



**Industry &
Investment**

Shark Meshing (Bather Protection) Program 2009-10

Annual Performance Report

**Prepared in accordance with the requirements of the Joint
Management Agreements and associated Management Plan**

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Shark Meshing (Bather Protection) Program 2009-10 Annual Performance Report

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Disclaimer

The information contained in this publication is based on knowledge and understanding at the time of writing (2011). However, because of advances in knowledge, users are reminded of the need to ensure that information on which they rely is up to date and to check the currency of the information with the appropriate officer of Industry & Investment NSW or the user's independent advisor.

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Executive Summary

In August 2009 the first Joint Management Agreements (JMAs) under the *Fisheries Management Act 1994* and the *Threatened Species Conservation Act 1995* were finalised. The agreements were made in relation to the NSW Shark Meshing (Bather Protection) Program (SMP) which has been identified as a Key Threatening Process under both of the enabling statutes. The aim of a Joint Management Agreement is to manage, control, regulate or restrict an action that is jeopardising the survival of a threatened species, population or ecological community. In this case, the SMP impacts on a range of non-target threatened species including marine mammals, marine reptiles and threatened sharks. To ensure the objectives of both JMAs relating to the SMP are achieved, a comprehensive Management Plan was developed, the performance of which is reportable annually. The Annual Performance Report (this report) reviews the SMP in accordance with details provided in the JMAs and Management Plan.

An assessment of the progress on achieving the objectives of the Management Plan shows that substantial compliance has been achieved across all reportable components (refer to *1.1 Progress on Implementing Measures Contained in the Management Plan*). Of the trigger points developed to ensure the aims of the Management Plan are being met, none were tripped in the 2009-10 season (refer to *1.2 Performance Indicators*).

Key outcomes of the 2009-10 SMP include:

- Delivery of the SMP as per the current contract requirements.
- Delivery of the Observer Program.
- Delivery of the SMP catch reporting and monitoring requirements.
- Recruitment of a position to help facilitate the SMP Management Plan.
- Completion of the Shark Meshing Contract Tender Project.
- Development of a Compliance Plan for the SMP (2010-11).
- Steady progress towards research and monitoring components.
- Improved communication between I&I NSW and other groups collecting data.

While the 2009-10 meshing period was largely a transitional phase towards the complete implementation of the provisions of the Management Plan (including substantial variations to shark meshing contracts), the range of planned outcomes were either completed on time or are progressing to schedule.

Other programs that are complementary to the SMP were also delivered during the reporting period and are detailed in this report including development of the 'SharkSmart' awareness and public education program - and an aerial (helicopter) surveillance trial to help assess whether there is a role for aerial surveillance to play in bather protection.

Introduction

The Joint Management Agreements (JMAs), between the Minister for Primary Industries and I&I NSW, - and I&I NSW and Department of Environment, Climate Change and Water (DECCW) - and the associated Management Plan for the Shark Meshing (Bather Protection) Program (SMP), were developed after broad consultation with targeted specialist groups and the wider community during March to May 2009. The consultation document *'Report into the NSW Shark Meshing (Bather Protection) Program - 2009'* (the SMP Report) provided a primary environmental assessment of the impacts of the SMP and made key recommendations about ways to achieve the objectives of the program while reducing the potential impact on threatened species and other non-target species - and to maximise the potential scientific benefits of the SMP.

The objective of each JMA is to:

1. Minimise the impact of shark meshing on fish and marine vegetation which are a threatened species, population or ecological community.
2. Ensure that shark meshing does not jeopardise the survival or conservation status of threatened species, populations or ecological communities, or cause species that are not threatened to become threatened.

To achieve the objective of each JMA:

1. I&I NSW will only carry out shark meshing in accordance with the JMAs and the associated Management Plan.
2. I&I NSW will only carry out shark meshing during the meshing season.
3. I&I NSW will ensure that nets are fitted with acoustic warning devices.
4. I&I NSW will require that contractors comply with by-catch reduction protocols and release protocols contained in the Management Plan and any release plans.
5. I&I NSW will continue research into methods of minimising by-catch of non-target species through implementation of the Strategic Research and Monitoring Program contained in the Management Plan.
6. The parties to the JMAs will ensure that comprehensive release plans are in place.

The Management Plan objective is to:

1. Reduce the risk to humans from shark attack at beaches subject to the SMP, and, consistent with that objective:
 - a. Minimise the impact on non-target species and to ensure that the SMP does not jeopardise the survival or conservation status of threatened species, populations and ecological communities, or cause species that are not threatened to become threatened.
 - b. Minimise occupational health and safety risks to contractors and agency personnel associated with implementing the SMP.
 - c. Ensure that monitoring and reporting on the SMP is undertaken in a transparent manner.

Activities of the SMP under the JMAs and Management Plan are defined as:

1. The placing of nets around beaches or other waters at the 51 beaches listed in Table 1 of the Management Plan to protect the public from sharks.
2. The activity is formally undertaken in NSW through the SMP.
3. The SMP uses bottom-set synthetic filament mesh nets 150m in length and 6m in depth of 60cm mesh size that are set in a generally parallel direction off the beach, anchored in approximately 10-12m depth of water. The nets have a weighted bottom line (leadline) and a floated top line (floatline) and are identified by surface floats.
4. The SMP includes all activities by contractors who set, haul, run, and clear the nets in accordance with requirements established by contract.
5. The SMP also includes all activities by I&I NSW associated with contract administration, compliance, supervision, observer programs, research programs, monitoring, and reporting.

Table 1 shows the 5 administrative regions and 51 beaches meshed during the 2009-10 meshing period (1 September 2009 to 30 April 2010).

Table 1. The 5 regions and the 51 beaches of the SMP meshed during the 2009-10 meshing period.

Newcastle	Central Coast	Sydney North	Sydney South	Illawarra
Stockton	Lakes	Palm	Bondi	Coledale
Nobbys	Soldiers	Whale	Bronte	Austinmer
Newcastle	The Entrance	Avalon	Coogee	Thirroul
Bar	Shelly	Bilgola	Maroubra	North Wollongong
Dixon Park	Terrigal	Newport	Wanda	South Wollongong
Merewether	North Avoca	Mona Vale	Elouera	
Redhead	Avoca	Warriewood	North Cronulla	
Blacksmiths	Copacabana	North Narrabeen	Cronulla	
Caves	MacMasters	Narrabeen	Wattamolla	
Catherine Hill Bay	Killcare	Dee Why	Garie	
	Umina	Curl Curl		
		Harbord		
		Queenscliff		
		North Steyne		
		Manly		

1) Reporting on Achieving the Management Objectives:

In accordance with the legislative requirements relating to the JMAs, an annual review of the performance of the parties to the agreements is to be conducted by the Fisheries Scientific Committee convened under the *Fisheries Management Act 1994* and the Scientific Committee convened under the *Threatened Species Conservation Act 1995*. The Annual Performance Report (this report) is to be prepared by I&I NSW on the operation of the program, and will be made available publicly.

The Annual Performance Report is required to:

- a) Document progress in achieving management objectives by:
 - i) Reporting on progress in implementing the measures contained in the Management Plan,
 - ii) Assess and report on each performance indicator,
 - iii) Identify any trigger points that have been tripped, and
 - iv) Identify any overdue actions.

- b) Document outcomes of:
 - i) The Compliance Plan,
 - ii) The Strategic Research and Monitoring Program, and
 - iii) The Observer Program.

- c) Recommend any amendments to the Management Plan that may be required as a result of the performance of the SMP for the meshing year including:
 - i) The nature of the proposed change,
 - ii) The reason why the proposed change is required, and
 - iii) The effect of making the proposed change.

1.1 Progress in Implementing Measures Contained in the Management Plan

1.1 (a) Controls on the activity (Part 3 of the Management Plan)

Part 3, Division 1 of the Management Plan (clauses 14 to 31) sets out the controls on the activity specifying the operational parameters of the program including; contract management, restrictions on waters, timing, gear and methods – and environmental protection provisions.

The Management Plan requires variation to the terms of existing contracts by at least 30 April 2012, however, until contracts are varied to reflect the Management Plan (commencing September 2011), any shark meshing operations conducted in accordance with the terms of existing contracts are considered to be conducted in accordance with the JMAs and the Management Plan (see clause 54 of Part 9 of the Management Plan - Transitional Provisions).

Contract procurement process

To meet the objective of Part 3, I&I NSW conducted an open tender (from 6 April 2010 to 29 April 2010) for the provision of shark meshing services which are consistent with the objectives of the JMAs and Management Plan. Contracts are for three years with two one year options starting from the 2010-11 meshing period.

I&I NSW had already developed a Strategy Leader position in 2009 to help achieve the objectives of the JMAs and Management Plan and the incumbent of this position chaired the Shark Meshing Tender Review Panel. Other panel members included the Shark Meshing Supervisor (a senior compliance officer with six years experience in supervision of the SMP), and the department's Senior Procurement Officer (with high-level expertise in government contract management). The panel was to include the Manager OHS but he had to withdraw from the panel. To ensure the process was not delayed, the Strategy Leader assumed the role of OHS expert on the review panel.

The panel followed NSW Treasury guidelines for procurement of services culminating in contracts being offered to the six most competitive and experienced operators from the eight tenders received.

Variations to the contract review procedures

There were some variations to the application of Division 1 of Part 3 (Contract Management), namely that the Principal, originally nominated as the State Contracts Control Board (SCCB), was changed to I&I NSW and the Principal's Delegates amended to include any staff member of I&I NSW as identified by the Principal (e.g. Strategy Leader, Shark Meshing Supervisor, Shark Scientist) and that the Department managed the contract tender system internally instead of out-sourcing to the SCCB. After lengthy discussions with the SCCB, this move was adopted as a cost-efficient alternative that significantly cut red tape and expenditure whilst being equally transparent and effective. An estimated \$20,000 in service fees was saved by managing the process internally - as well as reducing double handling and administration costs.

To ensure the good governance, a probity advisor was engaged by I&I NSW to give guidance to the Shark Meshing Tender Review Panel. Some of the trigger points for engaging a probity advisor include:

- High risk project.
- Incumbent provider – particularly long term.
- High cost project.
- Political risk.
- History of controversy or litigation.
- You suspect that there will be a complaint.
- Changes to bid process after process commenced.
- Significant meetings / presentation expected.
- Small market – potential for collusion.
- Involvement of consultant bidder at pre-bid stage.

At the completion of the tender process, a 'Project Review and Closure Report' was prepared for SCCB as required.

Variation to meshing regions offered by contract

Before the tenders were offered, the existing Sydney North region consisting of 15 beaches was split into two smaller regions, Sydney North (7 beaches) and Sydney Central (8 beaches). This change was in accordance with Recommendation 9 in the review of the SMP which

recommended the creation of a sixth meshing region for the purposes of practicality.

The addition of the sixth region (Sydney Central Administrative Region) resulted in a variation of clause 20 of the Management Plan which prescribes five meshing regions. The sixth meshing region incorporates the following beaches formally in the original Sydney North region; North Narrabeen, Narrabeen, Dee Why, Curl Curl, Harbord, Queenscliff, North Steyne and Manly.

The addition of the sixth administrative region does not result in a spatial increase of the SMP or any increase in the fishing effort permitted by the SMP under the JMAs and Management Plan. Rather, through decreasing the size of the historically largest SMP region, it ensures the feasibility of contractors to achieve the JMA requirement of increased meshing regularity and potential release of any live animals.

Formalisation of contracts

Formal instruments of tender specifications (the contracts) which incorporate all the requirements for the controls on the activity with the variations established by the JMAs and Management Plan have been prepared by the Director-General for commencement on 1 September 2010, two years and eight months before the deadline of 30 April 2012.

The contracts include:

- (a) a copy of 'Request for Tender' (*Request for provision of shark meshing services NSW 10/06*);
- (b) a formal Instrument of Agreement signed by the Director General;
- (c) a copy of the tenders' response to (a);
- (d) special conditions relating to the provision of the service; and
- (e) any correspondence between the successful tender and I&I NSW regarding the services to be provided.

Services to be provided by each contractor are described in detail in Part G of the Tender Specifications (included as 'appendix a' in this report). The Tender Specifications are consistent with the requirements as detailed in the JMA and Management Plan and underpin the requirements of the Compliance Plan.

The following individuals / businesses are the recommended service providers and have been issued contracts for the 2010-11 to 2012-13 meshing periods (with 2 x 1 year options):

1. Hunter: Mr Paul Holbert
2. Central Coast: R&S Holbert (Mr Ray Holbert)
3. Sydney North: Splash Marine P/L (Mr Troy Gordon)
4. Sydney Central: Fishmax (Mr James Lumb, Jr)
5. Sydney South: Sea Rogue Charters (Mr James Lumb, Sr)
6. Illawarra: E & SM Hollis (Mr Ted Hollis)

1.1 (b) Observer Program 2009-10 (Part 4 of the Management Plan)

Establishment of the Observer Program

Part 4 of the Management Plan (clauses 32 to 36) establishes the Observer Program of the SMP, the purpose of which is to help qualify the delivery of the services provided under contract and quantify certain aspects of the activity including:

1. Contractor compliance with contract conditions.
2. Certifying that the observed meshings meet contract requirements.
3. Data and sample collection.
4. Detailing catch of target and non-target species.

Temporary employment

To satisfy the Observer Program requirements, five people were engaged in August 2009 by way of temporary employment for the eight months of the SMP (2009-10). Four of the positions were temporary-part time positions for 8 months of the SMP meshing period for 2009-10 and the fifth position (Sydney South) was retained as a temporary full-time position for the 8 months of the SMP meshing period. The latter position also helps the Shark Scientist with collation of data, dissections and cataloguing samples, purchasing and maintaining acoustic alarms and other duties associated with the SMP.

Duties of the Observers

Clause 35.1(a - e) of the Management Plan sets out the duties to be performed by observers, namely:

1. Observing the work involved in the setting, hauling or running of nets to ensure it is undertaken in accordance with all terms and conditions of the contract and the Management Plan.
2. Coordinating and performing the physical collection of biological samples for DNA analysis (or other projects).
3. Identifying shark species taken in net catches (cross-referencing with the provided identification manual).
4. Maintaining a written logbook and photographic image record of all animals that are caught in the nets while observers are present.
5. Collection and recording of biological samples from animals, as requested and including, but not limited to, genetic, teeth, vertebrae, reproductive and stomach content samples of sharks.
6. Liaising with the I&I NSW Shark Scientist regarding collection of fins and other research samples.
7. Organising for the collection of sampled material for delivery to relevant end-point.
8. Observing and verifying (by initialling the contractor's log book) the meshings observed each day against those recorded by the contractor.

9. Signing the monthly logbook to certify accuracy of the observed meshings.
10. Keeping a record of acoustic warning devices (dolphin pingers and whale alarms) – identifying the number of devices which are operational / not-functioning, and date of battery replacement (including battery type), and providing that advice to the Shark Scientist.

Training of the Observers

The duties of the observers require that they have a good general knowledge of the meshing operations as specified in the Tender Specification and are proficient at shark identification. Most importantly, observers require training and equipment to undertake the work safely, particularly with regard to seagoing skills, assisting in the release of enmeshed animals and performing animal dissections and tissue sampling.

To ensure the observers were competent and resourced to safely undertake the duties prescribed in the Observer Program for the 2009-10 meshing period, the department conducted a Training Day in August 2009 at the Cronulla Fisheries Research Centre of Excellence. Contractors also attended the seminar and a subsequent training day was conducted by I&I NSW Shark Scientist on 17 September 2009 to provide technical training in shark identification, dissection and tissue sampling as well as the operation and maintenance of whale/dolphin pingers.

Provision of equipment

Prior to the commencement of the meshing period each observer was provided equipment and resources specific to the role including:

- Personal Protective Equipment such as:
 - Skin cancer (UV) protection (e.g. sunscreen, sunglasses and broad-brimmed hat).
 - Wet weather gear - protective clothing for boat work.
 - Type-1 PFD life jacket (yoke style).
 - High visibility work vest (Hi-vis vest).
- Safe Work Method Statements (read, understood and signed by each Observer).
- Kits for specimen dissection and sampling.
- Shark identification books.
- Marine mammal and sea bird identification information resources.
- Mobile phone (for reporting captures / arranging trip dates/times).
- Digital camera for photographing specimens taken in nets.
- Hand-held GPS devices for logging net locations.
- Sundry items for administration and paperwork.

Allocated hours for observers

For the 2009-10 meshing period each observer was allocated designated observer hours per meshing region as set out in clause 34(2)

of the Management Plan. The number of 'allocated' hours and the 'actual' hours worked during the reportable period, as certified by observers on monthly timesheets for the 2009-10 meshing period, are set out in Table 2a.

Table 2a. Allocated hours for observers and actual hours worked during 2009-10.

Meshing Region	Allocated Hours	Actual Hours
Hunter	490	488.5
Central Coast	630	454
Sydney North	630	588.5
Sydney South	1225	1225*
Illawarra	350	385.5
Total	3325	3141.5

*Denotes the only full-time observer position in the SMP- further time is allocated for this position up to 35hrs per week for the entire meshing period and includes work on other SMP-related duties.

Number of days observers worked on vessels

Observers are used on days when nets are being hauled to check what is being caught and to assist contractors with obtaining samples for scientific research.

Contractors must set the nets before the net can be hauled. During the hauling process the contractors check the net for any catch, clean the net and check for any damage. After the net is hauled it may be reset.

On average observers were present on over 50% of hauling days, details for each region are provided in Table 2b.

Table 2b. Number of days observers are on contract vessels during 2009-10.

Meshing Region	Total No. of days at sea (i.e. setting and hauling nets)	No. of hauling days	No. days observer is present	Percentage of hauling days observers present
Hunter	113	105	65	62%
Central Coast	99	93	52	56%
Sydney North	110	109	71	65%
Sydney South	168	159	65	41%
Illawarra	101	84	62	74%
Total	591	550	315	57%

Variations to allocated hours

Downward and upward variations to the allocated hours can be expected due to inclement / favourable weather and unforeseen events. For example, the Central Coast 'Actual' hours were down due to the Observer taking unexpected leave for 6 weeks during September / November 2009 and inclement weather resulting in the contractor not taking to sea on a number of days as expected. The Central Coast Administrative Region accounted for 176 of the 183.5 hours of the entire downward variation. Due to the short notice of the observer's leave and the complexities in recruiting, training and equipping a temporary

employee it was deemed impractical and cost-prohibitive to arrange a replacement. Opportunities were taken by members of the shark meshing team (Shark Meshing Strategy Leader and the Manager Operational Planning and Review) to fill-in for the observer on two meshing operations where some critical first-hand experience was gained.

In another example of variation, the Observer from the Illawarra region took expected leave for medical purposes and was replaced by a temporary appointment. Additional training of the temporary observer and good weather conditions in the Illawarra region resulted in an overrun, or upward variation of hours in that region.

The 'Actual Hours' worked by all observers was within 6 percent of the total 'Allocated Hours'.

Outcomes of Observer Program

Outcomes of the Observer Program in achieving progress toward the measures specified in the Management Plan for the 2009-10 meshing season include:

1. All catches of target and non-target species taken in nets by each contractor as submitted by the contractor were authorised by the observer and certified by way of monthly catch data sheets (records held by Fisheries Compliance Unit, Narara).
2. Using hand-held GPS units the observers provided accurate setting locations of all nets within the area of operation.
3. Details relayed to I&I NSW and DECCW of all marine mammals and reptiles captured in nets.
4. Samples of all animals as required and assistance in the delivery of whole animals.

1.1 (c) Compliance Plan (Part 5 of the Management Plan)

A Compliance Plan is required to ensure that the optimal level of compliance with the controls on the activity is achieved as set out in Part 5 (clause 37) of the Management Plan.

Development of the Compliance Plan

An SMP Compliance Plan was finalised on 08 July 2010. The Operation Plan (Sierra Mike 10) is a restricted document and will not be made available publically.

Compliance methodology

The compliance methodology used in the Compliance Plan is drawn from the 'Australian Fisheries National Compliance Strategy, 2010-2015' (AFNCS) prepared by the National Fisheries Compliance Committee of the Australian Fisheries Management Forum, 2010.

Under the AFNCS, the optimal level of compliance is ‘... that which holds the level of non-compliance at an acceptable level, which can be maintained at a reasonable cost while not compromising the integrity and sustainability of the resource’.

The two key measures used to achieve the optimal level of compliance – as adapted from the AFNCS and applied to the SMP include; (1) Maximising voluntary compliance with the provisions of the management regime; and (2) Creating effective deterrents against non-compliant activity.

During the 2009-10 meshing period, compliance managers evaluated the compliance needs of the program and the most effective and cost-efficient measures that could be used to best achieve the optimal level of compliance utilising the accepted fisheries compliance methodology. A multi-point compliance planning document (Operational Plan) was developed utilising the key elements of the ANFCS.

To maximise voluntary compliance in the SMP, the following measures were considered appropriate:

1. An annual training seminar for contractors and observer staff to promote understanding of the provisions of the Management Plan, contractual obligations (and possible sanctions), OHS requirements, I&I NSW Code of Conduct, release protocols, reporting requirements and dissection/tissue sampling techniques.
2. Pre-season quality inspections of meshing nets and related fishing gear to ensure compliance with the controls on the activity relating to gear specifications.
3. Use of any scheduled aerial surveillance trials to establish whether nets are set correctly and as required on weekends during the peak swimming period.
4. Evaluation of compliance risks and more targeted compliance efforts where required (risk-based compliance).

To create effective deterrence in the SMP the following measures were considered appropriate:

1. Random covert inspections of operations.
2. Random inspections of operations ‘at sea’ and inspection of nets in-situ.
3. Follow-up surveillance of netting operations carried out by fisheries compliance officers as directed by the Shark Meshing Supervisor.
4. Penalties under the *Fisheries Management Act 1994* for illegal use of gear or any other fisheries offences detected.
5. Referral to DECCW for consideration of penalties under the *Threatened Species Conservation Act 1995* for non-compliance with provisions under that Act.
6. Auditing and reviewing catch records and invoices for payment against compliance observations.

7. Referral of any administrative non-compliance to Legal Services for consideration of breach of contract provisions (clause 17 of the SMP Management Plan).

The Compliance Plan sets out these key concepts as part of the Operational Plan approved by the Director Fisheries Compliance. The Operation Plan (Sierra Mike 10) is a restricted document and will not be made available publically.

The Compliance Plan was rescheduled by 6 weeks to coincide with the Annual District Compliance Plan (ADCP) cycle whereby each fisheries compliance officer at the rank of District Fisheries Officer or above submits a structured annual budget for compliance in their respective areas of responsibility. This includes areas where the SMP operates and the two offshore fisheries patrol vessels (FPV) "Sydney Swan" and "Ngaarru". The ADCP process, incorporating the principles of the SMP Compliance Plan, was agreed and approved by the Director Fisheries Compliance on 23 June 2010 and finalised on 08 July 2010.

Audit and Compliance Checks in 2009-10

Compliance inspections were undertaken prior to and during 2009-10 meshing period. For example:

- An inspection of nets and equipment was undertaken prior to the start of the SMP at which time all contractors complied with current contract conditions.
- Covert operations were conducted by the Shark Meshing Supervisor as opportunities arose to do so in a cost efficient manner.
- All nets were checked during a helicopter shark surveillance trial conducted in 2009-10 to ensure they were set correctly and to report on any animals entangled in the nets.

Details of the compliance measures undertaken in the 2009-10 meshing period are set out in Table 3.

The auditing and compliance checks undertaken during 2009 did not reveal any non-compliance with the current provisions of the SMP.

Table 3. Details of compliance measures undertaken during 2009-10.

Region	Inspection Type	Date
Hunter	15 nets inspected*	25/08/2009
Sydney North / Sydney South	34 nets inspected*	26/08/2009
Hunter / Central Coast	23 nets inspected*	27/08/2009
Central Coast	2 nets observed [#] (Umina)	11/11/2009
Hunter / Central Coast	6 nets observed [#] (Bar 1, Terrigal 1, North Avoca 1, Copacabana 2, & MacMasters 1)	12/11/2009
Sydney South	4 nets observed [#] (Cronulla)	21/04/2010
All regions	Helicopter aerial surveillance (all nets)	Every weekend and each public holiday between 19 December 2009 and 10 January 2010 inclusive and the Australia Day long weekend.

* 'Inspected' means physically inspected by the Shark Meshing Supervisor.

'Observed' means covert surveillance of the netting operation.

Damage to shark net potentially from commercial stern trawlers

Nets in the Hunter region were potentially damaged by commercial stern trawlers during the program in 2008-09. In a pro-active effort to avoid damage to nets during the program in 2009-10 an A4 sized flyer was developed and distributed to all commercial fishers in the Newcastle area via the Newcastle Fishermans Co-operative in August 2009.

After nets were damaged in the Hunter region the flyer was updated to include GPS information and again distributed via the Newcastle Fishermans Co-operative. Also, the flyer was hand-delivered to trawler operators by local fisheries officers. The fisheries officers reminded the commercial fishermen that interfering with set fishing gear is an offence under the *Fisheries Management Act 1994*. Similarly, the Strategy Leader telephoned and spoke with the trawler operators that were known to operate in the area where the damage occurred.

Non-complying float-sizes

The Shark Meshing Supervisor was required to instruct one of the contractors to use the correct size net float after it was noted from a third party that an incorrect float size was being used on one of the nets.

Non-recovery of shark carcasses

An I&I NSW shark meshing observer and contractor were reminded of their responsibilities after it emerged through reporting procedures that in early September 2009 two great white shark carcasses were not completely recovered. Only tissue samples were taken because the fish were reportedly in an advanced state of decomposition. There was some confusion on the Observer's part about the requirements of their role in this regard. The confusion was later clarified and body bags were issued to all contractors to ensure collection of decomposing carcasses. No further such cases occurred during the meshing period. Two other

sharks were not recovered due to dangerous conditions and this was deemed acceptable by the Shark Scientist.

Apart from the above issues and the net float incident which were all resolved to the satisfaction of the Shark Meshing Supervisor, there was nil non-compliance identified during the 2009-10 meshing period.

Non-recovery of turtle carcasses

DECCW advised that it required the carcasses of all deceased turtles taken by the SMP. In response I&I NSW shark meshing observers and contractors were advised to retain all dead turtle carcasses and reminded of their responsibilities. Body bags were issued to all contractors to ensure collection of decomposing carcasses.

Overall compliance

Compliance with contractual arrangements must be greater than the trigger point of 80% under the Management Plan. As contracts had not yet been varied and a compliance plan not required until the following meshing period, the target of 80% compliance with the provisions of the SMP under the Management Plan was not measureable. However, compliance would have exceeded 80%.

It is proposed under the Compliance Plan that rigid compliance statistics are determined after full evaluation of the compliance measures taken in 2010-11 to determine whether the compliance rate is mathematically within the acceptable range.

1.1 (d) Strategic Research and Monitoring Program (Part 6 of the Management Plan)

The purpose of the Strategic Research and Monitoring Program (SRMP) is to provide information that will lead to continuous improvement in the operation of the SMP and in achieving the objectives of the Management Plan.

Table 3 of the Management Plan categorises research priorities into levels (levels 1, 2 or 3) relevant to the risks identified through the environmental assessment process to provide information necessary to support the objectives of the Management Plan:

- a) **Level 1** (Planning): Within first 12 months of commencement of the Management Plan.
 - i) Develop SMP research plan and identify budgetary requirements and funding sources.
- b) **Level 2** (Actions): Immediate and ongoing.
 - i) Research associated with ongoing actions undertaken to implement the Management Plan.
- c) **Level 3** (Applied research): As required to meet the objectives of the Management Plan.
 - i) Research requirements identified from the environmental assessment process to mitigate adverse impacts of the SMP.

Table 4 (overleaf) provides details of progress in achieving the objectives of the Strategic Research and Monitoring Plan:

Table 4. Progress on achieving the objectives of the Strategic Research and Monitoring Plan.

Level 1: Identify information gaps and research needs	
Level and Topic	Status and Comment
1.1 Review and report on research and information needs, funding requirements and possible sources of funding.	<p>Status: Commenced / due before 1 September 2010.</p> <p>The sole level 1 component of the SRMP is due within 12 months of the commencement of the Management Plan (1 September 2010). This ambitious project is underway as I&I NSW Shark Scientists review literature and seek funding opportunities. It is anticipated that as a better picture emerges of the operation of the SMP (as proposed under the Management Plan) a moderate level of refinement will occur to the sub-objectives of this research component.</p>

Level 2: Data collection and review of existing data	
Level and Topic	Status and Comment
2.1 Review and refine data collection methods	<p>Status: Commenced /ongoing.</p> <p><i>2.1.1: Review data collection methods used in theSMP.</i> Data collection methods are under continual review and are adapted as technology and applicable uses are identified. The Shark Scientist informally reviewed sampling techniques used in the SMP during 2009 and conducted a workshop on 17 September 2009 to ensure observers and contractors were trained to collect appropriate material for DNA analysis and other uses. A complete wet lab training session was undertaken and a dissection kit was dispensed to each shark meshing boat.</p> <p><i>2.1.2: Develop refined catch data forms and identification resources.</i> Data catch reporting forms are currently under review and any necessary refinements will be incorporated into the 2010-11 meshing period with new forms and instructions for use dispensed at the pre-season training days for observers and contractors. DECCW representatives are being consulted with regard to any refinements that may be required for improved reporting of marine mammals, birds and reptiles. Weekly catch reporting will commence in the 2010-11 meshing period.</p> <p><i>2.1.3: Identify associated training programs for observers and contractors.</i> The I&I NSW Shark Scientist and the Shark Scientific Officer identify training needs for contractors and observers and develop the annual training program in conjunction with other members of the shark meshing team. DECCW representatives are also being consulted with regard to developing any refinements that may be required for improved management of captured marine mammals, birds and reptiles under the Management Plan. The most prominent new training required for the 2010-11 meshing period for observers</p>

	<p>and contractors is tagging procedures for nominated shark species and disentanglement procedures for non-target species from DECCW.</p>
<p>2.2 Review genetic samples to compare with reported species identification.</p>	<p>Status: Commenced and ongoing.</p> <p><i>2.2.1: Review shark genetic samples held by I&I NSW and cross-reference with reported species identification.</i> Research is being conducted by the I&I NSW Shark Scientist and Macquarie University undertaking molecular forensics on whaler sharks. The primary objective of this research is to obtain a better understanding of the historical composition of whaler sharks caught in the NSW Shark Meshing Program (SMP). The main outputs of the research includes:</p> <ol style="list-style-type: none"> 1. Developing genetic markers suitable for rapid species identification of NSW sharks. 2. Genetically identifying sharks caught in the NSW meshing program during past years. 3. Correcting the SMP catch database to species level, particularly for whaler sharks. <p>Samples held by I&I NSW are being cross checked with DNA markers to determine the level of accuracy in phenotypical (visual) analysis. Where inconsistencies are identified catch records are updated. Ongoing training of contractors and observers is designed to improve accuracy of shark identification, specifically for the whaler shark family which are intrinsically hard to differentiate without keys to identification and DNA analysis.</p> <p><i>2.2.2: Identify associated training programs/resources for observers and contractors.</i> Phenotypic analysis is being improved by provision of training to observers and contractors to identify common sharks encountered in the SMP. A training session on this topic was provided at the observer/contractor training day in August 2009 by the principal researcher of the I&I NSW publication '<i>Identifying Sharks and Rays, A Guide for Commercial Fishers</i>'. This guide is designed to assist in the identification of sharks and rays potentially encountered in NSW waters (and the SMP). It contains simple, easy-to-use keys that highlight certain external distinguishing features of sharks and rays for identification purposes. The keys are further supported by detailed species information and illustrations so that identification can be made with confidence. Each contractor was provided with a copy of the identification book for retention on their meshing boat prior to the commencement of the season.</p> <p>DECCW representatives are being consulted with regard to developing / sourcing and providing training that may be required for improved management of captured marine mammals, birds and reptiles. Training of contractors and observers by DECCW officers is scheduled for the pre-season training day in August 2010.</p>
<p>2.3 Review data on temporal and spatial factors affecting the operation of the SMP.</p>	<p>Status: Commenced and ongoing.</p> <p><i>2.3.1: Review research being conducted by CSIRO Marine Research on great white shark movements.</i> I&I NSW works closely with Dr Barry Bruce, principal investigator of the CSIRO Great White Shark Project, supplying data from white sharks caught in the SMP and data of tagged sharks detected on I&I NSW arrays of underwater acoustic listening stations. Although the CSIRO research is yet to be finalised, the results of these studies will be used to develop a greater understanding of this potentially dangerous species and</p>

	<p>implications for the SMP. Early indications emerging from the research show that the main aggregations of juvenile white sharks in NSW occur north of Stockton Beach and therefore outside the SMP area of operation. Juvenile white sharks appear to be resident in the Stockton Bight region from mid August through early January; and resident in Victoria from January through April (Russ Bradford, CSIRO Great White Shark Project, pers. comm. July 2010).</p> <p><i>2.3.2: Review existing data on other species (e.g. tiger shark, bull shark).</i> The report into the SMP in 2009 reviews existing data on tiger and bull sharks. There have been no substantial increases in knowledge or research on tiger sharks in NSW that would benefit the operations of the SMP. Bull shark movement research is being conducted using acoustic tags and the 380 listening stations I&I NSW has established in various areas along the coast of NSW. This research was instigated following the attack on the Navy diver in 2009 and will have direct relevance to shark protection and the SMP.</p> <p><i>2.3.3: Review existing data on spatial and temporal movements of non-target species.</i> Spatial and temporal movements of non-target species are under continual review and are considered an important component in decreasing potential impact of the SMP on nearshore fauna. As a member of the NSW DECC Marine Fauna Advisory Group and the IUCN Shark Specialist Group, the I&I NSW Shark Scientist is aware of any new research outputs or management issues for both shark and non-shark species considered non-target for the SMP.</p>
<p>2.4 Review data on shark interactions and beach usage.</p>	<p>Status: Commenced and ongoing.</p> <p><i>2.4.1: Access / review data collection by various organisations.</i> There were two shark interactions during the reporting period, namely the two wobbegong bites at Avoca and Mona Vale. The NSW I&I Shark Scientist investigated both incidents and ensured relevant reports were completed and submitted to the Australian Shark Attack File. A cross-reference with data held by the Australian Shark Attack File and the International Shark Attack File showed there to be no other interactions in NSW during the meshing period.</p> <p>All shark sightings as recorded by SLS NSW (Shark Logs) have been acquired by I&I NSW (supplied June 2010). The information is being reviewed by the shark meshing team with a view to identifying any data that may increase knowledge supporting the operations of the SMP, the SharkSmart awareness and education program, or other uses. During the SMP meshing period there were 78 sharks sighted by members of SLS NSW. Around 25% seen were identified as great whites by the person completing the Shark Log. Although the SLS volunteers are not trained at shark identification, the fact that most of these sighting were at Bennetts Beach in the Hawks Nest area corroborates known great white shark distribution in NSW. 56% of all sharks sighted were unidentified. It is unclear what level of consistency there is in reporting from club to club. Further assessment and discussion with SLS NSW is ongoing with a view to refining the Shark Log data capture fields, ensuring consistency of submissions from club to club and whether further data needs to be captured.</p> <p>One of SLS NSW major projects at the moment is with their statewide communications system, which is</p>

aimed to bring all volunteer and professional services under an SLS NSW run system in the next 2 years. This is being implemented at the same time as the comprehensive internet based SurfCom Management System. Accordingly, there may be scope in the near future to record shark sightings/beach closures in real-time and produce reports.

2.4.2: Review data on beach usage rates and future usage predictions.

From 2006 to 2036 the population of NSW is projected to grow by over 2.3 million as natural increase and net overseas migration drive growth, while Sydney's population is projected to grow by 1.7 million people during this period (2009, State of the Environment Report, CoA). The SOE population trend prediction for NSW shows substantial growth in the area in which the SMP operates. Average population growth in regional NSW is 1.06% p.a., in the Sydney general metropolitan region it is 1.04% and in the coastal areas outside the general metropolitan region it is 2.28%. An ongoing increase in beach usage in the area of the SMP can be expected into the foreseeable future given these predictions.

SLS NSW anticipates the visitation to beaches within the SMP area will increase proportionate to the general increase in population. SLS NSW is more focussed on anticipated expansion in beach visitation outside the area of the SMP as roads and housing subdivisions increase access to beaches in regional areas. The risk of drowning is highest at unmanned / unpatrolled beaches as demonstrated by drowning deaths in the past 12 months.

SLS NSW provided the following beach visitation figures for the periods 2006-07, 2008-09 and 2009-10. The beach visitation is recorded at midday for the period between September 25 to April 25 in each year.

Beach visitation 2009-10

Central Coast Branch: 273,863
Hunter Branch: 231,767
Illawarra Branch: 172,407
Sydney Branch: 600,825
Sydney Northern Beaches Branch: 1,028,487
Total: 2,307,349

Beach visitation 2008-09

Central Coast Branch: 348,881
Hunter Branch: 257,775
Illawarra Branch: 104,529
Sydney Branch: 604,966
Sydney Northern Beaches Branch: 1,072,784
Total: 2,388,935

Beach visitation 2007-08

Central Coast Branch: 417,729

Hunter Branch: 218,475

Illawarra Branch: 101,777

Sydney Branch: 561,271

Sydney Northern Beaches Branch: 907,325

Total: 2,206,577

The average beach visitation within the area of the SMP over the three years is 2,300,953.6 people per annum. Whether this points to an upward trend will be revealed as more data becomes available for analysis.

If beach visitation could be directly linked to population growth at even a conservative 0.1%, the increase in swimmer activity across all regions between the Hunter and Illawarra would equate to around 2,300 extra beach visitors annually. Several thousand more people in the water each year along NSW coast line creates more opportunity for shark interactions.

Previous years' beach visitation records have been sought from SLS NSW to make more accurate observations about trends in visitation. Future accounts will also be sought as part of this annual review process.

Beach usage data was also collected during a helicopter trial where around 7000 images were captured by a professional photographer of the 51 beaches in the SMP. Poor beach going conditions were experienced during the majority of the flights so visitation was more than likely lower than when fine conditions prevail. It is expected that the data will form some useful baseline comparisons for any future aerial surveillance trials using helicopter and/or fixed-wing aircraft.

2.4.3: Develop better links between agencies and develop systems to optimise collection and use data.

Better links have been developed between I&I NSW, SLS NSW, APOLA and the Australian Shark Attack File. These links were initially forged during the development of the 2009 Shark Meshing Report and cooperative development of the SharkSmart awareness and education program (August 2009) where each organisation provided input into the program.

Data and information is shared freely between the groups and coordination of information is increasing during other shark-related matters such as shark attack responses and the provision of 'real-time' information to surf life saving groups during the aerial surveillance trials.

The accumulation and assessment of Shark Log data from SLS NSW and the aerial surveillance trials should lead to a better understanding of what data is usable and beneficial to the operation of the SMP in achieving the objective of the Management Plan – and in beach safety generally.

	<p>Better working relations have been established with DECCW. Information on the catches of marine animals was conveyed in a timely manner to the appropriate DECCW representative and whole carcasses were delivered for necropsy where requested. DECCW is substantially involved in the training of contractors and observers to improve outcomes for entrapped marine mammals.</p>
<p>2.5 Review effectiveness of fishing operations used in shark control programs.</p>	<p>Status: Completed - ongoing.</p> <p><i>2.5.1: Review NSW shark meshing net configurations.</i> A comparison of the SMP net configurations with the Queensland and South African shark meshing operations was included in a Keynote Address at the recent Sharks International conference held in Cairns during June 2010. This work will be submitted for peer-reviewed publication in the scientific journal 'Marine & Freshwater Research'. A research project investigating the SMP net configurations, hanging depths and catch composition is planned for the 2010/11 and 2011/12 shark meshing seasons, depending on available funding opportunities, catches and contractor cooperation at historical high-catch beaches for bottom-dwelling non-target species.</p> <p><i>2.5.2: Review the application of other shark control measures for use in NSW (e.g. drum lines).</i> The use of drum lines is not permitted under the operation of the SMP through the Management Plan as contractors are prohibited from using baits or lures under the Tender Specification (CI G.8).</p> <p>A review of the potential for electric barrier technology to be used as a shark control measure off NSW was completed in 2007 (Peddemors, 2007). The I&I NSW Shark Scientist has over 20 years experience in electro-repelling of sharks and is consistently reviewing any new technologies that may assist in developing non-lethal shark control measures.</p> <p><i>2.5.3: Use outcomes to trial gear-related modifications of the SMP.</i> No alternative shark control measures are considered viable to trial any gear modifications in the SMP.</p>
<p>2.6 Develop methodologies for standardising fishing effort and analysing comparative CPUE data.</p>	<p>Status: Ongoing</p> <p><i>2.6.1: Investigate the feasibility of standardising soak-times for shark nets.</i> Standardisation of fishing effort is one of the most important issues to allow accurate assessment of the status of shark stocks via catch per unit effort (CPUE) methodologies. As the only long-term coastal shark fishery in NSW, efforts are continually underway to address this from both a historical and future perspective. The new JMA requirements will greatly assist in attempts to standardise soak times.</p> <p><i>2.6.2: Develop alternative approaches to standardised soak-times.</i> Review of literature and collaboration with research colleagues to investigate alternative approaches to standardised soak times are ongoing.</p>

Level 3 Establish/support collaborative research (e.g. CSIRO, other government agencies and universities)

Level and Topic	Status and Comment
<p>3.1 Research needs identified (e.g. environmental impacts of shark meshing).</p>	<p>Status: Commenced and ongoing</p> <p>3.1.1: <i>Distribution, abundance, biology and ecology of target species affected by the SMP.</i> Collaborative research initiatives have been established with the CSIRO Great White Shark Research Project investigating inter-annual variability in great white shark presence on the NSW coast using microchemistry of vertebrae. During 2009/10 the CSIRO researchers have participated in great white shark dissections at the Cronulla Fisheries Research Centre as part of their investigations into the biology and ecology of this species.</p> <p>Collaboration is ongoing with the South East Queensland Tiger Shark Research Project being conducted through the University of Queensland and the Queensland DEEDI. A research project on the biology and ecology of tiger sharks in NSW is being formulated in collaboration with Macquarie University.</p> <p>A new I&I NSW research project investigating the ecology and movements of bull sharks in NSW has forged strong links with researchers from Griffith University, Queensland, and the Queensland Department of Employment, Economic Development & Innovation (DEEDI).</p> <p>Several new research projects investigating whaler (dusky, spinner and blacktip) sharks in NSW and Queensland waters have been initiated with collaborations via Macquarie University, James Cook University and the Queensland DEEDI.</p> <p>3.1.2: <i>Distribution, abundance, biology and ecology of non-target species affected by the SMP.</i> Although non-target species have, to date, not formed the focus of the I&I NSW research efforts, research into wobbegong shark distribution, ecology and movements, is being conducted in collaboration with Macquarie University, Sydney Aquarium and the NSW DECCW.</p> <p>The I&I NSW Shark Scientist has been nominally involved in advising on some Macquarie University cetacean research initiatives and, in collaboration with Macquarie University and NSW DECCW, is planning research into the efficacy of whale alarms on shark nets. As an international expert on acoustic dolphin deterrents (ADDs, popularly known as 'pingers') and member of the international WWF Cetacean Bycatch Task Force, the I&I NSW Shark Scientist is reviewing the efficacy of pingers in reducing dolphin bycatch in the South African shark nets in collaboration with the KwaZulu-Natal Sharks Board.</p>

<p>3.2 Establish DNA library of shark species taken in the SMP to improve accuracy of identification.</p>	<p>Status: Competed - ongoing</p> <p>3.2.1: <i>Conduct collaborative research with relevant research institutions.</i> An analysis of historical DNA samples taken from sharks caught in the SMP is ongoing in collaboration with Macquarie University. DNA samples from SMP-caught sharks are being incorporated in studies investigating east coast stock structure of various whaler sharks in collaboration with the Queensland DEEDI and James Cook University.</p> <p>3.2.2: <i>Develop SMP DNA library.</i> A shark DNA library incorporating material from the SMP has been established by I&I NSW. Accessioning of new material from the SMP is ongoing.</p>
<p>3.3 Conduct scientifically-based shark attack risk assessment.</p>	<p>Status: Ongoing</p> <p>3.3.1: <i>Compile data from research relating to identified high-risk elements.</i> Data are continually being reviewed and assessed for potential inclusion in a database proposed to incorporate all activities and environmental conditions in both temporal and spatial fields. The historical lack of accuracy in any such data has, to date, hampered the establishment of a suitable database.</p> <p>3.3.2: <i>Apply standard risk assessment model (i.e. AS/NZ: 4360).</i> A first attempt at applying a standard risk assessment model to potential for shark interaction has been completed with the Royal Australian Navy relating to their diver work in Sydney waters. Ongoing data collection on abundance, distribution and movements of potentially dangerous sharks are being collected for use in the development of future models. As any future models for risk assessment of shark attack will need to include data on user use of NSW coastal waters, it is imperative that these data be collected in a scientifically robust manner.</p>
<p>3.4 Conduct morphometrics on sharks and other species caught in the SMP.</p>	<p>Status: Commenced and ongoing</p> <p>3.4.1: <i>Identify need for morphometrics in meeting the needs of the SMP.</i> Quality morphometric data are imperative to understanding the efficacy of the shark nets in reducing interactions with potentially dangerous sharks. They also provide data on the size classes and any possible size-based stock structuring of sharks off NSW. Understanding these data will allow better assessment of the potential impacts of the SMP on shark stocks and enable better management and conservation initiatives to be implemented.</p> <p>3.4.2: <i>Include in research priorities document (1.1) if considered appropriate.</i> The SMP Research Review and Proposal is ongoing and will be completed by the due date of 1 September 2010.</p>

Monitoring Program	
1. Shark Meshing Contractor Catch Report.	<p>Status: To be commenced in 2010-11 meshing period.</p> <p>Weekly catch data forms are required under the Tender Specification and will commence in the 2010-11 meshing period.</p> <p>Note: An Interactive Voice Response (IVR) system is under development by I&I NSW for applications supporting telephone-based business services. Further development of this program is continuing with a view to provide a shark net capture reporting facility which will allow contractors to telephone a number and key in capture statistics in real time. The information is then automatically sent via Short Message Service to the Shark Meshing Team and DECCW representatives. The requirement to use any IVR system when developed is incorporated into the contracts (appendix a, CI G.6.2)</p>
2. Shark Meshing I&I NSW Catch Summary Report.	<p>Status: Completed and ongoing.</p> <p>Monthly catch returns were submitted as required to the Fisheries Scientific Committee, Threatened Species Committee and DECCW.</p>
3. Tagging program.	<p>Status: To be commenced in 2010-11 meshing period.</p> <p>Shark and ray tagging educational material is being developed by I&I NSW in collaboration with the KwaZulu-Natal Sharks Board.</p> <p>All captured live sharks and rays, excluding grey nurse sharks, and marine turtles will be tagged and released by contractors where safe to do so under the Tender Specification. Tags and training to be supplied by I&I NSW & DECCW.</p>
4. Routine DNA sampling and verification.	<p>Status: To be commenced in 2010-11 meshing period.</p> <p>Routine DNA sampling of all dead animals and certain species of live sharks is incorporated into the Tender Specification (appendix a, CI G.9.2).</p>
5. Shark vertebral and other tissue samples.	<p>Status: To be commenced in 2010-11 meshing period.</p> <p>The requirement to sample all animals nominated by I&I NSW is incorporated into the Tender Specification (appendix a, CI G.9.2).</p> <p>Note: A total of 76 sharks were caught in the nets during the 2009/10 shark meshing season. Eleven sharks were released alive and, as such, were not sampled or tagged. Of the remaining 59 individuals, 7 were not sampled due to their state of decomposition or sea conditions. All threatened and endangered species were sampled or whole animals provided for research purposes.</p>

<p>6. Monitoring of all shark attacks.</p>	<p>Status: Ongoing.</p> <p>Where an attack occurs in NSW the I&I NSW Shark Scientist interviews the victims where possible and seeks as much information and evidence of shark identification as can be attained. This includes scale-bar photography of wounds requested from surgeons, examination of wounds and damage to surf craft or clothing / diving materials that show evidence of bite marks and any tooth fragments for analysis to help determine shark species. The Shark Scientist also provides key media support following shark attacks in NSW providing balanced information to the community on the reasonable level of threat. This is particularly important where the media is supplied with false or misleading information by individuals seeking to sensationalise media coverage thereby potentially heightening public concern.</p> <p>Note: The I&I NSW Shark Scientist also appeared on an international television program “Maneaters” where he again provided a scientifically based opinion on the threat posed by sharks and in particular some compelling information about oceanic water temperatures that may have contributed to increased shark interactions during the 2008-09 meshing period.</p>
<p>7. Monitor technological advances in shark control measures.</p>	<p>Status: Completed.</p> <p>As developed and sourced from relevant agencies.</p> <p><i>Passive sonar technology</i> Passive sonar technology primarily relies on echo characteristics of ‘targets’ in the water. As air is the most reflective property to sound underwater, swim bladders of fish provide excellent targets for active sonar devices such as fish-finders. There was a review of this technology by the Shark Scientist for the potential application to shark control.</p> <p>The Shark Scientist noted that as sharks do not possess swim bladders they provide a very limited potential acoustic signature for effective tracking. The potential for a passive acoustic array to locate and track sharks was thought therefore likely to be highly restricted. Acoustic signatures for most marine species are not well defined and even acoustic stock assessments of commercially important fish species require a high level of expertise to enable specialist scientists to calculate the biomass of fish in the region.</p> <p>Currently, an automated recognition system only exists in defining acoustic signatures of certain categories of vessel - after many years of dedicated research into vessel signatures. The lack of knowledge of marine animal acoustic signatures would currently require any system to be manned by specialists able to detect potential shark signals as every fish, marine reptile and marine mammal that passes through the acoustic ‘curtain’ would trigger the alarm. Even if such an array was currently available, it would be unfeasible to use as a shark defence system due to the sheer logistics of such a program.</p> <p>No other shark control measures have emerged recently that can be reasonably considered as a practical alternative to meshing.</p>

8. Patterns of movements of non-target marine animals.	<p>Status: Ongoing</p> <p>I&I NSW is working with relevant agencies and reviewing information as it becomes available.</p>
9. Population trends and patterns of movements of dangerous sharks and attack behaviour.	<p>Status: Ongoing</p> <p>I&I NSW has sourced information from relevant agencies and is developing trends and patterns of movements of dangerous sharks through research programs (refer to section 2.3 <i>Review data on temporal and spatial factors affecting the operation of SMP</i>).</p>
10. Patterns of recreational water contact activities in marine waters.	<p>Status:</p> <p>I&I NSW has reviewed the information that is available from relevant agencies (refer to section 2.4 <i>Review data on shark interactions and beach usage</i>).</p>
11. Threatened Species recovery plan reviews.	<p>Status: Completed.</p> <p><i>White Shark Recovery Plan</i></p> <p>I&I NSW shark meshing team reviewed the Commonwealth's Draft Recovery Plan for White Shark whilst on public exhibition. The specific objectives of the plan include monitoring and reducing the impact of shark control activities. Measures to reduce the impact of shark control activities on white sharks are listed below with management responses:</p> <ol style="list-style-type: none"> 1. <i>Numbers of White Shark taken in shark control activities monitored annually where the take of white sharks is made public.</i> All great white shark captures are reportable under the SMP Tender Specification (appendix a, Cl. 29). All catches are reported in accordance with the JMAs and Management Plan and the annual review report (this report) is made publicly available. 2. <i>Develop and trial non-lethal shark control alternatives to beach meshing and drumlines with a view to phasing out bottom set shark netting programs of shark control with alternatives trialed.</i> Addressed under SMP Monitoring Program (2.4). <i>Continue recording, tagging and biological sampling of shark meshing captures and information collated and records in accordance with the JMAs and Management Plan and the annual review report (this report) is made publicly available.</i> Routine sampling of all great white sharks occurs presently and under the Management Plan from 2010-11 meshing period the routine collection of DNA samples and tagging is established. All catches are reported in accordance with the JMAs and Management Plan and the annual review report (this report) is made publicly available. 3. <i>Undertake a review of the effectiveness of shark control programs on public beaches with a review to be undertaken within 5 years of the Recovery Plan.</i>

A full review of the SMP is scheduled under the JMAs to be completed within five years from 1 September 2009.

With regard to national reporting requirements I&I NSW primarily addresses this monitoring requirement by preparing and distributing this Annual Performance Report (which includes annual catch statistics) to the shark conservation management branch of DEWHA.

Grey Nurse Shark Recovery Plan and Issues Paper - 2010

The Grey Nurse Shark Recovery Plan and Issues Paper 2010 was developed as part of the review processes for the Grey Nurse Shark Recovery Plan 2002. The actions in the Recovery Plan are substantially based on the material that came out of a Grey Nurse Shark Workshop that was held on the 27 November 2009. The issues paper was reviewed to establish if any new or emerging threats relating to shark control measures have occurred. Measures to reduce the impact of shark control activities on Grey Nurse Sharks are listed below with management responses:

1. *Shark control programs to continue to report catches.*
All grey nurse shark captures are reportable under the SMP contract specification (appendix a, Cl. G.6.9). All catches are reported in accordance with the JMAs and Management Plan and the annual review report (this report) is made publicly available.
2. *Maintain the current review process of the effect of shark control programs.*
The SMP report in March 2009 provided a comprehensive review of the SMP and the operation of the program is subject to annual review in accordance with the JMAs and Management Plan and the annual review report (this report) is made publicly available.
3. *Establish and implement uniform minimum standards for the continued biological recording and sampling of Grey Nurse Sharks caught in shark control programs.*
Addressed under 2.1 *Review and refine data collection methods.* Whole dead carcasses of white sharks, grey nurse sharks, (protected, endangered or threatened species) or other species or samples as nominated are to be delivered to the location indicated by the Shark Scientist or delegate in accordance with the contract specifications (appendix a Cl. G.9.2)
4. *Develop a photo-tagging program for Grey Nurse Sharks caught and released in shark control programs, in conjunction with existing programs.*
There is scope for this to occur in the SMP under the contract specification (appendix a, Cl. G.6.10 or G.10.3). Additional training and resources would be required.
5. *Evaluate alternatives to shark meshing/drumlining including cessation of the program or the use of non-lethal alternatives.*
Addressed in section 2.5 *Review effectiveness of fishing operations used in shark control programs.*

I&I NSW continues to meet national and international commitments in shark conservation and management by implementing and reviewing the National Plan of Action (NPOA) for the Conservation and Management of Sharks (Shark-plan 1). In its ongoing role on the Shark-plan Implementation and Review Committee (SIRC) and the National Shark Recovery Group (NSRG), I&I NSW provides annual reports of interactions with threatened species of sharks, namely grey nurse sharks and great white sharks. I&I NSW also outlines how it has addressed the 43 actions in the NPOA to mitigate the impacts on threatened sharks and to ensure the sustainability of targeted sharks. I&I NSW has also contributed to: the review of the Commonwealth's Recovery Plans for the great white shark and for the grey nurse shark; the development of an Issues Paper for both species; and the development of revised Draft Recovery Plans for both species.

The following recovery plans relating to cetaceans were all reviewed to identify any new or emerging threats posed by the SMP to the species in question.

- *Blue, Fin and Sei Whale Recovery Plan 2005 – 2010*
- *Humpback Whale Recovery Plan 2005 – 2010*
- *Southern Right Whale Recovery Plan 2005 – 2010*

While no new or emerging threats were identified it was noted that an ongoing issue forming an objective in each of the recovery plans is habitat degradation, the aspects of which most relevant to the SMP include entanglement in marine debris and fishing equipment.

Actions to achieve the objectives of these recovery plans includes encouraging best practice approaches that will reduce the likelihood of whales being entangled. If entanglements occur, managing the impact of individual entanglements where possible through the application of national standards for disentangling large cetaceans is also recommended. Best practice will also be implemented through education programs to inform marine users (including fishermen) about best practice behaviours and regulations when interacting with whales.

Although whale entanglements are extremely rare in NSW, the operation of the SMP under the Management Plan seeks to support this response through greater involvement with DECCW (whale entanglement response team), who would be engaged in any entanglement event occurring in the SMP using the national standard.

For the 2009-10 meshing period, 100 whale proximity signs (copy appended) were developed by I&I NSW. The signs were developed to address the whale proximity provisions in the Management Plan (appendix a, CI 19.2) where if DECCW is of the opinion that the location and behaviour of an individual or group of individuals belonging to the family Balaenidae, Balaenopteridae or Dugongidae places it at risk of entanglement, DECCW may make a request to I&I NSW to delay or modify the setting of nets at specified beaches and I&I NSW must consider this request.

Nets must be fitted with acoustic warning devices (pingers and whale alarms) to reduce the risk of cetaceans becoming entangled and in the 2010-11 meshing period net checking times will be reduced to a minimum of 72hrs from 96hrs. This will improve the likelihood of any entrapped animal being released.

I&I NSW provided an effective coordinated response to reports of whales entangled in the nets during the program in 2009-10. A number of agencies were involved including; NSW Water Police, Surf Life Saving NSW, and DECCW. Contractor and fisheries officers inspected the nets but no whales were seen entangled in the nets and contractors noted no damage to the nets.

Seals

Threatening Processes for seals also include entanglement in fishing gear and other debris and it is anticipated that the measures developed under the Management Plan for whales, dolphins and dugongs will also reduce threats to seals.

Marine Turtles

The Recovery Plan for Marine Turtles in Australia was reviewed and while no new or emerging threats were identified, an ongoing requirement for NSW is to determine the mortality and species composition of marine turtle bycatch in shark control activities.

Environment Australia (now DEHWA) is to liaise with New South Wales Fisheries (now incorporated into I&I NSW) and provide data on marine turtle bycatch in shark control activities. The annual review report (this report) will be directed to that agency and made publicly available. The Recovery Team is to conduct a review of monitoring to coincide with the review of the recovery plan.

With regard to national reporting requirements I&I NSW primarily addresses this monitoring requirement by preparing and distributing this Annual Performance Report (which includes annual catch statistics) to the marine mammal management branch of DEHWA.

DECCW advised that it required the carcasses of all deceased turtles taken by the SMP. In response I&I NSW shark meshing observers and contractors were advised to retain all dead turtle carcasses and reminded of their responsibilities. Body bags were issued to all contractors to ensure collection of decomposing carcasses.

Black Cod

The Black Cod Draft Recovery Plan was reviewed. Of all the risks identified to this species the activity most similar to the SMP operations is commercial estuarine mesh netting which is identified as a low risk to black cod recovery.

While no specific arrangements are required of the SMP, the range of the black cod covers the entire region of the SMP so there is scope to facilitate several of the draft Recovery Plan management arrangements, namely to improve collection of data on interactions – and promote best practice release techniques.

To improve the collection of data on interactions between black cod and fishers, the draft plan seeks to encourage fishers/spearfishers and managers to record the capture location and approximate length and weight of incidentally caught black cod in NSW to the Threatened and Protected Species Sighting Program and via mandatory reporting arrangements for commercial fisheries. To support this Protected Species Sighting Sheets

	<p>will be provided to contractors and observers prior to the commencement of the 2010-11 meshing period and identification resources and training will be provided.</p> <p>The draft recovery plan also seeks to promote best practice techniques for handling and releasing incidentally caught black cod. When this advice is available all contractors will be provided best practice techniques for release.</p> <p><i>Little Penguin Recovery Plan</i> There have been no updates or reviews of the Little Penguin Recovery Plan since 2007. The Little Penguin Recovery Team conducted the Status of the Endangered Population of Little Penguins (<i>Eudyptula minor</i>) at Manly: Review of five years of monitoring (2002-03 to 2006-07) and the implementation of the Recovery Plan since 2000. No penguins were reported in the nets (dead or alive) in the past 2 years.</p>
12. Contractor compliance.	<p>Status: Completed for 2009-10 meshing period.</p> <p>This monitoring is conducted annually or when major non-compliance is detected. The Shark Meshing Supervisor advised that no major non-compliance was detected during the meshing period (see Compliance Plan).</p>
13. Monitor net locations by GPS.	<p>Status: Completed for 2009-10 meshing period.</p> <p>Required annually by I&I NSW this monitoring was completed during the first half of the meshing period. SMP observers were provided with hand-held GPS devices to accurately record net locations for the season and these data sets are held by the Shark Scientist. The net locations will be recorded in the 2010-11 meshing period and will also be used for compliance purposes under the Compliance Plan.</p>
14. Shark Meshing Program Annual Performance Evaluation.	<p>Status: Draft completed.</p> <p>This Annual Performance Report provides an evaluation of the performance of the SMP under the Management Plan.</p>

1.2 Performance Indicators

The following performance indicators / trigger points were specified in the JMAs and associated Management Plan to determine if the SMP is meeting the defined objectives.

1.2 (a) Change in the number of human fatalities or serious injuries resulting from shark attack

The trigger point for this objective is: one (1) fatality or serious injury per meshing season on a meshed beach. A serious injury means injuries from a shark attack that result in a threat to life or limb.

There were no shark attacks on meshed beaches in 2009-10 that resulted in a fatality or posed a serious threat of life or limb. While there were two reported shark attacks on meshed beaches during the 2009-10 meshing period (Avoca 26/12/2009 and Mona Vale 11/2/2010) I&I NSW Shark Scientists identified that the sharks involved were wobbegong sharks (*Orectolobus* sp.). Wobbegongs are not generally considered to pose a serious threat to life or limb due to their nature as predominantly docile, bottom-dwelling, ambush predators whose diet consist of relatively small fish, molluscs and crustaceans. Although the teeth of the wobbegong sharks inflicted some deep puncture wounds and cuts to the lower leg area of the victims, the men received rapid medical attention and are highly unlikely to suffer from long-term disabilities or a threat to life or limb. The two incidents are subsequently recorded as such in the Australian and International Shark Attack Files.

Wobbegong sharks are not target species in the SMP. Despite the two attacks during the reporting period it is not considered appropriate that this species be considered as a target species in future as both attacks occurred on or near kelp beds and reef terrain and not in the main swimming area (i.e. between the flags). Both swimmers appeared to have trodden on the shark, triggering the bite response. Better public education would be more feasible to highlight the potentially increased risk of encountering a wobbegong in these types of situations and when near the specie's preferred environment.

The intention of this trigger point is to determine whether attacks by dangerous predatory sharks are increasing despite the operation of the SMP under the Management Plan. Some may find an argument to suggest the wobbegong attacks constitute serious attacks, however, given that they are not a target species and the meshing operations are not intended to deter attacks from this species there is an opportunity to refine this objective (see 3) *Recommended Amendments*).

Table 5 shows shark attacks in the area of operation during the 2008-09 and 2009-10 meshing season.

Table 5. Fatal and serious shark attacks in the SMP area of operation in 2008-09 and 2009-10.

Meshing Period	Fatal	Serious	Total	Trend
2008-09	-	3	3	-
2009-10	-	0	0	↓

Note: Shark attack information was cross-referenced with shark log records held by SLS NSW (Surf Life Saving Manager) and the Australian Shark Attack File (Curator: John West). These enquiries showed that no other attacks resulting in fatality or serious injury were recorded in the area of operation during the reporting period.

1.2 (b) Change in the number of major or minor occupational health and safety related incidents reported by contractors or observers.

The trigger point for this objective is: one (1) major or minor incident occupational health and safety incident – a major incident is one that results in 5 or more compensable days off work and minor incident is one that results in less than 5 days off work.

There were no reported occupational health and safety incidents during the program in 2009-10.

1.2 (c) Change in the number of entanglements with non-target species and threatened species, populations and ecological communities in the SMP.

The trigger point for this objective is: entanglements of non-target species and Threatened Species over two consecutive meshing seasons exceed twice the annual average catch of the preceding 10 years for those species.

The indicators in Table 6 (↑ ↓ —) show whether the numbers of non-target species or threatened species captured in the nominated meshing period exceeded two times the average annual catch of the preceding 10 years (↑), or whether it is below the two times the 10 year average (↓) or remains constant (—). If the number exceeds the 10 year average for two consecutive meshing periods the trigger is tripped. No trigger points were tripped for non-target species during the program in 2009-10.

Catch statistics showed a total of 120 animals were reported entangled in the nets during the reportable period from 1 September 2009 to 30 April 2010, of which 44 were released alive (Table 8). Species encountered alive by the contractors were all released, these included one live turtle, thirty-three rays, six Port Jackson sharks, two whaler sharks, and two angel sharks.

Rays (*Myliobatiformes* sp.) continue to provide the largest component of all catches in each region (37% over all regions, 75% released alive). Hammerhead sharks (*Sphyrna* sp.) accounted for 13% and whalers (*Carcharhinus* sp.) 12%. Two dolphins, one dugong, one Australian fur seal and one turtle succumbed after becoming entangled in the nets. Other species contributed less than 10% of the total catch as detailed in Table 8.

Table 6: Comparison of non-target and threatened species catch for the past 2 meshing terms with twice the average annual catch over the past 10-years.

Scientific Name	Common Name	2 x 10-year annual average*	2008/09	2009/10	Trigger point tripped
Threatened Species					
<i>Carcharodon carcharius</i>	great white shark	13	8↓	5↓	No
<i>Carcharias taurus</i>	grey nurse	3	1↓	2↓	No
Non-Target Species					
<i>Sphyrna lewini</i>	scalloped hammerhead	4	1↓	0↓	No
<i>Sphyrna zygaena</i>	smooth hammerhead	32	9↓	11↓	No
<i>Sphyrna sp.</i>	hammerhead	65	4↓	5↓	No
<i>Alopias sp.</i>	thresher	5	3↓	6↑	No
<i>Squatina australis</i>	angel shark	27	13↓	12↓	No
<i>Heterodontus sp.</i>	Port Jackson	9	2↓	6↓	No
<i>Myliobatiformes sp.</i>	rays	126	30↓	44↓	No
<i>Osteichthyes</i>	finfish	2	1↓	0↓	No
<i>Tursiops truncatus</i>	bottlenose dolphin	2	0↓	1↓	No
<i>Delphinus delphis</i>	common dolphin	2	3↑	1↓	No
<i>Dugong dugong</i>	Dugong	0	0—	1↑	No
<i>Pinniped sp.</i>	seal	1	1—	1—	No
<i>Cheloniidae sp.</i>	turtle	5	3↓	2↓	No

*The twice 10-yearly annual average is rounded to the nearest whole number and does not include all species caught in the past 10 years. Catch data from when the program was first introduced in Sydney in 1937 until 2007-08 is available in the 2009 document entitled 'Report into the NSW Shark Meshing (Bather Protection) Program - Incorporating a review of the existing program and environmental assessment'.

- ↑ 10-yearly annual average exceeded one of the previous 2 years.
- ↓ 10-yearly annual average was less than one of the previous 2 years.
- 10-yearly annual average was the same as one of the previous 2 years.

Table 7: All species reported entangled in the beach nets during the program for 2008-09.

Scientific Name	Common Name	Central Coast	Illawarra	Hunter	Sydney North	Sydney South	Total released alive	Total deceased	Total	%
<i>Carcharhinus brachyurus</i>	bronze whaler		1	3				4	4	3
<i>Carcharhinus sp.</i>	whaler	4	4	7	12	18	2	43	45	34
<i>Galeocerda cuvieri</i>	tiger					1		1	1	1
<i>Notorhynchus cepedianus</i>	broadnose sevengill		1		1			2	2	2
<i>Carcharodon carcharius</i>	white			4	2	2	1	7	8	6
Non-Target Species										
<i>Sphyrna sp.</i>	hammerhead	2		1		1		4	4	3
<i>Sphyrna lewini</i>	scalloped hammerhead				1			1	1	1
<i>Sphyrna zygaena</i>	smooth hammerhead		4	4		1		9	9	7
<i>Alopias sp.</i>	thresher			3				3	3	2
<i>Squatina australis</i>	angel				3	9	4	8	12	9
<i>Carcharias taurus</i>	grey nurse			1			1		1	1
<i>Heterodontus sp.</i>	Port Jackson					2	1	1	2	2
<i>Osteichthyes</i>	finfish					1		1	1	1
<i>Delphinus delphis</i>	common dolphin				1	2		3	3	2
<i>Isurus oxyrinchus</i>	shortfin mako		1					1	1	1
<i>Myliobatiformes species</i>	unidentified ray			1	8	21	18	12	30	23
<i>Pinniped sp.</i>	seal					1		1	1	1
<i>Cheloniidae sp.</i>	turtle					3	1	2	3	2
	Total	6	11	24	28	62	28	103	131	100

Table 8: All species reported entangled in the beach nets during the program for 2009-10.

Scientific Name	Common Name	Central Coast	Illawarra	Hunter	Sydney North	Sydney South	Total released alive	Total deceased	Total	%
<i>Carcharhinus brachyurus</i>	bronze whaler		1	1			1	1	2	2
<i>Carcharhinus sp.</i>	whaler	3	3			6	1	11	12	10
<i>Galeocerda cuvier</i>	tiger shark					1		1	1	1
<i>Notorhynchus cepedianus</i>	broadnose sevengill		6		1	1		8	8	7
<i>Carcharodon carcharias</i>	great white			2	1	2		5	5	4
Non-Target Species										
<i>Sphyrna zygaena</i>	smooth hammerhead		9		1	1		11	11	9
<i>Sphyrna sp.</i>	hammerhead	3				2		5	5	4
<i>Alopias vulpinus</i>	thresher shark			5		1		6	6	5
<i>Squatina australis</i>	angel shark				1	11	2	10	12	10
<i>Carcharias taurus</i>	grey nurse			1	1			2	2	2
<i>Heterodontus sp.</i>	Port Jackson					6	6		6	5
<i>Myliobatiformes species</i>	unidentified ray			8	11	25	33	11	44	37
<i>Tursiops truncatus</i>	bottlenose dolphin				1			1	1	1
<i>Delphinus delphis</i>	common dolphin		1					1	1	1
<i>Dugong dugong</i>	Dugong					1		1	1	1
<i>Pinniped sp.</i>	seal					1		1	1	1
<i>Cheloniidae sp.</i>	turtle				2		1	1	2	2
	Totals	6	20	17	19	58	44	76	120	100

1.2 (d) Extent to which the reporting requirements are met.

Trigger points and management responses:

- i) Monthly catch summary reports to be provided to DECCW, the Scientific Committee and the Fisheries Scientific Committee.

Management Response: I&I NSW provided monthly catch summary reports to DECCW, Scientific Committee and the Fisheries Scientific Committee, during the program in 2009-10. The last monthly report was provided on 19 May 2010 after the conclusion of the meshing period. One turtle was not reported in the monthly reporting cycle due to an oversight when transposing written data to electronic form. In validating the data for this annual performance report the oversight error was discovered and corrected.

- ii) Annual performance report submitted to DECCW, the Scientific Committee and the Fisheries Scientific Committee by 31 July each year.

I&I NSW has prepared this annual report with a view to providing it by the required date. A corrected and proofed version of this report will be made available publicly.

2) Other Programs Complementing the SMP:

2.1 The SharkSmart Public Awareness and Education Program

In September 2009, following a recommendation from the SMP report and submissions from the community, a public education and awareness campaign 'SharkSmart' was launched to reduce the risk of a close encounter with a shark. SharkSmart is the State's first ever public education campaign designed to inform water goers, through web and print, of how they can reduce their risk of a close encounter with a shark.

The website page was developed to establish a 24-hour platform for the information and 100,000 SharkSmart brochures (appendix b) were produced. The brochure is an informative guide that clearly outlines some simple common sense measures to increase safety in the water. The brochure includes a check list including such information as avoiding the water when sharks are most active, at dusk and dawn; not swimming or surfing near schools of baitfish and avoiding murky water.

The majority of the brochures were distributed to all NSW Surf Life Saving Clubs, the Australian Professional Ocean Lifeguard Association (APOOLA) and tourist information centres throughout NSW. It is also available electronically at www.industry.nsw.gov.au.

The website has an on-line order function that allows for tailored and effective delivery to any community groups with an interest in holding the brochure in stock.

The SharkSmart campaign was an initiative to come from the 2009 SMP report.

2.2 The Helicopter Aerial Surveillance Trial

A helicopter shark-spotting trial was conducted during the peak swimming season of 2009-10 to evaluate whether helicopters have a role to play in enhancing the effectiveness of the SMP. This decision was made by the Minister for Primary Industries to ensure that all avenues for enhancing the protection of swimming had been adequately examined.

Newcastle Helicopters Pty Ltd was engaged through an open tender system to conduct a trial over each weekend and public holiday during the busy holiday period. Three-hour flights were undertaken morning and afternoon on each weekend day and each public holiday between 19 December 2009 and 10 January 2010 inclusive - and the Australia Day 2010 long weekend. There was one confirmed sighting of a great white shark and 210 hammerhead sharks were seen. There were ten other sightings where the species could not be confirmed due to the difficulty in identifying sharks in deeper water because of aberrations caused when light enters the water distorting the view of the shark.

Any sharks seen that may have posed a danger to swimmers or caused alarm were reported directly to appropriate surf life saving bodies to ensure that swimmers could be notified almost instantly of any increased risk or concern. During the trial, no beaches were closed due to sharks seen from the helicopter.

The helicopter was required to have an observer on board who was able to take high resolution digital photographs. The specified duties of the aerial surveillance observer were to:

- Look for sharks in the water and shoals of bait fish – where possible, accurately identifying species of sharks from the air.
- Provide timely and adequate records of sightings to I&I NSW, Surf Life Saving NSW (SLS) and the Australian Professional Ocean Lifeguards Association (APOLA).
- All sightings should be reported by mobile phone to the relevant surf lifesaving group (Surf Life Saving NSW (SLS) and APOLA) and I&I NSW contact person.
- Check the shark nets set to note if they are in a straight line and report any issues with the nets to the nominated I&I NSW contact person.
- Check the shark nets for any animal entanglements in the net and report any issues to the nominated I&I NSW contact person.
- Capture high quality air photographs (images) using a high resolution digital SLR camera (e.g. minimum 12 Mega Pixel with 200mm zoom lens). Each image must have metadata that includes the date taken. Crew shall take photographs of:
 - Every shark (note: high resolution images are required to enable species to be identified).
 - Bait fish shoals.
 - Beach usage (note: high resolution images are required so that the number of people on each beach and number of people in the water can be counted).

A professional marine photographer was engaged by Newcastle Helicopters to meet the observer requirement.

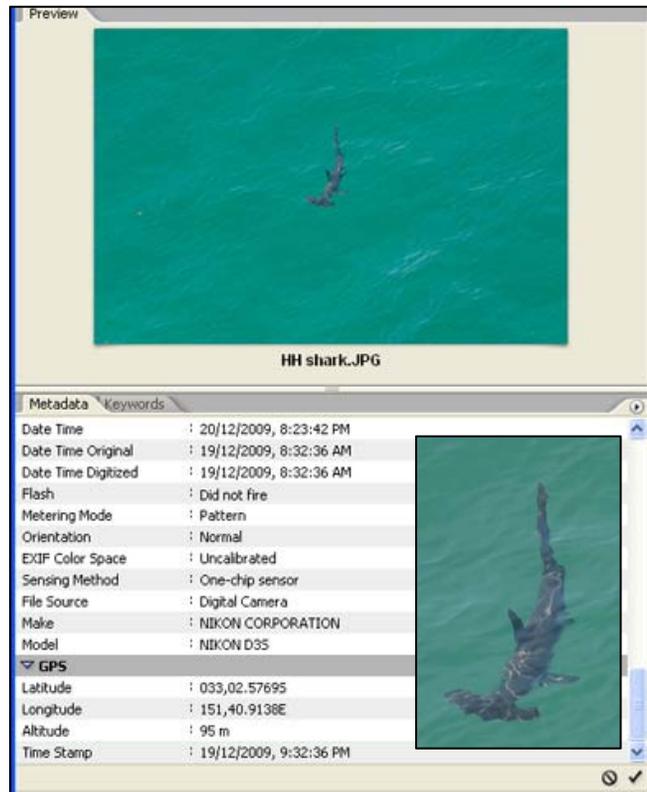
The helicopter crew was required to follow any instructions given by the nominated I&I NSW contact person, which may have included monitoring a particular shark once seen, however, this instruction was not required as no sharks were sighted that posed a clear and present risk to swimmers.

During the trial, around 7000 photographs were collected and data from these images will be used to provide information on beach usage during the trial and evaluating the quality of the data captured. I&I NSW Shark Scientists are still collating the data and the metadata contained within each file (e.g. date, time, GPS location, altitude, latitude and longitude).

The figure to the right shows a sample of the photography taken during one of the flights. Note the metadata from the picture file in the metadata tab. Inset is a more close-up view of the shark pictured, unmistakably a hammerhead.

The trial covered 202 kilometres of NSW coastline from Stockton Beach to South Wollongong Beach covering all the 51 beaches within the SMP. Three-hour flights were undertaken twice each day (morning and afternoon).

During the trial all nets observed were set correctly and no species were reported as entangled. A member of the I&I NSW Shark Meshing team was on hand to take reports twice daily on every day of the trials during weekends, public holidays, Christmas Day, Boxing Day and Australia Day.



The figure below shows the most detailed photograph of a great white shark acquired. Note the aberrations created by the water column that make quick and accurate identification difficult.



Over 100 schools of fish of varying sizes were seen; however, there were no sightings of sharks interacting with these. There were however, two occasions where a single hammerhead shark was seen with schooling fish nearby. The figure below shows a large school of fish photographed during the aerial surveillance trial which were identified by the helicopter observer as Australian salmon.



I&I NSW plans to continue the shark aerial surveillance trial of selected NSW beaches in 2010-11. The 2010-11 trial will include the use of a mixture of fixed wing and helicopter surveys, flying on both weekend and midweek days, and at different times of the day, to enable more variations for assessment.

3) Recommended Amendments

Clause 50 of the Management Plan sets out circumstances in which the Management Plan may be amended, these include 'a recommendation made in the annual performance report' (CI 50(1)a)). The following details are required to support a recommendation:

- i) The nature of the proposed change,
- ii) The reason why the proposed change is required, and
- iii) The effect of making the proposed change.

A process for creating amendments to trigger points is also established under Part 8, clause 52 (Special Circumstances). Under this process I&I NSW may amend aspects of this Plan that do not result in increases to the total effort of meshing operations, at any time. The following details are required to support a recommendation:

- i) The nature of the proposed change,
- ii) The reason why the proposed change is required, and
- iii) The effect of making the proposed change.

3.1 Amendment to Trigger Point 1.

An amendment to Trigger Point 1 is recommended:

The nature of the proposed change

The nature of this recommendation is to change Trigger Point 1 to better reflect the intention of the trigger point which was designed to determine whether attacks by 'dangerous predatory sharks' resulting in a fatality or serious injury are increasing despite the operation of the SMP under the Management Plan. Dangerous predatory sharks generally include great white sharks, tiger shark and whaler species such as bull sharks.

The reason why the proposed change is required

Under the Management Plan a serious injury means injuries from a shark attack that result in a threat to life or limb. The definition of serious injury requires further refinement so as not to capture data arising from non-predatory, non-target species such as wobbegong sharks, especially where the victim is not swimming in the main bather area where the enhanced protection of the SMP nets are designed to have maximal effect. Other measures could be invoked to reduce the risk from wobbegongs and similar sharks through public education and awareness.

The effect of making the proposed change

If this recommendation is enacted then the chance of triggering a wasteful reviewing of the program would be avoided should it be tripped by species that does not pose the risk sought to be reduced by the operation of the SMP.

3.2 Other Recommendations

A process for creating amendments to the Management Plan are established under Part 8, clause 52 (Special Circumstances). Under this process I&I NSW may amend aspects of this Plan that do not result in increases to the total effort of meshing operations, at any time.

It is intended to make the following amendments:

- a. Change of Principal and Principal's Delegate and name update (I&I NSW).
- b. Variation to the number of meshing administrative regions from five (5) to six (6).
- c. Update the management plan to reflect the detailed specification as included in appendix a.

3.2 (a) Change of Principal and Principal's Delegate and update the departments name (I&I NSW)

The nature of the proposed change

The nature of this change is to reflect that during the Shark Meshing Tender Project it was agreed by SCCB that the Principal should be I&I NSW, not the SCCB, and the Principal's Delegate should be any of those positions so nominated (Strategy Leader, Shark Scientist and Shark Meshing Supervisor). As for the departmental name change, the Management Plan refers to the Department of Industry and Investment (DII). The legal name remains as the Department of Industry and Investment, however, the preferred name since becoming a NSW Government super department is Industry and Investment NSW (I&I NSW). The update of the naming convention would be for administrative purposes only and to reduce the possibility of confusion.

The reason why the proposed change is required

To reflect the arrangements as they stand from this point and for administrative purposes.

The effect of making the proposed change

The effect of the proposed change does not increase the effort in the SMP or create any other issues that would generate concern that the program would not meet its objectives. It merely recognises the change of Principal and Principal's Delegate and the proper name of the Principal (I&I NSW).

3.2 (b) Variation to the number of meshing administrative regions

The nature of the proposed change

To change the number of administrative regions from five (5) to six (6).

The reason why the proposed change is required

The variation to the number of meshing administrative regions (as specified in the Management Plan) from five to six was foreshadowed by the SMP Report for the

purposes of practicality and was acted on during the Shark Meshing Tender process.

The effect of making the proposed change

The effect of the proposed change does not increase the effort in the SMP or create any other issues that would generate concern that the program would not meet its objectives.

3.2 (c) Update the management plan to reflect the detailed contract specifications as provided in appendix a.

The nature of the proposed change

Change the management plan to reflect the current contract specification as detailed in appendix a.

The reason why the proposed change is required

In preparing the 'Request for Tender' and detailed contract specifications it was noted that there was some duplication of information and inconsistencies in the Management Plan. The specifications in appendix a meets or exceed the specifications provided in the Management Plan and have been reviewed by I&I NSW legal branch staff to check that all requirements of the management plan were included in the new specifications (appendix a). For example the current specifications provides for IVR system reporting that was not included in the Management Plan.

The effect of making the proposed change

The effect of the proposed change does not increase the effort in the SMP or create any other issues that would generate concern that the program would not meet its objectives.

Appendices

A. Tender Specification



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G. TENDER SPECIFICATIONS

G.1. Work to be Performed

- G.1.1. The Contractor will be required to carry out a specified number of meshings, off the beaches detailed in the attached Table between 1 September and 30 April for the Term of the Contract. On seasons commencing or concluding on a weekend, the Nets may be set up to 2 days before the 1 September or retrieved up to 2 days after the 30 April. This variation is limited to seasons commencing on a weekend (e.g. 2012 & 2013) and seasons concluding on a weekend (e.g. 2010 & 2011)
- G.1.2. The number of meshings in respect of the beaches specified in the attached Table shall be calculated on the basis of the number of times a single net 150 metres in length is used. Only one net may be set at a time on any one beach.
- G.1.3. A meshing shall be completed when a net is hauled, or run and cleared, after it has been set continuously in the water for a minimum of twelve (12) hours between 4pm on one day and sunrise the following day. Weather conditions permitting set nets must be hauled or run and cleared after a period not exceeding 72 hours.
- G.1.4. Weather conditions permitting, set nets are to be hauled or run and cleared by the Contractor within 72 hours of the previous inspection. At each inspection the contractor is to remove all catch and debris from the nets.
- G.1.5. Not more than 70% of the number of meshings specified opposite each beach in the Table(s) are to be completed in either half of the calendar month.
- G.1.6. At the completion of sets/hauls for the month, all shark nets are to be completely removed from the water until the commencement of the next month's operations.
- G.1.7. During the term of the Contract as specified in Clause G.1.1, every weekend each of the beaches specified in the table(s) shall have nets set as a minimum between sunrise on Saturday to sunset on Sunday, with nets hauled or run and cleared on Monday, weather permitting. Calculation of the number of meshings during this period shall be the same as that referred to in Clause G.1.2 and Clause G.1.3.
- G.1.8. Nets must be set not more than 500m offshore (measured to the nearest land drying point), nor in water greater than 12m deep, and/or must be set at a position determined by the authorised I&I NSW representative (e.g. Observer, Shark Meshing Supervisor) as being appropriate for catching target species of sharks.
- G.1.9. The meshing net must be used as a sunk net only. No part of the net (other than that used for the purposes of marking, prescribed in Clause G.1.11 of this Specification) shall be on the surface. (NOTE: refer to Clause G.2.2)
- G.1.10. The work involved in hauling or running of nets shall be supervised by an official Observer who has delegated authority from the Director General, I&I NSW to certify that the number of meshings meet with the Table(s) as per the Contract and that all terms and conditions of the Contract are met including materials supplied, method of meshing, vessels, crew, gear, maintenance of records of operations, disposal of catch or other duties as directed by the Director General I&I NSW or his authorised representative.

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G.1.11. Nets used shall comply with the specifications as listed in the following table:

Gear/item	Specification
Floatline	150m of not less than 8mm diameter, synthetic rope with a breaking strain of not less than 900kg
Leadline	150m of not less than 8mm diameter, synthetic rope with a breaking strain of not less than 900kg
Floats	Gill net floats of not less than 10cm in diameter and 5cm thickness, or a float of equivalent buoyancy at not more than 5m apart.
Netting twine	Continuous synthetic filament with a breaking strain of not less than 60kg
Mesh size ¹	Mesh size must be 60cm.
Mesh depth	So that the 'net height' is approximately 6m when set, nets with 60cm mesh size must not be less than 12 meshes deep
Hanging coefficient (floatline & leadline)	0.67 (33% slack hung) i.e. each 60m of net is hung into 40m of floatline or leadline.
Hanging coefficient (sidelines)	0.74 of the product of the mesh size and number of meshes deep of the net used.
Side rope length	5.33m (60cm mesh * 12 meshes deep)
Bridle	The bridle from each net to the anchors shall have sufficient slack to fish to its maximum depth.
Identification	Nets must be tagged at the surface with a minimum of 20cm diameter yellow floats and clearly marked in black letters "Shark Net". The net must be identified by having securely attached, at or above water level, a tag with dimensions of at least 80mm by 25mm on which are legibly and durably displayed in capital letters the Contractor's name.

Note 1: ¹Nets are to be measured in accordance with cl. 53A of the NSW Fisheries Management (General) Regulation 2002.

Note 2: Refer to Clause G.2.2

- G.1.12. Contractors must immediately report any lost, damaged, stolen or over-set gear to the Shark Meshing Supervisor.
- G.1.13. The Contractor shall deploy acoustic listening devices, acoustic warning devices (i.e. dolphin pingers and whale alarms) on shark meshing nets as specified by the Shark Scientist or Shark Meshing Supervisor. The Contractor shall not be responsible for supply or maintenance of the devices, or the supply of batteries for their operation. However, the contractor must report lost and non-functioning devices to the Shark Scientist or Shark Meshing Supervisor.

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G.2. Methods of Use

- G.2.1. For the purposes of this contract, the methods of deploying nets (meshing) will be limited to 'hauling' and 'running' where:
- (a) 'Hauling' means a net deployed (shot from the vessel), set for at least the minimum required period as specified in Clause G.1.3 and then completely hauled back into the vessel.
 - (b) 'Running' means a net deployed, set for at least the minimum required period as specified in Clause G.1.3 and then checked by lifting the entire headline progressively from the water sufficiently to ascertain if any sharks or non-target species are meshed, and then clearing the net and returning the net to the water in a continuous operation from end to end.
- G.2.2. The position and method of setting nets, and the procedure in all matters affecting the efficiency of the meshing operations is subject to the direction of the Supervisor, who may also decide whether a meshing is counted as a meshing in accordance with clause G.1.3.
- G.2.3. Not more than one net shall be set on any one beach on any one day unless authorised by the Shark Meshing Supervisor, and the JMAs and associated Management Plan.
- G.2.4. The Observer must be on board the Vessel used to haul or run the nets during the allocated period

G.3. Vessels, Crew, Gear and Observers

- G.3.1. The Vessel shall be under survey in accordance with the requirements of NSW Maritime and shall be maintained in a seaworthy condition at all times and be manned by a sufficient crew to properly perform the Contract.
- G.3.2. The Vessel must be capable of safely loading the catch onto the deck and unloading catch from deck, securing and transporting target or non-target species up to three and a half (3.5) metres in length.
- G.3.3. All equipment as specified by NSW Maritime to cover all crew, the Observer and one other person authorised by the Principal's Delegate under Clause G.7.1 shall be provided on board the Vessel at all times.
- G.3.4. At least 24 hours notice of proposed departures of the Vessel shall be given to the Observer. This time of departure shall be determined by agreement between the Contractor and the Observer.
- G.3.5. The following accommodation shall be provided for the Observer on each Vessel used in the provision of the services:
- (a) a fully enclosed marine type flushing toilet.
 - (b) a hand basin with connected running fresh water.
 - (c) adequate individual cabin seating with provision for writing.
 - (d) a suitably enclosed changing area.

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G.3.6. Whilst the Contractor is engaged in shark meshing operations, no persons, apart from normal Crew members and approved I&I NSW personnel, are permitted to be on board the Vessel without the express written authority of I&I NSW.

G.3.7. The Contractor shall at all times use the nominated Vessel in the performance of works under the Contract unless the Contractor has obtained prior written notification, from the Principal's Delegate to use a vessel other than the nominated Vessel. A tender or dinghy may be used as an ancillary to the main vessel to run the net.

G.4. Contractor's Work Representative

The Contractor shall be required to, at all times during the progress of the work under the Contract, have in charge of the work a responsible Representative authorised to receive instructions on behalf of the Contractor and to represent the Contractor for all purposes of the Contract

G.5. Maintenance of Equipment and Safety of Employees

- G.5.1. The Contractor shall be required to:
- (a) Maintain equipment in good condition and repair.
 - (b) Maintain nets in good condition and repair to the satisfaction of the Shark Meshing Supervisor or Observer or Shark Scientist. Note: To keep nets in good condition it is anticipated that they would generally be removed from the water cleaned, checked and fully repaired or replaced with a clean net in good condition at least every 14 days. Holes in the net greater than 2 mesh panels shall be repaired within 72 hours of discovery (i.e. next time the net is hauled).
 - (c) Comply with waste disposal requirements outlined in clause G.9.4 and clause G.9.5 when disposing of waster arising from cleaning and maintenance operations.
 - (d) Secure the safety, health and welfare of persons engaged in the performance of the Contract.

G.5.2. The Contractor shall lay out nets for inspection and measurement in a manner and at a place and time specified by the Shark Meshing Supervisor. These inspections may be required prior to the commencement of the Term of the contract as specified in Clause G.1.1 and on a number of separate occasions during term of the contract as specified in Clause G.1.1. The Contractor shall be required to, at all times during the progress of the work under the Contract, have in charge of the work a responsible Representative authorised to receive instructions on behalf of the Contractor and to represent the Contractor for all purposes.

G.6. Records and Reporting of Operation

G.6.1. The Contractor shall keep a complete log on each Vessel in which shall be recorded daily the operations of the Vessel, the number and position of nets set, and any further information as required by the Shark Meshing Supervisor Note: This may include a Vessel Monitoring System (VMS).

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- G.6.2. The Contractor shall measure the length of target and non-target species taken in a net and, as far as possible, identify the species and report the target and non-target species caught in the previous 7 days to the Observer (or to the Integrated Voice Response (IVR) system when available) by 4 pm each Monday.
- G.6.3. The Contractor will supply a photographic image of each shark, threatened or protected fish, or aquatic mammal captured or entrapped in the nets. The image should be of adequate quality to allow reasonable identification and assessment of decomposition (where this applies).
- G.6.4. The Contractor shall at all times permit the Shark Meshing Supervisor and/or Observer to have access to such records and shall on the last day of each calendar month when meshing is required, forward a summary to the Principal's Delegate a copy of such record. Note: Weekly reporting is required to the Observer in Clause G.6.2.
- G.6.5. The Contractor is required to notify the Supervisor (or to the Integrated Voice Response (IVR) system when available) by 4 pm each Friday of the proposed shark meshing activities for the next 7 days.
- G.6.6. The Contractor is required to notify the Shark Meshing Supervisor by 4.00pm Friday if any nets have not been set on any beach specified in the Tables for the weekend, and advise the reasons.
- G.6.7. The Contractor is required to notify the Shark Meshing Supervisor prior to the removal of nets if set nets are to be removed from the water during a weekend (i.e. before sunset Sunday), and advise the reasons.
- G.6.8. Catch data records detailing the non-target and target species collected in the nets, vessel log data as specified in Clause G.6.1 and photographs as specified in Clause G.6.3 must be provided with monthly invoices.
- G.6.9. All reasonable efforts should be made to safely and immediately release target and non-target species with the least possible harm (refer also to Clause G.10.1). Contractor is to then immediately contact and follow the instructions provided by the Shark Meshing Supervisor or Shark Scientist or Delegate where:
- (a) Threatened or Protected fish species are entangled (e.g. grey nurse shark, great white shark).
 - (b) Marine mammals, marine reptiles are entangled (e.g. whales, dolphins, turtles).
 - (c) Protected or threatened fauna are entangled.
- Note: Shark Meshing Supervisor or Shark Scientist or Delegate is to then advise Threatened Species Unit of I&I NSW and Regional Duty Officer of DECCW.
- G.6.10. All sharks taken in the SMP must be reported to the Shark Scientist or Shark Meshing Supervisor or delegate (or to the Integrated Voice Response (IVR) system when available) within 24 hours. Information to be reported includes date and beach of capture, species, sex and approximate length. A photographic image must also be provided.

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G.7. Access for Observer

- G.7.1. The Contractor shall at all times allow the Observer or any other person authorised by the Principal's Delegate access to and conveyance on any Vessel used in connection with the Contract.
- G.7.2. Notwithstanding the provisions of Clause 9 hereof, the Contractor shall at all times allow any person so authorised in writing by the Principal's Delegate to collect any target or non-target species or any portion of target or non-target species.

G.8. Bait and Lures not to be Used

The Contractor shall not, within three (3) miles of any point on the coastline of New South Wales, use any bait or lure for the purpose of attracting sharks.

G.9. Disposal of Catch and Waste Management

- G.9.1. No sharks, fish or other animal caught under the Contract or skins, carcass or any other portion thereof shall be landed anywhere in New South Wales or dumped within three (3) miles of the New South Wales coastline except as provided by this Clause, Clause G.7.2 and Clause G.10.1. Any breach of this clause shall be a ground for termination in accordance with the provisions of the Contract.
- G.9.2. In accordance with the Clause G.3.2, JMAs and associated Management Plan, the contractor shall retain, land and deliver locally as nominated by the Shark Scientist or Shark Meshing Supervisor or Delegate the following:
 - (a) All dead carcasses of white sharks (*Carcharodon carcharias*) and grey nurse sharks (*Carcharias taurus*).
 - (b) All dead carcasses of protected, endangered or threatened species as requested by Shark Meshing Supervisor.
 - (c) Any other material from living or deceased target or non-target species including whole individuals or in part as specified by I&I NSW or DECCW (e.g. tissue samples from entangled marine mammals, marine birds and marine reptiles).
 - (d) All dead carcasses or material from living or deceased target or non-target species shall be covered during transport.
- G.9.3. Reporting requirements before disposal of catch are detailed in Clause G.6.9 and G.6.10.
- G.9.4. Carcasses disposed beyond 3 nautical miles of the NSW coastline must be weighted with an inert material sufficient to cause the carcass to sink to the bottom.
- G.9.5. The management and disposal of waste matter derived from the meshing operations, including any encrusting organisms, marine algae and anthropogenic marine debris is the responsibility of the Contractor and must be disposed of in accordance with local waste management protocols defined by NSW Maritime or local government.
- G.9.6. Waste holding tanks (e.g. toilet waste) are to be emptied at pump-out facilities wherever possible.

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G.10. Requirements Concerning Live Entrapped Marine Life and Research

- G.10.1. To minimise harm to live entrapped marine life the contractor shall:
- (a) Use the information resources prepared by I&I NSW or DECCW on species identification and release techniques (i.e. to maximise post-capture survival of non-target species).
 - (b) Take all reasonable efforts in the interests of contractor safety to release live target and non-target entangled marine life to minimise harm.
 - (c) Prior to release, contractor or delegate shall tag all live sharks, except grey nurse sharks and all marine reptiles (e.g. turtles) in accordance with approved training and safety controls.
 - (d) Prior to release, contractor or delegate shall photograph, and collect tissue samples as specified by resources prepared by I&I NSW or DECCW, Shark Scientist or Shark Meshing Supervisor.
- G.10.2. The Contractor shall co-operate with any research or monitoring program authorised by I&I NSW or authorised under the JMAs and associated Management Plan, where such authority is evidenced in writing and produced to the Contractor.
- G.10.3. The Contractor shall operate in accordance with the JMAs and associated Management Plan The Joint Management Agreements that are available on the Industry and Investment website (www.dpi.nsw.gov.au/fisheries/info/meshing) and Department of Environment Climate Change and Water website (www.environment.nsw.gov.au/threatenedspecies/jmas.htm).

G.11. Media Communications

Neither the Contractor nor Crew shall communicate in any way with any media organisation or media representative concerning any aspect of shark meshing operations without the express written authority of I&I NSW, and must refer all such inquiries to the I&I NSW Media and Public Affairs Unit.

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ATTACHMENT 1 — REGION

The region is nominated in [Part F.8](#) and the relevant table is to appear in this part and be included in the formal instrument of the contract.

Table 1 — Newcastle

Table 2 — Central Coast

Table 3 — Sydney North

Table 4 — Sydney Central

Table 5 — Sydney South

Table 6 — Wollongong

* Included in the total is 4 weekend meshings; each weekend in the 4 week period must be meshed in accordance with Clause G.1.1 and Clause G.1.7.

#104 meshing per year, eight 4-week periods and one three-week period as defined in the Formal Instrument of Agreement. Any additional meshing (other than those indicated in the Formal Instrument of Agreement) must be pre-approved by Shark Meshing Supervisor in accordance with Clause G.6.5 and the price for each pre-approved additional meshing will be calculated as 1/12 the 4 weekly contract price as provided in Part F.

A. Tender Specification (continued)



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TABLE 1 - NEWCASTLE

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
Catherine Hill Bay	12 ^H	*
Caves Beach	12 ^H	*
Swansea-Blacksmiths	12 ^H	*
Redhead	12 ^H	*
Merewether	12 ^H	*
Dixon Park	12 ^H	*
Bar Beach	12 ^H	*
Newcastle	12 ^H	*
Nobbys	12 ^H	*
Stockton	12 ^H	*

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TABLE 2 - CENTRAL COAST

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
Lakes (Birdie)	12 [#]	*
Soldiers	12 [#]	*
The Entrance	12 [#]	*
Shelley	12 [#]	*
Terrigal	12 [#]	*
Avoca	12 [#]	*
North Avoca	12 [#]	*
Copacabana	12 [#]	*
MacMasters	12 [#]	*
Killcare (Pretty)	12 [#]	*
Umina/Ocean	12 [#]	*

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TABLE 3 - SYDNEY NORTH

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
Palm	12 [#]	*
Whale	12 [#]	*
Avalon	12 [#]	*
Bilgola	12 [#]	*
Newport	12 [#]	*
Mona Vale	12 [#]	*
Warnewood	12 [#]	*

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TABLE 4 - SYDNEY CENTRAL

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
North Narrabeen	12 [#]	*
Narrabeen	12 [#]	*
Dee Why	12 [#]	*
Curl Curl	12 [#]	*
Harbord	12 [#]	*
Queenscliff	12 [#]	*
North Steyne	12 [#]	*
Manly	12 [#]	*

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TABLE 5 - SYDNEY SOUTH

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
Bondi	12 ^H	*
Bronte	12 ^H	*
Coogee	12 ^H	*
Maroubra	12 ^H	*
Wanda	12 ^H	*
Elouera	12 ^H	*
North Cronulla	12 ^H	*
Cronulla	12 ^H	*
Wattamolla	12 ^H	*
Garie	12 ^H	*

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TABLE 6 WOLLONGONG

NAME OF BEACH	TOTAL NUMBER OF MESHINGS PER 4 WEEKS	WEEKEND MESHINGS
Coledale	12 [#]	*
Austinmer	12 [#]	*
Thirroul	12 [#]	*
North Wollongong	12 [#]	*
South Wollongong	12 [#]	*

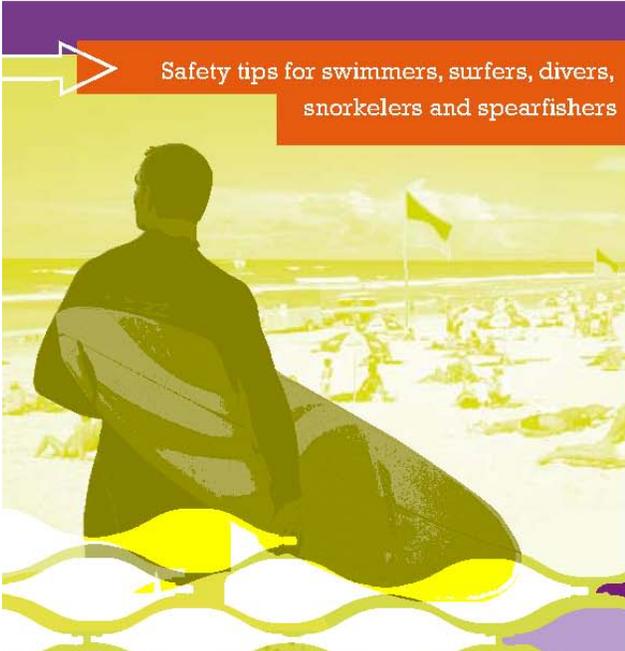
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B. SharkSmart awareness and education program brochure



➔ Safety tips for swimmers, surfers, divers, snorkelers and spearfishers



➔ Know the risks and reduce your chances of a close encounter with a shark at NSW beaches and estuaries

www.dpi.nsw.gov.au/info/sharksmart



Sharks live in healthy oceans

Sharks are a natural part of healthy oceanic and estuarine environments. When people enter open water, they are entering the shark's domain.

Shark attacks are rare events. Millions of us swim in oceans, harbours, coastal rivers and lakes each year, with just a handful of attacks. The only way to completely rule out a close encounter with a shark is to swim in a pool or other enclosure, or to stay on the shore!

However, a better awareness and understanding of sharks and their behaviour can help everyone to safely enjoy water sports, particularly younger people and tourists, as well as surfers and divers who choose to swim outside patrolled areas.

Shark meshing in NSW

The Shark Meshing (Bather Protection) Program helps provide a safer environment for swimmers and surfers and has proven effective in greatly reducing the number of shark attacks.

The program sees specially designed nets placed along 51 high-use beaches from Newcastle to Wollongong from 1 September to 30 April. The nets deter sharks from establishing territories—reducing the odds of an encounter. They are not meant to form a physical barrier.

There has only been one fatal attack on a netted beach since 1937 but there are no 100% guarantees against a shark attack.

While committed to the program, the NSW Government is conscious of the potential impact nets have on other marine life. Specialist contractors free any non-target sharks or other marine life caught where it is practical and safe to do so. Nets are not set during the majority of the whale migration season. When nets are set, special sound devices are used to deter dolphins and whales.





www.dpi.nsw.gov.au/info/sharksmart

18/NSW 9899_SEPT09

B. SharkSmart awareness and education program brochure (continued)



SharkSmart swimmers and surfers



- Swim at a patrolled beach, between the flags—lifesavers and lifeguards are there to monitor risks and maximise swimmer safety
- Tell an on-duty lifesaver or lifeguard if a shark is spotted near swimmers or surfers
- Leave the water if a shark is spotted or alarm is sounded
- Don't swim too far from shore
- Swim in groups
- Avoid surfing alone
- Avoid swimming and surfing when it's dark or during twilight hours
- Avoid murky water and waters with known effluents or sewage
- Avoid areas used by recreational or commercial fishers
- Do not swim/surf near or interfere with shark nets
- Avoid areas with signs of baitfish or fish feeding activity—watch for diving seabirds
- Do not rely on dolphins to indicate the absence of sharks—they often feed together
- Avoid having pets in the water with you
- Be aware that sharks may be present between sandbars or near steep drop offs
- Avoid swimming in canals, and swimming or surfing in river/harbour mouths

SharkSmart divers, snorkelers and spearfishers

- Find out about the kinds of sharks you might encounter and what behaviour to expect from them
- Realise diver safety becomes increasingly difficult with decreasing visibility at night or in turbid water, and with increasing depth and current
- Discuss dive logistics and contingency plans such as hand signals, entry and exit considerations and separation procedures with your dive partner before you enter the water
- Be aware that using bait to lure fish may attract sharks
- Don't chase, grab, corner, spear or touch a shark
- Don't use bait or attempt to feed sharks—feeding may radically change behaviour and lure other sharks
- Be aware of the behaviour of fish—if they suddenly seek cover or appear agitated, leave the water as quickly and quietly as possible
- Don't attach a speared fish to your body or keep them near you—use a float and line to keep your catch away



C. A4 flyer to commercial fishers to advise of net locations in Hunter region

Readhead / Swansea-Blacksmiths Beaches Shark Net Alert

Fishing trawler operators are asked to be mindful of the shark nets at the 51 beaches listed in table 1. Recently shark nets have been damaged in the Newcastle area.

These nets forms part of an important public safety measure but can be damaged by fishing operations, especially during prawn trawling activity.

Reasons to avoid the shark net:

- **Damage to the net may put swimmers at increased risk of shark attack**
- **Entanglement may result in damage to fishing gear, loss of manoeuvrability and vessel control**
- **Interference with set fishing gear is an offence and may result in legal action and replacement costs**

Table 1. The 5 regions and the 51 beaches of the shark meshing program

Newcastle	Central Coast	Sydney North	Sydney South	Illawarra
Stockton	Lakes	Palm	Bondi	Coledale
Nobbys	Soldiers	Whale	Bronte	Austinmer
Newcastle	The Entrance	Avalon	Coogee	Thirroul
Bar	Shelly	Bilgola	Maroubra	North Wollongong
Dixon Park	Terrigal	Newport	Wanda	South Wollongong
Merewether	North Avoca	Mona Vale	Elouera	
Redhead	Avoca	Warriewood	North Cronulla	
Swansea-Blacksmiths	Copacabana	North Narrabeen	Cronulla	
Caves Beach	MacMasters	Narrabeen	Wattamolla	
Catherine Hill Bay	Killcare	Dee Why	Garie	
	Umina	Curl Curl		
		Harbord		
		Queenscliff		
		North Steyne		
		Manly		

The net is present from 1 September to 30 April each year. It is 150 metres in length and bottom-set. The net is identified at both ends with floats marked "Shark Net".

For further information (e.g. GPS points for the nets) please contact:

John Turpin on 4428 3402 or
 Alan Genders on 4916 3973
 Fisheries & Compliance Branch
 Industry and Investment NSW

Thank you for your co-operation.



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D. Whale proximity warning sign



E. Changes made in response to the letters from the Scientific Committee and Fisheries Scientific Committee (refer to Appendix F and G)

In accordance with JMAs clause 8.3 [Measure: Annual Performance Report] the Annual Performance Report was provided to the Scientific Committee, Fisheries Scientific Committee, Minister for Industry and Investment and the Department of Environment, Climate Change, and Water (DECCW) for comments before 31 July 2010.

The following changes / comments are included to address the issues raised by the committees:

1. *Scientific Committee suggested improving the observer data by reporting how many days observers were on vessels.*

The following was added to the observer section.

Number of days observers worked on vessels

Observers are used on days when nets are being hauled to check what is being caught and to assist contractors with obtaining samples for scientific research.

Contractors must set the nets before the net can be hauled. During the hauling process the contractors check the net for any catch, clean the net and check for any damage. After the net is hauled it may be reset.

On average observers were present on over 50% of hauling days, details for each region are provided in Table 2b.

Table 2b. Number of days observers are on contract vessels during 2009-10.

Meshing Region	Total No. of days at sea (i.e. setting and hauling nets)	No. of haul days	No. days observer is present	Percentage of haul days observers present
Hunter	113	105	65	62%
Central Coast	99	93	52	56%
Sydney North	110	109	71	65%
Sydney South	168	159	65	41%
Illawarra	101	84	62	74%
Total	591	550	315	57%

2. *Scientific Committee suggested that there was a lack of available catch data and that Table 6 (page 32 in the report) was too confusing.*

Table 6 is designed to provide a comparison of non-target and threatened species catch for the past 2 meshing terms with twice the average annual catch over the past 10-years. This is the trigger point as listed in the JMAs and the table was designed to be easily interpreted.

Catch data from 1937 until 2007-08 is publicly available in the document entitled 'Report into the NSW Shark Meshing (Bather Protection) Program - Incorporating a review of the existing program and environmental assessment'.

Catch data for 2008-09 and 2009-10 are included in Tables 7 and 8 in this report so that catch data from 1937 to 2009-10 is now publicly available.

The following text was added below Table 6 on page 32 so that it is clear where to find more information on previous years.

Catch data from when the program was first introduced in Sydney in 1937 until 2007-08 is available in the 2009 document entitled 'Report into the NSW Shark Meshing (Bather Protection) Program - Incorporating a review of the existing program and environmental assessment'

3. Scientific Committee suggested reviewing the trigger points.

The trigger points in the JMAs were set following extensive consultation. If the trigger points are tripped then a more detailed review report is required. The detailed report could then review information such as the population size, demographic structure, breeding biology and the cumulative effect of other anthropogenic sources of mortality affecting each the species.

In addition, much of this data was assessed in the in the 2009 document entitled 'Report into the NSW Shark Meshing (Bather Protection) Program - Incorporating a review of the existing program and environmental assessment'.

4. Scientific Committee suggests discontinuing the program in September.

A number of potentially dangerous sharks are caught in September each year and following the extensive consultation in 2009 the program continues to operate from 1 September to 30 April each year following the stricter controls and reporting requirements as detailed in the JMAs and the associated Management Plan.

5. Scientific Committee suggests that 72 hours is not maximising post-release survival rates for entangled non-target species.

2010-11 will be the first year where 72-hour checking rates are used. As such, it is too early to provide any comments whether this will improve non-target species survival rates.

6. Fisheries Scientific Committee suggested that there was a lack of detail in the assessment of the trigger points.

Refer to the response to points 2 and 3 above.

7. Fisheries Scientific Committee noted that the seal and turtles were not identified to species level.

Identification material for key mammal, reptile and bird species likely to be encountered was provided by DECCW to the contractors and observers at the

beginning of the program in 2010-11. It is anticipated that species identifications will be improved for 2010-11. Photographs are also being collected to aid in species identifications.

DECCW are contacted to arrange collection of the whole animal if dead turtles or marine mammals are found in the nets.

8. Fisheries Scientific Committee noted that listening stations could be attached to each net dovetailing with the current I&I NSW research and monitoring program that is tracking acoustically tagged sharks.

For the 2010-11 year I&I NSW did consider attaching listening stations on shark nets, but, as I&I NSW currently have over 320 listening stations in NSW waters, 47 of which are in coastal waters between Stockton Beach and Wollongong, it was decided to extend the program to include the Clarence River and gain data about sharks movements outside the area of operation of the SMP. This will allow researchers to investigate the movement patterns of juvenile and adult bull sharks throughout their range on the NSW coast, and not only in the SMP region. Placing listening stations at each shark net installation remains under consideration within the long-term research plan for the SMP.

9. Fisheries Scientific Committee noted that aerial surveillance should be done in a scientifically robust manner and include non-target species so that it can contribute to population assessments of non-target species.

I&I NSW Shark Scientist provided valuable input into all aerial surveillance trials.

In 2010-11 the trial has been expanded to include the use of a mixture of fixed wing and helicopter flights and will include non-target species sightings. All flights are being flown according to a scientific design to maximise data use.

The results of this research will be used in conjunction with the data from the 2009-10 trial to assess any future role for aerial surveillance.

10. Fisheries Scientific Committee noted that more scientific research is required and recommended that sufficient funding be provided to ensure science and research requirements can be met.

I&I NSW Shark Scientist is reviewing all potential sources of funding so that the science and research components of the program can best be met.

F. Letter from the Scientific Committee

NSW SCIENTIFIC COMMITTEE

Shark Meshing (Bather Protection) Program 2009-10 Annual Performance Report

Comments from the NSW Scientific Committee September 2010

The New South Wales Scientific Committee has reviewed the Annual Performance Report for the Shark Meshing (Bather Protection) Program (SMP) 2009-1010 and provides the following comments.

1. The way in which observer effort is presented in the report makes it very difficult to determine precisely how observers were used during the operation of the program for the 2009-2010 season. For example, from the aggregate figures presented in Table 2 it is not clear that observers were present each time nets were set and hauled, nor is it evident how observer hours were determined. Providing more detail on the observer program in the annual report would improve the transparency of the program and would help substantiate stated outcomes of that aspect of the program.
2. Similarly, the Committee considers that the way in which entanglement rates for threatened species is presented in the report is poor. For example, it is impossible, from the data presented in Table 6, to compare entanglement rates before and after the introduction of the SMP and the use of arrows to graphically indicate whether catch rates have increased or decreased relative to 10 year annual averages is confusing. Once again, the transparency of the program would be greatly enhanced if the annual report simply provided the number of individuals of each species caught each year in, say, the 5 or even 10 years prior to the year of reporting. Surely it would be in the interests of the SMP to clearly demonstrate that measures designed to reduce threatened and non-target species by-catch are indeed working. As the data are currently presented, it is not possible to get an accurate sense of this.
3. The Committee maintains its concern with respect to the way in which trigger points have been set within the program. Trigger points should be sensitive to the population parameters of particular species, however, as they are currently set, they are likely to be too coarse to initiate a change in management response for species with declining or recovering populations. The Committee therefore once again recommends a reconsideration of trigger points, taking into account population size, demographic structure, breeding biology and the cumulative effect of other anthropogenic sources of mortality affecting each non-target and threatened species that interacts with the SMP.
4. The Committee re-iterates that meshing should be discontinued during the month of September. A number of non-target and threatened species experience highest rates of mortality during September (e.g. dolphins, grey-nurse sharks). Closure of the program at this time could be supplemented with alternative shark monitoring activities, such as aerial surveillance, which the Committee is encouraged to see being trialled in the current program. As a compromise, shark meshing could be discontinued during September just at those beaches that are near important habitat areas for non-target species, such as grey nurse shark aggregation sites.

[sharkmeshing 2010](#)

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F. Letter from the Scientific Committee continued

NSW SCIENTIFIC COMMITTEE

5. The Committee also wishes to re-iterate that the frequency of net inspections will have a significant influence on the likely post-release survival of non-target species, particularly air-breathing species such as cetaceans, seals and marine turtles. Under the Tender Specifications, nets must be set for a minimum of 12 hours and must be cleared no later 72 hours after being set. The Committee feels that the upper limit of this condition is not appropriate for maximising post-release survival of entangled non-target species.

G. Letter from the Fisheries Scientific Committee



The Hon Steve Whan MP
Minister for Primary Industries
Parliament House
Macquarie Street
SYDNEY NSW 2000

Dear Minister

Annual Performance Report for the Shark Meshing (Bather Protection) Program

The NSW Shark Meshing (Bather Protection) Program (SMP) operates under two Joint Management Agreements (JMAs) and a management plan, which provides for improved environmental outcomes and are required by legislation under the *Fisheries Management Act 1994* and *Threatened Species Act 1995*.

As required by Section 221Y of the *Fisheries Management Act 1994*, the Fisheries Scientific Committee's (FSC) role regarding the JMA is to:

- (1) conduct a review of the performance of all parties to the joint management agreement, and
- (2) advise the Minister of any deficiencies in implementation of the joint management agreement by any party to it.

The FSC has reviewed the performance of all parties as outlined in the SMP 2009-10 Annual Performance Report. Although operational aspects of the SMP were largely fulfilled, the FSC has significant concerns in relation to the scientific and research aspects of the performance and subsequent report. The Annual Performance Report contains no scientific data or information that would allow anyone to assess the success or lack thereof of the program itself. As such, the FSC finds it difficult to offer its learned peer review of a document as wanting as what has been provided. Having said that, the FSC offers the following critique in an effort to improve the SMP and future Annual Performance Reports.

We note that one of the trigger points for the SMP involves changes in the number of entanglements with non-target species and threatened species, populations and ecological communities in the SMP. The only data presented in the report for the FSC's assessment, however, is in Table 6, which only contains arrows showing a relationship to the 2 x annual average catch over the preceding 10 years. We find it very disappointing that the report contains no other details regarding catches. Considering the objectives of the JMA and the SMP, particularly with respect to threatened species, populations and communities, this lack of detail is very remiss.

We note that the threatened and/or protected species caught include great white sharks (n = 5), grey nurse sharks (2), marine turtles (2), marine mammals (1 seal, 1 dugong, 1 bottlenose dolphin, 1 common dolphin), yet no details (biological, spatial and/or temporal) are provided to enable our assessment of the potential impact of such catches other than the JMA trigger point. Although covered by the Scientific Committee, the FSC is disappointed that the marine turtles and seal caught were not identified to species, making it impossible to assess the conservation

G. Letter from the Fisheries Scientific Committee continued

importance of these entanglements.

The FSC considers that several of the research projects listed as commencing in the new 2010/11 meshing period are crucial to our understanding of the impact of the program on both individual sharks and NSW shark stocks. At the individual shark level, an understanding of shark movements around nets and the beaches of NSW will provide important data to assess public safety and the efficacy of nets in protection from shark attack. A research program tracking acoustically tagged sharks via underwater listening stations placed at nets is required to dovetail with ongoing research on bull sharks, great white sharks and tiger sharks, and adds potential for further research on other species. The FSC is disappointed that at the time of this report, much of the research as listed in Table 4 has not begun yet and the FSC considers it a high priority that these projects begin as soon as possible.

The FSC considers that the proposed aerial surveys to be continued in 2010 will provide an opportunity to contribute to population assessments of non-target species, as per the requirements under 3.1.2 of the JMA, but this work should be conducted in a scientifically robust manner with sufficient funding allocated to allow this. Unless such aerial survey work is done in a proper scientific fashion, under a sound experimental design, we believe that there is little point in doing it at all.

The FSC's contact with the SMP over the years has revealed that the scientific component of the SMP has, historically, not been well-supported by the government in terms of resources. This has led to a dearth of information from what should have been a world-leading, long-term dataset, allowing assessment of temporal and spatial changes in the nearshore marine environment.

We note that there is to be a new Strategic Research and Monitoring Plan, and that alternative funding sources are to be sought to do research. However, we consider that, in the likely event that such alternatives are not forthcoming, the NSW government must provide the necessary resources, such is the vital importance of the research that is required.

The FSC is concerned that without substantial government financial support for the Strategic Research and Monitoring Program in the SMP, we will again be faced with an inability to scientifically assess the impact of the SMP, as per the requirements of the JMA and MP. The FSC therefore urges the government to allocate a suitable budget to the science and research component of the SMP to ensure all JMA and Management Plan requirements are met.

Yours sincerely



Dr Jane Williamson
Chairperson
Fisheries Scientific Committee
09th November 2010