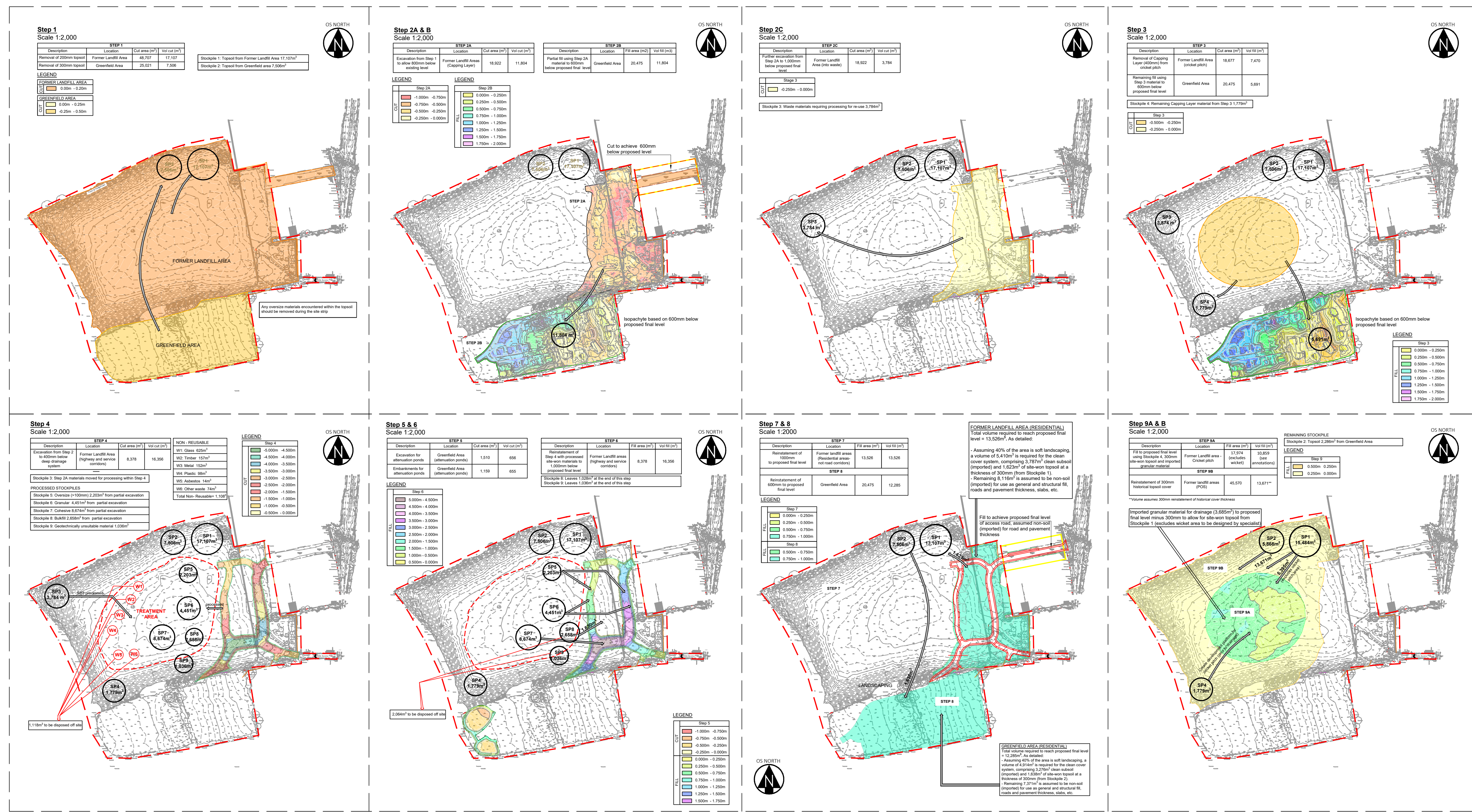




EXTRACT TABLE 6/1 to SHW 5600: Earthwork materials, typical use and compaction requirements as shown in clause 612 & additional notes			
Earthworks Class of expected materials on site	Typical Use envisaged	Compaction Control and Key Performance Requirements	Potential Source
Class 1A General Granular Fill (Wet Graded)	Earthwork fill to raise levels underlying highway corridors.	SHW Table 6/4 Method 2, modified as required to ensure minimum 95% MDD and maximum 10% air voids content. *	Granular fill, 'crush' identified in stockpiles, comprising approximately 4.451m ³ of the in-situ stockpiled fill on site.
Class 1C General Granular Fill (Coarse Graded)		SHW Table 6/4 Method 5, modified as required to ensure minimum 95% MDD and maximum 10% air voids content. *	Imported Fill.
Class 2A General Wet Cohesive Fill	Earthwork fill to raise levels within development plots and communal soft landscaped zones	SHW Table 6/4 Method 1 or 2, modified as required to ensure MC between 95 - 105% MDD and <5% air voids with a minimum Cu of 50kPa.	General 'Made Ground' identified in stockpiles, comprising approximately 8674m ³ of the in-situ stockpiled fill on site.
Class 2B General Dry Cohesive Fill			
Class 2C General Stony Cohesive Fill			
Class 4	Landscaping features.	SHW Table 6/4 Method 1, only needs to achieve CBR 9% if granular or Cu 50kPa if cohesive. Does not need density tests or CBRs.	Granular or Cohesive fill from stockpiles.
Class 6F2 Selected Granular Material (Coarse Grading)	Capping and working platform	SHW Table 6/4 Method 6, end product to be tested to show 95% MDD or density corresponding to air voids < 15% and CBR of 15%.	Granular fill, 'crush' identified in stockpiles, comprising approximately 4.451m ³ of the in-situ stockpiled fill on site.
Class 6F5 Selected Granular Material (Coarse Grading) - Imported onto the site	Capping and working platform	SHW Table 6/4 Method 6, end product to be tested to show 95% MDD or density corresponding to air voids < 15% and CBR of 15%	Imported Fill.
* In-situ testing locations to be confirmed by Project Engineer / Validation of site material to be according to Table 1/5, 6/1 and 6/2 to SHW 5600			

EXTRACT OF TABLE 6/2 to SHW 5600: Grading Requirements for Acceptable Earthwork Materials															
Class	Size (mm)				Size (mm) BS Series								Size (microns) BS Series		Size (microns)
	500	300	125	90	75	37.5	28	20	14	10	6.3	5	3.35	2	1.18
1A	100	95-100													<15
1C	100	10-85													0-25
2A	100														15
2B	100														15
2C	100														15-80
6F2	100	80-100	65-100	45-100						10-45			0-25		0-12

EXTRACT OF TABLE 6/5 to SHW 5600: Grading Requirements for Acceptable Earthwork Materials (Imported)															
Class	Size (mm)				Size (mm) BS Series								Size (microns) BS Series		Size (microns)
	500	300	125	80	63	40	31.5	20	16	10	8	6.3	4	2	1
6F5	100	75-99		50-99		30-75	15-60						0-35		0-12

TABLE A: Strata	
Topsoil: Firm, light brown slightly sandy gravelly clay.	
Cohesive (recent construction waste): Brown to grey slightly sandy gravelly clay and concrete.	
Cohesive (pits backfill): Firm to stiff, locally soft, dark grey to black slightly sandy slightly gravelly clay with anthropogenic materials.	
Kimmeridge Clay Formation: Firm brown to yellow slightly sandy clay.	

TABLE 6/4: Method Compaction for Earthworks Materials: Plant and Methods (Method 1 to Method 6)

Type of Compaction Plant		Ref. No.	Category	Method 1 D N#	Method 2 D N#	Method 3 D N#	Method 4 D N#	Method 5 D N#	Method 6 N for D = 110 mm N for D = 150 mm N for D = 250 mm						
Smoothed wheeled roller (or vibratory roller operating without vibration)	1	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg	125	8	125	10	125	10*	175	4	unsuitable	unsuitable	unsuitable		
	2		125	6	125	8	125	8*	200	4	unsuitable	16	unsuitable	unsuitable	
	3		150	4	150	8	150	8	300	4	unsuitable	8	16	unsuitable	
Grid roller	1	Mass per metre width of roll: over 2700 kg up to 5400 kg over 5400 kg up to 8000 kg over 8000 kg	150	10	150	12	150	12	250	4	unsuitable	unsuitable	unsuitable		
	2		150	8	125	12	unsuitable	325	4	unsuitable	20	unsuitable	unsuitable		
	3		150	4	150	12	unsuitable	400	4	unsuitable	12	20	unsuitable		
Deadweight tamping roller	1	Mass per metre width of roll: over 4000 kg up to 6000 kg over 6000 kg	225	4	150	12	250	4	350	4	unsuitable	12	20	unsuitable	
	2		300	5	200	12	300	3	450	4	unsuitable	8	12	20	
Pneumatic-tyred roller	1	Mass per wheel: over 1000 kg up to 1500 kg over 1500 kg up to 2000 kg over 2000 kg up to 2500 kg over 2500 kg up to 4000 kg over 4000 kg up to 6000 kg over 6000 kg up to 8000 kg over 8000 kg up to 12000 kg over 12000 kg	125	6	unsuitable	150	10*	240	4	unsuitable	unsuitable	unsuitable	unsuitable		
	2		150	5	unsuitable	unsuitable	300	4	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		
	3		175	4	125	12	unsuitable	350	4	unsuitable	unsuitable	unsuitable	unsuitable		
	4		225	4	125	10	unsuitable	400	4	unsuitable	unsuitable	unsuitable	unsuitable		
	5		300	4	125	10	unsuitable	unsuitable	unsuitable	12	unsuitable	unsuitable	unsuitable		
	6		350	4	150	8	unsuitable	unsuitable	unsuitable	12	unsuitable	unsuitable	unsuitable		
	7		400	4	150	8	unsuitable	unsuitable	unsuitable	10	16	unsuitable	unsuitable		
	8		450	4	175	6	unsuitable	unsuitable	unsuitable	8	12	unsuitable	unsuitable		
Vibratory tamping roller	1	Mass per metre width of a vibrating roller: over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	100	12	100	12	150	12	100	10	unsuitable	unsuitable	unsuitable		
	2		125	12	125	12	175	12*	175	8	unsuitable	12	unsuitable	unsuitable	
	3		150	12	150	12	200	12*	unsuitable	unsuitable	8	12	unsuitable		
	4		150	9	150	9	250	12*	unsuitable	400	5	6	10	unsuitable	
	5		200	9	200	9	275	12*	unsuitable	500	6	6	10	unsuitable	
	6		225	9	225	9	300	12*	unsuitable	600	6	4	8	unsuitable	
	7		250	9	250	9	300	9*	unsuitable	700	6	3	7	12	
	8		275	9	275	9	300	7*	unsuitable	800	6	3	6	10	
	Vibratory roller		1	Mass per metre width of vibratory roll: over 270 kg up to 450 kg over 450 kg up to 700 kg over 700 kg up to 1300 kg over 1300 kg up to 1800 kg over 1800 kg up to 2300 kg over 2300 kg up to 2900 kg over 2900 kg up to 3600 kg over 3600 kg up to 4300 kg over 4300 kg up to 5000 kg over 5000 kg	unsuitable	75	16	150	16	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
			2		unsuitable	75	12	150	12	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable
3		100	12		125	10	150	6	125	10	unsuitable	16	unsuitable	unsuitable	
4		125	8		150	8	200	10*	175	4	unsuitable	6	16	unsuitable	
5		150	4		150	4	225	12*	unsuitable	unsuitable	4	6	12		
6		175	4		175	4	250	10*	unsuitable	400	5	3	5	11	
7		200	4		200	4	275	8*	unsuitable	500	5	3	5	10	
8		225	4		225	4	300	8*	unsuitable	600	5	2	4	8	
9		250	4		250	4	300	6*	unsuitable	700	5	2	4	7	
10		275	4		275	4	300	4*	unsuitable	800	5	2	3	6	
Vibrating plate compactor	1	Mass per m ² of base plate: over 880 kg up to 1100 kg over 1100 kg up to 1200 kg over 1200 kg up to 1400 kg over 1400 kg up to 1800 kg over 1800 kg up to 2100 kg over 2100 kg	unsuitable	unsuitable	75	6	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		
	2		unsuitable	75	10	100	6	75	10	unsuitable	unsuitable	unsuitable	unsuitable		
	3		unsuitable	75	6	150	6	150	8	unsuitable	unsuitable	unsuitable	unsuitable		
	4		100	6	125	6	150	4	unsuitable	unsuitable	8	unsuitable	unsuitable		
	5		150	6	150	5	200	4	unsuitable	unsuitable	5	8	unsuitable		
	6		200	6	200	5	250	4	unsuitable	unsuitable	3	6	12		
Vibro-tamper	1	Mass: over 50 kg up to 65 kg over 65 kg up to 75 kg over 75 kg up to 100 kg over 100 kg	100	3	100	3	150	3	125	3	unsuitable	4	8	unsuitable	
	2		125	3	125	3	200	3	150	3	unsuitable	3	6	75	
	3		150	3	150	3	225	3	175	3	unsuitable	2	4	10	
	4		225	3	200	3	225	3	250	3	unsuitable	2	4	10	
Power rammer	1	Mass: 100 kg up to 500 kg over 500 kg	150	4	150	6	unsuitable	200	4	unsuitable	unsuitable	5	8	unsuitable	
	2		275	8	275	12	unsuitable	400	4	unsuitable	5	8	14		
Dropping-weight compactor	1	Mass of rammer over 500 kg weight drop: over 1 m up to 2 m over 2 m	600	4	600	8	450	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	
	2		600	2	600	8	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable	unsuitable		

Earthwork Specification General Notes

1. All dimensions are to be checked on the site before the commencement of works. Any discrepancies are to be reported to Hydrotek for verification.

2. The Contractor is responsible for providing a weekly summary providing an up-to-date review of the works completed (it is recognised by Hydrotek that tests may have been carried out in the preceding week for which no results have been provided). However the reference and type should be included in the summary in terms of compliance testing. Weekly reporting shall include the following records, to be provided by midday of the first working day per week.

• Sequential test number

• Date of test

• Coordinated position to include easting and northing, correct to National Grid Reference

• Reduced level, to metres above Ordnance datum, referencing the local datum point used.

• Site reference

• Test grid reference

• Layer number (during placement of fill)

• Test type

• Whether results are Draft (before the issue of the certificate) or Final (certificate issued and received by the Contractor); and

• The results of the testing, compliance with the Specification and any comments relating to the test.

3. At the completion of the Earthworks, the Contractor is responsible for providing a factual Validation Report, covering all activities which have been completed. The Validation Report shall include the following records, to be provided by midday of the first working day per week.

• Daily record sheets to include a summary of the day's activities;

• Progress photographs;

• General description of the works completed, including any earthworks, excavations (including excavations of hard obstructions or foundations), placement and compaction methodology and plant used.

• Detailed weather conditions;

• Formation and foundation treatment, including drainage and treatment of soil areas;

• Plant, personnel and visitors present;

• Aspects relating to Health & Safety, Environment control;

• Waste transfer notes;

• Application of acceptability criteria and summary of control test results for each specific earthworks material placed during the earthworks operations.

• Chemical and geotechnical test certificates and monitoring data including location and level with associated drawings;

• As-Built surveys, including base of excavations to include drawings;

• Coordinates, levels, invert levels and diameters of services remaining on site;

• Drawings showing the location and level of each specific earthworks material placed during the earthworks operations, any feature or operation relevant to the earthworks including any instrumentation and the location of trial areas and control tests; and

• All correspondence with the Statutory Authorities.

4. All earthworks are to be undertaken in accordance with BS 6031: 2009 Code of practice for earthworks and BS EN 12342 (Hydraulically bound and unbound materials for use in civil engineering) using the Specification for Highway Works as the model specification. Additional reference shall be made to the recommendations and model specification for earthworks defined in BRE B67 Building on fill, geotechnical aspects version 3: 2015. Site specific testing requirements for fill materials are as detailed on this drawing and should be read in conjunction with the above publications.

5. Where there is a perceived conflict in requirements between the various documents detailed above and the content of this drawing, the Contractor shall assume the most onerous requirement and immediately inform Hydrotek as to the exact requirements to be met.

6. The Contractor shall be responsible for ensuring all testing is undertaken, and is permitted to self-certify the works, in accordance with the requirements of the Specification. The right of self-certification is not to be delegated or extended to any of the following parties:

• Subcontractors, employed by the Contractor

• Service owners contractors undertaking backfilling of diverted service trenches.

• Other third party contractors undertaking works on the site

7. Should any material be placed which has not been given prior written approval from the Engineer, the Contractor will have done this at their own risk and they will be responsible for any and all remedial works required to rectify the situation. All costs associated with this remedial work are to be borne by the Contractor

8. All works and associated costs relating to the control and management of water on site, from existing proposed or redundant courses or from any source including groundwater, rainfall and surface water shall be undertaken in accordance with the Flood Risk Strategy document published by North Somerset Council

9. Where in-situ testing is required "per layer" this refers to material placed in one layer in one working day. Therefore, within the context of verification, earthworks layers cannot span multiple days

10. (U) indicates that a UKAS or MCRTS test report or certificate is required

11. Unless otherwise shown in the tables forming this specification, tests and test certificates for works, goods or materials are to be undertaken on any one class are required for all such work, goods or materials in the works.

12. Frequency of testing applies to each separate earthworks material within each of the earthworks material class.

13. Unless specifically stated to the contrary, all samples used in the testing shall be taken from materials after delivery to the site for incorporation into the works.

14. The Contractor's attention is drawn to the requirements of the relevant HA Series 600 Specification Appendices for the form of all deliverables, storage of test records and storage of records of materials imported to and exported from site.

15. Where source approval is specified, source testing shall be carried out at each quarry or stockpile used for supply to site and at each location of borrowable borrowings used for on-site material.

Extract of Table 1/5 to SHW600: Acceptance and In-Situ Testing to be undertaken by the Contractor

Class	Work, Goods or Materials	Test	Frequency	Test Certificate	Comments	
Series 600 601, 631 to 637, 640	Earthworks					
	Acceptable Limits					
1A 1C	General Granular Fill (External Areas)	Class	General Description			
		MC (U)	1 per 2,000m ³			
		Grading (U) & Uniformity Coefficient	1 per 2,000m ³			
		OMC(MDD) (U) (Vib Hammer)	1 per 2,000m ³			
		Remoulded CBR at NMC	1 per 2,000m ³			
		TRL 447 Sulphate Suite including WS, OS, TPS, OM	1 per 2,000m ³			
	General Cohesive Fill (External Areas)	Chemical Suite	As Remediation MS			
		MC (U)	1 per 2,000m ³			
		PL, LL, PI (U)	1 per 2,000m ³			
		Grading (U)	1 per 2,000m ³			
		MCM/MCV Calibration (U) (where MCV used in Clause 612)	1 per 2,000m ³			
		OMC(MDD) to include HSV at each compaction & Particle Density (U) (2.5kg for 2A & 2C or 4.5kg for 2B)	1 per 2,000m ³			
2A 2B 2C	General Cohesive Fill (External Areas)	Underdrained Triaxial Shear Strength/HSV Calibration (where HSV used in Clause 612)	Source Approval			
		Remoulded CBR at NMC	1 per 2,000m ³			
		Remoulded Undrained Shear Strength (HSV)	1 per 2,000m ³			
		TRL 447 Sulphate Suite including WS, OS, TPS, OM	1 per 2,000m ³			
		Chemical Suite	As Remediation MS			
		MC (U)	1 per 5,000m ³			
4	Landscape Fill	Grading (U)	1 per 5,000m ³			
		Remoulded Undrained Shear Strength (HSV/MCV)	1 per 5,000m ³			
		MC (U)	1 per 1,000m ³			
		Grading (U) & Uniformity Coefficient	1 per 1,000m ³			
		OMC(MDD) (Vib Hammer)	1 per 1,000m ³			
		Los Angeles Coefficient	1 per 1,000m ³			
	6F2 6F5	Selected Granular Fill (Working platform, capping)	Remoulded CBR at NMC	1 per 1,000m ³		
			Effective Stress (σ' and c')	Source Approval		
			TRL 447 Sulphate Suite including WS, OS, TPS, OM (Only where hydraulic binder is used)	TBC		
			Constituent Parts to include bitumen content (Recycled Aggregate)	Source Approval		
			Chemical Suite	Appendix 6/14 & 6/15		
602	Earthworks material beneath the surface of a road or external area with hardstanding, if within 450mm of the finished surface	Frost Heave (U)	Source Approval	For ALL material within 450mm of the finished level		
612	Method Placement	Class 1A, 1B, 2A, 2B, 3C,	Compaction Trial	1 per method per source		
			MCV	N/A		
			CBR (Mexe Probe) or Underdrained Shear Strength (HSV)	Initially every other layer on 20m x 20m grid		
			Dual Cycle Plate Load Test for equivalent CBR in accordance with Table 15-3 (BS 1377-9 and DMRB IAN 73/06 Rev 1)	Initially every 5th layer on 40m x 40m grid		
			Field Dry Density & Moisture Content	Initially every other layer on 20m x 20m grid		
			Underdrained Shear Strength (HSV)	Initially every other layer on 20m x 20m grid		
	End Product	Class 6	Compaction Trial (to include both plate load tests)	1 per method per source		
			Field Dry Density & Moisture Content (U)	Initially every other layer on 20m x 20m grid		
			Underdrained Shear Strength (HSV)	Initially every other layer on 20m x 20m grid		
			Dual Cycle Static Incremental Plate Load Test in accordance with Table 15-2			
			to alternate with			
			Dual Cycle Plate Load Test for equivalent CBR in accordance with Table 15-3 (BS 1377-9 and DMRB IAN 73/06 Rev 1)	Frequencies as below		
Plate load testing for equivalent CBR to be carried out in accordance with BS 1377-9 and DMRB IAN 73/06 Rev 1.						
Incremental plate load testing to be undertaken in accordance with BS 1377-9: 1990 and Clause 6.17.1 Method 1 of the Institution of Civil Engineers Specification for Ground Treatment, 1987						
Plate load testing designated at the subgrade level below structures, roads and external areas to also be undertaken in areas of cut at the frequency stated.						
Refer to Appendix 6/1 and 6/3 for minimum compaction requirements to be met.						
Compaction Trial to be completed in accordance with App 6/3 and be witnessed by the Employer and/or the Supervisor.						
Where the hand shear vane is used as compaction control it should be calibrated against the laboratory triaxial test.						
Where the Nuclear Density Gauge (NDG) is used for the measurement of density and moisture content it shall be calibrated for the particular source material under test.						