Appendix 10.6 Proposed Protection for Gossa Water Catchment

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ENERGY ISLES WIND FARM

Proposed Protection for Gossa Water Catchment

March 2019

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1 Executive Summary

1.1.1 This report provides an overview of Scottish Water's legal requirements to provide safe drinking water and Scottish Water's use of Gossa Water and its catchment to provide drinking water for the population of Yell, Shetland. Energy Isles Ltd (hereafter referred to as the 'Applicant') is proposing the development of a wind farm (hereafter referred to as the 'Proposed Development') on Yell which has the potential to impact on the water quality of Gossa Water. This report outlines the mitigation measures that the Applicant proposes to implement to protect the Gossa Water Catchment.

2 Legislative Framework

2.1 Background

2.1.1 The Water Framework Directive (2000/60/EC) (WFD) of the European Parliament and Council requires member states to aim to reach good chemical and ecological status in inland and coastal waters. The WFD is designed to enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, to promote sustainable water use, to reduce pollution of water and to ensure progressive reduction of groundwater pollution. The WFD is transposed in Scottish law by the Water Environment and Water Services (Scotland) Act 2003 (WEWS 2003). Under this act the Scottish Ministers must identify any bodies of water within each river basin district which are used for, or intended to be used for, the abstraction of water intended for human consumption and either:

(1) provide more than 10 cubic metres of such water per day, or;
(2) serve more than 50 persons.

2.1.2 The Water Environment (Drinking Water Protected Areas) (Scotland) Order 2013 (WEDWPA Order 2013) came into force on 11th March 2013 and as required by the WEWS 2003 identified bodies of water used for the abstraction of drinking water. It identifies Drinking Water Protection Areas (DWPAs), of which the Gossa Water Catchment is one.

2.1.3 Under the Public Water Supplies (Scotland) Regulations 2014 Scottish Water is required to take and analyse samples of drinking water against set standards to ensure that public supplies conform.

2.2 Regulatory Requirements

2.2.1 Scottish Water are the regulatory authority responsible for the protection of DWPAs and are required to ensure that any activity falling within a DWPA does not result in the deterioration of water quality and quantity. Under the Water Industry (Scotland) Act 2002, the Drinking Water Quality Regulator for Scotland (DWQR) are responsible for monitoring the quality of Scotland's public drinking water and confirming that it meets the requirements of The Public Water Supplies (Scotland) Regulations 2014. Scottish drinking water is tested for 51 different substances, ten of which DWQR has set out as the most significant parameters for Scotland. These are listed in **Table 2.1**. Drinking water is tested by Scottish Water for these parameters as it leaves a treatment works, or from a consumers' tap, and is an indication of the effectiveness of the treatment process to meet water quality standards. Water Treatment Works are designed to treat the specific parameters of the raw water source they receive and if these change or deteriorate it can affect the ability of the works to supply drinking water to customers at the required standards.

2.2.2 The Scottish Environment Protection Agency (SEPA) is the public body responsible for the regulation of all activities related to the wider water environment and are responsible for ensuring that Scottish Water meets environmental requirements.

Table 2-1 Ten Top Drinking Water Standards in Scotland[1]

Parameter	Importance Regarding the Indication of Water Quality	SW Threshold for Yell WTW
Coliforms	Bacteria, should not be in the water supply, removed by effective disinfection process through addition of chlorine	
E.coli	One species of coliforms group. Only found in gut of warm blooded animals, presence indicates faecal matter contamination. Testing for E.coli verifies successful disinfection	
Colour	Aesthetic parameter, no health significance, but unnacceptable to consumers	
Turbidity	Caused by suspended particales or colloidal matter and primarily aesthetic but can interfere with disinfection effectiveness.	
Hydrogen Ion (pH)	Degree water is acidic or alkaline. Low pH can corrode infrastructure	
Aluminium	Dissolved from soils and rocks. Extreme concentrations may be damaging to health	
Iron	Appears as discolouration, often occurs naturally or can be due to corrosion of water mains.	
Manganese	Dissolved from rocks, appears as black discolouration, can impact water mains	
Lead	Enters water supply from lead supply pipes	
Trihalomethanes (THMs)	By-products of disinfection, form when naturally occuring organic material react with chlorine used to disinfect water.	

3 Site Description

3.1 Gossa Water Catchment

3.1.1 Scottish Water is the publicly owned company answerable to Scottish Ministers and the Scottish Parliament, and responsible for providing water and waste water services to household customers and wholesale Licensed Providers.

3.1.2 Gossa Water is a public freshwater supply catchment on Yell, Shetland Islands managed by Scottish Water and servicing approximately 1,000 customers. The catchment covers 401.6 hectares (ha) and comprises the waterbodies Gossa Water 44.32 ha, Grud Water 2.18 ha, Little Gossa Water 1.54 ha and multiple un-named waterbodies (refer to **Figure 1**). These are connected by the Burn of Rimminamartha and other un-named tributaries, and then flows out of Gossa Water in a general southeast direction via the Burn of Gossa water to discharge into Basta Voe.

3.1.3 This catchment serves the Yell Water Treatment Works (WTW) which is located outwith the catchment boundary at grid reference British National Grid Reference (NGR) 451124, 1199243. We understand that the water from Gossa Water Catchment is tested monthly against water quality standards, with daily in-house monitoring of select parameters done at the WTW.

3.1.4 The catchment site is mostly covered in blanket peat bog, three to four metres deep in places, with noticeable degradation across the site, resulting in a baseline condition of poor water quality in terms

[1] http://dwqr.scot/public-water-supply/national-water-quality/ten-key-parameters/

of colour and turbidity. A 250 mm raw water main runs from Gossa Water to the WTW, and from there a clean water main distributes water across Yell (refer to **Figure 1**).

3.2 Energy Isles Wind Farm Site

3.2.1 The Proposed Development site is located on the north-west of Yell, Shetland Islands, to the south of Gloup, west of Cullivoe and north of Sellafirth. The site covers Hill of Vigon, Hill of Bakkanlee, Sandwater Hill, Hill of Markamouth, Tonga Field Muckle Bratt-houll, Little Bratt-houll, and Fugla Field. The elevation of the site ranges from 0 – 84 m above ordnance datum (AOD). The site occupies an area of 1,679 ha. The central grid reference for the site is NGR 450134, 1201392. The site location and site boundary are shown in **Figure 1**.

3.2.2 The site comprises grazed peatland, intersected with waterbodies (including Gossa Water), burns and drainage ditches. No buildings or structures are located within the site boundary. The old Cullivoe Road (now replaced by the B9082) intersects the south-eastern corner of the site and will be used as the access to the site from the A968.

3.2.3 The Gossa Water Catchment is partially within the Proposed Development site boundary.

4 The Proposed Development

4.1.1 The Proposed Development comprises 29 wind turbines of up to a maximum 200 m height from ground to blade tip when vertical (up to 160 m rotor diameter), each being up to 7 MW in power rating, with a maximum overall capacity of 200 MW. The British National Grid coordinates denoting where each of the turbines are proposed to be located are listed in **Table 4.1**. Of the 29 proposed turbines three lie within the Gossa Water Catchment including their crane pads and access tracks, shown in **Figure 2** and highlighted in **Table 4.1**.

4.1.2 The initial design proposed during scoping included 63 turbines, of which 10 were within the Gossa Water Catchment. Following scoping, and work on the design, this has been reduced and the three turbines remaining within the Gossa Water Catchment have moved near to the boundary.

Table 4.1 - Wind Turbine coordinates (British National Grid)

Turbine	X	Y
1	448784	1203666
2	448331	1203036
3	449144	1203369
4	449765	1203441
5	449676	1202945
6	449640	1202314
7	448360	1201874
8	449002	1201654
9	449577	1201755
10	448922	1201085
11	449777	1201270
12	449088	1200632

Turbine	X	Y
16	450428	1200150
17	450396	1201116
18	450606	1200678
19	451071	1200336
20	451554	1200185
21	450563	1201645
22	451005	1201521
23	451298	1200900
24	451800	1200817
25	451593	1201475
26	451724	1202184
27	451323	1202379

Turbine	X	Y
13	449752	1200772
14	449368	1200263
15	449961	1200325

Turbine	X	Y
28	451037	1202718
29	450906	1203324

4.1.3 A number of ancillary elements are also proposed, including three temporary construction compounds (northern, central and southern), permanent hardstandings adjacent to the wind turbines for maintenance and decommissioning cranes, external transformers, internal access tracks, underground cables between turbines, an on-site substation and maintenance building with welfare facility, up to two permanent meteorological monitoring masts and nine potential temporary borrow pits search areas. The proposed site layout is shown in **Figure 2**. None of the meteorological masts, construction compounds, borrow pits or substation are within the Gossa Water Catchment.

4.1.4 Whilst the location of the infrastructure described above has been determined through an iterative environmental based design process, there is the potential for these exact locations to be altered through micro-siting allowances prior to construction. A micro-siting allowance of up to 100 m in all directions is being sought in respect of each turbine and its associated infrastructure in order to address any potential difficulties which may arise in the event that preconstruction surveys identify unsuitable ground conditions or environmental constraints that could be avoided. Any variation of between 50 m and 100 m shall only be permitted following prior written approval of Shetland Islands Council in consultation where relevant with aviation consultees, Scottish Water, Scottish Environment Protection Agency (SEPA) and/or Scottish Natural Heritage (SNH). It is proposed that the final positioning of all infrastructure will be agreed through an appropriately worded planning condition.

4.1.5 The construction of the Proposed Development is estimated to begin in 2022/2023 with completion taking around 24 months.

5 Potential Impacts

5.1.1 In their scoping opinion, Scottish Water raised concerns over the current sensitivity of the water quality from Gossa Water Catchment, with colour, turbidity and dissolved organic carbon (DOC) noted as a current issue prior to any development occurring in the catchment. Any deterioration in water quality through an increase in DOC from sedimentation could lead to an increase in THM formation, and effect water quantity due to an increase in water treatment activities.

5.1.2 In order to protect the Gossa Water Catchment, the water supply and health of the residents of Yell, the Applicant proposes to implement the mitigation measures outlined in Section 6 below.

6 Proposed Mitigation Measures

6.1 Design

6.1.1 Scottish Water recommends that for a wind farm development, where it is impracticable for infrastructure and activities to be located outside a DWPA, they should be located a minimum distance of 50 m away from any watercourse. The Proposed Development has been designed keeping at least a 50 m buffer around all watercourses and waterbodies mapped on OS 1:50,000 mapping and all Scottish Water infrastructure. This includes the locating of all turbines, crane hard standing areas, cable trenches, access tracks and temporary construction related activities such as borrow pits, plant stockpiled materials, cement batching, wheel washing and construction compound areas.

6.1.2 The original design for the Proposed Development submitted as part of the EIA Scoping Request in 2017 was for 60 turbines, ten of which would be located within the Gossa Water Catchment. The Applicant then reduced this layout to 53 turbines (nine of which would be located with the Gossa Water Catchment), removing turbines from the area of land south of the Gossa Water and requested and updated Scoping Opinion.

6.1.3 Following receipt of Scottish Water's Scoping Opinion, and the conclusion of the environmental surveys, the Applicant re-considered the design of the Proposed Development with the aim to minimise both impacts on the Gossa Water Catchment and wider environmental effects. The turbine numbers were reduced to 36 turbines (with five turbines in the Gossa Water Catchment) and then further reduced to 29 turbines (with four turbines in the Gossa Water Catchment).

6.1.4 Following a meeting with Scottish Water in January 2019 further design work was undertaken to minimise access track and hardstandings within the Gossa Water Catchment where possible. Following this design work the access track and the hardstanding for turbine T14 were moved outwith the catchment (refer to **Figure 2**).

6.1.5 It should be noted that although these are the main design changes, micro-siting of the Proposed Development infrastructure has been consistently ongoing throughout the design process to improve the design and minimise the potential effects.

6.2 Pre-Construction

6.2.1 A water sampling programme of watercourses within Gossa Water Catchment will be undertaken for a minimum one year prior to construction to determine natural water quality fluctuations throughout the seasons. Water quality monitoring will be undertaken at up to three locations in the catchment which will be discussed with Scottish Water and SEPA, and will include the main water discharge to Gossa Water and the intake to the WTW.

6.2.2 The Applicant proposes to install continuous monitoring sondes that would measure parameters at hourly intervals. The proposed measured parameters are:

- pH
- temperature
- dissolved oxygen; and
- turbidity.

6.2.3 The Applicant will also install a rainfall gauge to record rainfall levels.

6.2.4 In addition to the above the Applicant proposes to monitor the following on a fortnightly basis:

- pH;
- alkalinity;
- electrical
- conductivity;
- dissolved
- oxygen;
- total
- suspended solids;
- nitrate;
- phosphate;

- sulphate;
- dissolved organic carbon (DOC);
- total organic carbon (TOC);
- turbidity;
- aluminium;
- iron;
- manganese; and
- total petroleum hydrocarbons (THP).

6.2.5 In addition to the above, for one year prior to construction monthly photographic record and a record of the flow and sediment will be undertaken of all major watercourses crossing points within the Gossa Water Catchment. A fish survey and macro-invertebrate survey will be undertaken pre-construction within the Gossa Water Catchment at locations to be agreed with SEPA and Scottish Water at an appropriate time of year.

6.3 Construction

Hydrological Clerk of Works

6.3.1 A qualified Hydrological Clerk of Works (HCoW) will be on site to oversee construction works of the three turbines within the Gossa Water Catchment. The HCoW will be responsible for ensuring the correct implementation of the mitigation measures outlined below and monitoring their effectiveness. The HCoW will report directly to the Environmental Clerk of Works (ECoW).

6.3.2 The HCoW will identify the 50 m buffer around the watercourses in proximity to the proposed construction works and will mark them prior to construction using coloured pegs so that they are clearly visible to construction staff.

Scottish Water Liaison

6.3.3 Scottish Water will be provided with a point of contact for liaison throughout the construction process (this is anticipated to be the ECoW). Scottish Water will be consulted on the detailed programme of construction works for the infrastructure within the Gossa Water Catchment prior to work commencing. Scottish Water will be provided with regular updates regarding the construction process and programme and will be granted access to site at any time during construction (subject to health and safety requirements and notification to Operational Controller).

Pollution Prevention

6.3.4 With reference to the SEPA Guidelines for Water Pollution Prevention from Civil Engineering Contracts and Special Requirements (SEPA, 2006), the Contractor will produce a robust Construction and Environmental Management Plan (CEMP) which will set out measures to include a drainage management plan, pollution prevention plan, water quality monitoring plan and incident response plan.

6.3.5 Potential pollution risks shall be considered, with watercourse crossing points having pollution prevention measures installed and silt traps at regular intervals. A drainage network will keep silted water and clean water separate.

6.3.6 Cut-off drains will be installed to intercept any uncontaminated upstream drainage and prevent it from entering working areas. This will ensure that water entering the surface watercourses remains clean.

6.3.7 Site drainage design will account for likely Storm Event Intensity, being adequately planned for flood events and designed to suit the volume and velocity of flows. The Applicant will aim to capture all upstream drainage and route around infrastructure to the surface watercourses so that it remains clean.

6.3.8 No refuelling or storage of fuel or hazardous material shall take place within the Gossa Water Catchment, or within 50 m of watercourses or waterbodies. All vehicle fuelling and washing shall be undertaken in designated areas in order to minimise the risk of leaks to soil and surface waters. There shall be designated oil storage areas, and all vehicles, plants and high risk areas will have spill kits. All areas of waste storage, concrete preparation, washout areas, and welfare facilities shall be out with the Gossa Water Catchment and a minimum of 50 m from all watercourses and waterbodies.

6.3.9 Surface water or groundwater from the working areas will not be allowed to drain directly into the water environment.

Peat Management

6.3.10 A site specific Peat Management Plan will be implemented throughout construction as part of the CEMP to prevent further deterioration of peat and mitigate potential risks to water quality from peat.

6.3.11 Where possible peat excavated during construction will be reused on site to repair areas of significant gullying and erosion, or to aid in restoration of natural peatland area. Areas of eroded peat within the Gossa Water Catchment will be restored through the replanting of native plants and creation of bog pools to aid in the protection of long term water quality.

Water Quality Monitoring

6.3.12 The water quality monitoring programme outlined in Section 6.2 will continue throughout construction.

6.3.13 During construction weekly inspections will occur of all watercourse and waterbodies in the vicinity of the Proposed Development, with daily inspections of the watercourses and waterbodies within the Gossa Water Catchment while construction of the infrastructure within the catchment is occurring.

6.3.14 Any significant changes in water quality will be reported to Scottish Water and SEPA and measures taken to ensure impacts are minimised. The threshold levels of water quality parameters deemed a significant change will be defined in agreement with Scottish Water, along with a procedure and schedule for reporting any such changes to them.

6.3.15 Fish and macro-invertebrate surveys will be undertaken annually at appropriate times of year during the construction period.

Construction Process

6.3.16 Timing of construction within Gossa Water Catchment will give consideration to meteorological conditions and will be scheduled to the driest periods, avoiding the seasons with heaviest rainfall i.e. winter and spring. However, Scotland naturally encounters considerable rainfall year-round, therefore it will be difficult to avoid wet conditions altogether. Works in the catchment will be sequenced to limit the amount of disturbed areas in the catchment at any one time. When constructing roads, drainage ditches and trenches, drainage from outwith the Gossa Water Catchment will not be directed into the Gossa Water Catchment but retained within the existing catchment. Any surface water within the vicinity of the access tracks and hardstanding areas will be routed into drainage channels for filtration.

Contingency Fund

6.3.17 The Applicant intends to set aside a £100,000 contingency fund for the duration of the construction period. This contingency fund would be available should construction of the Proposed Development

create an incident where increased maintenance or equipment is required at Yell Water Treatment Works.

6.4 Operation

6.4.1 Following construction, the Applicant proposes to grant Scottish Water access to the Proposed Development access tracks so that Scottish Water can access the Gossa Water Catchment. This will be subject to an agreement with the Operator.

6.4.2 The Operator will implement a maintenance plan throughout operation to monitor and maintain the access tracks, crane pads and drainage ditches to ensure that they are functioning correctly and to prevent pollution events.

6.4.3 Water quality monitoring as outlined in Section 6.2 will continue for a year following completion of construction. A fish survey and macro-invertebrate survey will be undertaken within the first year of operation at the appropriate time of year. To ensure data collected is comparable from baseline monitoring to post construction, all these surveys will be taken within the same time period each year.

7 Conclusion

7.1.1 This report outlines Scottish Water's legal responsibilities to provide safe drinking water, and their use of the Gossa Water Catchment to provide drinking water to the population of Yell, Shetland. The Applicant proposes to construct the Proposed Development which will partially fall within the Gossa Water Catchment and therefore could potentially impact on the water quality of the catchment.

7.1.2 This report outlines the mitigation measures proposed to be implemented by the Applicant to ensure the protection of the Gossa Water Catchment. Following Scottish Water's acceptance of these measures, the Applicant proposes to request that these measures will be a condition to the consent of the Proposed Development by the Scottish Government

8 References

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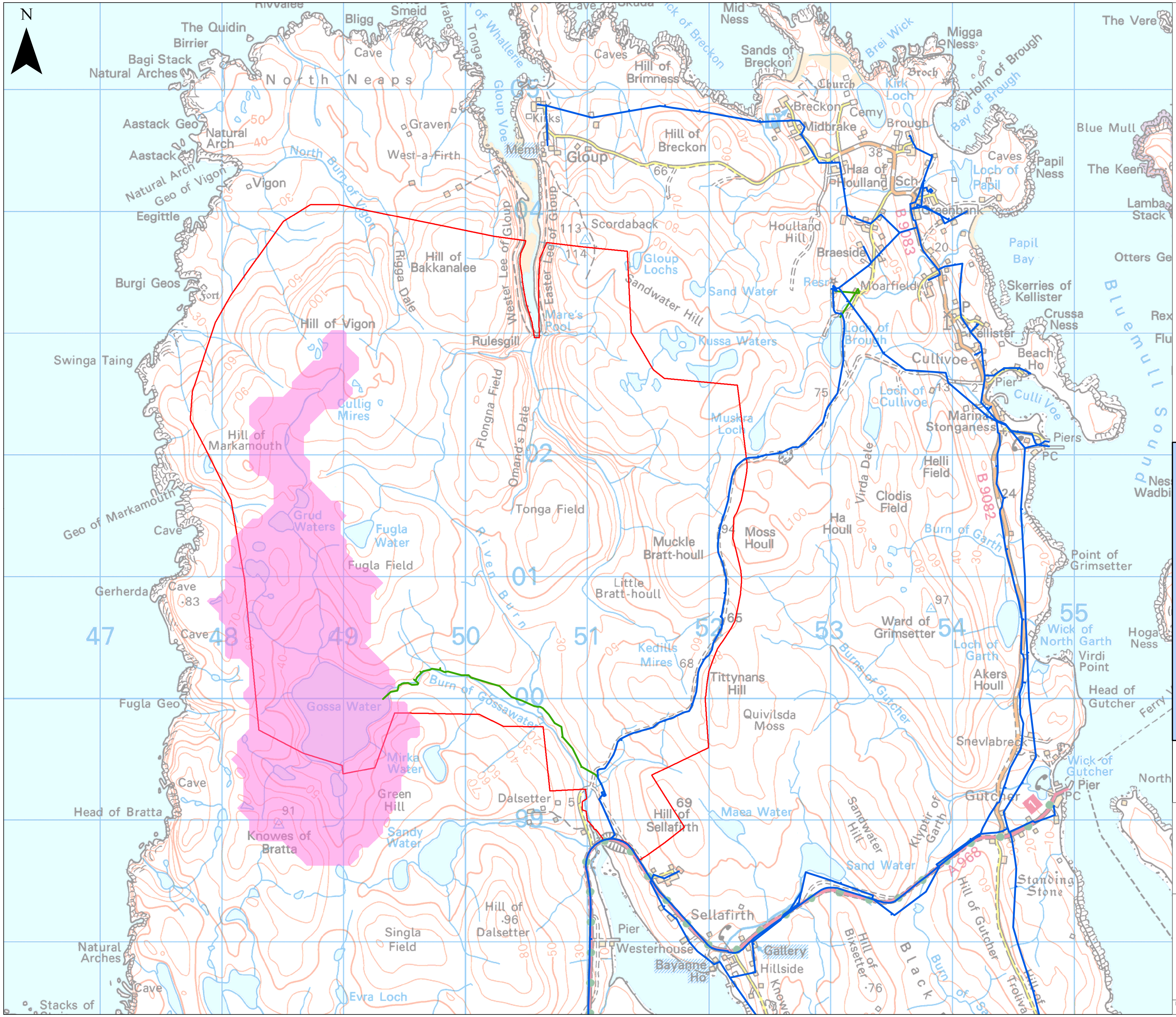


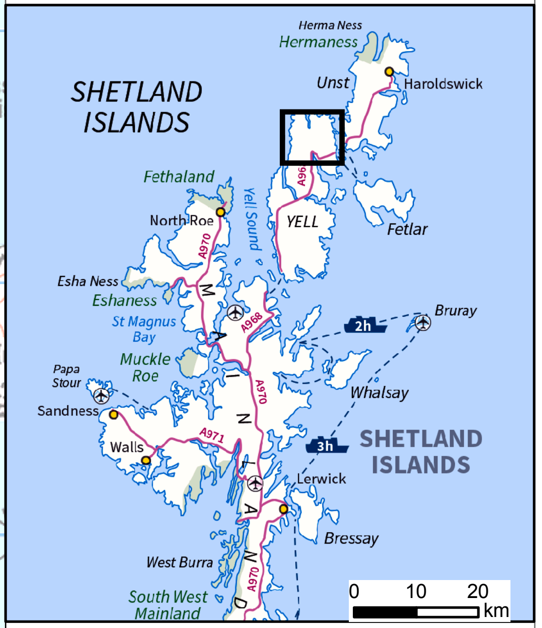
KEY

▭ Site Boundary

🟪 Gossa Water Catchment

▭ Raw Water Main

▭ Main Water Distribution



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Scale 1:30,000 @ A3

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Proposed Protection for Gossa Water
Energy Isles Wind Farm

Figure 1 - Site Location Plan, Gossa Water Catchment and Scottish Water Infrastructure

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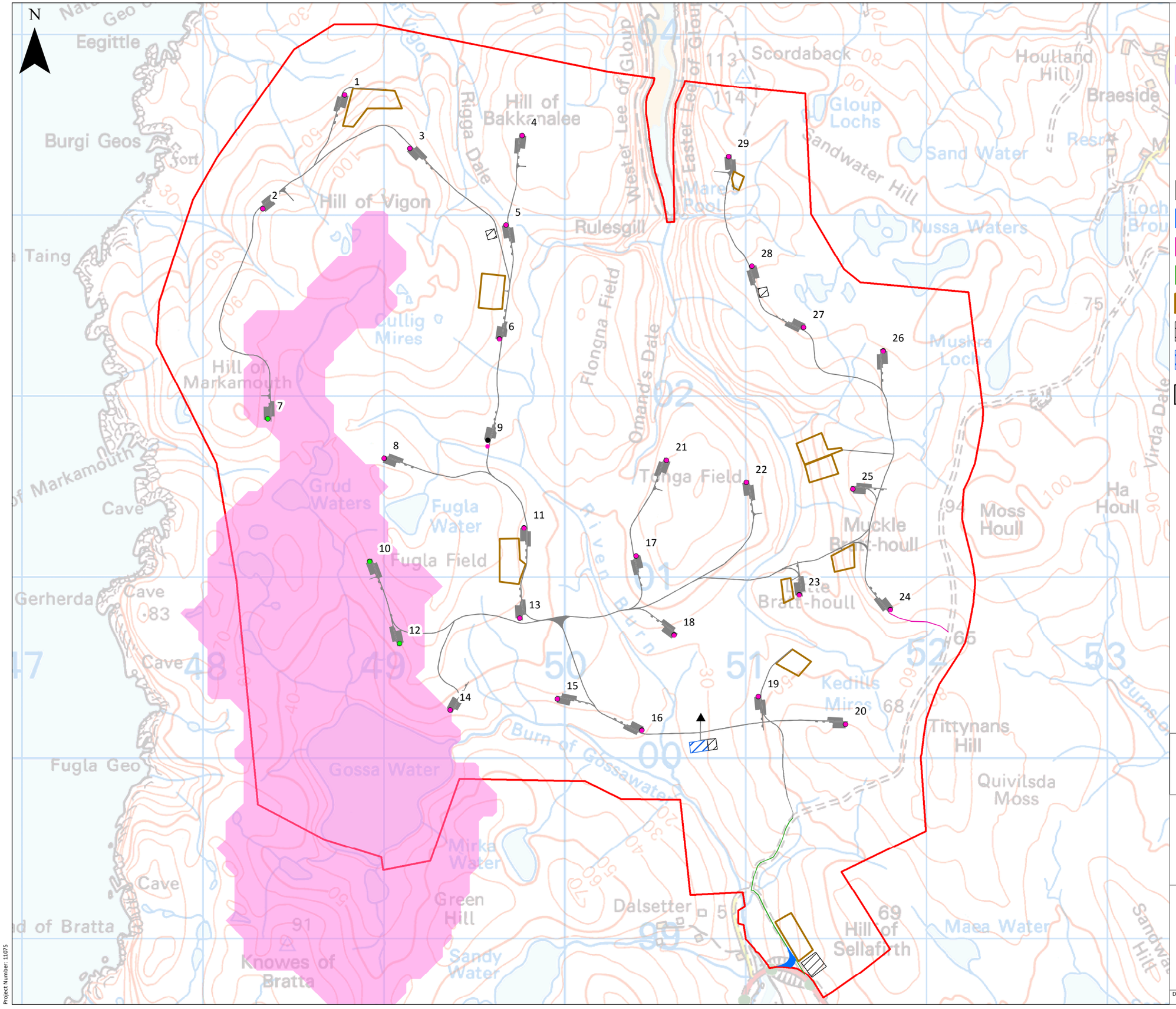
Project Number: 11075



KEY

- Site Boundary
- Gossa Water Catchment
- Turbines Outwith Gossa Water Catchment
- Turbines Within Gossa Water Catchment
- 1 Turbine Number
- New Access Track and Hardstanding
- New Access Track for Abnormal Loads Only
- New Access Track for Emergencies Only
- Upgraded Existing Road
- Borrow Pit Search Area
- Temporary Construction Compound
- Substation
- Met Mast (not to scale)

0 0.5 1 km

Scale 1:20,000 @ A3

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Proposed Protection for Gossa Water
Energy Isles Wind Farm

Figure 2 - Turbine Layout

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