ASSESSMENT REPORT

SOUTH-WEST NARRANDERA SEWER SCOPING STUDY

May 2020

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Version Control Table:

Version	Date	Comments	Prepared	Reviewed	Authorised
1	21/5/2020	Draft for preliminary comment	Neil Smith	Noel Crichton	Neil Smith
2	23/5/2020	Final draft	Neil Smith	Noel Crichton	Neil Smith

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1. Executive Summary

Building & Environmental Services Today (BEST) was engaged by Narrandera Shire Council to explore the desirability and feasibility of extending sewerage to South West Narrandera.

Site soil tests found that the soils within the unsewered study area, are suitable for on-site sewage disposal.

A detailed assessment of the performance of approximately 10% of the existing on-site sewage management systems (OSSMS) revealed a generally poor degree of operation in terms of risk to public health &/or the environment.

A comparison of the approximate number of new allotments possible in the study area was carried out to determine the land yield whether sewered or not. Not surprisingly, a much larger number of potential allotments was found to be possible when the land is sewered.

Some parts of the study area, most notably that portion adjoining Irrigation Way and Dixonville Road, lend themselves to larger allotments. Unsewered larger lots, compared to unsewered smaller lots, present a lower risk to public health & the environment whilst providing the additional advantage of a wider degree of land size choices to potential purchasers.

This report recommends that:

1. Subject to positive outcomes from detailed investigations outlined in Phase 2 of the project, reticulated sewer be provided to service the study area, excluding flood prone locations and the Dixonville locality.
2. Dixonville locality:
    a. Remain unsewered;
    b. Be zoned for large lot residential development;
    c. Minimum lot size 4,000 square metres.
    d. Policy be developed to clarify requirements for OSSMS in the Narrandera local government area (LGA).

2. Acknowledgements

The assistance of Noel Crichton, Project Engineer and Helen Ryan, GIS Officer, is gratefully acknowledged. Their help with information and local knowledge has been invaluable in bringing this report to fruition.

It is pertinent to note that assistance was provided during the COVID 19 pandemic - a particularly difficult period when social distancing and working from home was the "norm".

In addition to working under the above interruptive conditions, Noel was happy to meet on a number of occasions, after hours, at his home (social distancing observed) to discuss aspects of the work. At the same time Helen's prompt and willing help could not have been more cheerfully delivered.

3. Limitations

This report is based on observations made at the time inspections were carried out, information provided by Council, soil testing and calculations by McMahon Earth Science and the writer's experience on the subject of on site sewage management.

Information provided to BEST by Council included:

- A field inspection of the study area with long time shire engineer, Noel Crichton. Noel's extensive local knowledge regarding physical features and installations is considered invaluable.
- Council's flood mapping data, flood risk study and plan.
- Property information for the study area in the form of an Excel spreadsheet.
- Mapping of the study area showing lot, section and DP details of allotments.
- Aerial mapping of the study area.
- Minimum lot size recommendations for unsewered land.
- Assistance with identifying location of ground water bores.

Information commissioned by and provided to BEST by McMahon Earth Science included:

- A land capability assessment and report (Attachment 1 and Attachment D) including soil sample data, groundwater bore location and depth information and calculations regarding the land area required to sustainably support on site disposal using Aerated Waste Treatment Systems (AWTSs).
- Separate calculations regarding the land area required to sustainably support on site disposal using traditional septic tank and absorption trench systems.

The site area and in particular the "subdividability" of allotments was assessed using aerial mapping from the NSW government SIXMaps web site. This information source should considered approximate because the aerial photographs showing the position of buildings on land were approximately 4 years old. In addition, the cadastre may not be exactly aligned. To off-set the out of date nature of the aerial photography to some extent, a record of allotments containing dwellings was made by physically driving every street and lane and marking them on a map, thereby ground truthing the SIXMaps data and updating it where necessary – for example where new homes had been constructed. Nevertheless, the subdividability estimations are approximate only.

Every effort has been made to ensure accuracy and completeness of this report however the client should also ensure that all matters relating to the subject are considered and, where necessary, investigated.

4. Relevant Experience & Technical Skills

This report was produced by Neil Smith. Inspections were carried out by Neil Smith with assistance from Bob Callow.

Neil Smith is an environmental health and building surveyor with over 40 years experience working in local government. His primary qualification is a Bachelor Applied Science (Environmental Health).

A list of the main on-site sewage management related projects that Neil has been responsible for is given below:

a. Coolamon Shire Council -Ardlethan township OSSMS assessment & report on need for sewerage extension 2006.
b. Oberon Shire Council – East Oberon rural residential area OSSMS assessment & report on need for sewerage extension 2018.
c. Federation Council – Public Education Programme and Inspection of OSSMS throughout unsewered villages, unsewered parts of Corowa, Howlong, Urana, Mulwala and properties adjoining the Murray River 2019/2020.
d. On Site Sewage Management Strategies produced for:
    - Parkes Shire Council
    - Deniliquin Council
    - Conargo Shire Council
    - Windouran Shire Council
    - Jerilderie Shire Council
    - Murrumbidgee Council
e. Environmental Health Officer Training, “OSSMS Field Inspection Techniques”:
    - Blayney 2007
    - Narromine 2007
    - Cootamundra 2009
    - Glenn Innes 2010
    - Tumut 2012
    - Penrith 2013
    - Orange 2013
    - Jerilderie 2018
    - Corowa 2019
f. Various papers and presentations on the subject of OSSMS field inspections including:
    - Environmental Health Australia (EHA) 2006 National Conference, Sydney – “Effluent of the Affluent”.
    - Riverina Group Conference regional presentation.

5. Background and Methodology

A Request for Simple Quotation (RSQ), was provided to BEST. The RSQ document comprised 3 phases and specified a number of key outcomes within each phase. At the end of each phase were hold points designated to discuss with Council's Project Manager, information gleaned, current thoughts and any steps to be taken prior to moving to the next phase.

BEST submitted a quotation to undertake phases 1 and 2 and was subsequently engaged to carry out these first 2 phases of the project. The second phase to be worked jointly in consultation with Council's Project Engineer.

Methodology

The RSQ set out the main data collection requirements. This data was then to be used as the basis for decision making with respect to options for all or some of the study area to be sewered. The RSQ requirements for the study area are summarised below:

Phase 1 (completed on 29/4/20)

a) Map existing property holdings.
b) Identify and map holdings connected to sewer and not connected to sewer.
c) Map properties affected by physical constraints which may affect OSSMS performance. Constraints such as flood prone land etc.
d) Conduct soil tests to determine suitability or otherwise of land to support OSSMS and map areas not suitable.
e) Inspect 10% of existing OSSMS to determine operational efficiency and risk.

Phase 2

a) Investigate options for connecting holdings with existing OSSMS and vacant holdings to Council's sewerage system including possible additional holdings that may be created by subdivision or boundary adjustment.
b) Identify and map holdings not suitable for OSSMS or which need specific treatment conditions because of physical or other constraints.
c) Investigate options for communal treatment of wastewater.
d) Prepare preliminary construction and operational costs for all options for comparison.

Inspections & Site Visits

Three key inspection dates are worth mentioning:

- Thursday 20th February 2020 – Prior to submitting a quotation, the writer in the company of Bob Callow from BEST and Council's Project Engineer, Noel Crichton, inspected the study area. The local knowledge of Mr Crichton is underscored here and is recognised as invaluable in assisting to understand the project and local conditions. Key features identified during the inspection included:
    - Council water supply bores & depths
    - Old brick pit locations
    - Low lying "problem" land

- Locality names eg Dixonville, Sandhills, Brewery Flat etc.

- Monday 23rd March 2020 – The writer in the company of Alex Rudd from McMahon Earth Science and Council's Project Engineer, Noel Crichton, carried out an inspection of the study area for the purpose of identifying representative and appropriate locations for soil samples to be taken. In addition, Mr Crichton introduced Mr Rudd to the locations of Council's town water supply bores for closer evaluation.

- Monday 23rd to Wednesday 25th March 2020 – The writer with assistance from Bob Callow, BEST Office Manager, carried out inspection of randomly selected, existing on-site sewage management systems.
It was determined that a statistically accurate picture of existing conditions would be gained by inspecting approximately 10% of the existing septic and AWTSs. The original estimate of the total number of systems in the study area was 120, meaning 12 systems would have been selected at random. Following closer inspection and physically driving the area, noting the location of every dwelling and commercial premises, it was found that there were 139 premises with on site disposal systems. As a consequence, 14 systems were inspected and assessed with regard to risk.

- Friday 27th March 2020 – McMahon Earth Science staff attended the study area and carried out soil testing as detailed in Attachment 1 and Attachment D. Sixteen sites were sampled to a depth of 500mm. Three sites adjoining council's water supply bores were sampled to a depth of 3 metres.

Discussions with Project Engineer

Discussions with Noel Crichton occurred over the course of developing this report. These discussions were via telephone, email and face to face over the period of information collection and collation.

Spreadsheet Data

Base property data for the study area was provided by council. This data, amongst other things, included property lot numbers, deposited plan numbers, street address and owner information.

To this base data, the following additional information was inserted in separate columns, the aim being to facilitate separation of data and calculation of potential land yield:

- Street name separated from street number
- Locality ie Dixonville, Sandhills, South West or North West.
- "Excluded" or "Included" from potential for sewer connection. To elaborate, the excluded land can generally be described as meeting one or more of the following criteria:
  - Land is prone to flooding; &/or
  - Land is public land not for development (eg electricity sub station, cemetery etc); &/or
  - Already connected to reticulated sewerage.
- "Vacant", "House" or "Commercial"

- ➢ Approximate existing land area
- ➢ Subdivision potential “Yes” or “No”. This based on whether existing buildings are located such that they preclude potential subdivision and also whether the land is too small already to permit future subdivision.
- ➢ Estimated number of new lots if subdivided to minimum 4,000 square metres (minimum size to support on-site sewage management systems).
- ➢ Estimated number of new lots if subdivided to minimum 1,000 square metres if sewered.
- ➢ Subdivision restriction. This notes whether or not there are any other perceived restrictions to development such as brick pits etc.
- ➢ Notes elaborating on any conditions and assumptions made with regard to each property.

The additional data, once inserted in the spreadsheet was then able to be used to estimate potential maximum yield of land should the land be sewered or not. In addition, the separate localities of Dixonville, Sandhills, South West Narrandera and North West Narrandera could be separated for the purpose of determining the approximate land yields in each area.

With the above comparative land yield information, potential maximum rate return could be estimated for sewered properties, giving Council some basis for income potential versus cost of sewerage installation.

Mapping

A pdf map of the study area was provided by Council. This map included lot, section and deposited plan numbers for each allotment.

The above map was used as the basis for a “Key Features Map” (Attachment 2 and Attachment A). The following information was added to the base map provided:

- ❖ Street names, bridge locations, rail lines, river and canal locations
- ❖ Public land unlikely to be developed eg cemetery, sewage treatment plant, electricity sub-station, old brick pits.
- ❖ Flood prone land (1 in 100)
- ❖ House locations
- ❖ Commercial premises locations
- ❖ Sewered properties
- ❖ Locations where on site sewage systems were inspected
- ❖ Soil sample sites
- ❖ Deep bore hole testing sites
- ❖ Known ground water bore locations

The map provides an “at a glance” view of the study area clearly giving the reader an overall view of the land which would be unlikely to be suitable for future development and also indicating the land remaining which might be sewered. The map also shows the density of current development, residential and commercial.

6. Results & Discussion

Performance of Existing OSSMS

There were found to be approximately 140 OSSMS within the study area. Approximately 10% of existing OSSMS within the study area were randomly selected and inspected to determine the level of performance, risk to the environment & public health. A risk assessment ranking of high, medium and low was allocated with the following results:

Risk Rating	Number of Systems
High	4
Medium	6
Low	4

A standardised checklist in combination with a Risk Matrix & scoring system was used for the purpose of assessing the performance of the existing OSSMS. The detailed checklists and risk assessments for each property assessed are provided at Attachment 3. In addition, photographs showing examples of problems discovered during the inspections are included at Attachment 4. A comprehensive collection of all photographs taken are included in Attachment C.

From the above data it can be seen that there is a high percentage of systems that are of concern. This is despite the fact that the soils in the study area are highly permeable and therefore accept effluent readily.

Problems encountered with the systems inspected included such things as:

- X Poorly maintained systems such as effluent being irrigated above ground but no disinfection tablets present in the Aerated Waste Treatment System.
- X Effluent being siphoned from septic tank onto the ground, bypassing any approved, below ground, absorption trench.
- X Septic tank lids broken or otherwise providing access for vectors of disease such as flies, mosquitoes and/or vermin.
- X Undersized land area available for sub soil disposal, especially in relation to dwelling size and/or potential dwelling population.
- X Inaccessible septic tanks for the purpose of maintenance.
- X Children's play equipment located in close proximity to effluent ponding on the ground.

It is the writer's experience that rarely do owners and residents understand the health risks associated with OSSMS. In a majority of cases, OSSMS fail in terms of risk to public health and the environment.

Of particular concern are the higher density areas where small allotments of approximately 1,000 square metres exist. The southern portion of North West Narrandera locality around Audley Street and Twynam Street for example

As a side note, regardless of the final decision regarding "to sewer or not to sewer", Council should take steps to assess all the existing OSSMS to ensure that they are operating in a safe manner without risk to public health.

Soil Testing

McMahon Earth Science carried out extensive soil testing across the study area. Sixteen (16) soil samples were taken and, amongst other things, permeability tests conducted. In addition to these shallow (500mm deep) test sites, three deeper holes were drilled in close proximity to Council's town water supply bores.

The above testing found that with the exception of flood prone areas and one site off the Irrigation Way, the soils within the study area were suitable for on site disposal of sewage. The report confirms that of the 16 soil samples taken, 13 were sandy loam, 2 were loam and1 was clay loam.

The 2 loam sites are located at:

- Brewery Flat (WP13) ;and
- The extreme southern end of Woolscour Road (WP5).

The clay loam site is located at the extreme north western end of the study area adjoining Irrigation Way (WP12). It should be noted that based on this specific soil classification, particular attention must be made to the design and installation of any future OSSMS in this locality

All other locations were found to be sandy loam and highly suitable for on site sewage disposal.

Groundwater Bores

The McMahon Earth Science report also mentions the existence of a number of groundwater bores however specific information on the exact location of these proved difficult to find. Page 29 of the report shows 3 bores in the Dixonville locality and two bores at the southern end of Townsend Street in the South West Narrandera locality however the map accuracy was poor. As a consequence, the writer contacted council's Helen Ryan who conducted further enquiries and local investigations to provide a more accurate level of information regarding ground water bore locations. These have been included on the Key Features Map at Attachment 2 & Attachment A.

The reason that ground water bore information is important is because sewage disposal areas must not be located near them. Australian Standard 1547:2012 – On-site domestic wastewater management specifies buffers distances between effluent disposal areas and ground water bores of between 15m and 50m depending on the soil type. In sandy situations such as those that exist in the study area, the larger buffer zones are desirable.

In relation to ground water bores, suffice to say that any future approvals for subdivision of land and the installation of on site sewage management systems must consider the proximity of any existing ground water bores and diligent enquiries made regarding their exact location.

Disposal Area Sizes

The McMahon Earth Science report carried out modelling on the soil samples to determine the land area required for the above ground disposal of irrigated effluent from an AWTS and an assuming a range of house sizes from average to large. Disposal areas ranged from a minimum of 164 square metres to a maximum of 299 square metres. The McMahon Earth Science report also makes it clear that separate soil testing should be undertaken in each individual case and that the above figures should only be used as an approximation.

For the purpose of the calculations made in this report, the writer has taken a conservative approach and assumed the larger disposal area would be required in every case. In summary, a figure 300 square metres for an effluent disposal area has been used for the purpose of calculations when an AWTS is to be installed.

The McMahon Earth Science report did not elaborate on absorption trench options. The writer emailed Alex Rudd at McMahon Earth Science and obtained subsequent advice regarding the range of absorption trench lengths that would be appropriate for the soils in the study area. The range provided by Mr. Rudd in his response to was for loams rather than sandy loams and ranged from 47 metres to 65 metres in length. From this information, it can be safely assumed that for large homes in the study area, using traditional septic tank systems, a trench length of 65 metres would be adequate.

It should be stated here however that the McMahon Earth Science report makes it clear that site specific, individual testing and assessment should be carried out for any new systems to ensure that the effluent disposal area is accurately and comprehensively assessed and determined.

Septic Tank Versus Aerated Waste Treatment System

Ultimately it is up to the owner or applicant to decide what system they wish to install. As long as it is a system that is accredited by the NSW Health Department and approved by council.

Despite the choice being, to some extent, the owner’s, it is also normal for the council’s environmental health officer or building surveyor to provide advice to the applicant regarding options regarding OSSMS. The comments below may have no significant bearing on the outcomes of this report however they are included for information should council wish to continue with on site disposal in part or all of the study area. Notwithstanding that there are other locations throughout the shire that will continue to need on site disposal advice.

A personal opinion: The writer has personally inspected and assessed the operation of over 1,000 existing OSSMS. The majority of these have been traditional septic tanks with absorption trenches and AWTSs, these being the most popular options, at least in country NSW. The writer quite openly prefers traditional septic tanks for the following reasons:

- ✓ Septic tanks require much less maintenance whereas in the majority of cases, AWTSs must be serviced by an accredited technician every 3 months.

- ✓ The cost of servicing and electricity to run pumps and air blowers for an ATWS can be prohibitive, and many owners do not realise the critical nature of the servicing. Consequently, in many cases servicing is not done.
- ✓ If not maintained, unbeknown to the owner:
  - Air blowers cease to work meaning limited or no aerobic treatment of the effluent.
  - Chlorine tablets are not replaced meaning effluent is not disinfected yet it is still being irrigated above ground presenting a significant health risk through either direct contact or through indirect contact with vectors of disease.
  - Sprinkler heads block up and cease to work resulting in ponding of effluent.
- ✓ Irrigation lines associated with AWTSs are easily tampered with by owners. This can result in the following:
  - Lines are relocated to areas of human activity eg children's play areas, lawn areas near outdoor entertaining spaces and so on.
  - Lines are (less often) moved to irrigate vegetable growing areas.
  - Approved large droplet sprinkler heads are replaced with fine misting systems that result in effluent blowing over people on breezy days.
  - Sprinklers are dispensed with altogether and the effluent is simply pumped out of sight "down the back" and quite often next to the neighbour's fence.

By contrast, a properly sized and constructed septic tank and absorption trench system is relatively maintenance free. Sludge removal from the septic tank is the only regular maintenance that generally should be needed, and this – depending on the population in the home – should only need occur every 5 to 10 years. There are no running costs such as electricity because most septic systems work using gravity.

Potential Land Yield On Site Disposal Versus Sewer Connected

As mentioned previously, a Properties Summary Spreadsheet (Attachment B) provided by council was updated with additional data including an approximation of the maximum number of new allotments that might be possible should owners choose to subdivide or carry out a boundary adjustment in the future.

It is worth mentioning that surprisingly, the study area has no specified minimum lot size under Council's Local Environmental Plan. As a result there are a considerable range of existing lot sizes from small blocks around 750 square metres facing Irrigation Way, to large tracts of land of many hectares. Whilst the smaller allotments mentioned may have been established many years ago, they represent a risk, or to put it another way, a potential "time bomb" should staff not be alert to the need for sufficient land area for proper and safe effluent disposal.

Two land areas were used to calculate the potential land yields in this report:

> Unsewered lots - The minimum land area was based on information provided by Council's Manager – Development & Environment, Garry Stoll. Mr. Stoll advises that historically council has required land to be a minimum 4,000 square metres to accept on site disposal of effluent.

Sewered lots - The minimum land area has been arrived at in consultation with Noel Crichton and in consideration of the traditional house block size and has been assumed as 1,000 square metres.

The results below are split based on locality so that Council can better see the potential should it be decided to sewer some but not all of the study area or to stage the sewer extension process over a number of years.

Locality	**Approx. number of additional 1,000 square metre allotments if sewered**	**Approx. number of additional 4,000 square metre allotments if not sewered**
Dixonville	542	125
North West Narrandera	63	6
Sandhills	16	1
South West Narrandera	30	0

Public Health & Environment Based Priorities

Priorities below were generally established based on a hierarchy where risk to life safety, public health and environment were assigned the highest priority. In simple terms, the smaller the allotments and the closer that dwellings are to each other and to the individual effluent disposal areas, the higher the risk. It follows therefore that higher density areas, where there are more houses per square unit of measure, the higher the risk.

Vectors of disease, particularly flying insects such as flies and mosquitoes for example, having ready access to breeding sites such as poorly sealed septic tanks and/or ponding effluent are a major cause for concern.

The reader should bear in mind that in some respects, the priorities below are like "splitting hairs" since flies and mosquitoes are known to travel quite some distance, particularly depending on wind conditions, so the risks to public health are not dramatically reduced in what is essentially an urban situation.

The priorities, based on density of development, are in order with number one being the highest:

1. North West Narrandera –This locality, particularly around Audley and Twynam Street area, has the highest density of development and the smallest allotments.
2. South West Narrandera – The second highest density of development exists in this locality, east of the disused rail line. Some properties have so many buildings on them that there is little remaining for an adequately sized effluent disposal area.
3. Sandhills – This locality is not so densely populated with buildings and generally houses are further apart.

4. Dixonville – This locality remains relatively undeveloped in comparison to those previously listed. As such it still has the opportunity to be ear marked for installation of properly controlled and regulated on-site sewage management systems.

Logistical Considerations

The reader must bear in mind that the comments below are based on a general overview of the "lay of the land" only at this stage of reporting. No specific levels have been taken nor detailed design carried out in making the observations here.

Whilst the above priorities might be seen as the sensible order in which works should be carried out, the logical order is sometimes different. When considering the physical installation of sewer pipework and the path that pipework must follow to achieve maximum advantage from gravity flow, we arrive at a different and more sensible order of works.

It is observed that generally the land in the northern part of the study area is at a level higher than the existing main pumping station approximately located at the southern end of Adams Street.

The logical course of action would be to first extend sewer mains from the North West locality to connect with the Adams Street pump station if it has capacity to accept the additional effluent. Whether or not additional pump stations are required to achieve this is yet to be determined.

Regarding the Sandhills and South West Narrandera localities, it would seem counter productive to only connect the higher priority South West sector in exclusion of Sandhills given their close proximity and the fact that any new pipe system would have to pass through Sandhills to reach the Sewage Treatment Plant.

7. Summary

Provide Reticulated Sewage to North West, South West and Sandhills

In conclusion, and in consideration of both the public health risks and the logistical factors, it is felt that further detailed investigations occur regarding providing reticulated sewage services to the North West, South West and Sandhills localities.

Dixonville Earmarked for On Site Disposal with Extra Controls

If Dixonville is to remain unsewered, there should be some controls put in place to regulate further development of the locality.

Presently Council's Local Environmental Plan 2013 does not specify any minimum lot size and the land is zoned RU5 Village. As a consequence, every application for development must be considered on merit running the risk that undersized allotments and inappropriate uses may "slip through".

Appropriate zonings and policies give clear guidelines and boundaries for not only developers but also for staff.

It has been mentioned previously that the estimates in this report for lot yield where on site effluent disposal is permitted have been based on 4,000 square metres. This figure was provided by council staff and is supported by the writer. Such a limit on lot size in the Dixonville locality in combination with a zoning more reflective of the larger lot character of the area is strongly recommended.

In addition, clearer policy should be developed regarding council's requirements for the installation of OSSMS. Such policy should be consistent across the local government area and not simply focus on Dixonville. The policy would specify, amongst other things, the minimum requirements for soil testing and effluent disposal area design. The minimum size for septic tanks and AWTSs etc. Such a policy would not need to be highly prescriptive but at least set the boundaries around minimum standards of testing and documentation required with new applications.

8. Recommendations

1. That further detailed investigations occur regarding providing reticulated sewage services to the North West, South West and Sandhills localities.
2. That the Dixonville locality be identified for large lot development and on site sewage disposal.
3. That appropriate actions be taken to control development of Dixonville. Without limiting the generality of the aforementioned sentence, appropriate actions may include:
    a. Re-zoning;
    b. Setting a minimum lot size of approximately 4,000 square metres; and
    c. Developing a policy which sets standards for on site sewage management systems in Narrandera local government area.

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ATTACHMENTS

Attachment 1 – McMahon Earth Science Land Capability Assessment Report.

Attachment 2 – Key Features Map

Attachment 3 – Existing OSSMS Inspection Checklists and Risk Matrix Sheets

Attachment 4 – Photographic Examples of Problems Observed

Electronic (soft copy) Attachments **(see attached USB stick)**

A. – Key Features Map
B. – Properties Summary Spreadsheet
C. – Photographic Examples of Problems Observed
D. – McMahon Earth Science Land Capability Assessment Report
E. - All Photographs Taken During Inspections