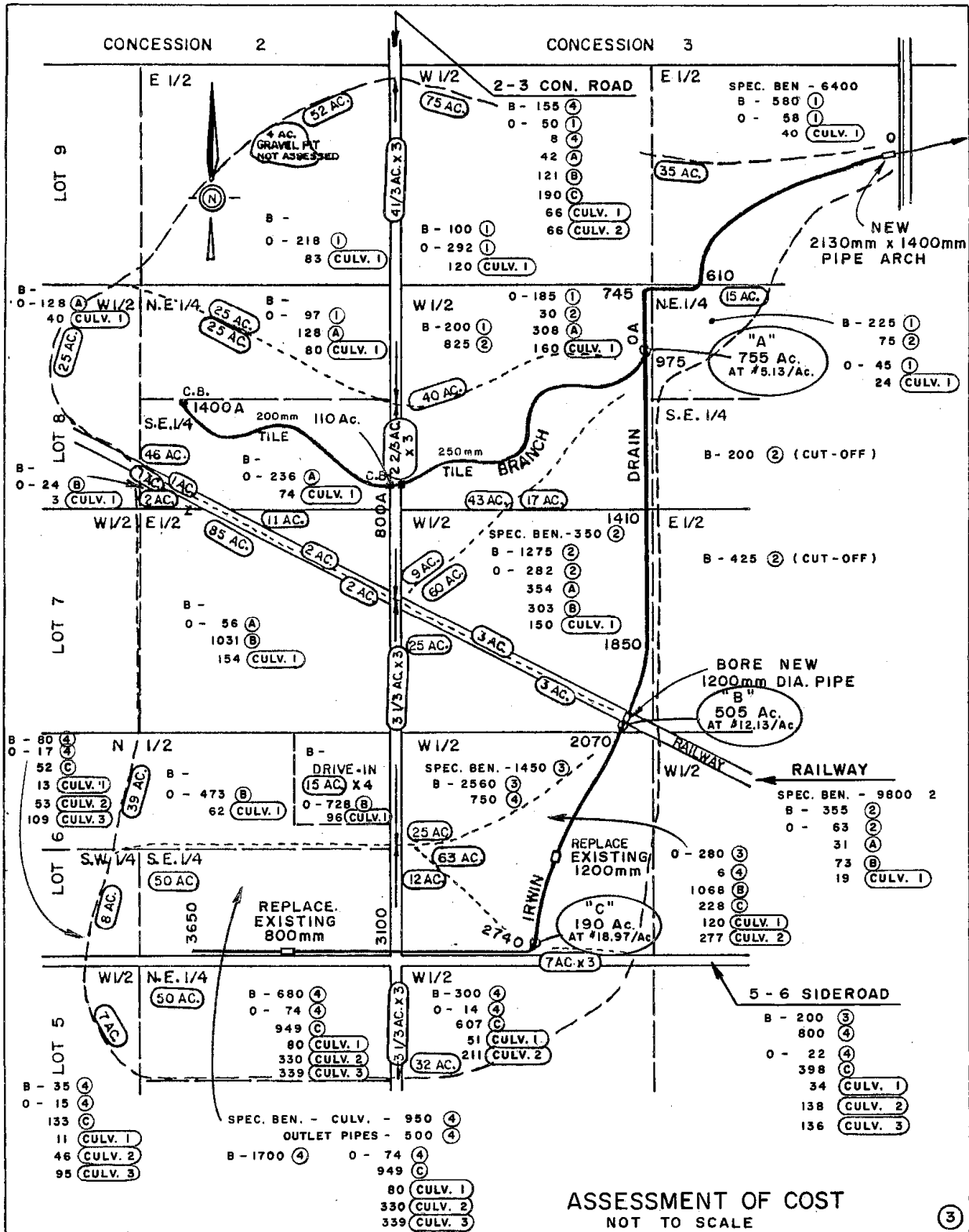
The next step in the process involves the assessment of the benefit and direct outlet costs against the adjoining lands within each section. From the previous discussion on making the initial split as between adjacent and upstream lands, we have a known amount to be assessed against the adjacent lands. We have also established a fixed rate of outlet assessment to be assessed against all upstream lands which in this example, is \$5.13/acre. It follows that the adjacent lands within the section should be assessed a direct outlet rate that varies from \$0.00 per acre at the most downstream limit of the section to \$5.13 per acre at the upstream limit of the section. The rate of

direct outlet to be charged is calculated in relation to the length of this section. The average point of outlet for each property within the section is determined and the computed outlet rate at that location is applied. The actual calculations for the direct outlet assessments in Section 1 are as follows:

DIRECT OUTLET ASSESSMENTS IN SECTION 1

E½ Lot 9 Con 3	-	35 acres discharges near Sta. 315 Charge .33 x \$5.13 or \$1.69/Ac	= \$ 58.00
NE¼ Lot 8 Con 3	-	15 acres discharges near Sta. 610 Charge .59 x \$5.13 or \$3.03/Ac	= \$ 45.00
W½ Lot 9 Con 3	-	75 acres discharge near Sta. 745 Charge .76 x \$5.13 or \$3.89/Ac	= \$ 292.00
W½ Lot 8 Con 3	-	40 acres discharge near Sta. 900 Charge .90 x \$5.13 or \$4.61/Ac	= \$ 185.00
2-3 Con Road	-	41/3 Ac x 3 = 13 equivalent agricultural acres which discharge near Sta. 745 Charge .76 x \$5.13 or \$3.89/Ac	= \$ 50.00
E½ Lot 9 Con 2	-	56 acres less 4 acres of gravel pit = 52 acres drained which discharge near Sta. 745 Charge .76 x \$5.13 or \$3.89/Ac	= \$ 218.00
E½ Lot 8 Con 2	-	25 acres discharge near Sta. 745 Charge .76 x \$5.13 or \$3.89/Ac	= \$ <u>97.00</u>
TOTAL DIRECT OUTLET			\$ 945.00

As each amount is determined, it is our practice to write the assessment on the Plan on the property which is being assessed. Each assessment, whether it be Special Benefit, Benefit, or Outlet, the assessed value is followed by the section number. In this manner, every assessment which is made against a property can be identified as to its origin. An example of the final assessment plan is illustrated in Figure 3 and is entitled "Assessment of Cost".



After having calculated the total value of the direct outlet assessment to be levied against the adjoining lands, the remaining amount, as shown by example in Section 1 to be \$1,105.00, is to be assessed as Benefit against the adjoining lands. Again, the Engineer must exhibit good judgement in the fair apportionment of the Benefit Assessment against the lands within the section which are affected by the work. The Engineer must objectively and impartially view all the benefits that are provided to the properties within the section and apportion the remaining costs accordingly.

In this particular case, we have distributed the Benefit Assessment as follows:

- E½ Lot 9, Con 3 \$580.00
- W½ Lot 9, Con 3 \$100.00
- W½ Lot 8, Con 3 \$200.00
- NE¼ Lot 8, Con 3 \$225.00

As with the outlet assessments, the benefit assessments are written on the Assessment Plan. It is also helpful to indicate on the Plan the outlet rate assessed against the upstream lands. Therefore, at Station 975 the outlet rate of \$5.13 per equivalent acre is shown and designated to be the rate at point "A".

It is essential that all of the costs of Section 1 be accounted for before proceeding to Section 2. The process then repeats itself in the successive sections. The outlet rates at each section may be summed as the process proceeds upstream. In this example the outlet rate through point "A" is \$5.13/acre. The outlet rate in Section 2 is \$7.00/acre. Therefore, the total outlet rate through point "B" is the sum of rates for Sections 1 and 2, or \$12.13/acre.

After all of the assessments are put on the Plan, the Benefit, Special Benefit and Outlet Assessments are totalled for each property and a Schedule of Assessment may be prepared. At this point, the total assessments can be determined and compared with the Estimate of Cost. Both must agree.

As a last step, the Engineer should sit back and look over the various dollar amounts and ask the question "Is it fair?". The Benefit and Outlet Assessment against each property should be compared with every other one in order to ensure that each property has been dealt with fairly as compared with every other property. Sometimes, even though the arithmetic has been very precisely done, and the division of costs has been carefully carried out, it happens that the resulting dollar amounts are not quite fair and the Engineer must then make some minor adjustments to take care of this. If any unfairness appears, adjustments should be made until the Engineer is satisfied that all the assessments are fair and in balance.

It must be remembered that when Engineers undertake work under The Drainage Act, they do so as semi-judicial officers and this places on them an obligation that they must discharge to the very best of their ability. They must therefore be careful to see to it that the appropriate legal requirements are met and, when they come to assessing the cost, that the "Is it fair?" test is properly applied.

A common approach taken by many layman and municipal officials who do not understand the principals of drainage assessment, involves the summation of all assessments (Benefit, Special Benefit and Outlet) on a property, division of the total by the area of the property and the production of a rate per acre which is then compared with a similarly calculated rate on another adjacent property. As you can see from this example, the assessments under each heading (Benefit, Special Benefit and Outlet) are all approached quite differently and it therefore makes no sense to try to lump them all together to arrive at a gross rate per acre which may be compared with any other property in the watershed.

It is evident from this example, that the assessment of costs of a drainage project is not an exact science nor does it involve the application of specific formulas. Many of the decisions on assessment are based entirely on the judgement and experience of the Engineer and the condition of the drain and the lands which make use of the drain at the time the investigation and survey were carried out. It should be clear in comparing this method of assessment with the method of assessment which was outlined in the proceedings of the Drainage Engineer's Conference of 1969, that the principals of assessments have not changed. Some of the mechanics have been adjusted slightly to more clearly define the assessment of specific works in the form of Special Benefits but by and large the methodology has not changed.

As with the methodology of assessment, the closing paragraph from the paper published from the 1969 proceedings is still applicable and bears repeating.

"There may be some who will say that the method followed in this example is much too complicated and time consuming and they may well feel that they could distribute the cost into amounts that would be just as acceptable as those at which we have arrived. While this may be so, it is also true that without a definite method of distributing the cost, such as that illustrated, it is next to impossible to explain satisfactorily to either an owner or a judge the reason for assessing a stated amount against a particular property."