

Item No.	Inspection and Test Point	Detail	Acceptance / Conformance Criteria	Standard / Specification	Verifying Document	Testing Quantity Required (based from schedule qtys)	Verification Activity		Downer Conformance of Compliance Signoff		
							Activity	By	Downer Signature	Date	Comments / Closeout Details
SECTION 1 – PRE-CONSTRUCTION HOLD POINTS											
1.1 General											
1.1.1	Earthworks Methodology	The Contractor shall submit the construction and QA methodology, for each element of Earthworks, incl construction, Site Access, dewatering, wet weather, testing, inspection and hold points for review and approval prior to works.	Engineers Approval	Appendix V	Approved Methodology	Prior to Earthworks	HP	ENG			
1.1.2	Ecology Sign Off	Confirmation from Ecology that earthworks can proceed	Email	Internal Hold Point	Email from Ecology NZ	Prior to Earthworks	H	QM			
1.1.3	Erosion & Sedimentation Controls	Confirm that Erosion and Sedimentation Controls are in place prior to earthworks proceeding	As-built Completed	Internal Hold Point	ESC As-built	Prior to Earthworks	H	QM			
1.2 Imported Material Testing - Source Property Tests for Type A1 Imported Structural Fill - ALL TESTS TO BE NO OLDER THAN 3 MONTHS											
1.2.1	Weathering Resistance	NZS4407:2015, Test 3.11 - The Weathering Quality Index of Coarse Aggregate	AA, AB, AC, BA, BB, or CA	Appendix XVIII PS 16.5.5 Appendix V	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.2.2	Los Angeles Abrasion Test	NZS4407:2015, Test 3.12 - The Abrasion Resistance of Aggregate by use of the Los Angeles Machine	50%	PS 16.5.5 Appendix V	IANZ Accredited Report	1 Test Required Results to Engineer 2 wks before importing	HP	ENG			
1.2.3	Particle Size Distribution	NZS4407:2015, Test 3.8.1 - Particle Size Distribution	No Particles >200mm Maximum fines 10% passing 75micron sieve	Appendix XVIII PS 16.5.5 Appendix V	IANZ Accredited Report	Stockpile Size (m3): 0-400 - 2 tests 400-1,500 - 3 tests 1,500-4,000 - 4 tests >4,000 - 1 test for each additional 1,000m3 Results to Engineer 2 wks before importing	HP	ENG			
1.2.4	Maximum Dry Density and Optimum Water Content	NZS4402:1986, Test 4.1.2 - Heavy Compaction Test	Report Value Only	Appendix XVIII Appendix V	IANZ Accredited Report	1 Test Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.2.5	Soaked CBR	NZS4407:2015, Test 3.15 The California Bearing Ratio (CBR)	>25%	PS 16.5.5 Appendix V	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.2.6	Solid Density	NZS4407:2015, Test 3.7.1 - The Solid Density of Aggregate Particles	Report Value Only	Appendix XVIII Appendix V	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.2.7	Crushing Resistance	NZS4407:2015, Test 3.10 - The Crushing Resistance of Coarse Aggregate Under a Specified Load	>100KN	Appendix XVIII Appendix V	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			

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1.3 Pumice Sand Fill											
1.3.1	Particle Size Distribution	NZS4407:2015, Test 3.8.1 - Particle Size Distribution	Report Value Only	PS 16.5.12	IANZ Accredited Report	Number of Tests Required? Stockpile size: 0 to 400m3 – 2 tests 400 to 1500m3 – 3 tests 1500 to 4000m3 – 4 tests >4000m3 – 1 test for each additional 1,000m3 Results to Engineer 2wks before importing	HP	ENG			
1.3.2	Maximum Dry Density and Optimum Water Content	NZS4402:1986, Test 4.1.2 - Heavy Compaction Test	Report Value Only	PS 16.5.12	IANZ Accredited Report	1 Test Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.4 Drainage Aggregate - Used in Subsoil Trench Drains & Drainage Blankets											
1.4.1	Crushing Resistance	NZS4407:2015, Test 3.10 - The Crushing Resistance of Coarse Aggregate Under a Specified Load	>100KN	Appendix XVIII	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.4.2	Particle Size Distribution	NZS4407:2015, Test 3.8.1 - Particle Size Distribution	Max Particle Size 53mm Max 10% passing 13.2mm sieve	Appendix XVIII	IANZ Accredited Report	1 Test per 100m3 Results to Engineer 2wks before importing	HP	ENG			
1.4.3	Weathering Resistance	NZS4407:2015, Test 3.11 - The Weathering Quality Index of Coarse Aggregate	CA or better	Appendix XVIII PS 16.5.5 Appendix V	IANZ Accredited Report	2 Tests Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.5 Geotextile											
1.5.1	Geotextile	The Contractor shall submit the full details of the filter fabric they propose to use to the Engineer for approval prior to installation.	Engineers Approval	PS 16.5.7 Appendix V	Data Sheets	Results to Engineer for Approval	HP	ENG			
1.6 Topsoil Source Testing											
1.6.1	Laboratory Testing for Soil Suitability	Soil Test Results from Hill Laboratories to confirm that topsoil suitable to for reuse Soil Reaction Electrical Conductivity Mechanical Analysis (texture) Stone Content Nutrient Levels of nitrogen, available phosphorus, available potassium and available magnesium Organic Matter Content Check for Toxic or Hazardous substances	Engineers Approval	NZTA P39:2013 3.1	Hill Laboratories Test Report	10 equal samples taken from site, mixed together, then 1kg of soil sealed into a plastic bag and sent to lab for sampling	I	SE			
1.7 Rock Ballast Aggregate											

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1.7.1	Crushing Resistance	NZS4407:2015, Test 3.10 - The Crushing Resistance of Coarse Aggregate Under a Specified Load	>100KN	PS 16.5.15	IANZ Accredited Report	1 Test Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
1.7.2	Particle Size Distribution	NZS4407:2015, Test 3.8.1 - Particle Size Distribution	Max Particle Size 130mm Max 5% passing 19mm sieve Grading Sieve Size % Passing 130mm 100 100mm 70-80 63mm 0-50 37.5mm 20-25 19mm 0-5	PS16.5.15	IANZ Accredited Report	1 Test Per Material, Per Source Results to Engineer 2 wks before importing	HP	ENG			
SECTION 2 – SITE WON LANDSCAPING FILL											
2.1 Type A3 Material - Site Won Landscaping Fill - Field Test											
2.1.1	On Site track-able Testing	Fine grained Type A3 site won materials may be considered suitable for use as landscape fill providing that it is 'track-able' by the contractor's plant. This shall be determined before Sampling.	Trackable by Contractors Plant	PS 16.5.5	Visual Site Record	Engineers Approval	R	ENG			
2.1.2	Shear Vane	NZ Geotechncial Society 2001 - Guideline for Hand Held Shear Vane Test Fine grained Type A3 site won materials may be considered suitable for use as landscape fill providing that it meets minimum shear vane strength of 80kPa	Min >80kPa	PS 16.5.5	Shear Vane Report	Results to Engineer for Approval	R	ENG			
2.2 Type A3 Material - Site Won Landscaping Fill - Placement											
2.2.1	Placement of Site Won Landscaping Fill	To be visually free of deleterious material, litter etc, and track rolled for compaction, with no slumping once placed	Visual Inspection	PS 16.5.6	Visual Site Record	As Required	V	SE			
SECTION 3 – CUT SUBGRADE TESTING											
3.1 Cut Subgrade Testing - All Soils											
3.1.1	Proof Roll	Visual Inspection of Proof Roll	Displacement <15mm	Appendix XVIII	Visual Observation	Across stripped area	V	SE			
3.1.2	Cut Subgrade Inspection	Engineer to inspect all foundation surface inspections	Engineers Approval	Appendix V	Visual Observation	Across stripped area	HP	ENG			
3.2 Cut Subgrade Testing - Cohesive Soils											
3.2.1	Cut Subgrade Testing - Cohesive Soil Shear Vane	NZ Geotechncial Society 2001 - Guideline for Hand Held Shear Vane Test This test shall be undertaken at the design subgrade level to a depth of 2-3m below the design subgrade level	Average Minimum SU: > 60kPa Single Test Min SU: >50kPa	Appendix XVIII	Shear Vane Report	4 test per 400M2	I	SE			

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3.2.2	Cut Subgrade Testing - Cohesive Soil Scala Penetrometer	NZS4402:1988, Test 6.5.2 - Dynamic Cone Penetrometer Scala penetrometer testing to be undertaken instead of shear vane tests where shear vane is unable to penetrate subgrade material	Minimum 3 blows per 100mm penetration	Appendix XVIII	Scala Report	4 test per 400M2	I	SE			
3.3 Cut Subgrade Testing - Granular Soils											
3.3.1	Cut Subgrade Testing - Granular Soil Scala Penetrometer	NZS4402:1988, Test 6.5.2 - Dynamic Cone Penetrometer This test shall be undertaken at the design subgrade level to a depth of 2-3m below the design subgrade level	Minimum 3 blows per 100mm penetration	Appendix XVIII	Scala Report	4 test per 400M2	I	SE			
3.4 Foundation Subgrade Hold Point Release											
3.4.1	Release of Hold Point	To release the subgrade hold point and be able to start placing fill, the Contractor shall provide written certification that all insepcted and tested subgrade comlies with the requirements in PS 16.6	Engineers Approval	PS 16.9.3	Written Certification	Engineers Approval	HP	ENG			
SECTION 4 – CUT SLOPE INSPECTIONS											
4.1 Cut Slope Inspection											
4.1.1	Cut Side Slope Inspection	Inspection records to include photographs, logged soils (to NZ Geotechnical Guidelines) and shear vane testing	Engineers Approval	PS 16.6.4	Site Records	As per Engineer	WP	ENG			
4.1.2	Cut Slope - Soil Log	Soils to be logged to NZ Geotechnical Guidelines		PS 16.6.4	Soil Log		I	SE			
4.1.3	Cut Slope - Shear Vane Test	NZ Geotechncial Society 2001 - Guideline for Hand Held Shear Vane Test This test shall be undertaken at the design subgrade level to a depth of 2-3m below the design subgrade level	Average Minimum SU: > 60kPa Single Test Min SU: >50kPa	PS 16.6.4	Shear Vane Report		I	SE			
4.1.4	Drainage Measures if Seepage Encountered	Borehole Drains or ballasting may be required, to be directed by Engineer	Engineers Approval	PS 16.6.4	Engineer approval	As per Engineer	I	ENG			
4.1.5	Design and Grade Check	Confirm cut slopes have been correctly excavated to design and grade		PS 16.7.1	Survey Records		D	SV			
4.1.6	Stabilisation of Cut Slope Surface	Cut slope surfaces to be topsoiled and grass seeded or planted as soon as possible		PS 16.6.4	Site Records		C	SE			
4.2 Foundation Subgrade Hold Point Release											
4.2.1	Release of Hold Point	To release the subgrade hold point and be able to start placing fill, the Contractor shall provide written certification that all insepcted and tested subgrade comlies with the requirements in PS 16.6	Engineers Approval	PS 16.9.3	Written Certification	Engineers Approval	HP	ENG			
SECTION 5 – UNDERCUT TO WASTE & BACKFILL											
5.1 Undercut to Waste & Backfill											
5.1.1	Undercut Surface Inspection	Engineer to inspect undercut surface	Engineers Approval	Appendix V	Engineers Approval	Across stripped area	WP	ENG			
5.1.2	Placement of Geotextile on Undercut	Geotextile to be placed across the undercut base and up the sides, with joints overlapped by 500mm minimum	Engineers Approval	PS 16.6.4 TNZ F/7: 2003 8.3			WP	ENG			
5.1.3	Subsoil Drain inspection	Subsoils to be placed at base of cuts where directed by the Engineer	Engineers Approval	PS 16.6.4		No less than 24 hours prior to placement of backfill	WP	ENG			
5.2 Foundation Subgrade Hold Point Release											
5.2.1	Release of Hold Point	To release the subgrade hold point and be able to start placing fill, the Contractor shall provide written certification that all insepcted and tested subgrade comlies with the requirements in PS 16.6	Engineers Approval	PS 16.9.3	Written Certification	Engineers Approval	HP	ENG			

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SECTION 6 – COMPACTION OF IMPORTED FILL											
6.1 Placement of Geotextile Under Structural Fill											
6.1.1	Placement of Geotextile	A layer of Class B Geotextile Fabric to be placed between cut surface and imported A1 Structural Fill with 500mm overlaps	Visual Inspection	NTC084	Visual Observation	As Required	I	SE			
6.2 Compaction Requirements for Type A1 Imported Structural Fill (Granular Bulk Fill, GAP40, GAP65)											
6.2.1	Compaction - Clegg Hammer	ASTM D5874-16:2016 Clegg Hammer Testing	Structural Fill Min CIV 18 Ave CIV 20 Non-Structural Fill Min CIV 10 Max CIV 12	Appendix XVIII	Clegg Hammer Report	1 set (5 tests per 5x5m grid) per 1000m2 of placed per area worked each day, <u>per lift</u>	I	SE			
6.2.2	Compaction - NDM	NZS4407:2015, Test 4.3 Nuclear Moisture Density Gauge (Backscatter Mode)	Ave >95% of MDD Min >92% of MDD Non Granular Material Max Air Voids 8%	Appendix XVIII	IANZ Accredited Report	1 set (5 tests) per 400mm lift (every 2nd lift) of fill per 1000m2 of placed	I	SE			
6.2.3	Compaction Trials	The Contractor shall carry out compaction trials of the various soil types and combinations on site, and any imported fill materials, using different layer thicknesses, types of rollers and conditioning plant (ie construction discs and scarifiers). The trials shall be conducted over the duration of the earthworks operation with the objective of determining the most suitable and efficient techniques to meet the compaction requirements. The trial details, test data and conclusions shall be reported and copied to the Engineer within five days of completion of each trial.	Engineers Approval	PS 16.6.5	Trial Results		R	ENG			
6.3 Compaction Requirements for Pumice Sand Fill											
6.3.1	Compaction - Structural Fill Scala Penetrometer	NZS4402:1988, Test 6.5.2 - Dynamic Cone Penetrometer Scala penetrometer testing to be undertaken instead of shear vane tests where shear vane is unable to penetrate subgrade material	Minimum 5 blows per 100mm penetration	PS 16.5.12	Scala Report	Minimum 1 test per 500m3 of filling evenly distributed over the extent and depth of the filling. A minimum of 1 test per 500mm lift or part thereof to be completed through the full lift thickness.	I	SE			
6.3.2	Compaction - Structural Fill NDM	NZS4407:2015, Test 4.3 Nuclear Moisture Density Gauge (Backscatter Mode)	Ave >95% of MDD Min >92% of MDD	PS 16.5.12	IANZ Accredited Report	1 set (5 tests) per 400mm lift (every 2nd lift) of fill per 1000m2 of placed	I	SE			
6.3.3	Pumice Sand Fill	Pumice Sand Material shall be contained with an outer layer of fill with a minimum thickness of 600mm. Must be Hardfill and/or imported Type A1 material and/or Type A2 material and/or Type A3 material		PS 16.5.12	Site Records		E	SE			
SECTION 7 – TOPSOIL PLACEMENT											
7.1 Cut and fill embankments											
7.1.2	Topsoil Placement on cut and fill embankments	Confirmation of thickness and material suitability	Meets spec and thickness requirements as per drawings	PS 16.6.3 b)	Visual Observation	Once per lot after topsoil re spread	I	SE			
SECTION 8 – SETTLEMENT INSTALLATION & MONITORING											
8.1 Settlement Monitoring											
8.1.1	Instrument Reading Notice	The Contractor shall inform the Engineer two days in advance of planned instrument readings so that the Engineer may observe the work.	2 days notice to Eng	PS 16.8.2	Site Records	Every Time	I	SE			

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8.1.2	Results Submitted to Engineer	Results will be submitted to the Engineer within 1 day of reading the instruments	To Engineer within 1 day of Reading	PS 16.8.2	Site Records	Every Time	I	SE			
8.1.3	Baseline Readings	The Contractor shall take 3 sets of baselines readings from all instruments at 2 day intervals	Engineers Approval	PS 16.8.2	Site Records	Every 2 days	I	SE			
8.1.4	Readings During Active Fill Placement	During active fill placement, the Contractor shall read all monitoring plates twice a week or every 1 metre of fill whichever is more frequent	To Engineer within 1 day of Reading	PS 16.8.2	Site Records	Twice a week	R	SV			
8.1.5	Readings During No Active Earthworks in Area	The Contractor shall read all monitoring plates weekly if there is no active earthworks taking place in the area	To Engineer within 1 day of Reading	PS 16.8.2	Site Records	Weekly	R	SV			
8.1.6	Settlement Monitoring Termination	The criteria for terminating the embankment preload are either: Three consecutive measurements indicating the t90 settlement value has been achieved, A rate of settlement less than 10% of the maximum rate measured immediately after the fill was completed. The settlement readings shall be evaluated by the Engineer to assess the need to extend the monitoring.	Either: 3 Consecutive Measurements showing T90 settlement value achieved Or Rate of settlement less than 10% of the maximum rate measured immediately after the fill was completed	PS 16.8.5	Site Records	Engineers Approval	HP	ENG			
SECTION 9 – AS-BUILTS											
9.1.1	As-Builts	As-Built records and drawings shall accurately record the layout and extents of all the work including all of the cuts and fills, monitoring instrumentation, ground improvements, and locations of foundation / subsurface drainage systems and their outlets.		PS 16.7.6	Survey Records	During Earthworks	D	SV			