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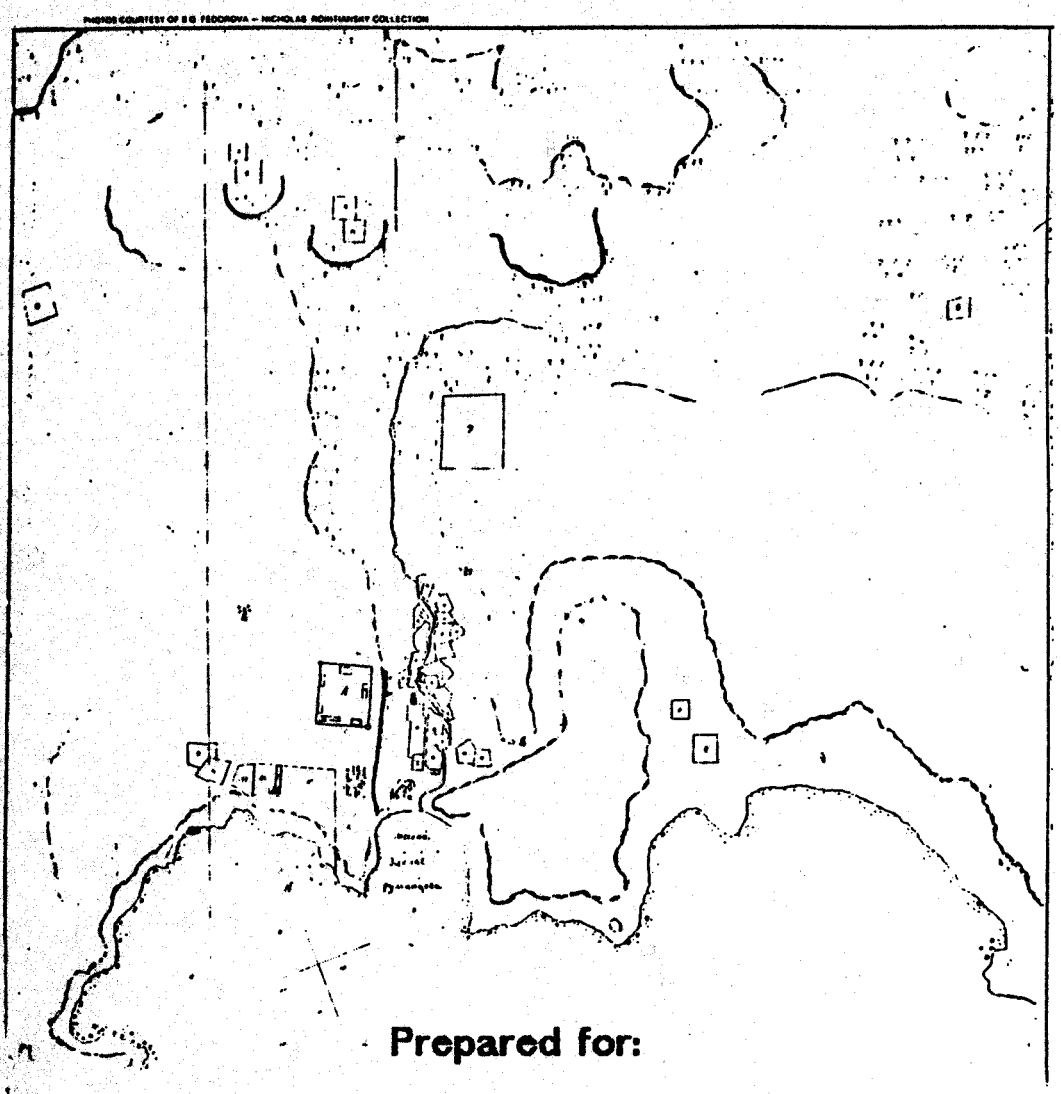
UNDERWATER AND TERRESTRIAL MAGNETOMETER SURVEY

FORT ROSS COVE AREA



Prepared for:

California Department of Parks and Recreation
Under Contract Number 4-827-1006

UNDERWATER AND TERRESTRIAL MAGNETOMETER SURVEY

FORT ROSS COVE AREA

Prepared for:

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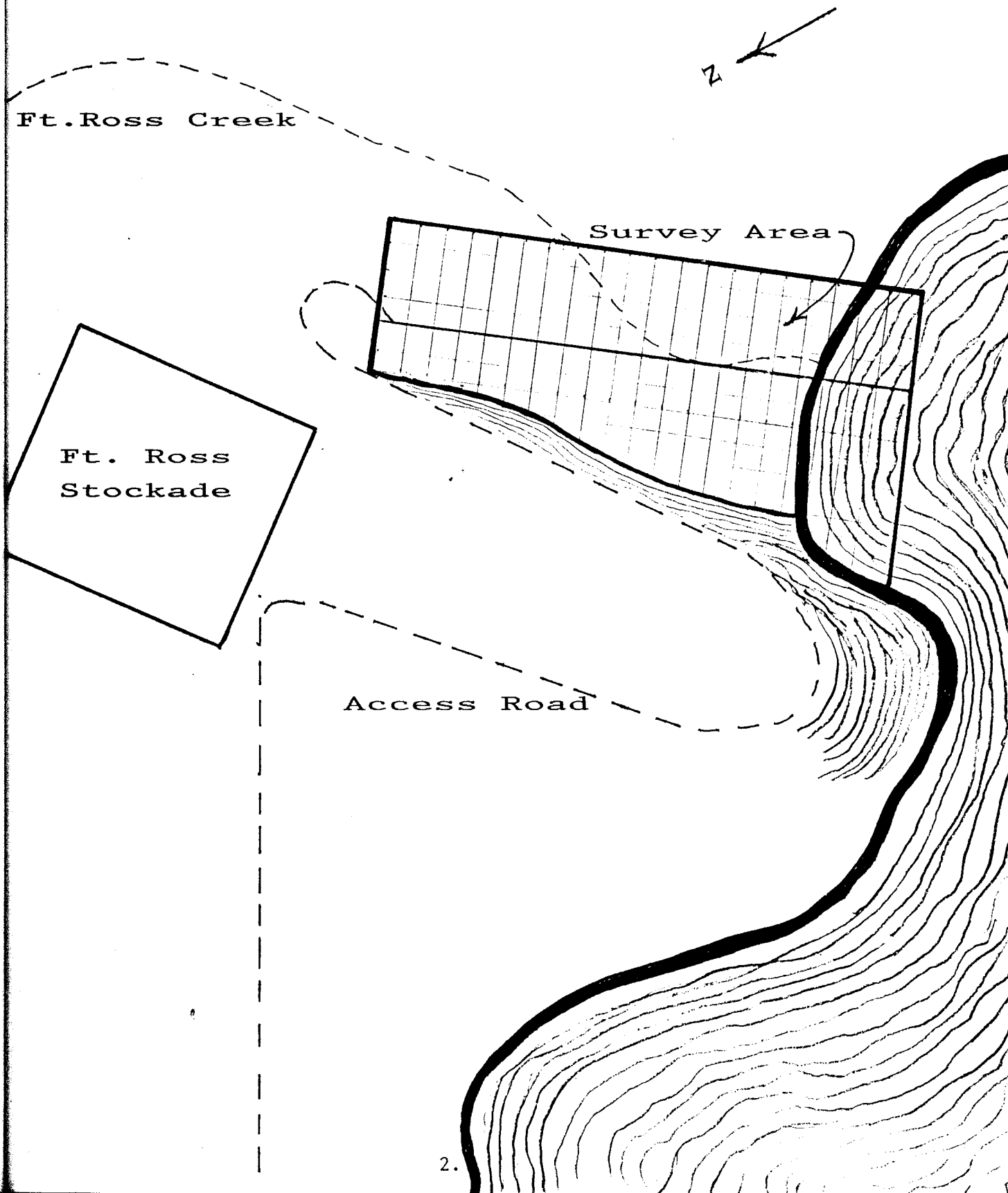
June 1991

INTRODUCTION

Fort Ross State Historic Park, located some 90 miles north of San Francisco on the coastal terrace of the Sonoma County coast, has been the focus of several archaeological projects conducted in conjunction with or under the auspices of the California Department of Parks and Recreation. The present investigation, a magnetometer survey to determine the location of the Fort's shipyard, was conducted in the Fort Ross cove area during August and September of 1990 under contract number 4-827-1006 issued by the Department of Parks and Recreation. A permit to conduct this archaeological investigation was issued by the Department of Parks and Recreation on July 11th, 1990. This investigation is the first phase of a three phase study of the shipbuilding industry which occurred at the Ross colony during the years 1816 to 1827.

The project study area is located in the small cove south of and below the Ross stockade. The area surveyed begins at the end of an access road servicing the cove, extends 300' in a southwest direction across the beach and ends 60' beyond the shoreline in the waters of the cove. The northwest-southeast boundary begins at the base of a bluff on the cove's northwestern side and extends in a southeastern direction across the beach and cove, measuring 180' at the widest point. Figure 1 is an illustration of the survey area.

Figure 1



HISTORICAL BACKGROUND

Fort Ross State Historic Park marks the southernmost colonial settlement of the Russian-American Company, a quasi-governmental mercantile company engaged in hunting, processing, and trading the fur of sea otters and other sea mammals during the 18th and 19th century. The Ross colony was established in 1812 by Ivan Kuskov, chief deputy to Aleksandr Baranov, Chief Manager of the Russian-American Company. It was intended to provide both a base for the exploitation of fur-bearing sea mammals and to develop a capability for provisioning the Company's outposts in the North.

Within four years of its founding, the colony had so depleted the surrounding population of sea mammals that the economic benefit of its hunting activity had substantially diminished. Ross was becoming a financial burden on the company. Attempts to develop Ross into an agricultural base from which the northern colonies could be supplied proved unsuccessful. In an effort to create a new economic base, Kuskov introduced shipbuilding in 1816 when the keel was laid for the first sailing vessel built in California.

Vasilii Grudinin, a promyshlennik from the Irkutsk region who had learned the art of shipbuilding in Novo-Arkhangel'sk, was transferred to Ross to begin the enterprise and to train the otherwise unskilled members of the colony. Grudinin had been trained in the shipyard at Novo-Arkhangel'sk by the American shipwright Lincoln [sometimes spelled "Linken"] who had been hired in 1806 by Baranov (Khlebnikov, 1820).

During the period 1816 to 1827, six vessels were constructed in the cove which lay at the foot of the bluff below the Company's fort (Khlebnikov, 1832). In addition, at some point prior to the official commencement of shipbuilding activity, Kuskov himself built a small vessel, referred to as either a small bark (Khlebnikov, 1832) or a rowboat (Kashevaroff, n.d.).

Four of the six vessels built at Ross were constructed specifically for the Russian-American Company's use. The last two vessels built, one in 1826 the other in 1827, were built for sale to the missions. "The Russians ... built in 1826 a new boat with sails and rigging for the Mission at San Francisco for 1200 piastres; and in 1827 also built a fully equipped barge [barque?] for the Mission San Jose for 1500 piastres." (Kashevaroff, n.d.) The four Company vessels were constructed in the shipyard at Ross, launched, then transferred to the Russian port at Bodega, Port Rumiantsev, for fitting-out and loading (Lutke, 1818).

The keel for the first of these vessels, Riumianzoff, was laid in 1816. Finished in 1818, Riumianzoff was rated at 160 tons displacement by Kirill T. Khlebnikov, an officer of the Russian-American Company (Khlebnikov, 1832) but was

described as being only 80 tons by Fedor P. Lutke during his visit to California in 1818 (Lutke, 1818).

Riumianzoff was used in Sitka until 1823, at which time it was abandoned. Described in 1818 as "very well built, judging from its outward appearance" and not looking "as if it had been built by a simple promyshlennik" (Lutke, 1818: 281), Riumianzoff was declared unseaworthy five years after its launching because of "the open rot in all parts" (Khlebnikov, 1833).

Khlebnikov states that the keel of the second vessel built at Ross, the Buldakov, was laid in 1819 (Khlebnikov, 1833: 116) but he is probably in error since Lutke describes the vessel in his diary of September, 1818. Buldakov was finished in 1820 and there are many references in Khlebnikov's travel notes of that year regarding its fitting out at Bodega.

On September 15th, 1820, the keel was laid for the third Company vessel built at Ross. Khlebnikov, who had returned from a visit to Monterey, describes the occasion thusly:

> "Mr. Kuskov wanted to start building a new ship. He did not want to christen it until a new Chief Manager had been appointed. I suggested naming the ship in honor of RAK Director Kramer....Mr. Kuskov agreed to my idea and at 11 o'clock we went to the shipyard, read a prayer, and set to work. An hour later, we raised the Company flag on the sternpost of the new ship. We congratulated Mr. Kuskov, drank a glass of wine, and gave each of the workers and Aleuts a cup of rum. The ship is 60 feet long at the keel, and almost all the wood used in its construction was prepared here" (Khlebnikov, 1820: 86).

Sometime between its christening and its completion in 1822, the vessel was officially named the Volga, despite Khlebnikov's suggestion. It was a vessel of 160 tons and was used heavily, frequently travelling between Company headquarters in the north and the southern colony at Ross. In 1827 the ship was sent to the island of Atkha where it was put into use as a storage vessel for lumber.

In 1823 construction of a fourth Company vessel began at the shipyard at Ross. Completed in 1824, the 200 ton vessel Kiakhta was launched on August 9th and was taken to the port of Rumiantsev [Bodega] the next day. Its maiden voyage was to Monterey where, on August 22nd, it arrived to be impatiently greeted by Khlebnikov, who had been awaiting its arrival for several weeks. Although his notes of 1833 describe the vessel as having a displacement of 200 tons, Khlebnikov records it as being of 120 tons when describing his business transactions with Spanish in Monterey, possibly indicating he had intentionally falsified its size to reduce the amount of duty he was to pay.

Subsequent references to the vessel are scarce. It apparently saw limited service along the coast with an occasional trip to the northern outposts and was abandoned after a few years.

Little is known at this point about the two vessels built for the Spanish missions. Certainly nothing in the Russian documentation examined to date gives any information about them. An examination of the Spanish records, more complete and accessible than those remaining records of the Russian-American Company, should be of some help in this regard.

PROJECT BACKGROUND

The commonly accepted explanation for the failure of the Ross shipyard to perform as a long-term economic enterprise is that the wood chosen to build the ships was both unsuitable and improperly prepared for its application, leading to the premature deterioration of the vessels. Whether this was actually the cause of each ship's demise is open to speculation. Of equal likelihood is the fact that the ships were simply poorly designed and constructed by Grudinin, the furhunter-turned-shipwright.

This project is an attempt to identify the location and design of the shipways used in the construction of the vessels. Since neither the vessels built at Ross nor their remains are available for study, a study of the archaeological remains of the shipyard may provide some insight into the level of craftsmanship employed in the construction of the ships. The overall project will address three questions that pertain to the construction of the six vessels constructed at Ross between 1816 and 1827: (1) Given the technologically unsophisticated environment typically found in a frontier outpost, were modifications in 19th century shipbuilding techniques necessary to produce the vessels at Ross? (2) Can the design of the vessels and the level of craftsmanship employed in their construction be determined through an examination of the design and construction of the shipways? (3) Can data be developed so that a comparison can be made between the design and construction of the shipways at Ross and those that may be found in the Russian-American Company's shipyards at Sitka and Kodiak?

INVESTIGATIVE PROCEDURES

To address these questions, the project has been divided into three phases. The first phase, which forms the subject of this report, consisted of a magnetometer survey of the beach and cove areas. Phases 2 and 3 involve a refinement of the magnetic survey, testing of the anomalies, and excavation to an extent that will vary with the results of the testing.

Magnetic anomalies identified through the Phase 1 survey may reflect either disturbance of the soil from human activities (i.e.) shipbuilding, or may reflect the actual presence of the remains of the construction or launching facilities. Phase 1 of the project was conducted over a three week period in August and September of 1990. Project personnel consisted of James Allan, who served as project director, and seven volunteers who generously gave of their time during the course of the field work. Through the efforts of Paula Sapunar, Dave Makin, Cookie Hirn, Thelma Coyle, Bill Allan, David Edelsohn, and Pam Canales a great deal of work was accomplished in a relatively short period of time.

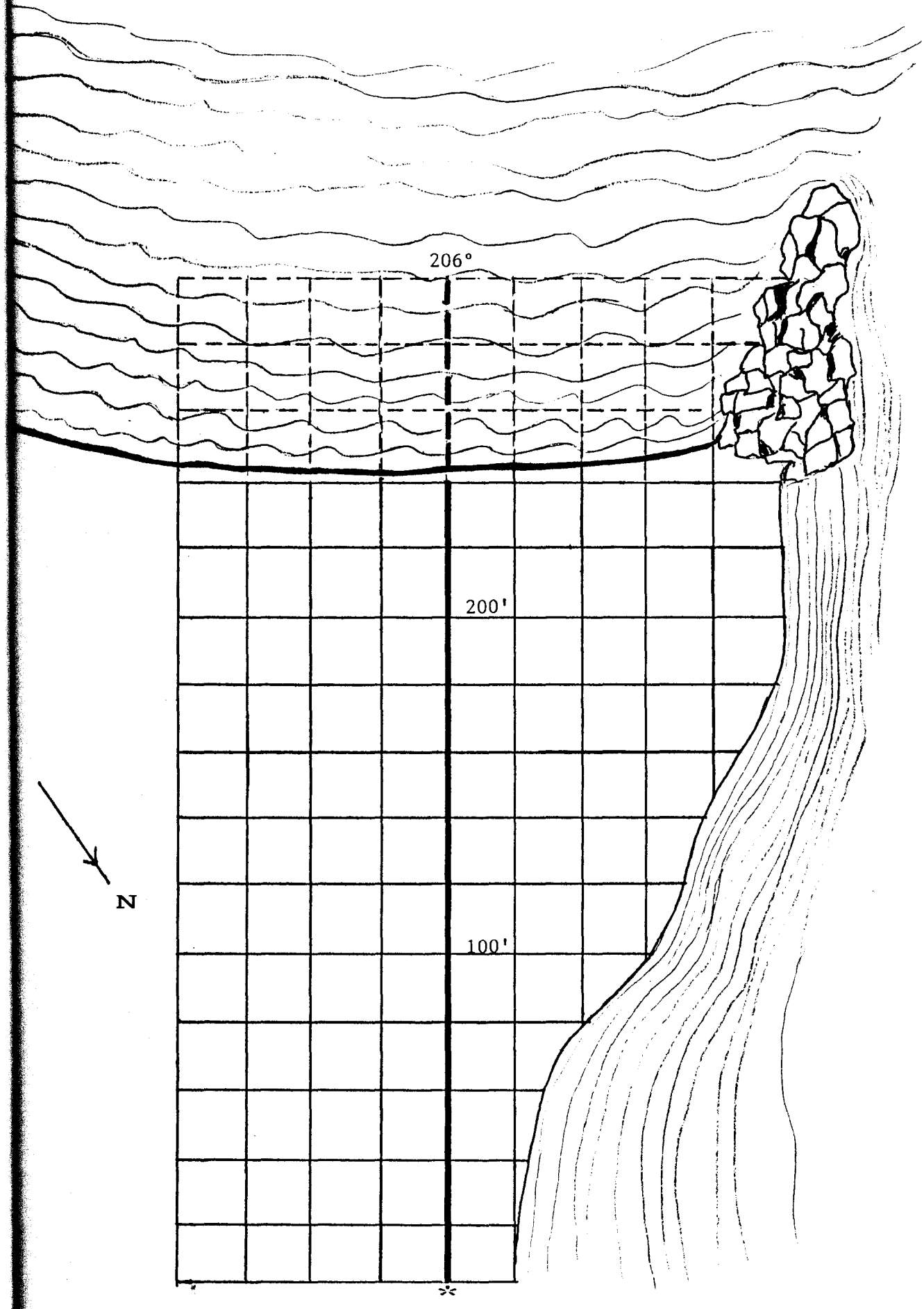
Survey Procedures

Field work commenced with the establishment of a grid system over the survey area (see Figure 2). A datum was established at the foot of the access road. From the datum a 240'base line was surveyed at 206^{o} which crossed the beach and extended an additional 60'into the waters of the cove. At 20'intervals along the length of the baseline, perpendicular transects were surveyed which extended in variable lengths on the northwest side, running from the baseline to the bluff, and which extended a uniform 80' from the southeast side of the baseline. Each perpendicular transect was staked at 20' intervals, creating a grid of 20' squares.

When a ship is launched, the launching way must extend into water deep enough to allow the ship to float-off the way. Consequently, it was necessary to also survey both the surfline and near-shore waters of the cove to determine what, if anything, may remain of the launching structure. To that end, a magnetometer designed for underwater use was loaned to the project by the Program in Maritime History and Underwater Research at East Carolina University, Greenville, North Carolina. This was used for both the underwater and terrestrial portions of the survey.

In the terrestrial portion of the survey, readings were taken at the corners and the center of each 20' square. A project volunteer held the magnetometer sensor over each location until the reading stabilized and was recorded. Care was taken to insure that the sensor was oriented in the same

Figure 2



direction and held at the same height for each reading and that the volunteer was free of any metallic objects that would have distorted the readings. The process of reading each square's corners insured that each corner received multiple readings. This served to average the distortions in individual readings.

The underwater portion of the survey was divided into two components: the surfline and near-shore waters were each surveyed separately. The survey of the surfline area was essentially a continuation of the procedure used on the beach. Volunteer Dave Makin, suitably equipped in a drysuit, followed the visual extension of the baseline into the surfline. Holding the sensor in one hand and the end of a ranging line in the other, he was observed through the transit and directed along a line that was a continuation of the baseline. The ranging line, marked in 20' increments, was attached to the baseline's last beach stake. Distance into the surfline from this last stake was controlled by the ranging line. The sensor head was lowered into the water and held at a uniform height above the bottom. Readings were taken at 20' intervals along the baseline extension until a depth was reached in which it was too deep to stand. The same procedure was used to extend into the surfline each transect that paralleled the baseline. This enabled us to extend the grid system as much as an additional 60' into the water's of the cove.

Although this method precluded the possibility of reading each underwater "square's" corners more than once, the readings taken at each corner were far more uniform than those taken on the beach. Unlike the terrestrial readings, then, it was not necessary to average-out any distortions in this data.

The near-shore waters, in which it was too deep to stand, were surveyed by boat. The magnetometer was placed in a 16' inflatable Zodiac with the sensor head trailing from the stern at both a uniform distance from the boat and height above the bottom. Two surveying transits were established on the beach and their respective locations were tied into the grid system. Unlike the survey of the surfline area that paralleled the baseline along the northeast-southwest grid axis, this area was surveyed along the northwest-southeast grid line, parallel to the shoreline. As in the survey of the surfline area, a ranging line marked in 20' increments was used to control distance from the last transect which paralleled the shoreline. This ranging line was held at one end by the boat operator and at the other by a volunteer who walked along the last transect. The boat carried the sensor head along a course which paralleled the last beach transect. As readings were taken from the sensor, shot marks were called out from the boat over a hand-held radio to the two transit operators who were following the boat through the transit scope. Readings from each transit were noted for each shot mark along each boat transect. By triangulating these readings, the location of each shot mark

and its respective reading was later transferred to the map of the survey area. Three transects were made in alternating directions which paralleled the shoreline. This enabled us to extend the survey area 100' into the waters of the cove.

Survey Constraints

Because of financial considerations, we were limited to using one magnetometer for surveying both the terrestrial and underwater portions of the site. The small boat magnetometer we employed was designed for underwater use and performed to expectations when used in that environment. However, its use during the terrestrial portion of the survey involved something of a compromise in accuracy since it was not designed for that application. Since the underwater portion of the survey formed an essential component of Phase 1, we decided this compromise was justified and feel the results of the survey bear this out.

The magnetic background in the survey area is "noisy". Because of its strength, this noise tends to cover the subtle variations in the magnetic field that were the subject of our search. Use of a dual-station magnetometer to provide simultaneous readings at both the site and a remote station would have enabled us to account for this interference and would have improved the sensitivity of the terrestrial survey. However, it would have also precluded the underwater portion of the survey.

Lou Sommers, a remote-sensing expert, described the compromise we accepted as akin to looking at the sun through heavily tinted glasses in which the lenses would filter out all but the brightest portion of sunlight. In similar fashion, the magnetic "noise" would filter out or hide all but the strongest magnetic variations which the sensor could "see".

RESULTS

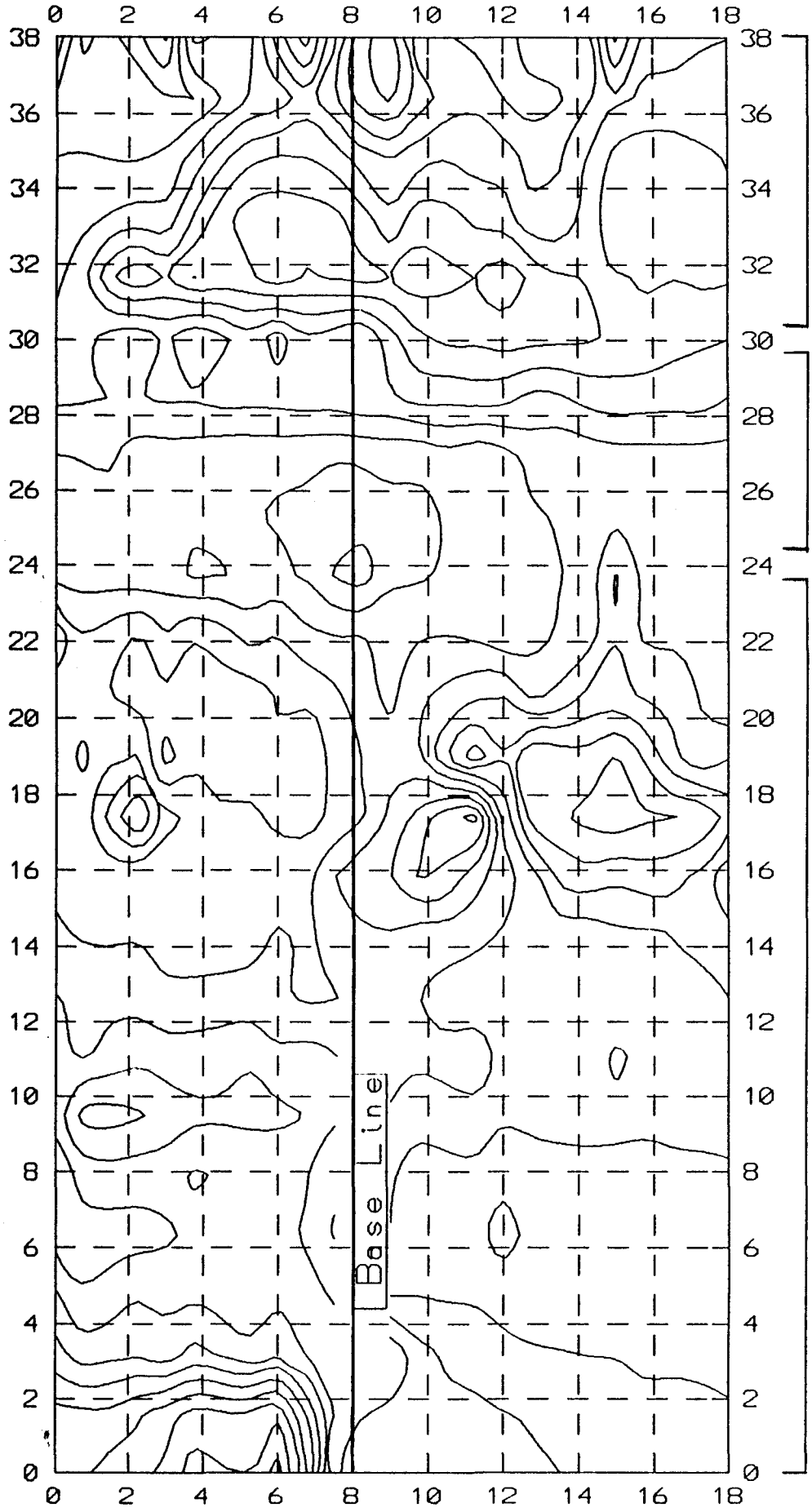
Despite these constraints, the survey in the terrestrial and underwater portions of the site produced readings of sufficient consistency and accuracy to enable us to produce a magnetic contour map of the site. This map is illustrated in Figure 3.

The contours on this map describe an area of significant magnetic variation on that portion of the beach which would have logically been the site of the shipyard. An 1817 map of the Ross settlement (Figure 4) shows the brig Riumianzoff under construction in precisely this area of the beach.

The survey of the surfline area provided the most consistent data, indicating very little magnetic variability. This is represented in Figure 3 by a series of horizontal contours which are nearly parallel to each other.

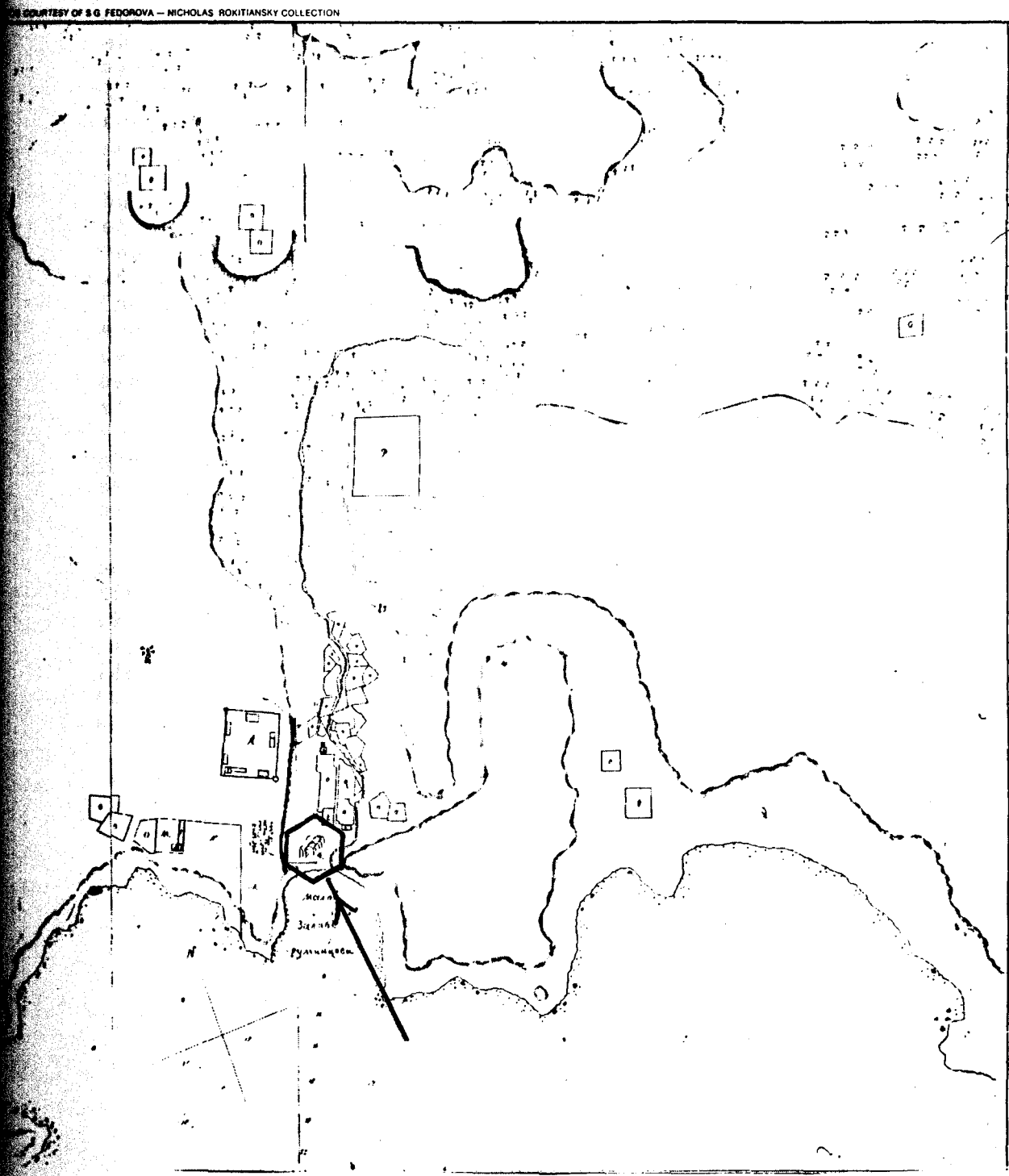
The contours of the data obtained in the survey of the deeper waters of the cove are not particularly revealing. There are no apparent magnetic anomalies in this area but both this area and the surfline should be re-examined as described below.

Magnetic Contour Map - Ft. Ross Cove



ure 3

Figure 4.



ASSESSMENT OF THE FINDINGS

The anomalous readings concentrated on that portion of the beach suspected of being the location of the shipyard could very well be an indication that something of the shipyard still remains beneath the sand. Throughout the writings of Khlebnikov and Lutke, reference is made to the shipbuilding enterprise and frequent reference is made to the structures built to accommodate both the construction activities and the launching of the various vessels. This underscores the fact that there were indeed specifically-built foundations and frameworks employed in this activity, eliminating the possibility that the vessels were constructed with temporary shoring structures, then dragged across the beach for launch. The descriptions of these facilities indicate the structures were of substantial size and in virtually uninterrupted use during the eight year period in which the four company ships were being built, and again later when the two vessels were built for the missions. It is highly likely that, given the long-term use to which these were put, they were built as permanent additions to the colony's capital equipment and that something of them may remain beneath the sands of the cove's beach.

Nails of the type used to sheath vessel hulls have been and are still frequently found in this area of the beach after storms have disturbed the site's surface area (Walton, 1990). Although it is not possible to describe these nails categorically as sheathing nails, they are virtually identical to nails used for that purpose. Their presence in that area of the beach being studied adds weight to the argument that the shipyard was located there.

ADDENDUM TO THE FINDINGS

Through the kindness of John Foster, Underwater Archaeologist for the California Department of Parks and Recreation, an 1866 photograph of the fort and cove area was brought to our attention (Figure 5). Prominent in this photo is a large barn and corral situated on the beach below the fort's stockade. Because of the barn's proximity to the area in which the anomalies registered, it was necessary to determine whether or not our readings were the product of either the barn's sub-surface remains or the disturbances associated with its presence near the site. To that end, we employed a technique developed by Gene Prince of the Lowie Museum of Anthropology at the University of California, Berkeley, (Prince, 1988) in which a transparency of a photo is placed on the focusing screen of a 35mm camera. A view through the camera then produces a view through the transparency. We located the position from which the 1866 photo had been taken and with this technique, and the slight adjustment provided with the use of a zoom lens, were able to superimpose the 1866 view of the fort onto the present landscape. By insuring that the blockhouse and chapel in the transparency were placed over the camera's view of the actual structures, we were able to lock-in the position of the barn on today's beach. Hand-held radios were used to direct project staff members who were on the beach and visible through the camera. The corners of the building, location of the main door and the direction and run of the corral behind the barn were marked with surveyor's flags. These flags were then surveyed into the site map relative to the datum established for the baseline.

By determining the location of this building, we were able to eliminate it as a contributor to the readings we received from the magnetometer, which further strengthens the suspicion that the anomalies are caused by activities associated with the shipyard.

The 1817 map of the colony shows a building, labeled "barn", and a corral in this location. This may very well be the same building described in the 1879 History of Sonoma County as that whose rear half was "used for the purposes of tanning leather" and whose front half "was used as workshop for the construction of ships." (Munro-Fraser, 1880: 367).

Figure 5.

Sources Consulted

Bancroft, Hubert Howe. California Pastoral. The Works of Hubert Howe Bancroft, vol. 34. San Francisco: The History Company, 1888.

_____. History of Alaska, 1730-1885. The Works of Hubert Howe Bancroft, vol. 33. San Francisco: The History Company, 1886.

_____. History of California. The Works of Hubert Howe Bancroft, vols. 34. 18-24 .San Francisco: The History Company, 1884-90.

Bandini, Jose. A Description of California in 1828. Translated by Doris Marion Wright, Bancroft Library Publications Number Three. Berkeley: Friends of the Bancroft Library, 1951.

Blue, George Verne, ed. "The Report of Captain La Place on His Voyage to the Northwest Coast and California in 1839." California Historical Quarterly 18 (December, 1939): 315-28.

Bunje, Emil Theodore Hieronymous; Penn, H.; and Schmitz, Frederick Joseph. Russian California, 1805-1841. Cultural Contributions of California, Bay Cities Series, W.P.A., California Cultural Research. Berkeley, 1937. Photocopy reprint. San Francisco: R and E Research Associates, 1970.

Chevigny, Hector. Russian America: The Great Alaskan Adventure 1741-1867. Portland: Binford and Mort, 1979.DuFlot de Mofras, Eugene. DuFlot de Mofras's Travels on the Pacific Coast. Translated, edited and annotated by Marguerite Eyer Wilbur, 2 vols. Santa Ana, California: Fine Arts Press, 1937.

Fedorova, Svetlana Grigorevna. The Russian Population in Alaska and California, Late 18th Century-1867. Translated and edited by Richard A. Pierce and Alton S. Donnelly. Materials for the Study of Alaska History, No. 4. Kingston, Ontario: The Limestone Press, 1973.

Fisher, R.H. Records of the Russian-American Company: 1802, 1817-1867. Washington, D.C.: National Archives, 1971.

Gibson, James R. "Russian in California, 1833: Report of Governor Wrangel." Pacific Northwest Quarterly 60 (October, 1969): 205-15.

_____. "Russian America in 1821" Oregon Historical Quarterly 77 (June 1976): 174-88.

_____. "Russian America in 1833: The Survey of Kirill Khlebnikov." Pacific Northwest Quarterly 63 (January, 1972): 1-13.

Golovnin, V.M. Around the World on the Kamchatka, 1817-1819. Translated by Ella Lury Wiswell. Honolulu: Hawaiian Historical Society, 1979.

Kashevaroff, A.P. Letter in Alaska Magazine, vol 1, No. 5 (235-242).

Khlebnikov, Kirill. The Khlebnikov Archive: Unpublished Journal (1800-1837) and Travel Notes (1820, 1822, and 1824). Translated by John Bisk. Edited by Leonid Shur. Alaska: University of Alaska Press, 1990.

_____ Colonial Russian America: Kyrill T. Khlebnikov's Reports 1817-1832. Translated by Basil Dmytryshyn and E.A.P. Crownhart-Vaughan. Portland: Oregon Historical Society, 1976.

Kotzebue, Otto von. A New Voyage Round the World, in the Years 1823, 24, 25, and 26. 2 vols. London: H. Colburn and R. Bentley, 1830. Facsimile ed., 2 vols. Amsterdam: N. Israel; NY: DaCapo Press, 1967.

Lutke, Fedor P. Observations on California: The Diary of Fedor P. Lutke During His Circumnavigation Aboard the Sloop Kamchatka, 1817-1819. Edited by Basil Dmytryshyn, E.A.P. Crownhart-Vaughan, Thomas Vaughan. Vol. 3, The Russian American Colonies: Three Centuries of Russian Eastward Expansion, 1798-1867. Portland: Oregon Historical Press, 1989.

Munro-Fraser, J.P. History of Sonoma County.... San Francisco: Alley, Bowen & Co., 1880. Facsimile reprint ed. Petaluma, California: Charmaine Burdell Veronda, 1973.

Ogden, Adele. The California Sea Otter Trade, 1784-1848. Berkeley and Los Angeles: University of California Press, 1941.

Okun, Semen. The Russian-American Company. Ed. by B.D. Grekov; translated by Carl Ginsberg. Russian Translation Project Series of the American Council of Learned Societies, 9. Cambridge, Massachusetts: Harvard University Press, 1951.

Pierce, Richard A., translator. The Russian American Company: Correspondence of the Governors. Communications Sent - 1818. Alaska History Number 25. Ontario: Limestone Press, 1984

Prince, Gene. "Photographs for Discovery and Scale by Superimposing Old Photographs on the Present-Day Scene", Antiquity, vol. 62, no. 234, 1988, pp 112-116.

Thompson, R.A. The Russian Settlement in California: Fort Ross, Why the Russians came and Why They Left. Oakland: Biobooks, 1959.

CONCLUSIONS AND RECOMMENDATIONS

The convergence of several lines of evidence raises the strong possibility that the Phase 1 portion of this project may have isolated that area of the Fort Ross beach used as a shipyard from 1816 through 1827. Evidence is found in the results of the magnetometer survey which define an area of magnetic disturbance in that portion of the beach site that logically would have served as the shipyard. In addition, the 1817 map of the colony depicts the Riumianzoff under construction in this same area of magnetic disturbance. Further evidence may be seen in the fact that nails of a type normally used to sheath a ship's hull have been found in the vicinity of the anomalies. Finally, a building has been located in a position that is close to and behind the suspected shipyard. There is a strong possibility this was the same building described in contemporary writings as being behind the shipyard and used as a workshop in the shipbuilding enterprise.

Based on this evidence, it is recommended that the Phase 2 magnetometer survey and testing of anomalies be undertaken. In the Phase 2 survey, a dual station magnetometer will be used that will filter much of the magnetic background noise at the site. This will enable us to more precisely locate the anomalies, which may then be individually examined through the installation of small test pits. Although the results of the underwater portion of the Phase 1 magnetometer survey indicate that little or nothing of the launching ways remain under the bottom of the cove's surfline, the possibility that something may still remain should not be completely ruled-out at this point. If, in testing the anomalies on the beach, evidence is found that supports the presence of the shipyard, then that area of the surfline which is visually in-line with the evidence should be tested on SCUBA by means of probes and hand-fanning.