Representation to
West Lothian Local Development Plan
Main Issues Report

In Support of
Land west of Murieston Road, Murieston, West Lothian

Prepared by
Clarendon Planning and Development Ltd

On behalf of
BDW Trading Ltd and H & J Russell

October 2014

Contents

Introduction

Clarendon represent BDW Trading Ltd and H&J Russell and wish to reiterate the merits of landholdings west of Murieston Road, Murieston, Livingston with respect to their residential development capability and potential to contribute to the current housing land requirement within West Lothian through the Local Development Plan period.

This representation seeks to address the specific questions raised within the West Lothian Council Local Development Plan Main Issues Report (the 'MIR') and is structured in order of ease of reference to these questions.

The report also elaborates upon initial representations submitted to West Lothian Council at the 'pre-MIR' stage in November 2012 (and to the Call for Sites exercise in 2011) with a view to confirming site effectiveness.

As outlined hereafter, whilst current support by the Council for the site as an 'alternative' housing site is noted, this representation seeks to demonstrate the suitability of the site as a preferred housing allocation within the forthcoming Proposed Local Development Plan.

The representation specifically addresses the following questions within the MIR.

- LDP Vision Statement & Aims (Q 1-4)
- LDP Housing Strategy (Q 15-19)
- LDP Affordable Housing & Infrastructure (Q 35-41)
- LDP Settlement Statements - Livingston Site Ref. EOI-0110

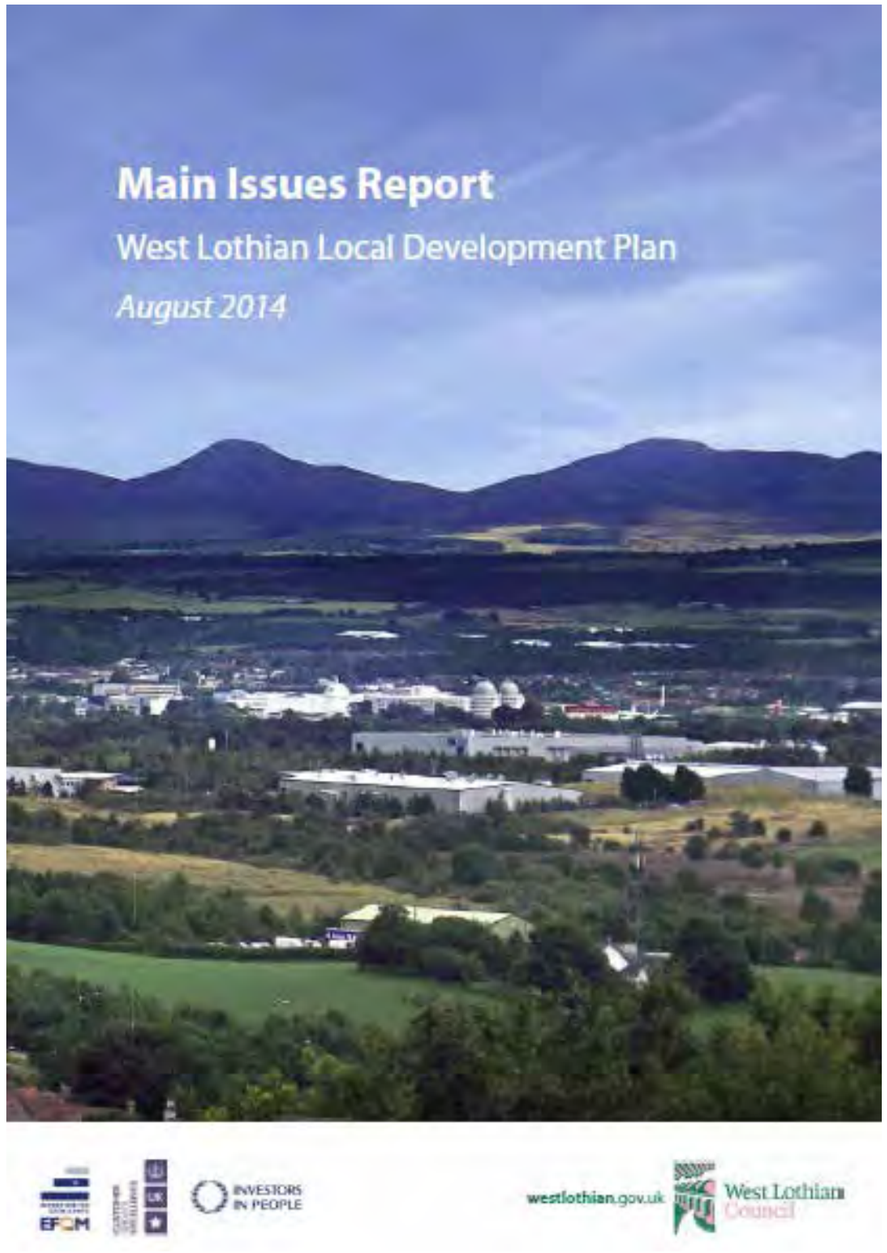

Figure 1 - West Lothian Council LDP Main Issues Report

LDP Vision

The West Lothian Local Development Plan 'Vision Statement' is **supported** by BDW Trading Ltd and H&J Russell and in particular, the importance of West Lothian in relation to the Edinburgh City Region.

As such, allocation of sufficient housing land is crucial, both in terms of deliverable sites which can contribute to the effective land supply and facilitating well considered urban growth for the medium to longer term growth of West Lothian's towns.

LDP Aims Main Issue 3

With specific regard to 'Main Issue 3', LDP aims are **supported** in terms of the need for the Council to, *"provide a generous supply of housing land and provide for an effective five year housing land supply at all times"*.

The provision of land for housing and the timely release of that land to enable building of homes is, arguably, one of the key elements of the West Lothian LDP.

In providing a generous housing land supply the Council need to meet obligations set out within the approved SESplan and associated Supplementary Guidance in terms of addressing both periods 2009-19 and 2019-24.

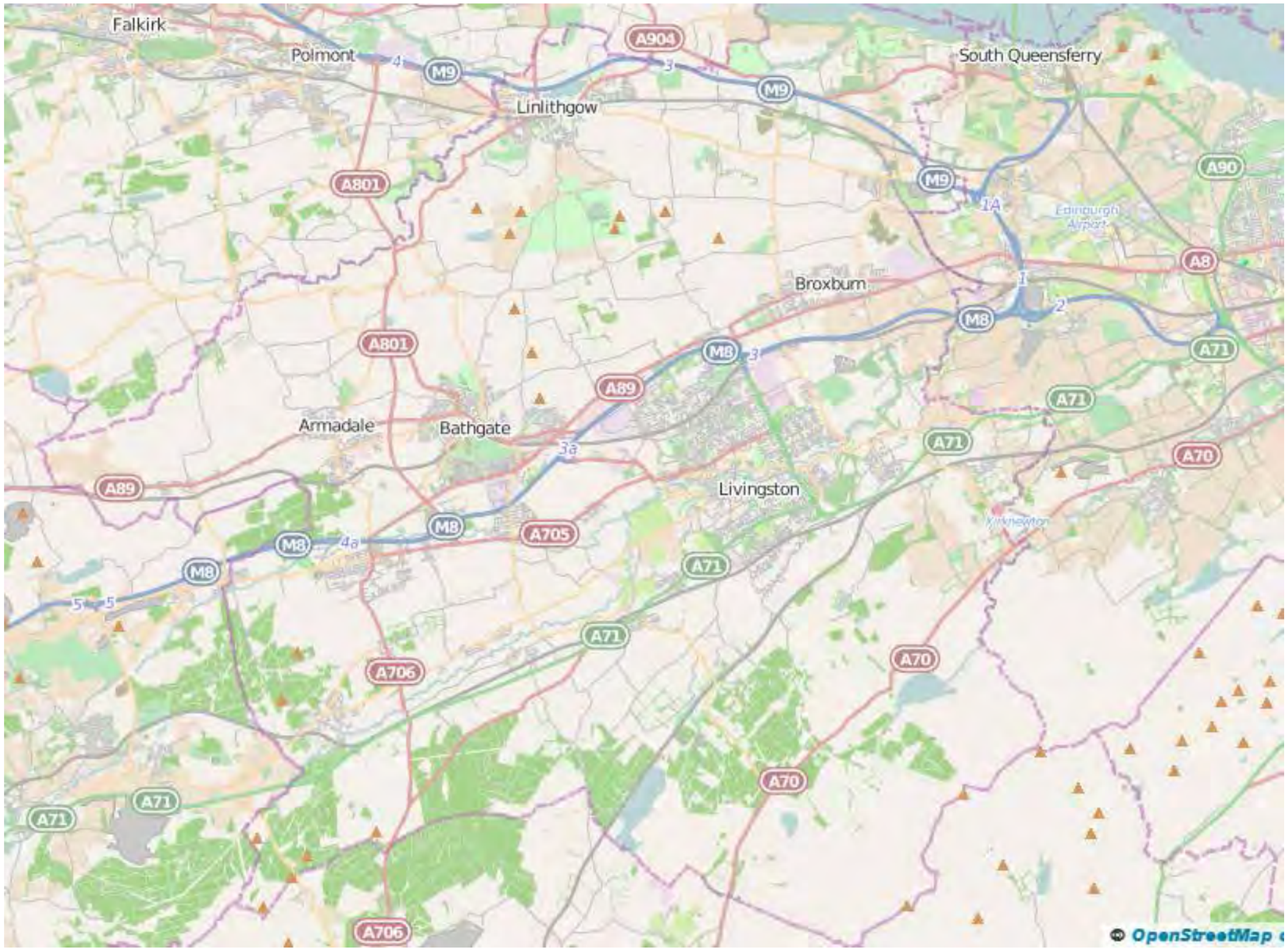

Figure 2 - West Lothian Context Map

LDP MIR Housing Strategy
Questions 15 - 19

Q15 - Preferred Strategy
Q16/Q17 - Alternative Strategies
Q19 - 5 Year Effective Housing Land Supply

Whilst the positive MIR strategy is noted and supported in general, the actual housing land requirements and associated calculations are not supported. In this respect, West Lothian must meet the needs of both SESplan periods as well as maintaining a 5 year effective land supply.

The requirement upon Local Authorities to maintain a generous land supply at all times, including a minimum 5 year effective housing land supply, is firmly established in national planning policy. Housing land deliverability is critical in terms of meeting demand and its importance is elaborated upon within *Scottish Planning Policy (SPP) (Scottish Government, updated June 2014) and the National Planning Framework 3 (Scottish Government, June 2014)*, which is reflected at regional level by the approved South-East Scotland Strategic Development Plan (*'SESplan') (June 2013)*.

SESplan Supplementary Guidance on Housing Land is also a key material consideration. Following public consultation, ratification by participating local authorities and submission to the Scottish Government, Ministers issued a letter on 18th June 2014 seeking a modification to ensure the Guidance accorded with SESplan in requiring housing requirements for both periods 2009-19 and 2019-24 to be met in full (with associated impact upon defining how a 5 year land supply is to be calculated). It is understood that this modification will be adopted by SESplan, subject to ratification by member local authorities by the end of October 2014. In approving the LDP MIR for consultation on 19th June 2014, West Lothian Council were aware of the modified SESplan requirements.

Housing Land Requirement

SESplan Supplementary Guidance confirms the requirement for West Lothian in 2009-19 as 11,420 units with a further 6,590 units in 2019-24. As noted above, this agreed housing land requirement should form the basis of calculating a 5 year effective land supply requirement.

Based on the SESplan requirements and SPP requirements to build in a minimum 10% flexibility allowance, this provides for the following:

Net Requirement 2009-19	11420
+10% Flexibility Allowance	1142
Total Requirement 2009-19	**12562**
Net Requirement 2019-24	6590
+10% Flexibility Allowance	660
Total Requirement 2019-24	**7250**
Net Total Requirement 2009-24	**19812**

From this requirement, we can deduct completions for the period 2009-13, as detailed within agreed Housing Land Audits 2010-2013, comprising 1,825 units (543/530/229/523).

This provides for a **net 2013-19 requirement of 10,737 units** (12562-1825), equating to an annual average of 1790 completions.

Utilising this requirement, the **5 year Effective Land Supply requirement is 8,950 units** (5x1790).

Housing Land Supply

West Lothian HLA 2013 programmed completions for the period **2013-2019** comprise the following:-

- 2013/14 573 units
- 2014/15 649 units
- 2015/16 755 units
- 2016/17 875 units
- 2017/18 773 units
- 2018/19 711 units

- Total **4336 units**

The above programming indicates a **5 year Effective Land Supply** of **3625 units**.

For the period **2019-24**, the 2013 HLA only provides programming for 2019/20 (679) so the remainder of the period can be estimated by rolling forward programmed completions from sites within the HLA. This provides for 2,702 units contribution from the existing HLA sites. Therefore, the total current supply available for the 2019-24 period based on best available knowledge of programming is **3381 units.**

Based on the overall **2009-24** period including completions to 2013 and programmed supply to 2024, this provides the following overall supply prior to new LDP sites:

- Total **7717 units** (4336+3381)

Housing Land Shortfall

Based on known requirements and known supply, we can identify the current shortfalls:

2013-19 SESplan Period (10737-4336)	**-6401**
2019-24 SESplan Period (7250-3381)	**-3869**
Total Shortfall 2013-24 (17987-7717)	**-10270**
5 yr Effective Land Supply (8950-3625)	**-5325**

Based on the above, there is currently just a 2 year Effective Land Supply (40% of requirement) and shortfalls in the SESplan periods of 60% to 2019 and 53% in the period 2019-24, or 57% overall.

Requirements for Proposed LDP

West Lothian have to address the considerable land supply shortfalls identified above if SPP and SESplan obligations are to be met in terms of both the immediate 5 year land supply and also to 2024.

In order to meet these objectives, land capable of early completions must be allocated for housing to provide for the 6,400 unit shortfall to 2019 and 3,900 shortfall from 2019-24.

Affordable Housing

BDW Trading Ltd and H&J Russell reserve their right to make specific responses to the Council's review of Affordable Housing policy.

In particular, the role of provider is of particular concern with sufficient flexibility required to ensure private providers of affordable housing are given a sufficient role as part of wider mixed housing developments.

Infrastructure Provision

BDW Trading Ltd and H&J Russell note the preferred approach to infrastructure provision in terms of maintaining a policy of developer contributions and promote growth which can partly utilise existing infrastructure capacity. The alternative approach of 'no growth' is clearly not an option.

The particular focus on education capacity within West Lothian requires a coherent approach whereby planned infrastructure investment is aligned with housing requirements. BDW Trading Ltd are very concerned over the proposed continuation of a piecemeal approach to provision with associated impacts on housing delivery.

West Lothian Council are urged to further investigate more innovative capital infrastructure (with long term repayments from developer contributions rather than unviable upfront payments) approaches to provide certainty over education provision.

BDW Trading Ltd and H&J Russell welcome the opportunity of providing further input to West Lothian Council with regard to alternative approaches, as required.

Delivering infrastructure in West Lothian

West Lothian Local Development Plan: background paper

Spatial Strategy

The scope for Livingston to expand southwards / westwards without risk of coalescence is noted and supported.

Preferred and Alternative Housing Sites - Livingston South

The inclusion of Site Ref.EOI-0110 - Murieston Castle Farm - as an alternative site (in part) for housing is noted. **It is considered however that the site, in part, as indicated on Figure 3 (i.e. the red-line boundary), should be included as a preferred housing allocation within the forthcoming Proposed LDP. It is considered that the red-line boundary should be included as a preferred allocation for 400 units if based on the whole red-line boundary or 200 units if allocating half of the red-line boundary.**

The currently preferred sites (Wellhead Farm 100 units & Linhouse 250 units) further east along Murieston Road both require more extensive structural planting to create long term southern boundaries than land west of Murieston Road and proximity to services and transport is comparable.

Given the severe housing land supply shortfall noted on Page 5, it is **strongly contended that land west of Murieston Road should also form an allocated housing site which can provide short term housing completions** and a high quality residential environment in line with national, strategic and local planning policy.

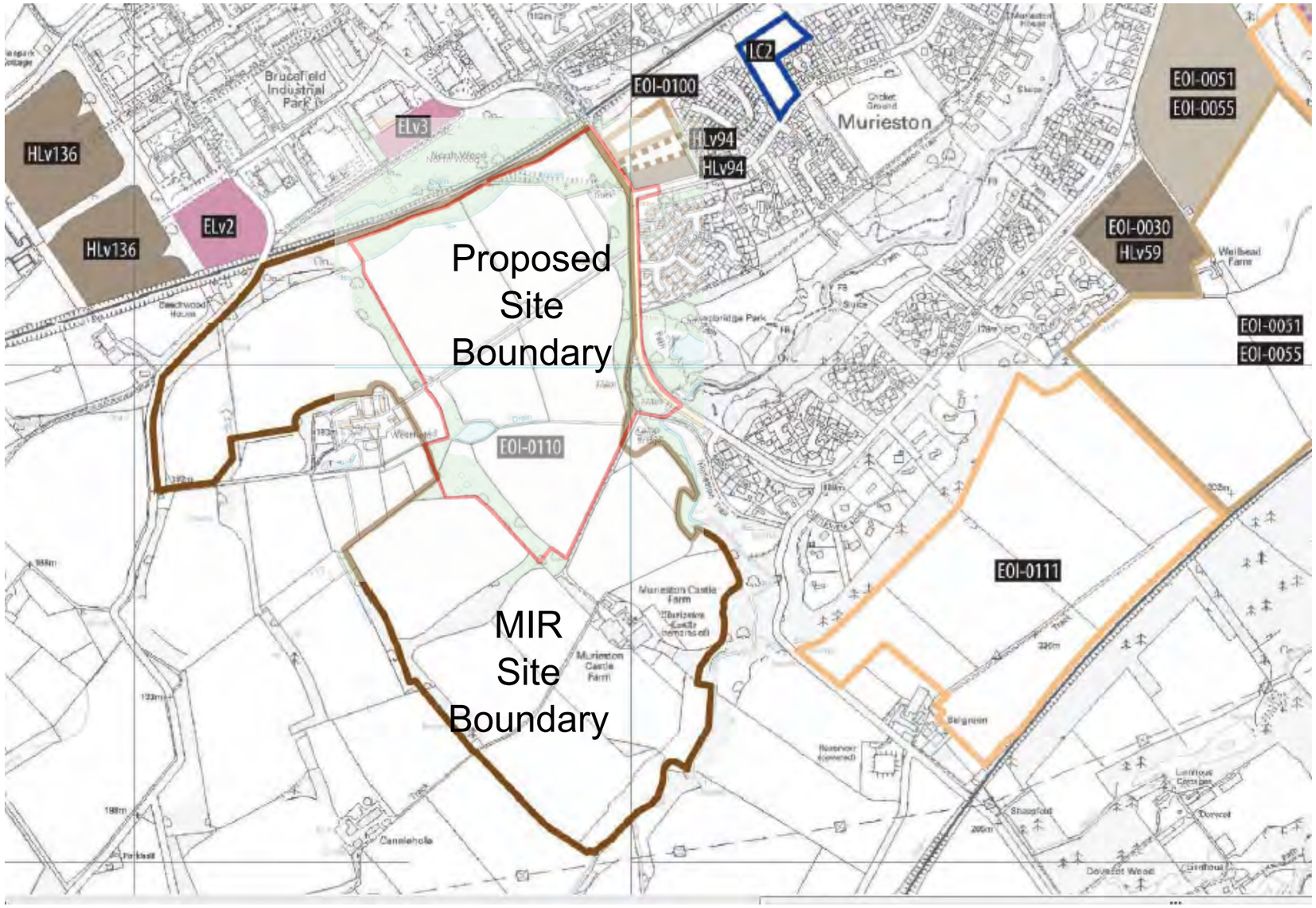

Figure 3 - Overlay of Proposed Site Boundary on MIR Map 6

LDP MIR Settlement Statements - Livingston (Site Ref.EOI-0110 - Murieston Castle Farm)
Site Overview

Site Description

The proposed site extends to approximately 31 hectares and is situated on the south-western edge of the Murieston area of Livingston, as per **Figure 3**.

The immediate surroundings include the established residential areas of Murieston and Bellsquarry to the east and north-east and Brucefield Industrial Park to the north.

The site is bound to the east by Murieston Road, which forms a local distributor road and bus route connecting the Murieston, Bellsquarry and Bankton residential areas along with the Brucefield industrial area to the A71 arterial route approximately 1km to the north. This provides access to Livingston town centre, approximately 3.5km to the north and onwards to the M8, approximately 8km north of the site. Murieston is a well established residential area which includes Livingston South rail station and the adjoining village centre services and facilities, linked to the site via the Murieston Water valley parkland.

The site itself comprises rough grazing land (understood to comprise Class 3 and 4 agricultural quality by the MLURI) and is bound by mature woodland on three sides (north, east and west) with a minor access road and mature hedgerow to the south. The Edinburgh-Glasgow rail line extends along the northern boundary beyond the woodland and Murieston Road bounds the eastern edge of the land, also set behind established woodland.

The site is traversed by an access road to the existing farm, situated west of the site and divides the site into two fields in the north and three fields in the south. The topography is generally level although land falls away to the south. Access is currently taken from the two minor farm access roads leading off Murieston Road.

Site Connectivity

Accessibility - the site adjoins an existing bus service route, which connects Murieston to Livingston town centre. Services 404/405/406 run along Murieston Road on the eastern edge of the site, linking the town centre, Livingston South rail station and onwards connections. There is scope to add an extra bus stop on Murieston Road to add to the existing provision. Livingston South rail station is situated approximately 1600m (20 min walk or 5 min cycle) to the east of the site, via Murieston Valley (either the residential road or the parkland cycle/footpath). This provides a regular (20-30 min) service to Edinburgh Haymarket (13-20 mins) & Waverley (20-30 mins) and Glasgow (45-55 mins).

Services and amenities - the Murieston site benefits from close proximity to a range of services within reach by varying modes of transport for potential residents. This includes:-

- Murieston Village/Bankton Centre within 1600m (20 min walk / 5 min cycle) including Livingston South rail station, local supermarket, medical centre, local restaurant.

- Murieston Water parkland adjoins site with cycle/ footpaths to local centre and wider town network

- Bellsquarry Primary School within 1100m (15 min walk / 4 min cycle) and West Calder High School within 2300m (8 min cycle) - Brucefield employment site (H) within 500m (5-6 min walk)

- Banntynes health centre within 2000m (7 min cycle / 25 min walk) and cricket club within 600m (7 min walk)

- Almondvale Centre shops and services within 3.5km (10-12 min cycle and on direct bus route)

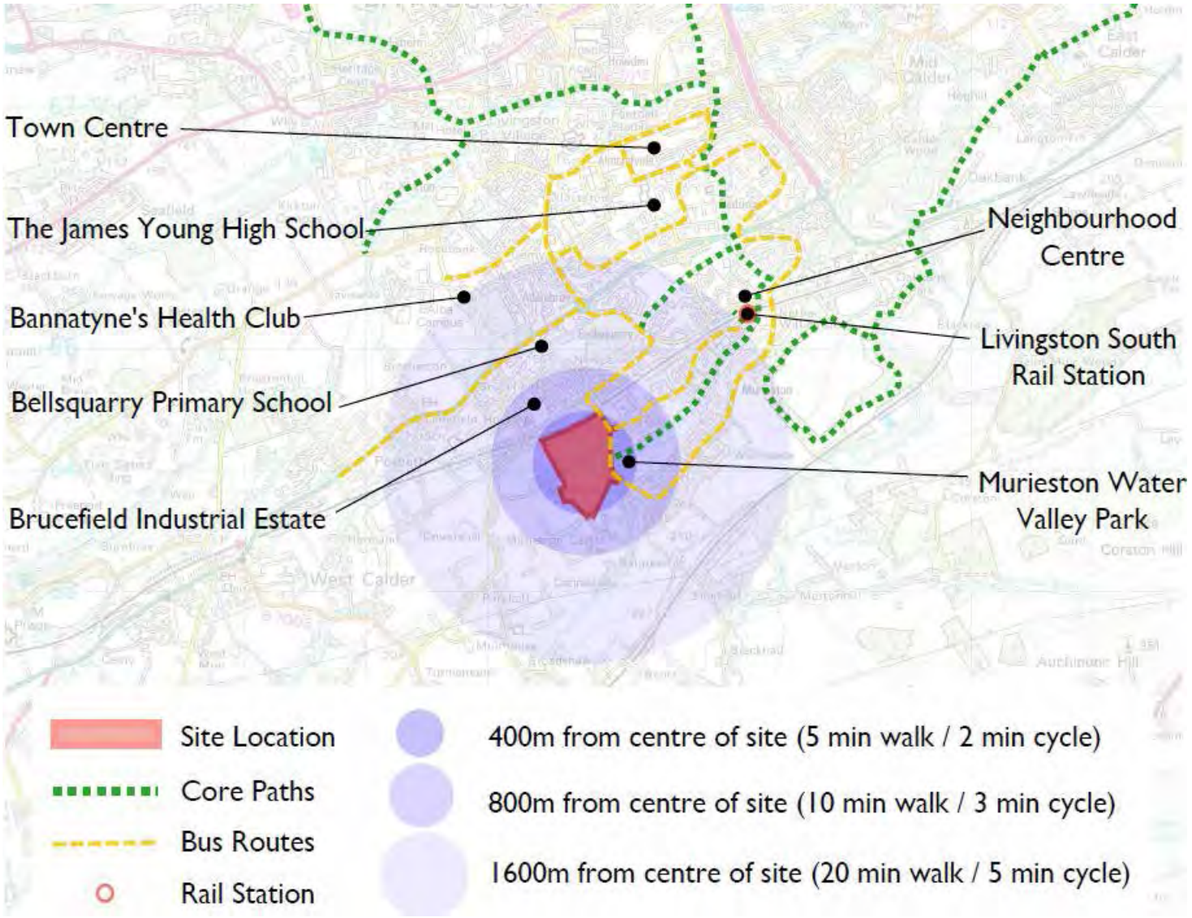

Figure 4 - Connectivity

LDP MIR Settlement Statements - Livingston (Site Ref.EOI-0110 - Murieston Castle Farm)
Site Suitability

Landscape

The site, as with the preferred sites, is located within the Harburn/Hartwood Fringe Landscape Character Area (LCA), as defined by the *West Lothian Landscape Character Area Classification* (August 2014). One of the main characteristics is that of shelter belts which has been retained in the growth of Murieston with pockets of residential development set amongst woodland belts. The site offers scope to continue this landscape and urban pattern.

As noted within the *West Lothian Local Landscape Designation Review* (2013), this LCA has ***"no core areas which would potentially merits SLA (Special Landscape Area) designation"*** with **'low' rarity value** and more of a relationship with the existing settlement at its northern edge, i.e. in locality of the site.

The site therefore is **not subject to specific landscape restrictions** and existing shelter belt planting can be utilised to minimise any perceived impact. Intrusion into the countryside is minimised with the site forming a natural extension of Murieston with defensible boundaries formed by existing mature tree belts to north and west, whilst the southern hedgerow boundary can be augmented by tree planting. A southern boundary for Phase 1 would be formed by the existing wooded access lane which bisects the overall site.

A Landscape and Visual Impact Assessment is being undertaken to demonstrate the deliverability of the site in landscape terms. It should also be noted that the initial LDP environmental assessment of the site was based upon the wider MIR site assessment boundary and not the site in part that is the subject of this representation.

MIR Site Assessment

The LDP background paper, *Consultation Responses to Proposed Sites* (August 2014), summarises the Council's own internal and external consultation process. This provides Council support in terms of the potential development of land west of Murieston Road and, in particular, conclusions on Page 359:

Although priority is to be given to development of brownfield land, there is not enough brownfield land to meet requirements of the Strategic Development Plan. Greenfield release is supported in this instance on part of the site as an alternative to other sites in the Murieston Valley locality. The overall integrity and function of the countryside belt will be minimal through the area suggested to be allocated. It will also present a logical extension to the west side of Livingston. Education capacity is available. Capacity in and access to the local road network would, however, require to be fully assessed and agreed.

This assessment positively highlights the merits of the site in terms of key factors of urban form and education capacity availability. The supporting Transport Assessment addresses local road network capacity and access, as detailed on Page 11.

The *MIR Strategic Environmental Assessment* provides further analysis of site selection with individual site assessments. Preferred sites at Wellhead Farm (negatives for greenfield land, prime agricultural land and proximity to industrial) and Linhouse (same as Wellhead plus impact on designated biodiversity sites, habitat and open space) both have factors to overcome. The assessment of the proposed site is based upon the original, much larger boundary given comments on landscape and prime agricultural land (site is non prime as noted in the Council's own Consultation Paper above).

Site Capacity

BDW Trading Ltd and H&J Russell make representation to the capacity of the site in part (which we consider to be the area outlined in **Figure 3** above) to be 400 units rather than the 375 noted in the MIR Appendix 1.

The site is proposed to be split into two phases, north and south with a Phase 1 of 200 units on the northern half of the site.

This would provide a short term contribution to the housing land requirement whilst allowing for integration with established residential areas through longer term expansion of the whole site.

In terms of delivery, BDW Trading Ltd have the ability to utilise two brands (Barratt and David Wilson) thereby enabling a high completion rate.

The proposed programming (Phase 1) comprises:

2016/17	- 25 units
2017/18	- 50 units
2018/19	- 50 units
2019/20	- 50 units
2020/21	- 25 units

Planning Application & Key Studies

As the Council are aware, BDW Trading Ltd and H&J Russell submitted a Proposal of Application Notice for the site which was registered in April 2014. A subsequent Pre-Application Consultation exhibition was undertaken at Bellsquarry Village Hall on 29th May 2014.

This introduced the site and its merits as a housing location to the local community and provided initial feedback on proposals.

As part of the application process, a number of reports have already been produced in the assessment of the site, including;

Flood Risk Assessment (Kaya Consulting)
Tree Survey and Report (Alan Motion)
Transport Assessment (Jacobs)
Noise Assessment (Charlie Fleming Associates)
Stage 1 Archaeological Assessment (AOC)
Desktop Ground & Services Study (DR Murray)
Education Capacity Appraisal (Clarendon)

Copies of the above studies are contained within the accompanying CD in support of the proposed site allocation.

Further reports are being prepared and will support an application, including:

Landscape and Visual Impact Assessment (Clarendon)
Stage 1 Habitat Survey (Nigel Rudd Ecology)

The intention of BDW Trading Ltd and H&J Russell is to work positively with West Lothian Council in terms of development plan promotion and a concurrent planning application with timescales to be agreed.

LDP MIR Settlement Statements - Livingston (Site Ref.EOI-0110 - Murieston Castle Farm)
Indicative Design Framework

Figure 5 outlines an indicative design framework for the development of the site. This is based upon an extension of the high quality existing Murieston residential area with new housing set within a strong woodland framework and a continuation of the Murieston Trail greenspace links through the site.

Given the scale of the site, it is considered that a phased approach is appropriate with Phase 1 incorporating the northern part of the site for up to 200 No. houses plus open space and augmented woodland. Access would be via a new junction onto Murieston Road, north of Murieston Valley linking a new residential street and a network of residential lanes.

Existing mature treebelts will contain the site whilst additional tree planting will augment the western boundary. The southern boundary of Phase 1 would be formed by the existing wooded access lane, bisecting the overall site.

Plan Key:

A
Proposed new residential street, accessed from Murieston Road

B
Existing tree-lined access to Westfield

C
Proposed greenspace through heart of site, linking to Murieston Trail

D
Existing woodland augmented with new planting where necessary

E
Proposed housing, formed with range of plot sizes

F
Proposed Sustainable Urban Drainage (SUDS) on lower-lying land

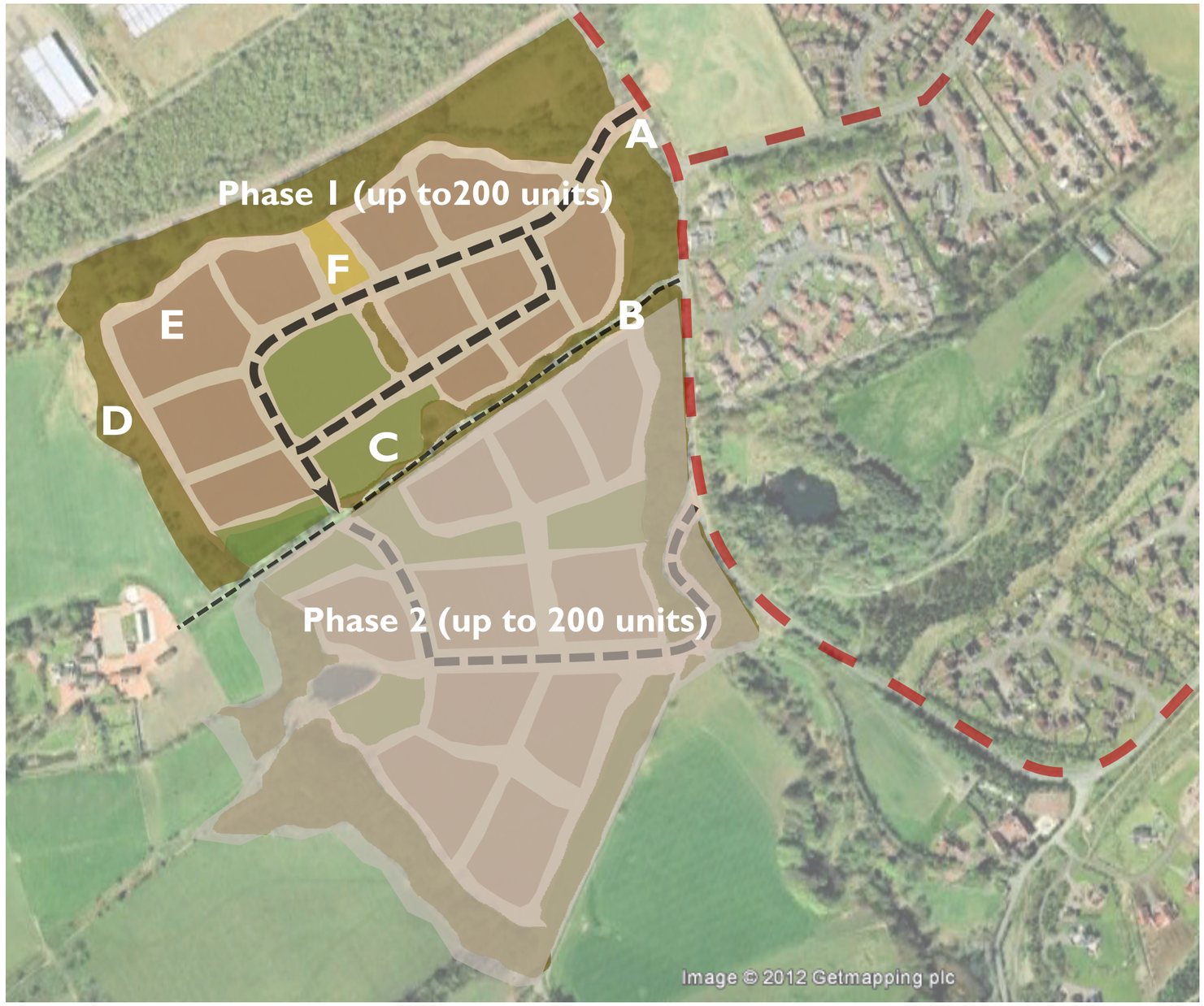

Figure 5 - Indicative Design Framework

Site Effectiveness Summary

Scottish Planning Policy (SPP) and guidance set out in *PAN 2/2010 Affordable Housing and Housing Land Audits* require that sites allocated within Local Development Plans are effective, being able to contribute completions during the plan period (up to year 10 from LDP adoption).

As such, PAN2/2010 criteria for assessing site effectiveness provide a test against which sites require to be gauged with **land west of Murieston Road, Murieston considered effective, being free of potential site constraints and able to deliver units within the plan period.** Specifically:-

Ownership Status: **Effective**

The site is owned by a willing seller and under option to a national housebuilder seeking to start construction at the earliest opportunity.

Physical Status: **Effective**

The appended **Desktop Ground/Services study** indicates there are no restrictions to the proposals with regard to ground conditions or services (not in coal mining risk area and historic limestone mine area in north-east of site will not be developed). The appended **FRA/Drainage Strategy** notes that flood risk will not impact on the proposed development area with surface water drainage options to north and south of the site. The appended **Archaeology Assessment** confirms the site is not subject to constraints that would hinder development, subject to further investigations through the detailed planning stage.

Contamination Status: **Effective**

The site, given its greenfield arable nature, has been deemed to have a low risk of contamination as indicated within the **Desktop Ground/Services study.**

Deficit Funding Status: **Effective**

The development would be privately funded, also allowing for required infrastructure upgrades.

Marketability Status: **Effective**

The wider Edinburgh housing market remains a highly marketable location with demand for both private and affordable units confirmed via the SESplan Housing Needs and Demand Assessment. The proposed site could provide significant completions within the pre-2019 SESplan period plus additional capacity within the 2019-24 period. Based on the estimated Phase 1 capacity of 200 units, a site start in 2016 and annual programmed completions thereafter of 25-50-50-50-25, the site can deliver **125 units within the pre-2019 period**. The remainder of Phase 1 (75 units) and Phase 2 (up to 200 units including 150 units pre-2024) could **contribute a further 225 units towards the 2019-24 housing target**.

Infrastructure Status: **Effective**

Utility connections and water and drainage connections are available to the site with any localised upgrading of capacity able to be met by the developer.

A full **Transport Assessment (TA)** has been undertaken by Jacobs on behalf of BDW Trading & H & J Russell with scoping agreed directly with WLC in April 2014 for a development of up to 400no residential dwellings. Whilst appended to this Representation, to summarise, the TA's findings are positive and underscore the subjects' accessibility in terms of walking, cycling and, moreover, public transport access and thereby its sustainability minimising reliance on private car travel. Jacobs Report includes a Travel Plan Framework to support the foregoing opportunities for sustainable travel.

Notwithstanding, results of concurrent traffic modelling, in line with the agreed scope, demonstrate that the majority of surrounding junctions will operate within capacity with only two requiring minor mitigation which will deliver a 'no net detriment' situation. BDW Trading & H & J Russell support proposed mitigation via an equitable contribution to same.

The appended **Tree Survey** confirms that existing trees at the site access location are not of special quality and limited tree removal can be off-set by sensitive design and compensatory planting.

The site is thus fully deliverable and effective in terms of transport considerations.

The **Education Capacity Appraisal** confirms capacity exists to accommodate initial development within The James Young High, Bellsquarry Primary and St.Ninian's RC Primary with financial contributions towards the upgrade of St,Margaret's Academy. A meeting was held between Clarendon and WLC Education/Planning on 24th April 2014 which highlighted that the school catchment area had existing capacity. If further contributions are required for future school expansion, it was also noted that existing school sites are capable of on-site expansion if required.
Furthermore, the **MIR states that education capacity is available.**

Land Use Status: **Effective**

Housing (both private and affordable) is the predominant proposed use for the site.

Overall

There are no known constraints which will hinder delivery of housing completions within the LDP period.

The site allows for an extension of the established Murieston housing area and can be integrated within the existing urban and landscape context.

The site is located within an area of identified education infrastructure capacity, which is a significant restriction on many other areas within West Lothian.

BDW Trading Ltd and H&J Russell have initiated the planning application process and undertaken supporting studies which demonstrate site deliverability in the short term.

The site is capable of making a significant contribution to West Lothian's housing land supply shortfall. Therefore, it is strongly considered that the site should form a Proposed Housing Allocation within the Proposed LDP.

Appendix 1 - Economic Benefit

Planning Policy Context

Scottish Planning Policy (SPP) outlines the core values of planning which is to ***"play a key role in facilitating sustainable economic growth, particularly the creation of new jobs and the strengthening of economic capacity and resilience within communities"*** (Paragraph 4).

In this respect, SPP contained four planning outcomes with Outcome 1 being a ***"successful, sustainable place – supporting sustainable economic growth and regeneration, and the creation of well-designed, sustainable places"*** (Page 6).

Elaborating on the role of planning to deliver economic growth, Paragraph 16 states:

Good planning creates opportunities for people to contribute to a growing, adaptable and productive economy. By allocating sites and creating places that are attractive to growing economic sectors, and enabling the delivery of necessary infrastructure, planning can help provide the confidence required to secure private sector investment, thus supporting innovation, creating employment and benefiting related businesses.

With particular regard to the role new housing plays, Paragraph 109 states that, ***"house building makes an important contribution to the economy. Planning can help to address the challenges facing the housing sector by providing a positive and flexible approach to development"***.

BDW (Barratt and David Wilson brands)

For the first phase of development at Murieston, comprising 200 units, and assuming a build period of 5 years, BDW will:

- create 60 direct temporary construction jobs per annum;
- create a direct gross value added economic output of £3,309,237 per annum
- support 90 indirect and induced jobs in related areas of the economy per annum
- create an indirect gross value added economic output of £4,666,024 per annum in other areas of the economy - estimating a total gross value added of £39,876,013 over the build period
- create over £1m of total first occupation expenditure in the economy and over £3.5m of ongoing expenditure generated by the residents of the development
- enable an estimated £291,491 of council tax revenue to be generated by the development per annum

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On behalf of BDW Trading Ltd and H&J Russell

Education Capacity Appraisal

In Support of

Planning Application in Principle

At

Murieston Road, Murieston, Livingston, West Lothian

Prepared by Clarendon Planning & Development Ltd

on behalf of BDW Trading Ltd & H&J Russell

March 2014

CLARENDON
PLANNING AND
DEVELOPMENT

Contents

Section 1
Introduction

1.1

This Education Capacity Assessment has been prepared on behalf of the BDW Trading Ltd & HJ Russell by Clarendon Planning and Development, Chartered Town Planning Consultants, in support of a proposed Planning Application in Principle at Murieston, Livingston.

1.2

The purpose of this report is to provide an overview of the education capacity within the relevant school catchment area and the impact that this new development will have on existing and planned education provision within the area and associated impact on site capacity and delivery.

1.3

The proposed residential development capacity is yet to be fully confirmed through detailed design but for the purposes of this appraisal, options for both a 200 and 400 unit development are considered.

Section 2
Methodology & Approach

2.1

This assessment utilises information relating to school rolls and capacity contained within West Lothian Council's '*2011 Base School Forecasts*' report (dated 9th October 2012), which was the base information provided by the Council in the recent appeal at Blackburn by Hallam Land (PPA-400-2036), in addition to planned housing supply information contained within the adopted West Lothian Local Plan, 2013 Housing Land Audit and recent consents.

2.2

The assessment examines the existing school capacities and rolls within the relevant catchment area followed by an assessment of the housing land supply and associated demands on these schools to ascertain the capacity to accommodate proposed development at Murieston and any implications for site delivery. In particular, the following key points will be examined:-

- confirmation of the catchment of non-denominational and denominational primary and secondary schools

- confirmation of the pupil capacities, current school rolls and spare capacity of each school

- indication of pupil places generated by existing and proposed housing land supply, utilising the Council's average child per house ratio, site programming within the 2013 Housing Land Audit and an indicative programme for the proposed site

- confirmation of whether housing land supply can be accommodated within existing school capacity or whether new capacity is required and the impact of emerging housing supply via SESplan/the new LDP

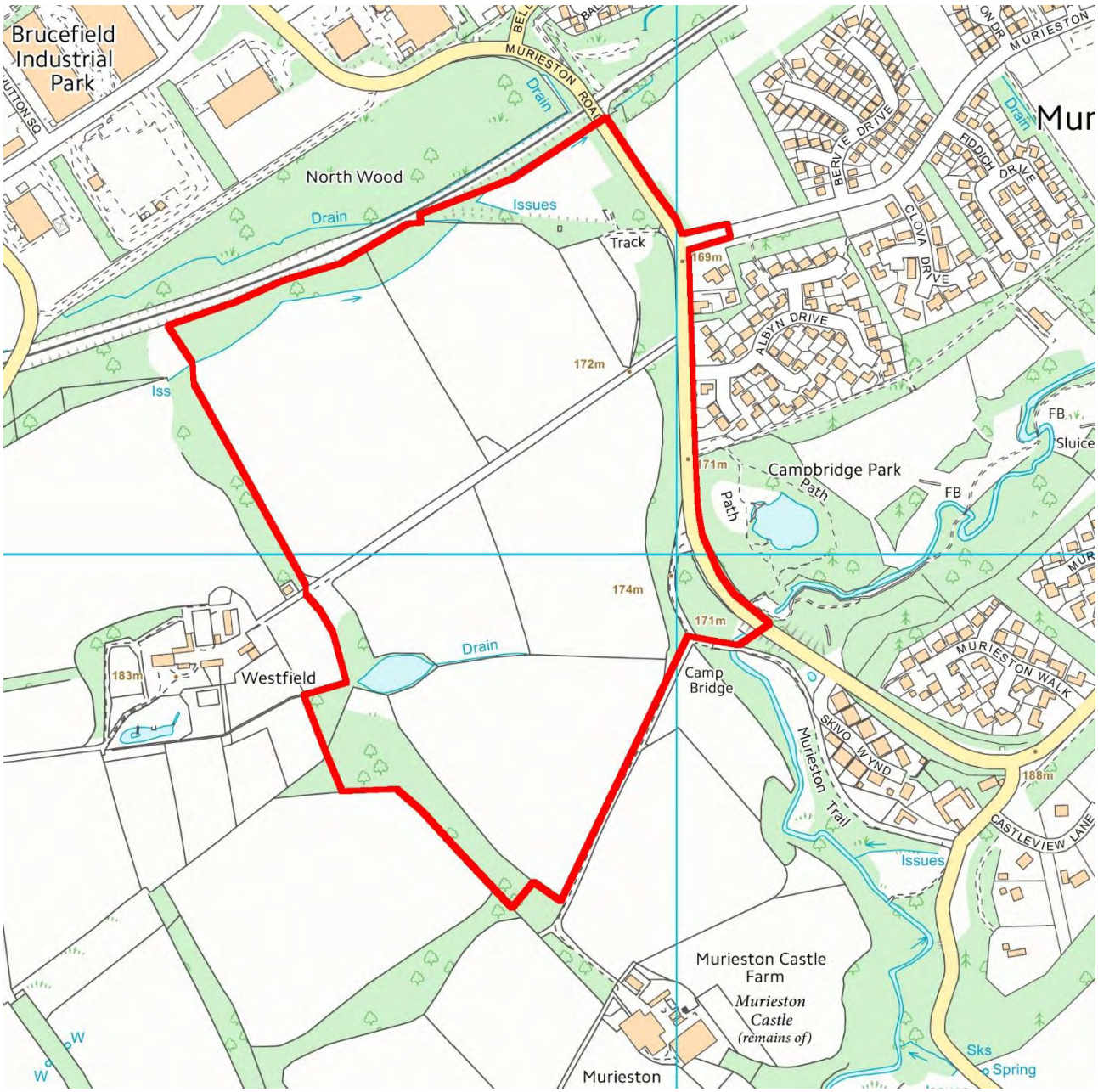
- the level and timing of developer contributions for providing additional school capacity if required and preferred locational aspects of any new school requirement

Section 3
Proposed Development

3.1

The representation addresses educational capacity requirements for a residential development proposal at Murieston Road, Murieston, Livingston. The location of this site is highlighted on **Figure 1** below, which forms the Proposal of Application Notice (PAN) boundary delineated in the PAN submitted to West Lothian Council in March 2014.

Figure 1 – Location Plan



3.2

The proposal is for residential development and associated uses with the proposed application to be in principle with a supporting masterplan. Therefore, the site capacity is yet to be determined via detailed site assessment and design. For the purposes of this appraisal, two options will be utilised; 200 housing units which is understood to accord with a potential Phase 1 development and, 400 housing units, which accords with the estimated total site capacity. An indicative programme for the site (**Table 1**), based upon planning consent and construction lead-in times, is provided below:-

Table 1 – Indicative Programme (based on Housing Land Audit timescales)

Murieston Road	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**Total**
Housing Units Per Annum	0	0	25	50	50	
Completions within 5 Year Effective Land Supply Period:						**125**
Completions post-5 Year Effective Land Supply Period: (based on Option 1 – 200 Units Proposal)						75
Completions post-5 Year Effective Land Supply Period: (based on Option 2 – 400 Units Proposal)						275
Based on PPP submission June 2014, approval October 2014, detailed approval Spring 2015 *Based on 50pa (4.16pcm) sales rate with 2 brands/developers on site*						

Section 4
Education Requirement

4.1

For the purpose of consistency with West Lothian Council's the calculations, site capacity will be assessed utilising formulas contained within the Council's '*2011 Base School Forecasts*' report (dated 9th October 2012).

4.2

Given the requirement for greenfield sites to focus on delivery of family housing but also allow for a mix of house types and urban form (as outlined on Page 107, Paragraph 7.38 of the *Adopted West Lothian Local Plan* with reference to new Core Development Areas), the proposed site would have to accommodate a range of housetypes. Whilst it would be possible to provide an estimated housetype split, for the purpose of this assessment and to accord with the Council's own child per house ratios, the overall site capacity options will be utilised (Option A - 200 units and Option B - 400 units).

4.3

Utilising West Lothian Council's own 'average ratio' formula, as set out within the Council's '*2011 Base School Forecasts*' report (Appendix 5, Section 5), provides for the following average child per house ratios based upon their medium-term forecast:-

- Non-denominational Primary School 0.3156
- Denominational (RC) Primary School 0.0927
- Non-denominational Secondary School 0.1706
- Denominational (RC) Secondary School 0.0597

4.4

Based on this formula, the site would generate the following educational requirement:-

Option A – 200 units

• Non-denominational Primary School	63.12 pupils	64 rounded-up
• Denominational (RC) Primary School	18.54	19 rounded-up
• Non-denominational Secondary School	34.12	34 rounded-up
• Denominational (RC) Secondary School	11.94	12 rounded-up

Option B – 400 units

• Non-denominational Primary School	126.24 pupils	127 rounded-up
• Denominational (RC) Primary School	37.08	38 rounded-up
• Non-denominational Secondary School	68.24	69 rounded-up
• Denominational (RC) Secondary School	23.88	24 rounded-up

These gross figures will be assessed further in terms of programming.

Section 5
Education Capacity Appraisal

Catchment Area Schools

5.1

In terms of **non-denominational** schooling, the site at Murieston is within the catchment areas of the following schools, indicated on ***Figure's 2&3 below***:-

- Bellsquarry Primary School
- The James Young High School

In terms of **denominational** schooling, the site at Murieston is within the catchment areas of the following schools, indicated on ***Figure's 4&5 below***:-

- St.Ninian's Primary School
- St.Margaret's Academy

Figure 2 – Bellsquarry Primary School Catchment (base map courtesy of West Lothian Council)

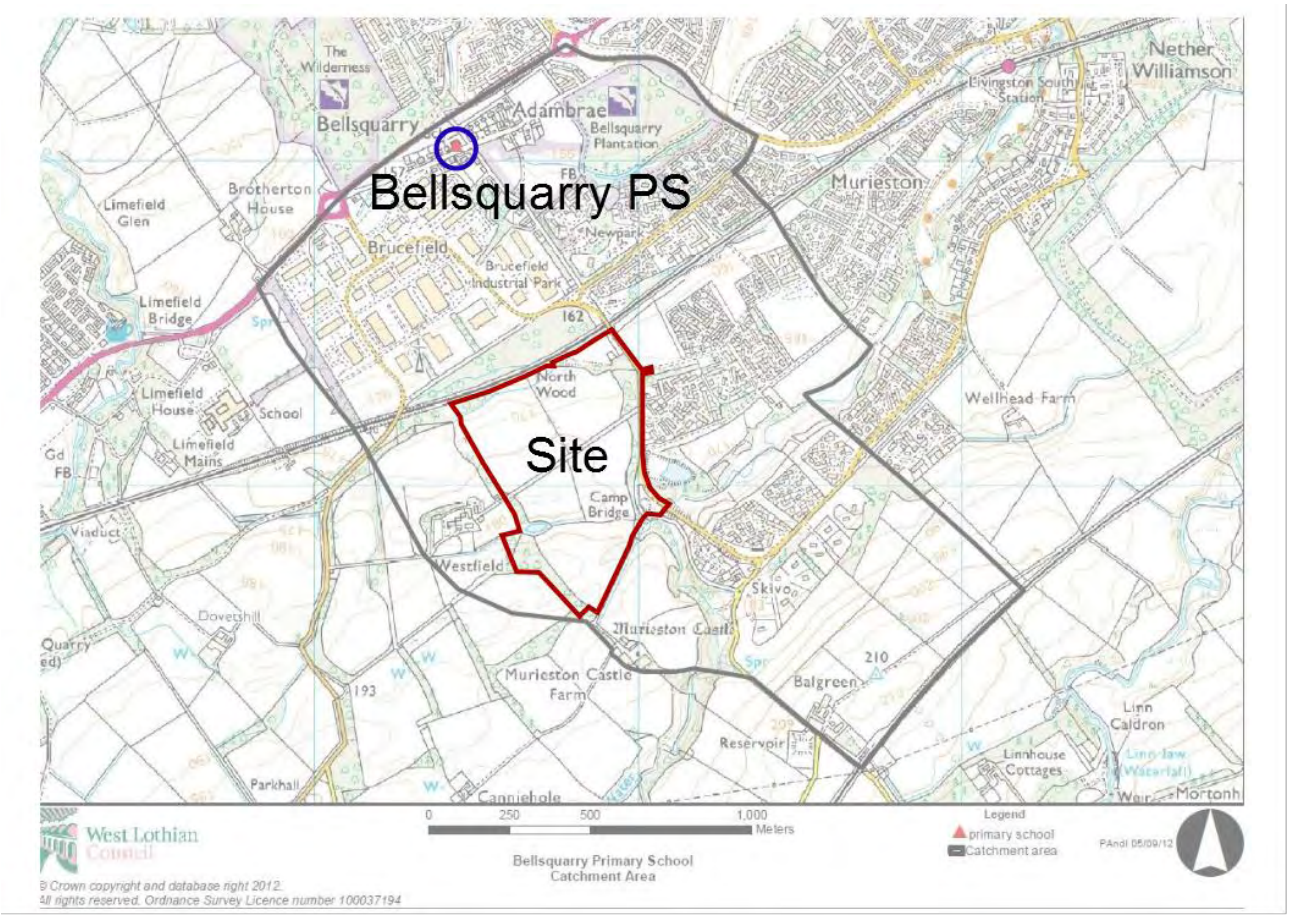


Figure 3 – The James Young High School Catchment (base map courtesy of West Lothian Council)

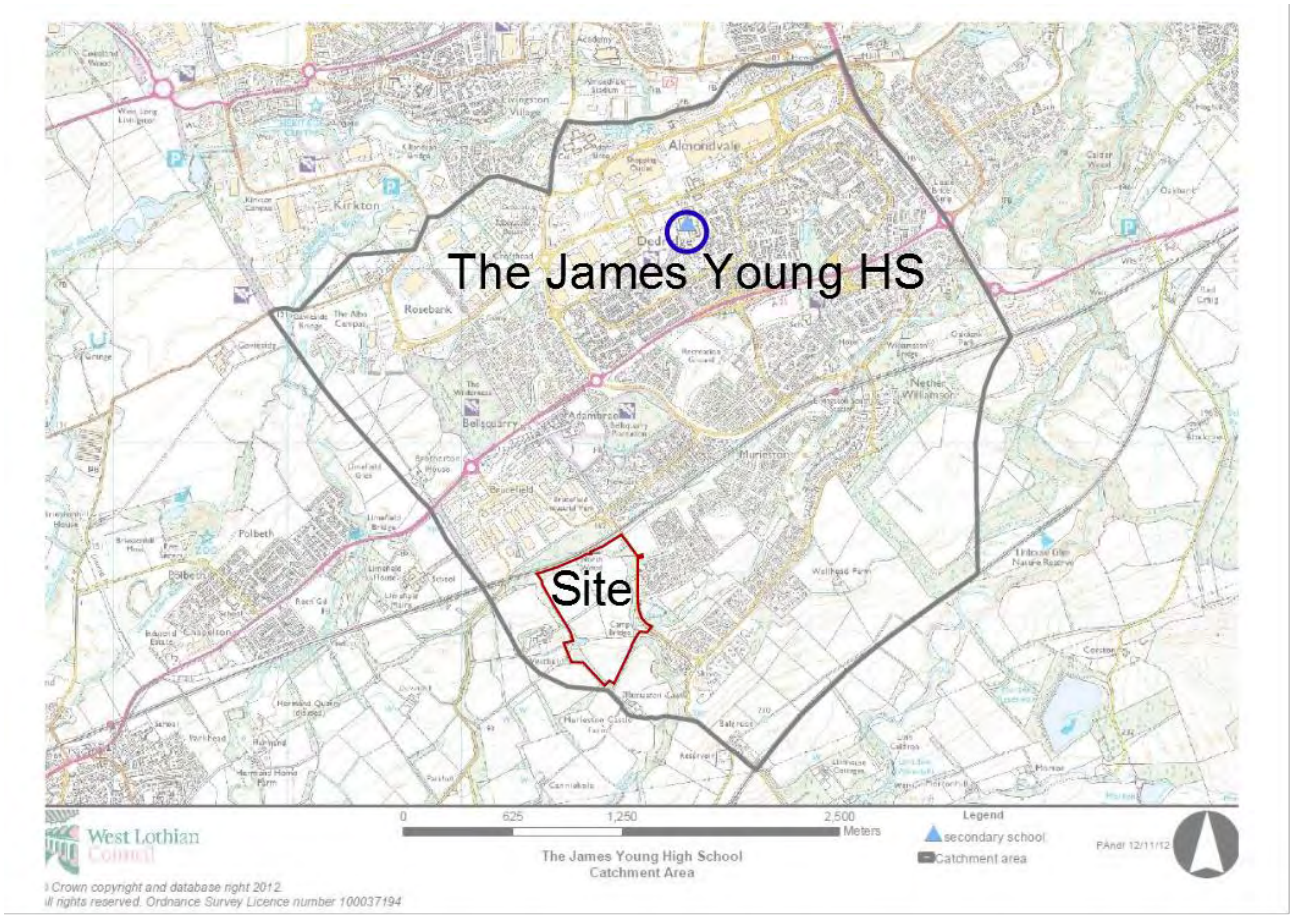


Figure 4 – St.Ninian's RC Primary School Catchment (base map courtesy of West Lothian Council)

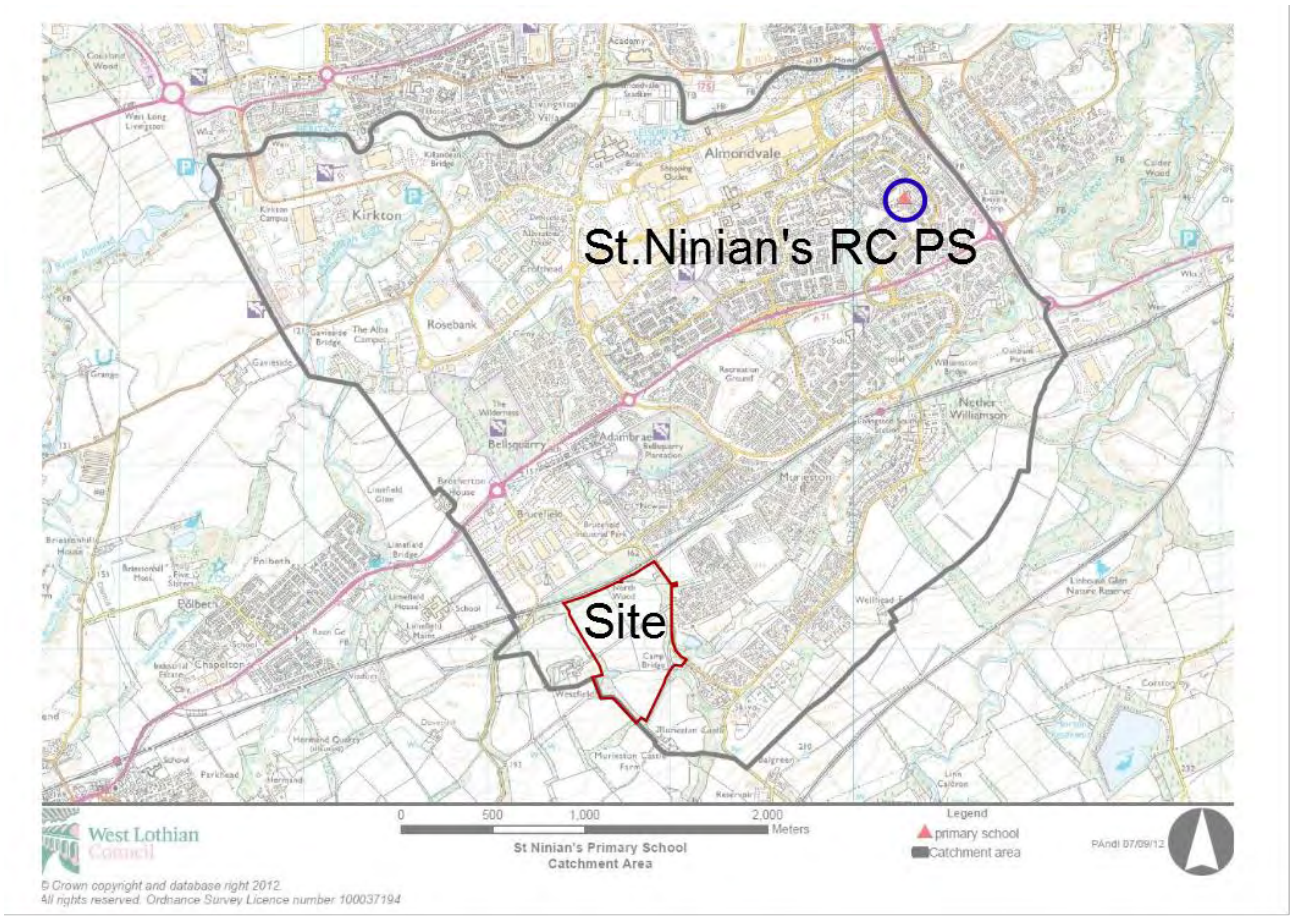
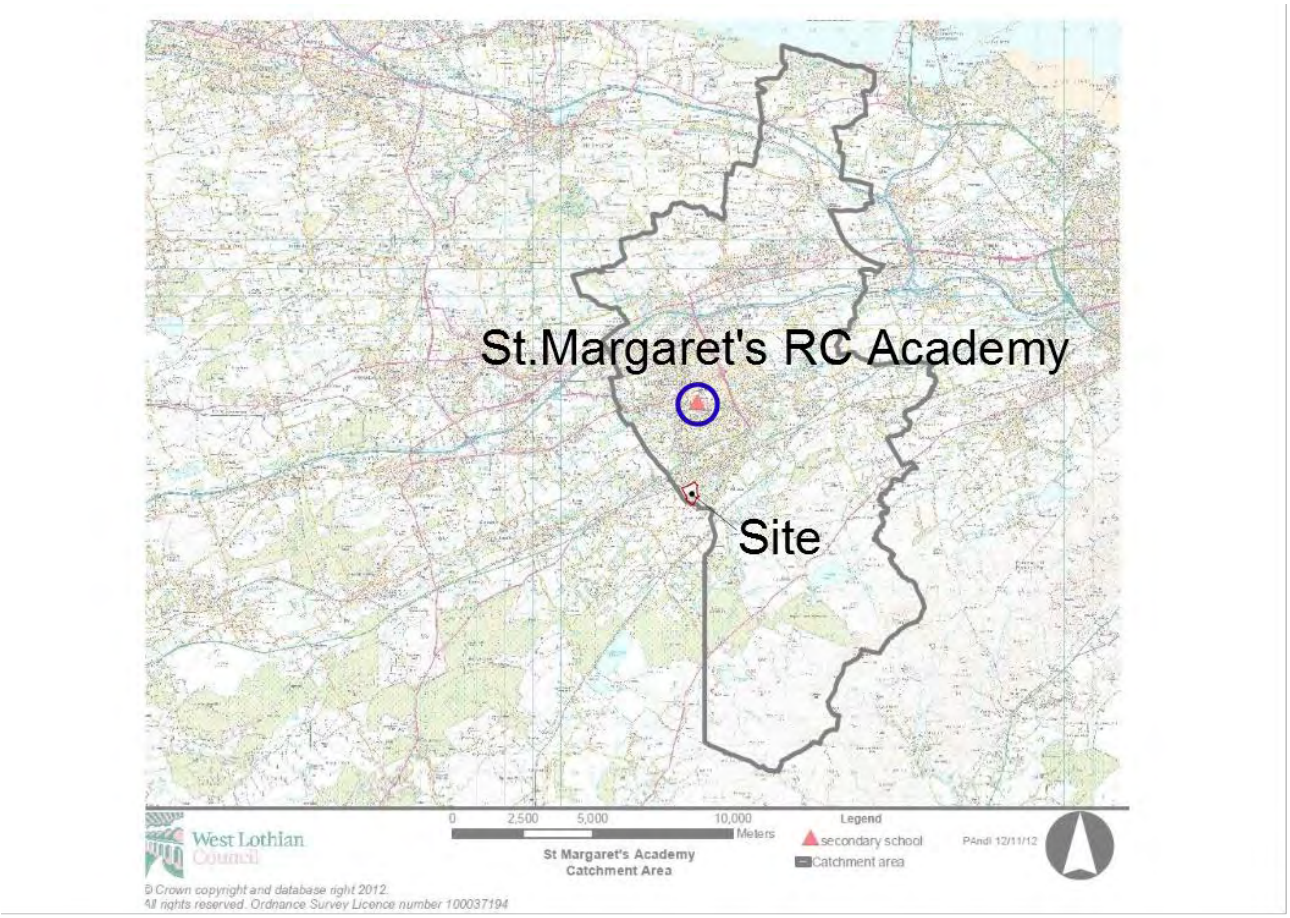


Figure 5 – St.Margaret's RC Academy Catchment (base map courtesy of West Lothian Council)



5.2

As per the Council's Education Appraisal, the capacities, forecast rolls and occupancy rate of these schools is contained in **Table 2** below:-

Table 2 – Catchment Area Schools Capacity

School	Capacity	2013-14 Forecast Roll	Occupancy Rate
Bellsquarry Primary	198	184	93%
The James Young High	1210	1142	94%
St.Ninian's RC Primary	387	276	71%
St.Margaret's RC Aca.	1100	1116	101%

Based upon 2011 Base School Forecasts (9th October 2012)
2013-14 Roll utilises higher of WLC's Auditable and AULP roll forecasts

5.3

West Lothian Council's *Supplementary Planning Guidance 'Denominational Secondary Education Infrastructure' (June 2009)* outlines the planned extension of St.Margaret's Academy. The first phase extension was completed in 2011, increasing capacity to 1,100 with future extensions the subject of a wider consideration of RC educational requirements for West Lothian. This is linked to the provision of a new RC secondary school at Winchburgh, as part of the approved masterplan at that location. As such, whilst estimated extensions to St.Margaret's by 2016 (up to 1,210 capacity) and by 2018 (up to 1,320 capacity) are possible, it may be that a catchment area review guides funding towards the new Winchburgh school in place of further capacity at Livingston.

5.4

The Council's *Supplementary Planning Guidance 'Planning for Education'* sets out the process by which to assess educational capacity demand. In this regard, the existing educational capacity within the catchment area is assessed to confirm whether capacity is or will become available or whether there is potential to amend the catchment area. Thereafter, developer contributions will be sought to improve educational infrastructure in line with adopted Local Plan policies and Supplementary Planning Guidance, whereby phasing of proposed housing through planning condition may be applied to align with new capacity timing.

Programmed Housing Land Supply Sites

5.5

Given that West Lothian have yet to publish a Local Development Plan Main Issues Report, an assessment of programmed housing and its impact upon capacity should be based upon the latest agreed Housing Land Audit (2013). This provides the current Effective Housing Land Supply and incorporates all consented and allocated housing sites which are programmed to contribute units within the next 5 year effective period along with post-5 year non-effective housing sites.

5.6

Table 3 is contained within **Appendix A** and confirms:-

- **no programmed housing output within the non-denominational Primary School catchment area within the next 5 year period**, with 20 No. units programmed beyond this period

- **59 No. units programmed within the non-denominational Secondary School catchment area within the next 5 year period**, with 318 No. units programmed beyond this period

- **59 No. units programmed within the denominational Primary School catchment area within the next 5 year period**, with 318 No. units programmed beyond this period

- **1,274 No. units programmed within the denominational Secondary School catchment area within the next 5 year period**, with 9,717 No. units programmed beyond this period (this catchment is subject to change once a new school is provided at Winchburgh)

Total Existing Pupil Space Requirement

5.7

To calculate the existing pupil space requirement, we can apply the average child per house ratios across both non-denominational and denominational schools and apply this to the programmed housing output in the Table 3 assessment above. This provides for a calculation of pupil space requirement across the next 5 year (Effective Land Supply) period and also in terms of all allocated/consented housing sites within the catchment areas.

5.8

Table 4 is contained within **Appendix A** and confirms:-

- **Zero child space requirement within the non-denominational Primary School catchment area within the next 5 year period**, with 7 No. child spaces required beyond this period (rounded up)

- **11 No. child spaces required within the non-denominational Secondary**

School catchment area within the next 5 year period, with 55 No. child spaces required beyond this period (rounded up)

- **6 No. child spaces required within the denominational Primary School catchment area within the next 5 year period**, with 30 No. child spaces required beyond this period (rounded up)

- **78 No. child spaces required within the denominational Secondary School catchment area within the next 5 year period**, with 581 No. child spaces required beyond this period (rounded up) - subject to change once new school is provided at Winchburgh

5.9

Based on the **existing programmed housing supply** (allocated and consented sites), the following can be confirmed:-

- **Bellsquarry Primary (14 spare spaces at 2013/14)**
  Sufficient capacity for 5 year (14 net spare spaces) and post-5 year supply (7 net spare spaces)

- **The James Young High (68 spare spaces at 2013/14)**
  Sufficient capacity for 5 year (57 net spare spaces) and post-5 year supply (2 net spare spaces)

- **St.Ninians RC Primary (111 spare spaces at 2013/14)**
  Sufficient capacity for 5 year (105 net spare spaces) and post-5 year supply (75 net spare spaces)

- **St.Margaret's RC Academy (over capacity by 16 spaces at 2013/14)**
  Shortfall in capacity for 5 year (94 net spaces required) and post-5 year supply (675 net spare spaces), subject to planned school expansion and new school at Winchburgh

5.10

West Lothian Council produced two forecasts (2011 to 2022) as part of their 2011 Base

School Roll Forecast, one based on 'Auditable' housing sites with some form of permission and one adding Local Plan allocations assuming a post-2018 economic recovery. This provides the following forecast rolls to 2022 and confirm **existing capacity is available for the full period to 2022 with the exception of St.Margaret's Academy**:-

Bellsquarry Primary (198 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable	184	168	147	139	136	137	132	137	142	153
AULP	183	167	146	138	135	136	132	137	142	149

The James Young High (1,210 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable	1140	1131	1116	1088	1061	1023	1013	1024	997	948
AULP	1142	1133	1118	1090	1062	1023	1015	1026	999	947

St.Ninians RC Primary (387 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable	276	256	237	234	234	227	216	208	209	214
AULP	275	255	236	233	232	226	215	208	209	214

St.Margaret's RC Academy (1,100 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable	1111	1118	1137	1153	1144	1150	1170	1186	1187	1173
AULP	1116	1116	1137	1153	1147	1152	1175	1209	1237	1248

Total Pupil Space Requirement incorporating Proposed Site

5.11

To calculate the impact of the proposed site at Murieston Road upon existing education capacity, the estimated site programming within Section 3 and the pupil space generation calculated in Section 4 can be applied to the existing position (Table 4 above).

5.12

An assessment has been calculated upon both Option A (200 units) and Option B (400 units) for Murieston Road, both based upon the indicative site programming of 25 completions in 2015/16 and 50 units per annum thereafter.

5.13

Table 5 is contained within **Appendix A** and confirms that, with the addition of the proposed Murieston Road site:-

- **40 No. child spaces are required within the non-denominational Primary School catchment area within the next 5 year period**, with between 31 and 94 No. child spaces required beyond this period depending on Option A or Option B (rounded up)

- **32 No. child spaces required within the non-denominational Secondary School catchment area within the next 5 year period**, with between 68 and 102 No. child spaces required beyond this period depending on Option A or Option B (rounded up)

- **18 No. child spaces required within the denominational Primary School catchment area within the next 5 year period**, with between 37 and 55 No. child spaces required beyond this period depending on Option A or Option B (rounded up)

- **92 No. child spaces required within the denominational Secondary School catchment area within the next 5 year period**, with between 566 and 578 No. child spaces required beyond this period depending on Option A or Option B (rounded up) - subject to change once new school is provided at Winchburgh

5.14

Based on the above (and assessing a 200-unit Option A and a 400-unit Option B), the following 'gross' capacities can be confirmed, based on the 2013/14 forecast school rolls:-

- **Bellsquarry Primary (14 spare spaces at 2013/14)**
  Shortfall in capacity for 5 year (26 net spaces required) and post-5 year supply

(between 57 and 120 net spaces required)

- **The James Young High (68 spare spaces at 2013/14)**
  Sufficient capacity for 5 year (36 net spare spaces) but shortfall for post-5 year supply (between 32 and 66 net spaces required)

- **St.Ninians RC Primary (111 spare spaces at 2013/14)**
  Sufficient capacity for 5 year (93 net spare spaces) and post-5 year supply (between 38 and 56 net spaces)

- **St.Margaret's RC Academy (over capacity by 16 spaces at 2013/14)**
  Shortfall in capacity for 5 year (108 net spaces required) and post-5 year supply (between 674 and 686 net spare spaces required), subject to planned school expansion and new school at Winchburgh

5.15

However, if **applying the additional Murieston Road requirement to the higher of the 'Auditable' and 'Auditable & Local Plan Allocations' forecasts within the Council's 2011 Base School Roll Forecast**, the following 'adjusted' forecast can be derived:-

Bellsquarry Primary (198 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable/AULP	184	168	147	139	136	137	132	137	142	153
+Murieston Rd	184	168	155	155	162	153	148	153	158	169

The James Young High (1,210 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable/AULP	1142	1133	1118	1090	1062	1023	1015	1026	999	948
+Murieston Rd	1142	1133	1123	1099	1071	1032	1024	1035	1008	957

St.Ninians RC Primary (387 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable/AULP	276	256	237	234	234	227	216	208	209	214
AULP	276	256	240	239	239	232	221	213	214	219

St.Margaret's RC Academy (1,100 No. capacity)

F/cast	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Auditable/AULP	1111	1118	1137	1153	1147	1152	1175	1209	1237	1248
AULP	1111	1118	1139	1156	1150	1155	1178	1212	1240	1251

5.16

When utilising the Council's own forecasts, the additional educational requirement derived from the Murieston Road site can be accommodated in all schools with the exception of St.Margaret's Academy. As noted earlier, a solution to RC educational capacity is being addressed by West Lothian Council via financial contributions to allow for either extension of St.Margaret's plus the new Winchburgh RC secondary, or the latter only, dependent upon catchment area review.

Emerging Housing Land Supply and Flexibility Allowance

5.17

Notwithstanding the existing housing supply including allocated and consented sites, West Lothian Council are currently preparing a new Local Development Plan. A Main Issues Report is expected in Summer 2014 and this will include options for new housing sites to meet SESplan requirements to identify an additional 2,130 units in the period to 2024 (as per draft Supplementary Guidance expected to be approved by the Government in June 2014).

5.18

Therefore, significant new housing land supply is expected to be brought forward via the Local Development Plan which will have further direct implications on education capacity across the local authority area.

5.19

The exact requirement will not be able to be confirmed until the Proposed LDP stage (likely to be 2015) but in the meantime, the need to augment the shortfall in West Lothian's effective housing land supply needs to be addressed.

5.20

Given the above, and the findings of this assessment, sufficient educational capacity will be required for future growth, population projections and non-catchment placements. In this regard, additional capacity will be required for the Murieston catchment areas.

5.21

However, given the need to deliver housing supply in the short term, realistic approaches will be required by West Lothian Council which allow for suitable timing of additional schools or school extensions.

Timing of Increased School Capacity & Contributions

5.22

Based on the above, it is considered that whilst additional school space in the Murieston catchment area will be required, the impact varies when assessed against non-denominational and denominational primary and secondary schooling.

5.23

Based on assessments of capacity based on either 'gross' capacities derived from the 2013 forecast school roll or the Council's 2011 Base School Roll Forecast, both St.Ninian's RC Primary and The James Young High School have capacity to accommodate programmed housing plus the Murieston Road site for the next 5 years. It is expected that **financial contributions** towards the extension or new provision of the High School *may* be required for the post-5 year period (i.e. beyond 125 units), which could be addressed within any planning approval at Murieston Road.

5.24

Bellsquarry Primary can accommodate required capacity based on the 2011 Base School Roll Forecast but the latest forecast calculations would require to be verified by the Council to determine whether additional capacity may be required. However, there is also **clear scope to utilise spare capacity at St.Ninian's** if short to medium term capacity is required. Therefore, **financial contributions** towards the extension or new provision of the Primary School *may* be required, which could be

addressed within any planning approval at Murieston Road.

5.25

Finally, with regard to **St.Margaret's RC Academy**, the **current over-capacity issue requires to be addressed**. Planned extensions, as per the Council's Supplementary Planning Guidance, would increase capacity from 1,100 t0 1,320 within the next 5 years – this **planned additional capacity would accommodate programmed housing supply and the Murieston Road site**. Additionally, the **post-5 year period is expected to align with the provision of a new denominational secondary** as part of a new Winchburgh schools campus (this has to be provided by the 550th housing completion at Winchburgh, which is programmed by 2018/19 in the 2013 Audit). Further confirmation from West Lothian Council would be required to be sought in relation to these timescales.

5.25

In the short to medium term, it is considered that there is scope to utilise spare capacity within The James Young High School, which has a forecast decreasing roll to 2022, subject to agreement with West Lothian Council. However, it should also be noted that the recent planning approval for Gladman at Eliburn (ref.0056/P/12), comprising 87 units as part of a mixed-use scheme, was approved with just a requirement for financial contributions towards denominational secondary schools (£1,983 per unit) – this site is within the St.Margaret's catchment and was an allocated business site, i.e. a windfall housing site. Additionally, recent approval for the CALA site at Murieston (ref.0780/FUL/12) significantly increased density from that contained within the Local Plan for this allocated site (consent for 59 units as against Local Plan density of 14 units), again with just a requirement for financial contributions towards denominational secondary schooling. In this respect, notwithstanding capacity issues at St.Margaret's, the Council may be adopting a practical approach in any case to enable housing to be delivered.

5.27

Financial contribution requirements are set out within West Lothian Council's Supplementary Planning Guidance; 'Developer Contributions towards School Commissioning Costs' (specific costs subject to individual area requirements) and 'Denominational Secondary Education Infrastructure' (£1,983 per residential unit).

Section 6
Summary

- **The proposed development at Murieston Road has two options; a 200 unit option and a 400 unit option. These options generate between 64-127 non-denominational primary pupils, 19-38 denominational primary pupils, 34-69 non-denominational secondary pupils and 12-24 denominational secondary pupils**

- **West Lothian Council's 2011 Base School Roll Forecast has been utilised to determine the 2013 forecast rolls and occupancies; Bellsquarry Primary (184, 93% capacity), The James Young High (1,142, 94% capacity), St.Ninian's RC Primary (276, 71% capacity) and St.Margaret's Academy (1,116, 101% capacity)**

- **Adopted Supplementary Planning Guidance outlines planned extensions for St.Margaret's Academy in two stages by 2018 whilst there is also a requirement for a new RC secondary school by the 550th completion at Winchburgh (programmed as 2018/19)**

- **Existing programmed housing land supply (both effective and post-5 year supply) can be accommodated at all catchment schools with the exception of St.Margaret's Academy**

- **Additional capacity requirements for the proposed Murieston Road site may require financial contributions for non-denominational Secondary School beyond 125 units but when assessed against the Council's 2011 Base School Roll Forecast (to 2022), all catchment area schools can accommodate requirements with the exception of St.Margaret's Academy**

- **Shortfall in capacity at St.Margaret's Academy will be rectified if the planned extension outlined in West Lothian Council's SPG comes forward (increase from 1,100 to 1,210 capacity by 2016 and to 1,320 by 2018); current required financial contributions are £1,983 per unit**

- **Alternatively, spare capacity within The James Young High School could be utilised within the short to medium term (5 year period), subject to agreement with West Lothian Council**

- **Additionally, recent planning approvals within the St.Margaret's catchment area (Eliburn - ref.0056/P/12 and Murieston – ref.0780/FUL/12), comprising 87 units on a non-allocated windfall site and an increased density of a Local Plan site by 45 units respectively, were approved by the Council subject only to financial contributions for denominational schooling**

- **Financial contributions may be required for non-denom requirements in the post-5 year period (costs subject to area-specific assessments)**

BDW Trading Limited and H&J Russell

Proposed Development at Murieston, Livingston

Flood Risk Assessment

15 July 2014

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Document Information and History

Project:	Proposed Development at Murieston, Livingston
Client:	BDW Trading Ltd and H&J Russell
Client Representative:	Ross Manson, Clarendon Planning
Kaya Consulting Job Number:	KC785
Filename:	Murieston FRA Rev 1 15 July 2014
Project Director:	Michael Stewart
Author	Michael Stewart/Anni Luttu

This document has been issued and amended as follows:

Version	Date	Description	Created by:	Verified by:	Approved by:
V1.0	15.07.2014	Draft Report	M Stewart /Anni Luttu	Y Kaya	Y Kaya
V2.0	10.10.2014	Final Report	M Stewart	Y Kaya	Y Kaya

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1 Introduction

Kaya Consulting Ltd. was commissioned by BDW Trading Ltd and H&J Russell though Clarendon Planning and Development Limited to undertake a flood risk assessment at a proposed development site in the Murieston area of Livingston.

The site is located on a sloping greenfield ground on the edge of Murieston area of Livingston. There are a number of water features within and close to the site boundary, including an unnamed watercourse / field drain close to the northern boundary of the site, and a small pond near the south-west corner of the site. The site currently drains north and east. A flood risk assessment would need to consider risk from the watercourses, surface water runoff from adjacent land and groundwater.

The flood risk assessment is in support of a Planning Application in Principle.

The scope of work includes the following:

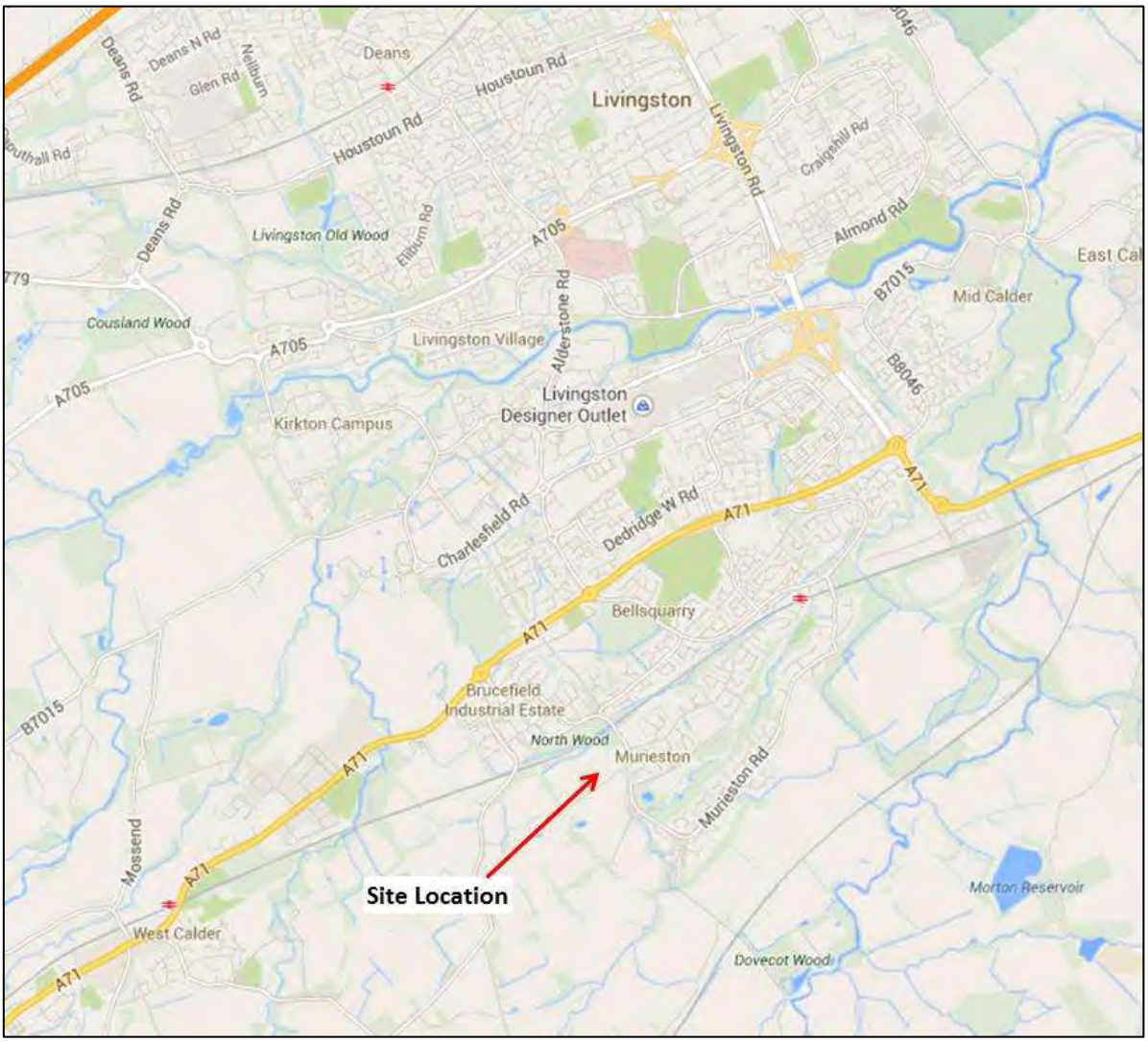
- Walkover site visit, including identification of key water features on site.
- Contact local council flooding officers with a view to obtain any relevant information related to the site including historical flood records.
- Assessment of flooding risk from open watercourses. This will be based on definition of catchment areas, simple calculations and LiDAR topographical data, if available.
- Assessment of flooding risk from surface water runoff from adjacent land.
- Assessment of risk from groundwater, based on readily available data.
- Overview of site drainage options and calculation of greenfield runoff rates.
- Development of outline SuDS drainage strategy, based on discharging attenuated surface water runoff to the open watercourse within the site.
- Identification of work required for a full flood risk assessment at the detailed design stage.
- Flood Risk Assessment report suitable for submission with planning application in principle.

Information made available to Kaya Consulting Ltd for the study includes the following:

- Location plan;
- Topographical survey of the site; and
- Outline development layout (Masterplan).

A general location map of the site is shown in Figure 1. The work carried out to assess the flooding risk of the site and main findings of the study are summarised in the following sections.

Figure 1: General site location



2 Legislative and Policy Aspects

2.1 National Planning Policy

The current version of the Scottish Planning Policy (SPP) was published in June 2014 and replaces the previous version which was published in February 2010. The SPP sets out national planning policies which reflect Scottish Government's priorities for operation of the planning system and for the development and use of land. It relates to:

- the preparation of development plans;
- the design of development, from initial concept through to delivery; and
- the determination of planning applications and appeals.

The National Planning Framework (NPF) provides a statutory framework for Scotland's long term spatial development and sets out the Scottish Government's spatial development priorities for the next 20 to 30 years. The SPP sets out the policy that will help to deliver the objectives of the NPF.

Some extracts from the SPP are listed below:

Policy Principles

255. The planning system should promote:

- *a precautionary approach to flood risk from all sources, including coastal, water course*
- *(fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and*
- *culverts), taking account of the predicted effects of climate change;*
- *flood avoidance: by safeguarding flood storage and conveying capacity, and locating*
- *development away from functional flood plains and medium to high risk areas;*
- *flood reduction: assessing flood risk and, where appropriate, undertaking natural and*
- *structural flood management measures, including flood protection, restoring natural features*
- *and characteristics, enhancing flood storage capacity, avoiding the construction of new*
- *culverts and opening existing culverts where possible; and*
- *avoidance of increased surface water flooding through requirements for Sustainable*
- *Drainage Systems (SuDS) and minimising the area of impermeable surface.*

256. To achieve this, the planning system should prevent development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere. Piecemeal reduction of the functional floodplain should be avoided given the cumulative effects of reducing storage capacity.

257. Alterations and small-scale extensions to existing buildings are outwith the scope of this policy, provided that they would not have a significant effect on the storage capacity of the functional floodplain or local flooding problems.

Key Documents

- *Flood Risk Management (Scotland) Act 2009105*
- *Updated Planning Advice Note on Flooding*
- *Delivering Sustainable Flood Risk Management106 (Scottish Government, 2011).*
- *Surface Water Management Planning Guidance107 (Scottish Government, 2013).*

Delivery

258. Planning authorities should have regard to the probability of flooding from all sources and take flood risk into account when preparing development plans and determining planning applications. The calculated probability of flooding should be regarded as a best estimate and not a precise forecast. Authorities should avoid giving any indication that a grant of planning permission implies the absence of flood risk.

259. Developers should take into account flood risk and the ability of future occupiers to insure development before committing themselves to a site or project, as applicants and occupiers have ultimate responsibility for safeguarding their property.

Development Planning

260. Plans should use strategic flood risk assessment (SFRA) to inform choices about the location of development and policies for flood risk management. They should have regard to the flood maps prepared by Scottish Environment Protection Agency (SEPA), and take account of finalised and approved Flood Risk Management Strategies and Plans and River Basin Management Plans.

261. Strategic and local development plans should address any significant cross boundary flooding issues. This may include identifying major areas of the flood plain and storage capacity which should be protected from inappropriate development, major flood protection scheme requirements or proposals, and relevant drainage capacity issues.

262. Local development plans should protect land with the potential to contribute to managing flood risk, for instance through natural flood management, managed coastal realignment, washland or green infrastructure creation, or as part of a scheme to manage flood risk.

263. Local development plans should use the following flood risk framework to guide development. This sets out three categories of coastal and watercourse flood risk, together with guidance on surface water flooding, and the appropriate planning approach for each (the annual probabilities referred to in the framework relate to the land at the time a plan is being prepared or a planning application is made):

- ***Little or No Risk*** *– annual probability of coastal or watercourse flooding is less than 0.1% (1:1000 years)*
  - *No constraints due to coastal or watercourse flooding.*
- ***Low to Medium Risk*** *– annual probability of coastal or watercourse flooding is between 0.1% and 0.5% (1:1000 to 1:200 years)*
  - *Suitable for most development. A flood risk assessment may be required at the upper end of the probability range (i.e. close to 0.5%), and for essential infrastructure and the most vulnerable uses. Water resistant materials and construction may be required.*
  - *Generally not suitable for civil infrastructure. Where civil infrastructure must be located in these areas or is being substantially extended, it should be designed to be capable of remaining operational and accessible during extreme flood events.*
- ***Medium to High Risk*** *– annual probability of coastal or watercourse flooding is greater than 0.5% (1:200 years)*
  - *May be suitable for:*
    - *residential, institutional, commercial and industrial development within built-up areas provided flood protection measures to the appropriate standard already exist and are maintained, are under construction, or are a planned measure in a current flood risk management plan;*
    - *essential infrastructure within built-up areas, designed and constructed to remain operational during floods and not impede water flow;*
    - *some recreational, sport, amenity and nature conservation uses, provided appropriate evacuation procedures are in place; and*
    - *job-related accommodation, e.g. for caretakers or operational staff.*
  - *Generally not suitable for:*

        - *civil infrastructure and the most vulnerable uses;*
        - *additional development in undeveloped and sparsely developed areas, unless a location is essential for operational reasons, e.g. for navigation and water-based recreation, agriculture, transport or utilities infrastructure (which should be designed and constructed to be operational during floods and not impede water flow), and an alternative, lower risk location is not available; and*
        - *new caravan and camping sites.*
    - *Where built development is permitted, measures to protect against or manage flood risk will be required and any loss of flood storage capacity mitigated to achieve a neutral or better outcome.*
    - *Water-resistant materials and construction should be used where appropriate. Elevated buildings on structures such as stilts are unlikely to be acceptable.*

Surface Water Flooding

- *Infrastructure and buildings should generally be designed to be free from surface water flooding in rainfall events where the annual probability of occurrence is greater than 0.5% (1:200 years).*
- *Surface water drainage measures should have a neutral or better effect on the risk of flooding both on and off the site, taking account of rain falling on the site and run-off from adjacent areas.*

Development Management

264. It is not possible to plan for development solely according to the calculated probability of flooding. In applying the risk framework to proposed development, the following should therefore be taken into account:

- *the characteristics of the site;*
- *the design and use of the proposed development;*
- *the size of the area likely to flood;*
- *depth of flood water, likely flow rate and path, and rate of rise and duration;*
- *the vulnerability and risk of wave action for coastal sites;*
- *committed and existing flood protection methods: extent, standard and maintenance regime;*
- *the effects of climate change, including an allowance for freeboard;*
- *surface water run-off from adjoining land;*
- *culverted watercourses, drains and field drainage;*
- *cumulative effects, especially the loss of storage capacity;*
- *cross-boundary effects and the need for consultation with adjacent authorities;*
- *effects of flood on access including by emergency services; and*
- *effects of flood on proposed open spaces including gardens.*

265. Land raising should only be considered in exceptional circumstances, where it is shown to have a neutral or better impact on flood risk outside the raised area. Compensatory storage may be required.

266. The flood risk framework set out above should be applied to development management decisions. Flood Risk Assessments (FRA) should be required for development in the medium to high category of flood risk, and may be required in the low to medium category in the circumstances described in the framework above, or where other factors indicate heightened risk. FRA will generally be required for applications within areas identified at high or medium likelihood of flooding/flood risk in SEPA's flood maps.

267. Drainage Assessments, proportionate to the development proposal and covering both surface and foul water, will be required for areas where drainage is already constrained or otherwise problematic, or if there would be off-site effects.

268. Proposed arrangements for SuDS should be adequate for the development and appropriate long-term maintenance arrangements should be put in place.

2.2 National Indicative River and Coastal Flood Map (Scotland)

The SEPA third generation flood map shows the likely extent of flooding for high, medium and low likelihood for fluvial, pluvial (surface water) flows and tidal waters. Consultation of the map shows that the site is outside of any mapped fluvial floodplains in the area. However, the maps show part of the north-east corner of the site lying within the surface water flood map (pluvial flood map). The maps suggest flooding upstream of the old railway line culvert within the site. SEPA maps are indicative, and for sites close to or partially within the flood extent a detailed site specific assessment is required to determine flooding risk more accurately.

2.3 SEPA Technical Flood Risk Guidance

The latest version of SEPA 'Technical Flood Risk Guidance for Stakeholders' would need to be consulted when undertaking flood risk assessments (current version is 8, February 2014). This technical guidance document is intended to outline methodologies that may be appropriate for hydrological and hydraulic modelling and sets out what information SEPA requires to be submitted as part of a Flood Risk Assessment.

SEPA Policy 41 sets out roles and responsibilities of SEPA and Planning Authorities.

2.4 Flood Risk Management (Scotland) Act 2009

The Flood Risk Management (Scotland) Act 2009 came into force on 26 November 2009. The Act repealed the Flood Prevention (Scotland) Act 1961 and introduces a more sustainable and streamlined approach to flood risk management, suited to present and future needs and to the impact of climate change. It encourages a more joined up and coordinated process to manage flood risk at a national and local level.

The Act brings a new approach to flood risk management including a framework for coordination and cooperation between all organisations involved in flood risk management, new responsibilities for SEPA, Scottish Water and local authorities in relation to flood risk management, a revised and streamlined process for flood protection schemes, new methods to enable stakeholders and the public to contribute to managing flood risk; and SEPA to act as a single enforcement authority for the safe operation of Scotland's reservoirs.

2.5 Controlled Activities Regulations

The Water Environment (Controlled Activities) (Scotland) Amended Regulations 2013 (CAR) brings new controls for discharges, abstractions, impoundments and engineering works in or near inland waters. Any such work requires authorisation (licence) from the Scottish Environment Protection Agency (SEPA) who are responsible for the implementation of the Act. The Regulations include a requirement that surface water discharge must not result in pollution of the water environment. It also makes Sustainable Drainage Systems (SuDS) a requirement for new development, with the exception of runoff from a single dwelling and discharges to coastal waters.

2.6 Climate Change

The SPP states that "*planning system should promote a precautionary approach to flood risk from all sources, including coastal, water course (fluvial), surface water (pluvial), groundwater, reservoirs and drainage systems (sewers and culverts), taking account of the predicted effects of climate change.*"

One of the sustainable policy principles within the National Planning Framework is supporting climate change mitigation and adaptation including taking account of flood risk.

SEPA recommend a 20% increase in peak flow for the 0.5% AEP (1:200) event, in accordance with DEFRA (Department of Environment, Food and Rural Affairs) and recent Scottish Government research. Although the 2009 climate change predictions (UKCP09) provides information on spatial variations, for current studies a 20% increase in peak flows is assumed.

It is recommended that any site drainage design considers future estimates of increased precipitation and follows an adaptive approach.

3 Site Location and Description

The proposed development is a greenfield site in the Murieston area of Livingston, West Lothian, Figure 2. The site is currently in grassed fields, Photo 1.

The site is bounded to the west by fields and a narrow band of trees. To the south the site is bounded by an access road to Westfield Farm and beyond the road are more fields. The site is bounded to the north-east by a B-class road and existing developments beyond. A railway line runs along the northern boundary of the site, separated from the site by an area of trees.

The site slopes north and north-east from a high point at the south-western boundary of the site. Ground levels in this area are at around 183 m AOD (Above Ordnance Datum), with the lowest point at the north-east corner of the site at approximately 158 m AOD. The site topography is shown in Figure 3, with 0.5 m contours produced from the site topographical survey.

From a review of historical maps of the area it is clear that there was a small limestone quarry at the north-eastern corner of the site (Westfield Mine). The mine is visible as an operational mine in Ordnance Survey maps of 1908. It is shown closed in the 1940s, although the 1940s maps show a number of ponds within the site towards the north-east corner. These ponds are no longer water features within the site and all that remains of the mine is raised ground at the north-eastern corner that represents a railway embankment that used to take a spur off the main railway to the mine site.

An unnamed stream flows along the northern boundary of the site and separates the site from the narrow tree belt running along the railway. The stream is around 1 to 1.5 m wide through the site and it flows parallel to the railway line. A minor tributary enters the stream from under the railway line near to the mid-point of the site (Figure 2) and a small ditch enters the stream at the north-east corner of the site. The ditch receives runoff from the eastern part of the site. The unnamed stream leaves the site through a brick arched culvert under Murieston Road, Photo 2. The arch was measured in the field to be 1.2 m wide and 1.45 m high, Photo 3. Within the site the stream passes under the old railway embankment by way of a 0.9 m high and 1.5 m wide arched culvert, Figure 3.

The Third Generation SEPA Indicative Flood Map of the site shows part of the north-east corner of the site lying within the surface water flood map (pluvial flood map). The maps suggest flooding upstream of the old railway line culvert within the site.

West Lothian Council's flooding officer was contacted to obtain any relevant information regarding historical flooding at the site. The flooding officer had no records of historical flooding at the site and the council held no information on the culverted watercourse downstream of the site.

Figure 2: Site Location

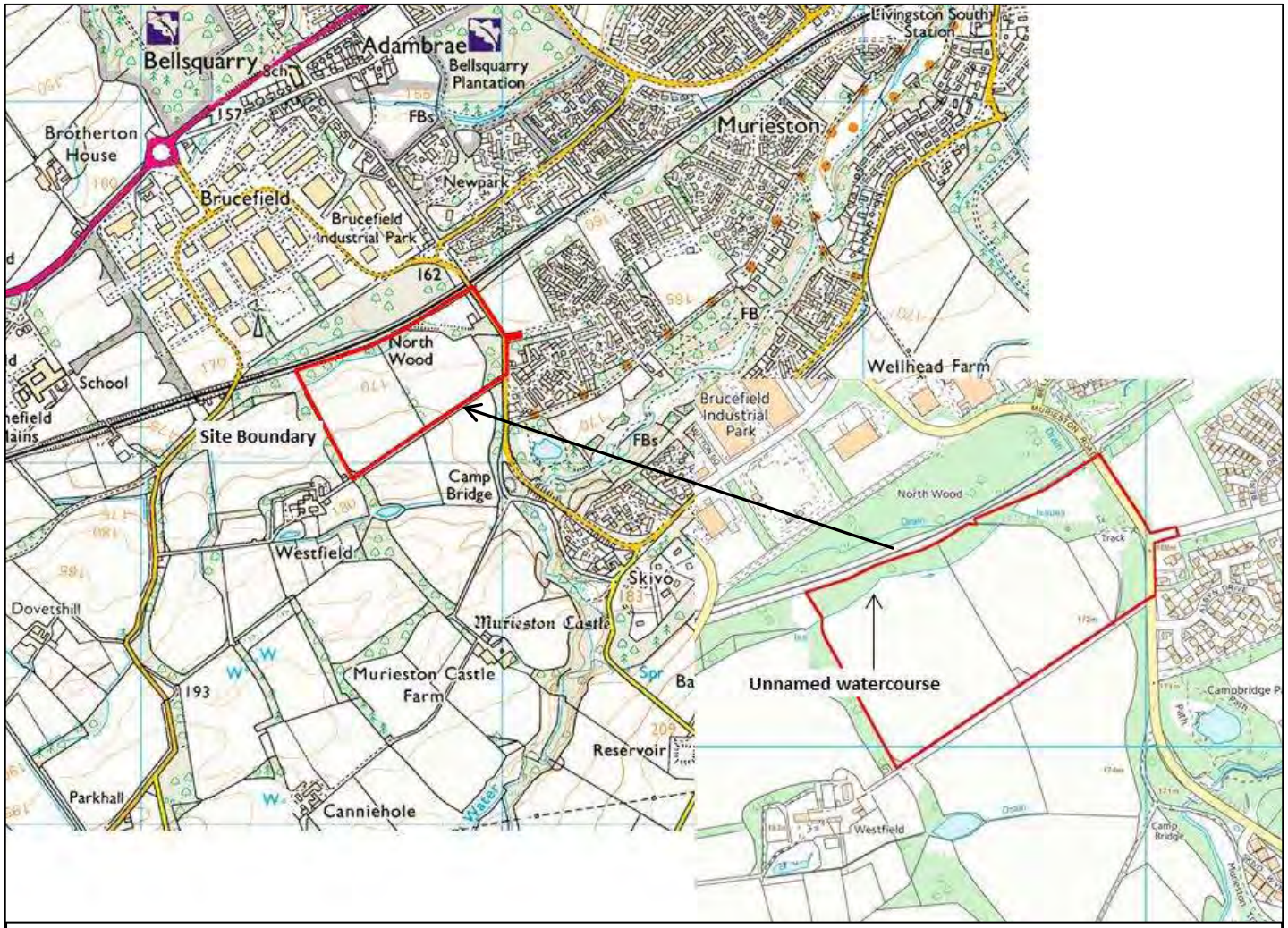


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Figure 3: Site Topography and Surface Flow Pathways

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Plate 1: View of site from south-east corner

Plate 2: View of unnamed stream downstream of site from Murieston Road culvert

Plate 3: Culvert under Murieston Road

4 Hydrological Analysis

The hydrological assessment makes estimates of;

- Design flows for Unnamed Stream; and
- Greenfield runoff rate.

4.1 Estimation of design flows for Unnamed Stream

The catchment area for the unnamed stream is difficult to determine as there are a number of man-made land drains affecting flow paths upstream of the site. Based on the Flood Estimation Handbook (FEH) CD-Rom Version 3 the catchment is calculated to be 0.59 km^2. However, following a site visit and inspection of the upstream catchment, it appears that the catchment of unnamed stream could be as much as 1.05 km^2, with the catchment area is shown in Figure 4. As the headwaters are impacted by a number of man-made drains and road crossings, there may be significant attenuation in the upstream areas, so design flows based on the full 1.05 km^2 catchment are likely to be conservative (high).

Key catchment characteristics are shown in Table 1.

Table 1: FEH CD-Rom Version 3 Catchment characteristics for Unnamed Stream at site

Parameter	Value
Easting (m)	304450
Northing (m)	664350
AREA (km^2)	1.05[a]
ALTBAR (m)	181
ASPBAR (^{o})	3
ASPVAR	0.73
BFIHOST	0.312
DPLBAR	2.3[a]
DPSBAR	26.1[a]
FARL	1
LDP	1.57
PROPWET	0.49
SAAR (mm)	885
SAAR4170 (mm)	910
SPRHOST	39.7
URBCONC1990	-
URBEXT1990	0
URBLOC1990	-

A Edited from FEH CD-Rom values

For small ungauged watercourses, the FEH recommends that return period flows are estimated based on standard rainfall-runoff methods. For the purpose of this assessment we have considered the FEH Rainfall-Runoff method and Institute of Hydrology (IH) small catchment method (Report 124) with FSR scaling factors. The results for each method are provided in Table 2.

Table 2: Return period flow estimates for Unnamed Stream at site

Method	Q_{200} (m^3/s)	Q_{200} + climate change (m^3/s)
[a]FEH Rainfall-Runoff	2.1	2.5
[b]IH124	1.8	2.1

a Design storm duration 3.9 hours, Design storm depth = 59.1 mm
b SAAR = 885 mm, SOIL = 0.45 (ISOIL4), Urban Correction = 1

To be conservative, the 200 year design flow for Unnamed Stream is estimated to be 2.1 m^3/s, based on the FEH Rainfall-Runoff method, which produced the highest design flow in Table 2.

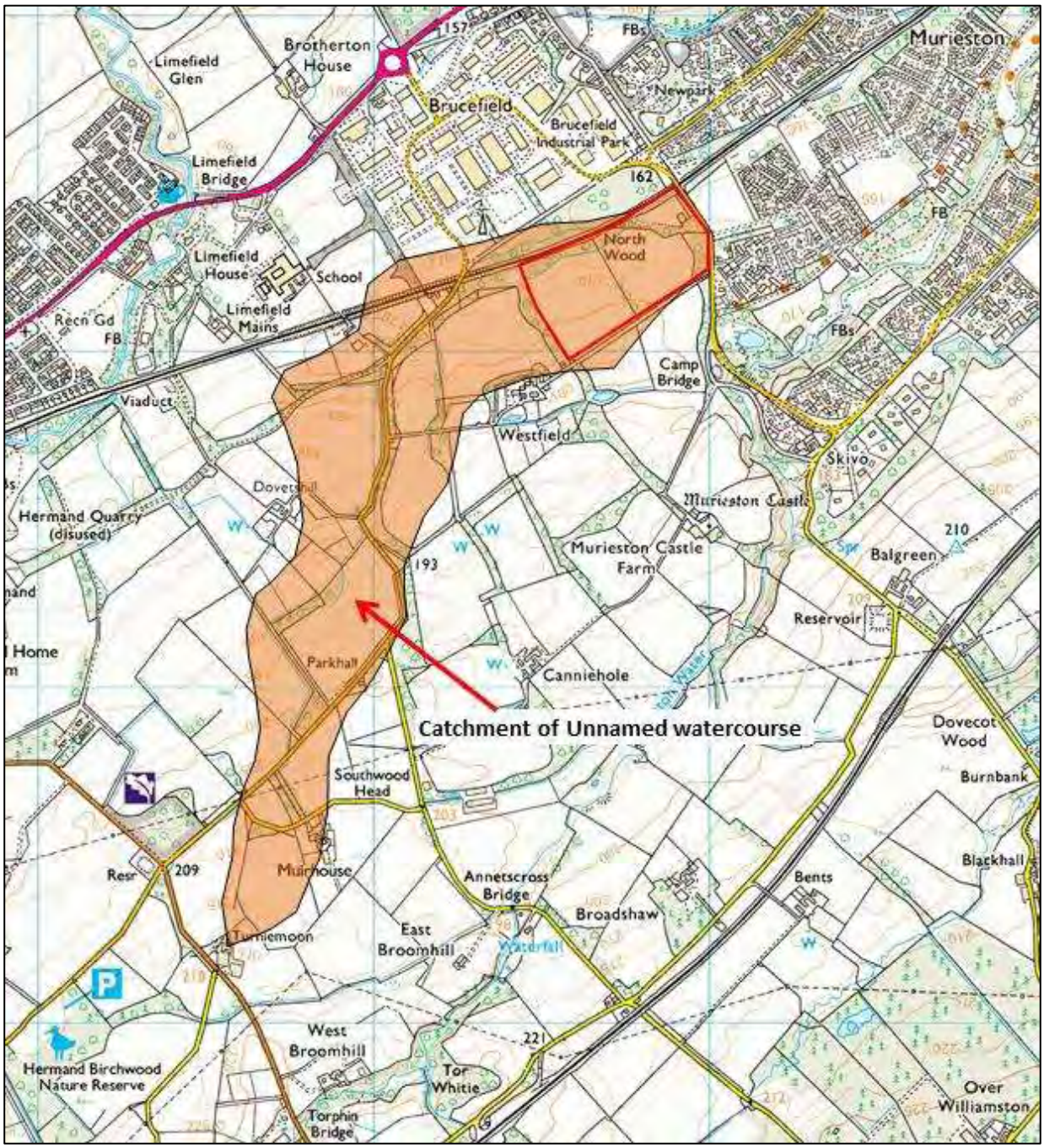
Scottish Government guidelines suggest that the magnitude of extreme flood events will increase by around 20% in the next 50 to 75 years. Estimates of 1 in 200 year flow + 20% are also provided in Table 2.

4.2 Estimation of greenfield runoff rate for site

The development site is greenfield. The total site area is around 15 ha.

Greenfield runoff rates for the existing site were estimated using the Institute of Hydrology (IH) small catchment method (IH124). The IH124 gave a 2-year greenfield runoff rate of around 5.3 l/s/ha. This is based on SAAR value of 885 mm and soil type 4 (i.e. SOIL=0.45). It should be noted that some councils may require site drainage systems to be designed for lower 2-year runoff rates, e.g. 5 l/s/ha. Requirements for West Lothian Council should be discussed and agreed with the council.

Figure 4: Unnamed Stream Catchment Area



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5 Flood Risk Assessment

This chapter assesses risk of flooding from:

- Unnamed Stream;
- Surface water runoff from adjacent land;
- Groundwater;
- Ponds at disused mine site;
- Site drainage; and
- Site access.

5.1 Flood risk from Unnamed Stream

5.1.1 Mathematical modelling of Unnamed Stream

An Unnamed Stream flows west to east along the northern boundary of the site. A HEC-RAS model of the stream was developed based on the available topographical survey through the site. The survey did not provide details of the channel sections through the site. However, given the site topography and the slope of land from south to north, a detailed model was not considered to be required to provide an indication of the floodplain extent within the site.

Twelve cross-sections were extracted from existing topographical survey through the site, as shown in Figure 5. The model was then extended to the culvert under Murieston Road. The culvert under the disused railway was included in the model, based on details obtained within the site survey. Dimensions of the culvert under Murieston Road were based on site observations.

The model was run with a Manning's n of 0.045 for the channel and 0.085 for the banks and floodplain areas.

The model was run in steady state, with the downstream boundary set as a normal depth boundary with slope of 0.007 (equivalent to surveyed slope of the stream) and upstream boundary set at the 200 year flow for the stream.

Predicted water levels within the site for 200 year and 200 year + climate change conditions are shown in Table 3. A long profile is provided in Figure 5 and key cross-sections are shown in Appendix 1.

The model results indicated that the culvert under the disused railway embankment within the site was under-sized for the 200 year flow, with the model predicting surcharging at the upstream end of the culvert under 200 year flow conditions. In contrast the culvert under Murieston Road was able to pass the 200 year and 200 year + climate change flows without surcharging.

Under 200 year conditions, flows were predicted to go out of bank along much of the length of the watercourse. Given the local topography flooding was predicted in a narrow strip adjacent to the channel only, as shown in Figure 6. Although the 200 year + climate change flow predicted higher flood levels along the channel, this increase in water level makes little difference to the areal extent of flooding as ground levels rise away from the channel.

Table 3: Predicted flood levels in Unnamed Stream

Cross-section	Peak flood level, Q_{200} (m AOD)	Peak flood level, Q_{200} + climate change (m AOD)
xs1	163.88	163.94
xs2	163.38	163.44
xs3	162.99	163.04
xs4	162.35	162.40
xs5	161.48	161.54
xs6	160.62	160.66
xs7	159.72	160.18
xs8	159.70	160.18
xs9	159.69	160.18
xs10	158.39	158.41
xs11	157.98	158.04
xs12	157.58	157.75
xs13	157.09	157.13
xs14	156.76	156.81

5.1.2 Model Sensitivity Analysis

A model sensitivity analysis provides an illustration of the effects of changing key model parameters on the important model outputs (in our case flood levels). By re-running the model, changing one input parameter at a time, the effect of that input on the model results can be isolated. Repeating this process to account for several model parameters of interest within the range of their possible input values, gives a sensitivity analysis that, when compared with the model assumptions and knowledge of realistic inputs, can provide an indication of the uncertainty associated with the model predictions.

The sensitivity analysis considers changes in Manning's n roughness coefficient, increasing flow, the model downstream boundary condition and culvert blockage. Results from these runs were compared to the 'Base Case' 200 year flow model run and are tabulated in Table 5.

Table 4: Model sensitivity runs

Scenario no.	Change to model
1	Manning's n increased by 20%
2	Manning's n decreased by 20%
3	Increase flow by 20%
4	Downstream boundary slope decreased by factor of 5
5	Culverts Blocked 50%
6	Culverts Blocked 95%

Varying Manning's n by 20% resulted in maximum change in flood levels of around 0.12 m, indicating that the Manning's friction values have a limited effect on model results.

Increase in flow by 20% increased flood levels around 0.02 – 0.5 m within the modelled reach.

A decrease in the downstream slope by a factor of 5 increased the flood levels by 1.2 m at the downstream boundary. Flood levels at other sections were not affected.

Blockage of 50% to both structures (railway embankment culvert and Murieston Road culvert) resulted in around 3.1 m increase in predicted water levels upstream of the railway embankment and around 2 m upstream of Murieston Road. Overtopping is predicted at the railway embankment. A 95% blockage scenario was also undertaken. The results of 95% blockage indicated that the flood levels would rise around 5.3 m at the railway embankment and 7.4 m at Murieston Road Bridge. Both structures are predicted to overtop. Under extreme cases water level would rise to approximately 165 m AOD, which is approximately 0.2 m higher than the lowest level on Murieston Road.

Figure 5: Model Cross-section Locations

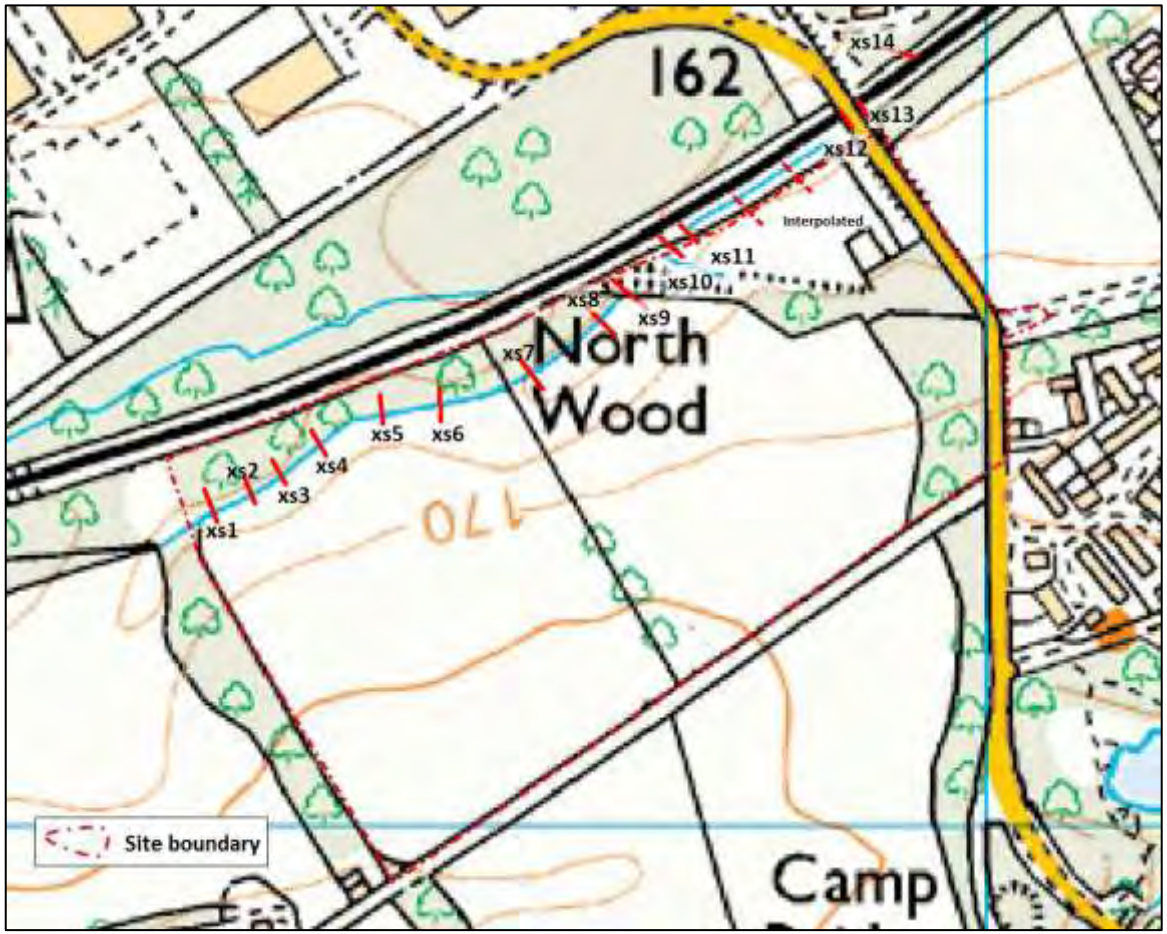


Figure 6: Long profile showing predicted 200 year flood level

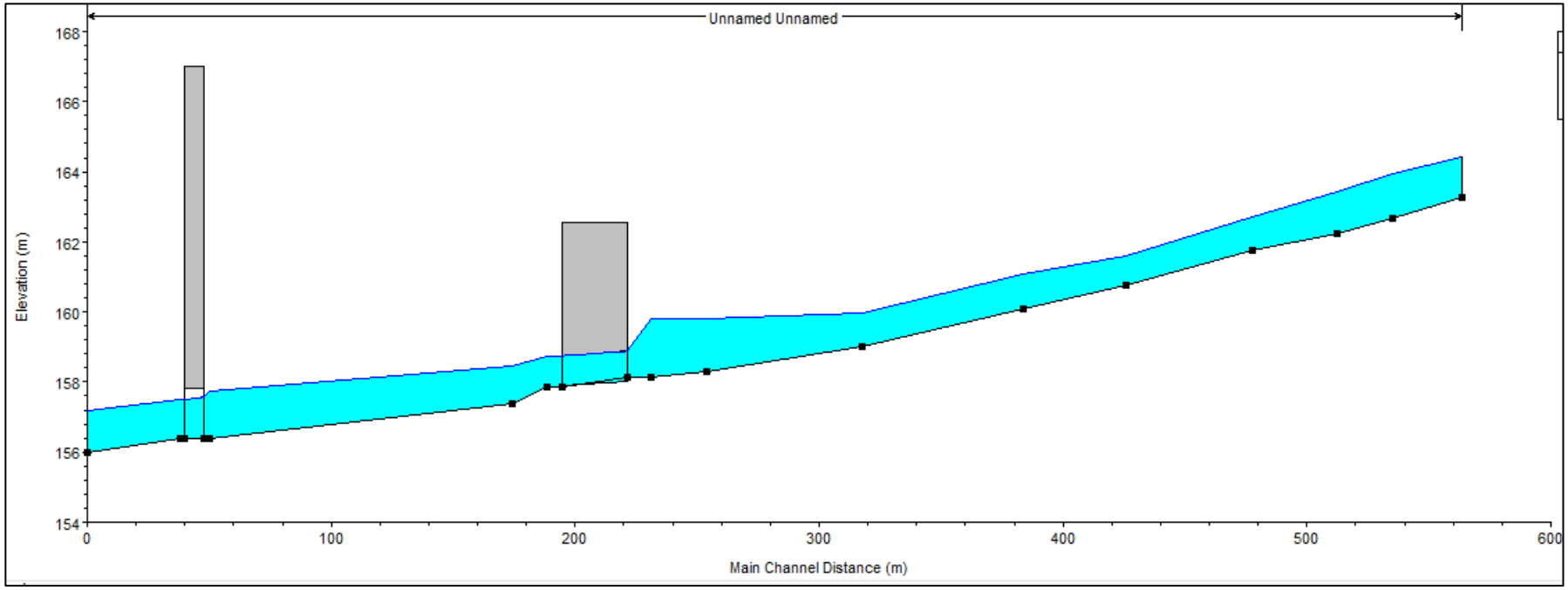


Figure 7: Indicative floodplain map for 200 year flood extent

Table 5: Results of Sensitivity Analysis

		Difference from Base Case (m)					
Cross-section	Peak flood level, Q_{200} (m AOD)	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
xs1	163.88	+0.06	-0.06	+0.06	0	-0.03	+1.12
xs2	163.38	+0.06	-0.08	+0.06	0	+0.04	+1.62
xs3	162.99	+0.07	-0.12	+0.05	0	-0.11	+2.01
xs4	162.35	+0.03	-0.03	+0.05	0	+0.45	+2.65
xs5	161.48	+0.10	-0.10	+0.06	0	+1.32	+3.52
xs6	160.62	0	-0.02	+0.04	0	+2.18	+4.38
xs7	159.72	+0.03	-0.02	+0.46	0	+3.08	+5.28
xs8	159.70	0	-0.01	+0.48	0	+3.10	+5.3
xs9	159.69	0	0	+0.49	0	+3.11	+5.31
xs10	158.39	+0.07	-0.04	+0.02	0	+1.20	+6.61
xs11	157.98	0	-0.06	+0.06	0	+1.61	+7.02
xs12	157.58	+0.01	0	+0.17	0	+2.01	+7.42
xs13	157.09	+0.05	-0.06	+0.04	0	0	0
xs14	156.76	+0.05	-0.06	+0.05	+0.27	0	0

5.1.3 Summary of Flood Risk from Unnamed Stream

The 200 year floodplain of the unnamed stream is shown in Figure 7. Based on SPP, no development should take place within this floodplain area, including the SuDS pond. We would also recommend that development is kept at least 5 m from the bank of the watercourse (to be discussed and agreed with the planning authority) to provide access for channel maintenance.

There are two culverts impacting flows within the site.

There is a relatively large culvert under Murieston Road at the downstream end of the site. Calculations indicated that this culvert was appropriately sized for the 200 year flow within the channel. However, if the culvert were blocked calculations showed that flood levels could rise significantly upstream of the culvert as the spill level for the culvert is some 10 m above the invert of the culvert. The culvert has no screen at present and during the detailed design stage we would suggest that the potential of installing a screen at the upstream end of the culvert is considered.

There is a second smaller culvert within the site, passing under an old railway embankment. The culvert is predicted to be surcharged under 200 year flow conditions. If this culvert were to be blocked flood waters could pond to around 3 m deep before overtopping the embankment. We would suggest that consideration is made for the removal of this culvert and the opening of the channel within the site. This would remove a potential flooding risk associated with blockage of this culvert. Calculations would have to be made to show that removing the culvert would not increase downstream flows.

Discussion should be held with the council related to ground levels and finished floor levels within the developed site. A key constraint will be the overtopping levels of the culverts within the site and ideally finished floor level would be set above the level of Murieston Road. However, given the small upstream catchment of the burn and if a trash screen is installed at the Murieston Road culvert, lower floor levels may be permitted within the site. This can be considered further at the detailed planning stage. However, at this stage it should be assumed that minimum Finished Floor Levels of properties should be above 165 m AOD.

There is a minor field drain along the north-eastern edge of the site (Figure 3). The ditch drains the eastern edge of the site. We would suggest that the drain is retained as it provides access to the lowest part of Murieston Road (164.8 m AOD) for flood waters within the site to escape.

Overall there are some flood management issues to be considered during the detailed planning stage (e.g., removal of minor culvert, trash screen for Murieston Road culvert and consideration of finished ground levels in the site). However, most of the site is not affected by these issues and flooding is not considered to be a significant issue limiting development of this site.

5.2 Flood risk from surface water runoff from adjacent land

The site rises to a local high point in the south-west corner of the site. The land to the south is higher and there is potential for some surface water entering the site from the south. However, access road to Westfield Farm which forms the southern boundary of the site slopes north-east and would intercept

any flows from the site. Flood waters flowing downs the road could enter the south-east corner of the site which is lower than the access road.

Land along the western boundary slopes down north and the risk of substantial surface water entering the site from the west is low.

The railway intercepts any flood waters from the north.

Murieston Road forming the eastern boundary of the site is higher and there is potential for excess water on the road to enter the site. The road slopes down to a low point a short distance south of the north-east corner of the site. This is the area from which excess surface water on the road could spill onto the site.

5.3 Flood risk from groundwater

The site slopes from south to north towards unnamed stream. There are no springs identified on Ordnance Survey maps and given the slope of the site there is not expected to be a significant risk of flooding from groundwater. However, as there is a disused railway embankment near the north-east corner of the site it is possible that the embankment affects local surface and subsurface flow pathways (i.e., compacted land under and around the embankment) resulting in poor drainage or locally raised groundwater levels to the west of the embankment. There was no evidence of this during the site visit; hence, the risk is expected to be low. Historical maps also indicate ponds in the north-east part of the site; remnants from historical mining activity within the north-east of the site (see Section 5.5).

The risk from ground water is not expected to be significant, but groundwater levels should be assessed as part of site investigation works and if a shallow groundwater table is encountered, appropriate design measures should be taken.

5.4 Flood risk from local sewer network

A review of the Scottish Water service drawings of the area indicated that there are no combined or other sewers located close to the site boundary. As a result, the site is not considered to be at risk of flooding from surcharging Scottish Water system.

5.5 Flood risk from site drainage

Design of the site drainage system is not part of this assessment. However, an outline drainage strategy for the site is provided in Section 6. As the site is greenfield, development will increase surface water runoff from the site. As a result, runoff will need to be controlled and attenuated before discharge.

5.6 Flood risk associated with ponds at disused mine site

As outlined in Section 3, the Westfield Mine was located in the north-east corner of the site, in the early 1900s. The mine site has been reclaimed; however, historical maps of the area showed the presence of ponds associated with the mine site. These ponds appear to have been surface features even after the end of mining operations. At present, the ponds are no longer visible and appear to have been infilled. However, it is not clear if these features have any sub-surface connections to old mining workings, or if they could accumulate water following rainfall. As the catchment areas of the ponds are located within the site boundary, the catchments will be incorporated within the site drainage system. However, we would recommend that an assessment of the ponds and old mine workings is undertaken as part of site investigations during detailed design.

5.7 Flood risk for site access

The location of the site access is not known at present, but we assume it will be from the east from Murieston Road. The road slopes generally to the north along the site boundary. There is not thought to be a significant risk of ponding of flood waters on the road (except at the low point), and the road is not predicted to lie within the floodplain of any watercourse. Irrespective of this care should be taken in the design of the site access so that it does not act as a flood flow pathway for surface water on the main road to enter the site and flow towards properties.

6 Outline Drainage Strategy

As the current proposals are for a Planning Application in Principle, outline drainage proposals are presented to provide evidence that the site will be able to be effectively drained consistent with Planning Policies. Further work will be required to produce final drainage plans suitable for submission with a detailed planning application.

6.1 Current Onsite Drainage

The site is currently a greenfield site. Surface flow pathways within the site, based on the site topographical survey are shown in Figure 6. At present, the entire site drains to the unnamed stream flowing along the northern boundary of the site.

Greenfield runoff rates for the site were calculated in Section 4.2.

6.2 Outline Surface Water Drainage Proposals

6.2.1 SuDS pond and surface water flow attenuation

The most obvious drainage option would be to attenuate surface water runoff from the whole site in a SuDS pond located toward the north-eastern corner of the site. We would suggest that SuDS ponds are designed to attenuate surface water runoff for events up to and including 200 year event to the 2 year runoff rate. Based on the current (total) site area draining to Unnamed Stream (Figure 6) the 2-year greenfield rate for the site would be 15 ha x 5.3L/s/ha = 79.5 L/s), unless an alternative flow rates can be agreed with the council. Lower flows will be necessary if a smaller site area is developed.

A conservative estimate of the pond size was made based on the following assumptions:

- Around 60% of the site will be impermeable and 40% permeable post-development;
- pond is 1 m deep; and
- the pond will have a 3.5 m buffer zone around it for maintenance access.

As a result, the area of the pond was estimated to be around 8,000 m^2 and the volume around 8,000 m^3. These figures will be refined during detailed design stage.

SuDS ponds should not be developed within the floodplain of the Unnamed Stream.

Appropriate SuDS measures to address water treatment requirements should be provided consistent with the requirements of the local council, SEPA and SUDS design manual. For development more than 50 houses, runoff from roofs and roads would need to pass through two stages of treatment. The SuDS pond would be considered as one stage of treatment, so a further stage of treatment would be required upstream of the SuDS pond, e.g., filter trenches alongside roads or permeable paving in driveways, or similar.

Further work is required at the detailed planning stage. However, due to the site topography, proximity to Unnamed Stream and available land on site for SuDS, it is clear that an acceptable site drainage

system will be able to be developed at the site. Hence, for the requirements of Planning in Principle there is confidence that the site can be effectively drained.

6.2.2 Surface water flow pathways

The site is located on sloping land and as a result there is a risk of surface water flooding within the site from runoff generated within the site boundaries (see Section 5.2). Hence, care will need to be taken when designing the site layout to take account of the sloping land. The site layout should be designed in a manner that provides flow pathways that route excess surface water (e.g., in the case of blockage of the site drainage system or rainfall events in excess of the design condition) through the site without ponding or flooding the properties.

6.2.3 Opening of culverted section of unnamed stream

The unnamed stream passes under a disused railway embankment in the north-east corner of the site. The culvert is a 1.5 m wide and 0.9 m high brick arch. SEPA has a policy of promoting the de-culverting of watercourses for flood risk management and environmental reasons. In addition, the removal of the culvert would also reduce the risk of blockage related flooding within the site and would have benefits in terms of long-term flood management within the site.

The flood modelling study undertaken for this assessment indicated that the culvert is able to pass the estimated 200 year flow with some surcharging. In the worst case of full blockage flood waters would back up behind the embankment to a level of around 163 m AOD, before overtopping the embankment. In the worst case flood depths could reach 5m upstream of the embankment. Such a situation would clearly constitute a significant flooding risk at the site. Hence, we would suggest that the option of the removal of embankment and culverted section of the unnamed stream is considered in more detail at the detailed planning stage. Detailed modelling of the post-development scenario would need to be undertaken to show that removing the culvert would not result in an increase in flows being passed downstream; however, results presented in this report would suggest that as the culvert is sized for the 200 year flow in unnamed stream that its removal would not affect downstream flood risk.

7 Summary and Conclusions

This report described a flood risk assessment for a proposed development site in the Murieston area of Livingston, West Lothian. The report also provides an outline drainage strategy for the site. This report is in support of a Planning Application in Principle.

The site generally slopes from south to north towards an Unnamed Stream. Calculations indicate that low-lying areas adjacent to the stream lie within the 200 year floodplain of the watercourse. No development should take place within the floodplain of the watercourse. Overall there are some flood management issues to be considered during the detailed planning stage (e.g., removal of minor culvert, trash screen for Murieston Road culvert and consideration of finished ground levels in the site), but flooding is not considered to be a significant issue limiting development of this site.

The site is not considered to be at significant risk of flooding from surface water runoff from adjacent land or groundwater. However, there is potential for some surface water to enter the site from the south and possibly east and this will need to be taken into account at the detailed planning stage.

An outline drainage strategy is proposed for the site. Further work is required at the detailed planning stage. However, due to the site topography, proximity to Unnamed Stream and available land on site for SuDS, it is clear that an acceptable site drainage system will be able to be developed at the site. Hence, for the requirements of Planning in Principle there is confidence that the site can be effectively drained.

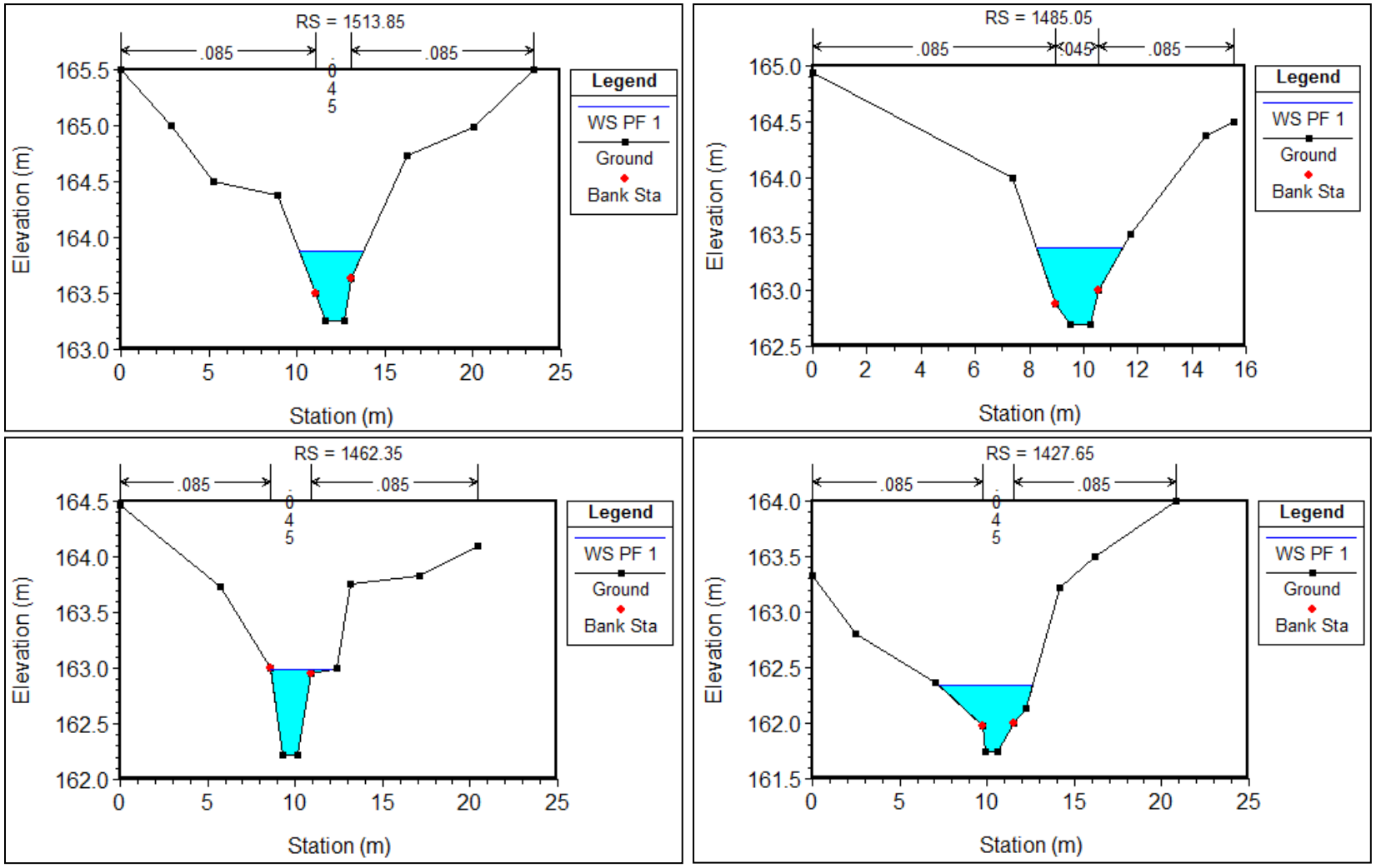
The site is located on sloping land and as a result there is a risk of surface water flooding within the site from runoff generated within the site boundaries. Hence, care will need to be taken when designing the site layout to take account of the sloping land. The site layout should be designed in a manner that provides flow pathways that route excess surface water (e.g., in the case of blockage of the site drainage system or rainfall events in excess of the design condition) through the site without ponding or flooding the property.

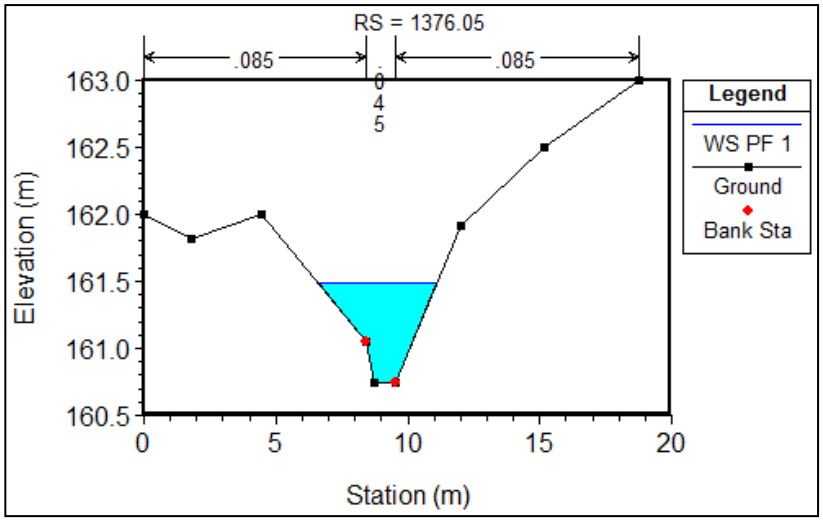
There was an operational mine with associated pond features within the north-east corner of the site. No water features are visible at present, but we would recommend that an assessment of the ponds and old mine workings is undertaken as part of site investigations during detailed design.

It is good practice to design finished floor levels an appropriate height above surrounding ground levels and arrange finished ground levels sloping away from buildings.

It should be noted that risk of flooding can be reduced but not totally eliminated, given the potential for events exceeding design conditions to occur and uncertainties associated with hydrological estimates

Appendix 1: Model cross-sections

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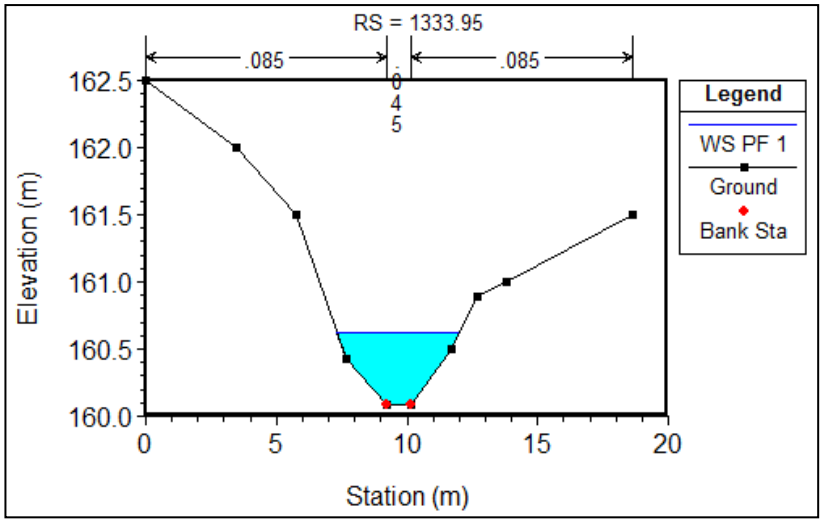
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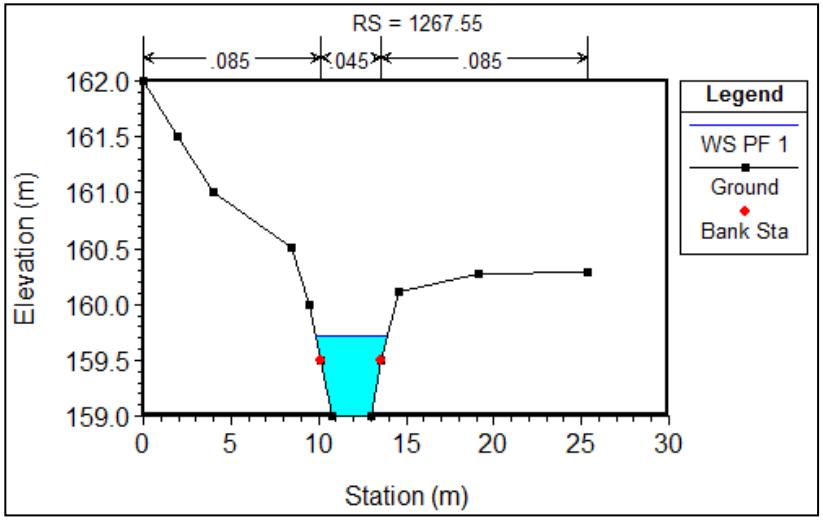
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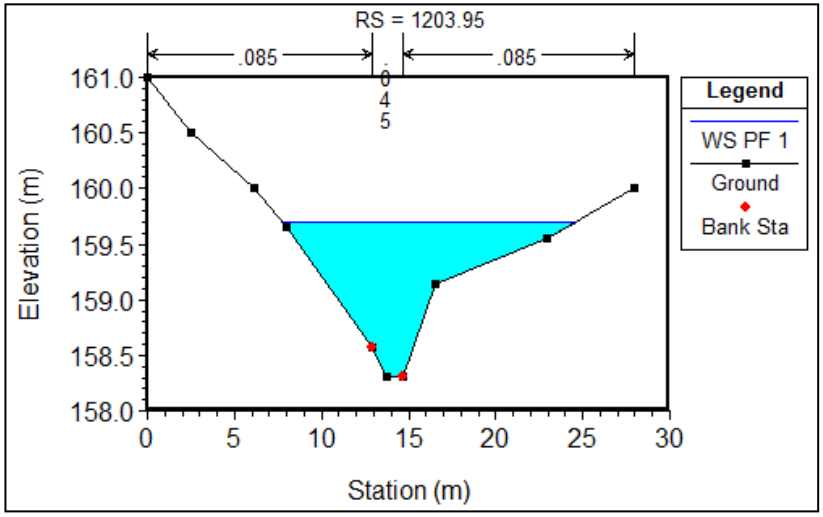
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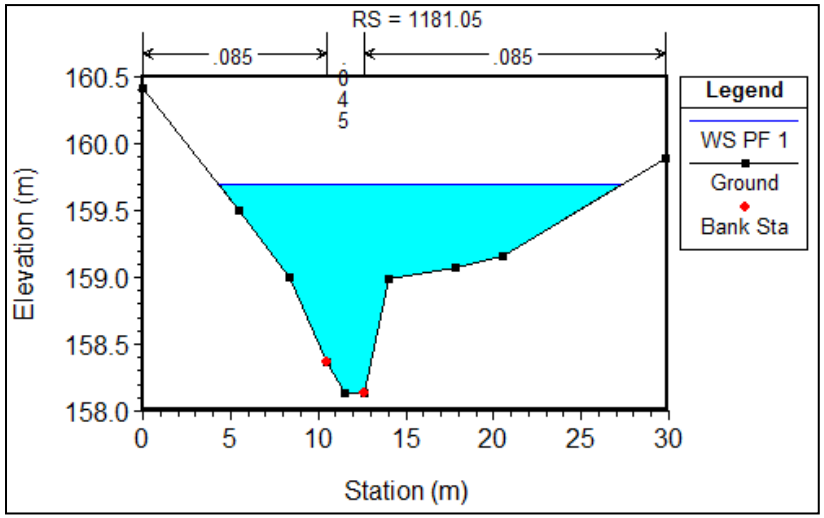
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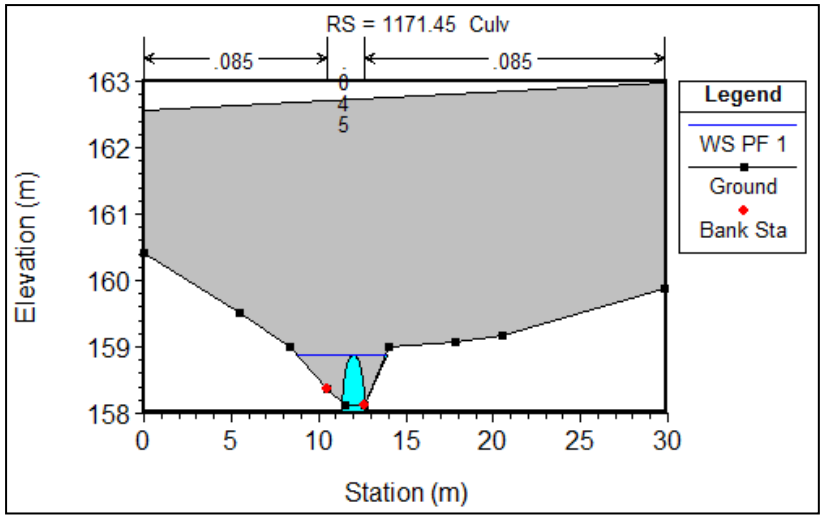
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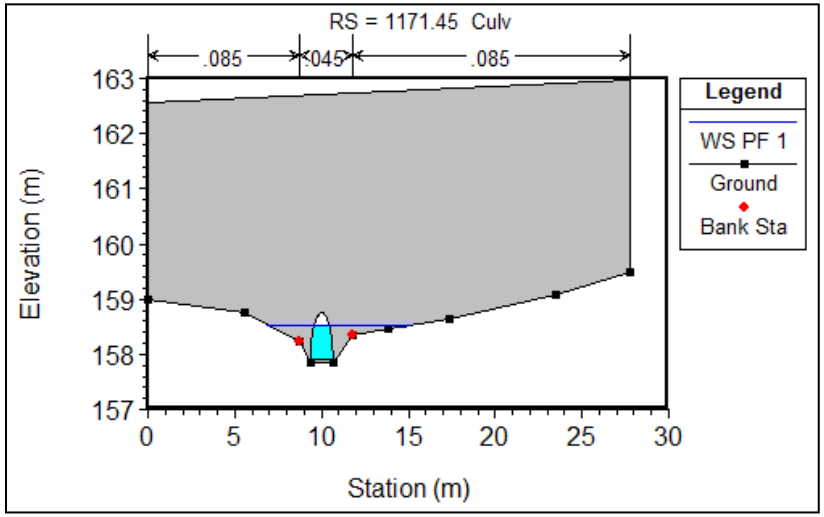
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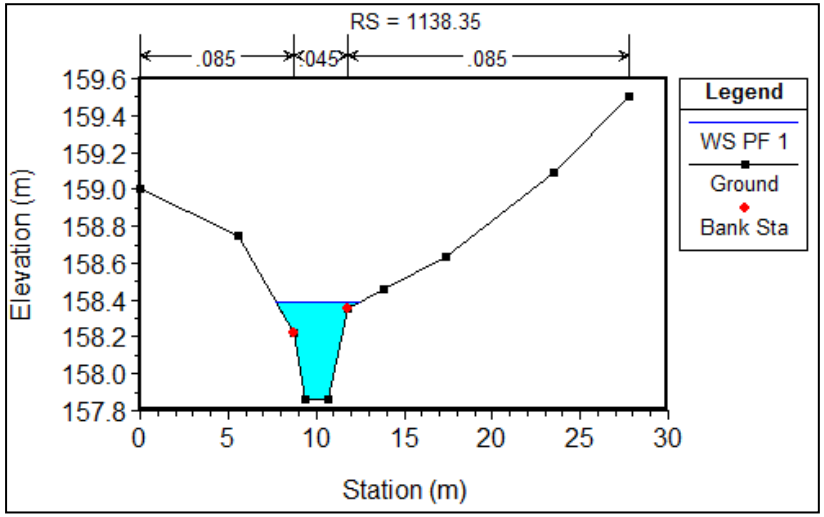
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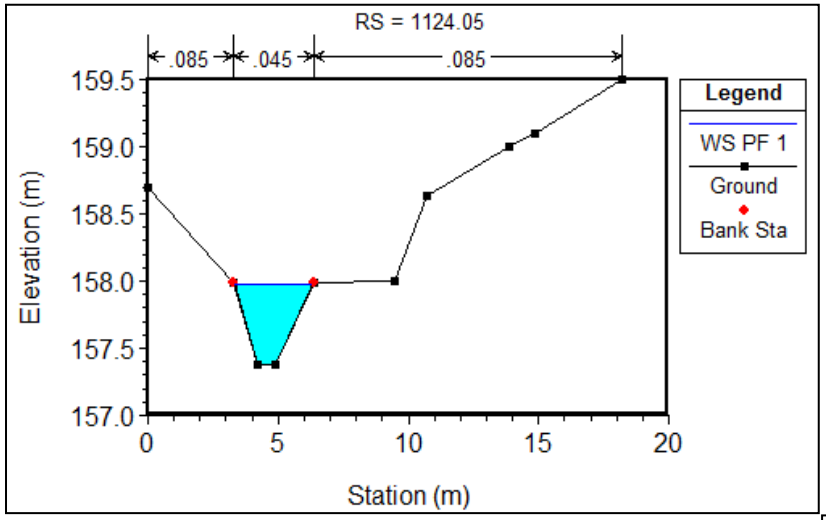
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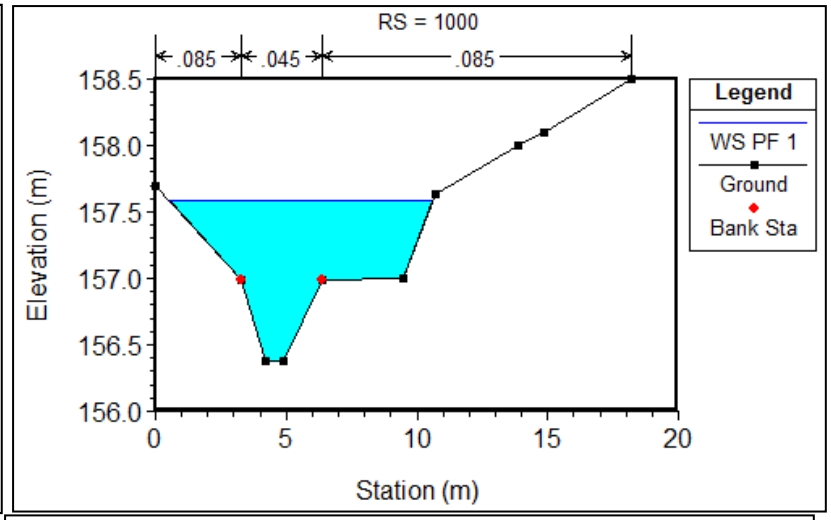
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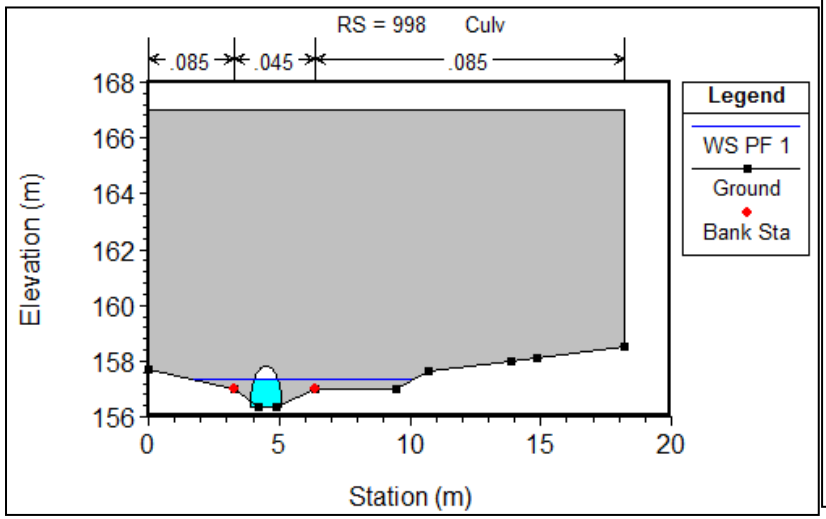
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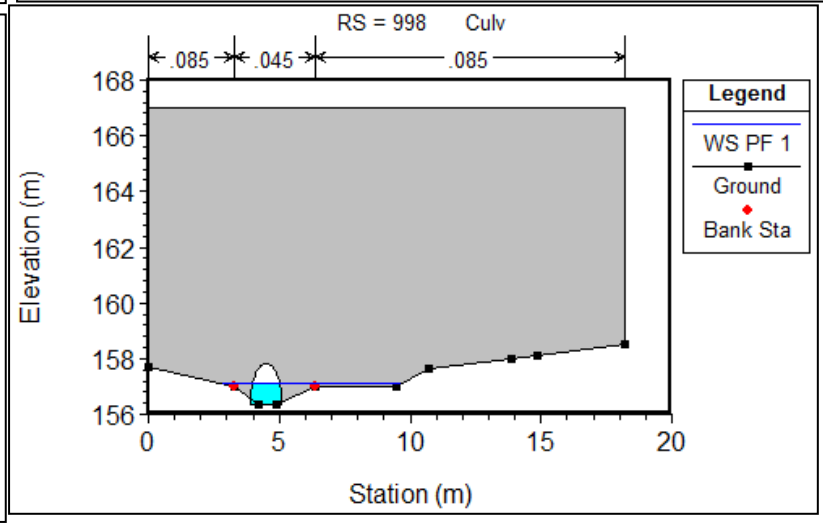
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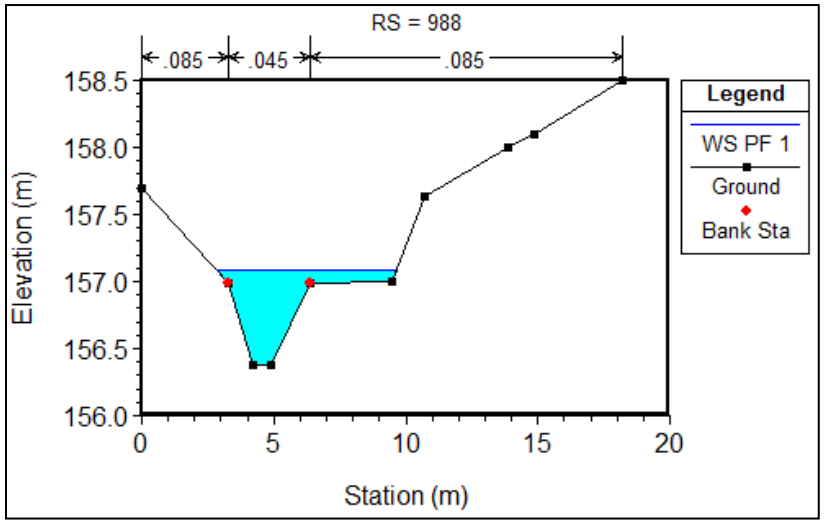
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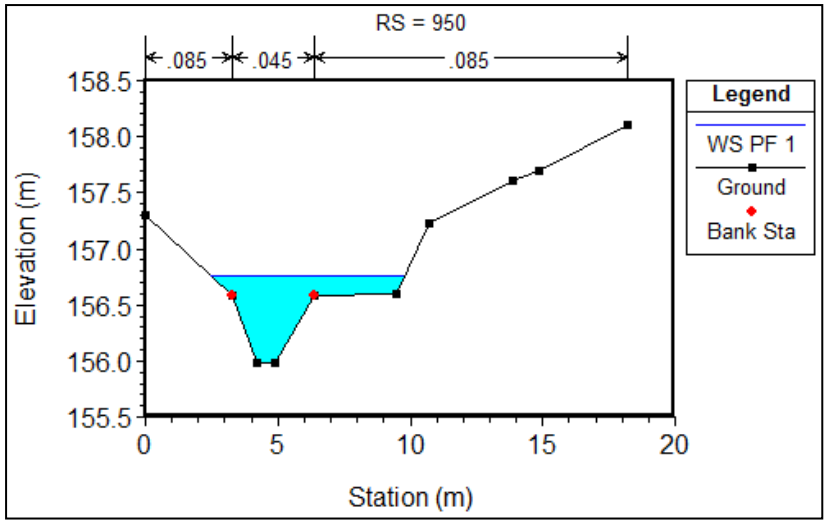
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CHARLIE FLEMING ASSOCIATES
ACOUSTICAL CONSULTANTS
NOISE CONTROL ENGINEERS

Report on Railway and Industrial Noise

For

BDW Trading / H & J Russell

At

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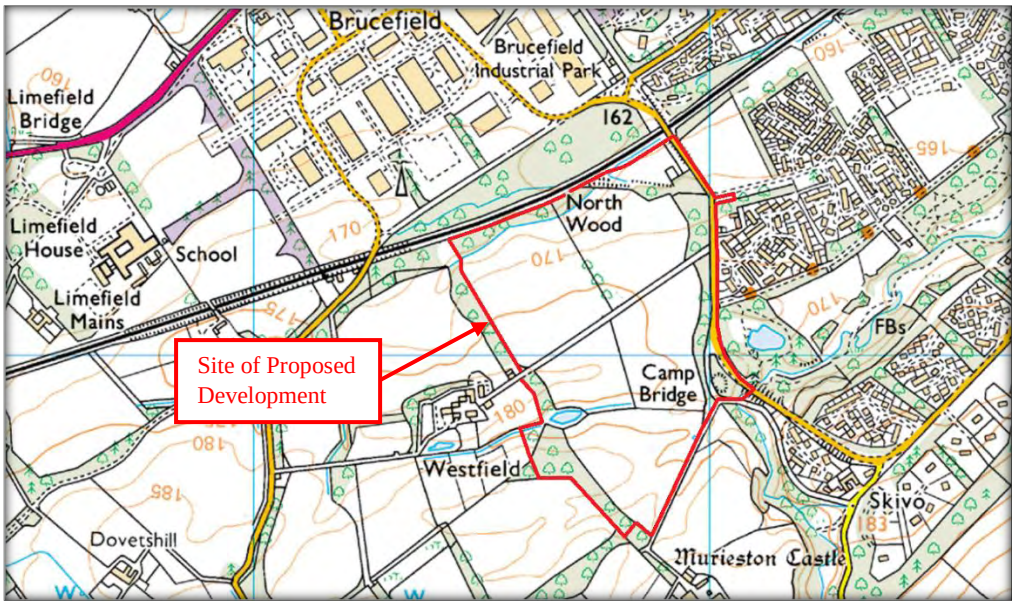
Table of Contents **Page No.**

1.0 Introduction

1.1 BDW Trading / H & J Russell propose to apply for planning permission to construct houses on land off Murieston Road, in Livingston. To the north-west of the land are railway lines. Beyond them, approximately 260m to the north-west of the land lies the nearest building in Brucefield Industrial Park. The boundary around the land is shown in red below on Figure 1(a), which is reproduced with the permission of Ordnance Survey. It is also shown overleaf on Figure 1(b), which is reproduced from a drawing titled *Location plan*, by Clarendon Planning and Development.

Figure 1(a)

Site of Land Proposed for Development
(Courtesy of Ordnance Survey)

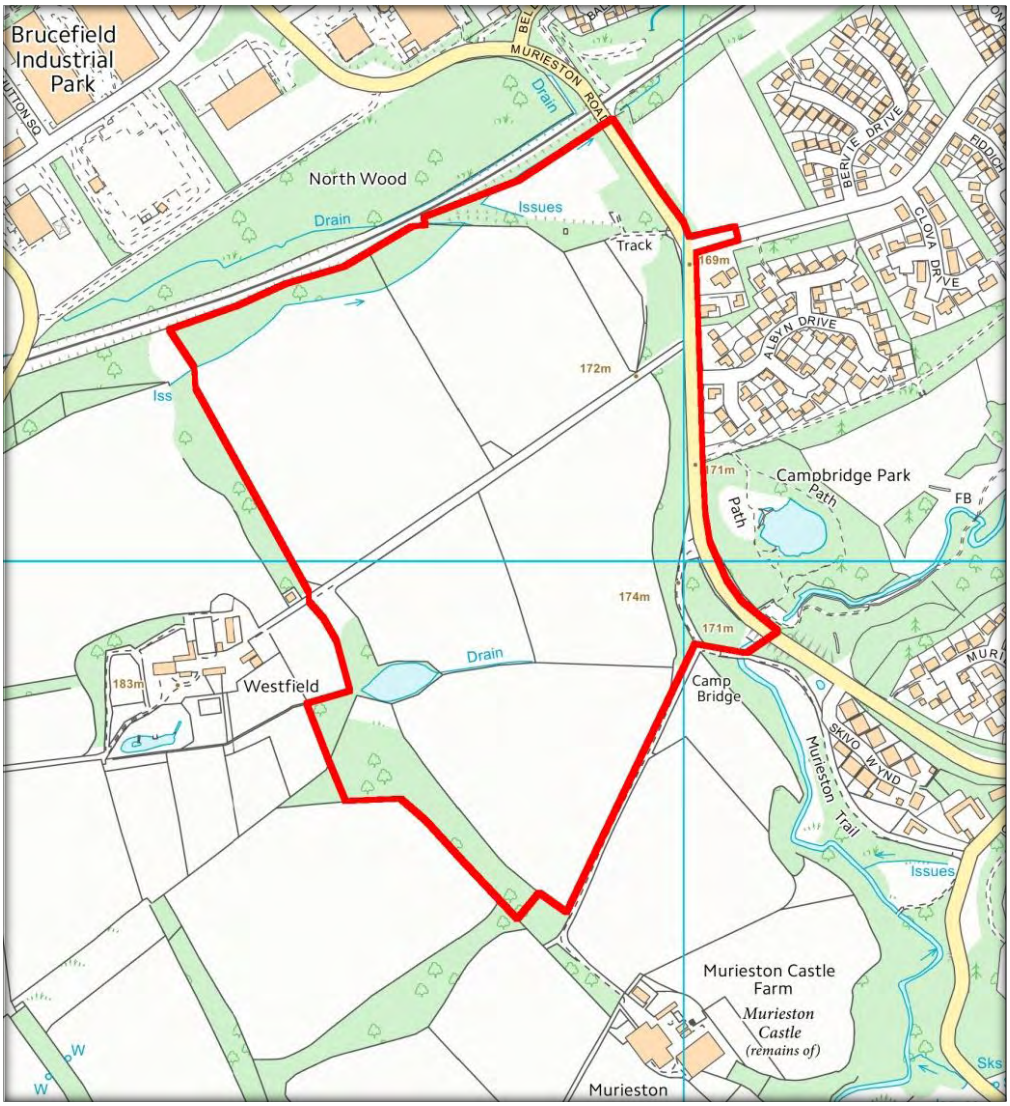


1.2 The concern was raised at the planning stage, by officers of West Lothian Council, that noise from the railway and industrial estate might disturb the residents of the new houses. Charlie Fleming Associates was asked by Mr Ross Manson, of Clarendon Planning and Development, acting as an agent of BDW Trading / H & J Russell, to quantify the levels of railway and industrial noise on the proposed development site, and determine whether they would be acceptable.

1.3 Railway noise, affecting the site of proposed residential development in West Lothian, is usually assessed in accordance with its own publication *supplementary planning guidance, Planning and noise*[1]. In turn, this refers to *Planning Advice Note 56 Planning and Noise*[2], (PAN 56), by the Scottish Executive. This document was replaced in 2011 by The Scottish Government publication titled *Planning Advice Note 1/2011: Planning and Noise*[3] (PAN1/2011). This, in turn, refers to *Technical Advice Note 2011: Assessment of Noise*[4] (TAN 2011) for technical guidance on noise assessment, also published by the Government.

Figure 1(b)

Site of Land Proposed for Development
(Courtesy of Clarendon Planning and Development)



1.4 TAN 2011 states that railway noise be considered over two periods, daytime from 07.00hrs to 23.00hrs, and night-time from 23.00hrs to 07.00hrs. The noise levels over these periods determine the *Magnitude of Impact* that the noise of the trains will have on the residents of the proposed development. In turn, this determines the *Level of Significance*, according to which it may, or may not, be necessary to reduce the noise.

1.5 It is extremely rare for a full 24-hour noise survey to be carried out. It is usual to measure the noise over 3 or 4 hours, calculate the average noise of the trains passing the site, and evaluate the total noise over the longer periods using information obtained from train timetables. This procedure is described in the Department of Transport document titled *Calculation of Railway Noise*[5]. This measurement

technique has been used many times before in West Lothian, the results it produces accepted by the council's officers and so it has been used in this case.

1.6 As mentioned in Section 1.3, noise affecting the site of proposed residential development in West Lothian is usually assessed in accordance with its own publication *supplementary planning guidance, Planning and noise*[1]. This, and the other documents referred to[2&3] do not offer definitive guidance on industrial noise, as its nature varies according to the source. What Charlie Fleming Associates usually does is measure the noise on the proposed development site. The results of the measurements are then used to calculate the levels likely in the houses, which are then compared to limits given in TAN 2011.

TAN2011[4] suggests that noise outside dwellings should not exceed 55dB $L_{Aeq, 16h}$, and that within dwellings it should not exceed 35dB $L_{Aeq, 16h}$. These limits apply to general environmental noise. TAN 2011 states that the nature of the noise should be taken into account, but does not advise on how to do this. British Standard 4142:1997 *Method for Rating industrial noise affecting mixed residential and industrial areas*[6] applies a 5dB(A) penalty to the noise if its characteristics are likely to disturb people. It is thus suggested that the limits be modified to 50dB(A) and 30dB(A).

1.7 Charlie Fleming Associates thus visited the site of the proposed development to measure the noise of the trains. Section 2.0 of this report describes how the noise levels were measured and the results are presented in Section 3.0. The calculations used to determine the *Magnitude of Impact* and *Level of Significance* that the railway noise will have on the residents of the proposed houses are described in Section 4.0.

1.8 Section 5.0 of this report describes how the industrial noise levels were measured and the results are presented and discussed in Section 6.0.

1.9 Section 7.0 concludes the main text of the report. Section 8.0 lists the documents referred to in the report, and is followed by an appendix which describes basic principles of acoustics, the measurement of sound, and explains the technical terms used herein.

2.0 Railway Noise Level Measurement Procedures

2.1 Mr Craig Cloy and Mr Iain Fleming, of Charlie Fleming Associates, visited the proposed development site between 11:00hrs and 15:30hrs, on Tuesday 5th August 2014, to measure the noise of the trains.

2.2 The following electroacoustical and meteorological instrumentation was used to conduct the measurements.

Brüel & Kjær Modular Precision Sound Analyzer Type 2260
Serial No. 2554046

Brüel & Kjær Sound Analysis Software Type BZ7210 Version 2.2
Serial No. Not applicable

Brüel & Kjær Prepolarised Condenser Microphone Cartridge Type 4189
Serial No. 2643248

Brüel & Kjær Sound Level Calibrator Type 4231
Serial No. 3010113

Brüel & Kjær Windscreen Type UA0237
Serial No. Not applicable

RS Components Digital Anemometer Type RS212-578 AM-4201
Serial No. L482154

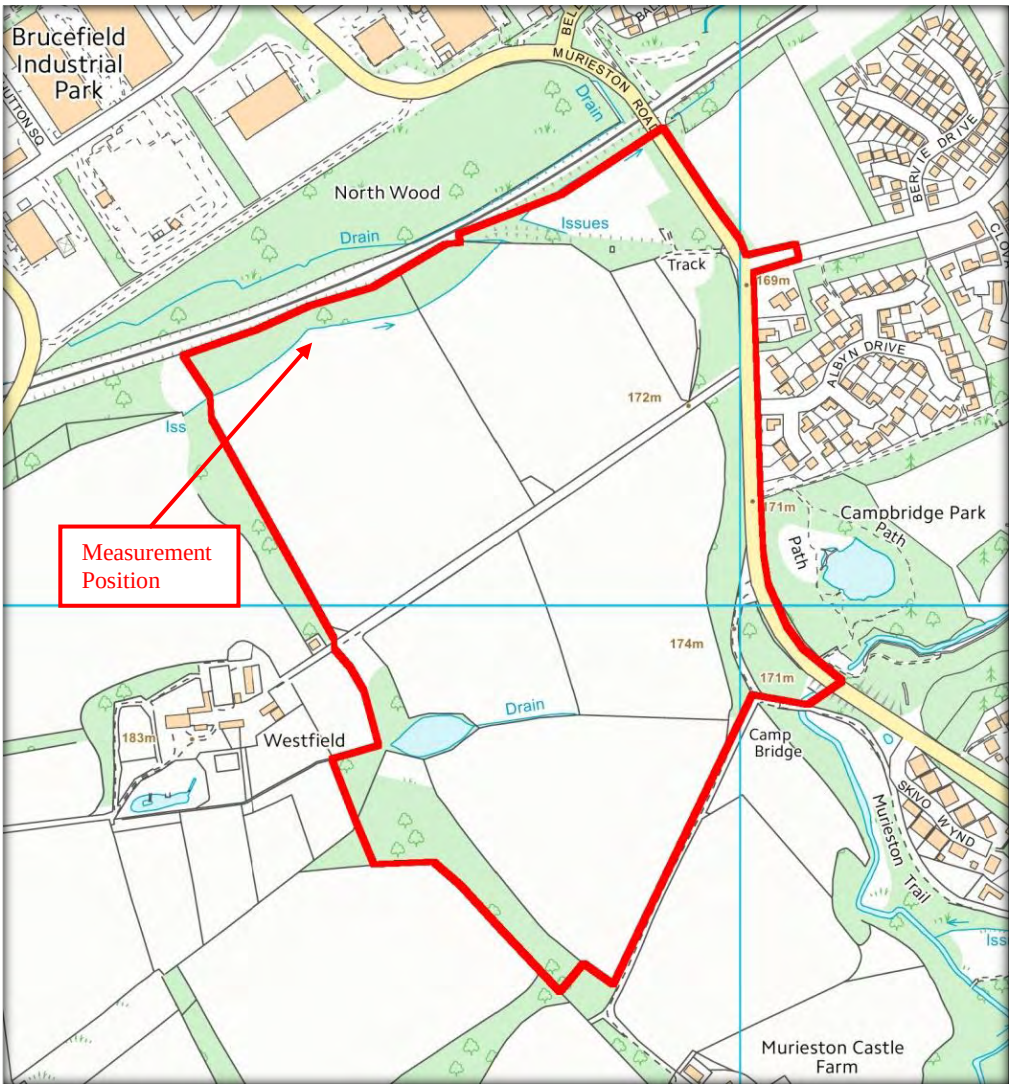
2.3 The noise levels were measured in accordance with the Department of Transport document titled *Calculation of Railway Noise 1995*[5]. This involves measurement of the A-weighted sound exposure level (L_{AE}) of each train. These can then be used to calculate the L_{Aeq} due to the trains over the day and night-time periods specified in TAN 2011. The sound level analyzer also measured the equivalent continuous sound levels, L_{Aeq}. The L_{eq}s were also measured in octave bands. All noise levels were measured in decibels referenced to 2×10^{-5} Pa.

2.4 It is usual, in an assessment like this, to measure the noise where the house which will be most exposed to it will be built. The principle in this is that, if the noise is acceptable at the most exposed house, it follows that it will also be acceptable elsewhere in the development. At the time of the visit, however, the layout of the development had not been drawn up. In situations like this, it is usually assumed that the nearest house will be 10m back from the boundary of the development site with Network Rail's land. This is because 10m is the length of a typical garden being provided with houses being built by developers in Scotland just now.

The measurement position is shown overleaf on Figure 2, which is reproduced from a drawing titled *Location plan*, provided by Clarendon Planning and Development.

Figure 2

Location of Measurement Position
(Courtesy of Clarendon Planning and Development)



2.5 In choosing the measurement position, it was assumed that the course of the burn close to the northern boundary of the development site would not be altered, as it would be impractical to move it further north, because of the railway line. This was, therefore, taken as being where the end of the gardens would be. The noise was measured 10m back from the burn.

A position at the north-eastern end of the development site was also considered, in the triangular area marked as "Issues", on Figure 2. At this position, 10m back from the northern site boundary, the noise would be greater than that measured as it is closer to the railway lines. The angle of view of the tracks, however, would be less than that from the measurement position, due to the proximity of the bridge taking Murieston Road over the railway. These effects would tend to cancel each other out, though empirical calculations suggest that the noise would be 0.5dB(A) greater at the position that was not used. It was also considered that the trains might be moving

more quickly, and thus generating more noise, on the tracks adjacent to the centre of the building line, that being further from Livingston South Station. Finally, another reason it was not used was because houses may not be built there at all, and the majority of the houses on the northern building line will be at the same distance back from the railway as the measurement position was.

In detail, the measurement position was 10m back from, and at 90° to, the burn flowing west to east close to the northern boundary of the development site. It was 111m in a south-westerly direction from the post and wire fence defining the north-eastern boundary of the field in which the measurements were conducted. The microphone of the sound level analyzer was horizontal, at a height of 1.60m above the existing ground level.

2.6 Measurements commenced as soon as the sound of a train was audible, and continued until it was inaudible. The measurement periods thus varied according to the speed, length and direction of travel of the train in question.

2.7 The sound level analyzer was calibrated at 94.0dB(A) prior to conducting the measurements. On completion of the measurement the calibration level was found to be the same.

3.0 Railway Noise Level Measurement Results

3.1 The results of the equivalent continuous, L_{Aeq}, and sound exposure, L_{AE}, noise level measurements are shown below in Table 1 and overleaf in Figure 3.

Table 1

Measured A-Weighted Train Noise Levels
(dB re 2 x 10^{-5}Pa)

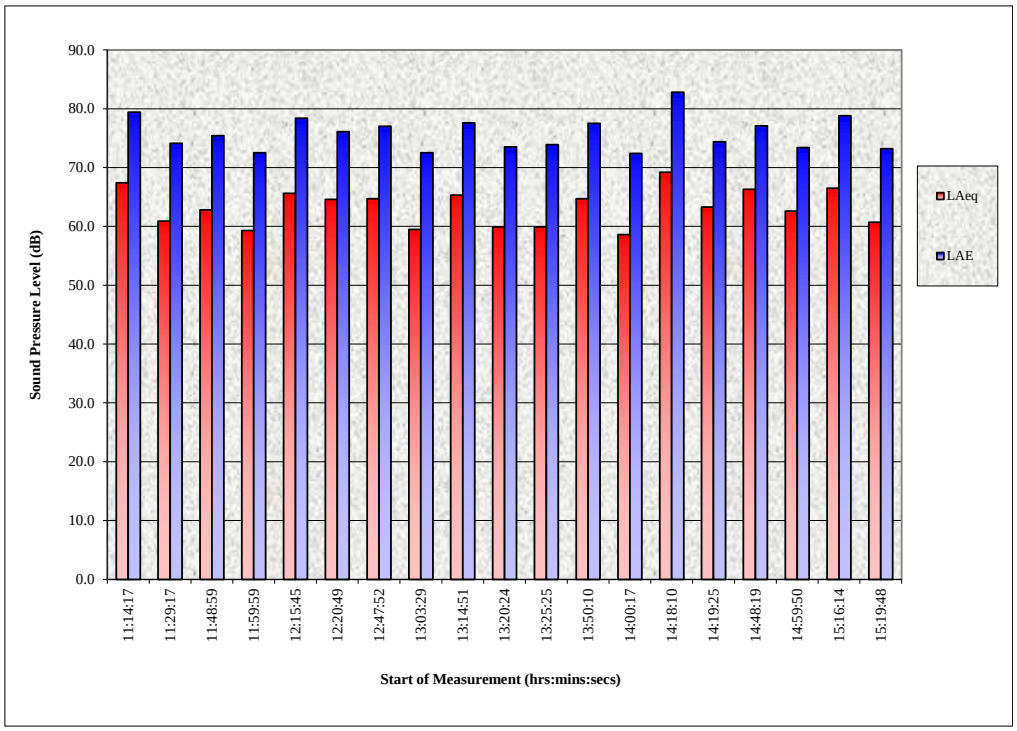
File No.	Start Time (hrs:mins:secs)	Type of Train	No. of Units	Direction of Travel	Approximate Speed (mph)	L_{Aeq} dB(A)	L_{AE} dB(A)
1	11:14:17	DMU	2	North-east	40	67.4	79.4
2	11:29:17	DMU	2	South-west	40	60.9	74.1
3	11:48:59	DMU	2	North-east	40	62.8	75.4
4	11:59:59	DMU	2	South-west	40	59.3	72.5
5	12:15:45	DMU	2	North-east	40	65.6	78.4
6	12:20:49	DMU	2	South-west	40	64.6	76.1
7	12:47:52	DMU	2	North-east	40	64.7	77.0
8	13:03:29	DMU	2	South-west	40	59.5	72.5
9	13:14:51	DMU	2	North-east	40	65.3	77.6
10	13:20:24	DMU	2	South-west	40	59.9	73.5
11	13:25:25	Freight	4	North-east	30	59.9	73.9
12	13:50:10	DMU	2	North-east	40	64.7	77.5
13	14:00:17	DMU	2	South-west	40	58.6	72.4
14	14:18:10	DMU	4	North-east	50	69.2	82.8
15	14:19:25	DMU	2	South-west	40	63.3	74.4
16	14:48:19	DMU	2	North-east	40	66.3	77.1
17	14:59:50	DMU	2	South-west	40	62.6	73.4
18	15:16:14	DMU	2	North-east	40	66.5	78.8
19	15:19:48	DMU	2	South-west	40	60.7	73.2

3.2 The majority of the trains that passed the site were passenger ones operated by First ScotRail. They were diesel multiple units, (DMUs), mostly consisting of 2 coaches. One freight train, consisting of four long wheel base coal wagons, pulled by an English Welsh & Scottish Railway class 66 locomotive passed the site.

3.3 The noise of trains is generally proportional to their length and speed. There was nothing unusual or remarkable about the results of the measurements.

Figure 3

Measured A-Weighted Train Noise Levels
(dB re 2 x 10^{-5}Pa)



3.4 The results of the octave band equivalent continuous, L_{eq}, noise level measurements are shown overleaf in Table 2.

Table 2

Measured Octave Band Train Noise Levels L_{eq}
(dB re 2 x 10^{-5}Pa)

Start Time (hrs:mins:secs)	Octave Band Centre Frequency (Hz)									A
	31.5	63	125	250	500	1000	2000	4000	8000	
11:14:17	62.5	62.0	52.4	60.8	64.6	64.9	57.9	50.2	37.8	67.4
11:29:17	64.3	68.0	66.2	51.5	55.8	57.9	53.3	46.3	38.3	60.9
11:48:59	64.7	71.1	61.7	49.0	57.7	60.4	55.4	46.7	34.9	62.8
11:59:59	63.8	72.9	61.4	48.4	54.4	55.9	51.3	44.6	34.7	59.3
12:15:45	63.1	63.6	58.3	50.9	59.4	63.9	57.3	47.8	39.5	65.6
12:20:49	63.9	67.5	68.5	53.3	58.7	62.9	55.0	47.8	37.8	64.6
12:47:52	63.5	62.6	55.5	49.0	58.2	63.1	56.3	46.2	35.9	64.7
13:03:29	63.2	67.8	67.6	53.5	57.8	54.5	51.2	44.1	34.1	59.5
13:14:51	67.8	69.5	55.2	46.2	56.8	63.9	57.1	47.7	37.7	65.3
13:20:24	61.6	75.3	61.0	49.3	55.4	56.9	50.3	44.2	38.6	59.9
13:25:25	72.8	66.8	56.6	49.0	57.3	56.5	52.0	45.0	33.1	59.9
13:50:10	62.7	63.3	58.7	48.8	58.3	63.0	57.0	46.0	34.5	64.7
14:00:17	62.7	74.2	60.9	47.3	53.0	55.3	50.1	43.9	34.7	58.6
14:18:10	68.0	71.6	65.9	52.1	59.0	67.3	62.9	50.4	37.8	69.2
14:19:25	66.7	76.4	67.7	52.7	57.8	60.2	55.8	47.6	36.9	63.3
14:48:19	67.7	73.7	66.8	52.0	59.7	63.3	60.6	50.4	37.3	66.3
14:59:50	66.6	81.5	67.8	51.1	56.6	58.1	53.5	47.4	36.3	62.6
15:16:14	63.7	64.0	59.0	50.2	60.4	64.8	58.5	48.1	38.4	66.5
15:19:48	62.4	72.0	62.7	49.5	55.8	57.9	52.3	45.3	34.9	60.7

3.5 During the measurements the sky was clear for the first hour, then became partially cloudy. Other meteorological conditions prevailing whilst the noise levels were measured were as shown in Table 3 below.

Table 3

Meteorological Conditions Prevailing During Noise Measurements

Time (hrs)	Direction of Wind	Range of Wind Speed (ms^{-1})	Temperature (° Centigrade)	Relative Humidity (%)	Atmospheric Pressure (mBars)
11:30	None	0.0 to 0.5	18.0	68	1017
12:30	North-east	0.0 to 1.0	17.0	72	1016
13:30	None	0.0 to 0.2	18.0	68	1016
14:30	North-east	0.2 to 2.3	19.0	64	1015

3.6 The noise level measurements were thus generally conducted within the meteorological condition "window" given in *Calculation of Railway Noise 1995*[5]. One meteorological condition which was not satisfied was paragraph 41.1 on page 47, which states;

(i) the wind direction is such as to give a component from the nearest part of the rail towards the reception point exceeding the component parallel to the rail:

That this clause was not satisfied was not important given the absolute wind speeds involved and the distance between the road and microphone. (It is only at distances of 50m and more that the wind significantly affects the propagation of the noise).

Furthermore, if satisfying all three conditions relating to wind given in the document[5] was considered a fundamental requirement, no measurements would ever be carried out.

4.0 Determination of *Level of Significance* of Railway Noise

4.1 The first stage in the process for assessing the noise levels, as prescribed in TAN 2011[4], is to conduct the *Quantitative Assessment*, which involves calculating the *Magnitude of Impact* the railway noise will have on the residents of the proposed development.

4.2 To determine the *Magnitude of Impact* of the railway noise on the site, it is firstly necessary to calculate the average sound exposure level, L_{AE}, of each type of train which passed the site. The average L_{AE} of the DMUs which passed the site has been calculated to be 75.9dB(A).

The L_{AE} of the freight train which passed the site was 73.9dB(A). Freight trains usually generate greater levels of noise than DMUs. The relationship between the two on many other development sites in Scotland has been studied, and the difference is, on average, 5.8dB(A). The average L_{AE} due to freight trains has thus been taken to be 81.7dB(A).

No Main Line East Coast Company, CrossCountry or Virgin trains passed the site during the measurements, because none of these operators run trains on the lines.

4.3 The numbers of trains which pass the site on a typical weekday, a Wednesday, as shown in First ScotRail and Network Rail's timetables, have been counted and are shown below in Table 4. Network Rail's timetables designate certain freight trains as Q, *runs when required*, and Y, *Runs to and from terminals/ yards as determined by traffic demand*. The absolute maxima given in Table 4 include all freight trains with the Q and Y designation. It should be noted that the author has never encountered anything like the maximum number of timetabled freight trains to actually pass a site, hence the use of the maximum will over-estimate the noise. This approach is usually required by West Lothian Council.

Table 4

Summary of Train Sound Exposure Levels and Numbers
(dB re 2 x 10^{-5} Pa)

Train Type	Average L_{AE}	No. per Day	No. per Night
DMU	75.9	53	5
Freight (normally timetabled)	81.7	3	0
Freight (absolute maximum)	81.7	20	5

4.4 The night-time $L_{Aeq(23:00hrs\ to\ 07:00hrs)}$, based on the maximum number of trains and the L_{AE}s mentioned above, is 45.1dB(A). The daytime $L_{Aeq(07:00hrs\ to\ 23:00hrs)}$ has been found to be 49.4dB(A).

4.5 The *Magnitude of Impact* is determined by the amount by which the L_{Aeq} exceeds 45dB(A) at night, and 55dB(A) during the day, as shown overleaf in Table 5.

Table 5

Magnitude of Impacts Associated with Night and Day Exceedance Levels[4]

Night Noise Level[1], x = (Existing – 45) $L_{Aeq,8h}$	Day Noise Level[1], x = (Existing – 55) $L_{Aeq,16h}$	Magnitude of Impact
> 15	> 10	Major adverse
10 ≤ x ≤ 15	5 ≤ x ≤ 10	Moderate adverse
5 ≤ x < 10	3 ≤ x < 5	Minor adverse
0 ≤ x < 5	0 ≤ x < 3	Negligible adverse
x < 0	x < 0	No adverse impact

During the night, the noise of the railway will be around 45dB(A). According to TAN 2011[4], the noise will, therefore, have *Negligible adverse* impact on the residents of the houses.

During the day, the noise of the railway is less than 55dB(A). The noise will, therefore, have *No adverse impact* on the residents of the houses.

4.6 The second stage in the process is to conduct the *Qualitative Assessment*. In this case, however, it is considered that the *Quantitative Assessment* adequately addresses the noise impact of the railway on the houses. The final stage is to determine the *Level of Significance* of the railway noise. This is determined using Table 6, which is shown below.

Table 6

Significance of Effects[4]

Magnitude of Impact	Sensitivity of Receptor		
	Low	Medium	High
Major	Slight/Moderate	Moderate/Large	Large/Very Large
Moderate	Slight	Moderate	Moderate/Large
Minor	Neutral/Slight	Slight	Slight/Moderate
Negligible	Neutral/Slight	Neutral/Slight	Slight
No change	Neutral	Neutral	Neutral

The *Sensitivity of Receptor* will be high as it is houses which are to be constructed. As the impact of the railway noise during the night on the residents of the houses will be *Negligible*, the significance will be *Slight*, which is defined in TAN 2011[4] as:

Slight: *These effects may be raised but are unlikely to be of importance in the decision making process.*

As the impact of the railway noise during the day on the residents of the houses will be *No change*, the significance will be *Neutral*, which is defined in TAN 2011[4] as:

Neutral: *No effect, not significant, noise need not be considered as a determining factor in the decision making process.*

4.7 It is thus concluded that the railway noise levels are within the limits given in current planning guidance, and that no measures are required to reduce them.

5.0 Brucefield Industrial Park Noise Level Measurement Procedures

5.1 Mr Craig Cloy, of Charlie Fleming Associates, visited the site of the proposed development between 11:15hrs and 15:30hrs on Tuesday 5th August 2014, to measure the noise of the industrial park.

5.2 The following electroacoustical instrumentation was used to conduct the measurements.

Brüel & Kjær Modular Precision Sound Analyzer Type 2260
Serial No. 1875656

Brüel & Kjær Enhanced Sound Analysis Software Type BZ7202
Serial No. 9445FBA

Brüel & Kjær Prepolarised Condenser Microphone Cartridge Type 4189
Serial No. 2820088

Brüel & Kjær Sound Level Calibrator Type 4231
Serial No. 2656302

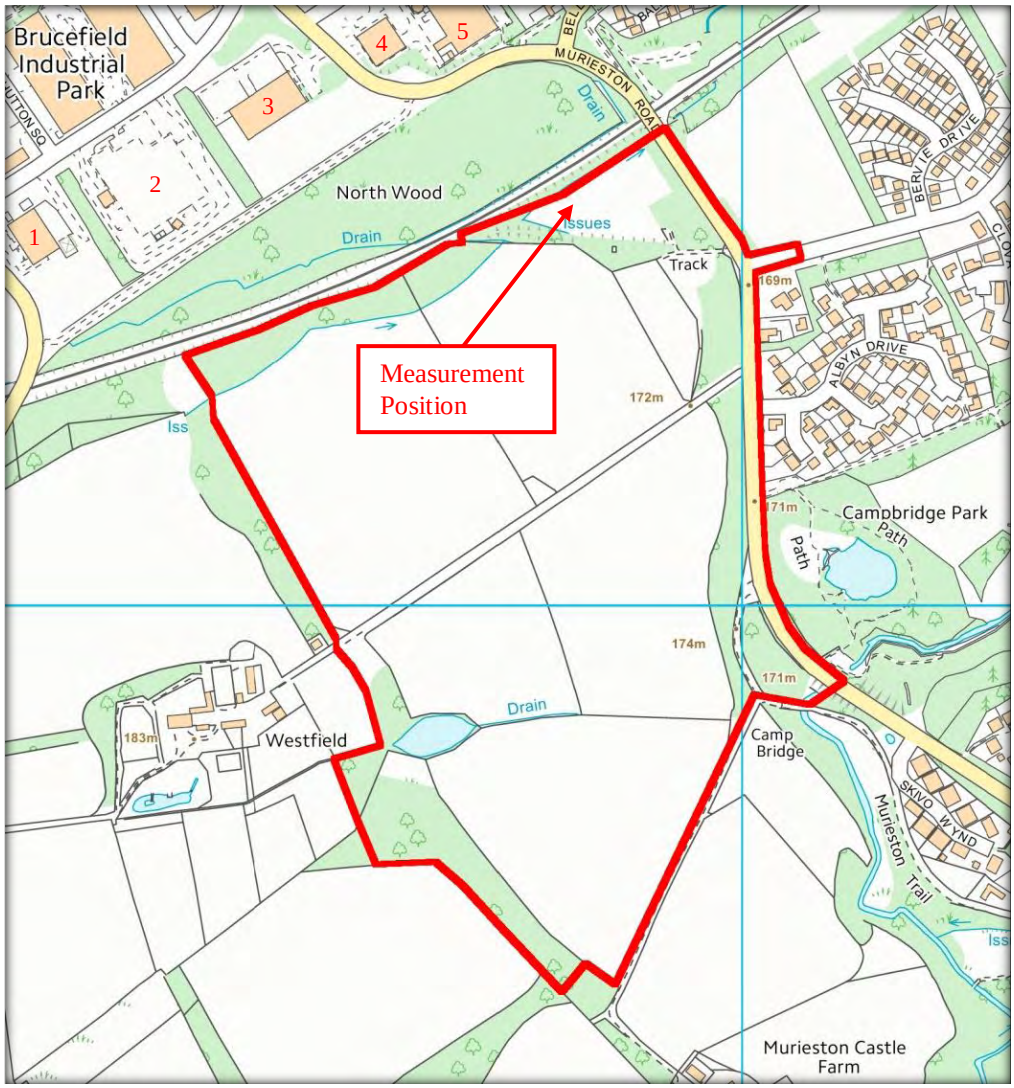
Brüel & Kjær Windscreen Type UA0237
Serial No. Not applicable

5.3 It is usual, in an assessment like this, to measure the noise where the house which will be most exposed to it will be built. The principle in this is that, if the noise is acceptable at the most exposed house, it follows that it will also be acceptable elsewhere in the development. At the time of the visit, however, the layout of the development had not been drawn up. In situations like this, it is usually assumed that the nearest house will be 10m back from the boundary of the development site with the industrial estate. This is because 10m is the length of a typical garden being provided with houses being built by developers in Scotland just now.

The measurement position is shown overleaf on Figure 2, which is reproduced from the drawing titled *Location plan*, provided by Clarendon Planning and Development.

Figure 4

Location of Brucefield Industrial Park Noise Measurement Position
(Courtesy of Clarendon Planning and Development)



5.4 In choosing the measurement position, to determine where the noise on the development site might be greatest, Mr Cloy visited the Industrial Park to ascertain what businesses occupy the units nearest the site.

The plots in the Industrial Park are numbered 1 to 5 on Figure 4 above. The businesses occupying the plots were as follows.

1) Unknown, but no obvious industrial noise sources visible or audible.
2) Vacant site, with no buildings or any other useage.
3) IBM Livingston Business Recovery Centre.
4) CB Technology.
5) Vacant industrial building.

CB Technology assembles, designs and tests electronic printed circuit boards. IBM Livingston Business Recovery Centre provides serviced workspaces for companies. Neither business was thus considered likely to generate noise that would be significant on the development site. Of the two, however, it seemed that if any noise was likely it would be from CB Technology rather than IBM Livingston Business Recovery Centre. The noise was, therefore, measured where it was considered that the nearest house to it might be built.

As mentioned earlier in Section 2.5, it was assumed that the course of the burn close to the northern boundary of the development site would not be altered, as it would be impractical to move it further north, because of the railway line. This was therefore, taken as being where the end of the gardens would be. The noise was measured 10m back from the burn. It was not measured directly adjacent to CB Technology because that part of the development site was covered in dense impenetrable vegetation.

In detail, the measurement position was located 10m back from, and at 90 degrees to, the post and wire fence defining the north-western boundary of the site. It was also 43m in a north-eastern direction from the aforementioned burn. The microphone of the sound level analyzer was horizontal, at a height of 1.40m above the ground.

5.5 Mr Cloy measured the noise on the development site between 11:15hrs and 15:30hrs, during which time businesses were operating as normal in Brucefield Industrial Park. No noise from them was audible. Measurements were thus made of the ambient noise, over periods of 10 minutes every half hour.

5.6 The equivalent continuous, L_{Aeq}, noise levels were measured at both positions. The analyzer also measured the maxima, L_{AFmax}, percentiles, L_{AF1}, L_{AF10}, L_{AF50}, L_{AF90}, L_{AF99}, minima, L_{AFmin} and octave band data. All noise levels were measured in decibels referenced to 2×10^{-5} Pa.

5.7 The sound level analyzer was calibrated before and after conducting the measurements. On completion of the measurements the calibration level was found not to have changed.

6.0 Brucefield Industrial Park Noise Level Measurement Results and Discussion

6.1 The results of the equivalent continuous, L_{Aeq}, maxima, L_{AFmax}, minima, L_{AFmin}, and percentile noise level measurements, L_{AFx}, are shown below in Table 7. The measurements of the ambient noise are shown in blue ink.

Table 7

Measured A-Weighted Ambient Noise Levels
(dB re 2 x 10^{-5} Pa)

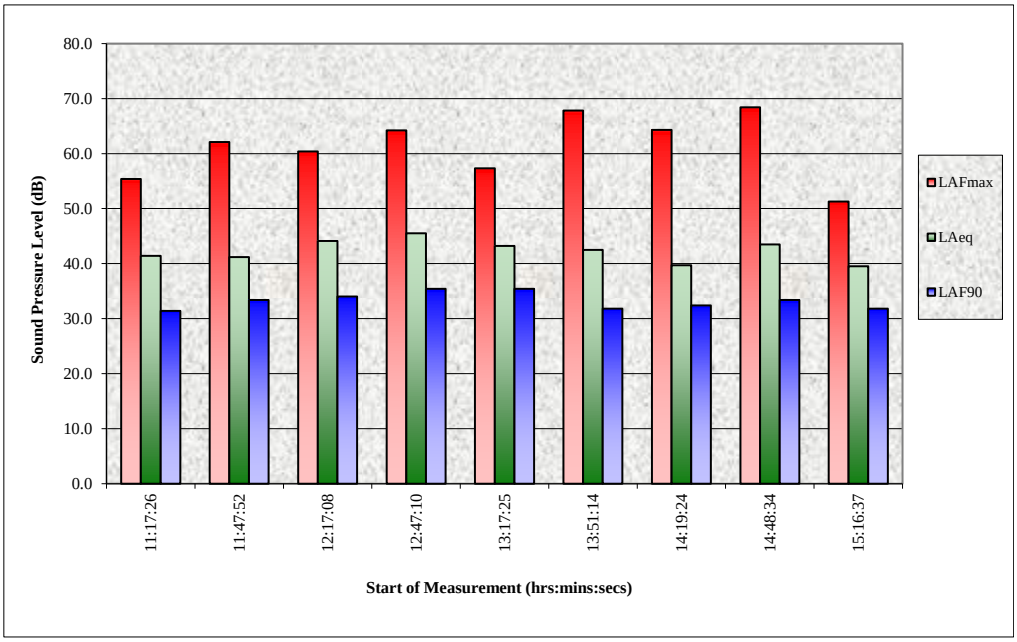
Start of Measurement (hrs:mins:secs)	L_{Aeq} dB(A)	L_{Amax} dB(A)	L_{A1} dB(A)	L_{A10} dB(A)	L_{A50} dB(A)	L_{A90} dB(A)	L_{A99} dB(A)	L_{Amin} dB(A)
11:17:26	41.4	55.4	48.4	45.4	38.8	31.4	29.0	28.2
11:47:52	41.2	62.1	48.2	44.6	39.0	33.4	31.2	29.9
12:17:08	44.1	60.4	53.8	47.4	40.4	34.0	31.6	30.3
12:47:10	45.5	64.2	55.2	48.4	42.0	35.4	31.8	30.3
13:17:25	43.2	57.3	51.8	46.4	40.8	35.4	32.4	30.3
13:51:14	42.5	67.8	51.2	43.6	37.8	31.8	29.6	28.6
14:19:24	39.7	64.3	48.2	42.2	36.4	32.4	30.6	30.0
14:48:34	43.5	68.4	49.8	44.6	39.6	33.4	31.2	30.0
15:16:37	39.5	51.3	47.2	43.4	36.2	31.8	29.4	28.6

Start of Measurement (hrs:mins:secs)	Duration of Measurement (hrs:mins:secs)	Description of Event	L_{Aeq} dB(A)
11:17:26	00:10:01	Road traffic noise on Murieston Road and surrounding roads, birdsong	41.4
11:47:52	00:10:02	Road traffic noise on Murieston Road and surrounding roads, birdsong, 11:49hrs meter paused for passing train	41.2
12:17:08	00:10:01	Road traffic noise on Murieston Road and surrounding roads, birdsong, distant aircraft noise	44.1
12:47:10	00:10:51	Road traffic noise on Murieston Road and surrounding roads, birdsong, 12:48hrs meter paused for passing train	45.5
13:17:25	00:10:02	Road traffic noise on Murieston Road and surrounding roads, birdsong, distant aircraft noise	43.2
13:51:14	00:10:17	Road traffic noise on Murieston Road and surrounding roads, birdsong, 13:59hrs meter paused for passing train	42.5
14:19:24	00:10:01	Road traffic noise on Murieston Road and surrounding roads, birdsong	39.7
14:48:34	00:10:54	Road traffic noise on Murieston Road and surrounding roads, birdsong	43.5
15:16:37	00:10:05	Road traffic noise on Murieston Road and surrounding roads, birdsong, 15:19hrs meter stopped for passing train	39.5

6.2 The most important of the parameters shown in Table 7, the equivalent continuous, L_{Aeq}, maximum, L_{AFmax}, and background, L_{AF90}, sound pressure levels are shown below in Figure 5.

Figure 5

Measured A-Weighted Ambient Noise Levels
(dB re 2 x 10^{-5} Pa)



6.3 Subjectively, no industrial noise was audible or discernible during the measurement period. The ambient noise was of mainly of traffic on Murieston, and other, roads in the vicinity, bird song and intermittent distant aircraft. The equivalent continuous noise level of all of the residual noise measurements, has been calculated, and found to be 42.7dB(A).

6.4 It was noted that the building numbered 5 on Figure 4 was industrial in nature, but vacant. It was not obvious what kind of manufacturing might have gone on in the building in the past. The building is some 260m from where the nearest house might be built. This distance will mean that any noise which may emanate from the building in future will be attenuated quite considerably. There is also a belt of trees just over 100m wide between the building and where the nearest of the proposed houses might be built. This will attenuate the noise by 9dB(A)[7]. With this attenuation due to distance and trees, it is unlikely that industrial activity inside, or outside, the building will generate noise that would disturb the residents of the new houses.

There are existing houses on New Park Road, Bellsquarry Road and Balmoral Gardens. These are all much closer to the vacant building than the nearest of the houses proposed on the development site. If industrial processes started in the building which were noisy, they would be more likely to generate complaints from the existing housing than the new houses. In this the onus would then be on the business generating the noise to control it, rather than it being a planning issue.

6.5 The meteorological conditions prevailing during the noise level measurements were as shown previously in Table 3. They were perfectly acceptable for measuring ambient noise.

7.0 Conclusions

7.1 BDW Trading / H & J Russell propose to apply for planning permission to construct houses on land off Murieston Road, in Livingston. To the north of the land are railway lines. Approximately 260m to the north-west of the land lies the nearest building in Brucefield Industrial Park. The concern was raised at the planning stage, by officers of West Lothian Council, that noise from the railway and industrial estate might disturb the residents of the houses. Charlie Fleming Associates was asked, by BDW Trading / H & J Russell, to quantify the levels of railway and industrial noise on the proposed development site, and determine whether they would be acceptable.

7.2 The railway noise was measured as described in Section 2.0 of this report, and the results are presented in Section 3.0. The noise levels have been assessed as prescribed in The Scottish Government publication titled *Technical Advice Note 2011: Assessment of Noise*[4] (TAN 2011).

7.3 The *Magnitude of Impact* of the railway noise, on the residents of the houses, was determined in Section 4.0. During the night, the noise will have *Negligible adverse* impact on the residents of the houses. The *Level of Significance* of the noise will therefore be *Slight*, which is defined in TAN 2011 as:

Slight: *These effects may be raised but are unlikely to be of importance in the decision making process.*

During the day, the noise will have *No adverse impact* on the residents of the houses. The *Level of Significance* of the noise will therefore be *Neutral*, which is defined in TAN 2011 as:

Neutral: *No effect, not significant, noise need not be considered as a determining factor in the decision making process.*

7.4 It is thus concluded that the railway noise levels are within the limits given in current planning guidance, and that no measures are required to reduce them.

7.5 The noise of Brucefield Industrial Park was measured as described in Section 5.0 of this report, and the results are presented in Section 6.0.

7.6 On the proposed development site, there was no industrial noise audible or measureable from Brucefield Industrial Park. The residents of the new houses will not, therefore, be disturbed.

[redacted]

Eur Ing Charlie Fleming BSc MSc CEng FIOA MCIBSE MIET

8.0 References

1) West Lothian Council, *supplementary planning guidance Planning and noise*, West Lothian Council, June 2008.

2) The Scottish Executive Development Department, *Planning Advice Note 56 Planning and Noise*, Crown Copyright April 1999, ISBN 0 7480 8157 7.

3) The Scottish Government, *Planning Advice Note PAN 1/2011 Planning and Noise*, Crown Copyright 2011, ISBN 978-1-78045-043-8 (web only).

4) The Scottish Government, *Technical Advice Note TAN 2011 Assessment of Noise*, Crown Copyright 2011, ISBN 978-1-78045-042-1 (web only).

5) Department of Transport, *Calculation of Railway Noise 1995*, HMSO, London, 1995, ISBN 0-11-551754-5.

6) British Standard 4142: 1997, *Method for Rating industrial noise affecting mixed residential and industrial areas.* British Standards Institution, London, 1997, ISBN 0-580-28300-3.

7) Bies D. A. and Hansen C. H., *Engineering Noise Control*, Unwin Hyman, London1988, ISBN 0 04 620022 3.

Appendix

A1.0 Basic Principles of Acoustics

A1.1 Sound Pressure

The sound we hear is due to tiny changes in pressure in the air, caused by something disturbing the air, such as a loudspeaker cone moving back and forward, the blades of a fan heater going round, the moving parts of a car engine, and so on. From the initial point of the disturbance the sound travels to the receiver in the form of a wave. It is not like a wave in water, rather like one that would travel along a stretched spring, such as a child's *Slinky* toy laid flat on the ground and "pinged" at one end. Whether the human ear can hear the sound wave as it travels through the air, however, depends on the size of the disturbance and the frequency of it. That is, if the loudspeaker moves very slightly we may not be able to hear the changes in air pressure that it causes because they are too small for the ear to detect. The magnitude of sound pressures that the human ear can detect ranges from about 0.00002Pascals (Pa) to 200Pa. This enormous range presents difficulties in calculation and so, for arithmetic convenience, the sound pressure is expressed in decibels, dB. Decibels are a logarithmic ratio as shown below:

Sound Pressure Level $L\ (dB) = 20Log_{10}\{ {}^{p}/_{P}\}$
Where p = the sound pressure to be expressed in dB
and P = reference sound pressure 0.00002Pa

Hence, if we substitute 0.00002Pa, the smallest sound the ear can hear, for *p*, the result is 0dB. Conversely, if we substitute 200Pa, the loudest sound the ear can hear, for *p*, the result is 140dB. Hence, sound is measured in terms of sound pressure level in dB relative to 0.00002Pa.

A1.2 Range of Audible Sound Pressure Levels

An approximate guide to the range of audible pressures is presented overleaf in Table A1. The sound pressure levels noted are typical of the source given and should not be considered to be precise. The notes in the "Threshold" column of the Table are for general guidance, the sound pressure levels of those thresholds varying between individuals.

Table A1

Range of Audible Sound Pressure Levels and Sound Pressures

Sound Pressure Level (dB re $2x10^{-5}$ Pa)	Sound Pressure (Pa)	Source	Threshold of:
160	2000	Rifle at ear	Damage
140	200	Jet aircraft take off @ 25m	Pain
120	20	Boiler riveting shop	Feeling
100	2	Disco, noisy factory	
80	0.2	Busy street	
60	0.02	Conversation @ 2m	
40	0.002	Quiet office or living room	
20	0.0002	Quiet, still night in country	
0	0.00002	Acoustic test laboratory	Hearing

A1.3 Frequency and Audible Sound

Returning to the example of the loudspeaker cone, if it moves back and forward very slowly, for example once or twice a second, then we will not be able to hear the sound because the ear cannot physically respond to such a low frequency sound. Human ears are sensitive to sound pressure waves with frequencies between about 30Hertz (Hz) and 16,000Hz, where Hz is the unit of frequency and is also known as the number of cycles per second. That is, the number of times each second that the loudspeaker cone moves in and out, the fan blade goes round, etc. At the other end of the frequency spectrum, a sound with a frequency of 30,000Hz will also be inaudible, again because the ear cannot physically respond to sound pressure waves having such a high frequency.

Across the audible frequency range, the response of the ear varies. For example, a sound having a frequency of 63Hz will not be perceived as being as loud as a sound of exactly the same sound pressure level, having a frequency of 250Hz. A sound having a frequency of 500Hz will not be perceived as being as loud as a sound of the same sound pressure level with a frequency of 1,000Hz. Indeed, for a given sound pressure level, the hearing becomes progressively more sensitive as the frequency increases up to around 2,500Hz. Thereafter, from 2,500Hz upwards to about 16,000Hz, the sensitivity decreases, with sounds having frequencies above 16,000Hz being inaudible to most adults.

Virtually all sounds are made up of a great many component sound waves of different sound pressure levels and frequencies combined together. To measure the sound pressure level contributed at each of the frequencies between 30Hz and 16,000Hz, that is, 15,970 individual frequencies, would require 15,970 individual measurements. This would yield a massive, unwieldy amount of data.

A1.4 Octave Bands of Frequency

As a compromise, the sound pressure level in particular ranges, or "bands", of frequencies can be measured. One of the commonest ranges of frequency is the octave band. An octave band of frequencies is defined as a range of frequencies with an upper limit twice the frequency of the lower limit, eg 500Hz to 1,000Hz. This octave is exactly the same as a musical octave, on the piano, violin, etc, or *doh* to high *doh* on the singing scale. Octave bands are defined in international standards

and are identified by their centre frequency. Sound measurements are generally made in the eight octave bands between 63Hz and 8,000Hz. This is because human hearing is at its most sensitive, in terms of its frequency response, over this range of frequencies. Furthermore, speech is made up of sound waves having frequencies in this range.

A1.5 "A-Weighting" and dB(A)

Whilst an octave band analysis gives quite detailed information as to the frequency content of the sound, it is rather clumsy in terms of presenting results of measurements, that is, having to note sound pressure levels measured at eight separate octave bands. Furthermore, the ear hears all these separate frequency components as a whole and thus it would seem sensible to measure sound in that way.

When sound pressure level is measured with a sound level meter, the instrument can analyse the sound in terms of its octave band content as described above in section A1.4, or measure all the frequencies at once. Bearing in mind that the response of the ear varies with frequency, the sound level meter can apply a correction to the sound it is measuring to simulate the frequency response of the ear. This correction is known as "A-weighting" and sound pressure levels measured with this applied are described as having been measured in dB(A).

A1.6 Variation of Sound Level With Time

Most sounds, for example, speech, music, a person hammering, road traffic, an aircraft flying overhead, vary with respect to time. Various terms can be applied to describe the temporal nature of a sound as shown in Table A2.

Table A2

Examples of the Temporal Nature of Sound

Description	Example of Noise Source
Constant or steady state	Fan heater, waterfall
Impulsive	Gun shot, hammer blow, quarry blast
Irregular or fluctuating	Road traffic, speech, music
Cyclical	Washing machine, grass mowing
Irregular impulsive	Clay pigeon shooting
Regular impulsive	Regular hammering, tap dripping, pile driving

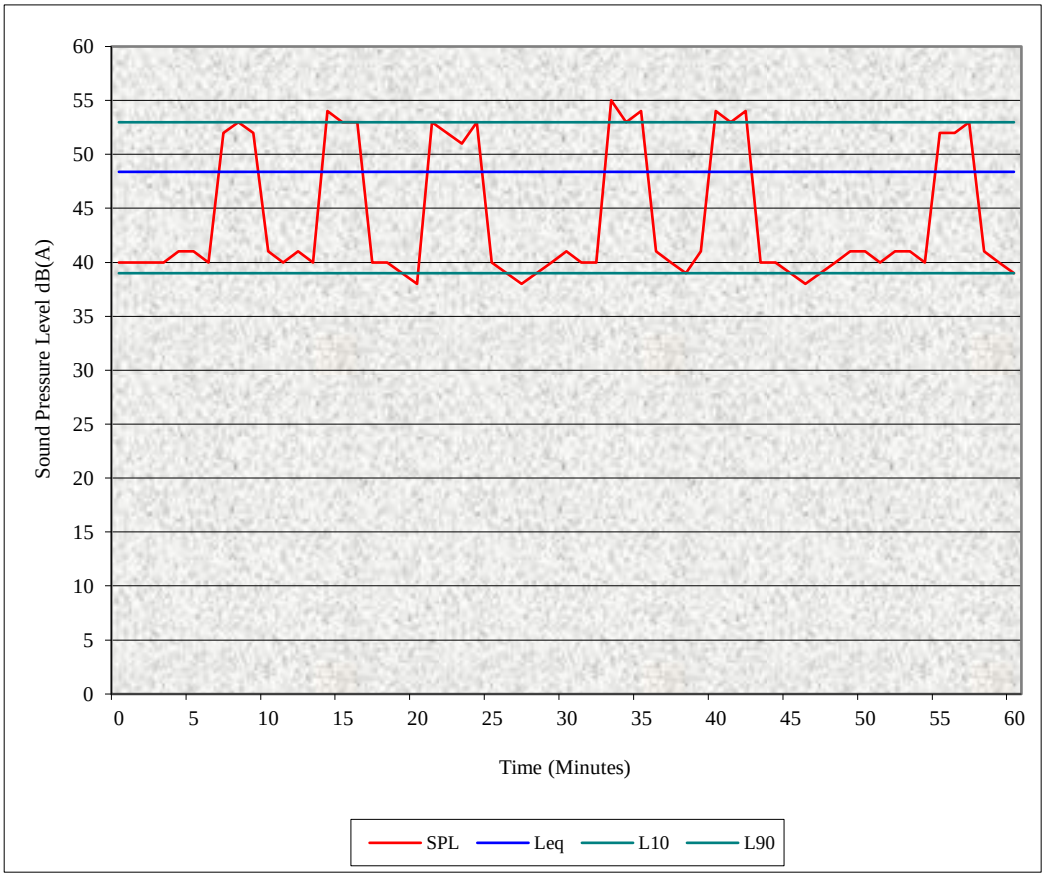
In practice, combinations of virtually any of the above can exist. In measuring noise it is necessary to deal with the level as it varies with respect to time.

A1.7 Time History

Consider the time history, as it is known, shown overleaf in Figure A1. Note that it is not an actual time history, rather an approximate representation of that which a person might experience some 100m away from a building site on which a man is operating a pneumatic drill.

Figure A2

Example of Time History of Construction Site Noise



The noise of the compressor and other activity on the site is reasonably constant with time, having a level of between 38dB(A) and 41dB(A). When the drill operates the noise level rises to between around 51dB(A) and 55dB(A).

A measurement of the noise between the 25th minute and the 32nd minute, when the noise is that of the compressor, would result in a level of about 40dB(A). This is very different from the result of a measurement made between the 33rd minute and the 35th minute, when the drill is operating, which would give a noise level of about 54dB(A). In the past acousticians therefore had to develop some way of measuring the noise which gives us information as to its variation in time. The easiest parameters to understand are the maximum and minimum levels, in this case 55dB(A) and 38dB(A) respectively. These do not tell us much about the noise other than the range of levels involved. The most widely used parameter is the equivalent continuous sound level, L_{eq}, which is explained in Section A1.8.

A1.8 Equivalent Continuous Sound Level, L_{eq}

A representative measurement of the noise to which the person in the example is exposed must deal with these changes in level. This can be done by measuring what is known as the equivalent continuous sound level, denoted as L_{eq}. If the measurement has been made in dB(A) it can be denoted as L_{Aeq} and expressed in dB. This is the sound level which, if maintained continuously over a given period, would

have the same sound energy as the actual sound (which varied with time) had. In the example the L_{eq} is 48.4dB(A) and it is shown on Figure A1 as a blue line. In layman's terms it may be considered to be the average of the sound over a period of time.

A1.9 Sound Exposure Level, SEL or L_{AE}

This is the sound level which if maintained constant for a period of one second would have the same sound energy as the time varying sound had. It may be considered to be a L_{eq} normalised to one second. It is very useful for measuring the noise of discrete events such as train pass-bys, aircraft flyovers, explosions and gunfire. A series of SEL's can be added together relatively easily and an L_{eq} calculated for a long period of time such as a whole day or night.

A1.10 Percentiles, L_x

Another parameter often used in describing noise is the percentile. This is a statistical parameter and with respect to noise is that level exceeded for x% of the measurement period. Hence the L_{10} is that level which was exceeded for 10% of the measurement period. In the example this is 53dB(A) and it is shown in green on Figure A1. It can be seen to be a reasonable representation of the typical value of the peaks in the time history. The L_{10} is often used to describe road traffic noise, such as in the *Calculation of Road Traffic Noise* by the Department of Transport and in the *Noise Insulation Regulations 1975/1988*.

Conversely, the L_{90} is that level exceeded for 90% of the time. In the example it is 39dB(A) and is also shown in green. It is a good descriptor of the troughs in the time history. Another way of thinking of the L_{90} is that it describes the background noise, during lulls in the more obvious noise, in this case the drill. The L_{90} is used in BS 4142:1997 *Method for Rating industrial noise affecting mixed residential and industrial areas*, as the descriptor of the background noise.

Any percentile can be specified such as L_{21}, L_{65}, L_8 ,L_{87} and so on. In practice however the only other percentiles used are the L_1, which is very similar to the maximum level that occurred during the measurement period and the $L_{99,}$ which is similar to the minimum level that occurred. Very occasionally the L_5 and L_{95} might be specified in a measurement procedure.

A1.11 Maximum, L_{max}

The greatest level occurring during a given measurement period. From the example illustrated in Figure A1 it would be 55dB(A).

A1.12 Time Weighting, Fast, L_F, or Slow, L_S

Time weighting refers to the speed at which the sound level meter follows variations in the time history. The “fast” weighting of 125 milli-seconds corresponds to the way in which the human ear follows sound. The “slow” weighting effectively introduces more averaging of the noise. Note that the L_{eq} is independent of the time weighting, which only applies in the measurement of maxima, minima and percentiles.