Part 1.

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Part 2.

The OFFICIAL '96 Census population figures for the OFFICIAL Kitikmeot communities are:

Cambridge Bay	1351
Kugluktuk	1201
Gjoa Haven	879
Pelly Bay	496
Taloyoak	648
Holman	423
Bay Chimo	51
Bathurst Inlet	18
TOTAL	5067

COMMUNITY GROWTH

$$P_{new} = P_{curr}(1 + r)^n$$

P_{new} - > Population at a future date
P_{curr} -> Current population
n -> number of years to P_{new} from P_{curr}
r -> Growth rate, %

End of Item 21.

4. WATER DEMAND FORECAST

A water demand forecast based on the present and future population predictions and compared these forecast to the actual consumption records provided by the community has been prepared.

As noted in the "GNWT - MACA Water & Sewage Facilities Capital Program: Standards and Criteria", the design total community water use is calculated as follows:

Table 4.1 Design Total Community Water Use Estimates

Total Community Population	Total Water Use per Capita
0 to 2,000	RWU x (1.0 + (0.00023 x Population))
2,000 to 10,000	RWU x (-1.0 + (0.323 x Ln(Population)))
over 10,000	RWU x 2.0

Where:

RWU is the Residential Water Use

Ln is the natural logarithm

It has been reported that the present per capita water use rate is 74 lpcd. The GNWT MACA accepted RWU factor for trucked system users is 90 lpcd. We suggest that this latter rate be used for all options studied in this planning document.

Based upon the previous design equation, at the present population of 1,201 people, the theoretical per capita daily water consumption for the community should be 114.8 lpcd, or approximately 137,950 litres per day (96 lpm) for the total population.

At the twenty year design horizon (year 2020), the population projection is for 2,183 people. As this population falls into the next category for consumption estimates, the theoretical per capita daily water consumption for this year would be 133.5 lpcd or approximately 291,500 litres per day (202 lpm) for the total population. We will be using this latter per capita consumption rate in our system analysis for this project.

SEWAGE = 80% WATER USE.

289

4.1 DAILY WATER PRODUCTION RATE FORECAST

Table 4.2 shows the estimated daily water production rate based on the following assumptions:

- Operation in 2020 to be 20 hours per day;
- Capable of meeting Peak Day Demand; and
- Allow additional 10% for in-plant and facility use.

$$PDD_{2020} = PDF \times TDF \times ADD_{2020} \quad (4.1)$$
$$= 734{,}290 \text{ litres/day}$$

Where:

PDD_{2020} = Peak Day Demand in Year 2020

PDF = Peak Day Factor = 1.5

TDF = Truck Delivery Factor

= 7/5 based on water delivery 5 days per week.

ADD_{2020} = Average Day Demand in Year 2020

$$\text{Total Production Rate}_{2020} = PDD_{2020} \times 110\% \quad (4.2)$$
$$= 807.719 \text{ litres/day}$$

389

GJOA HAVEN

A General

A.1 Location

Gjoa Haven is located on the southeast coast of King William Island, 68°30' N latitude and 95°53' W longitude. It is located 142 air km southwest of Taloyoak and 1,056 air km northeast of Yellowknife.

A.2 Geology and Terrain

Limestone bedrock, covered with a thin layer of frost weathered in situ sand and boulders forms the characteristic terrain of the area. Bedrock predominates in the higher hills, which rise up to 45 m. The surface in lower areas, especially near the core, is covered by a thick layer of fine sand and coarse rock.

Permafrost conditions underlay the entire area with the active layer ranging between 0.9 m to 1.2 m thick by the end of the summer.

A.3 Vegetation

Arctic tundra vegetation covers the area. Lichens grow on rock outcrops, while clusters of Arctic willows reaching a length of 0.5 - 1.0 m grow horizontally in well-sheltered areas.

A.4 Climate

Gjoa Haven receives an average of 5.1 cm of rainfall and 25.4 cm of snowfall per year. The July mean high and low temperatures are 13.9° C and 7.2° C, respectively. The January mean high and low temperatures are -23.3° C and -39.0 C, respectively. The winds are light and from the north.

A.5 Community History and Economy

The area was first occupied by the Netsilik Inuit, who, having to adapt to work on the winter or spring ice, are considered expert sealers.

Roald Amundsen, the first person to navigate the Northwest Passage between 1903 and 1906, wintered in a natural harbour on King William Island. He named the harbour Gjoa Haven, after his ship the Gjoa. The Hudson Bay Company opened their first post in 1923, moving to the present site in 1927. Both the Anglican and Roman Catholic Churches established missions in the community.

The economy of the area is still dependent on hunting and fishing. Tourism dollars have provided a boost to the sale of carvings and

other handicrafts. The Hamlet Council has proposed the formation of an Economic Sub-Committee to ensure that the creation of private enterprise continues growing; a new hotel, a construction company, a fish processing plant and several small firms have been slated for developing in the future.

Gjoa Haven gained Hamlet status on April 1, 1981.

A.6 General Demographic Information

The population of Gjoa Haven, 783, is increasing at a rate of 2.79% per year. Gjoa Haven is one of the fastest growing communities in the Northwest Territories; projections estimate that population will increase to 895 in 1996, 1,031 in 2001 and 1,147 in 2006. The population by ethnic distribution is 96% Inuit and 3% non-aboriginal. The remainder of the population is of either Metis or Dene origin. The population by age and sex distribution is as follows: 0-4, 18%; 5-14, 26%; 15-64, 55%; 65+, 1%; 50% male and 50% female.

A.7 Transportation and Access

The GNWT and the Hamlet jointly operate a 1,341 m X 30 m certified Arctic 'C' gravel runway. Facilities include a terminal building, weather/communications and navigation equipment. Scheduled flight service is provided by First Air Ltd via Yellowknife, Cambridge Bay and Iqaluit. An unlicensed water aerodrome provides float plane access, with anchorage available but no services.

Marine transportation is provided by NTCL Barge out of Hay River on a solo ~~July~~ September voyage. There are no facilities.

There is no direct road access to Gjoa Haven. Within the community there are approximately 12.8 km of roads. The airport road and the garbage disposal road are the two gravel-surfaced roads in the community, with the others being trails through the existing sand surface. Dust suppressant is not applied, yet these roads are improved with the addition of gravel fill.

A.8 Housing

Occupied private dwellings increased 38.1% between 1986 and 1991. As of 1994, the Housing Corporation owned 143 housing units. The Housing Assistance Program, the Alternative Housing Program and Government Lease-to-Own homes accounted for 33 homes in the community.

A.9 Commercial Accommodation

The Amundsen Hotel accommodates six guests.

B General Municipal Facilities and Services

B.1 Recreation and Culture

Gjoa Haven has a school gymnasium that is used in the day by the school and by the community in the evenings and on weekends. The Gjoa Haven Recreation Complex was completed in 1993 and contains an arena and curling rink. A community hall was built in 1985. The school has a playground and a community playground is being built this summer. A tot-lot was built in 1992. There is also a softball diamond and a developed trail system in the community. An above ground pool is planned for the community for 1996/97. Gjoa Haven has an active recreation committee.

B.2 Education

The Quqshuun Ilihakvik Centre teaches grades K-9. Nine teachers and four language specialists are employed. Vocational and continuing education are available through the resident adult educator and the Arctic College extension program.

B.3 Health

The current Gjoa Haven health centre was built in 1970. The facility is 5023 m² in area and contains four medical beds, two bassinets and two cribs. Staff includes three nurses, one dental technician and one community health representative.

B.4 Fire Protection

Fire protection in Gjoa Haven consists of a twelve-person volunteer fire brigade. Equipment consists of a 1980 IHC model, [illegible] 4,500 capacity triple combination pumper and a telephone alarm system. The community's firehall has one-bay.

B.5 Other Services and Municipal Buildings

A two-person RCMP detachment serves the community. There is also a two-person social services office.

Mail is delivered three times per week. NorthwesTel (local and long distance), CBC Radio and CBC Television are provided via the Anik satellite. NWTPC, area office Cambridge Bay, supplies power with a 1,080 kW capacity diesel generator.

Other MACA-provided buildings include staff housing, a Hamlet office, two three-bay parking garages and a two-bay maintenance garage that was built in 1994.

C Water and Sanitation

C.1 Water Supply and Treatment

Gjoa Haven's present water supply, Water Lake, has apparently has been used as such for many years. A well-constructed 1.0 km long road connects Gjoa Haven with the existing water truckfill station.

Water is pumped from Water Lake through a single intake to the

truckfill station, 170 m uphill from the lake. The present intake is located 9 m below the water surface and extends 30 m into the lake. Concrete ballast blocks placed at 1 m intervals keep the line in place. A mesh screen prevents large objects from entering the line. The pipeline consists of two sections, an intake line up to the pump removal station and a supply line from the pump removal station to the storage building.

The truckfill station contains a water storage tank and a treatment plant. The existing water system was constructed in 1980 with the water treatment plant being added in 1986. Larger capacity pumps have replaced the original pumps to bring the truck filling capacity of the station to 1000 L per minute.

The water from Water Lake has been chemically tested ~~several times~~ continuously since 1971, when the conceptual plans for the existing water system were first proposed. The water has been found to be of good chemical quality for domestic use. The water, was shown to be hard, well-buffered, slightly alkaline, containing a moderate amount of dissolved solids and slightly undersaturated with respect to calcium carbonate. Comparison to the raw and treated water samples to the GCDWQ showed those parameters tested as below the recommended maximum limits.

Treatment by disinfection, consisting of chlorination and colour and odour removal, is carried out in the truckfill/treatment plant. Processes are executed through the use of a hypochlorinator, complete with a 136 L feed tank and activated carbon and multi-media filters, respectively.

C.2 Water Storage and Distribution

Water Lake occupies a small valley, situated between the airport runway to the north and a hill to the south. It drains from the western end into Peterson Bay, with a drainage area total of approximately 28 ha. The volume of water available from Water Lake is 45 million L with an effective below ice winter storage volume of 22.5 million L. The existing water supply is reaching its capacity to supply the Hamlet. The next closest lake, meeting the Hamlet's water demand is Swan Lake, 4.5 km away. A recently completed engineering planning study concluded that it was more feasible, reliable and economical to modify the existing water supply lake than to construct an all-year water supply pipeline from Swan Lake to the Community.

It is proposed to increase the lake storage capacity and refill Water Lake each summer via an overland pipeline from Swan Lake. Fluoridation facilities would also be proposed subject to Hamlet Council approval. The project includes the planning, design and construction of earthworks and a 4 km overland pipeline. Additionally, works to protect the catchment area of the lake's watershed from receiving runoff contaminants would be constructed. ~~complete~~ completed 1993

Storage facilities at the end of the pipeline consist of an 11,365

L storage tank. The mild steel tank is located inside the building to prevent the water from freezing. Water is pumped from the storage tank to the water trucks via an overhead fill arm.

Water delivery is provided by the Hamlet with three water trucks, ~~each~~ 4500 L in capacity. The level of water service provided is a minimum of two deliveries per week, with high volume users such as the school and hotel receiving water daily.

C.3 Sewage Collection and Disposal

The Hamlet Council holds the contract for sewage and garbage collection. Three 4500 L Ford model F-700 trucks provide pumpout service to the residences, the school and the nursing station.
Pumpout sewage is disposed of at the Hamlet's single-cell lagoon, located approximately 3.4 km from the Hamlet, measuring 22,700 m². Once the effluent reaches capacity at the end of summer, it is discharged as overland flow through a ditch, toward the ocean, roughly 700 m from the lagoon.

To greatly reduce the movement of either sewage or groundwater, a cut-off wall in the lagoon berm was constructed that forms a barrier for lateral movement of water. The cut-off wall, constructed in two stages, consists of a heavy liner that extends vertically through the active layer. It is important to note that the complete water tightness of the lagoon vis a vis a cut-off wall is not guaranteed but the amount of seepage under the wall will be minimized; the wall can form an effective barrier to water movement.

Old fuel drums located in front of each house are used for the storage of bagged sewage. Bagged sewage in these barrels is collected ~~three times~~ per week by the Council, to be placed in a cell adjacent to the sewage lagoon.

C.4 Solid Waste Collection and Disposal

Garbage is placed in one of two 205 L barrels by individual residents. The refuse is collected daily by a two-man crew using a 1984 Ford model F-350 truck. Burning of wastes in the barrels is not practiced at the home. Twice per year, special collections are carried out for snowmobiles, mattresses and other bulky wastes.

The solid waste site is located 1.7 km southeast of the community in a human-made bermed area measuring 15,000 m². The site is to be fenced at some point ~~in the future.~~

Wastes are burned at the site once a week and an adjacent esker serves as a granular source for cover material.