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Wednesday, 9 May 2018

Andrew Sherman
Principal
Russell Kennedy
Level 12, 469 La Trobe Street
MELBOURNE VIC 3000

BY EMAIL: ASherman@rk.com.au

Dear Andrew,

Proposed works at Walkerville Retarding Basin

1. Expert Reports

1.1 We **enclose** by way of service copy of a report of Mr David Stewart – Australian Dams and Water Consultants Pty Ltd dated 30 April 2018.

2. Further Documents Required

2.1 As a result of a review of the Mr Stewart's report it is clear that there are a number of documents that should be provided by Council. Without seeking to limit the categories of documents, we would appreciate it if you would please provide copies of the following documents:

- 2.1.1 All documents in relation to the Ancold "Guidelines Of The Consequence Categories For Dams" (2012) – consequence category determination of the subject dam;
- 2.1.2 All documents in relation to the regime of regular monitoring operation and reporting of the dam for the period January 2016 to date;
- 2.1.3 All documents in relation to the SGSC Asset Management System for the subject dam;
- 2.1.4 All documents in relation to the monitoring, surveillance, reporting and maintenance of the subject dam for the period of January 2016 to date;
- 2.1.5 All documents relating to an appropriate and approved construction environmental management plan (CEMP) for that subject dam and the works proposed to be carried out by SGSC;
- 2.1.6 All documents in relation to the approval of and source of water for the large water tank on the fenced access track land immediately

behind the fire station which tank is labelled "reclaimed water – do not drink";

- 2.1.7 All documents relating to the process adopted by Council for the sample retrieval whether it was undertaken in accordance with any and what guidelines;
- 2.1.8 All documents in relation to the sample handling, storage and transport, and analytical and quality assurance methods in relation to the samples taken for the period 10 March 2016 to 23 January 2018 inclusive;
- 2.1.9 All documents known as the chain of custody documentation for each of the samples;
- 2.1.10 All documents relating to the methodology employed during the sampling episodes for the period 10 March 2016 to 23 January 2018.

3. Council Need To Undertake Appropriate And Approved Maintenance Works

- 3.1 Based upon the views expressed by Mr Stewart, your client should undertake further works on the dam in addition to the works referred to in your letter of 20 April 2018.
- 3.2 Please confirm by return that your client will not undertake any works at the subject site without preparing further detail drawings and specifications for the proposed works taking into account the recommendations of Mr Stewart referred to in his report of 30 April 2018.
- 3.3 In addition we would request that you indicate by return that you will provide to our client for comment further detailed plans detailing proposed works which incorporate the recommendations of Mr Stewart.
- 3.4 It is clear from the reports provided by Council under cover of your letter of 20 April 2018 and Mr Stewart's report that Council has been in breach of its maintenance obligations in respect of the dam for some considerable period of time.

Kind Regards,

WISEWOULD MAHONY

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Wisewould Mahony

Ansevata Nominees Pty Ltd v
South Gippsland Shire Council

Promontory Views Estate Retarding Basin
Walkerville

Report by Independent Expert

30th April 2018

Australian Dams & Water Consultants Pty Ltd



Wisewould Mahony – Ansevata Nominees Pty Ltd v South Gippsland Shire Council
 Promontory Views Estate Retarding Basin – Walkerville

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 Promontory Views Estate Retarding Basin – Walkerville

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Statement of acknowledgement of the requirements of the Expert Witness Code of Conduct for the Supreme Court of Victoria and The Civil Procedures Act 2010

This report has been prepared by the undersigned in accordance with the requirements of the Expert Witness Code of Conduct for the Supreme Court of Victoria, Form 44A, and Part 2.3 of The Civil Procedure Act 2010.

I confirm that I have read and agree to be bound by the Expert Witness Code of Conduct for the Supreme Court of Victoria.

I acknowledge the overarching obligations on an Expert Witness imposed by Part 2.3 of The Civil Procedure Act 2010 and I confirm that I have complied with those obligations in preparing of this report.

I declare that I have made all the inquiries which I believe are desirable and appropriate (save for any matters identified explicitly in this report) and that no matters of significance which I regard as relevant have, to my knowledge, been withheld from the Court.



30th April 2018

David Stewart

Australian Dams & Water Consultants Pty Ltd
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VICTORIA 3925

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Statement of Qualifications and Experience

This report has been prepared by David Stewart, BE(Hons), GAICD, CPEng, NPR-3, RPEQ and AM ANCOLD. I am a professional civil engineer and have worked for more than 35 years in both the public and private sectors in all aspects of dams engineering in all states and territories of Australia and internationally. I now practice as an independent dam safety consultant through my company Australian Dams & Water Consultants Pty Ltd, as a casual employee of Tasmanian Irrigation Pty Ltd and as a Director of SunWater Limited in Queensland.

My experience includes the investigation, design and construction of new dam projects, as well as remediation and dam safety upgrade works, with a background in dam design and geotechnical engineering. I have worked on projects on more than 400 dams of all types and I have also been responsible for the operations and maintenance of several large dams, all aspects of dam safety management programs, dam safety emergency planning and responses, staff training and independent dam safety program audit and review. I am also experienced in public sector dam policy, statutory reporting and governance requirements.

I have experience as Dam Safety Manager, Bulk Water Manager, Executive Manager Assets and Technical Services and various other senior management positions including as Managing Director for the large portfolio of public sector dams managed by Goulburn-Murray Water in Victoria, including Australia's highest dam, Dartmouth Dam.

I have strong industry professional affiliations, including with Engineers Australia, The Australian National Committee on Large Dams (ANCOLD) and The International Commission on Large Dams (ICOLD). I have served as a regional group Chairman for Engineers Australia and as an independent judge for the Victorian Engineering Excellence Awards. I also served on the Executive of ANCOLD as a Director from 2000 to 2012, including 3 years as Chairman, during which time I was also Australia's representative to ICOLD. I have authored and presented several papers to both ICOLD and ANCOLD and have served as Australia's representative on the ICOLD Technical Committees for Dam Safety, for Seismic Aspects of Dam Design, and for Climate Change.

I am the past convenor of ANCOLD's Technical Working Group preparing Guidelines on the Business Management of Dams and I am also a member of ANCOLD's Technical Working Group currently reviewing its Guidelines on Dam Safety Management.

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List of Acronyms and Terms Used in this Report

Abutment*	The part of the valley side against which the dam is constructed
ADWC	Australian Dams & Water Consultants Pty Ltd
ANCOLD	Australian National Committee on Large Dams Inc
Ansevata	Ansevata Nominees Pty Ltd
Consequence*	Effects of an action or event
Consequence Category**	A classification of adverse consequences resulting from a dam failure.
Dam*	An artificial barrier, together with appurtenant works, constructed for storage, or control of water, other liquids, or other liquid-borne material. This classification normally excludes canals and levees.
Dam Crest**	The lowest elevation of the non-overflow crest section of the dam excluding handrails, parapets or wave walls that have not been designed to store water.
Dams Engineer*	A professional engineer who is suitably qualified and recognised by the engineering profession as experienced in engineering of dams and its various subfields.
DELWP	The Victorian Department of Environment, Land, Water and Planning.
Dissipator	A structure designed to absorb the energy from the flow of water
Downstream	Looking in the direction of water flow away from current position
Embankment	Dam structure of earth or rockfill with the primary purpose of retaining water
Freeboard*	The vertical distance between a stated water level and the lowest level of the non-overflow section of a dam.
FSL*	Full Supply Level – the maximum normal operating water surface level of a reservoir when not affected by floods.
Gauge Board	An instrument used to visually determine the level of water stored in a reservoir, consisting of a vertical post marked with graduated indicators of water level or depth.
Hazard*	The threat or condition which may result from an external cause (eg flood, earthquake) with the potential for creating adverse consequences.
ICOLD	International Commission on Large Dams

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Inlet	A structure or facility designed to discharge water into a storage
Left	Left hand side, looking downstream
Maintenance*	The routine work required to maintain existing works and systems (civil, hydraulic, mechanical and electrical) in a safe and functional condition.
Outlet	A structure or facility used to release water from a storage in a controlled manner.
Overtopping	The flow of water over the crest of a dam
PAR*	Population at Risk. All persons directly exposed to floodwaters within the dambreak affected zone if they took no action to evacuate
Reservoir*	An artificial lake, pond, or basin for storage, regulation and control of water, silt, debris or other liquid or liquid borne material.
Retarding Basin*	A type of flood mitigation dam used to temporarily store some, or all, of the stormwater runoff from an urban environment.
Right	Right hand side, looking downstream
SGSC	South Gippsland Shire Council
Spillway*	A weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the reservoir normally under flood conditions or in anticipation of floods.
Storage	Has the same definition as Reservoir.
Surveillance*	The continuing examination of the condition of a dam and its appurtenant structures and the review of operation, maintenance and monitoring procedures and results in order to determine whether a deficient trend is developing or appears likely to develop.
Toe of dam*	The junction of the downstream (or upstream) face of the dam with the ground surface (foundation).
Upstream	Looking towards the direction from which water is flowing towards current position
Wisewould Mahony	Wisewould Mahony Lawyers

* As defined in whole or part in the ANCOLD Guidelines on Dam Safety Management (2003).

** As defined in whole or part in the ANCOLD Guidelines on the Consequence Categories for Dams (2012)

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1. Introduction

Australian Dams & Water Consultants Pty Ltd (ADWC) has been engaged by Wisewould Mahony through its letter of 29th March 2018 to retain the services of Mr David Stewart to produce this independent expert report in the matter of Ansevata Nominees Pty Ltd ("Ansevata") v South Gippsland Shire Council ("SGSC"). This matter relates to dam located off Panoramic Drive, Walkerville.

I have been advised by Wisewould Mahony that:

- 1.1. It acts for Ansevata which owns and operates a farm at its property known as "Marapana" at Loop Road, Walkerville. Marapana is about 400 hectares in size.
- 1.2. In about 1990 the then Shire of Woorayl acquired about 2.585 hectares of Ansevata's land to construct a retarding basin or dam (dam) to receive storm water drainage and treated septic effluent from an area known as the Promontory Views Estate at Walkerville (Estate).
- 1.3. The dam is unfenced but the retarding basin is fenced. The dam is located off Panoramic Drive, Walkerville, approximately 200 m north of the local CFA building on the basin land. The dam was designed with dimensions of 120 metres x 200 metres and a storage capacity of 15 ML - See plan 30-158 dated 16/11/1987
- 1.4. The dam captures flows from the Estate. The Estate covers approximately 25 ha, including 380 lots, of which approximately three quarters have dwellings most of which are holiday homes. The dam receives storm water from the majority, but not the entirety, of the Estate. There is no reticulated water supply or sewerage. Domestic wastewater is treated and reused/disposed on each individual site.
- 1.5. Ansevata uses the farm to graze cattle and conduct a vineyard. Ansevata has used the water in the dam to irrigate its crops and pastures and water stock. Ansevata breeds cattle and sheep on the property. Currently they have 220 breeding cows, 2400 cross ewes and 40 rams. The vineyard is a Pinot Noir area of approximately 2 hectares. Ansevata has a

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windmill pump next to the retarding basin dam connected to an underground water pipe of about 1 KM which takes the water from the retarding basin to the home dam as required.

- 1.6. By an agreement dated 8 May 1990 Ansevata and the Shire agreed that Ansevata had an entitlement to use the water in the dam for the purpose of irrigation of pasture and crops and watering of stock (Agreement). The Agreement sets out the rights and obligations of the parties.
- 1.7. SGSC has recently obtained reports concerning the construction and maintenance of the dam from GHD 10, March 2018 and a draft report from Southern Rural Water dated 28, March 2018.
- 1.8. Ansevata are concerned that the maintenance of the dam is inadequate and that a build up of silt and sediment has reduced the dam's capacity from its originally constructed capacity of 15 ML to approximately 13 ML.

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2. Assessment process used in the preparation of this report

Wisewould Mahony has provided me with a copy of the Supreme Court of Victoria Expert Witness Code of Conduct (Form 44A) and an extract of the Civil Procedure Act 2010 (Vic) – Part 2.3 concerning the obligations on expert witnesses in Victorian Courts.

Wisewould Mahony has also been provided me with copies of the documents listed in Table 2.1.

Table 2.1 – Supplied Documents

Reference	Author	Date	Description
1	Taylor Splatt & Partners	8 May 1990	Agreement for Taking of Water
2	Russell Kennedy Lawyers	28 November 2016	Deed of variation to the Water Agreement
3	Shire of Woorayl	16 November 1987	Storage capacity area and location Plan 30-158
4	SGSC	28 March 2018	Attachment 6.1.5 to Council Meeting of 28 March 2018 showing Basin Sampling Locations
5	GHD	2 March 2018	Letter report on Walkerville Basin Volume Assessment
6	Southern Rural Water	23 August 2017	Draft Report on inspection of Walkerville RB
7	Mackie Surveying	3 February 2016	Letter on Feature and Level Survey – Walkerville Basin
8	SGSC	12 April 2018	Letter to Ansevata re Proposed works on Walkerville Retarding Basin
9	Wisewould Mahony	13 April 2018	Letter to SGSC re Proposed Works on Walkerville Retarding Basin
10	Russell Kennedy Lawyers	20 April 2018	Letter to Wisewould Mahony on Proposed Works at Walkerville Retarding Basin
11	Mackie Surveying	13 October 2017	Drawing No: 155600AC, Version C, Sheets 1 – 4

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Reference	Author	Date	Description
12	Shire of Woorayl	February 1988	Promontory Views Estate Drainage Scheme Design Drawings. Plan No: 30-160, Sheets 1 – 17
13	SGSC	30 November 2017	Promontory Views Basin Works Layout Plan, Detail Plan and Sections, Plan Nos: 40/1703/1 & 40/1703/2

I conducted an inspection of the Walkerville Basin and surroundings on Thursday 5th April 2018, accompanied at the basin site by Mr Jeremy Rich of Ansevata.

During my inspection I noted:

- (i) The dam is an approximately rectangular structure in plan, with earthfill embankments on all sides and was accessed on foot via a fenced access track on a small embankment behind the fire station off Panoramic Drive, Walkerville.
- (ii) The dam is located in a rural setting to the north and west of the adjacent subdivision. The nearest dwelling which could possibly be impacted by dam failure appears to be approximately 220 metres to the east of the dam. I did not undertake a formal consequence assessment of the dam but I note and concur with the assessment by Southern Rural Water that the PAR (Population at Risk) is negligible (Reference 6).
- (iii) The general location of the inlet on the south eastern corner of the dam structure was inspected however due to water level and vegetation the inlet itself was mainly obscured from view.
- (iv) The dam retained water at the time of the inspection. The water level could not be accurately determined from the gauge board located in the south western corner of the storage as this is difficult to read. The water level was measured at approximately 1.1m below the top of the outlet pit.

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- (v) The stored water appeared generally clear but coloured, with a noticeable odour in the vicinity of the outlet structure.
- (vi) There is weed growth around the inlet and outlet structures and perimeter of the dam, including cumbungi in the water, predominantly in the northern end of the storage.
- (vii) The crests and downstream faces of the embankments are generally grassed of shin length or greater which made inspection difficult. I was advised that SGSC slash the grass on the embankments once per year.
- (viii) Where visible, the upstream faces of the embankments appear to be rock protected but heavily overgrown with grass and there are large trees at several locations on the embankment and at its downstream toe.
- (ix) Longitudinal crest cracking was noted on the western embankment which was easily probed to a depth of 150 mm.
- (x) Two small (approximately 100mm diameter) plastic pipelines are reportedly shallowly buried across the crest of the dam, one at the south western corner and another approximately mid-way along the western embankment. I am advised that these are the offtake points from which Ansevata access the water in the dam.
- (xi) There is a toe drain running close to parallel and at the downstream toe of the western embankment which was wet but not flowing and which is indicated as the outlet channel on the supplied drawings.
- (xii) The outlet structure is located through the western embankment towards the north western corner of the storage. The concrete of the intake pit appears to be in reasonable condition with no signs of excessive movement, cracking or settlement.
- (xiii) There is evidence of subsidence and voids in the fill material around this pit with voids easily probed to approximately 500 mm depth.

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- (xiv) This outlet structure did not appear to have operated for some time.
- (xv) A surface depression in the dam crest approximately 700 mm wide by 900 mm long by 300 mm deep is present approximately 2.5 m to the north west of the outlet pit, as noted by Southern Rural Water (reference 6).
- (xvi) The downstream end of the outlet was only partially visible due to heavy vegetation cover and could not be properly inspected.
- (xvii) There are animal (possibly wombat) burrows adjacent to the northern side of the storage and evidence of recent surface disturbance and removal of grass and topsoil on the crest of the eastern embankment, which appear to be consistent with wombat activity.
- (xviii) The crest levels of the embankment appear uneven, which is particularly noticeable towards the middle of the eastern embankment where there is a significant downstream cross fall.
- (xix) Apart from the storage level gauge board and two recent crest survey pegs, no monitoring instrumentation was noted at the dam.
- (xx) A large water tank is present on the fenced access track land immediately behind the fire station. This tank is labelled "Reclaimed Water – Do Not Drink". A similar sign is present on the fire hydrant at the front of the fire station. I could not determine the source of water used to supply this tank and hydrant, but they may be connected to the inlet supply pipeline to the dam.

I have assessed the information provided to me, considered the observations from my site inspection, referenced the ANCOLD Guidelines on Dam Safety Management (2003) and the ANCOLD Guidelines on the Consequence Categories for Dams (2012), made independent inquiries of the Department of Environment, Land Water & Planning (DELWP) and used my experience and professional judgement in the preparation of this report.

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3. Opinion

I have been requested by Wisewould Mahony to provide an opinion on six matters, which are addressed below.

3.1 Maintenance

Has the dam been properly maintained in accordance with the terms of the agreement and in accordance with sound engineering practice? If not what remedial work needs to be carried out in order to properly maintain the dam?

Clause 3.1 of the Agreement (Reference 1) requires SGSC to *“Properly maintain and repair the said fence and the dam and ensure that the same does not in any way become or cause a nuisance.”*

ANCOLD is the industry recognised source of guidance on sound engineering practice, including proper maintenance, in relation to dams in Australia.

ANCOLD recommends the assignment of a Consequence Category to a dam as defined in its *“Guidelines on the Consequence Categories for Dams”* (2012). There are seven Consequence Categories which are: Extreme, High A, High B, High C, Significant, Low and Very Low. The higher the Consequence Category, the greater the impact of the adverse consequence of dam failure which can include life safety, owner and third-party infrastructure costs and business impacts, health, social, community and environmental impacts.

Once the Consequence Category of a dam is assessed, ANCOLD recommends that it is used to ensure that an appropriate standard of design, construction, surveillance, operation, maintenance and documentation is adopted for the dam. The greater the Consequence Category, the more onerous these recommended requirements become.

I have not seen any evidence that the Consequence Category as defined by ANCOLD has been formally determined for this dam. However, on the available information I consider it to be a Very Low Consequence Category dam in accordance with ANCOLD’s *Guidelines on the Consequence Categories for Dams* (2012). I make this assessment because of the apparent negligible PAR and my

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assessment that the severity of damage and loss to the dam owner (SGSC) in the event of dam failure would be classified as “Minor” in accordance with those guidelines.

As a Very Low Consequence Category dam, ANCOLD does not require this facility to have a specific Operations and Maintenance Manual, a document which would describe, in part, detailed Operating Procedures and Maintenance Procedures and requirements for the dam.

ANCOLD does suggest that a Very Low Consequence Category Dam has formally documented dam safety surveillance practices in place including the monthly recording of rainfall, storage level and seepage, with routine monthly visual inspections (by operations personnel) and 5 yearly intermediate dam safety inspections (by a Dams Engineer).

I consider that sound engineering practice for a Very Low Consequence Category dam would include this regime of regular monitoring, inspection and reporting. Sound engineering practice would also include regular attendance to identified maintenance matters which, if left unchecked, could lead to a deterioration in condition and functionality of the dam or any of its components potentially impacting on its ability to perform its intended function, including the possibility of dam failure.

For this dam, I would expect SGSC to have some level of documented asset management system which would include routinely scheduled inspection, reporting and maintenance activities, as it might be expected to have in place for all of the infrastructure for which it is responsible.

GHD (Reference 5) and Southern Rural Water (Reference 6) state that the dam was constructed in 1988 – 30 years ago. I have seen no evidence of records of monitoring, surveillance, reporting or maintenance activities at the dam over that period, other than being advised by Mr Rich during my site inspection that the SGSC annually slash the grass and have assisted to bury his supply pipes across the crest of the dam.

From my inspection, I noted a number of issues indicating lack of maintenance at the dam, as also noted by GHD and Southern Rural Water. These include:

- (i) Heavy vegetation on the dam embankments and downstream toes, including shrubs and trees;

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- (ii) Vegetation around the inlet and outlet structures making inspection difficult and potentially affecting safe and efficient operation;
- (iii) Long grass on the dam embankments making visual inspection difficult;
- (iv) Vegetation encroaching on the upstream rock slope protection;
- (v) Longitudinal cracking on the dam crest;
- (vi) Uneven and varying levels on the embankment crests;
- (vii) Evidence of settlement, subsidence and voids around the outlet structure pit;
- (viii) A depression in the dam crest adjacent to the outlet structure. As noted by GHD and Southern Rural Water this is a potentially significant defect and may indicate erosion of fill material around the outlet pipe, which is a common cause of failure of small embankment dams;
- (ix) Large animal burrows adjacent to the northern dam embankment, and
- (x) Evidence of recent animal activity disturbing the crest of the dam.

I consider that if left unchecked, these issues could variously impact on the future integrity of the dam and potentially lead to a loss of functionality or failure of the dam. With the exception of annual grass slashing, I have seen no evidence that there has been any regular or special maintenance of the dam since construction as would be considered sound engineering practice.

In particular, the depression on the crest in the vicinity of the outlet works which was identified and reported on by Southern Rural Water in August 2017 (Reference 6) is a potential indicator of internal erosion of embankment materials around the outlet pipe which is a significant dam safety issue. Prudent dams engineering practice include immediate action to investigate and rectify this issue, as recommended by Southern Rural Water. I have seen no evidence that this matter has been investigated or remediated by SGSC to date.

I consider that the works which should now be undertaken to address these issues are:

- (i) Removal of all trees and shrubs from the dam embankments, adjacent to the embankment toes and around the inlet and outlet structures. Advice should be sought from a Dams Engineer on the extent of root removal and remedial treatment so that the dam and its foundations are not adversely affected by the removal of these trees and disturbance to embankment or foundation materials.

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- (ii) Regular management of vegetation including control of weeds (including in the rockfill on the upstream face of the dam) and cutting of grass to allow proper routine inspection.
- (iii) Investigation into the cause of cracking observed on the crest of the dam and appropriate remediation. This may include reworking the dam crest and the placement of a properly designed crushed rock capping, appropriately levelled and drained so as to prevent the potential for moisture variation, softening or cracking and movement of the underlying fill material.
- (iv) Reinstatement of the design crest level of the dam, including reinstatement of any loss of freeboard above the design impervious core level of the dam.
- (v) Investigation of the condition of the outlet structure, pipeline and surrounding embankment particularly in relation to the possibility that internal erosion of fill material is occurring. A properly designed and constructed outlet arrangement or remediation of the existing structure will be required.
- (vi) Control of animal activity in the vicinity of the dam.
- (vii) If it does not already exist, a formal inspection, reporting and maintenance regime for the dam should be established by SGSC as recommended by ANCOLD.

3.2 Storage Capacity

What has caused the reduction in the dam capacity from the original constructed capacity of 15 ML to its present capacity approximately 13 ML?

The Agreement for Taking of Water (Reference 1) at Clause 2.2 specifies a “*dam having a capacity of not less than 13.5 megalitres*” (ML), and “*...as shown in Schedule 3.*” I have not seen Schedule 3 to the Agreement.

The Shire of Woorayl Plan No: 30-158 dated 16 November 1987 (Reference 3) is titled “*Proposed Stormwater Retarding Basin – Storage Capacity Area and Location*” and indicates a Storage Capacity of 15 ML for a rectangular structure in an area of external dimensions 120 metres by 200 metres. This appears to be an initial planning document showing a general concept and location arrangement, perhaps for land acquisition purposes, and is not a design or construction drawing of the dam. I note it includes the annotation that the plan was amended on 23 December 1987, but it does not indicate the nature of this amendment.

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I understand the storage capacity of a dam to be the total volume of water which can be stored in that dam at its Full Supply Level (FSL), at which point the water level reaches a defined overflow point. In most dams a spillway is included to define this level – in this case the outlet structure performs that function. The level at which water starts to discharge from the dam (FSL) is therefore critical in determining the storage capacity, which is then determined as the volume below this level against the geometry of the inundated area retaining the water.

I am advised that there are no construction records available for the dam and no “As constructed” drawings.

The Shire of Woorayl drawing set titled “*Promontory Views Estate Drainage Scheme Design Drawings. Plan No: 30–160, Sheets 1 – 17*” dated February 1988 (Reference 12) indicates a Retarding Basin of internal dimensions 140 metres by 60 metres (sheets 6 of 16 and 16 of 16) and embankments with internal batter slopes of 2H:1V. (Southern Rural Water reports this slope angle, whereas GHD indicate the batter slopes to be 2.5H:1V. GHD’s figure may be based on the recent survey results (Reference 11) however I cannot determine which figure is correct.)

The design also shows a level floor in the basin at RL 94.5m, and an embankment crest level of 96.5m. Neither the design overflow level, the FSL nor storage capacity of the proposed dam is indicated on these drawings.

The drawings also show the detail of the inlet and outlet structure arrangements (plan 16 of 16). The invert level of the inlet pipe is specified on plan 8 of 16 as RL 94.5 m, equal to the design floor level indicated for the basin.

The invert level of the outlet pipe is not specified on the drawings but is drawn at the base of the outlet pit which is shown to have dimensions of 0.75 m by 0.9 m. I believe that this intends to refer to a pit 0.75 m square and 0.9 m deep, because the steel grating cover to the pit is shown as “1x 0.8m”, which I believe indicates a cover 0.8 m square. The drawing also indicates “2 No. 0.4 x 0.4 m square inlet ports”. There is no indication of the proposed invert level of these ports, which would determine FSL and consequently storage volume.

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During my inspection of the site, I inspected and measured this pit. I found it to be approximately 0.9 m square internally, with an internal floor level approximately 0.875m below the top of the pit. The pit has a singular rectangular opening on the upstream side, forming the overflow level from the storage approximately 0.5 m above the floor level of the pit and approximately 0.375 m below the top of the pit, which in turn approximates the elevation of the dam crest at this location. I did not observe any evidence of the "2 No. 0.4 x 0.4m square inlet ports" shown on the design drawings, nor any signs of modification of the pit since construction.

From my observations, it appears that the outlet pit is not constructed in accordance with the design drawings. I cannot determine why it was not constructed as shown on the drawings.

It is therefore not possible for me to determine the original and as-constructed storage capacity of the dam based on the available evidence because I cannot confirm the actual as-constructed geometry of the storage or FSL. The only evidence is that the current storage capacity at FSL has been calculated to be 13.2ML (GHD Reference 5).

Mackie Surveying (Reference 11) indicates a "Basin Capacity" of 13ML with an overflow level on the outlet of RL 96.06m, based on its survey dated 27th January 2016. GHD (Reference 5) appear to have used this same survey data and calculate a storage volume below RL 96.06m of 13.2 ML, a storage capacity of 13.5ML at RL 96.09, and a maximum storage capacity of 15.3ML when the dam embankment overtops at its lowest level (RL 96.28m).

GHD (Reference 5) states that "*Comparison of the design floor level of RL 94.5m against the survey data from January 2016 shows basin floor levels remain very close to design levels and sedimentation on the floor has been minimal*". If the original as constructed floor level of the basin was indeed RL 94.5m, then I concur with this statement.

I do note a slightly higher basin floor level in the local vicinity of the inlet structure shown on the survey data. This may indicate some sediment deposition, which I believe would be consistent with any sediment being carried with flowing water in the pipe dropping from suspension and settling as the water velocity slows when it enters the storage.

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Whilst I cannot determine the initial as-constructed storage capacity of the dam, I note that if the storage capacity had originally been 15ML and is now 13.2ML, and this loss of storage capacity has been caused by sedimentation, then approximately 1,800 m³ of sediment would have had to enter the storage. This is roughly equivalent to 2,600 standard "6x4" trailer loads of material. Spread evenly across the floor area of 140m by 60m this would raise the floor level by approximately 210 mm. (This depth would reduce to approximately 35mm if the original storage capacity was 13.5ML).

Alternatively, if the original storage capacity was originally 15ML and is now 13.2 ML, and this loss of storage capacity has been caused by settlement of the overflow point, then the overflow level of the outlet would have to have reduced (settled) by approximately 200mm. Whilst there are several deficiencies in the condition of the outlet as noted above, there is no evidence that settlement of this magnitude has occurred around the outlet structure, nor would I expect this magnitude of settlement for such a low height embankment.

I do not believe that either sedimentation or settlement of the outlet structure has had any significant impact on the storage capacity of the dam and consider that the current storage capacity of 13.2ML is approximately the original as-constructed storage capacity of the dam.

3.3 SGSC Proposed Works

Is the proposal to build around and/or on top of the walls of the dam an appropriate method of achieving dam capacity or will this have adverse effects on the water quality?

There are three matters to be considered in relation to the proposed works on the dam:

- (a) The rectification of existing dam safety and structural deficiencies;
- (b) The achievement of required dam storage capacity, and
- (c) Any actions necessary to ensure that the quality of the water in the dam is in accordance with the requirements of the Agreement (Reference 1).

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In relation to point (a), rectification of existing dam safety and structural deficiencies, Southern Rural Water (Reference 6) has made several recommendations in relation to works required to rectify identified deficiencies. These recommendations can be summarised as follows:

- (i) Vegetation clearing, animal control;
- (ii) Crest reinstatement to level and grading;
- (iii) Outlet works replacement, and
- (iv) Addition of a spillway structure.

I concur with these recommendations.

I understand that the proposed works on the dam are as shown on SGSC Plans of 30 November 2017 (Reference 13). No other documentation, specification, information or detail has been provided to me in relation to these proposed works.

The key components of the proposed works shown on these drawings include the following:

- (i) Removal of *“all vegetation from inside or on top of the basin wall”*;
- (ii) Installation of an *“all weather access/Class 3 crushed rock surface around the top of the basin wall. Grass to be stripped off prior to placement of rock.”* The contractor is to *“ensure that the minimum basin wall height (level) is RL 96.550 m”*;
- (iii) The outlet works are to be modified by the removal and reconstruction of the top of the outlet pit including a new overflow level of RL 96.160 m with the existing pipe to be removed and replaced with *“375 dia RCP RRR existing levels.”* I understand this to indicate a 375mm diameter rubber ring jointed reinforced concrete pipe.
- (iv) Construction of a spillway over the crest of the western embankment with a spillway crest level of RL 96.400m, 6m width and 0.15m deep. The spillway is to be lined with a reno mattress filled with 100mm (min) rock with *“rock spalls”* placed at the downstream toe of the dam. (A reno mattress is a wire mesh basket, typically filled with rock, used in waterway erosion protection works.)

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While the proposed works may address the identified dam safety deficiencies, there are several details which are either missing or unclear in the two drawings supplied by SGSC describing the works.

These missing or unclear details include:

- (i) The extent of the vegetation removal is apparently limited to the *“inside and top of the basin wall”*. Sound dams engineering practice is to remove all woody vegetation (generally trees, bushes and shrubs) and to maintain all faces of earthfill embankments, including the downstream face, free of any vegetation other than grass and similarly cleared away from the downstream toe such that tree roots cannot interfere with the embankment or its foundations.
- (ii) SGSC’s proposal to replace/reconstruct the outlet pipeline is generally supported, however the primary issue is to ensure that any existing damage, softening or erosion of the dam embankment in this area due to seepage along the existing pipe is properly remediated and prevented from occurring in the future. This may require excavation of affected areas of the embankment and replacement with properly sourced and compacted fill materials. This issue is not specifically addressed in the proposed works. The drawings shade the outlet pipe from just upstream of the dam crest centreline to the downstream end of the outlet. It is unclear as to what this shading represents but it could be interpreted to mean only a partial replacement and treatment of the outlet, which, on the available information, I do not consider to be sound practice.

In relation to the outlet structure, Southern Rural Water has recommended *“reconstruct embankment to adequate compaction standard”*, that the pipe should be concrete encased and shaped to allow good compaction and also the installation of a filter around the pipe. (In this instance a *“filter”* is a specifically designed and placed sand fill zone within the clay fill material of the dam which limits the potential for internal erosion of the clay.) Southern Rural Water’s recommendations are in accordance with sound dams engineering practice and are supported. I see no evidence that the works proposed by SGSC addresses these issues.

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- (iii) The placement of a crushed rock capping over the crest of the dam is supported, provided that it is suitably designed to ensure that any potential for excessive drying and cracking of the embankment fill, or the ponding of surface water leading to ingress into the earthfill, is minimised. There is no detail provided of the embankment treatment prior to the placement of this crushed rock material other than *“grass to be stripped”*.

Sound dams engineering practice would be to ensure that all vegetation and topsoil is removed from the embankment, the dam clay core is properly reconstructed to its design level (which should be at least to design FSL) and then the rock capping placed. This is an important issue as the proposal to raise the existing FSL by 100mm could lead to seepage and erosion occurring at the top of the dam if the existing dam core is below the proposed new FSL. I see no evidence that this has been considered in the design.

The 150mm deep longitudinal cracking noted during my inspection may indicate the presence of a 150mm depth of topsoil on the existing dam and if so, sound practice would be to remove this topsoil prior to rock placement. In any case the extent and causes of this cracking should be understood before any proposal to raise the dam FSL, because cracking in the top of an earthfill dam embankment can lead to seepage, internal erosion of embankment materials and potential dam failure.

- (iv) SGSC proposes the construction of a shallow (150mm deep) spillway overflow section on the western embankment, presumably to minimise the risk of embankment overtopping due to large inflow events or blockage of the outlet. The inclusion of such protection against overtopping (which could lead to dam failure) is supported and was also recommended by Southern Rural Water.

I have seen no design details for this spillway in relation to its discharge capacity or likely frequency of operation, which is usual practice when designing a spillway for a dam. The design and construction detail for the downstream side of the spillway where it discharges over the downstream face of the dam and toe are unclear but very important to ensure no erosion of the embankment will occur during spillway operation.

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- (v) It would be sound engineering practice for a Dams Engineer to provide a clearly documented specification for any significant modification to a dam, involving reconstruction of an outlet, construction of a new spillway and reconstruction of the embankment and permanently raising FSL. The purpose of such a specification is to ensure that the Dams Engineer's design is properly interpreted by the construction contractor to enable the works to be delivered to the required standard, including use of appropriate materials and placement techniques. I have not seen any evidence that such a construction specification exists for the proposed works.

Because the proposed works are designed to permanently increase the FSL of the reservoir, sound dams engineering practice would include a careful and controlled filling regime of the dam in conjunction with appropriate monitoring and surveillance to ensure that the works are performing satisfactorily. I would regard it as sound dams engineering practice to specify an appropriate maximum rate of filling of the dam above the prior FSL, and close observation of the dam to ensure unexpected seepage is not occurring in the newly constructed upper section of the dam or around the outlet works.

In relation to point (b) above, the achievement of the required dam storage capacity, I consider that the general arrangements of the proposed works indicated by SGSC will achieve this outcome, subject to the works being designed and constructed in accordance with sound dams engineering practice, including satisfactorily addressing the matters I have raised above. This is on the basis that the minimum required storage volume is 13.5 ML as specified in the Agreement (Reference 1).

I believe this to be the case on the basis of the evidence provided from the survey and storage volume calculations provided by GHD and Mackie Surveying (References 5 & 7 respectively) which indicates that for the basin floor and wall geometry determined by Mackie Surveying, an FSL of RL 96.09 m will achieve a storage volume of 13.5 ML, and the proposed invert of the new outlet overflow is set slightly higher at RL 96.16 m, so the minimum required volume should be achieved.

In relation to point (c) above, any actions necessary to ensure that the quality of the water in the dam is in accordance with the requirements of the Agreement, I am unable to comment in any detail as consideration of water quality matters is a specialised area and is outside my field of expertise.

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However, I would expect that as a minimum, and in accordance with sound engineering practice, the works would be undertaken in accordance with an appropriate and approved Construction Environmental Management Plan (CEMP). A CEMP for these works would identify all potential environmental risks which may arise during the works, including risks to water quality in the dam. Examples of potential risks I have seen identified and addressed on other projects are:

- (i) The control of dust and any material, including soil, from entering the water storage;
- (ii) The removal of dead or harvested vegetation from the water storage;
- (iii) The proper storage and handling of any potential contaminants which may impact on the water in the storage, including fuels, lubricants, litter and waste, and
- (iv) The maintenance of appropriate cross-fall to ensure drainage away from the storage at all times.

In addition, if there is concern over the quality of water stored in the dam during construction works, I would expect that any potential risks associated with the use of or contact with this water during construction would be identified and appropriately managed under the CEMP or other work procedure.

3.4 Sedimentation

Whether there has been a significant build-up of sedimentation either on the walls and/or the floor of the dam which has affected its capacity? Are you able to indicate the likely source of that sedimentation?

I refer to the discussion in Section 3.2 above concerning sedimentation of the storage and on the available evidence I do not consider that there has been a significant build-up of sedimentation either on the walls and/or the floor of the dam which has significantly affected its capacity.

As previously noted the survey data indicates a localised higher area of the basin floor in the vicinity of the inlet structure to the dam which may indicate localised sediment deposition. During my inspection of the site, I noted that the rock slope protection on the upstream side of the embankments above water level at the time was often obscured by vegetation with some localise soil inclusions in the rockfill. I do not believe this to be sediment entering the storage from the inlet

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pipe, but it is more likely to be localised erosion from the dam embankment surface soils or may indicate that the rockfill as originally placed contained a high degree of fine material.

I cannot comment on the likely source of any sediment which may have entered the storage via the inlet pipe system. I do not have the necessary level of expertise in urban drainage design to comment on likely sources of any material into the system.

I did not note any evidence of significant surface erosion or gullyng of exposed surface soils in the area of the adjacent subdivision or farmland. If such conditions were present, they may indicate the presence of highly erodible and mobile material in the area which could lead to sedimentation of the dam.

3.5 Water Quality

Assuming the water in the dam is not suitable for the purpose of irrigation of pasture and crops and watering of stock, what are the likely causes of the water not meeting that purpose?

I am unable to offer an opinion on this matter as it relates to water quality which is outside my field of expertise.

3.6 Regulation

What external controls exist to regulate maintenance of the dam?

In Victoria, Dam Safety is regulated under the *Water Act* 1989 and the *Water Industry Act* 1994, with the Minister for Water the responsible Minister and the Department of Environment, Land, Water & Planning (DELWP) the administering department. In 2014, the Victorian Government produced a document titled "*Strategic Framework for Dam Safety Regulation*", which describes this regulatory environment. (https://www.water.vic.gov.au/data/assets/pdf_file/0018/54135/Strategic-Framework-for-Dam-Safety-Regulation-April2014-.pdf). These governance arrangements remain current and the document sets out roles and responsibilities of dam owners and government.

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As in all jurisdictions, Dam Safety regulation in Victoria is primarily aimed at minimising the potential for adverse consequences in the event of dam failure, with life safety, community, environmental and economic impacts generally the areas of highest concern for governments.

For Victorian Government owned Water Corporations (generally the owners of the largest dams and those with the greatest potential to cause life loss if they were to fail), their overall responsibilities, including for dam safety, are documented in an individual *“Statement of Obligations”* between the Minister and the Corporation. These Statements of Obligations require that Water Corporations manage their dams with *“regard to ANCOLD Guidelines”*. The expectation is that these Water Corporation dam owners will follow the recommendations made by ANCOLD in its various guidelines, and they are required to report progress and compliance to the Department annually.

This regulation is sometimes referred to as *“light handed regulation”* by DELWP and the Victorian Water Corporations, because government rarely formally intervenes in these corporation’s dam safety programs. However, The Minister or his/her delegate has the power to intervene if he/she has reason to believe that dam safety issues are not being managed appropriately by any dam owner, whether that is a Water Corporation, local government or a private owner.

The *“Strategic Framework for Dam Safety Regulation”* notes that *“Regulatory arrangements are currently in place for dams managed by water corporations and privately owned dams”* and that *“DEPI is working to extend regulation to incorporate a small number of dams outside current arrangements which are managed by Parks Victoria, DEPI and local government.”* (DEPI, the Department of Environment and Primary Industries, was the predecessor body to DELWP).

Since the Strategic Framework was produced, the Department has progressed its assessment of local government owned dams and in 2017 undertook a technical survey of all local government owned and managed dams greater than one metre in height in order to better define the issues and inform future policy and management recommendations for government. The Southern Rural Water inspection and report on the Walkerville Basin (Reference 6) was part of this survey.

Whilst regulatory arrangements are not yet fully extended to local government, I have been advised by DELWP’s dam safety delegate that government expects that all dam owners will manage their dams with regard to ANCOLD Guidelines whether formal arrangements have been made with

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government or otherwise. DELWP has also advised me that under these dam safety regulations, there is no difference in the treatment of a water storage dam or a retarding basin.

As the maintenance of a dam is one important aspect of an owner's dam safety management program I consider that such maintenance would be viewed as being regulated under these arrangements, and this would apply to the maintenance of the Walkerville Basin.

I note the reference to this structure as a "Retarding Basin". By ANCOLD's definition a Retarding Basin is *"A type of flood mitigation dam used to temporarily store some, or all, of the stormwater runoff from an urban environment."*

I understand the primary function of a Retarding Basin to be the mitigation of the impact of flood flows on the downstream environment/ community. A Retarding Basin is typically empty or maintains a storage level well below FSL and will only retain water to FSL or a higher Design Flood Level immediately after a particular design flood, the waters of which are then released downstream in a controlled manner and at a slower flow rate than the inflow flood.

I believe that the Walkerville Basin would be more technically described as a water storage dam not as a retarding basin, as it has limited flood mitigation capacity.

In addition to dam safety obligations, DELWP requires that private dams meeting certain criteria must be licenced by the relevant agency. I believe the relevant licencing agency to be Southern Rural Water. I understand that DELWP expects that local government owned dams will be treated as private dams for the purposes of licencing but that there is currently no stringent enforcement of this expectation.

Southern Rural Water requires a licence be issued for the taking of water from a catchment and for the construction of a private dam and also a permit for any significant modification to a private dam (including *"modification of the dam crest, spillway, compensation pipe"* or *"repairs that result in disturbance of the embankment"*) if the dam meets any of the following criteria:

- (i) *"Being constructed on a waterway;*
- (ii) *5 metres or higher and 50 megalitres capacity or larger; or*

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- (iii) 10 metres or higher and 20 megalitres capacity or larger; or
- (iv) 15 metres or higher, regardless of capacity.

Note: "Waterway" includes rivers, creeks, natural channels or dams with a catchment of 60 hectares or greater.

Note: The height of the dam or embankment is the difference in level between the natural surface level, bed of a gully, stream or waterway at the downstream toe of the dam and the crest."

I cannot determine whether the Walkerville Basin is constructed on a waterway and I estimate the catchment area of the Promontory Views Estate to be less than 60 hectares. It is therefore likely that this dam does not meet any of the criteria required by Southern Rural Water for licencing or permitting of a private dam.

I have seen no evidence that any licences or permits exist for this dam.



30th April 2018

David Stewart

Australian Dams & Water Consultants Pty Ltd

Australian Dams & Water Consultants Pty Ltd





LAWYERS
MELBOURNE | GEELONG

ABN: 26 965 814 42

Our reference: RMM:40064584
Direct Line: (03) 9612 7209
Email: rob.mcgirr@wisemah.com.au

Thursday, 29 March 2018

ATTENTION: David Stewart
Australian Dam and Water Consultants Pty Ltd
PO Box 432, San Remo
VIC, 3924

BY EMAIL: david.stewart@adwc.com.au

Dear Mr Stewart,

Ansevata Nominees Pty Ltd (“Ansevata”) v South Gippsland Shire Council (“SGSC”)

1. Summary Of Factual Background

- 1.1. We act for Ansevata (our client). Our client owns and operates a farm at its property known as “Marapana” at Loop Road, Walkerville. Marapana is about 400 hectares in size.
- 1.2. In about 1990 the then Shire of Woorayl acquired about 2.585 hectares of our client’s land to construct a retarding basin or dam (**dam**) to receive storm water drainage and treated septic effluent from an area known as the Promontory Views Estate at Walkerville (**Estate**).
- 1.3. We are instructed that the dam is unfenced but the retarding basin is fenced. The dam is located off Panoramic Drive, Walkerville, approximately 200 m north of the local CFA building on the basin land. The dam was designed with dimensions of 120 metres x 200 metres and a storage capacity of 15 ML. – See plan 30-158 dated 16/11/1987
- 1.4. The dam captures flows from the Estate. The Estate covers approximately 25 ha, including 380 lots, of which approximately three quarters have dwellings most of which are holiday homes. The dam receives storm water from the majority, but not the entirety, of the Estate. There is no reticulated water supply or sewerage. Domestic wastewater is treated and reused/disposed on each individual site.
- 1.5. Our client uses the farm to graze cattle and conduct a vineyard. Our client has used the water in the dam to irrigate its crops and pastures and water stock. Our client breeds cattle and sheep on the property. Currently they have 220 breeding cows, 2400 cross ewes and 40 rams. The vineyard is a Pinot Noir area of approximately 2 hectares. Our clients have a windmill pump next to the retarding basin dam connected to an underground water

pipe of about 1 KM which takes the water from the retarding basin to the home dam as required.

- 1.6. By an agreement dated 8 May 1990 our client and the Shire agreed that our client had an entitlement to use the water in the dam for the purpose of irrigation of pasture and crops and watering of stock (**Agreement**). The Agreement sets out the rights and obligations of the parties. We enclose a copy of the Agreement. We refer you in particular to clauses 2.2, 3.1, 4.2, 6, 7, and 8 of the Agreement.
- 1.7. The Council had recently obtained reports concerning the construction and maintenance of the dam from GHD 10, March 2018 and a draft report from Southern Rural Water dated 28, March 2018.
- 1.8. Our clients are concerned that the maintenance of the dam is inadequate and that a build up of silt and sediment has reduced the dam's capacity from its originally constructed capacity of 15 ML to approximately 13 ML.

2. Material Provided

- 2.1. We enclose the following materials for your consideration:
 - 2.1.1. Expert Witness Code of Conduct for the Court of Victoria (Form 44A).
 - 2.1.2. Extract of the Civil Procedure Act 2010 (Vic) about the obligations on expert witnesses in Victorian Courts.
 - 2.1.3. Agreement for taking water dated 8, May 1990
 - 2.1.4. Deed of variation to the water agreement dated 28, November 2016
 - 2.1.5. Storage capacity area and location plan 30-158 dated 16, November 1887
 - 2.1.6. Walkerville basin feature level survey dated 27, January 2016 by Mackie Surveying
 - 2.1.7. Basin sampling locations SP1 to SP4: SP1 and SP3 are water outlets of the North West and South West corner of the dam: SP2 is the stormwater outlet of the South East corner of the dam from the Estate by underground pipe

3. Opinion Required

We are instructed to request that you provide us with a written report containing your opinion as to the following matters

- 3.1. Has the dam been properly maintained in accordance with the terms of the agreement and in accordance with sound engineering practice? If not what remedial work needs to be carried out in order to properly maintain the dam?

-
- 3.2. What has caused the reduction in the dam capacity from the original constructed capacity of 15 ML to its present capacity approximately 13 ML?
 - 3.3. Is the proposal to build around and/or on top of the walls of the dam an appropriate method of achieving dam capacity or will this have adverse effects on the water quality?
 - 3.4. Can you please advise us to whether there has been a significant build up of sedimentation either on the walls and/or the floor of the dam which has affected its capacity? Are you able to indicate the likely source of that sedimentation?
 - 3.5. Assuming the water in the dam is not suitable for the purpose of irrigation of pasture and crops and watering of stock, what are the likely causes of the water not meeting that purpose?
 - 3.6. What external controls exist to regulate maintenance of the dam?

4. Contents of report

4.1 Please ensure that you include the following in the report:

- a) An acknowledgement from you that you have read and agree to be bound by the Expert Witness Code of Conduct for the Supreme Court of Victoria (a copy is enclosed). Please note that paragraph three of the Code specifies matters that your report must contain including the declaration in paragraph 3(i) of the code.
- b) An acknowledgement of the obligations on an expert witness imposed by the Civil Procedure Act 2010 and that you have complied with those obligations in preparing your report.

5. Your Duties and Responsibilities as an Expert Witness:

5.1. The Report ultimately prepared by you must be prepared in accordance with the Expert Witness Code of Conduct. In particular, we note that you are required to include in your report the following matters:

- a) your name and address;
- b) your qualifications as an expert on the issue the subject of the report
- c) a statement identifying your areas of expertise
- d) a statement setting out your expertise to make the report
- e) all instructions that define the scope of the report (original and supplementary and whether in writing or oral);

-
- f) the facts, matters and all assumptions of fact, on which the opinions are based on which the report proceeds;
 - g) your reasons for each opinion expressed;
 - h) reference to those documents and other literature or materials you have been instructed to consider or take into account in preparing your report and the literature or other materials used in making the report.
 - i) any examinations, tests or other investigations upon which you relied in the making of the report, including details of the identity and qualifications of the person who carried out the examinations, tests or other investigations;
 - j) a summary of your opinion or opinions (to be located at the beginning of the report); and
 - k) a statement setting out any questions falling outside your expertise and also a statement indicating whether the report is incomplete or inaccurate in any respect.

6. Terms of Engagement

6.1. The terms of your retainer are set out in the Schedule A enclosed. Please sign and return a copy of the Terms of Engagement.

You are instructed to undertake such inquiries as you may regard as appropriate to enable you to respond to the questions set out above. In particular, if you require any further information please let us know.

If we have requested that you express an opinion on a matter which is outside your area of expertise, please inform us.

We look forward to receiving your report.

Yours faithfully,

WISEWOULD MAHONY

Partner: Robert McGirr

Contact: Rob McGirr – Partner

Email: rob.mcgirr@wisemah.com.au

Phone: (03) 9612 7209

Enc.

SUPREME COURT OF VICTORIA

Form 44A

Rule 44.01

EXPERT WITNESS CODE OF CONDUCT**Application of Code**

1. This Code of Conduct applies to any expert witness engaged or appointed—
 - (a) to provide an expert's report for use as evidence in proceedings or proposed proceedings; or
 - (b) to give opinion evidence in proceedings or proposed proceedings.

General Duties to the Court

2. An expert witness is not an advocate for a party and has a paramount duty, overriding any duty to the party to the proceedings or other person retaining the expert witness, to assist the Court impartially on matters relevant to the area of expertise of the witness.

Content of Report

3. Every report prepared by an expert witness for use in Court shall clearly state the opinion or opinions of the expert and shall state, specify or provide—
 - (a) the name and address of the expert;
 - (b) an acknowledgment that the expert has read this code and agrees to be bound by it;
 - (c) the qualifications of the expert to prepare the report;
 - (d) the assumptions and material facts on which each opinion expressed in the report is based (a letter of instructions may be annexed);
 - (e) the reasons for and any literature or other materials utilised in support of each such opinion;

- (f) (if applicable) that a particular question, issue or matter falls outside the expert's field of expertise;
- (g) any examinations, tests or other investigations on which the expert has relied, identifying the person who carried them out and that person's qualifications;
- (h) to the extent to which any opinion which the expert has expressed involves the acceptance of another person's opinion, the identification of that other person and opinion expressed by that other person;
- (i) a declaration that the expert has made all the inquiries which the expert believes are desirable and appropriate (save for any matters identified explicitly in the report) and that no matters of significance which the expert regards as relevant have, to the knowledge of the expert, been withheld from the Court;
- (j) any qualification of an opinion expressed in the report without which the report is or may be incomplete or inaccurate;
- (k) whether any opinion expressed in the report is not a concluded opinion because of insufficient research or insufficient data or for any other reason; and
- (l) where the report is lengthy or complex, a brief summary of the report at the beginning of the report.

Supplementary Report Following Change of Opinion

4. Where an expert witness has provided to a party (or that party's legal representative) a report for use in Court, and the expert thereafter changes his or her opinion on a material matter, the expert shall forthwith provide to the party (or that party's legal representative) a supplementary report which shall state, specify or provide the information referred to in paragraphs (a), (d), (e), (g), (h), (i), (j), (k) and (l) of clause 3 of this code and, if applicable, paragraph (f) of that clause.
5. In any subsequent report (whether prepared in accordance with clause 4 or not) the expert may refer to material contained in the earlier report without repeating it.

Duty to Comply with the Court's Directions

6. If directed to do so by the Court, an expert witness shall—
- (a) confer with any other expert witness;
 - (b) provide the Court with a joint report specifying (as the case requires) matters agreed and matters not agreed and the reasons for the experts not agreeing; and
 - (c) abide in a timely way by any direction of the Court.

Conference of Experts

7. Each expert witness shall—
- (a) exercise his or her independent judgment in relation to every conference in which the expert participates pursuant to a direction of the Court and in relation to each report thereafter provided, and shall not act on any instruction or request to withhold or avoid agreement; and
 - (b) endeavour to reach agreement with the other expert witness (or witnesses) on any issue in dispute between them, or failing agreement, endeavour to identify and clarify the basis of disagreement on the issues which are in dispute.

THE CIVIL PROCEDURE ACT 2010

PART 2.3—THE OVERARCHING OBLIGATIONS

16 Paramount duty

Each person to whom the overarching obligations apply has a paramount duty to the court to further the administration of justice in relation to any civil proceeding in which that person is involved, including, but not limited to—

- (a) any interlocutory application or interlocutory proceeding;
- (b) any appeal from an order or a judgment in a civil proceeding;
- (c) any appropriate dispute resolution undertaken in relation to a civil proceeding.

17 Overarching obligation to act honestly

A person to whom the overarching obligations apply must act honestly at all times in relation to a civil proceeding.

18 Overarching obligation—requirement of proper basis

A person to whom the overarching obligations apply must not make any claim or make a response to any claim in a civil proceeding that—

- (a) is frivolous; or
- (b) is vexatious; or
- (c) is an abuse of process; or
- (d) does not, on the factual and legal material available to the person at the time of making the claim or responding to the claim, as the case requires, have a proper basis.

19 Overarching obligation to only take steps to resolve or determine dispute

For the purpose of avoiding undue delay and expense, a person to whom the overarching obligations apply must not take any step in connection with any claim or response to any claim in a civil proceeding unless the person reasonably believes that the step is necessary to facilitate the resolution or determination of the proceeding.

20 Overarching obligation to cooperate in the conduct of civil proceeding

A person to whom the overarching obligations apply must cooperate with the parties to a civil proceeding and the court in connection with the conduct of that proceeding.

21 Overarching obligation not to mislead or deceive

A person to whom the overarching obligations apply must not, in respect of a civil proceeding, engage in conduct which is—

- (a) misleading or deceptive; or
- (b) likely to mislead or deceive.

22 Overarching obligation to use reasonable endeavours to resolve dispute

A person to whom the overarching obligations apply must use reasonable endeavours to resolve a dispute by agreement between the

persons in dispute, including, if appropriate, by appropriate dispute resolution, unless—

- (a) it is not in the interests of justice to do so; or
- (b) the dispute is of such a nature that only judicial determination is appropriate.

Example

A proceeding where a civil penalty is sought may be of such a nature that only judicial determination is appropriate.

23 Overarching obligation to narrow the issues in dispute

If a person to whom the overarching obligations apply cannot resolve a dispute wholly by agreement, the person must use reasonable endeavours to—

- (a) resolve by agreement any issues in dispute which can be resolved in that way; and
- (b) narrow the scope of the remaining issues in dispute—

unless—

- (c) it is not in the interests of justice to do so; or
- (d) the dispute is of such a nature that only judicial determination is appropriate.

24 Overarching obligation to ensure costs are reasonable and proportionate

A person to whom the overarching obligations apply must use reasonable endeavours to ensure that legal costs and other costs incurred in connection with the civil proceeding are reasonable and proportionate to—

- (a) the complexity or importance of the issues in dispute; and
- (b) the amount in dispute.

25 Overarching obligation to minimise delay

For the purpose of ensuring the prompt conduct of a civil proceeding, a person to whom the overarching obligations apply must use reasonable endeavours in connection with the civil proceeding to—

- (a) act promptly; and
- (b) minimise delay.

26 Overarching obligation to disclose existence of documents

- (1) Subject to subsection (3), a person to whom the overarching obligations apply must disclose to each party the existence of all documents that are, or have been, in that person's possession, custody or control—

- (a) of which the person is aware; and
- (b) which the person considers, or ought reasonably consider, are critical to the resolution of the dispute.

- (2) Disclosure under subsection (1) must occur at—

- (a) the earliest reasonable time after the person becomes aware of the existence of the document; or

- (b) such other time as a court may direct.
- (3) Subsection (1) does not apply to any document which is protected from disclosure—
 - (a) on the grounds of privilege which has not been expressly or impliedly waived; or
 - (b) under any Act (including any Commonwealth Act) or other law.
- (4) The overarching obligation imposed by this section—
 - (a) is an ongoing obligation for the duration of the civil proceeding; and
 - (b) does not limit or affect a party's obligations in relation to discovery.

27 Protection and use of information and documents disclosed under overarching obligation in section 26

- (1) A person who receives any information or documents provided by another person involved in the civil proceeding as a result of disclosure in compliance with the overarching obligation in section 26 is subject to an obligation not to use the information or documents, or permit the information or documents to be used, for a purpose other than in connection with the civil proceeding.
- (2) The obligation under subsection (1) is taken to be an obligation to the court, contravention of which constitutes contempt of court.
- (3) A person—
 - (a) may agree in writing to the use of information or documents otherwise protected under subsection (1); or
 - (b) may be released from the obligation imposed under subsection (1) by leave of the court.
- (4) Without limiting this section or discovery in any civil proceeding any information or documents exchanged in compliance with the overarching obligation in section 26 is required to be discovered in the civil proceeding to be admissible in that proceeding.
- (5) Nothing in this section limits any other undertaking to a court (implied or specific) whether at common law or otherwise, in relation to information or documents disclosed or discovered in a civil proceeding.

PART 2.4—SANCTIONS FOR CONTRAVENING THE OVERARCHING OBLIGATIONS

28 Court may take contravention of overarching obligations into account

- (1) In exercising any power in relation to a civil proceeding, a court may take into account any contravention of the overarching obligations.
- (2) Without limiting subsection (1), in exercising its discretion as to costs, a court may take into account any contravention of the overarching obligations.

29 Court may make certain orders

- (1) If a court is satisfied that, on the balance of probabilities, a person has contravened any overarching obligation, the court may make any order it considers appropriate in the interests of justice including, but not

- (a) an order that the person pay some or all of the legal costs or other costs or expenses of any person arising from the contravention of the overarching obligation;
 - (b) an order that the legal costs or other costs or expenses of any person be payable immediately and be enforceable immediately;
 - (c) an order that the person compensate any person for any financial loss or other loss which was materially contributed to by the contravention of the overarching obligation, including—
 - (i) an order for penalty interest in accordance with the penalty interest rate in respect of any delay in the payment of an amount claimed in the civil proceeding; or
 - (ii) an order for no interest or reduced interest;
 - (d) an order that the person take any steps specified in the order which are reasonably necessary to remedy any contravention of the overarching obligations by the person;
 - (e) an order that the person not be permitted to take specified steps in the civil proceeding;
 - (f) any other order that the court considers to be in the interests of any person who has been prejudicially affected by the contravention of the overarching obligations.
- (2) An order under this section may be made—
- (a) on the application of—
 - (i) any party to the civil proceeding; or
 - (ii) any other person who, in the opinion of the court, has a sufficient interest in the proceeding; or
 - (b) on the court's own motion.
- (3) This section does not limit any other power of a court to make any order, including any order as to costs.

30 Applications for orders under section 29

- (1) An application for an order under section 29 is to be made—
- (a) in the court in which the civil proceeding was, or is being, heard; and
 - (b) in accordance with the rules of court.
- (2) An application for an order under section 29 must be made prior to the finalisation of the civil proceeding to which the application relates (excluding any period for appeals).
- (3) For the purposes of subsection (2), if an order, including an order in respect of costs, is made after the date of finalisation of the civil proceeding to which the application relates, the date of making of the last of the orders is taken to be the date of finalisation of that proceeding.

31 Extension of time for application

- (1) Despite section 30(2), a person may apply to the court for an extension of time to apply for an order under section 29 after the finalisation of the civil proceeding.

- (2) The court may grant an extension of time for making an application under section 29 if satisfied that the party making the application was not aware of the contravention of the overarching obligations until after the end of the period specified in section 30(2).

3

ANNEXURE A
Water Agreement

2

- C. The Licensee is the registered proprietor of all that piece of land comprises Lots 1 and 2 on Plan of Subdivision No. 212161J Parish of Waratah being the land comprised in Certificates of Title Volume 9829 Folios 950 and 951 ("the Licensee's land" which expression shall not include "the basin land" hereinafter described, where the context so requires);
- D. The Shire has agreed with the Licensee to purchase that part of the licensee's land comprising 2.7 hectares of Lot 1 aforesaid delineated and coloured red on the plan in Schedule 1 to this Agreement ("the basin land") for the construction and maintenance of a storm water retarding basin ("the dam"). The precise dimensions of the basin land are being surveyed by or under direction of the Shire;
- E. The sale and transfer by the Licensee to the Shire of the basin land is conditional on the execution and exchange of this Agreement and the Shire making available all water to be stored in the dam free of charge to the Licensee for irrigation and stock watering purposes in accordance with this Agreement,

NOW THEREFORE IT IS EXPRESSLY AGREED by and between the parties hereto as follows:-

1. This Agreement shall bind the Shire and the Licensee and come into full force and effect upon:-
 - 1.1 The approval of the Scheme for the drainage of Promontory Views Estate pursuant to Section 651 or any other appropriate provisions of the Local Government Act 1958, and

4

3.1 Properly maintain and repair the said fence and the dam and ensure that the same does not in any way become or cause a nuisance;

3.2 Not without the consent of the Licensee use the basin land for any purpose other than for the collection, storage and disposal of water in or from the dam and purposes necessarily incidental thereto, including the purposes authorized by this Agreement. It is expressly agreed that this restriction shall run with the land in favour of the Licensee's land and each and every part thereof (save for the basin land) and shall be registered as a covenant against the title of the basin land to issue to the Shire after registration of the Transfer thereof from the Licensee. Such covenant shall be incorporated in the Transfer of the basin land in registrable form.

4. In part consideration for the transfer of the basin land from the Licensee to the Shire and conditionally upon such transfer, the Shire agrees, and hereby grants to the Licensee, the right hereinafter described in perpetuity or until, with the Licensee's consent as provided in the immediately preceding paragraph, the basin land is no longer used for the purpose therein described PROVIDED THAT should it become necessary, by reason of any declaration or order by any Court of appropriate jurisdiction or for any other legal reason, to read down or reduce the period of this right, it is expressly agreed that this right shall continue

6

Licensee.

5. It is expressly agreed that the right described in paragraph 4 hereof is not only a personal right but the benefit of it shall run with and attach to the Licensee's land and each and every part thereof whether or not the present Licensee, Ansevata Nominees Pty, Ltd., continues to be the registered proprietor thereof.
6. It is expressly agreed that the water from the dam shall not be suitable for human consumption and the Shire gives no warranty or representation that the waters from the dam will be suitable for any purpose other than the irrigation of pasture and crops and watering of stock.
7. Nothing herein contained authorizes or permits the Shire by any act or omission to be negligent or cause any nuisance or breach of statutory duty or any other breach of the law in relation to:
 - 7.1 The construction and/or maintenance of the dam;
 - 7.2 The quality of the water in the dam or to be in the dam;
 - 7.3 The collection or discharge of water to/from the dam;
 - 7.4 The Shire's ownership/occupation of the basin land.
8. The Shire shall, at least six times per year at no less an interval than one calendar month, and at such other times when the Licensee has reasonable grounds to believe that the

18

THE COMMON SEAL of THE PRESIDENT
 COUNCILLORS AND RATEPAYERS OF THE
 SHIRE OF WOORAYL was hereunto
 affixed in the presence of:

President *[Signature]*

Councillor *[Signature]*

Shire Secretary *[Signature]*

THE COMMON SEAL of ANSEVATA
 NOMINEES PTY. LTD. was hereunto
 affixed in accordance with its
 Articles of Association in the
 presence of:

Director

Secretary

5

ANNEXURE A
Deed of Variation

THIS DEED OF VARIATION is made on

2016

PARTIES

- 1 **ANSEVATA NOMINEES PTY LTD**
ACN 004 686 131
of 240 Bay Street Brighton 3186
("Ansevata")
- 2 **SOUTH GIPPSLAND SHIRE COUNCIL**
of 9 Smith Street, Leongatha, VIC 3953
("Council")

RECITALS

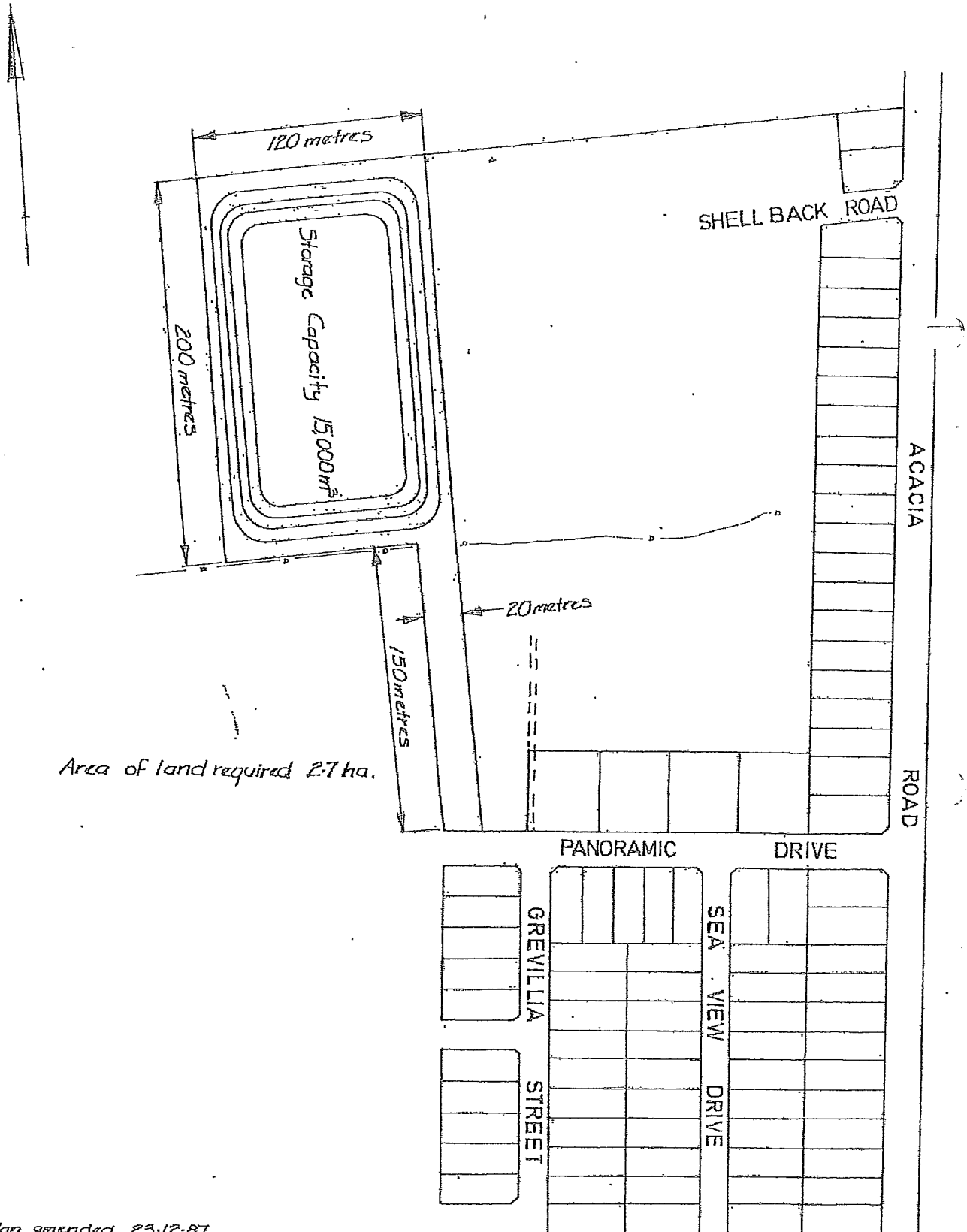
- A On 8 May 1990, Council's predecessor entered into an agreement with Ansevata which gave Ansevata the right to use water from a retarding basin ("the dam") for agricultural purposes without charge ("Water Agreement"). The Water Agreement is annexed to this Deed and marked "Annexure A".
- B Differing interpretations of the terms of the Water Agreement led to a dispute between the Parties as to their respective rights and obligations under the Water Agreement.
- C This Deed of Variation varies the Water Agreement to clarify the rights and obligations of the Parties.

THE PARTIES AGREE THAT:

1. The Parties agree that this Deed amends the Water Agreement and that the terms of the Water Agreement not amended by this Deed are hereby confirmed.
2. The following clause is inserted in the Water Agreement after Clause 3.2:
- 3.3 *Not take or use water from the basin land, provided however:*
- 3.3.1 *water may only be disposed of for the management, repair and maintenance of the Dam, and only via the Dam's existing external drain;*
- 3.3.2 *disposal for the purposes of this agreement means the Council may not take or use the water for any other purpose other than set out in clauses 3.3.1 and 3.3.3;*
- 3.3.3 *that the Shire may request, and the Licensee at its discretion may consent, to the taking of water by the Shire for other purposes.*
3. The variations in this Deed prevail to the extent of any inconsistency with any other clause of the Water Agreement.
4. The variations in this Deed take effect upon the Parties executing this Deed.

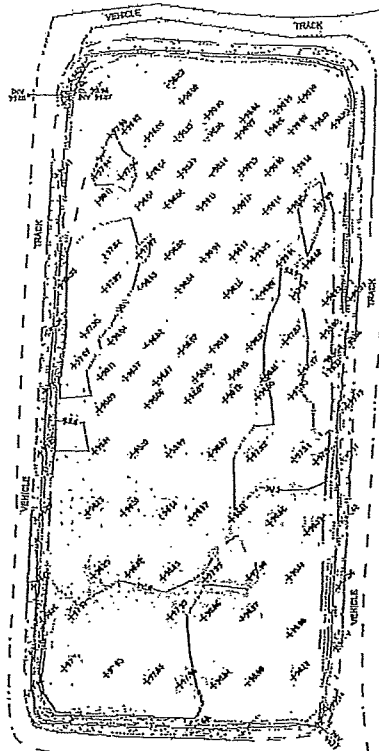
EXECUTED as a Deed.

Dated: 28th NOVEMBER 2016



Plan amended 23-12-87

SHIRE OF WOORAYL		30 May 2018	SCALE	1: 2000	DATE	LEVEL BOOK	344	FILE No 310210
PROPOSED STORMWATER RETARDING BASIN			DESIGN	A.E.C.	16.11.87	APPROVED		PLAN FILE No
			DRAWN	A.E.C.	16.11.87			20 150



BASIN CAPACITY
13000m³

WATER VOLUME
ON 27/01/2016
3000m³



LEGEND	
SYM.	LAYER NAME
▲	4 Cont'd
×	102 Top of bank
×	103 Top of bank
×	104 Natural Surface
×	108 Cont'd
×	117 Excavation
×	309 Cont'd
×	410 Edge of Cont'd
×	413 Edge of Cont'd
×	422 Water Level
×	423 Fence
×	424 DCHS Lot Boundary Only

NOTATIONS
This Plan must be read together with the attached
Abstract of Survey and Plan.

Lands are to be an ARBITRARY HEIGHT NATURAL
Surface. The surface is to be as shown on the plan and
is to be used for the purpose of the survey only and is not to be
used for any other purpose.

CLIENT
South Gippsland Shire
Council
PROJECT
Wickham Basin
Yarru Yarru
PROJECT DETAILS
Platens and Level Survey

Scale 1:500	Sheet Size A1
Date: 02/07/2016	Date of Survey: 27/01/2016
Drawn: BJC	Survey: 245
Checked: [Signature]	
Sheet 1 of 1	Drawing No: 155023A
Version A	

Mackie Surveying
120 Ticehurst
St Leonards
NSW 2234
147 000 0000

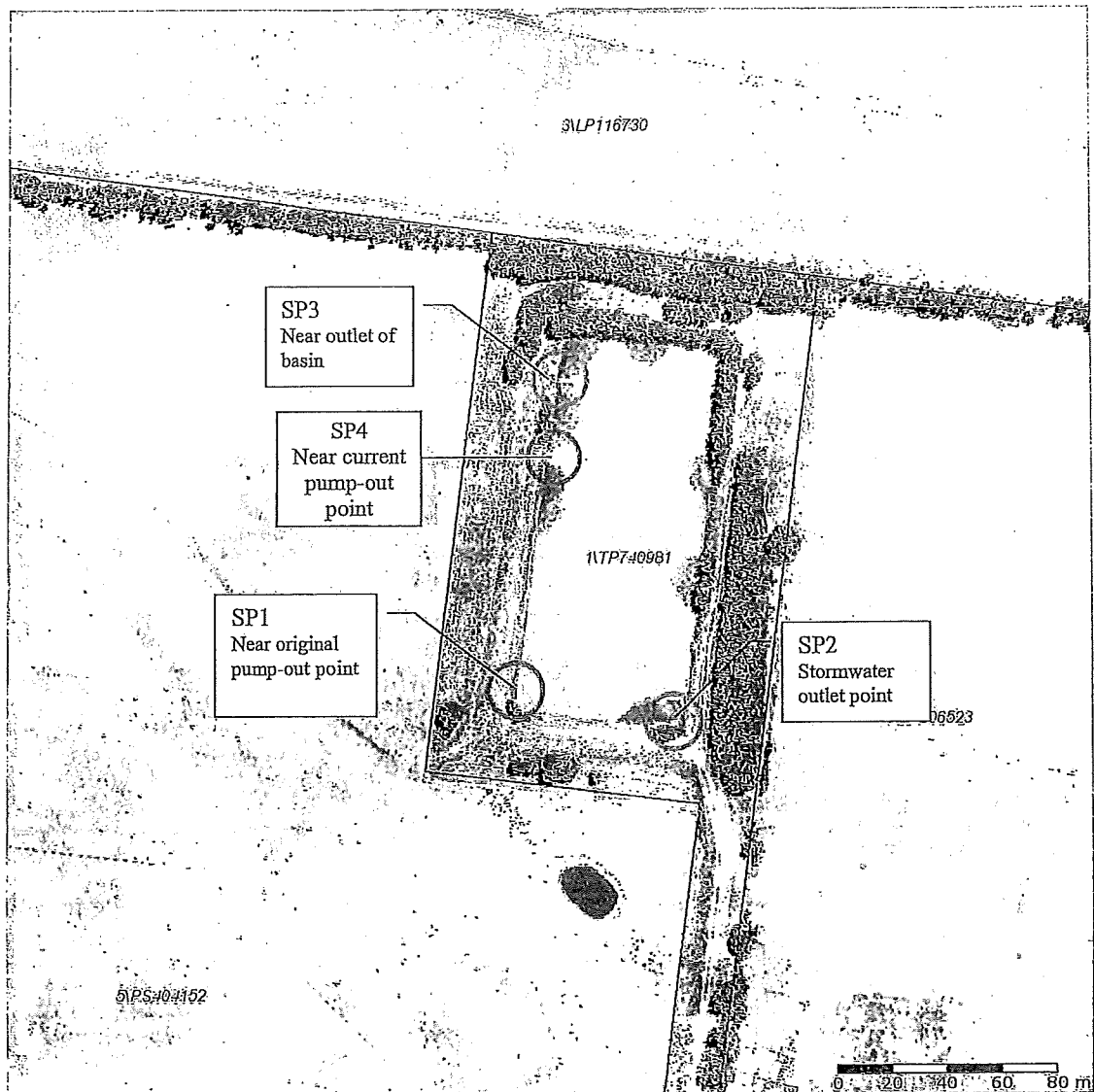


Figure 3-1: Basin sampling locations

The water and sediment samples have been tested for a range of parameters including microbial pathogens, nutrients, salinity and heavy metals. Details are provided in Sections 4 and 5.

As there has been no identification as to the specific 'toxic' nature of the sediment, the sampling and testing proposed can be considered an initial screen to determine if there are any general indicators of contaminants in the sediment that could cause harm to stock or irrigated land/crops. The sampling and testing set has been used to determine if further detailed analysis is warranted.

Sampling of stormwater in the drains was not undertaken. This can only be conducted during a rain event and the water quality during an event is likely to have high variability (e.g. first flush will be of different quality to sustained flow). Multiple events would need to be sampled to provide statistically relevant data.

Sampling and testing of drain water quality was undertaken by the South Gippsland Shire following rainfall in September 2017. This has been considered, but given it relates to only one rainfall event, it is difficult to draw meaningful conclusions.

SCHEDULE A

Terms of Engagement

Your engagement will be on the following terms:

1 Your fees/accounts

- 1.1 Prior to undertaking any work please provide an estimate of your fees prior to undertaking this retainer. Ansevata Pty Ltd will only pay fees that have our prior approval in writing;
- 1.2 You will be required to provide a tax invoice for work performed in relation to this matter each month, by the second last business day of each month. Any tax invoice must:
 - 1.2.1 Provide a detailed breakdown of the specific tasks performed by you and time spent by you in performing each of those tasks; and
 - 1.2.2 Set out the total fees and disbursements (including those being invoiced at the time) incurred to date in this matter.
- 1.3 Your accounts will be paid when Ansevata Pty Ltd has put us in funds to meet payment. In that regard, we advise that we intend to issue accounts to Ansevata Pty Ltd on a monthly cycle and for payment to be made within a month from date of issue. The result is that there can be a delay of an equivalent period between you rendering an account and it being paid.
- 1.4 Given point 1.1.1 above, you acknowledge and agree that payment to you of any fees comprised in any tax invoice rendered to us under the terms of this letter is conditional upon Wisewould Mahony receiving a corresponding payment in respect of that invoice from Ansevata Pty Ltd.

2 Disbursements

- 2.1 You will be required to advise us of any anticipated disbursements so that Ansevata Pty Ltd can agree to them prior to expenditure.
- 2.2 Ansevata Pty Ltd will only pay for expenses that have our prior approval in writing.

3 Legal professional privilege

- 3.1 All information, instructions and communications provided to you are confidential and are not to be used by you for any purpose other than for the purpose of your engagement under this letter.

3.2 Any communications by Ansevata Pty Ltd or us with you concerning the assistance you are providing in this matter are subject to legal professional privilege. Such communications include written documents, oral communications, electronic communications, video communications etc. For example, privilege will attach to:

3.2.1 Letters to you;

3.2.2 Notes you make of meetings or discussions with Ansevata Pty Ltd, us or with any other member of the legal team, including counsel, experts etc.;

3.2.3 Notes you make in the course of preparing any document or statement;

3.2.4 Drafts of any statements;

3.2.5 Your copies of any final statements.

3.3 If you are ever called upon to produce such documents to a third party (whether by subpoena or otherwise) you must contact us immediately, so that steps may be taken to preserve that privilege on behalf of our client.

3.4 You acknowledge that you owe a fiduciary duty to Ansevata Pty Ltd pursuant to your engagement under this letter not to use any information you have obtained for any purpose other than for the purpose of your engagement under this letter.

3.5 You must do everything reasonably necessary to protect the confidentiality of all information acquired during the course of your engagement under this letter so as not to waive legal professional privilege.

4 Confidential information

4.1 By virtue of your retainer you may become aware of information relating to the business affairs of SGSC and its subsidiaries, the business affairs of Ansevata and Wisewould Mahony, including but not limited to technical information, financial information and information about staff and clients (**Confidential Information**).

4.2 Confidential Information relating to:

4.2.1 SGSC and its subsidiaries remains the sole property of SGSC;

4.2.2 The Ansevata Pty Ltd Parties remains the sole property of the Ansevata Pty Ltd Parties; and

4.2.3 Wisewould Mahony remains the sole property of Wisewould Mahony.

4.3 You must not either during (except in the lawful discharge of your duties) or after your retainer has ceased, without the prior written consent of Ansevata Pty Ltd or Wisewould Mahony as the case may be, directly or indirectly, disclose to any person the Confidential Information for your own or another's benefit. That

consent may be withheld or given on such terms as Ansevata Pty Ltd or Wisewould Mahony in their sole and unfettered discretion consider appropriate.

4.4 You must immediately notify Wisewould Mahony if you suspect misuse of any Confidential Information and assist in any proceedings taken for alleged misuse of Confidential Information.

4.5 Further, the Proceeding may be sensitive and you acknowledge that you must not make any statements (oral, written or otherwise) in public or the media in relation to the Proceeding.

4.6 The terms of the retainer are and remain confidential.

5 Intellectual Property

5.1 You acknowledge and agree that Ansevata Pty Ltd is the exclusive owner of all copyright, databases and other intellectual property related to works created or designed by you in the course of your assistance under this letter.

5.2 The restraints contained in this clause are separate, distinct and several so that the unenforceability of any restraint does not affect the enforceability of other restraints.

6 Termination

6.1 Wisewould Mahony on the instructions of Ansevata Pty Ltd , may terminate your assistance under this letter without cause at any time.

6.2 You may terminate the retainer by giving Wisewould Mahony not less than one month's notice in writing during the term of the retainer.

6.3 On termination, you must return to Wisewould Mahony all documents, computer disks, files and other material, including draft copies and final copies of any reports that came into existence pursuant to your engagement under this letter, either provided to you or created by you in respect of your assistance under this letter and your engagement under this letter.

7 Acknowledgement of terms of engagement

7.1 A copy of these terms is enclosed for your approval. If you accept these terms of engagement, please sign the copy provided and return.

7.2 In the absence of receipt by us of the signed acknowledgment your acceptance of our instructions will serve as acceptance of these terms.

Dated

Signed

Attachment 6.1.3

Agenda - 28 March 2018



2 March 2018

Justin Taylor
 Senior Design Engineer
 South Gippsland Shire Council
 9 Smith Street
 Leongatha VIC 3953

Our ref: 3135925-6400

Dear Justin

Walkerville Basin Volume Assessment

1 Introduction

GHD Pty Ltd (GHD) was engaged by South Gippsland Shire Council (SGSC) to undertake a volume assessment of the Walkerville Basin, located in Walkerville, southern Victoria. The work was undertaken at the request of Justin Taylor and John Moylan of SGSC following a project briefing at GHD Traralgon on 9 January 2018.

2 Scope of work

The scope for this assessment was based on GHD's proposal,¹ and included the following works items:

1. Review existing data provided by SGSC.
2. Site inspection of the basin and surrounding area.
3. Staged volume assessment of the basin using survey data provided by SGSC.
4. Report presenting the findings of the assessment.

2.1 Limitations

This report has been prepared by GHD for SGSC and may only be used and relied on by SGSC for the purpose agreed between GHD and SGSC. GHD otherwise disclaims responsibility to any person other than SGSC arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible. The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

GHD has prepared this report on the basis of information provided by SGSC, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report, which were caused by errors, or omissions in that information.

¹ GHD 2018, *Walkerville Basin – Volume Assessment: Proposal and Fee Estimate*, 17 January 2018.

3 Project background

Walkerville Basin is located off Panoramic Drive, Walkerville, approximately 200 m north of the local CFA building. The basin was constructed in 1988 as part of the drainage scheme for the nearby Promontory Views Estate. The basin was designed with floor dimensions of 140 m by 60 m and a nominal storage capacity of 13.5 ML. Table 1 summarises the key design features taken from the drawings provided by SGSC.

It is understood there is an historical agreement between SGSC and an adjacent property owner, whereby the property owner has access to water in the basin for stock use via a number of mobile pumps. It is further understood that there are no records of the amount of water that is supplied to the property owner.

This purpose of this assessment was to determine the current storage capacity of the basin and investigate conditions that may be affecting the yield of the basin. Such conditions may include: leakage through the embankments, basin floor and/or overflow structure (spillway), sedimentation on the floor of the basin, restricted inflows, and settlement of the embankments and/or overflow structure.

Table 1 Walkerville Basin design features

Item	Description
Type	Off-stream turkeys nest – regular in plan with earthen embankments on all sides
Nominal storage capacity	13.5 ML
Year constructed	1988
Purpose	Retarding basin for residential estate stormwater. Stored water used as stock water for adjacent farm
Current owner	South Gippsland Shire Council
Floor dimensions	140 m x 60 m
Floor level	RL 94.5 m
Crest level (ave.)	RL 96.5 m
Crest width (ave.)	4 m
Batter slopes	2.5H:1V
Spillway	
Type	Concrete overflow intake pit and dia. 375 mm concrete overflow pipe through embankment
Location	Northwest corner

Item	Description
Level	Design level unknown (RL 96.06 m at 27-Jan-16)
Inlet	
Type	Dia. 675 mm pipe through embankment
Location	Southeast corner
Level	Pipe invert RL 94.6 m

3.1 Available data

The following information was provided to GHD for the purpose of this assessment:

- Feature and level survey of basin and upstream drainage (CAD files), 27 January 2016.
- Drainage scheme drawings for Promontory Views Estate, February 1988.

4 Observations from site inspection

The following observations and comments have been derived from the site inspection:

- The water level at the time of the inspection was not provided, but was well below full supply level.
- The condition of the embankments and crest were generally good. Some minor depressions were observed, however, all areas of the crest were accessible and trafficable using a regular light vehicle (Photo 01).
- There were a number of mature trees growing through the embankments. It is recommended trees and shrubs be removed from the embankments to prevent the development of piping pathways via root zones (Photo 02).
- Heavy reed growth was observed around the basin rim (Photo 03). Vegetation should be managed as it can restrict inflows and outflows.
- Minor cracking and spalling of the concrete overflow structure (spillway) was observed, however the overall condition was generally sound (Photo 04). No visible signs of settlement or leakage around the structure could be observed. However, it was understood that water levels have been low for some time, as such, any possible leakage pathways were difficult to identify.
- Despite minor concrete spalling, the general condition of the overflow outlet pipe was sound and clear of blockages (Photo 05).
- Backfilling around the overflow pit was sporadic and not tight against the pit (Photos 06 and 07). This is likely to be affecting the performance of the structure and foundation and may be providing pathways for leakage when water levels are higher than at present.
- Downstream, the spillway outlet should be cleared so any flow can pass unimpeded (Photo 08).
- The inlet was below the water line and could not be observed.

5 Staged volume calculation

GHD have completed a three-dimensional assessment of basin volume at various water levels using the survey data provided. The results show that at full supply level (FSL) of RL 96.06 m (current overflow level) the maximum storage volume is 13.2 ML (Table 2). Figure SK-01 is a schematic showing basin conditions.

Table 2 Storage volumes

Water Level	Storage Volume (ML)
RL 94.95 m (water level at 27-Jan-16)	3.0
Overflow (spillway) level RL 96.06 m	13.2
RL 96.09 m	13.5
RL 96.28 m (overtopping level)	15.3

6 Discussion and conclusions

The following comments are based on the results of the site inspection and volume assessment:

- As the basin was constructed 30 years ago, and no design storage capacity, spillway level or design freeboard has been provided, the design storage capacity cannot be conclusively determined. Furthermore, without the design spillway level, it cannot be concluded that settlement of the overflow structure significant enough to reduce basin volumes has occurred.
- Based on the current overflow level of RL 96.06 m, the maximum storage volume is 13.2 ML.
- Comparison of the design floor level of RL 94.5 m against the survey data from January 2016 shows basin floor levels remain very close to design levels and sedimentation on the floor has been minimal.
- Backfilling immediately around the overflow structure was sporadic and is likely to be affecting the performance of the structure and foundation. This may lead to leakage around the structure when water levels are higher than observed during the site inspection (hence, a lower full supply level).
- Silt laden or highly turbid water was not observed in the basin during the site inspection. However, no water quality testing was undertaken, nor have any water quality test results been provided.
- It is understood SGSC have been instructed by the relevant water licencing authority to undertake some minor works to improve the general safety of the basin. These works are to include removal of trees and shrubs from the embankments, placement of road base along the crest to maintain access in all seasons and upgrading the outlet structure to be in line with maximum inflows. These works will also address a number of the items raised in Section 4.
- Using select clay fill and proper construction methods (i.e. material specification and compaction control), any settlement of the embankments would likely occur within the first one to two years of placement, and generally be in the range of 25 to 50 mm. Any long-term consolidation of the embankments (and foundation) after this is difficult to quantify as it relates to material type and the

seasonal shrink-swell cycles that are influenced by local climatic conditions (i.e. periods of drought and/or prolonged wet periods).

- In addition to possible leakage around the overflow structure, other possible explanations for the alleged reduction in storage yield may be due to leakage through the basin floor or reduced inflows. Reduced inflows may be due to blockages upstream, water loss through the open drainage throughout the estate and the numerous water tanks collecting stormwater from houses within the estate.

We trust this report meets your requirements. If you have any queries, or require clarification, please don't hesitate to be in contact.

Sincerely
GHD



Joel Anders

Senior Engineer – Dams and Tailings
+61 3 5136 5836

Attachments

Site inspection photos

SK-01 – Schematic diagram showing basin condition



Photo 01



Photo 02



Photo 03

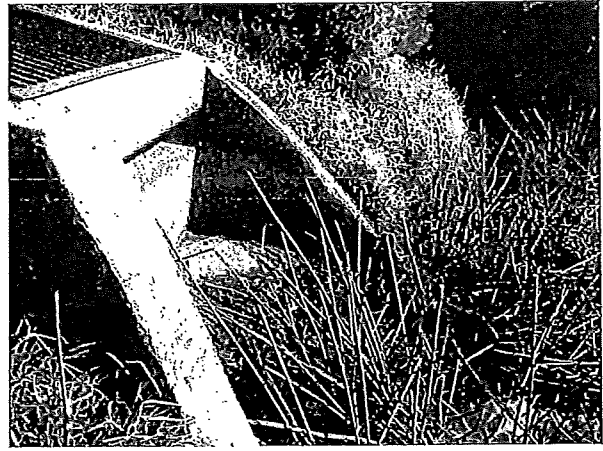


Photo 04

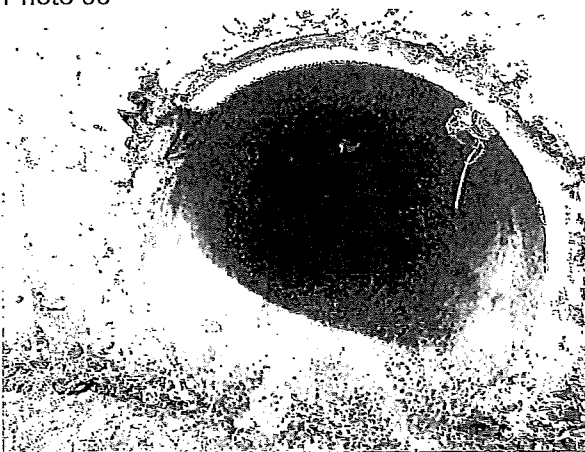


Photo 05

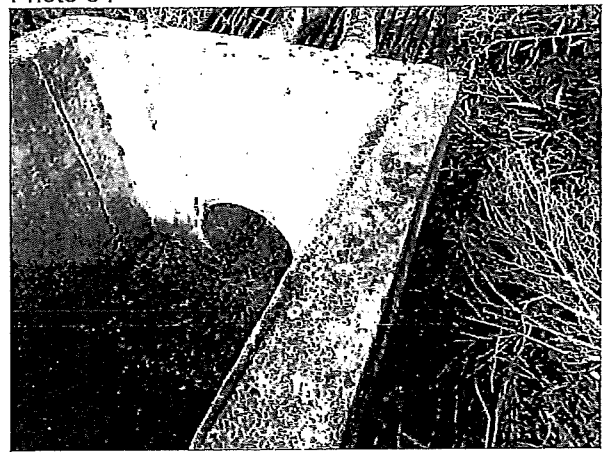


Photo 06



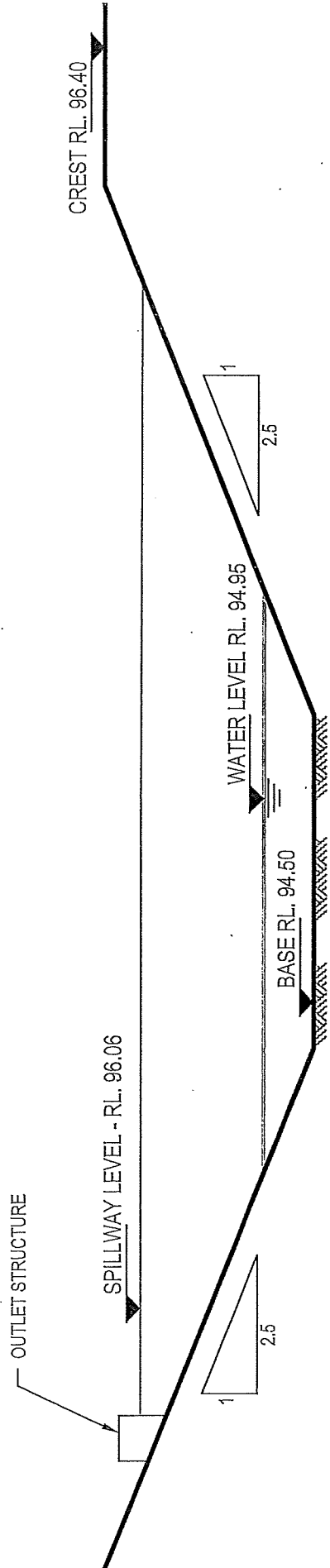
Photo 07



Photo 08

Agenda - 28 March 2018

Attachment 6.1.3



rev	description	app'd	date
A	INITIAL ISSUE	JA	23/2/18

SOUTH GIPPSLAND SHIRE COUNCIL
WALKERVILLE BASIN
EXISTING CONDITIONS
SCHEMATIC



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scale | NTS for A4 job no. | 31-35925
date | FEB 2018 rev no. | A

149 SK001

NOTES:

1. ALL EXISTING BASIN SURFACE LEVELS ARE AVERAGE VALUES.
2. WATER LEVEL SHOWN WAS AT 27/1/16.
3. ALL LEVELS IN mAHD

LGA Dams – Site inspection methodology, general asset information & inspection checklist

Asset name:	Walkerville RB
Locality:	Cnr Grevilla St & Panoramic Dr, Walkerville
Local government region:	South Gippsland
Date of inspection:	23 August 2017
Inspection team:	Ryan Glen, David Roche (SGSC) Greg Branson, Joe Matthews, Richard Mannix (SRW)
Weather conditions:	Cloud with some sun. Windy.
Temperature:	12°C

1) Inspection Methodology

The inspection is to be undertaken at an **“Intermediate Level” consistent with the Australian National Committee on Large Dams (ANCOLD) Guidelines on Dam Safety Management (2003)**. However, testing of electrical or mechanical equipment and soil sampling for lab testing purposes will not take place due to time constraints.

Any deficiencies will be identified by visual examination of the dam and its appurtenant infrastructure and review of available surveillance data (if any).

Observations made during the inspections will be summarised in a checklist format (see Section 3 below).


The following consistent terms in Table 1 will be used throughout the inspection checklist and feed into the final inspection report to describe the condition of various features or components of the dam.


Table 1: Condition ratings (source: modified from GHD, 2017).


Satisfactory	Expected to fulfil its intended function.
Fair	Expected to fulfil its intended function, but maintenance is recommended.
Poor	May not fulfil its intended function; maintenance is necessary.
Unsatisfactory	Not expected to fulfil its intended function; repair, replacement, or modification is necessary.
Not applicable	Component/structure or item does not exist at this site.

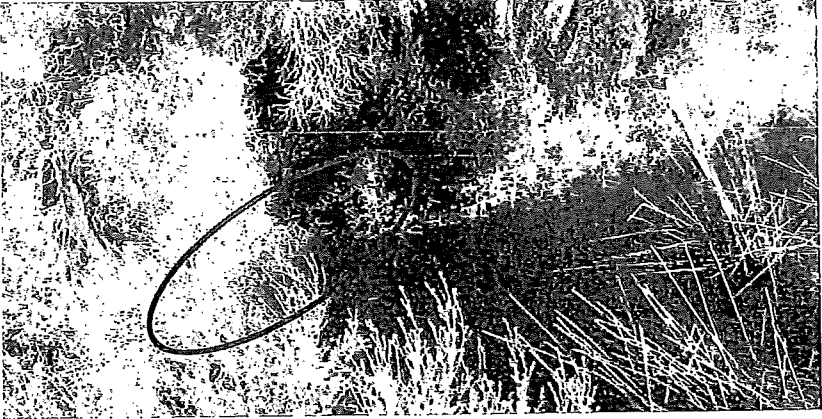
Any recommendations for corrective action will be included in the final inspection report issued to DELWP with accompanying urgency and importance ratings (refer to Appendix A).

2) General Asset Information

Type	Assessment
General site inspection details	
Site Name	Walkerville RB
Locality	Cnr Grevilla St & Panoramic Dr, Walkerville
Map Reference (Coordinates)	Latitude = -38.820639 Longitude = 145.997557
Asset owner	South Gippsland Shire
Describe access to site	Retarding basin is accessed via Grevilla St.
Photograph of site access	
Storage level at time of inspection	At FSL.
Spillway flowing	Yes, approximately 30 L/min.
Site data	
General purpose	Retarding basin to attenuate storm flow.
Watercourse	N/A. Urban runoff catchment.
Original construction date (year)	1988
Subsequent upgrades or minor works	None known. Planned outlet structure raising (100 mm) October 2017 to increase capacity.
Historic incidents	Unknown.

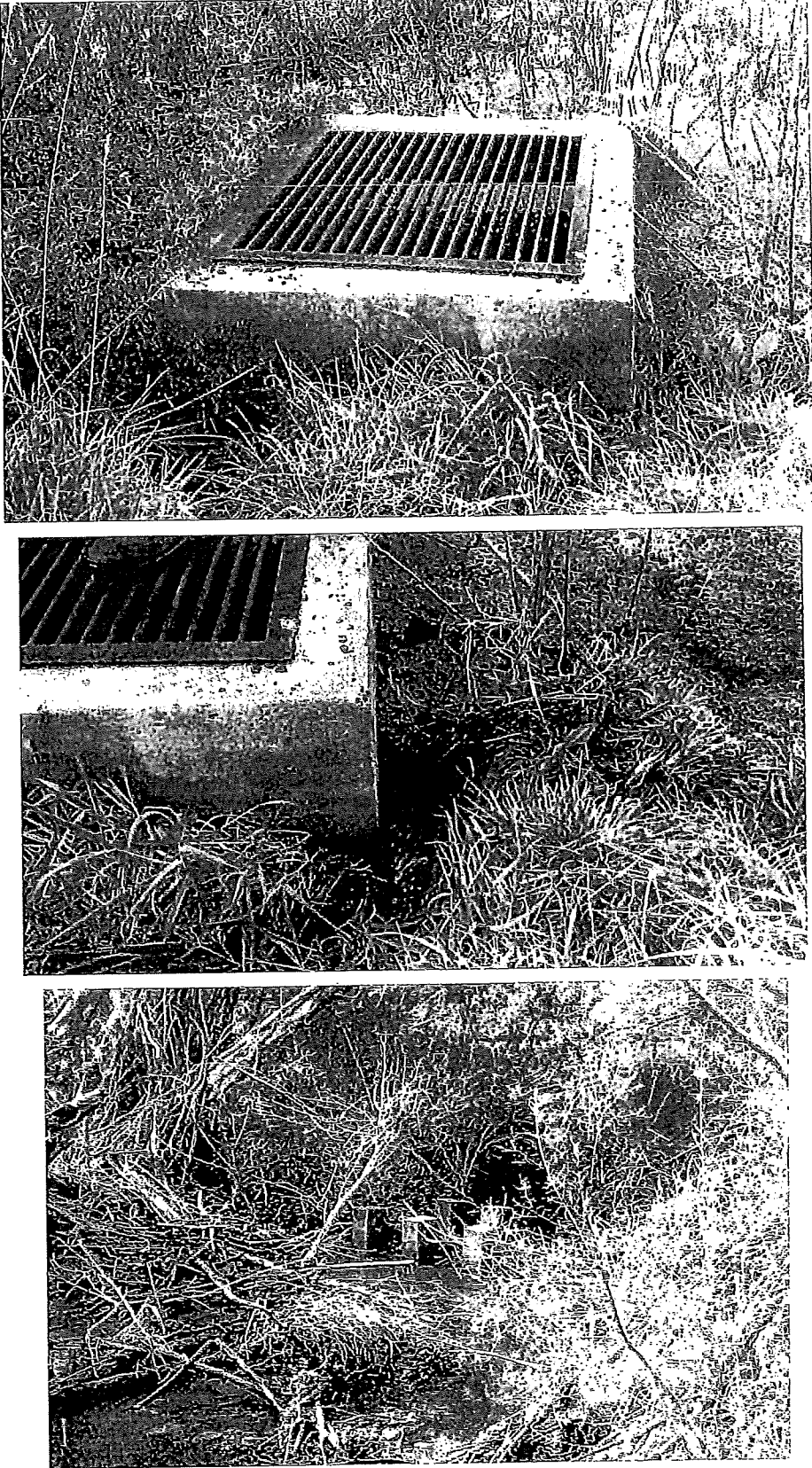
Type	Assessment
Is there a current surveillance program?	No.
Historic surveillance reports reviewed? Details?	None provided.
Has an Emergency Plan or inundation map been provided?	No.
Catchment	
Description	Urban catchment ~0.38 km ²
Determination from	ArcGIS analysis. Indicative only.
Downstream flood area	
Description	PAR negligible. Breach on southern or eastern side toward dwellings but would attenuate before inundation occurred.
Determination from	ArcGIS analysis and field inspection.
Dam Wall (refer to drawings for more info)	
Construction type	Homogeneous earthfill.
Upstream face type	Homogeneous earthfill.
Downstream face type	Homogeneous earthfill.
Photograph of dam wall	

Type	Assessment
	
Crest length (m)	Northern and southern crest lengths ~65.0 m Eastern and Western crest lengths ~150.0 m
Crest width (m)	Northern and southern crest width 4.2m Eastern and Western crest width 3.5m
Surface area at FSL (m ²)	~ 10,500 m ²
Upstream slope (V:H or %)	RB at FSL so couldn't be measured. According to drawings: 1V:2H.
Downstream slope (V:H or %)	25% or 1V:4H.
Height at maximum section (m)	3.50 m field altimeter test at southern embankment.
Inlet works (refer to drawings for more info)	
Size	DN675 according to drawings (submerged during inspection).
Type	Grated mitred outlet with concrete headwall.
Inflow source	Prom Views Estate – Walkerville.

Type	Assessment
Photograph of inlet	<p>Concrete headwall visible only (refer red outline) due to vegetation and storage level at time of inspection.</p> 
Spillway (refer to drawings for more info)	
Location	N/A.
Type	N/A.
Structure details	N/A.
Freeboard (m)	N/A.
Photograph of outlet	N/A.
Outlet works (refer to drawings for more info)	
Size	DN375
Detail	<p>Urgent Investigation Required.</p> <p>Riser outlet acting as side entry pit.</p> <p>Steel grate lid to prevent gross litter blocking outlet pipe when acting as glory hole spillway.</p> <p>No discharge through riser outlet as leakage around outlet emplacement and through embankment was occurring at time of inspection discharging via the outlet pipe (this indicates a break in the outlet pipe).</p> <p>Significant erosion around emplacement. Pipework exposed on u/s batter slope.</p> <p>Significant hole in crest offset ~0.5 m from outlet pipe alignment. Cause unknown but likely associated with leakage around outlet.</p>
Discharge reason	Stormwater excess

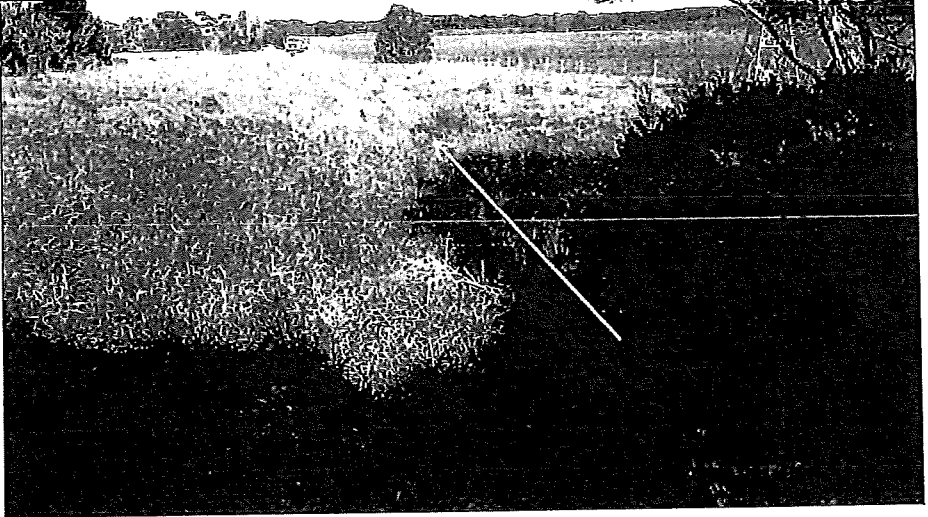
Attachment 6.1.4

Agenda - 28 March 2018
LGA Dam Safety Project - DELWP
Barwon South West and Gippsland Regions

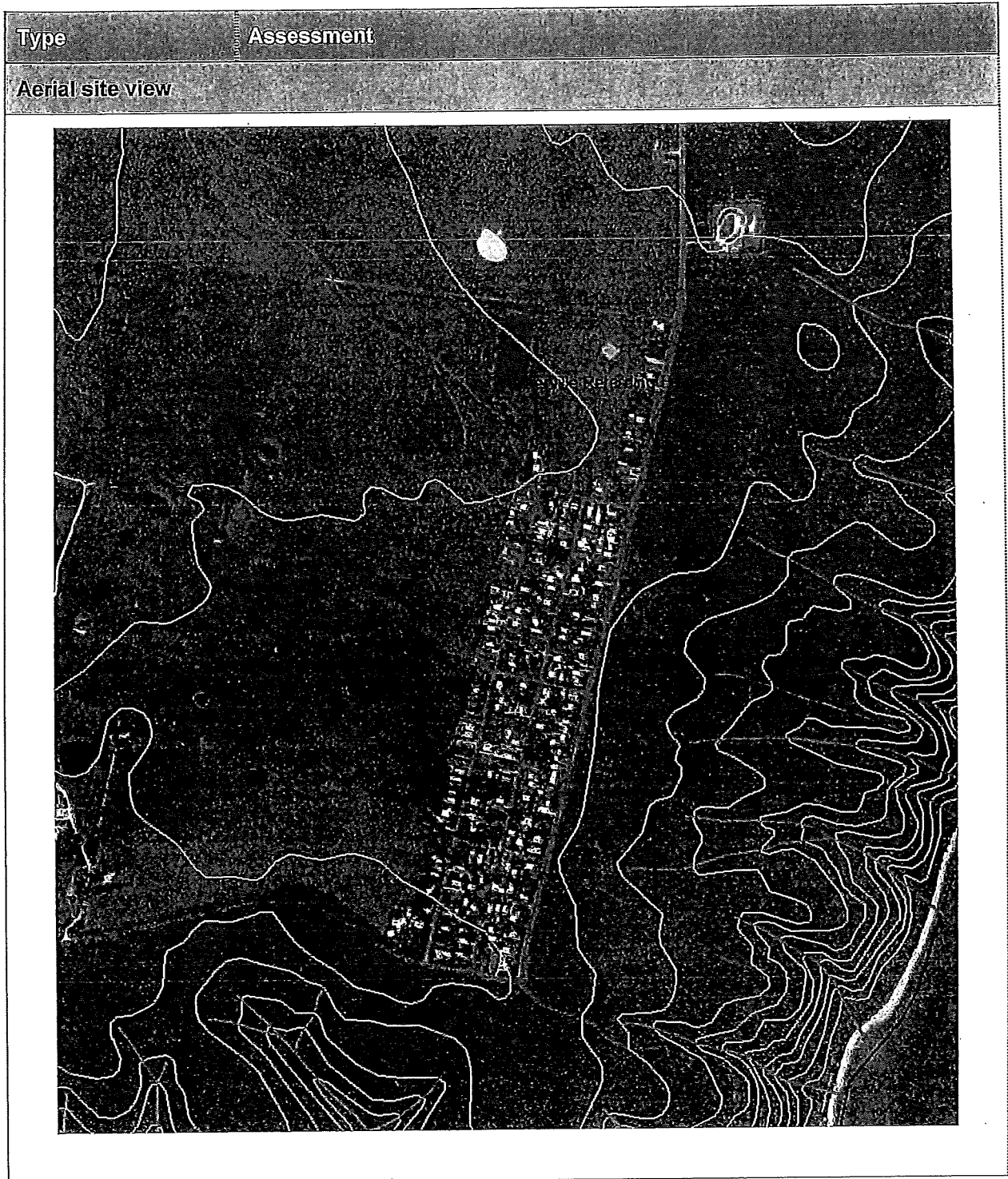
Type	Assessment
Photograph of outlet	 <p>The assessment section contains three black and white photographs. The top photograph shows a concrete structure with a metal grate outlet, partially obscured by tall grass. The middle photograph is a closer view of the grate and the concrete structure. The bottom photograph shows a wider view of the outlet structure, which is heavily overgrown with dense, tall grass and weeds.</p>

Attachment 6.1.4

Agenda - 28 March 2018
LGA Dam Safety Project - DELWP
Barwon South West and Gippsland Regions

Type	Assessment
	 A black and white photograph showing a field of tall, dense vegetation, possibly reeds or grasses, next to a body of water. A white arrow points from the right side of the image towards a specific area of the vegetation in the middle ground. The background shows a line of trees and a clear sky.

DRAFT



Agenda - 28 March 2018

Attachment 6.1.4

Ordinary Meeting of Council No. 42 - 30 May 2018

3) Inspection Checklist

Type	Assessment ¹⁾	Detail	Recommendation	Urgency Rating ²⁾	Importance Rating ³⁾
Dam/wall					
Upstream batter					
General condition	Poor	Significant tree growth in northern and northern end of the eastern embankments.	Remove vegetation and clear around inlet and outlet structures.	Short Term Action	Medium
Embankment crest					
General condition	Poor	Erosion of embankment material at outlet structure. Possible piping action occurring.	Dewater RB and inspect cause of erosion and possible pipe breakage. Reinstate outlet structure to original design specification and reconstruct embankment to adequate compaction standard. Pipe should be concrete encased with a cross section shape to allow good compaction. Install appropriate filter around pipe to intercept any seepage.	Immediate Action Immediate Action Immediate Action Immediate Action	High High High High
Surface condition	Poor	Grass too long to adequately inspect true condition. Felt uneven when trafficked in vehicle.	Remove vegetation layer and cap crest with road base material (aggregates <20 mm). This will assist in identifying	Short Term Action	Medium

365

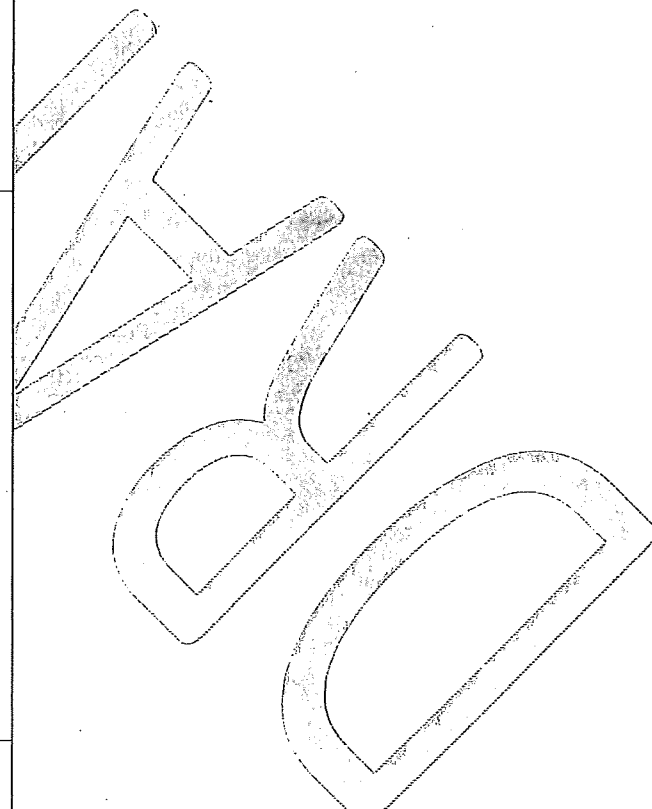
1 Refer to condition assessment Table 1 on p.1
 2 Refer to urgency rating descriptions in Appendix A.1
 3 Refer to importance rating descriptions in Appendix A.2



Type	Assessment ¹	Detail	Recommendation	Urgency/ Rating ²	Importance Rating ³
Downstream batter					
General condition	Poor	Significant tree growth on eastern side. Wombat hole on southeast corner of d/s batter. Soft in places indicating poor compaction.	Remove vegetation and burrows. If root and burrow penetration/ damage is significant reinstate embankment to adequate compaction standard.	Short Term Action	High
Surface condition	Poor	Significant tree growth in parts and grass too long to assess adequately.	Keep grass mown to short length.	Immediate Action	Low
Downstream Toe Area					
General condition	Poor	Ponding occurring at eastern embankment toe. Difficult to determine whether this is from seepage or recent rainfall. Drainage alignment along western and south western toe permanently wet. Soft in areas when tested with probe. Particularly at southern end. Water gathering at southern toe. Appears to be due to flows from spillway/outlet. This is resulting in saturated and soft toe.	Remove trees on eastern embankment toe and reinstate with drainage grade slope away from toe. Realign spoon drain channel away from western and southern toe. Consider excavating new spoon drain through adjacent property into drainage line.	Immediate Action	High
Reservoir Surrounds					
General condition	Fair	Requires regular mowing and vegetation removal.	See above.		

Type	Assessment ¹	Detail	Recommendation	Urgency Rating ²	Importance Rating ³
Spillway					
General condition	N/A	No spillway.	Consider installing spillway in northern crest for above design condition flow. Spillway will reduce freeboard but mitigate overtopping risk. Or, consider additional discharge capacity when upgrading existing riser outlet.	Immediate Action	High
Outlet works					
Intake structure or approach channel					
General condition	Unsatisfactory	Concrete in good visual condition, however not operating at time of inspection due to leakage through embankment at interface with riser emplacement. Top grate and side entry pit prone to blockage from gross litter and plant debris. Freeboard considered insufficient.	Review adequacy and configuration of outlet structure with a view to immediate upgrade due to existing preferential flow path through embankment.	Immediate Action	High
Outlet conduit/ pipework					
General condition	Unsatisfactory	Evidence of break in pipe as flow bypassing outlet discharging through outlet pipe on d/s side.	As above.	As above.	As above.
Discharge point					
General condition	Fair	Discharge point and channel immediately below requires cleaning and regular maintenance.	Refer to recommendations under Spillway and Downstream Toe Area.		

Type	Assessment ¹	Detail	Recommendation	Urgency Rating ²	Importance Rating ³
Inlet Works					
General condition	N/A	Not sighted due to storage level at time of inspection.	Remove vegetation around inlet structure.	Short term action	High
Other comments/ observations					
Freeboard and outlet adequacy.		Large rainfall event could cause outlet pit trash screen to block and RB to overtop due to inadequate freeboard causing further damage to embankment and pipework where already compromised at outlet.	See above.		



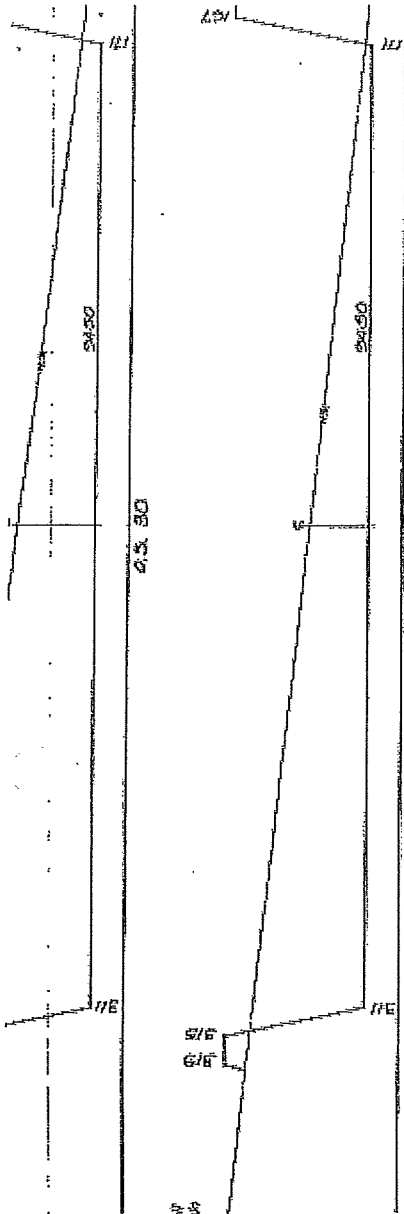
Appendix A

Table A.1 – Urgency Rating Descriptors (source: GHD, 2017).

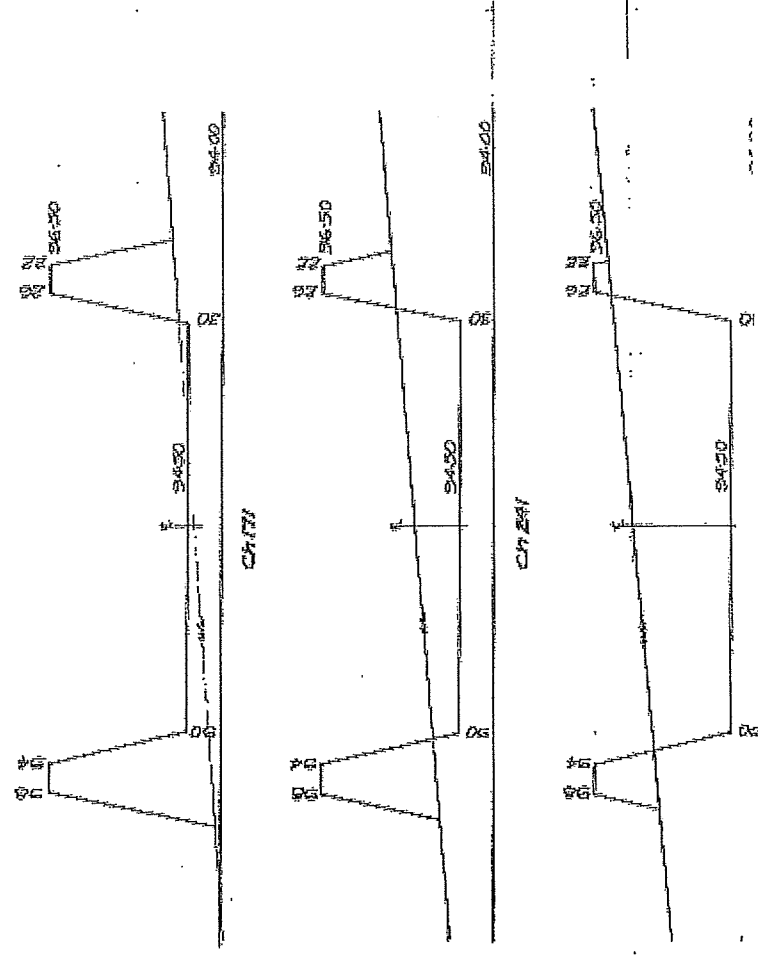
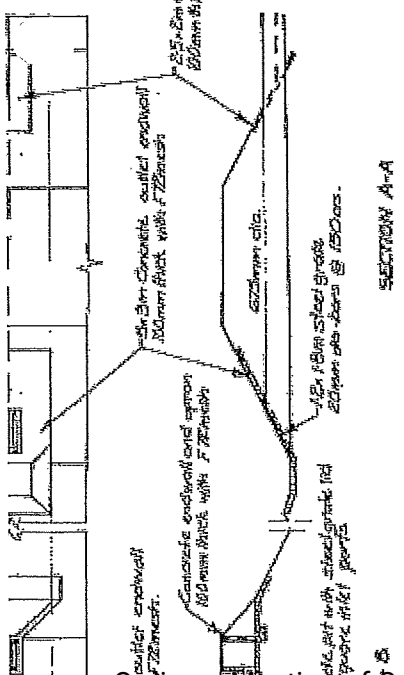
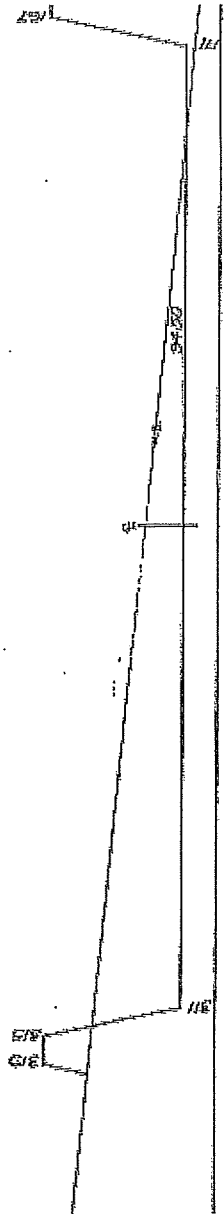
Immediate Action	Critical actions that need to be taken immediately to safeguard the integrity of the dam.
Short Term Action	Operation, maintenance, investigation or monitoring issues requiring detailed attention or action to be completed within the next twelve months, in addition to normal routine actions.
Long Term Action	Lower priority, long-term operation, maintenance, investigation or monitoring issues that will require attention in the future; however, commencement may be deferred for twelve months, but require prudence during operation and routine inspections
Major Works	Items requiring capital works upgrades to address dam safety and/or business risks.
Documentation	Items regarding documentation of the dam and its current condition. These items do not require physical works on site however are recommended as part of a comprehensive dam safety management programme.
Consider	Further information is required to determine whether action should be carried out. For example, action may depend on further monitoring of the issue for signs of deterioration.

Table A.2 – Importance Rating Descriptors (source: GHD, 2017).

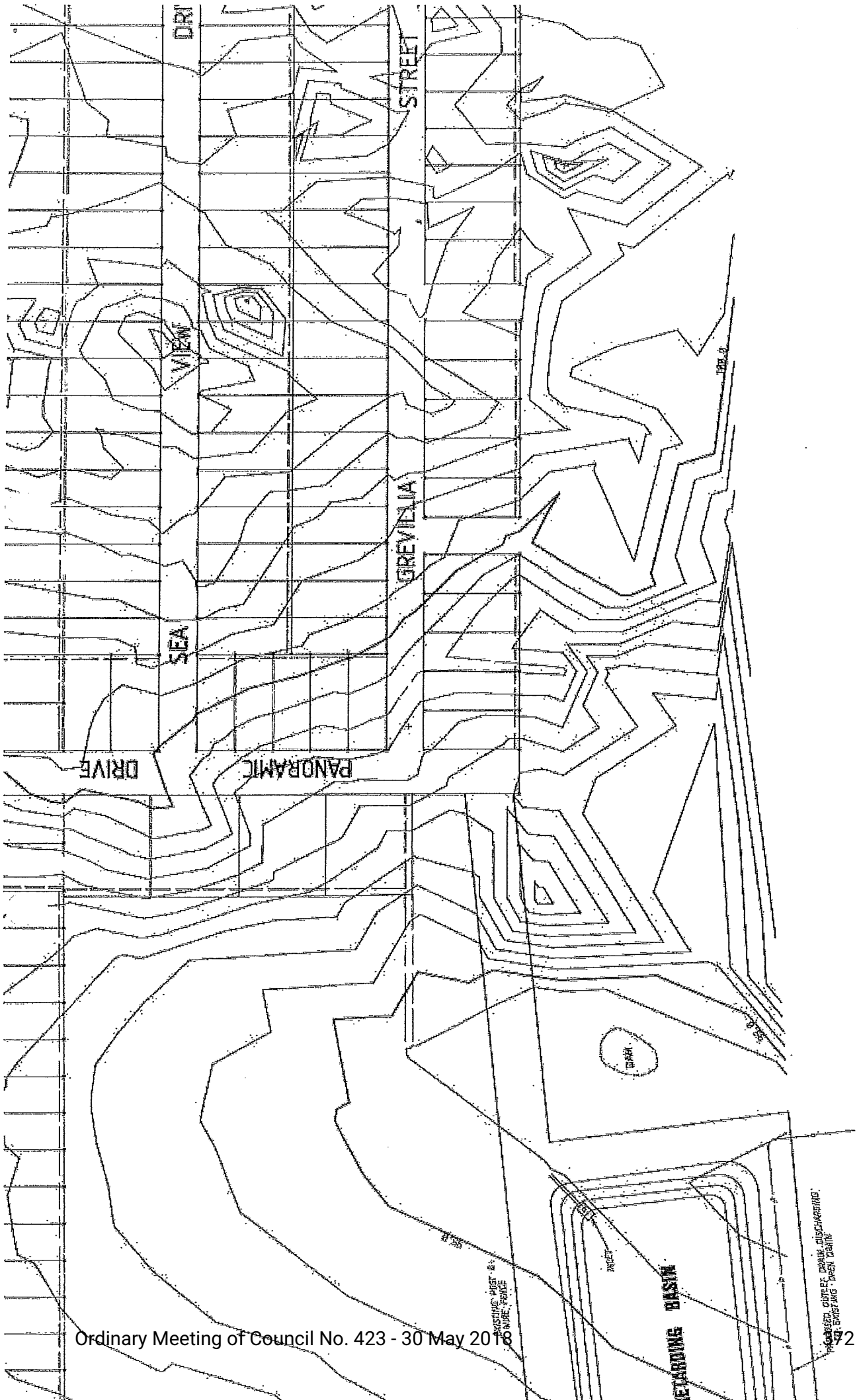
High	These recommendations have been made regarding actions required to address observed deficiencies in the condition and management of the dam, in order to avoid a dam safety incident. Generally, only 'immediate' and 'short-term' actions would be considered High priority.
Medium	These recommendations have been made regarding actions required to improve the surveillance and management of the dam, in order to detect in time those deficiencies that could eventually develop into a dam safety incident. Generally, only 'short-term' and 'long-term' actions would be considered Medium priority.
Low	These recommendations have been made regarding actions required to improve the operation, maintenance and surveillance of the dam to meet current good practice. These recommendations also deal with issues that are not currently a threat to dam safety, but are required to avoid increased operation, maintenance and surveillance activities and costs. Generally, only 'short-term' and 'long-term' actions would be considered Low priority.



RETAINING BASIN INLET AND OUTLET STRUCTURES
Scale 1:100



PLAN OF RETAINING BASIN
Scale 1:1000



AMENDMENTS: Revising Plans & other matters	DATE 23/05/18	SCALE 0 10 20 30 40 50 60	SHIRE OF WOORAYL	SURVEY 1888/89	A.E.C. A.E.C.
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CONCRETE DRIVE DISCHARGING
TO SWASTAGE BASIN DRAIN

**Mackie Surveying**3rd February 2016

Mr Justin Taylor
South Gippsland Shire Council
9 Smith Street,
Leongatha 3953

Dear Justin,

**FEATURE AND LEVEL SURVEY
WALKERVILLE BASIN
OUR REF: 1556**

The Feature and Level survey of the Walkerville Basin is now complete and our plan attached in AutoCad and pdf formats.:

To compute the capacity of the basin, we have created a Digital Terrain Model (DTM) over the bed and banks and measured an RL at the outlet. We have computed a volume of **13,000m³** between our DTM and the outlet RL of 99.58. The water volume on 27th January 2016 was computed to be **3,000m³**.

The following should be noted with regards to our volume calculation:

- There appeared to be possible gaps at the back of the outlet where water may escape below the computed outlet level of 99.58m. We have not allowed for leaks such as this or backflow through the inlet etc,
- We believe a toe of bank exists below water level along the western, eastern and part of the southern banks. Due to the awkward water level and soft base here, we could not canoe or walk to this area. We have computed the toes of bank coloured red by intersecting the grade of bank and bed of basin level,
- Due to the soft nature of the base, we have estimated the level of water containment by feel. This may create some error.

Data is shown to an arbitrary height datum. Our co-ordinate datum is arbitrary and bearing datum is based on the Digital Cadastral Map Base (approximate only).

In addition to the original scope of work set out in the quote from 5th January 2016, spot levels have been provided along the access track to and around the basin. A junction pit has been located in front of the CFA building on Panoramic Drive. A stake with marked intervals was placed in the south western part of the basin. This was found to be one of the deeper sections of the basin and should provide reference for water level observations.

Layers, including a 3D triangle file, have been frozen for clarity and can be thawed if required.



Mackie Surveying

If you have any queries regarding the survey, please do not hesitate to contact me at luke@mackiesurveying.com.

Yours faithfully,

A handwritten signature in blue ink that reads "Luke Mackie". The signature is written in a cursive style.

Luke Mackie
Licensed Surveyor
Mackie Surveying



Our Ref: AJS 120944-00444

Contact
Andrew Sherman
Tel +61 3 9609 1502
Fax +61 3 9609 6702
asherman@rk.com.au

20 April 2018

Mr Rob McGirr
Wisewould Mahony
Level 8
419 Collins Street
MELBOURNE VIC 3000

Dear Rob

Proposed works at Walkerville Retarding Basin

I refer to your letter to John Moylan dated 13 April 2018 requesting additional details in relation to the Walkerville retarding basin. In response to your request, please find attached to this letter the following:

- Original design drawings
- Updated Mackie Survey Plan dated 30/10/17 in AutoCAD & PDF formats to reflect AHD levels
- Plans 40/1703/1&2 detailing the proposed works

I note that Council does not have any "as constructed" information in respect of the basin.

Council agrees to defer the works as requested in your letter. However, it is considered that a response within two weeks of the date of this letter in lieu of the four weeks proposed in your letter should be adequate. You would appreciate that with the approaching wetter months, the proposed remedial works need to commence at the earliest possible date.

Yours faithfully
RUSSELL KENNEDY

Andrew Sherman
Principal

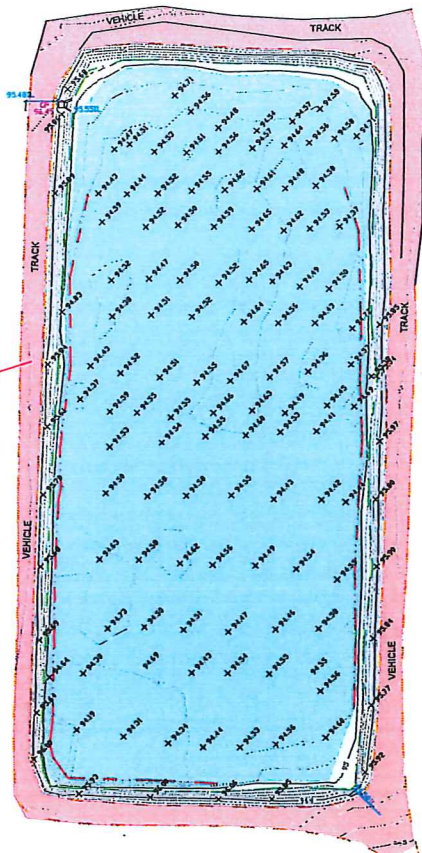
Enclosure(s)

APPROX. MGA ZONE 55

DISCLAIMER
 AREA HATCHED RED WAS NOT INTENDED TO BE MOCELLED
 AT THE TIME OF SURVEY. MODEL HERE MAY NOT CORRECTLY
 REPRESENT THE ACTUAL SURFACE

BASIN CAPACITY
 13000m³

WATER VOLUME
 ON 27/01/2016
 3000m³



LEGEND		
SYM	LINE	LAYER NAME
▲	4	Control
○	102	Top of Bank
×	103	Top of Bank
×	104	Natural Surface
×	110	Brickwork
×	309	Grated Pit
×	310	Junction Pit
×	319	Invert of Pipe/Pit
×	413	Edge of Concrete
×	603	CFA Building
×	620	Water Level
×	651	Fence

Ordinary Meeting of Council No. 423 - 30 May 2018

This Plan must be read together with the attached Licensed Surveyor's Report.
 All grey lines representing neighbouring property boundaries are from Vicmap Property and are indicative only.
 Certain layers have been frozen for clarity but can be thawed if required.
 Contour interval 0.2m.

CLIENT
 South Gippsland Shire Council
 PROJECT
 Wicksville Basin
 Yarraville
 PROJECT DETAILS
 Feature and Level Survey

Scale: 1:500	Sheet Size: A1
Date: 30/10/17	Date of Survey: 27/01/2016
Drawn: BK	Surveyor: BK
Licensed Surveyor: Luke Mackie	
Sheet 1 of 4	Drawing No.: 155600AC
Version C	

376

Mackie Surveying
 150 Victoria Street
 Seddon 3011
 P. 1300 653 678
 M@mackiesurveying.com



LEGEND		
SYM	LINE	LAYER NAME
▲	4	Control
×	102	Top of Bank
×	103	Toe of Bank
×	104	Natural Surface
×	110	Bedrock
×	309	Gravel Pit
×	310	Junction Pt
×	319	Invert of Pipe/Rt
×	413	Edge of Concrete
×	603	CFA Building
×	620	Water Level
×	933	Fence

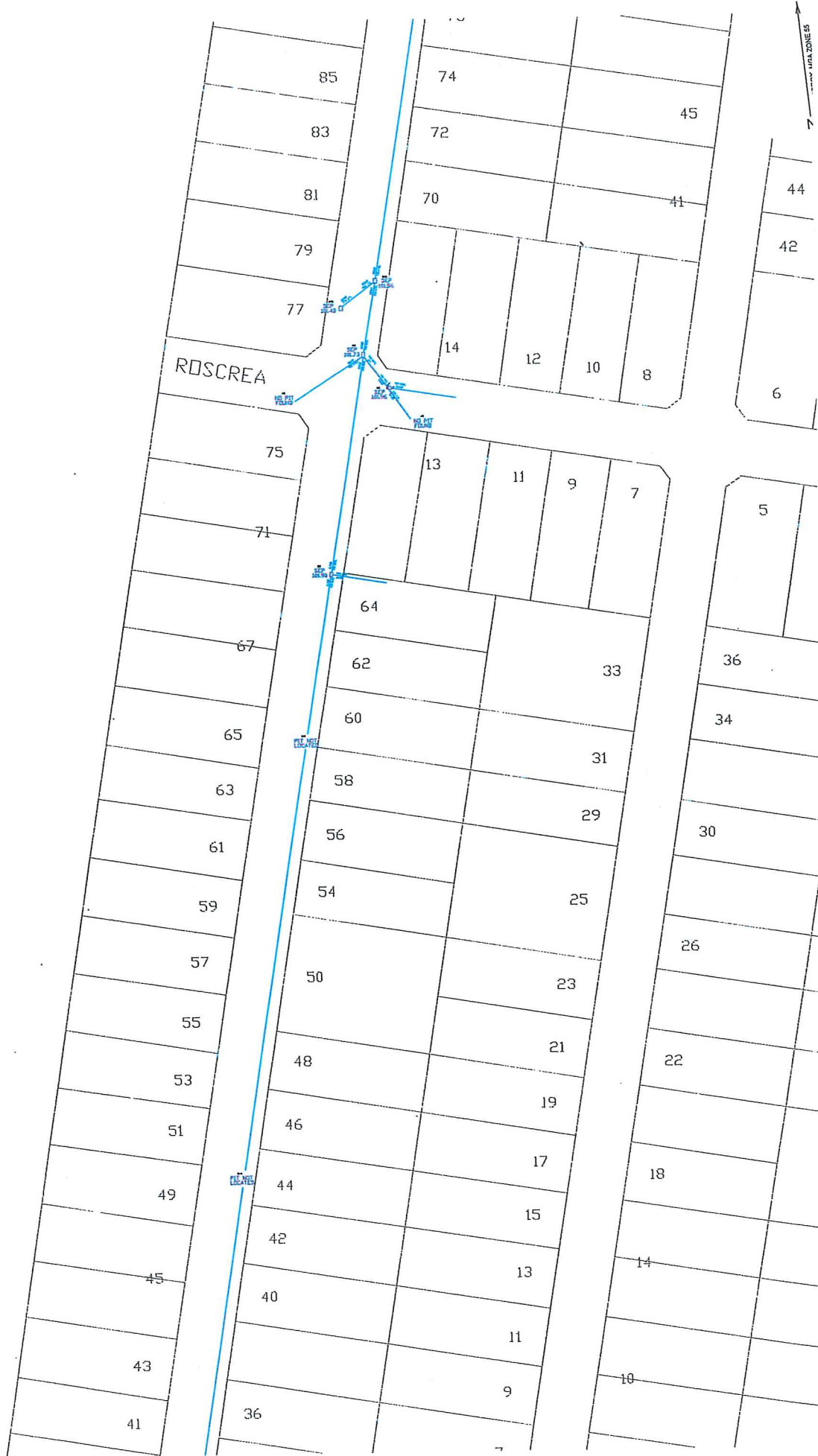
Ordinary Meeting of Council No. 423 - 30 May 2018

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 Certain layers have been frozen for clarity but can be thawed if required.
 Contour interval 0.2m.

CLIENT
 South Gippsland Shire Council
 PROJECT
 Walkerville Basin
 Yarraville
 PROJECT DETAILS
 Feature and Level Survey

Scale 1:500	5 25 50 100 150 200	Sheet 2 of 4
Date: 30/10/17	Date of Survey: 27/01/2015	Drawn: BK
Surveyor: BK	Licensed Surveyor: Luke Mackie	Drawing No.: 155600AC

Mackie Surveying
 150 Vada Street
 Seddon, VIC 3111
 P. 1300 693 876
 M. 0438 420 000



LEGEND		
SYM	LINE	LAYER NAME
▲	4	Control
▲	102	Top of Bank
▲	103	Toe of Bank
▲	104	Natural Surface
▲	110	Grassline
▲	309	Grated Pt
▲	310	Junction Pt
▲	319	Invert of Pipe/Ft
▲	413	Edge of Concrete
▲	603	CFA Building
▲	620	Water Level
▲	901	Fence

Ordinary Meeting of Council No. 423 - 30 May 2018

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 Certain layers have been frozen for clarity but can be thawed if required.
 Contour interval 0.2m.

CLIENT
 South Gippsland Shire Council
 PROJECT
 Warriville Basin
 Yarraville
 PROJECT DETAILS
 Feature and Level Survey

Scale 1:500	Sheet 3 of 4	Version C
Date: 30/10/17	Drawn: BK	Surveyor: BK
Date of Survey: 27/01/2016	Licensed Surveyor: Luke Mackie	Drawing No.: 155600AC

Mackie Surveying
 150 Victoria Street
 Seddon 3011
 P. 1300 663 676
 Luke@mackiesurveying.com



LEGEND		
SYN	LINE	LAYER NAME
▲	4	Control
—	102	Top of Bank
—	103	Toe of Bank
—	104	Asphalt Pave
—	110	Breastline
—	309	Grated Pit
—	310	Junction Pit
—	319	Invert of Pipe/Pit
—	413	Edge of Concrete
—	603	CFA Building
—	620	Water Level
—	621	Flow

Ordinary Meeting of Council No. 423 - 30 May 2018

This Plan must be read together with the attached Licensed Surveyor's Report.

All grey lines representing neighbouring property boundaries are from Vicmap Property and are indicative only.

Reference to the Australian Height Datum through connection to PM 27.

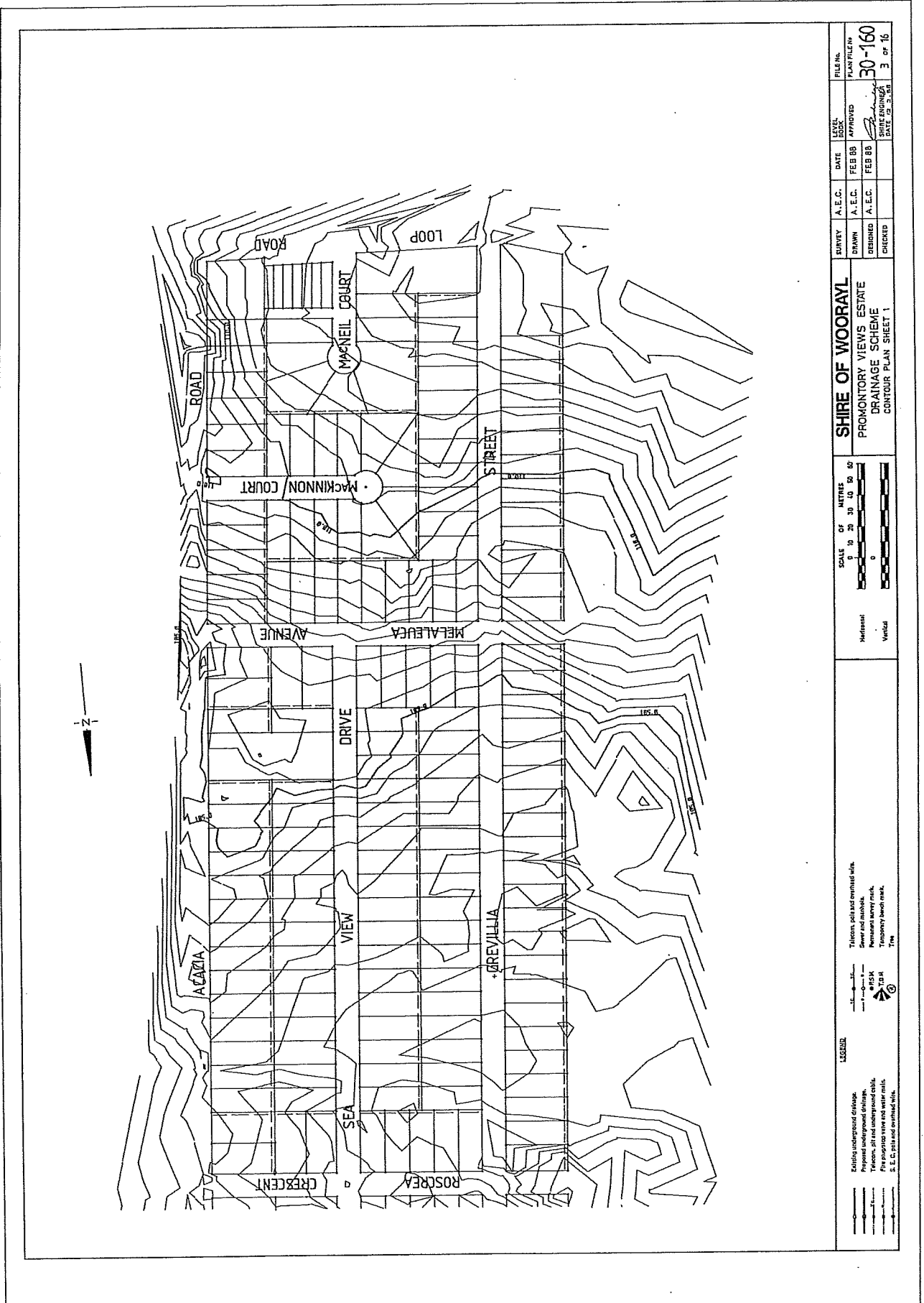
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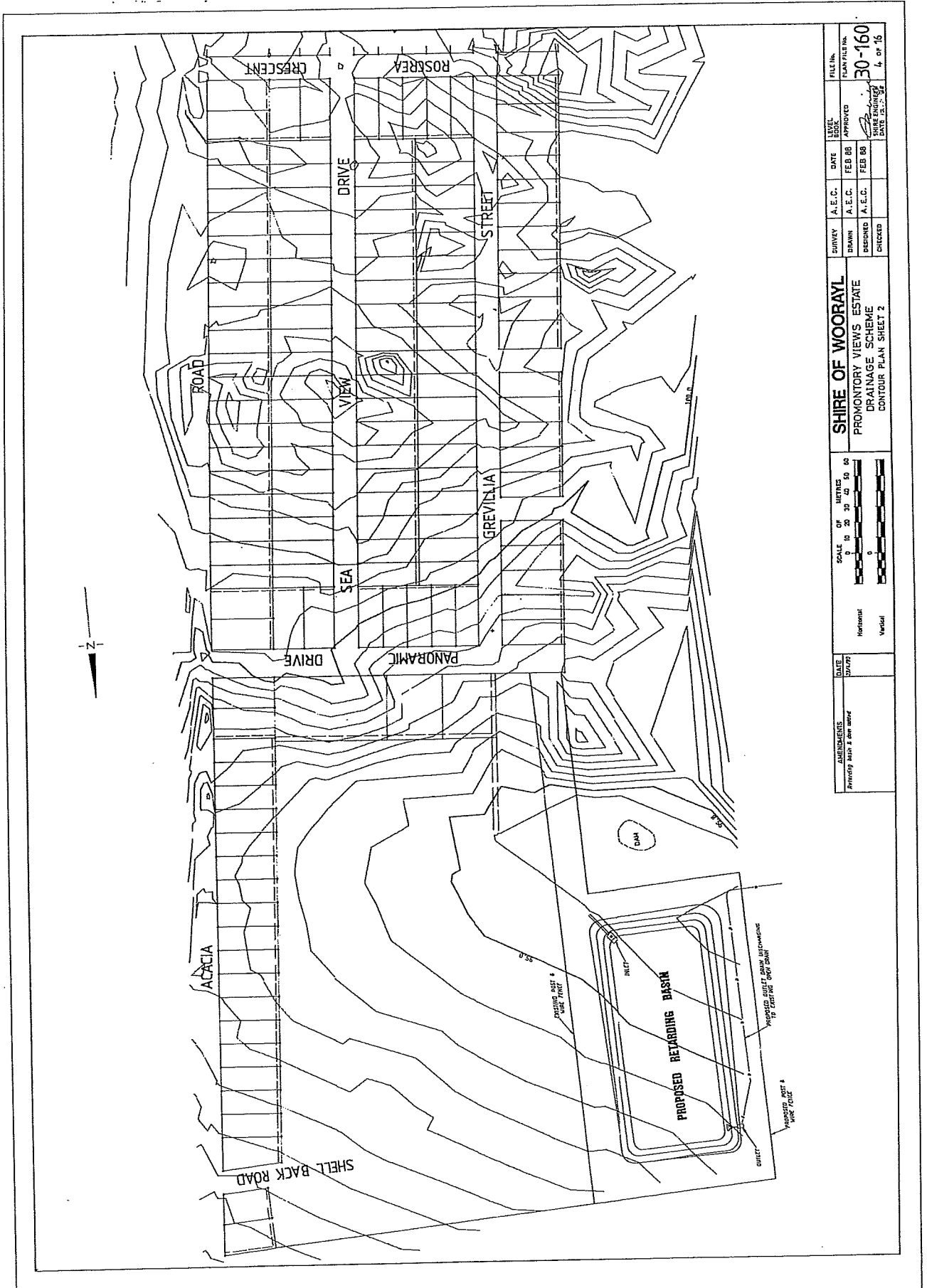
Contour Interval 0.2m.

CLIENT
South Gippsland Shire Council
PROJECT
Warriville Basin
Yarraville
PROJECT DETAILS
Feature and Level Survey

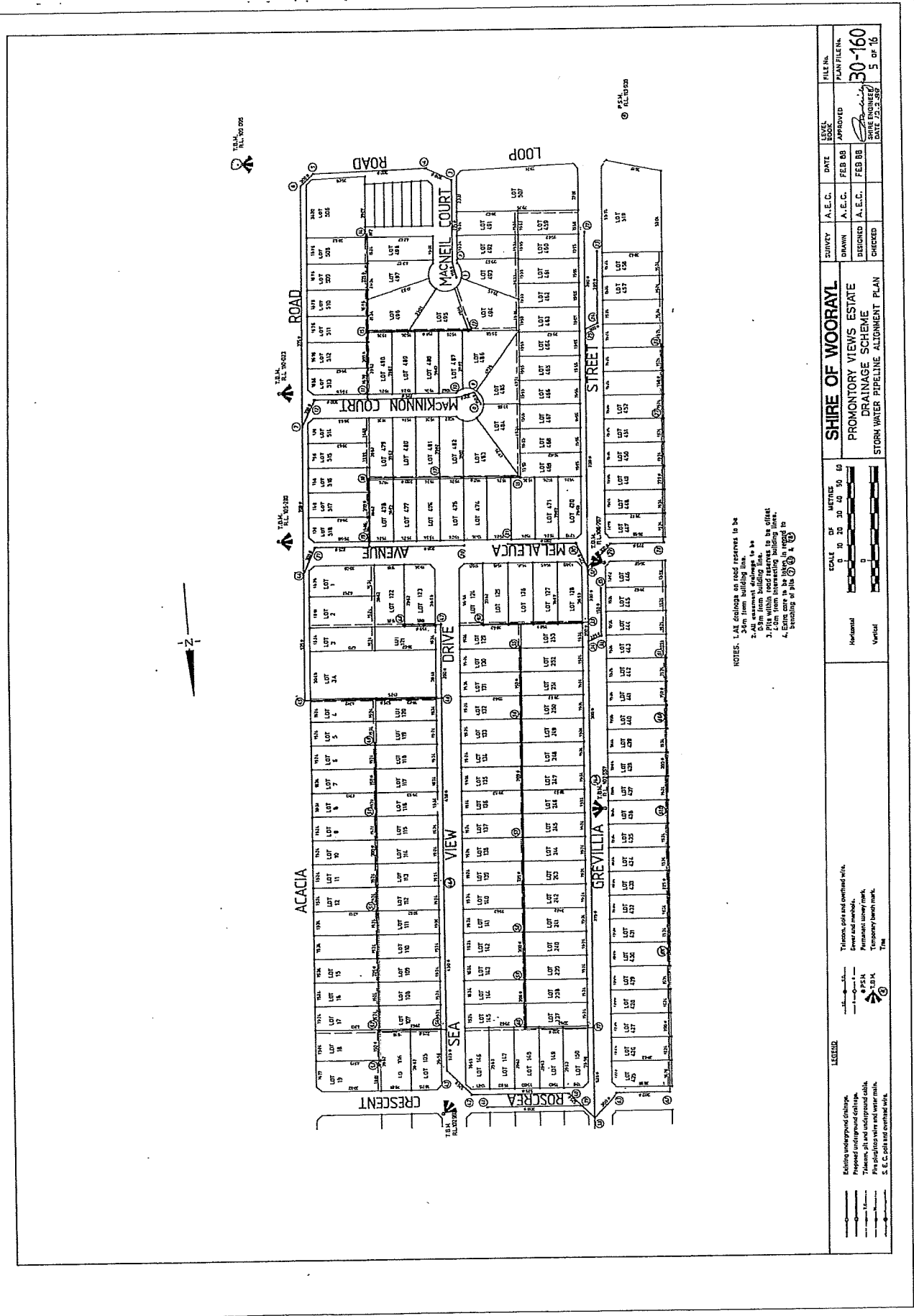
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Drawn: BJK	Surveyor: BK
Licensed Surveyor: Luke Mackillop	
Sheet 4 of 4	Drawing No.: 155600AD
Version C	

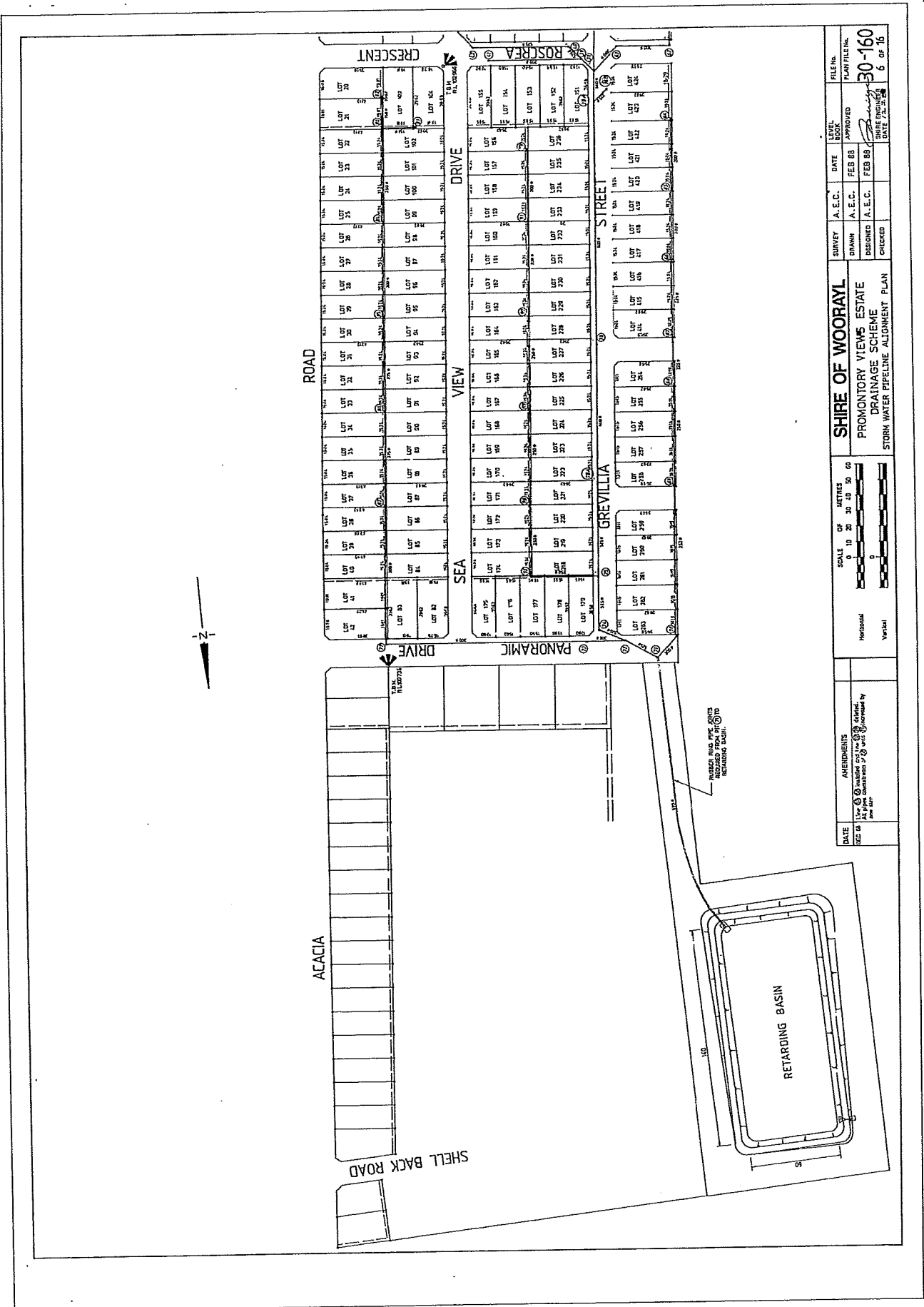
Mackie Surveying
100 Victoria Street
Edison 3011
P. 1300 663 676
L.M.C. 45454 Surveying

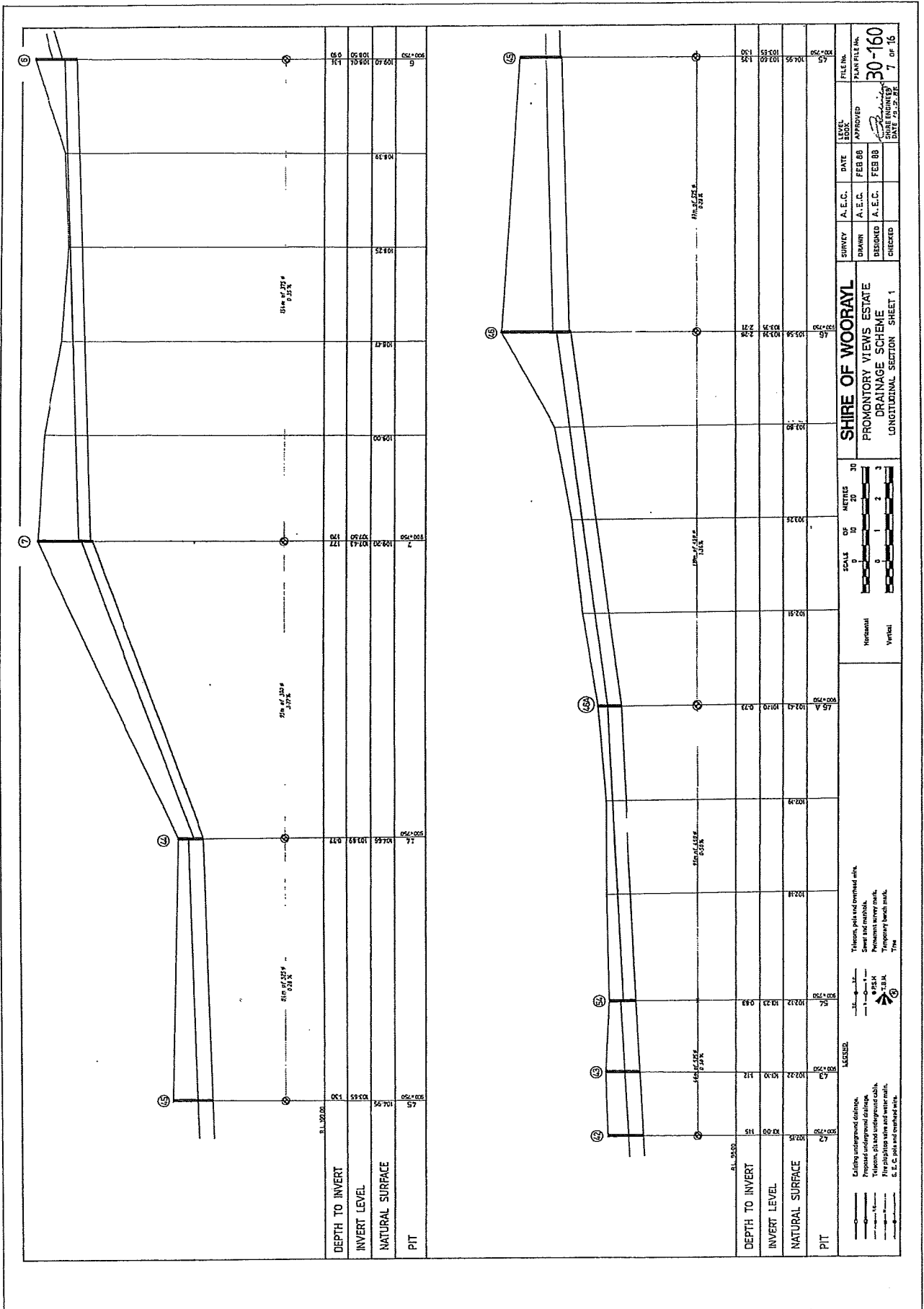


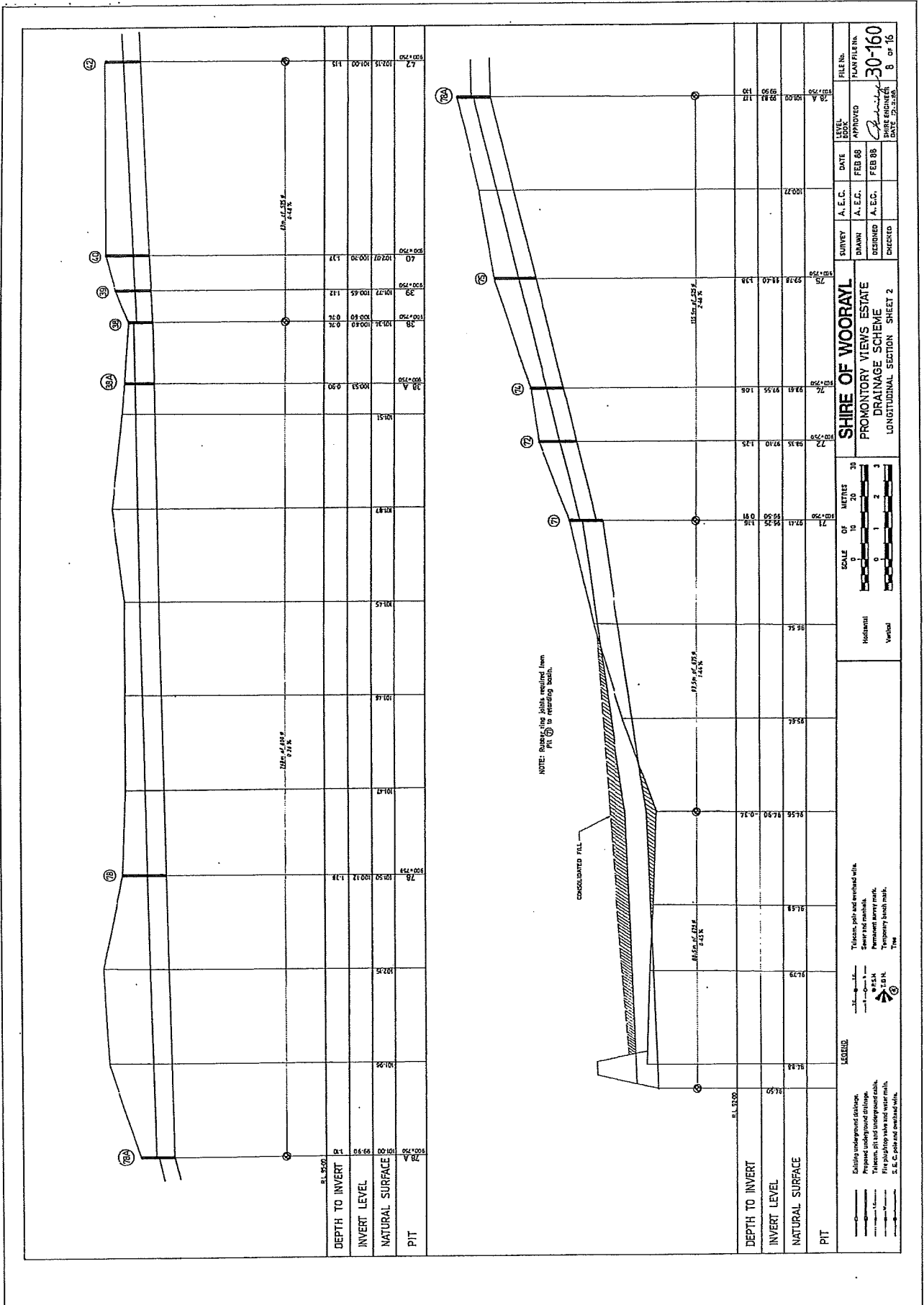


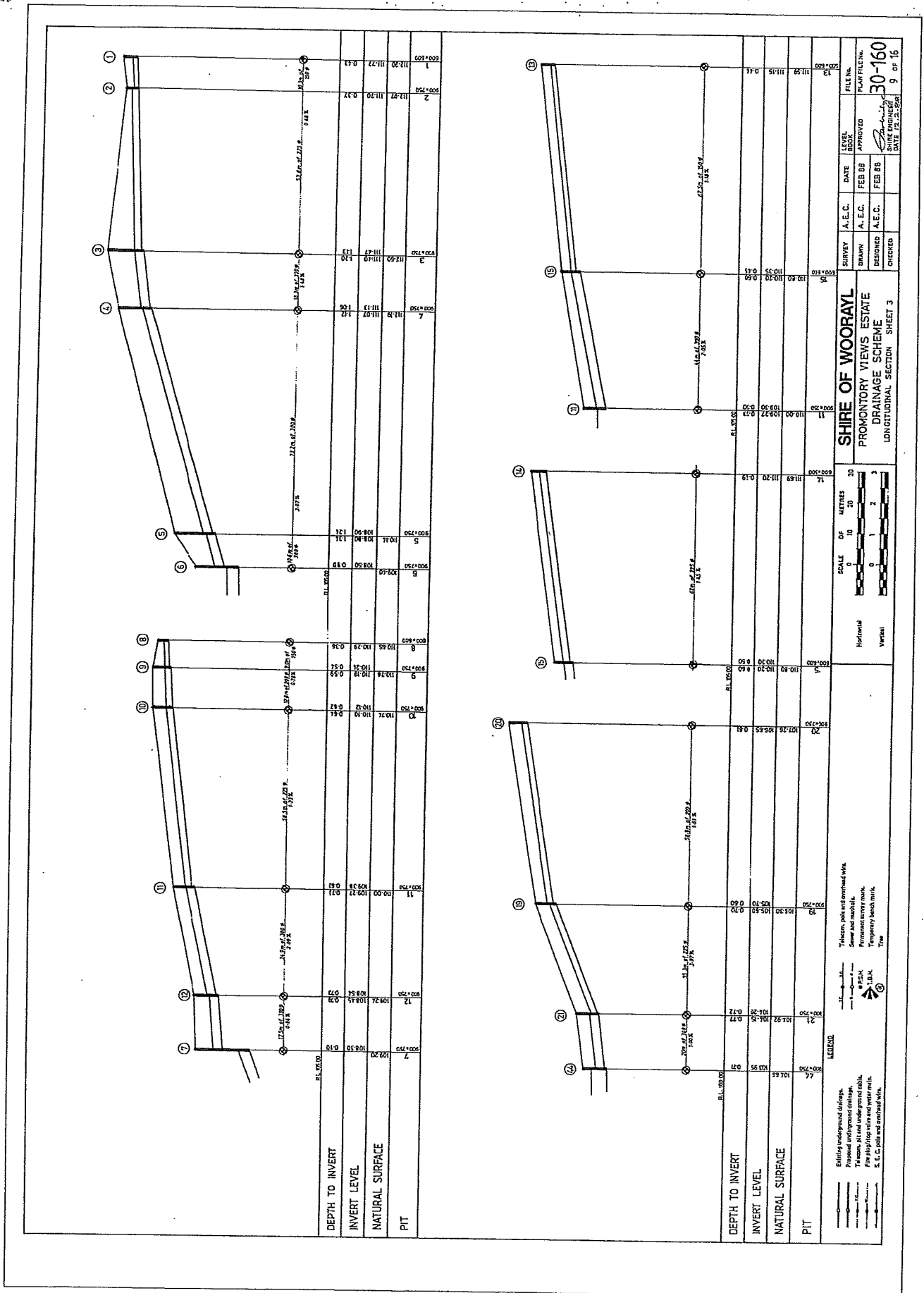
ASSEMBLIES Primary Plan & Reference		DATE 20/07/15	SCALE OF METRES 0 10 20 30 40 50 60 Horizontal Vertical		SHIRE OF WOORAYL PROMONTORY VIEWS ESTATE DRAINAGE SCHEME CONTOUR PLAN SHEET 2				DESIGNED [Signature]	CHECKED [Signature]	DATE FEB 08 FEB 08 FEB 08	APPROVED [Signature]	FILE No. 30-160 4 of 15
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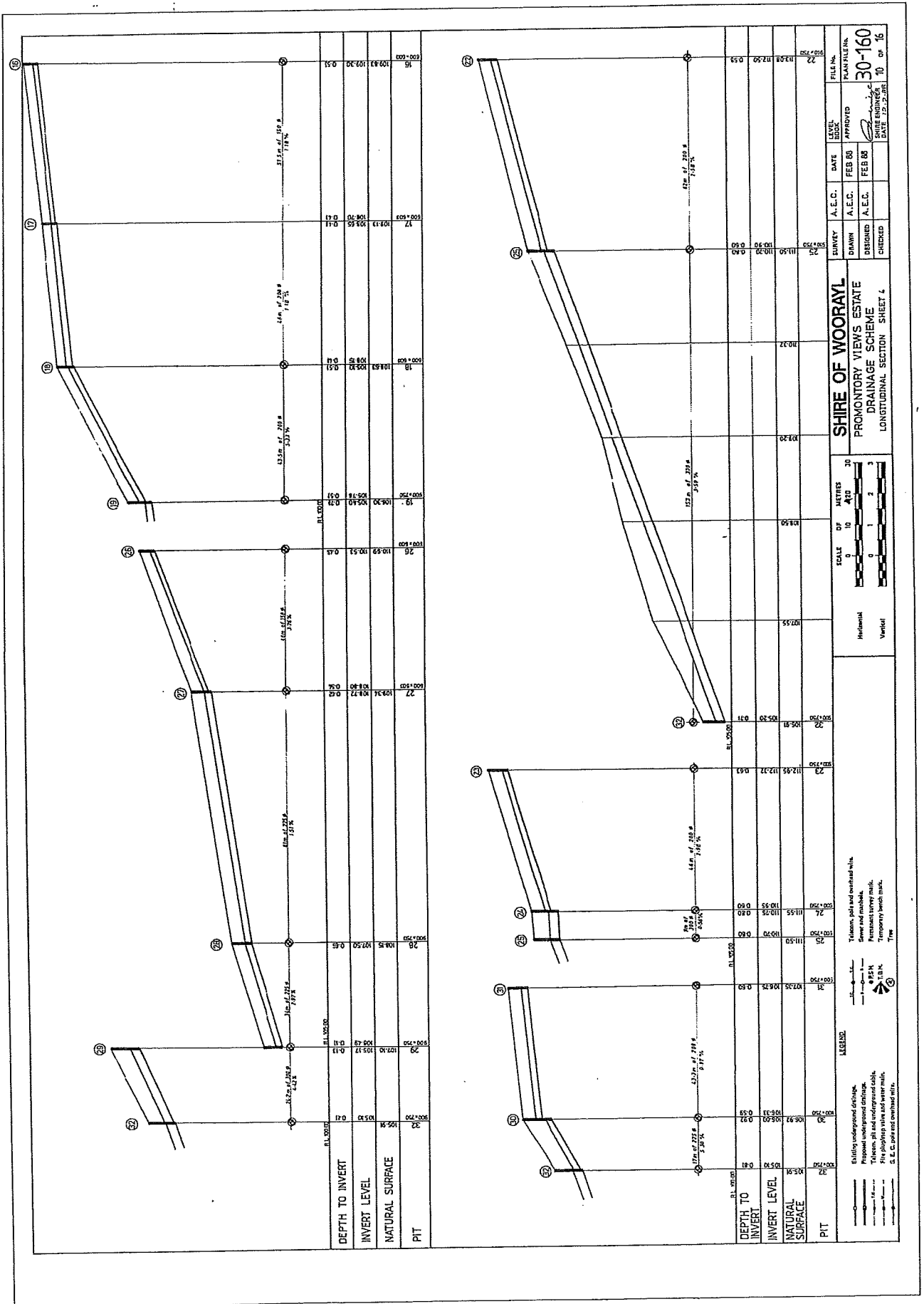


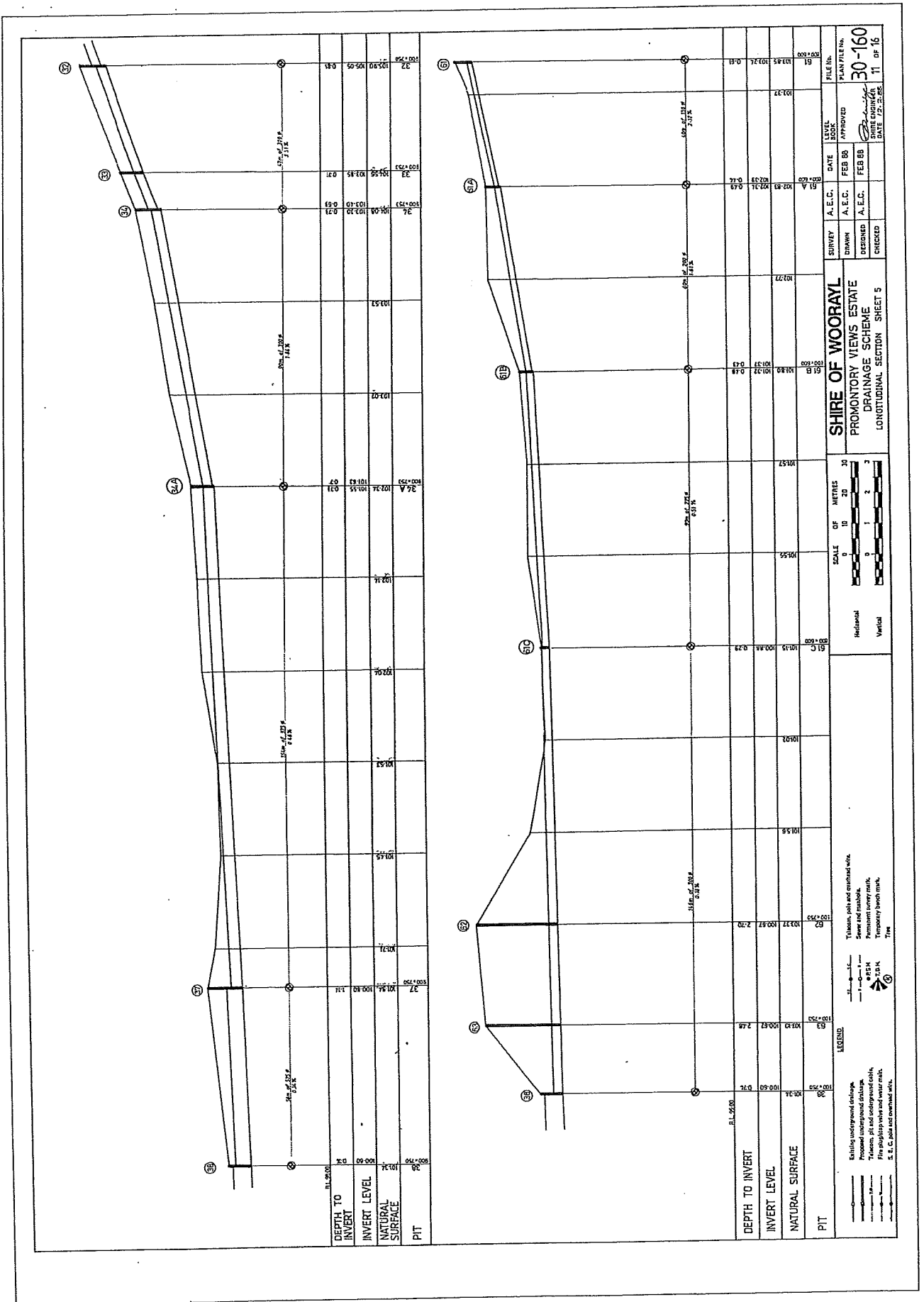


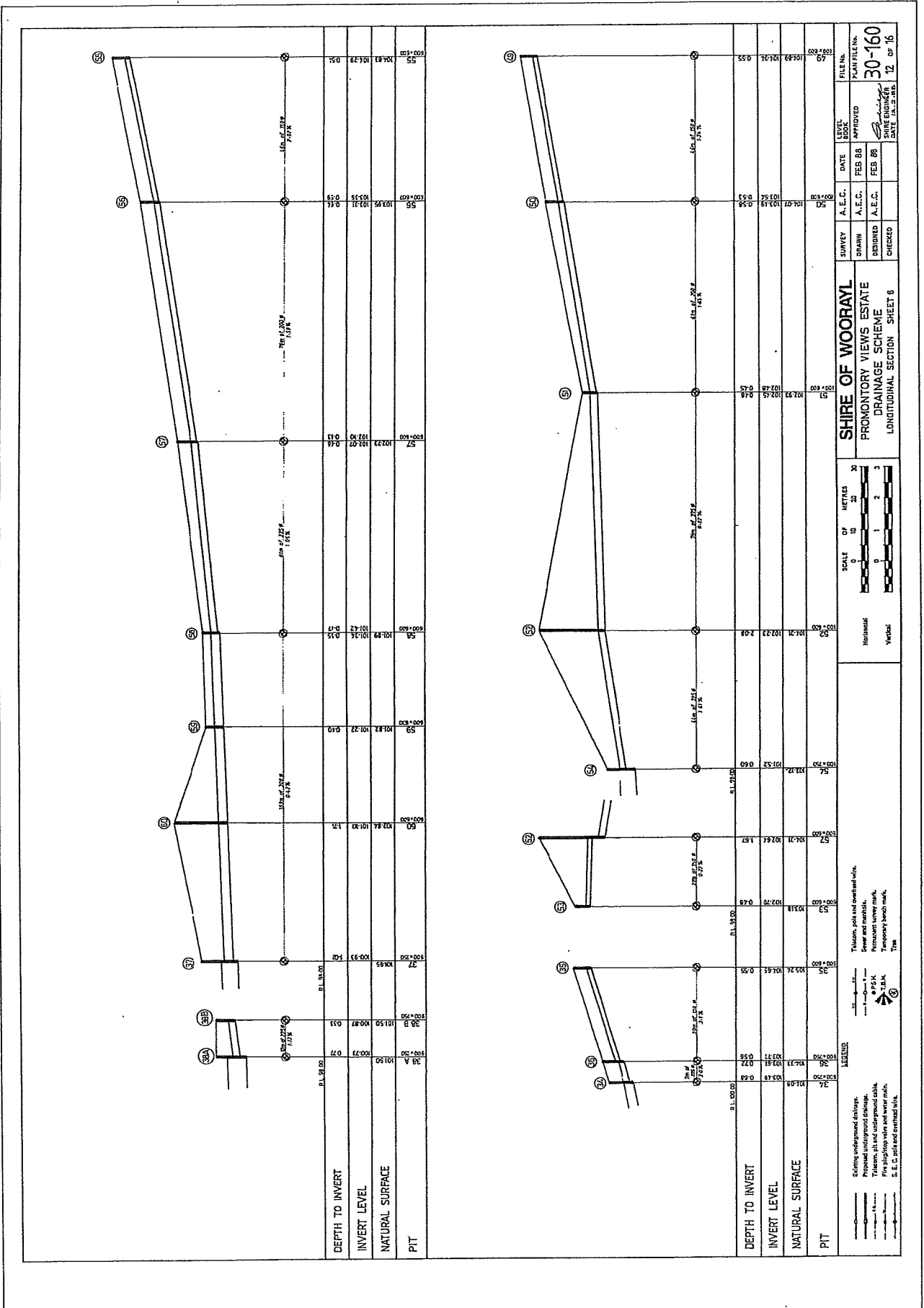


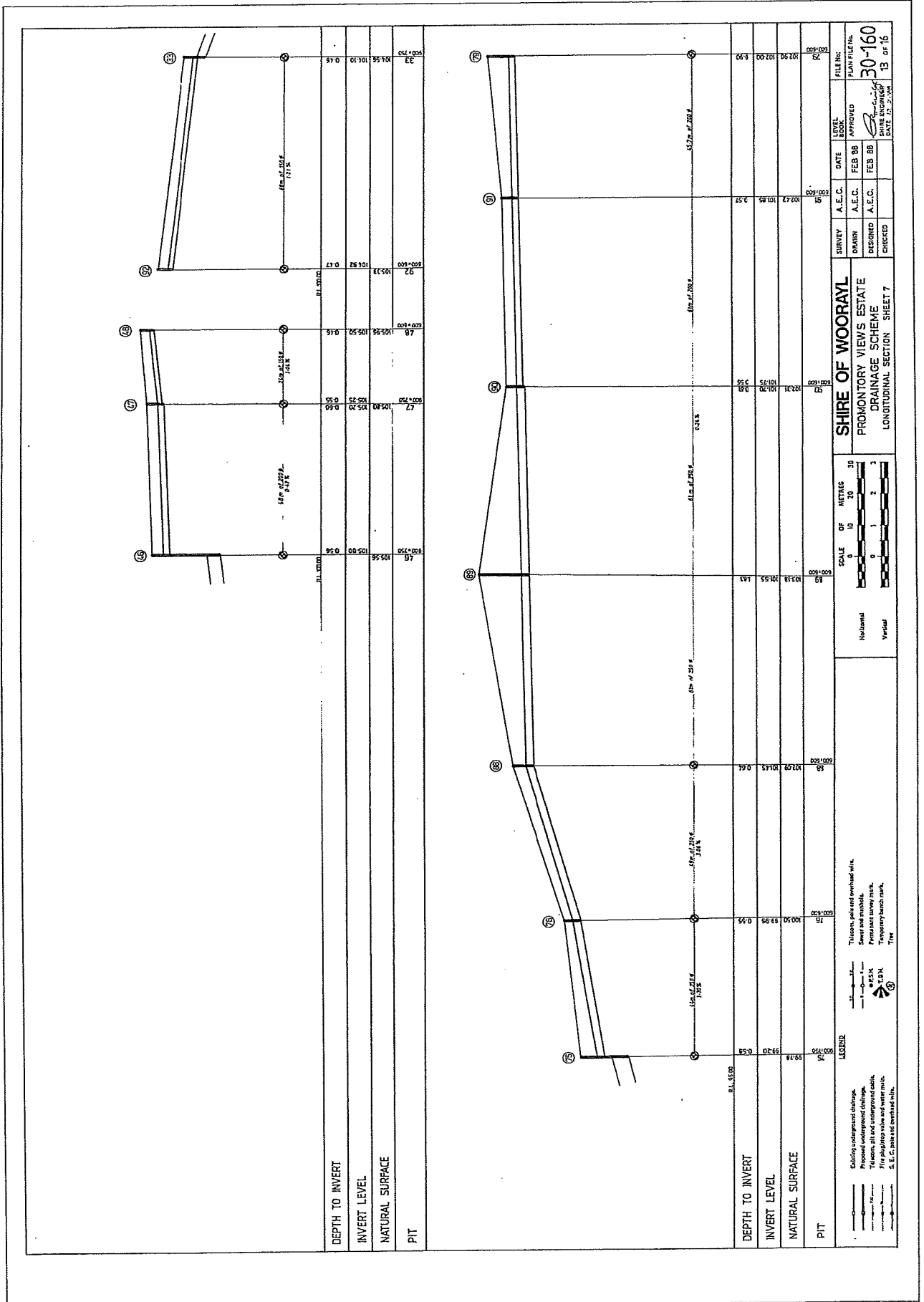


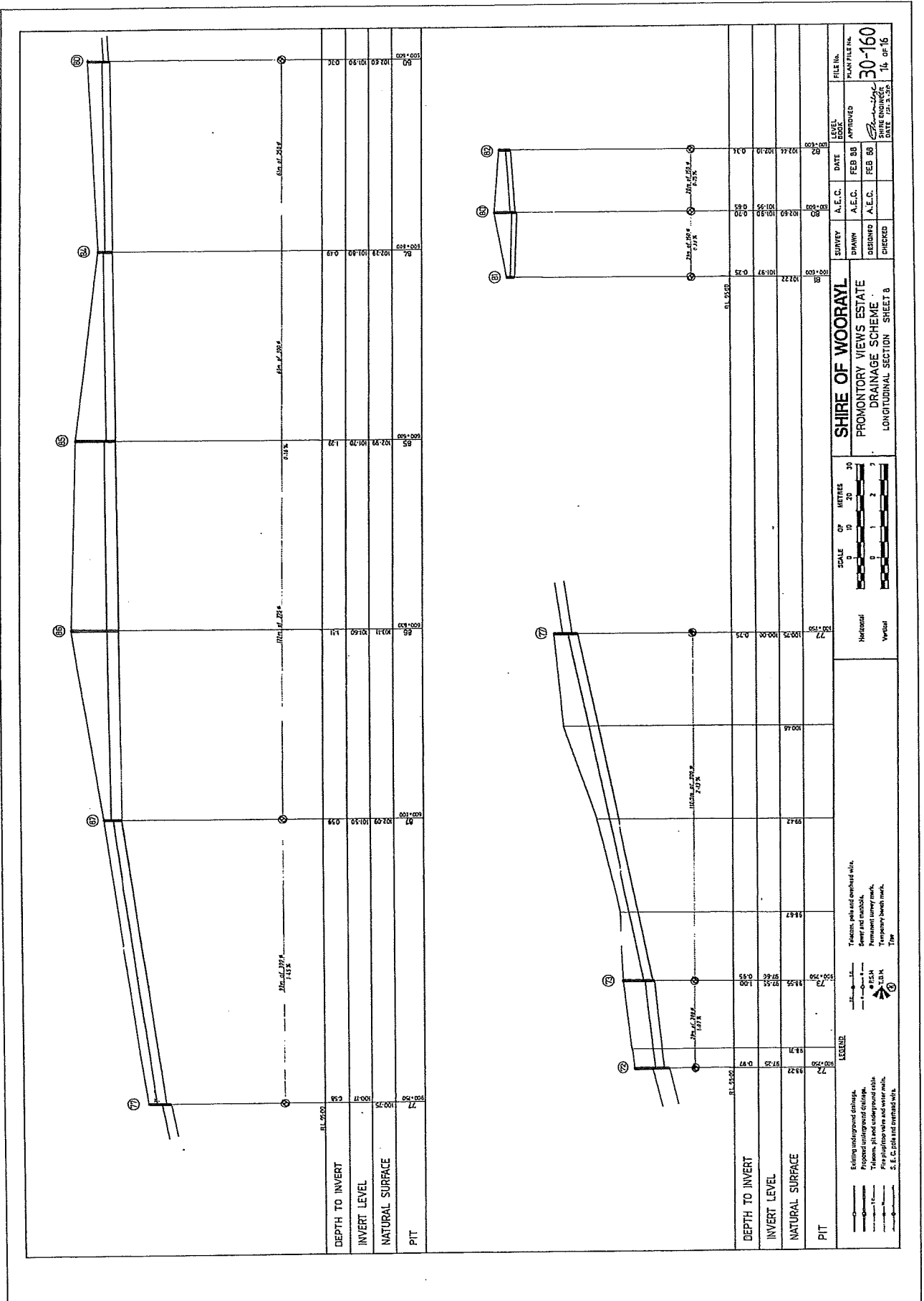


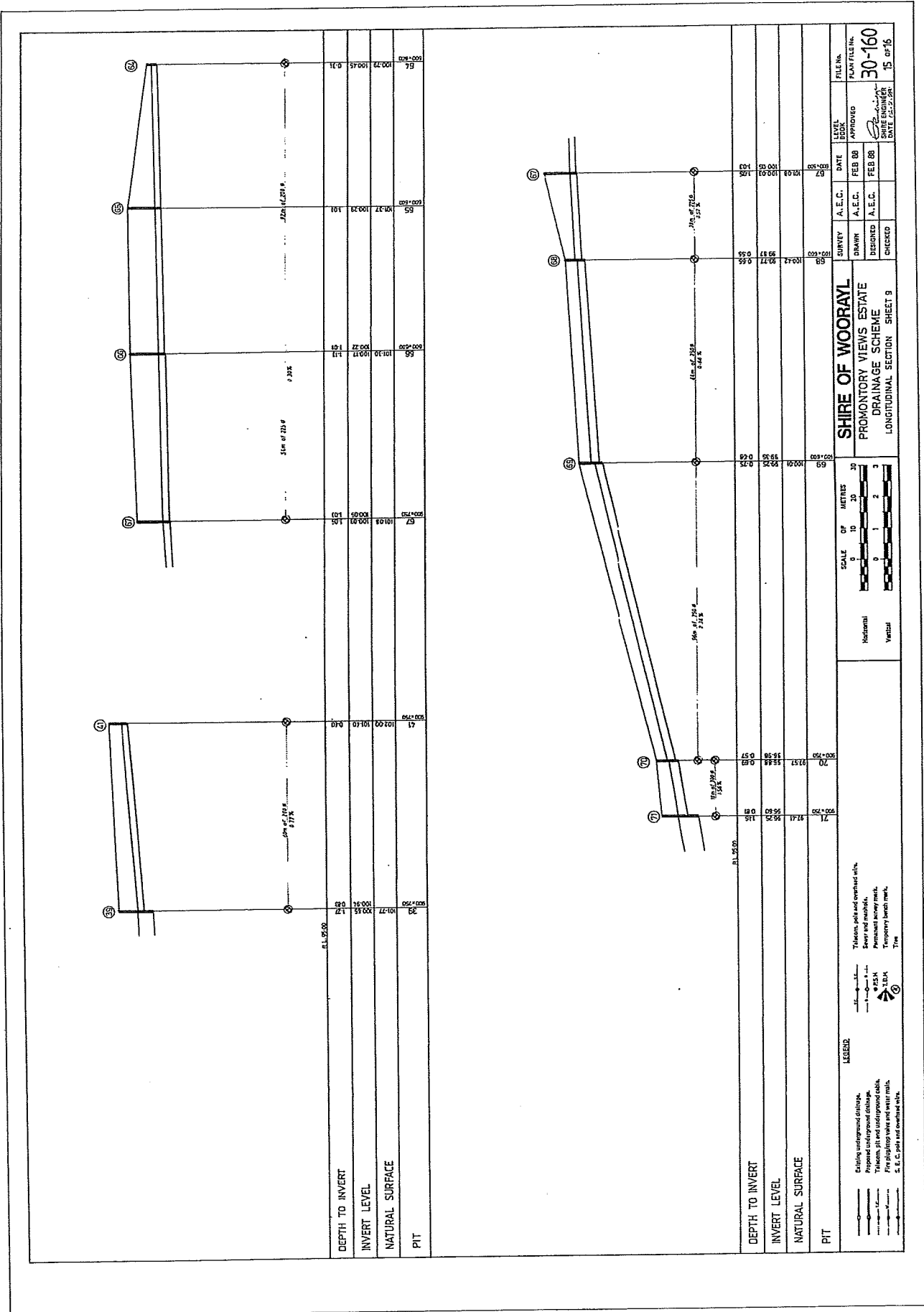




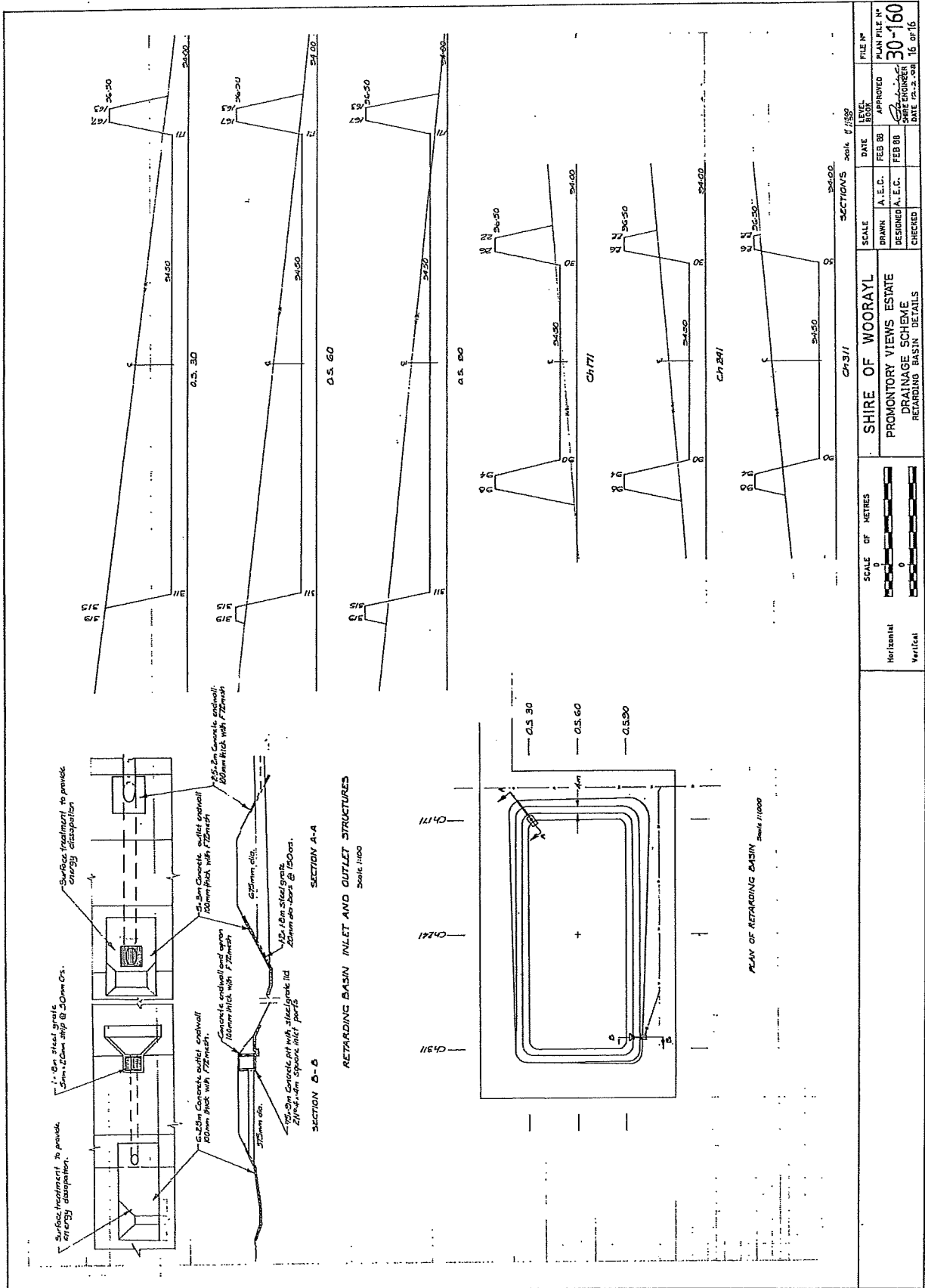








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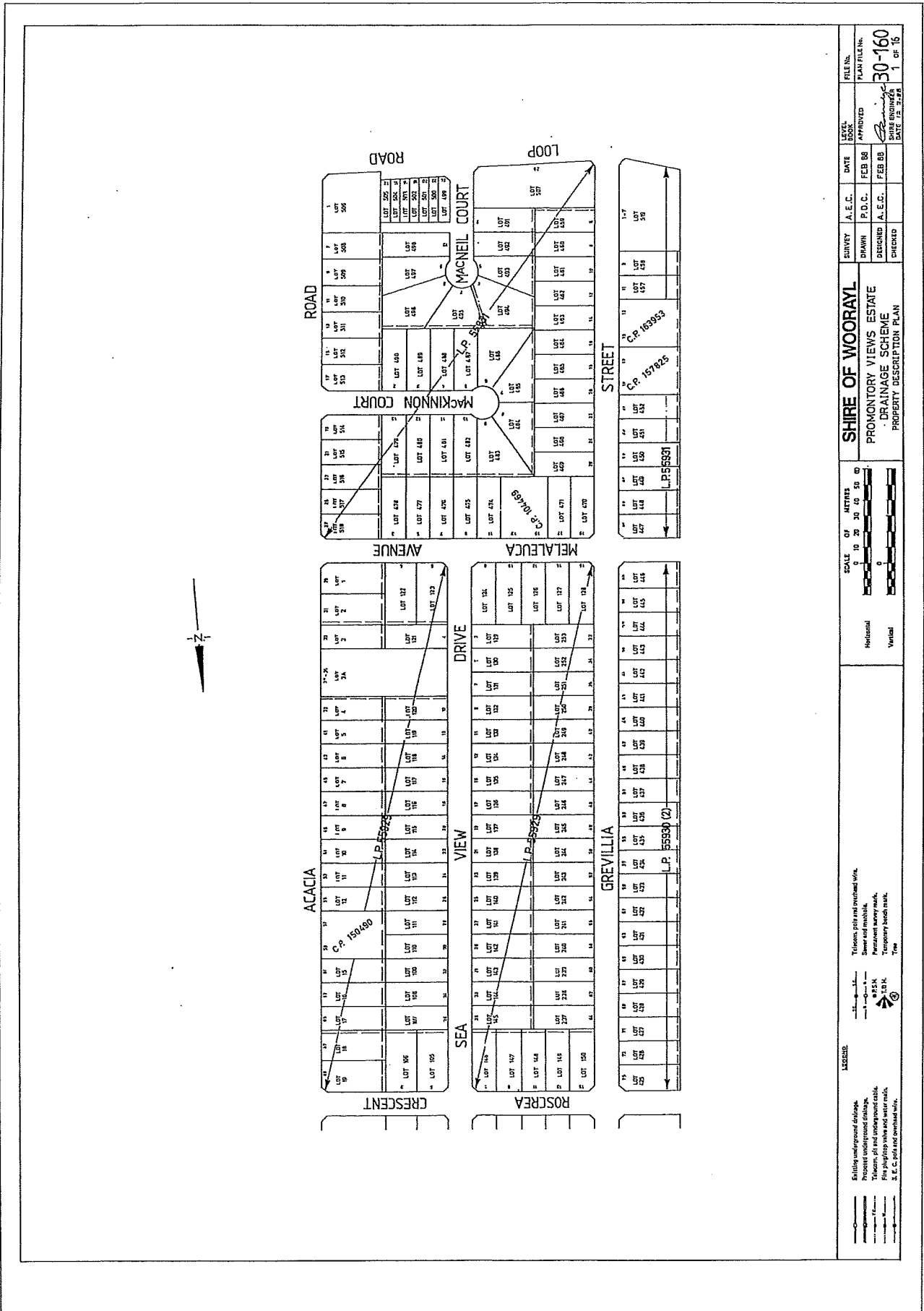


SCALE OF METRES		SCALE		DATE		LEVEL		FILE #	
Horizontal	0 10 20	DRAWN	A. E. C.	FEB 08	APPROVED	A. E. C.	FEB 08	30-160	PLAN FILE #
Vertical	0 10 20	DESIGNED	A. E. C.	FEB 08	CHECKED	A. E. C.	FEB 08	30-160	DATE CHECKED
SHIRE OF WOORAYL									
PROMONTORY VIEWS ESTATE									
DRAINAGE SCHEME									
RETAINING BASIN DETAILS									

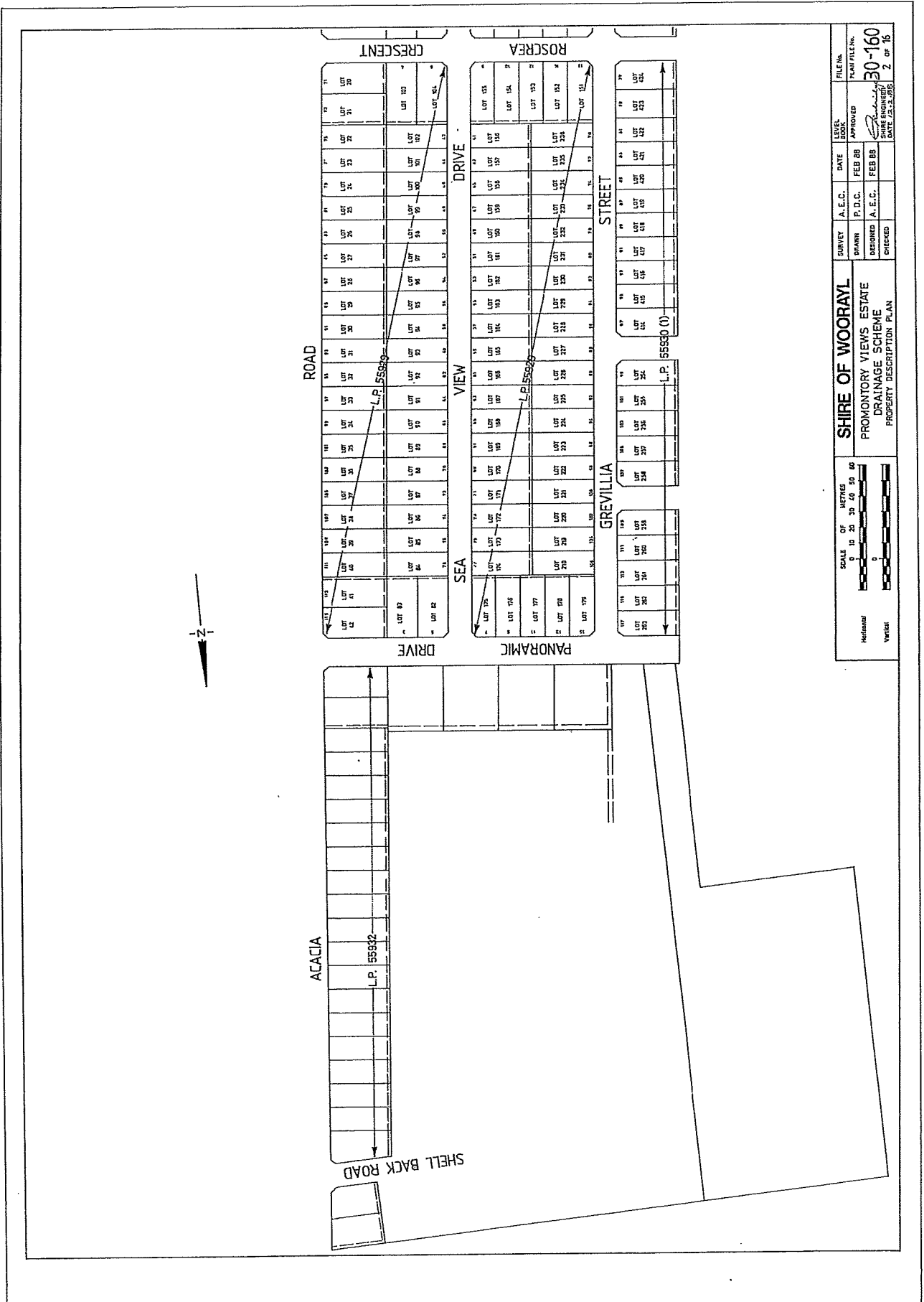
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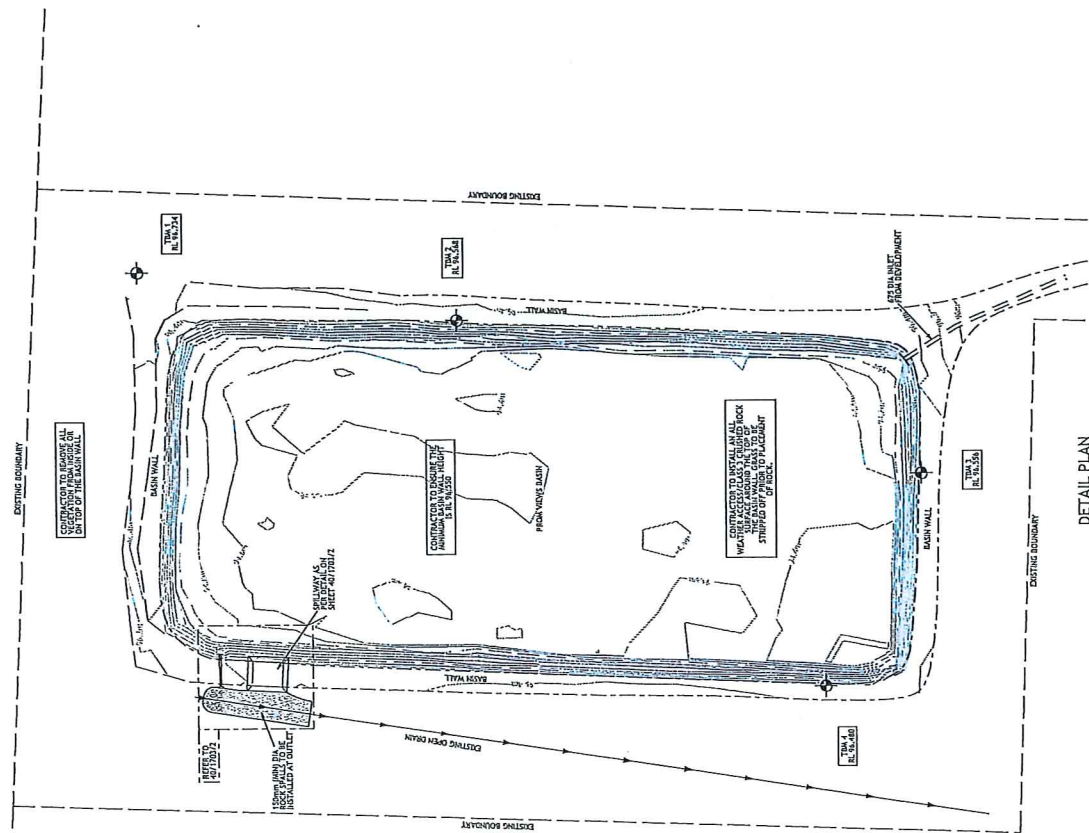
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3.	SEP	250	373.41	300	131.40	1.20			
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5.	SEP	300	308.08	300	108.00	1.24			
6.	SEP	300	308.09	275	108.04	1.26			
7.	SEP	300	308.08	300	108.00	1.24			
8.	SEP	300	308.08	300	108.00	1.24			
9.	SEP	300	308.08	300	108.00	1.24			
10.	SEP	300	308.08	300	108.00	1.24			
11.	SEP	300	308.08	300	108.00	1.24			
12.	SEP	300	308.08	300	108.00	1.24			
13.	SEP	300	308.08	300	108.00	1.24			
14.	SEP	300	308.08	300	108.00	1.24			
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7.



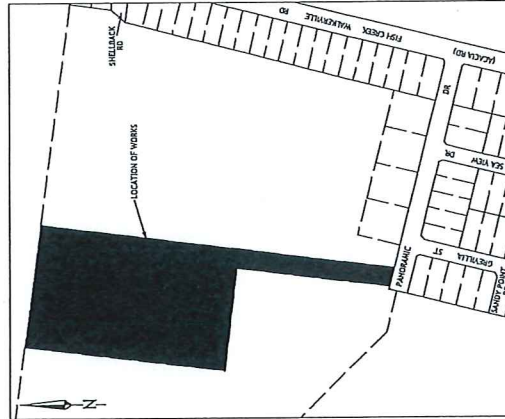
<p>Buildings and proposed drainage Proposed underground drainage Telephone, fire and underground cables Fire plug/riser pipe and water main S. E. C. poles and overhead wires.</p>		<p>LEGEND</p>		<p>Scale of meters 0 10 20 30 40 50 60</p>		<p>SHIRE OF WOORAYL PROMONTORY VIEWS ESTATE DRAINAGE SCHEME PROPERTY DESCRIPTION PLAN</p>		<p>DATE APPROVED FEB 88</p>		<p>DATE APPROVED FEB 88</p>		<p>FILE NO. PLAN FILE NO. 30-160 1 OF 15</p>	
<p>Telephone, split and overhead wires Sewer and stormwater Permanent survey mark Temporary bench mark Tree</p>		<p>Horizontal Vertical</p>		<p>DATE DESIGNED FEB 88</p>		<p>DATE CHECKED FEB 88</p>		<p>SURVEY DRAWN DESIGNED CHECKED</p>		<p>A. E. C. P. D. C. A. E. C.</p>		<p>1-7 208 208</p>	





NOTES

1. ALL WORKS SHALL CONFORM TO THE CURRENT INFRASTRUCTURE DESIGN MANUAL STANDARD DRAWINGS.
2. ALL DIMENSIONS ARE IN METRES.
3. ALL LEVELS TO BE CONFORMED TO ALL ASPECTS OF THE DESIGN AND CONSTRUCTION DOCUMENTS.
4. EXISTING SURFACE LEVELS SHOWN AS 8.47.
5. PROPOSED DRAINAGE SHOWN AS 8.47.
6. EXISTING DRAINAGE SHOWN AS 8.47.
7. THE CONTRACTOR SHOULD NOTE THE EXISTENCE OF GAS PIPES, WATER AND AIR SERVICES IN THE AREA.
8. AT COMPLETION, THE WHOLE SITE SHALL BE CLEANED UP, GRADED OVER AND THE SITE TO BE RETURNED TO THE ORIGINAL CONDITION TO THE SATISFACTION OF COUNCIL SUPERVISOR.
9. EXTENT OF CUT AND FILL IS SHOWN AS ---.
10. HOLD POINTS FOR CONSTRUCTION ARE AS FOLLOWS:
 - INSPECTION POINT TO DETERMINE LOCATION OF WORKS;
 - INSPECTION POINT TO DETERMINE LOCATION OF WORKS;
 - INSPECTION POINT TO DETERMINE LOCATION OF WORKS;
 - INSPECTION POINT TO DETERMINE LOCATION OF WORKS;
 - INSPECTION POINT TO DETERMINE LOCATION OF WORKS;
11. BACKFILL FOR ROAD CROSSINGS AND SHOULDER BOUNDARY CROSSINGS SHALL BE TO A MINIMUM 150mm.
12. SOFT POINTS TO BE REMOVED BY EXCAVATION AND BACKFILLED WITH MOIST LATER CONSTRUCTION WITH SOUTH GIPPSLAND SHIRE COUNCIL.
13. SOFT POINTS TO BE REMOVED BY EXCAVATION AND BACKFILLED WITH MOIST LATER CONSTRUCTION WITH SOUTH GIPPSLAND SHIRE COUNCIL.
14. BEFORE COMMENCING WORK ON TRENCHES IN EXCESS OF 1.0 METRES IN DEPTH, VISUAL SURVEILLANCE SHALL BE MAINTAINED AT ALL TIMES DURING SUCH EXCAVATION, MANAGED AS PER THE ATTACHED PLAN. ALL TRENCHES SHALL BE EXCAVATED.
15. ALL LINE MARKING AND SIGNAGE TO BE INSTALLED IN ACCORDANCE WITH AUSTROS AND CONSTRUCTION SHALL BE IN ACCORDANCE WITH AUSTROS.
16. CONCRETE GRADE TO BE USED FOR CONSTRUCTION OF FITS TO BE 25MPa.



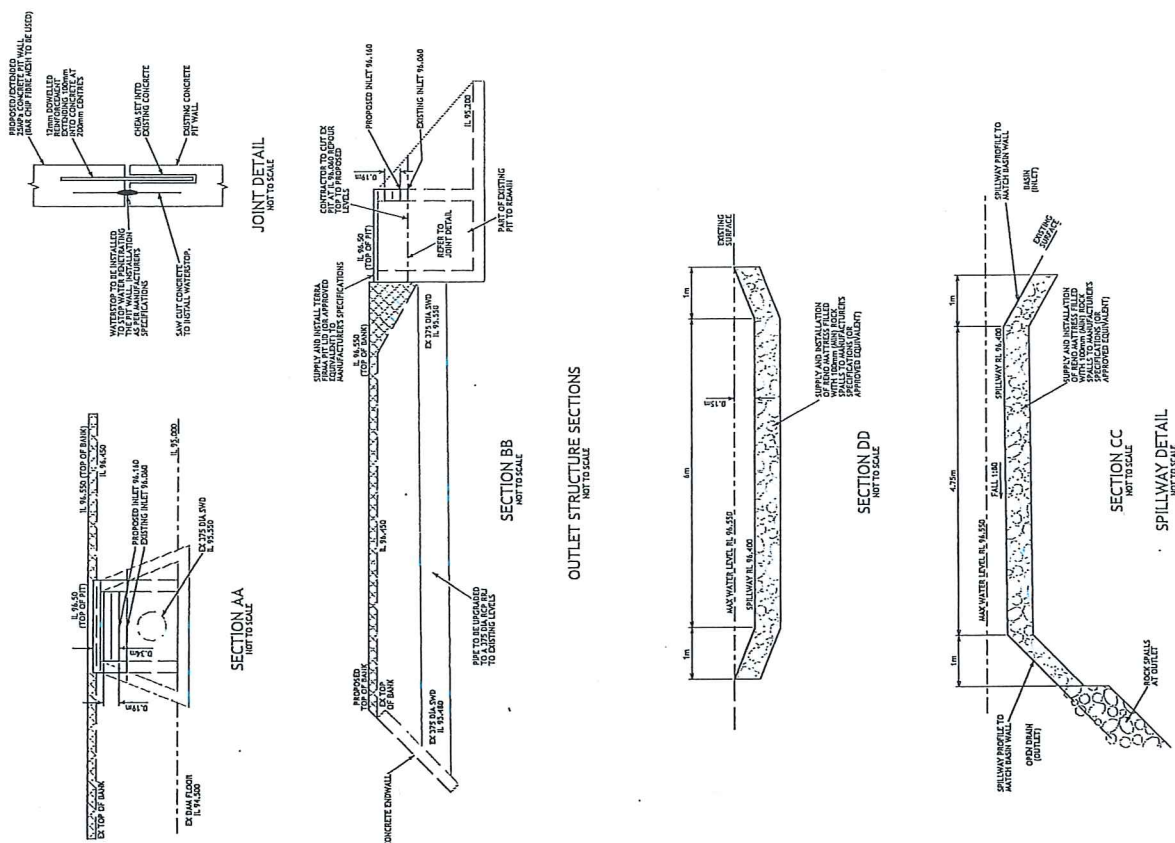
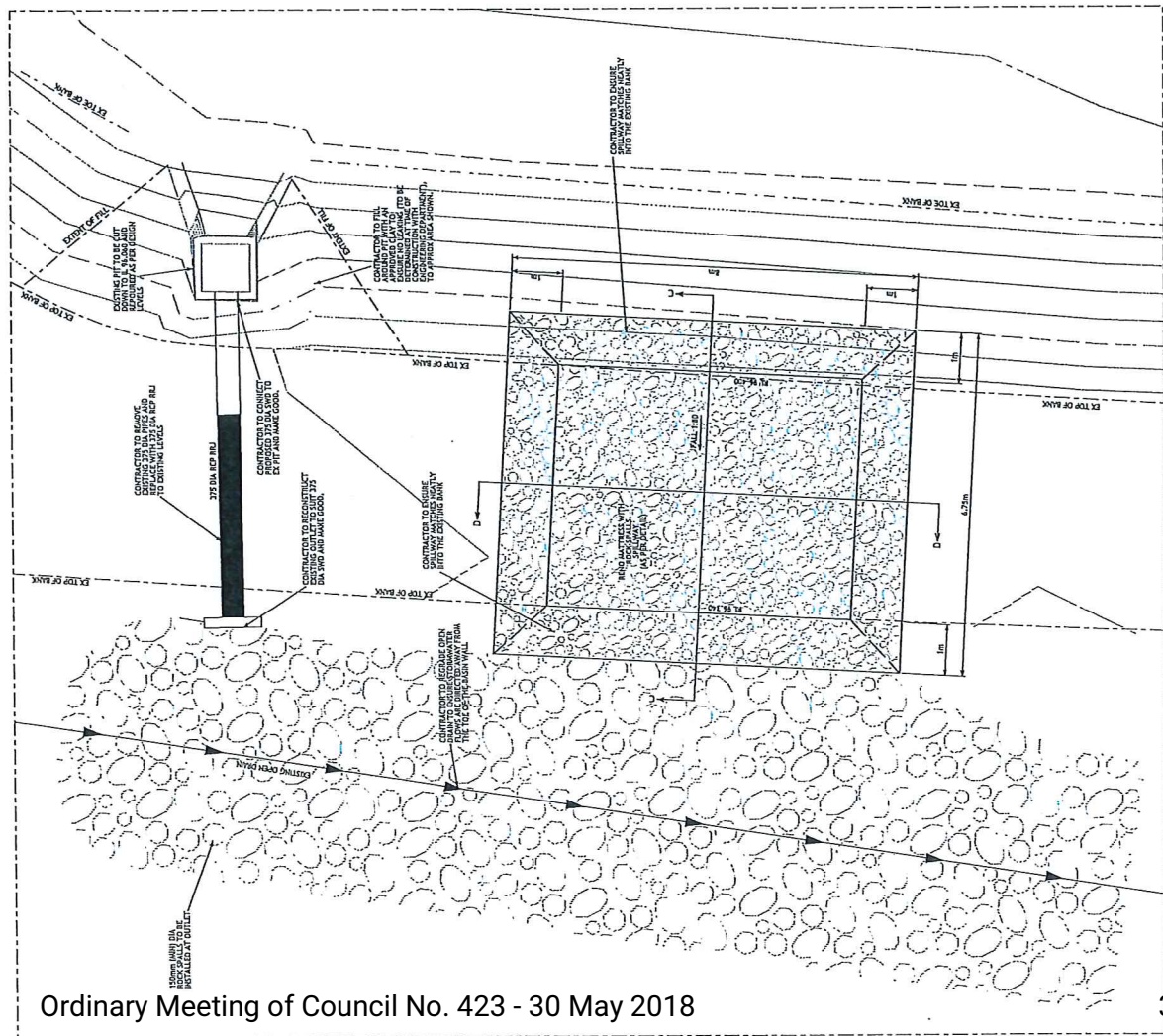
LOCALITY PLAN
FROM VIEWS WALKERVILLE
NOT TO SCALE

REV	A	FILE	CHECKED	T. PETERSON ENGINEERING COORDINATOR	DATE
PLAN FILE No.	40/1703/1	APPROVED	J. JAYOLAN MANAGER ENGINEERING	DATE	
TRM FILE No.	EF/17/157	DESIGN	J. JAYOLAN	DATE	
DATE	30/11/2017	DRAWN	J. JAYOLAN	DATE	
DATE	30/11/2017	DESIGN	J. JAYOLAN	DATE	
DATE	30/11/2017	DATE	J. JAYOLAN	DATE	

SOUTH GIPPSLAND SHIRE COUNCIL
PROMONTORY VIEWS BASIN WORKS
PANORAMIC DRIVE, WALKERVILLE
 LAYOUT PLAN



ITEM	DATE	REVISION
A	30/11/2017	PRELIMINARY DESIGN
B		
C		
D		
E		
F		



REV	FILE	APPROVED	PLAN FILE NO.	SHEET
A		J. MOYLAN	40/1703/2	2 OF 2
		T. PETERSON	TRIM FILE NO.	
		J. TAYLOR	EF/17/157	
		J. TAYLOR	DATE	
		J. TAYLOR	DATE	
		J. TAYLOR	DATE	
		J. TAYLOR	DATE	

ITEM	DATE	REVISION	APPD.
A	30/11/2017	PRELIMINARY DESIGN	JT

SOUTH GIPPSLAND SHIRE COUNCIL
 PROMONTORY VIEWS BASIN WORKS
 PANORAMIC DRIVE, WALKERVILLE
 DETAIL PLAN AND SECTIONS

