

Local Planning Policy 4.12: Horticulture

- Objectives:** Place
- Outcome:** 2.1 - A diverse, well planned built environment.
- Strategy:** 2.1.1 - Actively engage in the development and promotion of an effective planning framework.

Purpose

1. Ensure new horticultural enterprises pose a low risk to catchment water quality and are able to meet or improve catchment standards for water quality improvement.
2. Encourage new types of horticultural enterprises which are compatible with Catchment Water Quality Improvement Standards.
3. Encourage high-standards in horticultural management practices.
4. Ensure strategic and statutory proposals do not compromise existing well-managed horticultural developments, or compromise potential future horticultural development of relatively high capability areas.

Definitions

Bushland – land on which there is vegetation which is either a remainder of the natural vegetation on the land, or, if altered, is still representative of the structure and floristics of the natural vegetation, and provides the necessary habitat for native fauna (EPA, 2008b).

Catchment – is the area around the wetland or waterway that contributes surface run-off or groundwater to the wetland or waterway.

Catchment Water Quality – The quality of water in ground and surface waters of the Peel – Harvey Coastal Catchment including drains, creeks, wetlands, rivers and estuarine areas. Water quality parameters include levels of phosphorus, nitrogen, organics, salinity, acidity and total suspended solids.

Catchment Water Quality Improvement Standards – The threshold levels of nutrients applied to land, or exported from land as described in Appendix C.

Closed System (as in closed system hydroponics) – hydroponics system in which the nutrient solution is recirculated and the nutrient concentrations are monitored and adjusted accordingly. There is zero or minimal discharge of the solution or water to the environment.

~~**Horticulture or Agriculture Intensive** – premises used for trade or commercial purposes, including outbuilding and earthworks, associated with the following –~~

- ~~a) The production of grapes, vegetables, flowers, exotic or native plants, or fruit or nuts;~~
- ~~b) The establishment and operation of plant or fruit nurseries;~~
- ~~c) The development of land for irrigated fodder production;~~
- ~~d) Irrigated pasture (including turf farms); or~~
- ~~e) a) Aquaculture.~~



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Hydroponics – the process of growing plants using mineral nutrient solutions, with growing media, alternatives to in-situ soil.

In-ground Horticulture – horticulture where the crop is grown directly into in-situ soils and landforms, whether the soils have been amended or not.

Locally Significant Natural Areas – As identified in the Shire of Serpentine Jarrahdale Local Biodiversity Strategy

Site Management Plan - The plan prepared by the proponent to document how the production area and site will be managed over the lifespan of the operation to reduce nutrient export and manage all aspects of the operation in relation to the natural environment, pollution risk, visual landscape, and maintenance of the amenity to neighbouring properties. A checklist to guide preparation of a Site Management Plan is included in Appendix A.

Watercourse – a river, stream creek or manmade drainage features in which water flows in a channel, whether permanently or intermittently (EPA, 2008b)

Wetland – areas of seasonally, intermittently or permanently waterlogged soils or inundated land, whether natural or artificial, fresh or saline (EPA, 2008b).

Policy

1. All applications for horticultural pursuits / intensive agriculture proposed within the Peel-Harvey Catchment area, must be referred to the Department of Water and Environment Regulation (DoWER) and the Department of Primary Industries and Regional Development (DPIRD) for comment and any other agency the Shire deems relevant.
2. Planning applications within *high risk areas* (as defined by Appendix ED) are will not to be supported by the Shire, unless comments received from the DoWER and DPIRD are in support of the application. considered to be in support of the application.
3. All proposals for horticultural development must be accompanied by a site management plan.
4. Proposals for horticultural operations must pose a low risk to catchment water quality and land resources and aim to achieve the Catchment Water Quality Improvement Standards as contained within Appendix C.
5. All proposals for annual and perennial horticulture and viticulture which are located on soil-landscape mapping units which are not potentially suitable for the proposed type of horticulture (Appendix ED) should be accompanied by a Site Management Plan which reduces



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nutrient export risks to achieve Catchment Water Quality Improvement Standards, and must include, but not limited to:

- a) Site-specific soil testing
- b) Site-specific land capability assessment
- c) Nutrient Export Risk Assessment.
- d) All other details listed in Appendix A, including measures to reduce risk of nutrient export

6. All proposals for nurseries (potted plants) and closed systems (e.g. closed system hydroponics) are to be accompanied by a Site Management Plan with sufficient detail to demonstrate how the proposal will pose a low risk to catchment water quality and can be appropriately managed (refer to Appendix A ~~&~~, B and D for the preparation of a Site Management Plan).

7. Where on-site soil-landscape conditions vary from the mapped land units, shown in Appendix ED, the conditions must be demonstrated by the proponent through site-specific soil testing and site-specific land capability assessment for the proposed type of horticultural land use and included as part of the Site Management Plan.

Appendix A - Checklist for Site Management Plans

The following provides a checklist of the types of information that should be included within a Site Management Plan. Not all information may be required for all proposals. The checklist is not intended to be used as the format/structure of the Site Management Plan. It is intended to list the types of information that are used by government to assess development applications.

Information should be provided in map form where appropriate

Site conditions	<ul style="list-style-type: none"> • Soil types and mapping of soil types <ul style="list-style-type: none"> ○ Nutrient retaining capacity of soils ○ Other soil capability issues • Site-specific land capability assessment • Location of vegetation, watercourses and wetlands • Depth to groundwater • Existing structures and fences
Crop and cultivation details	<ul style="list-style-type: none"> • Location and size of production area • Future stages of development • Types of crops • Cultivation system • Physical barriers to soil (plastics)
Nutrient inputs and management	<ul style="list-style-type: none"> • Fertiliser regimes – rate and frequency • Total nutrient input calculation • Nutrient content of fertiliser



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	<ul style="list-style-type: none"> • Application method • Nutrient monitoring – soil and water • Crop nutrient monitoring
Irrigation management	<ul style="list-style-type: none"> • Type of irrigation • Water source • Irrigation control and monitoring
Nutrient Export Risk Assessment	<ul style="list-style-type: none"> • <u>The Nutrient Export Risk Assessment is to provide evidence to the local government (and experts advising the local government) that given the specific site conditions, production system and management practices, the proposal will likely pose a low risk to catchment water quality and other environmental values.</u> • <u>The level of detail to be provided in the risk assessment should be commensurate with the inherent risk posed by the type of production system and predominant landscape-soil units on the site. Where proposals are likely to pose a high risk to catchment water quality or other environmental value, quantitative nutrient budgets for phosphorus and nitrogen may be required in the Assessment.</u> • <u>Where appropriate, the Nutrient Export Risk Assessment may be provided in the format of a Nutrient and Irrigation Management Plan (NIMP), such as in cases where a NIMP is required by other agencies such as the Department of Water and Environment Regulation.</u> <p>8. <u>As per Section 1.2 of Attachment A</u></p>
Nutrient reduction strategies	<ul style="list-style-type: none"> • Production area design and establishment • Soil amendment • Soil ameliorants • Type of fertiliser – controlled release fertilisers • Crop monitoring and testing • Soil condition monitoring • Fertiliser application methods • Type of irrigation methods • Cultivation methods • Physical barriers • Vegetative barriers
Details of any other nutrient reduction strategies	<p>e.g. Where not addressed above:</p> <ul style="list-style-type: none"> • Offset plantings
<u>Information to address other considerations listed in Appendix B relevant to the site and proposal</u>	<u>See below</u>



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Appendix B - Other Considerations

Planning matter	Consideration
Protection of groundwater and surface waters	<ul style="list-style-type: none"> • Potential impacts of dam or drain construction (note: Approvals are generally required for dams and drain construction) • Storage of hydrocarbons, pesticides and other chemical • Levels of total suspended solids and organics in discharge waters (e.g. hydroponics) or drains/watercourses on the site • Levels of salinity and acidity of discharge waters (e.g. hydroponics).
Stormwater management	<ul style="list-style-type: none"> • Management of runoff from hard surfaces • Management of runoff from production area and site
Wetlands	<p>Proposals should comply with State Government policy in regard to:</p> <ul style="list-style-type: none"> • protection and management of Conservation Category Wetlands • protection and management of Resource Enhancement Wetlands, and \ • management of Multiple Use Wetlands (Water and Rivers Commission, 2001) (EPA, 2008b)
Wetland Buffers	<ul style="list-style-type: none"> • Wetland buffers should be determined in accordance with the Draft Guideline for the Determination of Wetland Buffer Requirements (WAPC, 2005
Watercourse protection	<ul style="list-style-type: none"> • Identification of suitable buffers to watercourses • Physical delineation and protection of the buffer area • Restoration of vegetated buffers
Native vegetation and bushland protection	<ul style="list-style-type: none"> • Protection of: <ul style="list-style-type: none"> ○ Peel Regionally Significant Natural Areas <u>Regionally and Locally Significant Natural Areas</u>, ○ Bush Forever Sites ○ Known location of Declared Rare and listed species of flora and fauna ○ Threatened Ecological Communities ○ Priority Ecological Communities ○ Other significant vegetation and flora ○ Other habitat for wildlife • Protection of buffers to native vegetation and bushland protection
Weeds, pests and diseases	<ul style="list-style-type: none"> • Compliance with control and management of species listed under the Biosecurity and Agricultural Management Act and Regulations • Other weed management • Other feral animal management
Odours	<ul style="list-style-type: none"> • Storage and use of manures

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Visual amenity	<ul style="list-style-type: none"> Existing vegetation Proposed revegetation and landscaping
Noise	<ul style="list-style-type: none"> Operating hours Types and standards of machinery or motors
Management of effluent	<ul style="list-style-type: none"> Workers ablution facilities Effluent treatment systems
Other matters	<ul style="list-style-type: none"> Dam construction approval Drain construction approval Groundwater abstraction licence Building approvals Buffers to sensitive premises Setbacks

Appendix C - Catchment water Quality Improvement Standards and Guidance**A1. Phosphorus - For proposals within the Peel-Harvey Coastal Plain Catchment Area.**Phosphorus application rates

To meet targets for phosphorus reduction established in the Peel-Harvey EPP (EPA, 1992) and supported in SPP2.1, proposals for new horticulture should not apply phosphorus at rates exceeding 6.5 kg P/ha/yr (Kelsey *et al*, 2011).

Phosphorus export rates

The following export rates of phosphorus from the Coastal Catchment Area have been determined by State Government (Kelsey *et al*, 2011) to ensure that catchment targets for phosphorus reduction are met:

- 0.29 kg P/ha/yr for sites in the Serpentine River Subcatchments
- 0.28 kg P/ha/yr for sites in the Murray River Subcatchments
- 0.47 kg P/ha/yr for sites in the Harvey Basin

These export rates of phosphorus from the Coastal Catchment Area are end of sub-catchment targets (measured at the end of the sub-catchment). Phosphorus export rates measured at each Site would be higher due to dilution and in-stream losses. However, the actual loss rate that is acceptable will vary depending upon the location of the site taking into account distance to the receiving water body, shape of sub-catchment, slope of the land amongst other factors.

A.2 Phosphorus – For all proposals in the Shire of Serpentine Jarrahdale

All other proposals in the Shire of Serpentine Jarrahdale should demonstrate, through a Site Management Plan including a Nutrient Export Risk Assessment, how the proposal will minimise the application and export of phosphorus from the production area and site.

A3 - Nitrogen – For proposals within the Peel-Harvey Coastal Plain Catchment Area

To meet targets for nitrogen reduction, proposals for new horticulture should not apply nitrogen (in all forms) at rates exceeding 45 kg N/ha/yr or on average not discharge nitrogen at rates above 1.2 mg/L (Total Nitrogen) (Kelsey *et al*, 2011).

A4 - Nitrogen – for all proposals in the Shire of Serpentine Jarrahdale



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All other proposals in the Shire of Serpentine Jarrahdale should demonstrate, through a Site Management Plan including a Nutrient Export Risk Assessment, how the proposal will minimise the application and export of nitrogen from the production area and site.

Appendix D: Guidance on site specific soil testing and land capability assessment for horticulture on the Peel-Harvey coastal plain catchment

The following guidelines have been developed by the Department of Primary Industries and Regional Development (DPIRD) specifically for on-site assessment of annual or perennial horticulture on the Peel-Harvey Coastal Plain. If you have queries regarding this guidance, please contact DPIRD.

Soil sampling, survey and land capability assessment undertaken as a requirement of this policy need to adhere to the following published guidelines:

Soil survey and characterisation

McKenzie NJ, Grundy, MJ, Webster, R and Ringrose-Voase AJ 2008 Guidelines for Surveying Soil and Land Resources Second Edition Australian Soil and Land Survey Handbooks Series 2 CSIRO Publishing

National Committee on Soil and Terrain 2009 Australian Soil and Land Survey Field Handbook Third Edition Australian Soil and Land Survey Handbooks Series 1 CSIRO Publishing; specifically, Soil profile (RC McDonald and RF Isbell)

Soil analysis

Rayment, GE and Lyons DJ 2010 Soil Chemical Methods - Australasia Australian Soil and Land Survey Handbooks Series CSIRO Publishing

Allen, DG and Jeffery, RC 1990 Methods for analysis of phosphorus in Western Australian soils. Report of investigation No:37. Chemistry Centre of Western Australia.

Soil type description and land capability

Isbell, R 2002 The Australian Soil Classification Revised Edition Australian Soil and Land Survey Handbooks Series 4

Schoknecht N and Pathan S 2013 Soil Groups of Western Australia A simple guide to the main soils of Western Australia Fourth Edition Resource Management Technical Report 380 Department of Agriculture and Food. Western Australia

Van Gool, D, Tille P and G Moore 2005 Land evaluation standards for land resource mapping Third edition Resource Management Technical Report 298 Department of Agriculture and Food

Minimum requirements

- Grid survey, free or transverse survey at scale of 1:10 000
- Observations in the range of 1 per ha to a minimum of 0.25 per ha
- On deep sands profiles, observations to extend to at least 100 cm (or to impeding layers if less than 100cm)



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- Detailed profile descriptions and sampling of each main soil type at a minimum one site per 10 ha
- GPS coordinates of soil profiles and soil sampling sites or sites located on aerial photo base image
- Detailed soil profiles described to at least 100 cm (or to impeding layers if less than 100cm)
- Description of impeding layer if present
- Horizons depths recorded and for each horizon:
 - Soil colour (Munsell colour chart) main colours and mottles
 - Soil texture
 - Soil structure (if described from soil pit)
- Information on soil samples collected for analysis: sampling depths and type of analysis
- Main soil types identified and classified to WA soil group (plus Australian Soil Classification is preferred)
- The above should be included in a report (e.g., Site Management Plan) and descriptions included in Appendix
- Map of main soil types, preferably marked on aerial photo background, scale, and north needs to accompany report; map should also identify area that is to be developed for horticulture. This map should show location of nearest surface drains creeks and waterways
- The depth to groundwater in winter needs to be assessed. This is difficult if studies are undertaken in summer and may require subsequent information to be provided by proponent if not available. The levels and dates of measurement need to be included in the Site Management Report.

Soil testing

Analysis for soil pH 1:5 Calcium chloride, salinity (EC 1:5), total phosphorus and soil PRI should be undertaken by an accredited laboratory.

The most important aspect for soil phosphorus (P) retention is the Phosphorus Retention Index (PRI) as described by Allen and Jeffery (1990)

Allen, DG and Jeffery, RC 1990 Methods for analysis of phosphorus in Western Australian soils. Report of investigation No:37. Chemistry Centre of Western Australia.

It is also important to interpretation of results of soil PRI against relevant experimental data for horticultural crops on the Swan coastal plain.

Dellar GA, Eales M, McPharlin IR, Delroy ND, and Jeffery RC (1990) Phosphorus retention of sandy horticultural soils on the Swan Coastal Plain Journal of Agriculture Western Australia 4 ser. V31(1) 28-

Dellar et al (1990) has evaluated existing horticultural sites on sandy soils and assessed the P leaching with respect to the PRI. All of the P was retained in the top metre of soil from 25 years of horticultural operations in a soil with a PRI of 7.



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Based on this a target PRI of 10 for a metre of soil would retain P for at least this period of time.

This could be achieved by a shallower depth of higher PRI, but the minimum depth of the high PRI soil should be greater than the usual operational tillage depth or 30cm. Note that this pertains to predominantly sandy soils and relies on their permeability to make contact with the subsoil and the water table must be greater than 1 metre.

Qualifications of consultant

The report should outline the experience and background of the consultant in soil survey and land capability assessment. A Certified Professional Soil Scientist or Fertcare Accredited Advisor is preferred.

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Appendix D - Nutrient export risk and suitability for in-ground horticulture in different land units of the Peel-Harvey Coastal Catchment

Column 1	Column 2	Column 3	Column 4			Column 5
Map-unit symbol	Map-unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture?
			Annual (A)	Perennial (P)	Vine (V)	A=Annual P=Perennial V=vine
<p>The Forrestfield System (213Fo) consists of undulating foot slopes of the Darling Scarp on colluvium over granitic and sedimentary rocks in the eastern margin of the Swan Coastal Plain. Soils include duplex sandy gravels, pale deep sands and grey deep sandy duplexes. Native vegetation is jarrah-marri forest and woodland.</p>						
F1a	1-15% lower slopes with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.	No	B2	B2	B2	Yes APV
F1b	1-15% lower slopes with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.	No	B1	B1	B1	Yes APV
F1c	1-15% lower slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.	No	B1	A2	A2	Yes APV



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Column 1	Column 2	Column 3	Column 4			Column 5
	Soil-landscape mapping unit	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
Map unit symbol	Map unit description		Annual (A)	Perennial (P)	Vine (V)	
F2a	Low slopes and foot slopes up to 5-10% with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.	No	B1	B2	B2	Yes APV
F2b	Low slopes and foot slopes up to 5-10% with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.	No	A2	A2	A2	Yes APV
F2c	Low slopes and foot slopes up to 5-10% slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.	No	B1	A1	A1	Yes APV
F3	1-3% foot slopes with deep, imperfectly drained yellow and, less commonly, acidic gley duplex soils.	No	B1	B2	B1	Yes APV
F4	Incised stream channels within gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	C1	C1	C2	No



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Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
F5	Poorly defined stream channels on lowest slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.	Yes	G2	G2	G2	No
Ff1	Foot and low slopes < 10% with deep rapidly drained siliceous yellow brown sands, and pale or bleached sands with yellow brown subsoil. Shrubland of unidentified species.	No	B1	A2	A1	Yes APV
Ff10	Alluvial fans on lower slopes <5-10% with variable poorly drained soils.	Yes	G1	G1	G1	No
Ff2	Foot and low slopes < 10%. Well drained gravelly yellow or brown duplex soils with sandy topsoil. Woodland of <i>E.marginata</i>, <i>E. calophylla</i> and some <i>B.grandis</i>.	No	B1	A2	A2	Yes APV



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			Annual (A)	Perennial (P)	Vine (V)	
Ff3	Foot and low slopes <10%. Well drained gravelly yellow or red duplex soils with sandy loam to loam topsoil. Woodland of <i>E. wandoo</i> and <i>E. marginata</i> .	No	B1	A2	A2	Yes-APV
Ff7	Alluvial fans on slopes <5-10%. Variable, imperfectly drained soils comprising layers of sand, sandy loam, clay, grit and weathered granitic detritus. Low woodland of <i>E. calophylla</i> , <i>Banksia attenuata</i> and <i>B. grandis</i> and some <i>Casuarina</i> spp.	Yes	C1	C2	C1	No
Ff9	Seepage areas and non-incised drainage channels on foot slopes <3% with poorly drained bleached grey sands over an iron-organic hardpan.	Yes	B2	C2	B2	No
<p>The Pinjarra System (213Pj) is a poorly drained coastal plain on alluvium over sedimentary rocks. Soils include semi-wet soils, grey deep sandy duplexes, brown loamy earths, pale sands and clays. Native vegetation is mainly jarrah-marri-wandoo-paperbark forest and</p>						



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Map-unit symbol	Soil-landscape mapping unit Map-unit description	Greater than 50% of the map-unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
			Annual (A)	Perennial (P)	Vine (V)	
woodland.						
B1	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.	Yes	B1	B1	B1	No
B2	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.	Yes	B1	B1	B1	No
B2a	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with an intensely coloured yellow B horizon usually well within 1 m of the surface.	No	B1	A1	A1	Yes-APV



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			Annual (A)	Perennial (P)	Vine (V)	
B3	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.	Yes	G2	G2	G2	No
B4	Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.	Yes	G2	G2	G2	No
B6	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Yes	G2	G2	G2	No
P1a	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and generally not susceptible to salinity.	No	B2	G2	G1	Yes-A



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Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture?
			Annual (A)	Perennial (P)	Vine (V)	A=Annual P= Perennial V= vine
P1b	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Moderately deep pale sand to loamy sand over clay; imperfectly drained and moderately susceptible to salinity in limited areas.	No	B2	C2	B2	Yes for AV
P1e	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Deep pale brown to yellowish sand to sandy loam over clay; imperfectly drained and moderately susceptible to salinity in limited are	No	B1	C2	B1	Yes for AV
P1d	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity.	No	C2	C2	C2	No
P1e	Flat to very gently undulating plain with deep acidic mottled yellow duplex (or "effective duplex") soils. Shallow	No	B1	B2	B1	Yes for APV



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			Annual (A)	Perennial (P)	Vine (V)	
	pale sand to sandy loam over very gravelly clay; moderately well-drained.					
P2	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.	No	G2	G2	G2	No
P2a	Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam with a silcrete hardpan at 50-100 cm depth generally on top of an olive grey clay.	No	G2	G2	G2	No
P3	Flat to very gently undulating plain with deep, imperfect to poorly drained acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.	No	G2	G2	G2	No



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			Annual (A)	Perennial (P)	Vine (V)	
P4	Poorly drained flats, sometimes with gilgai microrelief and with moderately deep to deep black, olive grey and some yellowish brown cracking clays and less commonly non-cracking friable clays with generally acidic subsoils.	No	G2	G2	G2	No
P4a	Poorly drained flats. Cracking clays similar to P4 with a thin veneer of grey sand.	No	G2	G2	G2	No
P5	Poorly drained flats, commonly with gilgai microrelief and with deep black-grey to olive-brown cracking clays with subsoils becoming alkaline.	No	G2	G2	G2	No
P5a	Poorly drained flats. Cracking clays similar to P5 with a thin veneer of grey sand.	No	G2	G2	G2	No
P7	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley sandy duplex and effective duplex soils.	Yes	G2	G2	G2	No



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Map-unit symbol	Map-unit description	Greater than 50% of the map-unit classed as a High, Very High or Extreme-risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
			Annual (A)	Perennial (P)	Vine (V)	
P7a	Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley duplex soils becoming alkaline with depth.	Yes	G2	G2	G2	No
P7b	Seasonally inundated swamps and depressions or seepage areas near the base of the foothills with very poorly drained deep bleached siliceous sands.	Yes	G2	G2	G2	No
P8	Broad poorly drained flats and poorly defined stream channels with moderately deep to deep sands over mottled clays; acidic or less commonly alkaline grey and yellow duplex soils to uniform bleached or pale brown sands over clay.	No	G2	G2	G2	No
P9	Shallowly incised stream channels of minor creeks and rivers with deep acidic mottled yellow duplex soils.	Yes	G2	G2	G2	No



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
P9a	Generally shallow incised stream channels of minor creeks and rivers with poorly drained deep mottled yellow duplex soils, becoming alkaline with depth.	Yes	G2	G2	G2	No
SW2	Low level, occasionally flooded, alluvial terraces with imperfectly drained variable alluvial soils with loamy surfaces.	Yes	G2	G2	G2	No
P11	Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement which is a clear barrier to drainage.	No	G2	G2	G2	No
P11a	Shallow sand to sandy loam over lateritic material; imperfect to moderately well-drained.	No	G1	G2	G1	No
SWP10	Gently undulating to flat terraces adjacent to major rivers, but below the general level of the plain, with deep well	No	B2	B1	A2	Yes-APV



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Column 1	Column 2	Column 3	Column 4			Column 5
Map-unit symbol	Map-unit description	Greater than 50% of the map-unit classed as a High, Very High or Extreme-risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
	drained uniform brownish sands or loams subject to periodic flooding.					
jSWP10a	Flat terraces adjacent to major rivers with deep black cracking clays with alkaline subsoils; soils similar to P5.	Yes	G2	G2	G2	No
SWP6a	Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with major current river systems and larger streams. Acidic red and yellow duplex soils, less common	No	A1	B1	A1	Yes-APV
jSWP6b	Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with prior stream deposits. Soils are uniform brownish sands.	No	B1	B1	A1	Yes-APV



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
			Annual (A)	Perennial (P)	Vine (V)	
2SWP6c	Very gently undulating, alluvial terraces and fans. Moderate to moderately well drained uniform friable brown loams, or well structured gradational brown earths.	No	A1	B1	A2	Yes APV
<p>The Bassendean System (212Bs) is sand dunes and sand plains with flats and swamps on sandy alluvium over sedimentary rocks. Soils include pale deep sand, semi wet soil and wet soil. These soils have low fertility and are susceptible to leaching. In the Peel, these soils may become waterlogged because of high groundwater levels and may become flooded in some areas. Native vegetation is mainly banksia-paperbark woodlands and mixed heaths.</p>						
B1	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale yellow B horizon or a weak iron organic hardpan at depths generally greater than 2 m; banksia dominant.	Yes	B1	B1	B1	No
B1a	Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon	No	B1	B1	A1	Yes APV



Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
			Annual (A)	Perennial (P)	Vine (V)	
	occurring within 1 m of the surface; marri and jarrah dominant.					
B2	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale yellow B horizon or a weak iron-organic hardpan 1-2 m.	Yes	B1	B1	B1	No
B2a	Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with an intensely coloured yellow B horizon usually well within 1 m of the surface.	No	B1	A1	A1	Yes APV
B3	Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.	Yes	G2	G2	G2	No



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
B4	Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.	Yes	G2	G2	G2	No
B5	Shallowly incised stream channels of minor creeks and rivers with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.	Yes	G2	G2	G2	No
B6	Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.	Yes	G2	G2	G2	No
<p>The Vasse System (211Va) is poorly drained estuarine flats and swampy depressions of the Swan Coastal Plain. Soils include tidal flat soil, saline wet soil and pale deep sand. Native vegetation includes samphire, sedges and paperbark woodland.</p>						



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
V1	Saline tidal flats composed of grey, black and brown foetid muds and humic sandy clays with locally common shell and limestone fragments.	Yes	G2	G2	G2	No
V2	Samphire covered sand and mud flats marginally higher than V1 and frequently inundated; with deep alkaline alluvial sands and clayey sands.	Yes	G2	G2	G2	No
V3	Sand flats marginally higher than V2. Frequently inundated; with deep alkaline alluvial sands and clayey sands, commonly supporting stands of <i>Melaleuca</i> spp.	Yes	G2	G2	G2	No
V4	Low level storm beach ridges and terraces with shallow to moderately deep uniform alkaline black sandy loams to loams overlying unconsolidated shell beds or clayey marl.	No	G1	G2	G2	No



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Column 1	Column 2	Column 3	Column 4			Column 5
	Soil-landscape mapping unit	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
Map unit symbol	Map unit description		Annual (A)	Perennial (P)	Vine (V)	
V5	Upper level sandy terrace and gently undulating beach ridges with shallow to moderately deep grey siliceous sands overlying soft shelly limestone or shell beds.	No	B2	A2	A2	Yes-APV
V6	Upper level sandy terrace and gently undulating beach ridges with deep grey or bleached pale brown siliceous sands overlying soft shelly limestone.	Yes	G2	G2	G2	No
V6a	Gently undulating beach ridges similar to V6, but formed from reworked Pleistocene Bassendean sands. Deep bleached grey acidic siliceous sands with iron-organic hardpan.	Yes	G1	G2	G2	No
V7	Very broad shallow depression with deep, poorly drained, fine textured alkaline estuarine alluvium.	Yes	G2	G2	G2	No
V8	Flat poorly drained plains forming the margins of the estuarine deposits which border and partially overlie the Pinjarra Plain with variable, moderately deep to deep	Yes	G2	G2	G2	No



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P=Perennial V=vine
			Annual (A)	Perennial (P)	Vine (V)	
	Soil-landscape mapping unit					
	saline soils. Commonly, these are mottled yellow duplex soils over calcar					
V9	Areas of former swamps which have been artificially drained, with uniform loamy or peaty sands.	Yes	G2	G2	G2	No
<p>The Spearwood System (211Sp) is sand dunes and plains on windblown sand and limestone over sedimentary rocks in the western edge of the Swan Coastal Plain. Soils include yellow deep sands, pale deep sands and yellow/brown shallow sands. Native vegetation includes tuart marri forest and woodland in south changing to heath and open woodland in north.</p>						
S1a	Dune ridges with shallow to moderately deep siliceous yellow-brown sands, very common limestone outcrop and slopes up to 15%.	Yes	G2	B2	G2	No



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Column 1	Column 2	Column 3	Column 4			Column 5
Map-unit symbol	Map-unit description	Greater than 50% of the map-unit classed as a High, Very High or Extreme-risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture?
			Annual (A)	Perennial (P)	Vine (V)	A=Annual P=Perennial V=vine
S1b	Dune ridges with deep siliceous yellow brown sands or pale sands with yellow brown subsoil and slopes up to 15%.	No	B1	A2	A1	Yes APV
S1e	Dune ridges with deep bleached grey sands with yellow brown subsoils, and slopes up to 15%.	No	B1	B1	A2	Yes APV
S1d	Dune ridges with moderately deep to very deep siliceous yellow brown sands, rare limestone outcrop and slopes 3-20% occurring on the eastern slip face.	Yes	C2	B1	C2	No
S2a	Lower slopes (1-5%) of dune ridge with moderately deep to deep siliceous yellow brown sands or pale sands with yellow brown subsoils and minor limestone outcrop.	No	B1	A2	A1	Yes APV
S2b	Lower slopes (1-5%) of dune ridge with shallow to deep siliceous yellow brown sands and common limestone outcrop.	No	B1	B1	A1	Yes APV



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Column 1	Column 2	Column 3	Column 4			Column 5
Map unit symbol	Map unit description	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
			Annual (A)	Perennial (P)	Vine (V)	
S2e	Lower slopes (1-5%) of dune ridge with bleached or pale sands with a yellow-brown or pale brown subsoil (like S1c). Usually occurs on the eastern edge of the Spearwood Dunes.	No	B1	A1	A1	Yes APV
S3	Inter-dunal swales and depressions with gently inclined side slopes and deep rapidly drained siliceous yellow-brown sands.	No	A1	A1	A1	Yes APV
S4a	Flat to gently undulating sandplain with deep, pale and sometimes bleached, sands with yellow-brown subsoils.	No	B1	A2	A1	Yes APV
S4b	Flat to gently undulating sandplain with shallow to moderately deep siliceous yellow-brown and grey-brown sands with minor limestone outcrop.	No	B1	B1	A1	Yes APV



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Column 1	Column 2	Column 3	Column 4			Column 5
	Soil-landscape mapping unit	Greater than 50% of the map unit classed as a High, Very High or Extreme risk of Phosphorus Export?	Capability Class Rating for In-ground Horticulture			Is the map unit potentially suitable for in-ground horticulture? A=Annual P= Perennial V= vine
Map unit symbol	Map unit description		Annual (A)	Perennial (P)	Vine (V)	
S4e	Flat to gently undulating sandplain with deep, yellow-brown or dark brown siliceous sands that are seasonally inundated.	Yes	G2	G2	G2	No
S6	Flat stony plain with poorly drained shallow siliceous sands and large areas of bare limestone pavement.	No	G2	G2	G2	No
<p>The Quindalup System (2111Qu) is coastal dunes with sand flats on wind-blown sand over sedimentary rocks on the western margin of the Swan Coastal Plain. Soils are mainly calcareous sands with native vegetation of mixed coastal scrub.</p>						
Qf2	Relict fore-dunes and gently undulating beach ridge plain with deep uniform calcareous sands.	No	B1	B1	B1	Yes, APV
Qp1	Complex of nested low-relief parabolic dunes with moderate to steep slopes and uniform calcareous sands showing variable depths of surface darkening.	No	G1	B2	G1	Yes, P

Appendix E: Suitability of soil-landscape mapping units in Shire of Serpentine Jarrahdale for annual horticulture, perennial horticulture, and viticulture

Table 1 provides advice from the Department of Primary Industries and Regional Development (DPIRD) on the potential suitability of mapped soil-landscape units in the (Insert local government name) for in-ground horticulture (Column 5). Mapping of soil-landscape units is available from (insert appropriate source for mapping).

The advice is based on two major assessments:

- The phosphorus export hazard associated with the soil-landscape unit (Column 3); and
- The land capability class rating of the soil-landscape unit for annual horticulture (A), perennial horticulture (P) and vines (V) (Column 4).

DPIRD defines land capability as the ability of the land to sustain a specific land use without undesirable onsite or off-site effects. The essence of land capability assessment is a comparison of the biophysical requirements for a particular land use with the biophysical attributes (or qualities) of the land (Wells and King 1989).

Land capability refers to the ability of land unit to support a type of land use without causing damage (Austin and Cocks, 1978).

The assessments follow the methodology described in van Gool, D, Tille, P J, and Moore, G A. (2005), Land evaluation standards for land resource mapping: assessing land qualities and determining land capability in south-western Australia. Department of Primary Industries and Regional Development, Western Australia, Perth. Report 298. Weblink <https://library.dpird.wa.gov.au/rmtr/280/>

Proportional land capability categories (Column 4) are denoted in Table 1 using the following symbols: A1 A2, B1, B2, C1 OR C2. These symbols represent the following:

A1 More than 70% of the unit has high capability land (class 1 and 2)

A2 50-69% of the unit has high capability land (class 1 and 2).

B1 More than 70% of the unit has moderate or high capability land (class 1, 2 or 3)

B2 50-69% of the unit has moderate or high capability land (class 1, 2 or 3)

C1 50-69% of the unit has low capability land (class 4 and 5)

C2 More than 70% of the unit has low capability land (class 4 and 5).

Note: Land capability ratings are designed for broad-scale map units in which the availability of water resources for irrigation and the proximity to waterways has not been considered. Any on-site assessment should consider this.

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Table 1: Nutrient export risk and suitability for in-ground horticulture in different land units of the Peel-Harvey Coastal Catchment

<u>Soil-landscape mapping unit</u>			<u>Less than 50% of the map unit classed as High, Very High or Extreme Phosphorus Export Hazard?</u>	<u>Proportional Land Capability Category for in-ground Horticulture</u>		
<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Very High (V)</u>
<p>The Forrestfield System (213Fo) consists of undulating foot slopes of the Darling Scarp on colluvium over granitic and sedimentary rocks on the Swan Coastal Plain. Soils include duplex sandy gravels, pale deep sands, and grey deep sandy duplexes. Native vegetation is jarrah forest.</p>						
<u>213Fo F1a</u>	<u>Forrestfield F1a phase</u>	<u>1-15% lower slopes with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.</u>	<u>Yes</u>	<u>B2</u>	<u>B2</u>	<u>B2</u>
<u>213Fo F1b</u>	<u>Forrestfield F1b phase</u>	<u>1-15% lower slopes with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.</u>	<u>Yes</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>213Fo F1c</u>	<u>Forrestfield F1c phase</u>	<u>1-15% lower slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.</u>	<u>Yes</u>	<u>B1</u>	<u>A2</u>	<u>A2</u>
<u>213Fo F2a</u>	<u>Forrestfield F2a phase</u>	<u>Low slopes and foot slopes up to 5-10% with well drained shallow to moderately deep, very gravelly acidic yellow duplex soils and common laterite.</u>	<u>Yes</u>	<u>B1</u>	<u>B2</u>	<u>B2</u>
<u>213Fo F2b</u>	<u>Forrestfield F2b phase</u>	<u>Low slopes and foot slopes up to 5-10% with well drained moderately deep to deep, gravelly acidic yellow duplex soils and rare laterite.</u>	<u>Yes</u>	<u>B1</u>	<u>A2</u>	<u>A2</u>
<u>213Fo F2c</u>	<u>Forrestfield F2c phase</u>	<u>Low slopes and foot slopes up to 5-10% slopes with well drained deep uniform yellowish brown sands which are generally free of laterite or gravel.</u>	<u>Yes</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>213Fo F3</u>	<u>Forrestfield F3 phase</u>	<u>1-3% foot slopes with deep, imperfectly drained yellow and, less commonly, acidic gley duplex soils.</u>	<u>Yes</u>	<u>B1</u>	<u>B2</u>	<u>B1</u>
<u>213Fo F4</u>	<u>Forrestfield F4 phase</u>	<u>Incised stream channels within gentle slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.</u>	<u>No</u>	<u>C1</u>	<u>C2</u>	<u>C2</u>

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<u>Soil-landscape mapping unit</u>			<u>Less than 50% of the map unit classed as High, Very High or Extreme Phosphorus Export Hazard?</u>	<u>Proportional Land Capability Category for ground Horticulture</u>		
<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Very High (V)</u>
<u>213Fo F5</u>	<u>Forrestfield F5 phase</u>	<u>Poorly defined stream channels on lowest slopes with deep acidic yellow duplex soils and sandy alluvial gradational brown earths.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Fo Ff1</u>	<u>Forrestfield (D Range) F1 phase</u>	<u>Foot and low slopes < 10% with deep rapidly drained siliceous yellow brown sands, and pale or bleached sands with yellow-brown subsoil. Shrubland of unidentified species.</u>	<u>Yes</u>	<u>B1</u>	<u>A2</u>	<u>A1</u>
<p><u>The Pinjarra System (213Pj) consists of poorly drained coastal plains on alluvium over sedimentary rocks. Soils include semi-loamy earths, pale sands, and clays. Native vegetation is mainly jarrah-marri-wandoo-paperbark forest and woodland.</u></p>						
<u>213Pj B1</u>	<u>Pinjarra, B1 phase</u>	<u>Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale-yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.</u>	<u>No</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>213Pj B1a</u>	<u>Pinjarra, B1a phase</u>	<u>Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface; marri and jarrah dominant.</u>	<u>Yes</u>	<u>B1</u>	<u>A2</u>	<u>A2</u>
<u>213Pj B2</u>	<u>Pinjarra, B2 phase</u>	<u>Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale-yellow B horizon or a weak iron-organic hardpan 1-2 metres.</u>	<u>No</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>213Pj B2a</u>	<u>Pinjarra, B2a phase</u>	<u>Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with an intensely coloured yellow B horizon usually well within 1 m of the surface.</u>	<u>Yes</u>	<u>B1</u>	<u>A1</u>	<u>A1</u>

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<u>Soil-landscape mapping unit</u>			<u>Less than 50% of the map unit classed as High, Very High or Extreme Phosphorus Export Hazard?</u>	<u>Proportional Land Capability Category for ground Horticulture</u>		
<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Viniferous (V)</u>
<u>213Pj_B3</u>	<u>Pinjarra, B3 phase</u>	<u>Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_B4</u>	<u>Pinjarra, B4 phase</u>	<u>Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_B6</u>	<u>Pinjarra, B6 phase</u>	<u>Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P1a</u>	<u>Pinjarra P1a phase</u>	<u>Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and generally not susceptible to salinity.</u>	<u>Yes</u>	<u>B2</u>	<u>C2</u>	<u>C1</u>
<u>213Pj_P1b</u>	<u>Pinjarra P1b phase</u>	<u>Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Moderately deep pale sand to loamy sand over clay: imperfectly drained and moderately susceptible to salinity in limited areas.</u>	<u>Yes</u>	<u>B2</u>	<u>C2</u>	<u>B2</u>
<u>213Pj_P1c</u>	<u>Pinjarra P1c phase</u>	<u>Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Deep pale brown to yellowish sand to sandy loam over clay; imperfectly drained and moderately susceptible to salinity in limited areas.</u>	<u>Yes</u>	<u>B1</u>	<u>C2</u>	<u>B1</u>
<u>213Pj_P1d</u>	<u>Pinjarra P1d phase</u>	<u>Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Shallow pale sand to sandy loam over clay; imperfect to poorly drained and moderately susceptible to salinity.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>

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<u>Soil-landscape mapping unit</u>			<u>Less than 50% of the map unit classed as High, Very High or Extreme Phosphorus Export Hazard?</u>	<u>Proportional Land Capability Category for ground Horticulture</u>		
<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Viniferous (V)</u>
<u>213Pj_P1e</u>	<u>Pinjarra P1e phase</u>	<u>Flat to very gently undulating plain with deep acidic mottled yellow duplex (or effective duplex) soils. Shallow pale sand to sandy loam over very gravelly clay; moderately well drained.</u>	<u>Yes</u>	<u>B1</u>	<u>B2</u>	<u>B1</u>
<u>213Pj_P2</u>	<u>Pinjarra P2 phase</u>	<u>Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam over clay.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P2a</u>	<u>Pinjarra P2a phase</u>	<u>Flat to very gently undulating plain with deep alkaline mottled yellow duplex soils which generally consist of shallow pale sand to sandy loam with a silcrete hardpan at 50-100 cm depth generally on top of an olive-grey clay.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P3</u>	<u>Pinjarra P3 phase</u>	<u>Flat to very gently undulating plain with deep, imperfect to poorly drained acidic gradational yellow or grey-brown earths and mottled yellow duplex soils, with loam to clay loam surface horizons.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P4</u>	<u>Pinjarra P4 phase</u>	<u>Poorly drained flats, sometimes with gilgai microrelief and with moderately deep to deep black, olive grey and some yellowish-brown cracking clays and less commonly non-cracking friable clays with generally acidic subsoils.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P4a</u>	<u>Pinjarra P4a phase</u>	<u>Poorly drained flats. Cracking clays similar to P4 with a thin veneer of grey sand.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P5</u>	<u>Pinjarra P5 phase</u>	<u>Poorly drained flats, commonly with gilgai microrelief and with deep black grey to olive-brown cracking clays with subsoils becoming alkaline.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj_P5a</u>	<u>Pinjarra P5a phase</u>	<u>Poorly drained flats. Cracking clays similar to P5 with a thin veneer of grey sand.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>

Local Planning Policy 4.12: Horticulture

<u>Soil-landscape mapping unit</u>			<u>Less than 50% of the map unit classed as High, Very High or Extreme Phosphorus Export Hazard?</u>	<u>Proportional Land Capability Category for ground Horticulture</u>		
<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Vinifera (V)</u>
<u>213PjSWP6a</u>	<u>Pinjarra P6a phase</u>	<u>Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with major current river systems and larger streams. Acidic red and yellow duplex soils, less common.</u>	<u>Yes</u>	<u>A1</u>	<u>B1</u>	<u>A1</u>
<u>213PjSWP6b</u>	<u>Pinjarra P6b phase</u>	<u>Very gently undulating alluvial terraces and low rises contiguous with the plain, with deep moderately well to well drained soils associated with prior stream deposits. Soils are uniform brownish sands.</u>	<u>Yes</u>	<u>B1</u>	<u>A2</u>	<u>A1</u>
<u>213PjSWP6c</u>	<u>Pinjarra P6c phase</u>	<u>Very gently undulating alluvial terraces and fans. Moderate to moderately well drained uniform friable brown loams, or well-structured gradational brown earths.</u>	<u>Yes</u>	<u>A1</u>	<u>B1</u>	<u>A1</u>
<u>213Pj P7</u>	<u>Pinjarra P7 phase</u>	<u>Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley sandy duplex and effective duplex soils.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj P7a</u>	<u>Pinjarra P7a phase</u>	<u>Seasonally inundated swamps and depressions with very poorly drained variable acidic mottled yellow and gley duplex soils becoming alkaline with depth.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj P7b</u>	<u>Pinjarra P7b phase</u>	<u>Seasonally inundated swamps and depressions or seepage areas near the base of the foothills with very poorly drained deep bleached siliceous sands.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj P8</u>	<u>Pinjarra P8 phase</u>	<u>Broad poorly drained flats and poorly defined stream channels with moderately deep to deep sands over mottled clays; acidic or less commonly alkaline gley and yellow duplex soils to uniform bleached or pale brown sands over clay.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>

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<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Vinifera (V)</u>
<u>213Pj P9</u>	<u>Pinjarra P9 phase</u>	<u>Shallowly incised stream channels of minor creeks and rivers with deep acidic mottled yellow duplex soils.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj P9a</u>	<u>Pinjarra P9a phase</u>	<u>Generally shallow incised stream channels of minor creeks and rivers with poorly drained deep mottled yellow duplex soils, becoming alkaline with depth.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213PjSWP10</u>	<u>Pinjarra P10 phase</u>	<u>Gently undulating to flat terraces adjacent to major rivers, but below the general level of the plain, with deep well drained uniform brownish sands or loams subject to periodic flooding.</u>	<u>Yes</u>	<u>B2</u>	<u>A2</u>	<u>A2</u>
<u>213PjSWP10a</u>	<u>Pinjarra P10a phase</u>	<u>Flat terraces adjacent to major rivers with deep black cracking clays with alkaline subsoils; soils similar to P5.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>213Pj P11</u>	<u>Pinjarra P11 phase</u>	<u>Shallow brown loamy soils or less commonly, very shallow sands over ironstone pavement which is a clear barrier to drainage.</u>	<u>Yes</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>

The Bassendean System (212Bs) consists of sand dunes and sand plains with flats and swamps on sandy alluvium over sedimentary semi-wet soil, and wet soil. These soils have low fertility and are susceptible to leaching. In the Peel, these soils may become very saline at high water levels and may become flooded in some areas. Native vegetation is mainly banksia-paperbark woodlands and mixed heaths.

<u>212Bs B1</u>	<u>Bassendean B1 phase</u>	<u>Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands sometimes with a pale-yellow B horizon or a weak iron-organic hardpan at depths generally greater than 2 m; banksia dominant.</u>	<u>No</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>212Bs B1a</u>	<u>Bassendean B1a phase</u>	<u>Extremely low to very low relief dunes, undulating sandplain and discrete sand rises with deep bleached grey sands with an intensely coloured yellow B horizon occurring within 1 m of the surface; marri and jarrah dominant.</u>	<u>Yes</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>

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<u>Map Unit Symbol</u>	<u>Map Unit Name</u>	<u>Map unit description</u>		<u>Annual (A)</u>	<u>Perennial (P)</u>	<u>Very High (V)</u>
<u>212Bs B2</u>	<u>Bassendean B2 phase</u>	<u>Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with a pale-yellow B horizon or a weak iron-organic hardpan 1-2 metres.</u>	<u>No</u>	<u>B1</u>	<u>B1</u>	<u>B1</u>
<u>212Bs B2a</u>	<u>Bassendean B2a phase</u>	<u>Flat to very gently undulating sandplain with well to moderately well drained deep bleached grey sands with an intensely coloured yellow B horizon usually well within 1 m of the surface.</u>	<u>No</u>	<u>B1</u>	<u>A1</u>	<u>A1</u>
<u>212Bs B3</u>	<u>Bassendean B3 phase</u>	<u>Closed depressions and poorly defined stream channels with moderately deep, poorly to very poorly drained bleached sands with an iron-organic pan, or clay subsoil. Surfaces are dark grey sand or sandy loam.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>212Bs B4</u>	<u>Bassendean B4 phase</u>	<u>Broad poorly drained sandplain with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>212Bs B5</u>	<u>Bassendean B5 phase</u>	<u>Shallowly incised stream channels of minor creeks and rivers with deep grey siliceous sands or bleached sands, underlain at depths generally greater than 1.5 m by clay or less frequently a strong iron-organic hardpan.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C2</u>
<u>212Bs B6</u>	<u>Bassendean B6 phase</u>	<u>Sandplain and broad extremely low rises with imperfectly drained deep or very deep grey siliceous sands.</u>	<u>No</u>	<u>C2</u>	<u>C2</u>	<u>C1</u>

Local Planning Policy 4.12: Horticulture

References

Name of Policy	Local Planning Policy 4.12: Horticulture
Previous Policy	N/A
Date of Adoption and Resolution Number	23 July 2018 - OCM063/07/18
Review dates and Resolution Numbers	
Next review date	
Related documents	<p>Acts/Regulations <i>Local Government Act 1995</i> <i>Planning and Development Act 2005</i> <i>Planning and Development (Local Planning Schemes) Regulations 2015</i></p> <p>Plans/Strategies Strategic Community Plan 2017 - 2027</p> <p>Policies</p> <p>References</p> <p>Delegations</p> <p>Work Procedures</p>

Note: changes to references may be made without the need to take the Policy to Council for review.