"Safer Alternatives to Copper Antifouling Paints" Standard Operating Procedures For Field Efforts Associated with Hull Testing

June 1, 2009

I. Background

The Port of San Diego (Port) and the Institute for Research and Technical Assistance (IRTA) were awarded an EPA Pollution Prevention Grant to identify alternatives to copper hull paint. The overall goal of this project is to identify viable alternatives to copper-based hull paint and work collectively to encourage the transition to these paints. The project aims to find replacements for copper hull paints that will minimize environmental impacts from hull coatings to the greatest extent possible while keeping performance at a level equal or greater than that of copper paints and cost equal to or less than copper paints. The selection and determination of viable alternatives will take into consideration the following criteria: 1) the ease of cleaning and/or maintenance, 2) the ability to control fouling, 3) cost effectiveness, and 4) the environmental impacts from the paints.

The two year project is comprised of ten tasks scheduled to occur between January 2008 and December 2010. The primary tasks include testing alternative coatings on panels and on boat hulls. Phase One of the study, the panel testing, was conducted during the summer of 2008 and has been completed. Boat hull testing, or Phase Two, will occur from April 2009 to December 2010.

The purpose of developing this Standard Operating Procedures (SOP) for the field assessment of coatings on boat hulls is to: 1) document the assessment process and measurement tools used, and 2) provide guidance on evaluating and cleaning boat hulls. The development of a field testing SOP is necessary to document the project's procedures and ensure consistency throughout the timeframe of the boat hull testing phase, which will ensure that the end results can be reproduced.

II. Hull Cleaning Overview

A key element of this project is to identify the frequency and effort needed to clean the test coatings. The Port and IRTA (herein referred to as "Project Team") and designated hull cleaners will assess the coatings on a regular basis. Inspections will be scheduled regularly in order to determine whether the coatings and cleaning procedures are effective in repelling fouling or preventing fouling attachment, how often the coatings require cleaning and the level of effort required for cleaning, and any physical deterioration of the coatings themselves. Understanding these factors will enable the Project Team to compare the effectiveness of alternative coatings (in terms of cleaning and cleaning costs) to commonly used copper paints.

Prior to conducting any hull inspections, the Project Team will identify hull cleaners to perform all hull assessments and cleaning efforts. Hull cleaners must meet key selection criteria in order to participate in the project. Qualified hull cleaners should have minimum of three years experience in the San Diego region, as well as familiarity with the local fouling environment and environmentally friendly Best Management Practices (BMP) cleaning methods. In addition, participating hull cleaners must have prior experience with alternative coatings. Participation in a diver certification program is preferred, but not a requirement of the project as long as the hull cleaner is currently using the accepted BMPs.

Once selected, hull cleaners will be assigned boats on which they will regularly perform all assessments. All inspections and cleaning activities for each boat involved in the study will be performed solely by the designated hull cleaner(s) for the duration of the boat hull testing phase. Working in coordination with the Project Team, the project hull cleaner(s) will assess the degree and type of fouling, the type of hand cleaning tool used, and level of effort required to clean the boats. Any physical deterioration of the coating will be assessed, as the longevity of the coatings is an important factor in determining the viability of a coating.

All hull cleaning will be conducted using hand cleaning methods, unless an enhanced cleaning process is deemed necessary as described in Section III.C of this document. As certain hull hand cleaning tools may be too abrasive for use on certain test coatings, the coating suppliers may designate the hand cleaning tool appropriate for their coating. If fouling cannot be removed using the coating suppliers recommended tools, a consultation with the coating supplier must occur prior to using any additional tools/methods for cleaning. The specific methods that will be used to evaluate the coatings are presented in the sections below.

III. Field Assessment

The methodology described in this section presents guidance for analysis and consistent evaluation of the performance of test coatings. The field assessment will be composed of four principal phases: 1) an underwater pre-cleaning assessment, 2) a hull cleaner and Project Team debriefing; 3) underwater cleaning and a cleaning assessment, and 4) an underwater post-cleaning assessment. The evaluation will include a description of the amount of fouling present and its location on the boat hull, the types of fouling, the level of effort required to clean the hull, and the amount of time required to clean the hull. This information will be noted using project field assessment forms which will be provided by the Port.

The Project Team will coordinate with the hull cleaner and boat owner to develop a three week inspection and cleaning schedule prior to visiting the boats. This will ensure that a Project Team member will always be present during each evaluation and enable the boat owner to know when their boat is required to be available. Each hull cleaner will be assigned a particular set of boats that they will evaluate throughout the project timeframe. The Project Team will be present dockside during every scheduled hull assessment and will collaborate with the hull cleaner in making decisions and participating in the evaluations.

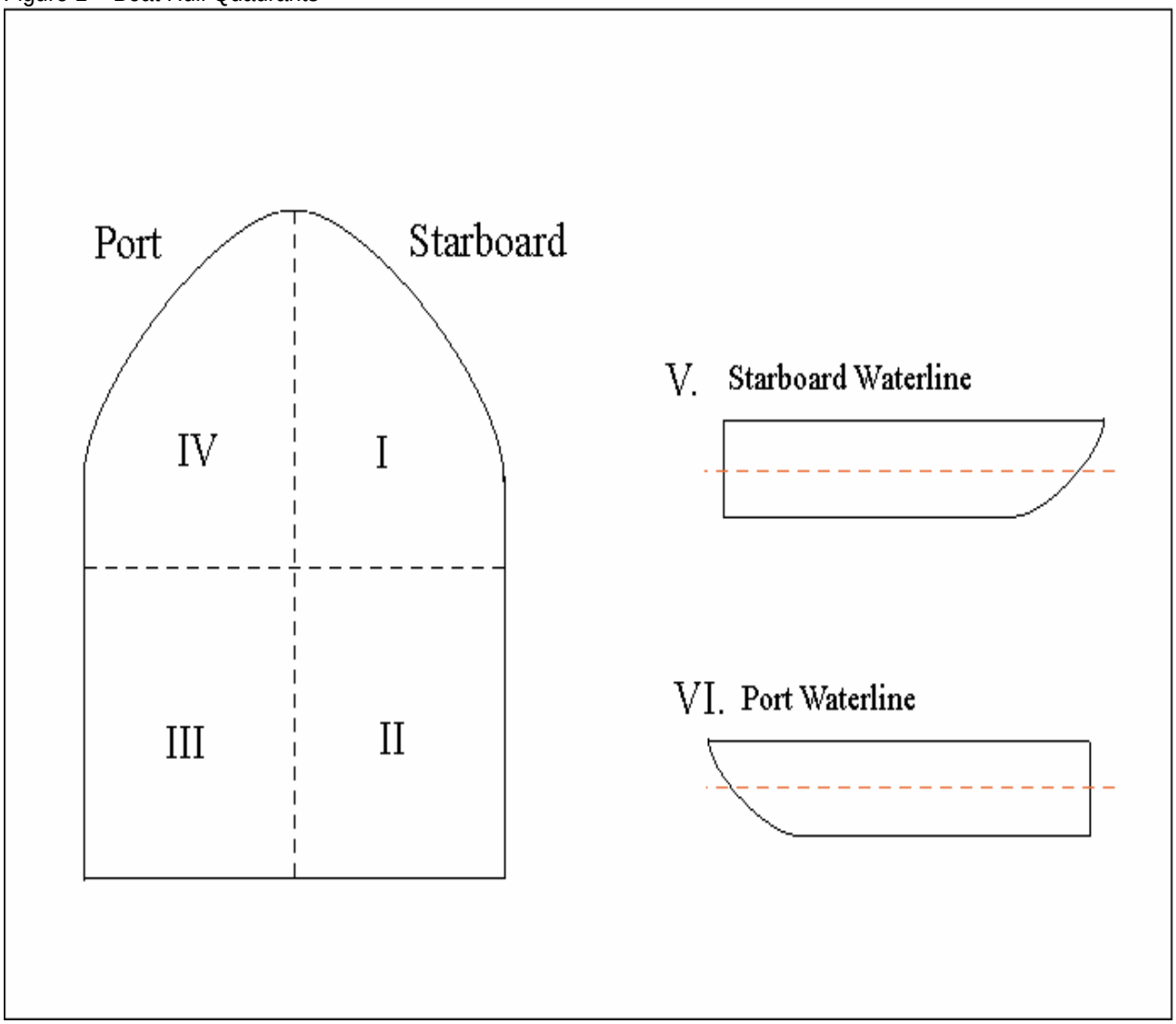
Once on the dock, the Project Team will record general site occupancy information on Test Coating Evaluation Form (Attachment 1). The type and quantity of fouling growth present in the San Diego Bay have been noted to be dependent on environmental factors, such as temperature, sun exposure and shading by the dock. As such, the Project Team will note any variances in temperature and positioning of the boat during each inspection. Date and time will be recorded for all inspections, as well as the team members present. Water temperature readings will be taken alongside each test boat on the day of inspection at a depth of six to twelve inches below the surface of the water and recorded by the Project Team on the form. The Project Team will also identify which side of the boat is adjacent to the dock (port or starboard) and record the compass direction for the bow heading.

A. Underwater Pre-cleaning Assessment

The first step in the inspection process is to conduct an underwater assessment of the fouling growth that has occurred since the last inspection and evaluate the coating condition. This will be completed before any hand cleaning is performed. The fouling evaluation used for this study was developed by the Project Team, in collaboration with the California Professional Divers Association (CPDA) and experts in the field of biofouling. The hull cleaner will perform a pre-cleaning inspection that entails a visual evaluation of the fouling growth present on the boat hull and identification of any coating blemishes or deterioration. During this phase, the hull cleaner must take care to not damage the hull's test coat and primer layer.

The hull cleaner will evaluate the boat hull in six quadrants (Figure 1). This will account for the potential variation in fouling growth due to position or location on the boat hull. The six quadrants are: I - starboard forward, II - starboard aft, III - port aft, IV - port forward, V - starboard waterline, and VI - port waterline. The bottom of the boat will be assessed using the first four quadrants. The last two quadrants will be from the waterline to the first chine below the waterline, from bow to stern, including the transom.

Figure 1 – Boat Hull Quadrants



Fouling Assessment

The hull cleaner will adhere to the following standard methodology when performing the fouling assessment. Numeric ratings will be used to assess fouling growth for each coating. Fouling growth on each boat hull will be evaluated on a 0 – 5 scale, with 0 representing the optimal condition and 5 the worst condition. Table 1 identifies the numeric ratings and provides a description of what type of fouling growth is associated with each rating.

Inspection of the boat hull will begin by assessing fouling growth and assigning a rating for Quadrant I (starboard forward), followed by evaluating Quadrants 2 through 6. The hull cleaner will record the fouling

rating for each quadrant and provide any additional observations or comments, such as noting the type of fouling present, on the hull cleaner field form (Attachment 2).

Table 1 – Fouling Rating Scale

Rating	Fouling Growth
0	No silting, biofilm or fouling growth present.
1	Light silting or biofilm. Little to no discoloration; Paint surface still clearly visible beneath.
2	Heavy biofilm; Light to moderate silting as indicated by discoloration (a solid, discernible, physical layer); Painted surface may be slightly obscured.
3	Low to medium levels of fouling present; Dark algae impregnation; Hard growth may be present (tubeworms, barnacles, bryozoans, etc.); Painted surface definitely obscured.
4	Medium to high levels of fouling present; Hard growth present, such as tubeworms, barnacles, bryozoans, etc.; Macrofoulers may include mature forms that may be densely grouped; Paint surface no longer visible beneath fouling in areas.
5	High levels of fouling present; Lengthy, soft algae and hard, tube worms and possibly barnacles impregnating the coatings; Macrofoulers may be densely grouped; Coral** growth can be seen to extend out from the hull; Paint surface no longer visible beneath fouling.

*0 is best condition; 5 is worst condition; ** Coral is the local term used for limestone tubes of worms that grow on the coating's surface.

Coating Condition:

During each pre-cleaning assessment, the hull cleaner will determine an overall pre-cleaning coating condition rating for the entire hull and will also note any blemishes or scratches on boats surface. The color of undercoat and the test coating was recorded when the coating was applied to the boat hull. This will enable the hull cleaner to identify and evaluate any physical failures to coating surface (scratches, blemishes, etc.) over the study period. Table 2 identifies the rating scale for evaluating the coating condition. Ratings of 1-3 represent antifouling painted surface appearance associated with normal physical wear due to underwater cleaning action or hydrodynamic effects. Ratings 4 and 5 indicate either excessive cleaning actions or blistering due to internal failure of the paint system. Such blisters are not the result of cleaning but may not be noticed until after a cleaning episode.

Inspection of the boat hull will begin by assessing the condition of the coating in Quadrant I, followed by evaluating Quadrants 2 through 6, in similar fashion to the fouling evaluation. The hull cleaner will record a single coating condition rating for the entire boat on the diver field form and will provide additional observations or comments, such as noting the location or type of damage observed on the boat hull, if any is observed.

Table 2 – Coating Condition Rating Scale

Coating Condition Rating	Coating Description
1	Antifouling paint intact, new or slick finish. May have a mottled pattern of light and dark portions of the original paint color
2	Shine is gone or surface lightly etched. No physical failures
3	Physical failure on up to 20% of boat hull. Coating may be missing from slightly curved or flat areas to expose underlying coating. Coating has visible swirl marks within the outermost layer, not extending into any underlying layers of paint
4	Physical failure of coating on 20-50% of boat bottom. Coating missing from slightly curved or flat areas to expose underlying coating. Coating missing from intact blisters or blisters which have ruptured to expose underlying coating layer(s). Visible swirl marks expose underlying coating layer
5	Phyiscal failure of coating on over 50% of boat bottom. Coating missing from intact blisters or blisters which have ruptured to expose underlying coating layer(s). Visible swirl marks expose underlying coating layer

Photographs and/or video recordings of cleaning or other hull coating related activities are a necessary part of the assessment process. The hull cleaners will take underwater photos before and after cleaning the hull to capture the amount of growth that has occurred and verify that the fouling growth is being removed. The decision to photograph a quadrant will be based on the fouling rating the quadrant receives. At a minimum, photographs will be taken of a quadrant when it is assigned a fouling rating of 3 or higher, or when a particular area shows abnormal fouling effects (diverse fouling community, or an increased amount of fouling compared to the rest of the hull, etc). Particular attention will be paid to those areas which appear to have consistent fouling. If a coating shows physical deterioration, photographs will be taken of the identified areas as well. The photographs taken throughout the boat hull phase will be useful when comparing the test coating performance.

B. Hull Cleaner Project Team Debriefing

Once the pre-cleaning assessment is complete, the hull cleaner will surface to debrief the Project Team member present on the dock. The hull cleaner will release the diver field form to the Project Team member upon surfacing and will describe the fouling growth and coating conditions they observed. The Project Team and the hull cleaner will discuss the extent and type of fouling present in order to determine the extent of cleaning required. The level of cleaning will be categorized into one of three general categories; 1) No cleaning required; 2) Partial cleaning – clean only discrete sections of boat hull – hull cleaner will indicate the quadrants in which cleaning is required; and 3) Full cleaning – removal of fouling from all quadrants of the boat hull.

The decision to clean a hull will be based upon the amount of fouling and type of fouling present. If the fouling rating is 0, no cleaning is required for a quadrant. Additionally, no cleaning is recommended for quadrants assigned a fouling rating of 1. When the fouling rating is 2, the Project Team and hull cleaner will discuss whether cleaning shall be initiated. Quadrants with fouling ratings of 3 through 5 will be processed as discussed in Section C. The boat hull will be deemed to require partial cleaning if only a few discrete sections or quadrants require cleaning. Full cleaning may be prescribed when most quadrants have a fouling rating of 2 or higher. In all cases, the determination on whether to clean will be made by consensus between the Project Team and the hull cleaner.

C. Underwater Cleaning and Cleaning Assessment

To fully assess alternative coatings, it is critical to gain an understanding of what cleaning regime is best for each test coating. The cleaning assessment is intended to provide an indication of the level of effort and the appropriate hand hull cleaning tool required to clean a specific test coating. It is important to understand this, as a critical element for any successful hull coating is proper maintenance. To be most effective, cleaning should occur in a timely manner, minimize coating wear, and not require considerable effort. Another important element is whether the boat hull remains relatively free of fouling until the next scheduled cleaning.

Cleaning tools will consist of the hand tools presented in Table 3, ranging from the least abrasive at the top of the table (carpet) and increasing in abrasiveness. The tools are consistent with the hull cleaning industry standards as specified in the California Professional Divers Association Divers (CPDA) Hull Cleaning Best Management Practices Certification Manual (2008). All cleaning tools will be purchased by the Project Team from hull cleaning supply distributors. For each cleaning, the Project Team will provide the necessary hand tools (all 5 hand tools: carpet, white pad, green pad, purple pad, and brown pad) to the Project hull cleaner. If coating supplier recommends use of an alternative cleaning tool, the specific tool will be provided to the hull cleaner as well. Coating suppliers may also prohibit the use of some of the more abrasive tools for their test coating, as such tools may damage the coating surface. In these instances, the suppliers have clearly discussed the cleaning limitations with the Project Team prior to any cleaning and this limited cleaning tool list will be followed.

Table 3 – Project Hull Cleaning Tools

Tool	Usage
Carpet – Soft medium to long shag	These pads are used to gently remove slime, sediment, light algae and other very soft fouling. Appropriate for newly painted hulls or soft coatings.
White pad (3M # H-08440 or 07445) - Soft	Used to gently remove slime, sediment, light algae and other very soft fouling. Appropriate for newly painted hulls or soft coatings.
Green/Blue Pads (3M #H-8242) - Medium	Used to remove heavy slime, sediment, and moderate algae impregnation, light marine grass growth and other soft fouling. Not suitable for newly painted boats.
Purple Pads (3M #H-07447 or 07448) - Medium	Used to remove heavy slime, sediment, and moderate algae impregnation, light marine grass growth, and other soft fouling. Also used in areas of low levels of hard growth Not suitable for newly painted boats.
Brown Pad (3M #H-08541) - Coarse	Used to remove heavy slime, sediment, and algae impregnation, moderate marine grass growth and other soft fouling. Also used in areas with low to medium levels of hard growth. Not suitable for newly painted boats.

* Obtained from the California Professional Divers Association's Hull Cleaning BMP Certification Manual (2008)

Once cleaning is initiated, the first tool utilized will be either the supplier recommended hand tool or the least abrasive hand tool (Table 3). The hull cleaner will use the selected tool and began cleaning, first using light pressure and gradually increasing pressure and the number of passes until all fouling growth is removed. The hull cleaner will continue moving through all hull quadrants that require cleaning using the selected tool. During the cleaning, the hull cleaner will periodically surface to debrief the Project Team on the progress being made and discuss areas where there is difficulty removing the fouling.

If the first tool is deemed inadequate (i.e., not able to fully remove fouling with hard effort), then the hull cleaner will surface to notify the Project Team. The hull cleaner will then continue the cleaning effort using the prescribed regime stated above with next hand cleaning tool on the list. This progression will continue, increasing the abrasiveness of the tool through the entire Table 3 list, unless limited by the coating supplier's cleaning specifications, until a tool can adequately remove all fouling. For example, if the hull cleaner first attempted the carpet, the next tool used would be the white pad. To maintain the coating's

integrity, the tool selection may be adjusted either less or more abrasive based upon the hardness of the coating and the fouling impregnation. The hand tool finally used to successfully remove the fouling will be assigned a numerical rating (0-5) for the level of effort required to remove the fouling (Table 4). Once the cleaning has been completed, the hull cleaner will document the progression of hand tools used, the cleaning effort rating for the final hand cleaning tool used, and the amount of time it took to clean the hull.

Table 4 - Cleaning Effort Rating Scale

Cleaning Rating	Effort Description
0	None; No cleaning required
1	Light pressure: very easy to remove growth with one wipe
2	Light to medium pressure: still easy to remove growth but may require two or more passes in some areas to remove growth
3	Firm effort: firm scrubbing and multiple passes required to remove fouling growth.
4	Firm scrub, hard effort: With very hard physical effort, firm scrub and continuous passes required to remove fouling growth.
5	Hard scrub, very hard effort: even with hard physical effort, growth presented a challenge to remove

It is acknowledged that maintaining coating integrity is critical for the long-term performance of the coating. Therefore, an effective long-term maintenance program is best achieved by using an appropriate combination of cleaning pressure, tool abrasiveness, and number of cleanings. During the course of the study, there may be instances in which the prescribed cleaning tools may not effectively remove fouling growth. This may occur when there is a significant amount of hard fouling, too much fouling is present, the suppliers' have limited the types of tools to use, or any combination of the above factors exist. When this occurs, the Project Team will consult with the coating supplier to determine the most appropriate course of action or enhanced cleaning options available for that selected test coating. The Project Team will also seek input from the hull cleaner using their experience and best professional judgment as to an appropriate course of action to take. In general, the available options will vary depending on the coating type or make-up (hard, soft, active ingredient or non-biocide). For example, some soft (silicon-based) coatings may not be able to withstand the abrasive pads (green, brown, etc). As such, special considerations for soft coatings or those having an active ingredient may be limited.

The following approach will be used to go beyond the normal cleaning process detailed above. In general an enhanced cleaning process will involve increasing the frequency of cleaning, and when acceptable, using more aggressive cleaning methods, even potentially moving beyond the limits of cleaning tools used in Table 3. In all cases, the Project Team will come to agreement with the supplier on the course of action that will be taken on their test coating, prior to initiating any enhanced cleaning regime. In extreme cases, the Project Team may also consider the use of mechanical brushes if fouling cannot be removed using an increased frequency and abrasive hand tools, as long as the supplier is open to such means. Please note however, that mechanical means will not be permitted on any coating containing an active ingredient. If an alternate cleaning method is deemed effective, the Project Team will continue this effort for the remainder of the study or until it is no longer effective. Finally, if none of these efforts are successful, the Project Team will discuss with the supplier and boater the possibility of repainting or removing the test coating from the study.

In all instances, the Project Team will clearly document on the field sheet all variances in cleaning from this SOP. While these additional efforts may not necessarily equate to a coating's failure, they may be

used to factor in additional costs for labor, maintenance, or the need for a special cleaning strategy. These will be considered in the overall coating performance in the final project report.

D. Underwater Post – Clean Assessment

The post cleaning assessment will reveal if there was any coating deterioration that had been covered by fouling or if cleaning efforts removed any of the coating. Once the cleaning is complete, the hull cleaner will then begin the post – cleaning assessment of the boat hull. In the same order as the pre – cleaning assessment, the hull cleaner will begin with Quadrant I, and progress through the other quadrants. The hull cleaner will note any physical deterioration or scratches on the coating's surface within each quadrant. The hull cleaner will note if there is any physical failure, and will determine a post-cleaning coating condition rating (using the criteria in Table 2) for the entire boat hull. Again, similar to the pre – cleaning assessment, a single coating condition rating will be used for the entire boat hull. The hull cleaner will complete the post – cleaning assessment by taking photographs of the boat hull, paying particular attention to those areas that were previously fouled to indicate that fouling has been successfully removed. The hull cleaner will then surface to debrief the Project Team on their post-cleaning observations.

IV. QUALITY ASSURANCE

Quality assurance is a necessary part of any study to ensure that the study can provide reproducible results and can be replicated by others. Quality Assurance mechanisms ensure that accuracy and precision can be documented throughout a project. The Project Team, hull cleaners, coating suppliers were involved in the development and review of this field SOP. The boat hull testing has incorporated the following quality assurance elements into the boat hull assessment and cleaning to ensure accuracy and consistency during all field efforts.

1. All participants will adhere to the methodologies describe in this document to ensure consistency throughout the project timeframe and maintain accuracy in the results. A copy of this SOP will be taken to every inspection effort. In the event that an unanticipated situation arises, the Project Team will refer to the cleaning strategy outlined herein. If this SOP does not fully address the issue, the Project Team, with consensus of the hull cleaner and coating supplier, will use best professional judgment to determine the most appropriate course of action for the particular boat, test coating and cleaning strategy. Once decided, the Project Team may amend this SOP to best reflect the updated practices.
2. A critical element in the development of this SOP was incorporating a peer review process into the development of the hull assessment protocol document. This ensures that this phase of the project will follow accepted methodologies. The Project Team identified experts in fouling research to serve as reviewers. Comments from the stakeholder workgroup were also incorporated into this SOP.
3. Project hull cleaners will conduct periodic pre-cleaning assessments on the same vessel. Two project hull cleaners will evaluate a single boat hull and confer their observations with the Project Team and each other. This element will ensure consistency among project hull cleaners when providing ratings for fouling, coating condition, and cleaning. This coordinated assessment element will also ensure consistency in initiating cleaning.
4. Project hull cleaners will also be periodically accompanied by a Port designated consultant during the pre-cleaning assessment. This will provide an additional mechanism to verify observed conditions and ensure consistency in the evaluating and assignment of ratings of fouling and coating condition. Other hull cleaners not directly involved in the project may occasionally be invited to attend the pre-cleaning evaluations as well. This may help provide an unbiased opinion on when cleaning should occur and the level of effort needed to satisfactorily clean the hull.

Attachment 1 Test Coating Evaluation Form

Safer Alternatives to Copper Antifouling Paints Study Coating Field Sheet

Date: _____ Coating ID: _____ Original Launch Date: _____

Time: _____ Vessel Name: _____ Marina/Slip: _____

Water Temperature: _____ Project Team: _____

Weather: □ Sunny □ P. Cloudy □ Overcast □ Fog Water Color: □ Blue □ Green □ Yellow □ Brown

Side of boat closest to dock: □ Port □ Starboard Bow Orientation: □ N □ S □ E □ W **Degree Heading**: ____

Pre-Cleaning Fouling Rating							**Notes (Photos taken)**
I (Starboard Forward)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	
II (Starboard Aft)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	
III (Port Aft)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	
IV (Port Forward)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	
V (Starboard Waterline)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	
VI (Port Waterline)	□ **0**	□ **1**	□ **2**	□ **3**	□ **4**	□ **5**	

Cleaning Tool

□ **N/A** □ **Supplier Cleaning Tool (_____)** □ **Carpet** □ **White** □ **Green** □ **Purple** □ **Brown**

Comments:

Cleaning Effort

□ 0 □ 1 □ 2 □ 3 □ 4 □ 5

Comments:

Coating Condition **Pre-Cleaning:** □ 1 □ 2 □ 3 □ 4 □ 5

Post-Cleaning: □ N/A □ 1 □ 2 □ 3 □ 4 □ 5

Comments:

Coating Condition Rating Criteria		Cleaning Effort Rating Criteria	
1	Paint intact; new, slick finish	0	None; No cleaning required
2	Shine gone or surface slightly etched; no physical failures	1	Light pressure: very easy to remove growth with one wipe
3	Physical failure up to 20% of hull. Coating may be missing from slightly curved or flat areas to expose underlying coating; Coating has visible swirl marks within outermost layer	2	Light to medium pressure: still easy to remove growth but may require two or more passes in some areas to remove growth
4	Physical failure on 20-50% of hull; Coating missing from slightly curved or flat areas to expose underlying coating; Visible swirl marks expose underlying layer; Coating missing from ruptured blisters	3	Firm effort: firm scrubbing and multiple passes required to remove fouling growth.
5	Physical failure on over 50% of hull; Coating missing from slightly curved or flat areas to expose underlying coating; Visible swirl marks expose underlying layer; Coating missing from ruptured blisters	4	Firm scrub, hard effort: With very hard physical effort, firm scrub and continuous passes required to remove fouling growth.
		5	Hard scrub, very hard effort: even with hard physical effort, growth presented a challenge to remove

Fouling Growth Rating	Additional Notes:
0 - None, No biofilm	
1 - Light bio film or mild silting – looks like dust	
2 - Moderate silting and/or slime layer	
3 - Moderate to heavy silting; Dark algae impregnation; Early stages of hard growth present	
4 - Lengthy soft growth; Hard growth present	
5 - Lengthy soft algae; hard growth (i.e., tube worms and/or barnacles) impregnating the coating. TW growth can be seen to extend out from the hull.	

Attachment 2 Hull Cleaner Field Form

Pre-Cleaning Assessment

Boat Name: _____ **Date:** _____

Marina: _____ **Hull Cleaner:** _____

Fouling Ratings

0 = No silting, biofilm or fouling growth present
1 = Light silting or biofilm
2 = Heavy biofilm; light to moderate silting (discoloration)
3 = Low to medium levels of fouling present; hard growth may be present; dark algae impregnation
4 = Medium to high levels of fouling; hard growth present
5 = High levels of fouling present. Lengthy soft algae and hard fouling present

IV - Fouling Rating:

0 1 2 3 4 5

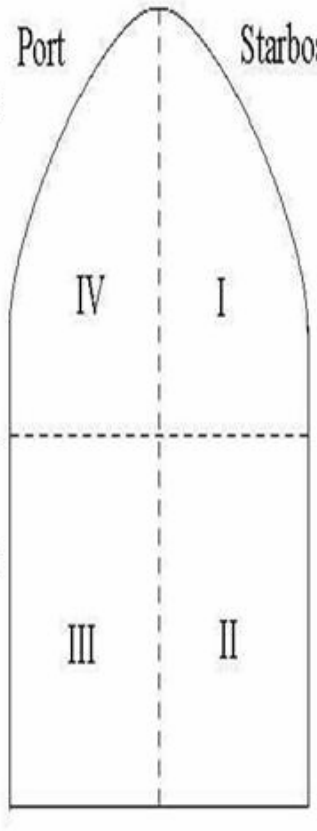
Notes (Type of fouling)

Port Starboard

I - Fouling Rating:

0 1 2 3 4 5

Notes (Type of fouling)



III - Fouling Rating:

0 1 2 3 4 5

Notes (Type of fouling)

II - Fouling Rating:

0 1 2 3 4 5

Notes (Type of fouling)

V. Starboard Waterline

V - Fouling Rating: **0 1 2 3 4 5**

Notes (Type of fouling)

VI. Port Waterline

VI - Fouling Rating: **0 1 2 3 4 5**

Notes (Type of fouling)

Overall notes:

Overall Coating Condition Rating:

1	Paint intact; new, slick finish
2	Shine gone or surface slightly etched; no physical failures
3	Physical failure up to 20% of hull. Coating may be missing from slightly curved or flat areas to expose underlying coating; Coating has visible swirl marks within outermost layer
4	Physical failure on 20-50% of hull; Coating missing from slightly curved or flat areas to expose underlying coating; Visible swirl marks expose underlying layer; Coating missing from ruptured blisters
5	Physical failure on over 50% of hull; Coating missing from slightly curved or flat areas to expose underlying coating; Visible swirl marks expose underlying layer; Coating missing from ruptured blisters