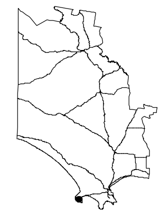
CAPE BRIDGEWATER
TOWN REPORT

March 2009



INTRODUCTORY COMMENTS

Cape Bridgewater is a very small town 19 km (20 minutes) west of Portland. There is no reticulated water, sewerage or gas. There are a number of bores that are used to supplement drinking water requirements. Other than a kiosk, there are no shops or services. No census statistics are available for Cape Bridgewater. Perusal of air photos (Map 1) reveals that there are 42 dwellings and 25 undeveloped parcels. This seems to be traditionally a holiday destination but tending to more permanent occupation, and the presence of a life saving club would suggest this is a popular destination over the summer months.

The landscape at Cape Bridgewater is one of steep dune slopes. There are no watercourses in close proximity. The soils in the area (dune sand, dune limestone soils and volcanic ash) are not mapped individually because for domestic wastewater purposes all the soils are AS/NZS category 1.

Cape Bridgewater is in a Rural Conservation (schedule 1) planning zone. The township has two distinct subdivision patterns. The Panoramic drive environ is characterised by blocks exceeding 2000m^2 while in the remainder of the town parcel the typical parcel size is around 600m^2. There are only few places where residential development has spread over multiple titles.

Cape Bridgewater is a holiday destination with a mix of housing stock. Many homes will be using all-waste systems with trench technologies for effluent disposal. A serious wastewater impact relates to groundwater. Category 1 soils are so permeable and soil percolation rates so rapid that while they are undoubtedly effectively disposing of septic effluent (unless trench systems are supported by a dosing pump and uniform effluent distribution little effluent treatment would be occurring in the soil). Therefore the bulk of microbial and chemical contaminants may well reach the groundwater table and pollute the groundwater. Hence the most likely wastewater impact relates to groundwater, and only in extreme circumstances would offsite effects such as overland flow of effluent into adjoining public and private spaces be important. For this reason Council needs to pay close attention to the onsite effluent disposal technologies being used in Cape Bridgewater.

It is our belief that no further trench systems should be permitted in Cape Bridgewater. Efforts should be made to ensure trench systems in the Panoramic Drive area are using dosing pumps. Blocks in the foreshore road / Flinders Street area are too small to sustainably deal with wastewater onsite and should be sewered.

WASTEWATER MAPPING

Maps 3 thru 10 apply the AS/NZS and Code Of Practice in various ways to Cape Bridgewater.

Development density series

Map 3 thru map 5 represent the current capacity for local areas to deal with wastewater onsite, and the likelihood that if fully developed they could deal with wastewaters onsite using trench and irrigation systems.

- Using trench systems a three bedroom home would require at least 1122 m^2 to adequately deal with its wastewater on AS/NZS category 1 soils (ie. 450m^2 of impervious surfaces plus 336m^2 disposal area plus 336m^2 reserve area - see table 6 in the report introduction). No new trench systems should be allowed in Cape Bridgewater. We have modelled this theme only for the purpose of understanding the sustainability of existing onsite systems.
- Using irrigation systems a three bedroom home would require at least 635 m^2 to adequately deal with its wastewater on AS/NZS category 1 soils (ie. 450m^2 of impervious surfaces plus 185m^2 disposal area - see table 3.1).

Map 3 assumes that trench systems are used throughout Cape Bridgewater and so represents the present of sustainability of onsite systems in areas. Assuming dosing pumps are in use, only the foreshore road / Flinders Street area is unlikely to be dealing with onsite wastewater to an acceptable standard.

Map 4 represents the sustainability of areas if all parcels were to be developed using trench systems. Three areas along the foreshore change status to red, meaning that on average they would be unable to deal with wastewater if fully developed with three bedroom homes.

Map 5 represents the sustainability of onsite systems in Cape Bridgewater if all parcels were to be developed and all developments were to make use of irrigation technology. Only one area along the foreshore area remains a problem.

Constraints

Map 6 shows slope and stream buffer constraints in relation to properties and parcels. The Code of Practice (EPA 2008) prohibits the consideration of land for wastewater absorption fields if within 6 metres upslope or 3 metres downslope of an adjacent allotment. Buffer distances from adjoining allotments are reduced by up to 50% if irrigation systems are used. Allotments are buffered by 3m for input into the trench system models (red) and 1.5m for input into the irrigation system models (pink) on the basis of our recommendation that all wastewater systems should be pressurised. Also, the Land Capability Assessment for Onsite Domestic Wastewater document (EPA 2003) suggests that slopes exceeding 20% are constrained. We show slopes as three classes (0-17% is unconstrained, 18-22% requires inspection and >22% is constrained).

Trench performance series

The trench system series (Map 7 and Map 8) gives some indication how existing systems might be performing in terms of surface runoff potential and does not account for impacts on groundwater, which will be greater where dosing pumps are not in use.

Map 7 shows that there are a significant number of properties with limited development potential, particularly in the foreshore road / Flinders Street area. Most of these are already developed, and many are clustered suggesting that there are probably already wastewater problems in this area of the town. Such clusters represent areas where point sources are most concentrated, and by inference are the areas of most pressing concern.

Map 8 shows that many parcels in the foreshore road / Flinders Street area have limited development potential if trench technology is used. Severe problems could emerge if all parcels were to be developed and trench systems were to be used.

Irrigation performance series

The irrigation system series (map 9 and map 10) shows that only a small number of blocks constrained when trench systems are used, are not constrained when irrigation technologies are used. This situation arises because many blocks are too small for onsite wastewater systems.

Map 9 represent the present ability of the local soils to deal with wastewater onsite should all existing development be upgraded to irrigation systems. There are some improvements when compared to trench systems (Map 7), however the foreshore road / Flinders Street area remains a problem.

Map 10 represents the overall effect of using irrigation technology should all parcels be developed in the future. There are a number of additional blocks that would be unable to deal with wastewaters onsite when compared to map 9. Once again these are in the foreshore road / Flinders Street area.

RECOMMENDATIONS AND CONCLUSIONS FOR IMPROVING SUSTAINABILITY

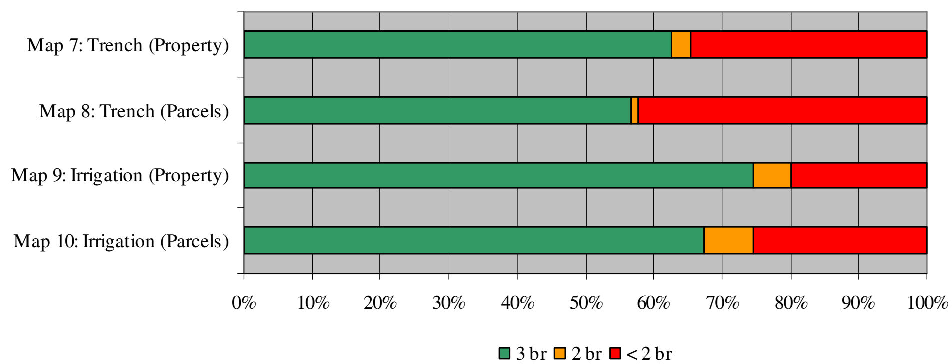


Chart 1: This chart illustrates the information shown in Maps 7 thru 10. It gives an impression of the impact that changes in technology and planning approaches make on the sustainability outcomes for development in the towns. The red area represents a number of blocks in the foreshore area that in each of the four scenarios are consistently modelled as being unsustainable for onsite systems. Council should investigate CED sewerage options for this cluster.

Failing or inappropriate onsite wastewater systems create concerns for human health and the health of the environment. For this reason we are concerned about two areas in Cape Bridgewater.

- The foreshore road / Flinders Street area: The onsite wastewater performance series (map 7 thru map 10) consistently shows that blocks in this area are unable to sustainably treat wastewaters onsite. The area is also represented by the persistent red shading in Chart 1.
- The foreshore parcel that probably represents the life saving club.

The use of onsite wastewater systems in these two areas is unsustainable. This is particularly concerning considering the peak usage pattern that would occur over the summer holiday period. Ideally, these two areas should have access to centralized sewage.

All the maps relating to trench systems have been produced based on the assumption that the systems are properly maintained and are accompanied by dosing pumps. The reality is that these technologies and maintenance regimes are unlikely to be in place for all developments. Category 1 soils are so permeable that the most likely wastewater impact relates to groundwater, and only in extreme circumstances would offsite effects such as overland flow of effluent into adjoining public and private spaces be important.

In the absence of reticulated sewerage, the maps suggest that for many blocks the situation would improve if irrigation systems were to be adopted (Map 5, Map 9 and Map 10). In fact, due to the high quality wastewater produced by Aerated Wastewater Treatment Systems, in the absence of reticulated sewerage the sustainability of all sites would be improved if upgraded to irrigation systems. For some sites where trench systems are being replaced, it may be necessary to re-use existing trenches for AWTS treated water, or to install irrigation lines within existing trench areas.

Recommendation: The maps indicate that wastewater issues should be approached differently in different areas of Cape Bridgewater. We suggest three approaches to dealing with this. Our most preferred is Approach 1 and our least preferred is Approach 3.

- **Approach 1:**
  - The Flinders Street / foreshore area should be sewered. A Common Effluent Drainage system would be the most practical.
  - Ensure trench systems in the Panoramic Drive area are using dosing pumps.
- **Approach 2:**
  - Upgrade all trench systems to be irrigation systems in the Flinders Street / foreshore area. Initial focus should be on those developed properties shaded red in map 7.
  - Ensure trench systems in the Panoramic Drive area are using dosing pumps.
- **Approach 3:** Adopt a policy that would:
  - Lead to the long term upgrading of trench systems in the Flinders Street / foreshore area to irrigation systems. Permit approval might be the trigger for this. Priorities should be blocks:
    - Using onsite systems that would not currently be approved (eg. soakage pits, blackwater only systems).
    - Mapped as being unable to sustain a three bedroom house.
  - Ensure trench systems in the Panoramic Drive area are using dosing pumps.
  - Manage remaining problems.

Notes on Approaches

Problems to manage

- Audit of existing systems in areas shaded red in map 7.
  - Document onsite technology being used
  - Initial desludging of all tanks
  - Establish system to monitor future desludging
- Begin a community awareness campaign to encourage:
  - The use of water saving devices and practices. The motivation for this is wastewater reduction rather than reduced water consumption.
  - The maintenance and care of septic tanks.
  - Effective operation of trenches through the installation of dosing pumps.
- Full Land Capability Assessment to be undertaken for development proposals that deviate from the wastewater technologies discussed in this document, or are shown to be unsustainable in Map 9 or Map 10.
- Ensure the regular maintenance of AWTS in accordance with certificate of approval.
- Where bores exist, the water could become contaminated from wastewater and health problems result.
  - Observe setback distances between disposal fields and bores that are set out in the Code Of Practice.
  - Discourage use of bore water for potable supply.
  - Promote secondary treatment and disinfection

Notes on upgrading existing septic tank systems

- Irrigation technology is the preferred option and implies the installation of AWTS. Wastewater should be treated to a 20/30 standard.
- A professionally designed and constructed sand filter would be an acceptable alternative technology.
- A dosing pump provides intermittent loading and uniform distribution of effluent. It is a relatively inexpensive option that would give immediate benefit to most blocks. It will not make a trench system more sustainable, but rather will ensure that it is performing the best it possibly can. A dosing pump might be connected to existing trenches or extended trenches.
- Aerated Wastewater Treatment System (AWTS) in combination with extended trenches and a dosing pump would be another option.

REFERENCES

Australian / New Zealand Standard, On-site domestic-wastewater management – AS/NZS 1547:2000, 2000

EPA, Guidelines for Environmental Management – Septic Tanks Code of Practice, Publication 891.2, December 2008

EPA, Land Capability Assessment for Onsite Domestic Wastewater, Publication 746.1, March 2003

ACKNOWLEDGEMENT

Extensive use has been made of an earlier wastewater report produced by Mr Larry White.

Table 2: Climatic Regime (mm) – Meteorological Stations: Portland for rainfall, Mount Gambier for evaporation.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Mean Rainfall	35.4	33.3	42.8	65.1	88.3	100.1	108.3	107.6	85.4	69.9	52.7	44.7	835.2
Mean Pan Evap'n	213.0	189.3	148.1	88.2	53.1	36.1	41.7	68.2	90.0	134.5	168.0	225.1	1347.3
Crop Factor	0.70	0.70	0.70	0.60	0.50	0.45	0.40	0.45	0.55	0.65	0.70	0.70	
Mean Pot'l Evapotrans'n	149.1	132.5	103.7	52.9	26.6	16.3	16.7	30.7	49.5	87.4	117.6	157.6	940.5
Water Deficit	113.7	99.2	60.9	-	-	-	-	-	-	17.5	64.9	112.9	469.1
Water Excess	-	-	-	12.2	61.8	83.9	91.6	76.9	35.9	-	-	-	362.2
90-Percentile Rainfall	69.8	69.7	82.8	109.1	141.8	153	167	164.6	124.8	111.3	92.2	80.4	997.7

The 90-Percentile annual rainfall[1] is the higher than normal yearly rainfall that on average occurs only once in ten years, and it is made up by some parts of the year having sufficiently higher than average rainfall. It is based on a long historical period of rainfall measurements. This index is used in EPA publications on irrigation of large scale industrial and municipal wastewater and also for grey water re-use schemes. In Cape Bridgewater the 90-percentile high rainfall is about 19% higher than the mean annual rainfall.

During an average rainfall and evaporation year, there will be six months that have more rainfall than will be transpired by a grassed surface. The excess rainfall in these months is about 340 mm. The excess rainfall water will infiltrate into the soil and some of it will be stored in the soil profile, becoming available for use during the six drier summer months when the total deficit amounts to approximately 470 mm. However, sandy soils have a low water holding capacity and very high permeability and therefore much of the excess in winter will be lost to plants by percolating beyond the root zone. The potential for irrigated vegetation to use up water and hence take up nutrients is significant only in the period from October to March. Irrigated effluent will likewise partially be taken up by plants with the remainder impacting on the groundwater.

The ground water in the Cape Bridgewater area is potable and a valuable resource and hence must be protected. Effluent contact time with the biologically active upper soil layers should be maximised to increase its purification by the soil. For Cape Bridgewater this means that the best final treatment of the effluent can be achieved by irrigation as this enables a better distribution of water and nutrients over the full application area. Tables 3.1 and 3.2 are based on the irrigation rate given in AS/NZS 1547:2000, which is 5 L/m^2.day for secondary quality effluent and highly permeable sandy soils. Where space is available, the loading rate should be reduced and a larger area irrigated to achieve a better outcome.

[1] The 90-Percentile annual rainfall is very much less than the sum of the 90-Percentile monthly rainfalls because the chance of having twelve months in succession each with the 90-Percentile high rainfall is vanishingly small. The chance of any one month having a 1 in 10 month high rainfall is 1:10 or 0.1 per definition. This is true for each month in the year. The chance that in one year two months will each have a 1 in 10 high rainfall therefore is 1:100, or 0.01 or 1 in 10^2. Thus for all twelve months in the year to have a 1 in 10 high rainfall is 1 in 10^{12} or 1 in a trillion years.

Table 3.1 Management for vacant allotments

Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
1	**Dune Sand & Dune Limestone Soils (Qpb)** Deep calcareous sands with common secondary dune limestone throughout Very steep and irregular topography	> 3 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 3 m + 2 m envelope	Not appropriate due to excessive permeability	n/a
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 850 mm AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Not appropriate due to excessive permeability	n/a
			Mounds AS/NZS 1547:2000	Not appropriate due to excessive permeability	n/a
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only 2 m envelope	Irrig'n area DIR = 5 L/m^2.day but preferably less	Disinfection desirable to protect groundwater 1 br: 230 L/day – 120 m^2 2 br: 345 L/day – 153 m^2 3 br: 460 L/day – 185 m^2 4 br: 575 L/day – 217 m^2
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		MAV Spreadsheet; Parameters: Crop N Uptake 150 kg/ha; Crop P Uptake 40 kg/ha; P sorption 400 mg/kg soil; Bulk Density 1.5 c/cm^3; Depth of soil allowing for rock 2.0 m

Comments – Soil and other terrain features:

Dune Sand & Dune Limestone Soils (Qpb) - loose, single grain well-sorted highly permeable dune sands, mostly strongly calcareous, with low water holding capacity, prone to wind erosion if vegetative cover is removed.

Mapped as Nelson Land System in the Glenelg Hopkins Catchment Regional Soil Health Action Plan.

Table 3.2 Management for existing premises					
Soil Category	Soil, Geology & Topography	Indicative permeability (Ksat)	Waste water management system	Design Loading rate	Area required for waste water management system
1	Dune Sand & Dune Limestone Soils (Qpb) Deep calcareous sands with common secondary dune limestone throughout Very steep and irregular topography	> 3 m/day	Absorption trenches & beds Standard 0.5 m wide; unit length 10 m; spacing 2 m + 2 m envelope	5 mm/day, 35 mm/week	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances, disinfection desirable to protect groundwater
			Evapo-Transpiration Absorption – Seepage Trenches & Beds EPA CA 01.2/3 for annual rainfall 850 mm -------------------- AS/NZS 1547:2000 Annual rainfall is not a factor for sizing in AS/NZS.	Loading Rate as per EPA CA 01.2/3. ------------------ Calculate Water Balance as per AS/NZS Appendix 4.2D for each month and full year.	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			Mounds AS/NZS 1547:2000	5 L/m^2.day	Upgrade by installing an AWTS, and extend trenches to maximum possible, install pressurised dose loading and install water saving appliances
			Irrigation Systems AS/NZS 1547:2000 Secondary treated effluent only	Irrig'n area DIR = 5 L/m^2.day or less	Extend irrigation area where possible and reduce loading rate; install water saving appliances, disinfection desirable to protect groundwater
			Irrigation Systems MAV Model for Sensitive Sites Secondary treated effluent only		

Comments – Soil and other terrain features:

Dune Sand & Dune Limestone Soils (Qpb) - loose, single grain well-sorted highly permeable dune sands, mostly strongly calcareous, with low water holding capacity, prone to wind erosion if vegetative cover is removed.

Mapped as Nelson Land System in the Glenelg Hopkins Catchment Regional Soil Health Action Plan.

Map 1: Air photo of Cape Bridgewater overlayed with 5m contours. Soils are uniform Qpb geology and AS/NZS category 1 across the town.

NO MAP 2 - The entire town is in a Rural Conservation zone (RCZ1).

Map 3: Present sustainability of trench systems in areas within Cape Bridgewater. [2] **The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump, and does not consider the constraints shown in Map 6 or potential impacts on groundwater. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, and an allowance of 450m^2 for impervious surfaces. Only areas with dwellings are shaded.** [3]

Map 4: Potential sustainability of trench systems in areas within a fully developed Cape Bridgewater. The map incorporates a reserve field and assumes that each parcel has a dwelling and that each of those dwellings uses an all-waste system and a dosing pump. It does not consider the constraints shown in Map 6. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, and an allowance of 450m^2 for impervious surfaces. Under this scenario, the Flinders Street / foreshore area would produce wastewater in excess of what could be treated onsite.

[2] Areas representative of a wastewater field-of-influence (eg adjoining titles not separated by a road reserve and on the same soil type) form the basis of maps 3 thru 5.

[3] Dots on all maps represent dwelling locations. These were digitized from air photography and have not been field validated.

Map 5: Potential sustainability of irrigation systems in areas within a fully developed Cape Bridgewater. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 3 and an allowance of 450m^2 for impervious surfaces. If all parcels in Cape Bridgewater were to be developed, and all existing and new developments were to use irrigation systems, in the absence of the constraints shown in Map 6, onsite wastewater systems would be sustainable in all areas except one along the foreshore.

Map 6: Slope constraints in Cape Bridgewater in relation to properties and parcels. The Code prohibits the consideration of land for wastewater absorption fields if it has steep slopes, or is within 3 metres of an adjacent allotment for pressurised trench systems (red buffer), or 1.5 metres of an adjacent allotment for irrigation systems (pink buffer). Here slopes are shown in three classes – 0-18% as being unconstrained, 19-21% as requiring inspection and >21% and as being constrained. Dots represent dwelling locations. A 60m buffer from the foreshore was not mapped because it would not have adversely impacted any developments.

Map 7: Present sustainability for properties using trench systems. The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. Many properties along the foreshore are too small to accommodate a trench system and a reserve field, and clusters of developed properties with limited development potential suggest that there are probably already wastewater problems in the town. Dots represent dwelling locations. [4]

Map 8: Potential sustainability for parcels using trench systems on AS/NZS category 1 soils. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 6 of the report introduction, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. The map incorporates a reserve field and assumes that each dwelling would use an all-waste system and a dosing pump. This is map of onsite system sustainability should each parcel be developed and indicates that severe problems might emerge in the foreshore area if Cape Bridgewater was to be fully developed using traditional trench technologies. Dots represent dwelling locations.

[4] In maps 7 thru 10, a block's sustainability reflects the likely size of its wastewater disposal envelope, and is expressed as Maximum Number of Bedrooms. The calculation takes into account the disposal area requirements for the AS/NZS soil category, a 450m^2 impervious surfaces allowance, and all of the constraints shown in map 6. Dots represent dwelling locations.

Map 9: Potential sustainability for properties using irrigation systems. It takes into account the absorption field recommendations for AS/NZS category 1 soils in table 3, an allowance of 450m^2 for impervious surfaces, and the constraints shown in map 6. If upgraded to irrigation systems, there are properties that would remain unable to deal with wastewaters onsite, and nearly all of these are already developed. Dots represent dwelling locations.

Map 10: Potential sustainability for parcels using irrigation systems. It takes into account the absorption field recommendations in for AS/NZS category 1 soils in table 3, an allowance of 450m^2 for impervious surfaces and constraints in map 6. Compared to map 9, there are a number of additional parcels that would be unable to deal with wastewaters onsite. Dots represent dwelling locations.