

Conwy Stage 2 Strategic Flood Consequence Assessment - Llanddulas Quarry Area 4 (Site 204)

Final Report

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1 Introduction

Conwy County Borough Council has commissioned JBA Consulting to prepare an independent Flood Risk Appraisal as part of a Stage 2 Strategic Flood Consequence Assessment (SFCA), for an allocation in its Replacement Local Development Plan (RLDP); Llanddulas Quarry - Area 4. This Flood Risk Appraisal will be used to understand the appropriateness of development at the site per Welsh Government Policy, as set out in Technical Advice Note 15 (TAN-15): Development Flooding and coastal Erosion (March 2025) and includes a review of Natural Resources Wales (NRW) flood mapping.

2 Site description

2.1 Site summary

Site 204	
Location	Llanddulas Quarry - Area 4
Existing site use	Brownfield; Quarry
Existing site use vulnerability	Less vulnerable
Proposed site use	Renewable energy; Solar
Proposed site use vulnerability	Less vulnerable development
Site area	40.5 hectares

The proposed site is located within the north of Conwy county in the electoral ward of Llysfaen and is approximately 40.5 hectares in area. The site is located on brownfield land, currently used for quarry purposes. The site is bounded by Pentregwyddel Road and a holiday park to the north. Greenfield land surrounds the rest of the site. The main access to the site will be via Pentregwyddel Road to the north. An overview of the location of the site can be seen in Figure 2-1.

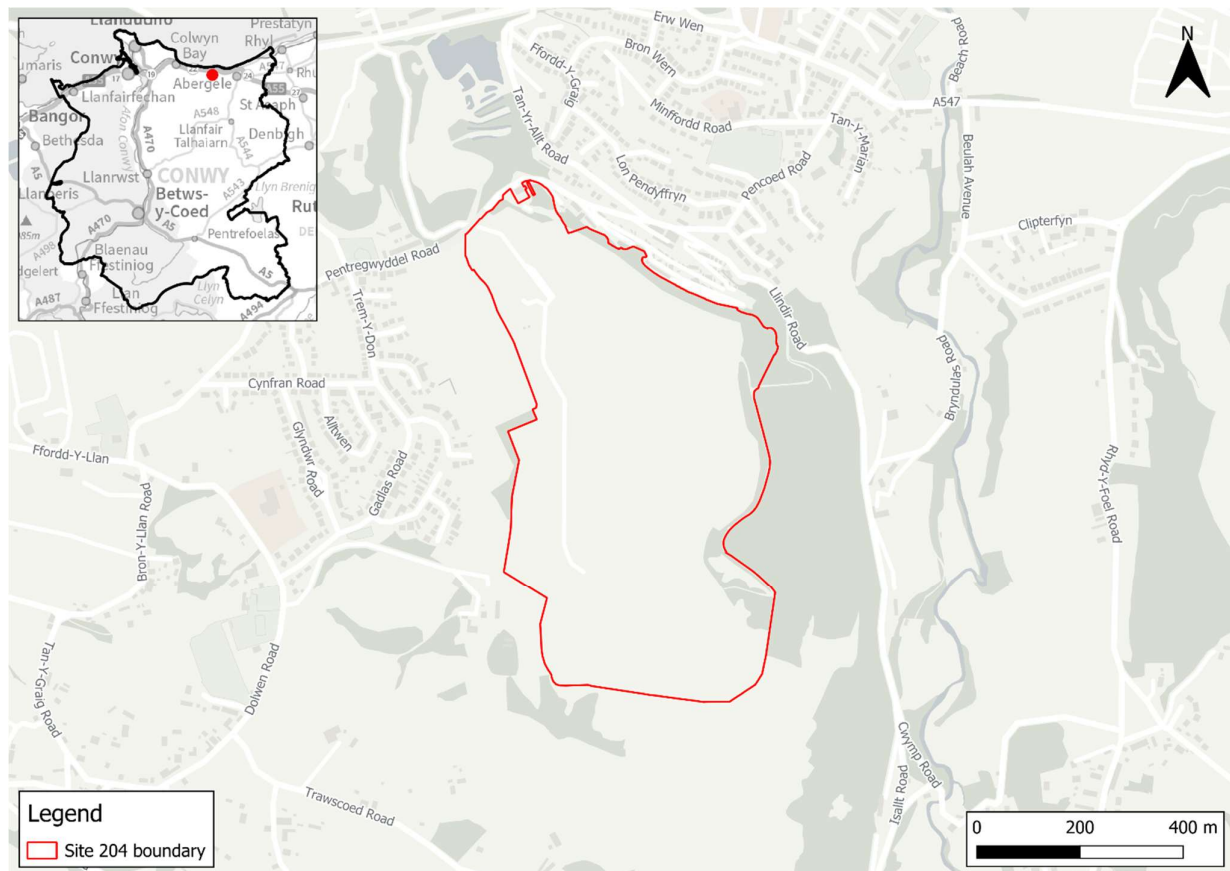


Figure 2-1 Site location

2.2 Development proposal

The proposed development of the site is less vulnerable renewable energy development, comprising a solar farm.

2.3 Watercourses and flood defences

The closest main river to the site is the Afon Dulas, located approximately 300m to the east (Figure 2-2).

There are no flood defences within the vicinity with the potential to influence flood risk to the site.

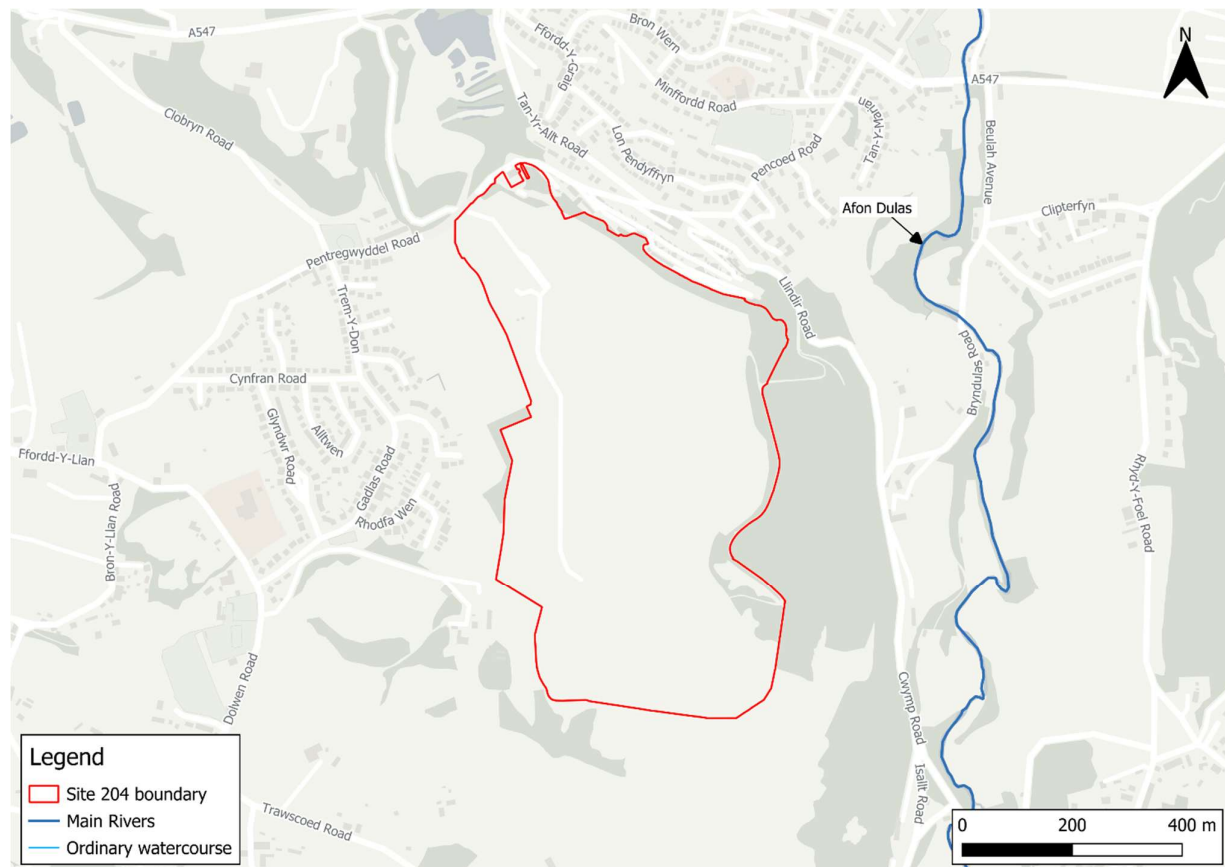


Figure 2-2 Watercourses

2.4 Site topography

The NRW Open Source 1m Light Detection and Ranging (LIDAR) data has been used to illustrate the site topography, as shown in Figure 2-3. Ground levels within Site 204 largely slope in a northerly direction towards the coast. There is a distinct pit within the centre of the site that is significantly lower in elevation than the surrounding ground levels. Highest ground levels are within the south of the site at approximately 185mAOD. The lowest ground levels are located within the north of the site at approximately 91mAOD.

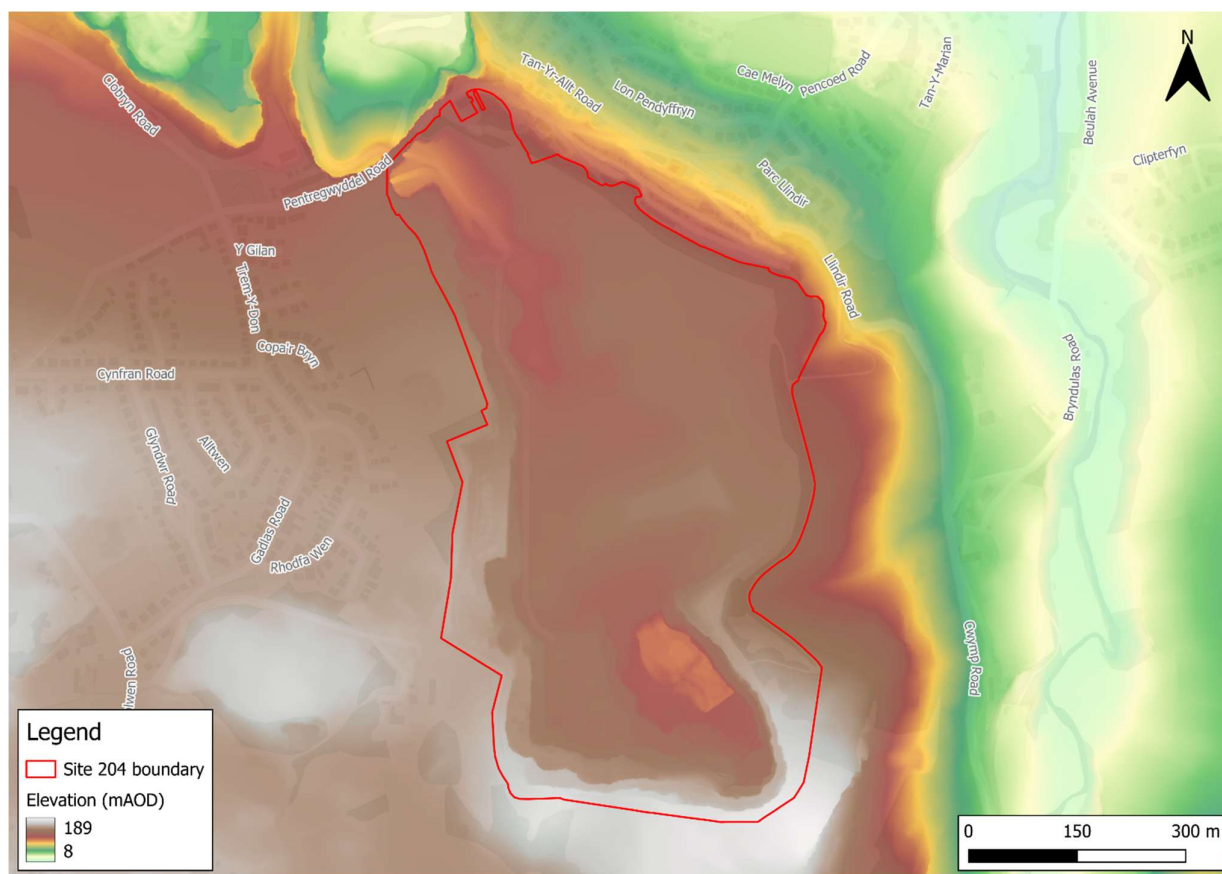


Figure 2-3 Site topography

3 Assessment of the site against Flood Risk Assessment Wales data

This chapter provides an assessment of flood risk to the proposed development site from all sources using the Flood Risk Assessment Wales (FRAW) data.

3.1 Flood Risk from the Sea

Figure 3-1 shows the FRAW Flood Risk from the Sea mapping data. The mapping shows that the site is at **very low risk** of flooding from the sea.

Table 3-1 summarises the definition of each risk band.

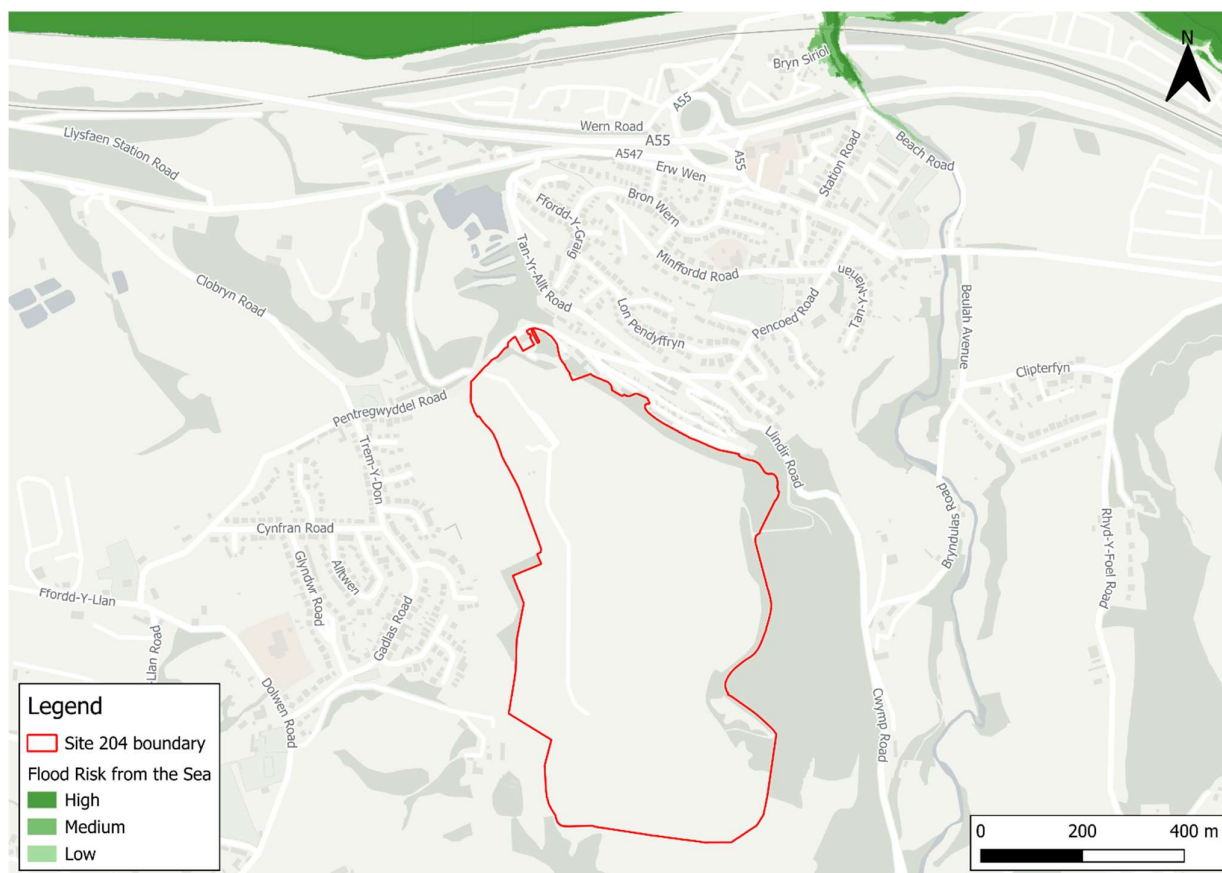


Figure 3-1 FRAW - Flood Risk from the Sea

Table 3-1 Flood Risk from the Sea risk band definitions

Risk Band	Definition
High	There is a greater than 3.3% AEP (1 in 30) chance of flooding from the sea in any given year.
Medium	There is a chance of flooding of between 0.5% AEP (1 in 200) and 3.3% AEP (1 in 30) in any given year.
Low	There is a chance of flooding of between 0.1% AEP (1 in 1000) and 0.5% AEP (1 in 200) in any given year.
Very Low	There is a less than 0.1% AEP (1 in 1000) chance of flooding from this source in any given year. However, the FRAW dataset ignores the influence of climate change induced sea levels.

3.2 Flood Risk from Rivers

Figure 3-2 shows the FRAW Flood Risk from Rivers mapping data. The mapping shows that the site is at **very low risk** of flooding from rivers.

Table 3-2 summarises the definition of each risk band.

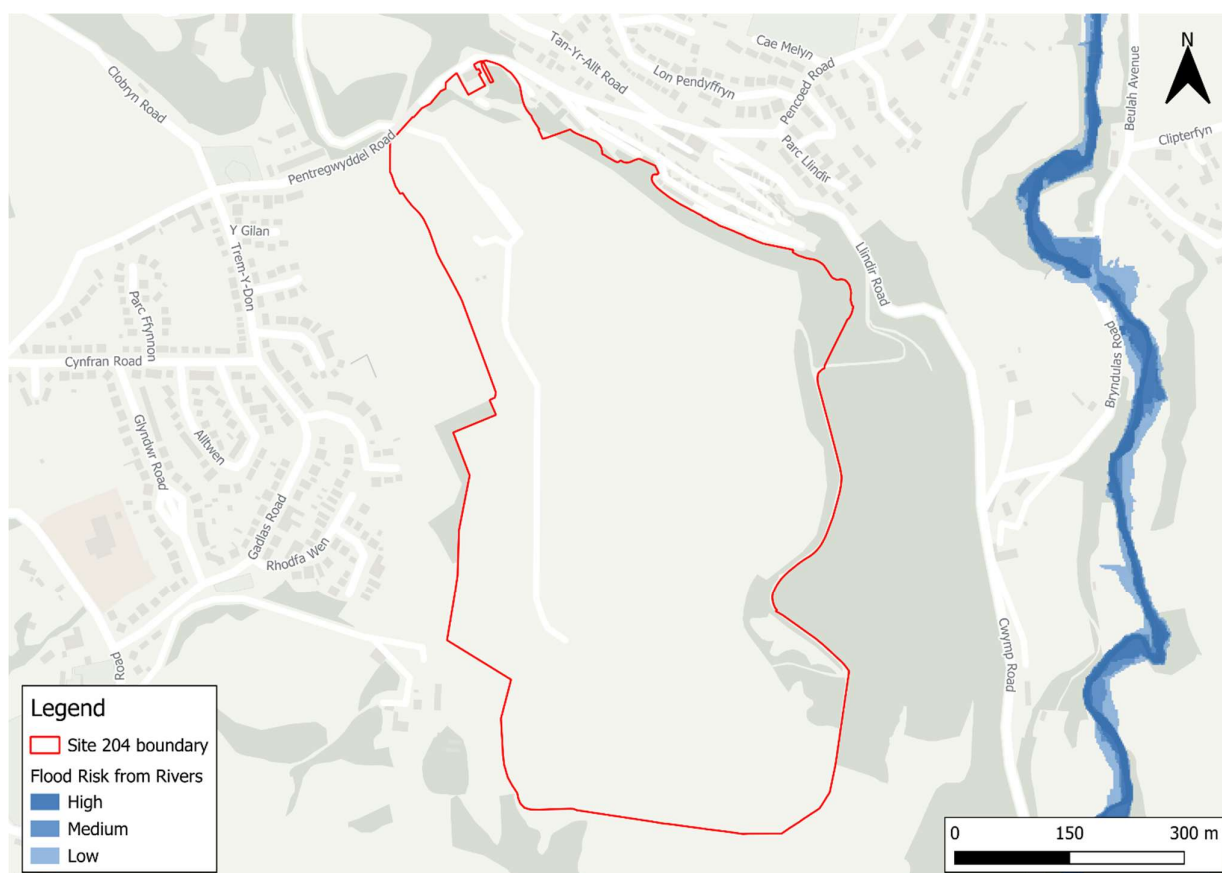


Figure 3-2 FRAW - Flood Risk from Rivers

Table 3-2 Flood Risk from Rivers risk band definitions

Risk Band	Definition
High	There is a greater than 3.3% AEP (1 in 30) chance of flooding from the sea in any given year.
Medium	There is a chance of flooding of between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) in any given year.
Low	There is a chance of flooding of between 0.1% AEP (1 in 1000) and 0.5% AEP (1 in 200) in any given year.
Very Low	There is a less than 0.1% AEP (1 in 1000) chance of flooding from this source in any given year. However, the FRAW dataset ignores the influence of climate change induced sea levels.

3.3 Flood Risk from Surface Water and Small Watercourses

Figure 3-3 shows the FRAW Flood Risk from Surface Water and Small Watercourses mapping data. The mapping shows that the site is predominantly at **very low risk** of flooding from surface water and small watercourses. Table 3-3 summarises the definition of each risk band. There are a number of areas of scattered surface water flood risk across the centre of the site, within the quarry pit, associated with topographic depressions caused by the quarrying process. This risk should be managed through considerate site design and SuDS. Displaced floodwater following any infilling of the quarry pits should be considered through a Flood Consequence Assessment (FCA).

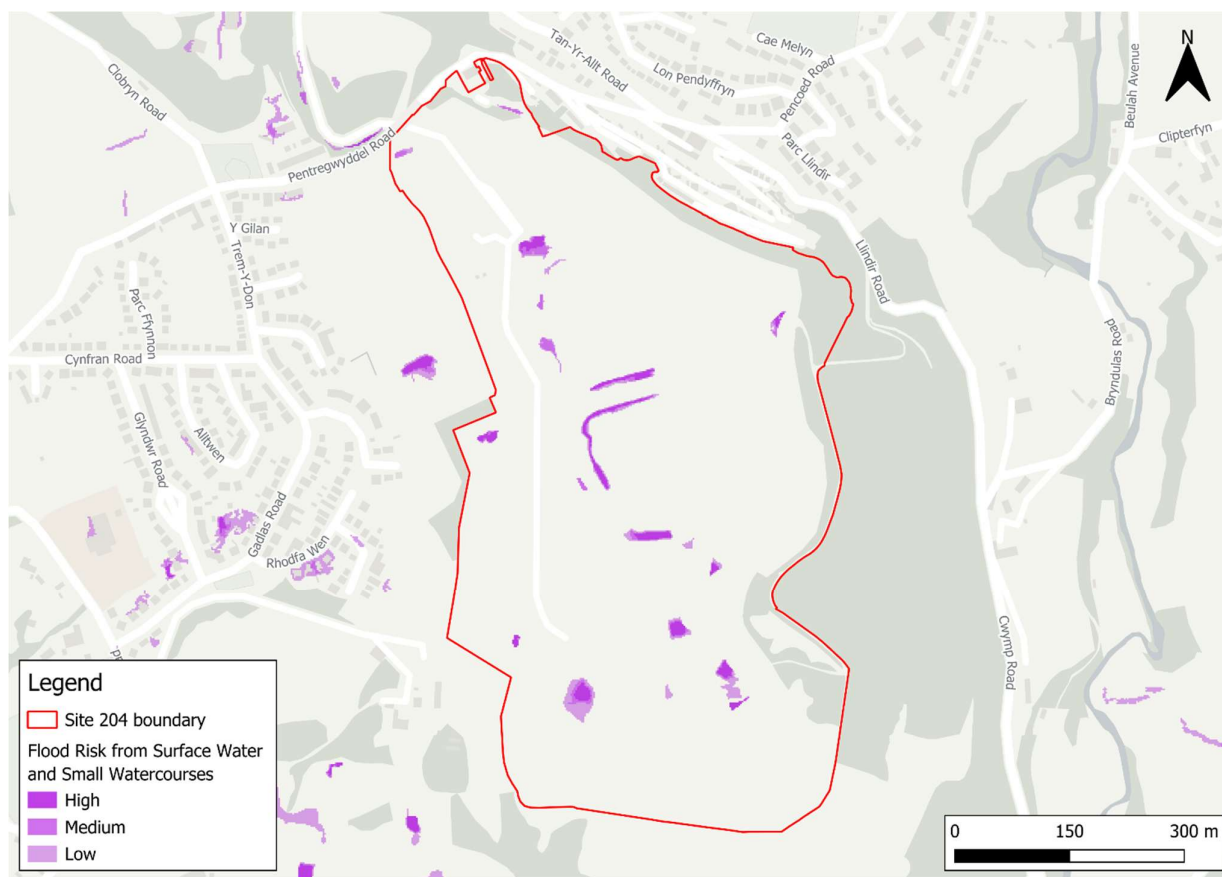


Figure 3-3 FRAW - Flood Risk from Surface Water and Small Watercourses

Table 3-3 Flood Risk from Surface Water and Small Watercourses risk band definitions

Risk Band	Definition
High	There is a greater than 3.3% AEP (1 in 30) chance of flooding from the sea in any given year.
Medium	There is a chance of flooding of between 1% AEP (1 in 100) and 3.3% AEP (1 in 30) in any given year.
Low	There is a chance of flooding of between 0.1% AEP (1 in 1000) and 0.5% AEP (1 in 200) in any given year.
Very Low	There is a less than 0.1% AEP (1 in 1000) chance of flooding from this source in any given year. However, the FRAW dataset ignores the influence of climate change induced sea levels.

3.4 Flood Risk from Reservoirs

The FRAW Flood Risk from Reservoirs mapping shows that the site is not modelled to be at risk from a reservoir breach. There is no risk level associated with reservoir flooding, rather a worst case scenario were a reservoir to fail.

3.5 Flood risk from groundwater (not in FRAW)

Groundwater flooding is caused by unusually high groundwater levels, and it occurs as excess water emerges at the ground surface or within manmade structures such as basements. Groundwater flooding tends to be more persistent than surface water flooding, sometimes lasting for weeks or months and can damage property. This risk of groundwater flooding depends on the nature of the site's geological strata and the local topography.

Flooding from groundwater sources is assessed in this Level 2 SFCA using JBA's 5m Groundwater Flood Map, as the FRAW does not include such a dataset. Figure 3-4 shows the map for Site 204 and the surrounding areas and

Table 3-4 explains the risk classifications. The majority of the site is within an area where groundwater emergence is unlikely. There are some areas of no risk of groundwater emergence. Groundwater conditions may therefore be suited to infiltration SuDS.

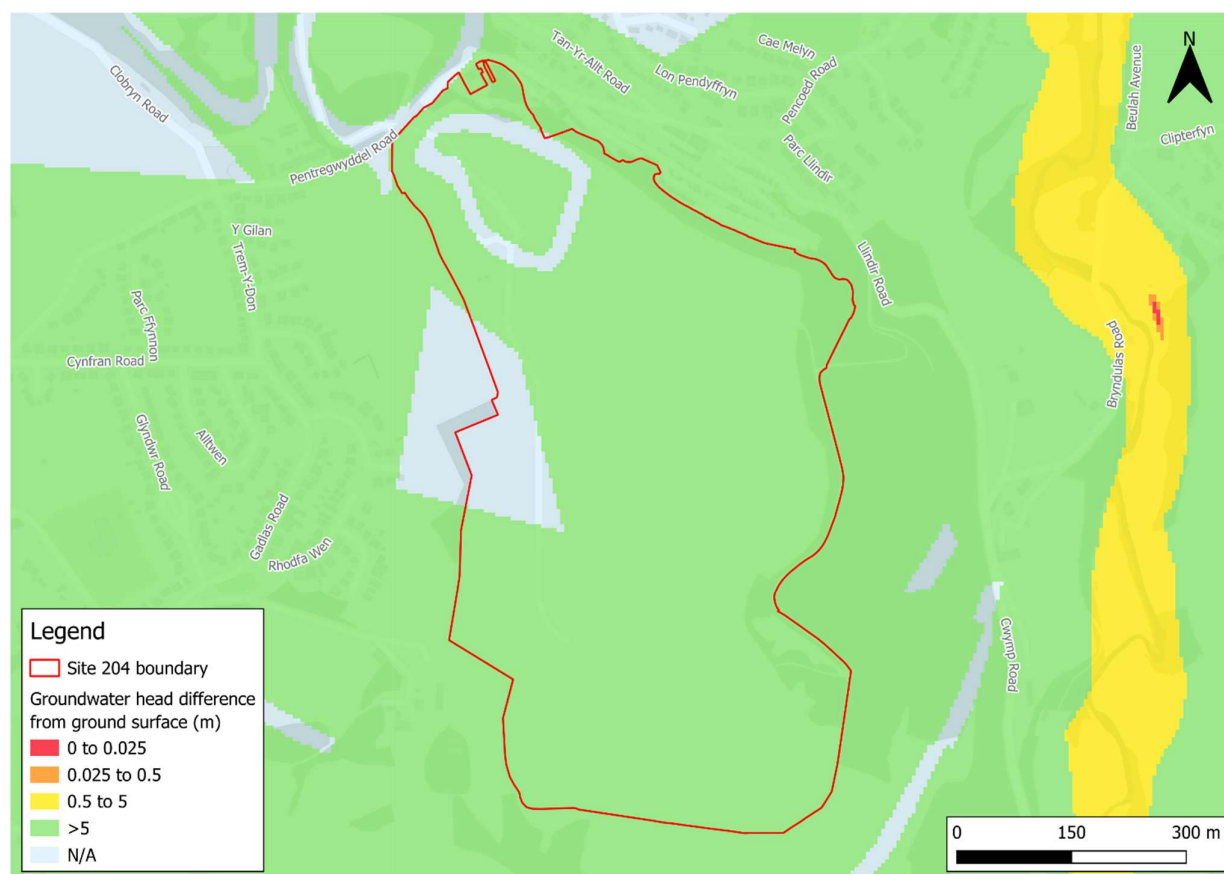


Figure 3-4 JBA 5m Groundwater Flood Map

Table 3-4 Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

3.6 Summary of flood risk

Much of the site is at very low risk from flooding according to the FRAW, with the main source of flooding being surface water ponding within the quarry pit in the centre of the site. However, if it can be proved through an FCA that surface water risk can be managed, and that any potential infilling of the quarry pit will not cause increased flooding to the surrounding areas, this should not impact the ability to develop this site.

4 TAN-15

This chapter provides a summarised overview of the requirements set out in TAN-15 (March 2025).

4.1 Flood Map for Planning

The initial requirement of TAN-15 is to identify the flood zones and vulnerability classification relevant to the allocation.

The Flood Map for Planning (FMfP) defines flood zones based on the central estimates of climate change, assuming a 100-year lifetime of the development. Table 4-1 summarises the flood zones and their definitions.

Table 4-1 TAN-15 Definition of the FMfP flood zones¹

Zone	Flooding from Rivers	Flooding from the Sea	Flooding from Surface Water and Small Watercourses
1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year.		
2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change.
3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change.	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change.

¹ [Figure 1, TAN-15 | March 2025](#)

Zone	Flooding from Rivers	Flooding from the Sea	Flooding from Surface Water and Small Watercourses
TAN-15 Defended Zone	Areas where flood risk management infrastructure, managed and maintained by Risk Management Authorities, provides a minimum standard of protection against flooding from rivers of 1:100 (plus climate change and freeboard).	Areas where flood risk management infrastructure, managed and maintained by Risk Management Authorities, provides a minimum standard of protection against flooding from the sea of 1:200 (plus climate change and freeboard).	Not applicable.

4.1.1 FMfP - Flood Risk from Rivers and the Sea

The Flood Map for Planning - Flood Risk from Rivers and the Sea indicates that the entirety of the site is within Flood Zone 1 (Figure 4-1). This represents a less than 0.1% AEP (1 in 1000-year) chance of flooding from fluvial or tidal mechanisms in any given year including the effects of climate change.

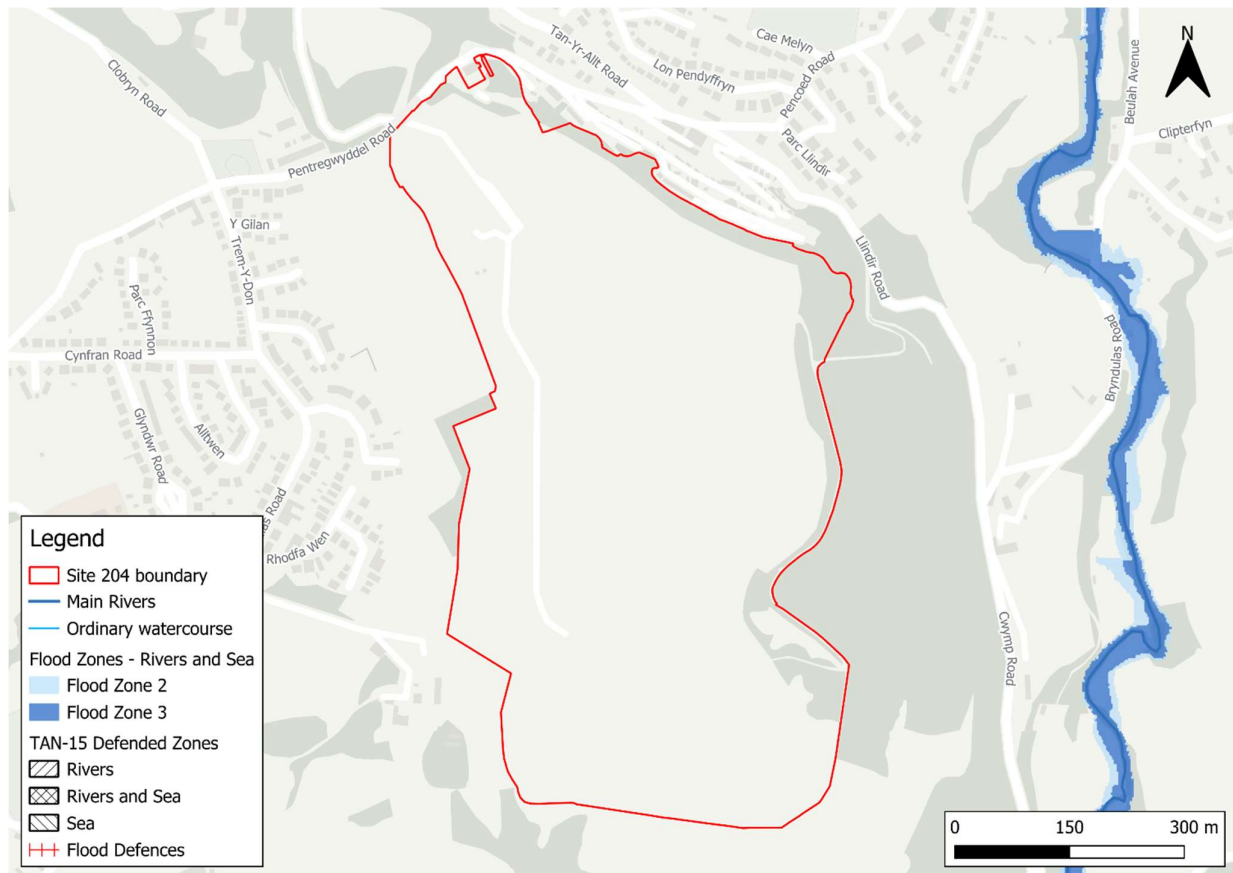


Figure 4-1 FMfP - Flood Risk from Rivers and the Sea

4.1.2 FMfP - Flood Risk from Surface Water and Small Watercourses

The Flood Map for Planning - Flood Risk from Surface Water and Small Watercourses indicates that the site is predominantly located within Flood Zone 1 (Figure 4-2), meaning that most of the site has a less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year from surface water or small watercourses. However, within the quarry pit in the centre of the site, there are some areas of surface water ponding within Flood Zone 3. The risk is very similar to that exhibited by the FRAW dataset.

As the site is partially located within Flood Zone 3 of the Flood Map for Planning for Surface Water and Small Watercourses, a FCA would be required if development were to progress at this site, in accordance with TAN-15. This would need to demonstrate that the risk can be managed and mitigated appropriately. Given the nature of the risk within the site, quarried depressions are likely to be infilled, and land regraded through the design and construction process through the use of appropriate SuDS techniques. The management of displaced floodwater following any infilling of the quarry pits should also be addressed through the FCA. Infiltration SuDS should be suitable on this site, based on the JBA Groundwater Flood Map.

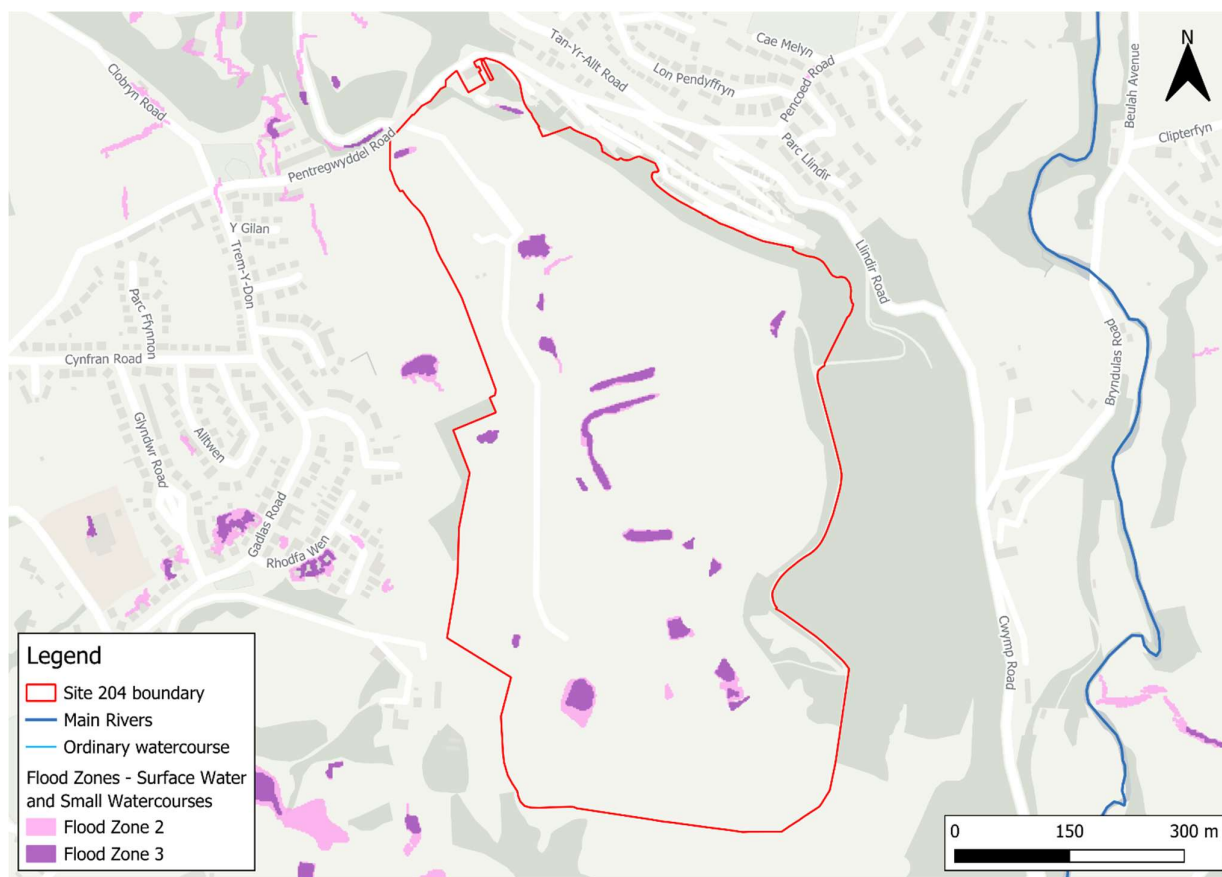


Figure 4-2 FMfP - Flood Risk from Surface Water and Small Watercourses

4.2 Vulnerability to Flooding

Under TAN-15, one of the three flood risk vulnerability classifications can be assigned to a development, as shown in Table 4-2 below. Site 204 has been proposed for renewable energy development, comprising a solar farm. Therefore, the site is classified as less vulnerable development.

Table 4-2 Development vulnerability categories²

Development category	Types
Highly vulnerable development	<p>All residential premises (including hotels, Gypsy and Traveller sites, caravan parks and camping sites). Schools and childcare establishments, colleges and universities. Hospitals and GP surgeries. Especially vulnerable industrial development (e.g. power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites. Emergency services, including ambulance stations,</p>

² Figure 4, TAN-15 | March 2025

Development category	Types
	fire stations, police stations, command centres, and emergency depots. Buildings used to provide emergency shelter in times of flood.
Less vulnerable development	General industrial, employment, commercial and retail development. Transport and utilities infrastructure. Car parks. Mineral extraction sites and associated processing facilities (excluding waste disposal sites). Public buildings including libraries, community centres and leisure centres (excluding those identified as in Highly Vulnerable category and emergency shelters). Places of worship. Cemeteries. Equipped play areas. Renewable energy generation facilities (excluding hydro generation).
Water compatible development	Boatyards, marinas and essential works required at mooring basins. Development associated with canals. Flood defences and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation.

4.3 New Development and Redevelopment

TAN-15 provides advice around four different types of development. This recognises that the ability to avoid or minimise risk when undertaking development varies according to the type of development proposed. These new definitions have been introduced to include an element of flexibility for appropriate regeneration and redevelopment proposals within flood-risk areas. The four different definitions of development are:

- New development,
- Redevelopment,
- Change of use or conversions, and
- Extensions.

Proposed development within Site 204 is most closely aligned with the definition of redevelopment. TAN-15 defines redevelopment as *"Any development on previously developed land as defined in Planning Policy Wales"*

At the time of writing, the proposed site will be classified as a redevelopment within TAN-15.

4.4 Acceptability of flood consequences

As indicated within Section 4.1, the proposed development is located within Flood Zone 1 of the Flood Map for Planning - Flood Risk from Rivers and the Sea. TAN-15 states that all types of development are acceptable in principle within Flood Zone 1. Planning authorities should develop locally specific planning policies for localised areas at risk of flooding.

Consequently, an FCA is not required to address fluvial or tidal flood risk. However, as the site is within Flood Zone 3 of the Flood Map for Planning - Flood Risk from Surface Water and Small Watercourses, an FCA would be required to address flood risk from these sources. The FCA will likely be simple due to the nature of the risk at this site. The FCA should include details on how the surface water risk will be managed, including the use of appropriate SuDS, and the management of displaced surface water flooding following any infilling of pits and regrading of land.

Surface water and ordinary watercourse flood risk management are the responsibility of the Lead Local Flood Authority (LLFA), which may have specific requirements for surface water management, including for greenfield runoff rates and site-specific SuDS design. The FCA should develop a full appreciation of:

- The risk and consequences of flooding on the development,
- The risk and consequences of the development on flood risk elsewhere,
- How surface water flood risk will be managed appropriately through the use of SuDS techniques and a robust surface water drainage strategy, and
- How existing risk areas will be retained in the proposed site layout.

5 Conclusion

Site Description

- JBA Consulting has been commissioned to prepare a Stage 2 SFCA in support of a RLDP allocation at Llanddulas Quarry - Area 4 for renewable energy use.
- The site is located in Llanddulas, Conwy and is currently used for quarry purposes.

Overview of flood risk

- The primary risk of flooding to the site is from surface water and small watercourses. Displacement of the ponding surface water flooding within the quarry pits must be managed.
- The site is at very low risk of flooding from fluvial, tidal and groundwater flooding.
- The site is not modelled to be at risk of flooding from reservoirs.

TAN-15

- TAN-15 appears to suggest that the proposed renewable energy development would be justified and appropriate at this site.
- The site is located within Flood Zone 1 for Rivers and the Sea.
- An FCA will be required for the site in line with TAN-15 guidance, as the site is partially within Flood Zone 3 for Surface Water and Small Watercourses. The FCA will need to demonstrate that the surface water and small watercourse flood risk at the site and surrounding areas is managed through the use of SuDS.

Conclusion

- It is concluded that on the grounds of flood risk, the development proposal complies with the aims and objectives of TAN-15 and Planning Policy Wales.

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