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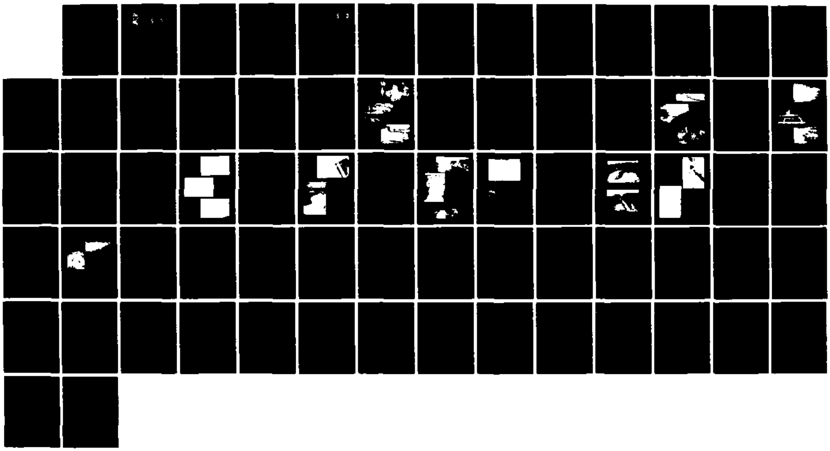

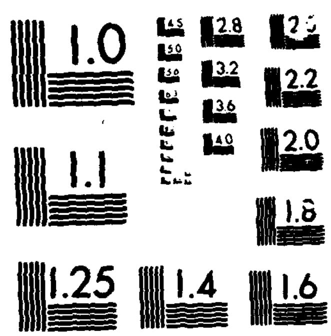

MICROCOP CHART

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PMRF BARKING SANDS
CABLE INSPECTION 1983

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FPO-1-83(39)
OCTOBER 1983

PREPARED BY

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FOR

OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE
CHESAPEAKE DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
WASHINGTON, D. C. 20374

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The Pacific Missile Range Facility comprises two underwater ranges and an additional underwater detection system. In all, there are some five sets, totalling eleven underwater cables that come ashore on the Facility property along the west coast of Kauai. The near shore portions of these cables (Con't)

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are subjected to severe environmental conditions and therefore require frequent inspection, maintenance, repair, and replacement. The Chesapeake Division, Naval Facilities Engineering Command has been tasked to perform much of the work involved in the upkeep of these near shore cables.

The project reported herein involved the inspection of all five sets of cables, determining whether any of the cable had moved or suffered damage as a result of environmental forces, and stabilizing or protecting those cables as necessary to mitigate future movement and deterioration.

Initially intended as a one month project, the final effort extended almost three months, 2 April to 23 June 1983; however, personnel from Underwater Construction Team Two, who performed the majority of the underwater construction work were off site for three weeks during May 1983 on other assignments.

The basic survey and inspection activities were carried out on schedule insofar as the near shore cables beyond the surf zone were concerned. Additionally, split pipe protection systems and stabilization clamps were repaired or replaced as necessary. Within the surf zone, however, all work was subject to the agaries of wave action and the littoral transport of sand which alternately covered and uncovered the inshore cables. Maintenance and repair work could be accomplished only during periods when the surf zone was tolerable and the cables were uncovered.

It became obvious during the inspection that immediate action was required to extend the encasement of one set of cables through the zone of breaking surf to prevent further deterioration. These were the Barking Sands Underwater Range Expansion (BSURE) North and South cables. Previous attempts to pour concrete over these cable areas had failed so it was proposed that they be covered with 8- by 15-foot concrete slabs. The project work was expanded to involve designing, building forms, and pouring five of these slabs.

Three slabs were installed over the North BSURE cable and two over the South BSURE cable. The total additional effort included securing the slabs to the beach rock with epoxied rock bolts and pumping concrete into the void spaces between the slabs and the bottom. This encasement of the BSURE cables through the surf zone is considered a major accomplishment of the 1983 Inspection Project since it appears to provide a successful solution to a problem of long standing.

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FPO-1-83(39)
OCTOBER 1983

LCDR T. K. PYLES, OFFICER-IN-CHARGE, UNDERWATER CONSTRUCTION TEAM TWO

CDR H. S. STEVENSON, HEAD, OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE

OCEAN ENGINEERING AND CONSTRUCTION PROJECT OFFICE
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EXECUTIVE SUMMARY

The Pacific Missile Range Facility comprises two underwater ranges and an additional underwater detection system. In all, there are some five sets, totalling eleven underwater cables that come ashore on the Facility property along the west coast of Kauai. The near shore portions of these cables are subjected to severe environmental conditions and therefore require frequent inspection, maintenance, repair, and replacement. The Chesapeake Division, Naval Facilities Engineering Command has been tasked to perform much of the work involved in the upkeep of these near shore cables.

The project reported herein involved the inspection of all five sets of cables, determining whether any of the cables had moved or suffered damage as a result of environmental forces, and stabilizing or protecting those cables as necessary to mitigate future movement and deterioration.

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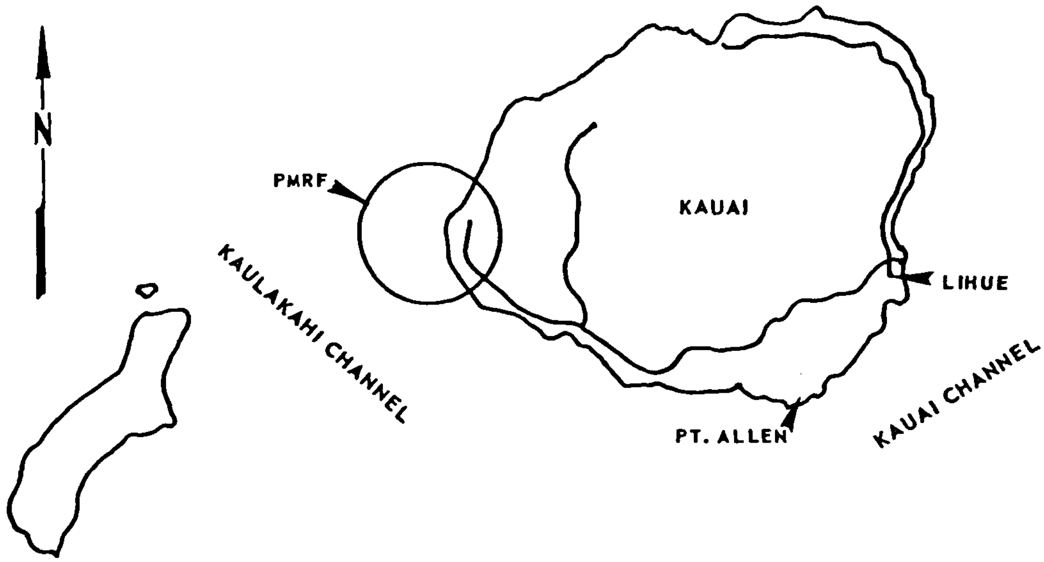
1.0 OVERVIEW

The Pacific Missile Range Facility (PMRF) is located on the western side of the island of Kauai in Hawaii, Figure 1-1.



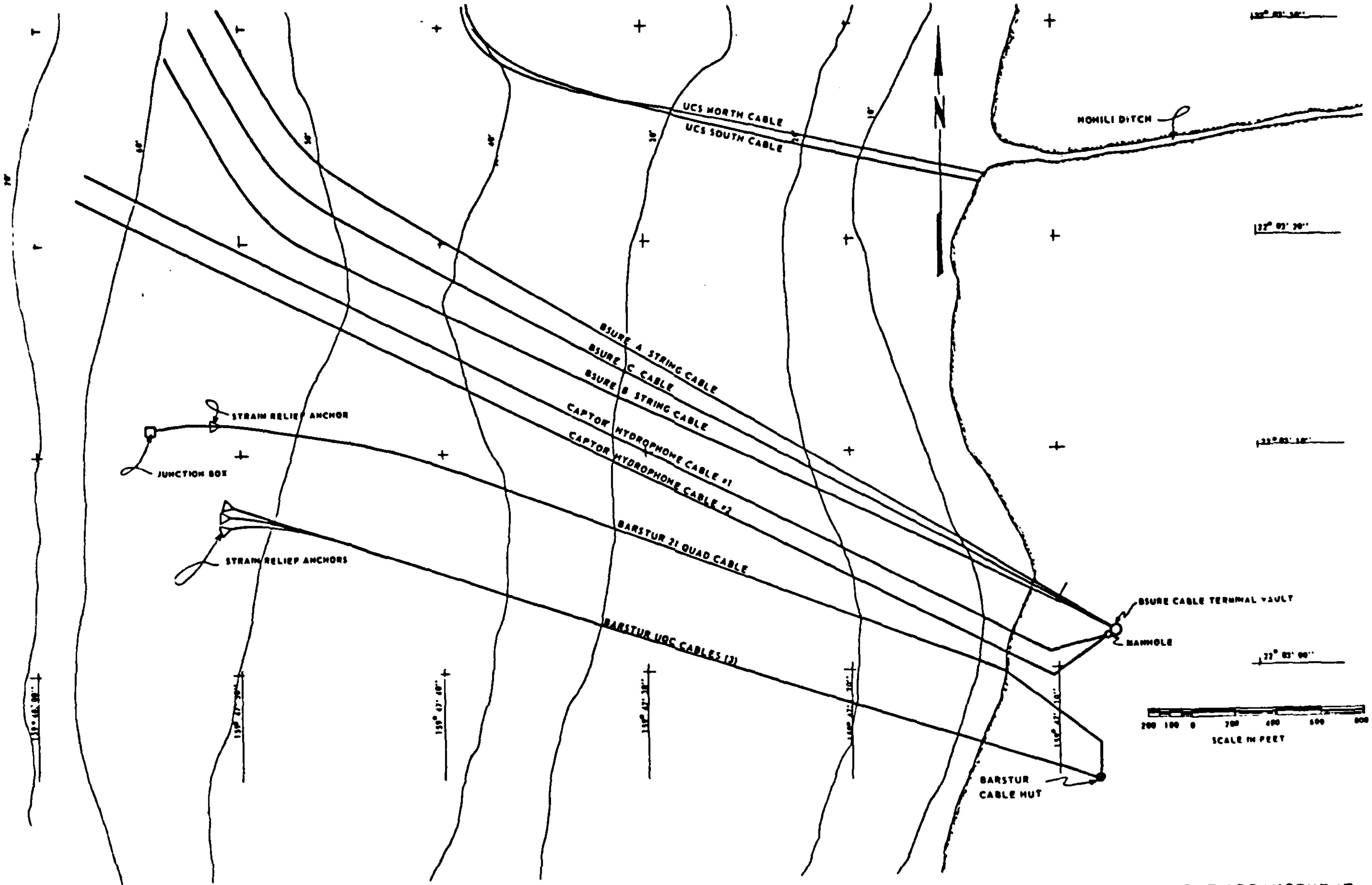
PACIFIC MISSILE RANGE FACILITY LOCATION

FIGURE 1-1

The facility has two underwater ranges, the Barking Sands Tactical Underwater Range (BARSTUR) and the Barking Sands Underwater Range and Expansion (BSURE). Both ranges have two sets of hydrophones, connected to the range operations building via undersea cables. These cables are landed along a half-mile stretch of beach near the north end of the aircraft runway. The location of these four sets of cables, the BARSTUR UQC and 21-QUAD, and the UCS and BSURE cables of the BSURE range are shown on Figure 1-2. A fifth set of cables, the CAPTOR cables, also land in this area. These cables are not directly involved with PMRF, but are used by the Naval Sea Systems Command (NAVSEA) for testing particular pieces of equipment; the landing point for these cables is also shown in Figure 1-2.

ENVIRONMENTAL CONDITIONS

All underwater cables that are not fully protected require periodic maintenance and inspection in the near shore area. The cables landed at the PMRF site require particular attention for several reasons. The most



PMRF INSHORE CABLE ARRANGEMENT

FIGURE 1-2

important of these are (1) the lack of protection during heavy storms, (2) the hard rock bottom which affords the cables no protection from the environment (as opposed to a very sandy bottom which would allow the cables to bury themselves), and (3) the constant movement of fine sand by the surf which causes severe abrasion damage to cables directly on the beach.

As a matter of history, an extremely severe storm, hurricane Iwa, struck the PMRF area in late November of 1982, approximately four months before the beginning of this inspection. In addition, extremely high winter surf conditions (a ten year storm) prevailed during January and February of 1983.

PROJECT ASSIGNMENT AND TASKING

Naval Air System Command (NAVAIR) AIRTASK A6306303-2084-347CF0512C tasked the Chesapeake Division, Naval Facilities Engineering Command to be responsible for the maintenance and repair of the near shore portion of the underwater cables at PMRF. CHESNAVFACENGCOM message 222101Z DEC 82 requested funding and authorization for an inspection of all cables and the landing of two new near shore portions of the UQC cables during the summer of 1983. NAVAIR responded in 120142Z JAN 83 that funds were unavailable in FY 83 for the landing of the cables but that the inspection was funded.

Funds and authorization for the inspection and maintenance of the CAPTOR cables were requested separately as these cables were the responsibility of NAVSEA. This was done in a 21 January phone conversation between LCDR Seltzer of CHESNAVFACENGCOM and CAPT Notting of NAVSEA.

The assistance of Underwater Construction Team Two (UCT-TWO) was requested in CHESNAVFACENGCOM 051213Z AUG 82.

INITIAL PROJECT PLANNING

The original plan for the project was to inspect all five sets of cables out to 3000 feet from shore for signs of movement and abrasion. As time permitted, after identification and documentation of these areas, repairs would be made. These repairs would consist of replacement or addition of split pipe protection and cable clamp stabilization. Repairs which were too extensive to complete during one month would be programmed later.

In addition, two sets of cables were to have concrete protection placed over them at the sea/shore interface. Both of these sets of cables, the BSURE and CAPTOR sets lay in trenches cut into the beach rock. The BSURE trench was about two feet deep and the CAPTOR trench was slightly deeper, about three feet. These trenches were perpendicular to the shore line and were filled with concrete up to the point where the waves broke on the beach. Offshore of this point, the cable lay exposed in the trench, protected only by split pipe. The BSURE cables both had an additional mass of concrete surrounding them, about 30 to 40 feet from the surf line. These two globs of concrete were about 10 feet in length and were formed by merely dropping bucket loads of concrete over the cables without use of a form.

The planned additional concrete protection on the BSURE cables would consist of filling the trenches between the concrete mass and the existing concrete in the trench. The CAPTOR cables would have their existing concrete overlay extended 40 feet. In both cases, the concrete would be held in place within the trenches by 40-foot SeaForms nylon bags to retain the concrete during its curing period.

During the construction and inspection activities, it was planned to sight-in points along each cable to check previous surveys and to determine whether there had been any cable movement along the bottom.

REPORT ORGANIZATION

In Section 2.0, the construction activities including inspection and survey as well as the physical efforts involved in cable clamping, split pipe replacement, and other cable protection activities are reported in narrative form. This is supported by a daily log of activities given in Appendix A. Section 3.0 gives the results of the cable inspection and Section 4.0 discusses the survey results and compares these data with earlier surveys of the Barking Sands cable installations. In Section 5.0, there are given a number of the lessons that have been learned in the process of executing this project. Finally, in Section 6.0, there are acknowledged the efforts of those who participated in this project. Messages documenting authorizations and construction activities are included in Appendix B. Data on the cementing system used to secure various elements to the bottom are contained in Appendix C.

2.0 CONSTRUCTION ACTIVITIES

An advance party from UCT-TWO arrived on site at PMRF on 28 March 1983 to receive material and equipment. The main body arrived on 2 April bringing the total personnel to twelve; SWCS Bradshaw was the CPOIC. The CHESNAVFACENGCOM representative, LT Carter, arrived on Sunday, 3 April.

The first two days were spent setting up equipment, unpacking, and taking care of administrative and supply functions. On the 6th, the sand continued to cover both the CAPTOR and BSURE cables, so the inspection portion of the project was initiated.

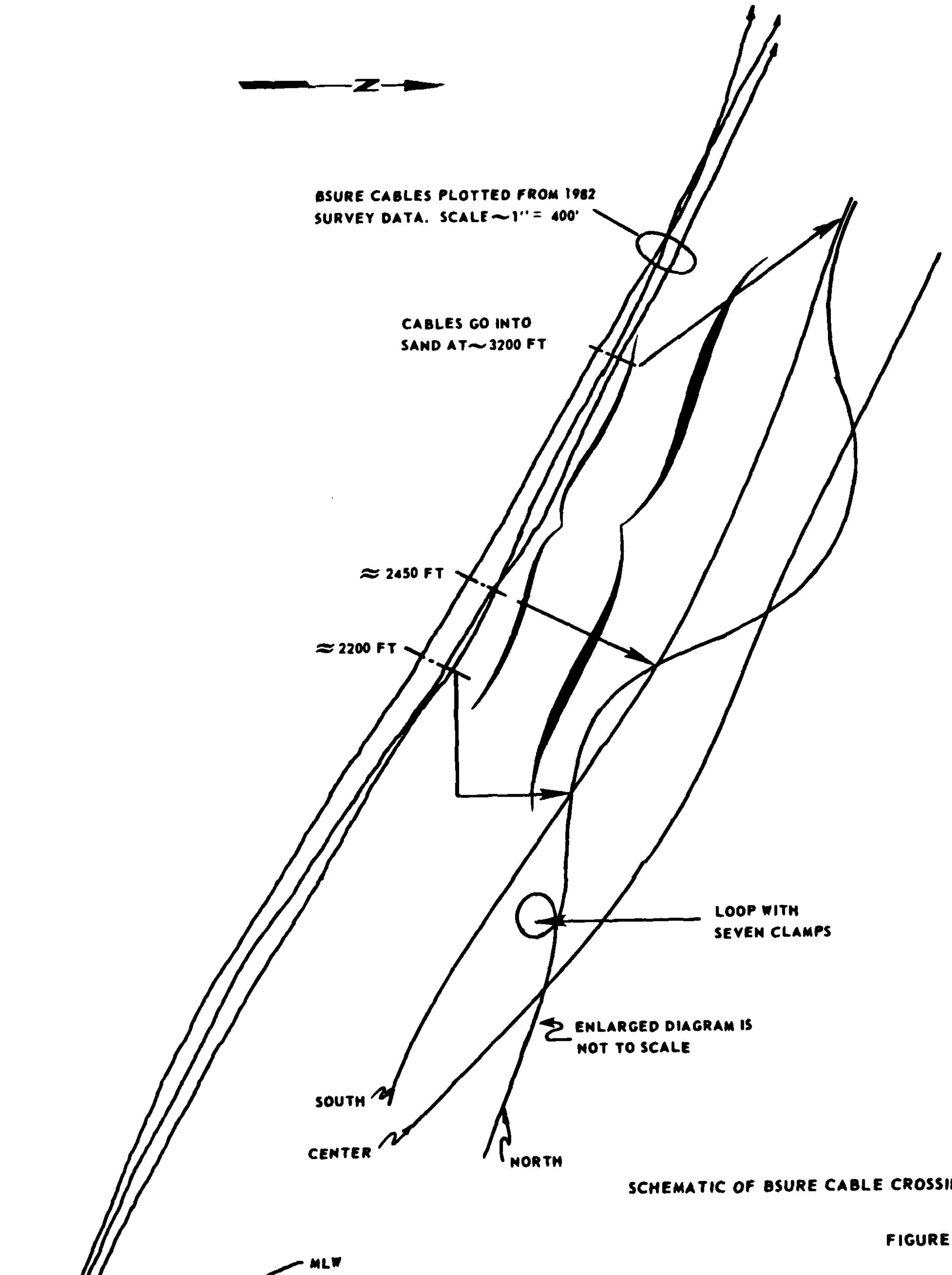
INSPECTION AND SURVEY

All dives during this project were made from either the Team's LARC XV or an inflatable Zodiac; SCUBA gear was used. The LARC normally was used to travel through the surf with the Zodiac launched at a distance from the beach.

The inspection was begun with the BSURE cables, which were the most difficult to inspect. This was because they crossed over themselves several times. These crossings were not displayed on the plotted cable paths available at the time and caused some confusion. It was not certain whether crossings were not displayed because the cables had moved since the last survey or because the last survey was inaccurate. There was a considerable amount of slack in the cable; this would have permitted the cable to move without breaking loose any clamps. After completing the entire survey, it was noted that the crossings constituted the only difference from prior survey results. It was therefore concluded that the cable had actually moved in the interim. The additional clamping done during this project should preclude any future movement. A schematic of the BSURE cable crossings is shown in Figure 2-1.

The inspection technique consisted of divers swimming the cable from close inshore, noting any broken clamps, evidence of movement, or particular points of interest. Peanut or pumpkin floats were used to mark these locations. Shortly after surfacing, each set of divers wrote out a narrative of the condition of the cable and was debriefed by the CHESNAVFACENGCOM representative.

The use of the floats not only allowed the divers later to return



SCHEMATIC OF BSURE CABLE CROSSINGS

FIGURE 2-1

easily to a particular point for installation of a clamp but gave the shore party a visible surface point to sight in on. The shore party then used these points, the existing survey base line, and two transits to triangulate and determine the location of the cables on the sea floor.

COMBINED INSPECTION AND CABLE STABILIZATION

After the inspection of the BSURE cables, with the sand still covering the BSURE and CAPTOR cables along the beach, UCT-TWO proceeded to inspect the CAPTOR cables. Also, since several broken clamps and points which needed stabilization were found on the BSURE cables, the Team began simultaneously to drill the holes to allow for the placement of new clamps. This was done with the inspection team diving from the inflatable Zodiac while the LARC XV was employed by the drilling team as a platform for their hydraulic drill and as a power source. After both CAPTOR cables were completed in this manner, with the stabilization crew following the inspection crew, the Team began work on the 21-QUAD BARSTUR cable.

PREPARATION FOR SHORE CABLE ENCASEMENT EXTENSIONS

On 7 April, a meeting was held at the Hale Kauai batch plant to discuss the purchase of concrete. It was determined that the Hale Kauai concrete pump truck would not be available on short notice (less than 7 days) although a small amount of concrete (less than 8 cubic yards) would probably be available on a 24 hour notice. A small two-inch concrete pump was requested from PWC Pearl Harbor. Thanks to a fast reaction by Warrant Officer Weeks, of PWC Production Control, the pump arrived, ready for use, on 15 April.

On 16 April, the beach sand moved away from the north BSURE cable for a second time, having also cleared away on 11 April. Since the concrete pump was now on site, preparations were begun to try and place concrete protection around the BSURE cables.

After an examination of the exposed cable and split pipe by SWCS Bradshaw and LT Carter, it was determined that the SeaForms bag system would be much more difficult to use to retain the poured concrete than thought originally. The sand had been removed from the BSURE cables by relatively strong surf action. This same strong surf would make the wrapping of the large SeaForms bags around the cable almost impossible. After wrapping, rebar tie-downs would still have to be driven through it and the bag then zipped up. It was decided instead to cover the entire trench with 12-foot by 8-foot steel plates weighted down with 6000 pound anchors and, after blocking off the seaward end with sand bags, pump the entire trench full of concrete.

Preparations were made on 15 April to place concrete in this manner the following day. The entire operation ended in frustration as the sand returned to cover the cables the next morning. As it now appeared, there was a chance that no concrete protection could be placed on the cables; it was therefore decided to replace the highly deteriorated split pipe at every available opportunity. Although the surf remained strong, making work difficult, two new pieces, or one section of split pipe were installed on the 16th.

From the 17th until the 27th of April, the BSURE cables remained covered. UCT-TWO utilized this period to complete inspection of the remaining section of the UQC and UCS cables and the 21-QUAD junction box. By this time, the epoxy had hardened on the threaded rods that were cemented into the bottom to keep cable clamps in place. This allowed the Team to tighten down the clamp nuts. During this period they also photographed all cables to provide the illustrations given later in this report.

On 27 April, the sand shifted away from the north BSURE cables and once again the Team could begin installing new split pipe on the north BSURE, under the direction of LCDR Pyles, the Team OIC, who had arrived on 23 April. This resulted in the placement of two new sections of pipe, Figure 2-2. By chance, concrete could be provided that day, so, on short notice, preparations began once again to place a lid on the trench and to pump it full of concrete to take advantage of the sand conditions. During this attempt, excess aluminum cargo pallets were used. These were weighted by 5000-pound ships' anchors attached by cargo nets, Figure 2-3.

This operation was also unsuccessful. The pallets and anchors were readied and lowered into position using a PMRF crane. But the surf proved so strong that it actually caused the pallet to move across the beach rock even when weighted down. The operation was halted and the anchor and pallet recovered.

At this point, it was decided to go ahead with an alternate plan which had first been discussed on 25 April. The problem was that any surf which was strong enough to move the heavy anchors was strong enough to preclude wrapping the long SeaForms sack around the cable. There would also be a problem of the surf segregating the concrete once the concrete was poured into the SeaForms.

UCT-TWO PERSONNEL
PRY UP CABLE TO INSTALL
A NEW SECTION OF
PROTECTIVE SPLIT PIPE

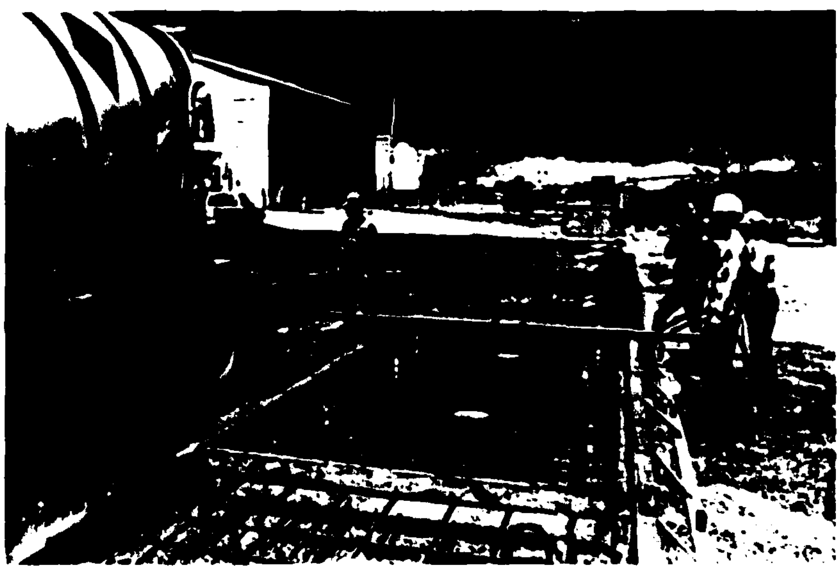
FIGURE 2-2

PALLET WITH 5000#
ANCHOR ATTACHED WITH
CARGO NET LOWERED
OVER BSURE TRENCH.
OPERATION HALTED WHEN
SURF MOVED PALLET
AND ANCHOR.

FIGURE 2-3

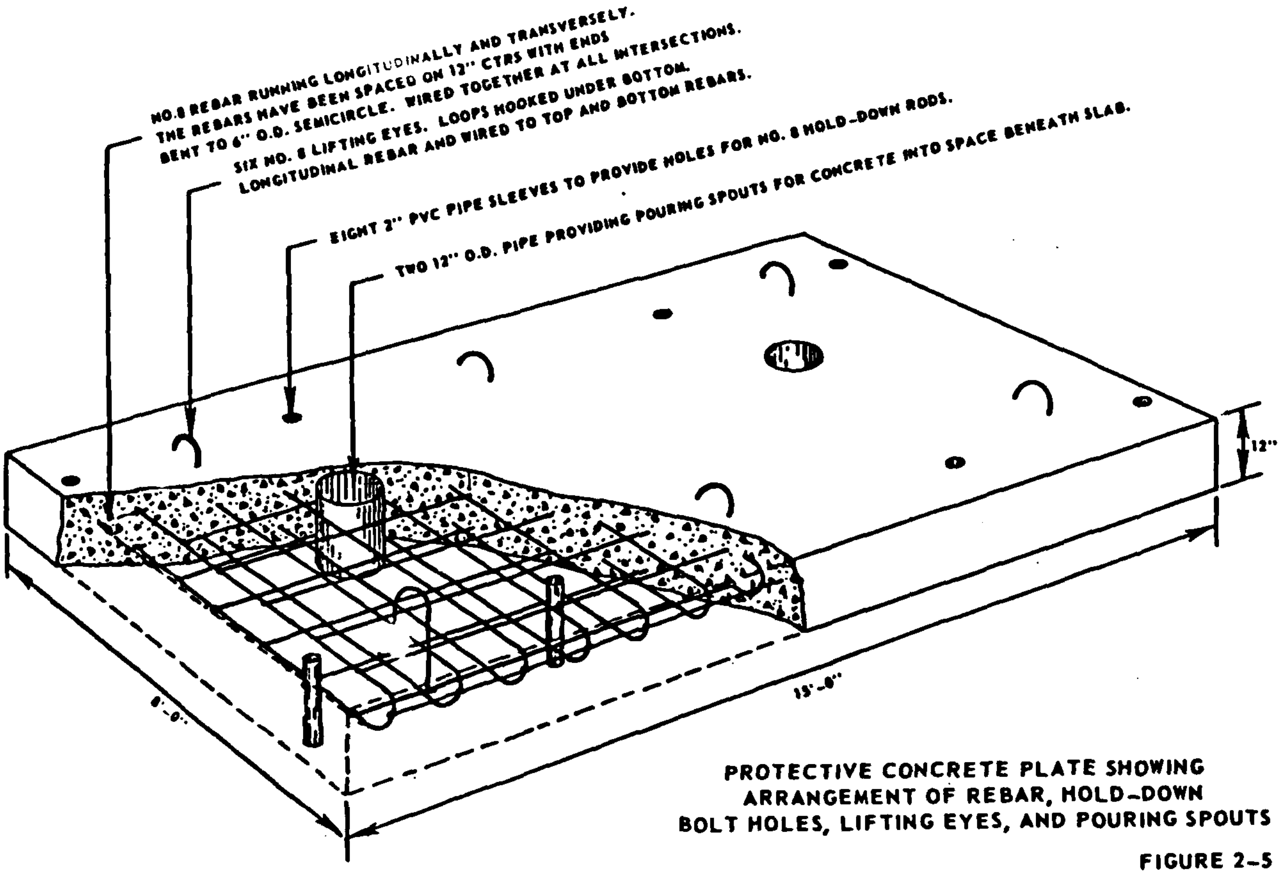
PREPARING TO POUR
CONCRETE IN FORMS FOR
PROTECTIVE SLABS. REBAR
CAGES IN PLACE IN FORMS.

FIGURE 2-4



The new plan was to precast 15' x 8' x 1' concrete plates which would be placed over the cable trench. The plates would be held in place by their own 10-ton weight and by 8 steel rods drilled into the beach rock and epoxied to both the beach rock and the plate.

From 27 April until 7 May, the material for the plates was ordered and the plates poured. A 60-ton mobile crane was rented from R-Electric Co. for the period of 23-27 May. The rebar layout for the plates as built is shown in Figure 2-4 and 2-5.



PROTECTIVE CONCRETE PLATE SHOWING ARRANGEMENT OF REBAR, HOLD-DOWN BOLT HOLES, LIFTING EYES, AND POURING SPOUTS

FIGURE 2-5

Each plate had eight 2-inch PVC pipe sleeves running vertically through the plate. These sleeves formed precast holes to hold the steel rods and also to act as guides for the drilling of holes into the beach rock. In each slab there also were two 12-inch diameter steel sleeves. These sleeves formed openings through which to pour concrete into the void spaces beneath the slabs. As the slabs were centered over the cable trenches, the concrete poured through these holes would fill the trench for added erosion protection. Rough gravel was cast in the bottom of the slabs to maximize the friction between the slab and the beach rock.

A major advantage of this plan was that it could be put into operation no matter what the sand level was. Should the sand be very deep, the slabs could be placed on top of the sand over their final position. The eight vertical steel rods would then be put into place in the rock through the sand. Water would then be pumped through the 12-inch steel sleeves and would wash away the sand below the slabs. The slabs, meanwhile, would settle into place guided by the steel rods.

During this period, the final pieces of worn and missing split pipe were replaced on the BSURE north and south cables. On the southern cable only the two three-foot sections near the beach were replaced, all others were intact. On the northern cable, starting with the second section from the beach concrete protection, the next 10 sections of pipe were replaced.

INTERIM ACTIVITIES

On 8 May, the Team departed Barking Sands for other projects for two weeks allowing the concrete time to cure. During this two-week period, the BSURE cables were again covered with sand near the beach, but the CAPTOR cables became clear of sand. The split pipe protecting the CAPTOR cables was all still intact, although several bolts were missing and the half-sections were separating. These missing bolts were replaced and all bolts tightened to bring the pipe half-sections together. This was done by the CHESNAVFACENGCOM and PMTC representatives.

INSTALLATION OF BSURE SURF ZONE PROTECTION SYSTEM

On 20 May, the Team returned with a ten man detachment to install protective concrete plates and on the same day the rented crane arrived. On 23 and 24 May, a hole was cut through the berm bordering the beach to allow the crane access to the BSURE cable landing site. The surface of the berm cut was hardened with waste asphalt from a runway repair project. During this same period, the rented crane had extra boom lengths added to bring its total reach to 80 feet. The concrete plates were then moved to the cable landing site.

On 25 May, the slabs were put into position, Figure 2-6. As the weight of one slab was more than the crane could lift at full outreach, the slabs were put in place by lifting them by the 4 corner lifting eyes onto the beach rock about 30 feet from the crane. Then the crane boom was lowered to increase the lifting radius and the rear lifting eyes were released. Then by retracting the crane hook, the slab could be dragged out farther, with

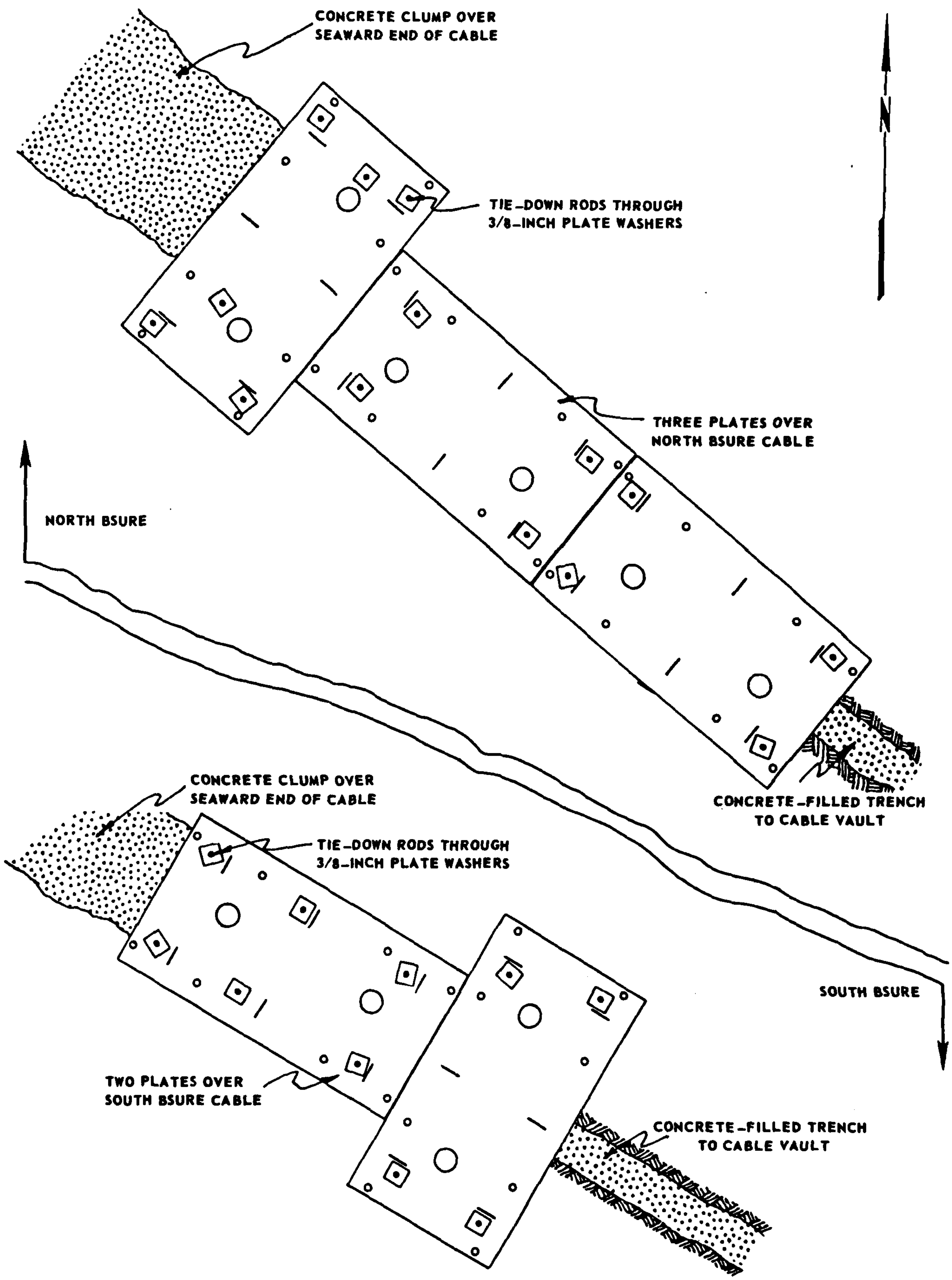


PLATE LOCATIONS OVER NORTH AND SOUTH BSURE CABLES

FIGURE 2-6

half of its weight supported by the beach rock. By pulling back and forth, right and left, while shifting the lifting point from eye to eye, the slabs were walked into place, Figure 2-7.

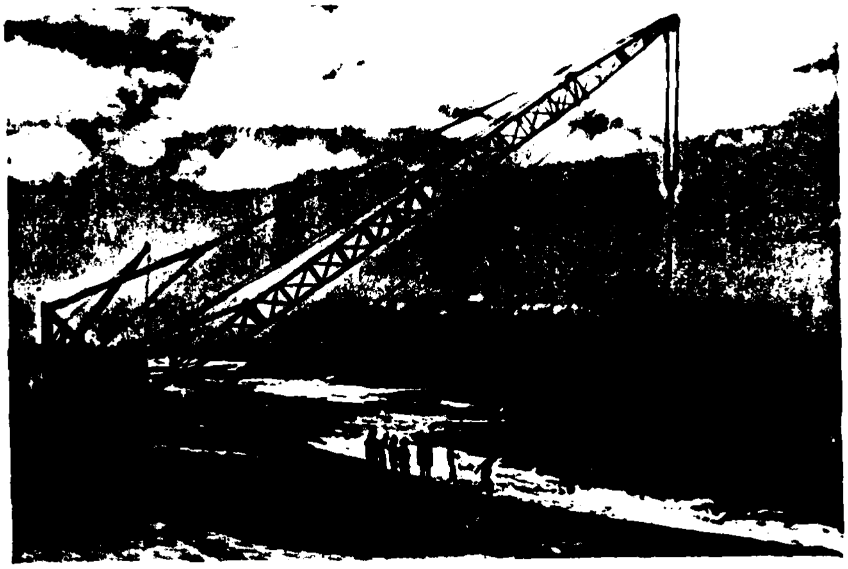
After each slab was in its correct position, a pneumatic drill was used to bore holes about one foot into the beach rock, using the eight pre-positioned PVC sleeves as guides. A two-foot piece of #8 rebar was then dropped into this hole so that it had one foot of its length in the rock and the other foot within the PVC sleeve. These pieces of rebar in each of the eight sleeves per slab then prevented the slab from sliding across the rock. When attempts were made to put epoxy into these holes also, the wave action washed the epoxy out before it could set up.

All five slabs were setting reasonably flat against the beach rock bottom except for the seawardmost slab on the northern cable (see Figure 2-8). This slab was approximately twelve inches off the bottom of the seaward edge due to the fact that the existing concrete mass was not level with the bottom. The center of the edge of the slab was resting on the top of the concrete which was about twelve inches off the bottom.

The following day, the edges of the slabs were sealed as far as possible with burlap cloth and SeaForms filled with concrete, Figure 2-9. These were held in place by rebar sections drilled into the beach rock. Then concrete was pumped through the large holes in the slabs into the trench below. Aggregate no bigger than 1/4" could be used because of the two-inch pipe size of the available concrete pump. After the section of trench below each hole was filled with concrete, the hole was covered with a plywood patch held in place with a hook formed of threaded rod.

A check on the holes the following day showed that the concrete had remained in all but the most shoreward hole of the northern set of plates. Attempts were made to fill this gap with quick-setting cement, but these attempts failed. During later days of calm surf, eopxy was poured in the holes to fill the open spaces. The epoxy stayed in place but the process was too slow and was finally abandoned. As the gap was small and would allow little or no erosion of the cable, it was left unfilled.

Attempts to remove the rebar which held the concrete-filled SeaForms patch also failed; the rebar was bent over the slab to provide additional deterent to movement. It is intended to cut these off in 1984 when the proper cutting equipment is on site.

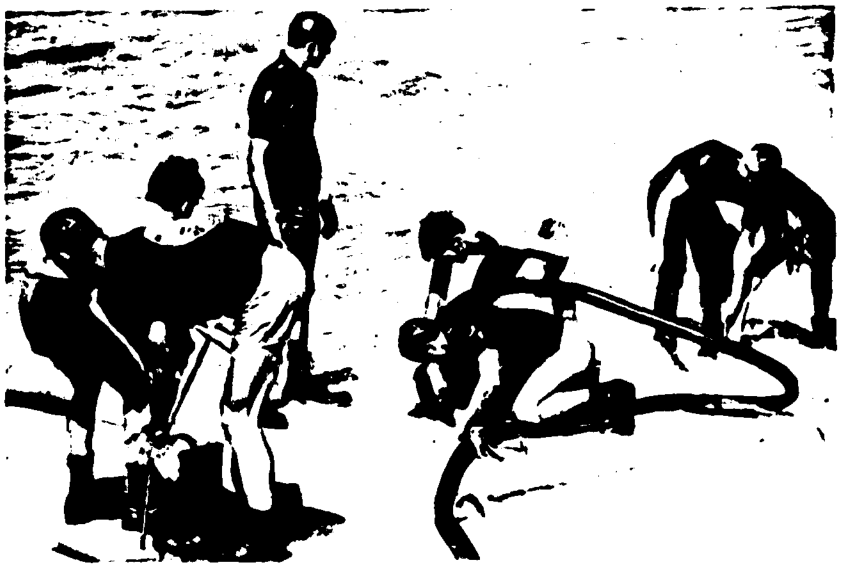


R-ELECTRIC CRANE RELEASES SLAB AFTER IT HAS BEEN PULLED *INTO POSITION* BY TAG-LINE CREWS.

FIGURE 2-7

INSPECTION OF THREE SLABS PROTECTING NORTH BSURE.

FIGURE 2-8



PUMPING CONCRETE THROUGH PORTS IN SLABS TO FILL TRENCHES UNDERNEATH

FIGURE 2-9

CONCERN WITH THE SECURITY OF THE INSTALLATION

As the epoxy had not stayed in place around the steel rods, as described earlier, no forces other than the plate weights were holding the plates down to the beach. There was concern that in severe storm conditions, waves could pick the plates up and move them. Review by the Engineering Analysis Division of CHESNAVFACENGCOM, FPO-1 confirmed this potential deficiency.

The Underwater Construction Team was firmly committed to other projects and their remaining time on site would not allow them to install any type of hold-down system. As a result, a contract was made with California Drilling, a firm which had a track drill on the island, to perform the work with the assistance of the CHESNAVFACENGCOM representative.

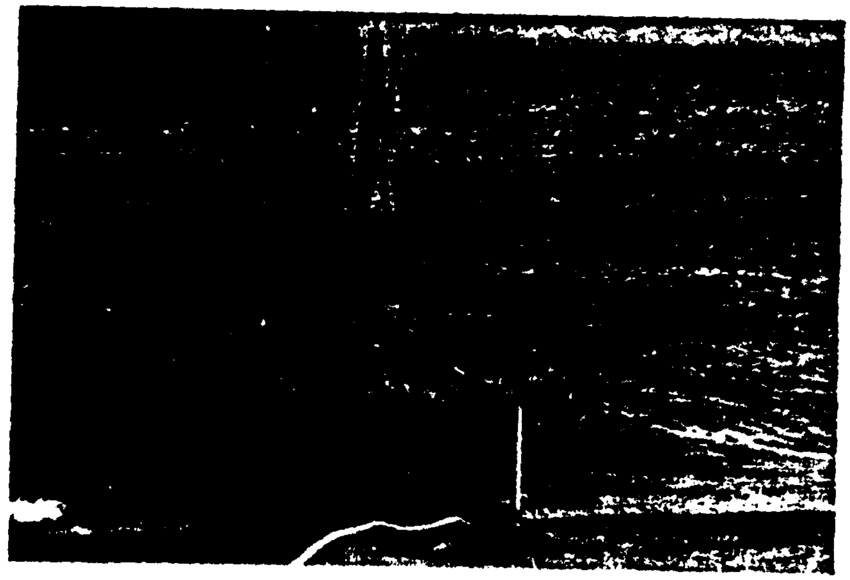
The proposed method of attachment was to hold the plates down with 5-feet long, #10 rebars grouted into the rock to form studs. The top foot of this bar was threaded to hold two nuts used to actually hold down the slabs. The construction method consisted of using the track-mounted drill, Figure 2-10, to drill a two-inch hole through the slab extending approximately 3 feet into the rock. The total depth would be a little more than 4 feet, taking into account a 6-inch gap between the slab and the beach rock plus the slab thickness. After the drilling, five epoxy cartridges were dropped into the hole. These cartridges, Figure 2-11, are described in Appendix C. They were made of thin plastic which contained a two-part epoxy separated by a plastic sheet.

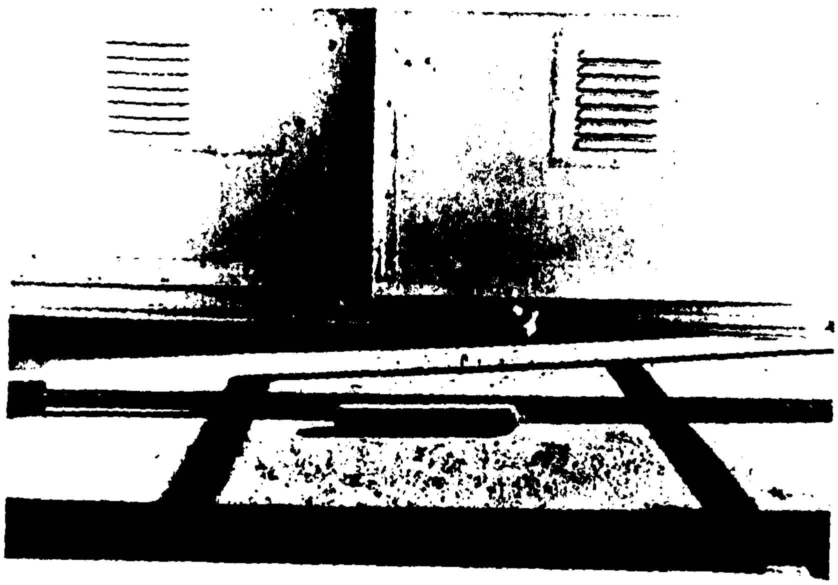
After the cartridges had been dropped in the hole, a 12-inch square, 3/8-inch steel plate with a 2-inch center hole was then placed over the hole. The driller then removed his drill bit from his rig and clamped in its place the five-foot #10 bar with two nuts started on the threaded section. The driller then drove the bar down through the hole in the plate, into the hole containing the cartridges, spinning the bar as it went in. This served to break up all the cartridges and mix the epoxy at the same time. The bar was spun for about 40 seconds to thoroughly mix the epoxy. After five minutes, the epoxy was assumed to be at full strength and the two nuts, which had been loosely threaded, were tightened, Figure 2-12.

The drill contractor arrived along with the epoxy cartridges on 18 June. The work was started on the four rods on the shoreward plate on the south cable. During this effort two problems were noted. The first

TRACK-MOUNTED AIR DRILL USED TO DRILL HOLES THROUGH SLABS AND BEACH ROCK FOR TIE-DOWN ROD PLACEMENT

FIGURE 2-10





THREADED NO. 10 REBAR SECTION FOR SECURING SLABS TO BEACH ROCK. CELTITE EPOXY PLASTIC CARTRIDGE USED TO CEMENT BAR TO ROCK.

FIGURE 2-11

TWO SLABS PROTECTING SOUTH BSURE CABLE

FIGURE 2-12

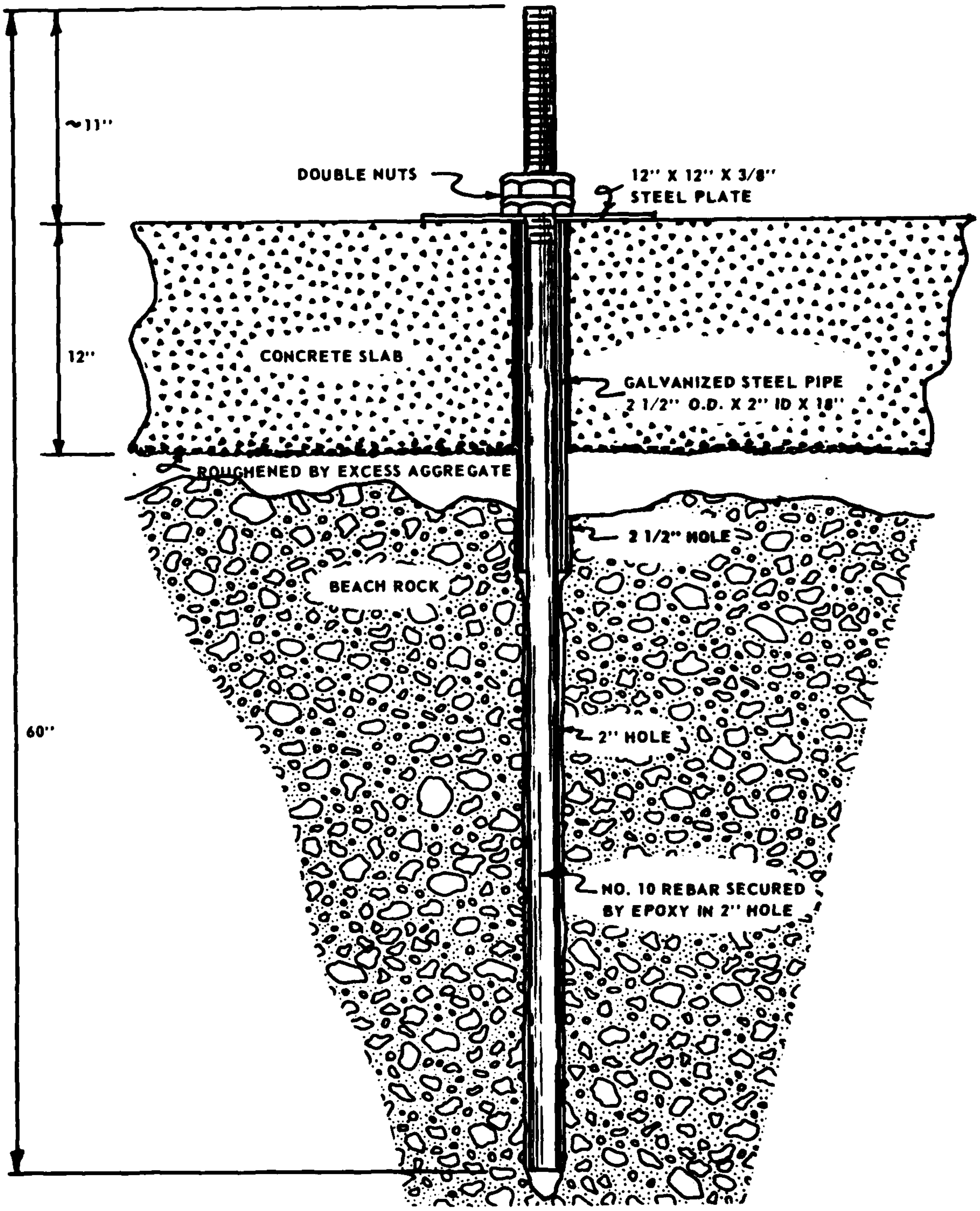
problem was that after drilling the 2-inch hole, sand washed in with the next wave and slid into the gap between the slab and beach rock, filling the hole that had just been drilled. The driller could not insert the cartridges or bar fast enough to prevent the hole filling up. This problem was solved by first drilling a 2.5-inch hole through the slab and about 3 inches into the beach rock. A 14-inch piece of 2-inch galvanized steel pipe was immediately inserted in this enlarged hole. This acted as a sleeve and filled the gap between the slab and rock, stopping the sand intrusion.

The sketch, Figure 2-13, illustrates this technique of preventing washout of the epoxy and shows the finished hold-down bolting system.

The second problem was that of the water from a wave shooting up the hole in the slab, and slapping the bottom of the steel plate. It was felt that this constant wave action under the plate would erode a hole through it. This splashing was stopped by filling the space around the rod in the hole with quick-setting cement. Because this had to be done after the rod and plate were in place, the nuts had to be removed. In some cases, this was not possible due to damage to the thread during installation. Eleven of the 24 rods installed had the cement placed in the hole.

It was calculated that the maximum upward force that a wave could apply to the bottom of a slab would be on the order of nine short tons. The slab weight in water was roughly 5 tons so that, in the worst case, a hold-down force of 4 tons might be required of a securing bolt. The lower graph on Figure C-1 shows that a 30-inch penetration in medium strength rocks provides about 20 short tons of anchoring force. Thus, under worst-case conditions, there would be more than adequate hold-down force available with only one bolt in place. Corrosion of these bolts and plates is a more likely mode of failure.

Work began on 18 June and was completed on 23 June 1983. Four rods were placed in each plate except for the two seaward plates which had six. The work was made extremely difficult by the surf with waves at times breaking over the drill tower. On the 23rd, the surf was extremely flat with only 1- or 2-foot waves; in these excellent working conditions, three rods were installed from start to finish in a period of one hour.



PIPE SLEEVE INSERTED THROUGH SLAB INTO BEACH ROCK
TO PREVENT WASHOUT OF EPOXY DURING MIXING

FIGURE 2-13

3.0 INSPECTION RESULTS

BARSTUR UQC CABLES

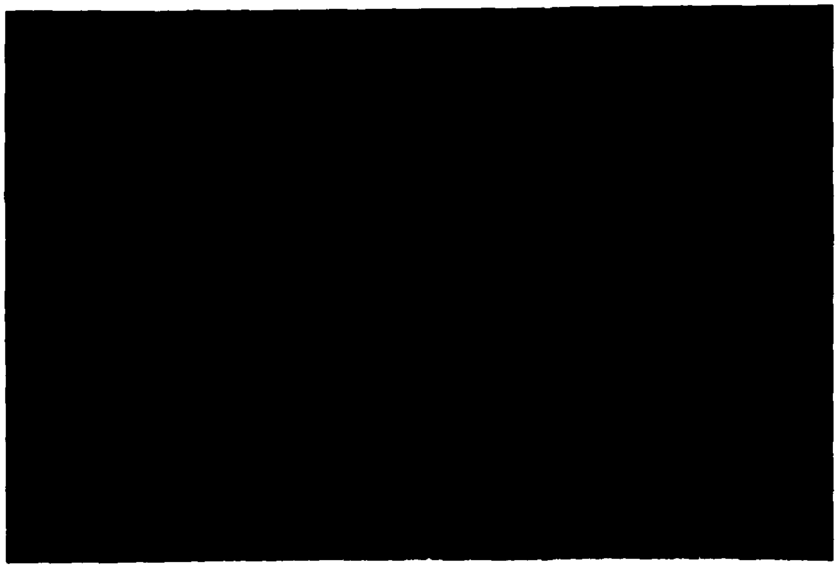
The UQC cables lie in a trench that was blasted into the sea floor; they appear to have been relatively sheltered from any ocean wave action. The trench is from 3- to 6-feet deep and extends out to the end of the inspected range, i.e., 3000 feet offshore. Any problem with the UQC cables will stem from aging, armor size,or the original laying technique employed.

As seen in Figure 3-1, the UQC cables were not laid in a straight or tight fashion. Each cable was laid with plenty of slack with numerous twists and loops over itself and the other UQC cables. Over the 15-year installed life of these cables, the stresses incurred by loops and twists have caused their light-duty D armor to flake off. This is evident in numerous places where 6- to 18-inch pieces of armor are laying on the bottom alongside the cable. No new clamps were installed on the UQC cables. Due to the protective nature of the trench, stabilization has not been a problem.

All cables were inspected out to 3000 feet from shore, or to where the water depth was approximately 50 feet. This was a visual inspection of the physical condition of the cable, its armor wire, its split pipe protection, and the stabilizing clamps. No electrical testing was done.

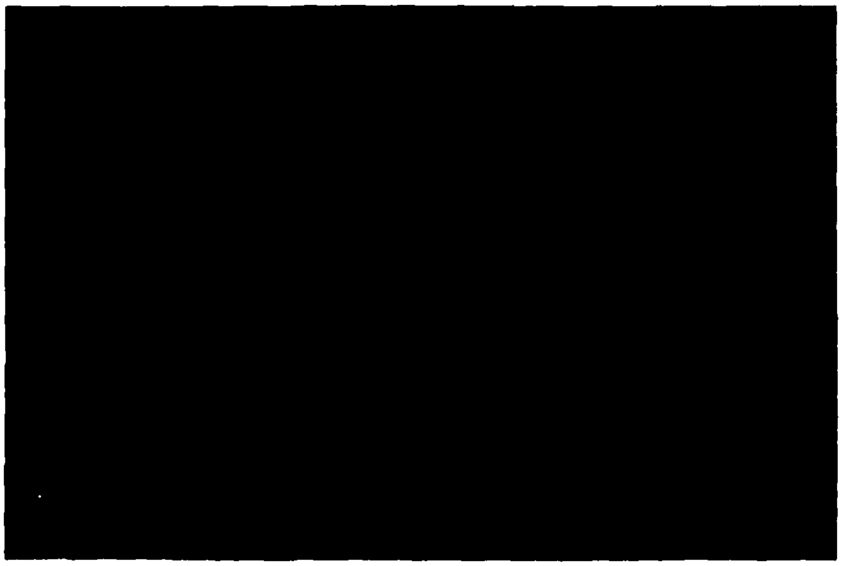
A critical section of any cable at PMRF is in the region of the sea/shore interface where the surf breaks over the cable and subjects it to sand abrasion. The southernmost UQC has already been cut through at the sea/shore interface by sand abrasion. At this point, the remaining UQCs are in good condition. The concrete groin, recently installed by Hawaiian Dredge and Construction, protects the cables from surf and sand action out to 40 feet from the shore, well outside the area of greatest abrasion and movement.

Although, as stated before, between the sea floor trench and the new concrete groin, the UQC cables are well protected, the cables are also very weak due to the continuing loss of armor wires. Considering that one cable has already parted, if the BARSTUR range is to be operational more than four years, it is strongly recommended that a new near-shore portion for



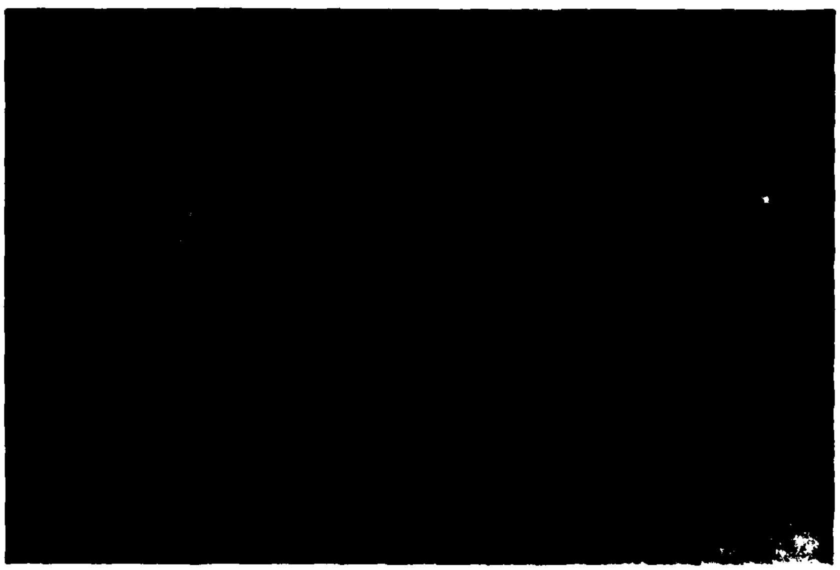
THREE UQC CABLES SHOWING LARGE AMOUNTS OF SLACK AND LOOP IN ONE CABLE.

FIGURE 3-1



BARSTUR CABLES SEAWARD OF JUNCTION BOX AFTER SPLITTING FROM 21-QUAD CABLE. NOTE TWISTS AND SLACK, AND CHAIN USED TO ANCHOR CABLES.

FIGURE 3-2



BIRDCAGING OF BARSTUR CABLES SEAWARD OF JUNCTION BOX AND BREAKDOWN IN ARMOR AT BEND IN CABLE.

FIGURE 3-3

all three cables be spliced in within the next three years. This will bring the range up to full capacity by restoring the southern cable and allow the installation of one-half mile of heavy, AA armored cable in a straight configuration.

BARSTUR 21-QUAD CABLE

Throughout the inspected portion of this cable, from the shore to 3000 feet out, it is in good condition. The concrete groin at the sea/shore interface has been extended by Hawaiian Dredge and Construction, protecting the cable well past the critical region. Areas of potential abrasion, such as where the cable was bent around coral heads, were protected by extra pieces of split pipe and/or wrapped with heavy line. Only one broken clamp was found and no signs of cable movement were seen. All split pipe was in good shape.

The problem area on this cable was in the area directly past the junction box where the larger cable is split up into 42 smaller cables. These smaller cables, as with the UQC cables, were put in place with excess slack. The lightly armored cables are twisted and looped on top of one another. Heavy anchor chain has been laid on top of these cables to stabilize them. This has caused, in some cases, sharp bends and kinks in the cables. As on the UQC cables, at the spots where the bends and loops have created stress zones, the armor wires have begun to fray and "bird cage" as evidenced in Figures 3-2 and 3-3.

The junction box itself is in good condition. It is well stabilized by heavy anchors and chains. Measurements of the 34 anodes, which were installed in 1982, indicated a 6 1/2-inch diameter and a 7/8-inch thickness, still well within tolerance. These are visible in Figure 3-4.

Physically, the 21-QUAD is in good condition and should not require any extensive repair in the near future. The smaller cables past the junction box have now begun to deteriorate and should be inspected annually to assess their deterioration rate. Considering the depth of the water, the number of splices required, and the time required to remove the existing tangle, the repair of these cables would be a major project. Before any thought is given to undertaking such a project, consideration should be given to the expected life of other portions of the BARSTUR range system. Some work has been done on the sea/shore interface area as recently as December 1982 (Figure 3-5).

ABOVE – JUNCTION BOX ANODES SHOWING MINIMUM WEAR AFTER ONE YEAR INSTALLATION.

FIGURE 3–4

LEFT – 21–QUAD CABLE SEAWARD OF OLD GROIN. THREE NEW SPLIT PIPE SECTIONS INSTALLED IN DECEMBER 1982. LATER COVERED BY CONTRACTOR–INSTALLED ENCASEMENT EXTENSION.

FIGURE 3–5

NORTH AND SOUTH CAPTOR CABLES

Both CAPTOR cables are in good physical condition within the area covered by this survey. Only three bad clamps were found on the south cable and two on the north; neither showed any signs of movement. The sea/shore interface portions of both cables were also in good condition, with all split pipe intact and only five missing bolts which were replaced, Figure 3-6.

As stated in the project summary, an electrical fault was discovered in CAPTOR south by a representative from NSWC approximately 1.1 miles offshore, outside the range of this survey. Considering the depth of water at that point, it seems doubtful that any fault would be caused by any wave or current action on the sea floor. Figure 3-7 shows the shore end.

An obvious recommendation is the repair by splicing of the south cable in the summer of 1984. Also, although the split pipe still has at least two remaining years of life, additional effort should be put into a permanent solution to the protection of the sea/shore interface. The extension of the concrete, shown in Figure 3-8 aided in covering the potions of the interface which receive the maximum wave action, but did not cover all susceptible areas.

Should the precast concrete slab technique used on the BSURE cables prove successful, the CAPTOR cables are also candidates for this method of protection. This is because of their location within a trench, below the level of the beach rock. This protection could be installed during the period when the splice is being made.

BSURE CABLE INSPECTION

Within the 3000-foot limit of the survey, the three BSURE cables cross over each other six times. Figure 3-9 is a typical example. At approximately 2050 feet, the North BSURE has a complete loop in it, as shown in Figure 3-10. Out beyond the 3000-foot mark, the two active cables, BSURE North and BSURE South, are lying side by side, twisting over one another until both cables disappear into a sand bank.

A total of 17 new clamps were put on the two active cables. (The BSURE C cable was not repaired as it has been cut at the sea/shore interface.)

FIGURE 3-6

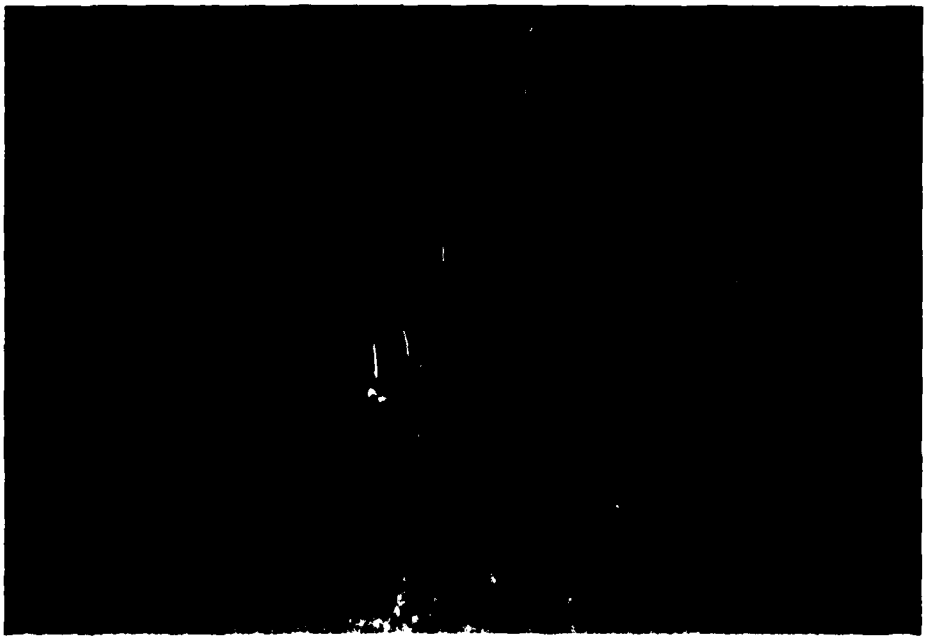
ABOVE - SHORE END OF CAPTOR CABLES BEFORE INSTALLATION OF ADDITIONAL CONCRETE PROTECTION. BOLTS BEING INSPECTED AND TIGHTENED.

LEFT - SHORE END OF SOUTH CAPTOR CABLE SHOWING SPLIT PIPE IN TRENCH AT SURF ZONE.

FIGURE 3-7

BELOW - SHORE ENDS OF CAPTOR CABLES SHOWING ADDITIONAL CONCRETE PLACED ON NORTH CABLE.

FIGURE 3-8



BSURE NORTH AND SOUTH CABLES CROSS OVER ONE ANOTHER. NEWLY INSTALLED CLAMPS STOP ABRASION.

FIGURE 3-9

FULL LOOP IN NORTH BSURE CABLE - STRAIN RELIEF AND CLAMPS INSTALLED TO PREVENT TIGHTENING

FIGURE 3-10

Of these clamps, eleven replaced broken clamps and six were placed at cable-crossing locations.

The sea/shore interface portion of the cables is now almost completely protected. All pieces of worn split pipe were replaced, ten on the North and two on the South, Figures 3-11 and 3-12. The cable trenches are now covered by the precast concrete slabs that will break the force of sand carried by waves which has so severely abraded the cable and pipe in the past.

The BSURE cables are in good condition now but, due to the cross-overs and twists, there is a potential for future problems. They should be inspected at least every two years.

UCS CABLE INSPECTION

During last year's UCT-TWO deployment to PMRF, considerable time was spent stabilizing the UCS cables. As a result, the cables are in good condition. Although there are numerous suspensions of the cable due to the irregularity of the sea bottom, the worst of the suspensions are center-supported by piles of grout bags, Figure 3-13, and all suspensions are tightly clamped at both ends. At the point where the two cables cross each other, Figure 3-14, the cables are bound together by heavy line to avoid armor wire abrasion by relative cable movement.

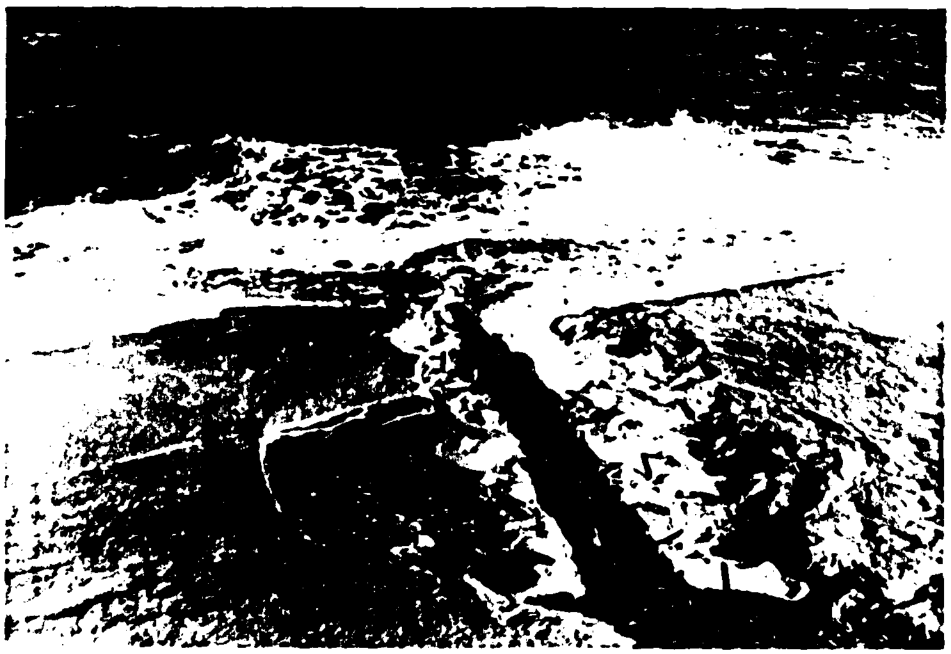
Only two broken clamps were found and replaced on these cables. Both were on the South UCS, approximately 2150 feet from shore. Due to the condition of the cable, it is assumed these clamps were broken by hooking the cable with an anchor or line.

At the sea/shore interface, the cables are well protected naturally. The cables are set in a deep trench so that they enter the surf zone underwater. All split pipe appeared to be in good condition and no bolts were missing.

No repairs to the UCS cables are recommended at this time.

SHORE END OF NORTH BSURE CABLE BEFORE
INSTALLATION OF SLABS; NEW SPLIT PIPE SECTIONS SHOWN

FIGURE 3-11

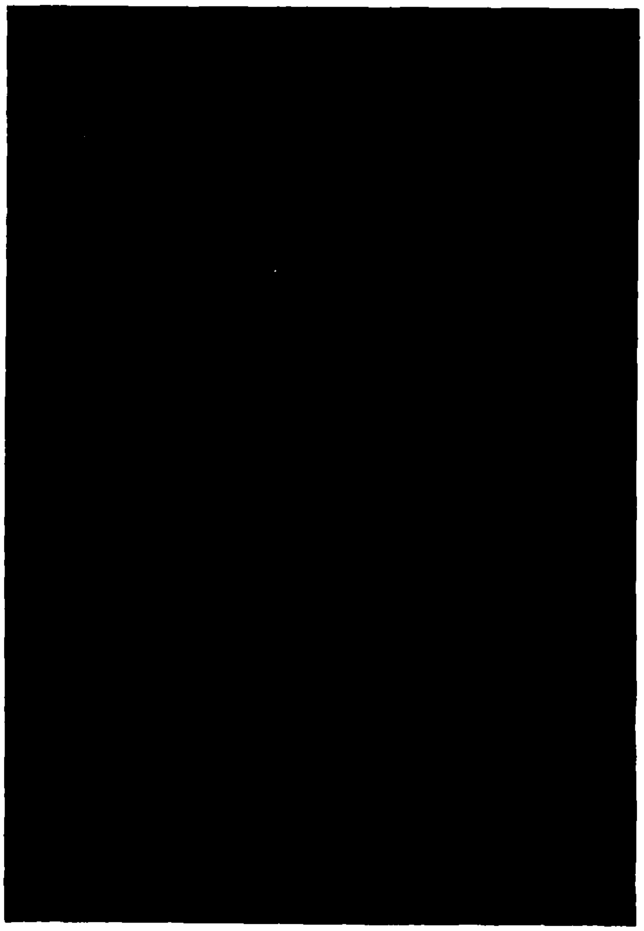


SHORE END OF SOUTH BSURE CABLE BEFORE
INSTALLATION OF SLABS; NEW SPLIT PIPE SECTIONS SHOWN

FIGURE 3-12

RIGHT – CEMENT–FILLED BAGS, STIFFENED BY REBAR, SUPPORT SOUTH UCS CABLE IN CENTER OF A LONG SUSPENSION. PHOTO TAKEN ABOUT 500 FEET FROM SHORE.

FIGURE 3–13



LEFT – TWO UCS CABLES CROSS OVER EACH OTHER. THEY ARE BOUND TOGETHER WITH LINE TO STOP MOVEMENT AND ABRASION.

FIGURE 3–14

4.0 SURVEY RESULTS AND DATA COMPARISON

The survey conducted during this deployment of UCT-TWO to Barking Sands is one of several that have been made in the PMRF area. Each of these surveys, performed to locate cable routes in different parts of the range, employed one or more pairs of bench marks on the beach to triangulate specified points along each of the range cables, either as the cable was laid, where the cable was fastened to the bottom, or where specific units of underwater equipment were located.

BENCH MARKS FOR SURVEYS

The earliest available plot shows the results of a survey conducted in 1977. It is entitled "Cable Survey 1977, Barking Sands, HI." It is designated as NAVFAC Drawing No. 3017607 and was drawn by EA3 Ingram of UCT-TWO and was included as Appendix E in the BSURE Project Completion Report FPO-1-78(5) of March 1978. This plot shows Cable A, Cable B, and Cable C (the three BSURE cables), Cable N-1977, and Cable S-1977 (the North and South CAPTOR cables). The bench marks for this survey, A, B, and C, were along a straight line parallel to the beach which was 4.22° to west of north, i.e., 355.78° True. Another bench mark, D, was also located about halfway between B and C, about 200 feet inshore. Each of these bench marks was geographically located by latitude and longitude as well as relative to the Hawaiian Grid. The BSURE Cable Vault was similarly located by latitude and longitude.

Additional underwater construction work was assigned to CHESNAVFACENGCOM and UCT-TWO at PMRF in early 1982. After mobilization, UCT-TWO proceeded to install temporary bench marks for the survey on 13 April 1982. The intent was to use a pair of transits, as done in the 1977 survey, and to establish points along each cable path by triangulation. Eight bench marks, lettered A through H, were established. The following notes regarding these bench marks were taken from the UCT-TWO drawing on which the survey results were plotted:

Mark A is a nail set in concrete in the northeast corner of a concrete box. B, C, D, and E are set atop concrete filled pipes, each fitted with a brass plate. F and G are nails in the rocks near the shoreline north of Nohili Ditch and H is a concrete monument near the berm road. Comparing these with the plot of the 1977 survey, it was possible to correlate several of the

1982 bench marks with the previous marks for which local Hawaiian Grid orthographic coordinates and geographic coordinates were given as tabulated below.

1982 Mark	1977 Mark	Geographic Coordinates Latitude	Geographic Coordinates Longitude	Hawaiian Grid Coordinates East	Hawaiian Grid Coordinates North
B	C	22° 02' 57.6090"	159° 47' 11.0798"	403,000.68	78,556.90
C	D	22° 03' 03.6025"	159° 47' 9.7111"	403,130.58	79,161.46
D	B	22° 03' 09.3236"	159° 47' 12.0316"	402,913.38	79,739.18
E	A	22° 03' 18.6073"	159° 47' 12.7845"	402,844.30	80,676.12

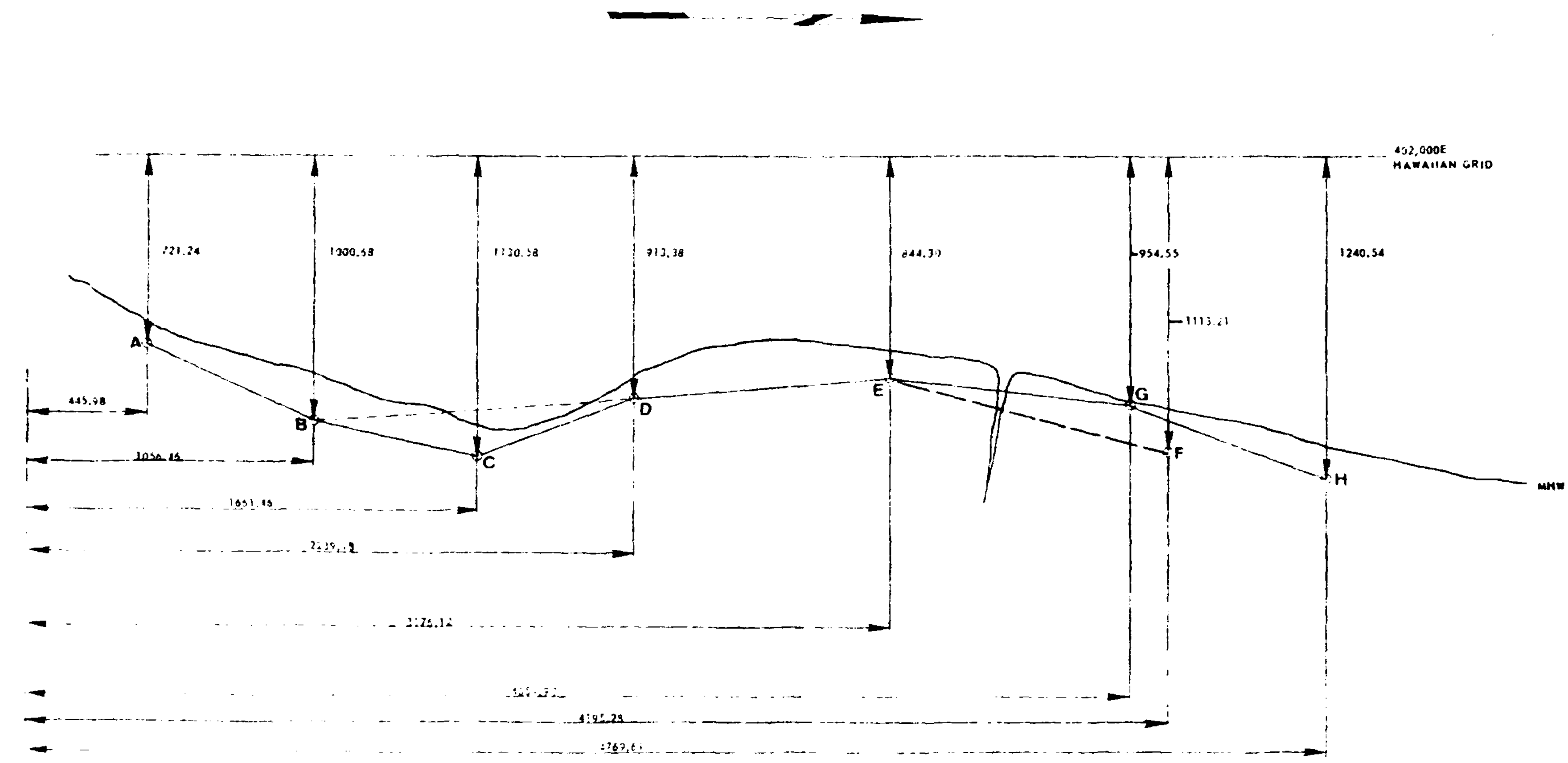
From these established points, and from the information provided by the UCT-TWO surveyor, the orthographic coordinates of the remaining bench marks given in Figure 4-1 could be derived.

During the current project reported herein, the nail in the rock which constituted Point F in the 1982 survey could not be located from the given angle and distance from Point E in the 1982 data. Transferring the angle and distance shown on the 1982 chart to the actual beach conditions, the bench mark could not be found. But within the area was located a steel bar driven solidly into the berm with the letter F clearly stamped on it. It was assumed that this was bench mark F. This point is shown in Figure 4-2 and was sighted in from both Point E and G. It is the Point F shown on Figure 4-1 and it was used for triangulating the plotting points for the UCS cable in the survey reported herein. Bench mark G is shown in Figure 4-3.

The mystery does not end here, however. The 1983 data for the UCS North cable have been plotted using the new Point F bench mark. These intersections fall directly atop the data plotted in 1982 for the UCS South cable for which the bench mark reported in 1982 was used. If the 1982 sighting angles are used in conjunction with the 1983 location of Point F, the results fall well beyond the known cable path. From this it appears that the nail was in the rock in 1982 and that this was the point where the transit was then set up.

CABLE TRACK PLOTTING DATA

The transit sights made from the bench marks designated in Figure 4-1 are tabulated below. The point on which the transit was mounted is designated and the tabulated angle is that which the transit telescope makes with the line between the mounting point and the designated backsight point.



ORTHOGRAPHIC COORDINATES
OF 1982 SURVEY BENCH MARKS
PLUS POINT F FROM 1983 SURVEY

FIGURE 4-

ABOVE – STEEL ROD DRIVEN INTO BERM TO SHOW POSITION OF BENCHMARK F. PERSON IN BACKGROUND STANDS ON BENCHMARK G.

FIGURE 4–2

NAIL DRIVEN INTO BEACH ROCK (CIRCLED) SHOWS POSITION OF BENCHMARK G. RANGE POLES (INDICATED BY ARROWS) IN BACKGROUND ARE MOUNTED IN BERM SOUTH OF THE NOHILI DITCH.

FIGURE 4–3

UCS North* Cable

Transit on Point E Backsight on Point D		Transit on Point F Backsight on Point H	
Degrees	Minutes	Degrees	Minutes
138	40	140	00
127	58	124	06
123	05	116	46
120	20	100	30

*Plotted results indicate that this was UCS South

BSURE South Cable

Transit on Point A Backsight on Point B		Transit on Point D Backsight on Point C	
Degrees	Minutes	Degrees	Minutes
48	30	100	30
54	33	112	08
55	16	113	13
*60	10	122	14
*61	00	126	00
62	30	127	30
64	10	127	20
65	52	128	50

*Crosses BSURE North

CAPTOR North Cable

Transit on Point D Backsight on Point C		Transit on Point A Backsight on Point B	
Degrees	Minutes	Degrees	Minutes
40	00	24	09
84	30	44	01
98	25	59	49
105	00	66	58
107	17	70	07
109	00	71	13
113	22	72	44

CAPTOR South Cable

Transit on Point A Backsight on Point B		Transit on Point D Backsight on Point C	
Degrees	Minutes	Degrees	Minutes
38	23	69	53
53	41	94	02
59	54	97	38
70	25	103	55
72	08	104	32
73	08	105	28

UQC Cable

Transit on Point A Backsight on Point B		Transit on Point D Backsight on Point C	
Degrees	Minutes	Degrees	Minutes
58	59	53	39
63	19	59	20
66	51	44	18

21-QUAD Cable

Transit on Point A Backsight on Point B		Transit on Point D Backsight on Point C	
Degrees	Minutes	Degrees	Minutes
46	19	49	03
63	04	72	51
67	59	81	23
82	03	110	39

Additionally sights were taken on a Tango buoy used to spot in the location of an anchor on the bottom. The connecting line had a considerable scope and the wind was blowing from the west so that the anchor will be located somewhat to the west of the intersection delineated below:

Transit on Point A Backsight on Point B		Transit on Point E Backsight on Point D	
Degrees	Minutes	Degrees	Minutes
85	45	82	10

The attached anchor is available for use in mooring small craft during future range repair operations.

COMPARISON WITH PREVIOUS SURVEYS

It may be noted that in many cases the number of survey points used to determine a specific cable location was minimal. Since the purpose of the survey was only to determine whether there had been major movement of the cables, a few triangulations were generally sufficient to achieve this purpose.

Generally, the plotted differences between the 1983 survey, the 1982 survey, and the 1977 survey indicated that there had been some cable movement over the sea floor. However, this movement was relatively minor and had not been drastic enough to suspect any major failure of the stabilization system. It was felt that the differences in cable position that could be ascertained were as much the result of survey errors as of actual cable movement. It was concluded that such surveys should be made every few years in conjunction with cable inspections and that the plotted results of different surveys fall within a reasonable range of agreement.

5.0 LESSONS LEARNED

ENVIRONMENT

The power of the surf action on the Barking Sands beach should never be underestimated. Moderate surf action was strong enough to cause a cargo pallet weighted with 5,000-pound anchors to move along the bottom. Heavier surf, associated with a storm, was strong enough to move these same anchors down the beach despite the fact that they were removed from the palletts and they were twenty feet above the normal high water mark.

Surf action not only has sufficient force to move major equipment but also is extremely dangerous to personnel working in the sea/shore interface area; personnel can be severely injured when tossed about by surf action in the vicinity of fixed objects, particularly concrete structures which can inflict skin lacerations as well as broken bones.

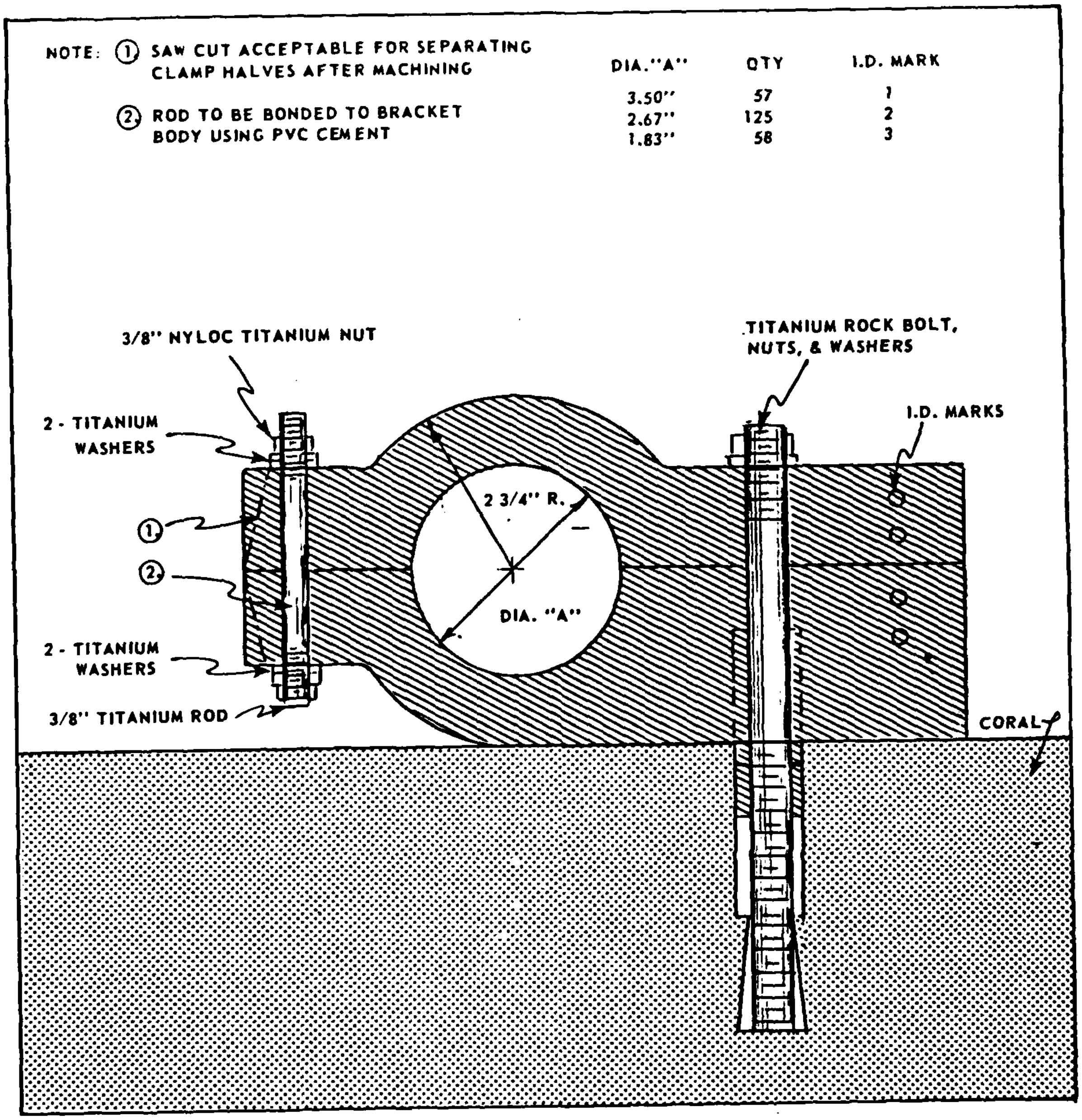
The permanence of all "permanent" structures is questionable along the Barking Sands beach and estimates of the working life of such structures should take this fact into consideration. Additionally, new designs that can cope with this severe environment are mandatory in the planning of future installations.

The sand on Barking Sands beach is moved up and down the beach by wave forces. Little or nothing can be done to stop this movement. Sand will find its way through the smallest of holes or cracks when a cofferdam is employed. Minimal success has been achieved in attempts to jet sand away from working areas since each successive wave replaces the sand at an equal or greater rate than can be attained with jet removal.

Additionally, the beach rock at PMRF is extremely hard and is not easily cut or drilled through.

EQUIPMENT AND MATERIALS AVAILABILITY

The concrete pump, owned by Hale Kauai, could be obtained only with an advance notice of one week to assure availability. As this is the only concrete pump on the Island, and should one be required to be on call for a particular job, it must be shipped to Kauai. Pumps are available from PWC Pearl Harbor.



ONE-BOLT CABLE CLAMP ASSEMBLY DRAWING

FIGURE 5-1

A 65-ton mobile crane, in relatively good condition, is available from R-Electric. A track-mounted drill and operator familiar with the site are available from California Drilling and Blasting Co.

Concrete is available on very short notice from Thornus Inc. Thornus proved to be very cooperative and slightly less costly than Hale Kauai. Thornus, however, does not have available a concrete pump.

CABLE STABILIZATION CLAMPS

During the 1977 BSURE construction activities, a number of single-bolt clamps were utilized for securing cables to the sea floor. A typical example is shown in Figure 5-1.

The current inspection showed this type of clamp to be ineffective. The mode of failure is for the bolt to bend over until it breaks off. A two-bolt clamp prevents this bending action and is thus much more effective.

SURVEY AND INSPECTION TECHNIQUES

Each cable is best inspected by one pair of divers. Since one pair of divers cannot inspect an entire 3000-foot length on one set of air bottles, the divers must come to the surface briefly to change air. By using one pair of divers per cable, the inspection can be carried out more rapidly, the description of cable condition is more consistent, and no confusion arises as to where one set of divers ended their inspection and where another set of divers continued the work.

If too many floats are put on the cable for use in triangulation, the surveyors become confused as to which buoy to sight in on. Buoys should not be placed any closer than one every 400 feet which also avoids similar misidentification of marker points.

It is extremely important that the baseline markers for survey activities be unequivocally identified and their location known precisely. The current situation with regard to baseline markers along the Barking Sands beach, and the anomalies that were discovered during this project, has been discussed in some detail in Section 4.0 of this report.

Much time has been wasted, and inaccurate conclusions have been drawn, because of lack of certainty of the location of baseline markers and the repeated inability to find and identify them in successive construction and repair projects at PMRF. It is strongly recommended, for the sake of efficiency in future projects, that a special survey be undertaken to establish precisely the geographic location of these markers and to provide them with positive and obvious means of identification.

6.0 PERSONNEL

UNDERWATER CONSTRUCTION TEAM TWO PERSONNEL

LCDR Pyles (Team OIC)
LCDR Nelson (TEAM AOIC)
SWCS (MDV) Bradshaw (CPOIC)

CM2 (DV) Austin	SW2 (DV) Tzucanow
CM1 (DV) Meserve	CE3 (DV) Reist
HM2 (DV) Kruse	CM3 (DV) Spear
BU1 (DV) Sutton	BU2 (DV) Harding
SW1 (DV) Elsasser	EA3 (DV) Torrens
CE2 (DV) Scheuren	PH2 (DV) Cotellessa
SW3 (DV) Platt	CM3 Hall

CHESNAVFACENGCOM REPRESENTATIVE

LT Carter

PMTC REPRESENTATIVE

Mr. Joe Gannatal

PHOTOGRAPHY

All of the abovewater photographs contained in this report, with the exception of Figures 2-10, 2-11, and 2-12 were taken by the PMTC representative, Mr. Gannatal. All underwater photographs were taken by personnel of UCT-TWO. Figures 2-10, 2-11, and 2-12 were taken by LT Carter.

APPENDIX A

LOG OF EVENTS AT BARKING SANDS DURING PERIOD FROM APRIL THROUGH JUNE 1983

2 April - UCT-TWO main body arrives at PMRF.

3 April - CHESNAVFACENGCOM EIC arrives at PMRF.

4 April - Surf moderate (2-3 feet) sand covering all of CAPTOR concrete; one foot deep, at most, on BSURE; tops of UQC and 21-QUAD groins are visible.
- UCT-TWO mobilizing equipment.

5 April - No change in surf or sand.
- UCT-TWO mobilizing equipment.

6 April - No change in surf or sand except now UQC groin is fully covered.
- UCT-TWO attempted to wash sand from BSURE cables with water pump but waves brought sand in too fast.
- UCT-TWO/CHESNAVFACENGCOM EIC made initial inspection of BSURE North.

7 April - Sand remains the same, surf 1-2 feet.
- CHESNAVFACENGCOM EIC and UCT-TWO CPOIC have meeting with Hale Kauai, owner of only concrete pump on Island. Determine 7-day notice is required to guarantee pump availability.
- UCT-TWO inspected BSURE cables but, due to confusion, cables require reinspection.

8 April - Sand still the same, surf rough (3-4 feet).
- BSURE North reinspected.

9 April - Surf still rough (3-4 feet); groins of 21-QUAD and UQC exposed. Middle and North BSURE exposed. South BSURE and CAPTOR covered.
- BSURE North reinspected and peanut floats attached to cable for triangulation. Floats too close together and surf too rough for transits to pick them out.

10 April - Sand and surf remain the same.
- No work.

11 April - Sand still the same; BSURE North still clear. Surf moderate (2-3 feet).
- BSURE South inspected and triangulated.
- Holes drilled in rock of BSURE North landing site for placement of rebar tie-downs for concrete.

11 April (Cont'd.)
- Concrete pump requested from PWC, Pearl Harbor.
- Hawaiian Dredging and Construction on beach to begin construction of new UQC and 21-QUAD groins.

12 April
- Sand now covers BSURE and CAPTOR cables; 21-QUAD and UQC groins visible; surf moderate.
- CAPTOR North triangulated and inspected.
- Began installation of new clamps on BSURE cables.

13 April
- Sand and surf remain the same.
- Installation of clamps on BSURE and CAPTOR cables continues.
- Team worked late. Inspected and installed floats on CAPTOR South and on UCS North and South.

14 April
- Sand and surf remain the same.
- Installation of clamps on CAPTOR and BSURE cables continues.

15 April
- North BSURE exposed again, CAPTOR and South BSURE covered. Surf moderate.
- Installation of clamps continues.
- 21-QUAD inspected.
- PWC Pearl Harbor concrete pump arrives.
- Preparations made to place concrete over North BSURE tomorrow.

16 April
- Sand in on all four sets of cables including North BSURE. Surf moderate.
- Installation of clamps continues (bolts being tightened).
- Concrete placement cancelled due to sand. Two new pieces of split pipe installed on BSURE North.

18 April
- Sand in on all cables; surf moderate.
- UQC cable inspected.
- Installation of clamps continues (bolts tightened).

19 April
- Sand in on all cables, surf low (2-3 feet).
- Photographed BSURE North and South.

20 April
- Sand in on all cables; surf low (2-3 feet).
- Photographed UCS cables.
- Took transit sightings on 21-QUAD and UQC cables.

21 April - Sand in on all cables; surf low (2-3 feet).

- Found Point F on the 1982 chart base was not as marked on chart. Turned new and correct angle for Point F.
- Installed large metal "Tango" buoy for base.
- Inspected 21-QUAD junction box.

22 April - Sand in on all cables; surf low (2-3 feet).

- Made second inspection of 21-QUAD junction box and the surrounding cables.

23 April - Team OIC, LCDR Pyles and Senior Enlisted Advisor CUCM Bishop arrived on site.

- No work.

25 April - Sand in on all cables; surf moderate.

- Team OIC and CHESNAVFACENGCOM representative inspected site and reviewed options.
- Team packing diving gear for return to home port.
- Decision made to use precast slabs to protect BSUREs.

26 April - Surf heavy (4-5 feet); sand still in on cables, but moving out on BSURE.

- Team procuring materials for slabs and continuing dive gear pack-out.

27 April - Surf moderate (2-3 feet); sand out on BSURE North.

- Team installed two sections of split pipe.
- Attempted to fill BSURE North trench with concrete using weighted cargo pallets as covers. Surf too strong; operations unsuccessful.

28 April - Surf heavy (3-4 feet); sand is very deep on 21-QUAD and UQC covering groins. Still covers CAPTORs but BSURE is completely uncovered.

- Team replaced two more sections of split pipe on BSURE North (total of six).
- Pack-out and material procurement continues.

29 April - Surf heavy; sand remains as before.

- Two sections of split pipe replaced on BSURE South.
- Construction of forms for slabs begun.

30 April - All of team except for OIC and four men departed for other projects.

- Rebar for slabs picked up from Nawiliwili and delivered to Port Allen for bending.

2 May - Surf calm (1-2 feet); sand still out on BSUREs but in on 21-QUAD and UQC.

- Team installed last four sections of split pipe on North BSURE.

3 May - Surf heavy (3-4 feet); sand still out.

- Attempted to put last two pieces of pipe on, but surf too bad.
- Bent rebar was delivered; rebar cages for three slabs assembled.

4 May - Surf heavy (3-4 feet); sand still out.

- Crane contractor came for site visit. Discussed how to get crane to the beach.
- Last two rebar cages completed.
- Used jack hammer on bottom of South BSURE cable trench to allow cable to settle lower.
- Installed last two sections of split pipe on North BSURE cable.

5 May - Surf heavy (3-4 feet); sand still out.

- Placed rebar cages in forms.

6 May - Surf moderate (2-3 feet); sand half covering BSURE cables.

- Poured concrete slabs.

7 May - Surf moderate (2-3 feet); sand out completely on BSURE cables; CAPTORs still covered.

- No work.

8 May - Remainder of Team departed for temporary duty elsewhere.

9 May - Surf flat (0-1 foot); sand covering both BSUREs but South CAPTOR cable uncovered for first time.

- CHESNAVFACENGCOM representative inspected South CAPTOR cable in surf zone. Installed two new bolts and found four others loose.

10 May - Surf flat (0-1 foot); BSUREs covered but both CAPTOR cables uncovered.

- CHESNAVFACENGCOM representative tightened bolts on North CAPTOR cable split pipe.

11 May - Surf very heavy; from beach to 100 yards out offshore covered with white foam. Both CAPTOR and BSURE cables exposed.

12 May - Surf moderate; sand out on BSUREs, but covering CAPTORs.
- CHESNAVFACENGCOM and PMTC representatives discovered that some of the bolts in the new pieces of BSURE split pipe had fallen out. They were replaced.

13 May - Surf low; sand covering both CAPTOR and BSURE cables.

14 May - Surf flat; South BSURE exposed but North BSURE and both CAPTORs covered with sand.

16 May - Surf low (1-2 feet); South BSURE and both CAPTORs exposed.

17 May - Surf moderate (2-3 feet); CAPTOR cables exposed; BSURE cables covered.

18 May - Surf moderate (2-3 feet); CAPTOR cables fully exposed along with South BSURE. North BSURE covered.

19 May - Surf flat (0-1 foot); CAPTORs exposed; BSUREs covered.

20 May - Surf highest ever this summer.
- Waves up to 8 feet; CAPTORs covered; BSUREs exposed.
- Contractor crane arrives.

21 May - Surf high (4-6 feet); BSUREs exposed; CAPTORs covered.
- UCT-TWO returned.

23 May - Surf low (1-2 feet); BSUREs exposed; CAPTORs covered.
- Team cutting through beach berm to allow crane access to job site.
- Contractor assembling crane.
- Slabs positioned near job site.

24 May - Surf low; BSUREs uncovered; CAPTORs covered.
- Team/Contractor paving road to job site with old crushed asphalt.

25 May - Surf moderate; BSUREs uncovered.
- Slabs put in place.

26 May - Surf low; sand out on both BSURE and CAPTOR.
- Concrete pumped under slabs and laid on top of CAPTORs.

27 May - Surf low; CAPTOR cables covered.
- Team cleaning up equipment and site.

31 May	-	Surf low (1 foot); UQC, 21-QUAD, and BSURE cables exposed.
1 June	-	Surf low; sand out on UQC, 21-QUAD, and BSURE cables; CAPTORs covered.
2 June	-	Surf low; sand as before.
3 June	-	Surf low with occasional large wave; sand as before.
4 June	-	Surf flat (0-1 foot); sand as before.
6 June	-	Surf moderate; sand covering CAPTOR, 21-QUAD, and UQC. BSURE cables appear clear (covered by slabs).
	-	CHESNAVFACENGCOM representative triangulated postion of sand gage and Tango buoy using PW transit.
7 June	-	Surf low; sand covers all four sets of South cables.
8 June	-	Surf low; sand as before.
9 June	-	Surf low; sand as before.
10 June	-	Surf low; sand as before.
11 June	-	Surf low; sand as before.
	-	Decision made to bolt slabs down.
	-	Material ordered for bolting.
13 June	-	Surf moderate; sand as before.
14 June	-	CHESNAVFACENGCOM representative off island at MSDU 1.
15 June	-	Surf low; sand out on BSURE but covers all other cables.
16 June	-	Surf moderate, with wind whipped spray; sand as before.
17 June	-	Surf moderate; sand as before.
	-	Drilling contractor brings equipment to site.
18 June	-	Surf moderate; small amounts of sand in BSURE area, all others sanded in.
	-	Drilling contractor begins drilling holes. All but three holes drilled. After four rods were installed, work stopped due to wave and sand action.
19 June	-	Surf low; sand same as before.
	-	CHESNAVFACENGCOM representative sealed holes around four installed rods with water plug.

20 June - Surf moderate; sand same as before.

- Additional six rods installed. Work stopped by strong surf.

21 June - Surf moderate; sand as before.

- Additional six rods installed.
- Work stopped by surf.

22 June - Surf heavy (3-5 feet); sand as before.

- Five rods installed; work stopped by surf.

23 June - Surf low (1-2 feet); sand as before.

- Final three rods installed.
- Job site cleaned up, CHESNAVFACENGCOM representative departed.

APPENDIX B

MESSAGES DOCUMENTING AUTHORIZATIONS AND CONSTRUCTION ACTIVITIES

ROUTINE

R 222101Z DEC 82

FM CHESNAVFACENGCOM WASHINGTON DC

TO COMNAVAIRSYSCOM WASHINGTON DC

INFO COMCBPAC PEARL HARBOR HI COMPACMISTERSTCEN PT MUGU CA
UCT TWO
PACMISRANFAC HAWAREA BARKING SANDS HI

BT
UNCLAS //N11000//

SUBJ: PMRF SEA/SHORE INTERFACE CABLE MAINTENANCE PROJECTS: FUNDING FOR

A. 16 DEC MTG BTWN CDR S. STEVENSON (CHESDIV) AND R. CRANGLE (NAVAIR)

1. THIS MESSAGE CONFIRMS PROJECT PLANNING INFO DISCUSSED REF A AND PROVIDES FUNDING REQUIREMENTS.

2. SCHEDULED SPRING/SUMMER UCT 2/CHESDIV EFFORTS AT PMRF ARE AS FOLLOWS:

A. ANNUAL INSPECTION, MAINTENANCE AND MINOR REPAIR OF CABLE PROTECTION AND STABILIZATION:

SCOPE OF WORK INCLUDES SURVEY OF ALL CABLES FOR DAMAGE, REPAIR OF MINOR SPLIT PIPE AND STABILIZATION PROBLEMS, AND REPLACEMENT OF ADDITIONAL CONCRETE PROTECTION FOR THE BSURE CABLE SEA/SHORE INTERFACES. ESTIMATED COST OF THIS EFFORT IS $60K. $20K OF THIS IS REQUIRED NLT 15 JAN FOR MATERIAL ACQUISITION AND FINAL PROJECT ENGINEERING. REMAINING $40K REQUIRED NLT 20 FEB 82.

B. LANDING AND STABILIZATION OF TWO REPLACEMENT UQC SHORE ENDS:

SCOPE PROVIDES FOR SPLICE REPAIR OF UQC CABLE NO. 1 WHICH HAS PARTED AND SPLICE REPAIR UQC CABLE NO. 2 WHOSE PROTECTIVE ARMOR HAS BEEN SERIOUSLY DAMAGED. THIS WILL RESTORE UQC COVERAGE OF THE COMPLETE BARSTUR RANGE AND INCREASE PROTECTION OF THE TWO CABLES AGAINST DAMAGE. COST ESTIMATE IS $450K. $220K IS REQUIRED NLT 1 JAN FOR PROCUREMENT OF CABLE AND LONG LEAD ITEMS. REMAINING $230K REQUIRED NLT 20 FEB.

3. DURING REF A NAVAIR REPS INDICATED UNCERTAINTY OF FUNDING

DLVR: CHESNAVFACENGCOM WASHINGTON DC (9) ... ORIG

RTD: 000-000/COPIES: 0009

963093/003 1 OF 2 M1 0090 003/18:30Z 222101Z DEC 82
CSN: RXOY00089 CHESNAVFACENGCOM WASHINGTON DC

AVAILABILITY FOR THE ABOVE EFFORTS. IT IS NOTED THAT UCT-2 SUMMER DEPLOYMENT SCHEDULES HAVE BEEN BASED IN PART, BY CVPAC/CINCPACFLT, ON A 1 APR 83 - 30 JUN 83 UCT-2 DETACHMENT REQUIREMENT AT PMRF IN ORDER TO ACCOMPLISH ABOVE OUTLINED TASKS. IT IS ANTICIPATED THAT NON-AVAILABILITY OF FULL PROJECT FUNDING IN TIME TO PROPERLY CARRY OUT THE EFFORT WILL CAUSE A REDUCTION OF THE UCT EFFORT AND TIME ON SITE. EARLY COMMITMENT OF FUNDING IS THEREFORE REQUIRED SO THAT CBPAC/CINCPACFLT CAN ADJUST UCT-2 TASKING IF REQUIRED.

4. IN VIEW OF ABOVE, REQUEST NAVAIR CONFIRM AVAILABILITY OF PROJECT FUNDS PER THE SCHEDULES INDICATED PARA. 2. RESPONSE BY 28 DEC 82 IS REQUESTED.
BT

963093/003 2 OF 2 M1 0090 003/18:30Z 222101Z DEC 82
CSN: RXOY00089 CHESNAVFACENGCOM WASHINGTON DC

ROUTINE

R 120142Z JAN 83

FM COMNAVAIRSYSCOM WASHINGTON DC

TO CHESNAVFACENGCOM WASHINGTON DC

INFO COMCBPAC PEARL HARBOR HI COMPACMISTESTCEN PT MUGU CA
UCT TWO
PACMISRANFAC HAWAREA BARKING SANDS HI

BT
UNCLAS //N11000//

SUBJ: PMRF SEA/SHORE INTERFACE CABLE MAINTENANCE

A. CHESNAVFACENGCOM WASHINGTON DC 222101Z DEC 82
B. FONECON BTWN W. LESLIE (PMTC) AND J. CULVER (NAVAIR) OF 21 DEC 82

1. REF A REQUESTED NAVAIR CONFIRM AVAILABILITY OF FUNDING FOR TWO UCT-2 SCHEDULED EFFORTS DESCRIBED IN REF A PARAS 2-A AND 2-B.

2. REF B DISCUSSED POSSIBLE USE OF PMRF MAINTENANCE ALLOCATION FOR A PORTION OF THE REPAIR WORK. PMRF PRIORITIES PRECLUDE FUNDING THE SUBJECT REPAIR IN THE NEAR TERM.

3. SHORTFALL OF FY83 O AND M, N FUNDS PRECLUDES COMPLETING EFFORT IN REF A PARA 2-B IN FY83. SECOND QTR FY83 O AND M, N IS IN PROCESS OF TRANSFER TO CHESDIV FOR EFFORTS IN REF A PARA 2-A. IF SUFFICIENT THIRD OR FOURTH QTR FY83 FUNDS ARE RECEIVED, A PROJECT ORDER WILL BE SENT TO CHESDIV FOR PROCUREMENT OF UQC CABLE AND LONG LEAD ITEMS FOR FY84 REPAIR EFFORT.

4. NAVAIR COG CODE IS AIR-630.
BT

DLVR: CHESNAVFACENGCOM WASHINGTON DC (9) ... ACT

RTD: 000-000/COPIES: 0009

021058/012 1 OF 1 M1 0144 012/06:31Z 120142Z JAN 83
CSN: RXPY00148 COMNAVAIRSYSCOM WASHINGTON DC

ROUTINE

R 201318Z JAN 83

FM CHESNAVFACENGCOM WASHINGTON DC

TO COMCBPAC PEARL HARBOR HI

INFO COMNAVAIRSYSCOM WASHINGTON DC COMPACMISTESTCEN PT MUGU CA
UCT TWO
PACMISRANFAC HAWAREA BARKING SANDS HI

BT
UNCLAS //N11000//

SUBJ: UCT-2 1983 PROJECT/PMRF CABLE MAINTENANCE

A. COMNAVAIRSYSCOM WASHINGTON DC 120142Z JAN 83

1. REF A STATED THAT FUNDS ARE NOT AVAILABLE FOR LANDING OF TWO UQC NEAR SHORE CABLE SECTIONS AT PMRF BARKING SANDS KAUAI IN FY 83.

2. THIS MSG CONFIRMS THERE WILL BE NO CABLE LANDING OPERATIONS AT PMRF IN SUMMER 83. SHORE END LANDING IS NOW PLANNED FOR FY 84 PROVIDED FY 83 FUNDING FOR PROCUREMENT OF LONG LEAD ITEMS.

3. RESULT OF THIS CHANGE IS A REDUCTION IN SCOPE OF UCT-2 EFFORT AT PMRF WITH A CONSEQUENT REDUCTION OF ON SITE TIME. ESTIMATED PERSONNEL REQUIREMENT NOW 15 PERSONS FOR 30 DAYS ON SITE.

4. REGRET INCONVENIENCE AS RESULT OF THIS CHANGE.
BT

DLVR: CHESNAVFACENGCOM WASHINGTON DC (9)... ORIG

RTD: 000-000/COPIES: 0009

082252/020 1 OF 1 M1 0379 020/18:48Z 201318Z JAN 83
CSN:RXOY00382 CHESNAVFACENGCOM WASHINGTON DC

ROUTINE

R 151244Z JUL 83

FM CHESNAVFACENGCOM WASHINGTON DC

TO COMPACMISTESTCEN PT MUGU CA

INFO PACMISRANFAC HAWAREA BARKING SANDS HI

BT
UNCLAS //N11000//

SUBJ: APPRECIATION FOR OPERATIONS SUPPORT

1. DURING THE PERIOD FROM 1 APRIL THROUGH 23 JUNE 1983, CHESNAV-FACENGCOM OVERSAW THE COMPLETION OF TWO CABLE PROTECTION PROJECTS ON THE BEACH AT PMRF. THESE PROJECTS INVOLVED BOTH CONTRACTOR AND MILITARY DIVER PERSONNEL, EACH ON A DEMANDING TIME SCHEDULE. DUE TO THE NATURE OF THE PROJECTS AND THEIR SCHEDULES, THE REQUIREMENTS FOR LOGISTIC AND ADMINISTRATIVE SUPPORT FROM THE BASE WERE EXTENSIVE. CONTRACT MODIFICATIONS, SUPPLY PURCHASES AND FABRICATION OF MATERIAL, ALL WELL OUT OF THE NORMAL SCOPE OF WORK FOR THE BASE, HAD TO BE HANDLED IN A EXTREMELY EXPEDITIOUS AND SKILLFUL MANNER. THE MILITARY CIVIL SERVICE AND CONTRACTOR PERSONNEL OF PMRF RESPONDED TO EACH OF THESE DEMANDING REQUESTS IN AN OUTSTANDING MANNER. THE EXTRA-ORDINARY ASSISTANCE PROVIDED BY LTJG PAUL SAMPSON, LT CINDY BROWN, AND LT DAN SAWYER AND THEIR STAFFS DISPLAYED AN EXCEPTIONAL "CAN DO" SPIRIT OF COOPERATION AND PROFESSIONAL THAT ABILITY IS TRULY A CREDIT TO THE STATION.

2. THE BASE SUPPORT CONTRACTOR, DYNALECTRON, PROVIDED THIS SAME OUTSTANDING ASSISTANCE. THE FOLLOWING PERSONNEL WARRANT SPECIFIC RECOGNITION: GARY ANDERSON AND CHUCK HEFNER FOR THEIR KNOWLEDGEABLE MANAGEMENT ASSISTANCE, DENNIS WOTTON, XAVIER IGNACIO AND LEE MOREY FOR THEIR FLEXIBLE AND EXPEDIOUS HANDLING OF THE STREAM OF PURCHASE AND CONTRACT REQUESTS AND NOBU DYAMA FOR HIS EXCELLENT SKILL AND CONCERN IN PRODUCING NUMEROUS PROMPT QUALITY FABRICATIONS FROM THE STEEL SHOP.

3. THE EXTRA EFFORT AND PERSONAL ATTENTION GIVEN BY THESE PERSONNEL AND OTHERS AT PMRF SAVED THE GOVERNMENT BOTH TIME AND MONEY IN TERMS OF CONSTRUCTION CONTRACTOR COSTS AND EFFECTIVE USE OF ITS MILITARY DIVERS. THIS COMMAND APPRECIATES THIS OUTSTANDING AID AND SUPPORT.
BT

DLVR: CHESNAVFACENGCOM WASHINGTON DC (9) ... ORIG

RTD:000-000/COPIES:0009

166193/5577/196 1 OF 1 M1 0259 196/14:18Z 151244Z JUL 83
CSN:RXOY0277 CHESNAVFACENGCOM WASHINGTON DC

ROUTINE

R 041320Z AUG 83

FM CHESNAVFACENGCOM WASHINGTON DC

TO PACMISRANFAC HAWAREA BARKING SANDS HI

INFO COMNAVAIRSYSCOM WASHINGTON DC
COMNAVFACENGCOM ALEXANDRIA VA
COMPACNAVFACENGCOM PEARL HARBOR HI
COMCBPAC PEARL HARBOR HI
COMPACMISTESTCEN PT MUGU CA
UCT TWO

BT
UNCLAS //N11000//

SUBJ: FY 83 INSHORE CABLE WORK AT PMRF

A. PACMISRANFAC HAWAREA BARKING SANDS HI 281825Z DEC 82

B. COMNAVAIRSYSCOM WASHINGTON DC 120142Z JAN 83

1. REF (A) REQUESTED CHESNAVFACENGCOM COMPLETE REPAIR OF CABLE PROTECTION OF BARSTUR CABLES IN THE SURF ZONE TO ARREST DETERIORATION OF UQC AND 21 QUAD CABLES. THIS WORK PERFORMED UNDER PMRF SPECIAL PROJECT R49-83. REF (B) REQUESTED CHESNAVFAC COORDINATE INSPECTION, DOCUMENTATION, PROTECTION, AND STABILIZATION OF BSURE CABLES. THIS WORK WAS PART OF ANNUAL CABLE SURVEY AND MAINTENANCE WORK CARRIED OUT BY UCT-2. THIS MSG IS TO PROVIDE SUMMARY REPORT ON COMPLETION OF THESE PROJECTS AND CURRENT STATUS OF INSHORE BARSTUR AND BSURE CABLES.

2. FOL EFFORTS COMPLETED:

A. PMRF SPECIAL PROJECT R49-63: CONTRACTOR COMPLETED EXTENSION OF FORMED CONCRETE ENCASEMENTS OF BARSTUR UQC AND 21 QUAD CABLES. CONCRETE EXTENDED APPROX 30 FT TO PROTECT CABLES THROUGH MOST ACTIVE BREAKING WAVE AND SAND MOVEMENT ZONE. DAMAGED AND MISSING SPLIT PIPE PROTECTORS WERE REPLACED PRIOR TO CONCRETE PLACEMENT. THREE SPARE CONDUITS WERE PLACED IN UQC CONCRETE EXTENSION TO FACILITATE PROTECTED INSTALLATION OF FUTURE CABLES. ONE SPARE CONDUIT WAS PLACED IN 21 QUAD EXTENSION. SPECIAL PROJECT R49-83 COMPLETED.

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B. UCT-2 SURVEY AND MAINTENANCE: ALL PMRF INSHORE CABLES INSPECTED TO APPROX 3000 FT FROM SHORE. BARSTUR JUNCTION BOX INSPECTED. SEVENTEEN ADDITIONAL CABLE CLAMPS/TIE DOWNS INSTALLED ON BSURE NORTH AND SOUTH CABLES WHERE INSPECTION INDICATED CABLE MOVEMENTS DUE TO WAVES. ALL DETERIORATED SPLIT PIPE REPLACED ON BSURE CABLES IN SURF ZONE.

3. STATUS OF PMRF INSHORE CABLES IS AS FOLLOWS:

A. BARSTUR UQC: THE TWO REMAINING CABLES EXTEND FROM NEW CONCRETE ENCASEMENTS WITH FULLY INTACT AND STABILIZED SPLIT PIPE TO APPROX 150 FT FROM SHORE. SEAWARD FROM SPLIT PIPE CABLES LIE IN MAN MADE TRENCH TO APPROX 2800 FT FROM SHORE INTO FIFTY FOOT WATER DEPTH. THERE ARE NO SIGNS OF CABLE MOVEMENTS OR ABRASION BUT ARMOR WIRES ARE SERIOUSLY DETERIORATED AND PARTED FROM CABLE IN NUMEROUS AREAS WHERE SLACK AND COILS WERE LEFT IN CABLES WHEN THEY WERE LAID. LOSS OF ARMOR ATTRIBUTED TO CABLE AGE AND STRESS DUE TO BENDING. IN VIEW OF DETERIORATED ARMOR AND FACT THAT ONE OF THREE UQC CABLES HAS ALREADY PARTED, RECOMMEND INSHORE PORTIONS OF THESE CABLES BE REPLACED. (DEPENDING ON CONTINUED RQMT FOR BARSTUR RANGE.)

B. BARSTUR 21 QUAD: CABLE EXTENDS FROM NEW CONCRETE ENCASEMENTS WITH FULLY INTACT AND STABILIZED SPLIT PIPE TO APPROX 150 FT FROM SHORE. SEAWARD OF SPLIT PIPE CABLE IS IN GOOD CONDITION WITH NO SIGNIFICANT WEAR OR MOVEMENT NOTED OUT TO ITS TERMINATION AT THE BARSTUR J-BOX.

C. BARSTUR HYDROPHONE CABLES SEAWARD OF J-BOX: IMMEDIATELY SEAWARD OF J-BOX THE 42 HYDROPHONE CABLES HAVE A MULTITUDE OF LOOPS, COILS, BENDS, AND TANGLES AS RESULT OF INITIAL VERY SLACK LAY. ARMOR WIRES ON THESE CABLES ARE CORRODED, BIRDCAGED AND BROKEN IN MANY PLACES DUE TO AGE, BENDING STRESS, AND KINKS. THESE CABLES HAVE MOVED SINCE THE LAST STABILIZATION WORK ON THEM IN EARLY 1970s. ANALYSIS INDICATES ONLY SEVERE STORM WAVES WILL GENERATE WATER VELOCITIES SUFFICIENT TO CAUSE GROSS CABLE MOVEMENT. THIS, PLUS THE AGE OF CABLES AND ADVANCED STATE OF STRESS CORROSION OF ARMOR, MITIGATES AGAINST ANY STABILIZATION WORK WHICH INVOLVES PULLING OR MOVING THE CABLES. PULLING LOOPS TO THE BOTTOM OR UNTANGLING AND TYING OFF BIGHTS WILL INDUCE ADDITIONAL BENDING STRESS IN THE ARMOR, POSSIBLY RESULTING IN NEW AREAS OF CORROSION.

D. BSURE CABLES: TWO ACTIVE BSURE CABLES HAVE FULLY INTACT SPLIT PIPE PROTECTORS FROM THE BEACH SEAWARD APPROX 150 FT. AT AREA IN SURF ZONE WHERE PREVIOUS CONCRETE WORK STOPPED ADDITIONAL INSTALLED PROTECTION CONSISTS OF FIVE 15 FT X 8 FT X 1 FT PRECAST CONCRETE SLABS ROCK BOLTED AND GROUTED INTO THE BOTTOM OVER THE CABLES. SLABS INTENDED TO PROVIDE PROTECTION AGAINST SAND EROSION OF SPLIT PIPE IN THE SURF/SAND MOVEMENT ZONE. SEAWARD OF SPLIT PIPE THE CABLES CROSS SEVERAL TIMES AND CONTAIN A LOOP BUT ARE WELL STABILIZED AND IN GOOD CONDITION INTO 60 FT OF WATER.

041320Z AUG 83
CHESNAVFACENGCOM WASHINGTON DC

E. BSURE UCS CABLES: TWO UCS CABLES HAVE FULLY INTACT SPLIT PIPE FROM BEACH ROCK TO APPROX 150 FT SEAWARD. CABLES ARE THEN STABILIZED WITH ROCK CLAMPS. CABLES ARE IN GOOD CONDITION INTO 60 FT OF WATER.

4. ANTICIPATE MINIMAL UCT-2 INSPECTION/MAINTENANCE EFFORT IN FY84 TO ENSURE CONTINUED STABILITY OF INSHORE CABLES.

5. FULL DOCUMENTATION AND "AS BUILTS" TO FOLLOW WITH PROJECT COMPLETION REPORT NLT 30 SEPT. POC AT CHESNAVFACENGCOM IS LT T. CARTER OR LCDR G. SELTZER AT (202) 433-6608 OR A/V 288-6608.

APPENDIX C

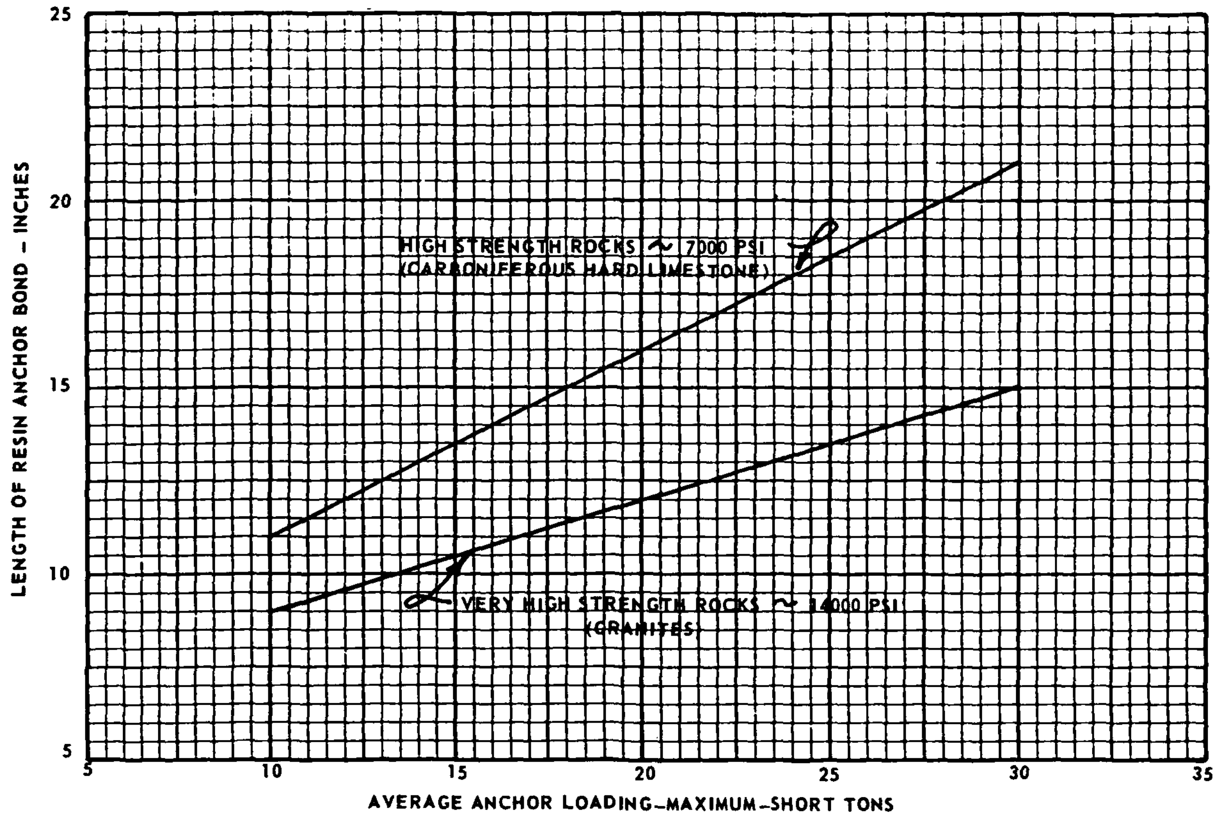
EPOXY CARTRIDGE DATA

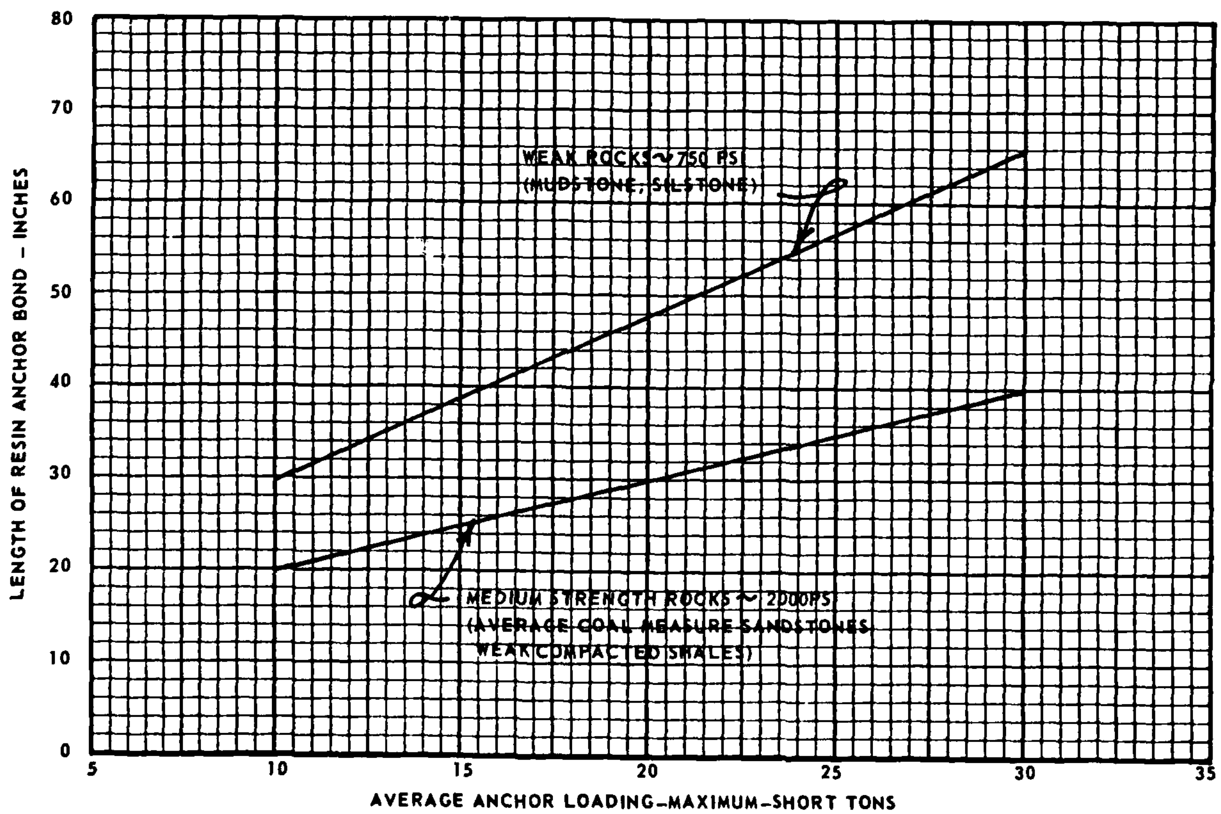
The epoxy cartridges were manufactured by Celtite, Inc., 13670 York Road, Cleveland, Ohio 44133 (Telephone 216-237-3232). They were made of thick plastic which contained a two-part epoxy separated by a plastic diaphragm. Mechanical mixing is required to integrate thoroughly the two materials before hardening takes place. The track drill, used for this purpose at PMRF, successfully provided the rapid mixing required.

The Celtite cartridge model numbers were 4512-0204 and 4512-0510. The former is a fast setting mix (2-4 minutes) and the latter is a slower setting mix (5-10 minutes). The total order shipped to PMRF contained quantities of both types with the slow setting mix included only because it was available in stock and a rapid response was required. In use, the slower setting setting mix cartridges were placed in the bottoms of the holes and the faster setting mix cartridges were placed in the top.

Both types of cartridges cost $2.30 each plus shipping charges and the total response time from the Celtite Colorado plant was about 10 days from the placement of the order to receipt in Hawaii.

The holding power of this epoxy cement is excellent in all types of rock structure as illustrated in Figure C-1. These anchorage loadings are based upon trials conducted by the Imperial College, London. The availability of this material will contribute significantly to future ocean construction projects.





TYPICAL ANCHORAGE LOADINGS FOR POINT ANCHORED CELTITE ROCKBOLTS

FIGURE C–1

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