BAR-1 Distant Early Warning (DEW) Auxiliary Station Komakuk Beach, Yukon Territory

David Neufeld Yukon Historian, CPS

Executive Summary

DEW Line station clean-up procedures and standards are currently under discussion and development within the Canadian Department of National Defence (DND). This department has contracted out a major study of the issues and problems facing such a project and is drawing up the detailed specifications for site clean-up. The Federal Green Plan also includes provision for the clean-up of abandoned military sites in the Arctic. Two stations, BAR-1 near Komakuk Beach and BAR-B at Stokes Point, are either in Ivvavik National Park or occupying land to be transferred to the park. To date DND, Department of the Environment (DOE) and the Department of Canadian Heritage - Parks Canada have agreed to consider a complete clean-up with appropriate site rehabilitation at these points.

The cultural resource management mandate of Parks Canada requires some consideration of the possible significance of these sites before a complete and irreversible clean-up operation is approved.

Introduction

The northernmost extension of a continental air defence system, the construction and operation of the Distant Early Warning (DEW) Line affected several areas of Canadian interest. The DEW Line reflected parts of contemporary Canadian military policy, raised concerns over Canadian northern sovereignty, created new facilities for the development of the north, and prompted the development of northern science and technology. All of these initiatives brought the Inuit into much closer contact with southern Canada with cultural consequences for both sides. Komakuk Beach, also known by its DEW acronym BAR-1, (Figure 1) was one of two experimental DEW Line stations built in 1953 to test the feasibility of a northern radar line. It was the first DEW Line station in Canada. BAR-1 will be closed down in the near future, replaced by a more sophisticated unstaffed North Warning radar on the same site.

This paper reviews the history of the DEW Line, and describes the reasons for its development, its place within the continental air defence system, and its impacts on areas of Canadian history. In more detail it describes the design, construction, and operation of the Komakuk Beach Auxiliary Station and the degree to which it can be considered representative of other sites in this network. The paper concludes with a summary of the present status of the site within Ivvavik National Park.

The DEW Line in Continental Air Defence

The concept of a unified approach to North American continental defence evolved with the developing possibilities of an inter-continental military threat to the United States and Canada after the Second World War. Mutual defence aid was promised by both countries politicians as early as the mid-1930s. The first concrete arrangement for continental defence was the creation of the Permanent Joint Board on Defence during the Second World War. More detailed agreements, generally addressing aspects of continental air defence, were made through the late 1940s and into the 1950s. These culminated in the creation of the North American Air Defence Command (NORAD) in September, 1957. Thus by the late 1950s the defence of the North American continent was integrated into a single organization controlling all aspects of early warning, interception, and battle direction.1

In 1945, after half a decade of commitment to total war the people of Canada and the United States demanded a return to ordinary life. Consequently there were large and immediate reductions in the armed forces of both countries. However the collapse of democratic governments behind the Iron Curtain in eastern Europe and Truman s acceptance of the Marshall Plan as an economic barrier to Communist expansion set the stage for continuing confrontation Tensions between the West and Communism made an early return to peace impossible to consider.2

The character of confrontation in this period also set the stage for North American military response through the 1950s. The successful airlift overcoming the year long Soviet blocade of Berlin and the importance of airpower in the Korean War were lessons not lost on American military planners. Coupling this experience with the western public s desire for a demilitarized society and the American monopoly of the atomic bomb during the late 1940s led to the creation of a doctrine of massive nuclear response to feared Soviet aggression.3 Thus the perception of modern war was changed from large conventional armies meeting on a European battlefield to crippling inter-continental nuclear air attacks on enemy populations and industrial centres.

To achieve this military position the American military developed a nuclear weapons delivery force, Strategic Air Command (SAC). Capable of reaching into the heart of the Soviet Union, the bombers of SAC were touted as a deterrent to a perceived threat of Soviet conventional military incursions into western Europe. There was an acknowledgement of the possibility of Soviet attack on North America but military planners in the late 1940s considered themselves at least a decade ahead of any threat. In response to heightened tension in the spring of 1948 the air force established an active air defence of Alaska. The equipment and organizational limitations obvious during this effort pointed out the aerial vulnerability of North America. Several study groups subsequently sponsored by the United States government came to similar conclusions.

Further, the operational introduction of long range bombers into the Soviet Air Force in the spring of 1948 and the successful explosion of a Soviet atomic bomb in the following year shocked Western governments. There was even concern about the possibility of nuclear-armed rockets.4 The sudden and

complete nature of these achievements caused a revision in the assessment of Soviet capabilities. In 1950 military planners assumed the Soviet Union would be able to launch a destructive attack on North America by the summer of 1954.

This startling reappraisal of Soviet attack capability and the deficiencies of North American air defences raised political and military interest in continental air defence in both Canada and the United States. The history of continental air defence was shaped by the events of the Cold War, economic constraints, developing military doctrine, and technological capacity. Through the early and mid-1950s continental air defence maintained a high priority, some $20 billion eventually being invested in the system. The bulk of this money was used for the design, development, and construction of the DEW Line.5

The continental air defence system erected through the 1950s can best be understood as an integrated technological fortification. Its chief components consisted of a detection and battle direction system, largely based upon radar and communications networks, and interception and destruction units, generally jet fighters and guided missiles. Canadian contributions to the interception/ destruction component included the Avro Canada CF-100 Canuck and CF-105 Arrow jet fighters, the Sparrow anti-aircraft missile, and the Astra I fire control system.6 Most of the detection/direction system was built on Canadian territory and hence its impact was largely socio-cultural, with additional economic and technological influences.

As noted the detection/direction system was expected to fulfil two functions: initial detection of advancing enemy forces and ongoing information of enemy activities to aid the defending forces. During the Battle of Britain, where radar first made a battlefield appearance, it provided initial warning of attack only. Subsequent information on enemy aircraft over Britain to direct defending aircraft was provided by a Ground Observer Corps, individuals with binoculars and a telephone. The North American air defence system in the immediate post-war years followed a similar model.

Canadian and American military planners considered the development of an arctic early warning radar sysem, complete with interceptor airfields, in 1946 and early 1947. Code-named SUPREMACY, the United States Air Force system envisaged some 411 radar installations across North America with 37 staffed stations in Canada and Greenland.7 Estimated to cost nearly $400 million to build and requiring 39,000 men to operate, the system was unwieldy and expensive to an extreme. As well, the great distance between the Arctic warning line and direction systems in the south (an effort to establish a North American ground observer corps in the late 1940s and early 1950s was largely a failure), meant that while a warning might be had there would be no effective direction of defending fighters against attacking bombers. Further the expected direction of attack was from either east or west. The plans, especially those for the Arctic warning line, were rejected by Congress.

However a much reduced version of SUPREMACY, known as the Modified Plan, was approved by Congress in 1948. Its central premise was the assumption that a Soviet attack would focus on the population and industrial centres of the north-east and north-west areas of the United States. The system therefore provided a brief warning for civil defence and direction for point defence for those

areas.8 The limitations of existing radar, the great expense of attempting continent-wide coverage, and the assessment of possible Soviet attack strategies all favoured the development of such a point defence plan. The system became operational in April, 1953.

The Canadian government adopted a similar approach to air defence. Negotiations with American officials led to Canadian approval for a northern extension of the Modified Plan, dubbed the Pine Tree System, in April, 1951.9 Consisting of over 30 radar stations in eastern Canada and along the Atlantic and Pacific coasts, the Pine Tree System was primarily designed to provide direction to American air force interceptor aircraft. (Figure 2) Although almost entirely in Canada the American defensive character of the line was recognized in the cost-sharing agreement worked out between the two countries. Canada contributed one-third of the estimated $450 million cost of the project. The Pine Tree System began operations in June, 1954, a little over a year after the completion of the Modified Plan stations.

Three significant changes in the early 1950s affected the subsequent development of the North American continental air defence system. Continuing improvement of radar equipment, a changing assessment of Soviet attack strategy, and the growing Canadian commitment to NATO forces in Europe all shaped the history of the Mid Canada and DEW Lines.

Technical improvements to radar equipment vastly improved its capability. Much longer range and more accurate information was available from the newer sets developed in the early 1950s. More important for the northern applications however, was the introduction of an auto-warning capacity. In areas with limited traffic the auto-device warning alerted personnel when the radar picked up a sighting. This greatly reduced the staffing requirements for radar stations. The earlier Pine Tree stations required 200 staff. With the new equipment a comparable DEW Line station could provide better coverage with only 10 men.10 This technical improvement not only made Arctic radar stations far more affordable but also increased their potential contribution to continental defence.

By 1952 military planners no longer assumed the main Soviet attack would be on cities and industrial plant or from the east or west. The revised plan assumed a first strike via a polar approach against the American nuclear retaliation force, the airfields and bombers of SAC. Scattered across the American Midwest these fields were unprotected from the north by the point defence networks of either the Modified Plan or the Pine Tree Line. The large gap in the defences of mid-continent became an immediate concern. The LINCOLN Study group commissioned by the American armed forces in 1952 to report on this deficiency recommended a northern extension of radar coverage to provide early warning and a broader band of fighter direction.11

As in the 1940s the high costs of the proposed extension caused politicians inthe United States and Canada to consider a reduced commitment to continental defence. However, the pace of Soviet weapons development, the Soviets introduced the M-4 Bison inter-continental jet bomber in 1952 and successfully detonated a hydrogen bomb in the late summer of 1953, strengthened the hand of the proponents of air defence. President Truman responded by making continental defence the United States highest military priority. In both Canada and

the United States the military were instructed to develop plans for this northward extension of the air defence system.

In Canada, the federal government was faced with a difficult choice. It was under pressure to control military expenditures, which continued to rise markedly through the early 1950s.12 Yet it was also faced with having to meet the demands for continental defence in addition to commitments for conventional military and air forces made to the NATO allies in Europe.13 The growing American military presence in Canada was also causing some politically embarrassing questions to be raised about Canadian sovereignty. To address these concerns and to maintain some control over national contributions to continental defence the Canadian government moved to establish its own continental defence initiative. The result was the Mid-Canada Line.14 (Figure 2)

The Mid-Canada Line effectively blocked the radar coverage gap left between the eastern and western sectors of the Pine Tree Network. Its primary operational purpose was the extension of the interceptor direction and control area into the mid-north of Canada. Politically, however, the Line fulfilled several other purposes. Paid for exclusively by the Canadian taxpayer, the Mid-Canada Line utilized Canadian-developed radar and electronics equipment supporting research and development. It was built by Canadian contractors and labour contributing to the national economy, and to address concerns about Canadian sovereignty, it was staffed by Canadian military personnel. Perhaps the most important aspect was the economic factor. Relatively modest in cost, the Mid-Canada Line freed the Canadian government from American pressure to contribute to the grandiose and far more expensive plans being prepared for Arctic defence lines. Approved by Parliament in June, 1954 the Mid-Canada Line became operational in 1957.

President Truman s commitment to continental defence in late 1952 was in fact a commitment to build an Arctic defence line if it was at all feasible. With the Mid-Canada Line filling in coverage in the mid-continent, northern early warning was becoming increasingly useful for both civil defence and nuclear strike force purposes. Design and successful testing took place in Alaska and Yukon through 1953 and early 1954. Bilateral negotiations followed. On 5 May, 1955 the Canadian Government gave approval for the construction of some 43 radar warning and communication stations across the Canadian Arctic. A massive construction project immediately invaded the north. Designed to provide six hours advance notice of attack the northern warning, or DEW, line was the last bastion erected of the North American continental air defence fortress. Its substantial operational presence continues to the present.

Building the DEW Line

The United States Air Force was given the responsibility to build and operate the northern warning line. Their first step was to award a contract to the Western Electric Company in December 1952. Known as Project CORRODE,15 the contracted work included the design and testing of two prototype stations in the north, survey of a feasible line across the Canadian Arctic, and the

recommending of specific sites for stations. The Canadian government was also approached about its interests and participation in the line.

The first work in the north was the aerial survey of two possible locations for the DEW Line. A high north line, along the 75th parallel, was discounted because of the difficulties associated with access for both construction and supply, the limited number of suitable site locations, and anticipated operational problems. The more southerly line, along the 70th parallel, was more accessible and a series of site surveys along it were completed by the spring of 953.

The selection criteria developed for DEW Line sites highlights those elements considered important to the system designers. They included:

1. Good access by water for initial construction and resupply operations. Further overland travel possibilities for lateral communications between stations was considered important.
2. the need for airstrips.
3. a good radar view to the north with no local conditions that might affect electronic communications.
4. ground capable of bearing a station or with sufficient local gravel resources to create such a base.
5. access to fresh water.
6. the use of the small but valuable reservoir of manpower... available in the native settlements .16

While the preliminary line and site surveys were underway the Americans approached the Canadian government with their requirements for CORRODE. While the physical tests could easily have been completed in Alaska the importance of Canadian participation, or at least permission, was central to the whole DEW Line. To meet this diplomatic test the experiment included a station in Canada. Originally sites at Herschel Island and Aklavik were considered but these were supplanted by a more isolated site just east of the Alaska boundary.17 Canada acceded quickly to the test station on the condition that the United States bear the complete cost of its construction and operation.18

Western Electric meanwhile developed its two prototypes. After constructing them in an Illinois cornfield the buildings were dismantled and shipped to Barter Island, Alaska. From there the components for one station were loaded on cat trains and hauled to the Canadian site through the spring of 1953. Construction of both stations took place through the summer and both were in operation by early 1954.19

The DEW Line facilities were originally divided into three classes of radar stations. Main stations, staffed with a complement of 50 civilian workers and a small complement of USAF officers trained to evaluate the radar sightings, acted as supply and service centres with direct aircraft and communication links to the south. Auxiliary stations, with about 20 civilian staff, and Intermediate stations, known as I-sites and staffed by five civilians, were supplied by and reported to their Main station.20 At roughly 80 kilometre intervals the stations provided overlapping long/high and short/low range radar coverage of the northern approaches to the continent.

This first pair of DEW Line stations straddled the Alaska-Yukon boundary. A Main station (BAR)21 was built at Barter Island. The first station in Canada, an

Auxiliary station (BAR-1) went up at Komakuk Beach. Komakuk Beach, also named Bagnall Beach22 by the contractor during construction, and the subsequent three western-most stations in Canada, Stokes Point (BAR-B), Blow River (BAR-2), and Tununuk (BAR-C) made up the first integrated unit of the DEW Line. (Figure 3)

The first winter of operations was carefully evaluated. In June, 1954 the USAF announced that the project had successfully met its objectives. The DEW Line was technically feasible. Budgets and construction specifications were prepared and negotiations with the Canadian government were concluded with a draft agreement on the DEW Line in September, 1954.23

The DEW Line provided a challenging problem for its designers. As a major military fortification system costing billions of dollars the Line was carefully planned by the military and its operational purpose clearly defined. Nevertheless the complexity of the equipment and the unfamiliar destination environment demanded the testing of the system with a prototype. BAR-1 at Komakuk Beach was one of these prototypes. The design and operational experience at BAR-1 shaped the subsequent form of the DEW Line.

Design Considerations

The DEW Line provided a challenging problem to its designers. As a major military fortification system costing several billions of dollars the DEW Line was carefully planned by the military and its operational purpose clearly defined. Nevertheless the complexity of this new military system demanded the production of a prototype to test the design, its operation, and its political acceptability. BAR-1 at Komakuk Beach isa component of this prototype DEW Line unit.

BAR-1 fulfilled an early warning task for continental defence purposes. Four interrelated functions were identified to meet this task.

1. Detection of air activity and communication of findings.
2. Station management and regulation.
3. Operational support to ensure functional continuity.
4. Staff support to maintain staff morale and abilities.24

Continuing operation required stations be designed to operate for extended periods without resupply in the rigorous arctic climate and to ensure the survival of the staff in the event of a disaster. The building shell, environmental control systems, and a regular and complete maintenance program were expected to ensure the station s ability to function in the Arctic. As the station became operational and additional observation and detection equipment was installed modifications to the site became necessary. For example, the present powerhouse replaced the original, subsequently made into the workshop, when power demands increased. The visitor s dormitory was also added as the steady stream of visiting military officials and contractors overstressed existing facilities. At present equipment modernisation and a diminishing role have reduced these stresses on the station. These limited modifications to the BAR-1 site however had not significantly altered the station s original appearance by June, 1990.25

The DEW Line stations essential military role required full-time,

continuous station operations. The stations locations, remote from the sources of resupply and repair, therefore demanded an ability to maintain operations for extended periods. Like any well designed fortification the possibility of war action required the DEW Line to be a mutually supporting, self-sufficient system. The design of the DEW Line and the individual stations therefore included elements of mutual support among adjacent elements and the provision of system self-sufficiency through the provision of extensive storage facilities, repair and maintenance capabilities, and multiple system redundancies. These elements of modern fortification are reflected on both the DEW Line systems level and the individual station level.

The station is integrated into the DEW Line on several levels to ensure mutual support for continued operations. The main base is equipped with a field hospital, large stores, and associated services, and had close administrative, service and supply links with each auxiliary and intermediate station in its area. Major repairs and equipment overhaul for the station were done at the main stations. At present these have been centralised at a maintenance and supply facility at Cambridge Bay, NWT. Stations and the various northern support facilities in Canada are connected to administrative and clearing house offices located in Winnipeg, Manitoba. The DEW Line project heaquarters, operated by ITT, and the base for USAF 4700 Squadron, the American military unit responsible for DEW Line operations, are both located in Hampton Virginia.

These inter-connections are reflected in several ways at BAR-1. Regular radio communications between DEW Line stations and the operating companies policy of moving staff across the line to different stations re-inforces the connection between stations. In a social sense the DEW Line staff, long forbidden by secrecy regulations to discuss their jobs with outsiders and generally isolated from the rest of Canadian society by their long work terms, have formed their own northern group, based upon the DEW Line.

FELEC, the Canadian operating company for the DEW Line has its headqaurters in Winnipeg and consequently recruiting for operations appears to include a substantial number of Manitobans on DEW staff. The station also maintains a subscription to the Winnipeg Free Press, generally only three or four days delayed.

The Station, like the whole DEW Line, operates on Eastern Standard Time, the local time for Project Headquarters in Hampton Virginia. Communications between individual stations and Project Headquarters seems to occur continuously. At BAR-1 this standard DEW Line leads to the spring time curiousity of being able to watch the sunrise after lunch and waitig until after midnight to see it set. Even more startling is the pair of clocks in the lounge at BAR-3 in Tuktoyaktuk, one labelled Local Time while the other is Village Time .

The western Arctic DEW Line sites, including BAR-1, while eventually dependent upon southern centres, have a capacity for extended operation through the depth of the services and the amount of storage within the system in the north.

At BAR-1 itself there is considerable storage capacity, well equipped shops to handle repairs, and considerable system redundancies. The large warehouse contains a full range of supplies including groceries, spare parts for equipment,

and a wide array of dry goods. Fuel storage on the site includes two steel tanks holding 12,000 US gallons of motor fuel and 10 steel tanks with 265,000 US gallons of diesel, sufficient to power the station for about a year. The garage (Figure 4) and station workshop have the capacity to undertake most maintenance and repair functions required.

To ensure site operation was not compromised by any failure every critical system was duplicated. Further, DEW Line regulations originally required multiple systems to operate simultaneously to prevent even a momentary interruption in function. Redundancies with already operating components of the North Warning system and the rapidly escalating cost of operations have led to a reduction in the requirement for multiple system operation.

Finally station design was influenced by a fear of disaster. In the harsh arctic climate the abundance of petroleum products, high-powered electrical equipment, and flammable building materials meant fire was the main danger. The designers of BAR-1 met this threat in several ways. A sensitive detection system and fire suppression plan were designed to provide early warning of fires, isolate the location of the fire through the closure of fire doors, and guide endangered staff to safety. Fire fighting equipment includes CO2 deluge systems in all permanent buildings, a large number of hand fire extinguishers of various types at strategic locations in the station, and a fire hose system in the corridor system capable of reaching all attached structures.

Overall design of the station was also shaped by the threat of fire. The prototype station consists of ten independent buildings connected with unheated corridors. (Figure 5) Fires, even if out of control, could thus be limited to single elements of the station. The provision of supply and communication redundancies (the station s main radio system is supplemented with two emergency radio facilities) also ensured continuing contact with other Line elements.

Many of the elements developed for the BAR-1 prototype to meet the disaster survival requirement subsequently led to operational problems. Later DEW Line elements follow a substantially different design. The basic design of separated individual units branching off the central utility corridor created numerous difficulties. The angular footprint of this structure acts as a snow trap. Despite an annual snow fall of only 600 mm the steady and continuous winds drift large amounts of snow around the buildings. This drifting requires a great deal of extra work and equipment usage to keep the building and outside equipment clear and accessible. The long winter season makes this an almost year round problem. Even in early June, during the 1990 site visit, two-metre high drifts remained between the buildings.

The many separate units also created heating problems. Each building required its own heat source; there are no less than eight independent oil furnaces and two heat recovery systems in the main station alone. This equipment redundancy is expensive to install and service. Further each building standing alone makes efficient and effective heat recovery impossible. Most of the excess heat from the powerhouse is exhausted outside serving no purpose. Finally the independent buildings and corridors created an extraordinarily inefficient shape to heat. The many emergency doors and windows penetrating the building shell also complicated construction and lead to a great deal of air infiltration. Most of these

emergency doors have now been sealed to reduce heat loss Heating fuel requirements for the station remain high.

While no significant modifications to the original design were made to Komakuk subsequent DEW Line stations were built to a much different design. Instead of the multiple units connected by corridor the station was housed in a long train of 5.2 M X 9.1 M (16' X 28' X 10' high) pre-fabricated wood modules.26 (Figure 6) Module construction techniques were favoured because of the ability to have construction completed quickly once on the site. Module size was determined by the largest dimensions that could be hauled on the sleds of the cat trains and the heaviest weight that could be handled off the sled. A door was included in each end so that the entire building train was connected once assembled. Intermediate stations consisted of five modules, Auxiliary stations had 25, and Main stations 50 modules.

Weaknesses in the original design were also addressed. Fire detection and suppression was facilitated by having a six inch space between each module filled with vermiculite. Further the regular interruption of the building train with storage modules acted as firebreaks. Staff survival needs were met by a re-design of the garage. The earlier single floor design was replaced with a higher garage that included a loft supplied with beds, emergency supplies, and communications equipment. Heating efficiency was also improved by the single structure and in most stations the waste heat from the diesel power plant was sufficient to heat the whole structure. Aligning the train with the prevailing winds at the site and raising the base of the buildings 1.5 metres above the grade reduced snow build-up and removed the risk of melting permafrost.

BAR-1 Auxiliary Station

The BAR-1 station, as part of the DEW Line as a whole, has been built into the landscape of northern Canada in nearly 40 years of its presence there. There have been only limited modifications to the stations but its existence and operations have had a variety of impacts on the local environment and people, the Canadian perception of the arctic, access to and development of the north, northern science and engineering, and Canadian sovereignty.

In the summer of 1955 G.W. Rowley, as the Canadian Government representative, was assigned to the U.S. Navy task force carrying out the sea supply of the western sector of the DEW Line. On August 25 and 26th, 1955, he visited BAR-1. His report27 on his stay there gives a vivid picture of the site during its early days of operation.

[After being put ashore by the United States icebreaker Burton Island , Rowley walked up to the station buildings.] ...Though the station was fully manned it was not until I had been in the buildings for some minutes trying to attract attention that my presence was noted. The station has been operating under the Western Electric Company for some time. It was originally manned almost completely by Canadians from the Northern Electric Company but they have now been replaced by U.S. personnel. The station is comfortable and clean; the food is excellent. The surroundings of the station are in good condition, there are only a few tracks and an effort has obviously been made to control the

number of cans and paper scattered around.28 There had been an airstrip but the runway was washed away by the storm of 17/18 August when there had been gusts at BAR 1 of up to 70 miles per hour. The runway was being repaired.... There were 14 men at the station. All of them were trained in electronics with the exception of two outside men. These two acted as plumbers, fitters, equipment operators, mechanics, etc., and looked after the oil supply. Oil had been an awful nuisance but they hoped that this would be overcome when bulk storage is installed next year. There are 17 Eskimos at BAR 1 from two families - those of Neil Allen and Foster Allen. They usually trade at Herschel but they also go into Aklavik and when I was there they were all away visiting friends at Barter Island. Neil Allen has been employed occasionally - for about two weeks in the last five months by the station and for six weeks by Northern Construction Company as a guide for their tractor train operations. No other Eskimos have been employe... The station takes a good deal of interest in the local Eskimo families. For instance Annie Neil had a child in June and was very ill. The Western Electric Company could not make contact with the doctor at Aklavik so they got the USAF to send their medical N.C.O. from Barter Island. After his arrival it was possible to get in touch with the doctor at Aklavik and he was able to diagnose the difficulty as a case of twins, one of which had not yet been delivered. Annie Neil was flown to the Aklavik hospital where the second child was born but both the babies unfortunately died. One of the cooks last year had, as a hobby, run a school for the Eskimo children, giving them about 1 1/2 hours a day and this had been very successful... The men sometimes accompany the Eskimos on their caribou hunts, and one of them had shot a caribou with the Eskimos rifle. I also heard that a goose had been shot. Two polar bears had been shot and it was said that this was necessary for protection as they had invaded the camp. I saw eight firearms at the site....29

There are four thousand steel barrels at BAR 1, many of them heavy duty, and several thousand more will be delivered in this year s sealift. The station cannot get rid of them as they cost more to ship out than they are worth.... A large number of snow geese were seen at the station. They had started to move in large numbers to the west on the 17 August and when I was there I saw several thousand flying west. They were mainly snow geese and do not nest locally. I saw beer and U.S. cigarettes at the camp, and almost certainly no Canadian duty had been paid. As long as BAR 1 is run by Barter Island as part of the Alaskan sector this will continue to be the case. It will also mean that Alaskan air operators will do the freighting both from the south through Fairbanks and along the line from Barter. I think it is extremely important that the operational organization of the line should be changed so that BAR 1 is grouped with other sites in Canada. This is not yet practicable as BAR 1 is already operational, but when the whole line becomes operational the change should be made.

Rowley s report provides an insight into the activities at BAR-1 during its early operation. A field trip to the site by the author in June, 1990 provides a view of the contemporary appearance of the site.

Prominent on the low lying flat tundra of the Yukon north slope the BAR-1 DEW Line Auxiliary radar station at Komakuk Beach, Yukon represents one of the earliest attempts to establish a permanently-manned military establishment in the

Canadian arctic. Located about 25 kilometres east of the international boundary the BAR-1 site occupies a 381 hectare enclave within Northern Yukon National Park. Buildings and related support facilities making up the actual station however are concentrated on roughly 100 hectares in the north-eastern corner of the enclave. The station retains roughly the same appearance today as when first constructed.30

From the air, the usual approach to this isolated location, BAR-1 s most obvious features are the various radar and communication aerial arrays and the runway angling inland from the coast. (Figure 7) Descending, the viewer is struck by the large number of buildings, extensive ground disturbances, the extent and variety of storage facilities, and the many piles of material littered about the site. The integrated nature of activities at the station is visually reinforced by the network of roads, above ground conduits, and the utility corridors connecting the various parts of the station. (Figure 8)

The station is built upon a substantial gravel pad, roughly one to two metres in thickness, laid over the permafrost tundra. This pad is connected by roads to the runway, sealift staging area, landfill sites, and the seasonal water supply points. Gravel for the site appears to have been trucked from Pattaktuq, on Demarcation Bay, just over the border in Alaska. Traffic ruts and a fuel dump between BAR-1 and Pattaktuq are still visible.31

The largest structure on the station is actually a collection of ten connected buildings. (Figure 9) This structure shelters the radar equipment and operations, provides repair space for equipment, inclues a power plant, and houses the staff. The C&E [Communications and Electronics] Operations Building, (Figure 10) housing the heavy radar equipment and connected to the unheated radar dome, is built on timber piles. The other nine buildings and the unheated utility corridors making up the rest of the complex rest upon timber mud sill and post foundations. All of the buildings, with the exception of the wood framed and sheathed visitors dormitory, are constructed of pre-fabricated wood frame units with insulated metal panels. Roof panels are insulated and metal sheathed. Interior finish is a plastic-coated plywood. Eight of the buildings are heated with independent oil fired furnaces. The diesel engines in the power house generate sufficient waste heat to keep it warm. (Figure 11) The C&E Operations Building is heated by the station s electrical equipment utilising a forced air waste heat recovery system. This system is part of an environmental control system necessary to protect sensitive electronic components from dust, temperature, and humidity variations. Plumbing is limited to the two staff dormitories and the kitchen.

Two large support buildings, the Garage and the Warehouse, are located on the north side of the pad. The Garage houses the vehicle service function and is built on concrete footings. It is a steel frame building sheathed with insulated metal panels. The Warehouse is the major dry goods storage for the station and is built on timber piles. Of wood frame construction this raised, insulated building is sheathed with metal. Both buildings are heated with oil fired furnaces.

Three small outbuildings complete the complement of the original station. A small pump house is located near the three large diesel oil tanks at the east end of the station pad. A storage shed at the runway also houses the airstrip lighting controls. Finally an Attwell tent on the eastern periphery of the station is used as a

hazardous products storage site. None of these buildings are heated.

In 1990 several new structures were under construction at Komakuk Beach. One of the components of the North Warning System, an unmanned replacement for the now dated technology of the DEW Line, the new station consists of an operations building, platforms for radar dishes, a new antenna tower, and several large above ground fuel storage tanks.

Impacts of the DEW Line

The construction and subsequent operation of the DEW Line has had a number of impacts on Canada. The issue of Canadian sovereignty in the north was an early concern and one expressed throughout the whole Continental Air Defence process. The system altered southern Canadians perspective of the north by opening access to previously remote areas for development. Although the system was designed and built by the Americans there were a number of science and engineering spinoffs of importance to Canada. The most important impact however was the impact the DEW Line had on Inuit acculturation.

The presence of the United States military in Canada was a point of political controversy since the Second World War. As the Cold War progressed and specifically with the development of the continental air defence system the growing presence of American military facilities and personnel increasingly irked parts of the Canadian political scene. The free hand given to the USAF in the construction of the DEW Line in northern Canada heightened these complaints.32 However Canadian political decisions in the 1950s were based on a strictly limited budget for defence33 and a significant conventional military commitment to the NATO forces in Europe. Finally Canadian polticians were anxious to avoid any possibility of having to deal with conscription. These decisions left little room for manouver on continental defence issues. Implicitly Canadians therefore accepted the American doctrine of massive nuclear retaliation and participated in the erection of a continental air defence umbrella.34 Canadian politicians, by taking the initiative in constructing and operating the much less expensive Mid-Canada Line, relinquished control over the DEW Line projects in the arctic but avoided any responsibility for the costs of the project. While the DEW Line remained an American oprated defence system, Canadian anguish over sovereignty was somewhat ameloriated in 1959. On February 1 RCAF officers took over the radar sitings assessment role from USAF colleagues.35 Canadian defence posture through the late 1940s and 1950s, constrained by other Canadian government priorities, largely reflected American military requirements. This is highlighted by the history of the DEW Line in northern Canada.

The DEW Line experience provided a wealth of experience and knowledge on Arctic conditions. The bulk of this information was collected by the United States but Canadian opportunities for contracting services and equipment to the DEW Line ensured that some was diffused into Canadian hands. The difficulties and solutions of permafrost construction, the development of appropriate transportation facilities, and the addressing of the difficulties of the northern electronic environment were all by-products of the DEW Line.

Spinoffs from the construction and operation of the DEW Line made significant changes to a number of areas in the Canadian economy. The most significant economic opportunities for individual companies were the air supply contracts for the DEW Line. The large freight volumes supported a huge expansion in northern air transport capacity. Several companies, Pacific Western (now Canadian Airlines) and Maritime Central Airways (the root company for Eastern Provincial Airlines), moved from being small bush lines to large integrated national airline companies.36 This growth in northern traffic supported the design and development of specific northern aircraft. DeHavilland Canada initiated their highly successful line of Short Takeoff and Landing (STOL) aircraft, such as the Beaver, on the basis of these northern requirements.37 Another high-technology development was the growth in Canadian electronics contractors who successfully bid on the supply and servicing of DEW Line components.38 The construction and supply of DEW Line building modules provided work for Sigurdson Millwork Co. Ltd. in Vancouver, BC, Hill-Clarke-Francis, New Liskeard, Ont., and Tower Co. Ltd., Montreal.39

The DEW Line opened up the High Arctic to southern Canadians. The psychological barrier of the remote north was broken down by the success of the project. By 1957 the DEW Line provided over 40 new airfields and helicopter landing sites, associated navigation aids, and a major hydrographic survey of the Arctic coastline.40 These facilities were supplemented in 1966 when new technologies made the I-Sites redundant. The Department of National Defence walked away from the sites, turning them over the the Department of Indian and Northern Affairs as possible bases for future northern development. While the bulk of these stations remained abandoned and have become environmental hot spots a number of remain important as research stations. (Appendix B) The DEW facilities and experience have also supported the exploration and development of natural resources in the north.

The most important impact of the DEW Line, and the spinoffs noted above, however, was the greatly increased southern contact with the northern Inuit. The construction and operation of the DEW Line significantly changed the life of aboriginal people living in the Canadian Arctic. Across the north the culture and contact experience of the different Inuit groups varied considerably. However a detailed description of the Inuit perception of Project 572, including BAR-1, provides insight into the general course of these changes. This is followed by a discussion of the federal government s attempts to manage the changes initiated by the DEW Line developments.

The Inuit along the Alaska-Yukon north slope subjected to Project 572 activities were already familiar with Euro-american culture by the early 1950s. Whalers had arrived in the Beaufort Sea in the 1890s. In addition to trading for fresh meat during their over-wintering, the whalers also employed Inuit whaling crews on a seasonal basis. By the 1920s commercial whaling had ended but the economic connection with the south was maintained through the fur trade. At the same time reindeer herding was introduced near Barter Island and, a decade later, to the eastern Mackenzie River delta. When fur pries collapsed in the 1940s some local Inuit maintained their limited requirements for southern goods by mining the placer gold deposits of the Firth River. By 1950 Inuit west of the Mackenzie had a

well incorporated cash component in their annual round of harvesting and social activites.41 (Figure 3)

In the winter of 1952-53 the elements of Project 572 were shipped to Barter Island. Cat trains, hauling construction equipment and supplies and a mobile camp with 50 workers, headed east towards the BAR-1 site. Work began immediately upon arrival. Ground preparation involved hauling large quantities of gravel from Pattaktuq to the site. A roadway, still visible today, was cut into the tundra. By spring the large buildings of the station were up and being fitted with equipment.42

The suddeness of their appearance, the rapid pace of the work, and the large scale of the camp and its products astonished local people. Surprised by the intensity and scale of the DEW Line work, Inuit were also concerned as they saw camps and graveyards destroyed or damaged by the newcomers. The lack of local consultation and the consequent failure to attend to issues of local importance affected people deeply.43 Nevertheless the proximity of the DEW camps made them part of the community and both social and economic connections developed.

The prospects for wage employment at the DEW camps were soon widely known. Only two months after the arrival of the work crew at the BAR-1 site Aklavik, some 250 air kilometres distant, was full of rumours. As the winter eased into spring community members discussed the many job opportunities and the high wages available there. After the spring ratting season many headed down the coast to see what was available.44 At the sites the immediate need for unskilled labour absorbed almost all who wanted to work.

While only a limited number of Inuit actually gained jobs their extended family networks joined them at the work sites. New Inuit camps made of discarded boxes and crates contrasted sharply with the non-native workers snugly housed in heated, specially insulated buildings. At BAR-B (Stokes Point) some of this box and crate housing type is still in use as a hunting camp. Thus a large part of the Inuit population had direct contact with the DEW camps.45

Parallel with the formal working relationships were a range of informal contacts between Inuit and construction crew. At BAR-1 camp workers traded personal and company goods with a pair of enterprising Inuit boys for fresh trout. At one 572 site the cook had a Christmas tree, ornaments, and presents sent up for the Inuit who were invited in for a turkey dinner with all the fixings. Crew workers also visited Inuit at their nearby camp and occassionally joined them in caribou hunts.46 The DEW camps quite quickly became part of the north slope community.

Both the formal and informal connections between Project 572 camps and the Inuit developed in a manner largely unregulated by either local agreements or government supervision. These connections included a number of changes. Herschel Island, long a regular Inuit camp, was effectively deserted during the mid-1950s. In response to this changing pattern of Inuit use the RCMP seriously considered the transfer of their Herschel Island post to the DEW camp at BAR-B (Stokes Point).47 More important from the Canadian government s point of view, was the extension of modern social and health services to the Inuit.

The Project 572 camps included extensive medical facilities to treat sick or

injured crew. These services also applied to Inuit employees and were also frequently extended to family or community members living nearby. The lack of any alternative medical services left camp managers with little choice when faced with requests for help. Some DEW staff also offered classes in basic literacy to their Inuit co-workers. These services and training opportunities were significant, and expensive, additions to those limited services previously supplied by the federal government in the north.

By building in the Arctic Project 572 not only tested building and organizational characteristics for continental defence. The project initiated a host of chages in Inuit lifestyle and activities. Old camps and traditional land use pattern were disrupted, directly by construction activities and indirectly by providing skills training and regular year round work. In the early period of DEW construction Inuit were generally hired on a casual basis as unskilled labourers on the site or for their knowledge of the area. Jimmy Jacobson hired on as a dog team driver assisting a survey crew along the Yukon coast.48 Later other jobs were also made available.

The combination of DEW Line jobs with a revival in fur prices in the early 1950s significntly accelerated the adoption of southern material goods. The HBC store in Tuktuk normally cleared about $55,000 of business annually. In 1955 the manager expected $150,000; in the first three weeks of August alone the store had $24,000 in sales. At the same time mail-order business increased from practically nothing in the late 1940s to over $10,000. Most of the purchases were for boats, outboard motors, and related capital goods.49 The range and scale of changes were absorbed by the local communities with some difficulty. However the Canadian government noted them with concern.

Up to the 1950s, the Canadian government had largely ignored its role as legal guardians of the Inuit. Apart from a few high profile projects such as the large reindeer herding experiment in the 1930s the isolation of and limited knowledge about the Inuit and the great expense of accomplishing anything had limited the government interest in their welfare. The pressures for change in this attitude, created in part by DEW Line activities, however led to an attempt to manage the impacts of the DEW Line upon the Inuit.

The Canadian government had at least a half century of involvement with the Inuit west of the Mackenzie. In response to urgent requests from missionaries at Herschel Island a North West Mounted Police post was established there in 1906. The missionaries felt that official management of the interaction between whalers and natives would limit the unwholesome affect of the sailors on the Inuit. Fur trade regulations in the Beaufort Sea area were also introduced in the mid-1920s at the request of the Hudsons Bay Company. Beleagured by itinerant traders the HBC moved to protect its effective stranglehold over trade in the far northwest. And the government initiated the massive migration of commercial reindeer from Alaska to the Mackenzie delta in the 1930s in an attempt to settle the Inuit population and provide them with regular wage employment. While intermittent the government s efforts were focused on minimizing outside influences on the Inuit. The RCMP Commissioner urged that Where Eskimos are getting along in good shape in the old fashion and supporting themselves by hunting and trapping, they should be left alone and not permitted, or at least not

encouraged, to abandon their old life and cluster around DEW line installations. 50 Project 572 and subsequent DEW Line connections however, challenged these attempts to minimize contact with non-natives.

The management of Inuit relations with non-natives was a major component of the treaty governing the construction of the DEW Line.51 The treaty noted the Eskimos... are in a primitive state of social development. It is important that these people be not subjected unduly to disruption of their hunting economy, exposure to diseases against which their immunity is often low, or other effects of the presence of white men which might be injurious to them. Six comprehensive conditions to govern the character of the contact with the Inuit were established. Under these conditions the Canadian government accepted responsibility for the management of all aspects of relations between the Inuit and DEW Line.

To fulfill these new obligations the Department of Northern Affairs and Natural Resources created Northern Service Officers (NSO). The NSO were to facilitate communications between northern construction crews, government agencies, and native people. Basically they were to protect the interests of the natives and prevent any local difficulties from slowing the pace of defence construction. By frequent visits to DEW sites the NSO were to stay informed of local concerns as epressed by DEW operators. The first six officers were appointed in January and February, 1955.

Hired to represent the best interests of the Inuit and to encourage their participation in local government the NSO were instructed to maintain tight control over the relations between Inuit and non-natives.52 Visits to Inuit encampments by non-residents were strictly limited to avoid inconveniencing them at home. While practicable at the more remote DEW stations these restrictions were unmanagable at the larger stations in the central and eastern Arctic. Nevertheless the NSO attempted to minimize disruptions of Inuit life.

Their primary responsibility was to secure the old way of life for those able and interested in pursueing it and providing alternative work to those incapable. To this end the NSO was to be aware of threats to game, especially due to construction or DEW operations, and make Inuit aware of the need to protect game species. Hunting was prohibited for DEW Line employees. For those unable to survive in the old ways the NSO managed the job opportunities available from the DEW Line. And there were many jobs. By 1962 over half of the Inupiat men at Kaktovik had jobs at BAR MAIN immediately beside their community.53 In Canada over a hundred Inuit were employed on the DEW Line by the end of 1957.54

For the Inuit workers the NSO strove to provide work to meet the perceived needs of the individual. The government s ideal was to ensure Inuit gained only permanent full-time jobs at the stations. They did not want the the Inuit to become a floating labour pool for northern contractors. The implications of this policy however, were far reaching. Single young men were the prime candidates for these jobs, a married man was only allowed work if he could make alternative arrangements for the care of his family. Once selected individuals were often required to move to distant stations and live on-site. Here they gained job training in an environment that would be difficult to escape on an impulse. Their wages

were deposited directly into trust funds managed by the NSO. Upon completion of the job the account was deposited into a bank account accessible by mail by the individual. More usual was for transfer of the account to the apppropriate local trading post. This proved unsatisfactory as the NSO often attached a semi-compulsory saving component on Inuit accounts, leading to pressure on post managers by Eskimo who wanted to spend his money. 55

Medical services at DEW Line stations also became a problem. After recognizing the interaction between Inuit and DEW Line stations the government attempted to develop an agreement with the operators of the line to act as medical services for local Inuit. While this piggybacking of services on an opportunistic basis offered an immediate medical service a host of complications followed. Medical staff at Auxiliary and Intermediate DEW Line stations were merely technical staff with some First Aid training. Many were overwhelmed by the nature of the injuries or diseases needing treatment and were often unable to deliver effective treatment to women and children. Finally in 1962, the fear of malpractise suits, the complex method of determining who should give permission and pay for what service, and the threat to the effective operation of DEW stations forced Federal Electric, the line contractor, to end medical services to all but its own employees.56

The direct impact of DEW Line construction and operation on the Inuit faded as the line reduced operations in the early 1960s. The closure of the 20 I-Sites in Canada at that time ended many jobs. Ongoing work for Inuit at the remaining stations has seemed less important but only because of the accelerated pace of southern development in the Arctic. Mining and oil exploration, both on land and in the sea, have offered many new challenges and some opportunities to the Inuit.

Through the course of the 1950s and early 1960s the DEW Lin stations had acted as both catalysts for and providers of southern Canadian services to Inuit. The opportunities for wage employment, technical training, and access to modern medical and educational services all dramatically changed the way Canadian Inuit lived.

Conclusion

The DEW Line is disappearing. Changing technology and the waning of international tensions have reduced the importance of the DEW Line for continental air defence in recent years. Improved radar equipment made the Intermediate stations unnecessary and they were abandoned in 1963. Satellite warning systems and the current introduction of the North Warning System with its automated unstaffed stations are making the remaining elements of the DEW Line redundant. These changes have made stations like BAR-1 the historic fortresses of the mid-twentieth century.

BAR-1 shut down as an operating station in June, 1993. Clean-up of the site is scheduled for the near future. Once clean-up is completed the land will be transferred to the Canadian Parks Service for inclusion in Ivvavik National Park. Commemoration of the site within the National Park for its regional importance is planned.

To ensure appropriate com-memorative options remain open Parks Canada has forwarded cultural heritage information for inclusion in the BAR-1 site clean-up criteria. The DEW Line stations at BAR-1 and BAR-B had significant regional impacts on the economy, aboriginal people, and the way the region has developed since the early 1950s. The Park Management Planning Team recognized this regional significance through a plan to record the site. The site recording will include:

- a photo record of the site (April/93)
- a descriptive historical background report (Sept./95)
- recorded interviews with site personnel and local Inuit (ongoing)
- the collection of working drawings and operating manuals as a permanent record of site and its operations (Oct./95)
- Selected artifacts representing aspects of DEW Line operation and lifestyle (Oct./95)

The Park Management Planning Team has already recognized the need to commemorate the regional importance of the BAR-1 station in Ivvavik NP. A number of constraints, including the high cost and great difficulty of maintaining sites in the area, the possibility of contaminants at the site, and the utility of the site to park users, will shape the character of this commemoration. At present the Planning Team has recommended the creation of a documentary and artefact collection, the preparation of a photographic record, and the retention and preservation of the gravel pad and the foundation remains of the building structures to commemorate the defence activity and regional impacts at BAR-1.

The site s primary function is the detection and reporting of trans-polar aircraft and missile activity for continental defence purposes. To support this function there are management, operational, and staff support infrastructures. This function and the supporting infrastructures determine the details and operations at the site. Detailed building and function descriptions therefore are based upon this infrastructure.

Functional Description
- Detection/Communication

The detection, monitoring, and communication functions are all housed in two buildings, the C&E Operations Building (Figure 10) and the Electronics Shop & Storage, located on the south end of the station. The buildings are directly connected to each other making a single unit roughly 8.5 M X 45 M. The C&E Operations Building, located directly beneath the radome, is made into five rooms containing the radar, console operations, radio equipment, and a substantial metal fire break. The Electrical Shop includes a large electronics repair shop, the radician s57 office, station files, and the station supervisor s accommodation.

The surveillance radar is housed in a rigid, unheated radome mounted on an independent platform straddling the C&E Operations Building. The main communication antenna are located close by the C&E Operations Building. Two antennae face west connecting the station to BAR MAIN at Barter Island (Figure 12) and two billboards face east providing a direct link to BAR-2. These

antenna are the main communicaion link for the station. The high levels of radiation emitted from these antennae are dangerous and two lines of used fuel drums radiating from each one mark the edges of the danger zone. Located further south is the High Frequency Air-Ground Antenna array which allows the station to communicate with aircraft. Weather reports and local conditions are provided to both general and international aviation traffic. A disaster antenna, located just south of the station warehouse, appears to have been removed for the North Warning construction. A TV satellite dish at the south east corner of the Electronics Shop & Storage provides a broad spectrum of television for the staff. Telephone connections to the outside and nearby DEW Line stations are maintained and a local system, with 20 phones, connects all parts of the station.

The detection/communication function employs five staff. Three console operators share the responsibility for the round-the-clock monitoring of the radar consoles and communications equipment. In addition two radicians service all electronic and radar equipment on the station and provide console coverage during the operator s coffee and meal breaks.

Functional Description
- Management

The isolated location and the staffs long terms on site mean there are special management requirements at the station. The station supervisor s responsibility is to manage the station in such a way that the primary function is not impaired by staff problems.

BAR-1, unlike many DEW Line stations, is in a completely isolated location. Staffing policies for the DEW Line contractors include generous provision for holidays out and extended leave if requested. However the expectations are that the staff will stay on site for between four and six months without a break.58 The close confinement of the staff within the station grounds performing essentially rote work for this extended period can cause difficulties. The need for continuing alertness in fulfilling the detection function and ever present vigilance in preserving station safety demands a solid management infra- structure. The station supervisor s task is to provide this infrastructure though the rigorous maintenance of routine and the sensitive application of station rules and regulations.

The station superintendent also maintains staff equilibrium on the station through his control of the communications and social organisation on the station. He handles the station mail, ensures the station notice board is kept up to date, and assists in the organisation of several staff committees handling non-work related functions at the station. These latter include the social committee that manages the station bar and recreation facilities. The station supervisor has his office and bedroom in the Electronics Shop & Storage. Mail and official notices are distributed in the anteroom to the shop. Committee minutes and work related issues are made available to the staff on a series of hallway bulletin boards in the Recreation and Kitchen Building.

Functional Description
- Operational Support

The operational support functions are those required to carry on the day to day operation of the station. These functions include the Powerhouse, the Workshop, various storage facilities, the Garage and associated heavy equipment, the air strip, and the sealift staging areas.

The Powerhouse is located on the north western side of the station in a 10 M X 60 M building. (Figure 11) A single large room, the Powerhouse contains six diesel electric units, controls for the station fuel pumping system, and a workbench for engine repairs. The power units are capable of producing 360 KW of electrical power. Peak power demand at the station is 126 KW giving some indication of the redundancy built into the DEW Line designs. At present only two of the units are running at any given time. Waste heat from the diesel electric units is used to heat the Powerhouse and a small amount of this surplus space heat is vented into the otherwise unheated corridor immediately adjacent to the Powerhouse. A heat exchange system connected to the diesels also provides sufficient heat energy to keep the two outdoor water storage tanks from freezing.

Immediately across the hall from the Powerhouse, on the east side of the station, is the Workshop & Storage. The building, 8.4 M X 13 M, contains a well-equipped workshop with metal and woodworking facilities. The building also includes the station water treatment and pumping plant.

The Powerhouse and the Workshop are the primary work areas of the station s Power Utility Mechanic. He is responsible for the ongoing monitoring and maintenance of the station s many operational and staff support systems.

Supplies for the station are delivered by ship through an annual sealift. The sealift staging area, located about 900 M. north east of the station, consists of a large gravel storage pad and a 6000 US Gal. gasoline storage tank and is connected to the station by road. A 6" (152.4 mm) pipeline is used to pump diesel fuel directly from the ships to the three 65,000 US Gal. tanks on the east side of the station. From these tanks diesel is pumped to the seven 10,000 US Gal secondary tanks and various fill stands and building day tanks around the station. A second 6000 US Gal gasoline storage tank is also located on the station pad.

A regular air service delivers immediate requirements and light freight including fresh food, newspapers, laundry, etc. The gravel airstrip, just over 1130 metres long, runs on an almost east-west bearing north of the station. (Figure 7) Built up on a non-frost acting gravel base and equipped with a navigation beacon and lights the strip is capable of supporting heavy aircraft. A helipad and fuel storage dump is located on the apron at the west end of the strip. In addition to supporting station activities the strip is currently also used as refuelling point for oil exploration, Yukon Territorial Government, and Canadian Parks Service operations among others. A small storage shed on the apron houses air strip lighting controls and snow marking powder.

Storage of supplies is centralised in the large warehouse at the north eastern corner of the station, though there is also considerable storage capacity for many items throughout the station at their point of use. The heated warehouse (28' X 120'), an insulated timber frame structure sheathed with metal and wood, is

built up on a pile foundation. Divided roughly in half by a firewall the warehouse contains 23 storage bays, a furnace room and a stores office (a position no longer staffed). The bays hold the bulk of the station s food supplies, dry goods, surplus equipment, and a full range of hardware items needed for station operation. The building also includes a security cage containing soda pop, liquor, and emergency kits.

Hazardous goods, such as motor lubricants and cleaning fluids, are stored in an Attwell shelter (17' X 27') mounted on timber sills on the eastern extremity of the station pad.

A fleet of vehicles and heavy equipment maintain the airstrip and roads. Several bulldozers, a front end loader, a road grader, and two large dump trucks are used to clear snow and grade the road and airstrip surfaces. Two four wheel drive 3/4 ton trucks are used for station transportation to pick up loads from the airport and the warehouse. Two trailers mounted on skids are used for hauling in the winter. A Nodwell (large wide tracked vehicle for all terrain travel) is maintained for emergency travel off the station site. All of the heavy equipment is operated by the seasonally employed Heavy Equipment Operator. All licensed staff may drive the light trucks for station business. All official vehicles on the station are United States Air Force equipment.

Equipment usage and maintenance is supervised by the Vehicle Mechanic. All vehicles have a regular maintenance program and periodic modifications are made as required. Only the largest jobs are sent out to the major depot at Cambridge Bay. The station Garage (42' X 63'), (Figure 4) where all local vehicle maintenance work takes place, is a steel frame building sheathed with metal insulated panels on a concrete footing with a concrete floor. The garage includes an office and three service bays. The garage also contains emergency survival equipment as noted above.

Functional Description
- Staff Support

The staff support facilities a BAR-1 are extensive and provide a full range of services. Meals are varied and generally of high quality, private bedrooms are provided for each staff member, and some recreational facilities are provided. The major structures supporting these activities are the Recreation and Kitchen buildings and the Dormitory buildings.

The Recreation and Kitchen building (26' X 124') and the attached Receiving and Storage building (26' X 80') make up the largest single unit on the station. These units include a staff lounge and bar, two television rooms (one smoking, one non-smoking), the dining room and kitchen, PX, laundry facilities, food and waste storage, a receiving room, a gym, and an emergency radio room.

The busiest part of the buildings is the kitchen. Two cooks and a kitchen helper were on staff during the site visit. Ordinarily only one cook is working but extra staff were required to serve the North Warning site construction crew. Meal menus are prepared by the contractor and distributed to the sites on a one or two week basis. Each meal provides a substantial amount of food and generally includes salad, fresh baked bread, a choice of two or three entrees, and a range of

desserts made on the station. Coffee, tea, milk, and juice, fresh fruit, and a range of baked goods are available to the staff at all times. Open shelving in the kitchen limits food storage there but a large store room is located just across the hall from the kitchen. A walk-in refrigerator is also nearby. The dining room, decorated with a Mediterranean theme is a large room with four tables. Meal times are posted and kitchen service is limited to those hours. Staff can forage for sandwiches between hours if the kitchen is not busy.

There are four dormitory buildings on the station providing accommodation. The two largest dormitories house the station crew, each person obtaining a small and spartanly furnished private room. While no opportunity to visit the private staff rooms arose, conversations indicated the presence of personal stereos, computers, and other hobby equipment. Non-official items, not in a private room, were deemed public property. The boundary between public and private goods was very clearly defined. Transgressions in this area appear to be one of the major causes of staff friction. The rigid schedule of station work and the isolated post and thus close quarters of the staff make the preservation of personal space and goods of great importance. Two smaller dormitory spaces are also attached to the station. These provide accommodation for visiting service people such as nurses, company officials, and visiting military. Work crews are periodically at the station to carry out major renovation or new construction projects. Toilet, washing, and shower facilities are available only in the two large staff dormitories.

The nearest communities, Old Crow in Yukon and Aklavik and Inuvik in the NWT, are some 250 air kilometres distant from the station. The very difficult ground around the station effectively confines staff to the immediate station area. Indoor recreational opportunities are provided by the station while the staff take advantage of a number of outdoor activities during the more temperate weather.

Indoor recreational facilities are concentrated in the Recreation and Kitchen buildings. A well equipped weight room, pool table, and ping pong are provided. In addition a selection of newspapers and magazines are delivered regularly to the station. Three televisions, hooked up to a satellite dish, ensure a steady diet of southern media. The station social club maintains a bar and snack shop in the largest lounge which also includes a dart board.

Outdoor recreation is limited to the summer season. Hiking to the summit of Mount Coneybear, 15 kilometres south of the station, or to one of the closer streams for some fishing provide occasional breaks from the routine of the station. However the presence of polar and grizzly bears limits these activities to the brave. One contractor, grateful for the friendly support provided by station staff, recently left a small all terrain vehicle at the station and this has allowed staff some mobility, though it can be used only on station grounds. Some years ago thesocial club built a tanning spa. Constructed as a well insulated greenhouse, it contained sand coloured carpet and cedar lawn furnishings. A barbecue is also on the station to take advantage of days when fine weather and good fishing coincide. Two dogs are kept at the station.59 These animals stay outside but are fed and watered regularly and annually receive the standard shots. All of the staff appear to appreciate their activity around the station.

Water is drawn from a small stream east of the station. (Figure 13)

Originally it appears the lake north of the station was to have provided water but this is no longer the case. A small dam on the stream provides a nearby reservoir for summer water supplies. One of the dump trucks is equipped with a large water tank for summer hauling. In winter a river spring about 3.7 kilometres from the station keeps a hole open for water. Water is hauled in a sled mounted tank. Water is stored in two 20,000 US Gal water tanks located beside the Workshop. Treatment and distribution equipment is located in the shop.

Clean-up and waste management at the station is not sophisticated. A single staff is responsible for the general cleaning of the station interior and the preparation of laundry. Personal laundry remains each staff s responsibility but bedding and towels are regularly stripped, bundled, and flown out for cleaning. Solid wastes are also collected and stored near the kitchen. All combustible materials are separated and burned in an incinerator behind the Kitchen and Recreation building. Ash and non- combustible solid wastes are hauled to the present landfill site just north of the airstrip. Both grey and black water sewage are held in steel holding tanks located in the Kitchen and Recreation building and the two main dormitories. These tanks are periodically pumped out to associated surface outfall areas.

The Canadian section of the DEW Line included four main stations, 18 Auxiliary stations, and 20 I-Sites.60

The four main stations remain in operation and are maintained in good repair. All main stations are of the standard module construction and have been converted to North Warning Sites. New electronic equipment, including two new radomes, has been installed but otherwise external appearance remains largely unchanged.

Fourteen of the 18 Auxiliary Stations remain in use. FOX-1 on Rowley Island, NWT was abandoned by the mid 1980s. Only the badly vandalized building train remains, out buildings have been demolished. The other three FOX stations were closed and stripped of equipment in 1991. Four stations will be shutdown in 1992 and six more stations will be closed in 1993. The remaining four stations will retained and are presently in the process of being converted to North Warning Stations. BAR-1, the prototype station under consideration here, is unique in its design and construction. It is one of the stations scheduled for shut down in 1993. All other stations are constructed of the prefabricated modules.

The I-Sites were abandoned in 1963. They are now in various stages of disrepair. Many have been dismantled with structures moved to new locations, others have been destroyed or heavily vandalized. A few still on original locations are used as research bases or hunting camps, almost all have been vandalized. By 1986 only six sites survived with all structures extant and in good condition. All are in the NWT.

BAR-D (Atkinson Point) - Used as reindeer herding station and operational centre for the Polar Continental Shelf DECCA Project.

PIN-A (Pearce Point) - all in excellent condition

PIN-B (Clifton Point)- all in good condition

CAM-F (Scarpa Lake) - Converted to field research station by DIAND and York university in 1977. Only the garage has been demolished.

FOX-B (West Baffin Island) - Used as research facility by DIAND. all in good

condition
FOX-E (Durban Island) - all in good condition

Endnotes

1 This discussion is based upon DND Directorate of History 79/649 Vol. 3, For Possible Inclusion in classified history of RCAF Air Defence Command, Feb. 28/58. Continental defence agreements include the Ogdensburg Agreement (August 18, 1940) Joint Statement on Defence Co-operation (February 12, 1947), NATO North American Regional Defence Committee (1949), and the series of radar station agreements through the early 1950s noted below.

2 This summary of the development of North American military doctrine in the post-war period is based upon J. Eayrs, In Defence of Canada - Peacemaking and Deterrence (Toronto, 1972), J. Eayrs, In Defence of Canada - Growing up Allied (Toronto, 1980), K.C. Eyre, Custos Borealis - The Military in the Canadian North (PhD., Univ. of London-King s College, 1981), C.A. & M.A. Beard, The Beard s New Basic History of the United States (Garden City, 1968), J.T. Jockel, The United States and Canadian Efforts at Continental Air Defence 1945-1957 (PhD., John Hopkins Univ., 1978), and R. Bilstein, Flight in America 1900-1983 (Baltimore, 1984).

3 J. Eayrs, Peacemaking and Deterrence, p. 358.

4 A.K. Wickson, Guided Missiles , The Engineering Journal, De/49, p. 816. Wickson was an armaments researcher with the Canadian Defence Research Board.

5 J. Eayrs, Peacemaking and Deterrence, p. 363.

6 Additional information on these elements is available from K.M. Molson and H.A. Taylor, Canadian Aircraft Since 1909 (Stittsville, 1982) pp.. 85-98

7 Information on SUPREMACY and the subsequent Modified Plan comes from J. Eayrs, Peacemaking and Deterrence, p. 356, K.C. Eayrs, Custos Borealis , p. 131, C.L. Grant, Development of Continental Air Defence, p. 81-83, and J.T. Jockel, The US and Canadian Efforts, p. 33-34.

8 J. Eyre, Peacemaking and Deterrence, p. 135-136 discusses the changing western assumptions of Soviet attack strategies that shaped continental defence programs.

9 Information on the Pine Tree Line from J. Eayrs, Peacemaking and Deterrence, p. 358 and C.L. Grant, Development of Continental Air Defence, pp. 61 & 108.

10 J.T. Jockel, The US and Cdn Efforts, p. 174.

11 C.L. Grant, The Development of Continental Air Defense, pp. 62-64.

12 J. Eayrs, Growing Up Allied p. 192 shows the five fold increase in defence expenditures between 1949-50 and 1952-53.

13 By 1951 the Canadian government committed both ground troops and supporting aircraft to a long term NATO standing force in Europe. J. Eayrs, Growing Up Allied p. 209-211 & 220.
14 The following material on the Mid Canada Line is from J. Eayrs, Peacemaking and Deterrence, p. 368-370 and J.T. Jockel, The US and Cdn Efforts, p. 214.

15 Originally designated COUNTER-CHANGE by the USAF, the contract was identified as CORRODE. Western Electric staff referred to the work as Project 572.

16 The line survey and site selection material comes from Western Electric, DEW Line Survey Report, Oct. 16, 1953, pp. 2-3. Interestingly subsequent writers on the DEW Line outlining these criteria have overlooked or ignored the reference to the local native labour force. cf. J.R.K. Main, Voyageurs of the Air (Ottawa, 1967) p. 227. Also not too surprising is the fact that these locations were also generally on or close to traditional habitation areas. Local Inuit have described how the DEW Line stations destroyed or built over old camps and graveyards. Personal communication, Nov. 29, 1991 with Murielle Nagy.

17 NAC RG 18 [85-86/048] f. G-825-11 (1958) Box 35. The reason for this change is not clear, though later evidence, discussed below, suggests a desire by the Canadian government to limit contact between southerners and northern aboriginal peoples.

18 C.L. Grant, The Development of Continental Air Defense , p. 64 and J. Eayrs, Peacemaking and Deterrence, p. 362.

19 Continental Defense , WE Magazine, Jy-Au/55 and Western Electric, DEW Line Site Survey Report, p. 5.

20 IT&T, Manning the DEW Line , c. 1960, pamphlet.

21 Note that all stations were codenamed after the host communities. Main stations gained a three letter code, ie. Barter Island became BAR, Cambridge Bay, CAM. Auxiliary stations gained a number suffix, BAR-1, PIN-2, while Intermediate stations a letter suffix, CAM-A, BAR-C. Details on the stations from DND, Directorate of History, 934.009 (D327) and NAC, RG 18 [85-86/048] f. G-825-8-11, Box 35.

22 Bagnal was the Western Electric project engineer assigned to 572. His death during the project led company officials to ask that BAR-1 be named after him. The Inuk name, Komakuk Beach, was actually taken from a nearby village. Used as a base for ptarmigan hunting and fishing Komakuk Beach consisted of four or five semi-subterreanean houses. It was recognized by the Canadian Board of Geographical Names and Bagnall s name was later applied to a previously

unnamed lake in the central arctic near CAM-5. "At CAM-5 the airstrip is short. One end runs into the ocean and the other into Bagnell Lake - I always wondered where the name came from." Personal communications, Murielle Nagy and Ric Stephens, and NAC RG 18 [85-86/048] f. G-825-8-11, pt. 2 Box 35, p. 355.

23 J.T. Jockel, The US and Canadian Efforts , p. 175 and J. Eayrs, Peacemaking and Deterrence, p. 371.

24 See Appendix A - A Detailed Component and Function Description of BAR-1 Komakuk Beach Auxiliary DEW Line Station.
25 D. Neufeld, Field Trip Report Notes, June, 1990.

26 Details on the building train modules and subsequent station design from A Review of the DEW Line , The Engineering Journal, Nov., 1957, pp. 1665-1670, Canadian Armed Forces, Production Report 84-CEU-55, PCB Clean-up of Abandoned DEW Line Sites April, 1986, NAC RG 18 [85-86/048] f. G-825-8-11 pt. 2, Box 35, pp. 356-357, and personal observation.

27 G.W. Rowley s report of November 25, 1955 is in NAC, RG 18 [85-86/048] G-825-8-11, pt. 2, Box 35, pp. 354-356.

28 Earlier in his report Rowley had noted the serious problems with oil drums and construction scrap littered around the Point Barrow site. On tracks on the tundra he noted Winter tracks made when the ground is frozen hard are probably comparatively harmless, but journeys during the rest of the year, particularly with heavy equipment, leave a deep scar. These scars will last for hundreds of years and in fact, rather than getting better with time, they grow worse since the water in the ruts freezes and in this way deepens and widens them year by year.... In addition to their unsightliness these tracks permanently destroy the vegetation which supports the fauna... [S]cientists... have found that the whole ecology of the area has been affected. p. 345.

29 The RCMP had suggested to the Line planners that only one rifle be allowed at each station for dealing with bears. This rifle was to remain under the direct control of the station manager. There was a real fear that DEW Line personal would threaten local wildlife populations as had occurred during the construction of the Alaska Highway.

30 The site description and much of the following site information comes from a field trip of June, 1990 and interviews with staff and a review of station files. ITT, Felec Services, Inc., DEWLINE REAL PROPERTY FACILITY - BAR-1, CONDITION AND SURVEY (FO5604-82-c-0055, March, 1990) was a particularly useful item.

31 D. Neufeld, Photo Inventory of Historic Resources - NYNP, CPS manuscript report, item 1.

32 Ralph Allen, Will Dewline cost Canada its northland? , Maclean s Magazine,

26 My, 1955. One DEW Line informant told me a story of a USAF source who upon being questioned why Canadians needed American permission to visit a station on Canadian soil was told Your Prime Minister couldn t get in here without our permission. Site visit, February, 1993.

33 The US spent almost twice as much proportionally as Canada on defence in the early 1950s. J.T. Jockel, The US and Canadian Efforts , p. 251.

34 J.T. Jockel, The US and Canadian Efforts , p. 209-211.

35 K.C. Eyre, Custos Borealis , p. 139-140.

36 J.R.K. Main, Voyageurs, p. 228.

37 J.R.K. Main, Voyageurs, p. 230.
38 K.C. Eyre, Custos Borealis , p. 145.

39 A Review of DEW Line The Engineering Journal, Nov., 1957, p. 1666.

40 K.C. Eyre, Custos Borealis , p. 142-143, J. Eayrs, Peacemaking and Deterrence, p. 294, and J.R.K. Main, Voyageurs, p. 230.

41 Canadian Parks Service, Northern Yukon National Park Resource Description and Analysis, Chapter 10 Cultural Resources of Northern Yukon National Park by D. Neufeld and G. Adams (PNRO, 1990) provides additionaldetail on this incorporation of cash into the Inuit annual round.

42 572 , WE Magazine, No-De/53 and A Review of the DEW Line , The Engineering Journal, Nov., 1957, p. 1670.

43 Reminiscences of Jimmy Jacobson via personal communication, Nov. 29, 1991 with Murielle Nagy.

44 NAC, RG 18 [85-86/048] f. G-825-11 (1958) Box 35, 1 My/53.

45 Quotes from 572 , WE Magazine, No-De/53, contact note from NAC RG 18 [85-86/048] f. G-825-8-11 pt.3 Box 35, p. 590.

46 Arctic Log and Next Door to S. Claus , WE Magazine, No-De/55 and No-De/54 and NAC RG 18 [85-86/048] f. G-825-8-11, pt.2 Box 35, pp.354-355.

47 NAC, RG 18 [83-84/068] f. G-567-1 Box 19 Ap 16/55, p. 29.

48 Arctic Log , WE Magazine, No-De/55.

49 NAC RG 18 [85-86/048] f. G-825-8-11 Box 35, pt. 2 p. 25.

50 NAC, RG 18 [85-86/048] f. G-825-8-11, pt.1 Box 35, 22 Feb., 1955, p. 98.

51 Canada, Treaty Series 1955 No. 8 DEFENCE - Establishment of a distant early warning system, 5 May, 1955, Annex 13 of the Statement of Conditions Matters Affecting Canadian Eskimos.

52 Information on the NSO and DEW community relations from M. Zaslow, The Northward Expansion of Canada 1914-1967 (Toronto, 1988) pp. 326-330 and R.Q. Duffy, The Road to Nunavut (Montreal, 1988) p. 200. Details of the NSO responsibilities from NAC RG 18 [85-86/048] f. G-825-8-11 pt.1 Box 35 Instructions for Northern Service Officers representing the Department on construction of the DEW Line , pp. 100-104 and 136-139.

53 Norman Chance, The Eskimo of North Alaska (New York, 1966) p.17.

54 NAC RG 18 [85-86/048] f. G-825-8-11 pt.3 Box 35 p. 590.

55 NAC RG 18 [85-86/048] f.G-825-8-11 pt.2 Box 35, p. 360.

56 NAC RG 18 [85-86/048] f. G-825-8-11 pt.2 Box 35 includes minutes of the negotiations for DEW Line medical services. Duffy, Nunavut pp. 61-62 describes the overall situation.

57 A DEW Line acronym for radar and electronics technician, noted in Continental Defense WE Magazine, Jy-Au, 1955.

58 The salary levels for DEW Line work are sufficient to allow many workers the option of working only a portion of a year. Shared positions are common. These allow an individual to be responsible for only half the time commitment required of a full-time position. In one case this meant shifts of eight weeks in and eight weeks out. Personal communication, Kathy George, February, 1993.

59 The RCMP had originally requested that stations be prohibited from keeping dogs. This presumably was to prevent fighting with local Inuit dogs and harrassment of wildlife. After incidents at several stations with Polar bears this restriction was relaxed and several stations obtained dogs to provide warning of bears. NAC RG 18 [?] ? GET REFERENCE.

60 Information on the condition of DEW Line sites comes from Canada, Dept. of Environment, Environmental Protection Services Report W&NR - 86/87-CP(EP)-16 Removal of Contaminants from Distant Early Warning Sites in Canada s Arctic (Dec., 1986) and personal communication 9 January, 1992, William Schaeffer, Area Manager, Western DEW Line, Cambridge Bay, NWT.