Appendix 2: weed management methods

1. Weed management arrangements in place				
Method	**Description**	**Benefits**	**Risks / dis-benefits**	**Officer feedback**
Manual weeding	Using manual techniques such as hoeing, brushing, ripping, mowing and pulling	• Pesticide-free and avoid potential risks associated with pesticide use • Encourages biodiversity and sustainability • Mitigates potential public health risks	• Labour intensive and time consuming • Requires a large amount of labour to be truly effective • Hard physical work for staff; considerable wellbeing issues for staff; risk of vibration injuries that have to be carefully managed • Trees susceptible to damage • Above surface growth treated and not root system therefore short term • Weeds will remain as its not possible to visit and manage all areas • Risk of damage to vehicles e.g. weed rippers can cause small stones to be projected that can damage cars	• Current method has limited effect due to lack of root removal and area to be covered • Significant impact on staff • Beneficial for biodiversity
Hoes	Using hoe between pavement cracks and elsewhere to remove weeds	• Pesticide-free • Encourages biodiversity and sustainability • Successful at cutting weeds	• Does not always remove the roots • Very slow process • Requires manual removal of residue	• Physically demanding; repetitive strain means that an Operative can only do for three hours a day, between breaks
Mechanical sweeper	Mechanical sweeper for pavements to remove weeds. Weeding arm has a brush to remove weeds.	• Pesticide-free • Encourages biodiversity and sustainability • Covers a long distance on long and wide pavements	• Does not remove roots • Limited where this can be used due to size of vehicle. Obstructions such as street furniture, narrow pavements, road signs, overhanging trees, shop	• Sweeper cannot do high speed rotation as this could project stones • Uneven surfaces means that the sweeper cannot get into all corners and cracks

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		• Residue is collected by the sweeper within the suction box	signs mean the sweeper cannot access everywhere • Brush requires changing once a week	
Weed ripper (two types in use)	Weed ripper with a metal brush attached at the front	• Pesticide-free • Encourages biodiversity and sustainability	• Does not always remove roots • Slow process • Physically demanding; risk of vibration injuries that have to be carefully managed • One van is needed to transport with tail lift/ramp to load one weed ripper • Doesn't sweep or pick up residue, also requires manual labour for sweeping/picking up loose weeds and silt • Requires transportation of five litres of petrol at a time due to fumes, which requires daily trip to petrol station	• Risks relating to hand arm vibration means control measures are required with two operatives adopting task rotation; one uses the equipment for 30 minutes, the other sweeps and then after 30 minutes they rotate tasks ensuring there is a break from using vibratory machinery • Each operative can use the equipment for a total of 120 minutes per shift, therefore not very efficient
Strimmer with wire brush	Strimmer with weed ripping brushes that are interchangeable	• Pesticide-free • Encourages biodiversity and sustainability • Successful at cutting weeds • Lower vibration than some strimmers but all strimmers and rippers are high vibration	• Does not remove roots • Slow process • Doesn't sweep or pick up residue • Physically demanding; risk of vibration injuries that have to be carefully managed • Requires transportation of five litres of petrol at a time due to fumes, which requires daily trip to petrol station • Van with tail-lift is needed to transport weed ripper	• This has helped speed up operations but can only be used for limited periods by each operative every day • Each operative can use the equipment for 20 minutes at a time. Operatives are working in pairs: one uses the equipment for 20 minutes, whilst the other sweeps the residue, then they swap, therefore not very efficient

2. Weed management methods considered and rejected				
Method	**Description**	**Benefits**	**Risks / dis-benefits**	**Officer feedback**
Acetic acid (vinegar)	Vehicle and knapsack used to treat weeds	• Pesticide-free • No licence required for application • Could be applied by hand / knapsack application	• Has been trialled, but feedback from PAN UK is it has not been effective • Strong smell, can give operator headache • Above surface growth only and not root system • Expensive	• Did not pursue as not considered a viable option • Pesticide Action Network (PAN) UK continue to say that '*this method is not very effective on larger areas of hard surface. As for being environmentally friendly that is probably open to interpretation. Better than glyphosate and other herbicides but it still kills vegetation and possibly has an impact on soil. But as a natural substance it is much more understood and less harmful than synthetic pesticides. But the real question is efficacy – so probably not a great choice for commercial use.'*
Benzalkonium Chloride (for killing moss)	Alternative pesticide badged as being biodegradable and less harmful to the environment	• Claims to be more environmentally friendly and biodegradable	• Harmful in contact with skin and if swallowed • Causes burns • Very toxic to aquatic organisms	• Not recommended due to toxicity and lack of suitability
Crystal salt and vinegar	Manually apply salt and vinegar to the weeds prior to removal after rain	• Natural substance – no licence required	• Does not remove roots • Trialled by Palmeira Square community; feedback was that it killed the leaves and not the roots and the weeds grew back • Large amounts of salt needed to be used • Negative impact on pets, snails and slugs • Strong smell, can give operator headache • Issue with storage • Would have to be applied by hand to very large areas	• Trialled in summer 2021, separately and together • Not recommended due to lack of effectiveness, for method of application, labour requirements, risk to biodiversity and smell

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Method	**Description**	**Benefits**	**Risks / dis-benefits**	**Officer feedback**
Electric voltage shock	An electric charge is applied to each weed individually	• Pesticide-free • Kills small weeds and roots	• Does not remove large roots • Time consuming as must operate per weed • Danger to animals and users • Requires road and pavement to be closed during operation • Requires generator within a van • Not suitable in wet / damp conditions • Requires two to three staff to be deployed	• Found to be unsafe and impractical • Not recommend as not practical or efficient and not to the standard required • Public safety concerns
Flame throwing	Flamers are portable gas torches that produce intense heat that quickly boils the water in plant cells, causing them to burst. This approach has been around for a while.	• Pesticide-free • Throwers relatively cheap to purchase • Suitable for weeds on hard surfaces	• Not very effective on perennial weeds • Brings health and safety risks (banned in the domestic market) • Not particularly effective	• Did not pursue as not considered a viable option • Concerns about insurance and health and safety
Hot foam	Combines heat with biodegradable foam made from natural plant oils and sugars. The heat is used to kill the weed while the foam acts as a thermal blanket keeping the heat applied for long enough to kill the root.	• Pesticide-free • Foam is safe and non-toxic • Can be used in all weather • Claims to kill 95% of targeted weeds	• Relatively new technology • Expensive • Additional cost of olive oil rather than palm oil • Host vehicle could impede traffic flow on many narrow city streets • Parked vehicles could prevent access to pavements • Requires several intensive treatments to remove roots	• Trialled in September 2019 • Lewes District Council carried out a six-month trial of using hot foam to remove weeds around playgrounds. They have now stopped using this due to the high cost and lack of effectiveness • Would probably still need operatives with wand / Knapsack, or manual weeding, to reach some areas • Not suitable for large hard surface areas and not very effective
Hot water	Boiling water is applied onto hard surfaces and a blast of thermal energy kills the weed and the root system	• Pesticide free • Kills small weeds • Steam is safe and non-toxic	• The previous trial demonstrated that it does not remove large weeds or weed roots. The newer system may address this	• Trialled in 2020 • Two weeks later, new weeds had started to grow • The machine was cumbersome and loud and releasing excessive steam,

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Method	**Description**	**Benefits**	**Risks / dis-benefits**	**Officer feedback**
		• The new system is all electric and purports to be quiet	• Uses large amounts of water that has to be transported	which was not good in areas of high footfall • Water needs transporting too so will need a trailer • Could not use on pavements next to parked vehicles due to risks of boiling water – new system may address this
Hot water product	The sudden surge of hot water damages the plant tissue.	• Pesticide free • Kills small weeds • Steam is safe and non-toxic • Very quiet; noise is like a garden hose • When unplugged the water is stored hot for up to 10 hours • The water is not at pressure, so there is no spray	• Uses large amounts of water that has to be transported • Water has to be heated before being transported (between 6 – 9 hours) • The 600 litre version is 460kg empty, so requires a larger vehicle to move it around, such as a van or vehicle with a trailer • The 300 litre version is 310 kg empty. It can be fitted in some utility vehicles or on the back of a compact tractor or a pickup truck	• New system designed in Finland • Been on the market in Finland for about four years (note that they have a much shorter growing season than the UK) • Not being trialled/used by any UK companies/LAs as of May 2023
Infra-red	The system consists of a shrouded spraying head mounted on the front of a purpose-built vehicle. Within the shrouded head are sensor units and spray nozzles. The sensor units detect the presence of weeds and triggers the appropriate spray nozzles to accurately apply the correct amount of herbicide just to those	• Claim is up to 80% reduction in glyphosate • Vehicle can mount pavement • No blanket spraying • Targets weeds only	• Still contains glyphosate • Host vehicle could impede traffic flow on many narrow city streets/pavements • Parked vehicles could prevent access to pavements • Not so effective on smaller weeds	• Large vehicle on pavement but impressive if can target weeds • Would probably still need operatives with wand / Knapsack, or manual weeding, to reach some areas

2. Weed management methods considered and rejected				
Method	**Description**	**Benefits**	**Risks / dis-benefits**	**Officer feedback**
	weeds and their immediate surroundings.			
[Different type of] weed electrical ripper machine	Electric rather than diesel weed ripper – still removing surface weeds rather than roots	• Pesticide free • Reduced use of diesel	• Does not remove roots • Requires several batteries per day as charge is one hour when battery is new • Trialled various sizes and different manufacturers • Doesn't sweep or pick up residue • Requires two operatives on rotating tasks due to Hand Arm Vibration	• Trialled in January 2022 • Not recommend as not practical or efficient and not the standard required
[Different type of] weed ripper	Weed ripper with brushes that removes surface weeds	• Pesticide free • Limited	• Does not remove roots • Requires several batteries per day as charge is one hour when battery is new. • Trialled two different sizes • Doesn't sweep or pick up residue • Requires two operatives on rotating tasks due to HAV	• Trialled on 22 September 2021 and 23rd November 2021
Electric barrow sweeper	Sweeper with Weed ripper functionality	• Removes small weeds • Lightweight • Can access all pavements • Only requires one person to operate	• Does not remove roots • Very low pressure; more designed for sweeping litter • Manually operated • Requires a charging point so has limited geographical area where it can be operated in, otherwise requires a trailer to transport • Filter tends to block frequently due to weeds	• Trialled on 29 June 2022 • Not recommend as not practical or efficient and does not reach the standard required.