Hanson
HEIDELBERGCEMENT Group

Hanson Construction Materials Pty Ltd
ABN 90 009 679 734
10 The Boulevard
Brisbane Airport Qld 4008
PO Box 1636
Toombul Qld 4012
Tel (07) 3246 5500
Fax (07) 3246 5533
www.hanson.com.au

2 March 2018

Mr Howard Reed
NSW Department of Planning & Environment
GPO Box 39
Sydney NSW 2001

Email: howard.reed@planning.nsw.gov.au

Dear Sir,

Re: Hanson Construction Materials Pty Ltd – Tweed Sand Quarry (DA 152-6-2005) Modification 1 – Request for additional information from Department of Planning & Environment

Hanson Construction Materials ('Hanson') commissioned Bitzios Consulting ('Bitzios') to review the issues raised in the Department of Planning and Environment ('DPE') emails dated 24 and 28 November 2017, including correspondence attached to those emails from Mr Stephen Segal of Gales-Kingscliff Pty Ltd ('Gales'). Those emails relate to the Hanson Tweed Sand Quarry Modification 1 (MOD1) application, which commenced in October 2016 and is currently with DPE for final approval. In addition, a third Gales submission was sent directly to DPE and HCM on 22 December 2017. That third submission has also been considered in the Bitzios review. In this letter, the 'Tweed Sand Quarry', Cudgen, New South Wales (as in our MOD1 application), is referred to as Tweed Sand Plant ('TSP').

For clarity and given recent correspondence with DPE, we highlight that both our MOD1 application and the Bitzios traffic modelling has been based on the delivery of a maximum of 503,500 tonnes of extracted sand per annum.

Preliminary issue – standing of 'submissions'

We understand that Gales (being the owner of the adjoining Cudgen Lakes Sand Quarry) was not notified during the formal notice period (being 29 June to 31 July 2017), as would be required under Part 6, Division 6, Clause 84 (2) (a) of the *Environmental Planning and Assessment Regulation 2000.* Mr Segal recognised this point in his 17 November 2017 letter, stating '*Gales received no notification of the lodgement or exhibition of the application*', and that Gales '*respectfully requests that our submission is fully considered despite being lodged following the formal submission period.*'

As each of the Gales 'submissions' was submitted outside of the notice period, a question remains as to whether Hanson needs to consider them. Nonetheless, in the spirit of your response to us about considering late submissions, the following comments are provided.

For this letter, Hanson sought advice from our traffic consultants, Bitzios. Having completed the traffic impact assessment supporting the MOD1 application, we requested Bitzios review the points

raised within the first two emails from DPE and corresponding letters from Gales. Bitzios was also instructed to complete additional traffic modelling. Biztios' report in response to the Gales submissions is included herein as Attachment 1.

The Gales submissions

Viewed together, the three Gales submissions focus on the following points:

1. Interpretation of the traffic impact modelling and assessment completed for the TSP MOD1 application, including the cumulative traffic assessment incorporating maximum truck movements from the Cudgen Lakes Sand Quarry. This interpretation extends to the comparison between the traffic impact assessment completed for the Cudgen Lakes Sand Quarry (2007) EIS and that completed for the TSP MOD1 application (2017), thereby answering DPE's query of 24 November 2017; *'The Gales submission draws attention to greatly differing and incompatible results in the application's TIA versus the TIA done for Gales' Cudgen Lakes quarry project application in 2006.'*
2. The identification of two nearby residential developments currently in bulk earthworks stage, which have been linked to Crescent Street as the primary route for traffic movements through to Tweed Coast Road.
3. Discussion around the required Altona Road maintenance agreement (a point Tweed Shire Council ('Council') highlighted in correspondence dated 21 March 2017, and again on 4 August 2017).

The Bitzios report addresses points 1 and 2 as follows:

Clause 2.6 states *'the Bitzios report cannot be compared with the forecast traffic volumes from the Veitch Lister traffic report because the Bitzios 2016 traffic survey data superseded any forecast traffic volumes used in the Veitch Lister report 10 years prior …. Veitch Lister traffic forecasts were based on …. traffic growth rate of 7.5% per annum …. which at the time of this report has not eventuated …. Assumptions and variables included within the Veitch Lister 2007 traffic growth rates for forecasting are again superseded by current known traffic data and variables.'*

Bitzios concludes that *'the current intersection layouts can adequately cater for TSP's maximum additional traffic. Further, the cumulative impact of both TSP and Cudgen Lakes developments maximum traffic does not warrant the need for any significant upgrades to the intersections'.* That is, no intersection work at all is required should both TSP and Gales operate at maximum heavy vehicle traffic movements of 36 and 29 respectively per hour, even though these maximums are unlikely to occur and if they do, are unlikely to occur concurrently.

Our commentary regarding point 3 is provided below:

Altona Road maintenance agreement

TSP currently performs 'as required' maintenance on Altona Road, which is part of TSP's main haul route. Such maintenance is mostly in the form of the provision of asphalt to rectify emerging potholes and other road defects. It appears that Gales is now agitating for the formalisation of a maintenance agreement for Altona Road. Hanson would be content with this, but not where it extends into intersection alterations or upgrades. To assist Gales' understanding in this regard, Hanson plans to expand the TSP site such that the future access/egress point for the site will be via Tweed Valley Way/Pacific Motorway, and not along Altona Road, Crescent Street and Tweed Coast Road.

We trust that the original submission, which we note was satisfactory to both RMS and Council, together with the comments and observations provided herein and attached in response to issues raised by DPE and Gales, satisfactorily address your requirements.

We would appreciate if you could now determine our MOD1 application expediently.

Please do not hesitate to contact the undersigned should you require any further details or elaboration.

Yours faithfully,

Murray Graham
Development Manager

Attachment 1

Traffic Impact Assessment - Tweed Sand Plant Response to DPE and Gales Submission Correspondence (Bitzios)

Gold Coast Office
S: Suite 26, 58 Riverwalk Avenue
Robina QLD 4226
M: PO Box 5102 Q Super Centre
Mermaid Waters QLD 4218
P: (07) 5562 5377
F: (07) 5562 5733
W: www.bitziosconsulting.com.au

Brisbane Office
S: Level 2, 428 Upper Edward Street
Spring Hill QLD 4000
M: Level 2, 428 Upper Edward Street
Spring Hill QLD 4000
P: (07) 3831 4442
F: (07) 3831 4455
E: admin@bitziosconsulting.com.au

Sydney Office
S: Studio 203, 3 Gladstone Street
Newtown NSW 2042
M: Studio 203, 3 Gladstone Street
Newtown NSW 2042
P: (02) 9557 6202
F: (02) 9557 6219

Our Reference: P2930.005L

15 February 2018

Hanson Construction Materials
C/- Gilbert and Sutherland Pty Ltd
5/232 Robina Town Centre Drive
ROBINA QLD 4226

Attention: Glyn Cowie
Sent via email: cowie.gr@access.gs

Dear Glyn

RE: TWEED SAND PLANT RESPONSE TO DPE AND GALES SUBMISSION CORRESPONDENCE

1.0 BACKGROUND

This letter is in response to concerns outlined by the NSW Department of Planning and Environment (DPE) and Gales Holdings Pty Ltd (Gales) regarding the proposed Tweed Sand Plant (TSP, formerly Tweed Sand Quarry) expansion. Specifically, the concerns relate to the combined impacts of surrounding developments on the Tweed Coast Road/Crescent Street intersection and the corresponding traffic assessment as part of the TSP development application.

Historically the proposed TSP development has received and responded to both Tweed Shire Council (TSC) and NSW Roads and Maritime Services (RMS) regarding the local and cumulative traffic impacts (including the 2007 approved Cudgen Lakes Sand Quarry development) and safety impacts at the nearby intersections of Altona Road/Crescent Street and Tweed Coast Road/Crescent Street. It is understood that both TSC and RMS comments have been addressed sufficiently.

The following technical note addresses concerns raised by the DPE and the neighbouring property owner Gales. It should be noted that for the purposes of providing an up-to-date analysis, the development and background traffic volumes have been re-assessed specifically for this response for the years 2018 and 2028.

1.1. Scope

This response relates directly to the submission letters from Gales Holdings dated 17 November 2017 and 27 November 2017, addressed to Genevieve Seed from the DPE and DPE's corresponding email. Specifically, this technical note includes:

- a chronology of events, including summary and clarification of TSC and RMS comments and responses;
- existing intersection impacts due to the proposed TSP expansion;
- conditioned intersection upgrades for the Cudgen Lakes Sand Quarry (Cudgen Lakes);
- traffic volumes and forecast comparisons;
- a review of intersection models; and
- comments regarding other surrounding developments that are proposed to utilise Crescent Street.

2.0 TRAFFIC RESPONSE AND COMMENT

2.1. Chronology of Events – Previous TSC and RMS Comments

To assist with clarity and perspective when reviewing the TSP development application process, the following table outlines a chronology of events, including TSC and RMS comments and response summaries.

Date Bitzios Received/Issued	Event	Comments
24/01/2017	Bitzios Traffic Report submitted to Hanson	Based on existing intersection and proposed development traffic only. Bitzios report concluded the capacity of the existing intersections were acceptable.
24/03/2017	TSC comments on development	Main concern was with the impact of heavy vehicle trips on the road pavement (particularly Altona Road). Bitzios report conclusions on intersection capacity in its existing layout were considered acceptable.
05/05/2017	Bitzios report updated and submitted addressing TSCs comments.	Included truck numbers and usage of heavy vehicles along Altona Road as well as vehicle ESAs.
22/08/2017	RMS Comments and Response	Public exhibition noted to be 29 June-31July 2017. Four items within RMS comments were addressed. These dealt with cumulative impact analysis due to Cudgen Lakes approval and conditions and a safety assessment of the existing intersections.
24/08/2017	Bitzios Response to RMS	Matt Adams from RMS clarified that the cumulative impact comments refer to assessing any additional impacts on the existing conditioned road upgrades should the Cudgen Lakes development proceed. RMS items 1 & 2 are noted below for reference[1]
28/09/2017	Bitzios Response to RMS submitted	Presented analysis of intersections including both TSP and Cudgen Lakes traffic based on the Cudgen Lakes conditioned upgrades to determine if intersection will operate effectively should the Cudgen Lakes development proceed. Also included a safety assessment of the Altona Road and Tweed Coast road intersections. Bitzios report concluded the capacity of the conditionally upgraded intersection was acceptable with both sites operating.
25/10/2017	DPE Email seeking further clarification – Genevieve Seed	Requested further clarification on traffic movements applied to assessment (worst case analysis – 36 movements). Percentage increase in heavy vehicles as a result of development and impacts on existing intersections was adequately addressed.
02/11/2017	Bitzios updated TIA report and RMS letter response to address DPE email	Report and letter updated to clarify 'worst case' traffic impacts and percentage of heavy vehicles. Bitzios report concluded the capacity of the conditionally upgraded intersection was acceptable with the worst case traffic movements and both sites operating.
30/11/2017	Additional correspondence email from DPE	Additional comments received from DPE based on Gales submission letters (Gales submissions dated 17 and 27 November 2017. DPE requested further investigation into the traffic analysis in comparison to the Gales Cudgen Lakes development traffic assessment.

1) *"The identified haulage for the subject development is also the approved route for the Cudgen Lake Sand Quarry under Project Approval MP05_10. The supporting Traffic Impact Assessment (TIA) should address the cumulative traffic and road safety impacts of existing and proposed development in the subject area*

2) *Project Approval MP05_103 requires an upgrade of the Tweed Coast Road and Crescent Street intersection prior to the transportation of sand by road. Consideration should be given to identifying an equitable arrangement for delivery of any intersection improvements required to address the cumulative road safety and traffic impacts of approved developments in the subject area"*

When considering the above chronology, the following points should be noted:

- Tweed Coast Road and Crescent Street are under the jurisdiction of TSC; and
- RMS and TSC were satisfied with the traffic assessments and conclusions for the proposed TSP development.

2.2. Tweed Sand Plant Impacts – Existing Scenario plus additional TSP truck impacts

As outlined in Bitzios Traffic Reports and Responses (24/01/2017 and 24/08/2017), the proposed expansion of the TSP does not require any upgrades to the existing Altona Road/Crescent Street and Tweed Coast Road/Crescent Street intersections. In assessing this, it was conservatively assumed that the development will operate at its maximum allowable 36 heavy vehicle trips per hour (i.e. existing 9 trips currently using the road network plus a maximum additional 27 trips).

On 30/11/2017 DPE requested further information into the traffic analysis and confirmation that the Tweed Coast Road/Crescent Street intersection will operate at a "safe and acceptable standard" as a result of both the proposed development and the Cudgen Lakes project.

A SIDRA intersection analysis of the existing Altona Road/Crescent Street and Tweed Coast Road/Crescent Street priority controlled intersections was undertaken based on 2016 traffic survey data and a 3% compounding traffic growth rate (based on historical evidence). The results of the SIDRA intersection analysis are discussed below.

Altona Road/Crescent Street Intersection

The SIDRA analysis confirmed that the Altona Road intersection will operate within acceptable capacity thresholds out to the year 2028 with and without the TSP traffic (36 trips), with a maximum delay of 6.5 seconds and maximum Degree of Saturation (DOS) of 0.046 on any movement for the year 2028 during the "worst case" AM peak period.

Tweed Coast Road/Crescent Street Intersection

A summary of the SIDRA analysis for the 2018 and 2028 AM peak period results for the existing Tweed Coast Road/Crescent Street intersection, including only the additional maximum TSP traffic volumes is provided in Table 2.1.

Table 2.1: Existing Intersection and TSP Maximum Traffic Analysis – Tweed Coast Road/Crescent Street

Scenario	Approach	Movement	DOS	Average Delay (s)	95th%ile Queue (m)
Base 2018	South: Tweed Coast Road	LT	0.491	7.1	0.0
		T	0.491	0.1	0.0
	North: Tweed Coast Road	T	0.334	0.0	0.0
		RT	0.109	18.2	3.2
	West: Crescent Street	LT	0.171	14	4.8
		RT	0.171	53.6	4.8
Scenario	**Approach**	**Movement**	**DOS**	**Average Delay (s)**	**95th%ile Queue (m)**
Base 2028	South: Tweed Coast Road	LT	0.660	7.2	0.0
		T	0.660	0.2	0.0
	North: Tweed Coast Road	T	0.449	0.1	0.0
		RT	0.353	31.6	9.9
	West: Crescent Street	LT	0.588	41.1	17.7
		RT	0.588	270.9	17.7
With TSP (36 veh) 2018	South: Tweed Coast Road	LT	0.491	7.1	0.0
		T	0.491	0.1	0.0
	North: Tweed Coast Road	T	0.334	0.0	0.0
		RT	0.134	14.7	3.9
	West: Crescent Street	LT	0.238	14.8	7.1
		RT	0.238	56.5	7.1
With TSP (36 veh) 2028	South: Tweed Coast Road	LT	0.660	7.2	0.0
		T	0.660	0.2	0.0
	North: Tweed Coast Road	T	0.449	0.1	0.0
		RT	0.414	33.3	12.0
	West: Crescent Street	LT	0.753	52.8	26.7
		RT	0.753	295.0	26.7

The above SIDRA results show that the intersection will remain within a Degree of Saturation (DOS) suitable for a priority control intersection of 0.80, over the 10-year design horizon (i.e. 2018)

An on-site traffic review conducted on the 6th of December 2017 during the AM peak period found that sufficient gaps in traffic were provided for eastbound vehicles exiting Crescent Street (turning left), alleviating the left turn delay of 52.8 seconds for the year 2028. This is due to the platooning of vehicles from the Tweed Coast Road / Cudgen Road intersection to the south and its cycle time of 95 seconds during the peak. The modelled delay for the right turn movement out of Crescent Street is not an accurate representation of the intersection's operation as no vehicles were surveyed to turn right during the AM peak period. However, it is considered appropriate to ban this right turn movement as the design year 2028 is approached regardless of any development (noting that it is understood no development traffic will be turning right out of Crescent Street).

Considering the abovementioned platooning of vehicles providing acceptable gaps in traffic flows on Tweed Coast Road and the Tweed Coast Road/Crescent Street intersection remains within capacity out to 2028 for the modelled 'worst case' scenario, the proposed development is not expected to impact the intersections ability to operate at a safe and acceptable standard.

2.3. Expansion Scenario Inclusive of Cudgen Lakes Truck Movements and Maintaining Current Intersection Arrangements

To assist in clarifying Tweed Coast Road/Crescent Street and Altona Road/Crescent Street intersection upgrade requirements, further analysis of the cumulative impacts of TSP and Cudgen Lakes on the existing configurations of the two intersections was undertaken (i.e. without the conditional intersection upgrades required under the Cudgen Lakes Consent Conditions).

Altona Road was shown to operate well within intersection performance thresholds for both 2018 and 2028 AM peak period, with a maximum 6.5 second delay at any movement, and a DOS of 0.055.

The results of the Tweed Coast Road/Crescent Street intersection are shown in .

Table 2.2: Cumulative SIDRA Analysis – TSP + Cudgen Lakes (existing intersection)

Scenario	Approach	Movement	DOS	Average Delay (s)	95th%ile Queue (m)
TSP + Cudgen Lakes 2018 (existing intersection)	South: Tweed Coast Road	LT	0.491	7.1	0.0
		T	0.491	0.1	0.0
	North: Tweed Coast Road	T	0.334	0.0	0.0
		RT	0.178	14.9	5.2
	West: Crescent Street	LT	0.264	15.1	8.2
		RT	0.264	59.2	8.2
TSP + Cudgen Lakes 2028 (existing intersection)	South: Tweed Coast Road	LT	0.660	7.2	0.0
		T	0.660	0.2	0.0
	North: Tweed Coast Road	T	0.449	0.1	0.0
		RT	0.521	36.7	16.1
	West: Crescent Street	LT	0.818	61.2	32.4
		RT	0.818	316.8	32.4

It should be noted that while the analysed 2028 design year scenario shows a significant delay for the Crescent Street/Tweed Coast Road intersection (left and right turns), the intersection marginally exceeds the theoretical capacity for a priority-controlled intersection (DOS<0.80).

SIDRA Intersection software requires a minimum (or nominal) volume of one (1) vehicle on turn movements that exist, even where no turn movements were recorded in the traffic surveys. This can result in reduced capacity, and higher DOS in some instances, as is the case for the Crescent Street/Tweed Coast Road intersection. Removal of the Crescent Street right turn movement in SIDRA reduces the DOS to 0.739 and average delay to 49.2 for the Left Turn movement, which is below the theoretical capacity of a priority-controlled intersection. As such a right turn ban from Crescent Street on to Tweed Coast Road may be recommended.

Furthermore, the analysed scenario is considered highly conservative due to the following assumptions/inputs:

- both the TSP MOD1 TIA and the Cudgen Lakes TIA outline that the modelled maximum traffic movements are unrealistic for the normal day-to-day operations of these two developments;
- Tweed Coast Road is planned to be upgraded to 2-lanes each way (TSCs Section 94 Plan). This scenario has been modelled (including both TSP and Cudgen Lakes traffic) and shows an acceptable intersection operation (Maximum DOS = 0.419);
- Hanson has noted it is in the preliminary stages of commencing a development application with DPE for a wider expansion of TSP, which will ideally be approved prior to 2028. Of importance to this current TSP MOD1 response, the proposed TSP expansion will no longer make use of Altona Road, Crescent Street and Tweed Coast Road once this expansion is approved (access will be to the west directly onto the Pacific Motorway via Tweed Valley Way); and

- the wider Gales-Kingscliff plan, including the Altona Road link through to Turnock Street and their intention to realign Crescent Street/Tweed Coast Road intersection to the south.

2.4. Expansion Scenario Inclusive of Cudgen Lakes Truck Movements and Conditioned Intersection Upgrade

At the time of the TSP MOD1 development application, the status of the Bitzios traffic assessment (24/01/2017) was such that no nearby development applications or upgrade works were known or more importantly, brought to our attention by TSC.

RMS advised on 22/08/2017 that an existing development approval for Cudgen Lakes existed with the condition to upgrade the Tweed Coast Road/Crescent Street intersection (Schedule 3, Condition 34 of the Cudgen Lakes Sand Quarry Development Consent 05_0103 dated 16 June 2009).

Further assessment of the Tweed Coast Road/Crescent Street intersection was requested by RMS for the TSP MOD1 to include the Cudgen Lakes conditioned upgrades, and based on the scenario of Cudgen Lakes (i.e. heavy vehicles) being in operation with the intersection upgraded. The Cudgen Lakes' conditions of consent include the following:

- the banning of the right turn from Crescent Street on to Tweed Coast Road (Condition 36 (c) of the Cudgen Lakes development consent);
- addition of a 200m acceleration lane for vehicles turning left from Crescent Street on to Tweed Coast Road; and
- addition of a right turn pocket for vehicles turning right from Tweed Coast Road on to Crescent Street.

It should be noted that this infrastructure was conditioned to be in place "*prior to dispatch of sand by road*" from the Cudgen Lakes development.

Bitzios Consulting assessed the cumulative development traffic to establish if the TSP MOD1 development would impact on the conditioned infrastructure within the Cudgen Lakes Consent. The results of the SIDRA analysis of the Crescent Street / Tweed Coast Road in shown in Table 2.2.

Table 2.3: Cumulative SIDRA Analysis – TSP + Cudgen Lakes (Conditioned Intersection Layout)

Scenario	Approach	Movement	DOS	Average Delay (s)	95th%ile Queue (m)
TSP + Cudgen Lakes 2018 (Conditioned intersection)	South: Tweed Coast Road	LT	0.491	7.1	0.0
		T	0.491	0.1	0.0
	North: Tweed Coast Road	T	0.334	0.0	0.0
		RT	0.178	15.0	5.2
	West: Crescent Street	LT	0.062	5.8	0.0
TSP + Cudgen Lakes 2028 (Conditioned intersection)	South: Tweed Coast Road	LT	0.660	7.2	0.0
		T	0.660	0.2	0.0
	North: Tweed Coast Road	T	0.449	0.1	0.0
		RT	0.521	36.9	16.1
	West: Crescent Street	LT	0.076	5.8	0.0

The SIDRA analysis of the cumulative development scenario, with the conditioned upgraded scenario, clearly shows that the intersection will operate well within the performance threshold in 2028.

2.5. Summary of Traffic Analysis Scenarios

A brief outcome summary of all the above-mentioned scenarios results is provided in Table 2.4.

Table 2.4: Traffic Analysis Scenario Summary

Traffic Assessment Scenario	Development Modelled		Intersection Layout		Outcome Summary
	TSP MOD1	Cudgen Lakes	Altona Road/Crescent Street	Crescent Street/Tweed Coast Road	
1 (Section 2.2)	Yes – 27 additional trips [1]	No	Existing arrangement	Existing arrangement	Maximum Movement DOS = 0.753 No requirements for intersection modifications. Suggested ban on right hand turn from Crescent Street onto Tweed Coast Road approaching the year 2028.[3]
2 (Section 2.3)	Yes – 27 additional trips[1]	Yes – 29 movements peak per hour	Existing arrangement	Existing arrangement	Maximum Individual DOS = 0.818 Recommend a ban on right hand turn from Crescent Street onto Tweed Coast Road.[2]
3 (Section 2.4)	Yes – 27 additional trips[1]	Yes – 29 movements peak per hour	Existing arrangement	Upgraded intersection (Cudgen Lakes Condition 34)	Maximum Individual DOS = 0.660 No requirements for additional intersection modifications above what is conditioned under the Cudgen Lakes Development Consent

1. 27 additional movements to the existing 9 measured peak movements, equating to 36 movements peak per hour.
2. Traffic from both developments using the existing intersection by the year analysed (2028) is considered unlikely to eventuate (refer Section 2.3).
3. It is understood no development traffic will turn right out from Crescent Street.

The left turn from Crescent Street onto Tweed Coast Road shows a delay approaching 50 seconds in 2028, however the intersection remains below the thresholder 0.8 DOS. Modelling for this design year is conservatively based on modelling assumptions/inputs for both developments.

As shown above, TSP development traffic does not warrant the need upgrade the existing Crescent Street/Tweed Coast Road intersection or the Cudgen Lakes (conditioned upgrade) intersection. With a right-turn ban recommended regardless of the proposed development. Additionally, TSP traffic does not create the need for the existing the Altona Road/Crescent Street intersection to be upgraded.

2.6. Traffic Volumes and Forecast Comparison

Within Gale's submission letter dated 17 November 2017 (received 30/11/207), direct comparisons were made between the forecast traffic volumes stated in the 2007 Veitch Lister traffic assessment for Cudgen Lakes and the 2017 Bitzios traffic assessment (2/11/2017) for the TSP MOD1.

The actual traffic volumes applied for the Bitzios report cannot be compared with the forecast traffic volumes from the Veitch Lister traffic report because the Bitzios 2016 traffic survey data superseded any forecast traffic volumes used in the Veitch Lister report 10 years prior. Additionally, the Veitch Lister traffic forecasts were based on a different set of variables (i.e. traffic growth rate of 7.5% per annum) around projected planning and development in the area which at the time of this report has not eventuated.

Traffic modelling and forecasting is reliant on an understanding of the current road environment, historical evidence and known future development plans at the time of assessment. Assumptions and variables included within the Veitch Lister 2007 traffic growth rates for forecasting are again superseded by current known 2016 traffic data and variables.

To confirm the appropriateness of the Bitzios applied traffic growth rate (3% compounding per annum) the 2016 traffic survey data utilised for the TSP MOD1 assessment, was compared with the 2006 traffic survey data from the Veitch Lister traffic assessment, for the Tweed Coast Road/Crescent Street intersection, as shown in Figure 2.1. This shows an actual traffic growth (2006 - 2016) of between 1.6% (PM peak) and 3.0% (AM peak), whereas the Veitch Lister report forecast a 7.5% compound growth.

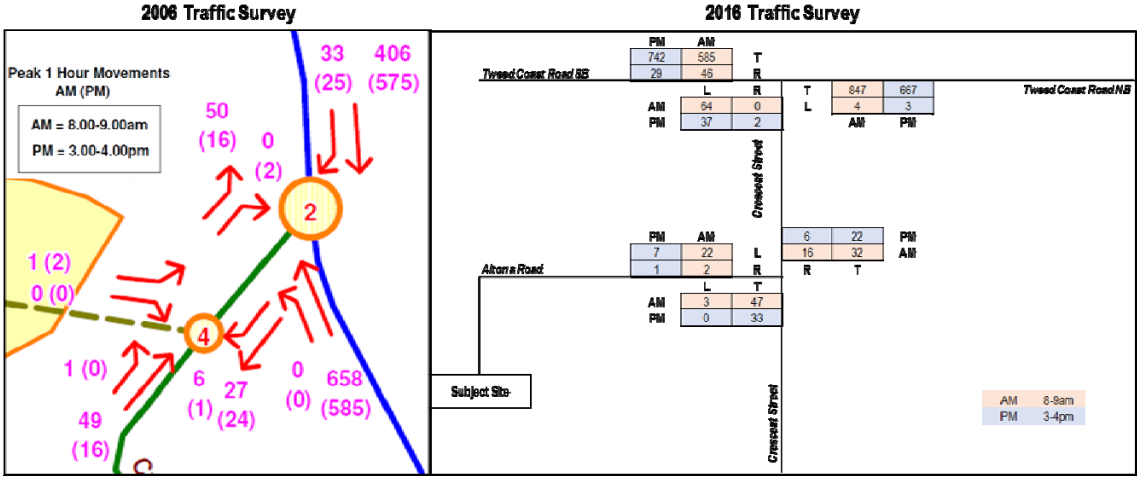

Figure 2.1: 2016 and 2006 Traffic Survey Data

DPE Traffic Spot Count Comparison

DPE (Genevieve Seed) undertook a 10-minute traffic spot count on 21 November 2017 and compared this data with the 3-hour peak period traffic surveys, noting that "*the Department's counts are higher than the counts found in either TIA*".

Although a 10-minute spot traffic count can provide a general idea of traffic directionality and flow, these types of surveys are typically used for low traffic volume intersections that do not required detailed analysis or modelling, as it is not considered an accurate reflection of traffic volumes and movements across a peak period.

Bitzios Consulting's commissioned 2016 peak period traffic surveys (by Traffic and Data Control – TDC) of the intersections over a 3-hour peak period. This data was then analysed to determine the intersections peak one-hour periods and associated traffic volumes. A 3-hour count allows for variation in traffic flows across the peak period where a 10-minute spot count cannot account for this.

As such, the 10-minute spot count conducted by DPE is not comparable with the Bitzios 2016 peak period traffic surveys.

2.7. Intersection Modelling Review

Prompted by the DPE and Gales correspondence, a comparison between the SIDRA results of the Bitzios and Veitch Lister traffic reports was undertaken with specific focus given to individual intersection movement Level of Service (LOS). The summary, below, clarifies the preferred method to interpret SIDRA result data and assist with understanding the difference in the Bitzios and Veitch Lister results:

- SIDRA utilises the HCM2000 method to define LOS, where its value is determined by the modelled average delay (i.e. Delay of 55 seconds = LOS D). The modelled average delay (and LOS) does not take into account nearby intersection and road network operations. It is important to include aspects, such as site observations of vehicle movements, nearby intersections, historical data, DOS and queue results, when analysing an intersection (For example - as noted in Section 2.2 above, it has been observed that vehicle platooning occurs due to nearby signals at Tweed Coast Road/Cudgen Road);

- as outlined in the SIDRA Output Guide, LOS is not an accurate measure of overall or major movement intersection performance for a priority controlled intersection, "*since the average delay is not a good LOS measure due to zero delays associated with major road movements*. – SIDRA7". That is, the 'Through' movements on Tweed Coast Road do not have any associated delay and this therefore impacts the movements average delay and modelled LOS;
- a combined assessment of the Degree of Saturation (DOS), Movement Average Delay and 95th Percentile Queuing is currently considered the most appropriate method for analysing impacts at intersections as these provide a more detailed breakdown of the potential impacts. The combined assessment takes each result into consideration (For example: while a delay time may be extensive, the queue length may be less than 1 vehicle). LOS is based on a singular function, the 'delay', making for less comprehensive assessment and conclusions;
- Bitzios has utilised the latest SIDRA7 intersection modelling software which has been updated significantly, in terms of input parameters and output results, since the 2007 VLC modelling. As such Bitzios model results would supersede any previous modelling data and associated conclusions; and
- heavy vehicle proportioning within the Bitzios SIDRA results is calculated for All Movements Classes of All Heavy Vehicles Model Designation and has been based on the 2016 surveyed traffic data for trucks at each individual movement.

Furthermore, the DOS shown within the VLC model results (2007 Traffic Report) scenario for both the Altona Road/ Crescent Street and Tweed Coast Road/Crescent Street intersections was shown to be within operational capacity (DOS<0.80 and LOS<F) and therefore acceptable under the existing intersection layouts.

Bitzios' SIDRA results and conclusions have been formulated based on the latest traffic assessment methodology (combined analysis of DOS, Average Delay and 95th Percentile Queuing), recent traffic survey data (2016) and by utilising the latest SIDRA7 modelling software. Gales appears to have made conclusions based on only the LOS which does not consider all aspects of the intersection model results and does not necessarily indicate the need for an upgrade.

2.8. Surrounding Residential Developments

Two nearby residential developments currently beginning first stage earthworks have been noted within the Gales and DPE correspondence (30/11/2017). The surrounding residential developments should not be taken into consideration for the purposes of the TSP assessment as:

- consultation with DPE, Council, RMS and others (initiated by HCM/G&S in correspondence dated 10 October 2016) did not identify these two future developments. The Gales letter of 17 November 2017 (outside of the notice period) first brought them to the attention of HCM;
- there are broader traffic plans for the immediate area, encompassed within the *Gales-Kingscliff Master Plan* and the *Draft Kingscliff Locality Plan (Council 2016).* Both plans propose changes to the intersections in question and associated traffic volumes for these intersections beyond anything that could be accurately modelled at this time; and
- having consulted with Council, we understand that it is content that the Bitzios TIA adequately addresses the local traffic regime. We trust that Council is well placed to understand and regulate local traffic on its roads, now and into the future.

For the purpose of a thorough assessment it is noted that any additional residential development traffic would likely cause the Tweed Coast Road intersection to require upgrades (i.e. Cudgen Lakes conditioned works or other). However, it should be acknowledged that any works that are undertaken at this intersection are likely to be interim only measures due to the below known factors:

1. Gales intent to realign Altona Road and the Crescent Street/Tweed Coast Road intersection to the south, as part of the wider Gales-Kingscliff plan for the area.
2. TSCs Section 94 plan outlines that Tweed Coast Road is to be upgraded to a four-lane cross-section. When this occurs the conditioned need for an acceleration lane is removed.

3.0 CONCLUSION

In line with the previous traffic assessments undertaken for this TSP MOD1, we conclude that there is no significant traffic or safety impacts associated with the proposed development. This statement is based on the following modelled scenarios, which have all demonstrated acceptable performance when compared to DOS, average delay and 95th percentile queue length:

1. Inclusion of the proposed TSP development modification operating at a maximum of 36 peak heavy traffic movements per hour, with the priority controlled intersection in their current configuration. No requirements for intersection modifications as a result of the proposed development, with the recommendation to ban right hand turning from Crescent Street onto Tweed Coast Road regardless of development traffic.

2. Inclusion of the proposed TSP development modification, and the Cudgen Lake development operating at the maximum 36 and 29 respective peak heavy traffic movements per hour, with the priority-controlled intersection as per their current configuration (no Cudgen Lakes conditioned upgrades). No requirements for significant intersection modifications, with the recommendation to ban right hand turning from Crescent Street onto Tweed Coast Road.

3. Inclusion of the proposed TSP development modification, and the Cudgen Lake development operating at the maximum 36 and 29 respective peak heavy traffic movements per hour, with the priority-controlled intersection upgraded as per the Cudgen Lake conditioned configuration. No requirements for intersection modifications above what has been conditioned by the Cudgen Lakes development consent.

In summary the current intersection layouts can adequately cater for the TSP's maximum additional traffic. Further, the cumulative impact of both TSP and Cudgen Lakes developments maximum traffic does not warrant the need for any significant upgrades to the intersections and although a right-turn ban for vehicles exiting Crescent Street is recommended, no TSP development traffic is expected to utilise this movement.

We trust that the responses and further analysis contained within this letter sufficiently addresses concerns from both DPE and Gales with any further traffic investigations at the Tweed Coast Road/Crescent Street and Altona Toad/Crescent Street intersections that relate to the Gales development to be the onus of Gales Holdings.

Yours faithfully

Steve Brooke
National Manager
Principal Traffic Engineer
BITZIOS CONSULTING