

Resource Piling Pte Ltd v Geospecs Pte Ltd  
[2013] SGHC 231

**Case Number** : Suit No 343 of 2011  
**Decision Date** : 05 November 2013  
**Tribunal/Court** : High Court  
**Coram** : Quentin Loh J  
**Counsel Name(s)** : Leo Cheng Suan and Teh Ee-von (Infinitus Law Corporation) for the plaintiff;  
Thomas Tan and Lai Kwan Wei (Haridass Ho & Partners) for the defendant.  
**Parties** : Resource Piling Pte Ltd — Geospecs Pte Ltd

*Tort – Negligence*

5 November 2013

Judgment reserved.

**Quentin Loh J:**

1 The plaintiff, Resource Piling Pte Ltd (“Resource Piling”), carries on the business of a piling contractor and also conducts related engineering works. The defendant, Geospecs Pte Ltd (“Geospecs”), is a company which specialises in soil investigation works, slope stabilisation, laboratory testing and related works. Resource Piling is suing Geospecs in tort, alleging that Geospecs had negligently carried out soil investigation works and had produced inaccurate borehole logs which Resource Piling relied upon to tender for a piling contract.

**Background facts to the dispute**

*The soil investigation contract*

2 HH Properties Pte Ltd (“the Developer”), wanted to develop two hotel blocks of 15 and 18-storeys, a 13-storey office block and basement car parks (“the Project”) on a site between Balestier Road and Ah Hood Road, Lot 09941T Mukim 17 (“the Site”). The Developer engaged Longrove & Associates (“Longrove”) as its consultant civil structural engineer and Longrove required the usual soil information and data to design the foundations. The Developer, through Longrove, called for tenders for the soil investigation. On 15 June 2009, Geospecs submitted a tender to carry out the required soil investigations works at the Site. On 7 July 2009, Longrove – on behalf of the Developer – awarded the soil investigation contract to Geospecs for the sum of \$20,500 excluding GST and rock coring (“the Soil Investigation Contract”).

3 The site was divided into two plots by a reserve along which the Mass Rapid Transit (“MRT”) line between Novena and Toa Payoh stations ran. The larger polygonal plot lay to the West of the reserve (“the Western Plot”) whilst the smaller polygonal plot lay to the East (“the Eastern Plot”). Geospecs conducted a field exploration programme from 20 August 2009 to 23 September 2009 and drilled a total of 11 boreholes on the Site, BH-1 to BH-11. On the Western Plot, BH-1 and BH-2 were to the west with BH-1 to the north of BH-2. BH-3 and BH-4 were in the centre, with BH-3 to the north of BH-4. BH-5, BH-6 and BH-7 were drilled in a line along the eastern edge with BH-5 to the north and BH-7 to the south. On the smaller Eastern Plot, BH-8 and BH-9 were on the western side with BH-8 to the north of BH-9, and on the eastern side, BH-10 was to the north of BH-11.

4 On 29 September 2009, Geospecs submitted its site investigation report ("the Report") – which included borehole logs for the 11 boreholes ("the Geospecs Logs") and the usual soil test data and analyses – to Longrove. The Geospecs Logs indicated that rock was only encountered in two of the boreholes, BH-5 and BH-6 (which were at the North-eastern corner of the Western plot), at depths of 18.00m and 18.70m respectively.

#### *The Piling Contract*

5 On 5 October 2009, Resource Piling received a letter from Longrove inviting tenders for the piling work which called for bored piles ranging from 600mm to 1200mm in diameter. The tender documents issued by Longrove ("the Tender Documents") contained the following general specifications ("the General Specifications"): [\[note: 1\]](#)

### **GENERAL SPECIFICATION**

...

#### 1.6 Site Investigation Report

An extract of the Soil Investigation Report is enclosed in the Appendix for information.

The Contractor should note that he has to satisfy himself as to the actual type of strata, geotechnical nature of the underlying stratum and ground conditions to be encountered during the works. It is to be at the risk of the Contractor if difficult ground conditions are actually encountered on the site.

If a Contractor wishes to perform investigation, which may involve excavation, sounding, or boring before submitting his tender he may do so at his own expense and arrangement could be made with the Engineer.

...

#### 1.10 Obstructions

An obstruction is defined as material the excavation of which requires additional effort. Upon encountering an obstruction, the Contractor shall immediately inform the Engineer and shall agree with the Engineer the method to be employed in removing the obstruction.

...

No claim for additional cost or time shall be allowed or excavation through obstructions and difficult ground conditions no matter how adverse or for the removal of boulders.

The Tender Documents also contained the following specifications relating to the bored piles ("the Bored Pile Specifications"): [\[note: 2\]](#)

### **SPECIFICATION FOR CAST IN PLACE CONCRETE BORED PILES**

...

#### 1.2 Site Conditions

1.2.1 The Contractor shall be deemed to have inspected the site and satisfied himself with regard to access, site conditions, existing buildings and structures.

1.2.2 The Contractor shall satisfy himself regarding subsoil conditions and the underground water table.

1.2.3 The soil report included in this contract is for the reference of the Contractor only. Neither the Consultants nor the Client accept responsibility for its accuracy or implications, if actual soil conditions are found to be different during progress of works.

No claims for extra cost or time shall be entertained on these grounds.

1.2.4 The Contractor may at his own cost and with the written approval of the Engineer, conduct additional soil tests if he so desires.

...

#### 4.2 Boring

...

4.2.4 Rates for boring shall be based on whatever ground conditions are found. No extra cost or time shall be allowed for boring through more difficult soil conditions than those envisaged by the Contractor.

...

The Geospecs Logs were included in the appendix to the Tender Documents but the full Report including the soil test data and analyses were not included. Resource Piling allegedly relied on the Geospecs Logs to calculate the tender price and submitted its tender to the Developer on 21 October 2009, the closing date for the tender, which was about 16 days after the date of the invitation to tender.

6 Resource Piling was successful and the Developer awarded the piling contract to Resource Piling for the sum of \$3,608,488.41 ("the Piling Contract") on 24 December 2009. The contract price was calculated according to per metre rates based on the provisional lengths of the bored piles. The material terms of the Piling Contract are set out below as follows: [\[note: 3\]](#)

#### **1. CONTRACT SUM**

...

The above price/unit rate shall include:

...

o) Any coring/chiselling/socketing into rock or use of special tools/equipments;

...

You agree that the Contract Sum shall cover your obligations under the Contract and all works

and expenditure necessary to carry out and bring the Works to completion. This shall include all ancillary works or processes which are indispensably necessary and may contingently become necessary to achieve completion whether described or otherwise in the face of practical difficulties or for other technical reasons.

..

## **2. CONTRACT DOCUMENTS**

The following letters and documents shall constitute integral parts of the Contract:-

...

c) M/S Longrove's Specifications ref. GS/1 to GS/11, BP/1 to BP/18 and Appendix for the Bore hole Log.

e) This letter. The terms and conditions stipulated in this letter shall prevail in the event of any inconsistency between the terms and conditions stated in the earlier letters and documents identified above.

...

## **7. SCOPE OF WORKS**

...

You shall deem to have inspected and examined the site and acquaint yourself as to the form and nature of the site condition. No claim whatsoever made by you on ground of want of knowledge of any of the aforesaid will be entertained.

...

## **11. CONTRACTOR'S OBLIGATION**

...

d) The Contractor shall be deemed to have inspected and examined the Site and its surroundings and to have satisfied himself before submitting the tender as to the nature of the ground and sub-soil and the form and nature of the Site and in general to have obtained for himself all necessary information as to risks, contingencies and all other circumstances influencing the tender.

## **16. WARRANTIES**

...

b) No warranty or representation as to the accuracy and/or quantities and/or information contained in any plans and/or drawings provided to the Contractor is made by the Employer nor may be implied against the Employer. The Contractor shall check the accuracy of all plans and/or drawings and to satisfy himself accordingly. In the event that there are any inaccuracies and/or discrepancies in the drawings and/or plans then it shall be the Contractor's responsibility to bring such matters to the attention of the Employer. In so far as the Contractor intends to make any

claims or to seek any extension of time as a result of any inaccuracy and/or discrepancy in the drawings and/or its plans then the Contractor shall be required to comply with the relevant provisions in the Contract relating to claims for additional payment and for the application for and the grant of an extension of time.

Clause 2(c) of the Piling Contract incorporated both the General Specifications and Bored Pile Specifications as terms of the Piling Contract.

### *The piling construction*

7 Sometime in January 2010, prior to the commencement of the piling works and in accordance with the Building and Construction Authority's ("BCA") requirements, Resource Piling drilled and constructed an ultimate test pile ("the UTP"). The purpose of the UTP was to verify the pile design submitted by the project engineer to the BCA as the UTP would be constructed and tested to at least 2.5 times of the working load under the pile design. Resource Piling drilled the UTP somewhere near the vertical midpoint between BH-10 and BH-11, and discovered that rock was encountered from 19.00m onwards.

8 Upon the UTP performing satisfactorily, Resource Piling proceeded to carry out the piling works, and claimed to have encountered ground conditions that were materially different from the conditions indicated in the Geospecs Logs. Resource Piling subsequently engaged Soil & Foundation Pte Ltd ("S & F") sometime around March or April 2010 to conduct additional soil investigation works on the Site. Three additional boreholes, NBH-1, NBH-2 and NBH-3, were drilled. The soil investigation report prepared by S & F dated 22 April 2010 (the "S & F Report") indicated the presence of rock in all three boreholes, which were located in the vicinity of areas where, according to the Geospecs Logs, rock was unlikely to be encountered.

9 During the course of the piling works, Resource Piling claimed that it had encountered rock in 326 piles, or 77% of the piles located in the areas where no rock was expected. Resource Piling averred that the time taken for boring into rock was 10 to 20 times longer than the time required for boring into soil and that it had to incur additional rock socketing costs which it had not provided for in its original tender price.

10 On 4 September 2010, Mr Foo Hee Kang ("Mr Foo"), the Managing Director of Resource Piling, wrote to the Developer to request an extra payment of \$1,188,554 for socketing into rock. Mr Foo claimed that the original cost of socketing in the contract sum was calculated on the basis of the ground conditions recorded in the Geospecs Logs, which were subsequently verified by S & F and found to be inaccurate. [\[note: 4\]](#) The Developer replied on 18 October 2010, rejecting Resource Piling's claim on the basis that it was not entitled to claim for the extra costs for rock socketing under the terms of the Piling Contract. [\[note: 5\]](#)

11 Resource Piling wrote two letters to the Developer on 27 October 2010, repeating its position that it had a contractual right to the extra payment for socketing into rock and stressing that the Geospecs Logs were "completely inaccurate". [\[note: 6\]](#) In a letter dated 12 November 2010 from Longrove to Resource Piling certifying interim progress payments under the Piling Contract, Longrove rejected Resource Piling's "variation claim" of \$1,188,554 on the grounds that the contract price was inclusive of any coring or socketing into rock and covered Resource Piling's obligations under the Piling Contract and all work and expenditure necessary to carry out the works to completion; the contract sum was firm notwithstanding the amount or quantity of work assigned to Resource Piling. Longrove further stated that the Geospecs Logs had been provided to Resource Piling for information only and

Resource Piling was deemed to have inspected and examined the site – any risks arising from the works were therefore to be borne by Resource Piling. [\[note: 7\]](#)

12 Sometime in November 2010, Resource Piling was allegedly informed by one Mr Babu, the Project Manager of the Developer, that Geospecs would be drilling two boreholes adjacent to BH-1 and BH-11, numbered BH-1A and BH-11A respectively, to prove that the Geospecs Logs were accurate. The drilling was done in the absence of a representative from Resource Piling. The borehole logs for BH-1A and BH-11A did not differ materially from the earlier Geospecs Logs for BH-1 and BH-11 and indicated that no rocks were present in both boreholes up to a depth of 27.02m. Resource Piling subsequently requested S & F to drill another borehole about 0.567m away from BH-11A, numbered BH-11B. This borehole log indicated the presence of rock from 21.50m below the surface.

13 On 21 December 2010, Resource Piling sent a letter to the Developer stating that the soil profile indicated in the borehole log for BH-11B was entirely different from those indicated in the borehole logs prepared by Geospecs for BH-11 and BH-11A. Resource Piling requested an explanation from Geospecs for the difference, and stated that if no explanation was forthcoming, it would file an official report with the BCA that the Geospecs Logs were completely wrong and a misrepresentation to Resource Piling at the tendering stage. [\[note: 8\]](#) On 24 December 2010, Geospecs responded to the issues raised in Resource Piling's letter in an email to a representative of the Developer. Geospecs maintained that the borehole logs for BH-11 and BH-11A were correct, and that the apparent differences in the soil profiles may be attributable to differential weathering of the underlying rock. [\[note: 9\]](#)

14 Following Geospecs' response, the Developer sent a letter in reply to Resource Piling on 4 January 2011, firmly stating that the Geospecs Logs were accurate, and that, in any event, there were no sums due and payable to Resource Piling for the rock socketing works. [\[note: 10\]](#) Resource Piling replied on 10 January 2011, reiterating that the Geospecs Logs were inaccurate and that it was contractually entitled to the extra payment that it was claiming for. [\[note: 11\]](#) There is no further record of any subsequent correspondence between Resource Piling and the Developer.

15 Resource Piling issued a writ of summons against Geospecs on 12 May 2011, claiming in the alternative for: (a) the extra costs it had incurred for drilling sockets through rock; or (b) the actual losses and losses of anticipated profit that it had incurred on the performance of the Piling Contract. At the date the trial commenced, Resource Piling had not taken any legal action against the Developer or filed any complaint to the BCA. [\[note: 12\]](#)

## **The issues**

16 The parties jointly requested, and I granted, an order for bifurcation of issues and the trial proceeded only on issues of liability. Although the lead counsels' statements list some 15 or 16 agreed factual issues and some three to seven agreed legal issues, as well as additional minor non-agreed issues, these can be essentially distilled into the following broad factual and legal issues:

(a) Factual Issues:

- (i) What is the generalised soil profile at the Site?
- (ii) What is the definition of "rock"?
- (iii) Are Resource Piling's records of the soil profiles of the boreholes accurate in that it

encountered rock in the construction of about 326 bored piles or 77% of the total number of piles where no rock was expected?

(iv) Were the Geospecs Logs accurate in approximately profiling the soil at the Site and the soil conditions in the vicinity of BH-1 to BH-11?

(v) Did Geospecs carry out its soil investigation works and compilation of the Geospecs Logs properly and to the expected standard of a competent soil investigator?

(b) Legal Issues:

(i) Did Geospecs owe Resource Piling a duty of care to ensure that the Geospecs Logs it prepared were accurate?

(ii) If Geospecs did owe Resource Piling a duty of care, did Geospecs breach that duty?

### **The parties' respective cases**

17 Resource Piling's claim rests on the allegation that Geospecs had negligently carried out the soil investigation works, prepared the Geospecs Logs that did not accurately profile the kind of soil at the Site and failed to show rock near BH-1, BH-2, BH-3, BH-4, BH-7, BH-8, BH-9, BH-10 and BH-11 when there was rock in the vicinity of these boreholes, and provided a soil profile in the Geospecs Logs that was vastly different from the actual soil conditions at the Site. Resource Piling alleged that around or more than 77% of the piles in the zones adjacent to these nine boreholes had to be socketed into rock, contrary to what was to be expected when considering the soil profiled in the Geospecs Logs.

18 Resource Piling pleaded that Geospecs owed it a duty of care to ensure that the Geospecs Logs were accurate and reliable and had breached that duty in its negligent conduct of the soil investigation and preparation of inaccurate Geospecs Logs. Resource Piling was a prospective piling contractor bidding for the piling work for the Site, and Geospecs knew that Resource Piling would be provided with the Geospecs Logs by the Developers to tender for the piling contract and would price its tender based on Geospecs' inaccurate soil information. Geospecs allegedly breached this duty by:

(a) failing to give a proper and accurate assessment of the soil conditions at the Site;

(b) failing to advise that there was rock present in the areas of the Site surrounding BH-1, BH-2, BH-3, BH-4, BH-7, BH-8, BH-9, BH-10, BH-11; and

(c) failing to detect the presence of rocks in the areas of the Site surrounding BH-1, BH-2, BH-3, BH-4, BH-7, BH-8, BH-9, BH-10, BH-11.

Resource Piling alleges that because of the widespread presence of rock, Longrove was able to reduce the length of the piles generally, which reduced Resource Piling's payment as it was based on measured pile lengths. Additionally, Resource Piling incurred greater cost in pile construction by having to socket the piles into rock, causing delays and construction difficulties. This resulted in economic loss to Resource Piling as the Developer refused to pay for such additional construction costs, alleging that the risk was on Resource Piling under the terms of the Piling Contract. While a number of factual allegations were made in the affidavits and in the course of oral testimony that Resource Piling had not been able to claim extra payments for the additional socketing works because Geospecs had incorrectly informed the Developer that the Geospecs Logs were accurate, Resource Piling did not additionally plead this as a basis of negligence, and I will put this aspect aside.

19 Geospecs denied that it owed a duty of care to Resource Piling as a matter of law. It had only contracted with the Developer and had submitted the Report, Geospecs Logs, test data and results and recommendations for the foundation system to suit the soil conditions, duly endorsed by a professional engineer, to the Developer and its consultant engineers Longrove. The Report with its attachments was prepared for Longrove to design the foundation system, estimate the costs and prepare the tender specifications to call for tenders for the Piling Contract. The Report clearly stated that "the presence of boulders probably due to differential weathering [was] expected within the residual layer". [\[note: 13\]](#) Geospecs had not been aware, until discovery, that Resource Piling had only been provided with the Geospecs Log by Longrove and/or the Developer. In any event, Resource Piling should not have relied solely on the Geospecs Logs as it only formed part of the entire Report.

20 Geospecs also averred that it had not been negligent in the preparation of the Geospecs Logs and that the Geospecs Logs were accurate. This was confirmed by the drilling of two more boreholes in October 2010, BH-1A and BH-11A, which was witnessed by representatives of the Developer and the Resident Engineer. Geospecs claimed that Resource Piling's alleged encounter with rock was only reported to it by the Developer ten months later on 7 October 2010 and not when it was first allegedly detected in January 2010. It was possible for the soil profiles of a particular area to differ greatly from that of neighbouring areas due to the differential weathering of different types of rocks and formations. Geospecs also questioned the accuracy of Resource Piling's records documenting that "rock" had been encountered in the course of constructing the bored piles.

### **Does a duty of care arise?**

21 I first address the preliminary and threshold issue of law, *viz*, whether a duty of care in respect of the damage suffered by Resource Piling was owed by Geospecs to Resource Piling. In *Spandeck Engineering (S) Pte Ltd v Defence Science & Technology Agency* [2007] 4 SLR(R) 100 ("*Spandeck*"), the Court of Appeal held that a single test should apply to determine the imposition of a duty of care in all claims arising out of negligence, irrespective of the type of damages claimed (at [71]) (hereafter referred to as the "*Spandeck Test*"). There was no justification for a general exclusionary rule against recovery of economic losses (at [69]). The Court of Appeal described the two-stage *Spandeck Test* as follows (at [73]):

In our view, a coherent and workable test can be fashioned out of the basic two-stage test premised on proximity and policy considerations, if its application is preceded by a preliminary requirement of *factual foreseeability*. We would add that this test is to be applied *incrementally*, in the sense that when applying the test in each stage, it would be desirable to refer to decided cases in analogous situations to see how the courts have reached their conclusions in terms of proximity and/or policy. [emphasis in original]

I now turn to consider each limb of the *Spandeck Test*.

### ***Factual foreseeability***

22 Geospecs argued that the loss suffered by Resource Piling, *ie*, the economic loss suffered as a result of the miscalculation of the tender price, was not foreseeable as Geospecs was not aware that the Geospecs Logs would form part of the tender documents provided by Longrove to potential bidders for the Piling Contract. Further, Geospecs could not have foreseen that Longrove would provide only the Geospecs Logs without the rest of the Report which would have indicated the presence of boulders. Geospecs also could not have foreseen that the piling contractor would suffer losses due to its inability to claim extra payment from the employer for additional rock socketing because of the terms of the contract it had entered into.

23 Geospecs' submissions miss the point of the factual foreseeability requirement. As stated by the Court of Appeal in *Spandeck* (at [75]-[76]), factual foreseeability is a threshold condition that is readily satisfied in most cases as the foreseeability threshold merely requires that the defendant ought to broadly know that persons in the position of the plaintiff would suffer harm or damage from the defendant's carelessness – this involves the establishment of a *factual foundation* upon which legal proximity can be founded (see *Ngiam Kong Seng and another v Lim Chiew Hock* [2008] 3 SLR(R) 674 (“*Ngiam Kong Seng*”) at [104]), but does not require the defendant to foresee the precise harm or manner in which the loss was suffered. In the context of a building project, soil investigation works are required to decide on the foundations required for the building. The consultant engineer would require this information and test data to design the required foundations. The information and data would also shape the terms and specifications of the piling contract to be awarded. That this is very important or even vital information and data to the developer and his consultant engineer cannot be gainsaid. If the soil investigation and tests are improperly conducted and the results are inaccurate, it cannot be disputed that the possible costs and time delays, financial and reputational consequences could be crippling. The other parties who would clearly be most interested in the soil substrata would be the piling and building contractors, both of whom would look at the soil investigation information and data. Their contract work, method of work or construction and the temporary works will be materially affected if the information and data is incorrect or misleading. It is my experience, and I can take judicial notice of the fact, that in the larger construction contracts, the borehole logs are invariably included as part of the contract documentation.

24 It was not surprising that Mr Tan Eng Gee (“Mr Tan”), a director of Geospecs, expressly conceded in cross-examination that if the borehole logs provided by the company engaged to conduct soil investigation were wrong, the contractor who relied on the borehole logs to price his tender for a piling contract would also calculate the cost of the work and the time taken to conduct the work inaccurately. [\[note: 14\]](#) A soil investigator would therefore expect that inaccuracies in his borehole logs could cause some form of economic loss – either in terms of loss of potential profit or actual losses from the performance of the contract – to contractors in so far as the contractors would be calculating their tender prices based on an incorrect premise. In my judgment, the threshold requirement of factual foreseeability is evidently satisfied on the present facts.

### ***Legal proximity***

25 In *Spandeck*, the Court of Appeal described legal proximity (at [78]-[79]) as a “composite idea, importing the whole concept of the necessary relationship between the claimant and the defendant”, and cited with approval Deane J’s observations in the High Court of Australia’s decision in *Sutherland Shire Council v Heyman* (1985) 60 ALR 1 that the requirement of proximity embraced the notions of physical proximity, circumstantial proximity and causal proximity, including the closeness of the parties, the directness of the relationship between the parties as well as the assumption of responsibility and reliance (at 55-56); the relative importance of each factor and the combinations of the factors was a legal question to be determined on the basis of legal reasoning, induction and deduction.

26 The Court of Appeal further held that the two-stage test premised on legal proximity and policy considerations was to be applied incrementally by reference to analogous situations to see how courts have reached their conclusions for these stages to determine whether the current limits of liability should be extended: see [43] and [73] of *Spandeck*. The lack of a factual precedent should not preclude the court from extending liability where it is just and fair to do so, taking into account the relevant policy consideration against indeterminate liability against a tortfeasor (*ibid*). I note that although the Court of Appeal in *Spandeck* set out a single test for a duty of care and enunciated a

number of broad proximity considerations (at [77]–[82]), the factors to be considered in ascertaining whether the requisite proximity exists depends on the precise factual circumstances, including the type of harm: see for example, *Spandeck*, which emphasised the traditional test of assumption of responsibility and reliance in *Hedley Byrne & Co Ltd v Heller & Partners Ltd* [1964] AC 465 (“*Hedley Byrne*”) in the context of economic loss; cf. *Ngiam Kong Seng*, which applied the three factors in *McLoughlin v O’Brian* [1983] 1 AC 410 within the context of the first proximity stage in the *Spandeck* Test for a claim involving a duty of care not to cause psychiatric harm. The case before me is one involving economic loss, and I analyse the factual circumstances primarily through the prism of the twin criteria of assumption of responsibility and reasonable reliance, but with reference to other considerations where relevant.

#### *Statutory duty of a qualified person carrying out soil investigation works*

27 Resource Piling laid great emphasis on a change in the legal regulatory landscape in relation to the conduct of soil investigations. Counsel for Resource Piling, Mr Leo Cheng Suan (“Mr Leo”), submitted that in the aftermath of the infamous tilting of the Samsung Hub building in Church Street, the BCA now imposed an express statutory duty for site investigation to be carried out in a proper and adequate manner and made it mandatory for a professional engineer to sign off any site investigation report. Mr Leo relied on reg 31 of the Building Control Regulations 2003 (S 666/2003) (“BCR”), which provides as follows:

#### **Site investigation**

**31.**—(1) Where foundation, tunnels, site formation (including excavations) or related earthworks are proposed to be constructed or carried out on any premises, an investigation of the site shall be undertaken by the qualified person appointed under section 8(1)(a) or 11(1)(d)(i) of the Act in respect of the structural elements of the relevant building works in order to establish the type and character of the ground and groundwater conditions on which the foundations, tunnels, site formation (including excavations) or earthworks are to be constructed or carried out.

(2) Whenever any site investigation is to be carried out, the qualified person appointed under section 8(1)(a) or 11(1)(d)(i) of the Act *shall carry out proper and adequate site investigation* —

(a) *in accordance with the relevant standards and codes of practice; and*

(b) *by conducting adequate investigation boreholes and other appropriate investigation means, in-situ field tests and laboratory tests to establish the ground and groundwater conditions, their variability and the geotechnical aspects for the works to be carried out.*

(3) Whenever any site investigation is to be carried out in respect of the building works, the qualified person appointed under section 8(1)(a) or 11(1)(d)(i) of the Act shall submit the site investigation reports to the Commissioner of Building Control and in accordance with paragraph (4).

(4) All site investigation reports shall contain field and laboratory data, and tests and results, and shall be accompanied by a certificate from an appropriate professional engineer who, having carried out, supervised or directed the site investigation, certifies that he has verified the accuracy of the information given in the site investigation report.

[emphasis in italics added]

Resource Piling submitted that changes were introduced by the Building Control (Amendment) Regulations 2008 (S 54/2008) ("Building Control (Amendment) Regulations 2008") to place a duty on soil investigators to carry out site investigation works properly and accurately, and that the intended class of direct beneficiaries of this statutory duty included contractors who relied on borehole logs produced as part of the site investigation to tender for and carry out their works. It was contended that the existence of this statutory duty "enhanced" the legal proximity between Resource Piling and Geospecs, such that the latter owed the former a common law duty of care in negligence in addition to its statutory duty. Geospecs disagreed and argued that no issue of public safety arose on the facts; the present case simply involved a commercial contract which was more expensive to perform than one party had originally anticipated.

28 It is well-established that the existence of a statutory duty does not *ipso facto* give rise to a common law duty of care in negligence, although it may form part of the contextual backdrop or be a relevant factor in favour of or militating against the imposition of a duty of care (see *Animal Concerns Research & Education Society v Tan Boon Kwee* [2011] 2 SLR 146 ("*Animal Concerns*") at [22]). In particular, the statutory duty may establish that the duty of care does not extend to the losses arising from a transaction falling outside the purpose for which an allegedly negligent statement was made (see the observations of Lord Jauncey of Tullichettle and Lord Oliver of Aylmerton in *Caparo Industries plc v Dickman* [1990] 2 AC 605 ("*Caparo Industries*") at 661D–E and 651F respectively). Alternatively, the imposition of a common law duty of care may support or undermine the legislative intention behind the statutory regime (see *Tan Juay Pah v Kimly Construction Pte Ltd* [2012] 2 SLR 549 ("*Tan Juay Pah*") at [53]–[54]). For present purposes, I will confine my discussion to the former, *viz*, the relevance of the statutory framework under the Building Control Act (Cap 29, 1999 Rev Ed) ("Building Control Act") and BCR in so far as the nature and purpose of the statutory duty may implicitly create a special or close relationship in the form of circumstantial or causal proximity or support an inference of assumption of responsibility, such that legal proximity under the first limb of the *Spandeck* Test is established.

29 The present reg 31 was inserted by the Building Control (Amendment) Regulations 2008, and had replaced the previous reg 31 on site investigation which stated:

### **Site investigation**

**31.**—(1) Where foundations or related earthworks are proposed to be constructed or carried out on any premises, an investigation of the site shall be undertaken by the qualified person appointed under section 6(3)(a) of the Act in respect of the structural elements of the relevant building works in order to establish the type and character of the ground on which the foundation or earthworks are to be constructed or carried out.

(2) The qualified person shall prepare and submit to the Commissioner of Building Control a report of any investigation under paragraph (1) containing recommendations on the measures to be taken in connection with the construction or carrying out of the foundations or related earthworks so as to prevent any settlement or other movement which may impair the stability of or cause damage to the whole or part of any adjoining premises or building.

The amended reg 31 extended the duty to apply to the construction of "tunnels" and "site formation (including excavations)". It imposed a more specific and detailed set of duties on those qualified to undertake site investigation works, including the requirements in reg 31(2) that site investigation works have to be done properly and adequately in accordance with the prevailing standards and codes of practice and by conducting adequate investigation boreholes and other appropriate investigation means: see also the explanatory note to the proposed amendment of reg 31 in Annex A

of the circular issued by the Commissioner of Building Control dated 10 December 2007. Further, it engrafted an additional layer of checks in reg 31(4), which mandates that the accuracy of the results of the site investigation have to be verified and certified by a Professional Engineer. Regulation 50 of the BCR imposes criminal liability for the contravention of, *inter alia*, regs 31(1), 31(2) and 31(3), but the BCR is otherwise silent on any concomitant civil liability.

30 The Building Control (Amendment) Regulations 2008 followed the amendments made by the Building Control (Amendment) Act 2007 (Act No 46 of 2007) ("BCAA 2007") to the Building Control Act. Mr Leo relied on the parliamentary debates during the passing of the Building Control (Amendment) Bill 2007 ("the Bill") in support for the submission that the purpose of introducing the requirement for a Professional Engineer to verify the accuracy of the site investigation reports was to "prevent the "Church Street incident" from recurring". [\[note: 15\]](#) Mr Leo cited the speech of a Member of Parliament, Mrs Lee Bee Wah ("Mrs Lee"), a Professional Engineer and former President of the Institution of Engineers (see *Singapore Parliamentary Debates, Official Report* (20 September 2007) vol 83 ("the 20 September 2007 Parliamentary Debates") at col 2082):

... I queried [BCA officers], in the past, which were the projects where they could show examples that if we introduced the [Professional Engineer] (Geotechnical) then they would have avoided the problem totally. Kong lie kong ker, they could only quote me Church Street. And I asked them which aspect of Church Street. In fact, to prepare for this, I had lunch with Church Street's [Professional Engineer], and he also told me that he was doubtful with the introduction of [Professional Engineer] (Geotechnical). That problem could be avoided.

The Church Street incident in 2002, which is well known to those in the construction industry, involved the 30-storey Samsung Hub building that started to tilt during construction as the superstructure was loaded, *ie*, being built. There were allegations in relation to the soil investigation, the characterisation of the soil substratum and possible piling construction shortcomings. It caused great alarm as there were completed buildings nearby. However, it should be noted that the introduction of the requirement for a Professional Engineer (Geotechnical) to supervise specific types of works in the BCAA 2007 followed the inquiry into the Nicoll Highway collapse in 2004 and relates only to "geotechnical building works", which do not include foundational works for buildings which are less than 30-storeys high: see the definition in s 2(1) of the Building Control Act and the then Minister of State for National Development, Ms Grace Fu's ("Ms Fu") explanation of the regulation of underground building works in the BCAA 2007 (see the *20 September 2007 Parliamentary Debates* at cols 2055-2056).

31 The comments that Mr Leo cited followed Mrs Lee's speech where she queried the need to introduce the requirement of a Professional Engineer (Geotechnical) for piling works for projects of 30-storeys and above as professional civil engineers had been designing the foundations of high-rise buildings for many years, and suggested that the employment of a second professional engineer was impractical and unnecessary: see the *20 September 2007 Parliamentary Debates* at cols 2068-2069. Ms Fu responded to this concern by explaining that any structural problems with the foundations of high-rise buildings could have very serious consequences, and cited the Church Street incident as an example: see the *20 September 2007 Parliamentary Debates* at col 2074. It is difficult to see how Mrs Lee's comments support Mr Leo's position; on the contrary, Mrs Lee was arguing that the Church Street incident could not have been prevented even with the input of a Professional Engineer (Geotechnical). Mrs Lee's comments were not directed at any proposed amendments to the Building Control Act that directly considered the duties of those engaged in specialised site investigation works.

32 It is evident that the overarching purpose of the BCAA 2007, and the subsequent amendments

to the BCR, were to “strengthen the building control regulatory framework to uplift professionalism, standards of safety and quality in the construction industry”: see Ms Fu’s speech in the *20 September 2007 Parliamentary Debates* at col 2053. Apart from this broad statement of purpose, the BCAA 2007 was silent on the duties of a soil investigator, although the constant reference to the Church Street incident suggests that it perhaps formed part of the catalyst for the BCAA 2007. (I should add that the Nicoll Highway collapse in April 2004 must have also been a major contributor but from a slightly different angle.) The BCAA 2007 introduced a requirement for those engaged in site investigation works to be licensed as a specialist builder (see s 29G of the Building Control Act) and additional duties on a soil investigator were inserted in the BCR by the amended reg 31. These changes undoubtedly followed the overall purpose of the 2007 amendments in improving the accountability and competence of those engaged in site investigation works to strengthen safety standards. However, I do not think that there is anything to suggest that the changes introduced by the BCAA 2007, or indeed the building regulatory regime as a whole under the Building Control Act, additionally have the statutory objective of protecting the *economic interests* of the various participants in the construction industry or to define the scope of their responsibilities *vis-à-vis* each other. The financial risks potentially incurred by contractors who rely on work done by other contractors in the same project are not regulated under the Building Control Act. While it is clear that specialised site investigators in the position of Geospecs owe an express statutory duty to carry out proper and adequate site investigation under reg 31(2), in my view, there is nothing that can plausibly support a suggestion that Parliament intended for this duty of competence to extend equally to contractors who rely on geological information provided by site investigators to price their tenders.

33 Contractors are not within the class of persons intended to be protected by the statutory duty to carry out adequate and proper site investigation works, and I am thus of the view that reg 31 of the BCR is of minimal assistance to Resource Piling in establishing that the parties were brought into a close and direct relationship or that Geospecs had assumed any responsibility, as part of its statutory duty, towards Resource Piling in relation to the accuracy of its soil investigation logs.

#### *Assumption of responsibility, reasonable reliance and the contractual framework*

34 Resource Piling submitted that Geospecs was a soil investigation specialist and had to expect that Resource Piling – as a potential bidder for the Piling Contract – would rely on the Geospecs Logs to price its tender. Resource Piling was also constrained to rely on the Geospecs Logs due to the short window of time within which tenders for the Piling Contract had to be submitted. There was therefore sufficient proximity between the parties.

35 Geospecs argued that there was no proximity between itself and Resource Piling. The Geospecs Logs contained only facts and did not purport to give any advice or make any representation to third party contractors. Further, Resource Piling was aware, at the time it submitted the tender for the Piling Contract, that it should not rely on the Geospecs Logs but should instead satisfy itself of the actual ground conditions.

36 It is clear from the contractual provisions between the Developer and Resource Piling (set out at [5] and [6] above) that the risk of unexpected, different, difficult or adverse ground conditions fell upon Resource Piling. The Developer would not pay for any extra costs incurred by Resource Piling or grant additional time to Resource Piling should it encounter such conditions. Under cl 1(o) of the Piling Contract, Resource Piling’s rates, based on bored pile lengths, were to include any coring, chiselling, socketing into rock or use of special tools or equipment and all processes that were indispensably necessary to achieve completion whether described or otherwise in the face of practical difficulties or for other technical reasons. At the tendering stage, cl 1.6 of the General Specifications provided that an “extract of the Soil Investigation Report [was] enclosed...for information” and cl 1.2.3 of the Bore

Pile Specifications stated that the Geospecs Logs was for Resource Piling's reference only and that neither Longrove nor the Developer accepted responsibility for the accuracy of the Geospecs Logs if the actual soil conditions encountered were different.

37 Both parties made use of aspects of this allocation of risk. Resource Piling argued that since the Geospecs Logs formed an integral part of the Piling Contract, Resource Piling should therefore be entitled to rely on the accuracy of the Geospecs Logs as it would have no other recourse for losses if the Geospecs Logs did not provide an accurate approximation of the ground conditions at the Site. Geospecs submitted that it only had a contractual relationship with the Developer and had satisfactorily discharged its duties in accordance with the Soil Investigation Contract. As Resource Piling was not contractually entitled to claim for the additional cost of rock socketing from the Developer over and above the fixed contract sum, *a fortiori*, it should not be allowed to claim the same from Geospecs.

38 Resource Piling's argument can be characterised as a claim of assumption of responsibility by Geospecs and corresponding reliance by Resource Piling. Although of considerable vintage, *Hedley Byrne* continues to be the starting point in many other Commonwealth jurisdictions for claims involving negligent misstatements. Lord Devlin's formulation of the test as to when a duty of care not to cause economic loss by making negligent statements arises can be found at 528–529 of *Hedley Byrne*:

... the categories of special relationships which may give rise to a duty to take care in word as well as in deed...include also relationships which...are "equivalent to contract," that is, *where there is an assumption of responsibility in circumstances in which, but for the absence of consideration, there would be a contract.* [emphasis in italics added]

The *Hedley Bryne* elements have been incorporated as part of the first proximity limb of the *Spandeck* Test at [81]:

In our view, Deane J's analysis in *Sutherland*, that proximity includes physical, circumstantial as well as causal proximity, does provide substance to the concept since *it includes the twin criteria of voluntary assumption of responsibility and reliance, where the facts support them, as essential factors in meeting the test of proximity.* ... [emphasis in italics added]

Assumption of responsibility is to be understood in a legal rather than factual sense. It therefore refers to "the circumstances in which the law will deem the maker of the statement to have assumed responsibility to the person who acts upon the advice" (per Lord Griffiths in *Smith v Eric S. Bush and Harris v Wyre Forest District Council* [1990] 1 AC 831 at 862; see also the observations of Phang J (as he then was) in *Sunny Metal & Engineering Pte Ltd v Ng Khim Ming Eric (practising under the name and style of W P Architects)* [2007] 1 SLR(R) 853 at [63], citing Andrew Phang, Cheng Lim Saw and Gary Chan, "Of Precedent, Theory and Practice - The Case for a Return to Anns" [2006] Sing JLS 1 at pp 47-48 that the concept of proximity is "not merely factual but is, rather, legal in nature").

39 I first dispose of the argument that was repeatedly stressed by Geospecs in its submissions, *viz*, that Resource Piling could not claim to have been negligently misled by the Geospecs Logs as the Geospecs Logs contained purely factual statements. The basis of liability for negligent misstatements, either under the *Hedley Bryne* principle or the *Spandeck* Test, is that one party may owe a duty of care to another not to provide information negligently; it is not dependent on whether such information may be classified under the semantic categories of "facts" or "advice". I am, with respect, unable to comprehend how this apparent distinction changes the character of any responsibility that Geospecs may have undertaken with respect to Resource Piling or the nature of Resource Piling's reliance on the Geospecs Logs. In this regard, I need only refer to the observations of Lord Steyn in

*Williams v Natural Life Health Foods Ltd* [1998] 1 WLR 830, at page 834D-H:

It is clear ... that the governing principles are stated in the leading speech of Lord Goff of Chieveley in *Henderson v Merrett Syndicates Ltd* [1995] 2 AC 145. First in *Henderson's* case it was settled that the assumption of responsibility principle enunciated in *Hedley Byrne & Co Ltd v Heller & Partners Ltd* [1964] AC 465 is *not confined to statements but may apply to any assumption of responsibility for the provision of services*. ... [emphasis in italics added]

The *Hedley Byrne* principle is conceptually premised on assumption of responsibility and a corresponding reliance, and does not turn on minute classification of what was said or done.

40 The present claim by Resource Piling against Geospecs, who provided geological or subsoil information or conditions to the Developer, is a novel one and neither counsel directed me to any previously decided case in a Commonwealth jurisdiction where a duty of care was held to exist on materially similar facts. In accordance with the incremental approach of reasoning by analogy endorsed by the Court of Appeal in *Spandeck* (at [82]), I now consider earlier cases where the courts have answered this broader question: does a professional owe a duty of care to a contractor where the contractor tenders for a contract on the faith of information prepared by the professional who does so under a separate contract with the contractor's employer, but with whom the contractor has no contractual relationship?

41 A close factual parallel can be found in the decision of the Court of Appeal of California in *M Miller Co v Dames & Moore* (1961) 198 Cal. App. 2d 305 ("*Miller*"), which predated the House of Lords decision in *Hedley Byrne*. It was alleged that negligent soil tests, which failed to disclose unstable ground material, were carried out by the defendant soil engineering firm under contract with the employer and their civil engineers. It was assumed for the purposes of the appeal that the report was *intended* to provide information for prospective bidders, including the plaintiff contractor, and was in fact made available to and relied upon by the contractor (at 307). As a result of the negligent report, the contractor's bid was less than the actual cost of completing the project. The court held that on the assumed facts, the soil engineering firm could be liable to the contractors in negligence under the rule in its earlier decision in *Biakanja v Irving* (1959) 49 Cal. 2d 467, *viz*, damages for negligent performance could be recovered if "the circumstances were such that the transaction was intended to affect the plaintiff and injury to the plaintiff was foreseeable". The court also rejected the defence that the contract between the contractor and the employer specifically provided that the contractor was not to rely on the soil report but was to make its own independent investigations; the rights and duties of the soil engineer as against the contractor were not necessarily equivalent to the scope of the liabilities that the contractor had chosen to waive in favour of the employer.

42 In my view, *Miller* is of limited guidance because it was decided at an interlocutory stage on summary judgment principles. It arose from a motion by the defendant to dismiss the claim against it as disclosing no merit. It was therefore decided as a matter of law only on the basis of the assumed facts set out in the preceding paragraph, including the plaintiff's pleading that the defendant soil engineer had *intended* for the report to provide information for prospective contractors bidding for the project. The summary judgment granted in favour of the soil engineering firm at first instance was accordingly reversed and the issue of negligence was sent for trial.

43 A similar conclusion and reasoning was adopted in *Edgeworth Construction Ltd v ND Lea & Associates Ltd* (1993) 107 DLR (4<sup>th</sup>) 169 ("*Edgeworth*"), a decision of the Supreme Court of Canada. The Supreme Court held that an engineering firm which had prepared specifications and construction drawings for a highway project and the relevant tender documents incorporating such plans owed a duty of care to a contractor who had successfully tendered for the project and incurred economic

losses as a result of errors in the specifications and drawings. McLachlin J, delivering the leading judgment of the court, made the following observations on the assumption of responsibility by the engineering firm at [5]:

... The engineers undertook to provide information ("the tender package") for use by a definable group of persons with whom it did not have any contractual relationship. ***The purpose of supplying this information was to allow tenderers to prepare a price to be submitted. The engineers knew this*** . The plaintiff contractor was one of the tenderers. It relied on the information prepared by the engineers in preparing its bid. Its reliance upon the engineers' work was reasonable. It alleges it suffered loss as a consequence. These facts establish a *prima facie* cause of action against the engineering firm. [emphasis in bold italics added; emphasis in italics in original]

McLachlin J then considered whether the contract between the contractor and the employer negated this *prima facie* duty of care, and held (at [9]) that although the specifications provided by the engineering firm had been incorporated in the contract and had also become representations of the employer, they did not cease to be representations of the engineering firm. The contractor continued to rely on the accuracy of the specifications and did not assume the risk of errors in the work of the engineering firm. The presence of a clause in the main contract between the contractor and the employer negating any warranty of the accuracy of the information provided in the tender documents also did not extend to protect the engineering firm from liability (at [10]) and did not oust any possible duties in tort that the engineering firm owed to the contractor (at [12]).

44 I am hesitant to draw any statement of general principle from *Edgeworth* as it similarly concerned a striking out application at an interlocutory stage. The Court of Appeal in *Spandeck* cited *Edgeworth* for the proposition that (at [107]):

... there might be situations where a negligent statement by the professional in preparing the tender documents would lead to liability under Hedley Byrne ... but, in the absence of such a statement to the contractor, it seemed unlikely that a court would find a duty of care based on the mere conduct of the professional.

From the very brief comment that *Edgeworth* drew from the Court of Appeal in *Spandeck*, it appears that the Court of Appeal gave a qualified and cautious interpretation of the decision as requiring a statement *to the contractor* instead of mere conduct of the third party professional in preparing the tender documents. The observations of McLachlin J (at [5]) that appear to suggest that the professional's knowledge that the purpose of supplying the information was to allow contractors to prepare a tender could amount to an undertaking by the professional must be read in the context of the factual scenario in *Edgeworth*. *Edgeworth* concerned a situation where the professional provided the information for the specific purpose of preparing a tender package that would be relied upon by potential contractors and was involved in the preparation of the tender package; this may, depending on the facts, go beyond mere knowledge and foreseeability.

45 The New Zealand Court of Appeal came to a different conclusion in *R M Turton & Co (in liquidation) v Kerslake & Partners* [2000] 3 NZLR 406 ("*R M Turton*"). The employer, a health authority, engaged architects to design a hospital building, oversee the tendering and supervise the construction. The architects engaged an engineering firm to advise on the engineering aspects, including the mechanical services specifications and the corresponding subcontract, and to supervise the engineering side of the construction. The mechanical services included a heating system that required identified models of heating pumps with a minimum output capacity of 185 kw output under certain specified conditions. There were also fairly detailed specifications on the oil cooler, condenser

and evaporator required for the heating system. The plaintiff company R M Turton & Co ("Turton") obtained the tender documents from the architects, including the mechanical services specifications which it passed on to its mechanical subcontractors NZ Mechanical and George Mechanical Ltd ("George Mechanical"). Turton submitted a bid which nominated NZ Mechanical, who tendered at a cheaper price based on substituted heat pumps, as their preferred subcontractor and George Mechanical as the alternative subcontractor. Turton's tender based on the specified heat pumps, with the compliant tender submitted by George Mechanical, was accepted. Upon construction, it was found that the heat pumps were unable to produce the required 185 kw output. The trial judge found that this inability was due to the performance inadequacy of the specified evaporators within the heat pump packages supplied to George Mechanical, and these packages in essence comprised shelf items. Turton had to bear the costs of remedial works. Turton commenced proceedings against the employers, the architects and the engineers for the cost of the remedial works, alleging that the mechanical services specifications had been negligently prepared. The District Court allowed part of Turton's claims against the employer but dismissed the claims against the architect and engineers, holding *inter alia*, that Turton had assumed the contractual obligation to provide heat pumps which would achieve the specified performance criteria. On appeal, the High Court upheld the District Court's conclusion that the engineers did not owe a tortious duty of care to Turton.

46 In the Court of Appeal, Henry and Keith JJ agreed and upheld the decision of the High Court that the engineers did not owe a duty of care to the contractor. There had been a careful allocation of risk for the negligence of the engineers (at [26]) and the imposition of a duty of care would "cut across and be inconsistent with the overall contractual structure defining the relationships of the various parties" (at [32]). Applying the principles in *Hedley Byrne*, the majority further held (at [28]–[30]) that the engineers were not possessed of a special skill that the contractor was relying upon, and there was thus no justification for holding that the engineers had voluntarily assumed a responsibility to the contractor. Notably, the majority distinguished *Edgeworth* and expressly departed (at [35]) from the approach of the Supreme Court of Canada in finding a *prima facie* duty of care that may *subsequently* be negated by the relevant contractual framework; instead, the imposition of the duty would depend on a consideration of all the circumstances, including the contractual framework.

47 Thomas J issued a robust dissent, disagreeing with the findings of the majority that the engineers had not assumed responsibility for the accuracy of the specifications or that the contractor had not reasonably relied on the specifications (at [84] and [86]). Thomas J also held (at [109]) that the contractual structure did not preclude the liability of the engineers to the contractor on the basis of the principles in *Hedley Byrne*, and approved (at [120]) of the basic logic underlying the reasoning of the Supreme Court of Canada in *Edgeworth*, *viz*, that proximity was made out once the elements of assumption of responsibility and reliance were satisfied and the tort law of negligence would as, a general rule, apply unless negated by contract.

48 I now turn to two English cases, a decision of the Court of Appeal in *J Jarvis and Sons Ltd v Castle Wharf Developments and others* [2001] EWCA Civ 19 ("*J Jarvis*") and a more recent High Court decision in *Galliford Try Infrastructure Ltd and another v Mott MacDonald Ltd* [2008] EWHC 1570 ("*Galliford Try*").

4 9 *J Jarvis* involved facts that are not found in the usual building contracts. The employer was engaged to provide an office tower for Northcliffe, a newspaper company. The tower was in a prominent and sensitive location in Nottingham and was constrained by planning requirements; the town planners, who wanted to retain Northcliffe's commercial presence in Nottingham, took a close interest in the approval of plans for that tower. The employer was determined to obtain planning permission but nonetheless wanted the least expensive scheme satisfactory to Northcliffe. The

planners, on the other hand, wanted to exercise control to ensure high quality design and architecture and imposed unusually onerous conditions for approval. The employer and their architects, Franklin Ellis, had many meetings with the planners over the planning approval and design of the tower. The employer also engaged the defendant, Gleeds, a quantity surveyor, to coordinate the construction project and pass information to contractors. When the employer thought it had planning approval on a certain basis, it got Gleeds, on its behalf, to invite Jarvis to tender for the design and construction of the tower. That invitation enclosed various documents, plans and drawings and Employer's Requirements which was expressed to contain a summary of known constraints to assist Jarvis in formulating proposals and submitting a tender. The contract was eventually awarded to Jarvis and many problems subsequently ensued in the obtaining of planning permission. Jarvis brought claims alleging that the employer, Franklin Ellis and Gleeds had been negligent. The relevant aspect of this case involved Jarvis' claim that Gleeds owed it a duty not to misrepresent that the scheme contained in its contractor proposals would comply with the planning permission that had been obtained and that Jarvis had relied on such misrepresentations. After an 18-day trial on the preliminary issues, the trial judge held that, *inter alia*, Jarvis was entitled to recover for loss and damage caused by negligence for which the employer and Gleeds were responsible and dismissed the defence that Jarvis was contributorily negligent. On appeal, the Court of Appeal allowed the appeal and dismissed Jarvis's claim against Gleeds.

50 The Court of Appeal recognised (at [51]) that the English courts had been slow to recognise a duty of care where a professional agent provides information to a third party with whom his principal has, or is about to enter into, a contractual relationship. However, the court went on to state that it was prepared to assume, without deciding the point, that Gleeds could owe a duty of care to the plaintiff contractor who tendered on the basis of the information provided, and made the following statement of general principle (at [53]):

... There is no reason in principle why the professional agent of the employer cannot become liable to a contractor for negligent misstatements made by the agent to a contractor to induce the contractor to tender, if the contractor relies on those misstatements. But whether a duty of care in fact arises in any given situation must depend on all the circumstances, including in particular the terms of what was said to the contractor.

After going through the facts in great detail, the Court of Appeal held that the factual findings of the trial judge, who had sadly died in the meanwhile, were uncertain and the court was unable to reach a conclusive decision that the quantity surveyor did in fact owe the contractor a duty of care (at [59]). The Court of Appeal therefore did not provide any detailed reasoning for the preliminary conclusion that a duty of care was not strictly precluded, nor did it make any affirmative finding on this basis. I note that the Court of Appeal confined the potential liability to negligent misstatements that were made by the agent *to induce* the contractor to tender; it did not include any misstatement that came to the contractor's knowledge or was conveyed to him.

5 1 *Galliford Try* involved a claim by a contractor, who undertook a design-and-build project, for economic losses it had suffered as a result of delays and additional redesign work that it had not adequately factored into its contract price due to carelessly provided information by the consulting engineers. Although the engineers had liaised extensively with the contractor and had provided tender information directly, Akenhead J held that the engineers did not owe the contractor a duty of care as there was no assumption of responsibility by the engineers, who were at all material times employed only by the main developers of the project and had not been involved in the contractor's pricing plans. Akenhead J further observed (at [315]):

In the ordinary course of events, I have no doubt that an architect or engineer engaged by a

developer would not owe any duty of care (at least in relation to economic loss) to tendering contractors even though the latter had been supplied by the architect or engineer with tender information, drawings and specification upon which to base their tenders. The successful tenderer would be considered to have taken the risk in respect of that information. ...

The judgment in *Galliford Try* comprised some 424 paragraphs where the judge went into great detail to analyse the evidence and facts to see whether a duty of care arose under the *Hedley Byrne* principles. His judgment bears reading also because the learned judge was a leading construction silk in his day.

52 Two threads are discernible from the above cases. First, in my view, statements made or information prepared by third party consultants employed by the employer that is given to prospective contractors are not, without more, to be treated as statements or information which constitute *Hedley Byrne* type statements, information or advice leading to liability. It is normal in the context of a building contract for consultants to convey information and, without more, there is no imputation of any assumption of responsibility by the consultants. Secondly, the manner in which the various contracts are structured and how risk has been allocated between the various parties forms the indispensable context and is an important factor in analysing whether the contractual relationships show or support intentions regarding the assumption or allocation of risk or responsibility inconsistent with the claimed duty in tort. The various contractual provisions which bind different parties have to be considered. Building and construction contracts for larger projects are all about the allocation of risk and responsibility; often, tied to that risk is the responsibility of insuring risks that are insurable. In referring to claims under the *Hedley Byrne* principle, Akenhead J made the following observation (at [190(c)] of *Galliford Try*):

It is always necessary to consider the circumstances and context, commercial, contractual and factual, including the contractual structure, in which the inter-relationship between the parties to and by whom tortious duties are said to be owed arises. Thus, it is not every careless misstatement which is actionable or gives rise to a duty of care. Foreseeability of loss is not enough.

Whilst factually most contractors will rely on information gleaned from tender documents, including the drawings and specifications, what is relevant is the issue of *legal* assumption of responsibility and reliance.

53 With these principles in mind, I now turn to the facts of the case. Four factors stand out in relation to Resource Piling's claim that Geospecs owed it a duty of care.

54 First, Geospecs is a specialised soil investigator and in carrying out its soil investigations on a site, it must know that three persons or groups would, or potentially would, rely on the information and data it produces. I have already mentioned the developer and his consultant engineer. The developer's engineer would want to know the subsoil conditions so that he can design and choose the kind of foundations required and the developer would want to know the cost of construction and the time it would take for the construction. The other group would be the contractors – the piling contractor and the superstructure contractor. They would need to know the subsoil to decide on the kind of temporary works required and construction methodology. In the present case, the Developer intended to construct basement car parks which would involve excavation. In addition, there were other buildings and structures in close proximity to the site, including the MRT line and reserve, and different construction methods might be necessitated by different types of subsoil conditions. Underlying those interests are those of the insurers and their specialist reinsurers (who often bear 90 to 95% of the eventual risk) who have become increasingly interested in subsoil conditions as one of

the main factors to rate the risk.

55 Secondly, in the context of the Singapore building construction industry, Geospecs would reasonably expect and know that at least the Geospec Logs would be made available to the contractors tendering for the piling and superstructure works. Geospecs initially pleaded that it did not know that the Geospecs Logs would be incorporated into the Tender Documents; fortunately for their credibility, Mr Tan candidly conceded during cross-examination that he was aware that the Geospecs Logs would be provided to the piling contractors to price their bids: [\[note: 16\]](#)

MR LEO:Mr Tan, when you drilled the bore hole, did you know it would finally be given to piling contractors to price their tender?

A: Yes.

...

Q: But logically, you have been in this trade for so long, you should know that ultimately it will form part of the tender specification to call for tender.

A: Yes, but how they incorporate the document to the tenderer, we don't know.

Q: That's a fair point, okay. For these contractors, your bore hole would be relied on to tender, correct?

A: Yes.

It would have been entirely unrealistic for Mr Tan to contend otherwise given the prevalent industry practice. Geospecs therefore must have foreseen and was probably aware at the material time that the Geospecs Logs would be relied upon in some form by a contractor in the position of Resource Piling or the main contractor for the superstructure. It is my experience, and I can additionally take judicial notice of the fact, that in the larger construction contracts, the borehole logs are invariably included as part of the tender and eventual contract documents.

56 Thirdly, although cl 1.6 of the General Specifications stated that Resource Piling was given the option to conduct its own soil investigations before tendering if it so wished, piling contractors are seldom given enough time to carry out soil investigations of their own in the short time interval between collecting the tender documents and the deadline for the submission of tenders. This necessitates piling contractors relying on the borehole logs of soil investigators to submit their tender bids. Resource Piling alluded to this in the evidence of Mr Foo, who claimed that although Resource Piling was contractually entitled to conduct its own soil investigation, it was not practically possible to do so within the two week time frame to submit its tender; Resource Piling therefore had no choice but to rely on the Geospecs Logs. [\[note: 17\]](#) This is the reality in Singapore's building contract environment, and I recognise that this is a necessary constraint under which most, if not all, contractors have to operate.

57 Having said that, what exactly is meant by "relying on" the borehole logs to price or base their tender bids? In my judgment, there is no mathematical correlation (as compared to assumptions, extrapolation and estimation) between the pricing methods used by piling contractors and the borehole logs. The borehole logs are invariably used by piling tenderers to give them an approximate idea of the general soil conditions. They do not calculate the length of the pile through different layers of soil with different costing on each layer and then build up the price of the piles. They look,

for example, for the depth of the water table and whether underground water will be a problem; they may generally see if there is marine clay and if so how thick the layer is, what depth it is at and what the sandwiching layers of soil are; they may look generally to see what the lower layers consist of so that they know if they have to socket into rock and what length the socketing has to be or whether they will have difficulties with 'soft toes' at the foundation levels which may affect the end-bearing capacity of the pile. They may want to know if driven piles into the subsoil may cause excessive vibration and damage to neighbouring properties or buildings. These factors affect construction and the time to do so.

58 I accept that if a piling contractor sees a rock layer underlain by softer layers, he will have to bore through that layer before reaching the foundation level and that may affect price. Also, if there are large boulders, measures will have to be taken to avoid any mistakes in construction based on an erroneous assumption that the foundation level has been reached. The presence of rock at the foundation level is seldom a problem as all it means is that the piling contractor should check the drawings or specifications to see the depth of and therefore his cost estimate for the socketing. However, Resource Piling's case is on a broader front – the Geospecs Logs only indicated rock around one area (the north-eastern corner of the larger Western plot around BH-5 and BH-6), whereas they encountered rock in almost every other area of the Site. I will deal more fully with this below as there are other factors to be taken into consideration.

59 Fourthly, there was no disclaimer of responsibility or a notation or clause – which is sometimes found in soil investigation reports – to the effect that the Report was prepared solely for and for the purposes of the developer and its consultant and that the maker expressly accepts no responsibility towards any other third party whatsoever and who relies on the same at his own risk. The terms on which Geospecs provided the soil investigation results to Longrove or the Developer clearly did not contain an express disclaimer as to the accuracy of the Geospecs Logs. Although Mr Tan asserted that Geospecs had preserved its position in this respect, he could only point to a single line in the Report when cross-examined: [\[note: 18\]](#)

MR LEO:Yes. Where is your disclaimer?

...

A: ... "The pile penetration length, may, however, depend on the type of piling system to be adopted, on any inherent special variations of the substrata and on the intended loads to be carried out by the piles. Presence of boulders probably due to differential weathering is expected within the residual layer."

So this presence of boulders if already found in bore hole 6, so it could have it in any part of the site.

MR LEO:This would be the disclaimer you are talking about?

A: Yes.

This statement was clearly not in the nature of an unambiguous and unequivocal disclaimer of responsibility that sufficed to exclude a *prima facie* assumption of responsibility.

60 However, in my judgment, although I am satisfied that Resource Piling was not practically able to ascertain the accuracy of the Geospecs Logs and that Geospecs had knowledge that the information contained in the Geospecs Logs would be conveyed to and relied upon by Resource Piling

to price their tenders, these *per se* are not sufficient to establish proximity. On the contrary, there are at least five other countervailing factors that militate against a finding that there was an assumption of responsibility by Geospecs or a corresponding reasonable reliance by Resource Piling.

61 First and foremost, Geospecs was engaged by the Developer to conduct soil investigations, ascertain water table measurements, record field Standard Penetration Test ("SPT") values, obtain undisturbed samples to enable tests to be carried out to obtain information on moisture content, bulk density, Atterberg limits, shear strength in triaxial compression and consolidation and other data *for the Developer and its consultant* for the purposes of pile design. This was expressly stated in the scope of works in the Soil Investigation Contract and the articulated purposes of the investigation. I accept that once the engineer has decided on the choice of piles and the foundation design based on the Report, information from this Report, including the Geospecs Logs, would be used to prepare the tender specifications and drawings for tender.

62 Secondly, the Soil Investigation Report was *not* primarily for tendering purposes and neither was it for any express purpose of enabling the piling tenderer *to calculate* his price. The Report consisted of some 203 pages. The Geospecs Logs for the 11 boreholes only comprised some 22 pages. The Report itself comprised 11 pages. The rest, which formed the bulk of the Report, were mainly detailed test data and results, graphs and laboratory test results which were clearly intended not for a piling contractor's use but for Longrove's use in designing the foundations. The Report also contained Geospecs' recommendations for the type of soil encountered and the recommended pile to be used. There was no passing of such information directly from Geospecs to Resource Piling, and neither was the Report addressed directly or indirectly to Resource Piling as the successful piling tenderer. In fact, there was no evidence before me that there was any immediate contact between Geospecs or Resource Piling right up to the time that the writ of summons was filed. All communications took place through the Developer or Longrove.

63 Thirdly, and consequent upon the second reason, only a small part of the entire Report was made available to Resource Piling, namely, the Geospecs Logs. Clause 1.6 of the General Specifications stated that "an *extract* of the Soil Investigation Report [was] enclosed...for information" [emphasis added], and it was thus clear that the full Report was not included. It is noteworthy that soil investigation, if properly done, only gives a snapshot of the cross-section of the soil which the bore went through. It does not say what the soil *is* ten metres away. If another borehole is sunk 20 metres away, then only a very approximate extrapolation of the *likely* soil profile is obtained by placing these borelogs at two ends of a page and connecting the layers. Sometimes, three or more borelogs are used in this fashion when extrapolating the likely soil profile along a longer axis. The point is, the analysis is not continuous, and because this is after all an extrapolation, it cannot show *exactly* the precise different soils or boulders or rock which may exist between any two boreholes. It has to be remembered that soil investigation borelogs are by their very nature limited in number across a much larger site and do not necessarily accurately profile the subsoil at a site; that is why employers and their consultants in Singapore always provide that the risk of different or adverse soil conditions is on the piling or superstructure contractor. Geospecs sank 11 boreholes whereas Piling Resources had to construct 442 bored piles across the site. These are facts, general as well as particular, that have to be weighed in deciding whether the first test of proximity can be satisfied.

64 It is therefore erroneous for Resource Piling to say that only two (BH-5 and BH-6) out of the 11 boreholes drilled by Geospecs indicated the presence of rock and that they could therefore anticipate that approximately only 18% of their piles would encounter rock, or that two out of 11 of the boreholes, which were adjacent to each other, indicated the presence of rock and that Resource Piling could therefore safely extrapolate that it would not encounter rock elsewhere across the Site.

That was therefore an *assumption* Resource Piling made. It accordingly took the risk, in the contractual context, of that assumption being wrong. Mr Foo's evidence [\[note: 19\]](#) clearly bears out his extrapolation and therefore assumptions he made in working out his tender price. Geospecs also pointed out (in my view very validly so, given the context), that they did not know the Report was not made available to Resource Piling. The Report stated at p 11 that: [\[note: 20\]](#)

Piles may be founded within the very dense/hard/weathered rock stratum ... *Presence of boulders probably due to differential weathering is expected within the residual layer.* [emphasis in italics added]

Although this does not say rock can be expected, it clearly opines that boulders can be expected, *ie*, drilling or coring through boulders may have to be carried out before reaching the layers below them. Therefore, while I would accept that it was reasonable for Resource Piling to have relied on the Geospecs Logs as one of the considerations in preparing their tender, I do not think it can be said with equal strength that it was reasonable to rely on the Geospecs Logs as enabling them to determine with accuracy that only 18% of the piles would hit rock. There was an element of risk that is inherent in extrapolating the overall soil profile of the Site based on 11 data points, and I believe that Resource Piling must have been aware of that.

65 Fourthly, also of importance is that there are different ways in which piling contractors price their works and Geospecs would not know which pricing structure would be adopted as between the Developer and Resource Piling. For bored piles, tenderers can price their piles by length and diameter of the pile with different rates for boring through soil, boring through soft soils (where there might be a need for additives to help stabilise the surrounding soil) and boring through rock or large boulders when they are encountered in the subsoil. They can also make provision for underground obstructions, like old structures sunken in the subsoil. There was no suggestion at all that Geospecs was aware how Longrove would structure the pricing for the tender or that Resource Piling would price their tender purely by the length and diameter of the pile, irrespective of the type of soil it encountered in its construction of the bored piles. I note that in the case of Geospecs, it protected itself by providing that its lump sum quote did not include rock coring and if required it would charge \$150 per metre subject to a minimum of three metres per borehole. The bill of quantities issued by Geospecs also stipulated that boring in soil would be priced at a rate of \$20 per metre whereas diamond drilling through solid rock or material with SPT results of not less than 100 blows per 300mm was at a rate of \$180 per metre. I do not think there was evidence of any close relationship between the parties as there apparently was in *Miller* or *Edgeworth* that would support the imputation of an assumption of responsibility on the part of Geospecs in relation to Resource Piling's reliance on the Geospecs Logs for tendering purposes. It had not participated in the drawing up of the tender documents or specifications or prepared the Geospecs Logs with the intention that it be used by Resource Piling.

66 Fifthly, in the context of the Singapore building and construction industry, the risk of adverse subsoil conditions is variably borne by the contractor. None of the standard building contract forms commonly in use in Singapore provide otherwise. This is the well-known and accepted commercial environment of long standing that both Geospecs and Resource Piling operated within. Hence, the terms of the Piling Contract and Tender Documents repeatedly emphasised that as between the Developer and Resource Piling, the risk that the ground conditions may be different from that indicated in the Geospecs Logs lay *solely* on Resource Piling:

(a) Clause 16(b) of the Piling Contract and cl 1.2.3 of the Bored Pile Specifications clearly excluded any warranty from the Developer and Longrove with respect to the accuracy of the Geospecs Logs and absolved the Developer and Longrove from any liability to Resource Piling on

this basis.

(b) Clauses 1.6 and 1.10 of the General Specifications and cll 1.2.3 and 4.2.4 of the Bored Pile Specifications expressly provided that the contractor tendered for the piling work on the Site on a fixed price per metre basis and no extra cost or time would be allowed in the event that difficult ground conditions were encountered on the Site.

(c) Clauses 7 and 11(d) of the Piling Contract, cl 1.6 of the General Specifications and cl 1.2.2 of the Bored Pile Specifications stated that Resource Piling was deemed to have inspected the Site and satisfied itself as to the ground and subsoil conditions.

The cumulative effect of these contractual terms was that Resource Piling accepted by its contract that it was not entitled to claim extra payment for the additional costs of coring through rock, *ie*, no extra payment would be due if there were unanticipated conditions that rendered the piling work more onerous or expensive to perform in accordance with the contractual specifications. Also, by contract, Resource Piling accepted payment according to a single variable of the length of the bored piles; this was an all inclusive price whether or not Resource Piling had to bore or core through soft soils, medium stiff soils, hard soils or rock or had to use any special tools or equipment.

67 Given the factual circumstances surrounding the relationship between Geospecs and Resource Piling, including the fact that this relationship was not formed directly but through the conduit of the contractual relationship between Resource Piling and the Developer, I am of the view that apart from Geospecs' knowledge that prospective piling contractors would rely on the Geospecs Logs to price the tender, there was no other element which would justify the imputation of an undertaking of responsibility by Geospecs. There was no physical proximity in terms of immediacy of relationship, nor was there circumstantial proximity in the sense of Geospecs performing the soil investigation on behalf of the Developer for the *immediate purpose* of conferring some benefit on Resource Piling or to assist Resource Piling. As Mr Tan averred – and this was confirmed by Resource Piling's expert witness Dr Ting Seng Kiong ("Dr Ting") – the borehole logs were prepared to enable the project engineer to design the foundations and to prepare the engineer's estimate and tender specifications. Geospecs' information was thus provided to the Developer for the primary purpose of the planning and design of the foundations; the contractors who relied on the information to price their tenders were ancillary recipients of that piece of work. Most crucially, I find that the overall contractual and commercial context – as the two general threads running through all the factors above – explicitly and implicitly evinces the parties' intentions to allocate the entire risk of any economic loss arising from inaccuracies in the information provided in the Geospecs Logs to the contractor tendering for the piling work on the Site. This undermines any direct assumption of responsibility by Geospecs to Resource Piling. It was Resource Piling that failed to adequately price for the risk that it undertook.

68 I recognise the possible countervailing argument that it does not follow that Resource Piling is not entitled to claim from Geospecs in tort *because* Resource Piling cannot claim against the Developer under the Piling Contract. The presence of a contractual relationship between Resource Piling and the Developer and the rubric of risk allocation in contract need not necessarily mirror the position of Resource Piling *qua* a third party professional in tort. I accept the general principles behind the reasoning in *Miller and Edgeworth*, *viz*, that a duty in tort cannot be "ousted" by a contractual duty, and *a fortiori* when the duties in contract and tort do not exhaustively occupy the same ground. However, I also do not consider it particularly helpful to frame arguments in terms of abstract theoretical propositions of whether parallel duties in contract and tort are logically inconsistent by the legal nature of the causes of action. In considering the issue of legal proximity, all the facts and circumstances of the case have to be considered. The question before me accordingly is this: given that Geospecs and Resource Piling were brought into a relationship by the Tender Documents and

Piling Contract, did this contractual structure indicate that Resource Piling should be deemed, by inference, to have also accepted the risk of the ground conditions being materially different from that indicated in the Geospecs Logs *vis-à-vis* Geospecs?

69 In answering this question, I respectfully prefer and adopt the approach of the majority in *R M Turton*, which I consider to be consonant with the *Spandeck* Test. The unified two-stage test for a duty of care in *Spandeck* does not separate the questions of whether a *prima facie* duty of care arises out of an assumption of responsibility and whether the contractual framework negates the duty of care; both factors are part of the open-textured enquiry under the first limb of whether legal proximity has been established. Of course, to the extent that the contractual structure may additionally be regarded as a relevant policy consideration, it may negate a *prima facie* duty of care; this is, however, an inquiry from a different and broader perspective.

70 In my judgment, the principle applied by the majority of the New Zealand Court of Appeal in *R M Turton* is directly relevant to the present circumstances and correct. The Court of Appeal held that where the chain of contracts had carefully defined the rights and obligations of the various parties, there is little justification for holding that the third party professional had voluntarily assumed a responsibility to the contractor in tort. The allocation of risk in the respective contracts indicate that as between Geospecs and the Developer, in the absence of any exclusion of liability, the general risk of the accuracy of the soil investigation report fell on Geospecs. As between Resource Piling and the Developer, Resource Piling bore the risk of any possible variations in the actual ground conditions as the contractual price was based on prices measured by the metre length of the bored piles *irrespective* of the actual subsoil encountered. In this manner, the risk that the Geospecs Logs did not reflect actual ground conditions was expressed to be borne by Resource Piling. In the circumstances, I do not consider that the parties contracted on the basis that the risk could be passed across the network of contracts through a tortious duty and do not see any basis to find that Geospecs had, in addition to the contractual duties that it owed to the Developer, assumed the risk of any losses arising out of Resource Piling's performance of the separate Piling Contract.

71 I acknowledge that a similar argument on risk allocation and responsibilities under contract was rejected by the Court of Appeal of California in *Miller*. The Court of Appeal stated as follows (at [4]):

It must be remembered, however, that this contract was one between [the contractor] and the district, and [the soil engineers] was not a party thereto. The fact that [the contractor] chose to assume certain responsibilities and to waive certain liabilities in favour of the district and its engineer does not necessarily result in a determination that its rights and duties as against the engineers were the same. ... No mention whatever is made of respondent's liability for inaccuracies.

With respect, this argument merely begs the question, and I decline to follow *Miller*. If the soil engineer was an independent third party, and was not a party to or a participant in the performance of the main contract between the contractor and the employer, then in the ordinary course of things, that contract would not have expressly defined the engineer's *contractual* scope of responsibilities simply because the employer has no reason to protect the engineer's interests. The rights and liabilities that the contractor has undertaken in relation to the employer therefore likewise should not necessarily result in a determination that its rights and liabilities in relation to a third party should not be deemed to be the same, particularly if that third party is also involved in the overall network of contracts within a building and construction project.

72 Finally, I turn to the submission that the proximity test was satisfied here because, unlike the case in *Pacific Associates Inc v Baxter* [1990] 1 QB 993 ("*Pacific Associates*") and *Spandeck*,

Resource Piling had no contractual remedy against the Developer if the Geospecs Logs failed to provide an accurate estimate of the ground conditions. I am unable to accept Resource Piling's argument that the absence of an adequate contractual remedy for Resource Piling in such an event must mean that Resource Piling placed greater reliance on the Geospecs Logs and that legal proximity under the first limb of the *Spandeck* Test was therefore enhanced.

73 In *Pacific Associates* and *Spandeck*, the courts held that a certifier of work done under a contract did not owe a duty of care to the contractor to exercise professional skill and judgment in certifying payment for work done so as to avoid causing the contractor loss as a result of undervaluation or under-certification of the works. A crucial part of the reasoning in both cases was that the contract between the employer and contractor, under which the scope of the certifier's employment was defined, contained arbitration clauses that gave the contractor a remedy against the employer for any under-certification of works by the certifier. The courts therefore held that it could not be said that the certifier had assumed any responsibility to the contractor, and the imposition of a duty of care on the certifier would cut across and be inconsistent with the contractual structure.

74 In my view, *Pacific Associates* and *Spandeck* do not present analogous fact situations to the present case; they are clearly distinguishable and are of a different sub-category. First, the consultant certifiers there interacted with the contractor throughout the pre-construction, construction and post-construction phases and were active participants in the administration of the construction contract. They belong to a different class of consultants in a building and construction contract. Their functions were also of a very different nature and were set out in the main contract between the employer and the contractor. This is quite unlike the soil investigator who does his one-time investigation, presents his findings and test data and leaves the stage unless he is engaged to do further boreholes and reports. Secondly, I do not read *Pacific Associates* and *Spandeck* as laying down a rule of general application that a duty of care will not be inconsistent with the contractual structure if there is no adequate contractual machinery that addresses the particular loss that the contractor claims to have suffered. It was but one of the factors (although I would accept, an important one) considered by the courts when assessing whether the proximity test was satisfied. Thirdly, *Pacific Associates* and *Spandeck* are cases relating to the professional's negligent performance of functions which, as I have noted, are defined in the main contract between the contractor and the employer. They are not cases akin to the *Hedley Byrne* type of factual scenarios involving a negligent misstatement by a professional to a contractor who relies on it in relation to his decision to enter into a contract, where the twin criteria of a voluntary assumption of responsibility and reliance come to the fore.

75 Where the very basis of the professional's duties stems from the main contract, and the professional is entrusted with certain direct functions in relation to the contractor, the availability of a comprehensive contractual remedy governing the rights and responsibilities of the parties in relation to losses arising from the performance of the professional's functions would be an important indicator that the contractor should be deemed by inference to have voluntarily accepted the limited role played by the professional and that the contractor should look only to its contractual remedies against the employer. In this context, the availability (or otherwise) of a contractual remedy is understandably of some importance. In contrast, the involvement of Geospecs was not expressly contemplated by the Piling Contract save to the extent that information in the form of the Geospecs Logs was provided to Resource Piling in the course of calling for tenders for the contract. The lack of remedies afforded to Resource Piling against the Developer under the Piling Contract does not provide any indication as to whether Resource Piling had therefore contracted on the implied contemplation that it would alternatively have recourse against Geospecs – a party whose "participation" in the Piling Contract was merely incidental – should the information on the subsoil conditions which formed

the assumptions for its contract price subsequently turn out to be inaccurate, or whether Geospecs had accepted this responsibility or obligation. Instead, as I have alluded to above, the lack of a remedy is simply another indication of the allocation of risk that Resource Piling was prepared to accept.

76 The present case is instead analogous to cases like *Caparo Industries*, where shareholders who bought into a company failed in their claim against the company's auditors for negligence in relation to the conduct of an audit and preparation of a report for the annual accounts, and *Simaan General Contracting Co v Pilkington Glass Ltd (No 2)* [1988] QB 758, where a main contractor failed in its action for negligence against the supplier of its subcontractor, alleging that the supplier owed it, the main contractor, a duty of care in respect of economic loss suffered by it as a result of the glass supplied being of an allegedly wrong colour. Bingham LJ, as he then was, said at 782D-E:

... Here, [the main contractor's] real (and understandable) complaint is that Pilkington's [the supplier of the subcontractor] failure to supply goods in conformity with the specification *has rendered their main contract less profitable. This is a type of claim against which, if laid in tort, the law has consistently set its face.* [emphasis in italics added]

Although the effect of *Spandeck* is that there is no longer any exclusionary rule against the recovery of particular types of loss, I agree that when separate and independent contracts are involved, absent special circumstances, an assumption of responsibility in relation to economic loss is not readily found between parties who are brought into a relationship only because they are interposed by a mutual third party.

77 For the reasons set out above, I find that Resource Piling has failed to establish proximity under the first limb of the *Spandeck* Test.

### ***Policy considerations***

78 Having found no legal proximity on the facts of this case, it is moot whether policy arguments may negate a *prima facie* duty of care under the second limb of the *Spandeck* Test. However in the event that I am wrong, I briefly set out my reasons explaining why, when applied to these facts, policy considerations will negate a duty of care. It should also be noted that while the Court of Appeal in *Animal Concerns* (at [77]) held that the *Spandeck* Test does not preclude the court from having due regard to positive policy considerations, the implicit assumption underlying the decision was that policy considerations *alone* cannot operate in an active manner to impose a duty of care where there is otherwise no proximity under the first stage of the *Spandeck* Test. I now turn to briefly address the policy considerations canvassed by the parties.

79 Resource Piling submitted that the Building Control (Amendment) Regulations 2008 sought to increase the accountability of those engaged in soil investigation works so as to avoid structural and safety issues that may subsequently surface due to improperly designed foundations. There was therefore a policy element of public interest and safety in imposing a duty of care not to perform soil investigation works negligently. It was also impossible, as a matter of practical reality, for Resource Piling to verify the Geospecs Logs by performing the soil investigation works itself, and Resource Piling was therefore compelled to rely on the soil investigator.

80 Geospecs contended that if there was proximity between the parties, it should be negated for policy reasons. It argued that allowing Resource Piling to claim for the extra costs of rock socketing would circumvent the contractual allocation of risk by allowing it to claim from Geospecs what it had otherwise given up contractually from the Developer. If Geospecs were liable for Resource Piling's

losses, it would effectively become an insurer for losses that Resource Piling made on the Piling Contract as a result of a bad bargain. This was not the legislative purpose of the Building Control (Amendment) Regulations 2008.

*The statutory framework and the objective of promoting safety in the construction industry*

81 An important policy consideration for the court under the second limb of the *Spandeck* Test is whether the imposition of a common law duty of care would be inconsistent with a statutory duty governing the same subject matter: see *Spandeck* at [53].

82 The primary objective of the Building Control Act is to create a regulatory framework that gives powers to the Building Authority to regulate building works and the safety of buildings, implements a system of independent checking and supervision by accredited checkers and qualified persons, and places a responsibility on contractors to construct buildings safely and in accordance with the approved building plans and regulations: see *Singapore Parliamentary Debates, Official Report* (16 February 1989) vol 52 at col 668. Section 11 of the Building Control Act and reg 31 of the BCR define the duties of builders engaged in site investigation works for the purpose of ensuring that the relevant work is carried out competently and in compliance with industry practice and professional standards. As I have discussed above, the statutory regime is intended to promote a common denominator of safety standards and competence in the industry for the public benefit; it does not purport to regulate the rights and commercial interests of private parties involved in the construction industry as between each other. I agree with Geospecs that there is nothing to indicate that the Building Control Act and BCR contemplated that all legal liability in respect of economic losses suffered by Resource Piling as a result of Geospecs' failure to discharge its statutory duties under reg 31 of the BCR should fall on Geospecs through a coextensive remedy in tort. I cannot dispute that it is desirable for Geospecs to meticulously discharge its statutory duties and that this would advance the purpose of protecting public safety, but imposing a duty on Geospecs owed to a piling contractor or subcontractor on the present facts has no rational or plausible relation to this objective. This is achieved through regulatory or criminal sanctions – which are expressly provided for in reg 50 of the BCR – and not through a private remedy in tort for *economic losses*. While I therefore do not consider that the statutory framework expressly militates against the imposition of a duty of care by reason of inconsistency, I am of the view that there are no positive policy reasons in favour of a duty of care either.

*Practical limitations on piling contractors, risk allocation and the contractual context*

83 In *Edgeworth*, McLachlin J made the following observation (at [18]) on the practical realities of construction contracts which merits citing *in extenso*:

One important policy consideration weighs against the engineering firm. *If the engineering firm is correct, then contractors bidding on construction contracts will be obliged to do their own engineering. In the typically short period allowed for the filing of tenders — in this case about two weeks — the contractor would be obliged, at the very least, to conduct a thorough professional review of the accuracy of the engineering design and information, work which in this case took over two years.* The task would be difficult, if not impossible. Moreover, each tendering contractor would be obliged to hire its own engineers and repeat a process already undertaken by the owner. The result would be that the engineering for the job would be done not just once, by the engineers hired by the owner, but a number of times. This duplication of effort would doubtless be reflected in higher bid prices, and ultimately, a greater cost to the public which ultimately bears the cost of road construction. *From an economic point of view, it makes more sense for one engineering firm to do the engineering work, which the contractors in turn*

*are entitled to rely on, absent disclaimers or limitations on the part of the firm. In fact, the short tender period suggests that in reality this is the way the process works; contractors who wish to bid have no choice but to rely on the design and documents prepared by the engineering firm. It is on this basis that they submit their bids and on this basis that the successful bidder enters into the contract. The fact that the contractor may agree to exempt the party inviting tenders from liability for the design process does not suggest that it thereby should be taken to have exempted the engineering firm. In the scheme of things, it makes good practical and economic sense to place the responsibility for the adequacy of the design on the shoulders of the designing engineering firm, assuming reasonable reliance and barring disclaimers. The risk of liability to compensate third parties for design error will be reflected in the cost of the engineers' services to the owner inviting tenders. But that is a much better result than requiring the owner to pay not only the engineering firm which it retains, but indirectly, the additional engineers which all tendering parties would otherwise be required to retain.*

[emphasis in italics added]

This paragraph was cited with approval by Thomas J in his dissenting judgment in *R M Turton* (at [132]). Thomas J stressed that the limitations in the tendering process necessitated reliance on information provided by the professional (at [129]), and that it was unrealistic, given the fiercely competitive nature of the tendering process, to require a contractor to either refrain from tendering or request the employer to protect him from loss (at [128]).

84 While Resource Piling did not expressly advance a similar argument in relation to the second *Spandeck* limb of policy considerations, Resource Piling did allude to this in Mr Foo's evidence that it was impossible to conduct its own soil investigation in the two weeks it had to submit its tender. I accept this evidence on the realities of the tendering process that are not reflected in the apparent contractual rights that parties are conferred, but do not think that this is a valid policy consideration that would support the imposition of a duty of care.

85 First, while the economic efficiency rationale proffered by McLachlin J in *Edgeworth* appears to be an intuitively attractive and sensible one, I would respectfully make the observation that there is no self-evident reason why the rational economic man should be more tolerant of free-riding than he is of waste through duplication of effort. The practical realities of the tendering process mean that the economic waste rationale is purely theoretical and the real issue before the court is therefore one of the allocation and spreading of the loss, *ie*, who should bear the burden of economic losses caused by inaccuracies in the site investigation reports.

86 Secondly, I am sympathetic to the fact that contractors are often left in an unenviable position where they are compelled to rely on the information provided to them at the time of tendering and can only price their contracts on the assumption that the information provided is accurate. However, as pointed out by Ian Duncan Wallace in his trenchant criticism of *Edgeworth* in *Hudson's Building and Engineering Contracts* (Sweet & Maxwell, 11th Ed, 1995) at para 1.296A:

... [t]he Supreme Court also noted the short period allowed for tendering as a factor supporting [architect or engineer] liability to the contractor. This is certainly a valid observation, and indeed a common-place of construction contracts ... and almost certainly explains the widespread use of "changed conditions" clauses in engineering contracts. Whether or not (as seems entirely possible if probable) such a clause existed in the *Edgeworth* contract, however, the fact that tenderers have for more than a century been prepared to tender at short notice at a time when they enjoyed no possible rights against the [architect or engineer] in tort does not seem a reason for introducing a novel liability and transfer of risk (and which would seem independent of the time,

however generous, in fact allowed for tendering).

87 The *status quo* argument is not necessarily a cogent one in the light of the fact that the *Hedley Byrne* principle is a comparatively recent development in the law of negligence. Nevertheless, in my view, it is certainly a valid answer to point to the existence of “changed conditions” clauses or different ways of pricing that I have referred to above in piling contracts. Resource Piling suffered economic losses in the present case precisely because the Piling Contract had expressly excluded Resource Piling’s right to claim for extra payment if additional rock socketing had to be carried out as a result of encountering rock. The practical limitations faced by contractors could be mitigated by entering into a contract that shared the risk between the parties, and if the contractor has entered into a contract that did not provide for this eventuality and voluntarily undertook that risk, I am of the view that this is a policy consideration that should negate an extra-contractual remedy against the third party soil investigator. In *Spandeck*, the Court of Appeal stated that one of the factors negating the duty of care under the second limb was this (at [83]):

... Among the relevant policy considerations would be, for example, the presence of a contractual matrix which has clearly defined the rights and liabilities of the parties and the relative bargaining positions of the parties.

It may well be true, as Thomas J pointed out in *R M Turton*, that the court is divorced from the competitive realities of the tendering process, but where commercial men are willing to enter into what may be unequal economic bargains, I do not see why a favourable protective stance should be adopted towards the contractor. Inasmuch as the third party professional may price for possible liability to the contractor, the contractor may also price for the possibility that the contract might end up to be an unprofitable one.

#### *Distributive justice*

88 Geospecs submitted that the imposition of a duty of care would effectively render it an insurer for the potentially large economic losses that Resource Piling may incur on the Piling Contract, which had a contract value of \$3,608,488.41. In contrast, the value of the Soil Investigation Contract was only \$20,500.00. The implicit tenor of this submission was that the legal liability imposed on Geospecs would be very onerous and disproportionate in relation to the value of Geospecs’ soil investigation works.

89 The Court of Appeal in *Tan Juay Pah* accepted, as a matter of principle, that distributive justice in economic terms could be a relevant policy consideration negating a *prima facie* duty of care. The Court of Appeal held (at [84]–[87]) that in determining where the balance of distributive justice lies, the court may have regard to the allocation of risk and where available, protection through insurance. In the circumstances before me, I consider that as a matter of policy, the imposition of a duty of care owed by a third party professional to a contractor in the tendering process would not be consistent with distributive justice and would undermine the private allocation of risk that parties have voluntarily entered into.

90 Participants in the construction industry are in the business of managing commercial risks through contracting; these risks are reflected in the contract bargain that each party is willing to accept. Given the minimal contracting price and Geospecs’ limited scope of work in drilling 11 boreholes over the entire site, the extent of risk that Geospecs was willing to accept cannot reasonably extend to cascading economic losses that a contractor may suffer in reliance on the Geospecs Logs due to an under estimation of the costs of the works, something which was entirely out of Geospecs’ control and within the realm of its own choice for the piling contractor. I do not

think that a third party professional, who contracts with one of the parties who then passes information on to his contracting party, would be the best party to shoulder risks that arise under the main contract. The contracting parties themselves, with specialised knowledge and experience of the potential contingencies that they may encounter in the performance of their contract as well as the pricing variables, are better able to spread the risk through careful contracting, and I am of the view that the law of tort should exercise much caution and restraint before intervening in such circumstances to shunt the risk onto the third party professional. The risk should generally lie where it falls and where it was intended to fall, in accordance with the agreement of commercial men.

91 I must point out that in this respect, I confine my observations above to economic losses to contractors arising purely out of bad bargains on hindsight, and would reserve my view on whether this consideration would have the same force in relation to physical damage or personal injury that is caused by the negligent conduct of soil investigation work.

92 I therefore conclude that even if Geospecs did owe Resource Piling a duty of care under the first proximity limb of the *Spandeck* Test, the above policy considerations ought to negate the duty of care under the second limb.

### **Breach of duty and causation**

93 In the event that I am wrong in my conclusions that Geospecs did not owe Resource Piling a tortious duty of care in preparing the Geospecs Logs such that they accurately reflected the soil conditions on the Site, I set out my findings on the primary factual issues identified above (at [16]).

### ***The Geospecs Logs***

94 I first describe what the Geospecs Logs showed, leaving aside all other portions of the full Report that was submitted to the Developer.

95 BH-1 and BH-2 show fairly similar subsoils. After the usual layer of fill (up to 1.40m and 1.90m respectively), there were layers of peaty clay (estuarine) underlain by very soft greenish grey marine clay (marine) going down to 8.70m and 9.50m respectively where, as can be expected, there was no resistance to the SPT blows; after that, there were varying layers of soft to firm greyish light brown clay with fine sand at the bottom of the layer (fluvial) extending to 11.80m and 12.30m respectively, followed by a layer of loose fine to medium sand with fine gravel and clay, a fluvial layer identifiable as the Kallang Formation down to 14.10m in both boreholes. This was followed by a very dense light bluish grey and brownish grey silty fine to coarse sand with fine to medium gravel identifiable as Old Alluvium in BH-1 and residual soil in BH-2, down to 20.30m and 16.30m respectively, with SPT of 100/18cm to 100/6cm in BH-1 and SPT of 100/19cm for BH-2. Below that there was the final layer of very dense light bluish grey and light yellow gravelly silty fine to coarse sand identifiable as residual soil, Bukit Timah Granite down to 27.20m (SPT 100/6cm to SPT 100/2cm) where the bore ended for BH-1 and down to 30.10m (SPT 100/6cm to SPT 100/2cm) where the bore ended for BH-2.

96 BH-3 and BH-4 had a similar profile, albeit with slightly different depths for each layer with a similar end layer of residual soil – Bukit Timah Granite from 19.80m to 30.02m (SPT 100/5 to SPT 100/2) for BH-3 and from 22.50m to 30.02m (SPT 100/4 to SPT 100/2) for BH-4.

97 BH-5 also had similar upper layers of subsoil: fill, estuarine peaty clay, very soft greenish grey marine clay, fluvial sandy clay, fluvial coarse sand with some fine gravel of the Kallang Formation followed by residual soil of silty fine to coarse sand with fine to medium gravel down to 18.00m. This was followed by rock, where a rebound was recorded by the SPT, consisting of highly to moderately

weathered granite layers down to 23.20m where the bore ended, with a core sample taken within that last layer of rock. BH-6 had a similar subsoil profile to BH-5 with the last layer of rock extending from a depth of 18.70m to 30.20m where the bore ended. The SPT recorded a rebound at a depth of 18.07m, but showed SPT of 100/17cm at about a depth of 24.00m depth to 100/2cm at a depth of 27.00m. A core sample was taken from 18.70m to 23.00m but no samples were recovered for the last 7m from 23.00m to 30.02m.

98 BH-7 also had similar subsoil layers as BH-1 to BH-4, but to different depths. The same bottom layer contained residual soil of Bukit Timah Granite which extended from 23.80m to 33.02m where the bore ended, with SPT 100/23cm, 100/08cm, 100/3cm and 100/2cm within that layer. No samples were recovered at the depths of 27.00m and 33.00m.

99 In BH-8 to BH-11, no marine clay layer was found but there were otherwise fairly similar layers of subsoil but to different depths:

- (a) BH-8 and BH-9 had similar layers of estuarine clay and peat, underlain with fluvial layers of clay of the Kallang Formation, before descending into layers of residual soils. BH-8 contained a layer of sandy silt and ended with a layer of residual soil of Bukit Timah Granite from 17.40m to 25.52m. BH-9 contained a layer of Old Alluvium beneath the Kallang Formation layer and ended with a bottom layer of residual soil of Bukit Timah Granite from a depth 17.30m to 26.01m where the bore ended. Like the other boreholes, no samples were recovered at the lower depths of this last layer.
- (b) BH-10 and BH-11 had similar layers of estuarine clay and peat, underlain with fluvial layers of clay of the Kallang Formation before descending into layers of residual soils, primarily hard dark reddish pink to reddish brown sandy silt of the Jurong Formation. The last layer of BH-10 extended from 19.80m to 27.02m where the bore ended, with SPT of 100/5cm to 100/2cm. The last layer for BH-11 extended from 22.30m to 27.02m where the bore ended, with SPT of 100/3cm to 100/2cm. Samples were not recovered at the lower depths of this last layer.

100 Resource Piling claimed that this told them there was rock only around the vicinity of BH-5 and BH-6 and they priced their tender accordingly. As noted above, the UTP (which was bored between BH-10 and BH-11) hit rock at a depth of 19.00m. By way of comparison, BH-10 and BH-11 showed no rock and terminated in a layer of sandy silt of the Jurong Formation which commenced at 19.80m for BH-10 and 22.30m for BH-11.

### ***The expert evidence***

101 The expert evidence for Resource Piling was given by Dr Ting, the Deputy President (Academic) for the Singapore Institute of Technology. Dr Ting was previously an Associate Professor at the Nanyang Technological University and is currently a Visiting Professor of Newcastle University, United Kingdom. He is a registered Professional Engineer and presently engages in ad hoc consultancy work from time to time, having been appointed a consultant or expert witness to more than 50 projects over the past five years. From his *curriculum vitae*, it appears that he was consultant for the underpinning works for the 30-storey office development at Church Street mentioned above.

102 The expert evidence for Geospecs was given by Mr Akira Wada ("Mr Wada"), the Managing Director of Asia Georesearch Agency Corporation Pte Ltd ("AGAC"), a specialist contractor for geotechnical works including soil investigation and geotechnical analysis. Mr Wada is registered as an APEC Engineer in the discipline of Civil Engineering by the APEC Engineer Monitoring Committee in

Japan but is not a licensed Professional Engineer in Singapore. Both experts were instructed to prepare an expert report based on a number of issues identified by counsel.

103 Under O 40A r 2 of the Rules of Court (Cap 322, R5, 2006 Rev Ed), an expert's primary duty is to assist the Court on matters within his expertise, and this duty overrides any obligation he owes to the party from whom he has received instructions. This means that while the courts will permit a spirited defence of an expert's independent views and position, the expert should not stray into engaging in partisan advocacy to advance his client's cause: see *Pacific Recreation Pte Ltd v S Y Technology Inc and another appeal* [2008] 2 SLR(R) 491 at [69]–[73]. It emerged in the course of cross-examination that Mr Wada's company AGAC had subcontracted soil investigation works to Geospecs about three to four times a year [\[note: 21\]](#) and had at least a fairly close working relationship with Geospecs. I would hesitate to conclude from this alone that Mr Wada was in any way partial or biased in his evidence, but my overall impression of Mr Wada's evidence was that he occasionally attempted to advance Geospecs' case on its behalf by making certain allegations that had not been previously put before Resource Piling's witnesses. This was in keeping with his admission that looking out for Geospecs was only natural: [\[note: 22\]](#)

Q: Wouldn't that cloud your objectivity because he works with you?

A: This one is -- one part is true, but if you say like this, most of Singapore, this soil investigation company, is our subcontractor. We cannot discuss with them about engineering matters.

Q: Because he's your subcontractor, you must look out for him, right? Yes?

A: Yes, this one is -- some part is human being, yeah, sure.

I therefore evaluated certain portions of Mr Wada's evidence with some degree of reservation.

104 Counsel for the defendant, Mr Thomas Tan ("Mr Thomas Tan") said it was not disputed that Longrove changed the pile design after the results of the UTP load tests. However, when Mr Wada went on the witness stand, he put forward the fact that it was actually Resource Piling that suggested the change in design. That caught even Mr Thomas Tan by surprise. With respect, Mr Wada also overlooked what I found to be shortcomings in Geospecs' case by giving unconvincing excuses:

(a) First, Mr Wada gave an elaborate explanation as to why samples could not be obtained from the lower levels of some of the boreholes: BH-2, BH-3, BH-4, BH-6, BH-7, BH-8, BH-9, BH-10 and BH-11. However, he later agreed that the inspection of samples was important for verifying borelogs. Mr Wada then said that tools were available to recover weathered rock in Japan but not in Singapore. [\[note: 23\]](#) However, when it was put to him, he could not explain why S & F managed to recover samples at the lowest levels but could only give an equivocal response: [\[note: 24\]](#)

Q: Then how do you explain that Soil & Foundation don't have all these problems with getting samples?

A: Very difficult to say, but Soil & Foundation also trustable company. I also use them.

(a) Additionally, Resource Piling managed to obtain soil investigation reports prepared by Mr

Wada for other projects (the Singapore Zoological Gardens and 25 Grange Road), [\[note: 25\]](#) where Mr Wada had, contrary to his earlier evidence, successfully cored and obtained samples for Grade IV rock. There was no indication of refusal or rebound before he switched to coring to obtain samples in Grade III and Grade IV rock and he also agreed that generally there would not be any refusal of the drill bit or rebound of the SPT hammer for Grade IV rock. [\[note: 26\]](#)

(b) Secondly, Mr Wada was asked to look at the data from BH-11 and BH-11A and BH-11B, which were within a distance of 1m to 1.5m from each other, and Mr Leo asked how the three borelogs could show both rock and soil. Mr Wada struggled to provide any explanation: [\[note: 27\]](#)

Q: How can it be possible that within such a small diameter the results can be so far apart, that one is soil and is rock?

A: Yeah. This one is I also many day consider about this 11, what is the condition. I cannot, still I cannot find out, I cannot get sure idea, because of within three, one number is rock, two number is based on this classification, not rock.

(b) I pause to mention that BH-11A was drilled by Geospecs to confirm the results of BH-11 but BH-11B was drilled by S & F. Rock was encountered at a depth of 21.50m to 27.00m in BH-11B. Geospecs' senior geologist Mr Okkar examined the samples and accepted that it was rock; Geospecs did not deny the results from BH-11B.

(c) Thirdly, Mr Wada did not seem to find anything surprising or strange with the borelogs for BH-1A and BH-11A, which were drilled by Geospecs to confirm the earlier results in the Geospecs Logs for BH-1 and BH-11, for the borelog of BH-1A to state that the soil encountered from 23.20m to 27.02m was "inferred" to be "very dense silty fine to coarse sand with gravel (completely weathered granite; Bukit Timah Granite)" and that no samples were recovered from those depths; and for the borelog of BH-11A to state that at a depth from 22.50m to 27.02m, the layer was "inferred as very dense silty fine to coarse sand (completely weathered SANDSTONE; Jurong Formation)", and again, no samples were recovered. When Mr Wada was asked during cross-examination whether "inferring" meant guesswork and whether it was unusual to use such a term in borelog descriptions, all he said was that different description terms were used by different companies but his company did not use that term. [\[note: 28\]](#) Even taking into account Mr Wada's less than fluent facility in the English language, I find this difficult to accept as an objective and non-partisan view.

(d) Fourthly, Mr Wada maintained that the Geospecs Logs were correct and that Resource Piling's records collated by Mr Michael Chong Kong Wai ("Mr Chong") during the piling works were wrong. He was taken through the borelogs of BH-3 and the records for one of the bored piles, BP-93, and it was clear that the two were dissimilar. The records for BP-93 was signed off by Longrove's Resident Engineer Mr K A Chua ("Mr Chua"). Mr Wada first attempted to say that Mr Chong was wrong and that Mr Chua was "writing wrongly" but eventually had to accept that the Professional Engineer and Accredited Checker were not wrong. [\[note: 29\]](#)

(e) Fifthly, I find that Mr Wada denied the obvious, which was that when Geospecs took a whole day to drill 3m, it was drilling into rock, not soil. [\[note: 30\]](#)

105 I therefore find that I prefer Dr Ting's evidence over Mr Wada's evidence where they differed.

***What was the generalised soil profile at the Site?***

106 Dr Ting adopted the observations in the S & F Report, which stated: [\[note: 31\]](#)

### **3.1 Site Conditions**

The area is covered with fills of sandy silt, firm to stiff sandy silt underlain Old Alluvium of fine to coarse and dense sand. The marine clay of 5m thk [sic] in Kallang formation found in NBH-02 at depth 3.5m ~8.5m.

The hard and completely weathered sandy silt were encountered on site.

NBH-1, NBH-2 and NBH-3 each ended in a layer of moderately weathered Grade III granite. The second report produced by S & F for BH-11B, (erroneously) dated 8 January 2010, also stated that "below [the Old Alluvium] layer, completely weathered granite, coarse grained granites are found in Bukit Timah Granite Terrain." Mr Wada stated that the ground material at the Site generally consisted of three groups of soil/rock formations: (1) a fill layer from a depth of 0m to 1.2/2.1m (2) a layer from the Kallang Formation to a depth of 10.9/14.5m and (3) an ending layer of weathered granite formation.

107 I note and find that the geological map of Singapore [\[note: 32\]](#) tendered in evidence showed that the Site was located in a "transition" region which was surrounded by the boundaries of the Kallang Formation, the Bukit Timah Granite and the Jurong Formation (conglomerate Rimau Facies). The Geospecs Logs indicated both the presence of residual soil and/or weathered rock from Bukit Timah Granite in the deeper layers of BH-1, BH-2, BH-3, BH-4, BH-5, BH-6, BH-7, BH-8 and BH-9 and residual sandy silt from the Jurong Formation in BH-10 and BH-11; and there were references to material from the Kallang Formation in all boreholes and Old Alluvium in BH-1 and BH-9.

#### ***What is the definition of "rock"?***

108 According to the National Productivity and Quality Specifications ("NPQS"), "rock" is defined as "[m]aterial classified as grade I to III in table 10 'Scale at weathering grades of rock mass' in [the British Code of Practice for Site Investigations]" [\[note: 33\]](#). It was not disputed that piling contractors in Singapore were generally entitled to claim for drilling into "rock" only when they encountered materials classified as Grade III or above. Resource Piling's case is that they only claimed for piles where they encountered rock that was classified as Grade III under the British Code of Practice for Site Investigations ("BS 5930") with a strength greater than 20 MN/m<sup>2</sup>.

109 Resource Piling and Geospecs both tendered expert evidence on the definition of "rock". Dr Ting explained that there were two main classification scales of rock: the weathering classification of rock from Grade I to Grade VI ranging from fresh rock to residual soil under table 10 of the BS 5930, and the strength description of the rock based on the unconfined compressive strength from less than 1.25 MN/m<sup>2</sup> to more than 200 MN/m<sup>2</sup> under table 2.1 of the Singapore Standard Code of Practice for Foundations ("CP4"). [\[note: 34\]](#) Dr Ting also stated that while a geologist may regard Grade IV and Grade V as rock, this was not the case for engineers. [\[note: 35\]](#) However, where the rock was Grade III and above, there was no ambiguity [\[note: 36\]](#), and the definition of Grade III rock bore a general correlation to the CP4 scale based on the compressive strength of the rock such that Grade III rock had a strength of 12.5 MN/m<sup>2</sup> to 50 MN/m<sup>2</sup>. [\[note: 37\]](#) I accept the evidence of Dr Ting and this is, in my view, correct and in accordance with engineering practice.

110 Mr Wada stated in his expert report that it was necessary to have a detailed soil description as

specified by BS 5930 in order to understand the mechanical properties of the ground material, and that the boring logs recorded by Resource Piling were insufficient for this purpose. [\[note: 38\]](#) In particular, during cross-examination, Mr Wada disputed Dr Ting's correlation between the grade of the rock under the scale of weathering and classification based on strength, *ie*, a Grade III rock would not necessarily have a strength between 12.5 MN/m<sup>2</sup> to 50 MN/m<sup>2</sup> as weathering was not homogeneous and it was possible for certain weathered zones to have rocks of different strengths [\[note: 39\]](#). However, it is important to note that Mr Wada accepted that where the rock had a strength of 20 MN/m<sup>2</sup>, it was possible but unlikely that the rock would be highly weathered rock and it was more likely to be moderately weathered rock. [\[note: 40\]](#)

111 I do not think that the positions of both experts were diametrically opposed on this issue. Both Dr Ting and Mr Wada were generally in agreement that there was a grey area and that the distinction between Grade III and Grade IV (*ie*, moderately weathered and highly weathered) rock could not be delineated with precision. It was not Dr Ting's position that there was a strict correlation between the grade of weathering and the uniaxial compressive strength, and Mr Wada eventually conceded that he would agree with such a gradation. [\[note: 41\]](#) Any residual disagreement between the experts over the definition of rock was, in my view, immaterial. I therefore accept, for the purposes of Resource Piling's claim, that where the ground material had a strength of at least 20 MN/m<sup>2</sup>, this could be classified as Grade III rock that falls under the definition of "rock" in the NPQS.

***Were the soil profile logs produced by Resource Piling in the course of conducting the piling works accurate?***

112 Geospecs adopted the strategy of trying to impugn the accuracy of Resource Piling's boring logs [\[note: 42\]](#) (hereafter collectively referred to as "the Boring Logs") that recorded that Resource Piling had hit rock in 77% of the piles that they had drilled in the zones surrounding the nine boreholes where the Geospecs Logs had indicated that no rock was encountered. In essence, Geospecs alleged that Resource Piling's claims that they had cored into rock were untrue.

113 The Boring Logs were mostly recorded by Mr Chong and one Mr Kumar. Geospecs contended that the Boring Logs recorded by Mr Chong were inaccurate as he had been specifically instructed by a Mr Eric Choo or Mr Foo to record the material as "moderately weathered rock". In comparison, Geospecs claimed that Mr Kumar's logs were more detailed and did not indicate that there was any rock detected even in boreholes that were very close to boreholes where Mr Chong had recorded that rock was encountered. The Boring Logs done by Mr Chong contained a description of the soil, with the word "rock" included in brackets following certain descriptions. In Mr Chong's affidavit of evidence-in-chief ("AEIC"), he stated that he was instructed to record the material bored out of the borehole as "moderately weathered rocks" when it was necessary to use core barrels to core the rock first, followed by a rock bucket to drill the borehole. [\[note: 43\]](#) Mr Foo also stated that this manner of description was the industry practice, and I accept his evidence. [\[note: 44\]](#) Geospecs seized upon the words used in Mr Chong's AEIC to cross-examine him on the basis that he did not really encounter rock but was instructed to say so by Resource Piling. Mr Chong's statement in his AEIC must be read in context and fairly. Geospecs' cross-examination and submission was that only the boring records recorded by Mr Chong indicated that rock was encountered. That is not true. I note and find that not all of Mr Chong's records state that rock was encountered. In Mr Kumar's limited records, he recorded that "[v]ery dense bluish grey and weather moderately sandstone" was encountered for BP-174. Other Resource Piling employees, contrary to Geospecs' allegations, also recorded the presence of rock. One Mr V. Suresh recorded encountering rock in BP-6, BP-243, BP-365 and BP-369. One Mr

Salam records hitting “[v]ery hard bluish (Rock)” in BP-60 and “[b]luish weathered granite (Rock)” for BP-423, and also recorded encountering rock in BP-38, CBP-180, CBP-163, CBP-170, CBP-172 and CBP-171. Mr N. Kumaresan also recorded encountering rock at BP-38. I also note that in accordance with standard practice, and as mentioned before me but not specifically addressed as it was not in issue, some piles would have been randomly selected for load tests; there is no suggestion that any of those test piles failed.

114 During cross-examination, Mr Chong candidly testified that he was not able to visually distinguish between moderately weathered rock and highly weathered rock, but he had learnt from experience that highly weathered rock could be torn apart by hand but moderately weathered rock could not. [\[note: 45\]](#) In the course of his work, he would consider that a rock was Grade III rock if it was necessary to use a core bucket or rock bucket instead of a soil bucket. [\[note: 46\]](#) The soil bucket used by Resource Piling could bore materials having a strength of up to 20 MN/m<sup>2</sup>. Therefore, when the soil bucket could not penetrate further and it was necessary to switch to a core bucket or core barrel, it meant that at least Grade III rock had been encountered in the borehole. [\[note: 47\]](#)

115 More importantly, Mr Chong also averred that when he extracted samples from the borehole, the Resident Engineer on site would verify what was recorded by him [\[note: 48\]](#) and would countersign on the Boring Logs. [\[note: 49\]](#) I accept his evidence. This is industry practice and Dr Ting held the same view. [\[note: 50\]](#) There is no basis for Geospecs’ insinuation that Mr Chong was instructed to deliberately record the Boring Logs in a particular manner merely because the piling records were less detailed than the standard descriptions in the BS 5930, and I find that there is no reason to doubt the Boring Logs accurately recorded the ground conditions at each layer of the borehole. It bears emphasising that the samples recovered from the boreholes were inspected and kept for the Resident Engineer and made available for Longrove’s or the Accredited Checker’s inspection if they so required. The Boring Records were countersigned by the Resident Engineer, who was a representative from Longrove and then lodged with the BCA. They were also implicitly accepted by Longrove, the Professional Engineer and the Accredited Checker (who signed off on the superstructure and substructure).

116 In the final analysis, if Resource Piling had not in fact hit rock, I am unable to see why Resource Piling would have fabricated this fact in the Boring Logs. Resource Piling evidently had nothing to gain by making false allegations; the Piling Contract was payable on a per metre basis and the pile lengths were in fact shortened as a result of the presence of rock at the Site. One of Resource Piling’s complaints was that due to the shortened piles, it was only paid \$2,274,063.36 instead of the contract sum of \$3,608,488.41. It would also take Resource Piling a much longer time to core through rock instead of boring through soil and they would also have to incur additional costs of rock socketing (*ie*, to anchor the piles two times the pile diameter into the rock layer). Furthermore, after an occurrence like the Church Street debacle, no Professional Engineer or Accredited Checker would blindly or lightly endorse or sign-off As-Built drawings and records showing shorter constructed piles with a significant number having been socketed into rock when this departed from the earlier construction drawings and documents that had originally been submitted and approved by the BCA.

***Did the Geospecs Logs accurately indicate the soil conditions at each borehole?***

117 On balance, I conclude and find that the Geospecs Logs were inaccurate and negligently prepared, even after making allowance for the inherent possibility of variations in soil conditions and differential weathering across the Site. I accept Dr Ting’s opinion in this respect that although only a

small proportion of the ground was tested by sinking 11 boreholes, this was in compliance with the BCA guidelines that the boreholes should not be more than 50m apart and that it was sufficient to generally ascertain the overall soil conditions if the soil profiles were consistent. [\[note: 51\]](#) I also agree, as a matter of common sense, that while slight gradations are possible, large variations across the Site at distances of one to two metres are unlikely unless a large number of the investigation boreholes were sunk precisely along the joints of the rocks.

118 I also find and accept the evidence in the S & F Report and the report for BH-11B, as well as the evidence of Dr Ting, that the site sat in a 'transition' region (as compared to sitting within one of the recognised geological formations in Singapore). To the north and northeast of the Site lay the igneous Bukit Timah Granite formation; to the south and southeast of the Site lay the Kallang Formation; and to its West, a little further on, lay the sedimentary Jurong Formation. There were also elements of Old Alluvium. Anyone with some familiarity of Singapore's geology (and this includes those who practice in construction) will know that these are part of the ten geological formations of Singapore and there are references to four of these formations scattered in the Geospecs Logs. This may account for those instances where rock was encountered in one borehole whilst being absent in an adjacent borehole, *eg.* BP-138 and BP-139 which was 3m to 4 m apart; BP-47, BP-48 and BP-49; BP-223 and BP-231 (which did not hit rock) and BP-229 and BP-230 (which hit rock); BP-249 and BP-250; BP-174 and BP-173; BP-169 and BP-171; BP-130 and BP-129; and a cluster comprising the UTP, BP-335, BP-332, BP-334, BP-337 and BP-349, with only BP-335 in the centre which did not hit rock. To this extent, I accept Geospecs' contention that the subsoil condition may vary naturally.

119 Comparatively, there were many more piles where rock was encountered when none should have been expected if the Geospecs Logs were accurate, *eg.* the many piles around the UTP, BH-2 and BH-11 which hit rock, and the differing soil profiles recorded in Geospecs' BH-11A and S & F's BH-11B which were only slightly over 0.5m apart. I note that BH-2, where no rock was encountered up to a depth of 30.01m and where the soil was classified as residual soil from 16.30m to 30.10m, was completely at odds with what was encountered when boring BP-189. BP-189, which was 1100mm in diameter and located close to BH-2, hit Grade III rock from 17.00m to 20.30m where it ended. Indeed, rock was also encountered in the other piles surrounding BH-2. In BP-188, rock was encountered from 18.00m to 19.285m where it terminated; in BP-159, rock was encountered from 20.00m to 26.355m where it terminated; and in BP-160 rock was encountered from 18.00m to 20.70m where it terminated. [\[note: 52\]](#) As a matter of statistical probability, I find it difficult to explain this by natural variances.

120 The overall objective evidence before me also leads me to the conclusion that the Geospecs Logs were not an accurate record of the subsoil at the lower levels of their boreholes.

121 First, in my judgment, the evidence tendered by Geospecs' two factual witnesses on the manner in which the drilling and recovery of soil samples were conducted gives rise to the inference that the soil investigation work was done incompetently and the Geospecs Logs were therefore an inaccurate reflection of the ground conditions on the Site. The majority of the field exploration and drilling work from August 2009 to September 2009 for BH-1 to BH-11 was supervised by Mr Tun Tun Latt ("Mr Tun Tun"), who was employed as the Site Geologist. Mr Tun Tun gave evidence that he collected soil samples and recorded the field logs based on the collected samples. [\[note: 53\]](#) The Senior Geologist Mr Okkar would then double check Mr Tun Tun's field logs against the sample collected and would occasionally make corrections. [\[note: 54\]](#) Mr Tun Tun stated that it was Geospecs' practice to continue drilling if there was some penetration, and he would only core if there was a total rebound after conducting the SPT. [\[note: 55\]](#) This procedure was confirmed by Mr Okkar. [\[note: 56\]](#) Mr

Okkar visited the site about four times when the field exploration work was conducted. [\[note: 57\]](#) Mr Okkar was also responsible for compiling the Geospecs Logs in accordance with the requirements of BS 5930 [\[note: 58\]](#) and he stated that he would thoroughly check the field logs recorded by Mr Tun Tun against each sample. [\[note: 59\]](#) Mr Okkar claimed that if the field logs were inaccurate, he had enough experience to recognise that the materials recorded did not correspond with the materials that would be expected at that level based on the profiles of neighbouring areas. [\[note: 60\]](#) I do not accept this at all.

122 Mr Tun Tun, who only had less than three years' work experience in Singapore, relied largely on instructions from Mr Okkar, who was rarely present. Mr Tun Tun was aware of the termination criteria for the boreholes but could not independently decide whether drilling should be terminated and had to refer to Mr Okkar for instructions [\[note: 61\]](#), although Mr Okkar was not onsite to satisfy himself as to the actual ground conditions. Mr Tun Tun also stated that while he had experience in soil description, he had little experience in either conducting rock coring or recording rock descriptions. [\[note: 62\]](#) I also note that although the Geospecs Logs were certified by a Professional Engineer Mr Cecil Sinnadurai ("Mr Sinnadurai"), Mr Okkar confirmed that Mr Sinnadurai was not present at the site and had relied on feedback from Mr Okkar that all procedures were correctly followed. [\[note: 63\]](#) I note that Mr Sinnadurai, who was in the full-time employment of Geospecs, was not called as a witness.

123 Dr Ting pointed out that CP4 cautioned that where Bukit Timah Granite was concerned, it was important to distinguish between Grades III, IV, V and VI as the engineering properties of each grade were very different. The weathered granite found in Singapore generally consisted of a thick mantle of residual Grade VI, and there was only a limited amount of Grade V and Grade IV material before hitting Grade III rock. It was therefore necessary to take frequent samples to correctly classify the grade of the ground materials. [\[note: 64\]](#) However, as noted above, as a result of the drilling procedures followed by Mr Tun Tun and Mr Okkar, proper samples had not been retrieved at the lower depths. Samples were not recovered from 24.00m to 30.01m for BH-2, from 24.00m to 30.02m for BH-3, from 27.00m to 30.02m for BH-4, from 27.00m to 33.02m for BH-7, from 24.00m to 25.52m for BH-8, from 21.00m to 26.01m for BH-9, from 24.00m to 27.02m for BH-10, and from 27.00m to 27.02m for BH-11. Mr Okkar, who was personally involved in the fieldwork for BH-1A and BH-11A, also did not attempt to core to recover any samples at the lower layers. I have also referred to the highly unusual notations which state that the soil was "inferred" since no samples were retrieved. For BH-1A, there was no recovery from 24.00m to 27.02m, and for BH-11A, there was no recovery from 24.00m to 27.02m. Mr Okkar also gave evidence that it took an entire day to drill the last three metres of BH-1A [\[note: 65\]](#) and BH-11A. [\[note: 66\]](#)

124 I find that the recording of the soil profiles at the lower depth in the Geospecs Logs was more likely to be based on guesswork as no proper samples were retrieved for verification. Dr Ting stated that where only a small sample was obtained it may be insufficient for an inexperienced person to ascertain whether the sample formed part of a rock layer, and that it was necessary to obtain a core to confirm the nature of the material. [\[note: 67\]](#) Mr Wada accepted that where the penetration was limited, for example 2 cm, it was not possible to obtain a sample by conducting the SPT. [\[note: 68\]](#) Mr Okkar "inferred" the characteristics of the soil layer by observing the particles that were flushed out from the boreholes together with the return water [\[note: 69\]](#), and claimed that this was more accurate than coring. [\[note: 70\]](#) I do not accept this at all. It appears on the face of the Geospecs Logs that where samples were not recovered, Mr Tun Tun had simply assumed that the soil characteristics at the lower depths were similar to those of the samples recovered from the preceding layer, although Mr Okkar stated that Mr Tun Tun followed the same procedure of observing particles

in the return water. [\[note: 71\]](#) I am unable to accept that this is a proper or scientific method of classifying the type and strength of material found within a defined layer, particularly if I accept Mr Wada's expert evidence that any particular layer may consist of material of differing weathering grades and strengths. In other words, a residual particle may not necessarily represent the overall soil condition of that layer.

125 I find that Mr Tun Tun was inexperienced and incapable of dealing with subsoil investigation when he reached the rock layers at lower depths. When he was asked how he had managed to describe the soil layers when he had not recovered any samples, his honest answer was that he did not know exactly and had assumed it was the same as the layer above from which he obtained his last sample. [\[note: 72\]](#) Mr Tun Tun also testified that Mr Okkar wrote the words "rebound" in the borelogs for BH-5 and BH-6 before the rock coring results were stated. [\[note: 73\]](#) Overall, I am of the impression that Mr Tun Tun's answers in cross-examination clearly demonstrate his inexperience and inability to independently handle the soil investigation when it reached the rock level, and Mr Okkar had to correct Mr Tun Tun's descriptions when rock samples were recovered in both BH-5 and BH-6. Based on Mr Okkar's evidence, I also find that he was not properly supervising Mr Tun Tun in carrying out the soil investigation work and had not performed his duties competently in failing to recognise Mr Tun Tun's deficiencies. Further, Mr Okkar was himself responsible for carrying out the investigation works for BH-1A and BH-11A, and as I have observed above, Mr Okkar only "inferred" the soil layers and likewise did not recover samples. Based on Mr Okkar's evidence, I consider that it was possible that Geospecs' Professional Engineer, Mr Sinnadurai, was signing off the report without checking whether the soil investigation was done in accordance with the applicable standards. My findings are made on a balance of probabilities and I say no more as Mr Sinnadurai was not called as a witness and did not have a chance to say anything in his defence.

126 Secondly, after the test results were obtained from the UTP, the design of the bored piles was changed. It was common ground that Longrove changed the pile designs after the UTP was constructed (on 22 January 2010), load tested (from 30 January to 5 February 2010) and the test results compiled in a report dated 10 February 2010 ("the UTP Report"). There was an attempt by Mr Wada, while giving additional evidence in testimony, to say that this change was proposed by Resource Piling. [\[note: 74\]](#) This fact was never put to Mr Foo or to Dr Ting. [\[note: 75\]](#) Mr Leo quite rightly lodged his protest. However at the end of the day, I do not think it makes much difference who first proposed the design change. Even if this was initiated by Resource Piling, they were but reporting on the test results of the UTP which clearly showed much higher mobilised skin friction than that assumed in the drawings that were issued for tender. In the UTP Report, under the heading "RECOMMENDATION", Resource Piling stated: [\[note: 76\]](#)

On the safe side, adapt the following procedure:

- i. Compute the pile length of bore pile base on ultimate skin friction of 2.5N for soil, 450KN/m<sup>2</sup> for sandstone and end bearing of 8,000 kNm<sup>2</sup>, copy of the pile length calculation is enclosed in Appendix D
- ii. Prior to obtain approval from BCA, construct bore pile base on the length stated in the pile layout plan. Pile length calculation base on parameter stated in the drawing. Skin friction : 2N; end bearing : 8000is enclose in appendix E.

In the final analysis, Longrove must have accepted or agreed to the recommendation (with minor amendments) and Longrove and the Accredited Checker would have signed off on the proposal and

sent it on to the BCA for approval. This new design was approved by the BCA. In the original design, the skin friction of the soil was 2 N KPa subject to a maximum value of 200 KN/m<sup>2</sup>, but the engineer subsequently increased the skin friction to 2.5 N KPa (for soil) subject to a maximum value of 450 KN/m<sup>2</sup>. Under CP4, a maximum value of 150 KN/m<sup>2</sup> is permitted for soils of Bukit Timah granite and sedimentary Jurong Formation, and a maximum of 300 KN/m<sup>2</sup> for dense or hard cemented soil in Old Alluvium. Higher maximum values may be adopted if sufficient load tests were conducted in similar soil condition. [\[note: 77\]](#) The 450kN/m<sup>2</sup> was supported by the UTP test results and at that time, Resource Piling would not have known that they would hit rock in the construction of some 302 out of their 391 bored piles. What is undeniable and not challenged by Mr Thomas Tan was that Longrove's original design for tender had used a skin friction of 2 N KPa subject to a maximum of 200 kN/m<sup>2</sup> with design pile lengths varying from 22.60m to 34.00m [\[note: 78\]](#). Under the subsequent design, the skin friction increased to 2.5N subject to a maximum of 450 kN/m<sup>2</sup> with design pile lengths varying from 16.80m to 27.20m. After the redesign, the piles were also divided into eleven sub-zones based on the location of the boreholes. [\[note: 79\]](#)

127 According to Mr Foo, the increase of the skin friction in the design above 300 KN/m<sup>2</sup> would not have been permitted by the BCA unless the material surrounding the piles was rock. [\[note: 80\]](#) Mr Tan agreed that calculations with 450 kN/m<sup>2</sup> skin friction meant skin friction in rock. [\[note: 81\]](#) I accept that the increase in skin friction must have meant that Longrove recognised that the ground conditions were different from what was originally indicated in the Geospecs Logs at the time that the piles were initially designed. The end bearing load value was unchanged at 8.0 MPa, but I am not convinced by Geospecs' contention that the end bearing load value must have remained unchanged because the engineer found that the Geospecs Logs were sufficiently accurate for design purposes. I accept Dr Ting's evidence that the engineer did not have sufficient information to determine whether the pile could bear an increased end bearing load as the UTP did not fail, and that there was therefore no reason to redesign the pile on this basis. [\[note: 82\]](#) The consequence would be that the pile was slightly overdesigned but the value would remain safe. [\[note: 83\]](#) It must be remembered that after the UTP test results, no one would know whether rock would be encountered elsewhere as well. If the bored piles did encounter rock, then the socketing requirement (twice the bored pile diameter) would take effect and the end bearing would be much higher than 8.0 MPa [\[note: 84\]](#). The fact that the end bearing load was not changed is at most a neutral factor. Additionally, the shorter lengths of the piles could be attributed to the fact that the skin friction was higher than was originally anticipated under the Geospecs Logs as the actual surrounding material was rock instead of soil. The piles could therefore be shortened accordingly.

128 There would be no reason for the pile designs to be changed by Longrove, an independent third party, and neither would the revised designs have been approved by the BCA if Resource Piling had not in fact encountered ground conditions that were different from those recorded in the Geospecs Logs. Although Mr Tan contended that the new designs of the piles were still based on the SPT indicated in the Geospecs Logs [\[note: 85\]](#), he acknowledged that the increase in the skin friction to a maximum value of 450KN/m<sup>2</sup> meant that the engineers were basing the design on the capacity of rock instead of soil. [\[note: 86\]](#) It is an uncontroverted fact that the design was changed, and I find that the new design had been calculated on the basis that Longrove accepted that the ground conditions encountered at the lower layers were in fact rock instead of soil (as recorded in the Geospecs Logs).

129 Thirdly, I find on a balance of probabilities that the S & F Report and their borehole logs were

accurate. NBH-1 was drilled in the vicinity of BH-10 and the UTP, and a layer of moderately weathered Grade III greyish pink granite spotted with black and white minerals was encountered from 19.80m. NBH-2 was located near BH-3 and the layer extending from 19.50m to 26.50m consisted of moderately weathered Grade III light greenish grey granite spotted with black, white and pink minerals. NBH-3 was located near BH-4 and moderately weathered Grade III light greenish grey granite spotted with black and white minerals was encountered from 26.30m to 33.30m. [\[note: 87\]](#) After Geospecs drilled BH-11A, S & F also drilled BH-11B 0.567m away from BH-11A. The borehole log for BH-11B indicated that moderately weathered Grade III light grey spotted with black and light pink coloured Bukit Timah Granite was encountered at a depth of 21.50m. [\[note: 88\]](#) This was followed by a layer of slightly weathered Grade III spotted with black and light pink coloured light grey Bukit Timah Granite at 24.90m, and a layer of moderately weathered Grade III Bukit Timah Granite from 25.50m to 27.00m. Samples for all four boreholes were recovered at every level.

130 Geospecs submitted that the exact geographic coordinates were not available for NBH-1, NBH-2 and NBH-3, and that it was impossible to verify whether the boreholes were in fact drilled on the precise locations on the Site where the S & F Report had claimed that they were drilled. Geospecs also claimed that the accuracy of the S & F Report was suspect as Mr Ng Dick Young ("Mr Ng") – who was a director of S & F and gave evidence on behalf of Resource Piling – had not been present when the fieldwork for NBH-1, NBH-2 and NBH-3 was done and did not personally verify the samples recovered onsite.

131 I do not think that either of these points seriously undermines the accuracy or reliability of the borelogs prepared by S & F. While the precise coordinates were not recorded, I am satisfied that the location plan, which was plotted by S & F's geologist, provided a sufficient approximation of which zone each borehole was drilled in. NBH-1 was set between BP-359 and the UTP and it was surrounded by BP-437, BP-348 and BP-360; NBH-2 was surrounded by BH-3, BP-71, BP-52, BP-56 and BP-75 and NBH-3 was surrounded by BH-4, BP-202, BP-198, BP-176, BP-177, BP-179, BP-203 and BP-204. S & F was an independent third party and Geospecs quite rightly did not challenge their impartiality at any point in cross-examination, and I do not see any ground for suspecting that the locations indicated in the S & F Report were misrepresented. I also do not think that I can draw any conclusions from the fact that Mr Ng was not personally involved in the fieldwork. Mr Ng testified that he had looked at photographs of the rock cores recovered before certifying the S & F Report [\[note: 89\]](#), and I cannot realistically draw any inference that the borehole logs were inaccurate or that the fieldwork was not conducted properly merely because Mr Ng was not personally involved in the recording and compilation of the borehole logs.

132 I pause to make my findings on Mr Ng's evidence. Mr Ng was first cross-examined on 26 June 2012. It was evident that something was amiss because he looked quite distracted and disturbed when he came on the stand. It appears that he rushed down to court and when his driver stopped at the front of the court, a policeman came up and fined his driver. His text message to Mr Leo's junior read: "I came here but was fined by the courts when my driver stopped me. I don't think I am in the right frame of mind to attend the court." I acceded to Mr Leo's request to halt proceedings for five to ten minutes while he tried to calm Mr Ng down. Nonetheless, even after that short break, it certainly looked as if some of Mr Thomas Tan's questions were not registering and Mr Ng's answers were suspect. I noted this at the end of the day. The next day, Mr Ng appeared to have recovered and was able to respond to the questions fielded to him very coherently.

133 I find Geospecs' attack on Mr Ng's absence from the Site and the conduct of the drilling and recording of the borelogs by Mr Ng's staff somewhat ironic in view of what went on in Geospecs' own soil investigation. The inevitable commercial pressures put on engineers involved in geotechnical soil

investigation means they cannot be at each and every site. I accept the evidence of Mr Ng and the accuracy of S & F's soil investigation results. S & F is an established soil investigation outfit and has been an ISO 9000 certified company since the late 1990s. Its staff members are trained and operating procedures are in place. Mr Wada acknowledged its reputation. I also accept and agree with the evidence of Mr Ng that there are different types of sampling methods that can be employed for different conditions [\[note: 90\]](#); if no sample is recovered with one method, another method should be employed. [\[note: 91\]](#) A sample can be recovered by using a core barrel to core and Mr Ng stated that where there was a possibility that the lower layers contained moderately weathered material, they would core to retrieve a sample [\[note: 92\]](#). Even Mr Tan, Geospecs' director, agreed that where the SPT penetration was 1cm or 2cm, using a core barrel would give him a chance to recover a sample. [\[note: 93\]](#) Mr Ng did not directly receive his instructions from Resource Piling and did not know of the background to this particular soil investigation. [\[note: 94\]](#) I find the recording of the S & F borelogs, sample retrieval and core identification much more professional than Geospecs' work. They retrieved samples where Geospecs did not or could not.

134 In my judgment, the borelog for BH-11B is also irreconcilable with the borelogs for BH-11 and BH-11A. All three boreholes were at most 1.5m apart. BH-11B indicated that there was Grade III Bukit Timah Granite from 21.50m to 27.00m. Mr Okkar [\[note: 95\]](#) and Mr Wada [\[note: 96\]](#) both accepted the accuracy of BH-11B. In contrast, BH-11 indicated that residual soil in the form of silty fine to coarse sand with fine to medium gravel was encountered from 17.20m to 22.30m and residual soil in the form of sandy silt from the Jurong Formation from 22.30m to 27.02m; samples were not recovered from 27.00m to 27.02m. BH-11A indicated that the layer from a depth of 20.40m to 22.50m contained residual soil in the form of silty fine to medium sand, and from 22.50m to 27.02m, it was inferred that this layer contained completely weathered sandstone from the Jurong Formation; samples were not recovered from 24.00m to 27.02m.

135 Mr Okkar averred that he had used the same method to drill BH-11A as Mr Tun Tun did for BH-11; he continued drilling as there was no rebound when the SPT was conducted and took about one day to drill the three metres from 24.00m to 27.02m. [\[note: 97\]](#) No samples were recovered from a depth of 24.00m and Mr Okkar explained that he had "inferred" the soil description from the sand contained in the return water from the borehole. [\[note: 98\]](#) While Mr Okkar contended that it was possible to find a wide variance in the properties of soil within a short distance, it appears to me that at the same level, *ie*, from about 22.00m to 27.00m, both the physical properties and the geological nature of the rock formations differed rather widely across the three boreholes. I would also observe, as noted above, that Geospecs' own expert witness Dr Wada conceded that he could not explain this difference. [\[note: 99\]](#) As complete samples of the rock core were recovered for BH-11B and seen and accepted by both Mr Okkar [\[note: 100\]](#) and Dr Ting [\[note: 101\]](#), I find that BH-11B was a more accurate reflection of the soil profile within that specific area. Mr Okkar had no other option but to accept the findings of S & F, including the rock samples recovered, notwithstanding that the results clearly differed from the borehole logs produced by Geospecs for BH-11 and BH-11A. The latter had the notation "inferred" in the description of the final soil layer when Geospecs failed to recover a sample. In my experience I have never seen a borelog of a soil investigator which infers the soil in a layer.

136 On balance, I therefore accept the veracity and accuracy of the borehole logs produced by S & F. It is an independent and reputable soil investigation company and had no reason to be partial to any party. I acknowledge that the soil investigation work by S & F covered a much more limited area, but it suffices to illustrate that the methods adopted by Geospecs contributed to a higher probability that the soil conditions at the lower layers were not correctly determined by Geospecs.

137 Fourthly, as between Dr Ting's and Mr Wada's expert opinions on whether the Geospecs Logs were accurate and the reasons for the disparity between the different sets of records of the soil profile of the Site, I prefer Dr Ting's evidence. Dr Ting expressed the view that the reason for the disparity between the Geospecs Logs and the Boring Logs at the lower levels was because Mr Tun Tun had failed to core when the SPT values fell below 100/3 cm and had continued to drill instead. [\[note: 102\]](#) As a result, no samples could be recovered and the geologist was unable to make an assessment as to whether the layer contained soil or rock, and the layers (with SPT values below 100/3 cm) that had been described as Grade VI residual soil in BH-1 to BH-11 could in fact have been Grade III or Grade IV rock. [\[note: 103\]](#) It was possible for the tungsten carbide drill used by Geospecs to cut through weaker Grade III rock. [\[note: 104\]](#) Dr Ting also explained that while certain bored piles did not hit rock, the pile length was shorter than the depth at which the rock layer started; consequently, while no rock was encountered, it could not be concluded that there was no rock at the deeper levels of the cross-section. [\[note: 105\]](#) Dr Ting's overall position was that while the SPT values recorded in the Geospecs Logs were correct [\[note: 106\]](#), the description and classification of the ground materials were incorrect. [\[note: 107\]](#) Mr Wada opined that the Geospecs Logs could be trusted and that the engineers had accepted it as a matter of judgment although there had been no physical recovery of samples. [\[note: 108\]](#) While Mr Wada did not respond directly to Dr Ting's explanation as to why the soil had possibly been described inaccurately at the lower levels, Mr Wada suggested that the Site was a boulder area based on the borehole logs for BH-5 and BH-6. [\[note: 109\]](#)

138 I also accept Dr Ting's evidence (which relied on CP4) that where Bukit Timah Granite is concerned, it is particularly important to distinguish between Grades II, IV, V and VI as there is a significant difference in the engineering behaviour of each of these grades. As noted above, CP4 also states that typically there is only limited Grade V and Grade IV material below the usual thick layer of residual soil and recommends careful and frequent sampling once the penetrational resistance in the SPT reaches 30 blows/300mm. [\[note: 110\]](#) This was something Geospecs clearly failed to do.

139 With respect, I find Mr Wada's expert evidence of limited assistance in explaining the disparity between the Geospecs Logs and the Boring Logs. I accept that differential weathering and the possibility of boulders on the Site may explain the occasional presence of rock, but it appears to me to be highly improbable that rock would be consistently encountered across the Site for these two reasons. As noted above, Mr Wada conceded that he was not able to explain the variations between BH-11, BH-11A and BH-11B, whilst Dr Ting was able to proffer a consistent and coherent theory that satisfactorily explained the results of the Geospecs Logs, Boring Logs and S & F Report.

140 Fifthly, I find that Geospecs' confirmatory boreholes BH-1A and BH-11A were drilled during a weekend and Resource Piling was not informed so that it could not send representatives to witness the drilling. Mr Tan explained that Mr Okkar had communicated the time of drilling to Mr Babu but the latter had failed to inform Resource Piling. [\[note: 111\]](#) However, I note that Mr Babu was not called as a witness to establish this fact. I find this excuse quite suspicious and self-serving. Geospecs knew there was a claim by Resource Piling that they had encountered rock over large areas in the site. That was the very reason why the confirmatory boreholes were being done in the first place. Mr Tan also claimed that Mr Sinnadurai witnessed the drilling of the two confirmatory boreholes and checked the termination depth. [\[note: 112\]](#) However he too was not called nor did a Professional Engineer sign off on the findings of Geospecs' confirmatory borelogs as no report was produced and Mr Tan claimed that Mr Sinnadurai's certification was therefore not required. [\[note: 113\]](#) I have already commented on the lack of sample recovery in the lowest levels of BH-1A (24.00m-27.02m) and BH-11A (24.00m-27.02m) which inevitably led to the lower layers being described as "inferred". I additionally note that

the description of these lowest layers from each borehole did not really correspond to the two layers above for each borehole. I find that no competent engineer could say that these two borelogs confirmed the findings in BH-1 and BH-11. On the other hand, as noted above, the Resident Engineer countersigned on Resource Piling's Boring Logs and I accept that Resource Piling recovered samples from their boring which were kept by the Resident Engineer for inspection by the Accredited Checker or Developer. Both the Accredited Checker and Developer must have been satisfied and agreed with Resource Piling because the Boring Logs were compiled and sent in together with the As-Built Pile Drawings, duly signed by the Professional Engineer and Accredited Checker, to the BCA. If the Resident Engineer or Longrove had any reservations, I cannot see them signing off these records and drawings for submission and retention by the BCA.

141 In summary, I find that Geospecs' soil investigation was negligently carried out and the Geospecs Logs were negligently logged and inaccurate, but as I have found that no duty of care exists *vis-à-vis* Resource Piling and Geospecs, it is not necessary to consider whether any such hypothetical duty has been breached. If it was necessary to do so, then I would have found that Geospecs was negligent and had breached that duty of care if it existed.

## **Conclusion**

142 For the reasons set out above, I dismiss Resource Piling's claim on the basis that Geospecs did not owe any duty of care to Resource Piling in relation to the preparation of the Geospecs Logs.

143 I will hear the parties on costs.

Reported by Mak Sushan Melissa.

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[\[note: 1\]](#) Exhibit P-1; Plaintiff's Supplementary Bundle of Documents Vol 2 p 821.

[\[note: 2\]](#) Exhibit P-1; Plaintiff's Supplementary Bundle of Documents Vol 2 p 821.

[\[note: 3\]](#) Plaintiff's Bundle of Documents Vol 1 pp 1-27.

[\[note: 4\]](#) Plaintiff's Bundle of Documents Vol 1 pp 30-32.

[\[note: 5\]](#) Plaintiff's Bundle of Documents Vol 1 p 162.

[\[note: 6\]](#) Plaintiff's Bundle of Documents Vol 1 p 163, p 167-168.

[\[note: 7\]](#) Plaintiff's Bundle of Documents Vol 1 pp 169-173.

[\[note: 8\]](#) Plaintiff's Bundle of Documents Vol 1 pp 174-175.

[\[note: 9\]](#) Defendant's Bundle of Documents Vol 2 p 570.

[\[note: 10\]](#) Plaintiff's Core Bundle of Documents p 156.

[\[note: 11\]](#) Plaintiff's Bundle of Documents Vol 1 p 207.

[\[note: 12\]](#) Notes of Evidence, XXN of Foo Hee Kang, 26 June 2012, page 100 at lines 12-23.

[\[note: 13\]](#) Affidavit of Evidence-in-chief of Tan Eng Gee, TEG-2 p 33.

[\[note: 14\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 59 at lines 12-24.

[\[note: 15\]](#) Plaintiff's Closing Submissions at [153].

[\[note: 16\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 47 lines 9-25, page 48 lines 1-3.

[\[note: 17\]](#) Notes of Examination, XXN of Foo Hee Kang, 25 June 2012, p 93 lines 19-25, p 93 lines 1-3.

[\[note: 18\]](#) Notes of Examination, XXN of Tan Eng Gee, 27 August 2012, p 45 lines 4-25, p 46 lines 1-4.

[\[note: 19\]](#) Notes of Evidence, XN of Foo Hee Kang, 25 June 2012, pages 76-87; Exhibit P-2.

[\[note: 20\]](#) Affidavit of Evidence-in-chief of Tan Eng Gee at TEG-2.

[\[note: 21\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 50 lines 2-20.

[\[note: 22\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 55 lines 4-16.

[\[note: 23\]](#) Notes of Evidence, XXN of Akira Wada, 31 August 2012, pages 167-169; Notes of Evidence, XXN of Akira Wada, 3 September 2012, pages 133-135.

[\[note: 24\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 137 lines 19-22.

[\[note: 25\]](#) Exhibit P-12.

[\[note: 26\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, pages 145-152.

[\[note: 27\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 141 lines 12-16.

[\[note: 28\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 57 lines 14-22.

[\[note: 29\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, pages 115-119.

[\[note: 30\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, pages 132-133.

[\[note: 31\]](#) Affidavit of Evidence-in-chief of Foo Hee Kang, FHK-8 at p 8.

[\[note: 32\]](#) Exhibits P-3 and P-4.

[\[note: 33\]](#) Plaintiff's Bundle of Documents Vol 5 at p 1808.

[\[note: 34\]](#) Affidavit of Evidence-in-chief of Ting Sing Kiong at TSK-2 p 17-18.

[\[note: 35\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 139 lines 11-20.

[\[note: 36\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 141 lines 13-15.

[\[note: 37\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 142 lines 1-4; Exhibit P-8.

[\[note: 38\]](#) Affidavit of Evidence-in-chief of Akira Wada at AW-2 p 16-17.

[\[note: 39\]](#) Notes of Evidence, XN of Akira Wada, 3 September 2012, page 20 lines 1-13.

[\[note: 40\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 20 lines 14-18; page 89 lines 5-18.

[\[note: 41\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 89 lines 19-25; page 90 lines 1-3.

[\[note: 42\]](#) See Plaintiff's Bundle of Documents Vol 2

[\[note: 43\]](#) Affidavit of Evidence-in-chief of Chong Kong Wai at [9].

[\[note: 44\]](#) Notes of Evidence, XXN of Foo Hee Kang, 25 June 2012, page 135 lines 15-22.

[\[note: 45\]](#) Notes of Evidence, XXN of Chong Kong Wai, 28 June 2012, page 30 lines 20-25, page 31 lines 1-4.

[\[note: 46\]](#) Notes of Evidence, XXN of Chong Kong Wai, 28 June 2012, page 31 lines 5-13.

[\[note: 47\]](#) Notes of Evidence, XXN of Chong Kong Wai, 28 June 2012, page 74 lines 20-23.

[\[note: 48\]](#) Notes of Evidence, XXN of Chong Kong Wai, 28 June 2012, page 126 lines 3-9.

[\[note: 49\]](#) Notes of Evidence, RXN of Chong Kong Wai, 28 June 2012, page 149 lines 8-23.

[\[note: 50\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 155 lines 9-22.

[\[note: 51\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 145.

[\[note: 52\]](#) See Exhibit B-3, As-Built Pile Penetration Table.

[\[note: 53\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, page 58-59.

[\[note: 54\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, page 60 lines 2-10.

[\[note: 55\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, page 97 lines 15-25.

- [\[note: 56\]](#) Notes of Evidence, RXN of Okkar, 29 August 2012, page 98 lines 22-25.
- [\[note: 57\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, page 68 lines 5-9.
- [\[note: 58\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 5 lines 24-25, page 6 lines 1-4.
- [\[note: 59\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 9 lines 1-9.
- [\[note: 60\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 8 lines 7-12.
- [\[note: 61\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, page 81 lines 8-12.
- [\[note: 62\]](#) Notes of Evidence, RXN of Tun Tun Latt, 28 August 2012, pages 148-149.
- [\[note: 63\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 14 lines 4-15.
- [\[note: 64\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page 169-171.
- [\[note: 65\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 34 lines 7-11.
- [\[note: 66\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 53 lines 11-17.
- [\[note: 67\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page 27 lines 6-12.
- [\[note: 68\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 135 lines 12-13.
- [\[note: 69\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 25 lines 14-22.
- [\[note: 70\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 31 lines 11-14; page 48 lines 13-19.
- [\[note: 71\]](#) Notes of Evidence, RXN of Okkar, 29 August 2012, page 121 lines 9-15.
- [\[note: 72\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, pages 109-111.
- [\[note: 73\]](#) Notes of Evidence, XXN of Tun Tun Latt, 28 August 2012, pages 118 lines 4-12; XXN of Tun Tun Latt, 28 August 2012, pages 120 lines 1-20.
- [\[note: 74\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012 (After 5.30 pm) page 6-10.
- [\[note: 75\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012 (After 5.30 pm) page 14-19.
- [\[note: 76\]](#) Plaintiff's Bundle of Documents Vol 5 at p 1889.
- [\[note: 77\]](#) Code of Practice for Foundations, Plaintiff's Bundle of Documents Vol 4 p 1574.
- [\[note: 78\]](#) Exhibit B-7.

[\[note: 79\]](#) Exhibit B-11.

[\[note: 80\]](#) Notes of Evidence, XN of Foo Hee Kang, 25 June 2012, page 40 lines 13-17.

[\[note: 81\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 79 lines 1-3.

[\[note: 82\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page 133 lines 10-21.

[\[note: 83\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page 135 lines 11-21.

[\[note: 84\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page pages 134-135.

[\[note: 85\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 75 lines 1-3.

[\[note: 86\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 79 lines 13-20.

[\[note: 87\]](#) Affidavit of Evidence in-chief of Foo Hee Kang, FKH-8 at pp 139-146.

[\[note: 88\]](#) Affidavit of Evidence-in-chief of Foo Hee Kang, FKH-13 at pp 395-396.

[\[note: 89\]](#) Notes of Evidence, XN of Ng Dick Young, 27 June 2012, Page 15 lines 5-9.

[\[note: 90\]](#) Notes of Evidence, FXN of Ng Dick Young, 27 June 2012, page 24 lines 5-14.

[\[note: 91\]](#) Notes of Evidence, FXN of Ng Dick Young, 27 June 2012, page 26.

[\[note: 92\]](#) Notes of Evidence, FXN of Ng Dick Young, 27 June 2012, page 36-38.

[\[note: 93\]](#) Notes of Evidence, XXN of Tan Eng Gee, 28 August 2012, page 25 lines 10-21.

[\[note: 94\]](#) Notes of Evidence, FXN of Ng Dick Young, 27 June 2012, page 18 lines 2-4.

[\[note: 95\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 83 lines 6-19; Affidavit of Evidence-in-chief of Okkar at para 18.

[\[note: 96\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 81 lines 13-15.

[\[note: 97\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 53 lines 11-17.

[\[note: 98\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 48 lines 13-19.

[\[note: 99\]](#) Notes of Evidence, XXN of Akira Wada, 3 September 2012, page 141 lines 9-16.

[\[note: 100\]](#) Notes of Evidence, XXN of Okkar, 29 August 2012, page 83 lines 9-19.

- [\[note: 101\]](#) Notes of Evidence, XN of Ting Sing Kiong, 30 August 2012, page 170 lines 8-11.
- [\[note: 102\]](#) Notes of Evidence, XN of Ting Sing Kiong, 30 August 2012, page 161 lines 12-19.
- [\[note: 103\]](#) Notes of Evidence, XN of Ting Sing Kiong, 30 August 2012, page 166 lines 16-23.
- [\[note: 104\]](#) Notes of Evidence, XN of Ting Sing Kiong, 29 August 2012, page 163 lines 3-9; RXN of Ting Sing Kiong, 31 August 2012, page 140 lines 9-15.
- [\[note: 105\]](#) Notes of Evidence, XN of Ting Sing Kiong, 30 August 2012, page 172 lines 1-16.
- [\[note: 106\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 31 August 2012, page 137 lines 21-25.
- [\[note: 107\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 31 August 2012, page 54 lines 9-20.
- [\[note: 108\]](#) Notes of Evidence, XN of Akira Wada, 3 September 2012, page 22 lines 18-25.
- [\[note: 109\]](#) Notes of Evidence, XN of Akira Wada, 3 September 2012, page 154 lines 1-8.
- [\[note: 110\]](#) Notes of Evidence, XXN of Ting Sing Kiong, 30 August 2012, page 170-171.
- [\[note: 111\]](#) Notes of Evidence, XN of Tan Eng Gee, 27 August 2012, page 16 lines 2-15.
- [\[note: 112\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 32 lines 12-25.
- [\[note: 113\]](#) Notes of Evidence, XXN of Tan Eng Gee, 27 August 2012, page 34 lines 11-22.