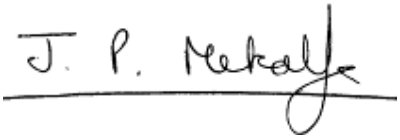
Document Ref:

Agricultural benefit statement for the sediment from the proposed dredging of Monmouth and Brecon Canal

Fields: Field Z

1.1 Person with appropriate technical expertise and permit details

- Phil Metcalfe, ADAS Agricultural Engineer
- BSc (Hons) Mechanical Engineering, MSc Agricultural Engineering, HND Supplement Aeronautical Engineering, FACTS qualified, Member Institute of Agricultural Engineers, Chartered Engineer, Chartered Environmentalist
- Has started his 40th year of experience working for ADAS as an Agricultural Engineer providing machinery, cultivation, crop nutrition, fertiliser and waste management (farm and non-farm) advice and consultancy. Experience includes numerous waste to land applications, nutrient, manure and soil management plans and advice for compliance with Nitrate Vulnerable Zone rules. He has research and development experience with Mechanisation, fertilisers and waste processes.
- FACTS Registration No. R/FE/3731
- **Signed by:** **Date: 16th October 2015**



Fields: Field Z

1.2 Where the waste is to be spread

Farm address:

Great House Farm,
Triley,
Abergavenny
Monmouthshire
NP7 8DE
Name and contact details of land owner:
Dean Watkins 07966914527

Spreading area grid reference: SO 30849 17311 Eastings 330849 Northings 217311

Area of the receiving land:

Fields Z of 5.86 ha with 5.56ha available area for spreading

Quantity to be stored at any one time:

The sediment will not be stored after dredging. Directly after dredging it is spread with a low ground pressure bulldozer.

Total quantity to be spread: estimate 7,000m^3 (9,450 tonnes assuming a dredgings density of 1.35t/m^3)

Fields: Field Z

1.2 Where the waste is to be spread

Location maps showing the field receiving sites and spreading control measures :

- Receiving Sites Location Map -
- Receiving Site Map –

Fields: Field Z

1.3 What is the waste to be spread

Waste producer: Land and Water Services

EWC code: 17 05 06 dredging's spoil

Waste description: Sediment dredged from a length of the Monmouth and Brecon Canal with an average dry solids content of 29%.

Fields: Field Z

1.4 Operational details

Cropping details:

- The field is currently grass.
- The field will be reseeded to grass following dredged sediment application.
- The dredged sediment will be applied on the current grass sward.
- Directly after dredging the sediment will be spread with a low ground pressure bulldozer to a depth of about 13cm.
- After the dredged sediments are spread they are allowed to dry out before being thoroughly worked into the existing site topsoil to a depth of 15cm.
- No land drains were noted in the field survey.

Fields: Field Z

1.5 Compliance

The field where it is intended to apply the dredged sediment is **not** within a designated NVZ

Recycling of dredged sediments from inland waterways to agricultural land, can provide a number of agricultural benefits including their contribution of available nitrogen needs to be taken into account in fertiliser planning.

The rate of dredged sediment applied will not supply more available nitrogen than crop nitrogen requirement. The farmer cropping the receiving field will be informed of the amount of available nitrogen applied by the dredged sediment, so that this can be considered in his nitrogen planning for the fields.

Fields: Field Z

1.6 Benefits and nutrients supplied to the soil or crop from this application

Table 1

Sediment Analysis Summary (average of 18 samples GOL1-18)

Monmouth and Brecon Canal – sediment to be applied to field

General properties & plant nutrients	Units	Average Result (Range)	Comment
pH	-	6.8 (6.3-8.6)	The pH would present no problems for recycling the sediment to agricultural land.
Moisture Content (30ºC)	%	71 (51-77)	
Dry solids (100 – Moisture Content 30ºC)	%	29 (23-49)	The average dry solids content is just below the typical range of 30-50% for dredged sediment.
Total Nitrogen	%	0.57 (0.48-0.67)	See Table 5 for information on available nitrogen supplied by the dredgings.
Ammonium-Nitrogen	mg/kg	45 (17-88)	Only a small proportion (about 0.9%) of the total N is present as readily available N.
Nitrate-Nitrogen	mg/kg	7 (5.2-13)	
Available Phosphorus	mg/l	21 (9.2-46)	The average sediment available phosphorus content is close to the levels in the receiving field soils (see Table 2).
Available Potassium	mg/l	15.3 (9.7-22)	The sediment has a lower level of available potassium than in the receiving field soils (see Table 2).
Available Magnesium	mg/l	13.4 (8.7-19)	The sediment contains a lower level of available magnesium as the receiving fields soil (see Table 2).
Organic Matter	%	16 (5.8-21)	The average organic matter content of the sediment is higher than the organic matter content of the soil in the receiving fields (see Table 2).

Fields: Field Z

1.6 Benefits and nutrients supplied to the soil or crop from this application

Proposed receiving fields

Table 2 pH, major plant nutrients and organic matter analysis results

Field	pH	Lime t/ha Grass Arable	Phosphorus[1] mg/l (Index)	Potassium[1] mg/l (Index)	Magnesium[1] mg/l (Index)	Organic Matter[2] %
Field Z	6.8	0 0	18 (2)	40 (0)	68 (2)	11

[1] Assuming a soil density of approximately 0.998/cm^3 for Field Z and (the results were reported as mg/kg).
[2]Based on Loss on Ignition (LOI)

Table 3 Estimated crop nutrient requirement as fertiliser (from Defra's RB209 7th Edition publication) without dredged sediment application

Field	2015 crop	Crop to be established after sediment application.	Nitrogen[1] kg/ha	Phosphate[2] kg/ha P_2O_5	Potash[3] kg/ha K_2O	Magnesium kg/ha MgO
Field Z	Grass	Grass – utilisation 1 cut silage followed by grazing	190	50	200	0

[1] Soil Nitrogen Supply (SNS) Moderate. The top and subsoil texture is sandy clay loam topsoil in both fields. The soil falls into RB209 'medium' soil category and, with the farm being in a high rainfall area, are in a Good Grass Growth Class. The nitrogen would be split 120kg/ha for silage followed by 70kg/ha for aftermath grazing.
[2]Reseeding recommendation but will also meet production requirement.
[3]Assuming a silage yield of 23t/ha @ 25% dry matter.

Table 4 Proposed Sediment application rates

Field	Total weight of fresh sediment[1] (t)	Dry solids content of sediment (%)	Area to be used for spreading (ha)	Dry solids loading (t/ha)
Field Z	9,450	29	5.56	493

[1] From 7,000 m^3 of fresh sediment assuming a density of 1.35 t/m^3.

Nitrogen provided by sediment application

The Defra Guidance document "NVZ action Programme and Application of Dredgings to Agricultural Land" provides an indication of the amount of nitrogen that will be available from dredgings for the following crop. The calculation assumes that 3% of the organic nitrogen and all of the ammonium and nitrate nitrogen will be available to the crop. Using these criteria, an application of 493t/ha of sediment dry solids from the Monmouth and Brecon Canal will supply *c*109kg/ha of available nitrogen for the following crop.

Table 5 Available nitrogen provided by sediment application

Field	Sediment dry solids application rate	Available nitrogen from sediment application	
	t/ha	kg/t	kg/ha
Field Z	493	0.221	109

Although at face value using the average available phosphorus (21mg/l), potassium (15.3mg/l) and magnesium (13.4mg/l) levels for sediment dredged from the Monmouth and Brecon Canal 493t/ha sediment dry solids would apply about 23 kg available P_2O_5/ha, 9 kg available K_2O/ha & 11 kg available MgO/ha applying sediment to a field is more akin to applying 'soil' than an 'organic manure', for example, so crop requirement for phosphate, potash and magnesium fertiliser following application should be based on the

Fields: Field Z

1.6 Benefits and nutrients supplied to the soil or crop from this application

estimated soil phosphorus, potassium and magnesium indices following incorporation of the sediment (or better a soil analysis of the field following incorporation). Table 6 shows the estimated phosphorus, potassium and magnesium indices and Table 7 the requirement for nitrogen, phosphate and potash fertiliser after sediment application.

Table 6 Estimated available phosphorus, potassium and magnesium levels after sediment application and incorporation

Field	Phosphorus mg/l (index)	Potassium mg/l (index)	Magnesium mg/l (index)
Field Z	19 (2)	37 (0)	43 (2)

Table 7 Estimated crop nutrient requirement as fertiliser based on estimated indices after sediment application and incorporation (Table 6)

Field	2015 crop	Crop to be established after sediment application.	Nitrogen kg/ha	Phosphate kg/ha P_2O_5	Potash kg/ha K_2O	Magnesium kg/ha MgO
Field Z	Grass	Grass – utilisation 1 cut silage followed by grazing	**81**	50	200	0

In summary application of the dredged canal sediment will confer agricultural benefit by reducing manufactured nitrogen fertiliser requirement for the grass following application. The dredged sediment application would be predicted to have negligible effect on the soil available phosphorus (P) levels and not change the P Indices (remain 2). There is no change in the applied phosphate requirement. The dredged sediment application would be predicted to decrease the soil potassium (K) levels but not change the K Indices (remains 0 in Field Z) There is no change in applied potash requirement on the fields following sediment application. Magnesium requirement is nil with or without sediment application. Although sediment application would be predicted to decrease soil magnesium levels they are not decreased to a level at which there would be a magnesium application recommendation. The dredged sediment application would also increase available water capacity by increasing the depth of topsoil.

Fields: Field Z

1.7 Potential negative impacts to the soil or crop from this application

Table 8 Potentially Toxic Element (PTE) and Organic Substance Analysis Summary for Monmouth and Brecon Canal sediment (average of 18 samples GOL1-18)

Potentially Toxic Elements (PTEs) & Organic Substances								
PTE	**Copper**	**Nickel**	**Zinc**	**Cadmium**	**Chromium**	**Lead**	**Mercury**	**Arsenic**
mg/kg Average Range	22 14-29	22 16-30	109 68-180	1.0 0.8-1.1	29 18-38	31 24-42	0.07 0.05-0.11	7.0 4.6-8.1
PTE	Total sodium	**Selenium**	Boron – water soluble	**Chromium (hexavalent)**	**Fluoride**	Barium	**Sulphide**	
mg/kg Average Range	397 190-1300	<0.6 <0.5-0.9	2.0 1.5-2.4	<1.0 All <1.0	<1.4 <1.0-3.5	142 82-170	166 120-210	
PTE	**Sulphur as S**	**Sulphate as SO_4**	**Conductivity**					
% **(µS/cm for conductivity** **Average** **Range**	0.16 0.09-0.22	0.12 0.08-0.16	253 91-510					
Organic substances	**Cyanide total**	**Cyanide free**	**PAH (total 16 EPA)**	**EPH (C5-C10)**	**EPH (C10-C25)**	**EPH (C25 - C40)**	EPH (C10-C40)	**Phenol-monohydric**
mg/kg Average Range	0.3 0.2-0.5	<0.11 <0.1-0.3	<1.9 <1.6-<6.8	<0.13 <0.1-0.6	<30 <10-65	<44 <10-170	<72 <10-200	1.4 1.0-1.8
Comments	The PTE and organic substance levels do not pose any concern for application to agricultural land. The mixing ratio will be about 1 part sediment dry solids to 2.9 parts soil dry solids.							

Table 9 Field Potentially Toxic Elements levels

Field	Conductivity µS/cm	Total Cu mg/kg	Total Ni mg/kg	Total Zn mg/kg	Total Cd mg/kg	Total Pb mg/kg	Total Hg mg/kg	Total As mg/kg	Total Cr mg/kg
Field Z	250	19	12	62	0.5	33	0.12	5.6	2
Average sediment content	253	22	22	109	1.0	31	0.07	7.0	29
Estimated levels following dredged sediment application									
Field Z	251	20	17	83	0.7	32	0.1	6.3	20
Maximum permissible level following sewage sludge application soil									
pH 5.0-5.4		80	50	200	3	300	1	50	400
pH 5.5-5.9		100	60	200	3	300	1	50	400
pH 6.0-7.0		135	75	200	3	300	1	50	400
pH greater than 7 and calcium carbonate content greater than 5%*.		200	110	300	3	300	1	50	400

- As the sediment mainly contains higher levels of PTEs than the receiving soils the predicted PTE content of the soils is mainly slightly higher following sediment application. All levels remain well below the maximum permissible levels following sewage sludge application. It is noted that PTE levels in all individual sediment samples are below maximum permissible levels following sewage sludge application.

Site topography

- Field Z. The field was located approx. 2 miles north of Abergavenny and was cropped with an established ryegrass sward. The land generally sloped gently from north 9west to south east. There was a hollow area running down the centre of the field. Land to the south was wet, particularly towards the west, with standing water on the day of survey. The presence of rush suggests that this area lies wet much of the year. There were several mature oaks within the field and there was a large concrete drain cover near the centre, over a concrete drain with water flowing through it. The eastern and southern boundaries comprised of hedgerows alongside a stream, which flowed south and east. The northern boundary was a tall hedgerow and the eastern boundary a wire fence alongside a railway line.

- A pit was dug to approx. 50cm depth in the centre of the earmarked area. The topsoil was a dark, crumbly, sandy loam, down to a depth of approx. 17cm. From 17 to 50 cm, the soil was a lighter coloured sandy loam, which became increasingly sandy with depth. A few medium sized stoned were found below 20cm.

Field Z Northern boundary looking west

Field Z. Concrete Drain Cover

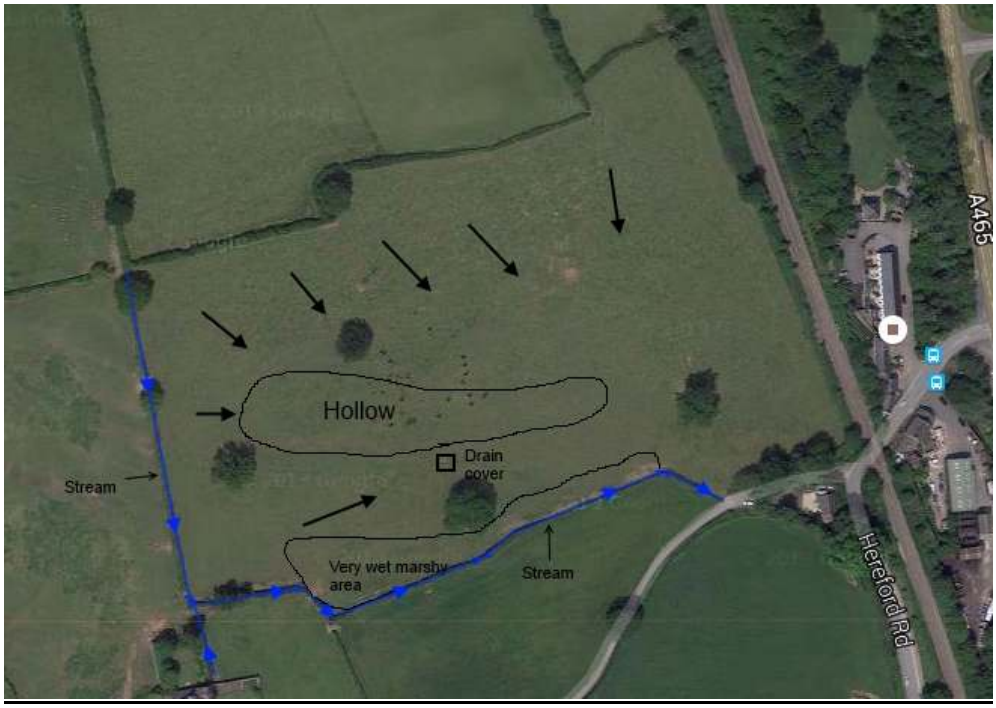
Field Z. Pit dug in the centre of the field

Field Z. Wet area along southern boundary of field

Field Z. Southern boundary

Field Z. Eastern boundary

Field Z. Overall Plan of Field



- With regard to impact of the operations on the receiving soil, for example wheel ruts, compaction, structural damage, soil erosion and run-off, impacts on the soil will be minimized by carrying out the spreading with a low ground pressure bulldozer.
- Other potential negative impacts from the operation, for example: traffic management, anti-vandalism measures. Land and Water Services will manage the traffic when plant/machinery is delivered to site. No vandalism is expected.

Fields: Field Z

1.8 Sensitive human and environmental receptors

Sensitive human receptors

- The closest properties to Field Z are a residential property <20m to the south east Other residences and commercial buildings are locate d beyond the railway line 50mto the east of the field,
- Great House Farm is located 100m south of the field.
- No public footpaths cross the field.
- Odour control - Low odour potential from dredged materials.
- Noise control - Equipment is similar to normal agricultural machinery. The fields are within an agricultural environment. Sensitive spreading periods will be avoided e.g. bank holidays and weekends. Deliveries will be during daylight hours.
- Land and Water Services will ensure that there are buffer areas in place when spreading near the footpaths and water courses.
- There are no known boreholes or springs in these fields.
- Land and Water Services will check the location of any water main services in the vicinity of the works before commencement.

Sensitive environmental receptors

- NRW/Environment Agency /'Groundwater Source Protection Zones'. The fields proposed to be used are not within any Groundwater Source Protection Zones.
- NRW/Environment Agency 'Aquifer Maps - Superficial Deposits Designation'. The field proposed is not within this designation.
- NRW/Environment Agency 'Aquifer Maps - Bedrock Designation'. The fields proposed are not with this designation.
- NRW/Environment Agency 'Groundwater Vulnerability Zones'. The fields proposed to be used are not designated
- NRW/Environment Agency Drinking Water Safe Guard Zone – the designation of the fields in a surface water safe guard zone for Pesticides is not known. Good agricultural practice is observed and these will not be to be used in association with deployments.
- Flooding. From the Environment Agency website, the following risks have been considered:

  Flooding from surface waters – Very Low risk.

  Flooding from rivers and sea – none.

  Flooding from reservoirs – none.

  Flood warning areas – none.
- It is not intended to spread near the boundary hedges. A 2.0m, minimum buffer zone will be left free from dredging's adjacent to bushes and hedgerows. No dredgings will be spread beneath tree canopies.
- The nearest SSSI is 800m to the south west.
- The contractor proposes to leave buffer strips (10m minimum) free from dredging's adjacent to any watercourses, in this instance the stream that borders field Z

Fields: Field Z

1.8 Sensitive human and environmental receptors

A search on MAGIC Map - http://www.magic.gov.uk/MagicMap.aspx - found that no statutory and non-statutory designations were **affected.**

A search on MAGIC Map - http://www.magic.gov.uk/MagicMap.aspx - found the following statutory and non-statutory designations to be **unaffected:**

Statutory designations:

- National Nature Reserve
- Ramsar Site
- Site of Scientific Interest
- Special Area of Conservation
- Special Protection Areas
- Biosphere Reserves

Non statutory:

- RSPB Reserves

Fields: Field Z

1.9 Practices to reduce the impacts of the operation on identified sensitive receptors

In this section you should set out the measures to be taken to reduce the impact of the operation on the receptors identified for example:

- There is a low odour potential from dredged materials. Sensitive spreading periods e.g. bank holidays and weekends will be avoided.
- Spreading will only be undertaken when weather conditions are suitable.
- There is a low odour potential from dredged materials and therefore odour should not be an issue.
- Buffer strips keeping any operations more than 10 metres from receptors will be put in place
- machinery operations will take account of soil conditions, slope etc
- machinery will be checked daily
- machinery turns will not be executed in the buffer strips
- Waste deliveries to fields will be supervised to minimize impacts
- Spreading restrictions within the 'Code of Good Agricultural Practice' will be adhered to.
- All machinery is regularly serviced and spreading equipment is calibrated.

Fields: Field Z

2.0 Contingency planning

Tell us about the measures you have in place in the event of

- Machinery breakdown; All Land and Water Services (LAWS) Excavators run on Bio Hydraulic Oil. A team of fitting staff are on standby if required.
- Staffing problems due to sickness, holidays etc.; LAWS Carry Sufficient Staff to cover eventualities.

Waste analysis

- Certificate Number – 15-33599 (Sediment Analysis)

DETS Certificate 15-33599 _Silt analysis

Summary of Chemical Analysis

Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

			Lab No	803864	803865	803866	803867	803868	803869
			Sample ID	GOL1C	GOL2C	GOL3C	GOL4C	GOL5C	GOL6C
			X	330212	330206	330171	330301	330273	330587
			Y	202132	202531	202889	203208	203496	203995
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content 30ºC	DETSC 1004*	0.1	%	68	68	69	76	73	70
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	6.2	6.4	4.6	6.4	6.6	6.2
Barium	DETSC 2301#	1.5	mg/kg	170	150	130	160	140	150
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.0	1.7	2.0	2.4	2.0	1.9
Cadmium	DETSC 2301#	0.1	mg/kg	1.0	0.8	0.8	1.0	0.9	1.0
Chromium	DETSC 2301#	0.15	mg/kg	38	30	26	38	34	35
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	21	21	16	23	20	20
Lead	DETSC 2301#	0.3	mg/kg	31	25	25	31	33	35
Available Magnesium	DETSC 2301*	0.1	mg/l	14	19	15	11	8.9	14
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.06	0.05	0.07	0.05	0.07
Molybdenum	DETSC 2301#	0.4	mg/kg	0.7	0.6	0.5	0.7	0.6	0.6
Nickel	DETSC 2301#	1	mg/kg	30	22	22	30	27	28
Available Phosphorus	DETSC 2301*	0.1	mg/l	23	17	20	16	13	30
Available Potassium	DETSC 2301*	0.1	mg/l	15	22	18	13	10	16
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.7	< 0.5	< 0.5
Sodium	DETSC 2301*	0.1	mg/kg	330	1000	300	370	320	260
Zinc	DETSC 2301#	1	mg/kg	110	90	80	110	94	100
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	190	420	170	380	220	160
pH	DETSC 2008#			6.7	7.0	6.7	6.3	8.6	6.6
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.4	0.4	0.3	0.2	0.3	0.3
Cyanide Free	DETSC 2130#	0.1	mg/kg	< 0.1	< 0.1	< 0.1	0.1	0.1	0.3
Organic matter	DETSC 2002#	0.1	%	12	14	16	19	20	11
Total Organic Carbon	DETSC 2002	0.1	%	6.8	8.2	9.5	11	12	6.1
Ammoniacal Nitrogen as N	DETSC 2119#	0.5	mg/kg	88	46	37	52	57	82
Fluoride	DETSC 2055	1	mg/kg	3.1	2.5	1.5	< 1.0	1.0	< 1.0
Nitrate as NO3	DETSC 2055	1	mg/kg	6.5	6.2	6.7	5.2	7.5	6.9
Nitrogen	DETSC 2121*	0.01	%	0.49	0.48	0.52	0.66	0.67	0.66
Total Kjeldahl Nitrogen	DETSC 2121*	0.01	%	0.49	0.48	0.52	0.66	0.67	0.66
Sulphide	DETSC 2024#	10	mg/kg	160	170	200	190	210	170
Total Sulphur as S	DETSC 2320	0.01	%	0.17	0.17	0.15	0.22	0.15	0.15
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.12	0.12	0.12	0.16	0.11	0.12
Petroleum Hydrocarbons									
EPH (C5-C10)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
EPH (C10-C25)	DETSC 3311	10	mg/kg	22	20	29	< 10	14	16
EPH (C25-C40)	DETSC 3311	10	mg/kg	21	10	< 10	< 10	< 10	< 10
EPH (C10-C40)	DETSC 3311#	10	mg/kg	43	30	35	< 10	21	21

Summary of Chemical Analysis
Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

			Lab No	803864	803865	803866	803867	803868	803869
			Sample ID	GOL1C	GOL2C	GOL3C	GOL4C	GOL5C	GOL6C
			X	330212	330206	330171	330301	330273	330587
			Y	202132	202531	202889	203208	203496	203995
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
PAHs									
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols									
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	1.0	1.1	1.0	1.5	1.6	1.3

Summary of Chemical Analysis
Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

			Lab No	803870	803871	803872	803873	803874	803875
			Sample ID	GOL7C	GOL8C	GOL9C	GOL10C	GOL11C	GOL12C
			X	330587	330870	331133	331438	331809	331648
			Y	204203	204085	203851	204133	204350	204647
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content 30øC	DETSC 1004*	0.1	%	72	77	51	77	74	68
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	7.5	8.1	7.0	7.0	7.5	7.3
Barium	DETSC 2301#	1.5	mg/kg	160	160	82	150	140	120
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.1	1.8	1.5	2.1	2.3	2.0
Cadmium	DETSC 2301#	0.1	mg/kg	1.1	1.0	1.0	0.9	0.9	0.8
Chromium	DETSC 2301#	0.15	mg/kg	33	35	21	31	28	26
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	25	23	14	23	21	19
Lead	DETSC 2301#	0.3	mg/kg	42	36	27	29	33	26
Available Magnesium	DETSC 2301*	0.1	mg/l	16	9.2	17	8.7	12	17
Mercury	DETSC 2325#	0.05	mg/kg	0.11	0.10	< 0.05	0.07	0.09	0.06
Molybdenum	DETSC 2301#	0.4	mg/kg	0.6	0.7	< 0.4	0.7	0.6	0.6
Nickel	DETSC 2301#	1	mg/kg	27	25	16	20	19	17
Available Phosphorus	DETSC 2301*	0.1	mg/l	24	21	46	9.2	23	21
Available Potassium	DETSC 2301*	0.1	mg/l	19	10	20	9.7	14	20
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.6	0.8	0.5
Sodium	DETSC 2301*	0.1	mg/kg	300	430	1300	370	300	280
Zinc	DETSC 2301#	1	mg/kg	120	120	68	99	98	88
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	360	510	110	260	180	290
pH	DETSC 2008#			6.8	6.9	6.7	6.6	6.6	6.8
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.2	0.3	0.2	0.4	0.3	0.3
Cyanide Free	DETSC 2130#	0.1	mg/kg	< 0.1	0.1	< 0.1	0.1	0.1	0.1
Organic matter	DETSC 2002#	0.1	%	18	19	5.8	20	21	17
Total Organic Carbon	DETSC 2002	0.1	%	11	11	3.3	11	12	10
Ammoniacal Nitrogen as N	DETSC 2119#	0.5	mg/kg	65	30	21	51	37	27
Fluoride	DETSC 2055	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	3.5
Nitrate as NO3	DETSC 2055	1	mg/kg	7.3	5.8	6.2	6.0	7.6	6.0
Nitrogen	DETSC 2121*	0.01	%	0.66	0.56	0.57	0.57	0.62	0.63
Total Kjeldahl Nitrogen	DETSC 2121*	0.01	%	0.66	0.56	0.57	0.57	0.62	0.63
Sulphide	DETSC 2024#	10	mg/kg	120	120	150	180	190	160
Total Sulphur as S	DETSC 2320	0.01	%	0.21	0.21	0.07	0.14	0.17	0.15
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.13	0.15	0.06	0.14	0.13	0.11
Petroleum Hydrocarbons									
EPH (C5-C10)	DETSC 3321*	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
EPH (C10-C25)	DETSC 3311	10	mg/kg	21	28	< 10	23	34	37
EPH (C25-C40)	DETSC 3311	10	mg/kg	< 10	< 10	< 10	14	170	63
EPH (C10-C40)	DETSC 3311#	10	mg/kg	25	32	< 10	36	200	100

Summary of Chemical Analysis
Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

			Lab No	803876	803877	803878	803879	803880	803881
			Sample ID	GOL13C	GOL14C	GOL15C	GOL16C	GOL17C	GOL18C
			X	331595	331601	331471	331373	331238	331361
			Y	204918	205315	205658	206044	206806	206258
			Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
			Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**						
Preparation									
Moisture Content 30øC	DETSC 1004*	0.1	%	76	75	72	77	76	61
Metals									
Arsenic	DETSC 2301#	0.2	mg/kg	7.7	7.6	7.4	8.8	7.5	7.0
Barium	DETSC 2301#	1.5	mg/kg	130	140	130	160	130	150
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.4	2.2	2.0	2.3	2.2	1.8
Cadmium	DETSC 2301#	0.1	mg/kg	1.0	1.0	1.0	1.3	1.0	0.9
Chromium	DETSC 2301#	0.15	mg/kg	28	28	23	29	28	18
Hexavalent Chromium	DETSC 2204*	1	mg/kg	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Copper	DETSC 2301#	0.2	mg/kg	22	25	22	29	23	20
Lead	DETSC 2301#	0.3	mg/kg	30	32	28	36	34	24
Available Magnesium	DETSC 2301*	0.1	mg/l	13	11	14	13	13	16
Mercury	DETSC 2325#	0.05	mg/kg	0.07	0.08	0.06	0.10	0.10	0.05
Molybdenum	DETSC 2301#	0.4	mg/kg	0.6	0.6	0.5	0.6	0.6	1.4
Nickel	DETSC 2301#	1	mg/kg	20	21	19	24	21	16
Available Phosphorus	DETSC 2301*	0.1	mg/l	19	18	16	19	13	30
Available Potassium	DETSC 2301*	0.1	mg/l	15	11	16	15	14	18
Selenium	DETSC 2301#	0.5	mg/kg	< 0.5	< 0.5	< 0.5	0.9	< 0.5	< 0.5
Sodium	DETSC 2301*	0.1	mg/kg	300	270	220	330	270	190
Zinc	DETSC 2301#	1	mg/kg	110	130	120	180	120	120
Inorganics									
Conductivity	DETSC 2009	1	uS/cm	230	91	300	200	240	240
pH	DETSC 2008#			6.4	6.5	6.6	6.6	6.7	6.9
Cyanide Total	DETSC 2130#	0.1	mg/kg	0.4	0.3	0.4	0.5	0.4	0.3
Cyanide Free	DETSC 2130#	0.1	mg/kg	0.1	0.1	0.1	0.1	0.1	< 0.1
Organic matter	DETSC 2002#	0.1	%	18	18	14	20	19	8.2
Total Organic Carbon	DETSC 2002	0.1	%	11	11	8.0	11	11	4.7
Ammoniacal Nitrogen as N	DETSC 2119#	0.5	mg/kg	40	47	45	25	35	17
Fluoride	DETSC 2055	1	mg/kg	1.2	1.6	< 1.0	< 1.0	< 1.0	< 1.0
Nitrate as NO3	DETSC 2055	1	mg/kg	6.9	6.3	13	6.9	6.1	7.3
Nitrogen	DETSC 2121*	0.01	%	0.63	0.58	0.59	0.58	0.61	0.60
Total Kjeldahl Nitrogen	DETSC 2121*	0.01	%	0.63	0.58	0.59	0.58	0.61	0.60
Sulphide	DETSC 2024#	10	mg/kg	180	160	120	140	190	170
Total Sulphur as S	DETSC 2320	0.01	%	0.16	0.14	0.13	0.13	0.18	0.09
Total Sulphate as SO4	DETSC 2321#	0.01	%	0.14	0.12	0.12	0.13	0.13	0.08
Petroleum Hydrocarbons									
EPH (C5-C10)	DETSC 3321*	0.1	mg/kg	0.6	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
EPH (C10-C25)	DETSC 3311	10	mg/kg	29	48	34	54	48	65
EPH (C25-C40)	DETSC 3311	10	mg/kg	71	72	62	74	83	87
EPH (C10-C40)	DETSC 3311#	10	mg/kg	100	120	96	130	130	150

Summary of Chemical Analysis
Soil Samples

Our Ref 15-33599
Client Ref
Contract Title Mon and Brec Canal

				Lab No	803876	803877	803878	803879	803880	803881
				Sample ID	GOL13C	GOL14C	GOL15C	GOL16C	GOL17C	GOL18C
				X	331595	331601	331471	331373	331238	331361
				Y	204918	205315	205658	206044	206806	206258
				Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
				Sampling Date	n/s	n/s	n/s	n/s	n/s	n/s
				Sampling Time	n/s	n/s	n/s	n/s	n/s	n/s
Test	**Method**	**LOD**	**Units**							
PAHs										
Naphthalene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Acenaphthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluorene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Phenanthrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.8
Pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.7
Benzo(a)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Chrysene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(b)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(k)fluoranthene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(a)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Indeno(1,2,3-c,d)pyrene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Dibenzo(a,h)anthracene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Benzo(g,h,i)perylene	DETSC 3301	0.1	mg/kg	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
PAH	DETSC 3301	1.6	mg/kg	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6	< 1.6
Phenols										
Phenol - Monohydric	DETSC 2130#	0.3	mg/kg	1.8	1.6	1.3	1.8	1.6	1.4

Soil analysis

- Certificate Number 15-47137 (Soil Sample Analysis).

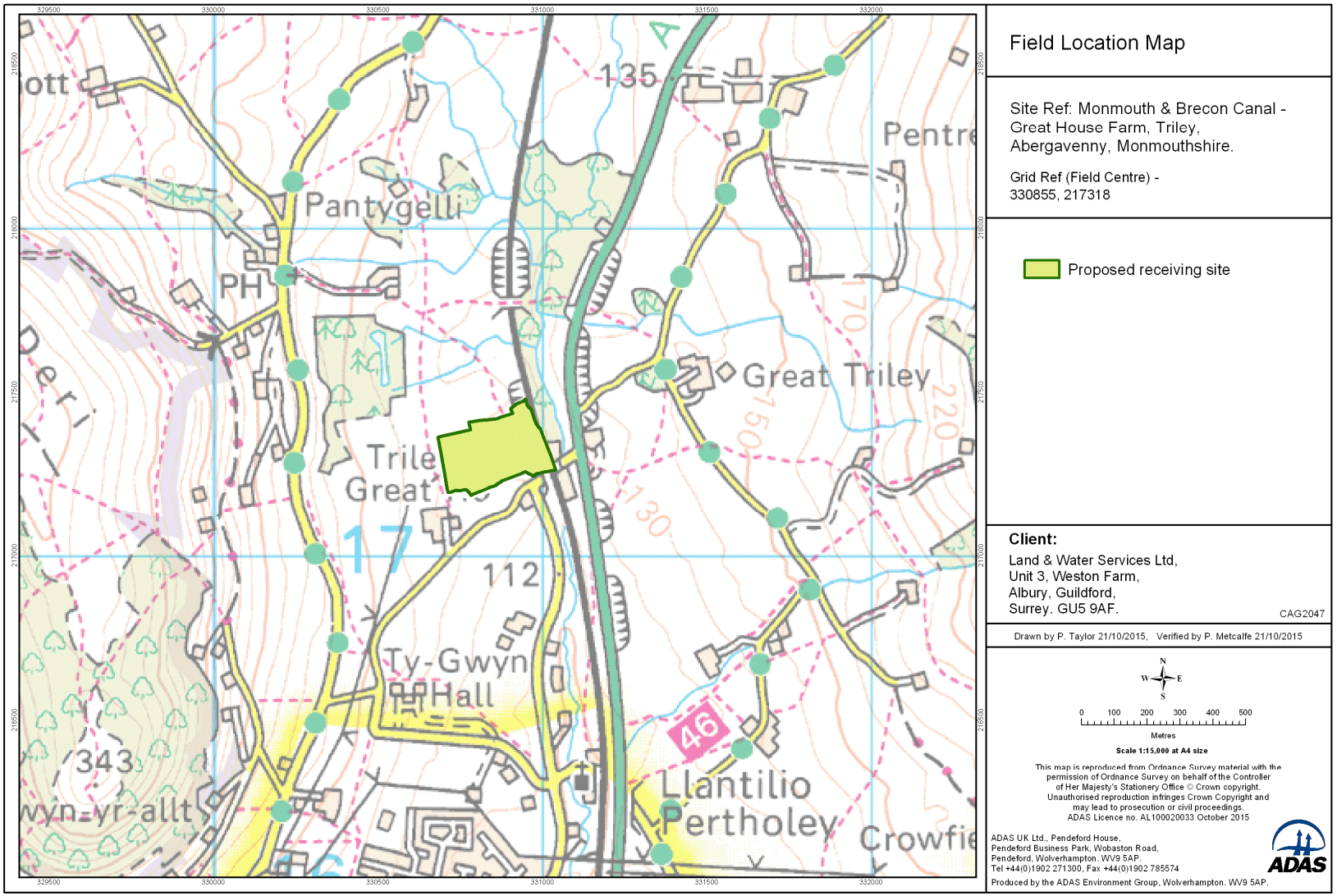
dets
Derwentside Environmental Testing Services

Summary of Chemical Analysis
Soil Samples

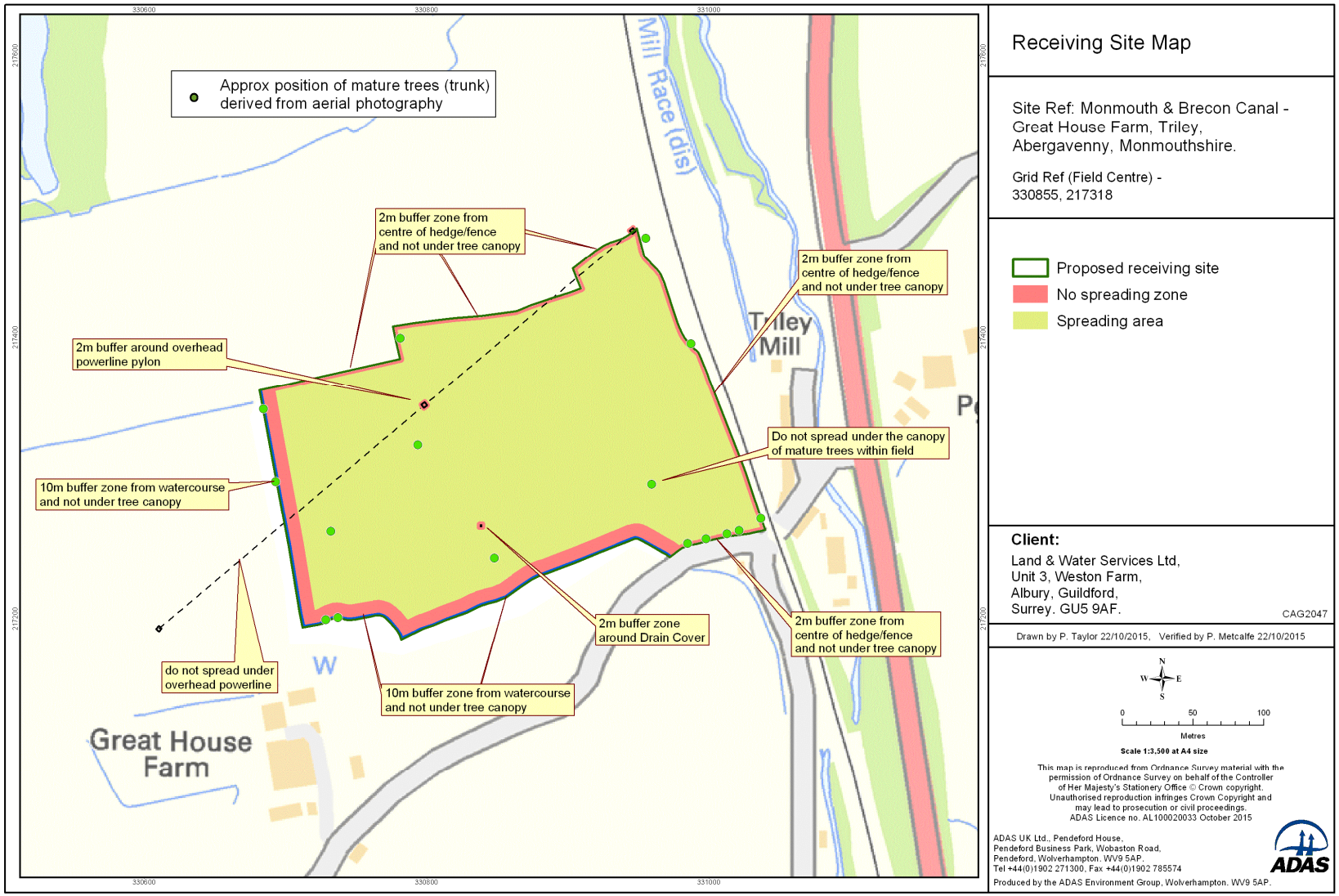
Our Ref 15-47137
Client Ref CAG2047
Contract Title Mon & Brec Canal

			Lab No	881421
				C-Gol
			Sample ID	Watkins
			Depth	
			Other ID	
			Sample Type	SOIL
			Sampling Date	08/10/15
			Sampling Time	n/s
Test	**Method**	**LOD**	**Units**	
Metals				
Arsenic	DETSC 2301#	0.2	mg/kg	5.6
Boron (water soluble)	DETSC 2123#	0.2	mg/kg	2.1
Cadmium	DETSC 2301#	0.1	mg/kg	0.5
Chromium	DETSC 2301#	0.15	mg/kg	22
Copper	DETSC 2301#	0.2	mg/kg	19
Lead	DETSC 2301#	0.3	mg/kg	33
Available Magnesium	DETSC 2301*	0.1	mg/kg	68
Magnesium	DETSC 2301*	1	mg/kg	2800
Mercury	DETSC 2325#	0.05	mg/kg	0.12
Nickel	DETSC 2301#	1	mg/kg	12
Available Phosphorus	DETSC 2301*	0.1	mg/kg	18
Phosphorus	DETSC 2301*	1	mg/kg	830
Available Potassium	DETSC 2301*	0.1	mg/kg	40
Potassium	DETSC 2301*	1	mg/kg	1200
Zinc	DETSC 2301#	1	mg/kg	62
Inorganics				
Loss on Ignition at 440oC	DETSC 2003#	0.01	%	11
Soil Density	*	0.1		9.98
Conductivity	DETSC 2009	1	uS/cm	250
pH	DETSC 2008#			6.8
Carbonate (as CO2)	DETSC 2005	1	%	2.0

Receiving Sites Location Map



Receiving Site Map



Receiving Site Map

Site Ref: Monmouth & Brecon Canal - Great House Farm, Triley, Abergavenny, Monmouthshire.

Grid Ref (Field Centre) - 330855, 217318

Proposed receiving site
No spreading zone
Spreading area

Client:
Land & Water Services Ltd,
Unit 3, Weston Farm,
Albury, Guildford,
Surrey. GU5 9AF.

CAG2047

Drawn by P. Taylor 22/10/2015, Verified by P. Metcalfe 22/10/2015

N
W E
S

0 50 100
Metres

Scale 1:3,500 at A4 size

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