



Our ref: STH08/02093/08  
Contact: Andrew Lissenden 4221 2769  
Your Ref: 2017.445

3 December 2018

Anna Bowman  
Bega Valley Shire Council  
BY EMAIL: council@begavalley.nsw.gov.au

## **DEVELOPMENT APPLICATION 2017.445 – LOT 1 DP 109606, 1070 PRINCES HIGHWAY, FROGS HOLLOW - RECREATIONAL FLIGHT SCHOOL**

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Dear Anna,

Roads and Maritime Services (RMS) refers to an email from Xeros Piccolo Consulting Engineers dated 16 November 2018 (refer to **Attachment 1**) and the subsequent email from NGH Environmental dated 26 November 2018 (refer to **Attachment 2**) regarding the above development application (DA).

RMS has reviewed the amended plans (refer to drawings with reference Project No. 180695, Drawing No. A1001, A1002, A1003, A1004, A2001, A3001, A4001, A5001, C1001, C1002, C1003, C1004, C1005, C2001, Rev B and dated 16.11.2018) and additional supporting information (Design Report dated 16 November 2018, Issue C and details on fights that will cross the Princes Highway) attached to the above emails while focusing on the potential impacts to the state road network. RMS as a result of its assessment notes and advises the following:

- For this DA the key state road is the Princes Highway;
- Council is seeking advice from RMS to assist in its assessment under Clause 104 of *State Environmental Planning Policy (Infrastructure) 2007* (i.e. development is captured as traffic generating development to be referred to RMS as per Schedule 3);
- The DA proposes to upgrade the existing access arrangements as part of Stage 1 of the development (refer to the amended plans in Attachment 1). The updated access plans and supporting design report addressing the majority of the issues RMS has previously raised. Any outstanding issues can be addressed as part of the Works Authorisation Deed (WAD) process post development consent; and
- A number of the training flights, based on the designated flight circuits, will cross the Princes Highway. RMS has reviewed the applicants submission (refer to Attachment 2) and is of the opinion, based on the information provided, that the flight movements over the Princes Highway will not cause a visual hazard/distraction to drivers using the state road network that will result in an unacceptable safety risk.

Having regard to the above, RMS will not object to the DA subject to the conditions outlined in **Attachment 3** being included in the conditions of any development consent issued.

RMS highlights that in determining the application under Part 4 of the Environmental Planning and Assessment Act 1979, it is the consent authority's responsibility to consider the impacts of any works required within the Princes Highway road reserve which are ancillary to the development. This includes any works which form part of the proposal (e.g. removal of vegetation within the road reserve) and/or any works which are deemed necessary to include as requirements in the conditions of development consent. Depending on the level of environmental assessment undertaken to date and nature of the works, the consent authority may require the developer to undertake further environmental assessment for any ancillary road works.

Upon determination of this matter, it would be appreciated if Council could email a copy of the Notice of Determination to RMS via 'development.southern@rms.nsw.gov.au' for our records.

If you have any questions please contact Andrew Lissenden on 4221 2769.

Yours faithfully



Joanne Parrott  
Network & Safety Manager  
Southern Region

*Cc: abowman@begavalley.nsw.gov.au;  
saxon@xerospiccolo.com.au; and  
steph.a@nghenvironmental.com.au*

- **Prior to the issuing of the Construction Certificate for the Stage 1 works approved under this application, the developer or their agent must:**

- Enter into a Works Authorisation Deed (WAD) with the RMS for all works on the Princes Highway which are associated with the upgrade of the developments sites access to/from the Princes Highway (refer to drawings prepared by Xeros Piccolo Consulting Engineers with reference 'Project No. 180695, Drawing No. A1001, A1002, A1003, A1004, A2001, A3001, A4001, A5001, C1001, C1002, C1003, C1004, C1005, C2001, Rev B and dated 16.11.2018' and Design Report dated 16 November 2018, Issue B and the associated 'Design Report for proposed intersection works, Issue C, dated: 16 November 2018' prepared by Xeros Piccolo Consulting Engineers). The detailed designs submitted as part of the WAD process must:
  - Ensure where 'SO' kerb and gutter is directed onto overland flow, scour protection is provided to help mitigate erosion (refer to *Austrroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations* - Section 3.6.2);
  - Provide a detailed signs and lines plan for the proposed intersection/sight access works (as per AS1742.2). This shall include details on signage to be provided (e.g. sign type and location) to warn that aircraft may fly over the road at a low altitude; and
  - Extend the guardrail at the northern end of the works adjacent to the south bound lane (by approximately 30 to 50m – refer to Drawing No.A1004, Rev B dated 16.11.2018) so as to capture the point of need.

*Notes:*

- *A WAD is a legally binding contract between RMS and the developer, authorising the developer to undertake works on a State road and/or install traffic signals.*
- *To progress the WAD, the developer needs to email a copy of the conditions of development consent to [development.southern@rms.nsw.gov.au](mailto:development.southern@rms.nsw.gov.au).*
- *All roadworks and traffic control facilities must be undertaken by a pre-qualified contractor. A copy of pre-qualified contractors can be found on the RMS website at: <http://www.rta.nsw.gov.au/doingbusinesswithus/tenderscontracts/prequalifiedcontractors.htm>*
- *Any new services or modifications to existing services associated with this development application that involve works on, over or under the Princes Highway (as defined the area from kerb to kerb) must be incorporated into, and managed under, the Works Authorisation Deed for the project. It is the developer's responsibility to identify these works to RMS project manager.*
- *More information on WADs can be found at:*  
[www.rms.nsw.gov.au/documents/projects/factsheet-development-process.pdf](http://www.rms.nsw.gov.au/documents/projects/factsheet-development-process.pdf)

- **Prior to the commencing works within the road reserve, the developer or their agent must:**

- Obtain Section 138 consent under the *Roads Act 1993* for the works associated with the WAD.

*Notes:*

- *RMS will be exercising its powers under Section 64 of the Roads Act, 1993 to become the roads authority for works associated with the WAD and therefore responsible for issuing the Section 138 consent for those specific works.*
- Apply for, and obtain a Road Occupancy Licence (ROL) from the RMS Traffic Operations Unit (TOU) prior to commencing roadworks on a State Road or any other works that impact a travel lane of a State Road.

*Notes:*

- *The application will require a Traffic Management Plan (TMP) to be prepared by a person who is certified to prepare Traffic Control Plans. Should the TMP require a reduction of the speed limit, a Speed Zone Authorisation will also be required from the TOU.*
- *The developer must submit the ROL application 10 business days prior to commencing work. It should be noted that receiving an approval for the ROL within this 10 business day period is dependent upon RMS receiving an accurate and compliant TMP.*
- *An approved ROL does not constitute an approval to commence works until an authorisation letter for the works has been issued by RMS Project Manager.*

- **Prior to the issuing of the Occupation Certificate for Stage 1 works (interim or final), the developer must ensure:**

- All works associated with upgrade of the sites access within the Princes Highway road reserve (i.e. provision of a channelized right turn (CHR) treatment and auxiliary left-turn (AUL) treatment) have been completed in accordance with Austroads Guide to Road Design requirements, other relevant standards as well as any approvals issued by RMS (i.e. Section 138 consent under the *Roads Act 1993*, etc); and
- All areas within road reserve that are disturbed by the works being undertaken are to be restored upon completion of the work to the satisfaction of the RMS.

*Notes:*

- *The pavement design on the Princes Highway must be in accordance with Austroads standards.*
- *Where required, the developer must upgrade/provide lighting in accordance with Australian Standard AS/NZS1158.*

- **General requirements**

- All roadworks, traffic control facilities and other works associated with this development, including any modifications required to meet RMS standards, will be at no cost to the RMS. All works must be completed by a suitably qualified contractor.
- For the life of the development a safe intersection sight distance must be maintained to the north and south of the development sites access with the Princes Highway. In this regard a sightline sight envelope should be maintained clear of any vegetation higher the 300mm (refer to Attachment 4).



## Lisa Foley

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**Subject:** Attachment 1  
**Attachments:** C\_180695\_revB\_PLANS\_UPDATED FOR RMS REVIEW.pdf; Design Report\_Frogs Hollow Intersection\_ Issue C\_180695\_16.11.2018.pdf

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**From:** Saxon Xeros [mailto:saxon@xerospiccolo.com.au]  
**Sent:** Friday, 16 November 2018 3:55 PM  
**To:** LISSENDEN Andrew  
**Cc:** 'Steph Anderson'; Lizzie Olesen-Jensen; ABowman@begavalley.nsw.gov.au; KOZAROSKI Goran  
**Subject:** RE: RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hello Andrew.

Please find attached updated Plans and Report for this project. The points that have been addressed with these revisions are indicated by **green highlight** below.

Please review and discuss as needed.

Kind regards,  
Saxon



**Saxon Xeros**  
**Civil Designer**

**5 Bye St, Wagga Wagga, NSW, 2650**  
**T: 02 69 255 855**  
**E: [saxon@xerospiccolo.com.au](mailto:saxon@xerospiccolo.com.au)**  
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**From:** LISSENDEN Andrew  
**Sent:** Tuesday, 13 November 2018 3:22 PM  
**To:** saxon@xerospiccolo.com.au  
**Cc:** 'Steph Anderson' ; ABowman@begavalley.nsw.gov.au; KOZAROSKI Goran  
**Subject:** RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hi Saxon,

Further to the phone discussion this morning please find below a summary of what outstanding issues relating to the level of detail (refer to the RMS letter dated 7 November 2018) will need to be resolved as part of the DA

process/prior to DA determination or post DA determination as part of the Works Authorisation Deed (WAD) process. The RMS comments are highlighted **yellow**.

Regards

Andrew Lissenden  
Development Assessment Officer  
**Network & Safety Southern** | Regional & Freight  
T 02 4221 2769 | M 0418 962 703  
[www.rms.nsw.gov.au](http://www.rms.nsw.gov.au)  
**Roads and Maritime Services**  
Level 4 90 Crown Street Wollongong NSW

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**From:** Saxon Xeros [<mailto:saxon@xerospiccolo.com.au>]  
**Sent:** Wednesday, 7 November 2018 4:48 PM  
**To:** LISSENDEN Andrew  
**Cc:** 'Steph Anderson'; Lizzie Olesen-Jensen  
**Subject:** [WARNING: Attachments not scanned for viruses] Response to feedback - Proposed Intersection, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hello Andrew.

Thank you for your response regarding this project (dated 07.11.2018).

I have reviewed your comments and prepared responses to each item below (my comments in **red**). I think a phone call to discuss further will be worthwhile. Are you able to confirm a time that suits you to do this, hopefully in the next day or so?

My aim is to determine what key aspects that to be resolved now (prior to Conditioning) and what items, for which there are no foreseeable impediments to achieving, can be dealt with during detailed design.

- **Cross falls should be a projection of the existing lanes (refer to Austroads Guide to Road Design Part 3: Geometric Design - Section 4.3.5 Shoulder Crossfalls);**
  - Referring to Sections A to C (sheet A2001), the cross fall on the widening(s) is to match the existing road cross fall. Also shown in these Sections is that the widening of the road is to be from the edge of existing seal/shoulder; in other words, the existing shoulder is to remain and additional pavement added to the outside of the existing shoulder. Therefore, the proposed widening is proposed to match the cross fall of the shoulder. Based on the survey provided, the cross fall of the shoulder does not necessarily match the cross fall of the existing lane, and in some cases is quite different. Therefore the proposed widening cross fall will not necessarily match that of the existing lane, but will match that of the shoulder. This is why the cross falls on the outer lane and shoulder in the cross sections (C1001-1004) do not match the existing lane cross falls.
    - Is it acceptable to have the widening match the shoulder cross falls? Note that the shoulder cross falls are generally steeper than the lane cross falls and fall away from the centre of the road. This will aid in reducing the risk of aquaplaning (see further comments below)
    - Please discuss further as required

This issue needs to be resolved as part of the DA/prior to DA determination (i.e. in updated designs). **To assist a close contour spacing plan and edge line profile plan should be provided. ADDRESSED – widening and through lane re-alignments now match existing through lane cross falls. Aquaplaning Assessment Plan provided, showing close contours (see Sheet A5001). Edge line profile provided (see sheet C2001).**

- Width of flow (i.e. shoulder and 'SO' kerb and gutter capacity) needs to be assessed. This should be provided to confirm it has sufficient capacity (refer to See *Austrroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations* Section 4.2 Road User Considerations and *Austrroads Guide to Road Design Part 5A: Drainage – Road Surface, Networks, Basins and Subsurface - Section 5.4 Design Criteria*);
- This is something that we would definitely look into further during detailed design. Obviously, if widths/depths of flow are too large, grated pits and pipes would need to be provided. As there is reasonable fall on this site, there is unlikely to be an issue with achieving this (in terms of minimum grades and pipe cover).
  - As there is unlikely to be any issue with providing the required pits (if any) to keep flows within the kerb, does detailed analysis of the flows need to be completed prior to Conditioning?
  - Please discuss further as required

This issue can be resolved post DA determination (i.e. as part of the WAD process).

- An aquaplaning assessment needs to be undertaken to ensure the extra pavement width doesn't introduce any surface flow problems (refer to *Austrroads Guide to Road Design Part 5A: Drainage – Road Surface, Networks, Basins and Subsurface - Section 4.3 Assessment Process*);
- An aquaplaning assessment can be undertaken. Visual inspection of the contours suggests that surface flow paths are relatively long on the existing road. The widenings don't appear to add substantial lengths based on the current design, noting that the widening cross falls match the existing shoulder cross falls which are generally steeper than the adjacent lane cross fall and generally fall away from the road.
  - If assessment shows that the existing flow paths are hazardous and the widening make negligible difference, what will be RMS's approach?
  - Please discuss further as required

This issue (aquaplaning assessment) needs to be resolved as part of the DA/prior to DA determination. ADDRESSED – aquaplaning assessment has been undertaken – see report.

- The table drain shape should be trapezoidal (refer to *Austrroads Guide to Road Design Part 3: Geometric Design – Section 4.3.5 Shoulder Crossfall* and *Austrroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers – Section 5.4.5 Treatment for Drains*);
- The table drain side slopes should be 6:1 but not steeper than 4:1 (refer to *Austrroads Guide to Road Design Part 3: Geometric Design - Section 4.3.5 Shoulder Crossfall*);
  - Regarding a trapezoidal table drain, this can be done. The V-shape was proposed as the existing drain in this location is V-shaped. Providing a trapezoidal drain will widen the drain and potentially require adjustment of the fence and boundary on the western side of the road. This is not a major concern and this land is owned by the developer
  - Regarding the side slopes, flatter batters/side slopes can be provided. Again, 1 in 3 approximately matches the existing drain shape. Providing flatter slopes will widen the works slightly (see above comment)
  - As this is achievable, does it need to be addressed prior to Conditioning?

These issues (table drain shape and slopes) can be resolved post DA determination (i.e. as part of the WAD process). ADDRESSED – trapezoidal drain provided with 1 in 4 batters

- A berm should be provided behind the 'SO' kerb and gutter where there is no significant constraint (refer to *Austrroads Guide to Road Design Part 3: Geometric Design – Section 4.4.2 Verge Slopes*). A 0.5m berm would be considered acceptable;
- Verge rounding should be provided on the fill batters even if they have guard fence (refer to *Austrroads Guide to Road Design Part 3: Geometric Design – Section 4.4.3 Verge Rounding*);
  - Can be provided in detailed design, will be achievable with minor changes to design

- As this is achievable, does it need to be addressed prior to Conditioning?

These issues (berm and verge rounding) can be resolved post DA determination (i.e. as part of the WAD process). ADDRESSED – 0.5m berm provided in unconstrained locations and verge rounding provided and indicated

- A catch drain or other form of treatment needs to be provided to mitigate surface flow towards the cutting. Overland flow may erode the hinge point as well as allowing moisture to ingress into the top of the cutting; and
- Where 'SO' kerb and gutter is directed onto overland flow, scour protection must be provided to help mitigate erosion (refer to *Austrroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations - Section 3.6.2*).
  - Regarding the catch drains, this can likely be provided at most locations, except at the narrow section where the cutting approaches the eastern boundary of the corridor. There does not appear to be an existing catch drain at this location. Catchment flows to this cutting are relatively small (refer attached photos looking south along this boundary line (DSC04505) and toward the west (DSC04501)), although survey beyond the boundaries is minimal in this area. Based on low likely in flows, if the catch drain cannot be accommodated within the corridor, is it still required?
    - Please discuss further as required
  - Regarding scour protection, this will definitely be addressed in more detail, but is not considered critical to getting Conditioning for this project.
    - As this is achievable, does it need to be addressed prior to Conditioning?

These issues (catch drain, scour protection) can be resolved post DA determination (i.e. as part of the WAD process).

Please review and we can discuss further on the phone. Note that the remaining comments regarding flight paths, etc, will be addressed by Steph.

Kind regards,  
Saxon



**Saxon Xeros**  
**Civil Designer**

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# ***PROPOSED INTERSECTION WORKS***

## ***SPORTS AVIATION FLIGHT COLLEGE***

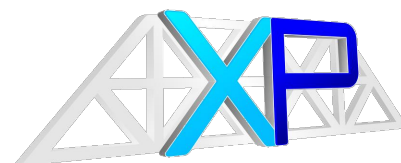
### ***1070 PRINCES HIGHWAY***

### ***FROGS HOLLOW NSW 2550***

***CLIENT: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY. LTD.***

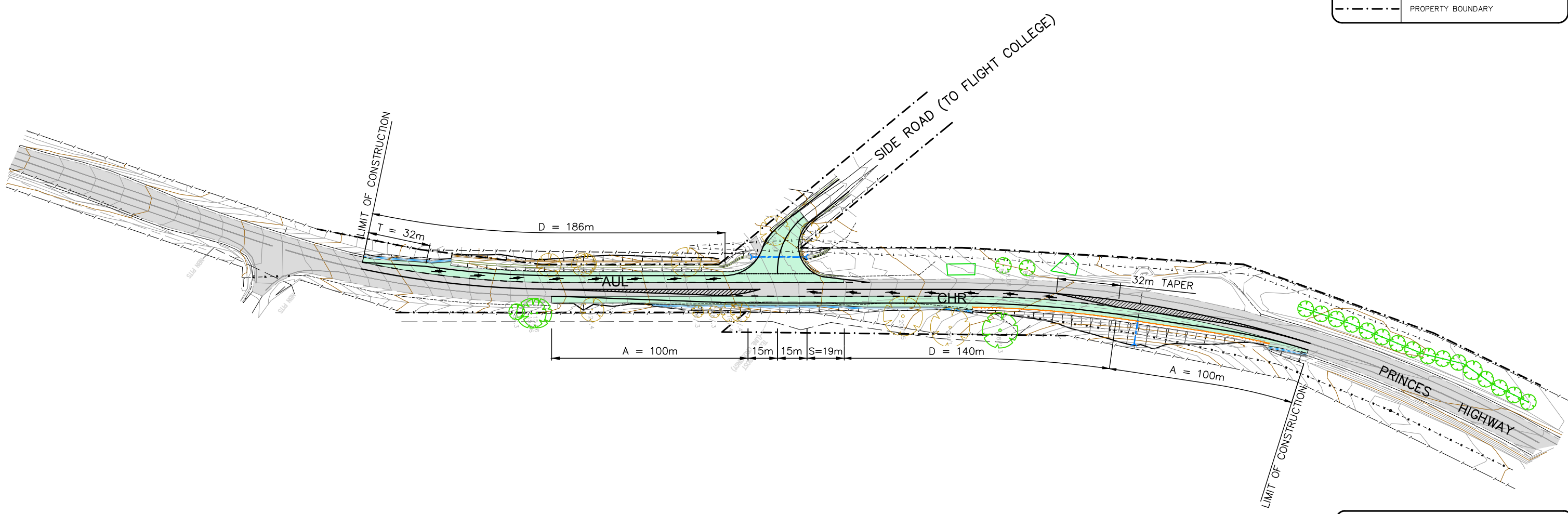
**ISSUED FOR RMS REVIEW**

DRAWING INDEX			
PROJECT No.: 180695		REVISION No.: B	
SHEET NUMBER	SHEET TITLE	SHEET NUMBER	SHEET TITLE
PLANS		SECTIONS	
A1001	SITE PLAN	C1001	PRINCES HWY – CROSS SECTION 1/5
A1002	LAYOUT PLAN 1/3	C1002	PRINCES HWY – CROSS SECTION 2/5
A1003	LAYOUT PLAN 2/3	C1003	PRINCES HWY – CROSS SECTION 3/5
A1004	LAYOUT PLAN 3/3	C1004	PRINCES HWY – CROSS SECTION 4/5
A2001	TYPICAL SECTIONS	C1005	PRINCES HWY – CROSS SECTION 5/5
A3001	TURNING PATHS PLAN	C2001	PRINCES HWY – EDGE LINE PROFILE
A4001	SISD PLAN		
A5001	AQUAPLANING ASSESSMENT PLAN		



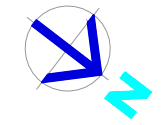
**XEROS PICCOLO**  
CONSULTING ENGINEERS

LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL
	PROPOSED TYPE 'SO' KERB
	PROPOSED SWALE DRAIN
	PROPOSED GUARDRAIL 'EZY-GUARD 4' W-BEAM
	EXISTING TREE TO BE REMOVED
	PROPERTY BOUNDARY



- NOTES**
- 1) CONTRACTOR TO CONFIRM DEPTH AND LOCATION OF EXISTING SERVICES PRIOR TO EXCAVATION AND ORDERING MATERIALS.
  - 2) DO NOT SCALE OFF DRAWINGS. DRAWINGS ARE FOR ENGINEERING PURPOSES ONLY. REFER TO RELEVANT REGULATORY PLANS FOR RELEVANT INFORMATION.
  - 3) ALL EARTHWORKS TO COMPLY WITH AS3798.
  - 4) ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
  - 5) PROPOSED INTERSECTION TREATMENTS HAVE BEEN DESIGN FOR A DESIGN SPEED OF 100km/h
  - 6) PLANS ARE CONCEPTUAL FOR DISCUSSION PURPOSES ONLY
  - 7) CONTOURS SHOWN ARE FINISHED SURFACE CONTOURS AT 0.5m INCREMENTS U.N.O

**NOT FOR CONSTRUCTION**



UNDER GROUND SERVICES ARE APPROXIMATE ONLY. CONTACT RELEVANT AUTHORITY PRIOR TO ANY EXCAVATION OR CONSTRUCTION.

No.	DATE	DETAILS	BY
B	16.11.2018	UPDATED FOR RMS REVIEW	S.X
A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X



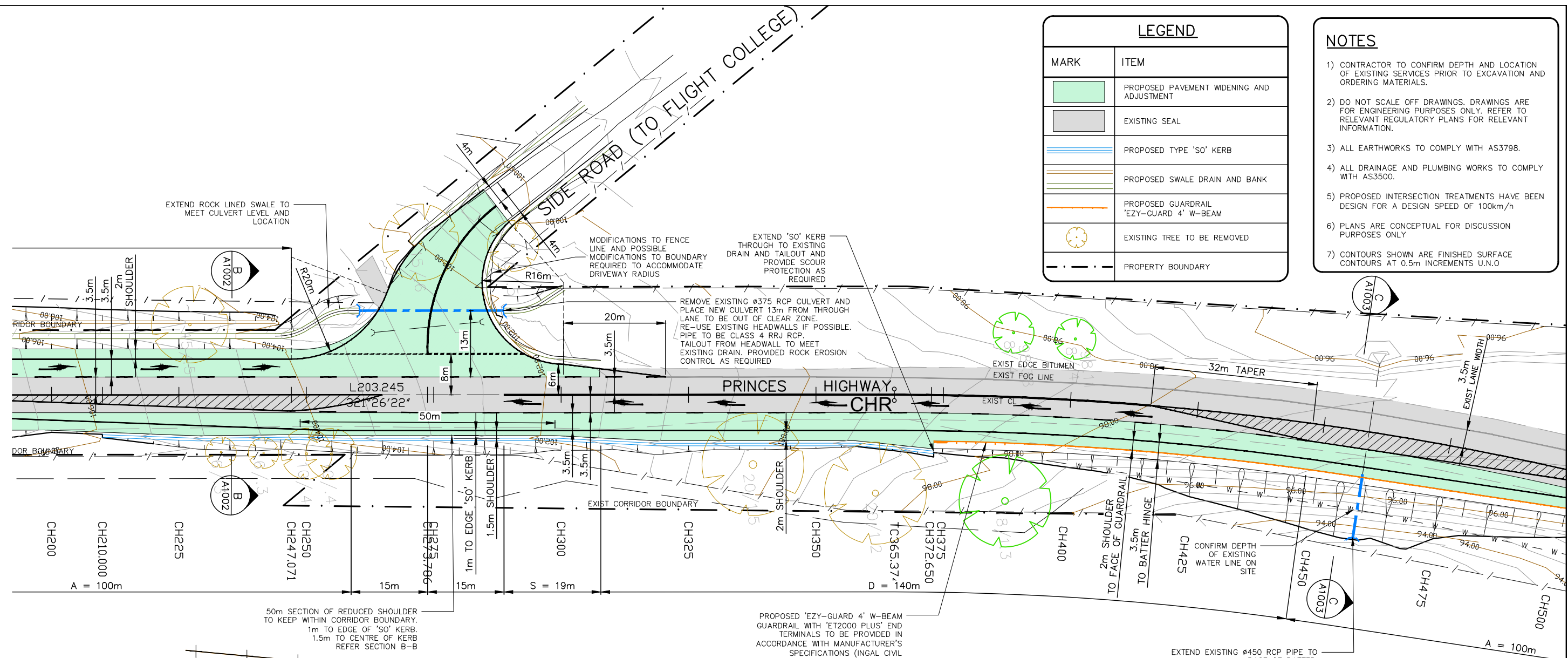
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Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: **SITE PLAN**  
Scale: 1:1000 (A1) 1:2000 (A3)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

Checked: \_\_\_\_\_ Approved: \_\_\_\_\_  
Project Number: **180695** Revision: **B**  
Drawing Number: **A1001** Sheets in Set: **14**





LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL
	PROPOSED TYPE 'SO' KERB
	PROPOSED SWALE DRAIN AND BANK
	PROPOSED GUARDRAIL 'EZY-GUARD 4' W-BEAM
	EXISTING TREE TO BE REMOVED
	PROPERTY BOUNDARY

- NOTES**
- 1) CONTRACTOR TO CONFIRM DEPTH AND LOCATION OF EXISTING SERVICES PRIOR TO EXCAVATION AND ORDERING MATERIALS.
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  - 7) CONTOURS SHOWN ARE FINISHED SURFACE CONTOURS AT 0.5m INCREMENTS U.N.O

50m SECTION OF REDUCED SHOULDER TO KEEP WITHIN CORRIDOR BOUNDARY. 1m TO EDGE OF 'SO' KERB. 1.5m TO CENTRE OF KERB REFER SECTION B-B

PROPOSED 'EZY-GUARD 4' W-BEAM GUARDRAIL WITH 'ET2000 PLUS' END TERMINALS TO BE PROVIDED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS (INGAL CIVIL PRODUCTS), AUSTRALIAN STANDARDS, AND ROADS AND MARITIME SERVICES AND COUNCIL REQUIREMENTS REFER SECTION C-C

EXTEND EXISTING Ø450 RCP PIPE TO BASE OF BATTER. PROVIDE HEADWALL AND ROCK EROSION CONTROL AS REQUIRED

CHAINAGE	EXISTING SURFACE	DESIGN LINE GRADING	VERTICAL GEOMETRY	HORIZONTAL GEOMETRY
230	104.901	104.902	-4.908%	VP R.L. 104.902
240	104.436	104.434	-4.682%	VP R.L. 104.434
250	103.985	103.985	-4.488%	VP R.L. 103.985
260	103.55	103.55	-4.348%	VP R.L. 103.550
270	103.113	103.114	-4.364%	VP R.L. 103.114
280	102.694	102.693	-4.209%	VP R.L. 102.693
290	102.283	102.281	-4.118%	VP R.L. 102.281
300	101.864	101.864	-4.169%	VP R.L. 101.864
310	101.442	101.442	-4.222%	VP R.L. 101.442
320	101.045	101.044	-3.978%	VP R.L. 101.044
330	100.65	100.65	-3.940%	VP R.L. 100.650
340	100.265	100.267	-3.829%	VP R.L. 100.267
350	99.893	99.893	-3.743%	VP R.L. 99.893
360	99.569	99.569	-3.246%	VP R.L. 99.569
365.374	99.394	99.394	-3.256%	MP R.L. 99.394
370	99.251	99.249	-3.124%	VP R.L. 99.249
380	98.952	98.951	-2.985%	VP R.L. 98.951
390	98.657	98.657	-2.934%	VP R.L. 98.657
400	98.377	98.377	-2.804%	VP R.L. 98.377
410	98.125	98.126	-2.511%	VP R.L. 98.126
420	97.887	97.887	-2.385%	VP R.L. 97.887
430	97.695	97.695	-1.923%	VP R.L. 97.695
440	97.5	97.501	-1.942%	VP R.L. 97.501
450	97.36	97.359	-1.421%	VP R.L. 97.359
460	97.23	97.23	-1.283%	VP R.L. 97.230
470	97.152	97.151	-0.789%	VP R.L. 97.151
			0.735%	

LONGITUDINAL SECTION - PRINCES HWY CL  
 Horizontal scale 1:400  
 Vertical scale 1:200

**NOT FOR CONSTRUCTION**

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No.	DATE	DETAILS	BY
B	16.11.2018	UPDATED FOR RMS REVIEW	S.X
A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X

**XP XEROS PICCOLO CONSULTING ENGINEERS**

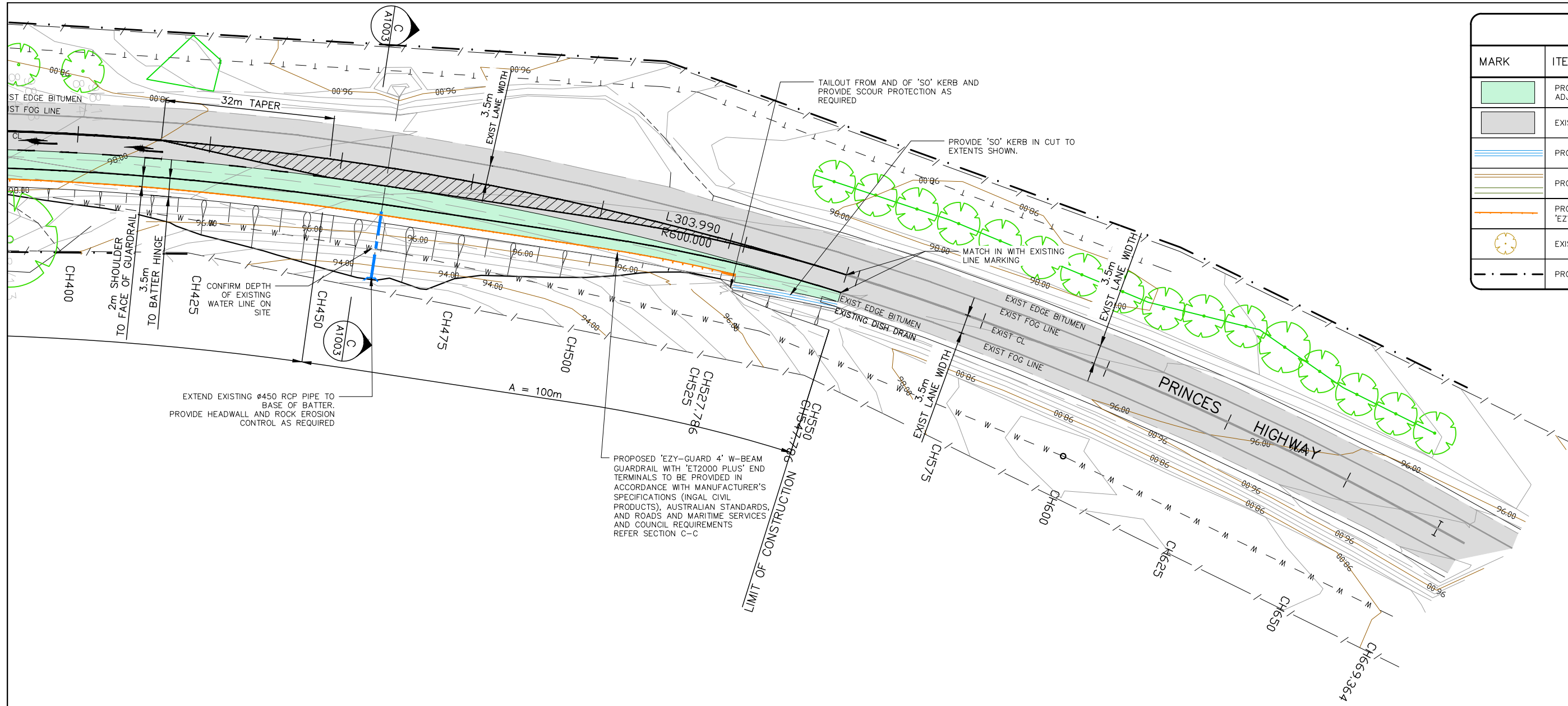
5 BYE STREET  
 WAGGA WAGGA, NSW, 2650  
 P (02) 6925 5855  
 F (02) 6925 5655  
 E WAGGA@XEROSPICCOLO.COM.AU  
 A.C.N. 137 881 853

Project:  
**PROPOSED INTERSECTION WORKS  
 SPORTS AVIATION FLIGHT COLLEGE**  
 1070 PRINCES HIGHWAY  
 FROGS HOLLOW NSW 2550

Sheet Title: **LAYOUT PLAN 2/3**  
 Scale: 1:400 (A1) 1:800 (A3)  
 Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
 Design: S.X Drawn: S.X Date: OCT 2018

Checked:	Project Number: 180695	Revision: B
Approved:	Drawing Number: A1003	Sheets in Set: 14

LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL
	PROPOSED TYPE 'SO' KERB
	PROPOSED SWALE DRAIN AND BANK
	PROPOSED GUARDRAIL 'EZY-GUARD 4' W-BEAM
	EXISTING TREE TO BE REMOVED
	PROPERTY BOUNDARY



EXTEND EXISTING #450 RCP PIPE TO BASE OF BATTER. PROVIDE HEADWALL AND ROCK EROSION CONTROL AS REQUIRED

PROPOSED 'EZY-GUARD 4' W-BEAM GUARDRAIL WITH 'ET2000 PLUS' END TERMINALS TO BE PROVIDED IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS (INGAL CIVIL PRODUCTS), AUSTRALIAN STANDARDS, AND ROADS AND MARITIME SERVICES AND COUNCIL REQUIREMENTS REFER SECTION C-C

DESIGN GRADELINE VERTICAL GEOMETRY	-1.283% -0.789% -0.735% -0.661% -0.585% -0.543% -0.625% -0.605% -0.484% -0.406% -0.501% -0.570% -0.503% -0.517% -0.580% -0.659% -0.904% -1.110% -1.368% -1.487% -1.889% -1.970% -1.995%																						
HORIZONTAL GEOMETRY	600m R																						
DATUM 82.0	VIP R.L. 97.230	VIP R.L. 97.151	VIP R.L. 97.078	VIP R.L. 97.012	VIP R.L. 96.953	VIP R.L. 96.899	VIP R.L. 96.853	VIP R.L. 96.837	VIP R.L. 96.789	VIP R.L. 96.748	VIP R.L. 96.698	VIP R.L. 96.641	VIP R.L. 96.591	VIP R.L. 96.539	VIP R.L. 96.481	VIP R.L. 96.415	VIP R.L. 96.325	VIP R.L. 96.214	VIP R.L. 96.077	VIP R.L. 95.928	VIP R.L. 95.739	VIP R.L. 95.542	
DESIGN LINE GRADING	97.23	97.151	97.078	97.012	96.953	96.899	96.853	96.837	96.789	96.748	96.698	96.641	96.591	96.539	96.481	96.415	96.325	96.214	96.077	95.928	95.739	95.542	95.355
EXISTING SURFACE	97.23	97.152	97.078	97.012	96.953	96.899	96.853	96.837	96.789	96.748	96.697	96.64	96.592	96.54	96.481	96.415	96.324	96.214	96.077	95.929	95.74	95.542	95.357
CHAINAGE	460	470	480	490	500	510	517.369	520	530	540	550	560	570	580	590	600	610	620	630	640	650	660	669.364

LONGITUDINAL SECTION - PRINCES HWY CL  
Horizontal scale 1:400  
Vertical scale 1:200

- NOTES**
- CONTRACTOR TO CONFIRM DEPTH AND LOCATION OF EXISTING SERVICES PRIOR TO EXCAVATION AND ORDERING MATERIALS.
  - DO NOT SCALE OFF DRAWINGS. DRAWINGS ARE FOR ENGINEERING PURPOSES ONLY. REFER TO RELEVANT REGULATORY PLANS FOR RELEVANT INFORMATION.
  - ALL EARTHWORKS TO COMPLY WITH AS3798.
  - ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
  - PROPOSED INTERSECTION TREATMENTS HAVE BEEN DESIGN FOR A DESIGN SPEED OF 100km/h
  - PLANS ARE CONCEPTUAL FOR DISCUSSION PURPOSES ONLY
  - CONTOURS SHOWN ARE FINISHED SURFACE CONTOURS AT 0.5m INCREMENTS U.N.O

**NOT FOR CONSTRUCTION**



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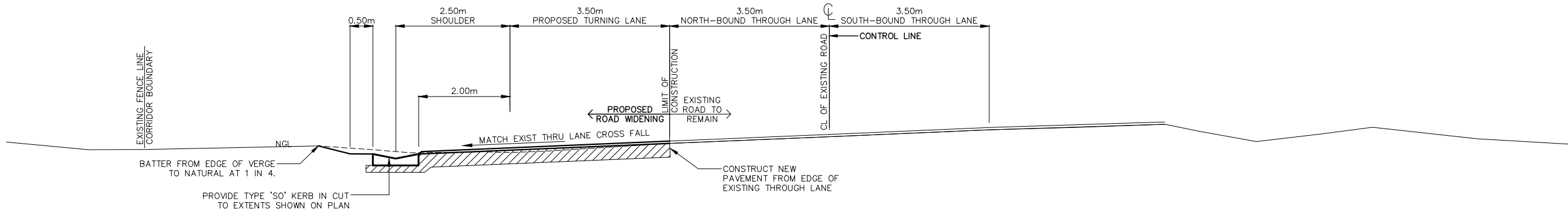
No.	DATE	DETAILS	BY
B	16.11.2018	UPDATED FOR RMS REVIEW	S.X
A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X

**XP XEROS PICCOLO CONSULTING ENGINEERS**  
5 BYE STREET WAGGA WAGGA, NSW, 2650  
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A.C.N. 137 881 853

Project: PROPOSED INTERSECTION WORKS SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY FROGS HOLLOW NSW 2550

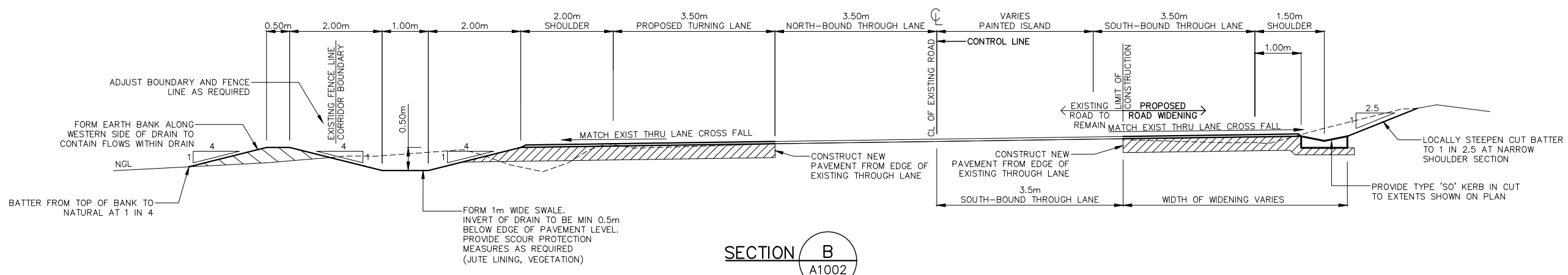
Sheet Title: LAYOUT PLAN 3/3  
Scale: 1:400 (A1) 1:800 (A3)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

Checked:	Project Number: 180695	Revision: B
Approved:	Drawing Number: A1004	Sheets in Set: 14



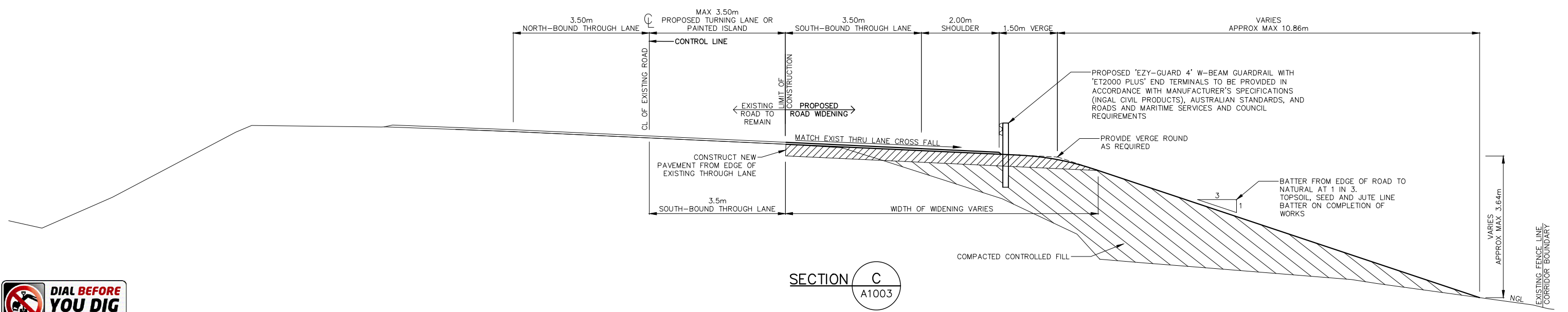
SECTION A  
A1002

TYPICAL CROSS SECTION THRU PRINCES HIGHWAY  
AT AUL WIDENING  
APPROX CH 61.076-106.250



SECTION B  
A1002

TYPICAL CROSS SECTION THRU PRINCES HIGHWAY  
AT AUL AND CHR WIDENING  
APPROX CH 106.250-247.071



SECTION C  
A1003

TYPICAL CROSS SECTION THRU PRINCES HIGHWAY  
AT CHR WIDENING  
APPROX CH 373.253-527.786

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No.	DATE	DETAILS	BY
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A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X



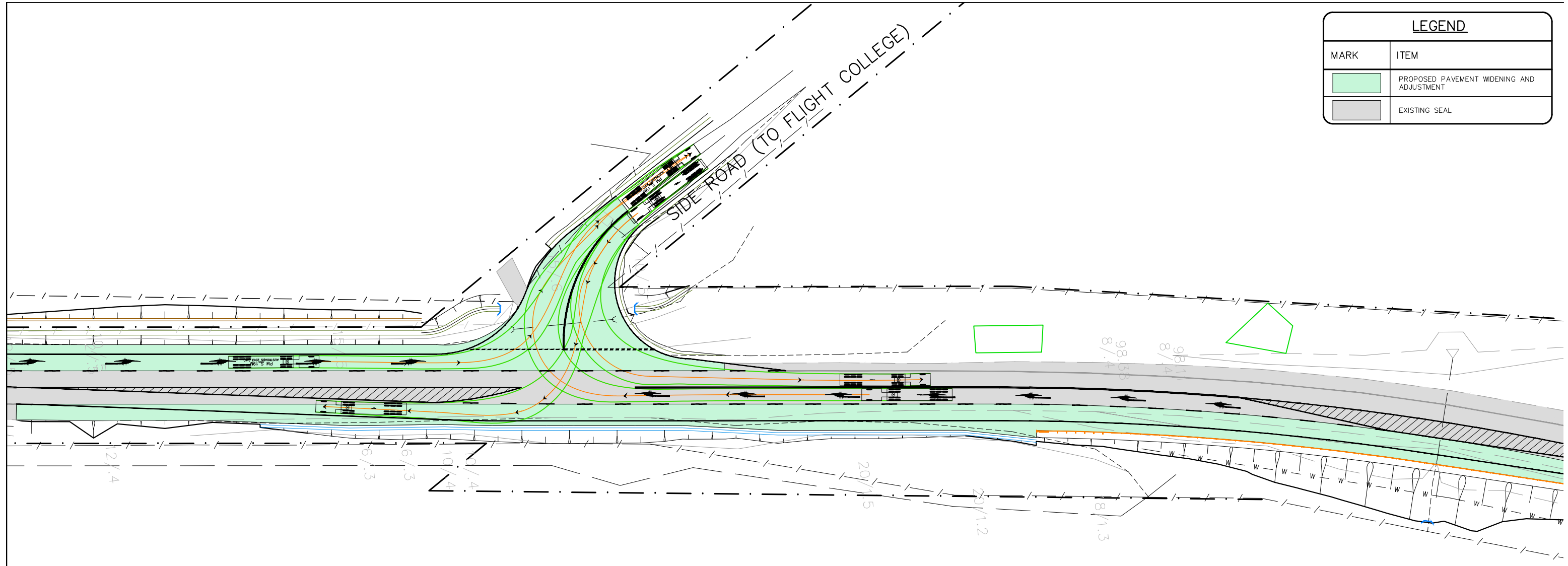
5 BYE STREET  
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P (02) 6925 5855  
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E WAGGA@XEROSPICCOLO.COM.AU  
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Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: TYPICAL SECTIONS  
Scale: 1:50 (A1) 1:100 (A3)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

Project Number: 180695  
Revision: B  
Drawing Number: A2001  
Sheets in Set: 14

LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL



**TURNING PATH NOTES**

- TURNING PATHS PRODUCED USING AUTOTURN
- TURNING PATH DETAILS:  
 VEHICLE: 19m SEMI-TRAILER (AUSTROADS 2013)  
 SPEED: 25km/h

**NOTES**

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- ALL EARTHWORKS TO COMPLY WITH AS3798.
- ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
- PROPOSED INTERSECTION TREATMENTS HAVE BEEN DESIGN FOR A DESIGN SPEED OF 100km/h
- PLANS ARE CONCEPTUAL FOR DISCUSSION PURPOSES ONLY
- CONTOURS SHOWN ARE FINISHED SURFACE CONTOURS AT 0.5m INCREMENTS U.N.O

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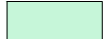



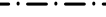
No.	DATE	DETAILS	BY
B	16.11.2018	UPDATED FOR RMS REVIEW	S.X
A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X

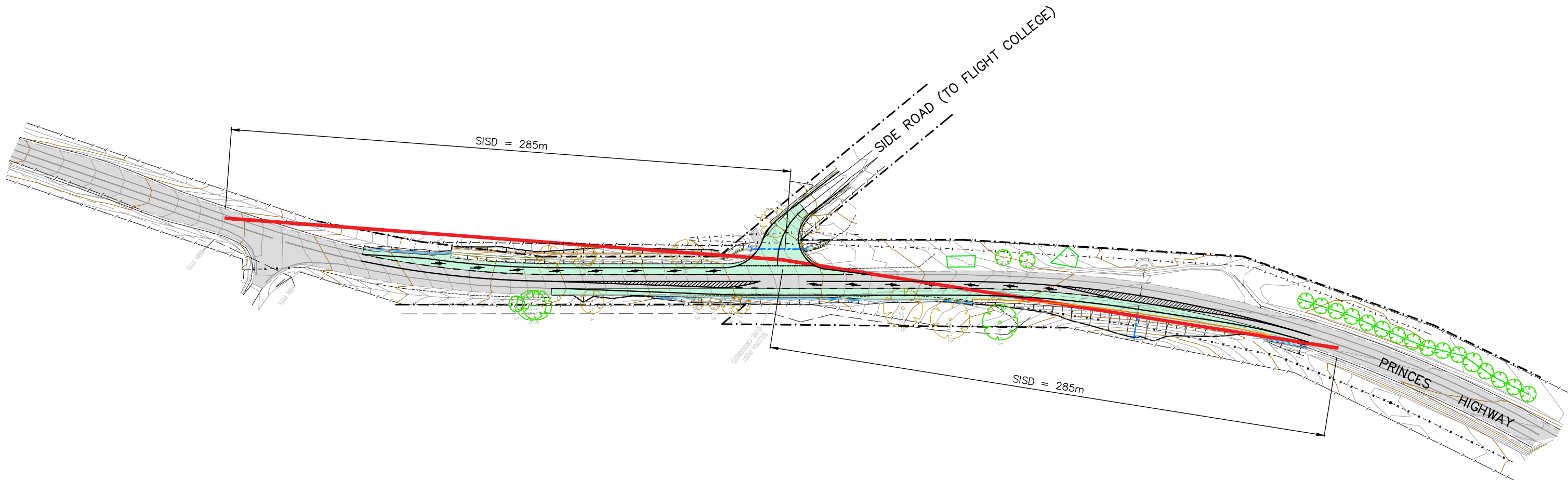
**XP XEROS PICCOLO CONSULTING ENGINEERS**

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Project:  
**PROPOSED INTERSECTION WORKS  
 SPORTS AVIATION FLIGHT COLLEGE  
 1070 PRINCES HIGHWAY  
 FROGS HOLLOW NSW 2550**

Sheet Title: <b>TURNING PATHS PLAN</b>			Project Number: <b>180695</b>	Revision: <b>B</b>
Scale: 1:400 (A1) 1:800 (A3)			Checked:	
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD			Approved:	
Design: S.X	Drawn: S.X	Date: OCT 2018	Drawing Number: <b>A3001</b>	Sheets in Set: <b>14</b>

LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL
	SISD SIGHT LINE
	EXISTING TREE TO BE REMOVED
	PROPERTY BOUNDARY



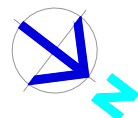
**NOTES**

- 1) CONTRACTOR TO CONFIRM DEPTH AND LOCATION OF EXISTING SERVICES PRIOR TO EXCAVATION AND ORDERING MATERIALS.
- 2) DO NOT SCALE OFF DRAWINGS. DRAWINGS ARE FOR ENGINEERING PURPOSES ONLY. REFER TO RELEVANT REGULATORY PLANS FOR RELEVANT INFORMATION.
- 3) ALL EARTHWORKS TO COMPLY WITH AS3798.
- 4) ALL DRAINAGE AND PLUMBING WORKS TO COMPLY WITH AS3500.
- 5) PROPOSED INTERSECTION TREATMENTS HAVE BEEN DESIGN FOR A DESIGN SPEED OF 100km/h
- 6) PLANS ARE CONCEPTUAL FOR DISCUSSION PURPOSES ONLY
- 7) CONTOURS SHOWN ARE FINISHED SURFACE CONTOURS AT 0.5m INCREMENTS U.N.O

**SISD NOTES**

- 1) SISD BASED ON 110km/h SPEED
- 2) ALL TREES AND SHRUBS WITHIN SISD AFFECTED AREA TO BE REMOVED

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No.	DATE	DETAILS	BY
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A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X



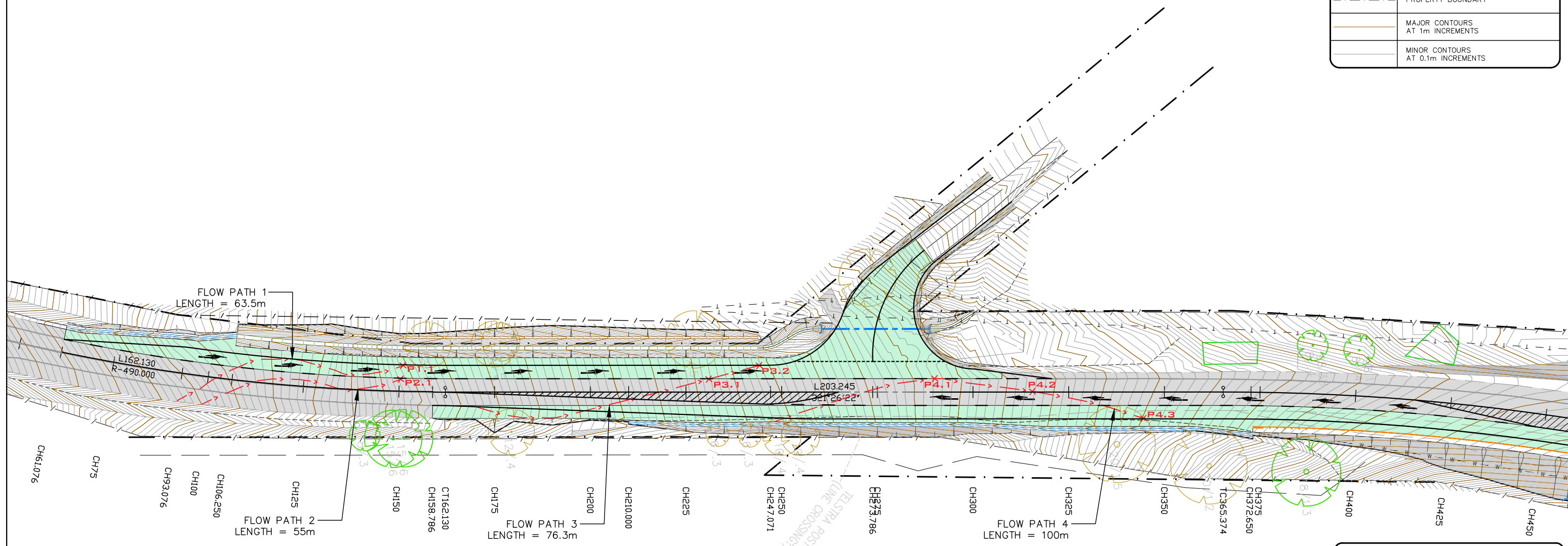
5 BYE STREET  
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E WAGGA@XEROSPICCOLO.COM.AU  
A.C.N. 137 881 853

Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: SISD PLAN  
Scale: 1:1000 (A1) 1:2000 (A3)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

Project Number: 180695  
Revision: B  
Drawing Number: A4001  
Sheets in Set: 14

LEGEND	
MARK	ITEM
	PROPOSED PAVEMENT WIDENING AND ADJUSTMENT
	EXISTING SEAL
	SURFACE WATER FLOW PATH FOR AQUAPLANING ASSESSMENT
	AQUAPLANING ASSESSMENT POINT
	PROPERTY BOUNDARY
	MAJOR CONTOURS AT 1m INCREMENTS
	MINOR CONTOURS AT 0.1m INCREMENTS



- NOTES**
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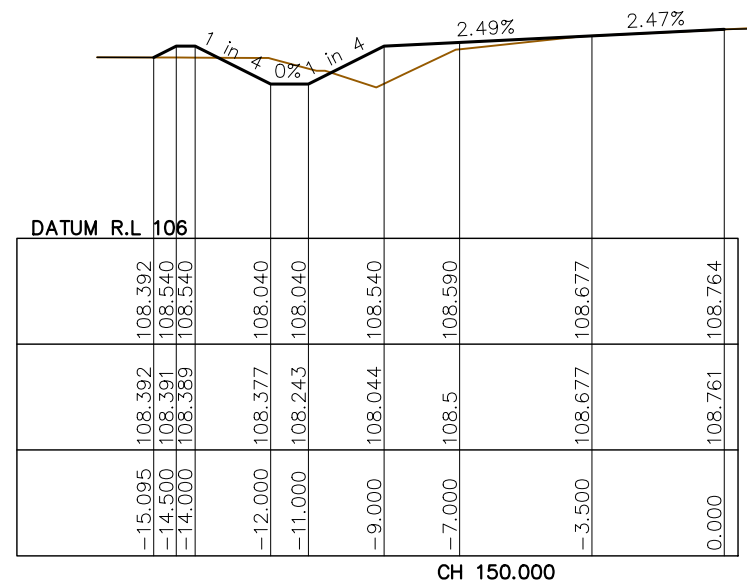
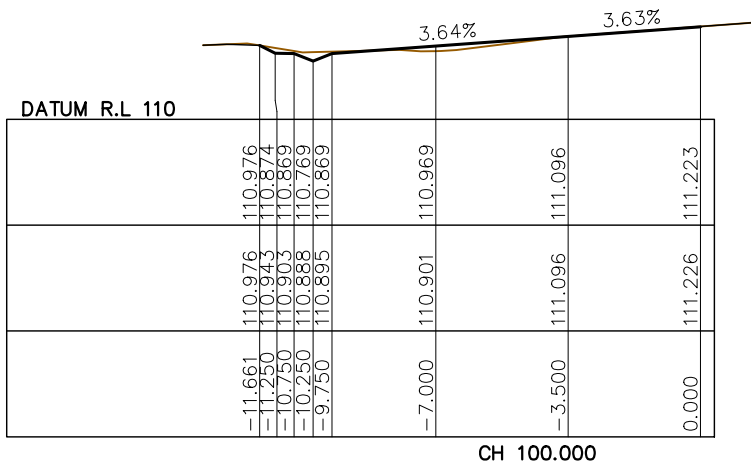
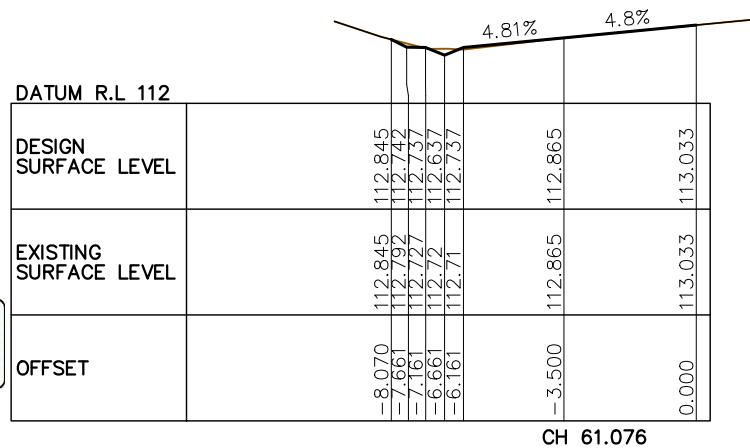
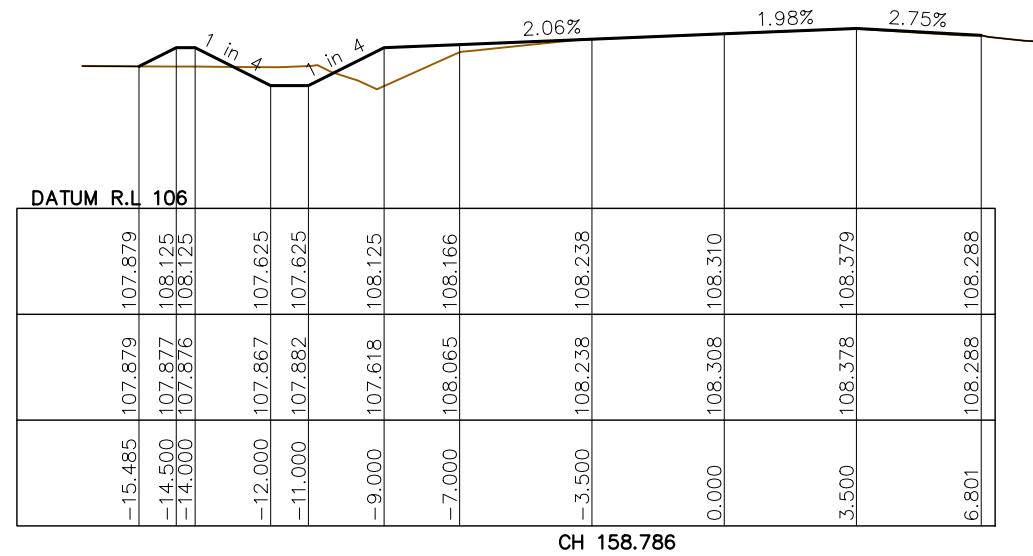
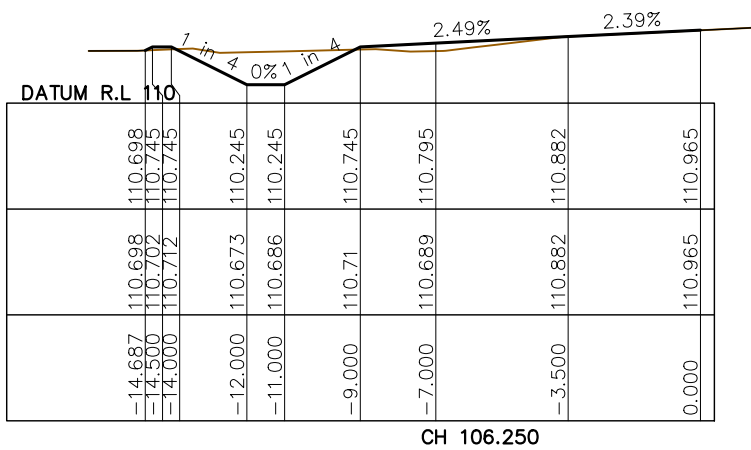
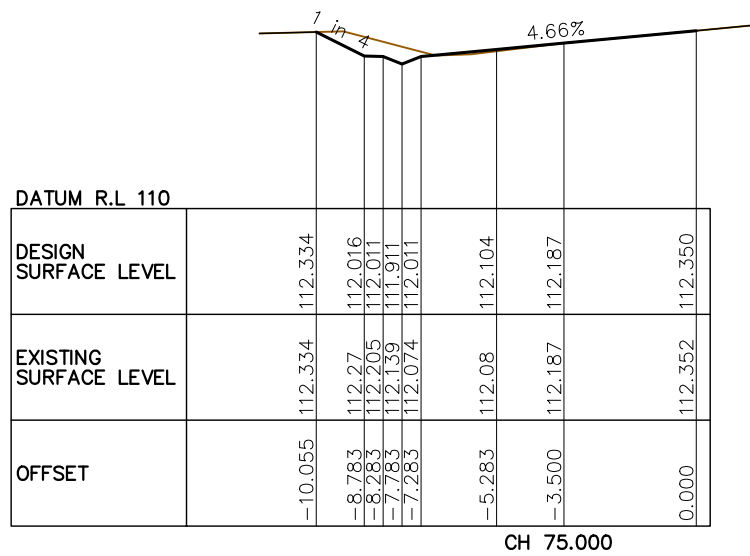
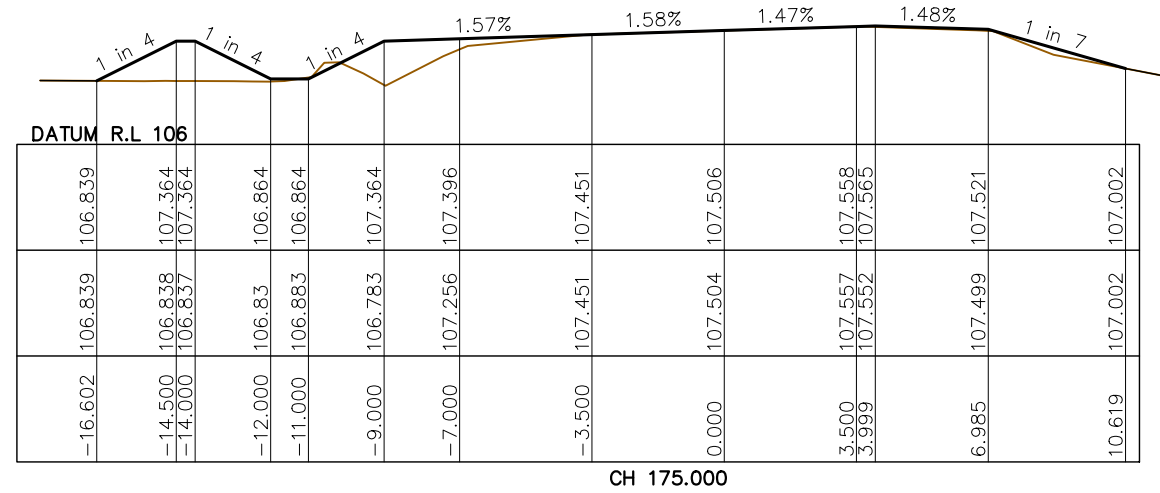
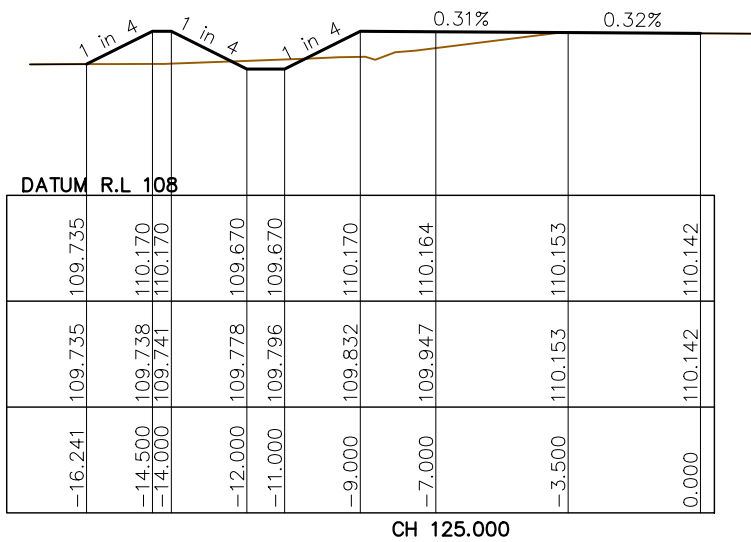
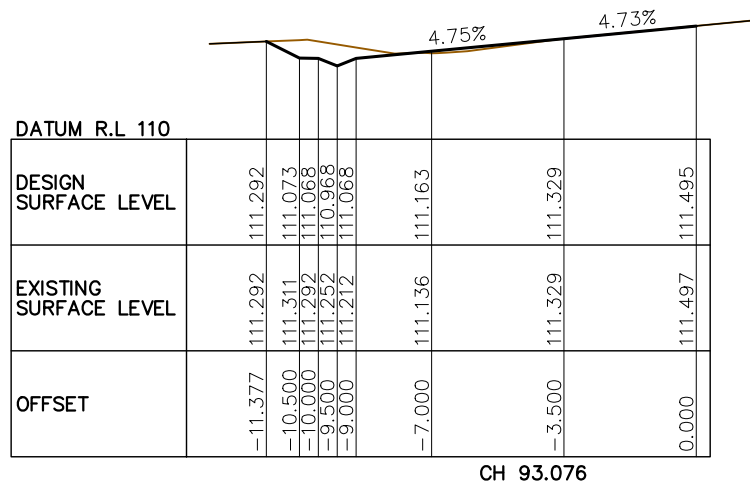
No.	DATE	DETAILS	BY
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Project:  
**PROPOSED INTERSECTION WORKS  
 SPORTS AVIATION FLIGHT COLLEGE  
 1070 PRINCES HIGHWAY  
 FROGS HOLLOW NSW 2550**

Sheet Title: **AQUAPLANING ASSESSMENT PLAN**  
 Scale: 1:500 (A1) 1:1000 (A3)  
 Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
 Design: S.X Drawn: S.X Date: OCT 2018

Project Number: **180695** Revision: **B**  
 Drawing Number: **A5001** Sheets in Set: **14**



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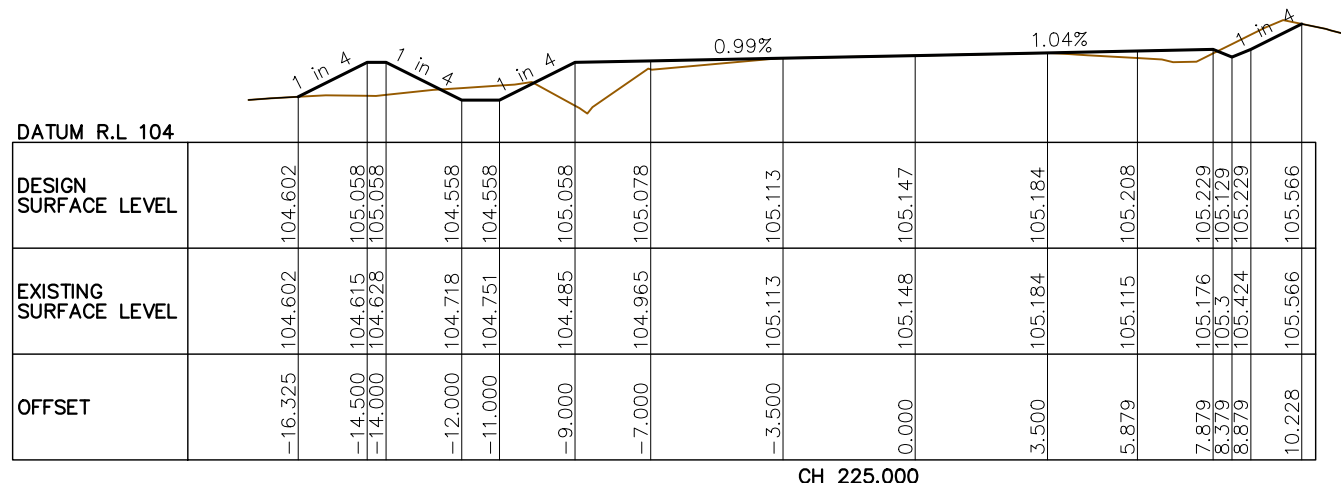


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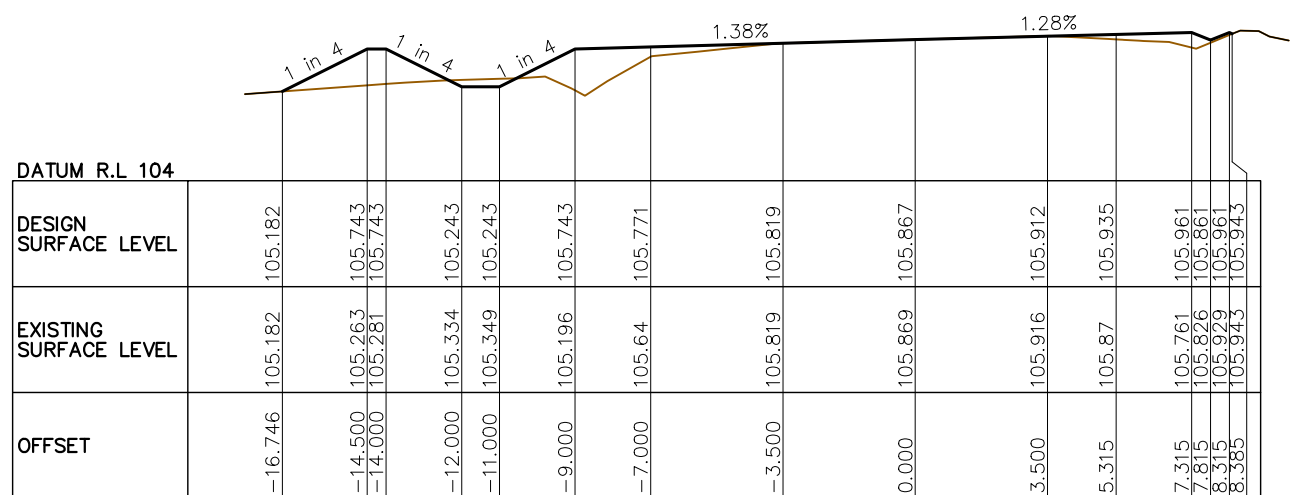
Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY – CROSS SECTIONS 1/5  
Scale: HOR: 1:100, VERT: 1:50 (A1)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

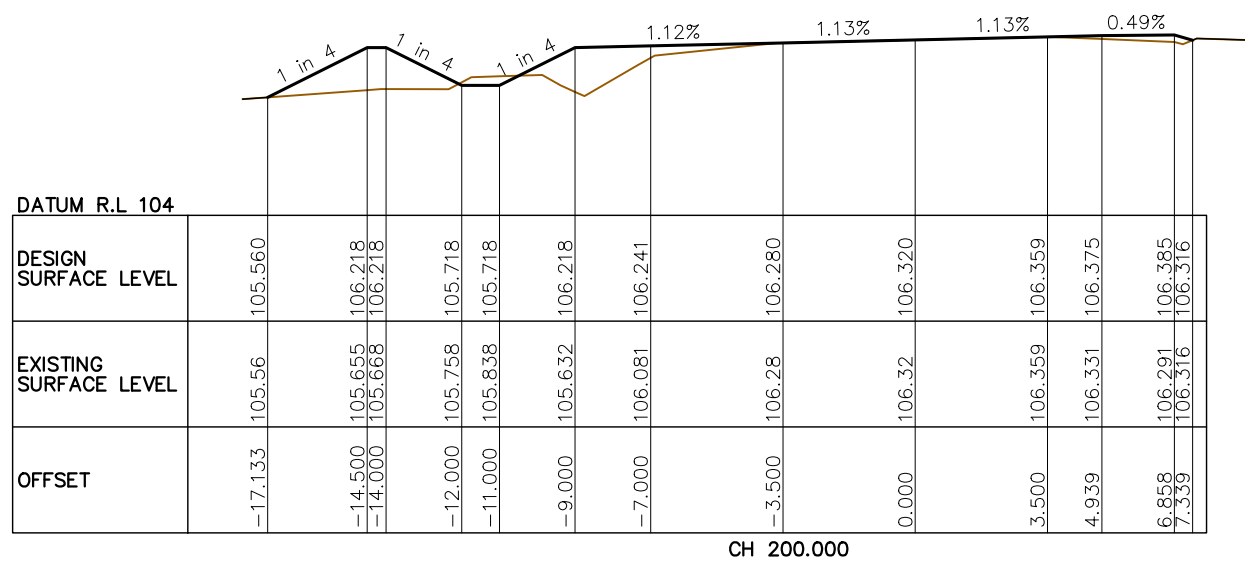
Project Number: 180695  
Revision: B  
Drawing Number: C1001  
Sheets in Set: 14



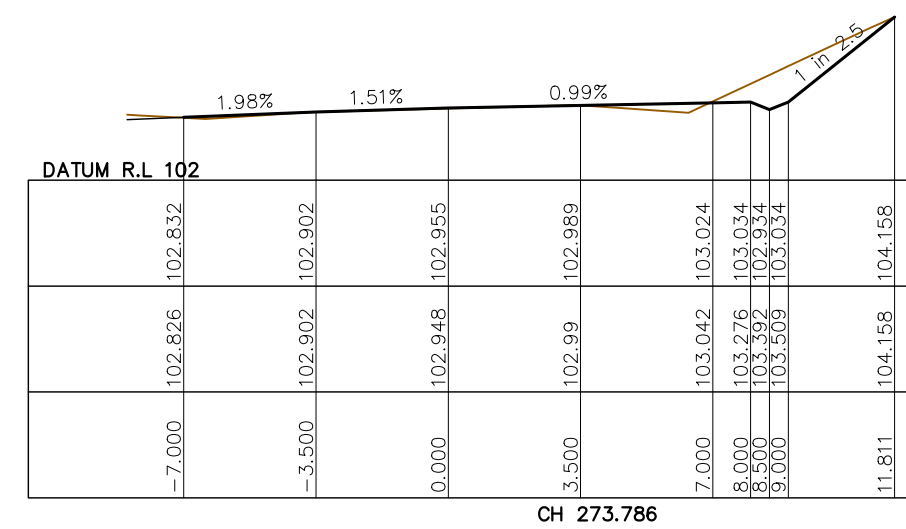
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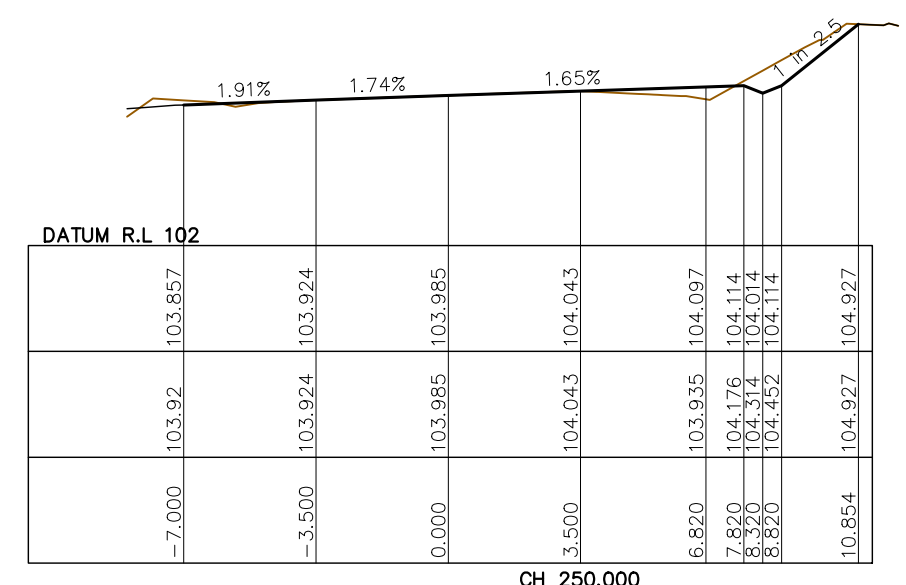
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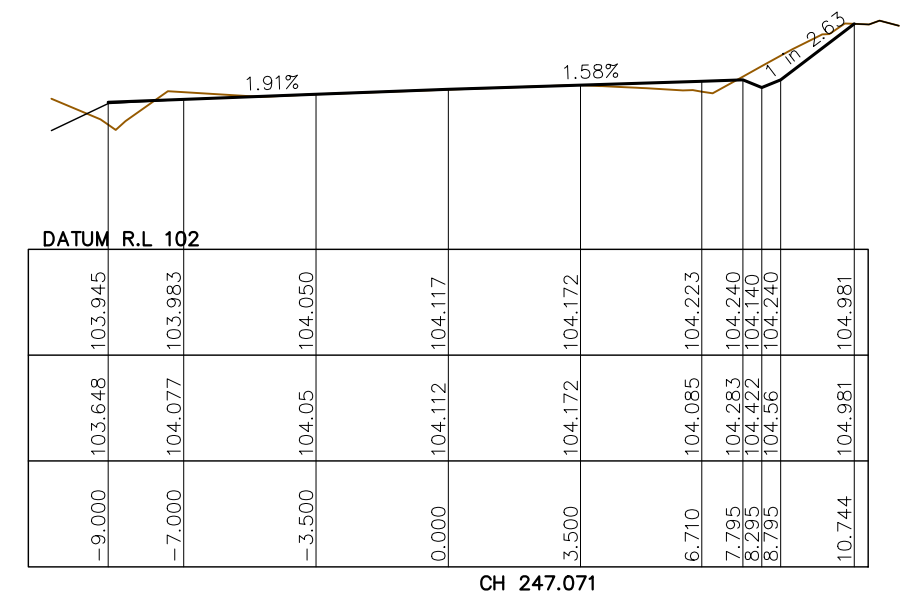
CH 200.000



CH 273.786



CH 250.000



CH 247.071



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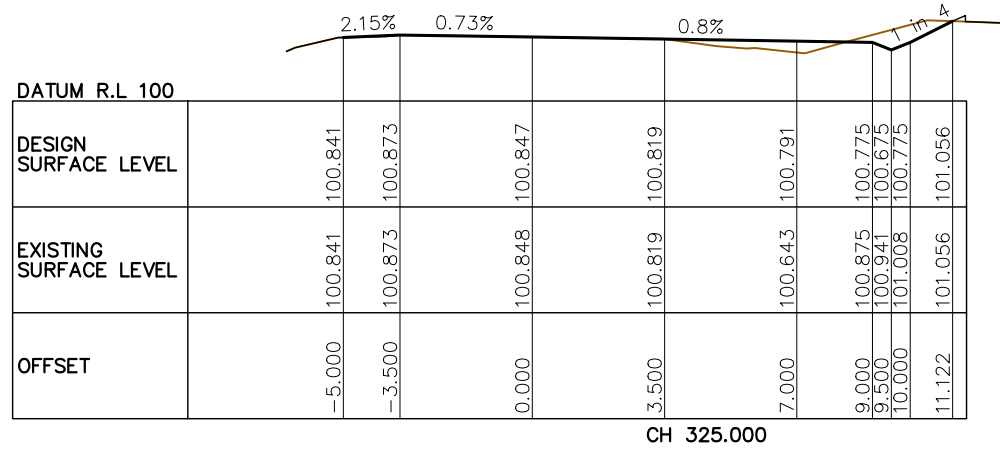
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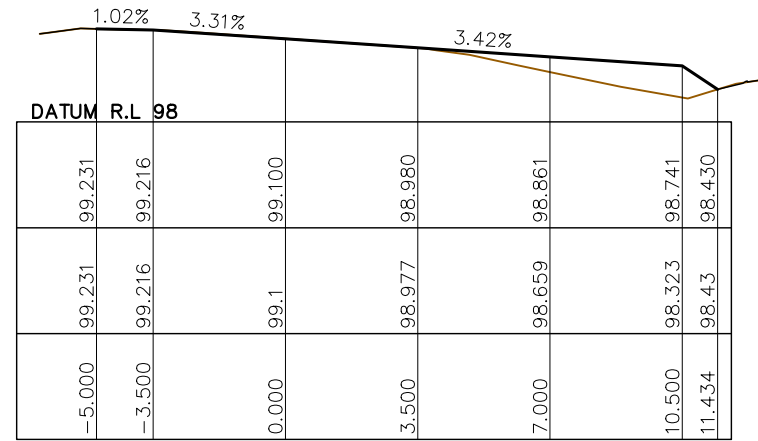
Project: PROPOSED INTERSECTION WORKS SPORTS AVIATION FLIGHT COLLEGE 1070 PRINCES HIGHWAY FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY - CROSS SECTIONS 2/5  
 Scale: HOR: 1:100, VERT: 1:50 (A1)  
 Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
 Design: S.X Drawn: S.X Date: OCT 2018

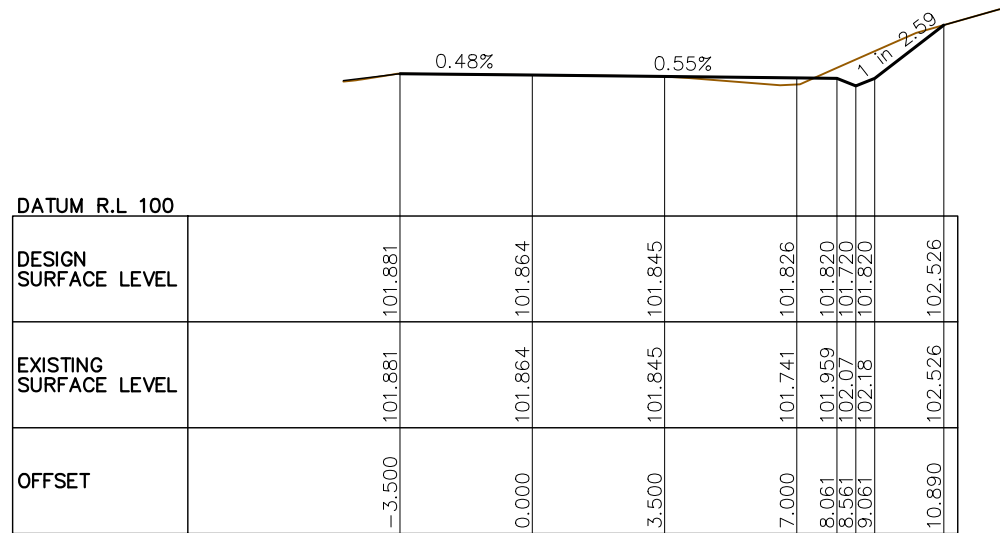
Project Number: 180695  
 Drawing Number: C1002  
 Revision: B  
 Sheets in Set: 14



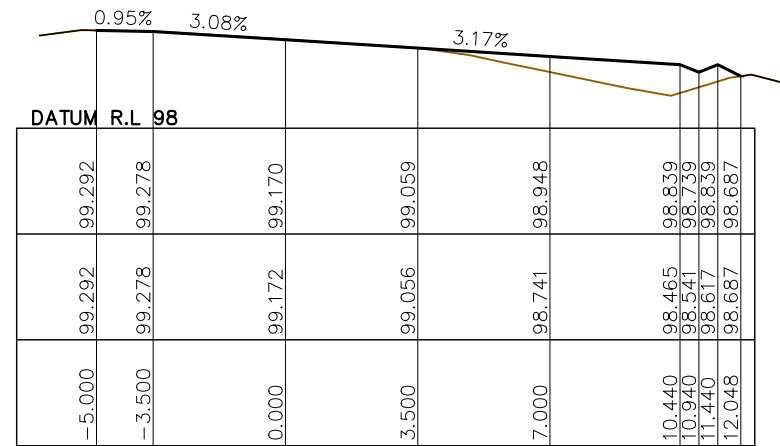
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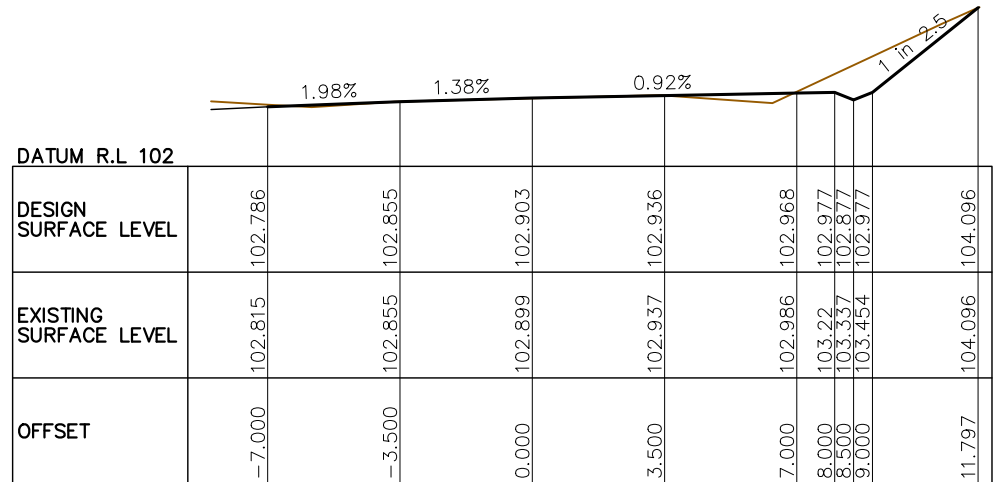
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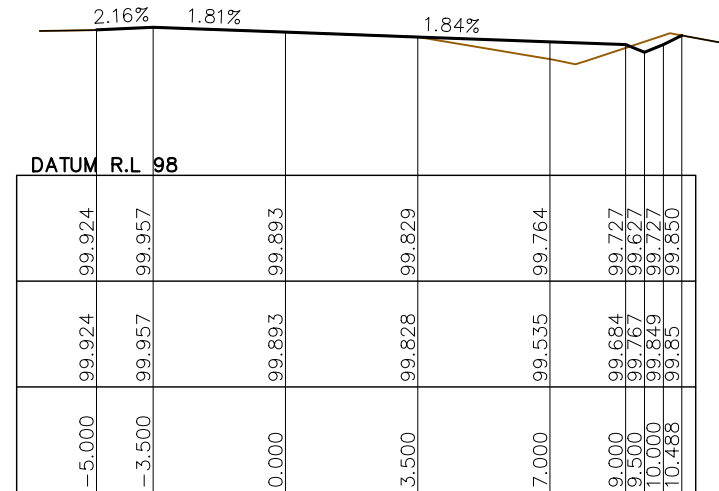
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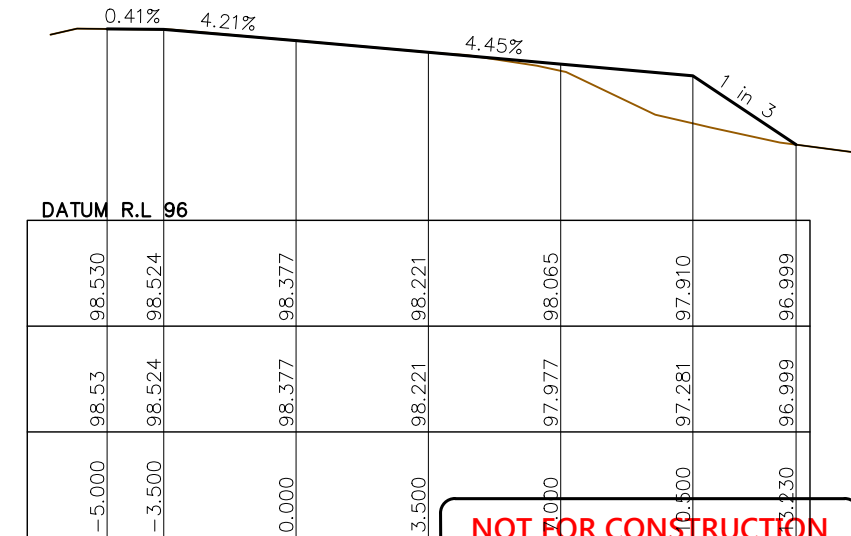
CH 372.650



CH 275.000



CH 350.000



CH 400.000



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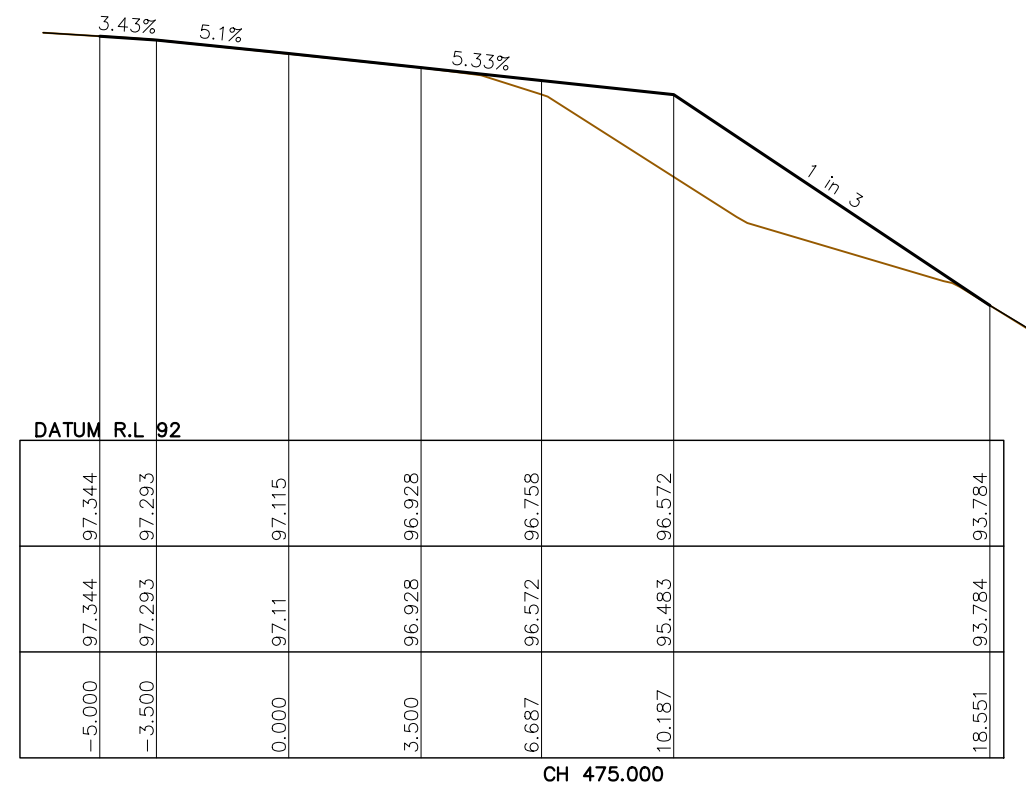
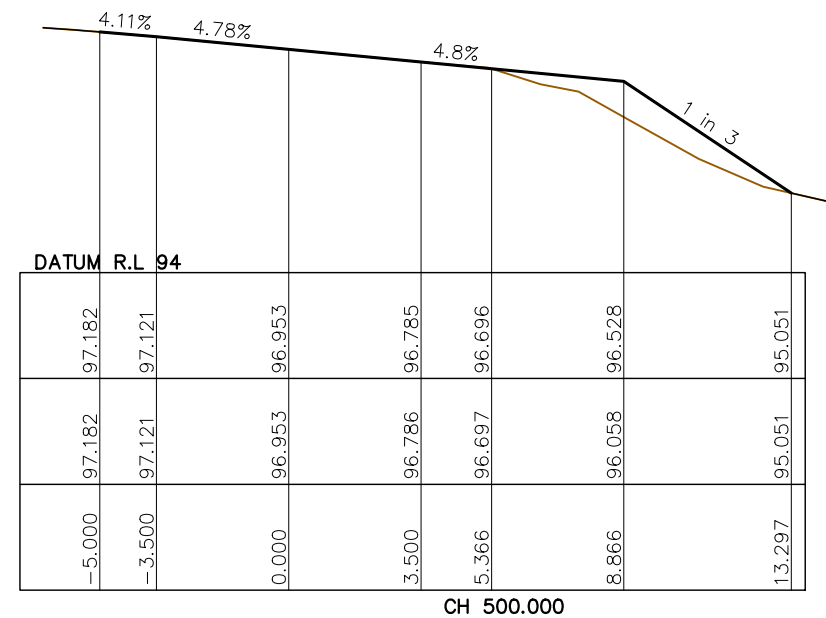
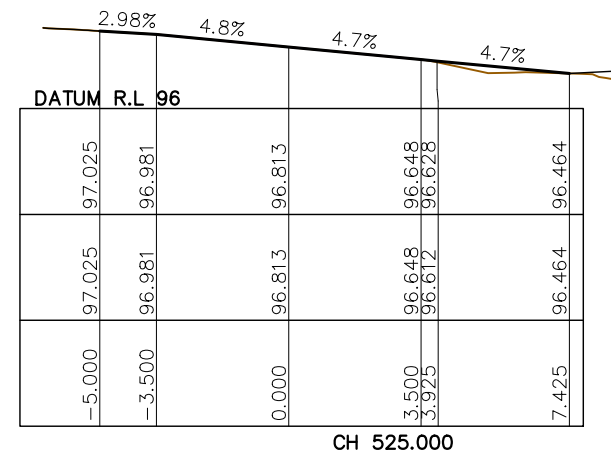
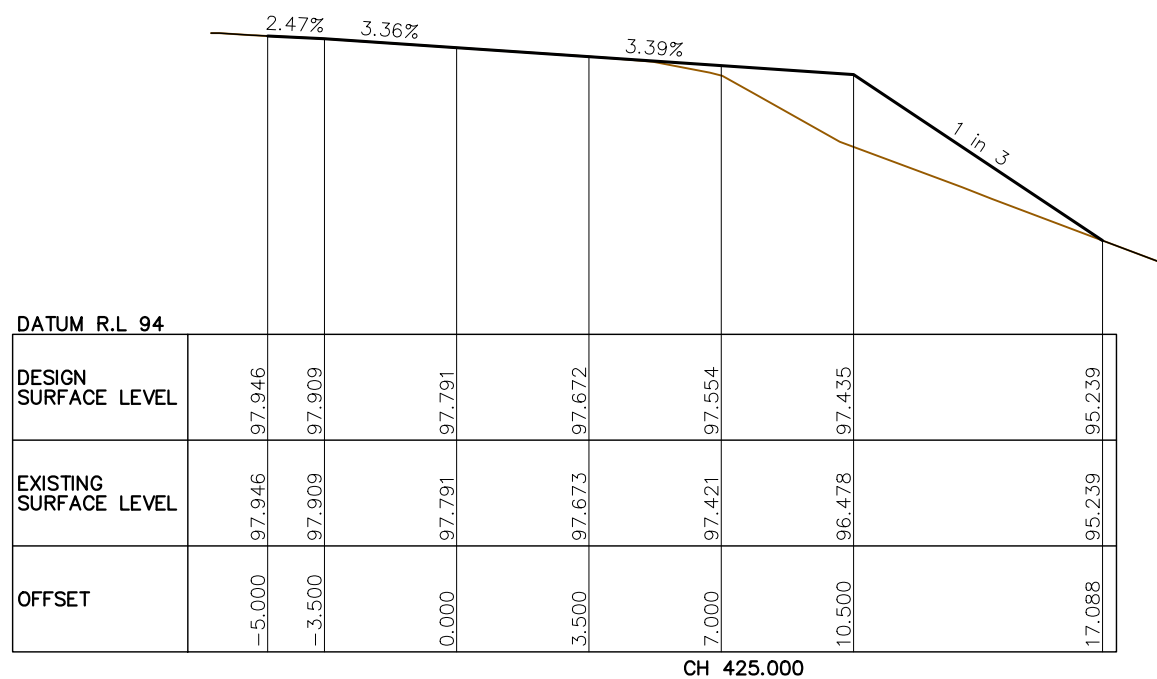
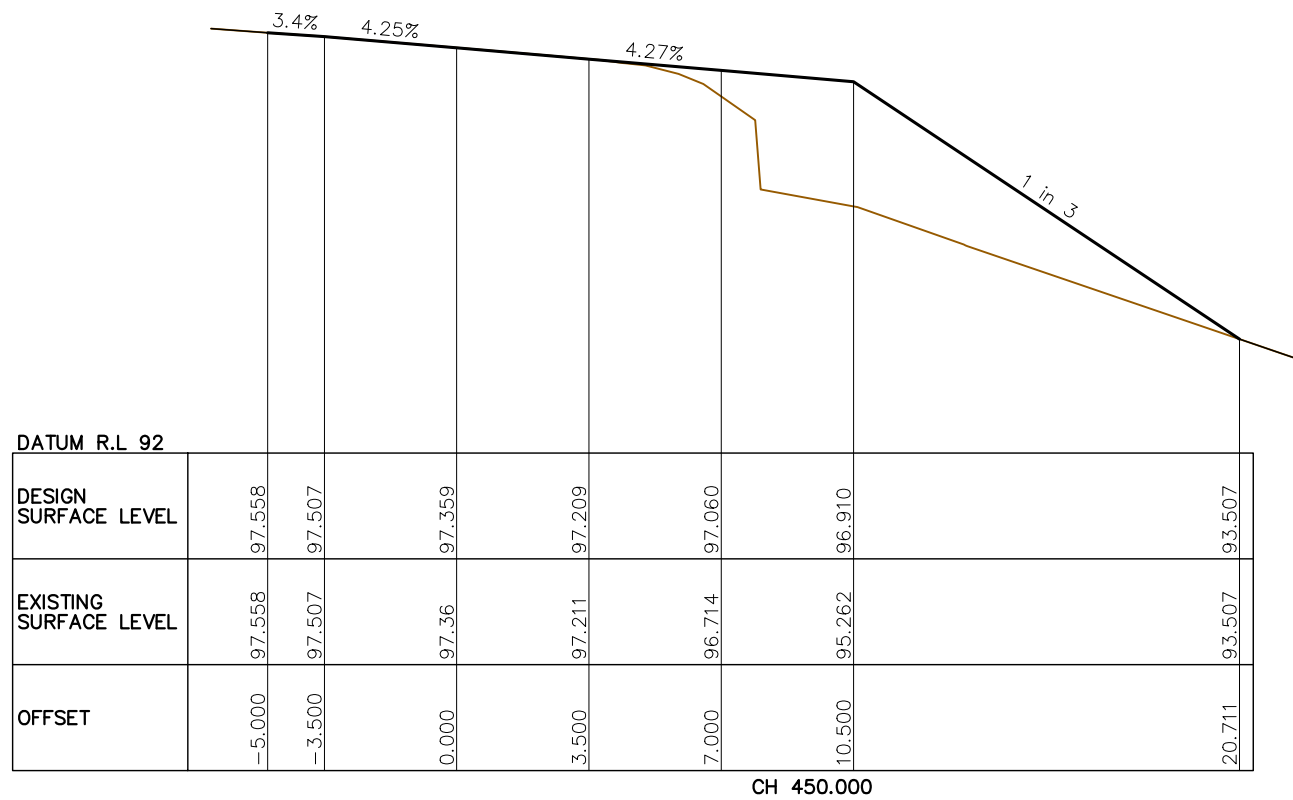


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Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY - CROSS SECTIONS 3/5  
Scale: HOR: 1:100, VERT: 1:50 (A1)  
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD  
Design: S.X Drawn: S.X Date: OCT 2018

Checked:  
Approved:  
Project Number: 180695  
Drawing Number: C1003  
Revision: B  
Sheets in Set: 14



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A	22.10.2018	PRELIMINARY FOR RMS REVIEW	S.X

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Project:  
**PROPOSED INTERSECTION WORKS**  
**SPORTS AVIATION FLIGHT COLLEGE**  
 1070 PRINCES HIGHWAY  
 FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY – CROSS SECTIONS 4/5		Project Number:	Revision:
Scale: HOR: 1:100, VERT: 1:50 (A1)	Checked:	180695	B
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD	Approved:	Drawing Number:	Sheets in Set:
Design: S.X	Drawn: S.X	Date: OCT 2018	C1004 14

3.21% 4.68%

DATUM R.L 96			
DESIGN SURFACE LEVEL	96.777	96.729	96.565
EXISTING SURFACE LEVEL	96.777	96.729	96.568
OFFSET	-5.000	-3.500	0.000

CH 575.000

1.72% 6.5%

DATUM R.L 94			
DESIGN SURFACE LEVEL	95.609	95.583	95.355
EXISTING SURFACE LEVEL	95.609	95.583	95.357
OFFSET	-5.000	-3.500	0.000

CH 669.364

2.41% 4.86%

DATUM R.L 96			
DESIGN SURFACE LEVEL	96.904	96.868	96.698
EXISTING SURFACE LEVEL	96.904	96.868	96.697
OFFSET	-5.000	-3.500	0.000

CH 550.000

2.33% 5.68%

DATUM R.L 94			
DESIGN SURFACE LEVEL	95.973	95.938	95.739
EXISTING SURFACE LEVEL	95.973	95.938	95.739
OFFSET	-5.000	-3.500	0.000

CH 650.000

2.44% 5% 4.96% 1 in 11.06 1 in 4

DATUM R.L 96									
DESIGN SURFACE LEVEL	96.921	96.884	96.709	96.535	96.371	96.271	96.371	96.371	97.391
EXISTING SURFACE LEVEL	96.921	96.884	96.708	96.533	96.371	96.381	96.371	96.371	97.391
OFFSET	-5.000	-3.500	0.000	3.500	5.319	5.819	6.319	6.819	10.880

CH 547.786

2.84% 5.02%

DATUM R.L 96			
DESIGN SURFACE LEVEL	96.363	96.321	96.145
EXISTING SURFACE LEVEL	96.363	96.321	96.148
OFFSET	-5.000	-3.500	0.000

CH 625.000

2.98% 4.92% 4.82% 4.82%

DATUM R.L 96									
DESIGN SURFACE LEVEL	97.016	96.971	96.799	96.631	96.615	96.446	96.446	96.446	96.415
EXISTING SURFACE LEVEL	97.016	96.971	96.8	96.63	96.603	96.469	96.452	96.446	96.415
OFFSET	-5.000	-3.500	0.000	3.500	3.827	7.327	7.827	8.327	9.155

CH 527.786

1.31% 5.13%

DATUM R.L 96			
DESIGN SURFACE LEVEL	96.614	96.595	96.415
EXISTING SURFACE LEVEL	96.614	96.595	96.415
OFFSET	-5.000	-3.500	0.000

CH 600.000



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Project:  
PROPOSED INTERSECTION WORKS  
SPORTS AVIATION FLIGHT COLLEGE  
1070 PRINCES HIGHWAY  
FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY – CROSS SECTIONS 5/5		Project Number: 180695	Revision: B
Scale: HOR: 1:100, VERT: 1:50 (A1)		Checked:	
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD		Approved:	
Design: S.X	Drawn: S.X	Date: OCT 2018	Drawing Number: C1005
			Sheets in Set: 14



LONGITUDINAL SECTION – PRINCES HWY CL  
 Horizontal scale 1:1000  
 Vertical scale 1:100



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Project: PROPOSED INTERSECTION WORKS  
 SPORTS AVIATION FLIGHT COLLEGE  
 1070 PRINCES HIGHWAY  
 FROGS HOLLOW NSW 2550

Sheet Title: PRINCES HWY – EDGE LINE PROFILE			Project Number: 180695	Revision: B
Scale: AS SHOWN			Checked:	
Client: SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY LTD			Approved:	
Design: S.X	Drawn: S.X	Date: OCT 2018	Drawing Number: C2001	Sheets in Set: 14

# XEROS PICCOLO

CONSULTING ENGINEERS



## DESIGN REPORT

FOR PROPOSED INTERSECTION WORKS

SPORTS AVIATION FLIGHT COLLEGE

1070 PRINCES HIGHWAY

FROGS HOLLOW NSW 2550

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<b>CLIENT:</b>	SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY. LTD.
<b>PROJECT NO.:</b>	180695
<b>ISSUE:</b>	C
<b>DATE:</b>	16 <sup>TH</sup> NOVEMBER 2018
<b>OFFICE:</b>	WAGGA WAGGA NSW

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**DESIGN REPORT**  
**FOR PROPOSED INTERSECTION WORKS**  
**SPORTS AVIATION FLIGHT COLLEGE**  
**1070 PRINCES HIGHWAY**  
**FROGS HOLLOW NSW 2550**

**CLIENT:** SPORTS AVIATION FLIGHT COLLEGE AUSTRALIA PTY. LTD.  
**PROJECT NO.:** 180695  
**ISSUE:** C  
**DATE:** 16<sup>TH</sup> NOVEMBER 2018  
**OFFICE:** WAGGA WAGGA NSW

Issue	Date	Description	Issued By	Approved By	Signed
Issue A	17 <sup>th</sup> October 2018	Draft	Saxon Xeros		
Issue B	22 <sup>nd</sup> October 2018	Preliminary Design Report for RMS Review	Saxon Xeros		
Issue C	16 <sup>th</sup> November 2018	Updated Design Report for RMS Review	Saxon Xeros		

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## INTRODUCTION

# **1 INTRODUCTION**

## **1.1 GENERAL**

Xeros Piccolo was engaged in October 2018 to undertake the design of new intersections works to facilitate a proposed flight college development at Frogs Hollow, NSW.

### **1.1.1 Locality and Existing Environment**

The intersection is located approximately 10km south of the town of Bega on the Princes Highway. The location of the access point/intersection is on a tangent between two opposing curves on the Princes Highway. The Highway at this location is two-lane with sealed shoulders of varying widths.

Roadside drainage consists of 'SO' kerb (concrete dish drain) in cut sections and rock lined swale drain on western side of the road on the approach to the intersection. A 375mm RCP culvert passes under the driveway.

## **1.2 REVIEW OF PREVIOUS DESIGN**

Previous to Xeros Piccolo undertaking design works, concept designs had been prepared by Tasman Engineering Consultants (TEC) which had been developed in conjunction with the client, Council, and the Roads and Maritime Services (RMS). TEC also undertook traffic assessments to determine the required intersection treatment types and requirements. The drawings and traffic assessments prepared by TEC have been reviewed by Council and RMS.

No traffic analysis or assessment has been undertaken by Xeros Piccolo in preparation of the design or this report.

## **1.3 ASPECTS OF TEC DESIGN GENERALLY ENDORSED BY RMS**

Aspects of the designs and assessments that have been reviewed and endorsed by the RMS are listed below. Note that this list is not intended to be exhaustive but is to indicate what aspects of the previous designs will be incorporated into the proposed designs undertaken by Xeros Piccolo.

1. The proposed intersections works are to consist of rural type AUL and CHR treatments
2. The design vehicle for determination of the storage length and turning movements is a 19m semi-trailer
3. The design speed for determination of the treatment designs is to be 100km/h (as advised by RMS)
4. The design speed for determination of sight distances is to be 110km/h (as advised by RMS)

## **1.4 REFERENCED DRAWINGS**

This report is to be read in conjunction with the latest revision of civil plans 180695 by Xeros Piccolo Consulting Engineers.

## INTRODUCTION

### **1.5 CONTACTS**

For inquiries relating to this report please contact one of the following:

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## DESIGN SUMMARY

# **2 DESIGN SUMMARY**

## **2.1 DESIGN PARAMETERS**

Below is a summary of the key design parameters used.

1. The intersection works to be designed for a design speed  $V$  of 100km/h
2. An Auxiliary Left Turn (AUL) treatment is to be provided for north-bound vehicles turning left into the site
3. A Channelised Right Turn (CHR) treatment is to be provided for south-bound vehicles turning right into the site
4. Deceleration lengths are to be adjusted to account for the longitudinal grade of the through road
5. Tapers on the access driveway are to be provided to allow for turning paths of a 19m semi-trailer entering and exiting the site in all directions
6. Through and turning lanes are to be 3.5m wide
7. Road widenings, through lane re-alignments and turning lanes are to have cross falls matching that of the existing adjacent through lanes

## **2.2 DESIGN REVIEW**

### **2.2.1 Channelised Right Turn Treatment (CHR)**

The CHR treatment is to allow for storage and deceleration of south-bound vehicles turning right into the development. Section A.16.5 and Figure A.30 of Austroads 'Guide to Road Design Part 4: Intersections and Crossings – General' (GRD Part 4) (2017) outline the requirements for this type of treatment.

#### **2.2.1.1 Lateral Movement Length, $A$**

The lateral movement length is determined from Table A.5 from Austroads *GRD Part 4*. For a lane width of 3.5m and design speed of 100km/h, the required length is 100m

**Therefore, lateral movement length  $A = 100m$**

#### **2.2.1.2 Storage Length, $S$**

Storage is to be provided to accommodate vehicles stopped and waiting to enter the site. Investigations undertaken by TEC indicated that a storage length to accommodate a single 19m semi-trailer was adequate.

**Therefore, storage length  $S = 19m$ .**

#### **2.2.1.3 Deceleration Length, $D$**

The deceleration length is to be determined from Table 5.2 of Austroads 'Guide to Road Design Part 4A: Unsignalised and Signalised Intersections' (GRD Part 4A) (2017). Based on this table, for a design approach speed of 100km/h and stop condition with comfortable rate of deceleration of  $2.5m/s^2$ , deceleration distance for cars on level grade is 155m (including taper).

There is an upgrade on the approach to the intersection with grades varying from approximately 1-4%, increasing on the approach to the intersection, with an average grade of approximately 3%. According to Table 5.3 of Austroads *GRD Part 4A*, the deceleration length may be reduced by 10%.

Therefore, minimum deceleration length  $D = 0.9 \times 155m = 139.5m$ .

**Therefore, deceleration length  $D = 140m$**

## DESIGN SUMMARY

### 2.2.1.4 Taper Length, $T$

The physical taper length for the deceleration lane is determined from the equation in Figure 8.4 of Austroads *GRD Part 4A*. This is reproduced in Equation 1 below.

$$T = \frac{0.33VW_T}{3.6}$$

Equation 1

Where,  $V$  = design speed of approach road (km/h)

$W_T$  = width of turning lane (m)

For a design speed of 100km/h and turning lane width of 3.5m, the taper length is 32m.

**Therefore, taper length  $T = 32\text{m}$ .**

### 2.2.2 Auxiliary Left Turn Treatment (AUL)

The AUL treatment is to allow for traffic turning left into the western access driveway of the development site. Section 8.2.3 and Figure 8.4 of Austroads *GRD Part 4A* outline the requirements for this type of treatment.

#### 2.2.2.1 Diverge/Deceleration Length, $D$

The diverge/deceleration length is to be determined from Table 5.2 of Austroads *GRD Part 4A*. Based on this table, for a design approach speed of 100km/h and stop condition with comfortable rate of deceleration of  $2.5\text{m/s}^2$ , deceleration distance for cars on level grade is 155m (including taper).

There is a downgrade on the approach to the intersection with grades varying from approximately 4.5-4.8%, reducing on the approach to the intersection. According to Table 5.3 of Austroads *GRD Part 4A* the deceleration length is to be increased by 20%.

Therefore, minimum diverge/deceleration length  $D = 1.2 \times 155\text{m} = 186\text{m}$ .

**Therefore, diverge/deceleration length  $D = 186\text{m}$ .**

#### 2.2.2.2 Taper Length

The physical taper length for the deceleration lane is determined using Equation 1.

For a design speed of 100km/h and turning lane width of 3.5m, the taper length is 32m.

**Therefore, taper length  $T = 32\text{m}$ .**

### 2.2.3 Safe Intersection Sight Distance (SISD)

RMS correspondence dated the 20<sup>th</sup> February 2018 (ref STH08/02093/03) indicated that 285m SISD is required on the approaches to the proposed intersection.

More detailed analysis of the SISD will be required prior to final design and construction.

#### 2.2.3.1 North-Bound Approach

An SISD of 285m has been used for the north-bound approach.

Using a value of 285m preliminary analysis indicated the sight distance would be adequate, subject to a number of trees being removed. These trees would be removed to accommodate clear zones in any case (see Section 2.2.5.2 below).

#### 2.2.3.2 South-Bound Approach

An SISD of 285m has been used for the north-bound approach.

## DESIGN SUMMARY

Preliminary assessment indicated that the south-bound approach SISD is adequate.

### **2.2.4 Proposed Cross Falls and Superelevation**

In order to maintain the existing superelevation conditions, all road widenings and through lane re-alignments have been design to match the cross fall of the adjacent existing through lanes. This will require construction of new pavement from the edge of the existing through lane outwards, as shown in the typical sections in the Drawings.

### **2.2.5 Roadside Environment, Barriers and Clear Zones**

#### **2.2.5.1 Provision of Guardrail At Large Fill Batter**

A section on the eastern side of the road, along the CHR widening (approx. chainages 372 to 515) results in fill, with 1V:3H batter lengths of up to approximately 10-11m. Due to the safety risk of batter lengths of this grade, length and height, a guardrail is to be provided as shown on the plans.

#### **2.2.5.2 Clear Zones**

The *Traffic Assessment Report Amendment 1* completed by TEC (project no. S-518, dated 26<sup>th</sup> April 2018) indicated that the Princes Highway has an ADT of 3676 vehicles.

According to Table 4.1 of Austroads '*Guide to Road Design Part 6: Roadside Design, Safety and Barriers*' (*GRD Part 6*), for a design speed of 110km/h, ADT of 1501-6000, and fill batters of up to 1V:4H, a clear zone of minimum 13m is recommended. For cut batters 1V:3H or steeper a minimum clear zone of 6m is recommended.

Therefore, for the extent of proposed works, trees within 13m of the edge of nearest through or turning lane are to be removed unless they are protected by a guardrail. Additionally, the culvert at the driveway is to be located to be 13m from the edge of the through lane.

The existing corridor and fence line are within relatively close proximity to the through lanes and turning lanes. On the western, north-bound side, the AUL turning lane is located as close as approximately 4.6m from the existing fence, and on the eastern, south-bound side, the through lane is located as close as approximately 4.9m from the existing fence. The road is relatively straight at these sections.

At this stage, no fence line adjustments or guardrail are proposed due to limited space between the road corridor boundaries. It is expected that RMS will review and discuss this with Xeros Piccolo as required. Subject to these discussions, fence line adjustments and/or guardrails may be required.

### **2.2.6 Other**

#### **2.2.6.1 Driveway Tapers**

The driveway tapers are to be provided to allow for turning path of a 19m semi-trailer. These paths have been produced using AutoTURN with the design vehicle travelling at 25km/h. A small amount of fence line adjustment, gate relocation and possible boundary adjustments may be required to accommodate the driveway tapers.

#### **2.2.6.2 Effects on Existing Services**

Irrespective of the below comments, the location and depth of all existing services within the vicinity of works should be located prior to construction.

### **Telstra/Communications**

## DESIGN SUMMARY

Existing Telstra/communications lines run underneath the access driveway. These are to be potholed on site prior to construction. The proposed works are not expected to negatively impact on these services.

### **Optic Fibre**

An optic fibre line runs along the eastern side of the road corridor. The proposed works are not expected to negatively impact on these services.

### **Water**

A water line and associated valves/hydrants are located on the eastern side of the road, in the vicinity of the proposed fill batters. Adjustment of valving, hydrants and so on will be required in accordance with the water authority requirements. It is not expected that the water lines will require relocating, however further advice from the water authority will be required.

### **2.2.6.3 Geotechnical Investigation and Pavement Design**

Prior to final design and construction, geotechnical investigation and pavement design would be required to determine the existing soil conditions and to design a suitable pavement.

## REVIEW OF EXISTING SUPERELEVATION

### **3 REVIEW OF EXISTING SUPERELEVATION**

The RMS requested that a review of the existing curve superelevation be provided. This review will use the equations and principles outlined in Austroads 'Guide to Road Design Part 3: Geometric Design' (GRD Part 3) (2016), in particular Equation 5 from Section 7.4.1. This equation provides the relationship between minimum curve size, speed, superelevation, and side friction.

Detailed assessment of the superelevation development length, tangent runout, superelevation runoff, and curve transition spirals has not been undertaken.

Note that the road cross falls are based on the provided survey data and are subject to the accuracy of this survey.

#### **3.1 ASSESSMENT CRITERIA**

The superelevation will be assessed using the following criteria:

1. Design speed  $V = 100\text{km/h}$
2. Minimum side friction value  $f = 0.12$

The existing curve radius and superelevation cross falls have been determined based on the provided survey data.

#### **3.2 SOUTHERN CURVE**

Start chainage = CH0.00m

End chainage = CH162.13m

Existing curve radius = 490m

According to Section 7.7 of Austroads *GRD Part 3*, the minimum required superelevation for this curve with a side friction value  $f$  of 0.12 is 4.1%.

Review of the survey data revealed that from approximately chainage CH96 to the end of the curve, a length of approximately 76m, superelevation is less than 4.1%, and from CH120 to CH135 a section of zero to adverse cross fall of -1.1% exists in the existing through lanes. The superelevation within the curve at other areas varies from over 5% to 1.7%, with values generally between 4-5%.

Based on this assessment, the Southern Curve's existing superelevation cross fall is not considered to meet the Austroads requirements.

However, the superelevation runoff length for this curve is approximately 50m; therefore, a large portion of the curve that has less than 4.1% cross fall (CH96 to CH162.13m) is in the section that would likely be transitioning back to normal cross fall.

##### **3.2.1 Impact of Proposed Works**

The proposed road works consist of widening on the inside of the curve (western side of the road) for the provision of an AUL turning lane. The proposed works do not alter the through lane alignment or cross falls and therefore it is considered that no additional safety risks are created for through traffic by the proposed works in regards to superelevation on this curve.

#### **3.3 NORTHERN CURVE**

Start chainage = CH363.374m

End chainage beyond survey extents (CH669.364).

Existing curve radius = 600m

According to Section 7.7 of Austroads *GRD Part 3*, the minimum required superelevation for this curve with a side friction value  $f$  of 0.12 is 1.2%.

## REVIEW OF EXISTING SUPERELEVATION

Review of the survey data revealed that the superelevation within the curve varies from over 5.5% to 3.1%, with values generally between 4-5%. A localised area from approximate chainages CH410 to CH447 (50-60m from the southern TC point) had lower values of between 3.1-4%.

Based on this assessment, the Northern Curve's superelevation cross fall is considered adequate.

### **3.3.1 Impact of Proposed Works**

The proposed road works consist of widening on the inside of the curve (eastern side of the road) for the provision of the CHR turning lane. The through lane alignment is moved further east from its existing alignment. The cross fall on the re-aligned through lane is to match that of the existing through lane and therefore it is considered that no additional safety risks are created for through traffic by the proposed works in regards to superelevation on this curve.

## AQUAPLANING ASSESSMENT

### **4 AQUAPLANING ASSESSMENT**

Due to the nature of the road cross fall and grades, an assessment of aquaplaning has been undertaken. The assessment is based on the equations and principles outlined in Section 4 of Austroads 'Guide to Road Design Part 5A: Drainage – Road Surface, Networks, Basins and Subsurface' (GRD Part 5A) (2013), in particular Equation 6 from Section 4.9.1. This equation determines the water film depth based on the pavement texture depth, length of drainage flow path, rainfall intensity and slope of the drainage path.

Note that the road cross falls are based on the provided survey data and are subject to the accuracy of this survey.

#### **4.1 ASSESSMENT CRITERIA**

The assessment criteria for aquaplaning are given in Section 4.10.1 of Austroads *GRD Part 5A* and are given below.

1. Drainage paths should be less than 60m
2. Maximum water film depth of 2.5mm (desirable) to 4.0mm (absolute maximum)
  - a. Applies to design speeds of 80km/h and greater, as well as approaches and exits from intersections and superelevation curves
  - b. A depth of 3.25mm may be considered subject to the road features and alignment

#### **4.2 ASSESSMENT PARAMETERS**

##### **4.2.1 Pavement Texture Depth $T$**

The existing pavement is a bitumen spray seal. No testing has been undertaken to determine the texture depth. Using Table 4.1 from Austroads *GRD Part 5A*, for spray seal aggregate sizes of 10mm or greater, a typical texture depth of 1.5mm or greater is recommended. As the aggregate size has not been measured, a smaller aggregate of 7mm will be assumed, giving recommended values of 0.6-1mm. For this assessment a value of 1mm will be used.

An assessment using a texture depth of 0.4mm will also be undertaken to enable assessment for impacts of possible future wear on the wearing surface.

##### **4.2.2 Rainfall Intensity $I$**

The rainfall intensity is to be the lesser of the 1-year, 5-minute ARI intensity or 50mm/h. Current data for this area indicates that the 1-year, 5-minute ARI intensity is greater than 50mm/h; therefore, 50mm/h will be used.

##### **4.2.3 Design Speed $V$**

For the purposes of the aquaplaning assessment, a design speed of 110km/h will be used.

It is noted that the design speed does not affect the depth of water film but does determine what criteria are to be used.

##### **4.2.4 Flow Path Lengths**

The flow paths lengths (see sheet A5001 – Aquaplaning Assessment Plan) are generally greater than 60m, including in the existing conditions.

It is noted that the existing road in this area is not crowned, but has one way fall from edge of lane line to edge of lane line.

## AQUAPLANING ASSESSMENT

### **4.3 AQUAPLANING ASSESSMENT RESULTS AND DISCUSSION**

The results of the aquaplaning assessment are summarised in Table 1 below. The location of the flow paths and points is provided in the Drawings (see sheet A5001 - Aquaplaning Assessment Plan). These flow paths and points have been determined through analysis of the surface contours with the likely worst-case points assessed.

**Table 1: Aquaplaning assessment results**

FLOW PATH	POINT NUMBER	CHAINAGE	DISTANCE	POINT LOCATION DESCRIPTION	WATER FILM DEPTH	
					T = 1mm	T = 0.4mm
1	P1.1	64m	64m	LHS of north-bound AUL turn lane	2.09	2.39
2	P2.1	55m	55m	LHS of north-bound through lane	1.9	2.22
3	P3.1	63m	63m	LHS of north-bound through lane	2.19	2.48
	P3.2	76.3m	13.3m	LHS of north-bound AUL turn lane	2.42	2.69
4	P4.1	44.7m	44.7m	LHS of north-bound through lane	1.89	2.21
	P4.2	70.3m	25.6m	RHS of north-bound through lane	2.49	2.75
	P4.3	100m	29.7m	LHS of south-bound through lane	3.11	3.31

Below is a brief summary of the results for each of the points assessed.

- **Point P1.1**
  - Water film depth acceptable
- **Point P2.1**
  - Water film depth acceptable
- **Point P3.1**
  - Water film depth acceptable
- **Point P3.2**
  - Water film depth acceptable using T = 1mm
  - Water film depth slightly above desirable levels using T = 0.4mm, however well below absolute maximum levels and also below 3.25mm.
  - As this is at the end of the turning lane, this is acceptable as the speeds will be considerably lower than 110km/h
- **Point P4.1**

## AQUAPLANING ASSESSMENT

- Water film depth acceptable
- **Point P4.2**
  - Water film depth acceptable using  $T = 1\text{mm}$
  - Water film depth slightly above desirable levels using  $T = 0.4\text{mm}$ , however well below absolute maximum levels and also below  $3.25\text{mm}$ .
  - As this point is located on a straight section of road (47m before the start of the Northern Curve), the level of risk is considered relatively low
- **Point P4.3**
  - Water film depth above desirable limits using  $T = 1\text{mm}$
  - Water film depth above desirable levels using  $T = 0.4\text{mm}$ . The level is below absolute maximum levels of  $4\text{mm}$  and slightly above  $3.25\text{mm}$ .
  - As this point is located after the Northern Curve and vehicles have entered a section of straight (21m from end of Northern Curve), the level of risk is considered relatively low.

### **4.3.1 Comparison with Existing Conditions**

The water film depth for the existing road conditions has been assessed for the point on the existing south-bound through lane that corresponds to point P.4.3. The flow path in this situation is slightly shorter than in the proposed conditions, at  $84\text{m}$ , but is still longer than the recommended maximum lengths.

Using the same criteria and parameters, water film depths are  $2.78$  and  $3.01\text{mm}$  for pavement depths of  $T = 1\text{mm}$  and  $0.4\text{mm}$  respectively.

Therefore, in the existing state the flow depths are above desirable levels, with an increase of approximately  $0.3\text{m}$  in the proposed state.

## **4.4 CONCLUSION**

Based on the assessment, the risk of aquaplaning is generally relatively low with water film depths mostly below desirable limits. All depths are below absolute maximum levels. Worst case depths on the south-bound through lane are above desirable levels, with the depths slightly increasing from the existing conditions to the proposed conditions. However, as this location is on a section of straight, it is considered that the level of risk is relatively low, with only minor change from the existing conditions.

One potential approach to reduce the flow path length, particularly for Flow Path 4, would be to create a crowned section of road at the start of the flow path. The crown could be offset from the centre of the road to reduce the extent of works. It is noted that this crown would have to be designed such that it does not adversely affect superelevation development for south-bound traffic entering the Southern Curve. This solution would however result in an increase in cut along the eastern side of the road at the constrained location with the reduced shoulder width.

## SUMMARY

### **5 SUMMARY**

The required AUL and CHR intersection treatments have been designed in accordance with Austroads guidelines and information provided by the RMS. The proposed fill and cut batters have been designed to avoid the existing road boundaries and fit within the existing corridor.

A guardrail has been provided to protect a larger fill batter, and trees within close proximity to the proposed widenings are to be removed.

Initial checks indicated that an SISD of 285m will likely be achievable, subject to some trees being removed.

Water film depths are below absolute maximum recommended values for aquaplaning.

## Lisa Foley

---

**Subject:** Attachment 2  
**Attachments:** NGH response to RMS Final.pdf

---

**From:** Steph Anderson [mailto:steph.a@nghenvironmental.com.au]  
**Sent:** Monday, 26 November 2018 10:01 AM  
**To:** LISSENDEN Andrew  
**Cc:** saxon@xerospiccolo.com.au  
**Subject:** RE: RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hi Andrew,

Thank you for your correspondence below and liaising with Saxon on our behalf.

We understand that RMS seeks details about potential overlying activity at Frogs Hollow, specifically:

- Details on the maximum number of flights (for each stage of the development that will result in crossing of the Princes Highway,
- Details on what the minimum heights will be at each crossing point of the Princes Highway, and
- Details on what measures will be put in place to ensure flights that cross the Princes Hwy (e.g. under 500ft) do not result in a distraction to drivers.

The attached document outlines such details and we trust that the information provided assists RMS in the finalisation of its assessment.

Should you have any questions, please don't hesitate to contact me directly.

Kind regards,

Stephanie Anderson | Town Planner

**ngh**environmental

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**From:** LISSENDEN Andrew  
**Sent:** Thursday, 22 November 2018 2:26 PM  
**To:** saxon@xerospiccolo.com.au  
**Cc:** Steph Anderson ; Lizzie Olesen-Jensen ; ABowman@begavalley.nsw.gov.au; KOZAROSKI Goran  
**Subject:** RE: RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hi Saxon,

The updated designs are currently in the process of being reviewed. I am hoping to have a response prepared by early/mid next week. As previously discussed if there are any issues and or things that cannot be conditioned we will give you a call to discuss.

Regards

Andrew

---

**From:** Saxon Xeros [<mailto:saxon@xerospiccolo.com.au>]

**Sent:** Wednesday, 21 November 2018 5:16 PM

**To:** LISSENDEN Andrew

**Cc:** 'Steph Anderson'; 'Lizzie Olesen-Jensen'; [ABowman@begavalley.nsw.gov.au](mailto:ABowman@begavalley.nsw.gov.au); KOZAROSKI Goran

**Subject:** FW: RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hello Andrew.

Sorry to hassle you, but just after an indication of when we might have feedback regarding this?

Appreciate your time.

Saxon



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---

**From:** Saxon Xeros <[saxon@xerospiccolo.com.au](mailto:saxon@xerospiccolo.com.au)>

**Sent:** Friday, 16 November 2018 3:55 PM

**To:** [andrew.lissenden@rms.nsw.gov.au](mailto:andrew.lissenden@rms.nsw.gov.au)

**Cc:** 'Steph Anderson' <[steph.a@ngHENvironmental.com.au](mailto:steph.a@ngHENvironmental.com.au)>; Lizzie Olesen-Jensen <[lizzie.oj@ngHENvironmental.com.au](mailto:lizzie.oj@ngHENvironmental.com.au)>; [ABowman@begavalley.nsw.gov.au](mailto:ABowman@begavalley.nsw.gov.au); 'KOZAROSKI Goran' <[Goran.KOZAROSKI@rms.nsw.gov.au](mailto:Goran.KOZAROSKI@rms.nsw.gov.au)>

**Subject:** RE: RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hello Andrew.

Please find attached updated Plans and Report for this project. The points that have been addressed with these revisions are indicated by **green highlight** below.

Please review and discuss as needed.

Kind regards,  
Saxon



---

**Saxon Xeros**  
**Civil Designer**

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**From:** LISSENDEN Andrew <[andrew.lissenden@rms.nsw.gov.au](mailto:andrew.lissenden@rms.nsw.gov.au)>  
**Sent:** Tuesday, 13 November 2018 3:22 PM  
**To:** [saxon@xerospiccolo.com.au](mailto:saxon@xerospiccolo.com.au)  
**Cc:** 'Steph Anderson' <[steph.a@ngghenvironmental.com.au](mailto:steph.a@ngghenvironmental.com.au)>; [ABowman@begavalley.nsw.gov.au](mailto:ABowman@begavalley.nsw.gov.au); KOZAROSKI Goran <[Goran.KOZAROSKI@rms.nsw.gov.au](mailto:Goran.KOZAROSKI@rms.nsw.gov.au)>  
**Subject:** RMS comments post phone discussion - Proposed Intersection Treatment, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hi Saxon,

Further to the phone discussion this morning please find below a summary of what outstanding issues relating to the level of detail (refer to the RMS letter dated 7 November 2018) will need to be resolved as part of the DA process/prior to DA determination or post DA determination as part of the Works Authorisation Deed (WAD) process. The RMS comments are highlighted **yellow**.

Regards

Andrew Lissenden  
Development Assessment Officer  
**Network & Safety Southern** | Regional & Freight  
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Level 4 90 Crown Street Wollongong NSW

---

**From:** Saxon Xeros [<mailto:saxon@xerospiccolo.com.au>]  
**Sent:** Wednesday, 7 November 2018 4:48 PM  
**To:** LISSENDEN Andrew  
**Cc:** 'Steph Anderson'; Lizzie Olesen-Jensen  
**Subject:** [WARNING: Attachments not scanned for viruses] Response to feedback - Proposed Intersection, Flight College, Princes Highway, Frogs Hollow - XP ref: 180695

Hello Andrew.

Thank you for your response regarding this project (dated 07.11.2018).

I have reviewed your comments and prepared responses to each item below (my comments in red).

I think a phone call to discuss further will be worthwhile. Are you able to confirm a time that suits you to do this, hopefully in the next day or so?

My aim is to determine what key aspects that to be resolved now (prior to Conditioning) and what items, for which there are no foreseeable impediments to achieving, can be dealt with during detailed design.

- **Cross falls should be a projection of the existing lanes (refer to Austroads Guide to Road Design Part 3: Geometric Design - Section 4.3.5 Shoulder Crossfalls);**
  - Referring to Sections A to C (sheet A2001), the cross fall on the widening(s) is to match the existing road cross fall. Also shown in these Sections is that the widening of the road is to be from the edge of existing seal/shoulder; in other words, the existing shoulder is to remain and additional pavement added to the outside of the existing shoulder. Therefore, the proposed widening is proposed to match the cross fall of the shoulder. Based on the survey provided, the cross fall of the shoulder does not necessarily match the cross fall of the existing lane, and in some cases is quite different. Therefore the proposed widening cross fall will not necessarily match that of the existing lane, but will match that of the shoulder. This is why the cross falls on the outer lane and shoulder in the cross sections (C1001-1004) do not match the existing lane cross falls.
    - Is it acceptable to have the widening match the shoulder cross falls? Note that the shoulder cross falls are generally steeper than the lane cross falls and fall away from the centre of the road. This will aid in reducing the risk of aquaplaning (see further comments below)
    - Please discuss further as required

This issue needs to be resolved as part of the DA/prior to DA determination (i.e. in updated designs). **To assist a close contour spacing plan and edge line profile plan should be provided. ADDRESSED – widening and through lane re-alignments now match existing through lane cross falls. Aquaplaning Assessment Plan provided, showing close contours (see Sheet A5001). Edge line profile provided (see sheet C2001).**

- **Width of flow (i.e. shoulder and 'SO' kerb and gutter capacity) needs to be assessed. This should be provided to confirm it has sufficient capacity (refer to See Austroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations Section 4.2 Road User Considerations and Austroads Guide to Road Design Part 5A: Drainage – Road Surface, Networks, Basins and Subsurface - Section 5.4 Design Criteria);**
  - This is something that we would definitely look into further during detailed design. Obviously, if widths/depths of flow are too large, grated pits and pipes would need to be provided. As there is reasonable fall on this site, there is unlikely to be an issue with achieving this (in terms of minimum grades and pipe cover).
    - As there is unlikely to be any issue with providing the required pits (if any) to keep flows within the kerb, does detailed analysis of the flows need to be completed prior to Conditioning?
    - Please discuss further as required

This issue can be resolved post DA determination (i.e. as part of the WAD process).

- **An aquaplaning assessment needs to be undertaken to ensure the extra pavement width doesn't introduce any surface flow problems (refer to Austroads Guide to Road Design Part 5A: Drainage – Road Surface, Networks, Basins and Subsurface - Section 4.3 Assessment Process);**
  - An aquaplaning assessment can be undertaken. Visual inspection of the contours suggests that surface flow paths are relatively long on the existing road. The widenings don't appear to add substantial lengths based on the current design, noting that the widening cross falls match the existing shoulder cross falls which are generally steeper than the adjacent lane cross fall and generally fall away from the road.
    - If assessment shows that the existing flow paths are hazardous and the widening make negligible difference, what will be RMS's approach?
    - Please discuss further as required

This issue (aquaplaning assessment) needs to be resolved as part of the DA/prior to DA determination.  
ADDRESSED – aquaplaning assessment has been undertaken – see report.

- The table drain shape should be trapezoidal (refer to *Austroads Guide to Road Design Part 3: Geometric Design* – Section 4.3.5 Shoulder Crossfall and *Austroads Guide to Road Design Part 6: Roadside Design, Safety and Barriers* – Section 5.4.5 Treatment for Drains);
- The table drain side slopes should be 6:1 but not steeper than 4:1 (refer to *Austroads Guide to Road Design Part 3: Geometric Design* - Section 4.3.5 Shoulder Crossfall);
  - Regarding a trapezoidal table drain, this can be done. The V-shape was proposed as the existing drain in this location is V-shaped. Providing a trapezoidal drain will widen the drain and potentially require adjustment of the fence and boundary on the western side of the road. This is not a major concern and this land is owned by the developer
  - Regarding the side slopes, flatter batters/side slopes can be provided. Again, 1 in 3 approximately matches the existing drain shape. Providing flatter slopes will widen the works slightly (see above comment)
  - As this is achievable, does it need to be addressed prior to Conditioning?

These issues (table drain shape and slopes) can be resolved post DA determination (i.e. as part of the WAD process). ADDRESSED – trapezoidal drain provided with 1 in 4 batters

- A berm should be provided behind the 'SO' kerb and gutter where there is no significant constraint (refer to *Austroads Guide to Road Design Part 3: Geometric Design* – Section 4.4.2 Verge Slopes). A 0.5m berm would be considered acceptable;
- Verge rounding should be provided on the fill batters even if they have guard fence (refer to *Austroads Guide to Road Design Part 3: Geometric Design* – Section 4.4.3 Verge Rounding);
  - Can be provided in detailed design, will be achievable with minor changes to design
  - As this is achievable, does it need to be addressed prior to Conditioning?

These issues (berm and verge rounding) can be resolved post DA determination (i.e. as part of the WAD process). ADDRESSED – 0.5m berm provided in unconstrained locations and verge rounding provided and indicated

- A catch drain or other form of treatment needs to be provided to mitigate surface flow towards the cutting. Overland flow may erode the hinge point as well as allowing moisture to ingress into the top of the cutting; and
- Where 'SO' kerb and gutter is directed onto overland flow, scour protection must be provided to help mitigate erosion (refer to *Austroads Guide to Road Design Part 5: Drainage – General and Hydrology Considerations* - Section 3.6.2).
  - Regarding the catch drains, this can likely be provided at most locations, except at the narrow section where the cutting approaches the eastern boundary of the corridor. There does not appear to be an existing catch drain at this location. Catchment flows to this cutting are relatively small (refer attached photos looking south along this boundary line (DSC04505) and toward the west (DSC04501)), although survey beyond the boundaries is minimal in this area. Based on low likely in flows, if the catch drain cannot be accommodated within the corridor, is it still required?
    - Please discuss further as required
  - Regarding scour protection, this will definitely be addressed in more detail, but is not considered critical to getting Conditioning for this project.
    - As this is achievable, does it need to be addressed prior to Conditioning?

These issues (catch drain, scour protection) can be resolved post DA determination (i.e. as part of the WAD process).

Please review and we can discuss further on the phone. Note that the remaining comments regarding flight paths, etc, will be addressed by Steph.

Kind regards,  
Saxon



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16 November 2018

Andrew Lissenden  
Development Assessment Officer  
Land Use Development, Network & Safety Southern  
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Dear Andrew,

**RE: DA2017.445 PROPOSED FLIGHT TRAINING SCHOOL 1070 PRINCES HIGHWAY, FROGS HOLLOW – YOUR REF: STH08/02093**

We are writing in response to RMS correspondence dated 3 July 2018 requesting details about flight paths over the Princes Highway, Frogs Hollow. It is understood this request is in response to questions posed by Bega Valley Shire Council officers to the RMS during the notification of the subject development application.

The RMS correspondence requests the following information:

- Details on the maximum number of flights (for each stage of the development that will result in crossing of the Princes Highway,
- Details on what the minimum heights will be at each crossing point of the Princes Highway, and
- Details on what measures will be put in place to ensure flights that cross the Princes Hwy (e.g. under 500ft) do not result in a distraction to drivers.

This document outlines the manner in which the crossing of the Princes Highway would occur in relation to the proposed flight training activities at Frogs Hollow. It is understood from correspondence of 3 July 2018 that the RMS considers the potential for driver distraction may occur where an aircraft crosses the highway at a height of less than 500 ft. In this regard, an outline of the indicative number of flights at the proposed site is also provided for RMS guidance as well as the potential for driver distraction by aircraft flying at less than 500 ft is also considered herein.

We trust that the information provided assists RMS in the finalisation of its assessment of the subject development application.

Yours sincerely,  
**NGH Environmental**

A handwritten signature in blue ink, appearing to read 'Stephanie Anderson'.

**Stephanie Anderson**  
Town Planner  
Ph 6923 1538

# FLIGHT PATH DETAILS

Runway 18/36 is referred to as the primary runway and Runway 09/27 is referred to as the secondary runway. Physically, there are two runways, however the runways at Frogs Hollow airfield can be utilised in both directions, meaning a total of four options exist for the use of these runways.

Long term average wind records have been analysed to provide details about the likely runway selections. Wind rose data is summarised below for the Bega Newton Road AWS (approximately 8 km north of the subject site). The wind roses were developed based on BOM records from 1965 to 1994.

<i>Long term average wind direction and resulting runway selection</i>									
	<i>N</i>	<i>NE</i>	<i>E</i>	<i>SE</i>	<i>S</i>	<i>SW</i>	<i>W</i>	<i>NW</i>	<i>Calm</i>
<i>9am</i>	1.5%	9.8%	1.7%	3.8%	5.2%	16.4%	1.9%	0.7%	59.1%
<i>3pm</i>	1.8%	29.3%	9.3%	12.5%	8.0%	15.6%	3.0%	1.5%	19.1%
<i>Runway</i>	Primary	Primary	Secondary	Primary	Primary	Primary	Secondary	Primary	Primary
	RW 36	RW 36	RW 09	RW 18	RW 18	RW 18	RW 27	RW 36	RW 36

<i>Runway use by proportion based on long-term average wind direction</i>			
	<i>9am</i>	<i>3pm</i>	<i>Total</i>
<i>RW 36</i>	71.1 %	51.7 %	61.4 %
<i>RW 18</i>	25.4 %	36.1 %	30.8 %
<i>RW 27</i>	1.9 %	3.0 %	2.0 %
<i>RW 09</i>	1.7 %	9.3 %	5.5 %

Note: may not add to 100 percent due to rounding of figures

## **Runway 36 – Priority Runway**

Should the prevailing weather conditions permit, Runway 36 (take-off in a northerly direction) would be the priority runway. The three other runways (09, 18, 27) would only be used when the prevailing conditions dictate this.

Long term average wind records have been analysed to provide details about the likely runway selections. The analysis of the wind roses determines that Runway 36 would be suitable to use, on average, 61 percent of the time. **The use of Runway 36 and use of Circuit 36 would not result in the crossing of the Princes Highway.**

## **Runway 18**

The use of Circuit 18 would result in the crossing of the highway at Point A (Attachment 1) near to the turn downwind. The turn is conducted after the aircraft reaches a height of at least 1,000 ft along the crosswind leg, therefore the aircraft would be flying at approximately 1,000 ft at Point A.

The use of Circuit 18 would also result in the crossing of the highway at Point B, near the turn to final leg/approach. The aircraft maintains a height of 500 feet when completing the turn to final leg. Therefore, the aircraft should be flying at approximately 650-700 ft when crossing the highway at Point B.

The analysis of the wind roses indicates that Runway 18 would be suitable to use, on average, 30 percent of the time.

### **Runway 09**

The use of Circuit 09 would result in the crossing of the highway on the upwind leg, as the aircraft ascends towards the turn crosswind. The turn to crosswind is commenced when the aircraft reaches a height of 500ft, therefore the aircraft would be approximately at 500ft when crossing the highway at Point C.

The use of Circuit 09 would also result in the crossing of the highway at Point D, approximately half way along the downwind leg. At this point, the aircraft is maintaining a height of not less than 1,000 feet for the full downwind leg.

The analysis of the wind roses suggests that Runway 09 would be suitable to use, on average, 5 percent of the time.

### **Runway 27**

The use of Circuit 27 would result in the crossing of the highway at Point E at the end of the downwind leg, at the turn to base leg. The aircraft would be maintaining a height of 1,000 ft at this point.

The use of Circuit 27 would also result in the crossing of the highway at Point F. The aircraft maintains a height of 500 feet when completing the turn to final leg, therefore the aircraft would be approximately 500 ft.

The analysis of the wind roses suggests that Runway 27 would be suitable to use, on average, 2 percent of the time.

### **Summary**

There are six points where aircraft may cross the highway during circuit training. Of these, two points (D, E) are on the downwind leg, where the aircraft would maintain a steady height of 1,000 ft. One point (B) is located on the base leg where the aircraft is descending from 1,000 ft but maintains a height above 500 ft. Conversely, at Point A, the aircraft would be on the crosswind leg ascending to 1,000 ft and maintains a height above 500 ft.

The two remaining points (C, F) are where the aircraft would cross at a height of approximately 500 ft.

Points C and F are associated with the use of Circuits 09 and 27, which together, would only be used 7 percent of the time, on average. Further details are outlined in the following section.

## **FLIGHT FREQUENCY DETAILS**

As indicated in the information supporting the development application, it is proposed that the facility would be established over nine progressive stages. Accordingly, the intended flight training would commence with a low level of activity. This would progress incrementally.

The following details are noted in relation to flight training at the proposed facility:

- Flight training would only be conducted between mid-February and mid-December,
- Flight training would only be conducted Monday to Friday, with limited remedial training on a Saturday,
- Flight training would only be conducted during daylight hours,
- Flight training is only proposed on 15 suitable weather business days of the training month,

The indicative number of circuits to be conducted at Frogs Hollow per day of flight training is as follows:

<b>Indicative number of flights at Frogs Hollow</b>			
<b>Stage</b>	<b>Indicative movements at Frogs Hollow per training day (15 training days)</b>	<b>Movements that cross the hwy (use of RW 09, 18, 27 equals 38.3% of movements)</b>	<b>Movements that cross the hwy around 500 ft (Point C and F, equals 3.8% of movements)</b>
<b>Stage 1</b>	192 movements	74 movements	7 movements
<b>Stage 2</b>	288 movements	110 movements	11 movements
<b>Stage 3</b>	384 movements	147 movements	15 movements
<b>Stage 4</b>	210 movements	80 movements	8 movements
<b>Stage 5</b>	252 movements	97 movements	10 movements
<b>Stage 6</b>	294 movements	113 movements	11 movements
<b>Stage 7</b>	306 movements	117 movements	12 movements
<b>Stage 8</b>	346 movements	133 movements	13 movements
<b>Stage 9</b>	384 movements	147 movements	15 movements

Note: take-off plus landing equates to two movements

## POTENTIAL FOR DRIVER DISTRACTION

An analysis of other regional airports identified that many of these are within proximity to major highways and the highway overflown by aircraft. The analysis specifically identified the following:

- Bathurst Airport (the Greater Western Hwy is 700 metres from the end of the primary runway),
- Wagga Wagga Airport (the Sturt Hwy is 700 metres from the end of the primary runway),
- Tamworth Regional Airport (the primary runway is within 200 metres parallel to the Oxley Hwy),
- Dubbo City Regional Airport (the Mitchell Hwy is 200 metres from the end of the primary runway),
- Albury Airport (the Hume Hwy is 1,100 metres from the end of the primary runway),
- Lismore Airport (the Bruxner Hwy is 300 metres from the end of the primary runway),

Given that airports must be accessible by a range of users and at various times of the day, evening and night, it would make sense that airports are accessed from higher-order roads such as highways, or arterial roads that serve highways, and not from local roads.

It is also noted that most of the highways identified above serve considerably higher traffic volumes than the Princes Highway does in the vicinity of Frogs Hollow.

Notwithstanding the above, it is considered that the potential for driver distraction at Frogs Hollow, specifically, is considered to be low. Based on the 500 ft threshold identified as RMS' concern, the potential for distraction would occur in connection with an ascending movement after take-off on Runway 09 and a descending movement with landing on Runway 27. Based on an analysis of long-term average wind roses, these runways are predicated to be used only 7.5 percent of the time, on average. Further, overflying of the highway at Point C and Point F specifically would only occur in connection with 3.8 percent of total movements, on average.

It is noted that the majority of aircraft movements would occur on Runway 36, which does not interact with the Princes Highway.

Should RMS still have concerns about overflying the Princes Highway at Frogs Hollow, signage identifying aircraft to be in the area may be a suitable advisory measure. It is understood that such signage is installed on other similar main roads where overflying may occur. The proponent has confirmed a commitment to erect this signage as part of the intersection treatment works relevant to the project, should RMS require this. Final details and arrangements could be provided to RMS satisfaction as part of the Works Access Deed (WAD) process.

# ATTACHMENT 1

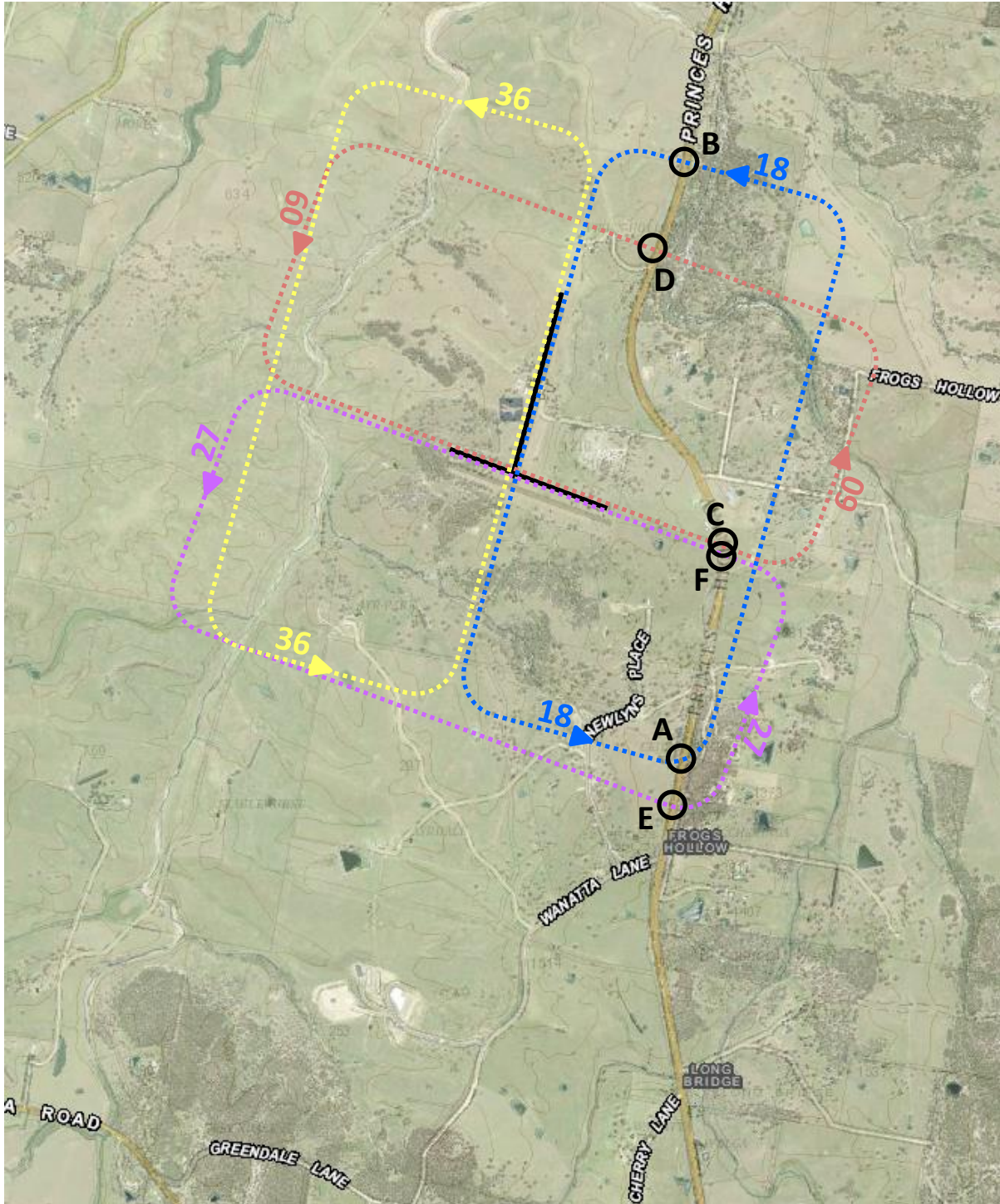


Figure 1 Circuit profiles and overflying points