Sydney Marine Sand Pty Limited

Application for a Mineral Exploration Licence Covering Standard Blocks in the New South Wales Adjacent Area

Commonwealth of Australia
Offshore Minerals Act, 1994

August 2012

Sydney Marine Sand Pty Limited
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Application Form

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COMMONWEALTH OF AUSTRALIA
OFFSHORE MINERALS ACT 1994

NO.	NSW/	/MEL

APPLICATION FOR EXPLORATION LICENCE
IN THE NEW SOUTH WALES ADJACENT AREA

To: The Designated Authority of New South Wales
Department of Trade and Investment, Regional Infrastructure and Services
Resources and Energy
Minerals and Petroleum
516 High Street
MAITLAND NSW 2320

P O Box 344
Hunter Region Mail Centre
MAITLAND NSW 2310

APPLICANT TO COMPLETE ITEMS 1 TO 7

(1) Full Name and Address of each Applicant	(2) No. of Shares
Sydney Marine Sand Pty Limited **PO Box 408** **Cremorne 2090** **New South Wales**	(2) **100**

(3) TOTAL **100**

(4) Signature of Applicant or Agent	(5) Date
(4)	(5) 8 August 2012

Particulars to be attached:

A. a map highlighting the blocks applied for,
B. the proposals of the Applicant for the activities and expenditure intended in respect of the blocks specified in the application,
C. the technical qualifications of the Applicant and of his employees,
D. the technical advice available to the Applicant,
E. the financial resources available to the Applicant,
F. if the application is by more than one person, specify the share each prospective holder will hold,
G the likely effects of the proposal on the environment, and
H. any other matters that the Applicant wishes to be considered.

NOTE:- ALL CHEQUES ARE TO BE MADE PAYABLE TO THE COMMONWEALTH OF AUSTRALIA
(6) Details of nearest onshore reference point.
(7) Indicate by arrow location of application on map below-

(6)
Reference Point:

Sydney

Distance from:

Sydney is ~30 km

Direction from:

Sydney - NNE

(7)

OFFICE USE

APPLICATION FEE

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RECEIPT NO. ISSUED

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RECEIVED ON:

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BY ……..
(RECEIVING OFFICER)

PAGE 2

APPLICATION FOR EXPLORATION LICENCE

NO. NSW/ /MEL

INDICATE BLOCKS APPLIED FOR ☒

BLOCK IDENTIFIER (ALL SECTIONS MUST BE COMPLETED)

1:1,00,000 PLAN NAME	PRIMARY NO.	LETTER IDENTIFIER																										SUB TOTAL
Lake Macquarie	1243	all	A	B	C	D	E	F	G	H	J	K	L X	M X	N X	O X	P	Q X	R X	S X	T X	U	V X	W X	X X	Y X	Z	12
Sydney	1314	all	A	B	C	D	E X	F	G	H	J X	K X	L	M	N	O X	P X	Q	R	S X	T X	U X	V	W X	X X	Y X	Z X	12
	1315	all	A X	B X	C X	D X	E	F X	G X	H X	J	K	L X	M X	N	O	P	Q X	R X	S	T	U	V X	W X	X	Y	Z	13
	1385	all	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P X	Q	R	S	T X	U X	V	W	X	Y X	Z X	5
	1386	all	A X	B X	C X	D X	E X	F X	G X	H X	J X	K X	L X	M X	N X	O X	P X	Q X	R X	S X	T X	U	V X	W	X	Y	Z	20
	1387	all	A X	B X	C	D	E	F X	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	3
	1457	all	A	B	C	D X	E X	F	G	H X	J X	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	4
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		all	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	

If insufficient space use additional pages

TOTAL BLOCKS **69**

Technical Assessment of Mineral Potential of the Area

The surface of the NSW inner continental shelf is predominantly covered with sand and minor proportions of gravel, with smaller areas of bedrock reef (Roy 2001). Roy (2001) calculated that the total area of inner shelf covered by sand off the NSW coast is in the order of 8,000 km^2 of which about 70% occurs north of Sydney. The Company is applying for a Mineral Exploration Licence (MEL) over an area of about 150 km^2, which is 0.019% of the estimated total inner shelf sand area.

The targeted resources within the MEL application area are 2 of the 3 main depositional units recognised on the NSW continental shelf by Roy (2001), namely inner shelf sand sheets (ISSS) and regressive shelf barriers.

Inner shelf sands occur as a surficial sheet-like deposit, generally 0.25 to 1.5 m thick, that blankets a coast-parallel zone 5-10 km wide in water depths of 20-60 m (Roy et al. 1994). Inner shelf sands are typically olive brown to orange in colour due to iron oxide coatings on the surface of the sand grains. Texturally the sand varies from fine to coarse grained and is moderately sorted, with mud either absent or occurring as a very minor component. The sand predominantly comprises quartz grains with <10% rock fragments and feldspar grains, while bioclastic material (mainly shell fragments) is present in the surface sediments but may be absent in the subsurface due to leeching (Roy 2001). On their seaward margin, the inner shelf sands may be blanketed by mid-shelf fine sand and mud (Davies 1979; Marshall 1980; Colwell and Roy 1983). Inner shelf sands are considered palimpsest in nature as they are thought to have originated through prolonged, *in situ* marine reworking of pre-existing deposits on the inner shelf surface (Roy, 2001).

Regressive shelf barriers are only found in the subsurface and their upper surfaces are covered by inner shelf sand sheets or mid-shelf sediments. They occur as 10-20m thick, relict sand bodies that were deposited by waves under conditions of falling sea level (Roy 2001). Regressive barrier sands are typically fine to medium grained, unimodal and moderately well sorted, rounded to subrounded, quartz-rich sand (Roy et al. 1997). All traces of carbonate have been removed by subaerial leeching.

Very little geological data exists within the MEL application area. In 1989 the Public Works Department NSW Coast & River Branch produced seabed information maps of Sydney's inner continental shelf that extended from Bate Bay in the south to Foresters Beach on the Central Coast in the north. The maps show the distribution of surface sediment types on the inner continental shelf and the extent of outcropping rock reef along the coast based on surveys and interpretation for the Sydney Coastal Study (Gordon and Hoffman 1979-1985). These maps were digitised and reproduced by the Department of Environment, Climate Change and Water NSW (see Figure 1) to show the distribution of seabed habitats (Jordon et al. 2010). The detailed seabed habitat dataset of Jordon et al. (2010) covers much of the NSW coastal waters in this area, but the surveys did not extend into the MEL application area, which lies in Commonwealth waters seawards of the area mapped.

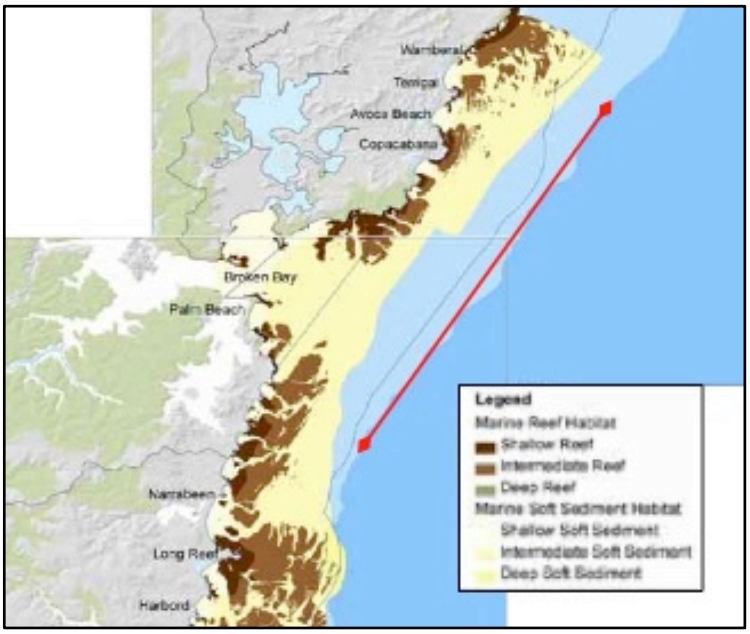

Figure 1 Distribution of known seabed habitats between the Central Coast and Long Reef. Red arrow shows approximate location of MEL application area. (Source: Jordan et al. 2010).

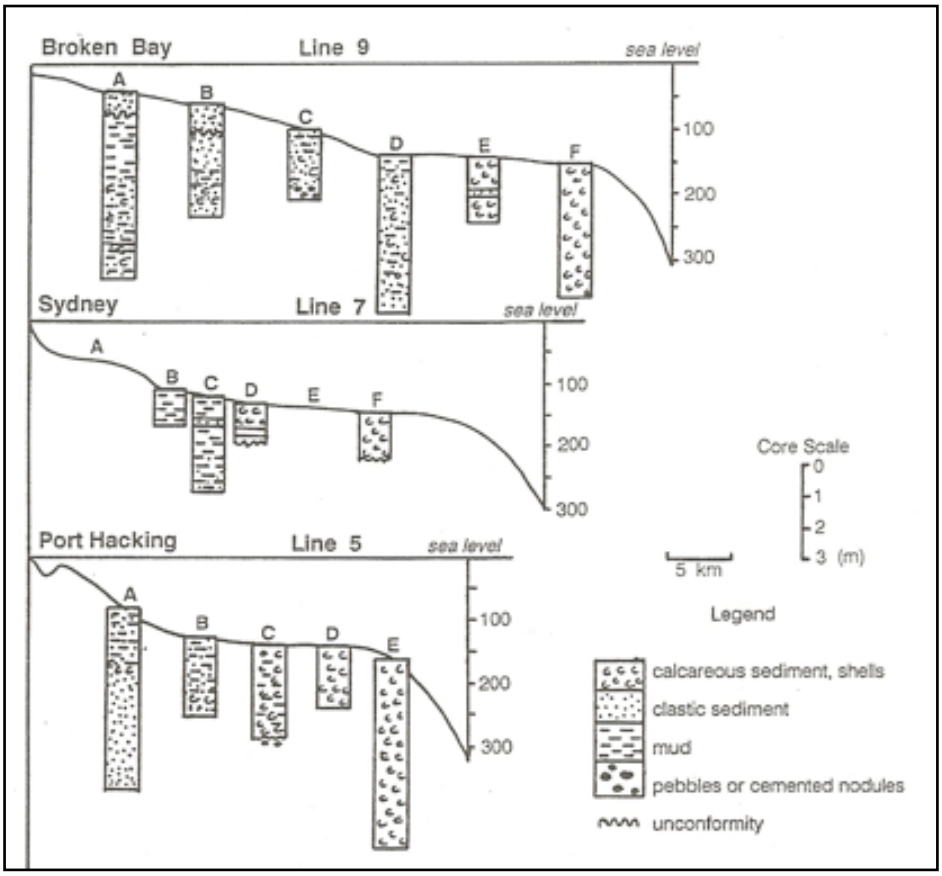

Figure 2 Shelf cross-sections showing the character of late Quaternary sediment based on preliminary interpretation of sediment recovered in vibracores (Source: AGSO 1993).

Figure 2 shows the results from a joint Australian Geological Survey Organisation, The University of Sydney and the NSW Department of Mineral Resources multidisciplinary research cruise in 1992 using the RV Rig Seismic (AGSO 1993). Bathymetric profiles of the continental shelf off Port Hacking, Sydney and Broken Bay are shown as well as the sedimentary stratigraphy at various depths along these profiles interpreted from vibracores collected at these locations.

Vibracore B on Line 9 off Broken Bay in 59m of water occurs within the MEL application area and shows about 1m of the inner shelf sand sheet unconformably overlying the regressive shelf barrier. The inner shelf sand is iron-stained, fine to medium grained, well sorted, quartzose sand with coarser shell fragments. The underlying regressive barrier sand unit is composed of clean, well sorted and non-ironstained, fine to medium grained quartzose sand. Both these units are prospective marine aggregate resources and will be targeted during the exploration program.

Figure 3 shows surface sediment samples from Geoscience Australia's MARine Sediment (MARS) database that have been collected within the MEL application area during past surveys. Table 1 shows the percentage of gravel, sand and mud in the samples from the area. All except one sample are typical of inner shelf sand having > 98% sand and < 2% mud with little or no gravel present.

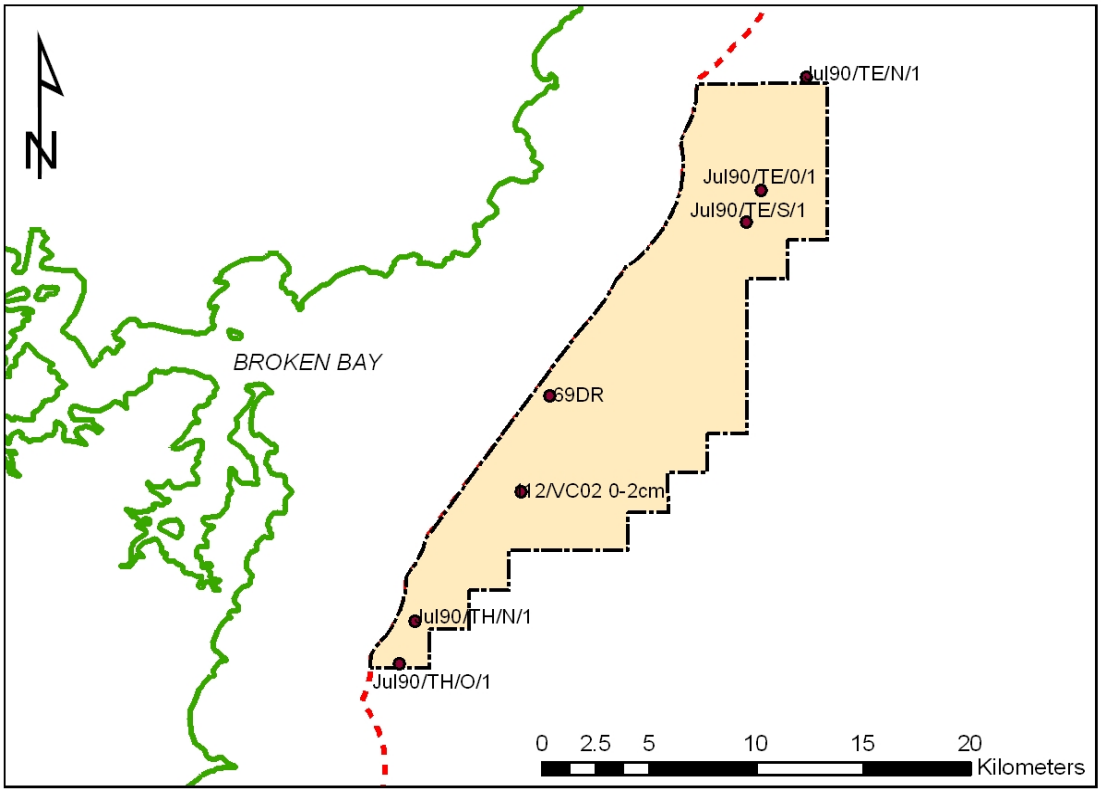

Figure 3 Seabed sediment samples from the MARS database in the MEL application area

Sample ID	Latitude	Longitude	Mud (%)	Sand (%)	Gravel (%)
Jul90/TE/N/1	-33.447167	151.558000	0.40	99.60	0.00
Jul90/TE/O/1	-33.495500	151.539167	2.00	98.00	0.00
Jul90/TE/S/1	-33.509000	151.532833	1.70	98.30	0.00
69DR	-33.583333	151.450000	0.16	99.67	0.17
112/VC02 0-2cm	-33.624500	151.438000	0.26	98.36	1.37
Jul90/TH/N/1	-33.680167	151.393500	8.50	91.50	0.00
Jul90/TH/O/1	-33.698167	151.387167	1.20	98.80	0.00

Table 1 Percentage of gravel, sand and mud in seabed sediment samples within MEL application area

For this application, photos and video of the seabed were collected at various locations within the MEL application area (see Figure 4 a, b, c and d). They show the typical soft sediment habitats found in the target water depths of between 50 and 65m. The sediments are fine to medium grained with coarser shell fragments. There is very little visible seabed biota, however there is evidence of scattered worm tubes and very sparse solitary sponges(?) and bryozoans(?). The proposed exploration of the MEL area to nationally/internationally recognised scientific standards will provide more detail on seabed biota and necessarily form the basis for any long term monitoring.

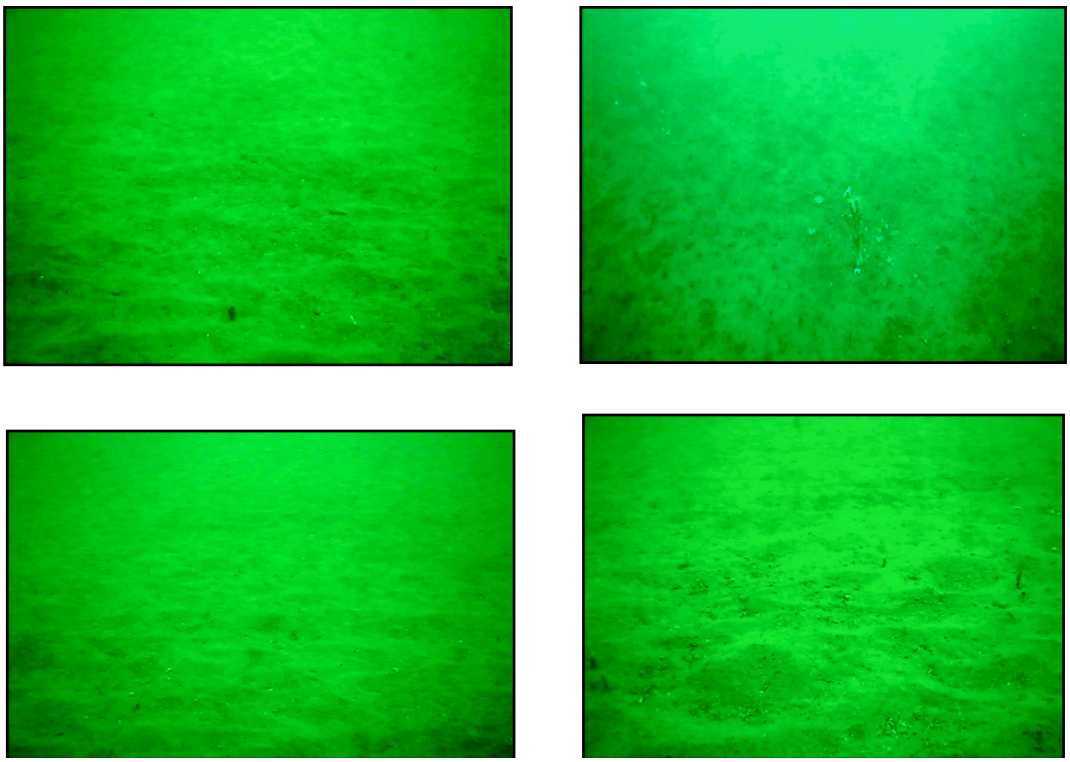

Figure 4a, b, c and d Photographs of the seabed within the MEL application area showing the soft sediment habitat. There is very little visible seabed biota in contrast to areas of reef as reported by Jordan et al. (2010).

Exploration Strategy and Details of Proposed Work Program

The aim of this project is to determine whether the targeted sand deposits have physical characteristics suitable for use in the construction materials industry. The targeted resources are ancient beach deposits that exist in water depths of between 50 and 80 metres. Existing geological models suggest that these sands are relict beach/barrier deposits formed tens of thousands of years ago during a period of lower sea levels and are not linked to the modern day beach systems.

The exploration strategy is to acquire robust, fundamental data to enable an investigation of the geology, morphology and stratigraphy of the inner shelf deposits within the MEL application area. The following work program is proposed:

Year One – Seabed Acoustic Survey:

- Survey of the seabed and sub-bottom in the licence area using acoustic remote sensing technology, including a multibeam echosounder (MBES) and an acoustic sub-bottom profiler (SBP);
- Processing the MBES and SBP data acquired, and compilation of the new and existing seabed morphology and sediment characteristics data; and
- Interpretation of the SBP data to determine the acoustic stratigraphy of the inner shelf;

The MBES survey system collects high-resolution georeferenced depth and seabed acoustic backscatter data. It will be carried out to map the seabed morphology and to characterise the roughness and hardness of the seabed, which is a function of its grain size and morphology. The proposed key instrument to be employed in the survey is the R2Sonic Multibeam Echosounder with selectable frequencies of 200 and 400 kHz. The system comprises a transducer on the end of a pole that is mounted on the side of the survey vessel, a topside data acquisition unit, Differential GPS, motion sensor and PC. The proposed shore-parallel survey tracklines within the MEL application area are shown in Figure 5. The swath width of the MBES system will be 250m, therefore survey lines will be spaced 175m apart for 100% overlap to provide a complete and high-quality coverage of the seabed. The total line kilometres of the MBES survey is approximately 1,200km.

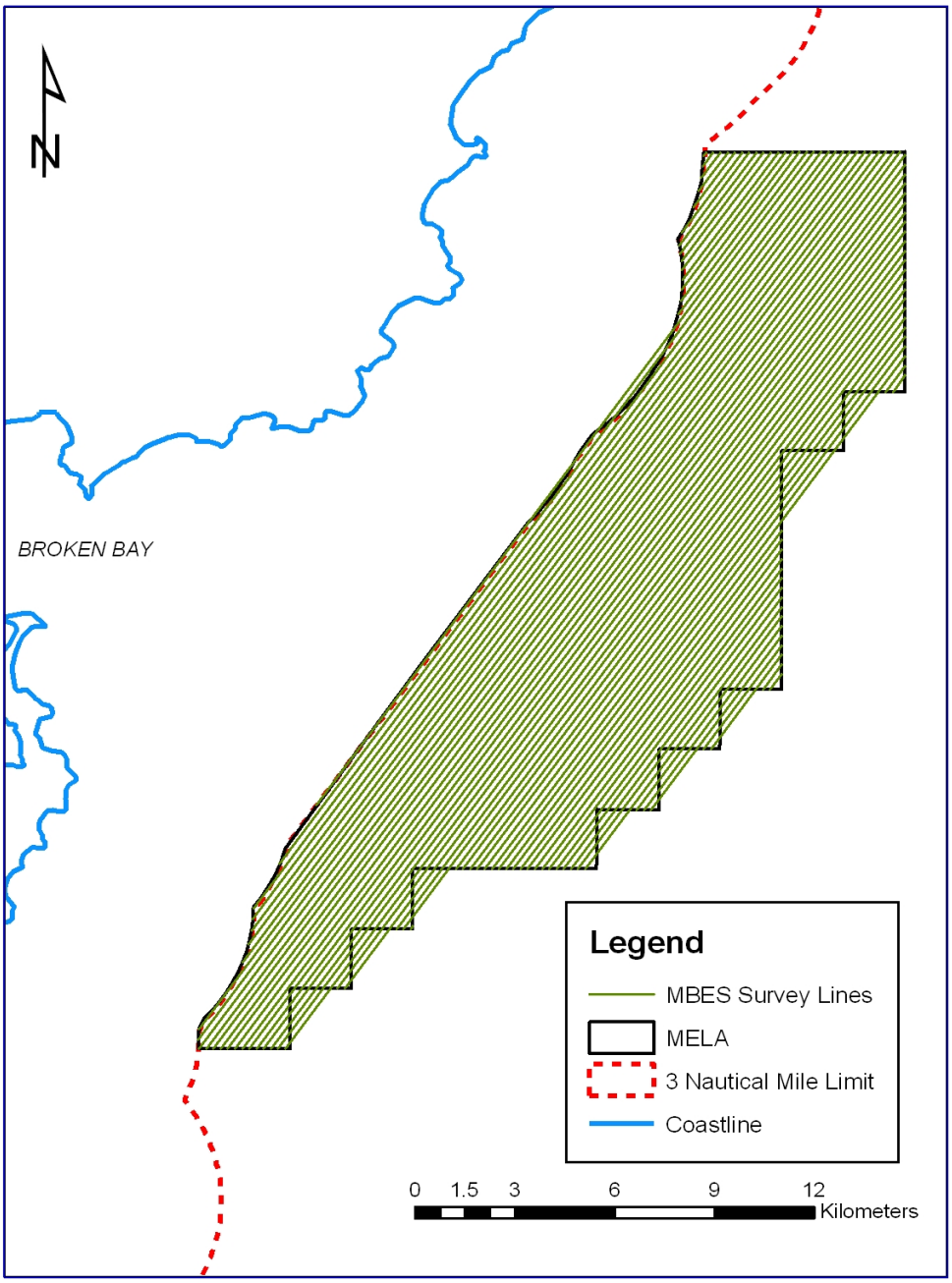

Figure 5 Map of the proposed MBES survey lines in the MEL application area

The sub-bottom profiler (SBP) survey will employ an Applied Acoustics Squid 500 Sparker unit (to be undertaken in conjunction with the MBES survey) to gather data on the stratigraphy and morphology on the sedimentary units in the MEL application area. The Squid 500 Sparker is used for high-resolution mapping applications, with low electrical power input and relatively high penetration into the sandy seabed substrate. The planned SBP tracklines are shown in Figure 6 and comprise shore normal lines at 1km line spacing, with two shore-parallel tielines. In total, approximately 300 line kilometres of SBP data would be collected.

The total length of the combined surveys is 1,500 line kilometres, which at a vessel speed of 7kts is about 5.0 x 24 hrs of survey time, without considering vessel turns. Budgetary estimates assume 7 days of survey at $22,000/day plus $20,000 for data processing.

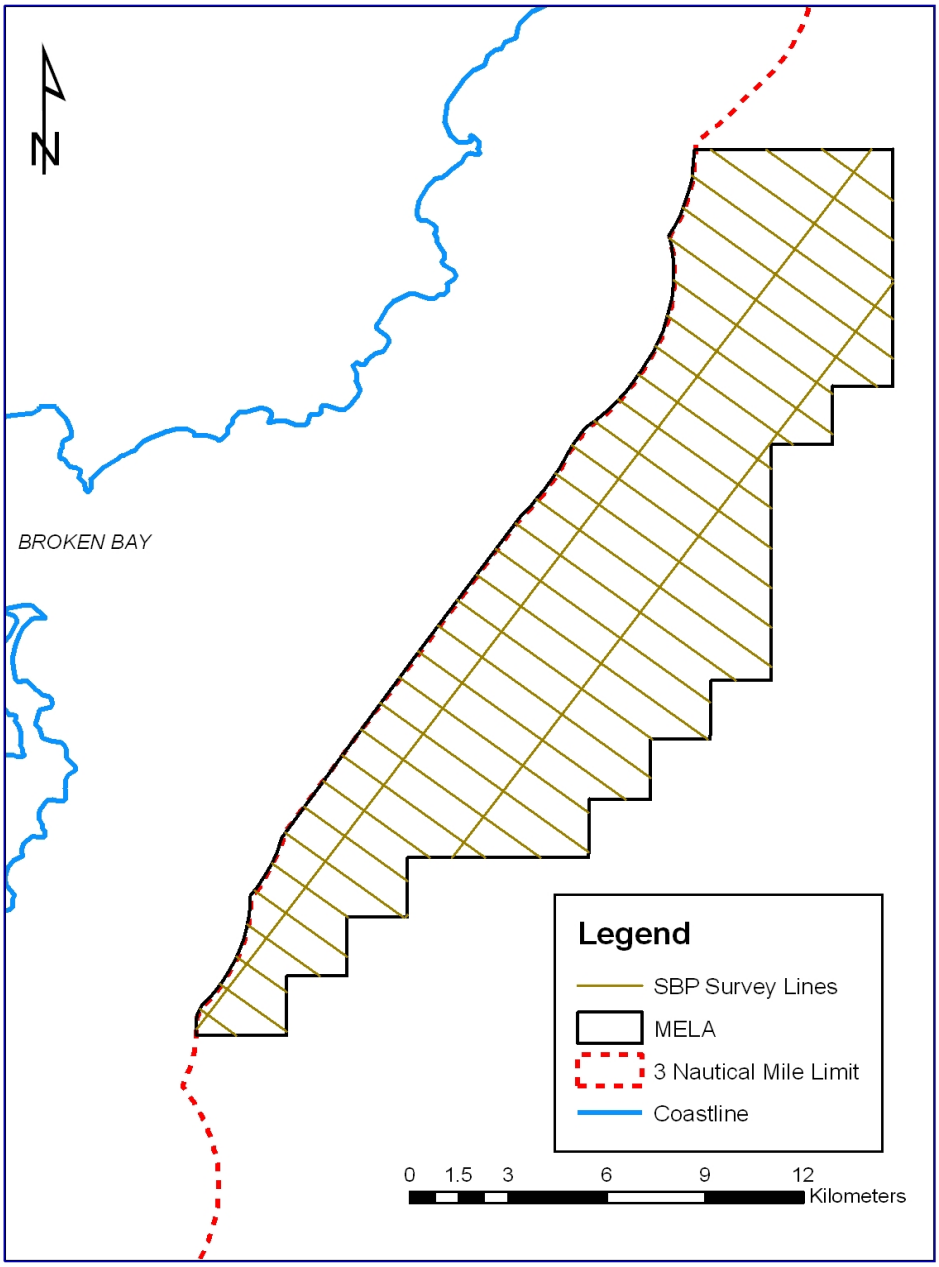

Figure 6 Map of the proposed SBP traverse lines in the MEL application area

Year Two – Seabed samples and underwater video:

- Surface sediment grab sampling program;
- Video and digital still photography of the seabed and mapping of benthic habitats;
- Vibracoring program to "ground truth" the SBP stratigraphic interpretations and to collect sediment samples for textural analysis;
- Laboratory analysis of samples and interpretation of the sediment data; and
- Initiate planning for a baseline environmental study.

A surface sediment sampling program and digital video/photography survey of the seabed will be undertaken over the entire MEL application area to collect samples and map the distribution of different sediment types and soft sediment habitats.

A small Van Veen grab will be used to take sediment samples from the sea floor (Figure 7). The grab is lowered to the seabed on a steel cable or rope with its "jaws" open. As soon as the open jaws touch the seabed, the latch keeping them open is released. As the grab is pulled back up the jaws close, scooping up sediment from the seabed. Once recovered to the vessel the grab is opened over a bucket and the contents are collected in a plastic bag and stored for analysis onshore. The proposed grab sampling program will collect sediment from the top 5-10 cm of the seabed from a sample site of approximately 0.060m^2. There will be no bulk sampling program. No material will be returned to the seabed. The seabed sample data will also be used to 'groundtruth' the MBES acoustic backscatter data and to inform the interpretation of photographs or video of the seabed at each location.

Figure 7 Deploying a Van Veen grab
(Source: http://www.geosi.no/en/equipment/grabb.htm).

The surface sediment sampling program will collect a total of 200 samples; about 3 samples randomly located in a 1 by 1 minute grid as shown in Figure 8. With a production rate of 40 samples a day, the program should take 5 days at a cost of approximately $2,500/day.

Following the surface sediment grab sampling program, a vibracore program will be undertaken to 'ground truth' the SBP interpretations and to collect subsurface samples for quantitative analysis of the resource. The vibracoring unit comprises a submersible, electrically powered, vibrating head attached to a rigid aluminium core barrel that is set inside an aluminium support frame or tower (see Figure 9). The vibracore is lowered to the seabed at predetermined locations, where it sits independent of the vessel, the vibrating head is turned on and the core barrel is then vibrated into the seabed. Total time to collect a core is between 1-2 minutes. Once full penetration is achieved, the core barrel is extracted from the seabed, with the sediment sample inside the barrel, and the whole system is then recovered back to the vessel. Sediment cores up to 6 metres long and 76mm diameter are collected. Unlike conventional rotary drilling techniques, vibracoring uses no drilling fluids or muds to collect cores. The vibracore is light weight (250kg), produces no sediment plume during coring and, apart from a 76mm hole that rapidly infills, has no impact on the seabed. No sediment is returned to the seabed

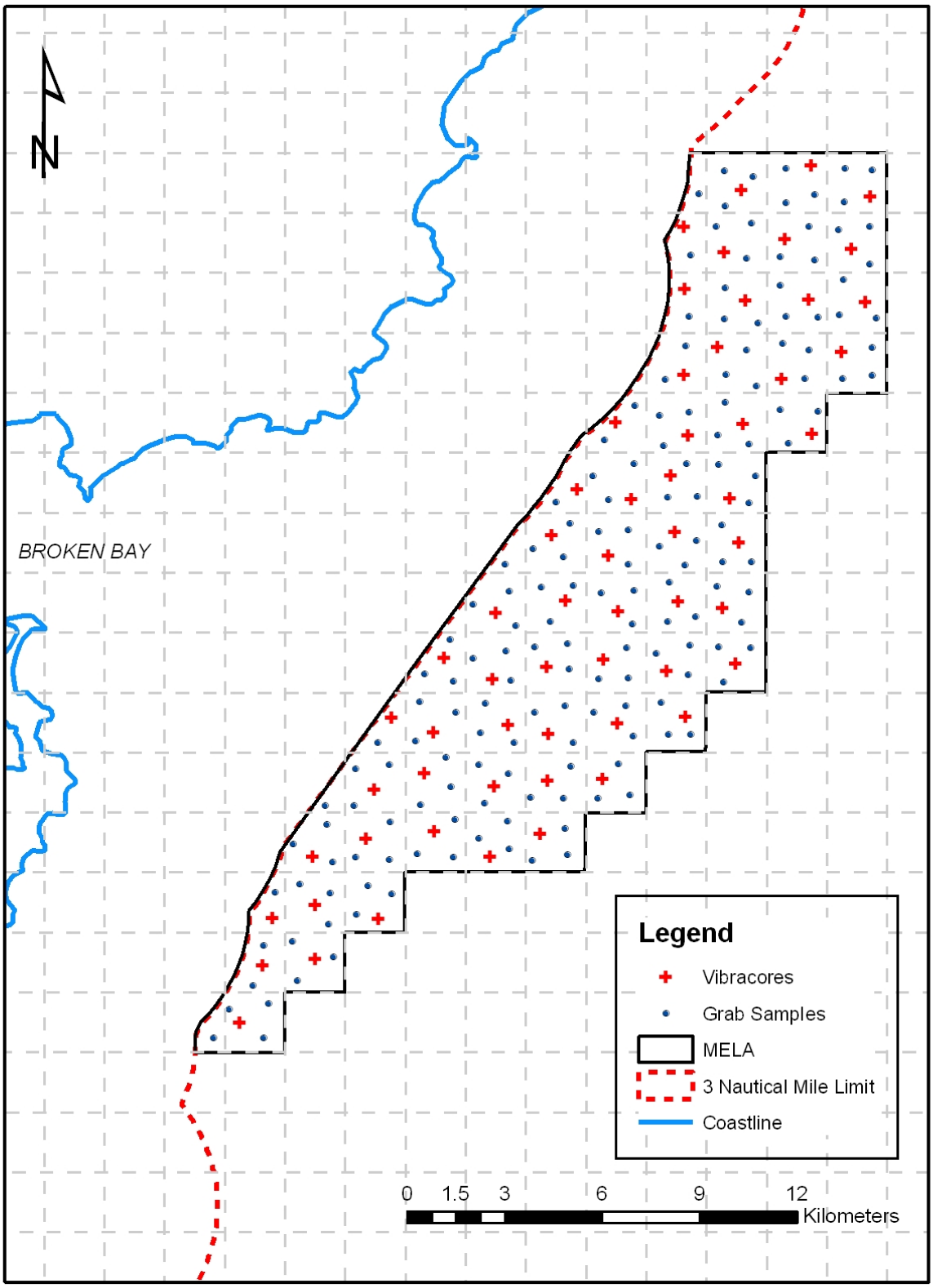

Figure 8 Proposed grab sample and vibracore locations within the MEL application area

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Figure 9 Vibracore being deployed from stern of vessel

On deck, the core barrel containing a continuous, undisturbed, *in situ* sample of the substrate is measured, sealed and stored for processing onshore. Once ashore the cores are cut longitudinally, photographed, logged and sampled for analysis of the physical properties of the sediment. The cores provide data about the key physical attributes of the resource and may reveal information about the Quaternary depositional environment under which the deposit was emplaced.

The proposed program will collect a total of 60 vibracores randomly located within a 1 by 1 minute grid in the MEL application area (see Figure 8). Based on a collection rate of 5 vibracores per day the coring program should take 12 days at a cost of $10,000/day. Sample processing and analysis is estimated at $27,500.

Should a suitable resource be identified during the exploration program, planning will begin on baseline environmental studies, with the assistance of Australian marine research experts. The environmental studies will be designed to identify and monitor potential environmental issues (eg. inner-shelf hydrodynamic processes, biology of water column and benthos) that may be impacted by any future marine aggregate extraction. These impacts will need to be properly identified and critically assessed in a scientific and robust way before any consideration can be given to an application for future sand extraction, any proposal for which would include preparation of a detailed environmental impact statement.

Proposed Exploration Expenditure

Year One – Proposed expenditure = $174,000

Year Two – Proposed expenditure = $160,000.

Evidence of the Applicant's Ability to Comply

Financial Resources to meet Licence Conditions and Work Program Commitments

The proposed exploration work program will be funded solely by Sydney Marine Sand Pty Limited (SMS). The Company is aware of the fees, charges and obligations associated with this mineral exploration licence application. A copy of the Company's Financial Report for the year ended 30 June 2011 is provided in Appendix A along with a letter from the Company's Accountants, Edney Ryan Group, attesting to the Company's liquidity and ability to fund the proposed exploration expenditure requirements.

Technical Advice and Expertise of the Applicant

SMS's Exploration Manager and Director, Mr Darren Skene BSc(Hons) MSc, is a qualified geologist with over twenty five years' experience in mineral exploration in marine and terrestrial environments within Australia and overseas. Mr Skene will manage the exploration program and related activities on behalf of the Company. His curriculum vita is provided in Appendix B.

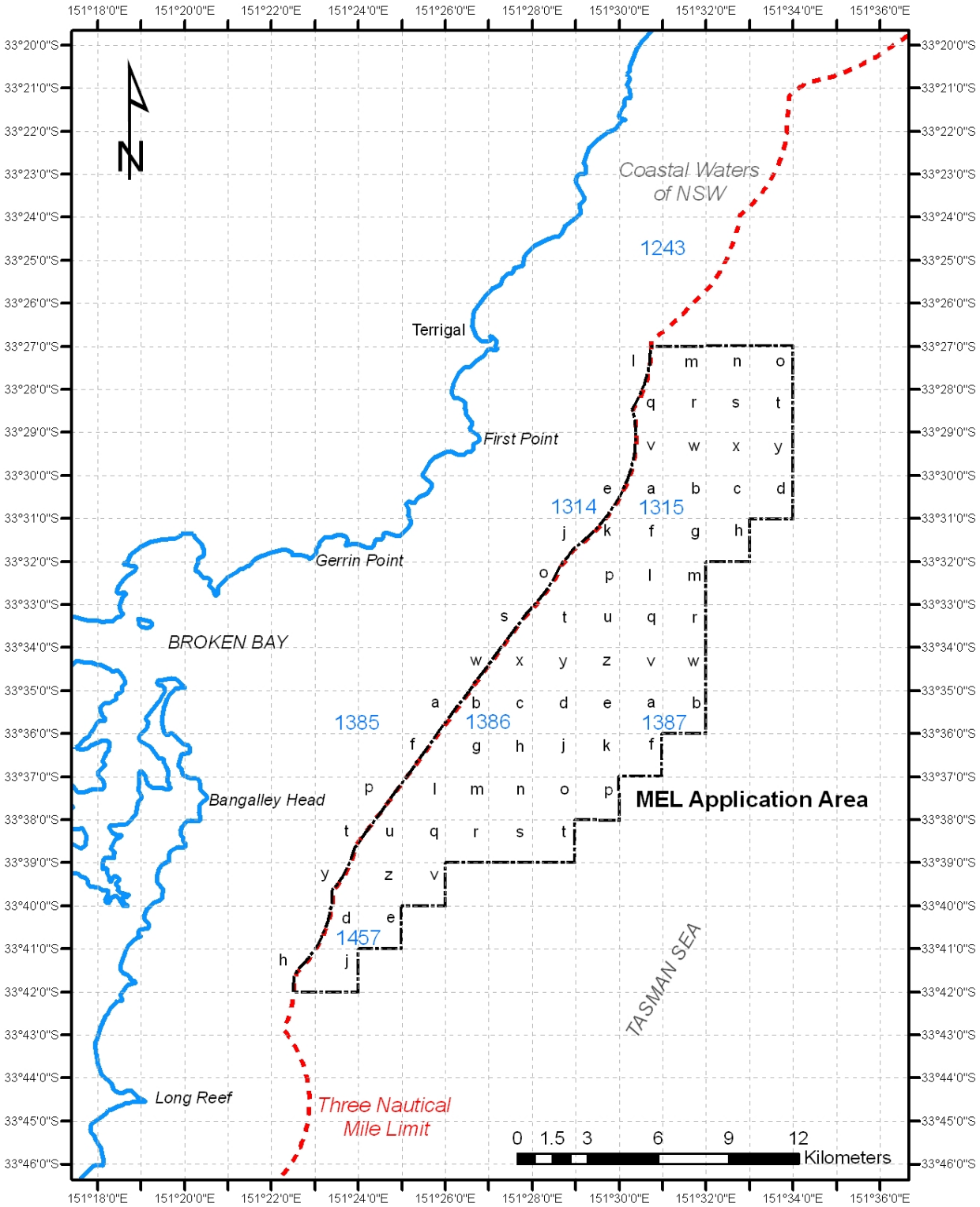
Mr Skene has worked for private and publically listed companies providing technical expertise in marine mineral exploration and mining. He has had the responsibility for planning, contracting, overseeing and conducting large marine and onshore exploration programs in a number of countries – primarily in Australia, Namibia, South Africa and PNG and overseeing budgets in excess of A$2.0 million.

His CV demonstrates his considerable experience working in the marine environment, having conducted research for private companies and research organisations including universities and state and federal government departments. In addition, he continues to consult to both public and private exploration and mining companies in the marine minerals and oil & gas industries. He is a member of the Society for Mining, Metallurgy & Exploration - International Marine Minerals Society and was also a member of the Advisory Group for the CSIRO Wealth from Oceans Flagship Project "Understanding the social risks to the expansion of an Australian seafloor exploration and mining industry".

SMS has identified key positions that are to be filled within the Company once the MEL is granted. These will be offered to highly regarded, experienced industry professionals that are known to the Company or sourced through a public recruitment process. At this crucial set-up phase, it is not feasible to employ a number of suitably qualified and experienced personnel. This would be an immediate priority once the MEL is granted.

Technical expertise to be used by the Company to carry out the proposed exploration program will be contracted to various professionals and companies known to SMS and who specialise in marine surveys and sampling operations with specific contracts put out to tender. The interpretation of the geophysical surveys and analytical data will be carried out in-house. Final selection of companies will be subject to a tender process, which will not be initiated until the MEL is granted.

Map of Application Area



Mineral Exploration Licence Application Area
Blocks under application – Lake Macquarie and Sydney 1:100,000 map sheets

List of Bocks:

Plan Name:	Lake Macquarie - 9231	1:100,000

Primary No.	**Letter**
1243	l, m, n, o, q, r, s, t, v, w, x, y

Plan Name:	Sydney – 9130	1:100,000

Primary No.	**Letter**
1314	e, j, k, o, p, s, t, u, w, x, y, z
1315	a, b, c, d, f, g, h, l, m, q, r, v, w
1385	p, t, u, y, z
1386	a, b, c, d, e, f, g, h, j, k, l, m, n, o, p, q, r, s, t, v
1387	a, b, f
1457	d, e, h, j,

Total number of blocks: 69

Company Details

Particulars of the Applicant

Sydney Marine Sand Pty Limited (SMS) is a privately owned Australian company, which was incorporated in 2000 explicitly to investigate the largely unexplored NSW continental shelf for marine aggregate (sand). The Company has applied for a Mineral Exploration Licence (MEL) in Commonwealth waters some 5.6km off the NSW coast.

SMS is seeking innovative solutions to the limited existing sand resources for the Sydney construction industry and is keen to promote consideration of marine aggregate (marine sand extracted from the seabed and delivered directly to market by boat) as a responsible and reliable alternative to Sydney's long-term construction material needs.

Address for service of notices to the Applicant

Sydney Marine Sand Pty Limited
PO Box 408
Cremorne
NSW 2090

admin@sydneymarinesand.com.au

Likely Effects of the Exploration on the Environment

The proposed exploration work programs will meet with the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999,* and *Environmental Protection (Impact of Proposals) Act 1974*, and will comply with State requirements and any conditions attached to the granted MEL. Established environmental protection procedures will be used throughout the program of works.

The afore-mentioned programs will have no to very little impact on the marine environment. The exploration would involve detailed mapping of the seafloor morphology and seabed types using advanced acoustic and video technology as well as the recovery of small surface and subsurface samples to determine the physical characteristics of any identified resource.

The acoustic surveys proposed (multibeam echosounder and sub-bottom profiling) have no impact on the environment and are routinely used in investigations of marine environments in Australia and overseas for a variety of resource, environmental and research projects. Data on the seabed morphology and subsurface stratigraphy is gathered remotely by these methods using acoustic signals, which are transmitted from the vessel or towfish to the seabed with the reflected acoustic signals gathered by receivers attached to the vessel or towed behind the vessel. These types of equipment are used by government agencies and private industry to map the seabed and the frequencies at which they operate have been assessed to have no impact on marine animals, specifically whales.

The sampling and vibracoring programs are site specific and the recovered sediment samples very small. The surface sediment sampling will be by means of a grab sampler that recovers a sample up to 3 kg in weight from the seabed.

Vibracores are obtained primarily to gather shallow sub-surface geological data and samples from the cores are analysed to accurately characterise the physical properties and spatial extent of the deposit. The cores are up to 6.0 metres in length and have a diameter of 76 mm. All material from the vibracore is recovered and no sediment is returned to the seabed. No drilling muds or associated compounds are used in vibracoring. Disturbance as a result of the vibracoring is restricted to the drill hole and this technique has far less impact on the environment compared to similar mineral exploration drilling programs onshore.

It is important to note that this MEL application is in Commonwealth waters and extends beyond the 3 nautical mile limit (5.6 km) offshore in water depths of between 50m and 80m. The exploration is to examine the suitability of ancient sand deposits that formed thousands of years ago and that are not part of the present day beach sediment budget. The proposed exploration will have no impact on the adjacent beaches.

Other Information for Consideration of the Application

Rationale

Sydney Marine Sand's motivation for wanting to explore the continental shelf off NSW for marine aggregate is to assess long-term supply options for the Sydney construction sand market within the context of sensible and risk-based resource management for the region. The Company wants to gather data on marine aggregate resources in order that these deposits can be properly assessed against current and proposed onshore sources. The impacts of both can then be compared. Although this application is for **exploration only**, it needs to be placed in the broader context of overall sand demand and supply for Sydney.

There is a looming sand supply shortage in Sydney. A number of government sponsored studies of current and potential sources of construction sand for Sydney have confirmed that sand sourced within the Sydney basin would soon be in critically short supply (Pienmunne and Whitehouse 2001; Ray and MacRae, 2006). Large volumes of sand are consumed on an annual basis by the construction industry in Sydney and there is a need to plan long-term to secure sand resources.

Sydney's construction industry consumes up to 7 Million tonnes per annum (Mtpa) of fine aggregate (sand) annually and in the medium term (next 20 years) 137 Mt of sand would be required and in the long term (next 40 years) 291 Mt of sand would be required to meet the predicted demand (Pienmunne & Whitehouse, 2001). The Pienmunne & Whitehouse (2001) report emphasised the need to secure long term construction sand resources for the Sydney region and put forward a number of options for the long-term supply of sand to the Sydney market, one being marine aggregate deposits on the NSW inner continental shelf.

Currently all construction sand in Sydney is obtained from onshore resources, such as dunes, rivers and sandstone quarries. Onshore sand mining often requires the destruction of vegetation and the creation of large pits or lakes, which causes major damage to the landscape and the environment.

Sydney already has a shortage of sand with imports from outside the Sydney planning region running at 1 Mtpa. Many of the sand resources are near depletion, not available due to other land uses or zoning, are far away from the city and/or located in environmentally sensitive areas (Langedijk, 2008). As a result, construction sand is becoming scarcer and sand costs are increasing. The problem will be exacerbated when several large, long-running quarries close in the next few years, notably Penrith Lakes (2012-14) and Kurnell (~2014). This will create shortfalls of both gravel and more significantly, fine to coarse sand (up to 3.4 Mtpa) for the construction industry.

The shortfall will have to be met by either increased production from friable sandstone areas within the Sydney Planning Region (Maroota and Somersby) and/or imports from outside the planning region (Newnes Plateau, Southern Highlands and Stockton Bight). Only Maroota and Somersby are within the greater Sydney metropolitan area, while the others are over 150km from the Sydney market. The great distances travelled to deliver the sand to market will have significant environmental and social costs. The challenge for the Government (and industry) is to consider all available options in developing an acceptable long term resource management strategy.

In Sydney delivery of all sand, to and within the city, is by truck. In their report for the Business Council of Australia on the growth of freight movements, Port Jackson Partners (2005) found that on present trends there would be an increase of 65 percent on the number of trucks on the main interstate roads and a 90 percent increase in articulated truck movements in metropolitan areas within the next 15 years. The consequences of these increases are congestion on public roads plus another 700,000 tonnes of carbon dioxide emissions and an estimated rise of $70 million a year in additional accident costs. Another impact and cost to government will be wear and tear on roads caused by the increased truck movements. A Bureau of Transport and Regional Economics report (BTRE, 2007) estimated that traffic congestion in Sydney cost $3.5 billion in lost productivity in 2005 and, if unchecked, this could rise to $7.8 billion by 2020.

The extra 3.4 Mtpa anticipated shortfall in the supply of fine aggregate for Sydney would result in an additional 226,000 truck movements per year (round trip, up to over 150km each way) to deliver these resources to the Sydney market, adding further to congestion on NSW roads both within Sydney and the surrounding areas and adding significantly to the delivered cost of sand to market. Marine aggregate resources, if developed, could be supplied by sea directly to the markets of Sydney, Wollongong and Newcastle for distribution by road or rail. This will bring a huge environmental benefit by reducing truck traffic on the regions already busy roads

One of the great benefits of the marine aggregate industry is its ability to deliver large volumes of aggregate close to the heart of urban areas, so greatly reducing the impact of heavy trucks. Less trucks means less road pavement deterioration, less congestion, better air quality and lower CO2 emissions due to exhaust fumes, less noise generation and less road accidents and fatalities caused by heavy trucks. In the UK one typical sand dredger load is equivalent to 250 truck loads of sand.

In addition to the impacts of truck transport, local regional communities adjacent to the remote extraction sites have voiced that they do not want to become the sandpit for Sydney. Local communities are vehemently opposed to expanding extraction sites in their area and are already concerned with land clearing and the resulting loss of biodiversity, toxic dust produced during extraction and processing, and the impact of extraction on water resources and indigenous sites. In recent years there has been considerable local opposition to proposed new or expanding sand extraction operations at Kurnell, Maroota, Somersby, Newnes Plateau and in the Nepean River. Marine sand represents a possible and potentially environmentally acceptable alternative to current construction sand sources, an alternative which remains largely unexplored and ignored.

Although extraction of construction materials from marine environments is well established internationally, marine mineral exploration and extraction is a new industry in NSW and the company understands the need for community engagement. The project's success will be dependent on acceptance of a new aggregate supply paradigm to include offshore resources. The proposition will need to include the relative impacts of onshore and offshore extraction and the delivery of the product to market. To improve community understanding of the project, the company will upload all exploration data to its website www.sydneymarinesand.com.au. An open and transparent exchange of information with stakeholders will enable interested members of the community to remain fully informed.

Beach Nourishment

In addition to being a supplementary source of fine sand for the Sydney construction market, marine aggregate also offers a real opportunity for developing the best coastal management solution to coastal erosion affecting beaches on the NSW coast – beach replenishment. Beach

replenishment, or nourishment, with offshore sands is a proven coastal protection method both nationally (Queensland, South Australia) and internationally (USA, The Netherlands) where large volumes of clean sand with very little fine material and sharing a similar origin and character (grainsize, colour, sorting) to the native beach sand are required. Trucking sand in to a beach is costly - financially, socially and environmentally. Delivering sand by sea is a far more socially and environmentally acceptable and practical solution, as has been demonstrated elsewhere in Australia and overseas.

Local councils have identified beach nourishment as an appropriate means of maintaining beach amenity and protecting development along their local beaches. Two Sydney local councils, Sutherland Shire Council and Warringah Council, are seriously considering marine aggregate deposits offshore as a potential source of sand to nourish their severely eroded beaches (e.g. Cameron and Corbett 2005). Also, Sydney Coastal Council Group Inc., which consists of 15 local councils, supports the extraction of sand from offshore for beach nourishment and commissioned AECOM to carry out a scoping study into maintaining Sydney's beach amenity against climate change induced sea level rise through beach sand nourishment (AECOM, 2010). Similarly, Patterson Britton and Partners (2006) undertook a scoping study for Byron Shire Council in northern NSW on the feasibility of offshore sand extraction from the Cape Byron sand lobe for beach nourishment.

State Government Authorities have listed numerous areas as being at risk from shoreline erosion around the Australian coast, including the Coastal Council of NSW that has identified many locations on the NSW coast where valuable land, buildings and infrastructure are threatened by possible shoreline erosion. These authorities recognise that offshore sand supplies exist in abundance along the coast and suggest that these deposits could be accessed for nourishment of the depleted beaches and that government should consider this option in the near future.

Langedijk (2008) suggests that commercial extraction of marine sand for the construction industry could offer an opportunity for developing a beach nourishment program. Employing a dredger for beach nourishment would be more economical if the dredger is being used for commercial sand extraction, owing to the high costs of mobilising a dredger. No suitably sized dredgers for beach nourishment currently reside in Australia. The costs to mobilise and demobilise a large international trailing suction hopper dredger to site is between $5 million (Patterson Britton and Partners, 2006) and $15 million (AECOM, 2008). A trailing suction hopper dredger is suitable for both tasks and could, for example, carry out beach nourishment works when not required for commercial sand extraction.

Summary

There is a clear shortage of construction sand for Sydney and a growing need by councils to source suitable material for beach nourishment. The suitability of marine aggregate as a replacement and/or adjunct to traditional sources of sand for the construction industry, and their undoubted suitability for beach nourishment, frames the question as to why we as a community accept ongoing degradation of highly valued land resources through sand extraction to the exclusion of other potentially more environmentally responsible supply alternatives. A considered review of sand resource alternatives is overdue – a review which seriously considers exploration of our marine sand resources is warranted and underlines the importance of a fresh approach to entrenched and outdated perceptions of extractive resource management for the Sydney Region.

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