

Appendix D:

Specialist Reports

Appendix D1:

Jeffares & Green Engineering Report



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CONSULTING ENGINEERS

PROPOSED WOODBURN DEVELOPMENT

STORMWATER MANAGEMENT PLAN AND FLOODLINE DELINEATION REPORT



PROPOSED WOODBURN DEVELOPMENT

**STORMWATER MANAGEMENT PLAN
AND FLOODLINE DELINEATION
REPORT**

QUALITY VERIFICATION

This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882



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ENGINEERING & ENVIRONMENTAL CONSULTING

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1 INTRODUCTION

O & T Development (Pty) Ltd (O & T Development) appointed Jeffares & Green (Pty) Ltd (J&G) to undertake a 1:50 year design flood stormwater management plan (SWMP) and floodline delineations for the 1:50 and 1:100 year design floods for a proposed development at Woodburn. The development site is located in Pietermaritzburg in the Msunduzi Local Municipality within KwaZulu-Natal (**Figure 2-1**). J&G were appointed to proceed with the SWMP and floodline delineations on the 14th November 2012 by O & T Development on the basis of quotation 12/SW61/RG dated 8th October 2012.

The objectives of this investigation were as follows

- 1) Assess the impact that the proposed development would have on the stormwater system under the 1:50 year return period flood conditions.
- 2) Determine solutions to channel and attenuate the additional 1:50 year return period stormflows that are generated by the new development at the site.
- 3) Assess the extents of the inundation areas resulting from the 1:50 and the 1:100 year design flood events, which included assessing a potential mitigation measure to prevent flooding of the site whilst minimising any impact on surrounding infrastructure.

For a floodline investigation, detailed survey data and resultant contour data is required in order to produce accurate floodline delineations. The client was able to provide survey data for the Foxhill Spruit River adjacent to the development site. Contour data at intervals of 5 metres were sourced by J&G and used in conjunction with the supplied survey data in order to create a full coverage of the floodplain. The accuracy of the floodline is determined by the quality of the contour and survey data, hence, the 1:50 and 1:100 year return period floodlines produced in this study are as accurate as the data provided to J&G by the client combined with the 5 m contours used for the floodplains.

2 SITE LOCALITY

The site (**Figure 2-1**) is located in Pietermaritzburg adjacent to the Foxhill Spruit River, a tributary of the uMsunduzi River. The Foxhill Spruit River originates in Foxhill Farm south-south west of Oribi Heights. The site lies to the north of Chief Albert Luthuli Street at the corner of Woodhouse Road. A site plan of the proposed Woodburn development is shown in **Figure 2-2**. The Woodburn rugby grounds are situated to the north of the proposed development site. The site is currently under grassland cover. There is an access road to the Woodburn rugby grounds through the proposed development site. The downstream point of the proposed development site has the coordinates:

29° 36' 42.21" S

30° 23' 24.46" E

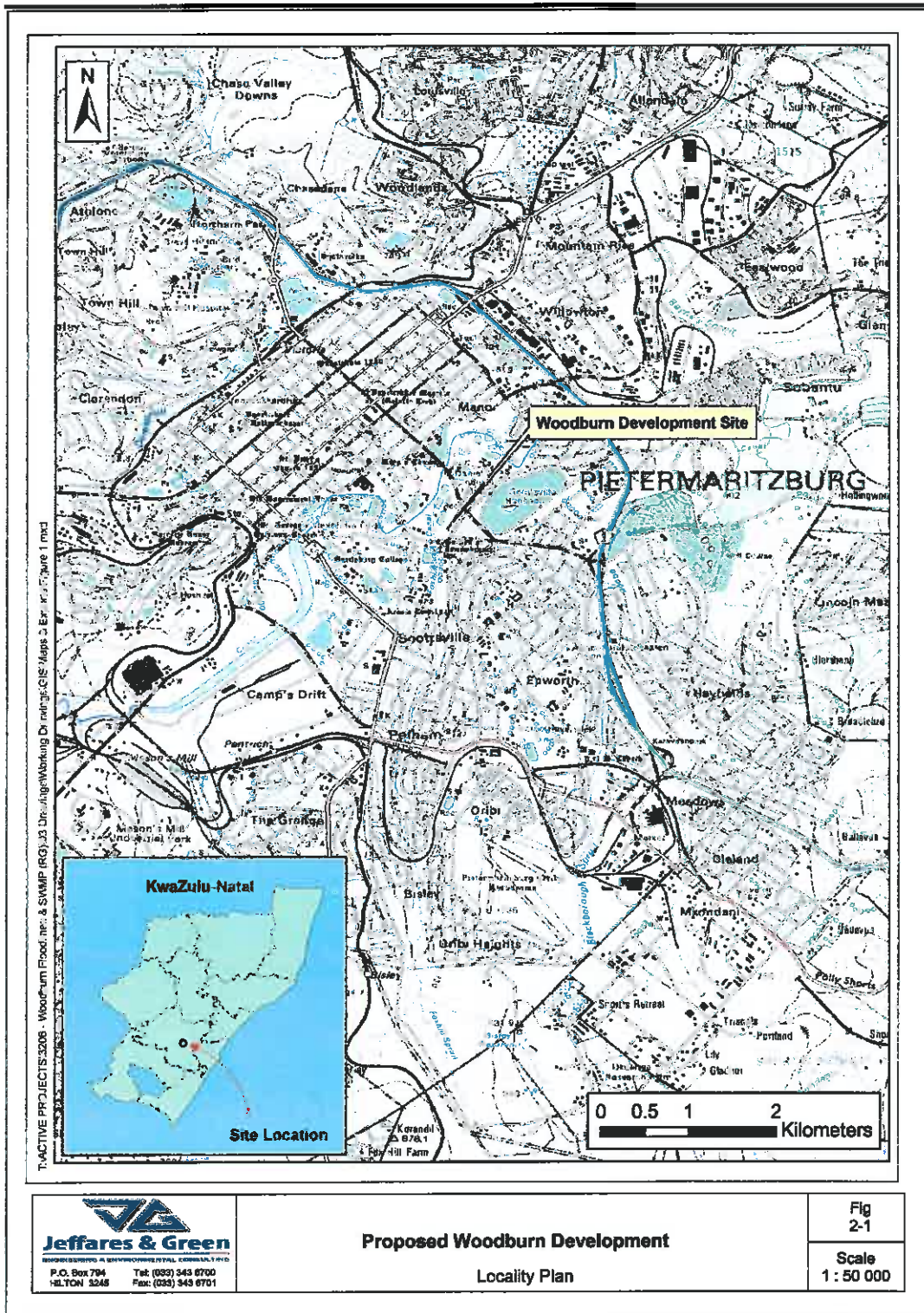


Figure 2-1 Locality Plan for the Proposed Woodburn Development Site

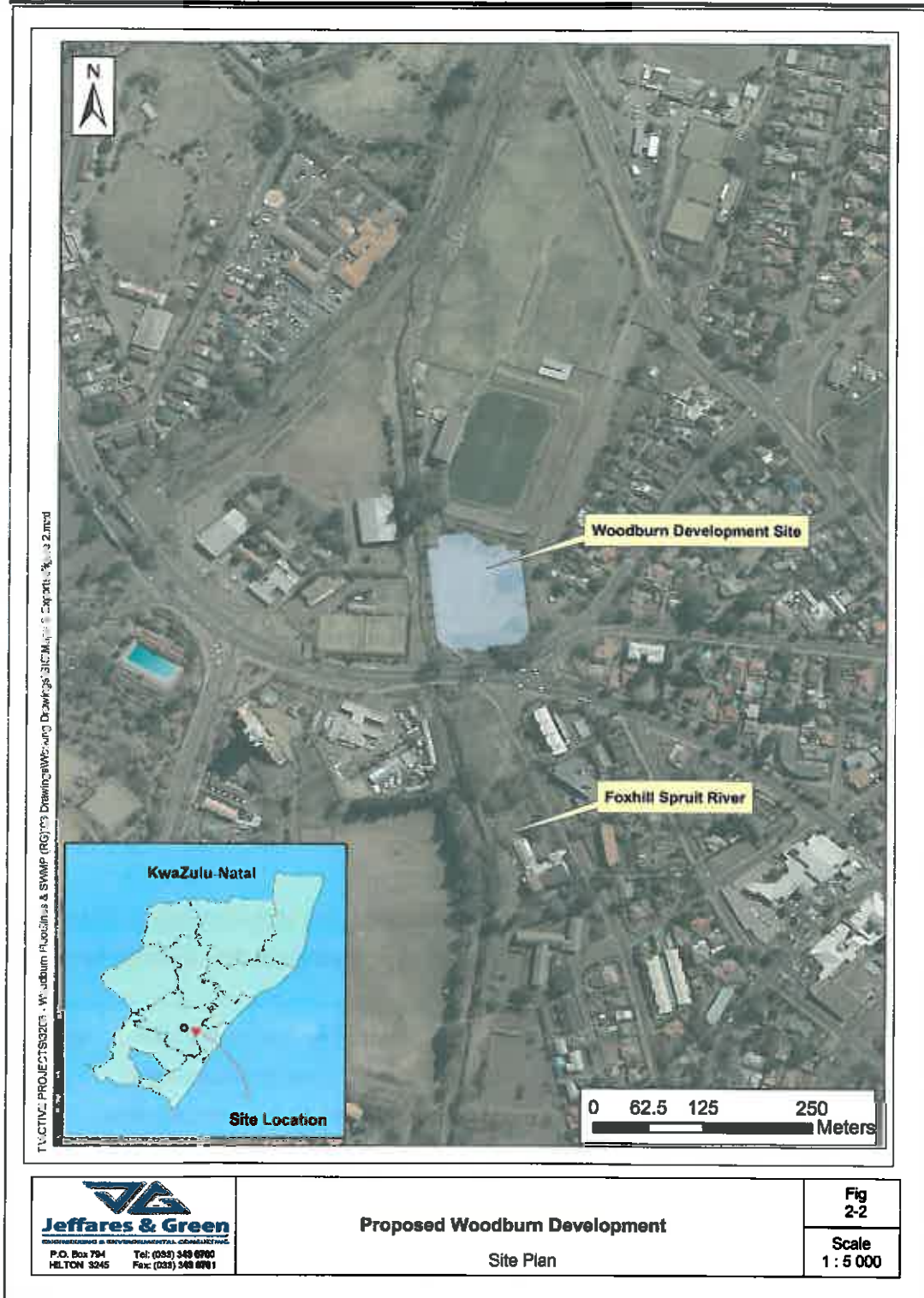


Figure 2-2 Site Plan for the Proposed Woodburn Development Site

3 METHODOLOGY

This section outlines the methodology adopted for this investigation, namely, the selection of the appropriate method for the calculation and determination of the peak discharge for the site and the Foxhill Spruit River Catchment. This was followed by the determination of the extents of the areas inundated by the 1:50 and 1:100 year design floods.

3.1 Stormwater Management Plan Flood Hydrology

The peak discharge for a particular site can be calculated using various methodologies. The method adopted for this study was the Rational Method. The Rational Method is one of the best-known and widely used methods for determining the peak floods of small to medium catchments (100 km² or less). The peak flow equation is based on a runoff coefficient (C), average rainfall intensity (I) and the effective area of the catchment (A).

The Rational formula is defined as:

$$Q = 0.278(CIA) \quad \text{Equation 1}$$

Where:

Q	=	peak flow (m ³ /s)
C	=	run-off coefficient (dimensionless)
I	=	average rainfall intensity over catchment (mm/hour)
A	=	effective area of catchment (km ²)

The Rational formula has the following assumptions:

- The rainfall has a uniform spatial distribution across the total contributing catchment;
- The rainfall has a uniform time distribution for at least a duration equal to the time of concentration;
- The peak discharge occurs when the total catchment contributes to the flow occurring at the end of the critical storm duration, or time of concentration;
- C remains constant for the storm duration, or the time of concentration; and
- The return period of the peak flow, T, is the same as that of the corresponding rainfall intensity.

The municipal requirements of the inputs (excluding catchment area) for the Rational Method for the SWMP component of this study were used and are presented in **Table 3-1**.

Table 3-1 Municipal Input Requirements for the Rational Method

	Catchment Area (km ²)	Run-off Coefficient	1:50 yr Rainfall Intensity (mm/hr)
Pre-development	0.018	0.35	165
Post-development	0.018	0.85	165

The level pool routing method was used to assess the pre and post-development stormflow volumes generated at the study site and to quantify the required attenuation volume required to mitigate the impacts of the proposed development on the municipal stormwater system.

3.2 Floodline Determination

The 1:50 and 1:100 year peak discharge values were calculated using the Rational Method. Rainfall data is essential for determining design flood events. For this purpose, design rainfall data was extracted from the six closest rainfall stations for which design rainfall is available using the Design Rainfall Utility developed by Smithers and Schulze (2000). Details of the six closest rainfall stations are presented in **Table 3-2**. The Mean Annual Precipitation (MAP) for the proposed development was determined as 741 mm, as per the gridded design rainfall results based on the relative position of the six closest stations to the site (Smithers and Schulze, 2000). The design rainfall depths were based on the data from the rainfall stations listed in **Table 3-3**.

Table 3-2 Rain Gauge Characteristics Used to Determine the Woodburn Development Catchment Design Rainfall

Station Name	SAWS Number	Distance from Site (km)	Record Used (years)	Mean Annual Precipitation (mm)	Altitude (m)
Ukulinga Agri Res Sta	0239700 A	2.5	33	714	866
Pietermaritzburg	0239577 W	6.5	49	949	819
Botanic Gardens – Pmb	0239605 P	8.0	83	1 001	882
Allerton	0239604 W	9.7	87	1 072	882
Baynesfield Estates	0239585 A	12.1	65	829	838
Thornville	0239676 S	12.6	28	845	853

Table 3-3 Design Rainfall of the Woodburn Development Site

Duration	Return Period (Years) Design Rainfall Depth (mm)						
	1:2	1:5	1:10	1:20	1:50	1:100	1:200
5 min	10.5	15.3	19.3	23.9	31.2	37.9	45.9
10 min	14.4	21.0	26.5	32.9	43.0	52.2	63.2
15 min	17.4	25.3	32.0	39.6	51.8	63.0	76.2
30 min	21.8	31.7	40.0	49.6	64.9	78.8	95.4
45 min	24.8	36.2	45.6	56.6	74.0	89.9	108.8
1 hour	27.3	39.7	50.1	62.1	81.2	98.7	119.4
1.5 hour	31.1	45.3	57.1	70.8	92.6	112.5	136.1
2 hour	34.1	49.7	62.7	77.7	101.6	123.5	149.4
4 hour	39.3	57.3	72.3	89.6	117.2	142.5	172.4
6 hour	42.8	62.3	78.6	97.5	127.4	154.9	187.4
8 hour	45.4	66.1	83.4	103.4	135.2	164.3	198.8
10 hour	47.5	69.2	87.4	108.3	141.6	172.1	208.2
12 hour	49.3	71.9	90.7	112.4	147.0	178.6	216.1
16 hour	52.4	76.2	96.2	119.3	156.0	189.5	229.3
20 hour	54.8	79.8	100.8	124.9	163.3	198.5	240.1
24 hour	56.9	82.9	104.6	129.7	169.5	206.1	249.3
1 day	48.3	70.3	88.7	110.0	143.8	174.8	211.5
2 day	61.3	89.2	112.6	139.6	182.5	221.8	268.4
3 day	70.4	102.6	129.5	160.5	209.8	255.0	308.5
4 day	76.4	111.2	140.3	173.9	227.5	276.4	334.5
5 day	81.3	118.4	149.4	185.2	242.1	294.3	356.1
6 day	85.5	124.8	157.2	194.9	254.8	309.7	374.7
7 day	89.3	130.1	164.2	203.5	266.1	323.4	391.3

The physiographic information (i.e. the river reach and the topography) was prepared in HEC-GeoRAS for input into the hydraulic model HEC-RAS. The flood peaks resulting from the 1:50 and 1:100 year design floods were hydraulically modelled against the merged five metre contour and survey data. The results from HEC-RAS were then exported to HEC-GeoRAS for the final floodline delineations.

From analyses done in ArcGIS 9.3, the land use of the Woodburn development's contributing catchment is approximately 50% urban and 50% rural. The urban component of the land use consists of approximately 88% houses, 2% heavy industry and 10% streets. The rural component of the land use consists of vegetation classified as grasslands. These variables were determined by delineating the various land uses and calculating their respective areas. The soils of the contributing catchment are 50% "Permeable" and 50% "Semi-Permeable" as indicated by soil coverage information of South Africa. The surface slope for each catchment was estimated from a digital terrain model (DTM) created from 20 m contour data, four classes of surface slope (<3, 3-10, 10-30 and 30-100 %) were

identified, this was followed by the determination of their respective areas. Further to the afore-mentioned characteristics of the contributing catchments, characteristics of further hydrological significance at the study site are presented in **Table 3-4**.

Table 3-4 Woodburn Contributing Catchment Characteristics

Area (km ²)	Length of Longest Watercourse (km)	MAP (mm)	Time of Concentration (hrs)	Catchment Centroid (dec deg)		Average Slope (m/m)
				Latitude	Longitude	
10.57	7.88	741.0	1.29 h	29.64909	30.38923	0.02754

As mentioned in the previous section, the HEC-RAS model was used to undertake the hydraulic modelling. Survey data was provided by the client. To further increase the accuracy of the simulations, the survey data and the contour data at intervals of 5 metres were input into ArcMAP (**Figure 3-1**) and merged to create a DTM. This allows for the cross-section elevations to be extracted from the DTM utilising HEC-GeoRAS. This data was subsequently exported into the HEC-RAS model for hydraulic modelling of the previously calculated peak discharge values. The bridge that crosses the Foxhill Spruit River on Chief Albert Luthuli St. to the south of the site was included in the hydraulic modelling to consider its impacts on the 1:50 and 1:100 year flood events. The back-water effects of the Msunduzi River were not taken into account. Once the hydraulic modelling was completed, the resultant floodline was imported into ArcMAP for delineation over the project area.

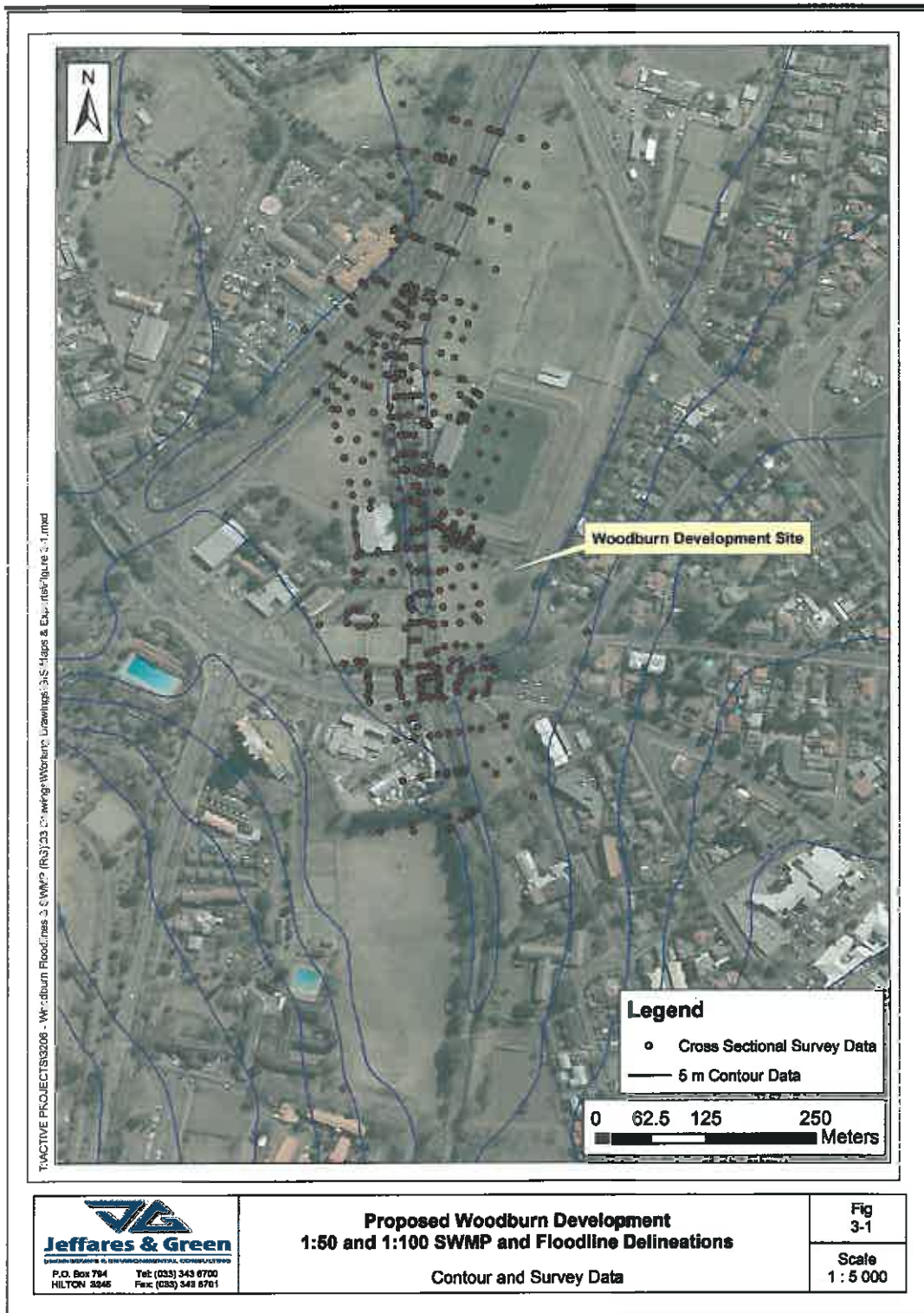


Figure 3-1 Contour Data and Survey Data used for the Determination of the 1:50 and 1:100 Year Floodlines

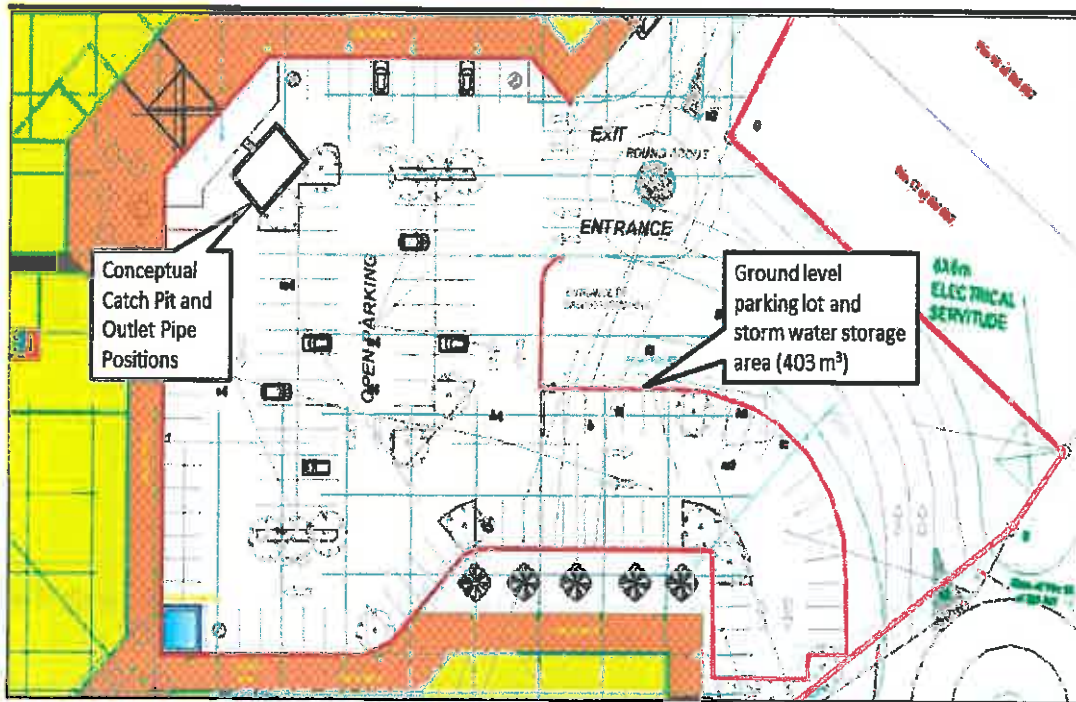


Figure 4-1 Conceptual Plan View of the Ground Level SWMP infrastructure

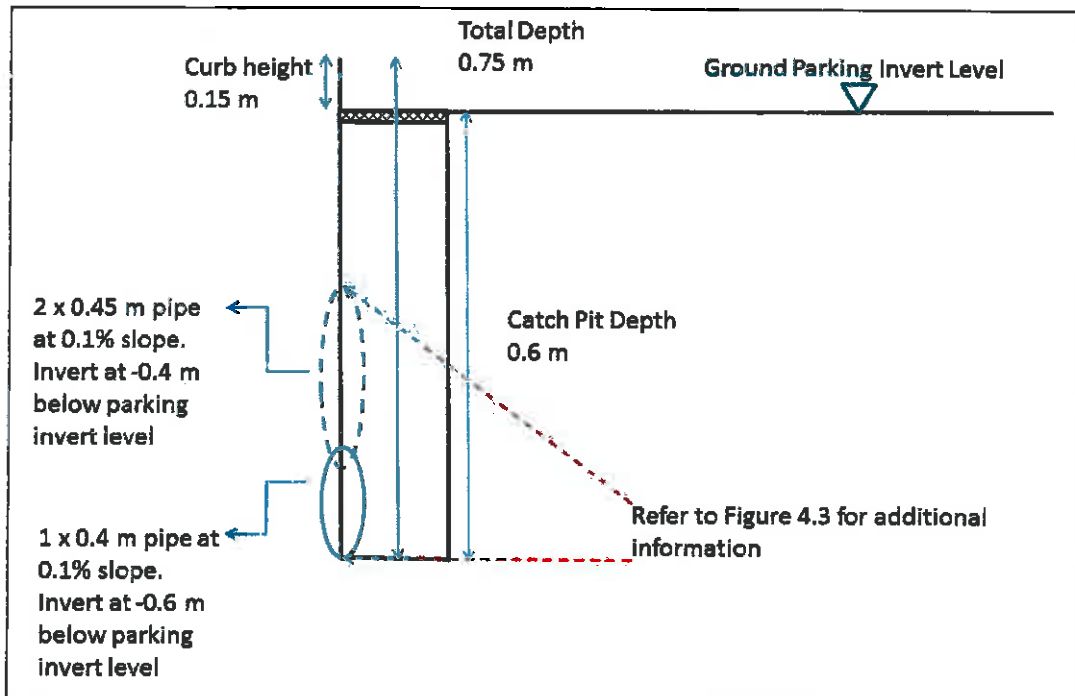


Figure 4-2 Conceptual Long Section Schematic of the Ground Level Catch Pit and the Stormwater Diversion Pipes.

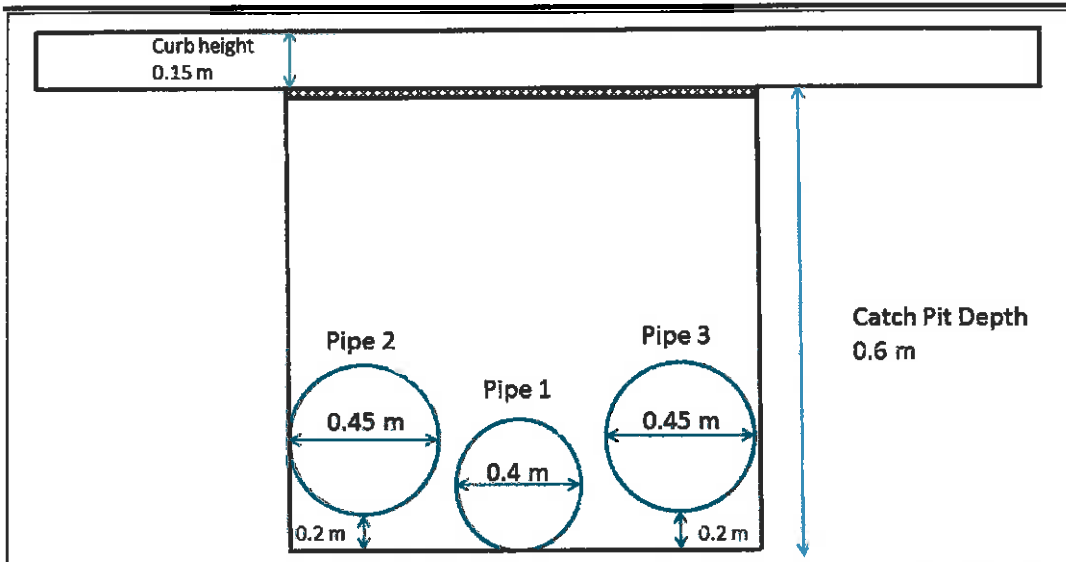


Figure 4-3 Conceptual Cross Section Schematic of the Catch Pit and the Stormwater diversion Pipes.

The final discharges of the individual pipes at a freeboard depth of 0.7 m are shown in **Table 4-3**. In order to prevent the flooding of the basement parking lot during the lower magnitude design flood events (i.e. the 1:2 year design flood event), it is recommended that the two larger outlet pipes are situated at an elevation of 0.2 m above the invert of the catch pit as shown in the schematic (**Figure 4-3**). The stormwater diversion system is conceptually designed such that Pipe 1 is situated at the invert level of the ground floor level catch pit and will lead into a sump located in the basement parking lot, (described further in the following paragraph) and then out to the receiving environment. Pipe 1 would discharge water into the Foxhill Spruit River at a rate of $0.28 \text{ m}^3/\text{s}$ (**Table 4-3**). This is less than the pre-development peak of $0.29 \text{ m}^3/\text{s}$ ensuring flood neutrality. The discharge from Pipe 1 would then require a stored stormwater volume of 403 m^3 which is obtained from the ground level parking area with a depth of 0.15 m. This results in the balance (704 m^3) of the total required attenuation ($1\,107 \text{ m}^3$) being diverted to the basement parking lot resulting in a standing water depth of 0.09 m. It is recommended that the ground floor parking lot is sloped toward the catch pit location to allow for the sufficient diversion and attenuation of the 1:50 year design stormwaters. Furthermore, all storm water producing and diversion structures (i.e. trading areas and downpipes) at the ground floor level are to direct the runoff they produce to the SWMP infrastructure located on the ground floor parking area. A layout plan view of the conceptual SWMP of the ground level is shown in **Appendix A**.

Table 4-3 Outflow Discharge of the Stormwater Pipes

Freeboard (m)	Foxhill Spruit River	Basement Parking Lot	
	Pipe 1 Discharge (m ³ /s)	Pipe 2 Discharge (m ³ /s)	Pipe 3 Discharge (m ³ /s)
0.7	0.28	0.21	0.21

The 704 m³ of stormwater diverted to the basement parking lot would reach a height of approximately 0.09 m during the 1:50 year design flood event based on the surface area of the basement parking lot (8 521 m² as provided by the client). A plan view of the basement level parking component of the SWMP is shown in **Figure 4-4**. The inflow characteristics of the 1:50 year design flood diverted by Pipes 2 and 3 into the basement level parking are shown in **Table 4-4**. In order to discharge the volume of water diverted to the basement level parking, two outlet pipes (diameters of 0.3 m) situated at an elevation of 0.4 m below the invert of the basement level parking are required (**Figure 4-5**) which will be situated in a sump in the storage area.

As mentioned previously, the development site is located adjacent to the Foxhill Spruit River. The proximity of the site to the Foxhill Spruit River necessitates the need to retain the stormwater stored in the basement level parking lot during the period in which the flood water levels of the river are above the elevation of the stormwater outlet pipes that drain the basement level parking (i.e. for the 1:50 year design flood and higher). No provision was made for the lower return period design flood events. Due to the need to retain the stormwater during the afore-mentioned flood events, a non-return valve will need to be installed on the two 0.3 m diameter pipes to prevent outlet control of the stormwater system and the Foxhill Spruit River flood waters entering the basement level parking through a backwater effect (**Figure 4-5**). The non-return valves will allow water to be released from the basement level parking lot following the recession of the 1:50 year design flood event and any events longer than this. Further to the above requirements, it is recommended that overflow structures situated at elevations of 621.3 mAMSL and 622 mAMSL are installed in the sump as emergency intervention structures to allow stormwater to exit the basement parking lot in the event of storm durations exceeding the recommended attenuation period of 0.5 hours. The above mentioned heights of 621.3 mAMSL and 622 mAMSL mAMSL are to compensate for the levels of the 1:50 and 1:100 year flood water levels of the Foxhill Spruit River. This will be discussed further in **Section 4.2**.

The SWMP results (**Table 4-5**) indicate that two 0.3 m diameter pipes sloped to 0.1% will discharge stormwater to the receiving environment at a rate of 0.22 m³/s. This is favourable

as it is less than the pre-development peak discharge of 0.29 m³/s. As for the ground level parking, it is recommended that the basement level parking is sloped to the position of the basement level catch pit to allow for the sufficient diversion and attenuation of the 1:50 year design stormwaters. As mentioned, during the 1:50 year design flood event, the flood waters of the Foxhill Spruit River will rise above the level of Pipes 4 and 5, which serve to drain the basement parking lot. During this period, Pipe 1 will discharge water to the Foxhill Spruit River at a rate of 0.28 m³/s as it has the required hydraulic head to discharge into the flooding river. The discharge rate of Pipe 1 will diminish and eventually stop as the 1:50 year flood waters recede. Pipes 4 and 5 will discharge water at a combined rate of 0.22 m³/s after the 1:50 year flood waters have receded, thus, the maximum discharge of stormwater to the receiving environment will not exceed 0.29 m³/s at any time. A layout plan view of the conceptual SWMP of the basement level is shown in **Appendix B**. The layout plan includes extents of the 1:50 and the 1:100 year floodlines, the proposed retaining wall which will be discussed further in **Section 4.2**.

Table 4-4 Inflow characteristics of the Diverted 1:50 Year Design Flood Event into the Basement Level Parking

Inflow Volume (m ³)	Inflow Discharge (m ³ /s)
704	0.42

Table 4-5 Basement Level Outflow Pipe Requirements and Outflow Discharge

Freeboard (m)	Pipe 4 Discharge (m ³ /s)	Pipe 5 Discharge (m ³ /s)	Total Pipe Discharge (m ³ /s)
0.4	0.11	0.11	0.22

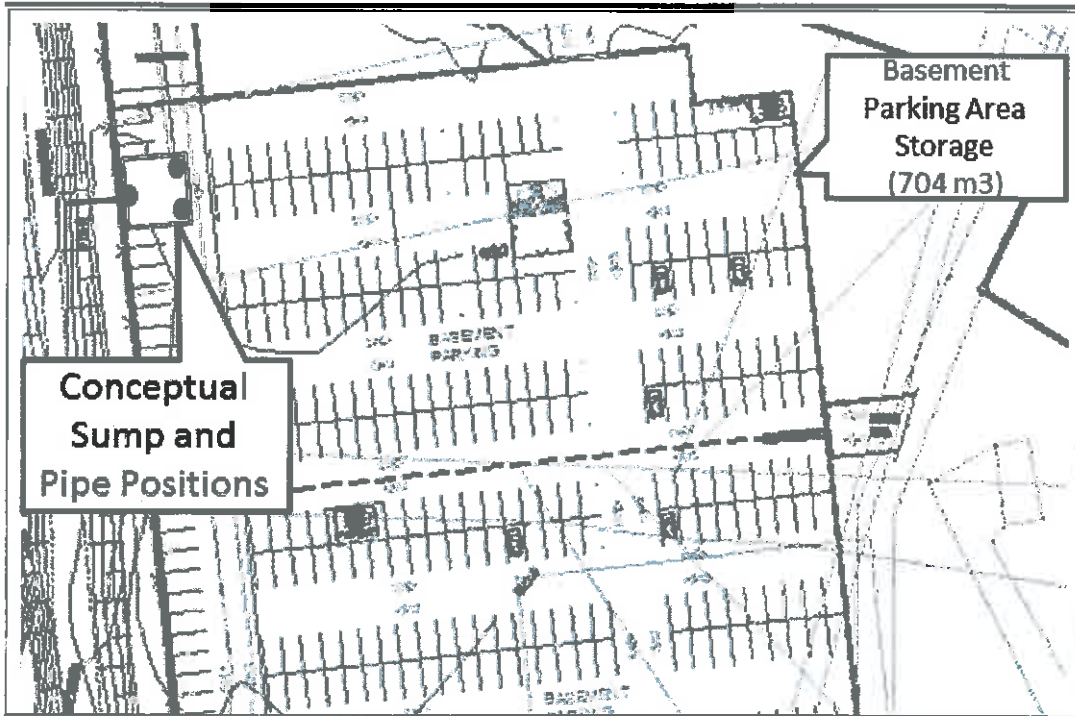


Figure 4-4 Conceptual Plan View of the Basement Level SWMP Infrastructure

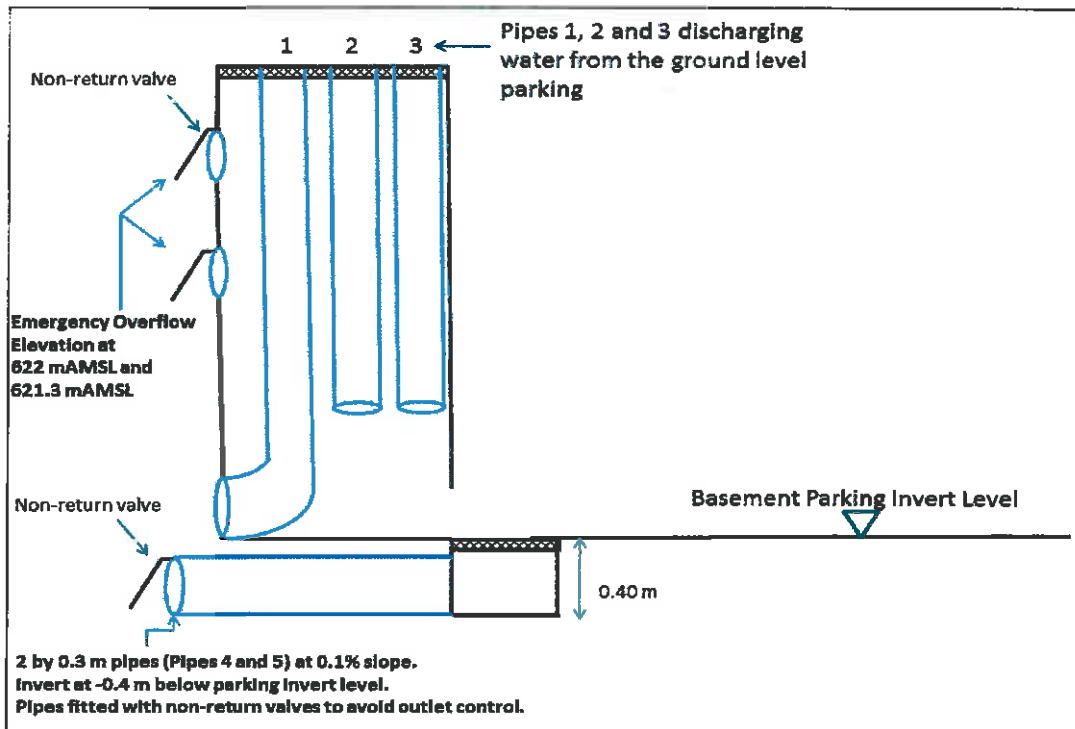


Figure 4-5 Conceptual Long Section Schematic of the Basement Level Sump, Catch Pit and Stormwater Diversion Pipes.

4.2 Floodline Delineations

The peak discharge values determined for the 1:50 and 1:100 year return periods for the Foxhill Spruit catchment at the proposed development are shown in **Table 4-6**.

Table 4-6 Foxhill Spruit Catchment Design Flood Results of the Proposed Woodburn Development Site

Peak Discharge	Return Period (years)	
	1:50	1:100
Q_p (m ³ /s)	113.4	142.0

The results from the 1:50 and 1:100 year floodline analyses are shown in **Figure 4-6** and **Figure 4-7** respectively (the 1:50 and 1:100 year floodlines are presented separately in **Appendices C** and **D** respectively). The blue floodlines, which present the current site conditions, indicate that a significant portion of the Woodburn development site is inundated by both the 1:50 and 1:100 year design flood events. This is possibly due to the low slope gradient as indicated by the sparsely positioned contour lines (**Figure 3-1**). The low slope gradient allows for flood waters from the 1:50 and 1:100 year design flood events to encroach on and inundate the development site.

A flood prevention scenario was assessed during the hydraulic modelling component of the study. This introduced a retaining wall to prevent flood waters entering the development site. It was found that the 1:50 year flood reached a maximum height of approximately 1.13 m approximately 121 m downstream of the bridge, which is located upstream of the study site. The 1:100 year flood reached a maximum height of approximately 1.76 m. It is, therefore, proposed that a flood protection barrier (retaining wall) with a minimum height of at least 1.76 m from the ground level be constructed to prevent any possible damage of the site resulting from the 1:50 and 1:100 year design flood events. The length of the retaining wall parallel to the Foxhill Spruit River would need to be approximately 141 m long. The north and south ends of the retaining wall would need to span a distance of approximately 10 m. The afore-mentioned retaining wall height is based on the elevation of the modelled flood waters and does not take into account wind-run and wave action during the 1:50 and 1:100 year design flood events. It is recommended that these factors be taken into account by the site engineer during the final design of the flood protection barrier, thereby allowing for a freeboard component to the berm.

As mentioned, the level of the 1:100 year design flood waters reaches an elevation of approximately 620.07 mAMSLL at a distance of approximately 121 m downstream of the Chief Albert Luthuli Road bridge. In order for the stormwater management infrastructure (section 4.1) to adequately discharge the 1:50 year design discharge, the level of the basement parking lot will need to be situated at an elevation of approximately 2.6 m above the elevation of the Foxhill Spruit River bank adjacent to the proposed development site to accommodate the required freeboard of 0.8 m and to ensure that the outlet pipe is not submerged by the 1:100 year design flood event water level.

In addition to the analyses, it was noted that no additional structures on the left side of the Foxhill Spruit River are impacted upon by the construction of a retaining wall around the areas of concern of the proposed Woodburn development. However, the bowling green and parking lot of the bowls club will be affected by the construction of the retaining wall under the 1:100 year flood conditions.

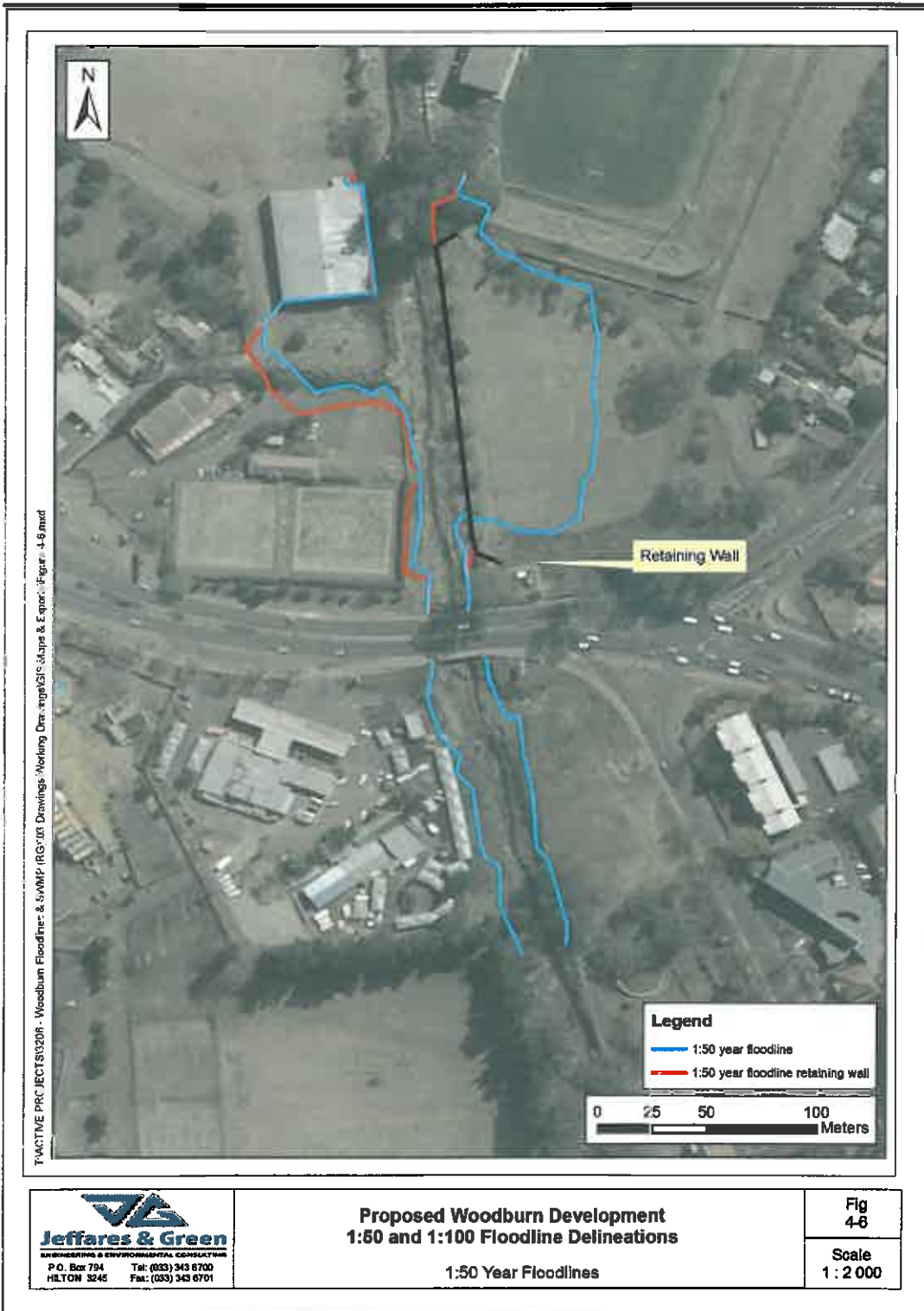


Figure 4-6 The 1:50 Year Floodlines for the Proposed Woodburn Development

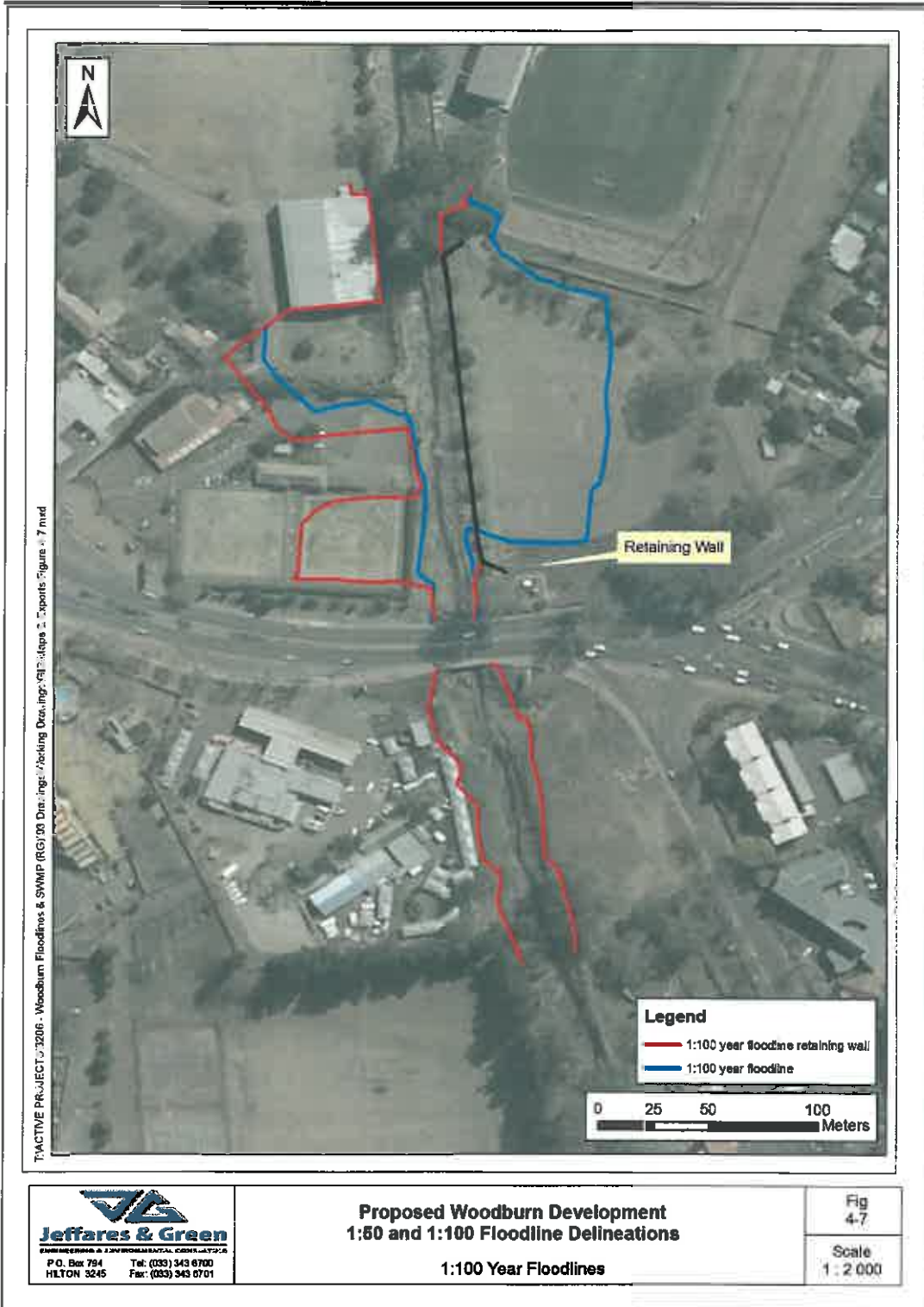


Figure 4-7 The 1:100 Year Floodlines for the Proposed Woodburn Development

5 CONCLUSIONS AND RECOMMENDATIONS

As part of the proposed Woodburn development project, assessments of a stormwater management plan (SWMP) and delineations of the 1:50 and 1:100 year floodlines were undertaken for the Foxhill Spruit River adjacent to the proposed development site. The first part of the investigation was to provide O & T Development with an indication of the stormflow volume generated by the proposed developments. The second part of the investigation was to provide O & T Development with an indication of the extents of the 1:50 and 1:100 year floodlines of the Foxhill Spruit River and to assess the areas of the property that may be vulnerable to inundation in the event of a 1:50 and 1:100 year floods.

The results from the assessment of the SWMP indicated that an additional volume of 1 107 m³ is required to attenuate the impact of the development occurring at the study site. Based on the clients instruction to use the parking areas as attenuation storage facilities, it is proposed that an outlet with a 0.4 m diameter pipe (Pipe 1) situated at the invert level of the catch pit. Pipe 1 would need to be positioned 0.6 m below the invert level of the ground level parking lot. In addition, two pipes (Pipes 2 and 3) with a diameter of 0.45 m would need to be placed with their invert levels 0.4 m below the invert level of the ground floor parking level. Pipe 1 would serve as a diversion of a portion of the stormwater resulting from the 1:50 year design flood event to the Foxhill Spruit River at a discharge rate of 0.28 m³/s. This was deemed acceptable as the discharge rate from Pipe 1 (0.28 m³/s) would be less than the pre-development discharge rate of 0.29 m³/s. Pipes 2 and 3 would serve to divert the balance of the stormwater to the basement at a combined rate of 0.42 m³/s.

The release of the 1:50 year design flood waters would be accomplished by 2 pipes (Pipes 4 and 5) with a diameter of 0.3 m installed in a sump 0.4 m meters below the invert level of the basement parking lot. Pipes 4 and 5 would discharge the stormwater from the basement parking lot at a combined rate of 0.22 m³/s. This is less than the pre-development peak of 0.29 m³/s. As mentioned, the development is located adjacent to the Foxhill Spruit River. It is worth noting that the 1:50 and 1:100 year design flood levels result in the submergence of the basement level outlet structures. Thus, the stormwater diverted to the basement level parking lot will need to be retained until the recession of the 1:50 or the 1:100 year design flood waters. Pipes 4 and 5 would need to be fitted with non-return valves that would prevent the Foxhill Spruit River flood waters flowing into the basement parking lot. The discharge rate of Pipe 1 will diminish and eventually stop when the above-mentioned flood water levels have receded (due to the shorter time of concentration of the site in relation to the river) to

an elevation that allows for the release of stormwater stored in the basement parking lot. Thus, the total discharge of Pipes 1, 4 and 5 will not exceed the pre-development peak of 0.29 m³/s. In addition to Pipes 4 and 5 serving as release structures from the basement level parking lot, it is recommended that emergency overflow structures fitted with non-return valves are installed in the sump containing Pipes 1 to 3. The elevations of the outlet structures should be 622 mAMS and 621.3 mAMS to prevent their submergence by the 1:100 and 1:50 year design flood levels, respectively. It is recommended that the ground and basement level SWMP infrastructure are installed in the north-west portion of their respective levels. The results of the hydraulic modelling exercise indicate that the flood waters are at the lowest elevation in line with the north-west portion of the basement level parking lot approximately 121 m below the Chief Albert Luthuli Road bridge upstream of the site., hence, providing storm water discharge earlier in the flood event. It should be noted that the ground level catch pit is in close proximity to the shopping area in the north-west portion of the development. It is therefore recommended that the catch pit, outlet pipes and manhole grating (or similar covering) are properly maintained and kept free of debris or other material which may cause as an obstruction to stormwater flow.

The results from the floodline assessment of the 1:50 and 1:100 year design floods indicate that a significant portion of the proposed development site will be inundated by the two afore-mentioned floods. It is proposed that a retaining wall with a minimum height of 1.76m metres be constructed to aid in the prevention of inundation by the 1:50 and 1:100 year design flood events (this excludes freeboard allowances for wind and wave action). Furthermore, no additional structures on the left side of the Foxhill Spruit River are impacted upon by the 1:50 and 1:100 year design floods with the intervention of a retaining wall at the proposed development site. However, the bowling green on the left side of the river will be inundated by the 1:100 year flood waters resulting from the intervention of a retaining wall. It must be noted that this may not occur, but due to the course level of the contour data on the adjacent river bank, it was not possible to confirm this.

The schematics of the plan, long and cross section views (**Figures 4-1 to 4-5**) of the SWMP are for conceptual purposes. The dimensions depicted in the above-mentioned schematics are not to scale. It is recommended that the design engineer takes cognisance of the required pipe, freeboard and slope requirements during the design of the SWMP infrastructure. However, the ultimate detailed design is at the engineer's discretion. Finally, erosion protection measures need to be included at all stormwater outlets discharging into the Foxhill Spruit River (e.g. flow splitters, reno mattresses and gabion baskets).

6 REFERENCES

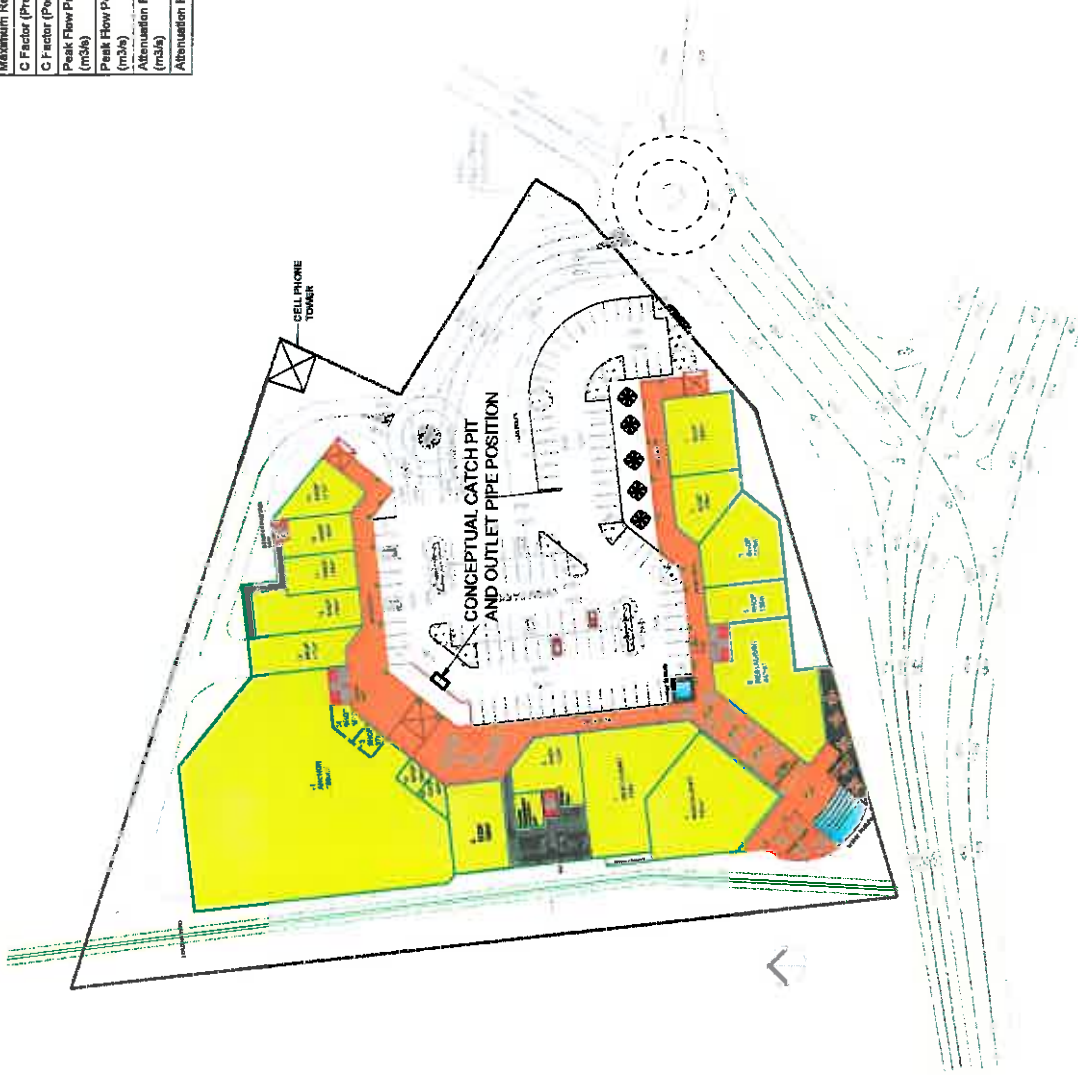
Henderson, F. M. 1966. Open Channel Flow, MacMillan Series in Civil Engineering.

Smithers, J.C. and Schulze, R.E. 2003. Design Rainfall and Flood Estimation in South Africa. Water Research Commission, Pretoria, RSA, WRC Report 1060/1/03. pp 156 plus CD-Rom.

APPENDIX A

Layout Plan of the Ground Level Conceptual Stormwater Management Plan

	Area km ²	Return Period (years)					
		2	5	10	20	50	100
Maximum Rainfall Intensity		51.5	75.0	94.7	117.3	165.0	196.5
C Factor (Pre-Development)		0.35	0.35	0.35	0.35	0.35	0.35
C Factor (Post-Development)		0.85	0.85	0.85	0.85	0.85	0.85
Peak Flow Pre-Development (m ³ /s)	0.0178	0.09	0.13	0.16	0.20	0.29	0.32
Peak Flow Post-Development (m ³ /s)	9.0178	0.22	0.32	0.40	0.49	0.70	0.78
Attenuation Requirement (m ³ /s)		0.13	0.19	0.23	0.29	0.41	0.46
Attenuation Requirement (m ³)		342.00	591.00	633.00	764.00	1107.00	1247.00



SCALE
1:1000

**WOODBURN DEVELOPMENT
CONCEPTUAL STORMWATER
MANAGEMENT**

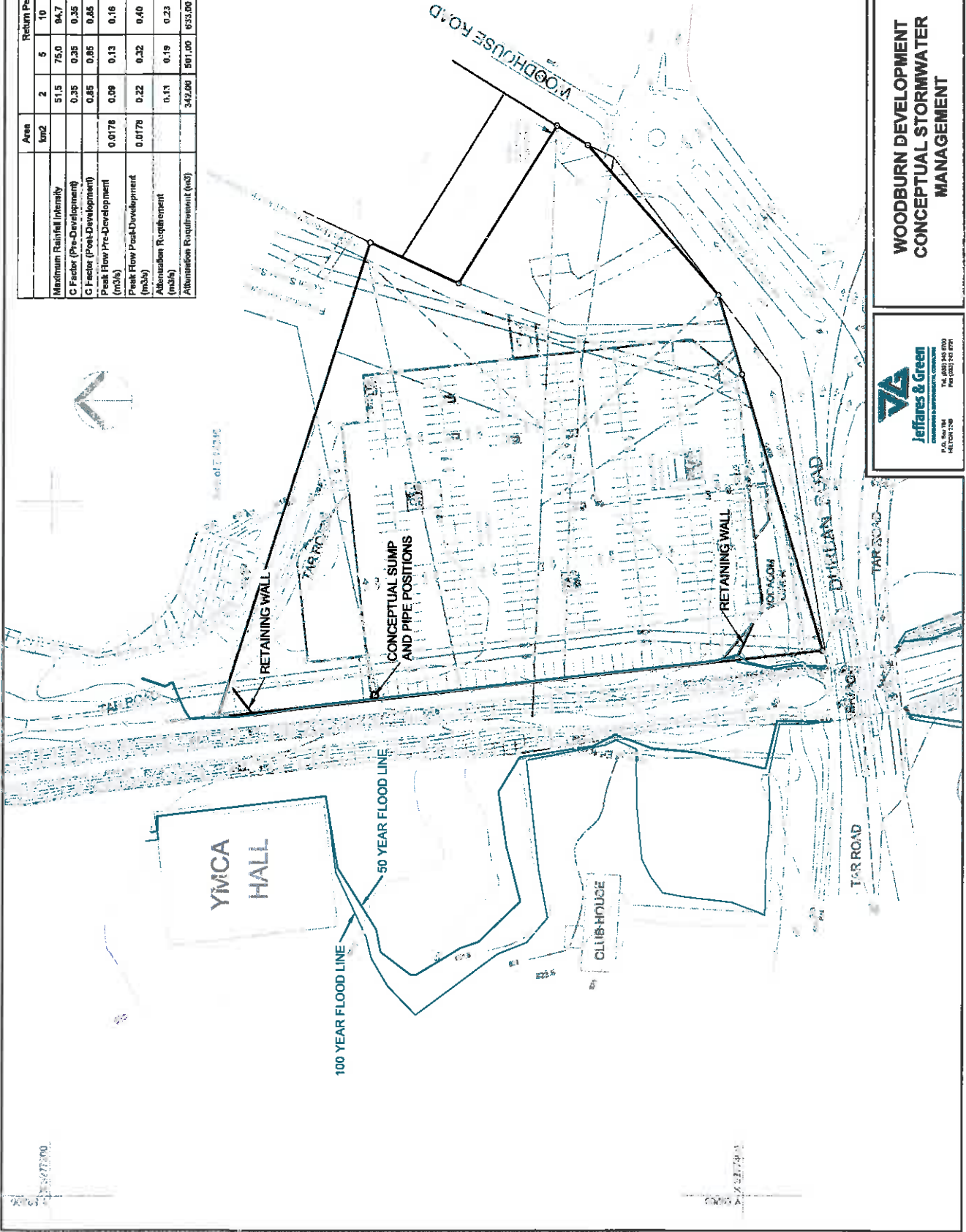
Jeffares & Green
Environmental & Sustainability Consultants
P.O. Box 294
Halifax, NS
Tel: (902) 744-8700
Fax: (902) 744-8701

FIG. A-1

APPENDIX B

**Layout Plan of the Basement Level Conceptual Stormwater Management Plan,
1:50 and 1:100 Year Floodlines and the Proposed Retaining Wall**

	Area	Return Period (years)					
		2	5	10	25	50	100
Maximum Rainfall Intensity	Imp2	51.5	75.0	94.7	117.3	165.0	186.5
C Factor (Pre-Development)		0.35	0.35	0.35	0.35	0.35	0.35
C Factor (Post-Development)		0.85	0.85	0.85	0.85	0.85	0.85
Peak Flow Pre-Development (m3/s)	0.0176	0.09	0.13	0.16	0.20	0.29	0.32
Peak Flow Post-Development (m3/s)	0.0176	0.22	0.32	0.40	0.49	0.70	0.78
Attenuation Requirement (m3/s)		0.13	0.19	0.23	0.29	0.41	0.46
Attenuation Requirement (acre)		342.00	581.00	633.00	784.00	1107.00	1247.00



SCALE
1:1000

**WOODBURN DEVELOPMENT
CONCEPTUAL STORMWATER
MANAGEMENT**

FIG. B-1

APPENDIX C

1:50 and 1:100 Year Floodlines of the Proposed Woodburn Development Site

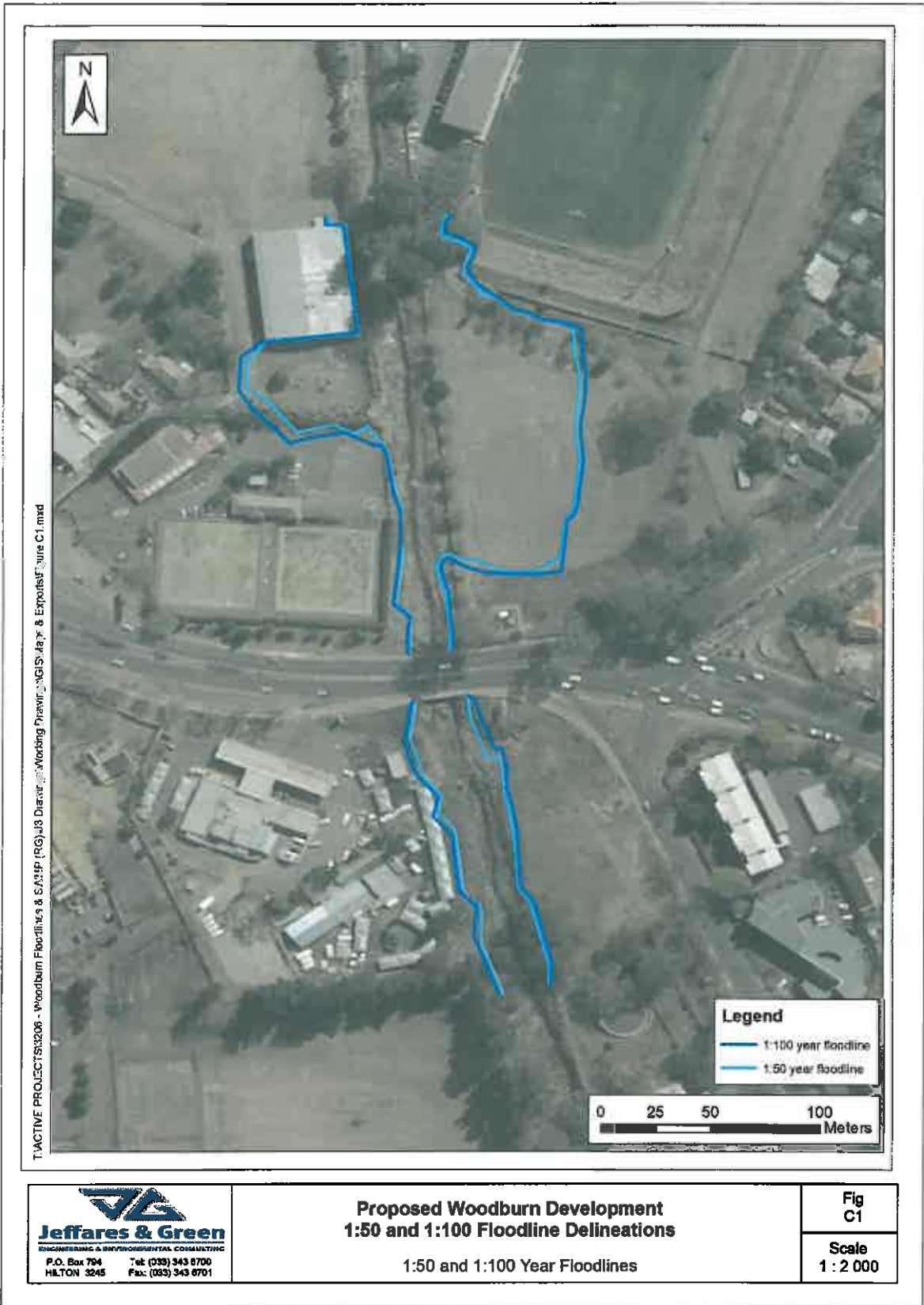


Figure C1 The 1:50 and 1:100 year Floodlines for the Proposed Woodburn Development

APPENDIX D

**1:50 and 1:100 Year Floodlines of the Proposed Woodburn Development Site
With the Proposed Retaining Wall Protection**

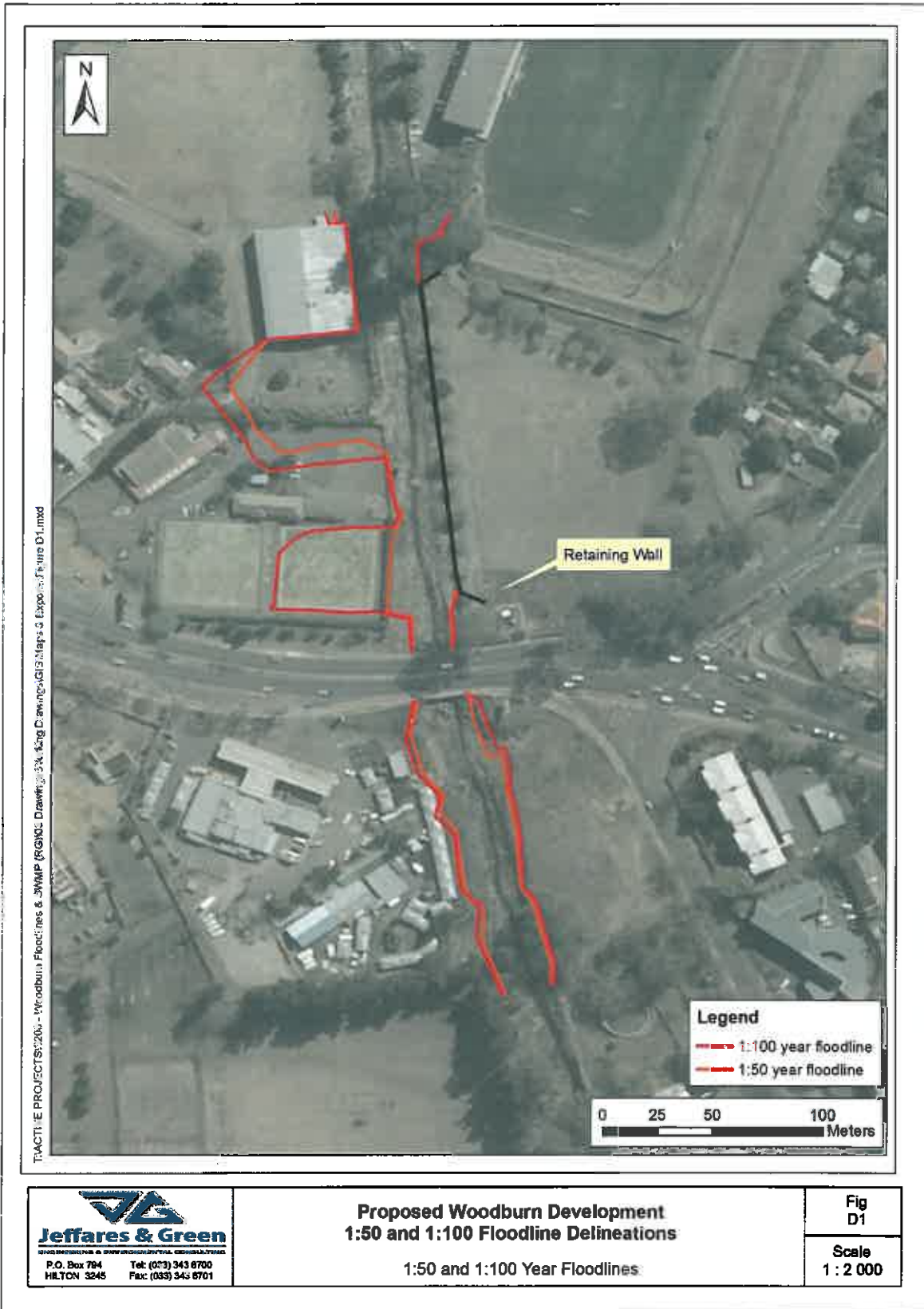


Figure D1 The 1:50 and 1:100 year floodlines and Retaining Wall for the Proposed Woodburn Development

Appendix D2:

Wetland Delineation Assessment

**Proposed Woodburn Boulevard Shopping
Centre, Pietermaritzburg KwaZulu-Natal**

***Specialist Wetland Delineation
Assessment***

Version 1.0

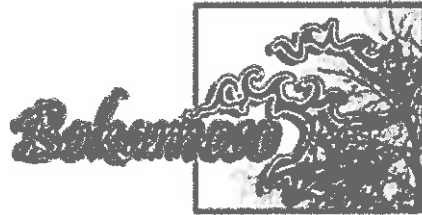


Date: April 2013

Author(s): Adam Teixeira-Leite & Douglas Macfarlane

Report No: EP75-01

Prepared for:



**Landscape Architects &
Environmental Consultants**

by



Date:

April 2013

Please direct any queries to:

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26 Mallory Road, Hilton, South Africa, 3245

Email: dmacfarlane@eco-pulse.co.za

Suggested report citation:

Teixeira-Leite, A. and Macfarlane, D.M. 2013. Proposed Woodburn Boulevard Shopping Centre: *Specialist Wetland Delineation Assessment Report*. Unpublished report for BOKAMOSO Landscape Architects & Environmental Consultants. April 2013.

SPECIALIST WETLAND DELINEATION REPORT DETAILS AND DECLARATION

Document Title:	Proposed Woodburn Boulevard Shopping Centre: <i>Specialist Wetland Delineation Assessment Report</i>
Report prepared by:	Adam Teixeira-Leite
Field of study/Expertise:	Wetland Ecology
Date:	09 April 2013
Revision Number:	1
Approved by:	Douglas Macfarlane
Date:	10 April 2013
Signature:	
Client:	BOKAMOSO: Landscape Architects & Environmental Consultants

I Adam Teixeira-Leite hereby declare that this report has been prepared independently of any influence or prejudice as may be specified by the Department of Agriculture and Environmental Affairs.

Signed: _____



Date: _____

09 April 2013

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LIST OF ANNEXURES

ANNEXURE A: Vegetation species list.

DEFINITION OF TERMS

Delineation	Refers to the technique of establishing the boundary of a resource such as a wetland or riparian area.
Ecosystem	An ecosystem is essentially a working natural system, maintained by internal ecological processes, relationships and interactions between the biotic (plants & animals) and the non-living or abiotic environment (e.g. soil, atmosphere). Ecosystems can operate at different scales, from very small (eg. a small wetland pan) to large landscapes (eg. an entire water catchment area).
Habitat	The general features of an area inhabited by animal or plant which are essential to its survival (ie. the natural "home" of a plant or animal species).
Indigenous	Naturally occurring or "native" to a broad area, such as South Africa in this context.
Invasive alien species	Invasive alien species means any non-indigenous plant or animal species whose establishment and spread outside of its natural range threatens natural ecosystems, habitats or other species or has the potential to threaten ecosystems, habitats or other species.
Transformation (habitat loss)	Refers to the destruction and clearing an area of its indigenous vegetation, resulting in loss of natural habitat. In many instances, this can and has led to the partial or complete breakdown of natural ecological processes.
Water course	Means a river or spring, a natural channel in which water flows regularly or intermittently; a wetland, lake or dam into which, or from which, water flows and any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks (National Water Act, 1998).
Wetland	Refers to land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil (NWA, 1998).

ABBREVIATIONS USED

DEAT	Department of Environmental Affairs & Tourism (now DEA)
DWA	Department of Water Affairs (formerly DWAF)
FW	Facultative wetland species - usually grow in wetlands (67-99% occurrence) but occasionally found in non-wetland areas
GIS	Geographical Information Systems
GPS	Global Positioning System
IAPs	Invasive Alien Plants
KZN	Province of KwaZulu-Natal
NEMA	National Environmental Management Act No.107 of 1998
NWA	National Water Act No.36 of 1998
Ow	Obligate wetland species - almost always growing in wetlands (>90% occurrence)
SANBI	South African National Biodiversity Institute

1 INTRODUCTION

1.1 Background to the assessment, area of study and proposed development activity

Eco-Pulse Consulting Services was appointed by Bokamoso: Landscape Architects & Environmental Consultants to conduct a wetland delineation study for the proposed Woodburn Boulevard Shopping Centre. The project area shown in Figure 1 is located on portion 5 of ERF 5346, corner of Woodhouse Road and Alan Paton Drive, Pietermaritzburg, KwaZulu-Natal.

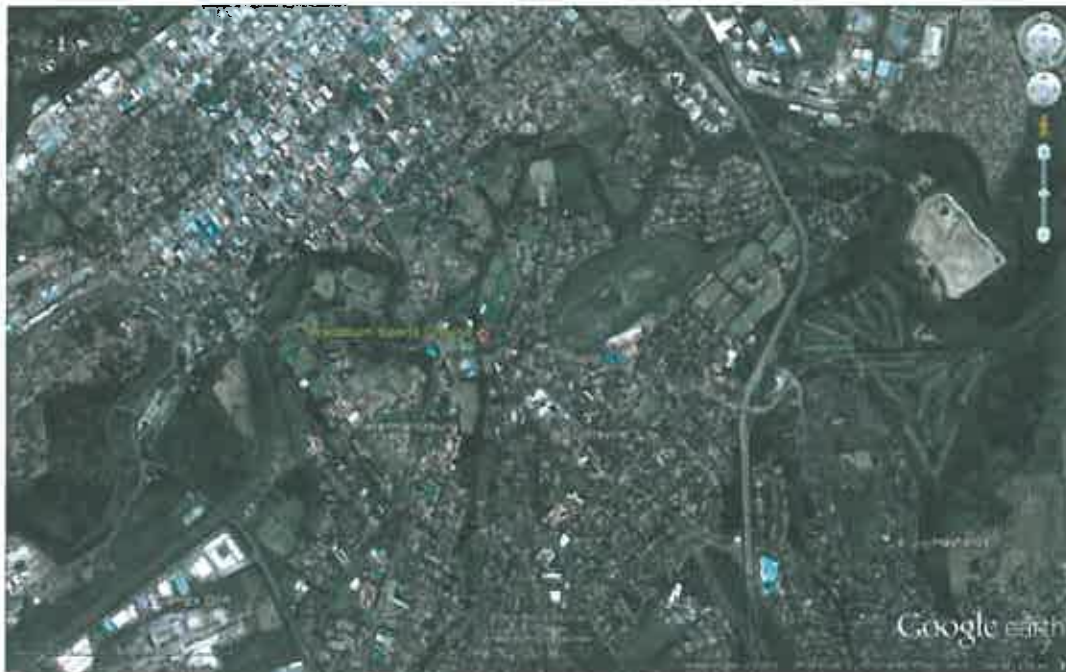


Figure 1 Google Earth™ map showing the location of the project area (Woodburn Sports Ground) in Pietermaritzburg, KwaZulu-Natal.

1.2 Scope of work

The focus of work was to undertake wetland delineation on the site of the proposed Woodburn Boulevard Shopping Centre. The scope of work included:

- Field visit by wetland ecologist to verify and delineate wetland habitat within the development zone according to the methods contained in the manual '*A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas*' (DWAF, 2005);
- GIS mapping of the outer wetland boundary (boundary between temporary wetland and terrestrial areas);
- Brief description of wetland soils, habitat and vegetation;

- Drafting of a specialist wetland delineation report documenting the methodology and findings of the wetland delineation assessment, including all relevant wetland delineation maps.

1.3 Project team

Details of project team members involved in the project are indicated below in Table 1:

Table 1. Details of team members

Team Member	Qualifications	Details
Douglas Macfarlane (Eco-Pulse)	BSc (Agric) MSc	Douglas Macfarlane is a Principal Scientist at Eco-Pulse and the director of the company. His qualifications include a BSc in Wildlife science (completed Summe Cum Laude) and an MSc in Environment & Development. He is a registered Professional Natural Scientist in the field of Ecological Science, having worked both in the corporate sector and consulting environment. He has been working in the field of wetland and ecological assessments for over 10 years. He was responsible for finalisation and review of the report.
Adam Teixeira-Leite (Eco-Pulse)	BSc Hons (Envs)	Adam is an employee at Eco-Pulse and Environmental Scientist with a BSc Honours degree in Environmental Science. Over the past 5 years he has worked extensively on numerous wetland projects requiring the delineation of wetlands and assessment of wetland functional importance and sensitivity, as well as wetland rehabilitation planning, in KwaZulu-Natal, the Western Cape and Eastern Cape and in Gauteng. Adam has also been recently involved in projects requiring the assessment of terrestrial and aquatic biodiversity involving both desktop analysis and field verification as well as in the development of a Biodiversity Sector Plan for the Ugu District Municipality. He has also been extensively involved in vegetation assessments and alien invasive plants surveys and nursery audits for eThekweni Municipality. He was responsible for undertaking the field work and drafting this report.

2. METHODOLOGY

2.1 Data sources consulted

The following data sources and GIS spatial information provided in Table 2 below was consulted to inform the assessment. The data type, relevance to the project and source of the information has been provided.

Table 2. Information and data coverage's used to inform the wetland assessment

DATA/COVERAGE TYPE	RELEVANCE	SOURCE
Colour Aerial Photography (2009)	Mapping of wetlands and other features	National Geo-Spatial Information
Latest Google Earth™ imagery	To supplement available aerial photography where needed	Google Earth™ On-line
5m Elevation Contours	To assist with desktop mapping of wetlands, delineation of catchments and calculation of slope/gradients	Surveyor General

2.2 Methods used

2.2.1 Wetland Delineation

The outer boundary of wetlands occurring on the site was identified and delineated according to the Department of Water Affairs wetland delineation manual 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005). Three specific wetland indicators were used in the detailed field delineation of wetlands, which include:

➤ **Terrain unit indicator**

A practical index used for identifying those parts of the landscape where wetlands are likely to occur based on the general topography of the area.

➤ **Wetland vegetation indicator**

Vegetation in an untransformed state is a useful guide in finding the boundary of a wetland as plant communities generally undergo distinct changes in species composition as one proceeds along the wetness gradient from the centre of a wetland towards adjacent terrestrial areas. An example of criteria used to classify wetland vegetation and inform the delineation of wetland zones is provided in Table 3.

Table 3. Criteria used to inform the delineation of wetland habitat based on wetland vegetation (adapted from Macfarlane *et al.*, 2008 and DWAF, 2005)

Vegetation	Temporary wetness zone	Seasonal wetness zone	Permanent wetness zone
Herbaceous	Mixture of non-wetland species and hydrophilic plant species restricted to wetland areas	Hydrophilic sedges and grasses restricted to wetland areas	Emergent plants including reeds and bulrushes; floating or submerged aquatic plants
Woody	Mixture of non-wetland and hydrophilic species restricted to wetland areas	Hydrophilic woody species restricted to wetland areas	Hydrophilic woody species restricted to wetland areas with morphological adaptations to prolonged wetness (e.g.: prop roots)
SYMBOL	HYDRIC STATUS	DESCRIPTION/OCCURRENCE	
ow	Obligate wetland species	Almost always grow in wetlands (>90% occurrence)	
fw	Facultative wetland species	Usually grow in wetlands (67-99% occurrence) but occasionally found in non-wetland areas	
f	Facultative species	Equally likely to grow in wetlands (34-66% occurrence) and non-wetland areas	
fd	Facultative dry-land species	Usually grow in non-wetland areas but sometimes grow in wetlands (1-34% occurrence)	
d	Dryland species	Almost always grow in drylands	

➤ **Soil wetness indicator**

According to the wetland definition used in the National Water Act (NWA, 1998), vegetation is the primary indicator which must be present under normal circumstances. However, in practice the soil

wetness indicator (informed by investigating the top 50cm of wetland topsoil) tends to be the most important, and the other three indicators are used to refine the assessment. The reason for this is that vegetation responds relatively quickly to changes in soil moisture and may be transformed by local impacts; whereas the soil morphological indicators are far more permanent and will retain the signs of frequent saturation (wetland conditions) long after a wetland has been transformed/draind (DWAF, 2005a). Thus the on-site assessment of wetland indicators focused largely on using soil wetness indicators, determined through soil sampling with a soil auger, with vegetation and topography being a secondary indicator. A Munsell Soil Colour Chart was used to ascertain soil colour values including hue, colour value and matrix chroma as well as degree of mottling in order to inform the identification of wetland (hydric) soils. Soil sampling points were recorded using a GPS (Global Positioning System) and captured using Geographical Information Systems (GIS) for further processing. An example of soil criteria used to assess the presence of wetland soils is provided below in Table 4 while Figure 2 provides a conceptual overview of soil and vegetation characteristics across the different wetness zones.

Table 4. Soil criteria used to inform wetland delineation using soil wetness as an indicator (after DWAF, 2005)

Soil depth	Temporary wetness zone	Seasonal wetness zone	Permanent wetness zone
0 – 10cm	Matrix chroma: 1- 3 (Grey matrix <10%) Mottles: Few/None high chroma mottles Organic Matter: Low Sulphidic: No	Matrix chroma: 0- 2 (Grey matrix >10%) Mottles: Many low chroma mottles Organic Matter: Medium Sulphidic: Seldom	Matrix chroma: 0- 1 (Prominent grey matrix) Mottles: Few/None high chroma mottles Organic Matter: High Sulphidic: Often
30 – 50cm	Matrix chroma: 0 – 2 Mottles: Few/Many	As Above	As Above

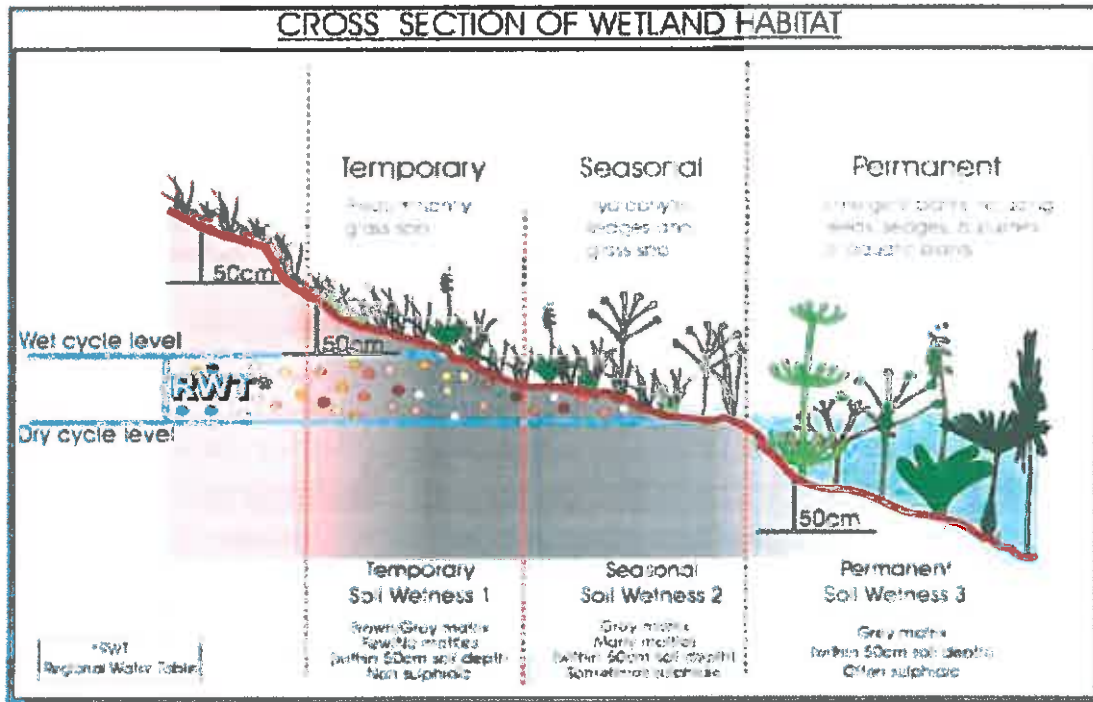


Figure 2 Diagram representing the different zones of wetness found within a wetland (from DWAF, 2005).

3. ASSESSMENT FINDINGS

3.1 Wetland Delineation

A number of soil samples were taken from different sites within the project area as indicated in Figure 3. The findings of the assessment are summarized in Table 5, below. **No wetland habitat was identified at the project site.** The site is a sports field surrounded by planted trees and with an area of alien bush dominated by exotic plants and weeds along the southern boundary. A small stream is located outside of the western fenceline, immediately adjacent to the property.

Table 5. Summary of findings of the delineation study at Woodburn

Component Assessed	Summary of Findings	Results indicate wetland?
Terrain	The topography of the site is very flat and raised above the floodline of the adjacent stream (Photo 1). The terrain is largely unfavourable for wetland formation.	No
Soils	Soils are highly compacted and contain gravel and other artificial fill material, indicating these soils have been largely disturbed (Photo 3 & 4). Soils are dry clay-loams. Soils sampled are not indicative of hydric conditions at the site as they do not display typical signs of wetness:	No

Component Assessed	Summary of Findings	Results Indicate wetland?
	<ul style="list-style-type: none"> • Soils do not contain any mottling • Soils are dry (little soil moisture) and have an estimated low organic content • Soils are not sulphidic • Soil value and matrix chroma are too high to be considered wetland soil type <ul style="list-style-type: none"> ○ Hue: 7.5YR ○ Value: 5-6 ○ Chroma: 2-3 ○ Colour: brown to light-brown 	
Vegetation	Vegetation comprises a combination of indigenous and exotic grasses and a variety of exotic herbaceous plants (Photo 2). None of these plant species are indicative of wetland habitat and are dryland species that indicate terrestrial (non-wetland) habitat conditions at the site. For a list of the plant species occurring at the site, refer to Annexure A at the back of this report.	No



Figure 3 Map showing the location of soil sampling sites and photo points.

Site Photos (location of Photo points shown in Figure 3, above)**P1** View West: overview of project area and sports field.**P2** View East: alien plants and weeds along southern boundary of the site.**P3** Terrestrial soils sampled at the site**P4** Terrestrial soils containing fill material

3.2 Description of stream to the west

The location of the watercourse to the immediate west of the project area is shown in Figure 3 and Photo 5. The watercourse is classified as a stream channel, with the main active channel being between 1 and 2m wide. The channel is incised, with the channel banks being roughly 2.5 – 3m above the active channel bed. The channel is a mixed bedrock-alluvial system and has been subject to artificial canalization. A large amount of artificial materials, building rubble, debris and solid waste has accumulated within the system. The channel banks comprise mainly fine sandy material and are steep sloping. The combination of sandy, erodible material and steep slope means that these slopes are inherently unstable and relatively susceptible to erosion (Photo 6). The vegetation of the stream comprises predominantly alien plants including a variety of aquatic invader species such as *Canna indicand* *Commelina benghalensis*, as well as woody species and herbaceous plants including *Arundo donax*, *Solanum mauritianum* and *Manihot esculenta*. The indigenous component of vegetation is very sparse and includes a few local grasses and sedge species such as *Cyperus sexangularis* and *Sporobolus spp.*



P5 View North: stream channel located immediately west of the property

5. CONCLUSION

The results of the wetland delineation exercise undertaken at Woodburn Sports Ground found that no wetland habitat is currently present on the site. A watercourse (stream) exists outside of the property on the western side and should be managed to prevent negative ecological impacts to this system during the construction & operational phases of the proposed development.

Should you have any queries regarding the findings of this report, please contact Eco-Pulse Consulting.

Douglas Macfarlane, Pr.Sci.Nat.

Principal Scientist

Eco-Pulse Consulting

dmacfarlane@eco-pulse.co.za

6. REFERENCES

Bromilow, C., 2010. Problem Plants and Alien Weeds of South Africa. Third Edition. Briza Publications, Pretoria, South Africa.

DWAF (Department of Water Affairs and Forestry). 2005. A practical field procedure for identification and delineation of wetland and riparian areas. Edition 1, September 2005. DWAF, Pretoria.

Macfarlane, D.M., Kotze, D.C., Ellery, W.N., Walters, D., Koopman, V., Goodman, P. & Goge, C. 2008. WET-Health: A technique for rapidly assessing wetland health, Version 2.

Munsell Soil Colour Chart (year 2000 edition).

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Van Oudtshoorn, F. (2006). Guide to grasses of Southern Africa. Pretoria, South Africa.

Appendix D3:

Engineering Input

Lizelle Gregory

From: Ryk Joubert <ryk@brava.co.za>
Sent: 09 May 2012 11:09 AM
To: 'Lizelle Gregory'
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346
Attachments: Draft Infrastructure report.pdf

Hi Lizelle

Kyk asb na hierdie verslaggie van my en laat weet of dit meeste van die vrae beantwoord

Groete

Ryk

From: Lizelle Gregory [<mailto:lizelleg@mweb.co.za>]
Sent: 08 May 2012 10:46 AM
To: 'Ryk Joubert'
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346

Ryk,

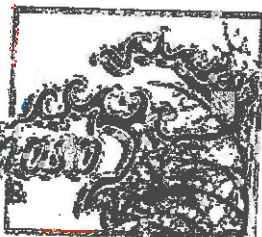
Dankie – dit lyk reg.

Ek het ook bevestiging nodig dat die stormwaterafdeling van die Stadsraad dat hulle die stormwaterbestuurs-konsep ondersteun en dat hulle bevestig dat hulle die ontwikkeling se afval kan ontvang. (Die "Waste Afdeling").

Groete,

Lizelle

Elsa Viviers
Namens/on behalf of
Lizelle Gregory



Environmental Consultants
Landscape Architects

111 27 11 27 3010 | 11 27 26 370 5450 | 082 35 58 3811
e: info@bakamoo.co.za | Ooselooislaan 111, 111, 111, 111, 111, 111

From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 25 April 2012 12:52 PM
To: 'Lizelle Gregory'
Subject: FW: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hallo Lizelle

Sal die onderstaande response van die stadsraad voldoende wees indien ek daarna verwys in my services report?

Groete

Ryk

From: Dhamendra Ragoonandan [<mailto:Dhamendra.Ragoonandan@msunduzi.gov.za>]
Sent: 25 April 2012 12:16 PM
To: Ryk Joubert
Cc: Rodney Colling; Brenden Sivparsad
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346

This email and all contents are subject to the following disclaimer:
http://www.msunduzi.gov.za/Email_Disclaimer.pdf or send a blank e-mail to disclaimer@msunduzi.gov.za to have the document e-mailed to you.

Hello, Ryk

As per our telephonic conversation on the 20/04/2012.

As long as the water and sewerage demand remains the same as the previous application the city can sustain the water and sanitation demand.

As per your request this is purely for EIA purposes.

Any other requirements from this business unit shall be addressed in the service level agreement.

PS Rodney please take note of this.



DHAMENDRA RAGOONANDAN
MANAGER PLANNING & DESIGN (ACTING)
WATER & SANITATION
TEL : 033 3922115
FAX : 033 3922588
CELL : 083 2950970
email: dhamendra.ragoonandan@msunduzi.gov.za



DEPARTMENT OF PUBLIC WORKS

From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 25 April 2012 08:48 AM
To: Dhamendra Ragoonandan
Subject: FW: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hi Dees

Any chance that you can still get around to this request of mine before the end of the week?

Regards

Ryk

From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 20 April 2012 11:54 AM
To: 'dhamendra.ragoonandan@msunduzi.gov.za'
Subject: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hi Dees

As per our telephone discussion this morning herewith the information I need for a new EIA being prepared for the Woodburn Shopping centre

Tony Statakis is still working on the shopping centre development at Woodburn & has commissioned a new EIA as the present one has expired. In order to finalise this report I need to update my services report. The scope of the development hasn't changed and he is still looking at a 6500m².

All that I need is confirmation from the city that:

- That city will/can provide a sewer connection to the site (should not be a problem as a main outfall sewer already crosses the site)
- The city will/can provide a water connection to the site (should also not be a problem as there is water in close proximity to the site and being a commercial development the water demand is fairly low)
- The city can provide solid waste removal services to the development – I don't know if you can help with this but maybe you can point me towards the right person.

I have already spoken to the roads & stormwater branch & have the city's requirements from Hoessein Essop which I will work into my report.

I already have confirmation of the above, but the EIA process requires confirmation to these facts that isn't older than 6 mths, so hence my request for updated confirmation.

The electrical engineer is dealing with the electrical supply.

Regards

Ryk

Ryk Joubert PrEng

Brava Engineers (Pty) Ltd.
57 Braid Street, Pietermaritzburg 3201, South Africa
PO Box 681, Pietermaritzburg, 3200, South Africa
Tel: +27 33 345 0502 Fax: +27 33 342 7513
Cel: +27 82 552 1743 email: ryk@brava.co.za

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1 INTRODUCTION

This report has been prepared in response to O&T Developments (Pty) ltd's intention to develop a new upmarket shopping complex on Portion 5 of Erf 4346, Pietermaritzburg.

The development will comprise an upmarket convenience shopping centre of extent 6500m² with associated parking facilities.

2 SITE DESCRIPTION AND GEOLOGY

The site is a 17 827m² open space which has already been incorporated in the Msunduzi Municipality Town Planning Scheme as a Special Area 30 development zone. The site is a levelled platform under grass and was previously used for sport and recreation.

The natural topography of the site has been heavily disturbed. A large level platform was prepared on the site for use as a sports field. The platform was created by cutting away the existing soil to an unknown spoil site, leaving the new embankment level below the original 1:50yr floodline of the Foxhill Stream.

Grass lands cover the majority of the site with a clump of old Eucalyptus trees on the eastern boundary.

The 1:250 000 geological mapping of the area reveals that the site is generally underlain by shales of the Pietermaritzburg Formation of the Eccca Group.

Extensive alluvial terrace deposits are however associated with the confluences of the major rivers of the area and it is expected that this may occur on this site. The alluvium consists of interlayered dark grey-brown, brown or red-brown silty and sandy clay as well as clayey to silty sands. It varies in thickness from between 2m and 8.5m and some exposures the alluvial boulder can be expected.

A detailed geotechnical investigation hasn't been commissioned but no areas of slope instability or unsuitable soil conditions are expected.

A flood line analysis of the Foxhill Stream has been undertaken. Due to the extensive earthmoving operations the natural ground levels have been disturbed to such an extent that the largest portion of the site now lies below the 1:10yr flood line.

3 PROPOSED INFRASTRUCTURE

3.1 Roads and Storm Water

3.1.1 Access

A traffic impact assessment for the site was undertaken by WSP. The study identified the following access points:

- a) Access onto the site off the east bound carriageway of Allan Paton Avenue
- b) Access onto and from the site off Woodhouse Road

3.1.2 Internal Roads

The internal roads would be blacktopped roads designed according to the capacity requirements of Traffic Impact Assessment.

3.1.3 Stormwater Management

The site is upstream of the Duzi River and Foxhill Stream confluence and is known to be at risk of flooding. The 1:10, 1:20, 1:50 and 1:100 yr flood lines for the Foxhill Stream were calculated and the drawing showing the flood lines is attached to this report. This drawing shows that the largest part of the developable land is within the flood lines.

The situation has been made worse by the extensive earthworks operations carried out to create a level platform. The natural ground levels have been lowered to below the 1:10yr flood line while in its original state the site would have been above the 1:50yr flood line.

It has however always been the intention that any development on the site would be built above the 1:50yr flood line and that to achieve this, the development would be constructed on columns with no other permanent structures within the 1:50yr flood line. This principle was approved by the DFA when they approved the rezoning and subdivision of the land in 2001.

Subsequent to the approval various pieces of legislation governing the development of land has changed significantly. With regards to storm water management, the local authority now requires that for any new development the post development 1:50yr storm water discharge does not exceed the pre development 1:50yr storm water discharge.

To comply with this requirement, it is necessary to attenuate the runoff and this is normally achieved by providing a detention facility. To cater for a 1:50yr flood, the detention facility should be constructed above 1:50yr flood line if it is to be effective.

This can only be achieved by either raising the natural ground levels to above the 1:50yr flood line or by creating sufficient storage in the parking area on the development ground floor. In this development the natural ground level is in fact a basement level which will be below the 1:50yr flood if left as is.

Should it be decided that the most economical and practical solution to attenuate the storm water is to raise the level of the ground to above the 1:50yr flood line, additional flood line studies will be required to determine the effect on the upstream and downstream land owners.

The final solution is beyond the scope of this report and will be addressed in detail during the design of the facility when a storm water management plan will be

prepared for the development. It is however sufficient to say that a suitable solution can be engineered.

3.2 Services

3.2.1 Water Supply

The Msunduzi Municipality is the water supply authority and they have indicated that they could provide potable water to the development

3.2.2 Sanitation

The Msunduzi Municipality is responsible for sewage reticulation in the city and they have indicated that they have sufficient capacity in their network to accommodate the new development

Umgeni Water is responsible for the treatment of the effluent and is presently busy with a major upgrade of the Darwill Waste Water plant and no development constraints are expected.

3.2.3 Electrical

Msunduzi Municipality is the service provider. A separate report has been prepared by the electrical consultants

3.2.4 Solid Waste Removal

Msunduzi Municipality is responsible for the solid waste removal and disposal within the municipal boundaries. The site is already serviced by this department and any further developments will not be an added burden to the service.

Waste collection for the development will be designed to be compatible with the systems and resources of the municipality.

4 Conclusion

With careful planning and due consideration for the sensitive nature of the site, there is no reason to believe that the proposed development cannot take place as envisaged.

Appendix D4:

Traffic Impact Study

Traffic Impact Study



WOODBURN SHOPPING CENTRE

PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

NOVEMBER 2010

Revision 1



TRAFFIC →

TRAFFIC IMPACT STUDY

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

327592

Revision 1

Issue/Revision	Issue 1	Revision 1	Revision 2	Revision 3
Remarks				
Date	August 2009	November 2010		
Prepared by	R Raven Pr Eng	R Raven Pr Eng		
Signature				
Checked by	H Schreurs Pr Eng	H Schreurs Pr Eng		
Signature				
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Signature				
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Annexures

- Annexure A Memorandums from Msunduzi Council's Department of Roads, Transport and Public Works.
- Annexure B Draft Site Development Plan
- Annexure C Relevant outputs of the SIDRA5 intersection capacity analysis

1 INTRODUCTION

1.1 Purpose

WSP SA Civil and Structural Engineers (Pty) Ltd was appointed by Venture Properties to conduct a Traffic Impact Study (TIS) for the proposed new Woodburn Shopping Centre situated on Portions 3 & 4 (i.e. to be consolidated to Portion 5) of Erf 4346 Pietermaritzburg FT. A first TIS submission was made to the Msunduzi Council's Department of Roads, Transport and Public Works in September 2009. This report is an amended TIS that deals with the comments received from the Council. Refer to Annexure A for the comments received from the Council.

1.2 Locality

The proposed development is situated on Portion 5 of Erf 4346 Pietermaritzburg FT (See Figure 1: Locality Plan).

The site is bounded by:

- The remainder of Erf 4346 and Portion 16 of Erf 567 to the north;
- Woodhouse Road to the east;
- Alan Paton Avenue (R103) to the south and
- The remainder of Erf 1000 to the west

1.3 Scope

The study covers the following aspects:

- Description of the development;
- Traffic surveys and data;
- Trip generation, distribution and assignment;
- Assessment of operational conditions at critical points in the road infrastructure;
- Comments on public transport and the accommodation of pedestrians;
- Comments on parking, internal circulation and loading/unloading and
- Conclusions and recommendations.

2 PROPOSED DEVELOPMENTS & SURROUNDING ROAD NETWORK

2.1 Description of Proposed Development

The proposed development on Portion 5 of Erf 4346 Pietermaritzburg is for the purposes of a shopping centre which includes a sit-down/drive-thru restaurant. Refer to **Annexure B** for copy of the Draft Site Development Plan (SDP). Table 2.1 contains details of the proposed development.

Table 2.1: Proposed Development

Development Control	Description
Size of Stand	17 820 m ²
Zoning	Business, Motor showroom, Ancillary motor workshop, Restaurants, Shops.
Land Use	(1) Shopping Centre = 6100m ² GLA (2) Restaurant (sit-down/drive-thru) = 400m ² GLA
Coverage	13 000m ² (permissible)
Storeys	1 storey (permissible)
On-site parking	1,2m ² gross parking for every 1m ² of gross floor area

Note: (i) GLA – Gross Leasible Area

The following comments can be made regarding Table 2.1:

- The proposed development is a total of 6500m² GLA in extent;
- The total number of parking bays required is 6500m² GLA x 1,2m² per 1m² GLA = 7800m² of parking area. If it is assumed that one parking bay covers approximately 22m² then a total of 355 parking bays will be required for the proposed development.

2.2 Development Scenario

For the purposes of this study it will be assumed that the proposed development will occur in a single phase. The base year for the traffic impact study is considered to be 2010.

The proposed development may be considered small from a trip generation point of view (< 2000 peak hour vehicle trips). The horizon year for this traffic impact study is considered to be 2015 (base year + 5 years) as per the Manual for Traffic Impact Studies.¹

2.3 Other Proposed Developments

The memorandum received from the Council dated 25 August 2010 (Refer to Annexure A) states the following with regards to other proposed developments; "the ... master plan shows proposed development on Ptn 1, Ptn 2 and Rem which have not been taken into account on the TIA (i.e. the WSP TIS of September 2009)".

The above statement resulted in discussions with the developer of the proposed Woodburn Shopping centre and again with the council. The said developer stated that although the master plan may indicate proposed developments on Ptn 1, Ptn 2 and Rem that these developments have not been approved and is not likely to take place in the near future.

A subsequent letter received from the council dated 26 October 2010 (Refer also to Annexure A) states; "Regardless of other portions not earmarked for development in the near future, the TIA and or the new traffic counts need to be undertaken and incorporate the following major intersections (at least) as they are the most critical: .../Woodhouse/Boshoff intersection... and ... Alan Paton.../Woodhouse... intersection."

This revised TIS therefore does not consider any other specific future developments in the area, as there is none that is approved. However, provision for other proposed development in the area is catered for in the normal background traffic growth as reflected in Section 3.4 of this report.

2.4 Existing Road Network

The following roads may be impacted by the proposed development.

- 1. Alan Paton Avenue (R103) – Class 2 (Metropolitan Distributor);
- 2. Alexandra Road (R56) – Class 2 (Metropolitan Distributor);
- 3. Leinster Road - Class 4 (Urban Collector);
- 4. New England Road - Class 4 (Urban Collector) and
- 5. Boshoff Street/Survey Road - Class 4 (Urban Collector).

For the surrounding area road network refer to Figure 1.

¹ Manual for Traffic Impact Studies, Report RR93/635, Department of Transport, October 1995.

2.5 Site Access

It is the developer's intention to apply for access to the proposed development as follows (Refer to Figure 2):

- **Access 1:** A full access onto the exiting priority control intersection of Durban Road/Woodhouse Road/New England Road. The proposal is to change the existing intersection control to roundabout control in order to accommodate the access to the proposed development and
- **Access 2:** Provide a "left in only" access to the development Alan Paton Avenue / Durban Road just west of the intersection with Leinster Road.

3 TRAFFIC FLOWS & TRIP GENERATION

3.1 Existing Traffic Flows

Traffic counts were carried out during the morning and afternoon peak periods, as follows:

- ① Intersection 1: Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection (15:30– 18:30 on Friday 3 July 2009 and 10:30 – 14:00 on Saturday 4 July 2009);
- ② Intersection 2: Alan Paton Avenue (R103) and Leinster Road signalised intersection (15:30– 18:30 on Friday 3 July 2009 and 10:30 – 14:00 on Saturday 4 July 2009) AND (15:00– 18:30 on Friday 5 November 2010 and 10:00 – 14:00 on Saturday 6 November 2010);
- ③ Intersection 3: Durban Road/Woodhouse Road and New England Road (R56) priority controlled intersection (15:30– 18:30 on Friday 3 July 2009 and 10:30 – 14:00 on Saturday 4 July 2009);
- ④ Intersection 4: Woodhouse Road and Boshoff Street/Survey Road signalised intersection (15:00– 18:30 on Friday 5 November 2010 and 10:00 – 14:00 on Saturday 6 November 2010);

The traffic counts at intersections 1 and 2 were escalated to 2010 counts based on the 2009 to 2010 escalation figures derived from intersection 2. The resulting peak hour traffic volumes at the intersections in the vicinity of the site are summarised in Figure 3.

3.2 Development Trip Generation

The proposed development on Portion 5 of Erf 4346 Pietermaritzburg is for the purposes of a shopping centre which includes a sit-down/drive-thru restaurant as mentioned in Section 2.1 of this report.

The guideline document of the Department of Transport, entitled "South African Trip Generation Rates (SATGR)²" was used for establishing the trip generation rates for the proposed development in the critical morning and afternoon peak hours. The manual recommends that the 75th percentile equations be used to calculate the trip generation rate for shopping/retail centres for design purposes with a 50:50 directional split as follows:

$$\text{Friday PM-Peak: } TGR_{75^{\text{th}}} = 224.5 \times GLA^{-0.34}$$

² South African Trip Generation Rates, 2nd Edition, Report RR92/228, Department of Transport, June 1995.

■ Saturday Peak: $TGR_{75th} = 250.2 \times GLA^{-0.30}$

With:
 TGR – Trip Generation Rate per 100m² GLA and
 GLA – Gross Leasable Area

For fast food restaurants the manual recommends a Friday afternoon peak hour trip generation rate of 29.7 trips per 100m² GLA. No suitable trip generation rate could be obtained for the Saturday peak period. A trip generation rate of 60% of that of the Friday afternoon is assumed to be applicable, namely 17.8 trips per 100m² GLA. The resulting trip generation rates for the proposed development is summarised in Table 3.1.

Table 3.1: Trip Generation Rates

Land Use	Unit	Recommended Trip Generation Rates		
		Period	Rate	Directional Split (In/Out)
Retail	100m ² GLA ⁽ⁱ⁾	Friday PM-Peak	11.59	50:50
		Saturday Peak	18.31	50:50
Fast Food Restaurant	100m ² GLA ⁽ⁱ⁾	Friday PM-Peak	29.7	55:45
		Saturday Peak	17.8	55:45

Note: (i) GLA – Gross Leasible Area

The expected number of trips that will be generated was estimated by applying the trip generation rate to the extent of the proposed development. Table 3.2 contains a summary of the estimated number of trips that will be generated, during the Friday afternoon and Saturday peak hours respectively.

Table 3.2: Trip Generation

Land Use	Gross Leasable Area (GLA)	Trip Ends Generated							
		Friday PM Peak Hour				Saturday Peak Hour			
		Trip Generation Rate	Total	In	Out	Trip Generation Rate	Total	In	Out
Retail	6100	11.59	708	354	354	18.31	1116	558	558
Fast Food Restaurant	400	29.7	119	56	53	17.8	71	39	32
TOTAL			827	410	407		1187	597	590

Three types of trips are generated by shopping/retail centres:

- ✘ **Primary trips:** The visit to the shopping centre is the primary reason for the trip;
- ✘ **Pass-by trips:** Motorists are intercepted without diversion by the shopping centre on their way from an origin to a primary destination, which is not the shopping centre and
- ✘ **Diverted trips:** Motorists are attracted from neighbouring streets in the vicinity of the shopping centre. These streets have no direct access to the shopping centre and necessitate a diversion to reach the shopping centre.

Diverted and pass-by trips generated by the retail component of the proposed development are considered as trips already present on the road network and are intercepted or diverted to the proposed development. Primary trips are considered as new trips to the proposed development. Based on the SATGR Manual and for the purposes of this study the trip categories for the retail component of the proposed development are as follows:

- ✘ **Primary trips (p)** - 42% of generated trips;
- ✘ **Pass-by (pb)** - 35% of generated trips and
- ✘ **Diverted trips (d)** - 23% of generated trips and

The expected trip generation taking into consideration trip categories for the proposed development are shown in Figures 5a and 5b.

3.3 Trip Distribution

Assumptions on the expected trip distribution were based on the location of the site access in relation to the surrounding road network along with the existing peak period traffic patterns. The expected trip distribution and expected development traffic volumes are shown in Figures 5a and 5b.

3.4 Future Traffic Flows & Growth

Due to the impact of the current economic recession on development the existing 2009 traffic volumes were escalated at an average annual growth rate of 3.0% in order to estimate future horizon year, 2015 background traffic volumes.

Figure 4 depicts the estimated 2015 horizon year traffic volumes.

4 TRAFFIC IMPACT & CAPACITY ANALYSIS

4.1 Road Network Capacity

The analysis of intersections has been carried out using the SIDRA software³ analysis package calibrated as far as possible for local conditions.

For the purposes of this study the following intersections are considered to be critical, and have been assessed:

- **Intersection 1:** Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection;
- **Intersection 2:** Alan Paton Avenue (R103) and Leinster Road signalised intersection;
- **Intersection 3:** Durban Road/Woodhouse Road and New England Road (R56) priority controlled intersection.
- **Intersection 4:** Woodhouse Road/Boshoff Street signalised intersection.

The following scenarios were considered in the analysis:

- **Scenario 1:** Existing/Base year (2010) without the proposed development;
- **Scenario 2:** Base year (2010) with the proposed development;
- **Scenario 3:** Horizon year (2015) without the proposed development and
- **Scenario 4:** Horizon year (2015) with the proposed development.

The following parameters were used in the analysis:

- **Critical peak hours** – Friday afternoon (15:30 to 16:30) and Saturday morning (12:15 to 13:15) peak hours;
- **Background traffic growth rate** of 3% per annum to escalate existing traffic volumes to the 2015, horizon year;
- **Existing control and layout** for the intersections analyzed and
- **Upgraded control and layouts** where relevant for the intersections analyzed.

³ aaSIDRA V5 software and manuals, Akcelik and Associates, 2010.

4.2 Intersection Analysis Results

The detailed analysis results of the background traffic and background traffic plus site generated traffic for the critical intersections are included in Annexure C.

4.2.1 Intersection 1: Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection

Annexures C1.1 to C1.4 has reference. The following comments are relevant regarding the analysis of this intersection:

(i) **Scenario 1: Existing / base year (2010) without development:**

FRIDAY PM-PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 17.3 seconds and overall volume capacity (v/c) ratio of 1.000. The west approach right turn movement is currently operates at marginal traffic flow conditions with Level of Service (LOS) E, average delay of 67.3 seconds and volume capacity (v/c) ratio of 1.000.

SATURDAY PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 16.6 seconds and overall volume capacity (v/c) ratio of 0.915.

(ii) **Scenario 2: Base year (2010) with development:**

NOTE: It is recommended that the developer upgrade the intersection by adding a short dedicated right turn lane on the south approach (Refer to Figure 2). Further it is recommended that the current traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 16.6 seconds and overall volume capacity (v/c) ratio of 0.938. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 13.4 seconds and overall volume capacity (v/c) ratio of 0.714. None of the individual movements or approaches is predicted to become problematic.

(iii) Scenario 3: Horizon year (2015) without development:

NOTE: It is recommended that the road authorities upgrade the intersection by adding a dedicated right turn lane on the west approach and extend the length of the existing right turn lane (Refer to Figure 2). Further it is recommended that the traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) F, average delay of 93.7 seconds and overall volume capacity (v/c) ratio of 1.468. The west approach through and right turn movements are predicted to be problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 25.3 seconds and overall volume capacity (v/c) ratio of 0.578. None of the individual movements or approaches is predicted to become problematic.

(iv) Scenario 4: Horizon year (2015) with development:

NOTE: No further geometric upgrading is required over and above that recommended under scenarios 2 and 3. It is however recommended that the traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) D, average delay of 40.1 seconds and overall volume capacity (v/c) ratio of 0.990. The west approach through movement is predicted to remain marginal with Level of Service (LOS) E, average delay of 66.4 seconds and volume capacity (v/c) ratio of 0.990. This is considered acceptable.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 16.9 seconds and overall volume capacity (v/c) ratio of 0.552. None of the individual movements or approaches is predicted to become problematic.

4.2.2 Intersection 2: Alan Paton Avenue (R103) and Leinster Road signalled Intersection

Annexures C2.1 to C2.4 has reference. The following comments are relevant regarding the analysis of this intersection:

(i) Scenario 1: Existing / base year (2010) without development:

FRIDAY PM-PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 12.7 seconds and overall volume capacity (v/c) ratio of 0.586. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 12.3 seconds and overall volume capacity (v/c) ratio of 0.427. None of the individual movements or approaches is predicted to become problematic.

(ii) Scenario 2: Base year (2010) with development:

NOTE: It is recommended that the current traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 32.7 seconds and overall volume capacity (v/c) ratio of 0.888. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 28.5 seconds and overall volume capacity (v/c) ratio of 0.713. None of the individual movements or approaches is predicted to become problematic.

(iii) Scenario 3: Horizon year (2015) without development:

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 13.5 seconds and overall volume capacity (v/c) ratio of 0.801. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 13.4 seconds and overall volume capacity (v/c) ratio of 0.422. None of the individual movements or approaches is predicted to become problematic.

(iv) **Scenario 4: Horizon year (2015) with development:**

NOTE: It is recommended that the developer upgrade the intersection by changing the lane configuration of the north approach through lane to a combined through and right turn lane (Refer to Figure 2). Further it is recommended that the current traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 23.5 seconds and overall volume capacity (v/c) ratio of 0.789. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 21.4 seconds and overall volume capacity (v/c) ratio of 0.661. None of the individual movements or approaches is predicted to become problematic.

4.2.3 Intersection 3: Durban Road/Woodhouse Road and New England Road (R56) roundabout

Annexure C3.1 has reference. The following comments are relevant regarding the analysis of this intersection:

(i) **Scenario 4: Horizon year (2014) with development:**

NOTE: It is recommended that the developer upgrade the existing intersection to a roundabout control and layout (Refer to Figure 2).

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) A, average delay of 8.7 seconds and overall volume capacity (v/c) ratio of 0.448. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 10.2 seconds and overall volume capacity (v/c) ratio of 0.600. None of the individual movements or approaches is predicted to become problematic.

4.2.4 Intersection 3: Woodhouse Road and Boshoff Street/Survey Road signalised intersection

Annexures C4.1 to C4.4 has reference. The following comments are relevant regarding the analysis of this intersection:

(v) **Scenario 1: Existing / base year (2010) without development:**

FRIDAY PM-PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 18.6 seconds and overall volume capacity (v/c) ratio of 0.714. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection currently operates at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 16.6 seconds and overall volume capacity (v/c) ratio of 0.644. None of the individual movements or approaches is predicted to become problematic.

(vi) **Scenario 2: Base year (2010) with development:**

NOTE: It is recommended that the current traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 19.6 seconds and overall volume capacity (v/c) ratio of 0.775. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 17.8 seconds and overall volume capacity (v/c) ratio of 0.727. None of the individual movements or approaches is predicted to become problematic.

(vii) **Scenario 3: Horizon year (2015) without development:**

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 22.9 seconds and overall volume capacity (v/c) ratio of 0.879. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) B, average delay of 17.9

seconds and overall volume capacity (v/c) ratio of 0.745. None of the individual movements or approaches is predicted to become problematic.

(viii) **Scenario 4: Horizon year (2015) with development:**

NOTE: It is recommended that the current traffic signal settings be optimized.

FRIDAY PM-PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 25.7 seconds and overall volume capacity (v/c) ratio of 0.901. None of the individual movements or approaches is predicted to become problematic.

SATURDAY PEAK: The intersection is predicted to operate at acceptable traffic flow conditions with the intersection Level of Service probably (LOS) C, average delay of 20.0 seconds and overall volume capacity (v/c) ratio of 0.829. None of the individual movements or approaches is predicted to become problematic.

4.2.5 Operational Assessment Conclusions

According to the Manual for Traffic Impact Studies⁴, it is proposed that a developer mitigate the traffic impact of any proposed development under the following circumstances:

- A. If the Level of Service (LOS) of any element drops below D; or
- B. If the volume to capacity ratio (V/C) of any element increases above 0.95; and
- C. If the contribution of the development is at least 2% of the sum of the critical lane volumes of the elements.

The following comments can be made regarding the above criteria for each of the intersections analyzed:

- A. **Intersection 1 - Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection:** According to the capacity analysis results the west approach right turn is a problematic movement. The proposed development is not envisaged to add any additional traffic volumes to this movement. In fact, due to the effect of traffic diversion (Refer to Figure 5A and 5B), it will actually reduce traffic volumes for the movement. Any mitigation measures required for this movement should therefore undertaken by the road authorities. The south approach right turn is also predicted to become problematic. The proposed development is predicted to contribute 16% and 26% of the volumes in the base year during the Friday afternoon peak and Saturday peak periods respectively. It is recommended that the developer provide the necessary mitigation measures for this movement.

⁴ Manual for Traffic Impact Studies, Report RR93/635, Department of Transport, October 1995.

- **Intersection 2 – Alan Paton Avenue (R103) and Leinster Road signalised Intersection:** According to the capacity analysis results the north approach right turn is a problematic movement. The proposed development is predicted to contribute 36% and 50% of the volumes in the base year during the Friday afternoon peak and Saturday peak periods respectively. The developer should therefore provide the necessary mitigation measures for this movement.

- **Intersection 3 – Durban Road/Woodhouse Road and New England Road (R56) roundabout:** The developer should provide the appropriate access to his development.

- **Intersection 4 – Woodhouse Road and Boshoff Street/Survey Road signalised intersection:** This intersection is not predicted to become problematic with or without development traffic.

5 ROAD AND/OR INTERSECTION IMPROVEMENTS

Based on the type and extent of development proposed and the capacity analyses covered in Section 4, it is recommended that the following road and intersection upgrades be undertaken by the developer (Refer to Figure 2):

- **Intersection 1 - Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection:** The south approach right turn movement should be upgraded by constructing a short dedicated right turn lane as indicated in Figure 2. The developer should also optimise the traffic signal settings. The upgrading of the west approach right turn movement should be undertaken by the road authorities.
- **Intersection 2 – Alan Paton Avenue (R103) and Leinster Road signalised intersection:** The lane configuration of the north approach through movement should be changed to a through/right turn movement as indicated in Figure 2. The developer should also optimise the traffic signal settings.
- **Intersection 3 – Durban Road/Woodhouse Road and New England Road (R56) roundabout:** Proposed Access 1 to the development should be provided by the developer is indicated in Figure 2 by upgrading the existing intersection to roundabout control.
- Proposed Access 2 to the development should be provided by the developer is indicated in Figure 2 as a "left in only" Access.

6 PUBLIC TRANSPORT

The proposed development will generate a public transport demand in the vicinity of the proposed development through the creation of employment opportunities such as employees, security personnel and maintenance/domestic staff as well as customers who rely on public transport.

It is recommended that two public transport laybys be provided by the developer along Woodhouse Road together with a pedestrian side walk along the road facing perimeter of the site to make provision for public transport users (Refer to Figure 2).

7 PARKING SITE CIRCULATION AND OFF-STREET LOADING

Parking should be provided on site and in accordance with requirements of the local authorities. According to the National Parking Standards⁵, the parking requirement for small retail centres (< 5 000m² GLA) is 6,0 parking bays/spaces per 100m² GLA. This yields 366 parking bays for a GLA of 6100m². According to our past experience and surveys done for fast-food / drive-thru restaurant developments a minimum of 25 parking bays should be provided. In this particular case, the resultant parking ratio for a total GLA of 400 m² is 6,25 parking bays/spaces per 100m² GLA.

According to the Site Development Plan (Annexure A) on-site parking is provided as follows:

- Shopping centre = 434 parking bays and
- Fast food/drive-thru restaurant = 11 parking bays.

It can therefore be concluded that the total number of parking bays provided is adequate.

Parking bay dimensions on the Site Development Plan appear to comply with the national requirements (5m x 2,5m per bay and module widths of 17,5m).

No detailed geometric layout plan of the proposed internal road layout and junctions is currently available. Due cognisance should however be given to generally acceptable geometric standards for design speeds and design vehicles, roadway widths, alignments and intersection design. Issues such as sight distances, bellmouth radii and intersection geometry will, however, have to be checked for compliance on the detailed layout plan. It is recommended that the provision for loading facilities be evaluated based on generally acceptable geometric standards.

⁵ Parking Standards Report PG 3/85, 2nd Edition, Department of Transport, November 1985.

8 CONCLUSIONS & RECOMMENDATIONS

From the results of the analysis in this study it can be concluded that:

- (i) The proposed development on Portion 5 of Erf 4346 Pietermaritzburg FT is for the purposes of a shopping centre with a sit-down / drive-thru restaurant.
- (ii) The proposed development is predicted to generate 827 vehicle trips/hour during the Friday afternoon peak period and 1187 vehicle trips/hour during the Saturday peak period of which 42% of the trips generated by the shopping centre are considered as new trips.
- (iii) An average background traffic growth rate of 3% per annum has been assumed. This is also considered to cater for the traffic impact of any other future developments in the area.
- (iv) The number of parking bays as per the draft SDP is considered to be sufficient.

It is therefore recommended that:

- (i) The following proposed road upgrading measures be implemented by the developer in order to mitigate the impact of the proposed development:
 1. **Intersection 1 - Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection:** The south approach right turn movement should be upgraded by constructing a short dedicated right turn lane as indicated in Figure 2. The developer should also optimise the traffic signal settings.
 2. **Intersection 2 – Alan Paton Avenue (R103) and Leinster Road signalised intersection:** The lane configuration of the north approach through movement should be changed to a through/right turn movement as indicated in Figure 2. The developer should also optimise the traffic signal settings.
 3. **Intersection 3 – Durban Road/Woodhouse Road and New England Road (R56) roundabout:** Proposed Access 1 to the development should be provided by the developer is indicated in Figure 2 by upgrading the existing intersection to roundabout control.
 4. Proposed Access 2 to the development should be provided by the developer is indicated in Figure 2 as a "left in only" Access.
- (ii) The following proposed road upgrading measures be implemented by the road authorities:

- ✱ **Intersection 1 - Alan Paton Avenue (R103) and Alexandra Road (R56) signalised intersection:** The west approach right turn movement should be upgraded as indicated in Figure 2.

- (iii) It is recommended that two public transport laybys be provided by the developer along Woodhouse Road together with a pedestrian side walk along the road facing perimeter of the site to make provision for public transport users.

- (iv) All aspects of road upgrading must be designed and constructed to the satisfaction of the local authority.

- (v) The proposed development may be approved from a traffic impact point of view subject to compliance with the relevant standards and requirements specified with respect to all internal traffic related functions.

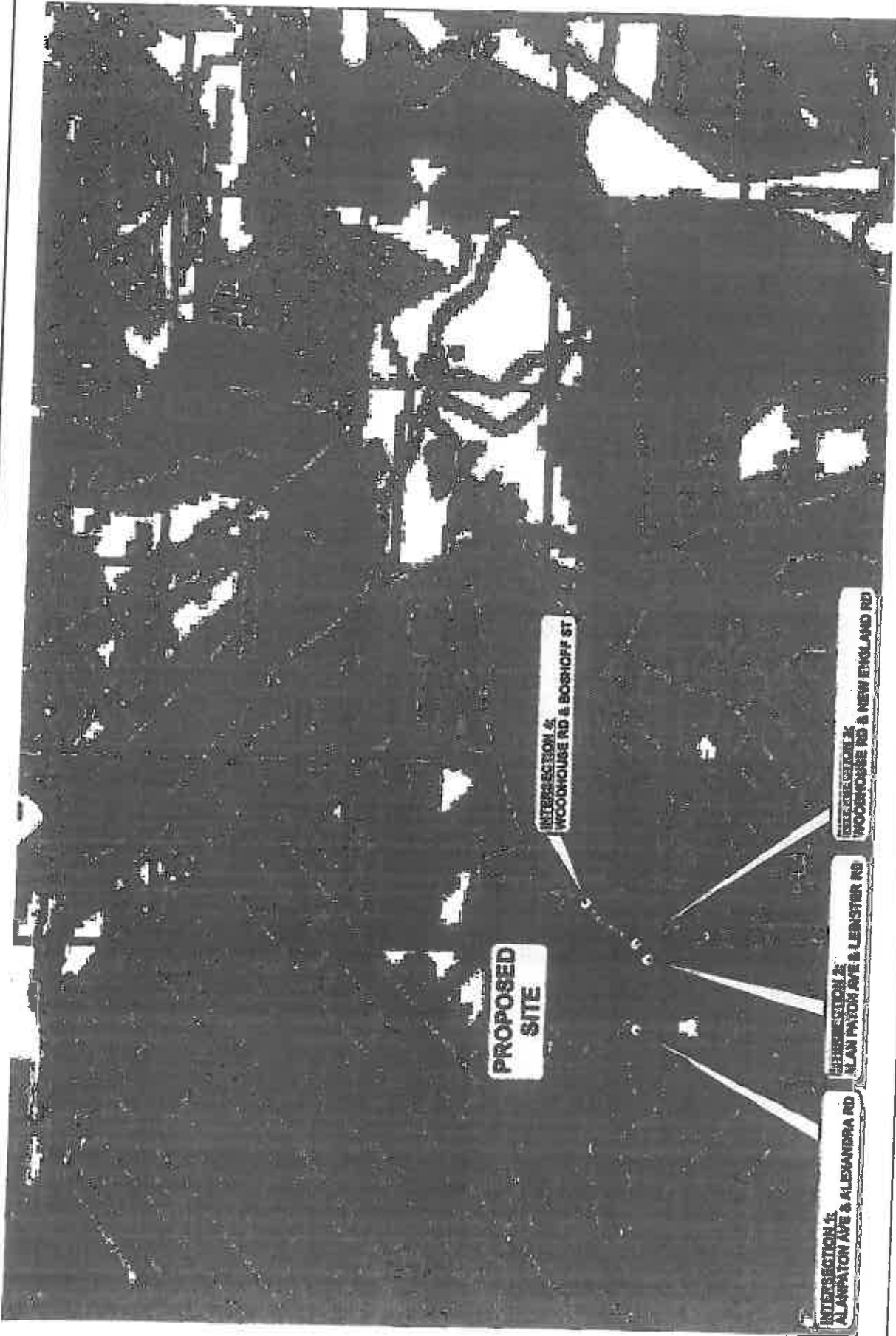
- (vi) A registered Professional Engineer should be appointed to attend to all aspects of design.

Figures

- Figure 1 Locality Plan
- Figure 2 Road Widening and Access Layout Plan
- Figure 3 Existing 2010 Peak Hour Traffic Volumes
- Figure 4 Future 2015 Traffic Volumes without Development Traffic
- Figure 5a Trip Generation and Assignment – Friday PM-Peak Hour
- Figure 5b Trip Generation and Assignment – Saturday Peak Hour
- Figure 6 Base Year 2010 Traffic Volumes with Development Traffic
- Figure 7 Horizon Year 2015 Traffic Volumes with Development Traffic



Schematic layout



Checked by: H Schreurs Pr Eng

327592_Woodburn Boulevard_Locality Plan_1.dwg

Figure Description:

LOCALITY PLAN

No.

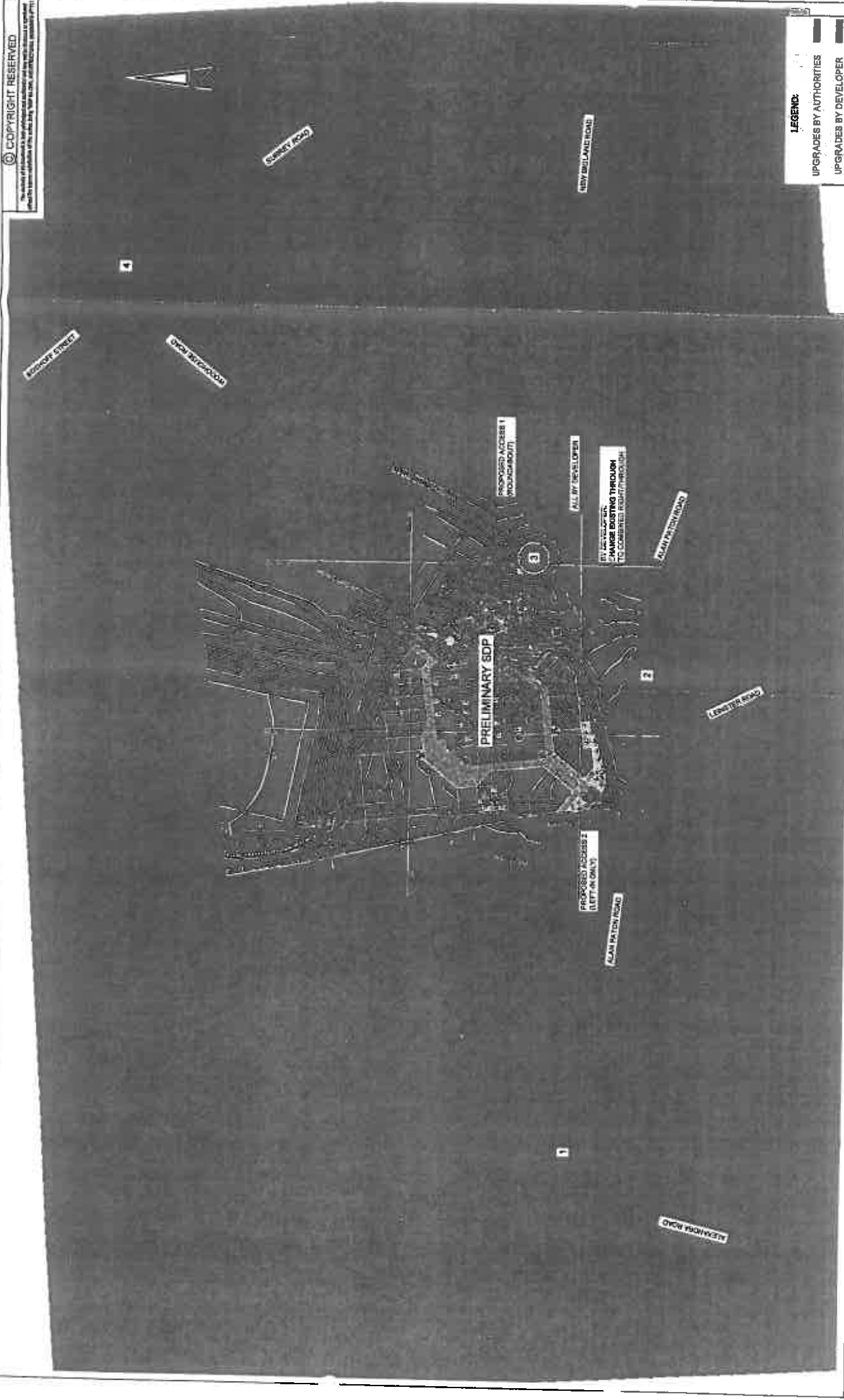
1

Project:

O & T WOODBURN BOULEVARD, PIETERMARITZBURG



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LEGEND:
 UPGRADES BY AUTHORITIES
 UPGRADES BY DEVELOPER

SCALE:	1:2000	CHECKED:	R. RAVEN	APPROVED:	H. SCHREURS
DESIGN:	R. RAVEN	DRAWN:	ND MOKGASI	DATE:	2010/11/12
PROJECT No:	327592	DRAWING No:	2	REV:	B
© WSP Group Inc.					

PROJECT: **WOODBURN BOULEVARD PIETERMARITZBURG**

TITLE: **ROAD WIDENING AND ACCESS LAYOUT PLAN**

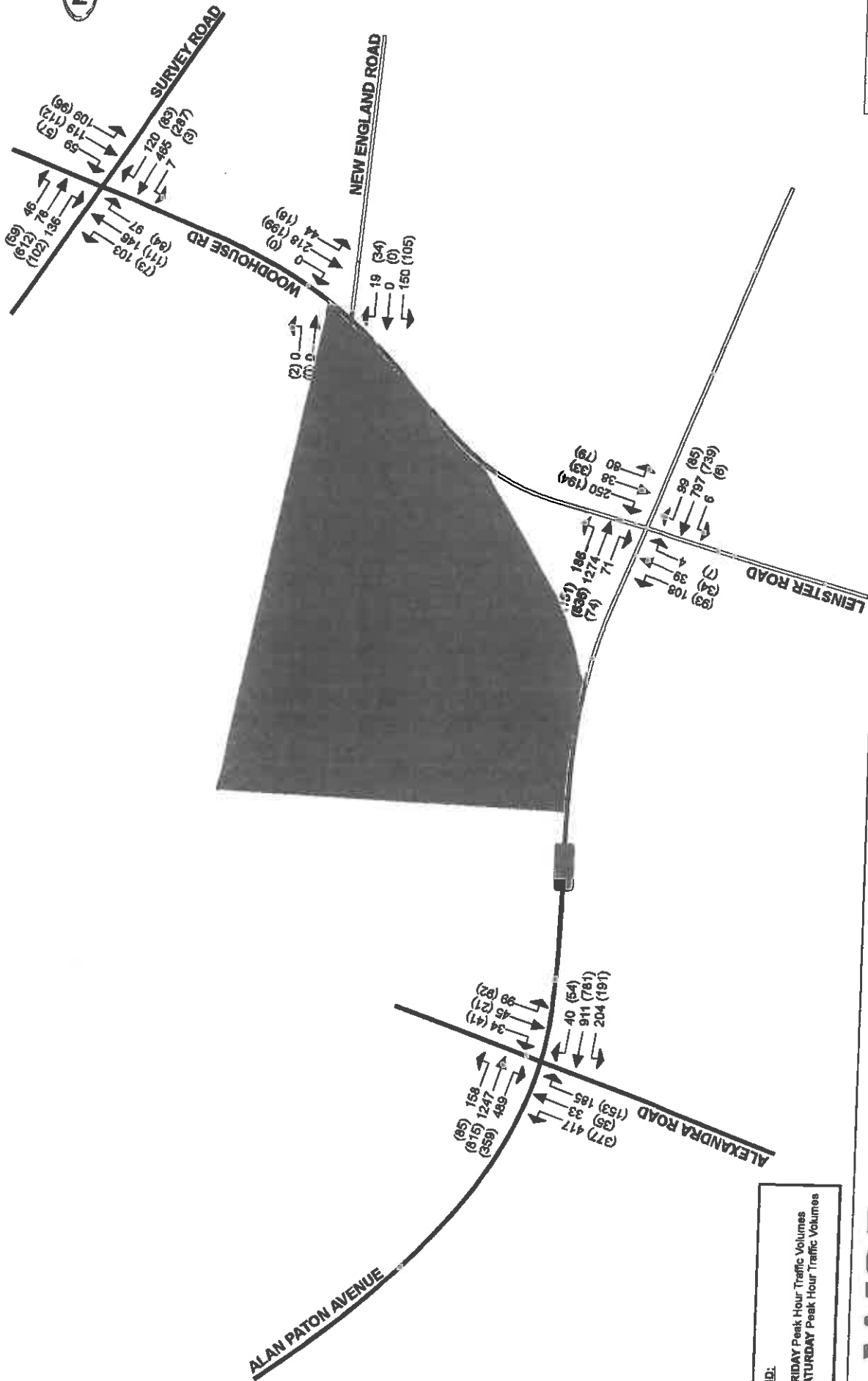
WSP
 WSP SA Civil and Structural Engineers (Pty) Ltd
 54 Boreas Avenue, Lyntonwood Ridge, Pretoria, 0099
 Phone: +27(0)11 431 1111
 Fax: +27(0)11 431 1112
 www.wspgroup.com

CLIENT: **VENTURE PROPERTIES**

REV	DATE	BY	INITIAL	IS/LE	DESCRIPTION	CHK	APP
A							

DRAWING STATUS: **FOR INFORMATION**

Schematic layout



LEGEND:
 108 FRIDAY Peak Hour Traffic Volumes
 (83) SATURDAY Peak Hour Traffic Volumes



Project:

WOODBURN BOULEVARD

Figure Description:

EXISTING 2010 PEAK HOUR TRAFFIC VOLUMES

Checked by: H Scheuers Pr Eng

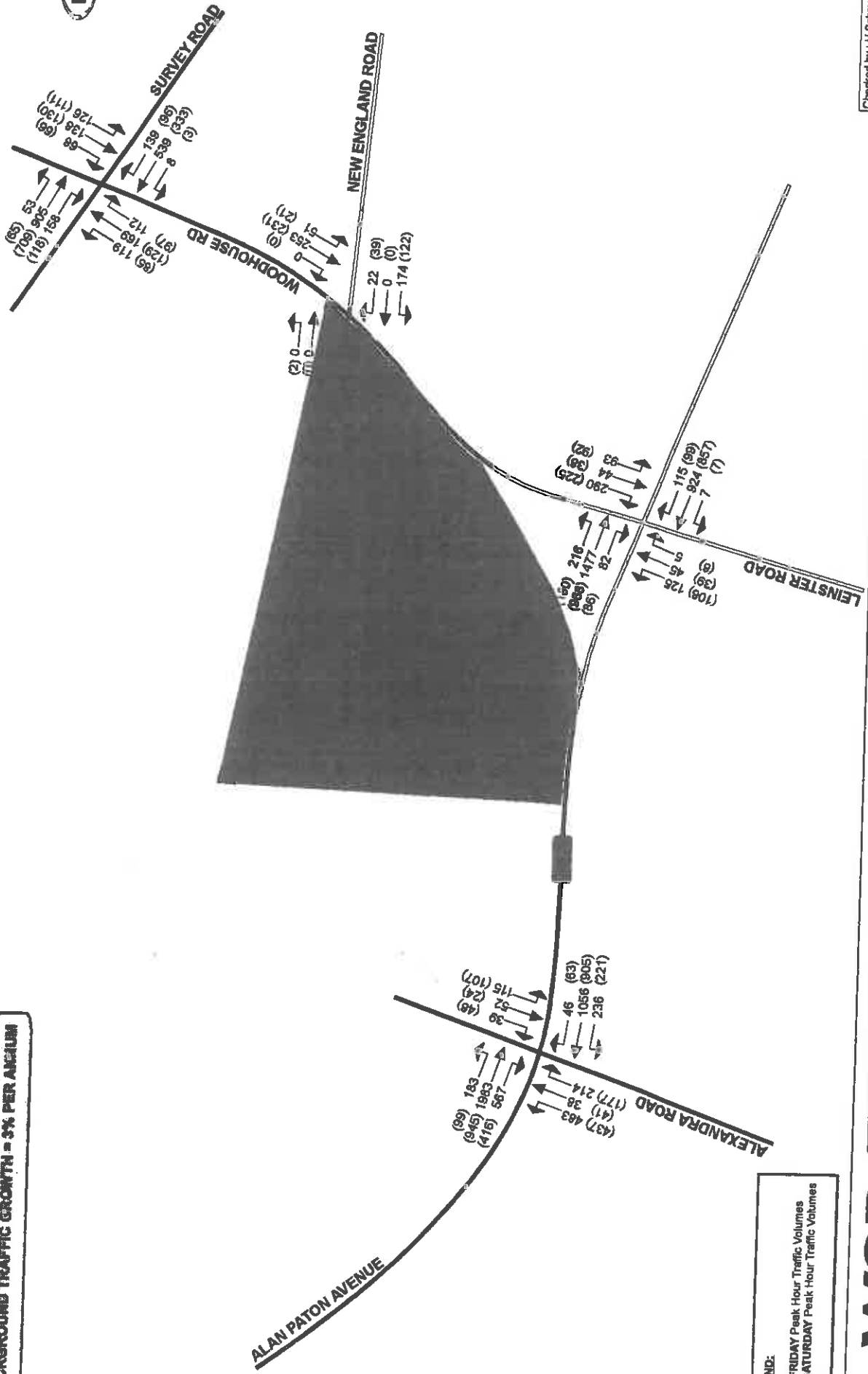
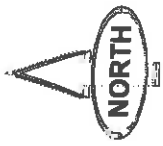
327582_Woodburn Boulevard_Existing 2010 Peak Hour Traffic Volumes_3.cdr

No.

3

Schematic layout

BACKGROUND TRAFFIC GROWTH = 3% PER ANNUM



LEGEND:
 108 FRIDAY Peak Hour Traffic Volumes
 (89) SATURDAY Peak Hour Traffic Volumes



Project:

WOODBURN BOULEVARD

Figure Description:

HORIZON YEAR 2015 PEAK HOUR TRAFFIC VOLUMES WITHOUT PROPOSED DEVELOPMENT

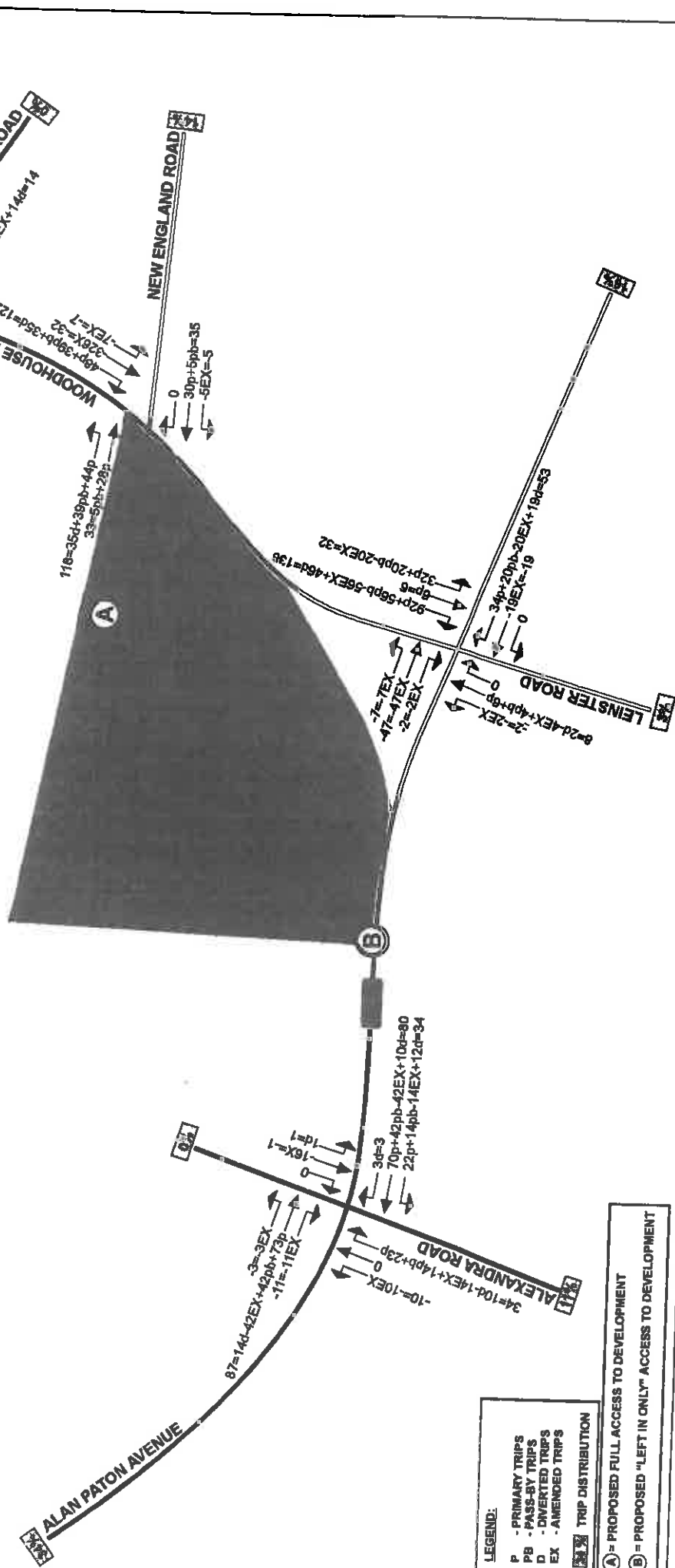
Checked by: H Schreurs Pr Eng
327882_Woodburn Boulevard_Horizon Year 2015 Peak Hour without Proposed Development_4.cdr

No.

4

Schematic layout

TRIP GENERATION				
Trips	P	Pb	D	Total
IN	214	124	81	419
OUT	282	134	81	497
TOTAL	416	243	163	826



LEGEND:
 P - PRIMARY TRIPS
 PB - PASS-BY TRIPS
 D - DIVERTED TRIPS
 EX - AMENDED TRIPS
 [Symbol] TRIP DISTRIBUTION

[Symbol] A = PROPOSED FULL ACCESS TO DEVELOPMENT
 [Symbol] B = PROPOSED "LEFT IN ONLY" ACCESS TO DEVELOPMENT



Project:

WOODBURN BOULEVARD

Figure Description:

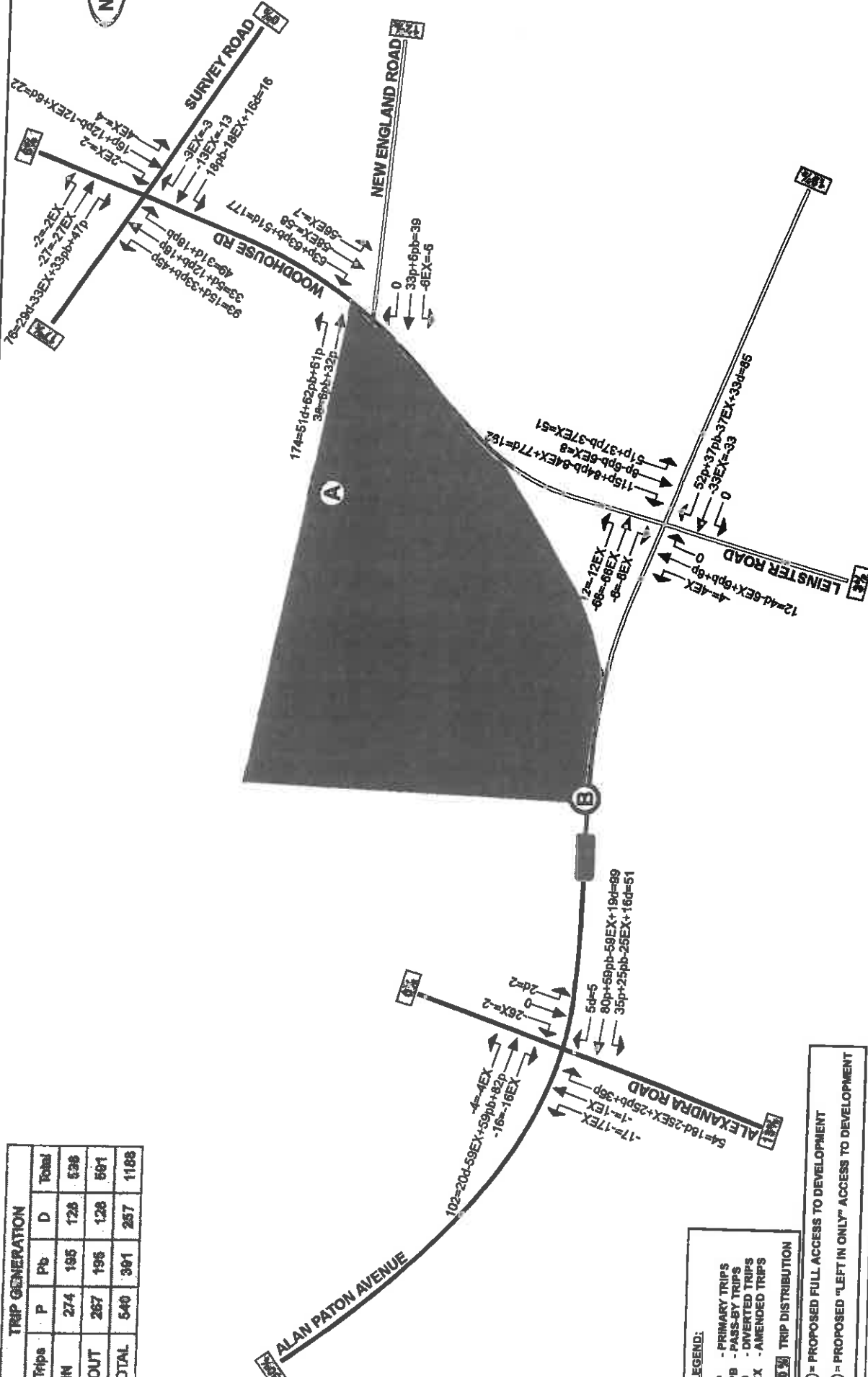
TRIP GENERATION & ASSIGNMENT
 FRIDAY PM PEAK HOUR

Checked by: H Screams Pr Eng

327682_Woodburn Boulevard_Trip Generation & Assignment Friday PM Peak Hour_5A.dwg

No.

5A



Schematic layout

TRIP GENERATION				
Trips	P	Pb	D	Total
IN	274	196	128	598
OUT	267	196	128	591
TOTAL	540	391	257	1188

LEGEND:
 P - PRIMARY TRIPS
 PB - PASS-BY TRIPS
 D - DIVERTED TRIPS
 EX - AMENDED TRIPS
 (Symbol) TRIP DISTRIBUTION

(A) = PROPOSED FULL ACCESS TO DEVELOPMENT
 (B) = PROPOSED "LEFT IN ONLY" ACCESS TO DEVELOPMENT



Project:

WOODBURN BOULEVARD

Figure Description:

TRIP GENERATION & ASSIGNMENT
 SATURDAY PM PEAK HOUR

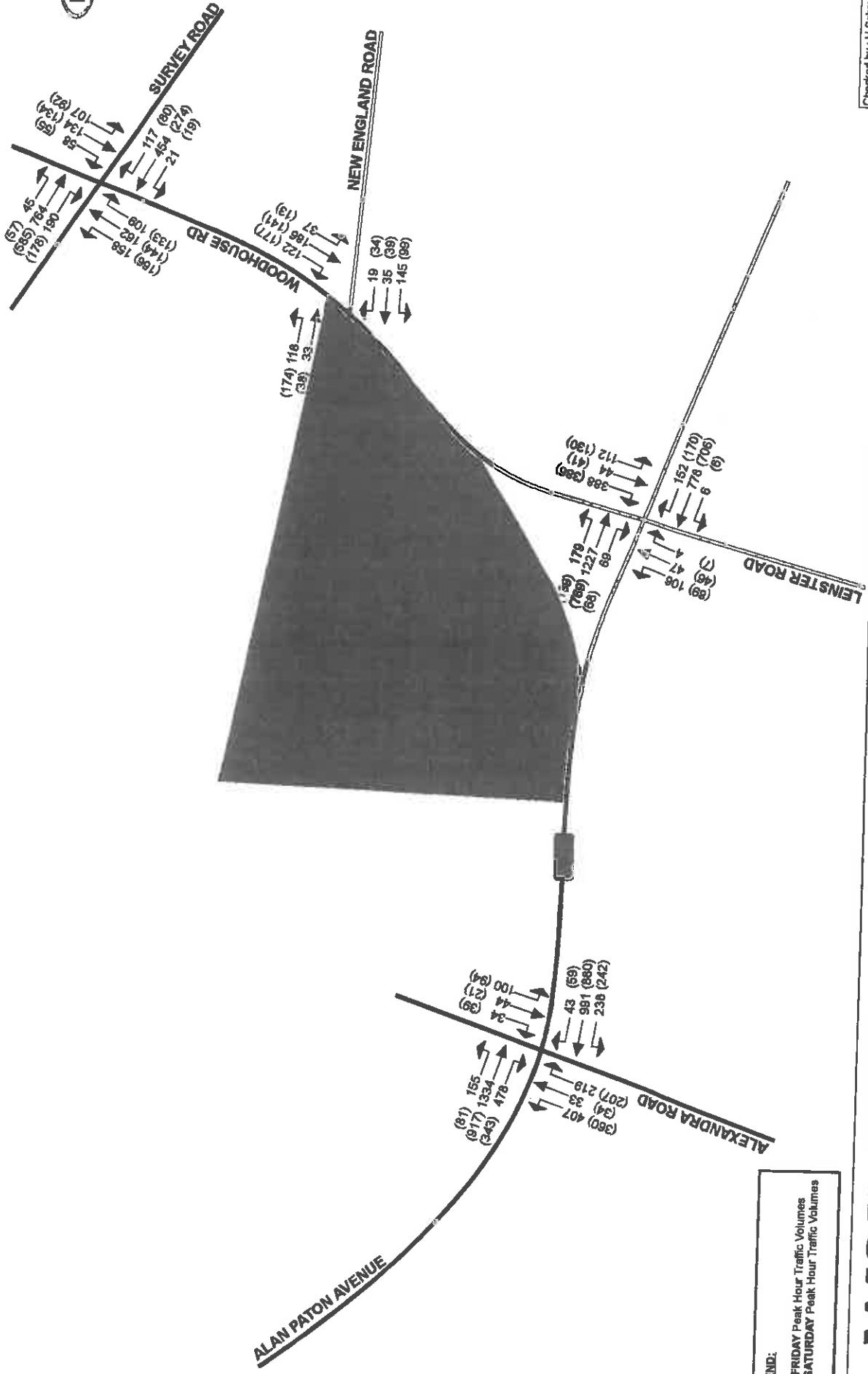
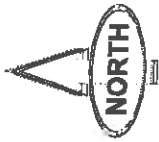
Checked by: H Schreurs Pr Eng

327592_Woodburn Boulevard_Trip Generation & Assignment_Saturday PM Peak Hour_5B.cdr

No.

5B

Schematic layout



LEGEND:
 108 FRIDAY Peak Hour Traffic Volumes
 93 SATURDAY Peak Hour Traffic Volumes



Project:

WOODBURN BOULEVARD

Figure Description:

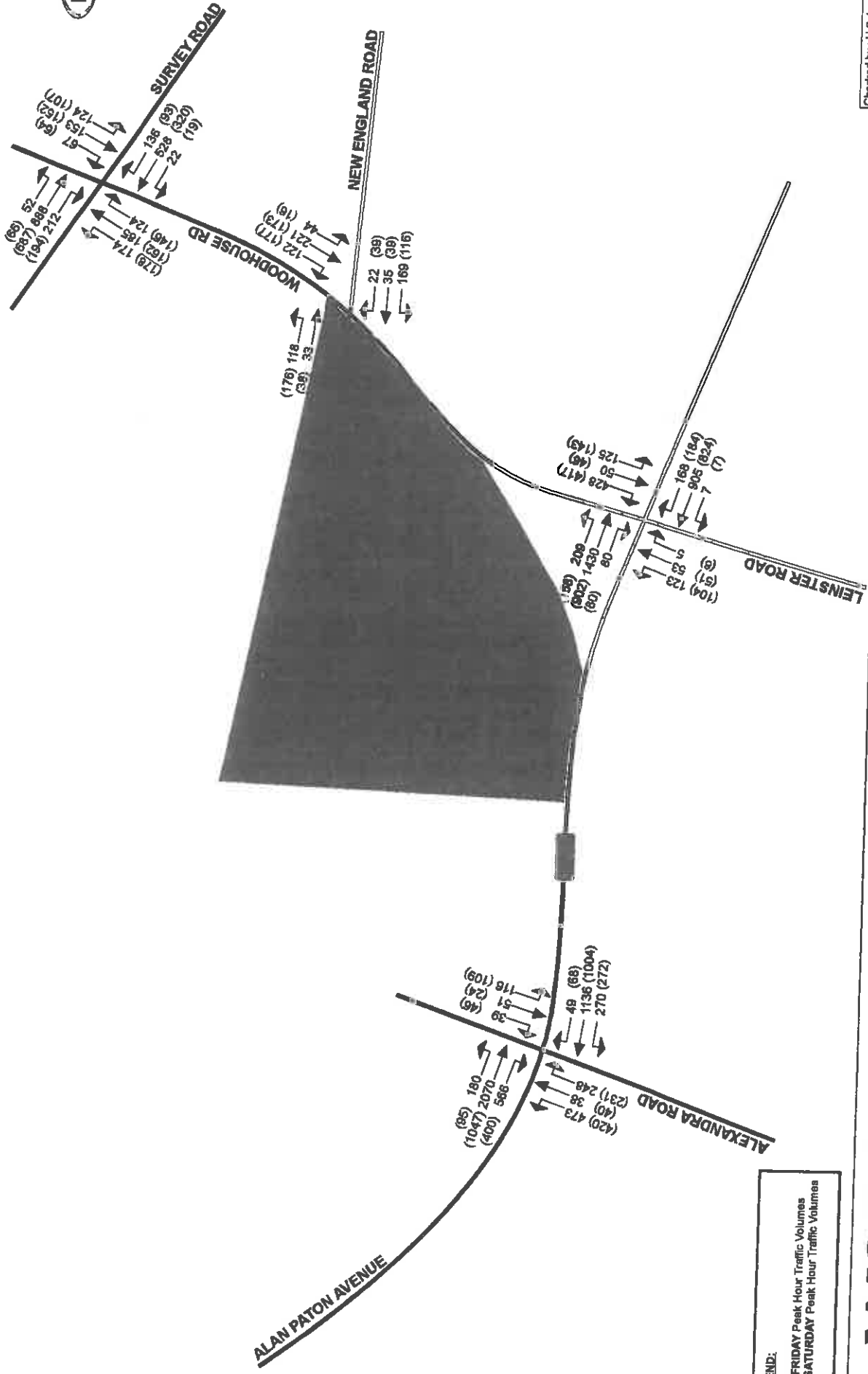
**BASE YEAR 2010 PEAK HOUR TRAFFIC VOLUMES
 WITH PROPOSED DEVELOPMENT**

Checked by : H. Schraus Pr Eng
327592_Woodburn Boulevard_Base Year 2010 Peak Hour Traffic Volume with Proposed Development_6.cdr

No.

6

Schematic layout



LEGEND:
 108 FRIDAY Peak Hour Traffic Volumes
 (93) SATURDAY Peak Hour Traffic Volumes



Project:

WOODBURN BOULEVARD

Figure Description:

HORIZON YEAR 2015 PEAK HOUR TRAFFIC VOLUMES WITH PROPOSED DEVELOPMENT

Checked by: H Schreurs Pr. Eng

327662_Woodburn Boulevard_Horizon Year 2015 Peak Hour Traffic Volume with Proposed Development_7.cdr

No.

7

Annexure A

**Memorandums from
Msunduzi Council's Department
of Roads, Transport and Public Works**





**INFRASTRUCTURE DEVELOPMENT, SERVICE
DELIVERY, AND MAINTENANCE MANAGEMENT
Roads, Transportation & Public Works (RTPW)**

MINUTE

Tel: (033) 392-2152

Email: sibulele.diko@msunduzi.gov.za

TO : **CORPORATE STRATEGIC PLANNING**
Att: Walter Van Rensburg

FROM : **EXECUTIVE: ROADS, TRANSPORTATION & PUBLIC WORKS (ACTING)**
Eng: Ms S. Diko

REF :

DATE : **25 August 2010**

SUBJECT : **WOODBURN BOULEVARD SITE DEVELOPMENT PLAN
PORTION 4&5 OF ERF 4346 PMB**

The Woodburn Boulevard site development plan application for portion 4&5 of erf 4346 PMB has reference;

The Traffic Impact Assessment (TIA) attached to this application cannot be accepted and/or approved and needs to be amended, for the following reasons;

The traffic counts were undertaken during school holidays, traffic counts should be undertaken during the school terms so as to get a realistic idea of the "normal" trip generation figures and volumes.

The TIA indicates "No information could be obtained of any other approved developments in the area which may require consideration in this study" yet the attached master plan shows proposed development on Ptn 1, Ptn 2 and Rem which have not been taken into account on the TIA.

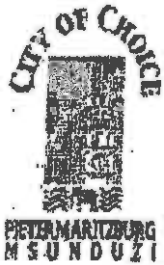
The Study Area for the Traffic Impact Assessment should therefore include (regardless of any phasing that there maybe);

1. Woodhouse road up to and including Surrey/Woodhouse/Boshoff intersection
2. Opening the closed section of New England road, as the proposed development will put strain on woodhouse road as the only road to and from the New England Road/Hesketh area.
3. Boshoff Street from Surrey/Woodhouse/Boshoff to the Riverside Bridge including the proposed access to Ptn 1 and 2.

Analyze the Saturday critical morning peak as 11h00 – 12h00

The TIA should further indicate how the entrance/s will be controlled (e.g. boom controlled or security controlled) and the measures to be taken to ensure that there is a free flow at all times. Pedestrian side walk should be provided on the perimeter of the site
Public Transport Laybys should be safely positioned closer to the proposed accesses

(ACTING) EXECUTIVE: RTPW



THE MSUNDUZI MUNICIPALITY

INFRASTRUCTURE DEVELOPMENT, SERVICE DELIVERY, AND MAINTENANCE MANAGEMENT

ROADS, TRANSPORTION & PUBLIC WORKS (RTPW)

Room 503
333 Church Street
Pietermaritzburg
3201

Private Bag X206
Pietermaritzburg
3200

Fax 033 392 2366

Tel. 033 392 2162

Email: sibulele.diko@msunc

Enquiries: S. Diko

Our Ref: IS/2/42/1

Your Ref:

WSP SA Civil & Structural Engineers Pty Ltd
34 Bouvardia Street
Lynnwood Ridge
Pretoria
0081

26 October 2010

Attention: Mr R. Raven
Fax: 012- 361 4142

Dear Sir;

RE: WOODBURN DEVELOPMENT

Our telephonic conversation this morning refers;

It appears as though there is a problem with some of my external emails not reaching the recipients, as I have been responding to your emails. Please accept my sincere apologies in this regard; I have raised the matter with our ITC to resolve.

We require traffic counts to be undertaken during the normal school term not only because it's a standard practise but because we need uniformity and the problems we experience with traffic congestion are worse during the school term.

Regardless of the other portions not earmarked for development in the near future, the TIA and/or the new traffic counts need to be undertaken and incorporate the following major intersections (at least) as they are the most critical;

1. Surrey/Woodhouse/Boshoff intersection,
2. Alan Paton (Old Durban Road)/Woodhouse/Leister intersection

The application I received showed the entire site developmental plan, including proposed development on Ptn 1, Ptn 2 and Rem. Hence we felt it's proper to undertake one study and/or whatever improvements might be required be done at once.

The position of the public transport lay byes can be "fixed" during the design stage.

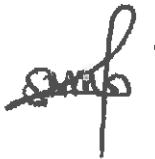
I would make myself available anytime you need to meet with me, so as to fast track and clarify any further issues you might have.

27. Oct. 2010 10:15

QUANTITY SURVEY

No. 9138 P. 2

Yours faithfully

 26/10/2010

SIBULELE DIKO
MANAGER: TRANSPORTATION PLANNING

Annexure B

Draft Site Development Plan (SDP)



Annexure C

Relevant outputs of the SIDRA Intersection Capacity Analysis

- C1** Intersection 1: Alan Paton Avenue (R103) and Alexandra Road (R56)
- C2** Intersection 2: Alan Paton Avenue (R103) and Leinster Road Signalised Intersection
- C3** Intersection 3: Woodhouse Road and New England Road Roundabout
- C4** Intersection 4: Woodhouse Road and Boshoff Street

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C1.1

MOVEMENT SUMMARY

Site: 1-1 Alan Paton/Alexandra 2010 Sat
AM-Peak Exist

1 - Alan Paton Ave / Alexandra Rd 2010 Existing Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	Hv	Deq	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	Sec	Sec	sec		veh	m	per Veh	per Veh	km/h
South: Alexandra Road (S)												
1	L	397		2.0	0.729	33.1	LOS C	6.8	48.7	1.00	0.90	31.6
2	T	37		2.0	0.795	27.5	LOS C	7.1	50.8	1.00	0.96	30.9
3	R	161		2.0	0.796	35.5	LOS D	7.1	50.8	1.00	0.96	30.7
Approach		595		2.0	0.795	33.4	LOS C	7.1	50.8	1.00	0.92	31.3
East: Alan Paton Road (E)												
4	L	201		2.0	0.247	8.9	LOS A	1.5	10.5	0.34	0.68	47.9
5	T	822		2.0	0.324	4.9	LOS A	6.3	45.2	0.51	0.44	50.7
6	R	57		2.0	0.141	15.1	LOS B	1.2	8.3	0.54	0.73	42.5
Approach		1080		2.0	0.324	6.2	LOS A	6.3	45.2	0.48	0.50	49.6
North: Fling Station Access (N)												
7	L	97		2.0	0.342	9.8	LOS A	0.9	6.7	0.41	0.68	47.3
8	T	22		2.0	0.077	21.1	LOS C	0.8	5.5	0.90	0.63	36.0
9	R	43		2.0	0.272	34.5	LOS C	1.7	12.0	0.99	0.71	30.9
Approach		162		2.0	0.342	17.9	LOS B	1.7	12.0	0.63	0.68	40.0
West: Alan Paton Road (W)												
10	L	89		2.0	0.084	8.5	LOS A	0.5	3.3	0.26	0.65	48.3
11	T	858		2.0	0.338	4.9	LOS A	6.6	47.3	0.51	0.45	50.6
12	R	378		2.0	0.915	47.5	LOS D	16.8	119.4	0.94	1.24	26.0
Approach		1325		2.0	0.915	17.3	LOS B	16.8	119.4	0.62	0.69	39.8
All Vehicles		3162		2.0	0.915	16.8	LOS B	16.8	119.4	0.64	0.67	40.6

MOVEMENT SUMMARY

Site: 1-2 Alan Paton/Alexandra 2010 Fri
PM-Peak Exist

1 - Alan Paton Ave / Alexandra Rd 2010 Existing Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	Hv	Deq	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed
		veh/h	%	Sec	Sec	sec		veh	m	per Veh	per Veh	km/h
South: Alexandra Road (S)												
1	L	439		2.0	0.806	35.1	LOS D	7.8	55.3	1.00	0.97	30.8
2	T	35		2.0	0.896	33.4	LOS C	8.9	63.2	1.00	1.10	28.4
3	R	195		2.0	0.897	41.4	LOS D	8.9	63.2	1.00	1.10	28.3
Approach		668		2.0	0.897	36.9	LOS D	8.9	63.2	1.00	1.01	29.9
East: Alan Paton Road (E)												
4	L	215		2.0	0.250	8.7	LOS A	1.4	9.9	0.32	0.67	48.1
5	T	959		2.0	0.378	5.1	LOS A	7.5	53.3	0.53	0.46	50.3
6	R	42		2.0	0.155	15.4	LOS B	0.9	6.4	0.55	0.73	42.3
Approach		1216		2.0	0.378	6.1	LOS A	7.5	53.3	0.49	0.51	49.6
North: Fling Station Access (N)												
7	L	104		2.0	0.529	12.2	LOS B	1.7	11.8	0.55	0.72	45.1
8	T	47		2.0	0.165	21.5	LOS C	1.6	11.7	0.91	0.67	35.7
9	R	36		2.0	0.226	34.4	LOS C	1.4	9.9	0.98	0.71	30.9
Approach		187		2.0	0.529	18.8	LOS B	1.7	11.8	0.72	0.71	39.1
West: Alan Paton Road (W)												
10	L	166		2.0	0.156	8.5	LOS A	0.9	6.4	0.28	0.66	48.3
11	T	1467		2.0	0.582	6.1	LOS A	12.4	88.2	0.64	0.57	48.4
12	R	651		2.0	1.800	67.3	LOS E	19.4	137.8	1.00	1.37	21.1
Approach		1994		2.0	1.000	17.4	LOS B	19.4	137.8	0.67	0.73	39.2
All Vehicles		4068		2.0	1.800	17.3	LOS B	19.4	137.8	0.68	0.71	39.6

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C1.2

MOVEMENT SUMMARY

Site: 1-3 Alan Paton/Alexandra 2010 Sat
AM-Peak Exist + Develop

1 - Alan Paton Ave / Alexandra Rd2010 Existing + Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV Den. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prog. Queue	Effective Stop Rate	Average Speed		
		veh/h	%	sec		veh	m	per veh	per veh	km/h		
South: Alexandra Road (S)												
1	L	379	2.0	0.609	30.5	LOS C	6.2	44.2	0.98	0.83	32.9	
2	T	36	2.0	0.463	22.1	LOS C	4.3	30.3	0.95	0.75	33.8	
3	R	218	2.0	0.463	30.1	LOS C	4.3	30.3	0.95	0.78	33.1	
Approach		633	2.0	0.609	29.9	LOS C	6.2	44.2	0.97	0.81	33.0	
East: Alan Paton Road (E)												
4	L	255	2.0	0.299	8.8	LOS A	1.7	12.2	0.33	0.68	48.0	
5	T	926	2.0	0.420	7.4	LOS A	8.5	60.4	0.64	0.55	47.4	
6	R	62	2.0	0.126	12.9	LOS B	1.1	7.5	0.45	0.72	44.3	
Approach		1243	2.0	0.420	8.0	LOS A	8.5	60.4	0.56	0.59	47.3	
North: Fling Station Access (N)												
7	L	99	2.0	0.250	8.7	LOS A	0.6	4.3	0.30	0.66	48.2	
8	T	22	2.0	0.068	20.0	LOS B	0.7	5.3	0.88	0.62	36.7	
9	R	41	2.0	0.246	33.4	LOS C	1.6	11.2	0.97	0.72	31.3	
Approach		162	2.0	0.251	16.5	LOS B	1.6	11.2	0.55	0.67	40.9	
West: Alan Paton Road (W)												
10	L	85	2.0	0.081	8.5	LOS A	0.4	3.1	0.26	0.65	48.3	
11	T	965	2.0	0.437	7.5	LOS A	8.9	63.2	0.64	0.56	47.2	
12	R	361	2.0	0.714	19.0	LOS B	9.2	65.2	0.75	0.89	39.5	
Approach		1412	2.0	0.714	10.5	LOS B	9.2	65.2	0.65	0.65	45.1	
All Vehicles		3449	2.0	0.714	13.4	LOS B	9.2	66.2	0.67	0.66	42.7	

MOVEMENT SUMMARY

Site: 1-4 Alan Paton/Alexandra 2010 Fri
PM-Peak Exist + Develop

1 - Alan Paton Ave / Alexandra Rd2010 Existing + Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flow	HV Den. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prog. Queue	Effective Stop Rate	Average Speed		
		veh/h	%	sec		veh	m	per veh	per veh	km/h		
South: Alexandra Road (S)												
1	L	428	2.0	0.918	43.2	LOS D	8.6	61.2	1.00	1.13	27.6	
2	T	35	2.0	0.606	25.0	LOS C	4.7	33.2	0.99	0.82	32.1	
3	R	231	2.0	0.605	33.0	LOS C	4.8	34.0	0.99	0.82	31.7	
Approach		694	2.0	0.918	38.9	LOS D	8.6	61.2	1.00	1.02	29.1	
East: Alan Paton Road (E)												
4	L	251	2.0	0.332	9.0	LOS A	2.0	14.0	0.36	0.69	47.8	
5	T	1043	2.0	0.440	6.4	LOS A	8.9	63.7	0.60	0.53	48.6	
6	R	45	2.0	0.117	12.1	LOS B	0.7	5.1	0.41	0.71	45.1	
Approach		1339	2.0	0.440	7.1	LOS A	8.9	63.7	0.55	0.57	48.3	
North: Fling Station Access (N)												
7	L	105	2.0	0.326	8.7	LOS A	0.6	4.6	0.31	0.66	48.1	
8	T	46	2.0	0.189	22.7	LOS C	1.7	11.8	0.93	0.69	35.0	
9	R	36	2.0	0.226	34.4	LOS C	1.4	9.9	0.98	0.71	30.9	
Approach		187	2.0	0.326	17.1	LOS B	1.7	11.8	0.59	0.68	40.2	
West: Alan Paton Road (W)												
10	L	163	2.0	0.154	8.5	LOS A	0.9	6.1	0.28	0.66	48.3	
11	T	1404	2.0	0.592	7.3	LOS A	12.7	90.2	0.69	0.61	47.3	
12	R	503	2.0	0.937	39.2	LOS D	19.4	137.8	0.97	1.15	29.0	
Approach		2071	2.0	0.938	15.2	LOS B	19.4	137.8	0.72	0.75	41.0	
All Vehicles		4291	2.0	0.938	16.6	LOS B	19.4	137.8	0.71	0.73	40.2	

Annexure C1.3

MOVEMENT SUMMARY

Site: 1-5 Alan Paton/Alexandra 2015 Sat
AM-Peak Exist

1 - Alan Paton Ave / Alexandra Rd 2015 Background Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles												
Move ID	Turn	Demand Flow	HV Del. Sat	Average Delay	Level of Service	% Back of Queue	Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed		
		veh/hr	%	sec		veh	m	per veh	per veh	km/hr		
South: Alexandra Road (S)												
1	L	437	2.0	0.241	23.0	LOS C	7.4	52.4	0.64	0.75		37.0
2	T	41	2.0	0.553	42.2	LOS D	6.4	45.7	0.99	0.78		25.8
3	R	177	2.0	0.553	50.3	LOS D	6.4	45.7	0.99	0.79		25.4
Approach		655	2.0	0.553	31.6	LOS C	7.4	52.4	0.75	0.77		32.2
East: Alan Paton Road (E)												
4	L	221	2.0	0.270	8.6	LOS A	1.9	13.8	0.22	0.65		48.6
5	T	905	2.0	0.553	22.4	LOS C	16.6	118.0	0.82	0.72		35.4
6	R	63	2.0	0.159	34.9	LOS C	3.1	22.0	0.79	0.75		30.7
Approach		1189	2.0	0.553	20.5	LOS C	16.6	118.0	0.71	0.71		37.0
North: Fling Station Access (N)												
7	L	107	2.0	0.278	8.3	LOS A	0.7	4.9	0.18	0.64		48.8
8	T	24	2.0	0.096	38.7	LOS D	1.5	10.5	0.92	0.66		27.9
9	R	48	2.0	0.450	56.0	LOS E	3.2	23.0	1.00	0.74		23.7
Approach		179	2.0	0.450	25.2	LOS C	3.2	23.0	0.50	0.67		35.3
West: Alan Paton Road (W)												
10	L	99	2.0	0.098	8.2	LOS A	0.6	4.0	0.16	0.63		48.9
11	T	945	2.0	0.578	22.7	LOS C	17.4	123.7	0.84	0.73		35.2
12	R	416	2.0	0.576	39.0	LOS D	9.8	69.9	0.91	0.82		29.0
Approach		1460	2.0	0.578	26.3	LOS C	17.4	123.7	0.81	0.75		33.8
All Vehicles		3483	2.0	0.576	26.3	LOS C	17.4	123.7	0.75	0.74		34.6

MOVEMENT SUMMARY

Site: 1-6 Alan Paton/Alexandra 2015 Fri
PM-Peak Exist

1 - Alan Paton Ave / Alexandra Rd 2015 Background Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 110 seconds

Movement Performance - Vehicles												
Move ID	Turn	Demand Flow	HV Del. Sat	Average Delay	Level of Service	% Back of Queue	Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed		
		veh/hr	%	sec		veh	m	per veh	per veh	km/hr		
South: Alexandra Road (S)												
1	L	508	2.0	0.346	29.2	LOS C	9.7	69.0	0.76	0.79		33.5
2	T	40	2.0	0.460	35.4	LOS D	7.1	50.7	0.93	0.75		28.1
3	R	225	2.0	0.460	43.4	LOS D	7.1	50.7	0.93	0.80		27.6
Approach		774	2.0	0.460	33.7	LOS C	9.7	69.0	0.82	0.79		31.3
East: Alan Paton Road (E)												
4	L	248	2.0	0.264	8.2	LOS A	1.8	12.6	0.17	0.64		48.9
5	T	1112	2.0	0.532	15.8	LOS B	17.5	124.3	0.72	0.64		39.9
6	R	48	2.0	0.273	49.7	LOS D	3.0	21.4	0.95	0.75		25.4
Approach		1408	2.0	0.532	15.6	LOS B	17.5	124.3	0.63	0.64		40.4
North: Fling Station Access (N)												
7	L	121	2.0	0.506	8.3	LOS A	0.8	5.7	0.19	0.64		48.7
8	T	55	2.0	0.134	32.2	LOS C	2.9	20.8	0.86	0.65		30.5
9	R	41	2.0	0.404	50.0	LOS D	2.6	18.6	0.95	0.74		25.4
Approach		217	2.0	0.505	22.2	LOS C	2.9	20.8	0.50	0.66		36.8
West: Alan Paton Road (W)												
10	L	193	2.0	0.187	8.1	LOS A	1.2	8.2	0.15	0.63		49.0
11	T	2219	2.0	1.065	116.5	LOS F	99.4	708.0	1.00	1.70		13.9
12	R	465	2.0	1.468	389.9	LOS F	45.9	326.9	1.00	2.10		5.1
Approach		2877	2.0	1.468	153.4	LOS F	99.4	708.0	0.94	1.69		11.3
All Vehicles		6276	2.0	1.468	93.7	LOS F	99.4	708.0	0.82	1.24		16.5

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C1.4

MOVEMENT SUMMARY

Site: 1-7 Alan Paton/Alexandra 2015 Sat
AM-Peak Exist + Develop

1 - Alan Paton Ave / Alexandra Rd2015 Background + Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles											
Mov ID	Dir	Volume	HV	Seg	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop Queue	Effective Stop Rate	Average Speed
			W	N	Sec		Var	m	Person	Person	km/h
South: Alexandra Road (S)											
1	L	442	2.0	0.812	35.3	LOS D	7.8	55.9	1.00	0.97	30.7
2	T	42	2.0	0.583	23.8	LOS C	4.9	34.9	0.98	0.80	32.8
3	R	243	2.0	0.582	31.8	LOS C	5.0	35.3	0.98	0.82	32.3
Approach		727	2.0	0.812	33.5	LOS C	7.8	55.9	0.99	0.91	31.3
East: Alan Paton Road (E)											
4	L	286	2.0	0.356	9.0	LOS A	2.3	16.0	0.37	0.69	47.8
5	T	1057	2.0	0.479	7.8	LOS A	9.8	69.8	0.66	0.58	46.9
6	R	72	2.0	0.146	12.5	LOS B	1.2	8.4	0.44	0.72	44.7
Approach		1415	2.0	0.479	8.3	LOS A	9.8	69.8	0.59	0.61	47.0
North: Filing Station Access (N)											
7	L	115	2.0	0.307	8.7	LOS A	0.7	5.0	0.31	0.66	48.1
8	T	25	2.0	0.088	21.1	LOS C	0.9	6.3	0.90	0.64	36.0
9	R	48	2.0	0.306	34.6	LOS C	1.9	13.4	0.99	0.72	30.8
Approach		188	2.0	0.307	17.0	LOS B	1.9	13.4	0.56	0.67	40.5
West: Alan Paton Road (W)											
10	L	100	2.0	0.095	8.5	LOS A	0.5	3.6	0.27	0.65	48.3
11	T	1102	2.0	0.499	7.9	LOS A	10.3	73.1	0.67	0.59	46.8
12	R	421	2.0	0.816	26.0	LOS C	12.9	92.1	0.83	1.00	35.1
Approach		1623	2.0	0.816	12.6	LOS B	12.9	92.1	0.69	0.70	43.1
All Vehicles		3954	2.0	0.816	15.1	LOS B	12.9	92.1	0.70	0.71	41.3

MOVEMENT SUMMARY

Site: 1-8 Alan Paton/Alexandra 2015 Fri
PM-Peak Exist + Develop

1 - Alan Paton Ave / Alexandra Rd2015 Background + Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles											
Mov ID	Dir	Volume	HV	Seg	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop Queue	Effective Stop Rate	Average Speed
			W	N	Sec		Var	m	Person	Person	km/h
South: Alexandra Road (S)											
1	L	473	2.0	0.608	43.8	LOS D	11.4	80.9	0.96	0.82	27.4
2	T	38	2.0	0.495	35.7	LOS D	7.6	54.1	0.94	0.76	27.9
3	R	248	2.0	0.494	43.7	LOS D	7.6	54.1	0.94	0.81	27.5
Approach		759	2.0	0.608	43.4	LOS D	11.4	80.9	0.95	0.81	27.5
East: Alan Paton Road (E)											
4	L	270	2.0	0.336	8.1	LOS A	1.5	10.4	0.17	0.64	48.9
5	T	1136	2.0	0.544	15.9	LOS B	17.9	127.5	0.73	0.65	39.8
6	R	49	2.0	0.153	24.0	LOS C	2.0	13.9	0.61	0.74	36.2
Approach		1455	2.0	0.544	14.7	LOS B	17.9	127.5	0.62	0.65	41.1
North: Filing Station Access (N)											
7	L	116	2.0	0.491	8.3	LOS A	0.9	6.1	0.20	0.64	48.7
8	T	51	2.0	0.125	32.1	LOS C	2.7	19.5	0.86	0.65	30.5
9	R	39	2.0	0.389	51.2	LOS D	2.5	18.0	0.96	0.74	25.1
Approach		206	2.0	0.490	22.3	LOS C	2.7	19.5	0.50	0.66	36.8
West: Alan Paton Road (W)											
10	L	180	2.0	0.159	8.0	LOS A	0.9	6.5	0.13	0.63	49.1
11	T	2070	2.0	0.990	66.4	LOS E	71.4	508.3	1.00	1.34	20.5
12	R	566	2.0	0.681	21.4	LOS C	10.4	74.1	0.69	0.83	37.9

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Approach	2816	2.0	0.990	53.6	LOS D	71.4	508.3	0.88	1.19	23.6
All Vehicles	5236	2.0	0.990	40.1	LOS D	71.4	503.3	0.88	0.88	27.9

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C2.1

MOVEMENT SUMMARY

Site: 2-1 Alan Paton/Leinster 2010 Sat
AM-Peak Exist

2 - Alan Paton Ave / Leinster Rd 2010 Existing Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles

Flow	AV Demand Flow	AV Demand Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
South: Leinster Road (S)										
1 L	98	2.0	0.057	7.9	LOS A	0.4	2.9	0.12	0.63	49.1
2 T	36	2.0	0.083	27.4	LOS C	2.2	15.4	0.79	0.60	32.5
3 R	7	2.0	0.083	35.5	LOS D	2.2	15.4	0.79	0.79	31.6
Approach	141	2.0	0.083	14.3	LOS B	2.2	15.4	0.33	0.63	42.4
East: Alan Paton Road (E)										
4 L	6	2.0	0.302	16.2	LOS B	9.4	66.9	0.49	0.98	43.3
5 T	778	2.0	0.303	7.9	LOS A	9.4	66.9	0.49	0.42	47.4
6 R	89	2.0	0.274	22.5	LOS C	3.4	24.3	0.61	0.76	37.2
Approach	874	2.0	0.303	9.5	LOS A	9.4	66.9	0.50	0.46	46.1
North: Leinster Road (N)										
7 L	83	2.0	0.051	7.9	LOS A	0.3	2.4	0.12	0.63	49.1
8 T	35	2.0	0.066	27.2	LOS C	1.8	12.5	0.79	0.58	32.9
9 R	204	2.0	0.411	38.4	LOS D	9.3	66.0	0.88	0.80	29.3
Approach	322	2.0	0.411	29.3	LOS C	9.3	66.0	0.67	0.73	33.2
West: Alan Paton Road (W)										
10 L	159	2.0	0.124	8.0	LOS A	0.7	4.8	0.13	0.63	49.1
11 T	879	2.0	0.427	8.8	LOS A	13.6	96.6	0.54	0.48	46.1
12 R	78	2.0	0.427	17.0	LOS B	10.6	75.2	0.54	0.91	42.3
Approach	1116	2.0	0.427	9.3	LOS A	13.6	96.6	0.48	0.53	46.2
All Vehicles	2463	2.0	0.427	12.3	LOS B	13.6	96.6	0.50	0.54	49.7

MOVEMENT SUMMARY

Site: 2-2 Alan Paton/Leinster 2010 Fri
PM-Peak Exist

2 - Alan Paton Ave / Leinster Rd 2010 Existing Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles

Flow	AV Demand Flow	AV Demand Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queued	Effective Stop Rate	Average Speed	
South: Leinster Road (S)										
1 L	114	2.0	0.066	7.9	LOS A	0.5	3.4	0.12	0.63	49.1
2 T	41	2.0	0.095	29.2	LOS C	2.3	16.6	0.82	0.81	31.7
3 R	4	2.0	0.095	37.2	LOS D	2.3	16.6	0.82	0.79	30.9
Approach	159	2.0	0.095	14.2	LOS B	2.3	16.6	0.32	0.63	42.5
East: Alan Paton Road (E)										
4 L	6	2.0	0.311	15.4	LOS B	9.6	68.6	0.47	0.99	43.9
5 T	839	2.0	0.315	7.1	LOS A	9.6	68.6	0.47	0.41	48.3
6 R	104	2.0	0.556	29.6	LOS C	5.0	35.9	0.78	0.81	33.2
Approach	949	2.0	0.556	9.6	LOS A	9.6	68.6	0.50	0.46	46.0
North: Leinster Road (N)										
7 L	84	2.0	0.052	7.9	LOS A	0.3	2.5	0.12	0.63	49.1
8 T	40	2.0	0.084	29.1	LOS C	2.1	14.8	0.81	0.61	31.9
9 R	263	2.0	0.580	41.5	LOS D	12.1	85.9	0.94	0.83	28.1
Approach	387	2.0	0.580	32.9	LOS C	12.1	85.9	0.75	0.76	31.4
West: Alan Paton Road (W)										
10 L	196	2.0	0.154	8.0	LOS A	0.8	6.0	0.13	0.63	49.1
11 T	1341	2.0	0.586	9.2	LOS A	20.0	142.5	0.60	0.55	45.6
12 R	75	2.0	0.586	17.4	LOS B	16.6	118.5	0.60	0.94	42.4
Approach	1612	2.0	0.586	9.5	LOS A	20.0	142.5	0.55	0.58	45.8
All Vehicles	3107	2.0	0.586	12.7	LOS B	20.0	142.5	0.55	0.57	43.2

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C2.2

MOVEMENT SUMMARY

Site: 2-3 Alan Paton/Leinster 2010 Sat
AM-Peak Exist + Develop

2 - Alan Paton Ave / Leinster Rd 2010 Existing + Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles											
Mov ID	Turn	Flow	HV	Del. Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queue Length	Effective Stop Rate	Average Speed
			%	veh	-sec		veh	m	per veh	per veh	kmph
South: Leinster Road (S)											
1	L	94	2.0	0.106	11.8	LOS B	1.6	11.5	0.43	0.69	45.7
2	T	48	2.0	0.064	14.6	LOS B	2.0	14.5	0.59	0.45	40.9
3	R	7	2.0	0.064	22.7	LOS C	2.0	14.5	0.59	0.85	38.4
Approach		149	2.0	0.106	13.1	LOS B	2.0	14.5	0.49	0.62	43.6
East: Alan Paton Road (E)											
4	L	6	2.0	0.661	39.6	LOS D	16.0	114.2	0.94	0.87	30.3
5	T	743	2.0	0.660	31.3	LOS C	16.0	114.2	0.94	0.81	30.7
6	R	179	2.0	0.701	33.4	LOS C	7.4	52.9	0.98	0.84	31.4
Approach		928	2.0	0.701	31.8	LOS C	16.0	114.2	0.95	0.81	30.8
North: Leinster Road (N)											
7	L	137	2.0	0.140	11.3	LOS B	2.6	18.5	0.36	0.68	45.8
8	T	43	2.0	0.046	14.4	LOS B	1.6	11.3	0.58	0.44	41.3
9	R	406	2.0	0.708	33.2	LOS C	16.7	118.7	0.90	0.86	31.5
Approach		586	2.0	0.708	26.7	LOS C	16.7	118.7	0.75	0.79	34.7
West: Alan Paton Road (W)											
10	L	146	2.0	0.169	8.6	LOS A	1.2	8.6	0.22	0.65	48.6
11	T	809	2.0	0.713	32.5	LOS C	17.6	125.3	0.96	0.84	30.2
12	R	72	2.0	0.267	29.7	LOS C	3.0	21.6	0.88	0.75	33.1
Approach		1027	2.0	0.713	28.9	LOS C	17.6	125.3	0.85	0.81	32.2
All Vehicles		2692	2.0	0.713	28.5	LOS C	17.6	125.3	0.84	0.80	32.7

MOVEMENT SUMMARY

Site: 2-4 Alan Paton/Leinster 2010 Fri
PM-Peak Exist + Develop

2 - Alan Paton Ave / Leinster Rd 2010 Existing + Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles											
Mov ID	Turn	Flow	HV	Del. Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Distance	Prop. Queue Length	Effective Stop Rate	Average Speed
			%	veh	-sec		veh	m	per veh	per veh	kmph
South: Leinster Road (S)											
1	L	112	2.0	0.133	11.9	LOS B	2.0	13.9	0.45	0.70	45.4
2	T	49	2.0	0.072	19.1	LOS B	2.2	15.9	0.67	0.51	37.6
3	R	4	2.0	0.072	27.1	LOS C	2.2	15.9	0.67	0.84	35.8
Approach		165	2.0	0.133	14.4	LOS B	2.2	15.9	0.52	0.65	42.5
East: Alan Paton Road (E)											
4	L	6	2.0	0.569	33.5	LOS C	16.0	113.8	0.86	0.90	33.0
5	T	819	2.0	0.568	25.3	LOS C	16.0	113.9	0.86	0.75	33.7
6	R	160	2.0	0.713	32.3	LOS C	6.0	42.6	1.00	0.85	31.9
Approach		985	2.0	0.714	26.5	LOS C	16.0	113.9	0.88	0.76	33.4
North: Leinster Road (N)											
7	L	118	2.0	0.138	15.1	LOS B	3.2	22.7	0.48	0.69	42.5
8	T	46	2.0	0.060	18.9	LOS B	1.9	13.8	0.66	0.51	37.8
9	R	408	2.0	0.868	50.6	LOS D	21.4	152.7	1.00	1.01	25.2
Approach		573	2.0	0.868	40.7	LOS D	21.4	152.7	0.87	0.90	28.4
West: Alan Paton Road (W)											
10	L	188	2.0	0.217	8.5	LOS A	1.6	11.3	0.21	0.65	48.6
11	T	1292	2.0	0.888	40.3	LOS D	32.4	230.6	1.00	1.06	27.2
12	R	73	2.0	0.237	25.1	LOS C	2.7	19.2	0.81	0.75	35.5
Approach		1553	2.0	0.888	35.7	LOS D	32.4	230.6	0.90	1.00	29.1
All Vehicles		3276	2.0	0.368	32.7	LOS C	32.4	230.6	0.87	0.80	30.6

TRAFFIC IMPACT STUDY

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

327592

Revision 1

Annexure C2.3

MOVEMENT SUMMARY

Site: 2-5 Alan Paton/Leinster 2015 Sat
AM-Peak Exist

2 - Alan Paton Ave / Leinster Rd 2015 Background Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles											
Flow	Dir	Vol	HT	HT	Average Delay	Level of Service	% Sat	Dist	Queue	Effective Sat	Average Sp. Del
			%	Wt	Sec		Vol	Dist	Len	per Veh	per Veh
South: Leinster Road (S)											
1	L	114	2.0	0.066	7.9	LOS A	0.5	3.3	0.12	0.63	49.1
2	T	41	2.0	0.084	25.0	LOS C	2.4	16.8	0.76	0.58	33.7
3	R	8	2.0	0.084	33.1	LOS C	2.4	16.8	0.76	0.80	32.7
Approach		163	2.0	0.084	13.5	LOS B	2.4	16.8	0.32	0.62	43.1
East: Alan Paton Road (E)											
4	L	7	2.0	0.372	18.1	LOS B	11.8	83.8	0.55	0.97	41.9
5	T	902	2.0	0.371	9.8	LOS A	11.8	83.9	0.55	0.49	45.3
6	R	104	2.0	0.386	25.0	LOS C	4.3	30.8	0.68	0.78	35.7
Approach		1014	2.0	0.386	11.5	LOS B	11.8	83.9	0.57	0.52	44.0
North: Leinster Road (N)											
7	L	97	2.0	0.059	7.9	LOS A	0.4	2.8	0.12	0.63	49.1
8	T	40	2.0	0.068	24.8	LOS C	1.9	13.6	0.76	0.57	34.2
9	R	237	2.0	0.422	36.0	LOS D	10.2	72.6	0.86	0.81	30.3
Approach		374	2.0	0.422	27.5	LOS C	10.2	72.6	0.66	0.73	34.1
West: Alan Paton Road (W)											
10	L	189	2.0	0.148	8.0	LOS A	0.8	5.8	0.13	0.63	49.1
11	T	1019	2.0	0.415	10.2	LOS B	13.3	94.7	0.57	0.51	44.9
12	R	91	2.0	0.291	23.5	LOS C	3.5	25.2	0.63	0.77	36.5
Approach		1299	2.0	0.415	10.8	LOS B	13.3	94.7	0.51	0.54	44.8
All Vehicles		2813	2.0	0.422	13.4	LOS B	13.3	94.7	0.54	0.56	42.7

MOVEMENT SUMMARY

Site: 2-6 Alan Paton/Leinster 2015 Fri
PM-Peak Exist

2 - Alan Paton Ave / Leinster Rd 2015 Background Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles											
Flow	Dir	Vol	HT	HT	Average Delay	Level of Service	% Sat	Dist	Queue	Effective Sat	Average Sp. Del
			%	Wt	Sec		Vol	Dist	Len	per Veh	per Veh
South: Leinster Road (S)											
1	L	132	2.0	0.076	8.0	LOS A	0.6	3.9	0.13	0.63	49.1
2	T	47	2.0	0.129	32.1	LOS C	2.8	20.1	0.86	0.65	30.3
3	R	5	2.0	0.130	40.2	LOS D	2.8	20.1	0.86	0.79	29.8
Approach		184	2.0	0.129	15.1	LOS B	2.8	20.1	0.33	0.64	41.8
East: Alan Paton Road (E)											
4	L	7	2.0	0.345	14.3	LOS B	10.4	73.7	0.44	1.00	44.8
5	T	973	2.0	0.348	6.1	LOS A	10.4	73.7	0.44	0.39	49.6
6	R	121	2.0	0.800	50.0	LOS D	8.1	57.4	0.92	1.02	25.4
Approach		1101	2.0	0.801	10.9	LOS B	10.4	73.7	0.49	0.46	44.8
North: Leinster Road (N)											
7	L	98	2.0	0.081	7.9	LOS A	0.4	2.9	0.12	0.63	49.1
8	T	46	2.0	0.113	32.0	LOS C	2.5	17.8	0.85	0.64	30.6
9	R	305	2.0	0.785	48.9	LOS D	15.2	108.4	1.00	0.91	25.7
Approach		449	2.0	0.785	38.2	LOS D	15.2	108.4	0.79	0.82	29.2
West: Alan Paton Road (W)											
10	L	227	2.0	0.179	8.0	LOS A	1.0	7.1	0.13	0.63	49.0
11	T	1555	2.0	0.664	8.6	LOS A	23.9	170.2	0.62	0.57	46.2
12	R	86	2.0	0.663	16.8	LOS B	18.8	133.6	0.62	0.94	43.0
Approach		1868	2.0	0.664	8.9	LOS A	23.9	170.2	0.56	0.60	46.3
All Vehicles		3003	2.0	0.801	13.5	LOS B	23.9	170.2	0.56	0.59	42.5

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C2.4

MOVEMENT SUMMARY

Site: 2-7 Alan Paton/Leinster 2015 Sat
AM-Peak Exist + Develop

2 - Alan Paton Ave / Leinster Rd 2015 Background + Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles												
Move	Turn	Demand Flow	HV Deg Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Length (m)	Prob. Delayed Stop Rate	Effective Stop Rate	Average Speed (km/h)		
South: Leinster Road (S)												
1	L	109	2.0	0.123	11.4	LOS B	1.7	12.3	0.46	0.70	45.9	
2	T	54	2.0	0.107	19.2	LOS B	2.3	16.5	0.76	0.58	37.2	
3	R	8	2.0	0.107	27.3	LOS C	2.3	16.5	0.76	0.81	35.8	
Approach		172	2.0	0.123	14.6	LOS B	2.3	16.5	0.57	0.67	42.2	
East: Alan Paton Road (E)												
4	L	7	2.0	0.600	28.3	LOS C	13.9	98.8	0.87	0.89	35.8	
5	T	867	2.0	0.599	20.1	LOS C	13.9	98.8	0.87	0.76	36.6	
6	R	194	2.0	0.577	21.9	LOS C	5.2	36.9	0.91	0.80	37.5	
Approach		1068	2.0	0.599	20.5	LOS C	13.9	98.8	0.88	0.76	36.8	
North: Leinster Road (N)												
7	L	151	2.0	0.147	11.4	LOS B	2.6	18.4	0.43	0.70	45.7	
8	T	48	2.0	0.661	27.5	LOS C	9.9	70.7	0.96	0.83	31.1	
9	R	439	2.0	0.661	35.8	LOS D	9.9	70.7	0.96	0.86	30.5	
Approach		638	2.0	0.661	29.4	LOS C	9.9	70.7	0.83	0.82	33.2	
West: Alan Paton Road (W)												
10	L	177	2.0	0.200	8.8	LOS A	1.5	10.6	0.27	0.66	48.3	
11	T	949	2.0	0.650	20.6	LOS C	15.2	107.9	0.89	0.78	36.3	
12	R	84	2.0	0.239	20.5	LOS C	2.3	16.3	0.81	0.75	36.4	
Approach		1211	2.0	0.650	18.8	LOS B	15.2	107.9	0.80	0.76	37.8	
All Vehicles		3088	2.0	0.661	21.4	LOS C	15.2	107.9	0.82	0.77	36.6	

MOVEMENT SUMMARY

Site: 2-8 Alan Paton/Leinster 2015 Fri
PM-Peak Exist + Develop

2 - Alan Paton Ave / Leinster Rd 2015 Background + Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 90 seconds

Movement Performance - Vehicles												
Move	Turn	Demand Flow	HV Deg Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	Queue Length (m)	Prob. Delayed Stop Rate	Effective Stop Rate	Average Speed (km/h)		
South: Leinster Road (S)												
1	L	129	2.0	0.163	11.4	LOS B	2.4	16.8	0.42	0.70	45.9	
2	T	56	2.0	0.118	26.9	LOS C	3.0	21.2	0.79	0.81	32.8	
3	R	5	2.0	0.118	35.0	LOS D	3.0	21.2	0.79	0.81	31.9	
Approach		191	2.0	0.163	16.6	LOS B	3.0	21.2	0.54	0.67	40.7	
East: Alan Paton Road (E)												
4	L	7	2.0	0.498	26.2	LOS C	15.9	113.4	0.75	0.93	36.8	
5	T	953	2.0	0.503	17.9	LOS B	15.9	113.5	0.75	0.66	38.3	
6	R	177	2.0	0.738	30.7	LOS C	6.4	45.8	0.99	0.89	32.6	
Approach		1137	2.0	0.739	20.0	LOS B	15.9	113.5	0.79	0.69	37.3	
North: Leinster Road (N)												
7	L	132	2.0	0.151	8.2	LOS A	0.9	6.5	0.18	0.64	48.8	
8	T	53	2.0	0.756	39.3	LOS D	13.2	93.8	0.99	0.91	26.6	
9	R	451	2.0	0.757	47.6	LOS D	13.2	93.8	0.99	0.91	26.2	
Approach		635	2.0	0.757	38.7	LOS D	13.2	93.8	0.82	0.86	29.1	
West: Alan Paton Road (W)												
10	L	220	2.0	0.252	8.7	LOS A	1.9	13.5	0.23	0.66	48.5	
11	T	1505	2.0	0.789	23.1	LOS C	29.2	207.7	0.91	0.84	34.8	
12	R	84	2.0	0.247	19.8	LOS B	2.5	17.7	0.70	0.75	38.9	
Approach		1809	2.0	0.789	21.2	LOS C	29.2	207.7	0.82	0.82	36.2	
All Vehicles		3772	2.0	0.789	23.5	LOS C	29.2	207.7	0.80	0.78	35.3	

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C3.1

MOVEMENT SUMMARY

Site: 3-1 New England/Woodhouse
2010 Sat AM-Peak Exist

3 - Woodhouse Rd / New England Rd 2010 Existing Traffic Volumes Saturday AM-Peak Stop (Two-Way)

Movement Performance - Vehicles											
Mov	Turn	Demand Flow	HV	Dist. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Delayed	Effective Stop Rate	Average Speed
		veh/h	%	veh	sec		veh	m	per veh	per veh	km/h
South: Woodhouse Road (S)											
1	L	5	2.0	0.142	8.5	LOS A	1.2	8.3	0.19	1.72	49.8
2	T	263	2.0	0.141	0.3	LOS A	1.2	8.3	0.19	0.00	56.4
3	R	16	2.0	0.014	9.0	LOS A	0.1	0.5	0.32	0.61	47.6
Approach		284	2.0	0.141	0.9	LOS A	1.2	8.3	0.20	0.07	55.7
East: New England Road (E)											
4	L	111	2.0	0.119	12.0	LOS B	0.6	4.0	0.34	0.89	45.9
5	T	1	2.0	0.117	12.4	LOS B	0.6	4.0	0.34	0.98	45.5
6	R	36	2.0	0.086	17.1	LOS C	0.4	2.8	0.57	0.97	41.8
Approach		147	2.0	0.119	13.2	LOS C	0.6	4.0	0.40	0.91	44.8
North: Woodhouse Road (N)											
7	L	19	2.0	0.125	8.3	LOS A	0.9	6.8	0.02	1.68	49.0
8	T	209	2.0	0.126	0.1	LOS A	0.9	6.8	0.02	0.00	59.6
9	R	1	2.0	0.132	8.5	LOS A	0.9	6.8	0.02	1.11	48.7
Approach		229	2.0	0.126	0.8	LOS A	0.9	6.8	0.02	0.14	58.5
West: New England Road (W)											
10	L	2	2.0	0.011	12.8	LOS B	0.0	0.3	0.50	0.62	44.3
11	T	1	2.0	0.011	15.8	LOS C	0.0	0.3	0.50	0.87	42.8
12	R	2	2.0	0.011	15.3	LOS C	0.0	0.3	0.50	0.90	43.1
Approach		5	2.0	0.011	14.4	LOS C	0.0	0.3	0.50	0.78	43.5
All Vehicles		666	2.0	0.141	3.7	NA	1.2	8.3	0.18	0.26	53.6

MOVEMENT SUMMARY

Site: 3-2 New England/Woodhouse
2010 Fri PM-Peak Exist

3 - Woodhouse Rd / New England Rd 2010 Existing Traffic Volumes Friday PM-Peak Stop (Two-Way)

Movement Performance - Vehicles											
Mov	Turn	Demand Flow	HV	Dist. Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Delayed	Effective Stop Rate	Average Speed
		veh/h	%	veh	sec		veh	m	per veh	per veh	km/h
South: Woodhouse Road (S)											
1	L	1	2.0	0.175	8.6	LOS A	1.5	10.6	0.24	1.70	50.1
2	T	325	2.0	0.170	0.4	LOS A	1.5	10.6	0.24	0.00	55.6
3	R	16	2.0	0.014	9.2	LOS A	0.1	0.5	0.35	0.62	47.5
Approach		342	2.0	0.170	0.9	LOS A	1.5	10.6	0.24	0.03	55.1
East: New England Road (E)											
4	L	158	2.0	0.176	12.3	LOS B	0.9	6.1	0.38	0.90	45.6
5	T	1	2.0	0.175	12.7	LOS B	0.9	6.1	0.38	1.00	45.3
6	R	20	2.0	0.057	18.8	LOS C	0.3	1.8	0.62	0.97	40.5
Approach		179	2.0	0.176	13.0	LOS C	0.9	6.1	0.41	0.91	45.0
North: Woodhouse Road (N)											
7	L	46	2.0	0.159	8.3	LOS A	1.2	8.5	0.02	1.43	49.0
8	T	229	2.0	0.159	0.0	LOS A	1.2	8.5	0.02	0.00	59.6
9	R	1	2.0	0.150	8.5	LOS A	1.2	8.5	0.02	1.06	48.7
Approach		277	2.0	0.159	1.5	LOS A	1.2	8.5	0.02	0.24	57.5
West: New England Road (W)											
10	L	1	2.0	0.008	14.5	LOS B	0.0	0.2	0.57	0.63	42.8
11	T	1	2.0	0.008	17.5	LOS C	0.0	0.2	0.57	0.87	41.5
12	R	1	2.0	0.008	17.0	LOS C	0.0	0.2	0.57	0.91	41.8
Approach		3	2.0	0.008	16.3	LOS C	0.0	0.2	0.57	0.80	42.0
All Vehicles		661	2.0	0.176	3.8	NA	1.5	10.6	0.26	0.31	53.2

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C3.2

MOVEMENT SUMMARY

Site: 3-3 New England/Woodhouse
2010 Sat AM-Peak Exist + Develop

3 - Woodhouse Rd / New England Rd 2010 Existing + Development Traffic Volumes Saturday AM-Peak Roundabout

Movement Performance - Vehicles												
Approach	Turn	Demand Flow	HV	Req	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Proj. Queue Rate	Effective Stop Rate	Average Speed
		veh/s	%	veh	%	sec		veh	m	per-veh	per-veh	km/h
South: Woodhouse Road (S)												
1	L	114	2.0	0.101		6.6	LOS A	0.6	4.5	0.41	0.55	49.3
2	T	115	2.0	0.103		5.3	LOS A	0.7	4.7	0.40	0.48	50.3
3	R	14	2.0	0.103		12.2	LOS B	0.7	4.7	0.40	0.83	46.6
Approach		242	2.0	0.103		6.3	LOS B	0.7	4.7	0.40	0.53	49.6
East: New England Road (E)												
4	L	104	2.0	0.163		9.2	LOS A	1.3	9.0	0.70	0.73	47.7
5	T	41	2.0	0.163		8.1	LOS A	1.3	9.0	0.70	0.69	47.6
6	R	36	2.0	0.065		16.7	LOS B	0.4	2.9	0.68	0.80	42.2
Approach		181	2.0	0.163		10.5	LOS B	1.3	9.0	0.70	0.73	46.4
North: Woodhouse Road (N)												
7	L	14	2.0	0.391		8.3	LOS A	3.1	21.9	0.67	0.72	47.6
8	T	148	2.0	0.392		7.3	LOS A	3.1	21.9	0.67	0.66	47.5
9	R	186	2.0	0.392		14.2	LOS B	3.1	21.9	0.67	0.84	44.7
Approach		348	2.0	0.392		11.0	LOS B	3.1	21.9	0.67	0.76	45.9
West: New England Road (W)												
10	L	183	2.0	0.509		6.5	LOS A	4.6	32.7	0.47	0.53	48.6
11	T	40	2.0	0.506		5.6	LOS A	4.6	32.7	0.47	0.48	48.9
12	R	398	2.0	0.509		12.4	LOS B	4.6	32.7	0.47	0.70	45.3
Approach		621	2.0	0.509		10.2	LOS B	4.6	32.7	0.47	0.64	46.4
All Vehicles		1393	2.0	0.509		9.8	LOS A	4.6	32.7	0.54	0.66	46.8

MOVEMENT SUMMARY

Site: 3-4 New England/Woodhouse
2010 Fri PM-Peak Exist + Develop

3 - Woodhouse Rd / New England Rd 2010 Existing + Development Traffic Volumes Friday PM-Peak Roundabout

Movement Performance - Vehicles												
Approach	Turn	Demand Flow	HV	Req	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Proj. Queue Rate	Effective Stop Rate	Average Speed
		veh/s	%	veh	%	sec		veh	m	per-veh	per-veh	km/h
South: Woodhouse Road (S)												
1	L	89	2.0	0.113		6.6	LOS A	0.7	4.8	0.37	0.54	49.7
2	T	301	2.0	0.221		5.1	LOS A	1.5	10.8	0.36	0.46	50.6
3	R	15	2.0	0.220		12.0	LOS B	1.5	10.8	0.36	0.84	46.7
Approach		405	2.0	0.221		5.7	LOS B	1.5	10.8	0.36	0.49	50.2
East: New England Road (E)												
4	L	153	2.0	0.190		8.3	LOS A	1.4	10.1	0.64	0.69	48.0
5	T	37	2.0	0.191		7.1	LOS A	1.4	10.1	0.64	0.64	48.0
6	R	20	2.0	0.033		15.3	LOS B	0.2	1.4	0.61	0.74	43.3
Approach		209	2.0	0.190		8.8	LOS B	1.4	10.1	0.63	0.69	47.5
North: Woodhouse Road (N)												
7	L	39	2.0	0.367		7.3	LOS A	2.9	20.5	0.58	0.64	48.4
8	T	196	2.0	0.369		6.4	LOS A	2.9	20.5	0.58	0.58	48.5
9	R	128	2.0	0.368		13.3	LOS B	2.9	20.5	0.58	0.81	45.7
Approach		363	2.0	0.368		8.9	LOS B	2.9	20.5	0.58	0.67	47.4
West: New England Road (W)												
10	L	124	2.0	0.428		7.4	LOS A	3.3	23.2	0.58	0.65	47.8
11	T	35	2.0	0.429		6.5	LOS A	3.3	23.2	0.58	0.58	47.9
12	R	269	2.0	0.428		13.4	LOS B	3.3	23.2	0.58	0.79	45.0
Approach		428	2.0	0.429		11.1	LOS B	3.3	23.2	0.58	0.73	46.0
All Vehicles		1406	2.0	0.429		8.8	LOS A	3.3	23.2	0.53	0.64	47.7

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C3.3

MOVEMENT SUMMARY

Site: 3-5 New England/Woodhouse
2015 Sat AM-Peak Exist

3 - Woodhouse Rd / New England Rd 2015 Existing Traffic Volumes Saturday AM-Peak
Stop (Two-Way)

Movement Performance - Vehicles												
MOVID	Turn	Demand	Flow	Delay	Average Delay	Level of Service	Stop	Queue	Distance	Prop. Delay	Average Speed	
			veh/h	s	s		veh	m	m	per veh	km/h	
South: Woodhouse Road (S)												
1	L	6	2.0	0.204	8.6	LOS A	1.8	12.7	0.22	1.69	50.0	
2	T	377	2.0	0.201	0.4	LOS A	1.8	12.7	0.22	0.00	55.9	
3	R	18	2.0	0.016	9.2	LOS A	0.1	0.6	0.35	0.62	47.5	
Approach			401	2.0	0.201	0.9	LOS A	1.8	12.7	0.22	0.05	55.4
East: New England Road (E)												
4	L	128	2.0	0.144	12.3	LOS B	0.7	4.9	0.38	0.90	45.7	
5	T	1	2.0	0.150	12.6	LOS B	0.7	4.9	0.38	1.00	45.3	
6	R	41	2.0	0.129	20.4	LOS C	0.6	4.1	0.68	1.00	39.4	
Approach			171	2.0	0.144	14.3	LOS C	0.7	4.9	0.45	0.92	44.0
North: Woodhouse Road (N)												
7	L	22	2.0	0.145	8.4	LOS A	1.1	8.0	0.02	1.68	49.0	
8	T	243	2.0	0.146	0.1	LOS A	1.1	8.0	0.02	0.00	59.7	
9	R	1	2.0	0.150	8.5	LOS A	1.1	8.0	0.02	1.12	48.6	
Approach			266	2.0	0.146	0.8	LOS A	1.1	8.0	0.02	0.14	58.5
West: New England Road (W)												
10	L	1	2.0	0.012	16.5	LOS C	0.1	0.4	0.63	0.67	41.2	
11	T	1	2.0	0.012	19.5	LOS C	0.1	0.4	0.63	0.89	40.1	
12	R	2	2.0	0.012	19.0	LOS C	0.1	0.4	0.63	0.93	40.3	
Approach			4	2.0	0.012	18.5	LOS C	0.1	0.4	0.63	0.85	40.5
All Vehicles			842	2.0	0.201	3.7	NA	1.8	12.7	0.21	0.23	53.4

MOVEMENT SUMMARY

Site: 3-6 New England/Woodhouse
2015 Fri PM-Peak Exist

3 - Woodhouse Rd / New England Rd 2015 Existing Traffic Volumes Friday PM-Peak
Stop (Two-Way)

Movement Performance - Vehicles												
MOVID	Turn	Demand	Flow	Delay	Average Delay	Level of Service	Stop	Queue	Distance	Prop. Delay	Average Speed	
			veh/h	s	s		veh	m	m	per veh	km/h	
South: Woodhouse Road (S)												
1	L	1	2.0	0.211	8.7	LOS A	1.8	12.7	0.27	1.67	50.2	
2	T	377	2.0	0.197	0.5	LOS A	1.8	12.7	0.27	0.00	55.1	
3	R	18	2.0	0.017	9.5	LOS A	0.1	0.6	0.39	0.64	47.3	
Approach			396	2.0	0.197	0.9	LOS A	1.8	12.7	0.27	0.03	54.7
East: New England Road (E)												
4	L	183	2.0	0.214	12.7	LOS B	1.1	7.5	0.43	0.92	45.4	
5	T	1	2.0	0.211	13.0	LOS B	1.1	7.5	0.43	1.00	45.0	
6	R	23	2.0	0.078	21.1	LOS C	0.3	2.4	0.69	1.00	38.9	
Approach			207	2.0	0.214	13.6	LOS C	1.1	7.5	0.46	0.93	44.6
North: Woodhouse Road (N)												
7	L	54	2.0	0.184	8.3	LOS A	1.4	10.1	0.02	1.43	49.0	
8	T	266	2.0	0.184	0.0	LOS A	1.4	10.1	0.02	0.00	59.6	
9	R	1	2.0	0.175	8.5	LOS A	1.4	10.1	0.02	1.06	48.7	
Approach			321	2.0	0.184	1.5	LOS A	1.4	10.1	0.02	0.24	57.5
West: New England Road (W)												
10	L	1	2.0	0.009	16.4	LOS C	0.0	0.3	0.62	0.66	41.3	
11	T	1	2.0	0.009	19.3	LOS C	0.0	0.3	0.62	0.88	40.2	
12	R	1	2.0	0.009	18.9	LOS C	0.0	0.3	0.62	0.93	40.4	
Approach			3	2.0	0.009	18.2	LOS C	0.0	0.3	0.62	0.82	40.6
All Vehicles			927	2.0	0.214	4.0	NA	1.8	12.7	0.23	0.31	52.8

TRAFFIC IMPACT STUDY

327692

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C3.4

MOVEMENT SUMMARY

**Site: 3-7 New England/Woodhouse
2015 Sat AM-Peak Exist + Develop**

3 - Woodhouse Rd / New England Rd 2015 Background + Development Traffic Volumes Saturday AM-Peak Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand	HV	Dist	Average	Level of	95% Peak of Queue	Prop	Effective	Average		
		Flow	Dist	Dist	Delay	Service	Vehicle	Queue	Queue	Stop Rate	Speed	
		veh/h	%	veh	sec		veh	m	per veh	per veh	km/h	
South: Woodhouse Road (S)												
1	L	115	2.0	0.121	7.0	LOS A	0.7	5.3	0.44	0.57	49.1	
2	T	252	2.0	0.216	5.4	LOS A	1.5	10.6	0.44	0.49	50.0	
3	R	16	2.0	0.216	12.3	LOS B	1.5	10.6	0.44	0.84	46.7	
Approach		382	2.0	0.216	6.2	LOS B	1.5	10.6	0.44	0.53	49.6	
East: New England Road (E)												
4	L	122	2.0	0.192	9.6	LOS A	1.5	11.0	0.74	0.76	47.4	
5	T	41	2.0	0.192	8.4	LOS A	1.5	11.0	0.74	0.72	47.2	
6	R	41	2.0	0.078	17.1	LOS B	0.5	3.6	0.71	0.82	41.9	
Approach		204	2.0	0.192	10.9	LOS B	1.5	11.0	0.73	0.76	46.1	
North: Woodhouse Road (N)												
7	L	17	2.0	0.443	8.4	LOS A	3.8	26.8	0.72	0.74	47.3	
8	T	182	2.0	0.446	7.5	LOS A	3.8	26.8	0.72	0.68	47.1	
9	R	186	2.0	0.446	14.4	LOS B	3.8	26.8	0.72	0.86	44.7	
Approach		385	2.0	0.446	10.9	LOS B	3.8	26.8	0.72	0.77	45.9	
West: New England Road (W)												
10	L	185	2.0	0.600	8.3	LOS A	6.2	44.5	0.69	0.71	47.1	
11	T	40	2.0	0.597	7.4	LOS A	6.2	44.5	0.69	0.68	47.0	
12	R	400	2.0	0.600	14.3	LOS B	6.2	44.5	0.69	0.81	44.4	
Approach		625	2.0	0.600	12.1	LOS B	6.2	44.5	0.69	0.77	45.3	
All Vehicles		1597	2.0	0.600	10.2	LOS B	6.2	44.5	0.64	0.71	46.5	

MOVEMENT SUMMARY

**Site: 3-8 New England/Woodhouse
2015 Fri PM-Peak Exist + Develop**

3 - Woodhouse Rd / New England Rd 2015 Background + Development Traffic Volumes Friday PM-Peak Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand	HV	Dist	Average	Level of	95% Peak of Queue	Prop	Effective	Average		
		Flow	Dist	Dist	Delay	Service	Vehicle	Queue	Queue	Stop Rate	Speed	
		veh/h	%	veh	sec		veh	m	per veh	per veh	km/h	
South: Woodhouse Road (S)												
1	L	89	2.0	0.127	6.6	LOS A	0.8	5.5	0.37	0.54	49.7	
2	T	353	2.0	0.250	5.2	LOS A	1.8	12.6	0.37	0.46	50.5	
3	R	17	2.0	0.251	12.0	LOS B	1.8	12.6	0.37	0.84	46.7	
Approach		459	2.0	0.250	5.7	LOS B	1.8	12.6	0.37	0.49	50.2	
East: New England Road (E)												
4	L	178	2.0	0.223	8.6	LOS A	1.7	12.3	0.67	0.72	47.8	
5	T	37	2.0	0.223	7.5	LOS A	1.7	12.3	0.67	0.67	47.7	
6	R	23	2.0	0.039	15.7	LOS B	0.2	1.7	0.63	0.75	43.0	
Approach		238	2.0	0.224	9.1	LOS B	1.7	12.3	0.67	0.71	47.2	
North: Woodhouse Road (N)												
7	L	46	2.0	0.414	7.4	LOS A	3.4	24.0	0.60	0.66	48.3	
8	T	233	2.0	0.413	6.5	LOS A	3.4	24.0	0.60	0.59	48.3	
9	R	128	2.0	0.413	13.4	LOS B	3.4	24.0	0.60	0.82	45.6	
Approach		407	2.0	0.413	8.8	LOS B	3.4	24.0	0.60	0.67	47.4	
West: Proposed Development (W)												
10	L	124	2.0	0.448	7.8	LOS A	3.4	24.2	0.62	0.68	47.6	
11	T	35	2.0	0.451	6.8	LOS A	3.4	24.2	0.62	0.62	47.5	
12	R	269	2.0	0.448	13.7	LOS B	3.4	24.2	0.62	0.82	44.9	
Approach		428	2.0	0.448	11.4	LOS B	3.4	24.2	0.62	0.76	45.8	
All Vehicles		1533	2.0	0.448	8.7	LOS A	3.4	24.2	0.56	0.66	47.7	

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C4.1

MOVEMENT SUMMARY

Site: 4-1 Woodhouse/Boshoff 2010 Sat
AM-Peak Exist

4 - Woodhouse Rd / Boshoff St 2010 Existing Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles													
Mo	ID	Turn	Demand Flow	HV	Deq	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
			veh/h	%	veh	veh	sec		veh	m	person	per veh	km/h
South East: Sunray Rd (SE)													
21		L	3	2.0	0.279		15.4	LOS B	6.1	43.6	0.55	0.96	44.2
22		T	302	2.0	0.277		7.2	LOS A	6.1	43.6	0.55	0.47	47.9
23		R	87	2.0	0.304		25.3	LOS C	3.0	21.1	0.78	0.78	35.3
Approach			393	2.0	0.304		11.3	LOS B	6.1	43.6	0.60	0.54	44.4
North East: Woodhouse Rd (NE)													
24		L	101	2.0	0.494		30.5	LOS C	7.4	52.8	0.91	0.82	33.6
25		T	118	2.0	0.494		22.3	LOS C	7.4	52.8	0.91	0.75	34.2
26		R	60	2.0	0.247		34.0	LOS C	2.5	17.4	0.92	0.75	30.9
Approach			279	2.0	0.494		27.8	LOS C	7.4	52.8	0.92	0.78	33.2
North West: Boshoff St (NW)													
27		L	62	2.0	0.645		17.9	LOS B	15.6	110.8	0.73	0.93	42.5
28		T	644	2.0	0.644		9.6	LOS A	15.6	110.8	0.73	0.66	44.6
29		R	107	2.0	0.210		17.4	LOS B	2.6	18.7	0.58	0.76	40.5
Approach			814	2.0	0.644		11.3	LOS B	15.6	110.8	0.71	0.69	43.9
South West: Woodhouse Rd (SW)													
30		L	77	2.0	0.436		30.2	LOS C	6.6	47.0	0.90	0.82	33.9
31		T	117	2.0	0.435		21.9	LOS C	6.6	47.0	0.90	0.73	34.5
32		R	88	2.0	0.392		34.9	LOS C	3.6	25.7	0.94	0.77	30.6
Approach			282	2.0	0.436		28.2	LOS C	6.6	47.0	0.91	0.77	33.0
All Vehicles			1767	2.0	0.644		18.6	LOS B	15.6	110.8	0.75	0.69	39.9

MOVEMENT SUMMARY

Site: 4-2 Woodhouse/Boshoff 2010 Fri
PM-Peak Exist

4 - Woodhouse Rd / Boshoff St 2010 Existing Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles													
Mo	ID	Turn	Demand Flow	HV	Deq	Satn	Average Delay	Level of Service	95% Back of Queue Vehicles	Distance	Prop. Queued	Effective Stop Rate	Average Speed
			veh/h	%	veh	veh	sec		veh	m	person	per veh	km/h
South East: Sunray Rd (SE)													
21		L	7	2.0	0.404		15.2	LOS B	10.1	72.1	0.54	0.98	44.3
22		T	489	2.0	0.407		7.0	LOS A	10.1	72.1	0.54	0.47	48.2
23		R	126	2.0	0.541		30.5	LOS C	5.2	36.9	0.86	0.81	32.6
Approach			623	2.0	0.541		11.8	LOS B	10.1	72.1	0.60	0.55	43.9
North East: Woodhouse Rd (NE)													
24		L	115	2.0	0.633		37.2	LOS D	9.6	68.2	0.97	0.84	30.5
25		T	125	2.0	0.632		29.0	LOS C	9.6	68.2	0.97	0.82	30.7
26		R	62	2.0	0.429		43.9	LOS D	3.2	22.7	0.99	0.75	27.1
Approach			302	2.0	0.632		35.2	LOS D	9.6	68.2	0.97	0.81	29.8
North West: Boshoff St (NW)													
27		L	48	2.0	0.713		17.7	LOS B	20.9	148.9	0.73	0.95	42.8
28		T	822	2.0	0.714		9.4	LOS A	20.9	148.9	0.73	0.67	44.9
29		R	143	2.0	0.331		19.1	LOS B	4.1	29.1	0.61	0.78	39.3
Approach			1014	2.0	0.714		11.2	LOS B	20.9	148.9	0.71	0.70	43.9
South West: Woodhouse Rd (SW)													
30		L	108	2.0	0.688		36.3	LOS D	10.6	75.1	0.98	0.87	30.2
31		T	154	2.0	0.688		30.0	LOS C	10.6	75.1	0.98	0.86	30.4
32		R	102	2.0	0.645		45.2	LOS D	5.1	36.4	1.00	0.82	26.7
Approach			364	2.0	0.688		36.8	LOS D	10.6	75.1	0.99	0.85	29.2
All Vehicles			2303	2.0	0.714		18.6	LOS B	20.9	148.9	0.76	0.70	38.5

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C4.2

MOVEMENT SUMMARY

Site: 4-3 Woodhouse/Boshoff 2010 Sat
AM-Peak Exist+Develop

4 - Woodhouse Rd / Boshoff St 2010 Existing plus Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles												
Move ID	Turn	Demand Flow	HV	Req	Satn	Average Delay	Level of Service	95% Rank of Queue Vehicles	Distance	Prop. Queue	Effective Stop Rate	Average Speed
		veh/h	%	veh		sec		veh	m		per veh	km/h
South East: Survey Rd (SE)												
21	L	20	2.0	0.331		17.0	LOS B	6.3	44.6	0.66	0.92	43.0
22	T	288	2.0	0.331		8.8	LOS A	6.3	44.6	0.66	0.56	45.8
23	R	84	2.0	0.344		27.5	LOS C	2.8	19.7	0.88	0.78	34.1
Approach		393	2.0	0.344		13.2	LOS B	6.3	44.6	0.71	0.62	42.5
North East: Woodhouse Rd (NE)												
24	L	97	2.0	0.446		24.8	LOS C	6.5	46.6	0.87	0.83	37.0
25	T	141	2.0	0.446		16.6	LOS B	6.5	46.6	0.87	0.72	37.8
26	R	58	2.0	0.254		30.6	LOS C	2.0	14.6	0.93	0.75	32.5
Approach		296	2.0	0.446		22.0	LOS C	6.5	46.6	0.88	0.76	36.4
North West: Boshoff St (NW)												
27	L	60	2.0	0.727		20.8	LOS C	15.5	110.4	0.86	0.95	40.6
28	T	616	2.0	0.727		12.5	LOS B	15.5	110.4	0.86	0.80	41.7
29	R	187	2.0	0.387		20.3	LOS C	4.7	33.6	0.75	0.80	38.5
Approach		863	2.0	0.727		14.8	LOS B	15.5	110.4	0.83	0.81	40.9
South West: Woodhouse Rd (SW)												
30	L	175	2.0	0.615		26.0	LOS C	9.0	64.0	0.92	0.85	36.0
31	T	152	2.0	0.616		17.7	LOS B	9.0	64.0	0.92	0.79	36.6
32	R	140	2.0	0.488		29.6	LOS C	4.6	32.8	0.94	0.79	33.0
Approach		466	2.0	0.616		24.4	LOS C	9.0	64.0	0.93	0.81	35.2
All Vehicles		2018	2.0	0.727		17.8	LOS B	15.5	110.4	0.84	0.77	39.0

MOVEMENT SUMMARY

Site: 4-4 Woodhouse/Boshoff 2010 Fri
PM-Peak Exist+Develop

4 - Woodhouse Rd / Boshoff St 2010 Existing plus Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles												
Move ID	Turn	Demand Flow	HV	Req	Satn	Average Delay	Level of Service	95% Rank of Queue Vehicles	Distance	Prop. Queue	Effective Stop Rate	Average Speed
		veh/h	%	veh		sec		veh	m		per veh	km/h
South East: Survey Rd (SE)												
21	L	22	2.0	0.454		16.4	LOS B	10.3	73.2	0.63	0.95	43.5
22	T	478	2.0	0.455		8.2	LOS A	10.3	73.2	0.63	0.55	46.5
23	R	123	2.0	0.585		32.9	LOS C	4.9	35.0	0.94	0.84	31.5
Approach		623	2.0	0.585		13.4	LOS B	10.3	73.2	0.69	0.62	42.4
North East: Woodhouse Rd (NE)												
24	L	113	2.0	0.572		31.0	LOS C	8.5	60.8	0.94	0.83	33.4
25	T	141	2.0	0.572		22.8	LOS C	8.5	60.8	0.94	0.78	33.9
26	R	81	2.0	0.409		39.1	LOS D	2.7	19.5	0.99	0.75	28.8
Approach		315	2.0	0.572		28.9	LOS C	8.5	60.8	0.95	0.79	32.6
North West: Boshoff St (NW)												
27	L	47	2.0	0.774		21.0	LOS C	21.7	154.3	0.83	0.97	40.5
28	T	804	2.0	0.775		12.7	LOS B	21.7	154.3	0.83	0.80	41.7
29	R	200	2.0	0.472		22.7	LOS C	6.0	42.5	0.77	0.81	36.9
Approach		1052	2.0	0.775		15.0	LOS B	21.7	154.3	0.82	0.81	40.7
South West: Woodhouse Rd (SW)												
30	L	166	2.0	0.761		34.8	LOS C	11.9	84.6	0.99	0.93	31.6
31	T	171	2.0	0.761		26.5	LOS C	11.9	84.6	0.99	0.92	31.8
32	R	115	2.0	0.567		37.8	LOS D	4.8	34.2	0.99	0.80	29.4
Approach		452	2.0	0.761		32.4	LOS C	11.9	84.6	0.99	0.90	31.1
All Vehicles		2441	2.0	0.775		19.6	LOS B	21.7	154.3	0.83	0.77	37.7

Annexure C4.3

MOVEMENT SUMMARY

Site: 4-5 Woodhouse/Boshoff 2015 Sat
AM-Peak Exist

4 - Woodhouse Rd / Boshoff St 2015 Background Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 60 seconds

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed	
		veh/h	%	sec		veh	m	per sat	per sat	km/h	
South East: Survey Rd (SE)											
21	L	3	2.0	0.328	LOS B	7.1	50.7	0.56	0.96	44.0	
22	T	351	2.0	0.321	LOS A	7.1	50.7	0.56	0.49	47.6	
23	R	101	2.0	0.446	LOS C	3.9	27.4	0.89	0.80	32.6	
Approach		455	2.0	0.446	LOS B	7.1	50.7	0.64	0.56	43.2	
North East: Woodhouse Rd (NE)											
24	L	117	2.0	0.572	LOS C	8.5	60.8	0.94	0.83	33.4	
25	T	137	2.0	0.572	LOS C	8.5	60.8	0.94	0.78	33.8	
26	R	69	2.0	0.314	LOS D	2.9	20.6	0.94	0.76	30.4	
Approach		323	2.0	0.572	LOS C	8.5	60.8	0.94	0.79	32.9	
North West: Boshoff St (NW)											
27	L	72	2.0	0.747	LOS B	19.7	140.4	0.81	0.95	41.3	
28	T	746	2.0	0.745	LOS B	19.7	140.4	0.81	0.75	42.8	
29	R	124	2.0	0.253	LOS B	3.2	22.6	0.61	0.77	39.9	
Approach		942	2.0	0.745	LOS B	19.7	140.4	0.78	0.77	42.3	
South West: Woodhouse Rd (SW)											
30	L	89	2.0	0.507	LOS C	7.6	54.2	0.92	0.83	33.7	
31	T	136	2.0	0.506	LOS C	7.6	54.2	0.92	0.76	34.2	
32	R	102	2.0	0.505	LOS D	4.3	30.4	0.98	0.78	29.6	
Approach		327	2.0	0.507	LOS C	7.6	54.2	0.94	0.78	32.5	
All Vehicles		2047	2.0	0.746	LOS B	19.7	140.4	0.80	0.73	38.8	

MOVEMENT SUMMARY

Site: 4-6 Woodhouse/Boshoff 2015 Fri
PM-Peak Exist

4 - Woodhouse Rd / Boshoff St 2015 Background Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles											
Mov ID	Turn	Demand Flow	HV Deg Sat	Average Delay	Level of Service	95% Back of Queue Vehicles	95% Back of Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed	
		veh/h	%	sec		veh	m	per sat	per sat	km/h	
South East: Survey Rd (SE)											
21	L	8	2.0	0.478	LOS B	12.0	85.2	0.57	0.98	44.1	
22	T	567	2.0	0.471	LOS A	12.0	85.2	0.57	0.51	47.7	
23	R	146	2.0	0.860	LOS D	8.1	57.9	1.00	1.07	24.7	
Approach		722	2.0	0.860	LOS B	12.0	85.2	0.66	0.63	40.1	
North East: Woodhouse Rd (NE)											
24	L	133	2.0	0.732	LOS D	11.3	80.6	0.99	0.90	29.6	
25	T	145	2.0	0.732	LOS C	11.3	80.6	0.99	0.89	29.8	
26	R	72	2.0	0.602	LOS D	3.8	27.0	1.00	0.79	26.1	
Approach		349	2.0	0.732	LOS D	11.3	80.6	0.99	0.87	28.9	
North West: Boshoff St (NW)											
27	L	56	2.0	0.829	LOS C	30.3	216.1	0.84	1.00	39.1	
28	T	953	2.0	0.827	LOS B	30.3	216.1	0.84	0.83	40.3	
29	R	166	2.0	0.396	LOS C	5.2	36.7	0.68	0.79	37.9	
Approach		1175	2.0	0.827	LOS B	30.3	216.1	0.82	0.83	39.9	
South West: Woodhouse Rd (SW)											
30	L	125	2.0	0.796	LOS D	12.7	90.3	1.00	0.95	28.8	
31	T	178	2.0	0.796	LOS C	12.7	90.3	1.00	0.95	29.0	
32	R	118	2.0	0.879	LOS D	6.4	45.4	1.00	1.00	24.5	
Approach		421	2.0	0.879	LOS D	12.7	90.3	1.00	0.97	27.5	
All Vehicles		2667	2.0	0.879	LOS C	30.3	216.1	0.82	0.80	35.6	

TRAFFIC IMPACT STUDY

327592

WOODBURN SHOPPING CENTRE - PORTION 5 OF ERF 4346 PIETERMARITZBURG FT

Revision 1

Annexure C4.4

MOVEMENT SUMMARY

Site: 4-7 Woodhouse/Boshoff 2015 Sat
AM-Peak Exist + Develop

4 - Woodhouse Rd / Boshoff St 2015 Background + Development Traffic Volumes Saturday AM-Peak
Signals - Fixed Time Cycle Time = 50 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV Deg Satn	Average Delay	Level of Service	95% Back of Queue Vehicle	Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed	
		veh/h	%	sec		veh	m	per veh	per veh	km/h	
South East: Survey Rd (SE)											
21	L	20	2.0	0.382	17.3	LOS B	7.3	51.8	0.68	0.92	42.9
22	T	337	2.0	0.383	9.1	LOS A	7.3	51.8	0.68	0.58	45.4
23	R	98	2.0	0.495	31.9	LOS C	3.5	24.9	0.97	0.78	31.9
Approach		455	2.0	0.495	14.3	LOS B	7.3	51.8	0.74	0.64	41.6
North East: Woodhouse Rd (NE)											
24	L	113	2.0	0.511	25.2	LOS C	7.5	53.2	0.89	0.84	36.7
25	T	160	2.0	0.511	17.0	LOS B	7.5	53.2	0.89	0.74	37.5
26	R	67	2.0	0.323	31.9	LOS C	2.4	17.3	0.95	0.75	31.9
Approach		340	2.0	0.511	22.6	LOS C	7.5	53.2	0.90	0.77	36.0
North West: Boshoff St (NW)											
27	L	48	2.0	0.827	25.9	LOS C	20.8	147.9	0.93	1.04	37.3
28	T	723	2.0	0.829	17.7	LOS B	20.8	147.9	0.93	0.96	37.9
29	R	204	2.0	0.456	21.5	LOS C	5.4	38.2	0.79	0.81	37.7
Approach		976	2.0	0.829	18.9	LOS B	20.8	147.9	0.90	0.94	37.8
South West: Woodhouse Rd (SW)											
30	L	187	2.0	0.675	27.0	LOS C	10.0	71.5	0.94	0.88	35.5
31	T	171	2.0	0.675	18.7	LOS B	10.0	71.5	0.94	0.84	35.9
32	R	154	2.0	0.583	31.3	LOS C	5.2	37.0	0.97	0.82	32.2
Approach		512	2.0	0.675	25.5	LOS C	10.0	71.5	0.95	0.85	34.6
All Vehicles		2282	2.0	0.829	20.0	LOS C	20.8	147.9	0.88	0.83	37.4

MOVEMENT SUMMARY

Site: 4-8 Woodhouse/Boshoff 2015 Fri
PM-Peak Exist + Develop

4 - Woodhouse Rd / Boshoff St 2015 Background + Development Traffic Volumes Friday PM-Peak
Signals - Fixed Time Cycle Time = 70 seconds

Movement Performance - Vehicles

Mov ID	Turn	Demand Flow	HV Deg Satn	Average Delay	Level of Service	95% Back of Queue Vehicle	Queue Distance	Prop. Queue	Effective Stop Rate	Average Speed	
		veh/h	%	sec		veh	m	per veh	per veh	km/h	
South East: Survey Rd (SE)											
21	L	23	2.0	0.495	16.8	LOS B	12.8	91.3	0.61	0.96	43.1
22	T	556	2.0	0.497	8.6	LOS A	12.8	91.3	0.61	0.55	46.2
23	R	143	2.0	0.902	58.1	LOS E	8.4	59.5	1.00	1.12	23.1
Approach		722	2.0	0.901	18.7	LOS B	12.8	91.3	0.69	0.67	38.5
North East: Woodhouse Rd (NE)											
24	L	131	2.0	0.671	36.3	LOS D	11.2	79.9	0.97	0.87	31.0
25	T	161	2.0	0.671	28.0	LOS C	11.2	79.9	0.97	0.84	31.2
26	R	71	2.0	0.623	47.8	LOS D	3.8	26.8	1.00	0.78	25.9
Approach		362	2.0	0.671	34.8	LOS C	11.2	79.9	0.97	0.84	29.9
North West: Boshoff St (NW)											
27	L	55	2.0	0.853	26.6	LOS C	32.9	234.0	0.88	1.03	36.8
28	T	935	2.0	0.850	18.3	LOS B	32.9	234.0	0.88	0.90	37.6
29	R	223	2.0	0.575	24.7	LOS C	7.6	54.3	0.80	0.83	35.7
Approach		1213	2.0	0.850	19.9	LOS B	32.9	234.0	0.87	0.90	37.2
South West: Woodhouse Rd (SW)											
30	L	183	2.0	0.871	45.7	LOS D	16.4	116.8	1.00	1.06	27.3
31	T	195	2.0	0.871	37.5	LOS D	16.4	116.8	1.00	1.06	27.4
32	R	131	2.0	0.813	48.4	LOS D	6.7	47.6	1.00	0.95	25.7
Approach		508	2.0	0.871	43.3	LOS D	16.4	116.8	1.00	1.03	26.9
All Vehicles		2805	2.0	0.901	25.7	LOS C	32.9	234.0	0.88	0.85	34.1

Appendix E:

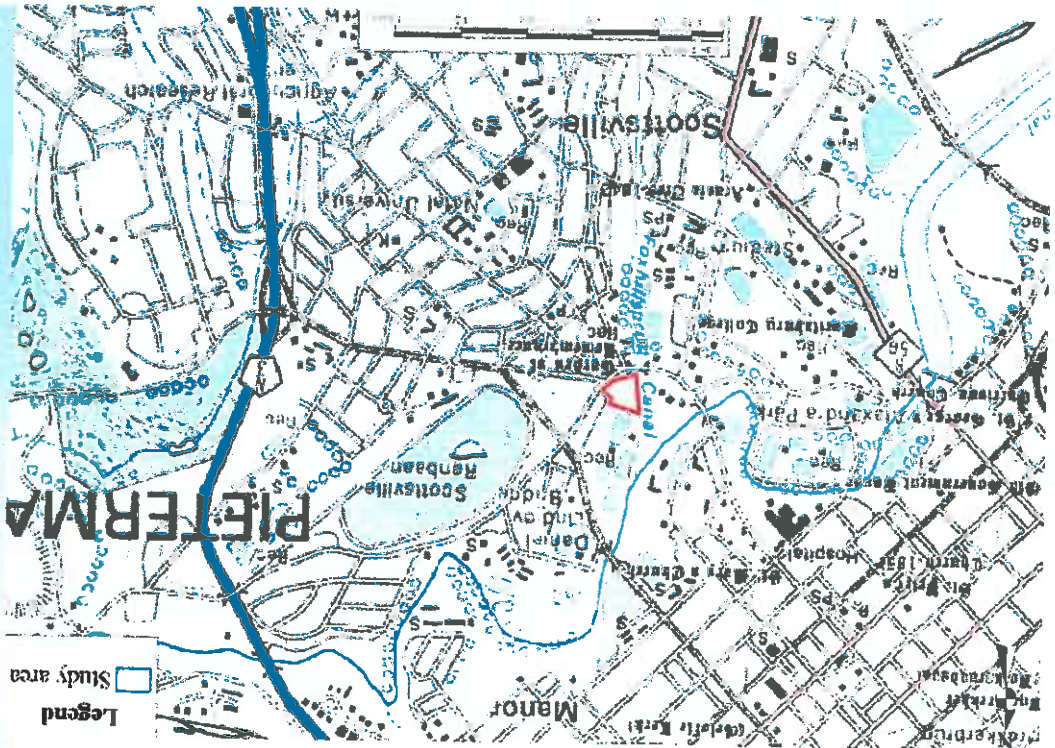
Public Participation

Appendix E1:

Advert and Notices

Draft Basic Assessment Report for Review

Woodburn Boulevard Shopping Centre



All interested and affected parties are invited to review the development information and to register any issues and concerns to be included and addressed in the Final Basic Assessment Report.

Venue: Msunduzi Municipal Library

Physical Address: 260 Church St,
Pietermaritzburg

Tel: 033 392 2683

Date: 15 August 2012 – 25 September 2012

Website: www.bokamoso.net

Please do not hesitate to contact us if there are any questions in connection with the above-mentioned development.

Contact Person: Juanita De Beer
Tel (012) 346 3810 Fax (086) 570 5659
E-mail: lizelleg@rmweb.co.za
Website: www.bokamoso.net

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 02:57 PM
To: 'afromatz@telkomsa.net'
Subject: Review Invitation
Attachments: Review Notice.pdf

Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer



**Environmental Consultants &
Landscape Architects**

Tel: 07123 44 8318 | E: 2736 020 9659 | e: jvdbeer@bokamoso.net
36 Edenburg Road Addis Gardens, PTW

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 02:58 PM
To: 'bookings@kznwildlife.com'
Subject: Review Invitation
Attachments: Review Notice.pdf

Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer


**Environmental Consultants &
Landscape Architects**
Tel: 07123 346 8810 | E: 27 031 970 9059 | info@bokamoso.co.za
36 Debonville Road, Ashlea Gardens, Pietermaritzburg

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 02:58 PM
To: 'zama.sibisi@eskom.co.za'
Subject: Review Invitation
Attachments: Review Notice.pdf

Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer



**Environmental Consultants &
Landscape Architects**
Tel: 011 709 8101 / 011 709 8100 | info@bokamoso.co.za
16 Federal Road Ashlea Gardens, Pretoria

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 03:00 PM
To: 'bernadetp@amasapmb.co.za'
Subject: Review Invitation
Attachments: Review Notice.pdf

Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer



**Environmental Consultants &
Landscape Architects**

Tel: 0741212851 / 011 278 4901 / 011 278 4902
36 Edengolfs Road, Ashburton, Pretoria

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 03:06 PM
To: 'noel.stevens@davislangdon.co.za'; 'noel.stevens@aecom.com'; 'gashul@somta.co.za'; 'nqobile@pmfever.co.za'; 'sandals@webmail.co.za'; 'BarnarJB@eskom.co.za'; 'abrie@booyens.net'; 'hicksmarglynn@gmail.com'; 'lynmac@futurenet.co.za'; 'royphyll@absamail.co.za'; 'ivaneeden@oldmutualpfa.com'; 'helgab@dihlase.co.za'; 'juliang@futurenet.co.za'; 'atwaru@vodamail.co.za'; 'sashenc@spanafrica.co.za'; 'nac@pmmtrust.org'
Subject: Review Invitation
Attachments: Review Notice.pdf
Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer


**Environmental Consultants &
Landscape Architects**
| t: 011 461 4810 | f: 011 470 5654 | e: info@bokamoso.co.za |
46 Lebowale Road, Boksburg, Gauteng, P.O. Box 101

Juanita

From: User3 <user3@bokamoso.net>
Sent: 08 August 2012 02:56 PM
To: 'wayne.evans@kzntransport.gov.za'
Subject: Review Invitation
Attachments: Review Notice.pdf

Flag Status: Flagged

Dear Interested and Affected Party,

Please refer to the attached Invitation for Review regarding the proposed **Draft Basic Assessment Report Woodburn Boulevard Shopping Centre**.

Kind Regards/Vriendelike Groete

Juanita De Beer

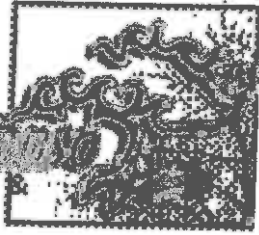


**Environmental Consultants &
Landscape Architects**

Tel: 071 27 46 4010 | **F:** 071 27 46 5059 | **e:** juanita@bokamoso.co.za |
36 De Vriesdorp Road, Ashburton Gardens, Pietermaritzburg

**Environmental Consultants &
Landscape Architects**

011 431 2000 • 011 431 2001 • 011 431 2002 • 011 431 2003
26 Tchamba Road Ashlea Gardens, Pretoria



From: Mluleki Phungula [mailto:mluleki.phungula@pmbfever.co.za]
Sent: 10 November 2011 10:25 AM
To: Lizelle Gregory
Subject: Maritzburg Fever (Mirror)

Hi Lizelle Gregory

Please see below proof of your advert.
Advert size 11cm top to bottom x 9cm across.
Advert amount R1015.74 including vat.

Many Thanks
Lou

From: Dumisani Mthembu
Sent: 09 November 2011 04:18 PM
To: Mluleki Phungula
Subject: Sent from Snipping Tool

NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is given of an application for environmental authorisation that was submitted to the KwaZulu-Natal Department of Agriculture, Environmental Affairs and Rural Development, in terms of Regulation no. R543 published in the *Government Notice No. 33306* of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Basic Assessment procedures (Notice 1 and 3—Governing Notice R544 & R546) for the following activity:

Name of project: Woodburn Boulevard Shopping Centre.

Project description: The proposed project will entail the development of a 6 500 sq m Shopping Centre in the city of Pietermaritzburg, KwaZulu-Natal.

Property description: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg.

The application was submitted for the following activities in terms of the Government Notice R. 544, R. 545 and R. 546, 18 June 2010:

R. 544, 18 June 2010	Activity 9
R. 544, 18 June 2010	Activity 11
R. 544, 18 June 2010	Activity 18
R. 544, 18 June 2010	Activity 37
R. 544, 18 June 2010	Activity 39

Extent: The total study area is approximately 1,7885 ha in extent.

Name of the proponent: O & T DEVELOPMENT (PTY) LTD.

Location: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346 Pietermaritzburg. When travelling South on the N3 through the town of Pietermaritzburg one could take the New England Road exit to the left. Follow this road for approximately 1,4 km until reaching Woodhouse Road. The study area is located on the corner of Woodhouse Road and Alan Paton Drive.

Date of notice: 9 November 2011

Queries regarding this matter should be referred to:

Bokamoso Landscape Architects and Environmental Consultants

George Gericks

P.O. Box 11375

Maroelana 0161

www.bokamoso.net

Tel: 012 346 3810

Fax: 086 570 5659

email: lizellsg@mweb.co.za

In order to ensure that you are identified as an interested and/or affected party please submit your name, contact information and interest in the matter, in writing, to the contact person given above within 40 days of publication of this advertisement.

This email and its contents are subject to an email legal notice that can be viewed at: <http://www.naspers.com/email/disclaimer.html> Should you be unable to access the link provided, please email us for a copy at Helpdesk@Media24.com.

Hierdie e-pos en sy inhoud is onderhewig aan 'n regskenningsgewing oor elektroniese pos wat gelees kan word by <http://www.naspers.com/epos/vrywaring.html> 'n Afskrif kan aangevra word by Helpdesk@Media24.com.

This email and its contents are subject to an email legal notice that can be viewed at: <http://www.naspers.com/email/disclaimer.html> Should you be unable to access the link provided, please email us for a copy at Helpdesk@Media24.com.

Hierdie e-pos en sy inhoud is onderhewig aan 'n regskenningsgewing oor elektroniese pos wat gelees kan word by <http://www.naspers.com/epos/vrywaring.html> 'n Afskrif kan aangevra word by Helpdesk@Media24.com.

George Gericke

From: Ontvangs
Sent: 24 November 2011 09:13 AM
To: George Gericke
Subject: FW: CONTACT DETAILS FOR SHOPPING CENTRE @ WOODBURN PIETERMARITZBURG

-----Original Message-----

From: sandra hemingway [mailto:sandals@webmail.co.za]
Sent: 24 November 2011 08:44 AM
To: lizelle@mweb.co.za
Subject: CONTACT DETAILS FOR SHOPPING CENTRE @ WOODBURN PIETERMARITZBURG

24 November 2011

Dear George,

Thank You so much for taking my call. I would be most grateful if you could supply me with contact details regarding application for opening a shop in the Woodburn Shopping Mall.

My name is Sandy Hemingway
Phone 083-231 0738
Please reply on this email

Kind Regards
Sandy

South Africas premier free email service - www.webmail.co.za

For super low premiums, click here. <http://www.dialdirect.co.za/?vdm=15828>

Nr	Registered Parties	Contact details	Address
1	Noel Stevens	<u>noel.stevens@davislangdon.co.za</u> <u>noel.stevens@aecom.com</u> 033 345 8371 084 588 8788	
2	Simon Gushu	<u>gushul@somta.co.za</u>	
3	Ngobile Mtolo Maritzburg Fever Reporter	<u>ngobile@pmfever.co.za</u> 033 355 1170 072 629 7287	
4	Sandy Hemingway	<u>sandals@webmail.co.za</u> 083 231 0738	
5	Jenny Barnard	<u>BamarJB@eskom.co.za</u> 033 395 3854 Fax: 086 665 8153 Cell : 084 774 3073	1 Portland Rd Mkondeni
6	Abrie Bouwer	<u>abrie@booyens.net</u> Cell: 076 812 1806 Tel: 033 342 4909 Fax: 033 342 4905	80 Roberts Road Clarendon Pietermaritzburg PO Box 2370 Pietermaritzburg 3200
7	Larry and Lynn Hicks	<u>hicksmarglynn@gmail.com</u>	23 Woodhouse Road Scottsville
8	Jenny Barnard	<u>bamarjb@eskom.co.za</u> <u>BARNARJB@eskom.co.za</u> Tell: 033 394 2073	Sheila Dyer 17 Woodhouse Road Scottsville Pietermaritzburg 3201
9	Sheila Dyer Jenny Barnard (Daughter)	<u>barnarjb@eskom.co.za</u> Tel: 033 294 2073 Tel: 033 395 3854 Cell: 084 774 3073	17 Woodhouse Road Scottsville Pietermaritzburg, 3201
10	N.A. Mcdonald	<u>lynnmac@futurenet.co.za</u> Tel: 033 342 8454 Cell: 082 677 0234	8 New England Road Scottsville Pietermaritzburg, 3201

NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is given of an application for Environmental authorization that was submitted to the Kwazulu- Natal Department of Agriculture, Environmental Affairs & Rural Development, in terms of regulation no. R543 published in the Government Notice no. 33306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Basic Assessment procedures (Notice 1 and 3 – Governing Notice R544 & R546) for the following activity:

Name of project: Woodburn Boulevard Shopping Centre

Project description: The proposed project will entail the development of 6500m² Shopping Centre in the city of Pietermaritzburg, KwaZulu-Natal.

Property description: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg.

The application was submitted for the following activities in terms of the Government Notice R. 544, R. 545 & R. 546, 18 June 2010:

R. 544, 18 June 2010	Activity 9
R. 544, 18 June 2010	Activity 11
R. 544, 18 June 2010	Activity 18
R. 544, 18 June 2010	Activity 37
R. 544, 18 June 2010	Activity 39

Extent: The total study area is approximately 1.7885 ha in extent.

Name of the proponent: O & T DEVELOPMENT (PTY) LTD

Location: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346 Pietermaritzburg. When travelling South on the N3 through the town of Pietermaritzburg one could take the New England Road exit to the left. Follow this road for approximately 1.4 km until reaching Woodhouse Road. The study area is located on the corner of Woodhouse Road and Alan Paton Drive.

Date of notice: 11 November 2011

Queries regarding this matter should be referred to:

Bokamoso Landscape Architects and Environmental Consultants

George Gericke

Tel: (012) 346 3810

P.O. Box 11375

Fax: 086 570 5659

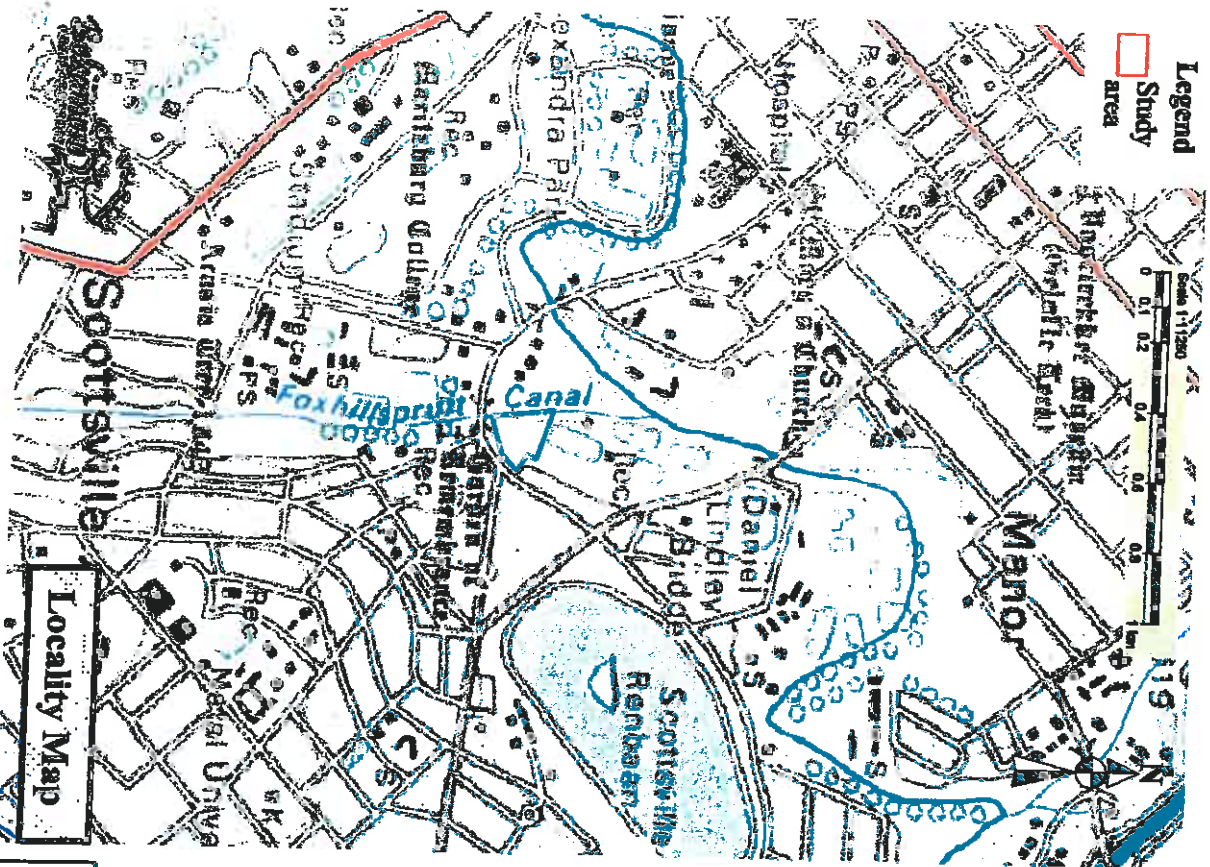
Maroelana 0161

email: lizelleg@mweb.co.za

www.bokamoso.net

In order to ensure that you are identified as an interested and/or affected party please submit your name, contact information and interest in the matter, in writing, to the contact person given above **on or before 31 January 2012.**

Woodburn Boulevard Shopping Centre



NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is given of an application for Environmental authorization that was submitted to the KwaZulu-Natal Department of Agriculture, Environmental Affairs & Rural Development, in terms of regulation no. R543 published in the Government Notice no. 33306 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Basic Assessment procedures (Notice 1 and 3 – Governing Notice R544 & R546) for the following activity:

Name of project: Woodburn Boulevard Shopping Centre

Project description: The proposed project will entail the development of 6500m² Shopping Centre in the city of Pietermaritzburg, KwaZulu-Natal.

Property description: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg.

The application was submitted for the following activities in terms of the Government Notice R. 544, R. 545 & R. 546, 18 June 2010:
 R. 544, 18 June 2010 Activity 9 R. 544, 18 June 2010 Activity 11 R. 544, 18 June 2010 Activity 18 R. 544, 18 June 2010 Activity 37R. 544, 18 June 2010 Activity 39

Extent: The total study area is approximately 1,7885 ha in extent.

Name of the proponent: O & T DEVELOPMENT (PTY) LTD

Location: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg. When travelling South on the N3 through the town of Pietermaritzburg one could take the New England Road exit to the left. Follow this road for approximately 1,4 km until reaching Woodhouse Road. The study area is located on the corner of Woodhouse Road and Alan Paton Drive.

Date of Notice: 17 November 2011

Queries regarding this matter should be referred to:

Bokaroso Landscape Architects and Environmental Consultants
 George Genfcke
 P.O. Bx 11375
 Midrand 0161
 www.bokaroso.net
 Tel: (012) 346 3810
 Fax: 086 570 5659
 email: lizelleg@rweb.co.za

In order to ensure that you are identified as an interested and/or affected party please submit your name, contact information and interest in the matter, in writing, to the contact person given above on or before **31 January 2012**.

NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

The purpose of this notice is to inform you of the environmental basic assessment process for the proposed project. This process is required by the Environmental Assessment Act, R.S.O. 1990, c. 191, and the Environmental Assessment Regulations, R.R.O. 1990, c. 191, Reg. 101.

Name of Project: [Project Name]

Project description: [Project Description]

Location: [Project Location]

Proposed start date: [Start Date]

Proposed end date: [End Date]

Project description: [Project Description]

Location: [Project Location]

Proposed start date: [Start Date]

Proposed end date: [End Date]

Project description: [Project Description]

Location: [Project Location]

Proposed start date: [Start Date]

Proposed end date: [End Date]

Project description: [Project Description]

Location: [Project Location]

Proposed start date: [Start Date]

Proposed end date: [End Date]

FROM

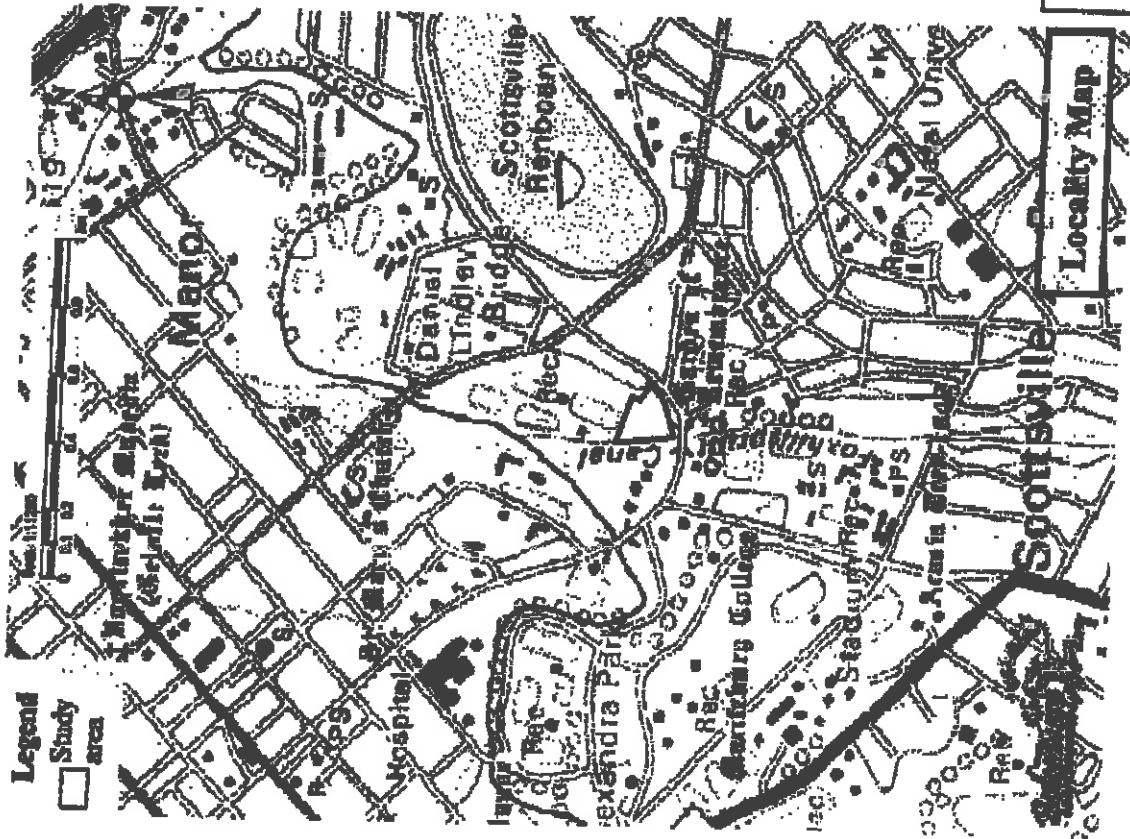
(MON) JAN 30 2012 10:37/ST. 10:36/No. 9401481173 P 1

FOR ATTENTION

GEORGE GERICKE

FAX No 086 570 5659

Woodburn Boulevard Shopping Centre



In order to ensure that you are identified as an interested and/or affected party please submit your name, contact information and interest in the matter, in writing, to the contact person given above on or before 31 January 2012.

NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is given of an application for Environmental authorisation that was submitted to the KwaZulu-Natal Department of Agriculture, Environmental Affairs & Rural Development, in terms of regulation no. 4549 published in the Government Notice no. 35306 of 15 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Basic Assessment procedures (Notice 1 and 3 - Governing Notice R344 & R346) for the following activity:

Name of project: Woodburn Boulevard Shopping Centre

Project description: The proposed project will entail the development of 6500m² Shopping Centre in the city of Pietermaritzburg, KwaZulu-Natal.

Proposed description: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg.

The application was submitted for the following activities in terms of the Government Notice R. 544, R. 545 & R. 546, 18 June 2010:

R. 544, 18 June 2010 Activity 9 R. 544, 18 June 2010 Activity 11 R. 544, 18 June 2010 Activity 18 R. 544, 18 June 2010 Activity 37 R. 544, 18 June 2010 Activity 37

Extent: The total study area is approximately 1,7885 ha in extent.

Name of the proponent: O & I DEVELOPMENT (PTY) LTD

Location: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346 Pietermaritzburg. When travelling South on the N3 through the town of Pietermaritzburg one could take the New England Road exit to the left. Follow this road for approximately 1.4 km until reaching Woodhouse Road. The study area is located on the corner of Woodhouse Road and Alan Paton Drive.

Date of notice: 17 November 2011

Queries regarding this matter should be referred to:

Botswana Landscape Architects and Environmental Consultants
George Geddie
P.O. Box 11375
Mabopane 0161
www.botanosa.net

* MR HENTIE STEIGER
1 NEW ENGLAND ROAD
SCOTTSDALE
083 232 3756
I LIVE ACROSS THE
ROAD FROM THE
PROPOSED
DEVELOPMENT

N.A. MCDONALD
8 NEW ENGLAND ROAD
SCOTTSVILLE
PIETERMARITZBURG
3201

TELEPHONE: 033 3428454
MOBILE: 0826770234
EMAIL: lynnmac@futurenet.co.za

18.01.2012

BOKAMOSO LANDSCAPE
ARCHITECTS AND ENVIRONMENTAL
CONSULTANTS

ATTENTION : George Gericke

FAX NUMBER: 0865705659

RE : WOODBURN BOULEVARD SHOPPING CENTRE

Dear Sir

I would like to be identified as an interested and/or affected party as my property is some 200 metres from the proposed location.

I am particularly concerned regarding the vehicular entrances and exits, the activities proposed, the environmental impact on the area and building design in relation to the surrounding properties.

Yours sincerely



N.A. MCDONALD

FROM

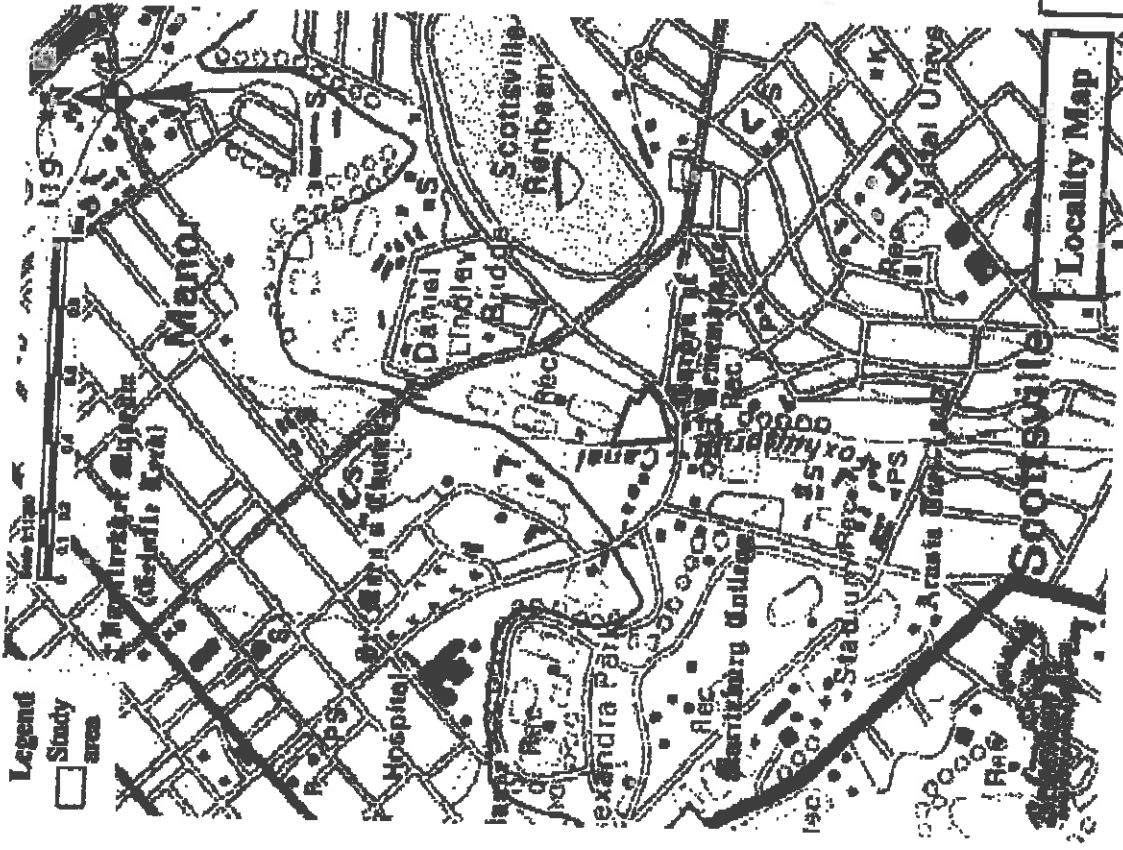
(MON) JAN 30 2012 10:38/ST. 10:37/No. 8401481174 P 1

FOR ATTENTION

GEORGE GERICKE

FAX No 086 570 5659

Woodburn Boulevard Shopping Centre



NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Notice is given of an application for Environmental authorization that was submitted to the KwaZulu-Natal Department of Agriculture, Environmental Affairs & Rural Development, in terms of regulation no. R543 published in the Government Notice no. 33906 of 18 June 2010 of the National Environment Management Act, 1998 (Act No. 107 of 1998) governing Basic Assessment procedures (Notice 1 and 3 - Governing Notice R544 & R546) for the following activity:

Name of project: Woodburn Boulevard Shopping Centre

Project description: The proposed project will entail the development of 6500m² Shopping Centre in the city of Pietermaritzburg, KwaZulu-Natal.

Property description: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346, Pietermaritzburg.

The application was submitted for the following activities in terms of the Government Notice R. 544, R. 545 & R. 546, 18 June 2010:

R. 544, 18 June 2010 Activity 9 R. 544, 18 June 2010 Activity 11 R. 544, 18 June 2010 Activity 16 R. 544, 18 June 2010 Activity 37R. 544, 18 June 2010 Activity 39

Extent: The total study area is approximately 1,7885 ha in extent.

Name of the proponent: O & T DEVELOPMENT (PTY) LTD

Location: The study area is located on the corner of Woodhouse Road and Alan Paton Drive on Portion 5 of Erf 4346 Pietermaritzburg. When travelling South on the N3 through the town of Pietermaritzburg one could take the New England road exit to the left. Follow this road for approximately 1,4 km until reaching Woodhouse Road. The study area is located on the corner of Woodhouse Road and Alan Paton Drive.

Date of notice: 17 November 2011

Queries regarding this matter should be referred to:

Isakomso Landscapes Architects and Environmental Consultants
George Geritcke
P.O. Box 11375
Marolana 0161
www.bokamoso.net

Tel: (012) 346 3810
Fax: 086 570 5659
email: isaaleg@web.co.za

* MR BV NAIDOO
18 WOODHOUSE ROAD
SCOTTSVILLE
0829034153

I LIVE ACROSS
THE ROAD FROM
THE PROPOSED
DEVELOPMENT

In order to ensure that you are identified as an interested and/or affected party please submit your name, contact information and interest in the matter, in writing, to the contact person given above on or before 31 January 2012.

User3

From: Ontvangs
Sent: 09 December 2011 09:33 AM
To: George Gericke
Subject: FW: Assessment - Woodhouse Road

Follow Up Flag: Follow up
Flag Status: Flagged

From: lynn hicks [<mailto:hicksmarglynn@gmail.com>]
Sent: 09 December 2011 09:22 AM
To: lizelleg@mweb.co.za
Subject: Assessment - Woodhouse Road

Good morning

We have read your article on the environmental assessment on Woodburn shopping centre & would like to submit our names as affected and interested residences of the area.

Thank you

Larry and Lynn Hicks
23 Woodhouse Road
Scottsville

User3

From: Ontvangs
Sent: 24 November 2011 09:13 AM
To: George Gericke
Subject: FW: CONTACT DETAILS FOR SHOPPING CENTRE @ WOODBURN PIETERMARITZBURG

-----Original Message-----

From: sandra hemingway [<mailto:sandals@webmail.co.za>]
Sent: 24 November 2011 08:44 AM
To: lizelleg@mweb.co.za
Subject: CONTACT DETAILS FOR SHOPPING CENTRE @ WOODBURN PIETERMARITZBURG

24 November 2011

Dear George,

Thank You so much for taking my call. I would be most grateful if you could supply me with contact details regarding application for opening a shop in the Woodburn Shopping Mall.

My name is Sandy Hemingway
Phone 083-231 0738
Please reply on this email

Kind Regards
Sandy

South Africas premier free email service - www.webmail.co.za

For super low premiums, click here. <http://www.dialdirect.co.za/?vdn=15828>

User3

From: Ontvangs
Sent: 12 September 2011 10:53 AM
To: George Gericke
Subject: FW: Fwd: Woodburn - Pietermaritzburg Application Form

From: Garth Jager - RAN Technologies [<mailto:rantechologies@gmail.com>]
Sent: 12 September 2011 10:13 AM
To: lizelleg@mweb.co.za
Subject: Re: Fwd: Woodburn - Pietermaritzburg Application Form

Hi George,

I have passed on all your requests for information to Tony Stathakis (ventureprop@icon.co.za). I will be out of the country for the next month but you can mail me any time. However, any information you may need you have to ask Tony.

Regards,
Onne

On 02/09/2011 11:50 PM, Onne Jager wrote:

----- Original Message -----
Subject: Woodburn - Pietermaritzburg Application Form
Date: Fri, 2 Sep 2011 14:45:41 +0200
From: Lizelle Gregory <lizelleg@mweb.co.za>
To: <llevel@acenet.co.za>

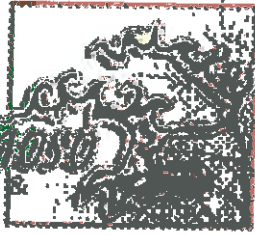
Middag Onne

Vind asb. aangeheg die aansoekvorm vir die Woodburn projek. Ek het 'n paar goed in die vorm in oranje ge'highlight'. Kan jy dit net asb. vir ons invul en seker maak al julle details is korrek. Sodra jy dit terugstuur dien ons hom in dank an ons begin met die public participation.

Groete

George Gericke

Bokumose



**Environmental Consultants &
Landscape Architects**

or: bokumose@bokumose.co.za Tel: +27(0)11 946 3830 Fax: +27(0)11 946 3839
36 Leventhorpe Road Ashlea Gardens, Pretoria

User3

From: Ontvangs
Sent: 16 November 2011 04:15 PM
To: George Gericke
Subject: FW: Media Enquiry - Woodburn Boulevard Shopping Centre
Importance: High

From: Nqobile Mtolo [<mailto:nqobile@pmbfever.co.za>]
Sent: 16 November 2011 04:04 PM
To: lizelleq@mweb.co.za
Subject: Media Enquiry - Woodburn Boulevard Shopping Centre
Importance: High

Greetings

I am a reporter for the Maritzburg Fever community newspaper and I recently read from the Pietermaritzburg Chamber of Business website that a new shopping centre is proposed on the corner of Woodhouse Road and Alan Paton Avenue.

I would like to find out more about the project in the sense that:

1. Who is spearheading the proposal and how is the property suitable for building a mall?
2. The proposed project will entail the development of 6 500m² retail space – how will the mall benefit the community. How many job opportunities are likely to be created?
3. While conducting research for the need of a shopping mall in this area, was the community involved in the process, especially residents who live closer to the site?
4. During research was Msunduzi Municipality contacted and will there be any partnerships, should the proposal go ahead?
5. What would be the proposed budget for the project and how many shops are likely to be located inside the mall?
6. What is the current stand of the proposal?

I would welcome your response before 16:30pm this coming Friday. Your help is very much appreciated.

Thank you.

Nqobile Mtolo

Maritzburg Fever Reporter

033 3551170 (tel.)

033 3551164 (fax)

072 6297287

Hierdie e-pos en sy inhoud is onderhewig aan 'n regskenninggewing oor elektroniese pos wat gelees kan word by <http://www.naspers.com/epos/vrywaring.html> 'n Afskrif kan aangevra word by Helpdesk@Media24.com.

User3

From: Thabang Hlongwane
Sent: 17 January 2012 08:28 AM
To: George Gericke
Subject: FW: Request to be on Tender list for Woodburne Boulevard

From: Ontvangs
Sent: 17 January 2012 08:24 AM
To: Thabang Hlongwane
Subject: FW: Request to be on Tender list for Woodburne Boulevard

From: Abrie Bouwer [<mailto:abrie@booyens.net>]
Sent: 16 January 2012 04:30 PM
To: lizelle@mweb.co.za
Subject: Request to be on Tender list for Woodburne Boulevard

Hi Juanita

Dankie vir jou hulp vroeer.

Onder is al my besonderhede om my in die hande te kry.

Net om jou te herinner ons doen die volgende:

- 1) Refrigeration
- 2) Air conditioning
- 3) Ventilation
- 4) Heat recovery installations (taking the heat from your refrigeration unit and heating your water)
- 5) Under floor heating

En nog baie ander dinge!

Baie dankie!

Abrie

Booyens
REFRIGERATION

Abrie Bouwer
PROJECT MANAGER - REFRIGERATION CONTRACTING
80 Roberts Road • Clarendon • Pietermaritzburg
• PO Box 2370 • Pietermaritzburg • 3200
Telephone 033 342 4809 • Facsimile 033 342 4805 • Cell 076 812 1896
abrie@booyens.net

Just chill.
We'll get it right

User3

From: Ontvangs
Sent: 27 January 2012 11:46 AM
To: User3
Subject: FW: Woodburn Boulevard Shopping Centre

Importance: High

From: Helga Barnard [<mailto:helgab@dihlase.co.za>]
Sent: 27 January 2012 11:26 AM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre
Importance: High

Good morning,

I reside in Woodhouse Road, Pietermaritzburg, adjacent to the proposed development. Please add my details to your list of affected parties and keep me informed accordingly.

Thank you,

Helga Barnard
P O Box 101081
SCOTTSVILLE
3209

Tel: 033 – 342 4658
Cell: 083 231 2298

User3

From: Ontvangs
Sent: 27 January 2012 11:06 AM
To: User3
Subject: FW: Woodburn Boulevard Shopping Centre

Follow Up Flag: Follow up
Flag Status: Flagged

From: Leonard Johannes van Eeden [<mailto:lvaneeden@oldmutualpfa.com>]
Sent: 27 January 2012 10:57 AM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre

Good day

In response to your Notice re. the Woodburn Boulevard Shopping Centre, we hereby give notice as interested and/or affected parties.

Name: LJ van Eeden
Email: lvaneeden@oldmutualpfa.co
Cell: 0827810820
Owner: Woodhouse Road 25

Regards

Len van Eeden

User3

From: Ontvangs
Sent: 23 January 2012 08:03 AM
To: George Gericke
Subject: FW: WOODBURN BOULEVARD SHOPPING CENTRE : NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

From: roy phyll [<mailto:royphyll@absamail.co.za>]
Sent: 22 January 2012 08:40 AM
To: lizelleg@mweb.co.za
Subject: WOODBURN BOULEVARD SHOPPING CENTRE : NOTICE OF ENVIRONMENTAL BASIC ASSESSMENT PROCESS

Dear Mr Gericke

A copy of your Notice with map in connection with the proposed Woodburn Boulevard Shopping Centre to be located at the intersection of Alan Paton Avenue, Woodhouse Road and New England Road in Pietermaritzburg, has just been handed to me by one of my neighbours.

I write to advise that I am an interested and affected party by virtue of the fact that I am the owner of the following properties, namely:

- * Sectional units 1, 2, 3, 4, 5, 6, 7 & 8 "Wendy Court" - 7 New England Road;
- * 5 New England Road and
- * 3 New England Road

which are in close proximity to your proposed development. I am accordingly interested in obtaining more information about your proposed development.

My name and contact details are as set out at the foot of this e-mail.

Regards
Roy Geyser

Roy Geyser

5 New England Road, Scottsville, Pietermaritzburg, 3201, KwaZulu-Natal, Republic of South Africa

Tel: 033 342 4316

Fax: 086 578 0753

Cell: 083 270 0041

e-Mail: royphyll@absamail.co.za

GPS: S. 29° 36.782 E. 030° 23.591

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User3

From: Ontvangs
Sent: 13 January 2012 03:46 PM
To: George Gericke
Subject: FW: Woodburn Boulevard Shopping Centre: Sheila Dyer
Attachments: 20120112_Sheila_Dyer_letter.docx

From: Jenny Barnard [<mailto:BarnarJB@eskom.co.za>]
Sent: 13 January 2012 03:15 PM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre: Sheila Dyer

Good Afternoon

My mother asked me to forward the attached letter – a hand-written copy of which she has already posted to you - so that you can send correspondence via e-mail should you so wish.

Thank you

Regards

JENNY BARNARD
Specialist Advisor: GIS
MSc GIS - PGP0129
1 Portland Rd, Mkondeni
033 395 3854 / 8311 3854
Fax: 086 665 8153
Cell: 084 774 3073

[I'm part of the 49Million initiative.](#)

<http://www.49Million.co.za>

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User3

From: Ontvangs
Sent: 15 November 2011 10:25 AM
To: George Gericke
Subject: FW: Woodburn Boulevard Shopping Centre,

From: Stevens, Noel [<mailto:Noel.Stevens@davislangdon.co.za>]
Sent: 15 November 2011 10:16 AM
To: lizelleq@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre,

Hi George,

Please can you send us more info on the Woodburn Boulevard Shopping Centre project

Message

Adobe PDF



Reply



Reply to All



Forward

Respond



Delete



Move to Folder



Create Rule



Other Actions

Actions



Block Sender



Safe Lists

Junk E-mail



Categorize



Follow Up

Options



Mark as Unread



Find

Find

From: Pietermaritzburg Chamber of Business [news@pcb.org.za]
 To: Stevens, Noel
 Cc:
 Subject: E-Biz Blitz - 15 November 2011

[Click here to view online or for a print](#)



NEW SHOPPING CENTRE FOR WOODBURN

A new shopping centre is proposed on the corner of Woodhouse Road and Alan Paton Drive, according to a notification for an Environmental Impact Assessment (EIA). Provisionally named the Woodburn Boulevard Shopping Centre, the proposed project will entail the development of 6 500m² retail space. The property in question measures 1.7865 hectares and is directly adjacent to the Woodburn Stadium and the Allan Wilson Bowling Club.



The locality map of the proposed Woodburn Boulevard Shopping Centre.

It is understood the developer is O & T Development and that all enquiries should be directed to the Architects and Environmental Consultants. The contact person is George Gerich at lizelleg@mweb.co.za

Comment

AMAZING RACE IN HOSPITAL CORRIDOR

In celebration of the unusual 11/11/11 date convergence, Midlands Medical Centre Private Hospital hosted its very own "Amazing Race". A representative from every department was nominated to solve riddles, sing nursery rhymes and hunt for the management team hidden throughout the hospital. It was an exciting and fun-filled event with the Pharmacy department emerging the winner.



The participants in the MMC Amazing Race.

NEW APPOINTMENT TO BOOST PDC

Pressure Die Castings has welcomed Andre Lourens (right) to the team. Lourens is responsible for the sale of PDC range of products to stockists in the Cape area. Having grown up in the retail industry, he has spent the last 12 years in the retail industry.

NEWS WORTH KNOWING

VULINDLELA HOUSING DEVELOPMENT IN THE SPOTLIGHT

Regards

Noel Stevens

Executive, Africa Region

D +27 (0) 33 345 8371 M +27 (0) 84 588 8788

noel.stevens@davislangdon.co.za

noel.stevens@aecom.com

Davis Langdon, An AECOM Company

300 Jabu Ndlovu Street, Pietermaritzburg, 3201

P.O Box 980, Pietermaritzburg, 3200

KwaZulu-Natal, South Africa

T +27 (0) 33 345 8371 F +27 (0) 33 394 9201

www.davislangdon.com

www.aecom.com

AECOM Davis Langdon SA (Pty) Ltd

Registration No. 2010/013644/07 VAT number 4370256515

Registered Address: 10 Fricker Road, Illovo Boulevard, Johannesburg, 2196

Directors: I Pillay (MD) H Ntene D Gan* R Osborne* (*USA)

Level 4 contributor to B-BBEE ISO 9001:2008 CERTIFIED

ISO 14001:2004 CERTIFIED OHSAS 18001:2007 CERTIFIED

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 Please consider the environment before printing this email

User3

From: Ontvangs
Sent: 30 January 2012 09:35 AM
To: User3
Subject: FW: woodburn boulevard shopping centre

From: JULIAN GOLDACRE [<mailto:juliang@futurenet.co.za>]
Sent: 30 January 2012 09:21 AM
To: lizelleg@mweb.co.za
Subject: woodburn boulevard shopping centre

Hi Lizelle,

Please can you note me down as a party who will be effected by the above.

My contact details are:

JULIAN GOLDACRE
27 WOODHOUSE ROAD
TEL: 033 345 8900 (H)
CELL: 083 558 4852

Thanks and regards
Julian Goldacre
GHI

Find us on Facebook: Goldacres Garden Creations

Tel: 033 345 3832

Fax: 086 695 1358

PO Box 1551, PMB, 3200

BE GREEN, READ FROM THE SCREEN.



Sheila Dyer
17 Woodhouse Road
Scottsville
Pietermaritzburg
3201

Tel 033 394 2073

E Mail - lizelleq@mweb.co.za

9th January, 2012

George Jeriche
P.O. Box 11375
MARGARETA 0161

Re Woodburn Boulevard Shopping Centre

Dear Mr. Jeriche,

Further to my conversation with you on the 9th December in connection with the registered letter sent to me about the above project, I am sending you my daughter Jenny Barnard's E-Mail address so that I can receive although her or at the above address any correspondence about Woodburn Boulevard.

Your E Mail address is

BARNARJB@eskom.co.za.

Yours faithfully

Sheila Dyer

User3

From: George Gericke
Sent: 13 January 2012 04:27 PM
To: 'BarnarJB@eskom.co.za'
Subject: RE: Woodburn Boulevard Shopping Centre: Sheila Dyer

Dear Jenny,

Thank You for updating me in connection with your contact details. You will be updated in the future.

Kind Regards

Juanita De Beer

From: Ontvangs
Sent: 13 January 2012 03:46 PM
To: George Gericke
Subject: FW: Woodburn Boulevard Shopping Centre: Sheila Dyer

From: Jenny Barnard [<mailto:BarnarJB@eskom.co.za>]
Sent: 13 January 2012 03:15 PM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre: Sheila Dyer

Good Afternoon

My mother asked me to forward the attached letter – a hand-written copy of which she has already posted to you – so that you can send correspondence via e-mail should you so wish.

Thank you

Regards

JENNY BARNARD
Specialist Advisor: GIS
MSc GIS - PGP0129
1 Portland Rd, Mkondeni
033 395 3854 / 8311 3854
Fax: 086 665 8153
Cell: 084 774 3073

[I'm part of the 49Million initiative.](#)

<http://www.49Million.co.za>

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From: User3
Sent: 27 January 2012 02:39 PM
To: 'helgab@dihlase.co.za'
Subject: RE: Woodburn Boulevard Shopping Centre
Dear Helga Barnard,

Thank you for the previous email in connection of the Woodburn Boulevard Mall project.

You are now registered as an Interested and Affected Party.

We will keep you updated in the process.

Have a wonderful day!

Kind Regards

Juanita De beer



From: Helga Barnard [mailto:helgab@dihlase.co.za]
Sent: 27 January 2012 11:26 AM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre
Importance: High

Good morning,

I reside in Woodhouse Road, Pietermaritzburg, adjacent to the proposed development. Please add my details to your list of affected parties and keep me informed accordingly.

Thank you,

Helga Barnard
P O Box 101081
SCOTTSVILLE
3209

User3

From: User3
Sent: 27 January 2012 02:34 PM
To: 'lvaneeden@oldmutualpfa.com'
Subject: RE: Woodburn Boulevard Shopping Centre

Dear Len van Eeden,

Thank you for the previous email in connection of the Woodburn Boulevard Mall.

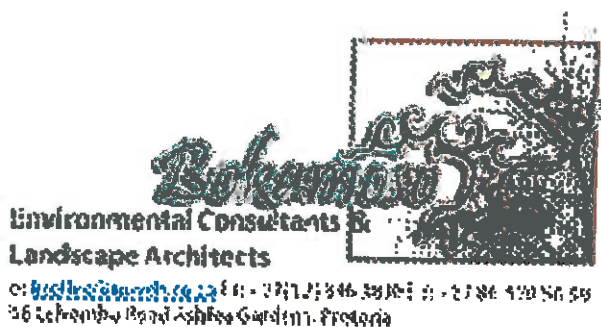
You are now registered as an Interested and Affected Party.

We will keep you updated in the process.

Have a wonderful day!

Kind Regards

Juanita De beer



From: Leonard Johannes van Eeden [<mailto:lvaneeden@oldmutualpfa.com>]
Sent: 27 January 2012 10:57 AM
To: lizelleg@mweb.co.za
Subject: Woodburn Boulevard Shopping Centre

Good day

In response to your Notice re. the Woodburn Boulevard Shopping Centre, we hereby give notice as interested and/or affected parties.

Name: LJ van Eeden
Email: lvaneeden@oldmutualpfa.co
Cell: 0827810820

Owner: Woodhouse Road 25

Regards

Len van Eeden

User3

From: Lizelle Gregory <lizelleg@mweb.co.za>
Sent: 30 January 2012 11:42 AM
To: 'juliang@futurenet.co.za'
Subject: RE: woodburn boulevard shopping centre

Dear Julian Goldacre,

Thank you for the previous email in connection of the K56 project.

You are now registered as an Interested and Affected Party.

We will keep you updated in the process.

Have a wonderful day!

Kind Regards

Juanita De beer



From: JULIAN GOLDACRE [<mailto:juliang@futurenet.co.za>]
Sent: 30 January 2012 09:21 AM
To: lizelleg@mweb.co.za
Subject: woodburn boulevard shopping centre

Hi Lizelle,

Please can you note me down as a party who will be effected by the above.

My contact details are:

JULIAN GOLDACRE
27 WOODHOUSE ROAD
TEL: 033 345 8900 (H)
CELL: 083 558 4852

Thanks and regards
Julian Goldacre

GHI

Find us on Facebook: Goldacres Garden Creations

Tel: 033 345 3832

Fax: 086 695 1358

PO Box 1551, PMB, 3200

BE GREEN, READ FROM THE SCREEN.

User3

From: Lizelle Gregory <lizelleg@mweb.co.za>
Sent: 14 February 2012 09:01 AM
To: 'sashenc@spanafrica.co.za'
Subject: Registered

Dear Sashen Chetty,

Thank you for the previous email in connection of the Woodburn Boulevard Mall.

You are now registered as an Interested and Affected Party.

We will keep you updated in the process.

Have a wonderful day!

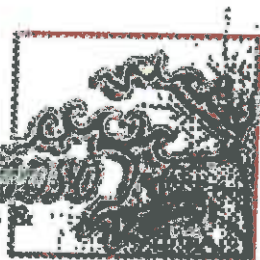
Kind Regards

Juanita De beer

Environmental Consultants &

Landscape Architects

lizelleg@mweb.co.za | T: +27(12) 346 3805 | F: +27(12) 420 56 59
56 Lechamba Road (Ashlea Garden), Pretoria



User3

From: Lizelle Gregory <lizelleg@mweb.co.za>
Sent: 22 November 2011 01:30 PM
To: 'noel.stevens@davislangdon.co.za'; 'noel.stevens@aecom.com';
'gushul@somta.co.za'; 'nqobile@pmfever.co.za'
Subject: Woodburn Boulevard Shopping Centre - I&APs
Attachments: Public Notice BA.pdf

To whom it may concern

Thank you for your correspondence regarding the proposed **Woodburn Boulevard Shopping Centre** project. Please note that you were registered as an Interested and/or Affected Party (I&APs) for the proposed project, and that we will inform you of any public meetings or draft reports that will be made available to all I&APs as soon as possible. **Also refer to the attached public notice for more information on the project.**

Please don't hesitate to contact our offices for any additional queries in this regard.

Kind regards,

George Gericke



User3


From: Lizelle Gregory <lizelleg@mweb.co.za>
Sent: 14 November 2011 07:23 AM
To: 'atwaru@vodamail.co.za'; 'mm@umdm.gov.za'; 'lmathenjwa@kzn.sahra.org.za';
'badenhorstt@dwa.gov.za'; 'masefieldd@dwa.gov.za'; 'reddyj@dwa.gov.za';
'MkhizeV@dwa.gov.za'; 'gabothe@geoscience.org.za';
'pdlamini@geoscience.org.za'; 'schmidk@nra.co.za'; 'hemsonc@gmail.com';
'margaret@burgerip.co.za'; 'cborresen@iburst.co.za'; 'pcb@pcb.org.za'
Subject: Woodburn Boulevard Shopping Centre - Public Notice
Attachments: Public Notice BA.pdf

To whom it may concern

Please refer to the attached public notice for the proposed **Woodburn Boulevard Shopping Centre** project.

Please don't hesitate to contact our offices for any additional information or queries.

Kind regards
George Gericke


Environmental Consultants &
Landscape Architects
c: lizelleg@mweb.co.za t: +2711 253 46 39 f: +2786 490 54 59
36 Lebonhe Road Ashlea Gardens, Pretoria

Nr	Registered Parties	Contact details	Address
1	Noel Stevens	noel.stevens@davislangdon.co.za noel.stevens@aecom.com 033 345 8371 084 588 8788	
2	Simon Gushu	gushul@somta.co.za	
3	Ngobile Mtolo Maritzburg Fever Reporter	ngobile@pmfever.co.za 033 355 1170 072 629 7287	
4	Sandy Hemingway	sandals@webmail.co.za 083 231 0738	
5	Jenny Barnard	BamarJB@eskom.co.za 033 395 3854 Fax: 086 665 8153 Cell : 084 774 3073	1 Portland Rd Mkondeni
6	Abrie Bouwer	abrie@boysens.net Cell: 076 812 1806 Tel: 033 342 4909 Fax: 033 342 4905	80 Roberts Road Clarendon Pietermaritzburg PO Box 2370 Pietermaritzburg 3200
7	Larry and Lynn Hicks	hicks marglynn@gmail.com	23 Woodhouse Road Scottsville
8	Jenny Barnard	barnarjb@eskom.co.za BARNARJB@eskom.co.za Tell: 033 394 2073	Sheila Dyer 17 Woodhouse Road Scottsville Pietermaritzburg 3201
9	Sheila Dyer Jenny Barnard (Daughter)	bamarjb@eskom.co.za Tel: 033 294 2073 Tel: 033 395 3854 Cell: 084 774 3073	17 Woodhouse Road Scottsville Pietermaritzburg, 3201
10	N.A. Mcdonald	lynnmac@futurenet.co.za Tel: 033 342 8454 Cell: 082 677 0234	8 New England Road Scottsville Pietermaritzburg, 3201

Appendix E2:

Comments and Inputs received from Authorities

Lizelle Gregory

From: Ryk Joubert <ryk@brava.co.za>
Sent: 09 May 2012 11:09 AM
To: 'Lizelle Gregory'
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346
Attachments: Draft Infrastructure report.pdf

Hi Lizelle

Kyk asb na hierdie verslaggie van my en laat weet of dit meeste van die vrae beantwoord

Groete

Ryk

From: Lizelle Gregory [<mailto:lizelleg@mweb.co.za>]
Sent: 08 May 2012 10:46 AM
To: 'Ryk Joubert'
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346

Ryk,

Dankie – dit lyk reg.

Ek het ook bevestiging nodig dat die stormwaterafdeling van die Stadsraad dat hulle die stormwaterbestuurs-konsep ondersteun en dat hulle bevestig dat hulle die ontwikkeling se afval kan ontvang. (Die "Waste Afdeling").

Groete,

Lizelle

Elsa Viviers
Namens/on behalf of
Lizelle Gregory

Bokamoso

Environmental Consultants &
Landscape Architects

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1111 1111 1111 1111 1111 1111 1111 1111 1111 1111



From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 25 April 2012 12:52 PM
To: 'Lizelle Gregory'
Subject: FW: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hallo Lizelle

Sal die onderstaande response van die stadsraad voldoende wees indien ek daarna verwys in my services report?

Groete

Ryk

From: Dhamendra Ragoonandan [<mailto:Dhamendra.Ragoonandan@msunduzi.gov.za>]
Sent: 25 April 2012 12:16 PM
To: Ryk Joubert
Cc: Rodney Colling; Brenden Sivparsad
Subject: RE: Woodburn Shopping Centre - Portion 5 of Erf 4346

This email and all contents are subject to the following disclaimer:
http://www.msunduzi.gov.za/Email_Disclaimer.pdf or send a blank e-mail to disclaimer@msunduzi.gov.za to have the document e-mailed to you.

Hello Ryk

As per our telephonic conversation on the 20/04/2012.

As long as the water and sewerage demand remains the same as the previous application the city can sustain the water and sanitation demand.

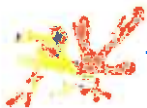
As per your request this is purely for EIA purposes.

Any other requirements from this business unit shall be addressed in the service level agreement.

PS Rodney please take note of this.



DHAMENDRA RAGOONANDAN
MANAGER PLANNING & DESIGN (ACTING)
WATER & SANITATION
TEL : 033 3922115
FAX : 033 3922588
CELL : 083 2950970
email : dhamendra.ragoonandan@msunduzi.gov.za



...www.msunduzi.gov.za...

From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 25 April 2012 08:48 AM
To: Dhamendra Ragoonandan
Subject: FW: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hi Dees

Any chance that you can still get around to this request of mine before the end of the week?

Regards

Ryk

From: Ryk Joubert [<mailto:ryk@brava.co.za>]
Sent: 20 April 2012 11:54 AM
To: 'dhamendra.ragoonandan@msunduzi.gov.za'
Subject: Woodburn Shopping Centre - Portion 5 of Erf 4346

Hi Dees

As per our telephone discussion this morning herewith the information I need for a new EIA being prepared for the Woodburn Shopping centre

Tony Statakis is still working on the shopping centre development at Woodburn & has commissioned a new EIA as the present one has expired. In order to finalise this report I need to update my services report. The scope of the development hasn't changed and he is still looking at a 6500m².

All that I need is confirmation from the city that:

- o That city will/can provide a sewer connection to the site (should not be a problem as a main outfall sewer already crosses the site)
- o The city will/can provide a water connection to the site (should also not be a problem as there is water in close proximity to the site and being a commercial development the water demand is fairly low)
- o The city can provide solid waste removal services to the development – I don't know if you can help with this but maybe you can point me towards the right person.

I have already spoken to the roads & stormwater branch & have the city's requirements from Hoessein Essop which I will work into my report.

I already have confirmation of the above, but the EIA process requires confirmation to these facts that isn't older than 6 mths, so hence my request for updated confirmation.

The electrical engineer is dealing with the electrical supply.

Regards

Ryk

Ryk Joubert PrEng

Brava Engineers (Pty) Ltd.
57 Braid Street, Pietermaritzburg 3201, South Africa
PO Box 681, Pietermaritzburg, 3200, South Africa
Tel: +27 33 345 0502 Fax: +27 33 342 7513
Cel: +27 82 552 1743 email: ryk@brava.co.za

**SUSTAINABLE DEVELOPMENT & CITY
ENTERPRISES DEPARTMENT**

Environmental Management Unit

P O Box 31
Pietermaritzburg
3200

**MSUNDUZI
MUNICIPALITY**



Enq:Ms S.Farnsworth

Tel:033-392 3243

Fax:0862190368

Email:shannon.farnsworth@msunduzi.gov.za

Date: 15th August 2012

BOKAMOSO ENVIRONMENTAL CONSULTANTS & LANDSCAPE ARCHITECTS

PO Box 11375
Maroelana
0161

Attention: Ms Lizelle Gregory

Dear Lizelle,

**RE: DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED WOODBURN
BOULEVARD SHOPPING CENTRE ON THE CORNER OF WOODHOUSE ROAD AND ALAN
PATON DRIVE (ON PORTION 5 OF ERF 4346, PIETERMARITZBURG**

With reference to the above Draft BAR dated July 2012 the following comments are submitted for your information and consideration:

1. Page 12 makes reference to 'the service agreement between the local authority and the developer will be finalized as soon as the EIA authorization is issued'. Written confirmation from all relevant departments within the Msunduzi Municipality (i.e. Water and Sanitation, Electricity) is needed as part of the BAR and environmental authorization process in order to confirm that each department has the capacity to service the proposed development.
2. The proposed development site is zoned 'special residential' and falls under special area 30 which lists business premises, restaurants and shops as permissible development or uses of land for that area. Therefore activity 24 under listing notice one (R. 544, 18 June 2010) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) will not be triggered as the proposed site is not zoned open space.

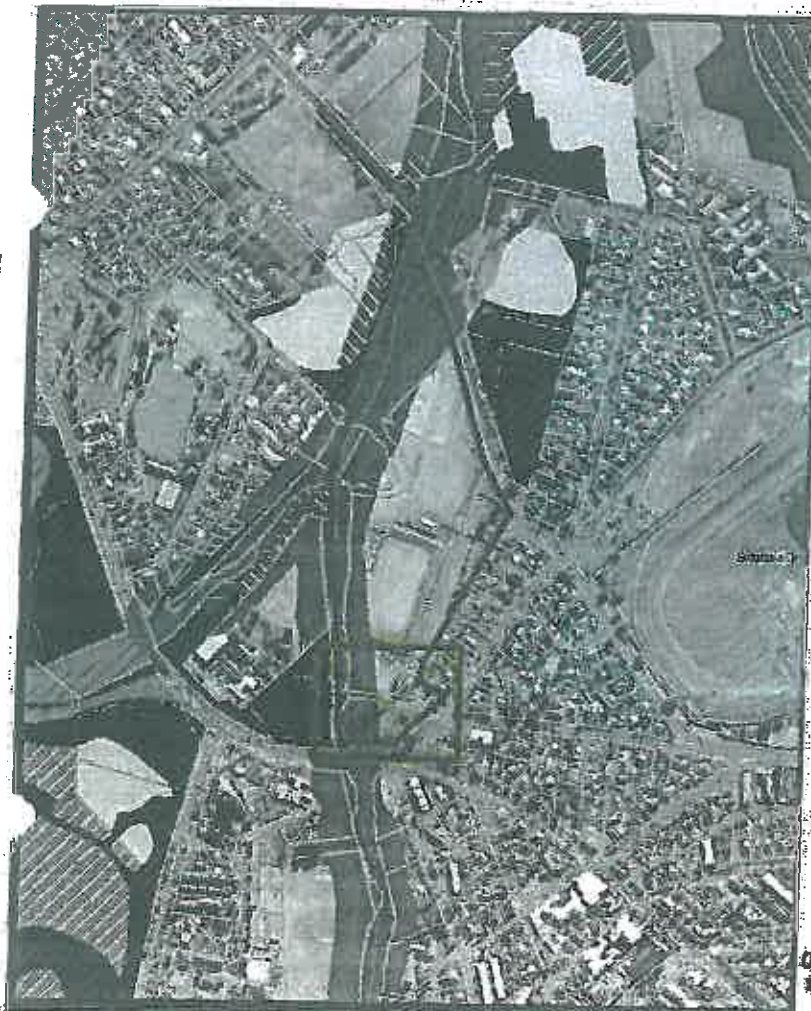
3. Page 25 mentions that 'the National Water Act also required that (where applicable) the 1:50 and 1:100 year flood line be indicated on all the development drawings (even the development drawings for the external services) that are being submitted for approval'. However the ground floor plan (drawing no. 2502-100) does not indicate these flood lines.
4. Page 34 mentions 'the area adjacent to the river however has high ecological potential and should be rehabilitated as part of the development project'. Is the developer [O & T Development (Pty) Ltd] willing to consider this as an offset option? If so a rehabilitation program should be implemented in consultation with this unit.
5. Page 42 makes reference to a 'plan to erect a conservation fence on the conservation line' however there is no indication of the conservation line location; this line should be indicated on all development drawings and fenced off prior to any construction taking place.
6. Page 43 mentions 'the wetland area which is situated to the south and west of the site'; wetland zones need to be clearly shown on the development plans. Further more on page 45 it states that 'where possible avoid any work within 1m from the wetland buffer'; the extent of the wetland buffer needs to be specified and included on all development drawings. A site visit was conducted on the 10th of August 2012 and no wetland areas were identified on site, hence further clarity on the above is needed.
7. This unit requires a copy of the follow up geotechnical survey that is to be done during the rainy season in order to identify perched water conditions (page 48).
8. Correction on page 50, Matlosana Local Municipality must be changed to Msunduzi Local Municipality.
9. Page 53 makes reference to the planting of embankments with grass to stop any excessive soil erosion and scouring of the landscape. A list of indigenous grass species that will be used is to be submitted to this unit for approval prior to planting taking place.
10. With regards to the landscape plan, page 49 under point 12 mentions 'in cases where exotic species are to be used, such species must be non-invasive' however page 55 under point 6 says 'no plants not indigenous to the area should be introduced in the communal landscaping of the proposed site', this unit encourages the design of landscape plans to be fully complied of indigenous species. The landscape site development plan (H L 0005 Site Plan) done by Habitat Landscape Architects dated 04 August 2010 seems to show the incorrect location of the cell phone tower towards the east of the site when in fact this tower is situated to the south of the site. The plan makes use of *Acacia xanthophloea* in the car park, this is not recommended as these trees drop thorny branches, provide little shade and the root systems will lift paving. The landscape plan also only includes 7 plant species within a repeated design, more variety and colour should be encouraged. This unit requests that future landscape plans be done in consultation with this unit and a copy of the draft landscape plan is to be submitted to this unit for comment and approval prior to commencement.
11. Page 59 makes reference to 'a rehabilitation plan for the construction phase'. This plan must be submitted to this unit prior to construction works commencing.
12. If during construction any new evidence of archaeological sites or artifacts are found, operations must be stopped and the relative competent authority, Amafa aKwaZulu-Natali, must be contacted immediately as opposed to SAHRA.
13. The section 21 Water Use Licenses application (page 71) must be submitted to this unit.
14. This development is required to be flood neutral and hence a stormwater management plan must be undertaken and submitted to the Msunduzi Municipality for approval prior to construction

commencing. Page 3 under section 3.1.3 Stormwater Management, it mentions that 'it is necessary to attenuate runoff by constructing a detention facility above the 1:50 year flood line'. This should be depicted on development drawings as well as forming part of the stormwater management plan.

15. Page 14 of the EMP mentions that 'fires shall only be permitted in specifically designed areas and under controlled circumstances', what materials are intended to be burned on site? The burning of waste material, rubbish and garden refuse on site is prohibited.
16. The appointed ECO must register with this unit, providing contact details and audit reports, site visits should be conducted at least every 10 working days.
17. The appointed ECO is to provide basic environmental awareness training to all staff working on site prior to the commencement of any construction activities.
18. Construction staffs are to make use of facilities provided for them, as opposed to alternatives. Using surrounding areas as a toilet facility is strongly prohibited. .
19. Chemical toilets should be placed outside 32m from any watercourse i.e. the Foxhillspruit. A registered chemical waste company is to be used to remove waste from the chemical toilets on site. Documentation for this must be kept by the contractor for review purposes by the ECO if needed.
20. Construction staff shall not be permitted to use any watercourse adjacent to the site for the purpose of bathing or washing of clothing.
21. The contractor shall not in any way modify or damage the banks of the adjacent watercourse, unless required as part of the dissipation structures at the stormwater outlet points.
22. All concrete mixing is to take place on mixing boards to prevent contamination of groundwater.
23. All equipment must be checked regularly for oil and fuel leaks before being operated.
24. Contaminated wastewater must be managed by the site manager to ensure existing water resources in the vicinity of the site are not contaminated.
25. The following measures must be included as part of the management of the site during the operational phase:
 - : monitoring stormwater exit points
 - : fill in and re-vegetate eroded areas
 - : regularly maintain stormwater structures to maintain efficiency.
26. All building plans must be submitted to and approved by the Msunduzi Municipality for approval prior to construction commencing.



For: MANAGER: ENVIRONMENTAL MANAGEMENT
draft BAR for woodburn shopping centre (DC22/0059/2011)



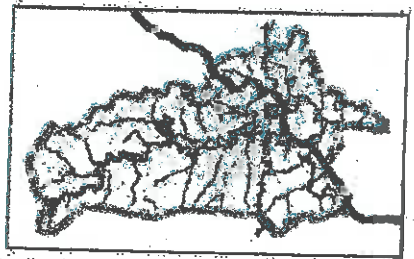
ESP: Woodburn Site Vicinity

Legend

- Public Open Space - Transformed
- Draft MOSS (MOSS symbology)
- MOSS Class:**
- Protected Areas
- Key Areas
- Transport Corridors
- Riparian Corridor
- Public Open Space - Untransformed
- Riparian Areas and Recreation Corridors
- Protected Areas - Riparian Corridors and Public Open Space
- Protected Areas and Public Open Space (Untransformed)
- Key Areas and Transport Corridors
- Key Areas and Riparian Corridors
- Key Areas, Riparian Corridors and Public Open Space (Untransformed)
- Key Areas and Public Open Space (Untransformed)
- Transport Corridors and Public Open Space (Untransformed)
- Riparian Corridors and Public Open Space (Untransformed)
- Proposed Site



0 45 90 180
Meters





MSUNDUZI MUNICIPALITY

-Local

Umgungundlovu District

SELECTION REPORT 2010/11/08 08:25:04 AM



Prepared for the DEA, DAEARD and Msunduzi Municipality by:

SRK Consulting Contact: (033) 345 6311

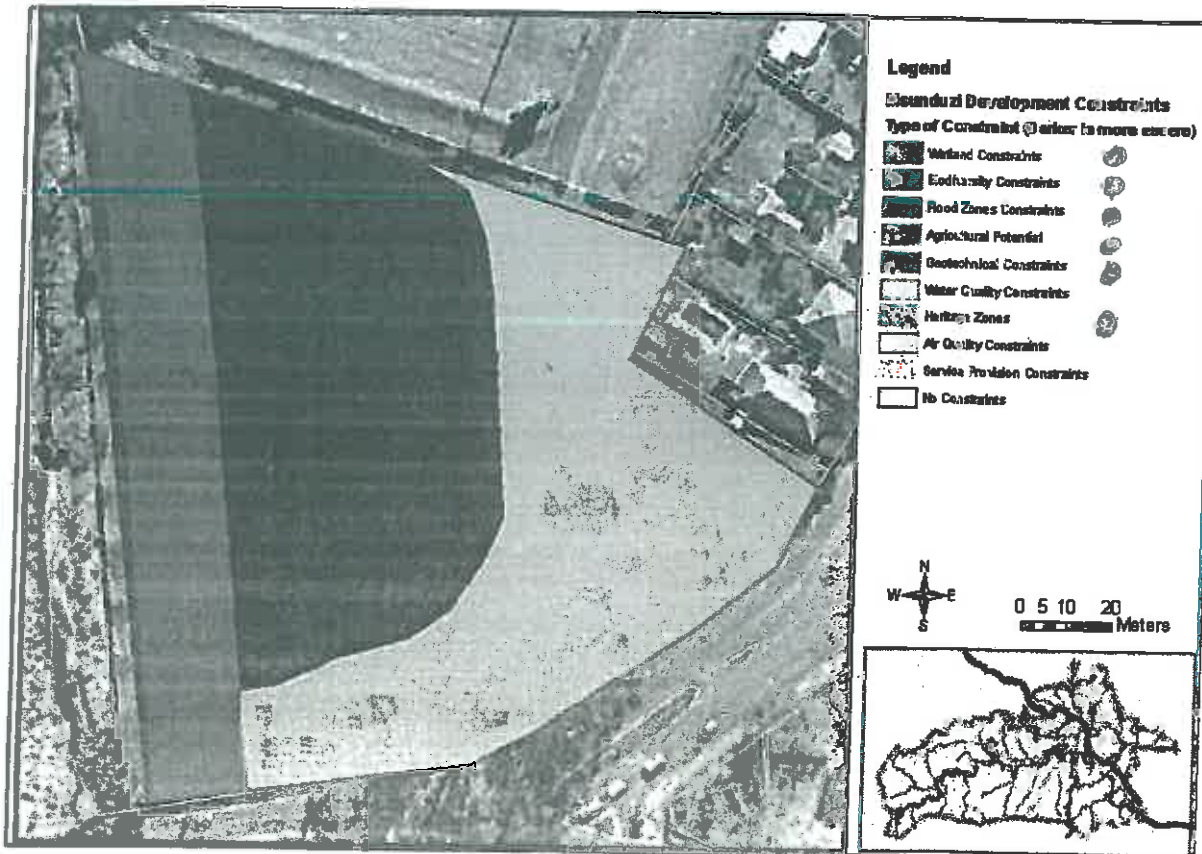
Project Partner: Mr. M.J. Mosis (Pr.Eng.)

Environmental Scientist: Ms. P. Emanuel (Pr.Sol.Nat.)

GIS Operator: Mr. K.Alan

PLEASE NOTE: LAYOUT MUST BE SET TO LANDSCAPE, BEFORE PRINTING THIS DOCUMENT

DISCLAIMER: Use of this report are entirely at the user's own risk. The user assumes full responsibility for the risk or loss resulting from the use and the user's reliance on information contained within this report. In no event will SRK or any third party be liable for any damages, whether direct, indirect, special, incidental, or consequential whatsoever relating to the user's use or the information contained on this report or the user's inability to use this report, whether such damages arose out of contract, or delict or otherwise and regardless of whether SRK or any third party was expressly advised of the possibility of such loss or damage. Images used for the constraints reporting have been sourced from <http://images.google.co.za>.



Conservation Significance



Conservation Significance: High Wetland Development Constraint

Wetland areas are prized for the ecosystem goods and services that they provide in the form of water management and biodiversity conservation. Wetlands are deemed to be no-go areas in terms of development on site. Further specialist investigations including wetland delineation and functionality assessments should be undertaken to inform any proposed development application process on or within a reasonable distance of any wetland area.

No land use that will result in the transformation of wetlands is recommended. Wetlands should be retained for the ecosystem goods and services they supply, therefore only rehabilitation and conservation activities are proposed within this zone. There should be no net loss of wetland area or functionality as a result of any proposed development. In cases where wetland impacts cannot altogether be avoided or acceptably mitigated on-site, consideration must be given to establishing off-site wetland offsets that would result in positive impacts for wetland management in the region.

Should it be impossible to avoid the transformation of wetland habitat a suitable off-set area should be identified and conditions pertaining to the rehabilitation of the off-set area included as a condition of any development authorization.



Conservation Significance: High Biodiversity Constraint

Areas of high biodiversity are important for their intrinsic value and the ecosystem goods and services that they provide. These areas were identified by the Msunduzi C-Plan as being necessary to ensuring the persistence of biodiversity in Msunduzi. These areas have very high development constraint and care should be taken to ensure that large scale transformation does not occur and that the ecological functioning of these sites is not lost.

Any development proposed within this zone should be subject to a pre-feasibility assessment which must include all necessary specialist biodiversity investigations and the consideration of alternatives. If the site is confirmed to be highly sensitive and the proposed activity is expected to result in the potential net loss of critical biodiversity elements, then the development should be considered fatally flawed from a biodiversity perspective and should not proceed.

Land use that would result in transformation or the net loss of critical biodiversity elements should not be undertaken in this zone.

Land use that is compatible with biodiversity management objectives and that would result in a net increase in biodiversity should be supported. This may be achieved through mitigation measures such as the consideration of alternatives; the reduction of land use density; the commitment to rehabilitation of any degraded areas; and, local indigenous landscaping. In cases where biodiversity impacts cannot altogether be avoided or acceptably mitigated on-site, consideration must be given to establishing suitable off-site biodiversity offsets that would result in positive impacts for biodiversity in the region.

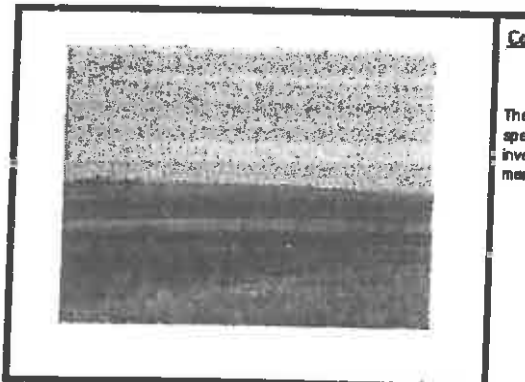


Conservation Significance: High Flood Potential

Any site proposed for development within a possible flood zone is a danger of being affected by a river in flood and may place people and structures in danger on-site, upstream or downstream of the site. Development within flood prone areas may also negatively impact the ecology and hydrology. If development is proposed within a flood zone a detailed flood risk assessment should be conducted in order to establish the location of the 1:10, 1:50 and 1:100 flood lines for the site prior to the development of any infrastructure.

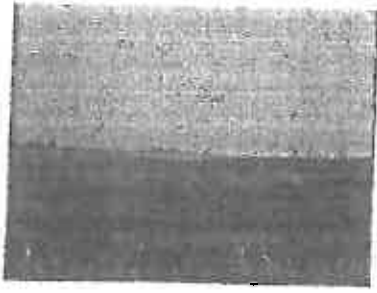
Should development be proposed within a prohibited floodline, precautions must be made to ensure the protection of the infrastructure as well as any people or structures within the flood zone. The protection of infrastructure and people from on- and off-site flood risk of the site. Flood zones are areas and catchment basins that help in flood management and the development of a proposed site within a prohibited flood zone, care must be taken to ensure that the flooding of the flood zone area is not compromised. A hydrological and ecological assessment of the potential impact of large scale infrastructure proposed within the flood zone area should be undertaken.


Land use that is compatible with flood risk management objectives and that would result in a net increase in flood risk management should be supported in the flood zone. More appropriate land use for the zone would include areas that require low infrastructure or that would not be directly affected by the flooding of the floodplain system such as sports fields and parks. The activities normally associated with these types of land use should ensure the flood risk is not increased to ensure that they do not result in the pollution of the ecosystem.





Conservation Significance: Good Agricultural Potential

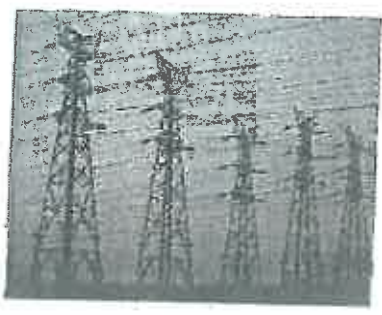
These areas may have agricultural value, however this can only be determined through more detailed site specific slope and soil analysis. These areas could possibly have high agricultural potential and further investigation of these sites is recommended. If the site is deemed to have high agricultural potential then the management priorities and land use guidelines for the High agricultural potential constraint should be applied.

	<p><u>Conservation Significance: Gentle Slopes (0 - 10 degrees)</u></p> <p>Gentle slopes (0-10 degrees) do not constrain development, however geotechnical studies should be undertaken to ensure that the site can accommodate the proposed development. Land use in these areas is not constrained by slope.</p>
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	<p><u>Conservation Significance: High Water Quality Constraints</u></p> <p>Water quality within this catchment area has been seriously modified. In order for these catchments to be rehabilitated as per municipal requirements, catchment management interventions are required prior to any further development of the catchment. Development (future and present) within water quality constrained catchments should demonstrate how they intend to improve water quality within the catchment. Mechanisms proposed may include improved drainage; tracking and monitoring of legal and illegal discharge; management of agricultural activities; wetland and riverine rehabilitation and management; the improvement of waste services; and, the use of advanced effluent management and treatment systems in the catchment.</p> <p>Land use in these catchments is severely constrained and only land use that would result in positive impacts to water quality should be undertaken. Monitoring of industrial and sewerage discharges and illegal activities will be critical in this zone. Activities such as recreation which make use of these river systems is also constrained as use of these rivers may result in impacts to human health.</p>
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	<p><u>Conservation Significance: High Air Quality constraints</u></p> <p>This area is located below the inversion layer in the Municipality and is therefore most sensitive to air pollution emissions. The area has the highest ambient pollutant concentrations. Prior to any development commencing in this zone that will result in air pollutant emissions it is recommended that a Tier 3 Air Quality Assessment be undertaken. It is recommended that existing emitting industry within this zone be encouraged to invest in cleaner production technology in order to reduce emissions. Development that will result in unacceptable air pollutant emissions is not recommended for this area. Development such as schools or social facilities, sensitive to poor air quality is also not recommended for this area, especially in close proximity to air pollution emission sources, if possible.</p>
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	<p><u>Conservation Significance: Low Cultural Heritage Significance</u></p> <p>No cultural heritage resources have been identified in these areas. It is however acknowledged that the data set used to identify sites and zones of cultural significance is incomplete and focused mainly European cultural heritage sites. Cultural heritage assessments must be undertaken in accordance with the requirements of the KZN Heritage Resources Act. Amata eKwaZulu-Natali should be consulted prior to any transformation of buildings older than 60 years. If any potential heritage objects are identified during any earthmoving activities, all development activities should immediately cease, and may only proceed with the approval of Amata eKwaZulu-Natali.</p> <p>Land use should not negatively impact on the cultural or historic importance of any area or any specific cultural heritage resources identified.</p>
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Conservation Significance: Very High Service Provider

This zone has all of the service required for the sustainability of developments. New developments may however exceed the current capacity of the zone and investigations into the capacity and possible upgrading of the services within this zone may be needed. Land use is therefore not limited by the existence of basic services but rather by their capacity. Service capacity, particularly of existing infrastructure, should be considered prior to the approval of any development that would result in increased population density. Opportunities for alternative service options such as biodigesters and renewable energy (solar, wind, cogeneration) should be considered in this zone.

Attribute Information

LAYER: Intersect Result. 10 features selected.

FID	Name	Pred Sens	Sensi Code	Wetlands	B iversity	Flood Zone	Agric Pot	Geotech	Water Qual	Air Qual	Heritage	Serv Del
0	Flood Zones		73204	Identified Wetland Buffer Area	No Biodiversity Constraint	Within Flood Zone	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
1	Water Quality		42205	Identified Wetland Buffer Area	No Biodiversity Constraint	None	Investigation into Agricultural Potential Required	0 - 0.5 degrees (Extremely Flat)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
2	Water Quality		42106	No Wetland Area Identified	No Biodiversity Constraint	None	Investigation into Agricultural Potential Required	0 - 0.5 degrees (Extremely Flat)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
3	Wetlands		93105	Identified Wetland Area	No Biodiversity Constraint	None	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
4	Water Quality		42205	Identified Wetland Buffer Area	No Biodiversity Constraint	None	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
5	Water Quality		42106	No Wetland Area Identified	No Biodiversity Constraint	None	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
6	Flood Zones		73105	No Wetland Area Identified	No Biodiversity Constraint	Within Flood Zone	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
7	Wetlands		95103	Identified Wetland Area	High Biodiversity Constraint	Within Flood Zone	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
8	Flood Zones		73204	Identified Wetland Buffer Area	No Biodiversity Constraint	Within Flood Zone	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels
9	Wetlands		94104	Identified Wetland Area	No Biodiversity Constraint	Within Flood Zone	Investigation into Agricultural Potential Required	0.5 - 6 degrees (Moderate Slope)	Catchment Management Intervention Required	High Air Quality Contraints	Base	Very High Service Levels

Appendix E3:

Issues and Response Report

**APPENDIX E3: COMMENT AND RESPONSE REPORT-
DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED WOODBURN
BOULEVARD SHOPPING CENTRE ON CORNER OF WOODHOUSE ROAD AND
ALAN PATON DRIVE (ON PORTION 5 OF ERF 4346, PIETERMARITZBURG)**

Issue	Commentator	Date	Response
<p>1. Page 12 makes reference to 'the service agreement between the local authority and the developer will be finalized as soon as the EIA authorization is issued'. Written confirmation from all relevant departments within the Msunduzi Municipality (i.e. Water and Sanitation, Electricity) is needed as part of the BAR and environmental authorization process in order to confirm that each department has the capacity to service the proposed development.</p>	<p>S. Farnsworth</p>	<p>15 August 2012</p>	<p>According to the appointed engineer Mr. Ryk Joubert of Brava Engineers, all the necessary services will be available for purpose of the proposed development. According to the involved local authority, they are in favor of the proposed development and the EIA Authorization is the only outstanding aspect. Note: The Draft BAR was circulated to the relevant services divisions of the local authority and Bokamoso received positive comments from the water and sanitation division. Refer to Appendix Eii</p>
<p>2. The proposed development site is zoned 'special residential' and falls under special area 30 which lists business premises, restaurants and shops as permissible development or uses of land for that area. Therefore activity 24 under listing notice one (R. 544, 18 June 2010) of the National Environmental Management Act (NEMA), 1998 (Act No. 107 1998) will not be triggered as the proposed site is not zoned open space.</p>			<p>This is correct; Bokamoso just wanted to confirm the zoning and decided to rather include that activity as part of the application process because it would have been difficult to include the activity after the process has been completed. Note: This activity has been removed from the final list of activities applied for in the Final BAR.</p>
<p>3. Page 25 mentions that 'the National Water Act also required that (where applicable) the 1:50 and 1:100 year flood line be indicated on all the development drawings (even the development drawings for the external services) that are being submitted for approval'.</p>			<p>A figure, which indicates the flood lines, is included as Appendix Di (Jeffares and Green Report) of the FBAR.</p>

<p>However the ground floor plan (drawing no. 2502-100) does not indicate these flood lines.</p>			
<p>4. Page 34 mentions "the area adjacent to the river however has high ecological potential and should be rehabilitated as part of the development project". Is the developer [O&T Development (Pty) Ltd] willing to consider this as an offset option? If so a rehabilitation program should be implemented in consultation with this unit.</p>			<p>The developer is willing to accept it as an offset option. In fact the developer would like for the development to open –up towards the watercourse. This will improve the security in the area and if rehabilitated this current constraint can be converted into an asset. The unit will be contacted for more inputs if the project is authorized by the delegated authority. During the meeting at the local authority in March 2013, it was requested that Bokamoso confirm that there is no wetland present on the study area. The appointed specialists did confirm that there is no wetland on or adjacent to the study area. Refer to Appendix Dii of the FBAR</p>
<p>5. Page 42 makes reference to a 'plan to erect a conservation fence on the conservation line' however there is no indication of the conservation line location; this line should be indicated on all development drawings and fenced off prior to any construction taking place.</p>			<p>The exact position for the temporary construction conservation fence will be determined on site by the main contractor and the appointed ECO prior to the commencement of construction.</p>
<p>6. Page 43 mentions 'the wetland area which is situated to the south and west of the site'; wetland zones need to be clearly shown on the development plans. Furthermore on page 45 it states that 'where possible avoid any work within 1m from the wetland buffer'; the extent of the wetland buffer needs to be specified and included on all development drawings. A site visit was conducted on the 10th August 2012 and no wetland areas were identified on site, hence further clarity on the</p>			<p>Note: It has been confirmed that there are no wetlands on or adjacent to the study area. This information has been removed from the FBAR. Refer to Appendix Dii for wetland survey.</p>

<p>above is needed.</p> <p>7. This unit requires a copy of the following geotechnical survey that is to be done during the rainy season in order to identify perched water conditions (page 48).</p> <p>8. Correction on page 50, Matlosana Local Municipality must be changed to Msunduzi Local Municipality.</p> <p>9. Page 53 makes reference to the planting of embankments with grass to stop any excessive soil erosion and scouring of the landscape. A list of indigenous grass species that will be used to be submitted to this unit for approval prior to planting taking place.</p> <p>10. With regards to the landscaping plan, page 49 under point 12 mentions 'in cases where exotic species are to be used, such species must be non-invasive' however page 55 under point 6 says 'no plants not indigenous to the area should be introduced in the communal landscaping of the proposed site', this unit encourages the design of landscape plans to be fully complied of the indigenous species. The landscape site development plan (H L 0005 Site Plan) done by Habitat Landscape Architects dated 4 August 2010 seems to show the incorrect location on the cell phone tower towards the east of the site when in fact this tower is situated to the south of the site. The plan makes use of the <i>Acacia xanthophloea</i> in the car park, this is not recommended as these trees drop thorny branches, provide little shade and the root systems will lift paving. The landscape plan also only includes 7 plant species within a repeated design, more variety and colour should be encouraged. This unit requests that future landscape plans be done in consultation with this unit and a copy of the</p>			<p>Request noted. This requirement is incorporated into the EMP. Refer to Appendix F.</p> <p>Correction made.</p> <p>Requirement included as part of the EMP. Refer to Appendix F</p> <p>Requirement noted and incorporated as part of the EMP. Refer to Appendix F.</p>
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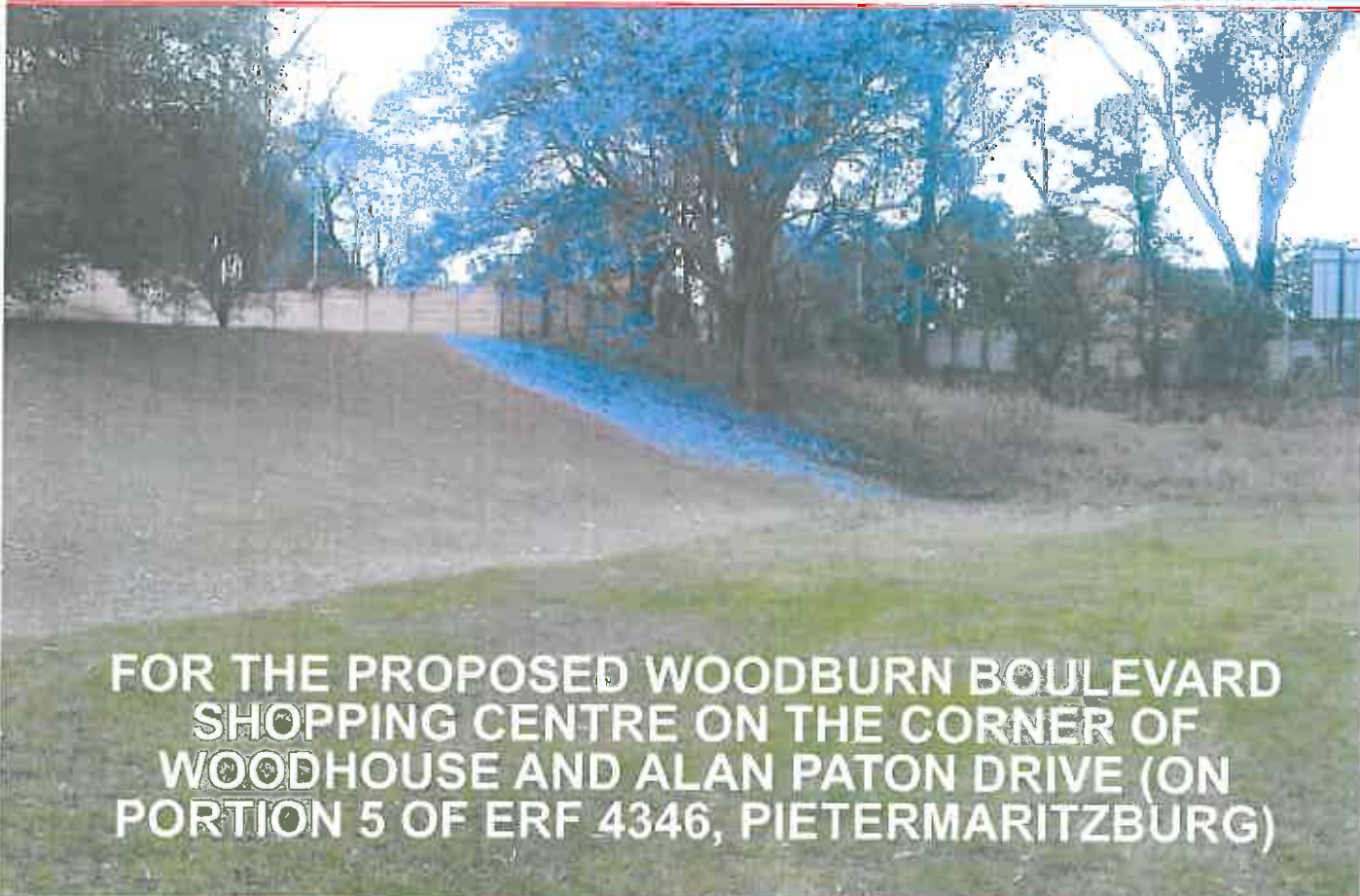
<p>draft landscape plan is to be submitted to this unit for comments and approval prior to commencement.</p>			
<p>11. Page 59 makes reference to 'a rehabilitation plan for the construction phase'. This plan must be submitted to this unit prior to construction works commencing.</p>			<p>Noted. Requirement included as part of the EMP. Refer to Appendix F</p>
<p>12. If during construction any new evidence of archaeological site or artifacts are found, operations must be stopped and the relative competent authority, Amafa aKwazulu-Natali, must be contacted immediately as opposed to SAHRA.</p>			<p>Noted. Requirement included as part of the EMP. Refer to Appendix F</p>
<p>13. The section 21 Water Use Licenses application (page 71) must be submitted to this unit.</p>			<p>Note: Bokamoso already had discussions with DWA in August 2012 regarding the necessity to obtain a Section 21 WUL. According to the department, the watercourse is regarded as a man-made/ artificial watercourse, which has already been altered and therefore no Section 21 WUL will be required. It will only be necessary to indicate the 1:100 year flood line on the planning drawings (requirement of Section 144 of the NWA) and mitigation measures to address possible flooding problems must be applied.</p>
<p>14. This development is required to be flood neutral and hence a storm water management plan must be undertaken and submitted to the Msunduzi Municipality for approval prior to construction commencing. Page 3 under section 3.1.3. Storm water Management, it mentions that 'it is necessary to attenuate runoff by construction a detention facility above the 1:50 year flood line'. This should be depicted on the development drawings as well as forming part</p>			<p>The developer appointed Jeffares and Green Engineers to assist with the flood management of the study area. Refer to Appendix Di for copy Jeffares and Green report. A more detailed storm water management plan will be compiled and submitted to the local authority for approval prior to the construction phase.</p>

<p>of the storm water management plan.</p> <p>15. Page 14 of the EMP mentions that 'fires shall not only be permitted in specifically designed areas and under controlled circumstances', what materials are intended to be burnt on site? The burning of waste material, rubbish and garden refuse on site is prohibited.</p> <p>16. The appointed ECO must register with this unit, providing contact details and audit reports, site visits should be conducted at least every 10 working days.</p> <p>17. The appointed ECO is to provide basic environmental awareness training to all staff working on site prior to the commencement of any construction activities.</p> <p>18. Construction staff is to make use of facilities provided for them, as opposed to alternative. Using surrounding arrears as a toilet facility is strongly prohibited.</p> <p>19. Chemical toilets should be placed outside 32cm from any watercourse i.e. the Foxhillspruit. A registers chemical waste company is to be used to remove waste from the chemical toilets on site. Documentation for this must be kept by the contractor for review purposes by the ECO if needed.</p> <p>20. Construction staff shall not be permitted to use any watercourse adjacent to the site for the purpose of bathing or washing of clothing.</p> <p>21. The contractor shall not in any way modify or damage the banks of the adjacent watercourse, unless required as part of the dissipation structures at the storm water outlet points.</p>			<p>The intention was not to cater for the burning of rubbish on the site. We only included these guidelines, because the contract workers often make fires for cooking and heating purposes. We removed this guideline from the FBAR and EMP.</p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p>
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<p>22. All concrete mixing is to take place on mixing boards to prevent contamination of groundwater.</p> <p>23. All equipment must be checked regularly for oil and fuel leaks before being operated.</p> <p>24. Contaminated wastewater must be managed by the site manager to ensure existing water resources in the vicinity of the site are not contaminated.</p> <p>25. The following measures must be included as part of the management of the site during the operational phase: monitoring storm water exit points; fill in and re-vegetate eroded areas; regularly maintain storm water structures to maintain efficiency.</p> <p>26. All building plans must be submitted to and approved by the Msunduzi Municipality for approval prior to construction commencing.</p>			<p>EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p> <p>Noted. Requirement included as part of the EMP. <i>Refer to Appendix F.</i></p>
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Appendix F: **Final Environmental Management Programme**

Environmental Management Programme Report



FOR THE PROPOSED WOODBURN BOULEVARD
SHOPPING CENTRE ON THE CORNER OF
WOODHOUSE AND ALAN PATON DRIVE (ON
PORTION 5 OF ERF 4346, PIETERMARITZBURG)

APRIL 2013- DC22/0059/2011



**BOKAMOSO LANDSCAPE ARCHITECTS
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1 Project Outline

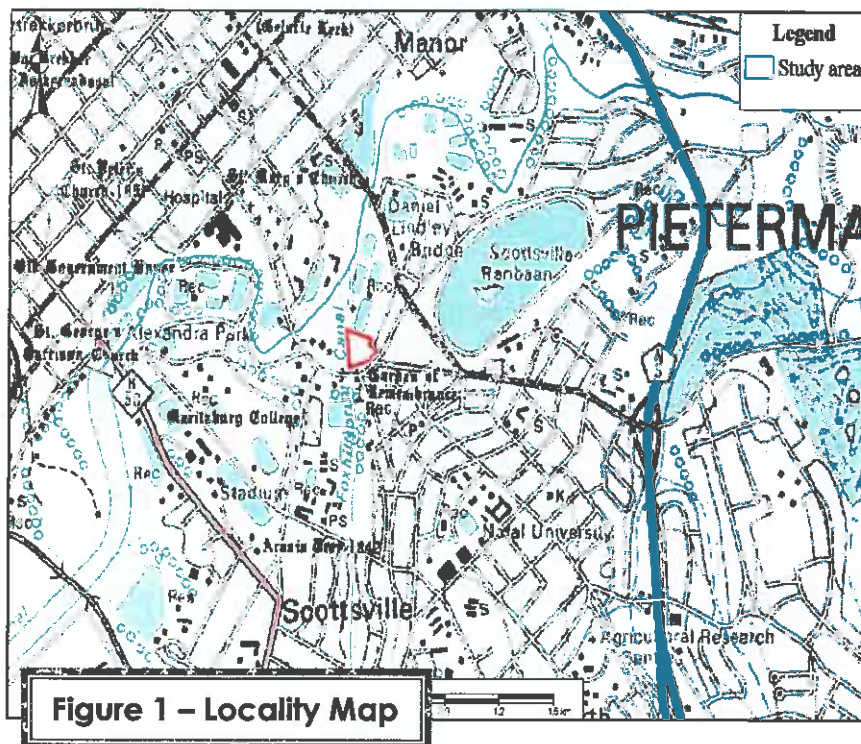
1.1 Background

Bokamoso Environmental Consultants was appointed by **O & T Developments (Pty) Ltd** to compile a Basic Assessment Report for the proposed Woodburn Shopping Centre Development on the corner of Woodhouse and Alan Paton Drive, Pietermaritzburg.

1.2 Project Description

O&T Development (Pty) Ltd is planning a proposed 6 500m² shopping centre development to be known as the **Woodburn Boulevard Shopping Centre**.

The proposed development will take place on Portion 5 of Erf 4346 KwaZulu-Natal and it is situated within the uMgungundlovi District Municipality Boundaries, approximately 1Km to the south-west of the Pietermaritzburg CBD. The site is located on the corner of Woodhouse Road and Alan Paton Drive and the Fox-Hillspruit Canal (a tributary of the Umsumduzi River) runs along the western boundary of the study area. Refer to Figure 1 for Locality Map and Refer to Figure 2 for Aerial Photograph. The site is approximately 17 820m² in extent.





Timeframe for construction:

Construction will commence as soon as the project is approved. **O & T Developments (Pty) Ltd** will be responsible for the on site activities. The EMP will be a binding document for purposes of compliance.

1.3 Receiving Environment

Hydrology:

- No river or wetlands occur on the study area, but the study area is affected by a floodline and the Foxhill Spruit runs along the souther boundary of the study area.

Fauna and flora:

- No Red Data Listed (RDL) faunal species were observed, directly or indirectly, to inhabit the proposed project area. The vegetation coverage of the study area has been completely transformed, because it was utilised as a sports field. Lawns were established on an excavated area and lawns and garden trees were

established on an embankment, which surrounds the sports field in the form of an amphitheatre.

Furthermore, the vegetation along the river is also completely disturbed and exotic invaders and weeds ruined whatever was left of the original natural riparian vegetation. This area is also covered with rubble and litter and is regarded as a security and health risk.

It was not regarded as necessary to conduct any detailed fauna and flora studies.

Cultural /Historical:

- No obvious features, sites or artefacts of cultural significance were found on the site.

Visual:

- The study area is visible from the Alan Paton and Woodhouse Roads.

Geology:

- The 1:250 000 geological map of the area reveals that the site is generally underlain by shales of the Pietermaritzburg Formation of the Ecca Group. Extensive alluvial terrace deposits are however associated with the confluences of the major rivers of the area and it is expected that this may occur on this site. The alluvium consists of interlayered dark grey-brown, brown or red-brown silty and sandy clay as well as clayey to silty sands. It varies in thickness from between 2m and 8.5m and some exposures of the alluvial boulder can be expected.

EMP context

This EMP fits into the overall planning process of the project by carrying out the conditions of consent set out by KZN DAEA. In addition, all mitigation measures recommended in the Basic Assessment report are included in the EMP.

This EMP addresses the following three phases of the development:

- Pre-construction Planning Phase;
- Construction phase; and
- Operational phase.

2 Monitoring

In order for the EMP to be successfully implemented all the role players involved must have a clear understanding of their roles and responsibilities in the project.

These role players may include the Authorities (A), other Authorities (OA), Developer/proponent (D), Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), Environmental Assessment Practitioner (EAP) and Environmental Site Officer (ESO). Landowners interested and affected parties and the relevant environmental and project specialist's area also important role players.

3 Roles and responsibilities

3.1 Developer (D)

The developer is ultimately accountable for ensuring compliance with the EMP and conditions contained in the environmental approval. The developer must appoint an independent Environmental Control Officer (ECO), for the duration of the pre-construction and construction phases, to ensure compliance with the requirements of this EMP. The developer must ensure that the ECO is integrated as part of the project team. The responsibility of compliance will be carried across to the school as soon as transfer of the erven has taken place. It will be ensured that a copy of this document accompanies the purchase agreements for the erven.

3.2 Project Manager (PM)

The project Manager is responsible for the coordination of various activities and ensures compliance with this EMP through delegation of the EMP to the contractors and monitoring of performance as per the Environmental Control Officer's monthly reports.

3.3 Environmental Control Officer (ECO)

An independent Environmental Control Officer (ECO) shall be appointed, for the duration of the pre-construction and construction phase of the mall, warehouse(s) and the access road, by the developer to ensure compliance with the requirements of this EMP.

After the construction the associated rehabilitation works are completed, the ECO must do a final site inspection and if satisfied with the compliance with the EMP the ECO must issue a certificate of compliance with the EMP to the developer and forward a copy of the compliance certificate to KZN DAEA.

- The Environmental Control Officer shall ensure that the contractor and developer are aware of all the specifications pertaining to the project.
- Any damage to the environment must be repaired immediately after consultation between the Environmental Control Officer, Consulting Engineer main Contractor and Relevant Sub- Contractors.
- The Environmental Control Officer shall ensure that the developer and the appointed project team and contractors adhere to all stipulations of the EMP.
- The Environmental Control Officer shall be responsible for monitoring the EMP throughout the project by means of site visits and meetings. This should be documented as part of the site meeting minutes.
- The Environmental Control Officer shall be responsible for the environmental training program.
- The Environmental Control Officer shall ensure that all clean up and rehabilitation or any remedial action required, are completed prior to transfer of properties.
- A post construction environmental audit is to be conducted to ensure that all conditions in the EMP have been adhered to.

3.4 Contractor (C):

The contractors shall be responsible for ensuring that all activities on site are undertaken in accordance with the environmental provisions detailed in this document and that sub-contractor and laborers are duly informed of their roles and responsibilities in this regard.

The contractor will be required, where specified to provide Method Statements setting out in detail how the management actions contained in the EMP will be implemented.

The contractors will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the environmental regulations.

3.5 Environmental Site Officer (ESO):

The ESO is appointed by the developer as his/her environmental representative to monitor, review and verify compliance with the EMP by the contractor. The ESO is not an independent appointment but must be a member of the contractor's management team. The ESO must ensure that he/she is involved at all phases of the construction (from site clearance to rehabilitation).

3.6 Authority (A):

The authority is the relevant environmental department that has issued the Environmental Authorisation. The authority is responsible for ensuring that the monitoring of the EMP and other authorization documentation is carried out by means of reviewing audit reports submitted by the ECO and conducting regular site visits.

3.7 Other Authorities (OA):

Other authorities are those that may be involved in the approval process of the EMP.

3.8 Environmental Assessment Practitioner (EAP):

According to Section 1 of NEMA the definition of an environmental assessment practitioner is "the individual responsible for the planning, management and coordination of environmental impact assessments, strategic environmental assessments, environmental management plans or any other appropriate environmental instruments through regulations".

4. Lines of Communication

The Environmental Control Officer in writing should immediately report any breach of the EMP to the Project Manager. The Project Manager should then be responsible for rectifying the problem on-site after discussion with the contractor. Should this require additional cost, then the developer should be notified immediately before any additional steps are taken.

5. Reporting Procedures to the Developer

Any pollution incidents must be reported to the Environmental Control Officer immediately (within 12 hours). The Environmental Control Officer shall report to the Developer on a regular basis (site meetings).

6. Site Instruction Entries

The site instruction book entries will be used for the recording of general site instructions as they relate to the works on site. There should be issuing of stop work order for the purposes of immediately halting any activities of the contractor that may pose environmental risk.

7. ESA/ESO (Environmental Site Officer) Diary Entries

Each of these books must be available in duplicate, with copies for the Engineer and Environmental Site Officer. These books should be available to the authorities for inspection or on request. All spills are to be recorded in the ESA/Environmental Site Officer's diary.

8. Methods Statements

Methods statements from the contractor will be required for specific sensitive actions on request of the authorities or ESA/ESO (Environmental Site Officer). All method statements will form part of the EMP documentation and are subject to all terms and conditions contained within the EMP document. For each instance wherein it is requested that the contractor submit a method statement to the satisfaction of ESA/ESO, the format should clearly indicate the following:

- What – a brief description of the work to be undertaken

- How- a detailed description of the process of work, methods and materials
- Where- a description / sketch map of the locality of work; and
- When- the sequencing of actions with due commencement dates and completion date estimate.

The contractor must submit the method statement before any particular construction activity is due to start. Work may not commence until the method statement has been approved by the ESA/ESO.

9. Record Keeping

All records related to the implementation of this management plan (e.g. site instruction book, ESA/ESO dairy, methods statements etc.) must be kept together in an office where it is safe and can be retrieved easily. These records should be kept for two years at any time be available for scrutiny by any relevant authorities.

10 Project activities

10.1 Pre-Construction Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
General	Project contract	To make the EMP enforceable under the general conditions of the contract.	The EMP document must be included as part of the tender documentation.	The EMP is included as part of the tender documentation	Developer	-
Design and planning	Stability of structures and restriction of land use due to geology	To ensure stability of the development structure.	The layout and land must correspond to the stability zonation and development types recommended by the geotechnical engineer.	The land uses and layout corresponds to the recommended stability zonation and development type.	Individual Development Engineer	-
	Waste storage	To control the temporary storage of waste.	Temporary waste storage points on site shall be determined. These storage points shall be accessible by waste removal trucks and these points should not be located in sensitive areas/areas highly visible from the properties of the surrounding land-owners/tenants/in areas where the wind direction will carry bad odours across the properties of adjacent tenants or landowners.		Contractor ESO	-
		Ensure waste storage area does not generate pollution.	Build a bund around waste storage area to avoid occurrence of pollution.		Contractor	-
	Visual Impact	To minimize the visual impact of the proposed development.	Architectural guidelines should be compiled for the proposed development and the styles used must promote unity through the use of certain street furniture.		Architect Contractor.	

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
Preparing the site access	Environmental Integrity	To avoid erosion and disturbance to indigenous vegetation.	planting and paving patterns, colours and textures that do not only blend in tastefully with the character of the area, but are also functional and easy to maintain. Designated routes shall be determined for the construction vehicles and designated areas for storage of equipment. Clearly mark the site access point and routes on the site to be used by construction vehicles and pedestrians. Provide an access map to all contractors whom in turn must provide copies to the construction workers. Instruct all drivers to use access point and determined route.	Access to site is erosion free.	Contractor	Continuous
	Fauna and Flora	To give smaller birds, mammals and reptiles a chance to move into other undisturbed areas close to their natural territories.	Work should be planned to be restricted to one area at a time.		Contractor, Site Manager	
		To prevent the invasion of the area with alien invaders.	Alien invaders must be eradicated before, during and after construction.		ECO PROJECT MANAGER	
Geology and soils	Unsuitable Geotechnical conditions	To prevent unsuitable Geotechnical conditions	The site camp and storage areas shall be established in a disturbed area as indicated by the ECO prior to construction. No dolomite was found on the application site.	Precautionary measures implemented	ECO, SITE SUPERVISOR Contractor	-

4.2 Construction Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
	<p>Pollution of the environment</p>	<p>To prevent unhygienic usage on the site and pollution of the natural assets.</p>	<p>1) Weather proof waste bins must be provided and emptied regularly. 2) The contractor shall provide laborers to clean up the construction site on a daily basis. 3) Temporary waste storage points on the site should be determined. THESE AREAS SHALL BE PREDETERMINED AND LOCATED IN AREAS THAT IS ALREADY DISTURBED. These storage points should be accessible by waste removal trucks and these points should be located in already disturbed areas /areas not highly visible from the properties of the surrounding land-owners/ in areas where the wind direction will not carry bad odours across the properties of adjacent landowners. This site should comply with the following:</p> <ul style="list-style-type: none"> • Skips for the containment and disposal of waste that could cause soil and water pollution, i.e. paint, lubricants, etc.; • Small lightweight waste items should be contained in skips with lids to prevent wind littering; • Bunded areas for containment and holding of dry building waste. <p>4) No solid waste may be disposed of on the site. 5) No waste materials shall at any stage be disposed of in the open veld of adjacent properties. 6) The storage of solid waste on the site, until</p>	<p>No waste bins overflowing No litter or building waste lying in or around the site.</p>	<p>Contractor ESO</p>	<p>Daily Weekly</p>

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			such time as it may be disposed of, must be in a manner acceptable to the local authority and DWAF.			
		Recycle material where possible and correctly dispose of unusable wastes.	<p>1) Waste shall be separated into recyclable and non-recyclable waste, and shall be separated as follows:</p> <ul style="list-style-type: none"> • General waste: including (but not limited to) construction rubble, • Reusable construction material. <p>2) Recyclable waste shall preferably be deposited in separate bins.</p> <p>3) All solid waste including excess spoil (soil, rock, rubble etc) must be removed to a permitted waste disposal site on a weekly basis.</p> <p>4) No bins containing organic solvents such as paints and thinners shall be cleaned on site, unless containers for liquid waste disposal are placed for this purpose on site.</p> <p>5) Keep records of waste reuse, recycling and disposal for future reference. Provide information to ECO.</p>	No visible signs of pollution.	Contractor ESO	Daily Weekly
Construction site	Geology and soils	To prevent the damaging of the existing soils and geology.	<p>1) The top layer of all areas to be excavated for the purposes of construction shall be stripped and stockpiled in areas where this material will not be damaged, removed or compacted.</p> <p>2) All surfaces that are susceptible to erosion, shall be protected either by cladding with biodegradable material or with the top layer of soil being seeded with grass seed/planted with a suitable groundcover.</p>	No signs of erosion.	Contractor	Monitor daily
Social	Construction vehicles	The construction of the proposed development can cause a heavy	Barrier tape must be spun around where the proposed development construction will be taking place. Sign boards can also be used to prohibit construction vehicles as	Barrier tape is maintained throughout the project timeline.	Contractor, Developer	

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
		vehicle traffic increase and construction vehicles will be operating as well during the construction phase.	machinery to enter the site. Heavy construction vehicles must be instructed to only use the main roads during off-peak hours and only smaller access road to site. Safety signs should be erected around the site to indicate and caution road users about the construction site. A traffic regulator could be used on peak traffic times to regulate the traffic.			
	Noise impact	To maintain noise levels below "disturbing" as defined in the National Noise Regulations.	1) Site workers must comply with the Provincial noise requirements. 2) Noise activities shall only take place during working hours.	No complaints from surrounding residents and I & AP	Contractor	Monitored daily
	Dust impact	Minimise dust from the site.	1) Dust pollution could occur during the construction works, especially during the dry months. Regular and effective damping down of working areas (especially during the dry and windy periods) must be carried out to avoid dust pollution that will have a negative impact on the surrounding environment.	No visible signs of dust pollution No complaints from surrounding residents and I & AP	Contractor	Monitored daily
	Safety and security	To ensure the safety and security of the public.	1) Although regarded as a normal practice, it is important to erect proper signs indicating the operations of heavy vehicles in the vicinity of dangerous crossings and access roads or even in the development site if necessary.		Contractor ESO	Monitored daily

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
			<p>2) With the exception of the appointed security personnel, no other workers, friend or relatives will be allowed to sleep on the construction site (weekends included)</p> <p>3) Construction vehicles and activities to avoid peak hour traffic times</p> <p>4) Presence of law enforcement officials at strategic places must be ensured</p> <p>5) Following actions would assist in management of safety along the road</p> <ul style="list-style-type: none"> ▪ Adequate road marking ▪ Adequate roadside recovery areas ▪ Allowance for pedestrians and cyclists where necessary ▪ Although regarded as a normal practice, it is important to erect proper signs indicating the danger of the excavation in and around the development site. Putting temporary fencing around excavations where possible. 			
	Visual Impact	In order to minimise the visual impact.	The disturbed areas shall be rehabilitated immediately after the involved construction works are completed as the construction vehicle and equipments will be causing visual impact during construction phase.	Visual impacts minimized	Contractor ESO	Monitor daily
	Stability of structures due to geology	To ensure stability of structures.	Preventative foundation designs shall be done. Detailed foundation inspections should be carried out at the time of construction to identify any variances and adjust foundation designs accordingly if need to be. The foundation recommendations and geotechnical engineers must be adhered to.			
	Increased fire risk to site and	To decrease fire risk.	1) Fires shall only be permitted in specifically designated areas and under controlled	No open fires on site that have	Contractor	Monitor daily

TYPE	Environmental risk or issue surrounding areas.	Objective or requirement	Mitigation measure	Performance indicator	Responsibility	Frequency of Action
	surrounding areas.		<p>circumstances.</p> <p>2) Food vendors shall be allowed within specified areas.</p> <p>3) Fire extinguishers to be provided in all vehicles and fire beaters must be available on site.</p> <p>4) Emergency numbers/contact details must be available on site, where applicable.</p>	been left unattended.		
	Access Roads	To minimise impacts from construction of access road.	Management plans must be compiled to assist in peak traffic hours and also to assist in peak traffic hours and also to prevent access roads works from impacting negatively on the development and surrounding land owners.			

4.3 Operational Phase

TYPE	Environmental risk or issue	Objective or requirement	Mitigation measure	Responsibility	Frequency of Action
SITE CLEAN UP AND PREPARED FOR USE	Development construction waste.	Minimize waste	Decontaminate and collect waste in storage area ready for off-site recycling or disposal Arrange for final collection and removal of excess and waste materials.	Contractor	-
MATERIALS FAILURE	Structural damage. Loss of site materials.		Inspect all structures monthly to detect any cracking or structural problems. Confirm with designer if there are design problems. Rectify with materials to match, or other agreed solution.	Contractor	-
SITE AUDIT	Eventual project failure	Successful project establishment.	Routinely audit the works and adjust maintenance schedule accordingly.	Contractor	-
GENERAL	Mis-management	Maintenance team in place.	A maintenance team as well as a landscaping team is needed to ensure that the development is well maintained. Open fires and smoking during maintenance works are strictly prohibited.	Developer	-
GEOLOGY	Erosion of topsoil	Prevent topsoil erosion	Due to loose topsoil, the soil must be covered by means of re-seeding and vegetation with suitable ground covering.	Contractor Engineer/ Contractor	Once off

4 Procedures for environmental incidents

4.1 Leakages & spills

- Identify source of problem.
- Stop goods leaking, if safe to do so.
- Contain spilt material, using spills kit or sand.
- Notify Environmental Control Officer
- Remove spilt material and place in sealed container for disposal (if possible).
- Environmental Control Officer to follow Incident Management Plan.

4.2 Failure of erosion/sediment control devices

- Prevent further escape of sediment.
- Contain escaped material using silt fence, hay bales, pipes, etc.
- Notify ECO.
- Repair or replace failed device as appropriate.
- Dig/scrape up escaped material; take care not to damage vegetation.
- Remove escaped material from site.
- ECO to follow Incident Management plan.
- Monitor for effectiveness until re-establishment.

4.3 Bank/slope failure

- Stabilize toe of slope to prevent sediment escape using aggregate bags, silt fence, logs, hay bales, pipes, etc.
- Notify ECO.
- ECO to follow Incident Management plan.

- Divert water upslope from failed fence.
- Protect area from further collapse as appropriate.
- Restore as advised by ECO.
- Monitor for effectiveness until stabilized.

4.4 Discovery of rare or endangered species

- Stop work.
- Notify ECO.
- If a plant is found, mark location of plants.
- If an animal, mark location where sighted.
- ECO to identify or arrange for identification of species and or the relocation of the species if possible.
- If confirmed significant, ECO to liaise with Endangered Wildlife Trust.
- Recommence work when cleared by ECO.

4.5 Discovery of archeological or heritage items

- Stop work.
- Do not further disturb the area.
- Notify ECO.
- ECO to arrange appraisal of specimen.
- If confirmed significant, ECO to liaise with National, Cultural and History Museum.
P.O. Box 28088
SUNNYSIDE
0132
Contact Mr. J. van Schalkwyk
or
Mr. Naude
- Recommence work when cleared by ECO.

5 EMP review

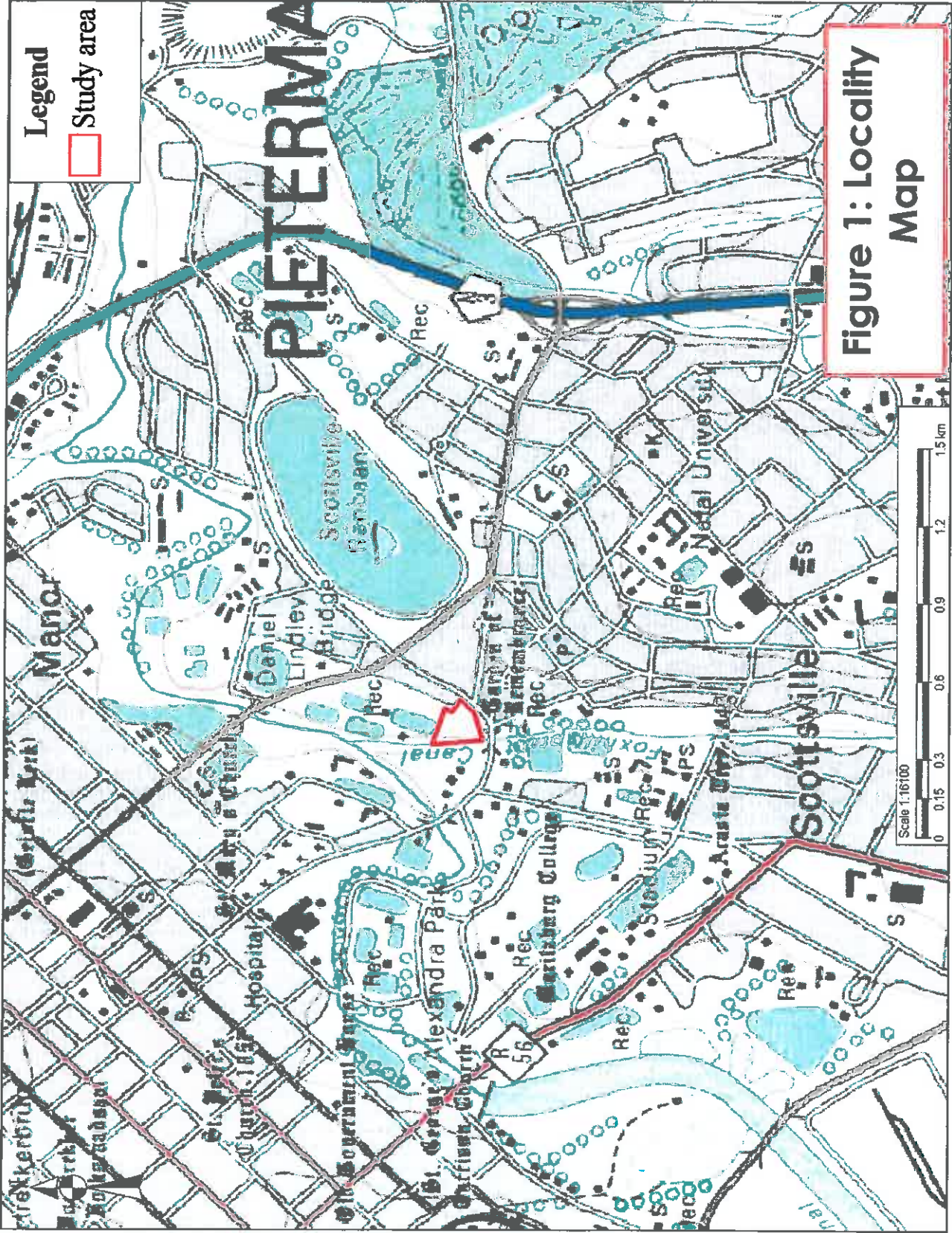
1. The Site supervisor is responsible for ensuring the work crew is complying with procedures, and for informing the work crew of any changes. The site supervisor is responsible for ensuring the work crew is aware of changes that may have been implemented by KZN DAEA before starting any works.
2. If the contractor cannot comply with any of the activities as described above, they should inform the ECO with reasons within 7 working days.

Appendix G:

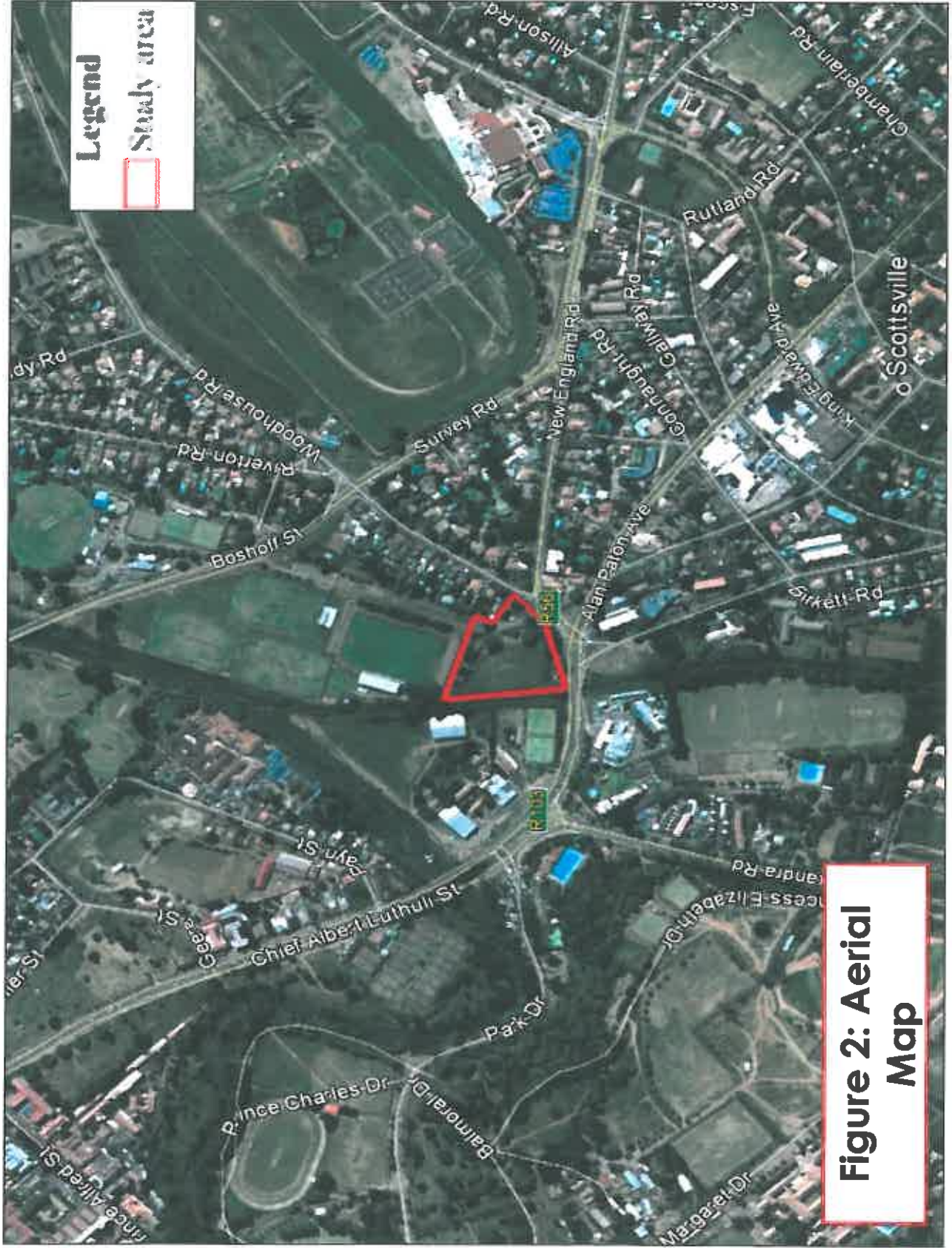
Enlarged copies of figures



**Figure 1:
Locality Map**



**Figure 2:
Aerial Photograph**



Legend
Study area

Figure 2: Aerial Map

Figure 3:

Access point of proposed new Shopping Centre and proposed development layout

Figure 3: Access Point Of Proposed New Shopping Centre And Proposed Development Layout



Existing Access to Rugby Club will act as access point to the development

Woodhouse Road - to be upgraded

Durban Road/ Alan Paton Drive - to be upgraded

Watercourse/ River

Woodburn Boulevard
proposed new Shopping Centre

Ground Floor Plan
ground

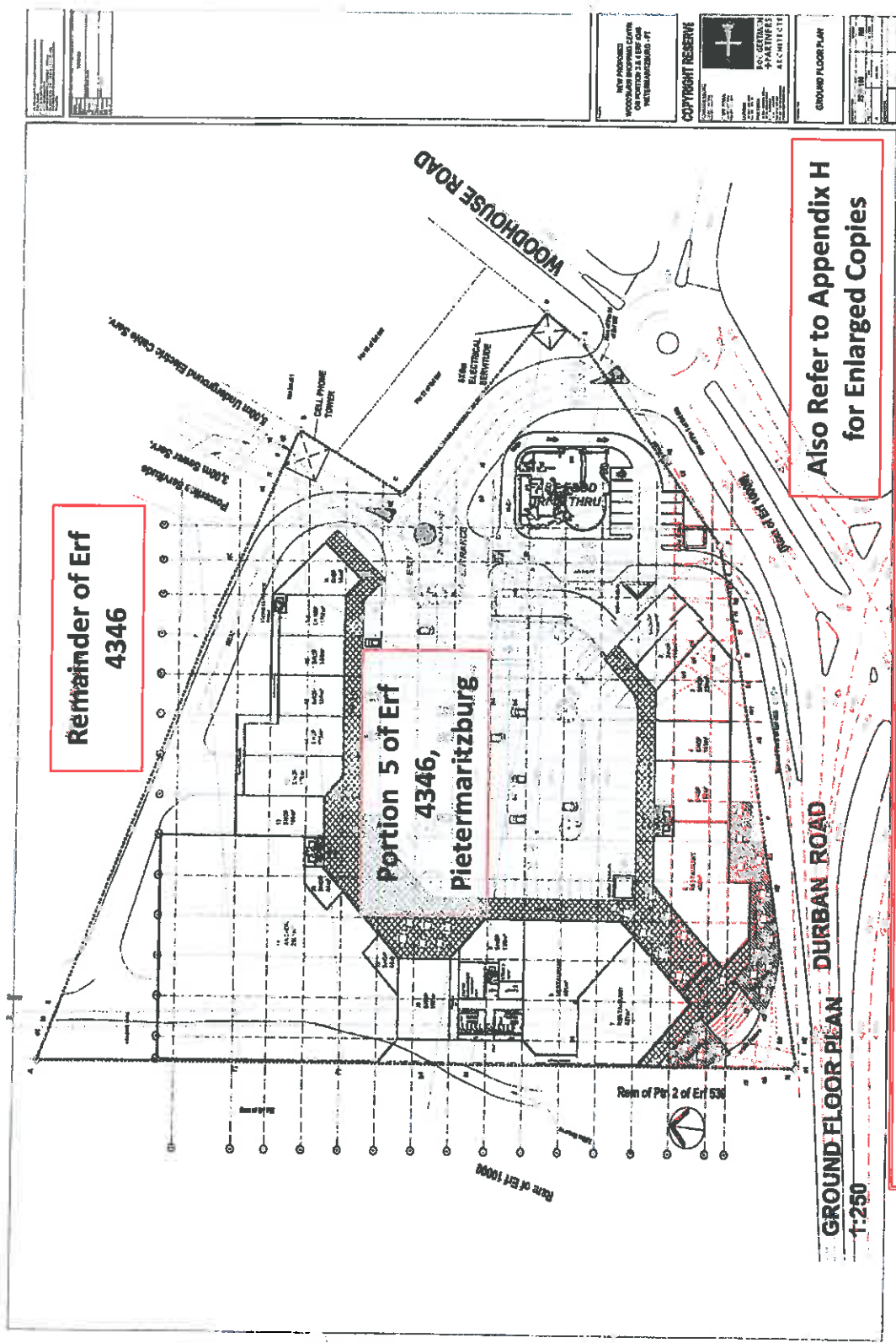


Figure 4:

Master plan of larger development already approved by the KZN Development Tribunal

Figure 5:

Description of adjoining properties and proposed development overlaid over the site plan



Remainder of Erf
4346

Portion 5 of Erf
4346,
Pietermaritzburg

Also Refer to Appendix H
for Enlarged Copies

Figure 5: Portion 5 of Erf 4346, Pietermaritzburg (Description of adjoining properties and proposed development overlaid over the site plan)

Project Name	
Client	
Site No.	
Scale	1:250
Date	

NOT FOR CONSTRUCTION
ON PORTION 5 OF ERF 4346
PIETERMARITZBURG, FT

COPYRIGHT RESERVE



GROUND FLOOR PLAN

Scale	1:250
Date	
Author	
Checked	
Approved	

Figure 6:

The current land use zoning of each of the properties adjoining the site or sites

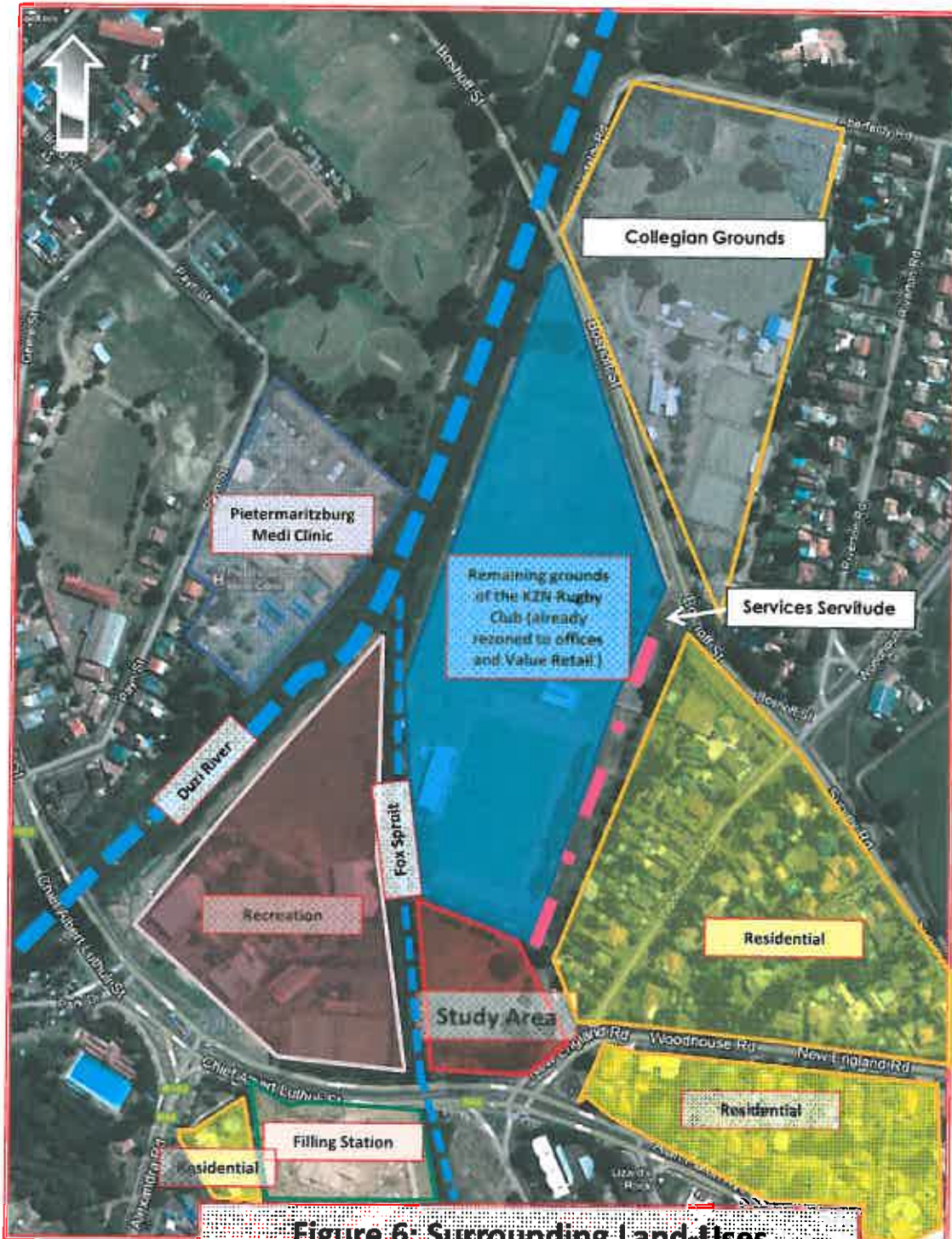


Figure 6: Surrounding Land-Uses

**Figure 7:
Existing Land-use
The Study Area**

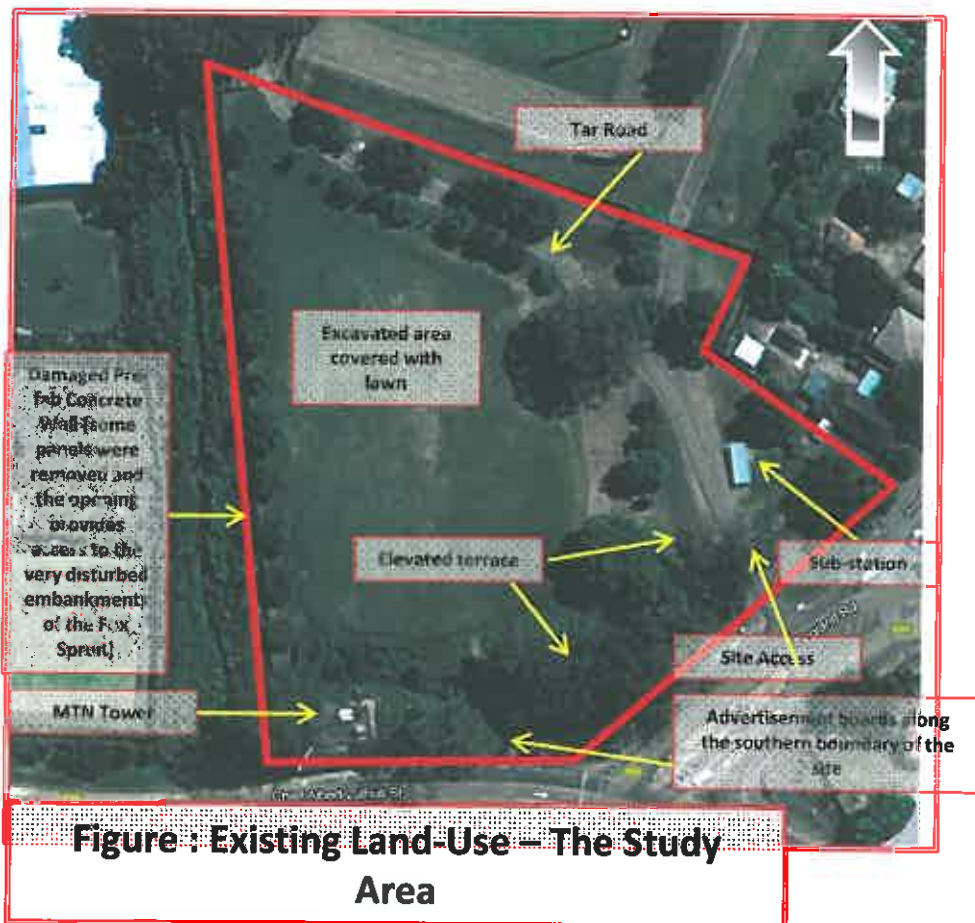


Figure : Existing Land-Use – The Study Area