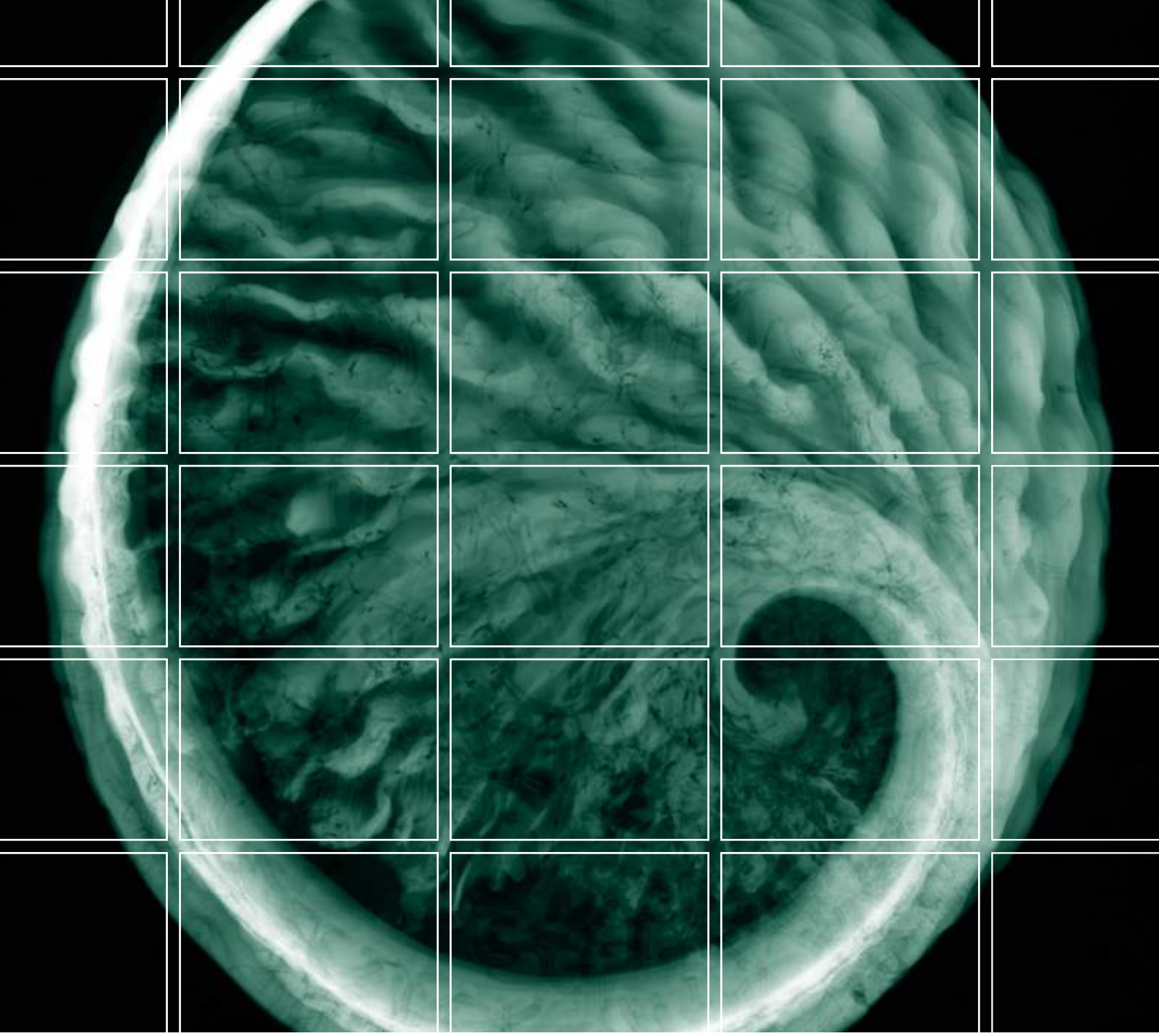

Rainbow Beach
Proposed Urban Development, Ocean Drive, Bonny Hills

Preliminary Site Investigation

for St Vincent's Foundation Pty Ltd

November 2007

0072982

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ERM

FINAL REPORT

St Vincent's Foundation Pty Ltd

Rainbow Beach, Proposed Urban Development, Lot 123 DP 1106943 and Lot 5 DP 25886, Ocean Drive, Bonny Hills

Preliminary Site Investigation

November 2007

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St Vincents Foundation Pty Ltd

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Preliminary Site Investigation

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Reference: 0072982

For and on behalf of
Environmental Resources Management Australia

Approved by: Paul Douglass

Signed: 

Position: Managing Partner

Date: 8 November 2007

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1 INTRODUCTION

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by St Vincent's Foundation Pty Ltd to undertake a *Phase 1 Preliminary Site Investigation* (PSI) at the proposed Rainbow Beach residential precinct, located at Bonny Hills (the site).

The purpose of the Phase 1 PSI was to assess any potential environmental risk associated with current and historical land use activities at the site.

A *Concept Plan Application* to the (application number MP 060085) and *Project Application* (application number MP 07_0001), have been lodged under Part 3A of the *Environmental Planning and Assessment Act 1979*. The further purpose of this report is to respond to the issued Director Generals Requirements (DGRs) and Environmental Assessment Requirements (EARs) relating to the potential for site contamination and to inform the design and environmental management of the proposed development.

The site location is shown in Figure 1 of Annex A. A site concept plan for the proposed development is provided as Annex B.

1.1 PROJECT OBJECTIVES

The *Phase 1 PSI* conducted by ERM had the following objectives:

- identify the existing site conditions;
- identify any past and present potentially contaminating activities and potential contamination types;
- undertake a site inspection to identify any potential sources or visible evidence of impacts to site soils;
- assess the need for further investigations and to advise mitigation measures where necessary in accordance with SEPP 55 – Remediation of Land in order to address the NSW Department of Planning Director General's Requirements in relation to the *Concept Plan Application* (application number MP 060085) and *Project Application* (application number MP 07_0001) for the proposed future development.
- produce a *Phase 1 PSI* report in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure* (the 'NEPM') published by the National Environment Protection Council (NEPC) in 1999 and all relevant NSW Department of Environment and Climate Change (DECC) guidance.

1.2 SCOPE OF WORKS

Research into historical activities conducted on-site was undertaken to identify past and present potentially contaminating activities that may have occurred. The scope of the site history followed NSW EPA (1997) - *Guidelines for Consultants Reporting on Contaminated Sites* for a *Phase 1 PSI*.

The scope of work undertaken during the *Phase 1 PSI* included:

- Review of historical and site background information including:
  - Council Section 149 Planning Certificate and Development Applications;
  - Department of Land and Water Conservation (DLWC) aerial photographs and registered groundwater bore records;
  - Work Cover NSW dangerous goods license records;
  - Historical certificates of title;
  - Published geological and hydro geological information, and
  - Notifications by the NSW Department of Environment and Conservation (DEC) under the provisions of the Unhealthy Building Land Act.
- A site inspection by ERM's Will Weir (Senior Environmental Engineer) to identify evidence (if any) of potential site impacts or contaminating activities.
- A detailed summary of the findings of the investigation as outlined in this *Phase 1 PSI* report.

2 SITE DESCRIPTION

2.1 SITE IDENTIFICATION

The following details describe the portion of land being the subject of the investigation:

Table 2.1 Site Identification Details

Item	Details
Site Owner	St Vincent's Foundation Pty Ltd
Site Address	Ocean Drive, Bonny Hills, NSW, 2445
Lot and DP Number	Lot 5 DP 25886 and Part Lot 123 DP 1106943
County and Parish	County of Macquarie, Parish of Queens Lake
Local Government Authority	Port Macquarie Hastings Council
Current Zoning	1(a1) Rural and 2 (a1) Residential
Distance from nearest CBD	Approximately 1.5km southeast from the Lake Cathie shopping centre and 2.0km north west from the Bonny Hills neighbourhood shops
Geographical Coordinates	6506750N, 484250E
Site Area	177.3 ha
Site Elevation	Approximately 10m AHD
Locality Map, Site Layout and Site Aerial	*Refer Figure 1*, *Figure 2* in *Annex A*

Notes:

1. Coordinates are approximate and relative to Australian Map Grid (AMG – Zone 56).
2. Elevation is approximate and relative to Australian Height Datum (AHD) based on a 1:25,000 topographic map of the area.
3. CBD – Central Business District.

2.2 SITE LAYOUT AND FEATURES

The site comprises of an irregular shaped area of land, occupying approximately 177.3 hectares (refer to *Figure 2 Annex A*). The site is bound to the west by Ocean Drive, and Queens Lake State Forest and rural residential areas are further west. Rainbow Beach is located immediately to the east and a sewerage treatment plant is located to the south east that services the existing villages of Lake Cathie and Bonny Hills. Ocean Drive also forms the northern boundary of the site with a motel and rural residential development further north. There is additional rural land, earmarked for residential development immediately to the north east of the site. The existing Rainbow Beach residential estate encompasses the southern boundary of the site.

The site is predominantly cleared and has been used for farming in the past. There are two dwellings located on the property (refer to *Figure 2*), only one of which is still used as a residence. The other is used as a storage and work area for a native plant enterprise and is in a state of disrepair. A farm shed located at the northern residence houses farm machinery. The shed has a small workshop which stores small quantities of fuel, oil and farm chemicals.

Cattle stock yards are also located on the property (refer to *Photograph 1 Annex G*). Earthworks have previously been undertaken on the eastern portion of the site for construction of a golf course, which can be seen clearly on the 2002 aerial photograph (refer *Annex C*).

A large stockpile of fill material and possibly excess soils resulting from previous on-site or adjoining development (i.e. municipal sewer treatment plant) is located in the eastern section of the site. The surface material consisted of a mix of sandy clay and gravel (i.e. crushed aggregate). No evidence of construction or demolition waste or other potential sources of contamination was identified in the shallow surface material. An area in the north western section of the site was previously used as a small retail plant nursery.

Other features of the site include a small Telstra communications building (refer to *Photograph 3 Annex G*) adjoining the northern boundary and some remnant vegetation along the western boundary. A large dam is located towards the central section of the site with two smaller dams to the west and south of the cattle yards.

An electricity easement with older timber power poles transects the eastern portion of the site (refer to *Photograph 4 Annex G*).

The site layout is presented as *Figure 2 in Annex A.*

2.3 ENVIRONMENTAL SETTING

2.3.1 Site Topography and Drainage

The majority of the site is generally flat with an elevation less than 10m Australian Height Datum (m AHD), with some higher elevations between approximately 10m and 20m AHD mainly in the north of the site.

The site drains to the east into Duchess Gully. Duchess Gully drains south and then east into the Pacific Ocean approximately 800m from the site.

A municipal sewer treatment plant (STP) is located south east of the site which is considered likely to be down hydraulic gradient from the site. The STP should however be considered a potential source of current and future groundwater impacts beneath the site.

The sites surface water is expected to flow generally to the eastern boundary towards Duchess Creek via the natural drainage lines.

2.3.2 *Geology and Soils*

The *Australia 1:250 000 Tamworth-Hastings, Metallogenic Series Sheet Sh56 13-14, Sl56 1-2* (*Ed 1, 1987)* indicates that the geology of the site consists of Quaternary aged deposits consisting of sand, silt, mud and gravel, overlying early Palaeozoic aged deposits of the Ordovician and Cambrian periods consisting of slate, chert, minor slaty sandstone and rare metabasalt that make up the Watonga Formation. Mineral sand deposits and Fault zone complexes of Dolerite, gabbro, diorite, basalt, chert, jasper, tonalite, trondhjemite and quartz-feldspar porphyry are also overlayed by these deposits.

Soils at the site are expected to generally be sandy and therefore have good drainage. Earthworks were undertaken at the site during the 1980's for development of a golf course which was only used for a short period. and the course is now overgrown and used for cattle grazing.

The *Hastings Local Environmental Plan 2001* included in the Port Macquarie Hastings Council's Section 149(2) & (5) planning certificates specifies the area of the site as having known occurrences of Acid Sulfate Soils. Clause 26 Acid Sulfate Soils indicates that parts of the subject land are shown as being Classes 2, 3, 4 and 5 land on the acid sulfate soils map.

2.3.3 *Hydrogeology*

Information obtained from the Department of Natural Resources (DNR) indicated that there is no registered groundwater bores situated on-site. There are 22 registered groundwater bores recorded as being within 1 kilometre of the site boundary. The closest is approximately 200m to the north of the site located on private property and used for domestic purposes. A groundwater bore is located 250 m to the east of the site which is used for waste disposal purposes for the sewage treatment plant located on the Rainbow Beach dune system.

Any shallow groundwater is expected to flow generally towards the eastern boundary where it is likely to flow towards Duchess Creek. It is unlikely that the sites groundwater would influence the above groundwater bores located offsite.

During the site visit a number of groundwater monitoring bores were observed, which are understood to have been installed to establish the groundwater depth profile across the site. No groundwater testing was collected as part of this investigation.

2.3.4 Sensitive Environments

The nearest surface water body indicated by the topographic map is Duchess Gully, located in the eastern section of the site. There are also three dams/lakes on the site located in the central and southern section of the site. Rainbow Beach is situated approximately 200m from the eastern boundary of the site and a coastal wetland is located 300m from the southern boundary of the site.

Lake Innes Nature Reserve is situated approximately 375m from the northern boundary. The reserve predominately consists of a coastal wetland and Lake Cathie and Lake Cathie Creek. Queens Lake State Forest is also located approximately 200m from the westerly boundary of the site. Existing residential developments adjoin the southern boundary of the site.

3 SITE HISTORY

3.1 REVIEW OF HISTORICAL AERIAL PHOTOGRAPHS

The following information was derived from reviewing historical aerial photographs (dated 1952, 1963, 1979, 1981, 1991 and 2002) for the site and surrounding area. The photographs are maintained by and were reviewed at the NSW Department of Lands in Sydney. The main features potentially relating to contaminating activities identified in each photograph are summarised below:

1952 (B&W): The site appears largely undeveloped and is predominately occupied by open forest. A pocket of cleared vegetation is evident within the northern portion of the existing site boundary. Another small area of cleared vegetation with a small structure is observed situated past the southern boundary adjoining the road alignment. No structures are evident within the site boundary. The road alignment to the north of the site differs from the current alignment of Ocean Drive. A section of road crosses the central section of the northern boundary. The road also weaves along the western boundary of the site. Residential dwellings are located to the south of the site and Houston Mitchell Drive is visible to the north as well as a road leading south to Bonny Hills.

1963 (B&W): The site appears to have changed noticeably since 1952. A large area of forest has been cleared within and to the north and west of the site. This area appears to have been cleared for agricultural purposes. Possible evidence of potential sand extraction activities (coinciding with anecdotal evidence provided) in the cleared eastern portion of the site is observed, though not obvious. This is generally to the north of the existing municipal sewer treatment plant. There is no evidence of large scale strip sand mining activities on or in the vicinity of the site. Drainage and/or fence lines appeared to have been created in the central part of the site. The road alignment is similar to the previous photo. The land surrounding the site has been cleared to varying degrees. The land around lake Cathie has been significantly cleared. The area of land directly to the south of the site appears to have been stripped of vegetation.

1979 (B&W): The site is now bound to the north and west by Ocean Drive road. Additional roads are visible to the south and residential development in Lake Cathie is evident to the north. The vegetation on site appears to have recovered from clearing activities which occurred prior to the 1963 photograph.

1981 (B&W): The remaining site and surrounding area appears not to have changed significantly from 1979.

1991 (Colour): The site appears to have changed noticeably since 1981. A large dam is now evident towards the south east section of the site and the remainder of the vegetation on the site has been considerably cleared. A sewage works facility is now visible to the south east of the site along with additional roads/tracks across the entire site. Additional clearing has been undertaken and the golf course is visible in the north eastern section of the site. The two dwellings and nearby sheds/garages are evident within the northern section of the site.

2002 (Colour): The site appears largely unchanged from 1991 with the exception of the land adjoining the southern end of the site, which appears to have been developed for a residential estate.

Historical aerial photos are displayed in *Annex C* while the 2002 photo also appears as a background to *Figure 2* in *Annex A*.

3.1.1 Title Deed Information

The site is described as containing Part Lot 123 Deposited Plan 1106943 and Lot 5 Deposited Plan 25886, County of Macquarie, Parish of Queens Lake. The various parcels of land that make up the site were acquired by a previous developer in 1973.

The historical land title records for the site (*Annex* E) indicate that St Vincent's Foundation acquired the majority of land at the site in 1998. Acquisition was via a power of sale on the Mortgagee Aquahill Pty Ltd (Aquahill). Various lots were added to St Vincent's site since the initial acquisition of various lots in 1998 to form Lot 123 DP 1106943 in 2007. Lot 5 DP 25886 was acquired by the St Vincent Foundation in 1999.

Prior to the site being subject to development the various lots land use was for agricultural purposes. The various parcels of land that make up the site were owned by a number of private land owners including market gardeners, public accountants, labourers, metal workers, farmers and graziers.

A copy of historical land title information for the site as provided by Advance Legal Search Pty Limited is included in *Annex E*.

3.1.2 Council Records

A review of Port Macquarie Hastings Council's Section 149(2) & (5) planning certificates for the site indicted that it has not been declared as an investigation area or remediation site under the Contaminated Land Management Act (1997) or the Mine Subsidence Compensation Act (1961). The land is not mapped as flood liable.

A copy of the Section 149 Certificates are provided in *Annex D*.

3.1.3 Current Land Use

The site is currently used for cattle grazing, rural and other agricultural pursuits. In keeping with these land uses the site is currently managed for general grazing, agricultural and rural purposes.

3.1.4 Groundwater Bore Register

As previously discussed in *Section 2.3.3,* no registered groundwater bores were identified on the DNR register as situated on-site. There are 22 registered groundwater bores identified to be within 1 kilometre of the site boundary. A number of unregistered groundwater bores were observed during the site visit installed to determine groundwater depth across the site.

There are at least four groundwater bores located to the south east of the site which are potentially down gradient of the site. These are located along Duchess Creek.

A copy of the DNR response is provided in *Annex G*.

3.1.5 NSW Department of Environmental and Conservation POEO Act Register

An on-line search of the NSW Department of Environmental and Conservation (DEC) public register for licences, applications or notices held for the site under the Protection of the Environment Operations Act 1997, and no statutory notices issued under the provisions of the Unhealthy Building Land Act 1990.

3.1.6 WorkCover NSW Dangerous Goods Register

A search of WorkCover NSW records pertaining to licenses for the storage of dangerous goods and potential for aboveground or underground storage tanks to have been present on the site was requested. The search did not locate any records relating to the storage of dangerous goods on the site (Refer to *Annex F*).

It is also noted that no evidence of the presence of underground storage tanks (i.e. fill points or vent pipes) was observed at the site.

A copy of the NSW WorkCover advice received to-date is provided in *Annex F*.

3.1.7 Anecdotal Land Use Evidence

A site visit was undertaken on Monday 24 September 2007 by ERM employees. During the day anecdotal evidence was received from Mr Ray O'Connel, the current farm caretaker, and also from a Telstra employee visiting the Telstra communications building mentioned in *Section 2.2*. Prior to the site visit ERM was advised that sand extraction activities were know to occur to the south of Lot 5 DP 25886. Information received relating to the activities undertaken at the site is summarised below.

Mr Ray O'Connel (Caretaker)

At approximately 11.30am during the site visit ERM employees met the current property caretaker, Ray O'Connel. He reported that:

- the site has been used for cattle grazing over the past 14 years and no development, other than the golf course, has occurred;
- the golf course never went further than the earthworks stage and no chemical herbicides or pesticides were understood to have been used on the golf course;
- a stockpile of liquid storage drums located to the rear of the garage/workshop (refer to *Figure 2 Annex A*) contained molasses;
- a minor fuel storage tank was located on a trailer in the garage/workshop and no other bulk fuel storage appears to have been present on the site; and
- the spray system located along the cattle race in the stock yards has never been commissioned or used for application of pesticides.

Telstra Employee

The Telstra employee confirmed that no fuel storage is located on site and therefore it is not considered as a potential contamination source.

4 SITE INSPECTION

A site visit was undertaken on Monday 24 September 2007 by William Weir (Senior Environmental Engineer) and Rachael King (Project Environmental Scientist) of ERM.

The site is primarily cleared and used for cattle and horse grazing. There are two dwellings located on the site as indicated on *Figure 2* in *Annex A,* which are constructed with bonded fibre cement cladding. The northern dwelling is an old homestead that was observed to be in a state of disrepair. Fibre cement cladding was observed to be damaged in sections (refer to *Photograph 9 Annex G*) and not sealed (i.e. not painted). A sample of the cladding material was taken from an inside wall of this building. The southern dwelling appeared in good repair from the exterior.

A garage/workshop is located to the north of the northern dwelling. Large rusted drums (200L) were observed immediately to the west of the workshop which anecdotal evidence suggests previously contained molasses used for stock feeding (refer to *Photograph 5 Annex G*). Dark soil staining around the drums, which was confirmed to be molasses by its obvious odour, has occurred as a result of spills from the drums. A localised area of soil likely to be oil stained was observed to the east of the workshop and a soil sample taken from this area. A small tub containing water and oil was observed in this area. The tub is considered the likely source of the small area of stained surface soils (refer to *Photograph 2 Annex G).*

As stated previously, stock yards are located towards the centre of the site. The yards include holding yards, a cattle race and cattle crush likely to have been used for general stock handling purposes such as drenching and marking. Two rusted drums were observed adjacent to the stock yards with localised staining beneath (refer to *Photograph 7 Annex G*). Surface soil samples were taken from the cattle race, cattle crush and from beneath the rusted drums. A search of the relevant DECC registers did not identify the known presence of a current or former cattle dip at the site.

An overhead electricity line traverses Lot 5 DP 25886 (refer to *Photograph 4 Annex G*). The poles within the easement are considered likely to have been treated at the base. A soil sample was taken from the base of one electricity pole.

A large stockpile of fill material is located in the eastern section of the site which at the surface level consisted of a mix of sandy clay and gravel (i.e. crushed aggregate). No evidence of construction or demolition waste or other potential sources of contamination was noted (refer to *Photograph 8* in *Annex G).* It is possible that the stockpile was residual material from construction of the golf course, access tracks or that has been pushed up during the construction of the municipal sewer treat plant.

No obvious evidence of former sand extraction activities were observed on the site with the possible exception of small pile of concrete rubble along the eastern boundary. This material is of unknown origin but may have been a remnant of former buildings or slabs used for sand extraction equipment foundations.

4.1 SAMPLING METHODOLOGY

All fieldwork was conducted in accordance with ERMs Contaminated Site Investigation and Quality procedures, and relevant NSW EPA guidelines.

Surface and near surface soil sampling locations and fibrous cement material sampling locations are presented in *Figures 2 Annex A*. The following summary outlines the fieldwork conducted.

4.2 OBJECTIVES OF DATA COLLECTION

The objectives of the preliminary soil sampling investigation were to:

- evaluate whether chemical concentrations were present in near-surface and shallow soils at the site relating to historical or observed potentially contaminating activities;
- assess the reported chemical concentrations (if any) against the adopted site assessment criteria; and
- provide recommendations with regard to what further assessment may be required in order to quantify any potential risks relating to on-site activities.

4.3 SOIL SAMPLING AND ANALYSIS PLAN

A limited targeted sampling program was conducted in the vicinity of several identified potential contaminant sources. Given the size and the limited historical use of the site, a grid based sampling program in accordance *NSW EPA (1995) Sampling Design Guidelines* was not considered necessary.

Soils samples were not collected on the golf coarse as it was evident that it had never been fully developed and chemical pesticides and herbicides were not believed to have been used at the site.

A sample of fibrous material was collected for the purpose of asbestos identification. Close inspection of the on-site dwellings indicated they were likely constructed with bonded asbestos cement sheeting materials. The cladding materials appeared to be in good physical condition and were painted on the caretakers residence, while the disrepair of the northern residence was notable.

Soil, grid sector and fibrous material sampling locations are provided in *Figure 2* and *Figure 3* in *Annex A*. Global Positioning System (GPS) coordinates for most sampling locations, including individual grid sampling locations, are also provided in *Table 1* of *Annex C*.

A summary of the potential sources of contamination to site soils and the Potential Chemicals of Concern (PCOCs) is provided in *Table 4.1* below.

Table 4.1 Potentially Contaminating Site Activities and Chemicals of Concern

Potentially Contaminating Site Activities	PCOCs
Workshop area	TPH, BTEX, PAH, inorganics
Residences	Asbestos
Electricity Easement	OCP/OPP, PCB[6], inorganics (including As & Cr^{6+})
Areas of sand extraction	Radioactive minerals
Cattle yards	OCP/OPP, TPH, BTEX, PAH

Note:
1. TPH – total petroleum hydrocarbons
2. BTEX – benzene, toluene, ethyl benzene and xylenes
3. PAH – polycyclic aromatic hydrocarbons
4. OCP - Organochlorine Pesticides
5. OPP - Organophosphate Pesticides
6. PCB – Polychlorinated Biphenyls
7. Inorganics – Arsenic, Cadmium, Chromium, Copper, Lead, Nickel, Mercury and Zinc

4.4 ASSESSMENT CRITERIA

The current assessment criteria used in NSW to evaluate soil analytical results are based on the NSW EPA (1998) *Guidelines for the NSW Site Auditor Scheme*, NSW EPA (1994) *Guidelines for Assessing Service Station Sites* and the National Environment Protection (*Assessment of Site Contamination*) Measure (NEPM 1999). These combined guidelines present a range of Health-Based Soil Investigation Levels (HILs), Provisional Phytotoxicity-Based Investigation Levels (PBILs), Ecological Investigation Levels (EILs), sensitive land use thresholds and expected background concentration ranges for urban redevelopment sites in NSW. Guideline values have been appended to the analytical results tables (*Tables 2 to 6 in Annex I*) for comparison. Application of these guidelines is briefly described below.

Soil analytical results have been compared to NEPM 'A'-HILs for standard residential.

For the assessment of hydrocarbon contamination, the NSW EPA (1998) guidelines refer to the use of the NSW EPA (1994) *Guidelines for Assessing Service Station Sites*. These guidelines contain threshold concentrations for hydrocarbon compounds in soil and provide for the protection of human health and the environment assuming a sensitive land use.

Given the proposed redevelopment of the site for residential subdivision and schools the above conservative criteria are considered to be acceptable for the investigation.

The issue of potential radioactive materials pertaining to historical sand mining activities are discussed separately in *Section 6.3* below.

4.5 LABORATORY ANALYSIS

Samples were submitted to LabMark (primary laboratory) of Asquith, NSW.

All analyses and identifications conducted were performed using National Association of Testing Authorities (NATA) registered methods.

4.6 SAMPLING METHODOLOGY

Near surface soil sampling was conducted at five targeted locations across the study area in order to investigate whether on-site activities have potentially impacted the soil and/or groundwater. The program involved an ERM environmental engineer excavating soil and collecting samples directly from the ground surface in order to describe the shallow soil profile and investigate potential soil contamination (if any).

Soil sampling equipment was thoroughly cleaned between sampling locations by scrubbing with a phosphorous free detergent solution and rinsing with potable water. New disposable nitrile gloves were also worn at each sampling location to reduce the potential for cross contamination between samples.

The soil samples analysed as part of the investigation are presented in *Table 1* of *Annex I* along with location, sample description, and the laboratory analysis undertaken. Soil samples (total of five) and one fibrous cement material sample were analysed for the PCOCs as presented in *Table 4.1* above.

4.7 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

The ERM QA/QC procedures were followed during all sample collections and analyses. These procedures are used to collect data of consistent and defensible quality. Field duplicate samples were not collected due to the small number of field samples collected and as direct sampling techniques were used minimising the potential for cross-contamination of samples.

Based on an assessment of field sampling methodologies and laboratory QA/QC data (refer *Annex J*), the field investigation procedures and reported analytical results are considered to have produced valid and representative concentrations of the analysed compounds at the sample locations tested.

5 ANALYTICAL RESULTS

5.1 LABORATORY RESULTS – SOIL AND BUILDING MATERIALS

The laboratory results for targeted soil samples collected from across the study area are summarised as follows:

- TPH (C_{10}-C_{36}) was reported at 27-times the NSW EPA (1994) sensitive land use criteria in sample SS05_0.1, which was collected from shallow fill soil near the garage/workshop. TPH (C_{10}-C_{36}) was also reported at levels slightly elevated above the adopted site criteria in sample SS03_0.1 collected beneath rusted drums adjacent to the cattle-yards.

- Total PAHs and benzo(a)pyrene were reported in excess of the NEPM (1999) 'A'-HILs in sample SS04_0.1 collected within the electricity easement. PAHs were not reported above the laboratory estimated quantisation limited (EQL) in the remaining samples analysed.

- OCP were reported as below the NEPM (1999) 'A'-HILs and the laboratory EQL in all samples analysed except SS04_0.1. The OCP compound Dieldrin was detected in SS04_0.1 at 3.7 mg/kg below the NEPM (1999) 'A'-HILs criteria of 10 mg/kg.

- OPP were reported as not detected above the laboratory EQL in the samples analysed.

- Inorganics (As, Cd, Cr, Cu, Ni, Zn, Hg & Pb) were not at reported at levels in excess of the NEPM (1999) 'A'-HILs in any of the samples analysed.

- The fibrous cement sample collected from the northern dwellings internal wall lining tested positive for the presence of Chrysotile, Amosite and Crocidolite asbestos fibres.

Results from soil and building material analyses are presented in *Tables 2 to 6* in *Annex I* with laboratory analytical reports provided in *Annex K*.

6 PRELIMINARY SITE CHARACTERISATION

6.1 SOILS

TPH was reported in shallow soils at levels exceeding the adopted site assessment criteria in the vicinity of the rusted drums at the cattle-yards and the garage/workshop behind the house.

PAH including benzo(a)pyrene and the OCP compound Dieldrin were detected in surface soils surrounding a telegraph pole within the electricity easement. PAHs and benzo(a)pyrene were the only compounds reported at levels exceeding the adopted site assessment criteria.

Field observations indicate that the identified soil impact in the vicinity of the cattle-yard and workshop can likely be attributed to localised spills of waste oils.

PAH impacted soil samples collected from the vicinity of a telegraph pole in the electricity easement likely reflect leaching and/or spraying of timber preservatives (i.e. creosote).

Asbestos containing materials (ACM) was detected within the northern dwelling. The ACM sampled from the northern dwelling is considered to be representative of the fibrous cement sheeting within the remainder of the dwelling. It is also considered representative of the fibrous cement sheeting within the other dwelling on the site. This material should be treated as potential ACM material until further testing and an asbestos survey completed on these buildings.

A review of composite sample data collected across the site indicates that evidence of the broad-scale use of pesticides or herbicides was at the site was not apparent. The use of pesticides is considered to be localised to the areas at the base of the electricity poles.

Based on ERM's review of available information and current on-site and adjoining land conditions, the historical nearby sand mining activities are not expected to create potential for prolonged exposure to low level radiation via inhalation of heavy mineral sands dusts at the site.

6.2 *WATER QUALITY*

As soil impacts identified across the site are likely limited to minor localised 'hot spots' and no other on-site potential sources of groundwater contamination were identified at the site, groundwater impacts are not expected at the site relating to on-site activities. The STP located to the southeast of the site is considered to be down hydraulic gradient of the site and therefore unlikely to be a source of on-site groundwater impacts.

Surface water, including Duchess Creek and the on-site dams is not considered to have significant potential as a receptor with regard to historical and current on-site activities with the exception of small scale grazing activities (i.e. nutrient).

6.3 *SAND MINING ACTIVITIES (LOW-LEVEL RADIATION)*

No obvious evidence of large scale strip sand mining activities or concentration slurry ponds or stockpiles were observed on the site during the *Phase I* PSI site inspections and sampling activities. However, ERM undertook a review of relevant literate to evaluate the likely impacts of nearby historical sand mining activities (if any) on the site.

Deposits of mineral sands are formed along ancient coastlines where the heavier minerals have been concentrated by wave and wind action. Sand extraction may have occurred to the south east of the site. A review of available historical data undertaken as part of the *Phase I ESA* did not indicate that dry strip sand mining had occurred on the site.

> Dry strip mining involves scraping the shallow deposits to collect and transport ore to concentration plants. The ore is generally washed through spirals that use gravity to separate the heavy mineral sands from the lighter quartz and clay deposits. (APPEAL, 2002; DME, 1996)
>
> In ore, or heavy mineral concentrates, the radiation levels are too low to enable radioactive classification. When the radioactive materials (i.e. thorium or uranium) are concentrated in the process of separation and production of monazite, the radiation levels are increased. This is recognised as creating an occupational health and safety risk in dry separation plants. The most significant potential radiation problem is via long-term inhalation exposure of low level radioactive elements in concentrated heavy mineral sands dusts. *However, the limited monazite content of most east coast deposits means that radiation levels in New South Wales and Queensland dry plant have always been well below occupational health and safety limits.* (UIC, 1998).

The *Phase I PSI* and field observations indicated that commercial strip mining and/or processing activities are not considered likely to have been undertaken on the site. If sand extraction activities were limited to the extraction for building and construction purpose (i.e. without separation of heavy minerals) it would not be considered to be a direct source of potential impacts at the site.

Heavy mineral concentrates in the vicinity of the site (if any) were likely to have been processed and removed only as part of any commercial mining process. Opportunities for significant and prolonged production of heavy mineral sands dusts are therefore considered to be minimal.

7 *CONCLUSION AND RECOMENDATIONS*

Based on the site characterisation discussion above, ERM has identified some minor localised areas of impacted soil and fibrous building materials that may warrant remediation, if the site is to be developed for standard residential purposes. However, evidence of significant gross impact across the broader site was not identified in relation to known historical and current land uses.

If the existing electricity easement in the eastern portion of the site is to be constructed upon for residential purposes, or where soils are to be readily accessible for garden etc., then the soil beneath the poles should be appropriately remediated to sensitive land use standards.

No further targeted or systematic sampling is recommended at this stage. However, any areas of localised soil impact such as those identified above, or others identified during any future site works (i.e. such as buried farm refuse) should be appropriately remediated and validated as required under SEPP 55.

Evidence of potential bulk soil impacts, such to suggest the potential for significant groundwater impacts were not identified during site inspection. It is noted that the STP to the southeast of the site, although expected to be down hydraulic gradient of the site, may represent a potential source of groundwater impacts into the future.

The full extent of the asbestos containing materials within the dwellings requires a detailed survey and appropriate management of material is required during demolition. Care should be undertaken to ensure all such material are removed in accordance with statutory requirements such that they do not present a risk to human health.

Heavy mineral sand dusts resulting from sand extraction activities are not considered likely to be present at the site.

LIMITATIONS OF THIS REPORT

The findings of this report are based on the Scope of Work outlined above. ERM performed the services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties express or implied, are made.

Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials on the subject property should not be interpreted as a guarantee that such materials do not exist on the site.

This *Phase 1 Preliminary Site Assessment* is based on a site inspection conducted by ERM personnel and information provided by the property owner or other people with knowledge of site conditions. All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved with the project and, while normal checking of the accuracy of data has been conducted, ERM assumes no occurrences outside the scope of this project.

ERM is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report is for the exclusive use of the client, its representatives and advisers and any investors, lenders, underwriters and financiers who agreed to execute the reliance letter, and the client agrees that ERM's report or correspondences will not be, except as set forth herein, used or reproduced in full or in parts for such promotional purposes, and may not be used or relied upon in any prospectus or offering circular.

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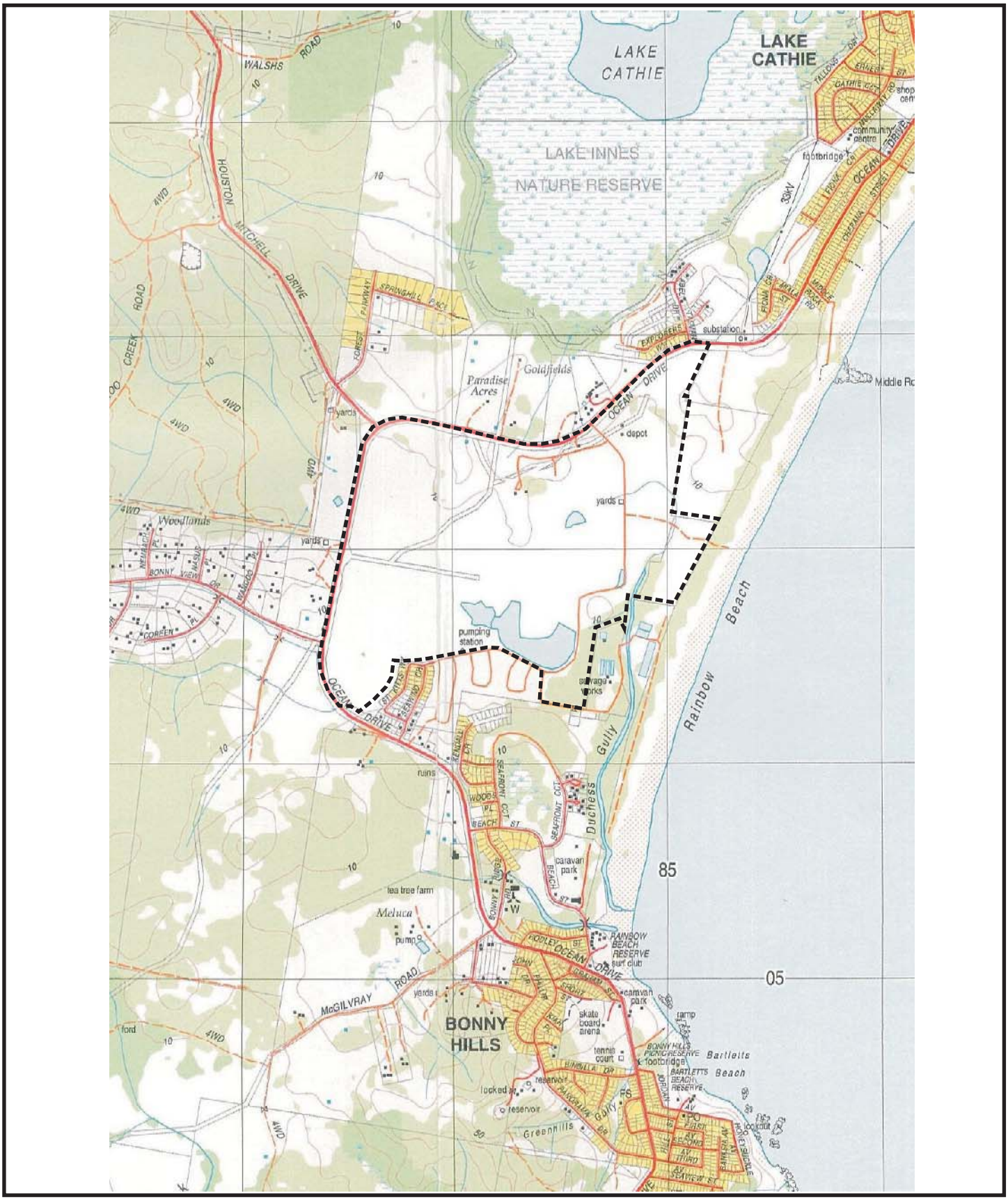
Annex A

Figures



Site Location

Figure 1

Site Location

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Project:	Rainbow Beach Phase 1		
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Date:	21/09/2007	Drawing size:	A4
Drawn by:	RK	Reviewed by:	WW
Source:	Land Information Centre, 2000		
Scale:	Refer to Scale Bar		

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0 1km

Suffix	Revisions	Date	Init
A0	Preliminary Issue	21-09-07	RK

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Legend

- Surface soil sample
- Fibrous cement material sample
- Study Area

Figure 2

Site Layout and Sampling Locations

Client:	St Vincent's Foundation Pty Ltd		
Project:	Rainbow Beach Ph1 PSI		
Drawing No:	0044444_01		
Date:	21.09.2007	Drawing Size:	A3
Drawn By:	RK	Reviewed By:	WW
Source:	Dept. of Lands		
Scale:	Refer to Scale Bar		

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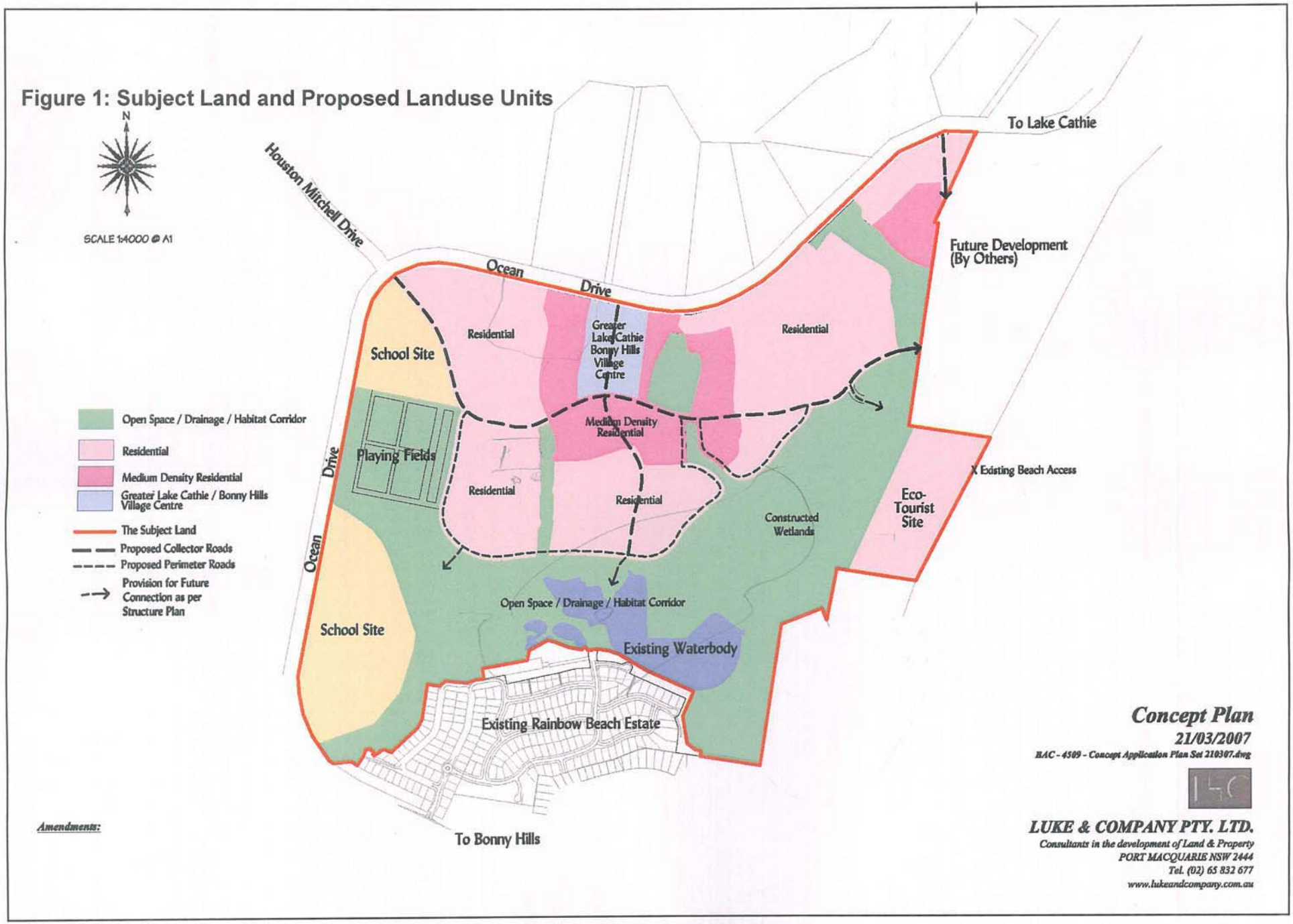
Annex B

Site Concept Plan

Figure 1: Subject Land and Proposed Landuse Units



Annex C

Aerial Photographs


0189
CAMDEN HAVEN
1:25000 Approx. Scale
NSW4744 (M2327)
RUN 2
15-09-02
187-205
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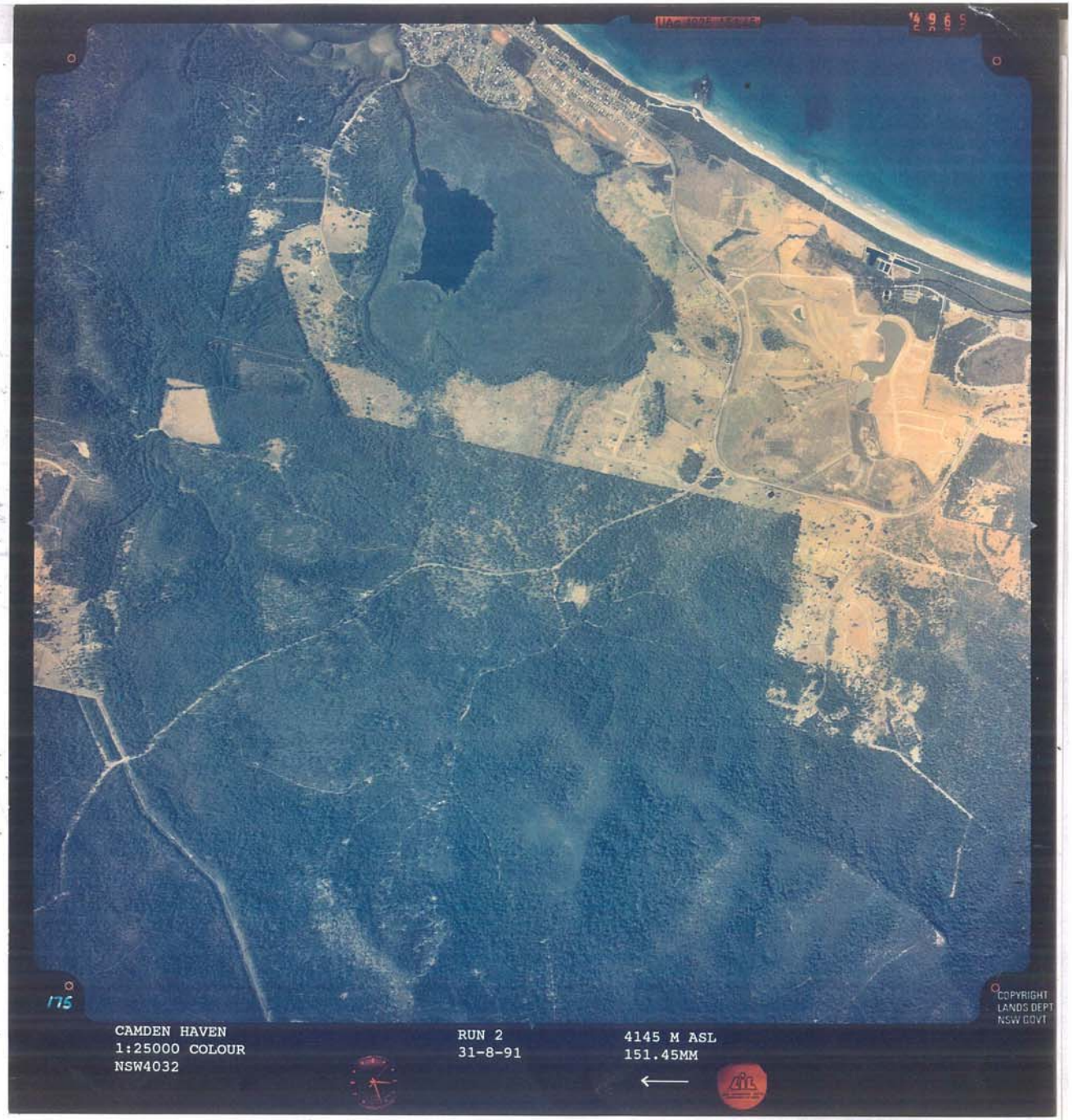
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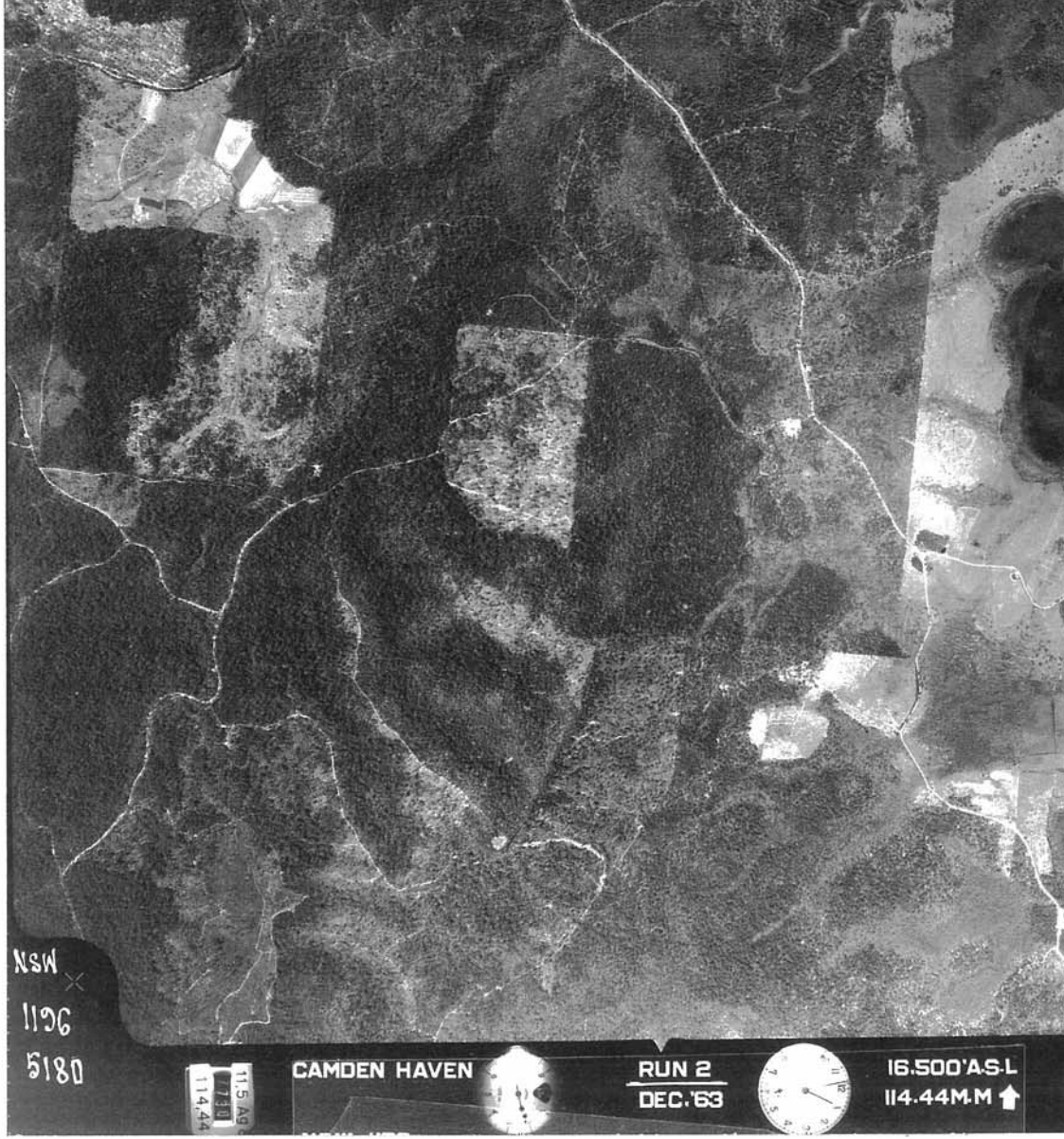

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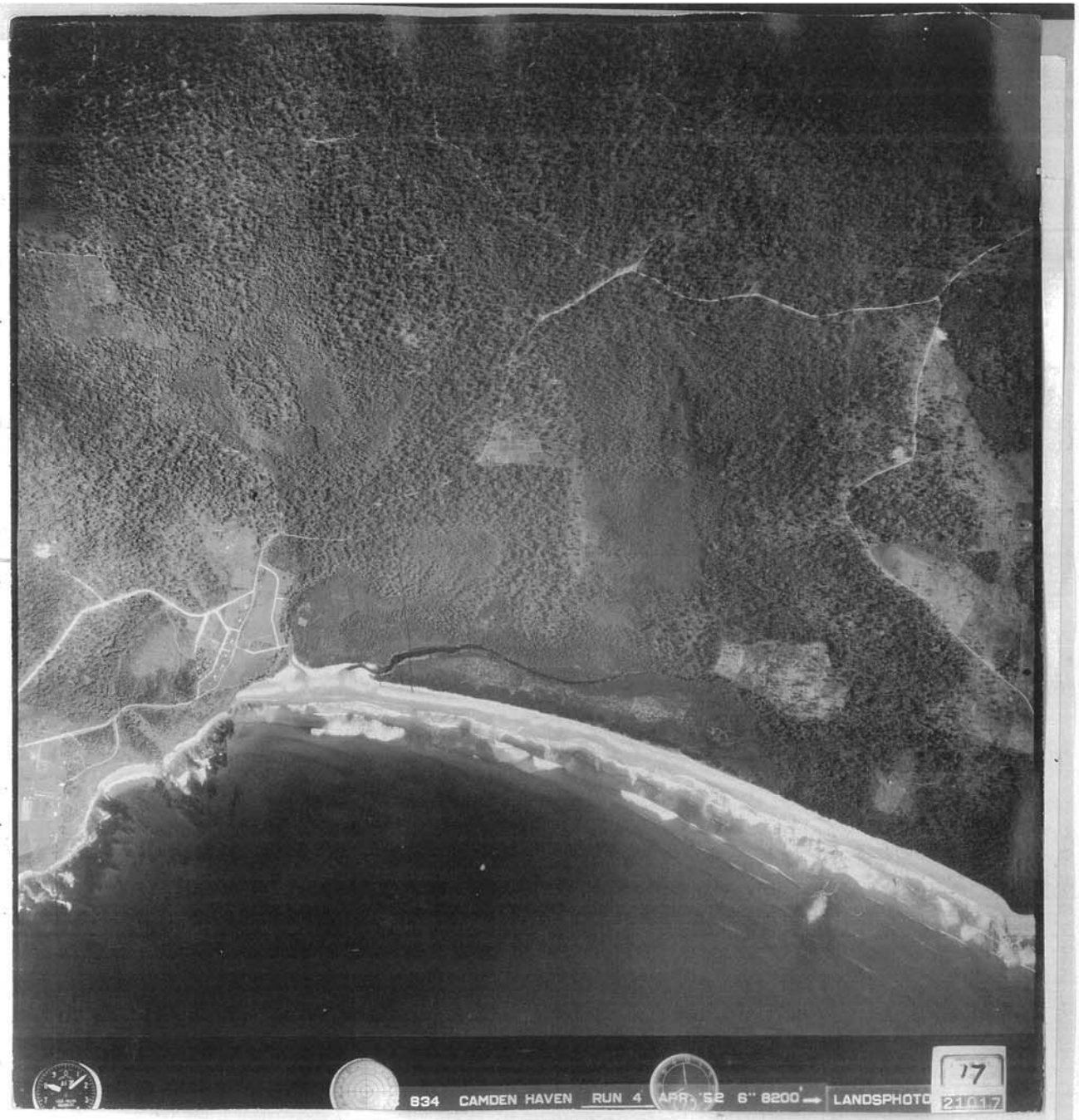

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