Arboricultural Implication Assessment

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Contents:

Document information 1
Executive Summary 2
Introduction 3
Trees to be affected by the proposed design 4
Effects on trees 16
Summary 17
Appendix A – Limitations 18
Appendix B – Landscape plans 19
Appendix C – Draft TTP 20

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Executive Summary

Eight Associates has been appointed by Swansea City and County Council to carry out an Arboricultural Implication Assessment (AIA) to the British Standard 5837:2012 'Trees in relation to design, demolition and construction' at Castle Square, Swansea.

This Arboricultural Implication Assessment relates to main works proposed at the site. The main works, subject to this AIA include the construction of 2no. pavilions, remodelling of raised grassed areas into lawn and wild flower areas, removal of existing water foundation and installation of water feature.

A site visit was made on 17th December 2021 to survey the trees, hedges, and vegetation to the British Standard. The condition of all trees on site was assessed and a Category Rating was allocated; this information is detailed in Appendix C of the Tree Survey report. A Tree Constraints Plan was produced following the survey, which along with the Tree Survey and provided design drawings informs the implications considered within this report.

A Tree Protection Plan accompanies this report which shows trees to be retained and removed, as well as their Root Protection Areas (RPA) and the location of tree protection measures, such as protective barriers. The locations of the tree protection measures are preliminary and subject to refinement as the design progresses. This report considers trees which will be affected by the proposed build.

A summary of tree work related to the main works to be undertaken on site is as found in Table 1. This is dependent on the potential options provided.

Table 1 Trees to be retained / removed

Consideration	Number of trees
Trees/groups/hedges to be retained	17
Category A trees/groups/hedges to be removed	0
Category B trees/groups /hedges to be removed	0
Category C trees/groups/hedges to be removed	6
Category U trees/groups/hedges to be removed	0

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Introduction

Eight Associates has been instructed by Swansea City and County Council to produce an AIA on specified trees and vegetation in and adjacent to the site identified at Castle Square, Swansea]. The AIA is based on the findings of a Tree Survey and Tree Constraints Plan undertaken on 17th December 2021 in partnership with Eight Associates and David Riley from Writtle Forest Consultancy Ltd.

The aim of this AIA is to consider how the development as currently proposed and the associated trees will co-exist and interact in the present and the future. The AIA addresses and considers issues such as statutory constraints, above and below constraints, alternatives to tree loss and infrastructure requirements. It also considers such issues as end-use of space, the need to prune or remove trees due to excessive shade or encroachment.

Some aspects are not dealt with within the report (please also refer to Appendix A). The AIA does not include an Arboricultural Method Statement (AMS). This AIA does not consider issues relating to boundary lines and the proposed structures. It may be that such issues affect ownership of trees, but the assessment does not deal with this issue. (Issues of boundary line dispute and/or ownership of vegetation may require a land registry search and reference to local records. This can be conducted if so requested).

The considerations in this report have been based on the following drawings provided to us:

- 211-ACME-ST1-00-0011_Revl – 18.03.22
- 211-ACME-ST1-00-0012_Rev L – 18.03.22
- 211-ACME-GA1-00-7020_Rev C – 22.04.22
- 211-ACME-GA2-00-7030_Rev A – Rev A - 08.04.22
- 211-ACME-GA2-00-7031_Rev A – Rev A - 08.04.22
- 211-ACME-GA2-00-7032_Rev A – Rev A - 08.04.22
- 211-ACME-GA2-00-7033_Rev A – Rev A - 08.04.22
- TFW-843-00-PL-0240revP02
- CSQ-A10-01-SW-DR-E20301 – received 21.04.22
- CSQ-CEC-XX-ZZ-DR-C-00001 – Rev P05, March 2022.
- 1496-S-SK-015 – Planter Foundations
- CSQ-A10-01-GF-DR-Z-40000

Proposed Development

This Arboricultural Implication Assessment relates to main works proposed at the site. The main works, subject to this AIA include the construction of the construction of 2no. pavilions, remodelling of raised grassed areas into lawn and wild flower areas, removal of existing water foundation and installation of water feature.

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Trees to be affected by the proposed design

Table 2 Trees to be affected by the proposed design

Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
T1	Silver Maple	NA	NA	NA	✓	Wall of existing planter to be removed, construction of new wall for reconfigured planter and lowering of levels by up to 200mm collectively encroach RPA by 20%. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. If this cannot accommodated, any new foundations must not extend beneath the existing. Lowering of levels, which encroaches within extents of RPA by 9%, to be carried out by hand/ air-spade. Soft landscaping proposed within new planter encroaches remaining RPA. There should be no further lowering of levels and any raising will be no more than 50mm using a suitable soil mix. Within RPA seeding is to be favoured over plugs to reduce impact on roots. Lighting column 4 proposed to north-east of crown. Methodology required for lifting column into place without conflicting with tree. Electricity service to feed light to be located outside RPA.	Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4– Soft Landscaping.
T2	London Plane	NA	NA	NA	✓	Wall of existing planter to be removed encroaches RPA by 18%. Wall of new planter encroaches RPA by less than 2%, which is minor such that no further mitigation is required. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Stripping out of existing water service and replacement with new water service for Pavilion A encroaches within approx. 20% of RPA. Traditional trench would necessitate cutting all roots encountered, which would impact on tree. Therefore, excavations within RPA to be carried out by hand using an air-spade/ suction unit whilst preserving significant roots (>25mm dia.). To reduce disturbance of roots and impact on tree, the existing water pipe should be retained in-situ where possible. Amendments to paving proposed within RPA and adjacent stem.	Installation of Tree Protective Box prior to the commencement of . Phase 2 - Main Demolition/ Construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 3 – Stripping out of existing Water Service and LV Cable.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers and that the existing tree surround with soil fill is retained.	
T3	London Plane	NA	NA	NA	✓	New planter to be constructed encroaches RPA by 20%. Installation of traditional strip foundation would be unacceptable due to the extent of root loss and proximity to structural roots from this tree. Special foundation design required. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots (>25mm dia.). Installation of new planter will involve raising of levels by approx. 500mm within 20% of RPA. Given that this section of the RPA is presently covered with jointed slabs which are only partially permeable, the tree has adapted to some impediment of water ingress and gaseous exchange. As such the raising of levels should not have significant impact on this tree. Amendments to paving proposed within RPA and adjacent stem. 2.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers and that the existing tree surround with soil fill is retained. 3. Existing bus shelter to be removed and in-fill railings encroach RPA. 3.1 There should be little or no impact on tree provided that the bus shelter is dismantled by hand. Any supporting foundations are to be retained -n-situ to remove potential for damage to tree roots. 3.2 In-fill railings are to utilise the existing foundations where possible. Where that cannot be accommodated the new foundations will be of smallest dimensions suitable to support the lightweight structure and installed using hand operated tools only.	Installation of Tree Protective Box prior to commencement of demolition/ main construction.. Phase 2 – Main Demolition/ Construction.
T4	London Plane	NA	NA	NA	✓	Wall of existing planter to be removed, construction of new wall for reconfigured planter and stripping out of existing lighting columns collectively encroach RPA by 30%. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Installation of new foundations using traditional strip footings would be unacceptable due to the extent of root loss and proximity to structural roots from this tree. Special foundation design required. The installation of small diameter	Installation of Tree Protective Box prior to commencement of demolition/ main construction. Phase 2 – Main Demolition/ Construction. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots (>25mm dia.). Stripping out of lighting column to be carried out by hand at time of planter reconfiguration. Installation of new planter will involve raising of levels by approx. 500mm within 10% of RPA. Given that this section of the RPA is presently covered with jointed slabs which are only partially permeable, the tree has adapted to some impediment of water ingress and gaseous exchange. As such the raising of levels should not have significant impact on this tree. Amendments to paving proposed within RPA and adjacent stem. 2.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers and that the existing tree surround with soil fill is retained. 3. Existing bus shelter to be removed and in-fill railings encroach RPA. 3.1 There should be little or no impact on tree provided that the bus shelter is dismantled by hand. Any supporting foundations are to be retained -n-situ to remove potential for damage to tree roots. 3.2 In-fill railings are to utilise the existing foundations where possible. Where that cannot be accommodated the new foundations will be of smallest dimensions suitable to support the lightweight structure and installed using hand operated tools only.	
T5	London Plane	NA	NA	NA	✓	Wall of existing planter to be removed and construction of new wall for reconfigured planter collectively encroach RPA by 25%. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Installation of new foundations using traditional strip footings would be unacceptable due to the extent of root loss and proximity to structural roots from this tree. Special foundation design required. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots. Installation of new planter will involve raising of levels by approx. 100mm within 15% of RPA. Given that this section of the RPA is located to the north of the existing	Installation of Tree Protective Box prior to commencement of demolition/ main construction. Phase 2 – Main Demolition/ Construction. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						planter wall it is likely that roots have grown beneath the foundations and have proliferated at depth. Therefore the modest raising of levels above should have little or no impact on this tree. Amendments to paving proposed within RPA and adjacent stem. 3.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers and that the existing tree surround with soil fill is retained.	
T6	London Plane	NA	NA	✓	✓	New planter to be constructed encroaches RPA by 16%. Installation of traditional strip foundation would be unacceptable due to the extent of root loss and proximity to structural roots from this tree. Special foundation design required. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots (>25mm dia.). Installation of new planter will involve raising of levels by approx. 500mm within 20% of RPA. Given that this section of the RPA is presently covered with jointed slabs which are only partially permeable, the tree has adapted to some impediment of water ingress and gaseous exchange. Therefore the raising of levels should only minimally impact on this tree. Installation of new planter will involve raising of levels by approx. 200mm within 16% of RPA. Given that this section of the RPA is presently covered with jointed slabs which are only partially permeable, the tree has adapted to some impediment of water ingress and gaseous exchange. Therefore the raising of levels should only minimally impact on this tree. 1no new foul and 1no new surface water pipes for drainage to be installed collectively encroach 10% or RPA to depths of approx. 2.0 metres. Traditional trench would necessitate cutting all roots encountered, which would impact on tree. Therefore, excavations within RPA in upper soil levels to be carried out by hand using an air-spade/ suction unit whilst preserving significant roots (>25mm dia.). Amendments to paving proposed within RPA and adjacent stem. There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers and that the existing tree surround with soil fill is retained. Access for construction vehicle encroaches RPA to east within pedestrian paving by 45%. 4.1 Existing hard-standing to be retained and supplemented with suitable ground protection to spread the load of accessing vehicles.	Phase 1 – Tree Works Installation of Tree Protective Box and Ground Protection prior to commencement of demolition/ main construction. Phase 2 – Main Demolition/ Construction. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						4.2 Lift crown to 4.5 metres for vehicular access.	
T7	London Plane	✓	NA	NA	NA	Tree located less than 0.4 metres from proposed new planter wall. Impractical level of mitigation required to retain tree given low value 'C' Category tree. Fell tree and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works
T8	Cherry	NA	NA	NA	✓	Walls of existing planter to be removed collectively encroach RPA to north and south by 70%. Raising of levels proposed within new planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Installation of new foundations using traditional strip footings would. Special foundation design required within RPA to south. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots. Raising of levels by up to 1.0 metre outside the footprint of the existing planter encroaches within 30% of RPA. Given that these sections of the RPA are presently covered with jointed slabs which are only partially permeable, the tree has adapted to some impediment of water ingress and gaseous exchange. Therefore the raising of levels should only minimally impact on this tree. It is further proposed to raise the levels within the footprint of the existing planter by up to 100mm. Given the extent of works around this tree it is recommended that further raising of levels is avoided, but if unavoidable levels should not be raised more than 50mm and graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. Within RPA, seeding should be favoured over plugs to reduce impact on roots.	Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.
T9	Norway Maple	NA	NA	NA	✓	Walls of existing planter to be removed collectively encroach RPA to north and south by 30%. Raising of levels proposed within new planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Foundations for new planter wall to north of tree to be seated no deeper than existing foundations..	Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						It is proposed to raise the levels within the footprint of the existing planter by up to 100mm. Given the extent of works around this tree it is recommended that further raising of levels is avoided, but if unavoidable levels should not be raised more than 50mm and graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. Within RPA, seeding should be favoured over plugs to reduce impact on roots. Amendments to paving proposed within RPA and adjacent stem. 3.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers.	
T10	Silver Maple	NA	NA	NA	✓	Walls of existing planter to be removed collectively encroach RPA to south by 20%. Raising of levels proposed within new planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Proposed raising of soils by 50mm rising to 300mm at extents of RPA encroaches <20% of RPA to north. To compensate for this encroachment it is recommended that the soils within the RPA are de-compacted prior too installation. Soils used to build up levels should be permeable. Given the extent of works around this tree it is recommended that further raising of levels within the remaining RPA is avoided/ <50mm and if required graded down toward the stem. Removal of existing screen encroaches within 5% of RPA. The screen will need to be lowered and removed from the north on the opposite side of the tree. The foundations supporting the screen, whether they be pads or piles, should where possible be retained in-situ within the RPA to prevent root disturbance. If that cannot be accommodated removal below ground should be achieved using hand tools. Soft landscaping proposed within new planter encroaches remaining RPA. 3.1 Within RPA, seeding should be favoured over plugs to reduce impact on roots. Lighting column 3 proposed to east of crown. 4.1 Methodology required for lifting column into place without conflicting with tree. Electricity service to feed light to be located outside RPA. Amendments to paving proposed within RPA and adjacent stem.	Phase 1 – Tree Works Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 3 – Stripping out of existing Water Service and LV Cable. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						5.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers. 6. Proposed stripping out of existing Water Services encroaches RPA and close to main stem. 6.1 Excavations to remove this service will encounter significant roots and it will be complex to prevent impact on tree and thus should be avoided.	
T11	Silver Maple	NA	NA	NA	✓	Wall of existing planter to be removed encroaches RPA by 10%. Raising of levels proposed within new planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Proposed raising of soils by 50mm rising to approx. 500mm at extents of RPA encroaches <14% of RPA to north. To compensate for this encroachment it is recommended that the soils within the RPA are de-compacted and improved prior to installation. Soils used to build up levels should be permeable. Given the extent of works around this tree it is recommended that further raising of levels within the remaining RPA is avoided/ <50mm and if required graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. 3.1 Within RPA, seeding should be favoured over plugs to reduce impact on roots. Lighting column 2 proposed to south of crown. 4.1 Methodology required for lifting column into place without conflicting with tree. Foundations for pole and Electricity service to feed light to be located outside RPA. Amendments to paving proposed within RPA and adjacent stem. There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers.	Phase 1 – Tree Works Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.
T12	Cherry	NA	NA	NA	✓	Wall of existing planter to be removed encroaches RPA by 10%. Raising of levels proposed within new planter. Therefore, the following options are available; It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible.	Phase 1 – Tree Works Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						Proposed raising of soils by 50mm rising to 500mm at RPA extents encroaches <20% of RPA to north. To compensate for this encroachment it is recommended that the soils within the RPA are de-compacted and improved prior to installation. Soils used to build up levels should be permeable. Given the extent of works around this tree it is recommended that further raising of levels within the remaining RPA is avoided/ <50mm and if required graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. 2.1 Within RPA, seeding should be favoured over plugs to reduce impact on roots. Amendments to paving proposed within RPA and adjacent stem. There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers.	
T13	Silver Maple	NA	NA	NA	✓	Walls of existing planter to be removed collectively encroach RPA by 35%. Raising of levels proposed within new planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Special foundation design required for new planter wall within RPA to south. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots. Proposed raising of soils within new planter by 50mm rising to 600mm at RPA extents encroaches <18% of RPA to east. To compensate for this encroachment it is recommended that the soils within the RPA are de-compacted and improved prior to installation. Soils used to build up levels should be permeable. Given the extent of works around this tree it is recommended that further raising of levels within the remaining RPA is avoided/ <50mm and if required graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. 2.1 Within RPA, seeding should be favoured over plugs to reduce impact on roots. Lighting column 1 proposed to north-west of crown. 3.1 Methodology required for lifting column into place without conflicting with tree. Foundations for pole and Electricity service to feed light to be located outside RPA. Amendments to paving proposed within RPA and adjacent stem.	Phase 1 – Tree Works Installation of Tree Protective Barriers and Ground Protection prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers. 5. Access for construction vehicle encroaches RPA to north within pedestrian paving by 10%. 5.1 Existing hard-standing to be retained and supplemented with suitable ground protection to spread the load of accessing vehicles.	
T14	Silver Maple	NA	NA	NA	✓	Wall of existing planter to be removed encroaches RPA by 35%. Wall of new planter encroaches RPA by 8%. Raising of levels proposed within new enlarged planter. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. Special foundation design required for new planter wall within RPA to north. The installation of small diameter helical piles with above ground beam/ stone is suggested. Prior to installation it will be necessary to conduct a root investigation so that piles are located to avoid significant roots. Proposed raising of soils within new planter by 50 – 400mm in height encroaches 18% of RPA to north, by 50 – 220mm in height encroaches RPA to the south by 8% and by 50 – 500mm in height encroaches RPA to the west by 25%. The construction of the new planter will remove hard-standing from around the tree and replace with soft ground. This will be beneficial for the tree. However the raising of soil levels of >50-100mm collectively encroaches the RPA by 51%. It is foreseeable that the pre-existing soils are already compacted, however there is potential for further compression due to the soil raising. To improve conditions for the tree it is recommended that the soils within the RPA are de-compacted and improved prior to works. Soils used to build up levels should be permeable. Given the extent of works around this tree it is recommended that further raising of levels within the remaining RPA is avoided/ <50mm and graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. 2.1 Within RPA, seeding should be favoured over plugs to reduce impact on roots. Amendments to paving proposed within RPA to north. There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers.	Phase 1 – Tree Works Installation of Tree Protective Box and Ground Protection prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						4. Proposed stripping out of existing Water Services encroaches RPA and close to main stem. 4.1 Excavations to remove this service will encounter significant roots and it will be complex to prevent impact on tree and thus should be avoided. 5. Access for construction vehicle encroaches RPA to north within pedestrian paving by 10%. 5.1 Existing hard-standing to be retained and supplemented with suitable ground protection to spread the load of accessing vehicles.	
T15	Norway Maple	NA	NA	NA	NA	Amendments to paving proposed within RPA and adjacent stem. 1.1 There should be little or no impact on tree provided that new paving is installed without excavation beneath existing sub-base layers.	Installation of Tree Protective Box. Phase 2 – Main Demolition/ Construction.
T16	London Plane	NA	NA	NA	NA	No Issues	NA
T17	Himalayan Birch	✓	NA	NA	NA	Tree located within footprint of proposed pavilion. Fell and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works
T18	Cherry	✓	NA	NA	NA	Tree located within footprint of proposed pavilion. Fell and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works
T19	Sycamore	NA	NA	✓	✓	Wall of existing planter to be removed and construction of new wall for reconfigured planter encroach RPA by 30%. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. If new foundations are required they should not extent beneath the existing. Given the extent of works around this tree it is recommended that the raising of levels within the remaining RPA is avoided/ <50mm and graded down toward the stem. Footprint of new Pavilion B encroaches within 4% of RPA and beneath extents of crown to west and south-west. This level of encroachment is considered acceptable provided that any roots encountered in the excavations for the foundations are pruned back cleanly and subsequently protected. Facilitation pruning required to prune back crown to west and south-west by 2.5 metres for construction access Soft landscaping proposed within new planter encroaches remaining RPA.	Phase 1 – Tree Works Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						There should be no further lowering of levels and any raising will be no more than 50mm using a suitable soil mix. Within RPA seeding is to be favoured over plugs to reduce impact on roots. Lighting column 7 and 12 proposed to north-west and north-east of tree encroach RPA and edge of crown. Foundations for the columns are to be designed and installed using methods to minimise impact on tree. This will involve hand excavation, with final location to avoid significant roots (>25mm dia.) and prevention of wet cement leaching out into surrounding soils. Methodology required for lifting column into place without conflicting with tree. Electricity service to feed light to be located outside RPA or excavated by hand if within extents of RPA. 5. Proposed stripping out of existing LV Cable encroaches RPA. 5.1 Excavations to remove this service will encounter significant roots and it will be complex to prevent impact on tree and thus the cables should remain in-situ.	
T20	Whitebeam	NA	NA	✓	✓	Wall of existing planter to be removed and construction of new wall for reconfigured planter encroach RPA by 15%. It is foreseeable that roots from this tree will have grown against and along the existing planter wall. Retention of existing below ground foundations in-situ and dismantling of wall above ground carried out by hand only will minimise impact on tree. Construction of new retaining wall to utilise existing foundations where feasible. If new foundations are required they should not extent beneath the existing. Given the extent of works around this tree it is recommended that the raising of levels within the remaining RPA is avoided/ <50mm and graded down toward the stem. Soft landscaping proposed within new planter encroaches remaining RPA. There should be no further lowering of levels and any raising will be no more than 50mm using a suitable soil mix. Within RPA seeding is to be favoured over plugs to reduce impact on roots. Lighting column 8 and 12 proposed to north-west and south-east of tree encroach RPA and close to edge of crown. Foundations for the columns are to be designed and installed using methods to minimise impact on tree. This will involve hand excavation, with final location to avoid significant roots (>25mm dia.) and prevention of wet cement leaching out into surrounding soils.	Installation of Tree Protective Barriers prior to commencement of demolition/ main construction. Phase 2 - Demolition/ main construction. Tree Protective Barriers to be removed prior to soft landscaping within RPA. Phase 4 – Soft Landscaping.

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Tree Number	Species	Removal due to		Mitigation required		Details of how the proposed build layout affects tree and outline mitigation required	Phase of Project
		Works	Condition	Crown	RPA		
						Methodology required for lifting column into place without conflicting with tree. Electricity service to feed light to be located outside RPA or excavated by hand if within extents of RPA. 4. Proposed stripping out of existing LV Cable encroaches RPA. 4.1 Excavations to remove this service will encounter significant roots and it will be complex to prevent impact on tree and thus the cables should remain in-situ.	
T21	Cherry (Tree has been felled)	NA	NA	NA	NA	Stump located within the footprint of proposed remodelling of raised grass areas. Stump to be removed to allow proposed works to proceed.	Phase 1 – Tree Works
T22	Cherry	✓	NA	NA	NA	Tree located within footprint of the construction of proposed raised bed therefore, requiring soil levels to be raised by up to a 1 metre within the entire RPA . Impracticable to retain tree given the extent of encroachment. Fell tree and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works
T23	Cherry	✓	NA	NA	NA	Tree located within footprint of the construction of proposed raised bed therefore, requiring soil levels to be raised by up to a 1 metre within the entire RPA . Impracticable to retain tree given the extent of encroachment. Fell tree and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works
T24	Cherry	✓	NA	NA	NA	Tree located within footprint of the construction of proposed raised bed therefore, requiring soil levels to be raised by up to a 1 metre within the entire RPA . Impracticable to retain tree given the extent of encroachment. Fell tree and remove stump to allow proposed works to proceed.	Phase 1 – Tree Works

A draft TPP can be found in Appendix C.

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Effects on trees

Loss of trees

Trees T7, T17, T18, T22, T23 and T24 would be lost to allow the scheme to be implemented. All of the trees to be removed are 'C' Category specimens, all of the 'B' Category trees can be retained. It is currently proposed to plant 10no new trees to replace those 6no trees that would be lost. This will improve the quality of the tree stock.

Figure A.1 on page 37 of the Swansea Council Consultation Draft (Second Consultation June 2021) includes a table to calculate the number of replacement trees required as a result of trees lost to development. This has been reproduced below for reference.

Trunk Diameter of Tree lost to development (cm measured at 1.5 meters above ground level)	Number of Replacement Trees
Less than 15 0 - 1	0-1
15 - 19.9	1
20 - 29.9	2
30 - 39.9	3
40 - 49.9	4
50 - 59.9	5
60 - 69.9	6
70 - 79.9	7
80 +	8

Figure A.1 – Tree Replacement Calculation

The stem diameters taken from the Tree Survey Report for those trees to be removed are as follows: T7 = 480mm, T17 = 270mm, T18 = 380mm, T22 = 240mm, T23 = 180mm and T24 = 320mm. Using the above table, the number of trees required would be 4 + 2 + 3 + 2 + 1 + 3 = 15 trees.

As can be seen by the calculations, whilst the 10no replacement trees proposed will increase the tree stock and the canopy cover, the numbers fall short of the 15no trees calculated using the Swansea Council methodology. Castle Square is currently dominated by well-established trees; it is considered that the planting of 10no new trees is likely to be better suited to the area than attempting to fit in some 15no trees. Further discussion is suggested with the LPA in this regard.

Summary of mitigation required to retain the trees

The proposed scheme necessitates a significant amount of changes within the Root Protection Areas of the existing trees. It will be imperative that all works are carried out sympathetically to trees, and in accordance with methodologies to reduce impact on the retained trees, and to give them the best opportunity to thrive in the future.

Both below ground and above ground mitigation is required to retain the trees, this is discussed in the table included above.

Infrastructure Requirements

The proposals include new foul and surface water drainage that encroaches the RPA of retained tree T6 London Plane. For this installation and any others that encroach RPAs it will be necessary to carry out excavations using hand tools and the use of an air-spade and/ or suction unit where suitable.
If the installation of new trenches is required, they must be conducted in accordance with National Joint Utilities Group (2007) Publication Volume 4: Issue 2 Guidelines for the planning, installation and maintenance of utility apparatus in proximity to trees.

Installation of protective barriers and ground protection

It will be necessary to install Protective Barriers or Protection Boxes around retained trees at the site. If construction access is required within the RPAs of retained trees it will be necessary to lay Ground Protection. The Ground Protection will need to be sufficiently robust to prevent soil compaction and rutting during the works.

Consideration of ecological concerns

No ecological concerns have been raised in relation to the works or the trees on the site at the time of writing this report and none were noted at the time of the survey. Ecological considerations that involve EU Habitats Directive will overrule any Arboricultural recommendations as given within this report.

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Implications of the potential growth and/or nuisance of the trees within the next 10 years

Table 3 Implications of the potential growth and/or nuisance of the trees within the next 10 years

Tree Number	Species	Implications
T19	Sycamore	The crown of this tree will require regular pruning on a 3 year cycle to maintain clearance from the new Pavilion located to the south.

Potential root damage to infrastructure

This report does not consider the implications of trees, whether retained or removed, indirectly or directly on the proposed development. The design of the installations should account for such potential movement.

Summary

Table 4 Trees to be retained / removed

Consideration	Number of trees/ groups/ hedges
Trees/groups/hedges to be retained	17
Category A trees/groups/hedges to be removed	0
Category B trees/groups /hedges to be removed	0
Category C trees/groups/hedges to be removed	6

Further Considerations

An Arboricultural Method Statement (AMS) and TPP have been compiled to accompany this AIA for submittal to the LPA. The AMS takes into consideration construction operations undertaken in the vicinity of the trees. It will deal with such issues as site access, the intensity of construction activity, space needed for works, location of materials and installation of service runs.

Arboricultural Implication Assessment
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Appendix A – Limitations

Limitations of the Arboricultural Implication Assessment and scope of the report
Please refer to the introduction of the report. This report is based upon information obtained from the Tree Survey. All dimensions and measurements are based upon the previous data collected from the survey and the design drawings as provided. This Assessment considers the possible implications to the proposed future built structures. Suggestions may be given outlining alternative proposals for building layout. Such suggestions must be considered by the architect, designer or engineer before implementation.

Findings of the survey and the report
Validity, accuracy, and findings of the report will directly relate to the accuracy of information provided at the time of the survey. The report is based on information provided by third parties and the specifications and recommendations are dependent upon information provided therein. No checking of independent data provided will be undertaken.

Timing of the survey and the report
The considerations/findings in this tree report and tree survey are only valid for one year. Such considerations/findings will become invalid if any building works are undertaken, soil levels are altered, or tree work is undertaken. If there are any alterations to either the property or soil levels, or if tree works are carried out, it is recommended that a new tree survey/report is undertaken.

Trees in relation to subsidence, heave and direct damage
This report does not deal with issues relating to subsidence or heave in relation to any built structures and surrounding vegetation. However, it may be prudent to consider the effects of heave on any property if trees are removed. Similarly, the issue of direct damage (when the roots of a tree have physical contact with a structure) is not considered within this report.

Trees in relation to other properties
This report/survey only considers the trees in relation to the site as identified. It does not comment on possible effects of trees on neighbouring properties, including in relation to subsidence or heave, or with regard to possible hazards presented by trees surveyed. Neighbouring owners of trees that are identified as posing a possible risk to the property/site in question should seek their own advice as to possible effects of the recommendations given within this report. Damage to, or the possibility of damage to, any other structure that is not referred to within the report is not considered unless otherwise specified. This includes both neighbouring structures and any other structure on the property, built structures and surrounding vegetation.

Trees subject to statutory controls
Where trees are covered by a Tree Preservation Order or are located in a Conservation Area it will be necessary to consult the local authority before any tree works, other than certain exemptions, can be carried out. The works specified above are necessary for reasonable management and should be acceptable to the local authority. However, tree owners should appreciate that the local authority may take an alternative point of view and have the option to refuse consent.

Trees are subject to changes outside man's control
Trees are living organisms subject to changes outside man's control. Changes to groundwater conditions will affect the root growth of a tree. Such changes are not always the result of man's influence and other factors may be involved.

Limitations of the Arboricultural Implication Assessment
The considerations/findings in this tree report and tree survey are only valid for one year. Such considerations/findings will become invalid if any building works are undertaken, soil levels are altered, or tree work is undertaken. If there are any alterations to either the property or soil levels, or if tree works are carried out, it is recommended that a new tree survey/report is undertaken.

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Appendix B – Landscape plans

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Appendix C – Draft TTP