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Contact
M. Dumas

Our Ref
P2309893JC01V04

Pages
10 + attachments

13 June 2024

C/ - EG Property Advisory
Attn: Diana Brajuha
By Email

Dear Diana,

Preliminary Onsite Wastewater Options Review – 1411 The Northern Road, Bringelly, NSW.

1 Overview

This report provides a preliminary review of onsite wastewater management options for a proposed rezoning and subsequent retail / industrial development located at Lot 6 DP 1217784, 1411 The Northern Road, Bringelly, NSW (the '**Site**'). The assessment has been prepared in response to Liverpool City Council's (**LCC**) Request for Further Information (6 September 2023) regarding onsite wastewater management.

1.1 Proposed Rezoning and Development

We understand that the proposed rezoning and subsequent development will comprise:

1. Rezoning of the Site to allow for the development of a service station and associated retail and 'fast-food' services.
2. Construction of associated service station buildings and infrastructure.
3. Construction of an internal access road and connection to The Northern Road.
4. Associated infrastructure including temporary onsite wastewater management and other services (stormwater, potable water, electricity, telecommunications, *etc.*).

1.2 Staging

We understand that Stage 1 of the development comprises the development of the service station and associated retail services. Subsequent stages would be determined in the future.

1.3 Standards and Guidelines

Standards and guidelines considered in this assessment include:

1. LCC (2021) *On-site Sewage Management Standard.*
2. NSW Health (2001) *Septic Tank and Collection Well Accreditation Guidelines.*
3. NSW Department of Environment and Conservation (2004) *Use of Effluent by Irrigation*.

Whilst the proposed development is a commercial development, the following additional guidelines were also considered:

1. Australian / New Zealand Standard 1547 (2012) *On-site Domestic Wastewater Management.*
2. NSW Department of Local Government *et al.* (1998) *On-site Sewage Management for Single Households.*

2 Site Details

2.1 General

The Site is approximately 2.1 ha in size and is described as Lot 6 DP 1217784, being 1411 The Northern Road, Bringelly, NSW. The Site contains an existing single storey dwelling with associated car port, sheds, driveway, accesses, services (including onsite wastewater management facilities) and a farm dam in the south-western part of the site. The Site is bounded by The Northern Road to the north and rural-residential properties to the south, west and east. Existing vegetation consists largely of grasses with scattered trees and landscaping adjacent to the existing driveway.

Site topography is characterised by predominantly south facing slopes of 0 – 10% with elevation ranging from approximately 84 mAHD in the south-eastern corner of the Site to approximately 94 mAHD adjacent to the northern boundary.

The nearest climate station to the site is Badgerys Creek (Maryland) (Bureau of Meteorology station 067015) located approximately 5 km to the south of the Site. Site annual median rainfall is approximately 727 mm and annual pan evaporation is estimated to be approximately 1500 mm.

The Site is mapped as having two hydrolines, one in the western portion which drains to the existing farm dam and the other crossing the Site in the south-eastern corner. Desktop assessment of these features show that both have relatively small catchments (< 10 ha) upslope of the Site.

Review of the Australian Groundwater Explorer found that there are two registered water supply groundwater bores within 500 m of the Site. Both bores are drilled to a depth of > 100 m. It is not known if either is used for potable drinking water supply.

2.2 Soils and Geology

Review of Clark and Jones (1991) *Penrith 1:100,000 Geological Sheet 9030* indicates that the Site is underlain by the Bringelly Shale series consisting of shales, carbonaceous claystones, claystones, laminites, fine to medium grained lithic sandstones, coal and tuff of the Wianamatta Group.

Review of Hazelton *et al.* (1989) *Soil Landscapes of the Penrith 1:100,000 Sheet* shows that the site is likely to be underlain by the Blacktown soil landscape, consisting of up to 300 mm of loam topsoil overlying 100 – 200 mm of clay loam then up to 900 mm of light clay subsoils then shale bedrock.

The South Creek soil landscape is noted to be an associated soil landscape of the Blacktown soil landscape, predominantly occurring along drainage lines. This soil landscape consists of up to 500 mm of clay loam topsoils overlying 600 – 850 mm of medium to heavy clay then bedrock.

3 Desktop Onsite Wastewater Analysis

3.1 Soil and Land Constraints

A preliminary desktop soil and land constraints assessment generally in accordance with NSW DLG *et al.* (1998) and NSW DEC (2004) is completed for the site and summarised as follows.

Table 1: Site and soil capability assessment (NSW DLG *et al.,* 1998 and NSW DEC, 2004).

Parameter	Likely Value	Limitation
Flood potential	Above 1% AEP flood level	Minor
Exposure	Well exposed to sun and wind	Minor
Slope (%)	Generally < 10%	Minor
Landform	Side slope	Minor
Run-on / seepage	Unlikely	Minor
Erosion potential	Unlikely	Minor
Site drainage	Unknown	-
Fill	Unlikely	Minor
Buffer distance	See Table 2	Moderate
Land area	Adequate area not available without lot loss	Major
Rock outcropping	Unlikely	Minor
Geology	No major discontinuities	Minor
Depth to bedrock (m)	> 1.5	Minor[1]
Depth to water table (m)	> 1.0	Minor
Permeability category	Topsoil: 4b Subsoil: 5a	Topsoil: Minor Subsoil: Moderate
Estimated hydraulic conductivity (K_{sat}) (mm/hr)	5 – 20.8	Moderate
Coarse fragments (%)	< 20	Minor
Bulk density (g/cm^3)	< 1.4	Minor
pH (1:5 in H_2O)	< 6.0	Moderate[2]
ECe (dS/m)	< 2.0	Minor[2]
Exchangeable sodium (%)	5 – 10	Moderate[2]
CEC (cmol(+)/kg)	> 15	Minor[2]
P-sorption (kg/ha)	> 6,000	Minor[2]
P-sorption (mg P / kg soil)	674	Minor[2]
Emerson aggregate class	5	Minor[2]

Notes:

1. All effluent disposal systems.
2. Based on laboratory testing of local soils.

The following comments are made regarding likely constraints to effluent disposal:

1. The current site layout does not specify a specific onsite effluent disposal area with minimum buffers to boundaries, buildings and other site features (e.g. mapped watercourses and farm dams) in accordance with NSW DEC (2004) and LCC (2021) guidelines. However, review of the proposed development footprint shows that sufficient land area is available for the proposed service station and retail development for the purposes of a dedicated onsite effluent disposal area.

2. Site subsoils are light to medium clays. These soils have reduced design irrigation rates and require additional effluent irrigation area to be provided to avoid waterlogging of site soils.

3. The site contains two mapped watercourses and an existing farm dam. These would likely need to be redirected or piped and / or filled in conjunction with the development. If the effluent disposal area coincides with these areas, fill would need to include an appropriate depth of suitable topsoil (sandy loam or similar) and the disposal area designed to ensure that effluent application did not result in adverse impacts.

3.2 Buffers

Recommended buffers in accordance with NSW DLG *et al.* (1998) and NSW DEC (2004) and LCC (2021) guidelines are summarised in Table 2.

Table 2: Buffers in accordance with NSW DLG et al. (1998), NSW DEC (2004) and LCC (2021).

Site feature	Liverpool City Council (2021)	NSW DEC (2004)	NSW DLG *et al.* (1998)
Permanent surface waters	100	50	100
Intermittent waterways and farm dams	40	Site specific	40
Permanent groundwater[1]	0.6	1	1
Lot boundaries, buildings, pools and driveways (absorption systems)[2]	12 / 6	-	12 / 6
Lot boundaries, buildings, pools and driveways (surface irrigation systems)[2]	6 / 3 (lot boundaries, driveways and pools) 15 (dwellings)	-	6 / 3 (lot boundaries, driveways and pools) 15 (dwellings)
Lot boundaries, buildings, pools and driveways (subsurface irrigation systems)[2]	6 / 3	6 / 3	6 / 3
Groundwater bores	250	250	250

Notes:

1. Vertical offset between effluent application field and permanent groundwater level.
2. X/Y = Upslope / downslope setback.

3.3 Available Effluent Management Area

LCC (2021) buffers (Table 2) were used to determine available area for onsite effluent management. The following additional assumptions were made:

1. Removal of the existing dam from the Site.
2. Piped drainage of existing Site watercourses.
3. Retention of the existing watercourse on Lot 7 DP 1217784 (1375 The Northern Road Bringelly) to the east of the Site.
4. In accordance with LCC (2021) guidelines, a reserve area is required for absorption bed and Wisconsin mound systems.

Based on the above assumptions and buffers approximately 4,361 m^2 is available for mound / subsurface irrigation options. For an absorption bed / trench option, available area outside of minimum buffers is approximately 1,882 m^2.

3.4 Design Irrigation Rates

Typical soil conditions are based on desktop assessment of Site soils (Section 2.2). Soil profiles and design irrigation rates from AS/NZS 1547 (2012) are provided in Table 3.

Table 3: Inferred soil profiles and design irrigation rates (AS/NZS 1547, 2012).

Layer	Depth range (mm)	Typical Texture	Indicative Permeability (K_{sat}) (m/day)	Design Loading Rate (mm/day)	Design Irrigation Rate (mm/day)	Design Mound Loading Rate (mm/day)
A – Topsoil	0 – 300	Clay Loam	0.5 – 1.5	30.0[1]	3.5	16.0
B – Subsoil	300 – 1,200	Light Clay	<0.06 – 0.5	12.0[1]	3.0	8.0

Notes:

1. Assumes secondary treated effluent.

3.5 Wastewater Generation Rates

Proposed development wastewater generation rates have been calculated using NSW Health (2001) guidelines and the following assumptions:

1. 18,000 northbound vehicle movements / day on the adjacent Northern Road.[1]
2. 3% of vehicles visiting the service station (540 vehicles / day).
3. Average daily visitor rate of 810 persons / day to the service station.

[1] Australian Department of Infrastructure and Regional Development (2016) *Western Sydney Airport: Environmental Impact Statement – Chapter 15 Traffic, Transport and Access,* 227.

4. Of the total Site visitors, 10% of visitors use wastewater generating facilities either at the service station or the retail food outlet (assumed 50 / 50 split or 40 visitors / day for each facility).

5. Service station and retail food outlet have a combined daily staff of 20 persons.

Preliminary high level wastewater generation estimates are summarised in Table 4.

Table 4: Preliminary high level wastewater generation estimates (NSW Health, 2001).

Development Component	Units	Equivalent Population (EP)	Type of Premises[1]	Unit Flow Rate[1] (L/EP/day)	Hydraulic Load (L/day)
Service Station (retail)	Persons	40	Service station	14	560
Retail food outlet	Persons	40	'Café'	10	400
Staff – service station complex	Staff	20	Service station	27	540
Total					**1,500**

Notes:

1. Based on NSW Health (2001) guidelines.

3.6 Preliminary Onsite Effluent Management Requirements

3.6.1 Effluent Management Options

Three onsite effluent management options that have initially been considered for the Site are:

1. Wisconsin mound disposal system.

2. Absorption bed disposal system.

3. Sub-surface drip irrigation system.

Surface spray irrigation is not considered feasible for the site given the minimum buffer requirements (Table 2).

3.6.2 Hydraulic Sizing

Based on the preliminary design effluent irrigation rates (Table 3) and wastewater generation rates, the minimum areas required to satisfy soil hydraulic capacity to accept treated effluent are summarised in Table 5.

Table 5: Summary of minimum effluent disposal area requirements based on soil hydraulics (AS/NZS 1547, 2012).

Effluent disposal system	Adopted design loading / irrigation rate (mm/day)	Minimum area (m^2)
Wisconsin mound	8.0	187.5
Absorption bed	12.0[1]	125.0
Subsurface drip irrigation	3.0	500.0

Notes:

1. Based on subsoil design irrigation rate as absorption system is likely to have a base below topsoil extents.

Based on soil hydraulics, approximately 125 m^2 of the site would need to be reserved for purposes of effluent disposal via absorption beds, approximately 190 m^2 of for effluent disposal via a Wisconsin mound or approximately 500 m^2 for a subsurface irrigation effluent disposal system (excluding buffers to boundaries, buildings *etc*).

3.6.3 Water and Nutrient Balances

Preliminary water and nutrient balance calculations have been undertaken. These calculations used the following data and assumptions:

1. Median monthly rainfall data for Bringelly (Maryland) (BoM station 067015) and median monthly pan evaporation data for Bringelly (McMasters Fire Station) (BoM station 067068).
2. Design deep percolation rate of 10 mm/week.
3. Effluent loading rates for the development as per Table 4.
4. Effluent quality of 25 mg/L for Total Nitrogen and 10 mg/L for Total Phosphorus.
5. Soil chemistry as per Table 1 (P-sorption halved to account for 50 year design irrigation field lifespan).

A summary of the minimum water balance and nutrient assimilation requirements for the development is provided in Table 6, with calculations appended in Attachment B.

Table 6: Summary of minimum EMA sizing for wet weather and nutrient assimilation.

EMA Sizing Criteria	Minimum Area Required (m^2)	Comments
Nitrogen assimilation	684	TN concentration adopted may be difficult to achieve by onsite wastewater treatment system based on likely influent quality.
Phosphorus sorption	417	Assumed p-sorption value. No laboratory analyses of site soil samples has been undertaken.
Water balance	520	Assumes minimum 50 kL wet weather storage tank. Minimum of 950 m^2 required if no wet weather storage included.

4 Wastewater Options Assessment

The following wastewater management options are discussed in the following sections:

1. Connection of Site to reticulated sewerage network.
2. Onsite wastewater management.
3. Wastewater pump out.

4.1 Connection to Sydney Water Sewerage Network

The attached feasibility letter from Sydney Water indicates that the site is located in the Thompsons Creek wastewater catchment and is to be serviced with reticulated sewer and dedicated sewage pump station and carrier to the proposed Upper South Creek Advanced Water Recycling Centre.

Sydney Water indicates that this infrastructure is likely to be operational around 2031. Until this time, an alternative wastewater management system is required to service the development.

4.2 Onsite Wastewater Management

An onsite wastewater management system comprised of a commercial treatment system (i.e. sewage treatment plant) and onsite effluent disposal system would be a viable temporary wastewater management solution for the Site.

Any onsite wastewater management system would need to be integrated with other Site water cycle management measures (e.g. stormwater conveyance and treatment) to ensure that onsite effluent disposal was sufficiently separated from any proposed onsite water cycle management measures.

4.3 Pump Out

New pump out systems are not permitted under LCC (2021) guidelines.[2] However, should LCC support the temporary use of a pump out system at the Site whilst the development was awaiting availability of connection to Sydney Water reticulated sewerage services, the following are indicative requirements:

1. Wastewater storage tank. This is likely to require a minimum capacity of 7 days storage at average wastewater generation rates and may be in the order of 15 KL plus freeboard.

2. Pump out system. Comprised of an appropriate Storz coupling to suit a pump out tanker, lockable cap and stand pipe connected to the storage tank. This system would also likely require a dedicated tanker standing bay to allow a pump out tanker to park adjacent to the pump out connection point without adversely impacting on Site traffic movements.

5 Conclusion

In light of the above available options and the initial desktop constraints assessment, we conclude the following:

1. It is understood that connection to Sydney Water reticulated sewer will be available in approximately 2030/31. The development should be connected to Sydney Water's reticulated sewer servicing the local area once this becomes available.

2. Onsite wastewater management is feasible with a dedicated effluent disposal area and reserve . Preliminary high level sizing estimates indicate that at least 684 m^2 would likely be required for subsurface drip irrigation of treated effluent based on the limiting factor of nitrogen assimilation. This requirement is subject to detailed site investigations and land capability assessment and detailed development design.

3. Temporary pump out of wastewater is feasible with LCC support, however, is unlikely to be required given the availability of Site area to accommodate an onsite effluent disposal system.

[2] Liverpool City Council (2021) *On-Site Sewage Management Standard,* 12, 20.

If you require any further information, please do not hesitate to contact our offices.

For and on behalf of

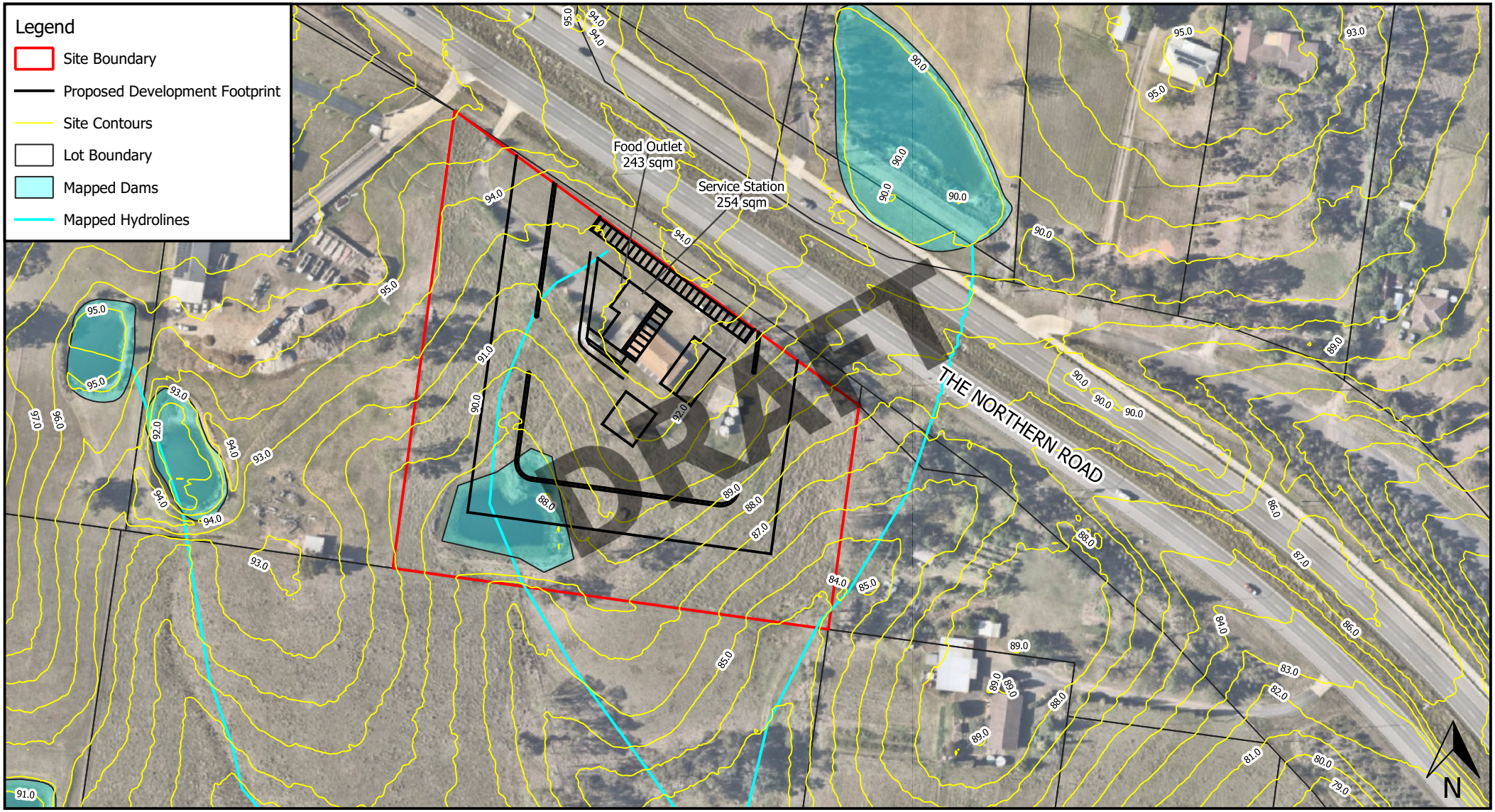
Martens & Associates Pty Ltd

Michael Dumas

JD, BEng(Environmental).

Senior Civil Engineer.

6 Attachment A – Maps



Project No: P2309893 Map Set: MS01-R02 EPSG: 28356

0 20 40 60 80 100 m

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Notes:
- Aerial from Nearmap (2023);
- Site boundary and cadastre from NSW Six Maps (2023);
- Proposed site layout from Planning Proposal (2022)

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Map Title / Figure:

Proposed Development Layout

Map 01	Map
1411 The Northern Road, Bringelly NSW	Site
Industrial Development	Project
Wastewater Assessment	Sub-Project
Mark Tooker	Client
06/06/2024	Date

0 20 40 60 80 100 m

1:2000 @ A4

Notes:
- Aerial from Nearmap (2023);
- Site boundary and cadastre from NSW Six Maps (2023);
- Proposed site layout from Planning Proposal (2022)

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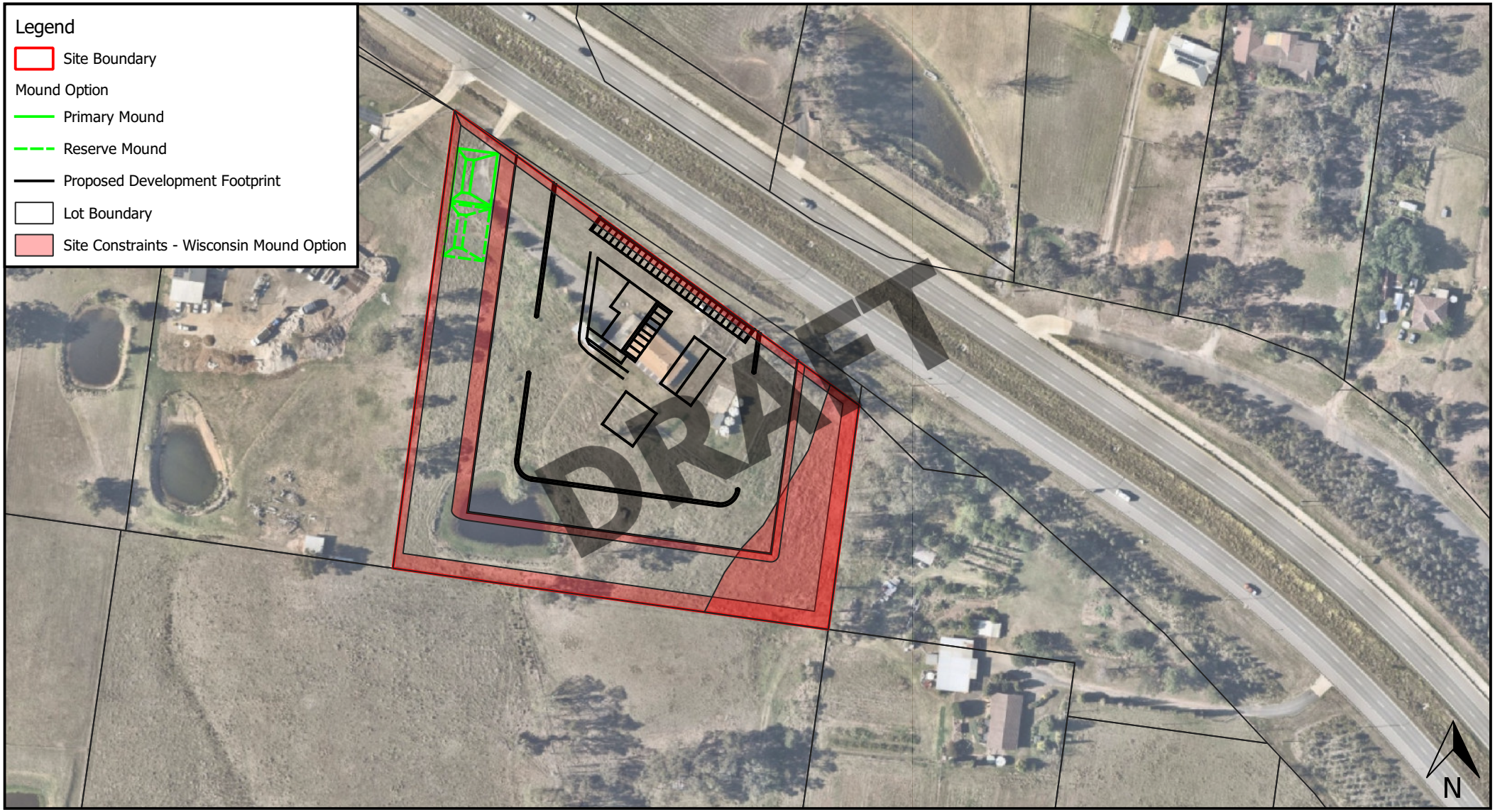
Project No: P2309893 Map Set: MS01-R02 EPSG: 28356

Map Title / Figure:

Absorption bed option

Map 02	Map
1411 The Northern Road, Bringelly NSW	Site
Industrial Development	Project
Wastewater Assessment	Sub-Project
Mark Tooker	Client
06/06/2024	Date



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Notes:
- Aerial from Nearmap (2023);
- Site boundary and cadastre from NSW Six Maps (2023);
- Proposed site layout from Planning Proposal (2022)

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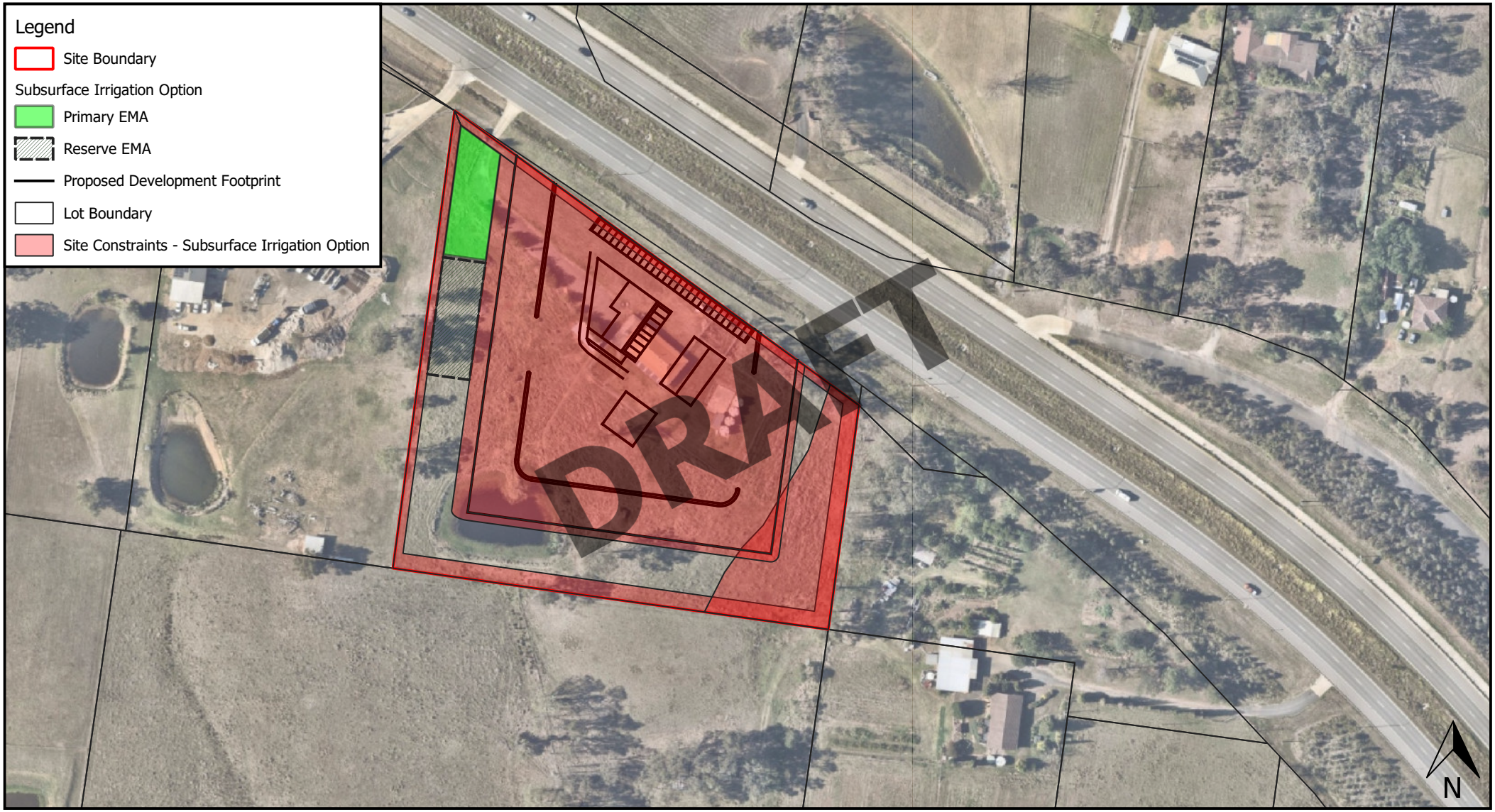
Project No: P2309893 Map Set: MS01-R02 EPSG: 28356

Map Title / Figure:

Wisconsin mound option

Map 03	Map
1411 The Northern Road, Bringelly NSW	Site
Industrial Development	Project
Wastewater Assessment	Sub-Project
Mark Tooker	Client
06/06/2024	Date



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Notes:
- Aerial from Nearmap (2023);
- Site boundary and cadastre from NSW Six Maps (2023);
- Proposed site layout from Planning Proposal (2022)

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Project No: P2309893 Map Set: MS01-R02 EPSG: 28356

Map Title / Figure:

Subsurface irrigation option

Map 04	Map
1411 The Northern Road, Bringelly NSW	Site
Industrial Development	Project
Wastewater Assessment	Sub-Project
Mark Tooker	Client
06/06/2024	Date

7 Attachment B – Water and Nutrient Balance

Effluent Disposal Field - Annual Nutrient Balance Assessment

Method ST-14 Revised 20.3.2007

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PROJECT DETAILS

Project	Preliminary Onsite Wastewater Options Review, 1411 The Northern Road, Bringelly			Ref. No.	P2309893
Author	MD	Reviewed	JF/DM	Date Created	6/06/2024

STEP 1 : ENTER SITE AND FIELD CHARACTERISTICS

FACTOR	Enter Data	Unit	
Treatment System	Commerical AWTS	-	
Effluent flow rate	1500	L/day	
Effluent N	25.0	mg/L	
Effluent P	10.0	mg/L	
Design soil depth	1.00	m	
Soil P-sorption	337.0	mg/kg	(value is 50% of the weighted average P-sorption value)
Plant N uptake	200.0	kg/ha/year	
Plant P uptake	20.0	kg/ha/year	

STEP 2 : ASSESSMENT

NITROGEN BUDGET FOR RE-USE FIELD

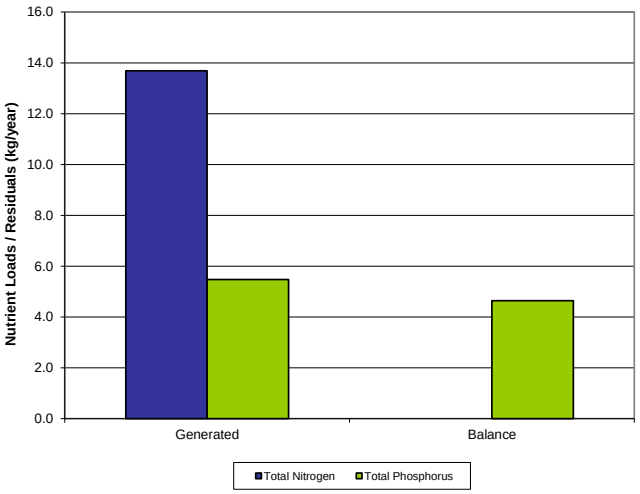
N generated	13.69	kg/year
N consumed	13.69	kg/year
N balance	0.00	kg/year
Min Area	684	m^2

PHOSPHORUS BUDGET FOR RE-USE FIELD

P generated	5.48	kg/year
P consumed	0.83	kg/year
P balance	4.64	kg/year
P sorption	232.0	kg P/design soil depth
Field life (for P)	50.0	Years
Min Area	417	m^2

MINIMUM NUTRIENT ASSIMILATION AREA

Minimum Area	**684**	m^2



Effluent Disposal Field - Water Balance Assessment

Method ST-XX Revised 11.8.2010

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PROJECT DETAILS

Project	Preliminary Onsite Wastewater Options Review, 1411 The Northern Road, Bringelly			Ref. No.	P2309893
Author	MGD	Reviewed	JF / DM	Date Created	6/06/2024

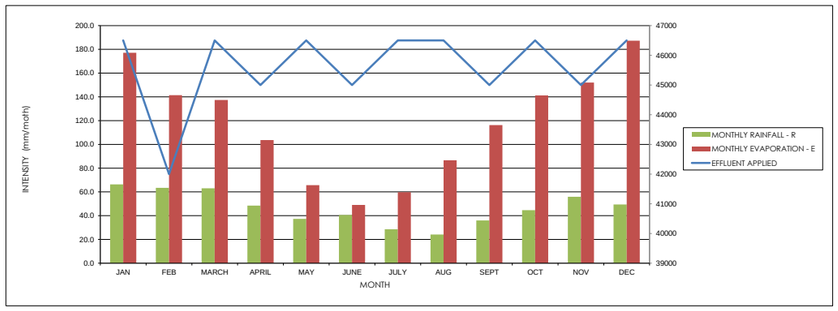
STEP 1 : ENTER SITE AND FIELD CHARACTERISTICS

FACTOR	Enter Data	Unit				
Runoff Factor - RF	0.35	%		Peak Design Irrigation Rate - DIR	2.9	mm/day
Daily Effluent Load - DEL	1500.0	L		Wet-Weather Storage (KL)	49.0	KL
Effluent Disposal Area - A	520.0	m^2	36820			
Design Percolation Rate (DPR)	1.4	mm/day				

STEP 2 : ENTER CLIMATE DATA

Source(s): Rainfall: Bringelly (Maryland - 067015) 1867 - 2024; Evaporation: Bringelly (McMasters Fire Station - 067068) 1967 - 1984

MONTH	MONTHLY RAINFALL - R Enter Data	MONTHLY EVAPORATION - E Enter Data
JAN	66.30	177.10
FEB	63.40	141.40
MARCH	63.00	137.40
APRIL	48.50	103.60
MAY	37.30	65.70
JUNE	40.60	49.00
JULY	28.60	59.80
AUG	24.10	86.60
SEPT	36.00	116.20
OCT	44.60	141.20
NOV	55.90	152.00
DEC	49.40	187.30



STEP 3 : ASSESSMENT

MONTH	NUMBER OF DAYS	MONTHLY RAINFALL (mm)	RETAINED RAINFALL	MONTHLY EVAPORATION	CROP FACTOR	EVAPO-TRANSPIRATION RATE	DESIGN PERCOLATION	AVAILABE IRRIGATION CAPACITY	EFFLUENT APPLIED	APPLICATION RATE	INCREASE IN PONDING DEPTH OF EFFLUENT	CUMULATIVE PONDING DEPTH OF EFFLUENT FROM PREVIOUS MONTH	DEPTH OF EFFLUENT	PONDING DEPTH OF EFFLUENT	WET-WEATHER STORAGE REQUIRED
-	(days)	(mm/month)	(mm/month)	(mm/month)	-	(mm/month)	(mm/day)	(mm/month)	(L/month)	(mm/month)	(mm)	(mm)	(mm/month)	(mm)	(KL)
-	DAY	R	RR = R x (1- RF)	E	CF	ETR = E x CF	DP = DPR x DAYS	AIC = ETR - RR +DP	EA = DEL x DAY	AR = EA / A	D = (AIC - AR)	CPD = PD from previous month	DE = D + CPD	PD	WWS
JAN	31	66.30	43.1	177.10	0.80	141.7	44.3	142.9	46500	89.4	-53.4	0.0	-53.4	**0.0**	**0.0**
FEB	28	63.40	41.2	141.40	0.80	113.1	40.0	111.9	42000	80.8	-31.1	0.0	-31.1	**0.0**	**0.0**
MARCH	31	63.00	41.0	137.40	0.80	109.9	44.3	113.3	46500	89.4	-23.8	0.0	-23.8	**0.0**	**0.0**
APRIL	30	48.50	31.5	103.60	0.80	82.9	42.9	94.2	45000	86.5	-7.7	0.0	-7.7	**0.0**	**0.0**
MAY	31	37.30	24.2	65.70	0.65	42.7	44.3	62.7	46500	89.4	26.7	0.0	26.7	**26.7**	**13.9**
JUNE	30	40.60	26.4	49.00	0.65	31.9	42.9	48.3	45000	86.5	38.2	26.7	64.9	**64.9**	**33.7**
JULY	31	28.60	18.6	59.80	0.65	38.9	44.3	64.6	46500	89.4	24.9	64.9	89.8	**89.8**	**46.7**
AUG	31	24.10	15.7	86.60	0.65	56.3	44.3	84.9	46500	89.4	4.5	89.8	94.3	**94.3**	**49.0**
SEPT	30	36.00	23.4	116.20	0.80	93.0	42.9	112.4	45000	86.5	-25.9	94.3	68.4	**68.4**	**35.6**
OCT	31	44.60	29.0	141.20	0.80	113.0	44.3	128.3	46500	89.4	-38.8	68.4	29.6	**29.6**	**15.4**
NOV	30	55.90	36.3	152.00	0.80	121.6	42.9	128.1	45000	86.5	-41.6	29.6	-12.0	**0.0**	**0.0**
DEC	31	49.40	32.1	187.30	0.80	149.8	44.3	162.0	46500	89.4	-72.6	0.0	-72.6	**0.0**	**0.0**