Before the Hearing Panel

Under	the Resource Management Act 1991
In the matter of	applications by Cromwell Certified Concrete Limited to the Otago Regional Council and Central Otago District Council for discharge permits, a water permit and a land use consent relating to expansion of an existing quarry at 1248 Luggate-Cromwell Road

---

Statement of Evidence of Earnscy Weaver

For the Hayden Little Family Trust, Nicola and Bryson Clark, and Amisfield Orchard Limited

8 December 2021

Submitter's solicitors:
Maree Baker-Galloway | Rosie Hill
Anderson Lloyd
Level 2, 13 Camp Street, Queenstown 9300
PO Box 201, Queenstown 9348
DX Box
p + 64 3 450 0700
maree.baker-galloway@al.nz | rosie.hill@al.nz

anderson lloyd.

Qualifications and Experience

1 My full name is Earnscy Weaver.

2 I hold a Diploma in Horticulture from Lincoln College, granted in 1971.

3 I am a member of the International Society of Horticultural Science (ISHS) and the NZ Institute of Agricultural and Horticultural Science (NZIAHS) and was awarded the NZIAHS Agmardt Technology Transfer Award in 2011 for my technology transfer work in the Summerfruit industry.

4 I have attended ISHS Cherry Symposiums in USA (2001), Turkey (2005) Chile (2009), Spain (2013) and Japan (2017) and have attended ISHS Apricot Symposiums in Italy (2007) and Armenia (2011). I have attended International Fruit Tree Association (IFTA) workshops in USA, Canada and Australia. The symposiums covered research on all facets of the crop identified.

5 I was an elected board member of Summerfruit New Zealand the industry body representing all Summerfruit growers and was chair of the research committee for ~18 years relinquishing the position in June 2018. The industry's research programme covers pests, diseases, crop nutrition, crop physiology and growing systems.

6 I am a director of Leaning Rock Cherries Ltd (LRC) who are located on Rockview Road to the east of Alexandra and produce cherries, apricots, peaches and nectarines.

7 I am director of Weaver Horticulture Ltd, based in Alexandra. I have undertaken this role for the past 15 years providing horticultural advisory services covering summerfruit (stonefruit) and pip fruit production. In this role I undertake work ranging from trouble shooting on orchard problems through to site appraisals and development plans and I have advised on properties throughout Central Otago, North Otago, South Canterbury, Nelson, Marlborough, Hawkes Bay, and Australia.

8 I have completed development appraisals for properties throughout Central Otago, North Otago, Hawkes Bay, Central Hawkes Bay, Australia and China.

9 I have completed development appraisals for properties in the Cromwell basin including on the east side of Lake Dunstan/Clutha River as far north as Tarras and on the west side as far north as Luggate.

10 Prior to my role as a Horticultural Advisor, I was the General Manager of Molyneux Holdings Ltd and its subsidiary companies, Molyneux

Fruitgrowers Ltd, Molyneux Management Ltd, and Molyneux Packhouse Ltd.

11 Molyneux Management Ltd managed ~100ha of pipfruit and summerfruit contained within the north end of the area bounded by Ord Road, Ripponvale Road and State Highway 6.

12 The Molyneux Holdings group of companies at the time managed and packed the crop from ~150 ha of orchard including Apricots, Cherries, Nectarines, Peaches, Plums, and Apples.

13 Prior to becoming GM of Molyneux Holdings Ltd and companies I was the GM and a Director of Summerfruit Orchards Ltd from 1986 to 2002. Summerfruit Orchards purchased our family orchard of ~13ha and developed over time an additional 52 ha of orchard. The company produced Apples (Organic), Apricots, Cherries, Peaches, and Nectarines. Summerfruit Orchards Ltd's properties were located in the Earnscleugh area of the Alexandra basin.

14 Along with my wife we operate our Family Trust's 2 ha high density cherry planting. The planting is in its sixth growing season and is fully rain covered with Voen covers imported from Germany. The planting has had two successful harvests in years when many growers have been impacted by light crops and rain and is carrying a full crop going into its third harvest this season

15 I am directly familiar with the Application Site (**Site**) and its surrounds.

Scope of Evidence

16 In preparing this evidence, I have reviewed the respective applications for resource consent and the supplementary information provided by the Applicant. I have also reviewed the Submitters' submissions[1], evidence, and corresponding photos and videos.

17 I have reviewed the following evidence from the Applicant:

(a) Ruth Underwood (horticultural); and

(b) Fraser Colegrave (economic effects).

[1] Submissions for Hayden Little Family Trust, Nicola and Bryson Clark, and Amisfield Orchard Limited

18 I have been asked by the Submitters to provide horticultural evidence in respect of the Application Site.

Code of Conduct for Expert Witnesses

19 While this is not a hearing before the Environment Court, I confirm that I have read the Code of Conduct for expert witnesses contained in the Environment Court of New Zealand Practice Note 2014 and that I have complied with it when preparing my evidence. Other than when I state I am relying on the advice of another person, this evidence is within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Executive Summary

20 My evidence outlines that:

(a) From a horticultural perspective, the proposed quarry expansion area and surrounding land (the **Site**) is productive land. Economic quantities of high value crop (specifically, cherries) can be fully ripened on a consistent basis. The topography, climate and soils of the Site make this a very suitable location for cherry and viticulture production, and the products that are produced from these horticulture activities have a distinctive 'sense of place' and potential to command international acclaim.

(b) The establishment and operation of a commercial cherry operation at the expansion site is economically viable. Such an operation has the potential to command a price commensurate with the yield / quality tier of cherries grown.

(c) As per other Central Otago cherry production sites, the Site lends itself to capturing additional productive value.

21 The proposal will result in a loss of finite prime productive horticultural land to (comparatively) short term mining. In making these decisions it is important to think in particular about our future generations, and what we are leaving behind.

22 The added loss of horticultural capabilities to neighbouring properties further compounds this economic loss.

23 Proposed landscaping bunds will create an increased frost load on two neighbouring properties, seriously compromising the highest and best use of the Site, being its horticultural capabilities.

Horticultural attributes of the Pisa area

24 In this part of my evidence, I consider the following attributes of the Pisa area: climate, soil, current cherry operations, and practices. For the reasons set out below, it is my opinion that cherry orchards can be, and are, successfully cultivated in the Pisa area and in particular, on the Site. High quality crops can be grown and ripened on a consistent basis. Cherries that are produced from this location have a distinctive 'sense of place' and have commanded, and continue to command, international acclaim.

25 Development of cherry orchards should take into account:

(a) Location in regard service industries such as packhouse, orchard management and support services and staff accommodation; and

(b) Site suitability – topography (frost load/shelter), soils, water availability, rain fall, chill hours and growing degree days (**GDD**) (ripening/warmth).

26 The Cromwell / Alexandra basins and surrounds have seen the highest level of new cherry orchard plantings in New Zealand over the past decade and the region produces over 90% of New Zealand's export cherry crop.

27 The key climatic drivers[2] of the Pisa area are outlined below:

(a) Accumulated heat (GDDs)

(i) Growing degree days measure the accumulated heat for the growing season.

(ii) High GDD results in earlier maturity of the crop. Combined with early maturing variety selections this allows early entry to markets. Early entry provides a number of advantages

(A) Re establish the brand for the new season before other suppliers

[2]*The **growOtago** project comprehensively maps the Otago region's climate and soils. It provides information that can be used to improve existing land uses, develop new high value land-based activities and foster regional economic development, through optimising the use of Otago's varied climate and soils.*

***growOtago** was developed by the Otago Regional Council, using the scientific expertise of NIWA, AgResearch, Landcare, and the universities of Otago and Auckland. These organisations used the latest climate modelling and mapping techniques, including satellite technology to develop these maps*

(B) Provide an extended season for harvest and post-harvest facilities gaining efficiencies in packhouse operations, harvest crews and accommodation

(b) The Pisa area is mapped at 1001 – 1050 GDD (Base 10) in a low annual accumulation (The median annual accumulation map was not available on the growOtago site). This is higher than the Cromwell flats and Ripponvale area at 901 – 1000 hours. The area is early maturing as a result of the high GDD accumulation. CHILL Hours

(i) Temperate fruit crops which include cherries and other stonefruit types, and apples and pears require a given number of chill hours to break dormancy.

(ii) For cherries, chill hours requirements range from 800 -1200 hours depending on the variety. Apples run from 400 to 1000 chill hours.

(c) The Pisa area is mapped at 1801 to 1900 chill hours which is sufficient for those crops grown in the wider central Otago region Rainfall

(i) Rainfall has a significant impact on cherry fruit quality when it occurs pre harvest. The fruit becomes susceptible to macro-cracking damage at the commencement 3 to 4 weeks pre harvest. Both the amount of rain as well as the hours of wetness impact on incidence of rain cracking

(ii) Secondly the fruit may not macro-crack from a rain event however the storage ability of the fruit will be compromised as microcracks undetectable by the naked eye will have formed resulting in increased water uptake by the fruit resulting in one or some of the following:

(A) Soft fruit

(B) Impaired appearance (dull appearance, shrivel)

(C) Increased incidence of rots

(iii) Both the Cromwell and Alexandra basins are recognised as having low rainfall and thus are suitable for the production of export quality cherries.

(iv) Albeit the area has reduced rainfall there are years when rain damage will result in significant losses. Growers attempt to mitigate rain damage in various ways:

(A) Spraying with coatings to reduce the uptake of water

(B) Applying calcium sprays in an attempt to reduce the osmotic potential and thus reduce water uptake via the skin surface

(C) Erecting covers to shelter the fruit from rain events.

(d) Frost risk

(i) Like all areas in the Central Otago region, the Site is subject to frost risk. However, the relief (or aspect) of the Site does aid frost drainage, which in turn will reduce the risk of frost damage, as compared to other sites in the area.

(ii) Further, the close location to the lake enhances the inversion layer and therefore effectiveness of frost fans.

Economic Analysis – Central Otago District Cherry Orchards

28 Cherry orchards can continue producing *ad infinitum* with replanting in new varieties not required as frequently as other summer fruit (some cherry varieties like Lapin are still producing viable crops at over 30yrs of age).

29 There are numerous of successful examples of cherry orchards on similar sized blocks of land to the quarry expansion area, as set out below.

Example - Lot 3 DP 301379 (Applicant's expansion land)

30 This is a 9ha flat block at Amisfield Mt Pisa (15km north of Cromwell) some 250m from Lake Dunstan second terrace, up from shoreline. This analysis assumes an 8 ha canopy area planted.

31 This is a well-established horticultural and viticulture location with numerous vineyard and cherry orchards adjacent or in close proximity.

32 These soils will readily support cherries with some crushing / soil conditioning of stony soils on the east terrace edge (included in ground preparations set out below). I understand from Mr Little's account, that recent cultivation has showed the soils become heavier from east to west and the neighbouring Clark property displays no stony topsoil. The Hayden Little Family Trust block used similar methods for soil renovation, and which now supports cherry trees.

33 There is good frost drainage being elevated above the nearby lake shore to the east. However drainage on the southern boundary to the Amisfield

Burn has been blocked by quarry bunds as has the neighbouring Clark property.

Initial Investment (first 5 years of establishment)

34 The following section of evidence details estimates on the return from a cherry orchard on this Site, including establishment and investment costs. In summary, it is estimated that this 8ha Site would generate more than a 20% return on investment, and over $1,656,000/yr Export earnings.

35 This analysis is a traditional development model, which has a conservative result. Whereas higher intensity tree-wall growing systems, with higher capital costs, will return greater operating surpluses per ha than that presented below.

36 The analysis is based on a centre leader trellis with 3.5m row width x 3m tree space. Establishment costs would be greater if the more popular intensive UFO planting system was adopted (1600 trees/ha or 13,000 trees with 2.5m row width x 2.5m spacing).

37 First crop 4th year producing 70% 9t/ha. Max production reached year 6 OR 7.

Purchase Land Ground prep Trees – 8,000@$28 Bore/Irrigation ($15k/ha)	$ 900,000 $ 24,000 $ 224,000 $ 120,000	$100k/ha Rip/cultivate/fert ($3kha) Includes planting/guards/prune Fully automated under tree sprinklers. New bore
Growing / protection ($150k/ha)	$1,200,000	Trellis/bird nets/rain cover structures
Windmachines (2)	$ 130,000	Two Frost Boss 5 blade
(frost protection) Plant purchases	$ 300,000	Full range
Establishment (4yrs)	$ 384,000	($12k/ha/yr management/tree training etc)
Total Capital	**$3,282,000**	

38 Production/Price Assumptions:

(a) Produce 12Ton/ha, 75% export, 20% local, 5% waste

(b) Assume $18/kg export $6/kg local

(c) Note, that the key is to not over crop to ensure large cherries to maximise returns.

39 Income**:**

(a) Harvest - 96t

(b) Export - 9ton x 8ha or 72t @$18/kg $1,656,000

(c) Local 2.4ton x 8ha or 19t @$6/kg $ 114,000

(d) Total Income **$1,770,000**

Expenditure:		
Prune/Train ($1,500/ha)	12,000	additional labour
Weed/Pests sprays	12,000	
Pollination (5 hives/ha @$180) Nets/rain covers – extra labour	7,000 5,000	
Fertiliser/foliars	6,000	
Electricity(irrigation)	3,000	
Soil Tests etc	1,000	
Consultant	3,000	
R & M / tree replacement Staff training/PD	10,000 2,000	
Fuel (tractors etc /frost fans)	12,000	
Accountant	3,000	
Fees/Administration/insurance	8,000	
Labour (2 full time)	120,000	
Rates **Total Orchard**	3,000 **$207,000**	
Picking labour 92 Ton @ $1.5/kg	138,000	
Packhouse 92 Ton @ $3.25/kg Freight/marketing/levies@$6/kg	299,000 432,000	Includes packaging on export fruit
Total Expenditure **Surplus** **Return on investment >20**%	**$1,076,000** **$ 694,000**	

Direct Economic Impact for Local Economy Per Annum

40 Key takeouts: **$2.7m** Labour/consumables invested up to peak first harvest exclusive of land

41 **$294,000/yr** Labour

42 **$857,000/yr** Packing/freight/marketing

Including - $250k wages

- $322K freight in NZ / Airlines (av $3/kg)
- $189K packaging etc

Balance packhouse profit

43 **$70,000/yr** Orchard materials/consumable's/service industries

44 **$1,656,000/yr** Export earnings

Over 50yrs
- $27m Wages
- $29m Goods/services
- $82m Export earnings
- Portion of profits re invested

Long term contribution to the region and NZ

45 Productive soils are finite, and there is therefore importance in conserving high quality productive horticultural land where it is currently available

46 I consider the climate and soils in particular make this site very suitable for cherry production. When compared to other sites, frost risk is reduced due to the lie of the land, (or, aspect) and close proximity to Lake Dunstan. The lie of the land towards Lake Dunstan gives it a frost advantage.

47 The soils are identified by the applicant as Mataura -7a.2, Molyneux-8a.1 and Blackmans-5a.1 from Smaps soil classification maps. These soils are described as loam or sandy loam and as free draining making the soils ideal for cherry production. Normal remediation fertiliser application will be required to establish the required nutrient balance and on-going crop nutrition maintained by the use of fertigation, solid fertiliser applications and foliar applications.

48 This Site has potential to consistently achieve full maturity and create high quality export quality cherries.

Quarry economic analysis and ability to rehabilitate

49 Even once remediated after quarrying activities are concluded, the expansion Site will not be able to be restored to its full horticultural capability unless the ground level is restored up to the surrounding land. There will remain a large frost prone hole / quarry ponds as a result of the topographical changes which will result in a 25 metre deep pond of cold air in frost conditions. The site will be significantly colder than the surrounding land which will have the cold air draining to lower lying areas.

50 Because of the increased frost risk even if the top soil is returned through rehabilitation and drainage established following compaction from heavy machinery, the site would not be suitable for cherries.

51 By comparison, the mining proposed is finite, and on a relatively small parcel of land in mining terms (even a small set back of 50m reduces the remaining mining area of expansion to under 5ha).

52 The Site will produce a 25m deep x 5ha or 1.25M m^3 of product and at an extraction rate of 200,000m3/yr. this Site will last around 6 years. According to the Fulton Hogan Aggregate prices, the average return appears to be $20/m3 so the total gross income off the Site is $25M. Cherries however will have surpassed this within 15 years and carry on indefinitely.

53 The Applicant's evidence has relied on the importance of the aggregate resource to the Region. However, the inevitable fact remains that there will eventually need to be new mining sites found which protect prime horticultural / high value land and soils, and which don't have adverse effects on existing horticultural operations and capabilities.

54 The Applicant has not provided an economic analysis on alternative uses of the Site, however based upon the modelling outlined above, I believe the Site is more viable under successful horticultural activities, with cherries being the currently most sustainable and 'highest and best' use.

55 There is a direct relationship between size / quality and the prices the cherries command, and this has been sustained. Demand for Central Otago cherries is currently strong. I am advised that Purepac export orders exceed supply for 2021/2022, despite impacts on the market from Covid.

Current and future adverse effects of the Cromwell Certified Concrete Limited Quarry activity on horticulture

Earth bunds

56 Site suitability is critical to achieve reliable economic returns which ultimately effects land value.

57 The Clarks and the Davis's properties form together an approx. 14ha flat terrace largely on the same elevation as the applicant's expansion land. The natural fall is towards Lake Dunstan and the Amisfield Burn therefore the Katabatic frost drainage in this small valley is to the east/south. The existing Quarries bunds already blocks cold air flowing into the Amisfield Burn to the South, so the only other flow direction for the cold air is across the 'expansion' title (see **Appendix 1**).

58 Formation of impermeable 3m high earth bunds from the elevated north east corner of the quarry expansion to the south-east corner will create a frost prone valley until such time they are removed.

59 Wind machines (Frost fans) work by moving the cold air and replacing it with warmer air from the inversion layer. Due to disease, high water take requirements (40 cubic metres per hour per hectare), creation of water logged soils, and fruit damage, overhead sprinklers are no longer used in new stonefruit (includes cherries) orchards to protect the flower and fruitlet stages.

60 Site suitability is downgraded as frost prone sites have the following issues:

(a) Frost damage to tree trunks throughout winter/early spring is the entry point for bacterial blast (Pseudomonas syringae). Up to 90% losses in young tree have been reported with 30% to 40% losses not being unusual. Considerable fruit loss occurs in older trees from death or die back of infected branches.

(b) Flowers and fruitlets are lost to frost damage from early September.

(c) Fruit marking from bacterial infection (*Pseudomonas syringae*) because of initial frost damage to the fruit allowing entry and establishment of the bacteria

(See **Appendix 2** Summerfruit in NZ – Management of Pest and Diseases by Hort Research).

61 In October 2018 a frost seriously damaged over 50% of the cherry crops in the Cromwell Basin; there was no inversion layer, so the more frost prone the orchard the greater the losses. This again emphasised the importance of site selection for frost.

62 The choice of site for a new development is most often governed by the incidence of spring frosts particularly in more recent times with the introduction of wind machines which do not have the 100% protection ability that was provided by overhead water.

63 Economic impact from frosts can be significant from both production losses, tree losses, quality issues, and additional orchard costs.

Adverse effects of Quarry Dust on adjoining orchards

64 Ms Underwood's evidence, for the Applicant, considers dust effects on existing orchard operations. At 7.12 of her evidence, it is stated that:

(a) *The closeness of the 'Little' east orchard to the proposed quarry expansion site and the degree of immediate boundary to the north of the orchard increases the potential risk of dust effects on the orchard from the proposed quarry expansion. The main wind directions should*

mean limited carry of dust from either the existing or expanded quarry to the 'Little' eastern orchard based on the three-year average of data in Mr Cudmore's modelling, although there were some winds directly from the north during 2020 which could have blown dust into the orchard from the quarry expansion site. I understand that continuous and real time dust and wind monitors are proposed to be used as part of the dust management approach, particularly when excavating close to sensitive receptors such as the east orchard.

65 However, having considered the Submitters' air quality evidence from Mr Stacey, I note:

(a) Both existing cherry blocks on the AOL land will receive dust from either the westerly or northerly quarters being the two most prevailing winds and downwind of the quarry.

(b) As discussed in Mr Little's evidence, dust effects are problematic not just for the fruit and plant growth, but also for chemical spray efficiency, the bird netting and plastic protective covers, which would require additional cleaning and labor costs in order to mitigate dust settling and corrosive effects.

66 Ms Underwood considers that the most sensitive stage of the cherry crop to dust is the period immediately before harvest to the end of harvest covering late-November through to mid-February. To the suggested time frame I disagree. The dust will commence accumulating in the stem bowl of the fruit from the time the fruitlet emerges from the shuck (the remains of the flower sepals) of those fruit which are hanging perpendicular or close to perpendicular. Dust would thus accumulate over the period from late October through to late January being a period of up to 3 months.

67 Ms Underwood refers to the fruit being washed at packing. Washing is a consequence of the activities of conveying the fruit and hydro-cooling the fruit with water as close to 0^{o}C as possible. Although Ms Underwood states that the cherries float, other than for a portion of the Sonnet variety, cherries generally do not float (if they do float there is most likely something wrong with the fruit). The fruit is not deliberately agitated or impacted by water under pressure in any way as this would lead to surface pitting and bruising as a result of mechanical damage leading to the fruit being downgraded. The damage is exacerbated by the chilled fruit temperatures as a result of hydro-cooling. This is different than for example apples which are deliberately cleaned with pressure jets to remove dirt and debris.

68 I am aware of situations where dust has settled into the stem bowl of the fruit and has not been removed through the packing process. The fruit is

rejected as under packhouse food safety requirements the fruit is classed as contaminated and therefore not suitable for any use including processing

69 Ms Underwood observes that the next sensitive stage to dust is flowering and notes that the stigma is sticky and if high levels of dust were stuck there, this would impede pollination. Ms Underwood then considers that the effect would be contained in various ways. However cherries are notoriously unreliable in setting crop and any additional event that has an impact on crop yield such as dust impacting on pollen being transferred to the stigma will have a negative impact on the yield. There are blocks in the Cromwell basin this season that I have estimated as being 25% of a full crop. Further losses from dust contamination of the stigma would further reduce the economic performance of the affected trees.

70 Dust on bird netting and on rain covers will aggregate to have an impact on light levels to a greater or lesser degree. Rain covers have a rough surface and in normal circumstances collect dust.

71 Rain covers have a significant impact on light levels with some covers, for example “Voen”, reducing the irradiance levels on some days by up to 50%. At these levels it requires intensive management of all inputs (e.g. irrigation, nutrition, PGRs (Plant Growth Regulators) and other inputs to achieve the fruit quality demanded by the market, in particular fruit firmness. Any further reduction in light levels (and thus photosynthesis) such as dust, on bird netting, and on rain covers will have an impact on fruit quality depending on the extent of the dust contamination.

72 Spraying leaves contaminated with dust can affect the uptake of those agrichemicals particularly those that have systemic activity. This is noted in the 1990 McCrea thesis referred to by Ms Underwood.

73 I observed a trial of a newly introduced systemic fungicide for the control of Powdery Mildew (*Podosphaera leucotricha*) in apples that was conducted in the days when the orchard interrow was open cultivated. The cultivation of the dry soil produced dust which was deposited on the leaf. In this trial site the agrichemical failed to prevent the Powdery mildew infection. The fine layer of dust on the leaves was not noticeable to the human naked eye however it was visible when looking through a magnifying glass

74 Ms Underwood notes the placement of shelter belts around the various plantings and their possible benefit in reducing the dust load on the orchard plantings. I expect in time that at least some of the shelter if not all will be required to be removed to enable the proposed wind machines to cover a wider area. Shelter belts disrupt the airflow and reduce the reach and efficiency of wind machines.

Dated this 8th day of December 2021

Earnscy Weaver

Appendix 1 – Map showing frost flow direction

NOTES:

1. Contours were captured by UAV survey with increments being 0.5m.

2. Base aerial imagery has been sourced from CODC GIS and is for indicative purposes only.

3. Origin of levels - A3M4 (D 184) - RL: 215.802

Revision	Amendments	Date
B	FROST FLOW PATH	08/12/2021

C. HUGHES & ASSOCIATES LTD
Surveying and Resource Management • Central Otago

CROMWELL
17A MURRAY TERRACE
P.O. BOX 51
03 445 0376

WANAKA
LEVEL 3, 80 ARDMORE ST
P.O. BOX 599
03 443 5052

www.chasurveyors.co.nz

Project:

CLARK, DAVIS,

AMISFIELD ORCHARD LTD

MOUNT PISA, CROMWELL

Title:

CONTOURS AND FROST FLOW OVER LOT 2 DP 518956 AND LOT 2 DP 301379

CONTOUR PLAN

Scale: 1:2500 (A3)

Job No:	Drawn By:	Datum:	
6267	ALC	NZVD2016	
Drawing No:	Sheet No:	Revision:	Date Created:
C1652	1 OF 1	B	08/12/2021

Appendix 2 – Summerfruit NZ Extract

BACTERIAL BLAST AND DECLINE (initiated by frost damage followed by cool, wet conditions)

Synonyms

Bacterial canker, gummosis, sour-sap, die-back, decline of peach trees, apoplexy of apricots, and peach tree short life.

Causes

Pseudomonas syringae pv. *syringae* (blast); *P. s.* pv. *persicae* (decline)

Host range

All summerfruit: bacterial blast most common in apricot and cherry; and bacterial decline affecting peach, nectarine, almond and Japanese plum.

Incidence

Bacterial blast and decline are most common in nurseries and orchards in cooler southern regions, but the former is also readily found in Marlborough, Hawke's Bay and northern regions wherever frost damage occurs. Bacterial blast was first identified in 1954 by Dye and bacterial decline in 1978 by Young.

Importance

Losses from blast and decline are worst in southern regions. While trees of all ages may be attacked, young trees suffer most and the highest losses (up to 90 per cent or more) are in establishing blocks.

Apricot, cherry, peach and nectarine are particularly susceptible and plums least susceptible. Tree losses are caused by extensive cankering and girdling of framework limbs, and fruit losses by intensive surface spotting.

Fig. 4.28: Blast canker at bud union on young apricot tree.

Fig. 4.29: Bacterial blast of 'Bing' cherry, with amber gumming at crotch.