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# PRELIMINARY ENGINEERING REPORT

## TIOGA DRAIN

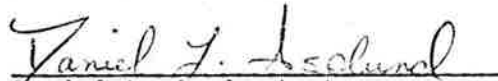
SWC PROJECT NO. 1640

NORTH DAKOTA  
STATE WATER COMMISSION

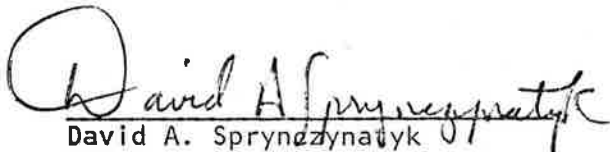
NOVEMBER 1978

TIOGA DRAIN

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SWC Project #1640

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PRELIMINARY DESIGN FOR  
TIOGA DRAIN  
SWC PROJECT NO. 1640

I. INTRODUCTION

PURPOSE AND SCOPE

This report on the Tioga Drain watershed contains the results of a preliminary engineering design conducted by the State Water Commission in cooperation with the Williams County Water Management District. The objective of the preliminary design was to develop a water management plan for a 15 square mile area west and north of Tioga. As part of the plan, it is intended to establish a legal drain to alleviate drainage problems. Since there have been substantial expenditures to provide the city of Tioga with flood protection, this project is designed so as to prevent the creation of additional flood problems for the city of Tioga.

Preceding the engineering analysis is a general description of the watershed and a discussion of the problem areas. The engineering analysis includes a hydrologic investigation of the area and a presentation and discussion of the various alternatives. Following each alternative is a breakdown of the various costs of the alternative. An environmental survey and a summary complete the report.

The engineering analysis utilizes the best practical technology to devise alternatives that sufficiently meet the needs of the drainage area. The preliminary design of the drain and control structures comply with criteria established by the State Water Commission. Data used in this report was obtained by the State Water Commission, Williams County Water Management District, and local individuals.

## DESCRIPTION OF PLANNING AREA

The project study area is located in Williams County. The drainage area studied lies northwest and west of the city of Tioga (see Figure 1). The drainage area contains several major sloughs with no natural outlet for the sloughs except during periods of high water. During these periods, the water contributes to flooding problems in Tioga. The area is privately owned except for an area owned by the U. S. Fish and Wildlife Service in the middle of the watershed.

The Tioga Drain watershed is located on the imaginary border between the Missouri Plateau and the Missouri Coteau in the Great Plains physiographic province. Before the State was glaciated, all drainage was directed generally northeastward toward Hudson Bay. However, drainage patterns were drastically affected by glaciation. The region of Missouri Coteau is known for a characteristic of very poorly developed drainage, which leaves numerous potholes, sloughs, and lakes. On the other hand, the Missouri Plateau generally has well developed drainage. In the Tioga Drain watershed, an area of potholes and sloughs is found, necessitating improved drainage for optimization of agricultural land use.

The soils in the area are of the Coleharbor Formation, which includes all the deposits of glacial origin. These deposits are mainly till, outwash sand and gravel, and lake sediment. These were deposited during several advances and retreats of glacial ice.

The economy of the area is structured around agriculture. Most of the land is productive farmland producing small grains and row crops. However, poor surface drainage hinders some farming operations in the area. The community which would be directly influenced by the development is Tioga.

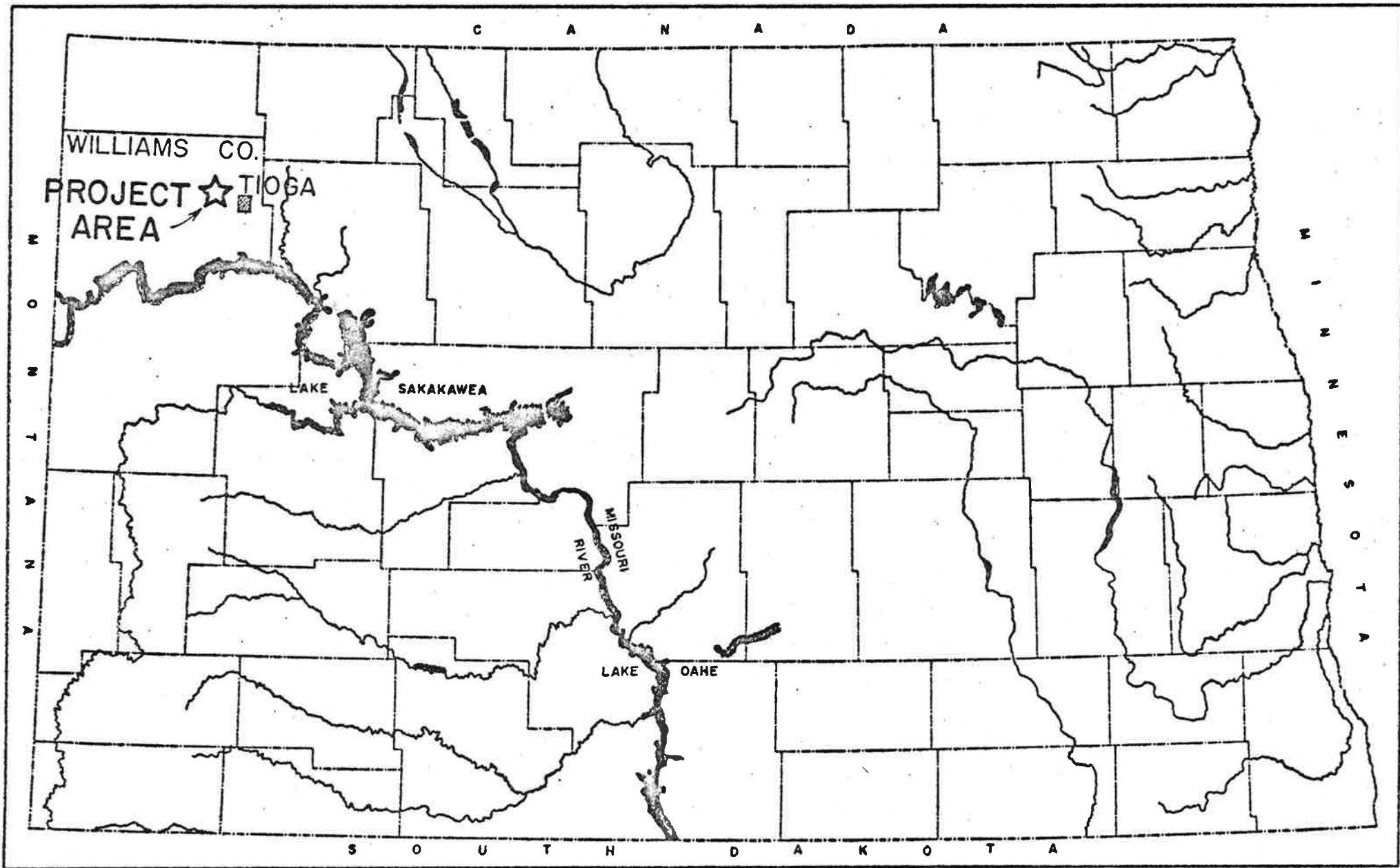


FIGURE 1

Project Area Location

The closest major commercial center is Williston, located approximately 30 miles west and 20 miles south from Tioga.

Precipitation for crop production is adequate during normal years, although occasionally the region suffers from periods of drought. The average annual precipitation is  $13\frac{1}{2}$  inches, most of which occurs during the growing season. Approximately 80 percent of the precipitation occurs during the months from April through September. The average annual snowfall is 30 inches with 100 days during which there is one inch or more of snow on the ground. The annual mean temperature is  $39^{\circ}\text{F}$ .

## II. STATEMENT OF PROBLEM

### BACKGROUND

Flooding and drainage have been problems for the city of Tioga for many years. It was brought to the State Water Commission's attention in April of 1975. At that time a slough to the west of Tioga (Biber Slough) was filled to capacity and was threatening to overtop dikes at the slough. To remedy the situation a gated control structure and additional dikes were installed. This removed Tioga from eminent flooding danger from this slough.

Another flooding problem was occurring at the same time Biber Slough was causing problems. Runoff from the Tioga Drain watershed was becoming impounded at the section line between Sections 27 and 28 of Tioga Township at the railroad-roadgrade crossing. The impounded water would then flow through two culverts, a 30" CMP and a 36" CMP, and flood portions of Tioga. The flooding occurred as the runoff water drained through the city along a natural drainage channel that also carried drainage from the city. The capacity of the channel was exceeded, resulting in flooding.

A remedy suggested in July of 1975 was a floodway channel running south from the railroad-roadgrade crossing, on the east side of the section line road for approximately  $1\frac{1}{4}$  miles. At this point, the floodway channel would discharge into a natural coulee. The cost of this floodway was estimated at \$30,000. Land acquisition became a major problem, so the project was discontinued.



Following the dismissal of the floodway, Webster, Foster and Weston Consulting Engineers proposed a floodwater conduit inside the city of Tioga. Their studies revealed that the flooding occurred when the water impounded at the railroad-roadgrade crossing between Sections 27 and 28, passed through a 30" culvert on the north side of the tracks and through a 36" culvert on the south side of the tracks. The water would then flow along the tracks until it reached Tioga. On the north side of the tracks, Tioga has a 24" CMP culvert to receive the flows, which then pass through Tioga. However, on the south side of the tracks, there was no culvert or drain to receive the flows. These flows would then back up, causing flooding.

This area on the south side of the tracks was where Webster, Foster and Weston proposed to install a 36" RCP floodwater conduit. Also to be installed were control gates on the 30" CMP and 36" CMP at the impoundment area. The cost of this project was estimated at \$50,000 and was completed by October of 1976.

#### CURRENT CONCERNS

In March of 1976, a petition was received by the State Water Commission from farmers north and west of Tioga to investigate the feasibility and preliminary design of a legal drain (Appendix A). This petition asked for the drainage of Simon Slough (Section 18, Tioga Township), Schmidt Slough (Section 25, Golden Valley Township; Section 30, Tioga Township) and Mowdy Slough (Section 19, Tioga Township) (See Figure 2). An agreement was signed in April of 1976 between the State Water Commission and the Williams County Water Management Board, in regard to investigation and preliminary design of a drain. (Appendix B). A remittance of \$1500 was received as the investigation fee.

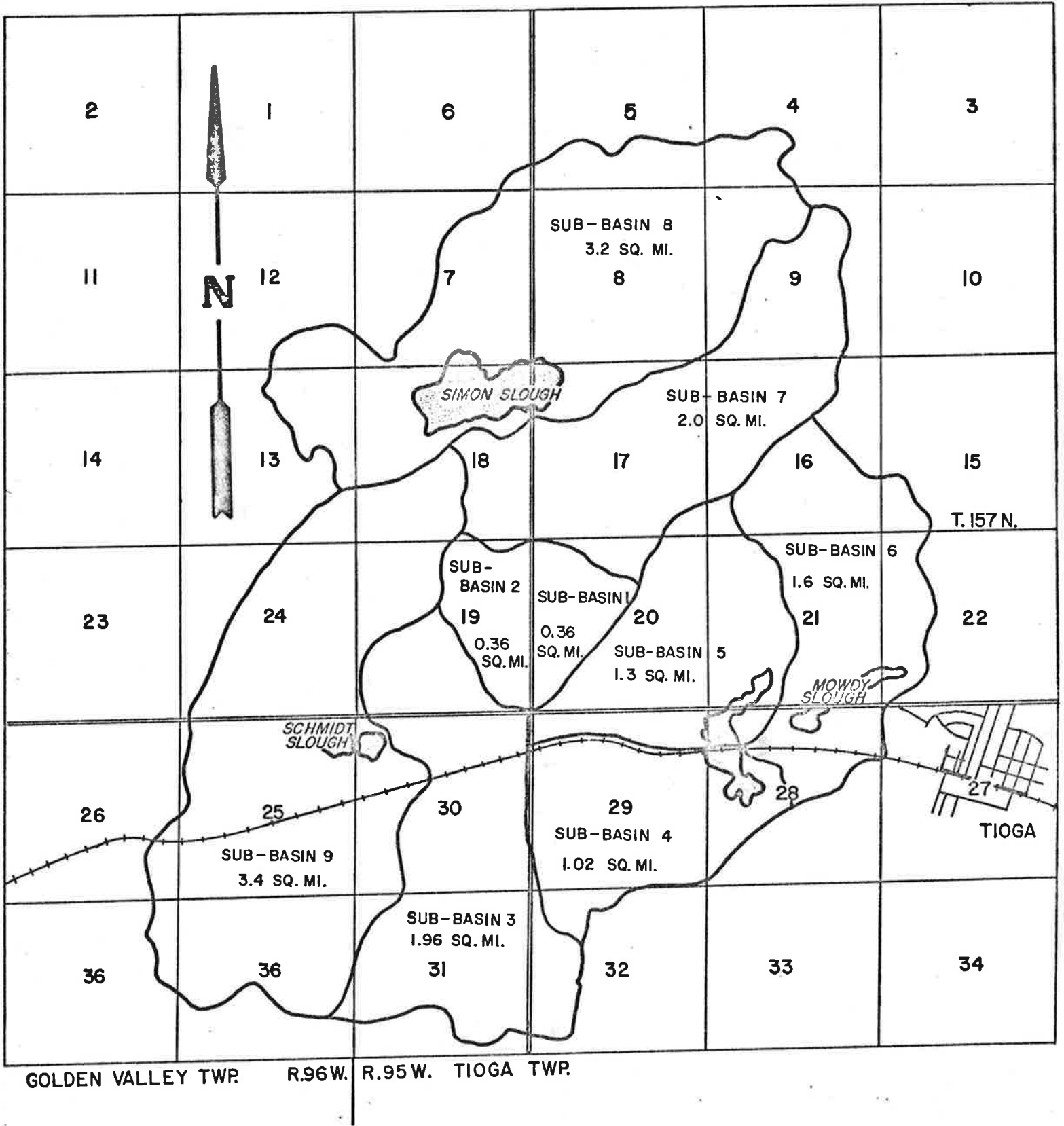


FIGURE 2  
Tioga Drain Sub-Basins

Work began on the preliminary design and by May of 1977, the initial hydrology was completed. By June of 1977, a preliminary design and cost estimate for the total drainage had been obtained. The proposal consisted of a channel ranging in width from 12 feet to 40 feet with a slope of 0.0009 ft/ft . The estimate also included three drop structures, two with a 12 foot drop and one with a five foot drop, and a couple 72" x 44" CMP arch-culvert road crossings. The cost for this project was estimated at \$666,000, which did not include any costs for relocation of any facilities such as gas lines or land acquisition.

In July of 1978, Gerald Rustad, Acting Secretary for the Williams County Water Management District, requested that the State Water Commission develop a new cost estimate on a modified plan for controlled drainage. Controlled drainage makes use of maximum natural storage of water in the area, but allows for drainage of the area with reduced discharges. The reduction is realized from a lengthened duration of flows resulting from the control structure's regulation of the flows. This report is the result of the revision of the previous Tioga Drain project.

## II. ENGINEERING ANALYSIS

### HYDROLOGIC INVESTIGATION

The purpose of the hydrologic investigation is to estimate the peak flows in the Tioga Drain watershed for various frequency flows resulting from snowmelt or rainfall. These peaks are then used to size the drainage channel and structures. To obtain these peaks, the TR-20 computer program was utilized.

The TR-20 computer program was developed by the Soil Conservation Service for their hydrologic analyses. This program requires various parameters to generate runoff patterns from a watershed. A few of the more important ones are given in the following paragraphs.

Cover complex numbers (CN) are used in estimating direct runoff from rainfall and snowmelt. To determine "CN" the soil type needs to be determined using county soil maps. There are four major soil groups for the primary classification of soils. They are as follows:

Group A - Soils having high infiltration rates even when thoroughly wetted, consisting chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and would result in a low runoff potential.

Group B - Soils having moderate infiltration rates when thoroughly wetted, consisting chiefly of moderately deep to deep, moderately well to well drained soils with moderately coarse textures. These soils have a moderate rate of water transmission.

Group C - Soils having slow infiltration rates when thoroughly wetted, consisting chiefly of (1) soils with a layer that impedes the downward movement of water, or (2) soils with moderately fine to fine texture and a slow infiltration rate. These soils have a slow rate of water transmission.

Group D - Soils having very slow infiltration rates when thoroughly wetted, consisting chiefly of (1) clay soils with a high swelling potential, (2) soils with a high permanent water table, (3) soils with claypan or clay layer near the surface, and (4) shallow soils over nearly impervious materials. These soils have a very slow rate of water transmission.

The soils are grouped without considering slope as a variable and without considering the benefit of vegetative cover. The "CN's" are further adjusted for each drainage basin in the watershed by determining the characteristics of the land use. The soil type encountered in the analyses of Tioga Drain was type B. The land use is given below:

LAND USE	
85%	Small grain crop
13%	Pasture
1%	Farmsteads
<u>1%</u>	Roads
100%	Total

Another parameter, is the time of concentration (Tc), which denotes the amount of time required for water to travel from the furthest end of a drainage area to its outlet. The method commonly used by the State Water Commission is called the "Upland Method". This method involves separating the different flow conditions for each drainage area and determining the length, drop and slope of the drainage area. Charts are used to obtain the velocity for the various flow conditions using the slope of the area. When a velocity has been obtained, the time of concentration is determined by dividing the length of flow reach by the velocity. The time of concentration will determine the time of the peak flow from an area.

The amount of precipitation for a certain frequency rain or snow storm is determined by using maps which show the precipitation amount in inches for North Dakota. These maps are located in the North Dakota Hydrology Manual developed by the Soil Conservation Service and the National Weather Service. After the amount of precipitation is determined for the storm frequencies to be analyzed, the amount of precipitation is adjusted

to reflect the amount of ponding areas within the drainage area. Generally, the more ponding areas in a drainage area, the less the runoff will be. To reflect this decrease in runoff, the amount of precipitation is reduced accordingly.

The Tioga Drain drainage area north and west of Tioga consists of approximately 15 square miles. Approximately 1.0 square miles of this area are ponding areas and do not contribute to the runoff for most storms, however, upon installation of a drain, these areas will contribute to the runoff in the Tioga Drain drainage. For application into the TR-20 program, the Tioga Drain watershed was broken into nine sub-basins (see Figure 2).

The drainage area was analyzed to determine the peak discharges for the 10 and 25 year frequency rainfall and snowmelt. Table 1 contains the amount of pre-adjusted precipitation used for each event.

TABLE 1

<u>Storm Frequency</u>	<u>Rain (Inches)</u>	<u>Snow Runoff (Inches)</u>
10 year	3.1	1.7
25 year	3.5	2.5

#### PRELIMINARY DESIGN

After the hydrologic study was completed, a preliminary design was developed. Two alternatives were examined in the attempt to develop the most economical and beneficial project.

### Alternative No. 1

A main drainage channel was planned running west along the railroad tracks starting at the east edge of Section 28, Tioga Township until the channel intersected the Section line between Sections 30 and 29, also in the Tioga Township. At this point, the proposed channel will run north along the Section line road between Section 29 and Section 30 until the corner of Sections 19, 20, 29 and 30 of Tioga Township. At this point, the channel splits. One branch continues north along County Road #21 until it reaches Simon Slough in Section 17 of Tioga Township. The other branch will run west from the Section corner in the ditch along County Road #10 until it reaches Schmidt Slough in Section 30 of Tioga Township. A small lateral channel will run south from Mowdy Slough in Section 28 of the Tioga Township to tie into the main drain.

For application in the TR-20 computer program, the above drain system was divided into four major reaches. The reaches are Reach 1, that portion of the drain running from Simon Slough south along County Road #21 until the Section corner of Sections 19, 20, 29 and 30; Reach 2, that portion of the drain running from the Section corner of Sections 19, 20, 29 and 30 south until it meets the railroad tracks and then west along the railroad tracks until it runs into an area operated by the U. S. Fish and Wildlife Service in Section 28 of the Tioga Township; Reach 3, that portion of the drain running from the U. S. Fish and Wildlife Game Management area east until it meets the Section line road between Section 27 and 28 of the Tioga Township; and Reach 4, that portion of the drain running from Schmidt Slough east until the Section corner of Sections 19, 20, 29 and 30 of the Tioga Township (see Figure 3).

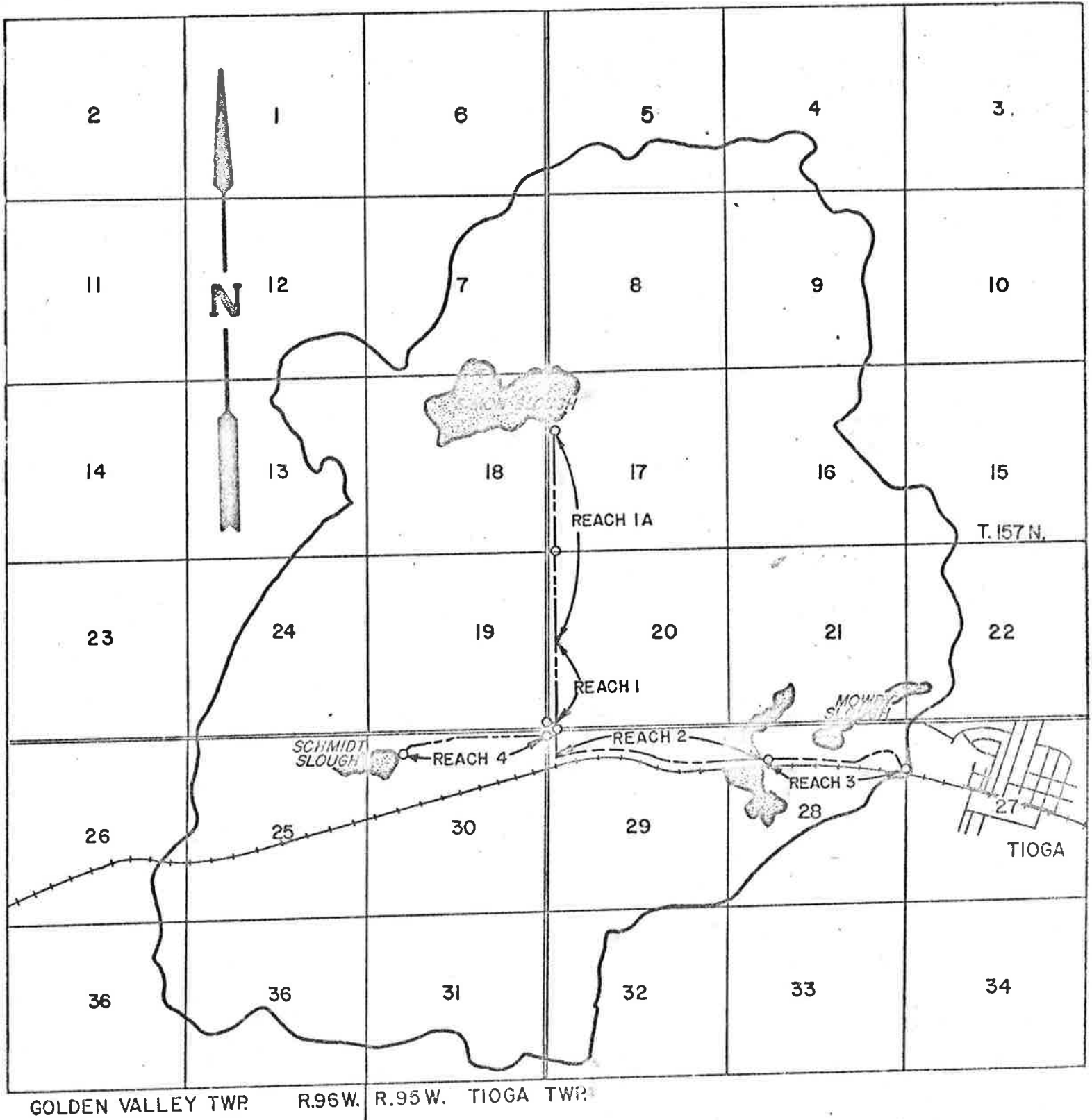


FIGURE 3  
Channel Location  
-13-



Reach 1 was divided into two reaches because of the structure requirements. Reach 1A is that portion of the drain running from Simon Slough south along County Road #21 until the half-line of Section 20 of the Tioga Township. Reach 1 is that portion of the drain running from the half line of Section 20 of the Tioga Township south along County Road #21 until the Section corner of Sections 19, 20, 29 and 30.

In controlled drainage, the natural storage of an area is used to reduce the peaks from accumulating runoff. In Alternative No.1, control structures restrict the runoff flow and back water into several natural storage areas along the legal drain, and thereby reduce the discharges along the channel.

The structures used are culverts and drop structures. A general description of the structures follows:

- |                      |   |
|----------------------|---|
| Control Structure #1 | A 36" CMP to be installed under the Section line road to the east of the common corner of Sections 19, 20, 29 and 30.                 |
| Control Structure #2 | An existing 24" CMP under the Section line road to the north of the common corner of Sections 19, 20, 29 and 30.                      |
| Control Structure #3 | A 9' weir to be installed in the channel downstream from the U. S. Fish and Wildlife Game Management Area                             |
| Control Structure #4 | Existing 30" and 36" gated CMP culverts at the intersection of the railroad and roadgrade between Sections 27 and 28.                 |
| Control Structure #5 | A 24" CMP to be installed under the Section line road between Sections 17 and 20 of Tioga Township and lying in the drainage channel. |
| Control Structure #6 | A 24" CMP to be installed at the outlet of Simon Slough in Section 17 of the Tioga Township along County Road #21.                    |
| Control Structure #7 | A 24" CMP to be installed at the outlet of Schmidt Slough in Section 30 of the Tioga Township to feed into drainage channel.          |

Control Structure #8	Existing 24" and 36" CMP culverts under the Section line road to the south of the common corner of Sections 19, 20, 29 and 30.
Drop Structure #1	A 3' drop to be installed in Reach 1 at Station 134+00 of the proposed route to facilitate minimum excavation.
Drop Structure #2	A 4' drop structure to be installed in Reach 2 at Station 72+50 of the proposed route to facilitate minimum excavation and maximum slope gradients.
Drop Structure #3	A 4' drop structure to be installed in Reach 3 at Station 8+00 of the proposed route to facilitate minimum excavation and maximum slope gradient.

The natural storage areas utilized by each structure follow:

Control Structure #1	Channel storage available in Reach 1
Control Structure #2	Ditch storage in SE corner of Section 19, Tioga Township.
Control Structure #3	Slough area operated by U. S. Fish and Wildlife Service in NW part of Section 28, Tioga Township.
Control Structure #4	Ditch and channel storage at the intersection of drain and Section road between Sections 27 and 28, Tioga Township.
Control Structure #5	Ditch and slough storage found along drain in Section 17, Tioga Township.
Control Structure #6	Slough area, Simon Slough, in Sections 17 and 18, Tioga Township.
Control Structure #7	Slough area, Schmidt Slough, in Section 25, Golden Valley Township and Section 30, Tioga Township.
Control Structure #8	Ditch and channel storage in NW corner of Section 30, Tioga Township.

The above structures are located on Figure 4.

Upon routing the runoff of the watershed, derived from the TR-20, to the various structures and using their storage capacities, the following design discharges along the various reaches and from the control structures are obtained.

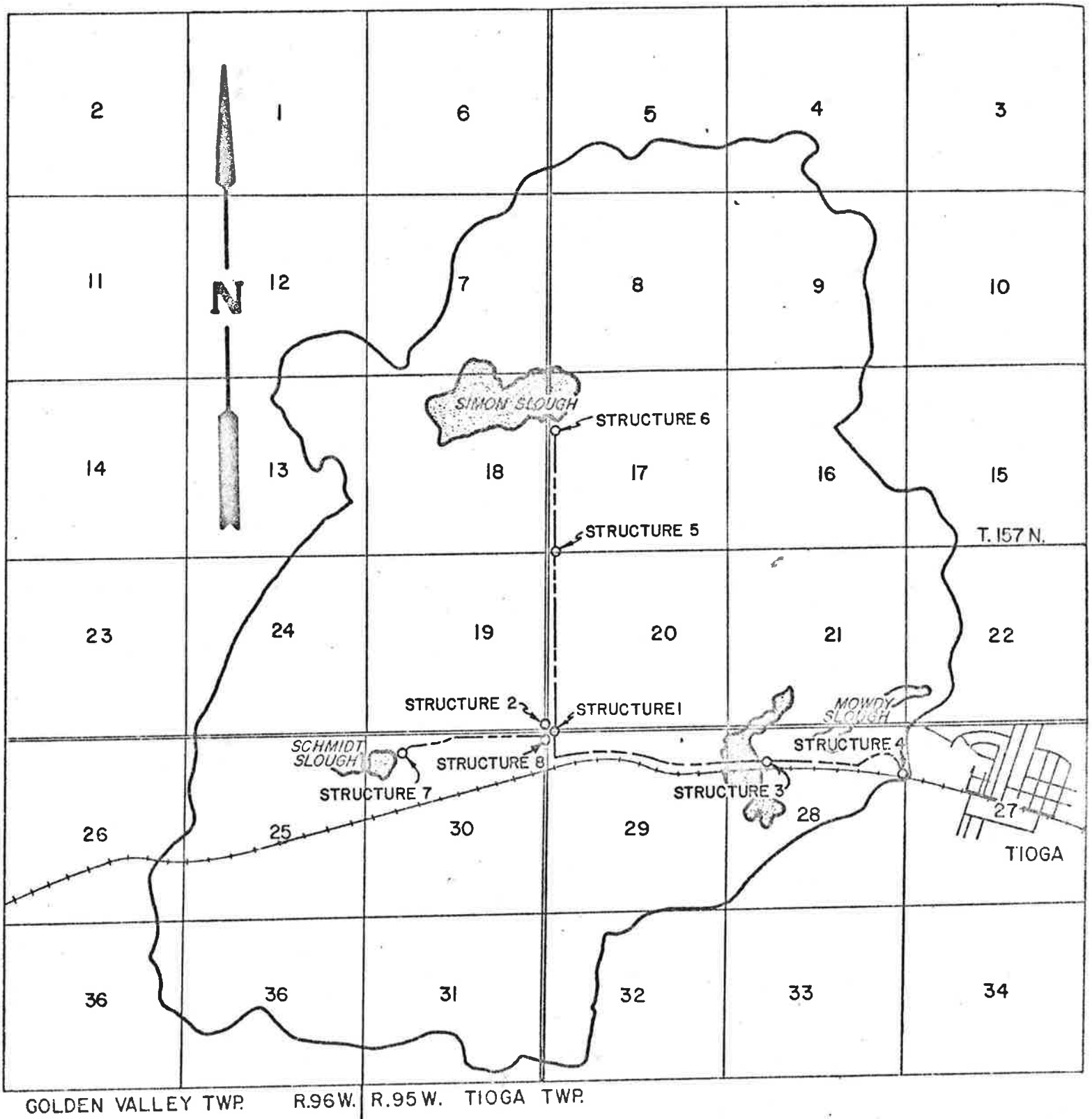


FIGURE 4  
Structure Location

TABLE 2

<u>Reach</u>	<u>Channel Design Peak Discharge</u>
1A	53 cfs
1	16 cfs
2	70 cfs
3	51 cfs
4	55 cfs

<u>Control Structure</u>	<u>Structure Design 10 Year Discharge</u>	<u>Structure Design 25 Year Discharge</u>
1	24 cfs	37 cfs
2	11 cfs	17 cfs
3	33 cfs	50 cfs
4	50 cfs	70 cfs
5	6 cfs	8 cfs
6	4 cfs	5 cfs
7	8 cfs	10 cfs
8	36 cfs	50 cfs

The channel design discharges from Table 2 are the 10 year storm peaks. These discharges are not accumulative and are dependent upon controlled releases from upstream structures and local runoff (See Figures 3 and 4). These are the discharges required by the criteria set forth by the State Water Commission, which require the 25 year storm peak discharge to design structures and the 10 year storm peak discharge to design channels.

The design channel has a 12 foot bottom width and 4 to 1 side slopes. The various reaches have different design discharges and therefore, have different slopes, velocities, and flow depths. This is shown below:

Reach 1A	Station 153+00 to Station 220+00 slope = 0.0011 ft/ft design discharge = 53 cfs velocity = 1.63 ft/sec @ 1.72' depth
Reach 1	Station 134+00 to 153+00 slope = 0.0011 ft/ft design discharge = 16 cfs velocity = 1.13 ft/sec @ 0.89' depth
	Station 134+00 3' drop structure

Station 128+00 to 134+00  
slope = 0.006 ft/ft  
design discharge = 16 cfs  
velocity = 2.00 ft/sec @ 0.55' depth

Reach 2      Station 72+50 to 120+00  
                 slope = 0.00125 ft/ft  
                 design discharge = 70 cfs  
                 velocity = 1.84 ft/sec @ 1.92' depth

                 Station 72+50  
                 4' drop structure

                 Station 58+00 to 78+50  
                 slope = 0.0045 ft/ft  
                 design discharge = 70 cfs  
                 velocity = 2.91 ft/sec @ 1.37' depth

Reach 3      Station 8+00 to 46+00  
                 slope = 0.00425 ft/ft  
                 design discharge = 51 cfs  
                 velocity = 2.58 ft/sec @ 1.17' depth

                 Station 8+00  
                 4' drop structure

                 Station 6+00 to 8+00  
                 slope = 0.005 ft/ft  
                 design discharge = 51 cfs  
                 velocity = 2.73 ft/sec @ 1.12' depth

Reach 4      Station 0+00 to 50+00  
                 slope = 0.0006 ft/ft  
                 design discharge = 55 cfs  
                 velocity = 1.33 ft/sec @ 2.05' depth

## Cost Estimate

The costs of the earthwork and various structures follows:

### Reach 1A

Excavation	270,000 yd <sup>3</sup>	\$0.60/yd <sup>3</sup>	\$162,000
Control Struc. #6	24" CMP		1,600
Control Struc. #5	24" CMP		<u>4,000</u>
Subtotal			\$167,600

### Reach 1

Excavation	11,000 yd <sup>3</sup>	\$0.60/yd <sup>3</sup>	\$ 6,600
Control Struc. #1	36" CMP		3,000
Drop Struc. #1	3' drop		<u>5,000</u>
Subtotal			\$ 14,600

### Reach 2

Excavation	80,300 yd <sup>3</sup>	\$0.60/yd <sup>3</sup>	\$ 48,200
Drop Struc. #2	4' drop		<u>5,000</u>
Subtotal			\$ 53,200

### Reach 3

Excavation	39,000 yd <sup>3</sup>	\$0.60/yd <sup>3</sup>	\$ 23,400
Control Struc. #3	PSA-23 9' weir		10,000
Drop Struc. #3	4' drop		<u>5,000</u>
Subtotal			\$ 38,400

### Reach 4

Excavation	10,700 yd <sup>3</sup>	\$0.60/yd <sup>3</sup>	\$ 6,400
Control Struc. #7	24" CMP		<u>1,900</u>
Subtotal			\$ 8,300

Subtotal for Alternative No.1	\$282,100
+15% contingencies	42,450
+15% Engineering, contract administration, and field inspection	<u>42,450</u>

Total Alternative No. 1            \$367,000

This cost estimate does not include the purchase of land for the drain, nor the relocation costs for pipelines which may have to be moved.

## Alternative No. 2

This alternative is similar to the previous alternative, differing only in the deletion of Reach 1A from the drain. The cost of Reach 1A is \$218,000 including engineering, contract administration, inspection and contingency costs. This is approximately 60% of the cost of Alternative No. 1. It is questionable whether the enormous cost for Reach 1A is offset by the benefits received, thus Reach 1A was deleted.

The cost estimate for Alternative No. 2 follows:

Reach 1	\$14,600
Reach 2	53,200
Reach 3	38,400
Reach 4	<u>8,300</u>
Subtotal	\$114,500
+15% Contingencies	17,250
+15% Engineering, contract adminis- tration, field inspection, etc.	<u>17,250</u>

Total Alternative No.2 \$149,000

Should final design be requested, Reach 2 of Alternative No. 1 and No. 2 may be modified. Rather than running along the railroad tracks, it may be feasible to have Reach 2 run through Biver Slough, in the south half of Section 20 of the Tioga Township. Should this be a desire of the Williams County Water Management District, information will be obtained and this modification will be examined.

#### IV. ENVIRONMENTAL SURVEY

The following environmental survey will give an overview of the positive and negative environmental impacts that would result from the implementation of this project. This is not intended to be a comprehensive environmental assessment, however, it will identify subjects that would be analyzed in detail in an environmental assessment. In the following paragraphs several environmental categories are identified and discussed specifically for the Tioga Drain watershed.

##### LAND USE

The Tioga Drain watershed currently has the following land use breakdown:

Small Grains	80%
Pasture	13%
Wetlands	5%
Roads	1%
Farmsteads	<u>1%</u>
	100%

The wetland areas not currently functioning as wildlife management areas would be converted to cropland as a result of this project. Some land will be removed from agricultural production for the construction of the drainage channels.

##### Aesthetics

The excavated drainage channels will not conform to the natural environment. However, the excavated material will be leveled and the channel will be seeded with native grasses. The draining of the wetland



areas within the watershed will eliminate the unsightly shallow bodies of water that now exist.

#### DOWNSTREAM FLOOD FLOWS

The Tioga Drain watershed is located within the White Earth River Basin. As a result of this project there will be additional area contributing to this basin. However, the peak discharge from the area will not be increased because the discharge is controlled by the capacity of the Tioga city storm sewer system. This project would result in an increase in the total volume of runoff from the Tioga Drain watershed because of the increase in the contributing area.

#### DOWNSTREAM WATER QUALITY

Agricultural runoff, containing sediment and dissolved chemicals, is presently stored in potholes and sloughs and does not normally contribute to discharges from the watershed. This runoff would contribute if this project were constructed. However, the water quality of this additional discharge would be similar to that of the remainder of the White Earth River Basin.

#### FISH AND WILDLIFE

There is no existing water within the watershed that is suitable for maintaining a fish habitat, and the proposed project will not produce a body of water that would support fish life. No field data has been obtained for wildlife population within the watershed. The implementation of the proposed project will destroy some freshwater wetlands.

#### IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

All materials, labor and energy used in the construction of the project would be irretrievable.

## V. SUMMARY

The purpose of this report was to present alternative plans for a legal drain. This drain was to drain three major sloughs without creating additional flood problems for the city of Tioga.

Two alternative designs for this drain were developed. Alternative No. 1 drains the sloughs requested by the original petition and follows the suggested route. The cost for this alternative is estimated at \$367,000. Alternative No. 2 drains the same basin as Alternative No.1, with the exception of Simon Slough. The cost for this alternative is estimated at \$149,000.

Because of the large expense incurred with the addition of draining Simon Slough, the State Water Commission suggests that Alternative No. 2 be pursued further. The benefits received from the drainage of Simon Slough may warrant the expense of incorporating this area into the legal drain, however, at this time it is questionable.

Should a final design be requested by the Williams County Water Management District, additional information will be obtained to facilitate the design. Also, input from the local population will be very helpful in the final design.

APPENDIX A

Copy of Original Petition

PETITION FOR CONSTRUCTION OF DRAIN

We, the landowners, petition the Williams County Water Management Board for the construction of a main drain, with drains from outlying areas of lowlands. In Golden Valley Township, Sect. 24 & 25. In Tioga Township, Sect. 7, 8, 17, 18, 19, 20, 21, 28, 29, 30, 31, and Sect. 32. But, in no way, limiting to these stated sections, the final boundaries of the proposed drainage district.

The starting point of said main drain to be at the west section line of Sect. 29, from the Burlington Northern Railroad tracks, and precede along said tracks, with termination at the east section line of Sect. 28. All of said main drain being on the north side of the railroad tracks, as granted under Title #61, Sect. #21-31, of the N. DAK. CENTURY CODE.

Side Drain #1 to start in what is known as the Simon Slough, with necessary sub-drains to drain low lands in the area of Side Drain #1, and follow County Road #21, south until connecting with Main Drain, at railroad tracks.

Side Drain #2 to start in Schmidt Slough, connect to County Road #10 south ditch, precede east to Side Drain #1. Together with necessary sub-drains to drain low lands in the area of Side Drain #2.

Side Drain #3 to start in what is known as the Mowdy Slough, go south and connect with Main Drain. Together with necessary sub-drains to drain low lands in the area of Drain #3.

The 3 Side Drains mentioned above does in no way, restrict the amount of drains or tile drains needed in the areas involved to be drained.

It is the opinion of the petitioners that Williams County, and Tioga Township are also among the prime beneficiaries of this proposed drainage project, and said assessed county and township should be ~~\*\*\*\*~~ the percentage of the cost in accordance with benefits recieved. This opinion is made, by the fact that County Road #21, and #10 are/or have been inundated by high water in sloughs of the proposed drainage project.

Also, we the undersigned understand that the cost of the drainage project will be assessed to the acres either directly or indirectly benefited. Also, that there may be a cost share plan available from the Water Management Board, and the State Water Commission, if this project is approved.

We, The Petitioners, submit \$100.00 cash bond each.

<u>Name</u>	<u>Address</u>	<u>Date</u>
1. <u>Richard L. Nelson</u>	<u>Tioga, Pa.</u>	<u>3/7/76</u>
2. <u>William G. ...</u>	<u>...</u>	<u>3/6/76</u>
3. <u>...</u>	<u>...</u>	<u>...</u>
4. <u>...</u>	<u>...</u>	<u>3/2/76</u>
5. <u>...</u>	<u>...</u>	<u>...</u>
6. <u>Richard L. Nelson</u>	<u>...</u>	<u>3/9/76</u>
7. <u>...</u>	<u>...</u>	<u>...</u>
8. <u>Donald J. ...</u>	<u>Tioga</u>	<u>...</u>
9. <u>Lynn H. ...</u>	<u>Tioga</u>	<u>...</u>
10. <u>...</u>	<u>...</u>	<u>...</u>
11. <u>Richard L. Nelson</u>	<u>Tioga</u>	<u>3/9/76</u>
12. <u>Joe Beckley</u>	<u>...</u>	<u>3-9-76</u>

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APPENDIX B

Copy of Original Agreement

THIS AGREEMENT made and entered into by and between the State Water Commission, hereinafter referred to as the Commission, party of the first part, and Williams County Water Management District whose post office address is P.O. Box 476, Williston, N. Dak. 58801 hereinafter referred to as the Applicant, party of the second part,

WHEREAS, Williams County Water Management District  
(Name of Applicant)

has requested the Commission to investigate, or survey, and study the feasibility and desirability of the following proposed undertaking (describe proposed undertaking or project): To investigate the feasibility for establishing a legal drain in Sections 24 and 25, Township 157 North, Range 96 West, Golden Valley Township; and in Sections 7, 8, 17, 18, 19, 20, 21, 28, 29, 30, 31 and 32, Township 157 North, Range 95 West, Tioga Township, Williams County.

and

WHEREAS, in order to investigate, or survey, and study the undertaking proposed by Applicant, a deposit of \$1,500.00 is required, under rules and regulations prescribed by the State Water Commission, to cover the cost of such investigation, or survey, and study of the feasibility and desirability of the proposed undertaking; and

WHEREAS, if the cost of such investigation, or survey, and study does not equal or exceed the amount deposited with the Commission, the excess deposit will be credited to and returned to the Applicant, or if the undertaking is approved by the Commission, and carried out, the entire deposit will be applied to the cost of the undertaking as part of local contribution to its construction;

NOW, THEREFORE, the parties hereto agree as follows:

1. Applicant agrees to deposit with the Commission the sum of \$1,500.00 to partially cover the cost of an investigation, or survey, and study of the desirability and feasibility of the proposed undertaking.

2. Applicant agrees to obtain written permission from all affected land-owners whereby permission is granted to the Commission and/or contractors engaged by them, for the purpose of surveying said lands for investigation and subsurface explorations.

3. If, after investigation, or survey, and study of the proposed undertaking it is determined that it is not feasible, or that it will be of no public benefit, or if the Applicant shall notify the Commission of abandonment of the proposed undertaking, or if the Applicant fails to show an intent to proceed with the undertaking within 18 months after the date of the deposit, the Applicant shall be furnished a statement of the expenses incurred in conducting the investigation, or survey, and study thereof, and any balance of Applicant's deposit remaining unexpended shall be returned to Applicant.

4. If, however, the proposed undertaking shall, after investigation, or survey, and study, be found to be feasible, and of benefit to the public, the Applicant shall be notified accordingly.

Dated this 2nd day of April, 1976.

Williams Co. Water Management District  
By:

NORTH DAKOTA STATE WATER COMMISSION  
By:

  
\_\_\_\_\_  
(Applicant)

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\_\_\_\_\_  
Secretary and Chief Engineer

