



BURNSIDE

**Updated Traffic Impact Study
Marlwood Subdivision
Town of Wasaga Beach**

**TPC Marlwood Inc.
31 Marlwood Avenue
Wasaga Beach, ON L9Z 1S8**

**R.J. Burnside & Associates Limited
332 Lorne Avenue East
Stratford ON N5A 6S4 CANADA**

**February 2020
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Record of Revisions

| Revision | Date | Description |
|----------|---------------|--|
| 0 | August 2016 | Initial Draft Submission for Client Review |
| 1 | July 7, 2017 | Final Submission |
| 2 | November 2019 | Revised Submission |
| 3 | February 2020 | Revised Submission |

R.J. Burnside & Associates Limited

Henry Centen

Report Prepared By:



Henry Centen
Senior Transportation Engineer
HC:BA

Executive Summary

This Traffic Impact Study has reviewed the traffic impacts of developing a residential development in the Town of Wasaga Beach. Impacts have been assessed at the Proposed Development Access intersection on Golf Course Road, as well as along this road and internal to the subdivision. Traffic impacts have been assessed for horizon years 2021, 2026 and 2031. Forecasted traffic volumes have also included growth in background traffic in this area.

Based on the analysis completed, the following primary conclusions and recommendations are made in this study:

- The proposed developments are forecast to generate about 54 vph in the AM peak hour and 68 vph in the PM peak hour.
- The intersection of Golf Course Road/Proposed Development Access is forecast to operate with an excellent LOS and short delays through horizon year 2031. Therefore, no operational improvements are required to accommodate the proposed development.
- A left-turn lane is not warranted at the access intersection through horizon year 2031.
- A right-turn lane is not warranted at the access intersection through horizon year 2031.
- The location of the Proposed Development Access/Golf Course Road intersection meets the requirements for stopping sight distance and turning sight distance.
- A single access is proposed to service the 51-lot subdivision (south development). An emergency access is proposed through open space blocks to provide for a secondary access if the primary access becomes unavailable for a period of time.
- Daylight triangles are provided at the access intersection to meet the Town standard. It is recommended that the vegetation along Golf Course Road be cleared at the Proposed Development Access location in order to meet the sight triangle specified in the *Town of Wasaga Beach Engineering Standards* (Town of Wasaga Beach, 2015), which is 4 m along the local right-of-way and 10 m along the collector road right-of-way, as well as to maintain the required turning sight distances.
- Golf Course Road is forecasted to operate at about 55% to 56% of its capacity, based on its AADT or peak hour directional traffic, through horizon year 2031.
- It is proposed that the local roads internal to the subdivision will be designed to the Town's urban standard, including the provision of sidewalks along one side of the road.
- The Town's planning has identified a potential to adjust the existing transit 'Route 2' that would provide transit service immediately adjacent to the subject development.

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Disclaimer

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R.J. Burnside & Associates Limited makes no warranties, either express or implied, of merchantability and fitness of the documents and other instruments of service for any purpose other than that specified by the contract.

1.0 Introduction

R.J. Burnside & Associates Limited (Burnside) has been retained by TPC Marlwood Inc. to prepare a Traffic Impact Study (TIS) in support of a proposed residential development in the Town of Wasaga Beach. This TIS will support the planning level approvals that are required prior to the development of the property, by demonstrating how the subject lands can be serviced with transportation infrastructure and identifying the impacts on the broader transportation network.

A previous TIS, dated August 2016, was submitted for the Town's review, with the following comments received:

- Staff request that the proposed number of lots be confirmed to ensure that the number in the TIS is consistent with the number on the Draft Plan.
- It is recommended that a "typical" proposed road cross section be provided in the TIS.
- Intersection left turn lane warrant analysis is required based on future background plus development generated trips in the peak hours for Golf Course Road at Street "A".
- As Golf Course Road is a Collector Road, daylight triangles are to be 10 m x 4 m at the intersection with Street "A", as per Town Standards.

The preliminary Draft Plan that was considered in this earlier TIS has now been substantially revised, including the following:

- The previously proposed connection of the Draft Plan to the existing Masters Lane has been deleted.
- The proposed access to Golf Course Road has been shifted to the north.
- The previously proposed ten lots, located on Golf Course Road to the north of Masters Lane, are now proposed to be nine lots.
- The number of lots proposed in the Draft Plan (i.e., south of Masters Lane) have been reduced from 66 lots to 51 lots.

This updated TIS responds to the previous comments from the Town and to the revisions made to the Draft Plans. The Town's previous comments have been addressed as follows:

- The number of lots in the TIS are consistent with the number in the Draft Plans.
- A "typical" cross section is now included in the updated TIS.
- A left turn lane warrant analysis is provided in the updated TIS.
- The required 10 m x 4 m daylighting triangle is provided on the updated Draft Plans.

1.1 Site Description

The development locations are shown in Figure A1 (Appendix A), being constructed on the existing Marlwood Golf & Country Club.

TPC Marlwood Inc. proposes to provide a new local municipal road (Street A) that intersects with Golf Course Road, as shown on the updated south Draft Plan in Figure A2/S (Appendix A), to service 51 lots. The local road is proposed to continue as Street B, terminating as a cul-de-sac.

To the north, the south development property is bounded by the existing subdivision east of Golf Course Road (consisting of Marlwood Avenue and Masters Lane). To the west, the property is bounded by Golf Course Road. To the south, the property is bounded by The Boardwalk, which is a private road in the Park Place Retirement Community. To the east, the property is bounded by the Marlwood Golf & Country Club.

The north development proposes 9 lots located along Golf Course Road, to the north of Marlwood Avenue, as shown on the north Draft Plan in Figure A2/N.

1.2 Background Information

The following documents have been reviewed as background for this TIS:

- 2017 Transportation Study Update, The Town of Wasaga Beach (Ainley Group, December 2017).
- Wasaga Trails Master Plan (November 2017).
- Official Plan for the Town of Wasaga Beach (consolidated February 2016).
- Zoning By-Law 2003-60 for the Town of Wasaga Beach (consolidated December 2017).
- The Town of Wasaga Beach Engineering Standards (The Town of Wasaga Beach, March 2015).
- 2018 Road Needs Study Update, The Town of Wasaga Beach (Ainley Group, February 2019).
- Transit Study and Operations Review, The Town of Wasaga Beach (Transit Consulting Network, May 25, 2018).

2.0 Existing Conditions

2.1 Study Area Road Network

The location of the proposed development is shown on Figure A1 (Appendix A) and the updated Draft Plans are shown on Figures A2/S and A2/N (Appendix A). The study area includes the roads linking the proposed development to the adjacent collector road (i.e., Golf Course Road). The following collector road intersection is included in this study:

- Golf Course Road/ Proposed South Development Access.

The proposed municipal local roads (Street A and Street B) are shown on the updated Draft Plan (Figure A2/S).

Golf Course Road is a north-south two-lane collector road with a posted speed limit of 50 km/h.

The Golf Course Road/Proposed Development Access is a proposed T-intersection that will provide an access to the south development onto Golf Course Road. It is assumed that the intersection will be stop-controlled, with Golf Course Road operating freely.

In addition to the proposed 51 lots in the south Draft Plan, there are an additional 9 lots proposed to be development on Golf Course Road, immediately north of Marlwood Avenue.

2.2 Other Developments and Proposed Road Improvements

There are no other new developments or proposed road improvements that have been identified for the study area within the time period considered in this study.

Developments in the broader area are accounted for through the application of forecasted background growth factors, based on other network level planning studies that have been completed by the Town.

3.0 Background Traffic Forecasts

3.1 Study Horizon Periods

Considering the scope of the proposed development, as well as the assumption that the development will be completed by 2021, the following study horizons (cumulatively) are considered appropriate for consideration of traffic impacts:

- Horizon Year 2021 – Build-out Conditions.
 - Peak summer background traffic volumes.
 - Addition of full development (51 lots).
- Horizon Year 2026 – Five Year Horizon (i.e., 5 years post build-out).
 - Addition of background traffic growth.
- Horizon Year 2031 – Ten Year Horizon (i.e., 10 years post build-out).
 - Addition of background traffic growth.

3.2 Road Connections and Phasing of Development

For the purposes of this study it has been assumed that the proposed development will build-out by 2021. Full build-out conditions are considered, since these represent the worst-case scenario for traffic impacts on the adjacent roadways. A new access is proposed to Golf Course Road to serve the proposed development.

It is expected that phasing plans, if required, will be developed as part of the detailed designs and agreements for this development.

3.3 Time Period for Traffic Analysis

The time periods selected for traffic analysis are based on the type of development proposed. The peak traffic periods considered in this study, for residential development impacts, include the AM peak hour and PM peak hour of the adjacent roadway. Both peak hours are considered for weekday conditions.

3.4 Seasonal Adjustments for Traffic Volumes

The study area is affected by seasonal traffic fluctuations, due to the development being located immediately southwest of the Marlwood Golf & Country Club, as well as to the fact that the beach areas of the Town attract many residents/tourists in summer months. This was taken into account in this study by utilizing traffic volumes taken from turning movement counts completed in the summer (June 29, 2016) and using these in the analysis. The traffic counts were taken at the time of the completion of the previous TIS and have been updated in this current TIS based on the application of the road network growth factors forecasted in this study.

3.5 Traffic Growth Factors

Based on the traffic forecasts in the *Road Needs Study* prepared for the Town of Wasaga Beach (Ainley Group, 2019), it is forecast that the traffic on Golf Course Road will grow by 2.5% per annum (compounded) between 2018 and 2038. This growth rate has been used to forecast future background traffic for the various horizon periods considered in this study.

3.6 Forecast Background Traffic

A turning movement traffic count was obtained for Golf Course Road at Marlwood Avenue. The count was taken by Ontario Traffic Inc. on June 29, 2016. Since the count already reflects peak summer conditions, no adjustments were required to reflect peak seasonal conditions. However, since the growth rates established in the *Road Needs Study* (Ainley Group, 2019) were forecasted from a base year of 2018, an adjustment was made to the 2016 counts to reflect 2018 conditions. Based on the *2017 Transportation Study Update* (Ainley Group, December 2017), growth in the AADT on Golf Course Road was 5.04% per annum (compounded) between 2012 and 2017. Therefore, for the purposes of this TIS the 2016 traffic counts have been adjusted by 5.04% per annum between 2016 and 2018 (i.e., growth factor of 10.33%).

The background traffic volumes (weekday AM and PM peak hours) for horizon years 2021, 2026 and 2031 are summarized on Figure A3 (Appendix A).

4.0 Development Traffic Forecasts and Total Traffic Forecasts

4.1 Development Traffic Generation

Site generated traffic volumes, from the proposed developments, have been estimated based on trip generation information contained in the ITE *Trip Generation Manual 9th Edition*, and is summarized in the following table:

Table 4.1: Forecast of Trip Generation from Proposed Development – Full Build-Out

| Land Use | ITE Code | AM Peak Hour (vph) | | PM Peak Hour (vph) | |
|---|----------|--------------------|-----|--------------------|-----|
| | | In | Out | In | Out |
| South Development Single-Family Detached Housing (51 units) | 210 | 12 | 34 | 36 | 22 |
| North Development Single-Family Detached Housing (9 units) | 210 | 2 | 6 | 6 | 4 |

As shown in the above table, the total new trip generation (two-way) for the south development is forecast to be 46 vph in the AM peak hour and 58 vph in the PM peak hour. For the north development, the total trip generation (two-way) is forecast to be 8 vph in the AM peak hour and 10 vph in the PM peak hour.

4.2 Trip Distribution

The forecast development traffic has been distributed over the road network, according to logical routing to adjacent collector and arterial roads and origin/destination considerations. Considering the developments will be solely located immediately east of Golf Course Road, all of the trips are distributed to/from Golf Course Road. Golf Course Road provides the collector road function in this area.

Based on the traffic distribution for the existing background traffic in this area, the traffic distribution for the proposed developments are assumed to be 70% to/from the north and 30% to/from the south on Golf Course Road.

4.3 Forecast Total Traffic

The development traffic is added to the background traffic plus growth in background traffic to obtain the forecast total turning movement volumes. The forecast total traffic volumes (weekday AM and PM peak hours) are summarized on Figure A4.

5.0 Traffic Impact Analysis

5.1 Analysis Criteria and Approach

The traffic operation at the subject intersection has been assessed based on the following criteria:

- Turning lane requirements based on MTO warrant nomographs and criteria (Geometric Design Standards for Ontario Highways).
- Level of Service (LOS, delay) and volume-to-capacity (v/c) ratio for intersection with the collector road, or for specific movements at this intersection. The LOS is based on criteria in the Highway Capacity Manual, analyzed using Synchro software.
- Geometric constraints (sight distances, intersection spacing, etc.).
- Golf Course Road Considerations.

5.2 Left-Turn Lane Warrants for Collector Road Intersections

The warrants for left-turn lanes, at the unsignalized intersection of the local/collector roads, have been assessed based on MTO nomographs. The analysis is based on design speeds of 20 km/h over the posted speeds. The results of the left-turn lane warrant analysis is summarized below in Table 5.1 and Table 5.2.

Table 5.1: Left-Turn Lane Warrants for Golf Course Road & Proposed Development Access Unsignalized Intersection

| Left Turn Storage Lane Warrants | | |
|--|-----------------------|----------------------------------|
| Location: Golf Course Road & Proposed Development Access | | |
| Design Speed = 70 km/h | | Time Period = 2031 Total Traffic |
| Approach Direction | Southbound | |
| Peak Hours | Morning | Afternoon |
| Advancing Traffic | 139 | 298 |
| Opposing Traffic | 160 | 351 |
| Left Turning Traffic | 9 | 25 |
| Percentage of Left Turning Traffic | 6.5% | 8.3% |
| Figure Used (MTO Design Supplement for TAC Geometric Design Guide for Canadian Roads, June 2017) | Exhibit 9A-10 (upper) | Exhibit 9A-10 (lower) |
| Storage Length Required | 0 m | 0 m |

Based on the analysis, it is concluded that a left-turn lane is not required on Golf Course Road at the site access through horizon year 2031. Traffic in horizon years 2021 and 2026 will be lower than in 2031 and therefore left-turn lanes are not required in those horizon periods.

5.3 Right-Turn Lane Requirements

MTO guidelines (Geometric Design Standards for Ontario Highways) note that right-turn lanes or tapers may be considered, where right-turn volumes exceed 60 vph and where right-turning vehicles create a hazard or reduce capacity at the intersection.

The right-turn movements at the development access intersection on Golf Course Road for the peak hour with the higher right-turning volume (worst case), is forecasted to be 11 vph. Therefore, right-turn lanes or tapers are not required at this intersection, based on volume criteria.

5.4 Operational Level of Service

The access intersection has been analyzed using Synchro software, which uses methodologies based on the Highway Capacity Manual. The LOS and volume-to-capacity (v/c) ratio were determined for the egress movements from local road onto the collector road (unsignalized intersection). The LOS is a measure qualifying the amount of delay experienced by motorists. The delays associated with various LOS are summarized in the following table:

Table 5.2: Level of Service Criteria

| Level of Service | Unsignalized Intersection Average Total Delay (seconds/vehicle) |
|------------------|---|
| A | 0-10 |
| B | >10-15 |
| C | >15-25 |
| D | >25-35 |
| E | >35-50 |
| F | >50 |

It is desirable that turning movements operate at LOS E, or better, and within their capacity.

The Synchro analyses for the subject intersection is included in Appendix B for total traffic conditions and the results are summarized in Table 5.3.

Table 5.3: Intersection Operations

| Intersection | Year | Traffic | Movement | Level of Service (volume/capacity) | |
|--|------|---------|-----------------|------------------------------------|--------------|
| | | | | AM Peak Hour | PM Peak Hour |
| Golf Course Road & Proposed Development Access | 2021 | Total | WB Left / Right | A (0.05) | B (0.04) |
| | 2026 | Total | WB Left / Right | A (0.05) | B (0.04) |
| | 2031 | Total | WB Left / Right | A (0.05) | B (0.04) |

The above table shows that the Proposed Development Access intersection on Golf Course Road is forecast to have excellent operations through horizon year 2031.

5.5 Geometric Considerations

Golf Course Road is a two-lane collector road running north/south through the Town of Wasaga Beach. The section of Golf Course Road studied is relatively flat, however the Proposed Development Access is located between two horizontal curves on Golf Course Road (one to the north and one to the south). Golf Course Road has a speed of 50 km/h throughout the area studied; therefore, all geometric considerations will be based on a design speed of 70 km/h.

The required minimum stopping sight distance and intersection (turning) sight distances are based on the guidelines in the *Geometric Design Guide for Canadian Roads* (TAC, June 2017), which are as follows:

- Minimum stopping sight distance – 105 m.
- Minimum intersection sight distance for left turns – 150 m.
- Minimum intersection sight distance for right turns – 130 m.

The location of the proposed access onto Golf Course Road provides for a sight distance of over 200 m in each direction, which is better than the minimum TAC requirements.

The *Town of Wasaga Beach Engineering Standards* (Town of Wasaga Beach, 2015) specifies that intersections provide a minimum sight distance triangle of 4 m along the local right-of-way, and 10 m along the collector right-of-way. The proposed Draft Plan provides the required daylighting.

Based on the existing conditions along the section of Golf Course Road studied, it is recommended that the vegetation along Golf Course Road be cleared at the Proposed Development Access intersection to meet the sight triangle specified in the Town’s Standards, as well as to maintain the required sight distances noted above.

5.6 Emergency Access Considerations

A single access is proposed to serve the 51 unit south development. The Engineering Standards for the Town of Wasaga Beach do not prescribe the maximum number of units or maximum length of road for cul-de-sacs. However, it is understood that the number of units may be slightly higher than desirable for a single access, without a secondary emergency access. Therefore, it is proposed that a trail connection be developed through Blocks 53, 52, 56, 57 and 59 to allow for a secondary emergency access connection between the cul-de-sac on Street B and both Street A and Masters Lane. This access would provide for emergency access to be maintained, if the road connection becomes unavailable.

5.7 Golf Course Road Considerations

The *2018 Road Needs Study Update, Town of Wasaga Beach* (Ainley Group, February 2019) makes the following forecasts for Golf Course Road for horizon year 2038:

- That the road will have a volume/capacity (v/c) ratio of $\leq 56\%$, based on an assumed capacity of 600 vehicles per hour per lane (vphpl).
- That the road will have an AADT of 6600 vehicles per day (vpd), or 55% of the 12,000 vpd capacity assumed for collector roads.

The peak period traffic forecasted in this current TIS for Golf Course Road are consistent with the forecasts made in the Town's study. It is concluded that no improvements are required on Golf Course Road to accommodate the increased traffic volumes from the proposed development.

6.0 Alternate Travel Modes

6.1 Pedestrian and Cyclist Road Considerations

There are currently no sidewalks on the section of Golf Course Road being studied. It is proposed that Street A and Street B of the Marlwood Subdivision will have an urban road cross section (i.e., curb and gutter) and be designed in accordance with the Town's Standard Cross-Section Local Residential Subdivision Road on 20 m right-of-way (i.e., STD.DWG.No.2A). Sidewalks will be provided on one side of these local roads (i.e., north and west sides).

The *Active Transportation Plan (ATP) For the Town of Wasaga Beach* (Meridian Planning Consultants Inc., August 2008) was reviewed to identify existing and planned active transportation facilities in the study area.

There is a partially paved shoulder on the west side of Golf Course Road throughout the study area that may accommodate bicycle travel. This partially paved shoulder extends from River Road West to Klondike Park Road. The *ATP* proposes bike lanes on Golf Course Road. The internal local roads of the development provide sufficient width to accommodate shared vehicular/bicycle traffic, considering the low speeds and low traffic volumes.

The *ATP* has identified that the Wasaga Beach Provincial Park, which is located within the open space under tree cover west of Golf Course Road in the study area, contains several existing ski trails as well as part of the Gararaska Trail.

The *ATP* identifies a proposed community trail that will run along the east side of Marl Lake approximately 650 m east of the proposed development. The trail is proposed to connect Ryther Road south of the proposed development to Bells Park Road north of the proposed development.

There are no other existing or proposed pedestrian/cyclist connections in the study area.

6.2 Transit Considerations

The Town of Wasaga Beach operates two bus routes (i.e., Route 1 and Route 2) and shares one bus route with the Town of Collingwood (i.e., Wasaga Beach-Collingwood Transit Link, the C-Link). Route 1 operates on a 90-minute cycle, while Route 2 and the C-Link operate hourly.

Wasaga Beach Transit operates seven days per week as follows:

- Monday to Saturday – 7:00 AM to 9:00 PM
- Sundays and Holidays – 7:00 AM to 7:00 PM

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The C-Link operates as follows:

- Monday to Saturday – 6:00 AM to 8:00 PM
- Sundays (no holidays) – 7:00 AM to 10:00 AM and 3:00 PM to 8:00 PM

In addition to the Wasaga Beach and Collingwood Transit services, the Town of Clearview funds the operation of a bus service between Stayner and Wasaga beach Superstore, where all routes connect.

The nearest bus stop to the subject development is located at the intersection of Zoo Park Road / River Road West (i.e., Route 2), which is located about 2.0 km to the north of the south site. The *Town of Wasaga Beach Transit Study and Operations Review* (May 2018) recommends that a benchmark of 400 m walk distance to a bus stop, which represents a 5-minute walk when designing future bus stops. The Town's *Transit Study* identifies a potential re-routing of Route 2 to travel along Golf Course Road, between River Road West and 2263 Klondike Park Road, which will therefore run immediately adjacent to the proposed Marlwood Subdivision.

7.0 Conclusions and Recommendations

This Traffic Impact Study has reviewed the traffic impacts of developing a residential development in the Town of Wasaga Beach. Impacts have been assessed at the Proposed Development Access intersection on Golf Course Road, as well as along this road and internal to the subdivision. Traffic impacts have been assessed for horizon years 2021, 2026 and 2031. Forecasted traffic volumes have also included growth in background traffic in this area.

Based on the analysis completed, the following primary conclusions and recommendations are made in this study:

- The proposed developments are forecast to generate about 54 vph in the AM peak hour and 68 vph in the PM peak hour.
- The intersection of Golf Course Road/Proposed Development Access is forecast to operate with an excellent LOS and short delays through horizon year 2031. Therefore, no operational improvements are required to accommodate the proposed development.
- A left-turn lane is not warranted at the access intersection through horizon year 2031.
- A right-turn lane is not warranted at the access intersection through horizon year 2031.
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- It is proposed that the local roads internal to the subdivision will be designed to the Town's urban standard, including the provision of sidewalks along one side of the road.
- The Town's planning has identified a potential to adjust the existing transit 'Route 2' that would provide transit service immediately adjacent to the subject development.

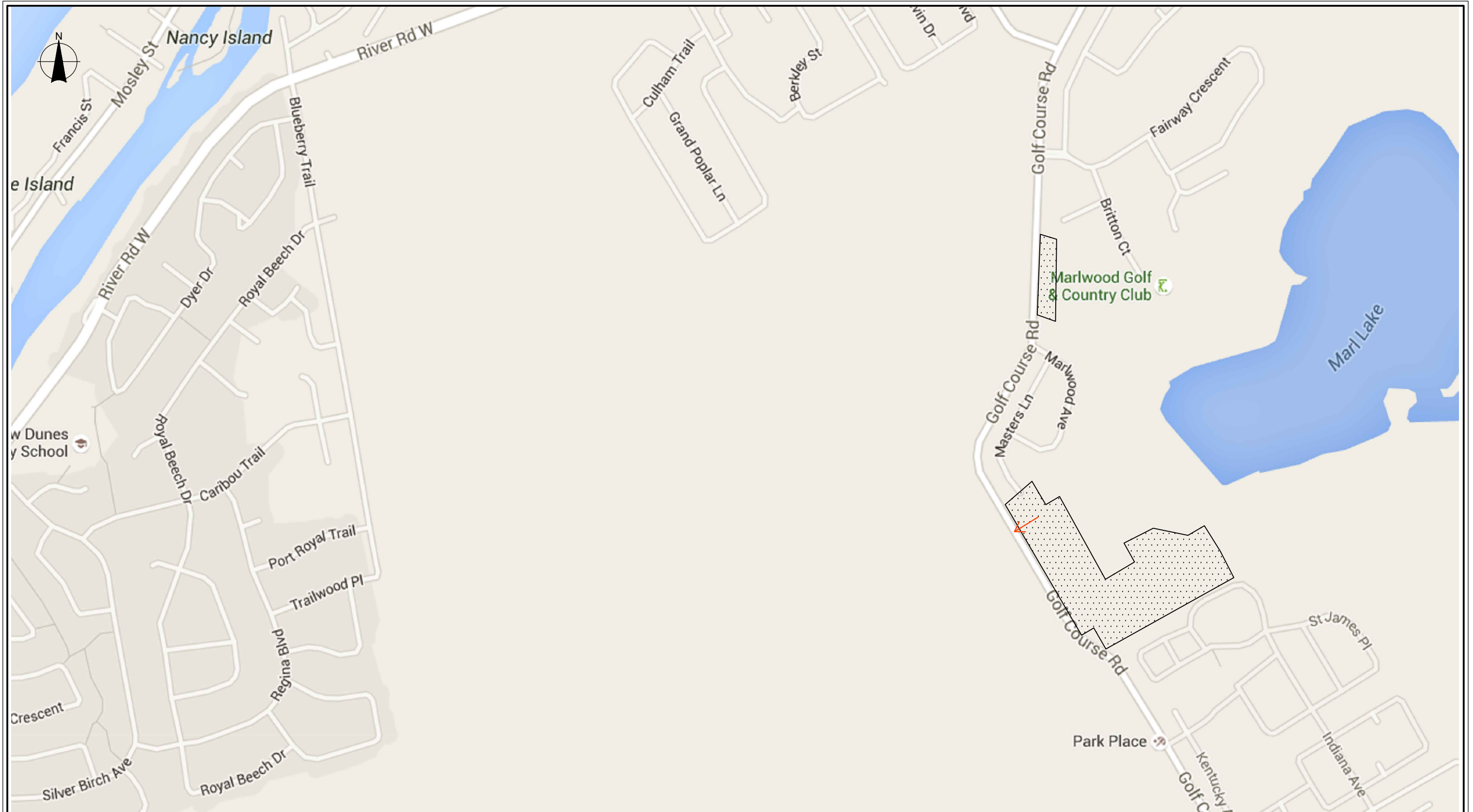


BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix A

Figures



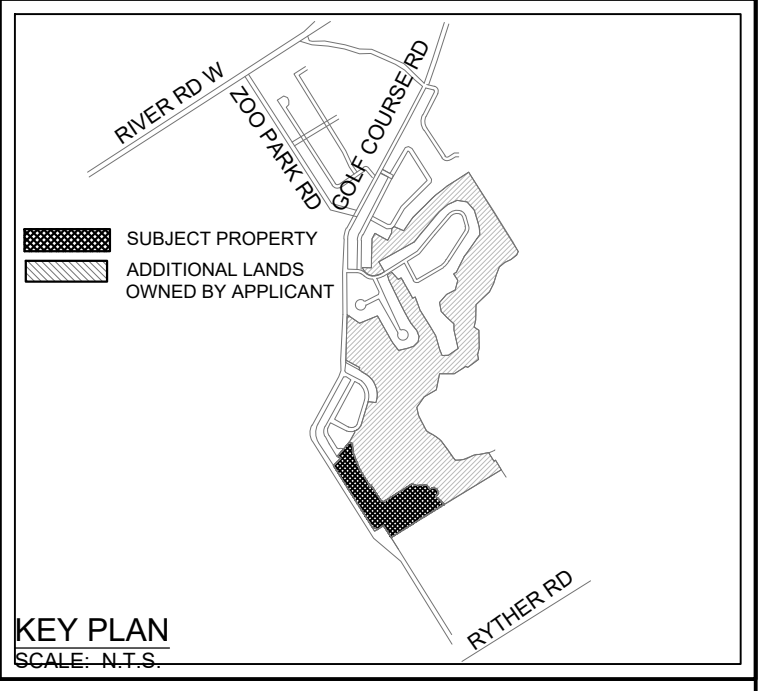
LEGEND

- DEVELOPMENT SITE

- APPROXIMATE PROPOSED DEVELOPMENT ACCESS LOCATION

| | | | | | |
|--------------------------|--|--------------|----------------|--|-----------|
| BURNSIDE | | Figure Title | | MARLWOOD SUBDIVISION TRAFFIC IMPACT STUDY SITE LOCATION | |
| | | Client | Drawn | | Checked |
| TPC MARLWOOD INC. | | JBL | HC | FEBRUARY 2020 | A1 |
| | | Scale | Project No. | | |
| | | NTS | 300037815.1000 | | |

| STATISTICS | | |
|-----------------------------|----------------|--------|
| PROPOSED LAND USE | LOT/BLOCK AREA | |
| SINGLE DETACHED RESIDENTIAL | 1-51 | 3.56ha |
| PROPOSED ROADS (644 LIN.M.) | | 1.19ha |
| OPEN SPACE & RESERVES | 53, 55-62 | 2.00ha |
| STORMWATER MANAGEMENT | 52 | 0.57ha |
| PUMPING STATION | 54 | 0.11ha |
| TOTAL AREA | | 7.43ha |



ADDITIONAL INFORMATION
 As required under Section 51(17) of the Planning Act.
 a), b), e), f), g) & j) - on plan
 c) - on key plan
 d) - see statistics
 h) - piped water to be installed by developer
 i) - sandy
 k) - all municipal services to be made available
 l) - nil

APPROVED SUBJECT TO CONDITIONS IN ACCORDANCE WITH SECTION 51(31) OF THE PLANNING ACT, R.S.O. CAP. P.13, AS AMENDED.
 THIS _____ DAY OF _____
 DIRECTOR OF PLANNING, DEVELOPMENT AND TOURISM,
 COUNTY OF SIMCOE

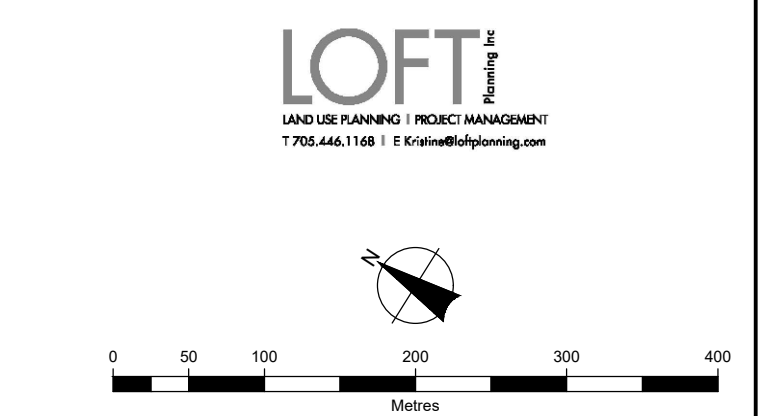
OWNER'S CERTIFICATE
 I authorize LOFT Planning Inc. to prepare and submit this Plan of Subdivision for approval.

TPC MARLWOOD INC. _____ date _____
 A.S.O.

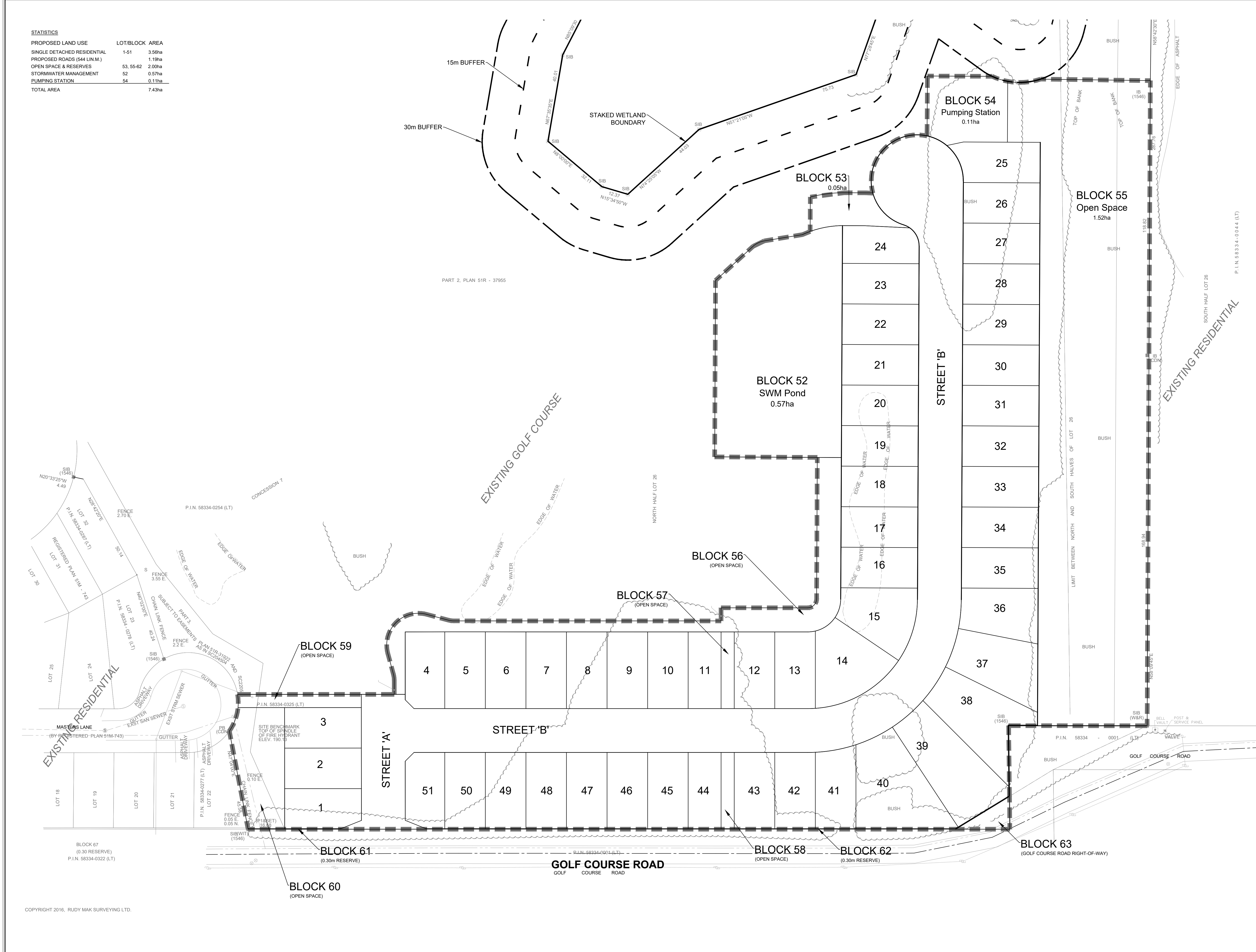
SURVEYOR'S CERTIFICATE
 I hereby certify that the boundaries of the lands being subdivided and their relationship to the adjacent lands are accurately and correctly shown.

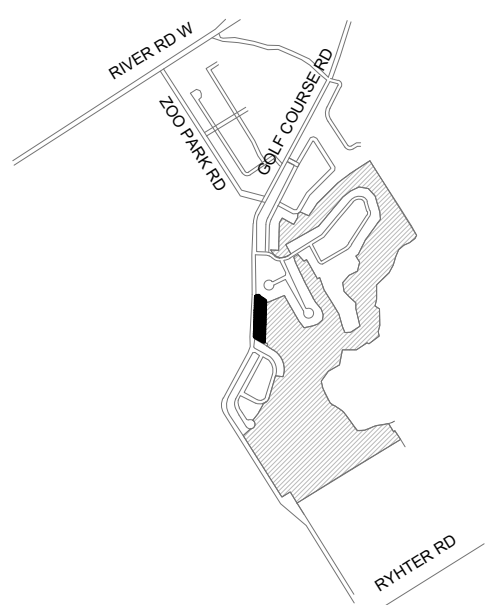
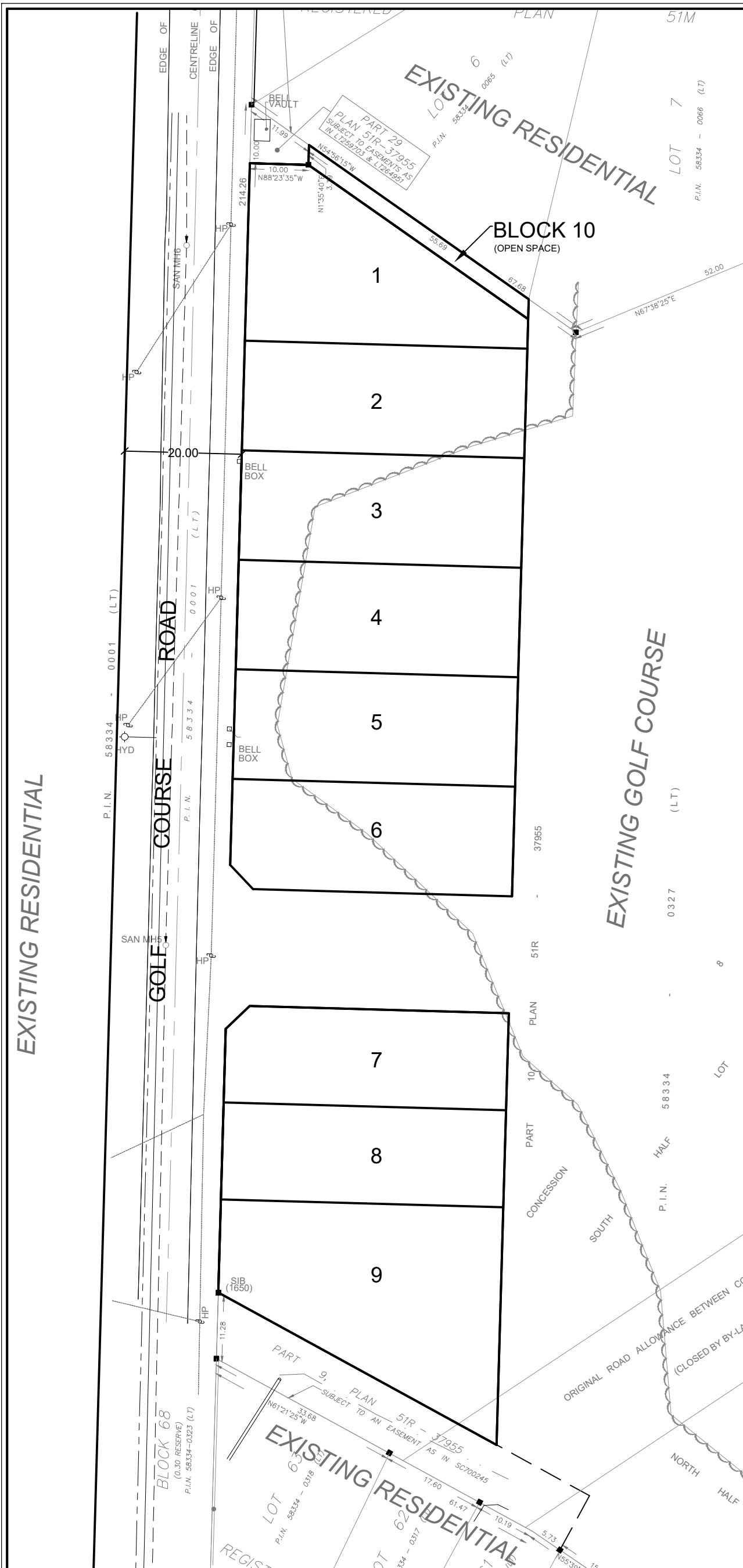
RUDY MAK SURVEYING LTD. _____ date _____

LEGEND
 ■■■■ PROPERTY LINE
 - - - - LOT LINE



BURNSIDE
 Client: **TPC MARLWOOD INC.**
 Figure Title: **MARLWOOD MASTER'S LANE EXTENSION PRELIMINARY DRAFT PLAN**
 Drawn: EDT, Checked: JO, Date: 20/01/14, Figure No.: **A2 S**
 Scale: 1:750, Project No.: 300037815

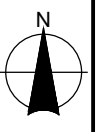




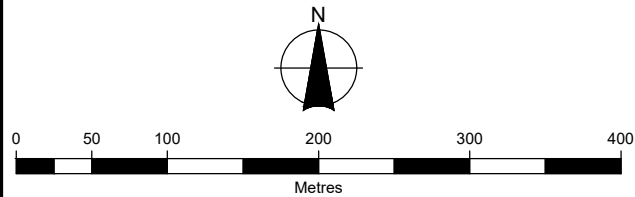
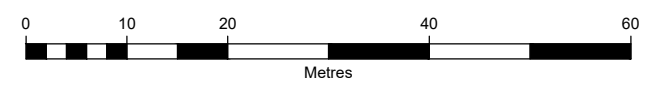
KEY PLAN
N.T.S.

SUBJECT PROPERTY

ADDITIONAL LANDS OWNED BY APPLICANT



REFER TO DRAWINGS FROM RUDY MAK SURVEYING LTD.
Dated: January 14, 2020

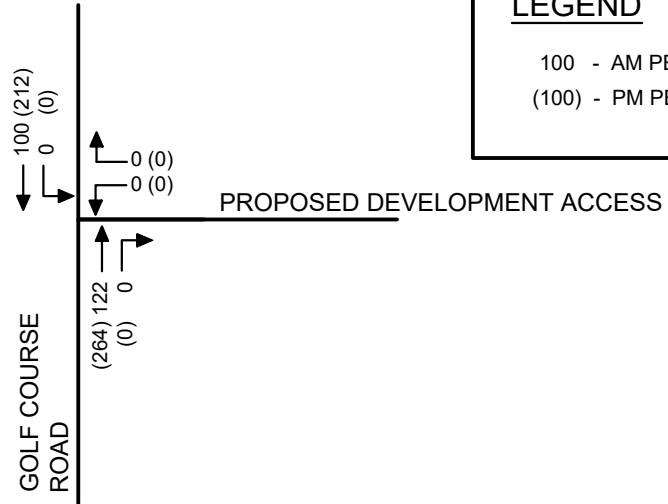


Client
TPC MARLWOOD INC.

| | | | |
|--|--------------------------|--------------------|---------------------------|
| Figure Title MARLWOOD (9 LOTS) PRELIMINARY DRAFT PLAN | | | |
| Drawn KAG | Checked EDT | Date 2020/02/03 | Figure No. A2 N |
| Scale 1:750 | Project No. 300039201 | | |



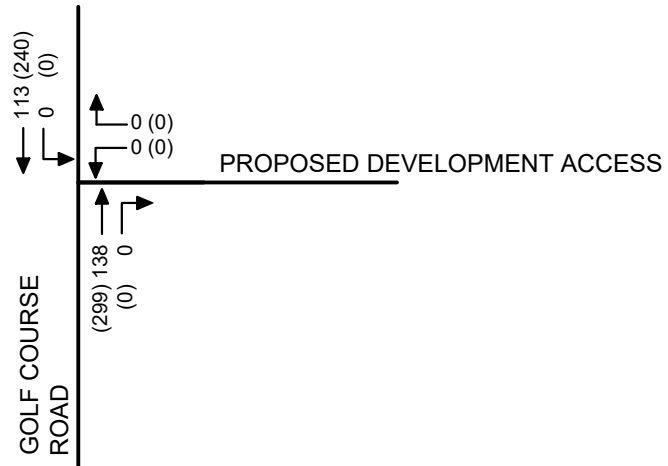
2021 BACKGROUND TRAFFIC



LEGEND

- 100 - AM PEAK HOUR (vph)
- (100) - PM PEAK HOUR (vph)

2026 BACKGROUND TRAFFIC



2031 BACKGROUND TRAFFIC

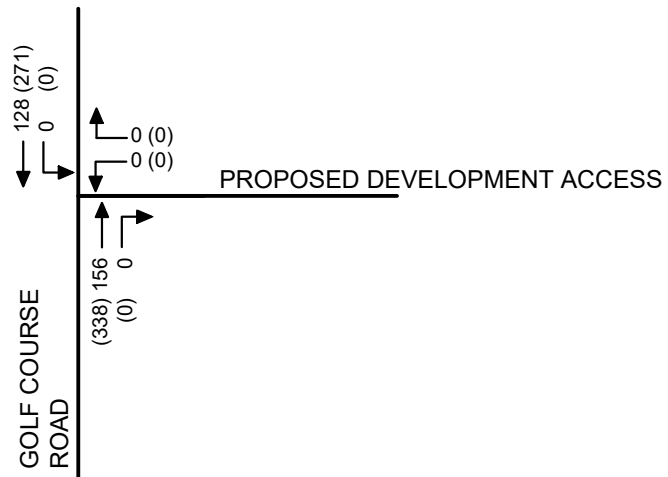


Figure Title

**MARLWOOD SUBDIVISION
TRAFFIC IMPACT STUDY**
BACKGROUND TRAFFIC 2021, 2026, 2031

Client

TPC MARLWOOD INC.

Drawn

JBL

Scale

NTS

Checked

HC

Date

FEBRUARY 2020

Project No.

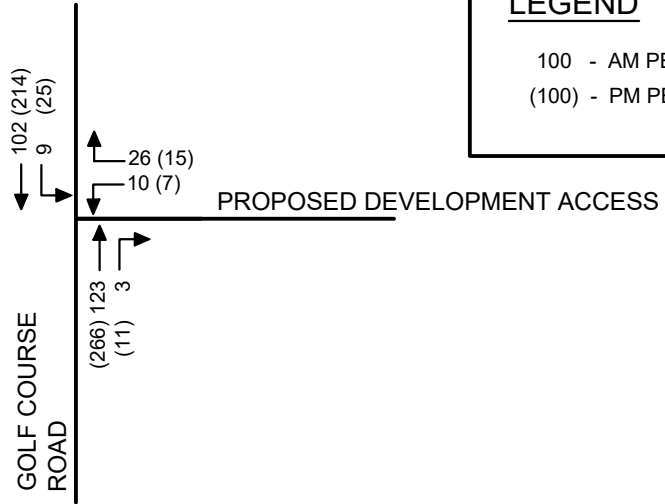
300037815.1000

Figure No.

A3



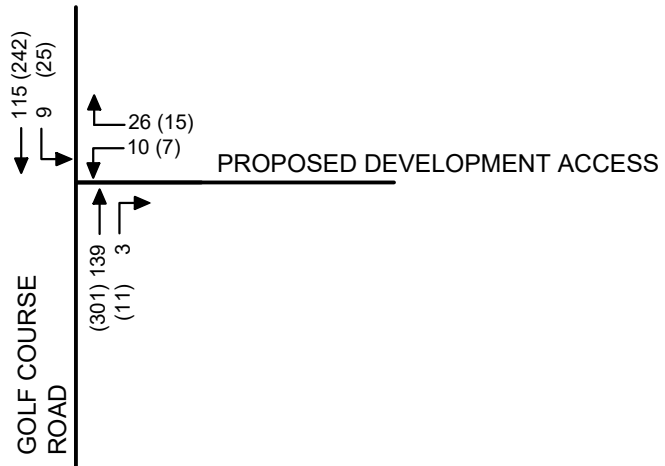
2021 TOTAL TRAFFIC



LEGEND

- 100 - AM PEAK HOUR (vph)
- (100) - PM PEAK HOUR (vph)

2026 TOTAL TRAFFIC



2031 TOTAL TRAFFIC

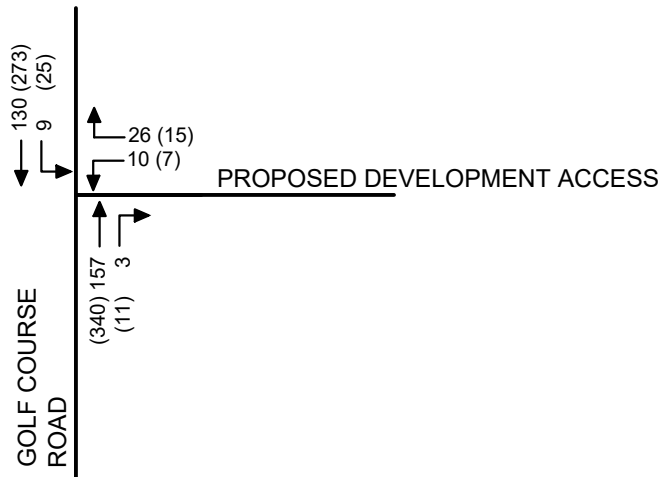


Figure Title

**MARLWOOD SUBDIVISION
TRAFFIC IMPACT STUDY**

TOTAL TRAFFIC 2021, 2026, 2031

Client

TPC MARLWOOD INC.

Drawn

JBL

Scale

NTS

Checked

HC

Date

FEBRUARY 2020

Project No.

300037815.1000

Figure No.

A4



BURNSIDE

[THE DIFFERENCE IS OUR PEOPLE]

Appendix B

Traffic Operations (Synchro)

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2021 Total AM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 10 | 26 | 123 | 3 | 9 | 102 |
| Future Volume (Veh/h) | 10 | 26 | 123 | 3 | 9 | 102 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 11 | 28 | 134 | 3 | 10 | 111 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 266 | 136 | | | 137 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 266 | 136 | | | 137 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 97 | | | 99 | |
| cM capacity (veh/h) | 718 | 913 | | | 1447 | |
| Direction, Lane # | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 39 | 137 | 121 | | | |
| Volume Left | 11 | 0 | 10 | | | |
| Volume Right | 28 | 3 | 0 | | | |
| cSH | 848 | 1700 | 1447 | | | |
| Volume to Capacity | 0.05 | 0.08 | 0.01 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 0.2 | | | |
| Control Delay (s) | 9.4 | 0.0 | 0.7 | | | |
| Lane LOS | A | | A | | | |
| Approach Delay (s) | 9.4 | 0.0 | 0.7 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 1.5 | | | |
| Intersection Capacity Utilization | | | 22.8% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2021 Total PM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|-------------|-------------|-------------|------|----------------------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 7 | 15 | 266 | 11 | 25 | 214 |
| Future Volume (Veh/h) | 7 | 15 | 266 | 11 | 25 | 214 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 8 | 16 | 289 | 12 | 27 | 233 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 582 | 295 | | | 301 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 582 | 295 | | | 301 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 98 | | | 98 | |
| cM capacity (veh/h) | 465 | 744 | | | 1260 | |
| Direction, Lane # | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 24 | 301 | 260 | | | |
| Volume Left | 8 | 0 | 27 | | | |
| Volume Right | 16 | 12 | 0 | | | |
| cSH | 620 | 1700 | 1260 | | | |
| Volume to Capacity | 0.04 | 0.18 | 0.02 | | | |
| Queue Length 95th (m) | 0.9 | 0.0 | 0.5 | | | |
| Control Delay (s) | 11.0 | 0.0 | 1.0 | | | |
| Lane LOS | B | | A | | | |
| Approach Delay (s) | 11.0 | 0.0 | 1.0 | | | |
| Approach LOS | B | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.9 | | | |
| Intersection Capacity Utilization | | | 40.6% | | ICU Level of Service | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2026 Total AM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 10 | 26 | 139 | 3 | 9 | 115 |
| Future Volume (Veh/h) | 10 | 26 | 139 | 3 | 9 | 115 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 11 | 28 | 151 | 3 | 10 | 125 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 298 | 152 | | | 154 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 298 | 152 | | | 154 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 97 | | | 99 | |
| cM capacity (veh/h) | 689 | 894 | | | 1426 | |
| Direction, Lane # | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 39 | 154 | 135 | | | |
| Volume Left | 11 | 0 | 10 | | | |
| Volume Right | 28 | 3 | 0 | | | |
| cSH | 825 | 1700 | 1426 | | | |
| Volume to Capacity | 0.05 | 0.09 | 0.01 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 0.2 | | | |
| Control Delay (s) | 9.6 | 0.0 | 0.6 | | | |
| Lane LOS | A | | A | | | |
| Approach Delay (s) | 9.6 | 0.0 | 0.6 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 1.4 | | | |
| Intersection Capacity Utilization | | 23.5% | | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2026 Total PM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|------|-------|------|----------------------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 7 | 15 | 301 | 11 | 25 | 242 |
| Future Volume (Veh/h) | 7 | 15 | 301 | 11 | 25 | 242 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 8 | 16 | 327 | 12 | 27 | 263 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 650 | 333 | | | 339 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 650 | 333 | | | 339 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 98 | | | 98 | |
| cM capacity (veh/h) | 424 | 709 | | | 1220 | |
| Direction, Lane # | | | | | | |
| | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 24 | 339 | 290 | | | |
| Volume Left | 8 | 0 | 27 | | | |
| Volume Right | 16 | 12 | 0 | | | |
| cSH | 579 | 1700 | 1220 | | | |
| Volume to Capacity | 0.04 | 0.20 | 0.02 | | | |
| Queue Length 95th (m) | 1.0 | 0.0 | 0.5 | | | |
| Control Delay (s) | 11.5 | 0.0 | 0.9 | | | |
| Lane LOS | B | | A | | | |
| Approach Delay (s) | 11.5 | 0.0 | 0.9 | | | |
| Approach LOS | B | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.8 | | | |
| Intersection Capacity Utilization | | 43.5% | | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2031 Total AM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 10 | 26 | 157 | 3 | 9 | 130 |
| Future Volume (Veh/h) | 10 | 26 | 157 | 3 | 9 | 130 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 11 | 28 | 171 | 3 | 10 | 141 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | | None | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 334 | 172 | | | 174 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 334 | 172 | | | 174 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 97 | | | 99 | |
| cM capacity (veh/h) | 657 | 871 | | | 1403 | |
| Direction, Lane # | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 39 | 174 | 151 | | | |
| Volume Left | 11 | 0 | 10 | | | |
| Volume Right | 28 | 3 | 0 | | | |
| cSH | 798 | 1700 | 1403 | | | |
| Volume to Capacity | 0.05 | 0.10 | 0.01 | | | |
| Queue Length 95th (m) | 1.2 | 0.0 | 0.2 | | | |
| Control Delay (s) | 9.7 | 0.0 | 0.6 | | | |
| Lane LOS | A | | A | | | |
| Approach Delay (s) | 9.7 | 0.0 | 0.6 | | | |
| Approach LOS | A | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 1.3 | | | |
| Intersection Capacity Utilization | | 24.2% | | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |

HCM Unsignalized Intersection Capacity Analysis
 1: Golf Course Road & Proposed Development Access

2031 Total PM Traffic
 11/19/2019



| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|-----------------------------------|-------------|-------------|-------------|----------------------|------|------|
| Lane Configurations | | | | | | |
| Traffic Volume (veh/h) | 7 | 15 | 340 | 11 | 25 | 273 |
| Future Volume (Veh/h) | 7 | 15 | 340 | 11 | 25 | 273 |
| Sign Control | Stop | | Free | | Free | |
| Grade | 0% | | 0% | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Hourly flow rate (vph) | 8 | 16 | 370 | 12 | 27 | 297 |
| Pedestrians | | | | | | |
| Lane Width (m) | | | | | | |
| Walking Speed (m/s) | | | | | | |
| Percent Blockage | | | | | | |
| Right turn flare (veh) | | | | | | |
| Median type | | | None | None | | |
| Median storage (veh) | | | | | | |
| Upstream signal (m) | | | | | | |
| pX, platoon unblocked | | | | | | |
| vC, conflicting volume | 727 | 376 | | | 382 | |
| vC1, stage 1 conf vol | | | | | | |
| vC2, stage 2 conf vol | | | | | | |
| vCu, unblocked vol | 727 | 376 | | | 382 | |
| tC, single (s) | 6.4 | 6.2 | | | 4.1 | |
| tC, 2 stage (s) | | | | | | |
| tF (s) | 3.5 | 3.3 | | | 2.2 | |
| p0 queue free % | 98 | 98 | | | 98 | |
| cM capacity (veh/h) | 382 | 670 | | | 1176 | |
| Direction, Lane # | WB 1 | NB 1 | SB 1 | | | |
| Volume Total | 24 | 382 | 324 | | | |
| Volume Left | 8 | 0 | 27 | | | |
| Volume Right | 16 | 12 | 0 | | | |
| cSH | 536 | 1700 | 1176 | | | |
| Volume to Capacity | 0.04 | 0.22 | 0.02 | | | |
| Queue Length 95th (m) | 1.1 | 0.0 | 0.5 | | | |
| Control Delay (s) | 12.0 | 0.0 | 0.9 | | | |
| Lane LOS | B | | A | | | |
| Approach Delay (s) | 12.0 | 0.0 | 0.9 | | | |
| Approach LOS | B | | | | | |
| Intersection Summary | | | | | | |
| Average Delay | | | 0.8 | | | |
| Intersection Capacity Utilization | | | 45.1% | ICU Level of Service | | A |
| Analysis Period (min) | | | 15 | | | |