From the Pilot House

This issue of *Cheesebox* marks a very important milestone in NOAA's stewardship role at the *Monitor* National Marine Sanctuary. With the issuance of the draft comprehensive preservation plan, "Charting a New Course for the *Monitor*," NOAA has taken a bold stance on the need to act decisively to ensure that the *Monitor*, or at least significant portions of its hull and contents, will be preserved for future generations. As this issue reports, the draft preservation plan was submitted to Congress in November, and comments and suggestions are now being sought from all segments of the professional and lay communities.

The first big step has been taken toward preventing the collapse and disintegration of the *Monitor*; however, the difficult work is yet to come. Advanced planning and on-site research must be carried out simultaneously in order to accomplish the stated goals. NOAA will be counting heavily upon the assistance of The Mariners' Museum and other governmental and non-governmental partners in finding the means to carry out this ambitious plan. As we examine the tasks before us, we are excited, yet apprehensive. The *Monitor* needs and deserves our help, and the actions recommended in the draft preservation plan appear to answer those needs; on the other hand, the plan calls for expensive and difficult engineering operations for which complete success cannot be guaranteed. One thing is certain, however: if no action is taken to preserve the *Monitor*, the Sanctuary will soon contain only an unrecognizable mound of debris. As we pass the 135th anniversary of her sinking, I hope we can offer the *Monitor* a more optimistic future.

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Monitor

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level of priority assigned to large scale stabilization and/or recovery operations at the *Monitor* National Marine Sanctuary should be in proportion to both the documented and perceived significance of this historic ship, its value to the public, and the long-range goals of the National Marine Sanctuary Program. The praise received by the USS *Monitor* over more than a century and the sustained high level of public interest and excitement over the wreck since its discovery in 1973 suggest that the site has significance to the American public that transcends Federal guidelines and National Register criteria.

Comments are encouraged on the plan through Feb. 2. Copies of the full draft preservation plan can be obtained by contacting

Dina B. Hill, Education Coordinator
Monitor National Marine Sanctuary
The Mariners' Museum
100 Museum Drive
Newport News, VA 23606
Telephone: 757-599-3122
Fax: 757-591-7353
email: dhill@ocean.nos.noaa.gov

The plan is also available on the Web at http://www.nos.noaa.gov/nmsp/monitor/

The Next Steps

Planning efforts are continuing into Fiscal Year 1998 with several key objectives. First, once NOAA has reviewed all comments on the draft preservation plan, Sanctuary staff will begin revising and updating the draft plan; simultaneously, a scope of work will be prepared for development of detailed plans for stabilization/recovery and conservation; in addition, during the summer of 1998 NOAA expects to conduct a large-scale research diving expedition to the Sanctuary to initiate early survey and mapping activities that must precede shoring work. Recovery of loose materials will also be carried out. By late 1998 or early 1999 a comprehensive final preservation plan should be nearing completion and efforts to generate the necessary funds will be underway.

***Monitor* National Marine Sanctuary**
The Mariners' Museum
100 Museum Drive
Newport News, Virginia 23606-3759

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Monitor National Marine Sanctuary Activities Report
CHEESEBOX

Volume IX, No. 2 **December 1997**

Charting a New Course for the *Monitor*

As we reported in the last issue, NOAA has determined that the Monitor's *hull has begun to deteriorate at an alarming rate. In 1996 Congress mandated the Secretary of Commerce to produce a "long-range, comprehensive plan for the management, stabilization, preservation, and recovery of artifacts and materials" from the* Monitor. *NOAA, on behalf of the Secretary, developed the plan Charting a New Course for the* Monitor, *key portions of which appear in this issue. Because of the* Monitor's *exceptional historical significance and the severity of the current threat to its hull and contents, NOAA elected to release this preservation plan in draft form in order to allow experts, interested parties, and the public at large to review and comment on the plan. Copies of the plan are available from the* Monitor *Sanctuary office. The plan has also been published on the Internet.*

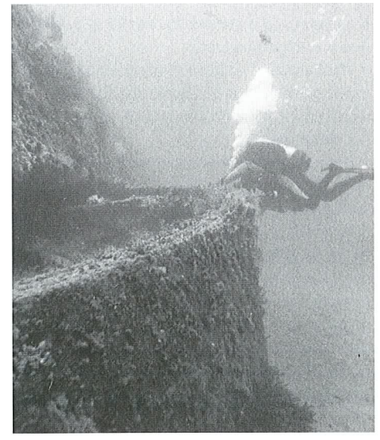
The Draft Preservation Plan developed by NOAA presents a variety of possible options for the stabilization and preservation of the *Monitor*, discusses the advantages and disadvantages of each option and presents preliminary cost estimates. Also included are supporting data from engineering, archaeological and historical reports.

This draft plan recommends that the *Monitor* be preserved through a combination of stabilization and selective recovery options. The technological requirements can be met by several ocean engineering firms; however, since the combined costs of stabilization, recovery and conservation are estimated to be in excess of $20 million, possibly the greatest challenge for NOAA will be to create a partnership of interested organizations that can generate the required funds. The next phase of planning includes detailed engineering and conservation plans and a "business" or funding plan.

A final decision on which option or options are selected for preservation of the *Monitor* will involve considerations of technological feasibility, probability of success, review under the National Historic Preservation Act section 106 process and other applicable laws, consistency with the Division's Strategic Plan, and funding. NOAA is confident that this preliminary plan contains the necessary information for decision-making and for moving to the next phase of planning and preservation.

Review of Options for Preserving the *Monitor*

This section describes and discusses a wide range of options for comprehensive preservation and management of the *Monitor* National Marine Sanctuary. In developing these options, NOAA reviewed all previous reports and proposals for on-site activities, including papers presented at a *Monitor* conference in 1978 in Raleigh, North Carolina, previous engineering and corrosion reports, and the Draft Revised Management Plan for the *Monitor* National Marine Sanctuary, all of which addressed preliminary studies and recommendations. In addition, NOAA held informal discussions with numerous engineers, archaeologists, and other specialists in order to identify potential new technology that could be applied to the *Monitor* situation. This report presents all options for stabilizing and/or preserving the *Monitor* that were identified by NOAA as being viable. Time and budget constraints have prevented full development of the options; however, this plan contains sufficient information to permit the formulation of a comprehensive phased approach to the problem.



***View of the interface between the turret and armor belt, looking forward* (Photo ©1997 Joe Poe, Farb *Monitor* Expeditions).**

The following options are presented along with advantages, disadvantages, required action and estimated costs. Advantages and disadvantages address potential impacts to the *Monitor* and its contents. Then the options are discussed and compared, and recommendations are presented. A preliminary analysis of these options was developed for NOAA and the U.S. Navy by Oceaneering International, Inc. at no cost to the government. It should be noted that cost estimates presented herein are for evaluation purposes only. No final estimates are available and no funding sources have been identified.

Options

1. Non-intervention:

This option could be selected if it is determined that on-site stabilization and/or recovery operations are beyond the technological and budgetary capabilities of NOAA. NOAA would continue to manage the *Monitor* National Marine Sanctuary in accordance with current policy. NOAA and/or private researchers would continue to conduct periodic on-site inspections; the resulting data would be documented and

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disseminated; NOAA would continue to work cooperatively with private diving expeditions for the recovery of small artifacts that are exposed and in danger of damage or loss; NOAA would continue to maintain a strong education program. The cost to NOAA for this option would be within current budgetary limits.

Advantages:

• This option requires no additional NOAA commitments;

• The *Monitor* would remain an active site to be visited by researchers and recreational divers, although the location limits access to only a few;

• No supplementary funds would be required.

Disadvantages:

• The *Monitor* would continue to disintegrate at an accelerated rate due to natural causes;

• The *Monitor* may also continue to be damaged by illegal human activities (e.g., anchoring and commercial fishing);

• This option would eventually result in the inevitable collapse of the hull and loss of much of the remaining cultural material and archaeological information.

Action required: None. NOAA would continue the current management program.

Estimated cost: None. This option requires no additional NOAA commitments or funding.

2. *In Situ* Preservation by Encapsulation

This option could decrease the rate of deterioration without removing the *Monitor* or parts of the *Monitor* from their current location. This would include some form of capping that would entomb the *Monitor* in an acceptable manner (i.e. covering with sand, grass mats, etc.) Possibly the simplest method would be to pump sand from the surrounding area under, around and over the *Monitor*, then covering the site with crushed stone and/or some type of stabilizing matting.

Advantages:

• The *Monitor* would no longer be exposed to damage from an oxygenated marine environment, strong currents, anchors, divers or commercial fishermen;

• Operating costs would be greatly reduced, since on-site research would be limited to a periodic site inspection;

• The method is relatively simple and could be accomplished with conventional equipment.

Disadvantages:

• The *Monitor* would no longer be visible or readily accessible, and public interest in the site would likely wane;

• The responsibility for research and recovery of artifacts would be delegated to future generations;

• Encapsulation would have to be preceded by shoring, since the weight of the sand might otherwise collapse the hull;

• Even with hull shoring, damage to interior components could result from the weight of encapsulating sand;

• Encapsulation would not eliminate the deterioration process, so the hull would inevitably collapse at some future time; in fact, the weight of sand in and over the hull could, itself cause further collapse.

Action required: Detailed engineering and corrosion plans would have to be developed by consultants; a review would have to be conducted under section 106 review process; funds would have to be obtained for procurement of the necessary planning and implementation phases; and a long-term monitoring program would have to be established.

Estimated cost: No accurate estimate available, but probably $4-5 million.

3. *In Situ* Preservation by Shoring

This option could decrease the rate of deterioration without removing the *Monitor* from its current location. Shoring would be accomplished through the use of approved methods and materials, such as sand bags, grout bags or jacks to support portions of the hull that are suspended above the bottom by the position of the turret.

Advantages:

• The *Monitor* would remains visible and accessible for future research;

• The collapse of the upper hull could probably be delayed by at least 5 to 10 years;

• The cost for this option would be moderate, compared to the recovery options discussed below.

Disadvantages:

• Since the *Monitor* would still be exposed, it would continue to disintegrate due to natural and human causes;

• The appearance of the wreck would be unnatural, degrading its scenic and aesthetic value;

• The shoring system(s) would require frequent inspection and expensive maintenance to be carried out at the Sanctuary;

• The inevitable collapse of the hull and loss of much of the enclosed cultural material and archaeological information would be delayed but not eliminated;

• Because of the instability of the hull and the difficulties of installing shoring gear, this option for stabilizing the hull could result in further deterioration or collapse.

Action required: Detailed engineering and corrosion plans would have to be developed by consultants; a review would have to be conducted under section 106 review process; funds would have to be obtained for procurement of the necessary planning and implementation phases; and a long-term monitoring program would have to be established.

Estimated cost: No accurate estimate available, but probably $3-4 million, not counting annual maintenance.

4. *In Situ* Preservation by Cathodic Protection

This option would involve the installation of a passive (sacrificial anode) or active (impressed current) cathodic protection system to reduce the corrosive action from the marine environment.

Advantages:

• The *Monitor* would remain visible and accessible for future research;

• This option utilizes proven and well-established technology;

• The collapse of the hull would probably be delayed by several years;

• The cost for this option would be moderate, compared to the recovery options discussed below.

Disadvantages:

• Since the *Monitor* would still be exposed, it would continue to disintegrate due to natural and human cases;

• Maintenance and replacement of system components would require the use of divers on a regularly scheduled basis;

• As has been reported from past corrosion studies, the degraded condition of the hull would greatly reduce the effectiveness of such a protection system;

• Because of the degraded condition of the hull, cathodic protection would only be effective if combined with mechanical shoring;

• The inevitable collapse of the hull and loss of much of the enclosed cultural material and archaeological information would be delayed but not eliminated;

• Because of the instability of the hull and the difficulties of installing shoring gear, this option for stabilizing the hull could actually result in further deterioration.

Action required: Detailed engineering and corrosion plans would have to be developed by consultants; a review would have to be conducted under section 106 review process; funds would have to be obtained for procurement of the necessary planning and implementation phases; a scheduled maintenance program would have to be developed and implemented; and a long-term monitoring program would have to be established.

Estimated cost: No accurate estimate available, but probably $3-5 million for shoring and cathodic protection, not counting annual maintenance.

5. Selective Recovery

This option includes a selective approach to recovering hull components and artifacts that are of significant historic value. Objects being considered for selective recovery include the propeller, turret, cannons, engine, and small artifacts.

Advantages:

• The *Monitor* would remain visible and accessible for future research and visitation;

• Significant objects would be recovered, conserved and placed on exhibit where they could be viewed and appreciated by large numbers of people;

• The recovered objects would be preserved and made available to the public indefinitely, regardless of the fate of the remaining hull and contents;

• The cost for this option would depend upon the numbers and types of objects selected for recovery, but would be far less expensive than recovery of the entire hull and its contents.

Disadvantages:

• Because of the instability of the hull and the difficulties of conducting recovery operations at the Sanctuary, recovery could result in severe collateral damage to the hull and contents, including the objects slated for recovery;

• Since the remaining portions of the *Monitor* and its contents would still be exposed, they would continue to disintegrate due to natural and human causes;

• The inevitable collapse of the remaining hull, cultural material and archaeological information may be delayed but not eliminated;

• Because of the depth and adverse environmental conditions, on-site recovery operations would be expensive, particularly for the recovery of large objects.

Action required: Detailed engineering plans would have to be developed by consultants; a review would have to be conducted under section 106 review process; funds would have to be obtained for procurement of the necessary planning, mapping, recovery, conservation and exhibition phases; and a long-term monitoring program would have to be established.

Estimated cost: Approximately $10 million for recovery, plus an additional $8-10 million for conservation for a total of $18-20 million. This estimate does not include costs for annual inspection and maintenance of the site.

6. Full Recovery

In this option , the entire hull, turret, cannons and all contents would be recovered, conserved and, eventually, displayed; this could propose recovery of the entire hull as a single unit or, alternatively, recovery in a series of smaller recoveries.

Advantages:

• If successful, the entire *Monitor*, all its equipment and stores, and all military and personal effects would be preserved and would be accessible for exhibition;

• NOAA would no longer be required to expend funds to maintain the Sanctuary or to conduct expensive offshore research and monitoring activities.

Disadvantages:

• Because of the depth and adverse environmental conditions, large-scale, on-site recovery operations would be extremely expensive;

• Because of the instability of the hull and the difficulties of conducting recovery operations at the Sanctuary, recovery attempts could result in severe damage to the hull and contents;

• Because of the advanced state of deterioration, conservation would be expensive and time-consuming;

• Because of the advance state of deterioration, the reconstructed hull remains of the *Monitor* might be a visual disappointment to viewers.

Action required: Detailed engineering, recovery and conservation plans would have to be developed by consultants; a review would have to be conducted under section 106 review process; a detailed curation and exhibition plan would have to be developed by consultants; and funds would have to be obtained for procurement of the necessary planning and implementation phases.

Estimated cost: No accurate estimate available, but based on the preliminary estimate for selective recovery, full recovery and conservation costs could be expected to exceed $50 million.

Combined Options

7. Selective Recovery Followed by Encapsulation

This option combines selective recovery (option 5 above) with in situ preservation by encapsulation (option 2 above). Following recovery of all selected hull components and artifacts, the site would be encapsulated for protection of the remaining cultural material.

Advantages and Disadvantages: As presented in the above sections.

Action required: As presented in the above sections.

Estimated cost: No accurate estimate available, but at least $20-22 million, including conservation.

8. Selective Recovery Combined with Shoring

This option combines selective recovery (option 5 above) with in situ preservation by shoring (option 3 above).

Advantages and Disadvantages:

• As presented in above sections.

• Has the advantage of permitting shoring to take place before recovery, thus decreasing the likeli-

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Editor's Corner

December 31, 1997, marks the 135th anniversary of the sinking of the USS *Monitor*. January 30, 1998, marks the 23rd anniversary of the designation of the *Monitor* National Marine Sanctuary. Some of us who have been working on the preservation plan have now been associated with the *Monitor* in one way or another for more (far more!) than twenty years. It remains a fascinating project; the more we do, the more there is to be done.

You will notice some new features in this issue, including "Myths and Mysteries," which will appear occasionally, and "From these poor men great dragons drew their breath," which will be a regular feature. "Myths" will explore misconceptions or mysteries surrounding the *Monitor* and "From these poor men" will feature an officer or crewman. We have begun research for an expanded study of the *Monitor*'s crew that will include the officers. We will combine two previous studies—one on the crew and one on the six commanding officers—and add new material on the other officers, along with material on various crewmen that has come to our attention since the original crew study was published. If we feature one of your ancestors in our new column, please let us hear from you.

Our next issue of *Cheesebox* will be published during the summer of 1998. By then we should have the final preservation plan well under way and will report on the progress.

Chris Barnett is the new Director of Education for The Mariners' Museum and coeditor of *Cheesebox*. Chris holds a master's degree in American History with an emphasis in the nineteenth-century American South. Prior to coming to The Mariners' he worked at the Museum of the Confederacy in Richmond, Virginia, where he acted as the Coordinator of Community programs. He has also worked in the Petersburg Museums in Petersburg, Virginia. While in Petersburg he was site supervisor at Blandford Church, an eighteenth-century Anglican church dedicated to the memory of the 30,000 Confederate soldiers buried there. He currently makes his home in James City, Virginia, with his wife and son.

We welcome Chris and look forward to working with him during this exciting time for the *Monitor*.

And finally we would like to say a big "Thank You!" to young Trey Kellogg of San Antonio, Texas, for his very innovative model of the *Monitor*. Trey used a shoe box, masking tape, and black spray paint to create his model. We have shared his idea with teachers of K through third grade, some of whom have used Trey's ideas in their classrooms. Thanks again, Trey.

hood of collateral damage to the wreck and its contents during recovery;
• Has the additional advantage of leaving the wreck in a stabilized condition following the selective recovery phase;
• Has the disadvantage of additional on-site cost.
Action required: As presented in the above sections; stabilization by shoring would precede recovery.
Estimated cost: No accurate estimate available, but at least $20-22 million, including conservation.

9. Expanded Enforcement of Sanctuary Regulations

There is evidence of increased illegal encroachment on the Sanctuary. In addition to the destructive 1991 anchoring incident, increasing quantities of commercial and sport fishing gear are being found on the site. Regardless of which of the above options is selected, NOAA will continue to review its enforcement policy in cooperation with the U.S. Coast Guard and the National Marine Fisheries Service; however, because of the *Monitor*'s remote location, it is not likely that enforcement efforts can be expanded to any appreciable degree.
Advantages: An expanded enforcement program could provide an increased level of protection for the *Monitor*.
Disadvantages: Distance of the Sanctuary (approximately 21 miles offshore from the nearest inlet) makes it impossible to provide more than periodic surveillance of the *Monitor*.
Action required: Periodic review of cooperative agreements with the U.S. Coast Guard and the National Marine Fisheries Service, as well as expanded efforts at educating commercial and sport fishermen of Sanctuary regulations.
Estimated cost: Both the Coast Guard and Fisheries Service are already engaged in enforcement activities in the Hatteras area; costs associated with expanded enforcement would be for providing coverage further offshore than necessary for currently mandated routine surveillance.

Recommended Option

Final Considerations

In deciding what, if any, large components are to be recovered from the *Monitor*, consideration should be given to several critical factors, especially technological feasibility, conservation and curation facilities, and financial capability. The decision to recover, conserve and curate (retain and care for in perpetuity) large objects that have been deteriorating in sea water represents a major long-term commitment of resources. The historical and archaeological significance of the object must be weighed against factors such as the condition of the object, diagnostic importance, size and weight, exhibit potential and available and projected curation resources.

The *Monitor* is almost completely exposed on the seabed, subject to the ravages of currents, corrosion and commercial fishing activities. The *Monitor*'s hull is under extraordinary stresses due to the configuration of the wreck. It could collapse at any time, an event that would result in severe damage or total destruction of many of the machinery and hull components and a variety of significant artifacts. Therefore, some form of on-site intervention is necessary to prevent catastrophic disintegration of the *Monitor*'s hull and contents.

In reviewing all intervention options, one major decision point is clear: all options involve either preservation by stabilization in situ or preservation by recovery and conservation. Stabilization options can be achieved with less technological difficulty and lower cost than can recovery options; however, stabilization will, at best, only delay the inevitable collapse of the *Monitor*'s hull. Eventually, NOAA will still have to decide if major hull components will be recovered for preservation and exhibition. Therefore, in the present analysis considerable attention was paid to comparing the short-term advantages and disadvantages of stabilization with those of moving directly into large-scale recovery.

Recommendations

The option recommended in this draft plan is selective recovery combined with shoring. This option includes two principal phases: in situ preservation by shoring (option 3) followed by selective recovery (option 5). The first phase would entail shoring up suspended and unstable portions of the *Monitor*'s hull using sand bags, grout bags, jacks, or a combination of methods; the second phase would be the recovery of all selected major components, including the propeller, engine, turret and cannons. Stabilization by cathodic protection is not recommended because of the disadvantages listed previously.

This combined option offers a number of disadvantages while, at the same time, minimizing the drawbacks:
Advantages:
• The stabilized portions of the *Monitor* would remain visible and accessible for future research and recreational visitation;
• The collapse of the portions of the hull left at the site would probably be delayed, possibly by 25 years or more;
• Significant objects would be recovered, conserved and placed on exhibit where they could be viewed and appreciated by large numbers of people;
• The recovered objects would be preserved and made accessible to the public on a permanent basis, regardless of the fate of the remaining hull and contents;
• Stabilizing the hull before commencement of recovery operations would minimize damage to the hull and contents.

Disadvantages:
• Since the remaining portions of the *Monitor* and its contents would still be exposed, they would continue to disintegrate due to natural and human causes;
• The appearance of the wreck would be altered, and its scenic and aesthetic value might be diminished;
• Because of the instability of the hull and the difficulties of conducting on-site operations, there is a possibility that stabilization and recovery efforts could result in collateral damage to the hull and contents, including the objects slated for recovery;
• The inevitable collapse of the remaining hull, cultural material and archaeological information may be delayed but not eliminated;
•The shoring system would require inspection and maintenance to be carried out at the Sanctuary;
• Because of the depth and adverse environmental conditions, on-site stabilization and recovery operations would be expensive, particularly for the recovery of large objects.

Implementation of this option would require a number of related activities over a period of at least three years before on-site stabilization and recovery operations could be completed. The first steps, which will take place during FY98 and FY99, will be the development of detailed plans for stabilization and recovery, archaeology, conservation, exhibition, curation, and business (funding). An environmental assessment will also have to be submitted for review. The business plan will provide a framework for project managers to develop the necessary partnerships or alliances, schedule and fund each phase or activity and track overall fundraising efforts.

Once planning activities are initiated, on-site diving activities can begin the long process of surveying and mapping the site, recovering small artifacts that might be damaged by the major stabilization and recovery operations, and, possibly, initiating the stabilization process. NOAA, the U.S. Navy, and the Cambrian Foundation are now planning a cooperative research diving mission for 1998 that will initiate the necessary mapping and recovery of small artifacts, all of which can take place on an ongoing basis, concurrent with planning activities.

The proposed six major phases of on-site activities are as follows:

I. Pre-shoring Survey, Mapping and Recovery
II. Shoring Beneath the Hull
III. Removal of Skeg, Propeller, Lower Hull and Engine
IV. Removal of Armor Belt Section and Hull Section over Turret
V. Removal and Recovery of Turret
VI. Post-removal Survey and Stabilization

These phases may have to be modified in the final stabilization and recovery plan.

Considerations for Selecting the Recommended Option

The following discussions provide additional considerations that were taken into account in making the final recommendation. Because of the complex nature of deep-water recovery operations, the adverse environmental conditions at the Sanctuary and the historical significance of the *Monitor*, review and comments by outside experts will be solicited and taken into account before final decisions are made and before the preservation plan is finalized. During this review period, the public will also be given an opportunity to review the draft plan. All comments will be reviewed and taken into consideration during preparation of the final plans for the various aspects of the project, including on-site activities, conservation, exhibition, and funding.

Technological Considerations

One of the most important factors to be borne in mind when planning research or recovery operations at the *Monitor* National Marine Sanctuary is the severity and unpredictability of the site environment. The most favorable weather window is historically June through September. Unfortunately that window overlaps the annual hurricane season. A review of NOAA and private expeditions to the Sanctuary since 1990 indicates that on average it was only possible to conduct diving operations on one day in three. That estimate includes expeditions staged from large research vessels and U.S. Navy salvage ships as well as from smaller craft. Therefore, planning must include a generous allocation of time to account for adverse weather. With proper equipment and support, diving and recovery operations can be conducted in relatively heavy weather and strong currents, but conditions at the Sanctuary can change very rapidly, causing potential safety and operational problems.

Planners must also take into account that the *Monitor* is a highly significant historical resource, a National Historic Landmark. The hull may also contain the remains of some of the *Monitor*'s officers and crew, requiring that a plan be developed for the proper handling and disposition of human remains. Therefore, special precautions must be taken to ensure the maximum protection of the hull and its contents during all on-site operations. Some conventional forms of salvage methodology, such as the use of explosives, will probably not be applicable to the project. A preliminary study prepared by Oceaneering International discusses various technological options in more detail, subjects each option to trade-off analysis, and makes recommendations as to which options offer the highest probability of success. The Oceaneering study was incorporated into the draft preservation plan.

For any given option, it is possible to propose several combinations of equipment and procedures to accomplish the desired results. However, a careful and thorough evaluation of each proposed approach should yield a preferred methodology for the given conditions at the Sanctuary. The final choice of methodology and equipment for any of the stabilization and/or recovery options must be made part of a detailed engineering plan, and that plan must be based on the options selected by NOAA.

Stabilization options, including cathodic protection, shoring by mechanical supports and shoring with sand, sandbags or grout bags, even though they are designed to help stabilize the *Monitor*'s hull, pose additional threats to the hull and its contents. The process of installing stabilization material may, if not carried out properly, cause more damage than it was intended to prevent. The plan must take all factors into account, including pressures exerted on the hull during support/sandbag installation, possible incidental damage from equipment and divers during installation, and the potential benefits to be gained from the various options.

Recovery operations will require even more precautions, since the most dangerous phase of any recovery operation is raising large objects through the air-water interface. Such operations should be attempted when sea and current conditions are sufficiently calm to minimize the additional dangers of boat and lifting gear motion. There are countless instances of recovery operations that successfully rigged and raised large objects from the sea bed, only to have them dashed to pieces against the side of a barge or torn apart by the forces created when they were raised from the water and, suddenly, all of their weight was concentrated on a few cables or straps.

Archaeological Considerations

Protection of the *Monitor* and its contents and proper archaeological control of all on-site activities were of paramount importance in the development of the draft preservation plan. The final plan must clearly delineate the responsibilities of all project directors and provide guidelines and thresholds for possible cessation or termination of on-site activities due to weather, technological problems or other factors. All on-site operations must be conducted under the close scrutiny of a qualified archaeologist who is familiar with the *Monitor* and the site. The project archaeologist must have the authority to halt operations if, in the opinion of the archaeologist, continuation might damage the *Monitor* beyond acceptable limits.

Archaeological survey, mapping and small-object recovery operations must take place before any large-scale stabilization or recovery operations commence. This pre-intervention effort will be extensive and will require many hours of bottom time by divers working under the supervision of qualified archaeologists. At least one archaeologist must be involved in all in-water operations to ensure that the quality of data collection and recovery meets accepted archaeological standards. The pre-intervention operations will be designed to map and recover artifacts that are likely to be damaged or destroyed during stabilization/recovery operations.

Following the large-scale stabilization/recovery phase of on-site operations, another archaeological survey must be conducted. If necessary, additional exposed artifacts will be mapped and recovered. The final phase of mapping is important, since the post-intervention site map will serve as a new baseline for long-term monitoring and assessment.

The detailed archaeology plan, like the engineering plan, must specify the methodology, equipment and personnel required for adequate mapping, documentation and recovery of cultural material. The plan must also make provision for the recovery of human remains, should they be encountered.

"Conservation must always be a major consideration when planning large-scale recovery operations."

Conservation Considerations

Conservation must always be a major consideration when planning large-scale recovery operations. Such recovery activities at the *Monitor* site would result in the recovery of cultural objects consisting of a wide variety of materials, including iron, brass, copper, wood, hemp, ceramics, and glass. Some of the objects would be made from more than one material. These "composite" artifacts are the most difficult to treat, since they often must be disassembled so that each type of material can be treated separately. Initially, however, on-site conservation would consist primarily of ensuring that recovered objects are stabilized and protected from damage until they can be transferred to a laboratory for treatment. On-site conservation could easily be carried out by relatively unskilled personnel, as long as at least one qualified conservator supervises the operation. Laboratory conservation would be a major effort and would require a sizable facility and staff.

Exhibition/Curation Considerations

Some of the objects that are removed from the *Monitor* may not be suitable for exhibition

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because of poor condition, unwieldy size or other factors. However, those objects must be placed into secure storage following conservation, where they can be maintained in a stable condition and where they can be accessed for study and inspection.

Funding Considerations

If any of the major stabilization or recovery options outlined herein are selected for implementation, the costs will run into millions of dollars. A final comprehensive plan involving large-scale stabilization and/or recovery operations must also include a detailed budget and identify sources of funding. Except for initial mapping and small-scale artifact recovery, no on-site intervention should take place until adequate funding has been committed for completion of all phases of the project. If large components of the *Monitor*'s hull are recovered, their conservation and long-term curation must be ensured.

Considerations must be given to all possible sources of funding and in-kind support pursuant to the revenue enhancement authority of the National Marine Sanctuaries Act and other pertinent laws. Once possible approach would be to create an alliance of Federal, state and private organizations with an interest in the preservation of the *Monitor*. Partnerships could be sought with governmental agencies and private entities with resources, skills and equipment that might be used in the preservation effort. A comprehensive fundraising program will need to be implemented within the context of the existing system-wide National Marine Sanctuary revenue enhancement program.

National Historic Preservation Act Considerations

Federal law provides that sites listed on the National Register of Historic Places are subject to protection and criteria have been developed for the review of proposed activities that might result in potential adverse effects to the resource. Since the *Monitor* is listed on the Register and, in addition, is a National Historic Landmark, any plan proposing on-site activities that disturb the site in any way must be reviewed by state and Federal officials, in compliance with the National Historic Preservation Act, section 106 criteria and other pertinent laws.

In establishing a realistic archaeology plan, consideration must be given to the fact that the *Monitor*'s hull and contents are threatened with damage or loss due to the rapid deterioration of the hull and loss of structural integrity. NOAA considers the *Monitor* to be a threatened site and, therefore, will develop the archaeology plan accordingly. There are special provisions for threatened sites, with consideration being given to the relative impact to a threatened resource if left undisturbed versus taking positive action to preserve the resource. In the *Monitor*'s case, an effective argument can be made that if positive steps are not taken to stabilize the hull and/or recover some of the material, the entire site could be irreparably damaged by continued deterioration in as little as one to five years.

Summary and Final Recommendations

The recommended option calls for actions that will substantially alter the *Monitor*'s hull and contents. If no action is taken, however, the *Monitor* will inevitably collapse. Therefore, the risk of collateral damage during shoring and recovery operations is somewhat mitigated, especially when it is recognized that recovered portions of the *Monitor* will be preserved in perpetuity. In addition, shoring the hull before recovery not only reduces the chance of collapse, but it also greatly diminishes the risk of damage during recovery.

Details of this option have not been fully developed, and an outside consultant or consultants will be required for this product. It is expected that on-site operations would include numerous activities, including initial reconnaissance, mapping and artifact recovery; shoring of the hull and engine; removal of the propeller and skeg; removal of the lower hull over the engine; disconnection of the engine from its mounts and piping; removal of the engine and associated machinery; excavation of the turret interior; removal of the two cannons and other turret contents; recovery of turret; recovery of other selected components; recovery of artifacts encountered during recovery operations; post-recovery inspection; and additional shoring if necessary.

Equipment might include a large-capacity crane mounted on a seagoing barge for all lifting operations and one or more tugboats used to propel and control the barge. Diving operations might be conducted by commercial divers using a saturation system, which is widely used by the offshore oil industry because of the extended work time afforded the divers.

Although shoring and selected component recovery would alter the appearance and character of the *Monitor*'s remains, the site would still contain the major portion of the hull, and the stabilization would extend the life of the remaining hull considerably, almost certainly 25 years or more. Thus the Sanctuary would continue to provide an opportunity for continued research and artifact recovery as well as an historic and exciting experience for visiting divers.

The option for stabilization combined with selective recovery appears to offer results that conform with the Sanctuaries and Reserves Division's long-range strategic objectives and that offer the best possible prospects for preservation of the *Monitor*. However, this option is expensive, with costs estimated to be in the range of $20-22 million, including conservation. The

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"From these poor men great dragons drew their breath...."

The title for this feature is from a poem written by Norman G. Cubberly during the 1974 Alcoa Seaprobe *expedition to the* Monitor. *This feature will highlight a* Monitor *officer or crewman or someone who may have served on board the* Monitor *but for whom no documentation can be found. Readers are invited to share any knowledge they may have of men who served or may have served on the* Monitor *during her brief career. We are particularly interested in receiving copies of service or pension records, discharge papers, correspondence, photographs, or other items related to men associated with the* Monitor.

The crewman featured in this issue is Richard Anjier, a man of British birth who served as a quartermaster aboard the Monitor. *The following information is from Crewmen of the U.S.S.* Monitor: *A Biographical Directory by Irwin Berent.*

Born in England about 1825, Richard Anjier enlisted in New York on January 28, 1862, for a 3-year term. He had hazel eyes, brown hair and dark complexion. He stood 5 feet, 6 1/2 inches tall. On or about March 6, he was transferred from the *North Carolina* to the *Monitor*, on which he served as ship's no. 2, with a quartermaster rating. He served on the *Monitor* until December 31, 1862.

On December 31, 1862, Anjier and fellow crewman Peter Williams both showed "the highest qualities of men and seamen," according to Commander Bankhead's report on the sinking of the *Monitor*. Bankhead reported that Anjier "remained at his post at the wheel when the vessel was sinking, and when told by me to get into the boat replied, 'No, sir; not till you go.' "

On January 12, 1863, Anjier was promoted to the rank of acting master's mate, possibly due to his actions during the sinking, and assigned to the North Atlantic Blockading Squadron.

Myths and Mysteries

This is a new column that will appear periodically to discuss Monitor *myths or to share new information that solves or adds to mysteries surrounding the USS* Monitor. *If you have suggestions for items that might be of interest to our readers, please let us hear from you.*

One of the most frequent comments made about the *Monitor* is that it was a most unseaworthy ship. This is usually said as though the speaker is imparting great wisdom and divulging information that John Ericsson could not possibly have known. The truth is that the *Monitor* was most unseaworthy, but by design rather than happenstance. Ericsson designed the *Monitor* for river and harbor defense; the virtually flat bottom and shallow draft made the ship ideal for patrol in interior waters where shoals and sandbars made passage difficult for ships with deeper drafts. The design that made the *Monitor* suitable for blockading or patrolling Southern ports contributed to the lack of seaworthiness. The addition of the 9-foot-high turret, which made the ship top-heavy, also contributed to the lack of stability in rough seas. Ericsson and the U.S. Navy knew that the *Monitor* would have to be towed if circumstances required travel in open water, and they knew that the ship would have difficulty traversing open water in heavy seas. However, the advantage of the *Monitor*'s design was apparently viewed as an acceptable trade-off for seaworthiness.

Ericsson maintained until his death that the sinking of the *Monitor* in a storm in December 1862 was caused not by a design flaw but by the addition of oakum packing under the turret. The packing was added prior to the *Monitor*'s leaving Hampton Roads for a rendezvous with other vessels in Beaufort, North Carolina. Ericsson argued that the turret was designed to fit flush against the brass ring that was set into the deck and that the addition of packing prevented, rather than ensured, a tight seal between the turret and the ring. Ericsson's theory was that as high seas struck the turret, portions of the packing were washed out, allowing large amounts of water to enter the ship. The fact that another monitor, the USS *Passaic*, was under tow about a mile behind the *Monitor* the night of December 31, and that the *Passaic* survived the storm despite problems similar to the *Monitor*'s, gave credence to Ericsson's theory. However, there was one difference in how the *Monitor* and the *Passaic* were towed that night: when the *Passaic* began having problems in the heavy seas, the *Passaic's* captain requested that his ship be towed backwards.

Would the *Monitor* have survived if it had been towed backwards as well? No one will ever know. What we do know is that the monitor design was a successful one, with monitors surviving globally well into the twentieth century.

We still have back issues of most of the previous *Cheesebox* issues as well as copies of *Ironclad Captains* by William N. Still, the 1987 expedition report, the information book, and various articles. We also still have paper models, bookmarks, brochures, and posters.

Teachers, some of this material is available in large quantities for classroom use. Also, we have a curriculum for use in conjunction with Civil War history units. To obtain copies of any of our material, or for information on additional material that may be available for classroom use, contact Dina Hill at the *Monitor* Sanctuary office.

Special Events

The *Monitor* traveling exhibit can still be seen at the North Carolina Maritime Museum, Beaufort, North Carolina. We will be updating this exhibit in late 1998 and early 1999.

Monitor artifacts are on exhibit at the Hampton Roads Naval Museum, Norfolk, Virginia, the Cape Hatteras National Seashore Visitors Center, Hatteras, North Carolina, and in the permanent *Monitor* exhibit at The Mariners' Museum, Newport News, Virginia.

For your reading enjoyment

Walker and Company of New York City released *Monitor* by James Tertius deKay in September. This delightful history of the *Monitor* and John Ericsson is available from the publisher at a cost of $21 plus $3.75 shipping and handling. New York and California residents should also add state tax. Send a check or money order to

Order Department,
Walker Publishing,
535 Hudson Street,
New York, New York 10014;
call 1-800-289-2553; or
fax 212-727-0984. Visa, MC, or American Express orders also accepted.

Editing of the *Monitor* bibliography compiled by Mariners' Museum librarian Benjamin Trask is nearing completion and the bibliography will be available by May 1998. Copies will be available from the Sanctuary office.

And also....

Monitor researcher Rod Farb of Cedar Grove, North Carolina, has developed a *Monitor* poster that is now available. The 24-inch-by-36-inch poster features divers at the stern of the wreck. The photograph was published in National Geographic in 1995. The poster is available at a cost of $20 plus $3 shipping from Rod Farb Productions, Inc.,
8329 NC 86 N,
Cedar Grove, NC 27231.
Toll-free 1.800.ROD.FARB (763-3272). Visa/MC accepted.