PREFACE

This report has been published by the Polar Ice Coring Office for the sponsors and participants of NSF supported research in Greenland. The purpose of this report is to provide an overview of the 1993 Greenland field season and of PICO's activities during that season. The contents include a summary of events taken from the daily and weekly situation reports of the Greenland Field Center (GFC) at Kangerlussuaq, PICO Operations (POP) at the Summit Camp, and PICO Drilling Operations (PDR) at the Summit Camp.

GISP2, currently the largest research project PICO supports in Greenland, successfully reached bedrock, obtaining 3053.51 meters of ice core. This ice core represents approximately 250,000 years of the earth's history, making it the deepest ice borehole ever drilled and the longest such record possible in the Northern Hemisphere. The GISP2 project took a total of 5 years to complete successfully.

The final ice cores extracted from the GISP2 borehole display the interface between clear and silty ice.
Photo by: Jay Klinck

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MISSION STATEMENT

The Polar Ice Coring Office is a National Science Foundation contract with the University of Alaska Fairbanks for the collection of cores for scientific study. This tasking has expanded to encompass all aspects of drilling (ice, soil, rock), logistics, research, and development to meet the needs of the scientific community.

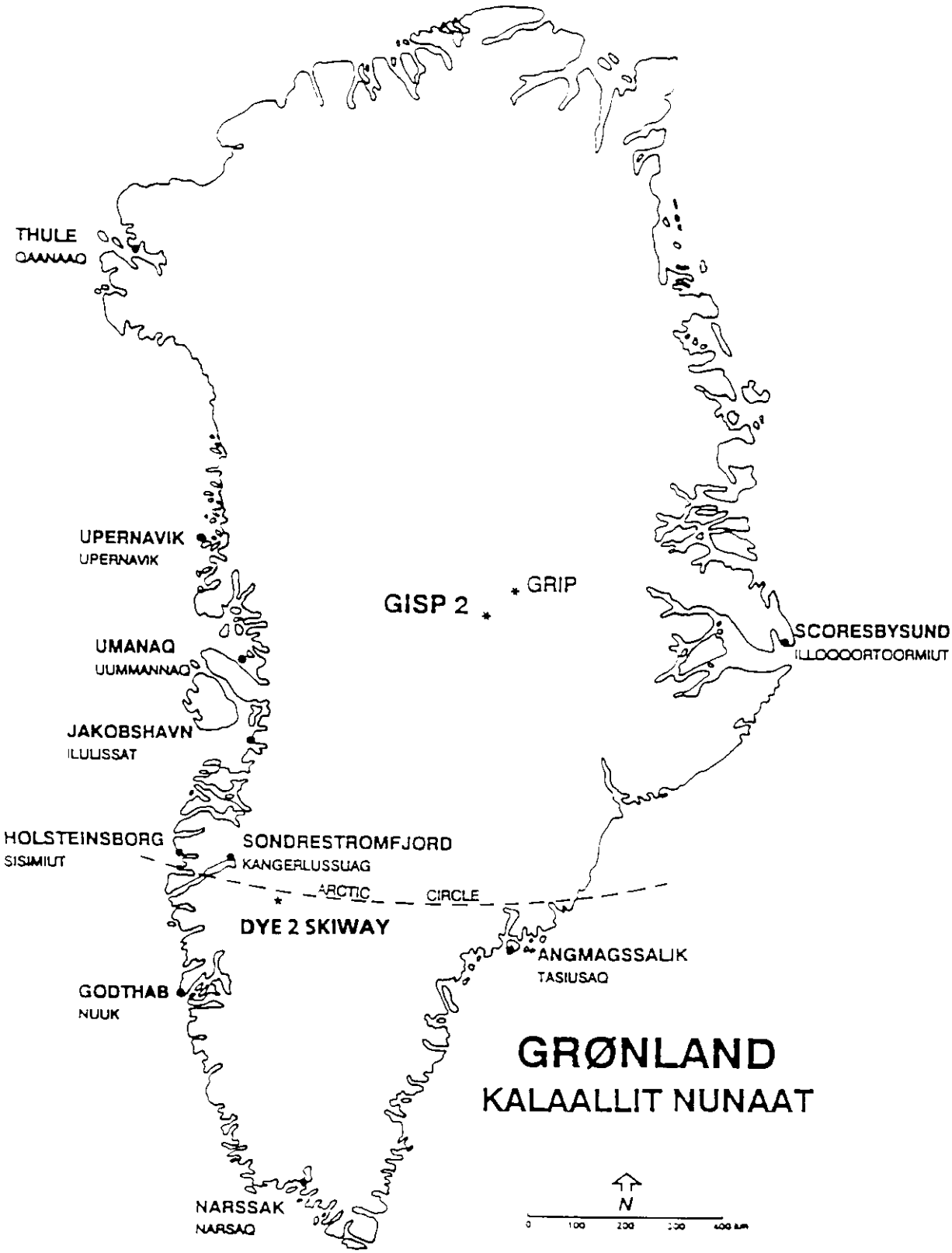
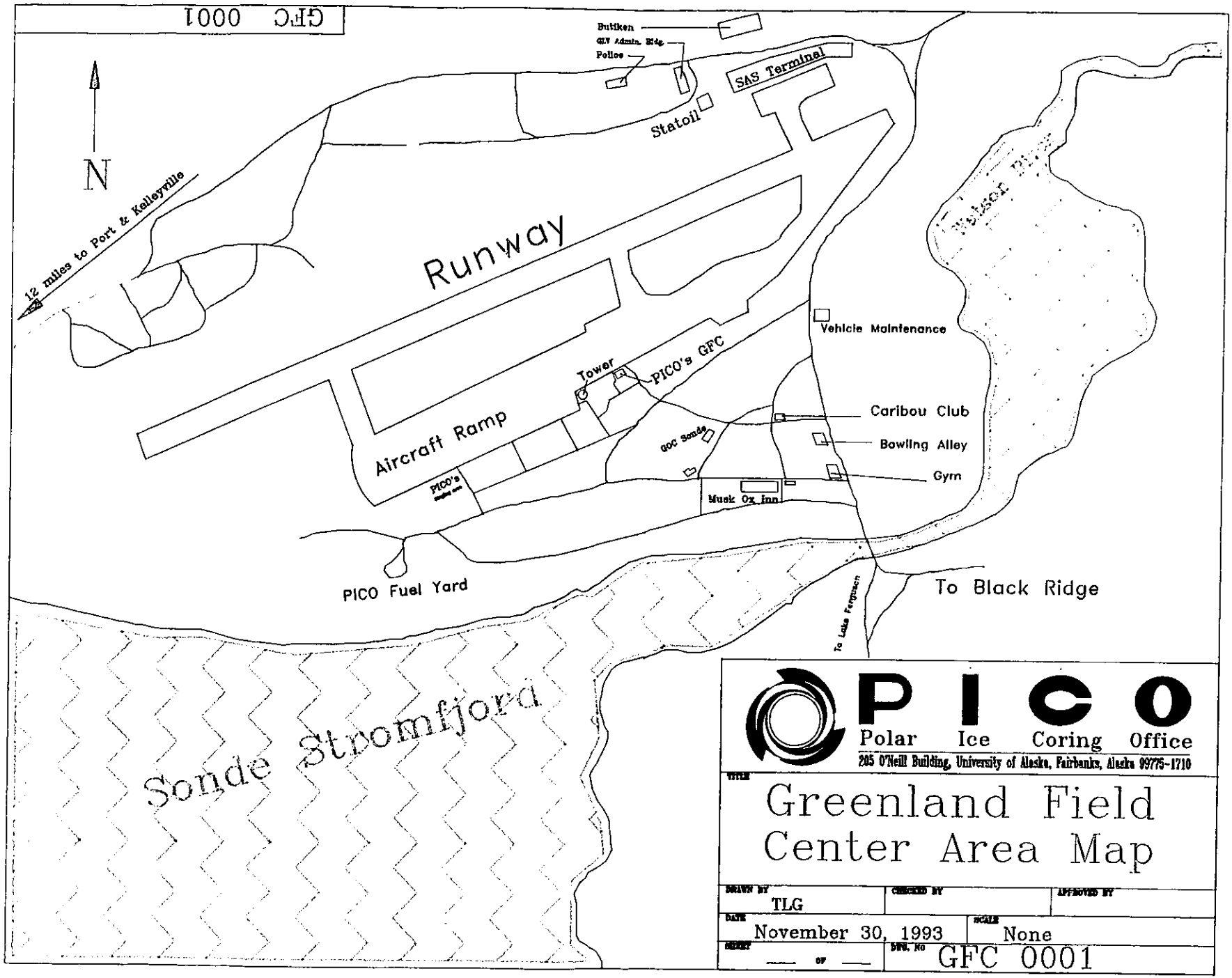


Figure 1. Location map of Greenland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PICO's
Musk Ox Inn
PICO Fuel Yard
To Black Ridge
To Lake Ferguson
Sonde Stromfjord
PICO
Polar Ice Coring Office
205 O'Neill Building, University of Alaska, Fairbanks, Alaska 99775-1710
Greenland Field Center Area Map
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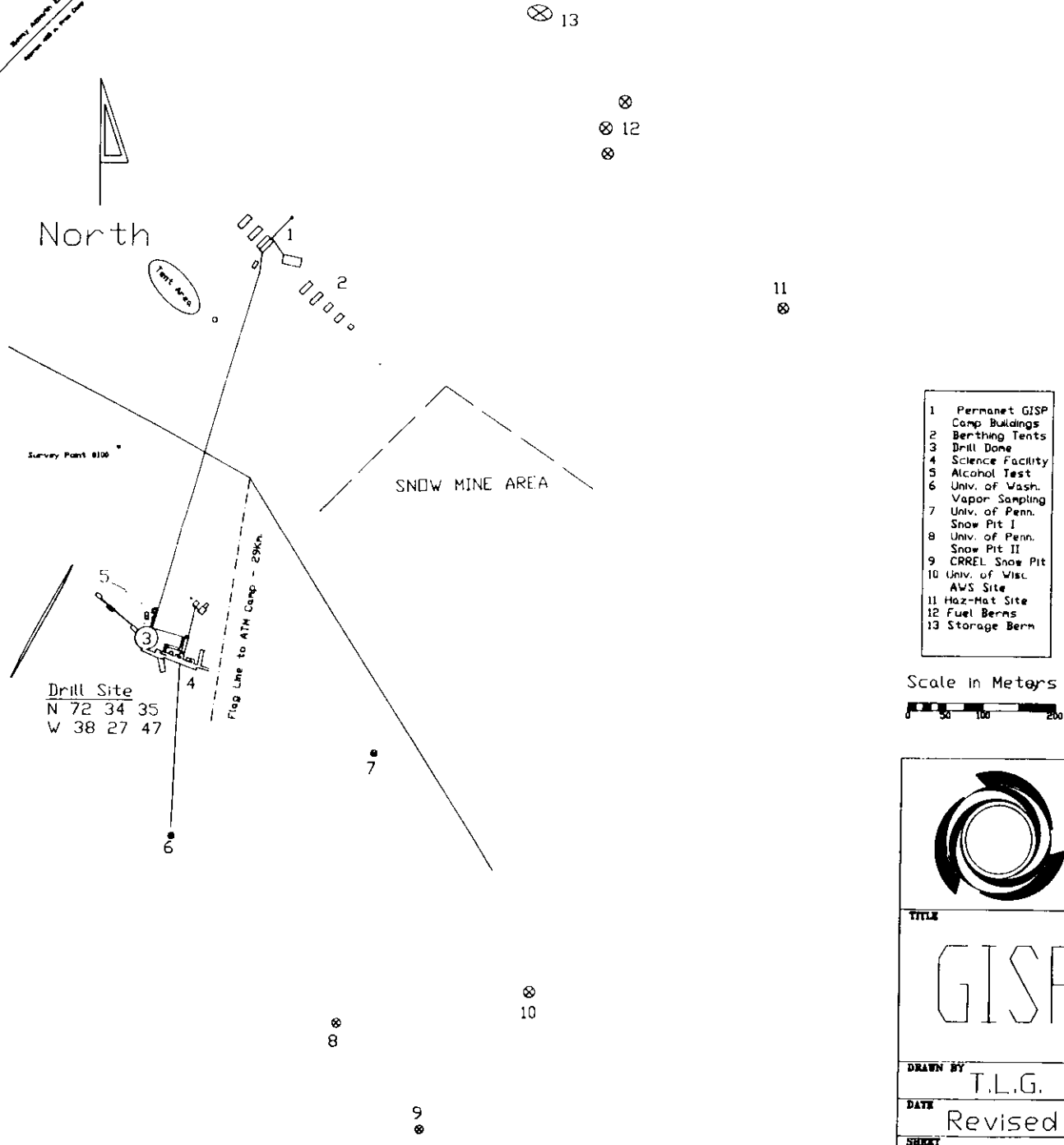

1	Permanet GISP Camp Buildings
2	Berthing Tents
3	Drill Dome
4	Science Facility
5	Alcohol Test
6	Univ. of Wash. Vapor Sampling
7	Univ. of Penn. Snow Pit I
8	Univ. of Penn. Snow Pit II
9	CRREL Snow Pit
10	Univ. of Wisc. AWS Site
11	Haz-Mat Site
12	Fuel Berms
13	Storage Berm

Scale in Meters

0 50 100 200

PICO

Polar Ice Coring Office

205 O'Neill Building, University of Alaska, Fairbanks, Alaska 99775

TITLE

GISP 2 Site Map

DRAWN BY T.L.G.	CHECKED BY	APPROVED BY
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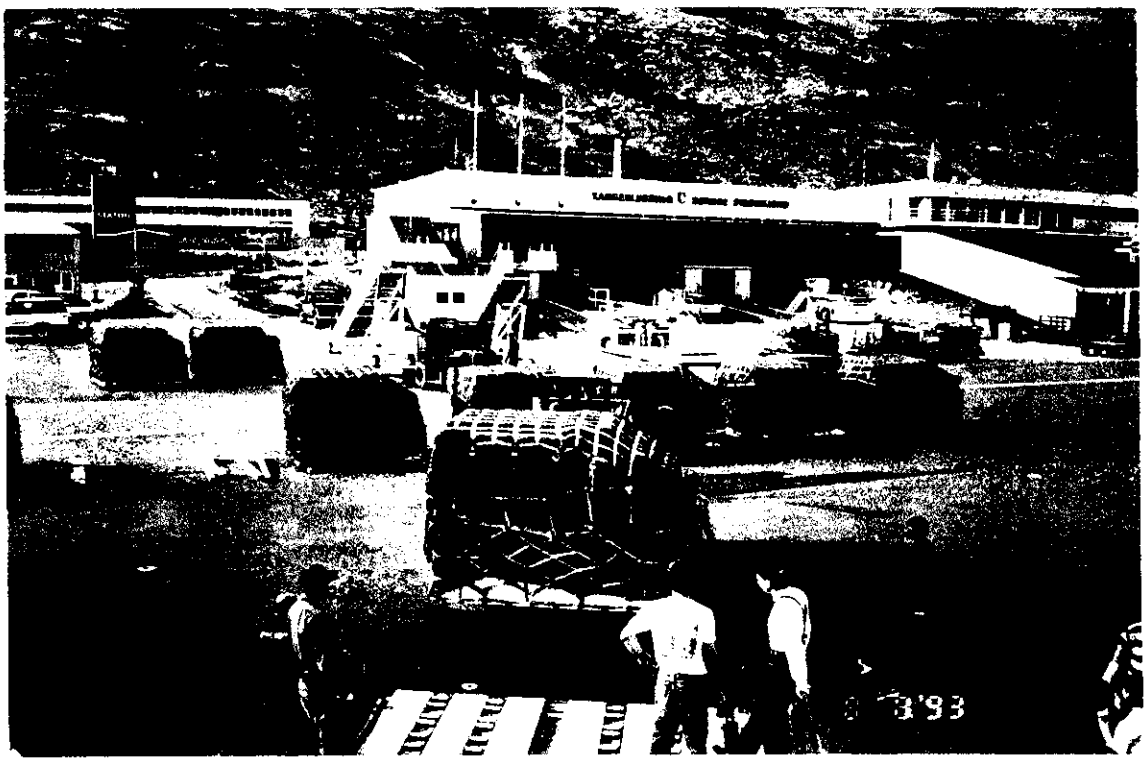
INTRODUCTION

The 1993 GISP2 Greenland field season produced the deepest ice core ever recovered. Final depth was 3053.51 meters including the transition between ice and basement rock. 802.2 meters of core was obtained as well as 1.55 meters of oriented rock core. This represents the first time that an ice core has been extended through the ice/rock interface.

The 1993 season also brought PICO many new challenges as the United States Air Force closed operations in Sondrestrom, Greenland. With this closure, the Greenland Home Rule Government assumed all responsibilities of operations in Kangerlussuaq, effecting the availability of many services and supplies.

OPERATIONAL CHANGES

On September 30, 1992 Sondrestrom Air Force Base was officially closed. This signaled a considerable loss of support facilities and services for NSF Greenland projects. With the withdrawal of the USAF, the Greenland Home Rule (GHR) Government's civilian Greenland Airport Authority (GLV), assumed sole proprietorship of the airport and is currently developing it's support network.



Ice retrograde operations at the Kangerlussuaq airport facility. Photo by: Sam Lamont

The former base, operated by USAF Space Command, had provided NSF projects with office and warehouse facilities, ground and inflight service for the 109th New York Air National Guard (NYANG), channel flights for passengers and cargo, material resupply, fuel supplies, DSN and local phone service, U.S. mail service, security, billeting, and food service. With the loss of these services, PICO began pursuing alternate lines of support for the 1993 field season. During this transition period, PICO has continually negotiated with the GLV and GHR seeking alternative sources for these services. In assessing the level of support available from local vendors, we determined that they could not provide the full range of services PICO needed to support the field season. Therefore, we researched and obtained additional sources for supplies in Denmark and the Continental United States (CONUS).

The local support that was available to PICO was principally:

1. Food - With the closing of the USAF commissary, monthly food resupply for camps was reassessed. The practical solution was to bring the entire season's stock of dry and frozen goods from the CONUS on our April charter. The Greenland Field Center (GFC) then provided food warehousing and monthly resupply services to the remote camps. Fresh foods were ordered monthly through the Butiken, the local store in Kangerlussuaq. This new system worked well and the fresh foods were consistently higher quality.

2. Fuel and POL - The GLV assumed fuel operations after the USAF base closure and successfully met all of our 1992 field season needs for bulk DFA and MOGAS. We have continued to bring some POL products from the CONUS and have increased our volume of business with Stat Oil in order to compensate for the loss of USAF base stores.

3. Services - The vehicle and equipment maintenance shops, buildings and grounds shops, laundry/dry cleaning, housekeeping, and local telephone services were operated for the USAF by Danish civilian contractors. Therefore, these facilities remain intact but have been down-sized and are now operated by the GLV. All of the services provided by these operations are still available to PICO, however, the availability of replacement parts for American products is very limited.

Two new factors that were pervasive in all of this season's business with our new landlords, were the increased costs and the difficulties encountered when all vendor orders and invoices were in Danish. While most of our Greenlandic and Danish colleagues are fluent in English, it was not practical to have the many invoices and documents translated. For upcoming seasons, the GFC staff should receive training, or already be fluent, in the Danish language.

Resupply in a timely fashion is of critical concern during the field season. With the loss of base supplies and the cessation of USAF cargo flights to Kangerlussuaq, an economical combination of air charters, routine air freight, freight forwarders and air express services were used throughout the season in order to deliver supplies and science cargo. Normal resupply requests, that could not be filled locally, were routed to CONUS or Denmark.

The normal response time for routine requests was seven to ten days and two to three days for critical requests. This was actually quicker and more predictable than the channel flights used in past seasons, due to our low priority on USAF flights.

Operations in Kangerlussuaq continue to be a transition and growth process. PICO, and all other operations in Kangerlussuaq, will continue to be affected by this change for several seasons. The local infrastructure is quickly growing and should be able to offer us more support in the future.

FIELD SEASON SUMMARY

5-6 October 92	109th Arctic Planning Conference
10-13 October 92	Annual GISP2 Workshop
5 December 92	Review Support Request with SMO Personnel - Fairbanks
12 April 93	Advance Team Arrives Kangerlussuaq, Greenland
26 April 93	Charter Flight
26 April 93	Deploy Remaining PICO Staff to Greenland
3 - 8 May 93	Flight Period 1
5 May 93	Deploy PICO Staff to GISP2
6 May 93	DYE2 Opens
17 May 93	Main Body of Researchers Arrive at Kangerlussuaq
17-22 May 93	Flight Period 2
18 May 93	Begin Traverses
22 May 93	Drilling Begins
7 June 93	Charter for Butyl Acetate
12 June 93	GRIP Put-In
14 June 93	NSF and Bidder Visit
16-30 June 93	Flight Period 3
19 June 93	Complete Traverses
1 July 93	Bedrock Reached
7 July 93	1.55 meters of Rock Core Recovered
10-16 July 93	Flight Period 4
14 July 93	GRIP Closes
24-31 July 93	Flight Period 5
24 July 93	Main Body of Science Personnel Depart GISP2
26 July 93	Close GISP Camp
28 July 93	Close DYE2 Camp
31 July 93	Charter, Drill String to CONUS
8 August 93	Charter, Ice Retrograde to NICL
9 August 93	GFC Closes

FIELD SEASON OPERATIONS

In October of 1992, representatives from PICO attended the Arctic Planning Conference held at the 109th New York Air National Guard (NYANG) in Scotia, New York. All flight requirements of the 109th NYANG and PICO's Greenland season were reviewed and the flight periods were established for the 1993 season during this conference.

Following the Arctic Planning Conference, representatives from PICO attended the annual GISP2 workshop at Pack Forest, University of Washington. During this workshop, 1992 activities were reviewed and the 1993 science support was discussed.

In December 1992, two representatives from the Science Management Office (SMO) traveled to Fairbanks in order to discuss their 1993 Support Request. This document was reviewed at length during this meeting and a final version was submitted to PICO in mid-March of 1993. Several updates were provided to PICO throughout the season as changes were made.

Detailed field season plans were developed once all of the requirements were identified. These planning documents included timelines and work assignments for phase-up, camp operations, and phase-down, and detailed plans for resupply, communications, emergencies, ice retrograde and winter over.

By 12 April, an advance team of eight PICO employees had gathered in Kangerlussuaq to reactivate the GFC for the 1993 field season. This team included the GFC and DYE2 staffs in addition to a mechanic and a general field assistant from the GISP2 staff.

The first task was to move from the old facilities to the new operations center. All essential equipment and supplies were moved and the new center was operational by 26 April, when the remaining GISP2 camp staff arrived. On 27 April, all hands helped to off-load the put-in charter flight that had arrived from CONUS with drilling equipment, camp supplies and the season's supply of dry and frozen foods.

The next nine days consisted of a concerted effort to prepare for put-in to the two field sites; GISP2 and DYE2. All communications gear was removed from warm storage. Each piece of equipment was set up and tested. All tents were inspected to insure all parts were present and the flies and liners were repaired and rebagged. Medical supplies and equipment were inventoried and boxed for shipment, to include setting up and testing the Gamow bag. Once all the equipment was tested, staff began building their put-in pallets. Two flights of C-130 ski equipped aircraft were planned for put-in. Each flight was limited to 10,000 lbs and load selection was critical. Prior to put-in, camp policy meetings and phase-up reviews took place.

During all of the put-in preparations, GFC staff continued establishing new points of contact and support in Kangerlussuaq to replace those lost with the USAF base closure. A transient working population has always been normal for this remote airport facility, however, this year posed many more personnel and operational changes. While points of contact and responsibilities are still being ironed out, GLV's cooperation and willingness to support NSF projects in Kangerlussuaq overcame many obstacles. The enthusiasm and good will of the new management and employees were very encouraging.

Building 506: The new Greenland Field Center with offices, berthing, warehouse and staging facilities.
Photo by: Sam Lamont

On 3 May 93, the 109th NYANG ski-equipped C-130's arrived. Preparations were completed and the planes were loaded for a 4 May put-in. Questionable summit weather delayed the mission, however, a successful put-in for GISP2 was completed on 5 May with the DYE2 put-in taking place the following day. Nineteen passengers were transported to GISP2 during the put-in flight period.

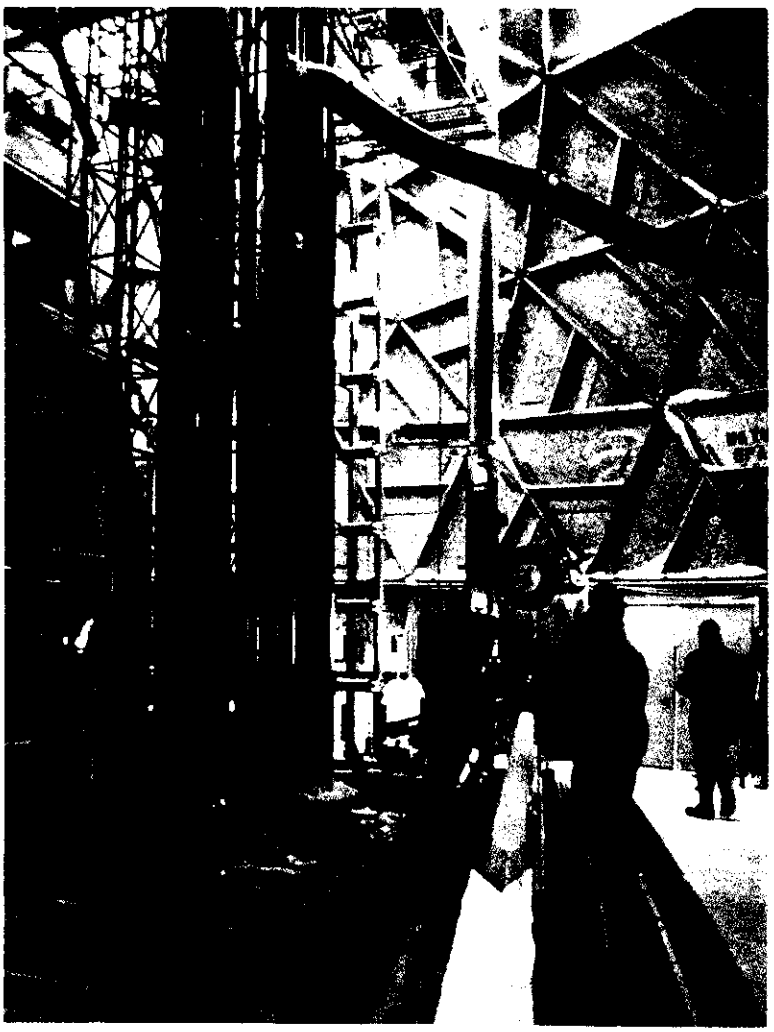
The weather proved to be exemplary at the summit with temperatures close to -30° Celsius, little wind and mostly clear skies. Upon arrival at camp, all buildings and work areas were accessed and surveyed. Within two weeks, all berthing WeatherPorts were erected and supplied with power and heat and a fifteen thousand foot skiway was groomed.

The big house upon arrival at the GISP2 camp. Photo by: Jay Klinck

Difficulties were encountered using MAPP gas with the convection oven; this was eventually returned to operating on propane. The heat exchanger for the snow melter was acid washed, which proved to give better results with greater water production over previous seasons. In addition, the compressor for the walk-in freezer was found to be inoperative and replacement parts were ordered.

All personnel were given tasks and work group assignments, which were reviewed in Kangerlussuaq, prior to deployment to the summit. Establishing these work assignments, and reviewing them in advance, proved to be extremely beneficial. Personnel were able to function effectively and independently upon arrival at the summit and during the first week of phase-up. Brief daily meetings were held to insure all personnel had the required tools and assistance to complete their jobs safely and successfully.

Drilling operations consisted of camp and drill dome open-up and preparations for core recovery. A new drill cable was installed and bore hole logging was completed before core production commenced, to enable data collection for ice dynamics and interpretation. Core production commenced on 22 May and proceeded without any significant technical problems for the duration of the field season.

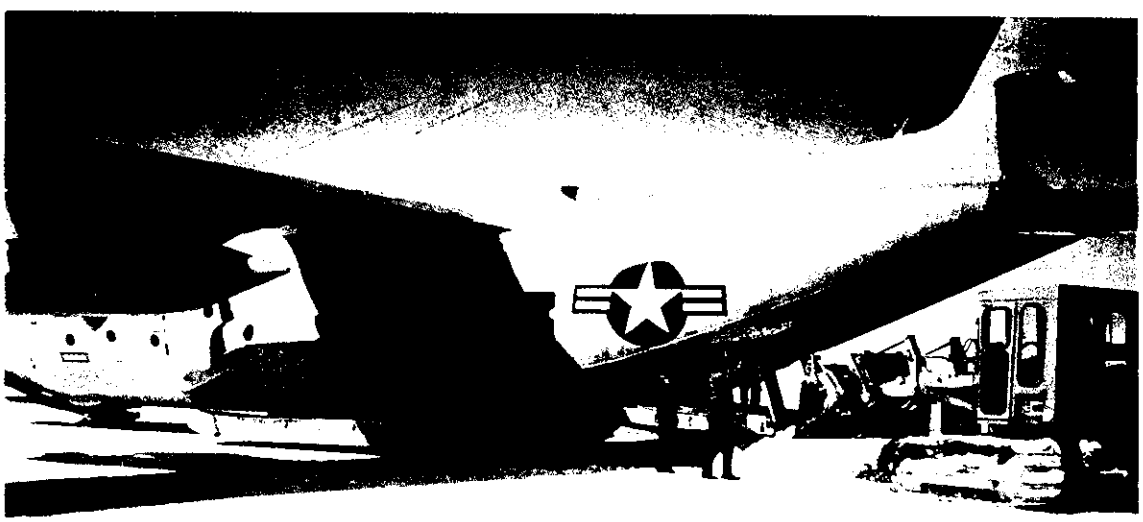


PICO drillers extracting typical six meter core from the inner core barrel. Photo by: Jay Klinck

Flight operations throughout the season went smoothly. After the first flight period, the skiway surface continued to improve enabling aircraft to get off deck with record weights of just under 18,000 lbs. The camp staff, in conjunction with the 109th flight crews, did an exceptional job in loading and off-loading the aircraft safely and in record times. The 109th and PICO crews are to be commended in their ability to safely and effectively load and off-load cargo. The two groups demonstrated outstanding teamwork during ground operations of the aircraft while at GISP2. The direction, guidance and cooperation from the 109th this season was invaluable.

Between the fourth and fifth flight period, all science and berthing structures were dismantled, palletized, and stored on the winter-over cargo line. The food storage weatherport, workshop, generator module, drill dome and big house remain standing. Each was winterized, with doors and windows sealed. Shovels were secured above each entrance to the big house, generator shack, workshop, drill dome, and entrance to the CPL trench. All entrances that had the potential of drifting were identified with bamboo markers. The bath module, water melter, and big house water lines were all drained and blown dry with compressed air. Potable water storage tanks were drained, scrubbed down, and sanitized with bleach. All batteries were placed in the generator room and connected to the solar charging circuit. The exhaust fans and stands at the drill dome were removed to increase the scouring and to retrograde the fans.

Vehicles were placed on a winter-over storage berm approximately six feet above the snow surface. This berm also included the drill winch, prime mover, groomer, 400 gallon fuel boat and the ten-ton sled holding four Skidoos and the Herman Nelson. All vehicles were serviced with multi-grade arctic oil and, along with the generator tanks, were topped off with DFA. All snowmobiles were topped off with 2-cycle MOGAS. All Skidoo covers were tied to the frames to protect against high winds.



New York Air National Guard crew assisting PICO staff with building a loading ramp for the retrograde of the triple married drill string pallet. Photo by: Jay Klinck

Herman Nelson heaters have been placed in the following locations; one on the back of the Tucker Sno-Cat, one on the tracks of the old CAT 931, and one on the ten-ton sled with the four snowmachines. There is an additional Herman Nelson prime mover in the workshop along with a 3-phase electric prime mover. The prime mover on the ten-ton sled was secured to a modified section of the Magline sled. This can be easily towed behind any snow machine. All Herman Nelsons were covered and secured with tarps to insure that no snow filters into the heater box.

All communications gear and weather monitoring equipment were removed from camp. Both anemometers on top of the big house have been secured so the wind cups will not rotate during the winter to prevent bearing failure.

All skiway markers and approach flagging were left in place. The camp was secured 45 minutes prior to the arrival of the last pull out aircraft on 26 July 1993.

The arrival of the last retrograde summit cargo and remaining camp personnel at Kangerlussuaq was the beginning of phase down for the GFC. On 29 July, the DYE 2 staff returned to GFC with their portable camp and Sno-Cat (see DYE2 summary, pp.12). With both field camps closed for the season, preparations for the end of season CONUS retrograde charter flight, and closing of the GFC, were in full swing.

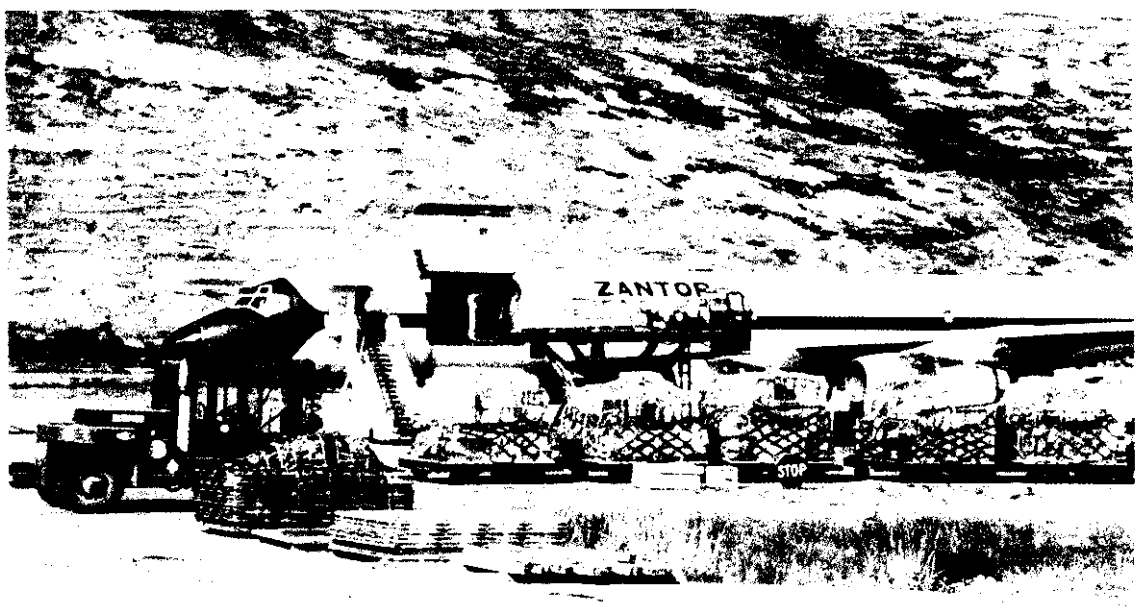
Drilling staff, camp staff, and science personnel were busy building retrograde pallets and configuring oversize loads. Concurrently, equipment and supplies remaining in Greenland were being cleaned, dried, repaired and warehoused for the winter. When the pallets were completed, and most of the supplies were reshelved, the end of season inventory began.

On 31 July, the civilian air charter for the East Coast retrograde cargo arrived at Kangerlussuaq. Designated as the "drill charter" it actually carried the core drill, science cargo, and ice samples. Over fourteen pallets of cargo were prestaged for this flight. The drill string and related parts were over length and had to be hand loaded. As soon as this was completed, two pallets of ice were built, bagged, and loaded. The charter was on the ground 4.5 hours, including fueling, and departed with nearly 59,000 lbs of cargo. This successful exercise provided some valuable pointers on how to get the plane loaded more efficiently and reduce overall ground time. Shorter ground time was the goal for the upcoming ice retrograde flight.

During the following week, the ice retrograde loading plan was reviewed, rehearsed and refined. Twenty eight of the ISC core boxes had to be removed from freezer storage to install thermistors for monitoring the ice core temperatures during transportation. During the hour that the boxes were out of the freezer, a demonstration pallet was built to verify the configuration to be used for all ice pallets.

While waiting for the ice charter, GFC inventory was completed and inside and outside storage were secured for the winter. All vehicles and equipment were serviced, the building was completely cleaned, and the last of the arctic clothing was cleaned.

Arrangements were finalized for off season monitoring of assets and appropriate utilities were scheduled for disconnect.



Science and drilling cargo being loaded for the East Coast retrograde flight on a DC-8 commercial charter. Photo by: Sam Lamont

On 8 August, the civilian air charter arrived for the ice retrograde to the National Ice Core Laboratory (NICL) in Denver. The charter arrived with 33,200 lbs of resupply cargo for the 1994 season. Half of this cargo was over length, requiring off loading by hand. The plane was scheduled for a maximum ground time of 4 hours. From previous experience it was known that it would take approximately 4 hours to build and load the 12.5 pallets of ice, and in addition, the aircraft needed to refuel. In order to meet the 4 hour maximum turn-around time, a staff of 14, with the addition of 10 local laborers and 6 volunteers from the SRI staff at Kellyville, assisted with the offload and onload. In addition, Dr. Joan Fitzpatrick from the USGS/NIRL assisted the PICO Logistics Manager in monitoring the operation. Two forklifts, four trucks, and one K-loader were used to move the cargo. Separate work teams simultaneously built, bagged, weighed and placarded ice pallets, off-loaded incoming cargo, and belly loaded loose cargo. Ice pallet building began one hour prior to the arrival of the charter aircraft in Kangerlussuaq so that loading could begin as soon as the 1994 pre-stage cargo was off-loaded. Under the watchful eye of the local fire department, the plane was refueled simultaneously with the cargo handling operations.

The plane was airborne within three hours, carrying approximately 50,000 lbs of ice and cargo. PICO staff continued working long into the night to clean up the ramp and store incoming supplies.

Dr. Joan Fitzpartick, USGS, and Kevin Killilea, DYE2 skiway operator, inside the main ice core storage facility in Kangerlussuaq. Photo by: Sam Lamont

On 9 August 1993, GFC was closed and the remaining staff departed for CONUS on the AMC channel flight.

DYE2 Summary:

The DYE2 camp put-in took place on 6 May 1993. This site is approximately twenty minutes flight time from Kangerlussuaq. The site is maintained and operated by PICO, and cost shared with GRIP, as a LC-130 training facility for the 109th NYANG. Two skiway operators set up a camp and are responsible for grooming and flagging the skiway. In addition, they provide weather, ground communications and flight following services.

In a pre-season meeting with the 109th, PICO was presented with a plan for upgrading the training facilities at the site. The two year improvement plan included relocation and upgrade of the field camp and the cargo off load area, construction of a field refueling site, flagging and grooming of a ski landing area, and the identification and inspection of a drop zone.

The old Sno-Cat used for grooming the skiway had reached the end of its serviceable life. In order to continue maintaining the skiway and to develop the proposed upgrades, it was traded in for a new LMC Spryte. In preparation for the 1993 flight training season, this machine was flown to GFC by the 109th in January of 1993.

The first order of work at the DYE2 site was to establish the camp and its life support system and then to prepare the skiway. In late May, the camp was relocated and a new cargo off loading area was established. In early June, the DYE2 staff began work on other requested improvements. This season the skiway was reflagged, the new cargo off loading area completed, and the new ski landing area was surveyed, groomed and flagged. These additions and upgrades were inspected by a 109th representative and were approved. In mid-June, the 109th began using the new ski landing area.

In mid-season, the DYE2 staff had to return to GFC in order to repair a factory oversight on the new Spryte that was discovered during routine maintenance. When this was completed, they assisted the GFC staff in completing the move to the new facilities.

There was concern over the accuracy of a new altimeter used as part of the flight following operation. The instrument was checked and recalibrated and the possible purchase of a higher quality instrument discussed.

The 1993 DYE2 operations went smoothly and the weather was very cooperative, allowing for a great deal of work to be accomplished. Things are in place to execute the remainder of the upgrades during the 1994 season. The camp closed on 29 July 1993.

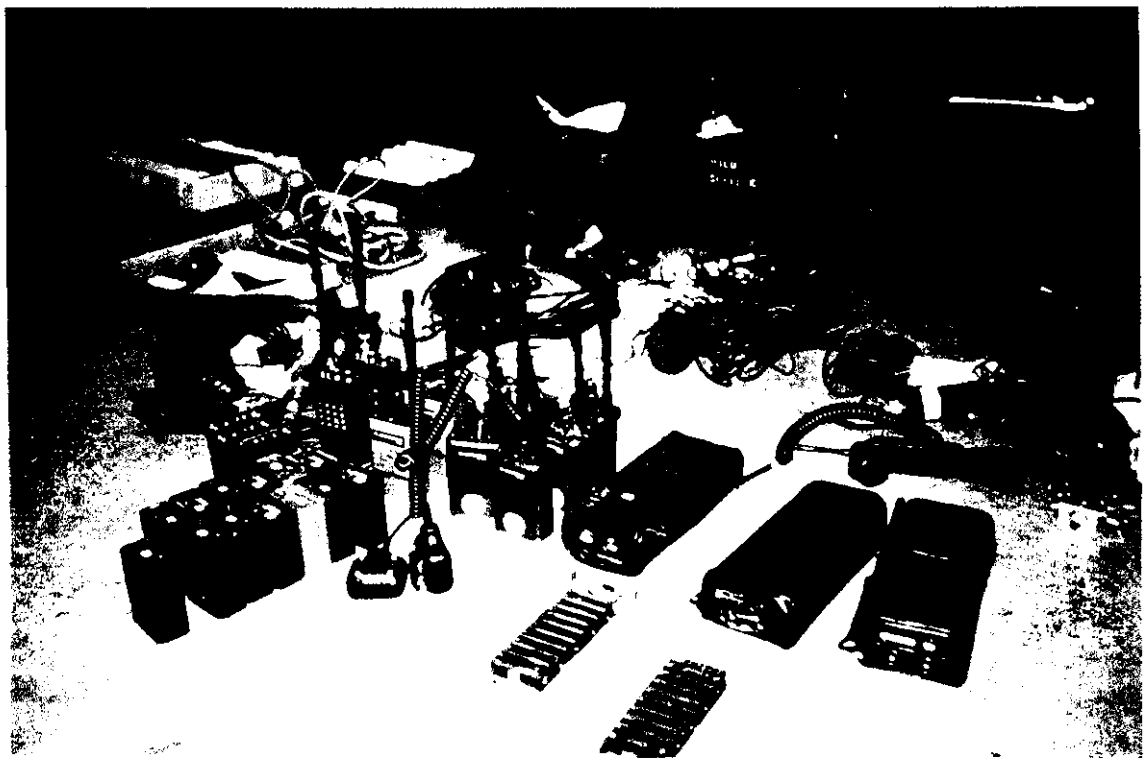
COMMUNICATIONS

For any program operating in several time zones, improving the communications network system provides the potential for maintaining or increasing operational efficiency and delivering better service. While we lost the use of the militaries DSN line this season, we realized a net gain in our communications options.

This season the communications hardware for data transfer between CONUS and GFC was improved with the addition of a pair of smart modems for computer to computer transfer of data, providing quick and inexpensive exchange of data. It provided up to the minute tracking of thousands of pieces of cargo moved during the season and greatly reduced the labor intensive manual transfer of the data required in previous seasons.

With this new data link, there was a measurable decrease in time between the initiation and completion of actions that proved significant when operating across ten time zones. The accessibility to, and speed of, transfer for cargo tracking data greatly improved shipping operations. Even during this period of transition, there was an observable improvement in the efficiency of our cargo handling operations.

Communications to the remote camps were greatly improved over previous seasons. This was a combination of better propagation and less sunspot activity. During the few times that propagation was substandard, the INMARSAT C telex was used. This season, PICO purchased two new mobile INMARSAT C's which proved to be invaluable for direct and prompt communications with both PICO/UAF and GFC. In previous seasons, telex lag time could be up to 18 hours prior to being received. This season most telex messages were received in 5-10 minutes.



Some of the communications equipment required for operations at GISP2, ATM and science traverses. Photo by: Jay Klinck

The VHF antenna and cable were replaced on the tower attached to the big house. This took care of previous seasons' difficulties in communicating from the big house using this antenna. As a result, communications with GRIP, ATM and locally around GISP greatly improved.

Voice communication back to a commercial phone network is still not available at GISP. Although the new mobile telex system greatly improved communications, voice communications is still extremely desirable.

CARGO AND PASSENGER MOVEMENTS

This season, there were three options for transporting cargo to Greenland; the initial commercial charter flight, 109th SAAM, and via Dan Transport, a commercial freight forwarding company. Following is a breakdown of cargo movements from CONUS to Greenland via each method:

April Charter	60,000 lbs
109th SAAM	8,100 lbs
Dan Transport	3,900 lbs
Total to Greenland	72,000 lbs

Throughout the season, over 380,000 lbs of cargo was transported to the GISP2 camp on ski-equipped C-130's and over 208,000 lbs of cargo was retrograded back to Kangerlussuaq from the remote camp.

At the end of the Greenland field season, there were two retrograde charter flights from Greenland, one to Albany, New York and one to Denver, Colorado. Following is a breakdown of the cargo weights, to include ice, via these two charters:

31 July Charter to Albany	60,000 lbs
8 August Charter to Denver	50,000 lbs
Total Retro Cargo	110,000 lbs

On July 27, 1993, PICO was provided funding by NSF to purchase and prestage supplies for the upcoming Greenland field seasons. This cargo was to be transported to Greenland on the 8 August retrograde charter. In order to meet this charter date, all cargo was procured and delivered to the charter staging area by 4 August. This charter was cost shared with SRI Kellyville. Following is a breakdown of the cargo transported to Greenland on this charter flight:

UAF Prestage Cargo	16,200 lbs
SRI Kellyville	17,000 lbs
Total Charter Cargo	33,200 lbs

Following is a breakdown of the passenger movements to and from Greenland:

CONUS to Greenland	94 pax
GFC to Summit Camp	67 pax
Summit Camp to GFC	67 pax
Greenland to CONUS	81 pax

Thirteen of the CONUS to Greenland pax were GRIP participants. PICO obtained all necessary clearances and transported them to Greenland, while GRIP took care of their return to the CONUS.

FOOD SERVICE

In the past, Greenland field season participants were able to purchase low cost, balanced meals at the USAF canteen. This season, the airport cafe and the GLV employee canteen were our only choices for meal service. The meals at the cafe are predominantly deep-fried and, in general, not well balanced. Special arrangements were made with GLV to allow participants to eat at the employees canteen and meal cards were issued to all field participants.

The cost of the meals was slightly more than double of what we paid for meals in previous seasons. In our effort to avoid financial difficulties for field personnel, GLV billed PICO directly.

The quality of the food at the canteen was good and the selection was broad enough for well balanced meals. However, the food was Danish and is different than what Americans are accustomed to. Some of the field participants did not like the selection and others missed getting per diem checks and the choices this offered (i.e. eat at the cafe, shop at the local grocery).

Each Sunday, both camp staff and project participants took turns volunteering to prepare brunch at the GISP2 camp, in order to give the cook a day off. Photo by: Jay Klinck

With the closing of the USAF commissary, monthly food supply for the camps were reassessed. A practical solution was to bring the entire season's stock of dry goods and frozen foods from CONUS by charter. Therefore, a food order was compiled and put out to bid. This proved to not only be cost effective, but also offered a wide selection of products in quantities suited to our needs. The food was flown to Kangerlussuaq via the April charter flight where it was broken down into lots and marked for each flight period. The boxes were then shipped to camp on routine resupply flights.

Over the 82 days at the GISP2 camp, approximately 7100 meals were served. Night shift workers and core handlers were prepared a separate evening meal.

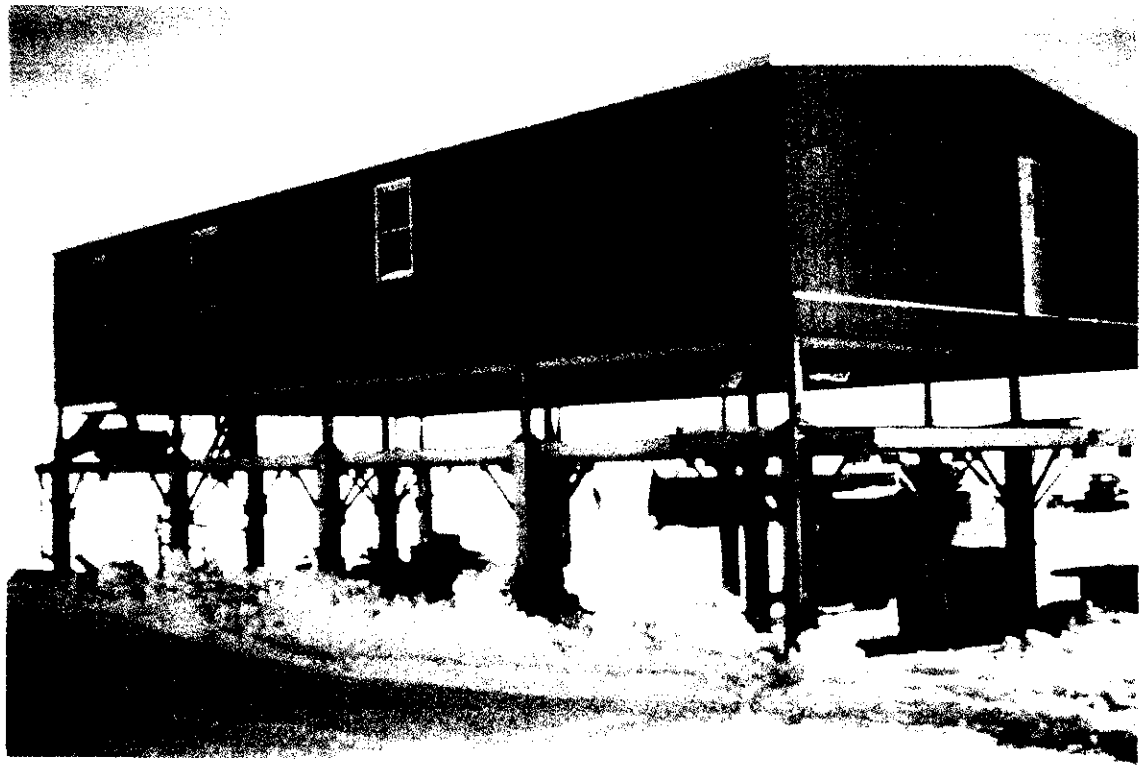
Once again this season, all camp members assisted in house mouse and scullery duties, rotating on a per meal basis. Detailed inventories were completed of all dry, canned and frozen foods at the beginning and end of the season. The in-snow freezer for frozen food storage was cleaned and culled of all outdated food. Although the roof had settled, about one and a half feet since construction four years ago, this continues to be a convenient and accessible storage area for frozen food products. The new dog house extension to the freezer completed last season proved to work well in providing nearly maintenance free access.

FACILITIES

PICO relocated its Greenland Field Center to building 506, formerly the flight line fire station. The location on the flight line is ideal and this building provides space for an office, warehouse, indoor area for building pallets, a 109th operations center, and transit berthing, under one roof. Previously, these facilities had been located in four different buildings. This consolidation, plus the ideal location, allows for more efficient coordination of operations.

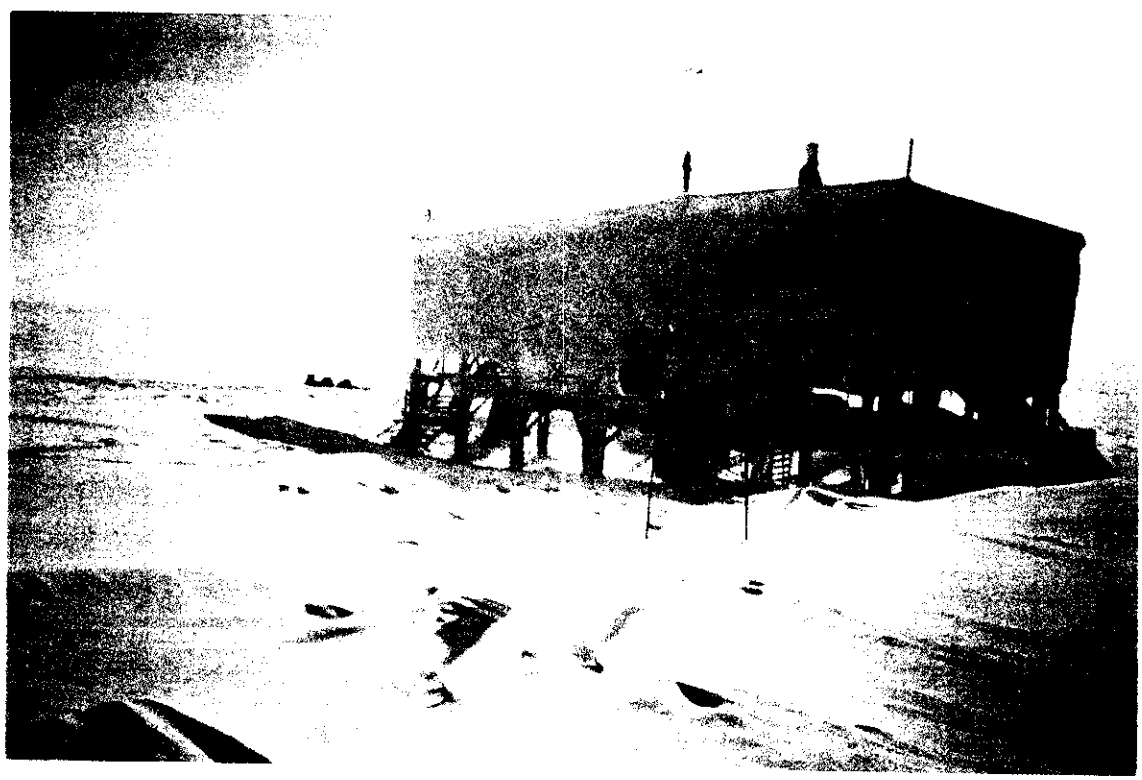
There were no new facilities established at the GISP2 camp. The normal entrance extensions were constructed and installed at the core processing and battery trenches at ATM. An additional 5,000 gallon fuel bladder was added to the existing fuel berm, giving a total of 15,000 gallons of fuel storage. The vehicle berm was also enlarged to accept the winch and prime mover for the winter.

There are two recommendations regarding facilities at the summit camp; raising the big house and replacing the generators with small, more economical units. It is recommended that the big house be raised 4 feet to provide an additional 2 to 3 years of life to the structure. A separate proposal outlining the justification, plan and budget has been submitted to the NSF.



Based on a CRREL foundation design to permit scouring, this stress skin panel building known as the big house, sits on piling approximately 10' above grade and was completed in 1990.

Photo by: Jay Klinck



By 1993, the floor of the big house is 4' to 5' above the surrounding grade. Scouring was hampered by a utilidore extending from the building. It is expected that drifting will increase dramatically when the surrounding grade reaches the base of the walls.

Photo by: Jay Klinck

Currently there are two 125 kW generators powering the camp. As this output is no longer required, these generators could be replaced with two 20 kW units. This would provide adequate power generation to support the currently projected camp operations and would provide substantial savings in fuel and transporation. The new generators would quickly pay for themselves and substantial savings would result over the next three years. The generators could be placed in a portable generator module that could then be stored on a berm at the end of each field season. This would negate digging out the generators at the onset of each field season.

EQUIPMENT AND VEHICLES

A new Kevlar reinforced drill cable was installed on the 4000 meter winch prior to the commencement of drilling operations at the GISP2 camp. This cable was identical in design to the cable used during the 1991 and 1992 field seasons. Drilling operations were completed without any significant problems with the drill cable. New data regarding drill cable construction types was obtained to enable new design types to be investigated.

The 1991 Caterpillar 931C LPG Series II was the main vehicle for loading and off-loading C-130s and excavating snow at the GISP2 camp. It was also used for mining snow for water production. Minor servicing problems were encountered during the season, however, there were no major repairs required. This vehicle is in excellent condition.

The 1972 Caterpillar 931 LPG tractor was used as back-up to the new Caterpillar. Compression tests were completed on the engine finding that one cylinder was far below required standards. If this piece of equipment is to be relied on in future seasons, the engine will have to be rebuilt or replaced. This vehicle is barely usable in its current condition.

The 1987 Tucker Sno-Cat hydraulic system was modified to allow use of the groomer. This vehicle was used mainly to groom the skiway and in conjunction with the Cat 931 to remove snow from drifted structures. All tracks were replaced and/or rebuilt, the radiator was replaced, and the pivot plates welded. This piece of equipment performed well and is in good condition for its age.

The Skidoo snowmobiles are in various conditions:

Cheyenne	4 ea.	1991	Condition: Good
Alpine II	2 ea.	1989	Condition: Good
Skandic	3 ea.	1984	Condition: Poor

The Cheyenne track slide assemblies show significant metal fatigue in the front runner supports. These were re-welded and fitted with additional bracing which proved to be ample for continued operation. New track slide assemblies will be needed for next season.

All Skandics now have in excess of 15,000 kilometers on them and are rapidly becoming unreliable for any long distance use. Two Skandic engines were completely rebuilt. As these machines continue to break down, they will be deadlined because their age and fatigue are becoming a liability to camp transportation. The deadlined machines will be used for spare parts for those still in operable condition.

To the credit of the snowmobile mechanic, the Alpines have moved from fair condition to good condition. These machines are used to carrying heavy loads on traverses.

The Yanmar snow blower is a 3 cylinder 23 hp tracked snow blower. The right track was replaced and otherwise, only minor servicing was required. The condition is excellent.

MEDICAL SERVICES

Prior to the closure of the USAF medical clinic at Sondrestrom Air Base, we contacted local and regional medical centers in Greenland and determined that we could call upon the Greenlandic National Health System for routine and emergency medical support. We identified the level of medical care offered at the local clinic, two regional hospitals, and the National Medical Center. Additionally, an agreement was established with the USAF civilian contract hospital in Thule. Our medical support plan, including evacuation routes, was revised to reflect this change in the medical support now available to our personnel in Greenland.

An agreement with a local airlines for priority seating of our routine and emergency medevac patients, provided us with a good chance to get camp personnel to and from care centers during the flight periods. This provided the opportunity for pax, who were medically fit, to return to the field without costly delays.

The impending cancellation of USAF channel flights prompted us to establish points of contact with four regional air carriers for medevac services that might be needed outside scheduled commercial flights. Additionally, we have established contact with the national air ambulance service which can mobilize local and regional air carriers, as well as the Danish Air Force coastal patrol plane, for emergency medical evacuations.

The 1993 season was a quiet and fairly routine season medically and there were no emergency medevacs required. Only two people required leaving camp for medical reasons and these were handled with routine flights; one for a broken tooth and one for long-term failure to adequately adapt to altitude. The Gamow bag was used for acclimatization of three people during the initial put-in but there were no further problems

after the first week. The pulse oximeter continued to be a useful tool for monitoring hemoglobin oxygen saturation levels, particularly during put-in.

Dr. Joe Shields, GISP2 Camp Medic, and Lynn Galanes, GFA/EMT, check the Gamow bag and other medical equipment prior to the GISP2 put-in. Photo by: Jay Klinck

There were approximately 50 routine patient encounters documented throughout the season. There were numerous other very informal discussions related to medical matters with camp members that were not recorded.

The remaining medical inventory at the summit camp is adequate for most routine medical situations. Medical resupply for the 1994 season is expected to be minimal.

1993 GREENLAND SCIENCE PROJECTS

Principal Investigator	Project/Institution	# Personnel
Mayewski, Paul	GISP2 Science Management Office	18
Dibb, Jack	ATM	9
Waddington, Ed	University of Washington	2
Clauer, Robert C.	MAGIC	2
Ferguson, Jerry	Atmospheric Noise Measurement	2
Bond, Gerald	Lamont-Doherty Geological Observation	11
Mattox, William	Greenland Peregrine Falcon Survey	8
Weaver, Barry	Ascension Island Research	2
Comberiate, Mike	NASA Goddard Space Flight Center	2

From left to right, Dr. Paul Mayewski (UNH), Dr. Pieter Grootes (UW), Mr. Henri Rufli (Univ. of Bern), and Mr. Craig Tozer (UW), enjoy a break at the GFC after the successful close of the 1993 field season.
Photo by: Sam Lamont

WEEKLY SITUATION REPORTS SUMMARY

Week 1, April 5-11

- 2 PICO pax arrive at SFJ from Copenhagen
- Take possession of building 506

Week 2, April 12-18

- Begin setting up 506 for field season
- Open local accounts

Week 3, April 19-25

- Submitted work order to bring freezers on line
- Attempted to sort customs issues; work and residence permits
- GISP2 Camp Manager arrived SFJ and began to review all put-in items

Week 4, April 26 - May 3

- DC-8 charter arrives with supplies and equipment, 4/27
- Completed moving all essentials out of building 386
- GISP2 and DYE2 staff begin put-in preparations
- Nanson sleds repaired, tents checked along with communications gear and camping gear

Week 5, May 3-9

- GISP2 put-in, 5/5
- DYE2 put-in, 5/6
- 109th begins training flights to DYE2
- Rented newly available freezer unit Z1
- Four berthing WeatherPorts erected and all heavy equipment operational

Week 6, May 10-16

- Built pallets at GFC for FP2
- European ATM personnel arrive on SAS
- Flight line groomed
- Flooring laid in kitchen and scullery
- Drill dome opened
- Winch and prime mover installed
- Drill cable spooled

Week 7, May 17-23

- Lt. Col. Pritchard inspects DYE2 upgrades
- 18 science pax arrive
- Frozen batteries removed to GISP2 for checking and charging
- Compressor to walk-in freezer failed.
- Tucker tracks and bogies replaced
- Drill string test
- Borehole reamed
- Bore hole logged and core production starts

Week 8, May 24-30

- Began moving PICO property out of building 436
- Falconers arrive
- Northern magnetometer traverse completed
- Winter/over pallet line relocated
- Prime mover from Herman Nelson rebuilt
- Snow removal continues

Week 9, May 31 - June 6

- Began making CONUS retrograde pax reservations
- GRIP FOMs arrive to open GOC Sonde
- 316 km Eastern magnetometer traverse completed
- 92 winter/over cargo area cleaned up and groomed
- 93 cargo line culled for retrograde items
- Palletizing retrograde cargo at GISP2 continues
- 2500m depth, 5/31
- 2600m depth, 6/3

Week 10, June 7-13

- Charter arrives with nBA
- Palletized 115,000 lbs of cargo
- GRIP camp activated
- Clauer traverses completed
- Flight line groomed and damaged flagging replaced
- 2700m depth, 6/7
- 2800m depth, 6/10

Week 11, June 14-20

- DV and bidder visit to summit camp
- GRIP put-in

- NASA put-in
- Retrograde ice cores from GISP2
- Retrograde DYE2 staff and Spryte
- 23 pallets completed for FP3 retrograde from GISP2
- Replacement compressor installed
- 2900m depth, 6/15

Week 12, June 21-27

- Repair Spryte
- Repair, dry and restock retrograde from GISP2
- Gas bottles inventory completed at GISP2
- Snow removal completed around structures
- 3000m depth, 6/22
- 1st silty ice encountered at 3040.63 meters, 6/23

Week 13, June 28 - July 4

- Completed filling 17 pallets of winter over fuels at GFC
- Extension to winter/over berm completed
- Major undercarriage repairs to the Tucker Sno-Cat
- Bedrock encountered, 6/29
- Log borehole, 6/30
- 1st rock core, 7/1

Week 14, July 5-11

- Redeploy DYE2 staff and Spryte
- Retrograde drill string
- Retrograde ice cores
- Flight period preparations
- Vehicle berm completed
- Camp inventory underway
- GRIP lab van delivered to GISP
- Rock coring complete after 1.55m rock core recovery, 7/7
- Log borehole

Week 15, July 12-18

- Continued preparing CONUS retrograde cargo
- Finalize pallets at GFC for flight period #5
- ATM relocated to 10k from GISP camp
- Winter/over cargo line completed
- Main freezer closed for season
- Camp inventory complete

- Structures began being dismantled
- Electrical lines disconnected where applicable

Week 16, July 19-25

- GOC Sonde closed 23 July
- Retrograde ice cores
- GISP2 phase-down complete

Week 17, July 26 - August 1

- GISP2 pull-out, July 26
- DYE2 pull-out, July 28
- Retrograde charter; drill string and science ice and cargo

Week 18, August 1-9

- Denver charter arrives; ice retrograde
- End of season inventory at GFC
- Close Greenland Field Center