



SHADOW STUDY

FOR

**1725 BARBERTOWN ROAD
MISSISSAUGA, ON.**

File Number: OZ 17/002 W6 & T-M17001 W6

Date: March 27 2019

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	- Complete set of Shadow Modeling	

1.0 Executive Summary

The shadow study is performed based on geographic location identified by Google Earth and topographic Survey of Part of Lot 1, Concession 4, West of Hurontario Street, Mississauga, The Regional Municipality of Peel by David B. Searles Surveying Ltd. The proposed development at 1725 BARBERTOWN ROAD, MISSISSAUGA comprises with 11 townhouse blocks and a total of 75 townhouse units. The shadow study and access of sunlight assessment are conducted based on three principal criteria.

1. Sunlight access and shadow impact on residential private outdoor amenity spaces
2. Sunlight access and shadow impact on communal outdoor amenity areas, and
3. Building face assessment

To assess shadow impact on the proposed development, June 21, September 21 (similar to March 21, and therefore, criteria for September 21 are deemed to apply to March 21) and December 21 are chosen because of their longer day light period. The shadow modeling is performed in every 1 hour between 1½ hours after sunrise to 1½ hours before sunset to investigate shadow impacts on the proposed development.

The shadow analysis illustrates that on average 60% of the total units in the proposed development have no shadow impact on their private outdoor spaces (rear yards of all towns) on June 21, September 21 and December 21. Only 40% of the proposed development units have partial or minor shadow impact in any two consecutive hours during the study times.

The shadow analysis also provides sun access factor of the communal outdoor amenity areas (2274 sq.m.). The study illustrates that during September 21 and June 21, there are almost no or little shadow impact on the amenity areas. The sun access on December 21 on communal outdoor amenity areas is 54.3% which still allows required sun light on the ground and proper landscape design can utilize these spaces for active recreations.

A comparative analysis of shadow casting on 21st day of June, September and December also suggests that none of the proposed buildings and their front, rear and exterior side yards are affected by shadows of adjacent buildings for any two consecutive hours during the test periods.

The overall shadow analysis suggests that the shadow impact is very minor and can be mitigated by design intervention such as using appropriate colors and building materials, specific roof design considering allowable angular plan that permits more sun access to the affected area and landscape treatments. These can be achieved during the detail design phase of the proposed development.

2.0 Data and Standards Used

Location: 1725 Barbertown Rd., Mississauga, Ontario, Canada

Site Latitude: 43.576023N

Site Longitude: 79.694223W

Astronomic North: Identified by Geo-locating the model using Sketchup Pro 2016

Source of Base Plan:

- 1 Topographic Survey of Part of Lot 1, Concession 4, West of Hurontario Street, the Mississauga, The Regional Municipality of Peel by David B. Searles Surveying Ltd.
- 2 Imported Terrain from Google Earth using municipal address of the property

Mississauga Sun Angle Data: Standards for Shadow studies, Mississauga (2014) retrieved from http://www6.mississauga.ca/onlinemaps/planbldg/UrbanDesign/FinalStandards_ShadowStudies_July2014.pdf

Dates: Shadow studies and analyses are conducted for –

- **June 21**
- **September 21** (similar to March 21, and therefore, criteria for September 21 are deemed to apply to March 21)
- **December 21**

Times: Shadow Studies and Analyses are conducted for –

- 1 Hour intervals from 1½ hours after sunrise to 1½ hours before sunset

Time Zone : Eastern

- Standard Time: UT– 5 hours
- Daylight Time: UT– 4 hours
- Universal Time (UT) is Greenwich Mean Time

3.0 Residential Private Outdoor Amenity Space

Residential private outdoor areas (rear yards of all individual units) are analyzed to assess shadow impact between 1½ hours after sunrise to 1½ hours before sunset on each of the following dates:

- June 21
- September 21 (March 21 shadow patterns are similar)
- December 21

The shadow study is performed in every 1-hour interval between 1½ hours after sunrise to 1½ hours before sunset.

The study shows (Figure 1) that on June 21, 60% of total 75 units of the proposed development has no shadow impact on their private amenity spaces (rear yard) at any point between 1 ½ hour after sunrise to 5:20 PM. Only 40% of the units have partial shadow impact between these hours. Only 27.4% of total number of units are partially impacted in any 2 two consecutive hours at any point between 1 ½ hour after sunrise to 1 ½ hour before sunset.

The study shows (Figure 2) that on September 21, 60% of total 75 units of the proposed development has no shadow impact on their private amenity spaces (rear yard) at any point between 1 ½ hour after sunrise to 1 ½ hour before sunset. Only 40% of the units have partial shadow impact between these hours.

The study shows (Figure 3) that on December 21, 60% of total 75 units of the proposed development has no shadow impact on their private amenity spaces (rear yard) at any point between 1 ½ hour after sunrise to 1 ½ hour before sunset. Only 40% of the units have full shadow impact between these hours.

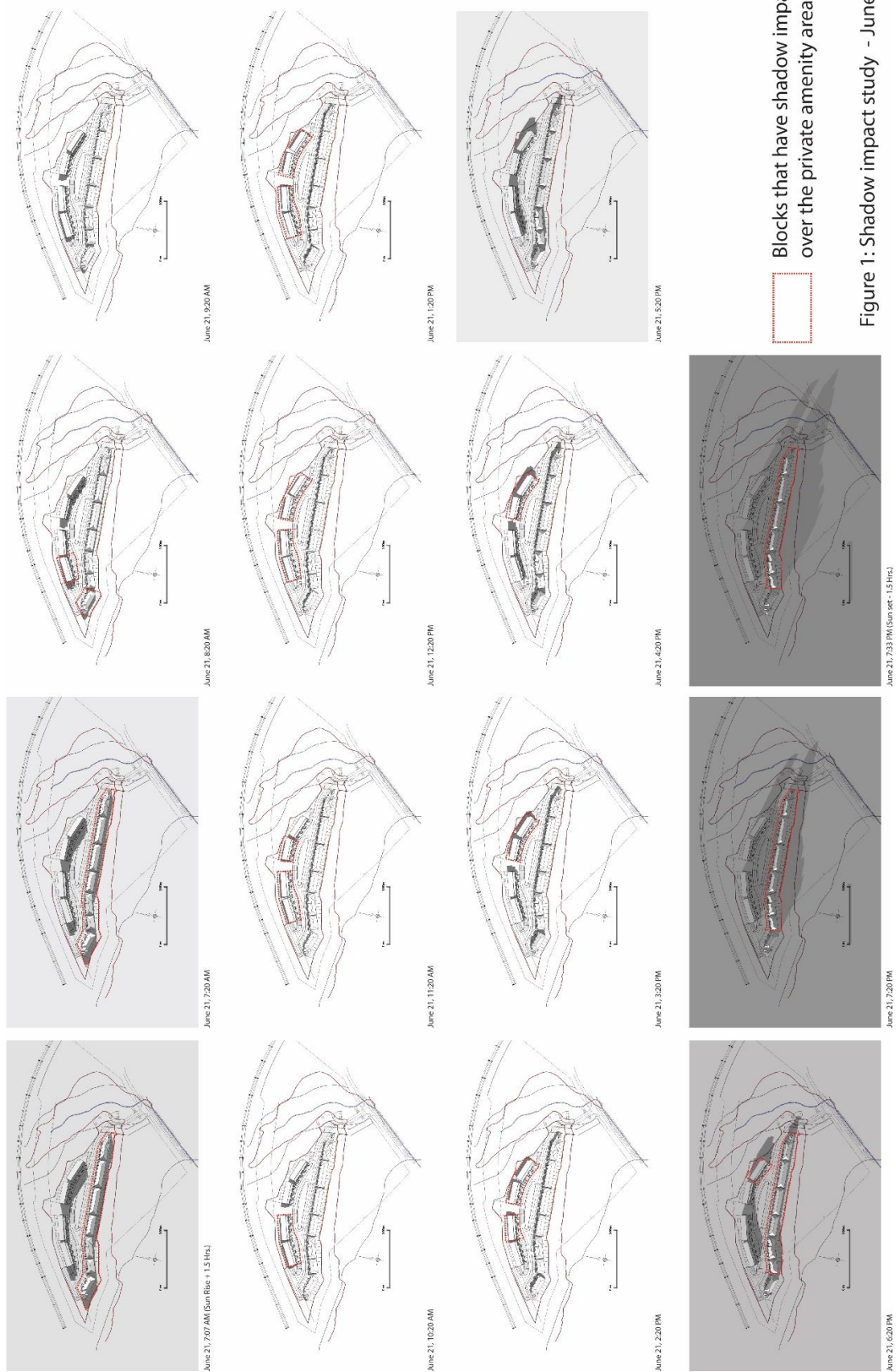


Figure 1: Shadow impact study - June 21

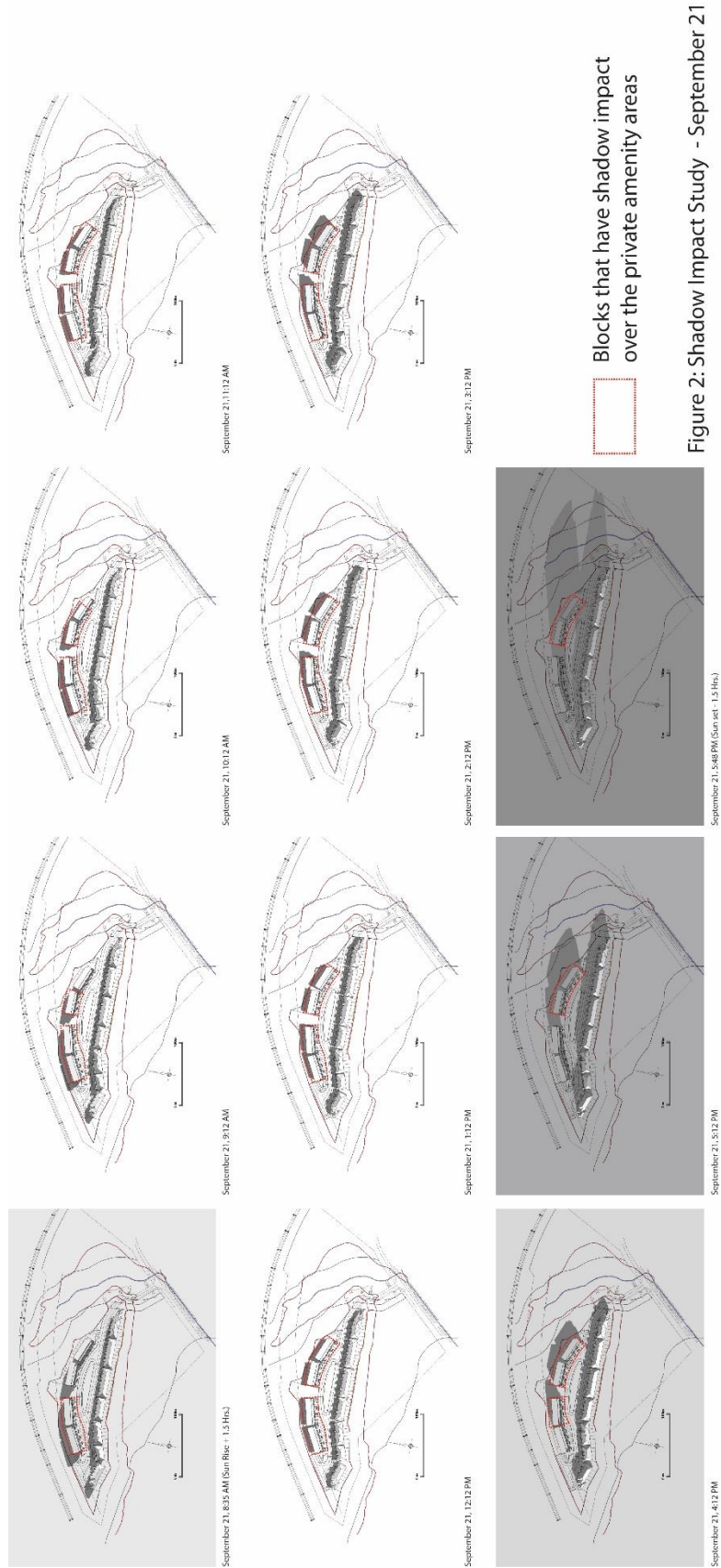


Figure 2: Shadow Impact Study - September 21

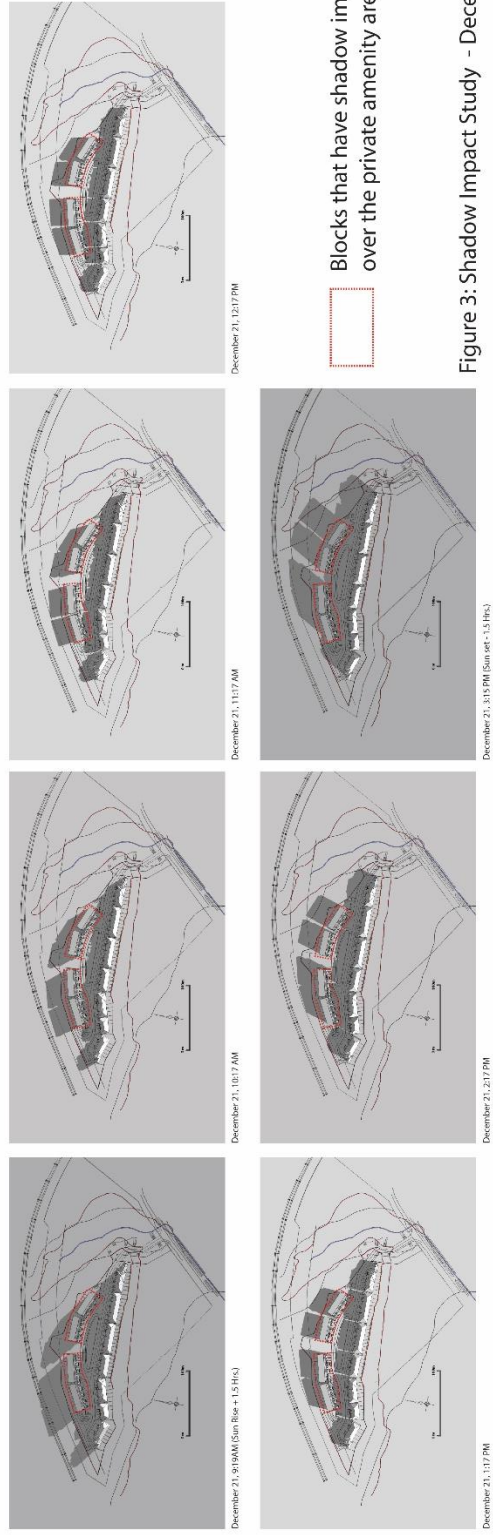


Figure 3: Shadow Impact Study - December 21

4. Communal Outdoor Amenity Areas

The proposed development consists a total amenity area of 2274 square meter which is analyzed (Figure 4-6) to assess overall sunlight access on each of the following dates:

- June 21
- September 21
- December 21

The criteria for the sun access on outdoor amenity areas are met for all study periods. For September 21 and June 21, the “Sun Access Factor” is significantly above the required 50% or 0.5. The Sun Access Factor for December 21 is also met the requirement and scored 54.3% based on the Sun Access Factor calculation. However, it should be noted that the sun angle on December becomes lowest and appearance of sun is rare in most of the days. Given the sun angle of December, the sun access performance on communal outdoor amenity areas is outstanding.

Sun Access Factor Calculation:

June 21:

Total Amenity area (A_T) : 2274 sq.m.

Average Value of the Area in Sunshine (A_s) : 2062.47 sq. m.

Average Value of the Area of shadow impact: 211.53 sq. m.

Sun Access Factor: 91.70% or 0.92

September 21

Total Amenity area (A_T) : 2274 sq.m.

Average Value of the Area in Sunshine (A_s) : 2036.96 sq. m.

Average Value of the Area of shadow impact: 237.04 sq. m.

Sun Access Factor: 89.6% or 0.90

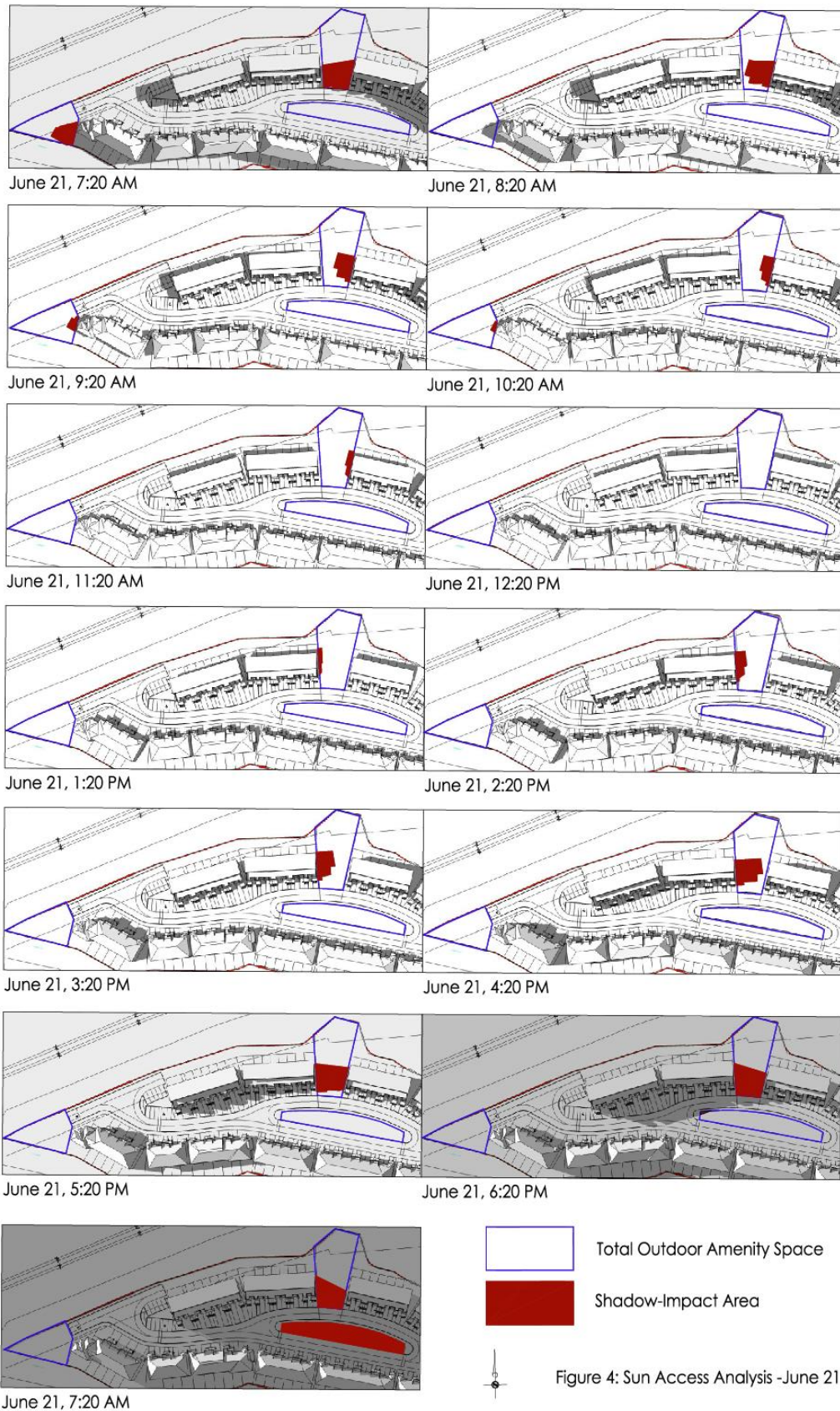
December 21

Total Amenity area (A_T) : 2274 sq.m.

Average Value of the Area in Sunshine (A_s) : 1235 sq. m.

Average Value of the Area of shadow impact: 1039 sq. m.

Sun Access Factor: 54.3% or 0.54



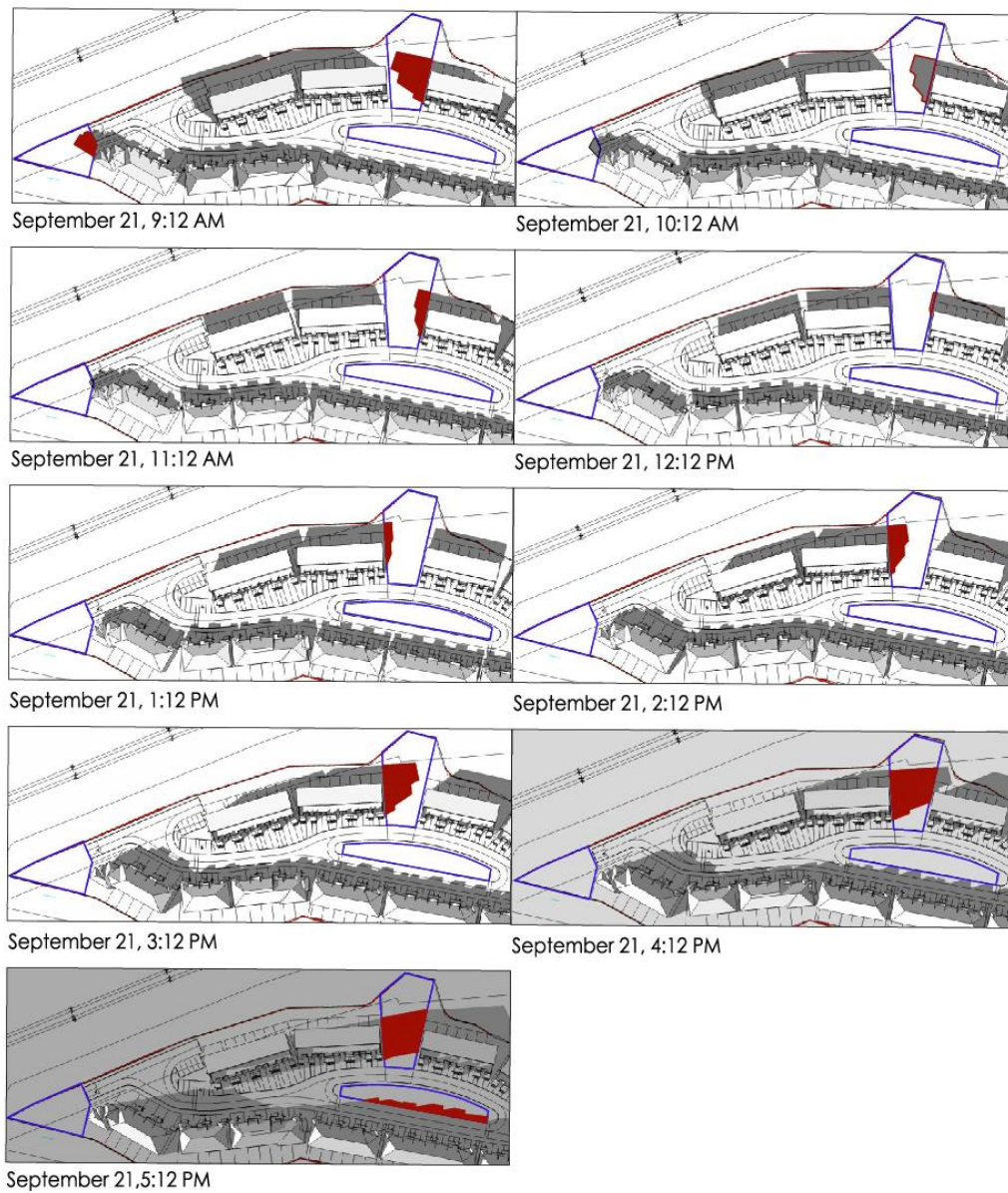


Figure 5: Sun access analysis – September 21

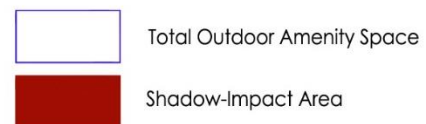
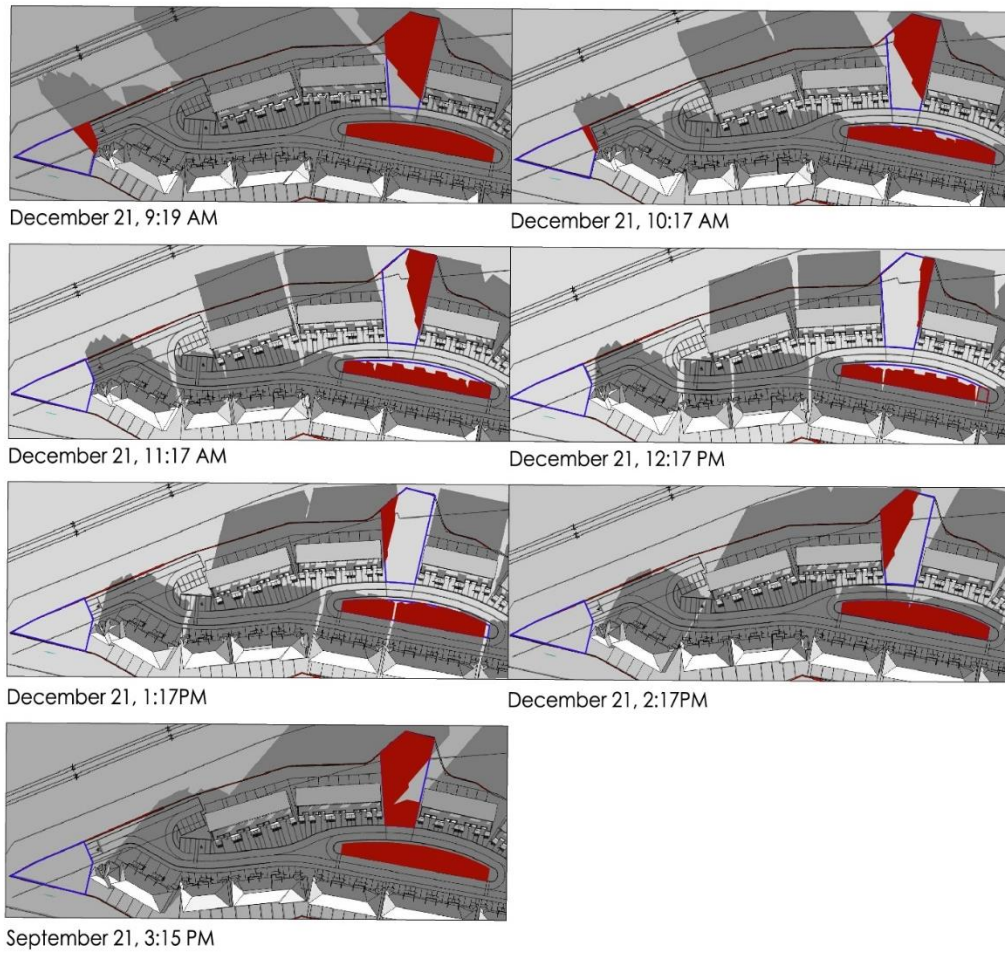
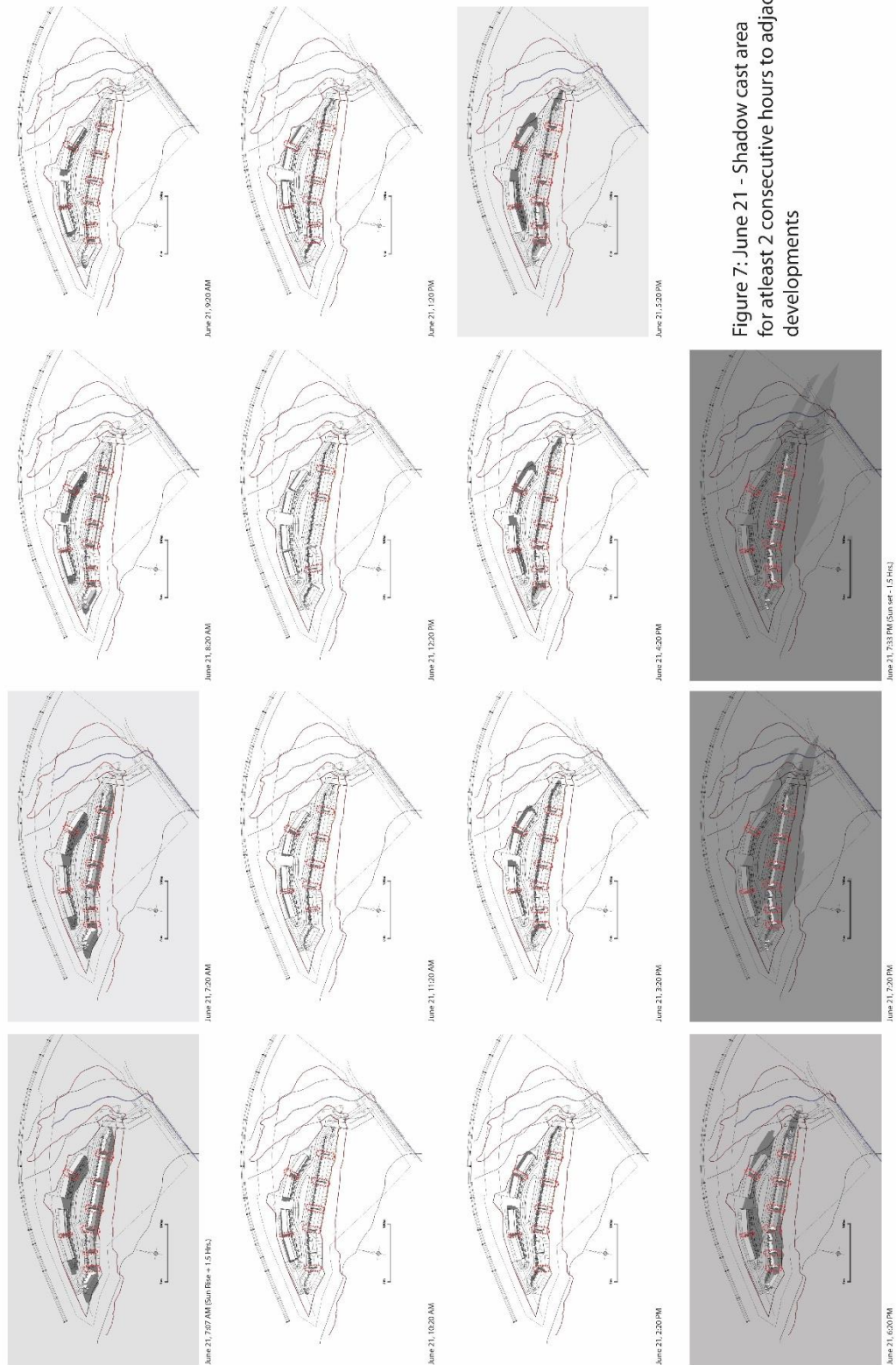


Figure 6: Sun access analysis – December 21

5. Building Faces Assessment

The criterion for this assessment is met if there is no shadow impact for more than two consecutive hourly test times in the “No Impact Zone”—3 meter from the front, rear and exterior side to the adjacent developments. This study has been performed for September 21 and June 21.

Figure 7-8 illustrates a comparative analysis of the shadow impact on front, rear and exterior side yards in every hours between 1½ hours after sunrise to 1½ hours before sunset on June 21 and September 21. All 75 units are 3 storey townhouses. Figure 7-8 clearly illustrates that during the time frame between 1 ½ hours after the sunrise and 1 ½ hours before the sunset on both September 21 and June 21 none of the units or their front, rear and exterior side yards are affected by shadow casting of adjacent properties for more than 2 consecutive hours. The only affected areas are interior side yards but it should be noted that the building separation at side yard is only 2.5 meter in most cases and in such scenario shadow casting on adjacent property is expected.



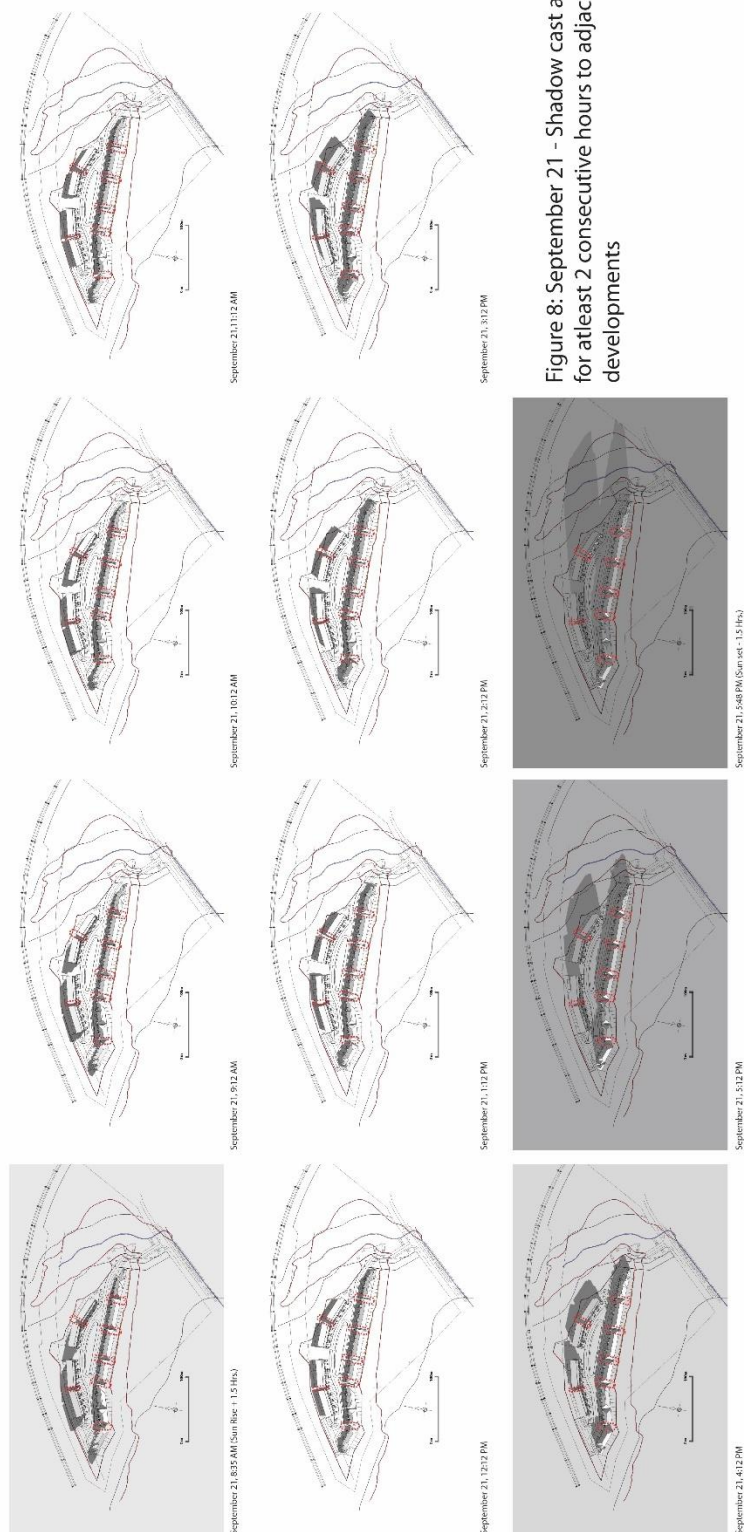


Figure 8: September 21 – Shadow cast area for atleast 2 consecutive hours to adjacent developments

6. Conclusion:

The shadow study and solar access assessment of proposed townhouse blocks illustrate that in most cases the criteria set by the city of Mississauga are met except few cases where it can be mitigated by design interventions and landscape treatments.

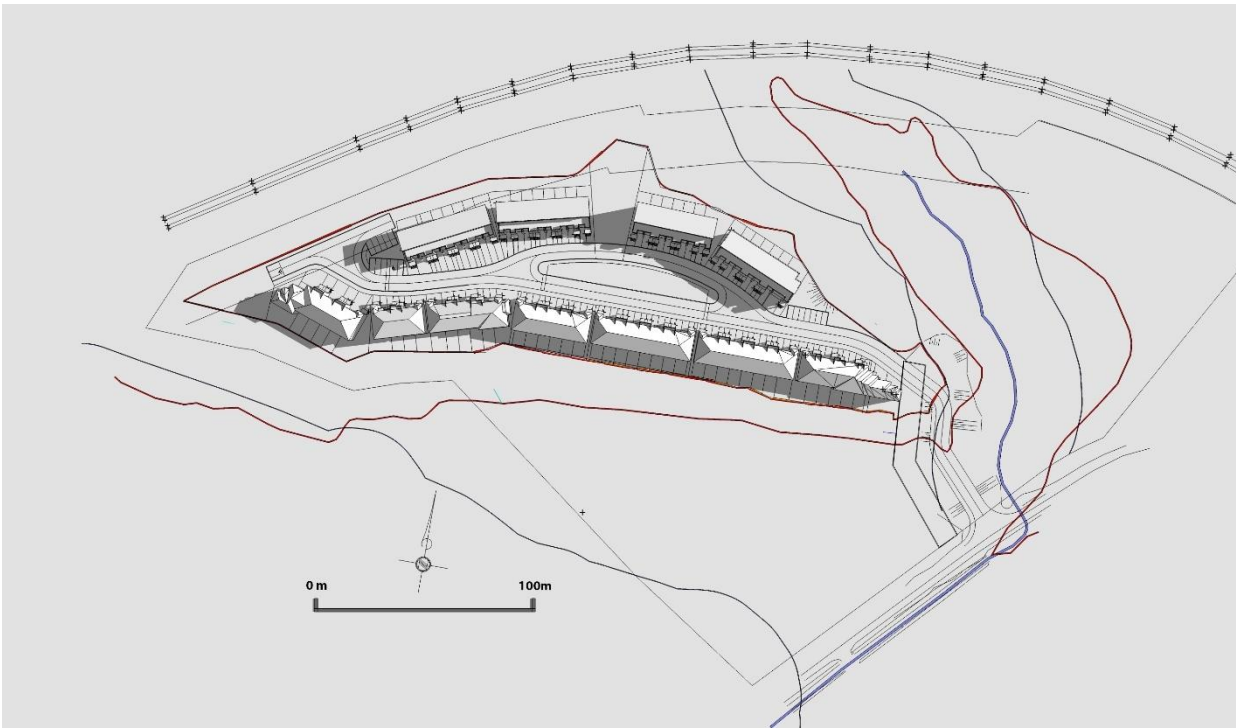
The Private amenity spaces (rear yards) have plenty of solar access – on average 60% townhouse units met the city criteria in June 21, September 21 and December 21 whereas the rest of the units have partial shadow impact for more than two consecutive hours. Design intervention such as use of light-colour building materials and appropriate trees that grow under medium sunlight can be utilized in these areas.

The shadow study investigated solar access on the communal amenity areas and identified that during September 21 (similar to March 21) and June 21 there are plenty of solar access and meet above and beyond the city's requirements. The solar access factor on December is 54.3% which is also significant considering the very low sun angle during this month. This report suggests low-height plants and landscape features to maximize the sun access on these areas.

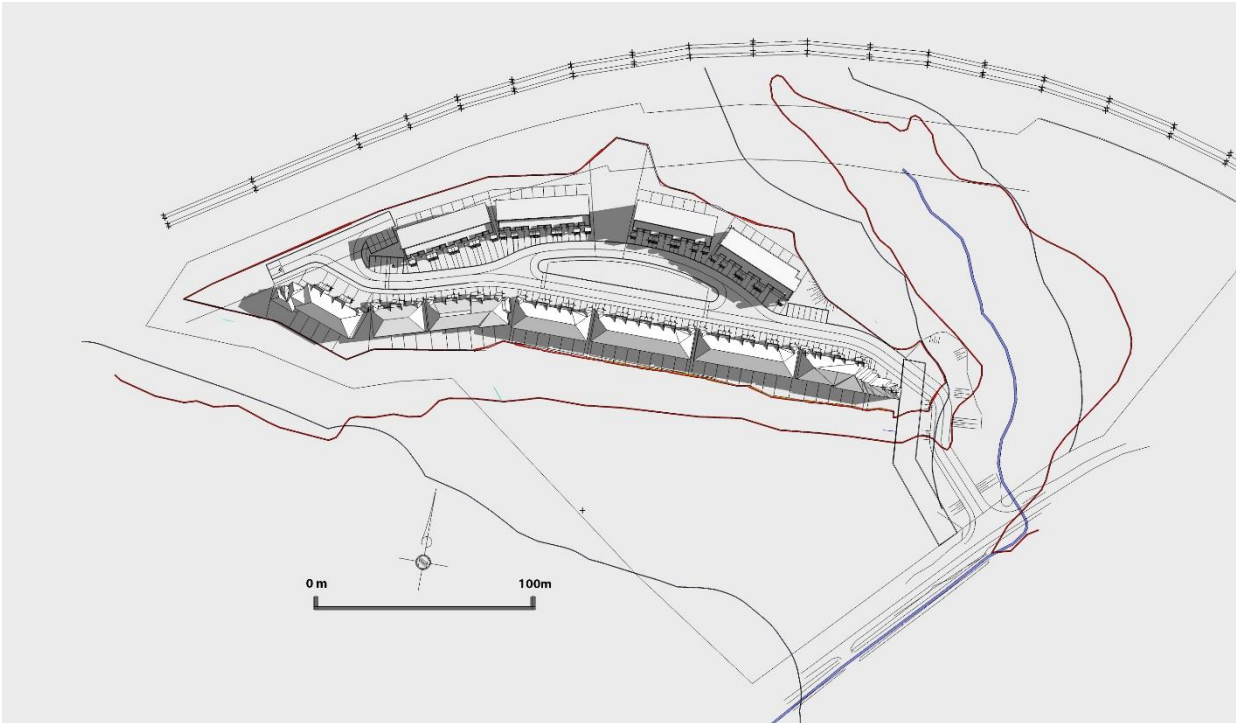
The shadow analysis also identifies very little or no impact on building faces (front, rear and exterior side yards) caused by adjacent buildings that will allow proper utilization of solar energy into the buildings.

Appendix : Shadow Study

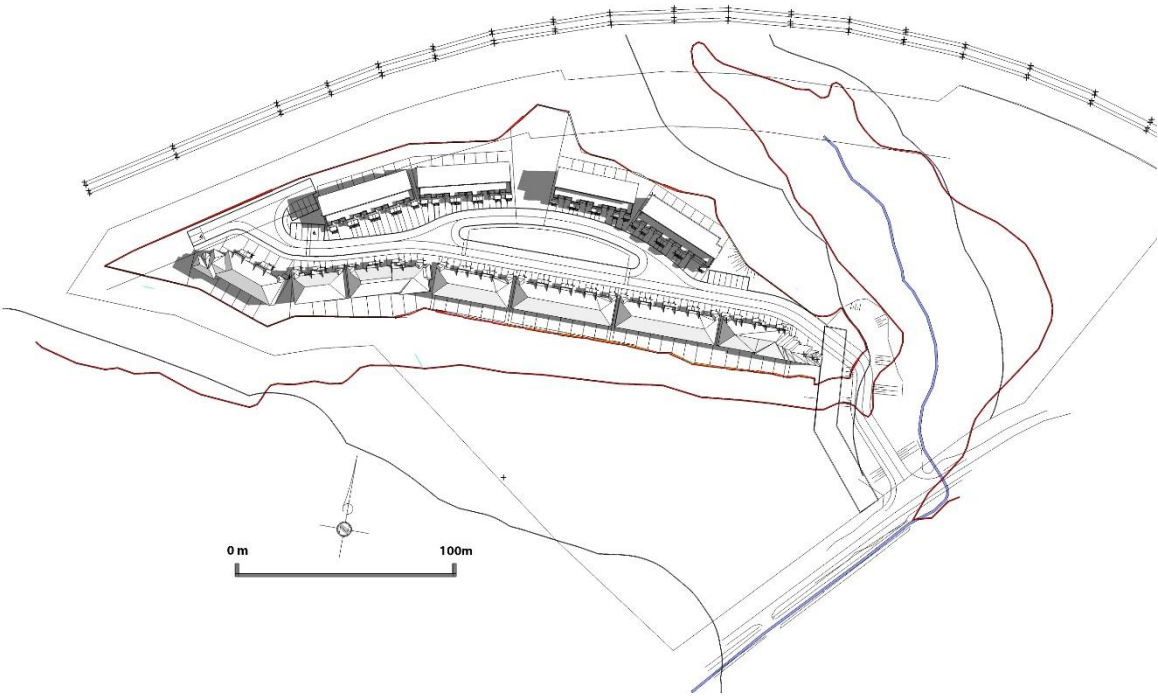
June 21, 7:07 AM (sunrise + 1.5 hrs.)



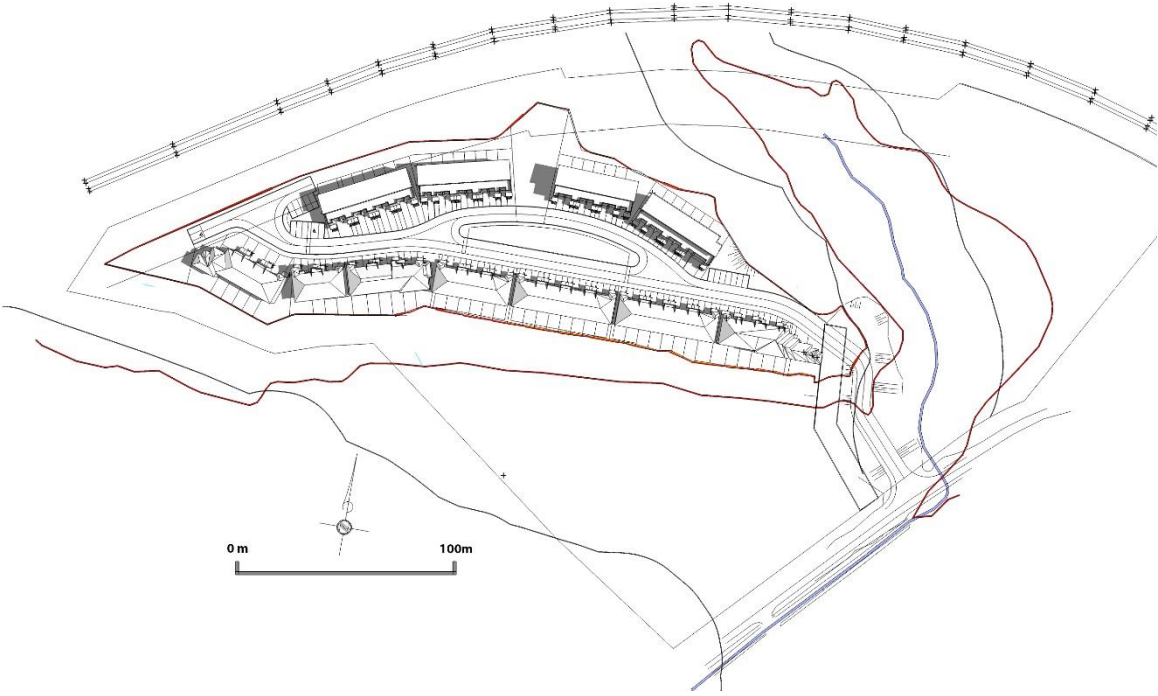
June 21, 7:20 AM



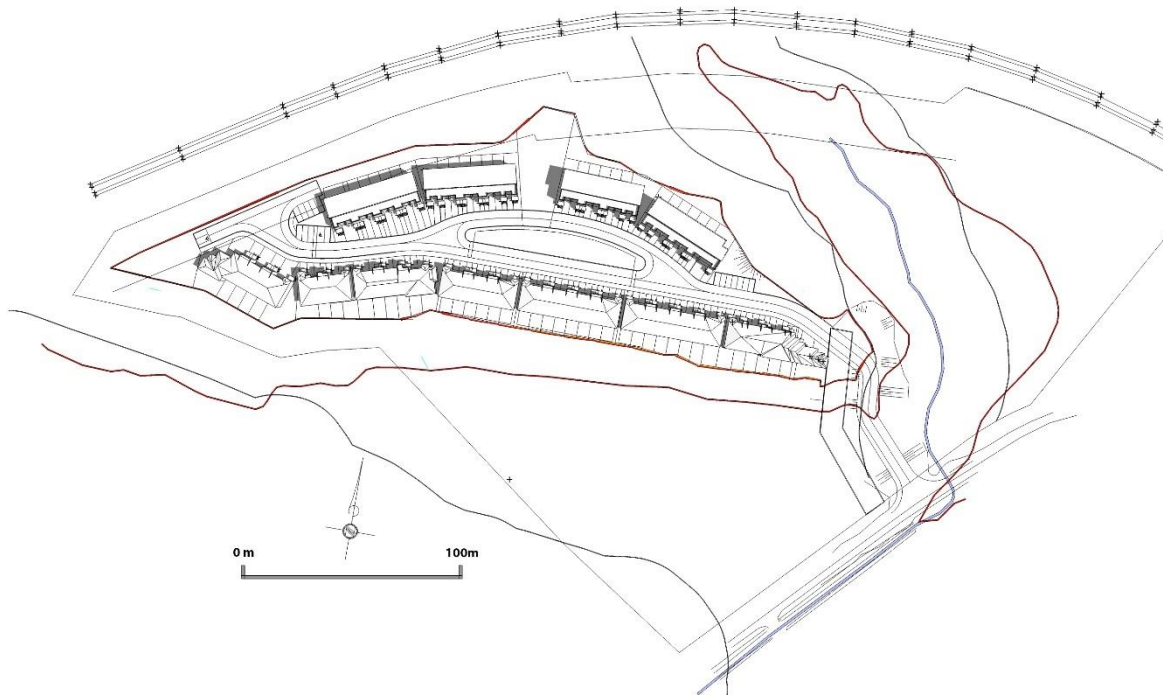
June 21, 8:20 AM



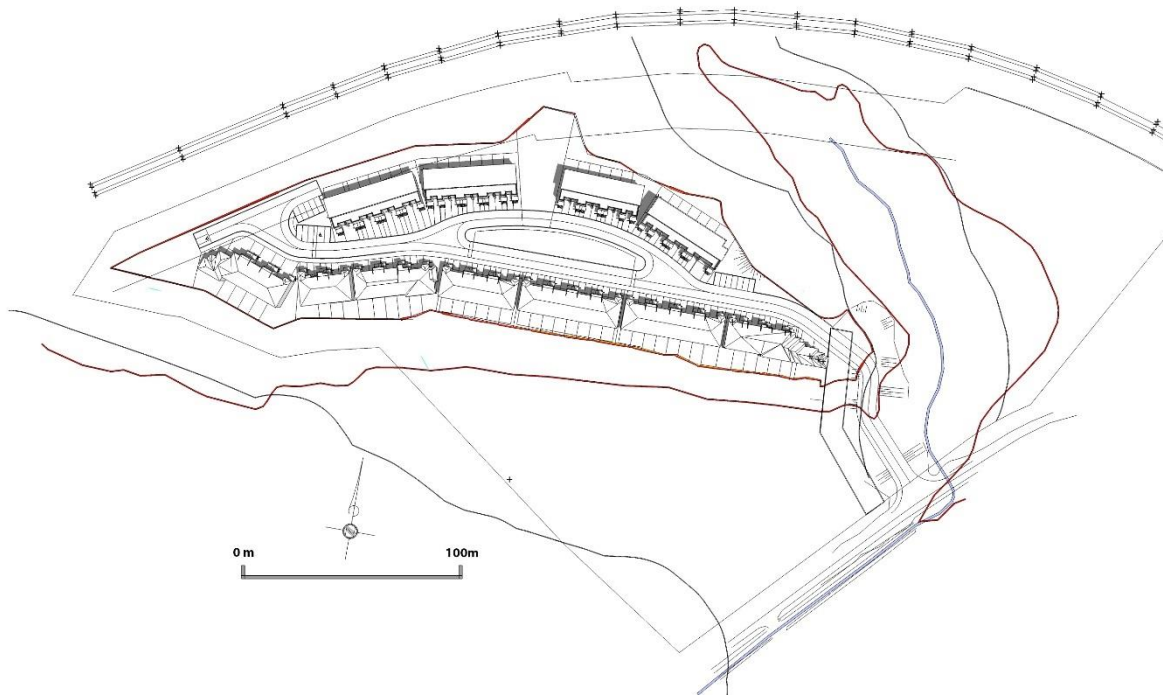
June 21, 9:20 AM



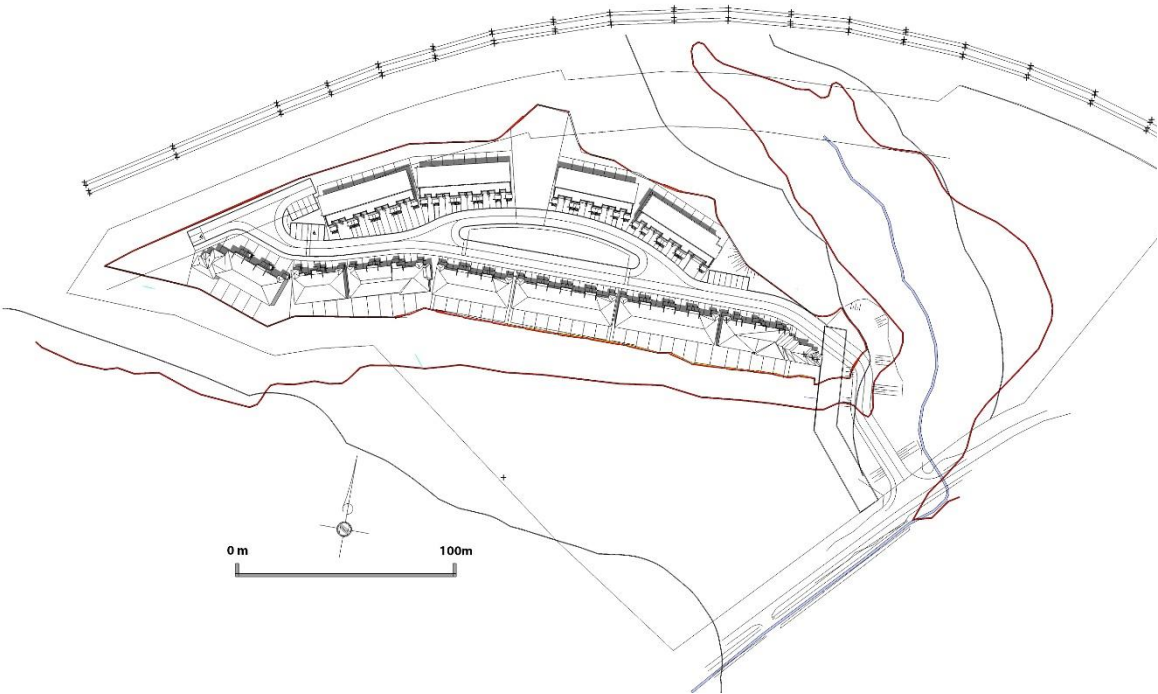
June 21, 10:20 AM



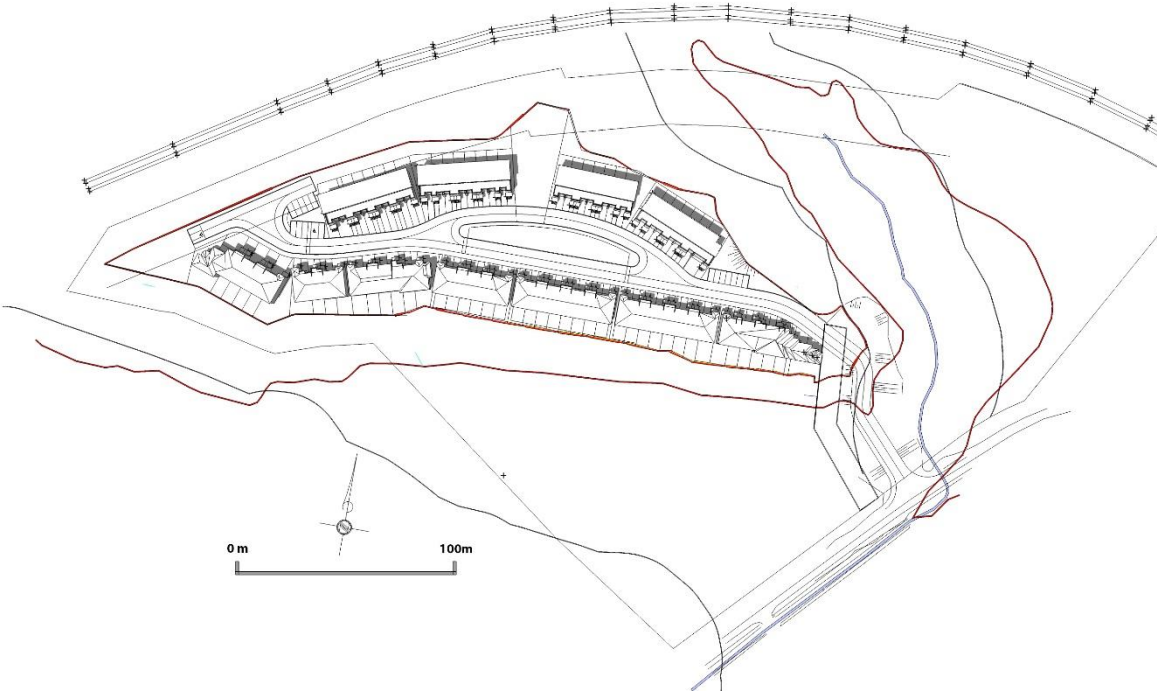
June 21, 11:20 AM



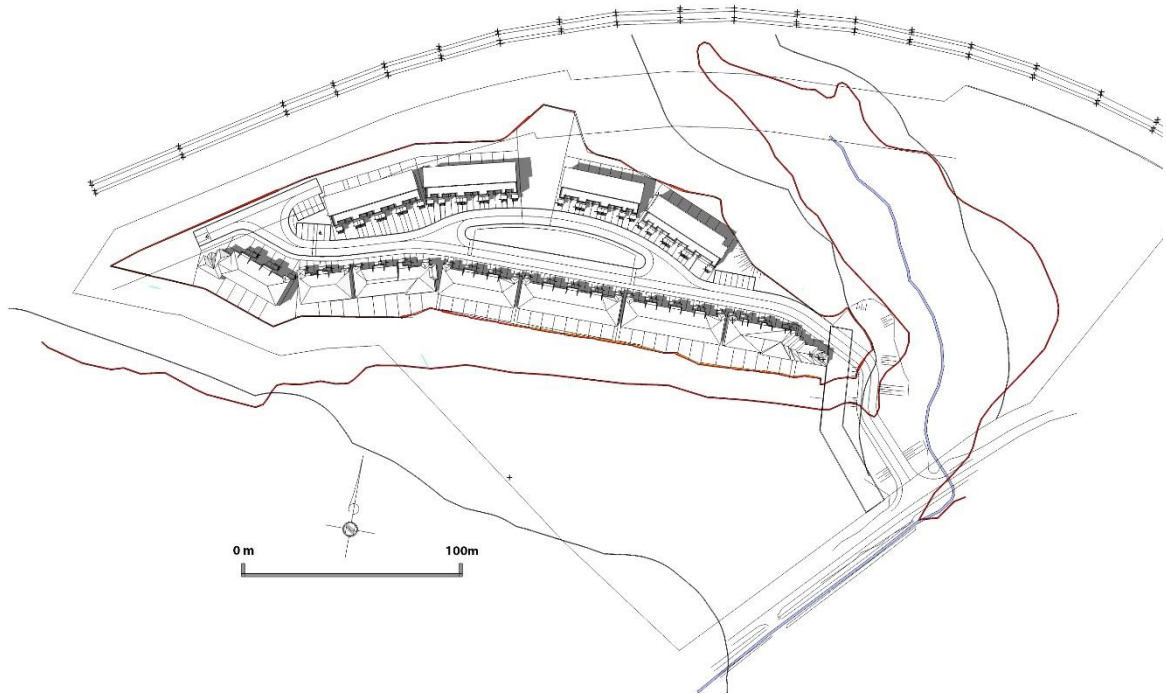
June 21, 12:20 PM



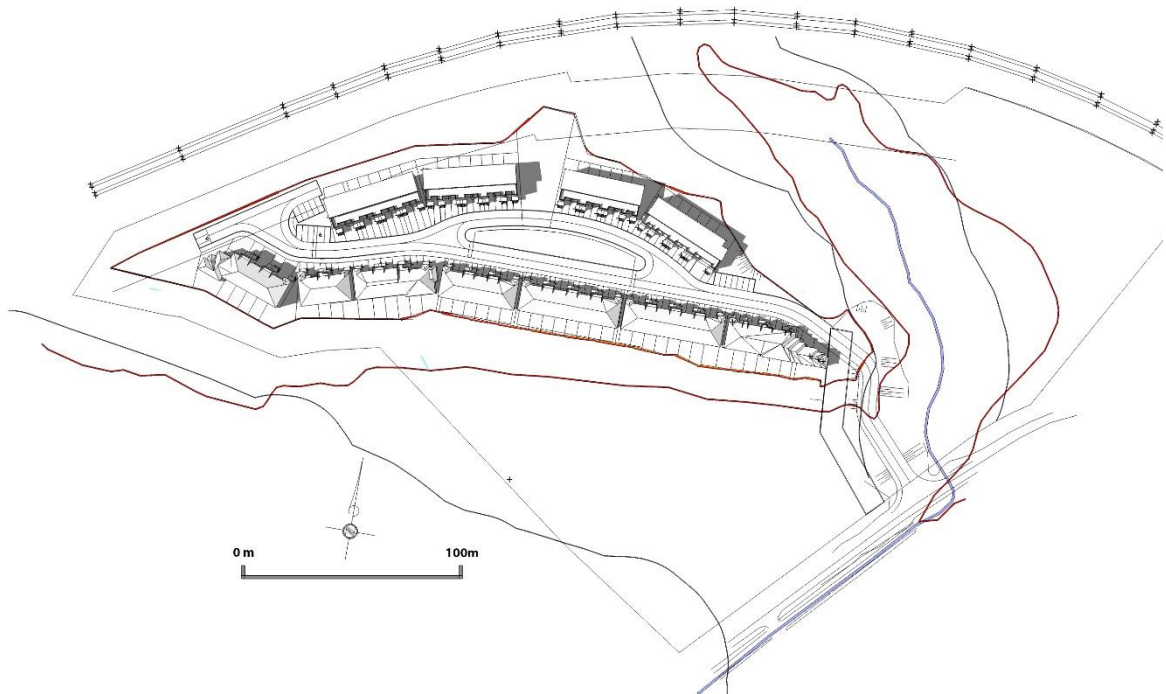
June 21, 1:20 PM



June 21, 2:20 PM



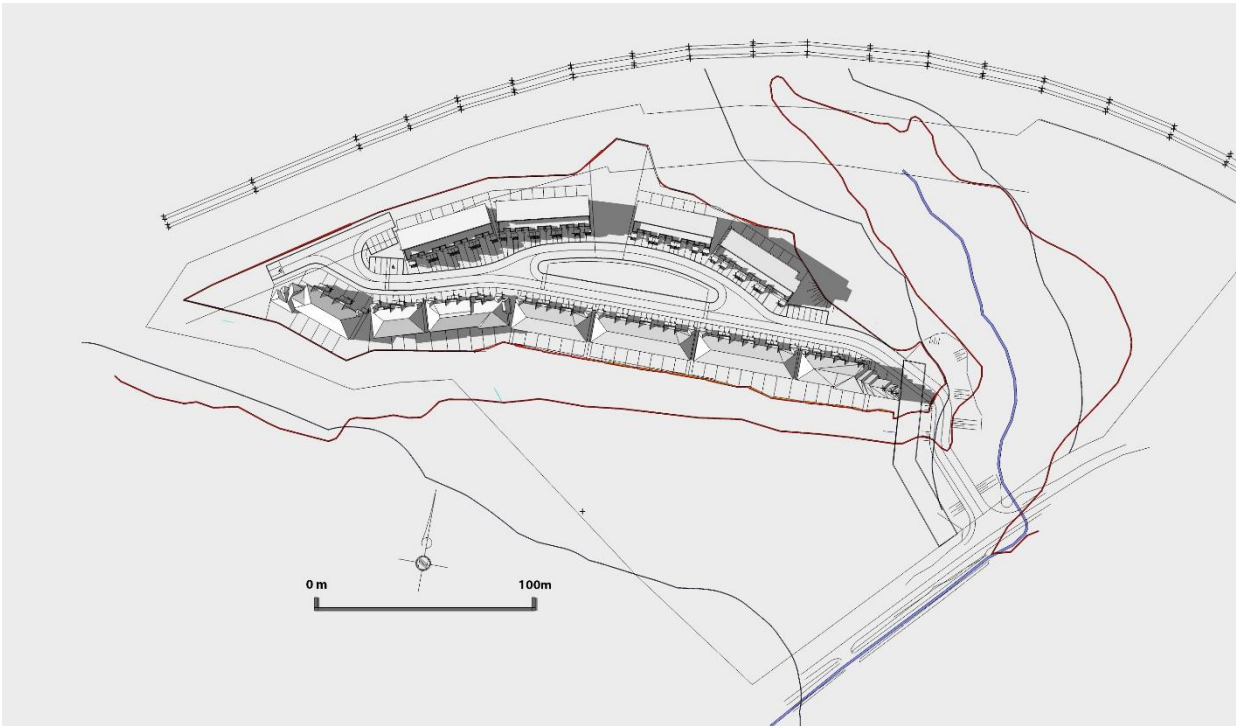
June 21, 3:20 PM



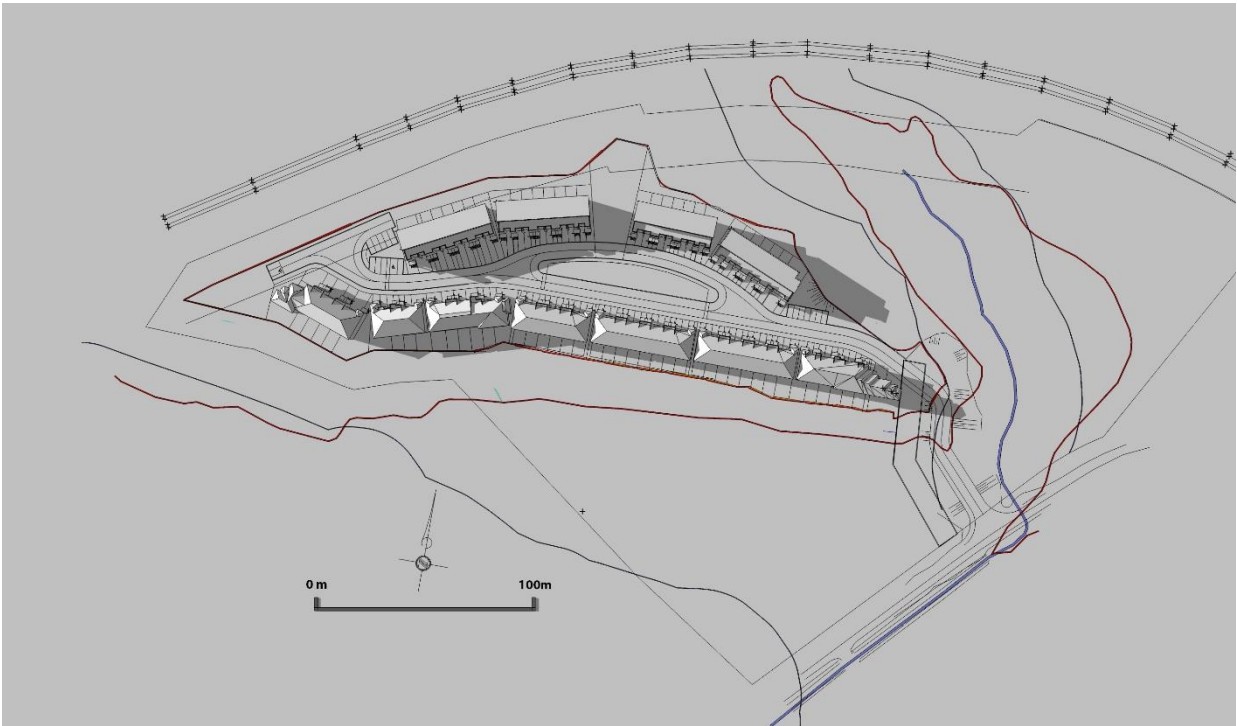
June 21, 4:20 PM



June 21, 5:20 PM



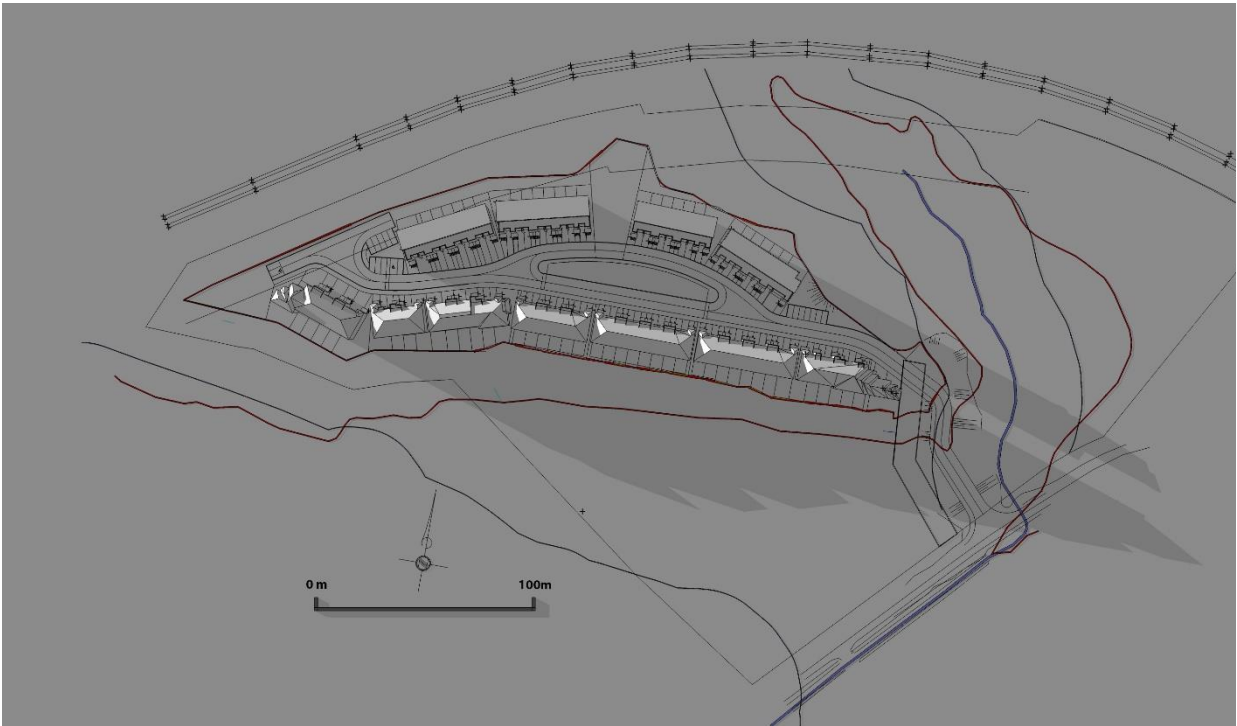
June 21, 6:20 PM



June 21, 7:20 PM



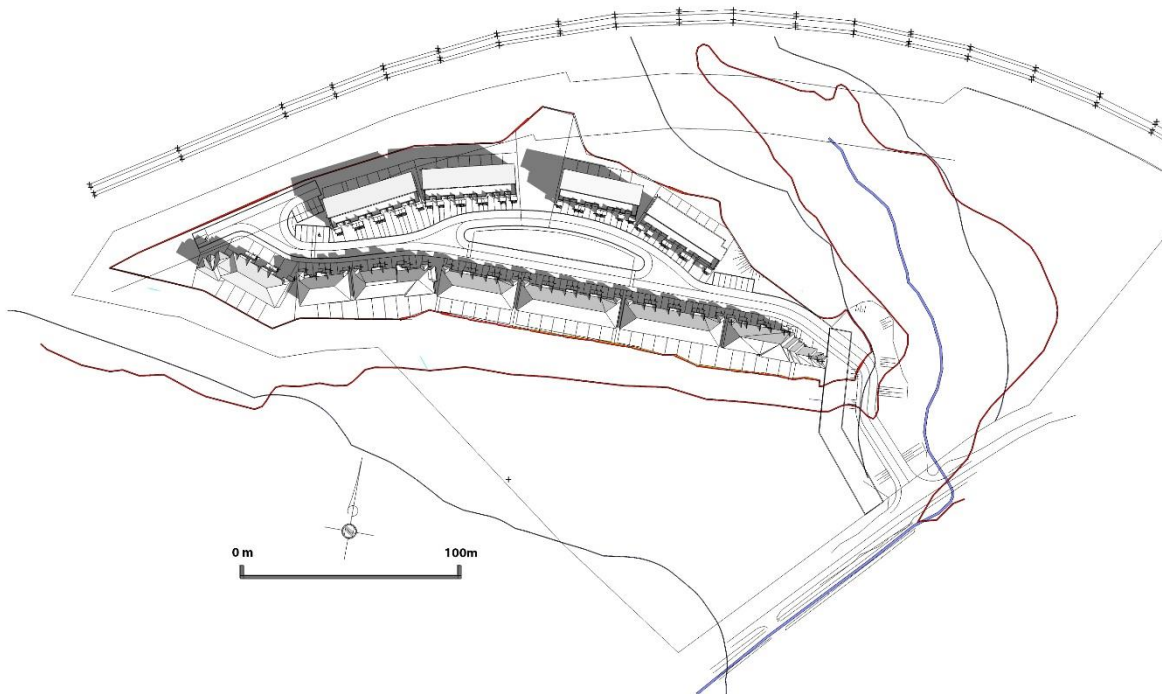
June 21, 7:33PM (sunset-1.5 hrs.)



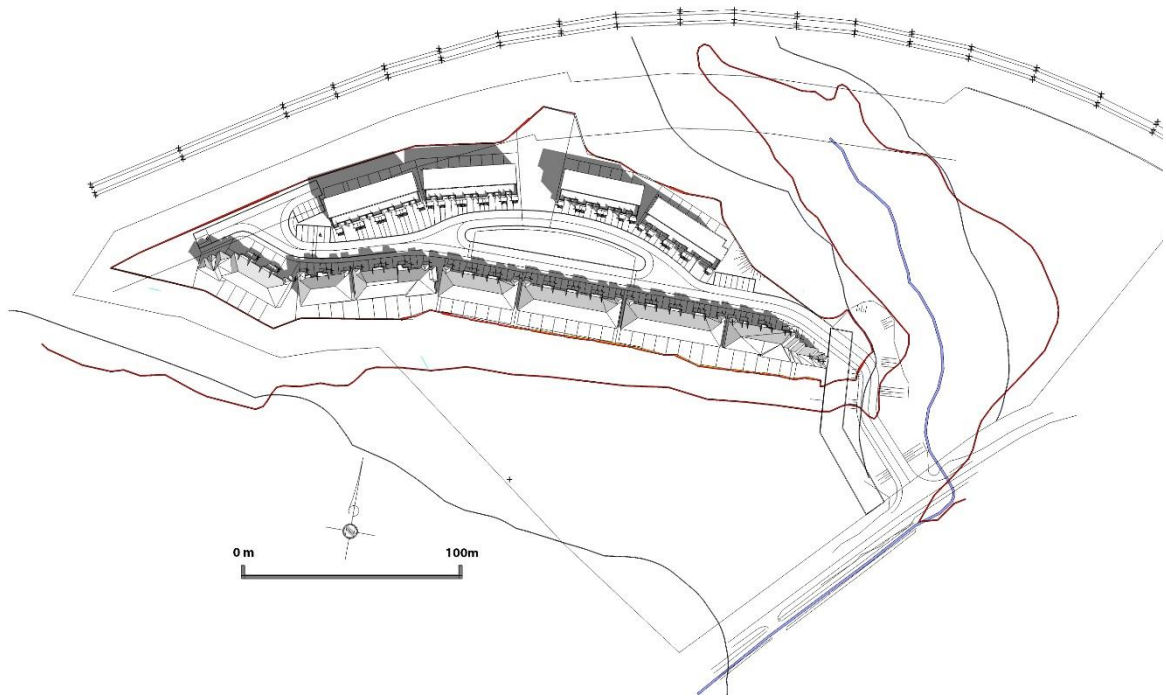
September 21, 8:35 AM (sunrise + 1.5 hrs.)



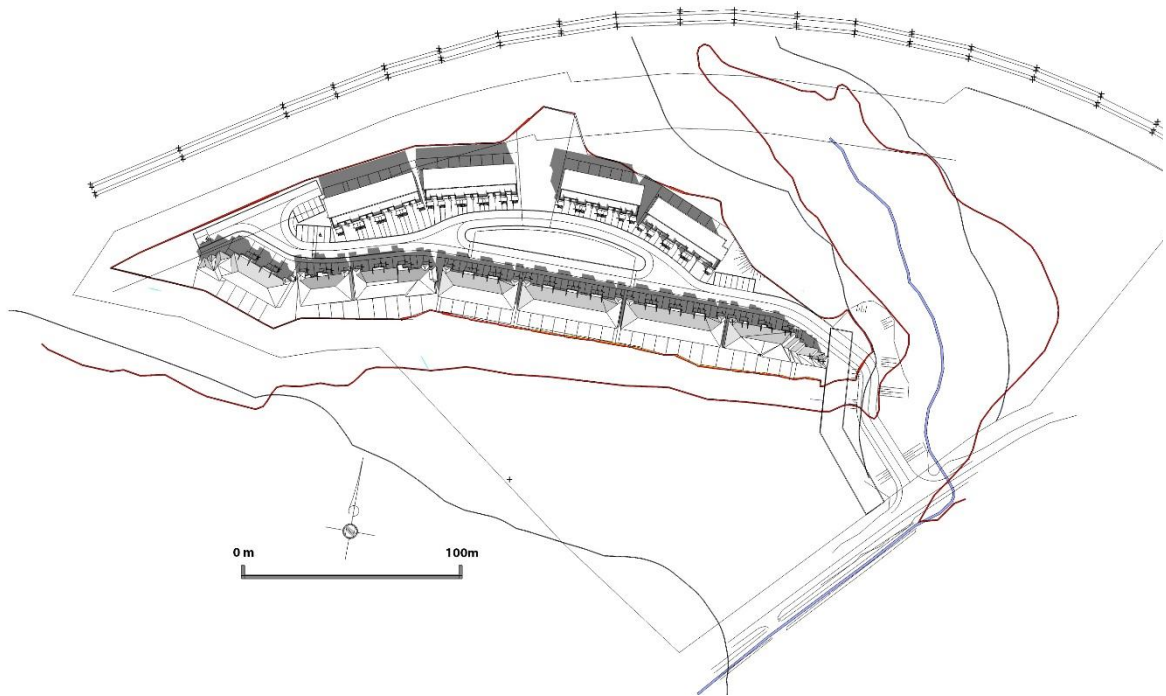
September 21, 9:12 AM



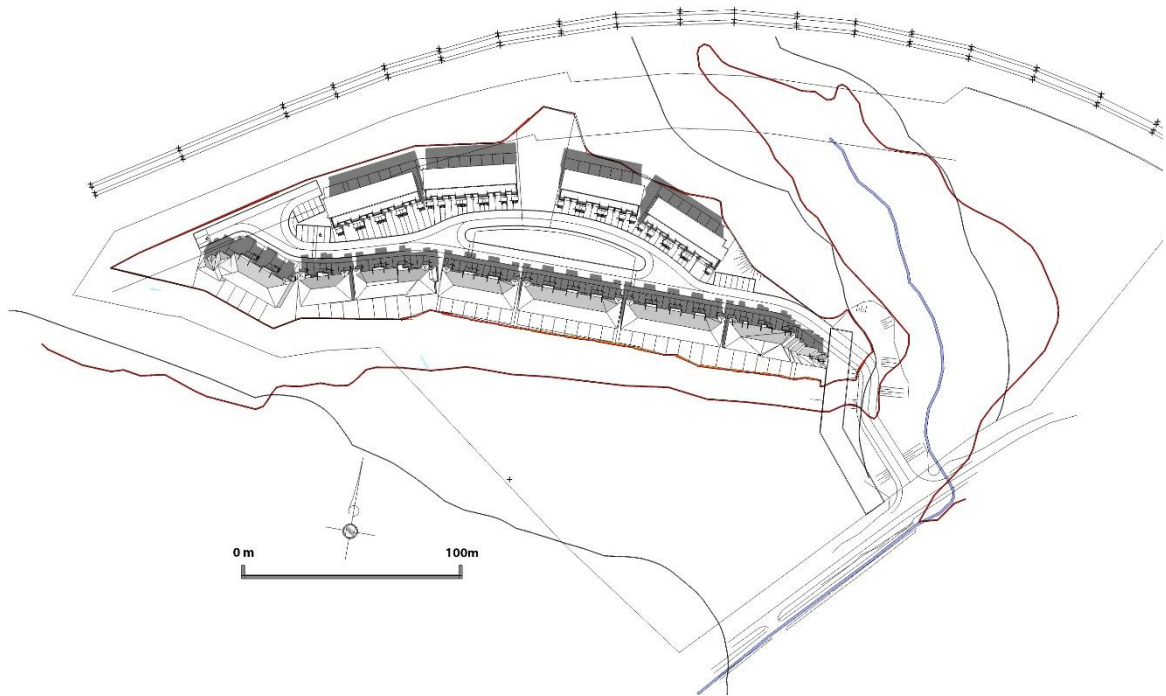
September 21, 10:12 AM



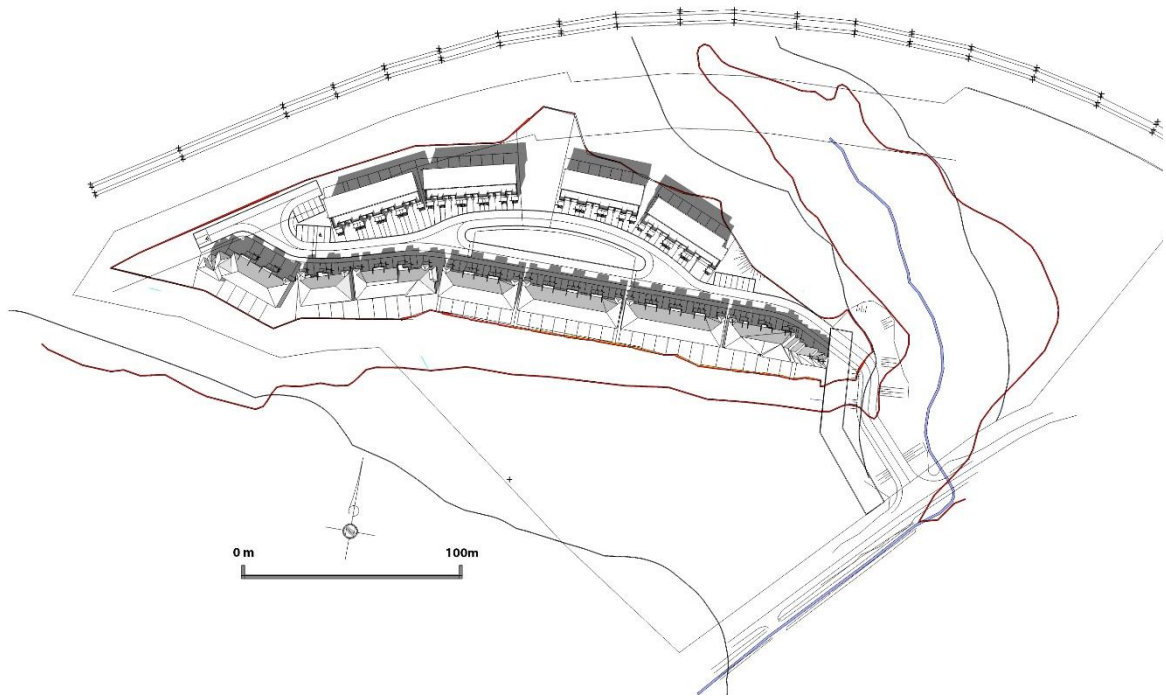
September 21, 11:12 AM



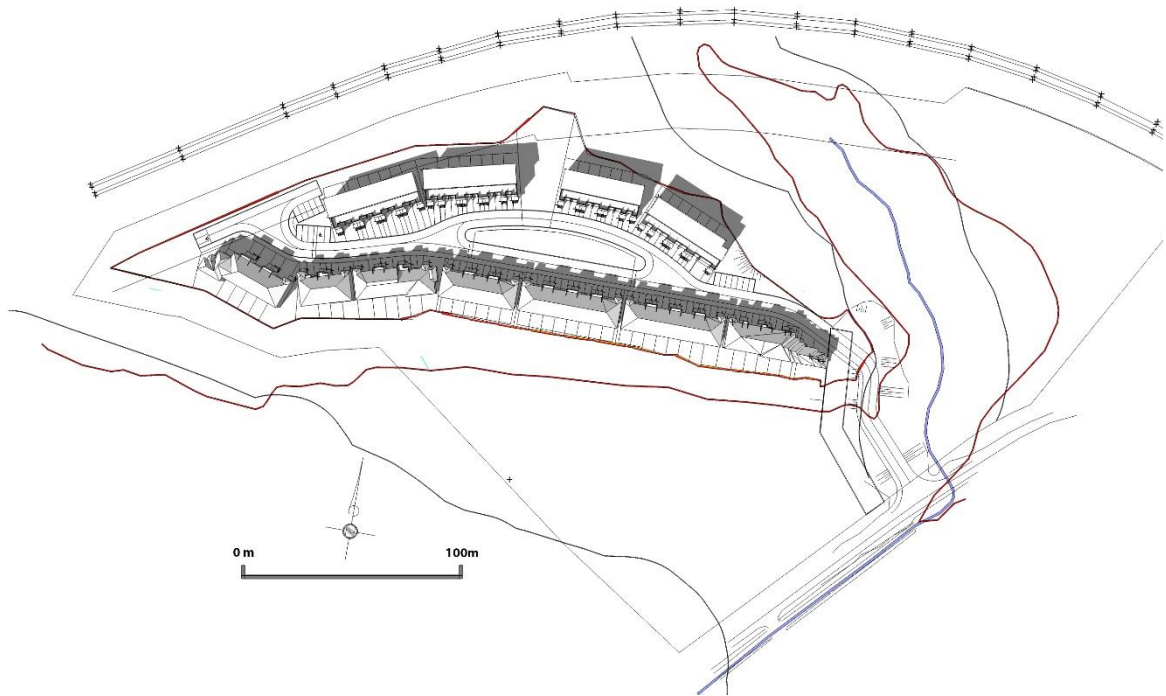
September 21, 12:12 PM



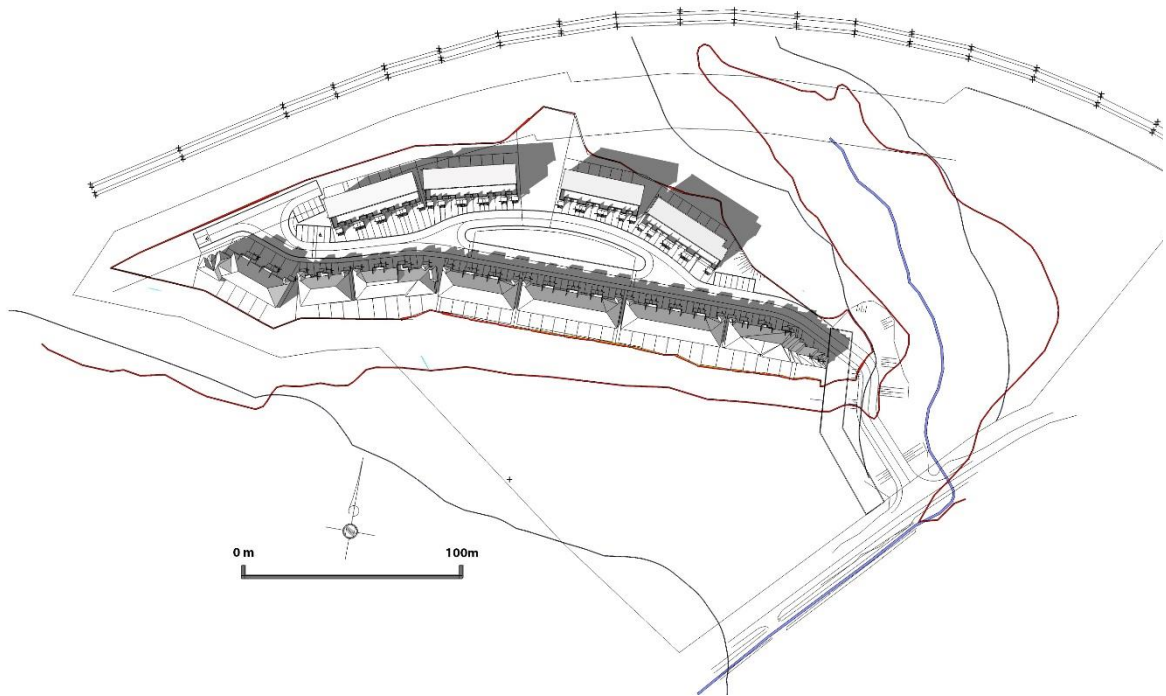
September 21, 1:12 PM



September 21, 2:12 PM



September 21, 3:12 PM



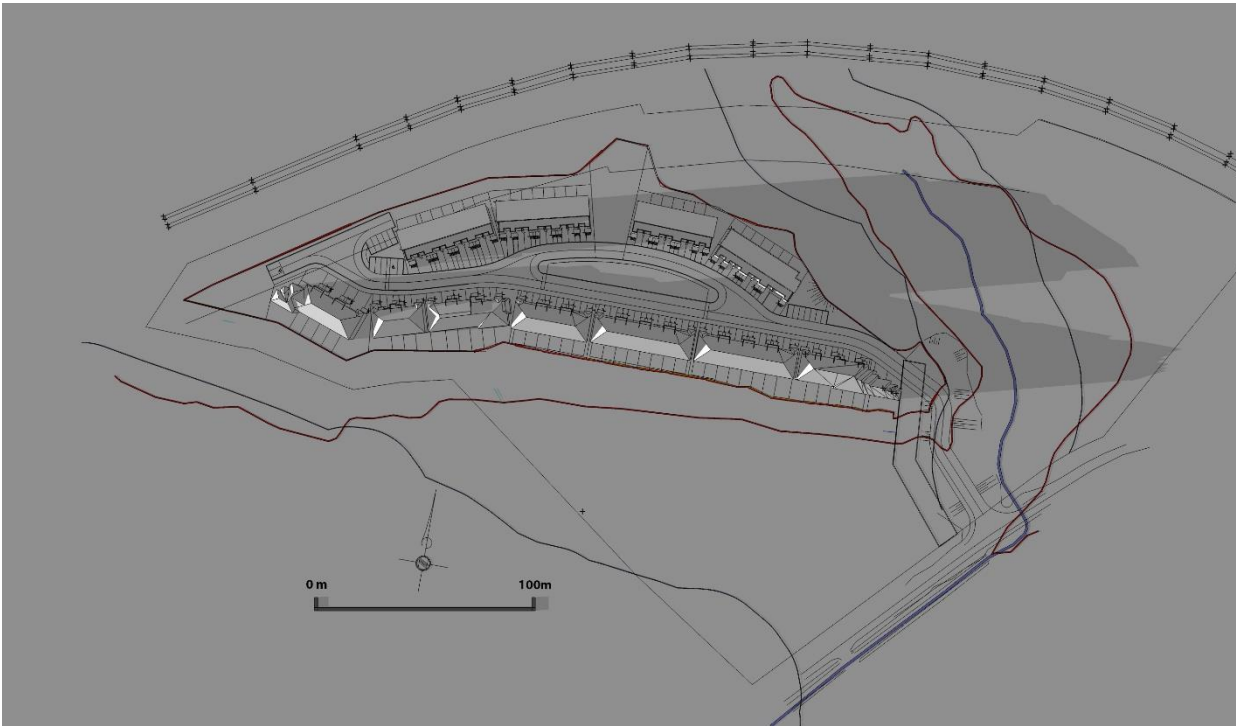
September 21, 4:12 PM



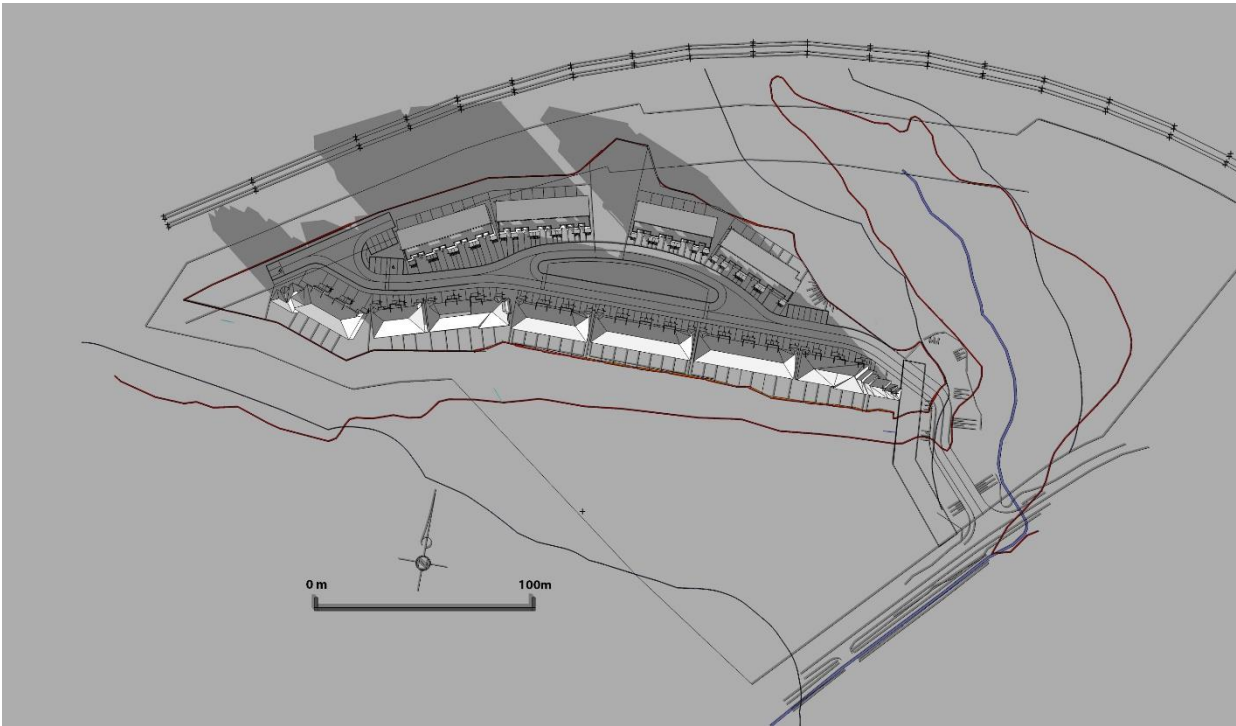
September 21, 5:12 PM



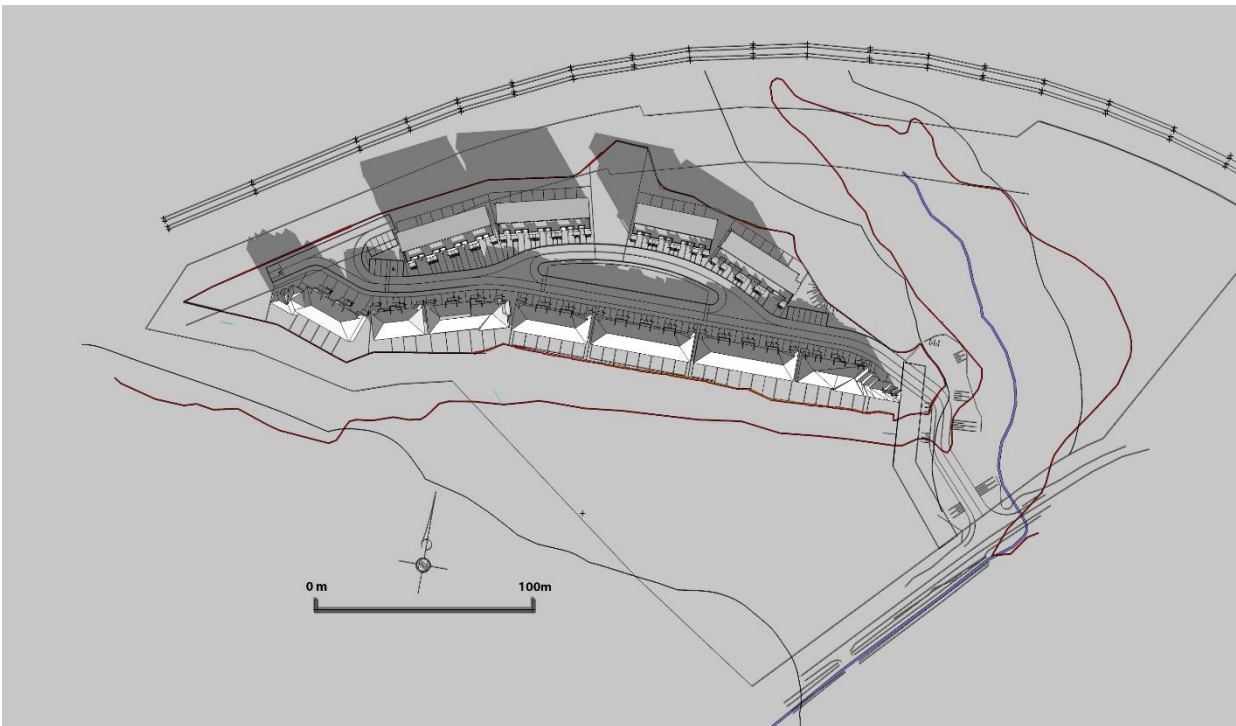
September 21, 5:48PM (sunset-1.5 hrs.)



December 21, 9:19 AM (sunrise + 1.5 hrs.)



December 21, 10:17 AM



December 21, 11:17 AM



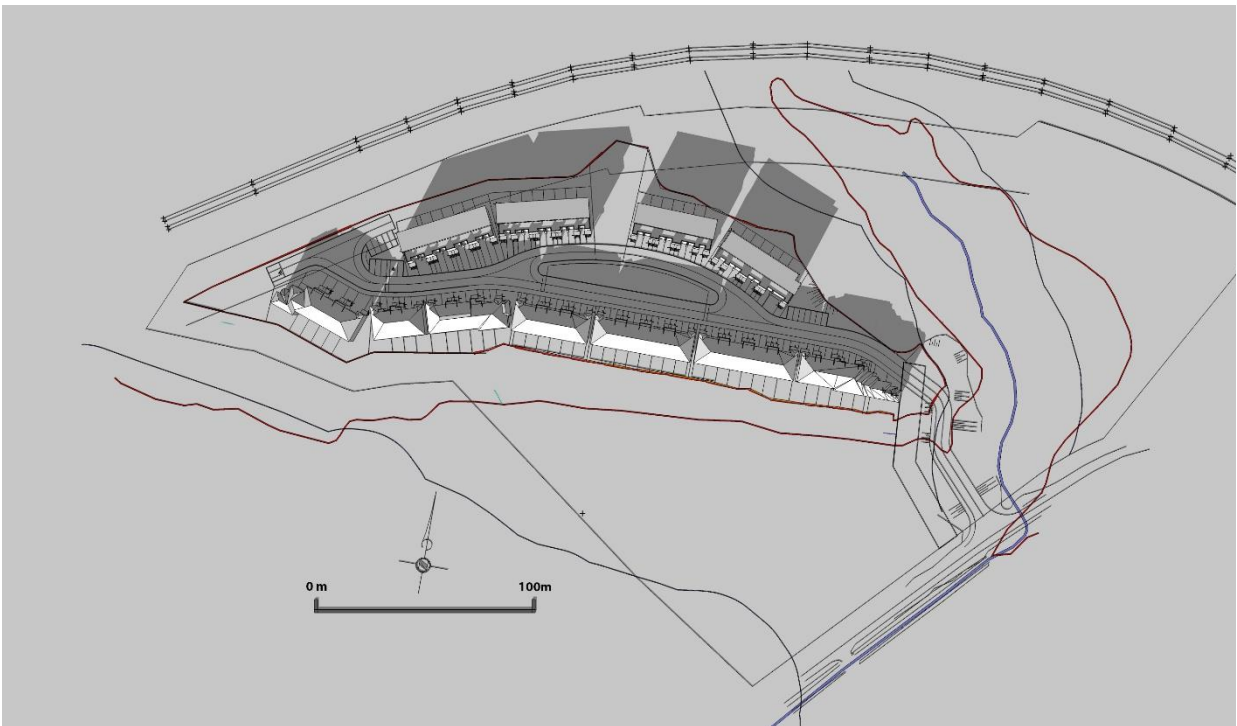
December 21, 12:17 PM



December 21, 1:17 PM



December 21, 2:17 PM



December 21, 3:17 PM (sunset-1.5 hrs.)

