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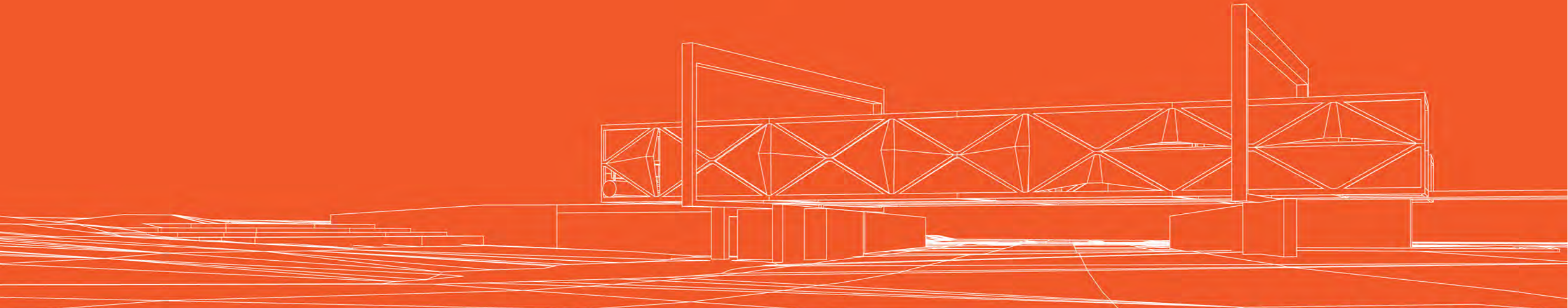
**transformative
infrastructures**
retrofitting the apartheid city

louwrens botha
m.arch (prof) 2015
university of cape town

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transformative infrastructures: retrofitting the apartheid city

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This dissertation is presented as part fulfillment of the degree of Master of Architecture (Professional) in the School of Architecture, Planning and Geomatics, University of Cape Town.

19 October 2015

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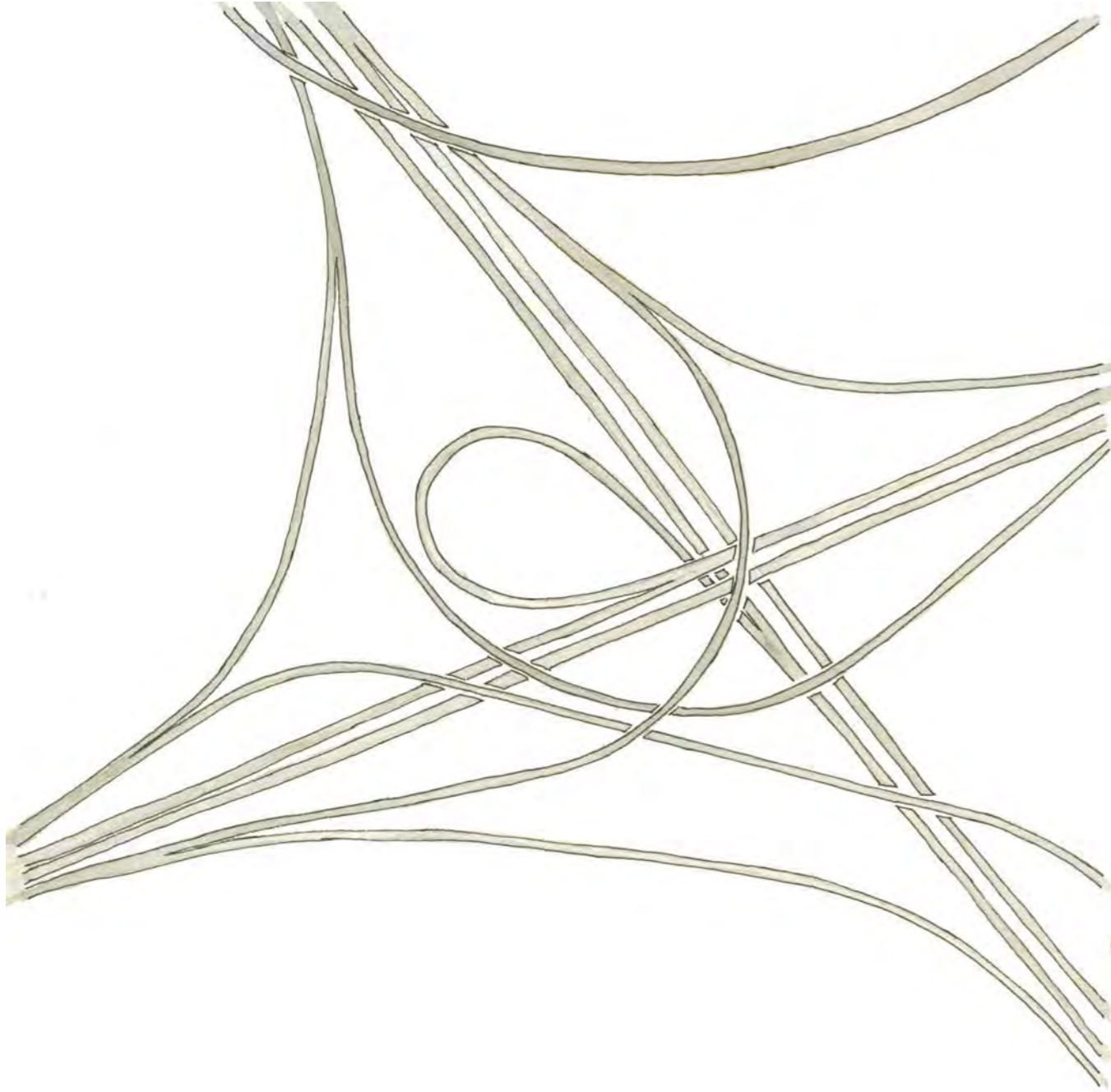
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Thank you to Kevin Fellingham for the conversations, pointers, advice, threats and encouragement, and to my parents for continuous support of various kinds.



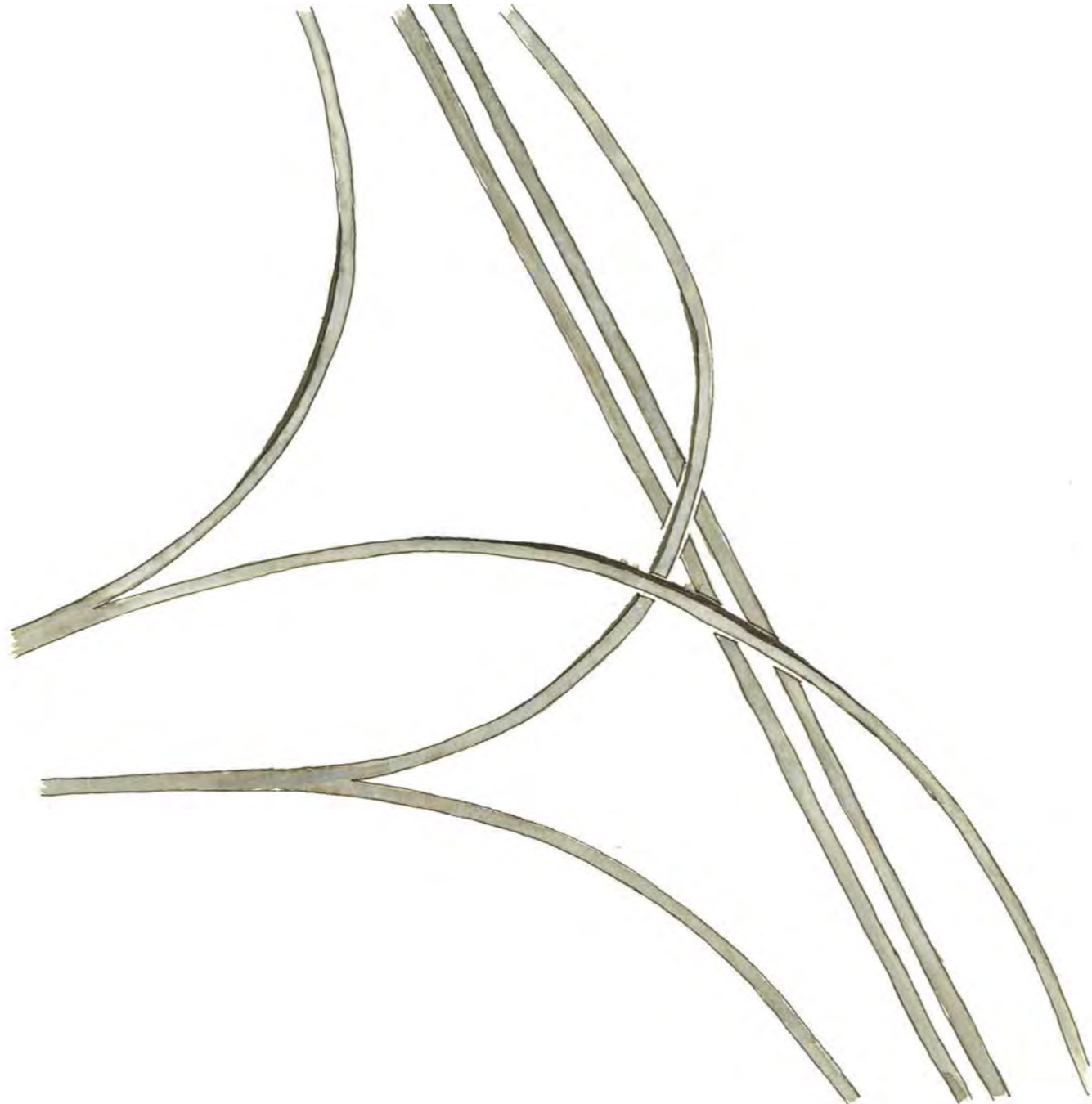
Abstract

This dissertation is a speculation on the role of infrastructure in shaping the city. By reimagining infrastructure in terms of its social, economic and topographical effects rather than purely on functional terms, the project proposes a method of intervention that transforms the city by ameliorating the negative spaces of existing infrastructure, bridges spatial divisions, and provides physical and social services to underserved communities.

The dissertation is founded on an understanding of Cape Town's twentieth-century planning and development as a modern, infrastructured city and simultaneously a segregated apartheid city. The modernist preoccupation with separation is demonstrated to have dovetailed with apartheid policy to produce a functionally, economically and racially segregated urban landscape, with infrastructural projects used to carve up these discrete land parcels.

The proposal is a hybrid spatial intervention that simultaneously adopts and subverts infrastructural processes to produce a more holistic approach to structuring the city, dealing with the issue of infrastructure at three levels: re-imagining existing sites of infrastructure to mitigate their divisive spatial effects and turn them into an urban resource; providing infrastructure to communities in need of basic services; and broadening the scope of what constitutes 'infrastructure' to include not only mobility and services but also social and educational facilities, landscape, recreation and access to information.

The result is a device for reconfiguring the urban landscape to encourage economic opportunity, social mobility and urban liveability, suggesting a route to a more integrated city.



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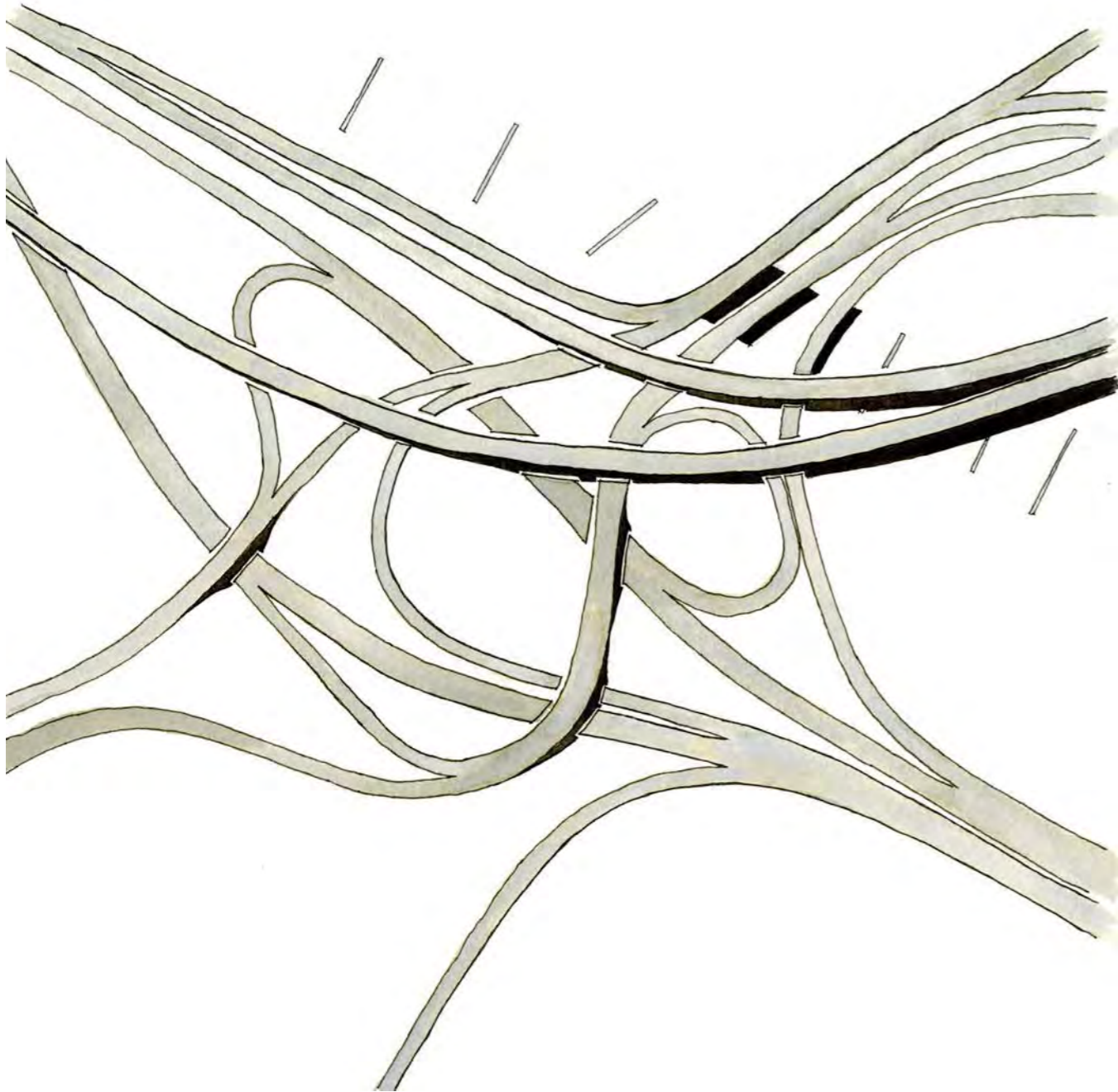
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At a larger scale, it is the infrastructure of our cities that provides the best opportunities for constructing the framework for an urban environment that is spatially equitable and open to the participation of all citizens.

- Mohsen Mostafavi

Gotta hit the gas baby I'm running late
This New Jersey in the morning like a lunar landscape

- Bruce Springsteen

Beginnings

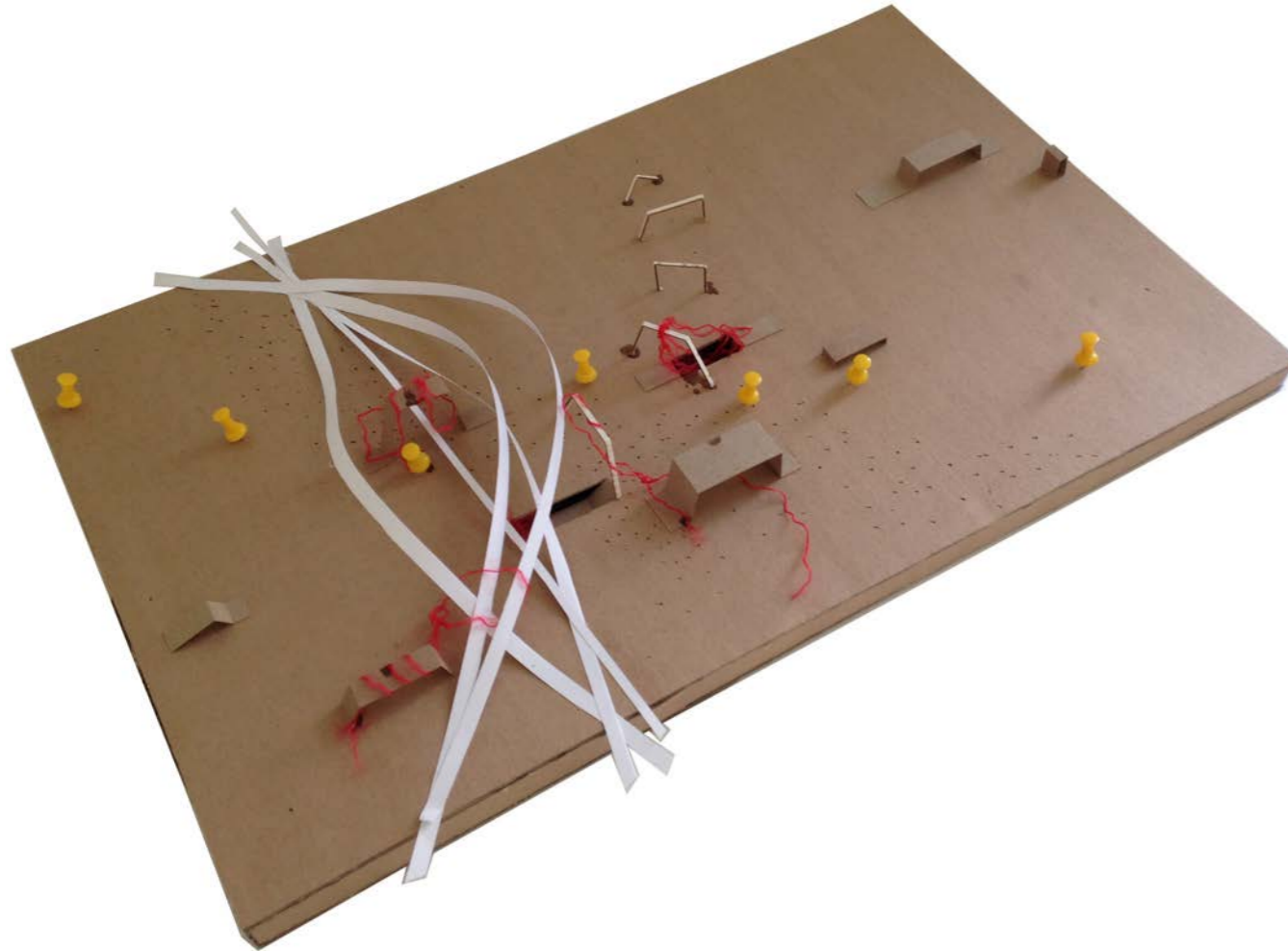


fig. 1 artefact: urbanity as layering and overlap of networks, landscapes and processes

This dissertation stems from two particular points of interest around the built environment.

Firstly, it is rooted in an interest in urbanity as a layering of systems, landscapes and objects, producing synergies and relationships where they meet, overlap, cross, pass or collide. The resultant intensities and opportunities allow the whole to be more than the sum of its parts, and for unforeseen occupations, connections and experiences to occur. This is the magic of cities.

Secondly, it is driven by an intense personal fascination with infrastructure and its role in defining and altering the landscape. Elements designed with a single-minded functional rationality can produce beautiful, surreal and profoundly inhumane sights, experiences and living environments, far beyond the scope of their designer's intent or their prescribed function. As a major use of resources, a human mark on the landscape, a spatial and aesthetic experience and a functional device, infrastructure presents fertile opportunity for architectural reimagining.

Exploring the notion of urbanity in the context of Cape Town highlighted the disparate and divided landscape of our city, often so lacking in these overlaps and synergies. We live in a city where parts are specifically designed not to touch, resulting in diminished opportunity, urban experience and interaction. Suburban sprawl is the norm and spatial demographics still follow the patterns of apartheid-era racial planning.

It is here that infrastructure becomes not only a point of interest, but a pressing concern where many of the city's problems and challenges intersect. Our road infrastructure facilitates (perhaps even enforces) the suburban commuter lifestyle while non-motorised alternatives are neglected. Large parts of the city are deprived of the infrastructure needed to facilitate basic living standards, entrenching many of the inequalities

inherited from the apartheid era. On the scale of the urban landscape, infrastructure often represents the dividing line between the city's separated parcels – neighbourhoods of differing race and/or socio-economic class, as well as prescribed land use zones. These systems ostensibly in place to facilitate urban life therefore become restrictive and disabling instead. However, their location also provides a great transformative opportunity: the line of division is also the point of contact and thus the ideal site for connection.

As a design project, this dissertation attempts to bring together this awareness of the crucial functional importance of infrastructure with an understanding of it as a significant spatial and aesthetic component of our environment.

Part i of this document gives an historical overview of Cape Town's development, exploring the role the modernist paradigm played in producing both the infrastructural systems and the racially motivated spatial divisions of the city. It is this single-minded rationality of these systems that give them their power as functional devices and aesthetic objects, but also their sometimes disastrous side-effects. It became important to subvert this paradigm while attempting to harness its force.

Leading on from the imperative to address existing infrastructure, case studies provided potential spatial and technical strategies to inform a design intervention. These case studies, and the strategies drawn from them, are found in **part ii**.

Part iii describes the design process as it developed out of this research and through issues of siting, programming and making. This is followed by a reflection on the process and a speculation on its potential to restructure the urban landscape as a transformative act.

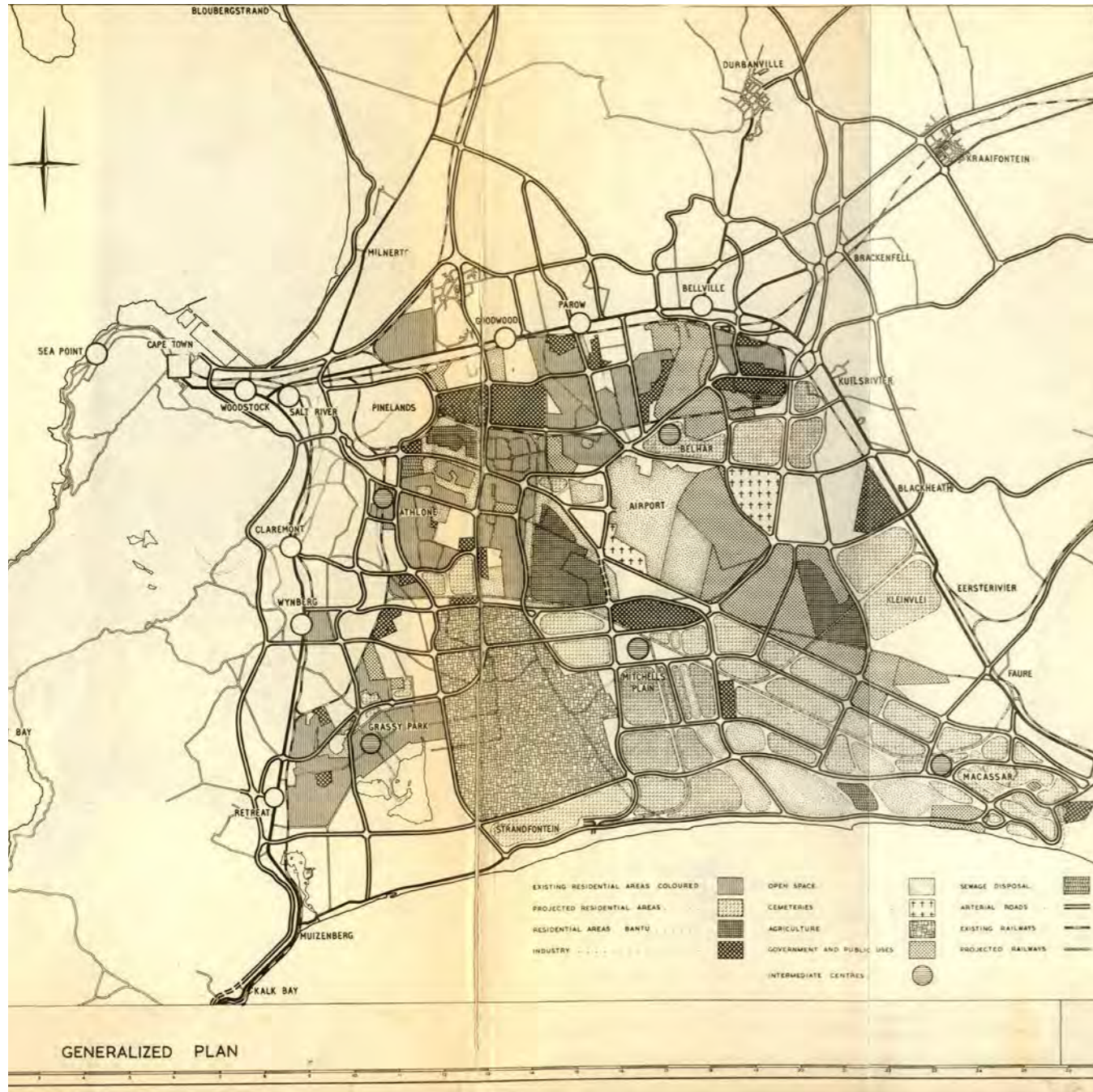


fig. 2 functional, racial and infrastructural planning, 1967

i.

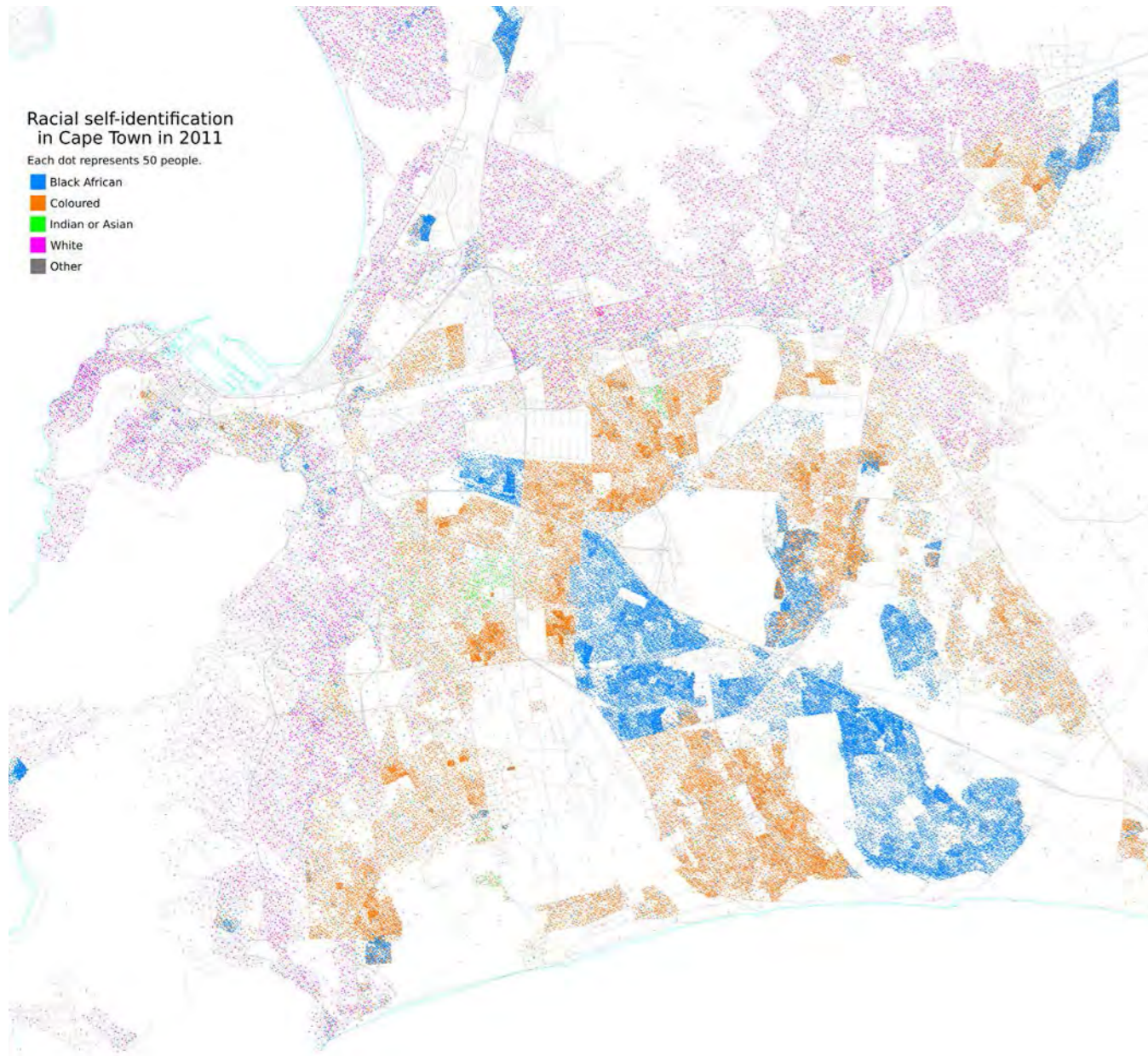


fig. 3 the enduring effects of apartheid-era planning: racial demographics in 2011

Modernist metropolis: 20th-century planning in Cape Town

In the 18th and 19th centuries, Cape Town expanded largely along three corridors: west, through Green Point and the Atlantic Seaboard; north-east along along Voortrekker Road towards the interior; and south along Main Road and the railway towards the alternative harbour at Simonstown. This growth followed transport infrastructure and created relatively dense nodes along its length, where living, work and trade could take place in walkable local centres. In other words, the growth of the city largely followed industry and economic opportunity rather than a predetermined plan or design¹.

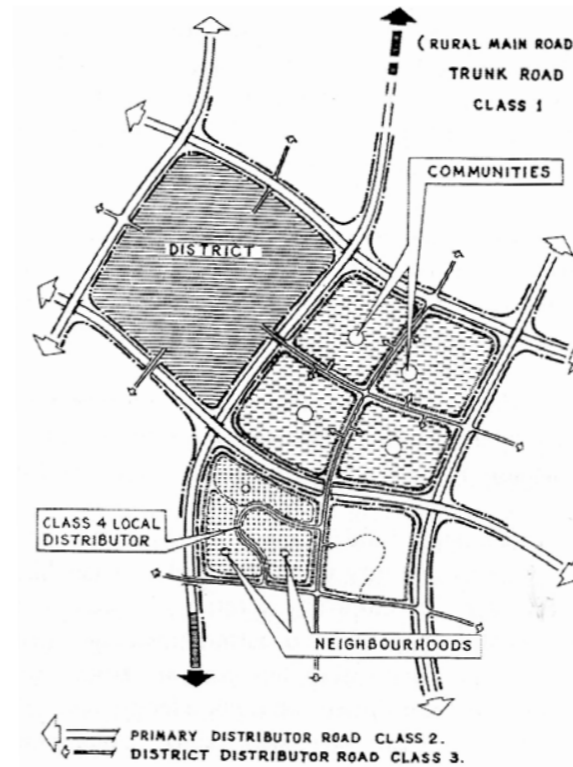


fig. 4 neighbourhood unit; note the representation of "communities" as discrete, homogenous cells

This changed in the 20th century with the advent of modernism, which brought with it town planning, prescriptive land use zoning (with an emphasis on the physical-spatial separation of work, living and leisure), and a prioritisation of personal motorcar usage as the preferred form of mobility. These ideas were at the time internationally popular, and they found favour in Cape Town as a solution to the perceived problems of low-income housing provision, increasing traffic congestion, and the increasing non-white population in the city².

The neighbourhood unit model (figure 4) imported from the United States was seen as a solution to these issues since it provided (in theory) a self-sufficient neighbourhood containing all the facilities its residents would need, separated from neighbouring areas (whether industry, agriculture or the next neighbourhood) by a buffer of open land and/or a high-speed road³. This meant that it could be located away from dense urban areas (seen at the time as unsafe and unsanitary), that people's basic needs could be met economically through centralized facilities, and that there would be no need for people to mix with other neighbourhoods or social groups.

While the design strategy of minimizing access to the residential area from the connecting high-speed arterial or highway was primarily intended as a safety measure for the residents, particular children, it was a feature that could also be exploited by authorities to control access to and from racially segregated communities⁴. This kind of exploitation, even if unintended in the original conception, begins to show how the separating drive of rationalist modernism began to dovetail with the racist policies of the white authorities in twentieth-century Cape Town (and South Africa).⁵

The combined ideas of self-contained, segregated communities, connected to the city and separated from each other by high-speed roadways, along with increasing enforcement of racial segregation, meant that the expansion of the city could now be rationally planned on the scale of the metropolis (figure 2). The



fig. 5 infrastructure as divider: Airport Industria, Barcelona informal settlement, and the N2 highway

use of motorcar infrastructure not only facilitated the eastward spread of development (as linear connector) but at the same reinforced the separation of the individual (racialised) units of development (as a physical barrier in the landscape). This separation was exacerbated by the introduction of legislation prohibiting development along major urban routes, stunting the development of dense and diverse urban corridors along existing routes, and completely preventing it along new routes.⁶ This exacerbated the separation and isolation of the newly planned neighbourhoods, leaving swathes of undefined space alongside movement routes, and preventing economic development between neighbourhoods.⁷

Where historically, urban growth had followed infrastructure as an enabling armature, infrastructure was now being used to enforce large-scale planned development, and with it, a political agenda of separation and division. The use of zoning reflected a view that the future development of the city would be rationally predictable and controllable.⁸

On the ground: lived realities of urban infrastructure

A result of this planning strategy is that Cape Town's regional road network has become a set of what Dewar and Louw term 'space bridgers' rather than 'space integrators', or urban corridors⁹. They connect distant 'cells' in a linear fashion without any urban spatial impact on the areas along its length. This isolates the low-income, mostly non-white 'cells' even further, both spatially and economically: the N2 highway, for example, connects the city bowl and its largely white suburbs to outlying satellite towns like Somerset West and Stellenbosch, cutting straight through the poverty of the Cape Flats with little to no interaction. This has been likened to a metaphorical pipe carrying 'water' (ie. wealth) between two poles of relative plenty, completely bypassing the 'thirsty'.¹⁰

The spatial divisions produced by this intra-urban system are further exacerbated by the expansive buffer



fig. 6 infrastructure shortfall: stills from "Our Toilets Are Dirty"



fig. 7 imagined inhabitation of infrastructural space - Hospital Bend

zones alongside the highways, and the large geometric contortions of high-speed intersections, calculated around the movement of cars rather than people. This creates a dangerous no-man's-land alongside and between residential neighbourhoods. Undefined, unclaimed and lacking surveillance, they become dangerous spaces due to crime as well as the high-speed traffic on the roads themselves. The difficulty of crossing the divide precludes the development of economic nodes or routes between different neighbourhoods or land use zones.

The spatial and economic effects compound one another further in that they make a pedestrian lifestyle almost impossible, forcing the poorest citizens to use an inadequate public transport system to commute to economic opportunity which is necessarily far away from their homes. In addition to the disproportionate drain on the time and money of the poor, this has the effect of emptying neighbourhoods for large periods of the day, encouraging crime and gangsterism among the young and the unemployed. This is a negative feedback spiral locking people into poverty and lack of opportunity for social and economic mobility.

Moving beyond the realm of transport, this structural inequality is exacerbated by the shortcomings of other forms of infrastructure. Basic sanitation services and clean water supply is drastically inadequate for the increasing population, especially in informal settlements (figure 6), producing "a seemingly constant undercurrent of protest and institutional distrust".¹¹ Housing provision in the form of free-standing RDP houses perpetuates an impoverished version of suburban life, restricting citizens' choice in how and where they live, forcing expensive and time-consuming commutes on the poor, and limiting future development and densification through the provision of exclusively single-residential infrastructure.

For the city as a whole, electricity production is failing to keep up with rising demand, the commuting lifestyle is becoming increasingly unaffordable with rising

petrol prices while increasing traffic congestion and air pollution, and the city is running out of viable landfill space¹². While the preceding discussion has focused on the need to mitigate some of the effects of large-scale infrastructure, these issues suggest that the design and provision of new infrastructure will also be integral to Cape Town's continuing liveability and economic viability.

In considering how infrastructure can contribute to the transformative and sustainable development of the city, lessons might be drawn from how infrastructure has structured the city we see today – socially, spatially and economically. And if the fabric of Cape Town can be read as a product of modernist design approaches, then such lessons may benefit from a critical reading of the ideas, processes and consequences of this modernist paradigm.

Subverting the modern

In forming a critique of the impact of modernist design on the built environment, it seems appropriate to refer to the founding text of postmodern architecture: Robert Venturi's *Complexity and Contradiction in Architecture*. Venturi's critique of modernism centered around its drive to simplify and abstract the complexities and ambiguities of life. Venturi calls instead for a return to a reality 'on the ground' – recognizing what people liked about and wanted from their environment – and an architecture of 'both-and' (complex and inclusive) rather than 'either-or' (exclusive, abstract and 'pure').¹³

Recognizing that orthodox modernism had become a self-validating aesthetic style detached from laypeople's feelings, memories and everyday lives,¹⁴ Venturi looked to the past as a source of greater relevance for architecture. This was intended to engage architecture with the familiar, as opposed to the tabula rasa newness upon which modernism was founded. However, by revolting against modernism as a whole, Venturi also stripped it of its social programme



fig. 8 imagined inhabitation of infrastructural space - Koeberg Road/N1 interchange

(however ineffective it may have proved to be). As a result, his proposed alternative could be argued to be morally and politically apathetic formalism, guided by populist or personal whims rather than critical agency: the unquestioning pursuit of reason and truth replaced by a directionless relativism.

So while Venturi helps break modernism's stranglehold, his text arguably does not provide a productive path forward. He makes possible new combinations and experiments of form, but without reference to social and ethical progress; everyday life gets its familiar symbols, but what is the role of design making something better? If there is no truth, are all approaches equally valid? As a productive alternative to these two extremes, it is useful to refer to Jeremy Till's argument around architecture and contingency.¹⁵

Till has heavily criticized the self-serving and self-validating rational abstraction of modernism as a pursuit of ideas and ideals removed from everyday life. Not only removed, in fact, but actively opposed to: modernist architecture, in his view, seeks to be timeless and 'pure' by avoiding change, decay and appropriation – in short, the realities of human existence. Because they seek an end that is at odds with the nature of life, they become doomed either to soulless (but 'rational') formalism that restricts liveability and is immediately broken down by reality, or to 'giving up', throwing their arms up and succumbing to populist postmodern eclecticism.

As an alternative to the pursuit of an aesthetic of rational progress divorced from society, or an 'anything goes' populism devoid of critical direction – "the retreat into the illusions of the redemptive potential of the modern project, or else into the decadent diversions of the postmodern project"¹⁶ – Till identifies the contingency of the everyday as a site of transformative potential. Modern architecture fears contingency because it means that *things might change*, but architecture's potency as a transformative tool relies on exactly that mutability. However, if this change is to better the

world, it cannot be left to random chance or entropy alone, and nor can it just be a superficial kaleidoscope of aesthetic form.

As an alternative to this binary, Till suggests the approach of *situated knowledge*, a term coined by feminist theorist Donna Haraway in her interrogation of scientific claims of objective knowledge. Haraway's intention is to "offer a more adequate, richer, better account of a world"¹⁷ that takes into account not only positivist scientific facts, but also lived reality, power dynamics, and social and fictional constructs, synthesized as narrative: neither claiming objective truth nor succumbing to skeptical relativism. For the architect, this means drawing on both rational knowledge and lived experience; knowing the limitations of one's perspective without being paralysed by this knowledge – it is precisely this 'situatedness' that reveals the transformative potential in a situation.¹⁸

The idea of situated knowledge can therefore offer a productive challenge to modernist ideas because it combines knowledge of broader structures with the embodied knowledge of lived reality. Contingency, flux and decay can be acknowledged as part of the process of design and making, but within the framework of a strong design intent. This means that an intervention can have critical direction without claiming a detached objectivity, and relate to the messy reality of the world without merely reflecting the status quo, nor being left entirely to chance and external influences; perhaps then Venturi's 'both-and' architecture of the 'difficult whole' can be possible.

In constructing his argument, Till has drawn heavily on the work of Bruno Latour, who describes modernism as a sort of shared myth or illusion. This myth is based on the separation of the world into discrete, knowable but isolated parts. Knowledge itself is compartmentalized into the natural, the social and the discursive; something can be understood within one of these spheres, but not two or three simultaneously – indeed, each is really defined in opposition to the other two. In this paradigm, a phenomenon can never be described or studied as



fig. 9 bridging urban discontinuities

a network intersecting all three: “simultaneously real, like nature, narrated, like discourse, and collective, like society”.¹⁹

This is contrasted to anthropologies of ‘pre-modern’ cultures, where the anthropologist, as an outsider, is able to describe a culture in terms of cosmology, social structure, art, knowledge, habitat, all woven together into a collective narrative. The myth of modernism, for Latour, is that our own world cannot be seen in terms of these collective networks. However, he demonstrates that this is an illusion (or delusion) of modern man; that science, culture, politics, narrative, everyday life and international relations are inextricably bound by complex networks not recognized by our terminology or our atomized knowledge systems.

(The preceding discussion has shown, for example, how road networks, far from residing in the realm of engineering, have profound effects on the social, political and economic life of the city and its residents. The ever-presence of the phrase “service delivery protest” in South African newspapers proves that this is equally true of other forms of infrastructure.)

The result of this contradiction is what Latour terms the “proliferation of hybrids”: the more we attempt to define the world in discrete terms, the more the interrelated nature of the world produces ‘hybrids’ that confound these definitions. This in turn forces a further withdrawal into the abstract in an attempt to find better definitions in response, as the abstract is incompatible with the reality of everyday life.²⁰

Thus it begins to emerge that the most appropriate and productive response to modernism is not outright rejection or deliberately seeking out its opposite, nor in merely splicing together its defined categories or forms, but in a close reading of the patterns and practices of everyday life and the complex and shifting networks and interrelationships incorporating people, things, places, ideas and memories.

To practice in this reality would therefore require a close engagement with the specific situation in order to understand it, but also a critical awareness of the broader social, theoretical and physical structures of the world around it. In this way, the architect situates herself in between scales, in between paradigms, in between rational positivism and postmodern relativism, and opens up a space of transformation. Contingency becomes opportunity, and architectural agency the means to seize that opportunity.

If the contingency and openness of the everyday is seen as a opportunity for opening up the strictures of modernism, what possibilities are offered by the rigidity of Cape Town’s modernist metropolis? It may be that it is precisely in the ruptures and blind spots of this macro-infrastructure where opportunity for small-scale intervention lies. These have been identified as sites where infrastructure is explicitly detrimental to everyday life, and where rational modernist categories are separated: life and work from movement. The danger of these sites arises when everyday experience causes friction between these artificially separated realms. Perhaps bringing them together in a more conscious and deliberate way could mitigate this and produce new, productive synergies as opposed to problematic conflicts: the difference, in Latour’s terms, between disquieting ‘hybrids’ upsetting our world-view, and networked ‘quasi-objects’ relating simultaneously to nature, society and discourse.²¹

A situated approach would pay close attention to the reality of the everyday and the mundane, but, as stressed above, also be driven by a strong directional intent. That means not merely addressing the contingent pressures of everyday life, but having a broader vision of a better future for the city; addressing social, economic and ecological resilience and sustainability at an urban scale while simultaneously seeking to transform everyday reality.



fig. 10 programming a hybrid infrastructural space

In the gaps

The preceding critique should not be taken as a wholesale rejection of modernist design processes or the benefits that twentieth-century planning and infrastructure have had for the city of Cape Town. Rather, the intent has been to identify the blind spots, the shortcomings, and the unplanned damage it has done to the city.

The question is then what lessons can be drawn from this in order to inform the way the city is read and subsequently remade. On the one hand, the rational logic of modern infrastructure planning is what facilitates its large-scale transformation of the city. At the same time, however, this rationality is limited and abstract, and this produces conflict with the complex and ambiguous realities of the world. This suggests that responding to these problems necessitates a networked approach, exploring infrastructure in terms of functional planning, lived reality and relation to a broader landscape *simultaneously* rather than as discrete categories.

What emerges is a dual reading of the importance of infrastructure as a potential site of transformation in Cape Town. On the one hand, the existing macro-infrastructure, while facilitating urban development and long-distance mobility, has also formed substantial spatial divisions in the urban landscape, leaving voids that might be approached as sites of intervention in attempting to bring continuity to the urban fabric. The notion of exploiting this 'remnant' space of architecture in the landscape to form connections between intentionally separated areas can perhaps be seen as a spatial parallel to Latour's idea of networked 'quasi-objects' confounding modernist categorization of the world.

Secondly, the pressing need for new infrastructure of varying kinds presents the opportunity to structure the future growth of the city in a way that learns from

the shortcomings of past approaches – in particular, the importance of considering the lived reality of the everyday rather than relying only on abstract rationality. This demands a difficult 'situatedness' for the designer, requiring knowledge and understanding of the broader-scale needs of the city as a whole and the logic of infrastructural deployment, as well as the reality 'on the ground' in the most immediate and mundane sense of lived experience, and the ability to move continuously between these.

Bringing these strands of the argument together begins to suggest a strategy of design intervention around urban infrastructure. The opportunity presents itself to re-imagine the remnant space of existing infrastructure in providing new forms of infrastructure to make up the shortcomings of current systems. And if such interventions can address both macro-scale metropolitan problems and the everyday lived reality at the human scale (and the intermediate scales between these), it could avoid some of the problematic side-effects of past infrastructures, and in this way play a positive role in structuring the city as a more just and resilient environment. While not seeking to replace the existing systems, it is possible that the points of friction they currently produce might be more productively harnessed.

Such a design strategy of situating oneself in the cracks, the in-between spaces of the city, the physical and conceptual gaps, can then attempt to make positive connections between realms previously conceived as entirely separate. In the context of post-apartheid Cape Town, these spatial separations necessarily also have socio-economic consequences and therefore new connections can have great transformative potential. Perhaps filling the gaps in our urban landscape could also begin to fill the gaps in urban experience and mitigate the social divisions this experience perpetuates. Infrastructure can then once more be an enabling device, facilitating rather than restricting everyday life, economic development and urban cohesion.



fig. 11 Settler's Way in relation to Cape Town metropole

ii.



fig. 12 population densities and racial demographics alongside the route



fig. 13 informal settlements in the negative space between neighbourhood units and highway



fig. 14 expansive buffer zone as urban void

Urbanizing Settler's Way

From this theoretical investigation, the N2 highway emerged as a focal point for the dissertation, as explored in a series of mapping exercises (figures 12-14). The portion known as Settler's Way, running eastwards from the city centre through the Cape Flats to Somerset West (figure 11), exemplifies the problem of connective infrastructure becoming divisive and isolating.

At both ends of this stretch, the highway has been designed as an urban one: upon entering the city bowl it is elevated above existing fabric before dissolving into the urban road network, while at Somerset West, it slows down drastically as it passes through industrial, commercial and residential fabric, with seven sets of traffic lights before it reaches Sir Lowry's Pass. Between these two poles Settler's Way is a non-stop, high-speed inter-urban connector. However, in the sprawling metropolis which Cape Town has become, the majority of the population actually resides in this 'peripheral' sprawl rather than the traditional centres; there are greater densities in the areas adjacent to Settler's Way than the areas it connects (figure 12). In this broader view of Cape Town, the N2 essentially runs through the city for almost its entire length.

However, the highway has been designed and built as if it were an inter-urban route across rural or open land. The roadway is on grade with the land and carries high-speed traffic despite passing through residential fabric. Interchanges with the rest of the road network are facilitated by expansive cloverleaves and off-ramps, creating further urban discontinuities. The series of mappings highlighted the extensive open land adjacent to it – open land representing here both a spatial barrier and a potential opportunity for intervention – as well as other adjacencies as sources of both friction and opportunity (informal settlements, land use separations, ecological systems, etc).

In the development of the city, with reference to environmental sustainability, spatial equality, economic opportunity and the recently adopted urban edge, focus is shifting to nodal densification as opposed to the traditional 'center' and 'periphery', of intensifying the existing rather than expanding further outwards²². In its present state, Settler's Way is a barrier to this form of development, but at the same time well located to act as a catalyst or driver, precisely because of its aforementioned centrality.

The imperative to transform this highway from a strictly linear connector to an enabling and integrating urban armature led to a series of case study investigations of how other cities have dealt with the problem of urban highways. While these are drawn from very different social, economic and geographical contexts, the intention is to extract productive strategies or principles which might be applied to the situation at hand.

The main strategies that emerge from the study can be summarised as follows:







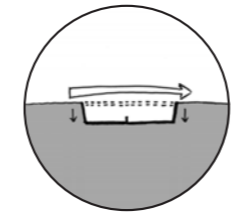
-  sinking the roadway and extending the ground plane over the road (**sink + cap**)
-  separating movement types both laterally and vertically, through sectional variation (**step**)
-  turning the roadway and its leftover spaces into a landscape feature (**landscape**)
-  using a building to cross over the road at an appropriate height (**bridge**)
-  combining different speeds or levels of traffic flow within the width of the road section (**boulevard**)
-  removing the highway (**remove**)



fig. 15 before and after; stitching together the divided urban fabric; new green public space in the city



Sink + cap
 Boston CA/T project (the Big Dig)
 Boston MA, USA (1991-2005)
 Massachusetts Turnpike Authority

The Central Artery/Tunnel project, or ‘Big Dig’, was a massive urban restructuring project centered around replacing 12.5km of elevated highway that ran through the center of Boston and cut much of the city off from the waterfront (figure 15a). The project represents some of the benefits as well as the many problems and complications involved in burying a highway.

Boston’s Central Artery had been designed and built in 1959 to accommodate 75 000 vehicles a day. By the 1980’s it was experiencing traffic of around 200 000 vehicles a day²³, causing large and frequent traffic jams with adverse effects on the city’s air quality, economy and general quality of life. The city proposed to replace most of the highway with a new, wider subterranean highway and make new connections to the city’s other major routes, including two new bridges across the Charles River.

The ground plane freed up by the sinking of the freeway was designed to reconnect the formerly divided urban fabric through public spaces, hard and soft landscaping, pedestrian-oriented mobility and more generous cross-connecting streets²⁴ (figure 15b). The addition of new underground lanes, and the rationalization of connections to the city’s road network, alleviated congestion and the related environmental pollution. In this sense the project could be seen as a successful urban intervention, but this does not take into account the enormous financial cost and disruption to the city caused by its difficult construction: costs ended up running to \$15 billion, and \$24 billion including interest on the bond payments – six times the initial estimate.²⁵ The cost overruns came largely from the complications

of tunnelling under the historic city at such a large scale, including the process of bracing the existing highway with large-span steel trusses before removing concrete supports to allow for tunnelling. Other major issues were unexpected soil conditions and regular leaks given the proximity to the river. The complications were exacerbated by poor workmanship, with executives of the concrete supplier later being arrested for fraud over the use of sub-standard concrete.²⁶

The urban benefits and aesthetic improvements are hard to quantify, although the development benefits have been estimated at \$7 billion.²⁷ While traffic congestion eased along the route in question, it has subsequently been found that traffic bottlenecks have merely been pushed out to other points, with congestion across the city staying more or less the same. The induced demand of the new highway (the phenomenon whereby traffic levels adapt to the available roadspace, and congestion tends to remain unchanged) is also blamed for the continuing traffic problems.²⁸

The newly-formed ground plane (the **cap**; figure 15c) achieves many of the aims identified for Settler’s Way. However, it is difficult to justify the enormous costs of the construction process (the **sink**), particularly in the South African context. The problems of uncertain soil conditions and groundwater would almost certainly appear when working in the Cape Flats. The project therefore serves as a warning about the process as much as an example of the urban benefits.

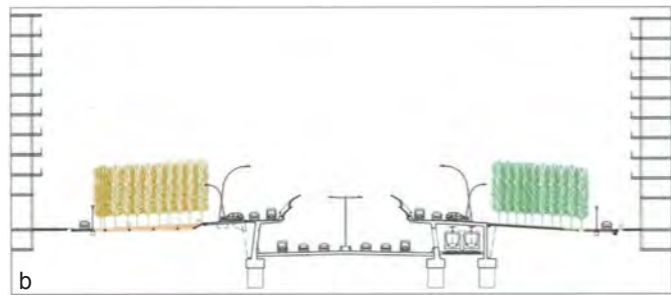
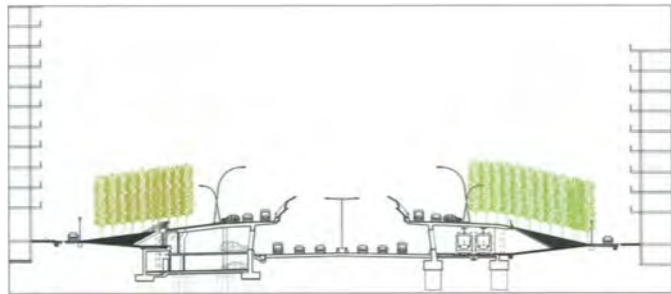
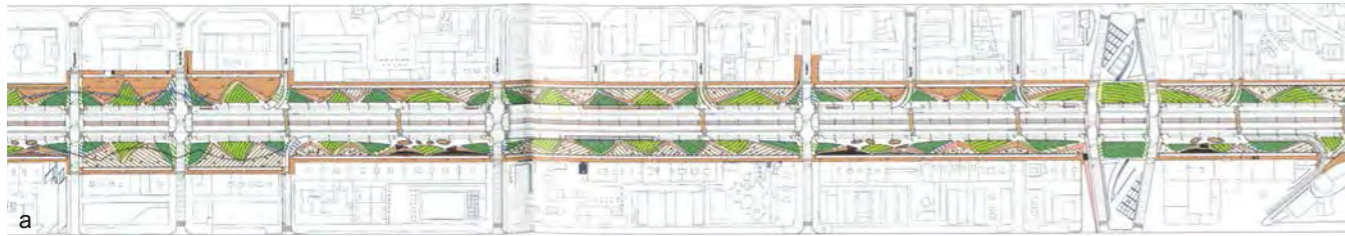
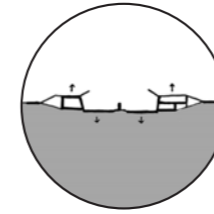


fig. 16 road verge as linear park; sectional manipulation; making infrastructural space habitable; balancing pedestrian and vehicular needs; infrastructure embedded in the landscape



Step

Gran Via de les Corts Catalanes

Barcelona, Spain (2002-2006)

Arriola & Fiol Arquitectes

The Gran Via de les Corts Catalanes was built as part of Barcelona's 1976 Metropolitan Plan urban structuring project, as a sunken highway with grass embankments. In the 1990s, the city became concerned with the way the route separated the adjacent neighbourhoods, prioritized cars over pedestrians, and produced noise and air pollution in a residential area. The eastern section has been transformed into a multi-level boulevard with a varied section to attempt to mitigate these problems.

The major design strategy was to make the most of the existing level change (figure 16b). The embankment has been built up by embedding an enclosed tramline along the southern edge, and parking structures at intervals on the northern to form part of a new retaining wall. This stronger and taller edge to the highway allowed the designers to cantilever the ground plane on either side partly over the highway, with curved acoustic panels keeping noise pollution away from the residential fabric. These elevated cantilevered portions carry lower intensity lateral roads, bus stops, landscaping, and some parking, while the third level, on grade with the surrounding buildings, consists of service roads and pedestrian and bicycle paths. The pedestrian network has also been extended with new bridges crossing the highway. The linear park produced by the adjacent landscaping also incorporates the new stations of the tramline.²⁹

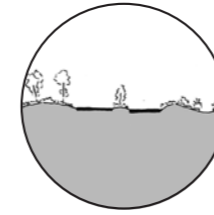
The effect of this sectional manipulation is to prioritise non-vehicular movement, public space and local residential experience over fast-moving traffic. The redesigned section separates traffic, both in plan and

section, into degrees of speed and intensity, while facilitating transfer between them: from pedestrian movement to public transport; from service lane to local road to highway; from park to tram. In this way it incorporates elements of both sink and cap, without the complete separation of those strategies impose, and with less drastic (and therefore costly) intervention required. Importantly, the spaces between these streams are designed for human habitation (figure 16c).

The contextual conditions that made this design possible include the presence of the existing highway at an already lower level, and the relatively high density of built fabric along either side. In trying to transfer this strategy to the problem of Settler's Way, immediate differences are the on-grade highway in a mostly flat landscape, and the relatively low density of the settlements it passes. However, the 'artificial embankments' of the new Gran Via also offers pointers in this regard: creating an artificial topography through service buildings. These could relate to both the adjacent neighbourhoods and the roadway in different ways at different places, going some way towards allowing bridging and connections between areas. This kind of intervention might be feasible at strategic points or stretches rather than a continuous linear structure like the Gran Via, perhaps as part of bigger projects of densifying nodes along this route, with the bridging of the highway and the densification of the surrounding fabric feeding each other.



fig. 17 negative space becomes a resource for adjacent neighbourhood; humanising a car-oriented landscape; landscaping and levels simultaneously reference and hide the adjacent highway



Landscape

Parc de la Trinitat

Barcelona, Spain (1993)

Batlle & Roig

Probably the least intrusive of the strategies discussed here, this involves re-using and/or re-interpreting the spaces produced or left over by highway construction. Parc de la Trinitat is such an intervention, with the 15-acre negative space of a complex highway interchange re-interpreted as positive public space. The park includes lawns, footpaths, water features, sculpture gardens, playgrounds and sports facilities. The design conforms to the curves imposed by the highway to shape its structures and spaces, and uses the level changes across the vast space, along with trees, to differentiate sub-spaces and to reduce the visual and noise impact from the interchange on the park.³⁰

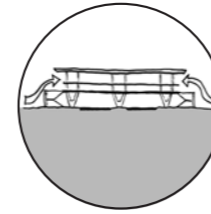
The park adds value to the city by turning vacant land into valuable open space, turning an urban void into a resource. It also turns the potentially awkward road geometry into an interesting spatial experience rather than merely trying to mitigate it. The design demonstrates that pedestrian-oriented public space can peacefully exist in close proximity to a fully functioning highway.

In terms of the question of Settler's Way, the strategy represented by the Parc de la Trinitat is of questionable value. Given the low density of greater Cape Town, the open land created by traffic interchanges is less valuable, and usually less accessible given that our highways are seldom elevated. A project like this might therefore be seen as primarily one of beautification of the highway, with more benefit for vehicular travellers than local communities – the landscaping of the renovated Hospital Bend interchange comes to mind as an aesthetic improvement not readily accessible

as habitable space. It also fails to address the issue of bridging space across the highway. This does not mean the strategy is without value or relevance to Cape Town, where positive public spaces are sorely needed, particularly in areas where schools and other facilities are often inadequate or poorly maintained. However, this strategy on its own does not really address the primary question of adapting Settler's Way as an urban highway.



fig. 18 inhabiting a piece of infrastructure; bridge as an element in a landscape; bridge as architectural object



Bridge

Orival Service Station + Restaurants

Nivelles, Belgium (1998-2001)

Samyn + Partners

The idea of a service station bridging across a highway, accessible from either side, is not new, but the Orival Service Station demonstrates higher ambition than simply petrol and fast food. Aside from its powerful architectural form, the project incorporates two service stations, two restaurants, parking, playgrounds and picnic space, with minimum impact on the surrounding landscape.

The building consists of two 210m-long tapering Warren truss steel girders, 25m apart, spanning approximately 70m across the highway on two service blocks, and cantilevering a similar distance at each end to cover the service stations. The trusses are fully glazed, and the space between roofed over to form the restaurants.³¹

Given its rural setting, the building is somewhat self-contained, serving only the highway below and deliberately trying to have a minimal effect on the landscape on either side. The act of drawing people up and over the highway does, however, suggest greater potential if transferred to a different context. The idea of the inhabited bridge as destination is interesting, as it could generate activity from both sides of a divide and encourage further transfer and development along such a cross-route.

Technically, the project demonstrates that the difficult means of spanning a wide section of highway also presents architectural opportunity, both in terms of expressive form (figure 18c) and internal spatial experience (figure 18a). The building very literally becomes an inhabited piece of infrastructure,

sculpturally expressing its act of spanning the highway and its nature as a bridge-building. The architecture manages to be a striking visual marker or gateway from the perspective of car travellers, as well as a powerful spatial experience for people inside it.

The other transferable technique here is the creation of height in a flat landscape. Service spaces and vertical circulation forms the two 'legs' on which the entire structure stands, elevating it to enable the crossing. These blocks serve both the service stations on ground level and the elevated restaurants, albeit in a limited way. In another context, whole service buildings could play a similar role in lifting people off the ground plane to access a raised bridge-building.

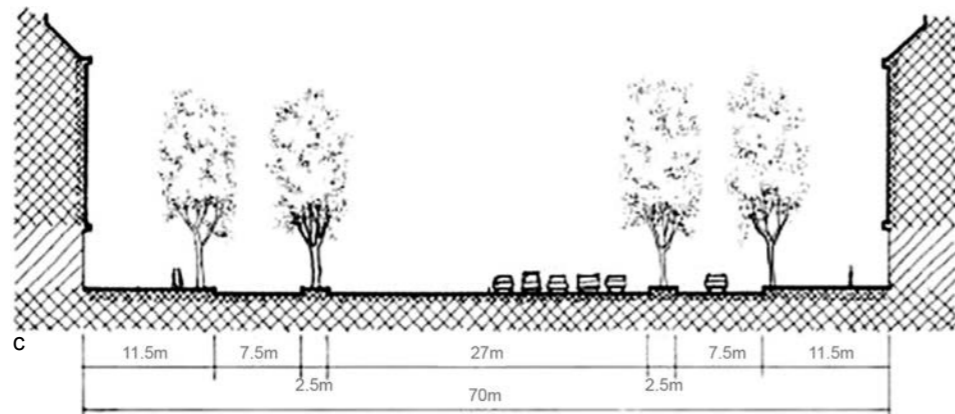
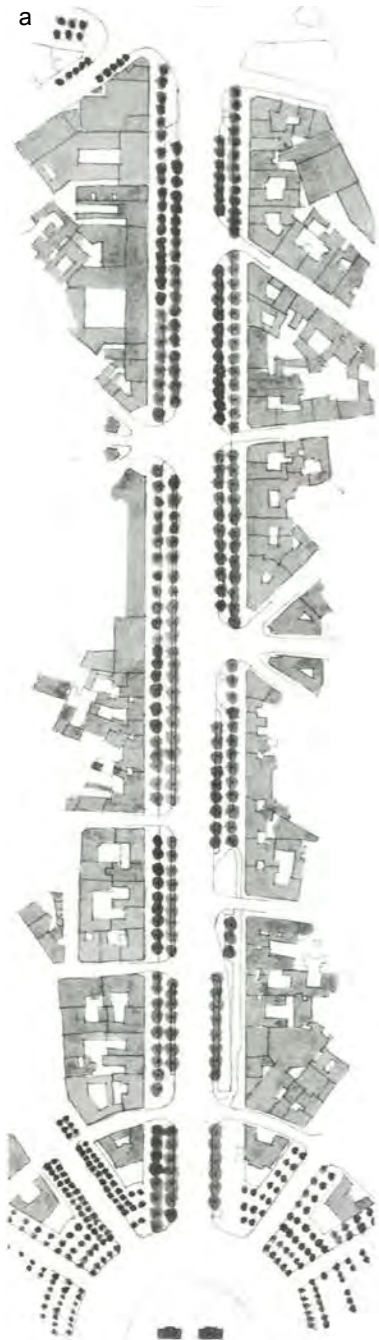
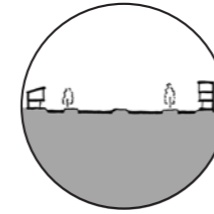


fig. 19 boulevard as urban spine, with strong urban edges and ample planting; heavy traffic flows coexist with dense urban fabric; generous spatial allocation to pedestrian and public space despite twelve lanes of traffic



Boulevard

Avenue de la Grande Armée

Paris, France

The Avenue de la Grande Armée is a multi-way boulevard in Paris, the extension of the Champs-Élysées westward of the Arc de Triomphe. It consists of five lanes of fast-moving traffic in each direction, tree-lined medians on either side, single-lane service roads with parking, and finally generous tree-lined sidewalks. This gives a total section width of around 70m, of which only 40% is taken up by high-intensity traffic and the rest given to slower local traffic, pedestrian movement, and greenery (figure 19c).

The sidewalks on both sides are lined with residences, large showrooms and small businesses. The gradient of intensity across the section allows the functional carrying capacity of an urban highway (more than 90 000 vehicles per day, though at reduced speeds) as well as an appropriate urban interface with adjacent buildings. The human scale of the sidewalks and service roads facilitate small-scale local trading and urban life, while the accessibility from the high-traffic central lanes encourage larger-scale commercial activity.³² The proximity and carefully designed separation of traffic flows allow these worlds to co-exist in a walkable and liveable urban realm. In this sense it is similar to the example of Barcelona's Gran Via (step, pg 37), but without the vertical manipulation – a relevant distinction when considering the landscape of Settler's Way.

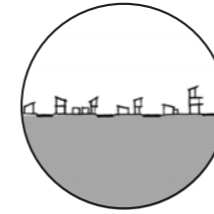
Given its location in a very dense urban context (figure 19b), the Avenue does not accommodate the same speeds as a true highway, with regular traffic lights and pedestrian crossings, although this is somewhat compensated for by its ten lanes and increased access to and from alternative routes. This difference suggests

once more that this strategy could work only at strategic points of Settler's Way, and possibly allied to further development at such a point, rather than along the length of the highway.

The presence of traffic lights and local access lanes adjacent is in fact very similar to the present situation where the N2 passes through a commercial and industrial centre in Somerset West. It is therefore not unrealistic to consider such a strategy being used where development encroaches on Settler's Way. Other challenges in our context could be the possibility for abuse of the service roads during peak traffic, and a lack of local knowledge or experience in handling such multi-lane interchanges.



fig. 20 highway as barrier; the same space reimagined as integrative, pedestrian-friendly boulevard; accommodating cars, public transport, pedestrians and greenery



Remove

Embarcadero

San Francisco, USA. (1991-2004)

Roma Design Group

Perhaps the most drastic gesture of these strategies is removing the highway outright. This strategy is gaining popularity worldwide, especially in the US, where the Congress for New Urbanism actively drives a “Highways to Boulevards” program to identify urban freeways – usually elevated, and usually cutting through a residential neighbourhood – that could be demolished and replaced by more pedestrian-friendly urban space. This is not only an urban strategy but also an economic one, given the costs and logistics of maintaining, repairing or replacing large-scale highway infrastructure (and the possible consequences of failing to do so).³³ The case of San Francisco’s Embarcadero is often cited as an example of the success of such a move.

The Embarcadero was a multi-level elevated freeway built along the edge of San Francisco Bay to connect the city’s two famous bridges, the Bay Bridge and the Golden Gate Bridge. The effect, however, was to cut the city off from the water’s edge and the historic piers and Ferry Building. When the freeway was badly damaged in a 1989 earthquake, the city seized the opportunity to dismantle it and reimagine the space (figure 20a).

The urban boulevard that replaced the freeway combines six lanes of traffic with streetcars, parks, public spaces and a pedestrian promenade. This permits easy movement along, within and across the space, with the former industrial structures of the waterfront becoming popular commercial and leisure spaces as a result. Nearby residential property values have also increased substantially, while transport efficiency has not been significantly affected.³⁴

The justification for removing a highway completely relies on the theory of induced demand, or what researchers call ‘the fundamental law of road congestion’: that traffic levels adapt to the amount of space allocated to traffic.³⁵ That is to say, building more roads encourages more driving, so congestion levels remain more or less constant. Likewise, decreasing road space means more people seek alternative routes or modes of transport. Continuing evidence in support of this theory³⁶ suggests that removing urban highways is a viable strategy, especially when considering the potential social, economical and environmental benefits.

In this sense, Settler’s Way could become seen as just one of several east-west transit routes, scaled down to a level closer to, for example, Klipfontein Road or Voortrekker Road. Reducing its carrying capacity and/or speed, in conjunction with continuing expansion of MyCiti bus routes and improvement of the Metrorail train network, could see movement patterns more evenly distributed across the city as a whole, which would not only ease the strain on one piece of infrastructure, but also encourage economic development along more corridors. This is in fact in line with the City’s own vision of future development, with the intent being to move away from a radial pattern of mobility to more of a grid pattern, increasing choice, access and development opportunities.³⁷

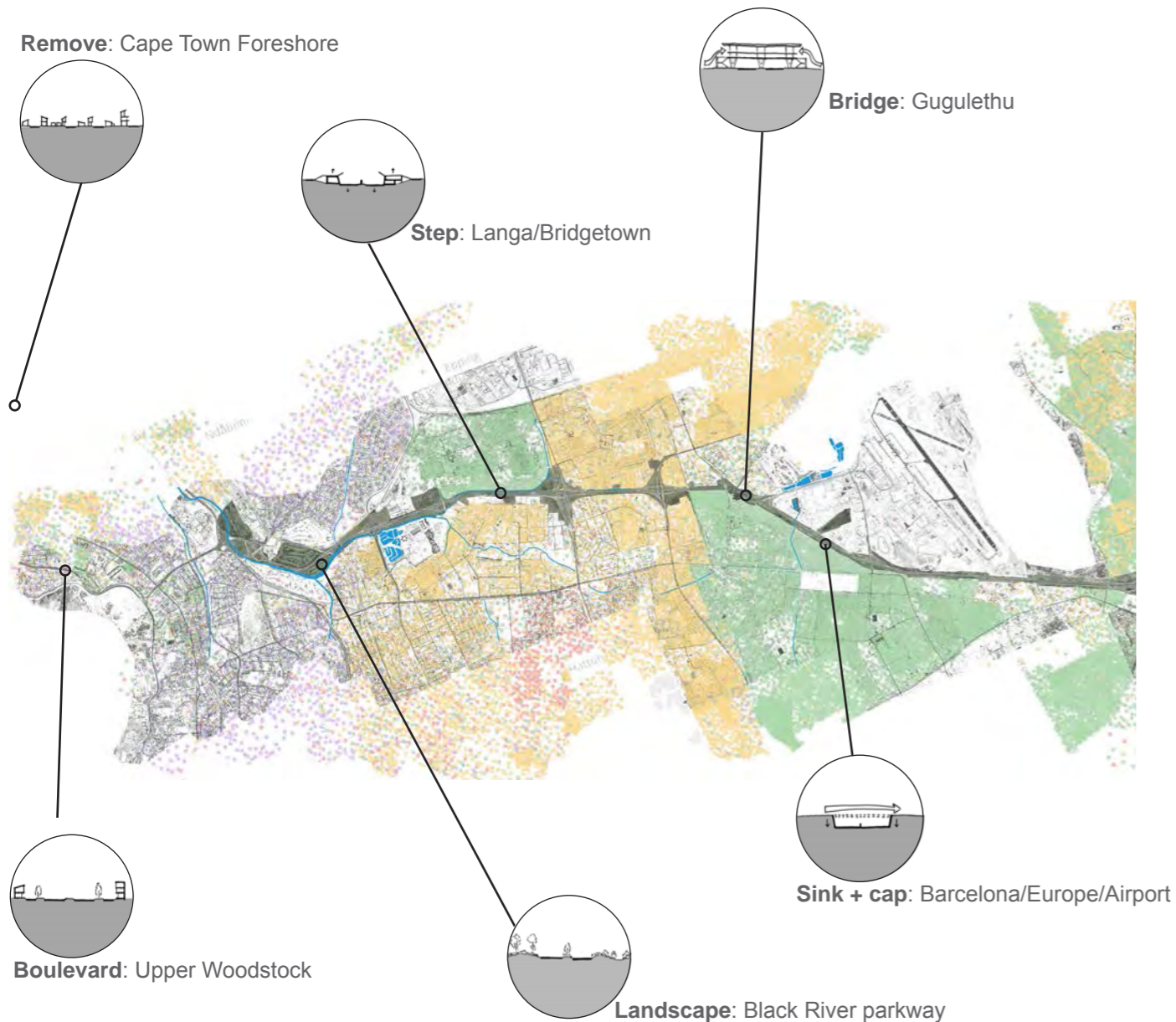


fig. 21 speculative grafting of case studies onto the fabric of Cape Town

Strategies

The given case studies have been drawn from contexts very different from that of Cape Town and none can be seen as a readymade solution to the particular challenge at hand. However, they do present certain common themes and transferable strategies, as well as suggesting which strategies would probably not be worth pursuing as options for transforming Settler's Way.

Sinking and **capping** an entire highway can probably be considered prohibitively expensive, particularly as we are in a more resource-strained context than the United States, while sharing many of the geographical and logistical challenges that beset the project. However, the urban benefits of the continuous ground plane should be noted as an important factor in addressing the problems at hand.

Some of the same benefits can be derived from the 'stepping' strategy of separating layers of traffic both in plan and section, allowing the urban fabric to function very close to the highway without conflict, and for bridging to occur more regularly without difficulty. The 'artificial embankment' in the example of the Gran Via suggests a possibility of overcoming the notorious flatness of the landscape around Settler's Way.

The Orival Service Station **bridge** demonstrates the architectural potency of a piece of inhabited infrastructure, addressing both the human occupant and the motorist. It further hints at the potential of programmed space above a highway to be a magnet for people on either side, becoming a point of meeting but also of crossing; a service station for adjacent communities as well as the road below.

The notion of removing Settler's Way as a highway and/or reducing its scale to more of an urban boulevard has the potential advantage of stimulating development in the often impoverished adjacent areas and improving

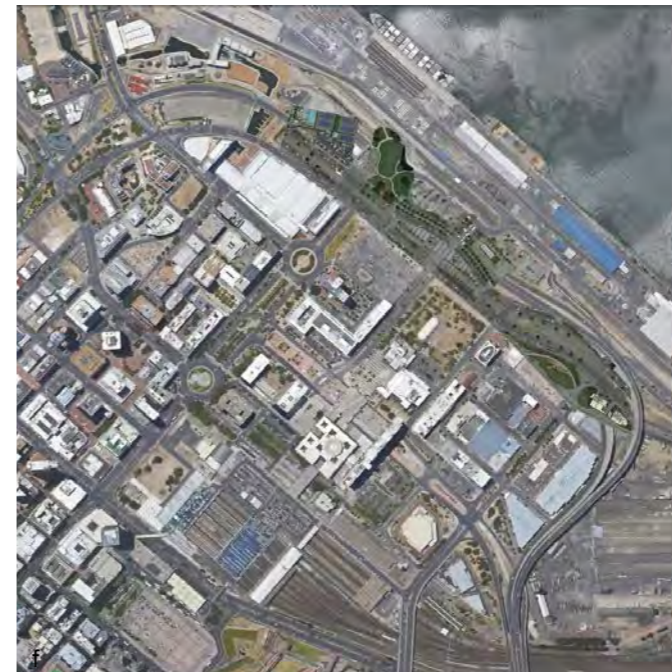
their access to the city. This could conceivably be viable for short stretches where the highway passes through or alongside denser areas, rather than its entire length. The planning and implementation of such a move would however be a lengthy and difficult process, perhaps prohibitively so.

The case studies demonstrate that these strategies are not only ways to reconnect urban space, but also add economic value, encourage alternative transport options and improve urban environmental quality.

The greatest potential might lie in a hybrid approach combining desirable and applicable elements and strategies. For example, the embankment-buildings creating the Gran Via **step** and the service-block 'legs' of the Orival **bridge** perform the same function of elevating the landscape to facilitate a bridging of the highway. Smaller lanes could be elevated and could be the local access roads of an urban **boulevard** before and after the level change, as part of a broader strategy to scale and slow the highway down at strategic points, or dedicated to public transport. **Landscaping** could be used in combination with any of the other strategies to positively define the vacant buffer zones as a public resource rather than an urban void.

Graftings

The case studies were followed by a quick 'grafting' exercise, speculating intuitively where each of the examples might be cut and pasted into Cape Town (figure 21-22). Rather than a considered design proposal, this was an attempt to kickstart the process of imagining how Settler's Way might be transformed, relating the strategies to the particulars of sites, and visualising what the resultant urban fabric might begin to look like.



a sink + cap: Barcelona / Europe / Airport Industria
popular but unsafe crossing point; informal soccer fields adjacent; employment opportunities across the highway

b step: Langa / Bridgetown
accommodating dense residential fabric alongside highway; buffer zone allows additional lane(s)

c boulevard: Upper Woodstock. highway sits tightly against residential fabric; traffic slows on approach to city centre

d landscape: Black River Parkway
interchanges create large voids; river neglected as potential resource; diverse neighbourhoods surrounding

e bridge: Gugulethu
existing vehicular bridge from main thoroughfare to shopping centre; potential gateway for travellers from airport

f remove: Foreshore
city cut off from harbour; negative spaces created below freeways; potential for densification of city centre

fig. 22 graftings



fig. 23 locating site

iii.



fig. 24 aerial site photograph

Siting

The ‘grafting’ exercise identified potential sites for an intervention developing out of this research, and one in particular stood out as presenting various opportunities: the widened buffer zone between Settler’s Way and two informal settlements in Gugulethu, known as Barcelona and Europe respectively.

Firstly, it serves as a representation, almost a caricature, of the dissertation’s problem statement: poverty and economic opportunity adjacent to each other but separated by a piece of infrastructure and the void around it. Secondly, this stretch of Settler’s Way can be considered one of few identifiable “places” when driving between Somerset West and Cape Town. This is due to its location on a rare kink in the straight line of the highway, the presence of two large trees in the otherwise flat and featureless landscape, and because of the way this space is already used. This is the third major factor – the buffer strip here is already used as informal recreational space and it is common to see local children playing soccer. It is also common to see this space used as an open toilet and dumping ground, symptomatic of the lack of services and basic infrastructure in the area, and it has been the site of several service delivery protests, serving as a point of access to the highway for local residents. Finally, this is a popular point of crossing the highway – either by footbridge (often with herds of cattle) or by running on foot. Cars frequently hit pedestrians here as a result, and the crossing is also a crime hotspot because residents are reliant on the ATMs in the industrial zone.

This site therefore embodies the concerns of the dissertation and at the same time suggests opportunities through its location and existing use. The design concept began to take shape out of this realization, as a way to address all these concerns simultaneously, introduce new benefits or opportunities, and suggest an infrastructural approach or prototype that might be applicable to other sites in the city where infrastructure has created similarly problematic situations.

Harnessing friction

The first speculation on a way to harness these overlaps and frictions into a positive synergy took as a starting point the idea of using the open strip to provide basic sanitation services, and the use of the site as a soccer field. Developing it as a local sporting facility would maximize the use of additional ablution facilities, while the waste from this toilet ‘spine’ could be used to produce fertilizer and/or biogas. This in turn could help residents grow their own food, or the rest of the vacant strip could become a small vegetable farm. This could then tap the traffic of the adjacent roadway as a source of income to make the development self-sustaining. This could become an active hub with additional services such as extracurricular learning spaces, internet connectivity and commercial space.

The potential in this idea was exciting – minimum intervention addressing different problems, activities and user groups to generate activity and opportunity, while improving the conditions of the community as a whole and turning an urban void into a resource. However, it was limited and limiting in that it was merely occupying the negative space rather than really trying to overcome the spatial barrier that had been identified. This demanded a more urban approach rather than merely thinking about the site as a pocket of remnant space.

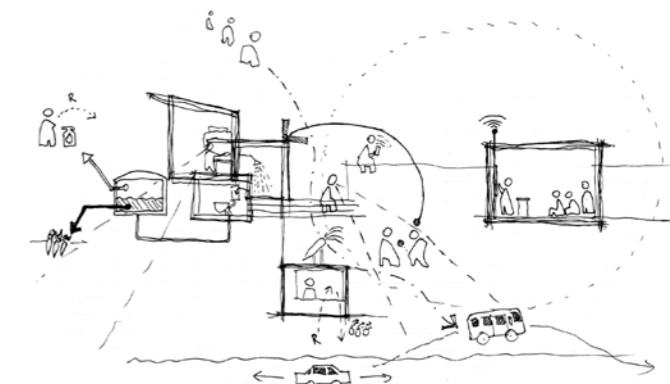


fig. 25 harnessing friction: potential synergies around existing and imagined uses of the site

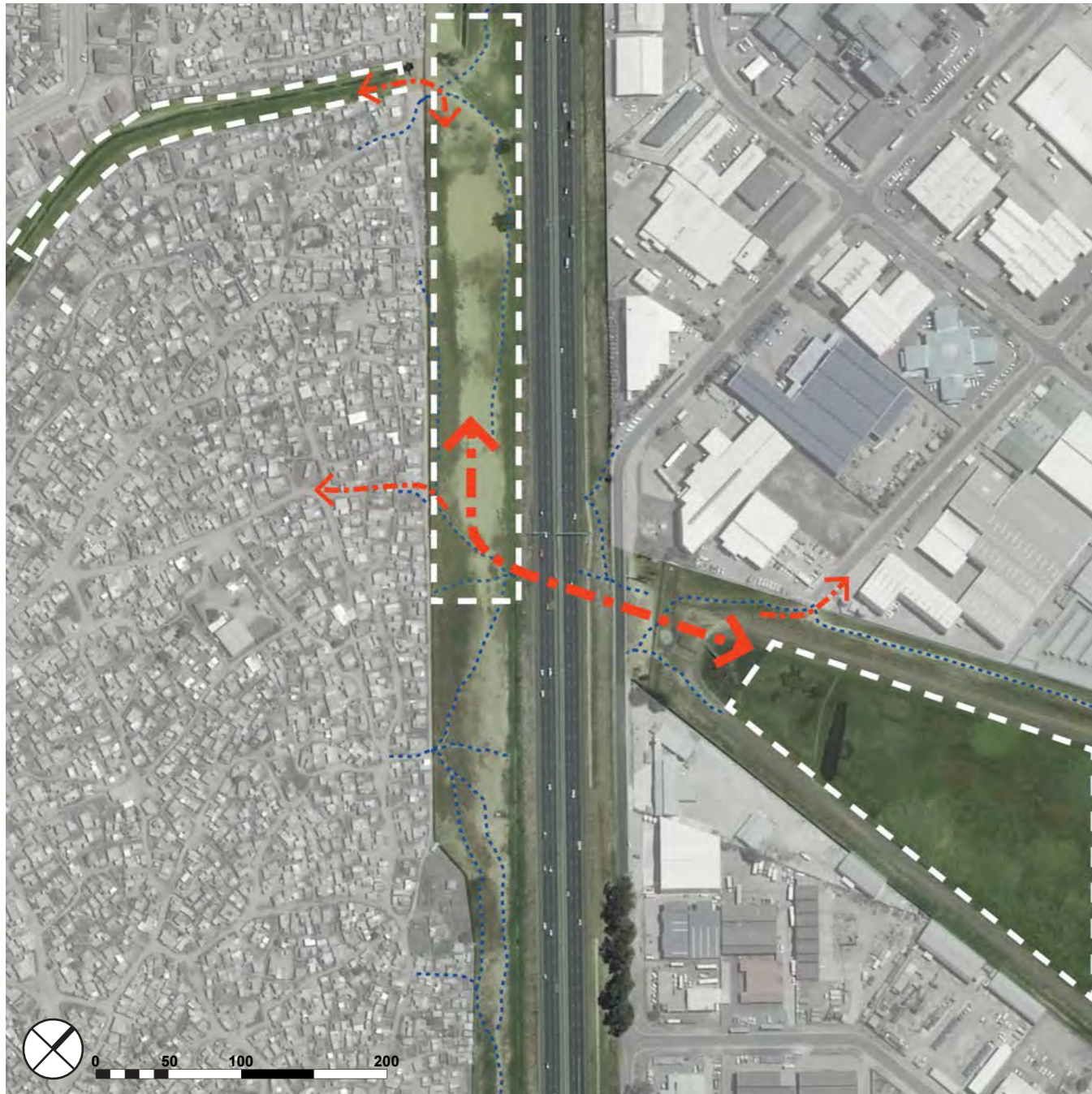


fig. 26 conceptualising the intervention as connecting a sequence of green spaces and feeding into existing desire lines and informal routes (blue)

An urban proposal was developed as a landscape approach to the site, connecting the green space alongside the canalized stream in the informal settlement to the retention pond of Airport Industria. This turns these fragments into a green resource, the landscape mediating the discontinuity of infrastructural space as a walkable, humanised space. The idea of extending into both areas suggested the potential for a new urbanity that sits between these functionally distinct zones, raising the possibility of small-scale industry more related to the economy of the informal settlement; entry-level businesses; live-work typologies; and other spaces operating between functions and between scales. This is not only intended as a mixing together of the existing binary, but as a creation of a new in-between urban landscape with the potential to become something new entirely.

This idea was developed into an initial sketch design (figure 27), combining elements of the **step**, the **bridge**, and **landscape** strategies, and incorporating three main ideas:

- the landscape as a connective element across the two sides
- the bridge itself as an inhabited destination building, programmed as a piece of 'soft' infrastructure: government services, access to information, and working or learning spaces
- a new point of access to and from the highway in the form of a taxi stop

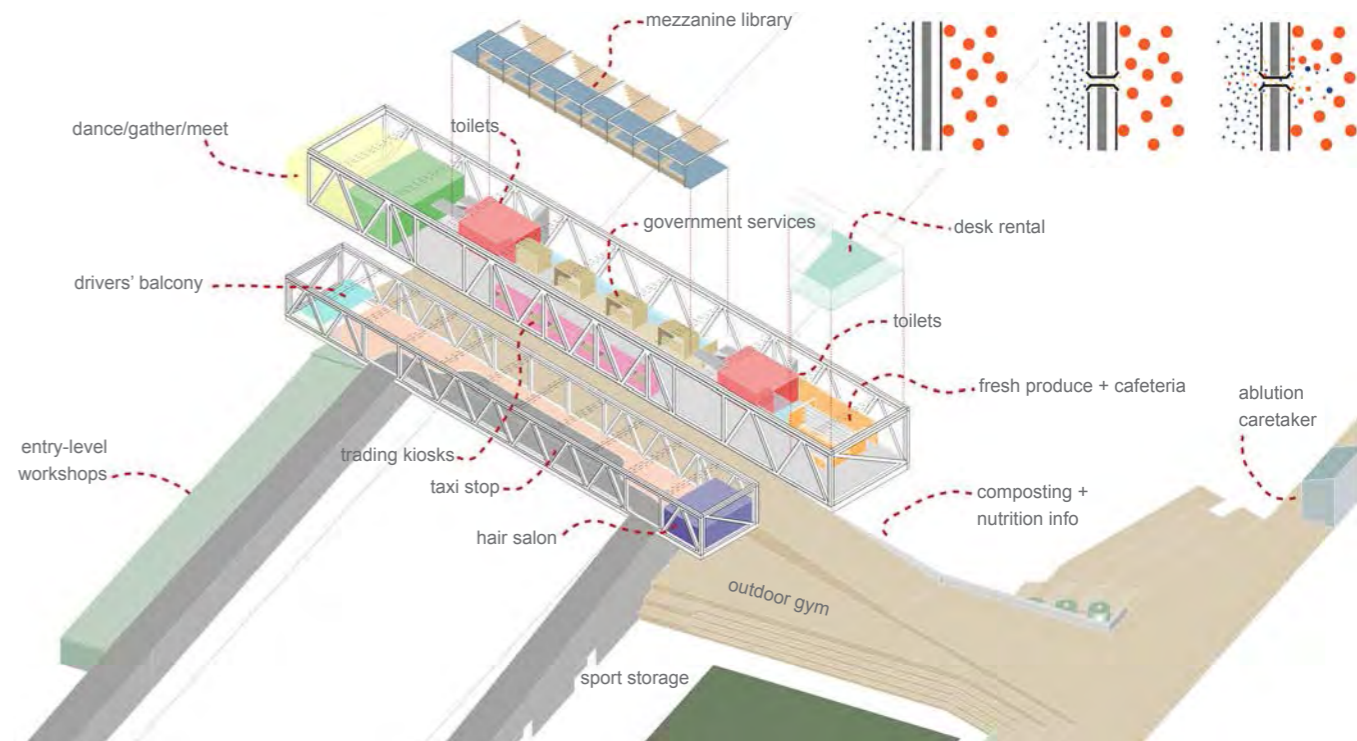


fig. 27 sketch design: programmatic axonometric



fig. 28 site strategy

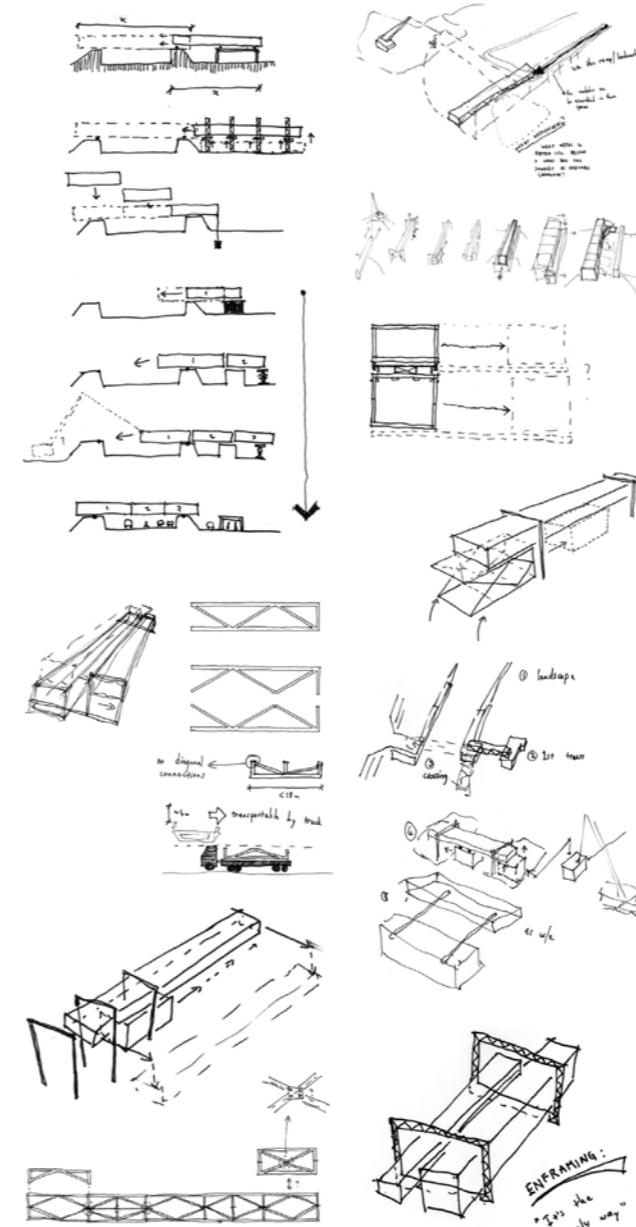


fig. 29 exploring implementation strategies

Making

Approached as a piece of infrastructure, the project's viability would rely heavily on the implementation strategy, so this became a major design driver. The obvious challenge of this cross-connection is the means of spanning across the on-grade highway, so this could determine the technical constraints and fixes for the rest of the design to work within.

From this, the 'building' component became seen as the structural element to carry the artificial 'landscape'. Developing this further, both the building and the taxi stop became inhabited structural trusses, with the landscape link supported between them. Service spaces such as workshops, storage, and the biowaste processing facility are used to create plinths supporting the bridge and lifting the ground plane to provide access to the raised bridge – both for minibus taxis and for pedestrians.

Design development from this point onwards explored the relationship between the technology and the spatial concept. Both conceptually and logistically, the project can be understood in terms of two major moves:

modified ground : reimagining and rehabilitating the vacant buffer strip as an active and positive urban landscape, embedding services, and creating an artificial topography

bridging : inserting a new building across the highway on the newly prepared landscape

This logic suggested two processes and two languages – the stereotomic and the tectonic – occurring in parallel before finally being brought together. This could mitigate the logistical difficulties of building over a major highway, and developing these two material languages, and the critical junctures between them, would inform the architecture in a way that reinforced the conceptual intent through the process of making. This became the

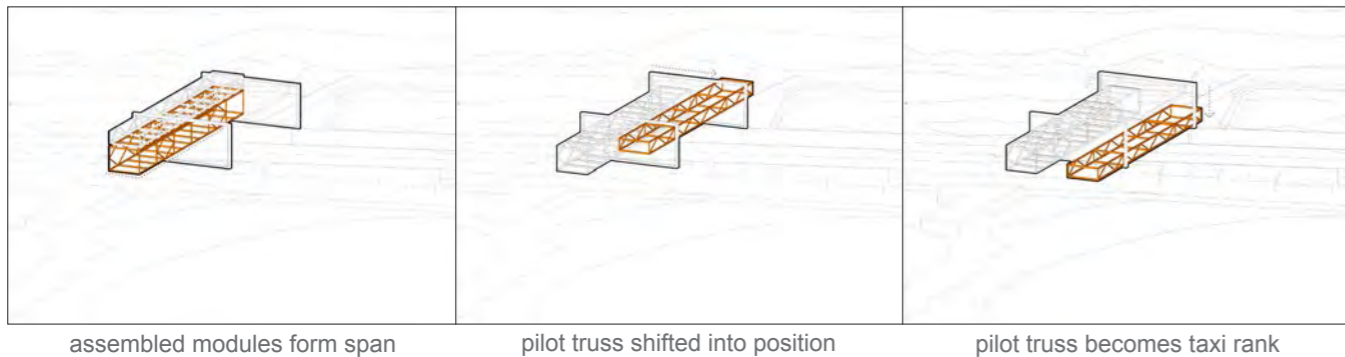
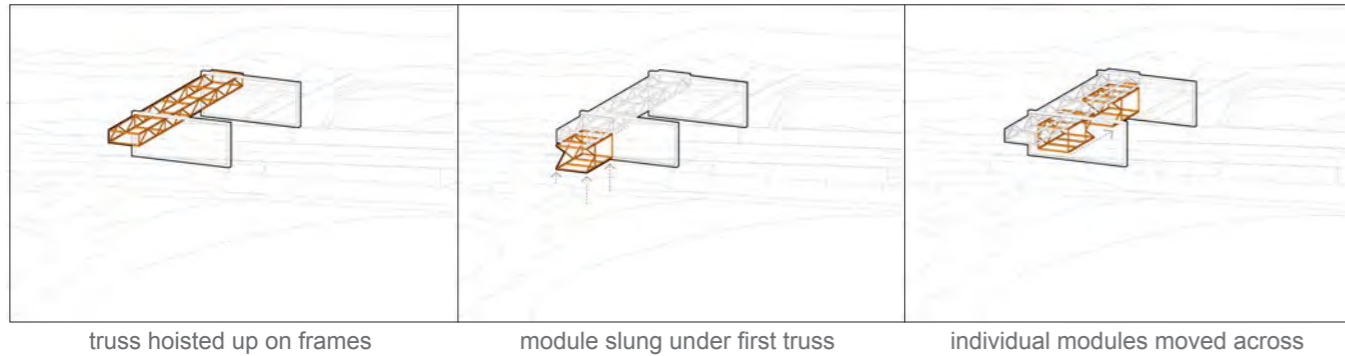
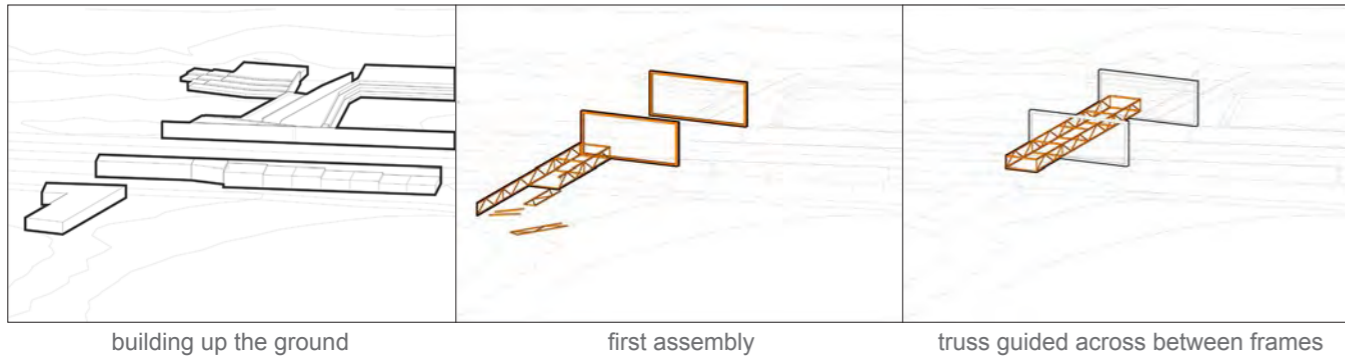


fig. 30 implementation strategy



fig. 31 module development

guiding principle giving critical direction to the project while negotiating any contingencies, compromises or technical challenges encountered in this process.

The construction of the 'trusses' was rationalized by clarifying the processes of assembly as well as overall implementation. In order to minimize traffic disruption and make maximum use of each element, the smaller truss, once assembled, is used as a pilot with which to build the bigger 'bridge' (figure 30). The larger building is conceived as a chain of modules assembled within the reprogrammed road verge and moved individually across the road along the smaller truss. This sets up certain design principles:

- the structural modules are designed to fit on a flatbed truck to be transported to site on public roads³⁸
- these steel modules are standardized as far as possible: the smaller truss satisfies the minimum span/depth ratio of a road bridge³⁹, and the larger truss stacks the same module size to create a double volume space
- the assembly of the 'cells', and the junctures between them, happens on site and should therefore use bolted rather than welded connections wherever possible
- the building skin is fixed inside the line of structure, as the mechanism of 'sliding' the modules requires direct contact with the structural frame
- enclosure and partitioning are non-structural and should be as lightweight as is practical; the manufacture of such parts could even happen in the new workshops and be transferable to self-built homes in the adjacent settlement
- the pedestrian landscape is slotted into place between the truss-buildings rather than built up from the ground, suggesting a lightweight deck

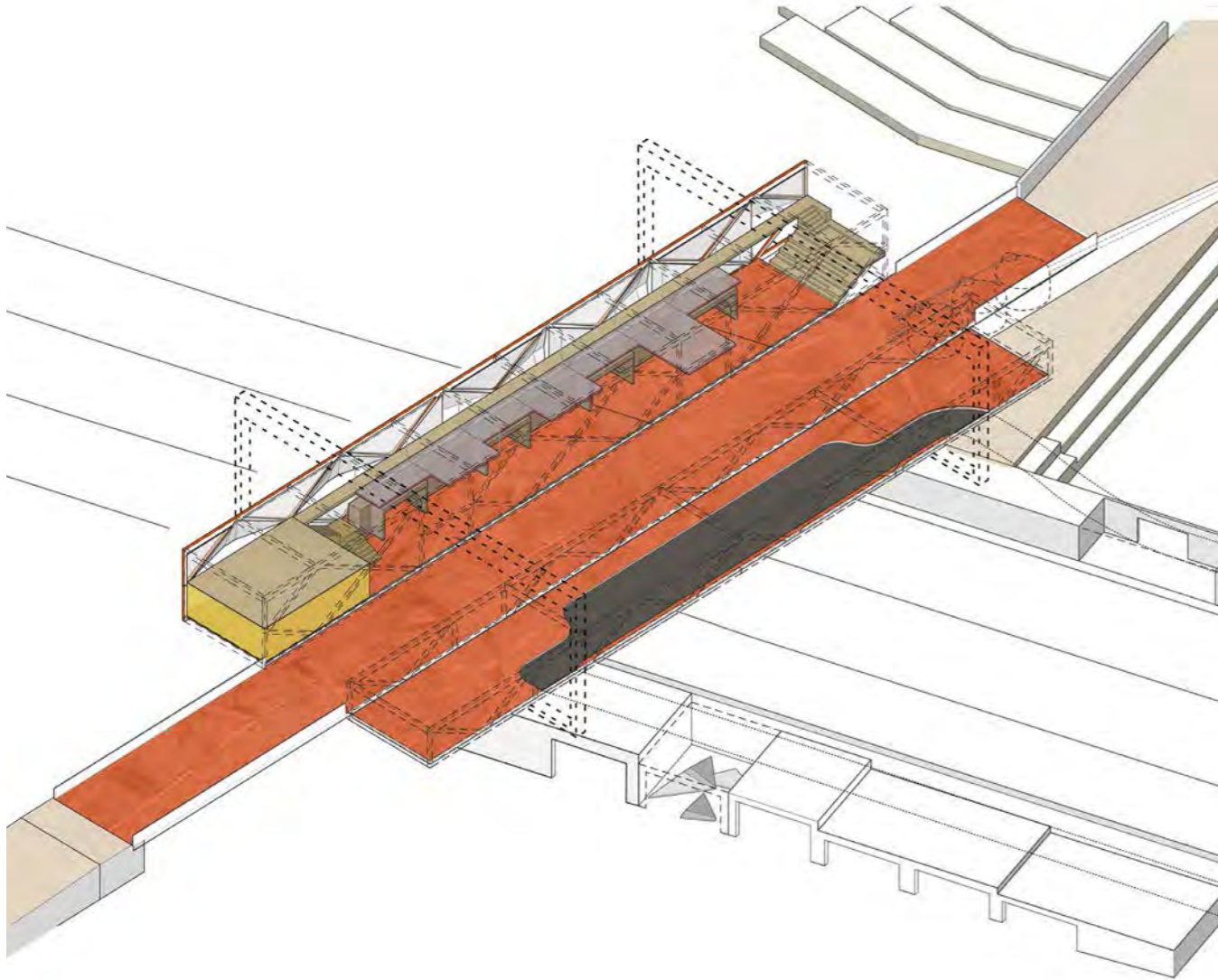


fig. 32 cutaway axonometric exploration

The architectural language is first and foremost expressive of the structure itself and the means of assembly and implementation. The steel trusses are fully exposed and the structural frames facilitating the process become landmark elements both from the highway and the pedestrian route, and carry signage and lighting, with the potential to support temporary structures or additional lighting in future.

Likewise, the habitable landscape expresses its functional role in enabling the construction process, as well as the process of being embedded with services and “programmed” for greater utility⁴⁰. The surface of the artificial topography is articulated as being different from the raised ground plane, without interrupting the pedestrian experience as a continuous one across the landscape (figure 34).

The building skin responds to the geometry of the steel structure as a system of lightweight panels folding in and out of the plane of structure (figure 33). This permits openings for views, lighting and ventilation and forms habitable spaces in the potentially hostile infrastructural object. Translucent polycarbonate panels are used for the practical benefits of daylighting, insulation and relative robustness, as well as the contrast with the boldness of the structure. The folds create a subtly shifting aesthetic experience of when approaching and passing under the bridge by car, which happens at a slight angle (figure 35).

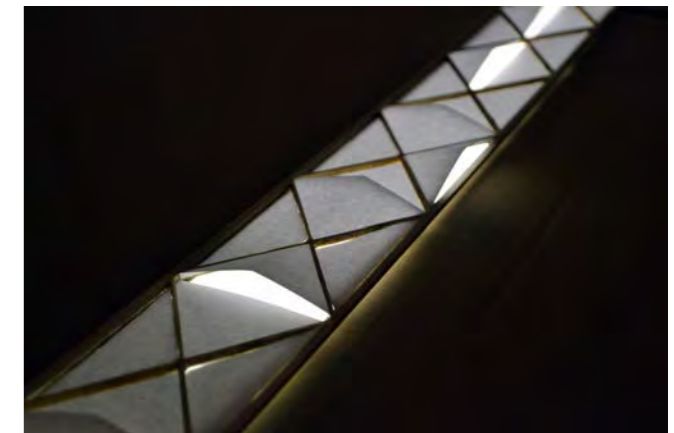
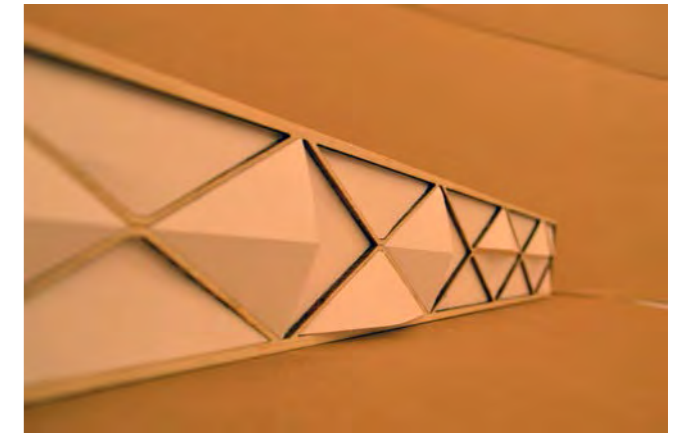
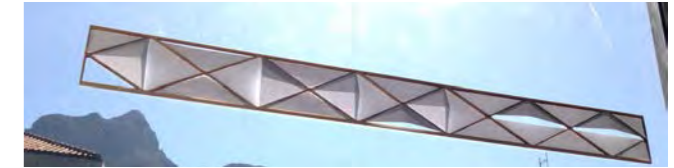
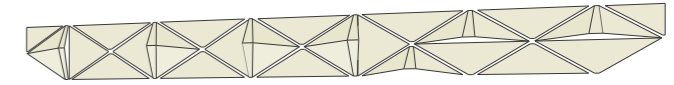


fig. 33 skin explorations

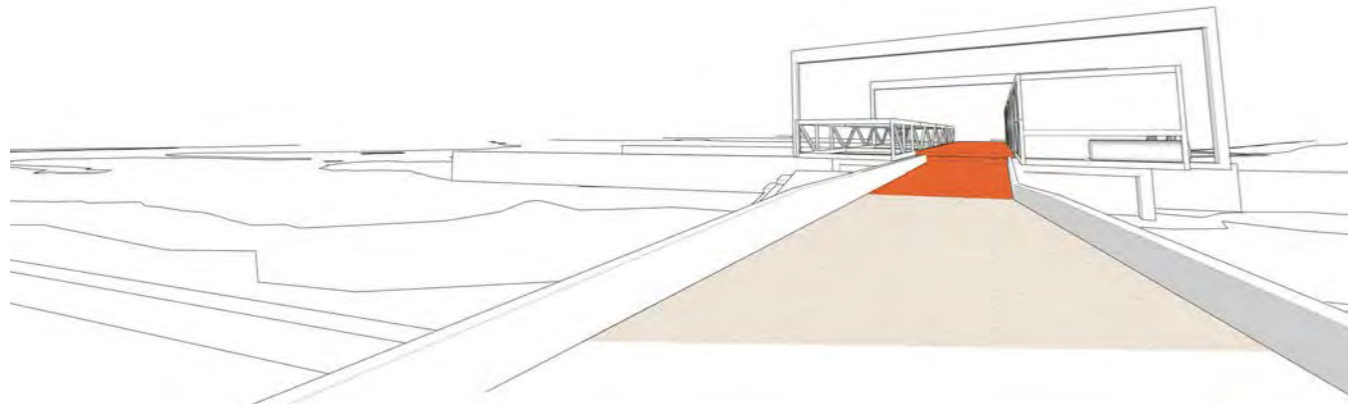


fig. 34 pedestrian landscape

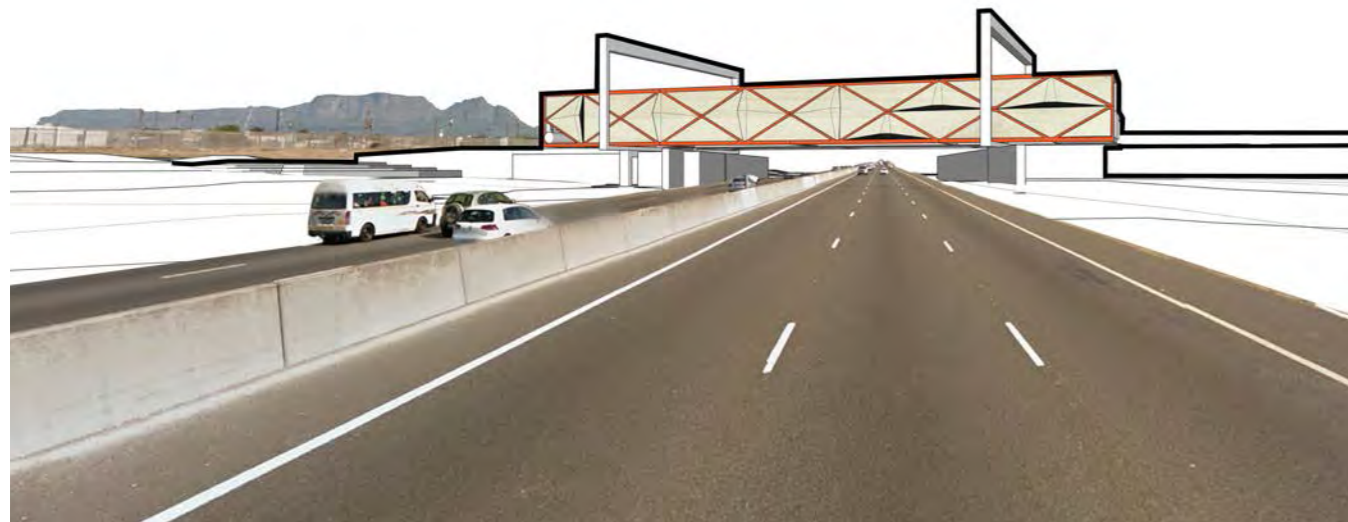


fig. 35 the three-quarter view from the road

As an architectural object, the project attempts to address two very different audiences simultaneously. On the one hand, pedestrian experience is intended to be one of continuity across the landscape rather than a crossing of a boundary between two discrete worlds (although the change in landscape is expressed in the ground surface). In this sense the bridge approximates a street with well-defined edges and clearly public space.

From the highway, the bridge is perceived as a bold infrastructural object. This is enhanced by the expression of structure, the shimmering translucent skin, the cantilevered ends, and the large frames on either side. This is not only intended as an aesthetic experience; the bridge's very presence signals the existence of the world(s) adjacent to the highway, otherwise ignored as mere periphery. To paraphrase Heidegger, the city emerges as city only as the bridge crosses the highway⁴¹.

Thus the spatial and aesthetic design follows, to a large extent, the logic of implementation and construction, as with other works of infrastructure. It is this single-minded rationality that can be considered to give infrastructure its functional and aesthetic force, but also its negative side-effects. The design development of this dissertation has attempted to embrace this, but also, crucially, to remain open to *multiple* rationalities while being steered by an overarching urban and human intent. It is through this that the project attempts to subvert and reimagine the infrastructural logic it is simultaneously utilizing and critiquing.

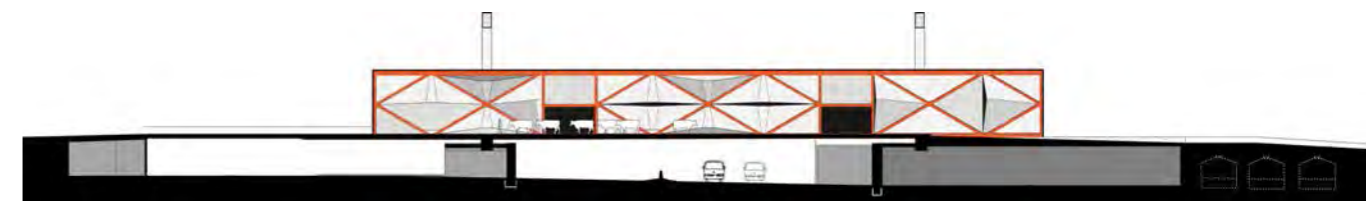


fig. 36 section: a continuous landscape across a former barrier

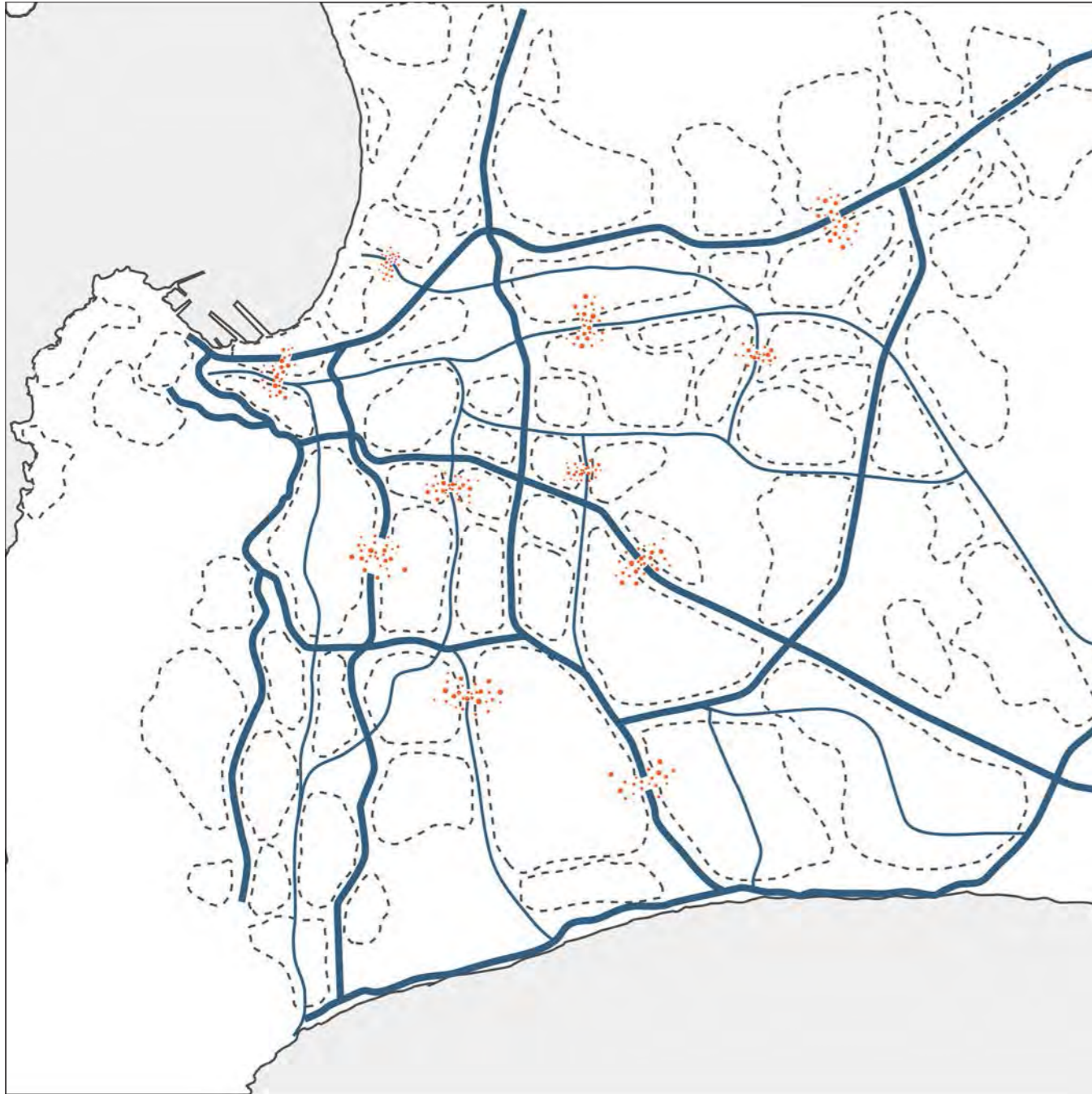


fig. 37 retrofitting the apartheid city

Retrofitting the apartheid city

The aim of this dissertation was to interrogate the processes by which infrastructure is designed and subsequently structures the city. By questioning the modes of thinking behind existing infrastructure and reading the spatial and urban side-effects thereof, an approach was established which challenges the monofunctionality and abstract rationality of past methods by harnessing the potential of productively bringing together difference. By looking at the way spaces are lived rather than the way they were planned; by attempting to maximize the impact of every gesture; by seeking to address metropolitan systems at the same time as everyday life; and by investigating spatial side-effects of as positive open-endedness rather than unfortunate leftover, this project proposes that careful architectural consideration can be applied to infrastructure to multiply the benefits and opportunities we build into the city.

At the same time, the project has attempted to engage the rhetorical and aesthetic power of the single-minded rationality of the systems it critiques. Whereas this mindset has resulted in friction when it comes into contact with the multiple, competing rationalities of the real world, the approach of this project has been to engage these in an inclusive, “both-and” process. It is through this that it attempts to avert the shortcomings of past infrastructural projects it is attempting to ameliorate.

The infrastructural prototype this dissertation proposes attempts to reconfigure the urban landscape physically, socially and economically. It is a device for physically restructuring the topography to ameliorate spatial divisions, enable people to have greater mobility and agency, and promotes access to the city and to economic opportunity.

The proposal is presented as a site-specific manifestation of a typology intended to address a generic condition found throughout the city. Part of its potential power – as a transformative device and as an expressive manipulation of the landscape – lies in its deployment as a system at a broader scale.

At the scale of the specific, the proposal has potency in the particular sites where it takes root because of the connections, relationships and networks it creates, modifies or enhances by puncturing the metropolitan supergrid of zoned cells. Straddling two worlds, it extends its influence into both but also creates a new terrain, a both-and landscape where difference is brought together and something new can develop, greater than a mere combination of the existing.

The potential of this new urban terrain is exciting when this idea is extrapolated across the city to other examples of this generic condition, as a kind of peri-urban acupuncture. Perhaps through the act of piercing the city’s zoned bubbles and creating a new landscape in the negative space, true urbanity can emerge as a source of opportunity and experiential richness. Perhaps the city might be restructured at a broad scale to work better for its residents. Infrastructure might then more convincingly become an armature to enable urban life and unlock its potential benefits.



Notes

epigraph

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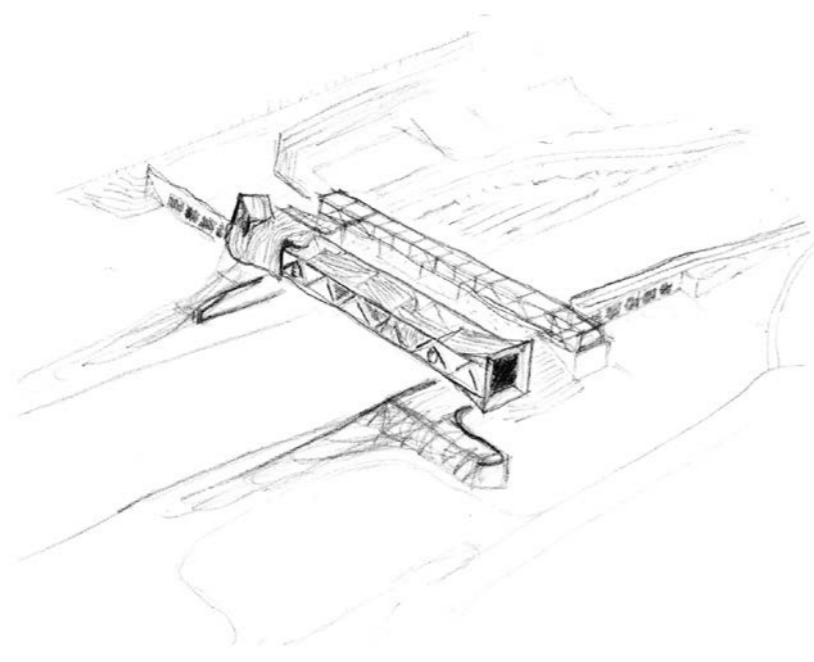
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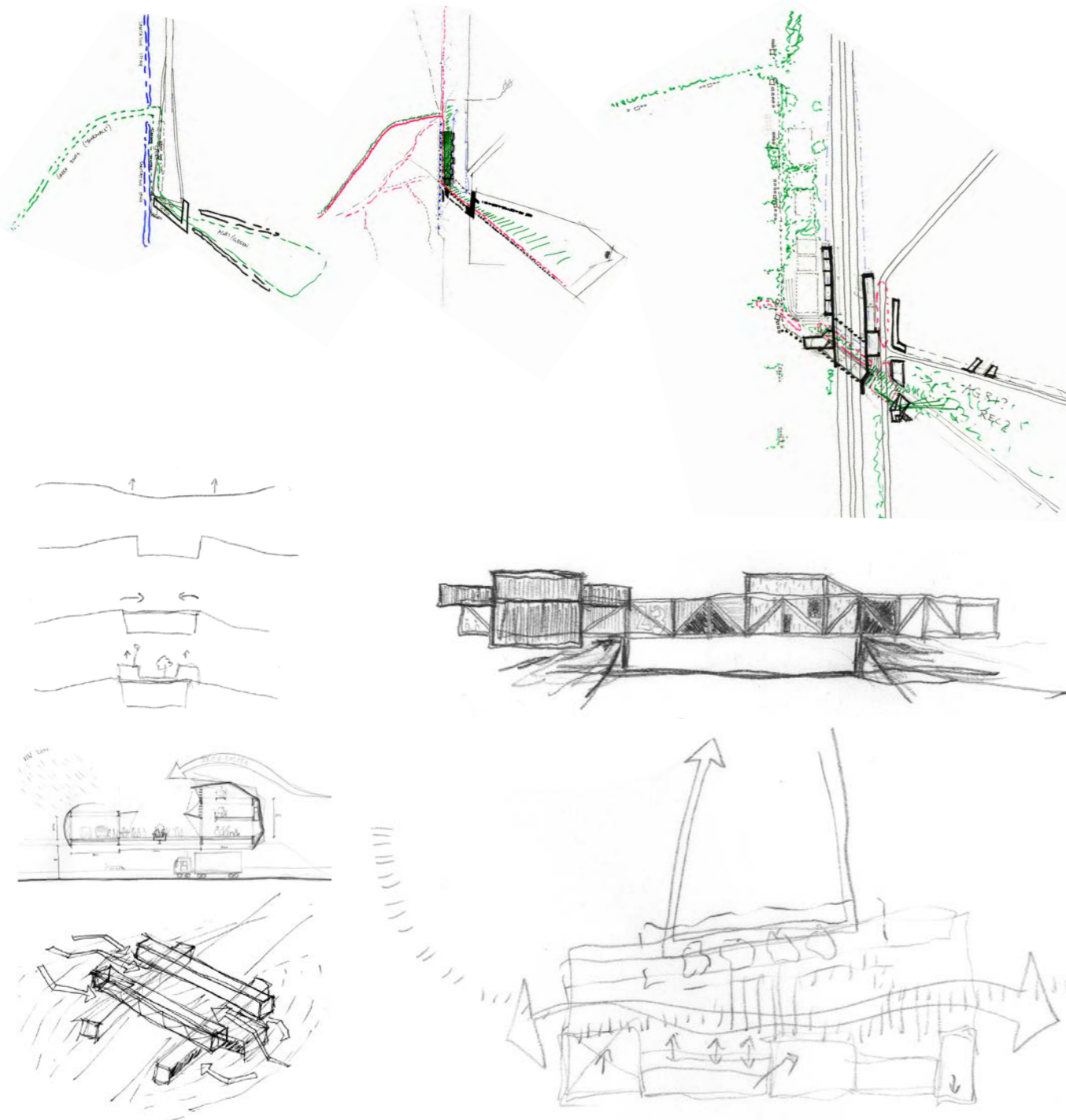
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The bridge *gathers* the earth as landscape around the stream...It does not just connect banks that are already there. The banks emerge as banks only as the bridge crosses the stream. (p.445)



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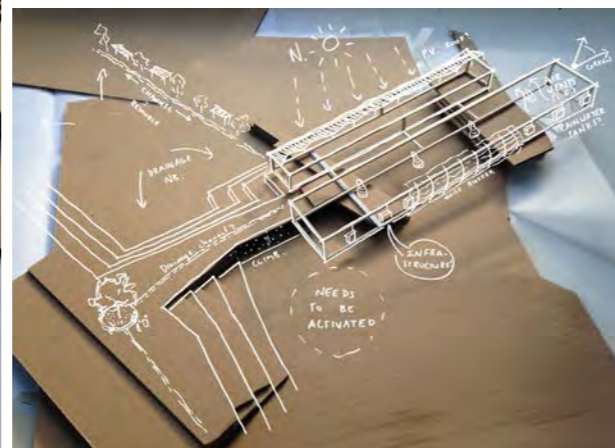
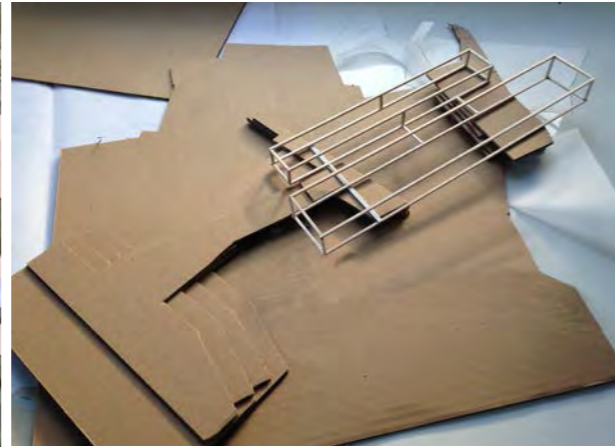


Image credits

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- Figure 2** JTPC (1967)
- Figure 3** Frith, A. (2013) *Dot-maps of racial distribution in South African cities* <<http://blog.adrianfrith.com/dot-maps/>>
- Figure 4** Dewar & Todeschini (2004)
- Figure 5** Google Earth
- Figure 6** Swingler, S. (2014). *Our Toilets Are Dirty: a social audit of the janitorial service in Khayelitsha, Cape Town*. Online documentary. <<https://www.youtube.com/watch?v=seqmzYfwlhA>>
- Figure 11** Google Earth
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b Future Boston. *Big Dig parcel map*. <www.futureboston.org/parcelmapff.htm>
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- Figure 16 a-e** Shannon & Smets (2005)
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b Landscape+Urbanism (2009). *Dailyland: Parc Nus de la Trinitat*. <www.landscapeandurbanism.com/2009/02/21/dailyland-parc-nus-de-la-trinitat>
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- Figure 18 a-c** Shannon & Smets (2005)
- Figure 19 a** Jacobs et al (2002)
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- Figure 20 a-c** Shannon & Smets (2005)
- Figure 22** Google Earth
- Figure 23** Google Earth
- Figure 24** Google Earth

transformative infrastructures

retrofitting the apartheid city

louwrens botha
m.arch (prof) 2015
university of cape town

This dissertation takes as its point of departure the idea of urbanity as a layering of systems, landscapes and objects, producing synergies and relationships where they meet, overlap, cross, pass or collide. The resultant intensities and opportunities allow the whole to be more than the sum of its parts, and for unforeseen occupations, connections and experiences to occur. This is the magic of cities.

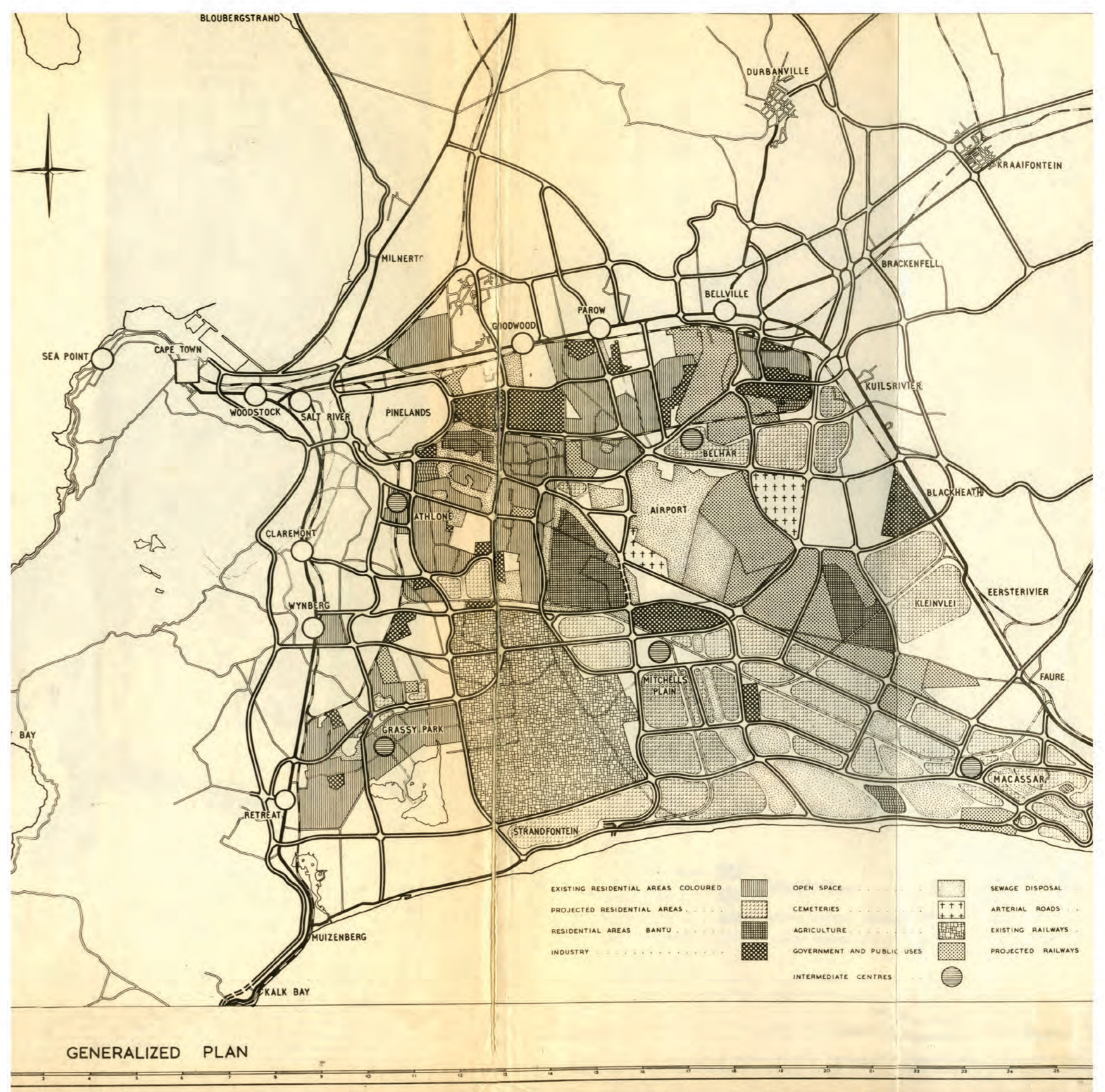
Cape Town has however been explicitly designed for difference not to touch. Apartheid planning, as an extension of Modernist planning, conceived of the city as a dispersed landscape of functionally and racially separate cells. Large-scale road and rail infrastructure facilitates movement from one cell to another while forming spatial barriers defining the separation between cells; infrastructure defines an anti-urban landscape.

At the same time, this historical role represents an opportunity for change: the line of division is also the point of contact, and thus the ideal site for new connections. The no-man's-land of a highway buffer strip becomes the place where things can touch, the site of Cape Town's becoming-urban.

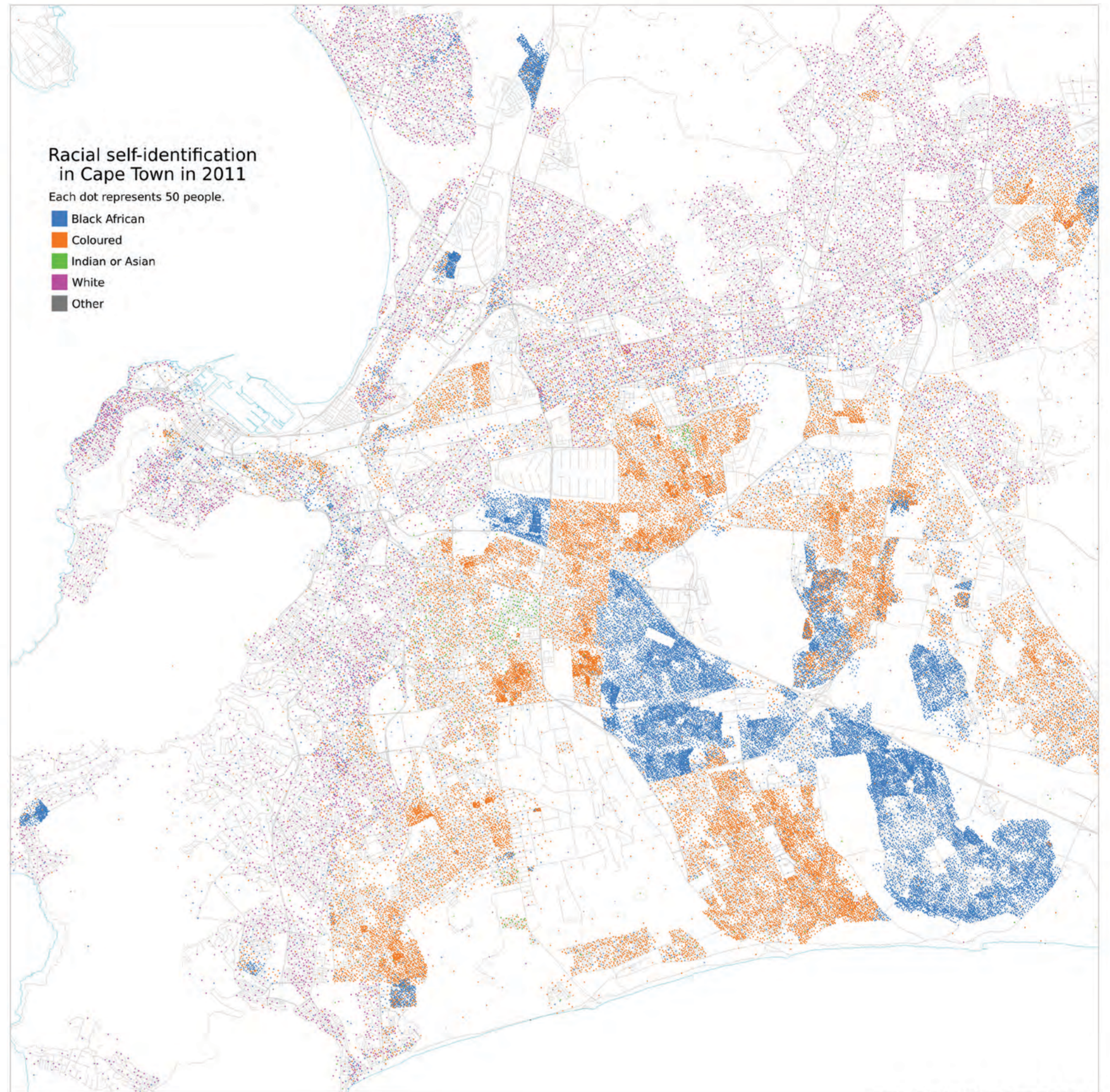
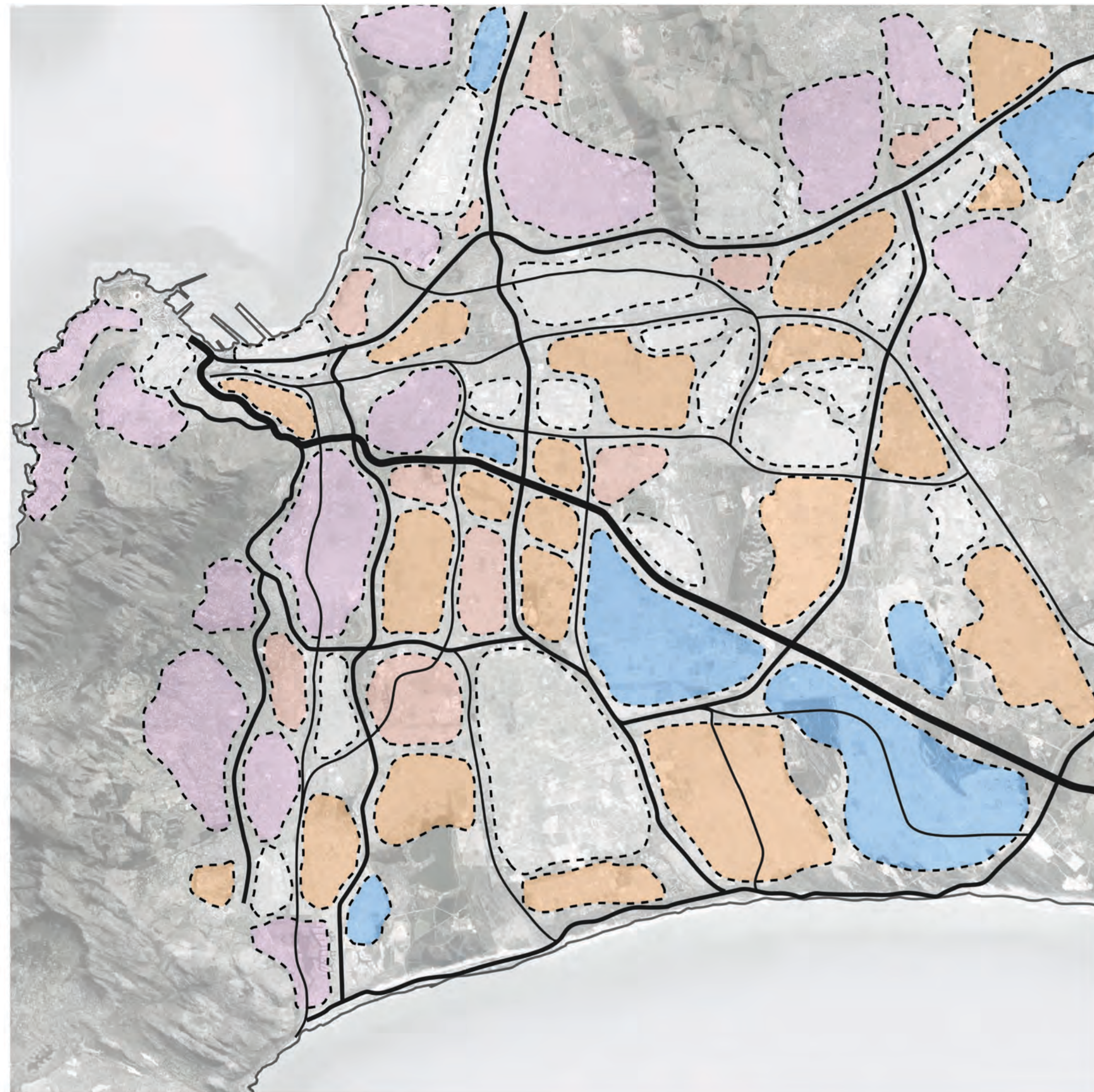
The N2 highway running eastward from the CBD across the Cape Flats (known as Settler's Way) is taken as an exemplar of this condition. Residential densities on either side of it (mostly non-white, and including several informal settlements) exceed those at its two "urban" ends, but it has been designed and built as a non-stop, high-speed connector indifferent to these adjacencies.

An alternative reading of the highway reveals the potential frictions and synergies of overlapping and adjacent realities: residential and industrial fabric; poverty alongside wealthy commuters; the buffer strip as a playground and a site of protest. Urbanizing the highway could harness this friction more productively.

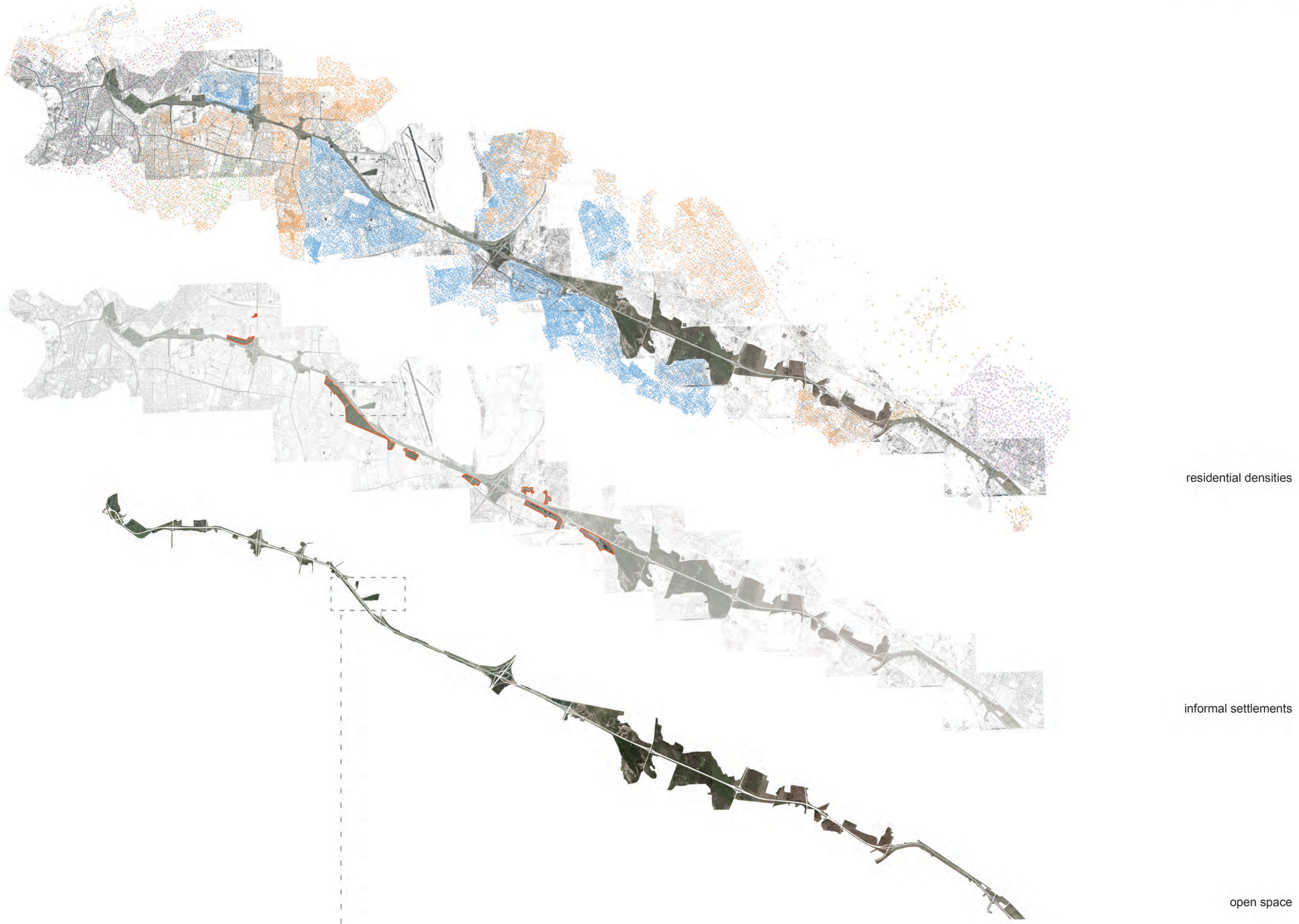
Ameliorating the negative spaces of the infrastructural landscape could further provide opportunity for inserting new infrastructure and services into a dense informal fabric, and to redefine what constitutes necessary infrastructure. Negative space is re-imagined as an urban resource, and infrastructure affirmed as an enabling, rather than restrictive, urban device.



functional, racial and infrastructural planning [1967]



racial distribution [2011]



residential densities

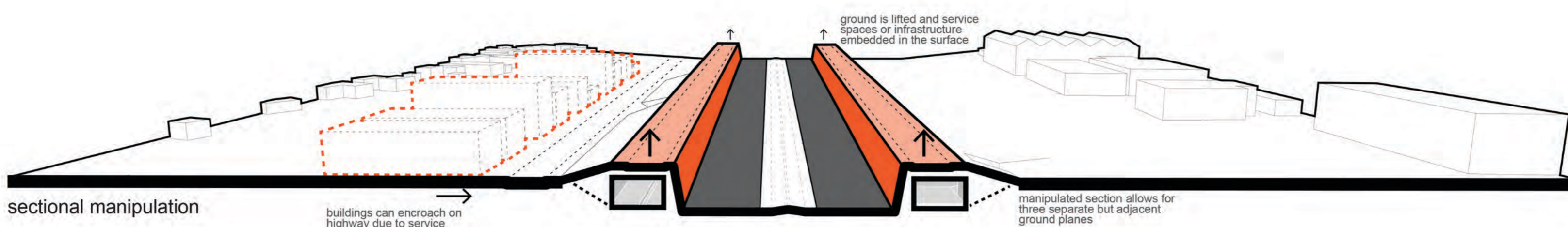
informal settlements

open space



strategies: urbanizing the highway

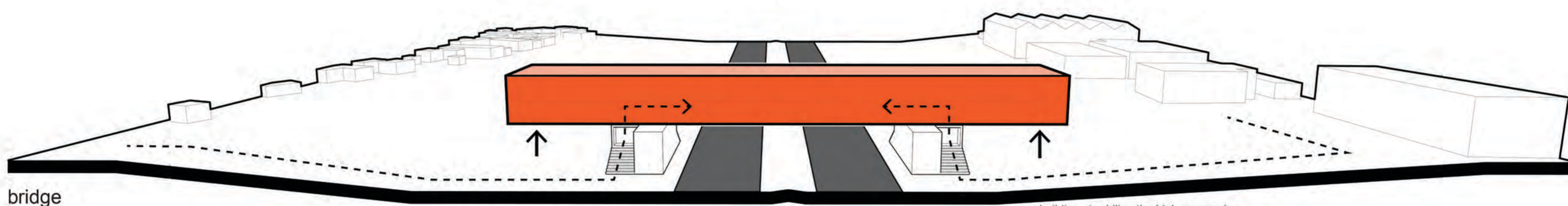
case studies explored strategies that seek to urbanize highways, identifying which could be productive in addressing settler's way. a combination of three promising strategies is proposed as the best balance of practicality and urban benefit in this context.



sectional manipulation

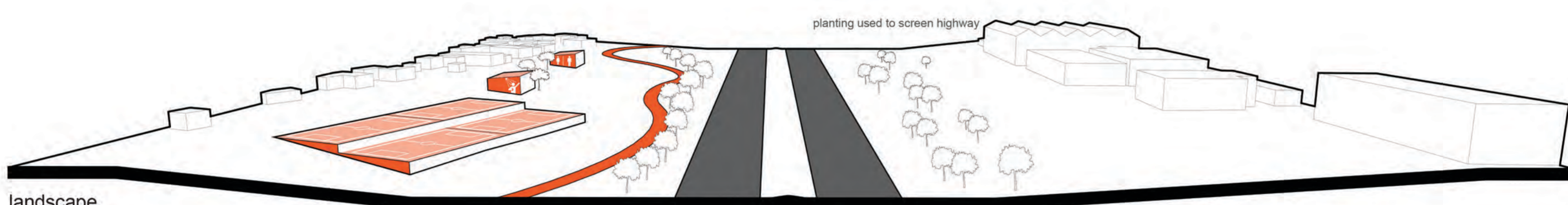
buildings can encroach on highway due to service lanes and sectional buffer

manipulated section allows for three separate but adjacent ground planes



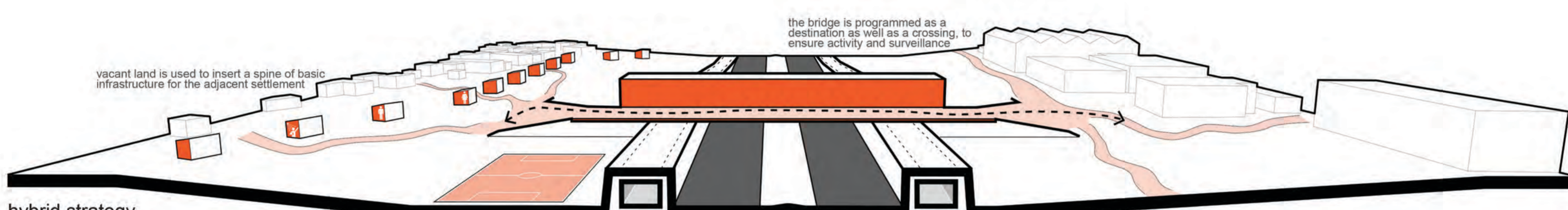
bridge

a building straddling the highway can be accessible from both sides, offering a point of meeting or of crossing



landscape

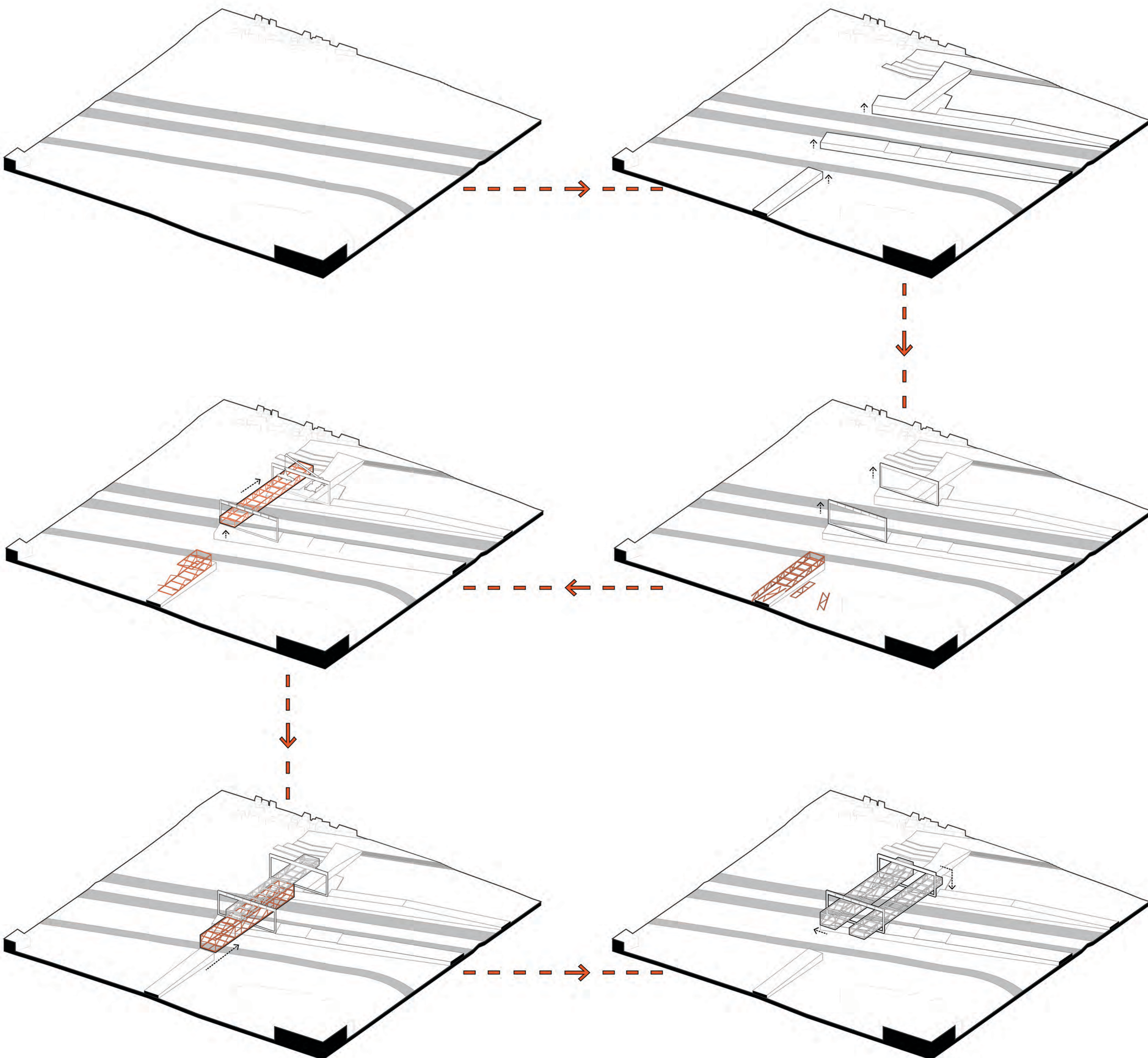
the negative space of highway design becomes an open space resource serving adjacent communities

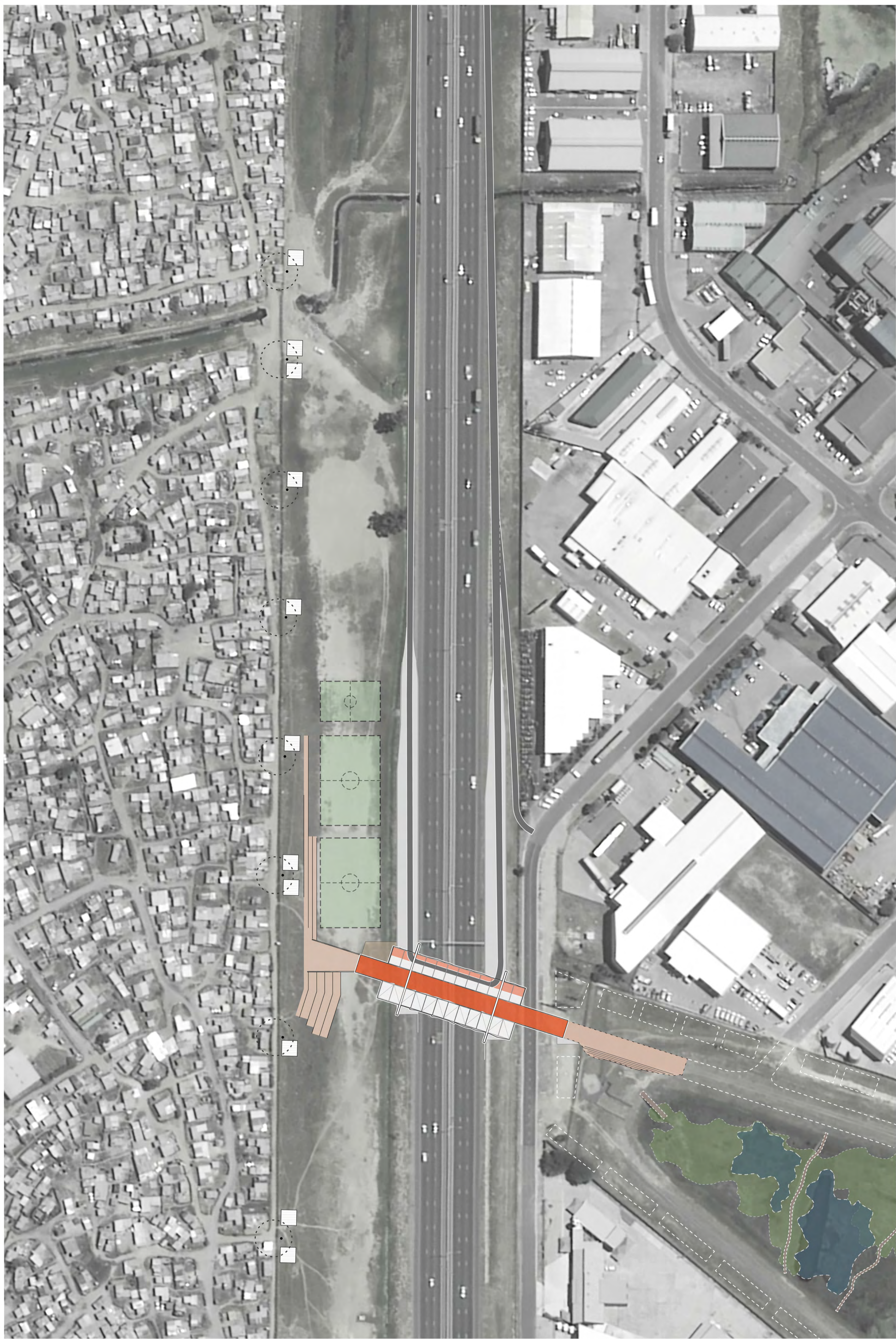


hybrid strategy

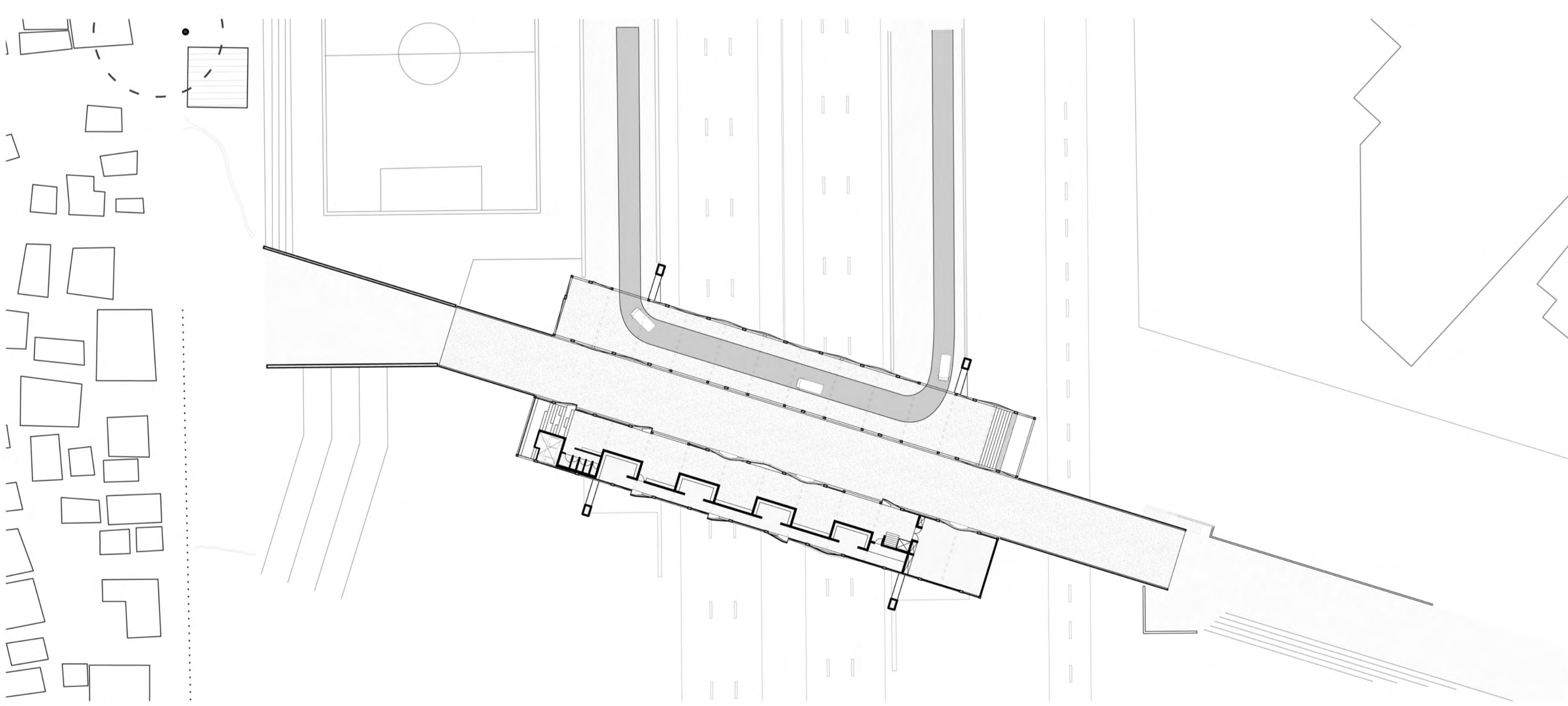
implementation

the logic of construction and implementation is prioritized both as a strategy for infrastructural deployment, and as the source of architectural expression. emphasis is on maximising use of the buffer zone and minimizing disruption of the highway, and on modular fabrication. structural module is derived from minimum span-depth ratios and maximum transportable load size.

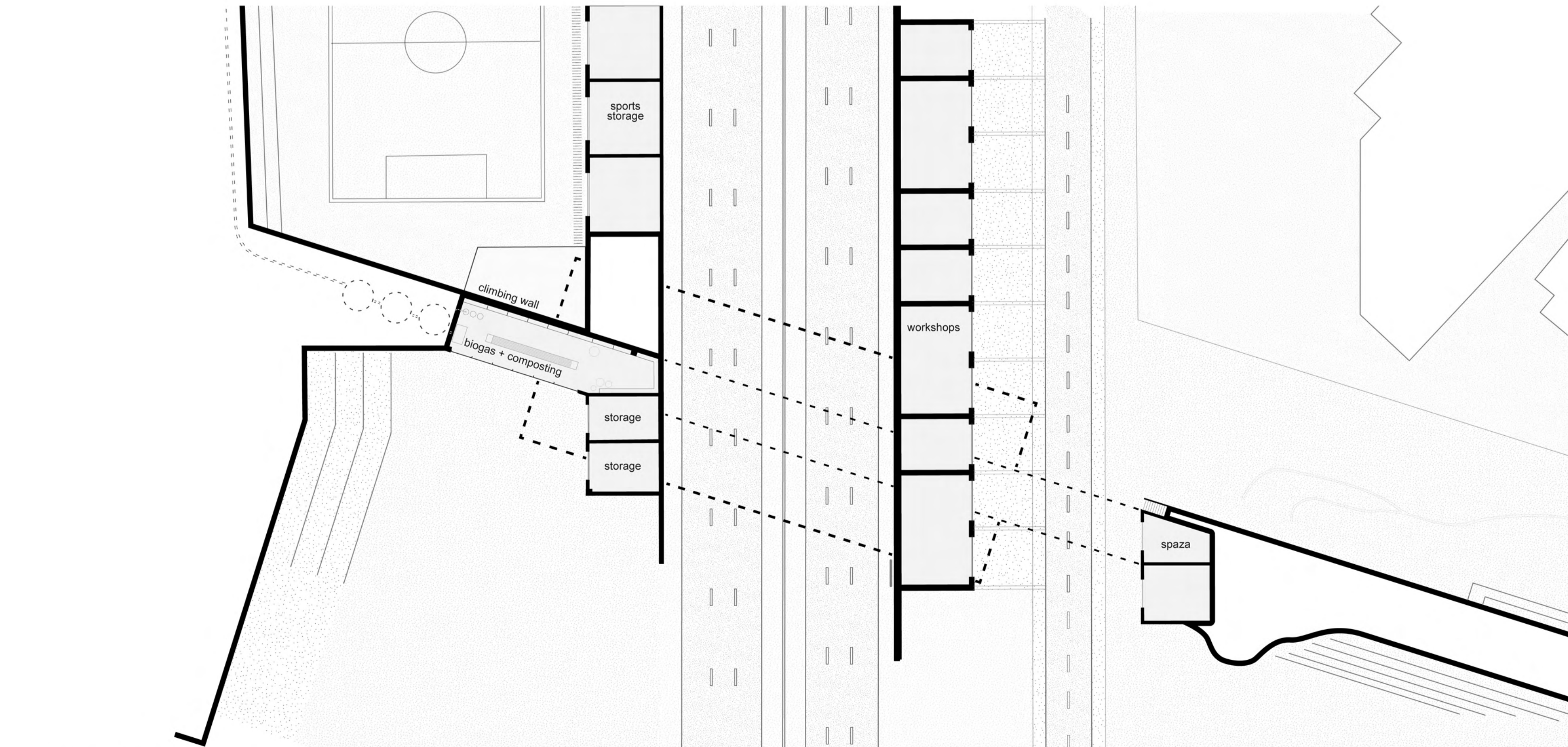




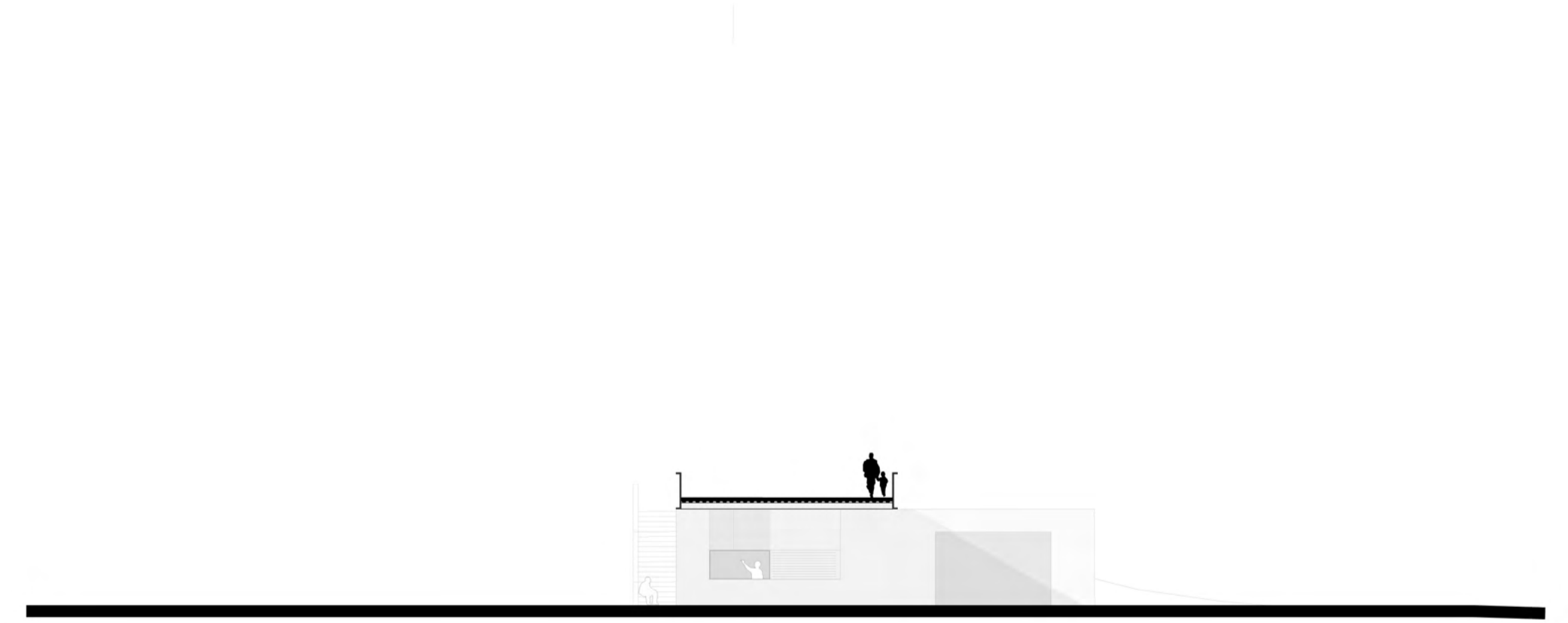
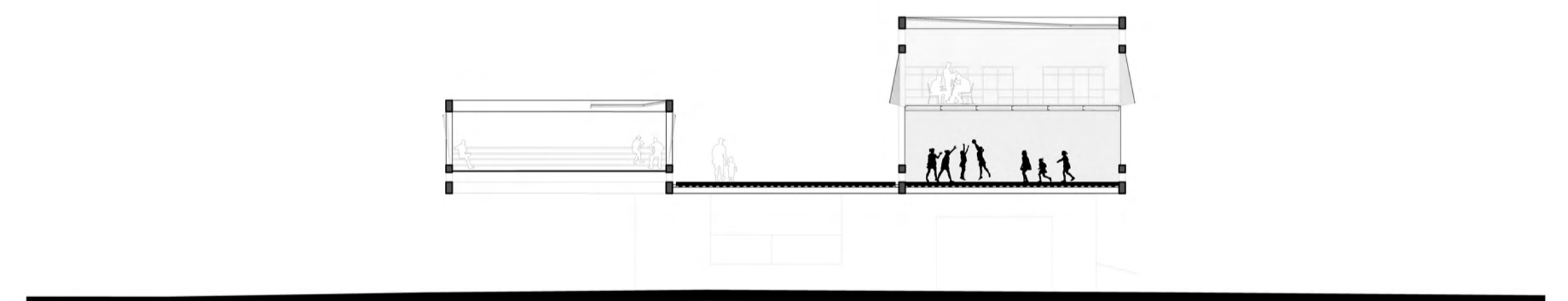
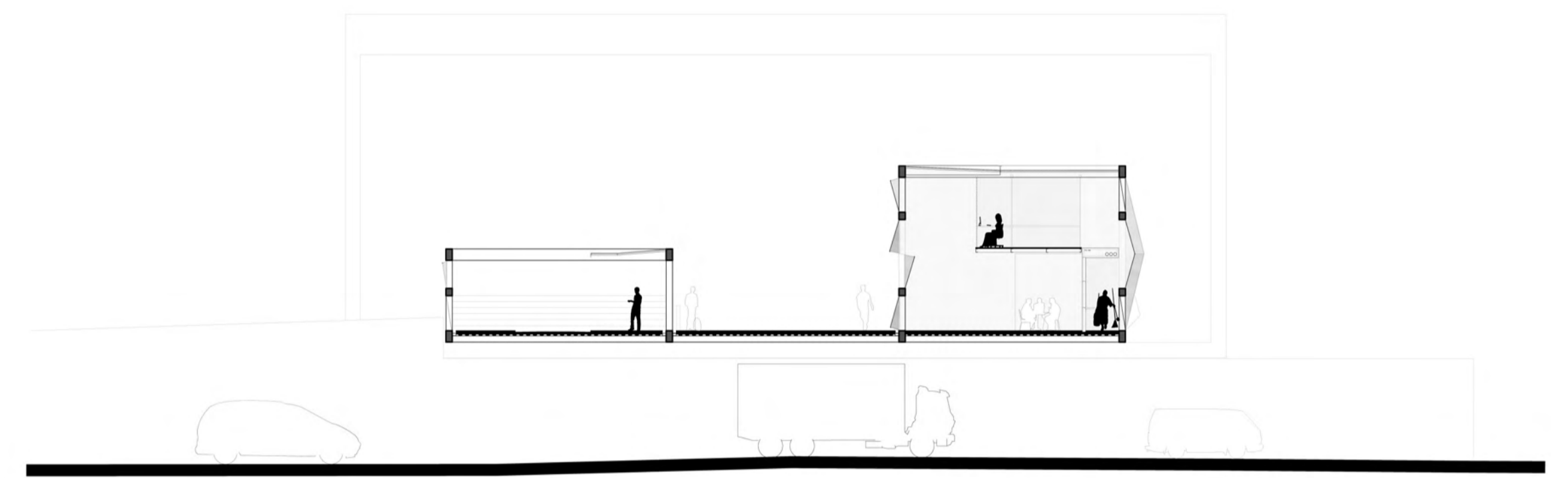
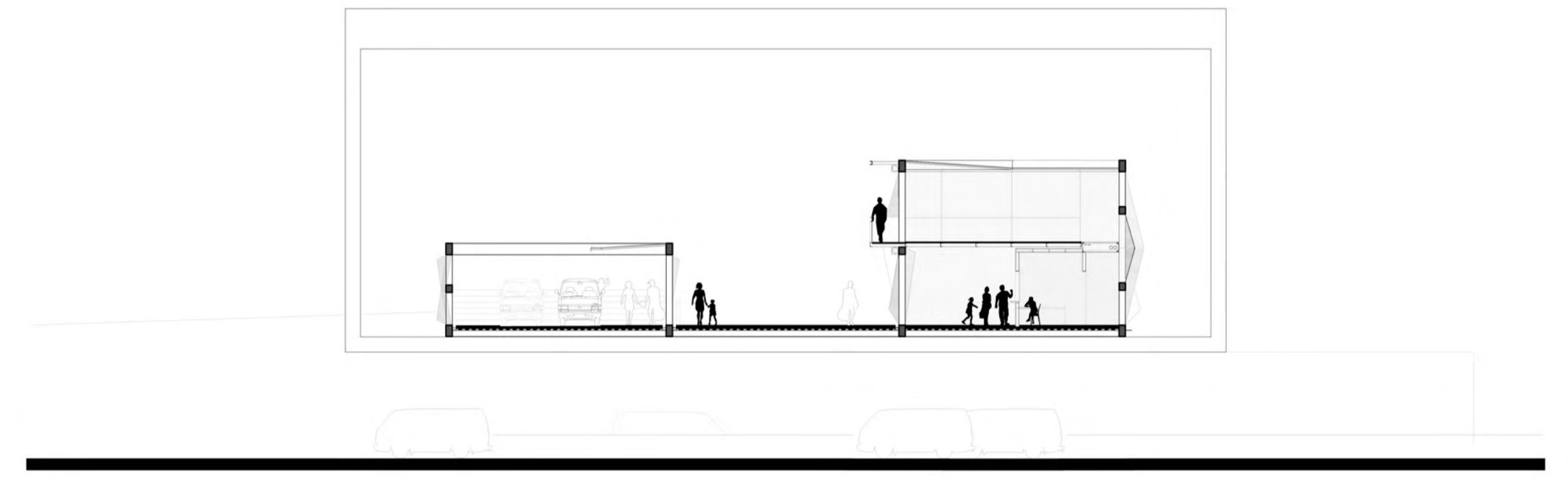
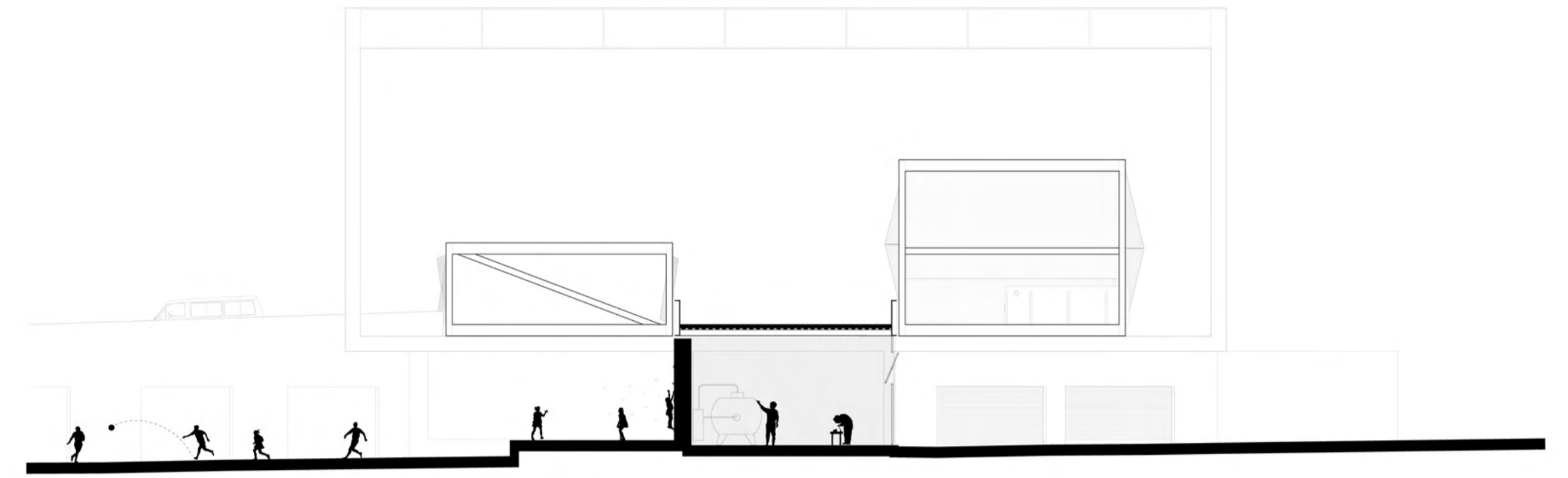
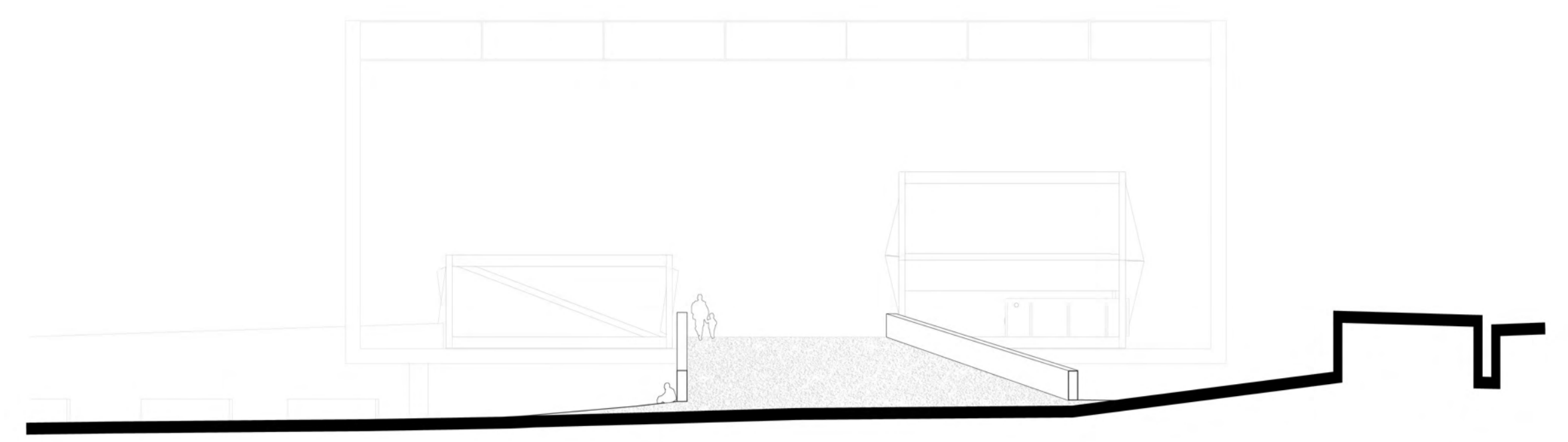
site plan
1:1000



upper ground level plan
1:500

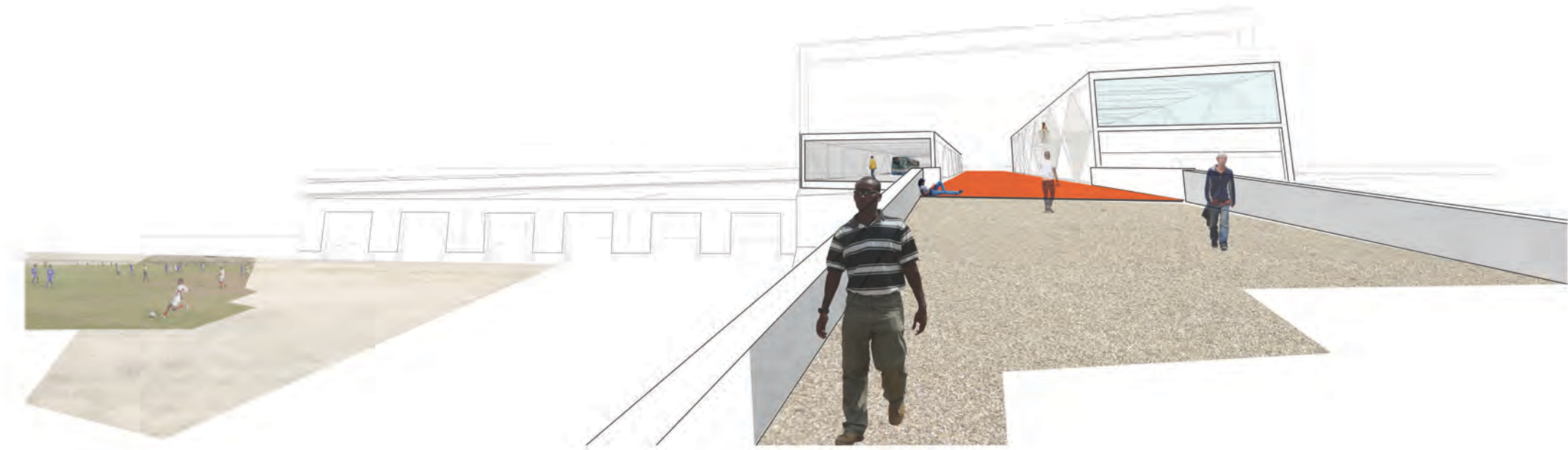


lower ground level plan
1:500

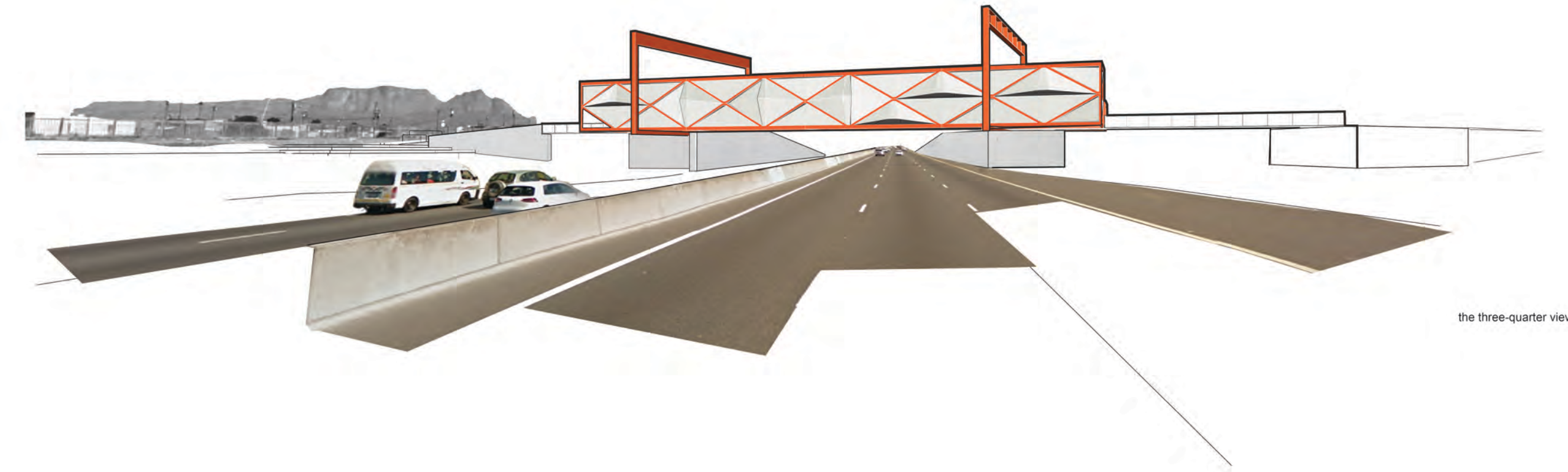


walking section
1:200

continuous pedestrian landscape



the three-quarter view from the road



bridge section
1:100

