CORRECT PIPE TRENCH DESIGN – ADVICE NOTE

The 1200-series SEQ Code standard drawings for embedment state (for sewerage):

TYPE 4 SUPPORT TO BE USED WHERE MIGRATORY NATIVE SOILS (SANDS & CLAYS) ARE ENCOUNTERED ADJACENT TO THE EMBEDMENT ZONE AND SINGLE SIZE AGGREGATE IS USED.

(The notes for water differ only in the trench type label being Type D rather than Type 4.)

i.e., filter fabric is required if the native soil is migratory.

1) Sand will migrate into the embedment because the Civil IPAM list requires the use of single-sized nominal 5mm or 7 mm crushed rock. Sand is non-cohesive material typically finer than 5mm (with more than half of the coarse fraction smaller than 2.36mm). Therefore, if the native soil is non-cohesive, a grading analysis will confirm whether the soil is a sand as classified in AS1726:2017 *Geotechnical Site Investigations*, which will require filter fabric.

2) Migratory clay can be identified using the Emerson Dispersion Index test or the Pinhole test. (Both tests must be carried out when soil bearing strength is less than 50 kPa. Otherwise the applicant can choose one or the other.)

3) The bearing strength test requirement is not only related to whether the native material is migratory. It will determine whether a more onerous trench design is required. If the native soil is very weak cohesive material, it can migrate into the trench and/or cause settlement of the pipe in the trench. A dispersion test does not identify that issue.

The Major Works Design submission form requires the applicant to carry out and submit the results of geotechnical investigations to justify the trench design. The following table is provided for the applicant's guidance.

Embedment support type must be based on representative NATA-certified geotechnical data from the proposed trench depth (to be submitted with the application).				
Dispersion		**Soil Bearing Strength (kPa)** *Note 3*	**Embedment support type**	**Requirement**
Emerson Class *Note 1*	**Pinhole Test** *Note 2*			
Not 1, 2 or 3	ND1 or ND2	> 50	Type 3/C is acceptable	NATA-certified test results only
1, 2 or 3	Not ND1 or ND2	> 50	Type 4/D minimum	NATA-certified test results only
Any value	Any value	< 50	Specific design	Interpretive report

Notes

1) AS 1289.3.8.1:2017 *Methods of testing soils for engineering purposes - Soil classification tests - Dispersion - Determination of Emerson class number of a soil*
2) AS1289.3.8.3:2014 *Soil classification tests – Dispersion – Determination of pinhole dispersion classification of a soil*
3) As specified on Drawing SEQ-SEW-1200-1 and SEQ-WAT-1200-1, a special geotechnical assessment is required when soil bearing strength is less than 50 kPa. The resultant interpretive report must recommend design parameter values to be adopted for the design.

The applicant must provide an interpretive report when native soil is identified as having less than 50 kPa bearing strength. The applicant's RPEQ design engineer must address the report's finding in the design:

- justifying that a more onerous design is not required; or
- justifying whether one of the details shown on SEQ Code standard drawings (such as SEQ-SEW-1204-1) would be adequate; or
- providing a specific design, including whether structural support and/or filter fabric would be appropriate and if so, the type(s) required.

Note that SEQ-SEW-1204-1 also requires filter fabric to fully wrap the embedment.

It is incumbent upon the certifying design RPEQ to ensure that the correct filter fabric is specified. Geotextile filter failures are grouped into four categories: inadequate design, atypical soils, unusual permeants, and improper installation, as follows:

1) poor fabric selection, poor fabric design, socked drainage pipe and reversing flow conditions.
2) fine grained soils, gap-graded soils, dispersive clays and ochre.
3) sludges, turbid water, alkaline water, leachates and agricultural waste liquids.
4) intimate contact and completely adhesive clogging of surfaces.

Reference:

Geotextiles and Geomembranes Volume 43, Issue 3, June 2015, Pages 272-281 *Lessons learned from geotextile filter failures under challenging field conditions* - Robert M. Koerner and George R. Koerner
https://www.sciencedirect.com/science/article/abs/pii/S0266114415000059

Example template Table of Contents for a geotechnical interpretive report

Purpose (trenched, HDD, and/or microtunnelled construction)
Site Description
Known Geology
Geotechnical risks to be considered
Borehole location survey
Field Investigations
Field Testing
Laboratory Testing
Remarks/Conclusions
Interpretation of Results/Engineering Appraisal
Recommended detailed design criteria and features
Recommended construction features and methodology
RPEQ certification
APPENDIX 1 –Geotechnical test types, numbers and locations tested
APPENDIX 2 –Survey locations of boreholes
APPENDIX 3 - Test Results and borehole logs
APPENDIX 3 – Boreholes overlaid on site plan
APPENDIX 4 - Borehole logs overlaid on pipeline longitudinal section