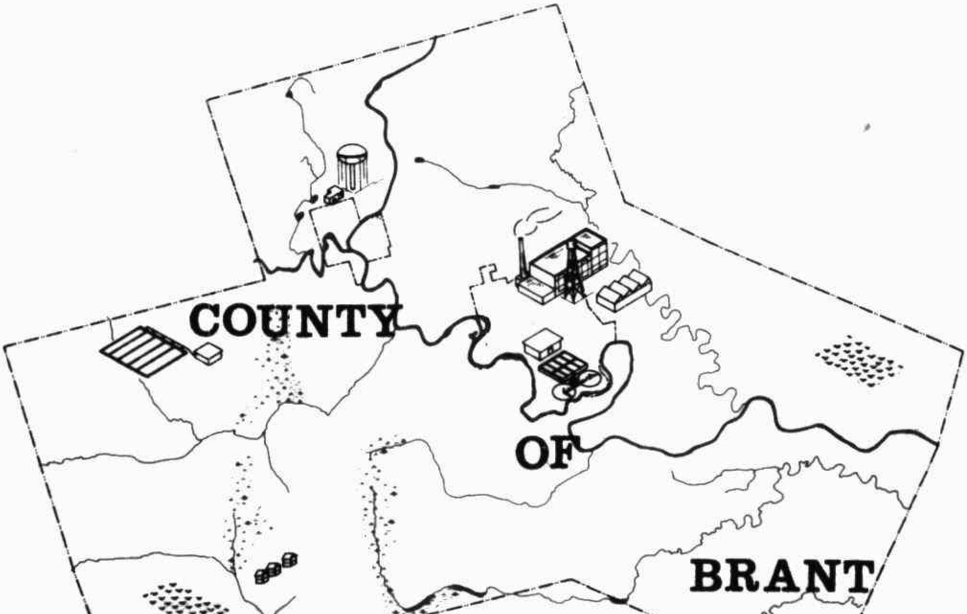
THE

ONTARIO WATER RESOURCES COMMISSION

REPORT ON

WATER RESOURCES SURVEY



1964

A water resources survey of the
county of B.rant.

BBBO

A

Water Resources Survey

of the

County of Brant

1964

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ABBREVIATIONS AND SYMBOLS

ABBREVIATIONS

Engineering Terms

ABS	alkyl benzene sulfonate
Ac. ft.	acre-feet
BOD	biochemical oxygen demand
cfs	cubic feet per second
COD	chemical oxygen demand
F.	Fahrenheit
ft.	feet
gpcd	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
M.F.	Membrane Filter
mg	million gallons
mgd	million gallons per day
mi.	miles
ml	millilitre
pH	hydrogen ion concentration
ppb	parts per billion
ppm	parts per million
sq. ft.	square feet
sq. mi.	square mile

Proper Names

GRCC	Grand River Conservation Commission
GVCA	Grand Valley Conservation Authority
OWRC	Ontario Water Resources Commission

Miscellaneous

Avg.	average
cont'd.	continued
Diss.	dissolved
lab.	OWRC laboratory
Max.	maximum
Min.	minimum
No.	number
Susp.	suspended
%	per cent
$>$	greater than
$<$	less than
Mfg.	manufacturing

ABBREVIATIONS AND SYMBOLS (CONT'D)

Symbols

—·· —	County Boundary
o	Elevated Tank or Standpipe
	Marsh
— - —	Municipal Boundary
→	Outfall
G-75.5 W	Outfall Sampling Point Mileage and Type D - Ditch I - Industrial S - Sanitary W - Storm T - Treated
	Refuse Disposal Site
Δ	Sewage Treatment Plant (STP)
	Streamflow Gauging Station
G-75.0	Stream Sampling Point
	Water Works

INTRODUCTION

PURPOSE

The Ontario Water Resources Commission is concerned with the management of water resources in the Province of Ontario, with particular attention to water supply and waste water disposal. In this regard, the Commission employs the water resources survey to study the needs of municipalities within the county unit.

The water resources survey reviews the existing water and waste water treatment facilities and indicates the requirements in developed areas which lack adequate facilities. The quality of surface waters is reviewed to assess their suitability for water supply and waste water disposal. The availability and quality of ground water also is examined.

The ultimate objective is to make recommendations concerning the general policies to be followed in the use of the water resources and to make specific recommendations for each municipality.

SCOPE

A general description of the county and the availability and quality of the water resources are presented in chapters 2 and 3.

In subsequent chapters, the water supply systems and sewage treatment works existing in each municipality are outlined briefly. The operational efficiency and capacity of these facilities are evaluated. Based on population projections prepared from past growth rates, the water supply and sewage treatment needs are estimated up to 1983. The surface water quality within each municipality is related to the major sources of pollution.

Conclusions based on the information presented in the survey are included at the end of each chapter. The summary and recommendations resulting from these conclusions constitute Chapter 1.

The maps and figures outline the areas of ground water availability, municipal water and sewage areas, stream gauging stations, sampling points on the main watercourses and the major sources of pollution.

CHAPTER 1

SUMMARY AND RECOMMENDATIONS

CHAPTER 1

SUMMARY AND RECOMMENDATIONS

I SUMMARY

The County of Brant contains eight geographical municipalities including one city, one town, five townships and Indian Reserve land. With the exception of the highly industrialized City of Brantford, the economy is oriented towards agriculture, with emphasis on the cultivation of tobacco. Sufficient water resources are available to support its continued development provided that sound policies of water conservation, including effective pollution control, are pursued.

Ground water generally is available for domestic use throughout the county. Where shallow dug wells are depleted due to fluctuations in the water table, it generally is possible to obtain water from greater depths. Local lowering of the water level in the vicinity of high capacity wells has been experienced in a few instances, but this effect is not responsible for water shortages over any extensive area. Highly mineralized bedrock water is encountered over most of the county.

Surface water is utilized for domestic and industrial supplies and for irrigation purposes. The withdrawal of water from natural sources is regulated by the OWRC permit system to ensure the equitable allocation of the available resources. Effective conservation storage of water is required to make more efficient use of the available resources for water supplies, irrigation and treated waste water dilution.

There are five municipally owned water works installations serving the City of Brantford, the Town of Paris and three portions of the Township of Brantford. The City of Brantford provides water for a fourth area within the township and the OWRC operates one of the supply installations there. Adequate bacteriological quality control requires chlorination of the ground-water sources in the Township of Brantford. With the exception of the City of Brantford, all supplies are obtained from ground-water sources.

Two privately owned ground-water supplies are operated in the townships of Brantford and Dumfries, South. The former is adequate, while the one in Dumfries, South requires extensive improvements which could be best accomplished on a municipal basis.

Due to the uncertainty of obtaining adequate groundwater supplies for large urban municipalities and the consumer tendency to demand improved water quality, consideration will have to be given to obtaining water from the Great Lakes.

The City of Brantford and the Town of Paris each has adequate sewage treatment facilities. However, the sewage collection system in Paris is limited and requires extension to eliminate pollution presently entering the Grand and Nith rivers. Private sewage treatment systems are provided for the Brantford Plaza and the Burtch Industrial Farm in the Township of Brantford. The Brant County Health Unit actively supervises the installation of private sewage disposal systems in the rural and suburban areas.

The most significant sources of pollution result from industrial waste discharges to the Grand River in the City of Brantford. Some domestic wastes are entering Fairchild Creek via St. George Creek from the Police Village of St. George. Refuse disposal sites represent potential sources of pollution in some instances.

The suburban area surrounding the City of Brantford may develop waste water disposal problems in the future.

The Indian reserves have no communal water or sewage treatment facilities and health and welfare measures are under the jurisdiction of the federal government.

II RECOMMENDATIONS

COUNTY OF BRANT

1. Water conservation programmes by municipalities and individuals should be encouraged to alleviate low stream flow problems.

2. Pollution abatement programmes for municipal and industrial wastes should be continued.

CITY OF BRANTFORD

Water Supply

1. The possibility of obtaining water from the Great Lakes to serve an extended area should be explored.

2. If the above is not immediately feasible, expansion of existing treatment facilities should be undertaken.

Water Pollution

1. The present programme of separating storm and sanitary sewage flows should be continued.

2. Uncontaminated industrial cooling waters should be redirected from sanitary sewers to storm or surface-water drains where possible.

3. The Canada Glue Company Limited should implement the plant to provide industrial waste treatment.

4. The municipality should endeavour to eliminate the pollution emanating from the sanitary landfill site.

5. A sewer use by-law should be enacted by the city to provide adequate protection of sewerage works.

TOWN OF PARIS

Water Supply

1. An additional ground-water supply should be developed as soon as possible, if test drilling establishes the presence of an adequate quantity of satisfactory quality water.

2. If the No. 1 Pumping Station is to be used in the future, chlorination facilities should be provided.

Water Pollution

1. The sewage collection system should be extended to serve the areas presently contributing pollution to the Grand and Nith rivers.

TOWNSHIP OF BRANTFORD

Water Supplies

1. Chlorination should be practised at all the municipally owned ground-water supplies.

Water Pollution

1. The cause of the hydraulic overloading at the Burtch Industrial Farm sewage treatment plant should be investigated and if possible, eliminated.

2. Care should be taken to maintain continuous chlorination of the effluent from the Brantford Plaza sewage treatment facilities.

3. The refuse disposal site should be closed and an alternative site selected -- one where ground and surface waters would be protected from pollution caused by refuse leachate. Effective measures are required to control the pollution which will continue to be a problem at the site.

4. Consideration should be given to sewering the built-up area adjacent to the City of Brantford and directing the sewage flows to the city's sewage treatment plant.

TOWNSHIP OF BURFORD

Water Supply

1. If growth occurs in the Police Village of Burford, a municipal water supply system utilizing ground-water sources should be developed.

Water Pollution

No recommendations.

TOWNSHIP OF DUMFRIES, SOUTH

Water Supply

1. Improvements to the water supply system in the Police Village of St. George should be made. A municipally owned system is desirable.

Water Pollution

1. The discharge of contaminating wastes to St. George Creek must be eliminated either by the provision of a municipal collection and treatment works or adequate private disposal systems.

2. Consideration should be given to providing continuous treatment to the industrial wastes from the Malcolm Condensing Company Limited plant.

TOWNSHIP OF OAKLAND

Water Supply

No recommendations.

Water Pollution

1. Care should be taken to prevent pollution from the present refuse disposal site.

2. If problems with individual sewage disposal systems in the Police Village of Scotland recur, consideration should be given to providing municipal sewage works.

TOWNSHIP OF ONONDAGA

Water Supply

No recommendations.

Water Pollution

1. A suitably located municipal refuse disposal site should be provided.

TOWNSHIP OF TUSCARORA

Water Supply

No recommendations.

Water Pollution

1. The federal government should maintain effective pollution control measures at the Indian reserves.

CHAPTER 2

GEOGRAPHY AND GEOLOGY

CHAPTER 2

GEOGRAPHY AND GEOLOGY

I GEOGRAPHY

1. Topography

The County of Brant has a varied and irregular relief. The topography ranges from level to undulating in the east and south-east to steeply sloping in the western and northern regions. Elevations range from approximately 650 feet in the south-eastern parts to 1,075 feet above sea level in the extreme northern areas. Level to undulating clay, till and sand plains occur in the eastern half of the county. In the western portion, a series of north-south trending recessional moraines give rise to steep slopes. The two most prominent are the Paris and Galt moraines. Broad, flat gravel and sand filled spillways separate the moraines. A glacial lake shoreline recognizable by sporadic deposits of thin gravel and a low bluff separates the plains from the moraine area. Stream erosion has deeply dissected the northern part of the county, where the major rivers occupy valleys up to 150 feet deep.

2. Drainage

Meandering in a south-easterly direction the Grand River drains eighty-eight per cent of the county area. Although the river is not a rapidly flowing stream it has cut deep channels into the overburden and in the Paris area flows over bedrock.

The major tributaries of the Grand River within the county are: the Nith River, Big*, Boston, Fairchild, McKenzie, Mount Pleasant and Whiteman** creeks.

Headwater streams of Big Creek* and Big Otter Creek which outlet directly to Lake Erie, drain the south-west corner of the county.

The drainage areas of main streams and tributaries are shown in Table 2-1.

* There are two "Big" Creeks within the county.

** Whiteman Creek which flows into the Grand River is considered to start near Colles Lake and to flow to the Grand River and to have as tributaries, Kenny and Horner creeks.

TABLE 2-1

DRAINAGE AREAS OF MAIN STREAMS AND TRIBUTARIES

Main Stream Tributary	Area in Square Miles Above County	Within County*	Below County
Grand River	2,044	378	2,422
Nith River	385	45	430
Whiteman Creek	89	56	145
Mount Pleasant Creek	0	15	15
Fairchild Creek	81	67	148
Big Creek	44	24	68
McKenzie and Boston creeks	42	70	112
Big Creek	20	43	63
Big Otter Creek	3	9	12

* This area includes lands which drain into the Grand River downstream of the County of Brant.

Adequate drainage for general farming needs is available in most of the county. There are two extensive north-south trending swampy areas south-west and south-east of the Police Village of Burford where flat sandy ground is often partially flooded until late in the summer. In the south-east section, natural drainage of the relatively flat clayey land is inadequate and tile drainage systems are often necessary.

3. Climate

Although the County of Brant lies inland from the Great Lakes, its climate is influenced and moderated by its proximity to lakes Erie and Ontario. Climatic normals of precipitation and temperature for representative stations within the area are presented in Table 2-2. Monthly and annual averages of precipitation, and of daily mean, maximum, and minimum temperatures for designated periods of record ending in 1960 are given.

Annual precipitation at Brantford is 31 inches. Monthly distribution is relatively uniform throughout the year. The temperature ranges from a mean of 23^{0}F in January and February to 71^{0}F in July. The county has an average crop season of 203 days which commences about April 14 and includes a normal frost free period of 153 days.

TABLE 2-2

CLIMATIC NORMALS OF PRECIPITATION AND TEMPERATURE

PRECIPITATION - MONTHLY AND ANNUAL AVERAGES IN INCHES

Station	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June
Brantford	1931-1960	2.72	2.60	2.62	2.86	2.42	2.50
Caledonia	1931-1960	2.61	2.44	2.59	2.69	2.79	2.40
Galt	1947-1960	2.93	2.37	2.59	3.30	3.18	2.42
Woodstock	1931-1960	2.69	2.40	2.58	2.88	3.01	3.13

		July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr.
Brantford	1931-1960	2.57	2.83	2.73	2.46	2.63	2.49	31.43
Caledonia	1931-1960	2.69	2.91	2.93	2.43	2.43	2.20	31.11
Galt	1947-1960	3.51	3.19	2.87	3.27	3.17	2.68	35.48
Woodstock	1931-1960	2.94	2.69	3.08	2.88	2.68	2.55	33.51

TABLE 2-2 (CONT'D)

DAILY MEAN TEMPERATURE

MONTHLY AND ANNUAL AVERAGES IN DEGREES FAHRENHEIT

Station	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr.
Brantford	1931-1960	23.6	23.2	30.9	43.5	55.4	65.7	71.0	68.6	61.0	50.0	37.6	27.1	46.5
Caledonia	1931-1960	23.5	22.8	30.8	43.5	54.4	64.6	69.7	68.2	60.8	49.7	38.1	26.7	46.1
Galt	1947-1960	24.5	24.3	29.6	44.3	54.6	65.5	70.0	68.3	60.0	49.9	38.4	27.7	46.4
Woodstock	1931-1960	22.3	22.1	29.7	42.8	54.1	64.3	68.7	67.5	59.8	49.2	36.8	25.7	45.3

TABLE 2-2 (CONT'D)

DAILY MAXIMUM TEMPERATURE

MONTHLY AND ANNUAL AVERAGES IN DEGREES FAHRENHEIT

Station	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr.
Brantford	1931-1960	30.3	30.6	38.4	53.0	66.7	77.3	82.9	80.4	72.3	60.6	44.8	33.3	55.9
Caledonia	1931-1960	30.6	30.8	38.7	53.2	65.7	76.3	81.6	79.8	71.9	60.1	45.6	33.4	55.7
Galt	1947-1960	31.4	32.0	37.4	54.9	65.9	77.0	81.3	79.8	71.4	60.3	45.6	34.2	55.9
Woodstock	1931-1960	29.0	29.3	37.0	51.9	64.3	74.6	79.4	78.2	70.1	58.8	43.5	31.9	54.0

TABLE 2-2 (CONT'D)

DAILY MINIMUM TEMPERATURE

MONTHLY AND ANNUAL AVERAGES IN DEGREES FAHRENHEIT

Station	Period of Record	Jan.	Feb.	Mar.	Apr.	May	June
Brantford	1931-1960	16.8	15.8	23.3	34.0	44.1	54.0
Caledonia	1931-1960	16.3	14.8	22.8	33.7	43.1	52.9
Galt	1947-1960	17.6	16.6	21.8	33.7	43.2	54.0
Woodstock	1931-1960	15.6	14.8	22.3	33.7	43.9	53.9

Station	Period of Record	July	Aug.	Sept.	Oct.	Nov.	Dec.	Yr.
Brantford	1931-1960	59.0	56.8	49.7	39.3	30.4	20.8	37.0
Caledonia	1931-1960	57.8	56.6	49.6	39.2	30.6	19.9	36.4
Calt	1947-1960	58.7	56.8	48.6	39.4	31.1	21.2	36.9
Woodstock	1931-1960	58.0	56.8	49.5	39.6	30.1	19.5	36.5

Note: This Table is prepared from records supplied by The Meteorological Branch, Department of Transport, Canada.

4. Land Use

The county covers an area of 269,400 acres, of which approximately 65 per cent is devoted to farming. General crops such as hay, oats, barley, wheat and silage can grow well throughout most of the county. The broad, flat, sandy ground in the south-west and south-central portions is devoted primarily to tobacco production. In recent years, corn has become very important in the central and northern parts. Agriculture is limited throughout much of the Township of Tuscarora, although some very productive land lies in the area.

As a result of deficiencies in soil moisture many farms employ irrigation systems utilizing dug ponds and streams. This use has shown a steady increase. In recent years the number of irrigators using high-capacity well systems has increased rapidly.

5. Population

The assessed population of the County of Brant in 1963 was 79,837, an increase of approximately 13,200 in 14 years. The populations and annual rates of increase for each municipality from 1950 to 1963 are shown in tables 2-3 and 2-4 respectively. The data was obtained from the annual Municipal Directory published by the Department of Municipal Affairs. The Township of Tuscarora is not included.

Since 1950 the average annual rate of increase for the county has been 1.4 per cent per year. At this rate of increase the 1983 population of the County of Brant will be 105,000.

II GEOLOGY

1. Bedrock

Bedrock formations within the county belong to the Silurian and Devonian systems of the Palaeozoic age. Brown to buff dolomite, grey, greenish and reddish shales, and grey limestones of the Salina formation are found beneath the overburden throughout the central section. Varying quantities of gypsum are found interbedded with the other rocks. Buff to brown dolomite of the Guelph formation underlies the Salina formation in the central section and is found immediately beneath the overburden in a band along the eastern part of the county. Buff and grey dolomite of the Bass Island formation of Silurian age and overlying cherty limestone of the Bois Blanc formation of Devonian age overlie the Salina formation in the extreme south-west and south-east.

TABLE 2-3

ASSESSED POPULATIONS*

Year	City of Brantford	Town of Paris	Twp. of Brantford	Twp. of Burford
1950	36,532	5,134	15,086	4,621
1951	36,602	5,274	16,318	4,759
1952	37,295	5,337	17,866	4,842
1953	36,526	5,396	18,662	4,920
1954	49,856**	5,404	5,722**	5,071
1955	49,944	5,429	5,989	5,093
1956	51,101	5,670	6,156	5,122
1957	51,669	5,698	6,483	5,201
1958	52,668	5,655	6,722	5,246
1959	53,201	5,759	7,247	5,574
1960	53,616	5,778	7,473	5,101
1961	54,425	5,790	7,824	5,263
1962	54,372	5,770	7,997	5,311
1963	54,917	5,923	8,094	5,230

* Municipal Directory, Ontario Department of Municipal Affairs
** Portion of the Township of Brantford annexed by the City of Brantford.

TABLE 2-3 (CONT'D)

Year	Twp. of Dumfries, South	Twp. of Oakland	Twp. of Onondaga	County of Brant***
1950	3,081	1,061	1,094	66,609
1951	3,071	1,117	1,166	68,307
1952	3,116	1,130	1,152	70,738
1953	3,141	1,179	1,202	71,026
1954	3,183	1,199	1,198	71,633
1955	3,250	1,178	1,188	72,719
1956	3,240	1,258	1,191	73,738
1957	3,117	1,271	1,192	74,631
1958	3,133	1,298	1,215	75,937
1959	3,146	1,316	1,204	77,447
1960	3,192	1,275	1,202	77,637
1961	3,190	1,285	1,190	78,967
1962	3,186	1,253	1,175	79,064
1963	3,248	1,232	1,193	79,837

*** Not including the Township of Tuscarora.

TABLE 2-4

PER CENT INCREASE IN POPULATION PER YEAR

Year	City of Brantford	Town of Paris	Twp. of Brantford	Twp. of Burford
1951	0.19	2.73	8.17	2.99
1952	1.89	1.20	9.48	1.74
1953	0.62	1.10	4.46	1.61
1954	*	0.15	*	3.07
1955	0.18	0.46	4.66	0.43
1956	2.32	4.44	2.79	0.57
1957	1.11	0.49	5.31	1.54
1958	1.94	-0.75	3.69	0.86
1959	1.01	1.84	7.82	6.26
1960	0.78	0.33	3.12	-8.49
1961	1.51	0.21	4.71	3.18
1962	-0.10	0.35	2.21	0.91
1963	1.00	2.65	1.21	-1.53
Average	1.04	1.12	4.80	1.01

* Not used due to annexation.

TABLE 2-4 (CONT'D)

Year	Twp. of Dumfries, South	Twp. of Oakland	Twp. of Onondaga	County of Brant
1951	-0.32	5.28	6.57	2.55
1952	1.47	1.17	-1.20	3.56
1953	0.80	4.34	4.34	0.41
1954	1.34	1.85	-0.33	0.85
1955	2.10	-1.75	-0.84	1.52
1956	-0.31	6.79	0.25	1.40
1957	-0.71	1.03	0.08	1.21
1958	0.51	2.12	1.93	1.75
1959	0.42	1.39	-0.91	1.99
1960	1.46	-3.12	-0.17	0.25
1961	-0.06	0.78	-1.00	1.71
1962	-0.13	-2.49	-1.26	0.12
1963	1.94	-1.67	1.53	0.98
Average	0.65	1.21	0.69	1.41

The bedrock is overlain with a mantle of unconsolidated overburden which varies from zero thickness in the extreme north-east and in the valley of the Grand and Nith rivers at Paris to more than 240 feet at a few locations along the top of the Galt moraine.

The bedrock surface appears to have little relief, except for a north-westerly trending depression or pre-glacial channel across the east-central part of the Township of Dumfries, South and an additional shallower depression west of the City of Brantford in the Township of Brantford. Although insufficient data is available to verify the hypothesis, it is possible that these two depressions may join east of the City of Brantford and continue eastward as the buried Dundas Valley north of Ancaster. In the central portion of the Township of Burford, holes drilled to the bedrock indicate that the regional slope of the bedrock surface (approximately 20 feet per mile to the south-west) is interrupted by a rise of almost 100 feet in a distance of approximately two miles. This anomalous rise in the bedrock surface may represent the western side of a third depression, or a buried continuation of the Onondaga escarpment which is exposed in the County of Haldimand.

2. Overburden

The overburden was deposited mainly during the glaciation and deglaciation of the area during Pleistocene time. The deposits occur as ground, recessional and kame moraines laid down by ice, deltaic plains formed in glacial lakes and beaches formed around the margins of these lakes.

The ice-deposited materials are called till and consist of poorly-sorted mixtures of clay, silt, sand, gravel and boulders. This material is believed to underlie most of the county and to make up a large portion of the overburden. It is exposed in the long moraine ridges and as ground moraine in the northern section of the county.

As the last ice sheet advanced westward from the Lake Ontario basin, it deposited a layer of ground moraine derived from the eroded bedrock and previously deposited overburden materials. During deglaciation, the ice-front retreated gradually to the east and south-east, making several halts and short re-advances. During these halts and re-advances, till was built up in front of the ice to form recessional moraine ridges. Meltwater, flowing southward in the vicinity of the present Grand River, entered the lakes and material was dropped to build a large delta. Inundation by the lakes resulted in the deposition of lacustrine clays over the moraines in the southern and eastern sections of the delta.

The deltaic materials consist of well-sorted sand and silt and occasionally coarse sand and gravel. The latter occur between and on the sides of the Paris and Galt moraines, west of the City of Brantford and south of the Town of Paris. These deposits are noticeably finer to the south. In the eastern section, the deposits are either lacking or covered by several feet of lacustrine clay. The clay blankets most of the townships of Onondaga and Tuscarora and extends into the eastern part of the Township of Brantford. Coarse, deltaic and outwash deposits in the Burford area extend to a depth of over 85 feet. The thickness varies locally, depending on the elevation of the underlying till and bedrock.

Figure 2-1, which is taken from "The Physiography of Southern Ontario, 1951" by Chapman and Putnam, shows the different physiographic regions of the county. Data indicating the availability of ground water from overburden deposits are shown in Figure 2-2.

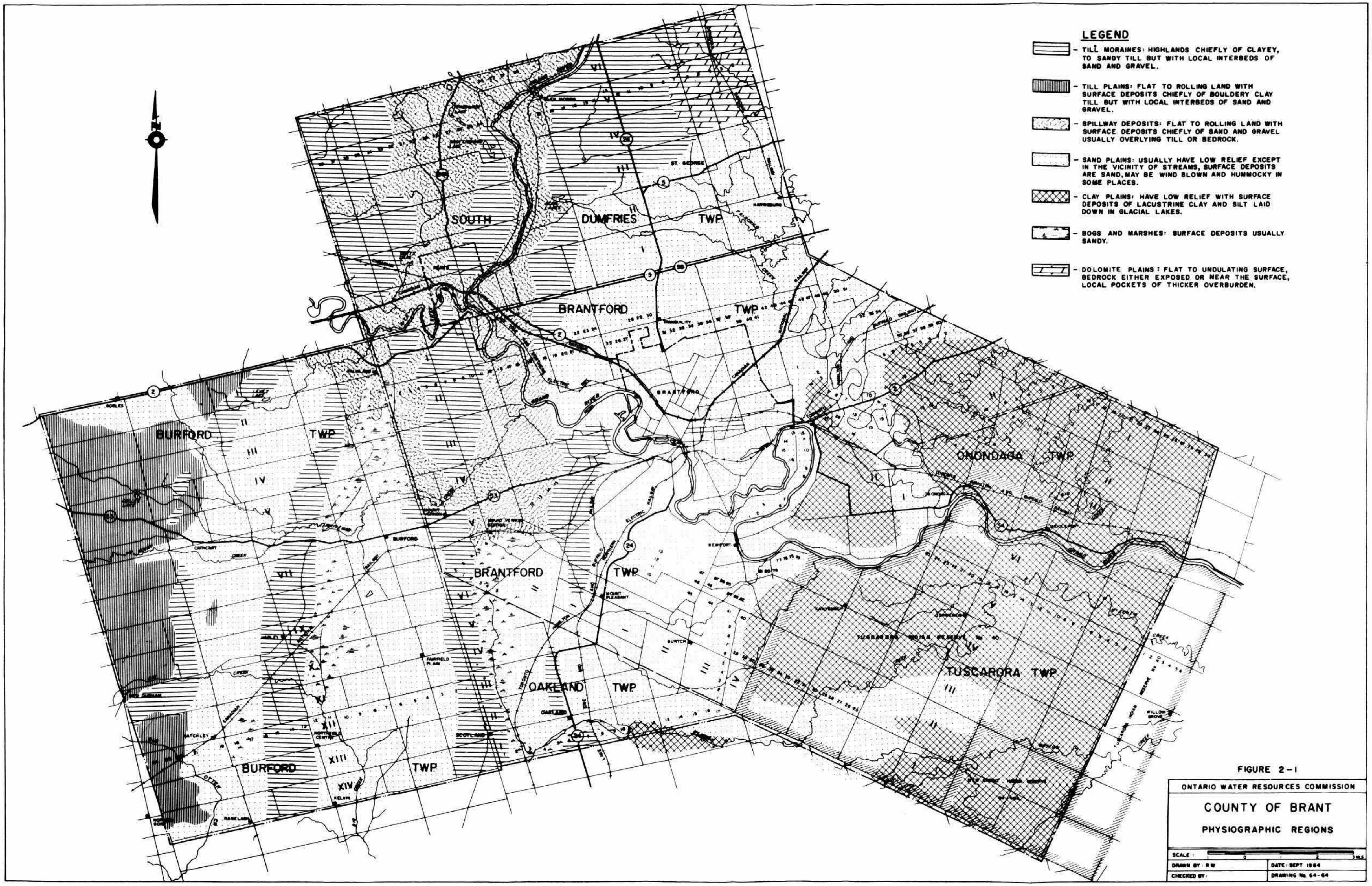


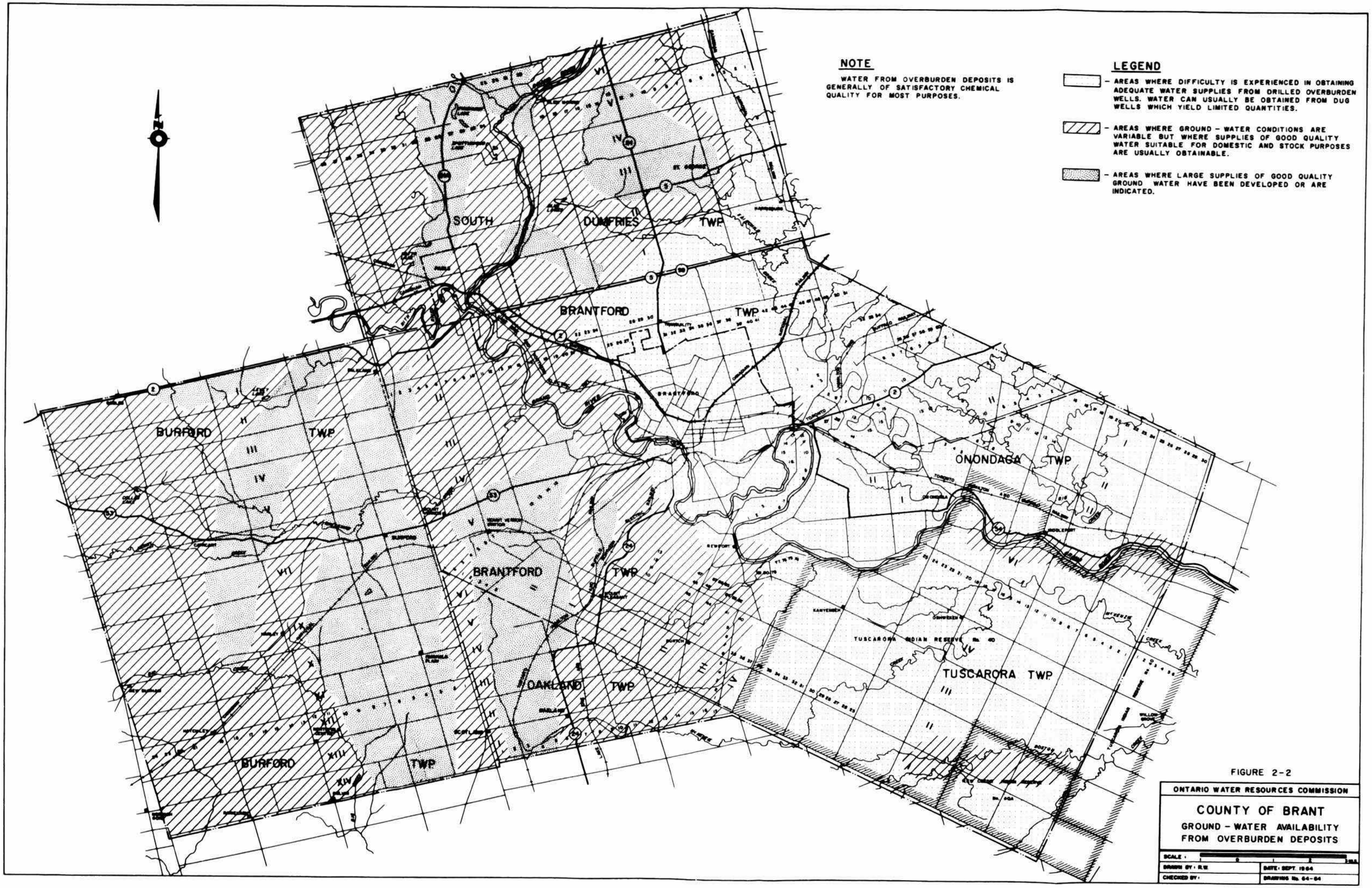
FIGURE 2-1

ONTARIO WATER RESOURCES COMMISSION

COUNTY OF BRANT

PHYSIOGRAPHIC REGIONS

SCALE:	
DRAWN BY: R.W.	DATE: SEPT 1964
CHECKED BY:	DRAWING No. 64-64


NOTE
WATER FROM OVERBURDEN DEPOSITS IS GENERALLY OF SATISFACTORY CHEMICAL QUALITY FOR MOST PURPOSES.
LEGEND
- AREAS WHERE DIFFICULTY IS EXPERIENCED IN OBTAINING ADEQUATE WATER SUPPLIES FROM DRILLED OVERBURDEN WELLS. WATER CAN USUALLY BE OBTAINED FROM DUG WELLS WHICH YIELD LIMITED QUANTITIES.
- AREAS WHERE GROUND - WATER CONDITIONS ARE VARIABLE BUT WHERE SUPPLIES OF GOOD QUALITY WATER SUITABLE FOR DOMESTIC AND STOCK PURPOSES ARE USUALLY OBTAINABLE.
- AREAS WHERE LARGE SUPPLIES OF GOOD QUALITY GROUND WATER HAVE BEEN DEVELOPED OR ARE INDICATED.
N
SOUTH DUMFRIES TWP
BRANTFORD TWP
BURFORD TWP
ONONDAGA TWP
BRANTFORD TWP
OAKLAND TWP
TUSCARORA TWP
BURFORD TWP
TUSCARORA INDIAN RESERVE No. 40
FIGURE 2-2
ONTARIO WATER RESOURCES COMMISSION
COUNTY OF BRANT
GROUND - WATER AVAILABILITY FROM OVERBURDEN DEPOSITS
SCALE:
DRAWN BY: R.W.
CHECKED BY:
DATE: SEPT. 1964
DRAWING No. 64-64

CHAPTER 3

WATER RESOURCES

CHAPTER 3

WATER RESOURCES

I INTRODUCTION

Both ground and surface water play an important role in the county's development and economy. Ground-water sources from wells and infiltration systems are used for municipal and private supplies, while rivers and streams are utilized as sources for municipal, industrial and agricultural requirements, for natural and storm drainage, municipal and industrial waste water disposal, and recreational purposes.

In Figure 3-1 the occurrence and extent of overburden wells is depicted while Figure 3-2 describes bedrock geology and wells.

The drainage pattern and watersheds are shown in Figure 3-3 as well as streamflow gauging stations and proposed reservoirs. Information and data for streamflow gauging stations located in and near the county are summerized in tables 3-3 and 3-4. More detailed information is published in The Water Resources Papers, Department of Northern Affairs and National Resources. Sampling locations for water quality appear on Figure 3-4.

II WATER MANAGEMENT LEGISLATION

Recognizing the problems related to multiple and frequently conflicting use of water, and the need for adequate conservation measures, the province has enacted legislation aimed at efficient management and control of water resources.

During 1961, a permit system* was introduced to provide for the fair sharing of the available supply of water and the alleviation of serious water-use interference problems.

The enactment of the Agricultural Rehabilitation and Development Act (Ontario) in 1963 provides for cost sharing agreements between the province and the Government of Canada on projects of development and conservation for agricultural purposes. These include works and research related to the conservation of soil and water.

* Under Section 28a of The Ontario Water Resources Commission Act the taking of water in an amount in excess of 10,000 gallons per day, with few exceptions, requires authorization by permit.

The Minister of Energy and Resources Management announced in 1964 a programme designed to encourage construction of farm ponds and water supply reservoirs. Subsidies amounting to 50 per cent of construction cost up to a maximum of $500 may be paid to individual farmers through the Department of Agriculture. To increase the number and speed up construction of water supply reservoirs, the Department of Energy and Resources Management increased its grant from 50 to 75 per cent of reservoir construction costs. Grants will be made available to conservation authorities undertaking such works. Where applicable, projects will be brought into agreement with the Government of Canada for cost sharing. Specific projects proposed or approved, which lie within the County of Brant are discussed elsewhere in this report.

III GROUND WATER

1. Occurrence

The distinction between ground and surface water is simply related to their relative and temporary positions with respect to the land surface. Both are part of a larger circulating system of water called the hydrologic cycle. Ground-water movement involves two interrelated zones termed the non-saturated and the saturated. The water in the saturated zone is replenished by infiltrating water previously deposited upon the ground surface in the form of rain and snow. As water infiltrates the ground it passes through the unsaturated zone, or zone of aeration, and into the zone of saturation below. In the latter zone, water fills all openings in the earth's formations. The upper surface of this zone is referred to as the water table. The depth to the water table varies from area to area depending on the elevation of the land surface, the permeability of the earth's materials and the amount of precipitation. The water table fluctuates annually and is generally highest in the spring and lowest in the fall. Very little precipitation infiltrates past the zone of aeration during the summer. In fact, during this period, a large amount of ground water is normally lost to evaporation and transpiration to the air.

Under the influence of gravity, ground water moves constantly. The rate of movement is controlled largely by the permeability of the geological formations through which the water passes. Formations consisting of fine-grained materials such as clay, silt and fine sand, generally contain more pore spaces per unit volume and thus more water than formations of coarse sand and gravel. However, because of fine grain size, water will not move through the finer materials as readily as it will through the coarser. Bedrock formations generally do not contain large volumes of water per unit volume, but fractures and joint planes in limestone and dolomite are often able to transmit appreciable quantities of water. Shales and crystalline granitic-type rocks usually contain fewer open spaces and generally do not yield much water to wells. All formations that permit the movement of substantial quantities of water through them are called aquifers.

Within the county, ground water occurs in aquifers of three general types: surface sand deposits, sand and gravel that occur deeper in the overburden, and limestone and dolomite formations of the bedrock.

In the south-western portion, the surface material is chiefly sand, and because of the generally flat topography the water table is close to the surface. Adequate water is usually obtainable from shallow dug wells and from driven well points.

In the extreme western section of the Township of Burford, the north-western two-thirds of the Township of Brantford, and most of the Township of Dumfries South, surface sand is uncommon, and because of the irregular topography the water table is often a considerable distance below the ground surface. In these areas many good sand and gravel aquifers are present within the overburden, and drilled wells generally provide the best supply of water. In places where overburden aquifers are absent, water can occasionally be found in fractures within the first few feet of the bedrock.

In the south-east part of the Township of Brantford and generally throughout the townships of Onondaga and Tuscarora, overburden aquifers are uncommon. Thus, it is usually necessary to drill wells to bedrock in order to obtain adequate quantities of water.

For a generalized understanding of the occurrence and extent of the overburden and bedrock aquifers, the accompanying figures 3-1 and 3-2 should be studied.

2. Availability

The availability of satisfactory quality ground water in the county varies from good to excellent in some sections and from poor to fair in others. In almost all cases the controlling factor is the geology.

The availability of ground water depends largely on the ability of the surrounding water-bearing formations to transmit water to the well. Overburden deposits containing coarse, sorted materials such as gravel are generally the most permeable and thus constitute the most important aquifers for the development of high capacity wells. Sand, though less permeable, is able to transmit substantial quantities of water. Silt and clay yield water very slowly. The bedrock yields various quantities of water, depending on the rock type and local permeability. Usually the first few tens of feet of rock contain the greatest number of openings and yield the most water. A few wells that have been drilled to greater depths yield large supplies. At present, insufficient deep drilling has been accomplished to outline areas where good deep-rock aquifers occur. Water quality is very likely to deteriorate with depth in the bedrock in most places.

A portion of the average annual precipitation of about 31 inches infiltrates the soil and reaches the water table to recharge ground-water aquifers. The recharge is greatest during the months of October to April when the effects of evapotranspiration are low, and is usually negligible during the summer months when growing vegitation and hot winds may actually withdraw a considerable quantity of ground water from storage. Only a small portion of the ground water is withdrawn by wells. A large part of the supply is discharged each year as springs to sustain base flow in surface streams.

The local availability of ground water is discussed under the various municipalities in the county. Figures 2-1, 3-1 and 3-2 should be studied in conjunction with this section of the report.

3. Quality

Table 3-1 summarizes the results of chemical analyses of random water samples collected from various aquifers and provides a general appreciation of ground-water quality in the county.

The analyses indicate that water from overburden aquifers is generally quite hard but suitable for most purposes. The iron content varies widely and may often exceed the 0.30 ppm recommended limit for municipal supplies. Chlorides in excess of 50 ppm in shallow overburden aquifers can be attributed possibly to surface contamination.

Table 3-1

Ground Water Quality - County of Brant

Aquifer	Hardness as $CaCO_3$ (ppm)	Alkalinity as $CaCO_3$ (ppm)	Iron as Fe (ppm)	Chlorides as Cl (ppm)	pH at Lab	Sulphates as SO_4 (ppm)
Surface Sand	240 to 470	188 to 530	0.08 to 11.2	26 to 51	7.2 to 7.7	-
Sand and Gravel in Overburden	250 to 314	216 to 246	0.00 to 13.0	2 to 65	7.2 to 7.6	-
Bedrock	230 to 1,870	34 to 272	0.69 to 13.0	1 to 49	6.8 to 7.8	15 to 2,080

Water from rock wells commonly contains hydrogen sulphide which may make the water non-potable. The amount of sulphide seems to increase as greater depths of rock are penetrated. Water from rock wells that penetrate the Salina formation underlying the central section of the county usually has an excessively high sulphate hardness. The sulphate content is due likely to the dissolving of gypsum as the water moves slowly through gypsum-bearing Salina shales and dolomites. Iron in bedrock wells often exceeds the recommended level. Small quantities of natural fluorides are usually present in water from bedrock wells.

Generally speaking, water from the Guelph, Bass Island and Bois Blanc formations is of better chemical quality than water from the Salina rocks.

IV SURFACE WATER

1. Water Supply

The City of Brantford is the only municipality relying on the Grand River for water supply. A number of industries within the county employ individual pumping facilities for industrial requirements.

In addition to livestock watering, the streams are used extensively as sources for irrigation. This occurs mainly in the townships of Brantford and Burford where tobacco is an important crop, and in scattered areas throughout the county where soils are suitable for market garden crops.

At the end of 1963, there were 241 irrigators within the county holding permits to take water from streams, stream-fed ponds and dugout ponds fed by ground water seepage. The total amount of daily taking, authorized by permit, was approximately 71.9 million gallons per day. Irrigation usage data is summarized in Table 3-2.

2. Waste Water Disposal

The Grand River receives the effluents from municipal sewage treatment plants at Paris and Brantford. A variety of industrial wastes are discharged partially treated or untreated to the stream.

The reliance upon surface waters to receive and carry away water-borne municipal and industrial wastes requires that close attention be given to the quantity and quality of waste discharges. Following the treatment process, residual amounts of pollutants remain in waste effluents and these are further purified or assimilated by natural oxygenation processes and dilution in the receiving bodies of water. It is the Commission's concern that these natural capabilities of lakes and streams can be considered in planning measures and put to reasonable use.

3. Streamflow

Only three of the several gauging stations shown in Table 3-3, lie within the county. The records of the other gauges beyond the county are also of significance. Two additional stations are being proposed for Fairchild Creek near Brantford and Mount Pleasant Creek north of Burtch.

Two automatic recording gauges are located on the Grand River; the one at Galt has been in operation since 1913 and the one at Brantford since 1947, with additional records for the years 1913 to 1922 inclusive. There is an automatic recording gauge on the Nith River at Canning with records similar to the Brantford gauge.

Table 3-4 shows the maximum daily, average daily, average summer, minimum month, minimum summer month, minimum seven day and minimum day discharges in cubic feet per second for the streams at the previously mentioned gauging stations. The records are shown for the period of continuous operation of the gauge or, in the case of the station at Galt, for the period since 1942, which was the year the Shand Dam was installed. This table clearly shows the variations in flow which are experienced and indicates what flows may be expected under existing conditions.

TABLE 3-2

IRRIGATION USE OF SURFACE WATERS

FROM STREAMS AND DUGOUT PONDS

COUNTY OF BRANT

	Number of Irrigators	Flow* (mgd)	Purpose					Source	
			T	M	Pa	C	P	S	Po
Grand River	1	.461	1						2
Nith River	6	1.168	6					2	7
Whiteman Creek	62	21.121	61	4			1	32	52
Mount Pleasant Creek	8	2.389	8					12	2
Fairchild Creek	4	1.056	2	1		1		4	
Boston and McKenzie creeks	46	13.726	44		2			7	56
Big Creek	101	27.675	101					10	134
Big Otter Creek	13	4.327	13	3				-	23
Total	241	71.923	236	8	2	1	1	67	276

Legend:

T - Tobacco
M - Market garden
C - Corn
Pa - Pasture
P - Potatoes

S - Stream-fed pond or stream
Po - Dugout pond not connected to stream

* These figures represent the amount of water authorized for withdrawal under a permit system. It does not necessarily represent actual withdrawals since all irrigators would not irrigate on the same day. Data are for the years 1961, 1962 and 1963.

TABLE 3-3

SUMMARY OF STREAMFLOW - GAUGING STATIONS

Station* Number	Stream	Location	Drainage Area in Square Mi.	Period of Record	Years of Record	Average Annual (cfs)	DISCHARGE Maximum (Date)	Maximum (cfs)	Minimum (Date)	Minimum (cfs)
2GA3	Grand R.	At Galt	1,360	1913- Present	50	1,185	Oct.16 1954	40,300	Aug.9 1936	26
2GB1	Grand R.	At Brantford	2,010	1913-1922 1947- Present	25	1,769	Mar.20 1954	47,800	Since 1947 Oct.12 1948	65**
2GB6	Horner Creek	Near Princeton	58	1953- Present	10	59	Feb.17 1954	1,420	At Various Times	0
2GA10	Nith R.	Near Canning	398	1913-1922 1947- Present	22	362	Oct.16 1954	11,600	Sept.12 1914	16
2GB8	Whiteman Creek	Near Mt.Vernon	148	1961- Present	-	-	Mar.27 1963	1,490	July 19 1962	7.5
2GB9	Kenny Creek	Near Burford	35.5	"	-	-	Mar.13 1962	530	At Various Times. 1962	0.4

TABLE 3-3 (CONT'D)

Station* Number	Stream	Location	Drainage Area in Square Mi.	Period of Record	Years of Record	Average Annual (cfs)	DISCHARGE Maximum (Date)	Maximum (cfs)	Minimum (Date)	Minimum (cfs)
2GB10	McKenzie Creek	Near Caledonia	66.0	1961-Present			Mar.18 1963	643	Sept.14 1961	0.1
	Fairchild Creek	Near Brantford		-						
	Mt.Pleasant Creek	North of Burtch		-						
	Big Creek	Near Kelvin		1963-Present						

* Station number used by Department of Northern Affairs and National Resources, Water Resources Branch.

** The minimum discharge recorded prior to the construction of any of the dams is 30 cfs on Aug. 2nd 1914.

TABLE 3-4

FLOWS IN GRAND RIVER AND TRIBUTARIES

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
2GA3 GRAND RIVER AT GALT - DRAINAGE AREA 1,360 sq. mi.							
1963	12,400	886	501	430	465	305	255
1962	11,000	728	476	275	444	270	238
1961	6,110	765	652	300	580	155	155
1960	24,000	1,700	810	706	706	424	405
1959	17,300	1,150	606	299	578	277	252
1958	14,000	847	443	349	349	242	222
1957	12,000	1,170	859	592	592	428	389
1956	23,100	1,750	1,139	393	773	313	228
1955	40,300	1,490	423	332	332	280	255
1954	17,800	1,220	461	435	435	299	257
1953	12,600	1,150	834	235	389	178	130
1952	13,500	1,420	400	301	301	212	198

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
1951	18,500	1,820	598	425	448	313	295
1950	26,800	1,460	460	211	427	172	158
1949	23,200	962	415	252	252	115	88
1948	37,700	1,210	308	148	261	176	137
1947	36,800	1,940	1,091	246	610	130	112
1946	18,670	1,190	386	283	283	164	151
1945	16,780	1,230	765	314	334	214	169
1944	13,390	1,020	395	269	269	140	121
1943	25,620	2,010	440	318	318	212	193
2GB1 GRAND RIVER AT BRANTFORD - DRAINAGE AREA 2,010 sq. mi.							
1963	20,900	1,310	629	560	577	428	428
1962	15,400	1,120	678	431	621	398	398
1961	9,160	1,090	882	226	810	212	212
1960	37,600	2,420	1,060	816	816	722	644

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
1959	23,100	1,700	747	469	701	423	384
1958	19,100	1,320	662	483	483	393	363
1957	15,400	1,800	1,200	750	750	688	650
1956	35,100	2,640	1,897	630	1,230	449	363
1955	39,000	2,070	568	465	465	447	358
1954	31,500	1,810	637	512	586	446	394
1953	14,100	1,690	1,204	423	525	361	334
1952	18,300	2,030	606	490	490	366	334
1951	26,300	2,470	859	618	638	492	471
1950	45,100	2,230	662	379	633	329	245
1949	24,600	1,430	469	281	379	188	65
1948	47,800	1,830	-	-	-	-	-

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
2GB6 HORNER CREEK NEAR PRINCETON - DRAINAGE AREA 58 sq. mi.							
1963	1,030	39.1	9.2	4.8	4.8	4.2	3.2
1962	763	38.0	9.8	6.0	6.0	0.5	0.2
1961	972	39.5	15.5	4	9.5	4.0	0.8
1960	1,320	90	27	10.0	10.0	7.6	6.0
1959	1,080	64	14	6.2	6.2	0.0	0.0
1958	725	44	11	3	3	1	1
1957	560	67	28	8	8	7	5
1956	1,360	94	88	22	41	9	7
1955	1,020	50	5	4	4	0	0
1954	1,420	57	6	3	3	2	2

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
2GA10 NITH RIVER NEAR CANNING - DRAINAGE AREA 398 sq. mi.							
1963	8,590	239	73	60	60	57	48
1962	5,910	235	87	71	71	55	52
1961	2,920	215	122	64	104	61	59
1960	8,760	480	153	83	83	79	74
1959	6,000	364	96	77	77	63	61
1958	5,030	270	119	73	73	56	47
1957	4,050	346	153	93	93	84	75
1956	8,100	520	312	135	216	67	64
1955	11,600	402	86	72	72	50	46
1954	10,600	366	89	76	76	68	58
1953	3,130	344	246	91	92	70	60
1952	3,900	391	103	94	94	74	58
1951	5,700	465	146	102	104	85	50

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
1950	11,600	445	109	90	90	67	60
1949	6,130	297	69	63	63	49	20
1948	10,500	387	97	67	67	57	45
2GB8 WHITEMAN CREEK NEAR MOUNT VERNON - DRAINAGE AREA 148 sq. mi.							
1963	1,490	91.4	27.1	18.0	18.0	17.1	15.3
1962	757	75.5	34.5	23.9	23.9	8.6	7.5
1961			38.7		26.6	22.0	10.2
2GB9 KENNY CREEK NEAR BURFORD - DRAINAGE AREA 35.5 sq. mi.							
1963	480	26.0	2.0	1.1	1.1	1.0	0.7
1962	530	15.8	5.4	1.4	3.2	0.4	0.4
1961			3.4		1.8	1.1	1.0

TABLE 3-4 (CONT'D)

Water* Year Ending	Maximum Day (cfs)	Average Day (cfs)	Average Summer[1] (cfs)	Minimum Month (cfs)	Minimum Summer[2] Month (cfs)	Minimum 7-Day (cfs)	Minimum Day (cfs)
	2GB10 McKENZIE CREEK NEAR CALEDONIA - DRAINAGE AREA 66 sq. mi.						
1963	643	36.4	6.7	2.2	2.2	0.9	0.5
1962	299	28.1	6.6	2.3	2.3	0.2	0.2
1961			13.4		7.9	2.4	0.1

* Water Year - a twelve-month period from October 1 to September 30 inclusive.

1 - average for June, July, August and September.

2 - minimum of June, July, August and September.

In 1963 a streamflow gauging station equipped with an automatic recorder was installed on Big Creek at Kelvin. The records from this station will provide useful water resources data.

There are no stream measuring gauges on Big Otter Creek within the county.

4. Water Quality

Pollution of the main section of the Grand within the county is generally confined to the Paris and Brantford areas (Table 3-5). The discharge of raw or inadequately treated domestic and industrial wastes from the Town of Paris contributes to deterioration of the Grand River. This has been reduced and will be eliminated when the sewer system is extended to serve the entire municipality. Excellent progress in pollution abatement has been achieved by the City of Brantford. However, serious contamination continues as a result of wastes discharging from the Canada Glue Company Limited plant.

The Nith River is in satisfactory condition as it flows into the county (Table 5-3). Some pollution occurs at Paris above the junction with the Grand River (Table 5-1). This results from the discharge of inadequately treated domestic waste to the Nith River via municipal storm drains.

The water quality of McKenzie Creek is generally satisfactory (Table 3-6). Some bacteriological contamination in Scotland Creek (sampling point GBOMS 66.6) may have resulted from malfunctioning private sewage disposal systems.

Whiteman Creek is generally satisfactory (Table 3-7), with the exception of the result obtained above the junction with the Grand River. There is no apparent reason for the adverse quality at this location.

The water quality in Mount Pleasant Creek is generally acceptable (Table 3-8). Some deterioration may occur during low flow periods in the Burtch Creek tributary (sampling point GMPB 52.9) due to the effluent discharge from the Burtch Industrial Farm sewage treatment plant.

Fairchild Creek is subjected to serious pollution in the St. George Creek tributary as a result of waste discharges from the Police Village of St. George (Table 8-1). Natural recovery of the stream is apparent from the results obtained at sampling point GF 43.3, Table 3-5, as it flows through rural areas to the Grand River.

TABLE 3-5

SAMPLE RESULTS - GRAND RIVER - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
G 82.8	May 21/64	Grand River at dam at Glen Morris.	2.3	382	8	374	0.3	410
G 75.6	May 13/64	Grand River at Paris dam.	2.3	414	4	410	0.2	340
GN 75.3	May 13/64	Nith River at Hwy. 24A, Paris, at mouth of river.	2.3	544	41	503	0.0	730
G 73.2	May 13/64	Grand River below Paris at road between Conc.1 and 2.	2.4	308	7	301	0.2	820
GM 70.6	May 20/64	Whiteman Creek at river road, west side of Grand River.	9.0	444	7	437	0.0	260
GBC 66.5	May 13/64	Brantford Canal at water works.	1.7	428	16	412	0.1	510
G 62.8	May 13/64	Grand River at junction Hwy.2 and 24.	1.7	416	13	403	0.1	4,800

TABLE 3-5 (CONT'D)

SAMPLE RESULTS - GRAND RIVER - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
G 59.1	May 13/64	Grand River at main road to Burtch.	2.6	442	13	429	0.1	4,000
G 54.5	May 13/64	Grand River at Cainsville below Brantford.	4.3	470	41	429	0.1	10,300
GMP 48.9	May 20/64	Mt.Pleasant Creek at river road.	1.4	484	19	465	0.0	400
GF 43.3	May 13/64	Fairchild Creek at Hwy. 54.	2.4	502	63	439	0.0	40,000
G 39.5	May 13/64	Grand River at Chiefswood Fairy.	3.9	532	64	468	0.1	600

TABLE 3-6

SAMPLE RESULTS - McKENZIE CREEK - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F. Coliform Count per 100 ml
GBOMS 66.6	May 20/64	Scotland Creek above junction.	2.8	298	18	280	0.0	5,900
GBOM 66.5	May 20/64	East of Scotland, 0.5 mile.	0.7	388	5	383	0.0	280
GBOM 64.3	May 20/64	At Hwy.24, south of Oakland.	2.7	332	16	316	0.0	570
GBOM 56.9	May 20/64	Victoria Mills (Tuscarora Reserve).	2.0	442	56	386	0.0	80

TABLE 3-7

SAMPLE RESULTS - WHITEMAN CREEK - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GMK 86.7	May 20/64	Kenny Creek at county line.	1.9	500	9	491	0.0	300
GMK 80.8	May 20/64	Kenny Creek at Hwy.53.	1.5	422	6	416	0.0	230
GMH 80.8	May 20/64	Horner Creek at Conc.5, Burford Township.	1.2	452	6	446	0.0	170
GM 81.2	May 20/64	Whiteman Creek at side road west of junction.	1.0	442	5	437	0.0	150
GMS 77.9	May 20/64	Lewis drain, west of Burford.	No flow					
GM 76.6	May 20/64	Whiteman Creek, north of Burford.	1.1	438	5	433	0.0	20
GM 74.2	May 20/64	Whiteman Creek, north of Mount Vernon.	1.0	430	4	426	0.0	30
GM 70.6	May 20/64	Whiteman Creek at river road above junction Grand River.	9.0	444	7	437	0.0	260

TABLE 3-8

SAMPLE RESULTS - MOUNT PLEASANT CREEK - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GMP 57.0	May 20/64	North-west of Mount Pleasant.	2.3	362	7	355	0.0	220
GMP 54.8	May 20/64	At Hwy.24	1.4	538	12	526	0.0	380
GMP 54.0	May 20/64	Between Conc.1 and 2.	1.3	502	15	487	0.0	630
GMP 52.8	May 20/64	West of Burtch Creek junction.	1.8	516	53	463	0.0	2,500
GMPB 52.9	May 20/64	Burtch Creek.	4.4	698	94	604	0.4	0
GMP 52.0	May 20/64	Approx.0.33 mile below Burtch.	1.5	478	19	459	0.0	510
GMP 50.7	May 20/64	Between Conc.1 and 2.	1.4	484	19	465	0.0	200
GMP 48.9	May 20/64	At river road to Newport.	1.4	540	15	525	0.0	400

The quality of the water in Big Creek has been generally satisfactory as indicated by the summary of sample results shown in Table 3-9.

On Big Otter Creek, water quality data (Table 3-10) at Concession Road No. 1, Township of Windham, just east of the Norfolk County Line has been satisfactory.

V CONSERVATION COMMISSION AND AUTHORITIES

1. The Grand River Conservation Commission

The Grand River Conservation Commission was established by the Grand River Conservation Act, 1938. Two of the eight member municipalities, are the City of Brantford and the Town of Paris. One of its purposes is the construction and operation of dams for the conservation of public water supplies and for flood control. Streamflow is regulated by the release of stored waters to supplement natural low flows in order to provide sufficient water for municipal water supply and waste dilution needs. The Conservation Commission has constructed the Shand, Luther, and Conestoga dams, having a total storage capacity of 105,000 acre-feet.

In June, 1964, the Grand River Conservation Commission submitted to the federal and provincial governments a report entitled, "Plan for Flood Control and Water Conservation in the Grand River Watershed". In addition to flood control problems, the report deals with the continuing need to use the river to carry away water-borne wastes. Additional conservation water storage is required to supplement low flows and thereby improve the quality of the river water.

The Commission proposed the construction of dams and reservoirs at West Montrose and Ayr with storage capacities of 55,790 and 83,130 acre-feet respectively. The summary below is reproduced from the report and shows the low flows at various return periods which may be expected at Galt and Brantford if the proposed dams are constructed.

City	Return Period in Years	Sustained Flow in cfs June-February (incl.)
Galt	1 in 50	385
	1 in 25	420
	1 in 10	480
	1 in 3	625
	Average	900

TABLE 3-9

SAMPLE RESULTS - BIG CREEK - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Total Solids (ppm)	Turbidity Units	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
B 43.9	July 30/59	At county line just east of Kelvin.	1.9	288	4.0	--	20,000
	July 21/60		4.5	324	5.0	--	47,000
	Aug. 14/61		0.6	368	1.0	--	72
	May 17/62		1.1	384	2.9	--	80
	April 10/63		2.4	338	1.4	--	40
	Oct. 8/63		1.4	324	2.6	Trace	160

TABLE 3-10

SAMPLE RESULTS - BIG OTTER CREEK - COUNTY OF BRANT

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Turbid-ity Units	Anionic Detergents as ABS (ppm)	M.F. Coliform Count per 100 ml
O 49.3	Aug.11/60	At Conc.road just east of Norfolk County Line.	1.7	--	--	--	3.0	--	81
	July 31/61		0.9	342	--	--	1.0	0.0	
	May 10/62		3.6	410	--	--	2.5	--	
	May 15/63		2.6	344	--	--	1.5	0.0	66
	June 3/64		0.9	322	4	318	--	0.0	

City	Return Period in Years	Sustained Flow in cfs June-February (incl.)
Brantford	1 in 50	595
	1 in 25	655
	1 in 10	740
	1 in 3	930
	Average	1,320

The flows in this table may be compared with the long-term flows experienced in the Grand River at Galt and Brantford which are recorded as 26 and 30 cfs respectively.

Table 3-11 shows reservoirs constructed, proposed or under study by the Grand River Conservation Commission and indicates estimated capacities and project status.

Table 3-11

Reservoirs of the Grand River Conservation Commission

Reservoir	Capacity (Ac. ft.)	Remarks
Shand	49,600	constructed 1942
Luther	10,000	constructed 1954
Conestogo	45,060	constructed 1958
Ayr	83,130	proposed 1970 construction
West Montrose	55,790	proposed 1965 construction
Nithburg		future available site

Although not within the county, these dams and reservoirs play a significant role in the surface-water resources of the county.

2. Grand Valley Conservation Authority

The Grand Valley Conservation Authority has jurisdiction over the entire drainage basin of the Grand River. The Authority was established on February 26, 1948, under the Conservation Authorities Act. Because of the role of the Grand River Conservation Commission, an agreement was reached whereby the Commission looks after the building of large dams and confines its other conservation activities to Commission lands. The Authority is concerned with reforestation, land-use problems, wildlife, recreation and flood-control measures other than large dams.

The following conservation reports have been prepared by the Conservation Authorities Branch, Department of Energy and Resources Management*.

Nith Valley Conservation Report, 1951
Speed Valley Conservation Report, 1953
Grand Valley Conservation Report, 1954
Grand River Conservation Report (Hydraulics),
First edition, 1954
Second edition, 1962
Whiteman Creek Conservation Report, 1962

Particular reference is made to the Grand River Conservation Report (Hydraulics) which includes plans for consideration by both the Commission and the Authority for reservoirs and other conservation measures.

Table 3-12 summarizes the reservoirs proposed or under study by the Authority. The reservoirs at Vandecar, Princeton and Colles Lake, located within or near the County of Brant, are proposed in part for agricultural supply purposes and will play an important role in meeting irrigation and other water requirements locally.

Table 3-12

Reservoirs of the Grand Valley Conservation Authority

Reservoir	Capacity (Ac. ft.)	Remarks
Guelph	-	Under study
Everton	-	Under study
Hespeler	-	Under study
Harrisburg	15,000	Under study
Laurel Creek	2,120	Proposed early construction
Vandecar	1,240	Proposed early construction
Princeton	2,500	Proposed early construction
Colles Lake	600	Proposed early construction

* This branch was previously in the Department of Lands and Forests and at earlier dates was the Conservation Branch with the departments of Commerce and Development, and Planning and Development.

3. Big Creek Region Conservation Authority

Big Creek Region Conservation Authority has jurisdiction over the drainage basins of Big Creek, Lynn River and a number of adjacent small basins. The region covers an area of 610 square miles of which 42 square miles are in the county and is bounded by the basins of Otter Creek on the west, the Thames and Grand rivers on the north and Sandusk Creek on the east.

The Big Creek Region Conservation Report, 1958, makes recommendations related to water resources. The authority has a broad programme of flood control and water conservation projects. While potential pond sites are described in the County of Brant, no major dams or reservoirs have been constructed or are being planned.

4. Otter Creek Conservation Authority

The Authority has jurisdiction over Big Otter Creek watershed and those smaller watersheds which drain into Lake Erie from the east boundary of the Big Creek region. It covers an area of 273 square miles, of which 9 square miles lie within the County of Brant.

The Otter Creek Conservation Report, 1957, makes recommendations related to flood control and water resources projects. There are no major dams or reservoirs planned for construction in the County of Brant.

VI CONCLUSIONS

The availability of satisfactory quality ground and surface water is essential to the county's continued development.

Legislation has been enacted by the province with the purpose of managing and controlling the demands made on these resources. Financial assistance has been made available for the construction of water reservoirs for agricultural and conservation purposes.

In certain areas ground water offers a supplemental source of supply although problems with quality may be experienced. The Commission may provide assistance to municipalities in undertaking ground-water surveys and evaluating potential supplies.

Increased use of surface waters will require that further pollution control measures be implemented.

These efforts will compliment conservation programmes involving flow regulating devices. The surface-water quality indicates that remaining sources of pollution have an adverse effect on the Grand River.

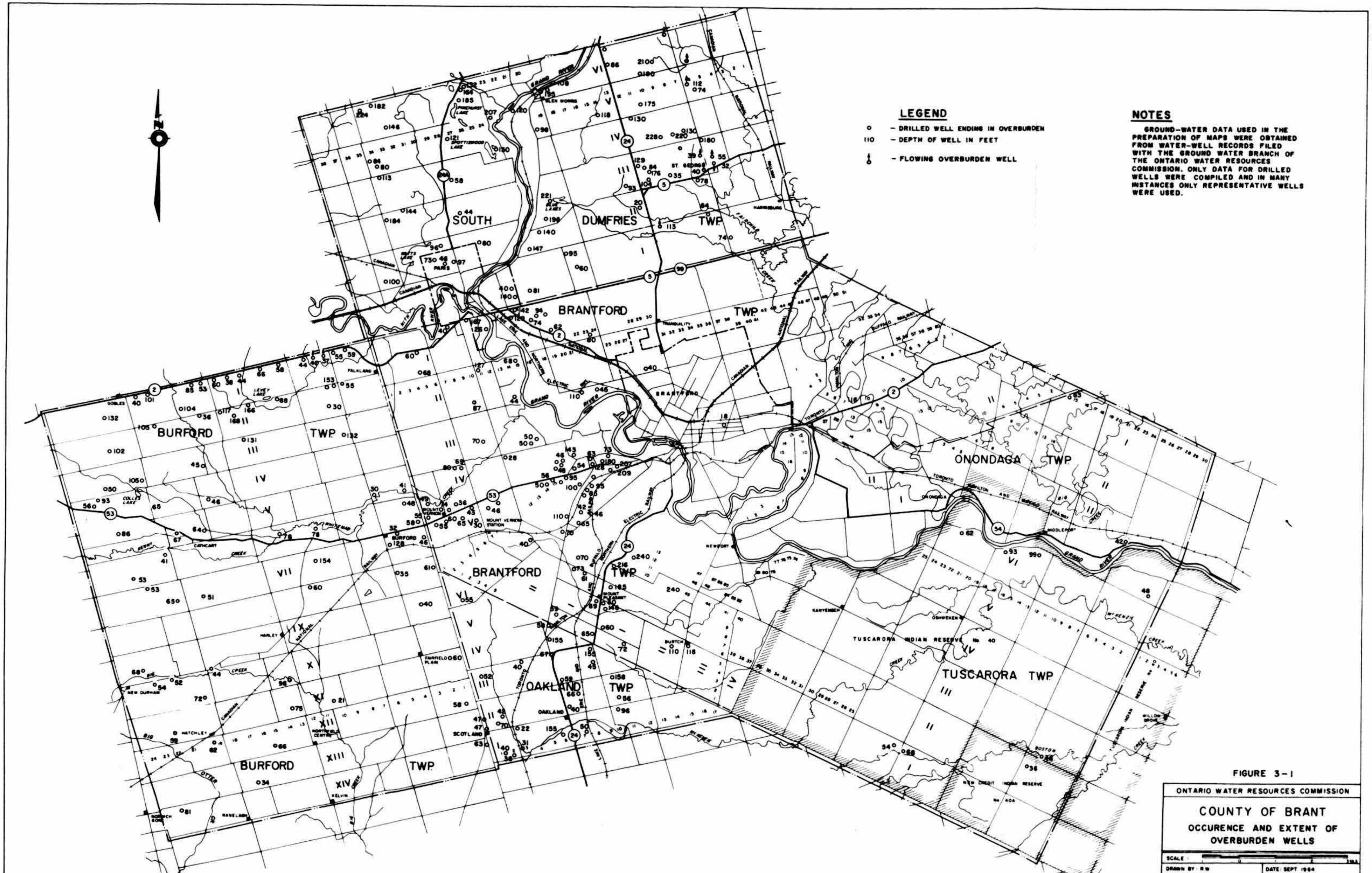
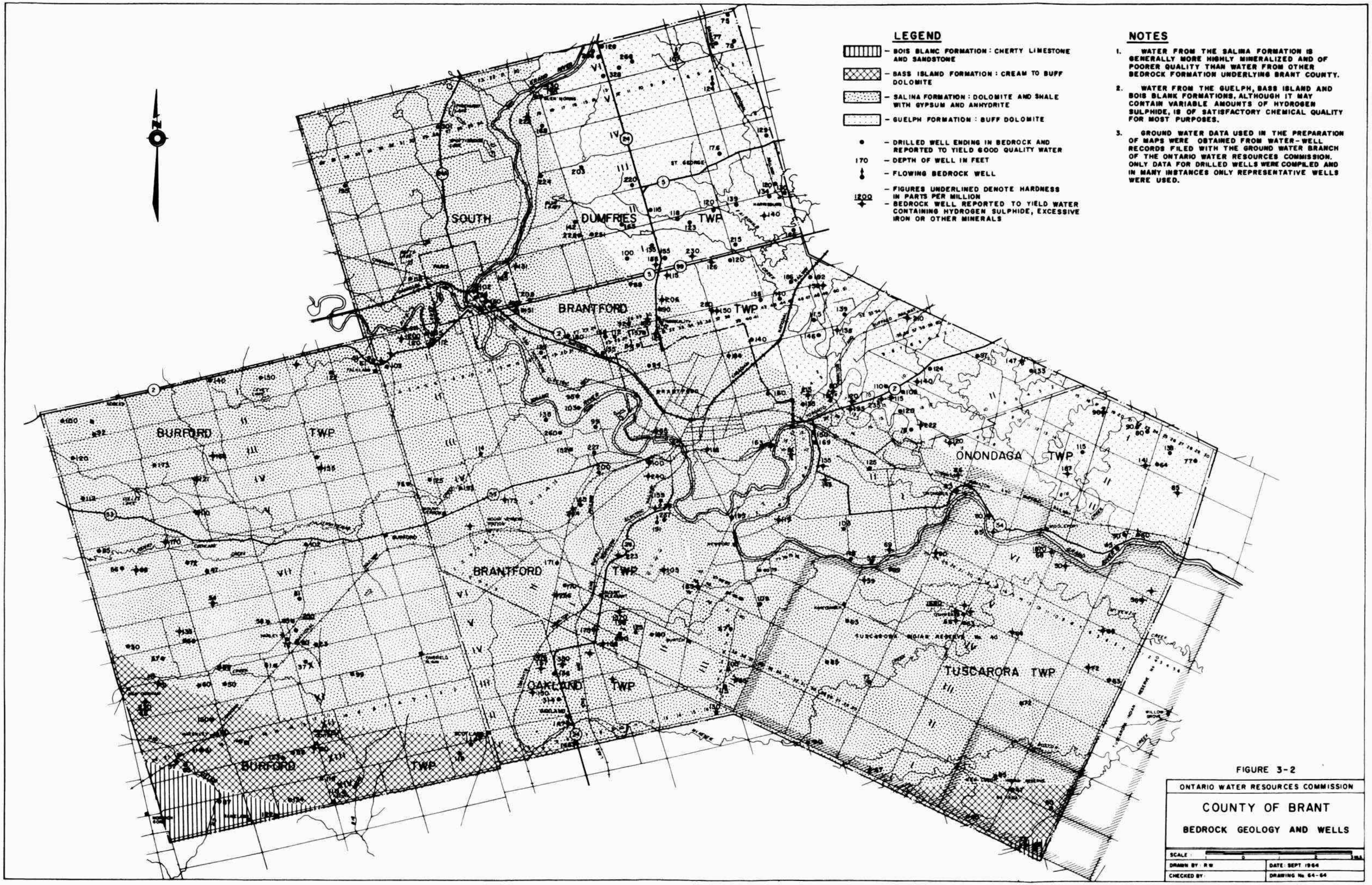
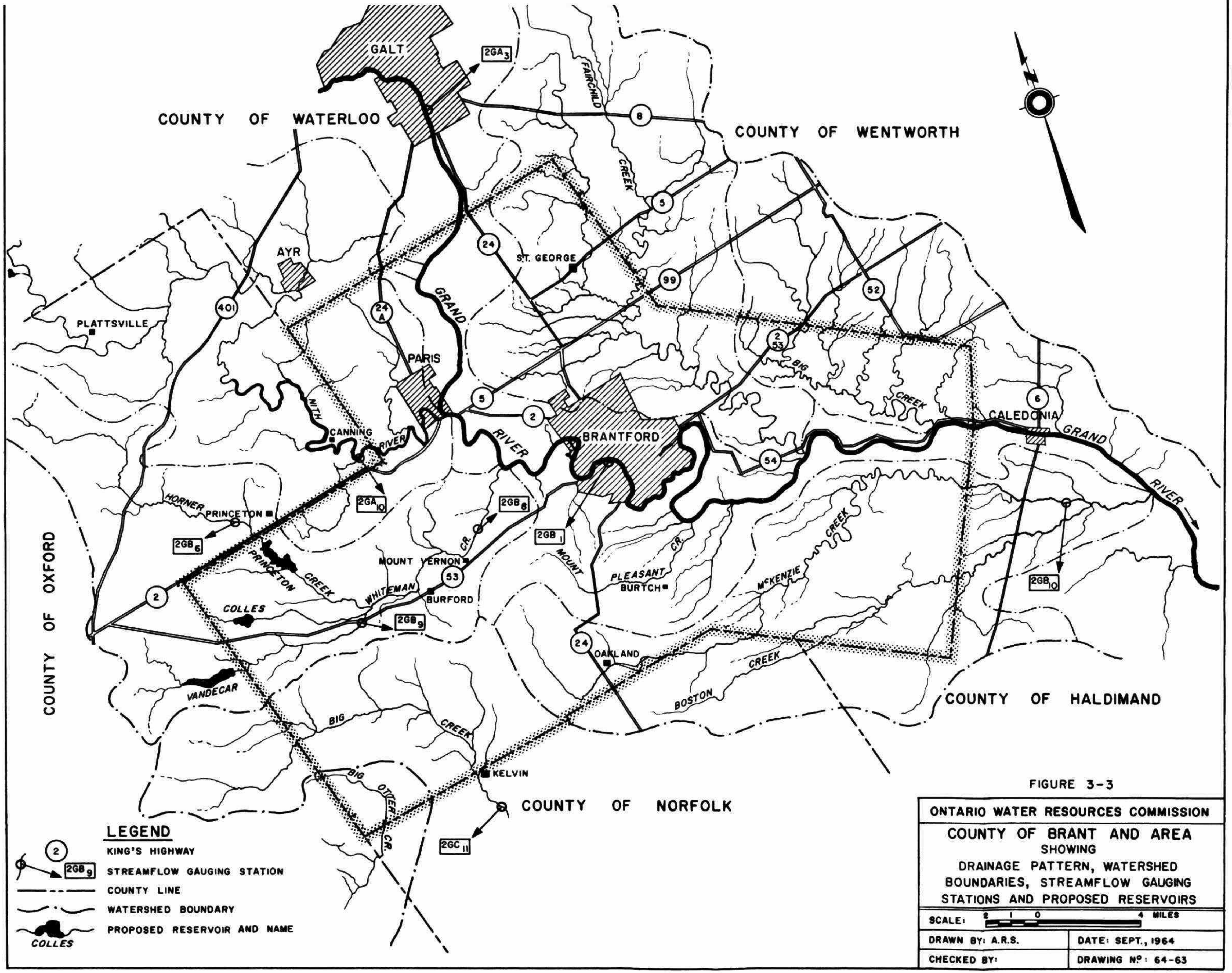

LEGEND
o - DRILLED WELL ENDING IN OVERBURDEN
110 - DEPTH OF WELL IN FEET
- FLOWING OVERBURDEN WELL
NOTES
GROUND-WATER DATA USED IN THE PREPARATION OF MAPS WERE OBTAINED FROM WATER-WELL RECORDS FILED WITH THE GROUND WATER BRANCH OF THE ONTARIO WATER RESOURCES COMMISSION. ONLY DATA FOR DRILLED WELLS WERE COMPILED AND IN MANY INSTANCES ONLY REPRESENTATIVE WELLS WERE USED.
SOUTH DUMFRIES TWP.
BRANTFORD TWP.
BURFORD TWP.
ONONDAGA TWP.
TUSCARORA TWP.
OAKLAND TWP.
BRANTFORD
TUSCARORA INDIAN RESERVE No. 40
NEW CREDIT INDIAN RESERVE No. 40A
GRAND RIVER
ONTARIO WATER RESOURCES COMMISSION
COUNTY OF BRANT
OCCURENCE AND EXTENT OF OVERBURDEN WELLS
SCALE
DRAWN BY: R.W.
DATE: SEPT 1964
CHECKED BY:
DRAWING No. 64-64

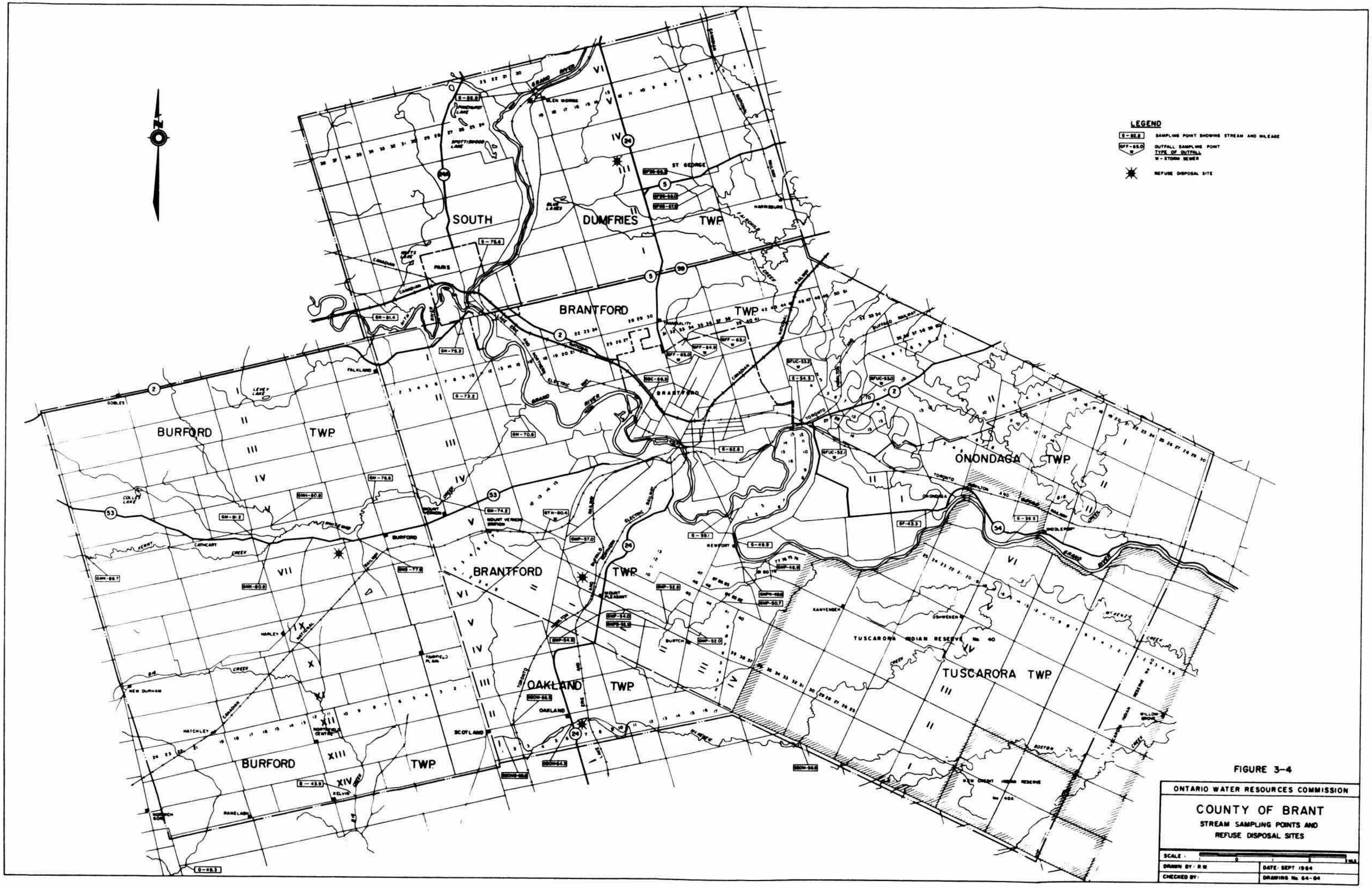
FIGURE 3-1



LEGEND
- BOIS BLANC FORMATION : CHERTY LIMESTONE AND SANDSTONE
- BASS ISLAND FORMATION : CREAM TO BUFF DOLOMITE
- SALINA FORMATION : DOLOMITE AND SHALE WITH GYPSUM AND ANHYDRITE
- GUELPH FORMATION : BUFF DOLOMITE
- DRILLED WELL ENDING IN BEDROCK AND REPORTED TO YIELD GOOD QUALITY WATER
170 - DEPTH OF WELL IN FEET
- FLOWING BEDROCK WELL
- FIGURES UNDERLINED DENOTE HARDNESS IN PARTS PER MILLION
1200
- BEDROCK WELL REPORTED TO YIELD WATER CONTAINING HYDROGEN SULPHIDE, EXCESSIVE IRON OR OTHER MINERALS
NOTES
1. WATER FROM THE SALINA FORMATION IS GENERALLY MORE HIGHLY MINERALIZED AND OF POORER QUALITY THAN WATER FROM OTHER BEDROCK FORMATION UNDERLYING BRANT COUNTY.
2. WATER FROM THE GUELPH, BASS ISLAND AND BOIS BLANK FORMATIONS, ALTHOUGH IT MAY CONTAIN VARIABLE AMOUNTS OF HYDROGEN SULPHIDE, IS OF SATISFACTORY CHEMICAL QUALITY FOR MOST PURPOSES.
3. GROUND WATER DATA USED IN THE PREPARATION OF MAPS WERE OBTAINED FROM WATER-WELL RECORDS FILED WITH THE GROUND WATER BRANCH OF THE ONTARIO WATER RESOURCES COMMISSION. ONLY DATA FOR DRILLED WELLS WERE COMPILED AND IN MANY INSTANCES ONLY REPRESENTATIVE WELLS WERE USED.
SOUTH DUMFRIES TWP
BRANTFORD TWP
BURFORD TWP
ONONDAGA TWP
BRANTFORD TWP
OAKLAND TWP
TUSCARORA TWP
BURFORD TWP
ST. GEORGE
ONTARIO WATER RESOURCES COMMISSION
COUNTY OF BRANT
BEDROCK GEOLOGY AND WELLS
SCALE
DRAWN BY : R W
DATE : SEPT 1964
CHECKED BY :
DRAWING No. 64-64

FIGURE 3-2


GALT
2GA3
COUNTY OF WATERLOO
FAIRCHILD CREEK
COUNTY OF WENTWORTH
AYR
ST. GEORGE
PLATTSVILLE
GRAND RIVER
PARIS
NITH RIVER
CANNING
BRANTFORD
BIG CREEK
CALEDONIA
GRAND RIVER
2GA10
2GB8
2GB1
HORNER
PRINCETON
2GB6
PRINCETON CREEK
MOUNT VERNON
WHITEMAN CR.
BURFORD
COLLES
2GB9
MOUNT PLEASANT CR.
BURTCH
McKENZIE CREEK
2GB10
OAKLAND
BOSTON CREEK
VANDECAR
COUNTY OF OXFORD
COUNTY OF HALDIMAND
BIG CREEK
BIG OTTER CR.
KELVIN
COUNTY OF NORFOLK
2GC11
LEGEND
KING'S HIGHWAY
STREAMFLOW GAUGING STATION
COUNTY LINE
WATERSHED BOUNDARY
PROPOSED RESERVOIR AND NAME
FIGURE 3-3
ONTARIO WATER RESOURCES COMMISSION
COUNTY OF BRANT AND AREA
SHOWING
DRAINAGE PATTERN, WATERSHED BOUNDARIES, STREAMFLOW GAUGING STATIONS AND PROPOSED RESERVOIRS
SCALE: 2 1 0 4 MILES
DRAWN BY: A.R.S.
DATE: SEPT., 1964
CHECKED BY:
DRAWING Nº: 64-63



ONTARIO WATER RESOURCES COMMISSION

COUNTY OF BRANT

STREAM SAMPLING POINTS AND REFUSE DISPOSAL SITES

CHAPTER 4

CITY OF BRANTFORD

CHAPTER 4

CITY OF BRANTFORD

I GENERAL

The City of Brantford is situated in the heart of the County of Brant. The Grand River flows in meanders through the south-west portion of the city.

The 1963 assessed population was 54,917. Some 138 small and medium-sized industrial and commercial enterprises and at least four large industrial complexes are located at Brantford.

II WATER SUPPLY

1. Municipal

(a) Source

Raw water is obtained from the Grand River via the Holmedale Canal. The water requires extensive treatment to improve its palatability, and the water temperature in the summer months is somewhat warm.

(b) Treatment

Treatment includes: pre-chlorination, screening, air mixing, the addition of several water works chemicals, (as required), flash mixing, flocculation, sedimentation, and filtration. Chemical treatment comprises the use of activated carbon, ammonia, sulphuric acid-activated silica, alum and lime, and the addition of sodium silicofluoride and sulphur dioxide or post-chlorine or ammonia. More than 1,260 tons of chemicals were used during 1963.

(c) Water Consumption

A summary of water consumption for 1960, 1961, 1962 and 1963 is shown below.

	1960	1961	1962	1963
Total Consumption (mg)	2,146.814	2,231.335	2,303.418	2,594.445
Average Daily Consumption (mgd)	5.866	6.113	6.310	7.108
Maximum Day (mgd)	9.325	9.025	10.010	11.970
Population (Municipal (Directory)	53,616	54,425	54,372	54,917
Average Per Capita Consumption (gpcd)	109.4	112.3	116.1	129.4

The average daily consumption in 1963 increased by 12.6 per cent over the 1962 level and represented 93.6 per cent of the nominal plant capacity of 7.590 mgd. The maximum day consumption in 1963 was 168 per cent of the average day. The industrial water consumption represents approximately 50 per cent of the average daily pumpage.

(d) Water Quality

While the raw water quality is not ideal, the treated water is generally quite palatable. A summary of the chemical quality of the raw and treated waters is shown.

	Raw Water*			Treated Water**		
	Avg.	Max.	Min.	Avg.	Max.	Min.
Hardness as $CaCO_3$ (ppm)	275	370	174	341	382	300
Alkalinity as $CaCO_3$ (ppm)	195	246	140	187	220	156
Iron as Fe (ppm)	0.69	2.60	0.16	0.10	0.16	0.05
Chloride as Cl (ppm)	29	54	12	46	62	34
Fluoride as F (ppm)	-	-	-	0.9	1.2	0.7
pH at OWRC Laboratory	8.1	9.2	7.8	7.8	7.9	7.6
Apparent Colour Units	23	40	5	<5	<5	<5
Turbidity Units	13.8	74.0	1.4	2.1	3.6	0.5

* - 11 samples
** - 3 samples

These results indicate the efficiency of the treatment processes and suggest that the treated water is very hard but otherwise of satisfactory chemical quality. The sanitary chemical analyses of the raw water are given in sampling point GBC 66.5.

The bacteriological quality of the treated water in the distribution system has been satisfactory. This is one of the few plants in Ontario where free residual chlorination is practised.

(e) Distribution

The water is distributed through more than 117 miles of cast iron, cast iron-concrete lined, asbestos-cement and copper mains ranging in size from 1 to 24 inches in diameter.

There are approximately 14,300 metered services, of which 244 are industrial. The meter sizes range from 5/8 to 8 inches. The city provides water to 78 services in the Cainsville area of the Township of Brantford. There are approximately 1,010 hydrants on the system.

(f) Storage

Distribution system storage is provided by two 0.50 million gallon elevated steel tanks and a one million gallon concrete ground level reservoir at Park Road. In addition, there are three treated water reservoirs at the plant providing approximately 1.13 million gallons of storage.

2. Potential Additional Supplies

(a) Ground Water

Extensive exploration would be necessary to evaluate the possibilities of establishing a ground-water source of sufficient capacity to supply the city's needs.

Testing carried out during 1964 in the vicinity of the Grand River where it passes through the city failed to locate a significant quantity of water. A test hole beside Highway 24 about two miles west of the city limits encountered fine material only. Testing along the west side of the Grand River 1.5 miles south of Cainsville indicated a potential supply of about 1.0 mgd from that area.

Ground-water systems capable of supplying several hundred gallons per minute have been developed in an extensive gravel aquifer located between the Paris and Galt moraines in the area between Brantford Airport and Burford and southerly toward Oakland. Similar favourable conditions exist west of the Paris Moraine along the southern portion of the east side of the Township of Burford. There is little doubt that large quantities of water are obtainable in these areas, but since the aquifers extend to the surface and are under water-table conditions, serious interference with shallow wells and dugout ponds could be expected if high capacity wells were developed.

(b) Surface Water

The suitability of the Grand River as a continuing source of supply for future municipal water needs will be predicated on the implementation of pollution control and flow maintenance programmes.

Due to consumer desire for a better water quality, consideration may have to be given to obtaining water from the Great Lakes. The provision of a pipeline from the lakes will be predicated, in part, on the need in the area to be served.

3. Future Requirements

The average increase in population for the City of Brantford for the preceding thirteen years has been 1.04 per cent (Table 2-4). At a future average growth rate of 1.25 per cent per year, the 1983 population might approximate 70,000.

The per capita consumption has also increased although metering is universal. At a rate of increased water usage of 1.50 per cent per year, per capita consumption would approach 175 gallons per day in 20 years.

The foregoing figures indicate an average demand in 1983 of 12.25 mgd with peaks up to 21.00 mgd. The present plant has a nominal capacity of 7.59 mgd whereas experience has indicated that the maximum capacity is 11.36 mgd (filtration rate of 2.50 gpm per sq.ft.). Recent test drilling programmes have indicated minimum supplies in close proximity to Brantford. Further, there is an indication that ground-water development at greater distances from the city might interfere with shallow wells and dugout ponds. The need for additional good quality water and increased treatment facilities is indicated. The two alternatives are the Great Lakes or further supplies from the Grand River.

III WATER POLLUTION

1. Sewage Treatment Facilities

General

Domestic and most industrial wastes are treated at the 12.5 mgd capacity conventional activated-sludge plant completed in 1960 by the OWRC under an agreement with the City of Brantford.

The treatment process includes screening and shredding, grit removal, primary clarification, aeration, final clarification and chlorination of the effluent prior to discharge to the Grand River. Two-stage heated digestion and vacuum filtration equipment are also provided.

Approximately 80 per cent of the developed land in the city is now serviced with sewers, and a period of approximately ten years will be required to complete the planned work. There are approximately 1,700 acres of suitable undeveloped land within the city boundaries, of which 50 per cent is zoned industrial. The planned major trunk sewers within the city are being sized to carry waste flows from the Township of Brantford area immediately north of the city boundary.

Treatment Efficiency

A summary of plant efficiency from March, 1960, to December, 1963 inclusive, follows.

	5-Day BOD (ppm)				Suspended Solids (ppm)			
	Max.	Min.	Avg.	% Red.	Max.	Min.	Avg.	% Red.
1960 (40 sets of results)								
Raw Sewage	355	42	181		454	76	185	
Final Effluent	57	2.4	16.1	91.1	46	2	22	88.1
1961 (55 sets of results)								
Raw Sewage	300	105	200		472	140	237	
Final Effluent	86	1.6	13.3	93.4	84	6	31	86.9
1962 (50 sets of results)								
Raw Sewage	360	130	219		344	152	208	
Final Effluent	24	4.0	10.6	95.2	52	2	18	91.4
1963 (13 sets of results)								
Raw Sewage	255	110	153		228	134	171	
Final Effluent	28	8.8	22.5	85.4	38	2	14	91.9

Sewage Flow

Below is a summary of the plant flows recorded from March, 1960 to December, 1963, inclusive.

	1960*	1961	1962	1963
Total Flow (mg)	1,978.00	2,287.00	2,082.03	2,040.33
Average Daily Flow (mgd)	6.46	6.27	5.67	5.59
Maximum Day (mgd)		8.40	7.90	9.50
Average Per Capita Flow (gpcd)	120.5	115.2	104.3	101.8
Sewage Flow as Percentage of Water Consumption (%)	110.1	102.6	89.9	78.6

* - for ten months only (March to December)

From the above results, it is noted that the plant does not reach design flow at current maximum flow. The average daily flow received at the plant has been decreasing due to the city's programme of separating storm and sanitary sewers. The plant flow is expected to increase in 1964 when the Eastern Circumferential Sewer is completed.

Operating Problems

The general difficulties experienced in operating a hydraulically underloaded plant have been encountered. These problems are expected to be resolved as greater waste loads are applied. Effluent chlorination which has been practised only during the warmer months (May to October), will be extended over the entire 12 months in 1965.

2. Industrial Waste Disposal

Only 21 of the industries in the City of Brantford produce quantities of waste requiring treatment. These "wet" industries discharge a total of 2 mgd of water-borne wastes. A number of industries which previously discharged contaminated wastes to the Grand River and its tributaries are now connected to the sanitary sewer system. A brief summary of the "wet" industries which discharge waste flows to the municipal system is given in Table 4-1.

The four industries with serious pollution problems are discussed following.

Canada Glue Company Limited

This industry contributes the greatest pollution load and provides the least treatment of the industries which continue to pollute the Grand River. The company has presented a proposal for primary treatment which has been accepted by the Commission as an initial step. When the efficiency of the treatment has been evaluated, further measures will be considered. The first phase of the work is to be completed by the end of 1964.

The present waste discharge characteristics are summarized below.

Waste Flow	Average BOD	Average Suspended Solids	pH Range
1.25 mgd	577 ppm	857 ppm	4.5 to 12.5

TABLE 4-1

INDUSTRIES DISCHARGING SIGNIFICANT INDUSTRIAL WASTES TO SANITARY SEWER SYSTEM

CITY OF BRANTFORD

Name	Type	Waste Volume (gpd)	Character of Waste
Campbell Electric Ltd.	Mfg.and Plating	1,500	High pH and cyanide
Canadian Westinghouse Co.Ltd.	Mfg.and Plating	76,000	High chrome
Crown Electrical Mfg.Ltd.	Mfg.and Plating	12,500	High cyanide
Domtar Construction Materials Ltd.	Manufacturing	99,000	Essentially cooling water
Fibre Products of Canada Ltd.	Textile	9,000	High BOD and solids
Gates Rubber of Canada Ltd.	Manufacturing	15,000	High BOD, solids and Ether solubles
Harding Carpets Ltd.	Textile	45,000	High BOD, variable pH and oil
Hussmann Refrigerator Co. Ltd.	Manufacturing	104,000	Essentially cooling water
Kleprite Products Ltd.	Manufacturing	41,000	Chrome, aluminum and Ether solubles
Lockwood Mfg.Can.Ltd.	Manufacturing	13,000	Essentially cooling water

TABLE 4-1 (CONT'D)

Name	Type	Waste Volume (gpd)	Character of Waste
Mott Mfg.Ltd.	Manufacturing	10,000	Essentially cooling water
Moulded Fibre Ltd.	Manufacturing	200,000	Phenols and ether solubles
Sunoco Products Co. of Canada Ltd.	Paper Converter	1,000,000	High BOD, solids and phenols
A.G. Spalding and Bros. of Canada Ltd.	Mfg. and Plating	138,000	Chrome and nickel
The Steel Co. of Canada Ltd.	Mfg. and Plating	34,000	High solids, pH and cyanide
George Weston Ltd.	Food	86,000	Essentially cooling water
York Farms (a division of Canada Packers Ltd.)	Canning	150,000 (seasonal)	High BOD and solids

Atlas Chemical Industries Canada Limited

This organic chemical plant is engaged in the production of fatty esters and sorbitol. A re-evaluation of waste disposal was made when plans for expansion and the production of other chemical products were being considered. Contaminated and uncontaminated waste waters have been segregated and plans for treatment of the former have been developed and should be implemented in 1964. Further evaluation of the treated effluent may require connection to the municipal sanitary sewer system.

The analysis of a sample of the effluent to D'Aubigny Creek follows.

5-Day BOD	Suspended Solids	Ether Solubles	pH
94 ppm	32 ppm	13 ppm	6.9

Watson Manufacturing Company Limited

This plant is a subsidiary of Penmans Limited and is engaged in the production of knitted goods. Waste flows are directed to the Grand River, however, plans have been completed for pre-treatment prior to discharge to the sanitary sewer system. The necessary enlarged sewer should be completed this year.

The average waste characteristics are shown below.

Volume	5-Day BOD	pH Range
50,000 gpd	1,000 ppm	4.5 to 10

George W. Endress Company Limited

The company which produces electric blankets, discharges liquid wastes from scouring and dying operations, directly to the river. This flow will be carried in the sewer serving the Watson Manufacturing Company Limited.

Sewer Use By-Law

Although the city is preparing an ordinance for controlling the quality of industrial waste discharges to sewers, this by-law has not been completed.

3. Refuse Disposal

The sanitary landfill site is located near the sewage treatment plant. Drainage from the area contributes to serious water pollution (See Table 4-2, sampling point G 56.7D).

A separate area in the vicinity is utilized for the disposal of combustible industrial waste material. There was no seepage emanating from this area.

4. Surface-Water Quality

Sample results obtained from surface-water drain effluents from June, 1962, to May, 1964, are shown in Table 4-2. The most recent results indicate that considerable success has been achieved in eliminating pollution. The waste flows from Canada Glue Company Limited continue to be a serious source of pollution.

Water qality data on the Grand River at Brantford from 1957 to 1964 are shown in Table 4-3. Deterioration of water quality in the river as it flows through the City of Brantford is evident. The most significant source of pollution is the waste from the Canada Glue plant.

5. Future Requirements

The sewage treatment plant is considered to be of sufficient capacity to treat the estimated 1983 sewage flow from the city. However, if extensive areas beyond the present city boundaries are served in the future, the plant may require expansion within the next 20 years.

The industries which are discharging untreated or inadequately treated wastes to the Grand should implement effective control measures.

Pollution emanating from the sanitary landfill site should be eliminated.

IV CONCLUSIONS

1. Water Supply

An adequate ground-water source does not appear to be available immediately adjacent to the city. Further test drilling would be required to evaluate the more distant water-bearing formations. The Grand River will provide a sufficient supply of raw water for the future needs of the City of Brantford. However, the water quality is not ideal. As area demands increase, consideration will have to be given to the use of water from the Great Lakes. If additional future supplies are to be obtained from the Grand River, the treatment facilities will require expansion.

2. Pollution Control

Inasmuch as the municipal water pollution abatement programme has achieved excellent results, significant pollution sources remain and the need for continuing effective control is evident.

Sufficient capacity is available at the sewage treatment plant for anticipated population increases within the city boundaries. If extensive areas in the Township of Brantford are to be served, the plant may require expansion within the next twenty years.

Several industries are actively contributing to the pollution of the Grand River. River water quality impairment is due mainly to the waste discharge from the Canada Glue plant. The drainage from the sanitary landfill site should be eliminated.

The need for a sewer use by-law has been indicated.

TABLE 4-2

SAMPLE RESULTS - MUNICIPAL AND INDUSTRIAL WASTE EFFLUENTS

CITY OF BRANTFORD

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
G 65.9W	June 5/62	Riverview Ave.	No flow and no evidence of pollution					
	Nov. 7/62							
	May 13/64							
GBC 66.4W	June 5/62	Morrell St.	40	1,610	1,188	422	0.0	104,000
	Nov. 7/62		2.0	452	5	447	0.0	2
	May 13/64		Broken in transit					
GBC 66.41W	June 5/62	Drain discharges	50	784	152	632	1.0	7,000
	Nov. 7/62	into Morrell St.	No flow					
	May 13/64	drain. Samples obtained at a manhole at entrance to water works.	1.8	466	7	459	0.1	58,000
G 65.6W	June 5/62	Catherine Ave.	11	758	14	744	2.5	178,000
	Nov. 7/62		16	542	15	527	0.6	13,000
	May 13/64		2.0	512	2	510	0.0	16
G 65.2W	June 5/62	Jubilee St.	7.0	692	5	687	0.5	120
	Nov. 7/62		14	786	51	736	0.4	240,000
	May 13/64		3.2	716	94	622	0.1	370

TABLE 4-2 (CONT'D)

Sampling Point No	Date of Sample		5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	Ether Solubles (ppm)	M.F.Coliform Count per 100 ml
G 64.7W	June 5/62	Jarvis St.	28	552	33	519	1.4		7,100
	Nov. 7/62		2.0	494	2	492	0.0		212
	May 13/64		0.6	512	1	511	0.0		39,000
G 64.6W	June 5/62	Waterloo St.	No flow						
	Nov. 7/62	west side.	No flow						
	May 13/64		No flow						
G 64.5W	June 5/62	Waterloo St.	5.0	472	2	470	0.2		166,000
	Nov. 7/62	east side	1.0	458	5	453	0.0		35,000
	May 13/64		1.8	480	5	475	0.1		13,100
G 64.3W	June 5/62	Church St.	No flow						
	Nov. 7/62		No flow						
	May 13/64		No flow						
G 63.5W	June 5/62	Scarfe St.	No flow						
	Nov. 7/62		No flow						
	May 13/64		No flow						
G 62.8W	June 5/62	Colborne St.	2.4	394	6	388	0.2		24,000
	Nov. 7/62		2.4	424	8	416	0.0		106,000
	May 13/64		1.2	480	5	475	0.1		18,000
GBC 59.0I	June 5/62	Scarfe	980	794	724	70	-	500	-
	Nov. 7/62	Point Co.	No flow						
	May 13/64	drain.	No flow						

TABLE 4-2 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GBC 58.9W	June 5/62	Hill St.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
GBC 58.8W	June 5/62	Market and	No flow					
	Nov. 7/62	Water sts.	No flow					
	May 13/64		No flow					
GBC 58.6W	June 5/62	Bain St.	10	402	5	397	3.4	950
	Nov. 7/62		230	542	15	527	0.6	102,000
	May 13/64		2.1	456	8	448	0.2	11,000
GBC 58.3D	June 5/62	Eastward Creek	110	844	172	672	2.4	20,000
	Nov. 7/64		21	620	25	595	0.2	130,000
	May 13/64		11	628	30	598	0.2	40,000
GBC 58.2W	June 5/62	Alfred St.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
GBC 58.1W	June 5/62	South St.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
GBC 57.8W	June 5/62	Riddols Ave.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					

TABLE 4-2 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GBC 57.1W	June 5/62	Rawdon St.	37	738	212	526	0.1	480,000
	Nov. 7/62		Not sampled					
	May 13/64		4.8	604	56	548	0.2	510,000
GBC 57.5W	June 5/62	Stanley St.(sampled	2.4	480	6	474	0.1	50,000
	Nov. 7/62	from manhole near	2.8	502	31	471	0.0	1,700
	May 13/64	Highway 2).	Broken in transit					460,000
GBC 56.0W	June 5/62	Mohawk Gardens	12	650	2	648	2.1	8,000
	Nov. 7/62		18	728	67	661	2.6	500,000
	May 13/64	Sanitary sewers being constructed.	5.2	637	19	618	1.4	9,900
G 62.7W	June 5/62	Corporation Yard.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
G 62.21W	May 13/64	Gilkinson St.	4.4	674	32	642	0.6	23,000
G 62.2W	June 5/62	Markel and Ontario	16	540	24	516	0.3	560,000
	Nov. 7/62	sts.	4.4	584	11	573	0.1	320
	May 13/64		2.0	448	1	447	0.1	35,000
G 62.1W	June 5/62	Eagle Ave.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					

TABLE 4-2 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
G 62.0W	June 5/62	Strathcona Ave.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
G 61.6W	June 5/62	Gladstone Ave.	6.0	424	3	421	0.3	320
	Nov. 7/62		2.6	784	2	782	0.0	1,130
	May 13/64		0.6	546	4	542	0.2	14,000
G 61.5W	May 13/64	Marlene Ave. at River Rd.	1.2	552	5	547	0.0	18,000
G 61.4W	June 5/62	Baldwin Ave.	9.0	640	13	627	3.6	12,200
	Nov. 7/62		No flow					
	May 13/64		No flow					
G 58.1W	June 5/62	Whitehead St.	No flow					
	Nov. 7/62		No flow					
	May 13/64		No flow					
G 57.1W	June 5/62	Birkett and Mohawk Rd.	No flow					

TABLE 4-2 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	Ether Solubles (ppm)	M.F.Coliform Count per 100 ml
G 56.9T	May 13/64	Sewage Treatment Plant-effluent.	10.0	680	5	675	2.9		38,000
G 56.7D	May 13/64	Creek from municipal refuse disposal site.	38	686	78	608	0.2		5,000
G 55.2I	Nov. 7/62	Canada Glue	640	13,914	6,404	7,510	-	1,120	
	May 13/64	Co.-effluent.	90	1,124	334	790	0.2		
G 55.0D	June 5/62	Open drain from	4.8	760	103	657	0.7		14,000
	Nov. 7/62	Glenwood Ave.	4.4	796	107	689	0.6		380,000
	May 13/64		8.4	6,334	5,612	722	0.3		1,600,000
G 54.9W	June 5/62	Rowanwood Ave.	3.2	742	1	741	0.6		47,000
	Nov. 7/62		3.2	728	3	725	0.6		4,500
	May 13/64		5.6	786	1	785	0.4		52,000,000

TABLE 4-3

SAMPLE RESULTS - GRAND RIVER - BRANTFORD SECTION

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Turbidity in Silica Units	Phenols (ppb)
GBC 66.5	Dec. 16/63	Brantford Canal	1.33	510	13	497		
	Dec. 17/63	at water works.	3.0	582	5	577		
	Dec. 18/63		3.6	562	2	560		
	Jan. 20/64		2.7	528	3	525		9
	Jan. 22/64		3.7	494	1	493		
	Feb. 10/64		2.8	478			1.8	
	Feb. 12/64		2.4	524			1.5	8
	May 12/64		1.7	428	16	412		
G 62.8	July 14/59	Junction Hwys.	3.2					
	July 19/60	2 and 24.	4.0					
	Apr. 19/61		10.0					
	Oct. 10/62		2.7					
	Feb. 15/63		3.9					
	May 12/64		1.7	416	13	403		
G 59.1	July 14/59	Main road to	6.0					
	July 19/60	Burtch.	2.0					
	Apr. 19/61		4.2					
	Feb. 15/63		4.1					
	May 12/64		2.6	442	13	429		
GBC 55.4	May 12/64	Brantford Canal above junction.	5.2	456	34	422		

TABLE 4-3 (CONT'D)

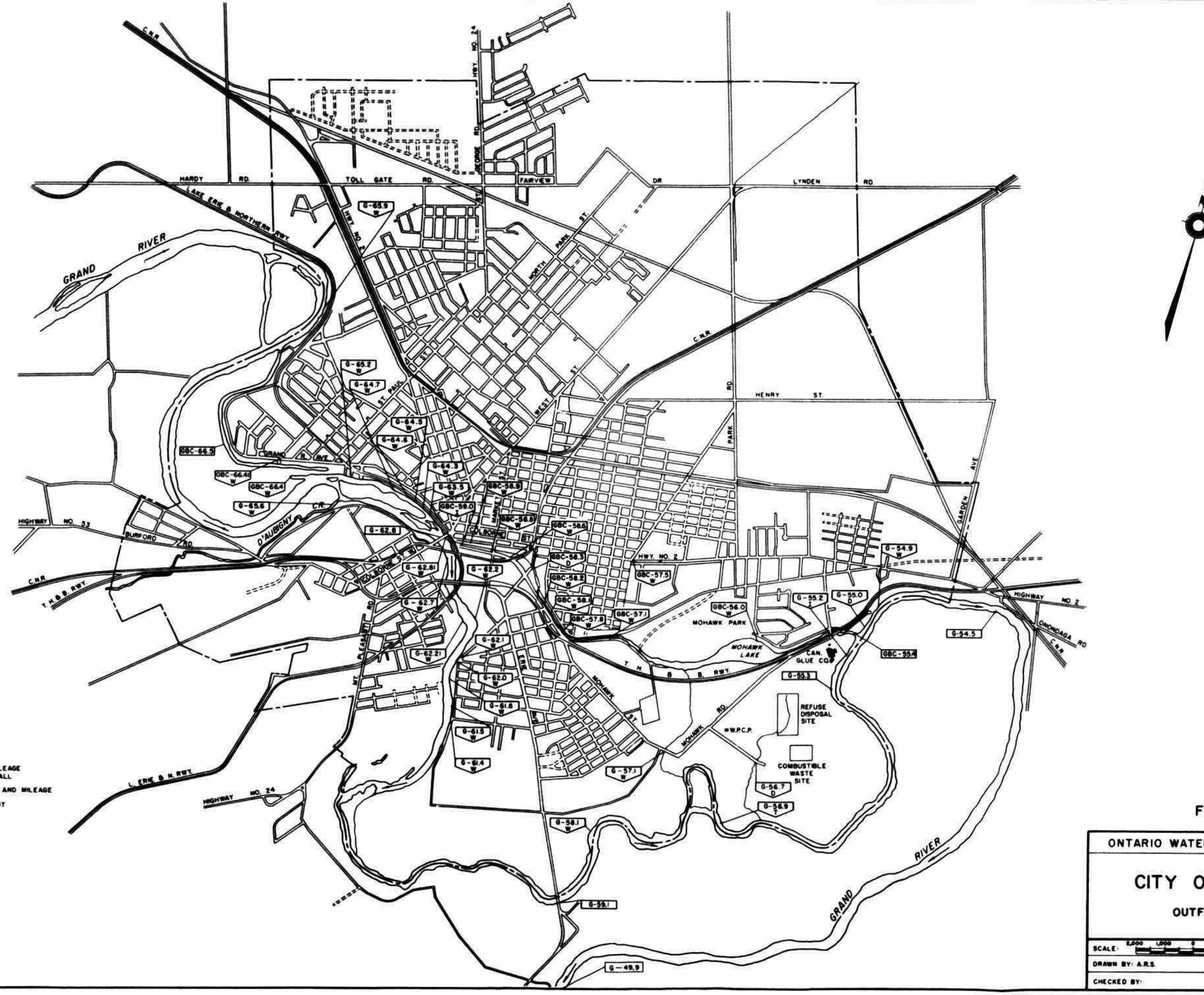
Sampling Point No	Date of Sample	Location	Chemical Oxygen Demand (ppm)	Anionic Detergents as ABS (ppm)	Phosphate as PO4 (ppm)	M.F. Coliform Count per 100 ml
GBC 66.5	Dec. 16/63	Brantford Canal at water works.		0.1	0.60	6
	Dec. 17/63			0.5	0.87	11,000
	Dec. 18/63			0.2	1.00	1,800
	Jan. 20/64		28	0.3	1.20	1,070
	Jan. 22/64			0.1	1.16	370
	Feb. 10/64			0.2	0.68	138
	Feb. 12/64			0.2	0.66	1,200
	May 12/64			0.1		510
G 62.8	July 14/59	Junction Hwys. 2 and 24.				4,100
	July 19/60					-
	Apr. 19/61					-
	Oct. 10/62					1,900
	Feb. 15/63					1,300
	May 12/64			0.1		4,800
G 59.1	July 14/59	Main road to Burtch.				300
	July 19/60					70
	Apr. 19/61					10
	Feb. 15/63					1,400
	May 12/64			0.1		-
GBC 55.4	May 12/64	Brantford Canal above junction.		0.2		310

TABLE 4-3 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Turbidity in Silica Units	Phenols (ppb)
G 54.5	July 14/59	At Cainsville	14.0					
	July 19/60		8.4					
	Apr. 19/61		8.4					
	Oct. 10/62		12.0					
	Dec. 16/63		3.8	558	8	550		
	Dec. 17/63		40.0	660	34	626		
	Dec. 18/63		13.0	610	17	593		
	Jan. 20/64		34.0	656	16	640		18
	Jan. 22/64		9.0	538	10	528		
	Feb. 10/64		14.0	536			5.5	
	Feb. 12/64		16.0	488			4.0	15
	May 12/64		4.3	470	41	429		
G 54.3	May 12/64	Below STP and above Canada Glue Co.	2.8	312	11	301		
G 49.9	May 8/57	Below Brantford where River Rd. turns sharply west.	2.5					
	July 14/59		3.8					
	July 19/60		8.0					
	Apr. 19/61		6.8					

TABLE 4-3 (CONT'D)

Sampling Point No	Date of Sample	Location	Chemical Oxygen Demand (ppm)	Anionic Detergents as ABS (ppm)	Phosphate as PO_4 (ppm)	M.F.Coliform Count per 100 ml
G 54.5	July 14/59	At Cainsville				1,300
	July 19/60					17,000
	Apr. 19/61					30
	Oct. 10/62					690
	Dec. 16/63			0.5	0.86	16,100
	Dec. 17/63			0.6	1.26	35,000
	Dec. 18/63			0.3	1.14	5,900
	Jan. 20/64		91	0.4	1.70	1,850
	Jan. 22/64			0.3	1.10	3,600
	Feb. 10/64			0.3	0.80	240
	Feb. 12/64			0.2	0.73	6,000
	May 12/64			0.1		-
G 55.3	May 12/64	Below STP and above Canada Glue Co.		0.1		-
G 49.9	May 8/57	Below Brantford where River Rd. turns sharply west.				4,500
	July 14/59					50
	July 19/60					1,540
	Apr. 19/61					40



LEGEND

GBC-58.1 W	OUTFALL SHOWING STREAM AND MILEAGE FROM MOUTH AND TYPE OF OUTFALL
G-55.3	SAMPLING POINT SHOWING STREAM AND MILEAGE
W.P.C.P.	WATER POLLUTION CONTROL PLANT
G.B.C.	BRANTFORD CANAL
W	STORM SEWER
S	SANITARY SEWER
I	INDUSTRIAL WASTE
T	TREATMENT PLANT
D	DITCH OR TRIBUTARY
G	GRAND RIVER

FIGURE 4-1

ONTARIO WATER RESOURCES COMMISSION

CITY OF BRANTFORD

OUTFALL LOCATIONS

SCALE: 2,000 1,000 0 2,000 4,000 FEET

DRAWN BY: A.R.S.	DATE: AUG., 1964
CHECKED BY:	DRAWING Nº: 64-62

CHAPTER 5

TOWN OF PARIS

CHAPTER 5

TOWN OF PARIS

I GENERAL

The Town of Paris straddles the Nith and Grand rivers in the north-west portion of the county. The two rivers unite near the centre of the town.

The 1963 assessed population was 5,923. The town supports a number of small industrial and commercial enterprises.

II WATER SUPPLY

1. Municipal

(a) Sources

Two separate systems of underground collector tiles on the banks of the Nith and Grand rivers comprise the sources of water supply for the town. The No. 1 Pumping Station and collector system, which is used during peak demand periods feeds a booster pumping station in the western end of the town. The No. 2 or Main Pumping Station on the bank of the Grand River is situated in the eastern section of the municipality. The initial 1.38 mgd capacity of the springs has decreased to approximately 0.80 mgd in recent years.

(b) Treatment

Water from the No. 2 or Main Station is chlorinated at the plant, while the supply from the No. 1 Station is disinfected at the booster pumping station. There is no other treatment provided.

(c) Water Consumption

The average daily pumpage in 1963 was 600,915 gallons, an increase of 5.35 per cent over the 1962 average of 570,375 gallons per day. The average per capita consumption (assessed population) was 101.5 gallons per day in 1963.

(d) Water Quality

A summary of the water quality from both plants is shown on the following page.

	No. 1 Plant	No. 2 Plant
Hardness as $CaCO_3$ (ppm)		
Average	271	302
Maximum	308	312
Minimum	248	260
Alkalinity as $CaCO_3$ (ppm)		
Average	220	249
Maximum	246	272
Minimum	208	176
Iron as Fe (ppm)		
Average	0.08	0.10
Maximum	0.20	0.52
Minimum	0.00	0.00
Chloride as Cl (ppm)		
Average	16	15
Maximum	20	20
Minimum	12	14
pH at OWRC Laboratory		
Average	7.7	7.6
Maximum	7.8	7.7
Minimum	7.6	7.4
No. of results	7	9

Samples from the distribution system have shown doubtful bacteriological quality from time to time. Two factors may be responsible for this: a small number of consumers (about 25) are supplied directly from the No. 1 Pumping Station and these could receive unchlorinated water, and secondly, routine chlorination control procedures have been found lacking. On three recent occasions during routine Commission inspections, inadequate chlorination procedures were evident. If the No. 1 Pumping Station is to be maintained, chlorination facilities will be required at the plant.

(e) Distribution

The distribution system comprises about 25 miles of cast iron and asbestos-cement mains ranging in size from 4 to 10 inches in diameter.

There are about 2,000 services, of which 301 are industrial and 44 are commercial. Thirty-six services beyond the town limits are supplied. There are 105 hydrants.

(f) Storage

Storage is provided by a 20,000 gallon raw water ground-level covered reservoir at the No. 2 Station and a one million gallon open ground-level reservoir at the booster pumping station. There is no elevated storage available.

2. Potential Additional Supplies

(a) Ground Water

The quality of the bedrock water is generally unsatisfactory for a municipal supply although substantial quantities appear to be available.

Due to the deep dissection in the Grand and Nith river valleys at Paris, the thick gravel deposits, normally good aquifers, are often drained, and are unsuitable for the development of high capacity wells.

It may be possible to find suitable aquifers several miles from town where the drainage effect of the dissection is minimal. Good aquifers are indicated in the vicinity of St. George, Blue Lake and Pinehurst Lake, and saturated gravel may be present beneath the Grand River approximately two miles north of Paris and also adjacent to the Nith River north of the No. 1 Pumping Station. More exploratory work is necessary to evaluate the potential of ground water supplies in these areas.

The Paris Public Utilities Commission is undertaking a test drilling programme at present, and it is understood that water has been located along the Grand River approximately two miles north-east of the town.

(b) Surface Water

The Grand and/or Nith rivers could be used for additional water supply; however, raw water quality would require extensive treatment. A summary of the Grand River water quality is given in Chapter 4, Section II, Subsection 1(d). Samples from the Nith River were collected during 1964 when this source was considered for municipal use. A summary of these results is shown following.

	Average	Maximum	Minimum
Hardness as $CaCO_3$ (ppm)	300	1,590	250
Alkalinity as $CaCO_3$ (ppm)	191	226	166
Iron as Fe (ppm)	0.53	1.12	0.26
Chloride as Cl (ppm)	12	16	7
pH at OWRC Laboratory	8.1	8.4	7.6
Apparent Colour Units	20	35	<5
Turbidity Units	11.9	34.0	3.1

The treatment required probably would consist of pre-chlorination, flocculation, sedimentation, filtration and post-chlorination. In addition, taste and odour control might be required. During the summer the water would tend to be warmer than the present ground-water supply.

3. Future Requirements

The average yearly increase in population for the Town of Paris from 1950 to 1963 has been 1.12 per cent. Based on a 1.30 per cent increase per year, the 1983 population could approximate 7,600 persons. Since the daily per capita usage throughout Ontario is increasing, it may be assumed that use might approximate 125 gallons per capita per day by 1983. These figures suggest that the water needs for the town at that time may average 0.950 mgd.

III WATER POLLUTION

1. Sewage Treatment Facilities

General

Domestic and some industrial wastes from the municipality are treated in an extended aeration-type modified activated sludge plant with a design capacity of 0.5 mgd. The works were constructed in 1962 under an agreement between the town and the Commission.

There are two raw sewage pumping stations on the collection system and a lift station adjacent to the treatment works. Facilities are provided for grit removal, solids shredding, aeration, sedimentation and chlorination of the final effluent before discharge to the Grand River.

At the present time only about 15 per cent of the town has been provided with sanitary sewers and, consequently, the treatment plant is hydraulically underloaded.

Treatment Efficiency

A routine sampling programme has only been established recently and insufficient results are available to evaluate treatment efficiency.

Sewage Flow

The sewage flow meter is not accurate in the lower range of flow. Consequently, a reliable estimate of the average daily inflow is not yet available.

Operating Problems

Some difficulties were experienced during the past winter due to freezing. These problems will be overcome as the daily sewage flow increases. Effluent chlorination facilities were only recently connected and continuous disinfection will take place in the future.

2. Industrial Waste Disposal

There are 26 industrial and commercial enterprises in the Town of Paris, most of which can be considered as dry. Prior to May 19, 1964, the largest source of industrial waste pollution was the Willow Street plant of Penmans Limited. Since then, the wastes from the plant have been treated by the municipality.

Austin Laboratories is engaged in the production of veterinary drugs. An industrial wastes survey was conducted at this plant in 1964 to ascertain the suitability of the waste for discharge to a municipal sewer. Until the investigation is completed, temporary disposal in a pit, in which neutralization and absorption take place, is being employed.

Gravel washings from Consolidated Sand and Gravel Limited, East Paris plant, are discharged into a settling area. The liquid seeps through the soil and there is no discharge to a watercourse.

3. Refuse Disposal

The municipal refuse disposal site is situated on the west side of the town at an abandoned gravel pit. The landfill method is utilized. There does not appear to be any danger of pollution of either surface or ground water at present.

4. Surface Water Quality

The analytical results of samples collected from various waste outlets within the town are given in Table 5-1. Since only a limited section of the municipality is connected to the sewer system, several storm water drains were found to be discharging polluting wastes into the Grand and Nith rivers.

Water quality data on the Grand River (Table 5-2) indicate a deterioration in the river as it flows through the Town of Paris.

A summary of the results of samples collected from the Nith River in the Paris section is given in Table 5-3. The water quality also shows some deterioration within the limits of the town.

5. Future Requirements

Extension of the sewage collection system is required to serve the entire municipality. As the population and need increase the municipality should ensure that sufficient treatment capacity is provided.

IV CONCLUSIONS

1. Water Supply

The existing ground-water supplies appear inadequate for current peak demands and will require enlargement in the future. The provision of elevated storage facilities might help meet peak summer requirements.

Continued use of the No. 1 Pumping Station will require the provision of chlorination facilities. More care should be taken in routine disinfection procedures.

While surface water sources are readily available, the water quality is such that extensive treatment is required.

2. Pollution Control

The sewage collection system serves a small part of the town and requires extension. This would eliminate pollution now entering the Grand and Nith rivers via storm and industrial drains.

The refuse disposal is satisfactory and studies are being conducted on the wastes from Austin Laboratories.

TABLE 5-1

SAMPLE RESULTS - MUNICIPAL AND INDUSTRIAL WASTE EFFLUENTS

TOWN OF PARIS

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GN 76.4W	May 12/64	Jefferson St.	14	540	6	534	1.8	11,000,000
GN 75.9W	May 12/64	Warwick St.	102	590	5	585	0.0	580
GN 75.8S	May 12/64	Penman's No. 1 mill sanitary sewer.	230	834	298	536	0.4	800,000
GN 75.74W	May 12/64	Emily St.	100	620	1	619	0.1	7,800
GN 75.73W	May 12/64	West of Charlotte St.	No flow					
GN 75.72W	May 12/64	Charlotte St.	90	1,212	740	472	6.0	8,000,000
GN 75.7W	May 12/64	West of William	No flow					
GN 75.6W	May 12/64	William St.	Outlet covered with fill, no evidence of a flow					
GN 75.61W	May 12/64	Laurel St. opposite William St. at Lions Park	No flow					

TABLE 5-1 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GN 75.56S	May 12/64	Sanitary sewer from Victoria Subdivision.	130	620	134	486	6.4	89,000,000
GN 75.5W	May 12/64	Laurel St. opposite Mechanic St. at Lions Park.		No flow				
GN 75.4W	May 12/64	East end of West River St.	No flow					
GN 75.35W	May 12/64	Rear Paris mill.		No flow				
GN 75.32W	May 12/64	Grand River St., east bank near mouth, west outlet.		No flow				
GN 75.31W	May 12/64	Grand River St., east bank near mouth east outlet.	125	724	72	652	15	60,000,000
G 75.51W	May 12/64	River Lane		No flow				
GR 75.45W	May 12/64	Brant St., discharges in Penman's Raceway.		No flow				

TABLE 5-1 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
G 75.41W	May 12/64	Between Charlotte and Emily sts.	No flow					
G 75.4W	May 12/64	Elm St. west	No flow					
G 75.39W	May 12/64	William St.	14	660	19	641	1.6	29,000,000
G 75.35W	May 12/64	Between William and Mechanic sts.	70	630	88	542	3.4	150,000
G 75.2W	May 12/64	Elm St. east	No flow					
GR 75.0W	May 12/64	Penman's Race-way outfall.	2.3	564	9	555	0.2	1,000
G 74.95W	May 12/64	Dundas St. west outfall.	Insufficient flow for sampling, but evidence of sanitary sewage					
G 74.9W	May 12/64	Dundas St. east outfall	21	636	19	617	3.2	9,000,000
G 74.6W	May 12/64	Catherine St.	6.2	678	9	669	3.0	1,020,000
G 74.2D	May 12/64	Ditch at Ball St.	9.2	426	2	424	2.0	60,000
G 74.1T	May 12/64	Sewage Treatment Plant - effluent.	8.4	702	17	685	5.2	92,000

TABLE 5-2

SAMPLE RESULTS - GRAND RIVER - PARIS SECTION

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Turbidity in Silica Units	Phenols (ppb)
G 75.6	May 8/57	At Paris dam	2.4					
	July 14/59	above Paris.	1.4					
	July 19/60		4.6					
	Apr. 19/61		3.8					
	Oct. 10/62		1.4					
	Feb. 15/63		5.3					
	Dec. 16/63		2.6	532	1	531		
	Dec. 17/63		5.1	512	4	508		
	Dec. 18/63		3.7	478	5	473		
	Jan. 20/64		2.2	492	1	491		
	Jan. 22/64		3.3	510	4	506		
	Feb. 10/64		3.2	472			1.4	
	Feb. 12/64		3.9	508			1.8	15
	May 12/64		2.3	414	4	410		

TABLE 5-2 (CONT'D)

Sampling Point No	Date of Sample	Location	Chemical Oxygen Demand (ppm)	Anionic Detergents as ABS (ppm)	Phosphate as PO_4 (ppm)	M.F.Coliform Count per 100 ml
G 75.6	May 8/57	At Paris dam above Paris.				4,500
	July 14/59					200,000
	July 19/60					440
	Apr. 19/61					-
	Oct. 10/62					1,400
	Feb. 15/63					4,300
	Dec. 16/63			0.5	0.92	1,300
	Dec. 17/63			0.5	1.38	1,200
	Dec. 18/63			0.3	1.34	800
	Jan. 20/64		28	0.3	1.30	400
	Jan. 22/64			0.4	1.44	520
	Feb. 10/64			0.3	0.83	800
	Feb. 12/64			0.4	1.40	11,700
	May 12/64			0.2		340

TABLE 5-2 (CONT'D)

Sampling Point No	Date of Sample		5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Turbidity in Silica Units	Phenols (ppb)
G 74.9	Dec. 16/63	At Highway 5	4.3	540	3	537		
	Dec. 17/63	bridge down-	4.5	516	2	514		
	Dec. 18/63	stream from	4.1	496	3	493		
	Jan. 20/64	Paris.	4.8	502	2	500		8
	Jan. 22'64		4.3	508	6	502		
	Feb. 10/64		13.0	486			6.5	
	Feb. 12/64		4.5	496			2.0	18
G 73.2	May 8/57	Below Paris	2.1					
	July 14/59	at road be-	1.5					
	July 19/60	tween con-	5.8					
	Apr. 19/61	cessions 1	4.4					
	May 12/64	and 2.	2.4	308	7	301		

TABLE 5-2 (CONT'D)

Sampling Point No	Date of Sample	Location	Chemical Oxygen Demand (ppm)	Anionic Detergents as ABS (ppm)	Phosphate as PO_4 (ppm)	M.F.Coliform Count per 100 ml
G 74.9	Dec. 16/63	At Highway 5		0.4	0.60	2,900
	Dec. 17/63	bridge down-		0.5	1.12	9,000
	Dec. 18/63	stream from		0.3	1.20	900
	Jan. 20/64	Paris.	35	0.3	1.50	340
	Jan. 22/64			0.4	1.18	480
	Feb. 10/64			0.3	0.82	600
	Feb. 12/64			0.4	0.68	1,500
G 73.2	May 8/57	Below Paris at				200
	July 14/59	road between con-				220
	July 19/60	cessions 1 and				90
	Apr. 19/61	2.				970
	May 12/64			0.2		820

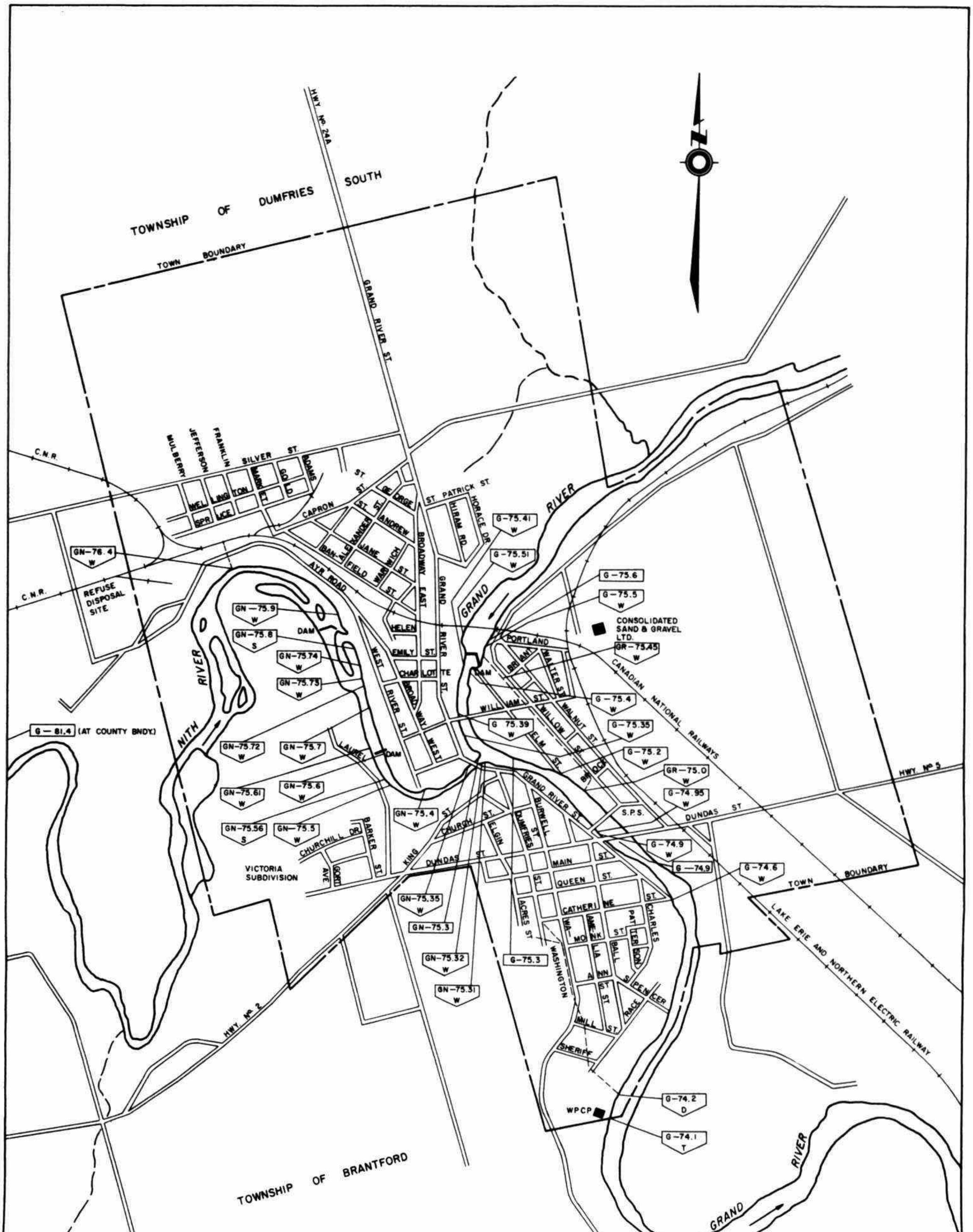
TABLE 5-3

SAMPLE RESULTS - NITH RIVER - PARIS SECTION (MAY, 1964)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GN 81.4		South-east of Canning upstream from Paris.	1.4	434	18	416	0.0	70
GN 75.3		Highway 24A, at river mouth, Paris.	2.3	544	41	503	0.0	730

SAMPLE RESULTS - NITH RIVER - PARIS SECTION (1959 - 1963)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GN 81.4	July 14/59	South-east of	0.9					100
	July 19/60	Canning upstream	1.9					90
	April 19/61	from Paris.	-					-
	Oct. 10/62		-					-
	Feb. 15/63		-					-
GN 75.3	July 14/59	Highway 24A at	0.6					60,000
	July 19/60	river mouth,	1.9					370
	April 19/61	Paris.	4.8					220
	Oct. 10/62		2.0					45,000
	Feb. 15/63		3.1					510



LEGEND

GN-75.3 — SAMPLING POINT SHOWING STREAM AND MILEAGE
G—GRAND R. GN—NITH R.

G-74.12 D — OUTFALL SAMPLING POINT — TYPE OF OUTFALL

D — DITCH OR TRIBUTARY
I — INDUSTRIAL WASTE
S — SANITARY SEWER
T — TREATMENT PLANT
W — STORM SEWER

WPCP — WATER POLLUTION CONTROL PLANT

FIGURE 5-1

ONTARIO WATER RESOURCES COMMISSION

TOWN OF PARIS

OUTFALL LOCATIONS

SCALE: 1040 520 0 1040 2080 3120 FT	
DRAWN BY: R.W.	DATE: JULY, 1964
CHECKED BY: K.F.	DRAWING No. 64-57

CHAPTER 6

TOWNSHIP OF BRANTFORD

CHAPTER 6

TOWNSHIP OF BRANTFORD

I GENERAL

The Township of Brantford is contiguous to the City of Brantford on the west, north and east. The northern portion of the township is bisected by the Grand River. Development is essentially rural, with the exception of the urbanized lands bordering the city on the north and east.

The assessed population in 1963 was 8,094. Fifteen commercial and industrial enterprises carry on business in the township.

II WATER SUPPLIES

1. General

Water supplies in the township are obtained from privately-owned wells, ponds and streams. Communal systems include one privately-owned and four municipally-owned systems. Dug wells have been the most used source, but due to unreliability, the number of drilled wells has been increasing.

In the western portion, except for a small area around the hamlet of Falkland, water wells usually terminate in overburden deposits. The water is hard but otherwise of relatively good chemical quality.

At Falkland, as in most of the eastern section, the majority of drilled wells are completed in the first few feet of the bedrock since good overburden aquifers are scarce. The bedrock water is generally very hard with sulphate and iron contents in excess of 1,000 and 0.50 ppm respectively.

In the Mount Pleasant area, water shortages can be attributed to fluctuating levels in shallow wells. Unfortunately, deep overburden aquifers in this area are irregular and bedrock wells often yield very poor quality water.

Dugout ponds utilizing ground water for irrigation purposes are common in the south-west.

2. Municipal

(a) Wyndham Hills - Area No. 1

The ground-water source is aerated for hydrogen sulphide removal. System capacity is 216,000 gpd. In 1963, the average daily consumption was 55,300 gallons. The chemical quality of the treated water is given in Table 6-1. The bacteriological examinations results in 1963 indicated that this system may require chlorination in the near future. The township is presently making arrangements to install these facilities. There are 445 services (23 commercial and 422 domestic) on the system. A 100,000 gallon ground level reservoir at the pumping station and a 250,000 gallon elevated steel tank provide storage.

(b) Tutela Heights - Area No. 2

This system is jointly owned by the Commission and the township. Well water is delivered untreated to the distribution system. A 100,000 gallon concrete ground level reservoir provides suction for the high lift pumps. In 1963, the average daily consumption was 11,200 gallons or only 5 per cent of the nominal plant capacity of 0.216 mgd. The chemical quality of the water is shown in Table 6-1. The bacteriological quality has indicated the need for continuous chlorination, and the disinfection equipment that is available at the plant should be placed in service. The distribution works consist of 5.41 miles of 8 and 6-inch asbestos-cement mains, and there are 72 services and 35 hydrants on the system.

(c) Cainsville - Area No. 3

Water for this system is obtained from the City of Brantford. During 1963 the average consumption was 39,400 gallons per day. The treated water chemical quality is shown in Table 6-1, and the bacteriological quality is satisfactory since the City of Brantford practises free residual chlorination at their water works. The system consists of 3.88 miles of cast iron mains ranging from 10 to 6-inches in diameter. There are 55 domestic, 11 commercial and 12 industrial services. A 333,000 gallon elevated steel tank provides storage and pressure equalization.

TABLE 6-1

WATER QUALITY OF SUPPLY SYSTEMS - TOWNSHIP OF BRANTFORD

Supply	No. of Samples	Hardness as $CaCO_3$ (ppm)	Alkalinity as $CaCO_3$ (ppm)	Iron as Fe (ppm)	Chloride as Cl (ppm)	pH at OWRC Lab.	Fluoride as F (ppm)	Apparent Colour Units	Turbidity Units
Wyndham Hills Area No. 1	3	558	177	0.12	14	7.8	1.7	-	-
Tutela Heights Area No. 2	4	237	192	0.09	8	8.0	0.1	-	-
Cainsville Area No. 3	3	341	187	0.10	46	7.8	0.9	5	2.1
Airport Area No. 4	1	262	204	0.78	15	7.6	0.1	-	-
Poplar Hills-Private Supply Well No. 1	2	296	230	0.05	20	7.5	0.1	-	-
Poplar Hills-Private Supply Well No. 2	2	299	234	0.21	24	7.7	0.1	-	-

Note: The results shown are the average of the number of samples.

(d) Airport - Area No. 4

Ground water is the source of supply, and no treatment is afforded the water prior to delivery to five industries. The average daily usage from February 2 to May 2, 1964, was 20,300 gallons or 14 per cent of the nominal plant capacity of 144,000 gallons per day. The chemical water quality is given in Table 6-1. Numerous positive bacteriological examination results have been obtained from this distribution system, indicating the need for the institution of continuous chlorination practices. Storage is provided by a 126,000 gallon concrete ground level reservoir.

3. Private

A private water works serves the Poplar Hills Subdivision. The wells and associated pumping equipment are owned by Mrs.L. Fellows, while the municipality owns and maintains the distribution system. The 1963 consumption averaged 13,950 gallons per day or 5 per cent of the nominal plant capacity of 259,000 gallons per day. Although a chlorine solution feeder is available, it has not been utilized since the water has been of generally satisfactory bacteriological quality. A summary of the chemical quality of the water from both wells is given in Table 6-1. Six-inch diameter asbestos cement mains deliver untreated ground water to approximately 70 residences. A 83,300 gallon steel tank provides storage on the system.

4. Potential Additional Supplies

(a) Ground Water

Additional ground-water supplies for domestic and farm purposes are available from overburden aquifers throughout most of the western part and from bedrock formations in the eastern portion of the township. In the south-west extensive areas of saturated sand and gravel exist, and large supplies of water may be available. Additional water for the Mount Pleasant area may be obtained from a section about 1.5 miles north-east of the community or from the area west of the Pleasant Ridge Road. Ground-water surveys and test drilling programmes would be needed to appraise accurately the ground water possibilities in specific areas.

(b) Surface Water

The Grand and Nith rivers, Whiteman, Fairchild, Mount Pleasant and Big creeks are major surface-water sources in the township. The Grand River above Brantford could be used for additional supplies, but extensive treatment would be required. The Grand River and its tributaries can be used for additional irrigation needs, especially if good water management can increase stream flow during low flow periods. Some limitation may be required on the use of untreated Grand River water for irrigation of certain crops if adequate pollution control facilities are not maintained.

5. Future Requirements

The bacteriological quality of the water at Wyndham Hills, Tutela Heights and the Airport supplies is unsatisfactory and chlorination is required. Sufficient water is available to serve future growth in the areas presently served by communal systems.

III WATER POLLUTION

1. General

Considerable development is occurring in sections of the township bordering the north and east sides of the City of Brantford. The residential and industrial areas employ private sewage disposal systems installed under the supervision of the Brant County Health Unit. The use of subsurface disposal systems is not recommended for heavily populated areas since the trend to increased water usage generally results in saturated soil in the vicinity of the tile field. When problems with these systems occur, pollution of storm water drains and watercourses invariably results.

2. Sewage Treatment Facilities

(a) Burtch Industrial Farm

Sanitary sewage, laundry wastes and during winter cannery wastes are treated at a mechanically-aerated activated sludge type plant with a design capacity of 42,500 gpd. The wastes are given complete treatment with effluent chlorination prior to discharge to a branch of Mount Pleasant Creek. An unheated sludge digester and sludge drying beds are provided. The plant has been hydraulically overloaded during storm periods and whenever cannery wastes are discharged to the system. The design capacity was exceeded 26 per cent of the time in 1963, based on total daily flow data. A summary of the plant flows from 1961 to 1963 inclusive follows.

Year	Total Flow (x 1000 Gallons)	Average Daily (x 1000 gpd)	Average Daily Maximum Month (x 1000 gpd)
1961	11,320	31.0	56.8
1962	14,867	40.1	56.6
1963	13,364	36.6	67.9

Following is a summary of the treatment efficiency for the same period.

	5-Day BOD (ppm)				Suspended Solids (ppm)			
	Max.	Min.	Avg.	% Red.	Max.	Min.	Avg.	% Red.
1961								
Raw Sewage	620	170	320		464	116	340	
Final Effluent	30	5	16	94.9	78	36	51	85.0
1962								
Raw Sewage	480	140	296		884	68	336	
Final Effluent	76	21	41	86.2	54	23	37	89.0
1963								
Raw Sewage	900	185	374		632	77	344	
Final Effluent	84	12	38	89.8	77	16	39	88.6

Although reasonable treatment efficiency is indicated, plant effluent quality does not conform with the Commission's objectives.

(b) Brantford Plaza

Sewage from store and office buildings is directed to a three compartment septic tank and an underdrained field-tile filter system. The effluent is chlorinated before discharge to Fairchild Creek. The system was designed to treat 12,300 gpd, but since the waste discharges are not measured, no actual flow data are available. Care is required to maintain adequate disinfection of the effluent. Generally, the effluent has been of satisfactory quality.

3. Industrial Waste Disposal

Only five industries produce quantities of wastes requiring treatment. These are detailed following.

Burtch Industrial Farm

The Ontario Reformatory, situated west of the hamlet of Burtch, produces waste from the canning operations. A spray irrigation system is utilized during warm weather conditions, and in winter the waste is directed to the sewage treatment plant.

Flintkote of Canada Gravel and Sand Company

The company is located approximately five miles north-west of the City of Brantford. Gravel washing waste disposal in settling ponds is satisfactory.

Ruff Clarkson Steel Limited

This firm produces custom cut steel. Wastes resulting from a dilute sulphuric acid pickling operation are neutralized and removed from the plant premises. There have been no problems resulting from this operation.

Telephone City Gravel Company Limited

Located on Hardy Road, 1.5 miles west of Highway No. 2, the firm employs adequate settling facilities for the gravel washing wastes.

York Farms Limited

Canning factory wastes are disposed of using a spray irrigation system. Its operation has been satisfactory.

4. Refuse Disposal

Refuse from the area surrounding the City of Brantford is trucked to the city's sanitary landfill site. Details on the site are included in Chapter 4.

Refuse from other rural areas is dumped at another site on Concession 1, Lot 7, near the hamlet of Mount Pleasant. Due to its proximity to Mount Pleasant Creek this site is a potential source of pollution. An alternative location should be obtained and the existing site closed.

5. Surface Water Quality

Natural drainage flows to Fairchild Creek in the north and east, to Mount Pleasant Creek and the Grand River in the south and west, and to Whiteman Creek in the north-west section. The sample results given in Table 6-2 indicate

TABLE 6-2

SAMPLE RESULTS - STORM AND WASTE WATER OUTLETS - TOWNSHIP OF BRANTFORD

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GFF 65.0W	May 21/64	Gable Heights Subdivision and Woolco Plaza drain.	1.1	784	8	776	0.3	11,000
GFF 64.9W	May 21/64	Queensway Subdivision.	3.8	724	87	637	0.2	1,500
GFF 63.1W	May 21/64	Greenbrier Subdivision.	1.7	788	3	785	0.2	17,800
GFUC 53.2W	May 21/64	Prince Charles Rd. (Cainsville).	3.7	530	4	526	0.4	110,000
GFUC 53.0W	May 21/64	Shaver St., north drain.	3.0	660	9	651	0.1	138
GFUC 53.0W	May 21/64	Shaver St., east drain.	3.2	338	32	306	0.1	390
GTH 60.4W	May 21/64	Tutela Heights drain.	0.4	610	3	607	0.1	166

satisfactory surface water quality within the township.

6. Future Requirements

If the hydraulic load at the Burtch Industrial Farm sewage treatment plant cannot be controlled, the plant may require expansion.

The built-up area adjacent to the City of Brantford will probably require municipal sewage works. It is recommended that the sewage flow be directed to the city's treatment plant.

An alternate location for refuse disposal should be developed.

IV CONCLUSIONS

1. Water Supplies

Ground-water sources are generally available for individual use within the rural areas of the township. Chlorination facilities should be provided for the municipally owned systems serving the Wyndham Hills, Tutela Heights and Airport areas.

2. Pollution Control

Individual sewage disposal systems are generally satisfactory for rural development.

A municipal sewage collection system would be desirable in the built-up portion of the township surrounding the City of Brantford.

CHAPTER 7

TOWNSHIP OF BURFORD

CHAPTER 7

TOWNSHIP OF BURFORD

I GENERAL

The Township of Burford occupies the western extremity of the county. The lands are essentially rural and the only built-up portion is the Police Village of Burford. The township population has remained relatively constant with an increase of only 609 persons over a period of 14 years.

In 1963, the assessed population was 5,230.

II WATER SUPPLIES

1. General

In most of the northern half and south-eastern parts of the township, good supplies are obtained from shallow dug and drilled wells and from driven well points. The flat, sandy terrain and above average infiltration conditions result in a shallow table depth, and finding water is not difficult.

In the south-western section, the land is clayey and most drilled wells penetrate to bedrock to obtain an adequate supply.

The ground-water quality is usually satisfactory, although rock wells may encounter hydrogen sulphide and iron in excess of the recommended limits.

Surface water for irrigation is obtained from dugout ponds fed by ground water, stream-fed ponds and surface streams. The streams used for irrigation include Whiteman, Kenny, Horner, Big and Big Otter creeks and their tributaries.

2. Potential Additional Supplies

(a) Ground Water

There should be no difficulty encountered in obtaining additional water for domestic and stock supplies in any portion of the township. Large, good-quality supplies are indicated from overburden deposits in the eastern section. In the south-western area, bedrock wells may be required to obtain adequate supplies.

The Police Village of Burford is presently served by private wells, but adequate water for a municipal supply could likely be obtained from the sand and gravel deposits about one mile south-west of the community.

Additional water for high capacity irrigation systems appears to be available in the south-eastern portion of the township, but the installation of such systems should be preceded by exploratory work.

(b) Surface Water

Although surface-water sources are available, the quality and quantity preclude their use for domestic and municipal supplies. If the proposed storage reservoirs in the Whiteman Creek Watershed are constructed, additional water would be available for irrigation purposes.

3. Future Requirements

It is probable that future domestic and livestock requirements can be obtained from private wells.

Future growth of the Police Village of Burford may necessitate the provision of a municipal supply utilizing ground-water sources.

III WATER POLLUTION

1. General

Private sewage disposal systems installed under the supervision of the Brant County Health Unit are utilized throughout the township. Drainage from the Police Village of Burford (population - 1,061) is generally to the Lewis Drain, a tributary of Whiteman Creek. This watercourse flows west of the community and under Highway No. 53 to the creek. There has been no evidence of polluted dry weather flow.

2. Industrial Waste Disposal

The waste flows from the Borden Company Limited milk receiving station in the Police Village of Burford are treated by means of a series of septic tanks and stone filters. The partially treated waste flows to the Lewis Drain. Due to porous soil conditions, the waste does not normally reach the watercourse. However, during wet weather the waste may reach the drain.

3. Refuse Disposal

The municipal refuse disposal site is located on Concession 7, Lot 7. There is no apparent pollution involved.

4. Surface Water-Quality

The Township of Burford lies within the drainage influence of Whiteman Creek in the north and Big Creek in the south. The more populated area drains to the former. Water quality data (Chapter 3, Table 3-6) indicates satisfactory conditions in Whiteman Creek as it flows through the township.

5. Future Requirements

Individual subsurface sewage disposal facilities appear to be adequate. However, a potential danger to private water supplies in the Police Village of Burford exists and might increase if substantial growth occurs. Under these conditions, a municipal sewage collection and treatment system would be desirable.

IV CONCLUSIONS

1. Water Supplies

The water supply for domestic purposes from ground-water sources is generally adequate. High capacity wells for municipal water systems and irrigation purposes probably could be developed in the eastern section of the township.

2. Pollution Control

Available information indicates that no major sources of pollution exist in the township.

CHAPTER 8

TOWNSHIP OF DUMFRIES, SOUTH

CHAPTER 8

TOWNSHIP OF DUMFRIES, SOUTH

I GENERAL

The Township of Dumfries, South situated in the northern part of the county is an agricultural community. The only heavily populated areas are the Town of Paris in the southwest, and the Police Village of St. George in the eastern section. The township population has increased by only 167 persons in the past 14 years. The 1963 assessed population was 3,248.

II WATER SUPPLIES

1. General

Water for rural residences is obtained from dug and drilled wells and from springs. Drilled wells are usually completed in the overburden, except along the eastern and southern limits of the township where they extend to the upper few feet of bedrock. Springs are numerous. Water for irrigation and cooling purposes is obtained mainly from the Grand River and its tributaries.

A private supply utilizing ground water serves the majority of the Police Village of St. George.

2. St. George Water Supply Company Limited

A system owned by eight shareholders serves 185 consumers in the police village. Two, flowing artesian wells are the source of supply, and the pumps provided are capable of delivering 193,000 gpd of untreated water to the 35,000 gallon concrete ground-level reservoir. This reservoir is located at a high point on the system and provides storage and some pressure equalization. A four-inch diameter asbestos-cement supply main feeds the reservoir. The distribution system is composed of approximately 1.3 miles of mains ranging from 1¼ to 4 inches in diameter.

A summary of the chemical quality of the water is shown on the following page.

	Average	Maximum	Minimum
Hardness as $CaCO_3$ (ppm)	261	266	256
Alkalinity as $CaCO_3$ (ppm)	226	228	224
Iron as Fe (ppm)	0.20	1.70	0.10
Chloride as Cl (ppm)	7	9	5
Fluoride as F (ppm)	0.1	0.2	0.1
pH at OWRC Laboratory	7.6	7.8	7.1

The bacteriological quality of the water has been satisfactory.

Due to the small-sized mains, the system provides little fire protection.

3. Potential Additional Supplies

(a) Ground Water

Adequate supplies of water for rural purposes should be obtainable from overburden wells in most of the township, with the exception of some areas immediately adjacent to the Grand and Nith rivers and along the sourthern and eastern borders of the municipality. Due to the rough topography, shallow deposits of sand and gravel are often dry, and deep drilling may be necessary. Bedrock wells, except in the north-east corner, are likely to yield very hard water with an objectionably high sulphate content. Quantities of hydrogen sulphide and iron may also be encountered in rock wells.

Additional good quality water from overburden wells should be available in the immediate vicinity of the Police Village of St. George. A test drilling programme should precede any construction.

(b) Surface Water

With extensive treatment, the Grand and Nith rivers could be utilized as a domestic water source. However, the availability of ground water almost precludes their use.

4. Future Requirements

Sufficient ground water appears to be available to satisfy individual domestic and stock requirements. With water conservation and pollution control programmes the surface water supplies should be adequate for irrigation purposes.

The private water supply system in the Police Village of St. George will require carefully planned improvements.

III WATER POLLUTION

1. General

Private sewage disposal systems, supervised by the Brant County Health Unit, are generally in use throughout the township. In the Police Village of St. George numerous connections were made to storm sewers prior to the introduction of health unit inspection. These connections have resulted in the serious pollution of St. George Creek. The laboratory results of the samples collected from the outfalls are shown in Table 8-1.

2. Industrial Waste Disposal

The Malcolm Condensing Company Limited milk processing plant is located in the Police Village of St. George. During warm weather, plant wastes are disposed of by spray irrigation. Strict supervision of this system is required to ensure that it is used as long as possible each year and that no waste reaches the watercourse during the summer months. A method of adequately treating the waste on a year-around basis should be investigated.

The Consolidated Sand and Gravel Limited, West Paris plant employs a ten acre settling area for gravel washing wastes. The settled effluent is re-used in washing operations. Make-up water is obtained from the Nith River. The present waste treatment facilities are satisfactory.

3. Refuse Disposal

Two refuse disposal sites on Concession 3, Lot 14, and Concession 5, Lot 19, are employed. Pollution of surface waters is not anticipated from either of these sites.

4. Surface Water Quality

Fairchild Creek drains the eastern portion, and the Grand and Nith rivers provide drainage for the central and western sections respectively. The quality of St. George Creek, a tributary of Fairchild Creek, deteriorates appreciably due to the discharge of untreated or inadequately treated wastes from the police village. The results of samples collected from the various outfalls and from St. George Creek are shown in Table 8-1.

TABLE 8-1

SAMPLE RESULTS - STORM AND WASTE WATER OUTLETS

POLICE VILLAGE OF ST. GEORGE AND ST. GEORGE CREEK

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GFSG 68.3	May 12/64	St. George Creek at Highway 5.	0.7	358	1	357	0.0	74
GFSG 68.0	May 12/64	St. George Creek prior to junction with drain from St. George and down-stream from Malcolm Condensing Company.	27	424	106	318	0.0	57,000,000
GFSG 67.5	May 12/64	St. George Creek at Branchton Rd. below St. George.	220	570	115	455	0.1	78,000,000
GFSG 68.2	May 12/64	Stream from north at Beverly St. (outfall GFSG 68.0B).	1.2	350	2	348	0.0	10,700
GFSG 68.0 (C) W	May 12/64	Drain from north-west outfall opposite mill (14").	190.0	1,496	150	1,346	20.0	80,000

TABLE 8-1 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GFSG 68.0 (B) W	May 12/64	Drain from north-west outfall opposite mill (30").	1.0	348	2	346	0.1	67,000
GFSG 68.0 (A) W	May 12/64	Drain from north-west outfall opposite mill (10")	2.9	868	2	866	0.5	97,000
GFSG 68.21 W	May 12/64	Drain from north-east outfall west of Lorimer St.	6.8	540	1	539	3.2	280,000
GFSG 67.99 W	May 12/64	Drain from north outfall south of High St. and between Lorimer and Main sts.	6.0	534	3	531	1.2	52,000

TABLE 8-1 (CONT'D)

Sampling Point No	Date of Sample	Location	5-Day BOD (ppm)	Solids Total (ppm)	Solids Susp. (ppm)	Solids Diss. (ppm)	Anionic Detergents as ABS (ppm)	M.F.Coliform Count per 100 ml
GFSG 68.01 W	May 12/64	Drain from north outfall between King William and Queen sts., south of Grand St.	3.6	590	84	506	0.6	37,000
GFSG 68.22 W	May 12/64	Drain from north outfall east of Baptist Church and south of Beverly St.	22.0	762	20	742	6.4	8,000,000

5. Future Requirements

Individual sewage disposal systems should be satisfactory in the rural areas of the municipality. A municipal sewage collection and treatment system will be required in St. George unless suitable arrangements for private disposal systems can be made. The discharge of polluting wastes to St. George Creek requires elimination.

IV CONCLUSIONS

1. Water Supplies

Adequate ground-water sources are available to meet individual domestic needs.

Expansion and improvement of the water system in the Police Village of St. George should be undertaken on a municipal basis.

2. Pollution Control

Serious pollution problems exist in the Police Village of St. George. The limited size of lots and poor soil conditions make the use of individual disposal units difficult. A municipally owned collection and treatment system should be considered in the future.

The industrial waste disposal system utilized by the Malcolm Condensing Company Limited requires adequate supervision. Consideration should be given to providing continuous treatment facilities.

The refuse disposal sites and rural individual sewage disposal systems should be adequate.

CHAPTER 9

TOWNSHIP OF OAKLAND

CHAPTER 9

TOWNSHIP OF OAKLAND

I GENERAL

The Township of Oakland, triangular in shape, is located in the south-central section of the county. This is the smallest township in the county, comprising only some 10,910 acres. The economy is essentially agricultural, with two relatively populated areas: the Police Village of Scotland and the hamlet of Oakland.

The 1963 assessed population was 1,232, an increase of 171 persons over a period of 14 years.

II WATER SUPPLIES

1. General

Residents located on sandy land usually obtain domestic and stock watering supplies from dug wells and drive points. On higher clayey land, it is usually necessary to drill into the overburden and in some instances, to the bedrock. In both cases the quantity is normally adequate, but bedrock water is often highly mineralized and may contain hydrogen sulphide.

Irrigation water is obtained from streams and ponds and, in a few instances, from deep bedrock wells.

There are no municipal water supply systems in the township.

2. Potential Additional Supplies

(a) Ground Water

Adequate ground water for continued rural development is available throughout the township. In the south-east corner, the presence of clayey overburden may require wells to be drilled into the bedrock. Should the Police Village of Scotland or the hamlet of Oakland decide to install municipal systems, adequate good quality water would likely be available from overburden aquifers.

Deep bedrock wells and large-diameter screened overburden wells may provide irrigation water where streams are absent and dugout ponds are impractical due to the low level of the water table.

(b) Surface Water

There are no suitable surface-water sources available for domestic use. McKenzie Creek can be utilized for additional irrigation.

3. Future Requirements

Adequate ground-water resources appear to be available to meet future domestic requirements.

In the more densely populated areas, such as the Police Village of Scotland and the hamlet of Oakland, the danger of pollution of private water supplies will increase with population growth, and a municipal supply may become desirable.

III WATER POLLUTION

1. General

The adverse soil conditions in the Police Village of Scotland create operational difficulties with individual sewage disposal systems. Correction of these problems is being supervised by the Brant County Health Unit.

Individual disposal systems throughout the rural areas are generally adequate.

2. Refuse Disposal

The municipal refuse disposal site on Concession 1, Lot 7, is situated approximately 400 feet south of McKenzie Creek. While no pollution problems exist presently, care should be taken in the future use of this area.

3. Surface Water Quality

Drainage from the township tends toward McKenzie Creek. The water quality data, given in Chapter 3, Table 3-5, are satisfactory.

4. Future Requirements

Individual sewage disposal systems should continue to be adequate. Care should be taken in the future operation of the refuse disposal site to control potential pollution.

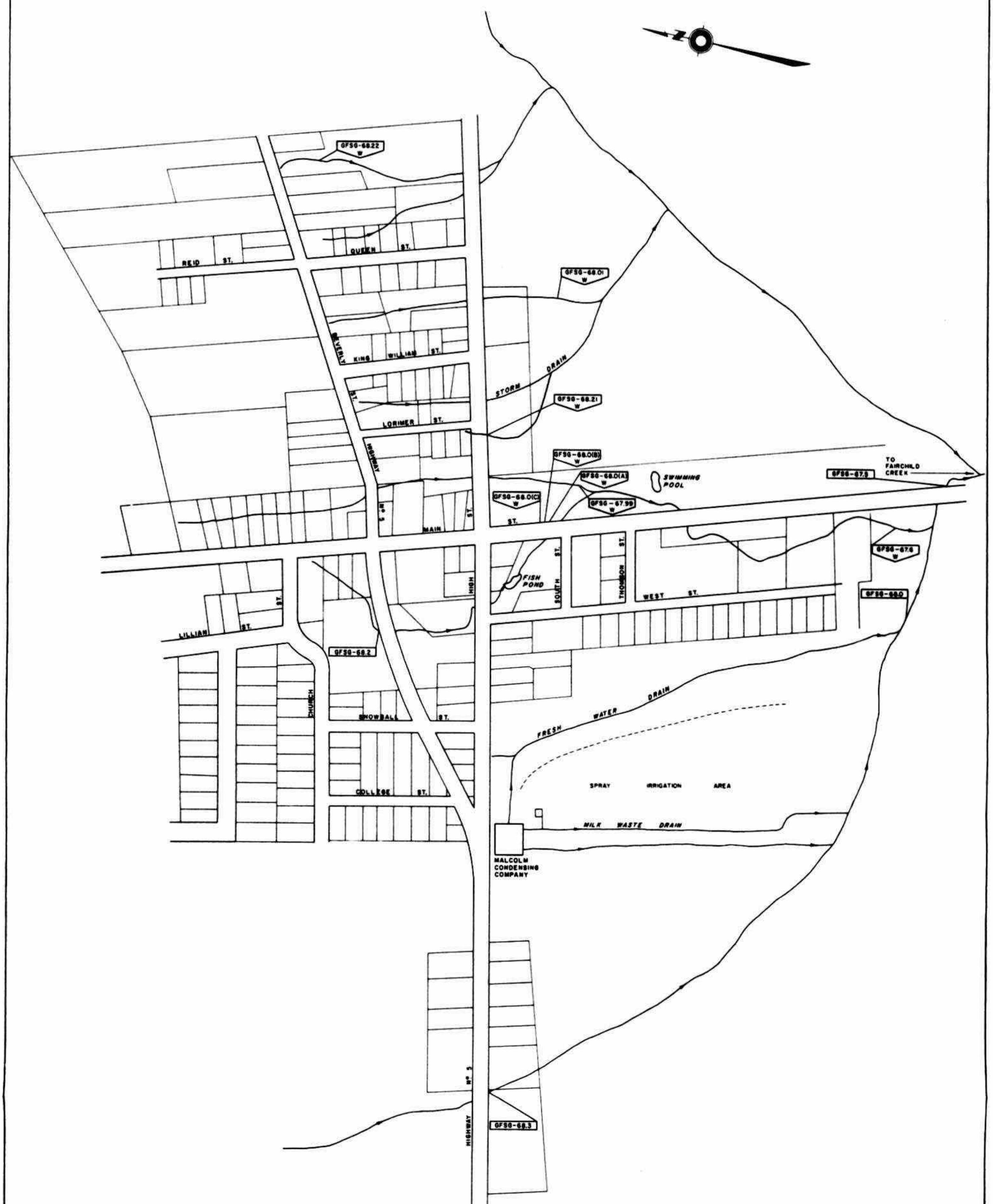
IV CONCLUSIONS

1. Water Supplies

Ground-water supplies are generally adequate although bedrock wells may deliver highly mineralized and hydrogen sulphide bearing water. Irrigation water can be obtained from wells or McKenzie Creek. Communal water supplies may become desirable in the Police Village of Scotland and the hamlet of Oakland.

2. Pollution Control

At present, there are no significant pollution problems in the township. Due to poor land drainage, problems with individual sewage disposal in the Police Village of Scotland may recur.



LEGEND

GFSG-68.3 — SAMPLING POINT SHOWING STREAM AND MILEAGE

GFSG-68.2 W — OUTLET SHOWING STREAM AND MILEAGE FROM MOUTH AND TYPE OF OUTLET

W - STORM SEWER
D - DITCH

FIGURE 8-1

ONTARIO WATER RESOURCES COMMISSION

POLICE VILLAGE OF ST. GEORGE

OUTFALL LOCATIONS

SCALE 100 0 100 200 300 400 500 FEET	
DRAWN BY: A.R.S.	DATE: AUG., 1964
CHECKED BY	DRAWING Nº 64-60

CHAPTER 10

TOWNSHIP OF ONONDAGA

CHAPTER 10

TOWNSHIP OF ONONDAGA

I GENERAL

The Township of Onondaga is situated in the south-eastern section of the county north of the Grand River. The township is rural in nature, with a section along the river dedicated to an Indian Reserve. Growth in the township has been slight, amounting to only 99 persons in a 14 year period.

The assessed population for 1963 was 1,193.

II WATER SUPPLIES

1. General

Wells drilled into bedrock and shallow dug wells in sand aquifers are sources of individual supplies. The dug wells occasionally do not yield adequate quantities. The bedrock wells very often produce relatively small supplies of very hard mineralized water, however, the residents appear to accept the high hardness and find the water satisfactory for domestic and stock-watering purposes. Bedrock wells along the north-east side obtain water from the Guelph-Lockport bedrock formations, and the chemical quality is somewhat better although hydrogen sulphide may be encountered. A few wells in gravel deposits immediately above the bedrock adjacent to the Grand River in the south-east section of the township have provided good quality water.

There are no communal water supply systems in the township.

2. Potential Additional Supplies

(a) Ground Water

Relatively poor quality ground water for domestic and stock usage can be obtained in most parts of the Township of Onondaga. In the area south of Cainsville, the water quality is poor and the quantity small.

It is doubtful whether satisfactory water for municipal use can be obtained, but a ground-water survey might indicate some possible areas. Deep bedrock drilling will probably yield a highly mineralized water.

(b) Surface Water

The Grand River, Fairchild and Big creeks are the major surface-water sources. The two former watercourses can be utilized for additional irrigation. Big Creek is not used since the crops grown in the area do not make its use economically feasible.

The Grand River could be used as a source of municipal water supply if extensive treatment facilities were provided.

3. Future Requirements

The ground-water supplies should be suitable for rural growth. A surface-water supply for municipal purposes utilizing the Grand River should be considered if urban development is considered.

III WATER POLLUTION

1. General

The rural development is served by private sewage disposal systems installed under the supervision of the Brant County Health Unit.

2. Refuse Disposal

There is no municipal refuse disposal site provided. The indiscriminate disposal of garbage, which could result in pollution problems, indicates the need for a municipally owned and supervised refuse disposal area.

3. Surface Water Quality

The township is drained by the Grand River and Fairchild and Big creeks. The analytical results of samples from these streams are given in Chapter 3, Table 3-4. There are no known sources of pollution within the township.

4. Future Requirements

A municipally owned and operated refuse disposal site is required. Individual disposal systems will meet the future pollution control measures in the rural areas.

IV CONCLUSIONS

1. Water Supplies

Adequate quantities of ground water are available in most of the township for individual domestic and stock needs, although the quality is not entirely satisfactory.

2. Pollution Control

A refuse disposal site would eliminate potential pollution from indiscriminate garbage disposal.

CHAPTER 11

TOWNSHIP OF TUSCARORA

CHAPTER 11

TOWNSHIP OF TUSCARORA

I GENERAL

The Township of Tuscarora is situated in the south-west portion of the county, south of the Grand River. The area comprises the Tuscarora Indian Reserve No. 40 and the New Credit Indian Reserve No. 40A under the jurisdiction of the federal government.

II WATER SUPPLIES

1. General

The individual water supplies are similar to those in the Township of Onondaga, that is, dug wells in relatively poor overburden aquifers and drilled bedrock wells with highly mineralized water. The quantity and quality of the water from rock wells is more satisfactory in the southern section.

There are no communal water supplies on the reserve.

2. Potential Additional Supplies

(a) Ground Water

A ground water survey would be necessary to determine whether water of adequate quality and quantity might be obtained for municipal purposes.

Adequate water for individual needs can be obtained throughout most of the township if wells are drilled a few feet into the bedrock. Deeper drilling would probably yield a poor water quality.

(b) Surface Water

The Grand River would require considerable treatment for use as a communal water supply. The Grand River, McKenzie and Boston creeks can be used for irrigating water requirements.

3. Future Requirements

Unless an urbanized area is developed a communal water system would be impractical. Wells in the sourthern area should provide sufficient water for individual domestic needs.

III WATER POLLUTION

1. General

Private sewage disposal systems are utilized throughout the reserves. The federal government is responsible for the sanitary and health conditions on these lands.

2. Surface Water Quality

McKenzie and Boston creeks and the Grand River provide drainage for the township. The quality of the water in these streams, given in Chapter 3, tables 3-4 and 3-5 indicates a satisfactory condition.

3. Future Requirements

Individual sewage disposal systems, installed with proper care and supervision, should continue to be satisfactory.

IV CONCLUSIONS

1. Water Supplies

Ground-water sources yield a limited quantity of poor quality water for domestic needs. Extensive treatment would be required to utilize surface waters for communal purposes.

2. Pollution Control

There are no known sources of pollution in the township.

APPENDIX

EXPLANATION AND SIGNIFICANCE OF LABORATORY ANALYSES

All the laboratory tests included in this report were performed at the Ontario Water Resources Commission Laboratory in Toronto.

A. BACTERIOLOGICAL EXAMINATION

Bacteriological examinations were performed on samples from water supplies, streams, and outfalls. The Membrane Filter Technique was used to obtain a direct enumeration of coliform organisms. These organisms are normal inhabitants of the intestines of man and other warm blooded animals. They are always present in large numbers in sewage and are generally minimal in other stream pollutants.

The results of the examinations are reported as "M.F. Coliform Count per 100 ml".

The Commission's objective for stream sanitation is a coliform density of not greater than 2,400 organisms per 100 ml.

B. STREAM AND OUTFALL SAMPLES

The chemical analyses performed on stream and outfall samples include determinations for biochemical oxygen demand, suspended solids, turbidity, and in some instances, pH, and alkyl benzene sulfonate (ABS).

BIOCHEMICAL OXYGEN DEMAND (BOD):

Biochemical Oxygen Demand is reported in ppm and is an indication of the amount of oxygen required for the stabilization of decomposable organic matter present in sewage, polluted waters, or industrial wastes. The completion of the laboratory test requires five days, under the controlled incubation temperature of $20^{0}C$.

The Commission objective for stream water quality is an upper limit of 4 ppm.

SOLIDS:

The laboratory carries out tests to determine the total and suspended solids in a sample. The value for dissolved solids is determined by taking the mathematical difference between the total and suspended solids.

The concentration of suspended solids expressed in parts per million (ppm) is generally the most significant of the solids analyses in regard to stream water quality. The effects of suspended solids in water are reflected in difficulties associated with water purification, deposition in streams, and injury to the habitat of fish.

Where suspended solids values approach 20 ppm or less, laboratory difficulties are experienced and, excepting the samples from sewage treatment works, the values of suspended matter are usually determined as turbidity.

TURBIDITY:

Turbidity is caused by the presence of suspended matter, such as clay, silt, finely divided organic matter, plankton and other microscopic organisms in water. It is an expression of the optical property of a sample and results are reported in "Silica Units".

pH:

The pH is an index of the acidity or alkalinity of the solution as represented by the instantaneous hydrogen ion concentration. The practical pH scale extends from 0, very acid, to 14, very alkaline, with the middle value of pH 7 corresponding to exact neutrality (at 25^{0}C.). The objectives for surface-water quality as adopted by the OWRC suggest that the pH of the waters following initial dilution, should not be less than 6.7 nor greater than 8.5.

ABS (ALKYL BENZENE SULFONATE):

The alkyl benzene sulfonate portion of the anionic detergents are reported in ppm. The test is generally employed to indicate the presence of illegal discharge of waste water to storm drains.

The popular use of synthetic detergents for general cleaning purposes has resulted in the incidence of residual ABS in streams. As an objective, the ABS concentration should not exceed 0.5 ppm in water used for domestic purposes.

ETHER SOLUBLES:

Ether solubles in a waste discharge indicates the presence of oil or grease in water as an emulsion from industrial wastes or similar sources, or a light petroleum fraction in solution.

The ether solubles in a waste discharge should not exceed 15 ppm.

PHOSPHATES:

Waters receiving raw or treated sewage, agricultural drainage and certain industrial waters normally contain significant concentrations of phosphate. The presence of phosphates in surface waters is an indication of the fertility of the water.

C. WATER SUPPLIES

The chemical analyses performed on water used as a source of supply for municipal or private systems include; hardness, alkalinity, chlorides, iron, fluoride, pH, turbidity, and colour.

HARDNESS:

No specific limit is usually placed on hardness although it is usually recommended that waters for domestic use should contain less than 250 ppm hardness as $CaCO_3$. This recommended limit has been used to avoid excessive soap consumption and other problems, primarily economic, usually associated with hard water. The degrees of hardness are indicated as:

Soft	-	0-75 ppm as $CaCO_3$
Moderately Hard	-	75-150 ppm as $CaCO_3$
Hard	-	150-300 ppm as $CaCO_3$
Very Hard	-	greater than 300 ppm as $CaCO_3$

ALKALINITY:

Alkalinity of natural waters is due to the presence of salts of weak acids, usually bicarbonates. The concentration is reported in ppm as $CaCO_3$ and is significant in determining aggressive tendencies and softening treatment requirements.

CHLORIDES:

Chlorides are naturally present, in varying concentrations, in water supplies. Increasing chloride concentration may indicate contamination from domestic sewage.

The recommended maximum concentration to avoid saline tastes is 250 ppm.

IRON:

The recommended maximum limit for iron in water supplies is 0.3 ppm. It is noted that waters with concentration of iron in excess of 0.3 ppm are not harmful to consumers but have objectionable staining and sediment-forming properties, and may cause the deposition of iron in pipes or the growth of iron bacteria. If the concentration exceeds 1 ppm, problems with metallic taste may occur.

FLUORIDE:

Fluoride may occur naturally in water or it may be artificially applied at the supply and/or treatment works.

A fluoride concentration of approximately 1 ppm is considered beneficial in the prevention of dental caries. The recommended maximum and minimum limits of fluoride are 1.2 ppm and 0.8 ppm respectively.

TURBIDITY:

The significance of turbidity is included in Section B.

The turbidity of treated water should not exceed 5 Silica Units.

COLOUR:

The colour intensity of water is reported in Hazen Units.

The colouration of natural water may result from contact with organic matter or chemical substances.

The recommended maximum colour content is 15 Hazen Units.