Internal Project

# Houseboat

Basis of Design

**Document Number: 17-013-BOD-001**

Mecanico Ltd

T: +44 (0) 1569 739446

**www.mecanico.com**

| Rev | Date | Description | Issued by | Checked By | Approved By | Client Approval |
|---|---|---|---|---|---|---|
| A1 | 03-Jul-2018 | Issued for IDC | BPH | FPH | BPH | n/a |
| C1 | 30-Jul-2018 | Issued for Use | BPH | FPH | BPH | n/a |
| C2 | 03-Oct-2018 | Reissued for Use | BPH | FPH | BPH | n/a |
| | | | | | | |
| | | | | | | |
| | | | | | | |

**Structural • Mechanical • Marine**

# CONTENTS

# 1 INTRODUCTION

## 1.1 Project Overview

For several years it has been my objective to build a home of architectural merit in an area of outstanding natural beauty, for both myself and my family to enjoy. Having spent considerable time on the west coast of Scotland; in particular the Lochcarron, Loch Kishorn and Applecross areas; there are few locations in the world that can match the stunning vistas and warmth of the local people. However, with restrictive planning and crofting legislation, limited land availability and logistical complications of remote sites; my efforts to date have proven fruitless.

Taking a lead from historical floating communities in Seattle and Vancouver, and more modern developments in Copenhagen and Rotterdam; I have invested energies in the pursuit of a 'floating home' alternative. The houseboat will be anchored to the shore side and connected to available utilities, but will have the key advantages of being manufactured off-site, and connected to a temporary mooring system, with little or no permanent impact to the shoreside. The site will be accessible by boat in absence of vehicular access, which opens a vast range of potential sites and locations, normally impractical for a 21st century dwelling.

## 1.2 Objective

The objective of this document is to detail the principal requirements of the houseboat design i.e. a potential location, general description and aesthetic appearance, construction methodology, foundation design, mooring requirements, and environmental impact. The document is intended for use as a concept overview for planning and licensing bodies, architectural representation for building contractors, and a means to dispel any concerns from interested parties.

## 1.3 Scope of Work

The scope of this document extends to the following areas:

- Location of interest
- General concept overview
- Foundation design
- Mooring system and design considerations
- Construction methodology
- Onshore utilities and renewables
- Waste management
- Access and egress

## 1.4 Abbreviations

| | |
|---|---|
| EPS | Expanded Polystyrene |
| GRP | Glass Reinforced Plastic |
| MTO | Material Take-off |
| SEPA | Scottish Environmental Protection Agency |
| SSE | Scottish & Southern Electric |
| VHF | Very High Frequency |

# 2 REFERENCES

## 2.1 Third Party References

[1] British Columbia Floating Homes Standard

[2] Floating homes and the Building Regulations. Guideline for developers, builders and local plan reviewers, VROM Inspectie, April 2009

[3] AMSL Report No. 06/08.1 2006a – Anderson, Kishorn North - Site and Hydrographic Survey Report to Scottish Sea Farms

[4] Scottish Sanitary Survey Report - Loch Kishorn – RC329, March 2013

[5] Report Presenting Proposals for a Scottish Technical Standard for Containment at Marine and Freshwater Finfish Farms, SARF073, Scottish Aquaculture Research Forum, February 2012.

# 3 BACKGROUND

Floating homes and houseboats are not a new phenomenon, they have been around for over a century. In the US they were first built to house workers in logging camps along the shores of rivers and the Great Lakes, they were then developed as summer homes for the wealthy. The concept of floating homes exploded in the 1930's when people, desperately seeking cheap places to live during the great depression, scavenged logs and floating debris to build 'temporary' accommodation. As the US economy slowly recovered, the respectable poor moved on to be replaced by a Bohemian occupation looking to live off-grid and outside the laws and social conventions of society. To curb the uncontrolled explosion of so called 'floating shanty towns', government in many of the large US cities gradually embraced the concept and brought it under controlled planning and licensing laws. Although not a smooth transition, many shore side modern cities now host a sustainable population of floating accommodation. Some with significant waiting list for mooring locations and highly sought-after properties.

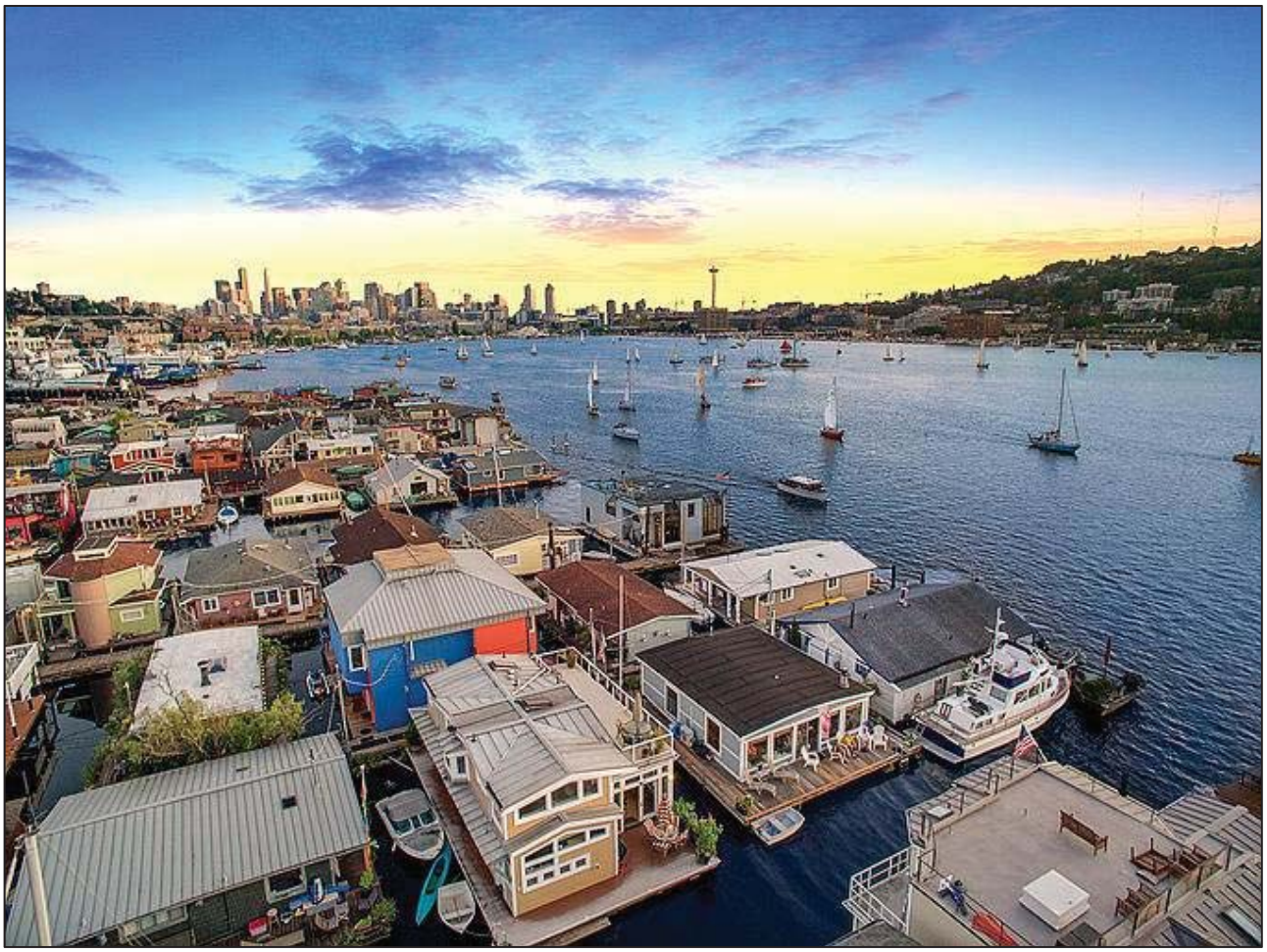


**Figure 3-1 - Seattle Portage Bay Floating Home Community**

As well as the want to live on water, there is also the necessity to live on water due over population and limited expansion zones in densely populated areas. Revolutions in house design have developed both permanently floating systems and amphibious houses suitable for development on

waterways or flood plains. In Europe, Holland has pioneered the way in this field, with cities such as Amsterdam and Rotterdam hosting large exclusive communities opting to live on water. Given a large portion of Holland is below sea level, this seems a sensible precaution against flooding; something that is also of grave concern to large portions of the UK.

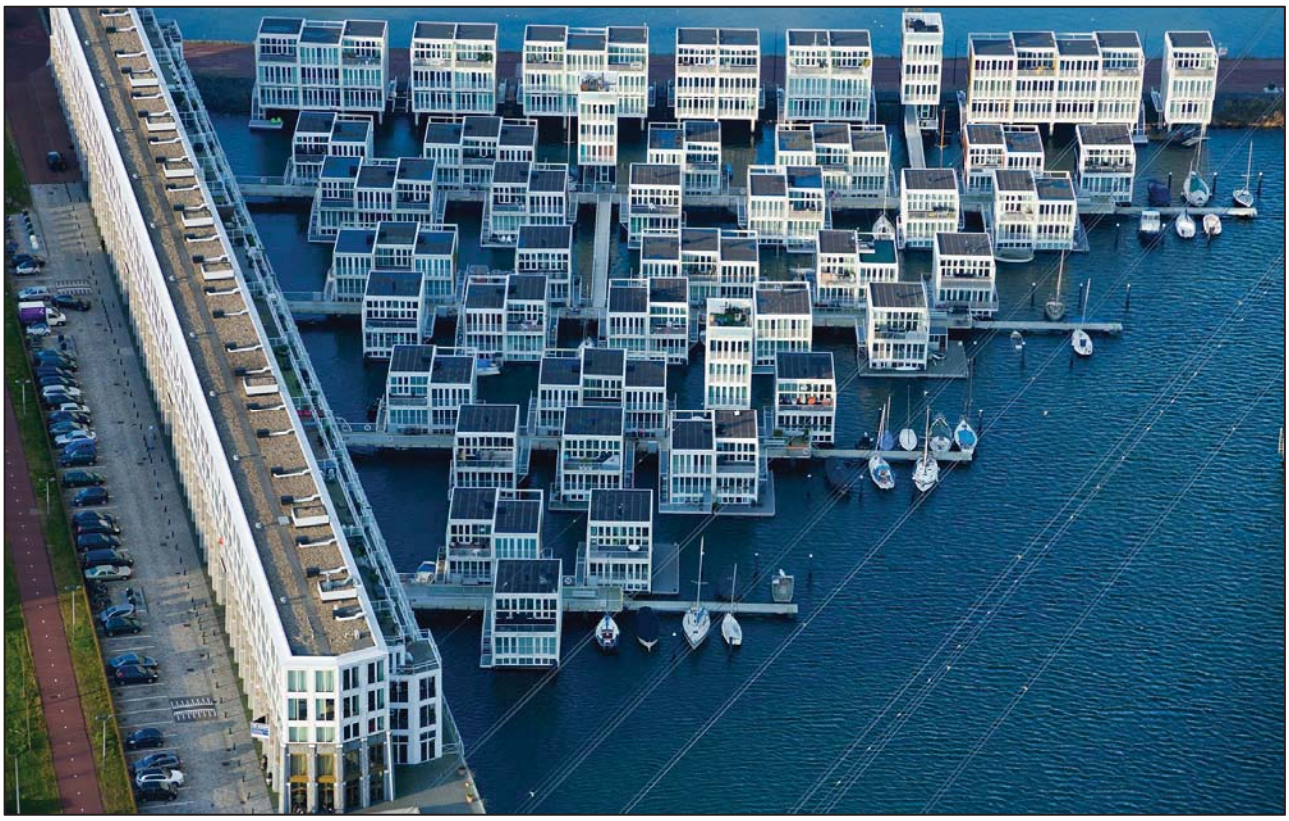


**Figure 3-2 – Ijburg, Holland Floating Home Community**

# 4 LOCATION

As previously mentioned, the emphasis of this Basis of Design is a houseboat located on the west coast of Scotland, in the Lochcarron and Loch Kishorn area. The selection criteria for potential locations has considered the seabed gradient drop-off from MLWS, natural shelter by headlands and natural rock promontories, local access to utilities, and access to site.

One location has been selected as a potential option for mooring a houseboat. The Landowner has been approached and has considered the concept acceptable in principal. However, as the home will be moored a few metres off the shoreline, approval of the concept and associated licensing will be required by the Crown Estate and Marine Scotland.

Grid reference for the location is as follows:

1. Applecross Peninsular – grid reference NG 7891 3811 (57°22’46.4”N 005°40’46.5”W)

A preliminary review of nautical charts for this location confirms there is sufficient water depth in this area to provide suitable clearance between the underside of the floating foundations and seabed. Also, the natural shape of the coastline offers good protection against both wind and current.

Refer to Figure 4-1 and Figure 4-2 for a general overview of the proposed location. A detailed layout of the location can be found on drawings 17-013-SKE-0001 Sht. 1 and 2 in Appendix A.




**Figure 4-1 – Houseboat Proposed Location**

**Figure 4-2 – Houseboat Proposed Location, Looking South West**

# 5 GENERAL CONCEPT

The houseboat concept design is based on an existing home moored in Portage Bay, Seattle. The building has a 120m$^2$ footprint with master bedroom, office / bedroom, bathroom and open plan kitchen, dining and living room. There are both fore and aft decks to extend the living space as well as a roof terrace. The exterior of the home is a mixture of structural steel and glass facing out to into the loch, weathered larch cladding on two sides, and natural grey zinc roofing extending to sea level on the fourth side. The combination of natural weathered larch and zinc will help bed the house into the surroundings.

**Figure 5-1 – Houseboat Concept – Side Facing Shore**

Figure 5-2 – Houseboat Concept – Side Facing Loch

Figure 5-3 – Houseboat Concept – Loch Side Deck

Figure 5-4 – Houseboat Concept – Upper Terrace

Figure 5-5 – Houseboat Concept – Weathered Larch Cladding


**Figure 5-6 – Houseboat Concept – Natural Zinc Roofing**

**Figure 5-7 – Houseboat Concept – Dinning, Living Room, Kitchen**

# 6 GENERAL DESCRIPTION

## 6.1 Foundations

Foundations are perhaps the most critical part of a houseboat and take many forms. The following is a non-exhaustive list of the types of systems in operation today:

- Natural materials i.e. log float
- Steel floating bodies
- Composite floating bodies i.e. GRP hulls
- Pneumatic stabilizing platforms
- Concrete caisson
- Concrete 'tray'
- Concrete-EPS bodies

The pros and cons of each option are exhaustive and not covered as part of this document. However, the merits of the preferred foundation type 'Concrete-EPS' are discussed here in more detail.

Firstly, to differentiate the Concrete-EPS concept from either a concrete caisson, pneumatic stabilised caisson or tray, the alternative can be defined as follows:

Concrete caisson – This in its simplistic term is a concrete enclosed watertight box, with an internal void of air, which provides the buoyancy of the floating structure. Generally, the caisson construction is a combination of boxes with watertight bulkheads to provide integrity in the event one compartment becomes flooded.

Pneumatic stabilised Caisson – This concrete box has no bottom; hence the buoyancy comes from air trapped in the void space between the water and concrete top. The floatation level can be controlled by pumping additional air into the void.

Concrete Tray – This is an open top box formed from steel reinforced concrete i.e. a caisson without the top. This methodology is used a lot in houseboat construction, allowing for a basement or multistore building to be installed in the void space.

All these variations have one fundamental flaw, which can affect the success of the foundation and premiums for insuring the property. They all rely on the integrity of the concrete shell to remain watertight. In the event of a leak, the integrity of the whole structure is lost.

The Concrete-EPS system is essentially a Pneumatic Stabilised Caisson with the trapped air replaced by a light weight Expanded polystyrene block. This allows for significantly more buoyancy and less draught for the same shape. Also, the structure becomes lighter with reduced thickness of concrete walls, and the unit is unsinkable as there are no void spaces for water to accumulate.

The concept was first developed in the early 1980's by International Marine Floatation Systems Inc (IMF) for construction of floating real estate in Canada, but is now used worldwide by a multitude of companies. Some of the key benefits are as follows:

- Unsinkable
- Low selfweight, high buoyant capacity
- Small draught
- High durability / low maintenance
- Construction directly on water possible
- Different shapes possible
- Insulating properties.

The only notable disadvantage with this approach is there are no internal voids in the foundation; hence, water / waste storage needs to be incorporated elsewhere.

**Figure 6-1 – Drijvend Pavilion, Rotterdam**
**(EPS foundation built on water with concrete slab and beam top)**

## 6.2 Mooring System

There are several options available for mooring the houseboat, some more permanent than others and with varying degree of impact on the local environment. The following is a range of options available, taken from both houseboats and traditional boating moorings:

- Clump Weight Anchor System
- Helix Anchor System
- Pile Guide System
- Brace Bar System
- Drag Anchor System

Due to the natural exposed features of the proposed site, a simplified 4-point mooring arrangement is proposed with mooring rings installed into low tide rock features where possible, either with expansion or adhesive securing bolts. Where natural features do not exist, either timber piles or helix anchors can be installed above or below the high-water mark. To prevent shock loading from wind and current acting on the houseboat and anchor points, a shock-absorbing system will be fitted to each mooring line. Refer to Figure 6-2 for a concept of the proposed mooring arrangement.

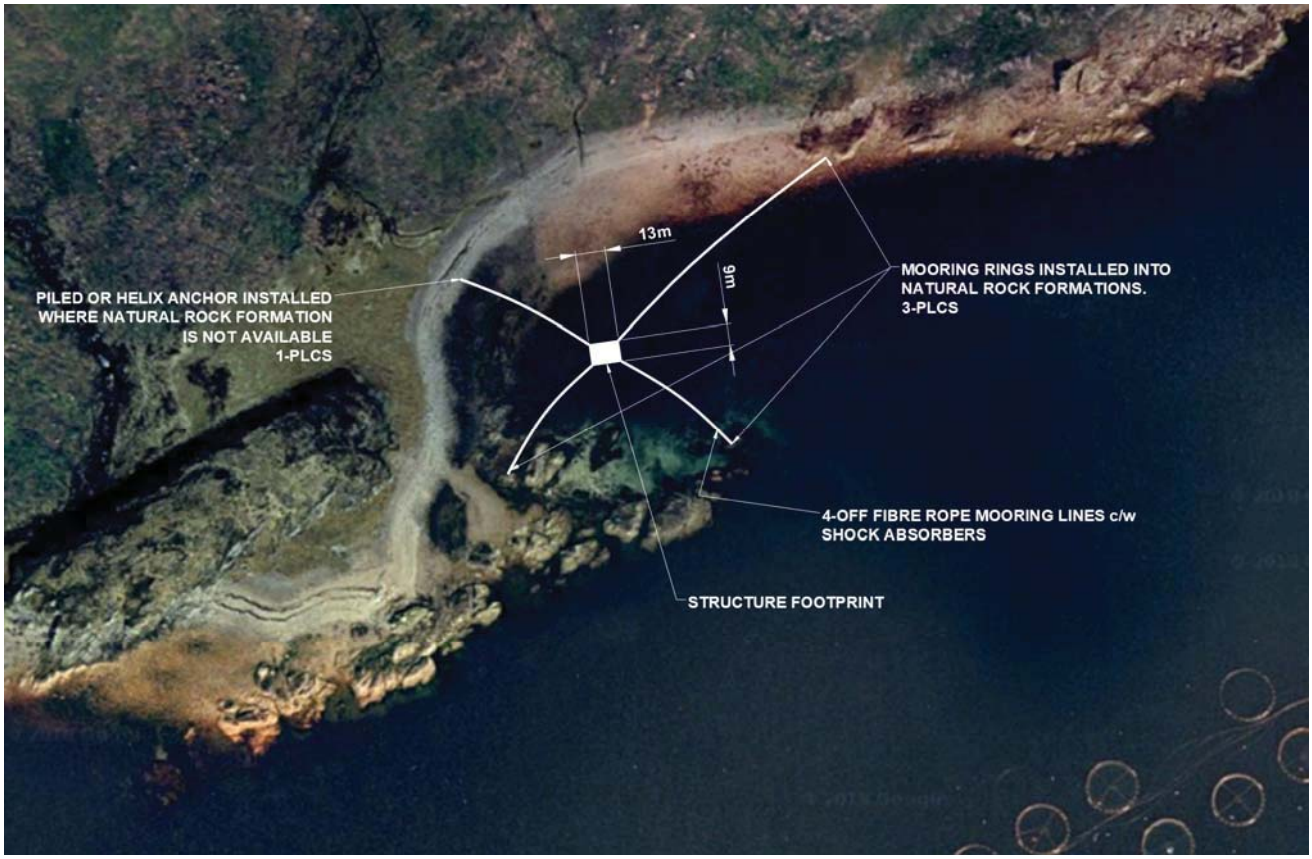





**Figure 6-2 - Proposed 4-point Mooring Arrangement**

## 6.3 Construction

The construction of the building above the floating concrete foundation (super structure) will be of standard timber frame construction, hence subject to the standard rules applicable to UK building codes. However, the selection of material, specifically for the lower floor supports and external cladding exposed to salt water spray, will have proven superior resistance against decay and infestation.

### 6.3.1 Flooring

The timber frame floor will be raised off the concrete foundation by pressure treated timber beams positioned above the strong points of the concrete. The emphasis of this is to provide cavities below the floor for fresh water tanks, waste tanks, pumps and other machinery. The floor construction will be of traditional timber joist framing and sheeting.

### 6.3.2 Walls

As mentioned above, the walls will generally be of timber frame construction, cladded in a larch. This is both for its excellent marine resistance, and to help the houseboat bed into the surrounding environment. Due to the large number of windows, steel construction with suitable marine grade coating will be adopted, both where practical and for aesthetic reasons.

### 6.3.3 Roof

The angled roof of the building will be covered in zinc roof cladding due to its excellent characteristics in a marine environment. This will be limited to exposed areas regular flushed by rain fall, as salt deposits can collect on the zinc facings over time, causing marking and eventual damage. Facias and soffits sheltered from rain fall will therefore be fabricated using alternate materials.

The flat roof will double as an upper deck, hence will have a corresponding load rating. An elastomeric membrane will be applied to the roof, complete with strategic skylights above internal spaces within the building. The roof will then be covered with timber decking. Handrails will be positioned around all edges of the upper deck.

### 6.3.4 Insulation / Heating

One emphasis of the build is to create a home with high insulation efficiency to reducing heating requirements, and to harness the south facing geography of the site with the use of renewable technology. Due to the remote location, heating will be generated directly from electricity, hence to reduce costs, a high level of insulation and draught reduction is required. Plus, the use of discreet solar panels positioned on the shore side to generate both electricity and to heat water. Consideration is made to the Passivhaus philosophy of an air tight constriction, with levels of insulation of both timber frame walls and doors/windows, which far exceed standard building requirements.

Although the building sits on a medium synonymous with heat loss i.e. water, the foundation fabrication material of EPS has advanced thermal insulation qualities. The interface between

foundation and floor will also be packed with EPS up to the floor joists and closed cell spray foam between the joists. This spray foam will also be used on all external wall and roof cavities.

Due to the natural beauty of the location, it is important to maximise the vista with good use of windows and glass doors. However, this normally comes at a cost to the insulating properties of the home, as windows loose heat in the winter months and generate heat during summer. The use of thermally efficient glazing and thermally insulated frames will be used to minimise the impact of heat loss/gain.

To counteract effects of condensation and poor air quality in the house, a heat recovery ventilation system will be installed throughout. This will be combined with a heat pump as the primary means to heat the home, supplemented by a wood burning stove fitted with back boiler to provide additional room and water heating.

## 6.4 Utilities

One of the principal benefits of the proposed location, which make it viable for a houseboat of this concept, is the existence of both electricity in the area and access to fresh water. Figure 6-3 is taken from the SSE database, mapping the position of an overhead 6.6/11kV electricity line. A new connection application is still to be made to SSE to verify a junction box can be installed in this location, but preliminary discussions see no reason this would prove an issue.

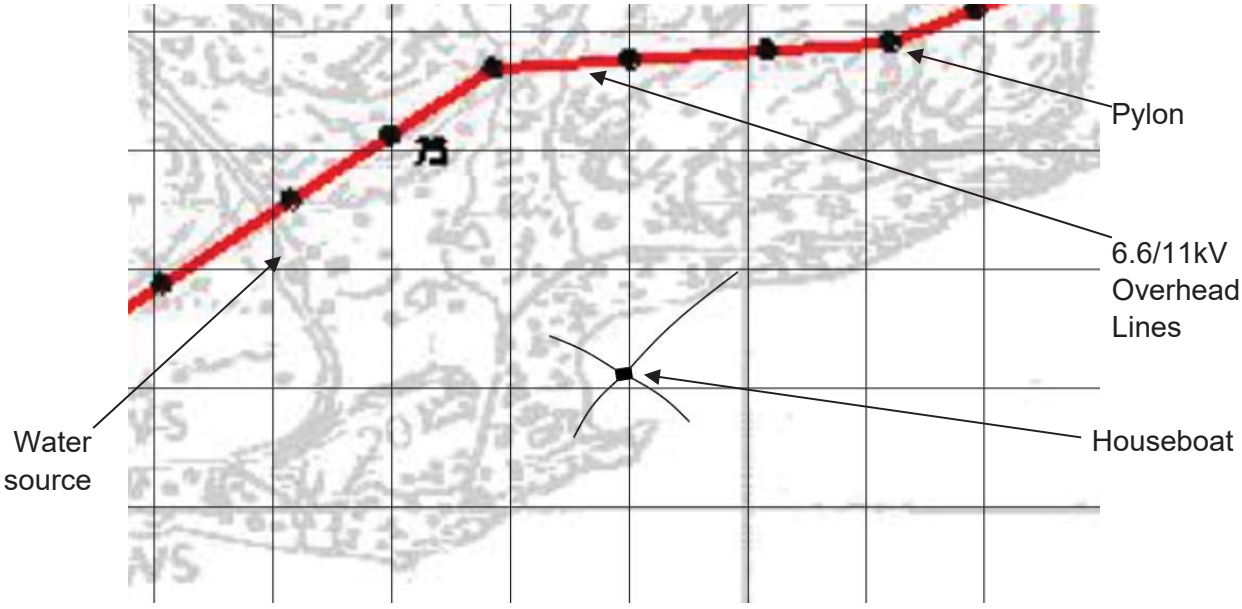





**Figure 6-3 – Scottish & Southern Electric Mapping Database**

There are several streams show on various maps and satellite imagery of the area, the main being Allt a' Chois, indicated on Figure 6-4. The intention would be to install a collection system upstream and run this to an onshore water reservoir tank buried above the high-water shoreline. This would feed smaller drinking water and utility water tanks on the boathouse, each fed through appropriate filtration units.

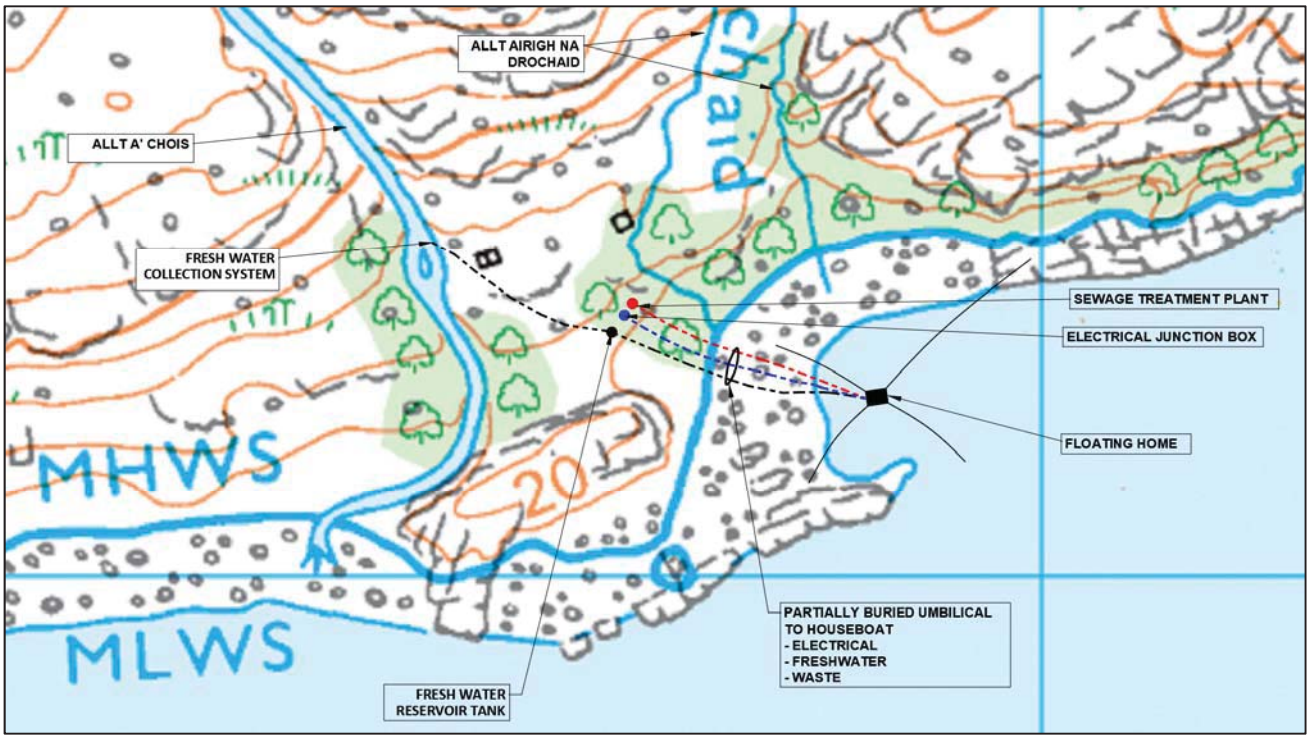





**Figure 6-4 – Site Utilities Layout**

There are no telephone lines near the proposed location, hence communications will be in the form of both mobile 4G, for telecoms and broadband (strong signal received during initial site visit). A VHF radio will also be installed in the houseboat for emergency communications and to monitor passing marine traffic.

## 6.5 Waste Management

It is impractical and uneconomical to moor a vessel alongside the houseboat for offloading of both grey and black waste water, hence the concept here is based on installation of a small sewage treatment plant onshore. There are several different types of domestic treatment plants on the market, but they all follow the same principal, and subject to Environmental Agency Consent to Discharge, can be discharged directly to a watercourse. Following initial approval of the houseboat concept. SEPA will be contacted to arrange both a survey and application for Consent to Discharge.

Refuse and recycled goods will be disposed of either at Plockton or Lochcarron recycle centres. As part of detail design, agreements will be put in place with The Highland Council for best practices for this process.

## 6.6 Access

Following an initial site visit to the proposed location, it is clear access will be predominately by boat or kayak, with local harbours being either Plockton (4.6km) or Achintraid (4.5km). While this may appear a handicap to the chosen location, it is also one of its greatest assets. Additional access can

also be obtained on foot, either by walking along the coast from Kishorn Port or by parking in the layby at Cnoc nan Uan on the Bealach na Ba. There are no clear paths along the coast, hence walking is over undulating ground, thus limiting access to hikers.

## 6.7 Design Principals

As the concept of a 'floating home' is still very new to Scotland, there are no industry guidelines for design and build available. In addition, there is currently no requirement for planning permission or a building warrant for the houseboat design and build (although this is subject to interpretation of real estate vs. movable goods). Planning permission is required for installation of a domestic onshore sewage treatment plant, along with SEPA 'Consent to Discharge. Licensing would also be required by the Crown Estate Scotland and Marine Scotland for mooring the houseboat. To insure the property, a certain level of oversight during the design and build would also be required. For this reason, it is proposed the design and build approach will follow Building Standards set forth by the Scottish Government. Where those standards do not cover aspects of the build such as buoyancy, freeboard, mooring design, stability or certain load conditions, guidance from the following Canadian and Dutch standards will be applied:

- Canadian Code - British Columbia Floating Homes Standard [1]
- Dutch Code - Floating homes and the Building Regulations. Guideline for developers, builders and local plan reviewers, April 2009 [2]

### 6.7.1 Design and Construction

The houseboat superstructure shall be designed in accordance with Building Standards set forth by the Scottish Government. Plans will be submitted for Building Warrant approval as per an onshore domestic dwelling. The foundations will be designed using a reputable ISO9001 accredited company with proven track record of Concrete-EPS foundation design.

### 6.7.2 Environmental Criteria

Because of shell fish and salmon farming in and around the Loch Kishorn area, several documents are available for assessment of local metocean data as follows:

- AMSL Report No. 06/08.1 2006a – Anderson, Kishorn North - Site and Hydrographic Survey Report to Scottish Sea Farms [3]
- Scottish Sanitary Survey Report - Loch Kishorn – RC329, March 2013 [4]
- Plockton Weather Station
- South Uist Range Weather Station

Loading conditions for the houseboat construction and mooring design will take account of both omni-directional wind and current. Wind induced current will also be considered.

### 6.7.3 Buoyancy

The foundations of the houseboat will have sufficient buoyancy to support the deadweight of the structure (lightship weight), live loads and snow loads, whilst maintaining a minimum freeboard of

500mm. This is based on the service limit state; for ultimate limit state in the event of unplanned extreme or accidental load conditions, a minimum freeboard of 100mm will be maintained.

### 6.7.4 Tilt and stability

During construction of the houseboat, heel and trim of the vessel will be closely monitored, including a live Material Take-off (MTO) Report. Once complete, additional ballast will be added to the void space between foundations and living area to level the structure. However, due to the nature of the float, the structure will be susceptible to heel and trim from wind and wave motion. To ensure this remains within practical limits, the vessel geometry will be designed such that stability in both the longitudinal and transverse directions will be limited to the lesser of 5deg or half the freeboard.

Normally, damage stability would be a consideration for any sea going vessel. However, the foundations employed in this concept design are solid, and are not dependent on the integrity of watertight bulkheads, therefore, damage stability need not be considered.

To qualify the impact of wave motion on the houseboat, a dynamic stability analysis will be performed to evaluate the natural oscillatory period (eigenperiod) of the structure, ensuring it is well above that of the anticipated wave period.

### 6.7.5 Depth underneath structure

The guidelines from Dutch guidance notes indicate a 600mm clearance should be applied under the floating foundation, which is assumed to be at Service Limit State. The justification for this is to provide sufficient clearance for flow capacity of water under the structure. The flow of water affects the water quality, particularly the amount of sediment and pollutants that are imported and exported, as well as sufficient oxygenation of the water.

### 6.7.6 Moorings

Mooring design is not covered either by Scottish building codes, or the Dutch and Canadian standards. The proposed methodology for mooring design is therefore to follow that applied to Marine and Freshwater Finfish Farms, ref. [5]. Key design parameters are as follows:

- Suitability for envisaged environmental conditions and all conceivable operations.
- Consideration of fatigue and accidental limit states as well as the service and ultimate limit state.
- To tolerate all expected loads and deformations with satisfactory safeguarding against failure.
- To prevent against shock loading of the moorings ends by means of a shock-absorbing system.
- Designed such as to prevent snagging or chaffing on lines.
- Inspection and maintenance plan for mooring lines and mooring points.

### 6.7.7 Fire and Safety

In addition to the standard fire and safety provisions associated with a domestic dwelling, as covered by Scottish Building Codes, the following additional mitigations will be included in the houseboat design:

- Guards / handrails will be installed in all areas where the height above water exceeds 1000mm. No guards or railing are required for open decks and balconies below this height.
- Life rings will be installed on both the loch side and shore side lower decks.
- The location and quantity of portable fire extinguishers will be detailed in Fire Safety Plan, which will be reviewed with the local fire authority during detailed design.
- As a primary means of escape in the event of a fire, the houseboat will be furnished with a floating pier for egress direct to land without need for boat or swimming. In addition, each room will have direct access to the outside via an external door.
- Markings and permanent lighting for the vessel, per maritime codes will be further reviewed during detail design.

# APPENDIX A – REFERENCE DRAWINGS


NOTES:

1. MAP PRODUCED BY ORDNANCE SURVEY, OS 1:25k HD NORTHERN SCOTLAND 2016, OS LICENCE NUMBER PU100034184, © 2016 CROWN COPYRIGHT.
2. NATIONAL GRID REFERENCE SYSTEM CONSTRUCTED ON TRANSVERSE MERCATOR PROJECTION, AIRY SPHEROLD, OSGB (1936) DATUM.
3. LATITUDE–LONGITUDE REFERENCE COORDINATE SYSTEM IS WGS84.



GENERAL TOLERANCES UNLESS OTHERWISE STATED

| | | | | |
|---|---|---|---|---|
| FABRICATION | - | 0-2000mm | - | ±1mm |
| | | > 2000mm | - | ±3mm |
| MACHINING | - | 2 DEC PLACES | - | ±0.05 |
| | | 1 DEC PLACE | - | ±0.10 |
| | | 0 DEC PLACE | - | ±0.5 |
| ANGULAR | - | ± 0.5° | | |

PROJECTION:

ALL DIMENSIONS IN MILLIMETERS

DO NOT SCALE FROM DRAWING

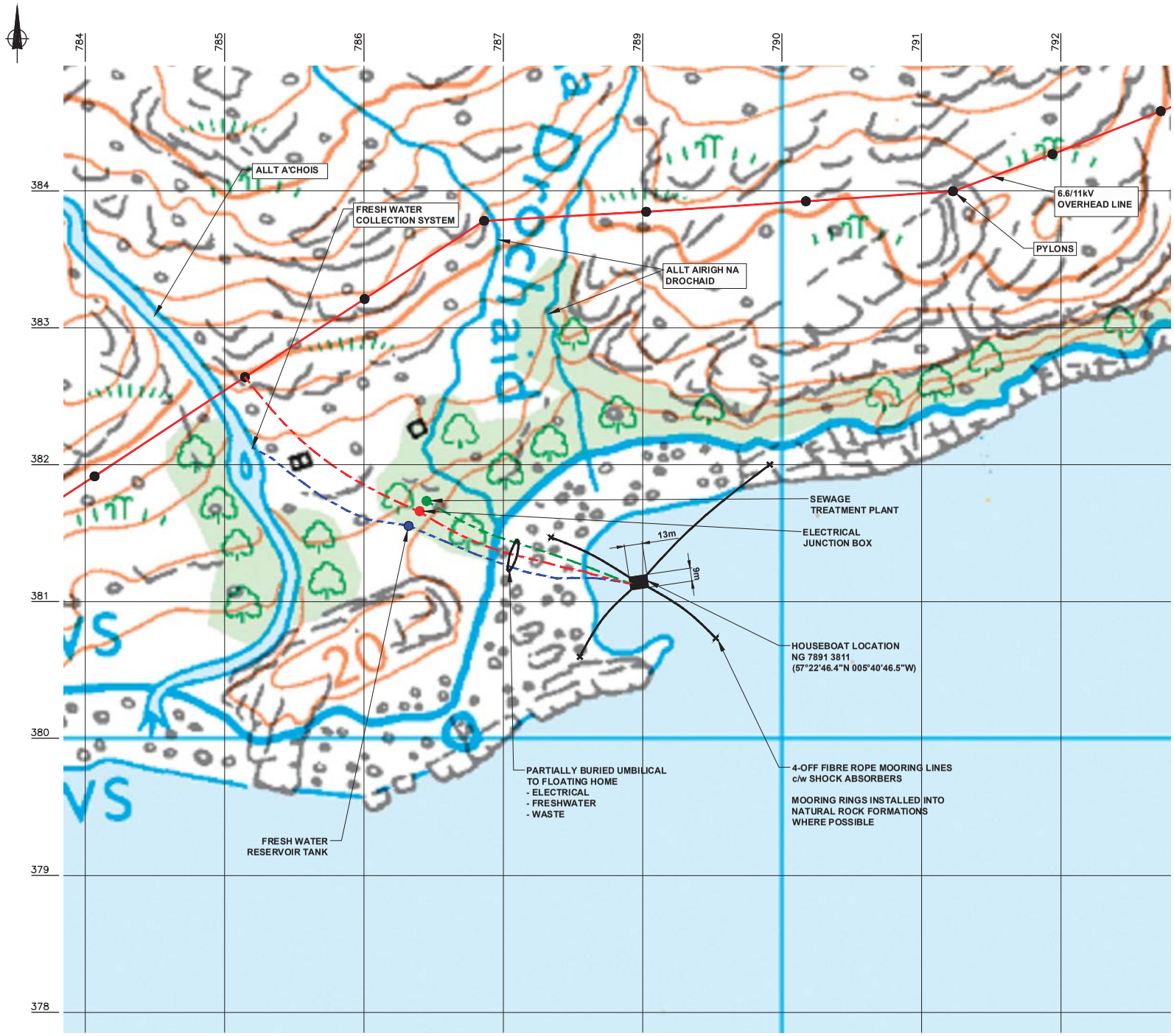
| REV | DATE | PURPOSE | BY | IDC | ENG |
|---|---|---|---|---|---|
| C1 | 26/09/18 | ISSUED FOR USE | BPH | FPH | BPH |
| A1 | 03/07/18 | ISSUED FOR IDC | BPH | FPH | BPH |

CLIENT: N/A

PROJECT: HOUSEBOAT

TITLE: OS SITEMAP 1 OF 2

| SCALE U.O.S. | MECANICO DRG No. | REV. |
|---|---|---|
| N/A | 17-013-SKE-0001 | C1 |
| SHEET NO. | CLIENT DRG No. | REV. |
| 1 OF 2 | | |




NOTES:

1. MAP PRODUCED BY ORDNANCE SURVEY, OS 1:25k HD NORTHERN SCOTLAND 2016, OS LICENCE NUMBER PU100034184, © 2016 CROWN COPYRIGHT.
2. NATIONAL GRID REFERENCE SYSTEM CONSTRUCTED ON TRANSVERSE MERCATOR PROJECTION, AIRY SPHEROLD, OSGB (1936) DATUM.
3. LATITUDE–LONGITUDE REFERENCE COORDINATE SYSTEM IS WGS84.



GENERAL TOLERANCES UNLESS OTHERWISE STATED

| | | | | |
|---|---|---|---|---|
| FABRICATION | - | 0-2000mm | - | ±1mm |
| | | >2000mm | - | ±3mm |
| MACHINING | - | 2 DEC PLACES | - | ±0.05 |
| | | 1 DEC PLACE | - | ±0.10 |
| | | 0 DEC PLACE | - | ±0.5 |
| ANGULAR | - | ±0.5° | | |

PROJECTION:

ALL DIMENSIONS IN MILLIMETERS

DO NOT SCALE FROM DRAWING

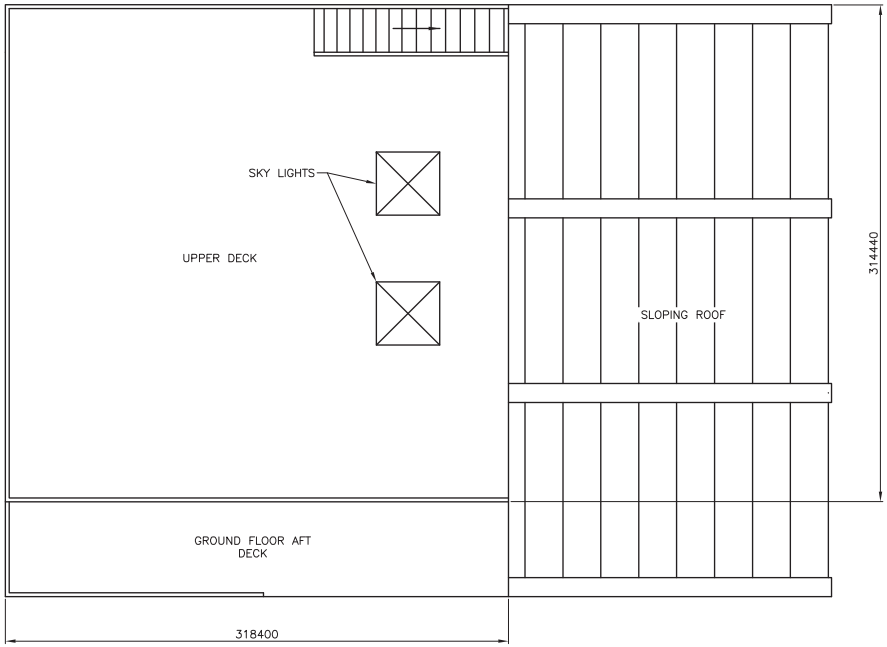
| REV | DATE | PURPOSE | BY | IDC | ENG |
|---|---|---|---|---|---|
| C1 | 26/09/18 | ISSUED FOR USE | BPH | FPH | BPH |
| A1 | 03/07/18 | ISSUED FOR IDC | BPH | FPH | BPH |

CLIENT: N/A

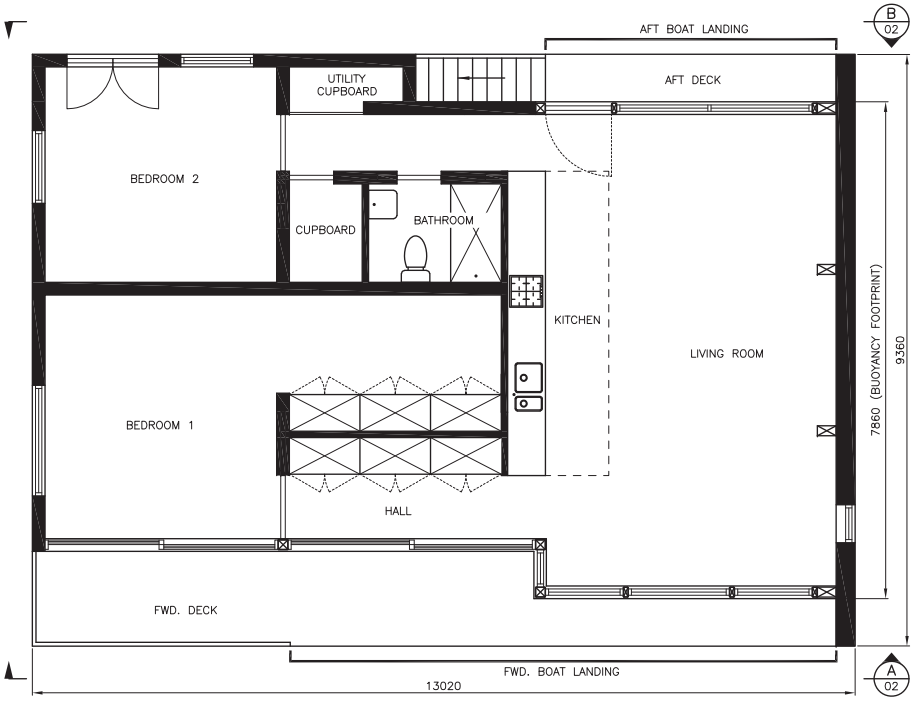
PROJECT: HOUSEBOAT

TITLE: OS SITEMAP 2 OF 2

| SCALE U.O.S. | MECANICO DRG No. | REV. |
|---|---|---|
| N/A | 17-013-SKE-0001 | C1 |
| SHEET NO. 2 OF 2 | CLIENT DRG No. | REV. |




FIRST FLOOR PLAN




GROUND FLOOR PLAN

UPPER DECK CONCEPT

BEDROOM 1 CONCEPT

LIVVINGROOM / KITCHEN CONCEPT

NOTES:

METRES
0 1 2



GENERAL TOLERANCES UNLESS OTHERWISE STATED

| | | | | |
|---|---|---|---|---|
| FABRICATION | - | 0-2000mm | - | ±1mm |
| | | > 2000mm | - | ±3mm |
| MACHINING | - | 2 DEC PLACES | - | ±0.05 |
| | | 1 DEC PLACE | - | ±0.10 |
| | | 0 DEC PLACE | - | ±0.5 |
| ANGULAR | - | ± 0.5° | | |

PROJECTION:

ALL DIMENSIONS IN MILLIMETERS

DO NOT SCALE FROM DRAWING

| REV | DATE | PURPOSE | BY | IDC | ENG |
|---|---|---|---|---|---|
| A1 | 03/07/18 | ISSUED FOR IDC | BPH | FPH | BPH |

CLIENT: N/A

PROJECT: FLOATING HOME

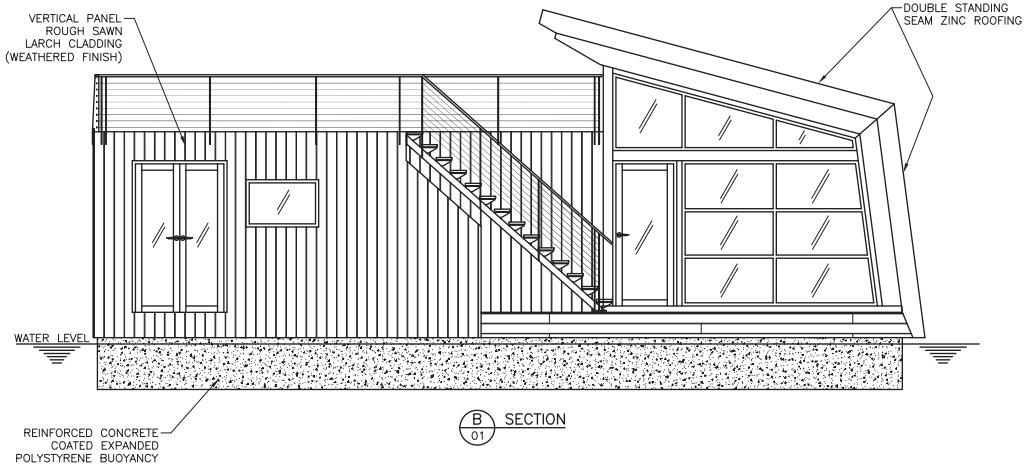
TITLE: GENERAL ARRANGEMENT DRAWING FLOOR PLAN

| SCALE U.O.S. | MECANICO DRG No. | REV. |
|---|---|---|
| 1:40@A1 | 17-013-SKE-0002 | A1 |
| SHEET NO. 1 OF 2 | CLIENT DRG No. | REV. |

AFT FACE CONCEPT

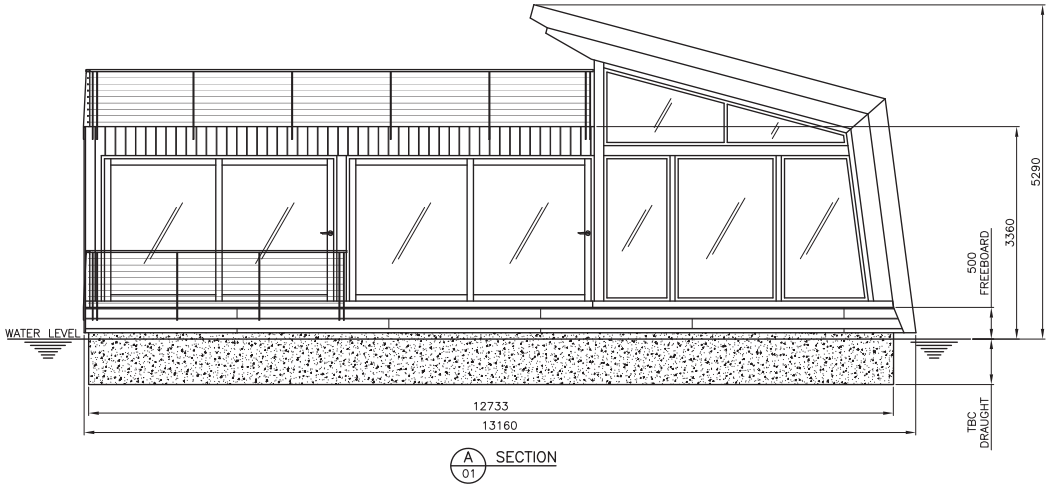
AFT / STBD. FACE CONCEPT

FWD. / PORT FACE CONCEPT




B / 01 SECTION

FWD. FACE CONCEPT




A / 01 SECTION

FWD. DECK CONCEPT

NOTES:

METRES
0 1 2



GENERAL TOLERANCES UNLESS OTHERWISE STATED

| | | | | |
|---|---|---|---|---|
| FABRICATION | - | 0-2000mm | - | ±1mm |
| | | > 2000mm | - | ±3mm |
| MACHINING | - | 2 DEC PLACES | - | ±0.05 |
| | | 1 DEC PLACE | - | ±0.10 |
| | | 0 DEC PLACE | - | ±0.5 |
| ANGULAR | - | ± 0.5° | | |

PROJECTION:

ALL DIMENSIONS IN MILLIMETERS

DO NOT SCALE FROM DRAWING

| REV | DATE | PURPOSE | BY | IDC | ENG |
|---|---|---|---|---|---|
| A1 | 03/07/18 | ISSUED FOR IDC | BPH | FPH | BPH |

CLIENT: N/A

PROJECT: FLOATING HOME

TITLE: GENERAL ARRANGEMENT DRAWING
SECTION VIEWS

| SCALE U.O.S. | MECANICO DRG No. | REV. |
|---|---|---|
| 1:40@A1 | 17-013-SKE-0002 | A1 |
| SHEET NO. 2 OF 2 | CLIENT DRG No. | REV. |