

Gunthorpe, Kegworth and Stoke Weirs Particle Size Distribution Study



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Gunthorpe, Kegworth and Stoke Weirs

Particle Size Distribution Study

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Cover photo: Stoke weir river bed image, Exo Environmental Ltd.

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Executive Summary

In October 2018 a three-person sampling crew recovered riverbed sediment from three sites on instruction from H2O Power Ltd and Renewables First, on the basis of technical advice from the Environment Agency. The sediments were obtained using a Van Veen grab sampler and hand scoop on the basis of a sampling plan provided. Subsequently samples were dried and sieved to produce a Particle Size Distribution. The sampling results at Gunthorpe, Kegworth and Stoke weirs were interpreted and a D50 Distribution completed for mapping purposes of each site.

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1 Introduction

1.1 Background

Exo Environmental Ltd was instructed to investigate the particle size distribution (PSD) at three lock and weir sites of Gunthorpe, Kegworth and Stoke, in relation to proposed hydropower schemes. It is our understanding that the PSD survey was required in relation to baseline conditions, fish spawning opportunities and aquatic bivalve habitat. The Kegworth site is located on the River Soar and Gunthorpe and Stoke sites on the River Trent, as depicted in figure 1.



Figure 1. Location overview. Blue Arrow = Site location (Source: www.magic.gov.uk. Date Accessed: 25/10/2018).

1.2 Scope of Work

The purpose of the survey was to recover sediment from the riverbed at the three sites on the basis of a random distribution sampling plan provided. Sediment samples with sufficient quantity were required to provide a representative PSD result hence composite samples were created where required. Sediment samples subsequently required drying and sieving to produce the PSD results. The survey consisted out of a total of 69 sample stations, with the Kegworth site having the majority of the samples (30), subsequently Stoke (21) and Gunthorpe (18). A three-person team was deployed to safely carry out this survey, with inflatable zodiac, Trimble GNSS, van Veen grab and hand scoop.

2 Methodology

2.1 Field Survey

A 3.4 litre Van Veen sampler was operated from a 2-person inflatable zodiac dinghy with a 6hp outboard engine. A Trimble GNSS and controller were utilised to identify the location of each sample. The sampling methodology was based on a minimum of 6 sample attempts to recover a sample at each sample station.

In case of shallow water conditions, a large 1.5 litre scoop was utilised in conjunction with the Trimble positioning equipment.

From the total of 69 sampling stations, 11 stations returned no representative sample. The main reasons for a no sample being include; depth of water, current velocity and river bed characteristic. A sample log was maintained, and the characteristics denoted.



Figure 2 & 3. Sampling in areas inaccessible by boat with portable Trimble positioning equipment

2.2 Laboratory Analysis

The samples were dried and subsequently passed through a sieve set with set apertures described in table 1. The sample passed through a total of seven sieves before the remainder caught in the final catch pan. The contents of each sieve were then weighed by a scale with 0.1g precision and the results collated to produce the PSD result. Any material that did not pass through the first sieve was measured along the three long axis to record the size of the largest cobbles recovered.

Sieve Sizes							
63mm	45mm	32mm	22mm	16mm	8mm	2mm	Catch Pan

Table 1. Sieve apertures used for the PSD.

3 Results

3.1 Site Summary

3.1.1 Gunthorpe

Gunthorpe Weir is located immediately upstream of area of well bedded sedimentary rock that dominates the riverbed. This sedimentary rock created areas of a hard and smooth riverbed, with incised cracks that are filled with larger cobbles and fine sediment. This riverbed condition and water depth in excess of 3m in the centre of the river made sampling conditions challenging. The samples on the righthand side bank were all taken by scoop as the depth was too shallow for the vessel.

3.1.2 Kegworth

The sampling area immediately downstream of the Kegworth weir was inaccessible by boat and was therefore sampled by scoop. The river subsequently narrowed and sampling in the downstream area was challenged by the weed growth and considerable current flow. Sampling on the left-hand bank was complicated in places by manmade concrete structures and rock armour. The sediment composition changed at the convergence of the weir and lock channel, with mostly fines and organic matter encountered.

3.1.3 Stoke

The riverbed at Stoke was more similar to Gunthorpe in characteristics than Kegworth. The riverbed was hard in places, but larger cobbles also present which hampered the sampling. There was more gravel present compared to Gunthorpe, with the sampling on righthand side bank completed by the scoop.

3.1.4 No Sample Returns

The sampling methodology was based on a minimum of 6 sample attempts to recover a sample at each sample station. Despite of our efforts, sampling at Kegworth and Gunthorpe, both had only two sample stations where no sample recovery was possible. The Stoke site proved to most challenging to sample due to the smooth bed, weed coverage and current velocity. The current and claylike bed material present in the main river channel, made the recovery of the umbrella boat anchor challenging at times. Table 2 below details the sampling success at the three sites.

Site	Gunthorpe	Kegworth	Stoke
Sample Points	18	30	21
Sample Recovered	16	28	14
Success Rate	89%	93%	67%

Table 2. Sampling Success Rate by Location

Table 3 below details the no sample stations and their specific characteristics, based on the experience of the sampling crew.

Sample Point	Sampling Conditions
Gunthorpe 04	Hard bed, sediment between bedrock 'slabs' and strong current
Gunthorpe 15	Hard bed, sediment between bedrock 'slabs' and strong current
Kegworth 01	Close to weir with strong undercurrents, very rocky
Kegworth 07	Strong current weed and cemented bed
Stoke 03	Smooth bed, sediment in cracks, large boulders
Stoke 04	Smooth bed, sediment in cracks, large boulders
Stoke 05	Smooth bed, weed and algae scraped with sampler
Stoke 08	Smooth bed, weed and algae scraped with sampler
Stoke 14	Smooth bed, weed and algae scraped with sampler
Stoke 17	Smooth bed, weed and algae scraped with sampler
Stoke 20	Hard bed, sediment in cracks, large boulders

Table 3. No Sample Location Characteristics

3.2 Sampling Locations

In appendix 1, 2 and 3 the sampling plan and sampling record are available, providing details of each sampling station. The proposed stations are coloured in orange and are linked by an orange line to the actual sample location. Successful sample stations are coloured in green and unsuccessful sampling locations are in red. The difference between the proposed and actual sample points varies due to the current of the river, dragging anchor, riverbed conditions and the availability of sample.

3.3 Particle Size Distribution

3.3.1 Sieving Results

The three graphs in figures 4, 5 and 6 provide an overview of the particle size distribution of the sediment samples recovered from each site. The graphs provide an indication of the variation between the three sites.

Some of the variation is related to the type of sampling as well as the sediment recovered. The sampling at Kegworth had the highest completion rate of Van Veen grab sampling and the largest size sieve contents has proportionally less material than the other sites. The scoop method is more likely to collect larger cobbles and fines than the Van Veen sampler. These charts also do not consider the distribution in relation to the characteristic of the river. Section 3.2.2 interpolates the individual sample locations and applies them to the context of each site. Full Results for each sample location can be found in the appendix 7-12.

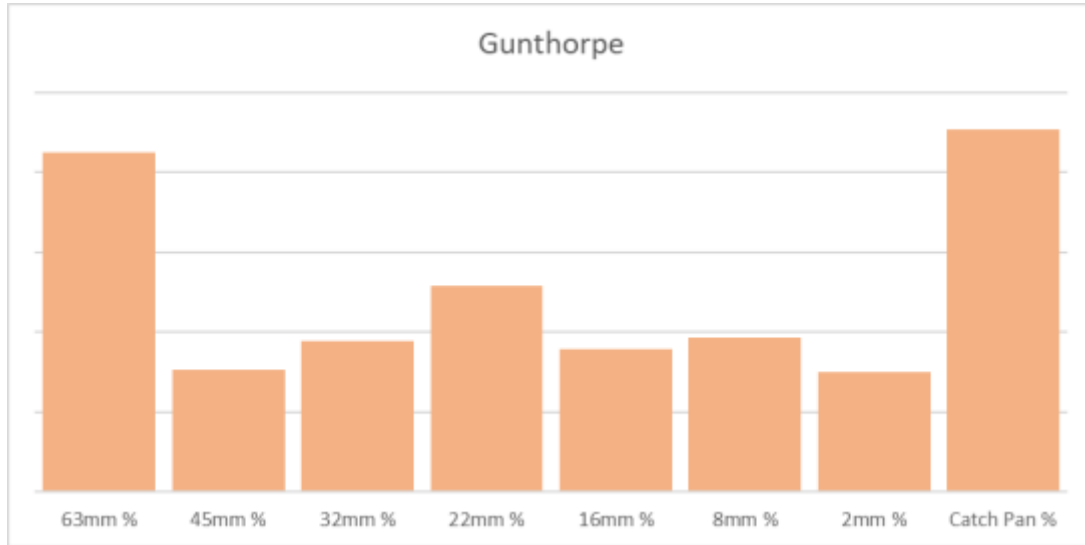


Figure 4. Particle Size Distribution Chart for Gunthorpe

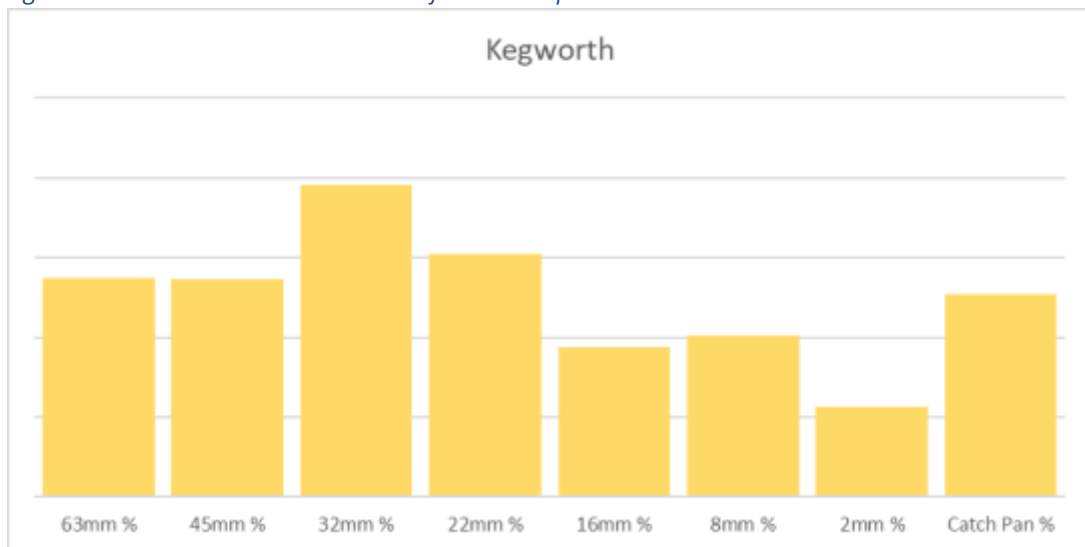


Figure 5. Particle Size Distribution Chart for Kegworth

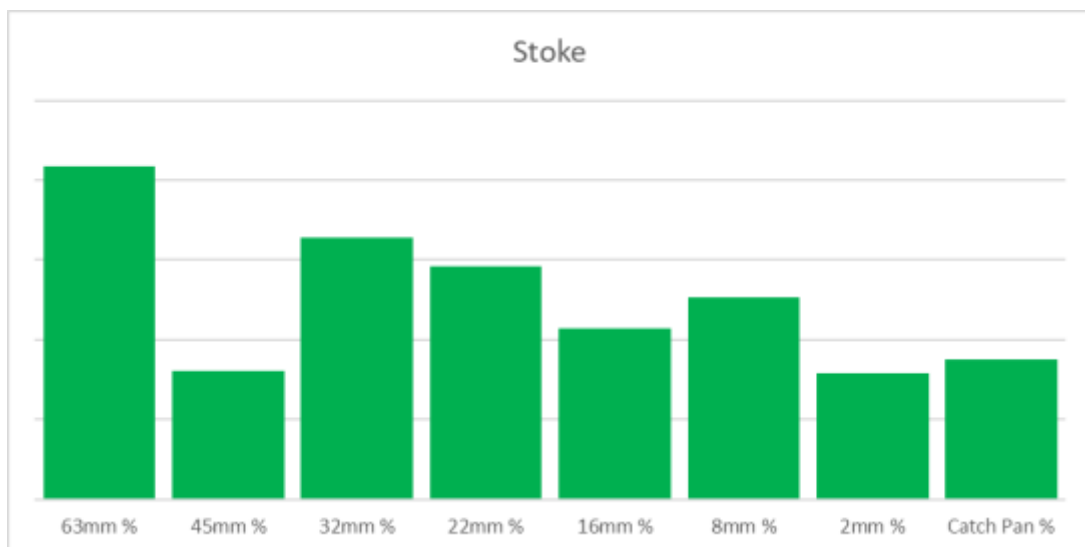


Figure 6. Particle Size Distribution Chart for Stoke

3.3.2 Particle Size Interpretation

For each sample location the D50 value was calculated and then plotted onto the map of each site. The D50 value is the diameter of the particle with an equal mass of particles both larger and smaller than itself, contained within the sample. The D50 sample data was used to interpolate the PSD across each site. The results of the PSD interpolation are presented in appendix 4 - 6, with the red areas indicating the largest D50 points and the blue the smallest D50 values.

For the interpretation we've made an assumption for each no Sample location, which was taken to be the largest size of sieve, cobble (63mm or above). There were many reasons for the return of no sample, as previously described.



Figure 7. Image of zodiac inflatable dinghy with 6hp outboard engine, Trimble GNSS positioning system.

Appendix 1 Gunthorpe Sampling Plan and Record

Gunthorpe sampling locations

Sampling plan vs actual sample locations



Attribution:

Orange dots represent the original sampling plan and the green dots actual sampled locations. Red dots denote a no sample location.

25-10-2018

Appendix 2 Kegworth Sampling Plan and Record

Kegworth sampling locations

Sampling plan vs actual sample locations



Attribution:

Orange dots represent the original sampling plan and the green dots actual sampled locations. Red dots denote a no sample location.

25-10-2018

Appendix 3 Stoke Sampling Plan and Record

Stoke sampling locations

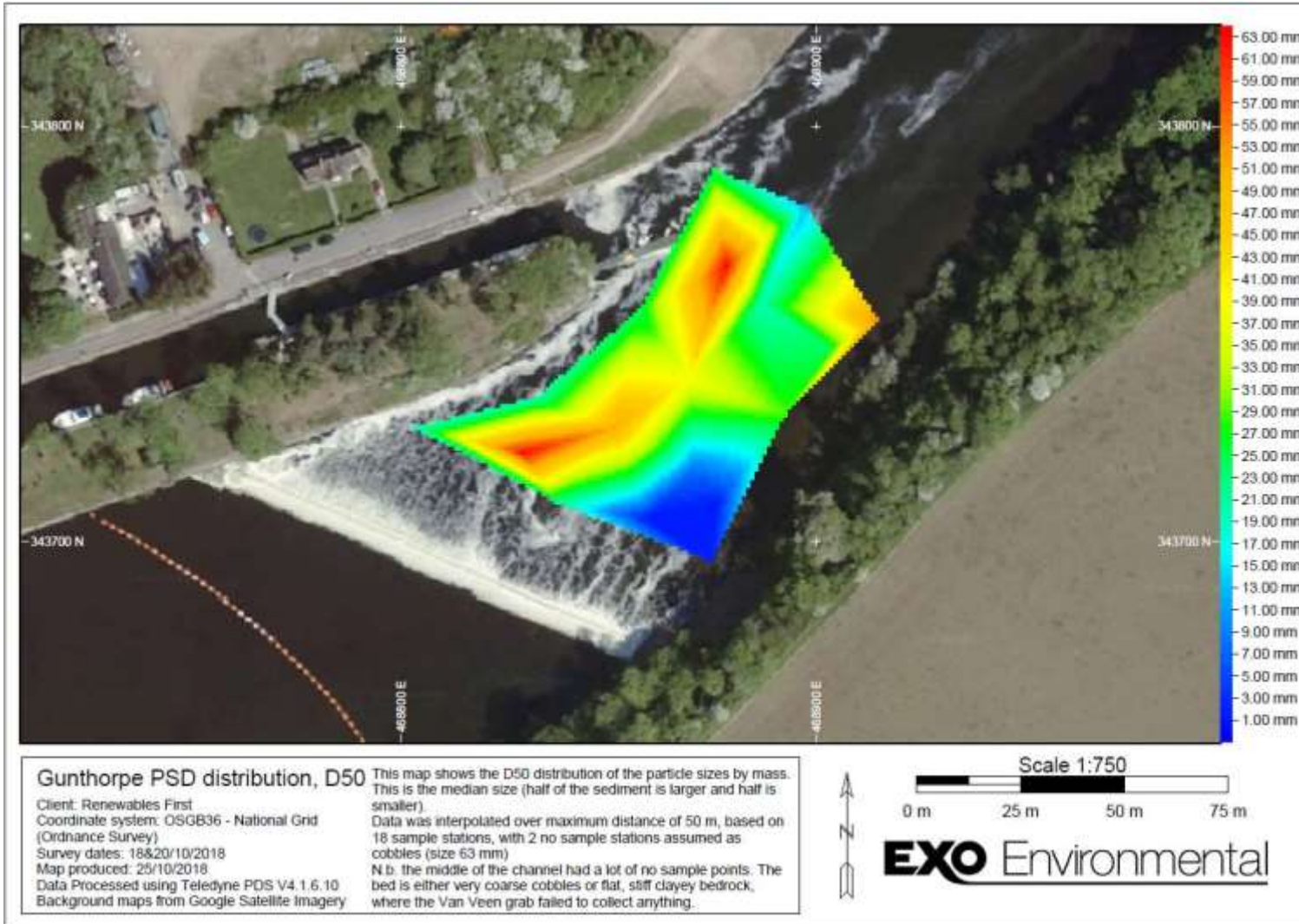
Sampling plan vs actual sample locations



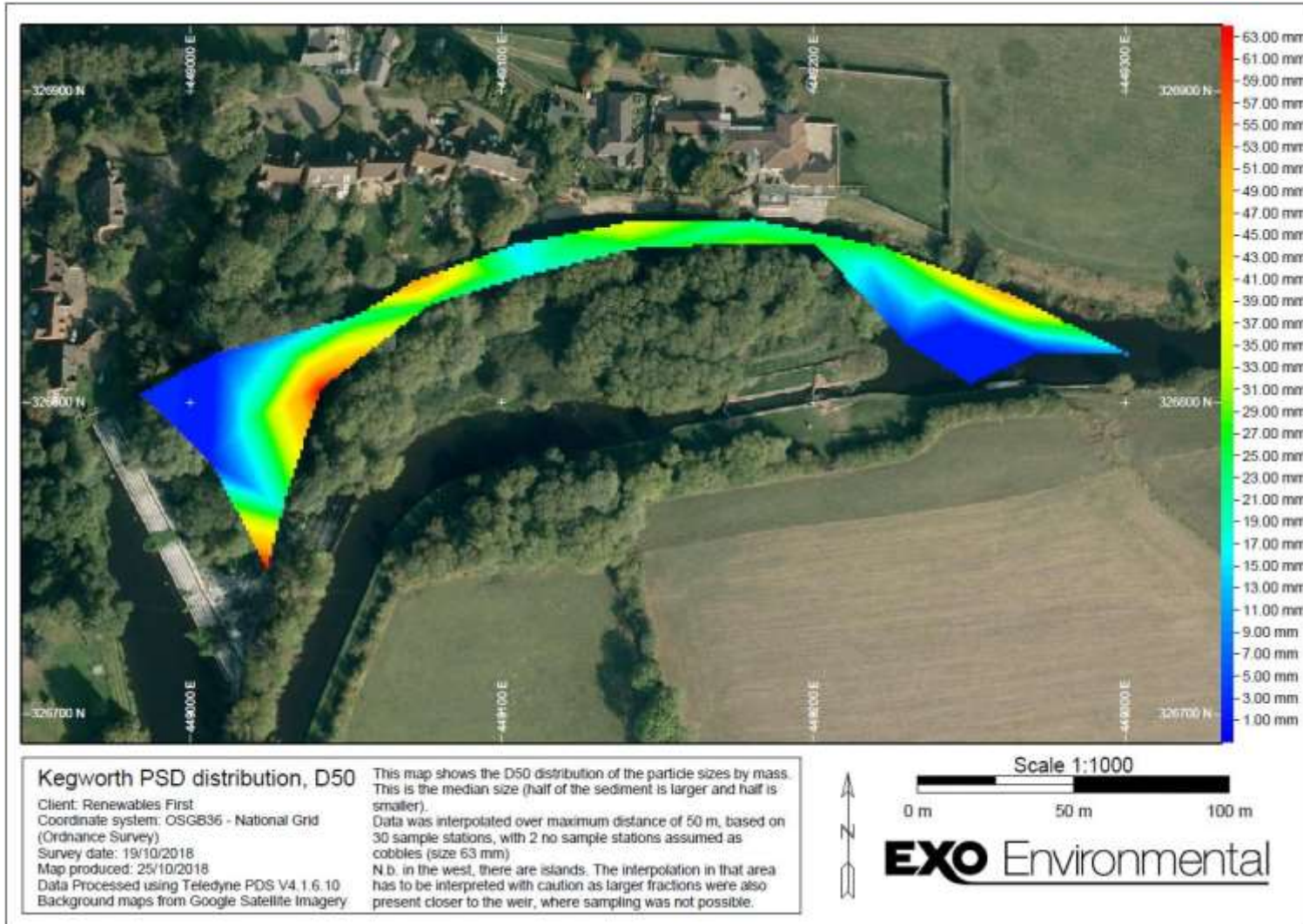
Attribution:
Orange dots represent the original sampling plan and the green dots actual sampled locations. Red dots denote a no sample location.

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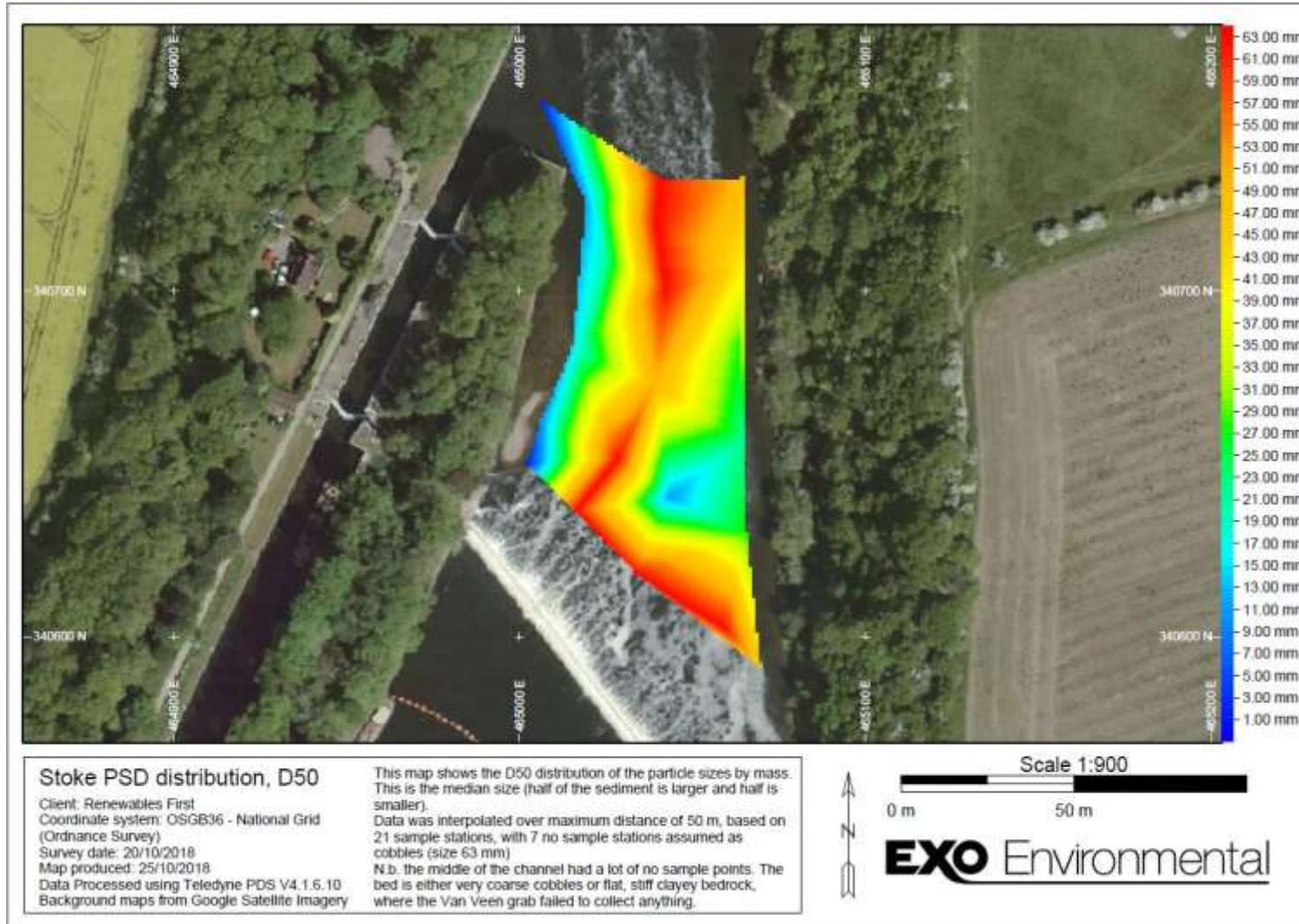
Appendix 4 Gunthorpe Particle Size Distribution D50



Appendix 5 Kegworth Particle Size Distribution D50



Appendix 6 Stoke Particle Size Distribution D50



Appendix 7 Gunthorpe Sample Locations and Results G01-G09.

Sample Point	G01	G02	G03	G04	G05	G06	G07	G08	G09
Sample Date	18 Oct 18	18 Oct 18	18 Oct 18	20 Oct 18	20 Oct 18	18 Oct 18	18 Oct 18	18 Oct 18	20 Oct 18
Northing	343695.2308	343705.3317	343709.1587	343721.4885	343727.6648	343709.3667	343717.1930	343727.2443	343734.9000
Easting	468874.1160	468859.6864	468837.5208	468829.7843	468803.4969	468876.8875	468870.0273	468851.1951	468832.4000
Sample Method	Scoop	VV	VV	N/S	VV	Scoop	VV	VV	VV
Water Depth	>0.5m	+0.5m	+0.5m	+0.5m	+0.5m	>0.5m	+0.5m	+0.5m	+0.5m
Wet Weight	5252.5	67.6	208.7	N/S	257.6	4235	4821.8	848.2	779.6
Dry Weight	4311.2	0.6	124.8	N/S	23.21	3426.6	4357.7	785.9	572.2
63mm	404.1	0	0	N/S	0	317.8	0	598.7	0
45mm	114	0	0	N/S	0	450.4	115.6	0	0
32mm	66.7	0	63.7	N/S	0	104.2	308.7	178.3	193.1
22mm	127.3	0	29.7	N/S	23.2	62.4	1034	0	287.2
16mm	224	0	10.4	N/S	0	167.5	711.2	0	41.2
8mm	431.8	0	2	N/S	0	242.6	644.2	0.1	23.1
2mm	591.8	0	7.6	N/S	0	265.1	427.8	0.4	7.9
Catch Pan	2351.5	0.6	11.4	N/S	0.01	1816.6	1116.2	8.4	19.7
63mm %	9.4%	0.0%	0.0%	N/S	0.0%	9.3%	0.0%	76.2%	0.0%
45mm %	2.6%	0.0%	0.0%	N/S	0.0%	13.1%	2.7%	0.0%	0.0%
32mm %	1.5%	0.0%	51.0%	N/S	0.0%	3.0%	7.1%	22.7%	33.7%
22mm %	3.0%	0.0%	23.8%	N/S	100.0%	1.8%	23.7%	0.0%	50.2%
16mm %	5.2%	0.0%	8.3%	N/S	0.0%	4.9%	16.3%	0.0%	7.2%
8mm %	10.0%	0.0%	1.6%	N/S	0.0%	7.1%	14.8%	0.0%	4.0%
2mm %	13.7%	0.0%	6.1%	N/S	0.0%	7.7%	9.8%	0.1%	1.4%
Catch Pan %	54.5%	100.0%	9.1%	N/S	0.0%	53.0%	25.6%	1.1%	3.4%
Oversize 1	106					121		111	
	98					101		78	
	22					28		48	
Oversize 2									
Oversize 3									

Appendix 8 Gunthorpe Sample Locations and Results G10-G18.

Sample Point	G10	G11	G12	G13	G14	G15	G16	G17	G18
Sample Date	18 Oct 18	20 Oct 18	18 Oct 18	18 Oct 18	20 Oct 18	20 Oct 18	18 Oct 18	20 Oct 18	18 Oct 18
Northing	343730.1446	343739.5728	343755.8752	343746.9932	343757.4023	343766.1251	343753.2186	343780.7000	343789.1868
Easting	468892.9452	468869.3534	468857.5889	468903.2411	468886.1422	468878.3317	468914.4906	468897.6218	468875.3833
Sample Method	Scoop	VV	VV	Scoop	VV	N/S	Scoop	VV	VV
Water Depth	>0.5m	+0.5m	+0.5m	>0.5m	+0.5m	+0.5m	>0.5m	+0.5m	+0.5m
Wet Weight	6000	2485.5	328.6	6000	1663.5	N/S	1193.5	1612.5	349
Dry Weight	5654.9	2166.6	211.5	3369.3	1359.5	N/S	964.9	1373.4	218.4
63mm	2352.2	794.4	0	786.9	0	N/S	890.9	0	0
45mm	300.7	588.2	0	639.9	0	N/S	0	0	0
32mm	564.4	149.3	134.2	334.8	504.3	N/S	0	0	137.8
22mm	389.2	360	20.3	297	530.9	N/S	0	544.6	21.8
16mm	422.7	127.8	22.1	307.1	156.2	N/S	32.3	327.5	26.2
8mm	521	104.6	15	294.4	99	N/S	12	385	14
2mm	417.2	28.4	7.5	270.5	35.4	N/S	12.7	94.5	6.5
Catch Pan	687.5	13.9	12.4	438.7	33.7	N/S	17	21.8	12.1
63mm %	41.6%	36.7%	0.0%	23.4%	0.0%	N/S	92.3%	0.0%	0.0%
45mm %	5.3%	27.1%	0.0%	19.0%	0.0%	N/S	0.0%	0.0%	0.0%
32mm %	10.0%	6.9%	63.5%	9.9%	37.1%	N/S	0.0%	0.0%	63.1%
22mm %	6.9%	16.6%	9.6%	8.8%	39.1%	N/S	0.0%	39.7%	10.0%
16mm %	7.5%	5.9%	10.4%	9.1%	11.5%	N/S	3.3%	23.8%	12.0%
8mm %	9.2%	4.8%	7.1%	8.7%	7.3%	N/S	1.2%	28.0%	6.4%
2mm %	7.4%	1.3%	3.5%	8.0%	2.6%	N/S	1.3%	6.9%	3.0%
Catch Pan %	12.2%	0.6%	5.9%	13.0%	2.5%	N/S	1.8%	1.6%	5.5%
Oversize 1	179	115		152					
	125	78		94					
	51	64		28					
Oversize 2	149			153					
	105			115					
	33			31					
Oversize 3									

Appendix 9 Kegworth Sample Locations and Results K01-K15.

Sample Point	K01	K02	K03	K04	K05	K06	K07	K08	K09	K10	K11	K12	K13	K14	K15
Sample Date	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10
Northing	326747.3985	326781.4031	326802.7353	326766.0637	326795.4263	326815.5329	326804.4881	326816.3411	326838.3720	326827.5365	326831.1583	326841.3735	326841.8425	326850.1992	326853.3640
Easting	449024.2010	449006.2424	448984.6442	449029.8725	449020.2453	449008.1068	449041.6986	449033.5267	449071.9448	449053.7204	449076.8203	449092.2140	449109.4404	449104.0988	449124.0981
Sample Method	N/S	Scoop	Scoop	Scoop	Scoop	Scoop	N/S	VV	VV	VV	VV	VV	VV	VV	VV
Water Depth	>0.5m	>0.5m	>0.5m	>0.5m	>0.5m	>0.5m	>0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m
Wet Weight	N/S	900.2	4092.4	3297.3	6000	1092	N/S	1149.6	644.3	894	1580.5	1570.6	1574.8	948.9	1273.6
Dry Weight	N/S	492.1	3433.4	2350.2	3854	556	N/S	994.4	566.4	747.8	1354.6	1312.2	1086.3	652.6	932.7
63mm	N/S	0	780.3	387.1	386.5	0	N/S	0	520.3	0	312	260.7	0	0	0
45mm	N/S	0	130.6	289.7	810.9	0	N/S	370.7	0	169.5	134.8	337.4	0	0	308.1
32mm	N/S	0	331.8	374.4	750.3	7.3	N/S	109.6	46	195.1	340	267.1	304.8	174.7	322.8
22mm	N/S	54.2	169.6	271.8	591.3	31.9	N/S	263	0	167.8	345	178.5	281.5	116.9	76.6
16mm	N/S	8	146.2	158.5	343.2	43.5	N/S	67.9	0	23.7	108	130.9	186.5	202.2	160.6
8mm	N/S	4.3	184.4	328.3	577.7	69.9	N/S	125.5	0	96.1	95.7	107.6	231.7	148.8	60.1
2mm	N/S	45	329.4	140.3	193.2	94.4	N/S	50	0	61.9	16.4	25.1	60.3	8	2.6
Catch Pan	N/S	380.6	1361.1	400.1	200.9	309	N/S	7.7	0.1	33.7	2.7	4.9	21.5	2	1.9
63mm %	N/S	0.0%	22.7%	16.5%	10.0%	0.0%	N/S	0.0%	91.9%	0.0%	23.0%	19.9%	0.0%	0.0%	0.0%
45mm %	N/S	0.0%	3.8%	12.3%	21.0%	0.0%	N/S	37.3%	0.0%	22.7%	10.0%	25.7%	0.0%	0.0%	33.0%
32mm %	N/S	0.0%	9.7%	15.9%	19.5%	1.3%	N/S	11.0%	8.1%	26.1%	25.1%	20.4%	28.1%	26.8%	34.6%
22mm %	N/S	11.0%	4.9%	11.6%	15.3%	5.7%	N/S	26.4%	0.0%	22.4%	25.5%	13.6%	25.9%	17.9%	8.2%
16mm %	N/S	1.6%	4.3%	6.7%	8.9%	7.8%	N/S	6.8%	0.0%	3.2%	8.0%	10.0%	17.2%	31.0%	17.2%
8mm %	N/S	0.9%	5.4%	14.0%	15.0%	12.6%	N/S	12.6%	0.0%	12.9%	7.1%	8.2%	21.3%	22.8%	6.4%
2mm %	N/S	9.1%	9.6%	6.0%	5.0%	17.0%	N/S	5.0%	0.0%	8.3%	1.2%	1.9%	5.6%	1.2%	0.3%
Catch Pan %	N/S	77.3%	39.6%	17.0%	5.2%	55.6%	N/S	0.8%	0.0%	4.5%	0.2%	0.4%	2.0%	0.3%	0.2%
Oversize 1			108	89	100				102		112	114			
			100	74	91				81		111	96			
			30	61	58				56		17	23			
Oversize 2			106												
			82												
			58												
Oversize 3															

Appendix 10 Kegworth Sample Locations and Results K16-K30.

Sample Point	K16	K17	K18	K19	K20	K21	K22	K23	K24	K25	K26	K27	K28	K29	K30
Sample Date	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10	19-10
Northing	326857.9881	326849.8185	326853.8835	326858.7160	326851.2165	326849.2969	326851.8912	326843.0634	326839.1053	326834.2652	326819.1169	326815.2903	326825.9021	326806.0385	326816.7482
Easting	449139.0934	449142.6790	449161.6149	449180.9885	449178.2914	449222.3088	449200.7162	449218.5451	449237.2742	449262.3820	449229.5476	449300.7242	449248.2130	449250.9976	449272.6975
Sample Method	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV	VV
Water Depth	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m
Wet Weight	281.3	827.9	926.5	227.9	1090.7	1095.8	1065.8	1028.6	1133.9	1797.3	4809	717.1	4180.4	1828.7	1147.2
Dry Weight	183.3	688.3	750	82.8	963.1	821.8	908.8	1067.5	1193.5	958.9	281.9	392.9	261.5	245.6	468.7
63mm	0	0	0	0	0	0	0	0	484.7	653.1	0	0	0	0	0
45mm	172.4	153.8	0	0	430.7	327.3	128.4	0	0	0	0	0	0	0	0
32mm	0	236.6	392.2	29.4	236.2	150	580.9	212.4	202.4	59.4	0	65.1	0	0	0
22mm	0	204.9	235.5	34.9	213.9	202	90.5	284	187.3	119.9	10.6	63.9	0	7.5	0
16mm	0	25.4	63.7	0	49.2	70.3	68.9	250.4	286.9	65.2	5.6	88.3	6.5	1	40.5
8mm	6.5	56.3	43.1	6.7	30.3	60.4	35.7	240.7	26	46.5	16.3	144.3	0	12.7	36.9
2mm	1.8	8.5	11	5.1	2.1	10.4	3	70.4	4.3	13.1	75.3	16.4	160.9	65.2	78.9
Catch Pan	2.6	2.8	4.5	6.7	0.7	1.4	1.4	9.6	1.9	1.7	174.1	14.9	94.1	159.2	312.4
63mm %	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.6%	68.1%	0.0%	0.0%	0.0%	0.0%	0.0%
45mm %	94.1%	22.3%	0.0%	0.0%	44.7%	39.8%	14.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
32mm %	0.0%	34.4%	52.3%	35.5%	24.5%	18.3%	63.9%	19.9%	17.0%	6.2%	0.0%	16.6%	0.0%	0.0%	0.0%
22mm %	0.0%	29.8%	31.4%	42.1%	22.2%	24.6%	10.0%	26.6%	15.7%	12.5%	3.8%	16.3%	0.0%	3.1%	0.0%
16mm %	0.0%	3.7%	8.5%	0.0%	5.1%	8.6%	7.6%	23.5%	24.0%	6.8%	2.0%	22.5%	2.5%	0.4%	8.6%
8mm %	3.5%	8.2%	5.7%	8.1%	3.1%	7.3%	3.9%	22.5%	2.2%	4.8%	5.8%	36.7%	0.0%	5.2%	7.9%
2mm %	1.0%	1.2%	1.5%	6.2%	0.2%	1.3%	0.3%	6.6%	0.4%	1.4%	26.7%	4.2%	61.5%	26.5%	16.8%
Catch Pan %	1.4%	0.4%	0.6%	8.1%	0.1%	0.2%	0.2%	0.9%	0.2%	0.2%	61.8%	3.8%	36.0%	64.8%	66.7%
Oversize 1									85	148					
									79	93					
									53	20					
Oversize 2										182					
										101					
										25					
Oversize 3															

Appendix 11 Stoke Sample Locations and Results S01-S11.

Sample Point	S01	S02	S03	S04	S05	S06	S07	S08	S09	S10	S11
Sample Date	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10
Northing	340591.3760	340650.6870	340618.7452	340602.8606	340636.2274	340629.4506	340662.4843	340651.8857	340640.1978	340656.4297	340673.2617
Easting	465069.5617	465002.5040	465033.3184	465059.5484	465016.1717	465065.8955	465006.4691	465028.3670	465043.0256	465064.2652	465039.4048
Sample Method	Scoop	Scoop	N/S	N/S	N/S	Scoop	Scoop	N/S	VV	Scoop	VV
Water Depth	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m
Wet Weight	3152.2	2261.6	N/S	N/S	N/S	3844.8	4303.9	N/S	87.1	3007.6	2003.5
Dry Weight	1828.7	1262.2	N/S	N/S	N/S	3380.5	3755.4	N/S	21	2492.4	1646.1
63mm	940.7	0	N/S	N/S	N/S	655.2	0	N/S	0	448.5	1133
45mm	0	0	N/S	N/S	N/S	693.6	0	N/S	0	292.1	286.6
32mm	219	0	N/S	N/S	N/S	890.8	323.5	N/S	0	488.3	157.5
22mm	205.5	40.7	N/S	N/S	N/S	462.7	821.6	N/S	0	297	50.9
16mm	55.5	63.3	N/S	N/S	N/S	181.3	1039.2	N/S	16.8	192.3	16.2
8mm	148.4	271.8	N/S	N/S	N/S	127	1107.9	N/S	3	275.5	0
2mm	143.8	341.8	N/S	N/S	N/S	165.4	428.1	N/S	0.8	248.1	0.6
Catch Pan	115.8	544.6	N/S	N/S	N/S	204.5	35.1	N/S	0.4	250.6	1.3
63mm %	51.4%	0.0%	N/S	N/S	N/S	19.4%	0.0%	N/S	0.0%	18.0%	68.8%
45mm %	0.0%	0.0%	N/S	N/S	N/S	20.5%	0.0%	N/S	0.0%	11.7%	17.4%
32mm %	12.0%	0.0%	N/S	N/S	N/S	26.4%	8.6%	N/S	0.0%	19.6%	9.6%
22mm %	11.2%	3.2%	N/S	N/S	N/S	13.7%	21.9%	N/S	0.0%	11.9%	3.1%
16mm %	3.0%	5.0%	N/S	N/S	N/S	5.4%	27.7%	N/S	80.0%	7.7%	1.0%
8mm %	8.1%	21.5%	N/S	N/S	N/S	3.8%	29.5%	N/S	14.3%	11.1%	0.0%
2mm %	7.9%	27.1%	N/S	N/S	N/S	4.9%	11.4%	N/S	3.8%	10.0%	0.0%
Catch Pan %	6.3%	43.1%	N/S	N/S	N/S	6.0%	0.9%	N/S	1.9%	10.1%	0.1%
Oversize 1	128					131				85	89
	105					101				80	84
	29					31				47	59
Oversize 2	110										134
	97										88
	25										49
Oversize 3											

Appendix 12 Stoke Sample Locations and Results S12-S21.

Sample Point	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21
Sample Date	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10	20-10
Northing	340683.1188	340685.3906	340700.5586	340709.4213	340706.7825	340719.3576	340725.2673	340732.0918	340732.0740	340754.9685
Easting	465015.3364	465063.7024	465042.5288	465025.4377	465064.1628	465039.4034	465019.7981	465064.1503	465040.0614	465006.1626
Sample Method	Scoop	Scoop	N/S	VV	Scoop	N/S	Scoop	Scoop	N/S	VV
Water Depth	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	+0.5m	>0.5m	>0.5m	+0.5m	+0.5m
Wet Weight	2889.6	2560	N/S	1317.9	3701.1	N/S	6000	4242	N/S	2155.4
Dry Weight	2527.1	1816.4	N/S	1278.9	2977.6	N/S	4705.7	3006.4	N/S	684.2
63mm	0	0	N/S	0	1329.8	N/S	0	1884.9	N/S	152.4
45mm	0	787.5	N/S	0	407	N/S	0	64.4	N/S	0
32mm	734.4	295.3	N/S	601.3	386.7	N/S	532.5	512.6	N/S	0
22mm	466.7	150.1	N/S	460.9	166.3	N/S	1325	119.2	N/S	12.8
16mm	481	93.1	N/S	135.5	87.3	N/S	893.1	44.4	N/S	68.7
8mm	468.2	130.9	N/S	66.4	251.3	N/S	1015.4	74.4	N/S	38.6
2mm	178.3	113.4	N/S	5.8	173.9	N/S	493.4	101.9	N/S	86.1
Catch Pan	198.5	246.1	N/S	9	175.3	N/S	446.3	204.6	N/S	325.6
63mm %	0.0%	0.0%	N/S	0.0%	44.7%	N/S	0.0%	62.7%	N/S	22.3%
45mm %	0.0%	43.4%	N/S	0.0%	13.7%	N/S	0.0%	2.1%	N/S	0.0%
32mm %	29.1%	16.3%	N/S	47.0%	13.0%	N/S	11.3%	17.1%	N/S	0.0%
22mm %	18.5%	8.3%	N/S	36.0%	5.6%	N/S	28.2%	4.0%	N/S	1.9%
16mm %	19.0%	5.1%	N/S	10.6%	2.9%	N/S	19.0%	1.5%	N/S	10.0%
8mm %	18.5%	7.2%	N/S	5.2%	8.4%	N/S	21.6%	2.5%	N/S	5.6%
2mm %	7.1%	6.2%	N/S	0.5%	5.8%	N/S	10.5%	3.4%	N/S	12.6%
Catch Pan %	7.9%	13.5%	N/S	0.7%	5.9%	N/S	9.5%	6.8%	N/S	47.6%
Oversize 1								97		
								69		
								60		
Oversize 2								158		
								146		
								30		
Oversize 3								132		
								87		
								28		

Appendix 12 Sampling Log

Thursday 18th October 2018

- 7:15 Begin loading Vehicle
- 8:00 Depart Norfolk for Nottinghamshire
- 10:30 Arrive Gunthorpe – Contact Lockkeeper and Renewables First
 - Identify deployment point on left hand bank
- 11:30 Toolbox talk, complete set-up, re-evaluated deployment.
- 12:00 Begin setting up access on right hand bank & level logger retrieved
- 12:30 Waded into point G1
- 12:45 Point G1 ~75cm of water
 - Very Rocky bottom
 - Some boulders between 40-100cm in width
 - First attempts with scoop and buckets unsuccessful
 - Bivalve and mussels shells
- 13:00 Boat deployed for two more samples
 - Tried two points south of G1
 - Same bedrock

Van Veen sampler ineffective with these conditions

13:10 Boat returned

Attempting to sample middle of channel

Six attempts at G15

Current method not suited to bed conditions

13:30 Return to shallower sampling area

13:55 Sample G6 taken with scoop

Requires two people due to dept and current

Photo taken 101-0706

14:30 All RHS shallower samples taken

G1, G6, G10, G13, G16

Flat Bedrock

Mixed Cobbles

Returned to centre of river

15:30 Move to G3 and G8

Six attempts at each location

Very difficult to sample

16:10 End of sampling

Six attempts at each location

Rocky river bed

Small amounts of clay

17:00 Boat and equipment demobilised due to gate locking at 17:00

Friday 19th October 2018

08:00 Depart Hotel

08:50 Arrive at Kegworth

09:30 Toolbox talk, mobilisation of boat complete

09:40 Boat reaches sample area

09:50 Arrive at Sample Site by foot

10:05 First sample K29 complete

High amounts of organic matter

Three drops of VV

10:10 K28 sampled

10:15 K26 Sampled

10:18 Sampler maintenance – round trip to vehicle

10:32 Sampling recommenced
10:50 K30 sampled – difficult
10:55 K25 sampled – rocky
11:10 K24 sampled – rocky
11:30 K21 & K23 Sampled – rocks and pebbles
11:50 K20 & K22 Sampled – rocks and pebbles
12:18 K19 concrete on river bed, K18 sampled
12:29 Level logger retrieved
13:00 Finished K15, K16 and K17 (concrete at 17)
13:20 Sample drop off to vehicle and collect lunch from vehicle
13:45 Completed K13 and K15
14:06 Completed K12 – GPS signal low
14:46 K9, K10 and K11 Completed – K9 Rock rubble from bank
15:20 K8 and 5 Completed – K8 had 10 attempts, K5 with a scoop and K7 was a N/S
16:10 K2, K3, K4 and K6 sampled K1 no sample
16:30 K29 taken from new location and sampling complete
17:00 Demobilisation complete
18:15 Returned to Hotel – via supply pick-up

Saturday 20th October 2018

- 7:00 Depart Hotel
- 7:50 Arrive at site after breakfast and refuelling (ferry boat inn)
- 8:20 Toolbox talk, mobilisation complete
- 9:35 Boat returned with samples
- 10:00 Relocate to Lock side
- 10:05 Boat redeployed
- 10:45 Level logger retrieved
- 11:00 Sampler maintenance
 - 14/21 sample sites visited
- 11:30 17/21 sample sites visited
- 12:10 sampling complete
 - Boat deployed to Gunthorpe lock
- 12:20 Vehicle repacked and deployed to Gunthorpe Lock
- 12:50 Arrival at Gunthorpe
- 13:25 Boat deployed

G5 sample, very deep and rocky bed

15:00 Sampling complete

15:30 Demobilisation complete

15:40 Depart Gunthorpe

18:05 Arrival in Norfolk

18:30 Vehicle unpacked.