CARBON AUDITS™

"The carbon management of landscapes and green infrastructure"

DARLINGTON – REPORT 2024

2001

2005

2018

2023

Images from Google Earth

Howard Wood B.Sc.(Hons)

November 2024

"The changing and historic landscape of Darlington"

CONTENTS	**Page**

CONTEXT OF THIS STUDY

Darlington Borough Council requested Origin Amenity Solutions (*the UK's largest provider of grounds maintenance and amenity products for the sports and landscape markets*), to undertake a study of its carbon sequestration in the summer of 2024, with a completion date before the end of the year.

Origin Amenity Solutions mandated Landscape & Environmental Services Ltd. to carry out this study through the latter's Carbon Audit™ methodology.

GREEN HOUSE GASES - DEFINITION

Greenhouse gases (GHGs) are gases in the Earth's atmosphere, such as carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O), that trap heat. Contributing to global warming they are essential for life on Earth to exist. GHG emissions are calculated by measuring the amount of these gases released from various activities, such as energy use, industrial processes, agriculture, and waste.
Calculations typically involve multiplying activity data (e.g., fuel consumption or electricity use) by corresponding emission factors - coefficients that estimate the amount of GHGs emitted per unit of activity. To standardise and account for the varying global warming potential of different gases, emissions are often expressed in terms of CO_2 equivalents (CO_2e), which represent their impact relative to CO_2. GHG accounting frameworks, like the Greenhouse Gas Protocol, categorise emissions into Scope 1, 2, and 3 to distinguish between direct, energy-related, and value chain emissions, respectively.

In alignment with government policy, many local authorities, companies and other organisations have pledged to become carbon neutral in the next 10 - 25 years.
The emphasis is to reduce Green House Gases (GHG's) through transport, insulate buildings, and generally become more energy efficient. Any remaining carbon emissions may then be offset by purchasing carbon credits. Carbon offsetting, (*measured and traded in tonnes of carbon dioxide*) compensates for carbon emissions and is used to pay for tree planting or environmental schemes in the U.K or elsewhere in the world.

The carbon management of landscapes and green infrastructure …
A typical maintained park with trees, shrubs, flowerbeds and lawns has the potential to absorb more carbon, than is emitted in its maintenance[1].
Therefore, it is quite possible that local authority green space is sufficient to offset a large proportion of its carbon emissions.
A **Carbon Audit™** calculates the difference between carbon emissions and carbon sequestration for any specified area by matching its carbon footprint with the natural processes of carbon accumulation in growing vegetation and soil.

SCOPES

The origin of Scopes 1, 2, and 3 in GHG accounting is rooted in the development of the Greenhouse Gas Protocol, spearheaded by the World Resources Institute (WRI) and the World Business Council for Sustainable Development (WBCSD) in the late 1990s and early 2000s. These scopes were introduced to provide a clear and standardised method for

organizations to measure their direct and indirect emissions, helping them manage and reduce their GHG impacts across their value chains.

Scopes: Defining Boundaries

- Scope 1 (Direct Emissions): These are emissions that come directly from sources that are owned or controlled by the company, such as emissions from combustion in boilers, vehicles, and industrial processes. This concept was introduced to capture emissions that the reporting company can directly influence.
- Scope 2 (Indirect Emissions from Energy): Scope 2 emissions are indirect emissions from the generation of purchased electricity, steam, heating, and cooling consumed by the reporting company. These emissions occur at the facility where the energy is generated but are attributable to the company consuming the energy. This distinction was introduced to separate emissions associated with purchased energy, which companies use but do not directly generate.
- Scope 3 (Other Indirect Emissions): Scope 3 includes all other indirect emissions that occur in a company's value chain, both upstream and downstream. This category was introduced to capture a wide range of emissions that a company influences but does not control directly, such as emissions from suppliers, transportation, product use, and waste. Scope 3 covers the broader life-cycle emissions associated with the company's activities.

Purpose of the Three Scopes

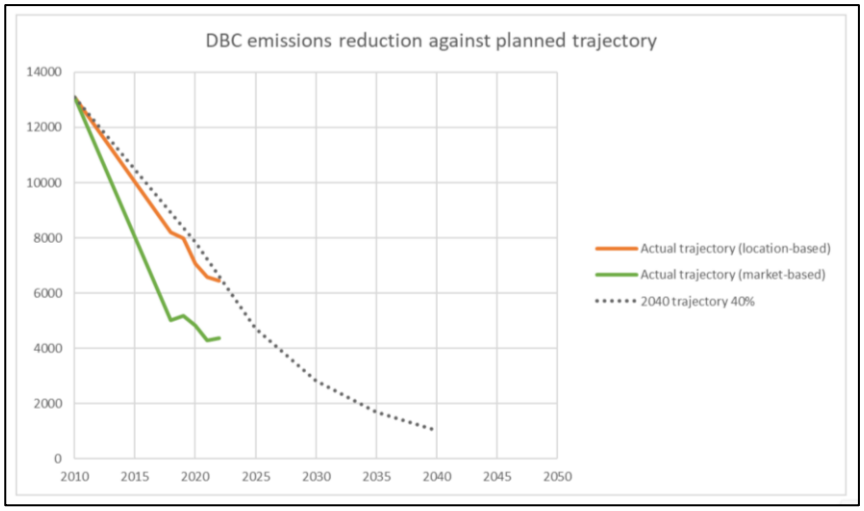
- The purpose of categorising emissions into scopes is to clarify responsibility and enable organisations to take appropriate actions on different kinds of emissions.
- It also provides a comprehensive view of an organisation's total GHG impact, encouraging them to look beyond their immediate operations (Scope 1) and also account for emissions from purchased energy (Scope 2) and their broader supply chain and product lifecycle (Scope 3).

Historic Skerne Bridge. 1825. The oldest railway bridge in the world still in use.

DARLINGTON'S OBJECTIVES

Darlington Borough Council produced its revised interim climate change action plan in 2023 stating its objective to become carbon neutral by 2040.
The trajectory aims a reduction of 40% GHG's every 5 years which will give an approximate 87% reduction in emissions by 2035. (fig.1)

Darlington Borough Council's objectives are currently set to include scopes 1 and 2. Not enough information from suppliers is yet available to include scope 3.



Darlington BC reports its emissions in two ways:
(a) location-based reflecting the average emissions intensity of actual energy consumption.
(b) market-based - reflecting emissions from the zero-carbon electricity tariff that they have chosen.

Fig. 1 Reproduced from Darlington Borough Council's interim Climate Change Action Plan 2023

DATA PROVIDED BY DARLINGTON BOROUGH COUNCIL

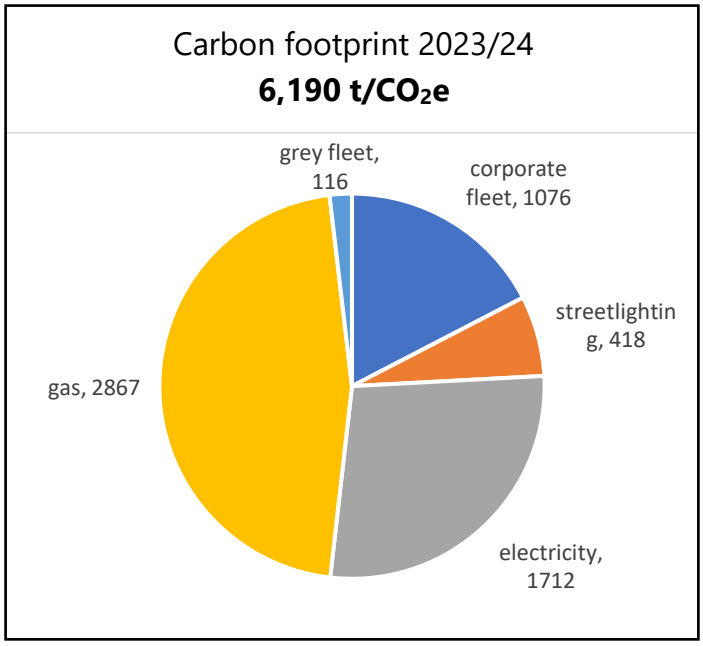


Fig. 2 Reproduced from Darlington Borough Council's reporting spreadsheet

Darlington Borough Council employs a sustainability officer who has, with colleagues collated the figures above. This report uses their calculations having no need to question it.

To date Darlington Borough Council's carbon emissions have been calculated to be **6,190 t/CO_2e** for the year 2023/2024 (fig. 2)

The estates department have identified in Darlington Borough area

- Grassland 533 Ha.,
- Cultivated land (farms) 253 Ha.,
- Woodland 242 Ha,
- Tree planting 36,000
- Grass verges 904 km
- Individual trees 7,784 adjusted to 10,297

The Arboriculture section have survey data covering 9,900 individual trees since March 2010 of which trees have measurements that can be used in this study.

CARBON AUDIT METHODOLOGY

Landscape & Environmental Services Ltd analyses carbon sequestration through its Carbon Audit methodology specifically developed for Green infrastructure.

Carbon Audit methodology includes:

1. A prior questionnaire put to the customer identifies the requirements for doing the survey work. It is then the customer's responsibility to provide the base information for sequestration to be calculated.
2. Visits to the area and onsite collection of samples,
3. Access to exclusive research data on grass variety carbon sequestration from grass breeder DLF France, drawing on research sites in France and Denmark.
4. The use of default published national and international conversion data,
5. The use of our own data base and calculator for establishing arboreal sequestration rates for trees in urban environments. The latter takes into account, species, wood density, height, d.b.h., (diameter at breast height), crown spread, isolated or trees in groups, age, coefficients for crown and root development.
6. Comparison above of 2 and 3 or 3 and 4, reporting on the most realistic figure only, to ensure margins of error exist in the geoclimatic area concerned,
7. Establishing a carbon score (emissions vs sequestration), if this is relevant to the study which would include scope 3 limited to green infrastructure maintenance.
8. Recommendations for increasing carbon sequestration,
9. Returning to the site(s) in following years for monitoring purposes as agreed with the customer.

Carbon sequestration is calculated by sampling Soil Organic Matter (SOM) and Dendrochronology.

SOM relates directly to the carbon content of the soil underlying different vegetation types. This information, whilst establishing a carbon sink (the total amount of carbon stored in the soil), cannot establish how much sequestration is taking place until further samples are taken at exactly the same location in future years.

SAMPLING & CONVERSION FACTORS

Trees

Estimating the quantity of carbon contained in a tree, short of cutting it down and excavating the roots is subject to estimation through the calculation of volumes of cones or truncated cones. Forestry volumetric tables rely on height and DBH (diameter at breast height) are readily available for quick reference which, when combined with the dry wood density of a particular tree species can give us its mass. They are used for commercial timber yield mainly for conifer plantations.

The shortcomings of forestry volumetric tables is that the growth habit of a forest tree is not the same as a tree in an urban environment. The former will typically be a monoculture of equidistant, identically aged trees. The latter may grow in open parkland or as street trees having been pruned and lopped occasionally or frequently over many years. Trees grown in urban environments may grow in groups at varying distances from each other and be multi-stemmed. Typically, 30% and 20% of the trunk biomass is allocated to branches and roots respectively. A trained arboriculturist looking at a free growing oak or Beech tree in open parkland where there is no competition from other trees will observe that the crown biomass may equal or exceed the trunk biomass. Growth rates of trees will also vary depending upon the local micro climate and soil nutrition, therefore, a more accurate method of determining the carbon content of trees is preferable to the use of forestry volumetric tables.

A tree's girth increases each year so its circumference is ultimately related to its age. A method known as 'Mitchell's Rule'[1] has established coefficients of tree growth for trees growing close together, street type environments and in open parkland.

By sampling and undertaking dendrochronological analysis on fifteen different tree species and another six samples from coniferous and hardwood woodland environments, we have adapted the Mitchell coefficient to local growing conditions within the boundaries of Darlington Borough Council.

We are thus able to make estimates of carbon sequestration for the individual surveyed trees where d.b.h. has been recorded. 2,116 trees from the 9,900 in the survey have been excluded from this Carbon Audit because insufficient data is available, many also appear

to have been felled over the years. The Arboriculture section of the council considers 80% of the street trees have been surveyed.

We cross checked the number of trees included in the tree survey for two sites, outside of street trees. 177 trees are mentioned for South Park of which 45 have dimensions that were included in the 7,784. Using Google Maps to count tree canopies we arrived at 621 trees representing that the tree survey covered 7.25%. It is also probable that there are over 5% more trees present, not recognisable as individual canopies on google maps.

South Park, tree canopy count

The second site visited was North cemetery, listing 125 trees in the tree survey of which 51 have dimensions included in the 7,784. The canopy count revealed 451 identifiable tree canopies representing 11.31% of the trees that actually exist.

For the purposes of this Carbon Audit, we have there adjusted the tree count to

7,784 trees – 45 south Park trees -51 North Cemetery trees = 7,688 trees

Plus 20% street trees not yet surveyed = 9,225

9,225 trees plus 621 trees at South Park + 451 trees at North Cemetery = 10,297 trees that can be included for this Carbon Audit (see recommendations)

North Cemetery tree canopy count

Having established average growth rates for Darlington's tree population it has been possible to project the increasing d.b.h. / girth on trees surveyed 10 or 20 years ago and return to those trees to cross reference the calculated coefficient with today's measurements.

Woodland

Carbon sequestration is calculated on a m^2 basis. The density of trees has been measured and the ages confirmed by increment borer. Google Earth provides interesting back up on the evolution of the arboreal landscape as illustrated on the title page for West Park and below for Geneva Woods.

Of the 242Ha. of woodland identified by Darlington BC, we have looked at the 7 main areas, totalling 160.9Ha. North cemetery has not been included as it now figures in the individual tree count. Not every site is 100% woodland so an estimated percentage tree cover only is counted here which amounts to 69.6 Ha. (*see table 1*)

Our sampling and dendrochronological analysis gives us an annual sequestration rate of 0.89kg/m^2/yr.

Darlington Woodland CO_2 sequestration				
Zone	**surface area**	**% trees**	**tree area**	0.89kg/m2
Geneva Woods	112,500	100%	112,500	100.13t.
West Park	162,396	65%	105,557	93.95t.
Faverdale	258,209	65%	167,836	149.37t.
Crematorium	169,273	75%	126,955	112.99t.
Cocker Beck	132,183	65%	85,919	76.47t.
Blackwell Golf	398,719	15%	59,808	53.23t.
CockerBeck 2	376,393	10%	37,639	33.50t
	1,609,673		696,214	**619.63t**

Table 1. Woodland carbon sequestration.

1945

2001

2008

2023

Google earth images of the evolution of Geneva woods 1945 - 2023

New tree planting

Data received from Darlington council states that over 36,000 trees have been planted over the last 2 years, with precise data for 17,471 trees. There being 15,040 whips, and 2,431 standards. Published data estimates that whips of 60-90cm sequester 0.01 – 0.2 kg./CO_2/yr. and standards with a 3.5-4cm diameter sequester 2-5 kg./CO_2/yr.

We have been given a natural survival rate of 75% for whips and 80% for standards and used conversion factors of 0.09kg./CO_2/yr. for whips and 3.5 kg./CO_2/yr. for standards.

Albeit a low figure the annual sequestration rate can be expected to increase each year.

Grassland

Grass leaves are not sampled for carbon content because surface vegetation is of variable heights depending upon the council's cutting regime, and much of it dies back in winter. By measuring the SOC (soil organic carbon) we measure grass leaves and stalks that have been assimilated, through decay into the soil. Scientific literature estimates this at about 10%. The remaining 90% is returned to the atmosphere as CO2 as part of the natural carbon cycle. Fibrous roots, unless separated from the soil, will be counted as part of SOC.

Research at DLF France on trial sites in France and Denmark for carbon sequestration in amenity grass species for nearly two decades have consistently given gross average results of between 7 – 8 t.CO_2/ha./yr. *(see table 2)*

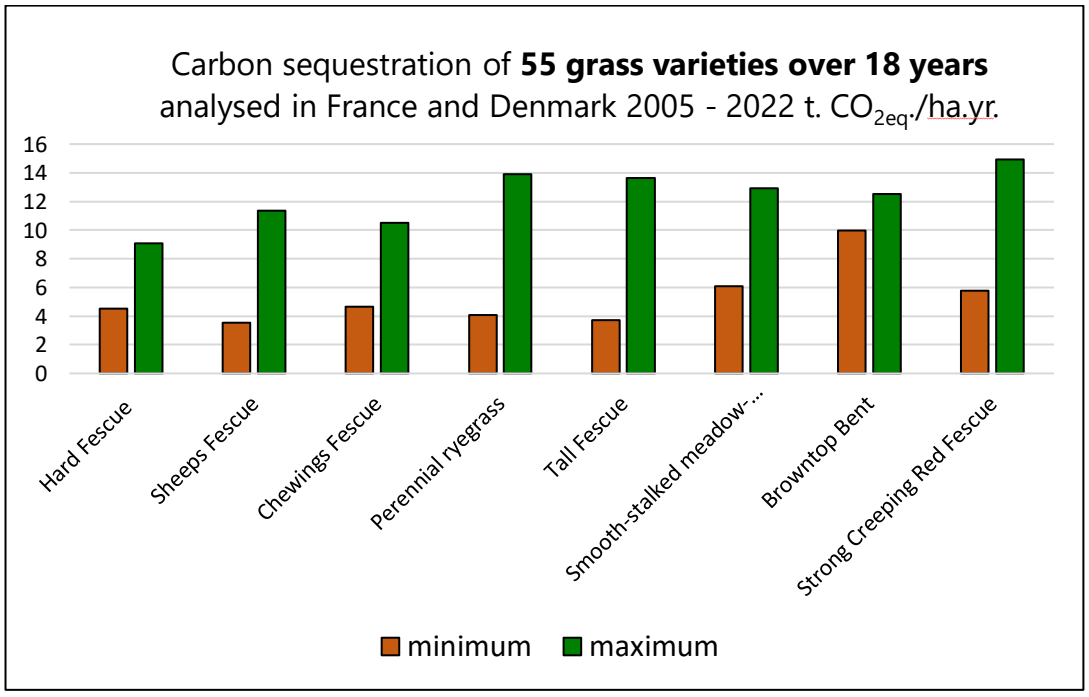


Table 2. Carbon sequestration potential of grass cultivars

A Carbon Audit carried out at Rockliffe Golf Club in 2023, at Hurworth and within Darlington's administrative area revealed that grasses were sequestering 2.47t.CO_2/ha./yr. this included scope 3 calculations which took into account, fertiliser and other treatments.

Calculations were facilitated at Rockliffe Golf Club with a known construction date taking into account a baseline agricultural S.O.M. content.

It would not be reasonable within the confines of this study to apply 2.47t.CO_2/ha./yr. to the grasslands across Darlington's administrative area for three reasons,

1. Darlington's grassland areas require further classification, (see soil sampled areas)
2. No previous baseline S.O.C. was established, before this study, this is effectively the baseline study,
3. Scope 3 has not been specifically calculated for grassland areas,
4. Some grasslands may have reached a stable carbon content if they have existed for 50 years or more; carbon inputs being equal to carbon outputs, other areas may be sequestering at high rates of > 8t.CO_2/ha./yr.

Published data on carbon sequestration in grasslands estimate:

- A study by Natural England suggests that improved grasslands (fertilised and managed for livestock production) sequester around 1 to 2 tonnes of CO2 per hectare per year. Unimproved (semi-natural) grasslands, the sequestration rate is lower, ranging from 0.5 to 1.5 tonnes of CO2 per hectare per year[2].
- The UK Committee on Climate Change (CCC) reports that grassland sequestration rates can vary depending on the type of grassland and the specific land management practices employed. They estimate that well-managed grasslands could sequester around 3 to 5 tonnes of CO2 per hectare per year under optimal conditions.[3]
- FAO and IPCC Reports: Global studies indicate that temperate grasslands, such as those found in the UK, can sequester between 0.8 to 2.5 tonnes of CO2 per hectare annually, depending on management intensity.[4]

In conclusion, CO_2 sequestration in UK grasslands typically falls between 0.5 to 5 tonnes of CO2 per hectare per year, depending on factors such as whether the grassland is intensively managed or semi-natural, without prior knowledge of cultivar selection.

Therefore, we consider a conservative sequestration rate in grassland to be 0.8 t across the borough, with this figure being revisable at a later date when more information is available, (see discussion & recommendations).

Cultivated Land (Farms)

These areas are not directly managed through council maintenance and for this reason are excluded from the study.

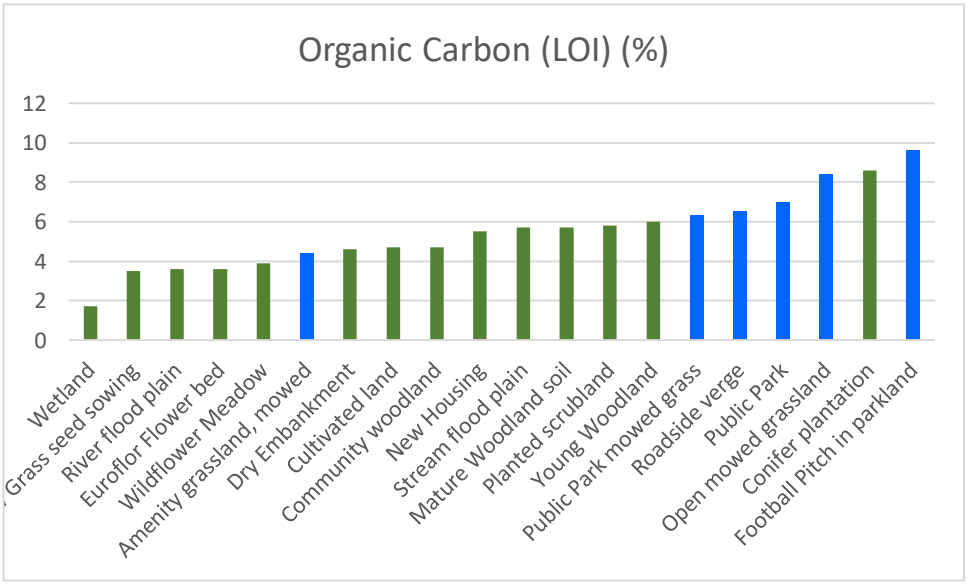
Soil

The carbon content of the soil decreases with depth, our results are based on sampled soil depths of 10 cm / 4", This was the maximum we could obtain before reaching rubble on some sites (previously industrialised) so for consistency the same depth was analysed across the borough. Any surface vegetation is removed before sending the samples to the soil laboratory.

SOM typically contains about 50-58% carbon by weight. We request that soil laboratories test our samples using the L.O.I technique (Loss On Ignition) method. L.O.I uses larger soil samples, 100's of grams as opposed to milligrams to 1 gram with the Dumas method.

Larger samples infer more accurate results for soil heterogeneity and extrapolations on a hectare basis.

The soil analysis results below indicate the range of values for S.O.C., it can be noted how amenity grassland (blue) soils generally contain more O.M., and thus carbon than soils under other vegetation types.



Average soil carbon content = 324.62t/CO_2/ha. to 10cm depth.

	SOIL ANALYSIS LOCATIONS - DARLINGTON B.C.				
	Type	**Place**	**Map ref**	**Latitude**	**Longitude**
1	Public Park	Sugar Hill Park	NZ271157	54.536483	-1.582530
2	Amenity grassland, mowed	Staindrop Rd	NZ263155	54.534957	-1.594477
3	Stream flood plain	Staindrop Rd	NZ265157	54.536484	-1.591959
4	Mature Woodland soil	Staindrop Rd	NZ265156	54.535670	-1.591472
5	Wildflower Meadow	West Park	NZ267167	54.544864	-1.588564
6	Young Woodland	West Park	NZ267166	54.544761	-1.587777
7	Public Park mowed grass	South Park	NZ287135	54.516222	-1.556745
8	Conifer plantation	Geneva Wood	NZ296128	54.510103	-1.544256
9	Amenity grassland	A167 Roadside verge	NZ326138	54.519154	-1.496538
10	Planted scrubland	Tornado Rd	NZ318153	54.532522	-1.509746
11	New Housing	Huworth Gardens	NZ299126	54.508329	-1.539595
12	River flood plain	R. Tees	NZ258130	54.511967	-1.603009
13	Euroflor Flower bed	Skerne Bridge	NZ291155	54.534400	-1.551168
14	Embankment	Skerne Bridge	NZ292156	54.535421	-1.549995
15	New Grass seed sowing	Hopetown Museum	NZ288157	54.536031	-1.555885
16	Wetland	Maidendale Nature Reserve	NZ312134	54.515299	-1.519093
17	Football Pitch in parkland	Maidendale	NZ311140	54.520393	-1.519811
18	Open mowed grassland	Maidendale	NZ311139	54.519467	-1.520021
19	cultivated land / set aside	Skernigham	NZ304189	54.555768	-1.539516
20	Community woodland	Skernigham	NZ304189	54.564764	-1.531318
21	Grass Verge	Whinbush Way	NZ311172	54.549207	-1.519072

THE RESULTS

	Nb./surface area Ha.	t./CO_2 Stored	Annual sequestration t.CO_2/yr	Remarques
Individual trees	10,297	11,599	137.70	Tree survey incomplete
Existing woodland	242 ha.	-	619.63	
Newly planted trees	36,000	-	8.33	This will increase annually
Grassland	533 ha.	-	426.40	Undifferentiated.
Soils	775ha	251,580	-	More with verges, river embankments etc.
Total sequestration / yr.			**1,192.06**	

DISCUSSION & RECOMMENDATIONS WITH A VIEW TO INCREASING CARBON SEQUESTRATION

Blackwell Grange Golf Club woodland or grassland

Land use plan & surface areas. The surface areas supplied for this study contain approximations, an area of grassland may contain trees that have been missed as either woodland or individual trees. Blackwell Grange Golf Club for example is shown as council land on the land use and is classed as woodland whereas it is a mixture of woodland and grassland.

Soil sampling has covered a large diversity of area types, ideally if the surface areas of the landscape typology could be ascertained, more accurate carbon recording could be established rather than rely on averages. This would include surface areas of grass verges, public parks, sports grounds where a specific management was followed, river and stream bank surface areas, wetlands and nature reserves, scrubland, embankments, etc.

Trees. In order to justify additional carbon sequestration, the tree survey of Darlington's Street trees requires completion with height, d.b.h. and crown spread being recorded,

It was noted that South Park and North cemetery contain more trees than was recorded in the tree survey, there may be other parks and church yards in a similar situation. Obviously, any trees that are felled require removing from the tree survey.

Woodland areas. The existing plantations are largely neglected from a woodland management point of view. The dense plantations requiring thinning as some trees are dying because of competition with no room for crown photosynthesis and development. As the branches rot, dead wood will fall to the ground which creates a conflictual situation with safety and public access.

Rewilding (*or land abandonment*) has been recognised in several scientific publications as being beneficial to both carbon sequestration and biodiversity, the downside is that this may take several decades to achieve. An intermediate solution may be preferable for an area like Geneva Woods.

New tree planting. It is essential to record mortality we have included the estimate provided by Darlington B.C. of 75% for whips and 80% for standards. A location map would help also.

Grasslands. Along with continued tree planting this is where the largest potential for increasing carbon sequestration lies, it is now possible to increase carbon sequestration by using the cultivars that have proven successful in trials. This can be done through overseeding existing areas where existing grasses are becoming sparse through lack of regeneration.

Another way of increasing carbon sequestration in grassland is by increasing the amount of nitrogen available to the plants. Artificial fertilisers are responsible for high GHG emissions in their manufacture *(scope 3)* but adding white clover to low cut grasslands, and red clover to areas that have a raised cutting height, have a similar action by fixing natural atmospheric nitrogen. Natural England[5] reported,

"Restoration of plant diversity on species rich neutral grasslands has been demonstrated to have carbon benefits. De Deyn and others (2011) observed that long-term biodiversity restoration approaches of an upland meadow increased soil carbon and nitrogen storage, with the greatest rates in treatments that were combined with promotion of the nitrogen fixing legume red clover Trifolium pratense. ***Sequestering*** *317 g C m-2 y-1 (****11.62 t CO_2e ha-1****) in the most successful management treatment,* ***this is over 5 times greater than the average C sink estimated for European grasslands*** *(Janssens and others 2005, as reported by De Deyn and others 2011)."*

An added benefit to clover is that the flowers are beneficial to pollinating insects notably bees. The Micro-clover cultivar "Pipolina" can be used to improve grassland nutrition, up to low density wear on sports pitches.

Our recommendation therefore is to establish a few trial plots across the borough in different grassland/scrubland situations with improved cultivars and/or clovers to observe

carbon sequestration in these areas. Note it is important to start with a soil analysis in each area which will serve as a baseline for carbon sequestration.

CONCLUSIONS

Darlington Borough Council's emissions are reported in their 2023/2024 reporting to be 6,190 t/CO_2e

Taking into consideration we have estimated 1,192 t/CO_2 to be sequestration annually through vegetation.

The breakdown is 12% through individual (street) trees, 52% through existing woodland, 1% through newly planted trees and 36% through grassland.

It is highly probable that the 1,192 t/CO_2 of carbon sequestration is an underestimate of what is occurring for the following reasons:

1. The tree survey is not complete and represents a probable underestimate, based on our findings at South Park and North Cemetery.
2. Woodland surface areas, as supplied, have been reviewed and revised downwards by 70% of the area announced by Darlington's Estate Service and 57% of the 160Ha looked at in this study, the surface areas need to be further refined by the relevant service.
3. Grassland surface areas need to be further refined, and classified into different types reflecting the soil sampled areas.
4. Grassland sequestration has been estimated provisionally at 0.9t/ CO_2/Ha. based on a mid-range figure of 0.6–1.2 tonnes of CO_2 as reported by the Centre for Ecology & Hydrology (CEH).
5. An accurate record of natural mortality and replacements is required for new tree planting.
6. Soil samples to date record a carbon sink and not carbon sequestration, these are inherently related to the vegetation types growing where they were taken and require monitoring in future years.

Once the above factors have been corrected it will be possible to revise carbon sequestration figures.

The potential for increasing carbon sequestration may be achieved by:

1. Overseeding with grass varieties proven to have better sequestration potential,
2. Trial the use of clover in grass swards,
3. Continue the policy of further tree planting.

Scope 3 carbon emissions have not yet been calculated by Darlington B.C. to do so for green space is possible if the relevant data can be collated (fertilisers, herbicides, vehicle park, maintenance sheds & office surface areas etc.) Our **Carbon Audit**™ methodology enables us to do this relatively easily compared to the task of calculating this for the rest of the Borough Council.

REFERENCES

[1] https://rfs.org.uk/learning/tremendous-trees/tree-age/

[2] *Natural England (2012), "Carbon Storage by Habitat"*

[3] *UK Committee on Climate Change (2018), "Land Use: Reducing Emissions and Preparing for Climate Change"*

[4] *IPCC Special Report on Climate Change and Land (2019)*

[5] Natural England (2012) Carbon storage and sequestration by habitat.

Centre for Ecology & Hydrology (CEH).
https://catalogue.ceh.ac.uk/eidc/documents?term=carbon+storage

TopGreen, France Data Base for Carbon Sequestration.

ANNEXE 1

SOIL ANALYSIS NPK

Lancrop Laboratories

Distributor

LANCROP

Customer

LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Soil Results Summary

Date Received 14/09/2024
Date Reported 27/09/2024

Order Number	Field Reference	mg/litre			Index			pH
		P	K	Mg	P	K	Mg	
G124121/01	SUGAR HILL PARK	20	92	247	2.4	1.5	4.9	5.8
G124121/02	STAINDROP ROAD	8	43	96	0.8	0.7	2.9	5.8
G124121/03	STREAM BANK	10	133	340	1.0	2.1	5.9	6.2
G124121/04	WOODLAND SOIL	22	291	279	2.6	3.3	5.3	6.9
G124121/05	MEADOW WEST PARK	7	132	474	0.7	2.1	6.5	7.4
G124121/06	YOUNG WOODLAND WEST	11	121	365	1.2	2.0	6.1	6.2
G124121/07	SOUTH PARK	7	76	263	0.7	1.3	5.1	5.3
G124121/08	GENEVA WOOD	12	226	237	1.3	2.9	4.8	7.1
G124121/09	A167 VERGE	7	260	268	0.7	3.1	5.2	7.4
G124121/10	TORNADO RD	14	296	492	1.7	3.3	6.6	7.4

Index Values are taken from the AHDB Nutrient Management Guide (RB209) published May 2017

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PAAG
Professional Agricultural Analysis Group

Lancrop Laboratories

Distributor

LANCROP

Customer

LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Soil Results Summary

Date Received 14/09/2024
Date Reported 27/09/2024

Order Number	Field Reference	mg/litre			Index			pH
		P	K	Mg	P	K	Mg	
G124122/01	HURWORTH GARDENS	15	185	323	1.8	2.5	5.7	7.7
G124122/02	RITEES BANK	10	63	231	1.0	1.0	4.7	7.3
G124122/03	EUROFLOR HOPETOWN	9	129	220	0.9	2.1	4.6	7.9
G124122/04	EMBANKMENT R SKERNE	60	505	356	4.6	4.5	6.0	8.0
G124122/05	HOPETOWN MUSEUM	5	254	441	0.5	3.1	6.4	6.9
G124122/06	MAIDENDALE	1	91	533	0.1	1.5	6.7	8.0
G124122/07	FOOTBALL PITCH	6	174	444	0.6	2.4	6.4	5.8
G124122/08	OPEN CUT GRASSLAND	7	195	425	0.7	2.6	6.3	6.2
G124122/09	CULTIVATED LAND	23	197	525	2.7	2.6	6.7	7.2
G124122/10	SKERNINGHAM - WOODLAND	14	164	264	1.7	2.4	5.1	6.5

Index Values are taken from the AHDB Nutrient Management Guide (RB209) published May 2017

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PAAG
Professional Agricultural Analysis Group

Lancrop Laboratories

Distributor

LANCROP

Customer

LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Soil Results Summary

Date Received 14/09/2024
Date Reported 27/09/2024

Order Number	Field Reference	mg/litre			Index			pH
		P	K	Mg	P	K	Mg	
G124123/01	WHINBUSH WAY	12	82	383	1.3	1.4	6.1	6.6

Index Values are taken from the AHDB Nutrient Management Guide (RB209) published May 2017

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Annexe 2

SOIL ANALYSIS RESULTS

Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref SUGAR HILL PARK

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/01 / DARLINGTON BC

Crop GRASS (AMENITY)

Distributor **Customer**

Analysis	Result	Guideline	Interpretation	Comments
pH	5.8	6.5	Low	Low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub-optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	20	26	Slightly Low	**(Index 2.4)** 50 kg/ha P2O5 (40 units/acre).
Potassium (ppm)	92	241	Low	**(Index 1.5)** 80 kg/ha K2O (64 units/acre).
Magnesium (ppm)	247	50	Normal	**(Index 4.9)** Adequate level.
Organic Matter (LOI) (%)	12.0			
Organic Carbon (LOI) (%)	7.0			
Lime Req. (t/ha)	7.0			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

* Any analytical parameters marked with an asterisk indicate the test was conducted under our UKAS accreditation. Full scope is available upon request.

pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.

Lancrop Laborartories is a UKAS accredited testing laboratory - No.4164. Full scope of tests accredited to ISO/IEC 17025:2017 is available upon request.

Lime requirements assume a medium textured soil.

Additional technical bulletins are available at www.lancrop.com

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Chris Lindley

Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	STAINDROP ROAD	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124121/02 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	5.8	6.5	Low	Low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub-optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	8	26	Very Low	**(Index 0.8)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	43	241	Very Low	**(Index 0.7)** 120 kg/ha K2O (96 units/acre).
Magnesium (ppm)	96	50	Normal	**(Index 2.9)** Adequate level.
Organic Matter (LOI) (%)	7.5			
Organic Carbon (LOI) (%)	4.4			
Lime Req. (t/ha)	7.0			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	STREAM BANK	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124121/03 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	6.2	6.5	Slightly Low	Slightly low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	10	26	Low	**(Index 1.0)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	133	241	Slightly Low	**(Index 2.1)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	340	50	Normal	**(Index 5.9)** Adequate level.
Organic Matter (LOI) (%)	9.8			
Organic Carbon (LOI) (%)	5.7			
Lime Req. (t/ha)	4.0			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref WOODLAND SOIL

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/04 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.9	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	22	26	Slightly Low	**(Index 2.6)** 50 kg/ha P2O5 (40 units/acre).
Potassium (ppm)	291	241	Normal	**(Index 3.3)** Adequate level.
Magnesium (ppm)	279	50	Normal	**(Index 5.3)** Adequate level.
Organic Matter (LOI) (%)	9.7			
Organic Carbon (LOI) (%)	5.7			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref MEADOW WEST PARK

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/05 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	7.4	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	7	26	Very Low	**(Index 0.7)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	132	241	Slightly Low	**(Index 2.1)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	474	50	High	**(Index 6.5)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	6.7			
Organic Carbon (LOI) (%)	3.9			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.

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Lime requirements assume a medium textured soil.

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref YOUNG WOODLAND WEST PARK

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/06 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.2	6.5	Slightly Low	Slightly low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	11	26	Low	**(Index 1.2)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	121	241	Slightly Low	**(Index 2.0)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	365	50	Normal	**(Index 6.1)** Adequate level.
Organic Matter (LOI) (%)	10.3			
Organic Carbon (LOI) (%)	6.0			
Lime Req. (t/ha)	4.0			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Lime requirements assume a medium textured soil.

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref SOUTH PARK

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/07 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	5.3	6.5	Low	Low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub-optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	7	26	Very Low	**(Index 0.7)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	76	241	Low	**(Index 1.3)** 80 kg/ha K2O (64 units/acre).
Magnesium (ppm)	263	50	Normal	**(Index 5.1)** Adequate level.
Organic Matter (LOI) (%)	10.8			
Organic Carbon (LOI) (%)	6.3			
Lime Req. (t/ha)	10.0			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	GENEVA WOOD	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124121/08 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	7.1	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	12	26	Low	**(Index 1.3)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	226	241	Slightly Low	**(Index 2.9)** 40 kg/ha K2O (32 units/acre).
Magnesium (ppm)	237	50	Normal	**(Index 4.8)** Adequate level.
Organic Matter (LOI) (%)	14.7			
Organic Carbon (LOI) (%)	8.6			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.
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Lime requirements assume a medium textured soil.

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Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	A167 VERGE	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124121/09 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	7.4	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	7	26	Very Low	**(Index 0.7)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	260	241	Normal	**(Index 3.1)** Adequate level.
Magnesium (ppm)	268	50	Normal	**(Index 5.2)** Adequate level.
Organic Matter (LOI) (%)	12.1			
Organic Carbon (LOI) (%)	7.1			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.

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Lime requirements assume a medium textured soil.

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref TORNADO RD

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124121/10 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	7.4	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	14	26	Low	**(Index 1.7)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	296	241	Normal	**(Index 3.3)** Adequate level.
Magnesium (ppm)	492	50	High	**(Index 6.6)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	10.0			
Organic Carbon (LOI) (%)	5.8			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION
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pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.
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Lime requirements assume a medium textured soil.

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Chris Lindley

Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP		
Sample Ref	HURWORTH GARDENS	**Date Received**	14/09/2024	(Date	Issued: 27/09/2024)
Sample No	G124122/01 / DARLINGTON BC				
Crop	GRASS (AMENITY)				

Analysis	Result	Guideline	Interpretation	Comments
pH	7.7	6.5	High	High. An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity.
Phosphorus (ppm)	15	26	Low	**(Index 1.8)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	185	241	Slightly Low	**(Index 2.5)** 40 kg/ha K2O (32 units/acre).
Magnesium (ppm)	323	50	Normal	**(Index 5.7)** Adequate level.
Organic Matter (LOI) (%)	9.5			
Organic Carbon (LOI) (%)	5.5			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Lime requirements assume a medium textured soil.

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Chris Lindley

Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	RITEES BANK	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124122/02 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	7.3	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	10	26	Low	**(Index 1.0)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	63	241	Low	**(Index 1.0)** 80 kg/ha K2O (64 units/acre).
Magnesium (ppm)	231	50	Normal	**(Index 4.7)** Adequate level.
Organic Matter (LOI) (%)	6.1			
Organic Carbon (LOI) (%)	3.6			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref EUROFLOR HOPETOWN

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/03 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	7.9	6.5	High	High. An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity.
Phosphorus (ppm)	9	26	Very Low	**(Index 0.9)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	129	241	Slightly Low	**(Index 2.1)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	220	50	Normal	**(Index 4.6)** Adequate level.
Organic Matter (LOI) (%)	6.1			
Organic Carbon (LOI) (%)	3.6			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Customer	LANDSCAPE & ENVI SERVICES 8 BIRKBECK GARDENS CA17 4TH	**Distributor**	LANCROP
Sample Ref	EMBANKMENT R SKERNE	**Date Received**	14/09/2024 (Date Issued: 27/09/2024)
Sample No	G124122/04 / DARLINGTON BC		
Crop	GRASS (AMENITY)		

Analysis	Result	Guideline	Interpretation	Comments
pH	8.0	6.5	High	High. An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity.
Phosphorus (ppm)	60	26	Very High	**(Index 4.6)** Possible interference on availability of Fe, Cu, Zn.
Potassium (ppm)	505	241	Very High	**(Index 4.5)** Possible interference on availability of calcium and magnesium.
Magnesium (ppm)	356	50	Normal	**(Index 6.0)** Adequate level.
Organic Matter (LOI) (%)	7.9			
Organic Carbon (LOI) (%)	4.6			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Lime requirements assume a medium textured soil.

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Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref HOPETOWN MUSEUM

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/05 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.9	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	5	26	Very Low	**(Index 0.5)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	254	241	Normal	**(Index 3.1)** Adequate level.
Magnesium (ppm)	441	50	High	**(Index 6.4)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	6.1			
Organic Carbon (LOI) (%)	3.5			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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pH and macro-nutrient guidelines, index values and any fertiliser & lime recommendations are taken from AHDB publication 'Nutrient Management Guide (RB209)'. The laboratory exercises a Simple Acceptance decision rule as per ILAC G8:09.

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Lime requirements assume a medium textured soil.

Additional technical bulletins are available at www.lancrop.com

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Chris Lindley

Customer LANDSCAPE & ENVI SERVICES
8 BIRKBECK GARDENS
CA17 4TH

Distributor LANCROP

Sample Ref MAIDENDALE

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/06 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	8.0	6.5	High	High. An alkaline environment will reduce the availability of certain nutrients - particularly P, K, B, Co, Cu, Fe, Mn and Zn. An elevated pH will also impact on beneficial soil fungal populations and activity.
Phosphorus (ppm)	< 2	26	Very Low	**(Index 0.1)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	91	241	Low	**(Index 1.5)** 80 kg/ha K2O (64 units/acre).
Magnesium (ppm)	533	50	High	**(Index 6.7)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	2.9			
Organic Carbon (LOI) (%)	1.7			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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CA17 4TH

Distributor LANCROP

Sample Ref FOOTBALL PITCH

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/07 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	5.8	6.5	Low	Low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub-optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	6	26	Very Low	**(Index 0.6)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	174	241	Slightly Low	**(Index 2.4)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	444	50	High	**(Index 6.4)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	16.4			
Organic Carbon (LOI) (%)	9.6			
Lime Req. (t/ha)	7.0			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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CA17 4TH

Distributor LANCROP

Sample Ref OPEN CUT GRASSLAND

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/08 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.2	6.5	Slightly Low	Slightly low. An acidic environment will reduce soil nutrient availability and the efficiency of any applied fertilisers or organic materials. A sub optimum pH will also impact on soil microbial populations and rates of activity. Refer to lime requirement.
Phosphorus (ppm)	7	26	Very Low	**(Index 0.7)** 120 kg/ha P2O5 (96 units/acre).
Potassium (ppm)	195	241	Slightly Low	**(Index 2.6)** 40 kg/ha K2O (32 units/acre).
Magnesium (ppm)	425	50	High	**(Index 6.3)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	14.5			
Organic Carbon (LOI) (%)	8.4			
Lime Req. (t/ha)	4.0			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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CA17 4TH

Distributor LANCROP

Sample Ref CULTIVATED LAND

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/09 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	7.2	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	23	26	Slightly Low	**(Index 2.7)** 50 kg/ha P2O5 (40 units/acre).
Potassium (ppm)	197	241	Slightly Low	**(Index 2.6)** 40 kg/ha K2O (32 units/acre).
Magnesium (ppm)	525	50	High	**(Index 6.7)** Possible interference with availability of Potassium.
Organic Matter (LOI) (%)	8.1			
Organic Carbon (LOI) (%)	4.7			

Additional Comments

INTERPRETATIONS, DECISION RULES & ACCREDITATION
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Lime requirements assume a medium textured soil.

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CA17 4TH

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Sample Ref SKERNINGHAM - WOODLAND

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124122/10 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.5	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	14	26	Low	**(Index 1.7)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	164	241	Slightly Low	**(Index 2.4)** 60 kg/ha K2O (48 units/acre).
Magnesium (ppm)	264	50	Normal	**(Index 5.1)** Adequate level.
Organic Matter (LOI) (%)	8.1			
Organic Carbon (LOI) (%)	4.7			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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Distributor LANCROP

Sample Ref WHINBUSH WAY

Date Received 14/09/2024 (Date Issued: 27/09/2024)

Sample No G124123/01 / DARLINGTON BC

Crop GRASS (AMENITY)

Analysis	Result	Guideline	Interpretation	Comments
pH	6.6	6.5	Normal	Adequate level. Maintain pH to ensure optimum nutrient availability and ideal conditions for an active soil biology.
Phosphorus (ppm)	12	26	Low	**(Index 1.3)** 80 kg/ha P2O5 (64 units/acre).
Potassium (ppm)	82	241	Low	**(Index 1.4)** 80 kg/ha K2O (64 units/acre).
Magnesium (ppm)	383	50	Normal	**(Index 6.1)** Adequate level.
Organic Matter (LOI) (%)	10.0			
Organic Carbon (LOI) (%)	5.8			

Additional Comments

Individual elements can be treated with foliar sprays of the appropriate nutrient. Where multi-element deficiencies exist consider applications of a general foliar feed. Equivalent rates of other fertilisers can be used if those quoted above are unavailable.

INTERPRETATIONS, DECISION RULES & ACCREDITATION

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