

Our Ref: K-2578-IRR-001
Your Ref: OP3043/2019
Date: 31 May 2019

The Chief Executive Officer
Douglas Shire Council
PO Box 723
Mossman Qld 4873
By email: enquiries@douglas.qld.gov.au

Attention: Neil Beck – Environment and Planning

Re: Information Request – Operational Works – 12 Crawford Street, Mossman

Response

General

The following general comments are made with respect to the contents of Council's Information Request (IR) dated 5 April 2019.

1. With respect to the Application for an Operational Works Permit made by KFB Engineers on behalf of NV & JS Pty Ltd on 11 March 2019 there is no non-compliance with the FNQROC Development Manual except as declared in the "Statement of Compliance Operational Works Design" submitted with the application. The following responses to the IR confirm this.
2. There are numerous comments made by the Reviewer within the IR that indicate:
 - a misreading and/or a misunderstanding of the Operational Works plans, and electrical/telecommunications plans, being reviewed;
 - a non recognition of the ROL Conditions (ROL 617/2015);
 - a non recognition of the pre-lodgement meeting (21 Feb 2017) and the minutes issued from that meeting;
 - an incorrect interpretation of both the FNQROC Development Manual and the QUDM
3. We have responded to all the items (1 to 41 incl.) listed in Council's IR; provided information as requested and advised amendments to plans where appropriate.

Earthworks

1. The Engineering Drawings show earthworks are proposed in neighbouring properties.

Provide evidence of landowner permission to undertake earthworks in their property.

In relation to the Mossman High School (MHS), provide consent regarding the provision of an easement over this area of land and that the area will be maintained by MHS.

Response

The neighbouring properties are those of the Douglas Shire Council (DSC), the MHS and Brie Brie Estate.

DSC Property

Earthworks on DSC land adjoining the sewage pump station was approved by DSC at the Pre-lodgement meeting of 21 Feb 2017 and recorded in the minutes of that meeting as – *officers supportive of earthworks in DSC land to avoid the need for retaining walls.*

Earthworks on DSC land required to facilitate the MHS southern stormwater outlet was condoned in DSC email dated 24 Jan 2018 – *I will liaise with property department as a Council resolution will be required in order to utilise Council's land for this purpose. I will be in touch once I have discussed with property.*

MHS Property

Earthworks on MHS land is associated with establishing the DSC approved drainage outlet for MHS Catchment B stormwater (refer Dwg K-2578 Sheet C09 C). The works necessary to effect the drainage from the MHS site was consented to by: Director, Portfolio Establishment, Infrastructure Services Branch, Department of Education and Training – dated 23 June 2017.

As the earthworks is solely within the MHS property, and forms part of an existing drainage system maintained by MHS, an easement is not required.

Brie Brie Land

The owners of Lot 1 on RP851435 have signed a consent for the Parker Creek outlet of the MHS Catchment B stormwater drain.

Roadworks

2. The road grade is below the FNQROC minimum and no approval was sought from Council. In addition the RPEQ does not disclose this departure from FNQROC in the certified Statement of Compliance.

With reference to FNQROC D1.06, Council does not approve the proposed road gradient of 0.3%. The gradient is to be increased to a minimum of 0.5%. Please provide amended engineering drawings to reflect this change.

Response

There is no departure from FNQROC in the certified Statement of Compliance with respect to the road grade design.

At the pre-lodgement meeting of 21 Feb 2017 DSC officers commented that the road grading was below the Q100 flood level although minimum lot level had been chosen to meet the design Q100 flood level. Subsequently the road was regraded to meet QUDM standards such that the maximum flow depth at kerb for Q100 is no greater than 250mm.

A road grade of 0.3% was required to achieve the satisfactory flood immunity for the road. This grading has retained the design surface levels which met the Q100 flood requirement; fitted in well with the main adjoining neighbour (MHS); minimised the need to import fill and retained the design layout approved by the DA- ROL 617/2015.

The process has adhered to FNQROC procedure. Following discussion at the pre-lodgement meeting with DSC officers the road grade was altered. The re-design was presented in the Operational Works Application allowing DSC to exercise its right under D1.06 1. to rule on the acceptance, or otherwise, on the selection of the 0.3% grade. There is no non-compliance with FNQROC Design Manual .

With regard to DSC deliberation as to the approval of the 0.3% grade we would submit that DSC in its assessment of all aspects of the development should approve the 0.3% grade for the following reasons:

1. The north to south aspect of the site (lot 12 on SP252360) is reasonably flat
2. The overall approved ROL (ROL 617/2015) layout has been retained.
3. The subdivision surface levels required to satisfy Q100 flood levels have been achieved without excessive fill being required.
4. 0.3% is an acceptable and practical grade in that its adoption allows for:
 - a. maintaining a high point close to existing Crawford Street thus minimising additional stormwater runoff to the existing street. A steeper grade would move the high point to the south and increase stormwater runoff to the existing street;
 - b. avoidance of retaining walls and/or steeper batters to the MHS/subdivision boundary. A steeper road grade would require raising of lot levels.

Reference.

D1.06 1.

A general minimum gradient of 0.5 per cent should be adopted for all roads, which will ultimately include kerb and channel. In very flat conditions where approved by Council it may be reduced to 0.3 per cent.

QUDM

Table 7.4.3 – Flow limits for “Transverse” flow during Minor Storm

Table 7.4.4 – Flow limits for “Longitudinal” flow during Major Storm

Table 7.4.5 – Flow limits for “Transverse” flow during Major Storm

- 3. The Traffic Island proposed near Road A Chainage 0m is not supported by Council . Please remove this from the Engineering Drawings. It is noted that no street lighting was proposed and the island would not have been compliant. Council seeks clarification on why this was certified by the RPEQ.**

Response

We will remove the Traffic Island from the Engineering Drawings, but comment as follows:

We were not responsible for the Traffic Island detail. DA – ROL 617/2015 Condition 3. - Street Layout and Design - detailed that the street layout and design - *is to be generally in accordance with RPS Drawing No PR 124 232-4 issue D*; which included the Traffic Island.

The Engineering Drawings submitted for review at the pre-lodgement meeting of 21 Feb 2017 incorporated the Traffic Island, as required by ROL condition 3. The pre-lodgement minutes “summary points” made no adverse comment on the Traffic Island.

Inclusion of the Traffic Island was compliance with a condition and did not represent “certification by the RPEQ” .

Stormwater

- 4. The lowest levels proposed (8.6 AHD) are elevated 250mm above the lower bound levels for Parker Creek 100yr ARI flood level (8.35) and are level with the upper bound level of 8.6m AHD.**

Both levels are lower than the QUDM minimum recommended freeboard (300mm). Please amend the drawings to provide the minimum freeboard.

Response

We do not intend to amend the drawings for the following reasons.

The reviewer has not correctly interpreted either the recommendation(s) of the Aecom Flooding Assessment or the QUDM requirements with regard to freeboard .

The Aecom Flooding report establishes that - *the 100year ARI flood level for planning purposes is 8.35 m AHD.*

Sensitivity analyses (hydrologic inflows and increased roughness) indicated a possible 100 year ARI flood level of 8.6 m AHD.

On that basis a decision was made to adopt a minimum lot level of 8.6 AHD which covers the declared sensitivity margin.

Reference to QUDM details that freeboard is referred to *as the clearance between the finished floor level of buildings and the major flood event* (ie 8.35m). Both QUDM and the Aecom Report recommend that the design freeboard for finished floor levels within the development should be a minimum of 0.3m.

The selection of a minimum lot level of 8.6 m provides the ability to achieve finished floor levels with a minimum of 0.3m clearance to the design 100 year ARI flood level of 8.35m.

With a minimum lot level of 8.6m AHD, the required flood immunity to the finished floor level can be achieved as follows:

A minimum floor level will normally be determined by a cut to fill earthworks balance on the lot for slab on ground construction. Floors are often built higher with imported fill (which would give greater flood immunity) but rarely will lots be excavated to the minimum lot level with removal of earthworks spoil from site. Based on these assumptions, freeboard is achieved as follows:

- From a minimum lot level of 8.6m, the lot rises up at a minimum grade of 1 in 200
 - a. At the centre of the lot, this rise from the road is generally 100m for a 40m deep lot
 - b. If the house is built closer to the road than the rear, the rise to a point 1/3 into the lot from the road is approx 70mm
 - c. The assumed bulk earthworks building pad level for a balance earthworks solution will therefore be 70 to 100mm above the lot frontage level
- The building floor slab is normally formed on the building pad with standard 230 – 250mm form boards and backfilled with crusher dust and compacted to the floor subgrade level
- This allows for a floor level 300mm to 350mm above RL 8.60 and achieves the required freeboard (albeit to the upper bound Q100 flood level)
- After slab construction, the surface levels around the building are shaped to provide falls to the lowest part of the lot.

Reference

- a) Crawford Street Flooding Assessment
NV & JS Pty Ltd
12 Dec 2015
Doc No 60517511
 - i. Table 14
 - ii. Figure 13
 - iii. Page 29
- b) QUDM
 - i. 7.3.12 Freeboard
 - ii. Table 7.3.6 Flow depth and width limitations for the major storm
Major system design criteria (a)
 - iii. Figure 7.3.2 – Major storm flow criteria
Building above top of kerb and channel
 - iv. Figure 7.3.3 – Major storm flow criteria
Easement width requirements for overland flow path

- 5. The longitudinal gradient proposed for stormwater reach 5/1 – 4/1 (0.14%) is less than the Queensland Urban Drainage Manual recommended minimum of 0.20% for a 600m dia. pipe. Amend the longitudinal grading of Line 1 so the gradient is 0.20% or greater.**

Response

Drawing K-2578 C10 amended as requested.

This has been amended with 5mm changes to the upstream and downstream pipe level for reach 5/1 – 4/1 for a pipe grade of 0.27%. Pipe size (600 dia) is unchanged.

- 6. The longitudinal calculation section indicates that for the 5 yr ARI event, the water surface elevation at headwall 4/4 will be 8.597m. The Road and Drainage plan (C03) lists the existing lot level on the south east corner of 5 – 7 Crawford Street as 8.586m. The design inundates the existing property in a 5 year ARI design flow.**

Based on the information before Council, Officers have concerns that the proposed culvert arrangement will result in an adverse impact to 7 Crawford Street. Please provide advice confirming that the proposed arrangement, will not result in an impact to 7 Crawford Street. In addition confirm that the QUDM minimum freeboard is achieved for Lot 7. Submit a revised plan if any changes to the culvert arrangement are required.

Response

The longitudinal calculation on drawing K-2578 Sheet C10 for culvert 4/4 – ¼ clearly indicates that it is for the 10 yr ARI event not the 5 yr ARI event as recorded by the reviewer.

We do not intend to make any amendments for the following reasons.

The proposed culvert construction will have a beneficial impact on 7 Crawford Street because the proposed design replaces the existing 750 dia pipe with a 1500x600 RCBC to convey (unchanged) Q10 flows (not Q5 as stated by the reviewer) from the MHS catchment. The proposed system has over twice the cross sectional area of the existing 750 dia pipe and laid at similar levels.

An assessment of the existing 750 dia pipe is as follows:

Existing 750 dia pipe under end of Crawford Street

U/S IL 7.542 U/S Hwall 8.60

D/S IL 7.464 D/S Hwall 8.45

4.93m long – 1.6% grade

Road crown at end RL 8.487 (low pointy RL 8.423)

For the 5ha contributing catchment, flows arriving at the existing culverts are as follows:

Q2: 0.404 Cumecs

Q5: 1.035 Cumecs

Q10: 1.198 Cumecs

Q100: 2.049 Cumecs

Hydraulic analysis of the existing culvert determines that the 750 dia pipe has Q2 capacity with the following characteristics:

$$Q2 = 0.404 \text{ Cumecs}$$

$$Hw = 0.74\text{m (RL 8.282)}$$

$$Tw = 0.75\text{m}$$

$$Vout = 0.91 \text{ m/s}$$

All flows above Q2 exceed the existing culvert (750 dia) capacity and will overtop Crawford Street. While the Q2 flow will be contained within the existing pipe with an inlet headwater RL of 8.282, all flows in excess of Q2 will have a headwater depth controlled by flows overtopping Crawford Street at the road crown point of 8.423. This level is lower than the existing surface levels for No 7 Crawford Street and surplus flows will overtop Crawford Street before inundating No 7. Lidar contours also indicate that the existing ground levels rise to RL 8.80 around the existing house at No 7 with the floor level assumed to be at least 100mm above RL 8.80.

The new Q10 culvert inlet headwater RL of 8.597 (say 8.60) is the same as the top of the inlet headwall of the existing 750 dia pipe. Surface levels surrounding the dwelling on No 7 Crawford Street vary from 8.6 to 8.8 indicating a floor level at No 7 in the order of 9.00.

The proposed Q10 culvert will not have a worsening impact on No 7 because it will convey all stormwater flows up to the Q10 event under Crawford Street (currently Q10 flows overtop the road with the existing 750 dia culvert having only Q2 capacity). The road low point of 8.43 does not change and the proposed Q10 culvert has a beneficial effect providing No 7 Crawford Street with a freeboard of at least 300mm.

- 7. It appears the proposed new road and kerbs will contain runoff from the site and external catchments and direct these flows down Crawford Street. Please confirm that the RPEQ undertook an assessment of the potential impacts of this changed stormwater scenario.**

Provide the assessment of the capacity and impacts of downstream streets (Crawford, Ingles, Williams). Council officers note that the lots on the eastern side of Crawford appear to be situated below the road.

Provide engineering calculations to demonstrate that the 100 yr ARI event is contained within the road reserve of the internal roads.

Response

As detailed in the following response the RPEQ undertook a detailed assessment of the stormwater scenario associated with the intersection of the proposed subdivision with the existing Crawford/Ingles/Williams Streets area.

Stormwater flow will not travel northwards along Crawford Street as stated by the reviewer and as such the flow down existing Crawford Street has not been increased. . On that basis there is no requirement to make *an assessment of the potential impacts of this changed stormwater scenario* or provide an *assessment of the capacity and impacts of downstream streets (Crawford, Ingles, Williams)*.

The existing part of Crawford Street falls to the south (away) from Williams Street to a low point near the south end of Crawford Street and the boundary with the subject site. The existing grade of the extension of Crawford Street rises to the south (away) from the existing Crawford Street construction. There is a road low point at the existing 750 dia culvert. Stormwater from the undeveloped site flows towards the end of Crawford Street and enters the existing drain either upstream or downstream of the 750 dia pipe. Because the end of Crawford Street is a low point no stormwater flows to the north. The proposed subdivisional design maintains that scenario.

Pre and Post development catchments contributing to the join with the existing Crawford Street construction are detailed on attached KFB drawing K-2578 Sheet SK5A and shows that:

- The pre development area contributing:
 - a. to the inlet of the 750 dia culvert is 186.8m², and
 - b. to the open drain at the outlet of the 750 dia culvert is 4447.7m²
- The post development area contributing:
 - a. to the inlet of the 750 dia culvert is 782.6m², and
 - b. to the open drain at the outlet of the 750 dia culvert is 1711.1m²

The 5ha MHS catchment and the post development 782.6m² catchment has been allowed for in the Q10 Line 4 culvert and will not have an adverse effect on the drainage of the existing leg of Crawford Street.

An assessment of the existing (750 dia pipe) and new culvert (1500x600 RCBC) capacities and water levels has been addressed in item 6.

In summary:

- Stormwater will not travel overland along Crawford Street because it falls to the south and Ingles Street and Williams Street being higher than Crawford Street are not adversely impacted by the proposed subdivisional works.
- The proposed culvert at the join with existing Crawford Street allows for unchanged flows and has additional capacity that will have the effect of lowering ponding levels.
- Ponding is also limited by retention of the existing crown level of RL 8.423.
- As regards the regional 100 yr ARI event, at the flood level of 8.60m, survey and Lidar levels indicate that it is not contained within the reserve on several of the existing Crawford Street lots.
- Lots to the eastern side of Crawford Street will not be adversely affected by the proposed subdivisional works and will be further addressed in the response to item 12.

- 8. The calculation table provided indicate the minor flow capacity is exceeded for stormwater reach 1/2 to 3/1. In providing a design with reduced grades it is Council expectations that the certifying engineer would review these matters that are directly impacted by the road grades. Please advise why the RPEQ certification did not disclose this non-compliance. Please rectify the non-compliance and advise what additional infrastructure is required to comply with the FNQROC guidelines.**

Response

There is no non-compliance.

As detailed following no action is required as the minor flow road capacity (0.134 Cumecs) at stormwater reach 1/2 - 3/1 is adequate for the design flow (0.114 Cumecs).

Road stormwater capacity for minor and major events have been determined independently from PC Drain (which was used fo the sheet C11 computation) and initial pit locations determined using these capacities and maximised catchment areas. The results of the independent calculations are as follows:

For road geometry as on Drawing K-2578 Sheet C01

Road grade	0.3%
Dg (depth of flow - road crown to kerb invert)	0.124m
Mannings 'n'	
Kerb	0.012
Asphalt	0.015
Verge	0.030

Road capacity =	0.134 Cumecs
Dg =	0.124m
Vav =	0.59 m/s
Dg.V =	0.70

In summary the minor flow road capacity is 0.134 Cumecs, not 0.102 Cumecs as shown on the PC Drain calculation table on Sheet C11, and is adequate for the design flow of 0.114 cumecs. The PC Drain gutter profile was checked and corrections made to the channel flow width for the minor flow scenario. Sheet 11 has been amended.

- 9. The submission indicates line 4/4 to 1/4 has been designed for a minor system of 5 yr ARI. Council Officers consider this line is a cross drainage (culvert) and therefore should be designed for the 10 yr ARI minor system as per FNQROC Table 4.3.**

In addition, further information is required to show how the 1% stormwater flows are managed by the proposed stormwater system, road grading and earthworks design. (see also request for severe impact assessment below).

Response

No action proposed on culvert line 4/4 to 1/4 .

The reviewer has misread Drawings K-2578 Sheets C10 and C11 which clearly details that the design is for 10 yr ARI.

Refer also responses to Items 6. and 7.

- 10. Provide a sensitivity analysis on the pit entry capacity, blockage factors, pit losses as requested by DA Condition 9. In addition a severe impact assessment is required to demonstrate safe conveyance of flows in the event of complete inlet blockage of structure 4/4.**

Response

Condition 9. Does not require a sensitivity analysis.

The specific requirement(s) of condition 9.g. are detailed on drawings K-2578 Sheets C09, C10, C11

A severe impact assessment has been undertaken and this determined that the likelihood of blockage is reduced by:

- no significant treed areas upstream, thus unlikely for tree limbs and other tree debris approaching the culvert; and
- the increased culvert size

In summary:

- the proposed scenario represents an outcome that is an improvement on the existing scenario, and
- If blockage does occur the situation is no worse than existing.

- 11. Engineering drawings show end wall 4/4 is located on private property; (Mossman School). This has potential operational and maintenance issues for Council. Please change the endwall location so that it is contained in the road reserve. Alternatively, a drainage easement in the private property is required.**

Response

The endwall detail will be amended so that the end wall, without apron or wing walls, is contained in the road reserve with the end wall face flush with the MHS boundary..

Note: The endwall detail, as shown on Dwg C03 D, was lodged with the pre-lodgement plans.

- 12. Downstream from the culvert road crossing, provide engineering calculations to confirm the 100 yr ARI rainfall event is contained within the open drain between 8 Crawford Street (existing) and Lot 1. Confirm the event is contained within the 4.0m easement proposed in Lot 1. In addition, confirm that QUDM recommended freeboard is achieved for both Lot 1 and Lot 8.**

Response

- a) The capacity of the existing open drain, downstream from the culvert road crossing, was assessed at the existing grade of 0.25% and found to have insufficient capacity to convey runoff from the proposed development and the 5 ha MHS catchment. The Q100 discharge from the MHS catchment is 2.049 Cumecs and the existing drain capacity is 1.70 Cumecs. The drain widening on drawing K-2578 Sheet C01 increases the drain capacity to 2.77 Cumecs at 0.25% grade with an average velocity of 1.1m/s.
- b) Refer to Aecom Crawford Street Flooding Assessment – Table 14; Figure 13; Page 29
- i. The selection of finished lot levels in excess of 8.6m provides the ability to achieve a finished floor level on Lot 1 with a minimum of 0.3m clearance to the design 100yr ARI flood level of 8.35m
 - ii. Reference to Figure 13 indicates the existing (predicted) 100 yr ARI flood impact on existing Crawford Street Lot 8. The proposed development does not make the event worse.
- 13. The 30min time of concentration adopted for Catchment A hydrology calculation is considered a lower bound estimate. Please undertake a sensitivity analysis to determine the performance of line 4 if the time of concentration is as low as 20 mins.**

Response

The time of concentration for catchment A has been calculated in accordance with Section 4.6.6 “Overland Flow Travel Times” of QUDM as required by FNQROC. QUDM Table 4.6.1 identifies this as an appropriate methodology for the catchment under consideration.

QUDM does not require sensitivity analyses to be undertaken for calculation of times of concentration. Furthermore, QUDM does not reference “lower bound estimates”.

We are confused by the reviewer’s assessment and if the foregoing response does not satisfy item 13, we request a technical basis relating to the assessment comments for consideration.

- 14. Advise how it is proposed to protect Lots 12 – 13 from stormwater runoff from the school and how QUDM recommended freeboard will be achieved.**

- 15. Provide engineering calculations confirming the drain proposed at the rear of Lots 10 – 13 is adequate in capturing and conveying the 100 yr ARI event and that QUDM recommended minimum freeboard is achieved.**

Response

The response to Items 14 and 15 is as follows:

- a. The MHS grounds fall away from the rear of Lots 12 & 13. Lot 12 is filled 300 – 900mm above the MHS levels and will not be affected by the MHS drainage. Lot 13 is lower but the MHS swale is further away.
- b. The new drain diversion, with side batters of 1 on 4 and a 5% grade, has the capacity to carry Q100 flows to Parker Creek . The flow depth is 0.59m and the flow velocity 1m/s.
Drain details are shown on drawings K-2578 Sheets C01, C02, C03, C08, C09
Freeboard depths are shown on attached drawing K-2578 Sheet SK6

16. Please provide the velocities in the open drain in Lot 1 and rear lots 10-13 and whether low flow provisions to protect for scouring are warranted.

Response

- a. The velocity in Lot 1 open drain is 1.1 m/s
 - b. The velocity in the Lot 10 – Lot 13 drain is 1.0 m/s
- In both cases the velocity is very low and scouring will not occur.

17. The earthworks grading indicates stormwater from Lot 3 mostly discharges to Lot 4. Please clarify, how it is intended to protect Lot 4 from Lot 3 stormwater.

Response

The reviewer has mis-read the drawings.

Lot 3 does not mostly discharge to Lot 4.

The earthworks plan shows most of Lot 3 falling to the internal road and with the southern part grading so as to fall to Parker Creek between Lot 3 and Lot 4.

Discharge from Lot 3 into Lot 4 has been totally eliminated with changes to Road A grading and stormwater management such that overland flow is directed between Lots 3 and 4 to Parker Creek.

Refer also to response to Item 21.

18. Confirm with site survey, the interface of the open drain and structure 1/1 outlets to Parker Creek. Council Officers seek to determine the extent of earthworks, vegetation removal and bank protection (rock) works required.

Response

There is sufficient survey information available to justify the design details tendered.

This is supported by site and photographic inspections .

The outlet headwall and apron will be constructed on cleared land.

- 19. A concrete access and hardstand area adjacent to the Gross Pollutant Trap (GPT) must be provided to allow maintenance vehicles to park near the roadway in accordance with FNQROC D5.08. Amend the road works drawing to show the proposed access and hard stand extent.**

Response

A 3.0m wide industrial access crossover and driveway has been detailed on Sheet C16 (new drawing) to provide access to both the Gross Pollutant Trap (GPT) and Sewer Pump Station.

- 20. Update the stormwater plans to provide a combined pit and pipe system and single creek outlet for lots discharging direct to Parker Creek. The pipe is to be located within the creek buffer area outside the lots. Each lot must have a collection pit for the builder to connect the roof water. Updated plans providing this system must be provided to Council. Sufficient setout, levels and longitudinal section are required to be included to detail pipework. The creek levels and in stream protection of the drainage points must be detailed.**

Response

No action is proposed for the following reasons

- i. FNQROC D4.13 does not permit the rear allotment drainage system detailed above.
- ii. FNQROC D4.13 2.a details the approved rear lot drainage system which is best provided for at the Building Permit approval stage.

- 21. Provide calculations to show the major road flows do not inundate properties in Road B and at the low point at stormwater pits 8/1 and 9/1. The road grading shows that on-road flows will pond in Road B and parts of Road A before tipping out at the kerb high point near Road ch 260m. Calculations must be provided to show the ponding levels in a major event. 100 year ARI flows and any hydraulic gradient required must be provided from the above point of reference (Ch 260) or other system reference points as may be appropriate.**

Response

The internal roads have been designed with sufficient capacity to contain major storm events within the road reserve.

The issue of Q100 flooding is compounded when comparing the relatively small catchments contributing to the subdivision runoff to the regional flood event. These issues, as well as the freeboard to floor levels, has been discussed in previous items.

To address the reviewers concerns, Road A levels have been adjusted to take advantage of the gap between Lots 3 and 4 to allow overland surcharge flows to flow directly east to Parker Creek rather than down Road A.

The eastern footpath has been flattened adjacent to pit 8/1 and calculations on drawing C01 show that the flow path contains the Q100 flow within the 4m gap in the event of a total stormwater system pipe blockage.

22. Detail the relationship between the proposed drainage reserve area, proposed property boundaries and the existing vegetation line to illustrate practical access can be achieved to the drainage reserve area.

Response

This is not a requirement of DA ROL 617/2015 which advised that the approved layout plan was RPS PR124232-4 Issue D dated 14 July 2015 and that the street layout and design is to be generally in accordance with that plan.

The rear boundaries of the allotments have been located as required by DA ROL 617/2015.

The area identified to be transferred to the Crown for Public Use Land – Drainage Reserve is cleared (previously used for growing cane), relatively level, and readily accessible.

Water Reticulation

23. Water Mains are to be Class 16 minimum

Response

Drawing K-2578 Sheet C14 has been amended to detail all water mains to be Class 16 (PN16).

24. Water mains are to connect to the 150mm Council main in Crawford Street with a cross connection to the existing 100mm main

Response

No action proposed.

There is no 150mm Council main in Crawford Street. Council records detail a 100mm CI main on the western side of Crawford Street, which the proposed new reticulation will connect to.

Enquiry with Council officers regarding this item has determined that the intention of the reviewer is that item 24 requires a direct connection of the proposed subdivision main to the 150mm main on the north side of Williams Street, a considerable distance from the development, and as well that a cross connection should be made to the existing 100mm Crawford Street main.

It is noted that Condition 4 “ Water Supply & Sewer” of Decision Notice ROL 617/2016 required the following:

An updated water supply and sewerage infrastructure plan and supporting information, including hydraulic network analysis, must be submitted demonstrating how the development will be serviced by Council’s infrastructure. In particular the plan must:

- a. Identify external catchments that will be connected to the internal sewer or water networks;*
- b. Identify any trunk infrastructure external to the subdivision that may require upgrading to accommodate the development; and*

- c. The applicant is to provide a network model for the water supply system operation demonstrating acceptable minimum and maximum pressures are achieved under the conditions nominated by the FNQROC Development Manual.*

In response to Condition 4, a report (“ Assessment of Water Reticulation Capacity” prepared by Civil Walker) was submitted with the Application for Operational Works Permit. The report included results of hydrant testing undertaken, calculation of water demands, a summary of the water supply design criteria, a summary of adopted boundary conditions, a peak hour network analysis and a fire fighting network analysis.

Conclusion of the water analyses were that the existing water infrastructure can adequately support the development and that the proposed water reticulation layout can service the development as required by the FNQROC Development Manual.

It is therefore considered that Council’s requirement for connection to the 150mm main on the north side of Williams Street is un-warranted.

- 25. Valves are to be installed on the leg of all tees. Additional valves should also be installed to one or both sides of tee junctions as per FNQROC D6.13. Provide an amended Water Reticulation Plan.**

Response

Drawing C14 amended to provide valves as requested.

- 26. The proposed hydrant locations on the western side of Road A are more than 80m apart and do not comply with FNQROC D6.12 (ie between the existing hydrant in Crawford Street and Lot 12/13 boundary). Change the hydrant locations or provide additional hydrants so that hydrants are no more than 80m apart. Provide amended Water reticulation Plan.**

Response

Drawing C14 amended so that hydrant location complies with FNQROC D6.12.

- 27. Please amend the Water Reticulation Plan to include the proposed location of water service connection for each lot.**

Response

Drawing C14 amended to show the location of water service, in accordance with Douglas Shire Council specific requirements, for each lot.

- 28. Tapping of water main required and service to be bought into the lots. Provide a note on the Water Reticulation Plan to this effect.**

Response

Note added to Drawing C14 stating that :

20mm PE100 PN16 water service in accordance with Douglas Shire Council standard. Service to be 500mm from side boundary and terminate with a ball valve underground 500mm inside front boundary.

Sewer Reticulation

- 29. The Sewer Longitudinal Section provided suggests that the vertical clearance between sewer reach 3/1 to 1/3 is less than 300mm. Please confirm 300mm or greater vertical clearance will be provided. Provide an amended sewer longitudinal section if necessary.**

Response

The sewer connection 3/1 – 1/3 has been removed as it was not required and this eliminates the service clearance problem.

- 30. Confirm the sewer property connections elevations calculated (for sewer grading) are deep enough to service the entire lot using the property drain design criteria set out in FNQROC D7.14, clause 12. Provide an amended sewer longitudinal section if necessary.**

Response

Drawing K-2578 Sheet C12 details the sewer lot control calculation for each lot. The lot control calculation is detailed on Sheet C12.

- 31. With regard to the photo below of the receiving manhole detail how the new connection relates to the existing stub and the proposed new pressure main. Assessment of the capacity of the existing manhole for pump flows is required.**

Response

Sheet C12 – Sewer Reticulation Layout - has been amended such that the rising main discharges into manhole 2/4 and gravity line 4 discharges into existing manhole EX4.

The existing manhole (EX4) has a discharge sewer outlet (225mm) and two existing inlets which are currently blanked off. Manhole EX4 will be re-benched to accommodate the inlet from gravity line 4.

The existing 225mm outlet pipe in manhole EX4 has a capacity, at minimum grade, of 549 equivalent domestic connections (Ref. Table 7.5, FNQROC Development Manual – D7). The 19 lot residential development proposal will generate 62.2 equivalent domestic connections.

Sewer Pump Station

- 32. Please demonstrate how the current plans comply with FNQROC D7.17 point 6 “The tenure of property on which pump stations and access roads are situated shall be transferred to Council as freehold title”.**

Response

The area designated “Park” at the southern end of the Council approved Plan RPS PR124232-4 D would be transferred to Council as freehold title.

- 33. The Engineering Drawings provided for the pump station do not comply with FNQROC D7.17. With reference to D7.17 please provide a specific design drawing which includes:**
- a. Relative levels (A through G) as denoted on these drawings as well as all pump start, stop and alarm levels appropriate to operating conditions shall be provided with the pump station design.**
 - b. Detailed site planning showing pump station relative to existing and proposed surface contours and in the relation to boundaries, flood levels and other elements and features.**
 - c. Cross-section and plans of the pump station drawn to scale and dimensioned.**
 - d. Pipework and ancillary elements drawn to scale and correct orientation.**
 - e. Detailed cross-section and plan of emergency storage infrastructure, and**
 - f. Design system curve and pump curves**
- Confirm details of the switchboard design will be provided at a later date**

Response

Subsequent to obtaining tenders for the subdivisional work a decision has been made to purchase and install a MULLALY MODEL ME200x545 package pump station complete with pumps, controls . Our advice is that a Mullaly package pump station is operating in the Shire. Sheet C16 details the Sewer Pump Station layout.

Responding to the above list:

- a. The levels (A through to G) are detailed on Sheet C16.
Operating levels (start; stop; alarm) will be provided to Council for approval prior to commencement of construction.
- b. This information is shown on sheet C16.
- c. Detailed design / documentation of the pump station from the supplier will be supplied to Council for approval prior to commencement of construction.
- d. This information is shown on sheet C16.
- e. Sheet C16 provides adequate detail of the Pump Station Overflow system , including levels. Reference is made to FNQROC Std Drawing S 3035 thus cross-section not required.
- f. Pump operating data (design system curve, pump curves, etc) and details of switchboard design will be provided to Council for approval prior to commencement of construction.

- 34. The current drawings do not provide suitable access arrangements to the pump station for maintenance. Please amend the drawings to provide hard stand access adjacent to the wet well opening.**

Response

Drawing C16 details the layout of the Sewage Pump Station and GPT and the provision of a shared concrete driveway.

- 35. The current location and proximity to the site boundary is not considered acceptable. The pump well must be located sufficiently offset from the property boundary for constructability and for future operation and maintenance.**

Response

Drawing C16 details the Pump Station with a clearance of 2.5m to the property boundary.

- 36. Detail design plans for the pump station are required prior to an approval for operational works being granted as per Condition 8 of the Development Approval. Reference is made to the minimum criteria set out in FNQROC AP1.27, in particular:**
- a. Air valve and scour valve locations;**
 - b. Thrust block calculation where required;**
 - c. Rising main hydraulic grade line;**
 - d. System resistance and pump curves showing static and friction head and duty points;**
 - e. Calculations supporting the provision of wet well storage;**
 - f. Calculations showing that flotation forces are counteracted for all buried or partially buried structures;**
 - g. Structural calculations where necessary for the pump well and associated works.**
 - h. Calculations supporting the hydraulic design of emergency relief structures.**

Response

Subsequent to obtaining tenders for the subdivisional work a decision has been made to install a MULLALY MODEL ME200x545 package pump station complete with pumps & controls.

Drawing C16 details the layout of the sewage pump station, the overflow system and nominates the operating levels.

Detailed design / documentation of the pump station from the supplier will be provided to Council for approval prior to commencement of construction.

- 37. Provide additional information on the pump station overflow (ie. Overflow chamber invert level, pipe diameter, Parker Creek flooding backflow prevention method etc.).**

Response

Drawing C16 details the overflow system and design levels which is based on FNQROC Std Dwg S30035.

- 38. The proposed pressure main diameter and material is not accepted by Council. With reference to FNQROC D7.19, the sewage pressure main is to be a minimum 100mm uPVC Class 12**

Response

Drawings amended to detail the Rising Main as 100mm uPVC Class 12

- 39. Provide a longitudinal section of the rising main showing proposed invert levels, air valve and scour valve locations etc. The longitudinal section should include the proposed connection elevation to the existing Manhole in Crawford Street and detail how the new connection related to the existing stubs and the proposed new sewer connection. The current application does not provided sufficient detail on the various pipe inlets.**

Response

Drawing C16 details a longitudinal section of the rising main and its connection to sewer MH 2/4.

Refer also to the response to Item 31.

- 40. Provide engineering calculations to demonstrate the proposed pump selection, flow rate and rising main diameter (to) achieve acceptable self cleansing velocities. That is compliance with design criteria in FNQROC D7.19.**

Response

Detailed pump data will be submitted for Council approval prior to commencement of construction.

- 41. The Electrical/Telecommunications Reticulation Plan included in the submission indicates that a service connection will not be provided to the sewer pump station. Provide a revised Electrical Reticulation Plan to show the proposed service connection location.**

Response

No action proposed.

The electrical drawings (2779-E01 & E02) clearly detail a service connection to the sewer pump station.

Our advice is that the telemetry system does not require a service connection. Thus drawings 2779-T01 & T02 do not detail a service connection.

Reference: Welcon Technologies

ATTACHMENTS

1. Job No K-2578; Sheets C00 to C16 (incl.)
2. Job No K-2578; Sheet SK5 A
3. Job No K-2578; Sheet SK6 A

N.V. & J.S. Pty Ltd

PROPOSED SUBDIVISION

CRAWFORD STREET, MOSSMAN

PROJECT No: K-2578



LOCALITY PLAN
N.T.S.

DRAWING LIST

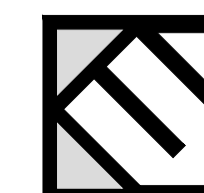
DRAWING No	DRAWING TITLE
K-2578-C00	LOCALITY PLAN AND DRAWING INDEX
K-2578-C01	MISCELLANEOUS SECTIONS AND DETAILS
K-2578-C02	EARTHWORKS
K-2578-C03	ROAD WORKS AND STORMWATER DRAINAGE LAYOUT
K-2578-C04	ROAD LONGITUDINAL SECTIONS
K-2578-C05	ROAD CROSS SECTIONS SHEET 1
K-2578-C06	ROAD CROSS SECTIONS SHEET 2
K-2578-C07	INTERSECTION DETAILS
K-2578-C08	INTERNAL STORMWATER DRAINAGE CATCHMENT PLAN
K-2578-C09	EXTERNAL STORMWATER DRAINAGE CATCHMENT PLAN
K-2578-C10	STORMWATER DRAINAGE LONGITUDINAL SECTIONS
K-2578-C11	STORMWATER DRAINAGE CALCULATIONS
K-2578-C12	SEWER RETICULATION LAYOUT
K-2578-C13	SEWER LONGITUDINAL SECTIONS
K-2578-C14	WATER SUPPLY LAYOUT
K-2578-C15	EROSION AND SEDIMENT CONTROL PLAN
K-2578-C16	SEWER PUMP STATION AND RISING MAIN DETAILS

No.	DATE	ISSUE / REVISIONS	EWK	EFB
D	23/05/19	DRAWING C16 ADDED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		
No.	DATE	ISSUE / REVISIONS	DRN	CHKD

DRAWING FILE: XREF FILE: N/A

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

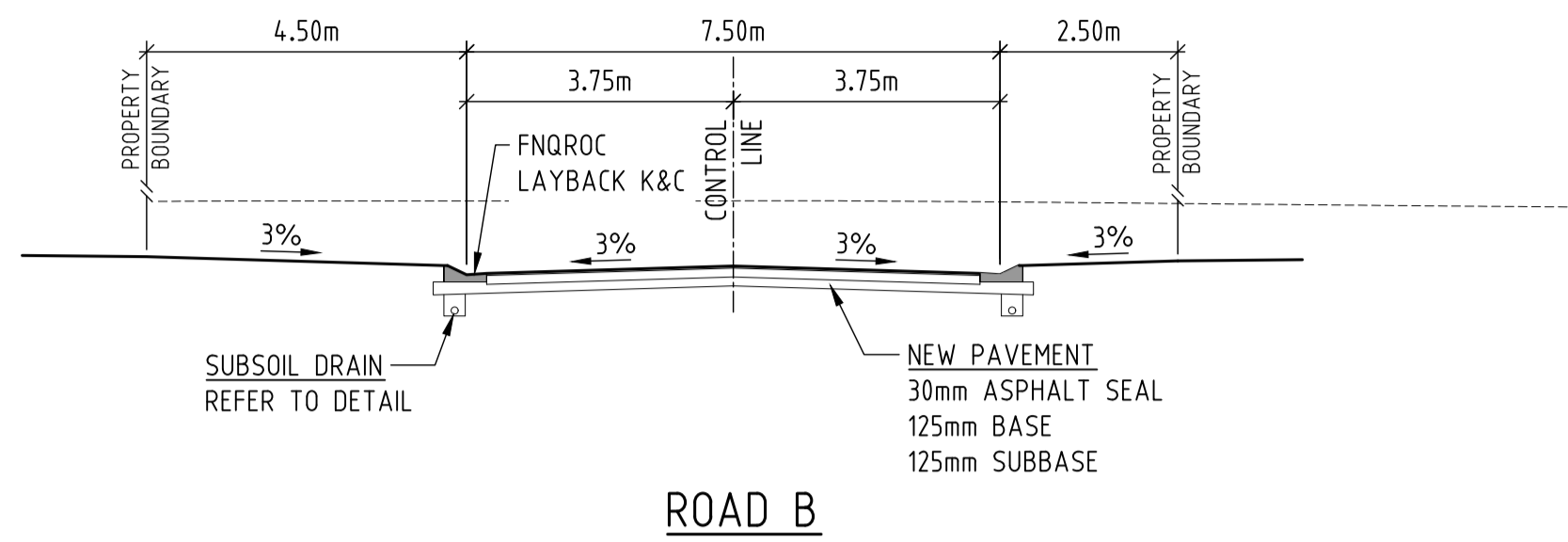
Locality Plan &
 Drawing Index



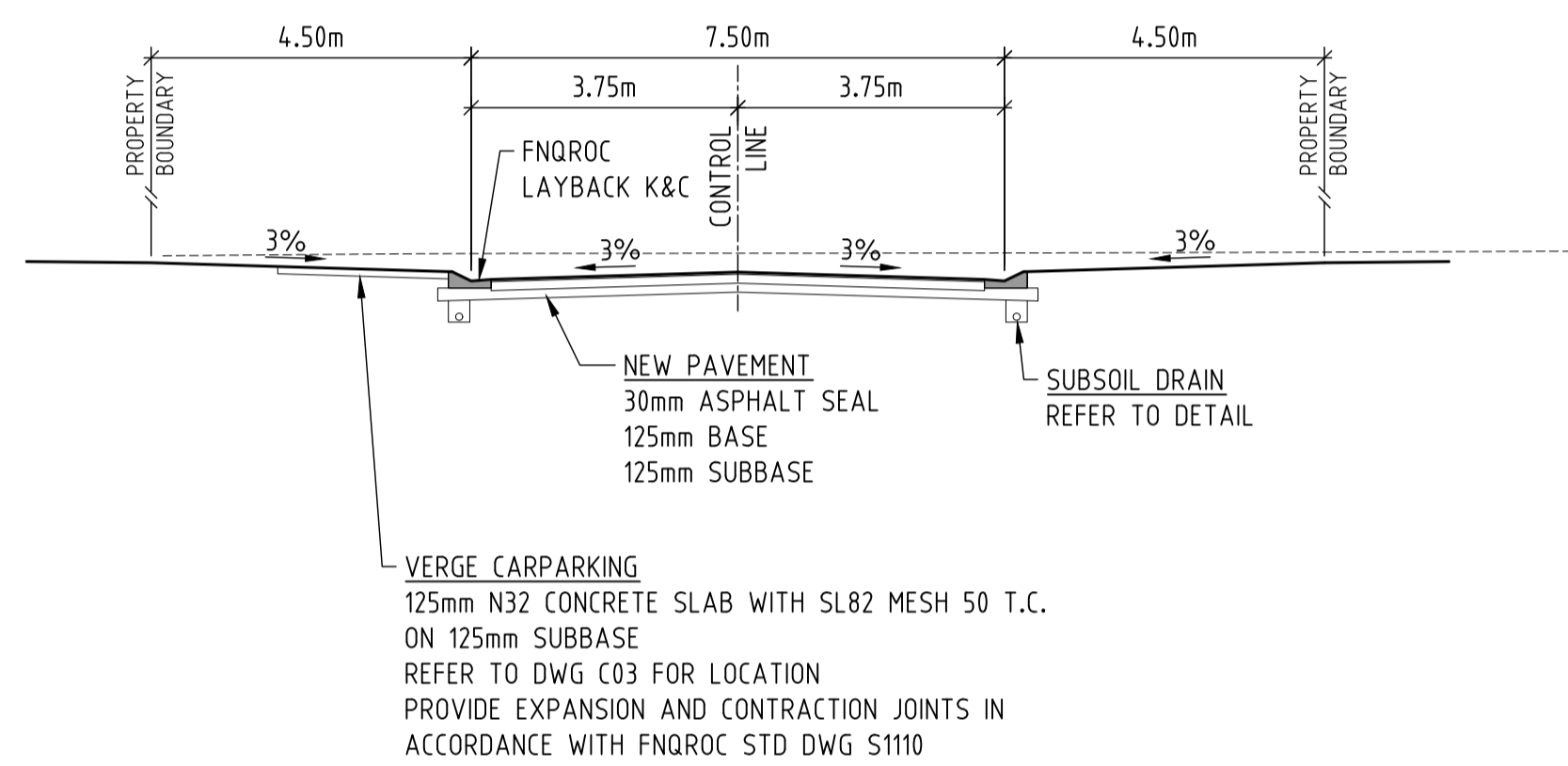
KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C00** | **D**
 SCALE: N.T.S. (@ A1)



ROAD B

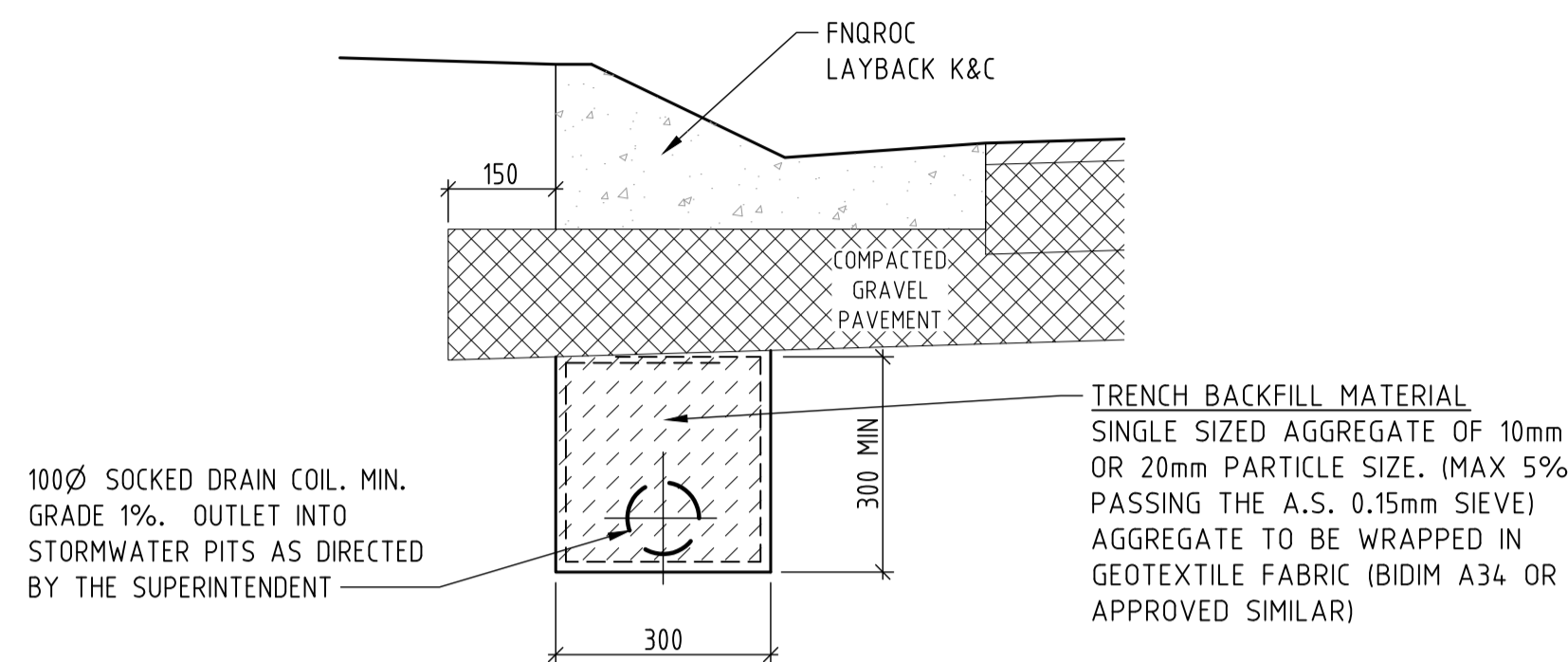


ROAD A

TYPICAL ROAD CROSS SECTIONS
SCALE 1:100 (A1)

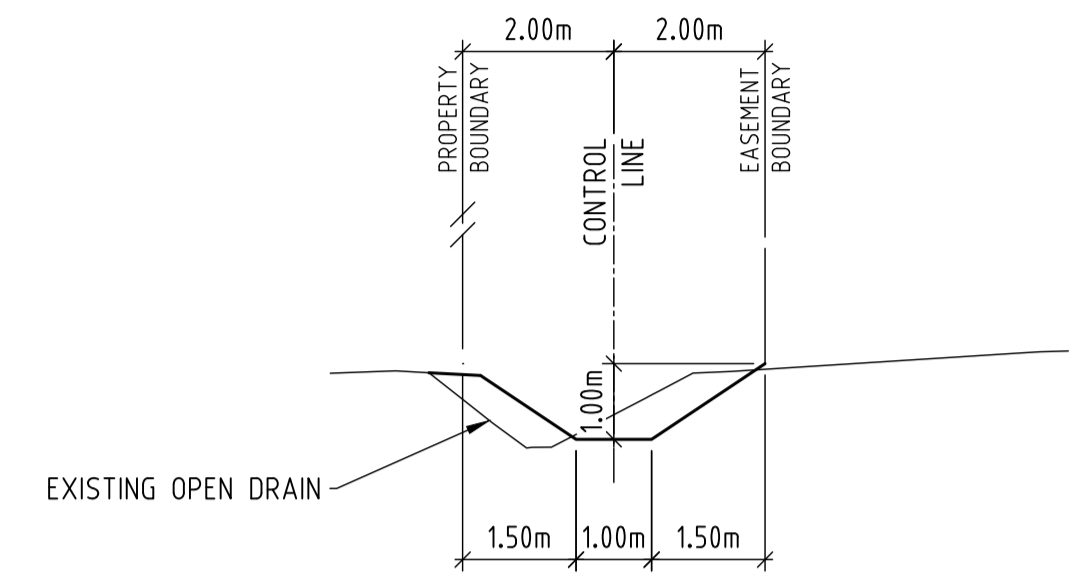
PAVEMENT NOTES

- PAVEMENT MATERIALS SHALL COMPLY WITH THE FNQROC DESIGN MANUAL AND SPECIFICATIONS.
- FOLLOWING COMPLETION OF SUBGRADE AND PAVEMENT COMPACTION AND TRIMMING, THE WHOLE OF THE SUBGRADE AND PAVEMENT SHALL BE INSPECTED BY PROOF ROLLING WITH A FULLY LOADED SINGLE REAR AXLE TRUCK OR EQUIVALENT. ACCEPTABLE PROOF ROLLING SHALL BE TAKEN TO BE NO VISIBLE SIGNS OF DEFORMATION OR INSTABILITY.
- PAVEMENT MATERIAL SHALL BE SPREAD IN UNIFORM LOOSE LAYERS OF NO LESS THAN 100mm OR GREATER THAN 200mm AND SHALL BE COMPACTED TO 100% MODIFIED (UNO).
- FOLLOWING COMPACTION OF THE EACH PAVEMENT COURSE, THE SURFACE SHALL BE WATERED AND ROLLED WITH A STEEL DRUM ROLLER TO GIVE A HARD, DENSE, TIGHTLY PACKED SURFACE FREE ON LENSES, COMPACTION PLANES AND CAKING.
- PLACEMENT OF BASE COURSE MATERIAL ON SUB-BASE SHALL NOT COMMENCE UNTIL THE COMPACTION STANDARDS OF THE LOWER LAYERS HAVE BEEN TESTED AND ACHIEVED.
- COMPACTION OF PAVEMENT MATERIAL SHALL BE IN ACCORDANCE WITH AS1289 "METHODS OF TESTING SOILS FOR ENGINEERING PURPOSES".
- WHERE NEW PAVEMENT IS TO BE JOINED TO AN EXISTING PAVEMENT, SAWCUT AND REMOVE A STRIP OF THE EXISTING PAVEMENT AT LEAST 300mm WIDE TO ITS FULL DEPTH BEFORE PLACING THE NEW PAVEMENT MATERIAL.
- PAVEMENT DESIGN IS BASED ON AN ASSUMED SUBGRADE CBR VALUE OF 5. THE CONTRACTOR SHALL CHECK THE PAVEMENT SUBGRADE CBR AND SUBMIT THE CBR TEST RESULTS TO THE SUPERINTENDENT FOR CONFIRMATION OF PAVEMENT DESIGN.
- THE CONTRACTOR IS TO ENSURE THAT THE PAVEMENT COURSES ARE SET DOWN SUFFICIENTLY TO ALLOW FOR ASPHALT SURFACING.
- BASE COURSE TO BE PRIMED OR TACK COAT APPLIED PRIOR TO THE PLACEMENT OF ASPHALT.
- THE CONSTRUCTION OF ROAD SIGNS, PAVEMENT MARKING AND ASSOCIATED ROAD FURNITURE SHALL COMPLY WITH THE MAIN ROADS MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES.

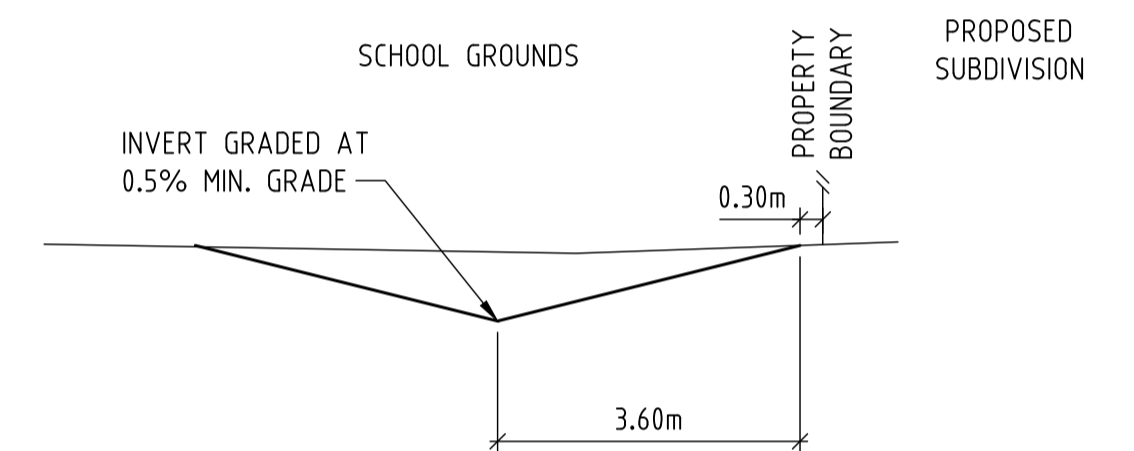


NOTE: SUBSOIL DRAINS ARE TO BE INSTALLED IN LOCATIONS SHOWN ON PLAN DRAWINGS. FLUSHING POINTS TO BE IN ACCORDANCE WITH FNQROC STD DWG S1095.

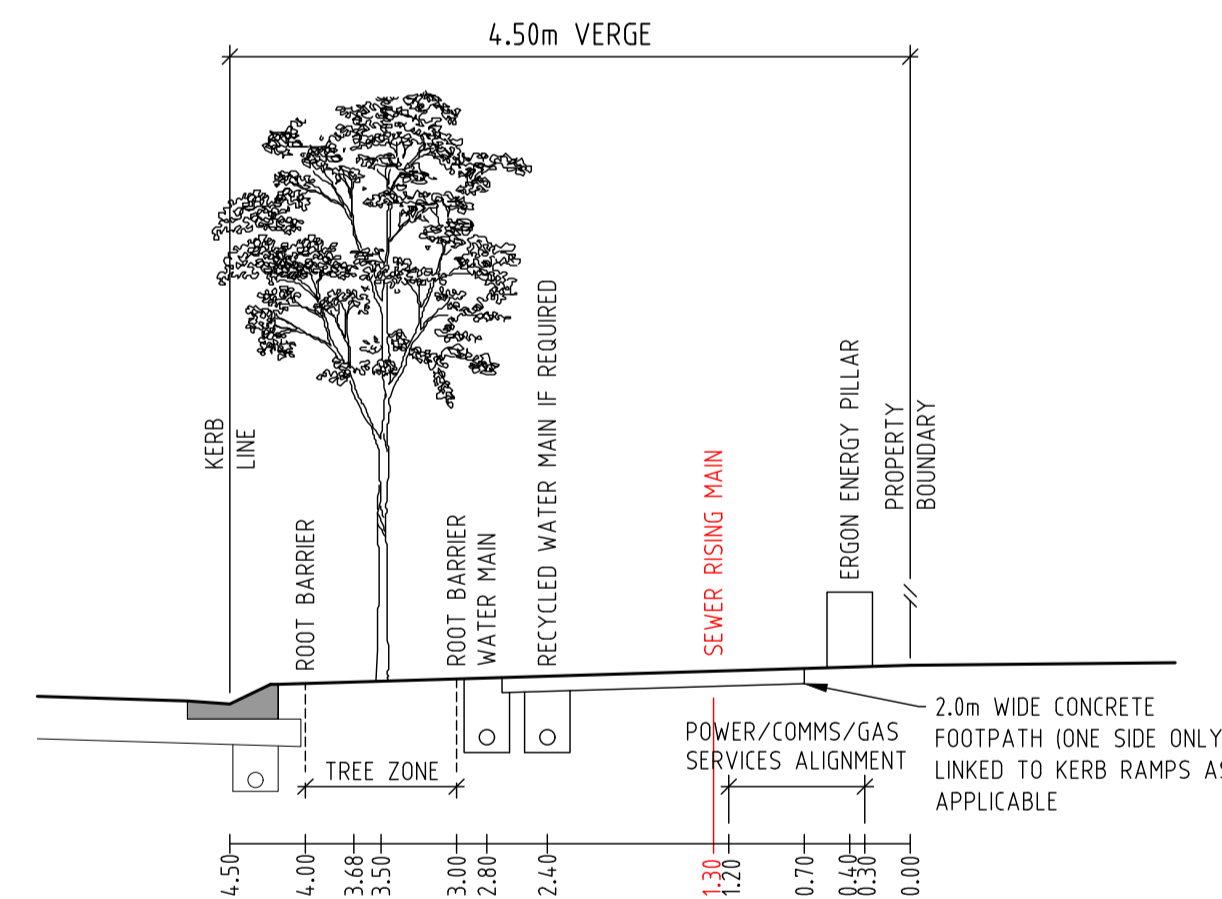
SUBSOIL DRAIN DETAIL
N.T.S.



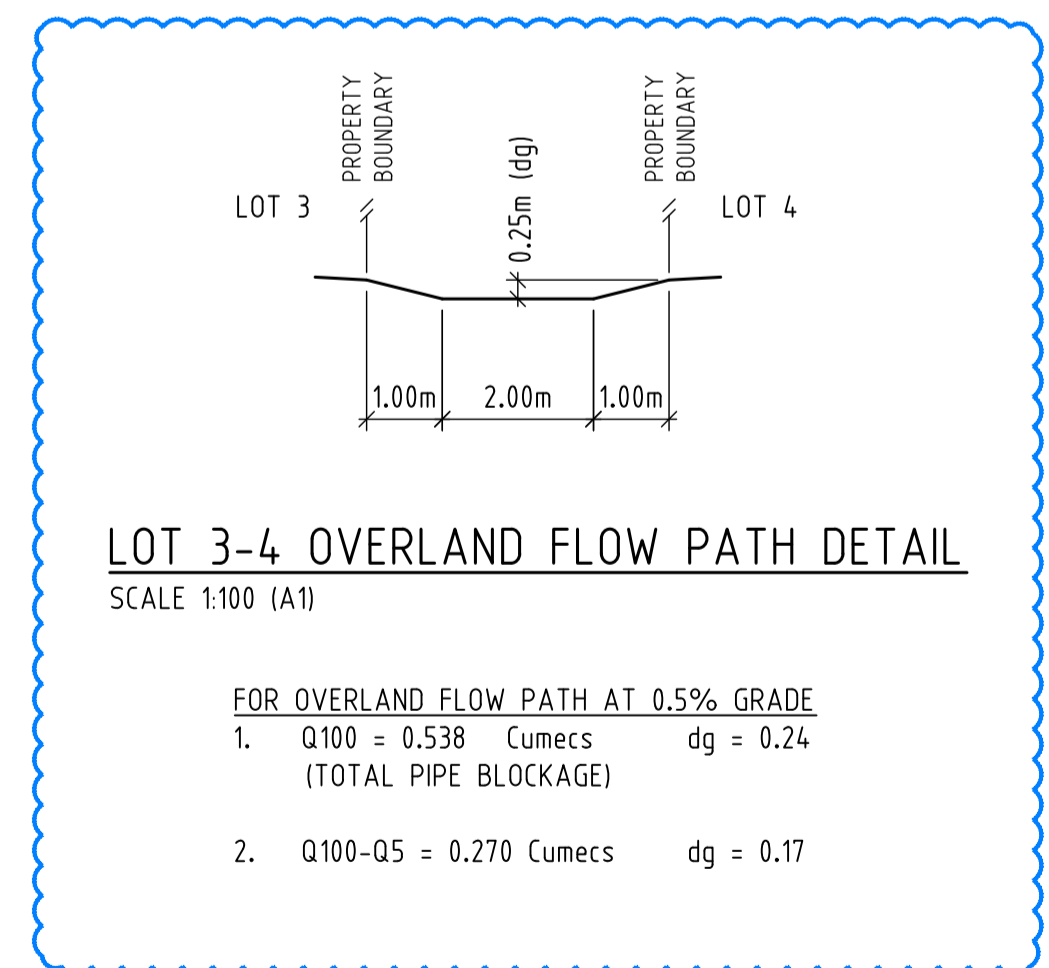
LOT 1 OPEN DRAIN DETAIL
SCALE 1:100 (A1)



OPEN DRAIN TO PARKER CREEK
SCALE 1:100 (A1)



SERVICES LAYOUT FOR 4.5m VERGE
N.T.S.



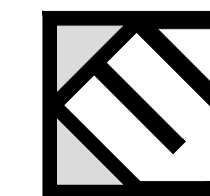
LOT 3-4 OVERLAND FLOW PATH DETAIL
SCALE 1:100 (A1)

FOR OVERLAND FLOW PATH AT 0.5% GRADE
 1. Q100 = 0.538 Cumecs dg = 0.24
 (TOTAL PIPE BLOCKAGE)
 2. Q100-Q5 = 0.270 Cumecs dg = 0.17

F	23/05/19	LOT 3/4 OVERLAND FLOW PATH DETAIL ADDED		
E	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
D	21/02/17	RETAINING WALL RW2 DETAIL ADDED		
C	11/12/16	RETAINING WALL REVISED	EWK	EFB
No.	DATE	ISSUE / REVISIONS	DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

Miscellaneous
 Sections and Details



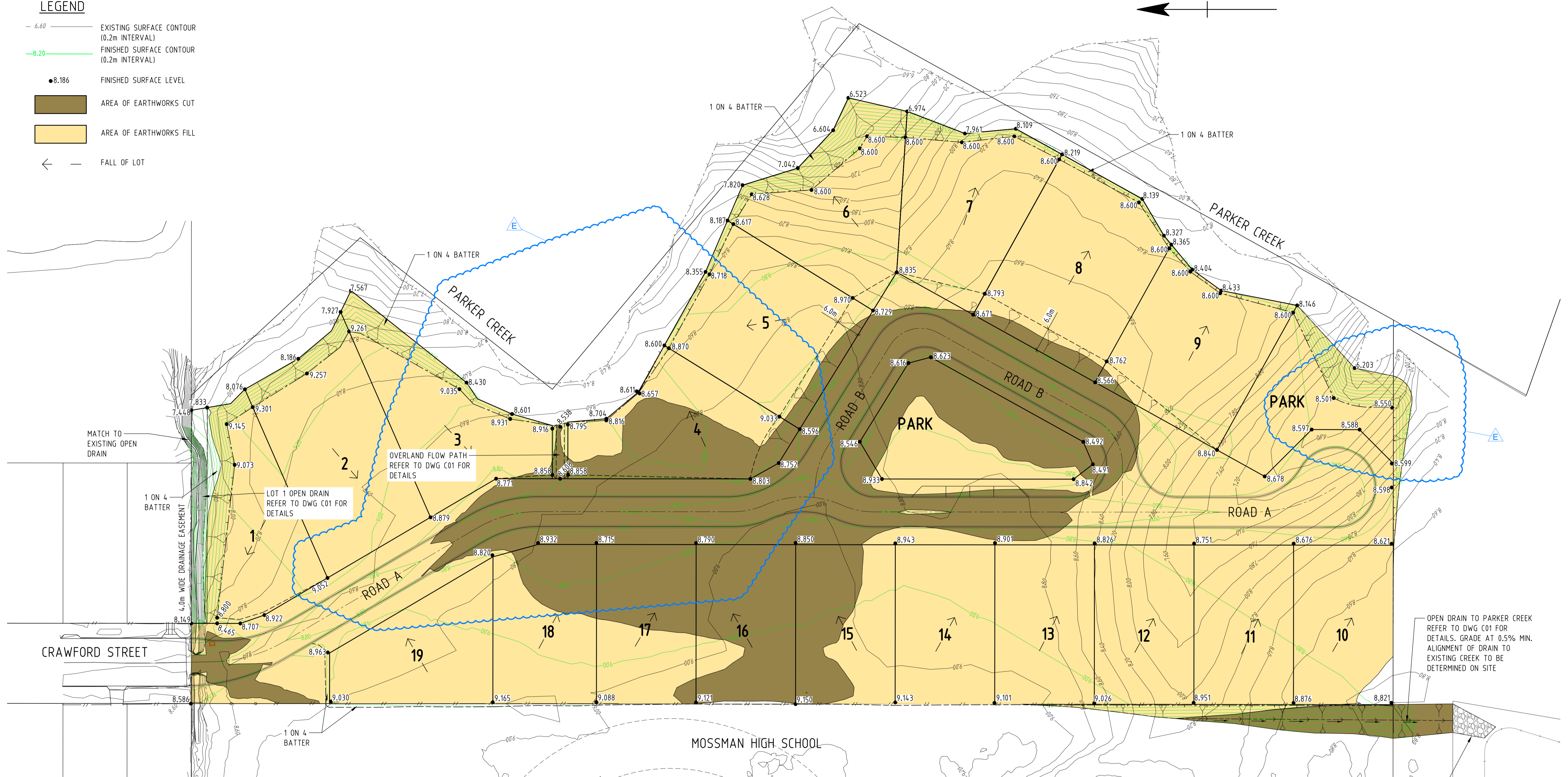
KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C01 | F**
 SCALE: N.T.S. (@ A1)

LEGEND

- 6.60 ——— EXISTING SURFACE CONTOUR (0.2m INTERVAL)
- 8.20 ——— FINISHED SURFACE CONTOUR (0.2m INTERVAL)
- 8.186 FINISHED SURFACE LEVEL
- AREA OF EARTHWORKS CUT
- AREA OF EARTHWORKS FILL
- ← — FALL OF LOT



PLAN
SCALE 1:500 (A1)

NOTES

1. ALL FOOTPATHS SHALL BE GRASSED (DRILL SEEDING WITH APPROVED GRASS SPECIES) IN ACCORDANCE WITH LANDSCAPE SPECIFICATIONS, FERTILIZED AND MAINTAINED FOR THE REQUIRED MAINTENANCE PERIOD.
2. ALL BARE EARTHWORKS AREAS (LOTS, DRAINS, PARKS, VERGES, ETC.), SHALL BE GRASSED (DRILL SEEDING WITH APPROVED GRASS SPECIES) FOR SLOPES UP TO AND INCLUDING 1 ON 4, OR HYDROMULCHED FOR SLOPES GREATER THAN 1 ON 4. USE APPROVED SEED MIX AND MAINTAIN, WATER AND FERTILISE FOR MAINTENANCE PERIOD.
3. 150mm TOPSOIL TO BE STRIPPED FROM SITE AND SUITABLY TREATED AND STOCKPILED FOR LATER USE AS SITE FILL
4. ALL GULLIES AND DEPRESSIONS REQUIRING FILLING SHALL BE CLEARED, GRUBBED AND CLEANED OUT OF SILT, BOULDERS, DEBRIS ETC TO PROVIDE A CLEAN, FIRM BASE PRIOR TO PLACING ANY FILL OR FILTER MATERIALS. COMPACT ALL NATURAL SUBGRADES WITH 6 TO 8 PASSES OF A 10 TONNE VIBRATING ROLLER PRIOR TO PLACING ANY FILL MATERIALS. PLACE SUBSOIL DRAINS/MATS TO ENGINEERS APPROVALS AT THE BASE OF ALL SUCH FILLS AND OUTLET TO THE STORMWATER DRAINAGE SYSTEM. NOTIFY THE SUPERINTENDENT FOR AN INSPECTION PRIOR TO PLACING ANY FILL MATERIALS.
5. WHERE FILL IS PLACED ON SLOPING EXISTING SURFACE, THE EXISTING SURFACE SHALL BE BENCHED AND THE BENCH COMPACTED TO 98% SRDD PRIOR TO PLACING THE FILL MATERIAL.
6. REMOVE SURFACE ROCKS FROM THE LOTS, FOOTPATHS, VERGES AND PARKLAND AREAS. REUSE IN SCOUR PROTECTION, REMOVE EXCESS FROM SITE OR STOCKPILE AS DIRECTED. ALL COSTS TO BE INCLUDED IN CONTRACT LUMP SUM.
7. THE CONTRACTOR SHALL ENSURE NO PONDING AREAS RESULT FROM THE EARTHWORKS OPERATION. ANY SUCH AREAS WHICH DEVELOP SHALL BE RECTIFIED AS DIRECTED BY THE SUPERINTENDENT. THE CONTRACTOR SHALL NOTIFY THE SUPERINTENDENT OF THE DEVELOPMENT OR EXISTENCE OF ANY SUCH PONDING AREAS.
8. THE CONTRACTOR SHALL LIAISE WITH THE SUPERINTENDENT TO ENSURE BATTERS IN EXCESS OF 1.5m HIGH SHALL BE ASSESSED AND REPORTED FOR STABILITY (DURING CONSTRUCTION) BY A GEOTECHNICAL ENGINEER. COPIES OF REPORTS SHALL BE FORWARDED TO THE SUPERINTENDENT AND TO COUNCIL.
9. ALL BOUNDARIES WITH EXISTING CREEKS AND VEGETATION MUST BE TEMPORARILY DELINEATED AND FENCED OFF/SEGREGATED TO RESTRICT BUILDING ACCESS FOR THE DURATION OF THE CONSTRUCTION ACTIVITY.
10. ALL EARTHWORKS SHALL BE IN ACCORDANCE WITH AS3798 "GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS" AND THE FNQROC DEVELOPMENT MANUAL.

IMPORTED NON-PLASTIC FILL

AS METRIC SIEVE	% PASSING BY WEIGHT
75mm	100
2.36mm	25 - 70
75um	0 - 30

1. MINIATURE ABRASION LOSS PASSING 2.36mm 0 - 15
2. LINEAR SHRINKAGE PASSING 4.25um 0 - 8
3. MATERIAL RETAINED ON 2.36mm SIEVE SHALL CONSIST OF SOUND STONE
4. SOAKED CBR 15 AT 98% SRDD COMPACTION

OPEN DRAIN TO PARKER CREEK REFER TO DWG C01 FOR DETAILS. GRADE AT 0.5% MIN. ALIGNMENT OF DRAIN TO EXISTING CREEK TO BE DETERMINED ON SITE

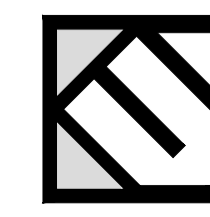
PROVIDE GROUTED ROCK OUTLET TO PARKER CREEK



E	23/05/19	EARTHWORKS REVISED		
D	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
C	11/12/16	STORMWATER DRAINAGE AND SITE LEVELS REVISED		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Earthworks



KFB ENGINEERS
ABN 28 351 246 509

Civil & Structural
20 Scott St, Cairns | PO Box 927, Cairns Q 4870
P: 07 40521700 | F: 07 40521634
E: email@kfbeng.com.au

JOB No: **K-2578**
SHEET: **C02 | E**
SCALE: 1:500 (@ A1)

LEGEND

- 8.40 --- EXISTING SURFACE CONTOUR (0.2m INTERVAL)
- S-S- EXISTING SEWER
- W-W- EXISTING WATER MAIN
- EXISTING TOP OF BANK
- 8.774 FINISHED SURFACE LEVEL
- 8.80 --- FINISHED SURFACE CONTOUR (0.2m INTERVAL)
- NEW STORMWATER DRAINAGE PIPE
- - - - - SUBSOIL DRAINAGE
- ☐ STORMWATER PIT / LINE No.
- ▭ NEW ROAD
- ▨ 50mm AC SURFACING TO INTERSECTIONS

GPT 1

DESIGN FLOW (Q5)	0.519 Cumecs
TREATMENT FLOW (3 MONTH)	0.141 Cumecs
PIPE DIAMETER	750Ø
TOP OF GPT	7.212
INLET LEVEL	5.389
OUTLET LEVEL	5.369



PLAN
SCALE 1:500 (A1)

NOTES

STORMWATER

- ALL CULVERTS SHALL BE IN ACCORDANCE WITH FNQROC STANDARD DRAWINGS AND RELEVANT AUSTRALIAN STANDARDS.
- PROVIDE SLOTTED DRAIN TAILS IN ACCORDANCE WITH FNQROC DWG No. S1050 AT THE DOWNSTREAM END OF STORMWATER PIPE REACHES ENTERING ALL PITS.

KERB AND CHANNEL

- TYPES SHALL BE ACCORDANCE WITH FNQROC DWG No. S1000 FOR ALL KERB AND CHANNEL

FOOTPATHS

- VERGE CROSS FALLS SHALL NOT EXCEED THOSE SPECIFIED.
- ALL FOOTPATHS SHALL BE HYDROMULCHED / GRASSED (DRILL SEEDING WITH APPROVED GRASS SPECIES), FERTILISED, AND MAINTAINED FOR THE REQUIRED MAINTENANCE PERIOD.

ALL WORKS

- CONSTRUCTION AND INSTALLATION OF ALL WORKS AS DETAILED ON THESE DRAWINGS SHALL BE IN ACCORDANCE WITH THE PROCEDURES, SPECIFICATIONS AND DRAWINGS CONTAINED IN THE CURRENT ISSUE OF THE FNQROC DEVELOPMENT MANUAL AND TO THE REQUIREMENTS OF THE CAIRNS REGIONAL COUNCIL.

COMPLIANCE WITH THE ASSESSMENT MANAGER CONDITIONS

- THE CONTRACTOR SHALL COMPLY WITH ALL ASSESSMENT MANAGER CONDITIONS SET OUT IN THE COUNCIL DECISION NOTICE FOR OPERATIONAL WORKS.

GENERAL NOTES

- TRAFFIC CONTROL DEVICES (ROAD EDGE GUIDE POSTS, SIGNS, ETC) SHALL BE SUPPLIED AND INSTALLED IN ACCORDANCE WITH THE REQUIREMENTS OF THE CURRENT ISSUE OF THE MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AS ISSUED BY THE DEPARTMENT OF TRANSPORT, QUEENSLAND AND FNQROC STD DWG S1041.
- THE CONTRACTOR SHALL LIAISE WITH THE RELEVANT AUTHORITIES TO CONFIRM THE LOCATION OF ALL EXISTING SERVICES, AND SHALL ARRANGE FOR THE REMOVAL OR RELOCATION OF ANY SERVICES WHICH WILL BE AFFECTED BY THE WORKS.
- ENSURE SERVICE CONDUITS ARE LAID BENEATH ANY EARLY WORKS FINISHES. E.g. WATER, POWER, TELECOMMUNICATIONS, ETC.
- THE CONTRACTOR SHALL REMOVE ALL EXISTING CONSTRUCTION, TREES, SERVICES ETC AS NECESSARY TO PERMIT CONSTRUCTION OF THE NEW WORKS.
- THE CONTRACTOR SHALL OBTAIN COUNCIL INSPECTIONS AND THEIR WITNESS TO TESTING PRIOR TO MAKING SERVICES LIVE. A COPY OF COUNCIL'S INSPECTION CERTIFICATE SHALL BE PROVIDED TO THE SUPERINTENDENT PRIOR TO PRACTICAL COMPLETION.

LANDSCAPING

- ALL INTERNAL & EXTERNAL LANDSCAPING SHALL BE ESTABLISHED AND MAINTAINED TO THE SATISFACTION OF THE COUNCIL.

SURVEY & EXISTING SERVICES

- LEVEL DATUM IS AHD. ORIGIN OF LEVELS PSM 52406 RL 9.293. MERIDIAN: SP252360
- ORIGIN OF COORDINATES: PSM 96085 E: 5002.531 N: 10000.315
- REFER RPS SURVEYORS FOR THE SURVEY STATION SETUP DETAILS
- THE EXISTING SERVICES SHOWN ON THESE DRAWINGS ARE DERIVED FROM SURFACE SURVEY AND COUNCIL RECORDS AND MAY NOT REPRESENT THE EXISTING SERVICES PRESENT BELOW THE SURFACE.
- THE CONTRACTOR SHALL BE RESPONSIBLE TO LOCATE ALL EXISTING SERVICES PRIOR TO ANY EXCAVATION, PARTICULARLY ON FOOTPATHS.
- ALL DAMAGE TO EXISTING SERVICES SHALL BE MADE GOOD TO THE SATISFACTION OF THE SUPERINTENDENT AND THE RELEVANT AUTHORITY, ALL AT THE CONTRACTORS EXPENSE. THE CONTRACTOR SHALL NOTIFY THE RELEVANT AUTHORITY IMMEDIATELY WHEN ANY DAMAGE OCCURS.
- THE LINE AND LEVEL OF EXISTING UNDERGROUND SERVICES SHALL BE DETERMINED BY THE CONTRACTOR AND THE ENGINEER SHALL BE NOTIFIED OF ANY POTENTIAL CLASHES WITH DESIGN STRUCTURES AND SERVICES PRIOR TO COMMENCING CONSTRUCTION.

- EXISTING OUTLET LEVELS OR CONNECTION LEVELS FOR ALL DESIGN STORMWATER AND SEWER SHALL BE CONFIRMED BY THE CONTRACTOR AND THE ENGINEER SHALL BE NOTIFIED OF ANY VARIATIONS PRIOR TO COMMENCING CONSTRUCTION.
- EXISTING SERVICES ON THE DRAWINGS ARE PLOTTED FROM THE BEST INFORMATION AVAILABLE. NO RESPONSIBILITY IS TAKEN BY THE PRINCIPAL OR SUPERINTENDENT FOR THE ACCURACY AND COMPLETENESS OF THE INFORMATION SHOWN.
- PRIOR TO THE COMMENCEMENT OF CONSTRUCTION THE CONTRACTOR IS TO ESTABLISH ON SITE THE EXACT POSITION OF ALL UNDERGROUND SERVICES IN THE PROPOSED WORKS AREA. METHODS FOR ACHIEVING THIS WILL INCLUDE BUT NOT BE LIMITED TO:-
 - CAREFUL EXAMINATION OF THE CONTRACT DRAWINGS.
 - CONSULTATION WITH THE RELEVANT SERVICE AUTHORITIES.
 - COMPREHENSIVELY SCANNING THE AFFECTED AREAS WITH A CABLE DETECTOR AND MARKING ON THE GROUND THE POSITION OF ALL SERVICES.
 - HAND EXCAVATING TO EXPOSE ALL SUCH SERVICES WHICH MAY BE AFFECTED BY THE PROPOSED WORKS UNDER THE DIRECTION OF THE RELEVANT SERVICE AUTHORITY.

'AS CONSTRUCTED' INFORMATION

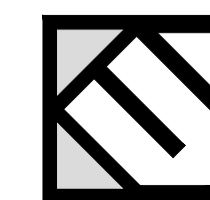
- THE CONTRACTOR SHALL PROVIDE 'AS CONSTRUCTED' DRAWINGS INCLUDING BOTH ELECTRONIC AND HARD COPIES CERTIFIED BY A REGISTERED SURVEYOR FOR ALL UNDERGROUND SERVICES INSTALLED FOR THIS PROJECT IN ACCORDANCE WITH FNQROC AND COUNCIL REQUIREMENTS.



E	23/05/19	STORMWATER DRAINAGE, SEWER PUMP STATION AND ROAD LEVELS REVISED		
D	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
C	11/12/16	STORMWATER DRAINAGE AND SITE LEVELS REVISED		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

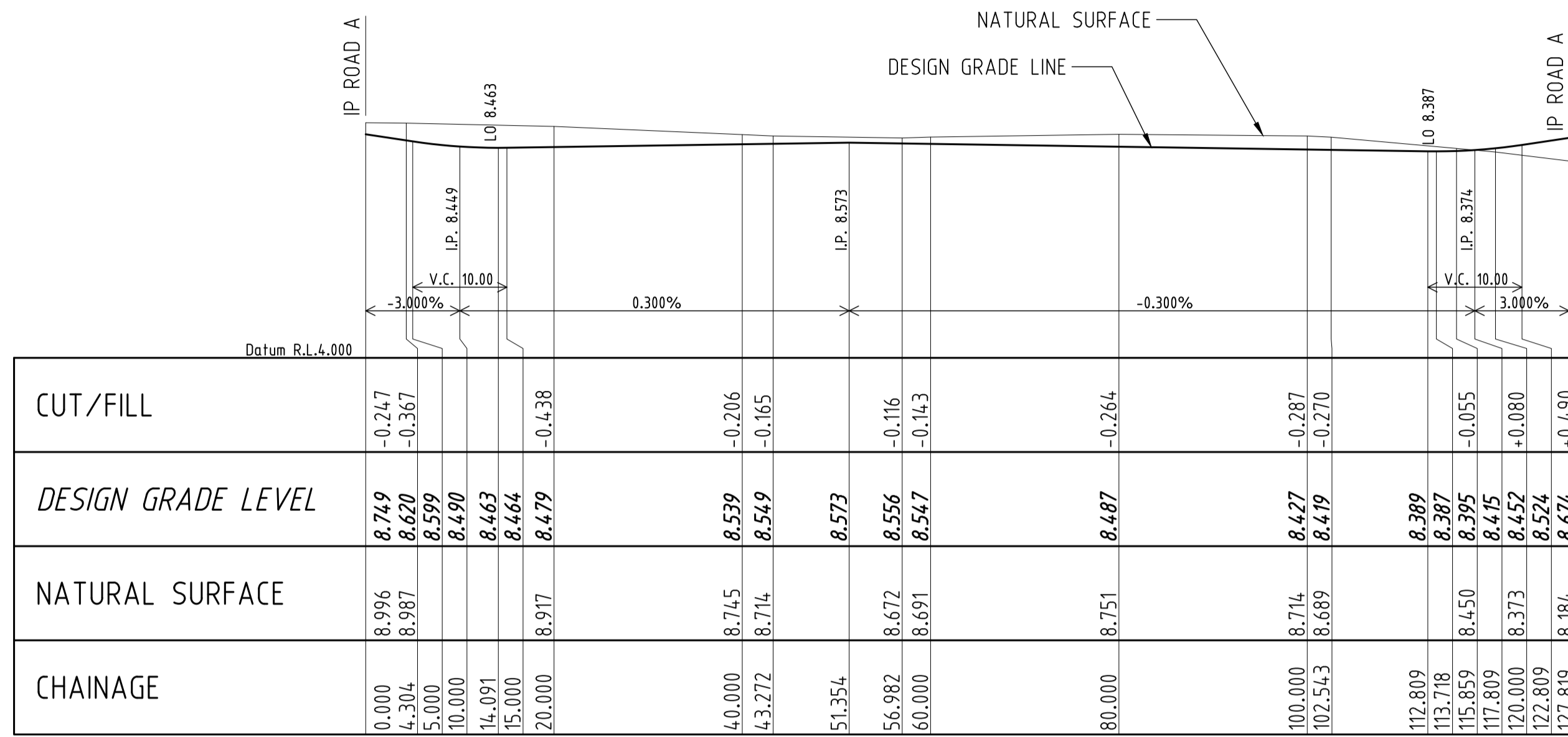
Roadworks and Stormwater
Drainage Layout



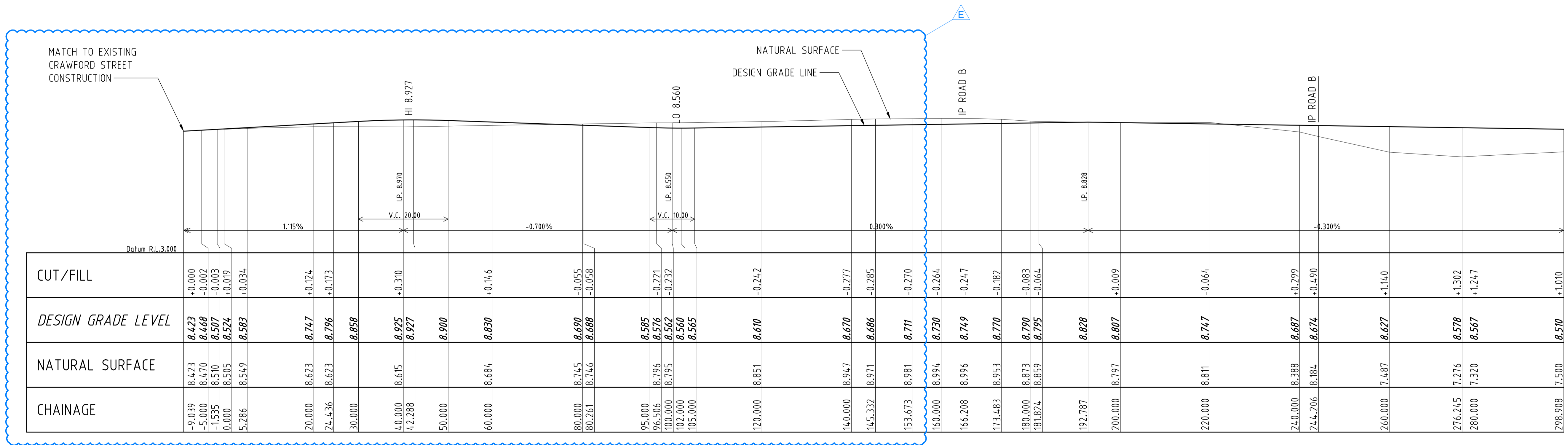
KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

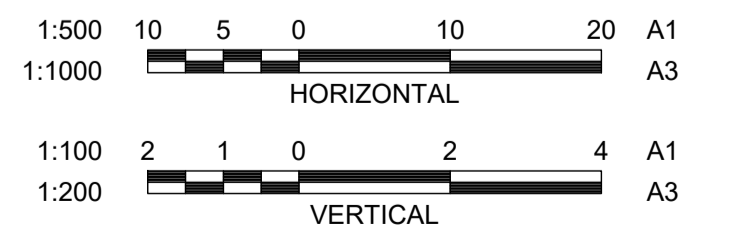
JOB No: **K-2578**
 SHEET: **C03 | E**
 SCALE: 1:500 (@A1)



LONGITUDINAL SECTION - ROAD A
SCALE: 1:500H 1:100V (A1)



LONGITUDINAL SECTION - ROAD B
SCALE: 1:500H 1:100V (A1)

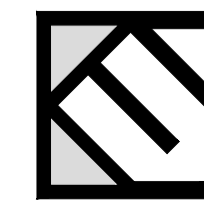


No.	DATE	ISSUE / REVISIONS	EWK	EFB
D	23/05/19	ROAD A REGRADED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		

DRAWING FILE: XREF FILE: N/A

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

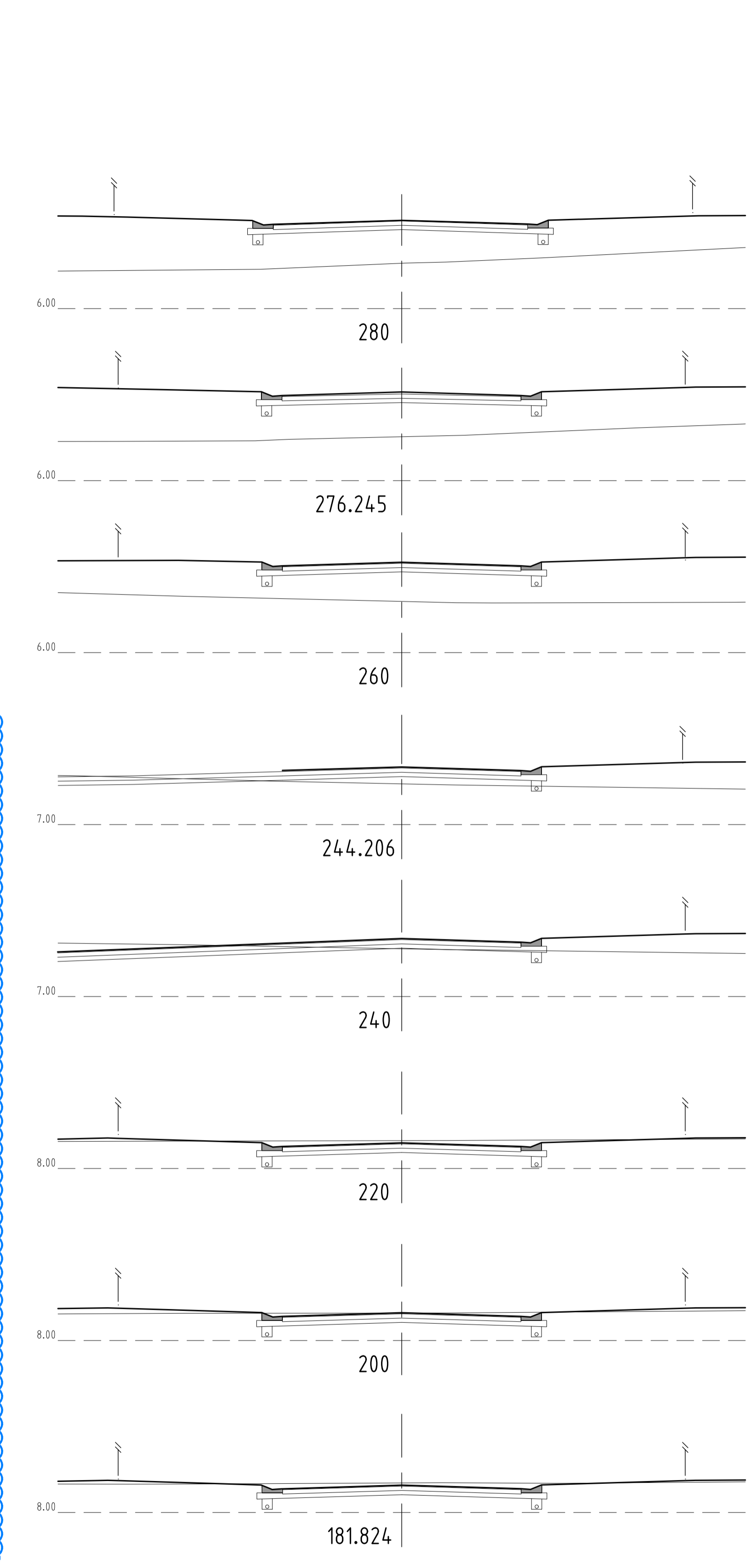
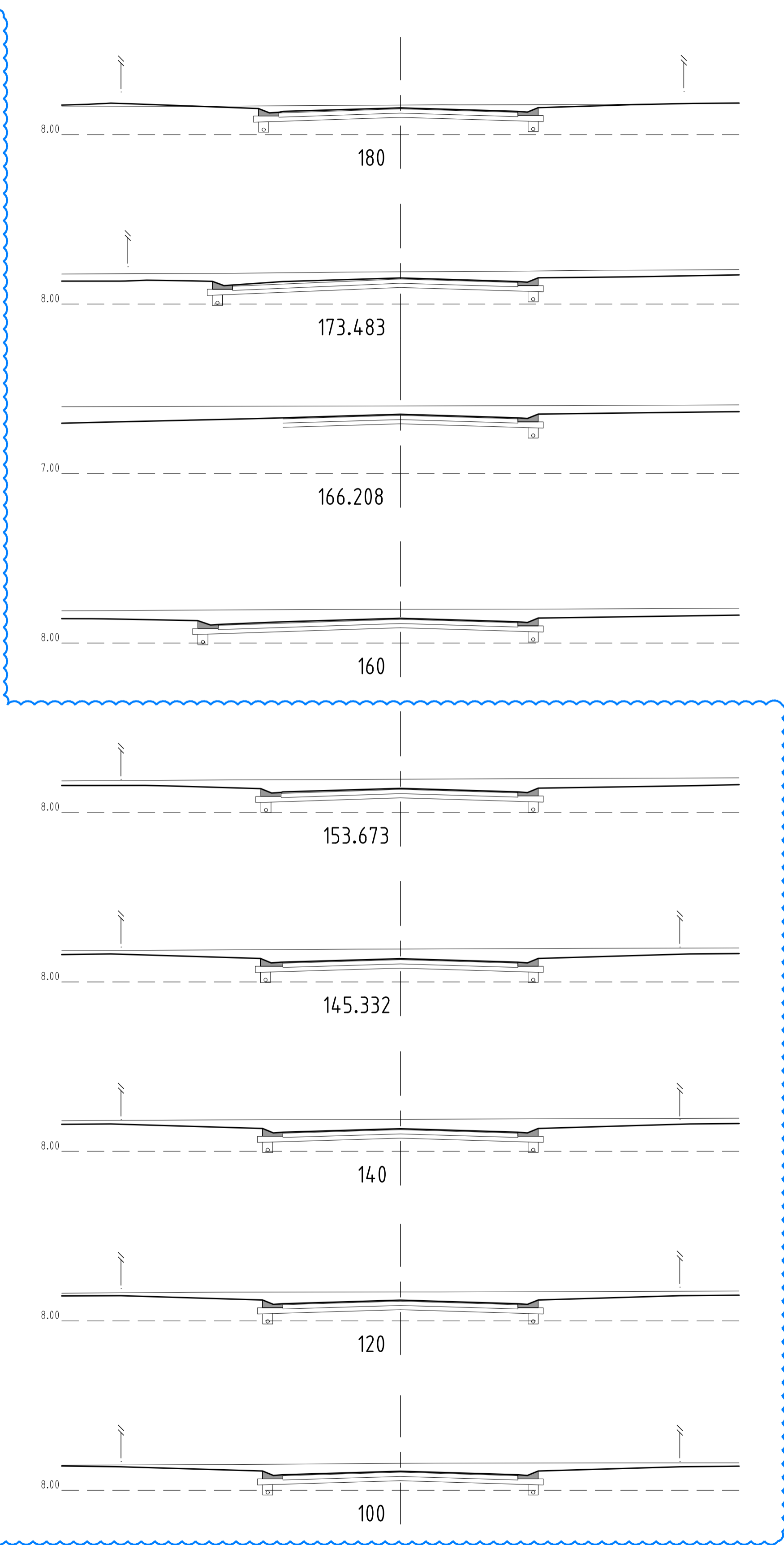
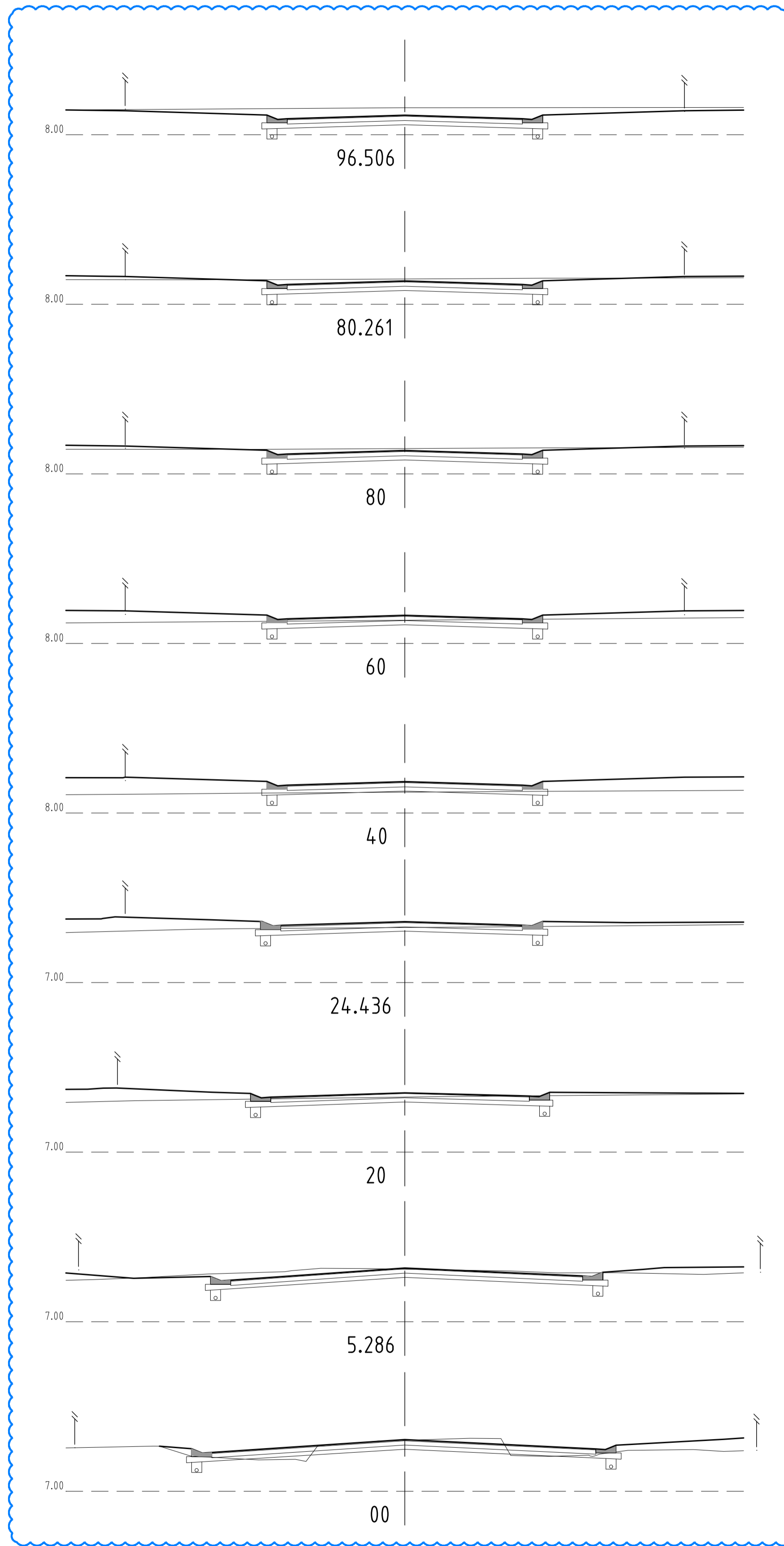
Road Longitudinal
Sections



KFB ENGINEERS
ABN 28 351 246 509

Civil & Structural
20 Scott St, Cairns | PO Box 927, Cairns Q 4870
P: 07 40521700 | F: 07 40521634
E: email@kfbeng.com.au

JOB No: **K-2578**
SHEET: **C04 | E**
SCALE: 1:500H 1:100V (@ A1)



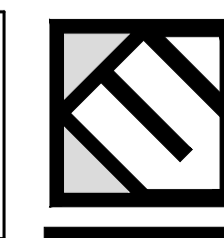
ROAD A

D

D	23/05/19	ROAD A REGRADED			
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS			
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE			
A	18/07/16	ORIGINAL ISSUE			
No.	DATE	ISSUE / REVISIONS	EWK	EFB	
			DRN	CHKD	
DRAWING FILE:		XREF FILE: N/A			

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

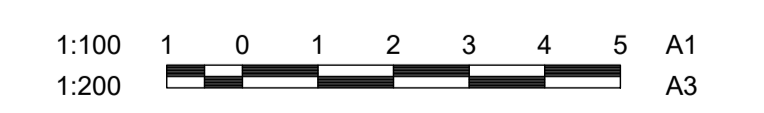
Road Cross Sections
 Sheet 1

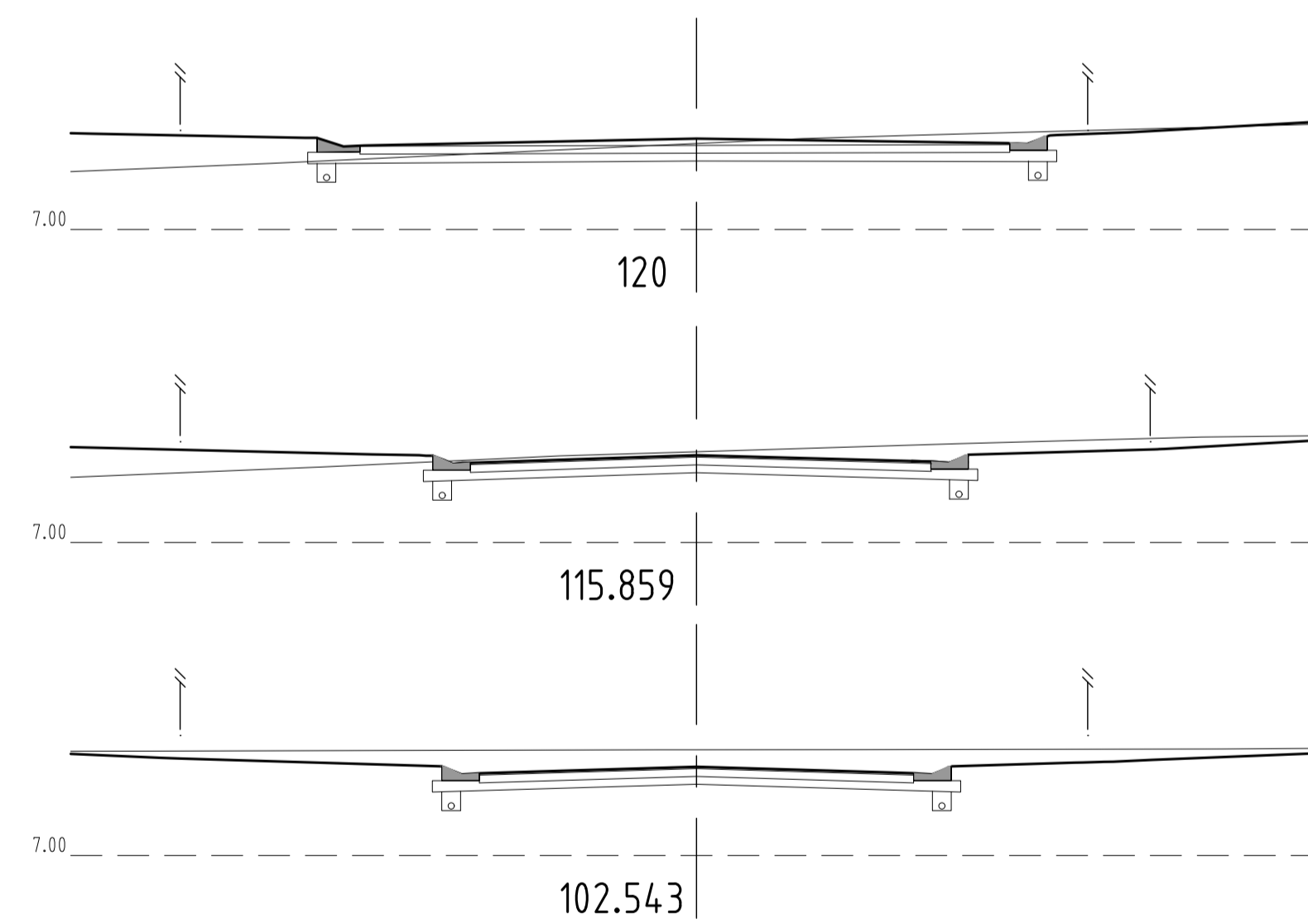
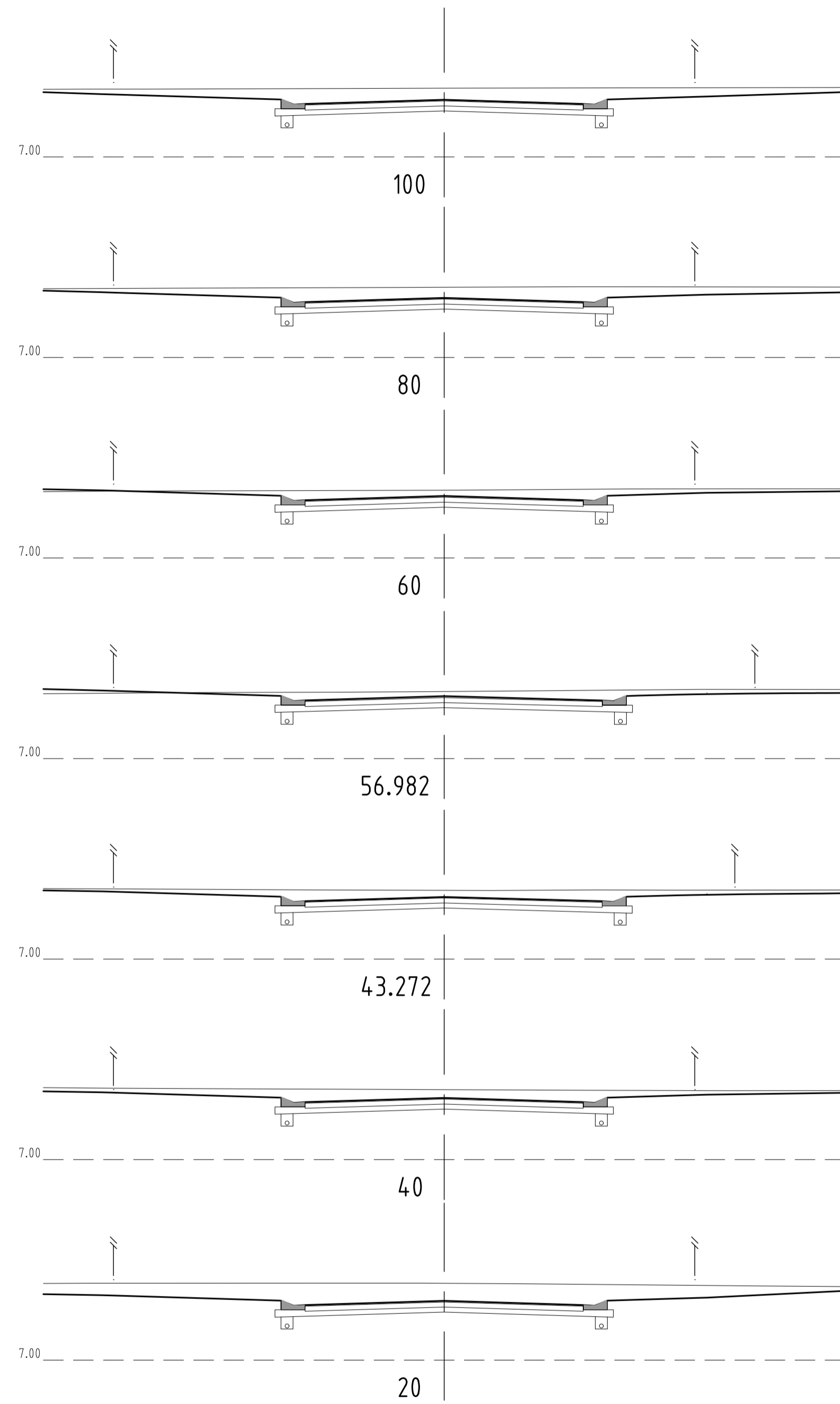


KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C05** | **D**
 SCALE: 1:100 (@ A1)





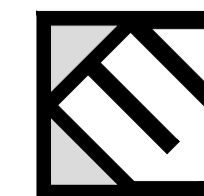
ROAD B



C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE	EWK	EFB
No.	DATE	ISSUE / REVISIONS	DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

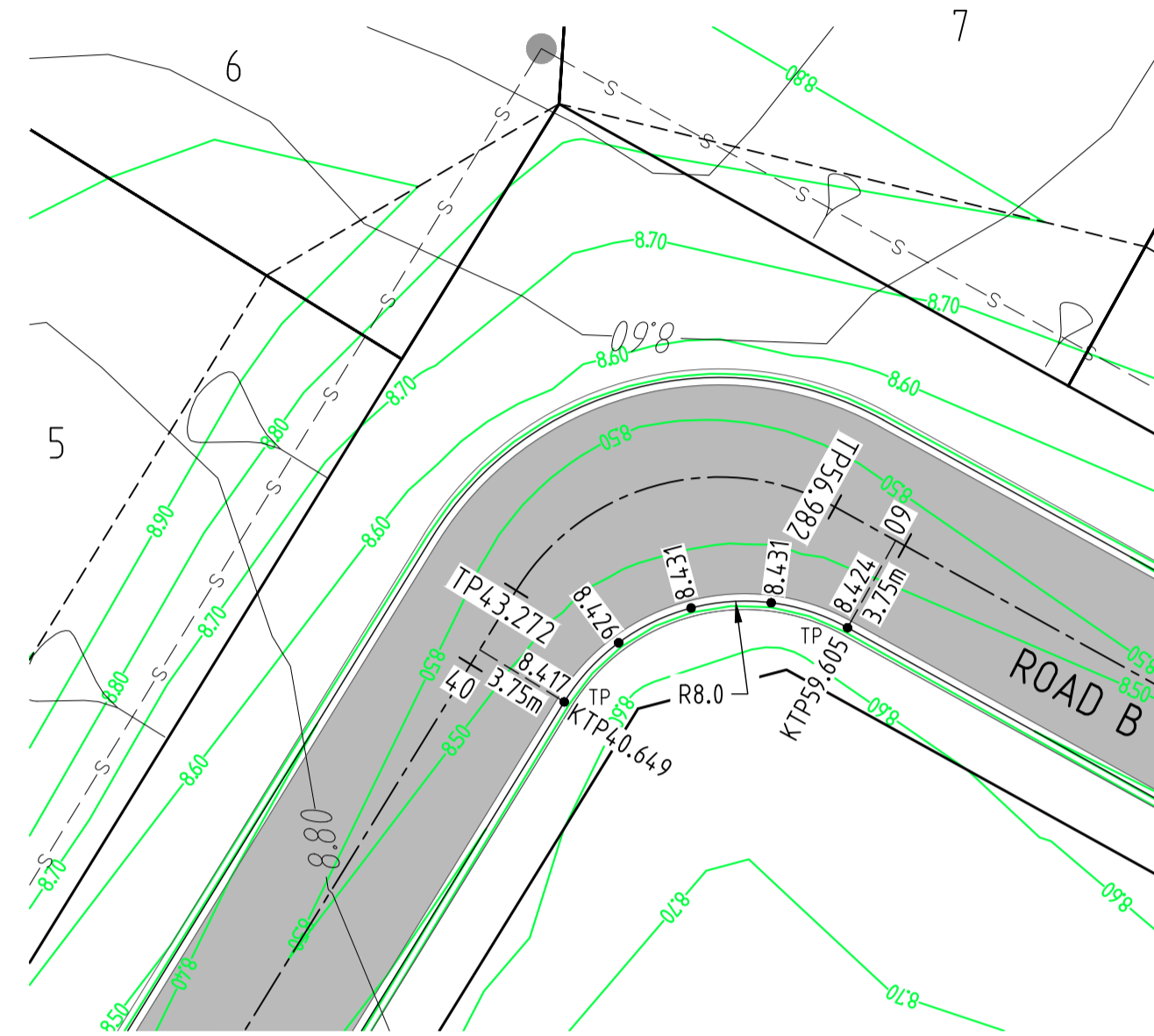
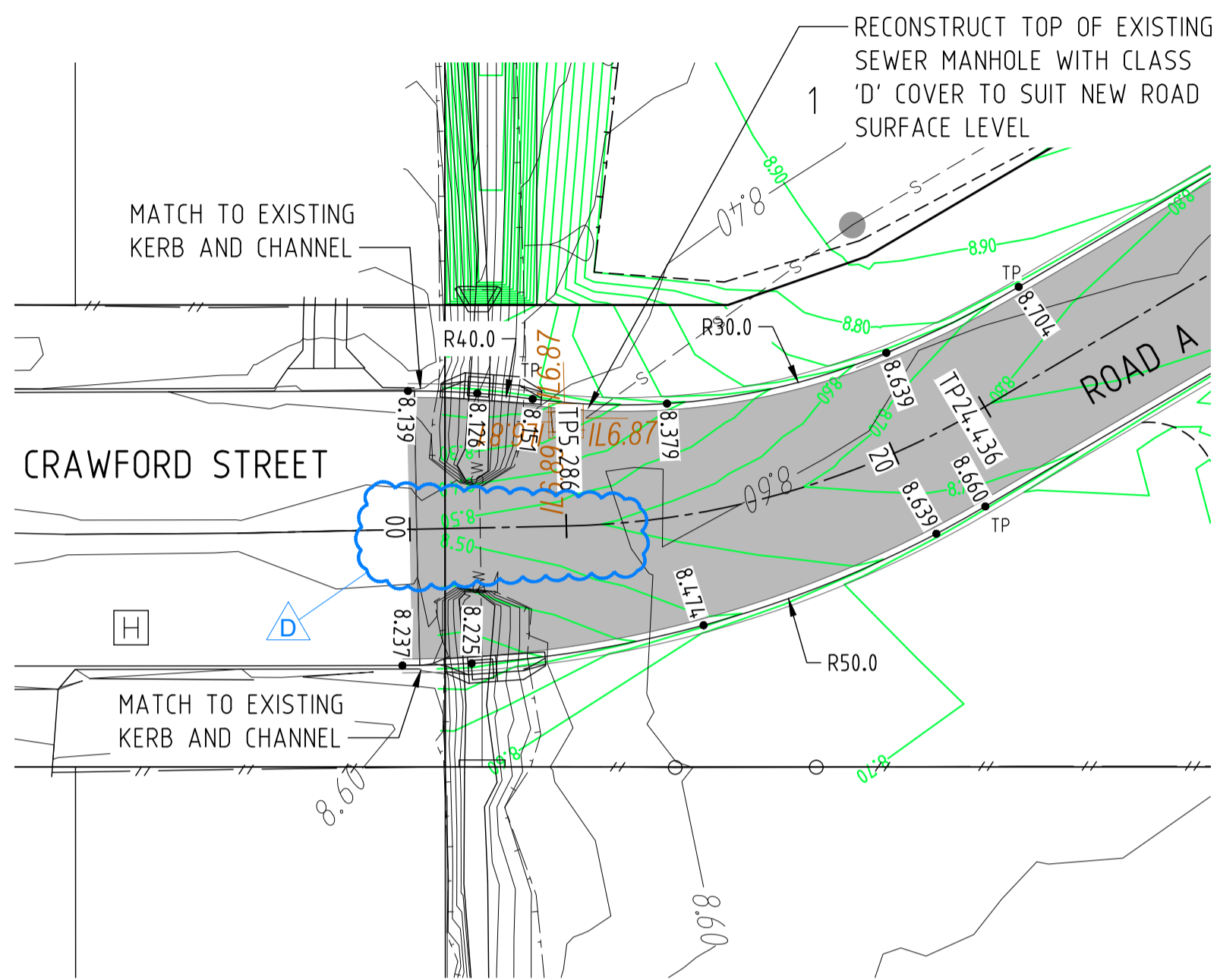
Road Cross Sections
 Sheet 2



KFB ENGINEERS
 ABN 28 351 246 509

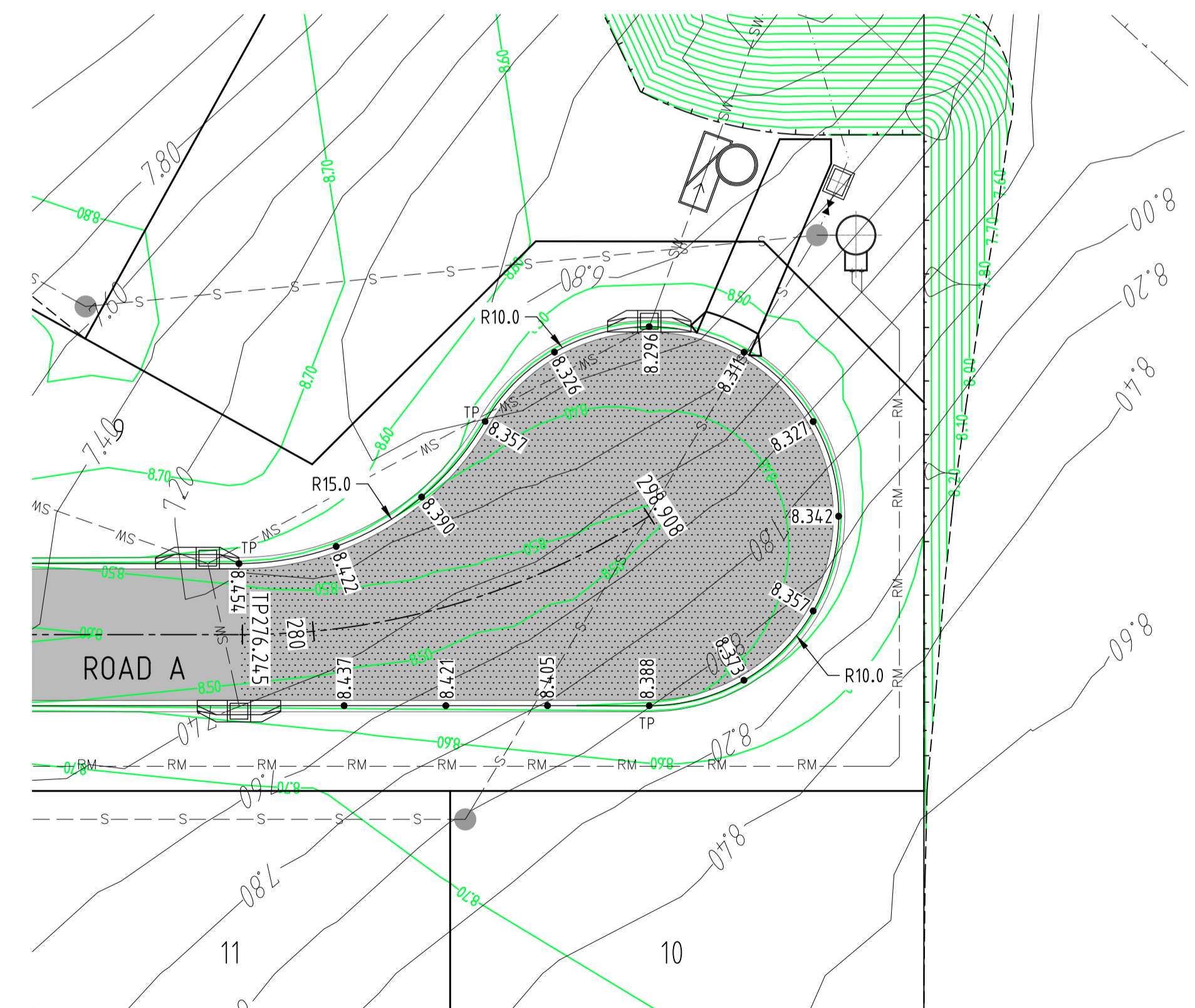
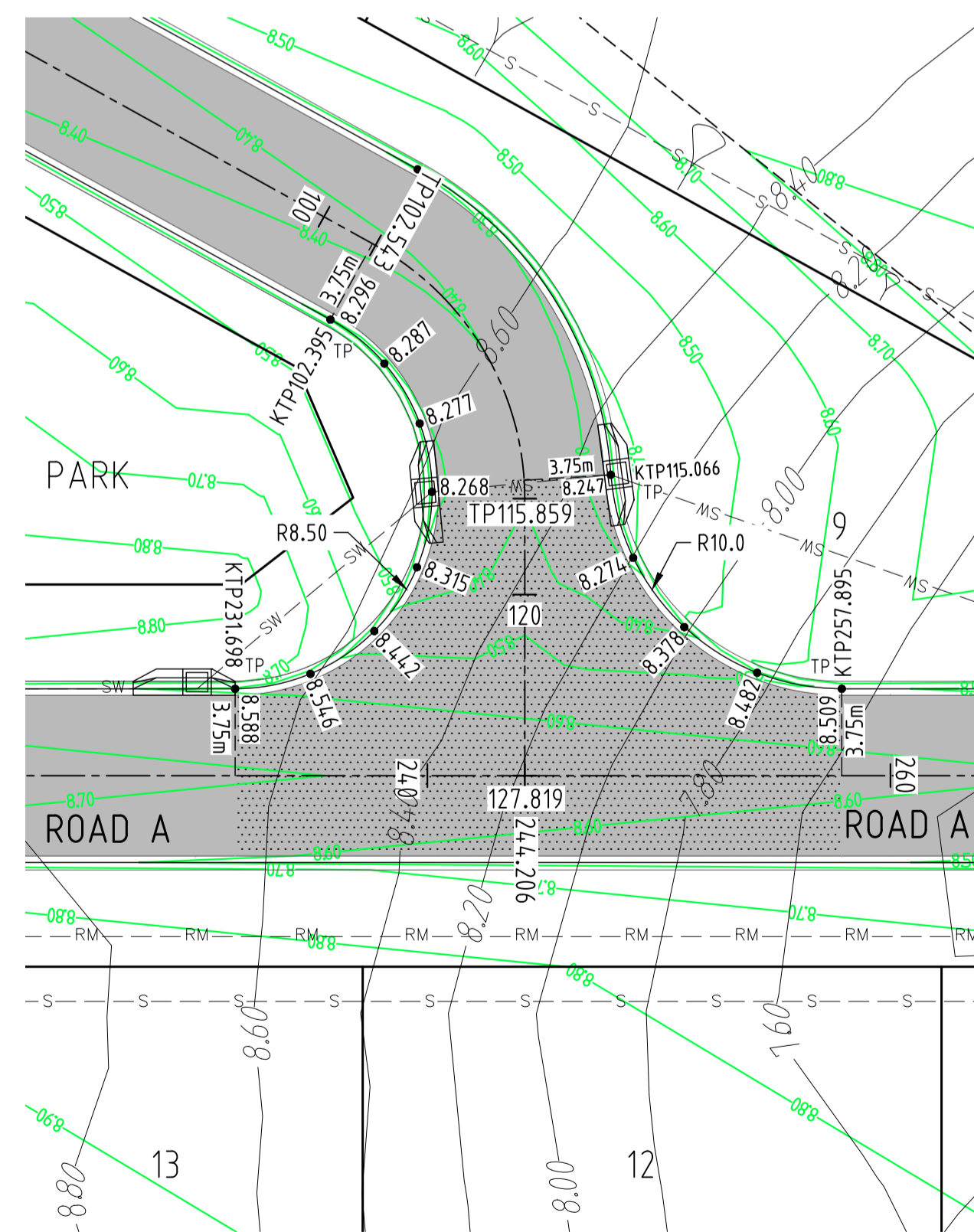
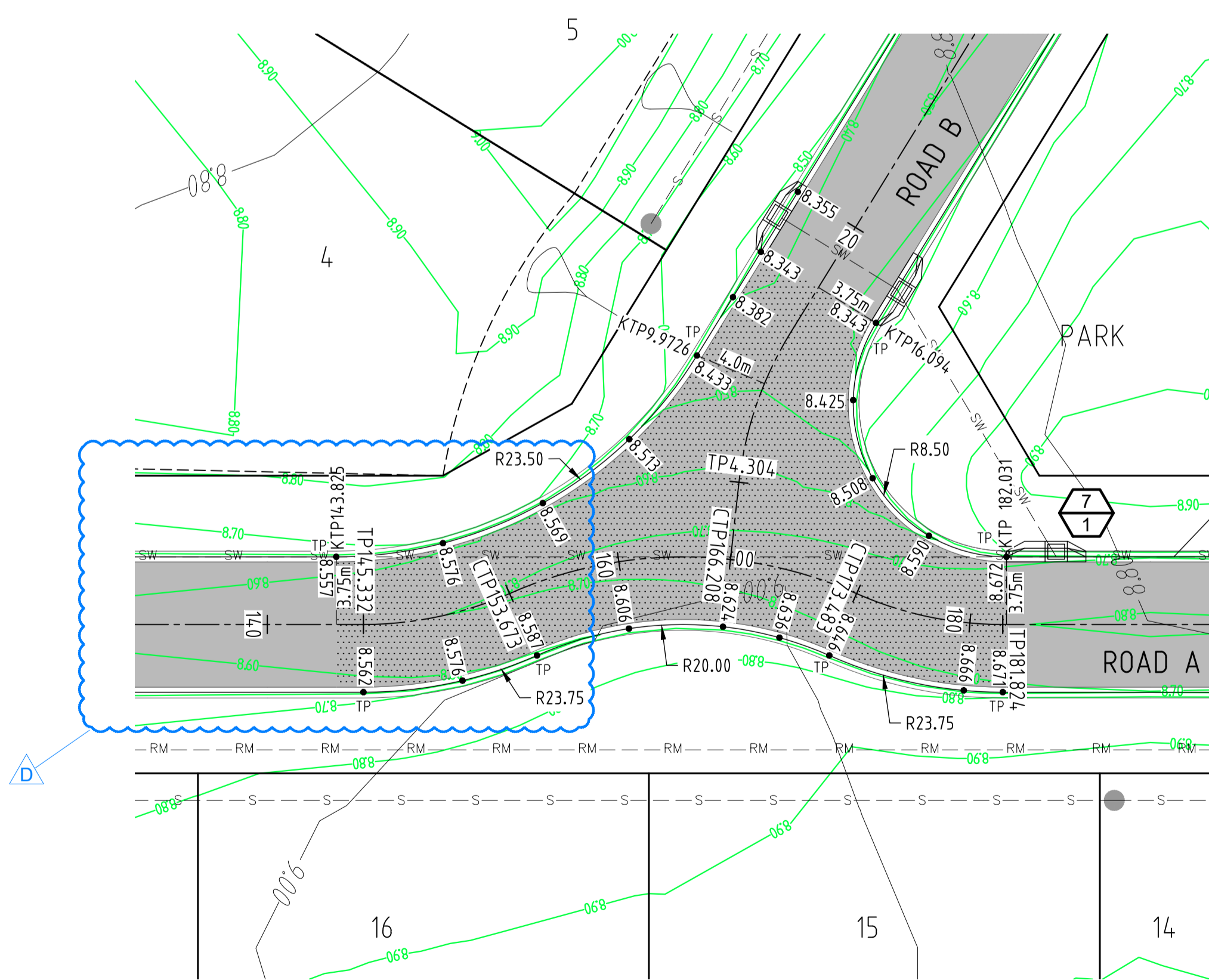
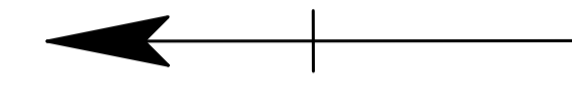
Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C06 | C**
 SCALE: 1:100 (@ A1)



LEGEND

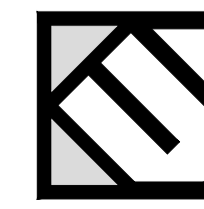
- 7.598 DESIGN KERB INVERT LEVEL
- FINISHED SURFACE CONTOUR
- LKC FINOROC LAYBACK KERB AND CHANNEL
- 50mm AC SURFACING TO INTERSECTIONS



D	23/05/19	TRAFFIC ISLAND REMOVED & ROAD A REGRADED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

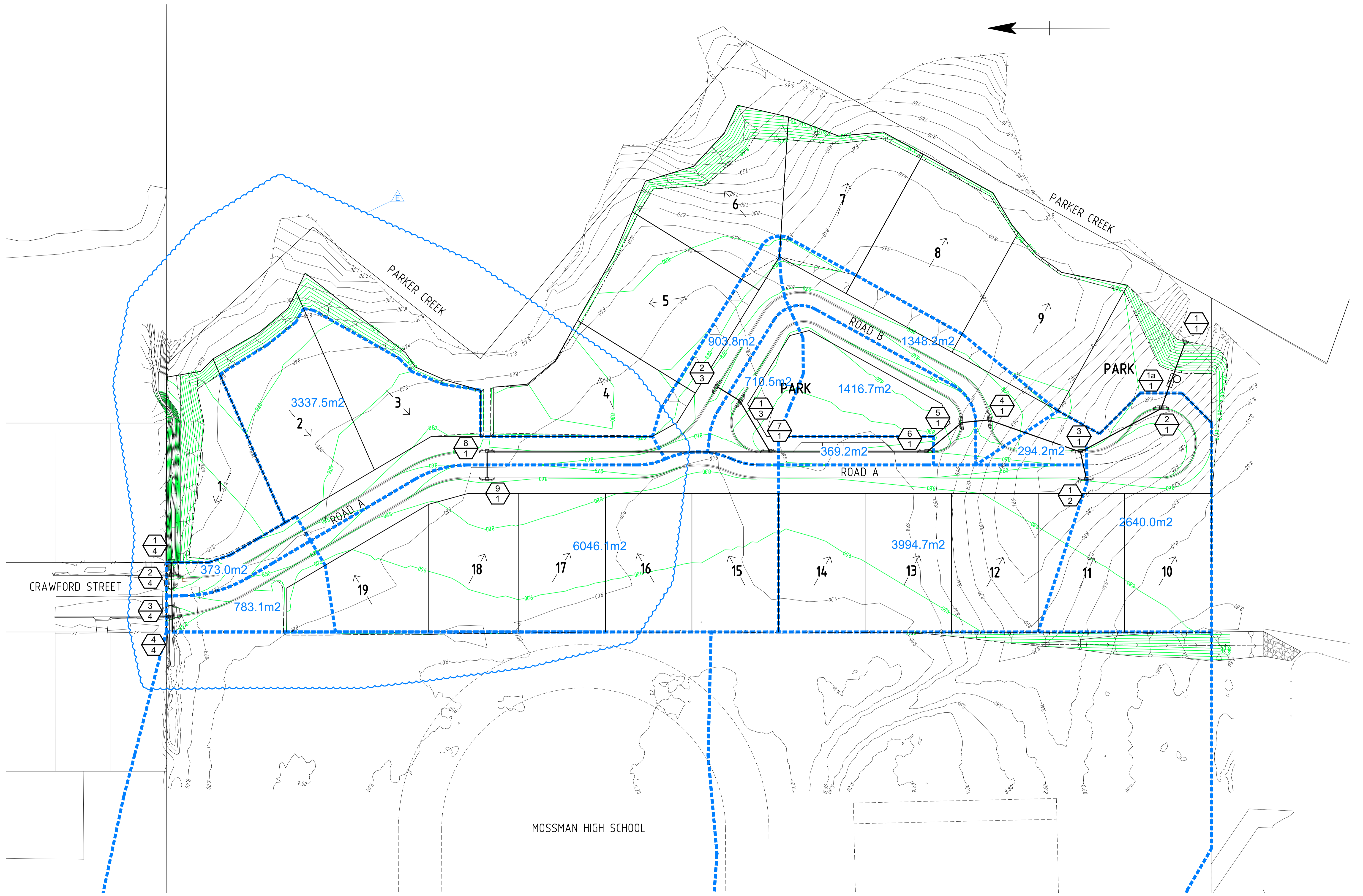
Intersection
 Details



KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C07 | D**
 SCALE: 1:250 (@A1)



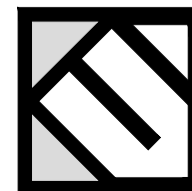
PLAN
SCALE 1:500 (A1)

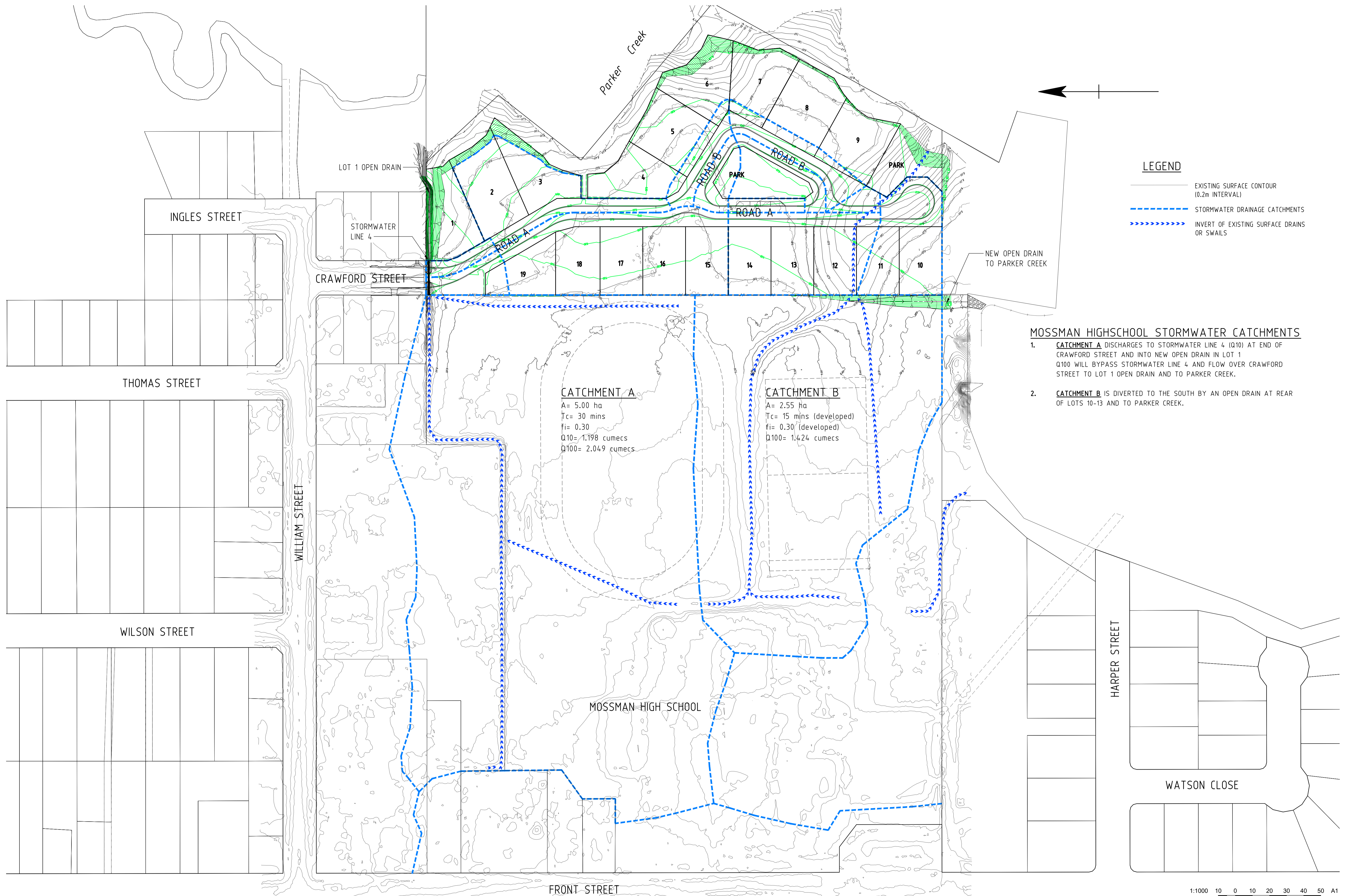


E	23/05/19	ROAD A REGRADED AND STORMWATER DRAINAGE REVISED			
D	30/04/18	REDESIGN FOR NEW DESIGN LEVELS			
C	11/12/16	STORMWATER DRAINAGE AND SITE LEVELS REVISED			
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE			
No.	DATE	ISSUE / REVISIONS	EWK	EFB	
			DRN	CHKD	
DRAWING FILE:		XREF FILE: N/A			

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Internal Stormwater
 Drainage Catchment Plan

 KFB ENGINEERS ABN 28 351 246 509	Civil & Structural	JOB No: K-2578
	20 Scott St, Cairns PO Box 927, Cairns Q 4870 P: 07 40521700 F: 07 40521634 E: email@kfbeng.com.au	SHEET: C08 E SCALE: 1:500 (@A1)



- LEGEND**
- EXISTING SURFACE CONTOUR (0.2m INTERVAL)
 - STORMWATER DRAINAGE CATCHMENTS
 - ==== INVERT OF EXISTING SURFACE DRAINS OR SWAILS

MOSSMAN HIGHSCHOOL STORMWATER CATCHMENTS

1. **CATCHMENT A** DISCHARGES TO STORMWATER LINE 4 (Q10) AT END OF CRAWFORD STREET AND INTO NEW OPEN DRAIN IN LOT 1. Q100 WILL BYPASS STORMWATER LINE 4 AND FLOW OVER CRAWFORD STREET TO LOT 1 OPEN DRAIN AND TO PARKER CREEK.
2. **CATCHMENT B** IS DIVERTED TO THE SOUTH BY AN OPEN DRAIN AT REAR OF LOTS 10-13 AND TO PARKER CREEK.

CATCHMENT A
 A= 5.00 ha
 Tc= 30 mins
 fi= 0.30
 Q10= 1.198 cumecs
 Q100= 2.049 cumecs

CATCHMENT B
 A= 2.55 ha
 Tc= 15 mins (developed)
 fi= 0.30 (developed)
 Q10= 1.424 cumecs



C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

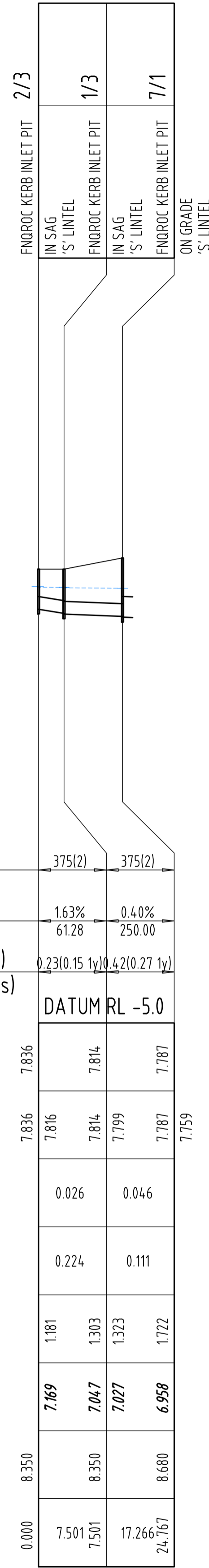
External Stormwater
 Drainage Catchment Plan

KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C09 C**
 SCALE: 1:1000 (@A1)

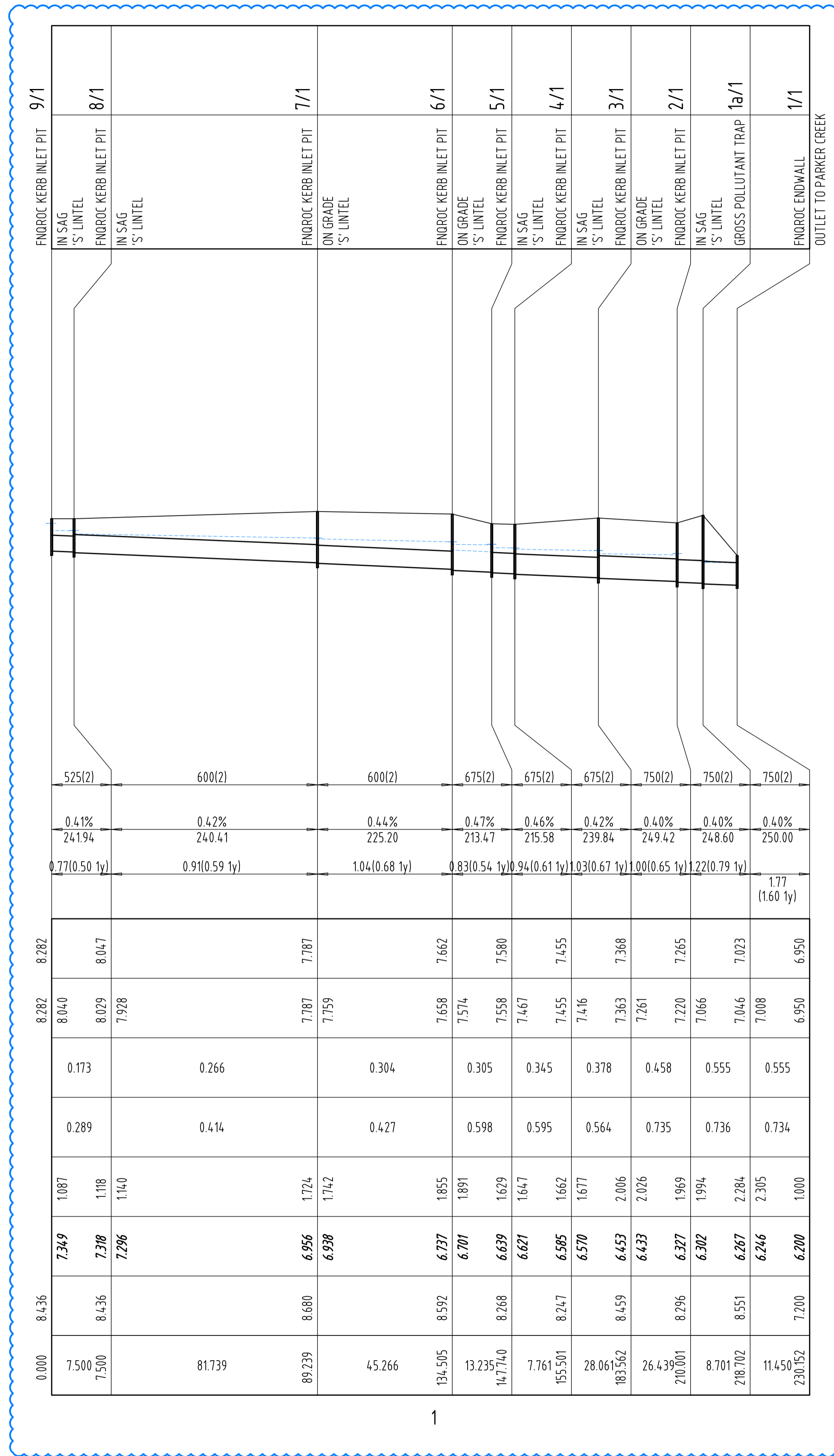
STRUCTURE NAME
STRUCTURE DESCRIPTION



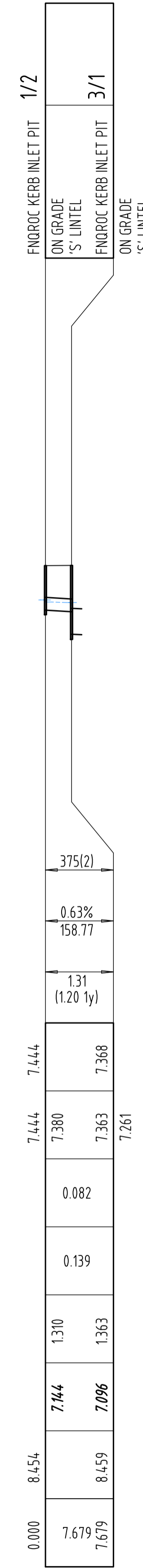
PIPE SIZEmm (Class)	375(2)	375(2)
PIPE GRADE %	1.63%	0.40%
PIPE SLOPE 1 in X	61.28	250.00
FULL PIPE FLOW VELOCITY (m/s)	0.23(0.15 1y)	0.42(0.27 1y)
PART FULL FLOW VELOCITY (m/s)		

WATER LEVEL IN STRUCTURE	7.836	7.836
HYDRAULIC GRADE LEVEL	7.816	7.814
PIPE FLOW (Q5) (Cumecs)	0.026	0.046
PIPE CAPACITY AT GRADE (Cumecs)	0.224	0.111
DEPTH TO INVERT	1.181	1.303
INVERT LEVEL OF DRAIN	7.169	7.047
DESIGN SURFACE LEVEL	8.350	8.680
RUNNING CHAINAGE	7.501	17.266

LINE 3

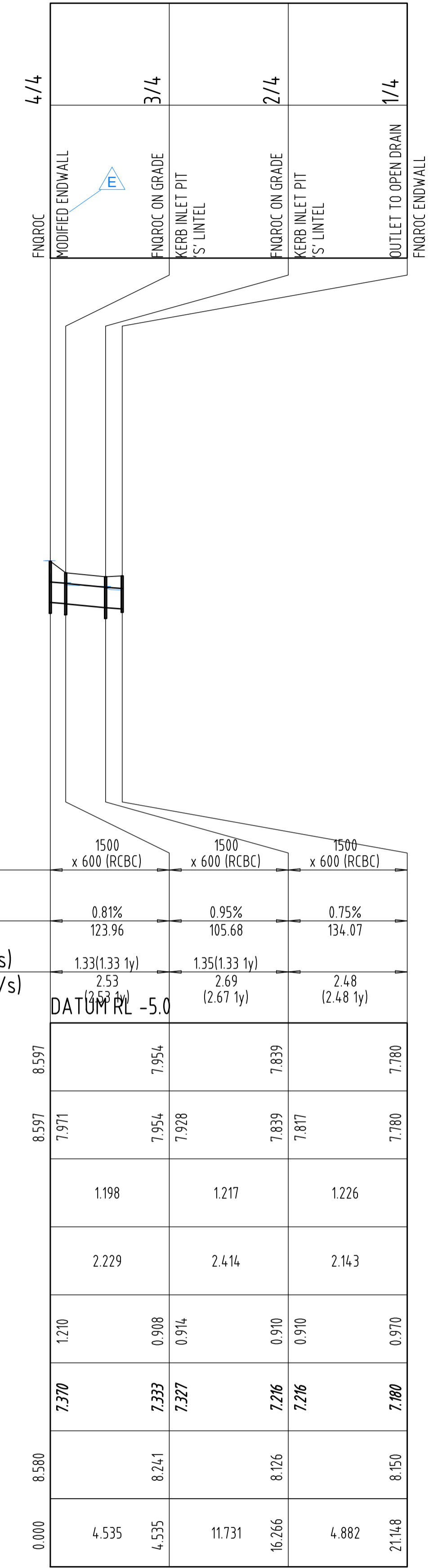


LINE 1



LINE 2

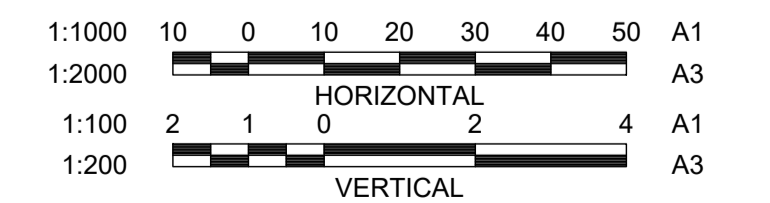
STRUCTURE NAME
STRUCTURE DESCRIPTION



PIPE SIZEmm (Class)	1500 x 600 (RCBC)	1500 x 600 (RCBC)	1500 x 600 (RCBC)
PIPE GRADE %	0.81%	0.95%	0.75%
PIPE SLOPE 1 in X	123.96	105.68	134.07
FULL PIPE FLOW VELOCITY (m/s)	1.33(1.33 1y)	1.35(1.33 1y)	2.48 (2.48 1y)
PART FULL FLOW VELOCITY (m/s)	2.53 (2.53 1y)	2.69 (2.67 1y)	

WATER LEVEL IN STRUCTURE	8.597	7.954	7.839	7.780
HYDRAULIC GRADE LEVEL	7.971	7.954	7.817	7.780
PIPE FLOW (Q10) (Cumecs)	1.198	1.217		
PIPE CAPACITY AT GRADE (Cumecs)	2.229	2.414		2.143
DEPTH TO INVERT	1.210	0.908	0.910	0.910
INVERT LEVEL OF DRAIN	7.370	7.333	7.216	7.216
DESIGN SURFACE LEVEL	8.580	8.241	8.126	8.150
RUNNING CHAINAGE	4.535	11.731	16.266	21.148

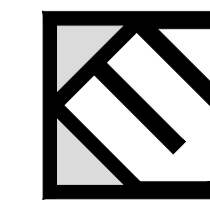
LINE 4



E	23/05/19	ROAD A REGRADED AND STORMWATER DRAINAGE REVISED		
D	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
C	11/12/16	STORMWATER DRAINAGE AND SITE LEVELS REVISED		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

Stormwater Drainage
 Longitudinal Sections



KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C10 | E**
 SCALE: 1:1000H 1:100V (@ A1)

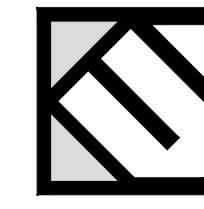
DESIGN ARI	STRUCTURE No.	DRAIN SECTION	SUB-CATCHMENTS CONTRIBUTING	TIME		SUB-CATCHMENT RUNOFF					INLET DESIGN					DRAIN DESIGN										HEADLOSSES								PART FULL		DESIGN LEVELS							
				min	mm/h	10yr RUNOFF CO-EFFICIENT OF RUNOFF	C	A	CxA	+CA	Q	Qg	Qb	BYPASS STRUCTURE No.	tc	l	+CA	Qt	Qm	Qs	Qp	L	S	V	T	STRUCTURE CHART No.	STRUCTURE RATIOS FOR 'K' VALUE CALCULATIONS	VELOCITY HEAD V2/2g	U/S HEADLOSS COEFFICIENT Ku	U/S PIPE STRUCT. HEADLOSS hu	LAT. HEADLOSS CO-EFFICIENT Kl	LAT. PIPE STRUCT. HEADLOSS hl	W.S.E CO-EFFICIENT Kw	CHANGE IN W.S.E hw	PIPE FRICTION SLOPE Sf	PIPE FRICTION HEADLOSS (IL * Sf) hf	DEPTH	VELOCITY Vp	OBVERT LEVELS	DRAIN SECTION H.G.L	UPSTREAM H.G.L	LAT. H.G.L	W.S.E
5	100	2/3 to 1/3	2/3	15.00	139	0.74	0.090	0.067	0.067	26	26	0.00	1754	101510	26	0	15.00	139	0.067	52		26	7501	1.63	375(210) (2.03)	0.13	0.003	1.73	0.020			7.73	0.020	0.02	0.002			7.544	7.816	7.836	7.836	8.350	2/3
5	100	1/3 to 7/1	2/3,1/3	15.00	139	0.74	0.071	0.053	0.053	20	20	0.00	1754	101510	20	0	15.13	138	0.120	93		46	17.266	0.40	375(210) (1.00)	0.29	0.009	1.67	0.015			1.67	0.015	0.07	0.012			7.402	7.799	7.814	7.814	8.350	1/3
5	100	9/1 to 8/1	9/1	15.00	139	0.74	0.605	0.448	0.448	173	173	0.00	1754	101510	173	0	15.00	139	0.448	349		173	7500	0.41	525(210) (1.29)	0.13	0.030	8.01	0.242			8.01	0.242	0.15	0.011			7.883	8.040	8.282	8.282	8.436	9/1
5	100	8/1 to 7/1	9/1,8/1	15.00	139	0.74	0.334	0.247	0.247	95	95	0.00	1754	101510	95	0	15.13	138	0.695	540		266	81.739	0.42	600(210) (1.42)	1.36	0.042	2.40	0.101			2.81	0.119	0.17	0.141			7.906	7.928	8.029	8.047	8.436	8/1
5	100	7/1 to 6/1	2/3,1/3,9/1,8/1,7/1	15.00	139	0.74	0.001	0.001	0.001	0	0	0.30	144	1	0	16.49	134	0.816	610		304	45.266	0.44	600(210) (1.46)	0.73	0.055	0.50	0.028			0.50	0.028	0.22	0.101			7.548	7.759	7.787	7.787	8.680	7/1	
5	100	6/1 to 5/1	2/3,1/3,9/1,8/1,7/1, 6/1	15.00	139	0.74	0.037	0.027	0.027	10	11	0.30	144	1	8	17.22	131	0.843	619		314	305	13.235	0.47	675(210) (1.62)	0.22	0.035	2.38	0.084			2.51	0.088	0.12	0.016			7.386	7.574	7.658	7.662	8.592	6/1
5	100	5/1 to 4/1	2/3,1/3,9/1,8/1,7/1, 6/1,5/1	15.00	139	0.74	0.142	0.105	0.105	41	43	0.00	1754	101510	43	0	17.44	131	0.948	692		345	7.761	0.46	675(210) (1.61)	0.13	0.045	2.02	0.091			2.51	0.113	0.16	0.012			7.306	7.467	7.558	7.580	8.268	5/1
5	100	4/1 to 3/1	2/3,1/3,9/1,8/1,7/1, 6/1,5/1,4/1	15.00	139	0.74	0.135	0.100	0.127	39	39	0.00	1754	101510	39	0	17.57	130	1.048	762		378	28.061	0.42	675(210) (1.53)	0.45	0.054	0.73	0.039			0.73	0.039	0.19	0.053			7.255	7.416	7.455	7.455	8.247	4/1
5	100	1/2 to 3/1	1/2	15.00	139	0.74	0.400	0.296	0.296	114	114	0.30	144	1	82	15.00	139	0.296	231		82	7.679	0.63	375(210) (1.26)	0.13	0.028	1.00	0.064			1.00	0.064	0.22	0.017	0.208	0.131	7.519	7.380	7.444	7.444	8.454	1/2	
5	100	3/1 to 2/1	2/3,1/3,9/1,8/1,7/1, 6/1,5/1,4/1,1/2,3/1	15.00	139	0.74	0.029	0.022	0.022	8	8	0.30	144	1	7	18.02	129	1.366	983		458	26.439	0.40	750(210) (1.61)	0.44	0.051	1.99	0.102			2.10	0.107	0.16	0.041			7.195	7.261	7.363	7.368	8.459	3/1	
5	100	2/1 to 1a/1	2/3,1/3,9/1,8/1,7/1, 6/1,5/1,4/1,1/2,3/1, 2/1	15.00	139	0.74	0.264	0.195	0.248	75	109	0.00	1754	101510	109	0	18.46	128	1.561	1113		555	8.701	0.40	750(210) (1.61)	0.12	0.076	2.03	0.154			2.63	0.199	0.23	0.020			7.064	7.066	7.220	7.265	8.296	2/1
5	100	1a/1 to 1/1	2/3,1/3,9/1,8/1,7/1, 6/1,5/1,4/1,1/2,3/1, 2/1,1a/1	15.00	139	0.74	0.001	0.001	0.001	0	0	0.00	1754	101510	0	0	18.58	127	1.562	1108		555	11.450	0.40	750(210) (1.61)	0.16	0.076	0.50	0.038			0.20	0.015	0.23	0.026	0.495	0.177	7.008	7.008	7.046	7.023	8.551	1a/1

10	100	4/4 to 3/4	4/4	30.00	113	0.76	5.000	3.800	3.800	1193	1193	0.00	2391	101520	1193	0	30.00	113	3.800	2048		1198	4.535	0.81	1500 (331) (2.47)	0.06	0.090	6.95	0.626			6.95	0.626	0.23	0.011	0.315	2.53	7.971	7.971	8.597	8.597	8.580	4/4
10	100	3/4 to 2/4	4/4,3/4	15.00	153	0.78	0.078	0.061	0.061	26	26	0.00	1991	101510	26	0	30.06	113	3.861	2081		1217	11.731	0.95	1500 (331) (2.68)	0.14	0.093	0.28	0.026			0.28	0.026	0.24	0.028	0.302	2.69	7.928	7.928	7.954	7.954	8.241	3/4
10	100	2/4 to 1/4	4/4,3/4,2/4	15.00	153	0.78	0.037	0.029	0.029	12	12	0.00	1991	101510	12	0	30.20	113	3.890	2084		1226	4.882	0.75	1500 (331) (2.38)	0.06	0.094	0.23	0.022			0.23	0.022	0.24	0.012	0.329	2.48	7.817	7.817	7.839	7.839	8.126	2/4

D	23/05/19	ROAD A REGRADED AND STORMWATER DRAINAGE REVISED			
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS			
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE			
A	18/07/16	ORIGINAL ISSUE			
No.	DATE	ISSUE / REVISIONS	EWK	EFB	
			DRN	CHKD	
DRAWING FILE:		XREF FILE: N/A			

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Stormwater Drainage
Calculations



KFB ENGINEERS
ABN 28 351 246 509

Civil & Structural
20 Scott St, Cairns | PO Box 927, Cairns Q 4870
P: 07 40521700 | F: 07 40521634
E: email@kfbeng.com.au

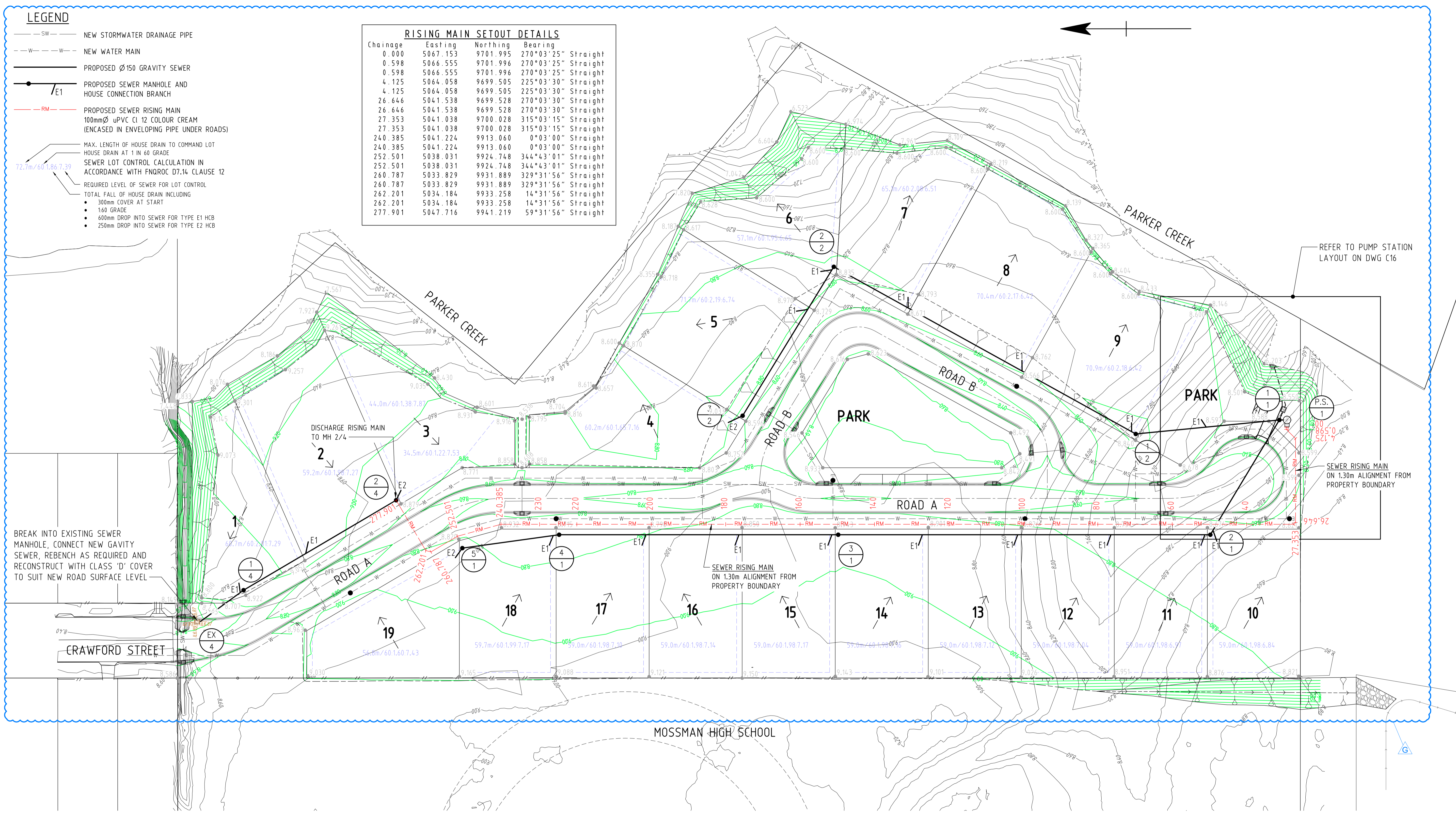
AS SHOWN

JOB No: **K-2578**
SHEET: **C11** | **D**
SCALE: N.T.S (@A1)

LEGEND

- SW — NEW STORMWATER DRAINAGE PIPE
- W — NEW WATER MAIN
- PROPOSED Ø150 GRAVITY SEWER
- E1 — PROPOSED SEWER MANHOLE AND HOUSE CONNECTION BRANCH
- RM — PROPOSED SEWER RISING MAIN
100mm Ø UPVC CI 12 COLOUR CREAM
(ENCASED IN ENVELOPING PIPE UNDER ROADS)
- MAX. LENGTH OF HOUSE DRAIN TO COMMAND LOT HOUSE DRAIN AT 1 IN 60 GRADE
- SEWER LOT CONTROL CALCULATION IN ACCORDANCE WITH FNQROC D7.14 CLAUSE 12
- REQUIRED LEVEL OF SEWER FOR LOT CONTROL
- TOTAL FALL OF HOUSE DRAIN INCLUDING
 - 300mm COVER AT START
 - 160 GRADE
 - 600mm DROP INTO SEWER FOR TYPE E1 HCB
 - 250mm DROP INTO SEWER FOR TYPE E2 HCB

RISING MAIN SETOUT DETAILS					
Chainage	Easting	Northing	Bearing		
0.000	5067.153	9701.995	270°03'25"	Straight	
0.598	5066.555	9701.996	270°03'25"	Straight	
0.598	5066.555	9701.996	270°03'25"	Straight	
4.125	5064.058	9699.505	225°03'30"	Straight	
4.125	5064.058	9699.505	225°03'30"	Straight	
26.646	5041.538	9699.528	270°03'30"	Straight	
26.646	5041.538	9699.528	270°03'30"	Straight	
27.353	5041.038	9700.028	315°03'15"	Straight	
27.353	5041.038	9700.028	315°03'15"	Straight	
240.385	5041.224	9913.060	0°03'00"	Straight	
240.385	5041.224	9913.060	0°03'00"	Straight	
252.501	5038.031	9924.748	344°43'01"	Straight	
252.501	5038.031	9924.748	344°43'01"	Straight	
260.787	5033.829	9931.889	329°31'56"	Straight	
260.787	5033.829	9931.889	329°31'56"	Straight	
262.201	5034.184	9933.258	14°31'56"	Straight	
262.201	5034.184	9933.258	14°31'56"	Straight	
277.901	5047.716	9941.219	59°31'56"	Straight	



BREAK INTO EXISTING SEWER MANHOLE, CONNECT NEW GRAVITY SEWER, REBENCH AS REQUIRED AND RECONSTRUCT WITH CLASS 'D' COVER TO SUIT NEW ROAD SURFACE LEVEL

REFER TO PUMP STATION LAYOUT ON DWG C16

SEWER RISING MAIN ON 1.30m ALIGNMENT FROM PROPERTY BOUNDARY

PLAN
SCALE 1500 (A1)

- NOTES**
1. ALL GRAVITY SEWER PIPES SHALL BE 150 DIA PVC, CLASS SN8, RRJ, UNLESS NOTED OTHERWISE.
 2. REFER TO THE SEWERAGE LONGITUDINAL SECTION FOR SEWER PIPE GRADES, INVERT LEVELS, STORMWATER CLASHES, ETC.
 3. CONSTRUCTION OF THE GRAVITY SEWERAGE RETICULATION SHALL BE IN ACCORDANCE WITH THE PROCEDURES, SPECIFICATIONS AND DRAWINGS INCLUDING REQUIREMENTS FOR "AS CONSTRUCTED" DRAWINGS AS CONTAINED IN THE CURRENT ISSUE OF THE 'REGIONAL DEVELOPMENT MANUAL' AS ISSUED BY FNQROC, AND SHALL BE TO THE REQUIREMENTS OF THE COUNCIL.
 4. INSTALL PIPE ANCHOR BLOCKS TO ALL 100 AND 150 DIA SEWERS AT GRADES GREATER THAN 1 ON 6 IN ACCORDANCE WITH FNQROC DWG No. S3015 AND WSA.
 5. THE CONTRACTOR SHALL MAKE ALL APPLICATIONS AND PAY ALL FEES TO COUNCIL FOR THE SEWERAGE WORKS AND SHALL ARRANGE AND MANAGE COUNCIL'S INSPECTIONS AND TESTING OF THE WORKS. A COPY OF COUNCIL'S INSPECTION CERTIFICATE SHALL BE PROVIDED BY THE CONTRACTOR TO THE OWNER PRIOR TO PRACTICAL COMPLETION.



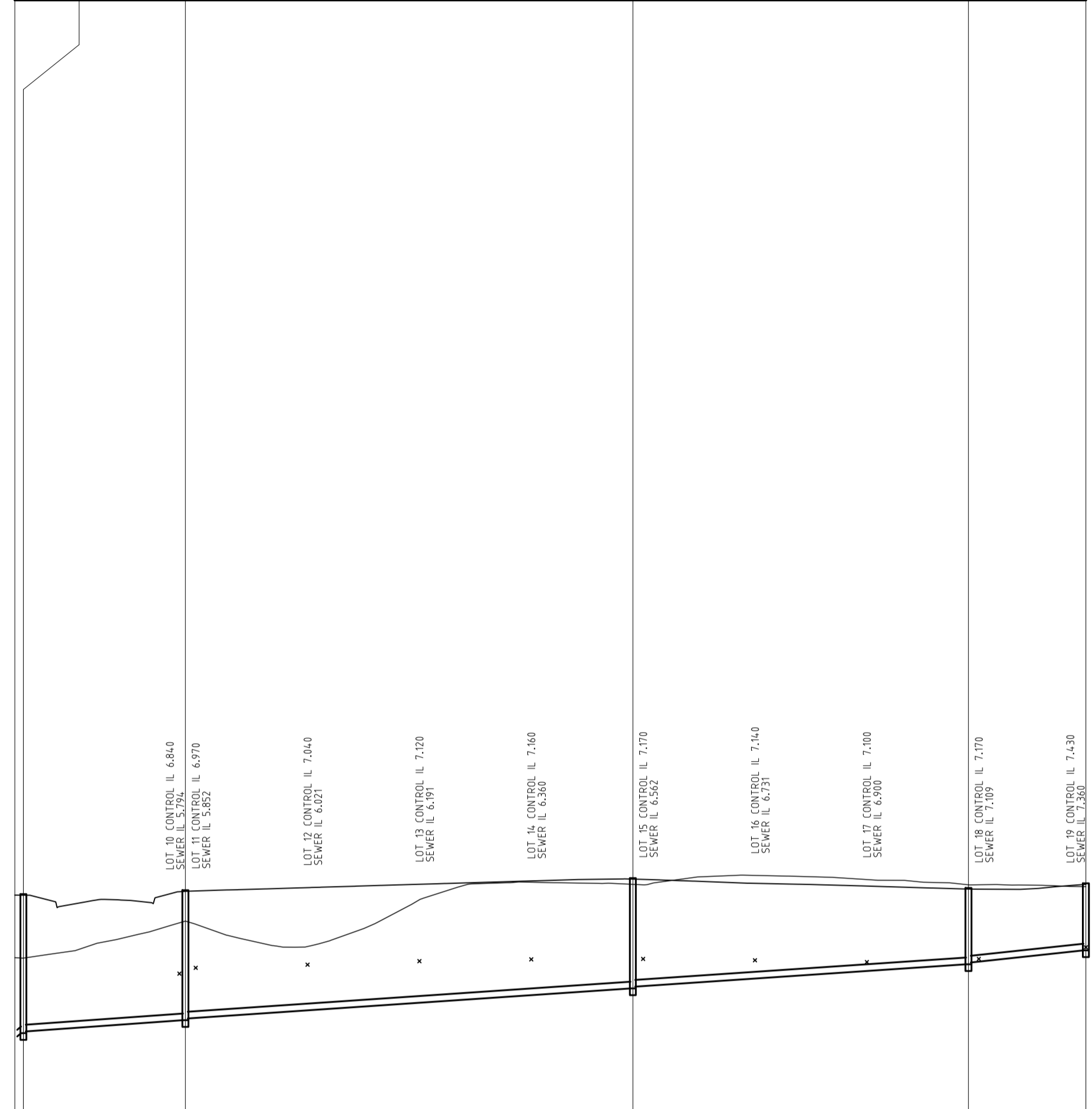
G	23/05/19	SEWER, RISING MAIN AND PUMP STATION DETAILS REVISED		
F	17/05/19	SEWER LEVELS ADJUSTED		
E	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
D	21/02/17	SEWER MANHOLES 1/3 AND 1/4 AND NOTES REVISED		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

Sewer Reticulation
Layout

<p>KFB ENGINEERS ABN 28 351 246 509</p>	Civil & Structural 20 Scott St, Cairns PO Box 927, Cairns Q 4870 P: 07 40521700 F: 07 40521634 E: email@kfbeng.com.au	JOB No: K-2578
	SHEET: C12G	SCALE: 1:500 (@A1)

JUNCTION LINE No					
MANHOLE COVER	CIRCULAR TYPE "B"	CIRCULAR TYPE "B"	CIRCULAR TYPE "B"	CIRCULAR TYPE "B"	RECTANGULAR TYPE "B"
MANHOLE DROP	TYPE "A"	TYPE "A"	TYPE "A"	TYPE "A"	
MANHOLE No	PS1 1/1	2/1	3/1	4/1	5/1

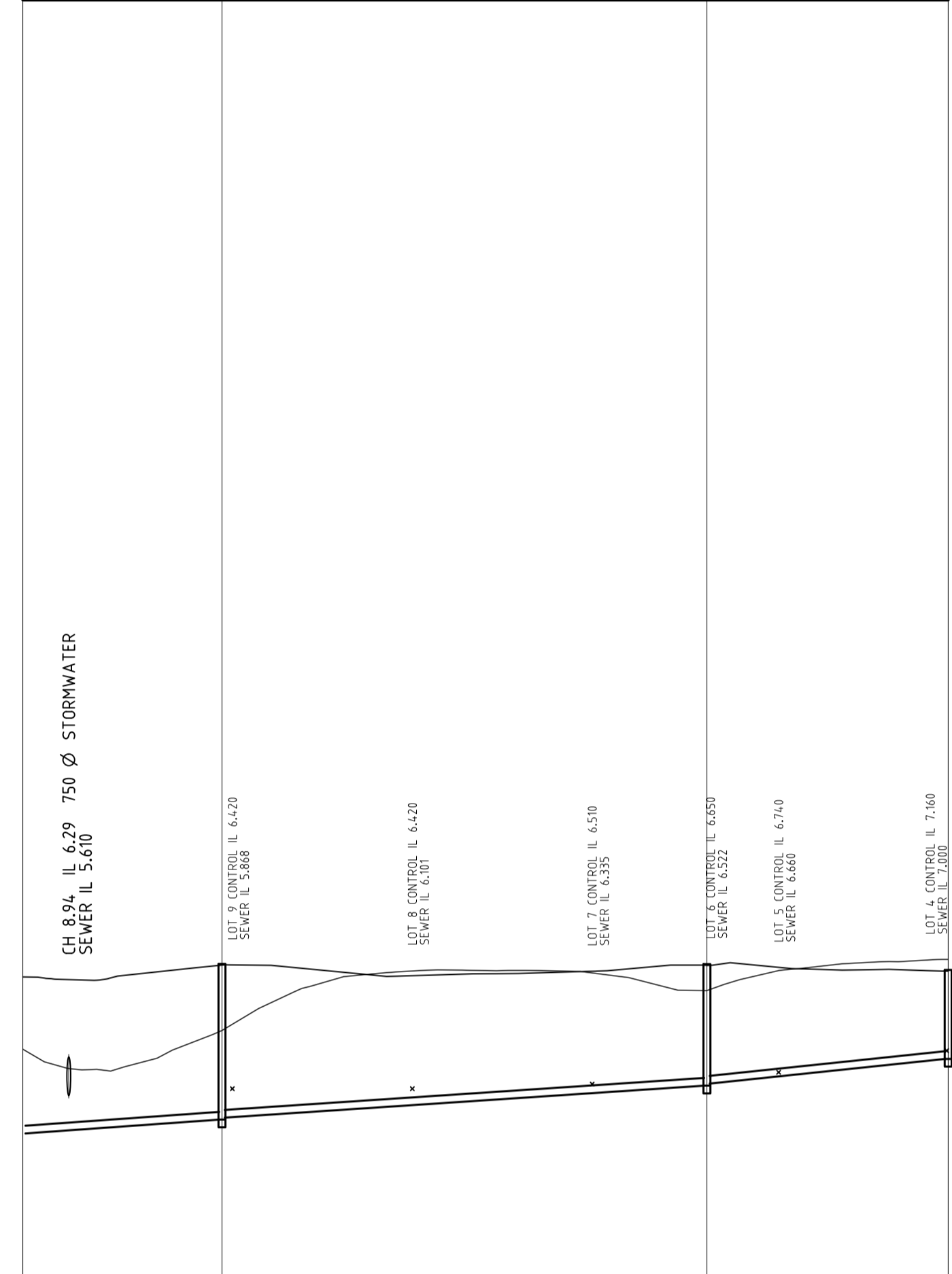


DIAMETER	150 Ø uPVC				
GRADE	1 on 11.74 8.52%	1 on 143.93 0.69%	1 on 147.69 0.68%	1 on 147.90 0.68%	1 on 93.33 1.07%
LENGTH	1.919	35.983	100.000	75.000	26.249
DATUM R.L.	-2.0				

R.L. TOP OF MANHOLE	8.618	8.705	8.977	8.755	8.860
JUNCTION INVERT LEVEL					
MANHOLE DEPTH LID TO INVERT	3.108	2.905	2.467	1.705	1.500
SEWER PIPE INVERT LEVEL	5.436 5.570 5.550	5.600 5.640	6.570 6.550	7.050 7.090	7.360
DESIGN SURFACE LEVEL	8.595	8.593	8.680	8.952	8.835
EXISTING SURFACE LEVEL	7.20	7.19	8.02	8.84	8.79
CHAINAGE	0.00	1.92	37.90	137.90	239.15

SEWER LINE "1"

JUNCTION LINE No			
MANHOLE COVER	CIRCULAR TYPE "B"	CIRCULAR TYPE "B"	CIRCULAR TYPE "B"
MANHOLE DROP	TYPE "A"	TYPE "A"	
MANHOLE No	1/1	1/2	2/2

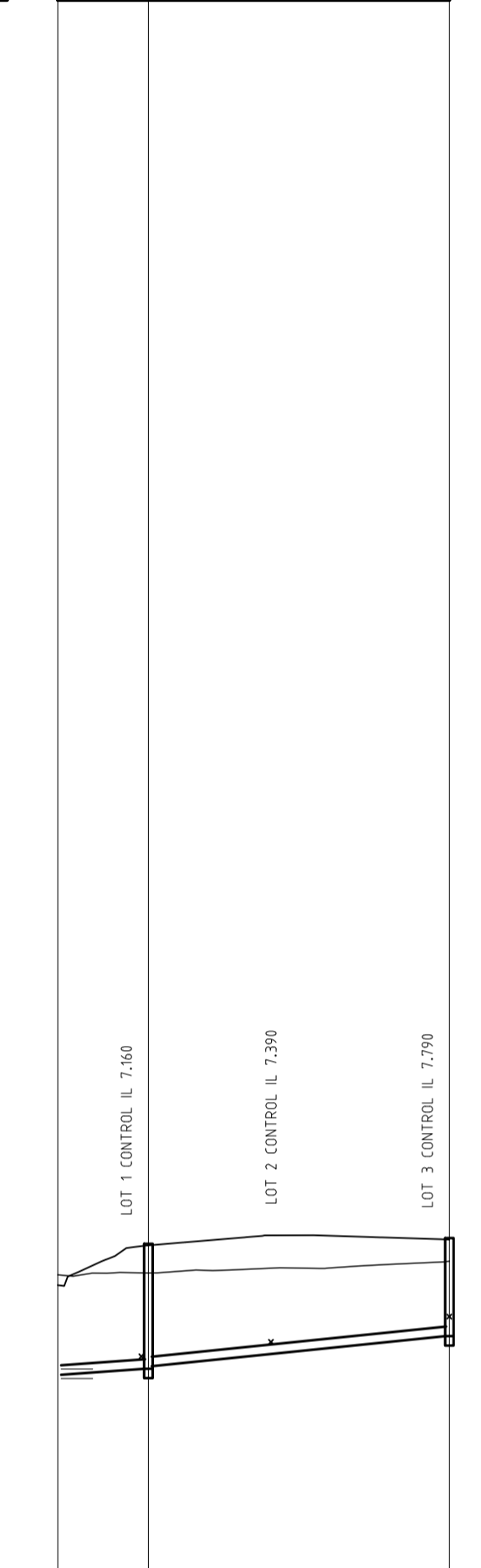


DIAMETER	150 Ø uPVC		
GRADE	1 on 143.61 0.70%	1 on 150.00 0.67%	1 on 95.56 1.05%
LENGTH	38.777	94.340	46.919
DATUM R.L.	-3.0		

R.L. TOP OF MANHOLE	8.849	8.844	8.731
JUNCTION INVERT LEVEL			
MANHOLE DEPTH LID TO INVERT	3.029	2.364	1.731
SEWER PIPE INVERT LEVEL	5.550 5.620 5.668	6.480 6.520	7.000
DESIGN SURFACE LEVEL	8.594	8.819	8.706
EXISTING SURFACE LEVEL	7.19	8.33	8.94
CHAINAGE	0.00	38.78	180.04

SEWER LINE "2"

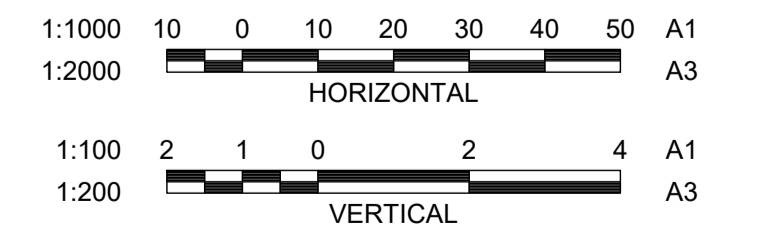
JUNCTION LINE No	EXIST	
MANHOLE COVER	CIRCULAR TYPE "B"	TYPE "B" RECTANGULAR
MANHOLE DROP	TYPE "A"	
MANHOLE No	EX4 1/4	2/4



DIAMETER	150 Ø uPVC	
GRADE	1 on 138.28 0.72%	1 on 97.79 1.02%
LENGTH	14.325	47.599
DATUM R.L.	-2.0	

R.L. TOP OF MANHOLE	8.940	9.031
JUNCTION INVERT LEVEL	6.910	
MANHOLE DEPTH LID TO INVERT	1.974	1.549
SEWER PIPE INVERT LEVEL	6.670 6.966 7.006	7.482
DESIGN SURFACE LEVEL	8.287	9.006
EXISTING SURFACE LEVEL	8.45	8.66
CHAINAGE	0.00	61.92

SEWER LINE "4"



D	23/05/19	SEWER LINE 1 & 2 REVISED, LINE 3 DELETED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE	EWK	EFB
No.	DATE	ISSUE / REVISIONS	DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
 PROPOSED SUBDIVISION
 AT CRAWFORD STREET, MOSSMAN

Sewer Longitudinal
 Sections

KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C13** D
 SCALE: 1:1000H 1:100V (@ A1)

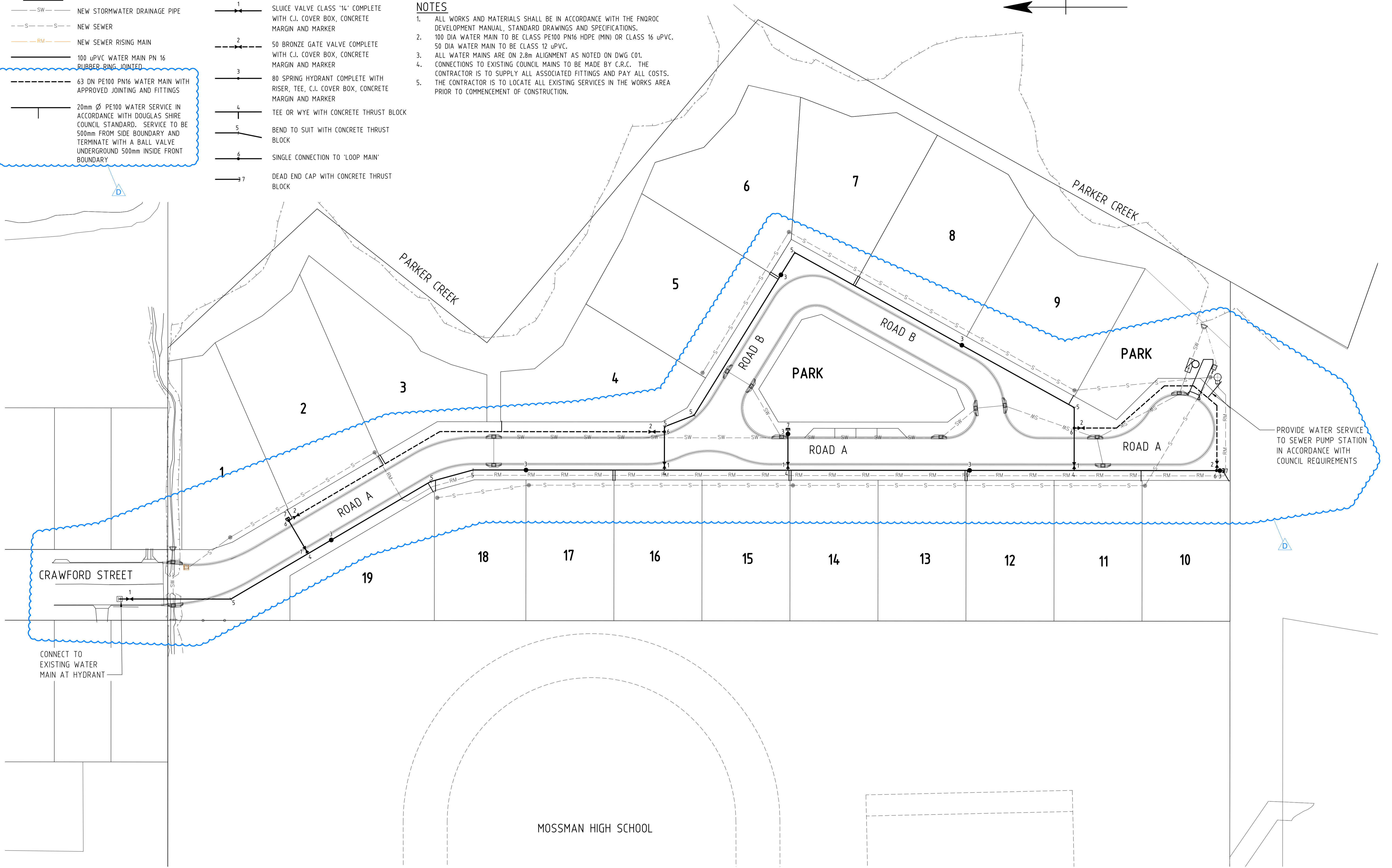
LEGEND

- SW— NEW STORMWATER DRAINAGE PIPE
- - - S - - - NEW SEWER
- - - RM - - - NEW SEWER RISING MAIN
- 100 uPVC WATER MAIN PN 16 RUBBER RING JOINTED
- - - 63 DN PE100 PN16 WATER MAIN WITH APPROVED JOINTING AND FITTINGS
- 20mm Ø PE100 WATER SERVICE IN ACCORDANCE WITH DOUGLAS SHIRE COUNCIL STANDARD. SERVICE TO BE 500mm FROM SIDE BOUNDARY AND TERMINATE WITH A BALL VALVE UNDERGROUND 500mm INSIDE FRONT BOUNDARY

- 1 SLUICE VALVE CLASS '14' COMPLETE WITH C.I. COVER BOX, CONCRETE MARGIN AND MARKER
- 2 50 BRONZE GATE VALVE COMPLETE WITH C.I. COVER BOX, CONCRETE MARGIN AND MARKER
- 3 80 SPRING HYDRANT COMPLETE WITH RISER, TEE, C.I. COVER BOX, CONCRETE MARGIN AND MARKER
- 4 TEE OR WYE WITH CONCRETE THRUST BLOCK
- 5 BEND TO SUIT WITH CONCRETE THRUST BLOCK
- 6 SINGLE CONNECTION TO 'LOOP MAIN'
- 7 DEAD END CAP WITH CONCRETE THRUST BLOCK

NOTES

1. ALL WORKS AND MATERIALS SHALL BE IN ACCORDANCE WITH THE FNQROC DEVELOPMENT MANUAL, STANDARD DRAWINGS AND SPECIFICATIONS.
2. 100 DIA WATER MAIN TO BE CLASS PE100 PN16 HDPE (MIN) OR CLASS 16 uPVC. 50 DIA WATER MAIN TO BE CLASS 12 uPVC.
3. ALL WATER MAINS ARE ON 2.8m ALIGNMENT AS NOTED ON DWG C01.
4. CONNECTIONS TO EXISTING COUNCIL MAINS TO BE MADE BY C.R.C. THE CONTRACTOR IS TO SUPPLY ALL ASSOCIATED FITTINGS AND PAY ALL COSTS. THE CONTRACTOR IS TO LOCATE ALL EXISTING SERVICES IN THE WORKS AREA PRIOR TO COMMENCEMENT OF CONSTRUCTION.



PLAN
SCALE 1:500 (A1)



D	23/05/19	FIRE HYDRANTS ADJUSTED AND VALVES AND SERVICE CONNECTIONS ADDED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Water Supply
Layout

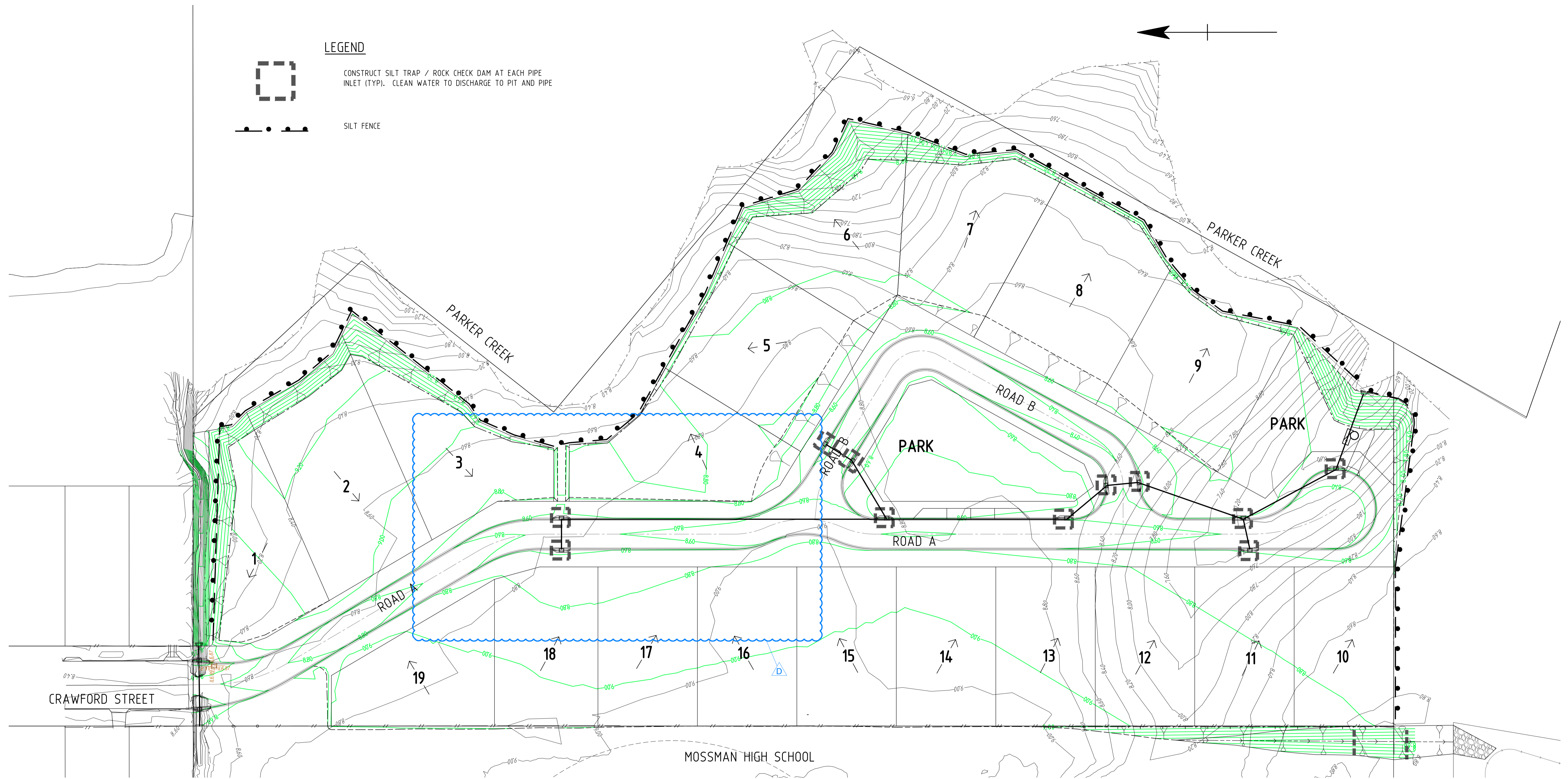
KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

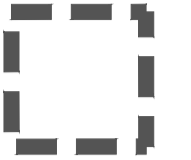

JOB No: **K-2578**

SHEET: **C14** | **D**

SCALE: 1:500 (@ A1)



LEGEND

-  CONSTRUCT SILT TRAP / ROCK CHECK DAM AT EACH PIPE INLET (TYP). CLEAN WATER TO DISCHARGE TO PIT AND PIPE
-  SILT FENCE

EROSION SEDIMENT CONTROL STRATEGY AND ENVIRONMENTAL PROTECTION

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO PROTECT AND PRESERVE THE NATURAL ENVIRONMENT AND SHALL AVOID ENVIRONMENTAL POLLUTION IN ACCORDANCE WITH THE ENVIRONMENTAL PROTECTION ACT.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INCORPORATION OF APPROPRIATE CONTROL AND MANAGEMENT MEASURES CONFORMING TO THE REQUIREMENTS OF THE ACT AND THE RELEVANT AUTHORITIES.
3. THE EROSION AND SEDIMENT CONTROL STRATEGY, SHOWN OR NOTED ON THESE DRAWINGS, HAS BEEN PROVIDED AS A GUIDE.
4. THE CONTRACTOR SHALL PROVIDE AN EROSION SEDIMENT CONTROL PLAN (ESCP) FOR EACH PHASE OF HIS PROPOSED CONSTRUCTION PROGRAM AND WORK METHODS, AND IS WHOLLY RESPONSIBLE FOR THE IMPLEMENTATION, CONTROL AND MANAGEMENT OF SUCH PLAN.
5. THE CONTRACTOR SHALL INSTALL ALL DEVICES/MEASURES NECESSARY TO COMPLY WITH THE PROVISIONS OF THE ESCP FNQROC DEVELOPMENT MANUAL, THE ENVIRONMENTAL PROTECTION ACT, AND COUNCIL REQUIREMENTS.
6. THE ESCP SHALL INCLUDE SUCH MEASURES AS SHOWN ON THE STRATEGIC PLAN.
7. KFB ENGINEERS DOES NOT ACCEPT RESPONSIBILITY FOR THE CONTRACTOR'S DESIGN & IMPLEMENTATION OF HIS ESCP NOR THE CONSEQUENCES OF HIS FAILURE TO APPLY ALL REASONABLE CONTROLS.
8. ALL STORMWATER INLETS, TRENCHES, ETC, SHALL BE CONSTRUCTED IN SUCH A WAY AS TO PREVENT THE ENTRY OF SEDIMENT INTO THE STRUCTURE. IF IT IS NECESSARY TO DISCHARGE INTO SUCH INLETS THEN SUITABLE SILT TRAPS SHALL BE CONSTRUCTED UPSTREAM OF THE INLETS SUCH THAT OVERFLOW FROM TRAPS ENTERS THE DRAINS AFTER THE SEDIMENT HAS DROPPED OUT.
9. ALL SEDIMENT CONTROL MEASURES SHALL REMAIN IN PLACE UNTIL THE END OF THE MAINTENANCE PERIOD, UNLESS NOTED OTHERWISE. ALL SEDIMENT CONTROL DEVICES ARE TO BE FULLY MAINTAINED IN AN EFFECTIVE WORKING CONDITION DURING CONSTRUCTION AND THE MAINTENANCE PERIOD. THE CONTRACTOR SHALL ENSURE THAT ALL SEDIMENT CONTROL DEVICES ARE KEPT FREE OF SEDIMENT BUILD-UP.
10. SEDIMENT FENCES SHALL BE INSTALLED SUCH THAT THE BASE OF THE FENCE IS PLACED 150mm MINIMUM BELOW GROUND LEVEL, AND ANCHORED SECURELY IN SUCH POSITION.
11. ALL VEHICLE EXIT POINTS SHALL HAVE SHAKER GRIDS, WASH BAYS OR SIMILAR TO PREVENT VEHICLES FROM TRACKING SOIL AND MUD OFF SITE.

12. ALL SOIL STOCKPILES SHALL BE PROTECTED AGAINST WIND EROSION BY COVERING AND AGAINST STORMWATER RUNOFF BY SILT FENCES AT THE DOWNHILL SLOPES. STOCKPILE LOCATIONS SHALL BE DETERMINED BY THE CONTRACTOR AND EROSION/CONTROL MEASURES IMPLEMENTED & MAINTAINED FOR THE LIFE OF THE STOCKPILE.
13. THE CONTRACTOR SHALL INSTALL TURF STRIPS BEHIND ALL KERB & CHANNEL, ADJACENT CONCRETE INVERTS AND ALLOTMENT DRAINS ETC. WHERE DIRTY WATER SHEET FLOWS INTO DRAINAGE COLLECTION SYSTEMS.
14. DIVERT CLEAN WATER AROUND AREAS OF CONSTRUCTION.
15. ALL ROAD SHOULDERS, FOOTPATHS, DRAINS AND CUT BATTERS UP TO 1 on 4 SLOPE SHALL BE DRILL SEEDED WITH APPROVED GRASS SPECIES, FERTILIZED AND MAINTAINED FOR THE REQUIRED MAINTENANCE PERIOD.
16. HYDROMULCH ALL CUT AND FILL BATTERS STEEPER THAN 1 on 4, WITH APPROVED SUITABLE GRASS SPECIES AND MAINTAINED FOR THE REQUIRED MAINTENANCE PERIOD.
17. THE CONTRACTOR SHALL CONSTRUCT TEMPORARY BERMS AT THE TOP OF ALL BATTERS TO DIRECT AND CONTROL RUNOFF TO A SINGLE LOCATION. THE DISCHARGE OVER THE BATTER SHALL BE THROUGH A STABILIZED CHUTE ADDRESSED IN THE CONTRACTORS PLAN, e.g. REINFORCED TURF, GEOTEXTILE, CONCRETE OR SIMILAR.
18. ALL WORKS AND MATERIALS SHALL BE IN ACCORDANCE WITH FNQROC.

SEDIMENT CONTROL TURF DETAILS

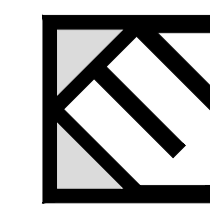
1. PROVIDE ONE STRIP OF TURF ADJACENT TO ALL KERBS, CONCRETE SLABS, DRIVEWAYS, BATTER CHUTES ETC, WITH ONE METRE LONG RETURNS AT 10 METRE CENTRES WHERE LONGITUDINAL GRADES EXCEED 5%. PROVIDE TWO STRIPS OF TURF TO INVERT OF ALL EARTH CATCH AND DIVERSION DRAINS.

1:500 10 5 0 10 20 A1
1:1000

D	23/05/19	ROAD A REGRADED AND STORMWATER DRAINAGE REVISED		
C	30/04/18	REDESIGN FOR NEW DESIGN LEVELS		
B	29/11/16	REVISION FOR NEW Q100 FLOOD LEVEL - TENDER ISSUE		
A	18/07/16	ORIGINAL ISSUE		
No.	DATE	ISSUE / REVISIONS	EWK	EFB
			DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

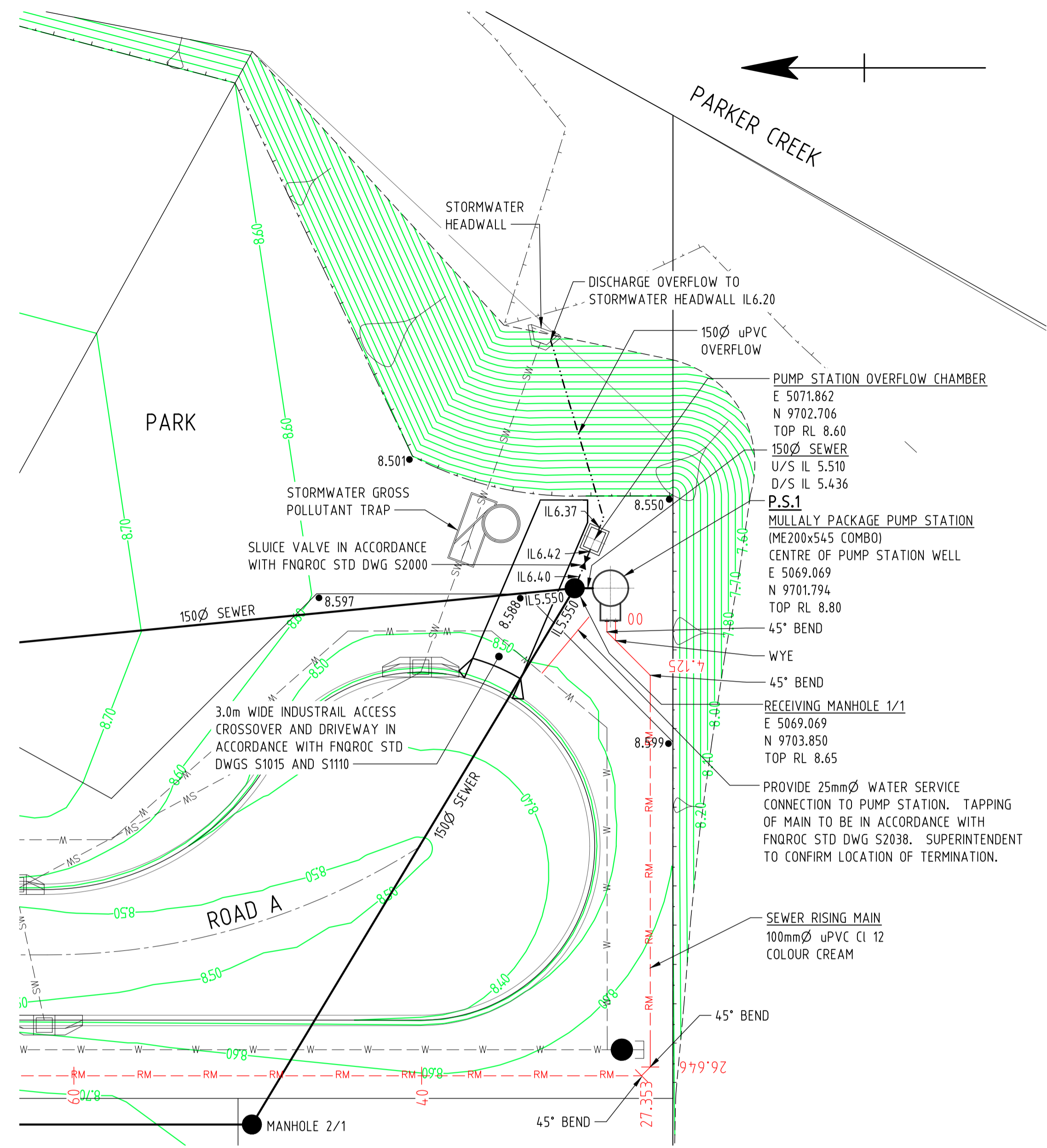
Erosion and Sediment
Control Plan



KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **C15** | **D**
 SCALE: 1:500 (@A1)



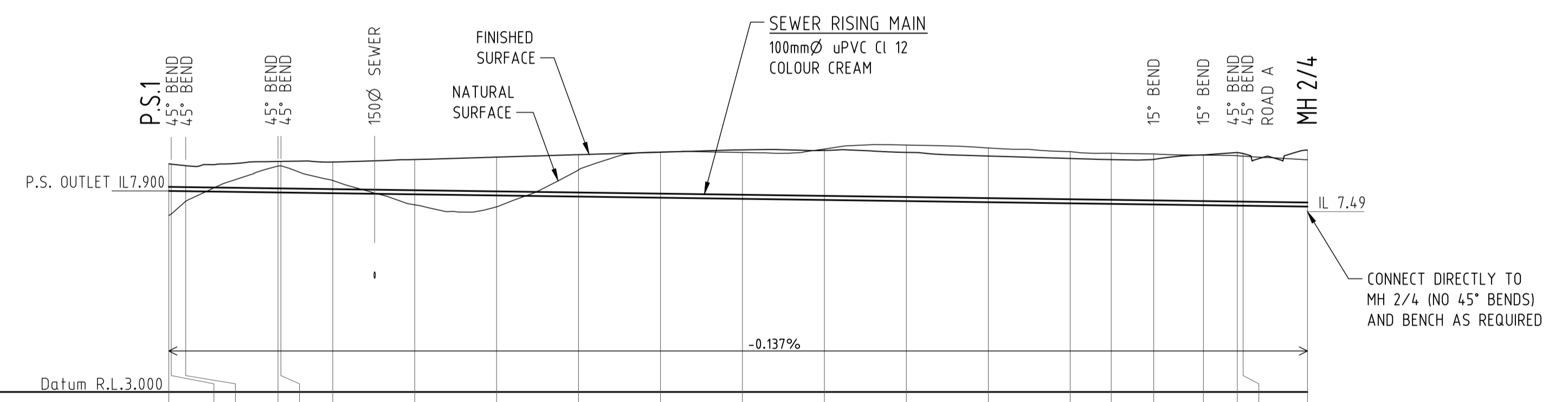
PUMP STATION LAYOUT
SCALE 1:200 (A1)

NOTES

- PUMP STATION**
- PUMP STATION TO BE MULLALY TANK SOLUTIONS MODEL ME 200x545 COMBO PACKAGE FRP PUMP STATION COMPLETE WITH BALLAST, ROOF SLAB AND TWO (2) GRP26 D HOMA GRINDER PUMPS.
 - REFER TO MANUFACTURERS INSTALLATION DRAWINGS FOR BALLAST ARRANGEMENT.
 - REFER TO FNQROC STD DWG S3035 FOR DETAILS OF PUMP STATION OVERFLOW CHAMBER.
- RISING MAIN**
- PROVIDE THRUST BLOCKS TO ALL HORIZONTAL AND VERTICAL BENDS IN ACCORDANCE WITH SEQ WATER STD DWGS SEQ-WAT-1205-1 & SEQ-WAT-1206-1

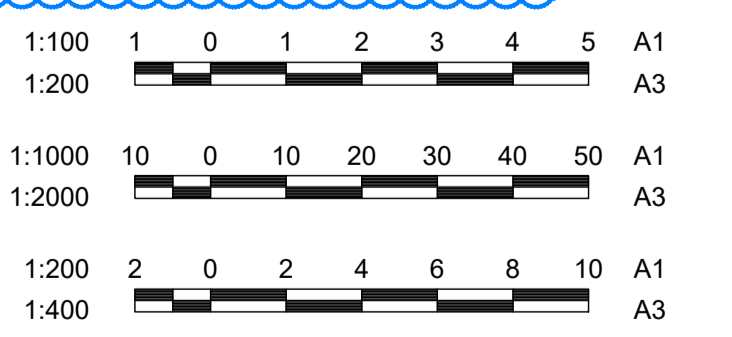
PUMP STATION LEVELS
MULLAY MODEL ME200x545 COMBO)

PUMP STATION INTERNAL DIAMETER	2.000
TOP OF PUMP STATION LEVEL	8.800
FSL ADJACENT TO PUMP STATION	8.600 (Q100)
SEWER INLET LEVEL	5.436
PUMP STATION FLOOR LEVEL	3.350
PUMP STATION OUTLET LEVEL	7.900
PUMP STOP LEVEL	3.700
DUTY PUMP START LEVEL	4.100
STANDBY PUMP START LEVEL	4.200
ALARM LEVEL	4.300



CHAINAGE	DESIGN INVERT LEVEL	FINISHED SURFACE LEVEL	NATURAL SURFACE LEVEL
0.000	7.900	8.564	7.301
0.598	7.899	7.899	7.337
4.125	7.894	8.517	7.650
26.646	7.864	8.620	8.509
27.353	7.863	8.621	8.512
40.000	7.845	8.605	8.158
60.000	7.818	8.668	7.563
80.000	7.791	8.726	7.513
100.000	7.763	8.786	8.416
120.000	7.736	8.846	8.851
140.000	7.709	8.902	8.839
160.000	7.681	8.889	8.923
180.000	7.654	8.842	9.020
200.000	7.627	8.752	8.950
220.000	7.599	8.692	8.860
230.000	7.586	8.665	8.821
240.385	7.571	8.669	8.802
252.501	7.555	8.779	8.773
260.787	7.543	8.838	8.761
262.201	7.541	8.815	8.750
277.901	7.520	8.901	8.664

SEWER RISING MAIN LONGITUDINAL SECTION
SCALE 1:1000 H 1:100 V (A1)



B	23/05/19	PUMP STATION DETAILS AND RISING MAIN ALIGNMENT REVISED		
A	17/05/19	INITIAL ISSUE	EWK	EFB
No.	DATE	ISSUE / REVISIONS	DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

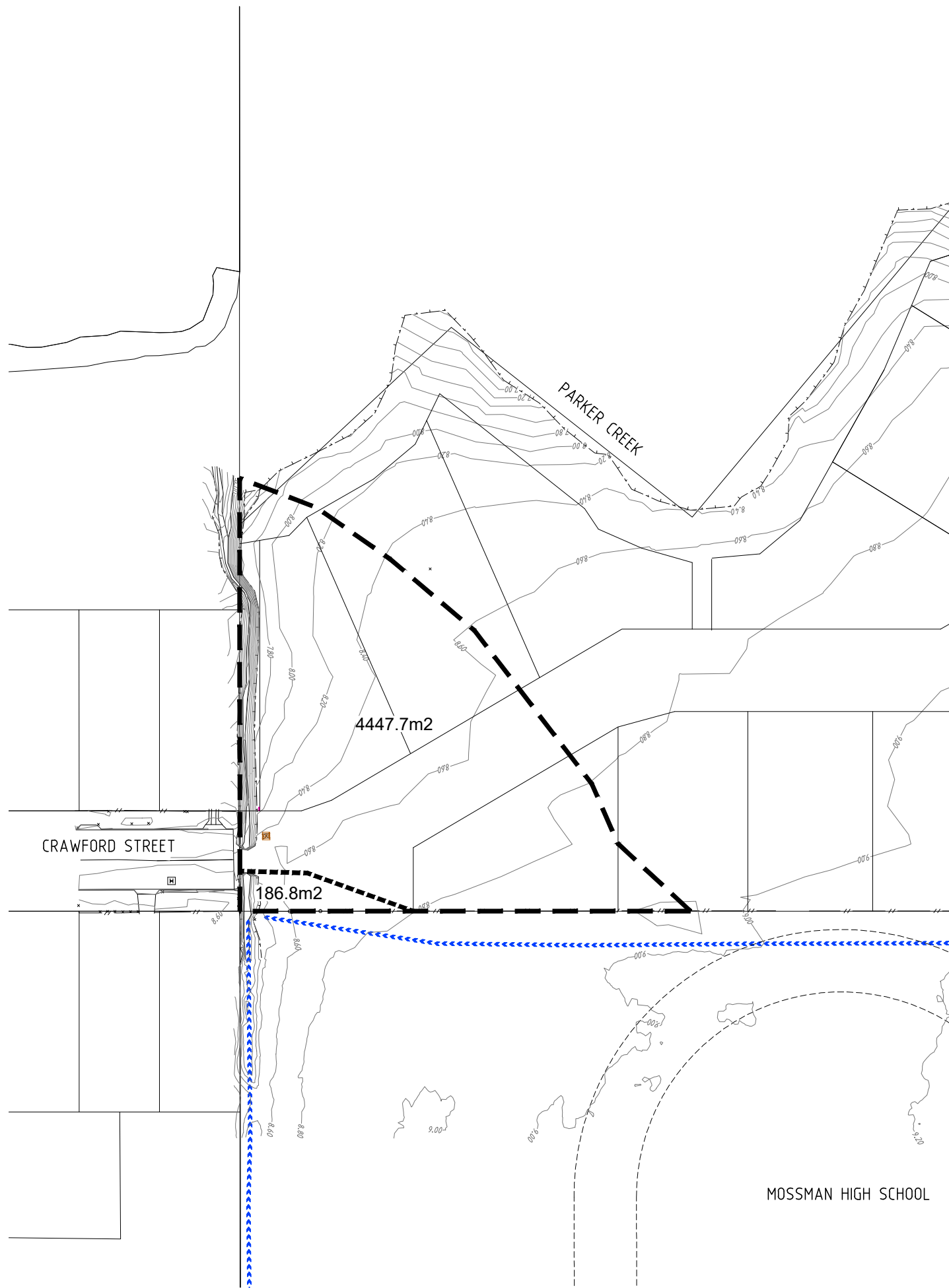
N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Sewer Pump Station and
Rising Main Details

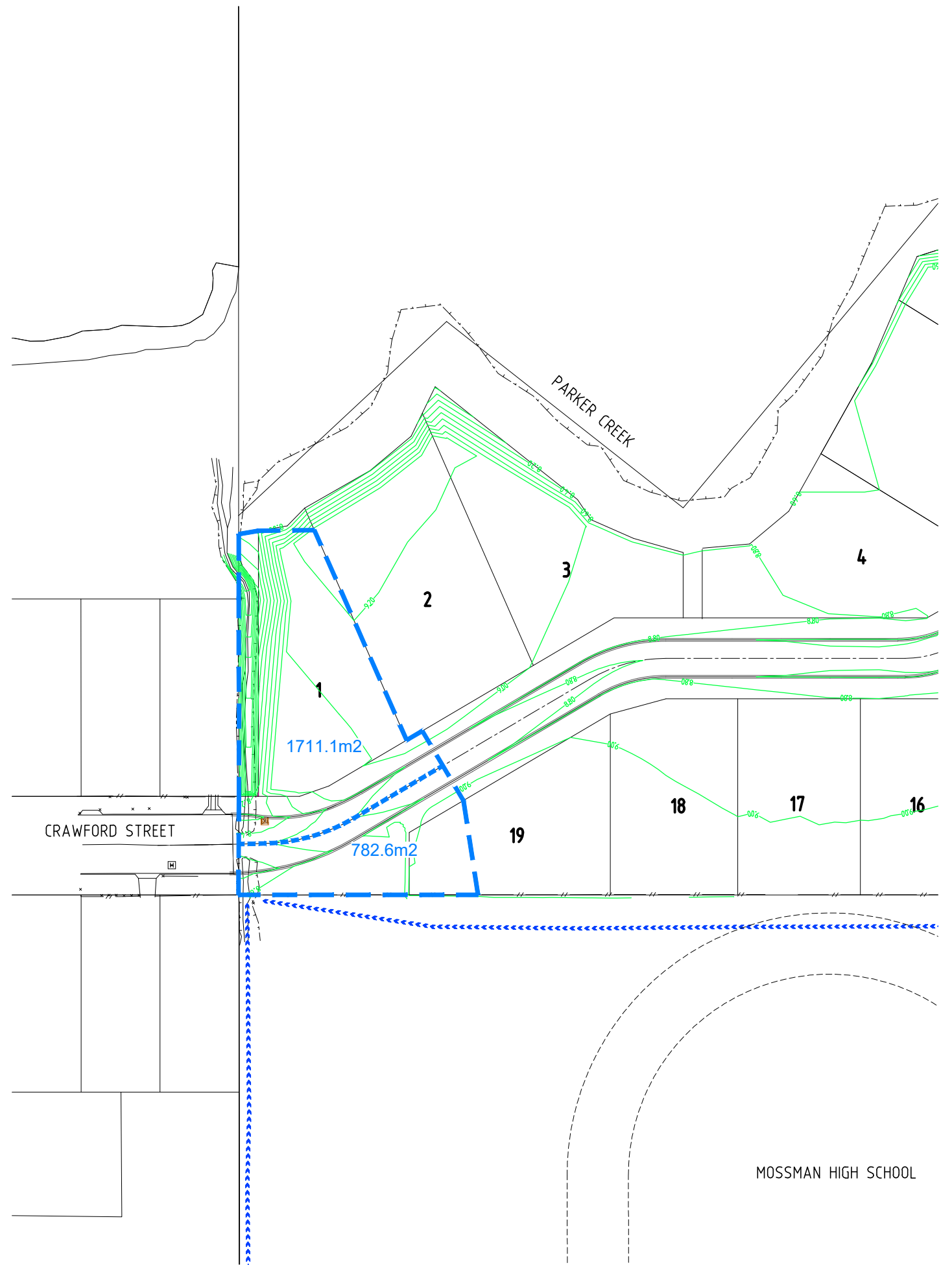
KFB ENGINEERS
ABN 28 351 246 509

Civil & Structural
20 Scott St, Cairns | PO Box 927, Cairns Q 4870
P: 07 40521700 | F: 07 40521634
E: email@kfbeng.com.au

JOB No: **K-2578**
SHEET: **C16 | B**
SCALE: AS SHOWN (@ A1)



PREDEVELOPMENT STORMWATER CATCHMENTS
SCALE 1:500 (A1)



POSTDEVELOPMENT STORMWATER CATCHMENTS
SCALE 1:500 (A1)



A	29/04/19	ORIGINAL ISSUE	EWK	EFB
No.	DATE	ISSUE / REVISIONS	DRN	CHKD
DRAWING FILE:		XREF FILE: N/A		

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

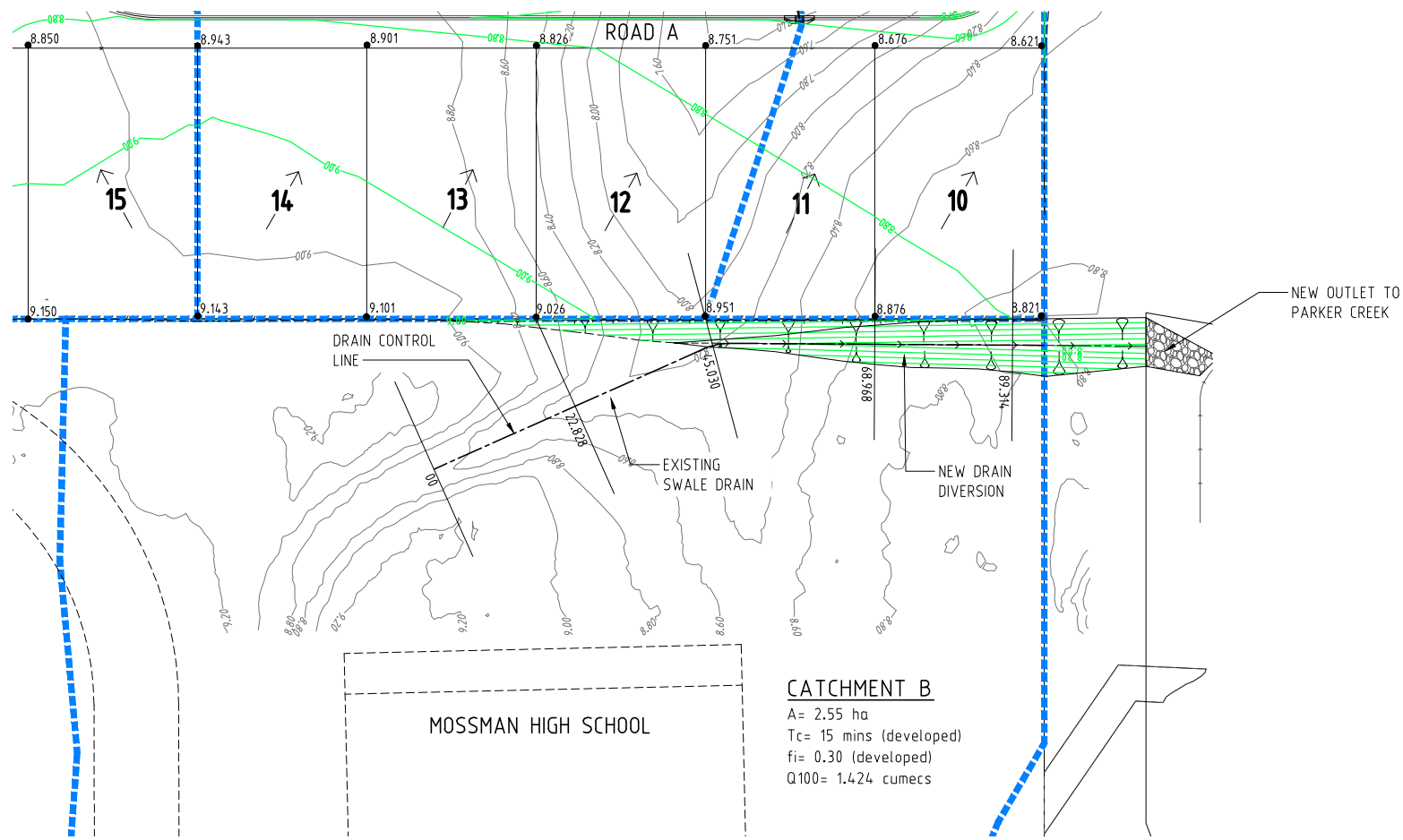
Stormwater Drainage
 Catchments Contributing
 to Crawford Street



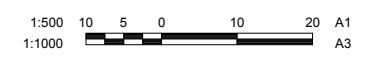
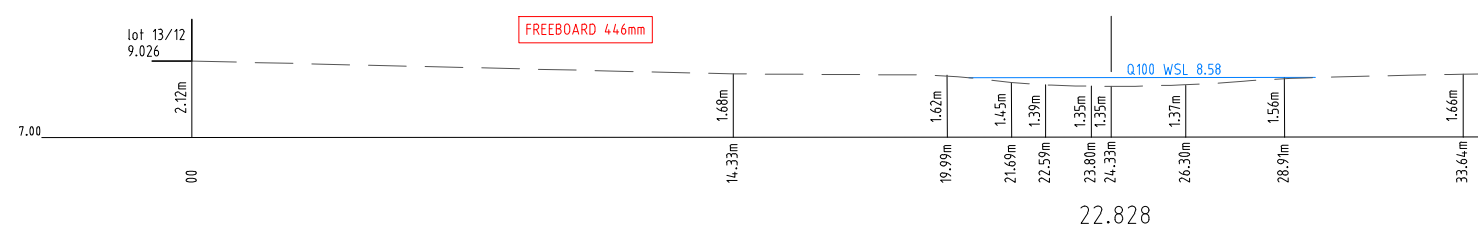
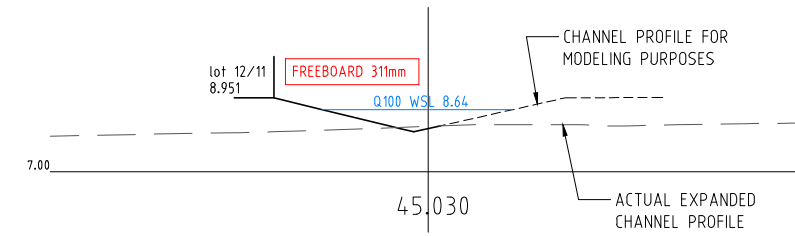
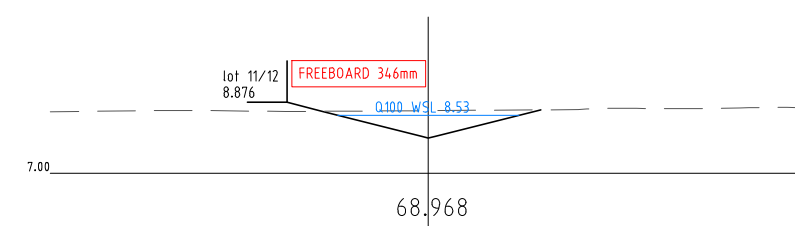
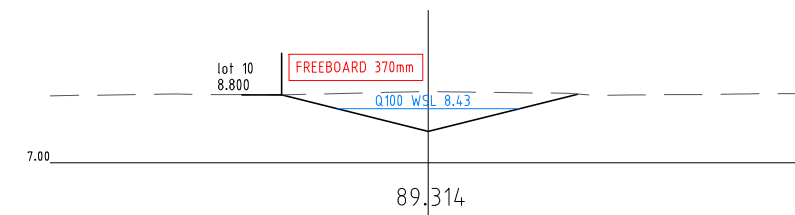
KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **SK5 | A**
 SCALE: 1:500 (@ A1)



EXISTING SCHOOL SWALE DRAIN
SCALE 1:500 (A1)



No.	DATE	ISSUE / REVISIONS	EWK	EFB
A	08/05/19	ORIGINAL ISSUE		
DRAWING FILE:			DRN	CHKD
XREF FILE: N/A				

N.V. & J.S. Pty Ltd
PROPOSED SUBDIVISION
AT CRAWFORD STREET, MOSSMAN

Stormwater Drainage
 Freeboard Calculations to
 school drain



KFB ENGINEERS
 ABN 28 351 246 509

Civil & Structural
 20 Scott St, Cairns | PO Box 927, Cairns Q 4870
 P: 07 40521700 | F: 07 40521634
 E: email@kfbeng.com.au

JOB No: **K-2578**
 SHEET: **SK6 | A**
 SCALE: AS SHOWN (@ A1)