REPORT ON FEASIBILITY OF PROVIDING AN ELEVATED STORAGE TO SERVICE NORTH LISMORE PLATEAU RESIDENTIAL DEVELOPMENT

1. INTRODUCTION AND BACKGROUND

ACM Landmark Pty Ltd has requested Civil Design Services to investigate the feasibility of using an elevated reservoir to service the proposed North Lismore Plateau development beyond Stage 1 development.

Provision of water supply to the proposed North Lismore Plateau development has previously been investigated in a number of reports. The latest full report by Civil Design Services Pty Ltd was prepared in July 2010. This report updated cost estimates contained in the initial report of September 2006.

Previous reports have investigated the extent to which the existing Tullera Reservoir has additional capacity to service the first stage development of the Plateau and the overall requirements to service the ultimate development of approximately 1000 lots.

Past investigations have concluded that the most appropriate method of servicing Stage 1 of the North Lismore Plateau would be via the existing 1 Ml Tullera Reservoir which is located off Dunoon Road, approximately 3 km north-east of the proposed development. This reservoir is currently supplied via a 150 mm main connected to the Lismore bulk water supply main at Howards Grass. The reservoir is currently operating at slightly more than half its capacity, and is capable of meeting requirements of Stage 1 development without further amplification.

It has been recommended that the full development of the North Lismore Plateau be served by adopting the same supply route as used for Stage 1. This would require the construction of a new 2.5 Ml reservoir adjacent to the existing reservoir and the amplification of the Rous Water trunk main to the reservoir.

It was proposed that the difficulty of providing minimum stipulated pressures within the higher parts of the North Lismore Plateau be overcome by the provision of variable speed booster pumps located in a pumping station constructed at the intersection of Dunoon and McLeay Roads.

This latest report will examine the feasibility of dispensing with the booster pumping station beyond the first stage of the development and instead maintaining supply to the development by gravity feed. This would require the construction of elevated storages either within or external to the boundaries of the development.

2. DESIGN PARAMETERS

These are the design parameters that have been used in previous investigation reports:

1) From Lismore City Council – Specification for the Design & Construction of Water Reticulation Pipework, July 1999:

a) *Static head to each lot should be between 30 m and 60 m with a minimum static head of 20 m under peak instantaneous demand at the property boundary.*
b) *The desirable maximum design head is to be 70 m.*

2) From Rous Water (letter dated 7 July 2006)

a) *Tullera Reservoir is serviced by a 150 mm gravity main connected to the trunk main at Howards Grass. Howards Grass Pumping Station is decommissioned and does not pump to Tullera Reservoir.*
b) *Rous Water expects that there would be no need to provide additional chlorination at Tullera Reservoir as the increased demand would reduce the storage time in the reservoir.*
c) *Rous Water will supply the peak day demand nominated by Lismore City Council to Tullera Reservoir over 22 hours.*

3) From Rous Water (letter dated 15 August 2006)

a) *The existing trunk main at Howards Grass presently operates in the range of 176 m static to 115 m. The system at Howards Grass operates via pressure reducing and pressure sustaining valves which limit the pressure in the bulk main. These valves have been set up to operate under the existing demand conditions and will be adjusted as demand grows.*
b) *Rous Water is presently decommissioning the old 450 mm trunk main and it is anticipated that new pressure settings will be required during the upcoming summer demand period.*

4) From discussions between Lismore Council and Rous Water and consultant David Stewart, 31 August 2006

a) *Rous Water estimates it can supply approximately 1 Megalitre of water to Tullera Reservoir over a 24 hour period.*
b) *Flow into Tullera Reservoir is controlled by an altitude valve set to Lismore City Council.*

Various alternative water supply systems for both the initial stage of the subdivision and the ultimate subdivision have been assessed and alternative designs have been analysed using a water modelling program (EPANET 2.0).

3. ANALYSIS

The Lismore Plateau consists of two natural high parts of the ridge (north and south), each with an elevation of RL 130. They are separated by a shallow depression with a level which varies from RL 105 to RL110.

It has previously been recommended that two separate hydraulic zones be created within the Lismore Plateau development, namely, a "northern" and a "southern" zone. It was proposed to separately service each zone from a proposed booster pumping station at the intersection of Dunoon Road and McLeay Road.

For the later stages of the development, water supplying the booster station would come from a new 2.5 Ml reservoir to be constructed adjacent to the existing 1 Ml Tullera reservoir. The reservoir site has an elevation of RL139. The existing reservoir has a top water level of RL 147 and it was proposed that the new reservoir also have the same top water level. The dimensions proposed for the new reservoir were 20 m diameter x 8 m water depth.

Based on friction head losses at maximum flow rates, the approximate pipeline losses that would occur in the 4.4 km of pipeline between the reservoir and the highest node in the "southern" zone would be in the order of 4 metres.

If an operating range in the reservoir was assumed to vary between 4 metres depth and 8 metres depth, then the TWL required for the reservoir to provide a minimum static head of 30 metres at the highest property in the development would be as follows:

RL of highest property = 130 m
Minimum head required at highest property = 30 m. This will be capable of being supplied at the minimum normal operating point of the reservoir (assumed 4m below TWL).
Hydraulic gradient required at highest property under static head conditions
= 130 + 30 = 160 m
Pipeline friction losses under peak flow conditions = 4 m.
Minimum allowable head at peak instantaneous demand = 20 m. Therefore static head of 30 m is governing criteria (20 m + 4 m friction loss < 30 m).
Minimum operating depth of reservoir = 4 m
Maximum operating depth of reservoir = 8m
Required TWL of reservoir = 160 m + 4 m = 164 m

To supply the North Lismore Plateau solely by gravity would necessitate the construction of a storage 164 -139 = 25 m in height. Obviously this is impractical for a full size reservoir. Additional pumping would also be required to boost the supply to the reservoir from the existing trunk main system at Howards Grass as there would be insufficient head in the trunk main to supply a reservoir at this level.

The practicality of finding a more elevated reservoir site was considered. There are no suitable nearby elevated sites that would meet the criteria required (minimum elevation required approximately RL 156).

Consideration was then given to constructing a standpipe adjacent to the Tullera reservoir. A pumping station would be required to be constructed adjacent to the reservoir to pump water from the reservoir into the standpipe to provide the required head.

The operating range for a standpipe would be in the order of 4 metres.

The TWL required to provide a minimum head of 30 m at the highest property would be in the order of:

160 m + 4 m = 164 m

This would involve the construction of a standpipe in the order of 25 m in height. By comparison the Hunter Water "Shuttlecock" elevated water tower at Madison Drive, Charlestown is about 20 m high overall (3.6 m operating depth).

A standpipe of these dimensions would be very expensive to construct and maintain and would be visually most intrusive on the ridgeline. It should be noted that it would still be necessary to construct a reservoir of 2.5 Ml capacity in addition to the standpipe in order to satisfy minimum storage requirement (1 day's storage at peak demand).

Because of the limited storage capacity available in the top storage section of the standpipe frequent pumping operations would be required at full development to maintain storage levels. This would not be acceptable from an operational viewpoint. In the event of power failure the limited storage in the standpipe would quickly deplete and pressure in the reticulation system would drop to a level that could be supplied from the adjacent reservoir.

Internal elevated tanks (one in each of the "southern" and "northern" pressure zones) were considered as part of the initial 2006 investigations. These were to be 25 m high overall (storage 6 m dia x 5 m high, TWL 154.5). Although minimum operating pressures greater than 20 m could be achieved, the criteria for 30 m minimum static head could not be satisfied. The high level tank alternative was rejected at the time because of the resultant unacceptable visual impact on the ridgeline.

4. SUMMARY

It is concluded that the suggested use of elevated storages to allow for a gravity fed reticulation system within the final development of the North Lismore Plateau development has a number of serious drawbacks.

To meet the Lismore City Council's criteria for a minimum static head of 30 metres would require the construction of excessively high and, therefore expensive, storages.

If the reservoir required to service the final development (2.5 Ml capacity) were to be elevated to provide a minimum static head of 30 m in the highest parts of the development it would need to be 25 m high, which is clearly impractical.

A standpipe adjacent to the storage reservoir was next considered. It too would need to be some 25 m in height. A pumping station would need to be constructed to supply the elevated storage from the adjacent reservoir. Frequent pumping cycles would be needed to maintain storage levels in the standpipe at full development because of the limited effective storage available.

High level tanks, 25 m high, located within each pressure zone of the development, have previously been investigated as a means of maintaining pressures within the two proposed pressure zones. Although these tanks would be able to maintain peak flow pressures greater than 20 m, they could not meet the criteria of 30 m minimum static head.

Because of their height, elevated storages were also considered undesirable because of their prominent visual impact on the ridgeline.

5. CONCLUSIONS

It has been demonstrated that elevated storages do not represent a better alternative to the method of supply recommended in our previous reports.

Our past recommendations, as set out in our latest report of July 2010, are summarized as follows:

It was recommended that the most suitable method of supplying the ultimate development of the North Lismore Plateau would be to construct a 2.5 Ml reservoir adjacent to the site of the existing 1 Ml Tullera reservoir. With a top water level of RL 147 this reservoir would be capable of supplying the entire development by gravity. However, to maintain the minimum pressures stipulated by the Lismore City council it would be necessary to provide pressure boosting. Pressure boosting would be provided by a proposed booster pumping station at the intersection of Dunoon Road and McLeay Road.

In practice variable speed pumps would be used to give better control over pressure as demand varies throughout the day and night. Variable speed pumps would also be far more economical to run than single speed booster pumps.

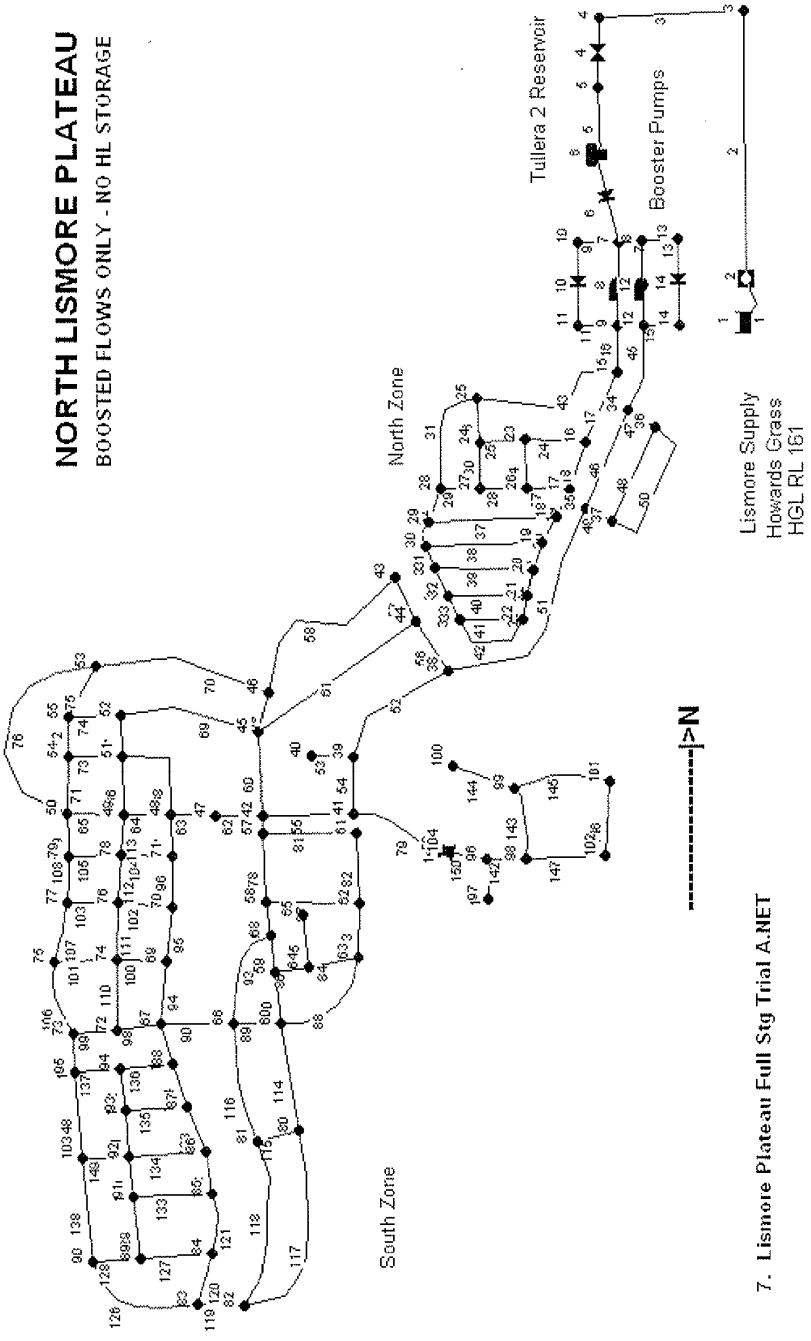
Thus far, modelling work has only been carried out using fixed speed pumps. However, the modelling program used (EPANET 2.0) is capable of modelling variable speed pumps. This could be a worthwhile exercise to demonstrate the efficiencies that could be achieved over fixed speed pumps.

As there will still be adequate pressure available in the system should the booster pumps be unable to operate because of power failure, there is little risk to supply in adopting pressure boosting without high level storage.

In the event of pump failure, the head available from the Tullera Reservoir would be capable of maintaining pressures at the highest points in the subdivision in the range 8 m to 17 m. These pressures would be acceptable under emergency conditions.

Overall, it would be far cheaper to provide pressure boosting than incur the additional construction, operational and maintenance costs associated with the provision of some form of elevated storage to provide a gravity fed supply within the North Lismore Plateau development.

APPENDED DIAGRAMS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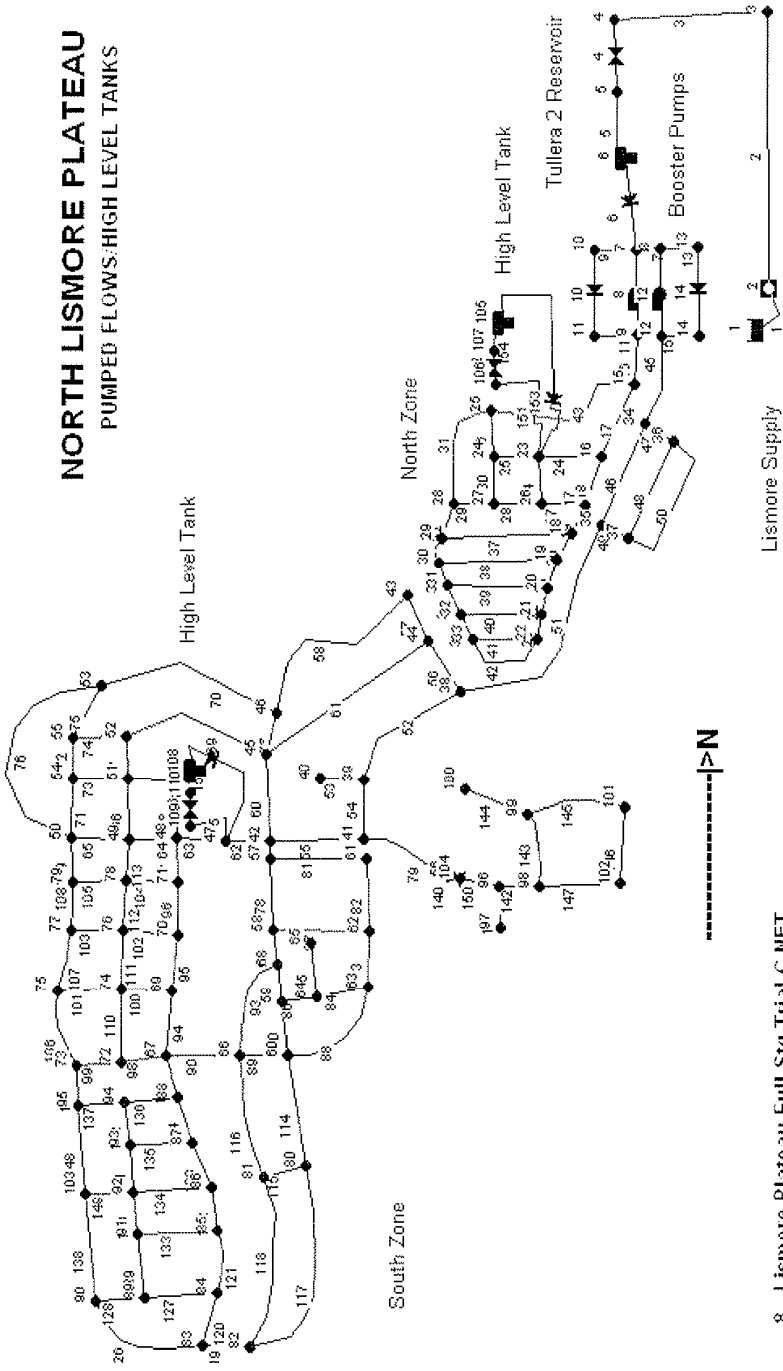
BOOSTED FLOWS ONLY - NO HL STORAGE
Tullera 2 Reservoir
Booster Pumps
North Zone
South Zone
Lismore Supply
Howards Grass
HGL RL 161
N
7. Lismore Plateau Full Stg Trial A.NET

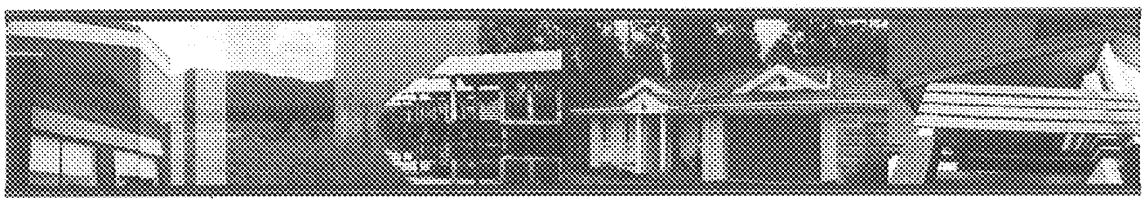
7


NORTH LISMORE PLATEAU
PUMPED FLOWS:HIGH LEVEL TANKS
High Level Tank
North Zone
High Level Tank
Tullera 2 Reservoir
Booster Pumps
Lismore Supply
Howards Grass
HGL RL 161
South Zone
N
8. Lismore Plateau Full Stg Trial C.NET

8

Water Availability

North Lismore Plateau



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1 INTRODUCTION

ACM landmark were engaged to undertake an assessment of the provision of water to the North Lismore plateau. The assessment was requested to determine a water servicing methodology including short term and long term storage requirements. The assessment also determined a short term servicing arrangement.

The information was required to be provided for the planning charrette in December 2010 with Lismore City Council.

2 SITE

The land is known as the North Lismore Plateau, a site approximately four (4) kilometers to the south west of the Central Business District of Lismore. The land comprises elevated plateau slopes rising to approximately 126m AHD and is located to the south of Dunoon Road and north of Nimbin Road. The area of the plateau is approximately 285ha and is expected to provide for approximately 1200 to 1600 residential lots. A plan of the study area can be seen as Appendix A.

3 PROPOSAL

It is proposed to zone the land from its current investigation zone of 1(b) to a residential RU2 zone. The residential development of the land would require the provision of services such as water supply.

Investigations into the provision of water supply to the plateau have identified the ability of water to be provided to the future urban development both in the short and long term.

4 BACKGROUND

The 1994 study titled "The Dunoon Road Planning Study' undertaken by Northern Rivers Engineers, Planners and Scientists in 1994 for Lismore City Council described a feasible method to service the plateau with water. The current proposal further investigates that scheme proposed and contained within the 1994 report in terms of connection of the plateau to the reticulated water supply from Tullera Reservoir and Howards Grass. Costs for the provision of water supply were originally prepared with the 1994 study however the current reports have independently costed those water supply works to current costs.

5 ASSESSMENT

The attached plan shown as Appendix B gives a pictorial representation of a proposed water supply connection route and scheme from the Tullera Reservoir. The plan demonstrates both the short term supply and the long term supply utilizing a new reservoir adjacent to the existing Tullera Reservoir.

The 1994 North Lismore Planning Study prepared for Lismore City Council by Northern Rivers Engineers Planners and Scientists considered the provision of water supply to the North Lismore Plateau. The preferred option was to supply water from the Tullera Reservoir.

In September 2006 and June 2010 ACM Landmark Pty ltd undertook water investigation reports to determine the following:-

- Determine to what extent Tullera Reservoir has additional capacity to provide for some first stage development of the plateau.
- Determine what level within the plateau can be developed with and without a booster pump and storage.
- Determine the size of trunk main from Tullera Reservoir to service both the first stage and ultimate stages of development.
- Determine the trunk main upgrade requirements from Howard Grass to Tullera Reservoir.

Investigations into the feasibility and costs associated with the water supply provision for both a first stage and ultimate development are included within the full report shown in Appendix C.

The investigation revealed that an initial stage of approximately 200 lots within the plateau can be serviced by the existing Tullera Reservoir with the provision of a new 300mm carrier main from the reservoir to the plateau area.

The Tullera Reservoir is operating at generally half of its capacity.

The first stage lots can occur in numerous locations on the plateau with the appropriate sizing of internal watermains.

The provision of a 300mm trunk main from Tullera Reservoir to the site approximately 1840m will serve both the first stage and ultimate development of the plateau.

Beyond 200 first stage lots a new 2.5ML reservoir adjacent to the Tullera Reservoir would be required together with the upgrading of the carrier main from Howards Grass to the new Tullera Reservoir via a 250mm trunk main 2620m in length.

For the first stage development a booster pump station at McLeay Road will be provided to ensure sufficient pressure. Further assessment has disclosed that an elevated reservoir or standpipe is impractical due to excessive height and adverse visability. This report can be seen as Appendix D.

The booster pump station whilst not being the most favoured option by Council will ensure that a continual pressure to the plateau was available to meet Councils static head requirements. The plateau can be serviced by gravity from the proposed Tullera Reservoir to the highest points in the subdivision in times of emergency without the operation of the pump station. However the operation of the booster pump station provides greater static head to the elevated areas of the plateau.

Some booster pumping of the system is inevitable and this would either need to be at the reservoir or as proposed at McLeay Road location.

The external scheme components would be funded by the developers of the plateau and could be offset against water headworks contributions. Internal water reticulation would also be provided by the developers within the subdivision of each stage of the residential development.

Rous Water have also confirmed the provision of bulk supply to the North Lismore Plateau and that the distribution of this supply would be carried out to the satisfaction of Lismore Water.

6 CONCLUSION

The North Lismore Plateau area proposed for rezoning has the capability to be serviced by water supply from the Tullera Reservoir. Lismore City Council however favours the provision of gravity supply system to the land. However assessment has shown that an elevated reservoir at Tullera, adjacent to the existing reservoir is not feasible.

Supply can be guaranteed to the plateau both in the interim and full development with some booster pumping to achieve Councils static head requirements in the more elevated lots on the plateau.

Upgrading of the carrier mains from Howards Grass to Tullera Reservoir will be required to provide increased capacity for the latter stages of the plateau development beyond 200 lots.

The provision of a new reservoir, augmentation of the carrier mains from Howards Grass to Tullera Reservoir and the provision of an ultimate sized main from Tullera Reservoir to the plateau will ensure that the North Lismore Plateau can be adequately services with reticulated water.

It can be seen therefore that the rezoning of the North Lismore Plateau would not be limited by the provision of sewer to enable future development.

APPENDIX A
STUDY AREA

APPENDIX B

Concept Water Plan

APPENDIX C

Water Supply Investigation June 2010

APPENDIX D

Water Supply Investigation January 2011

Attachment E

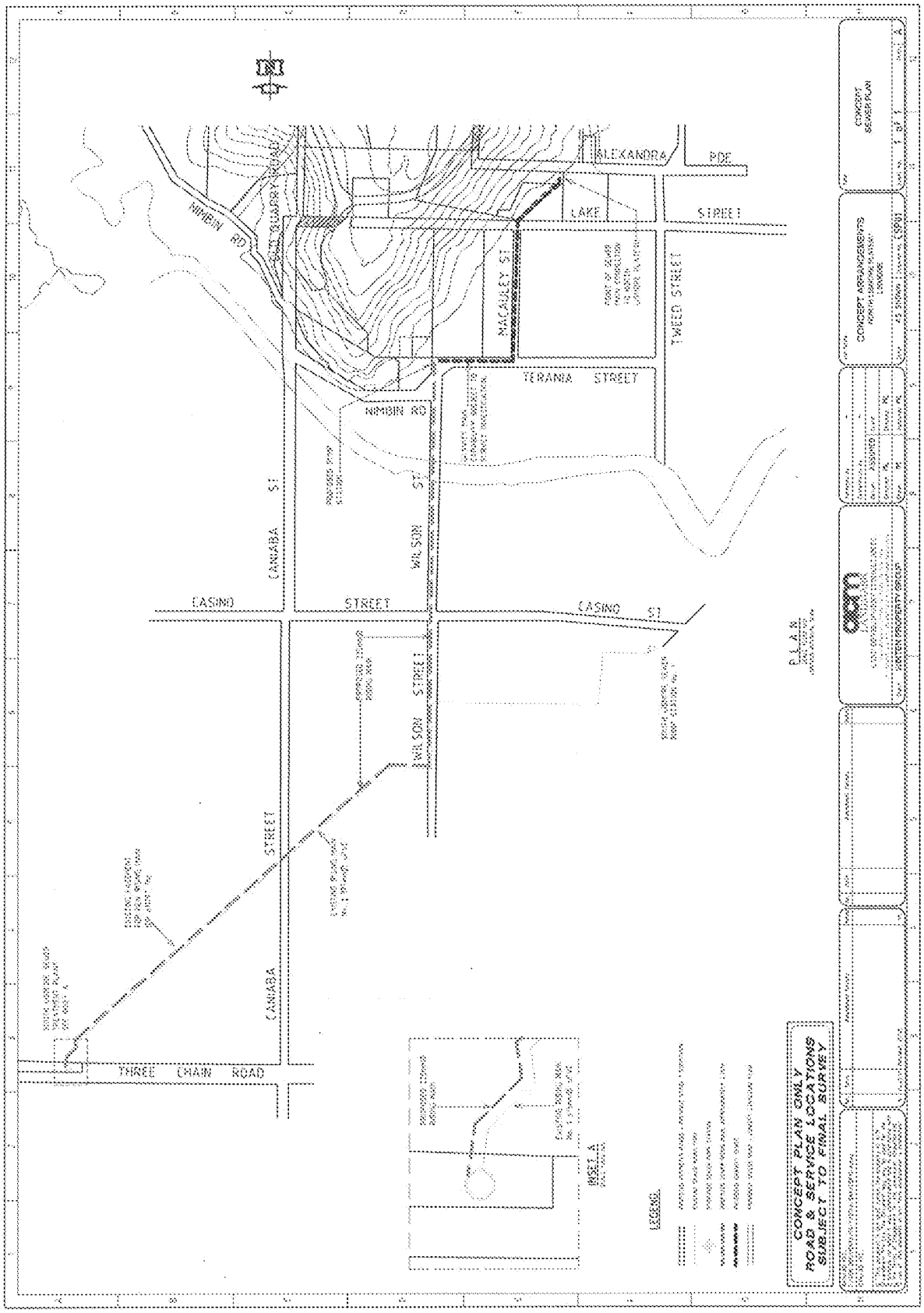
NORTH LISMORE PLATEAU STUDY AREA

FNCRS Boundary by Department of Planning

Proposed North Lismore Plateau Study Area (Approximately 285 Ha)

MGA

0 100 200 300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CANIABA ST
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CASINO ST
WILSON STREET
CANIABA STREET
THREE CHAIN ROAD
CONCEPT PLAN ONLY
ROAD & SERVICE LOCATIONS
SUBJECT TO FINAL SURVEY
LEGEND

ACM LANDMARK PTY LTD

BRIEF ASSESSMENT OF SOUTH LISMORE SEWER TREATMENT WORKS CAPACITY

REPORT FOR WINTEN PROPERTY GROUP
PROJECT 744 LISMORE

August 2010

BRIEF ASSESSMENT OF SOUTH LISMORE SEWER TREATMENT WORKS CAPACITY

CONTENTS

NORTH LISMORE PLATEAU DEVELOPMENT
WATER INVESTIGATION REPORT

1. INTRODUCTION

This assessment has utilized available data to consider the possibility of spare capacity within the South Lismore Sewer Treatment Works to accept staged development from the North Lismore Plateau.

The existing data included:-

- South Lismore Treatment Works Augmentation - Concept Design Report CMPS&F Pty Ltd July 1995.
- Flow data from the South Lismore Treatment works for 2007, 2008 and 2009.

Both the report and flow data documentation was kindly provided by Lismore City Council.

The report was a concise concept design for the upgrading South Lismore Sewer Treatment Works in 1995.

The report considered the existing conditions and proposed upgrading of the Sewerage Treatment Works (STW) to a projected ultimate loading of approximately 22,000 Equivalent Persons (EP). This comprised approximately 8800 Residential EP and approximately 13,200 Industrial/Commercial EP.

Flow Data provided by Lismore City Council from the South Lismore Treatment Works which incorporated spread sheets for 'Flows' through the inlet works for the years 2007, 2008 and 2009 were assessed. The flow sheets incorporated inflow and bypass flows in megalitres/year and can be seen as Appendix A within this report.

These recent inflows were assessed against the 1995 upgrade parameters to determine if available capacity existed within the treatment works to accept additional development flows.

2. SUMMARY

The coarse assessment of the data simply reviews the previous design parameters for the South Lismore Treatment Works upgrade against current inflow data from the plant in order to assess the likely capacity, if any, for the treatment works to accept additional development flows.

Based upon the available data the treatment works appears to have capacity of approximately 1900 EP or approximately 475 ET when compared to the design upgrade data.

This assessment however does not include 2010 inflow data from the treatment works which was unavailable at the time.

Organic loads treated within the treatment works are well below design parameters and also below Agreed Licensing Limits.

Whilst there may be some limitations to the available inflow there appears to be significant capacity within organic load limits to cater for additional increase in flow treatment within the treatment works.

There is also considered to be capacity within the South Lismore Sewer Treatment works site to cater for further upgrading beyond 1800 EP or 450 lots.

Capacity of pump stations and rising/gravity mains conveying flows to the treatment works has not been assessed.

3. BACKGROUND

The 1995 augmentation design report determined that South Lismore Sewage Treatment Works had a nominal 18,000 EP capacity and a theoretical loading of 21,000 EP prior to the upgrading. The upgrade budget of approximately $3 million included augmentation to treat increased loads and to meet environmental objectives. The catchment of the South Lismore STW includes the Central Business District (CBD) of Lismore, South Lismore and North Lismore including the North Lismore Plateau.

Upgrading was proposed to a nominal 22,000 EP made up of 8,800 EP residential and approximately 13,200 EP industrial

Residential 1 ET = 3 EP
Industrial/Commercial 1 ET = 4 EP

Actual Average Dry Weather Flow was determined at 228L/EP/day using 1988 flow data from the report.

The standard Public Works (PW) design flow allowance of 240L/EP was adopted within the upgrade documentation. Therefore it can be seen that the design parameters actually exceeded flows through the treatment works prior to augmentation.

The projected organic loads for the treatment works were:-

Table 1. Projected Organic Loading in kg/day

	2010	Ultimate
BOD	1512	1533
NFR	1512	1533
TOTAL P	52	53
TKN	259	263

The report concluded that as the 2010 and ultimate organic loads are similar the STW augmentation was assumed to provide capacity for the ultimate requirements.

Various components within the existing facility were found to be of sufficient capacity for the proposed upgrade these were:-

> Sludge stabilization (digestion), lagoon storage, sludge drying capacities (which has a total theoretical rating of 27,000 EP).

From the data provided by Lismore City Council comprising load based flows for the years 2007, 2008 and 2009 the following is shown:-

Table 2. Load Based Data 2007, 2008 & 2009

2007	Total Annual Inflow	1,432.70	ML/year
	Bypass Flow (wet weather)	.01	ML/year
	Total	1,432.71	ML/year
2008	Total Annual Inflow	1,760.14	ML/year
	Bypass Flow (wet weather)	8.36	ML/year
	Total	1,768.50	ML/year
2009	Total Annual Inflow	1,596.80	ML/year
	Bypass Flow (wet weather)	1,521.71	ML/year
	Total	3,118.51	ML/year

Bypass wet weather flows for 2009 show high flood flow bypass into the system, particularly in the months of April and June.

In considering the annual inflow rates only from 2007, 2008 and 2009 to corresponding EP the following is revealed.

2007 - 1,433 ML/day or approximately 16,360 EP
2008 - 1,760 ML/day or approximately 20,091 EP
2009 - 1,597 ML/day or approximately 18,230 EP

On this basis the South Lismore Treatment Works having been upgraded in 1998 to 22,000 EP shows that there could be a theoretical capacity of approximately 1,900 EP or approximately 475 ET (dwellings). However in using average bypass flows this reduces to 1,800 EP or 450 ET.

It should be noted that 2010 figures were not available at the time of this report and that if the abnormal bypass inflows of 2009 were considered then the treatment plant could be at capacity.

When assessing the projected organic loading within the design report against the organic loading within the three (3) year Sewer Treatment Works data the following is shown:-

Table 3. Organic Loading

Design Load	Year 2007	Year 2008	Year 2009	Agreed Licensing load
BOD 1533kg/d	8.25	9.01	6.11	57.53
Total P 53kg/d	2.6	3.44	4.27	6.65
TKN 263kg/d	18.6	18.36	21.26	57.53

The organic loads from the Sewer Treatment Works are well within capacity and licensing limits. Therefore whilst the South Lismore Sewer Treatment Works may have a more limited capacity of 1,800 EP in terms of inflow it would appear that greater operational capacity maybe available before organic load targets are reached.

4. CONCLUSION

Given the brief assessment of the available information from the treatment works including inflow and bypass flows and the review of the organic loads against upgrading design and licensing limits the South Lismore Sewer Treatment Works appears to have capacity to accept additional development of approximately 1,800 EP (450 lots).

It is also concluded that there is capacity for future upgrading of the Sewer Treatment Works beyond the 450 lots to service the North Lismore Plateau.

It is recommended that a more detailed investigation be undertaken of the Sewer Treatment Works including contributing pump stations, rising/gravity mains to fully determine the actual available capacity of the Sewer Treatment Works to accept proposed development from the North Lismore Plateau and consider the available 2010 inflow data to more accurately determine available capacity.

APPENDIX A
FLOW SHEETS

2007

Date	flow	TSS	Wt TSS	BOD	Wt BOD	TOG	Wt TOG	T.P.	Wt TP	T.N.	Wt TN
6-Dec	1.506	1	1505.9	1.2	1807.1	2	3011.9	0.35	527.1	3.34	5029.8
13-Dec	2.254	0.5	1127.0	1.5	3380.9	0.5	1127.0	0.26	586.0	1.09	2456.8
20-Dec	3.672	1.5	5508.0	1.8	6609.6	1.3	4773.6	0.57	2093.0	5.15	18910.8
27-Dec	3.044	0.7	2130.8	0.9	2739.6	4.7	14306.8	0.38	1156.7	3.49	10623.6
3-Jan	4.655	1.5	6982.5	1.1	5120.5	3.6	16758.0	0.55	2560.3	3.9	18154.5
10-Jan	4.142	1.5	6213.0	1.6	6627.2	0.5	2071.0	0.69	2858.0	3.69	15284.0
17-Jan	3.428	3	10284.0	1	3428.0	3	10284.0	0.53	1816.8	1.86	6378.1
24-Jan	3.067	0.5	1533.5	1.8	5520.6	0.7	2146.9	1.05	3220.4	2.75	8434.3
31-Jan	3.212	2.5	8028.8	2.4	7707.8	2.8	8992.2	0.51	1637.0	2.14	6872.8
7-Feb	-0.012	2	-24.0	0.9	-10.8	0.5	-6.0	0.76	-9.1	1.83	-22.0
14-Feb	6.810	5.5	37455.0	6	40860.0	2.6	17706.0	2.17	14777.7	2.44	16616.4
21-Feb	3.589	5	17945.0	3.2	11484.8	0.7	2512.3	1.55	5563.0	2.82	8403.2
28-Feb	0.133	52	6916.0	4	532.0	0.6	79.8	0.42	55.9	1.49	198.2
7-Mar	1.149	12	13788.0	4.8	5285.4	0.5	574.5	0.69	792.8	3.73	4285.8
14-Mar	2.173	1	2173.0	2.2	4780.6	0.5	1086.5	0.821	1784.0	1.6	3476.8
21-Mar	3.305	17.5	57837.5	3.9	12889.5	1.2	3966.0	0.53	1751.7	1.97	6510.8
28-Mar	0.420	6.5	2730.0	1.8	756.0	0.5	210.0	0.32	134.4	1.83	768.6
4-Apr	3.233	10	32330.0	2.5	8082.5	1.9	6142.7	0.29	937.6	4.97	16068.0
11-Apr	2.287	1.5	3430.5	0.5	1143.5	0.5	1143.5	0.22	503.1	1.09	2492.8
18-Apr	1.802	3.5	6307.0	1	1802.0	6.8	12253.6	0.19	342.4	1.51	2721.0
25-Apr	0.070	0.5	35.0	3.5	245.0	0.5	35.0	0.31	21.7	0.88	61.6
2-May	-0.312	4	-1248.0	0.5	-156.0	2.6	-811.2	0.38	-118.6	0.9	-280.8
9-May	2.964	2.5	7410.0	0.5	1482.0	0.6	1778.4	0.48	1422.7	0.82	2430.5
16-May	3.144	3.5	11004.0	0.5	1572.0	0.5	1572.0	0.31	974.6	3.16	9935.0
23-May	0.218	0.5	109.0	0.5	109.0	1.3	283.4	0.18	39.2	1.39	303.0
30-May	0.729	12	8748.0	0.5	364.5	0.5	364.5	0.35	255.2	2.65	1931.9
6-Jun	2.302	11	25322.0	9.7	22329.4	0.5	1151.0	0.91	2094.8	5.85	13466.7
[illegible]3-Jun	2.934	2	5868.0	0.6	1760.4	0.5	1467.0	0.34	997.6	6.87	20156.6
[illegible]0-Jun	2.915	2.5	7287.5	0.5	1457.5	0.5	1457.5	0.24	699.6	6.87	20026.1
27-Jun	8.299	3.5	29046.5	3.7	30706.3	0.6	4979.4	0.86	7137.1	9.64	80002.4
4-Jul	2.989	4	11956.0	3.2	9564.8	0.5	1494.5	0.66	1972.7	10.84	32400.8
11-Jul	2.699	6	16194.0	5.4	14574.6	0.5	1349.5	0.91	2456.1	11.86	32010.1
18-Jul	2.781	19	52839.0	10.8	30034.8	0.5	1390.5	1.21	3365.0	13.05	36292.1
25-Jul	2.777	4	11108.0	3.5	9719.5	0.8	2221.6	0.77	2138.3	9.41	26131.6
1-Aug	24.152	8	193216.0	2.1	50719.2	5.1	123175.2	0.658	18133.5	5.339	128947.5
8-Aug	0.088	0.5	44.0	0.7	61.6	1	88.0	0.558	49.1	2.884	253.8
15-Aug	0.498	3.5	1743.0	1.4	697.2	0.9	448.2	0.59	293.8	1.22	607.6
22-Aug	19.155	2	38310.0	1.8	30848.0	4.5	86197.5	0.72	13791.6	12.09	231584.0
29-Aug	3.883	6	23298.0	1.7	6601.1	5.7	22133.1	0.56	2174.5	5.56	21589.5
5-Sep	4.468	8	35744.0	3.2	14297.6	1.3	5808.4	0.93	4155.2	7.01	31320.7
12-Sep	5.416	2	10832.0	1.6	8665.6	3.7	20039.2	0.52	2816.3	3.81	20635.0
19-Sep	6.258	2.5	15645.0	1.1	6883.8	0.5	3129.0	0.74	4630.9	4.89	30601.6
26-Sep	3.258	0.5	1629.0	3	9774.0	0.5	1629.0	0.56	1824.5	5.23	17039.3
3-Oct	3.328	3.5	11648.0	1.7	5657.6	0.5	1664.0	0.44	1464.3	3.43	11415.0
10-Oct	7.868	2	15736.0	5.7	44847.6	2.3	18096.4	1.24	9756.3	6.01	47286.7
17-Oct	3.288	2.5	8220.0	0.5	1644.0	0.5	1644.0	0.61	2005.7	2.38	7825.4
24-Oct	3.100	3	9300.0	0.5	1550.0	0.5	1550.0	0.48	1488.0	2.65	8215.0
31-Oct	5.233	10	52330.0	1.7	8896.1	1.1	5756.3	1.12	5861.0	5.44	28467.5
7-Nov	4.172	1.5	6258.0	1	4172.0	1.6	6675.2	1	4172.0	3.41	14226.5
14-Nov	7.462	0.5	3731.0	0.5	3731.0	1.2	8954.4	0.458	3417.8	0.713	5320.4
21-Nov	3.587	1.5	5380.5	1.5	5380.5	1.5	5380.5	0.371	1330.8	0.788	2826.6
28-Nov	3.760	0.5	1880.0	1.5	5640.0	0.5	1880.0	1	3760.0	1.68	6316.8

[illegible]l	197.3513567	Ml	844624.96	grams	464177.32	grams	442121.7333	grams	145670.8103	grams	1044008.327	grams
[illegible]load/Ml.			4280.02	g/Ml.	2352.03	g/Ml.	2240.28	g/Ml.	738.13	g/Ml.	5290.10	g/Ml.
Inflow	1432.70	Ml/yr										
Reuse	151.81	Ml/yr										
Bypass	0.01	Ml/yr										
Outflow	1281.10	Ml/yr										

LOAD BASED LICENCE CALCULATIONS

			TSS		BOD		TOG		TP		TN	
Annual Fl.	1281.10	Ml										
Annual Load	(AL)		5,484	Kg	3,013	Kg	2,070	Kg	946	Kg	6,777	Kg
Agreed Load	(AL)		37,738	Kg	21000	Kg	12579	Kg	2,430	Kg	21000	Kg
Fee rate factor			15		10		2		0.3		10	
Fee Rate	(FRT)		19236.48		12810.97		2762.18		384.33		12810.87	Kg
AL - FRT	(check)		-13732.31		9792.70		307.82		561.20		8033.64	
2xAL - FRT	(AL1)		n/a		n/a		3,177.83		1506.50		n/a	
Assessable Load			5,484		3,013		2,870		1,507		6,777	Kg
CE			0.29066		0.00308		0.32185		2.496		0.08453	
			TSS		BOD		TOG		TP		TN	
Pollutant Fee			$1,573.13		$11.09		$780.50		$3,765.75		$572.87	
									TOTAL		$6,792.33	

2008

Date	flow	TSS	Wt TSS	BOD	Wt BOD	TOG	Wt TOG	T.P.	Wt TP	T.N.	Wt TN
5-Dec	3.963	18.5	73315.5	1.2	4755.6	2	7926.0	0.78	3091.1	0.95	3764.9
12-Dec	4.431	2	8862.0	1.4	6203.4	1.1	4874.1	1.01	4475.3	1.19	5272.9
19-Dec	3.410	0.5	1705.0	0.6	2046.0	1	3410.0	0.65	2216.5	0.86	2932.6
26-Dec	2.450	0.5	1225.0	4.2	10290.0	2.5	6125.0	0.952	2332.4	3.31	8109.5
2-Jan	16.793	4.5	75568.5	2.4	40303.2	0.5	8396.5	0.83	13938.2	3.13	52562.1
9-Jan	14.712	1.5	22068.0	4.3	63261.6	2.3	33837.6	0.872	12828.9	1.479	21759.0
16-Jan	5.430	0.5	2715.0	3	16290.0	1.4	7602.0	1.4	7602.0	2.81	15258.3
23-Jan	3.717	1	3717.0	1.6	5947.2	0.5	1858.5	1.3	4832.1	3.16	11745.7
30-Jan	2.898	0.5	1449.0	0.9	2608.2	0.5	1449.0	1.194	3460.2	1.488	4312.2
6-Feb	14.654	5	73270.0	2	29308.0	1.9	27842.6	1.01	14800.5	2.25	32971.5
13-Feb	8.109	0.5	4054.5	1.9	15407.1	0.5	4054.5	1.19	9649.7	2.25	18245.3
20-Feb	10.151	0.5	5075.5	0.9	9135.9	3.4	34513.4	0.68	6893.7	1.66	16850.7
27-Feb	5.033	1	5033.0	1.6	8052.8	5.7	28688.1	0.93	4680.7	1.23	6180.6
5-Mar	4.020	0.5	2010.0	0.5	2010.0	5.7	22914.0	0.51	2050.2	0.56	2251.2
12-Mar	3.630	0.5	1815.0	0.5	1815.0	3.4	12342.0	0.53	1923.9	0.57	2069.1
19-Mar	3.564	3	10692.0	0.7	2494.8	0.5	1782.0	0.83	2958.1	0.73	2601.7
26-Mar	9.377	6	56262.0	1.2	11252.4	0.5	4688.5	1.07	10033.4	1.302	12208.9
2-Apr	3.560	0.5	1780.0	2	7120.0	2.6	9256.0	1.02	3631.2	1.01	3595.6
9-Apr	15.340	1.5	23010.0	1.8	27612.0	2.6	39884.0	0.47	7209.8	9.62	147570.8
16-Apr	4.518	0.5	2259.0	0.5	2259.0	0.1	451.8	0.88	3975.8	1.4	6325.2
23-Apr	4.974	0.5	2487.0	0.5	2487.0	6.8	33823.2	0.46	2288.0	1.42	7063.1
30-Apr	3.651	0.5	1825.5	0.5	1825.5	3	10953.0	0.3	1095.3	2.34	8543.3
7-May	3.453	0.5	1726.5	0.5	1726.5	3.6	12430.8	0.29	1001.4	3.93	13570.3
14-May	3.352	0.5	1676.0	0.5	1676.0	2	6704.0	0.31	1044.2	3.06	10257.1
21-May	3.919	0.5	1959.5	0.5	1959.5	2.4	9405.6	1.62	6348.8	7.44	29157.4
28-May	7.580	0.5	3790.0	1.6	12128.0	2.7	20466.0	0.55	4169.0	3.121	23657.2
4-Jun	5.625	0.5	2812.5	1.6	9000.0	3.2	18000.0	0.54	3037.5	5.19	29193.8
11-Jun	4.248	0.5	2124.0	0.5	2124.0	1.7	7221.6	0.52	2209.0	2.52	10705.0
18-Jun	3.912	0.5	1956.0	0.5	1956.0	3.9	15256.8	0.49	1916.9	3.44	13457.3
25-Jun	3.441	2	6882.0	3.5	12043.5	2.8	9634.8	0.41	1410.8	5.33	18340.5
2-Jul	3.356	0.5	1678.0	0.5	1678.0	2.7	9061.2	0.32	1073.9	5.14	17249.8
9-Jul	3.404	0.5	1702.0	1.6	5446.4	0.5	1702.0	0.42	1429.7	6.67	22704.7
16-Jul	3.340	0.5	1670.0	2.8	9352.0	0.5	1670.0	0.42	1402.8	6.51	21743.4
23-Jul	5.576	0.5	2788.0	3.4	18958.4	5.3	29552.8	0.45	2509.2	8.03	44775.3
30-Jul	5.576	0.5	2788.0	1.1	6133.6	4	22304.0	0.3	1672.8	6.1	34013.6
6-Aug	5.591	2.5	13977.5	2.7	15095.7	2.6	14536.6	0.33	1845.0	7.49	41876.6
13-Aug	3.289	5	16445.0	3.9	12827.1	0.5	1644.5	0.37	1216.9	12.61	41474.3
20-Aug	3.334	3.5	11669.0	2	6668.0	0.7	2333.8	0.42	1400.3	9.79	32639.9
27-Aug	4.763	2	9526.0	1.2	5715.6	2.8	13336.4	0.99	4715.4	8.73	41581.0
3-Sep	5.556	1	5556.0	5	27780.0	1.1	6111.6	0.82	4555.9	4.07	27813.3
10-Sep	3.532	1	3532.0	4	14128.0	2.6	9183.2	1.05	3708.6	6.3	22251.6
17-Sep	3.208	0.5	1604.0	4.5	14436.0	3.2	10265.6	0.8	2566.4	2.95	9463.6
24-Sep	3.531	0.5	1765.5	1.8	6355.8	2.6	9180.6	0.613	2164.5	3.52	12429.1
1-Oct	3.110	0.5	1555.0	0.2	622.0	0.5	1555.0	0.37	1150.7	1.12	3483.2
8-Oct	3.059	0.5	1529.5	1.4	4282.6	2.2	6729.8	0.56	1713.0	1.6	4894.4
15-Oct	4.921	0.5	2460.5	8	39368.0	3.5	17223.5	0.72	3543.1	2.81	13828.0
22-Oct	4.026	0.5	2013.0	0.9	3623.4	7.4	29792.4	0.56	2254.6	1.03	4146.8
29-Oct	3.159	4	12636.0	0.5	1579.5	2.9	9161.1	0.23	726.6	0.965	3048.4
5-Nov	3.500	2	7000.0	0.5	1750.0	6	21000.0	0.45	1575.0	1.83	6405.0
12-Nov	4.380	2	8760.0	0.5	2190.0	3.5	15330.0	0.36	1576.8	1.34	5869.2
19-Nov	14.306	2	28612.0	1.5	21459.0	3.9	55793.4	0.62	8869.7	8.12	116164.7
26-Nov	4.301	0.5	2150.5	0.5	2150.5	3	12903.0	0.39	1677.4	1.08	4645.1

[illegible]al	282.733	Ml	544842.5	grams	526855.8	grams	708181.5	grams	201158.899	grams	1072843.581	grams
[illegible]ks.			1636.60	g/ML	1863.44	g/ML	2497.83	g/ML	711.48	g/ML	3784.35	g/ML
Inflow	1780.14	Ml/yr										
Reuse	5.59	Ml/yr										
Bypass	8.36	Ml/yr										
Outflow	1782.91	Ml/yr										

LOAD BASED LICENCE CALCULATIONS

			TSS		BOD		TOG		TP		TN	
Annual Fl.	1786.82	Ml										
Annual Load	(AL)		3,403	Kg	3,292	Kg	4,413	Kg	1,297	Kg	6,704	Kg
Agreed Load	(AL)		37,736	Kg	21000	Kg	12579	Kg	2,430	Kg	21000	Kg
Fee rate factor			15		10		2		[illegible]		10	
Fee Rate	(FRT)		[illegible]		17590.18		3523.84		520.89		17590.18	Kg
AL - FRT	(check)		[illegible]		14375.82		879.22		727.01		10882.61	
2xAL - FRT	(AL1)		n/a		n/a		5,302.07		1984.07		n/a	
Assessable Load			3,403		3,292		4,413		1,297		6,704	Kg
CF			[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	
			TSS		BOD		TOG		TP		TN	
Pollutant Fee			[illegible]		$12.12		[illegible]		[illegible]		[illegible]	
									TOTAL		[illegible]	

2009

Date	flow	TSS	Wt TSS	BOD	Wt BOD	TOG	Wt TOG	T.P.	Wt TP	T.N.	Wt TN
3-Dec	3.430	0.5	1715.0	0.7	2401.0	5	17150.0	0.42	1440.6	1.14	3910.2
10-Dec	2.925	0.5	1462.5	0.5	1462.5	2.8	8190.0	0.47	1374.8	1.14	3334.5
17-Dec	3.522	3.5	12327.0	0.7	2465.4	3.5	12327.0	0.5	1761.0	1.64	5776.1
23-Dec	3.231	1	3231.0	0.8	2584.8	3.6	11631.6	0.97	3134.1	1.06	3424.9
31-Dec	3.491	0.5	1745.5	0.5	1745.5	2.8	9774.8	0.556	1941.0	0.748	2611.3
7-Jan	3.272	0.5	1636.0	0.5	1636.0	2	6544.0	0.42	1374.2	0.66	2159.5
14-Jan	3.260	1.5	4890.0	0.5	1630.0	2.1	6846.0	0.33	1075.8	0.58	1890.8
21-Jan	3.067	0.5	1533.5	0.5	1533.5	0.8	2453.6	0.23	705.4	0.63	1932.2
28-Jan	3.185	0.5	1592.5	1.2	3822.0	0.5	1592.5	0.56	1783.6	1.94	6178.9
4-Feb	5.276	0.5	2638.0	0.5	2638.0	2	10552.0	0.46	2427.0	1.22	6436.7
11-Feb	3.305	0.5	1652.5	0.5	1652.5	4.5	14872.5	0.55	1817.8	0.812	2683.7
18-Feb	2.723	0.5	1361.5	1.5	4084.5	10.1	27502.3	0.52	1416.0	4.2	11436.6
25-Feb	3.898	1.5	5847.0	1.3	5067.4	0.5	1949.0	0.848	3305.5	0.682	2658.4
4-Mar	3.695	0.5	1847.5	1.5	5542.5	0.5	1847.5	0.82	3029.9	0.73	2697.4
11-Mar	3.573	0.5	1786.5	1	3573.0	0.5	1786.5	0.71	2536.8	1.02	3644.5
18-Mar	4.013	0.5	2006.5	0.5	2006.5	2.3	9229.9	0.42	1685.5	0.62	2488.1
25-Mar	3.590	0.5	1795.0	0.5	1795.0	2.4	8616.0	0.46	1651.4	0.65	2333.5
1-Apr	7.211	1.5	10816.5	0.5	3605.5	2.3	16585.3	0.61	4398.7	3.11	22426.2
8-Apr	7.163	0.5	3581.5	1.2	8595.6	4.8	34382.4	1.18	8452.3	2.22	15901.9
15-Apr	10.893	0.5	5446.5	0.5	5446.5	1.1	11982.3	0.83	9041.2	2.65	28866.5
22-Apr	6.700	0.5	3350.0	0.5	3350.0	1.5	10050.0	0.69	4623.0	2.14	14338.0
29-Apr	4.043	0.5	2021.5	0.5	2021.5	0.5	2021.5	0.63	2547.1	0.68	2749.2
6-May	3.747	0.5	1873.5	0.5	1873.5	0.5	1873.5	0.59	2210.7	0.7	2622.9
13-May	3.604	0.5	1802.0	0.5	1802.0	1.4	5045.6	0.33	1189.3	2.23	8036.9
20-May	4.467	0.5	2233.5	0.7	3126.9	9	40203.0	0.38	1697.5	4.92	21977.6
27-May	8.944	0.5	4472.0	0.5	4472.0	0.5	4472.0	0.45	4024.8	2.55	22807.2
3-Jun	5.347	0.5	2673.5	1.2	6416.4	1.2	6416.4	0.4	2138.8	2.3	12298.1
0-Jun	4.150	0.5	2075.0	0.5	2075.0	7.9	32785.0	0.25	1037.5	2.62	10873.0
7-Jun	3.883	0.5	1941.5	0.5	1941.5	0.5	1941.5	0.21	815.4	6.06	23531.0
24-Jun	17.913	0.5	8956.5	1.2	21495.6	0.5	8956.5	0.27	4836.5	4.13	73980.7
1-Jul	4.539	0.5	2269.5	0.5	2269.5	0.5	2269.5	0.19	862.4	2.76	12527.6
8-Jul	4.188	0.5	2094.0	0.5	2094.0	4.7	19683.6	0.29	1214.5	4.82	20186.2
15-Jul	4.461	0.5	2245.5	0.5	2245.5	2.3	10329.3	0.28	1257.5	3.46	15538.9
22-Jul	3.940	0.5	1970.0	0.6	2364.0	0.5	1970.0	0.24	945.6	4.98	19621.2
29-Jul	3.695	2	7390.0	0.5	1847.5	0.5	1847.5	0.27	997.7	5.91	21837.5
5-Aug	3.499	1	3499.0	0.5	1749.5	2.8	9797.2	0.35	1224.7	5.38	18824.6
12-Aug	3.580	0.5	1790.0	2.1	7518.0	0.5	1790.0	0.41	1467.8	6.81	24379.8
19-Aug	3.340	0.5	1670.0	0.6	2004.0	1.6	5344.0	0.35	1169.0	4.72	15764.8
26-Aug	3.274	0.5	1637.0	0.5	1637.0	0.6	1964.4	0.43	1407.8	2.11	6908.1
2-Sep	3.336	0.5	1668.0	0.5	1668.0	15.8	52708.8	0.37	1234.3	3.05	10174.8
9-Sep	3.432	0.5	1716.0	0.5	1716.0	0.5	1716.0	0.34	1166.9	4.34	14894.9
16-Sep	3.290	0.5	1645.0	0.5	1645.0	1.9	6251.0	0.34	1118.6	3.01	9902.9
23-Sep	3.226	0.5	1613.0	0.5	1613.0	0.5	1613.0	0.61	1967.9	1.41	4548.7
30-Sep	3.157	4	12628.0	0.5	1578.5	0.5	1578.5	0.39	1231.2	0.87	2746.6
7-Oct	2.805	0.5	1402.5	0.5	1402.5	2.2	6171.0	0.71	1991.6	0.93	2608.7
14-Oct	3.128	1	3128.0	0.5	1564.0	0.5	1564.0	0.61	1908.1	1	3128.0
21-Oct	2.465	16	39440.0	1.4	3451.0	1.4	3451.0	0.63	1553.0	1.28	3155.2
28-Oct	5.072	0.5	2536.0	0.5	2536.0	0.6	3043.2	0.8	4057.6	1.9	9636.8
4-Nov	3.157	0.5	1578.5	0.5	1578.5	0.5	1578.5	0.65	2052.1	0.766	2418.3
11-Nov	3.949	0.5	1974.5	0.5	1974.5	2	7898.0	0.65	2566.9	0.79	3119.7
18-Nov	3.310	0.5	1655.0	1.1	3641.0	0.5	1655.0	0.36	1191.6	2.466	8162.5
25-Nov	3.501	0.5	1750.5	0.6	2100.6	2.4	8402.4	0.35	1225.4	2	7002.0

[illegible]l	225.805	Ml	197611	grams	162059.7	grams	482206.1	grams	113284.98	grams	563093.856	grams
[illegible]/ML			874.79	g/ML	717.41	g/ML	2134.65	g/ML	501.49	g/ML	2492.72	g/ML
Inflow	1598.80	Ml/yr										
Reuse	5.64	Ml/yr										
Bypass	1521.71	Ml/yr										
Outflow	3112.87	Ml/yr										

LOAD BASED LICENCE CALCULATIONS

			TSS		BOD		TOG		TP		TN	
Annual FL	3112.87	Ml										
Annual Load	(AL)		2,723	Kg	2,233	Kg	6,646	Kg	1,561	Kg	7,760	Kg
Agreed Load	(AL)		37,738	Kg	21060	Kg	12579	Kg	2,430	Kg	21000	Kg
Fee rate factor			18		18		2		0.3		18	
Fee Rate	(FRT)		18563.02		31138.50		3226.74		533.80		3112.88	Kg
AL - FRT	(check)		-15869.91		-28826.47		418.14		627.23		-23339.18	
2xAL - FRT	(AL1)		n/a		n/a		7,064.01		2188.31		n/a	
Assessable Load			2723		2,233		7,064		2,188		7,760	Kg
CF			0.30118		0.00389		0.28671		2.82848		1.0183	
			TSS		BOD		TOG		TP		TN	
Pollutant Fee			3820.05		59.03		52,618.76		35,745.39		3839.05	
									TOTAL		39,281.38	

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REVIEW OF SOUTH LISMORE SEWER TREATMENT WORKS CAPACITY

Introduction

RPS has been engaged by Winten Property Group to review a report prepared by ACM Landmark assessing available capacity in the South Lismore Sewer Treatment Works. The assessment is based on data supplied by Lismore City Council including :-

- South Lismore Treatment Works Augmentation – Concept Design Report CMPS&F Pty Ltd 1995
- Flow data from the South Lismore Treatment Works for 2007, 2008, 2009.

The nominal capacity of South Lismore Treatment Works is 22,000 EP.

Review

The ACM Landmark assessment of available capacity at 1,900 EP is considered to be conservative. This available capacity has been determined using the total annual inflow for 2008 which was equivalent to 20,091 EP. The annual inflow not only includes discharge from connected properties but wet weather flows.

The inlet works have been designed to process flows of approximately 171 l/s (2.8 x ADWF), flows greater than this are directed to the wet weather bypass.

Review of average flows from August 2009 to November 2009, where no bypass flows were recorded, indicate average flows of 3,240 kl/day (37.5 l/s) this equates to 13,500 EP based on 240 l/person/day.

Review of average flows from August 2008 to October 2008, where no bypass flows were recorded, indicate average flows of 3,730 kl/day (43.2 l/s) this equates to 15,540 EP based on 240 l/person/day.

Review of average flows from January 2007 to November 2007, where no bypass flows were recorded, indicate average flows of 3,924 kl/day (45.4 l/s) this equates to 16,350 EP based on 240 l/person/day.

Using an average of the above loading figures (15,130 EP) indicates there could be 6,870 EP capacity available in the Treatment Works.

However in the area of wastewater treatment it is considered that a conservative approach should be adopted.

RPS

Conclusions

The conclusions drawn by the assessment completed by ACM Landmark are considered to be consistent with the data provided.

The South Lismore Sewer Treatment Works appears to have hydraulic and organic capacity to process flows from at least an additional 1,800 EP. This available capacity could be as high as 6,870 EP.

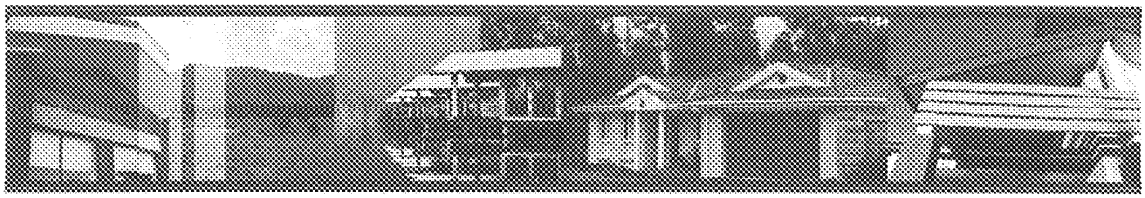
Information in the Concept Design Report indicates some existing components of the South Lismore Sewer Treatment Works have a theoretical rating of approximately 27,000 EP. Therefore it is not unreasonable to assume that the Treatment Works could be readily upgraded from its existing capacity of 22,000 EP to 27,000 EP.

Ian Murphy
Principal/ Water & Sewer Strategist

Sewer Availability

North Lismore Plateau

acm LANDMARK
LAND DEVELOPMENT CONSULTANTS



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CONTENTS

1 INTRODUCTION

ACM landmark were engaged to undertake a brief assessment of the provision of sewer to the North Lismore plateau. The assessment was requested to determine a sewer servicing methodology including transfer from the site of sewage to the South Lismore Sewer Treatment Plant (SLSTP). The assessment was also required to determine available capacity within the South Lismore Sewer Treatment Plant.

The information was required to be provided for the planning charrette in December 2010 with Lismore City Council.

2 SITE

The land is known as the North Lismore Plateau, a site approximately four (4) kilometers to the south west of the Central Business District of Lismore. The land comprises elevated plateau slopes rising to approximately 126m AHD and is located to the south of Dunoon Road and north of Nimbin Road. The area of the plateau is approximately 285ha and is expected to provide for approximately 1200 to 1600 residential lots. A plan of the study area can be seen as Appendix A.

3 PROPOSAL

It is proposed to zone the land from its current investigation zone of 1(b) to a residential RU2 zone. The residential development of the land would require the provision of services such as sewer.

Various possibilities to service the land with sewer have been considered including package treatment plants, standard gravity system etc. The most practical and feasible of these is the provision of a standard gravity system throughout the site comprising gravity mains, local pump stations where necessary and associated rising mains connecting to the South Lismore Sewer Treatment Plant.

4 BACKGROUND

The 1994 study titled 'The Dunoon Road Planning Study' undertaken by Northern Rivers Engineers, Planners and Scientists in 1994 for Lismore City Council described the most feasible method to service the plateau with sewer. The current proposal mirrors that contained within the 1994 report in terms of connection of the plateau to the South Lismore Sewer Treatment Plant. Costs for the provision of external gravity sewer mains, pump station and rising mains were originally prepared by Cardno in 2003. Those costs have been merely indexed as follows:-

$$\text{2003 price} \times \frac{30^{th}\ \text{September 2010 quarter (173.3)}}{30^{th}\ \text{December 2002 quarter (139.5)}} = 1.242$$

The sewerage costs are made up of the following:-

- New additional treatment facilities at the existing South Lismore Treatment Works.
- A new major pump station at the intersection of Terania Street and Wilson Street North Lismore.
- Rising main from the major pump station to the South Lismore Treatment Works (SLSTW).

The following sewer treatment costs were prepared by Cardno in 2003 and indexed to 2010 costs.

Gravity Main		
250mm Including Manholes Approx. 600m		$210,000.00
Land Matters		$30,000.00
		$240,000.00
SID 16%		$38,400.00
Contingencies 20% (on $210,000.00)		$42,000.00
TOTAL	Say	**$320,400.00**
Pump Station (60 L/S)		
Pump Station		$329,130.00
Land Matters		$62,323.00
Power Supply		$46,742.00
		$438,195.00
SID 16%		$70,111.00
Contingencies 20%		$87,639.00
TOTAL	Say	**$596,000.00**
Rising Main (2600m)		
2600m x 225mm @ $149/m		$447,120.00
Rail Crossing		$46,700.00
River Crossing		$62,300.00
Easement Widening allowance		$31,700
		$587,820.00
SID 16%		$94,052.00
Contingencies 20%		$117,564.00
TOTAL		**$799,436.00**
TOTAL SEWER CONNECTION SYSTEM		***$1,715,840.00***

This approximate $1,100.00 to $1,500.00 per lot for 1,200 to 1,600 lots.

The costs represent external sewer connection costs. Additional cost per lot for internal sewer will be applicable and combine normal development servicing costs.

5 ASSESSMENT

The attached plan shown as Appendix B gives a pictorial representation of a proposed connection route from the plateau to the South Lismore Sewer Treatment Plant. The transfer route comprises public road access, existing bridge access of Leycester Creek and existing easements through intervening land to the South Lismore Sewer Treatment Plant.

A proposed pump station has been located at the intersection of Wilson Street and Terania Street. A gravity main of approximate size and length of 250mm and 600m respectively will convey sewage from the plateau to the new pump station. The pump station will convey sewage thence to the South Lismore Sewer Treatment Plan via a new rising main running parallel within Wilston Street and thence to the existing ring main within the existing easement to the STP.

The approximate cost of the external scheme components has been assessed at $1,100.00 to $1,500.00 per lot.

The external components comprising gravity main, sewer pump station and ring main to the SLSTP will be provided and funded by the developers of the plateau generally to service the first stage of the residential development.

Internal gravity reticulation would also be provided by the developers within the subdivision of each stage of the residential development.

6 SOUTH LISMORE SEWER TREATMENT PLANT CAPACITY

A brief assessment of the capacity of the South Lismore Sewer Treatment Plant was undertaken in August 2010. That report considered the previous upgrading of the Sewer Treatment Plant within the 1995 major upgrade of the Sewer Treatment Plant. The upgrading in 1995 and its associated capacity were considered against current sewage inflows from 2007, 2008 and 2009. The assessment concluded that there was a possible capacity within the Sewer Treatment Plant for 600 ET (equivalent tenements). The full report can be seen as Appendix C.

A further review of the 2010 report was undertaken independently by RPS (Newcastle) in order to test the voracity of the initial assessment by ACM Landmark Pty Ltd. This report can be seen as Appendix D.

The RPS report found that the ACM report was somewhat conservative and that the actual capacity within the South Lismore Sewer Treatment Plant was up to 2000 ET. This of course would be subject to design and consideration of the actual design flows and the bypass peak wet weather flows. However the report clearly confirms the ability of the plateau to accommodate from 600 ET to 2000 ET within the existing capacity of the South Lismore Sewer Treatment Plant. There is also sufficient capacity

within the 600 ET to 2000 ET to accommodate existing catchment growth/development within North Lismore and the Lismore CBD.

It is understood that Lismore Council is in the process of briefing a consultant to undertake a review of the upgrading requirements for the South Lismore Sewer Treatment Works. That upgrade has been necessitated as a result of the current standard of the treatment works rather than specifically a capacity investigation.

7 CONCLUSION

The North Lismore Plateau area proposed for rezoning has the capability to be serviced by sewer in a manner of forms. Lismore City Council however favours the provision of a standard or regular system of gravity sewer service to the land and transfer to the South Lismore Sewer Treatment Plant.

The connection of the plateau to the South Lismore Sewer Treatment Plant comprise gravity mains, pump station and rising mains. There have been conceptually sized and costed to give an understanding as to the overall development costs.

The South Lismore Sewer Treatment Plant has been determined within the two assessment reports to have sufficient capacity within its current operation to cater for 600 ET to 2000 ET, subject to design.

It can be seen therefore that the rezoning of the North Lismore plateau would not be limited by the provision of sewer to enable future development.

Some upgrading of the South Lismore Sewer Treatment Plant will be required to provide plant improvement and possibly the latter stages of the plateau development. The proposed investigations of any necessary upgrading are currently being proposed by council.

That upgrading will however be to improve plant efficiency rather than upgrade to provide plant capacity for the North Lismore Plateau. Clearly therefore the provision of sewer to the North Lismore Plateau is not an impediment to the rezoning or urban development of the land.

APPENDIX A

Study Area

APPENDIX B

Concept Sewer Plan