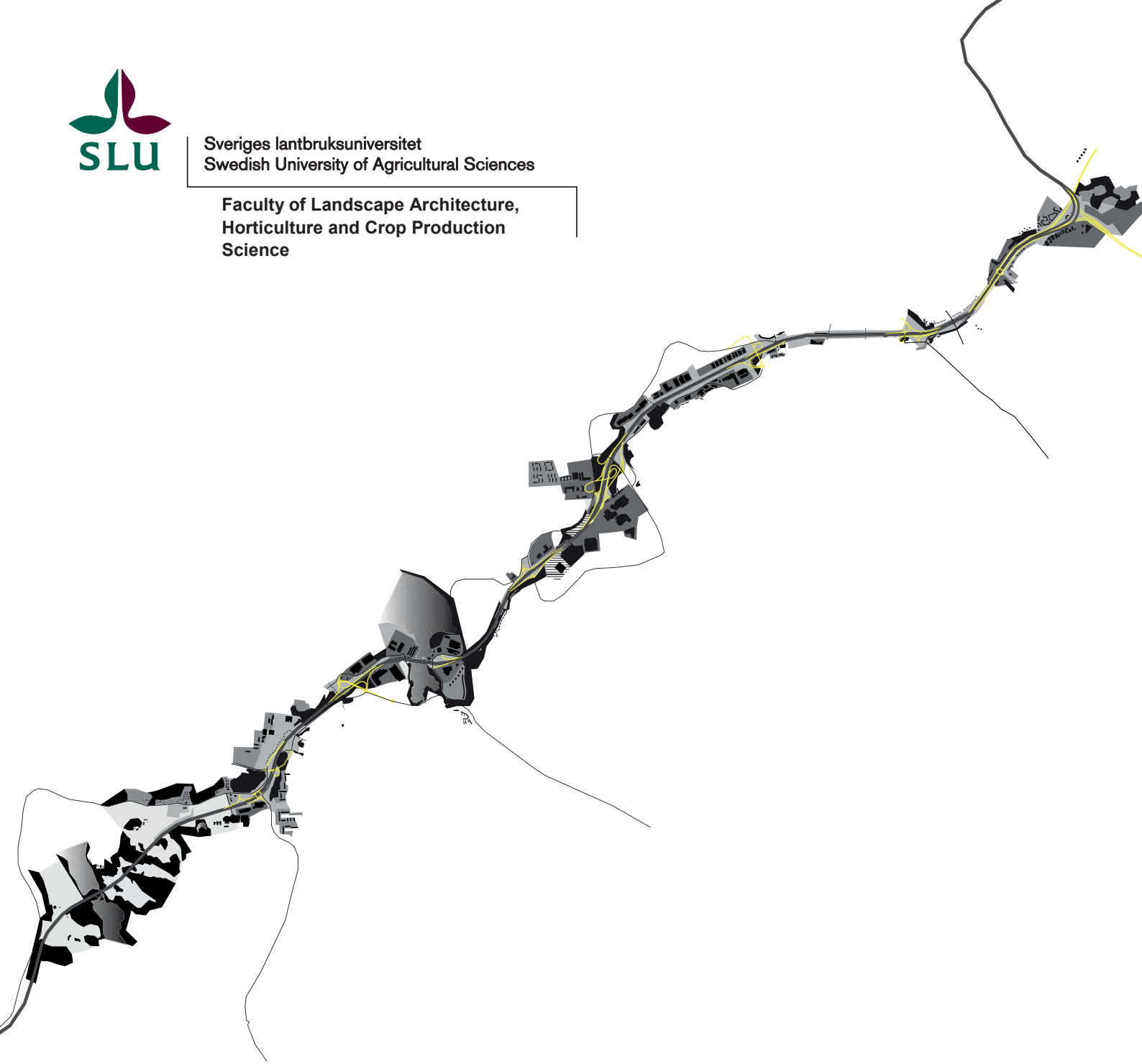
Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Landscape Architecture,
Horticulture and Crop Production
Science



Aesthetic considerations in localization decisions of city entrances

– The Southern approach to Greater Stockholm Region as an example

Ella Uppala

Department of Landscape Architecture, Planning and Management
Degree project • 30 credits

Aesthetic considerations in localization decisions of city entrances – The Southern approach to Greater Stockholm Region as an example

Gestaltningsfrågor vid val av stadsentréernas lokalisering – Södra infarten till Stockholmsregionen som exempel

Ella Uppala

Supervisor:	Caroline Dahl, Swedish University of Agricultural Sciences, Tankesmedjan Movium
Examiner:	Lisa Diedrich, Swedish University of Agricultural Sciences, Department of Landscape Architecture, Planning and Management
Co-Examiner:	Vera Vicenzotti, Swedish University of Agricultural Sciences, Department of Landscape Architecture, Planning and Management

Credits: 30
Level: Second cycle, A2E
Course title: Master's Project in Landscape Architecture
Course code: EX0814
Programme/education: Landscape architecture- Master's programme

Place of publication: Alnarp
Year of publication: 2017
Part
Online publication: http://stud.epsilon.slu.se

Keywords: Road architecture, road aesthetics, city entrances, city approaches, environmental aesthetics, road user experience, road environment

Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

Faculty of Landscape Architecture, Horticulture and Crop Production Science
Department of Landscape Architecture, Planning and Management

Abstract

This thesis is about the aesthetic qualities of highways that function as approach roads to cities, regions, and the different municipalities of these regions. A question that is posed is about the relevance of aesthetic considerations in the localization decisions of elements that signal approaching and entering areas along the highway: How can the need for cues of entrance be localized along city approaches, based on aesthetic criteria formulated from the road user's perspective?

The question was deemed important for two reasons. Approach roads are a significant part of many commuter's daily landscape, and their aesthetic qualities have an effect on the commuters' psychological processes, traffic behavior and quality of life. As such, aesthetic considerations on approach roads are a part of the discussion about the quality of people's living environments in general. The second reason is specific to city approaches and –entrances as expressions of identity of a place and other meanings that change the road user's impression of the places they are approaching, reaching and passing by. During the project it was found that the words "city entrance" and "city gate" have very strong connotations and associations, especially on a regional level where each municipality and district vie for the honor of being called the entrance to the region. To better understand the multiple functions and values that elements in the road environment that signal approach and entering can have, a new, less loaded concept of "cues of entrance" was created.

In order to understand what the role of aesthetics in the road environment and especially along approach roads is, a literature study was conducted. The literature study yielded a great amount of information about how the road user experiences the aesthetic aspects of their environment, and how they influence their further experience of the road and the places around it. The findings of the literature study were then formulated into goals for the aesthetic components of the road environment. These goals can also serve as criteria for evaluating the suitability of a certain location for new cues of entrance.

The practical inspiration for pursuing the subject was to create an analysis of the European highway E4/E20 in its role as the Southern Approach to Greater Stockholm Region. The highway has been analyzed from the municipality of Botkyrka to the southern districts of Stockholm city, and evaluated from an aesthetic point of view. The aesthetic qualities of the road environment along the highway that contributed to a sense of approaching to or arriving in different places were paid special attention to.

Evaluating the analysis of the approach road E4/E20 according to the goals for the aesthetic components of the road environment resulted in recommendations for improving the road environment along the highway, in some cases by adding new cues of entrance in specific locations.

Table of contents

Concepts and definitions 6

1. Project background 11
1.1. Execution of the Master's project 14
1.2. Literature and research methods 17
1.2.1. Literature studies 17
1.2.2. Research methods 18
1.2.3. Process descriptions for the research 19

2. Aesthetic considerations in the road environment 22
2.1. Aesthetic considerations in the work of Swedish Transport Administration 23
2.1.1. Swedish laws and guidelines for aesthetics in the road environment 23
2.1.2. Aesthetics in road infrastructure projects 24
2.2. Environmental aesthetics 27

3. Criteria for evaluating the aesthetic qualities of the road environment 30
3.1. Appreciation 31
3.1.1. Direct meaning 32
3.1.2. Indirect meaning 34
3.2. Perception 36
3.2.1. Attentiveness and focus 37
3.2.2. Mechanisms of perception 39
3.2.3. Influence on psychological processes 40
3.3. Quality 43
3.3.1. Visual attributes 44
3.3.2. Phenomenon in movement 45
3.4. Aesthetic criteria for the localization of cues of entrance 47
3.4.1. A meaningful road environment 48
3.4.2. Enjoyable driving 51
3.4.3. Improving the quality of the scenic landscape 53

4. The southern approach to Stockholm 55
4.1. City entrances and –approaches 58
4.2. Analysis of the E4/E20 as the Southern approach to Greater Stockholm Region 62
4.2.1. Sequence 1: Rural Botkyrka 64
4.2.2. Sequence 2: Hallunda-Alby 70
4.2.3. Sequence 3: Fittja-Vårby 76
4.2.4. Sequence 4: Vårby 82
4.2.5. Sequence 5: Kungens kurva 88
4.2.6. Sequence 6: Smista-Sätra 94
4.2.7. Sequence 7: Fruängen- Västertorp 102
4.2.8. Sequence 8: Västberga 108
4.2.9. Analysis of the E4/E20 as the Southern approach to Stockholm: Conclusions 114

5. Discussion and reflection 116
5.1. Discussion and reflection on the applied methods and theories 117
5.2. Need for further research 123
5.2.1. The conflict between road user experience and life by the road 123
5.2.2. The aesthetic quality of the public environment 125

References 128

Concepts and definitions

Aesthetic design brief

Swedish: *Gestaltningsprogram*
An aesthetic design brief is a document that summarizes the results of a project's efforts for road architecture. These results give information and guidelines for future planning of the project as well as for the management of the finished object. Depending on the size of the project, the scope of different design briefs vary as well. The required accuracy and visual quality of a design brief can also vary, depending on both the project size and the target readers of the documents. (Trafikverket 2014, pp. 7, 12-13.)

Architecture

Architecture is responsible for the physical form of a building, park, or other kinds of man-made constructions in the environment. Architecture can be seen as a whole consisting of the inseparable aspects of practicality, functionality, aesthetics and symbolic values. Architectural activity can create order and identity, increase orientability and express meanings bound to the structure and its context. (Nationalencyklopedins ordbok, see SOU 2015:88 p. 56, SOU 2015:88 p. 56-57.) According to this definition, the design of roads and the road environment are also considered to be architecture.

City approaches and -entrances

City entrances and –approaches are transitional spaces between urban and non-urban areas. A transition with a clear border between urban and non-urban can be called a city entrance. A longer stretch of a road where several borders and entrances are passed by can be called a city approach. The organization of city entrances and -approaches is a combination of public and private interests, road planning and city planning, as well as the changing composition of the urban-rural continuum. (Laurén 1992, p. 25.)

City border

There are different ways for defining the border of a city. The legal border is often defined through the boundaries of a municipality, which are usually unrelated to the density of built environment or other perceivable changes in the environment. Sometimes there is a clear visual difference between the urban and the rural environments, a visual border. (Laurén 1992, p. 15-16.)

Cues of entrance

In this thesis the concept of a cue of entrance is referring to a plethora of elements that can give the road user a sense of approaching or entering a place. This includes borders between loosely and densely constructed areas, landmarks, views, signage, junctions and so on.

Design

Design has been defined as the "artistic form-giving of utility objects" (Nationalencyklopedi, see SOU 2015:88 p. 60). "Designed living environment" presents design as a tool for creating identity and expressing it concisely. (SOU 2015:88 p. 61.) The concept of road design in this thesis includes both artistic and practical considerations, and is often used as a synonym for architecture or road architecture.

Environment

The concept of environment does not have a single unequivocal definition. It may refer to the location of a function, an ecosystem, or a context in which social, cultural, cognitive or perceptual experiences take place. (Carlson & Berleant 2007, p. 13-14.) Laurén's (1992, p. 27) definition of the environment as a combination of the landscape, the road and the adjoining built-up areas represents the context in which the concept is used in this thesis.

Landscape

The European Landscape convention, chapter I article 1, defines landscape as "*- - - an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors*". Simplified, this means that a landscape is the sum of the physical environment as well as an observer's experience of it. In practice, a landscape is usually tied to a certain geographical area where construction is planned. (Trafikverket 2016b, p. 7)

Landscape experience

The landscape experience is a combination of sensory perceptions, memories and images, which together form the personal ties that an individual has to a landscape (Trafikverket 2016b, p. 8). The road user obtains sensory perceptions from both the roadway and the surrounding landscape, and combines them with their previous experiences of the road environment, possibly also as seen from the landscape. An individual can obtain information from their environment through their senses, and process them cognitively and emotionally. (Bucht, Pålstam & Wingren 1996, pp. 7-8, 37.)

Landscape types and characteristic areas

A landscape type is an area with a distinct general structure. This general structure can be found in several areas, and it can have been caused by either natural processes, human intervention, or both. (Trafikverket 2016b, p. 7). In the context of this thesis, the prominent landscape type is the rift valley landscape of the Södertörn island, characterized by high forested hills and agricultural fields in the narrow valleys (Trafikverket 2016c, p. 5).

Characteristic areas are specific places that form the landscape types (Trafikverket 2016b, p. 7). As an example, the eskers Eriksberget and Hägerstensåsen represent the rocky hills of the Södertörn rift valley landscape type, whereas the Gömmaren- ravine represents the valleys between the hills.

Quality

Discussions about architecture and design often revolve around questions of quality. How quality is estimated depends on the previous experiences, knowledge and values of the appraiser. Quality can be considered through questions of functionality, usability, resource effectiveness, good design, relevant use of

technology, and cost effectiveness. (Prop. 1997/98:117, p. 11)

Road architecture

Road architecture includes considering the road from the combined perspectives of aesthetics, environmental psychology, physiology and traffic engineering (Drottenborg 2004, summary). Especially the human aspects of roads, such as accessibility, safety, aesthetics and quality of environment are specific to the discipline of road architecture (Rychlik 2005, pp. 11-14). A similar concept is that of aesthetic road design, which is concerned with both the the material result of a road project as well as the immaterial road user experience. The resulting constructed objects should support the experience and functions of a landscape, utilizing its characteristics. (Trafikverket 2014, p. 7)

Road environment

The road environment is the combination of the roadway and the part of a landscape or a cityscape that can be viewed from the road. The Swedish term would be *vägmiljö*, which in turn is divided into the inner spaces of a road *(vägens inre rum)* and the outer spaces of the road *(vägens yttre rum)*. An example of this division can be found in the aesthetic design brief for the new Stockholm Bypass (Trafikverket. E4 Förbifart Stockholm, Arbetsplan. Gestaltningsprogram del 1: Ytlägen. Utställelsehandling 2011-05-05).

Road user experience

Bucht, Pålstam and Wingren (1996) divide the road user experience into two subfactors: travel comfort and travel experience. Travel comfort is about practical issues: how can the road user reach their destination, how safe are they on the road, and can they access different services along the road? . Travel experience is about the immaterial qualities of the road environment: How does the road user feel when they travel along a certain road? (Bucht, Pålstam & Wingren 1996, p. 7.) The aesthetic qualities of the road environment have an effect on both of the subfactors.

Roadway

"Roadway: That portion of the highway included between the outside lines of the sidewalks, or curbs and gutters, or side ditches including also the appertaining structures, and all slopes, ditches, channels, waterways, and other features necessary for proper drainage and protection." (California Department of Transportation 2006.)

"Roadway: Part of the road comprising the carriageway, shoulders and median." (Vegvesen & Tanroads 2012.)

The exact definition of a roadway varies within the English-speaking world. The state of California and Tanzanian road administration use it in a way that is similar to the Swedish use of *vägområde*. *Vägområde* is defined in the Swedish road law 3 § in a following manner: "The roadway [*vägområde*] consists of the land or the space that a road facility [*väganordning*] has claimed for use."(Väglag 1971:948, lag 2005:940.) This includes different kinds of facilities and elements that are necessary for the existence of the road, the fulfilment of its purpose, its maintenance or use, which are managed by a person or an organization, such as the state transport administration." (§ 2, Väglag 1971:948, lag 1981:861). With this definition, the roadway also includes bridges, ramps,

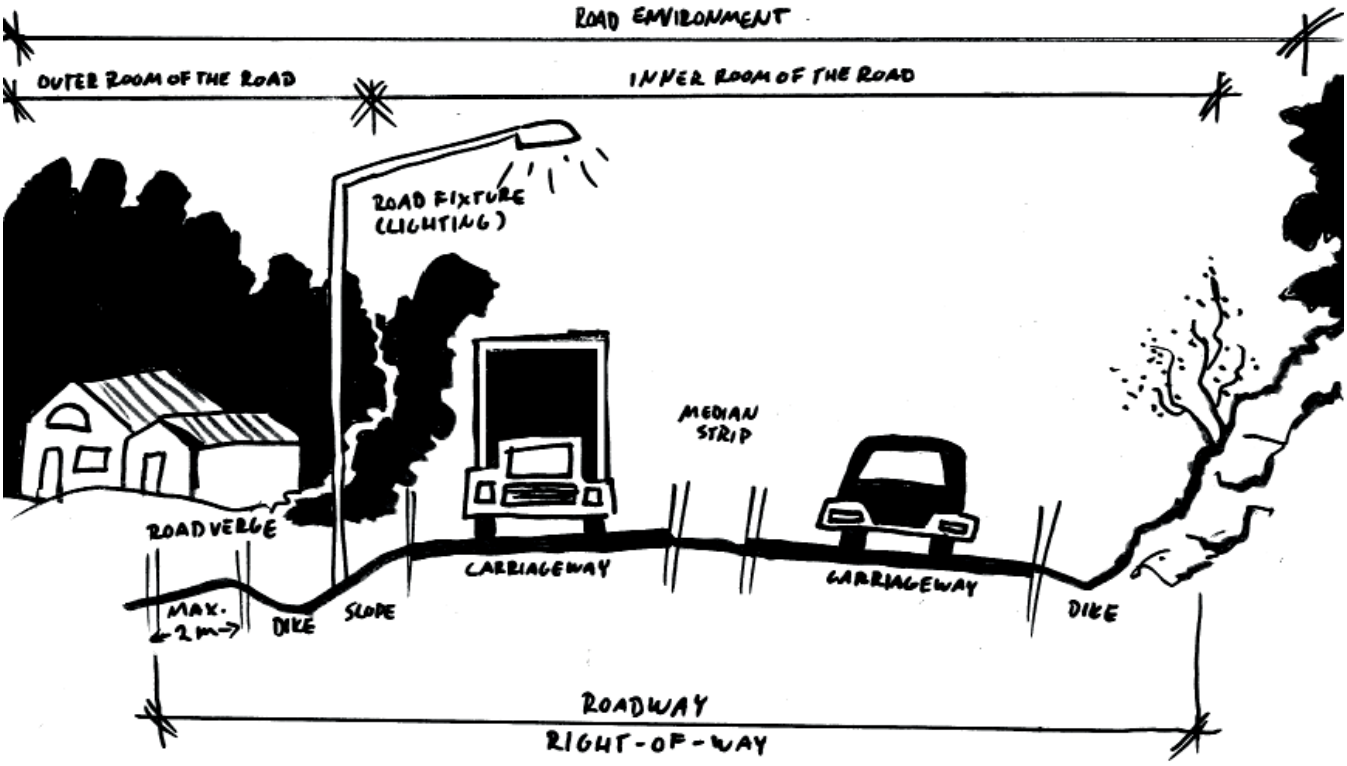


Figure 1. The anatomy of the road environment. Inspired by the Swedish Road Law § 2, Väglag 1971:948, lag 1981:861.

auxiliary lanes and so on. See figure 1.

Greater Stockholm Region

This term is used for all of the 11 municipalities that have areas belonging to the Stockholm urban area (Stockholm tätort). Along the southern stretch of the E4/E20, this includes the municipalities of Botkyrka, Huddinge and Stockholm.

Scenic landscape

The scenic landscape or the scenic cityscape is a concept that can be used to describe the identity and visual character of a place. The scenic landscape from the road expresses the extent to which the road user can interpret the natural and cultural structures of a place, as well as their possibilities for aesthetic experiences (Bucht, Pålstam & Wingren 1996, p. 31)

The Swedish Transport Administration

The Swedish Transport Administration, *'Trafikverket'* in Swedish, is a state organization that plans, builds, develops, operates and maintains roads, railways, shipping and aviation (Trafikverket 2015). In history, these same tasks have been handled by a variety of organizations, such as Väg- och vattenbyggnadsverket, Vägverket, and Banverket (Trafikverket 2011b). For convenience's sake, this thesis will refer to all of these organizations as "Swedish Transport Administration". Sources from the Swedish Transport Administration will be referenced under the name of the original publishing organization.

1. Project background

”Roads are not just routes along which people in vehicles move from one part of the environment to another - - -. To a large extent the road is the outside environment.” (McCluskey 1979, p. 7)

The road environment is a public space utilized by a great amount of the population every day. As such, it has a great influence on how we understand different places, and how we feel as we move from one place to another. Regions, municipalities and enterprises want to give a good impression of themselves to attract visitors, customers, inhabitants and businesses. Since the road environment is often the first and last view people have of a place or a construction, how it looks in the context of the roadscape can have a considerable influence on people's image of it. Studies on people's driving behavior in different environments have also shown that there is a link between the perception of the environment and the road user's cognitive capabilities, feelings and attitudes, which have an effect on their driving style. People's experience of the road environment is thus a combination of mental and emotional processes, some of which are a part of the experience of driving, some of which are simply a part of being human.

Approach roads transport people daily towards their workplaces and schools in central urban areas. For tourists, the approach roads can awaken expectations and curiosity towards their destination, or possibly confusion and suspicion. The approach roads are also the first and possibly even the only chance for road users to observe the different places along it. Additionally, the area around the approach roads is used and inhabited by people, making the highways a significant part of their everyday landscape. All of these four roles make the environments around approach roads an important area to consider when talking about the aesthetic quality of the environment. Michael Varming (in Vägverket 1989:23, p. 5) lists common issues that are specific to approach roads: the broad carriageways and increase in stimuli towards the end of the approach encourage high speeds that clash with the speed of their surrounding areas, the approaches around the country are almost identical with another and provide poor possibilities for orientation, and the roads with their frequent traffic cause barriers, noise, and pollution. Considering the road environment of the city approaches from an aesthetic point of view could help to solve many of these issues.

Aesthetics is often described as a subject that is impossible to describe in an objective manner. Still, many widely accepted definitions of the concept include the idea of aesthetic experiences as a result of a person observing their objective environment, for example by looking or listening. An aesthetic experience itself is often characterized through the pleasant sensations or feelings that sensory stimulus awaken (Oxford English Dictionary, 2008, see Meyer 2008, p. 8). Immanuel Kant (1914) states specifically that the aesthetic experience of beauty is something that is unrelated to the needs or desires the sources of the stimulus could fulfill, or the moral judgments that could be attached to them (in Crawford 2013, see Herrington 2016, p. 442). Other philosophers and studies, on the other hand, have found connections between aesthetic judgments and the observer's practical and ethical evaluations of objects and landscapes (Burton 2012, Eaton 2000, see Herrington 2016, p. 443-445).

These definitions raise relevant questions for the road environment, as well: What kinds of aesthetic experiences does the road environment provide? What is the quality of the road environments that are created? And how do

Figure 2. Components of the aesthetic road environment. Inspired by Drottenborg 1999, p. 11. The first row includes attributes of different features of the road environment. The second row has different kinds of compound units, where elements combine in a certain composition and vary so as to build more or less complex structures. The vegetation of a certain site can be understood as such a compound unit. The final row includes evaluations of the road environment: How is the road perceived, how does it affect the actual functions of the areas beside it, and what can be done to improve the situation?

these road environments affect the health and well-being of their users, both on the road and beside the road? Through research into how each part of the whole aesthetic road environment affects the attitudes, emotions, and physiological changes in their users, measures that could be taken to improve the human components of traffic safety could be found. These parts of the aesthetic road environment could include shape, color, light, composition, complexity, safety, uncertainty, accessibility, vegetation and so on, see figure 2. (Drottenborg 1999, p. 11.)

The aesthetic qualities of the environment are the second-most important factor in the human quality of living, as aesthetics play a great part in giving meaning to life as well as improving perceived safety (Cold 2001, see Drottenborg 2004, p. 1). Aesthetically pleasing environments have scientifically been proven to have a positive effect on people's health and well-being (Drottenborg 1999, p. 11). Appleyard, Lynch and Meyer posed a question in the 1960's of whether roads that provide positive aesthetic experiences should be treated as luxury items, or if the so-called "everyday highways" could also provide pleasure to their users (Appleyard, Lynch & Mayer 1964, p. 3). In the contemporary world, the answer seems clear: every road user should have the right to road environments that have a good aesthetic quality.

There are several laws and governmental policies in Sweden that aim to ensure people's right to environments with good aesthetic qualities, which also apply to the road environment. These include the Road Law (SFS 1971:948, SFS 1998:803), the Law for Cultural Environments (1988:950), the Zero Vision Policy (Trafikverket 2013), and the Swedish Goals for Environmental Quality (Trafikverket 2016f). Additionally, there is a national policy specifically for architecture, design and the built environment, elaborated on in the next paragraph.

In 1998 the Swedish government published an action plan called "Forms for the Future" (Prop. 1997/98:117). It states that architecture and design have an important role in the society as creators of the environments where people live. These environments should have high functional, technical, ecological and aesthetic qualities, as they need to answer to a variety of different needs throughout time and changes in the society. The action plan stresses the long-term influence that contemporary construction has on the future; today's creations need to be relevant even tomorrow. (Prop. 1997/98:117, pp. 10-11.) In 2014 the Swedish government decided to update the old action plan. The Commission of Inquiry "Designed Living Environment – A new policy for architecture, form and design" (*Gestaltad livsmiljö – en ny politik för arkitektur, form och design* SOU 2015:88) slightly changes the emphasis of national architectural and design policy. While the previous action plan led to positive development directly after its release, its goals no longer respond to the contemporary paradigm of architecture and design as tools for creating a better society. Both of these place a responsibility on the Swedish Transport administration as a creator of environments that improve the quality of designed living environments. (SOU 2015:88 p. 19.) A part of this responsibility is to document the Transport Administration's work on architectural and aesthetic considerations. Since the publication of the action plan the Swedish Transport Administration has worked actively on questions of road architecture in their operations and projects, which has yielded positive results. (SOU 2015:88 p. 44.) This thesis can be seen as a part of the Transport Administration's work towards a better aesthetic quality road environments, and thus towards better quality of life.

1.1. Execution of the Master's project

The author of the thesis worked as a summer intern at the Swedish Transport Administration, Region Stockholm in 2016, and proposed a continued co-operation in regards to a Master's project in spring 2017. The Transport Administration presented a list of possible subjects, out of which the evaluation of the aesthetic values of the highway E4 was chosen as a starting point for the project. The original idea was to look into the old aesthetic design brief for the highway stretch between Botkyrka and Västberga, and to update it so that it would answer to contemporary challenges and standards. Since the original aesthetic design brief could not be found until the very end of the project, the focus of the project was shifted from general aesthetic considerations in the stretch to an analysis that focuses on the highway's qualities as the approach road to the Greater Stockholm Region. The studied stretch of the road is called E4/E20 in this document, as the two European highways share the same roadway in this stretch.

Aim and purpose of the project

Since the beginning, the purpose of the project has been to find ways to improve the road user experience along the approach road E4/E20. For this end, the aesthetic qualities of the highway needed to be analyzed.

Because of the choice to concentrate on the highway's qualities as an approach road, the aim has been refined further: the goal is to identify suitable locations for adding features that would enhance the qualities of the road that give a road user a sense of approaching and entering, called cues of entrance in this thesis, by using aesthetic criteria. From a more general point of view, the thesis has also attempted to summarize information about aesthetics and the road user experience in a way that improves understanding about how the different qualities of the aesthetic road environment affect the road user's experience of approaching and entering cities. This understanding could contribute to a wider discussion about the value of good architecture in public spaces, including the road environment. It could also raise the question of what are place-identities, and what is their role in the contemporary society: how are they formed, how are they expressed, and where are they expressed?

Delimitations

The city approaches are studied from the perspective of national and European highways that connect to urban settlements in an urban region. They are often characterized by multi-level interchanges as points of exit and entry to the highway, which isolates the traffic on the highway from the network of streets and smaller roads. Because of this delimitation, the problematics of the meetings between roads and streets as well as unprotected road users versus motor vehicles are not considered. Additionally the point of view is predominantly that of an approach, as the stretch of the E4/E20 has been only studied

as seen by a road user travelling from south to north. The effects that eventual cues of entrance may have on the experience of exiting a place are discussed very briefly.

Questions about the aesthetic qualities of the road environment belong under the concept of road architecture. Road architecture is concerned with both the road and the landscape, as seen from the road and as seen from the landscape (Rychlik 2005, p. 6). All of these three aspects will be considered in the project study. However, due to the limited time available for this project, the road seen from the landscape will get the least attention.

Aesthetics are mostly considered from environmental aesthetics' point of view, and addressed from a practically applicational rather than a philosophical perspective. Because of this, the ontologies of aesthetics and aesthetic judgements are only briefly handled.

Interpretation of the task/ problem

In order to evaluate the aesthetic qualities of approach roads, a general understanding of aesthetic considerations related to roads as well as an understanding of the specific qualities of approach roads was needed. The role of aesthetics in the road environment seems to be tightly bound to the concept of road user experience, which in turn is influenced by the road user's psychological responses to their environment. The aesthetic qualities of the road are thus defined through the experience of the whole road environment, which is born as a sum of the cognitive and emotional reactions that result from the road user's interpretations of the sensory stimuli they perceive. Thus, the aesthetic qualities can be evaluated by studying the objective elements of the road environment, how they are perceived from the road while in movement, and the possible interpretations of these perceptions.

The highway E4/E20 that is analyzed in this thesis is expressly addressed as an approach road, as opposed to a thoroughfare, for example. The form and function of city entrances and –approaches has varied through the ages. In the past, city entrances were concrete gates embedded in the fences or walls around urban areas. In the contemporary world, urban areas have often grown too large to be contained within such static constructions. In some cases the road still meets the streets of a city at a clear visual border between urban and non-urban areas. These are significant city entrances. In the studied stretch of highway between Botkyrka and central Stockholm the road user crosses many visual borders between unbuilt and built, dense and sparse, urban and suburban, which vary greatly in clarity and importance. Identifying a true point of entrance in such and area proved to be impossible, and instead the term "cue of entrance" was coined to be able to discuss the different elements in the road environment that give the road user an experience of approaching a city.

Parallel to defining the criteria for evaluating the aesthetic qualities of the road environment, and the literature studies that anchor the subject to a larger context, the experience of the highway E4/E20 has been investigated as a site for applying the theoretical findings. The studies have comprised of learning about the past, present and future of the highway and the environment that is visible from it. Piece by piece the analysis of the highway has taken a shape that describes its aesthetic qualities that contribute to the experience of approaching and entering the Greater Stockholm Region.

Research question and hypothesis

The research question is: How can the need for cues of entrance be localized along city approaches, based on aesthetic criteria formulated from the road user's perspective?

It is hypothesized that cues of entrance already exist in most road environments, and by analyzing the aesthetic qualities of a stretch of road will provide information of their existence and function, as well as point out locations where new cues of entrance could improve road user experience. There are also likely to be places where new or existing cues of entrance would be or are detrimental to road user experience, as they diminish the coherence of the site as well as have adverse psychological effects. The analysis of the highway E4/E20 aims at understanding the role cues of entrance play in the aesthetic road environment's effect on the road user experience of the studied stretch.

1.2. Literature and research methods

The main two phases of the project have been as follows: first, the research question is studied through the creation of criteria for aesthetics in the road environment, and secondly the criteria are applied to an example project to test the hypothesis. Their processes are elaborated on in this chapter.

1.2.1. Literature studies

The first pieces of literature studied for this master's project were documents from the Swedish Transport Administration: a previous analysis of Stockholm city approaches' flaws and faults, an aesthetic design brief for the Stockholm bypass project, and a handbook on how aesthetic work is carried out in the Transport Administration. Documents related to infrastructure projects from the Transport Administration and the Stockholm County Administration Board have been important documents for this thesis, as well as planning documents from the addressed municipalities of Botkyrka, Huddinge and Stockholm. Additionally a number of books on environmental aesthetics and road design have been used.

The first concepts used for searching relevant literature were road design, road architecture, road aesthetics, city entrances, city approaches and aesthetic design brief. The search engines used were the Primo search engine of the SLU library as well as the Libris search engine of all of the scientific libraries in Sweden. The search was conducted both in English and in Swedish. The initial literature found with these key words were mainly previous degree projects on the subject, whose literature lists provided a wealth of new literature sources to look into, and so the material has largely been collected through "snowballing method", that is to say that one source has led to new sources. This yielded above all Swedish research on road user experience and the aesthetic aspects of traffic safety, as well as Appleyard, Lynch and Mayer who are widely cited in regards to analysis methods in the road environment. The previous degree projects also allowed possibilities to position this project into a larger context, so that it was possible to find perspectives that had not been studied before or that had in the author's opinion been handled too superficially.

Where there seemed to remain holes in knowledge, the thesis supervisor and the Transport Administration's steering group recommended and borrowed literature. This includes books on research methodology, the experience of driving, the previous phases of the road E4/E20 and the work process of the Swedish Transport Administration. A number of books, especially related to road design in English-speaking countries and environmental aesthetics, were found simply by looking at the Agricultural University's library shelves in Alnarp, and picking up any book that seemed interesting. This method was found especially useful when looking for literature on environmental aesthetics and general road design.

1.2.2. Research methods

A few research methods were employed in order to create a set of criteria for aesthetic considerations in the road environment, to analyze the road environment of the E4/E20 and to evaluate the findings of the analysis against the criteria. The methods used have all been qualitative in nature: a literature review, a case study, and a landscape assessment.

According to Swaffield and Deming (2011b) there are altogether nine main classes of research strategies in landscape architecture that vary in their epistemology, that is, the understanding of whether knowledge is independent of the knower or not, and in the direction of reasoning, as in whether the generation of new theory is prioritized against testing existing theory or not (Swaffield and Deming 2011b, p. 36-37). From the nine different classes presented, three seemed to correspond to the three phases of the research: classification, description and evaluation, respectively. Swaffield and Deming (ibid.) define classification and description as inductive methods, that aim at the creation of new theories, whereas evaluation is a deductive strategy that tests a theory. Description is understood as a strategy that collects objective knowledge, while classification and evaluation are constructive strategies where reality and the researcher's interpretation of it are both crucial for generating knowledge (ibid.).

The set of criteria were created through classification: reviewing literature, finding a framework for sorting the findings of the literature, and generating additional sub-classes and naming emergent dimensions for making sense of each findings' position in the overall context of the expanding classification system (Swaffield & Deming 2011b, p. 39). The findings to be analyzed were chosen through purposive sampling, meaning that the quotes from the literature that seemed to best contribute to agglomerating knowledge about aesthetics in the road environment were filtered from the wealth of information collected on environmental aesthetics, road design and road user experience (Swaffield & Deming 2011a, p. 131). This work was a qualitative analysis done in an Excel-table, see closer description in chapter 1.2.1.

The analysis of the road environment is a type of a complex descriptive case study. According to Swaffield and Deming (2011a, pp. 71-72, 77, 84) descriptive case studies are characterized by a limited geographical area to research, a predefined study perspective, empirical studies combined with descriptions acquired from secondary sources, and a critical approach towards both the earlier knowledge about the site and subject as well as their future. In the case of the analysis of the E4/E20 the geographical area is both limited by the length of the stretch of the road studied as well as the extent of the road environment visible from the Street View pictures along it; the subjects studied are the visual aesthetic qualities of the road environment in relation to the experiences of approaching and entering a place, constituting the empirical part of the study; Information of the past of the environment and possible development paths were acquired from previous architectural and landscape studies in the area, as well as future plans; source criticism has been relatively light-handed in relation to the historical aspects of the sites, but their predicted futures do not stand uncontested.

To answer the research question a third research strategy was necessary. The findings of the case study were compared to the results of the aesthetic criteria, which resulted in a set of recommendations for improving the situation or for

keeping it from getting worse. This process corresponds to Swaffield and Deming's (2011b, p. 39, 2011a, pp. 184-187) description of evaluation studies, in this case in the form of a landscape assessment.

1.2.3. Process descriptions for the research

The research consists of two parts: The creation of the aesthetic criteria for localizing new elements in the road environment, and the analysis of the visual aesthetic qualities of the highway E4/E20. The analysis has then been deepened through evaluating the road environment according to the found criteria.

Aesthetic criteria for localization decisions

In order to learn about the role of aesthetics in approach roads, literature about environmental aesthetics, environmental psychology in relation to the road environment, and the aesthetic and experiential dimensions of the road have been read carefully. Passages that seemed to contain aesthetic goals, definitions and theories, guidelines or examples of possible considerations were compiled into a table for further examination. All in all 270 quotes were analyzed.

First, each quote was noted next to its source. The quotes were sorted according to one of the paradigms of landscape aesthetics and their sub-categories, see figure 3. (Punter 1982, see Porteous 1996, p. 11-12). The sub-categories for perception could be utilized as is. Quality lacks sub-categories in the original model, which was deemed problematic. A categorization into attributes, features and phenomenon was issued. In the case of appreciation, it seemed like some of the quotes applied to both direct and indirect meanings. Such passages were categorized simply as "meaning". The type of information in the quote was also noted: whether it was a goal, a guideline, a statement, and so on.

The material was split into three tables according to the three paradigms. Additionally, a fourth table was assembled from the quotes categorized as guidelines across all of the three paradigms. This was done in part to make the task seem less daunting as well as to quickly achieve insight into the contents of each paradigm and to test methods for processing the material further. Each quote was categorized under one general subject, and two clarifications were made to boil down their context and essence. The quotes were rewritten into complete sentences that could be understood without the original context. These were then rewritten once more into guidelines. Since there was overlap between the subjects and advice of the guidelines, the different dimensions of each consideration were written down as the guidelines were

Paradigm of landscape aesthetics: Perception

Mechanisms of perception

Influence on psyche

Paradigm of landscape aesthetics: Appreciation

Direct meaning

Indirect meaning

Paradigm of landscape aesthetics: Quality

Features

Attributes

Phenomenon

Figure 3. Paradigms of landscape aesthetics (based on Punter 1982, see Porteous 1996, p. 11-12)

merged into each other. The results of this merging process were then collected into three smaller tables containing the findings of each category.

The initial idea was to compile a 10-phase guideline to use as criteria for applying the findings. This was deemed too complicated and fruitless as there was no obvious way to apply them to the example project. Instead, three goals for the aesthetic components of road architecture emerged from the findings of the literature research: a meaningful road environment, enjoyable driving, and improving the quality of the scenic landscape. These goals correspond respectively to the appreciative, perceptive and qualitative paradigms of landscape aesthetics (Punter 1982, see Porteous 1996, pp. 11-12). The goals can also be considered from the perspective of Lang's (1988, see Porteous 1996, p. 22) types of aesthetic experiences: a meaningful road environment provides symbolic aesthetic experiences, enjoyable driving is related to sensory aesthetic experiences, and the new element's design in a way that improves the quality of the scenic landscape can be evaluated from the point of formal aesthetics. Each of the overarching goals were given secondary goals that contribute to their fulfilment. Unlike the overarching goals, the secondary goals are seen as examples rather than as an exhaustive lists of goals for road aesthetics.

Application of the aesthetic criteria on E4/E20, the Southern Approach to Greater Stockholm Region

The road user experience of the European highway E4/E20 has been analyzed from the border of Botkyrka municipality to the Midsommarkransen district in central Stockholm. The extent of the studied stretch was chosen as a combination of recommendation from the Transport Administration and personal deliberation. The point of beginning of the analysis was chosen according to a wish to represent the typical rural landscape that precedes the entry to the more urban areas of Stockholm. The ending point of the analysis was moved from the end of the Nyboda interchange to its top. This decision reflects the author's view of the end of the approach, as after this the road turns away from the center of the city and from the heart of the region.

The author of the thesis "travelled" the stretch several times, from the municipal border between Botkyrka and Salem to Nybohov in Stockholm, by using Google Street View. No site visits were made for the analysis. The "journey" was documented in 339 screen shots from the map service, which were chosen according to their representivity as well as their ability to convey the logical procession of the journey. Landmarks, border elements and characteristic traits were paid special attention to. The choice of approaching the area through second-hand images instead of first-hand experience was assumed to be a satisfactory method for a few reasons. First of all, the road user experiences their environment primarily through their sense of sight (Hubendick 1976, Appleyard, Lynch & Mayer 1964, and others), which encourages the primary use of visual material. Secondly, Google Street View was assumed to present a perspective very close to that of a road user, as the photography has been executed from a moving car. Thirdly, the relative recency of the images was deemed to present an accurate enough impression of how it would have felt to take the journey on-site between early spring and late summer in 2017.

The screen shots were numbered from 1-339, and coded according to their dominant traits and focal points. Industry/commerce, forest, and electricity are examples of dominant traits found in the pictures. The found focal points included a variety of bridges, significant buildings such as the Ericsson headquarters, and strong silhouettes like the residential area on Albyberg. The cod-

ing was then used as a basis for identifying different sequences of the stretch. The initial amount of sequences found was 13, which were redefined and combined several times until the current 8 sequences were settled on. While many of these 8 sequences could be further broken down into smaller pieces, it was deemed unwise as their lengths would have fallen below 1,5 km, which in the dominant speeds of the stretch would take less than a minute to traverse. This was not felt to provide enough time for observation.

Among the 339 screen shots, approximately 100 were chosen to represent the most important features and experiences of each sequence. These were hand-drawn using a very low degree of detail as an attempt to work effectively and to find the absolutely most important qualities in each scene. The numbering of drawings and their descriptions in the analysis corresponds to the numbering of the screen shot the image is based on. Because of this, they represent the location of the scene only in very abstract terms and are not based on a systematic measure such as distance or time. The tightly framed screen shots and images were approximated to correspond to a driver's point of view when concentrating on the road ahead of them, with the view limited by the car's window frames (Andrews in Carlson & Berleant 2007, pp. 277-278).

The analysis of the existing situation at each of the sequences is in two parts. Firstly, the map describes the areas of the sequence that are visible or strongly implied from the road. "Strongly implied" means areas and features that are experienced as an entity rather than a collection of individual elements, such as a forest that is clearly deeper than its visible rows of trees, or a residential area whose additional houses can be seen briefly behind the buildings that make up its facade. The map analysis is necessary to show the progression of the road user in their journey and the location and scale of the elements that they encounter. Secondly, the area is described as it is experienced from the road in drawings and words. This part of the analysis aims at pointing out the most important features of the road environment as well as a road user's possible initial reactions to it. The choice of pictures and subjects of focus has been highly subjective, although special attention has been paid to identifying general landmarks, borders, and characteristic traits. The analysis shows the author's bias towards rock surfaces, bridges, and vegetation to some extent.

The existing analysis was deepened through studies into the historical values of the areas as well as the ongoing, future, and potential projects in the areas that could change the aesthetic qualities of the site. At this point of the process the literature studies were completed, and their results could be applied to the analysis as well. The images were re-analyzed through renewed lenses, yielding more directed analysis of what the initial reactions explained about the aesthetic qualities of the site, and how this effects the road user experience.

Finally, the analysis was evaluated against the aesthetic criteria, or rather, the goals for the aesthetic components in the road environment. The findings of the analysis were summarized under the overarching goals and the sub-goals that exemplify areas of improvement. Recommendations are given for each sequence and goals. These are once more summarized as conclusions of where new cues of entrance could best be localized.

2. Aesthetic considerations in the road environment

The road user experience is characterized by its dependency on the direction of traveling as well as the speed of travel. Additionally, the road looks different to the driver of a vehicle than to its passengers, as the passengers have a greater freedom to move themselves and to switch between points of focus. The motor vehicle in itself blocks most scents in cars, the noise from the traffic drowns out other sounds, and the field of sight narrows as motion blurs especially the peripheral vision. (Tunnard & Pushkarev 1963, see Bucht, Pålstam & Wingren 1996, pp. 38-39, Bucht, Pålstam & Wingren 1996, p. 38.)

Appleyard, Lynch and Mayer (1964) describe the experience of a highway as predominantly visual observations of spaces in movement. For the road user the highway in itself seems mobile, whereas an outside observer only perceives the movement happening on the highway. Appleyard et al. compare the variation between consequent spaces along the highway with that of "large-scale architecture" such as palaces or cities, the movement in time parallelized with the rhythms of "music and the cinema", going even so far as to state that the experience for the highway can cause similar perceptions of bodily movement as "the dance or the amusement park". What sets the highway apart from other modes of experience seems to be the two directions of the highway, coupled with the varying lengths, beginnings and ends of journeys that can be undertaken along the same road. This means that the road environment needs to provide a coherent sequence of spaces for people coming from and going to a variety of places. This would suggest that the sequences of a highway should be designed like a collection of short stories bound by a common theme rather than a long narrative arc in itself. (Appleyard, Lynch and Mayer 1964, pp. 4-5, 18.)

2.1. Aesthetic considerations in the work of Swedish Transport Administration

"Arkitektur, formgivning och design är en del av vår kultur och vårt samhälle.
Det vi bygger och de föremål vi formger skapar den omgivning som
påverkar vårt sätt att leva. Därför måste vår omgivning uppfylla höga krav
på kvalitet ur bl.a. funktionell, teknisk, ekologisk och estetisk synvinkel."
(Prop. 1997/98:117, p. 10)

"Architecture and design are a part of our culture and society. The [things] we build and the objects that we design create the environment that influences our way of life. That is why our environment needs to fulfil high quality standards related to function, technology, ecology and aesthetics."
(Prop. 1997/98:117, p. 10, translation)

Road architecture includes considering the road from the combined perspectives of aesthetics, environmental psychology, physiology and traffic engineering (Drottenborg 2004, summary). The road is a part of the transport infrastructure as well as a part of the physical environment, affecting the road users, the landscape and the people in the landscape alike (Rychlik 2005, p. 7, 11). Aesthetics in road architecture is concerned with both the whole of a project as well as its details, the material result as well as the immaterial road user experience. It should result in a situation where the constructed objects support the experience and functions of a landscape, utilizing its characteristics in a way that enables good quality for the resulting scenic landscape or - cityscape. The quality of the scenic landscape and –cityscape reflects directly on the value of the environments that they encompass, as well as the environments where they can be viewed from. Because of this, the management of public spaces should prioritize upkeeping the historical and aesthetic values of a site. (Prop. 1997/98:117, p. 32, Trafikverket 2014, p. 7)

2.1.1. Swedish laws and guidelines for aesthetics in the road environment

A governmental proposal called "Forms for the Future" (Framtidsformer, Prop. 1997/98:117) presents an action plan for creating a common policy for architecture, form-giving and design in Sweden (Prop. 1997/98:117, pp. 1). The action plan is based on the principle that public environments should be accessible for everybody: the functionality and appearance of a place affects the user's feelings of safety, amenity and social cohesion, which in turn have an influence on who uses a certain place and when. Public spaces should also provide their users with aesthetic experiences, both in their everyday life and during special events. Swedish public authorities, including the Transportation Administration, are responsible for the functions, appearance and effects of infrastructure as a part of the public environment. Roads, bridges,

tunnels, and so on, are often large structures that have significant impacts on their surroundings, changing the landscapes where people live. Infrastructure projects are thus a significant force that modifies the quality of people's living environments. (Prop. 1997/98:117, pp. 28, 32.)

The governmental proposal included creating long-term goals for national authorities' work with aesthetics in public spaces, as well as adding clauses to the road law that set requirements for the aesthetic dimensions of the public environment. In the context of road infrastructure the additions to the Road Law (1971:948) are the most relevant: clause 4 § and 13 § obligate road infrastructure projects to take considerations for the cultural environment, natural and cultural values as well as the scenic landscape and -cityscape. According to the law, the constructed infrastructure should also aim at good aesthetic quality. (Prop. 1997/98:117, pp. 1, 6.) The implementation of the action plan has been reported to have improved the Transport Administration's work with questions of aesthetics and architecture. As a public authority the Transport Administration is also responsible for carrying out their work with the landscape in a way that can be used as a positive example for all of the actors in the fields of architecture and design. The Transport Administration also reports the methods and results of their work with aesthetics to the Swedish Government so that the fulfilment of goals can be measured. (SOU 2015:88, pp. 44, 234-235.)

The update of the action plan Forms for the Future (Prop. 1997/98:117) became necessary, as its positive effect on Swedish architecture and design had been waning together with the recognition of the action plan. The new national policy for architecture and design, called "Designed Living Environment – A new policy for architecture, form and design" was commissioned in 2014. The concept of designed living environment used in the project describes the organization of cities and other living environments in a way that provides the required functionality as well as aesthetic experiences. The goals presented in the remit (SOU 2015:88) have been updated from the previous action plan (Prop. 1997/98:117) in a way that aims to represent a wider perspective, where architecture and design are used as tools for solving the society's everyday challenges. It recognizes the differences between people, and aims at serving as large a group of people as possible. The concept also reminds designers to look at each project as an individual, which means that the end result should always respond to the specific qualities of the site. (SOU 2015:88, pp. 16-17, 25, 52, 56-57.) Following this guideline, site analyses and –studies become an integral part of any project concerned with architecture and design, including projects in the road environment.

2.1.2. Aesthetics in road infrastructure projects

As the Swedish Transport Administration defines, every aspect of an infrastructure project involves work with aesthetics, as all the parts of the road environment are created through a formative process, the results of which are then perceived together as a whole. Because of this, the aesthetic considerations need to be taken up already at the early phases of infrastructure projects, and continued across the whole life cycle of the constructed objects.

"Transportinfrastrukturen ska utgöra en arkitektonisk helhet där alla ingående delar gestaltas med omsorg och vara förebildlig.
- - -.
Transportinfrastrukturen ska formas i samspel med landskapet så att trafikanter, resenärer och omgivning erbjuds positiva upplevelser i en vacker och väl fungerande miljö."

(TDOK 2015:0323, p. 7)

"The transportation infrastructure forms an architectural whole, where all of the adjoining parts are designed carefully and can be described as exemplary.
- - -.
Transport infrastructure is formed in co-operation with the landscape so that road users, passengers and their surroundings are provided with positive experiences in a beautiful and well-functioning environment."

(TDOK 2015:0323, p. 7, translation)

(Trafikverket 2014, p. 10.)

The Transport Administration is committed to following Swedish laws, including the Environmental Code, the Cultural Environment Law and Road Law that sets requirements for aesthetic considerations in infrastructure projects. Additionally, the Transport Administration has set their own internal guidelines and goals for landscape concerns in their work that have a higher level of ambition than the laws. These goals include for example a statement that "All infrastructure should be adapted to the landscape" and a vision of a sustainable society where a multitude of different cultural environments are preserved, used and developed. The sustainability of the society is thus tied to sharing knowledge about the cultural environment with everybody. (TDOK 2015:0323, pp. 1-2, 5-6.)

Fulfilling the goals set for landscape considerations requires generation and provision of knowledge about the landscape, including descriptions of the landscape's character and values. The aesthetic design brief for each project and phase summarizes the proposed measures that need to be taken to protect, develop and utilize the identity of the landscapes that are influenced by infrastructure projects. The responsibility for good road architecture needs to be divided among the project participants, making sure that they are capable of understanding and expressing the values and ideas that are involved in the process. It is especially important that the participants can understand the part that good road architecture plays in realizing further goals in the project. Without a common point of departure, the project organization cannot work efficiently for the shared goals. The discussions and decisions made in the aesthetic design process are to be documented in a 'Memorandum of Aesthetic design aspects' (PM Gestaltningsavsikter). It should be based on the different landscape analyses and include the definition of a goal image and unsolved questions. (Trafikverket 2014, pp. 10, 12, TDOK 2015:0323, p. 6.)

The 'Handbook for aesthetic design work and aesthetic design briefs in infrastructure projects' (Handbok för gestaltningsarbete och gestaltningsprogram i infrastukturpojekt, Trafikverket 2014) states that landscape analyses are necessary for creating an overview of any site and its context. The landscape analyses should present the character and typologies of the landscape within the project site, explain how these have formed, and give insight into the functions of urban areas, highlighting especially sensitive places. (Trafikverket 2014, pp. 7, 10.) What is

generally called a landscape analysis is actually a combination of several specific analyses about different factors in a landscape. The most important of these factors are geology, topography, hydrology, land use, vegetation, physical structure and scale, cultural, historical and natural connections, visual experience and character. The scale, scope and level of detail in the analyses is dependent on the scope and complexity of a project: The more space a structure takes, the more information about the landscape is required for making conscious decisions. A relevant level of generalization has been reached when removing any more information would be harmful for understanding the situation. (Trafikverket 2016b, pp. 6, 9-10.)

Cityscapes and other urban areas are a part of the landscape, and so it follows that their character, sensitivity and potentials are also important for understanding the effects of a road on the landscape. Because of the large amount of parties involved, these areas need to be described at a more detailed level than rural areas, and the participation of different interest groups is desirable. Landscape factors that are specific to urban areas are their green structure, patterns of movement, history of the area and the traces of history that are essential to the experience of a place. The description of a landscape needs to include the socio-economic conditions of the place, as well as the land use and building structure. An important question is: how do the locals relate to the landscape? How do they use it? How do they treat their landscape? The answers to these questions relate to the ecological conditions of the landscape, explain its history and give insight into what kinds of experiential values it has. (Trafikverket 2016b, pp. 8, 13-14, 16.)

In some cases, questions about the aesthetic design of a project can be a decisive factor for its localization. The different alternatives are researched in a document called "Aesthetic design brief for choosing among alternative locations" (Gestaltningsplan i val av lokaliseringsalternativ). The differences between the alternatives are studied from an aesthetic point of view, and as a result the optimal alternative should be suggested. These considerations could include the landscape context of each localization, how the road could be adjusted into the environment of each of the options, which of the alternatives have the most potential for providing the road users with specific experiences, and of course how each of the alternatives relate to the technical specifications of the project. (Trafikverket 2014, pp. 15, 18-19.)

After the localization has been cemented, the main design brief document will be produced. In some cases the process may begin by updating an old design brief, in other cases the project organization can start a completely new one. In this phase, the main objectives are on a general level, and the concrete methods for adapting the form of the road into the landscape is a central one. Design principles that enable protecting or enhancing the character of the landscape are sought. For especially sensitive areas a more detailed approach is adopted. The design brief should also contain descriptions for future action, including the architectural aspects that can be used for evaluating the quality of the finished construction as well as the management measures that are necessary for upkeeping the quality. (Trafikverket 2014, pp. 20-24, 27.)

2.2. Environmental aesthetics

"If the philosophy of aesthetics cannot help us understand our reactions to environment, we will clearly have to turn elsewhere." (Porteous 1996, p. 23)

How the journey is experienced may not have anything to do with the landscape or the technical standards that a road answers to. Hubendick (1976) claims that questions of the perception of a road cannot be answered through laws or guidelines, but belong to the realm of aesthetic design. He continues by listing the criteria that a road user might use for a positive experience of a road: driving comfort, good possibilities for orientation, good connection with the landscape, and not un-aesthetic. He does not take a definitive stand on what these aesthetic requirements could be, as he deems aesthetics to be a question of personal taste. On the other hand, he assumes that some principles should be universal, so that the wheel would not need to be reinvented in every road design project. (Hubendick 1976, pp. 9-10, 14.) Later studies have found that aesthetic experiences can be generalized to a certain extent (e.g. Stamps 2000, see Drottenborg 2004, p. 3), which has allowed for theories as to what these principles that Hubendick was looking for could be. The field of environmental aesthetics research provides concepts and theories that can be utilized in the study of people's reactions to the aesthetic qualities of an environment.

Environmental aesthetics approaches humans as a part of a wider environmental context, where they engage in actions that aim to or result in appreciating elements and entities in the environment. The sensory perceptions and immediate meanings people find in their environment tend to dominate their experience of aesthetic qualities, although deeper reflections are also a part of the phenomenon. The discipline of environmental aesthetics investigates people's experiences of the environment, as well as the physical and psychological mechanics behind the experience. Besides qualities that are visually perceivable, aesthetic appreciation involves senses like hearing and smell as well as cognitive phenomenon such as time and meaning, see figure 4. (Carlson & Berleant 2007, p. 16.) Environmental aesthetics is also interested in the relationship between people and the landscape (Carlson and Berleant 2007, pp. 14-15).

The word ”aesthetics” comes from the Greek words ”aisthanesthai”, “to perceive” and “aistheta”, “perceivable objects” (as opposed to immaterial, non-perceivable things). Aesthetics can thus be defined as “information attainable through the senses”. (Porteous 1996, p. 19.) Porteous (1996, p. 20) also presents the definition of aesthetics mentioned in the New English Dictionary: Aesthetics is “The apparent embodiment of emotion in art”, or the “philosophy or theory of taste, or the perception of beautiful in nature and art”. This view supports the idea of evaluating aesthetics based on subjective emotional experiences.

A third definition can be borrowed from Lang (1988), where three different types of aesthetic experiences are distinguished: “Sensory aesthetics is concerned with the pleasurableness of the sensations one receives from the environment; it is concerned with sounds, colors, textures, and smells. Formal aesthetics is more concerned with the appreciation of shapes, rhythms, complexities and sequences of the visual world. Symbolic aesthetics involves the appreciation of the meanings of the environments that give people pleasure, or otherwise.” (See Porteous 1996, p. 22.) Punter (1982) describes three paradigms for landscape aesthetics. The first one is the perception of landscape, which concerns itself with the mechanics of perception as well as the links between perception and people’s understanding, preferences and actions. The second paradigm is called appreciation, dedicated to studying the cultural meanings, lifestyles and values that are expressed in the landscape. The third paradigm, quality or visual quality, analyzes the formal sensory attributes of the environment. (See Porteous 1996, pp. 11-12.) Certain connections can be seen between these two classifications: Symbolic aesthetics and appreciation are both concerned with meanings, whereas formal aesthetics and sensory aesthetics could be both studied under the paradigm of quality. On the other hand, the paradigm of perception and sensory aesthetics are also close to each other, as both address the issues of how the perceiver reacts to the sensory stimulus that objects send.

How people perceive aesthetics from a cognitive and emotional perspectives are traits that have been developing in us with evolution. A famous example of this are theories of aesthetic preference, where it has been found that people find organized, but not obvious natural environments with distinct and varied elements the most attractive. According to Kaplan & Kaplan, (1987) the pleasantness of a scenic landscape can thus be enhanced by increasing its coherence, legibility, complexity and mystery. (Kaplan & Kaplan 1975 & 1987, see Drottenborg 1999, pp. 70-71.) Berlyne (1974, see Drottenborg 1999, pp. 15-16) devised another set of four attributes that has been used to explain the perception of aesthetics in a landscape. These are complexity, novelty, incongruity and surprisingness. Unlike the coherence, legibility, complexity and mystery of the Kaplan & Kaplan model, increasing the attributes named by Berlyne does not always improve the experience of aesthetics. Instead, a moderate value for each of these attributes tends to give best results in terms of pleasantness (Wohlwill, 1976, see Drottenborg 2004, p. 4), as high values tend to indicate stressful situations with a great amount of stimuli, whereas environments where the aforementioned values are low are low in stimuli and often perceived as dull. This finding is related to the concept of arousal, which signifies the physiological changes in brain activity as a response to stimuli (Hebb 1972, see Drottenborg 2004, p. 3).

Aesthetics is often considered to be synonymous with beauty, or thought of as the goal for improving aesthetic qualities. The definition of what is beautiful is often left up to personal deliberation, but also the concept of beauty itself can be defined in different ways. For Nehamas (2007) beauty is communication: how well does the perceiver understand the artist's intention when observing a piece of art (see Herrington 2016, p. 446-447)? Besides communication skills, one might also assume that understanding the artist's intention would require shared values, knowledge and culture, so that the perceiver could accept the artist's intention, as well. Parsons & Carlson (2008) call this a "translation problem", as the lack of common ground for interpretation easily prevents the intended experience from forming (ibid.). This poses challenges for aesthetic considerations in the design of road environments. Danto (1999) emphasizes the perceiver's personal perception and internal cognitive and emotional processes in the development of an experience of beauty (p. 192-193, see Meyer 2008, p. 18). This definition removes the pressure of communication from the artist.

In landscape architecture, aesthetic qualities are often seen as a part of a larger equation, where functional and ecological concerns have had more weight (Etteger, Thompson & Vicenzotti 2016, p. 80, Meyer 2008, p. 16). The instrumental value of beauty and other aesthetic concerns can be argued from the perspectives of health and well-being, as well as ecology, either referring to results of environmental psychology studies or the potential of using aesthetic experiences as a way of positively influencing public attitudes towards environmental issues (Buell 2001, see Meyer 2008, p. 9-10). The pleasure provided by aesthetic experiences can also be understood to have an intrinsic value (Zangwill 2007, see Etteger, Thompson & Vicenzotti 2016, p. 87).

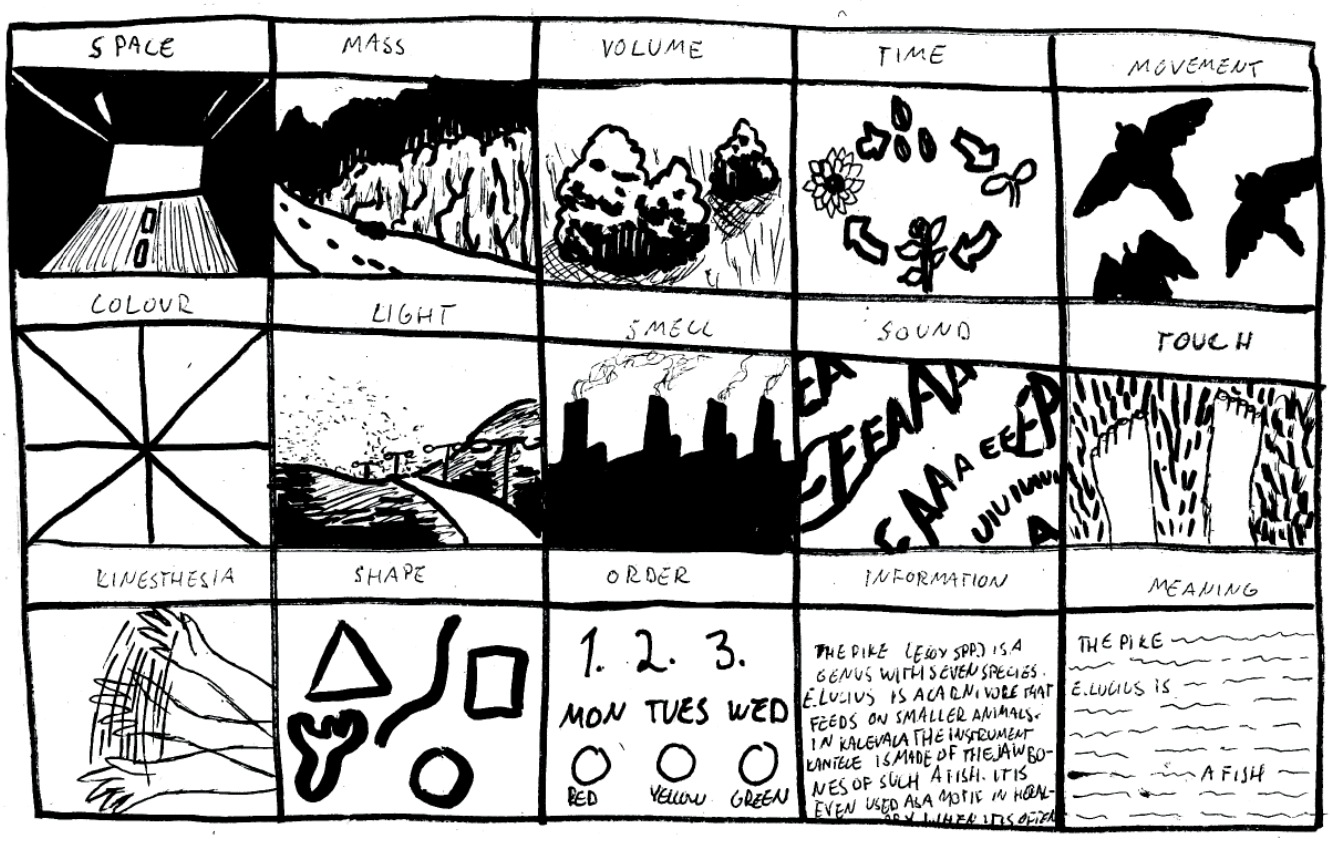


Figure 4. Subjects of study in environmental aesthetics. Inspired by Carlson & Berleant 2007, p. 16.

3. Criteria for evaluating the aesthetic qualities of the road environment

In order to find criteria for evaluating the aesthetic qualities of the road environment, a deeper look into the literature on the subjects of road architecture, road user experience and environmental aesthetics is needed. For the sake of organizing the multitude of aspects of the aesthetic road environment found in the literature, the paradigms of environmental aesthetics by Punter (1982, see Porteous 1996 pp. 11-12) are utilized as a framework.

Under the paradigm of appreciation it is possible to discuss the different meanings in the road environment. A key concept is interpretation: how are different symbols and signifiers understood, and do they serve a practical or an emotional function? In the road environment symbolic, textual meanings are often found in signage and the logos of buildings around the road. Additionally the road environment contains non-textual information whose interpretation may not follow similar, widely understood rules as reading does. The interpretation of the former group of information guides the road user's choices, whereas the latter allows for insight and emotional experiences. Both kinds of information are needed for finding those meanings in the road environment that enable orientation.

People's perception capabilities are partly individual, partly universal and to a high grade modified by their mode and speed of movement. On the highway, the road user is reliant on their sense of sight as the car isolates them from most other sources of stimuli. Visual perception is influenced by the road user's attentiveness and object of focus, as well as their speed: the faster the road user travels, the narrower is the time frame that they can use for focusing on each object in the road environment. This affects how and which parts of the road environment are perceived in the first place. The mechanisms of perception intermit information that stimulate psychological processes, such as a sudden stop in traffic causing frustration even before the road user has time to process what has happened, experiencing a jungle of meanings as stressful, no matter what these meanings are.

Qualities are the source of perception and meanings. They are the objective elements that make up the environment that is perceivable through senses and can be processed by the minds of living creatures. Qualities also are the components that the objective elements consist of: colours, textures, outlines, and so on. Additionally to the objects having attributes of their own, the perceivable relationships between different objects are also accounted as qualities. An example of qualities in all of these three different levels could be the variation between different plant species' leaf textures in a planting group.

3.1. Appreciation

The different dimensions of sensory perception are impossible to separate from the perceived elements' historical and social dimensions. Through observation of the element's visual, aural and sensory qualities the perceiver can study the meanings in the elements, including familiarities and differences between their own traditions and those that shaped the elements. Evaluative and descriptive aesthetic judgements are assigned to the perceived objects, and their suitability for human use is appraised. People may also try to relate to the values expressed in the objects and the environment, judging whether a certain place would suit their own needs and preferences. (Carlson & Berleant 2007, pp. 18-19, Zangwill 2007, see Etteger, Thompson & Vicenzotti 2016, p. 84.)

"- - - for an urban environment to act - - - as a source of rewarding aesthetic experience, it must succeed as a setting for experience, facilitating patterns of movement by determining the arrangement of things as they are encountered in our perception. This - - - enhances common symbols, meanings and memories." (Carlson & Berleant 2007, p. 19)

The context of the object provides additional layers and angles to its interpretation. For example, a welcome-to-the-city-sign by a beautiful view may give a pleasant first impression of the place, whereas a similar sign right at the visual border between urban and rural confirms the road user's interpretation of the physical environment (Laurén 1992, p. 16). A change in the perspective of the road user changes the way they understand relationships between objects. The frame of the view can reveal or disguise objects, show them overlapping each other or form a composition. The choices of framing and perspective are easiest to influence in the early phases of a road project, where the alignment of the road is decided on. Most roads are designed so that the carriageways in opposite directions are located within the same Right of Way, sharing a common road environment. Still the visible parts of the landscape and the roadway are perceived from different angles and belong to different contexts depending on the perceiver's direction of movement. The location of the object is an important part of its context, as it shows the object in relation to other elements in the same view. (Appleyard, Lynch & Mayer 1964, pp. 11, 17, Bucht, Pålstam & Wingren 1996, p. 38)

Appreciation could be characterized as voluntary observation of objects and environments, with the expectation

that the subjects of observation will provide the observer with different kinds of aesthetic experiences, such as the experience of beauty. While certain philosophers, like Immanuel Kant (1914), have deducted that beauty is separate from an object's functions, others it from the functionality of the perceived object (in Crawford 2013, see Herrington 2016, p. 442), others have found that the experience of beauty is closely related to moral and practical judgements. Burton (2012) found in his research that the experience of beauty is modified by the experiencer's understanding of the object and its function: in his studies, farmers consistently experienced more beauty in agricultural landscapes than other people did, since they had deeper understanding of the components that made them productive or not (see Herrington 2016, p. 443-444). On a related note, Eaton (2000) identifies "contextual beauty", a phenomenon that describes how ethical judgments influence aesthetic judgments. She exemplifies such a phenomenon with a discussion of whether or not invasive plant species can be described as beautiful. (see Herrington 2016, p. 444-445.) These findings emphasize the connection between meanings and aesthetic experiences.

While observation is an act that collects and processes sensory information, it also involves people's individual knowledge, memories and feelings, which decide their final interpretation of the sensory stimuli. In other words, appreciation is about finding meanings among information.

Meanings can be divided into two categories, direct and indirect. A direct meaning is a feature with an obvious significance, like rock beaches and erratic blocks directly signifying an area that has been modified by glacial ice. Indirect meanings are interpretations of symbols or unconsciously expressed values in the environment. An example of the latter could be a view of a historical landmark overshadowed by a larger, flashier commercial construction, which is easy to interpret as a prioritization of economical values over cultural values. Textual information can fall into either of the categories, although in this thesis it is mostly discussed in relation to signage and filed under direct meanings.

The primarily visual stimuli of the road environment ignite further processes in the road user's mind, connecting pre-existing knowledge and memories to the perceived landscape, forming and modifying the personal ties that an individual has to a landscape (Trafikverket 2016b, p. 8, Appleyard, Lynch & Mayer 1964, p. 17). The ties can involve the road user recalling knowledge of the history of a place when they see a certain object, or a certain view awakening associations to the road user's personal history. In some cases this can mean that the road user is isolated from their surroundings within the car, experiencing their internal world more vividly than the external one outside the car. The base of any interpretation being in the combination of meanings derived from sensory knowledge and the previous experiences of the road user implies that it is possible for a person to interpret meanings in landscapes they have not previously experienced (Bucht, Pålstam & Wingren 1996, pp. 10, 38.)

3.1.1. Direct meaning

Each environment has been formed as a result of a string of processes. Understanding what these processes have done to the environment is a way of

interpreting the identity of a place. The road user's possibilities of making sense of the past, present and possible futures of a road environment are dependent on the amount and quality of clues provided, affecting the legibility of meanings in the road environment. (Bucht, Pålstam & Wingren 1996, p. 10.) People's capability of visual comprehension also varies, which means that even in environments that have been formed to guide the observer to the likeliest conclusion, it will not be obvious to everybody (Hubendick 1976, p. 19). On the other hand, visual comprehension is a skill that can most likely be learned through the repetition of certain visual cues that lead to similar decisions. An example of this could be a road that disappears behind a hill, but curves to the right just before the continuation disappears from sight. By aligning the road so that it actually does continue the curve to the right after the hilltop, the road user's expectations of what will happen are rewarded, and they will probably feel more confident in their driving. (Hubendick 1976, p. 17.) Environments that correspond to the road user's expectations thus allow them to make accurate interpretations, whereas situations where no previous experience seem applicable can place considerable strain on the road user's psyche. This is especially noticeable when the road user attempts to orientate themselves, a recurring situation where the direct meanings of the environment are crucial.

At first these [traffic] signs can be the most psychologically unsettling of all aspects of the freeway – it seems incredibly bizarre when a sign directs one into the far left lane for an objective clearly visible on the right of the carriageway, but the sign must be believed. No human eye at windscreen level can unravel the complexities of even relatively simple intersection --- fast enough for a normal human brain moving forward at up to sixty mph to make the right decision in time, and there is no alternative to complete surrender of will to the instructions on the signs."
(Banham 2009, p. 201)

The act of orientating is about collecting sensory information from the environment, interpreting it and utilizing it to form an image of the surroundings. The pleasure obtained from acquiring an image that corresponds to reality can be compared with the pleasure that observing art may induce. From this point of view, orientating can be seen as an exercise in aesthetics in addition to having a practical function. (Appleyard, Lynch & Mayer 1964, p. 16.) The possibilities for orientation are dependent on the appearance of factors that give the road user information on their whereabouts. Signage is one example of such a factor, but the more intuitively graspable objects are often more important. Visual cues are often easier to understand than textual guidance such as signs, especially when the observer is not swamped with information. It is also important to present the information, no matter in which form, early enough for the road user to react to. While this "intuitive understanding" is heavily reliant on previous experiences, certain objects and phenomena are general enough to be understood by a wide variety of road users. These include borders between different landscape types (such as open or closed), natural features like forests or lakes, or specific types of buildings such as

a tower with a cross on top as a signifier for a church. On a more specific level, buildings, constructions and structures with a distinctive design can give the road user a very accurate picture of where they are. (Bucht, Pålstam & Wingren 1996, pp. 10-11, 50-51, Hubendick 1976, pp. 17, 20.) On the other hand, Banham's (2009, p. 201) testimony of the illogical interchanges of Los Angeles freeways, quoted on the previous page, gives a good idea of the need for signage in an otherwise confusing traffic environment.

3.1.2. Indirect meaning

Indirect meanings in the road environment are found by people in a variety of different emotional states, with different personal backgrounds. The interpretation of indirect meanings is more based on emotion than reason, and the reactions that they raise in people are probably more frequently emotional than reactions to direct meanings. The interpretation of indirect meanings can often be expressed as an evaluative statement: "This is how I experience the situation". The experienced positivity or negativity, variability or monotony, beauty or ugliness, are all aesthetic interpretations that give identity to the journey (Bucht, Pålstam & Wingren 1996, pp. 47). A stretch of a road can also be characterized as fun or boring, monotonous or variable, tiring or exciting. Sometimes the experience of a road is singularly negative, as the road user feels pressured or irritated. Some roads can be a pleasure to traverse, bringing a sense of peace. (Hubendick 1976, p. 9.) Still, the goals set on the road environment are usually defined by reducing "ugliness" and increasing "beauty" (Wingren 2009, p. 102).

While ugliness can often be correlated with over- or understimulating situations, beauty is harder to define simply. It is also a gross understatement of people's emotional range to address all positive reactions to the environment under the concept of "beauty". Wingren (2009, p. 106) has found that the perceived beauty is rather related to the meanings of elements in the roadscapes than to the appearance of the elements. She writes that bodies of water and farmsteads are examples of elements that are often experienced pleasantly, as most people can find positive direct and indirect meanings in them. Similarly, people tend to experience positively situations where they can observe the functions of places and where they can see people in action, as this gives insight into the interests and values of the people living in the landscape (Appleyard, Lynch & Mayer 1964, pp. 3, 17). So it follows that unused, unkempt and "meaningless" areas in the road environment are usually perceived negatively,

so much so that they can even dominate the road user's experience (Wingren et al. 2002, pp. 12, 15, Wingren 2009, p. 102). In situations like this, interventions may be necessary for increasing the meaningfulness of the road environment – or at least to decrease negatively experienced features in it.

Andrews' (in Carlson & Berleant 2007, pp. 272, 280-281) description of the French Autoroute and its signage gives fascinating insight into the division between direct and indirect meanings of the road environment. It juxtaposes the images raised by the pictorial touristic signs with the image of the motorway: Old-world stories and contemporary technology. The way these two types of signage talk to the road user is also clearly different. The pictorial signs are there to attract the road user and to persuade them to enter the world that they promise, whereas the informative signs' function is to direct the road user to their destination, without taking a stand on the desirability of each option. Cues of entrance that have been designed in other forms than signage can play a similar role, evoking feelings and impressions rather than stating cold facts. And just like the picturesque signs of the Autoroute, they should express the identity of the place they refer to – or at least some facets of it. In some cases, the city itself can be a symbol for something – technological progress, maybe (Appleyard, Lynch & Mayer 1964, p. 3).

"As you drive through the - - - region, you meet this road sign alerting you to the nearby town of Marvejols - - -. The sign conjures a world of ancient history, legend and superstition - - - and it stands beside that symbol of rational progress, the modern motorway."

"The pictorial signs belong to a different category of signposting from the purely directional or otherwise functional information signs on the Autoroute - - -. [The pictorial signs] alert the traveler to distinctive landscape features, historical sites or towns and villages (which may or may not be visible from the Autoroute) - - -. [Informational signs] will help you get to these off-Autoroute places - - -."

(Andrews in Carlson & Berleant 2007, pp. 272, 281-282)

The design of the road environment can also be a tool in creating or modifying identity. The Finnish national highway 51, Länsiväylä, runs close to the coast from Kirkkonummi until its destination, Helsinki. While the views to the sea are prominent in a few sequences of the road, there are also long stretches where the road user has no idea about their proximity to the shore. Instead of a direct view to the sea, the road user is provided with wave-formed noise screens by Haukilahti, the unofficial "beach district" of Espoo, the city between Kirkkonummi and Helsinki. This sets Haukilahti apart from many of the previous districts along the road that could also claim the title. This strengthens the image of that district, as well as provides a recognizable landmark even for people who cannot understand the symbolic connection between the form and the place. It also is a clear decision against using more literal symbolism for the district, as the pike fish, "hauki", in its name, could just as well have been used as a visual motif in the road environment.

3.2. Perception

As the road user is propelled along the road, they are offered great opportunities to observe the holistic road environment they are moving through. On the other hand, he road user's perceptions of their environment are based on a much smaller amount of sensory information than those of a free-standing observer. Since the car effectively isolates the road user from most smells, sounds and tactile elements of a landscape, sense of sight is their primary source of information. As a result, the road user's sensory perception creates experiences that often correlate strongly with the scenic landscape, that is to say the visual identity and character of a place. The scenic landscape for the road user includes perceptions of the roadway and the surrounding landscape, possibly including their memories of the place from the perspective of an observer in the landscape. (Bucht, Pålstam & Wingren 1996, pp. 7, 10, 31, 37, Drottenborg 2002, see Drottenborg 2004, p. 6.) While the sense of sight is the most important one for the road user, they can also feel the acceleration and slowing of the vehicle, their own small movements in accordance to the car's movement, as well as hear some sounds outside the vehicle (Hubendick 1976, p. 17). The kinesthetic sensations that a motor vehicle provides can also be a distinguishing feature in the road user's experience (Banham 2009, p. 72).

Road users can have varying roles in relation to the road environment. This affects their road user experience through their different modes of perception and behavior. For the tourist the environment is new, and they lack prior ties or engagements to the place. Their field of experience is dominated by the need to actively and constantly orientate themselves in the environment. The commuter has seen it all before, and is thus mostly interested in changes or surprising events in the environment. The driver of the vehicle needs to maintain focus in the front, on the traffic environment. Shifting focus from front to the sides may pose serious risks for the driver. The passenger has a much wider field of vision, a greater freedom of choice and more possibilities for moving in the car. They can even decide not to observe the road

"- - - all the senses combine in the temporal progression of perception- - -.

- - - sensory cues can serve to direct human activities, enabling us to move with comfort and security as well as interest and excitement, through an urban setting shaped to accommodate human functions."

(Carlson & Berleant 2007, p. 19)

environment at all, if they so wish. (Appleyard, Lynch & Mayer 1964, p. 4.) The road environment should accommodate each user group's typical needs and the most common modes of perception.

3.2.1. Attentiveness and focus

People pay attention to environments that they find pleasing as well as to those that they find displeasing. Attention, which can be defined as concentrated observation of stimuli, is a phenomenon that takes places for example in situations where a person needs to orientate themselves in an environment. (Küller, 1991, see Drottenborg 2004, p. 3.)This observation can originate from boredom, where the observer tries to find something to concentrate on in an environment, or from a stimulus that requires attention in a certain situation (Berlyne 1974, see Drottenborg 1999, pp. 15-16). Kaplan & Kaplan (1989, see Drottenborg 2004, p. 3) divide attention into two categories: directed and spontaneous attention, where the first requires cognitive capacity and the second either doesn't or even increases it. As a road user travels within the road environment, they encounter both stimuli that requires concentration and that can be allowed to flow by without reacting to them.

"The driving experience can now be described as being a sequence played to the eyes of a captive, somewhat fearful, but partially inattentive audience, whose vision is filtered and directed forward."

(Appleyard, Lynch & Mayer 1964, p. 5)

Cohen (1998) has devised a more specific model on attention and observation related to the road environment and driving. According to this theory, the driver of a vehicle is constantly scanning the whole of their environment, while directing specific attention to the objects most relevant to their task, dubbed "traffic objects", which are dependent on the traffic situation rather than on the nature of the object itself. How the driver views each situation has to do with the tasks that are required for the action of driving. According to Cohen, these tasks are planning how to drive in the following seconds, observing the current traffic, controlling the location and movement of the car, predicting possible events and orientating in the traffic system. (Cohen 1998, see Drottenborg 2004, pp. 5-6)

People's attentiveness follows a certain rhythm and is subject to general trends. In situations where many elements require the road user's attention, they tend to focus on objects that are close to them and directly ahead. The attention of the road user becomes forced, which enforces feelings of stress and hurry. In an environment with few elements that require focus, the road user's view wanders in the distance. Feelings of slow movement and detachedness from the environment can either provide the road user with rest between more demanding envi-

ronments or cause them to bore and tire. This has negative consequences for their driving behavior. (Appleyard, Lynch & Mayer 1964, pp. 4, 17.) It has been noted that places where the road user suddenly needs to focus intensely after a period of moving in an environment with low levels of stimulus are very accident-prone. Such places include interchanges to and from the road, tight curves, bridges and spots with sudden meaningful views. (Varming in Vägverket 1989:23, p. 3)

People tend to concentrate on the mobile elements in the roadway. The objects close to the road user, such as signs, railings and retentive walls within the roadway are in apparent movement, and they tend to be the second-most dominant feature in the road user's perception. The objects further in the distance are perceived as static, and prioritized low in the mind of the road user. In situations where the road user has crossed a significant barrier, for example as they drive out of a tunnel, the priorities for attention are momentarily less pronounced as the road user attempts to re-orientate themselves in the new environment. When faced with a situation where the road user needs to make a choice, their focus is sharpened and the element that stands between the choices is granted a specific value. For example, when the road user needs to make a choice between two lanes in an interchange, the tree standing at the median strip becomes the object that divides the choices in the road user's mind. If other landmarks are included in the same view as the dividing element, their significance is heightened as well. A part of the city's skyline on the right side of the tree and the silhouette of a water tower on a hill on the left become symbols of the two different lanes. Another situation that enhances the focus of the road user is driving through a strictly framed space. An obvious example of this is driving in a tunnel, but even very short periods in restricted spaces form a peak in the road user's attention graph. This emphasizes the meaning of carefully designed walls and ceilings of tunnels, bridges and their thoughtful equipment. (Appleyard, Lynch & Mayer 1964, p. 6.)

Both strictly focused attention and lack of focus can lead to inattentiveness. In the former case, the driver may be so concentrated on following the vehicle in front of them that they miss the car trying to join their lane from the interchange. In the latter, emotional imbalance may make it difficult to pay attention to the corporeal world at all. In both cases, the road user can also be stimulated by factors that are out of their focus, although they do not process it consciously. (Appleyard, Lynch & Mayer 1964, pp. 4, 17.)

3.2.2. Mechanisms of perception

The experience of movement on the road is a combination of the actual movement of the road user, their illusion of the movement of the environment and the actual perceived movement in the environment. Because the road user measures their own progression relative to the apparent movement of objects around them, the rhythm of those objects can either exaggerate the perceived speed of the road user or make them unsure of whether they are making progress at all. The latter situation may encourage the road user to increase their speed in an attempt to avoid further frustration in the situation. On the other hand, stretches of the road with slower rhythm may also provide the road user with a chance to wind down from stress caused by high-rhythm environments. The rhythm of objects often correlates with the shape of the space

the road user is driving through: In an open space the objects used as milestones tend to be further away from the road user, whereas objects in more closed spaces are often located on the roadway. (Appleyard, Lynch & Mayer 1964, p. 8.)

The faster the observer moves, the better they can focus on what they see, within an ever narrower field of vision. Both peripheral vision and the details in the foreground of the field are blurred, which degrades the ability to perceive spatiality. (Tunnard & Pushkarev 1963, see Bucht, Pålstam & Wingren 1996, pp. 39-40.) As the road user's speed increases, they also start paying more attention to groups of landmarks rather than individual objects. This places more emphasis on the size of the objects as well as the overall impression the view makes. (Appleyard, Lynch & Mayer 1964, p. 6.) From a design point of view, the mechanics of vision and speed mean that objects in a high-speed traffic environment need to have a clearly identifiable form and a location where they can be viewed from a longer distance to be able to be observed properly. Speed also affects the observer's perception of details close to them adversely. Instead, the designer should focus on the larger landscape: The topographical elements, silhouettes, borders between different kinds of areas, and the rhythm at which they are brought to the road user's attention. (Bucht, Pålstam & Wingren 1996, pp. 38-40.) Especially on routes prone to traffic jams the actual driving speed may vary very much from the speed limit, creating a need for variety that can only be observed at a lower speed and which doesn't muddle the overall impression of the road environment at higher speeds.

" - - - the motorist is alienated because the enhanced speed of passage reduces the time available to register the landscape. It thus becomes a passing spectacle, and one from which the motorist is relatively insulated. Physically insulated from roughness and ruggedness the motor-tourist can be visually stimulated by it."

(Andrews in Carlson & Berleant 2007, p. 277)

Tunnard and Pushkarev write about visual perception in relation to speed in their book Man-made America-Chaos or Control? (1963). Besides a lack of light, the lack of time has a negative influence on the accuracy and breadth of visual perception. (Tunnard & Pushkarev 1963, see Bucht, Pålstam & Wingren 1996, pp. 38-40.) Perception takes time and focus, which both are affected by speed. This is especially true for making sense of surprising or especially interesting foci. Speed modifies the length of time available to observe each stretch of the road, including objects and views along it. This means that the distance between the first and the last point of the road where a road user can see the desired view needs to be calculated by taking the common speed limit of the road into consideration. (Bucht, Pålstam & Wingren 1996, p. 64.) In order for a person to perceive an object while in movement, the view needs to be stable enough to be able to be perceived from multiple consequent

points in space. The spatial dimensions that are required to make an observation are of course dependent on the speed of the perceiver. (Tunnard & Pushkarev 1963, see Bucht, Pålstam & Wingren 1996, pp. 38-39.)

The connection between speed, time and perception can be exemplified by looking at the road user experience of a pedestrian, a slow driver and a fast driver in the same environment. If a person walks at the speed of 6 km/ hour, it takes them 10 minutes to walk through a 1 km long tree-lined avenue. The pedestrian has the opportunity to observe the details of each individual tree and the landscape beyond them, but they may get bored since the rows of trees seem to go on forever. A person driving a car through the same avenue at 30 km/ hour will only spend 2 minutes on the same stretch of a road. The slow driver will have a short time to appreciate the shade of the canopy, the general textures of the trees and the procession of one tree trunk after another. On a motorway with a speed limit of 90 km/ hour, a kilometer only takes about 40 seconds, and the motorway driver will mostly experience an aggressive flashing light before they are past the trees.

3.2.3. Influence on psychological processes

Aesthetics affect the basic emotional and cognitive processes of people. The stimuli from the surroundings can either cause or alleviate mental stress, increasing or decreasing tiredness. This has an influence on the way the observer of these stimuli processes information and solves problems. (Drottenborg 2004, summary, Strumse 1996, see Drottenborg 2004, p. 2.) Stimulation is defined as reactions to sensory perception. Processing perception into a reaction requires the perceiver's cognitive capacity, turning information into meanings. A lack of processing capacity delays people's reactions, which leads to decreased capability to make decisions. As decision-making is a significant operation in the act of driving, it should be in the interests of the people responsible for the road environment to design it in a way that leaves enough free capacity in the road user's mind for them to make conscious, thought-out choices in the road environment.

Especially environments that provide a large amount of new or complex information cause a feeling of overstimulation very fast. The situation is made even worse if the environment surprises the road user or involves elements that contradict with the rest of the scenery. (Küller 1976

"- - -utan att länka estetik till användarens känslor förblir vägestetik och skönhet i infrastruktursammanhang bara en 'svår definierbar' och ofta missbrukat koncept som inte samarbetar utan också motverkar dess syfte i infrastruktursammanhang."

(Drottenborg 2004, p. 11)

"- - - without linking aesthetics to the emotions of users, road aesthetics and beauty in infrastructural issues remain as concepts that are often misused or defined as 'difficult to describe', which makes their significance counterproductive rather than productive within the context of infrastructure."

(Drottenborg 2004, p. 11, translation)

& 1986, Evans 1971, see Drottenborg 2004, pp. 3-4). Hebb (1972) has found that high levels of stimuli induce frequent changes in brain activity, which is expressed with the concept of arousal. High levels of arousal have been associated with increased risk-taking, resulting in unsafe traffic behavior. (See Drottenborg 2004, p. 3.) An understimulated brain, on the other hand, is often a bored brain. Low levels of stimuli and arousal result in the driver tiring of the task, affecting their ability to concentrate (Hartley and Murdoch 1995, Stein 1993, see Drottenborg 2004 p. 4). A balance in stimulation would then be optimal for encouraging the road user's functioning cognitive processes. The road environment should consider situations where the traffic demands significant amounts of processing capacity, and tone down the amount of visual stimuli. In areas where driving itself is simple and uneventful, adding interest to the environment could prevent the road user from getting bored. In either case, the road environment should be logical and right decisions obvious so as not to place unnecessary strain on the road user's cognitive capacity (Appleyard, Lynch & Mayer 1964, p. 16).

Studies have shown that aesthetic qualities are not only in the beholders' eye; People have certain aesthetic preferences that can be generalized (e.g. Stamps 2000, see Drottenborg 2004, p. 3). The possibility to generalize people's aesthetic experiences and their effects on behavior feels somehow relieving, as it implies that the perception of environments can be improved through aesthetic measures, thus encouraging their appropriate use. For example, by forming the environment in a way that promotes stable psychological processes, risky behavior such as breaking speed limits can be discouraged. When the perspective is turned around, the quality of environmental aesthetics could be measured through their effect on people's behavior, judging for example by the amount of traffic accidents or frequency of vandalism at a given place. (Drottenborg 1999, Drottenborg 2002, see Drottenborg, 2004, pp. 7-8, 11.)

Drottenborg (2002) found in a study that the perceived beauty or ugliness of a road environment has an effect on the road user's sense of balance as well as their capability to process information and to make clear observations. The perception of the aesthetic quality of a road environment also had an effect on the emotional state of the road user, changing their quantifiable levels of traffic behavior, attention capacity and tiredness by up to 10 %. This means that the aesthetic experience of the road affects the road user's emotions, which in turn have an effect on the cognitive capabilities that influence the human components of traffic safety. (Drottenborg 2002, see Drottenborg 2004, p. 6)

It is important to keep the driver motivated in observing their environment and to trying to make sense of it. Banham (2009, pp. 196-197, 202) is motivated by what he calls "an illusion of free will", the enjoyment of driving: The ability to concentrate on the important, skill-demanding functions of driving, such as fast decision-making in unpredictable or difficult situations. He says that operating the car should work subconsciously, and the experience of driving should be enjoyed consciously; this makes moving on highways meaningful. Appleyard, Lynch and Mayer (1964, p. 14) prioritize the purpose of driving, which is to reach a destination. The road user forms and modifies their understanding of their location actively and continuously by observing how fast they approach, reach and pass by different objects in the road envi-

ronment. The objects may be simple focus points, like the trunks of a row of trees that mainly signify the procession of the journey, landmarks that anchor the road user to certain locations, or elements that symbolize or represent the destination of the journey. The latter two types are especially important for the road user's motivation, as they assure them of making progress. (Appleyard, Lynch & Mayer 1964, p. 14.)

To keep up the road user's belief that they are making progress on their journey, the road user should be provided with a view of their goal, either continuously or through repetitive views. In those parts of the journey where the goal itself cannot be seen, a chain of targets that act as milestones for the journey can act as motivators.

3.3. Quality

The road user specifically has access to experiencing formal qualities in movement and time. Appleyard, Lynch and Mayer (1964) describe "ideal" highways as possibilities to enjoy the landscape, to understand the structure of the city they are moving through and to learn about the places and phenomena they encounter. This is enabled by the great scale of the road environment, which allows the road user to experience spaces, light and texture in movement, perceiving visual and kinesthetic sensations in a rapid succession. (Appleyard, Lynch and Mayer 1964, p. 3.) The variation in these different kinds of qualities and the rhythm at which they appear stimulate the senses and upkeep interest. Examples of variation include changes between open and closed environments, or between flatland and hilly landscape. Certain stretches of the road can be perceived as a coherent whole, a sequence, which is followed by another sequence with different dominant qualities. The transition between these two sequences can be sudden, so that the contrast feels strong, or certain features may be strengthened gradually so that one sequence develops into another. Certain elements may be repeated in the sequences to create continuity, even in a complex environment. (Bucht, Pålstam & Wingren 1996, p. 52, Appleyard, Lynch & Mayer 1964, p. 17.) In this chapter, some qualities are studied further.

Since the sense of sight is the road user's most important source of sensory information, the qualities introduced are mostly visual in nature. Quality in this context does not involve interpretation or ranking, but is as close to an objective evaluation of perceivable objects as possible within the variability of individual perception capability. This definition is close to Zangwill's (2007), Sibley's (2001) and others' ideas about non-aesthetic attributes, which, when combined and organized with aesthetic intentions, can result in aesthetic attributes (see Etteger, Thompson & Vicenzotti 2016, p. 84). As a rule of thumb, these visual qualities can be expressed in drawings without resorting to symbolic explanations. It should be noted that a certain combination of certain non-aesthetic or descriptive attributes does not always result in the same verdictive judgment of an object's aesthetic properties, even when repeated perfectly. (Zangwill 2007, see Etteger, Thompson & Vicenzotti 2016, p. 84).

For the sake of organizing the different perceivable things in the road environment, this thesis classifies the sensory qualities of the environment into features, attributes and phenomenon. The category expresses whether the quality is a singular- or composite unit (feature), a description of an aspect of the feature (attribute) or the way units and/or attributes relate to each other (phenomenon). To give some further examples: Features are objects and

complexes that can be named easily, like rivers, bodies of water, buildings, habitation, hills, and mountain ranges. These can then be assigned different kinds of attributes. The river has a winding shape; the body of water has a murky color; the façade of a building has a rough texture; the habitation has an organic structure; the form of the hill is flat; the silhouette of the mountain range dominates the view. Phenomenon describe how the relationships between features and attributes are perceived. The heights of a row of buildings are organized from lowest to tallest, their coloration divides the row into sequences and their façades are passed by in a certain rhythm.

3.3.1. Visual attributes

Visual perception of objects begins with an assessment of the perceived object's holistic appearance and placing it into a corresponding mental category. After a person has repeatedly observed objects that evoke an image of 'car-ness', for example, they can categorize a number of objects with varying attributes, such as outlines, colors, textures and ways of moving under the concept of a 'car'. The mental categories are modified continuously through the observation of objects and complexes that are perceived as similar to dissimilar to another. People also tend to become skilled at recognizing and classifying subjects that are important for them, especially when the perceived features or phenomena have a significance for fulfilling their needs for survival. (Arnheim 1974, pp. 45-46, Gombrich 1950, see Arnheim 1974, p. 51, Appleyard, Lynch & Mayer 1964, s. 18.)

"For the purposes of everyday life, seeing is essentially a means of practical orientation, of determining with one's eyes that a certain thing is present at a certain place and that it is doing a certain thing."

(Arnheim 1974, p.42)

The quality of light influences visual perception by modifying the appearance of shapes and details. Strong backlighting may prevent the road user from perceiving objects in the same direction as the sun, whereas a gentler backlighting at dusk emphasizes silhouettes while erasing details. Artificial light can be used to improve overall visibility in the road environment, or its artful use can highlight certain elements. The lights of other vehicles in the road environment allow the road user to track the position of carriageways. (Appleyard Lynch & Mayer 1964, p. 7.)

Most road users perceive their surroundings in color. Together with spaces and form it shapes the road user's understanding of the road environment. The perception of color is strongly bound to the presence and type of light available, which means that it is largely dependent on seasons and the time of the day. In order for the observer to understand what they are looking at, contrast in color between adjacent objects is essential: lack of light

decreases contrast, making environments more difficult to interpret in the dark. Color and light direct people's attention, causing an innate preference of taking a turn to a light, open space rather than to a closed, dark place. (Hubendick 1976, pp. 17, 24-25.)

Spaces are defined by their qualities of allowing movement and views. The limits of the space, such as walls or ceilings, can be near or far from the observer, and they may include openings that enable the observer to look or step outside of the space. Spaces can be of varying shapes, contain different features, their proportions and materials defining the perceived character of the space. The road user is continuously moving into, within and out of different spaces, their endless shift in location allowing them to view the space from different perspectives. (Appleyard, Lynch & Mayer 1964, p. 12.)

3.3.2. Phenomenon in movement

"- - - urban design and planning cannot be confined to the arrangements of objects but rather must be used to create sequences of experience."

(Carlson & Berleant 2007, p. 19)

Phenomenon explain the way formal attributes relate to each other. Many objects with varying attributes form a complex combination; the contrast between closed and open spaces is stark; the perception of objects in time happens in a certain rhythm, and so on, see figure 5.

Variation means the difference between encountered elements during a stretch of a road. Rhythm is the frequency at which these elements and their changes occur. Designing variation and rhythm thus requires an overview of the road, planning the measures along it as an entity. Alternating sequences with different characters is a way of creating rhythmic variation, for example by contrasting open fields and dark forests in a rural environment, or by adding green areas to act as dividers in built areas. (Bucht, Pålstam & Wingren 1996, p. 64.) At other times new interventions are required in order to create variation. The rhythm of variation includes also the variation between sequences that are richer and poorer in stimuli. This both allows some rest to the senses of the road user as well as heightens the experience of switching from one sequence to another. In the case of a new road project, the alignment of the road could be considered from the point of creating rhythm and variation. This could mean drawing the line of the road through areas with different characteristics, allowing views over the larger landscape and respecting the landforms instead of disrupting them. (Bucht, Pålstam & Wingren 1996, pp. 11, 52.)

The art of creating sequences lies in the balance between

continuity and variation in the road environment, so that the end result is perceived as coherent. The different episodes of spaces, movement, objects and meanings can be tied together through the creation of overlap and repetition in views through or towards the same elements. The sequences and their transitions need to be understandable for road users from all of the directions of the road, and their organization and meanings need to be legible even for those who only experience some of the sequences along the whole road. (Appleyard, Lynch & Mayer 1964, pp. 5, 18). A possible guideline for creating order is to arranging the parts of a complex in the simplest way possible, while taking care to create a functioning whole where no parts are missing (Arnheim 1974, p. 60).

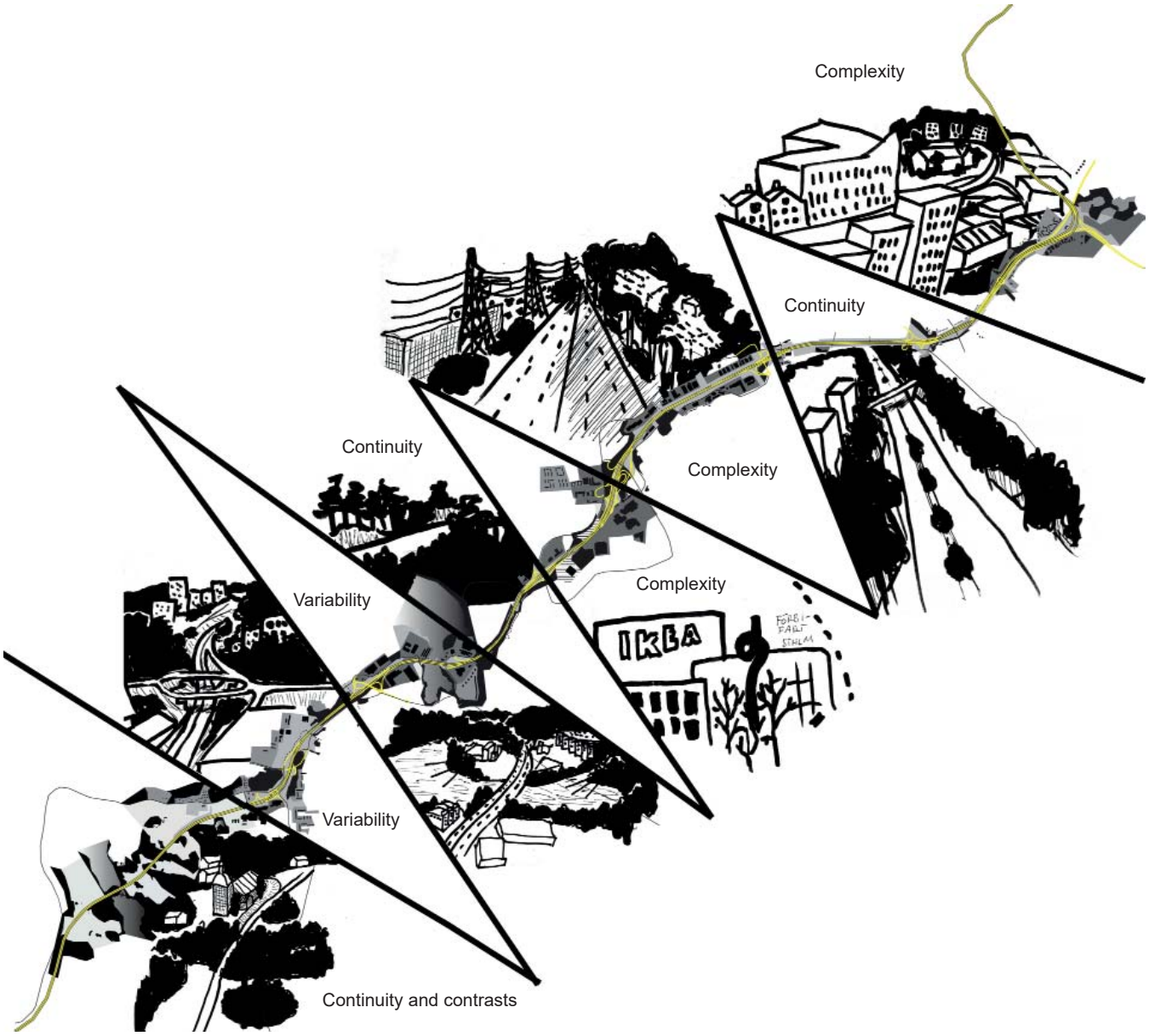


Figure 5. Examples of phenomenon in the road environment of the E4/E20. Inspired by Bucht, Pålstam & Wingren (1996) and Appleyard, Lynch & Mayer (1964), as well as Jan Augustsson's aerial photos from Botkyrka and Fittja-Vårby (2010), found in Riksantikvarieämbetets image service Kulturmiljöbild (http://kmb.raa.se/cocoon/bild/public_search.html).

3.4. Aesthetic criteria for the localization of cues of entrance

As the study has progressed, creating a set of criteria for evaluating aesthetics in regards to localization started to seem very complicated, but also somewhat too mechanistic. Instead, three goals for the aesthetic components of road architecture emerged from the literature research: a meaningful road environment, enjoyable driving, and improving the quality of the scenic landscape. These goals correspond respectively to the appreciative, perceptive and qualitative paradigms of landscape aesthetics (Punter 1982, see Porteous 1996, pp. 11-12). The goals can also be considered from the perspective of Lang's (1988, see Porteous 1996, p. 22) types of aesthetic experiences: a meaningful road environment provides symbolic aesthetic experiences, enjoyable driving is related to sensory aesthetic experiences, and the new element's design in a way that improves the quality of the scenic landscape can be evaluated from the point of formal aesthetics. Considering aesthetics in the road environment through goals instead of criteria give the designers, the administrators and other concerned parties wider possibilities to pursue the goals, and it also allows for discussion about the measures that would best contribute to fulfilling them. Additionally, while these goals are not specifically made for evaluating localization or cues of entrance, they are perfectly relevant for both subjects: any location and any cue of entrance that supports the fulfilment of these goals can be evaluated positively.

The overarching goals reflect the author's understanding about how the findings for each paradigm of landscape aesthetics can be applied to the road environment at their simplest form. These basic goals could possibly be applied to any consideration of the role of aesthetics in the road environment. The secondary goals, on the other hand, are more examples than absolutes. While they do contribute to fulfilling the overall goals, there are certainly many more goals that can be pursued, and an even larger amount of actions that can be taken towards fulfilling the goal. Accordingly, the real world includes many more prerequisites and limitations for the applicability of each measure than are mentioned in this thesis. Thus, these guidelines should be seen as an educated guess at simplifying complex processes and concepts, especially as the author is well aware of the ontological shortcomings of the classifications.

Because the goals and the suggested measures are a result of heavy summarization of information presented earlier in this thesis, the amount of references to sources are intentionally kept low.

3.4.1. A meaningful road environment

The first goal sets criteria for symbolic aesthetics in the road environment, correlating to the paradigm of appreciation of the landscape.

The overarching goal for the localization of cues of entrance is to add to the meaningfulness of the road environment.

Secondary goal: The road user is given positive impressions of the place.

The first step to pursuing this goal is to analyze the existing road environment from an experiential point of view, and to evaluate the current impressions it makes. This could be done by analyzing the direct and symbolic messages that the road environment sends, as seen from the road. The impressions and messages should be evaluated from different points of the road, in case the viewpoint changes the context of the information so much that it changes the interpretation. Similarly, the messages should be interpreted by different kinds of people to get an idea of some of the possible individual interpretations. Typical interpretations can be evaluated based on the individual interpretations.

The improvement of the impression may start simply at intensifying the management regime of the road environment: cleanliness and well-tended vegetation do much for the perception of the place, as it signals that the place is cared for. The second step could be to try linking the more positive image of the road environment to the image of the place by enabling views to easily recognizable features of the place, or to provide obvious symbols of the place. The symbolic presentation should not become mechanic or be an attempt to "illustrate" the place all the way. For example, if a place is known for a historical well, it might be better to symbolize the significance of the well instead of simply picturing the object itself. There are also dangers of creating decoration for decoration's sake (Wingren 2009, pp. 104-105, Bergman 2008, p. 176). Thirdly, conflicts between the different messages in the road environment should be solved insofar their clash makes the impression worse; having different kinds of messages in the same environment is not bad in itself, as long as they contribute to a coherent image.

Secondary goal: The road environment provides good possibilities for orientation.

A thematic analysis that maps the typical characteristics, dominant traits,

landmarks and important views from the road should be the basis for identifying the existing non-textual indicators of location. Their legibility and distinctiveness should be evaluated, as well as the order and distance at which they can be experienced. The appropriate distance is always tied to an appropriate time frame, which means that the location and dimensions of an object always need to be evaluated against the average speeds of the road. If the non-textual indicators of location provide the road user with a continuous chain of targets that they can approach, reach and pass by, the orientation possibilities are probably already quite good. Some of the targets should have a direct connection to their site, so that in addition to the general sense of progression the road user also gets a sense of exact location.

Some conflicts may occur between the textual and non-textual orientation information. For example, a building visible to the left of a junction may only be reachable by turning right. In such cases specific care needs to be taken to clarify the textual information and to encourage the road user to follow it by allowing enough time to perceive and understand the signs, or by repeating the information. Another possible limitation to improving orientation by providing views to the landscape are situations where the road environment is confined to the roadway. In such cases, the design of the roadway and its elements should contribute to orientation possibilities.

Secondary goal: The road user is given possibilities for aesthetic experiences and for understanding a place.

Landscape analyses that show the natural, cultural and historical values present are the prerequisite for identifying the information that the road user can be provided with. Positive aesthetic experiences, that is to say positive emotional reactions to subjects of observation, can be enabled by presenting these values in a way that allows the road user to form associations, emotional reactions and ideas related to the observation. The values can be emphasized through improved visibility, either by removing obstacles between the features and the road, or by increasing contrast around the feature and its surroundings for example by scenic lighting (Wingren et al. 2002, p. 40-45).
Here as well the road user experience and other values may conflict. There may be conservation issues, pressure for new establishments or a need for noise barriers that limit visibility and views to the environment. In some cases these values can be expressed through artistic or symbolic means in the roadway, instead.

Secondary goal: The road user experiences the place as distinct and original, with a clear identity.

Improving the sense of identity requires plenty of background material, as the first question to be answered is “what is the identity of this place? Or what could it be?”. The analyses suggested for the goals above would help to understand the place: The messages in the environment, the distinguishing physical features of the area and the different values in the landscape. A general experience of place should be identified and compared with the identity of the place as defined by the municipality, and maybe also by the frequent users and inhabitants of the place, as the perceived identity is most likely influenced by the personal ties people have related to the place, such as memories and impressions.

One possibility for expressing identity could be a designed narrative that presents one or more of the significant traits of the area as a kind of a "story" told in the road environment. Even if the road environment cannot be interpreted as a story, it should express a representative image of the place. That is not to say that, for example, a multicultural municipality where lakes make up 20% of the area should divide the road environment into pieces by the percentage of different kinds of people and different kinds of land uses, and dedicate a part of the road environment for each of these. Rather, if particular cultures have had a significant influence on the cityscape and architecture, which could be mirrored in the road environment, or if the lakes are the pride and joy of the municipality, the road user should probably get at least a glimpse of one of them.

The recurring challenge for providing meaning in the road environment is the mounting pressure to protect people around highways from the roads' adverse effects on health and well-being. Because of this, expressing the identity of a place with the design of railings, lighting, noise barriers, bridges and so on is gaining momentum. Especially in places with particularly important or rich meanings, artistic and symbolic expressions of their distinctive qualities could be encouraged.

3.4.2. Enjoyable driving

Many people experience driving as a pleasant activity. The reasons for this can vary, but a sense of freedom, effortlessness and possibilities for reaching faraway goals are probably quite popular answers (Banham 2009, pp. 70-72, Appleyard, Lynch & Mayer 1964, p. 3). These also serve as motivators for the road user. The second goal sets criteria for sensory aesthetics in the road environment, correlating to the paradigm of perceiving the landscape.

The overarching goal for the localization of cues of entrance is to enable enjoyable driving.

Secondary goal: support stable psychological processes.

There may be situations where negative emotions or lowered cognitive capacity cannot be easily avoided. Stretches of road that continue through seemingly endless forests, for example, where monotony and losing track of the journey travelled cause boredom and tiredness, may cause the road user to escape into daydreams. Keeping up the road user's motivation to keep concentrating on driving can be improved by giving them a sense of progressing at a reasonable pace. For example, locating cues of entrance close enough to each other to form a chain of targets for the road user can provide them continuously with feelings of accomplishment, which could prevent frustration and boredom.

The road user can also feel a lack of motivation in situations where it is hard to make sense of the road environment, either because of a lack of orientation possibilities or because of an overload of stimuli that makes it difficult to filter the most important information. For example, the complexity of the visual environment and the demands of the traffic are often high in urban areas, using up most of the cognitive capacity while causing stress and distracting the road user from the basic functions of driving. At worst, this can also lead to the road user giving up on "reading" the road environment, which is likely to affect their driving behavior as they get more frustrated and stressed out when they make bad decisions. To prevent this effect, making the right choices in traffic should be easy, see corresponding secondary goal. The most important information should be available for a long enough time, it should not be contradicted or obscured by further information in the road environment, and the road user should continuously be provided with possibilities for orientation.

Secondary goal: Making right decisions in traffic is easy.

The road user has a limited time and space for making decisions. Additionally, their cognitive capacity is limited, meaning that only so much information

can be processed at once. As a result, making choices in the road environment can be very stressful. Since stress may lead to inattentiveness and unpredictability, decision-making in traffic should cause as little stress as possible.

The first step for improving decision-making possibilities would be to identify the actual places of choice in the studied stretch of the road. The speed of the road user correlates directly to the time they have to act on the information that the road environment contains. The second consideration should be on the complexity of the area of choice. If the carriageway has been designed in a way that makes wrong decisions physically impossible, there is no real choice, and the pressure on the road user is lifted; in cases where the road user has to rely on textual guidance only without support from non-textual cues in the environment, the process of making decisions becomes much more complex.

In such situations the most important thing is to prepare the road user for making the decision. This could be achieved by localizing the cues of entrance in places where they either serve as non-textual clues of location, by making the road user focus their attention on the guiding elements in the road environment, or by signalling a change in the complexity of the environment by indicating the need for a lowered speed.

Secondary goal: The road environment provides balanced stimulation.

In order to evaluate the strain that the road environment places on the road user, the intensity of stimulation throughout the journey should be mapped. Appleyard, Lynch and Mayer (1964) provide an example of such a graph. This graph should be overlaid with a map that shows the areas along the approach road where traffic places the highest demands on the road user's cognitive capability. The basic result of this mapping could be that the road environment of junctions and intersections should be designed in a simple way with few stimuli to direct cognitive effort at making sense of the traffic, whereas long stretches of the road that are currently cognitively undemanding and low in stimulation could be spiced up.

The means to balancing stimulation through the locations of cues of entrance can be a question of simple calculations of adding and subtracting stimulus in different places. Covering or even removing distracting elements can be a way of calming down the environment, and low-stimulation areas may be in need for cues of entrance that prepare the road user for the following high-stimulus sequence. This means that the balance in stimuli does not require the graphs for stimulation and traffic demands to add up to the same sum of arousal throughout the trip. The balance should rather be seen in relation to the length of possible journeys along the road, by alternating high-stimuli environments with low-stimuli environments at smaller and larger scales. The transitions between different kinds of environments should also be considered, as sudden changes cause a spike in the brain activity of the road user. For example, the complexity of the road environment and the traffic are both likely to increase as the road user approaches the city. This could be balanced by increasing the amount of stimuli gradually so that the road user has time to adjust, or by giving the road user a possibility to plan their future actions at an undemanding stretch, a "threshold", to the environment ahead. Even a clear gateway element can inform the road user of changes ahead, allowing them to accept them.

3.4.3. Improving the quality of the scenic landscape

The third goal sets criteria for formal aesthetics in the road environment, correlating to the paradigm of the quality of the landscape.

The overarching goal for the localization of cues of entrance is to improve the quality of the scenic landscape.

Here it should be noted that the localization of cues of entrance by their formal visual qualities is rather a way of evaluating the effects of large-scale, functional cues of entrance, such as city development, bridges and interchanges. The same goal can be applied to the design of smaller cues of entrance after the localization has been decided on.

Secondary goal: The new feature is adapted to the landscape. The desired degree and manner of adaptation are specific to each project.

The environmental impact assessment that precedes road projects in Sweden includes a landscape analysis that considers the effect the project has on the scenic landscape, and how the road should be aligned so that the negative effects on it could be minimized. Another thematic analysis looks for the vulnerabilities and potentials of the landscape in order to determine the project's effect on the functions and structure of the landscape. Together, these analyses form the basis for formulating goals for the desired degree of landscape adaptation for the project.

In the case of localizing large-scale development projects, like urban expansion or new transport infrastructure that may also act as cues of entrance, the environmental impact assessment is a very important document. In the case of smaller additions, like new road equipment or openings in vegetation, such effort may not be required. Instead of considering landscape adaptation on a large scale, the location and design of smaller cues of entrance can be based on previous landscape analyses made in the area. For example, if the spatial experience of the place is monotone, it can be varied through creating openings. The dimensions of the openings should of course be considered from the point of mechanics of perception, but they should also correspond to the placement and typical direction of elements in the existing landscape, on a pre-defined level for landscape adaptation.

Secondary goal: New features complement existing visual qualities.

In some cases complementation can be about conforming to the existing formal qualities by adopting their forms, proportions, scale, structure and so on.

In some cases, complementation can also be achieved through adding values to the scenic landscape that did not exist before by creating a strong contrast through exceptional shapes or colors, for example. Which kinds of complementation are judged to best improve the quality of the scenic landscape depend on the landscape type as well as the vulnerabilities and potentials of the site.

Secondary goal: The new feature supports the classical ideal of beauty.

The concept of "beauty" has been widely used in the Swedish Transport Administration for decades, although its definition has greatly varied with each usage. Since the architectural qualities that the Transport Administration seeks after even today are beauty, function and sustainability, it seems logical to look into some possible definitions of formal beauty and see how it can be pursued. The Oxford English Dictionary (2008) defines beauty through its four different effects: sensory pleasure, conscious fascination, immediate positive emotional response, and judgment of suitability for use. These effects are a result of the quality that is beauty, or a combination of qualities that is beautiful. (see Meyer 2008, p. 8.) This definition seems to consider beauty as something that belongs to a feature itself. Other definitions consider beauty to be explicitly something that is born in the process of observation. Hume locates beauty in the mind of the observer, and thus distances it from objects in themselves (n.d., in Dadosky 2014, see Herrington 2016, p. 442), and Danto (1999) elaborates: the experience of beauty is a result of interaction between sensory perception and conscious processing of the perceived information, colored by the perceiver's memories and expectations. (p. 192-193, see Meyer 2008, p. 18.)

According to a known definition, beauty is characterized uniformity, harmony, variety, balance and proportion (Porteous 1996, p. 21). Through analyses of individual objects and their attributes, general trends can be found. For a more descriptive analysis, the scale needs to be increased, considering the attributes of complexes and the phenomena that define the relationships between the elements that form the complex. The design of the new object should thus contribute to a uniform appearance, conforming to the general proportions of the studied complex and providing some variety so that the end result does not become monotonous. The diverging qualities of the new feature should not be too different from the existing ones so as not to disturb the harmony, and it should contribute to a balanced composition.

Zangwill (2007) makes a point that descriptive aesthetic judgments, like the attributes that characterize beauty in the definition above, are often used as a basis for evaluative judgments, that is, whether the aesthetic qualities of a feature are experienced positively or negatively. He continues to claim that, unlike in the definition above, a certain combination of certain substantive attributes does not always result in the same verdictive judgment of an object's aesthetic properties. (Zangwill 2007, see Etteger, Thompson & Vicenzotti 2016, p. 84.) This is a valid point, which is why it should be clarified that the definition of beauty presented in Porteous' book (1996) is utilized in the analysis because of its practical applicability, not because it is deemed to be the most accurate definition of beauty.

4. The southern approach to Stockholm

"Humans have appropriated the whole of the planetary environment as their own. Nonetheless - - -. It also involves the more or less intentional production and creation of environments of great diversity and interest. These include not only the landscapes and countrysides that have been shaped by centuries of human habitation and utilization, but also those that have resulted from more deliberate planning and design. In addition, the human environment encompasses the most obvious products of human occupation: cities, towns and other dwelling places, as well as the obvious fixtures and structures that comprise them."

(Carlson & Berleant 2007, p. 13)

Bosse Bergman, a researcher in urban and regional studies, has chronicled the history and the development of the highway E4 and its adjoining districts from Botkyrka to Arlanda, excluding its run through central Stockholm under the name Essingeleden. He defines the areas around the highway as a city of their own, the "E4-Staden" as one of his books is called, and elevates the highway to the role of the "spine" of the whole transportation network in the Greater Stockholm Region. It is also a significant part of the everyday landscape of many of the inhabitants of the region. (Bergman 2008a, pp. 10-11.) As the stretch of the E4 studied in this thesis also houses the highway E20, the road from Botkyrka until Västberga will be called E4/E20 from now on. See figure 6.

Bergman presents the road environment along the E4/E20 predominantly through its development in correspondence with the highway itself. As the car became ever more common in the 1920's, cities were able to extend and produce "satellite towns" along the newly built roads. From the 1860's onwards a similar development had been achieved through the creation of railways in Stockholm, but the roads proved to be much more effective tool for establishing new urban areas and transporting people and goods between them. The 1950s and 1960s were an especially productive era for the expansion of Stockholm, as old farmlands were bought, split into smaller units of land, and constructed one by one. As a result, the Greater Stockholm Region grew together as the "satellites" expanded towards each other and the municipal centers, forming the landscape around the E4/E20. In the late 20th century the roadside became a desirable location for different enterprises to establish their stores, factories and offices, a development that is strongly present in the road environment of the E4/E20. While change has been the characteristic feature of the E4-city for a longer time, the rise and fall of different enterprises and business areas has in a way accelerated the change that is visible towards the road. (Hubendick 1976, p. 12, Laurén 1992, pp. 9-12, Bergman 2008a, pp. 12, 21, 26, 38, 52, 106.)

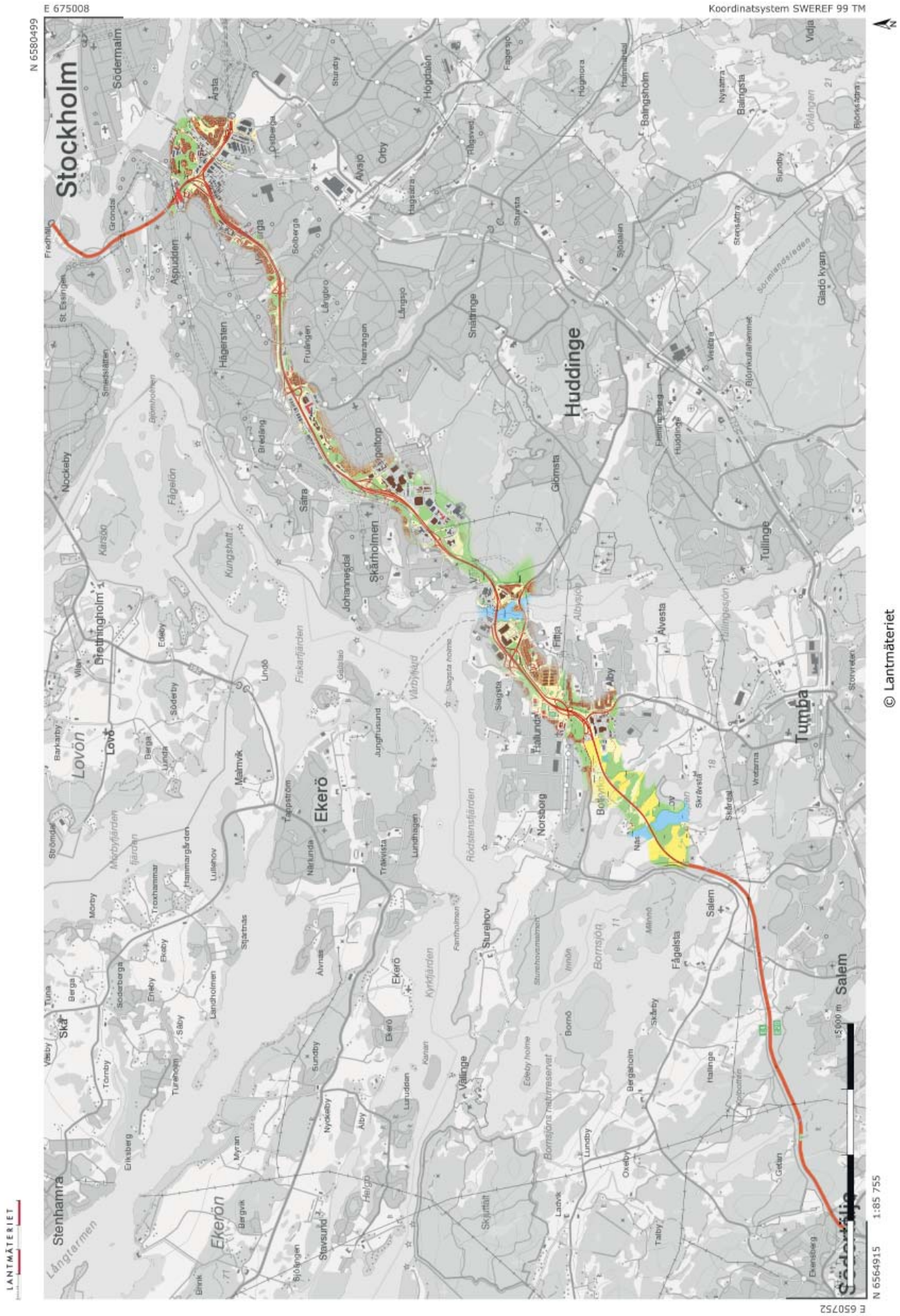


Figure 6. The studied stretch of E4/E20 with the extent of experienceable road environment in color. The stretch of the motorway E4/E20 north of the studied area is called Essingeleden until the two highways E4 and E20 separate in Solna just north of central Stockholm. South of the studied area the highway continues towards Södertälje through Salem. Map material used for this composite map is © Lantmäteriet.

As the very short summary of the road environment of the E4/E20 shows, the area is rife with modern history in smaller and larger scales. Bergman (2008a, p. 240) emphasizes the role of the road environment as a possibility for understanding Stockholm's urban development, and worries about the loss of history's legibility along the road. In addition to the modern history of urbanization, the roadscape includes signs of even earlier times: agricultural land with long traditions, buildings from medieval times, invisible ancient remains of pre-historical times and natural features that have been moulded by the ice age and other forces of nature. One of the most important signs of natural history are the rocky hills, rift valleys and forests that are typical for the island of Södertörn, where the studied highway stretch is located. (Botkyrka 2014, p.16, Bergman 2008a, p. 23.)

From the road user's point of view, the E4 is rather experienced as a stressful and accident-prone route between home and work than as a road where driving gives positive experiences. The landscape and the road are perceived as separate beings, not as a holistic road environment or even as a road through a cityscape. Compared with Essingeleden, the stretch of the E4/E20 that runs from Nyboda interchange to the Karolinska hospital in Solna, Bergman describes the E4/E20 is the most un-dramatic highway possible .(2008a, pp. 245-246.) He also laments the fact that the high points of the Southern stretch of the highway, driving between the hills Duvberget and Masmoberget in Vårby and through Eriksbergspasset in Hallunda, are more than 10 kilometers away from the point where the E4/E20 meets Essingeleden. Bergman's statement about the road environment of the E4/E20 as an area best understood through describing each of the individual areas it passes through is echoed in the sequential structure of the analysis. (ibid.)

A site visit showed that the experience of the studied stretch of the road as an exit instead of an approach includes only a few sites that are drastically different for the road user driving away from Stockholm. The most dramatic differences can be found in how Botkyrka municipality is experienced between Hallunda and the bridge over Fittja bay (sequences 2 and 3 in the analysis). Upon approach, districts of Slagsta, Fittja and Hallunda are the nigh-invisible. It is only when the road user leaves Stockholm through the same route that they can understand the use and scope of these areas. One of the reasons for this is topography, but the main factor is the vegetation that blocks views to these districts for the road user coming from the south. This difference makes the visual border between the urban and the rural areas of Botkyrka somewhat clearer upon departing than when entering. Naturally also some of the landmarks are replaced, for example by Västertorp interchange the tower of an old fire station is only visible for those coming from the North, while they cannot see Skärholmen center from Kungens Kurva. This goes to show that a holistic analysis of the road environment would need to include both directions of the road.

4.1. City entrances and –approaches

Approach roads to cities can vary in their expression and in the way they connect to the local road- and street network. There are especially large differences in the messages they send to the road user about getting closer to the destination and preparing them for it by informing them of their location, slowing them down, and allowing them to form their first images of the city.

The Turunväylä motorway is an approach road to Helsinki, the capital of Finland. It moves through the metropolitan region in a sparsely built "rurban" landscape with obligatory views to forests, fields and some large office buildings, allowing a few views to the sea through a slightly translucent barrier, continuing in a sunken corridor flanked by more trees, and ending abruptly at traffic lights only a few hundred meters after the speed limit has been lowered from 100 to 70 to 50. Welcome to Helsinki: The backdrop of the entrance consists of a hamburger restaurant, a vegetated area somewhere between a park and a forest and short side glances into a cluster of offices on the right. The sudden stop raises a question of a possibly heightened risk for traffic accidents.

For the road user approaching Helsinki from Länsiväylä, the first cue of entrance is the gateway element created by Piispansilta interchange that is framed by relatively massive commercial buildings on either side of it. After this landmark, the road environment becomes decidedly urban, although the road user gets very few glimpses into their surroundings over the well-tended, park-like noise berms and long rock cuts. The second strong cue of entrance comes 4 minutes later, when the road user can view the towers of Keilalahti business district over the bay Kuninkaanlahti. After passing by Keilalahti, the highway continues from island to island, allowing long views to the sea on either sides. It continues through the large island of Lauttasaari in a decidedly urban but kind of shabby stretch, passing by residential areas, a sports field and some businesses. At the edge of the island a tall terracotta tower becomes visible behind some trees, which give way to a magnificent open view on the Lapinlahdensilta bridge between Lauttasaari and center of Helsinki: The sea acts as a threshold, a transitional space, as the road user takes in the skyline of the Northern central parts of Helsinki with the Pasila tower, Linnanmäki amusement park and Kallio church on the left. Then the silhouette of Ruoholahti district with its industries appears on the right, the road user looks back at the skyline, then beyond Ruoholahti to the Länsisatama wharf, the red brick offices forming a wall to the right of the road user before a last view to the Hietalahti cemetery on the left, as the road curves steeply to the right and ends at traffic lights in the heart of Ruoholahti commercial district.

What can be learned of this simple comparison between two approach roads into Helsinki? The first thought that comes to mind is that it pays off to have great natural assets that can be utilized as transitional spaces or clear borders between the city entrance and the city approach. In this specific comparison, the long Lapinlahti bridge over the sea is the perfect connector between the highways and streets, the suburbs and the city center, high and low speeds. The second lesson is to ease the road user into the idea of approaching their destination by giving them strong reminders of their location in an urban region, like the massive business districts at certain points of the journey. The third is the character of the road space. Noise walls and –berms are often the prerequisite for a decent quality of life by a highway. While they block the road user's view to their surroundings, they can also be utilized as a way of communicating the general character of the surroundings. Case in point: On Turunväylä the road user can feel like that they are in a forest right until the very end of the road, while on Länsiväylä the suburbs are hinted at by the tended, cultural vegetation of the noise berms. To summarize, the road user can be informed of approaching and entering the city through the appearance of the highway and the environment leading there.

Cues of entrance

Historical entrances to cities were built as gates into walls and fences that protected the city from outside invaders and the wilderness. The walls and fences often included towers for watch-keeping, as well as custom stations for collecting taxes from people who wanted to do trade in the city. The clear boundaries allowed the cities to exist as closed units in the landscape, where the dense population and narrow streets contrasted with the wider landscape and the road network outside. (Laurén 1992, pp. 1-3, 26, Wingren et al. 2002, p. 17.) The historical fortifications and walls had largely lost their meaning by the beginning of the Gustavian era, and the borders between cities and the countryside were starting to become less defined (Laurén 1992, p. 6). Parts and traces of these walls can still be found around the so-called "old cities" within contemporary cities. In Stockholm, the historical custom stations that also represent old entrances to the city live on in the names of places, such as Hornstull or Norrtull, where the old custom houses have been preserved as historical monuments. The modern "custom stations", where congestion taxes are collected automatically as the road user passes under portals on the highway, are much less ceremonial.

From the history it can be interpreted that cities used to be closed units that could be perceived as "islands" in the cultural landscape. Nowadays the borders between urban and rural landscapes have become more fluid or even indistinct, and new kinds of land use that neither fall under the name "city" nor "countryside" occupy space. Approach roads to contemporary cities typically run through these mixed landscapes, often dominated by industries by the road. The landscape architect Christina Laurén suggests in a report (1992) for the Nordic Road Association that city approaches could be improved by giving the outer edges of cities a more fixed structure, creating a clearer border towards the surrounding landscape. Essentially, the report proposes that city gates, symbolic or concrete, should be reinstated as a part of the urban structure. (Laurén 1992, pp. 1, 13, 26.)

The report defines city gates or city entrances as expressions of the border between the urban and the rural, rather than as the actual borders between areas. The entrance can be a man-made construction, like a building or a bridge, but even natural elements such as bodies of water or passes between hills can be understood as gate elements. These gates are usually approached from roads, which means that the design of a city gate needs to be evaluated in relation to the standard of the road, the traffic design aspects and the influence the entrance has on the road user. The report states that a city gate has potential as a welcoming gesture, as well as as an architectural element that increases the travelers' interest in the place they are entering, and that represents the identity of the city or place in a way that the inhabitants can identify with. (Laurén 1992, pp. 17, 18, 26.)

"A gate to what?" Bergman (2008a, p. 240) asks, and questions the relevance of constructing such static entrance elements in a situation where both the perceived and the physical entrance to the city is continuously moving and changing form. Laurén (1992, pp. 16-15, 25) was aware of the forces that modify cities and that almost inevitably change the entrance's meaning, as the visual and administrational borders of urban settlements move further from such fixed points. She presents two possible solutions to this conundrum: Either both road planning and city planning co-ordinate their efforts to keep the entrance meaningful by regulating the environment of the approach to the gate, or the entrance is constructed as a portable element that can be moved in the same rhythm as the borders move. Bergman does not believe in the possibilities of keeping the modern cities within any kinds of clear borders, but rather advocates for a wider definition of a "city" that also includes urban areas that do not fit inside a region limited within customs stations or other gate elements (Bergman 2008a, pp. 212,240).

As the literary sources above witness, there is a question of whether or not physical entrances to cities or regions are still a relevant element in today's urban landscapes. It could be argued that symbolic entrances make the road user aware of the place where they enter, and as such have a function in creating a sense of place as well as preparing the road user for changes in the traffic environment, as roads are replaced by streets. The elements that make the entrance can act as landmarks that improve the road user's possibilities for orientation and understanding of the values and qualities of the place. (Laurén 1992, pp. 17-18, 26.) While the point of roads becoming streets at the city entrance is complicated by the many exits and entrances of approach roads, as well as the double-role of many approach roads as thoroughfares (Wingren et al. 2002, p. 9), the experiential functions of elements that signify entrance still stand. In the dynamic, multinodal and sometimes diffuse structure of landscapes around approach roads, such entrances could have a positive effect on road user experience by increasing the meaningfulness and visual pleasantness of the road environment, improving the enjoyment of the journey.

To answer Bergman's question of where such gates could possibly lead, the answer could be "a place". Any place. Instead of holding the idea of an "entrance" as something that can be encountered only once during a journey, as something that marks a definitive border, they could be thought of as a visual

cue of approaching and reaching different milestones and destinations. Since the words “entrance” and “gate” seem to be strongly loaded, a new concept is needed. This thesis proposes that the features of the road environment that inform the road user of their whereabouts in relation to the landscape around them could be called “cues of entrance”. This concept does not include physical entrance points like administrative borders or interchanges, but rather concerns the objects, complexes and their appearance along the journey that invoke an experience of approaching and entering a place. Whether the place is a city or not, whether it is the road user’s destination or something that is passed by, does not matter.

From this definition it follows that the area to be entered needs to have the qualities of a place, that is, it needs to be “relational, historical and concerned with identity” (Angé as quoted by Andrews in Carlson & Berleant 2007, pp. 277-278). The cues of entrance can be features that express the history of the site, project a sense of identity, and allow the road user to place the site in a context; in short, a cue of entrance can be significant for the place-qualities of a site. This category includes landmarks, typical natural elements, representative views and so on. It also follows that the road user, as a person moving on the road in a motor vehicle, needs to be able to observe and process the information that expresses the history, identity and context of the site. This means that features that give a sense of place while not contributing directly to the place-qualities of a site are also understood as cues of entrance. This category includes signage and other symbolized representations of a place.

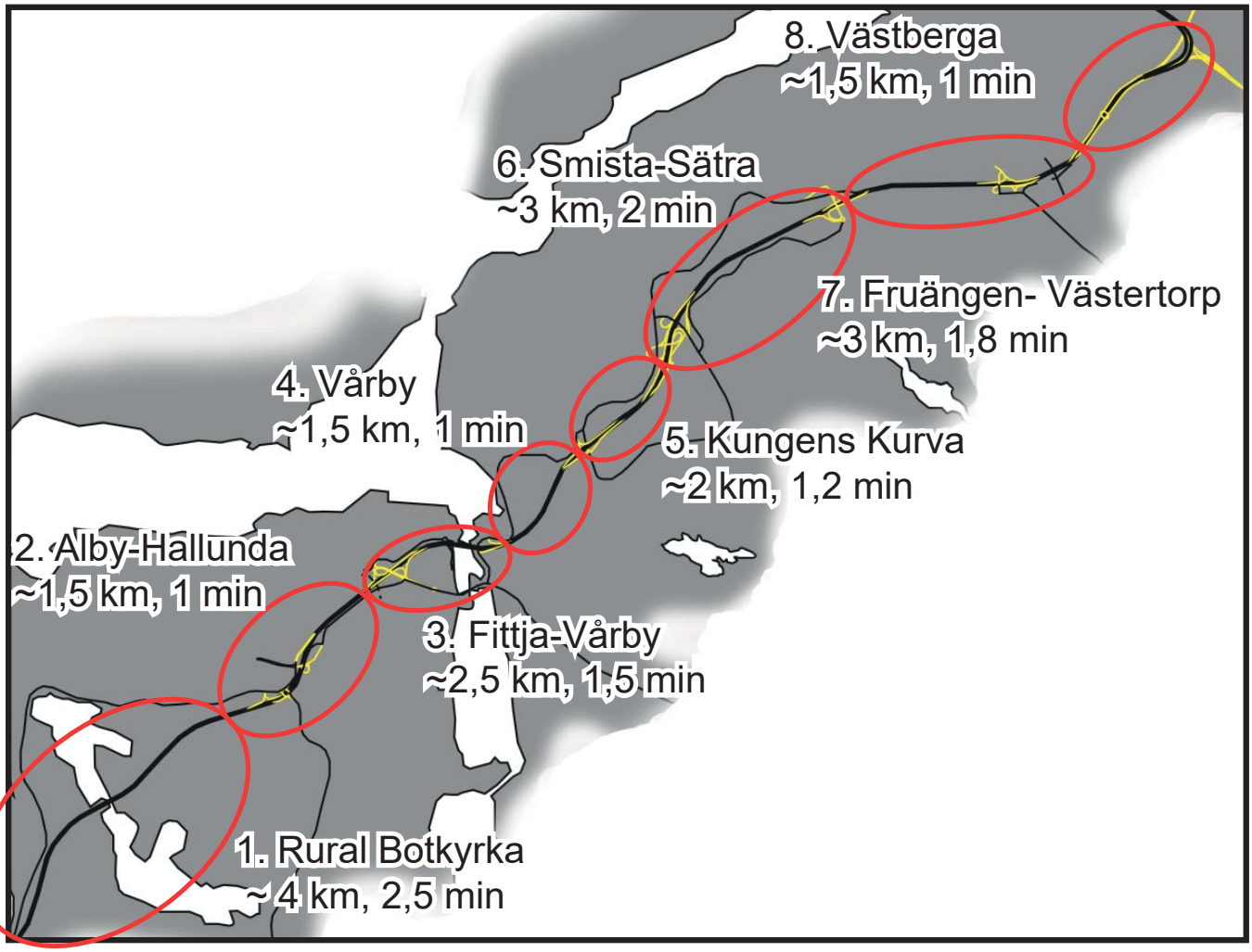
4.2. Analysis of the E4/E20 as the Southern approach to Greater Stockholm Region

In the context of this thesis, the Southern approach to Greater Stockholm Region is the highway E4/E20 from the municipal border of Botkyrka until the beginning of Essingeleden in central Stockholm city. This definition was encouraged both by Bosse Bergman's books *E4-staden* and *E4:n mot för mot* (2008a, 2008b) as well as the project's steering group at the Swedish Transport Administration.

As explained in chapter 1.3., the analysis has been carried out as a virtual journey through the E4/E20, moving along the highway in Google Street View, taking screen shots and transforming the most interesting and most representative views along the road into drawn images. These images have been annotated with first reactions to the roadscape as well as a more in-depth analysis about what the images tell about the aesthetic qualities of the road environment.

The studied stretch of the road has been organized into eight sequences, their length ranging between 3 and 1 kilometers. The approximate times mentioned in the map have been calculated with a speed of 100 km/hour, and do not necessarily correlate to the actual speed limits of the sequence. They still give an idea of how much or little time the road user has to perceive and understand their environment.

Each sequence is represented first with a short overview into its most notable features, its history and the likely changes in the area in the foreseeable future. Then the road environment is analysed as it has seemed in the Google Street view picture from either 2014 or 2016. Finally the findings of the analysis are evaluated against the goals for the aesthetic components of the road environment, and recommendations are given for adding new cues of entrance or otherwise improving the sequence so that it better contributes to the fulfilment of the goals.



Altogether about 19 km, duration of journey 12 minutes

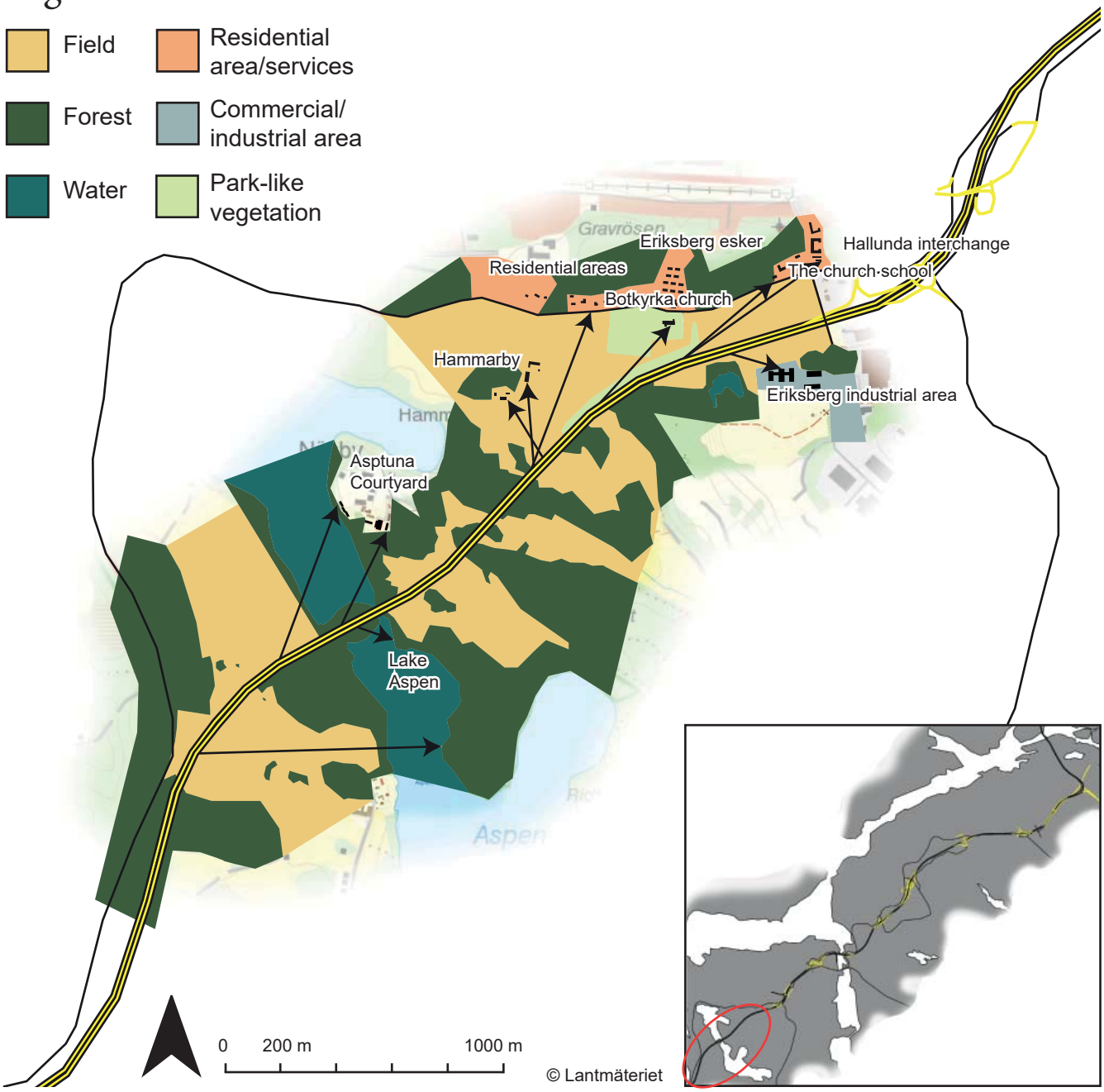
4.2.1. Sequence 1: Rural Botkyrka

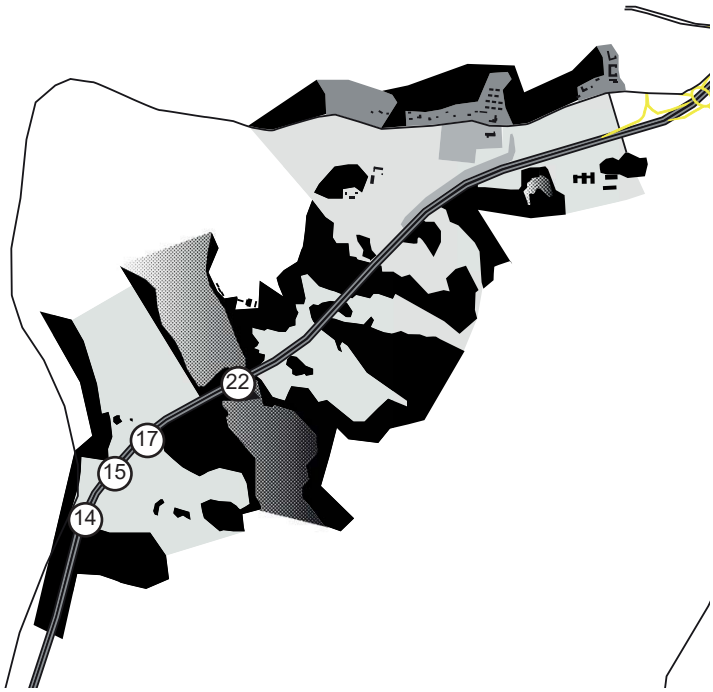
The E4 runs through the rural landscape of Salem and Southern Botkyrka, passing fields and forests in a relatively undulating landscape. A notable natural feature is the lake Aspen, which the road crosses. The whole sequence is of national interest as an area with high cultural values, with visible historical signs from pre-historical times and the Medieval times (Botkyrka 2011, p. 60-61.)

The Botkyrka church has obvious historical meaning, as it is the name-giver of the municipality and the sanctuary of the area's home saint Botvid (Botkyrka 2014, p. 16). The Botkyrka church and Eriksberg esker with the tall tower houses in Alby form significant goals for the road user. Additionally, there are both residential and service buildings along the stretch that give character to places.

Botkyrka municipality's general plan from 2014 points the triangle of Eriksberg-Alby-Hallunda as one of their main interests for expansion. According to a more detailed program of this plan, the open field between the church and the Hallunda interchange would be built as "The Southern Gate to Stockholm", the new business area forming a tight corridor around the road and climbing up the lower slope of Eriksberget. This would require a new interchange just past the churchyard. The planned development would bring about enormous changes in the scenic landscape, and thus have a significant influence on the road user experience along the E4.

The rural areas south of Hallunda with their fields and forests are pointed out as areas of interest for improving the ecological connections over the E4 (Botkyrka 2014, p. 25). To achieve this, the general plan suggests the building of passages, which would probably mean so-called ecoducts that would cross over or under the road. It is safe to assume that such measures would change the scenic landscape between the lake Aspen and the Botkyrka church.

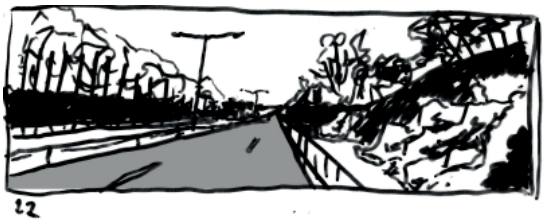

Legend
Field
Forest
Water
Residential area/services
Commercial/ industrial area
Park-like vegetation
Gravrösen
Eriksberg esker
Residential areas
Botkyrka church
The church school
Hallunda interchange
Hammarby
Eriksberg industrial area
Asptuna Courtyard
Lake Aspen
0
200 m
1000 m
© Lantmäteriet



14. After a stretch in the closed forest the landscape opens up to the east. The forests on either side of the road make a beautiful silhouette against the sky. The open fields and the alternating forest parties form a pattern that seems to indicate a long, continuous history of agriculture.

15. Shortly the fields spread to the Northwest as well. Between these two points there would be a possibility to open up a view to the lake Aspen, which would add to the sense of place.

17. The hill Fårberget starts to rise. The portal is visually supported by the hill and its vegetation. From here it would be possible to view the Asptuna Courtyard if it wasn't for the thick vegetation on the shores. Opening up a view towards it would provide the road user with a landmark that would increase their possibilities for orientation.



22. It is hard to tell that the road is crossing a lake due to the thick vegetation. The bare rock face gives a stronger character here than the lake. Providing a view to the lake on either side of the road would reinforce the sense of place, and make the road user understand that they are driving on a neck of land that is dividing the lake in two.

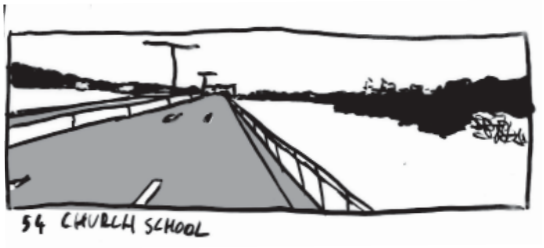
40. The Hammarby farm buildings and the more modern houses on the Eriksberget esker hint at the beginning of a more densely built area. The road user can slowly start to prepare themselves for the challenges of driving in an urban area.

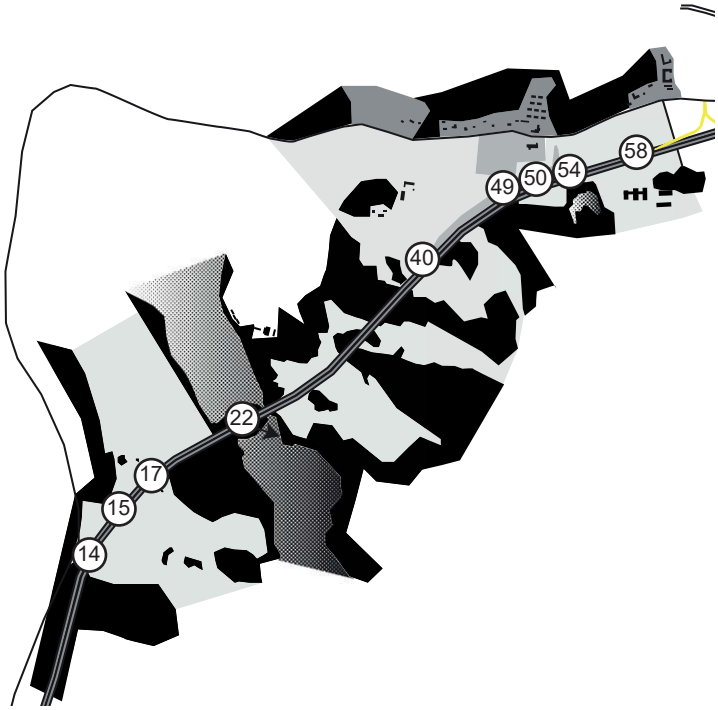
49. The Botkyrka church tower can be seen as a silhouette from afar. It is historically the most important landmark of this sequence, as it is the symbol and name-giver of the whole municipality of Botkyrka.

50. The open fields around the church should make it an obvious focal point, but the untidy noise berm and the trees by the church obscure it. There is a clear conflict between the church-goers' need for quiet and the highway.

54. The old church school's white color contrasts with the dark forest on the Eriksberget esker. To the west the field has an overgrown, wet character. The view grows quickly more complex, with many temporal layers and many possible points of focus.

58. The pedestrian bridge between Eriksberget esker and Eriksberget industrial area is a restless spot where traffic signs, commercial signs and the municipality's welcoming sign clash. In addition, the tall buildings on Albyberget start to show on the horizon. The result is distracting and chaotic.





Application of aesthetic criteria on sequence 1

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

There is a lack of hierarchy between the different elements in the road environment between Botkyrka church and Alby. It could be beneficial to direct the road user's attention to the church school on Eriksberget, so that they could better understand the connection between the church, the school and the residential areas as signifiers of the historical church village.

Orientation

Botkyrka church is a clear landmark for the beginning of the approach. The noise berm around it should probably be re-designed to link it better to the church village from the roadside, and to protect the church-goers better from noise.

The Aspen-lake and Asptuna Courtyard could be instated as landmarks by clearing vegetation and providing better views to them.

The slowly increasing inhabitation by Eriksberget's slopes is a gentle way of informing the road user of the approaching urban center.

Understanding

The mosaic of forest and field is a landscape characteristic that allows valuable insight into the area's agricultural history.

Identity

The sequence has a potential to express a strong identity by protecting the typical agricultural area, strengthening the area around lake Aspen and the Asptuna Courtyard, and the Botkyrka church village.

Recommendations

The meaningfulness of the sequence can be increased by strengthening the road user's connection to lake Aspen and Asptuna Courtyard. The status of Botkyrka church as the defining landmark of the beginning of the approach should be preserved. The development of the area around the church should be directed at strengthening the historical values of the site, and bringing them to the road user's attention. The cultural landscape with fields and forests should be conserved as far as possible.

No new cues of entrance are needed.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The existing signage and composition of the road environment direct decision-making adequately.

Psychological stability

There is nothing in the road environment that would specifically cause negative emotions. On the contrary, there are many motivating features available.

Balance in stimuli

The area around the pedestrian bridge is distracting, as there are too many objects clamoring for attention. This may cause a sudden rise in arousal, decreasing the quality of the road user experience.

Recommendations

The enjoyability of driving would be improved by relocating and/ or redesigning Botkyrka's welcoming sign and digital billboard that currently add up to a sudden, overstimulating view of the pedestrian bridge before Alby. Hiding the Eriksberget industrial area behind vegetation so that it cannot be seen in the same view as the welcome sign could be another possibility to improve the situation.

No new cues of entrance are needed.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The many valuable features of the scenic landscape would warrant a very high degree of landscape adaptation as a prerequisite for new constructions. (Botkyrka 2011, p. 41.)

Visual complement

Because of the vulnerability of the scenic landscape, the best way to complement the area visually is to draw from the existing qualities.

Beauty

The formal qualities of classic beauty could work well as guidelines for integrating possible new elements into the area.

Recommendations

Improving the quality of the scenic landscape in the area seems strongly tied to preserving its existing qualities. The planned development would strengthen the visual border between urban and rural, clarifying the entrance into the city, which also could be seen as a positive development in the scenic landscape (Botkyrka 2011, p. 41).

The new development would also provide a strong new cue of entrance, but it is very strongly recommended that the plans would be scaled down in a way that would better take the existing visual qualities of the place into consideration. Otherwise the result may be a worsened scenic landscape.

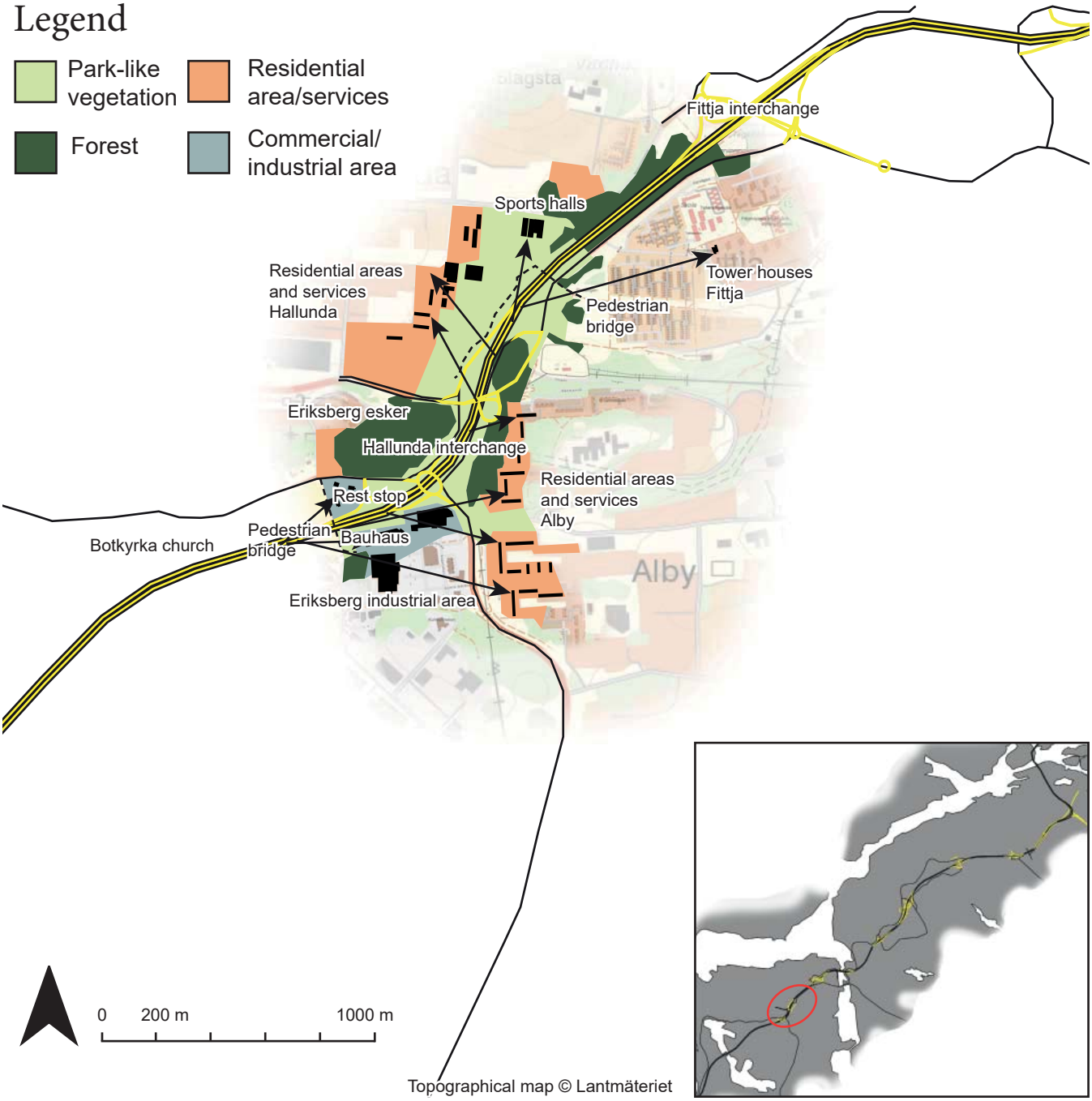
4.2.2. Sequence 2: Hallunda-Alby

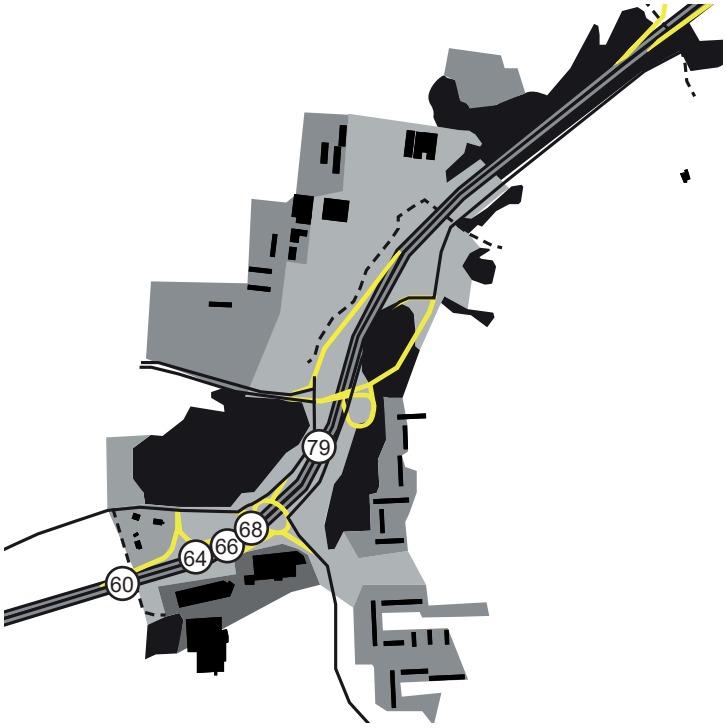
After the pedestrian bridge the view becomes more urban, with the tower houses on Albyberget growing ever closer. Glimpses of commercial buildings flank either side of the road before the break between two hills that houses the Hallunda interchange. After the interchange the road user can view the center of Hallunda to their left, and the forested slopes of Albyberget to the right. The district center makes itself known with faraway tower houses that are mostly overshadowed by the sports facilities between the habitation and the road.

The valley between the hills Eriksberget and Albyberget has been a landmark and a meeting place for people from the medieval times or since even earlier, which gives the Hallunda interchange historical weight. The sunken room at the heart of the interchange forms a comparison piece to a similar terraced road space in Haga Norra. Unlike Haga Norra, Hallunda has not acquired fame as the de facto entrance to Stockholm. (Bergman 2008b, p. 176, 180.) The long-term vision of Botkyrka municipality is to build a deck over the E4 at Hallunda interchange as a way to overcome barriers between Hallunda and Alby districts (Botkyrka 2014, p. 103). Whether or not this would be done in a way that respects the natural and cultural history of the area is yet unanswered.

Botkyrka municipality's general plan takes this sequence into account as one of their core areas for densification. Their primary interest is to increase the amount of buildings, mainly industry, directly by the E4/E20, as well as provide better social linkage between Hallunda, Slagsta and Alby. (Botkyrka 2014, p. 100-102.) This would increase the urban feel, and should have a significant effect on the road user's impression of having entered Greater Stockholm.

After passing by the sports halls and fields of Hallunda, the road user enters a short wooded corridor. Botkyrka municipality is interested in expanding the district of Fittja all the way to the edge of the E4/E20, both as a measure for decreasing noise in the district and as a way to frame the road, continuing the "southern entrance". (Botkyrka 2012, p. 31.)


Legend
Park-like vegetation
Residential area/services
Forest
Commercial/ industrial area
Fittja interchange
Sports halls
Residential areas and services Hallunda
Tower houses Fittja
Pedestrian bridge
Eriksberg esker
Hallunda interchange
Residential areas and services Alby
Rest stop
Botkyrka church
Pedestrian bridge
Bauhaus
Alby
Eriksberg industrial area
0
200 m
1000 m
Topographical map © Lantmäteriet



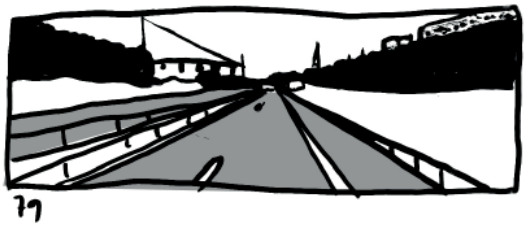
60. The bridge frames a view where many things compete for the road user's attention: The houses on Albyberget hill, Bauhaus and an electric sign to the right, and the rest stop to the left. The different messages and the approaching interchange seem like a lot to take in at once, which could induce stress in the road user.

64. As the road approaches the Hallunda interchange, the silhouette of the houses on Albyberget hill grows. It serves as a long-term landmark that motivates the road user.

66. The buildings in Eriksberg industrial area can be seen on and off, as the terrain changes and the vegetation is partly sparser and partly denser. Losing sight of the tower houses on Albyberget directs the road user's attention on the crossing bridge, instead.

68. After being shortly confined under the bridge, the road user's attention sharpens to make sense of the circular room inside the Hallunda interchange. The shape of the room is somewhat difficult to understand, partly because of its neglected condition (Street view 2014).

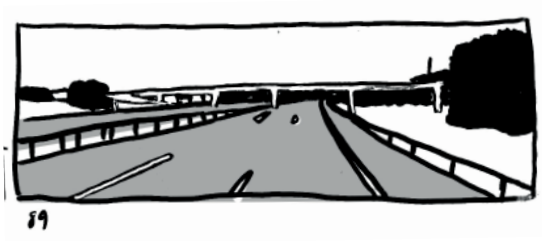
79. The housing on Alby passes the road user by quickly on their right-hand side, leaving a sense of confusion, as if the houses were just a theatre prop presenting a city. On the left, the rock face of Eriksberget esker is revealed to the road user.



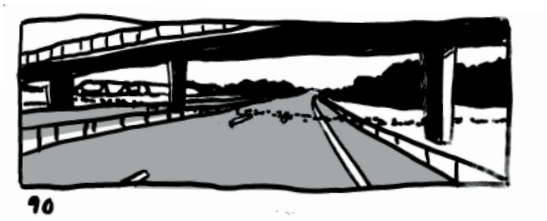
80. After the third bridge of the interchange the view opens up to the left, where Hallunda center lies. The tower houses of Hallunda have a relatively typical design, rather signifying an urban area in general than themselves in particular. To the right the road user can see the cut rock face of Albyberget hill.

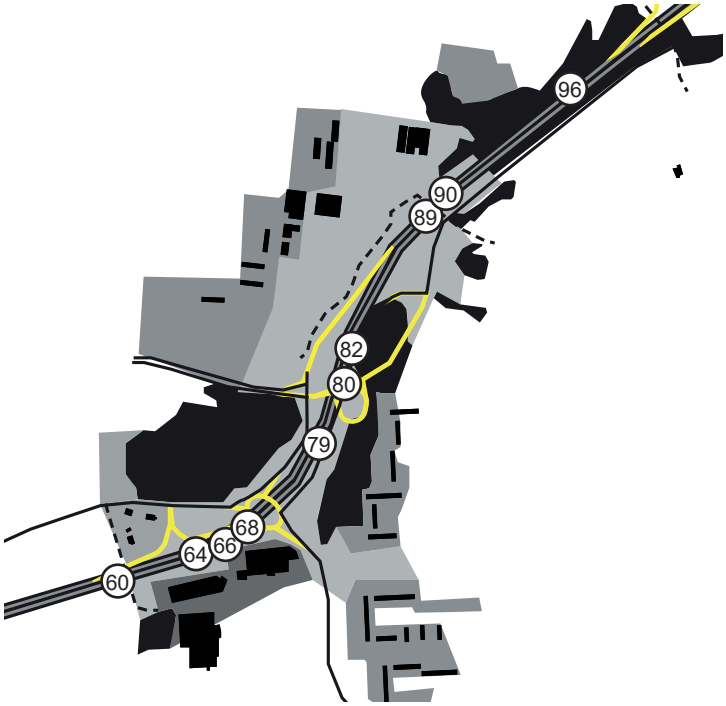
82. The hill on the right gives slowly way to a more even terrain, planted with islands of vegetation in a meadow. They recall to mind the islands of vegetation in the fields in the earlier sequence, but the connection is not obvious: the planted islands are not raised from the grassland, as is typical of remnant vegetation in agricultural fields.

89.-90. The pedestrian bridge between Hallunda and Fittja has a peculiar spiral slope on its left side. School buildings and red-green, half-circular sports halls can be seen behind it. Both are unique features along the approach, and are clear markers of the place. Passing under the bridge, the road user gets a good look at the bright red sports halls before heading into a long tunnel of green.



96. The stretch of road is a narrow, vegetation-lined shaft that continues all the way to the next interchange in Fittja. The road user may become disorientated and wonder why the previous signs of dense habitation suddenly stopped. On the other hand, because of the short duration of the stretch it could also serve as a possibility for the road user to relax and collect themselves before the interchange.





Application of aesthetic criteria on sequence 2

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The Hallunda interchange has untapped potential for presenting Botkyrka in a positive light. A renovation that takes into account the interchange's location as a historical meeting place could show the municipality's special qualities.

Orientation

The view of Alby tower houses, the Eriksberget hill and Hallunda interchange between them is a distinct view that anchors the road user strongly to the place.

Understanding

The road user's understanding of the patterns of built and unbuilt areas is not supported by the current land use of this sequence.

The traffic islands with clumps of vegetation are a lost opportunity to remind the road user of where they came from.

Identity

Hallunda has a poor presence in the road environment, and only becomes known for sports.

The latter pedestrian bridge and racket halls make a distinct image, thanks to their interesting shapes and contrasting colours.

Recommendations

The currently readable meanings in the area do not represent the amount of meanings actually present. These cultural and historical values could be presented in the road environment with reasonable effort. The road user's understanding of the urban fabric could also be improved.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The momentary disappearance of the important elements in the landscape, Alby tower houses and Eriksberg industrial area, directs the road user's attention to the roadway. This is an interesting effect that could be utilized to improve the road user's decision-making capability. In this particular place, however, there are no important decisions to be made.

Psychological stability

After the road user passes by Alby, there are few significant landmarks along the way that would encourage the road user to keep going. In the worst case the road user becomes confused, as the urban area they waited for seems vague and small. This could cause some frustration.

Balance in stimuli

The high-stimuli area around the first pedestrian bridge collides with the beginning of the interchange, where the road user needs to concentrate on taking the right lane if they are to leave the highway. See previous sequence.

The short passage through a wooded area before Fittja interchange is low in stimuli, providing a chance for the road user to rest their mind.

Recommendations

The experience of driving is affected negatively especially by the lack of continuation in the road environment: the "city entrance" at Hallunda interchange hardly seems to lead into a city at all. The entrance qualities would greatly benefit from new cues of entrance that would increase the sense of urbanity along the stretch.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The hills Eriksberget and Albyberget have a high value for the scenic landscape, and should be treated with respect. Hallunda center is much less vulnerable, and the demands to landscape adaptation could be lower.

Visual complement

If a gate-like expression is sought after in Hallunda interchange, the potential new buildings in Eriksberget could be designed as an extension of Alby. Hallunda center lacks a similar clear direction, and the potential new constructions could differ from the existing style.

Beauty

In the areas with a sensitive scenic landscape, balance, harmony and unity could be words to live by.

If Botkyrka municipality wanted to express their motto "Far from moderate" ("*Långt ifrån lagom*") in the development of Hallunda, the aesthetic impression could be one of "quirkiness", instead.

Recommendations

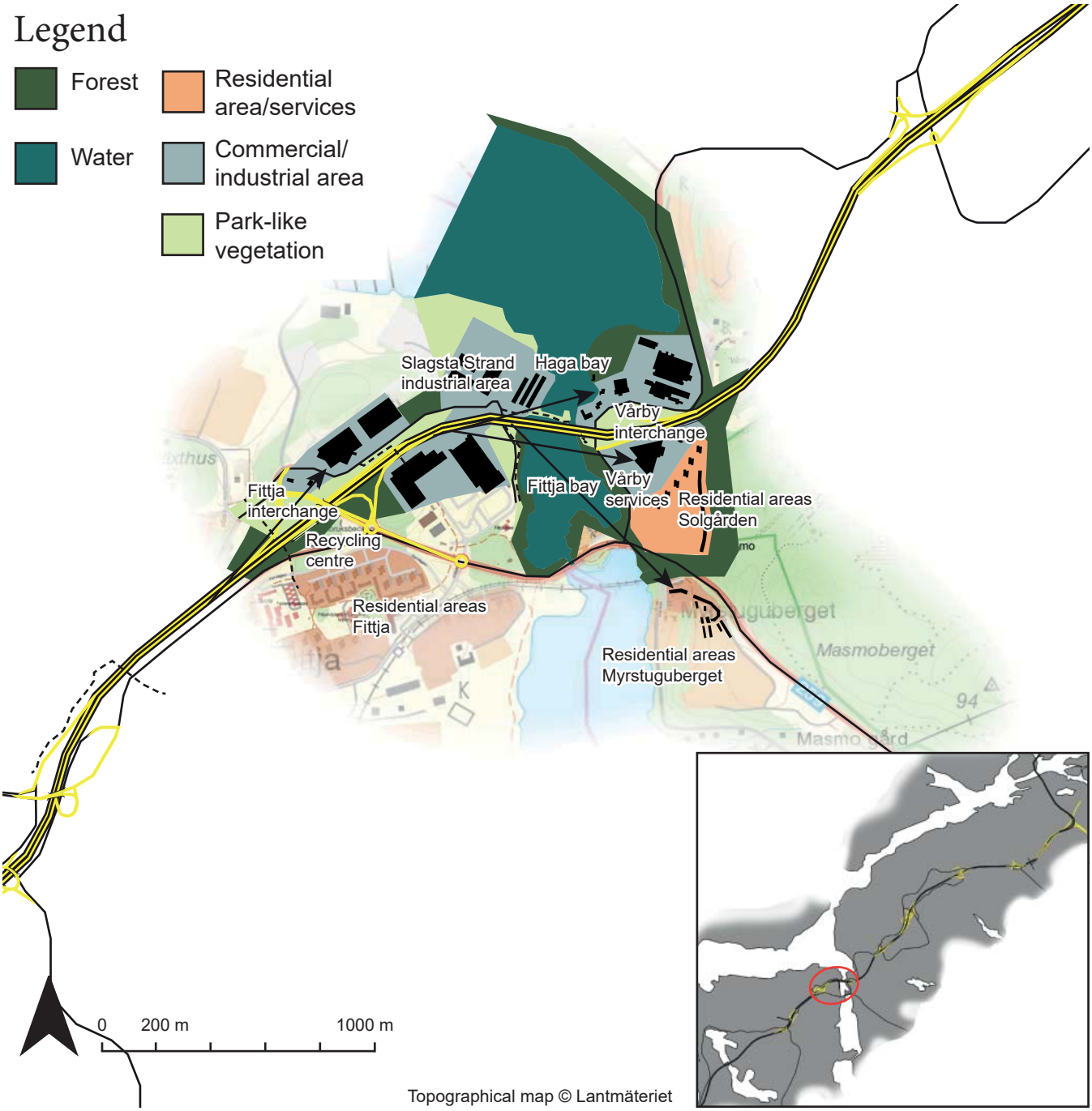
The possible new expansions of Hallunda, Eriksberget and Fittja would be recommended to be done in moderation so as not to do away with the green components of the scenic landscape. On the other hand, increasing the built area and expressions of urbanity could improve the scenic landscape to a certain point. Densifying Hallunda would give weight to Botkyrka's claim of being the southern entrance to Stockholm.

4.2.3. Sequence 3: Fittja-Vårby

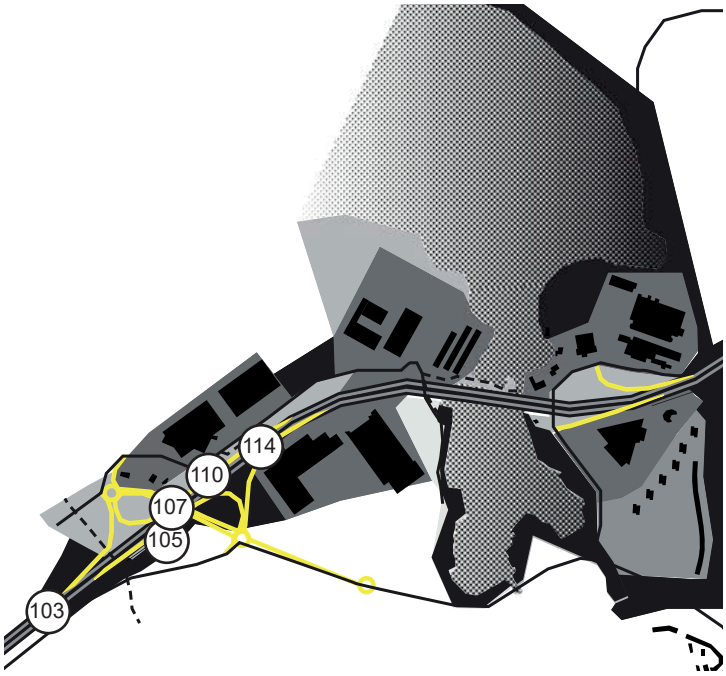
The Fittja interchange has the large commercial building Slagsta Gate as a clear focal point in the composition. After passing under the interchange, the road user enters a corridor of commerce and industry. As the road user approaches the lakes Albysjön and Mälaren, they pass by the Slagsta strand industrial area. The attractiveness of the lakeshore is meant to be improved by changing it to a mixed-use area. (Botkyrka 2014, p. 102.) Possible changes to the road environment are hard to predict.

The bridge over the lakes passes just short of the Fittja cape where the development of the districts around it originated (Bergman 2008b, p. 220). Especially the views to Fittja bay and Vårby are remarkable, as the hills Duvberget and Masmoberget rise in the horizon. The tower houses of Solgården and Myrstuguberget residential areas are also significant factors in the scenic landscape (Trafikverket 2016c, p. 68). Possibly this combination of lake and hill is one of the reasons why the E4/E20-chronicler Bergman (2008b, p. 217, 224) describes the passage from Fittja to Vårby as the most variable, highest-contrasting area with great drama along the approach. The landscape analysis for the new highway Södertörn cross-connection (Trafikverket 2016c, p. 68) goes so far as to name this place as the main entrance to Stockholm from the south, as it has been a transport hub for a long time.

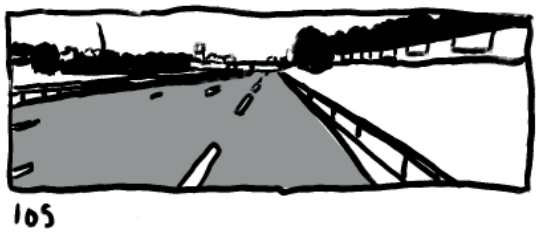
Great changes are to be expected in Vårby due to several large infrastructure- and expansion projects. Huddinge municipality has pointed this area out as one of their most important local centers, aiming to increase both the amount of housing and business on either sides of the E4/E20. This is enabled by the relatively low grade of exploitation today, as well as the re-purposing of the Spendrups brewery area north of the highway. The municipality also intends to create a passage between the two hills Duvberget and Masmoberget, so that both people and animals can cross the highway safely. (Huddinge general plan 2030, p. 5, 72.) In the face of the overall changes in the area it can be hoped that the passage is integrated into the new constructions.



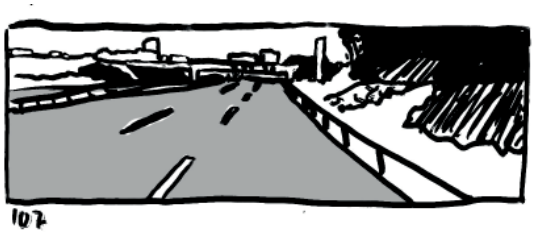
Topographical map © Lantmäteriet



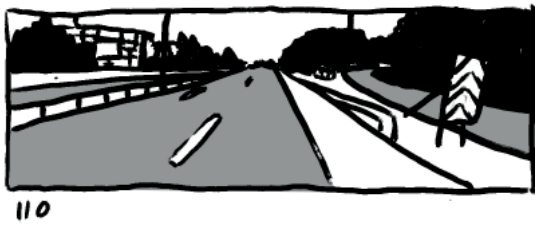
103. The Slagsta Gate building at Fittja interchange becomes visible on the left, finally giving a goal for the road user.



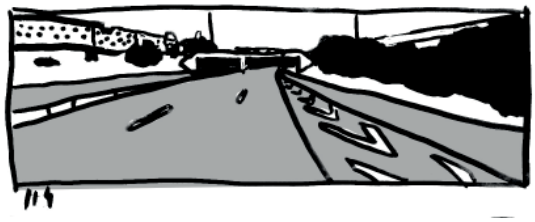
105. The interchange has a semi-open park-like feeling. The red fence of the recycling center to the right is quite visually dominating in this otherwise green/ bleak environment. Generally the interchange has a reasonable complexity, leaving the road user with a good amount of free cognitive capacity.



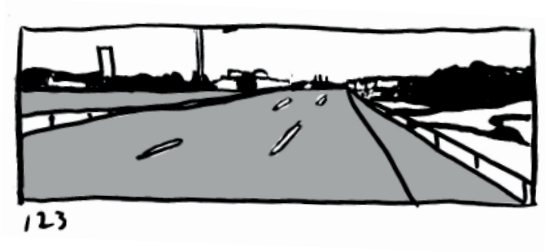
107. After the fence ends the road user is faced with plenty of information at once: The commercial signs of the shopping center to the left and the bright orange gas station tower to the right compete with the traffic signs right in front of the bridge. As this is also the final chance for the road user to turn right and leave the highway, it may be difficult to make the decision in time.



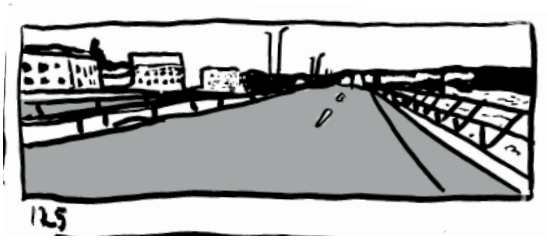
110. The light commercial buildings to the left are intuitively favored over the darker forest to the right. The traffic signs of the fork in the road leave a strong impression because of their bright color and close proximity, even though they require no action on the part of the road user continuing on the highway.



114. The orange streak at the top of the Hornbach building grabs the road user's attention. The pedestrian bridge in front has a simple but well thought-out form that makes it distinctive. On the other hand the vegetation here gives an overall look of neglect. There are many impressions at once that do not build a coherent overall picture.



119. Only pipes, masts and elevated signposts are visible behind the earth berms. The macadam-clad berm slope to the right feels out of place, and a redesign could be in order for improving the visual cohesion.



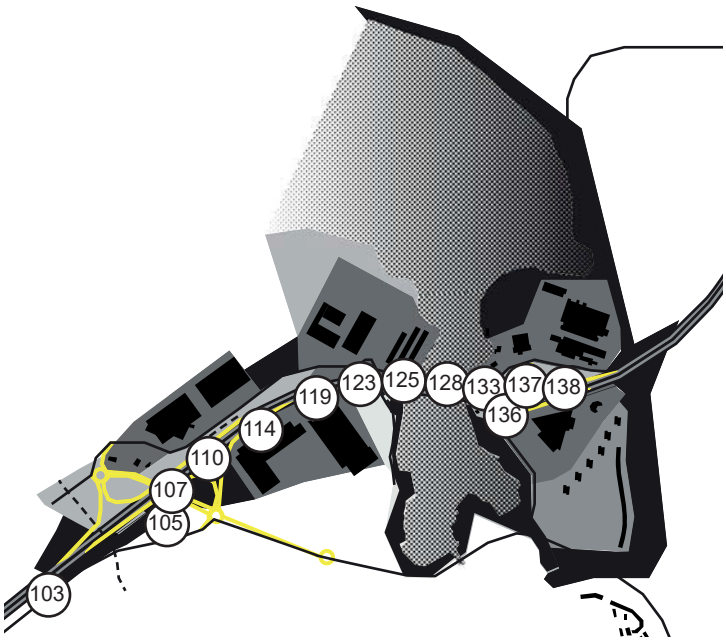
1233. The slopes end and the road user gets their first view of the Fittja bay, the Slagsta Strand industries and buildings in Vårby. The tower houses provide a clear target for the road user, motivating them to go on.

125. The three commercial buildings just before the Fittja cape seem isolated from the rest of the industrial area, and are experienced as irritating because they block the view to the lake Mälaren.

128. The dimly translucent plastic between the railings allows the road user limited views to and over Fittja bay on their right, but the vegetation on Fittja cape restricts views to the Haga bay and beyond on the left.

133.-136. The long-awaited target Vårby center approaches fast, allowing the road user to observe its details. The sign “Huddinge municipality” is placed right at the end of the bridge. It is unfortunately overpowered by the larger, more colorful commercial sign right behind it.

137.-138. A faded brown fence begins by the corner of the shopping center. The Spendrups brewery on the left can be experienced as a landmark. Its large billboard catches the road user’s eye on the left. On the right the Vårby health center passing by means leaving the urban area behind.



Application of aesthetic criteria on sequence 3

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The different messages in the commercial area of Slagsta Strand create a cacophony that is hard to decipher. The environment could be unified through conscious design of the roadway in the area.

Huddinge municipality's sign is overpowered by the commercial for services in Vårby. This does not give a good impression of the municipality.

Orientation

Slagsta gate is a good landmark of the Fittja interchange.

The view of Vårby over the lakes Mälaren and Albysjön is among the strongest landmarks of the approach.

The Spendrups brewery area with its distinctive buildings will be re-purposed in the future.

Understanding

Fittja cape is hidden from view, even though it has historically been the heart of the establishment of both of the districts around it.

A landscape analysis for Fittja-Vårby is especially concerned with preserving the signs of different generations of infrastructure as an expression of the area's significance as a historical meeting place for different forms of transportation (Trafikverket 2016c, p. 68).

Identity

The view over the bridge is extremely distinct, with the residential areas on both of the hills having their own identities as well.

Recommendations

Huddinge's sign for the municipal border could be relocated away from competing messages or complemented with a feature that would elevate the identity of the municipality above the commercial messages in the environment.

The second option requires great delicacy in choice of location and design, as the road environment already carries heavy meanings, which also the new development on both sides of the lakes should consider in their plans.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

Toning down the fence of the recycling center SRV in Fittja interchange would allow the road user to concentrate better on the traffic to the left.

Psychological stability

Visually dominating signage may unsettle the road user briefly, as it may make them feel like they should react to it even when it is directed at people using another lane.

Balance in stimuli

The view towards the Fittja interchange bridge is cluttered with commercial information, although the road user should be concentrating on choosing the right lane and staying on it.

Recommendations

The Fittja interchange could be simplified even further by reducing the amount of brightly colored elements that distract from the traffic functions of the place.

No new cues of entrance are needed.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The scenic landscape in Slagsta and Fittja is probably quite robust, and landscape adaptation in the area does not need to be too ambitious.

The scenic landscape of the lakeshores is more sensitive, and the goals should be set higher. The view of Vårby with its hills is highly vulnerable, and should be treated with care.

Visual complement

The immediate road environment through Slagsta should be redesigned in a way that unifies the different impressions that commerce and industries around it give.

If the Huddinge sign is to be emphasized with a new feature, it should place lower in the hierarchy than the holistic experience of Vårby.

Beauty

Beauty may not be the most important aim for the road environment in Slagsta and Fittja.

Development of the lakeside could follow the classic ideals of beauty.

Recommendations

No new cues of entrance are needed as such, but improving the impression of the road environment in Slagsta and taking good care of the scenic landscape in Vårby would greatly enhance the road user experience.

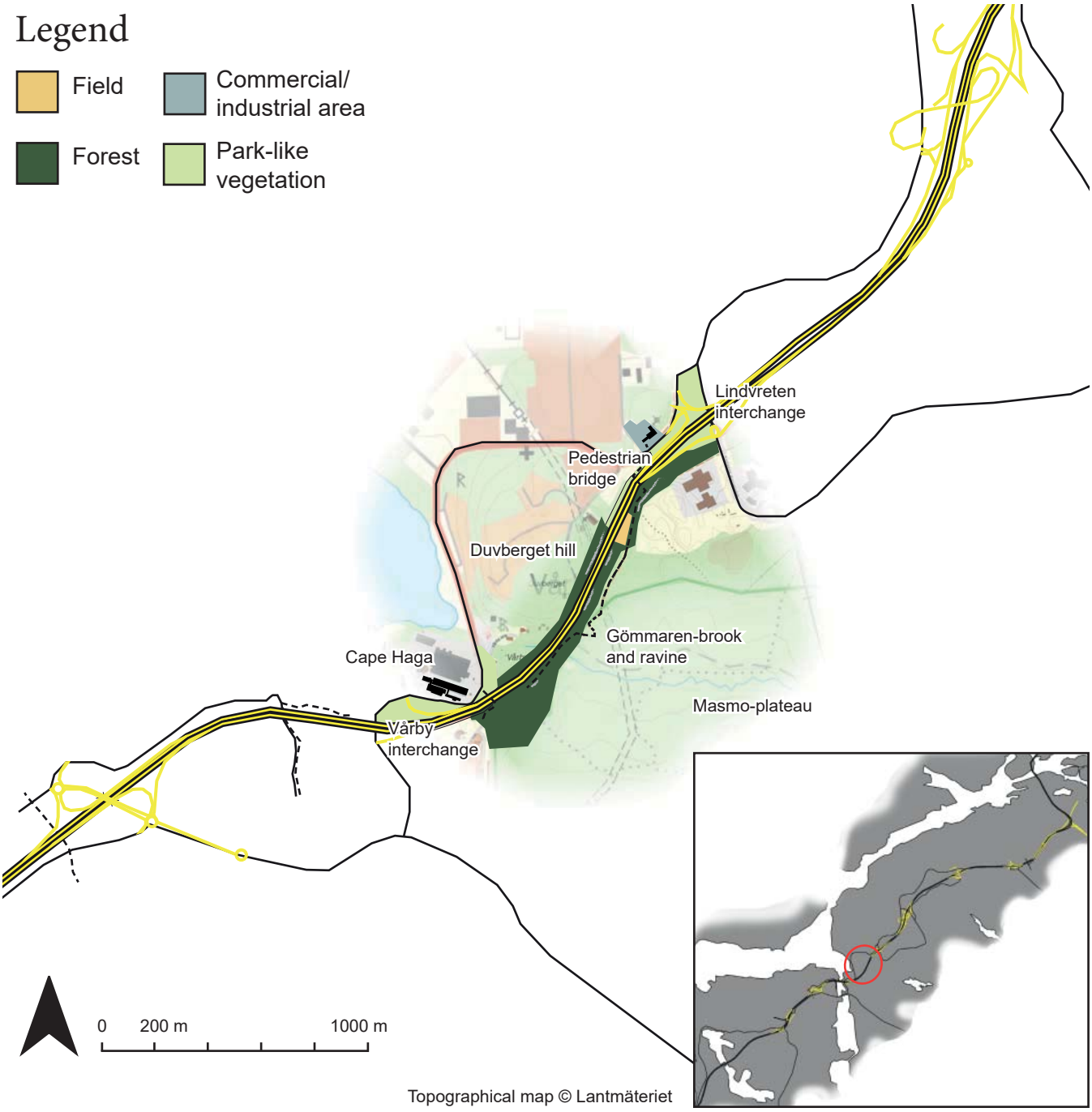
4.2.4. Sequence 4: Vårby

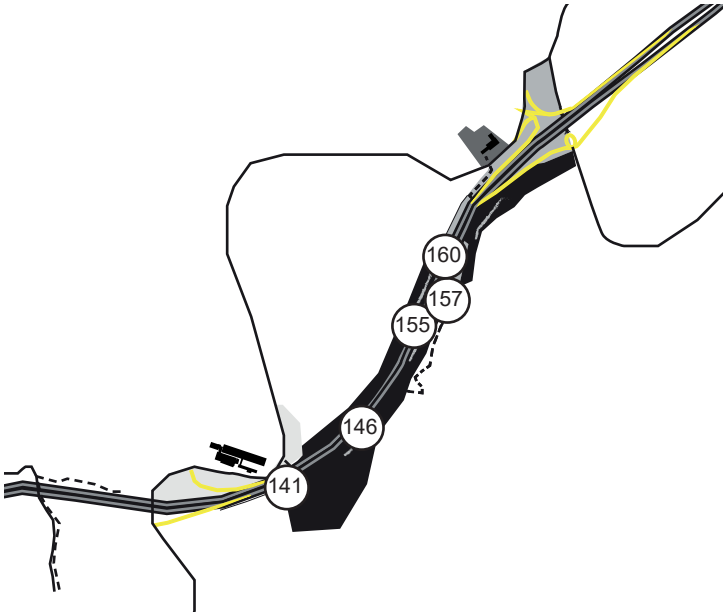
The sequence through Vårby is at the moment an uneventful corridor through a passage between two hills, evidenced by a number of rock cuts. The hills are wooded, both belonging to important nature- and recreational areas. As Bergman (2008b, p. 224) points out, this is the only stretch in the studied area where the highway is surrounded completely by true forest.

The forest to the east of the highway is the westernmost edge of the Masmo-plateau. The plateau is a rocky forested area on a variably rising and falling hill range, including few small open parties at formerly inhabited places. The whole forest on the plateau has been pointed out as an especially sensitive characteristic area with high natural values. Parts of the forest will be cut down to make space for several large infrastructure projects: The Södertörn cross-connection, its northern fork Masmolänken, their respective interchanges, and the Southern tram line.

The especially significant Gömmaren-ravine and the brook running at its bottom crosses the E4/E20 in Vårby, challenging the future development in the area to preserve as much of the natural values of the site as possible. The landscape analysis for the area is however pessimistic about the success of amending measures, as the values of the Masmo-plateau are very much tied to its wholeness and its linkage to the forests north of the highway. (Trafikverket 2016c, p. 4-5, 37, Huddinge general plan 2030, p. 73.) It is safe to say that this sequence will not be the same when the constructions begin, neither from the perspective of road user experience, scenic landscape, nor ecological functions.

The passage through the forest has also an important preparative function for the road user. Bergman (2008b, p. 224) mentions it as a stretch where the road user can concentrate on the densely placed traffic signs, so that they will be on the correct lane when they enter the Lindvreten interchange. The interchange offers possibilities of continuing towards Stockholm on the highway or leaving it for Kungens Kurva or Skärholmen.


Legend
Field
Commercial/
industrial area
Forest
Park-like
vegetation
Lindvreten
interchange
Pedestrian
bridge
Duvberget hill
Gömmaren-brook
and ravine
Cape Haga
Masmo-plateau
Vårby
interchange
0
200 m
1000 m
Topographical map © Lantmäteriet



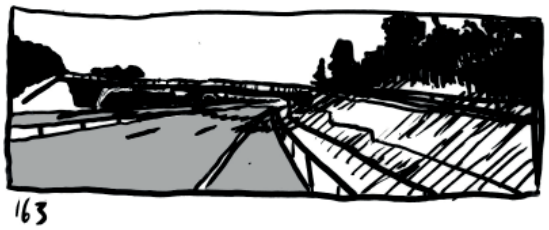
141. The fence ends at a pedestrian underpass. The commerce on cape Haga and the services of Vårby give way to forest. The border between built and unbuilt is very clear, which supports the idea of passing through a larger forested area.

146. The walk-and cycle path on the right allows the road user to take part in the everyday life of the area. Occasionally it is possible to get a glimpse of the rock underneath the forest. This is also the point where the Gömmaren-ravine and the brook with the same name cross the highway.

155. A more massive cut through the rock creates a high wall to the left, while on the right it shows as smaller, separate pieces of stone. This communicates the north-west-to-southeast orientation of the rock, providing an insight into the geological structure of the area.

157. A short piece of a semi-open landscape is visible behind this tree border. Unfortunately the field is overgrown, creating a messy feeling. The size of the opening is in line with the typical structure of the Masmo-plateau.

160. The opening is over as soon as it began. The traffic signs signal the approach to an interchange. A red fence behind the vegetation on the left protects the residential area from noise. The rock hill on the right side can be seen through the sparser vegetation at the border between the semi-open patch and the wooded belt between the road and the industries. This border between the more natural and more cultural environments may heighten the road user's attention, so that they are awakened to their final chances of taking the rightmost lane out of the interchange.

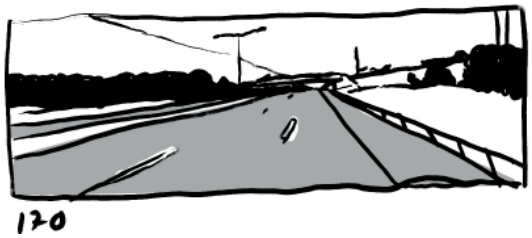


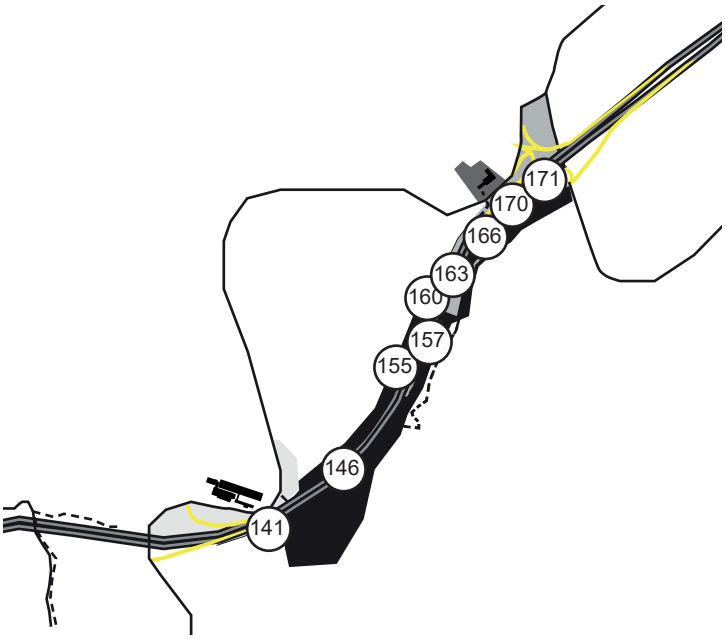
163. The walk-and cycle path on the right follows the rise of the rock, turning sharply to a pedestrian bridge. The slope has been carefully supported with stone-filled gabions. Pictures taken in May show the bright pink blooms of *Lychnis viscaria* on the slope. With proper management this slope could look very nice, as it already has a distinct design that separate it from other bridges along the studied stretch of E4/E20.

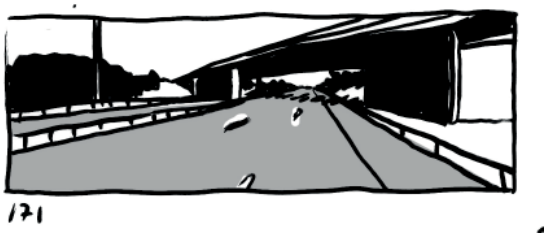
166. The gabions continue for a bit after the bridge. The vegetation on the left takes on a more park-like character, while the forest continues on the right. The pedestrian bridge creates an entrance to the interchange, the continuing gabions tying the two sides together.

170. The building of Södertörn Fire-fighters association can be glimpsed on the left. On the right a bright red art piece on a roundabout in the intersection cuts a towering figure. Unfortunately views to both are obscured by vegetation, diminishing their value as landmarks.

171. The diagonal position of the Lindvreten interchange's bridge creates dynamism, which is visually interesting. The design of the bridge is basic but neat, sitting well in the overall composition of the interchange.







Application of aesthetic criteria on sequence 4

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The image of a sequence with a more wild character can be supported by taking good care of the cultural elements in it. In this case the neatness of the slope to the pedestrian bridge and keeping open areas from growing closed (if the openness is desirable also from a conservational point of view) could be possible measures for achieving this.

Orientation

The clear border between Vårby residential area and the forest divides spaces and atmospheres effectively.

Both of the bridges in this sequence have enough character to serve as milestones, but not enough to be significant landmarks.

The art piece at Lindvreten interchange could have a stronger presence.

Understanding

Both the Gömmaren-ravine and the Gömmaren-brook are valuable signs of the natural history of the Masmo-plateau.

Allowing views to the cycling-and walking path connects the road user to the inhabitants of the area.

Identity

The cut rock faces are a typical feature of this approach road, as hills with a rock heart are a characteristic of the Södertörn landscape.

Recommendations

While this sequence is lacking in landmarks with significant personalities, it contains important meanings related to natural history.

The distinctiveness of the Lindvreten interchange could be improved by removing the obscuring vegetation between the art piece and/ or the Södertörn fire-fighter's association and the road user.

No new cues of entrance are needed.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

By giving the traffic sign visual support, its message can reach a more attentive audience.

Psychological stability

The environment includes few distinctive elements to act as goals. On the other hand, the monotonous passage is quite short, and will grow even shorter.

Balance in stimuli

The stimulation in this area is evenly low, with the strain of the traffic environment growing towards the Lindvreten interchange.

Recommendations

Slightly increasing the visual interest of the Lindvreten interchange could improve the road user's cognitive and emotional response to approaching a significantly more urban area, see summary for appreciation.

The future development of this sequence is likely to increase both the amount of visual stimuli and the high demands of the traffic.

No new cues of entrance are needed.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The Masmo-plateau and the forest on either sides of the highway are very valuable, and landscape adaptation needs to be a top priority.

Visual complement

The best way to complement the features of this sequence is to integrate possible new elements into the existing scenic landscape.

Expressing continuity through the design of constructed elements, like the continuing gabions on both sides of the pedestrian bridge, could be utilized to tie the new constructions together.

Beauty

According to Meyer (2008, p. 6), beauty and other positive aesthetic experiences create ties between people and their environment, thus increasing understanding and acceptance of ecologically motivated projects and features. Thus beauty could be used as a tool for protecting the remainders of the natural features in this area.

Recommendations

The scenic landscape of the forested areas has been evaluated to be extremely sensitive, and landscape adaptation is deemed to have little effect on preserving or amending it.

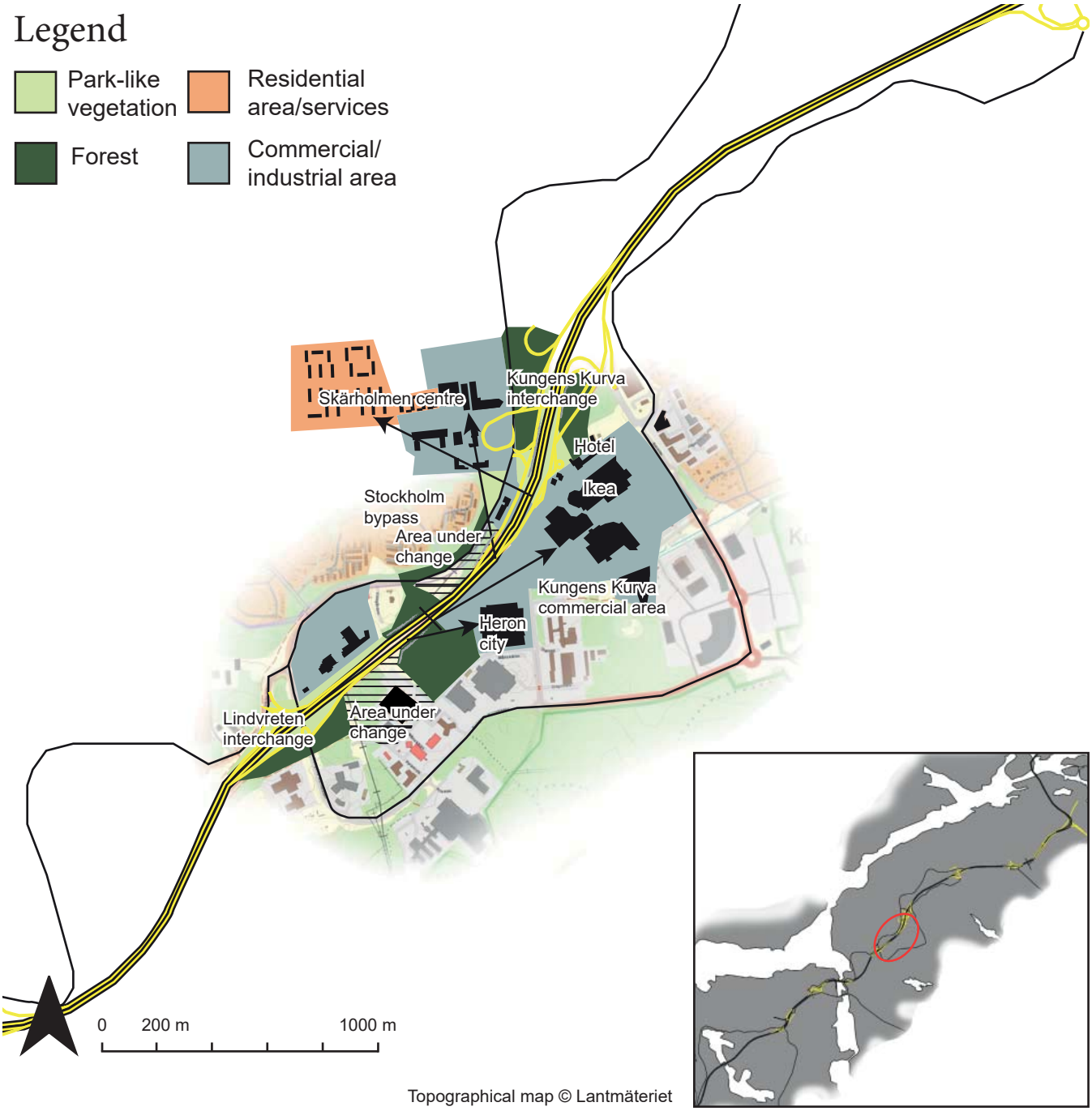
No new cues of entrance are needed.

4.2.5. Sequence 5: Kungens kurva

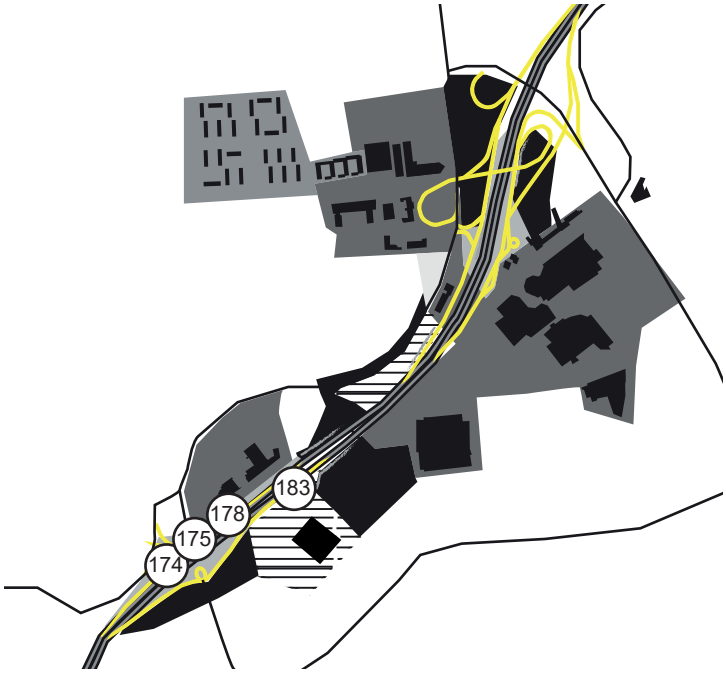
After the Lindvreten interchange the road user enters a brief stretch with a few commercial buildings and vegetation. A short passage between two rocky hills precedes the business district of Kungens Kurva, which has Ikea and Heron City as its special attractions. Viewed from the road, the Skärholmen center on the opposite side of the road is almost equally important with its masses of tower houses rising on the numerous hills of the district. As the aesthetic design brief for the Stockholm bypass points out, the area is strewn with small rock hills with natural vegetation. Especially by Skärholmen center and the Kungens Kurva interchange the bare rock and the characteristic oaks are a significant feature for the area's identity. (Trafikverket 2011a, p. 62, 66.)

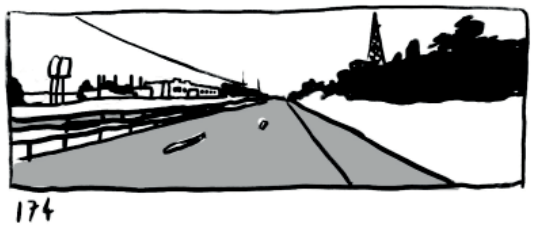
This sequence will be changed dramatically with the construction of the Stockholm bypass. It is an enormous infrastructure project that separates the highway E4 from E20, the former getting an entirely new alignment that curves away from the central parts of Stockholm (Trafikverket 2011a, p. 5). The new E4 will descend into a tunnel in the middle of Kungens Kurva, requiring a reconstruction of the existing Lindvreten interchange and a new interchange right behind it as well as a large decking over the mouth of the tunnel. The E20 will continue northwards at the outermost lanes of the new complex. Pedestrian connections between Skärholmen and Kungens Kurva are also to be improved in the project. (Trafikverket 2011a, p. 62.)

The new visual expression of Kungens Kurva's roadspace will follow the overall guidelines set for the Stockholm bypass, and take into consideration the large scale of the highway. The traffic separators and median strips are mentioned as connecting elements within the bypass, whereas different kinds of protecting barriers towards the commercial and residential areas are to be linked in design with the noise barriers of Masmolänken. All in all, the complexity of the traffic situation is intended to be met with a logical and understandable traffic environment. (Trafikverket 2011a, p. 62, 66)

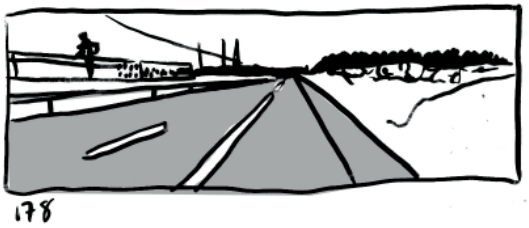


Topographical map © Lantmäteriet





174. Early outposts of the approaching commercial areas can be seen on the left. The electric towers start to make frequent appearances in the landscape. Both are clear signs of increasing urbanity.

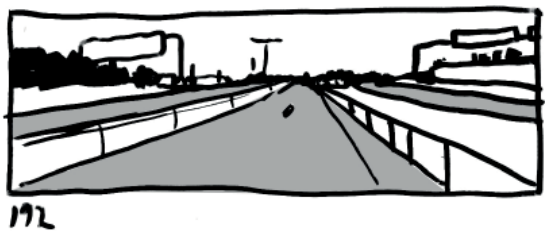


175.-178. The first picture has been drawn after a Street View photograph from 2014, the second picture after a photograph from 2016. The terrain has been clearly altered, and the development of the area has required removal of vegetation. The commerce on the right has been brought to sight, and a new interchange/overpass is under construction. A completely new set of landmarks and other characteristic features is about to emerge as a result of the changes in the area.

183.-184. The road runs through a cut in the rock. Heron City shopping center is visible behind the hill on the right. The rocky hills are a characteristic that define the natural topography of the area, whereas the commercial expansion is the force that has created the contemporary flat landscape. The bridge in process in this picture is for pedestrians and cyclists, with unusually high walls.

187.-190. Heron city with its large parking lots on the right. The area on the left is being used for the construction of the bypass. It is still possible to see quite deep into the commercial area of Kungens Kurva. This area will probably change the most with the Stockholm bypass, as the E4 will run into a tunnel around here, whereas E20 will continue onwards to Stockholm city.

192. The Ikea building on the right will probably remain a landmark in Kungens Kurva. This is also the spot where Skärholmen center becomes visible, with its imposing cluster of tower houses on a south-facing slope.



194. Skärholmen center on the right also has a piece of art to mark itself, a tall sculpture with a ribbon-like form. The sculptor Aston Forsberg has named it "*Vridande moment*", which could be translated for example as "rotational force" or "twisting moments", but people have also interpreted it as a "don't-forget-knot" and as an "image of the king disembarking from their ship" (Bergman 2008b, p. 234). This goes to show that people have remarkable imagination that they can use to interpret their environment.

196. As topography, rock and vegetation hide Skärholmen and the Northern parts of Kungens Kurva from view, the more natural elements start to catch the road user's eye. A lone oak tree at the road branch in the intersection is clearly separate from the vegetation behind. The bare rock cliffs give character.

197. Passing by the oak and approaching the bridge of Kungens Kurva interchange. The Northernmost corner of the commercial area fleets by behind the oak.

200. The underside of this bridge is neatly detailed and joins the rock face on the right beautifully. The left side and the median strips are not even half as nice, creating a dent in the overall image.

Application of aesthetic criteria on sequence 5

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The main messages of Kungens Kurva and Skärholmen center are clear: buy, buy, buy. While this kind of a message may not be experienced positively by all, it unifies this sequence.

The bridge over Kungens Kurva interchange is a reminder of how poor vegetation and an unevenly distributed design effort worsen the general image.

Orientation

Ikea, Skärholmen center and the sculpture "*Vridande moment*" are probably the strongest landmarks in Kungens Kurva at the moment.

One of the goals for the design of the Stockholm bypass in this area is to increase orientation through clear physical separation of the new E4 from the E20 that continues towards the city center.

Understanding

The effect of urbanization on the amount and quality of natural elements is clear in the changing roadscape. While this process is most obvious during the construction of the Stockholm bypass and other infrastructure projects, many of the marks it leaves will remain for a long time. A good example of this are the numerous vertical rock faces that are evidence of human influence.

Identity

Kungens Kurva will develop a new identity with the creation of the Stockholm bypass. Some of the old character should be retained, such as the small vegetated hills and views towards both Kungens Kurva and Skärholmen.

Recommendations

Kungens Kurva is clearly a commercial landscape, that hopefully will develop in a direction that also takes social values into consideration. The few remaining natural features should be protected as signs of the area belonging to the larger environmental context of Södertörn.

No new cues of entrance are needed.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The lone oak in the fork of Kungens Kurva interchange acts as a dividing element for those who exit the highway.

Psychological stability

The complexity of Kungens Kurva increases evenly, letting the road user get used to it.

The electric towers give a clear rhythm to the journey.

Balance in stimuli

The road environment and traffic situation will change so strongly that further speculation is deemed unnecessary.

Recommendations

The construction of the Stockholm bypass will change the experience of driving in the area.

No new cues of entrance are needed.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The Stockholm bypass project aims to retain the vegetation and small rocky hills that are remnants of the earlier landscape of the site.

Visual complement

Since the scenic landscape should be quite robust, even contrasting elements can find their place in it.

Beauty

The concept of beauty may not be central to this area.

Recommendations

The formal aesthetic qualities of the Stockholm bypass are detailed in the aesthetic design brief, which aims at creating continuity along the whole of the bypass by setting guidelines for materials, proportions and gradients (Trafikverket 2011a, p. 5). The overall architectural ambition seems to be high.

No new cues of entrance are needed.

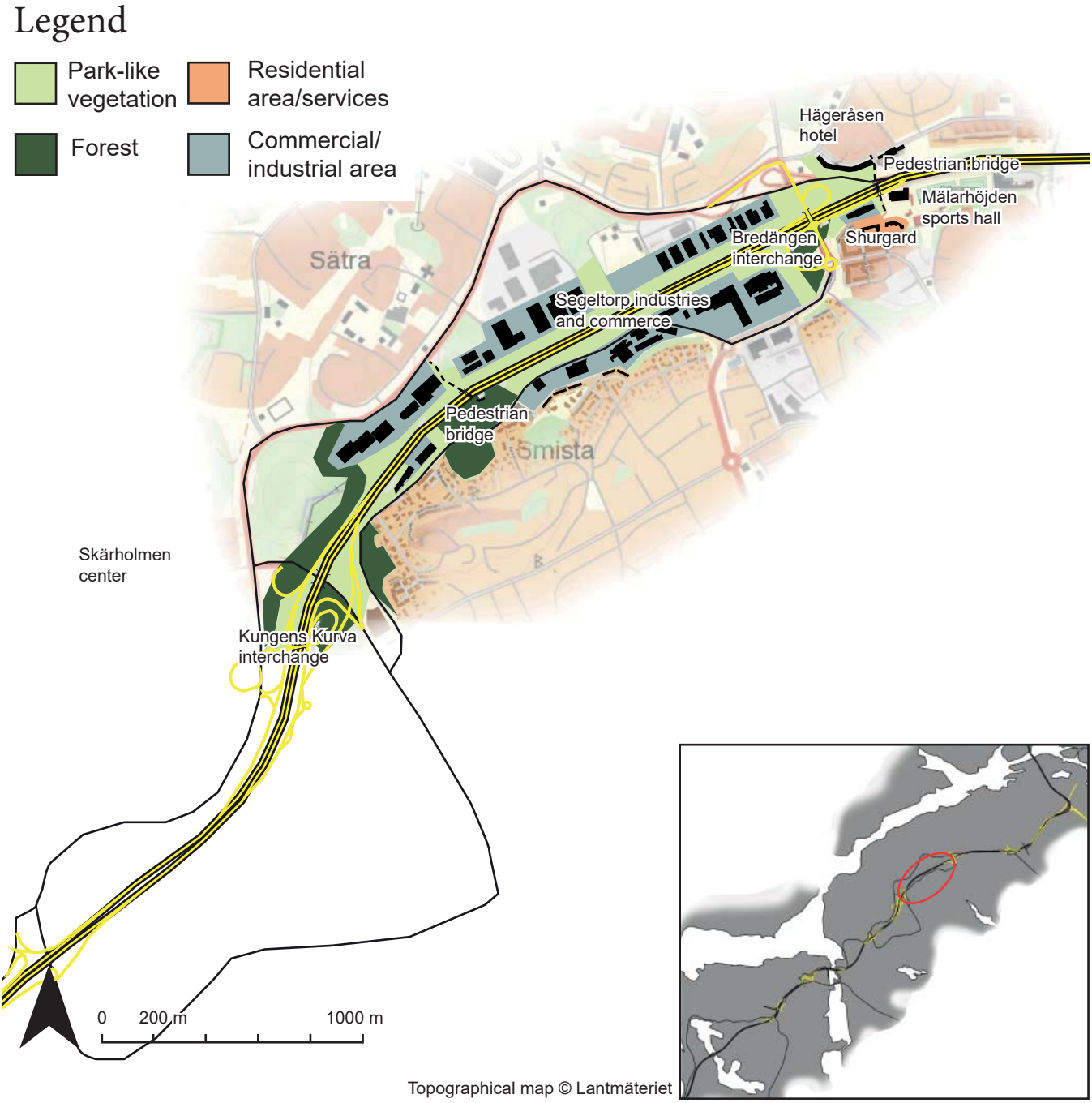
4.2.6. Sequence 6: Smista-Sätra

The road user gets a short breather between the commercial areas of Kungens Kurva and Smista allé- Segeltorp-Sätra at the relatively green Kungens Kurva interchange. The electric towers and cables that have set their mark on the character of the road environment from Lindvreten interchange continue by the road, hinting at the continuation of an urban milieu.

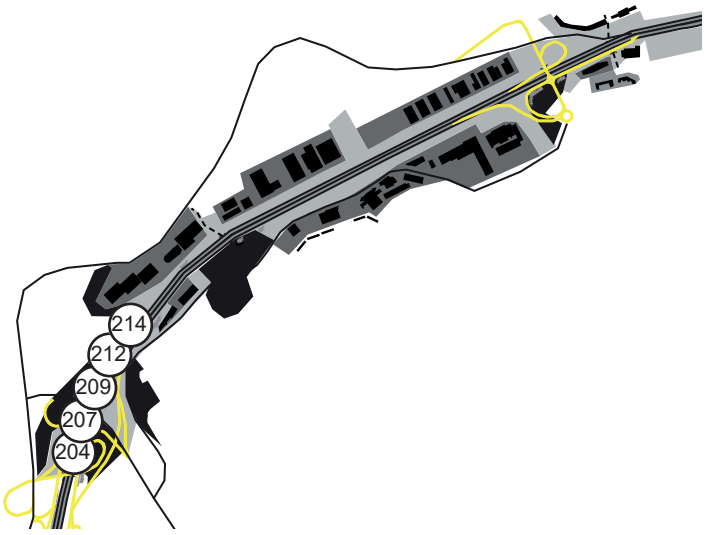
This is not to say that the sequence Segeltorp-Sätra is especially demanding, but the numerous businesses along the road do try their best to attract customers from behind the wooded strips that frame the road. Bergman (2008b, p. 268) even goes so far as to describe the concentration of car- and motorcycle stores in Segeltorp as an American-style celebration of motorism, alluding to their effective use of advertising space on their façades and on their parking lots with rows of flagpoles. He also notes that there seems to be a clear tension with the luxurious image projected by the intentionally imposing car sales district in Segeltorp and the everyday-commerce in Sätra (ibid., p. 274). The sides are visually united in their large scale and the rows of trees that separate them from the highway.

Some changes can be anticipated in the area, as the Southern tram line may be built with stops on both sides of the road. The environmental impact assessment judges that the effect on the business districts' cityscapes will remain reasonable or low, even with the simultaneous development of the Smista allé industries slowly being overtaken by residential areas. (Stockholms läns landsting 2015a, p. 54, Stockholms läns landsting 2015b, p. 47.)

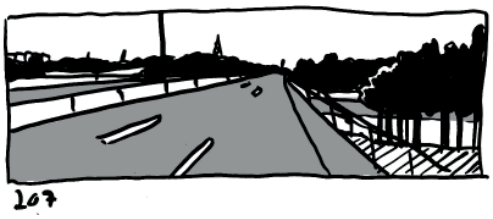
The sequence ends at Bredäng interchange, where a well-tended, simple traffic landscape flows into the district of Fruängen as the road user officially enters the city of Stockholm.



Topographical map © Lantmäteriet



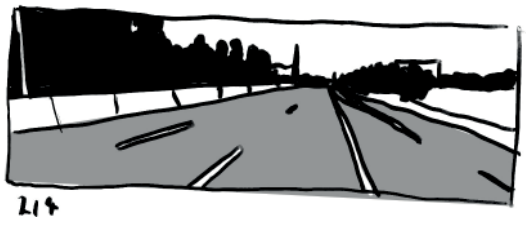
204. After the bridge the interchange continues in a simple, park-like environment. The electric towers are a prominent feature. The relative simplicity allows some rest for the road user's mind.



207. The road crosses over a smaller road on a bridge, which gives a short opening as a contrast to the otherwise narrower road space. This allows the road user to glimpse Skärholmen center again on the left as well as a cycle-and walking path on the right. The view to Skärholmen strengthens the road user's sense of location, whereas the possibility to see people in their everyday environment gives indirect indications of the nature of the place.

209. The park-like situation continues as the bridge ends. The road user can distinguish industrial buildings in the distance. The electric towers add their own contribution to the road user's sense of progressing on their way.

212.-214. The interchange draws to a close, and the space that shortly opens up closes back in very fast. The yellow-and-white billboard in the distance draws the attention very effectively. The funnel-like shape of the space strengthens the visual pull of the objects straight ahead. Since these drawings are based on pictures from 2016, it is unlikely that the billboard is still in place. The mixed forest on the left gives way to the industrial buildings, and the earth berm blocks views to the right.

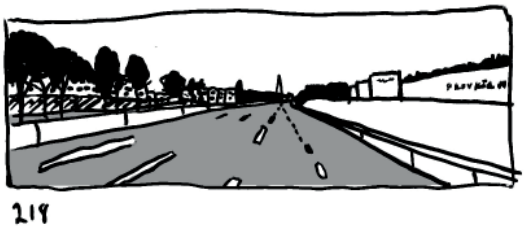


216. The road runs by a cut rock face. If the topography here follows the general trend along the road, we can assume that its continuation on the other side of the road has been exploded to make way for the industries. This creates a mental connection to the road environment in Kungens Kurva, giving a sense of continuity.

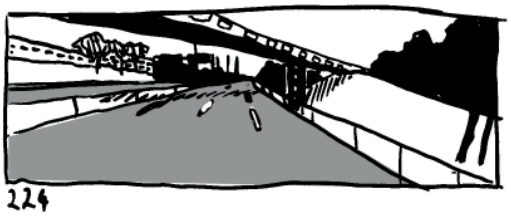
217. A narrow wooded road verge divides the industries on the right from the highway. This turns out to be a very typical design choice along this sequence. The tree rows tend to have a wild character with their scraggly stems, and the impression is not helped by the impressively vital shrubs and the moisture-loving tall grasses and forbs. The general impression is slightly bizarre, as the relative wildness makes the imposed structure seem like a desperate attempt at controlling the environment, without much success.

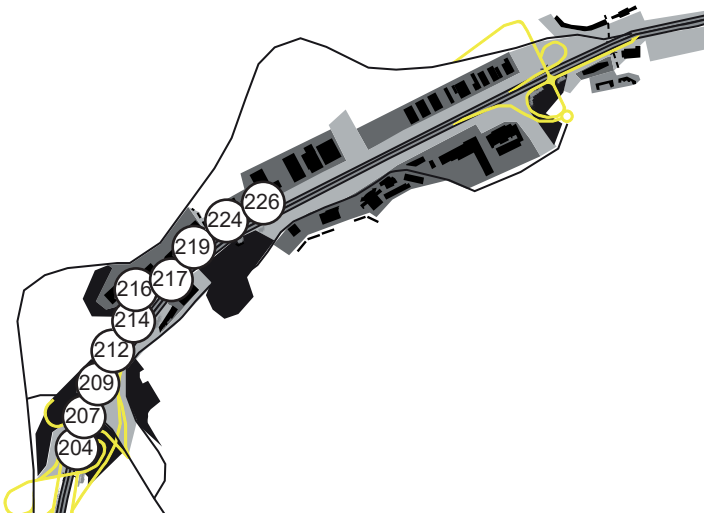
219. The tree row skips over the wall of a car sales building, which is covered by a giant advertisement that dominates the view. The tree row beginning on the left softens the impression somewhat, but also adds to the impression of a lack of structure in the commercial and industrial area.

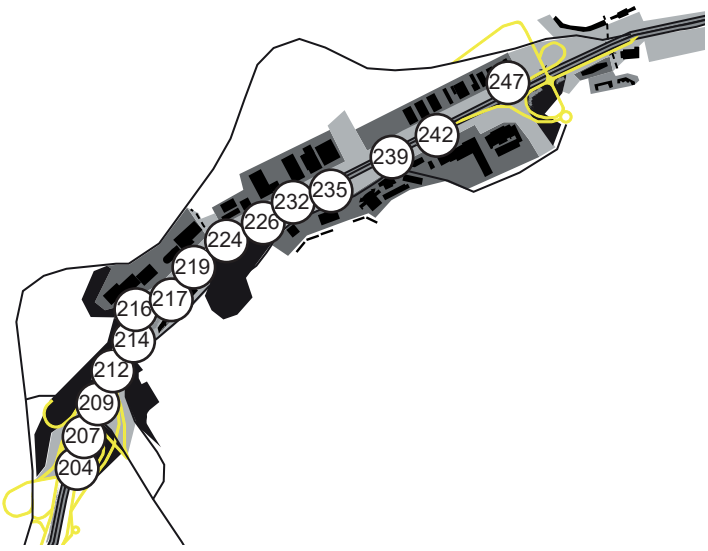
224. A pedestrian bridge crosses over the road at the end of a short forested part. The bridge has a unique design that seems to have been inspired by the window ribbons of the building behind it. It also fits together with the concrete traffic separator that blends in surprisingly well into the context of this commercial area.



226. Two rock cuts flash by after another on the right, with a brief view through tree trunks into the industrial area. Similarly to the part before the pedestrian bridge, the rock is nowhere to be seen on the left. The architecturally significant “Canon-building” is obscured by trees on the left (Bergman 2008b, p. 265-266).





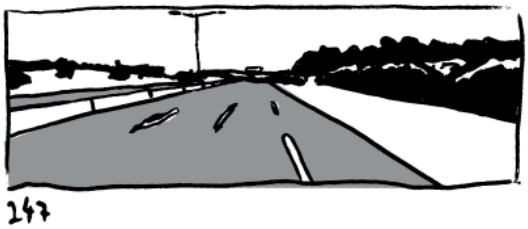


232.-235. Amidst the gray and white buildings there are some that pop out from the mass due to their color. Here, a bright red commercial building on the left is paired with the warm yellow of a residential building on the right, bringing the two sides of the road closer to each other. A bit further the bright blue of a building to the left gives a strong impression. The overall image is still dominated by the rows of trees, casting shadows on the road.

239. A short break in the tree row reveals another car sales building. Judging by the density of saplings planted in front of it the gap is meant to be closed as soon as possible. The walk- and cycle path behind it may liven up the view even after the trees have grown.

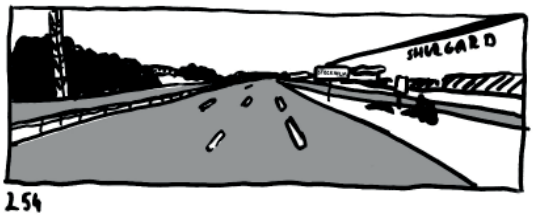
242. Another typical view of the industries being hidden behind plantings. While the goal for the vegetation on this stretch is clearly to calm the road environment down, it could be utilized to deliver additional qualities as well. For example, the lone pine tree on the left could have the makings of a character tree, if not damaged too badly by the construction show in the picture.

247. The Bredäng interchange provides a stark contrast to the industrial area before. The overall impression is very neat, simple and well-tended. This is probably partly due to drier conditions than what the tree rows growing in the ditches have. The timing of the photographs is likely to be a factor in the impression, as well. Keeping the road environment by the junction simple is a good way of directing the road user's cognitive capacity at driving.



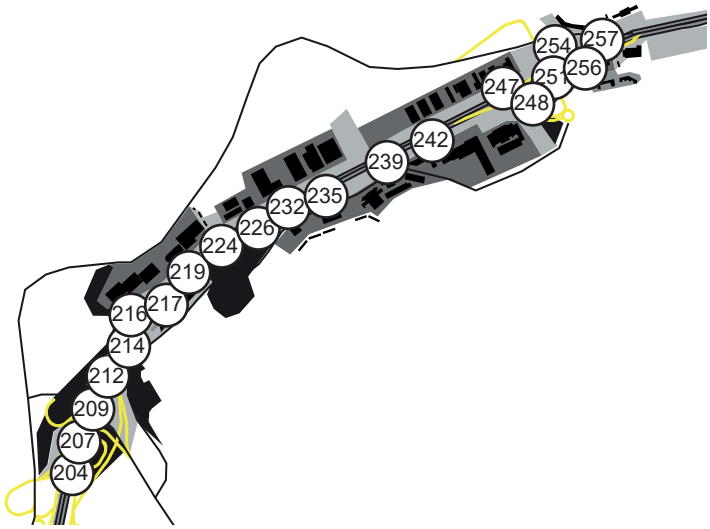
248. An impressive rock cut echoes the smaller pieces of rock seen before along the journey, strengthening the idea of forested bedrock hills as a typical feature of the region.

251. The bridge has a simple design, and the slope towards the rightmost lane is neatly paved. The overall feeling is heavy. The view framed by the bridge summarizes much of what we have seen before: A cut rock slope, electric towers, residence and commerce in light-colored buildings, park-like vegetation and another bridge looming ahead of us.



254. The sign “Welcome to Stockholm” is unfortunately located below the much louder logo of Shurgard self-storage. This gives a strange message of commerce over local identity, much like in Huddinge.

256.-257. The light blue sports hall is clearly visible behind the pedestrian bridge that makes a light and clean impression. A short gap between the Shurgard building and a concrete noise screen allows a glimpse into Fruängen. While the blue of the sports hall remains visually interesting, the tower of the hotel on the left could also be seen as a landmark. The view is distinctive, and anchors the road user effectively to this specific place.



Application of aesthetic criteria on sequence 6

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The character of the vegetation along the stretch in Smista-Sätra does not support the urban image of the commerce and industries, but it isn't either extensive enough to develop a strong wild character. The end result leans to the negative side, with the exception of the area around the pedestrian bridge.

The Welcome-to-Stockholm-sign's message is drowned under the larger logo of Shurgard storages.

Orientation

The electric towers continue to form a chain of milestones in the journey.

The environment in Smista-Sätra is complex and slightly monotonous at the same time, lacking obvious signifiers of place. This could cause feelings of disorientation.

Understanding

The repeated view to Skärholmen increases the road user's understanding of the structure of the area.

Views to pedestrian paths connects the road user to the life around them.

Identity

The occasionally visible rock cuts are a reminder or the regional landscape characteristics and the dynamics between nature and culture.

The view to Fruängen over the Mälarhöjden sports hall is very distinctive, and anchors the road user to this specific place.

Recommendations

New cues of entrance are needed in Smista-Sätra, both by elevating some buildings to the status of landmarks and by developing the vegetation into a more characteristic, urban direction. Completely new features could also be used to add meaning to the sequence.

The Welcome to Stockholm- sign needs to be relocated or redesigned in a way that clearly lifts it above the commercial messages in the road.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The funnel-like shape of the space at the end of the Kungens Kurva interchange directs the road user's attention forward. Hopefully the effect does not distract them from reacting to other road users joining the highway from the interchange.

Psychological stability

In a situation where most of the commercial buildings are hidden behind the vegetation, gaps in the vegetation and large advertisements have a somewhat unsettling effect as they seem to demand action. This might be experienced as stressful.

Balance in stimuli

The greenery of Kungens Kurva interchange gives some possibilities for resting the mind.

While the industries and commerce come in all shapes and sizes, the lush vegetation tones down the overall amount of stimuli.

The low amount of stimuli at Bredängen interchange balances the high demands of the traffic. On the other hand, the entry to the interchange is somewhat abrupt.

Recommendations

New cues of entrance could announce the beginning of the Bredängen interchange.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

Like in Kungens Kurva, the remnants of rock and vegetation are important links between the business area and the landscape beyond.

Visual complement

The scenic landscape in this area seems quite robust.

The existing impression is very variable, and the design of new features could attempt to find and incorporate some unifying elements.

Beauty

The stretch in Smista- Sätra is lacking in visual character in general, and beauty would probably be difficult to establish here.

Recommendations

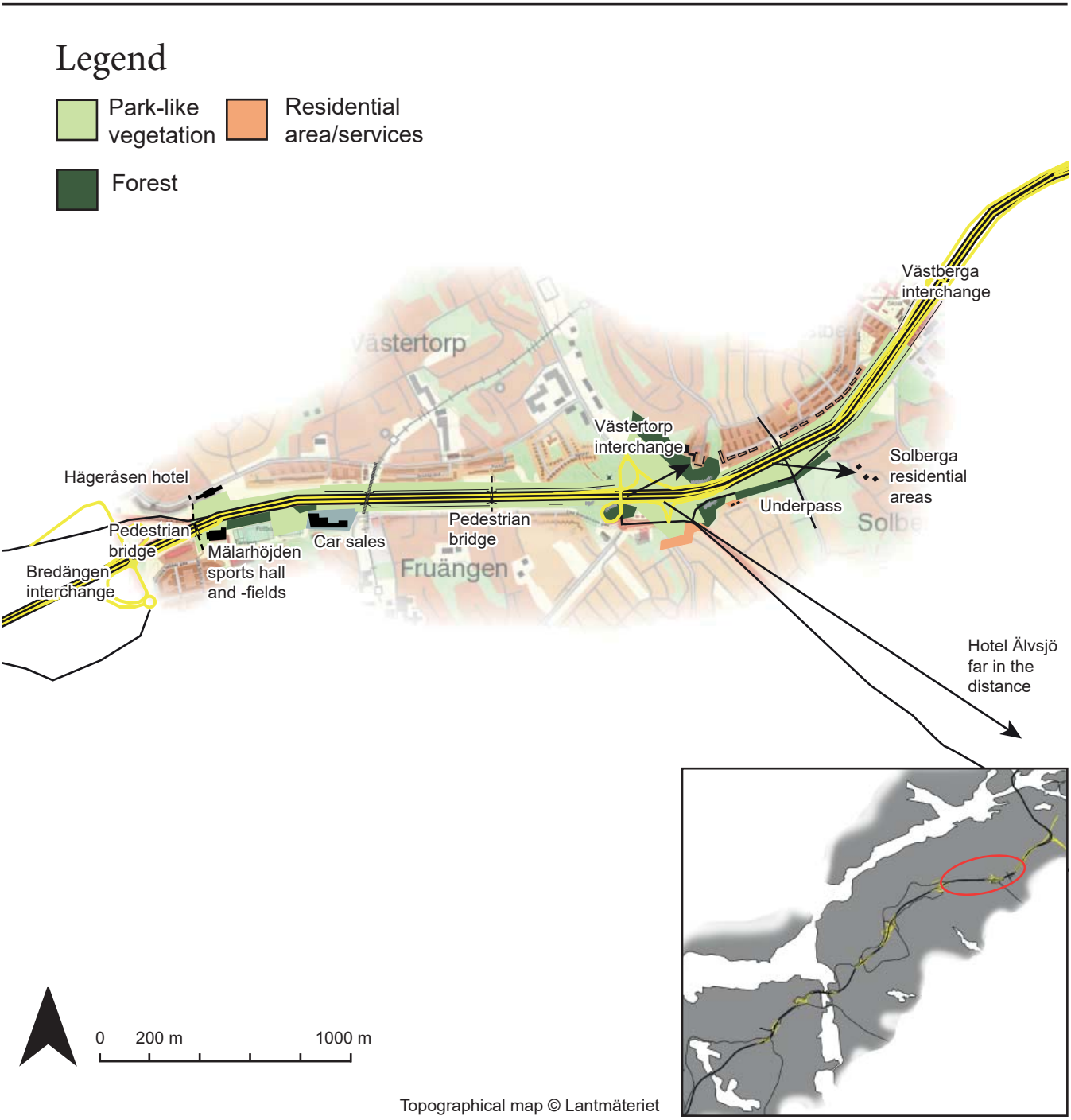
The possibilities for locating and designing new cues of entrance in this area could be investigated as a part of the Southern tram line project, as it is likely to demand some changes in the road environment as well. If the influence of residential establishments increases in the area, the new cues of entrance could be designed in co-operation with the residents.

4.2.7. Sequence 7: Fruängen- Västertorp

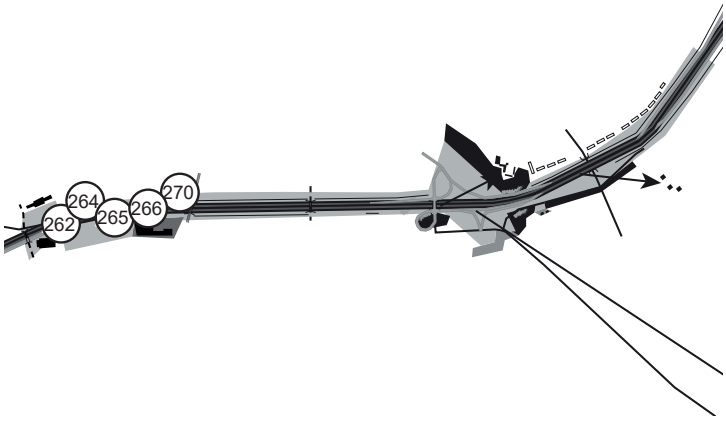
The E4/E20 runs through Fruängen and Västertorp in a corridor, isolated from its surroundings by vegetated earth berms and fencing that protect the residential areas from noise. Bergman (2008b, p. 284) explains that the districts around here were born as the result of the city of Stockholm buying and constructing one piece of formerly sparsely built land in the area at a time, adding up to an urban area with no clear historical direction. This is also reflected in the monotony of this sequence.

There are few spots where it is possible to view the world outside: The Mälarhöjden sports facilities are briefly visible, the Västertorp interchange allows short views into Brännkyrka and Hägersten districts, followed by a possibility to see some of the tower houses on top of Solberga hill. In the winter it is possible to see the tops of certain apartment buildings behind the bare branches of the trees lining the highway. Most of the buildings are hidden by a noise screen. The vegetation looks mostly intentional, but it would still probably seem quite untamed to the untrained eye. The median strip is grass-clad, and partially planted with trees in hopes of creating a sense of an avenue.

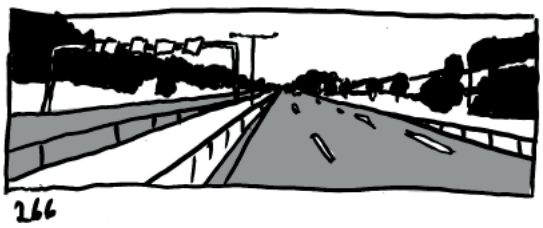
As the E4 will be separated from the E20 due to the construction of the Stockholm bypass, changes in the traffic flows in the sequences after it could be anticipated. This might allow possibilities to lower the road standard and speed, which could be expressed in the road environment through careful use of the space that would be left over. As no official documents have been found where the Transport Administration is considering this, however, it is not deemed likely.



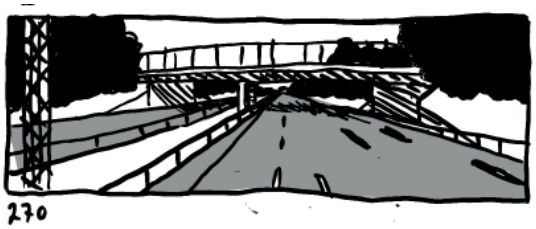
Topographical map © Lantmäteriet



262-266. Dense vegetation by the cycle-and walking path blocks the view to the sports fields on the right. On the left vegetation, landforms, fencing or all of the above form a wall in the road space that hides most of the districts north of the highway all the way to the Västertorp interchange. There is a short break in the vegetation by the second sports field. A small woodland obscures the cycling- and walking path, until it re-emerges in the break in vegetation that gives a glimpse into a commercial area in Fruängen. This is one of the few chances the road user has to make sense of the life in the districts around them.



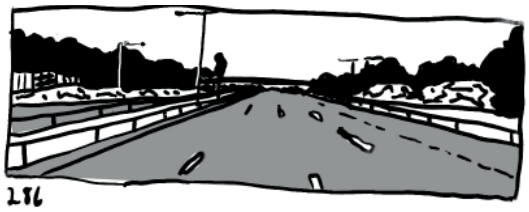
270.-274. This bridge is built for the metro trains. It sits nicely and symmetrically on the slopes on either side of the road, with carefully formed sides. Behind it the vegetation-clad, narrow road space continues. The width of the median strip allows for a planted tree row. The trees will not be able to reach their full size, as the space is scarce and possibly polluted with road salt.

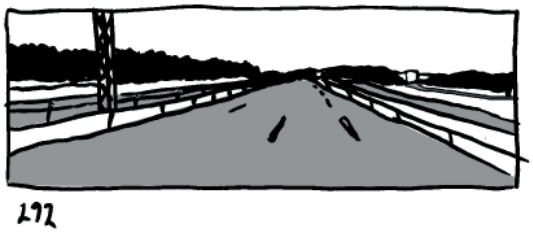


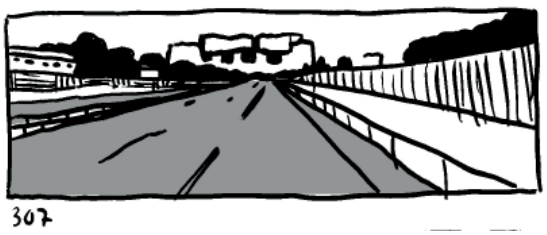
277.-284. The pedestrian bridge crossing over allows for a brief change in the monotonous road environment. The corridor continues, as does the tree row in the median strip. Since it takes about a minute to pass through this corridor, the sense of monotony may not have enough time to develop into boredom. Still, it is easy to imagine that it can cause an increasing sense of disorientation.

286. Västertorp interchange gives the road user a view of rock surface, as a high wall on the right and as a small outbreak on the left. This reminder of the significant natural features of the Södertörn landscape is a welcome display of character.

288. The bridge is quite long, which gives a relatively wide view into the interchange. The detailing of the joint between the bridge and the slope is tidy, which by now seems to have become a clear characteristic. Similarly conscious but uncomplicated design choices could be







used in conjunction to all of the bridges along the studied stretch to create a sense of unity and to show that the road environment is treated with consideration.

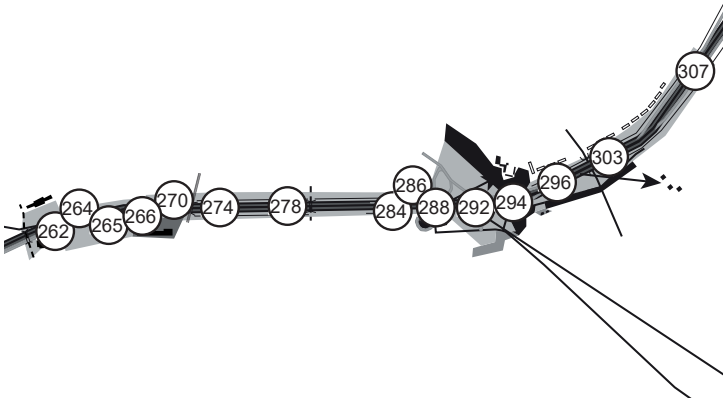
292. The interchange opens up, allowing views both to Brännkyrka residential area on the right and up the slope of the Hägersten esker to the left. Far away in the distance the tall tower of Scandic Talk hotel can be glimpsed. The change in the openness provides some much-needed variation in the sequence, although the elements that can be viewed from here may not be distinctive enough to make an impression on people who do not know the area.

294. The road runs through the esker, which can be seen as rock cuts on either side of the road. As the final gate element of this sort along the approach it could be elevated in status through design measures.

296. Depending on the time of the year, it could be possible to see the reddish houses of the residential area in Hägerstensåsen. In the summer the tree crowns probably make this area also into a continuation of the vegetated corridor that has been the dominant impression of this sequence. Due to its slightly larger amount of distinguishing features and short duration, this stretch may actually prepare the road user for the climax of the approach instead of lulling them to boredom.

303. The road crosses over a smaller local road, giving the road user a chance to view a bit further again. After the bridge a pine tree with interesting character is paired with a sign that warns the road user of the congestion taxes in the area.

307. The vegetation by the road grows sparser, until the noise screens become the dominant feature. The Ericsson headquarters can be seen in the distance, forming a clear goal for the road user. For people heading towards Southern parts of Stockholm, this is the last chance to take the right lane.



Application of aesthetic criteria on sequence 7

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The environment is visually nondescript, although it is clearly quite well cared for. The neatness is a positive feature, but it does not tell the road user anything about the places they are driving through.

Orientation

There are few features that aid orientation: the row of trees in the median strip create rhythm and a sense of progress, and the two bridges across the road offer short-term goals.

The view of the hotel tower may help the road user to understand their place in the city, and the Hägerstensåsen esker gives the Västberga interchange some character.

Understanding

There are few possibilities for understanding the area, as views to the outside world are short and far between. The Mälarhöjden sports facilities, Västertorp interchange and the underpass by Solberga offer glimpses into the use of the city around the road. Additionally a few glimpses of the Södertörn rock hills are available.

Identity

The noise screen has an impersonal design, but it is used in a consequent manner.

The views from the road are short and not very representative.

Recommendations

The road environment is poor in meanings. Since the lack of views from the road is a result of protective measures against noise, the creation of new views seems ill-advised. This means that the meaningfulness of this stretch would need to be increased through cues of entrance that are integrated in the roadway.

If the road standard can be lowered and one or more lanes removed, the leftover space can be used to widen the median strip and to express meanings there. Otherwise a redesign of the noise screens is suggested.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The road user could be prepared for the Västberga interchange by providing non-textual clues of the interchange's location.

Psychological stability

The monotony of the stretch may make the road user insecure of their progression and their whereabouts, causing stress. The relatively short duration of the sequence prevents the insecurity from becoming overwhelming.

Balance in stimuli

The level of visual stimulation is relatively even throughout the sequence, directing cognitive capacity at driving.

Recommendations

New cues of entrance could announce the beginning of the Västberga interchange.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The road environment has been designed on the inhabitants' terms, which should be respected in the future as well.

Disturbances in the scenic landscape of Hägerstensåsen esker and the rock hills in Västberga interchange should be avoided.

Visual complement

Whether the new elements should conform to the existing form language and color palette or not depend on the image that the city of Stockholm wants to present.

If they want to give an image of going through calm residential idylls, the current muted palette and masses of vegetation could be the starting point.

If the city would like to express a stronger identity, for example as the "capital of Scandinavia", the design options become much more varied.

Beauty

Unity and harmony can be found in the road environment as it is. Because of the relatively small scale of the roadscape, the proportions of new elements would do well to conform to the existing scale.

Still, many other aesthetic experiences than the experience of beauty are equally good goals for this sequence.

Recommendations

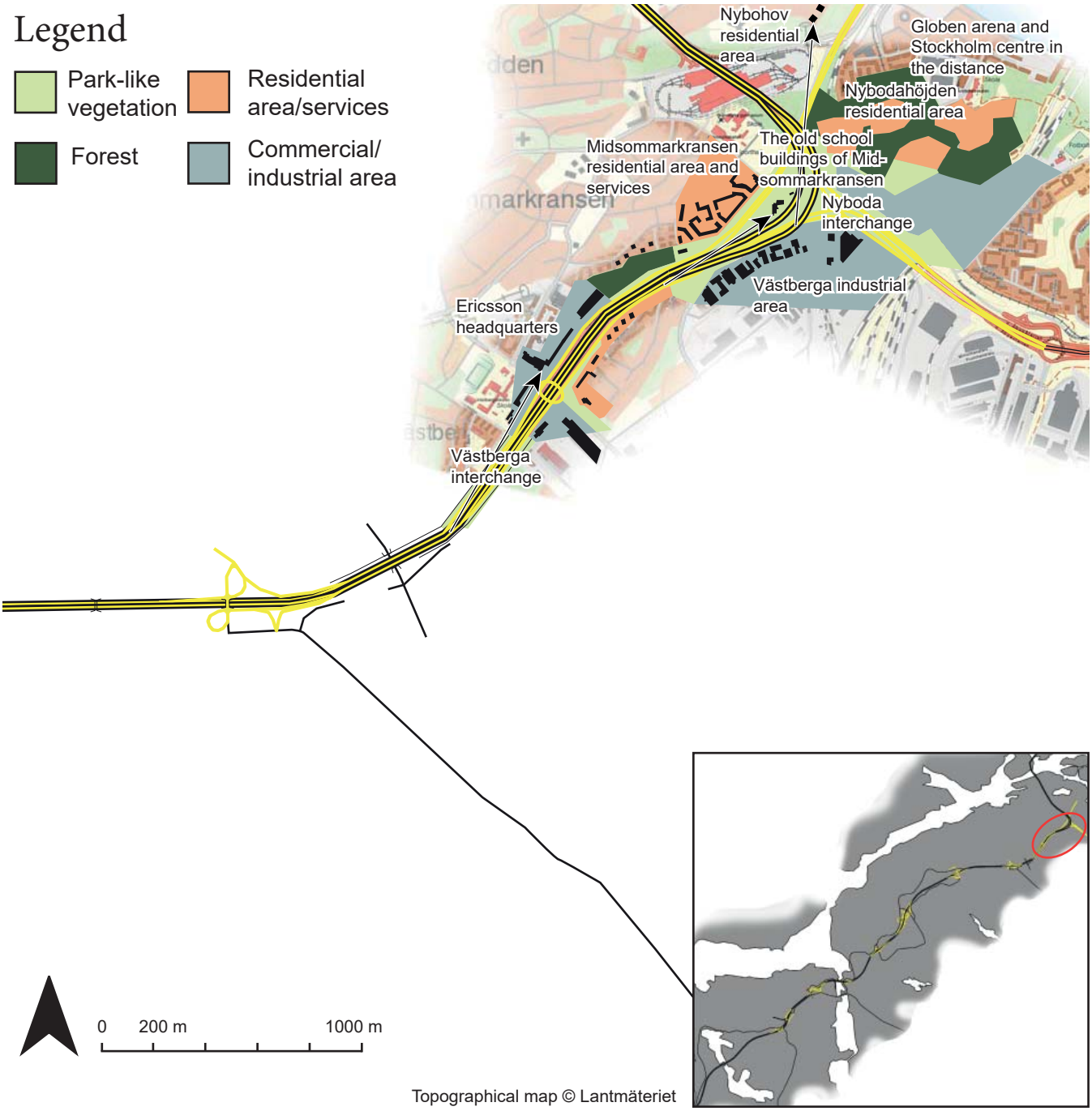
The design of the possible new cues of entrance should express the desired atmosphere and identity in a consequent manner.

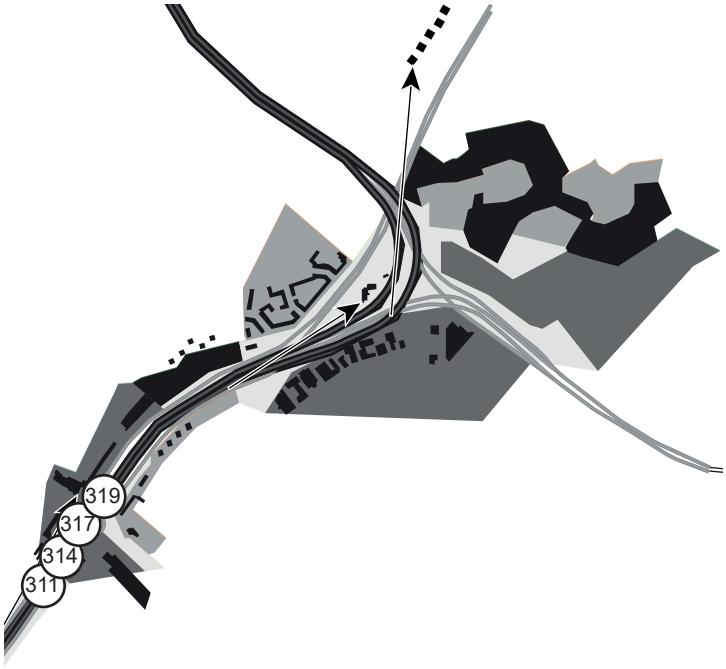
4.2.8. Sequence 8: Västberga

The final sequence of the approach to Stockholm along the E4/E20 begins with a fine view of the massive terracotta building that used to belong to the mobile phone company LM Ericsson. While the company has moved out of the area and the red tile building is to be renovated into an apartment complex, the façade will stay as a landmark of the city (Dagens Nyheter 2012). The Telefonplanen district beyond it, named after the Ericsson company as well, is undergoing the same change from pure business to a mixed area with residence, workplaces and commerce (Stockholm city general plan 2010, p. 59).

The countless industries and other businesses announce themselves to the road user both with their neon signs and the size of the buildings itself. The overall effect does not become too restless, though, thanks to their relative distance from the road and the vegetation that brings the overall scale down. The collection of different kinds of barriers and railings in the roadway takes a little bit away from the sense of unity that is present in the overall impression despite the visual complexity of the area.

From the very beginning of this sequence, the feeling of approaching the city is clearer than ever before. The mixed industry, commerce and residence on either sides of the highway is consequent, and the great scale of the environment is emphasized by the gradual rise of the highway. At first the road user feels dwarfed below the Ericsson colossus and its opposing wall, then very shortly on level with the recreational area, only to rise above the Midsommarkransen district and the Västberga industrial area. Finally they rise to the top of the E4, overlooking the city of Stockholm.


Legend
Park-like vegetation
Residential area/services
Forest
Commercial/ industrial area
Nybohov residential area
Globen arena and Stockholm centre in the distance
Nybodahöjden residential area
Midsommarkransen residential area and services
The old school buildings of Mid-sommarkransen
Nyboda interchange
Västberga industrial area
Ericsson headquarters
Västberga interchange
0
200 m
1000 m
Topographical map © Lantmäteriet

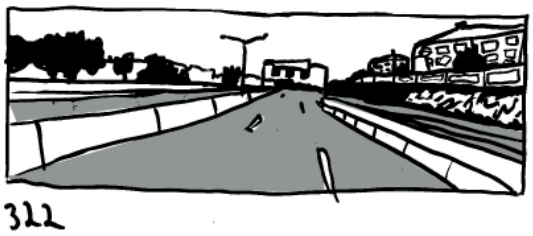


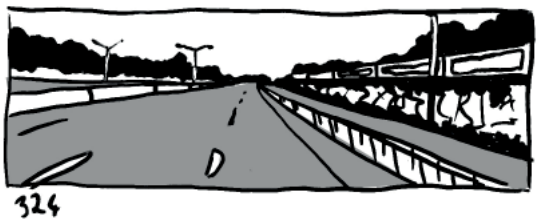
311.-314. The red tile building of Ericsson headquarters forms a strong urban silhouette together with the high tower house, a closed hotel and other commercial buildings. The silhouette breaks into individual buildings as they are approached and passed by. The commerce on the right can be experienced on a more detailed level.

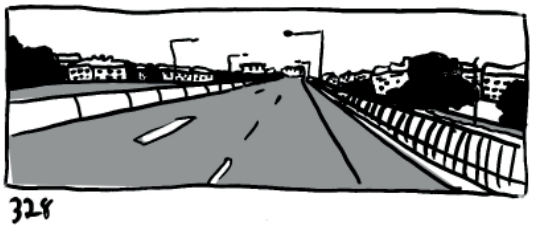
317.-322. The Västberga interchange can be experienced as the rise of the highway as it is crossed over. The residential areas opposite Ericsson balance the view. The Ericsson building is very large, and together with the rock cut and noise screens on the right they form clear walls to the road space. Behind the Ericsson building a partly vegetated stone wall begins, partially hiding a red commercial building from sight. The tall yellow houses with their orange roofs on top of the rock hill and the red noise screens make the overall impression colorful, but not overbearingly so.

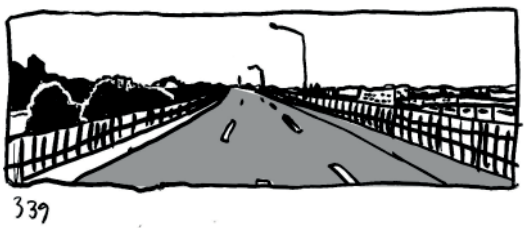
324. The scenery calms down as the road passes a wooded slope to the left and the rock hill on the right runs lower. This is the road user's final chance to gather strength before the complexity of the environment ramps up again.

326. The urban silhouette returns, gaining force as the road starts to ascend to the top of the interchange. The reddish buildings of Midsommarkransen old school almost at the center of the interchange ahead can be seen for the first time, providing an obvious target for the road user.









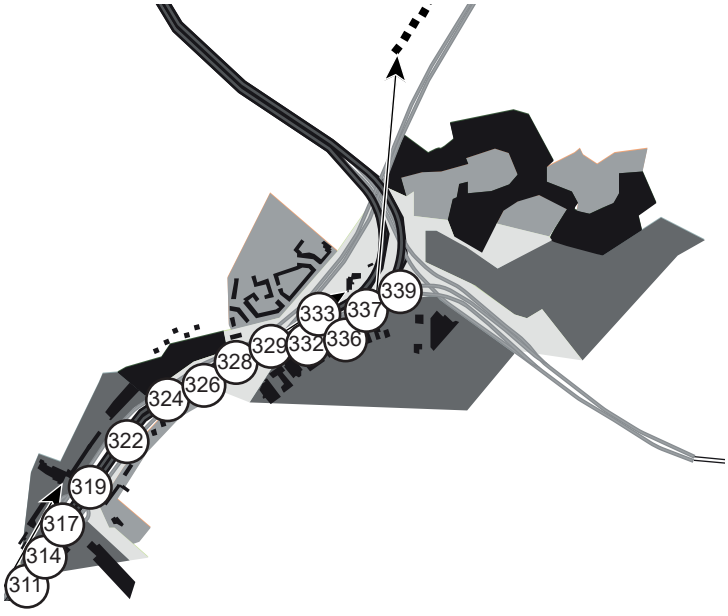
328. The feeling of having truly entered Stockholm is now stronger than ever, after all of the changes between built and unbuilt areas, between driving through isolated corridors in the past two sequences and as a part of the wider landscape earlier in the journey.

329. The logos of the commerce on the right are moderate, and allow the road user to concentrate on the traffic. The residential area on the left has a strong but unobtrusive presence, as well.

332.-333. The vegetation densifies on the left, directing the road user's gaze to the right instead, over the rooftops of the industrial area and towards the center of Stockholm. The Globen arena's domed silhouette appears in the skyline, making its presence known as a famous landmark of Stockholm. The road keeps ascending, until the buildings on the right form a carpet for the road space instead of walls.

336.-337. The Midsommarkransen old school buildings in the middle of the interchange makes its presence known strongly as the road user curves around it on their way from the Southwest to the Northwest. The cityscape appears complex, which might distract the road user from sudden changes in the traffic around them.

339. The road user is just moments away from the (possibly literal) high point of their journey. Many different buildings can be seen, some of which rise distinct from the mosaic of industry and commerce, residence and service, built and unbuilt areas. This scenery could be seen as a symbolic entrance to Stockholm city, as from this point onwards the highway curves away from the center of Stockholm to continue towards the north.



Application of aesthetic criteria on sequence 8

Appreciation: The localization of cues of entrance adds to the meaningfulness of the road environment.

Positive image

The density of the constructed environment gives a very distinctly urban feel. Whether or not this is experienced as positive will probably depend on the road user.

Orientation

This sequence has three main landmarks: the Ericsson building and the old school buildings of Midsommarkransen right by the road, as well as the arena Globen in the horizon.

Understanding

The road user gets several chances to understand the structure and functions of the built environment they are driving through.

Identity

The road environment expresses a clear, multifaceted identity. The view over the city is one of the most memorable views of the approach.

Recommendations

No new cues of entrance are needed, as the road environment already expresses a number of different meanings.

Perception: The localization of cues of entrance enables enjoyable driving.

Decision-making

The choice of right lane rests entirely on textual information, which is provided at regular intervals. The complexity of the environment may distract the road user.

Psychological stability

The road environment is complex and includes plenty of different features, but their order of appearance is logical. This means that while the road user's stress levels are likely to go up, they are likely to stay motivated to make sense of their environment.

Balance in stimuli

A short moment of peace before the city.

Relatively demanding traffic situation and complex environment, although removed enough not to be overwhelming.

Recommendations

No new cues of entrance are needed. Since this sequence is challenging for the road user, it could be recommended that the previous sequence would have a lower amount of stimulation for balancing the effect.

Quality: The localization and design of cues of entrance improves the quality of the scenic landscape.

Landscape adaptation

The scale and structure of this sequence is completely different from the ones before. If new elements are to be added, they should be concentrated on the roadway and aim at improving the experience of driving.

Visual complement

The existing railings, traffic separators and screens could be replaced with a more coordinated, visually simpler set of equipment. The style of the lighting fixtures with their clean, rounded forms could be the starting point for the design of new equipment.

Beauty

The classic qualities of beauty may be usable as guidelines for possible improvements of the road environment.

Recommendations

No new cues of entrance are needed. The road equipment is not in acute need for redesign, but simplifying and coordinating the formal expression of the roadway could support a better understanding of the complex traffic situation.

4.2.9. Analysis of the E4/E20 as the Southern approach to Stockholm: Conclusions

The studied stretch of the highway E4/ E20 can be seen as the combination of eight sequences with variation among and within them. From the rural zone of Botkyrka to its suburban districts, through significant natural areas in Huddinge, from one industrial area to another, passing the South-western districts of Stockholm in a corridor and finally ending up high above the city on top of the Nyboda interchange.

New cues of entrance are recommended in sequences 2, 6, and 7. In sequence 2 the overall expression would benefit from a more urban atmosphere, the impression of the roadway strengthened by the planned expansions of Hallunda and Fittja. In sequence 6 the orientability of the Smista-Sätra stretch should be improved, and the entrance to Bredängen interchange announced earlier. Sequence 7 should be analyzed even more thoroughly to see how it could be developed into a meaningful but visually calm road environment.

Additionally, the redesign of the roadway is recommended in the following places and stretches: Hallunda interchange, Slagsta Strand, Smista-Sätra and possibly even the Nyboda interchange. In all of these places the road verges, median strips, plantings and equipment related to the road do not add up to a road environment that seems intentional and well cared for. In Hallunda interchange the question is mostly about expressing the meanings of the place. In Slagsta-Fittja and Smista-Sätra the roadway should help to tie the complex industrial and commercial areas on both sides of the road into a coherent, well-tended entity from the road user's point of view. The equipment of Nyboda interchange could be renewed with a more united use of forms and materials.

All of the three municipalities along the studied stretch of road need to reconsider the placement and design of their welcoming signs. It is completely understandable that the sign announcing the administrative border sits at the border, but a welcoming sign should definitely be designed in a way that expresses the identity and values of the municipality, and located in a place that enforces its message.

Significant landmarks, views and characteristics

Botkyrka church

View of Vårby over the lakes

View of the hills Albyberget and Eriksberget

Skärholmen center

Ericsson LM building

View over central Stockholm, with Globen in the distance

The vegetated rocky hills characteristic of the Södertörn rift valley landscape

The enjoyability of driving

The overall stimulus graph seems quite well balanced along the stretch. The few places where the amount of stimuli rises too suddenly are the most disturbing ones, and should be amended.

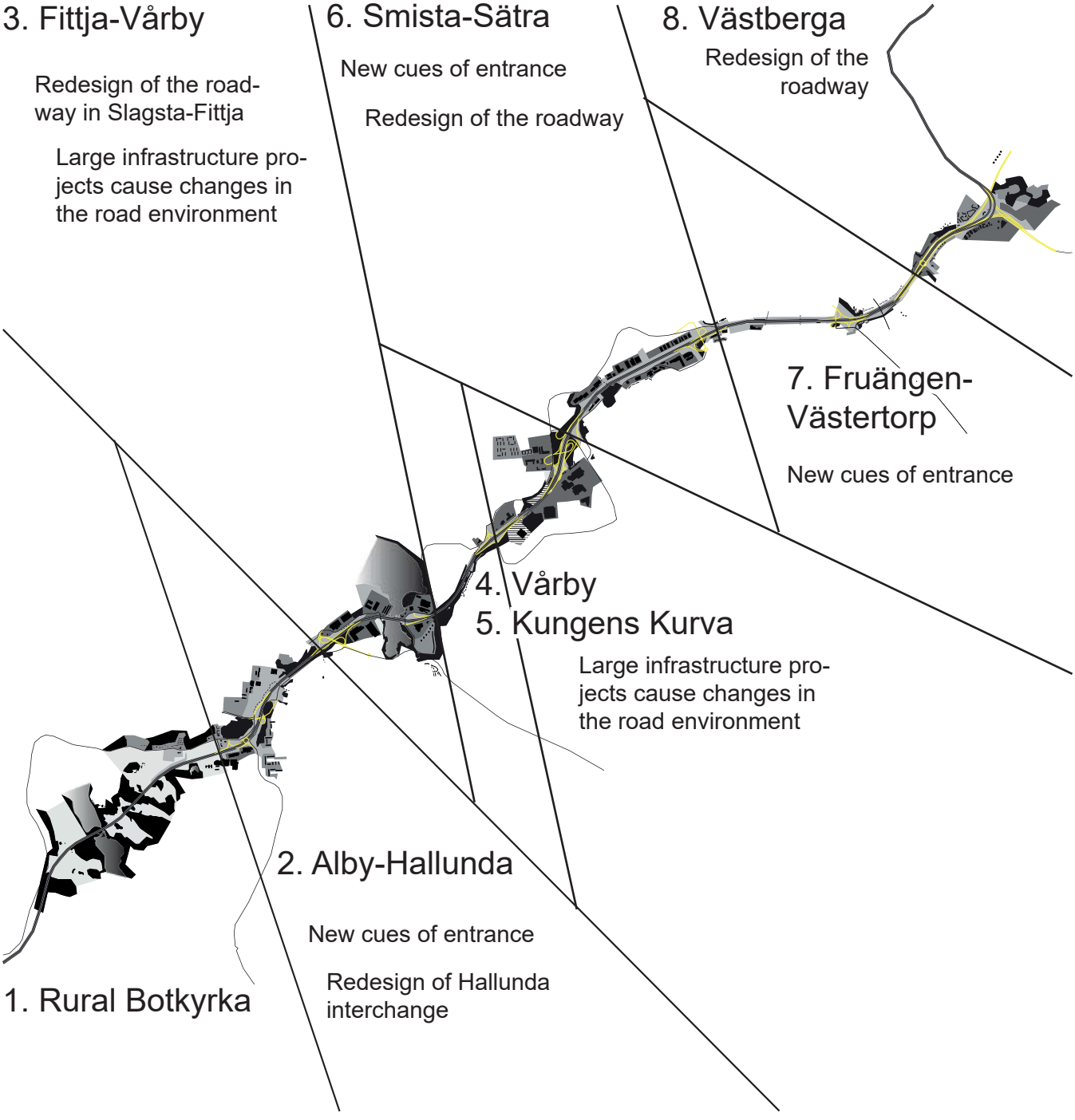
The places of choice, mainly intersections, should be kept visually simple even in the future.

Forces of change

Municipal expansion plans especially in Hallunda, Fittja and Vårby

The great road projects Stockholm bypass, Södertörn cross-connection and Masmolänken

The Southern tram line


3. Fittja-Vårby
Redesign of the road-way in Slagsta-Fittja
Large infrastructure pro-jects cause changes in the road environment
6. Smista-Sätra
New cues of entrance
Redesign of the roadway
8. Västberga
Redesign of the roadway
7. Fruängen-Västertorp
New cues of entrance
4. Vårby
5. Kungens Kurva
Large infrastructure pro-jects cause changes in the road environment
2. Alby-Hallunda
New cues of entrance
Redesign of Hallunda interchange
1. Rural Botkyrka

5. Discussion and reflection

The research project can be seen to have yielded two kinds of results.

First, the three overarching goals for the aesthetic components of the road environment are a result in themselves. As the literature study progressed, creating a set of criteria for evaluating aesthetics in regards to localization started to seem very complicated, but also somewhat too mechanistic. Instead of criteria, the emergent three goals seemed to better help to answer the research question. The goals of a meaningful road environment and enjoyable driving seem to be absolutely necessary for the creation of a good road user experience, and the aim to improve the quality of the scenic landscape in the area contributes even more to overall landscape experience. Considering aesthetics in the road environment through goals instead of criteria give the designers, the administrators and other concerned parties more room for discussion about how each of the main goals should best be pursued. While these goals are not specifically made for evaluating localization or cues of entrance, they are relevant for both subjects: any location and any cue of entrance that supports the fulfilment of these goals can be evaluated positively.

Second, the practical recommendations for adding new cues of entrance and improving the aesthetic quality of the road environment of the E4/E20 are a result of comparing the existing - or once-existent - reality of the highway to the found goals. Many of the recommendations address significant issues for land use in the municipalities of Botkyrka, Huddinge and Stockholm. It all boils down to priorities: historical and cultural values, natural values, social interests and commercial interests are all valid points to argue from when deciding which pieces of land to claim for urban development, and how the development should be executed. The author of this thesis has been more concerned with the conservational aspects than the needs for development, and this is clearly visible in the recommendations. While the presented recommendations may not be the optimal choices from all angles, they are possible choices with a certain logical reasoning behind them, and they could thus contribute to the discussions about the municipalities and the Transport Administrations' actions in the road environment along the E4/E20.

A possible answer to the research question becomes: The need for cues of entrance can be localized along city approaches by analyzing the meaningfulness of the road environment, the enjoyability of driving, and the quality of the scenic landscape, as experienced from the road. Cues of entrance, located in places where they contribute to the fulfilment of these goals, can be a way of improving the aesthetic experience of the road environment, and thus the road user experience.

5.1. Discussion and reflection on the applied methods and theories

The formulation of the goals for localization of cues of entrance leans heavily on Punter's (1982) paradigms for landscape aesthetics and Lang's (1988) theoretical classification of aesthetic experiences (see Porteous, pp 11-12, 22). The choice of drawing parallels between the paradigm of perception and experiences of sensory aesthetics, appreciation and symbolic aesthetics as well as quality and formal aesthetics was made without consulting the original sources. As a result, a reader versed in both of these theories may object to their almost synonymous use in this thesis. Also the logical and ontological relevancy of the classifications and deductions that lie as the basis of these goals can surely be contested from a philosophical point of view. Since these theories about aesthetics have been used as a framework for working with the complexities of the subject rather than as an objective taxonomy of aesthetic experiences, the philosophical inaccuracies have not been deemed to have large consequences on the applicability of the combined theories in the context of designing road environments.

The qualities of the aesthetic road environment of the E4/E20 were identified through a process where the analyzed and presented images were selected solely on the basis of personal deliberation, with the underlying idea of simulating an actual driving experience where specific objects and features would grab the road user's attention or leave different kinds of impressions. This method was chosen over a more set systematic of choosing the analyzed images because the author felt that it corresponded better to how road user experience actually is formed. A selection where a photograph would have been taken every 100 meters, and where every fifth photograph would have been turned into an image and analyzed, for example, would probably have missed some important compositions of elements, exaggerated the importance of some features that actually do not make much of an impact as well as shown some important elements only from afar. Thus, the selection of views analyzed and presented in the analysis is based on their contents, composition and representivity, as experienced by the author of the thesis.

Why these methods, strategies and presentation choices?

The choice of analyzing the road environment from a road user's point of view was largely inspired by Banham's book 'Los Angeles: The Architecture of Four Ecologies' (2009). His description of the Los Angeles freeways, quoted on this page, presents a number of concepts relevant to how roads are experienced and perceived: monotony, unity, confusion, variety, uniqueness. From this point of view, it is easy to see how he would identify driving as a way to decode the meanings in the cityscape. This choice was also encouraged by Swedish sources, namely Hubendick (1976) and Bucht, Pålstam and Wingren (1996).

From this point of view the decision to limit the analyzed extent to what can be seen also makes sense: road user experience is modified by the whole perceivable road environment. As motor vehicles limit all sensory perception, the value of sight as the least affected sense becomes the most important one (Tunnard & Pushkarev 1963, see Bucht, Pålstam & Wingren 1996, pp. 38-39, Bucht, Pålstam & Wingren 1996, p. 38.). Of course, having only the visual information to make judgments on overly emphasized the connection between the scenic landscape and road user experience that Bucht, Pålstam and Wingren point out (1996, p. 7). In reality, the traffic itself is a big factor especially on the psychological processes of the road user, an aspect that has not been studied at all so carefully as a full-fledged analysis of the demands that the traffic sets on the road user would have required.

Another related aspect is the underlying belief of the analysis that it is possible to evaluate more or less common subjective judgements through the study of objective features. It can be questioned whether or not experiences and other aesthetic qualities can be transmitted through second-hand representations in the first place, as pointed out by Meyer (2008, p. 10) and Etteger, Thompson & Vicenzotti (2016, p. 88-89). A site visit done after the analysis has been finished would suggest that it is possible, at least to a certain extent. The more technical specifications of discrepancies between first-hand experience and the Street View- method are discussed in the next sub-chapter. From a more general point of view it could be said that as long as the intention behind the second-hand media has been to provide an approximately objective image of the portrayed environment, and the material covers enough of the area to be representative, general impressions and atmospheres can be communicated.

Hubendick points out that there is often a difference between the designer's and the user's perspective on the road: while the designer may see the road as an indivisible whole, the road user observes it as a series of stretches and views that are separated from each other by distance and topographical forms. To the road user this means that each of these sequences is only interesting as long as they are a part of them. (Hubendick 1976, p. 13.) This understanding of the road user's perception of their environment seems to motivate the division of the journey into sequences and views. While the author's understanding of the studied stretch's sequentiality during the site visit was strongly biased and thus does not bear scientific reliability, tacit knowledge and certain literary sources (McCluskey 1992, Wingren et al. 2002) would support Hubendick's claim, and that the road user does

"So when most observers report monotony, not unity, and within that monotony, confusion rather than variety, this is usually because the context has escaped them; and it has escaped them because it is unique - - -and without any handy terms of comparison. ---. How then to bridge this gap of comparability. One can most properly begin by learning the local language; and the language of design, architecture, and urbanism in Los Angeles is the language of movement. - - - the city will never be fully understood by those who cannot move fluently through its diffuse urban texture, cannot go with the flow of its unprecedented life. - - - I learned to drive in order to read Los Angeles in the original."

(Banham 2009, p. 5)

indeed divide the journey into smaller stretches according to their dominant characteristics.

Bucht, Pålstam and Wingren (1996, p. 7) contest this approach by pointing out that the resulting presentation is a "collection of stills", even though the road user experience itself is in cinematic movement. A similar sentiment was also expressed by Dimendberg (1995, as quoted by Andrews in Carlson & Berleant 2007, p. 279), and Appleyard, Lynch and Mayer (1964, pp. 4-5). Especially actual documentation of the road environment and the study of perception in movement would have greatly benefited from filming the journey. Had this thesis been done by a person with an interest in 3D-modeling or cinema instead of comics, the analysis- and presentation method would surely have been different as well. By the time these alternate methods of presentation were found, the analysis had already been started with the cartoon-inspired style that characterizes the end result. The main virtue of the chosen style is the way in which it allows for simplification and thus gives possibilities to direct the reader's eye to the things that the analyzer found most interesting. Both in the illustrative maps and in the images the idea was to follow the Transport Administration's guideline of finding a good balance between simplicity and complexity, aiming at a level of detailedness where no more elements can be removed without sacrificing understandability (Trafikverket 2016b, p.10). In some images and maps this level has been aqcuired, while others would have benefited from a higher level of complexity.

"Landscape for the motorist is strongly mediated by frames –the car windows and mirrors- and by the sense one has inside the car of being insulated and independent of the natural world: inflated tires smooth the ride, a powerful engine propels you effortlessly, climate control is adjusted at the turn of a knob."

(Andrews in Carlson & Berleant 2007, pp. 277-278)

The quote from Andrews (2007) on this page is one of the many sources that emphasized visual information as the most important stimulus for the road user. He also alludes to the effect the car as a physical object has on the road user experience: The field of vision becomes limited and split by the window- and mirror frames. From this point of view, presenting the view from the road as a series of strictly framed snapshots seemed to correspond more or less to the actual field of sight. The original idea was to enhance the images by blurring the image slightly around the edges, and have the sharpest part of the image at the point where the road user's likeliest focus would be. This idea was dropped mostly due to a lack of time.

The choice of presenting the road environment in simple black-and-white images may have led to oversimplification of some views, and to outright mistakes in others. This is a result of the selective choice of elements to be reproduced from the photographs, as well as the unconscious overlooking of certain features. Beside the author's inattentiveness, there are several factors of error in the Street View-method itself.

Inspiration and ideas

At the beginning, the idea of adding aesthetic values to the road environment seemed superfluous and lacking in societal significance, diminishing motivation in the subject. But as the author's knowledge about the influence of aesthetics and the quality of the environment on people's actual behavior and quality of life increased, finding order and meaning in this seemingly arbitrarily designed mixture of landscape and roads became a cause worth advocating for. The question of location was raised as a result of learning about Botkyrka's project "Southern Gate to Greater Stockholm Region" in Eriksberget-Alby at the beginning of the studied stretch, and the confusion that followed when the author travelled virtually through the stretch for the first time and experienced a sense of having entered the city for the first time 12 kilometers later in Västberga, Stockholm.

The initial inspiration for focusing on the experience of entering a place is a bit difficult to locate exactly. The notes made at the beginning of the project would point at an interest in understanding the experience of place, and how cities can express their identity, structure and characteristics in the roadscape. This interest could have its roots in the structure of the author's home city of Espoo in Finland, where motorways and other large arterial roads transport the inhabitants from one local center to another through forests, fields and industrial areas, mostly avoiding direct contact with residential centers. The spread-out structure of the city, where the entrance points are frequent but impersonal, is somewhat reminiscent of the approach roads to Stockholm.

The end result was greatly influenced by the layout of Appleyard, Lynch and Mayer's 'The View from the Road' (1964), the concept of road user experience as presented by Bucht, Pålstam and Wingren in '*Trafikantupplevelse på väg*' (1996) and the contents of the Transport Administration's aesthetic design brief for the project 'City Approaches in the Gothenburg Region' (Wingren et al. 2002). The thoughts about the isolation or inclusion of highways in the urban fabric were influenced by many different sources, including Wingren (2009), Andrews (see Carlson & Berleant 2007) and the Swedish Transport Administration (2016b, as well as discussions with Broman, Gustavsson, Hallesjö and Ström, 2017).

How the problem was identified and dealt with

The creation of this thesis has been a learning experience, as the author has had little to no previous knowledge on environmental aesthetics, environmental psychology or the road environment. Because of this, the project was completed as three parallel processes: reviewing literature, analyzing the road environment and formulating the criteria to be able to turn the analysis into an answer to the research question. The initial problem, the low visual quality of the E4/E20, was known from the very beginning of the project. Identifying the reasons why it is perceived as low quality became the more pressing problem, as the formulation of the aesthetic criteria for evaluating the quality of the road environment took a very long time.

The first analysis of the aesthetic qualities of the E4/E20 was strongly influenced by the literature that had been read until then, but it did not explain the relevancy between the observations made in the analysis and the research question. The generation of the criteria resulted in a similar dead end: the 10 guidelines that were created through classifying different quotes from the literature did not seem applicable to the analysis of the E4/E20, and they did not answer to the research question, either. The key concepts of the problem could

be identified at a reasonable phase in the process: City approaches, aesthetic considerations in the road environment, and the method the Transport Administration uses to include aesthetics in road planning processes. The final consideration was dropped, as it was deemed to be more relevant to new projects than for increasing values in existing road environments. This was also understood to be the reason behind the inapplicability of the 10 guidelines. The emergence of the goals during the creation of the guidelines was the phase when the project finally started to make sense, since they provided a relevant, flexibly applicable method for finishing the analysis of the road environment and for answering the research question.

The author's relation to other actors in the project

The author decided on the research question in co-operation with both the steering group at the Transport Administration and the thesis supervisor. The analysis itself was carried out very independently. While this has possibly resulted in a slightly stronger scientific integrity, the accuracy and depth of the analysis might have been improved through a tighter contact with the Transport Administration and the studied municipalities. The steering group at Swedish Transport Administration Region Stockholm as well as the thesis supervisor provided many suggestions and sources of information for use, which have certainly influenced the thesis process even if they cannot be seen in the end result.

Google Street View as a tool for studying the road environment and road user experience

Google Street View has many strong points that resulted in the decision to use it as a tool for conducting the case study. It allows making observations of a site at the analyzer's own pace, from different points of view. The staticness of the images allows considerations on a more detailed level than live experiences or video do, which is practical when considering different speeds and roles of road users. As long as the images are even relatively recent, an overall impression can be attained, and especially the most dominant features seem to be well identifiable. The perspective is very close to that of a road user, and a sense of different seasons may be available, if the studied stretch of road has been documented more than once. It also saves time and fuel to use it. The images have been pre-processed in a way that makes them easy to understand, and each view can be accurately mapped in the service.

While a majority (~60%) of the image material from Google Street View that was used in the analysis stems from May 2016, many of the pictures (~40%) have been taken in June 2014. This could mean that the present situation is not accurately represented in the pictures. This question of the currency of the images could have been amended through documenting the studied stretch personally. Because of this, the project cannot be used as a base for an aesthetic design brief for the area as is, but site visits and co-ordination with the adjoining municipal and regional projects are essential in order to set well thought-out guidelines on the improvements of the aesthetic road environment of the E4/E20.

After a site visit and an actual road user experience of the studied stretch, some more deficiencies in the method could be identified. The most obvious one is the staticness of the images as opposed to the moving, more spatial experience of driving or being a passenger in a vehicle. Considering the road environment from an image-by-image basis often exaggerated travel distanc-

es, while understating the breadth of the road. This, in turn, had a great influence on the experience of openness and closedness. The somewhat spherical rendering that Street View uses to compose its imagery has a side effect of understating the height of smaller features, while exaggerating heights of high features and the vastness of open spaces. The camera used in the Street View-recording vehicle is also notably higher than an average road user's eyes, which meant that for example the experience of driving up the Nyboda interchange is much more impressive on Street View than live, as the screen-clad railings block views into the city. These factors make some of the descriptions of potential views and experience that much less reliable.

The Street View camera is also somehow calibrated to keep an even height, which almost entirely obscures the effect that topography has on the road. In other words, the rise and fall of the car and the road user is factored into this analysis only in a very limited fashion, while in reality the height differences do have an influence on the experience. Luckily on this specific stretch the topography of the road is, while important, not essential for forming an overall impression of the road environment, but for future use of Street View as a tool for surveying the roadscape this weakness is very important to acknowledge.

There is also the question of whether or not experience can be evaluated from second-hand sources, as pointed out by Etteger, Thompson & Vicenzotti (2016, p. 88-89). Something that became immediately tangible during the test drive was that an actual field of sight is wider than the framed extent used in this thesis, even though the missing field consists of the areas of peripheral sight. The test drive was experienced and documented from a passenger's point of view, which of course enables a wider field of vision due to a freedom of movement, but even a driver may choose to concentrate on something to their side if their attention is caught. The experience of a few sites, namely the Nyboda interchange and the bridge over Fittja bay, was actually more impressive on Street View than live, providing ideas about how to improve the current situation so that it would live up to the virtual experience. On the other hand, Street View could not properly express the beauty of Botkyrka church. So while second-hand media certainly can give an idea about aesthetic qualities of a place and even give aesthetic experiences of the place, the final judgment should be done on-site.

All in all, the chosen method served its purpose in this study quite well, as the approach is very much that of a preliminary study. Surprisingly few places and areas felt or appeared considerably different. Especially negative impressions were very well transmitted through imagery, like the lack of coherence in Smista-Sätra and the monotony of Fruängen-Västertorp. It must be added, though, that the textual information provided by Bosse Bergman's books (2008), municipal and regional plans as well as the Transport Administration's many documents and oral information concerning the area were indispensable for making sense of the studied stretch, its past, present and future. Without these descriptions and analyses there would have been a severe lack of local knowledge, which would have discredited the case study and the consequent landscape assessment completely.

5.2. Need for further research

Aesthetics in the road environment is a complex research area, where several different needs for new research could be identified. The two wider subject areas mentioned are only examples.

5.2.1. The conflict between road user experience and life by the road

This thesis presents some ideas for encouraging and enabling road users to experience the road environment in a way that ties them to their locations. Many of these suggestions can be applicable in situations where the road environment does not extend beyond the roadway, sometimes not even beyond the carriageway. For example, dividing the approach road into zones and assigning each zone their characteristic materials and design solutions, like on the approach roads to Gothenburg, is one possibility for creating identity for road sequences that could otherwise be experienced as non-places.

”- - - landskap är en plats där livet pågår vid sidan av vägen liksom på den, i två olika hastigheter.”

(Wingren 2009, p.108.)

” - - - the landscape is a place where life goes on by the road as well as on it, on two different speeds.”

(Wingren 2009, p.108, translation)

Still, one might wonder whether or not the creation of road environments that, isolated from their surroundings, are essentially non-places, is the optimal solution for road user experience. It cannot be denied that roads as objects fragment landscapes, habitats and even cause social barriers, not to mention the traffic on them that strengthens the barrier effect and causes noise and pollution, and for these reasons moving roads into tunnels and different kinds of walled shafts is becoming a more and more standardized solution in city- and road planning. It is a solution that can be argued for from social and ecological perspectives, and often isolating the road is also a good way to minimize adverse effects on landscape and cultural objects. Against heavy arguments like these it becomes somewhat hard to advocate aboveground roads where wide, unlimited views are provided for the road user.

As Wingren (2009 p. 108) so eloquently puts it in the

quote on this page, road user experience has its worth as a way of connecting people with their surroundings. There are places that people only experience from the road during the course of their lives, making the road user experience their only link to these places, their history, values and changes. Meyer (2008) sees this link as an opportunity to influence public attitudes positively, especially towards ecologically motivated projects and features that often otherwise are not understood or appreciated (pp. 6, 9-10, 15). The municipalities and other actors along the road are also interested in influencing the road users' impressions of places, usually for commercial reasons. While many effects can be attained through careful design of the roadway, one might wonder, for example, if the view of treetops behind a matchingly printed noise screen makes enough of an impression to make the road user interested in preserving that forest, or if that would rather require a direct view, with possibilities for observing how the appearance of the forest changes with the seasons and in the course of time.

In other words, it can be asked whether or not the link between the road user and the environment, as seen from the road, is something that can be created through designed expressions of the environment in a roadway that is otherwise isolated from its surroundings. This is related to the thoughts that Etteger, Thompson & Vicenzotti (2016, p. 88-89) and Meyer (2008, p. 10) express about the relationship between a depiction of a place and the actual aesthetic experience of a place. A landscape is so much more than its appearance, as frozen in time: its aesthetics are multi-faceted, multi-sensory and multi-temporal (Spirn 1988, see Meyer 2008, p. 8), which makes the landscape difficult if not impossible to experience through either something that only looks like it, or something that expresses an interpretation of it. As such, it could be assumed that isolation and second-hand depiction of places does not provide the road user with as high-quality aesthetic experiences as might be possible if a view into the actual place was possible. The result could then be that the ties between the road user and their environment are not formed or at the very least are weaker than what would be needed in order to make the road user care about the place. This could have consequences for decision-making, as the ties people have to places influence their thoughts and judgments concerning them, as pointed out by Wingren (2009), see the quote on this page.

The next question is then about the value of these ties, and how they can and should be prioritized in planning. Let us imagine how road environments could develop, if

"--- betydelsen av trafikantupplevelsen för att länka samman våra liv med det historiska landskapet såväl som med det nutida bruket av det som produktionsområde. Den andra var betydelsen av människors egna minnen från tidiga landskapsupplevelser, och dess inflytande på tankarna om vad som är vackert i landskapet och hur detta påverkar beslutsfattandet om landskapsförändringar."

(Wingren 2009, p. 108)

"- - - the meaning of road user experience [lies in the way it is] linking our lives together with the historical landscape as well as its current use as a production area. The other was the meaning of people's own memories of early landscape experiences, and their influence on thoughts about what is beautiful in the landscape and how this affects decision-making about changes in the landscape."

(Wingren 2009, p. 108, translation)

it would be decided that roads should categorically be isolated from the rest of the society through walls and sometimes ceilings, as well. In order to provide meanings, both direct and indirect, these road spaces could be furnished thoughtfully, with enough distinctiveness to keep the road user on track about their location. The municipalities and businesses along the road would probably still want their share of the space for advertising themselves in order to persuade the road user to leave the road and to actually come and see what the world outside has to offer. Because wouldn't this walling and tunnelling make the road a space that's basically "inside"? The amount of natural light entering these constructions would diminish drastically, partly obscuring the road user's sense of time. The changes in the outside world, both seasonal and temporary and permanent, would become invisible or hard to follow. None of this sounds too bad, especially not when compared to the known disturbances caused by noise and habitat fragmentation, but it would definitely be a great change to how roads have enabled observing the "outside". Also it should be noted that what has been described here is a kind of a "best-case scenario": what about the places where similar care to motivate the road user would not be taken?

From this point of view the open road environment, while having undeniably negative consequences for many people, seems like a much more democratic, more expressive option. At least in those situations the perceivable meanings, priorities and narratives are not inevitably decided on by somebody else, but the road user retains much of their own freedom of interpretation. But should the freedom of interpretation be available in all public spaces, or could we simply accept that we need to trade off the road user's wide possibilities for observing the road environment in order to enable quieter, cleaner and less risky areas by highways? After all, all of these places with their multifaceted meanings are still available to an observer on smaller roads, on foot or by bike. The conflict between the road user and the landscape user is strong, and the author of this thesis would prefer to solve these conflicts to the benefit of the people and animals living beside the road. On the other hand, after having spent almost half a year on learning about the benefits of providing the road user with a meaningful, rich and guiding road environment, the author cannot wholeheartedly agree with the idea of categorically isolating roads from their environments. A bland and non-confrontational suggestion would be to solve the issue of integration between the road and the wider landscape on a place-by-place basis, possibly supported by a kind of a typology of areas based on their vulnerability to the negative effects of the road.

The literature referenced in this thesis concentrates on the perspective of the road user, which has also been the reason why the thesis has the same focus. To be able to achieve a more balanced view on the isolation or integration between highways and the life around them, research on the experience of the highway as viewed from the landscape is encouraged.

5.2.2. The aesthetic quality of the public environment

The effects that the aesthetic environment has on people and especially on road user experience has been discussed widely in this thesis. To sum some of

the arguments up, it has been suggested that aesthetics affect people's health and well-being, their traffic behavior, and their relationship to their surroundings. The recommendations for enabling these effects to be positive have been mostly discussed from a functional perspective: cues of entrance function as aids for orientation which keeps the road user motivated, distinctive architecture strengthens a construction's work as a landmark, which strengthens the road user's ties to the place and so on. Sometimes also a redesign has been suggested, with a request that it provides a certain function, for example an impression of tidiness or a sense of coherence. The intrinsic value of aesthetics and the actual process of aesthetic design, as a way of forming the features that would provide a desired function (Nationalencyklopedi, see SOU 2015:88 p. 60) have not been as strongly on the agenda.

In the secondary goals for improving the scenic landscape it is suggested that new features should complement existing visual qualities. The character and objective of this "complementation" is intentionally left open. This has been done both to direct the designer's attention to site-specific qualities and to allow for artistic and cultural expression, instead of focusing on a certain set of visual attributes that would categorically be claimed to complement any site. The decision is supported by Howett (1987), who states that landscape architecture should answer to the functions, structures and processes of the landscape. The answer is formulated in the design process, which combines artistic ambition with the existing qualities of each individual site. This process of design gives a result that enables experiencing the beauty of that specific place. (see Meyer 2008, p. 8.) It is also a way to encourage layering of cultures, values and other meanings in the roadscape, to allow people to contemplate on the past, present and future of the societies and people that have made their mark in the road environment. This will also enable people to make judgments of the design choices, whether they find them funny, overused, refreshing, disgusting; that is, to have aesthetic experiences.

Another point to make for the role of aesthetic expression is that there will always be one, as was hinted at before. All of the things created and modified by humans have sensory attributes, which are perceived and processed emotionally and/ or cognitively. Meyer (2008, p. 10) points out that the practice of landscape architecture creates cultural objects. Zangwill (2007) then proposes that the reason why people create anything is to experience the aesthetic pleasure that the end result provides (see Etteger, Thompson & Vicenzotti 2016, p. 87). Both are understandable positions, even though opposite opinions can also be expressed: some landscape architects consider their work best done when no traces of it are visible in the end result, and hedonistic pursuits are often publicly judged. Still, even work produced according to the latter principles will express certain aesthetic preferences and judgments. Appreciating nature and landscape as is is an ideal in itself, often tied to an idea of ecological values only or mostly residing in features with natural appearances. Striving for this includes a descriptive aesthetic judgment, "naturalness", and the evaluative aesthetic judgment that follows is "beauty" or possibly "rightness", because of the moral goodness that some people associate with nature and ecology. Similarly, the discouragement of hedonistic pursuit is sometimes expressed as "form follows function", and objects designed accordingly can be described as "understated" or "modern" or "everyday". The pride that people

take in such objects is certainly partly due to their functionality, but it could also be argued that it involves aesthetic judgment; simple appearances are "good", unremarkable appearances are "beautiful".

Aesthetic expression, especially when artistically motivated, has still untapped potential in the road environment. As an example of this areas where the road environment are limited to the roadway can be mentioned. As suggested in many of the recommendations, the possibilities for creating narratives and identity for each place through aesthetically aware design of road equipment is intriguing, and could lead to great developments in the discipline of artistic road environment design. On the other hand, this development would raise a whole slew of new questions. What kind of a symbol language will be developed to express the different aspects of the world beyond the noise screen? Who decides which of these aspects are worthier of recognition and expression than others? Will somebody be held responsible for creating road environments that, while making sense to the artist themselves, do not communicate with the majority of road users?

It is important to recognize the societal and personal values that guide the formation of aesthetic judgments and consequently the design choices that are made in the everyday environment, including but not limited to the roadscape. If, for example, the subjective experiences of beauty will continue to be treated as objective judgments of aesthetic quality, there is a danger that the meanings and forms of expression that can be found in the public environment do not communicate the rich variety of aesthetic experiences available. For the democratic development of public spaces it should be made sure that the forms and contents of meanings in the road environment are plentiful, leaving it to the perceiver's own discretion to find and interpret those stimuli that correspond to and improve on their understanding, memories and experiences.

It would be very interesting to see an application of research-by-design methods that would attempt to investigate the connection between users, design and site in a strongly functional environment, like the road environment. The overall design's aesthetic qualities, societal response and effect on the primary functions of the space could be studied through creation and evaluation of different design proposals. Special attention could be paid to the experiential values and the prioritized user demographics of each proposal.

References

Appleyard, D., Lynch, K., & Myer, J. (1966). *The view from the road.* Cambridge, Mass.: MIT P.

Arnheim, R. (1974). *Art and visual perception: A psychology of the creative eye* (The new version, expanded and rev. ed.). Berkeley: Univ. of California P.

Banham, R. (2009). *Los Angeles: The architecture of four ecologies.* Berkeley, Calif. ; London: University of California Press.

Bergman, B. (2008a). *E4-staden: det trafikala stadslandskapet längs E4:an genom Stockholm.* Stockholm: Stockholmia.

Bergman, B. (2008b). *E4:an mot för mot: platser och bebyggelse längs Stockholms trafikala ryggrad* / Bosse Bergman. Stockholm: Stockholmia.

Berleant, A., Carlson, A. (2007). *The aesthetics of human environments.* Peterborough, Ont. [u.a.: Broadview Press]

Betänkande av Gestaltad livsmiljö - en ny politik för arkitektur, form och design. SOU 2015:88. 2015. Statens offentliga utredningar. Stockholm.

Botkyrka municipality, Skanska, WSP Analys & Strategi. (2015). *Botkyrka- Södra Porten till Stockholm.* Project brochure. https://www.botkyrka.se/bo--bygga/botkyrka-pa-langre-sikt/botkyrka---sodra-porten-till-stockholm.html (Downloaded 20.1.2017.)

Botkyrka municipality. (2011). *Program för områdena Hägelby, Eriksberg och Lindhov.* https://www.botkyrka.se/download/18.4a23abd9158495687c9ebc3f/1486981419975/Planprogram_Hagerik_101230_w.pdf (Last referenced 5.5.2017.)

Botkyrka municipality. (2012). *Framtid Fittja – Detaljplaneprogram förstadsutveckling.* Detaljplaneprogram för Fittja. 8 maj 2012. https://www.botkyrka.se/download/ 18 .4a 23abd9158495687c9ea283/1486981401772/Botkyrkas+%C3%96versiktsplan+2014.pdf (Last referenced 5.5.2017.)

Botkyrka municipality. (2014). *Botkyrkas översiktsplan 2014.* https://www.botkyrka.se/download/18.4a23abd9158495687c9ea283/1486981401772/Botkyrkas+%C3%96versiktsplan+2014.pdf (Last referenced 5.5.2017.)

Bucht, E., Pålstam, Y., & Wingren, C. (1996). *Trafikantupplevelse på väg* (Stad & land (Alnarp. 1982), 142). Alnarp: Movium.

California Department of Transportation (2006). *Highway design manual*, chapter 60, p. 1. (http://www.dot.ca.gov/hq/oppd/hdm/pdf/chp0060.pdf). Downloaded 24.2.2017.

Deming, E., & Swaffield, S. (2011a). *Landscape Architectural Research: Inquiry, Strategy, Design.* John Wiley & Sons.

Drottenborg, H. (1999). A*esthetics and safety in traffic environments* (Bulletin / Lunds tekniska högskola, Institutionen för teknik och samhälle, Lunds universitet, 176). Lund: Univ., Department of Technology and Society, Traffic Planning.

Drottenborg, Helena (2004). P*rogrambeskrivning inom området vägarkitektur: genom integrering av ämnesområdena trafikteknik, tillämpad estetik, miljöpsykologi, fysiologi, landskap och etik.* Lund: Univ.

Dagens Nyheter (2012), Sjöblom A. *Ericsson-byggnad ska förvandlas till bostäder, fasaden ska stanna kvar,* 15.12.2012. http://www.dn.se/bostad/bostader-planeras-i-kontor/, (referenced 28.4.2017)

Framtidsformer- Handlingsprogram för arkitektur, formgivning och design. Regeringens proposition 1997/98 :117. Presented to the parliament on the 5th of March 1998.

Herrington, S. (2016). *Beauty: Past and future.* Landscape Research, 441-449.

Hubendick, P. (1976). *SRS Vägformgivning.* 1. Uppl. ed. Stockholm: SRS Förl., Print.

Huddinge kommun (2014). *Huddinge kommun översiktsplan 2030.* https://www.huddinge.se/globalassets/_gemensamma/styrdokument-overgripande/plan/oversiktsplan-och-prioriterade-projekt/oversiktsplan-huddinge-kommun-2030. (Last referenced 6.5.2017.)

Lag om ändring i väglagen 1971:948 (1998). Stockholm (SFS 1998:803).

Laurén, C. (1992). *Stadsport: att forma en stadscentré = Kaupungin portti : kaupungin sisääntulon muotoilu.* [Helsingfors]: [Vägstyrelsen, utvecklingscentralen].

McCluskey, Jim. *Road Form and Townscape.* 2.nd ed. Oxford: Butterworth Architecture, 1992. Print.

Meyer, E. (2008). *Sustaining beauty. The performance of appearance.* Journal of Landscape Architecture, 3(1), 6-23.

New York State Department of Transportation (2009). *Highway design manual,* chapter 2, p. 10. (https://www.dot.ny.gov/divisions/engineering/design/dqab/hdm/hdm-

repository/chapt_02.pdf) Downloaded 24.2.2017.

Porteous, D. (1996). *Environmental aesthetics : Ideas, politics and planning.* London: Routledge.

Rychlik, C. (2005). *På väg mot vägarkitektur.* Lunds tekniska högskola, institutionen för teknik och samhälle. Trafikplanering 2005. Thesis. 131.

Stockholms läns landsting (2015a). *Programstudie Spårväg Syd Flemingsberg-Skärholmen-Älvsjö. Miljökonsekvensbeskrivning.* Samrådshandling, oktober 2015.

Stockholms läns landsting (2015b). *Programstudie Spårväg Syd Flemingsberg-Skärholmen-Älvsjö. Gestaltningsavsikter.* Samrådshandling, oktober 2015.

Stockholms stad (2010). *Promenadstaden – Översiktsplan för Stockholm.* Antagen av kommunfullmäktige 15 mars 2010. http://vaxer.stockholm.se/globalassets/tema/oversiktsplanen/promenadstaden_oversiktsplan-for-stockholm.pdf. (Last referenced 5.5.2017.)

Swaffield, S., & Deming, M. (2011b). *Research strategies in landscape architecture: Mapping the terrain.* Journal of Landscape Architecture, 6(1), 34-45.

Trafikverket (2011a). E*4 Förbifart Stockholm- Arbetsplan. Gestaltningsprogram del 1: Ytlägen. Ansluter till: Gestaltningsprogram del 2: Tunnlar.* Utställelsehandling 2011-05-05. Objektnummer 8448590.

Trafikverket (2011b). *Vägverkets namn genom tiderna.* (http://www.trafikverket.se/jarnvagsmuseum/samlingar-kunskap/vagsamlingar/historia/Vagverkets-historia/Vagverkets-namn-genom-tiderna-/) Referenced 25.2.2017.

Trafikverket (2013). *Trafiksäkerhetsmål.* Available at: http://www.trafikverket.se/om-oss/var-verksamhet/sa-har-jobbar-vi-med/vart-trafiksakerhetsarbete/trafiksakerhetsmal/nollvisionen/, referenced 7.2.2017.

Trafikverket (2014). *Handbok för gestaltningsarbete och gestaltningsprogram i infrastrukturprojekt.* TRV 2014/78881. Trafikverket.

Trafikverket (2015). Trafikverket (http://www.trafikverket.se/en/startpage/about-us/Trafikverket/). Referenced 25.2.2017.

Trafikverket (2016a). G*estaltningsprogram Tvärförbindelse Södertörn. Huddinge, Haninge och Botkyrka kommun, Stockholms län.* Vägplan- Val av lokaliseringsalternativ, 2016-10-14. Projektnummer 145326.

Trafikverket (2016b). *Landskapsanalys för planläggning av vägar och järnvägar, En handledning.* TRV 2016:033. Trafikverket.

Trafikverket (2016c). *Landskapsanalys Tvärförbindelse Södertörn. Huddinge, Haninge och Botkyrka kommun, Stockholms län.* Vägplan- Val av lokaliseringsalternativ, 2016-10-14. Projektnummer 145326.

Trafikverket (2016d). TDOK 2015:0323. *Riktlinje landskap.* Riktlinje.

Trafikverket (2016e). *Utformning och gestaltning.* Available at: http://www.trafikverket.se/for-dig-i-branschen/Planera-och-utreda/Arkitektur-och-gestaltning-i-transportsystemet/utformning-och-gestaltning/. Referenced 7.2.2017

Trafikverket (2016f). *Åtgärder inom Trafikverkets verksamhet som bidrar till miljökvalitetsmålen.* Available at: http://www.trafikverket.se/om-oss/var-verksamhet/trafikverkets-uppdrag/regeringsuppdrag-remisser-och-remissvar/Regeringsuppdrag/atgarder-inom-trafikverkets-verksamhet-som-bidrar-till-miljokvalitetsmalen/. Referenced 8.5.2017

Transportpolitik för en hållbar utveckling (1998). Stockholm (Regeringens proposition 1997/98:56).

Van Etteger, R., Thompson, I., & Vicenzotti, V. (2016). *Aesthetic creation theory and landscape architecture.* Journal of Landscape Architecture, 11(1), 80-91.

Vegvesen&Tanroads.(2012).MinistryofWorks,*RoadGeometric Design Manual. Abbreviations and Definitions.* (http://www.vegvesen.no/_attachment/367517/binary/630158?fast_title=Tanzania_Road+Geometric+Design+Manual+(2012).pdf) Downloaded 24.2.2017.

Vägverket (1989). 1989:23. *Hur ser våra vägar ut egentligen, och vad kan vi göra för en bättre vägmiljö?: dokumentation från seminarium med inriktning på två problemområden: de stora infartslederna, genomfarter i mindre tätorter.* Borlänge: Vägverket.

Wingren, C. (2009). *En Landskapsarkitekts Konstnärliga Praktik : Kunskapsutveckling via En Självbiografisk Studie.*

Wingren, C., Olsson, K., & Sverige. Vägverket. (2002). *Göteborgsregionens infarter : Ett samarbetsprojekt mellan Vägverket och de fem kommunerna Ale, Göteborg, Härryda, Mölndal och Partille.* Göteborg: Vägverket Region Väst

All maps are based on Lantmäteriet's geographical data service, Kartsöken. https://kso.etjanster.lantmateriet.se/ (referenced several times between January 2017 and May 2017). All of the utilized topographical map data is © Lantmäteriet. Any flaws in the modified maps are the responsibility of the author of the thesis.

All of the hand-drawn images from the journey are based on Google Street View data from 2014 and 2016. Any flaws in the images are the responsibility of the author of the thesis.

Many of the thoughts presented in this thesis have resulted from meetings and discussions with the following steering group at the Swedish Transport Administration, Region Stockholm (2017): Gustavsson, Kerstin; Hallesjö, Maria; and Ström, Kajsa. some of the meetings were also attended by Broman, Mats; Hällgren, Nina; and Modén, Maja, also from the Transport Administration.

The author of this thesis would like to thank everybody involved in the process: the steering group at Swedish Transport Administration, my thesis supervisor and the examinators.

Special thanks go also to SLU library that was my second home in Alnarp, the friends at school and abroad who listened to my long rants about various subjects, as well as a certain figure skating anime that reminded me that there might be a bright future ahead of me, and not just behind me.