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**REPORT No.:** 2006438SY 001 R01

**PROJECT:** PROPOSED TOURIST AND COMMERCIAL DEVELOPMENT  
NOISE IMPACT ASSESSMENT

**CLIENT:** Milad Investments No.1  
c/- Studio Internationale Pty Limited  
Level 1, 47 Queen Street  
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**ATTENTION:** Mr Milad Raad

**DATE:** 6<sup>th</sup> March 2007

**MARSHALL DAY ACOUSTICS**

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**DOCUMENT STATUS**

Revision	Purpose	Date delivered
-	Draft issued to client	12 January 2007
R01	Traffic assessment and site map included	6 March 2007

## 1.0 INTRODUCTION

Marshall Day Acoustics has been commissioned to undertake a noise impact assessment of the proposed tourist development at Goodnight Island and Greenwell Point. This assessment is to be submitted to the Department of Planning as part of the Project Assessment Application.

This report addresses the potential noise impact associated with both the construction and operational phases of the proposed development.

An outline of the content is provided below:

- A description of the proposed development and the surrounding areas with regard to noise generation.
- Assessment of the measured noise levels and a review of the background noise levels under guidance from AS1055.2 – 1997: *Acoustics – Description and measurement of environmental noise. Part 2: Application to specific situations.*
- Determination of project specific noise levels under guidance from the Department of Environment and Conservations (DEC) *Industrial Noise Policy.*
- Assessment of proposed helicopter noise activity under guidance from Airservices Australia's *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise.*
- A review of the construction noise under guidance from the EPA's *Environmental Noise Control Manual.*
- A discussion of the potential increase in traffic noise in line with guidance presented in the EPA's *Environmental Criteria for Traffic Noise.*
- A discussion of noise mitigation measures for the construction and operational phases.

## 2.0 SITE DESCRIPTION

The proposed tourist development is located at Goodnight Island in addition to two sites at 76 and 84 Greenwell Point Road, Greenwell Point.

The development at Goodnight Island will include facilities such as self contained units, luxury suites, restaurant, bar, cinema, amphitheatre, spa centre, gym, pool and tennis courts. Guest transfers to and from the island will be via boat, departing the mainland from 76 Greenwell Point Road. Helicopters will be used on occasion. Service deliveries and waste removal is also expected to be via boat.

The nearest noise sensitive location to the proposed Goodnight Island development is located to the north east at Orient Point, which is approximately 350m from the main complex.

The development at 76 Greenwell Point Road is expected to include car parking for guests of the proposed resort. In addition, retail and commercial spaces will be located on the ground floor, with residential units located above.

Retail, commercial and residential spaces are to be developed at 84 Greenwell Point Road, with the existing residence at the rear of the site to remain. Car parking facilities will also be provided for residents.

Our assessment has been based on the following drawings:

**Table 1**  
**Architectural Drawings Reviewed**

Drawing Title	Drawing Number	Date Issued
Proposed Site Plan 76 +84 Greenwell Point Road	2006-1 MP04	April 2006
Floor Plan Level B2 Car Park	2006-1 MP05	22/02/2007
Floor Plan Level B1 Car Park	2006-1 MP06	22/02/2007
Ground Level Retail, Commercial, Apartments Floor Plan	2006-01 MP07 A	22/02/2007
Level 1 Serviced Apartments Floor Plan	2006-01 MP08 A	22/02/2007
Level 2 Serviced Apartments Floor Plan	2006-01 MP09 A	22/02/2007
Roof Plan	2006-01 MP10 A	22/00/2007
Elevations North, South, East + West	2006-01 MP11 A	22/02/2007
Main Complex – western portion Floor Plan	2006-01 MP20 A	22/02/2007
Main Complex – eastern portion Floor Plan	2006-01 MP21 A	22/02/2007
Main Complex – western portion Roof Plan	2006-01 MP22 A	22/02/2007
Main Complex – eastern portion Roof Plan	2006-01 MP23 A	22/02/2007
Typical Pavilion A – 1 Bedroom (9 off) Floor Plan, Roof Plan + Elevations	2006-01 MP26 A	22/02/2007
Typical Pavilion B – 2 Bedroom (7 off) Caretaker's Residence (1 off) Floor Plan, Roof Plan + Elevations	2006-01 MP27 A	22/02/2007
Site Plan (showing ground floor plan)	2006-01 MP18 B	26/02/2007
Villa Elevations + Sections 1 and 2	2006-01 MP30 A	22/02/2007
Villa Floor Plan	2006-01 MP28 A	22/02/2007
Villa Roof Plan	2006-01 MP29 A	22/02/2007
Utility Shed Plan, Elevation, Section	2006-01 MP32 A	22/02/2007
Site Plan + Roof Plan over Aerial Survey of Existing Site	2006-01 MP17 B	26/02/2007
Amphitheatre Plan + Elevations + Section 1	2006-01MP31 A	22/02/2007
Floor Plan 84 Basement 84A Ground Floor 84 Ground Level 84A First Floor	2006-01 MP11	2006
Floor Plan Level L1 + L2 Apartments	2006-01 MP12	2006
Site Analysis	2006-01 MP01	08/12/2006

Acoustic terminology defined in this assessment is defined in Appendix A. An aerial photograph showing the area of interest is provided in Appendix B.

### 3.0 DEC INDUSTRIAL NOISE POLICY

In NSW, the DEC's *Industrial Noise Policy (INP)* is the standard for assessing noise emissions from industrial facilities and other developments with noise sources considered to be industrial in nature. The INP sets out a procedure where an industrial facility can be assessed against a series of noise level criteria. In the INP, these criteria are called *project specific noise levels* and are derived from an involved analysis of the ambient noise environment and zoning information. The derivation for the *project specific noise levels* for this development is summarised in Table 7 with full description set out below in Section 3.1 to 3.4.

#### 3.1 Existing Noise Environment

In order to support the assumptions made about the existing noise environment under guidance from AS1055.2 – 1997: *Description and measurement of environmental noise, Part 2: Application to specific situations*, a baseline noise survey was conducted between 1015hrs and 1045hrs on the 12<sup>th</sup> January 2007 opposite the proposed car park entrance on Jervis St.

**Table 2**  
**Measured Ambient Noise Levels**

Period	Time Period	$L_{Aeq, 15mins}$ dBA	$L_{A90}$ dBA
Day	0700 – 1800hrs	57	44

Further guidance has been sought from AS1055.2 – 1997 in order to determine the existing noise environment during the remaining time periods. AS1055 provides estimated average background A-weighted sound pressure levels ( $L_{A90}$ ) for different areas containing residences in Australia. The residential areas at Greenwell Point and Orient Point are considered to fit in the category R2 "Areas with low density transportation" as detailed below. The measured noise level is commensurate with those proposed in AS1055 for the day-time period.

**Table 3**  
**Estimated  $L_{A90}$  Levels from AS1055.2 – 1997**

Description	Average background sound pressure level, $L_{A90 8hrs}$					
	Monday to Saturday			Sundays (& public holidays)		
	0700-1800	1800-2200	2200-0700	0900-1800	1800-2200	2200-0900
AS1055.2 category R2	45	40	35	45	40	35

### 3.2 Intrusiveness Criteria

The intrusiveness noise assessment is based on knowledge of the background noise level at the receiver locations. The intrusiveness criterion is the background noise level at the nearest noise sensitive location plus 5 dB. Therefore the noise emissions from the industrial area are considered to be intrusive if the A-weighted noise source level ( $L_{Aeq, 15 mins}$ ) is greater than the background noise level ( $L_{A90}$ ) plus 5 dB. In the *INP* the background noise level is called the Rating Background Level (RBL).

Based upon the data summarised in Table 2 and Table 3, noise limits for intrusiveness have been calculated in accordance with the *INP* and are presented in Table 4.

**Table 4**  
**Calculated Intrusiveness Criteria**

Period	RBL $L_{A90}$ dBA	Intrusiveness Criteria (RBL + 5 dB)
Day	44	49
Evening	40	45
Night	35	40

### 3.3 Amenity Criteria

The Amenity Criteria are designed to prevent industrial noise continually increasing above an acceptable level. The initial stage in determining the Amenity Criteria is to correct the *acceptable noise levels* provided for the appropriate amenity area with the baseline noise monitoring. The area surrounding the proposed development is considered Suburban. The table below presents the recommended acceptable and maximum noise levels from industrial noise sources.

**Table 5**  
**Recommended  $L_{Aeq}$  Noise Levels from Industrial Noise Sources in a Suburban area**

Period	Recommended Noise Level $L_{Aeq}$ dBA	
	Acceptable	Maximum
Day	55	60
Evening	45	50
Night	40	45

As noise monitoring has only been undertaken for the day-time period, noise levels have been estimated under guidance from the *INP* for the remaining time periods. As there are currently no industrial noise sources in the area, we propose to apply the recommended *acceptable noise levels* as the Amenity Criteria.

The amenity criteria for each time period then become:

**Table 6**  
**Calculated Amenity Criteria**

Time of Day	Amenity Criteria
Day	55
Evening	45
Night	40

### 3.4 Determination of Project Specific Noise Levels

The final process in determining the operational noise limits for the development, called the *project specific noise levels* is simply to take the more stringent of either the calculated Intrusiveness or Amenity Criteria. The numerical values of both criteria are the same in this instance for the evening and night-time periods, and therefore the shorter assessment periods of the Intrusiveness Criteria become the project specific noise levels.

**Table 7**  
**Project Specific Noise Levels**

Period	Intrusiveness Criteria $L_{Aeq, 15mins}$	Amenity Criteria $L_{Aeq, period}$	Project Specific Noise Levels
Day	49	55	49 $L_{Aeq, period}$
Evening	45	45	45 $L_{Aeq, 15mins}$
Night	40	40	40 $L_{Aeq, 15mins}$

## 4.0 ENVIRONMENTAL CRITERIA FOR ROAD TRAFFIC NOISE

The noise level criteria for increased traffic flow as a result of land-use development with the potential to create additional traffic are set by the EPA's *Environmental Criteria for Road Traffic Noise*. Table 8 below presents the traffic noise criteria for this development.

**Table 8**  
**Road Traffic Noise Criteria**

Type of Development	Criteria	
	Day 0700 – 2200hrs	Night 2200 – 0700hrs
Land Use Developments with potential to create additional traffic on collector roads	$L_{Aeq(1hr)}$ 60 dBA	$L_{Aeq(1hr)}$ 55 dBA

Furthermore, the guidance states "where feasible and reasonable, existing noise levels should be mitigated to meet the noise criteria. Examples of applicable strategies

include appropriate location of private access roads, regulating times of use, using clustering, using 'quiet' vehicles, and using barriers and acoustic treatments".

In addition to the above criteria, the increased traffic associated with this development should not increase the existing noise levels by more than 2 dB.

## 5.0 CONSTRUCTION PHASE – NOISE IMPACT

### 5.1 Construction Noise Guidelines

In NSW there is no current guidance in relation to appropriate construction noise criteria. In the absence of a current standard, the DEC advises that the now out-of-date EPA *Environmental Noise Control Manual* is used to determine the allowable level of construction noise at residential receivers. The noise level restrictions are as follows:

- *Construction period 4 weeks and under.*

The  $L_{10}$  level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 20 dBA.

- *Construction period greater than 4 weeks and not exceeding 26 weeks.*

The  $L_{10}$  level measured over a period of not less than 15 minutes when the construction site is in operation must not exceed the background level by more than 10 dBA.

The  $L_{10}$  is defined as the noise level that is exceeded for 10% of the measurement period.

The construction associated with the proposed development is estimated to take approximately 12 to 18 months at each location. The EPA's *Environmental Noise Control Manual* does not set limits for construction periods greater than 26 weeks. It should be noted that for the purposes of this assessment, we have assumed that the demolition phase is the initial part of construction and is therefore subject to the same noise level limits. Advice on appropriate noise level limits for longer construction periods was sought from the DEC/EPA. The appropriate criterion for work of this duration is that the  $L_{10}$  measured over a period of not less than 15 minutes when the construction site is in operation, must not exceed the background level by more than 5dBA.

The DEC/EPA sets time restrictions for noise generated during construction work as follows:

- Monday to Friday, 7am to 6pm.
- Saturday, 7am to 1pm if audible on residential premises, otherwise 8am to 1pm.
- No construction work to take place on Sundays or public holidays.

## 5.2 Construction Noise Limits

Based on the above guidance, the construction and demolition noise limits will be the background noise level ( $L_{90}$ ) plus 5 dBA. The daytime background noise level was measured as 44 dBA  $L_{90}$  which corresponds to a construction noise limit of 49 dBA  $L_{10}$ .

It will be a contractual requirement that the selected builder will comply with this noise level limit.

## 5.3 Construction Noise Sources

It should be noted that following initial site preparation and building erection that a significant proportion of the construction fit-out work will occur within the proposed development and, as such, noise will be attenuated by the building envelope.

It is expected that some rock breaking may be required during the initial part of the construction phase.

## 5.4 Construction Noise Control Measures

With regard to construction activities, reference will be made to AS2436 – 1981: *Guide to noise control on construction, maintenance and demolition sites*, which offers detailed guidance on the control of noise and vibration from demolition and construction activities. In particular, it is proposed that various practices be adopted during construction, including:

- Limiting the hours during which site activities are likely to create high levels of noise or vibration;
- Establishing channels of communication between the contractor/developer, Local Authority and residents;
- Appointing a site representative responsible for matters relating to noise and vibration;
- Monitoring typical levels of noise and vibration during critical periods and at sensitive locations;
- All site access roads will be kept even so as to mitigate the potential for vibration from trucks.

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed. These may include:

- Selection of plant with low inherent potential for generation of noise and/or vibration;
- Erection of barriers as necessary around items such as generators or high duty compressors;
- Siting of noisy/vibratory plants as far away from sensitive properties as permitted by site constraints and the use of vibration isolated support structures where necessary.

## 6.0 OPERATIONAL PHASE – NOISE IMPACT

### 6.1 Helicopter Noise Activity

The helicopter landing site is to be located near the centre of Goodnight Island. It is expected that there will be in the order of 2 helicopter events per week. The nearest noise sensitive location to the helicopter landing site is on Orient Point at a distance of approximately 410 metres.

Helicopters are expected to approach Goodnight Island from the north, flying in between Greenwell Point and Orient Point. Departures are expected to fly south of the island, and around the residential area south of Culburra Beach.

Airservices Australia's *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* sets out a series of guidelines for minimising the aircraft noise impact over residential areas. The recommended upper and lower noise exposure limits are detailed as:

- Lower limit: 40 dBA  $L_{eq, 24hr}$  below which noise is not considered significant;
- Upper limit: 60 dBA  $L_{eq, 24hr}$  above which noise exposure is considered unacceptable.

Furthermore, the guidance states "There should be a current agreed aircraft noise exposure level above which no person should be exposed, and agreement that this level should be progressively reduced. The goal should be 95 dBA [ $L_{MAX}$ ]."

In order to predict the noise levels at the nearest noise sensitive location, the following assumptions have been made based on the Marshall Day Acoustics noise source database for a typical passenger helicopter (model Eurocopter BK117):

- Take-off and landing of the helicopter will yield a similar source level of 93 dBA at 32 metres, with duration of 30 seconds.
- The source noise level during fly-over to be 109 dBA SEL at 20 metres.

Assuming a worst case situation of 1 helicopter event per day, the predicted noise level at the nearest noise sensitive location is 32 dBA  $L_{Aeq, 24hr}$  which is below the recommended lower noise exposure limit of 40 dBA  $L_{Aeq, 24hr}$  and can therefore be considered insignificant. The predicted maximum exposure level at the nearest noise sensitive location is 70 dBA  $L_{MAX}$  thus complying with the recommended maximum exposure limit of 95 dBA.

Although helicopter noise is expected to comply with Airservices Australia's noise exposure limits, climb and descent procedures should be developed with respect to the guidelines in order to minimise noise impact on residential areas. For helicopters below 1500 ft AGL (457m), a twin engine helicopter should maintain a Closest Point of Approach (CPA) distance of at least 750 metres. For single engine helicopters the CPA distance should be at least 305 metres. Speed should be kept to 100 knots or less. As the nearest noise sensitive location is 410 metres from the proposed helicopter landing

site on Goodnight Island, it is recommended that helicopter operations be restricted to the following times (except in emergencies):

- Weekdays between 7am and 10pm
- Weekends and public holidays between 8am and 10pm.

## 6.2 Boat Noise Activity

Boat activity between 76 Greenwell Point Road and Goodnight Island is expected to include guest transfers, waste removal, and supply and service deliveries. There will be an estimated 1 round boat trip per hour between the hours of 7am and 10pm. The boat will be limited to a maximum speed of 4 knots.

The boat is to follow the existing route to Goodnight Island (refer Appendix B). Hence the residences located on Greenwell Point will have the greatest potential for noise impact.

In order to predict the noise levels at the residences on Greenwell Point, it has been assumed that the noise source level of a moving boat will be 60 dBA  $L_{Aeq}$  at 10 metres. The table below shows the predicted levels at a number of locations along Greenwell Point. Refer to Appendix B for a site map showing the assessment locations.

**Table 9**  
**Predicted Noise Levels on Greenwell Point for boat transfers to the island**

Location	Predicted Level, dBA $L_{Aeq}$
Position A	31
Position B	32
Position C	33
Position D	22
Position E	23

With respect to jetty activities at Greenwell Point, the closest residences will be 76 and 78 Greenwell Point Road, and noise sources are likely to include engine start-up and boat manoeuvring. Similarly, the jetty on the island will be closest to residences on Orient Point. The predicted noise levels at each location are shown below in Table 10.

**Table 10**  
**Predicted Noise Levels from jetty activities at Greenwell Point and Orient Point**

Location	Predicted Level, dBA $L_{Aeq}$
76 Greenwell Point Rd	29
Orient Point	20

The predicted noise levels shown above comply with the daytime project specific noise level criteria of 49dBA  $L_{Aeq}$ .

### 6.3 Building Services Plant

Once a development of this nature becomes fully operational, a variety of electrical and mechanical plant will be required to service the buildings associated with the development. Most of this plant will be capable of generating noise to some degree. Some of this plant may operate 24 hours a day, and hence has the potential to be most noticeable during the quiet periods i.e. at night.

The general philosophy adopted in this type of development is to locate building services plant within purpose built plant rooms in order to minimise noise emissions. Any openings required for ventilation will be orientated away from the nearest noise sensitive location and provided with acoustic attenuators as required.

In some instances, refrigeration or air conditioning plant may be located outside, however, a noise control barrier will be constructed and additional attenuation will be installed providing any noise level reduction that may be required.

Other plant will be sited as far away from noise sensitive locations as practicable and located in plant rooms. Proven noise control techniques will be employed to ensure that emissions from plant comply with day time, evening and night-time criteria.

With regard to building services plant, it is envisaged that the following will be employed:

- Duct mounted attenuators on the atmosphere side of all air moving plant;
- Splitter attenuators or acoustic louvres providing free ventilation to internal plant areas;
- Solid barriers screening any external plant;
- Anti-vibration mounts on all reciprocating plant.

### 6.4 Traffic Noise Levels on Local Roads

Martens Consulting Engineers have prepared a traffic report detailing current traffic conditions and the implications of the proposed development. Their report, dated February 2007, provides the expected increase in traffic volumes on the roads surrounding the proposed development.

Table 11 and Table 12 detail these traffic volumes and the expected effect on traffic noise levels. The existing traffic levels presented below were measured on a Sunday afternoon and Monday morning during peak traffic periods.

**Table 11**  
**Summary of Traffic Flows and Resultant Change in Noise Level**  
**Weekend PM Peak Period**

Location	Existing	Increase with development	Percentage increase	Increase in noise level dBA L <sub>Aeq</sub>
Greenwell Point Road				
- East	158	1	1	negligible
- West	137	56	41	1
Jervis Street				
- North	16	0	0	-
- South	49	57	16	3
Total	360	114	32	1

**Table 12**  
**Summary of Traffic Flows and Resultant Change in Noise Level**  
**Weekday AM Peak Period**

Location	Existing	Increase with development	Percentage increase	Increase in noise level dBA L <sub>Aeq</sub>
Greenwell Point Road				
- East	139	0	0	-
- West	61	104	170	4
Jervis Street				
- North	10	0	0	-
- South	88	10	11	negligible
Total	298	114	38	1

From

Table 11 and Table 12 above, it can be seen that most roads will comply with the ECTRN criterion of no more than a 2dBA noise level increase with the exception of south of Jervis St and west of Greenwell Point Road. We acknowledge that the increases are above the criterion, however a 1 and 2dBA excess is not considered to be significant. In addition, it is considered neither feasible nor reasonable to employ noise control measures at these locations.

It should be noted that this noise level increase is expected during peak hour flows only and it is expected flows will be considerably reduced at other times.

## 6.5 Activities on Goodnight Island

In addition to tourist accommodation, the proposed development on Goodnight Island is expected to include a cinema, amphitheatre, restaurant, spa centre, tennis courts, pool and gym facilities. Most of these facilities are expected to be indoors and therefore the noise contribution to residences located at Greenwell Point and Orient Point is expected to be negligible.

We understand that the proposed amphitheatre will be partially open to the external environment. The space will be primarily used as a place for congregating and reflection and will not have any significant sound sources, however, there may be acoustic instruments being played from time to time. It is anticipated that the level of sound generated will be such as to not cause disturbance to the accommodation on Goodnight Island and will be in the order of 30 to 35dBA at the nearest pavilions in the order of 50m away. Therefore the sound levels at the nearest residences on Orient Point are expected to be in less than 20dBA.

Noise from mechanical plant located in the main building and utility shed will be installed to minimise noise impact to the proposed tourist accommodation using the noise control measures discussed in Section 6.3. Therefore the noise impact from these services will be negligible at Greenwell Point and Orient Point.

## 7.0 SUMMARY

- Marshall Day Acoustics has been engaged to perform a noise impact assessment for the proposed tourist development located at Goodnight Island and Greenwell Point.
- The assessment has been conducted in accordance with the DEC's *Environmental Criteria for Road Traffic Noise, AS2436 – 1981: Guide to noise control on construction, maintenance and demolition sites* and Airservices Australia's *Environmental Principles and Procedures for Minimising the Impact of Aircraft Noise* and other guidance as appropriate.
- Baseline noise levels have been established based on short-term ambient noise level monitoring and with reference to AS1055.2 – 1997. Project specific noise levels have been derived under guidance from the DEC's *Industrial Noise Policy*.
- Noise limit criteria for noise generated during the construction phase have been derived. A construction noise management plan should be developed to ensure that all reasonably practicable noise control measures set in AS2436 – 1981 will be employed during this phase to ensure compliance with noise limits.

- Noise emissions from helicopter activity and boat activity have been found to easily comply with their respective criteria.
- Mechanical services noise sources will be installed with appropriate noise control treatment to ensure compliance with the project noise level criteria at all times.
- Based on the predicted additional traffic volumes, our assessment shows that noise generated by additional peak hour traffic will be no more than 2dB above the ECTRN criteria, which is not considered significant.
- Operational activities on Goodnight Island are expected to easily comply with project specific noise level criteria at the nearest existing residences.
- Based on the above, we may conclude that the proposed development will result in negligible noise impact on the surrounding environment.

**APPENDIX A**  
**ACOUSTIC TERMINOLOGY**

dB(A)	Unit of overall noise level, in A-weighted decibels. The A-weighting approximates the average human response over the entire frequency range.
$L_{Aeq}$	The "A" weighted equivalent continuous sound level.
$L_{eq}$	Continuous or semi-continuous noise levels are described in terms of the equivalent continuous sound level ( $L_{eq}$ ). This is the constant sound level over a stated time period which is equivalent in total sound energy to the time-varying sound level measured over the same time period. This is commonly referred to as the average noise level and is generally measured in dB(A).
$L_{90}$	Background noise levels are described in terms of the level exceeded for 90% of the measurement period ( $L_{90}$ ). This is commonly referred to as the typical minimum level and is generally measured in dB(A).
$L_{10}$	Non-continuous noise levels are described in terms of the level exceeded for 10% of the measurement period ( $L_{10}$ ). This is commonly referred to as the typical maximum level and is generally measured in dB(A).
SEL	The sound exposure level (SEL) is a notional level. It is the sound level that if maintained constant for one second contains the same acoustic energy as a varying noise level. It is normally used to quantify short duration noise events such as aircraft flyover, single vehicle bypasses, impact or impulsive noise

**APPENDIX B**  
**SITE MAP WITH NOISE ASSESSMENT LOCATIONS**

