Sunlight and Daylight Access Analysis

of

St Kevin's Strategic Housing Development

at

the former St. Kevin's Hospital and Grounds, Shanakiel, Cork

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1.0 Introduction

ARC Architectural Consultants Ltd has been retained by the Applicant, Land Development Agency, to prepare this Sunlight and Daylight Access Analysis of the St Kevin's Strategic Housing Development at the former St. Kevin's Hospital and Grounds, Shanakiel, Cork.

Note on Reference to Context under Technical and Guidance Documents and on Reference to Methodology

In order to avoid repetition, the sections outlining the relevant recommendations of technical and guidance documents and the methodologies used in undertaking this assessment have been set out in the Technical Appendix at the end of the written section of this report.

1.1 Receiving Environment

The application site comprises a substantial brownfield site at the western edge of Cork City, in the suburb of Shanakiel on the northern bank of the River Lee. The site is bounded to the south by the Lee Road, and the River Lee, and the north is bounded by Beechtree Avenue.

The wider area is largely residential in character. On its western side lies a mixture of residential developments characterised by two large apartment complexes comprising Atkins Hall and River Towers. There is also some commercial development, of which some is disused. To the west, the suburban area of the Shanakiel Road and Ashboro, to the north of which are two large concrete water tanks. To the south lies the small scale Lee Vista apartment block, and the Old Cork Waterworks Experience, a commercial tourist attraction. To the north further residential developments comprising of 2-storey terrace housing is bounded by Beechtree Avenue. To the east of this lies St. Anne's Pitch and Putt Club.

The application site itself is characterised by a mixture of former institutional buildings. At its northern edge, the site contains what remains of the ground floor outline of a demolished structure. To the south, a steep grass embankment leads up to the disused former St. Kevin's Hospital building. North west of this is another large 2-storey building. To the west are the shell of work sheds, and the hospital chapel. There are a number of small 2-storey dwellings within the site too. It is worth noting that the structures that currently exist on the site are in a considerable state of disrepair.

1.2 Relevant Characteristics of the Proposed Development

The Land Development Agency intend to apply to An Bord Pleanála (the Board) for permission for a Strategic Housing Development with a total application site area of c. 5.7 ha, on lands located at the Former St. Kevin's Hospital and Grounds, Shanakiel, Cork (A Protected Structure, 'Our Lady's Hospital' RPS Ref. PS620). The development, with a total gross floor area of c 24,344 sq m, will provide 266 no. residential units, a crèche and office enterprise centre. The development will consist of 46 no. town houses (32 no. 3 bedroom units and 14 no. 4 bedroom units) arranged in 11 no. two storey blocks; 54 no. ground floor 2 bedroom duplex apartments and 36 no. 3 bedroom and 18 no. 4 bedroom duplex townhouses above arranged in 7 no. three storey blocks and 52 no. walk-up apartments (11 no. 1 bedroom apartments and 41 no. 2 bedroom apartments) arranged in 3 no. four storey blocks. The development will also include the stabilisation, conversion, renovation and internal reordering (including new structural frame and floors) of the former St. Kevin's Hospital building to provide 60 no. apartments (26 no. 1 bedroom and 34 no. 2 bedroom apartments) a 440 sq m crèche at ground floor level, with ancillary outdoor play area and the conversion of the 630 sq m former chapel building to provide a new Office Enterprise Centre. The proposed development will include 241 no. surface car parking spaces and 563 no. bicycle parking spaces.

The development will also consist of the demolition of 2,901 sq m of former hospital buildings and associated outbuildings (including the demolition of the 1,129 sq m former two storey St. Dympna's Hospital block; 672 sqm of the rear toilet blocks and contemporary stair cores to the side and rear of the St. Kevin's Hospital building; the 220 sq m two storey former Doctors House; the 50 sq m one storey hospital mortuary building; 480 sq m of shed buildings to the rear of the Chapel; the 151 m retaining wall to the immediate south of the St. Kevin's Hospital building and the partial demolition of the existing 350 sq m link corridor structure, to be replaced with an integrated landscaped amenity area in the footprint of the original structure.) 2 no. new 228 sq m extensions with bridge access are to be provided to the rear of the St. Kevin's Hospital Building and 2 no. 31 sq m new glazed porch extensions to the south.

Figure 2.1: Location of sample zones analysed as part of this Sunlight and Daylight Access Analysis

The development will also include the provision of a play area to the immediate east of St. Kevin's Hospital; private, communal and public open space (including all balconies and terraces at all levels); internal roads and pathways; pedestrian access points; hard and soft landscaping; boundary treatments including the repair of some existing boundary walls; the provision of new surface water and foul drainage pipes and any associated pipe diversion works; new retaining walls; a new internal access road; changes in level; services provision and related pipework; electric vehicle charging points; attenuation tanks; SUDS; signage; the upgrading of the existing access from Beechtree Avenue; public lighting and all site development and excavation works above and below ground..

2.0 Assessment of the Impact of the Proposed Development on Sunlight Access

2.1 Impact of the proposed development on the existing shadow environment

The statistics of Met Eireann, the Irish Meteorological Service, indicate that the sunniest months in Ireland are May and June. During December, Cork receives a mean daily duration of 1.7 hours of sunlight out of a potential 7.6 hours sunlight each day (i.e., only 22% of potential sunlight hours). This can be compared with a mean daily duration of 6.2 hours of sunlight out of a potential 15.5 hours each day received by Cork during May (i.e., 40% of potential sunlight hours). Therefore, impacts caused by overshadowing are generally most noticeable during the summer months and least noticeable during the winter months. Due to the low angle of the sun in mid winter, the shadow environment in all urban and suburban areas is generally dense throughout winter.

In assessing the impact of a development on sunlight access, the comments of PJ Littlefair in *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) should be taken into consideration. The BRE Guide states that *"it must be borne in mind that nearly all structures will create areas of new shadow, and some degree of transient overshadowing of a space is to be expected."*

2.1.1 Overview of the potential impact of shadows cast by the proposed development outside the application site

Having regard to the shape, layout and orientation of the application site; to the retention of St. Kevin's Hospital Building and existing Chapel; and to the topography of the lands surrounding the site, the potential of the proposed development to result in material overshadowing of lands outside the application site is very limited.

Specifically, there is limited potential for the proposed development to result in a material change in the shadow environment on lands to the east of the site due, in part, to the proposed configuration of development on the site, and, in part, to the sloping southern facing nature of the site. For example, shadows cast by the proposed development have the potential to extend over the Ashboro estate for a short time during only the very late evenings of the summer and autumn months. The extent and duration of any additional overshadowing of lands in the Ashboro estate is likely to be so small in duration and extent that it is unlikely to be noticeable. The impact of the proposed development on lands to the east is, therefore, assessed as none to "imperceptible" to "slight".

The construction of the proposed development is also unlikely to result in any material change to the shadow environment to the north, west or south of the site (e.g. such as Beechtree Avenue to the north or the residential apartments to the west). As such, the impact of the proposed development on lands to the north, south and west is likely to range from none to "imperceptible".

2.1.2 Detailed analysis of the potential impact of shadows cast by the proposed development on existing buildings outside the application site

This Sunlight and Daylight Access Analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in the section entitled *"Overview of the potential impact of shadows cast by the proposed development outside the application site"*. However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on sunlight access to a representative sample of sensitive receptors (i.e. windows) in buildings in proximity to the application site (please see Figure 2.1). Within that representative sample of buildings, a worst case scenario was studied whereby windows at the lowest levels of accommodation were analysed.

The BRE Guide does not identify a need to undertake detailed quantitative assessment of the impact of new development on existing buildings, which do not face within 90° of due south (i.e. such as Win 4, 8, 9 and 10) and does not set out a recommended level of sunlight access for such windows. However, ARC's assessment includes analysis of these windows in the interests of completeness. The results of ARC's analysis are set out in Table 2.1.

Section 3.2.1 of the *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) provides as follows in relation to the assessment of the impact of development on sunlight access to existing buildings.

> *"If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:*
> - *receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March* ***and***
> - *receives less than 0.8 times its former sunlight hours during either period* ***and***
> - *has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours."*
>
> [Emphasis added]

As set out in Table 2.1, ARC's analysis indicates that shadows cast by the proposed development are unlikely to be of a level, which would suggest that *"sunlighting of the existing dwelling may be adversely affected"*. All studied sample windows facing within 90° of due south in dwellings in proximity to the application site will continue to be able to receive a level of sunlight access in excess of that recommended by the BRE Guide for rooms with a reasonable expectation of sunlight after the construction of the proposed development.

Table 2.1: Potential impact of the proposed development on sunlight access to sample ground floor windows surrounding the site

Zone	Existing Probable Sunlight Hours Received			Proposed Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
Win 1 Floor 00 6 Beechtree Avenue	47%	34%	13%	47%	34%	13%
	No potential change in sunlight access. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					
Win 2 Floor 00 1 Beechtree Avenue	86%	59%	27%	86%	59%	27%
	No potential change in sunlight access. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					
Win 3 Floor 00 St. Anne's Pitch & Putt Club	79%	54%	25%	79%	54%	25%
	No potential change in sunlight access. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					
Win 4 Floor 00 11 Shanakiel Road, Ashboro	35%	27%	8%	33%	25%	8%
	Potential "imperceptible" impact. Notwithstanding that this window faces within 90° of due north, this window is likely to continue to receive a level of sunlight considerably in excess of the BRE recommendation for windows facing within 90° of due south (i.e. 25% Annual Probable Sunlight Hours, including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
Win 5 Floor 00 10 Shanakiel Road, Ashboro	53%	38%	15%	52%	37%	15%
	Potential "imperceptible" impact. ARC's analysis indicates that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
Win 6 Floor 00 9 Shanakiel Road, Ashboro	63%	45%	18%	62%	45%	17%
	Potential "imperceptible" impact. ARC's analysis indicates that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					
Win 7 Floor 00 8 Shanakiel Road, Ashboro	70%	48%	22%	69%	48%	21%
	Potential "imperceptible" impact. ARC's analysis indicates that this window will continue to receive a level of sunlight considerably in excess of the BRE recommendation of 25% Annual Probable Sunlight Hours (including 5% Annual Probable Sunlight Hours during the winter period) after the construction of the proposed development.					

Zone	Existing Probable Sunlight Hours Received			Proposed Probable Sunlight Hours Received		
	Annual	Summer*	Winter*	Annual	Summer*	Winter*
Win 8 Floor 00 1 Rose Hill Upper	6%	6%	0%	6%	6%	0%
	No potential change in sunlight access. This window faces within 90˚of due north. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					
Win 9 Floor 00 5 Rose Hill	11%	11%	0%	11%	11%	0%
	No potential change in sunlight access. This window faces within 90˚of due north. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					
Win 10 Floor 01 Apartment, rear of Lee Vista	11%	11%	0%	11%	11%	0%
	No potential change in sunlight access. This window faces within 90˚of due north. ARC's analysis indicates that the construction of the proposed development is not likely to result in any change in sunlight access to this window.					

* For the purposes of this calculation, summer is taken to mean the period between March and September, and winter is considered to be the period between September and March.

2.1.3 Detailed analysis of the potential impact of shadows cast by the proposed development on existing amenity areas/gardens outside the application site

This Sunlight and Daylight Access Analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in the section entitled "*Overview of the potential impact of shadows cast by the proposed development outside the application site*". However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted detailed analysis of the potential for the proposed development to result in impacts on sunlight access to a representative sample of sensitive receptors (i.e. rear gardens) in proximity to the application site.

Insofar as amenity spaces / gardens are concerned, the BRE Guide provides that *"It is recommended that for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours of sunlight on 21 March. If as a result of new development an existing garden or amenity area does not meet the above,* ***and*** *the area which can receive two hours of sun on 21 March is less than 0.8 times its former value, then the loss of sunlight is likely to be noticeable."* [Emphasis added.] This suggests that where a garden or amenity area can receive two hours of sun over half its area on 21 March notwithstanding the construction of a proposed development, loss of sunlight as a result of additional overshadowing is not likely to be noticed. Table 2.2 sets out the likely proportion of these gardens in sunlight before and after the construction of the proposed development throughout the day on 21st March:

As set out in Table 2.2, the rear gardens of all zones are likely to continue to be able to achieve at least two hours of sunlight over half their areas on 21st March and so will continue to be adequately sunlit throughout the year within the meaning of the BRE Guide after the construction of the proposed development.

Table 2.2: Potential impact of the proposed development on sunlight access to sample gardens to the rear of Ashboro, Shnankiel Road

Zone	21st March Time	Percentage area in sunlight	
		EXISTING	PROPOSED
11 Shanakiel Road, Ashboro Garden 01	1000	84%	84%
	1100	90%	90%
	1200	98%	98%
	1300	99%	99%
	1400	94%	94%
	1500	93%	93%
	1600	90%	90%
	1700	83%	83%
	1800	22%	0%
10 Shanakiel Road, Ashboro Garden 02	1000	82%	82%
	1100	90%	90%
	1200	100%	100%
	1300	100%	100%
	1400	97%	97%
	1500	95%	95%
	1600	92%	92%
	1700	65%	65%
	1800	0%	0%
9 Shanakiel Road, Ashboro Garden 03	1000	86%	86%
	1100	95%	95%
	1200	98%	98%
	1300	100%	100%
	1400	99%	99%
	1500	93%	93%
	1600	85%	85%
	1700	68%	68%
	1800	0%	0%
8 Shanakiel Road, Ashboro Garden 04	1000	96%	96%
	1100	97%	97%
	1200	100%	100%
	1300	100%	100%
	1400	99%	99%
	1500	96%	96%
	1600	93%	93%
	1700	77%	77%
	1800	0%	0%

3.0 Assessment of Sunlight Access within the Proposed Open Spaces

Section 3 of the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* sets out design advice and recommendations for site layout planning to ensure good sunlight access suggests that, for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours sunlight at the equinox.

Please note that, in determining whether or not to include existing and proposed substantial trees in the three dimensional model for the purposes of this quantitative analysis, ARC made reference to the BRE Guide (as updated in 2011), which states that the *"question of whether trees or fences should be included in the calculation depends upon the type of shade they produce. Normally trees and shrubs need not be included, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."* Given this, ARC did not show the shadows cast by trees on the shadow study diagrams.

As part of this analysis, ARC assessed the likely proportion of the proposed communal open space serving the proposed residential development (please see Figure 2.1) predicted to receive sunlight access on 21st March. The results of ARC's analysis are set out in Table 3.1 below.

Table 3.1: Approximate areas of proposed communal open space in sunshine on 21st March

Time	Internal Open Space Proposed Percentage area in sunlight
1000	100%
1100	100%
1200	100%
1300	100%
1400	100%
1500	100%
1600	100%
1700	88%
1800	67%

As suggested by the results set out in Table 3.1, the proposed communal open space is predicted to receive a level of sunlight in excess of the level recommended by the BRE Guide for amenity spaces. ARC's analysis, therefore, indicates that the proposed communal open spaces will appear adequately sunlit throughout the year within the meaning of the BRE Guide.

More than this, the proposed internal open space is predicted to receive a high level of sunlight access through most of the day and for most of the year. ARC's analysis indicates that this proposed communal open space will afford residents a place within the proposed development where residents can go to sit and enjoy the sunshine on a sunny day for a significant portion of the day for most of the year.

4.0 Assessment of the Impact of the Proposed Development on Daylight Access

The BRE Guide provides that *"The quantity and quality of daylight inside a room will be impaired if obstructing buildings are large in relation to their distance away"*. Generally speaking, new development is most likely to affect daylight access in existing buildings in close proximity to the application site.

4.1 Overview of the potential impact of the proposed development on daylight access to existing buildings outside the application site

ARC's analysis indicates that the construction of the proposed development has the potential to result in little or no change in daylight access to most neighbouring existing buildings. The impact of the proposed development on most existing buildings surrounding the application site is likely to range from none to "imperceptible".

Given that the potential for development to result in impacts on daylight access diminishes with distance, it is the finding of ARC's analysis the proposed development will have no undue adverse impact on daylight access within buildings in the wider area surrounding the application site.

4.2 Detailed analysis of the potential impact of the proposed development on daylight access to existing buildings outside the application site

This Sunlight and Daylight Access Analysis assesses the impact of the proposed development to all potential receptors surrounding the application site - these impacts are described in the section entitled *"Overview of the potential impact of the proposed development on daylight access within existing buildings outside the application site"*. However, by way of example in order to illustrate briefly the findings outlined in the overview section, ARC conducted quantitative analysis of the potential for the proposed development to result in impacts on daylight access to a representative sample of sensitive receptors (i.e. rooms) in buildings in proximity to the application site (please see Figure 2.1).

In carrying out the detailed analysis of the proposed development on neighbouring existing buildings, ARC measured daylight access to existing buildings before and after the construction of the proposed development with reference to Vertical Sky Component. The Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) defines Vertical Sky Component as the *"Ratio of that part of illuminance, at a point on a given vertical plane, that is received directly from a CIE standard overcast sky, to illuminance on a horizontal plane due to an unobstructed hemisphere of this sky. Usually the 'given vertical plane' is the outside of a window wall. The VSC* does not include reflected light, either from the ground or from other buildings".

Section 2.2.21 of the BRE Guide suggests that:

> *"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if ...*
>
> - *the VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value..."*

Adherence to the recommendations of the BRE Guide with regard to achieving a Vertical Sky Component of 27% has been shown to lead to densities of development, which would be too low to be sustainable and would be inconsistent with the local, regional and national statutory planning policy. Given this and given that Vertical Sky Component offers an incomplete measurement of daylight access within a room (e.g. given that it does not take into account the size and shape of the room, the size of the window relative to the size of the room or the effect of internally or externally reflected light), **the results of assessment of the impact of development on daylight access using Vertical Sky Component must be interpreted with caution.**

The results of ARC's analysis are set out in Table 4.1 below, together with a short commentary on the results.

Table 4.1: Potential impact of the proposed development on daylight access to sample rooms in buildings near the application site

Sample Room	Vertical Sky Component			
	Existing	Proposed	Comment	Predicted Impact
Win 1 Floor 00 6 Beechtree Avenue	37.30%	37.30%	**No potential change in Vertical Sky Component.** ARC's analysis indicates that the Vertical Sky Component at this window is unlikely to change after the construction of the proposed development.	None
Win 2 Floor 00 1 Beechtree Avenue	39.60%	39.60%	**No potential change in Vertical Sky Component.** ARC's analysis indicates that the Vertical Sky Component at this window is unlikely to change after the construction of the proposed development.	None
Win 3 Floor 00 St. Anne's Pitch & Putt Club	39.60%	39.60%	**No potential change in Vertical Sky Component.** ARC's analysis indicates that the Vertical Sky Component at this window is unlikely to change after the construction of the proposed development.	None
Win 4 Floor 00 11 Shanakiel Road, Ashboro	36.20%	34.40%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible
Win 5 Floor 00 10 Shanakiel Road, Ashboro	38.00%	37.30%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible
Win 6 Floor 00 9 Shanakiel Road, Ashboro	38.80%	38.10%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible
Win 7 Floor 00 8 Shanakiel Road, Ashboro	39.20%	38.50%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible
Win 8 Floor 00 1 Rose Hill Upper	26.40%	28.00%	**Potential "imperceptible" increase.** ARC's analysis indicates that the proposed demolition of an outbuilding has the potential to increase the Vertical Sky Component of this window from below the BRE recommended level of 27% to 28%. The construction of the proposed development is likely to increase the Vertical Sky Component of this window to 1.06 times its former value after the construction of the proposed development. The impact will be positive.	Imperceptible (Increase)
Win 9 Floor 00 5 Rose Hill	32.40%	32.30%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible
Win 10 Floor 01 Apartment, rear of Lee Vista	32.90%	31.00%	**Potential "imperceptible" impact.** ARC's analysis indicates that Vertical Sky Component will remain above 27% after the construction of the proposed development.	Imperceptible

ARC's analysis indicates that the construction of the proposed development is likely to result in little impact on daylight access within most neighbouring buildings. Indeed, ARC's analysis suggested that one studied window (i.e. Win 8 at 1 Rose Hill Upper) has the potential to experience an improvement in Vertical Sky Component as a result of the demolition of an existing outbuilding as part of the construction of the proposed development. ARC's analysis, therefore, indicates that the construction of the proposed development will not result in any undue adverse impact on daylight access to rooms within neighbouring buildings within the meaning of the BRE Guide.

5.0 Assessment of Daylight Access within the Proposed Development

The *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* provide that *"planning authorities should have regard to quantitative performance approaches to daylight provision outlined in guides like the BRE guide 'Site Layout Planning for Daylight and Sunlight' (2nd edition) or BS 8206-2: 2008 – 'Lighting for Buildings – Part 2: Code of Practice for Daylighting'[1] when undertaken by development proposers which offer the capability to satisfy minimum standards of daylight provision."* Given this, the standards for daylight access in buildings (and the methodologies for assessment of same) suggested in these documents have been referenced in this report.

The BRE Guide states as follows (at paragraph 2.1.8) in relation to daylight access within new development:

> *"2.1.8 Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In housing BS 8206-2 also gives minimum value of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms."*

During tripartite pre-planning consultation, Cork City Council raised concerns about daylight access to bedrooms in Units 5, 6, 7 and 8 of Block U (as then proposed under the emerging design) due to the proximity of that previously proposed east-west oriented, Block U to the former St Kevin's Hospital building and due to nearby retaining walls. In response to those concerns, the final design for the proposed development removed that block and proposes a new Block U, which is oriented north-south and with a greater separation distance from the former St Kevin's Hospital building. The final design also no longer proposes bedrooms lit by light-wells.

As part of this *Sunlight and Daylight Access Analysis,* ARC undertook an assessment of the likely daylight access within the proposed residential units. A representative sample of rooms within the proposed development was studied at the lowest levels of accommodation given that daylight access to lower levels will be the most obstructed in terms of daylight access so issues in respect of daylight access are most likely to occur at the lowest levels of accommodation. An emphasis was placed on analysis of rooms likely to receive lower levels of daylight (e.g. rooms with the potential to receive lower levels of daylight access due to their location within the proposed development and/or due to their layout and fenestration) (see Figure 2.1 above). For more detail on the methodology used in assessing daylight access, please refer to the Technical Appendix of this Report. The results of ARC's analysis of likely daylight access within the proposed development are set out in Table 5.1.

ARC's analysis indicates that all sample study rooms within the proposed development will achieve levels of daylight access at or above the minimum Average Daylight Factor recommended by the British Standard for bedrooms (i.e. 1% Average Daylight Factor), living rooms (i.e. 1.5% Average Daylight Factor) and for kitchens (i.e. 2% Average Daylight Factor). All sample study rooms within the proposed development are predicted to achieve a level of daylight in excess of that recommended by the British Standard for a predominantly daylit appearance (i.e. 2% Average Daylight Factor).

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Table 5.1: Predicted daylight access to sample rooms within the proposed development

Location	Floor	Room Type	Predicted Average Daylight Factor
Zone A	Floor 00	Kitchen / living / dining room	3.48%
Zone D	Floor 00	Kitchen / living / dining room	3.87%
Zone E	Floor 01	Kitchen / living / dining room	5.19%
Zone G	Floor 00	Kitchen / living / dining room	4.17%
Zone Q	Floor 00	Kitchen / living / dining room	3.88%
Zone R	Floor 00	Kitchen / living / dining room	5.87%
Zone Hos A00	Floor 00	Kitchen / living / dining room	5.72%
Zone Hos A01	Floor 01	Kitchen / living / dining room	5.75%
Zone Hos B00	Floor 00	Kitchen / living / dining room	4.67%
Zone Hos B01	Floor 01	Kitchen / living / dining room	4.73%
BLK B	Floor 00	Kitchen / living / dining room	5.90%
BLK C	Floor 00	Kitchen / living / dining room	5.05%
BLK F	Floor 00	Kitchen / living / dining room	4.08%
BLK H	Floor 00	Kitchen / living / dining room	4.13%
BLK J	Floor 00	Kitchen / living / dining room	4.98%
BLK M	Floor 00	Kitchen / living / dining room	4.42%
BLK N	Floor 00	Kitchen / living / dining room	4.51%
BLK S	Floor 00	Kitchen / living / dining room	4.71%
BLK T	Floor 00	Kitchen / living / dining room	6.25%
BLK U	Floor 00	Kitchen / living / dining room	4.65%
BLK V	Floor 00	Bedroom	4.21%

1 It is noted that *BS 8206-2:2008: Lighting for buildings - Part 2: Code of practice for daylighting* was recently replaced with IS EN 17037:2018 Daylight in Buildings. However, given that the *Sustainable Urban Housing: Design Standards for New Apartments Guidelines for Planning Authorities* refer to the BS 8206-2:2008 and not to IS EN 17037:2018, BS 8206:2008 has been referenced in the preparation of this report.

Technical Appendix

Explanatory Note

In assessing sunlight and daylight access analysis, Irish practitioners tend to refer to the relevant PJ Littlefair's 2011 revision of the 1991 publication *Site layout planning for daylight and sunlight: a guide to good practice* for the Building Research Establishment (the BRE Guide). The standards for daylight and sunlight access in buildings (and the methodologies for assessment of same) suggested in this documents have been referenced in this Sunlight and Daylight Access Analysis.

The BRE Guide does not set out rigid standards or limits, but is preceded by the following very clear warning as to how the design advice contained therein should be used:

> *"The advice given here is not mandatory and* ***the guide should not be seen as an instrument of planning policy****; its aim is to help rather than constrain the designer. Although it gives numerical guidelines, these should be interpreted flexibly since natural lighting is only one of many factors in site layout design."* [Emphasis added.]

That the recommendations of the BRE Guide are not suitable for rigid application to all developments in all contexts is of particular importance in the context of national and local policies for the consolidation and densification of urban areas or when assessing applications for highly constrained sites (e.g. lands in close proximity or immediately to the south of residential lands).

Given that the BRE Guide and the British Standard were drafted in the UK in the context of UK strategic planning policy, recommendations or advices provided in either document that have the potential to conflict with Irish statutory planning policy have been disregarded for the purposes of this analysis.

The purpose of this report is to provide a general indication of daylight performance and sunlight access before and after the construction of the proposed development on the basis of numerous assumptions outlined below and with reference to design tools set out in the guidance documents referenced above. ARC takes no responsibility for any errors introduced by the third party proprietary sunlight and daylight analysis software used to perform the quantitative assessment. This report does not offer a guarantee of daylight performance or sunlight access to existing or future occupants or owners of the application site or neighbouring lands or any other party.

Sunlight Access to Buildings and Open Spaces

Context under Technical and Guidance Documents

Section 3.2.1 of the *Site layout planning for daylight and sunlight: a guide to good practice* (the BRE Guide) provides as follows in relation to the assessment of the impact of development on sunlight access to existing buildings.

> *"If a living room of an existing dwelling has a main window facing within 90° of due south, and any part of a new development subtends an angle of more than 25° to the horizontal measured from the centre of the window in a vertical section perpendicular to the window, then the sunlighting of the existing dwelling may be adversely affected. This will be the case if the centre of the window:*
>
> - *receives less than 25% of annual probable sunlight hours, or less than 5% of annual probable sunlight hours between 21 September and 21 March* ***and***
> - *receives less than 0.8 times its former sunlight hours during either period* ***and***
> - *has a reduction in sunlight received over the whole year greater than 4% of annual probable sunlight hours."*
>
> [Emphasis added]

The BRE Guide states that *"Any reduction in sunlight access below this level should be kept to a minimum. If the available sunlight hours are both less than the amount above and less than 0.8 times their former value, either over the whole year or just in the winter months (21 September to 21 March), then the occupants of the existing building will notice the loss of sunlight … The room may appear colder and less cheerful and less pleasant".*

Section 3.3 of the Building Research Establishment's *Site layout planning for daylight and sunlight: a guide to good practice* sets out design advice and recommendations for site layout planning to ensure good sunlight access to amenity spaces and to minimise the impact of new development on existing amenity spaces. The Guide suggests that, for it to appear adequately sunlit throughout the year, at least half of a garden or amenity area should receive at least two hours sunlight at the equinox. The BRE Guide recommends that, as a rule of thumb, the centre of the space should receive at least two hours of sunlight on the 21st March in order to appear adequately sunlit throughout the year.

Assessment Methodology for Sunlight Access

A three dimensional digital model of the proposed development and of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team; and with reference to on-site, satellite and aerial photography and to drawings available on the online planning register. Using the digital model, shadows were cast by ARC at several times of the day at the summer and winter solstices, and at the equinox. An equinox occurs twice a year: the March or vernal equinox (typically in or around the 20th to 21st March) and the September or autumnal equinox (typically in or around the 21st to 23rd September). For the purposes of this analysis and with reference to the BRE Guide, shadows were cast at several times of the day on 21st March.

In determining whether or not to include existing and proposed substantial trees in the three dimensional model, ARC made reference to the BRE Guide (as updated in 2011), which states that the *"question of whether trees or fences should be included in the calculation depends upon the type of shade they produce. Normally trees and shrubs need not be included, and partly because the dappled shade of a tree is more pleasant than the deep shadow of a building (this applies especially to deciduous trees)."* Given this, ARC did not show the shadows cast by trees on the shadow study diagrams and, where detailed results of sunlight access analysis are provided in tables above, shadows cast by trees did not form part of these calculations.

The results are presented in shadow study diagrams associated with this report. Two images have been prepared for each time period on each representative date as follows:

- ***Receiving Environment:*** this image shows the shadows cast by the existing buildings only. Existing buildings surrounding the application site are shown in light grey, while existing buildings on the application site are shown in brown. The shadows cast are shown in a dark grey tone.
- ***Proposed Development:*** this image shows the shadows cast by the existing buildings together with the shadows cast by the development as now proposed. The existing buildings surrounding the site are shown in light grey, while existing buildings to be retained on the application site are shown in brown and the proposed development on the application site is shown in blue. The shadows cast are shown in a dark grey tone.

In order to calculate sunlight access to rooms, ARC referenced the methodology outlined in *Appendix A: Indicators to calculate access to skylight, sunlight and solar radiation* of the BRE Guide. Using proprietary sunlight and daylight access analysis software, ARC analysed a sunpath diagram overlaid with a shading mask corresponding to the existing or proposed shadow environment (as appropriate) and the sunlight probability diagram for a latitude of 53° N (i.e. Dublin) for a reference point (i.e. the centre point) of each sample study window. The sunlight availability indicator has 100 spots on it. Each of these represents 1% of annual probable sunlight hours (APSH). The percentage of APSH at the reference point is found by counting up all the unobstructed spots.

Definition of Impacts on Sunlight Access

The list of definitions given below is taken from *Table 3.3: Descriptions of Effects* contained in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency (Draft of 2017). Some comment is also given below on what these definitions might imply in the case of sunlight access. The definitions from the EPA document are in italics.

- ***Imperceptible:*** *An effect capable of measurement but without significant consequences.* The definition implies that the development would cause a change in the sunlight received at a location, capable of measurement, but not noticeable to the casual observer. If the development caused no change in sunlight access, there could be no effect.

- ***Not Significant:*** *An effect which causes noticeable[2] changes in the character of the environment but without significant consequences* (the footnote "2" to the word *"noticeable"* is: *"for the purposes of planning consent procedures"*). The definition implies that the development would cause a change in the sunlight received at a location, which is capable of measurement and capable of being noticed by an observer who is taking an active interest in the extent to which the proposal might affect sunlight access.

- ***Slight:*** *An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.* For this definition to apply, the amount of sunlight received at a location would be changed by shadows cast by the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the shadow environment of the surrounding environment should remain largely unchanged.

- ***Moderate:*** *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.* In this case, a development must bring about a change in the shadow environment of the area; and this change must be consistent with a pattern of change that is already occurring, is likely to occur, or is envisaged by policy. A moderate effect would occur where other developments were bringing about changes in sunlight access of similar extent in the area.

- ***Significant:*** *An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of sunlight access in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a development resulting in a *"significant"* diminution of sunlight access would overshadow a location to the extent that there is a significant change in the amount of direct sunlight received at that location.

- ***Very Significant:*** *An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.* For example, a *"very significant"* reduction in sunlight access would occur where the development overshadows a location for most of the time that the location would have been in sunlight prior to the construction of the development and where overshadowing of that magnitude is not *"consistent with existing and emerging baseline trends"*.

- ***Profound:*** *An effect which obliterates sensitive characteristics*. Examples of development resulting in a *"profound"* effect on sunlight access would include facilitating sunlight access at a location where that location has previously had none (e.g. facilitating sunlight access as a result of the demolition of a building) or by removal of all access to sunlight at a location.

In relation to sunlight access, it is conceivable that there could be positive impacts, but this implies that a development would involve a reduction of the size or scale of built form (e.g. such as the demolition of a building, which might result in an increase in sunlight access). Though that is possible, it is usually unlikely as most development involves the construction of new obstructions to sunlight access.

The range of possible impacts listed above deal largely with the extent of impact; and the extent of the impact of a development is usually proportional to the extent to which that development is large in scale and/or height and its proximity to the location. This proportionality may be modified by the extent to which the development is seen as culturally or socially acceptable, and on the interaction between the proposed development, the character of the existing shadow environment and the land use pattern of the receiving environment.

Daylight Access to Buildings

Context under Technical and Guidance Documents

Section 2.2.21 of the BRE Guide suggests that:

> *"If any part of a new building or extension, measured in a vertical section perpendicular to a main window wall of an existing building, from the centre of the lowest window, subtends an angle of more than 25° to the horizontal, then the diffuse daylighting of the existing building may be adversely affected. This will be the case if ...*
>
> - *the VSC measured at the centre of an existing main window is less than 27%, and less than 0.8 times its former value..."*

The BRE Guide states as follows (at paragraph 2.1.8) in relation to daylight access within new development:

> *"2.1.8 Daylight provision in new rooms may be checked using the average daylight factor (ADF). The ADF is a measure of the overall amount of daylight in a space... BS 8206-2 Code of practice for daylighting, recommends an ADF of 5% for a well daylit space and 2% for a partly daylit space. Below 2% the room will look dull and electric lighting is likely to be turned on. In housing BS 8206-2 also gives minimum value of ADF of 2% for kitchens, 1.5% for living rooms and 1% for bedrooms."*

Assessment Methodology for Daylight Access

A three dimensional digital model of the proposed development and of existing buildings in the area was constructed by ARC Consultants based on drawings and three dimensional models supplied by the Design Team; and with reference to on-site, satellite and aerial photography and to the online planning register, where relevant. Existing and proposed landscaping was not included in this model. In assessing daylight access within rooms within the proposed development, assumptions were made as to the colour schemes (e.g. materials, reflectances, etc) used in the decoration of the walls, floor and ceiling of the room and the type of glazing used in the window opes. In all cases, rooms are assessed as excluding furniture and window treatments (e.g. curtains, blinds). Assumptions are also made as to the materials and reflectances of external surfaces.

ARC assessed the Vertical Sky Component of each window at a point at the centre of each window. Sky Component and Average Daylight Factor were assessed on the working plane (taken as 750 mm above finished floor level for the purpose of this report). Having regard to the extreme variability in sky luminance over the course of any given day depending on weather conditions and the changing seasons, in order for daylight factor to be a meaningful and comparable measure of daylight access, it is necessary to assume a particular luminance distribution for the sky when calculating Average Daylight Factor. This daylight access analysis uses the Commission Internationale de l'Eclairage (CIE) Standard Overcast Sky Distribution model in its calculations, which is the standard sky most commonly used in daylight access analysis. This model assumes that sky luminance varies from horizon to zenith and is considered to correspond to an overcast day. Unless specifically referenced, analysis of uniformity of daylight access within a room has not been carried out as part of this assessment.

Definition of Impacts on Daylight Access

The list of definitions given below is taken from *Table 3.3: Descriptions of Effects* contained in the *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports* prepared by the Environmental Protection Agency (Draft of 2017). Some comment is also given below on what these definitions might imply in the case of daylight access. The definitions from the EPA document are in italics.

- ***Imperceptible:*** *An effect capable of measurement but without significant consequences.* The definition implies that the development would cause a change in the daylight received at a location, capable of measurement, but not noticeable to the casual observer. If the development caused no change in daylight access, there could be no effect.

- ***Not Significant:*** *An effect which causes noticeable2 changes in the character of the environment but without significant consequences* (the footnote "2" to the word *"noticeable"* is: *"for the purposes of planning consent procedures"*). The definition implies that the development would cause a change in the daylight received at a location, which is capable of measurement and capable of being noticed by an observer who is taking an active interest in the extent to which the proposal might affect daylight access.

- ***Slight:*** *An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.* For this definition to apply, the amount of daylight received at a location would be changed by the construction of the development to an extent that is both capable of measurement and is noticeable to a minor degree. However, the daylight environment within an existing building should remain largely unchanged.

- ***Moderate:*** *An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.* In this case, a development must bring about a change in the daylight environment within an existing building; and this change must be consistent with a pattern of change that is already occurring, is likely to occur, or is envisaged by policy. A moderate effect would occur where other developments were bringing about changes in daylight access of similar extent in the area.

- ***Significant:*** *An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of daylight access in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a development resulting in a *"significant"* diminution of daylight access would reduce daylight to the extent that minimum standards for daylighting are not met and artificial lighting is required for part of the day.

- ***Very Significant:*** *An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.* The definition implies that the existence of the development would change the extent of daylight access to a considerable degree and in a manner that is not *"consistent with existing and emerging baseline trends"*. For example, a *"very significant"* effect would occur where a development would result in daylight received in a room falling well below the minimum standards for daylighting and where artificial lighting would be required in that room as the principal source of lighting all the time.

- ***Profound:*** *An effect which obliterates sensitive characteristics.* Examples of development resulting in a ***"profound"*** effect on daylight access would include facilitating daylight access to a room in an existing building where the existing room has none (e.g. as a result of the demolition of a building) or by removal of all access to daylight within an existing building.

In relation to daylight access, it is conceivable that a development could result in positive effects, but this implies that a development would involve a reduction of the size or scale of built form (e.g. such as the demolition of a building, which might result in an increase in daylight access). Though that is possible, it is usually unlikely as most development involves the construction of new obstructions to daylight access.

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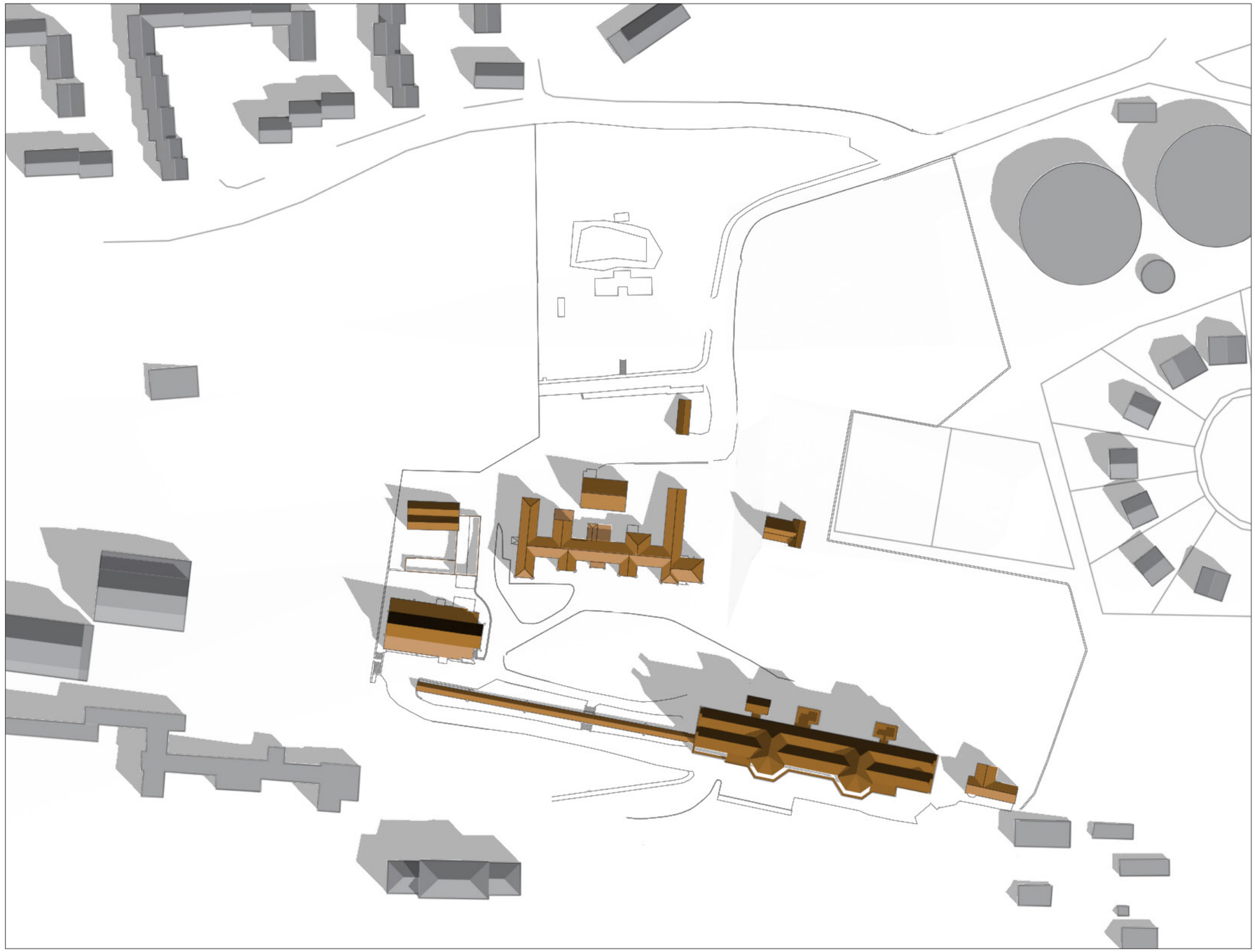

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SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : MARCH 21ST - EQUINOX
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SUNSET : 6.49 PM

TIME :
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PROPOSED
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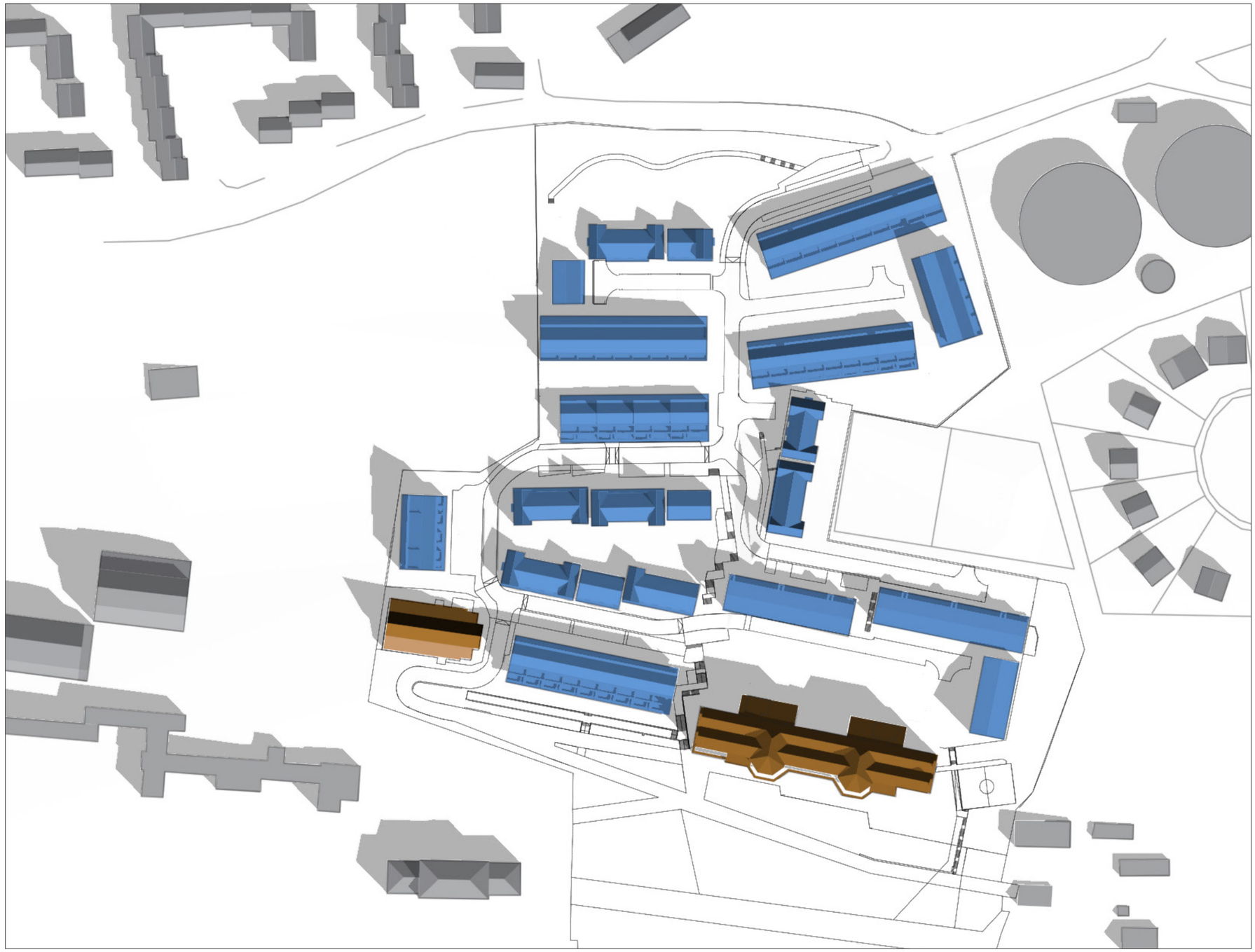

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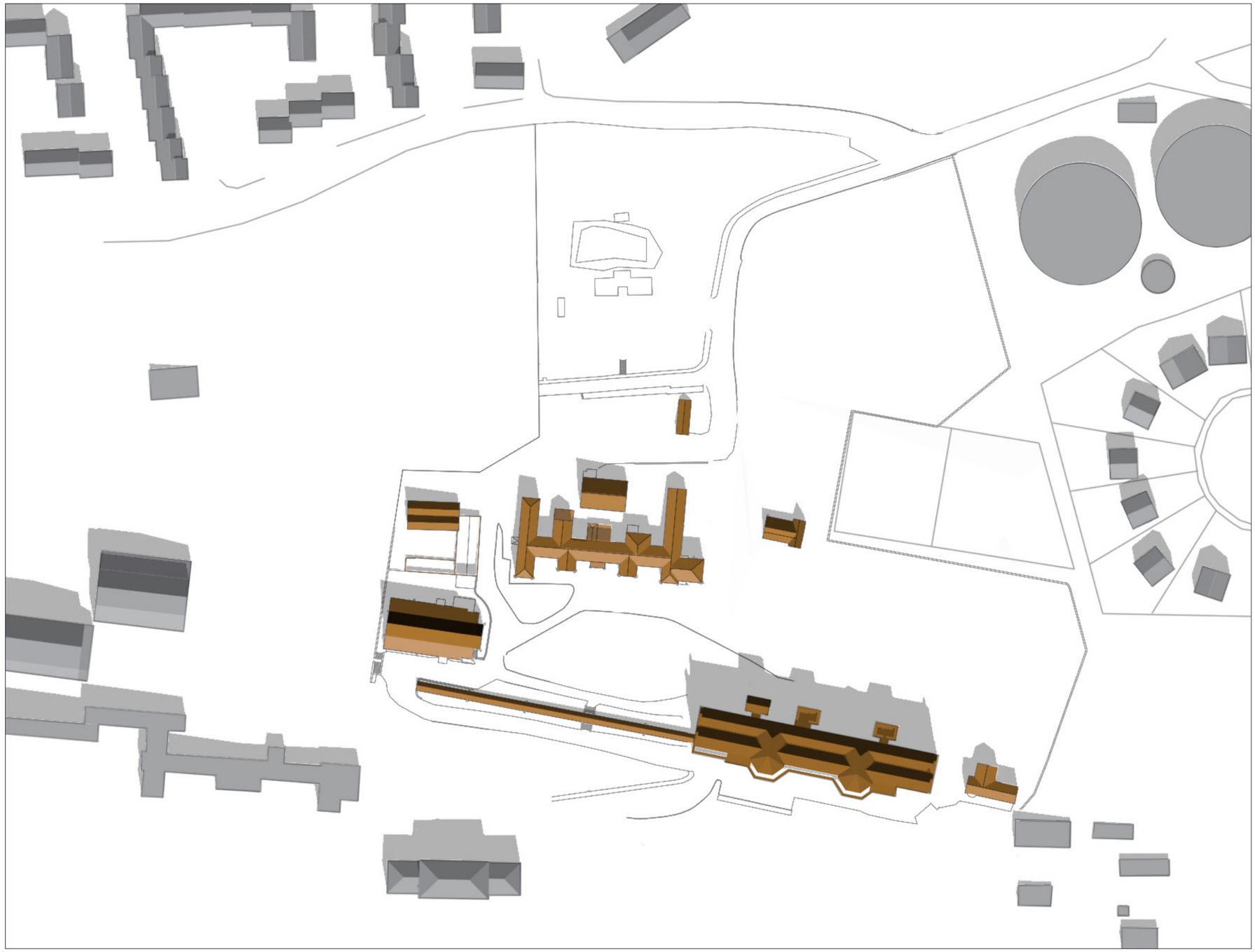

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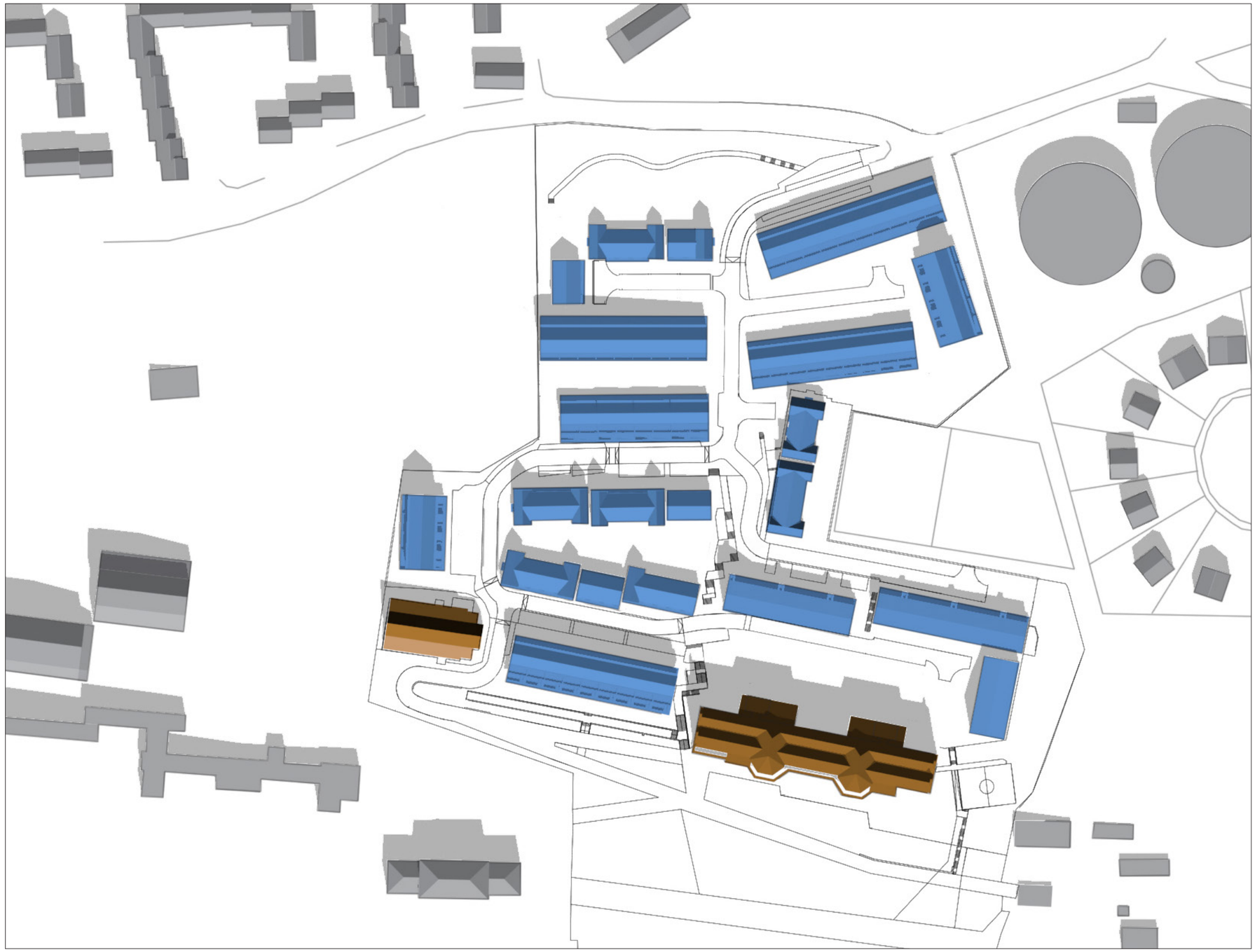

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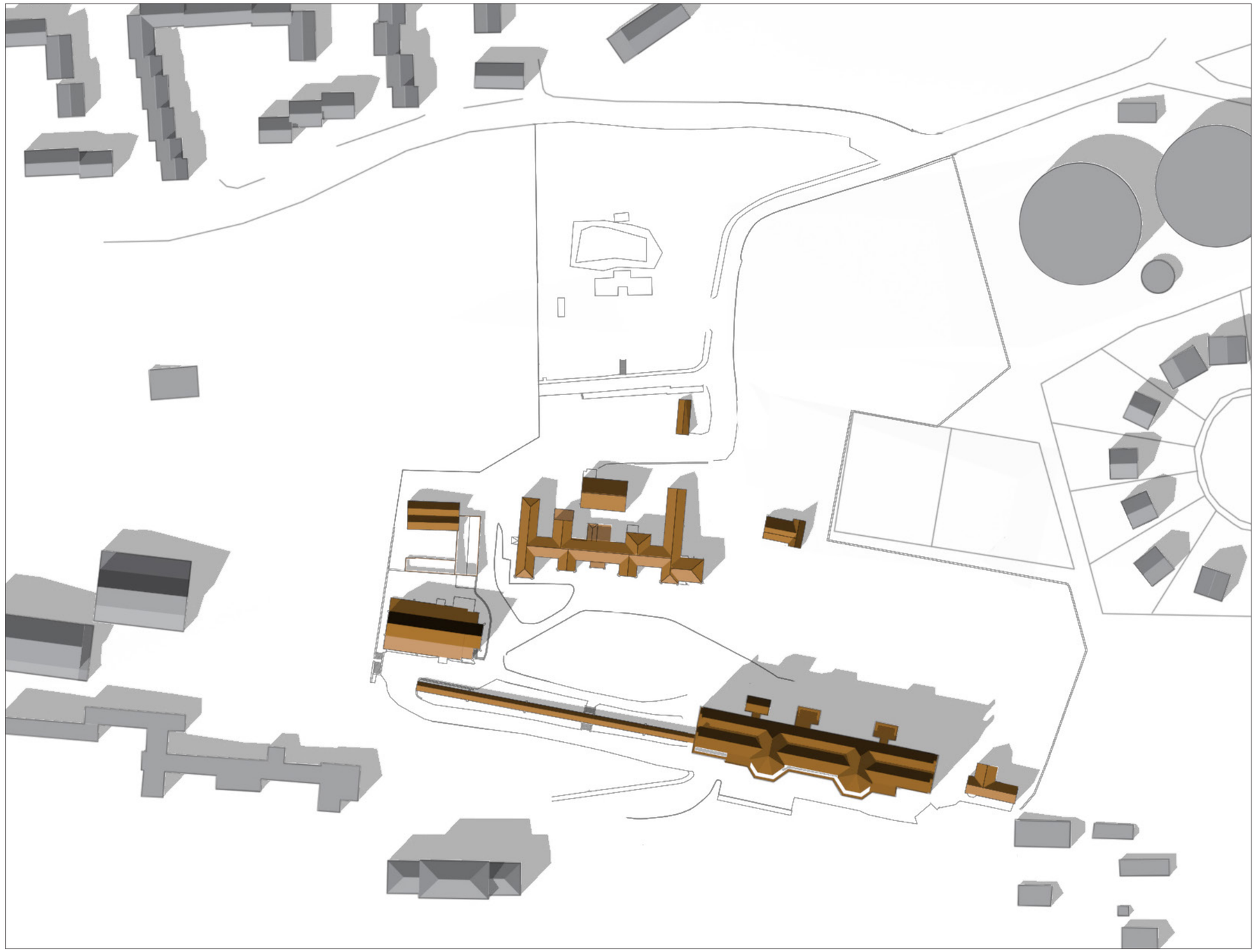

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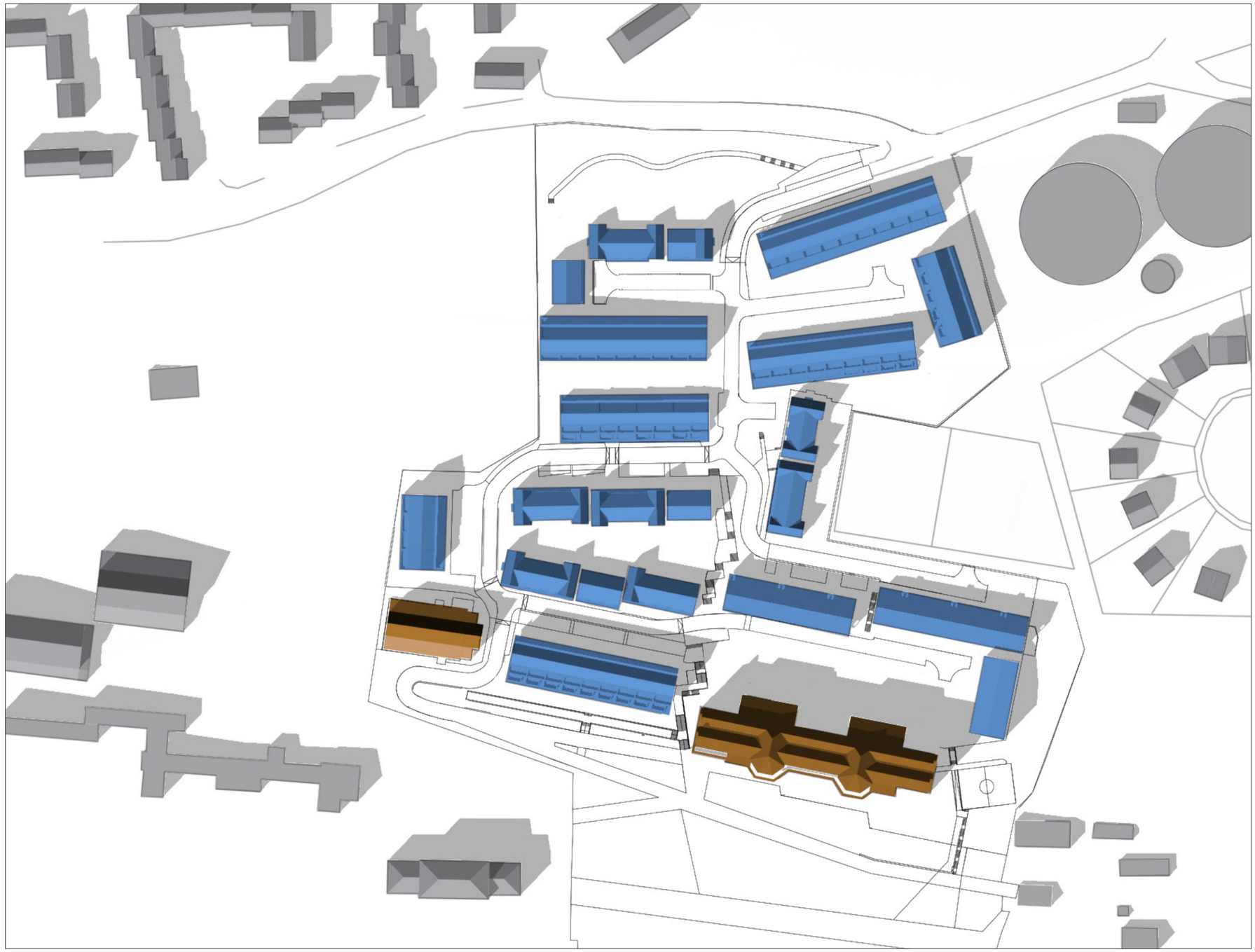

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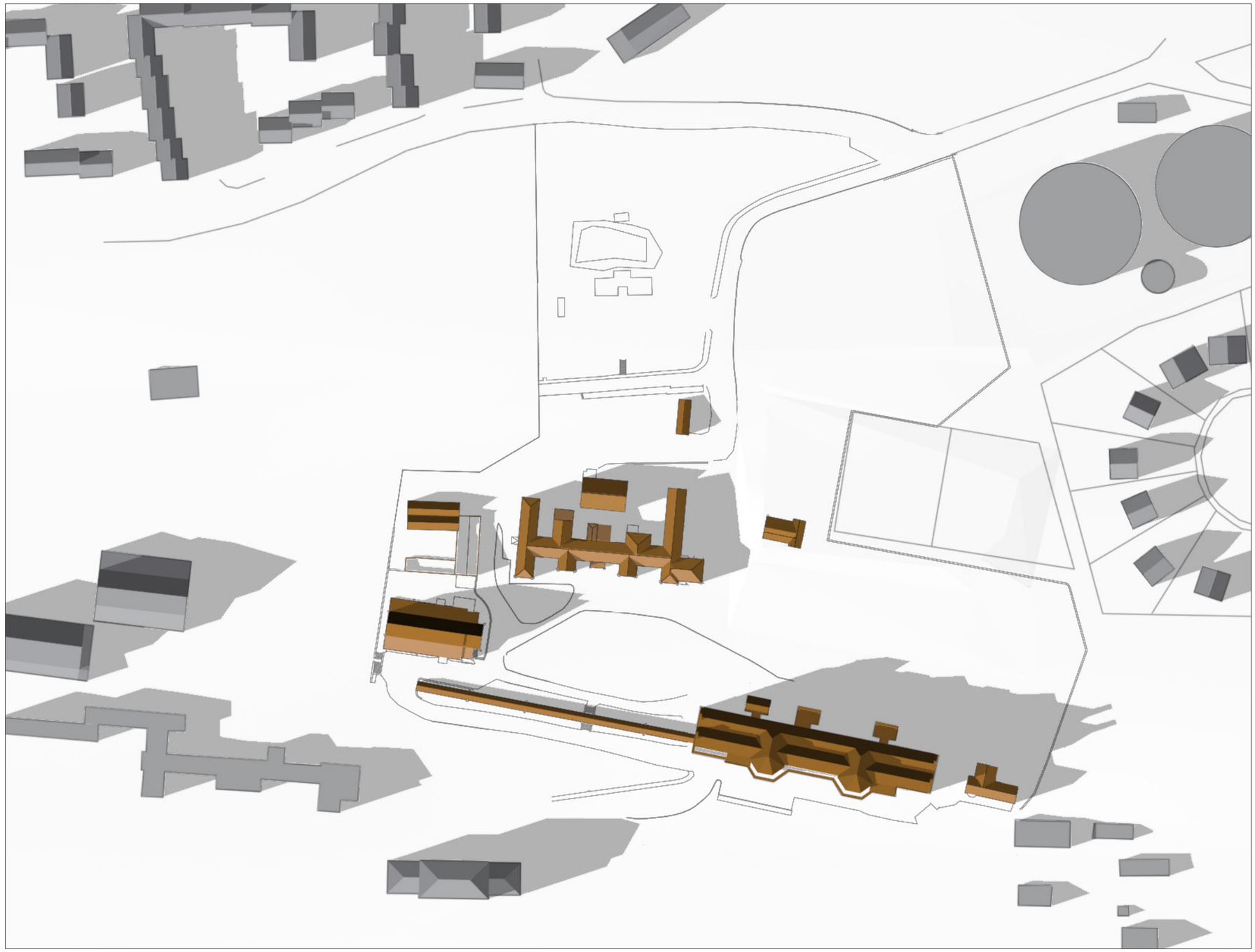

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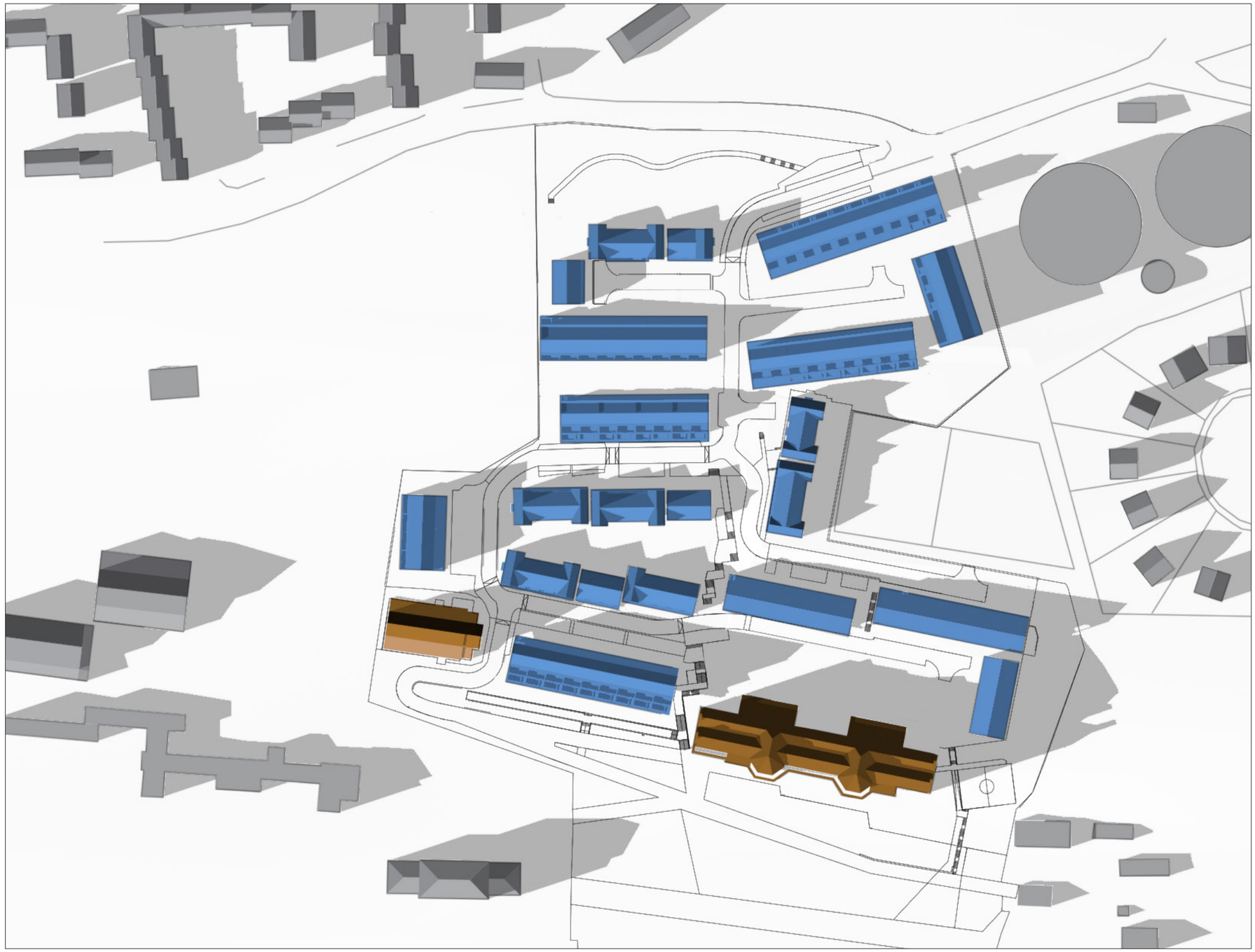

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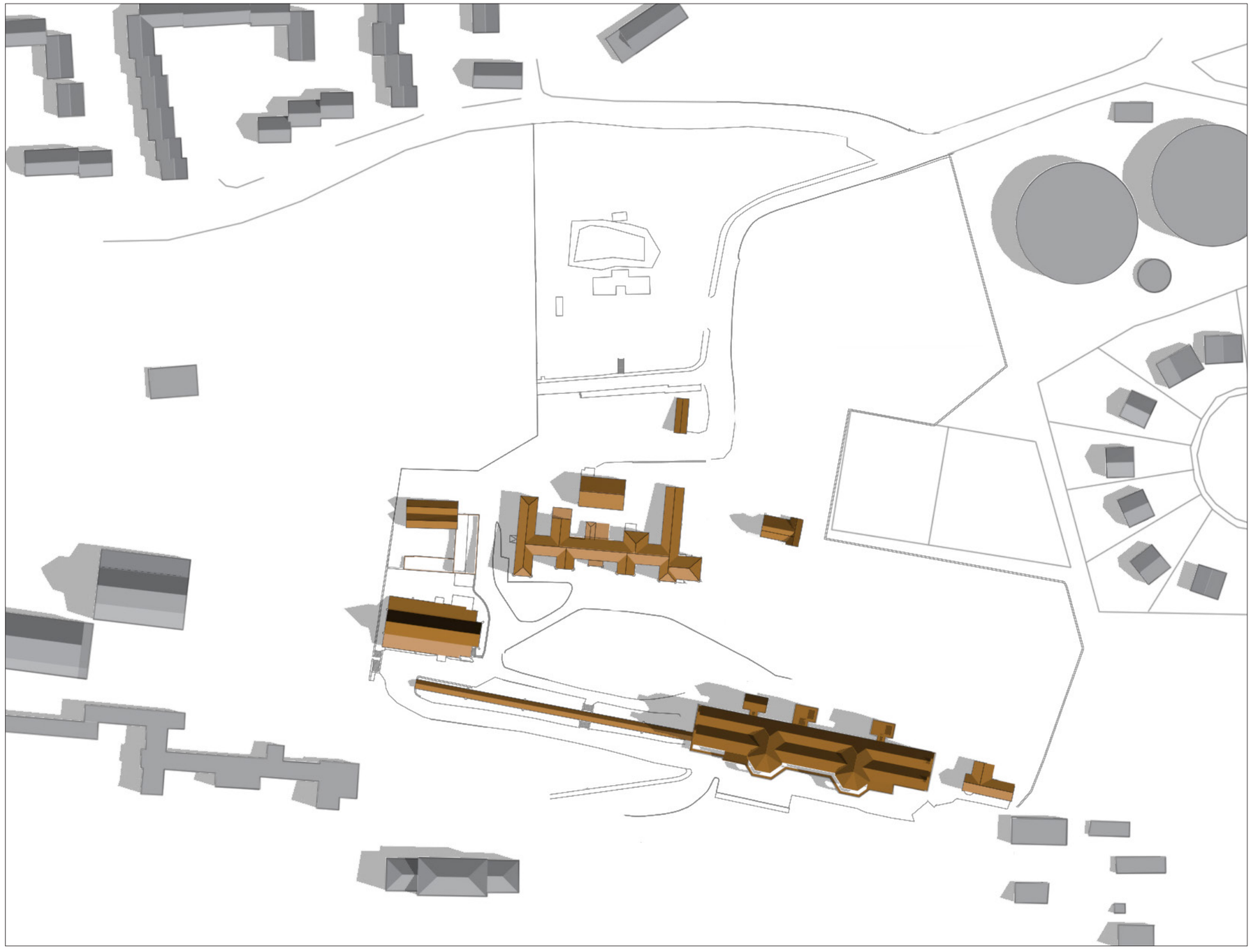

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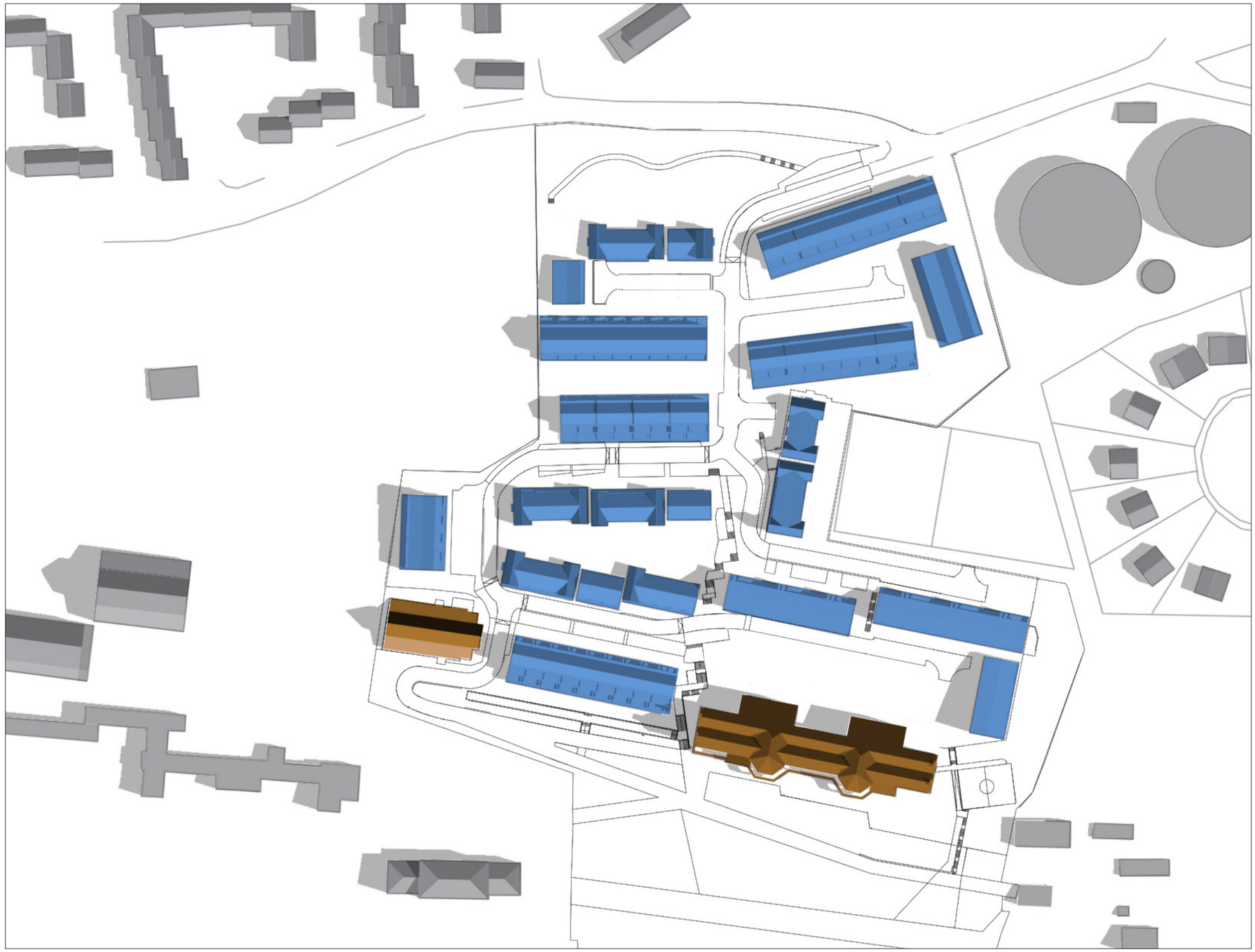

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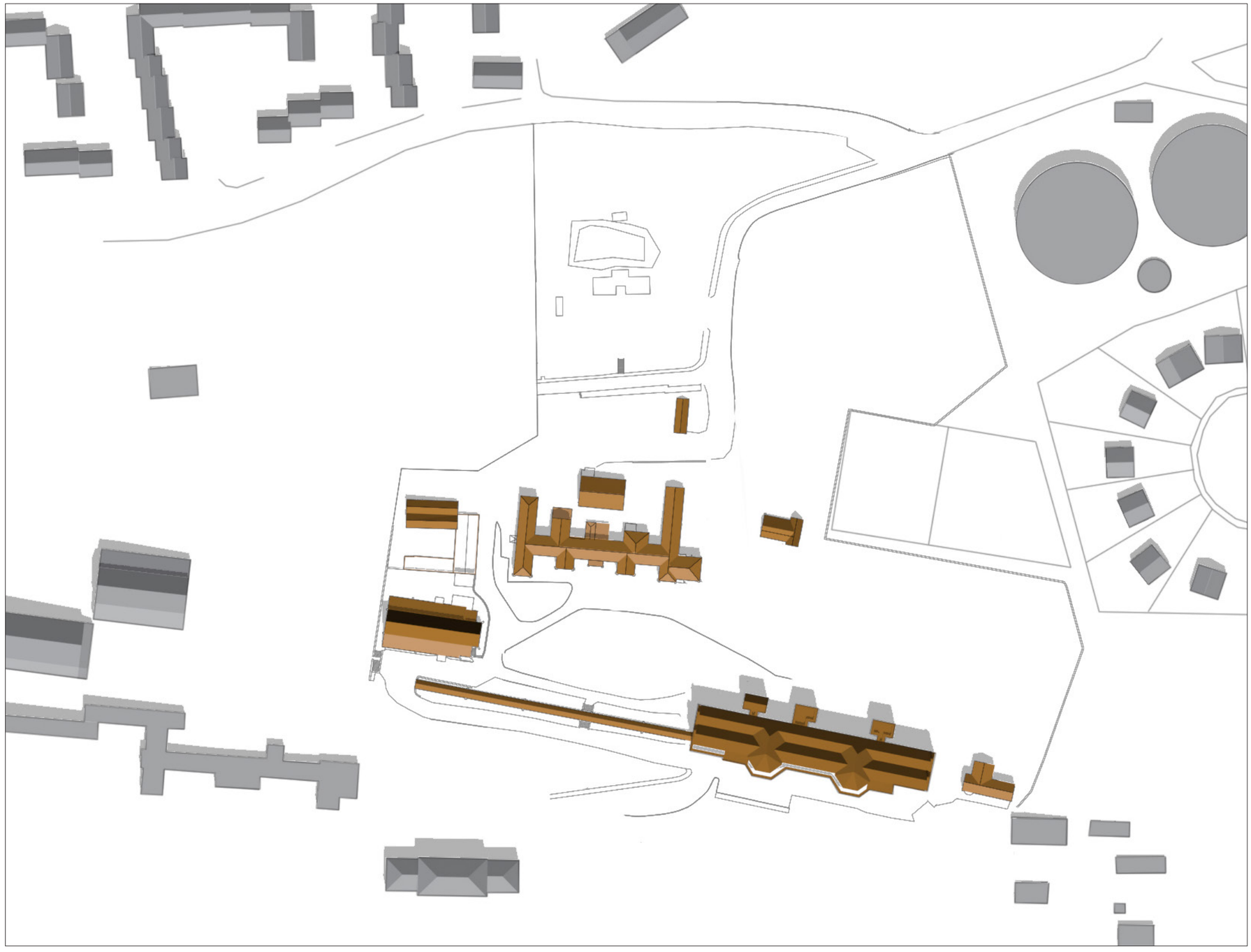

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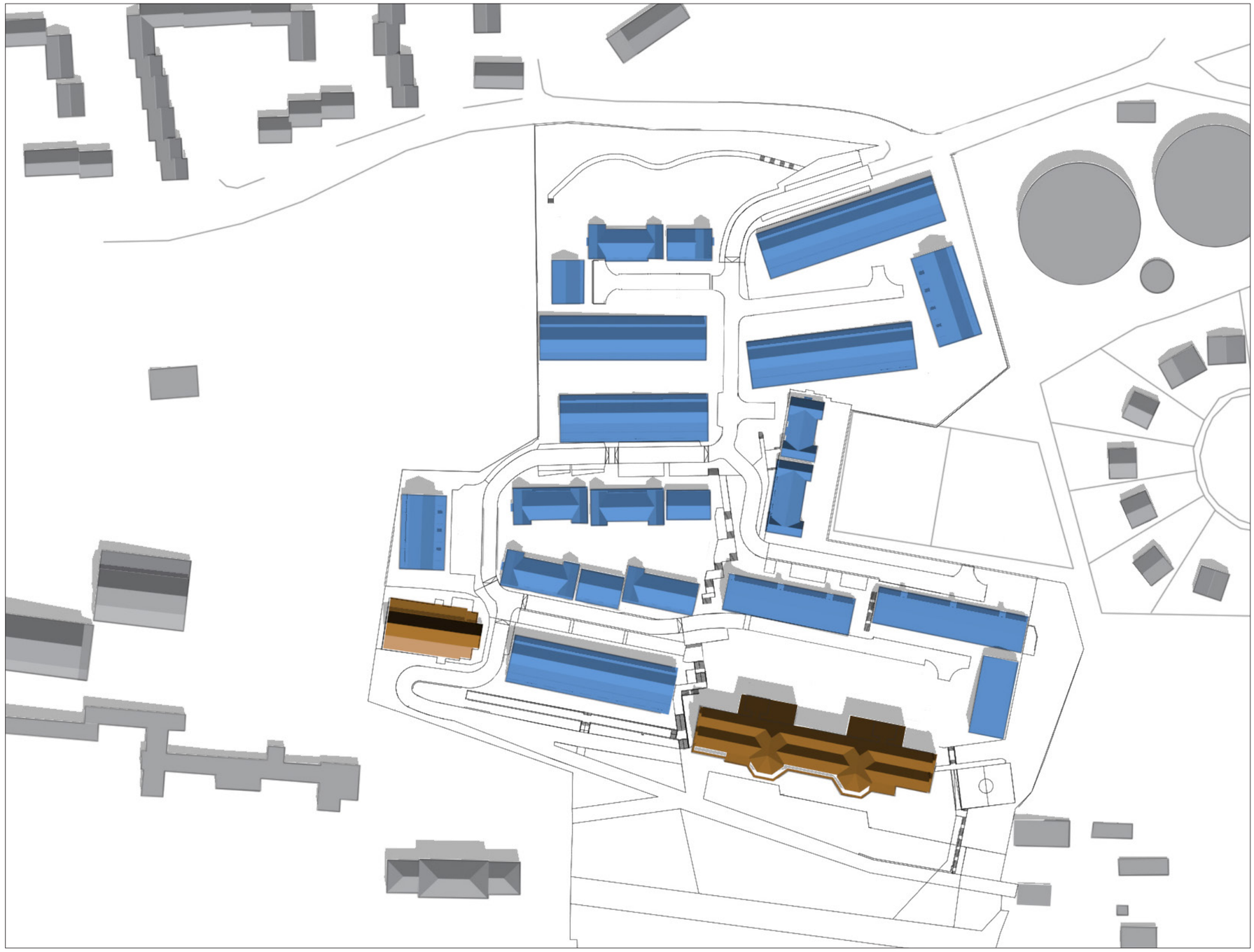

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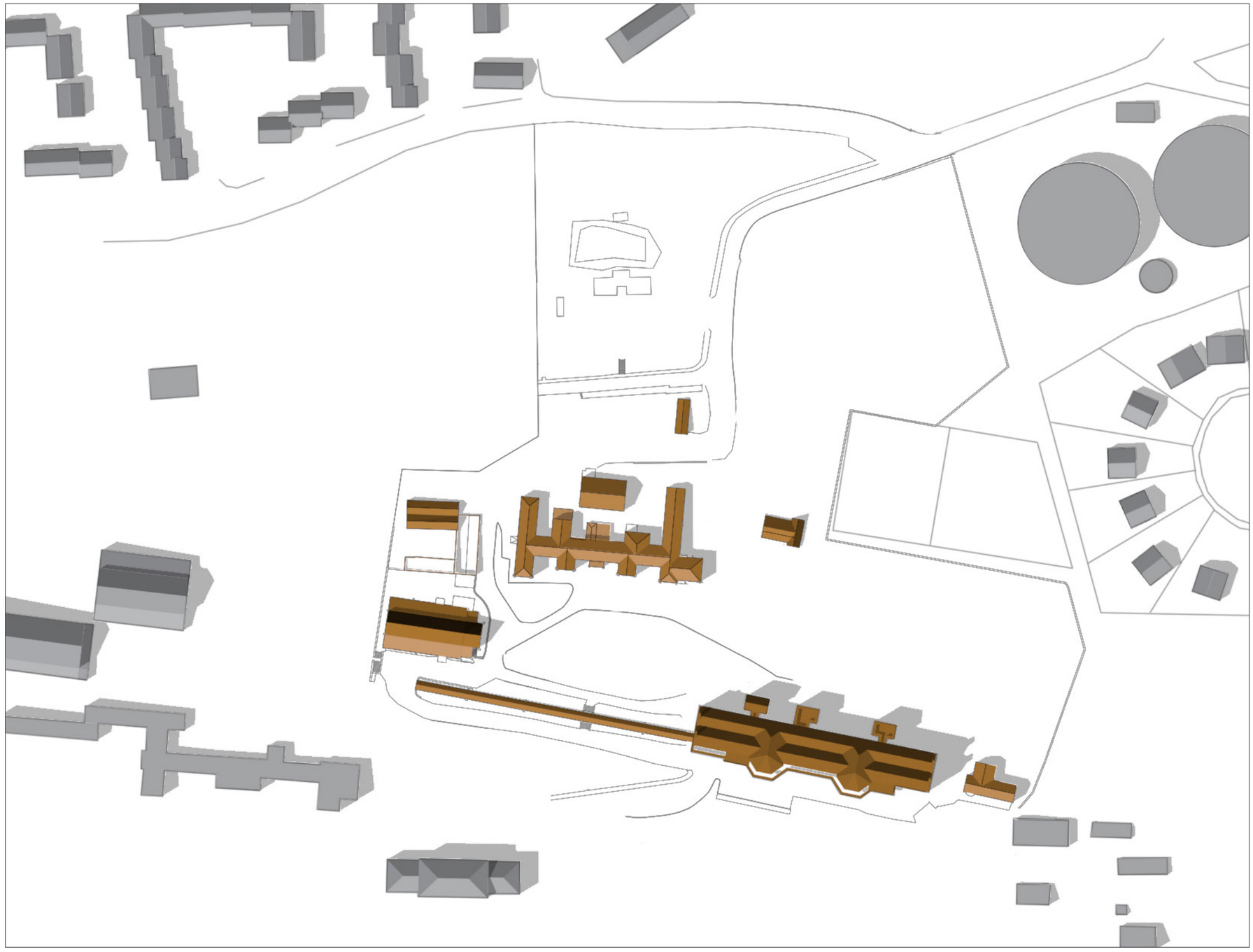

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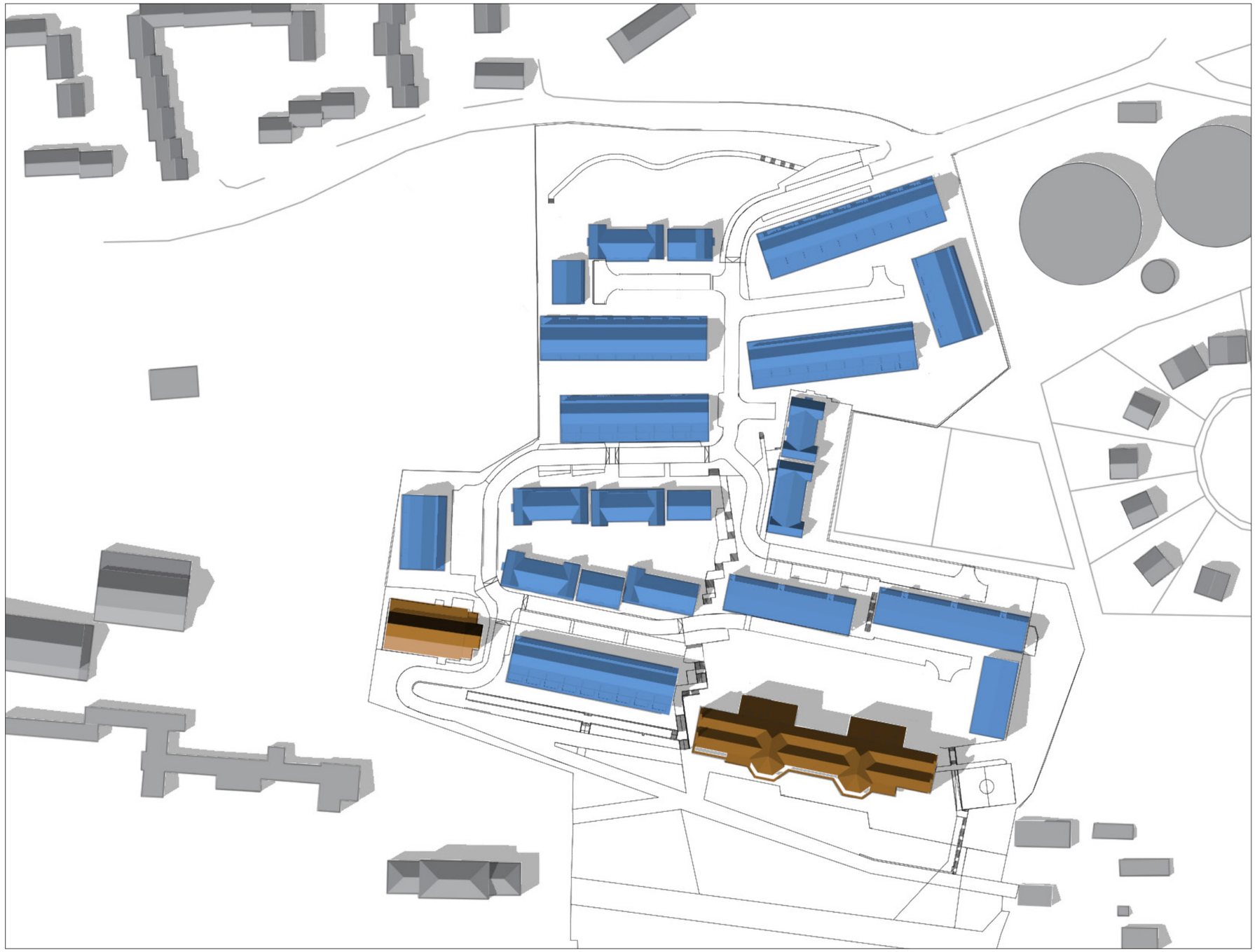

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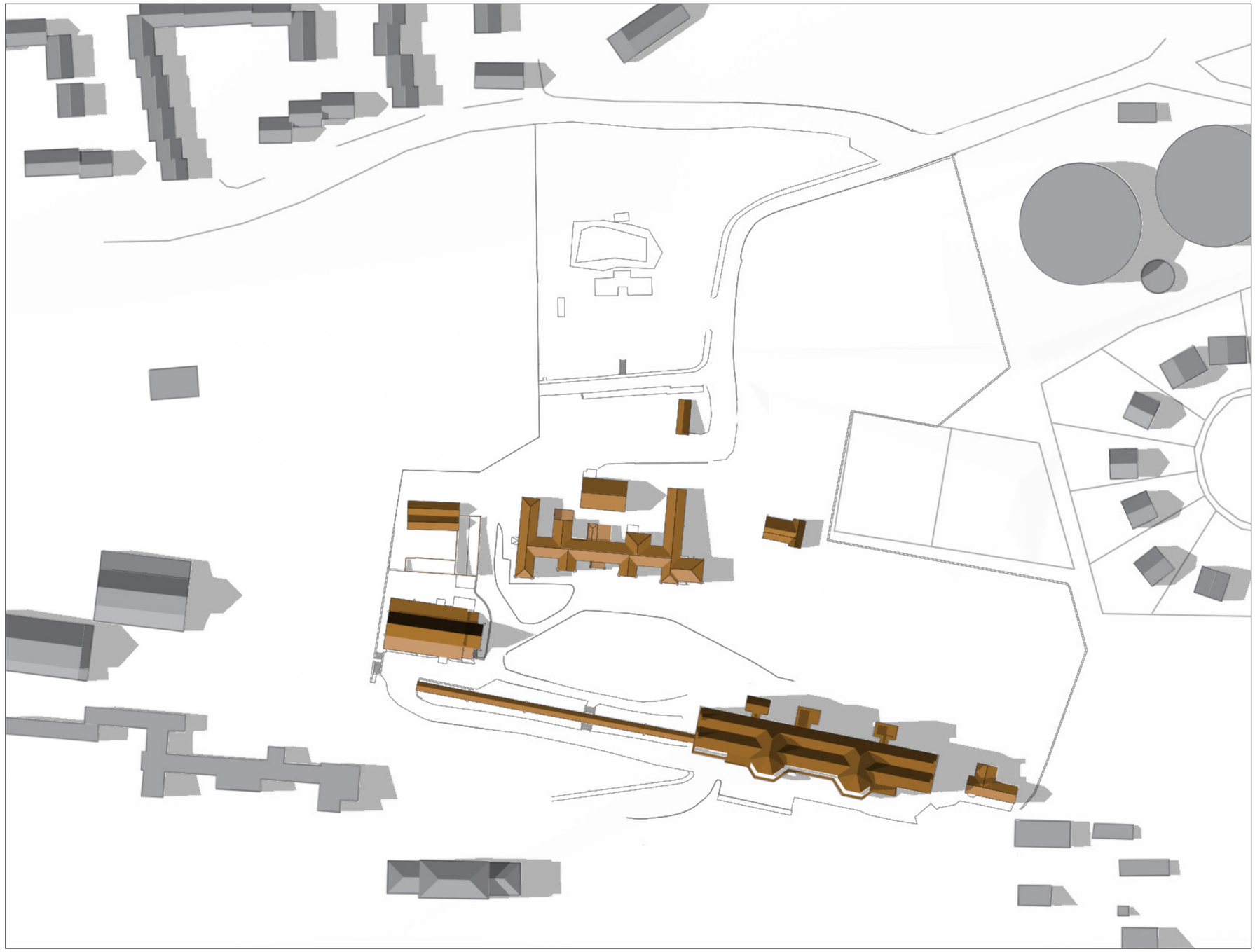

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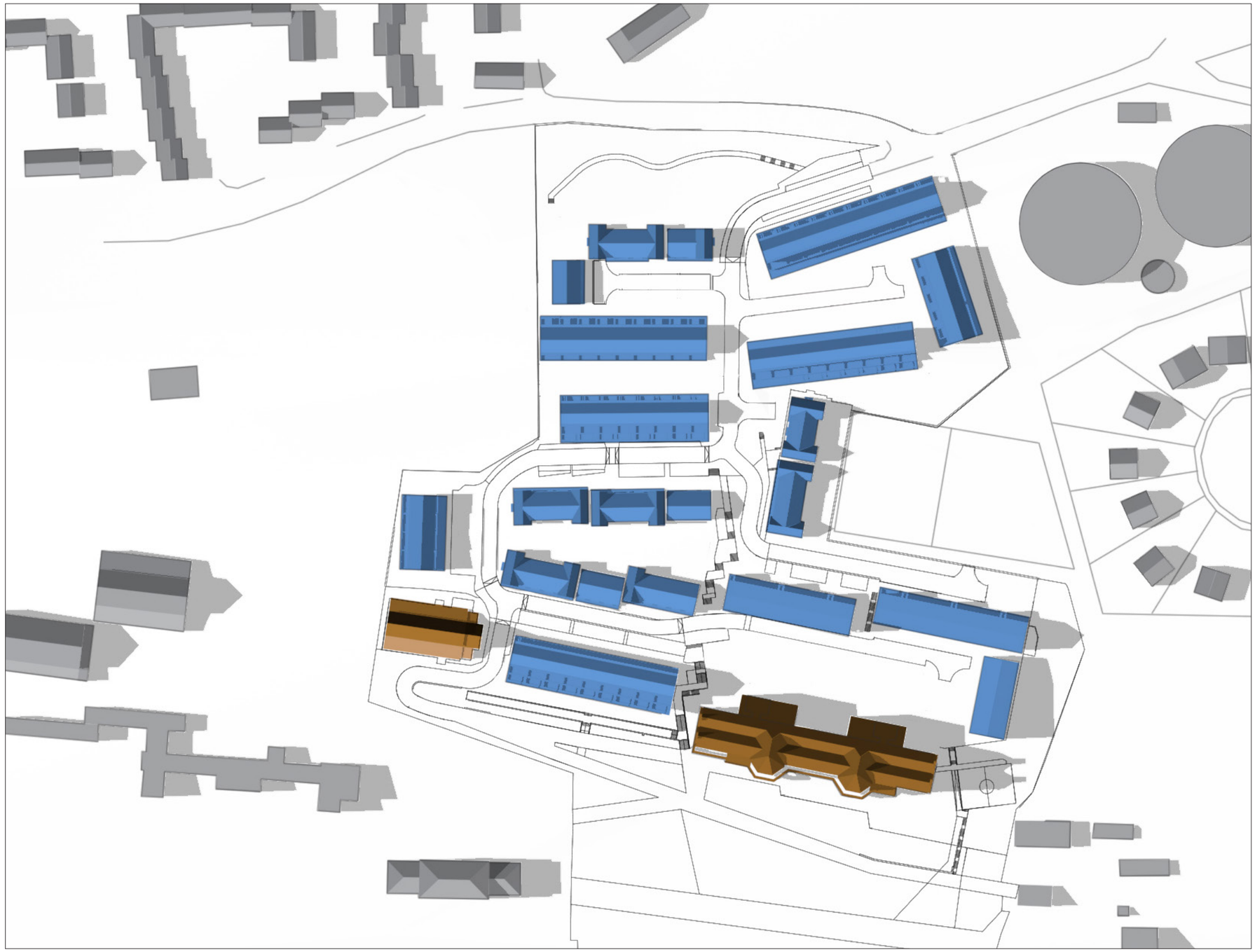

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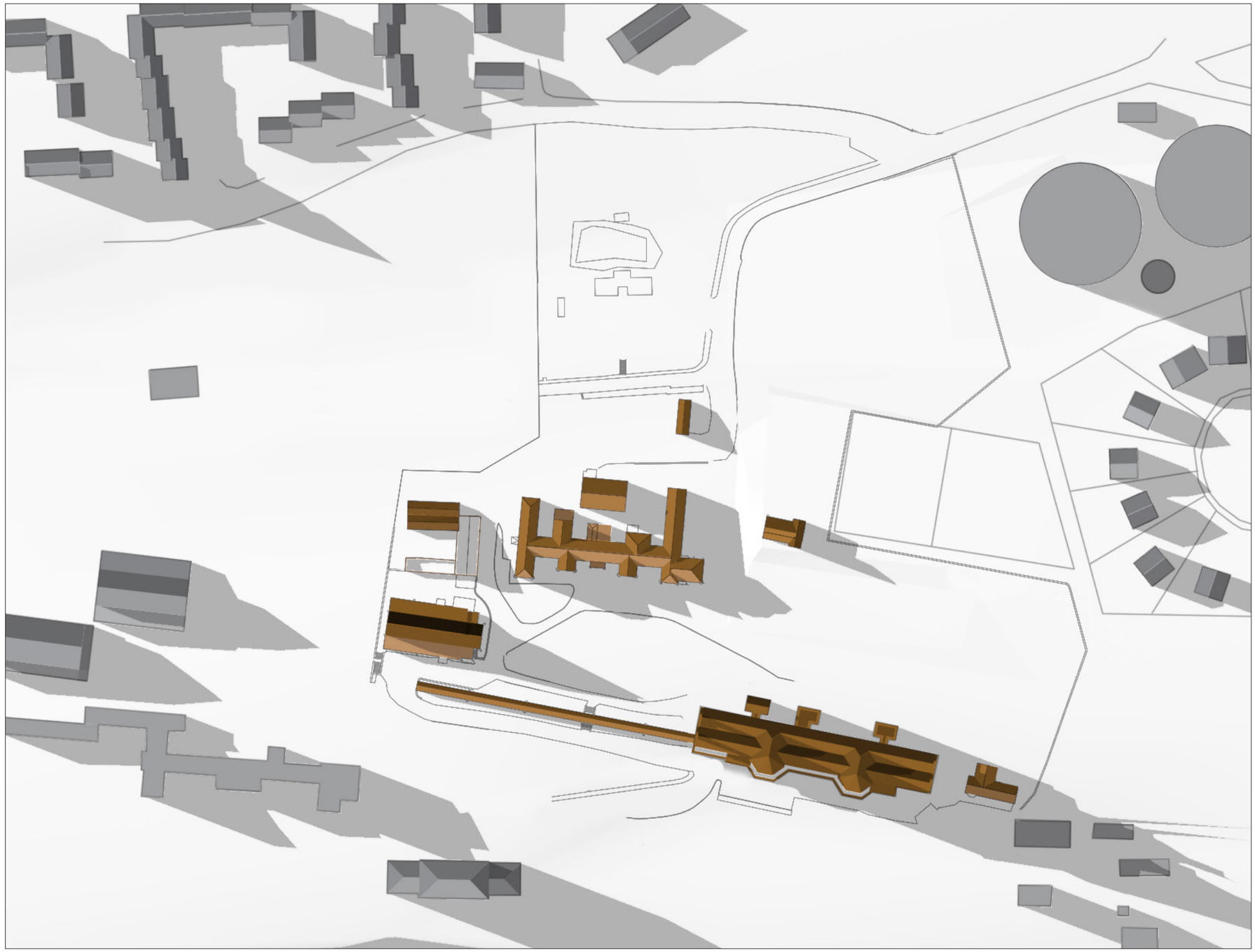


N

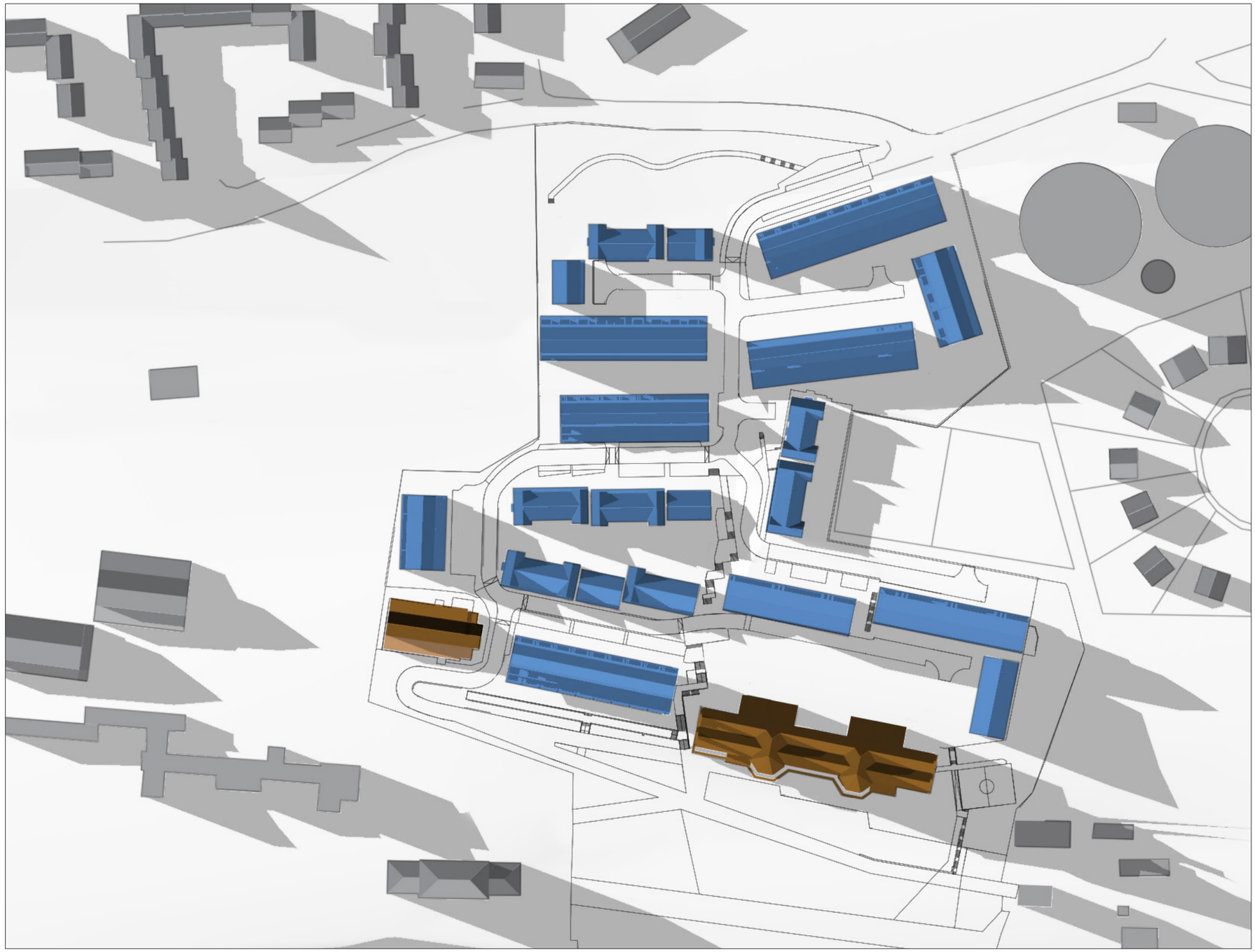
SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : JUNE 21ST - SUMMER SOLSTICE
SUNRISE : 5.14 AM
SUNSET : 9.57 PM

TIME :
7.00 PM

PROPOSED
DEVELOPMENT

OSI Licence No. AR 0087020



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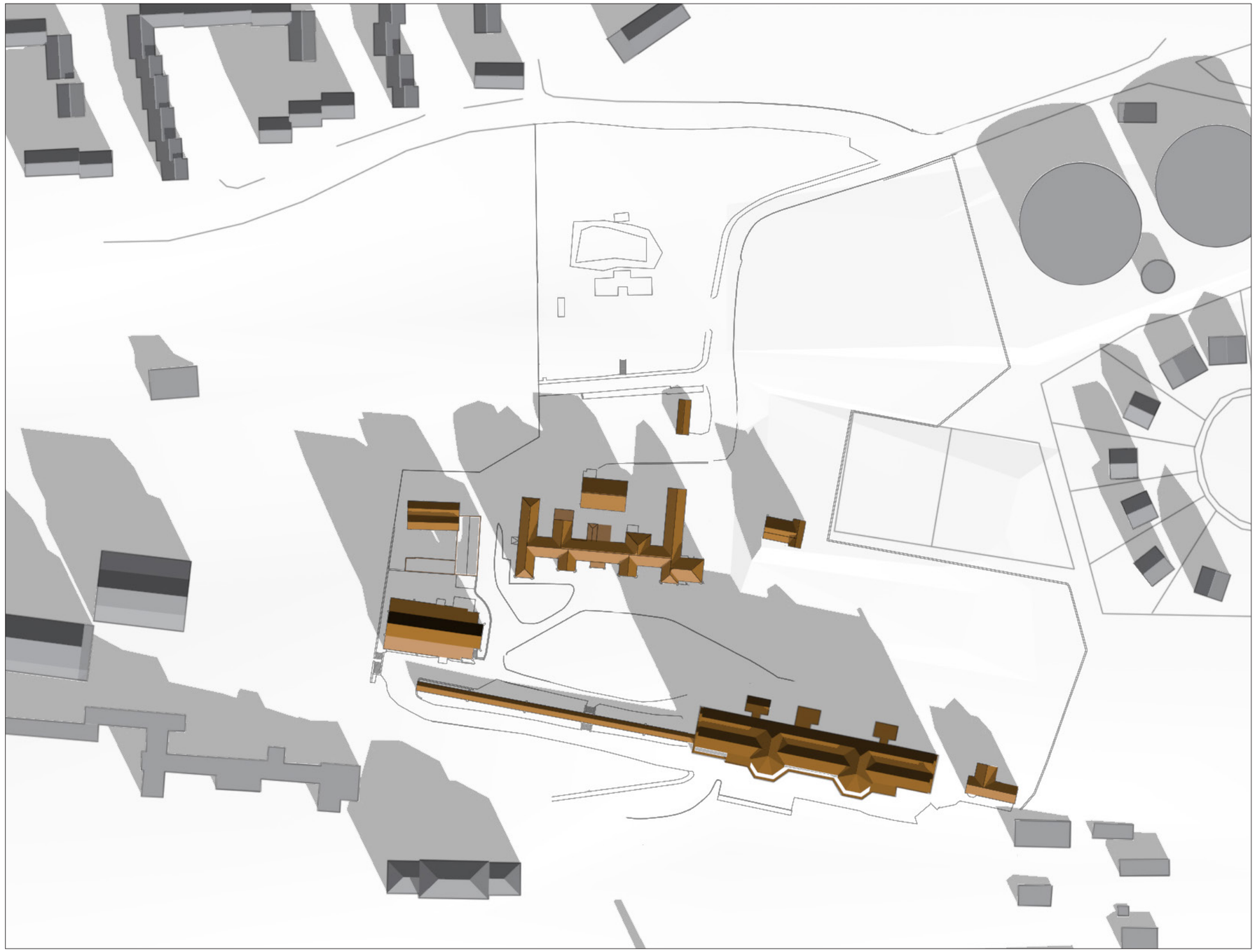
SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : JUNE 21ST - SUMMER SOLSTICE
SUNRISE : 5.14 AM
SUNSET : 9.57 PM

TIME :
7.00 PM

RECEIVING
ENVIRONMENT

OSI Licence No.AR 0087020



N

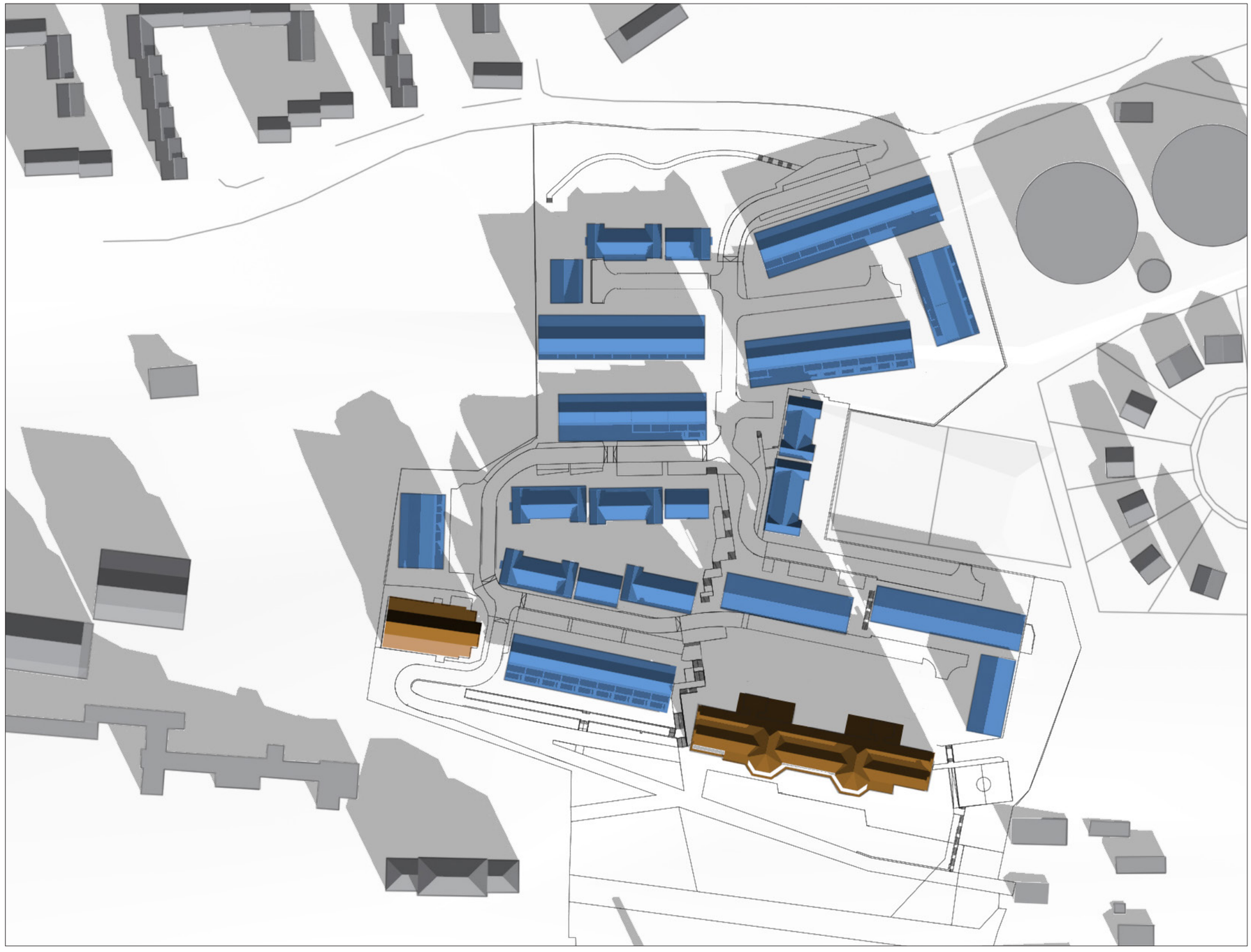
SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
10.30 AM

PROPOSED
DEVELOPMENT

OSI Licence No.AR 0087020



N

SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
10.30 AM

RECEIVING
ENVIRONMENT

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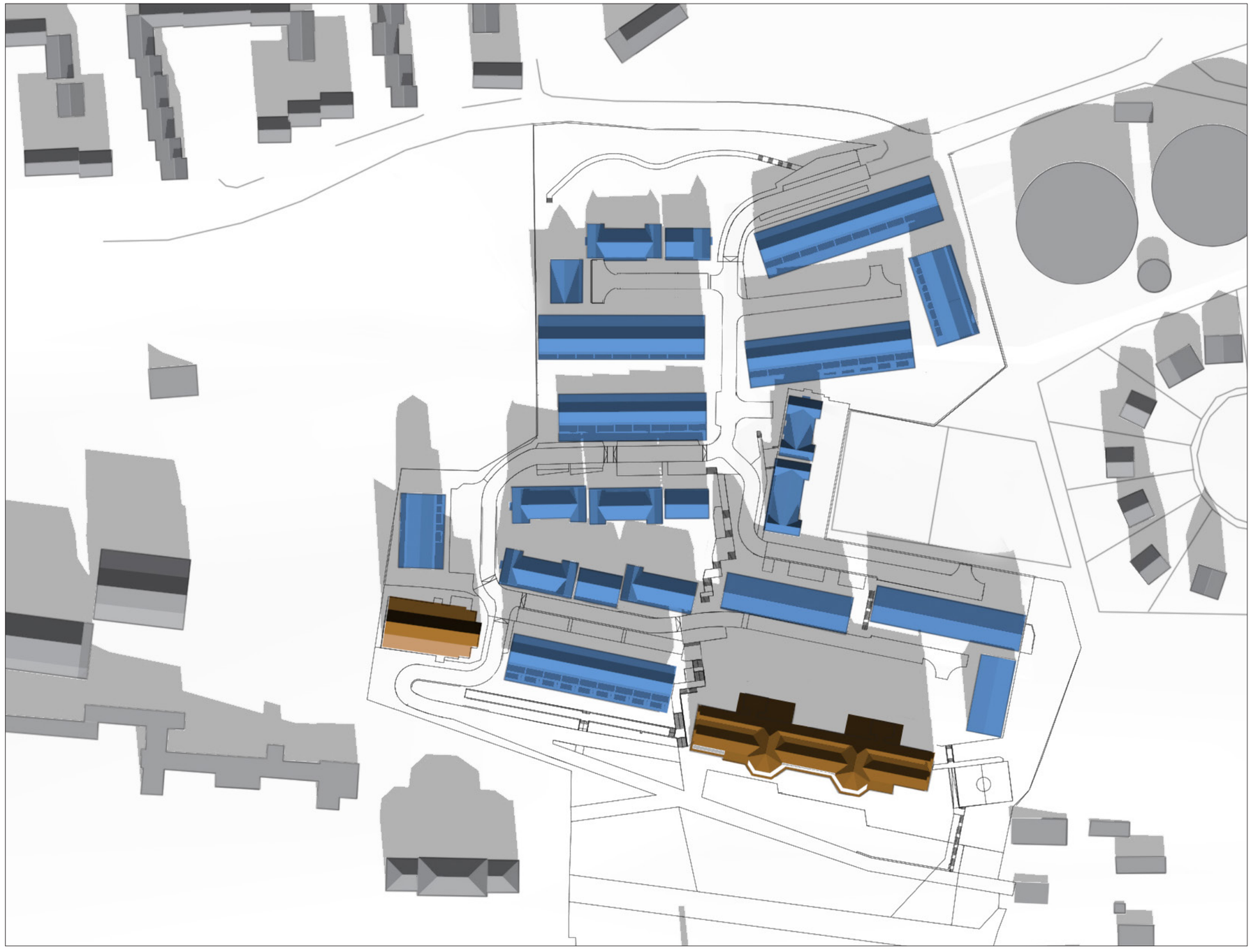
SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
12.00 PM

PROPOSED
DEVELOPMENT

OSI Licence No.AR 0087020



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SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
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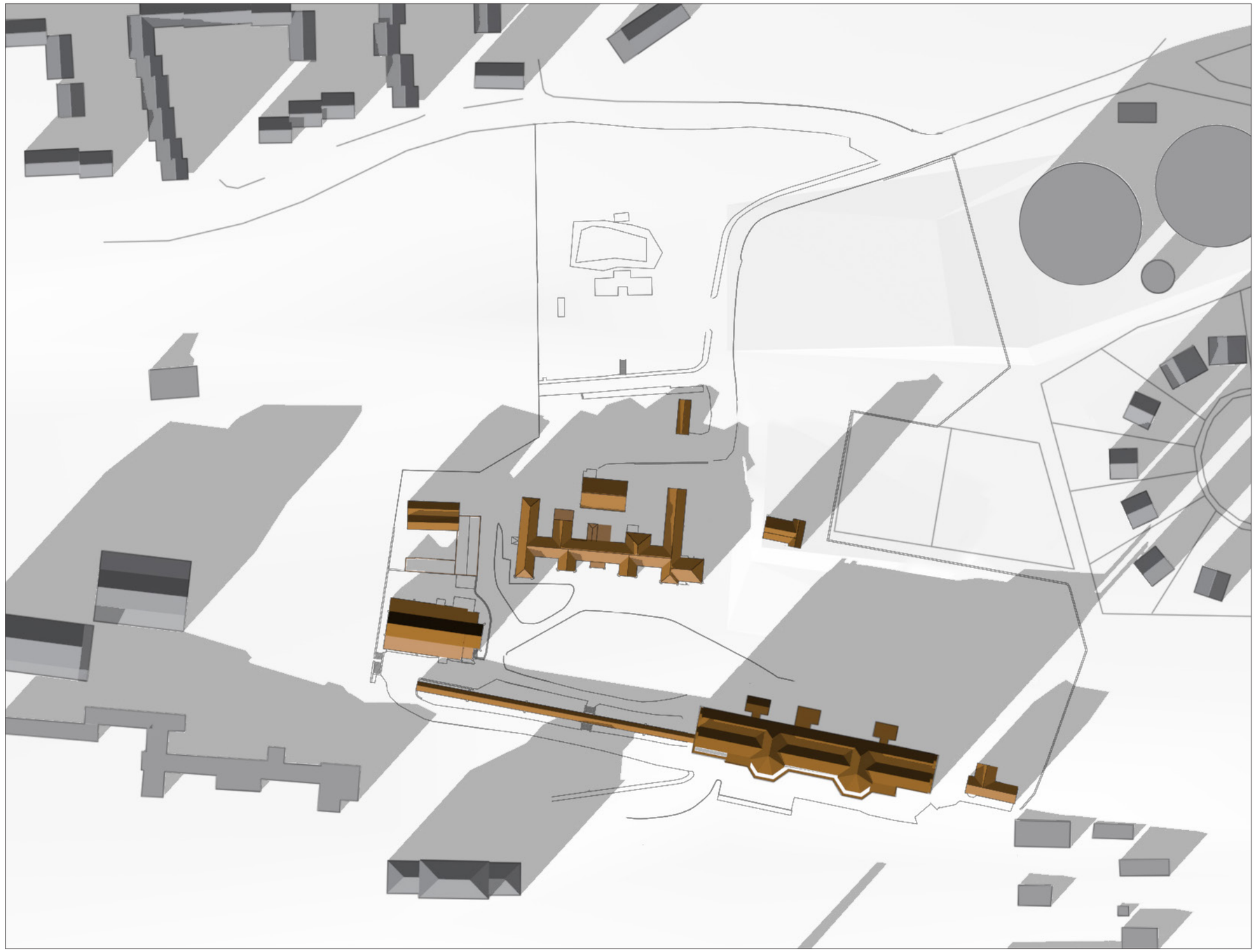
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
12.00 PM

RECEIVING
ENVIRONMENT

OSI Licence No.AR 0087020



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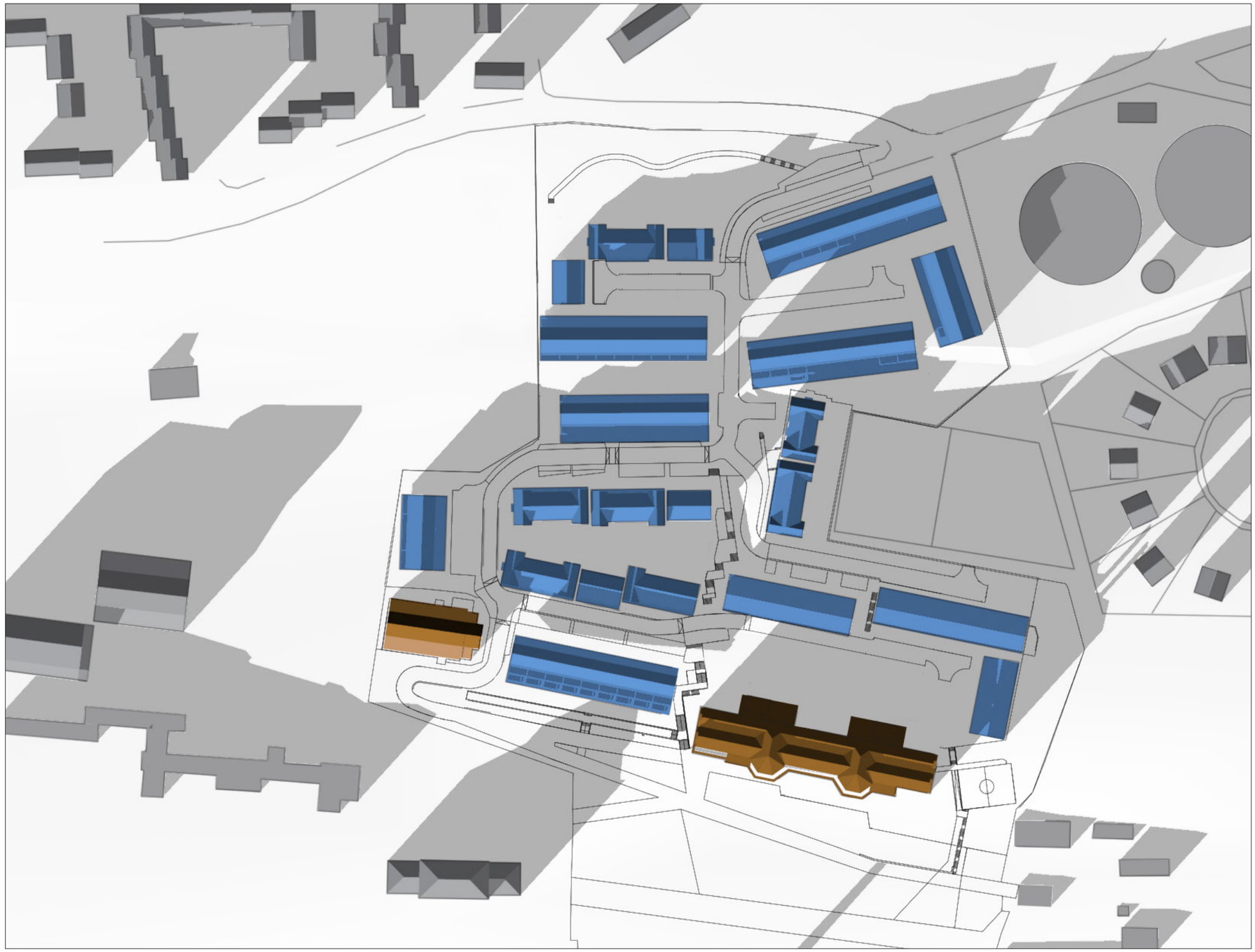
SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
3.30 PM

PROPOSED
DEVELOPMENT

OSI Licence No.AR 0087020



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SHADOW STUDY
ST KEVIN'S STRATEGIC HOUSING DEVELOPMENT AT THE
FORMER ST. KEVIN'S HOSPITAL AND GROUNDS, SHANAKIEL, CORK
NOVEMBER 2020

DATE : DECEMBER 21ST - WINTER SOLSTICE
SUNRISE : 8.39 AM
SUNSET : 4.25 PM

TIME :
3.30 PM