



Transport for Wales

AMLWCH TO GAERWEN

Bus Options Study



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1 STUDY AREA OVERVIEW

- 1.1.1. This study is designed to assist work being undertaken to consider new rail alignments on the Isle of Anglesey, and specifically between Amlwch and Gaerwen.
- 1.1.2. This brief Technical Note considers the bus route alignments that are currently in place, and/or those which could potentially be put in place in lieu of a heavy or light rail link between the two towns.
- 1.1.3. Former redundant track beds remain in place following the closure of the rail link between Amlwch and Gaerwen. Current feasibility work is considering operational and capital costs of re-opening this link using a heavy or light rail solution. However, to understand all potential public transport options this Technical Note provides potential bus link scenarios between the two towns.
- 1.1.4. The following sections outline the current level of bus service between the two towns and different route alignments that could be used so parallel existing routes or create new links.



2 CURRENT BUS SERVICES

- 2.1.1. The study area covers the Isle of Anglesey. This is a remote rural area to the north-west of Wales with communities located largely around its coastal perimeter and the denser urban areas of Holyhead in the south west of the Isle and Bangor on the Welsh mainland a short distance across the Menai Strait.
- 2.1.2. The principal towns of Holyhead and Bangor (mainland Wales) provide the largest draws on demand for residents more widely distributed across the Isle of Anglesey and the current public transport network reflects this situation with service focused on trips to and from these towns.
- 2.1.3. The heavy rail network currently provides only one alignment across the Isle of Anglesey, running from Holyhead via Valley, Rhosneigr, Bodorgan, and Llanfairpwll, stations to Bangor and continues across North Wales
- 2.1.4. The remainder of the settlements across the Isle of Anglesey are connected by local bus services running to varying levels of frequency. The main routes are operated by Arriva Cymru (Arriva). The local bus network comprises three main bus services:
- Holyhead to/from Bangor (Arriva routes X4, and 4/A/B/H/R/X)
 - Holyhead to/from Amlwch (Lewis Y Llan route 61)
 - Amlwch to Bangor (Arriva routes 62/A)
- 2.1.5. These core routes are supplemented by a network of local inland services that are centred on the town of Llangefni and which provide a reasonably well integrated pattern of services to smaller settlements across Anglesey.
- 2.1.6. **Table 2-1** provides a high-level summary of the three core routes across the Isle of Anglesey in terms of their typical trip time (one-way), midweek / weekend frequency, and first / last bus times.

Table 2-1 High-Level Summary of Core Bus Routes Across Anglesey

Route	Origin	Destination	One-Way Time	Midweek Freq/hour	Saturday Freq/hour	Sunday Freq/hour	First / Last Bus
4	Holyhead	Bangor	105 mins	2 / hr	2 / hr	0.5 / hr	0500/2215
61	Amlwch	Holyhead	57 mins	0.7 / hr	0.6 / hr	No Service	0700/1705
62/A	Amlwch	Bangor	62 mins	1.3 / hr	1.3 / hr	0.5 / hr	0625/2315

- 2.1.7. The focus of this study is corridor between Amlwch and Gaerwen. There are no direct services between the two towns and travel therefore requires one change. The first opportunity to travel southbound midweek is 06:22 with an arrival time of 07:58 via Menai Bridge. The last southbound midweek journey operates at 19:09 and arrives at 20:41 via the same route alignment. Other trips throughout the day require an interchange at Menai Bridge, however some trips offer a combination of interchange at Llangefni and take a slightly shorter time of c1 hour 20 minutes.
- 2.1.8. Northbound the first available journey runs at 06:28 (arriving 08:37) and the last trip runs at 23:14 (arriving 00:24). **Table 2-2** provides a summary of journey options in each direction.



Table 2-2 Summary of Midweek Journeys Between Amlwch and Gaerwen (both directions)

Direction	First	Last	Number of Trips	Average Headway	Longest Trip	Shortest Trip
Southbound	06:22	19:09	18	43 mins	96 mins	67 mins
Northbound	06:28	23:14	21	47 mins	129 mins	66 mins

2.1.9. **Figure 2-1 and Figure 2-2** provide a route map for the two bus route options between Amlwch and Gaerwen. The alignment via Llangefni shown in **Figure 2-2** is more direct and would be more attractive to customers based on the route alignment and slightly shorter journey time.

Figure 2-1 Amlwch to Gaerwen via Menai Bridge

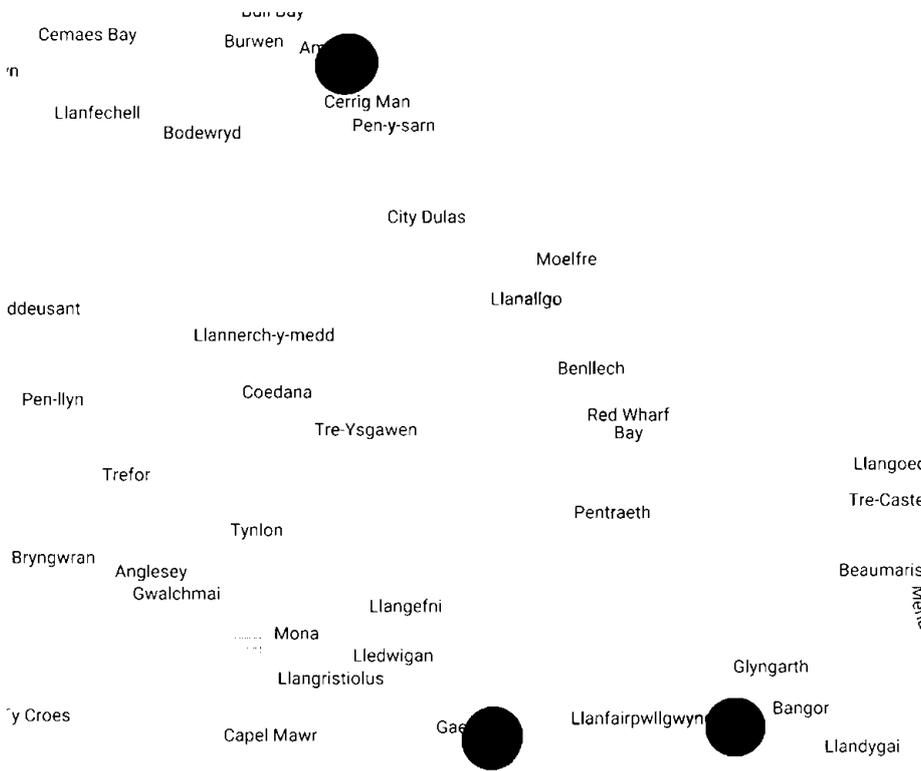
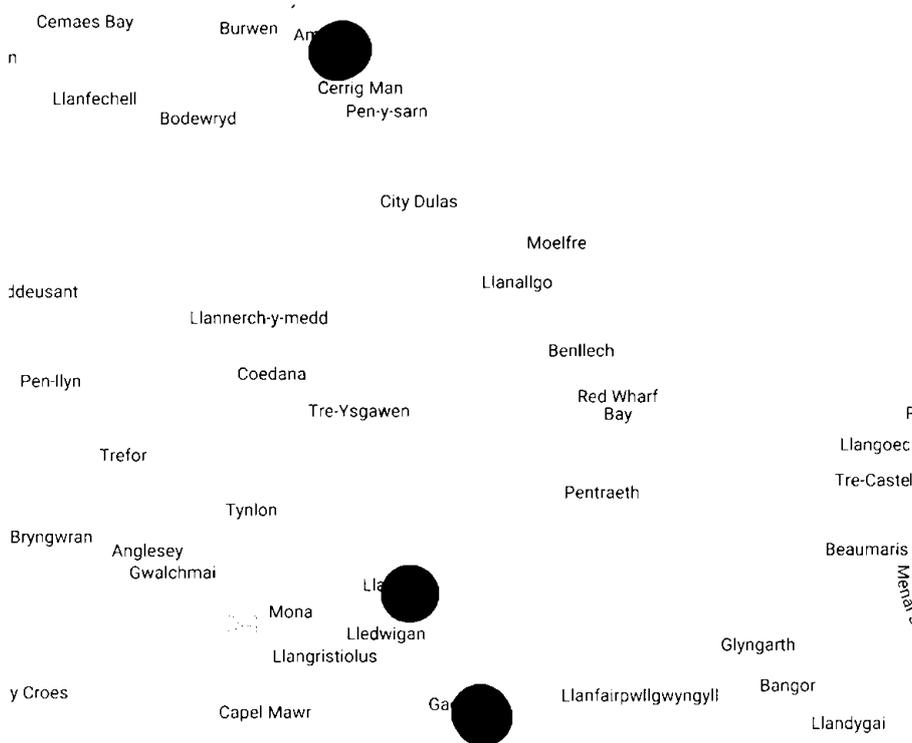




Figure 2-2 Amlwch to Gaerwen via Llangefni



- 2.1.10. **Table 2-2** demonstrates that the current local bus service provision between Amlwch and Gaerwen operates at a low frequency level of approximately one bus every 45 minutes in either direction. This low level of frequency is further compounded by the indirect nature of either route alignment and the need to make one change between bus service.
- 2.1.11. The road distance between Amlwch and Gaerwen is 17.3 miles taking the most direct road route via the B5111 and A5 via Llanerch-y-medd and Bodffordd. This route takes an average of 33 minutes (car) to complete. However, the road route via Llanallgo and Llangefni via the A5025 and B5110 is slightly longer at 18.2 miles but takes approximately 31 minutes to complete by car.
- 2.1.12. These journey times for direct travel compare favourably to the current bus offer. However, some of the bus journey time is lost to walking connections to local stops at each terminus and the interchange time between services at their connection point. The shortest southbound bus journey includes only 55-minutes on 'on-bus' time, whilst the shortest northbound trip also includes only 55-minutes of 'on-bus' time.
- 2.1.13. As a result, it is possible to envisage a direct service taking under one hour by bus.



2.2 SUMMARY OF CURRENT NETWORK

- 2.2.1. Whilst a full review of the local bus service network across the Isle of Anglesey is outside the scope of this Technical Note, it is reasonable to conclude that aside from the core bus routes connecting the triangle of main locations in the study area (Holyhead, Amlwch, and Bangor) with reasonably good levels of service, in particular those between Holyhead and Bangor where bus competes with rail services, there is a low frequency network operating between most inland settlements, the principal towns and the administrative centre of Llangefni.
- 2.2.2. Across the corridor of interest between Amlwch and Gaerwen, there is no direct bus service currently operating. Instead, routes take one of two alignments requiring a change between local bus services at either Menai Bridge or Llangefni.
- 2.2.3. The interchange time penalty for this connectional alignment is in the order of 10 to 40 minutes dependent on the trip and services between the two towns operate approximately every 45 minutes in each direction with first buses at c0620 each direction and last buses at 1909 southbound and 2314 northbound.
- 2.2.4. There is no current data to suggest the level of passenger use for 'bus' between the two towns but the level of frequency and indirect nature of the current offer suggests that use is likely to be low unless a significantly improved offer was made available with likely onward connections beyond Gaerwen to Bangor being required to make such an offer sustainable in the long-term.
- 2.2.5. Amlwch is connected to both Bangor and Holyhead through local services 61 and 62/A, albeit at lower frequencies than services between Holyhead and Bangor. Gaerwen is on the corridor served by the X4 and 4 (group) services and therefore has good east/west connections. As such a direct service from Amlwch to Gaerwen could connect to the east/west Arriva services but may not serve enough settlements en-route to make the direct route financially sustainable – particularly if the 62/A routes remain.
- 2.2.6. The next section considers potential direct route alignments between Amlwch and Gaerwen that may be delivered in lieu of a heavy or light rail reinstatement across the former track bed between the two towns. These potential routes are designed to show how bus may be considered over rail options, either as an interim step to build demand or as a permanent option.



3 POTENTIAL DIRECT ROUTE OPTIONS

3.1.1. Long-listing work has generated six potential direct bus route alignments. These closely parallel the route alignment being considered for the heavy/light rail options as a comparison of operational and capital costs between the two modes is required for later, more detailed short-list analysis.

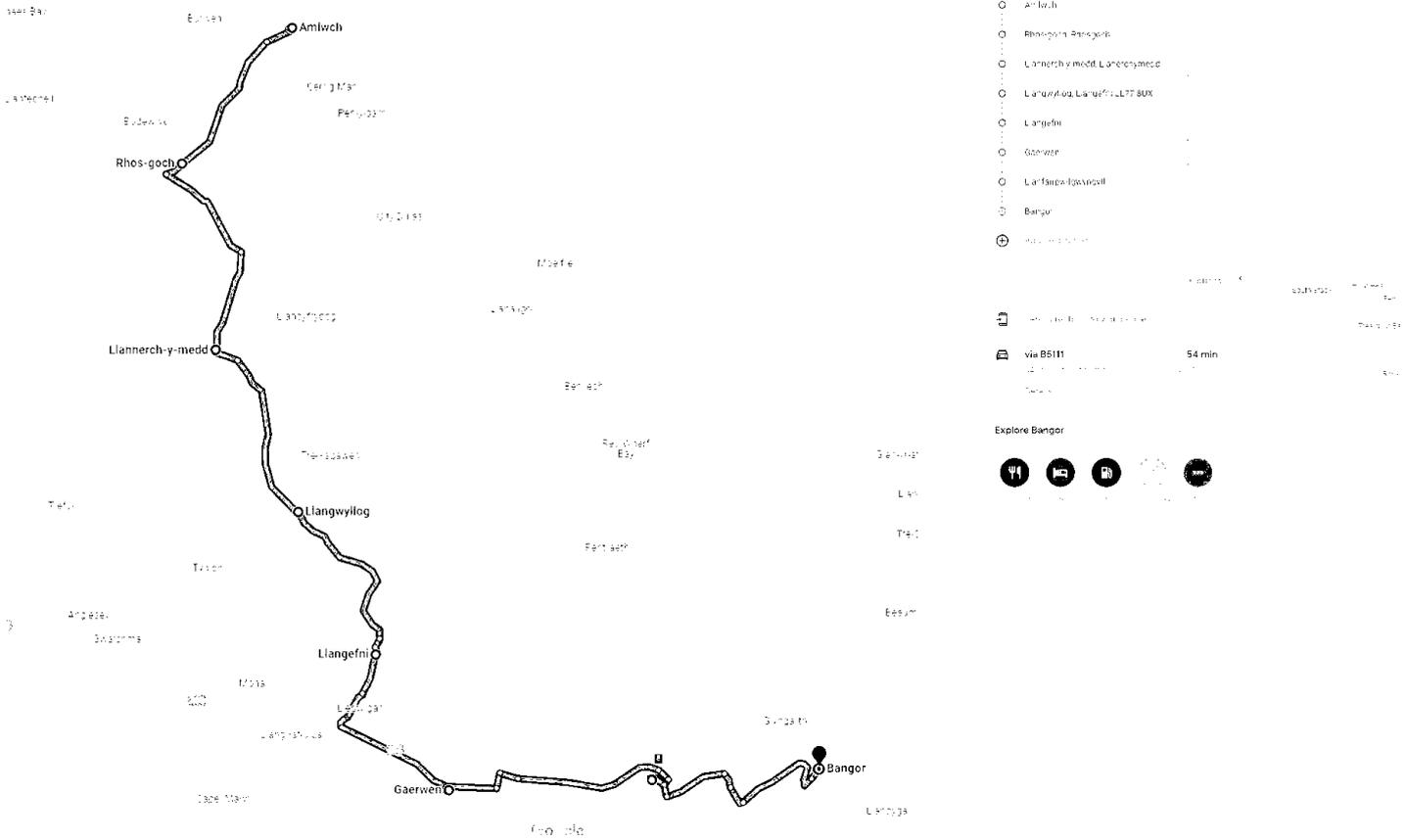
3.1.2. The six options and their intermediate locations are shown in **Table 3-1** below. It should be noted that given the viability issues noted in **Section 2** regarding running services only between Amlwch and Gaerwen, all long-list options consider direct bus routes extending to Bangor.

Table 3-1 Proposed Long-List Options for Direct Bus Routes

Route ID	Start	Calling at ...	End	Via
1e	Amlwch	Rhos-goch Llanerch-Y-Medd Llangwyllog Llangefni Llanfairpwll	Bangor	Gaerwen
1f	Amlwch	Llanerch-Y-Medd Llangefni Llanfairpwll	Bangor	Gaerwen
1g	Amlwch	Llangefni Llanfairpwll	Bangor	Gaerwen
1h	Amlwch	Llangefni	Bangor	Gaerwen
2c	Amlwch	Pen-Y-Sarn Moelfre Benllech Llangefni Llanfairpwll	Bangor	Gaerwen
2d	Amlwch	Benllech Llangefni Llanfairpwll	Bangor	Gaerwen

3.1.3. Each route ID above provides a different level of intermediate stops along each of two proposed core alignments. **Figure 3-1** and **Figure 3-2** show the route alignments for 1e and 2c that include all proposed intermediate stops to demonstrate the proposed broad alignments for each long-list option being considered.

Figure 3-1 Proposed Route Alignment for Option 1 (routes 1e-1h)

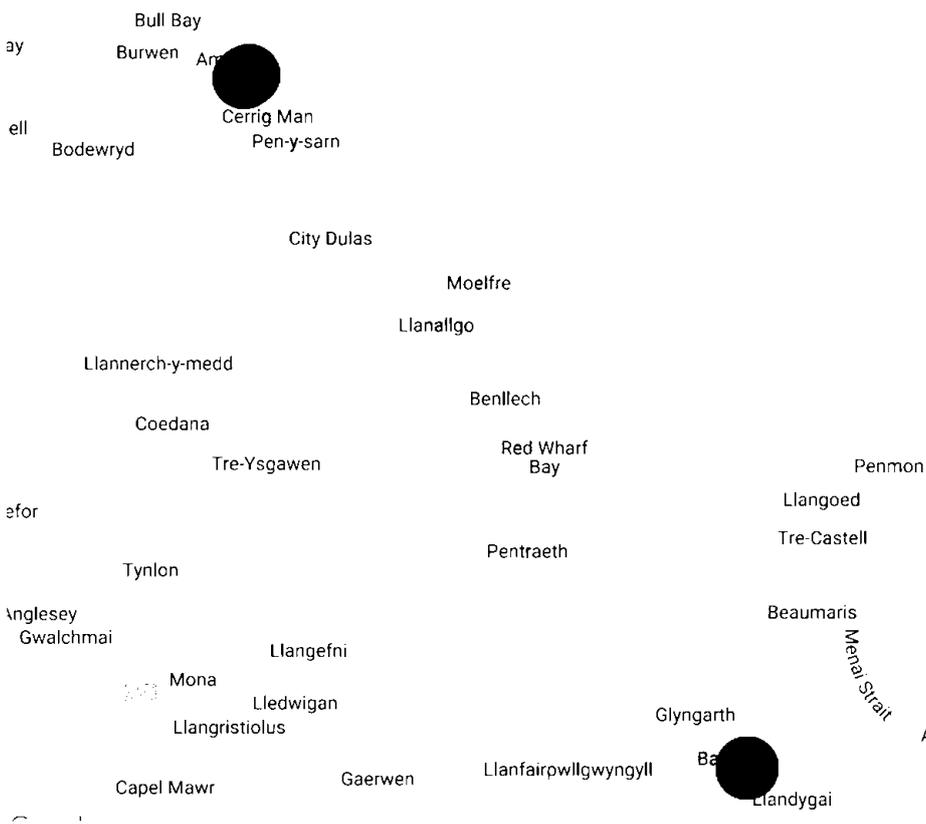


- 3.1.4. The route alignment suggested in **Figure 3-1** provides a route through Llangefni to ensure connectivity to the wider inland local bus network. The direct north/south alignment parallels closely the former rail alignment between Amlwch and Gaerwen and take in three notable intermediate settlements.
- 3.1.5. The alignment shown in **Figure 3-1** represents option 1e. Variations on this alignment (1f to 1h) sequentially remove each proposed intermediate location from Rhos-goch to Llanfairpwll while retaining Llangefni in each case.
- 3.1.6. Given the potential viability issues for this alignment, which would require existing service 62/A (Amlwch to Bangor via Benllech) to be retained, the removal of any intermediary location is not recommended, and it is considered that no significant time benefit will be gained from their removal.

new alignment likely to attract end to end passengers due to a shorter trip time than the coastal service currently operated on route 62/A.

- 3.1.10. As with option 1, proposals consider removing some intermediate locations between option 2c (shown in Figure 3-2) and option 2d. As with option 1, the removal of any intermediate locations is not recommended as no significant time benefit will be achieved and the loss in passenger traffic may cause some commercial viability options and a lack of coordination with any parallel services.

Figure 3-3 Current Service 62/A Route (Amlwch to Bangor via east coast)



- 3.1.11. Figure 3-3 demonstrates the similarity between options 2c and 2d and current service 62/A between Amlwch and Benllech.

- 3.1.12. If created, routes 2c and 2d would represent a bifurcation of services between Amlwch and Bangor at Benllech with the new alignment running inland via Llangefni and Gaerwen before following the A5 to Menai Bridge where the two routes would re-join for the common section to/from Bangor.



3.2 ROUTE ANALYSIS

3.2.1. Analysis has been undertaken to understand journey times for all routes while considering necessary resources to run the services at regular intervals throughout the day. This is shown within **Table 3-2** below.

3.2.2. Note the values within the brackets of Table 3-2 represent journey times and distances of the route without a stop in Llangeffni. The stop reduced the distance travelled for multiple routes using Google Maps and did not increase the journey time in any instance. Therefore, all routes should be routed via Llangeffni to support local connections and journeys on public transport.

3.2.3. **Table 3-2 – Route Journey Times**

Route ID	One-Way Journey Distance (miles)	One Way Car Journey Time (min)	Round Journey Distance (miles)	Round Journey Times (min)	Round Journey Time Bus (min)
1e	26.9 (27.7)	54 (53)	54.6 (55.4)	109 (55)	154
1f	25.7 (26.5)	50 (50)	51.8 (52.6)	100 (100)	146
1g	25.7 (26.5)	50 (50)	51.8 (52.6)	100 (100)	146
1h	24.9 (25.7)	45 (45)	50.2 (51)	90 (90)	141
2c	30.5 (29.7)	60 (60)	61.5 (59.9)	120 (120)	173
2d	28.8 (28)	55 (55)	58 (56.4)	110 (110)	163



3.2.4. Methodology for calculating the time taken for bus journeys in **Table 3-2** is as follows:

- Access 62 bus route on bustimes.org, <https://bustimes.org/services/62-bangor-cemaes-2#map>
- Add stops on 62 bus route into Google Maps to understand the journey distance is 21.6 miles.
- Calculate average duration of bus route from Bangor to Amlwch using bus timetables (minimum 41 minutes, maximum 66 minutes, mean 61 minutes)
- $21.6\text{miles}/61\text{mins}=0.36\text{miles per minute} = 21.3\text{mph average}$
- Divide all journey distances by 21.3mph for round trip time estimates.

3.2.5. The bus journey times have been used in the table below to calculate the peak vehicle requirement (PVR) of each bus service for the following scenarios:

- 2 services per hour
- 1 service per hour
- 0.5 services per hour

3.2.6. The round bus journey time methodology described in **Section 3.2.2** is shown within the **Table 3.3** below along with a 10% increase on this time to allow for layover at start and midway of the round-trip journeys.

3.2.7. **Table 3-3 Peak Vehicle Requirement**

Route ID	Round Bus Journey Time with Layover (min)	PVR for 2 buses per hour	PVR for 1 bus per hour	PVR for 0.5 buses per hour
1e	169	6	3	2
1f	161	6	3	2
1g	161	6	3	2
1h	155	6	3	2
2c	190	7	4	2
2d	179	6	3	2



3.3 FURTHER ROUTE OPTIONS

- 3.3.1. There are few other road options that connect Amlwch and Gaerwen other than those already shown through options 1 and 2 in addition to those already used by the connecting local bus service options under the current local bus network on the Isle of Anglesey.
- 3.3.2. However, consideration could be given to creating an addition 'option 3a' which would replicate option 2 but continue the route south from Benllech to Pentraeth before running via Llangefni and Gaerwen to Bangor.
- 3.3.3. While option 3a would have merit in providing additional frequency to the existing local service between Amlwch and Bangor (62/A) by coordinating services through all main locations, the diversion westwards towards Llangefni before a return to Bangor via Gaerwen would be an awkward dog-leg, adding time and potentially frustrating passengers.
- 3.3.4. A separation of the routes as proposed at Benllech or even earlier at Llanallgo would be a more efficient and attractive route should a new alignment following the east coast be pursued.
- 3.3.5. A further consideration for the local bus network may be to convert some or all of the former track bed for the rail line between Amlwch and Gaerwen to a dedicated bus-way. This would provide fast journeys and the opportunity for a green corridor with adjoining cycling and walking facilities. However, this option is likely to be expensive unless it was designed to be an interim measure that may lead to a conversion from a bus to a 'very-light' or light rail solution as patronage builds.
- 3.3.6. No other potential route options appear to be viable without adding additional mileage and time to each trip direction and having the effect of making any new / alternative alignment less attractive to potential and existing bus users (e.g., adding Trefor and Tynlon to option 1 between Llanerch-y-medd and Llangefni).
- 3.3.7. While rail options focus on the Amlwch to Gaerwen line with a linkage to the existing east/west railway network between Holyhead and Bangor, the bus options propose continuing to Bangor. This is potentially sensible given the need for each route to be as financially viable as possible. However, where connection arrangements to be guaranteed with high quality mobility hub style interchange at Gaerwen between the bus and rail options then a direct route following option 1a alignments and terminating in Gaerwen would reduce the vehicle and crew requirements for the bus service and provide a faster journey time between Amlwch and Bangor / Holyhead than currently provided across the local bus network.



3.4 SUMMARY AND RECOMMENDATIONS

- 3.4.1. The local bus network across the Isle of Anglesey operates at a generally low frequency with several cross-Anglesey connections made at Llangefni. Three core routes operate, serving a triangle of principle towns linking the north, east and west principal towns across the Isle of Anglesey.
- 3.4.2. The former railway linking Amlwch and Gaerwen with the main east/west Holyhead/Bangor has long since gone, though the track bed remains, and no direct road service has replaced it with any level of sustainability.
- 3.4.3. The current local bus service network provides a connectional service to and from Gaerwen via Menai Bridge or Llangefni dependent on the time of day and service combination used. The case for a direct route is questionable given the draw of both Holyhead and Bangor and the direct services to these locations already in place from Amlwch.
- 3.4.4. The proposed options that are designed to parallel the rail alignment and provide a comparator to the development of rail based on operational and capital costs are both feasible. Those focusing on option 1 alignments are more direct but may lack significant levels of population to make the services financially viable. Those focusing on option 2 provide the opportunity to coordinate part of the route with existing service 62/A before offering the potential for faster journeys to Bangor via Llangefni and the A5.
- 3.4.5. Consideration of a direct bus service as far as Gaerwen provided a high-quality bus/rail interchange through a mobility hub can be provided has merit as this would provide a new, fast, alignment and allow bus and crew resources to be lowered and recycled faster owing to the shorter route length. However, the alignment may serve too few significant settlements to justify its case financially with Gaerwen a relatively insignificant end terminus for any passengers not transferring to rail.
- 3.4.6. The recommended next steps would be to:
- Short-list currently proposed options to 1a and 2c as a minimum
 - Consider alternative options in the short-list including option 3a via Pentraeth and a Amlwch to/from Gaerwen only with a high-quality bus/rail interchange.
 - Understand how any of option 2 (and option 3a) alignments could coordinate with current service 62/A
 - Analyse the difference in potential resources and costs required to deliver each of the shortlisted options (including 3a) and including an Amlwch/Gaerwen only to determine the potential cost and benefit trade-offs between each and their comparison to potential costs to re-open the former rail alignment as either a very-light, light, or heavy rail option.
 - It is anticipated that the short-listing work and calculated operational and capital costs related to potential bus route options will be a follow-on Technical Note, and this study therefore sets the scene and establishes the rationale for some options being removed at this long-list stage.



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