Environmental Assessment Report

For the Modification of NSW DoP Development Application No 220-07-2002-i for Cargill Beef Australia, Bomen

____

Eric Claus, BSc, MSc

Claus Environmental Engineering
113 Sporing Ave, Kings Langley NSW 2147
0414-496-894
eclaus@ozemail.com.au

May 2011

Submitted to:
Charles Hollingworth
Environment, Health and Safety Manager
Cargill Beef Australia
Dampier St Wagga Wagga NSW 2650
Phone: 02 6938 3219
Fax: 02 6931 7236
Mobile: 0447 508 618
Email: Charles_Hollingworth@cargill.com

Executive Summary

This Environmental Assessment has been prepared by Cargill Beef Australia (CBA) and Claus Environmental Engineering in response to the NSW Department of Planning Director-General's Requirements for the section 75W modification of DA No. 220-07-2002, for the proposed wastewater irrigation of the CFA Low area. CBA has also had consultation with OEH and Wagga Wagga City Council (WWCC) and included responses to their comments in this document.

CBA is located at Bomen outside Wagga Wagga, NSW and is currently constructing an upgraded wastewater treatment plant for the effluent wastewater from its meat processing operations. CBA discharges most of its treated wastewater to WWCC's Bomen Industrial Sewage Treatment Facility (BISTF). The new CBA treatment plant will significantly improve the water quality of the effluent wastewater. CBA proposes to irrigate the CFA Low area in addition to the separate, previously approved, 10 hectare irrigation area (CFA High) with treated effluent from the new treatment plant starting on the 1st of October 2011 and continuing on a sustainable basis, as conditions permit.

Assessment of the soil capacity, in conjunction with analysis of soil samples collected in April 2010, shows that the nutrient, organic and salinity loading rates will be sustainable and allow for growth of the Lucerne crop through the life of the project. Monitoring of the soil and groundwater nutrients and salinity will be undertaken to ensure that the loading rates are appropriate and the soil is not becoming overloaded. CBA will also monitor the soil moisture prior to irrigation to ensure that there is no irrigation when conditions are inappropriate.

Investigation of the potential for flooding on the CFA Low land shows that the land is in the Murrumbidgee flood plain but that there is a negligible risk of environmental impacts due to pollution from the site and no risk of impedance of flood flow due to the 0.5m berm design.

Odour impacts and Spray Drift impacts will be minimised through the use of operator checklists and data from the CBA weather station.

The CFA Low land has remained essentially the same, with respect to flora and fauna habitat, since the 1990's and there are no changes required for the irrigation development. This means that the irrigation of CFA Low should have no impact on biodiversity. A review of the endangered and vulnerable flora and fauna has been made to confirm this.

Less Greenhouse gases will be generated through the irrigation of the wastewater, compared to treating the wastewater at the BISTF.

In conclusion, CBA has experience managing wastewater treatment and irrigation of wastewater effluent. This proposal is an expansion of the irrigation already approved, with the only change being an expansion to a previously irrigated area. All the same safeguards and management practices that have been used in the past will serve as the basis for future management and monitoring of the system.

Table of Contents

1. Introduction

This Environmental Assessment has been prepared by Cargill Beef Australia (CBA) and Claus Environmental Engineering in response to the NSW Department of Planning Director-General's Requirements for the section 75W modification of DA No. 220-07-2002, for the proposed wastewater irrigation of the CFA Low area. . CBA has also had consultation with Office of Environment and Heritage (OEH) and Wagga Wagga City Council (WWCC) and included responses to their comments in this document.

The detailed information provided includes a description of the proposal, the project location, the history of the site, soil quality data, the quality of the wastewater to be irrigated on the site, any changes to structures on the site, a description of how the irrigation and the land will be managed, calculation of Greenhouse impacts, a review of potential biodiversity impacts, a discussion of odour and spray drift, and other potential environmental impacts

2. Description of the Proposal

2.1 General

Cargill Beef Australia is located at Bomen outside Wagga Wagga, NSW and is currently constructing an upgraded wastewater treatment plant for the effluent wastewater from its meat processing operations. CBA discharges most of its treated wastewater to Wagga Wagga City Council's (WWCC) Bomen Industrial Sewage Treatment Facility (BISTF). The new treatment plant will significantly improve the water quality of the effluent wastewater to be applied to the irrigation areas, as well as meet the Wagga Wagga City Council (WWCC) Trade Waste Acceptance Limits.

CBA proposes to irrigate the CFA Low area in addition to the separate, previously approved, 10 hectare irrigation area with treated effluent from the new treatment plant starting on the 1st of October 2011 and continuing every subsequent year after 2011.

The proposed irrigation area is located on Lot 2 DP 700113 Bomen and is owned by Cargill Beef Australia. The CBA Abattoir includes Lots 1, 2 and 4 DP 700113, Lot 1 DP 840624, Lot 6 DP 614169 and Lot 11 DP 814225, Dampier Street, Wagga Wagga. The CFA Low land is within the Zone 5 Special Uses under the Wagga Wagga LEP and is also within the area described in the LEP as the Murrumbidgee Floodplain.

A Development Application (DA No. 220-07-2002-i) was lodged with the Department of Planning on 15 July 2002 for expansion of the Bomen Abattoir facility. The proposal was classified as a State Significant, Designated and Integrated Development under the Act and was approved by the Minister on 27 February 2003. Four subsequent modifications were lodged with the Department of Planning and approved by the Minister. The most recent modification (Mod 4) was approved on 2 August 2010 for the current scope of the Effluent System Upgrade (ESU).

2.2 Location of CFA Low Irrigation Area

The CFA Low irrigation area is located just east of East Street and north of Hilary Street in Bomen about 2 kilometres southwest of the beef processing facility. The area within the property boundaries is greater than 30 hectares but the area that can be planted and irrigated efficiently is about 28 hectares. **Figure 1** shows the CFA Low irrigation area relative to the Murrumbidgee River and the Beef Processing Facility on a section of the Lands Department Map. The area shown on **Figure 1** in red is not the full extent of the CBA property but it is the flat section that can be planted and irrigated. **Figure 2** shows an aerial photo of the CFA Low site with the nearest residences to the southeast. **Figure 3** shows a contour plan of CFA Low indicating that the site is very flat with the half metre contours showing essentially no slope across the site.

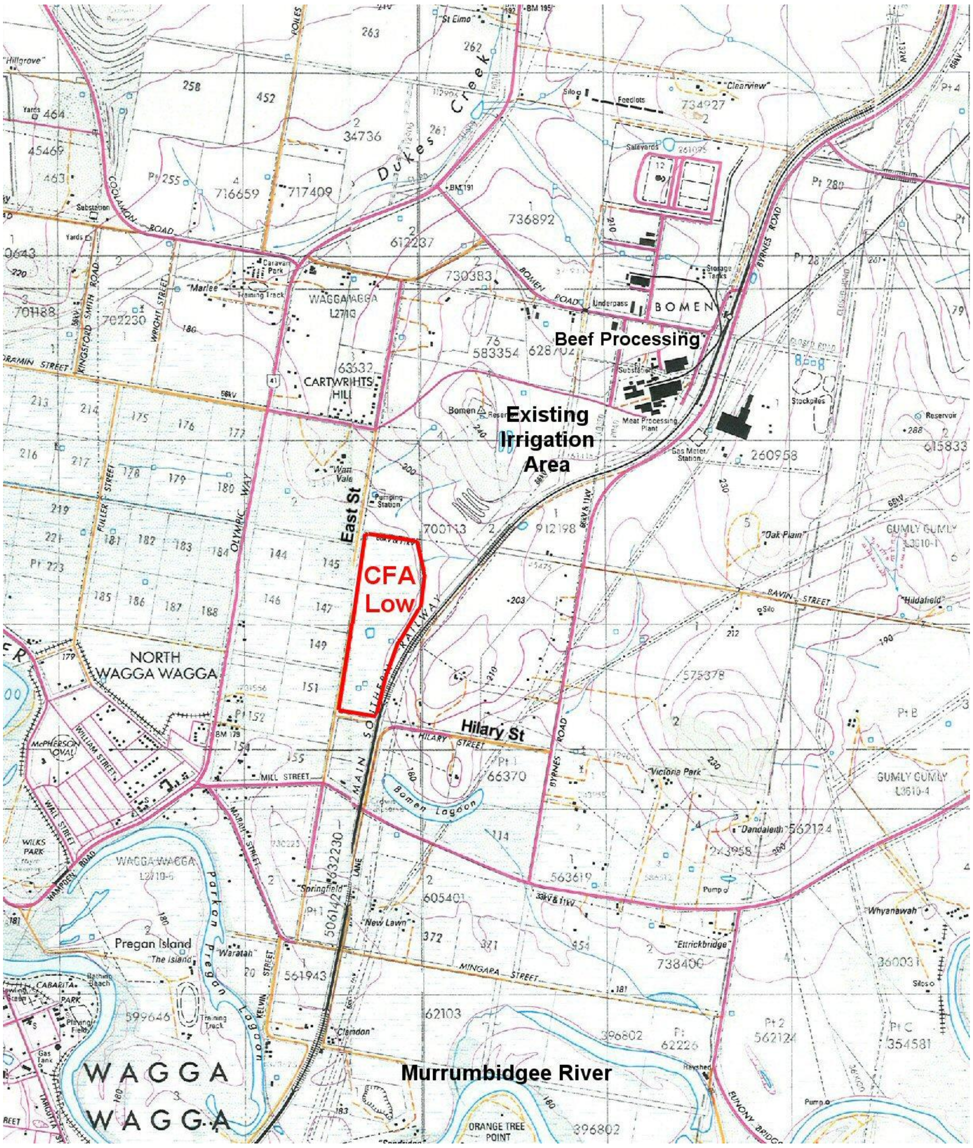

Figure 1 – Section of Lands Department Map showing the CFA Low irrigation area near Hilary Street and East Street Bomen and its relationship to the Processing Facility and the Murrumbidgee River.

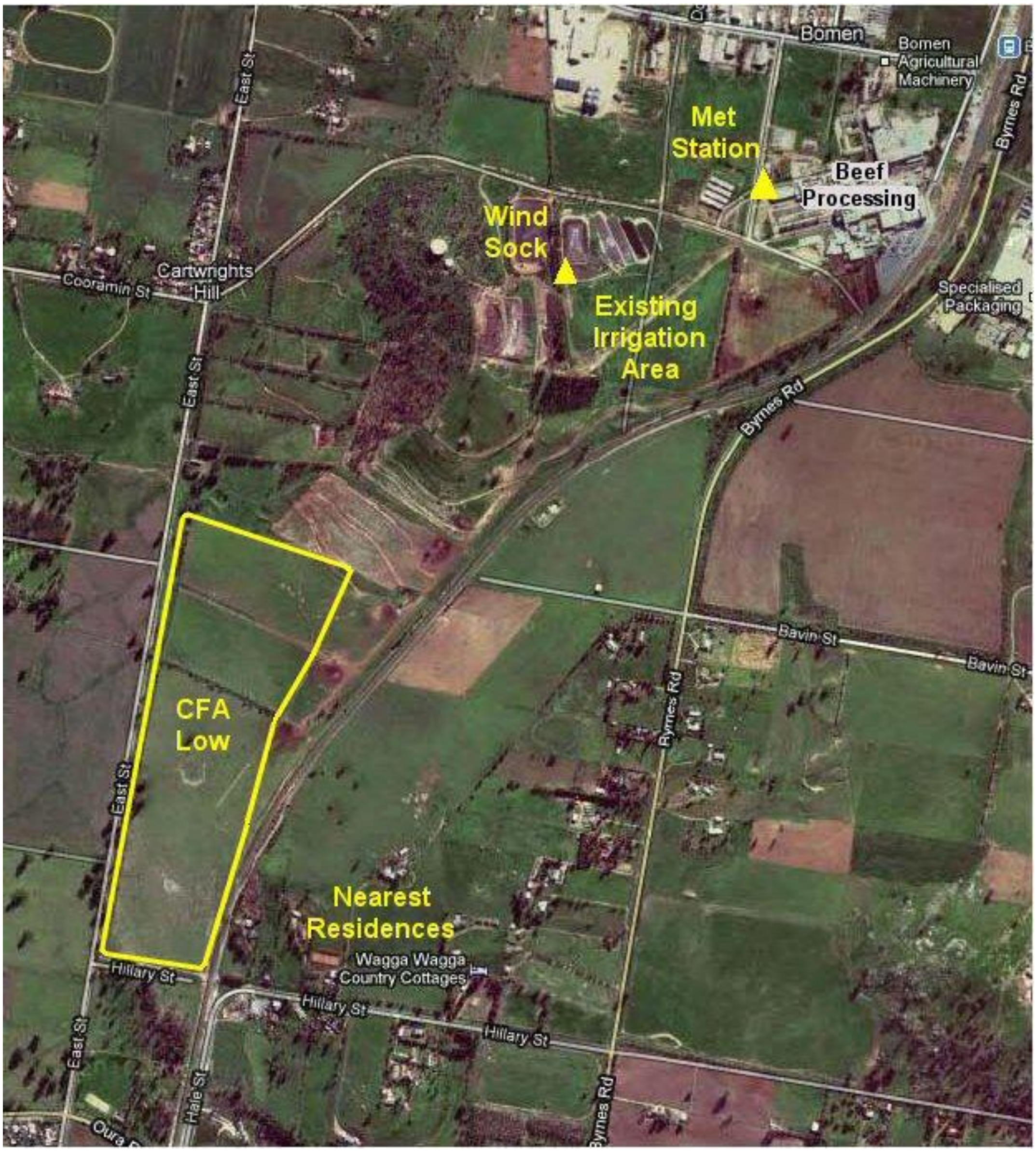

Figure 2 – Aerial Photo from Google Maps showing the CFA Low area, existing irrigation area, nearest residences to CFA Low, the Wind sock adjacent to pond 4 and the Meteorological Station adjacent to the Abattoir entrance. CBA will also install a wind sock on the CFA Low irrigation area but the exact location is still being determined.

2.3 CFA Low Site History

The CFA Low land has been a part of the Beef Processing Facility site since Cargill Australia purchased the property in 1991. The land has been used for grazing since that time and most likely before that as well. Some irrigation was carried out in the period 1998 to 2000 following the granting of a WWCC Development application No 215 / 97 on 13 February 1998. The DA lapsed on 13 February 2000 and CBA have received written advice from WWCC that future irrigation should be approved through a modification of DA No. 220-07-2002 issued by the NSW Department of Planning.

2.4 Proposed Irrigation Volume and Water Quality

2.4.1 Irrigation Volume

CBA proposes to irrigate 300ML per year on the CFA Low area. A description of the water balance, nutrients loading and salinity loading, showing that the 300 ML is sustainable, is included in the following sections.

It is understood that exactly 300 ML cannot be irrigated every year due to changes in the weather patterns, the ability of the soil to absorb the irrigation water in such a way as to promote the efficient planting, harvesting and maintenance of the Lucerne crop and to meet CBA's operational requirements. A portable moisture probe will be used to assess the soil moisture so that irrigation volumes can be sustainably optimised.

2.4.2 Irrigation Water Quality

Table 1 shows the expected effluent water quality from the new Wastewater Treatment Plant being constructed at the Bomen Beef Processing Plant.

Table 1 – Treated Effluent Specification from Johns Environmental Conceptual design of the Effluent System Upgrade

Parameter	Trade Waste Limits	Quality to Irrigation or Sewer
Total Chemical Oxygen Demand (mg/L)	None	<150
BOD_5 (mg/L)	300	<20
Total Suspended solids (mg/L)	300	300
Oil and Grease (mg/L)	50	<10
Total Dissolved Solids (mg/L)	1000	2000
Total Nitrogen (mg/L)	NA	<50
TKN (mg/L)	50	<50
NH_3 – N (mg/L)	35	<35
Total Phosphorus (mg/L)	10	10
Sulfate (mg/L)	50	<50
Sulfite (mg/L)	NA	1
pH	7.0 – 9.0	7.0 – 9.0
Colour	NA	No visible colour

Source: Cargill Beef Australia, 8 May 2011

2.5 Modifications to the Irrigation Area

CBA plans to construct control berms at the western (East Street), north western and south western sides of the site as shown on **Figure 3**. The site is very flat. There is no discernible drainage flow to the west, north or south. Assuming the area of the very flat part of the site is 25 hectares, a 500mm berm could hold 125 ML of water, so there is plenty of spare capacity with the proposed low berm around the CFA Low site to prevent runoff escaping from the site. The 100 year – 24 hour ARI storm would drop about 4.83mm / hour for 24 hours or a total storm of about 116mm. Assuming a total catchment of 100 hectares including the slopes above the site and a runoff coefficient of 80% the total runoff would only be 93 ML.

Figure 3 – Plan of CFA Low area showing location of low berm to protect downslope areas from natural runoff or excess irrigation water. The plan shows the 0.5 metre contours as provided by Wagga Wagga Council. All the 0.5 m contours on the irrigation area are either 177.0m contours or 177.5m contours giving an indication of how flat the site is. There is no major slope.

It is likely that there will be some uneven areas around the boundary of the site so the construction of the berm will require the use of GPS aided equipment to ensure that the top of the berm is level.

The other modifications to the site will be the construction of the pump station and pipe from the treatment plant to the irrigation area. Standard Erosion and sedimentation controls based on the NSW Department of Housing Blue Book will be employed during the construction of the pipeline. During the construction of the berm and in the construction of the pipeline in the flatter parts of the site, there is no real requirement for erosion and sedimentation controls because runoff water cannot really flow in any direction because the site is so flat. When the berm is complete it will act as the whole site's erosion and sedimentation control.

2.6 Management of New BNR Wastewater Treatment Plant

CBA understands that the loading rates proposed for the CFA Low irrigation area are dependent on the new Biological Nutrient Removal (BNR) Wastewater Treatment Plant consistently producing high quality effluent. CBA engaged *Johns Environmental Pty Ltd* to provide the conceptual design for the new plant. *Johns Environmental* has produced design reports that were submitted to WWCC, OEH and the Department of Planning, detailing the design requirements and potential issues that must be resolved through the detailed design and construction process.

Cargill Beef Australia's parent company, Cargill, operates similar plants at several locations in North America and has provided the CBA staff at the Bomen site with advice and Standard Operating procedures for similar plants. CBA has also engaged a highly experienced civil / mechanical contractor to construct the plant and they have provided CBA with a performance guarantee for the plant, as have other major suppliers.

3. Referral under the EPBC Act

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places — defined in the EPBC Act as matters of national environmental significance.

The EPBC Act requires that if a development could have a **significant impact** on the Australian environment, the developer will need to refer the proposed action to the Australian Government Minister for the Environment, Water, Heritage and the Arts.

A significant impact is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. Cargill Beef has carefully considered all of these factors when determining whether the modifications to the CFA Low area for irrigation are likely to have a significant impact on the environment.

Following review of the legislation and consultation with stakeholders who have an understanding of the project, Cargill Beef has determined that the proposed CFA Low development will not have a significant impact on the environment and therefore does not need to be referred to the Australian Government Minister for the Environment, Water, Heritage and the Arts.

The reasons for the low impact to the environment include:

- The previous land use has been agricultural;
- The proposed land use is agricultural, so there will be no change in land use. Irrigation is an agricultural use and has been conducted on the land before;
- There is no planned clearing of trees in the proposal but it may be necessary to clear a few trees in constructing the berm and pipeline;
- There are, therefore, not expected to be any impacts to flora and fauna.

4. Water Balance

The volume of water that can be irrigated in any month is estimated using the precipitation, evaporation for Wagga Wagga and the crop factor data for Lucerne. A month to month break down of each factor is shown in **Table 2**. When all the potential factors are added together an estimate of the total volume of water that the soil and crops can accept can be calculated. An area of 27 hectares was used to be conservative and allow for some lost area to ensure that the irrigation spray does not drift off the site. When the calculations are made for Lucerne and 27 hectares, a volume of about 312 Mega-Litres per year can be sustainably irrigated based on the average precipitation and evaporation.

The hydraulic loading of the irrigation area on a month-to-month basis can be balanced using the averages as shown in **Table 2**. On a day-to-day basis, care needs to be taken with soil moisture to ensure that the water and nutrients in the wastewater are being recycled and not simply running off the land. Irrigation is managed on a day-to-day basis using a soil moisture probe, the operator’s daily checklist, the operators experience and the meteorological data available at CBA’s on-site meteorological station.

Table 2 – Water Balance for each month based on zero percolation assumption and 300 ML/year total irrigation and proportional application													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Evaporation (mm)	316	255	214	120	65.1	39	37.2	58.9	90	152	216	295	1857.5
Precipitation (mm)	37.4	36	36.2	39.1	44	50.3	49.5	48.2	48.5	52	39.7	40.1	521
Crop factor-Lucerne	0.95	0.9	0.85	0.8	0.7	0.55	0.55	0.65	0.75	0.85	0.95	1	79%
Percolation	0	0	0	0	0	0	0	0	0	0	0	0	0
Evapotranspiration (mm)	300.4	229.3	181.8	96.0	45.6	21.5	20.5	38.3	67.5	129.1	205.2	294.5	1629.6
Irrigation Potential (mm)	263.0	193.3	145.6	56.9	1.6	-29	-29	-9.9	19.0	77.1	165.5	254.4	1108.6
Irrigation Potential (ML)	71.0	52.2	39.3	15.4	0.4	0.0	0.0	0.0	5.1	20.8	44.7	68.7	317.6
Irrigation Planned (ML)	68.3	50.2	37.8	14.8	0.0	0.0	0.0	0.0	0.0	20.0	43.0	66.0	300.0
Irrigation Planned (mm)	253	186	140	55	0	0	0	0	0	74	159	245	1111.1
% of potential irrigation	96%	96%	96%	96%	0%	0%	0%	0%	0%	96%	96%	96%	

Evaporation: Bureau of Meteorology Station: 072150 Wagga Wagga AMO
Precipitation: Bureau of Meteorology Station: 073127 Wagga Wagga Agricultural Institute
Crop Factor – Lucerne:
Percolation: Zero Percolation is assumed to ensure that groundwater is protected
Evapotranspiration = Evaporation x Crop Factor
Irrigation Potential (mm) = Evapotranspiration – Precipitation
Irrigation Potential (ML) = Irrigation Potential (mm) x 10 hectares x 10,000 m^2/ha x 0.001 m/mm
Irrigation Planned (ML) = Proportional distribution of total ML based on irrigation potential for that month. May, Jun, Jul, Aug, Sep = 0

Irrigation Planned (ML) is based on a yearly total of 300 ML and is divided proportionally to the months with the most irrigation potential which equates to the months with the greatest difference between Evapotranspiration and Precipitation

Irrigation Planned (mm) = Irrigation Planned (ML) / (10 hectares x 10,000 m^2/ha x 0.001 m/mm)
% of potential irrigation = Irrigation Planned (ML) / Irrigation Potential (ML)

5. Potential for Flooding and Related Environmental Impacts

5.1 Agency Requirements

The Director-General's Requirements Soil and Water section includes the requirement for Cargill to provide "details of the potential for flooding and any flood mitigation measures." (DoP, 16 March 2011)

OEH requests that "The EA (Environmental Assessment) should assess the potential for the proposed irrigation area to become inundated with flood waters as well as the frequency of any inundation. (Department of Environment Climate Change and Water (DECCW), 27 January 2011) The DECCW has been renamed the Office of Environment and Heritage (OEH).

Wagga Wagga City Council has requested that Cargill consider whether the holding capacity of the land will be impacted by the development and whether there is any potential for "contamination of the Murrumbidgee River system from waste water during flood events." (WWCC, 8 March 2011)

The intention in preparing the following sections is to address these requirements.

5.2 Potential for Flooding of the CFA Low Site

The Wagga Wagga Floodplain Risk Management Plan lists several design flood levels at significant points along the Murrumbidgee River near Wagga Wagga in Table 2 (page 10/25). The list of significant locations includes, from upstream to downstream, Braehour, Gumly Gumly (River), Railway Bridge, Hampden Bridge, Narrung Street and Gobbagombalin Bridge. **Table 3** shows the Design Flood levels as determined in 2009 for the Wagga Wagga Floodplain Risk Management Plan.

Table 3 - Selected Design Flood Levels (mAHD) (metres Australian Height Datum)

	10yr	20yr	50yr	100yr	PMF
Hampden Bridge (downstream)	179.3	180	180.8	181.4	186.1
Railway Bridge (upstream)	179.9	180.5	181.3	181.9	186.4
Difference between U/S and D/S	0.6	0.5	0.5	0.5	0.3
Halfway Pt. (Estimate of CFA Low)	179.6	180.25	181.05	181.65	186.25
Average difference 20yr and 100yr				1.4	

PMF = Probable Maximum Flood

Figure 4 shows the 100 year ARI (Annual Recurrence Interval) Floodplain Hazard Map as adapted from Figure 3 in the Floodplain Risk Management Plan. The CFA Low land is shown about half way between the Railway Bridge and Hampden Bridge River stations, so it can be assumed that the Design flood level for CFA Low will be about half way between the design flood levels of Hampden Bridge and Railway Bridge.

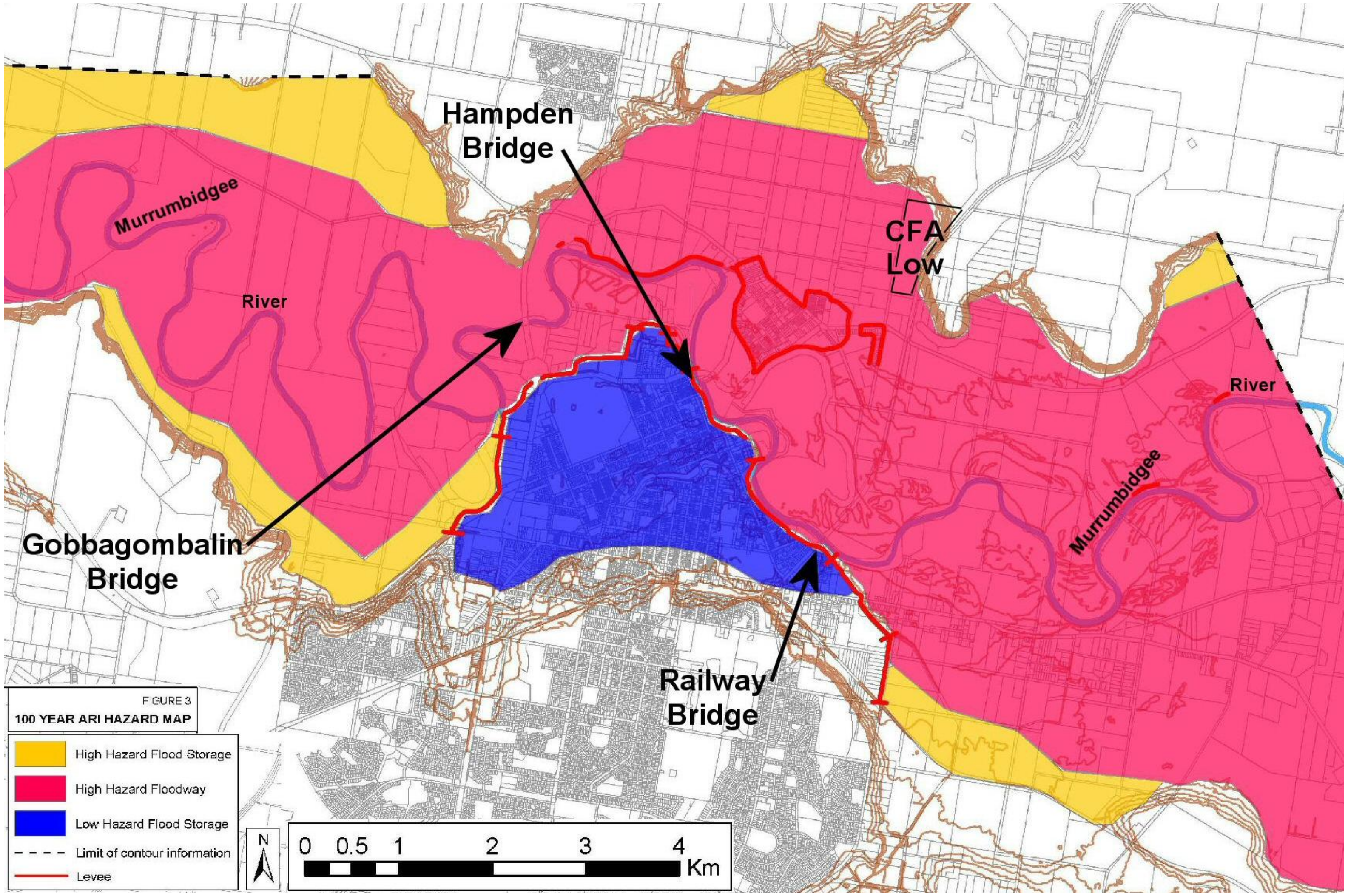

Figure 4 – 100 year ARI hazard map, modified from Figure 3 of Wagga Wagga Floodplain Risk Management Plan

Figure 3 in Section 2.5 above, shows that all the contours in the flat part of the CFA Low area (the area that will be irrigated) are either 177.0 or 177.5m AHD. It is likely that the top of the 0.5m high berm will be at about 177.8m AHD. This berm height / elevation has been selected because it is high enough to control the runoff from the catchment above, as well as the potential for any broken pipe or other leak of wastewater. It is also low enough so that it will not impede any flood water flow from the Murrumbidgee. The 10 year ARI design height for the Murrumbidgee is between 179.3 and 179.9m and is likely to be about 179.6m. This is 1.8 m higher than the proposed berm so the berm would not impede the flood flow in a 10 year storm. The 1.8 margin is enough so that it is likely that even in the 5 year storm there would be no impedance of the flow. In smaller storms it is unlikely that the free flowing cross section of the catchment flow path would be as critical.

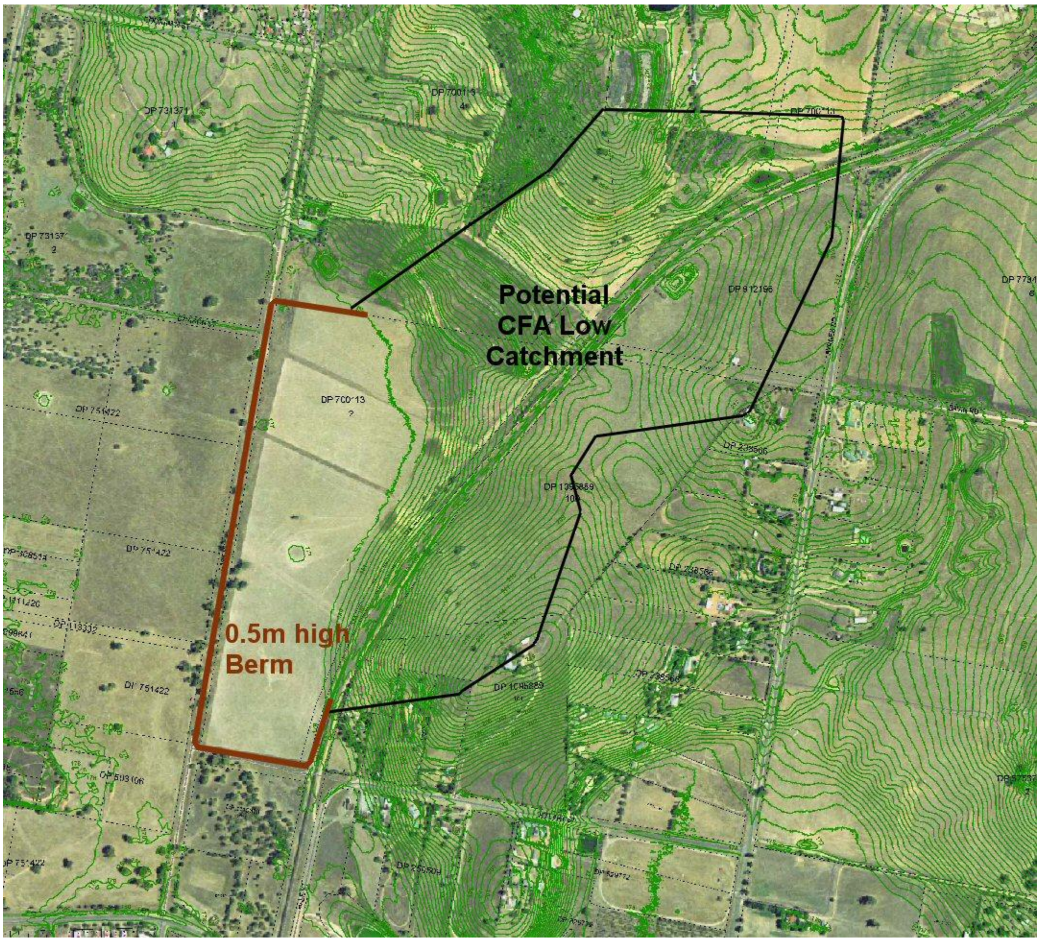

Figure 5 – 1.0 metre contour drawing from Wagga Wagga City Council modified to show the 0.5m berm and the Potential Catchment that may flow to the CFA Low irrigation area. The Potential CFA Low catchment is also shown estimated at about 100 hectares total.

Figure 5 shows the potential catchment that could flow to the CFA Low area based on the natural contours. **Figure 6** shows the Potential Catchment and the berms and constructed embankments that currently divert water away from the CFA Low area. With these berms and embankments in good condition and well maintained the pressure from upslope runoff is greatly reduced.

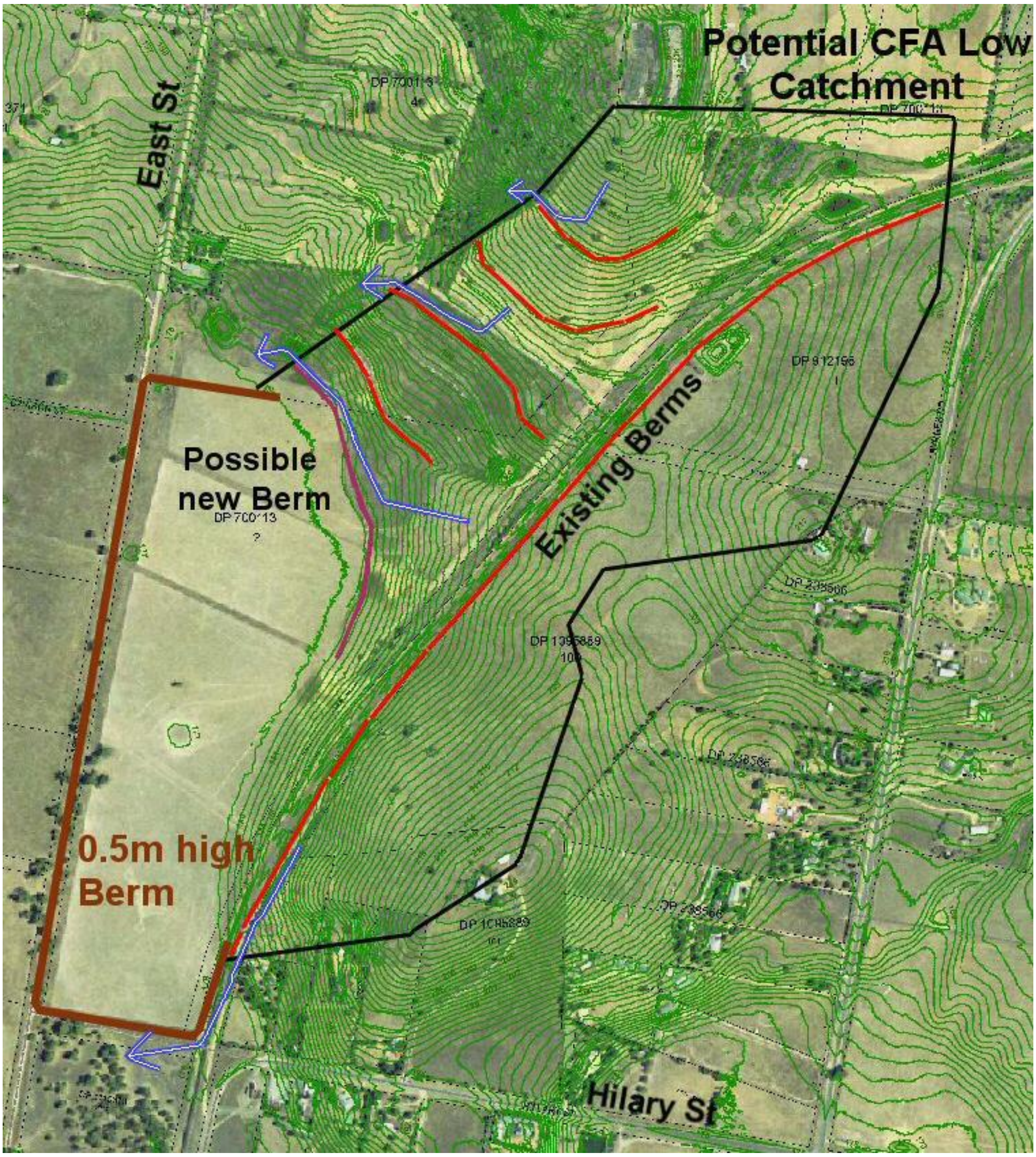

Figure 6 – 1.0 metre contour drawing from WWCC showing the 0.5m berm and the Potential Catchment. Red Lines are existing berms and embankments and the purple line is a possible new berm that may be constructed in about this area to divert the runoff from the area above away from the irrigation area. The blue lines and arrows show the direction of runoff flow. The red line to the right of the catchment is the existing embankment for the train line. Near Hilary Street the train line runs on to a bridge, so runoff water can flow under from this point. That is why the 0.5 m berm has been extended to this point.

5.3 Potential Frequency of Flooding

As described above, the 10 year ARI Flood level at Hampden Bridge, in the middle of Wagga Wagga, is 179.3m AHD and the 20 Year flood level is 180.0. The maximum level of the December 2010 storm at Hampden Bridge was 9.64m (Daily Advertiser (6 Dec 2010) and Wikipedia File (6 Dec 2010)) which equates to 179.69m AHD. The total elevation of the flood is calculated by adding the listed Gauge Zero (170.05m AHD (page 10/25, WWCC (April 2009) Wagga Wagga Floodplain Management Plan)) to the Flood level. Therefore, 170.05m + 9.64m = 179.69m.

The December 2010 flood level of 179.69m AHD is about half way between the 10 and 20 year floods at Hampden Bridge. Confirming this assessment is the letter from Colby Farmer of the Wagga Wagga City Council to Andrew Hartcher of the DoP, received by DoP on 17 March 2011. The letter states:

> "The subject land is prone to flooding and was evidently inundated during the December 2010 (1 in 20 year) flood event."

Figure 7 – Aerial Photo of the CFA Low area during the December 2010 Flood

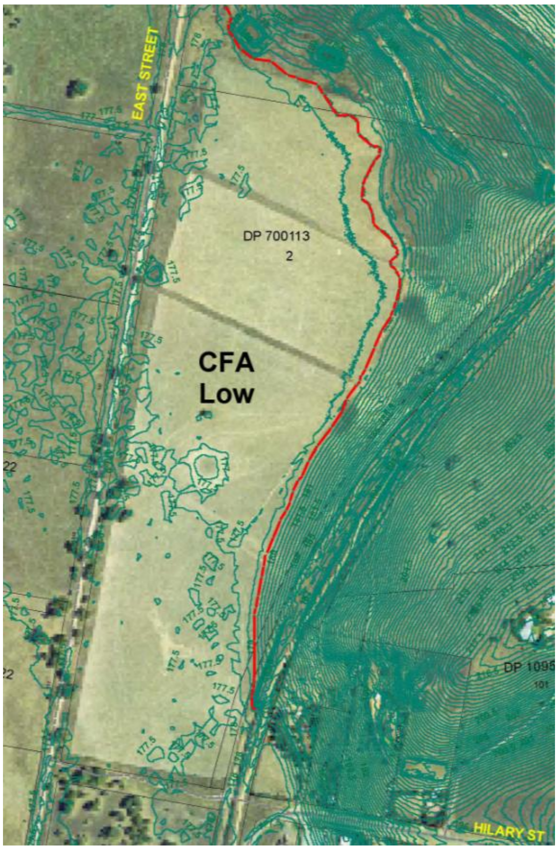

Figure 8 – 0.5m contour plan showing the 179.5 m contour highlighted in Red

Wagga Wagga City Council is correct regarding the inundation of the CFA Low land in December 2010. **Figure 7** shows an aerial photo taken in December 2010 with the CFA Low land that is proposed for irrigation, completely inundated. **Figure 8** shows the 0.5 m contour plan with the 179.5m contour highlighted in Red. The 179.5 contour would be very close to the high Flood Level mark of 179.69m AHD. Comparing **Figures 7** and **8**, it can be seen that the 179.5 contour line closely follows the Flood line, indicating that the

Flood level at CFA Low, was probably close to the 179.69 m level recorded at Hampden Bridge. **Figures 9, 10 and 11** also show the extent of the CFA Low land flooding when the Murrumbidgee flooded on 3 December 2010.

It is also worth noting that if the 0.5 m berms, with a top elevation of about 177.8m had been constructed prior to the December 2010 floods, they would have also been inundated.

In summary the CFA Low land is likely to be inundated in less than the 10 year storm. With the 10 year storm level at about 179.6m AHD and the tops of the 0.5m berm at about 177.8m AHD there will be no impedance of flow through the CFA Low area.

The elevation differences between the design year flood levels are shown in **Table 4.**

Table 4 - Selected Design Flood Levels (mAHD) and the differences between the elevations of the different design flood levels

	Hampden Bridge	Difference	Railway Bridge	Difference
10 year	179.3		179.9	
		0.7		0.6
20 Year	180.0		180.5	
		0.8		0.8
50 Year	180.8		181.3	
		0.6		0.6
100 Year	181.4		181.9	

Flood levels less than the 10 year ARI are generally not considered in detail in flood planning by Councils and Stormwater authorities. It may not be critical to consider any further detail on the frequency of flooding other to say that that the site is likely to flood in events more frequent than the 1 in 10 year storm. Some assumptions regarding a more accurate assessment of flooding frequency are possible with the information available. In general when the design year doubles, the flood level increases by about 0.6 or 0.7m. This relationship may not follow down to the 5 year storm or the 2.5 year storm because the shape of the channel is significant in determining the height of the flood level. Considering, though, that the area around CFA Low is generally flat and that the elevation difference between the top of the berms and 10 year storm is about 1.8 metres, there is a high probability that the CFA Low site would flood in events more frequent than the 1 in 5 year storm.

Figure 9 – Panoramic view of CFA Low from the slope to the Northeast of the irrigation area. Photo taken 3 December 2010.

Figure 10 – Looking East from East Street from about the middle of CFA Low. Photo taken 3 December 2010.

Figure 11 – Looking Northeast from near Hilary Street toward the railway bridge. Photo taken 3 December 2010.

5.4 Potential for Contaminated runoff from the CFA Low area

There are 3 potential incidents whereby contaminated water could escape the CFA Low irrigation area and cause off site pollution.

- Broken pipe or leak from irrigation supply pipe combined with a failure of the 0.5 m high berm in a location that allowed the irrigation water to flow off site.
- Rainfall runoff from the catchment above CFA Low mixing with freshly irrigated or spilled irrigation water and overtopping or escaping through a failure in the 0.5m berm.
- Flooding from the Murrumbidgee River mixes with the irrigated or spilled irrigation water and is carried off site over the top of the 0.5 m berm by the Murrumbidgee floodwaters

These three broad categories are considered in the following sections.

5.4.1 Leak and Failure of Berm

There are a number of conditions that make a leak through the berm highly improbable.

- The berm is checked by the Cargill operators every day that there is irrigation so if there was a break in the berm the irrigation could be shut down before any liquid escaped the site.
- Under normal irrigation the wastewater is spread evenly over the soil so that there is no significant ponding or flowing streams that would escape the site even if there were no berm present. Only on a day when the berm was broken and not detected and a pipe broke or a leak occurred in another way and was not detected could there be a potential for irrigation water to flow off site.
- The berm is a substantial earth structure 0.5 m high and usually about 1.5 m wide so even if a car ran into it, it would not be easy to break. If some event significant enough to break the berm occurred it would be likely to attract attention.
- It is assumed that the most wastewater that could be discharged during an irrigation day is 3 ML. Cargill operators monitor the irrigation through the day so if there was a broken pipe of a leak of some kind it would be recognised under normal operating conditions and shut down before the full days discharge were allowed to escape. Under many circumstances even 3 ML would not escape the site.
- The irrigation distribution pipe is proposed to run down the middle of the CFA Low Irrigation area about 100 metres from the berm adjacent to East Street. The site is flat so there is no slope that would drive the leaking wastewater to flow quickly off site. Prior to the water flowing off site through the break in the berm there would need to be some ponding on the flat ground to build up the head to force the water off site. The following calculations illustrate that even in the unlikely combination of a broken pipe and a failure of the berm, the environmental impacts would be minimal.

a) Assuming 3 ML was pumped in 8 hours that would be 6250 Litres per minute. The 6250 L/min break would be a catastrophic break. It is much more likely that a break in the pipe would cause only a small percentage of the flow to escape through the break. All the calculations below are based on this catastrophic pipe breakage even though the probability of such a breakage occurring is minor.

b) Following a pipe break, it is assumed an area approximately 100m x 100m x 20mm deep would pond up before any water flowed off site. That would be 200,000 Litres and take 32 minutes.
c) As the water spreads out some of it soaks into the ground assuming the ground is not already saturated. If the ground is already saturated then it would be close to the end of the irrigation day and there would be less chance that the gap in the berm was undetected and there would be less pumping time left in the day and less chance of a significant discharge off site.
d) Assuming a 2m wide gap in the berm at ground level, the water would flow out of the site at about 620 Litres per minute at 20mm deep. If the water leaked at 6250 L/min then the ponding behind the gap in the berm would widen and the water would deepen.
e) After another hour, the water would be 30mm deep and be flowing at about 1140 L/min which is still less than the 6250 L/min. In this one and a half hours since the leak started, about 53,000 Litres would have flowed off site and about 500,000 Litres would still be on site.
f) Assuming there was no intervention by Cargill Operators for 5 hours, although about 1,900,000 Litres would leak only about 400,000 would flow off site.
g) In a condition where the berm was broken but still retained a 60mm deep barrier. There would be no water lost from the site in 5 hours, even with the catastrophic pipe breakage.
h) If a 100mm deep barrier were still present after the berm breaking incident no water would pass outside the barrier.
i) On many irrigation days less than 3 ML would be irrigated. As described earlier if 2.4 ML were irrigated on 125 days during the irrigation season, the entire 300 ML for the year could be irrigated. If a break occurred part way through the day, in many cases there would not be enough flow to get off site even if the berm was substantially broken in just the right location for a leakage off site to occur.

5.4.2 Runoff from the Catchment above CFA Low

First it must be noted that the 0.5m berm could not be overtopped by flow from the catchment above, even in the 100 year storm, assuming that the berm did not fail. Second it would be rare for there to be irrigation during wet weather so the probability of irrigation water escaping would require the combination of three unlikely events

1) A high intensity rainfall event, for example a 10 year storm
2) Irrigation of wastewater or a break in an irrigation pipe while the pumps were running just before or during a rainfall event, and
3) Failure of a part of the 0.5m high berm in a location that would allow runoff water to flow off the CFA Low site.

The 0.5 m berm has been designed to strike a balance between protection against runoff from the catchment above, impedance of Murrumbidgee flood flows and the cost of the berm.

Assuming that 3 ML of wastewater mixed with 27ML of runoff there would be a dilution of the irrigation water to one tenth of its original strength. **Table 5** below shows the likely concentrations that would result from this condition. A large storm might be more likely to escape the site due to increased hydraulic pressure, but the increased dilution would reduce the overall impact.

Table 5 – Treated Effluent Specification and comparison with 10% and 5% dilution due to mixing with runoff from catchment above.

Parameter	Quality to Irrigation or Sewer	10% dilution	5% dilution
Chemical Oxygen Demand (mg/L)	150	15	7.5
BOD_5 (mg/L)	20	2	1*
Total Suspended solids (mg/L)	300	30	15
Oil and Grease (mg/L)	10	1	0.5
Total Dissolved Solids (mg/L)	2000	200*	100*
TKN (mg/L)	50	5	2.5
NH_3 – N (mg/L)	35	3.5	2
Total Phosphorus (mg/L)	10	1	0.5
Sulfate (mg/L)	50	5	2.5

* Background levels would be greater

5.4.3 Flooding from the Murrumbidgee

First, the risk is limited because it would be rare for the site to be irrigated in any kind of rainfall event and even more rare for any pipe breakage to take place Even if a pipe were broken, if the pumps are not turned on, the treated wastewater will not be pumped to CFA Low. In order for flooding to overtop the 0.5 m berm it would have to be relatively significant storm. Probably less than a 1 in 5 year flood event, as described previously, but still a significant volume of water would be flowing through the site.

In a big storm, over 30,000 ML/day will flow past the CFA Low site, if the entire flow of the Murrumbidgee is considered. That would be a substantial (1:10,000) dilution of any wastewater that was on the CFA Low site. If it is assumed that only the water that flowed directly over CFA Low would be polluted then the dilution would still be substantial. If the water flowed over CFA Low for one day at 0.1m/sec that would be about 8 kilometres per day or about 8 passes over the site. Assuming 125 ML would fill up CFA Low as calculated previously, the dilution for 1000 ML would be about 333 times, which would reduce the pollutant levels to less than detectable levels in the total volume of floodwater.

6. Results of Soil Sampling and Analysis

Soil sampling on the CFA Low site was conducted on 1 April 2010. The results of the sampling are summarised in **Table 6**. The sampling locations are shown in **Figure 12**.

Table 6– Summary of CFA Low Soil Monitoring conducted on 1 April 2010 by Aitken Rowe Testing Laboratories (Sampling by Cargills)

	Ave Surface	Ave Deeper
Calcium, exchangeable (cmol/kg)	8.00	8.71
Conductivity (µS/cm)	216	584
Exchangeable Sodium Percentage	23%	20%
Magnesium Exchangeable (cmol/kg)	7.2	9.5
Nitrate as N (mg/kg)	6	4
Nitrogen Total (mg/kg)	968	226
Phosphorus Buffer Index (L/kg)	69	42
Extractable Phosphorus (Colwell) (mg/kg)	79	25
Phosphorus Total (mg/kg)	311	174
pH	7.9	7.1
Potassium , Exchangeable (cmol/kg)	0.45	0.40
Sodium, Exchangeable (cmol/kg)	3.86	7.78
Total Kjeldahl Nitrogen (mg/kg)	962	222
Total Organic Carbon (mg/kg)	12200	5150
Sodium Adsorption Ratio	1.4	3.0

Aitken Rowe Testing Laboratories Laboratory Analysis Report Number 1004-0020

Figure 12 – Soil Sampling Locations from Aitken Rowe Report Number S10-100

7. Assessment of Soil Capacity

7.1 Assessment of Soil Capacity - Phosphorus

The capacity for the soil to adsorb and recycle phosphorus can be estimated using the Example of a phosphorus sustainability calculation in section 4.3 (page 60/135) of the DEC Environmental Guidelines, Use of Effluent by Irrigation (2004). The assumptions and calculations are as follows:

Assumptions:
Phosphorus sorption capacity = 350 mg/kg
Phosphorus sorption capacity (critical) = 117 mg/kg
Soil depth = 1 metre
Soil density = 1300 kg/m^3
Land Area for irrigation = 27 ha
Total P in applied effluent = 9 mg/L
Volume of Effluent = 300 ML/year over 212 days, which is the equivalent of 1110 mm/year

Calculations:
Total P absorbed before leaching:
= P sorption capacity (critical/3) soil x soil density x soil depth x area
= 117 mg/kg x 1300 kg/m x 1m x 27 ha x 10,000 m^2/ha x 10^{-6} kg/mg
= 41,067 kg
= P sorption capacity (critical/10) soil x soil density x soil depth x area
= 35 mg/kg x 1300 kg/m x 1m x 27 ha x 10,000 m^2/ha x 10^{-6} kg/mg
= 12,285 kg

Total P in applied effluent:
= 9 mg/L x 300,000,000 Litres x 10^{-6} kg/mg = 2700 kg

Total P removed by Crop (Lucerne) per hectare per year = 80 kg/ha/year
Total P removed by Lucerne per 27 ha = 27ha x 80 kg/ha = 2160 kg/year

Based on these assumptions (2700 kg – 2160kg =) 540 kg of Phosphorus would be added to the soil each year. This means that with the Phosphorus absorption capacity at 117 mg/kg as described in the example in the DEC Guidelines, there would be (41,067 kg / 540 kg/year =) 76 years of capacity in the soil. Even if the P sorption capacity were reduced to one tenth of the original assumption (35 mg/kg) there would be (12,285 kg / 540 kg/year =) 23 years of phosphorus absorption capacity. These calculations are highly dependent on the new wastewater treatment plants capacity to remove Phosphorus from the wastewater. CBA intends to install chemical dosing, mixing and separation equipment in the new treatment plant, to assist in the removal of Phosphorus.

7.2 Assessment of Soil Capacity – Nitrogen

The capacity for the soil to adsorb and recycle nitrogen can be estimated using a method very similar to the method used for phosphorus above with one slight alteration. Considerable ammonia can volatilise in warm dry weather during spray irrigation. In this estimation, though, the volatilisation of ammonia is insignificant because the nitrification / de-nitrification process oxidises such a high percentage of the ammonia before it is discharged. This estimate is simpler and slightly conservative without the extra ammonia volatilisation. The assumptions and calculations are as follows:

Assumptions:
Land Area for irrigation = 27 ha
Total Kjeldahl N in applied effluent = 50 mg/L
Total Ammonia in applied effluent = 35 mg/L
Volume of Effluent = 300 ML/year over 212 days, which is the equivalent to 1110 mm/year

Calculations:
Total N in applied effluent:
= 50 mg/L x 300,000,000 Litres x 10^{-6} kg/mg = 15,000 kg

Total N removed by Crop (Lucerne) per hectare per year = 700 kg
3.5% Nitrogen x 20 Tonnes per hectare = 0.7 tonnes = 700 kg
Total N that can be removed by Lucerne per 27 ha = 27ha x 700 kg/ha = 18,900 kg

Since 18,900 kg of Nitrogen can be removed from 27 hectares of soil and only 15,000 kg is being applied, it is clear that the irrigation will not add excess Nitrogen. In fact in years when heavy rainfall limits the volume of irrigation water that can be applied, it may be necessary to add nitrogen fertiliser to ensure adequate growth of the Lucerne. The level of total nitrogen in the top 300mm of soil on the CFA Low site as measured in April 2010 is 968 mg/kg, which is ample for good soil fertility.

7.3 Assessment of Soil Capacity – Organic Material

Organic material is important for soil fertility but overloading of soil with organic material can clog soil pores and create anaerobic conditions. The DEC Environmental Guidelines, Use of Effluent by Irrigation (2004), (page 65/135) indicates that an average organic loading rate of 1500 kg / ha / month is appropriate when the organic material is defined as BOD plus oil and grease. Assuming a seven month irrigating year, that means 10,500 kg of organics per hectare per year.

Assumptions:
Total area to be irrigated = 27 ha
Total BOD in applied effluent = 20 mg/L
Total Oil and Grease in applied effluent = 10 mg/L
Sustainable rate of organic application = 10,500 kg/ha/yr
Volume of Effluent = 300 ML/year

Calculations:
Total Organic material = BOD + O&G = 20mg/L + 10 mg/L = 30 mg/L
Total kg of organic material that can be sustainably accepted by the soil:
= 10,500 kg/ha/year x 27 ha = 283,500 kg/year
Total kg organic material applied per year = 300ML x 30 mg/L = 9000 kg/yr
Percent of sustainable total = 9000 / 283,500 = 3%

The calculations show that the proposed mass of organic material to be applied to the irrigation area is only 3% of the sustainable mass, so there is little concern about the sustainability of the soil due to the application of organics.

7.4 Assessment of Soil Capacity - Salinity

When the salinity of the soil is considered by itself the irrigation area soil is very healthy. The DEC Environmental Guidelines, Use of Effluent by Irrigation (2004), (page 25/135) states “Where the EC_e (dS/m) of a soil is less than 2, effects on plants are mostly negligible.” The average conductivity of surface soils (0 to 300mm) as monitored in April 2010 by Aitken Rowe Testing Laboratories is 216 µS/cm (0.2 dS/m) and the average conductivity of deeper (300mm to 1200mm) soils is 584 µS/cm (0.6 dS/m). These salinity levels are far below the 2.0 dS/m level where impacts are considered more than negligible.

Salinity must still be monitored carefully, though, because it is estimated that the average Total Dissolved Solids in the effluent may be as high as 2000 mg/L. This indicates that the potential for an increase in soil salinity must be carefully monitored as the irrigation continues.

7.5 Assessment of Soil Capacity – Sodicity

The CFA Low soil is generally healthy based on the criteria shown in **Table 7** below, extracted from the Colorado State University Fact Sheet on Sodic Soils. The Sodium Adsorption Ratio is low, the salinity as indicated by the electrical conductivity of the soil is low and the soil pH is in the normal range.

Table 7 - Sodium hazard of soil based on SAR values. (from Table 1 Colorado State University Fact Sheet no. 0.504 – Managing Sodic Soils)

Classification	Sodium adsorption ratio (SAR)	Electrical conductivity (dS/m)	Soil pH	Soil physical condition
Sodic	>13	<4.0	>8.5	poor
Saline-Sodic	>13	>4.0	<8.5	normal
High pH	<13	<4.0	>7.8	varies
Saline	<13	>4.0	<8.5	normal
http://www.ext.colostate.edu/pubs/crops/00504.html				
CFA Low Soil	**1.4**	**0.2**	**7.9**	**Assumed Normal**

Although the CFA Low soils are healthy by the criteria shown above and by the anecdotal comments of the operators, CBA intends to maintain their close monitoring of the site. The DEC Environmental Guidelines, Use of Effluent by Irrigation (2004), (page 24/135) notes that "soils with an ESP (Exchangeable Sodium Percentage) of greater than 5 are at risk of showing the adverse structural impacts associated with sodicity." The average ESP of surface (0 to 300mm) soils is 23% and the average ESP of deeper (300mm to 1200mm) soils is 20%. It is important to note that the guidelines don't say that the soils WILL develop the adverse structural impacts associated with sodicity. The guidelines say that these soils are AT RISK. In the case of the CFA Low soils it does not seem like the adverse structural impacts are realised.

8. Control of Spray Drift

Irrigation is only carried out with a trained operator on site. The operator checks the Wind Sock adjacent to Pond 4 and will also be able to check the Wind Sock on the CFA Low site. The operator uses a checklist including factors such as soil moisture, wind velocity and weather forecasts, when deciding whether to initiate irrigation. When the wind is considered by the operator as so strong and blowing to the south or the west such that there is potential for drift beyond the boundaries of the site, the irrigation will not be commenced. The residences nearest to the CFA Low irrigation area are shown in **Figure 2**. CBA maintains an on-site weather station that the operator can view, located at the beef processing facility's rear security gate house (**Figure 2**).

The weather station records wind speed and direction so the weather station data can also be viewed in the environmental manager's office. The environmental manager can be in contact with the operator via two way radio if the wind is too strong and in a direction that may impact the nearest residents.

9. Potential Odour Impacts

Table 7 shows that the recommended Odour performance criterion for sparsely populated areas such as the area around CFA Low is 6.0 or 7.0 Odour Units. Based on previous odour assessment of wastewaters with BOD < 20 mg/L, the initial odour level of the wastewater is likely to be less than 6.0 OU and with the additional dispersion the odour levels would be reduced significantly from the initial low levels. At a BOD of 20 mg/L there will not be significant anaerobic breakdown of the organics in the wastewater which is the usual source of the most severe odours from wastewater.

Table 7 – Odour Performance Criteria under various Population Densities

Population of affected community	Odour Performance criteria (Odour Units)
Urban Area (≥ ≈ 2000)	2.0
≈ 500	3.0
≈ 125	4.0
≈ 30	5.0
≈ 10	6.0
Single Residence (≤ ≈ 2)	7.0

Source: Department of Environment and Climate Change (NSW) 2005, Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales, referred to in Odour Unit (August 2007)

As described above, Cargills has a program for ensuring that there is no Spray Drift. The control of odours is complimented by the Spray Drift control procedures as they ensure that irrigation is not carried out when strong wind is blowing in the direction of sensitive receptors.

The Director General's requirements also require compliance with Section 129 of the POEO Act. Section 129 of the POEO Act requires that no offensive odours be emitted from the premises unless in accordance with the conditions of the licence. There are not expected to be any offensive odours from the CFA Low project. Previous EPA / OEH Licences have not included requirements regarding odours from the existing irrigation area so it is assumed that the OEH would not expect odours from CFA Low, especially considering that the quality of the wastewater to be irrigated will be greatly improved.

10. Biodiversity Assessment

The CFA Low land consists of and is primarily surrounded by cleared rural land. Very little remnant native habitats exist in the vicinity of the site. There has been no change to the CFA Low land use or the land use of the surrounding lands since Environmental Impact Statements were prepared in 1997 and 2002. None of the habitats that might support endangered, threatened or vulnerable species have been changed or will be changed by the irrigation of the CFA Low land.

Requests were made to the Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) and to the NSW National Parks and Wildlife Service (NPWS) (more specifically to the wildlife data exchange officer / office of environment and heritage / department of premier and cabinet / scientific services division / information sciences branch / spatial data programs section / wildlife data unit) regarding endangered and vulnerable flora and fauna in the CFA Low area. The request to the DSEWPC was for the entire Wagga Wagga Local Council area and the request to NPWS was for an area 10km x 10km around Bomen, so it is not surprising that more species were reported for the larger Council area from DSEWPC.

The lists of species provided by NPWS (**Tables 8** and **10**) and DSEWPC (**Tables 9** and **11**) are provided in the following tables with information about the habitat and the impacts that the CFA Low project might have. The CFA Low development will not impact any existing native flora or fauna of the area. No vulnerable or endangered species will be affected by the proposed development.

Table 8 – Flora Species identified as Vulnerable or Endangered by NSW NSWS				
Scientific	Common	ve	Habitat	Impact
Senecio garlandii	Woolly Ragwort	v	Wooly Ragwort grows on the sheltered lower slopes of isolated rocky outcrops in NSW.	Habitat not found on CFA Low site. No Rocky outcrops on CFA Low. Species not identified in previous surveys.
Swainsona murrayana	Slender Darling-pea, Slender Swainson, Murray Swainson-pea	v	Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. Swainsona species contain a poisoning principle, swainsonine, which affects the nervous system and is toxic to stock.	Species not identified in previous surveys. Toxic properties would be critical to grazing on site so it is unlikely that there has been any colonisation since the previous surveys.

Table 9 – Flora Species identified as Vulnerable or Endangered by Australian Government DSEWPC				
Scientific	Common	ve	Habitat	Impact
Senecio garlandii	Woolly Ragwort	v	Described in NSW List	Described in NSW List
Swainsona murrayana	Slender Darling-pea	v	Described in NSW List	Described in NSW List
Ammobium craspedioides	Yass Daisy	v	Grows in sclerophyll woodland, forest and on roadsides, rare, confined to the Yass district. Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities.	Species not identified in previous surveys. There have been no changes since previous surveys and no changes planned so unlikely to be present or impacted.
Amphibromus fluitans	River Swamp Wallaby-grass	v	River Swamp Wallaby-grass inhabits both natural and man-made water-bodies, including swamps, lagoons, billabongs and dams, and in roadside ditches	Habitat not found on CFA Low site. No significant standing water like lagoons and swamps.

Table 9 (continued) – Flora Species identified as Vulnerable or Endangered by Australian Government DSEWPC				
Scientific	Common	ve	Habitat	Impact
Austrostipa wakoolica	(A Spear Grass)	e	Grows on floodplains of the Murray River tributaries, in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise.	Disturbed CFA Low habitat not suitable for colonisation by new species.
Brachyscome muelleroides	Mueller Daisy, Claypan Daisy	v	Grows in damp areas on the margins of claypans in moist grassland with Pycnosorus globosus, Agrostis avenacea and Austrodanthonia duttoniana. Also recorded from the margins of lagoons in mud or water, and in association with Calotis anthemoides. The species occurs in seasonally wet depressions in the landscape, and appears to rely on seasonal inundation to survive.	Species not identified in previous surveys. Site would not be described as moist or to have seasonally wet depressions. There have been no changes since previous surveys and no changes planned so unlikely to be present or impacted.
Brachyscome papillosa	Mossgiel Daisy	v	Occurs chiefly from Mossgiel to Urana, in south-western NSW, with sites in the Jerilderie area, the Hay Plain, Willandra Lakes district and north to Ivanhoe. A north-western outlier is at Byrnedale Station, north of Menindee. The only known site on South Western Slopes is Ganmain Reserve. Recorded primarily in clay soils on Bladder Saltbush (Atriplex vesicaria) and Maireana aphylla plains, but also in grassland and in Grey Box (Eucalyptus microcarpa) - Cypress Pine (Callitris spp.) woodland.	Mossgiel to Urana is west of Bomen by 100-300km. Jerilderie is west by 150+ km. Hay Plain 250+km west.
Tylophora linearis	(A Slender, almost hairless twiner)	E*	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of Eucalyptus fibrosa, Eucalyptus sideroxylon, Eucalyptus albens, Callitris endlicheri, Callitris glaucophylla and Allocasuarina luehmannii. *National Status: Endangered, NSW status: vulnerable	Species not identified in previous surveys. Habitat inappropriate. There have been no changes since previous surveys and no changes planned so unlikely to be present or impacted.

Table 10 – Fauna Species identified as Vulnerable or Endangered by NSW NSWS				
Scientific	Common	E-V	Habitat	Impact
Hieraaetus morphnoides	Little Eagle	V	The Little Eagle is seen over woodland and forested lands and open country, extending into the arid zone. The Little Eagle occupies habitats rich in prey within open eucalypt forest, woodland or open woodland. Sheoak or acacia woodlands and riparian woodlands of interior NSW are also used (Marchant and Higgins 1993; Aumann 2001a). For nest sites it requires a tall living tree within a remnant patch, where pairs build a large stick nest in winter and lay in early spring. Young fledge in early summer. It eats birds, reptiles and mammals, occasionally adding large insects and carrion	CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.
Glossopsitta pusilla	Little Lorikeet	V	Little Lorikeets mostly occur in dry, open eucalypt forests and woodlands. They have been recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes.	CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.
Lathamus discolor	Swift parrot	E1-Th	The Swift Parrot inhabits dry sclerophyll eucalypt forests and woodlands. The Swift Parrot migrates from its Tasmanian breeding grounds to overwinter in the box-ironbark forests and woodlands of Victoria, New South Wales and southern Queensland.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. As described in 2002 EIS.
Neophema pulchella	Turquoise Parrot	V	Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. The Turquoise Parrot favours open, grassy woodland with dead trees near permanent water. It also inhabits coastal heaths and pastures with exotic grasses and weeds, along roadsides and in orchards.	CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.

Table 10 (continued) – Fauna Species identified as Vulnerable or Endangered by NSW NSWS				
Scientific	Common	E-V	Habitat	Impact
Polytelis swainsonii	Superb parrot	V-Th	The Superb Parrot mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums (*Eucalyptus camaldulensis*) and box eucalypts such as Yellow Box (*Eucalyptus melliodora*) or Grey Box (*E. microcarpa*).	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. As described in 2002 EIS.
Climacteris picumnus	Brown Treecreeper	V	Found in eucalypt woodlands (including Box-Gum Woodland) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and River Red Gum (Eucalyptus camaldulensis) Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses; usually not found in woodlands with a dense shrub layer; fallen timber is an important habitat component for foraging; also recorded, though less commonly, in similar woodland habitats on the coastal ranges and plains.	CFA Low is a cleared site with a row of trees on the perimeter. There is not any fallen timber for foraging so this would not be an attractive site for the Brown Treecreeper. Few trees will be felled. Species not identified in previous surveys.
Anthochaera phrygia	Regent Honeyeater	E4ATh	Regent Honeyeaters mostly occur in dry box-ironbark eucalypt woodland and dry sclerophyll forest associations, wherein they prefer the most fertile sites available, e.g. along creek flats, or in broad river valleys and foothills. In NSW, riparian forests containing *Casuarina cunninghamiana* (River Oak), and with *Amyema cambagei* (Needle-leaf Mistletoe), are also important for feeding and breeding.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. As described in 2002 EIS

Table 10 (continued) – Fauna Species identified as Vulnerable or Endangered by NSW NSWS

Scientific	Common	E-V	Habitat	Impact
Epthianura albifrons	White-fronted Chat	V	The White-fronted Chat lives in salt marsh and other damp areas with low vegetation such as swampy farmland and roadside verges. Sometimes occurs on beaches and the edges of lakes.	Habitat not found on CFA Low site. The farmland is not swampy now or in past years and it will not be in the future. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.
Melithreptus gularis gularis	Black chinned Honeyeater (es)	V	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Mugga Ironbark (Eucalyptus sideroxylon), White Box (E. albens), Inland Grey Box (E. microcarpa), Yellow Box (E. melliodora) and Forest Red Gum (E. tereticornis). Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks and tea-trees.	CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.
Pomatostomus temporalis temporalis	Grey Crowned Babbler (es)	V	Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Flight is laborious so birds prefer to hop to the top of a tree and glide down to the next one. Birds are generally unable to cross large open areas.	CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. Species not identified in previous surveys.
Macrotis lagotis	Bilby	E4	Once widespread in arid, semi-arid and relatively fertile areas, the Greater Bilby is now restricted to arid wastelands and remains endangered. Most Bilbies live in sandy desert areas in Spinifex (Triodia species) grasslands. They dig large large burrows up to 2 metres deep in sandplain country. They also seem to prefer freshly burnt country where there are more plentiful supplies of preferred foods.	The typical habitat is not found on CFA Low site and the current distribution is far from Bomen. The site would not be ideal for digging the large burrows. Species not identified in previous surveys.

Table 10 (continued) – Fauna Species identified as Vulnerable or Endangered by NSW NSWS				
Scientific	Common	E-V	Habitat	Impact
Petaurus norfolcensis	Squirrel Glider	E2	Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range. Prefers mixed species stands with a shrub or Acacia midstorey.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. CFA Low is not woodland or a forest. Few trees will be felled. Species not identified in previous surveys.
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. CFA Low is not forested and there are no caves. Few trees will be felled. Species not identified in previous surveys.
Myotis macropus	Southern Myotis (Bat)	V	Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage. Forage over streams and pools catching insects and small fish by raking their feet across the water surface.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. CFA Low is not forested and there are no caves. Few trees will be felled. Species not identified in previous surveys.

Table 11 – Fauna Species identified as Vulnerable or Endangered by Australian Government DSEWPC				
Scientific	Common	ev	Habitat	Impact
Lathamus discolor	Swift parrot	e	Described in NSW List	Described in NSW List
Anthochaera phrygia	Regent Honeyeater	e	Described in NSW List	Described in NSW List
Polytelis swainsonii	Superb parrot	v	Described in NSW List	Described in NSW List
Leipoa ocellata	Malleefowl	v	The Malleefowl occurs in shrublands and low woodlands that are dominated by mallee vegetation. It also occurs in other habitat types including eucalypt or native pine *Callitris* woodlands, acacia shrublands, Broombush *Melaleuca uncinata* vegetation.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. There are no shrubs in the central part of the site.
Pedionomous torquatus	Plains wanderer	v	The Plains-wanderer inhabits sparse, treeless, lowland native grasslands. These grasslands usually occur on hard, red-brown clay soils that do not support dense pasture growth under any conditions. They typically consist of about 50% bare ground, 40% grasses and herbs, and 10% litter. The majority of the vegetation is less than 5 cm tall, but larger plants, mostly up to 30 cm tall, and generally spaced 10 to 20 cm apart, are important because they provide shelter from predators.	Habitat not found on CFA Low site. The grazing land that is on the CFA Low site now is not 50% bare ground.
Rostratula australis	Australian painted snipe	v	The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans.	Habitat not found on CFA Low site. No wetlands, swamps or permanent lakes on site.
Dasyurus maculatus maculatus	Spot tailed Quoll, Tiger Quoll	e	The Spot-tailed Quoll has a preference for mature wet forest habitat. Habitat requirements include suitable den sites such as hollow logs, tree hollows, rock outcrops or caves (NPWS 1999at)	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. There are no rock outcrops or caves. Few trees will be felled. As described in 2002 EIS.

Table 11 (continued) – Fauna Species identified as Vulnerable or Endangered by Australian Government DSEWPC				
Scientific	Common	ev	Habitat	Impact
Nyctophilus timoriensis (south-eastern form)	Greater Long eared bat	v	The South-eastern Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled. As described in 2002 EIS.
Pseudomys fumeus	Konoom, smoky mouse	e	The Smoky Mouse occurs in a variety of vegetation communities, ranging from coastal heath to dry ridgeline forest, sub-alpine heath and occasionally, wetter gullies.	Habitat not found on CFA Low site. CFA Low is a cleared site with a row of trees on the perimeter. Few trees will be felled.
Litoria booroolongensis	Booroolong Frog	e	The Booroolong Frog is present along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses	Habitat not found on CFA Low site. There are no permanent streams through the CFA Low land.
Litoria rainformis	Growling Grass Frog, Green and Golden Frog	v	This species is found mostly amongst emergent vegetation (Robinson 1993), including *Typha sp.* (bullrush), *Phragmites sp.* (reeds) and *Eleocharis sp.* (sedges), in or at the edges of still or slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams	Habitat not found on CFA Low site. No significant standing water like lagoons and swamps. As described in 2002 EIS.
Aprasia parapulchella	Pink tailed worm lizard	v	The species is only found at sites with good numbers of invertebrates under rocks (Barrer 1992). The populations in NSW are restricted to one small site near Bathurst and two small hills in farmland near Tarcutta.	Habitat not found on CFA Low site. CFA Low is not a rocky site.
Delma impar	Striped legless Lizard	v	Natural temperate grassland. At the Commonwealth Defence Land, Lawson (ACT), survey results indicate a decline in population that is compounded when grassland is grazed. Heavy habitat modification by extended intense grazing, pasture improvement, ploughing, and drought can eliminate this species from a site	Habitat not found on CFA Low site. CFA Low is a disturbed site with forage for cattle grazing.

Table 11 (continued) – Fauna Species identified as Vulnerable or Endangered by Australian Government DSEWPC				
Scientific	Common	ev	Habitat	Impact
Maccullochella peeli peeli	Murray Cod, Goodoo	v	The Murray Cod is found in a wide range of warm water habitats, from clear, rocky streams to slow-flowing turbid rivers and billabongs. Generally, they are found in waters up to 5 m deep and in sheltered areas with cover from rocks, timber or overhanging banks.	Habitat not found on CFA Low site. No major Rivers on site
Macquaria australasica	Macquarie Perch	e	The Macquarie Perch is a riverine, schooling species. It prefers clear water and deep, rocky holes with lots of cover.	Habitat not found on CFA Low site. No major Rivers on site

11. Hazard and Risk Assessment

The Director-General's requirements for Hazards and Risks are described in two parts:

1) Risks to adjacent industries, and
2) A preliminary risk screening following SEPP 33.

These are addressed in the following sections.

11.1 Risks to Adjacent Industries

The proposed irrigation of CFA Low does not pose any risks to adjacent constructed industries because there are no buildings or other facilities near the irrigation area and it is unlikely that there ever will be. The area adjacent to CFA Low is all in the 100 year flood plain so it is unlikely that any industrial development would ever be allowed on the land.

The only "industry" that might be impacted by the development would be agriculture if the adjacent properties were developed for agriculture and water escaped the site in some way. There are four ways that contaminated water could escape the site:

- Spray Drift
- Direct Discharge due to a broken pipe or some other condition
- Discharge of runoff water with high volumes of irrigation water
- Groundwater contaminated on the CFA Low site, migrating to aquifers adjacent to the CFA Low site.

Cargill has developed methods to minimise the risk of all four of these possibilities and has used these methods successfully since the 1990's when irrigating the CFA High area. Cargill also plans to monitor surface water and groundwater to ensure that the control methods are working as designed. Additionally, the risk of harmful impacts will be reduced for the CFA Low land because the irrigated wastewater will be a higher quality than in previous years.

11.2 Hazard and Offensive Development – SEPP 33

11.2.1 Introduction

The Director-General's Requirements require:

> "A preliminary risk screening must be completed in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33) and *Applying SEPP 33* (DUAP, 1994) and where necessary, a Preliminary Hazard Analysis (PHA) undertaken."

The Department of Planning has produced a newer version of *Applying SEPP 33* that was released in January 2011.

11.2.2 Does SEPP 33 Apply?

In order for SEPP 33 to apply two conditions must be met:

> A. The development must require consent under section 3A or section 4 of the EP&A Act,
> and the development must be either

B. A potentially hazardous industry or a potentially offensive industry.

Cargill is seeking approval for a Modification to Development Application No 220-07-2002-i which was granted under the EP&A Act so the condition described in part A. above is met.

The development is not a potentially hazardous industry because there are no hazardous materials of any kind or in any quantity stored on the CFA Low land. Therefore, the first part of part B., has not been met. This is also important because the Director-General's requirements say that "where necessary, a Preliminary Hazard Analysis (PHA)" should be undertaken. As there is no potentially hazardous industry there is no necessity for a PHA.

The key consideration in assessing whether a development is offensive "is that the consent authority is satisfied that there are adequate safeguards to ensure emissions from a facility can be controlled to a level that they are not significant. An important factor in making this judgement is the view of the OEH (for those proposals requiring a pollution control licence)." The industry is generally not considered offensive, if the OEH considers that the licence conditions can be met.

It is assumed that the OEH will require conditions similar to the conditions required for the CFA High Land that has been irrigated for many years. If the conditions are similar then it is assumed that the OEH will consider that Cargill will be able to meet the conditions as Cargill has met the conditions for the CFA High land.

11.2.3 OEH Licence Conditions Summary

Cargill holds NSW Environment Protection Licence Number 2262. It can be inspected on the OEH website or Cargill can provide a copy if required. The following are the key elements to the Licence for the irrigation of effluent onto CFA High.

Section 2 requires effluent quality monitoring and soil monitoring. Section 3 sets concentration limits for the discharges to Water and Land.

Section 4 has Operating conditions including:

- Activities be carried out in a competent manner
- All plant and equipment be operated and maintained in a proper and efficient way
- Effluent application must not occur in a manner which causes surface runoff
- Spray drift must not drift beyond the boundary of the premises
- Livestock access must be denied during irrigation and not allowed until the irrigation water has dried on the paddock. [Cargill plans to grow lucerne on CFA Low but does not object to this condition remaining in the licence].
- The quantity of effluent and solids must not exceed the soils ability to effectively utilise the effluent and solids.

Section 5 requires monitoring and record keeping. The records must be kept in complete and legible form for at least 4 years and available to any authorised officer of OEH on request. The records include:

- Dates and times on which samples were taken
- The sample point location and the name of the sampler

- Analytes include: BOD, conductivity, Exchangeable Ca, Mg, K and Na, Exchangeable Sodium %, extractable P, Nitrate, Total N, Total P, Phosphorus Sorption Capacity, TOC and pH
- A record of complaints must be kept

Section 6 requires annual reporting and lists the details of the Annual Return.

12. Greenhouse Gas Assessment

12.1 Introduction and Assumptions

The assessment of the Greenhouse Gas impact from the CFA Low project can be summarised by comparing:

- The Greenhouse gases produced if the CFA Low project is approved and goes forward,

with

- The greenhouse gases generated assuming that the CFA Low project does not go forward.

In the case that the CFA Low project does not go forward the wastewater from the final Pond in the new treatment plant would be pumped / flow by gravity to the Bomen Industrial Sewage Treatment Facility (BISTF) and treated with the other wastewater that flows to the BISTF. Using the data previously discussed in this report and the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (referred to as the NGER) the following assumptions can be made.

The following assumptions are relevant to both options.

- Total volume of wastewater to be irrigated per year = 300 ML
- The COD, BOD and TKN of the effluent to irrigation and the BISTF will be as shown in **Table 12**

Table 12 – Treated Effluent Design Factors

Parameter	Design Quality to Irrigation or Sewer	Assumed Quality to Irrigation or Sewer
Chemical Oxygen Demand (mg/L)	150	150
BOD_5 (mg/L)	<20	20
TKN (mg/L)	<50	50

Source: Johns Environmental Pty Ltd (2009) page 11/26

- NGER Conversion Factor for tonnes of COD converted anaerobically to methane = 5.3 tonnes of CO_2-e per tonne of COD when converted to methane (page 180 / 238) NGER
- Assumed conversion factor for COD converted aerobically to CO_2 = 5.3 divided by 21 (which is the multiplier factor for methane compared to CO_2) = 5.3 / 21 = 0.25 tonnes of CO_2-e per tonne of COD
- NGER conversion factor for tonnes of Nitrogen converted to NO_x and the equivalent NO_x = 4.9 tonnes of CO_2-e per tonne (page 183 / 238) NGER
- NGER power consumption factor 0.89kg CO_2-e/kW-hour
- Fuel economy for a ute = 8 km / Litre of petrol
- Fuel economy for large truck = 3 km / Litre of petrol / diesel

- NGER conversion factor = 2.38 kg CO_2-e/ Litre of petrol

12.2 Greenhouse Gas Generation by Treatment at BISTF

12.2.1 Conversion of COD to CO_2-e

Although the COD would only be reduced 150 mg/L to 50 mg/L at the BISTF it must be assumed that eventually all the COD would be converted to CO_2 following discharge to the receiving waters. Using the National Greenhouse and Energy Reporting (Measurement) Determination 2008 (referred to as the NGER) conversion factors, the mass of greenhouse gases that will be generated by the treatment of the wastewater can be calculated.

300 ML/year x 150 mg COD /L x 10^6 L/Ml x 10^{-9} tonnes/mg = 45 tonnes COD/year
Assuming that 100% of the 45 tonnes of COD would be converted aerobically in the BISTF and in the natural environment, the conversion to CO_2-e would be 1/21st as high as the conversion of COD to methane = 0.25 tonnes of CO_2-e per tonne of COD
45 tonnes of COD x 0.25 tonnes of CO_2-e per tonne of COD = 11.2 tonnes CO_2-e / year

12.2.2 Conversion of total Nitrogen to NO_x and CO_2-e

The impacts of Total Nitrogen can be calculated in a similar way:
300 ML/year x 50 mg TKN /L x 10^6 L/Ml x 10^{-9} tonnes/mg = 15 tonnes TKN/year
Assume 10% would be discharged as sludge and not be converted to NO_x, because the sludge would be subject to nitrification / denitrification where the Nitrogen would be finally converted to N_2 gas which does not have a greenhouse potential.
15 tonnes / year x 90% = 13.5 tonnes / year
13.5 tonnes of NO_x x 4.9 tonnes of CO_2-e per tonne of NO_x = 66 tonnes CO_2-e / year

12.2.3 Power Usage and CO_2-e conversion for Treatment at BISTF

Assuming 1.03 kW-hours/kL of CFA wastewater through the BISTF based on the letter from, City of Wagga Wagga to Cargill Beef Australia, dated 20 December 2010. The 300 ML of wastewater to be irrigated would require:
1.03 kW-hours/kL x 300 ML / year x 1000 kL/ML = 309,000 kW-hours/year
309,000 kW-hours/year x 0.89kg CO2-e/kW-hour = 275 tonnes / year

12.2.4 Pumping power usage from Cargill Beef to BISTF

Pumping costs for pumping to the BISTF would probably be similar to pumping to the CFA Low irrigation area. The final effluent pond is at a higher elevation than both the BISTF and the CFA Low area. The distance is greater to the BISTF but there needs to be more pressure to CFA Low to spread the irrigation water. Irrigation is planned for the months of October through April, which is 212 days in a non-leap year. Assuming that irrigation can only be carried out on 125 days then 2.4 ML/day would have to be pumped to the irrigation area. If the irrigation was over a 12 hour period this would be 200,000 Litres/hour or 56 Litres per second.

Assuming 56 L/sec pumped through a 250mm pipe with 1000 m under pressure and then the remainder by gravity, the friction would be 4.7m. Assuming 60% efficiency for the pump and motor together, about 1.3 kW would be needed to pump against 5m of head at 56L/sec, therefore, about 1900 kW-hours per year would be needed.
1900 kW-hrs x 0.89 kg CO_2-e/kW-hr = 1.7 tonnes/year

12.2.5 Maintenance costs for pumping

Assuming one ute driven around Wagga Wagga for the maintenance. It is assumed that the 300 ML/year would be about 30% of the total flow to the BISTF and that half the km travelled would be travelled anyway so 15% of the total driven in a year can be used. Assuming 16,000 km/year the fraction for the 300 ML would be 16,000km x 0.15 = 2400 km.
2400km / 8km/L of petrol = 300 L/year
300 L/year x 2.38 kg CO_2-e/ Litre of petrol = 0.7 tonnes CO_2-e/ year

12.2.6 Transport of Lucerne

It is assumed that the energy used to cut the Lucerne is the same regardless of whether it is done on CFA Low or at another property. It is only the transportation costs that are different. Assuming 20 tonnes / hectare-year of lucerne can be grown on CFA Low then 540 tonnes of Lucerne can replace feed that must be brought in from off site. To be conservative it is assumed that 20 tonnes of lucerne can be brought in per 40 km round trip. That means 27 trips which equals 1080km. Assuming 3 km/Litre that is 360 Litres of petrol / diesel.
360 L/year x 2.38 kg CO_2-e/ Litre of petrol = 0.9 tonnes CO_2-e/ year

12.3 Greenhouse Gas Generation by Irrigation of CFA Low

12.3.1 Conversion of COD to CO_2-e

It is assumed that a thin layer of organic material (COD) on the grass or on the ground would breakdown aerobically after irrigation. The aeration of the initial application of irrigation water to the crop would be extensive considering that the strength of the wastewater effluent is relatively low and the aeration during irrigation would be 100% saturation. Although the COD would only be reduced from 150 mg/L to 50 - 100 mg/L initially, it must be assumed that eventually all the COD would be converted to CO_2 in the soils. Using the NGER conversion factors, the mass of greenhouse gases that will be generated by the treatment of the wastewater can be calculated.

300 ML/year x 150 mg COD /L x 10^6 L/Ml x 10^{-9} tonnes/mg = 45 tonnes COD/year
Assuming that 100% of the 45 tonnes of COD would be converted aerobically in the air, soils and natural environment, the conversion to CO_2-e would be 1/21st as high as the conversion of COD to methane = 0.25 tonnes of CO_2-e per tonne of COD
45 tonnes of COD x 0.25 tonnes of CO_2-e per tonne of COD = 11.2 tonnes CO_2-e / year

12.3.2 Conversion of total Nitrogen to NO_x and CO_2-e

The impacts of Total Nitrogen can be calculated in a similar way:
300 ML/year x 50 mg TKN /L x 10^6 L/Ml x 10^{-9} tonnes/mg = 15 tonnes TKN/year
Assume 10% would remain in the soil, be taken up in the plants and not be converted to NO_x, and also be subject to nitrification / denitrification where the Nitrogen would be finally converted to N_2 gas which does not have a greenhouse potential.
15 tonnes / year x 90% = 13.5 tonnes / year
13.5 tonnes of NO_x x 4.9 tonnes of CO_2-e per tonne of NO_x = 66 tonnes CO_2-e / year

12.3.3 Power Usage and CO_2-e conversion for Treatment

There is no additional treatment so there is no additional power usage.

12.3.4 Pumping power usage from Cargill Beef to CFA low

Pumping costs for pumping to the BISTF would probably be similar to pumping to the CFA Low irrigation area. The final effluent pond is at a higher elevation than both the BISTF and the CFA Low area. The distance is greater to the BISTF, but there needs to be more pressure to CFA Low to spread the irrigation water. Irrigation is planned for the months of October through April, which is 212 days in a non-leap year. Assuming that irrigation can only be carried out on 125 days then 2.4 ML/day would have to be pumped to the irrigation area. If the irrigation was over a 12 hour period this would be 200,000 Litres/hour or 56 Litres per second.

Assuming 56 L/sec pumped through a 250mm pipe with 2500 m under pressure, the friction would be 12m. Assuming an additional 5 m of head to account for valves and irrigation pipe constrictions the total would be 17 m of head. Assuming 60% efficiency for the pump and motor together, about 4.3 kW would be needed to pump against 17m of head at 56L/sec, therefore, about 6500 kW-hours per year would be needed.
6500 kW-hrs x 0.89 kg CO_2-e/kW-hr = 5.8 tonnes/year

12.3.5 Maintenance costs for pumping

Assuming one ute driven around Wagga Wagga and the Bomen site for the maintenance. It is assumed that the ute will be driven 40 km on each day of irrigation (125 days x 40 km/day = 5000 km) and an additional 1000km of driving will also be necessary.
6000 km / 8km/L of petrol = 750 L/year
750 L/year x 2.38 kg CO_2-e/ Litre of petrol = 1.8 tonnes CO_2-e/ year

12.3.6 Transport of Lucerne

The transport costs of the Lucerne from CFA Low to the Beef Processing Facility are negligible compared to bringing the Lucerne from offsite so they are assumed to be zero for this comparison.

12.4 Comparison of CO_2-e for treatment at BISTF and irrigation on CFA Low

Table 13 below shows that the Greenhouse gas impact is much greater when pumping the 300 ML / year to the BISTF, primarily because of the power needed for the aerators, pumps and other equipment at the BISTF.

Table 13 – Comparison of Greenhouse gases resulting from sending 300 ML to BISTF or irrigation 300 ML. Tonnes of CO_2-e/year

	BISTF	CFA Low
COD to CO_2	11	11
Total Nitrogen to NOx and CO_2-e	66	66
Power at BISTF for Treatment	275	0
Pumping to BISTF or CFA Low	2	6
Petrol for Maintenance	1	2
Transport of Lucerne	1	0
Total	356	85

13. Other Key Environmental Impacts

13.1 Noise

The site is relatively remote with only the three residences on the southeast side of the site within one kilometre. The spraying of the irrigation water would probably be inaudible. There may be some audible noise from the site when the lucerne is cut and bailed. The neighbouring residences would probably receive more noise impacts from the roads and railway line.

The risk of noise impacts during operation is minute considering that the sprinklers are quiet, the pumps are located over a kilometre inside the Cargill property and the nearest premises is hundreds of metres from the sprinklers and partially blocked at some angles from any potential noise. Even if a pipe broke and there was some spraying of water under pressure the chances of it causing some kind of loud noise are minor.

There may be some noise impacts during construction with excavating equipment on site, but there will be no rock breaking or other especially loud construction noise. The construction may be carried out over several months but the noisy work itself should be completed in less than 20 days of full time work.

13.2 Dust

The irrigation would not generate any dust. There is potential for some dust generated during installation of the pipelines but this would be minor or non-existent. The cutting and bailing of the lucerne may generate vegetative dust during the cutting, but this would be infrequent and minor. Similarly the planting and other cropping activities would also be infrequent and generate minor amounts of dust.

13.3 Groundwater

CBA understands that it is important to monitor and protect the groundwater so three groundwater bores will be positioned around the perimeter of the site following approval of the proposal. The first sampling will commence prior to the first irrigation so that background levels of all the important groundwater constituents can be determined. Analytes will include: Nitrate, TKN, Ammonia, Orthophosphate, pH, Conductivity, TDS, Sodium, Magnesium, Calcium, Potassium and Chloride.

13.4 Visual Impacts

While the sprinklers are on the water may be seen from the nearest residences. The growth of the lucerne will be higher than the pasture grasses that are on site now, but that is unlikely to have a negative visual impact.

13.5 Cultural Heritage

Two archaeological surveys were carried out for the 1997 Environmental Impact Statement (EIS) prepared by HLA-Envirosciences. These are included in the appendices of the EIS. The reports showed that only one isolated artefact was located during the course of the surveys and this piece of brown coarse rubbing silicate was not found on CFA Low it was found on another property being investigated for the larger EIS. It was concluded that this artefact was transported to the site rather than originating at the site. The reports concluded that there would be no archaeological impediments to a development on the CBA property including the CFA Low site.

During the excavations for the ESU construction one brown silcrete grindstone was found. An application to the DECCW / OEH for a Care Agreement pursuant to s.85A1(c) of the National Parks and Wildlife Act was made on 30 November 2010. A Care Agreement was issued to the Wagga Wagga Local Aboriginal Land Council on 9 December 2010. The grindstone was found in a highly developed area of the CBA site that has been subject to extensive earthworks. DECCW / OEH has written to CBA thanking CBA for the appropriate safe handling of the Grindstone.

As with the previous discovered rubbing silicate, the grindstone was not found on the CFA Low land and there is no indication that there are likely to be any issues regarding aboriginal heritage on the CFA Low site.

14. Potential Environmental Risks

The Director General’s Requirements require:

> “a risk assessment of the potential environmental impacts of the project, identifying the key issues for further assessment.”

Although the environmental risks associated with the CFA Low project have been discussed in other parts of this report, a Risk Matrix with values for Consequences and Likelihood has been adopted to formally address this requirement. Each issue is summarised in **Table 14**. An explanation of the Risk matrix is included in the Appendices.

Table 14 – Summary of Environmental Risks for proposed CFA Low Project			
	Likelihood	Consequences	Risk
	E = Rare	5 = Insignificant	
Water Pollution – Broken Pipe / Berm Failure	E	4	Low
Water Pollution – Flood Murrumbidgee	E	5	Low
Water Pollution – Runoff / Berm Failure	E	5	Low
Groundwater Pollution	E	4	Low
Salty runoff from Saline Soil	E	5	Low
High nutrient runoff from Contaminated Soil	E	5	Low
Spray Drift	E	4	Low
Construction Noise	E	5	Low
Operational Noise	E	5	Low
Construction Dust	E	5	Low
Operational Dust	E	5	Low
Flora Impacts due to Operation	E	4	Low
Fauna Impacts due to Operation	E	4	Low
Visual Impacts	E	5	Low
Cultural Heritage	E	4	Low

Every likelihood has been designated to be rare due to the design of the irrigation system including the operational methods to be employed.

15. Cumulative Impacts of CFA Low with CBA Meat Processing Facility

As described in the section above, the environmental risks of the CFA Low project have been reduced to very low levels due to the management systems being put in place for the irrigation and due to the experience that CBA has in irrigation management of this kind. Other factors for the low risk to the environment are that the surrounding land uses are agricultural land similar to the CFA low land and there have been no changes to the land uses of the CFA Low land or the surrounding lands for many years.

15.1 Cumulative Impacts for Odour

The odour from the irrigation is expected to be negligible because the wastewater will be treated to less than 20 mg/L BOD. At 20 mg/L there will not be significant anaerobic breakdown of the organics in the wastewater which is the usual source of the most severe odours from wastewater. Procedures will be put in place to control spray drift which will have the dual purpose of controlling the drift of potential odours from the irrigation off site. Odours from the larger CBA site have been considered in the past and the new treatment plant is one of the methods that that CBA is employing to reduce overall odours from the site. Taken together the odour impacts are likely to be greatly reduced considering the new treatment plant and the new irrigation of the CFA Low land.

15.2 Cumulative Impacts for Waste

There are no waste management issues with regard to the irrigation of the CFA Low land so there will be no cumulative issues with respect to the CBA site as a whole.

15.3 Cumulative Impacts for Soils

The CFA Low land is separated by about 700 metres from the CFA High irrigation area and the wastewater treatment plant. There is no reason to believe that the irrigation of the CFA Low land could impact the CFA High soils or vice versa. There are no other soils impacts that are anticipated so there are no cumulative impacts on soils.

15.4 Cumulative Impacts for Preservation of Water Quality

The irrigation of the CFA Low land would provide a positive impact because less water from CBA would go to the BISTF and that water, including the nutrients in the water, would be used to grow Lucerne. The Lucerne would then be eaten by the cattle on site rather than requiring feed to be brought in from off site with the additional requirement for resources. The load on the BISTF would also be reduced and the mass of nutrients and organics disposed to landfill and to the Murrumbidgee from the BISTF would also be reduced.

16. Conclusions

CBA has experience managing wastewater treatment and irrigation of wastewater effluent. This proposal is an expansion of the irrigation already approved, with the only change being an expansion to a previously irrigated area. All the same safeguards and management practices that have been used in the past will serve as the basis for future monitoring and management of the system. CBA will continue to improve the treatment and irrigation systems, as this proposal indicates, and endeavour to continue to protect the environment.

Special care will be taken with the monitoring and management of the soil at CFA Low to ensure that the Phosphorus and Nitrogen levels are sustainable and that the salinity and sodicity of the soil remain appropriate for lucerne or whatever crops are planted on the site. Care will also be taken with potential impacts to groundwater from the irrigation.

CBA looks forward to working with the Department of Planning to provide whatever information is required to assist the Department in its assessment.

17. References

Aitken Rowe Testing Laboratories Pty. Ltd. Annual Soil Sampling & Analysis for Proposed Irrigation Area, Reg. No.: S10-100, sampling completed on 1st April 2010

Applying SEPP 33 (2011)– Hazardous and Offensive Development Application Guidelines, NSW Department of Planning, January 2011, DOP HAZ_002

Colorado State University Fact Sheet no. 0.504 – Managing Sodic Soils http://www.ext.colostate.edu/pubs/crops/00504.html

Daily Advertiser (6 Dec 2010) Major Flood Warning for the Murrumbidgee River http://www.dailyadvertiser.com.au/news/local/news/general/major-flood-warning-for-the-murrumbidgee-river/2017351.aspx

DEC Environmental Guidelines, Use of Effluent by Irrigation (2004), DEC 2004/87

DECCW, 27 January 2011, Letter from Brian Wild, DECCW to Andrew Hartcher Department of Planning, dated 27 January 2011, DECCW reference: LIC518-07 DOC11/3787

Director-General's Requirements, attached to letter from Chris Ritchie, NSW Department of Planning to Mr. Matt Wentzel, Cargill Beef Australia, dated 16/3/11, DoP reference: 10/07446

Environment Protection Biodiversity Conservation Act 1999 (EPBC Act), including amendments 16 May 2005, Prepared by the Office of Legislative Drafting and Publishing, Attorney General's Department, Canberra

International River Symposium, 2010 http://www.riversymposium.com/index.php?element=Th_S1_GH1_Craig+MacKay.pdf

Johns Environmental Pty. Ltd., Wastewater Treatment Upgrade at Cargill Wagga Meat Processing Plant, August 2009 (26 Pages)

Johns Environmental Pty. Ltd, DRAFT Process Options for Wastewater Treatment Upgrade at Cargill Wagga Meat Processing Plant, August 2009 (43 pages)

National Greenhouse and Energy Reporting (Measurement) Determination 2008, (NGER) Prepared by the Office of legislative Drafting and Publishing, Attorney General's office, Canberra, ACT, Australia

National Water Quality Management Strategy, Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006

Odour Unit (August 2007) Odour Impact Assessment required by Development Consent DA 220-07-2002-i, Conditions 5.5, 6.1, 6.2 and 6.3, Cargill Beef Australia

State Environmental Planning Policy 33 – Hazardous and Offensive Development, NSW Department of Planning

Wagga Wagga City Council (WWCC, 8 March 2011) letter from Colin Farmer WWCC to Andrew Hartcher, WWCC Ref: Cargill Beef Abattoir, DoP Received Stamp dated 17 Mar 2011

WWCC (April 2009) Wagga Wagga Floodplain Management Plan, prepared by WMAwater, Level 2, 160 Clarence St, Sydney NSW 2000

Wagga Wagga City Council, Notice of Determination for Development Application No 215 / 97, dated 13 February 1998

Wagga Wagga City Council (Dec, 2010), Letter from Geoff Veneris, Acting Manager, Waste and Stormwater, City of Wagga Wagga to Matt Wentzel, Operations Manager, Cargill Beef Australia, dated 20 December 2010, regarding power usage at the BISTF

Wikipedia File:Murrumbidgee River in major flood and historic maker showing the '74 flood 1.jpg
http://en.wikipedia.org/wiki/File:Murrumbidgee_River_in_major_flood_and_historic_maker_showing_the_'74_flood_1.jpg

Appendix A – Explanation of Risk Matrix

The risk analysis matrix is as follows:

LIKELIHOOD	***CONSEQUENCES***				
	Catastrophic 1	Major 2	Moderate 3	Minor 4	Insignificant 5
A (almost certain/daily)	Extreme	Extreme	Extreme	High	High
B (likely/weekly)	Extreme	Extreme	High	High	Medium
C (possible/monthly)	Extreme	Extreme	High	Medium	Low
D (unlikely/annually)	Extreme	High	Medium	Low	Low
E (rare)	High	High	Medium	Low	Low

Likelihood refers to the possibility or frequency of an environmental impact. The organisation undertakes many routine activities that have an environmental impact on a daily or relatively frequent basis. Other activities are done less routinely, and environmental incidents can also occur. The following criteria explain the five categories of likelihood:

Almost certain/daily: An environmental impact or impact on the organisation from an environmental-related issue is expected to occur in most circumstances, or will occur on a daily basis.

Likely/weekly: An environmental impact or impact on the organisation from an environmental-related issue will probably occur in most circumstances, or will occur on a weekly basis.

Possible/monthly: An environmental impact or impact on the organisation from an environmental-related issue could occur, or will occur on a monthly basis.

Unlikely/annually: An environmental impact or impact on the organisation from an environmental-related issue could occur but is not expected, or will occur annually.

Rare: An environmental impact or impact on the organisation from an environmental-related issue would occur only in exceptional circumstances.

The following provides criteria for determining consequence to the environment or the agency from an environment-related issue:

Catastrophic: Widespread, irreparable environmental damage; loss of human life or long term human health effects; national attention; serious litigation; over $1 million to manage consequences.

Major: Widespread, medium to long term impact; serious human health impacts; state-wide or national attention; major breach of legal requirements; major disruption to operations; agency's reputation badly tarnished; $100,000 to $1 million to manage consequences.

Moderate: Localised medium to long term impact; moderate contribution to climate change; moderate human health impacts requiring medical treatment; regional media attention; moderate breach of legal requirements with fine; $10,000 to $100,000 to manage consequences.

Minor: Localised short to medium term impact; minor contribution to climate change; minor and reversible human health impacts treatable with first aid; negative publicity from local media; minor breach of legal requirements; $1000 to $10,000 to manage consequences.

Insignificant: Limited impact to a local area but no long term effects; concern or complaints from neighbours; no injury to people; minor technical nonconformity but no legal nonconformity; less than $1000 cost to the agency to manage consequences.