From Arterial Integration to Segregated Lanes: A 1988-2011 Case Study of Cycling Routes in Vancouver, British Columbia

by

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B.A. (Communication), Simon Fraser University, 2008

THESIS SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF ARTS

in the
School of Communication
Faculty of Communication, Art and Technology

SIMON FRASER UNIVERSITY

Summer 2012

Approval

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Degree: **Master of Arts**

Title of Thesis: ***From Arterial Integration to Segregated Lanes: A 1988-2011 Case Study of Cycling Routes in Vancouver, British Columbia***

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Date Defended/Approved: August 14, 2012

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Abstract

After more than two decades of cycling transportation planning, Vancouver's first segregated bike lanes represent a new and perhaps temporary stability in cycling route design in the city's dense downtown core. The 1988 *Vancouver Comprehensive Bicycle Plan* called for the integration of cyclists with arterial vehicle traffic via the research of John Forester (1987; 1994). However, the infrastructure for cyclists created since that time, including the city's local street bikeway network and the new downtown segregated bike lanes, has deviated significantly from this strategy. From a social construction of technologies perspective, I argue that this shift required the recognition of a new relevant social group in the social construction of the city's cycling infrastructure. The recognition of this group, the "near market" for cycling, helped produce the conditions necessary for more powerful relevant social groups to reconstruct the meaning of cycling routes in Vancouver to favour segregated designs.

Keywords: utilitarian cycling; social construction of technologies; sustainable urban transportation; Vancouver; cycling infrastructure

For my grandmother Jane Goeth, who we
affectionately know as Muzzy,
and for my grandmother Phyllis Zeisler Porter,
who is dearly loved and fondly remembered.

Acknowledgements

To my partner, Rachel Rees, for putting up with me at perhaps my most crazy, cranky and exhausted each in turn. Thank you for nourishing my body and mind. Thank you for keeping me grounded.

To my loving parents Hans and Evie Hirschberger for their unwavering love and support. You have taught me, encouraged me and inspired me all at pivotal junctions in my life.

To my beautiful and fierce younger sister Kari, who does not understand the word “no”. As the older sibling, I have always felt it was my duty to set a good example for you, but you have always insisted on forging your own path. You have been a role model for me in this way, and I respect and admire you for it.

To Dr. Zoë Druick: Thank you for inspiring me to pursue graduate work, and for your patient yet firm guidance through this whole process. It has been a privilege to be your student.

To Dr. Peter Chow-White: Thank you for the generosity of your time, and for introducing me to some new favourite theorists.

To Dr. Zena Sharman, whose sound advice and editing expertise helped me not only enter my graduate program, but also fund it. Thank you for lending me your wisdom and your experience; they were indispensible.

To my wonderful editors Naomi Moses and Ashley Dunne, thank you for applying your skills to looking over my thesis. You were incredibly thorough and alleviated a great deal of stress.

To the Social Sciences and Humanities Research Council of Canada for granting me the Joseph-Armand Bombardier Canada Graduate Scholarship to aid me in my research.

To the Dean of Graduate Studies, for funding my studies with two Graduate Fellowships.

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List of Acronyms

ANT	Actor network theory
BAC	Bicycle Advisory Committee
BCCC	British Columbia Cycling Coalition
BEST	Better Environmentally Sound Transport
BNSC	Bicycle Network Subcommittee
COPE	Coalition of Progressive Electors
CoV	City of Vancouver
MEC	Mountain Equipment Co-op
NPA	Non-Partisan Association
PEDAL	Pedal Energy Alternatives
RSG	Relevant social group
SCOT	Social construction of technologies
STS	Science and technology studies
TEAM	The Electors Action Movement
UBC	University of British Columbia
VACC	Vancouver Area Cycling Coalition
VBNG	Vancouver Bikeway Network Group
VPD	Vancouver Police Department

Preface

Cycling has become a passion of mine over the last six years. Although I grew up with a bicycle, it never meant much more to me than any other toy. However, when I entered my early twenties, the combination of my romantic interest in a triathlete and the increasing presence of the bicycle in my immediate social circle brought the artefact back into my life as a commuter vehicle. By early 2007, I was riding my bike for nearly all of my short distance travel in Vancouver.

Around the same time, I began tinkering with a bike my grandmother had passed along, and that tinkering helped place me in the cycling department when I began working at Mountain Equipment Co-op (MEC) in late 2008. At first I was taken aback. Given that I had several years of paid backcountry experience, I had expected to be assigned to the backpacks and tents. However, this unexpected placement turned into an opportunity to learn a great deal more about bicycles and cycling. By the time I quit my job to begin my graduate program in the fall of 2010, I had approximately a year and a half of experience as a bicycle mechanic and was conducting both internal training on cycling gear and bike building, and public workshops on bicycle maintenance.

It should come as no surprise then that cycling began to seep into my intellectual interests as well. I began asking myself questions about the bicycle's evolution as a social technology and having conversations with co-workers and friends about how lower quality bicycles were beginning to look more and more like high quality racing bikes. Perhaps because of my interest in cultural studies, these conversations raised questions for me about the semantic properties of bicycle frames as cultural artefacts.

During this period, Vancouver, BC could not have been a more interesting case for examining the rise of the bicycle as individual local transportation. While I was writing graduate school applications, the City of Vancouver was installing trial bike lanes on the Burrard Street Bridge. The following year, two new segregated lanes in the downtown core made headlines across Canada. I feel fortunate to have been able to examine these facilities so soon after their installation, especially since they attracted so much public praise and scrutiny.

To the cyclist in me, the recent investments by the City of Vancouver in cycling transportation were incredibly exciting, even if my own routine rarely brought me into contact with the new facilities. It seemed to represent a shift in local politics, in which City Council was prepared to give cyclists what they had been requesting for decades. As a researcher, I had questions about whether it was necessary for the elite members of our community to embrace the bicycle before cycling could be considered a legitimate form of transportation. It did not seem like a coincidence that the new mayor, Gregor Robertson, gained rather than lost status in the eyes of his electorate with his decision to ride a bike.

When I began reading social construction literature and thinking more critically about my interests, it became clear that what it meant to be a cyclist and the development of cycling infrastructure were closely intertwined with one another and with the evolution of the bicycle itself. The literatures in my field of Communication support this inquiry into the development of cycling routes in Vancouver, which engages several of Communication's streams. Cultural studies and semiotics provide the foundations in social behaviour and meaning-making necessary to conduct this research, and technology and society studies engages with this material as well as provides the analytical framework.

Introduction

Between 2009 and 2010, the City of Vancouver removed a lane of vehicle parking and traffic on several streets in order to install cycling lanes in its dense city centre. In doing so they were not just engaging in the cultural and political struggle between supporters and opponents of the bicycle, they were also participating in a decades-old battle to stabilize the form of the city's cycling routes. The core controversy in this debate surrounds the opposing principles of whether to integrate cyclists into arterial traffic or whether to segregate them as "at risk" road users in their own facilities. This controversy has taken shape over time and across the globe, and has become an increasingly important discourse as all levels of governments begin to take the consequences of petroleum reliance more seriously.

Nowhere is this more poignant than in dense urban centres, where the bicycle has the potential to usurp the function of the automobile for personal travel of shorter distances. Common estimates of the distances best suited to cycling range from between three and five kilometers (Gardner, 1998), or less than eight kilometers (Carnall, 2000). At the time of the 2001 census, over 33% of those who worked in Vancouver commuted five kilometers or under to their place of employment and only 25% commuted further than 15 kilometers. This data includes those who reside outside of Vancouver and commute into the city from surrounding municipalities (Statistics Canada, 2001).

As discussed in the Preface, I have myself become immersed in cycling culture in Vancouver over the last six years. Between a love of the outdoors, a motivation to maintain personal fitness, and a desire to reduce my own ecological footprint, cycling has taken up a great deal of significance for me. My greatest motivator in taking on this research is to support the bicycle's use as a mode of transportation, especially as it relates to a reduction in the number of personal vehicle trips and a corresponding reduction in harmful carbon emissions (Woodcock, Banister, Edwards, Prentice &

Roberts, 2007), as well as the bicycle's potential to support public health (Cavill, Rutter & Hill, 2007; Hartog, Boogaard, Nijland & Hoek 2010). This potential of the bicycle undergirds my inquiry at all points, and environmentalism is also a political and social motivator for many of the groups I have examined. While not always an explicit element of my analysis, my concern for sustainability and public health is always already present.

The City of Vancouver, in its attempts to support alternatives to personal travel by car, has been an exemplary case for transportation planning in many ways. In choosing this municipality for my case study, I had hoped to uncover a set of best practices that might be pursued by other cities. What I found was that the distinctive historical and social circumstances that led Vancouver to its current status as a sustainable, cycle-friendly city are not all comparable to other cities, even those within the United States and Canada. For instance, the City of Vancouver's choice to forego building a freeway into and through its downtown core makes it quite unique among many of its North American contemporaries, and this decision has had major benefits for cycling transportation.

However, it is the examination of the social construction of cycling routes specifically that might have implications for other urban areas. Cycling routes have met with a great deal of interpretive flexibility by designers as well as by users and non-users of the bicycle. The processes by which this has taken place have been about much more than the policy cycle. They have been heavily determined throughout by two social and technological questions: who is a cyclist, and what is a bicycle? Further, an analysis of these circumstances raises questions about the power of various groups with interests at stake to privilege their desires over those of other groups. All of these factors—technology, society, and power—make science and technology studies a fitting area of inquiry to examine the development of Vancouver's cycling routes.

The field of science and technology studies (STS) as it is employed in this research is the primary subject of the next chapter, "Technology and Society Theory". The social construction of technologies (SCOT) is both a philosophical and a methodological tool for science and technology scholars. Within the philosophy of technology, the constructionist perspective has been theorized extensively, as well as criticised and then reworked by numerous theorists (e.g. Feenberg, 2002; Latour, 2005),

who while taking issue with some of the SCOT oversights agree with its fundamental assertion that technologies are to some extent shaped by society. As a methodological tool, the SCOT approach has also been carefully conceived and adapted (e.g. Bijker, 1995; Klein & Kleinman, 2002; Khoo, 2005; Rosen 1993). It has not, however, been widely employed in a way that demonstrates its usefulness in examining cities as sociotechnologies that structure the examination of transportation technologies within them, as technology and society scholar Paul Rosen (2001) has suggested it might.

Ideally, this research will serve as a blueprint by which similar examinations of urban cycling infrastructure might take place in other cities, including, and maybe especially, those with no historic precedent for supporting cycling as an alternative mode of transportation. In serving this purpose, it is my hope that barriers to increasing the cycling transportation mode share might be easier to identify and thus more readily removed. By situating my study in this way, I hope it will contribute to filling the gap in cycling research identified by Rosen (2003).

While not an academic field in the same way as science and technology studies, the area of cycling research is a pragmatic one that has implications for urban policy and engineering. Given my personal interests in cycling as a form of urban transportation and the global concern for reducing carbon emissions, it is appropriate that this study should be situated within the cycling research area of inquiry as well as within the field of science and technology studies. Cycling research has also overlapped with the social construction of technologies in the work of a number of significant STS scholars. Rosen in particular has taken an interest in the bicycle in his scholarly work, publishing on topics ranging from the social construction of mountain bikes (1993) and sustainable urban transportation (2001) to the relationship of cycling research to policy development (2003) and gender and racing's influence on the development of bicycle technologies (2004).

In both his 2003 examination of cycling research, and with fellow editors David Horton and Peter Cox in the introduction to *Cycling and Society* (2007), Rosen calls for further, interdisciplinary research into cycling transportation. Perhaps put most succinctly:

> The time is ripe for sustained scholarly interest in cycling. Cycling is profoundly relevant to a whole range of important contemporary debates, about how we move around and with what consequences, about the appropriate pace and scale of everyday life, about how we treat our bodies, our communities and our planet, about the very viability of human futures.
>
> (Horton, Rosen & Cox, 2007, p. 10).

Rosen (2003) identifies a number of specific areas for further cycling research intended to benefit the United Kingdom's National Cycling Strategy (NCS). While his article focuses on the strengths and gaps in research in his own geographical locus almost a decade ago, the areas he identifies are still applicable in Canada today. Rosen identifies a need to incorporate health, social inclusion, and public space as concerns in cycling research, which are among contemporary Canadian concerns as well. A recent doctoral graduate of the University of British Columbia (UBC), Dr. Megan Winters, and UBC public health researcher, Dr. Kay Teschke, have recently addressed such issues as part of the ongoing Cycling in Cities study. Winters and Teschke have published several articles on environmental barriers to cycling, including one on route preference among adults (2010). This demonstrates a contemporary and ongoing need for cycling research that exists beyond the boundaries of Rosen's context in the United Kingdom in 2003.

Most importantly for this study, Rosen notes, "one mainstream perspective that is in short supply within cycling research is comparative work that examines cycling trends, developments and provisions in different geographical or historical settings" (2003, p. 37). What he is advocating might best be described as a multi-site case study in the UK. However, this is far beyond the scope of a Master's thesis, and as a Canadian I am much more interested in situating my research within my own geographical locus. By focusing upon a local exemplary single case in urban cycling development and by employing a detailed and replicable method for others or myself to follow in subsequent research, this study will contribute to filling the gap in cycling research within Canada.

This is especially true since it is also the balance of various methods that needs addressing and not just the possible comparative content of the research. As Rosen states, "increasing the balance of social research and case study work is, in fact, supported not just by cycling advocates but also by the [Department for Transport],

which wishes to ensure perspectives and methodologies are balanced across its full research remit" (2003, p. 19). So, although the Cycling in Cities studies have produced significant research on a number of important and well-targeted topics (e.g. Thai, McKendry & Brauer 2008; Winters, Davidson, Kao & Teschke, 2011; Winters, Freisen, Koehoorn & Teschke, 2007), their methods reflect the more positivist epistemology of the health sciences. In the interests of the type of balance between various methods and approaches Rosen calls for in the United Kingdom, a social construction of technologies case study will offer a more holistic, contextual analysis.

While urban planning, cultural policy, geography and political science may seem to be the natural fields of inquiry for addressing the social relationships between cycling infrastructure and the users and non-users of cycling technologies, Rosen (2001) has demonstrated that it is also appropriate to examine urban centres as sociotechnologies in and of themselves, especially as they relate to such an embedded and intricate issue as transportation. By examining the city as its own sociotechnology, the analyst may relate the process of construction shaping the urban area to those that have shaped the particular technology under examination. This also moves toward addressing Hans K. Klein's and Daniel Lee Kleinman's (2002) assertion that SCOT studies need to go further in their consideration of structural factors. In this study, the urban environment of Vancouver is definitely part of this necessary structural consideration, and examining this context allows the study to avoid the problem of social determinism often associated with constructionism (MacKenzie and Wajcman, 1999; Kirkpatrick, 2008).

Method

This section outlines the case study methodology employed in this study, and discusses the research questions as well as the suitability of the methodological tools chosen for answering them. The particulars as well as some of the challenges with and changes to the method due to reconsiderations and necessary adaptations while carrying out the research can be found in the Study Details section below. Since it is my hope that this study will serve as an example that may be used to draw comparisons between case studies conducted in other cities, it is important that the assumptions, priorities, questions and procedures be examined as they evolved. Further, Rosen's

(2003) call for greater inclusion of comparative studies and social research methods within the area of cycling research requires that those projects that endeavour to fulfill this need be transparent and repeatable.

Research Questions

As an avid cycle-commuter, I am passionate about the bicycle's potential as a mode of sustainable urban transportation. As a researcher, I am most interested in how the bicycle has come to be taken seriously by some cities as an alternative to the automobile, and how it may continue to grow as a primary means of transportation in urban settings. The following research questions have guided this inquiry, and reflect this twofold interest. They take into account that it is not only important to understand how the goal of making the bicycle a primary mode of transportation can be realized, but also whether recent developments create new barriers to taking up the bicycle for any relevant social groups:

- How have stabilizations in the social construction of Vancouver, British Columbia's cycling infrastructure shifted since the City's 1988 *Vancouver Comprehensive Bicycle Plan*?
- Have these shifts had any foreseen or unforeseen consequences for relevant social groups?

These questions presume that the social construction of cycling infrastructure has varied over time, and that this shift has been toward greater adoption and support of the bicycle. Given a steadily growing cycling mode share, or percent of utilitarian trips per day made using a certain mode, it is safe to say that the bicycle has achieved greater acceptance as a commuter vehicle in Vancouver since 1988. Still, to adequately address the primary research questions, the case study will also have to address several other secondary questions.

- How has the social construction of the bicycle shifted over the period of the case study?
- How have developments external to cycling transportation contributed to shaping cycling infrastructure?

In conducting this study, the general idea of "cycling infrastructure" quickly became a more targeted inquiry into the types of cycling routes. This occurred despite

the fact that the transportation plans and interviews that formed the backbone of the study frequently mentioned other kinds of infrastructure. While cyclist triggered lights at intersections, bicycle parking and other end of trip facilities such as lockers and showers are important to cyclists, the greatest issue of contention in Vancouver has long been one about where cyclists belong on the road.

Study Design

This section outlines the overall design for a case study that addresses the above research questions by exploring the relationships between urban transportation technologies and society. As previously discussed, the object of investigation for this project is cycling infrastructure development in Vancouver, British Columbia. This choice is motivated both by my own residence here with an interest in managing the scope of my Master's thesis, and by the municipality's recent developments to its transportation infrastructure in relation to its aspiration to become one of the greenest cities in the world by 2020. "Green transportation", although vague as a benchmark, is one of the ten goals that the City has listed as areas that it will contribute to in order to help Vancouver become a world sustainability leader. Transit, walking and cycling are major considerations in this transportation plan, and three new protected bike lanes into and through the downtown core demonstrate that the City is ready to make the kind of changes that its transportation plans have been calling for since 1988.

Vancouver has recently taken action to make its streets friendlier to cyclists, but it has been home to a vibrant community of cycle-commuters for many years. In fact, one of the factors that makes the city such an interesting case for examining cycle-commuting is that many of the conditions necessary to achieve Vancouver's goal of having a high percentage of travel in the city completed by bicycle seem to have been present for many years already. "One less car", a phrase denoting that every cyclist on the road equates to just that, is by no means a new mantra in Vancouver. Further, the city had decided to turn some streets into traffic calmed neighbourhood bikeways as early as 1991 (Vancouver Bikeway Network Group). The end of 2011 is contemporary to this research project and marks a municipal election year in Vancouver, making it an intuitive end for this study. The temporal period for this research will span back from the first cycling transportation plan in Vancouver, the 1988 *Vancouver Comprehensive*

Bicycle Plan (City of Vancouver Engineering Department) through 2011 in order to document the process by which cycling infrastructure in Vancouver evolved as utilitarian cycling gained greater cultural and municipal support.

In theory, the geographic and political boundaries of the City of Vancouver neatly limit this study's research population. However, in practice the City not only cooperates with surrounding municipalities and other levels of government on some projects, including transportation projects, but many relevant social groups operate across the region and not just within municipal borders. As such, the boundaries of my research area have had to be fluid enough to record these relationships without letting the margins slip so far as to make the size of the project unmanageable. So, I have included regional groups like Translink and the Vancouver Area Cycling Coalition in this analysis, but only insofar as their activities have been relevant to the case study population.

Robert K. Yin (2009) notes that "how" and "why" questions are well suited to the case study, and in particular those questions about contemporary events the investigator has little control over (p. 13). As such, case study methodology is appropriate for this inquiry. The need to document past events in this study might have also made it suitable as a history (Yin, 2009); however, ultimately the aim of this research is to come to an understanding of current and ongoing events, making a case study the best match. "How" questions also suit the social construction of technologies method of inquiry to understanding the relationships between technologies and society, and this approach is discussed at length in the next chapter as both a philosophy and a methodology.

Along with its appropriateness for answering descriptive research questions, case study methodology is also particularly fitting for engaging in some theory testing (Yin, 2009; Woodside, 2010). For this study, theory testing takes place in regard to the suggestion Rosen (2001) makes about examining cities as sociotechnologies in and of themselves, which necessarily presumes that the social construction of technologies approach can be a useful tool for examining the operations of urban centres and their relationship to society. Further, the research questions motivating the study imply that there has been an identifiable shift in the social construction of Vancouver's cycling infrastructure and that this shift has recently allowed the city to more fully embrace the bicycle. While preliminary research into the topic suggested that this was the case,

further data collection and analysis might well have suggested otherwise, making it necessary to develop and evaluate this theory. Case study methodology is appropriate for both this framing and propositional use of theory, as suggested by Woodside (2010, p. 11).

A multi-site case study comparing the social construction of cycling infrastructures in numerous cities might be most desirable for gaining a clear picture of the place of the bicycle in urban transportation systems, and this is what Rosen (2003) calls for to address a gap in cycling research, but the scope of a Master's thesis is limiting in this regard. As such, this inquiry has employed a holistic single case design (Yin, 2009) to study Vancouver. A holistic study is desirable in this instance because while it may be possible to dissect a city into various relevant groups, the theory this study uses to analyze these groups focuses upon the city as a larger frame composed of competing factors. While feasible, an embedded design would not do the same justice to the all-important issue of context within this setting.

Beyond the issue of scope for this project, there are other reasons that a single case design is ideal. Yin (2009) identifies five justifications for choosing a single case study over a multi-site case study. These are the critical case, the extreme or unique case, the representative or typical case, the revelatory case and the longitudinal case (pp. 47-49). The focus of this research is best described as a longitudinal case under this schema, or elsewhere as a diachronic analysis (Gerring, 2007, p. 27), as it will examine the same case population over a period of time. Because the case study population was identified partially based upon its recent successes in implementing its cycling strategy, I have also referred to it as an exemplary case, since neither the frames of the unique case nor the revelatory case seem to quite capture this. Rather than being a justification for conducting a single case analysis, framing the study as an exemplary case situates it within cycling research, which is one of the areas that it contributes to.

Study Details

To address its research questions, this case study has had to identify significant elements related to cycling in Vancouver. These have included the relevant social groups, such as activists, politicians and various kinds of cyclists; technologies like

bicycles, bus racks and bikeways; and pieces of the sociotechnical frame such as prevailing discourses about traffic congestion or sustainability, perceptions about the safety of cycling, and policy decisions. The concept of relevant social groups is defined in the next chapter, since it comes from the social construction of technologies framework discussed there in detail. With case study design, it is appropriate to use multiple types of data and analysis to obtain a more detailed, accurate depiction of events. Data collection has thus focused upon identifying relevant social groups, technologies and elements of the sociotechnical frame before describing them to establish their relationships to one another through historical documentary research and interviews.

The most important roles for historical documentary research in this study have been to help identify relevant social groups and to provide a timeline for policies shaping the social construction of cycling infrastructure in Vancouver. It has also helped identify significant events and has provided context for subsequent interviews. This inquiry initially focused upon municipal transportation plans pertaining to cycling from the 1988 *Vancouver Comprehensive Bicycle Plan* (City of Vancouver Engineering Department) onward, most of which were available through the Vancouver Public Library. It has also included biographical information on relevant social groups available via organizational websites. Marshall and Rossman (2011) note that, “there is a dialectical tension in this kind of [historical documentary] analysis between contemporary and historical interpretations of events, even though texts representing either perspective are influenced by the social contexts in which they are produced” (p. 185).

Because this study takes a constructivist approach to understanding data within its social context, this usual pitfall of a historical documentary analysis is not a challenge for it, but rather part of the study’s justification. Further, since the study covers a period of only twenty-three years and most of the documents are municipal, there is less concern for the issues identified by Marshall and Rossman about whether key words or phrases have changed meaning or that documents have been falsified (p.186). However, there were some interpretive differences between the tone of some documents and the way interviewees recalled the events, even where those interviewees were close to those that produced the documents.

Following Hammersly's characterization of the approach to discourse of structuralist theory (1997, p. 237), this study understands discourses in both documentary research and interviews as constituting a social reality that is contingent upon the social factors that align in a particular temporal moment. This approach shares with critical discourse analysis the assumption that it is necessary to locate discourses within wider social structures and the understanding that these discourses are not neutral (Hammersly, 1997, pp. 238-239).

The primary role of interviews in this inquiry was to identify as many elements of the sociotechnical frame as possible and to put relevant social groups and contemporary policy decisions into perspective. Typically, a researcher using SCOT would employ the snowball approach to interviewing until no further relevant social groups came to light (Bijker, 1995, pp. 46-48), but this study has had to balance this need with appropriate time management, since the scope of a Master's thesis necessarily limits the amount of data that can be collected. So, initial interview subjects were be chosen strategically to begin with the widest representation of perspectives possible, based upon the interview subject's inclusion in various relevant social groups identified through documentary research, as well as by my personal experience as a member of Vancouver's cycling community. From this broader starting point, I used the snowball method for identifying further interviewees.

However, the approach of a SCOT researcher can be rather interpretive in determining what relevant social groups to include as well as in deciding how to frame them (Bijker, 1995, p. 49). As a member of the local cycling community, I have been both benefitted and hindered in this regard. It was easy for me to identify a number of important groups with which to begin my inquiry, but it is possible that I have taken other groups for granted.

Interviews were conducted until no further suggestions by interviewees yielded a further relevant social group, and until the picture of Vancouver's development of cycling infrastructure was complete. Although an infinite amount of detail might have been discovered if I had continued interviewing until there were no new individuals identified to speak with, this was neither practical nor desirable. By the time I had finished conducting 12 interviews with 11 people lasting an average of approximately an hour each, I had

gathered perspectives from people who had been involved with the Bicycle Advisory Committee, Cycling British Columbia, the Vancouver Area Cycling Coalition, Vancouver City Council, the City of Vancouver Engineering, Translink, cycling research studies, Pedal Energy Alternatives and bike design. As so many of my interviewees were cyclists themselves, and could even claim inclusion in two or more of the above groups, I chose not to interview any members of the general public about their use of cycling infrastructure or perceived barriers to cycling. Also, many of these issues have been well-documented recently by the Cycling in Cities study at the University of British Columbia (e.g. Winters and Teschke, 2010; Winters, Davidson, Kao and Teschke, 2011).

Because I chose to index by letter those interviewees who preferred to remain anonymous, the balance between the numbers of men and women I interviewed is not obvious. From a feminist perspective this might seem to make the women in my study invisible, but I have employed this tactic as a way of improving the anonymity of my interview subjects. Further, from my own queer feminist perspective, this choice was intended to eliminate gender entirely as a way of understanding these interviewee's comments and to take it away as a marker of legitimacy and credibility. I was disappointed to find at the end of my interviews that out of 11 people, only four were women. However, this imbalance was affected somewhat by the availability of members of some of the relevant social groups I targeted for interviews, and it was not necessarily an indicator of women's involvement in cycling in Vancouver. For instance, I attempted to contact two women for interviews who were current or former members of Council and received no response.

Similarly, it was my intention to interview Vancouver Mayor Gregor Robertson, but I received a response from his secretary to inform me that the Mayor was busy during the six week time period I had suggested. Although I responded to indicate that I would also be available much further into the future, I never received a second response. The mayor's secretary suggested I contact another one of the Vision Councillors, but Heather Deal's secretary also failed to respond to my inquiry. It was my expectation that with a municipal election in the fall of 2011, it would be difficult to sit down with any of the Council members in the fall, but I had not anticipated this difficulty would persist into the beginning of the 2012-2014 Council term.

Marshall and Rossman note that in general elites tend to be problematic interview subjects in part because they are difficult to access (2011, pp. 155-156). Even so, I was able to sit down with former Non-Partisan Association Councillor Gordon Price, who sat on Council from 1986-2002. He had been mentioned by another interviewee, who suggested that no longer being an elected official would make Mr. Price both more accessible and candid than any incumbent Councillor.

All of my interviewees were adults over the age of nineteen, and most were interviewed in their roles as experts and political elites. The only exceptions to this designation were those interviewees who were identified for their role as cycling activists and advocates. I contacted my first set of interviewees personally, who in turn forwarded my request for subsequent interviewees to people we had discussed in their interview. I was copied on these requests, which allowed me to follow up with them as well as give some accountability to the recipients to respond. These potential participants then also knew how I came to have their contact information.

Interviews were all conducted in person before being transcribed either in full or in part. It was originally my intention that interviewees would not be assured confidentiality, as I thought it neither practical nor necessary for this minimal risk study to assure the anonymity of some interviewees when others would be readily identifiable public figures. However, I changed my mind on this issue after discussing it with my first interviewee, who felt that a pseudonym would allow for a much more candid conversation. As such, I allowed my participants to choose whether they preferred to be referred to by a pseudonym.

Since there is no need for this study's interview data to be generalizable, and the focus of the project is fairly clear, semi-structured interviews best suit this inquiry (Bryman & Teevan, 2005, pp. 184-186). The interview guide for this study, as opposed to a more structured interview schedule (p. 186), was used only to provide a general framework for myself as the interviewer as a reminder of general questions and areas of inquiry. This allowed for a flexible mode of inquiry that permitted me to adapt questions where appropriate to suit the experiences and sociotechnical frames of each individual interviewee, while remaining consistent enough to allow for some comparisons between responses where relevant. Some of the more revealing and informative conversations

occurred when the interviewees were not afraid to go “off track” and elaborate. This served the data collection well since the goal of the interviews was to have a range of individuals’ perspectives as representatives of their relevant social group or groups, as well as to draw upon their experiences as experts, or witnesses to events as they unfolded over the case study period. The semi-structured interview also suits the realist perspective (Silverman, 1985, pp. 158, 170-175) used to understand interview responses. This treatment of data is appropriate for the constructivist theoretical orientation of this project since it situates responses as an interpreted reality.

Two appendices contain further study detail that may be useful to refer to throughout. In Appendix A, I have included a list of interviewees along with their relevant social group affiliations where possible, and in Appendix B the ethical approval and consent forms used in preparation for data collection can be found.

Research Summary

Between 1988 and 2011, the City of Vancouver developed and carried out strategies to include the bicycle as an alternative transportation option to the motor vehicle. Because this study attempts to demonstrate the suitability of the social construction of technologies as a methodological approach for understanding the relationships between society and technologies, Chapter 1 deals in depth with the constructionist approach as both a philosophy and as a method. I argue that while social construction in the philosophy of technology has been rightly criticised for failing to acknowledge the substantivist assertion that technologies do to some extent structure society, it is useful as a methodological approach for examining relationships between technologies and society.

In Chapter 2, I set up several important details for the case study. First, I establish its historical context in Vancouver by examining the city’s transportation and planning history. Second, I discuss the relationship between cycling transportation, the bicycle and social conceptions about what it means to be a cyclist. Each of these elements contributes to the necessary understanding of structural elements for examining a technology, and allows this study to position itself, as Feenberg’s dual

aspect theory does (1991), in between substantivist and constructionist perspectives. Finally, I define how the concept of relevant social groups is used in the case study, as well as detail those relevant social groups.

Chapters 3 to 5 cover the period of the case study, and are broken up into sections based upon a series of significant events. Chapter 6 summarizes the case study and notes a number of questions remaining after the research, which are based upon events contemporary to this writing. Concluding the investigation, Chapter 7 examines the study, noting its limits and its implications for further research.

Chapter 1
Technology and Society Theory

> …what depends upon a social force can be changed by another social force: technology is not destiny.
>
> (Feenberg, 2002, p. 64).

Before going on to discuss the details of the case study, it will be useful to examine the key ideas and frameworks that this research employs. I have split this section into several parts to break down the core social construction of technologies concepts and the debates surrounding the approach. The first section deals with the philosophy of technology, where social construction is praised for solving the problem of technological determinism, but meets with a number of its own criticisms. Second, I discuss key definitions and concepts for the pragmatic use of the SCOT approach for understanding the relationships between technologies and society, drawing examples from literatures related to cycling. Next I examine the importance of semiotics to the social construction of technologies, which I follow by a closely related discussion of the importance of understanding the role of power. In these sections I have detailed the SCOT approach perhaps more carefully than is necessary for an academic audience familiar with the STS field, but since I aim to make this study accessible outside of my discipline, and outside of academia, I feel that this level of detail is absolutely necessary.

This case study overlaps the field of policy studies by virtue of its subject matter—infrastructure—but it employs a distinct mode of inquiry rooted not just in the relationships between government, citizens and policy decisions; it also includes technologies as artefacts endowed with social properties and as structuring social architecture. While policy studies might have allowed this research to uncover similar historical information, science and technology studies has provided a richer and more appropriate mechanism for the analysis of this information. The social construction of technologies provides the contextual tools necessary to examine a phenomenon like

cycling infrastructure that is so thoroughly embedded in relationships with other social and technological structures. As Rosen states,

> It is difficult to dislocate questions around transport from the urban centres that form the physical hubs and the *raisons d'êtres* of most transport systems… a growing body of research within STS is now concerned with the study of cities as sociotechnologies, regarding cities not as, "a mere geographical locus for social or technical phenomena", but as "a powerful tool in building new boundaries between the social and the technical, and therefore, in building new forms of life" [Aibar and Bijker, 1997]
>
> (2001, p. 119).

The Philosophy of Technology

The epistemological perspective employed in this research is a constructivist one, and all of the theories employed throughout are compatible if not directly reliant upon this understanding of reality. The social construction of technologies approach will be used in this study as a way of understanding cycling technologies and society within their temporal context. Here technology is understood as Graeme Kirkpatrick has defined it: "technology is a culturally specific combination of the elementary anthropological disposition to create and use tools and the way of life of a social group. This definition highlights the fact that technology is always both socially constructed and sociologically determinate" (2008, p. 2). Such an interpretation positions technologies as artefacts with use value and social meaning, both of which are important for understanding the relationships between technologies and society as reciprocal and contingent. In this way, the concept of a technology is fundamentally distinct from that of a tool, which is purely instrumental; it is arguable whether there can be such a thing, but realists often give the example of furniture (Edwards, Ashmore, & Potter, 2003).

In this way, all transportation infrastructures are technologies. Paved roads serve the utilitarian purpose of allowing the speedy transportation of people and goods while at the same time the accompanying concrete barriers, off-ramps and painted lines dictate a particular and socially accepted way of moving through space. One has only to accidentally go the wrong way down a one-way street or drive into a bus loop to remember how important these conventions are. As Don Ihde argues (1990),

technologies achieve transparency when they are incorporated into our daily routines in this way, but that this "is never complete because there are always glitches and breakdowns at some point," as in the example above, "the technology will [then] reappear in its objectness" (Kirkpatrick, 2008, p. 22).

A constructionist theoretical orientation has shaped this study's data collection and interpretation by providing a structuring framework for understanding the social and cultural factors that have influenced the bicycle as a mode of transportation. In the philosophy of technology, two seemingly opposing schools of thought discuss the relationships between technology and society. The substantivist perspective introduced by Heidegger is concerned with how technologies have structured society, especially since modernism. Heidegger criticises the instrumentalist, or "anthropological" (Kirkpatrick, 2008) understanding of technology, which sees it as a tool-based and user-driven device for altering the physical world. "The point of his substantive critique is that technology is not something we encounter and use in this way. Technology is always an integral element of the world even before we act on it" (Kirkpatrick, 2008, p. 19).

Conversely, the social construction approach to technology and society pioneered by Trevor J. Pinch and Weibe E. Bijker (1984) sees technologies not as the structuring mechanism of society, but as the unique cultural and social product of that society. While this solves the substantivist problem of technological determinism, constructivists have been criticised for going too far the other direction, "[obscuring] what is distinctive about the technological attitude to the world, regardless of historical setting" (Kirkpatrick, 2008, p. 30). To MacKenzie and Wajcman, this tendency toward social determinism is a quandary of failing to consider, in an attempt to demonstrate the importance of social construction and criticise technologically determinist perspectives, that technologies can also influence social relations (1999, p. 23). However, this failing is not inherent to a constructionist perspective, as Andrew Feenberg demonstrates with his "double aspect" theory (1991, pp. 78-83), also known as "dual aspect" theory (Kirkpatrick, 2008). As Kirkpatrick puts it, "…Feenberg's critical theory of technology is based on a combination of pragmatic and phenomenological approaches to the hermeneutics of technology that incorporates both its instrumental and social dimensions" (2008, p. 35).

Dual aspect theory and the critical theory of technology address two criticisms of a purely constructionist approach to the philosophy of technology. First, they avoid social determinism by acknowledging that substantivists are correct in their assertion that technologies are always already present in society, and like language, they have their own built in rule sets based upon their physical properties. In this way, the possible social interpretations that answer the all-important questions "what is it for?" and "does it work?" are limited. "At the same time, which rule sets are to be instantiated in designs is a matter of social choice. It is here that technology is open to social shaping and power" (Kirkpatrick, 2008, p. 36).

Second, combining instrumental and social understandings of the role of technology avoids Kirkpatrick's criticism that "constructivists lose sight of what connects all the different instances of technology, so that what particular technical artefacts signify to people is exhausted by the proximal meanings they take on in the course of being used" (2008, p. 14). To avoid this narrowing of focus, this research has also relied upon the influence of cultural studies theories of semantic meaning creation and power, which Kirkpatrick (2008) also repeatedly identifies as significant to the study of technology and society. The relationship of these to the social construction of technology as a methodological approach will be discussed later in this chapter.

In discussing constructionist perspectives in science and technology studies, it is necessary to deal with Bruno Latour's interventions in the field with his Actor Network Theory (ANT).

> Latour's view is that the idea of the "social" is a kind of lazy shorthand for things that need themselves to be explained, rather than something that we can take for granted. For ANT, human agents, artefacts and social relations (including "society") require us to explain other phenomena… The point of this critique was to insist that if we want to use society as an explanatory variable then we need first to provide an account of the strategic interactions of rational individuals.
>
> (Kirkpatrick, 2008, p. 101)

To address this, Latour creates the category of "actor", in which humans and technological artefacts are equally important. These human and technological actors comprise networks of association and in them participate in exchanges via mediators

and intermediaries to produce various patterns of connection. In these exchanges, human agency is afforded no superiority (Kirkpatrick, 2008, pp. 101-105). For this reason and because ANT does not seem to offer any new tools for understanding technology and society, this study will not incorporate it. Kirkpatrick notes that:

> The goal of ANT is not to expose the workings of power or to reveal any truths that were not well known to relevant social actors in the first place, but rather to generate descriptions that do not invoke any social substance… aside from his barbs at the "sociology of the social", [Latour] gives us no reasons to follow him, since ANT does not speak to any question or interest that we might take in any given situation.
>
> (2008, p. 105)

This research has relied heavily upon the constructivist understanding of technological development, in that the meanings and uses of a technology are thought to be contingent upon the society that created and employs that technology. Seeing technological development as a social, cultural and economic process allows the analyst to avoid a technologically deterministic analysis, or a "Whiggish" account of technological development, whereby history is represented as inevitable and uninterrupted progress (Bijker, 1995, p. 45). Technologies do not appear miraculously in response to a particular need, nor do the ones that persist necessarily represent the best pragmatic solution to the problem, or problems, that they were created to address.

What follows is not intended to insert itself in the philosophical debates engaged with the spectrum between substantivist and constructivist assertions about whether technology shapes society or vice versa. Instead, it takes as a starting point, following Feenberg (1991), that while matter and things in the physical world have properties that do not depend upon human interpretation, and necessarily limit social construction, it is that process of interpretation that shapes what it is we understand them to be. Where dual aspect theory addresses oversights in a purely constructionist approach to the philosophy of technology, the social construction of technologies still offers an excellent toolkit of concepts for analysing the relationships between technology and society.

Social Construction of Technologies

In the previous section I have made a modest attempt to summarize important arguments in the philosophy of technology. The purpose of this research is not to intervene in these intricate debates, which have already been the topic of numerous works (e.g. Feenberg, 2002; Kirkpatrick, 2008; Latour, 2005), but rather to move past them toward a more pragmatic application for the social construction of technologies. This section is meant to orient the reader to this use of SCOT as methodology for understanding specific, contextual relationships between technologies and society, as are the related segments following, which discuss the importance of semiotics and power to a SCOT analysis. In these sections key terms and concepts are defined that will be used throughout the case study analysis.

Technology and society scholars Pinch and Bijker advocated for a constructivist approach to understanding technology in a seminal 1984 article, but it is Bijker who best details the approach as research method in his book *Of Bicycles, Bakelites and Bulbs* (1995). In it he uses early bicycle designs as well as other artefacts to demonstrate the importance of understanding the relationships between technologies and society as diverse and contextual by nature. Bijker also discusses several key concepts that are important to the SCOT approach. While he attempts to address some of the criticisms that had been levelled against his original publication with Pinch, these deserve further critical attention and will also be addressed here in turn.

The key concepts for a SCOT approach include relevant social groups, technological frames, inclusion, interpretive flexibility, stabilization and closure (Bijker, 1995, pp. 30-103). Bijker illustrates the importance of the first of these, relevant social groups, by way of their influence on the technologies that competed to become the archetypical artefact “bicycle” in the late 19th century. Pinch and Bijker define relevant social groups in this way:

> The term is used to denote institutions and organizations (such as the military or some specific industrial company), as well as organized or unorganized groups of individuals. The key requirement is that all members of a certain social group share the same set of meanings, attached to a specific artefact.
>
> (Pinch & Bijker, 1984, p. 414)

Understood this way, government institutions and local advocacy organizations like the ones described in Chapter 1 are no less relevant social groups than inventors and intended users of artefacts.

If we take Bijker's example of the Ordinary bicycle as unproblematic, despite criticisms of the accuracy of the account (Clayton, 2002), we see how the interests of various relevant social groups might shape an artefact. According to Bijker (1995), it was a group of "young men of means and nerve" (p. 41) who drove bicycle sales and innovation away from the low-wheeled velocipede with their desire for speed. Prior to the invention of gearing, the only way to accommodate this was to increase the circumference of the drive wheel on the front of the bicycle. Although Clayton finds Bijker's assertion that women were a relevant social group unfounded, Bijker names the group of women and elderly men responsible for problematizing the Ordinary bike as unsafe and unfitting to a lady's style of dress. Although this called the artefact "bicycle" into question, Bijker names John Dunlop's invention of the pneumatic tire as responsible for allowing the safety bicycle to solve the problems of all relevant social groups, since it allowed the low-wheeled bicycle to surpass the speed of the Ordinary.

According to Bijker, although a relevant social group is often considered an actors' category, it is also an important one for the analyst (1995, p. 48). He notes that, "the basic rationale for this strategy is that only when a social group is explicitly on the map somewhere does it make sense for the analyst to take it into account" (p. 48). Bijker advocates a snowball sampling technique whereby the analyst continues to conduct interviews or documentary research until no new categories come to light. However, there is a notable problem with this approach, namely structural exclusion (MacKenzie & Wajcman, 1999, p. 22), which occurs when marginalized groups are not identified as significant since other relevant social groups do not recognize them in their interviews or publications. "The trouble, of course, is the exclusion of some groups from the processes of technological development may be such that they have no empirically discernable influence on it, and are not, for example, mentioned in documents concerning it" (MacKenzie & Wajcman, 1999, p. 22). Further, if as Clayton (2002) has suggested, Bijker's inclusion of women in his analysis of the development of the safety bicycle is not based upon enough evidence that women were even riding the machines at the time, then SCOT can also suffer from the inclusion of irrelevant groups.

Bijker suggests that structural exclusion can be avoided by deploying positive and negative heuristics that both guide the analyst and direct him or her to appropriate conclusions. He goes on to use his own research on fluorescent lighting as an example. Although one of his sources mentioned the category “housewife” as a potentially relevant social group, and women are indeed a relevant group in other instances, Bijker chose not to include them. He notes that this is where the SCOT approach is rather interpretive. If not including housewives had led to an oversight in the analysis, or in the case of Clayton’s (2002) criticism too great an attribution of importance, it would not necessarily negate all of the insights achieved in the investigation, especially since individuals generally belong to multiple relevant social groups simultaneously. In the fluorescent lighting example, a housewife might still have been included in a broader category like that of “consumers”, and Bijker might have included the few women interested in riding the Ordinary bicycle by defining “women and elderly men” as “potential users” instead.

Structural exclusion is not the only problem with the concept of relevant social groups, however. The individual inventor also poses a challenge for a SCOT analysis. On the surface it appears that although other inventors might have had the same resources and failed repeatedly to discover the solution to a problem, one outstanding individual eventually succeeded and changed the rules of a particular technology irreversibly. This does not make a good case for social construction. However, Bijker introduces the concept of the technological frame to overcome this issue, which is one of situating the individual inventor as part of a network of existing social relationships. This is not to discount the brilliance of some notable individual actors, but rather to contextualize them. “A technological frame comprises all elements that influence the interactions within relevant social groups and lead to the attribution of meanings to technical artifacts” (Bijker, 1995, p. 123). Importantly, these frames are not exclusive to the categories of inventor or engineer, but apply equally to all relevant social groups from invention stages to dissemination and use of technologies.

A technological frame consists of a number of elements, many of which are applicable across social groups, but some groups may have elements unique to their category. Bijker’s common elements of a technological frame are goals, key problems, problem-solving strategies, requirements to be met by the problem solution, current

theories, tacit knowledge, testing procedures, design methods and criteria, user's practice, perceived substitution function, and exemplary artefacts (1995, p. 125). As previously mentioned, individuals will often belong to more than one relevant social group, making it necessary to have an understanding about how this affects the ability of a technological frame to configure the actions of an actor, because the more relevant social groups an individual belongs to, the greater the number of elements that influence their interactions. For this reason, Bijker establishes the concept of inclusion, where "the degree of inclusion of an actor in a technological frame indicates to what extent the actor's interactions are structured by that technological frame" (1995, p. 143). In this way, multiple frames might structure a person's actions simultaneously, but if and when those frames conflict, the one in which the actor has the greatest inclusion will likely supersede in ordering his or her actions and interpretations.

Rosen uses a more encompassing term than technological frame to describe this set of influential elements, which he calls the "sociotechnical frame" (2001). Like Bijker in his concluding chapter of *Of Bicycles, Bakelites and Bulbs*, he also later refers to it as a "sociotechnical ensemble" (Bijker, 1995; Rosen, 2004), which proves all the more fitting since it implies not a single frame but rather a set of relationships. Within this schema the inclusion of culture goes some way toward addressing Rosen's (1993) call for a SCOT approach to give as thorough an account of society as it had of the development of technologies. Cultural considerations expand the typical elements of Bijker's technological frame to include such factors as predominant values, organizational clusters, publications, and cultural discourses around certain artefacts or clusters of artefacts. It also allows the analyst to consider mass discourses, or media accounts of a technology, which become very important when such things as the implementation of municipal planning strategies rely heavily upon public support. Where a technological frame provides problems for the analyst studying a broader context like urban transportation, the sociotechnical frame focuses "on the ways that technologies, social groups and wider cultural factors cohere in particular ways" (Rosen, 2001, p. 119), providing the stronger hinge needed to link multiple technologies with numerous relevant social groups.

The sociotechnical frame has a number of implications for examining cycling transportation in an urban environment. For one, it underscores the importance of

analyzing cycling in cities as a heterogeneous practice open to interpretation by both users and non-users of the bicycle. As is noted at intervals throughout this research, the bicycle has been subject to a great deal of interpretive flexibility. Its users and non-users attribute meanings to it ranging from “fitness machine” and “green transport” to “traffic nuisance”, and each and every one of these becomes a part of what the technology is at a given time.

The concepts of the sociotechnical frame and inclusion solve the problem of how to understand an individual’s involvement in multiple relevant social groups, but also reinforce the socially constructed nature of the individual inventor’s actions by accounting for why one person might have the resources to solve a problem his or her predecessors could not. An excellent example of this phenomenon comes from Glen Norcliffe’s 2001 book *The Ride to Modernity: The Bicycle in Canada 1869-1900*. In his chapter on what he calls the “bicycle carrier wave”, a tie between larger waves of innovation that characterized the first and second industrial revolutions, Norcliffe notes that Canadian patents for innovations relating to the bicycle were concentrated in Ontario. Today this might go unquestioned, since Ontario is home to some of the largest cities in Canada. What makes this interesting is that at the time, Montreal was the largest city in Canada but accounted for only fourteen bicycle related patents to Toronto’s ninety (2001, pp. 82-83). The difference is related to the concept of a sociotechnical frame because while Montreal was a powerful city whose financial capital and industries were concentrated in resources, textiles and other consumer durables, Toronto’s strength lay in steel manufacturing and other technical industries (2001, p. 83). As such, the technological frames of individuals in Toronto included a great deal more tacit knowledge relevant to bicycle design than their Montreal counterparts.

Another key concept for SCOT is interpretive flexibility, which is the possibility that people at any stage of an innovation might understand its potential uses differently. Andrew Feenberg emphasizes the importance of social, cultural and political factors to what might be considered the interpretive flexibility of end users in his opening chapter of *Technology and the Politics of Knowledge* (Feenberg & Hannay, 1995). In this chapter, Feenberg explores what seems much like a precursor to the modern social networking site, the French Teletel system. As part of an early videotex system, the Minitel device, complete with keyboard and screen, was designed by the French

government to strengthen their national communication system to anticipate advances in communication technology and also to catch up to other developed nations like Britain. The Teletel system gave the French people access to a videotex directory, and the government envisioned the system primarily as a business service. However, like the telephone before it, the Minitel device quickly gave way to social demands based upon what the users themselves wanted to apply the technology to, rather than what its inventors and promoters had in mind; in this instance, the greatest demand was for the Minitel to facilitate social networking and romantic encounters. This case aptly demonstrates the ability of a technology to be repurposed by its users, but technologies are equally likely to meet with interpretive flexibility at the innovation stage.

Bijker demonstrates this with his study of Bakelite, a forefather of modern plastics patented in 1907 by Leo Hendrik Baekeland (1995, p. 103). He notes that researchers studying various natural and synthetic resins were motivated by scientific curiosity as well as by the possibility of commercial success. They conceived of a variety of purposes for their research and eventual discoveries, and among these were dyes, lacquers, electric insulators and jewellery (1995, pp. 105-119). While several of these researchers had particular aims in mind, or successfully marketed their discoveries, it was the combination of many individuals' research and the demand for particular properties in a mouldable substance that eventually aligned the interpretive flexibility of these engineer's research interests toward more industrial applications. This alignment is called stability, and stability can happen at any stage and orient in as many directions as relevant social groups can come up with interpretations.

Stability and closure are closely related, and Bijker notes that their difference is largely one of application. Stability is the most appropriate concept for the previous case as it relates to "the intragroup development of artefacts, while closure is primarily relevant to intergroup analysis" (Bijker, 1995, p. 85). This means that closure is the most appropriate term for discussing cases like that of the pneumatic tire, which was initially promoted as a way to reduce the vibration experienced on the low-wheeled safety bike. This problem of vibration was not an issue for the Ordinary bike users, whose interests were still chief among relevant social groups at that time, and early air tires were anything but aesthetically pleasing (Bijker, 1995). So, it was with jeering and insults that the racing crowd met the first pneumatic tire entries into the field, but as Arthur du Cros

noted, “to the stupefaction of onlookers the ugly interloper outpaced all rivals so decisively that their derision was turned to hysterical applause” (as cited in Bijker, 1995, p. 82). Thus, it was not until pneumatic tires proved themselves useful as a way of attaining greater speed that the technology achieved broad acceptance (Bijker, 1995, pp. 77-85).

This is another case of interpretive flexibility, and one that lead to the closure of the technology of the pneumatic tire as a device for speed rather than a tool that reduced road vibrations, despite the fact that it did both. Such meaning making activities are important for a SCOT analysis. In considering the process by which an artefact comes to have a symbolic function for one or more relevant social groups, the field of semiotics is a rich resource for examining the social interactions that frame and create meaning.

Semiotics

In *Technology and Social Power* (2008), Graeme Kirkpatrick identifies language both as a metaphor for the relationship between technology and society and as a key element of a constructionist approach to understanding the role of technology. He uses hermeneutics to describe how society constructs the phenomenological role of technologies (pp. 15-34), which he does not meaningfully distinguish from semiotics despite citing well-known semiotics theorist Charles Saunders Peirce (p. 33). However, for the purposes of this research semiotics will be used to understand this construction of a symbolic function for technological artefacts. Semiotics is a well-defined field, and it benefits this inquiry by offering a description of the relationship between texts, be they a language or an artefact, and the subject interpreting them. This will be important later for understanding the formation of relevant social groups.

In her work *The Subject of Semiotics* (1983), Kaja Silverman demonstrates that “…the terms ‘subject’ and ‘signification’ are at all points interdependent, and that psychoanalysis must consequently be understood as a branch of semiotics” (p. 194). This interdependence has consequences for understanding subjectivity and the relationships between discourses and identity. Silverman applies her ideas to the concept of suture in cinema studies and she relies upon contributions from Sigmund

Freud and Jacques Lacan to strengthen her case. However, it does not follow that her observations are applicable only to scholars of psychoanalysis or film studies. If texts such as film situate viewers to take up a certain subjective position that is inexorably tied to the discursive interplay of camera angles, sexual difference and other social formations that exist independently of and prior to the subject, then so too must other texts be making similar demands upon the subject, including artefacts.

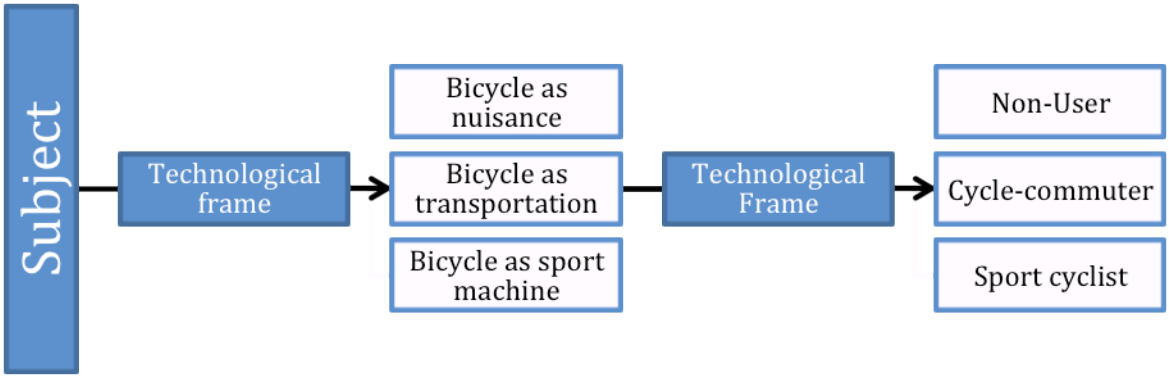
Unlike language, which only takes up subjective meaning through discourse (Silverman, 1983, pp. 43-46), the potential symbolic function of an artefact may be realized both through discourses and through physical interaction, which constitutes a kind of interactive discourse between subject and artefact. Because the artefact is imbued with social properties, it positions the subject in relation to itself. This is the case with technologies like the bicycle as much as it is with other cultural objects already understood to have these properties, such as articles of clothing.

Depending upon the context, the wearer of a leather vest might intend to position himself as a member of a motorcycle gang or as a leather daddy, but in each case the signification relies upon the interaction between the artefact and the subject interpreting it. It does not, however, follow that the interaction between the wearer and the article of clothing will produce the same subjective understanding as an interaction between a third party and the article. This possibility for multiple interpretations creating multiple artefacts and multiple subjectivities is not unlike the relationships between relevant social groups and artefacts described by Bijker (1995).

In an attempt to balance between the extremes of social and technological determinism, Bijker models the relationships between relevant social groups and artefacts via technological frames by combining social-interactionist and semantic perspectives. Using the former, he demonstrates that through interpretive flexibility, a single relevant social group attributes various meanings or purposes to a technology and in effect produces a number of different artefacts. Meanwhile, a semantic perspective allows the analyst to understand the way that a single artefact positions and in this way creates multiple relevant social groups via the structuring lens of the technological frame. This relationship is illustrated in Figure 1. It is the combination of these perspectives that allows the analyst to see the relationships between relevant social

groups and technologies as many to many, with the technological frame acting as a "hinge" between the two (Bijker, 1995, pp. 194-196).

Figure 1. From Subject to Subjectivity



The technological frame acting as a mechanism by which the subject interprets the technological artefact and takes up a subjective relationship to it. Each construction of the artefact "bicycle" creates multiple relevant social groups relating to as many subjectivities.

Although Figure 1 depicts a mostly linear relationship for the sake of simplicity, it is no less possible for a subject whose technological frame leads them to interpret the bicycle primarily as transportation to reject the subjectivity of a cyclist and align themself with the relevant social group of non-users. This will depend heavily upon the contents of the sociotechnical frame and the meanings the subject associates with the artefact, as well as their inclusion in other sociotechnical frames.

When the various objects that relate to a social practice are taken as a whole, these relationships between discourses and technologies are all the more complex. In relation to cycling, these objects include apparel, helmets, bicycles themselves, cycling infrastructure and more. As artefacts with symbolic value, bicycles have conferred meanings ranging from "young" and "elite" to "juvenile" and "poverty" over their more than a century in existence. These interpretations of the bicycle as an artefact are in a reciprocal relationship with the interpretations of what the practice of cycling means to society at any given time.

In his analysis of early bicycle designs, Bijker notes that “whereas skiing began as a way of getting around and evolved into a sport, bicycling began as a sport activity and evolved into a means of getting around” (1995, p. 37). The bicycle as sport machine made sense within the context of the late nineteenth century given the expense of the machines and their novelty. However, as competition and improved manufacturing techniques made the bicycle more fiscally accessible, and the automobile became the choice mode of transport for those who could afford it, cycling evolved into the mode of transportation for the proletariat and later an activity for children. Thus, the practice of cycling and the symbolic value of the bicycle as an artefact have fluctuated dramatically since the bicycle’s creation.

In this way, the symbolic value of artefacts, much like the layers of meaning in language with each concept’s endless referral to another set of concepts (Silverman, 1983, pp. 37-38), is heterogeneous and contested. An artefact positions subjects differently depending upon whether that subject is a user or a non-user of the artefact, and upon how from that position the subject reads the artefact. This is clear in Bijker’s description of the way non-users of early bicycles might jest at cyclists or even throw sticks and stones between the spokes of the front wheels as they rode past (1995, p. 41), while at the same time cycling began to emerge as a popular sport among elite white males. The interpretation of the bicycle as an artefact that achieved the greatest closure would depend heavily upon the status of the relevant social group who held it.

This is why in his 1993 article, *The Social Construction of Mountain Bikes: Technology and Postmodernity in the Cycle Industry*, Paul Rosen criticises Pinch and Bijker’s original publication on the social construction of the safety bicycle (1984) for failing to elaborate upon the characteristics of the relevant social groups (RSGs) they identify:

> …if the wider context of a technology rests on its RSGs, then these too must be seen as socially constructed. It is not enough to take categories such as 'women' and 'elderly men' as unproblematic. The same applies to the relations among RSGs, which Pinch & Bijker's account suggests were not completely harmonious. The conflicts that exist between different social groups are another key to understanding the social processes that lead to stabilization. (p. 485)

This suggests that not only is it necessary to describe the characteristics of relevant social groups, but also to give some account of their relationships and their relative standing. The ability of elite white males in the late nineteenth century to achieve a temporary stabilization of the bicycle despite the problems of other social groups indicates greater influence at the time.

Social Construction and Power

This ability to influence, or power, is another important notion for an analysis of technology and society. Philosophers of technology whose approaches are broadly constructivist, including Feenberg's dual aspect theory, make power relations quite explicit in their analyses (Feenberg, 2002; Kirkpatrick, 2008). Bijker (1995) too makes an attempt to include power analytics in his methodological description of SCOT, and uses his chapter on fluorescent lighting to illustrate how this might be accomplished. He demonstrates that the interests of utility companies and fixture manufacturers shaped the development of fluorescent lighting despite the size and general influence of the dominant bulb producer, the General Electric corporation, steering it toward a less efficient bulb and hence a more profitable one. It is only by understanding power dynamics in context that we might come to see how the resolutions of such conflicts of interest are embedded in stabilized technologies.

Bijker uses Giddens' definition of power in his analysis, understood as "the transformative capacity to harness the agency of others to comply with one's ends" (Giddens in Bijker, 1995, p. 262). While it is important that this conception does deal with power as a "relational concept" that is "exercised rather than possessed" (Bijker, 1995, p. 262), this study will adopt a conception of power that is more social and less individual. Since SCOT takes relevant social groups as a starting point, it is important to understand power as its transformative capacity coheres in certain ways, rather than as single actors exercise it.

In *The History of Sexuality, Volume I* Foucault refers to power as "the multiplicity of force relations immanent in the sphere in which they operate and which constitute their own organization…" (1978, p. 92). Foucault's understanding of power as force relations is particularly appropriate for a SCOT approach to understanding how

technologies develop and redevelop since it does not presuppose that only some groups have power, that it comes from the top down, or that it cannot act on multiple sites from multiple directions simultaneously. As Feenberg notes:

> Foucault rejects the neutrality thesis: knowledge and power are not value-free tools that may be put to a good or bad use. Truth and power are not two independent things that meet contingently in the moment of application… power/knowledge is a web of social forces and tensions in which everyone is caught as both subject and object.
>
> (2002, p. 68)

This conception of power acknowledges that while it may be anywhere and everywhere, its reach and its influence in a given situation is limited to the specific context where that power is relevant. In this way, power exists in all places at once and it is relative and dependent.

Although SCOT has been criticized as being too socially determinist at the same time as it criticizes technological determinism (MacKenzie & Wajcman, 1999, p. 23), the approach can be applied in a way that allows for an understanding of both technology and society as having a part in influencing the other through this multiplicity of force relations. A semiotic understanding of technologies as entities endowed with character and meaning, and as capable of positioning subjects in their roles as members of various relevant social groups, takes the power of technological artefacts into account and treats them as actors. Notably, the artefact as actor in this description only has power because it is ascribed to the artefact by human agency, which significantly differentiates it from Actor Network Theory's attribution of agency to technologies by which it equates them with human actors. Bijker's conception of the technological frame acting as a hinge between technologies and relevant social groups promotes an understanding of this power relationship as multiple and reciprocal.

So, for the purposes of this research, the social construction of technologies framework, in which is embedded a semantic understanding of meaning creation and a post-structuralist conception of power, offers a number of useful concepts and tools for framing the development of cycling infrastructure. SCOT is known to have some pitfalls, but none of these necessarily inhibit the approach, with the possible exception of structural exclusion. Since structural exclusion is also a problem for other prominent

technology and society theories, such as ANT, this problem must be avoided as best as possible and accepted as part of this kind of research.

Chapter 1 Discussion

Although purely constructionist perspectives within the philosophy of technology have been rightly criticised for being too sociologically determinate, as substantivist perspectives were for technological determinism, dual aspect theory offers a fitting compromise. Using this philosophical stance as a starting point, the social construction of technologies can offer a rich and contextual methodological toolkit for examining the development of cycling infrastructure as a technology.

By examining Vancouver as a sociotechnology that provides the rule system for transportation developments, this research overlaps with policy studies. Inevitably a number of the relevant social groups to municipal transportation infrastructures will have power to enact related policy or to influence it, but whereas a policy study might examine how policy and political power are used to shape the urban environment, this study focuses upon the social relations between cycling technologies, the city as a sociotechnology and society, treating policy and political power as one of the rule systems already in place structuring the city.

In the next chapter, these relationships are explored in greater detail. Following Klein and Kleinman (2002), this study treats the city of Vancouver as the framework within which cycling transportation as a sociotechnology is constructed. The role of the bicycle and the cyclist in these relationships is also examined.

Chapter 2
Framing Cycle-commuting in Vancouver

> …Despite holding up relevant social groups [RSGs] as the agents of technological change, few studies give a detailed enough account of RSGs to justify this claim. … The relationship of RSGs to each other must also be explained; if the wider context derives from the RSGs, then the relations among them are the social arena within which the technology is constructed.
>
> Rosen, 1993, pp. 508-509

To understand the development of cycling infrastructure in Vancouver, it is important to understand the roles of the relevant social groups at play. In turn, an analysis of RSGs necessitates an examination of their context, which in this case study is Vancouver; its history, its cultures and its physical characteristics all contribute to the boundaries that the relationships between RSGs and cycling transportation technologies operate within. A careful examination of Vancouver will serve a twofold purpose for the study, providing both the context for developments related to transportation infrastructure and a framework within which to situate the various relevant social groups. Examining the city as a whole is especially important if, as Rosen (2001) asserts, cities must themselves be taken as sociotechnologies. Further, it would be presumptive to think of the beginning of a case study as a blank slate. By detailing the relevant history of Vancouver, this study will avoid isolating its analysis of the research period from its historical and social circumstances.

Putting relevant social groups into context is a vital step, because “in order to understand the social construction of a technology, it is important first to understand the social construction of its relevant social groups” (Rosen, 1993, p. 494). In conjunction with its examination of Vancouver, this chapter will introduce the RSGs identified through the study before going on to discuss them within their temporal contexts in later chapters. There, the relationships between relevant social groups as well as their contributions to events unfolding in Vancouver will be explored in greater detail. Their

establishment in this chapter will serve to provide those details that would be awkward in relation to the chronology of the case study. By providing such detail of RSGs, I hope to go some way toward addressing Rosen's (1993) criticism of some SCOT studies' inadequacy in representing relevant social groups as the instruments of technological development.

Another issue worth addressing before proceeding to the case study is that of dependent and independent technologies. Cycling infrastructure is a dependent technology because without the bicycle it does not have a reason to exist, just as it does not exist without the city, which gives all urban transportation infrastructures their *raison d'être* (Rosen, 2003). The bicycle did not need the modern transportation infrastructure system to come into being, but concrete barriers, lines on the pavement, bicycle parking facilities and cyclist triggered intersections have come to support its use as a utilitarian transportation object. As was apparent in Figure 1, questions like "what is a bicycle?" and "who is a cyclist?" run parallel to one another, and the answers to both of these questions and others like them will directly impact how dependent technologies like cycling infrastructure develop, with variations at the national and local levels. As such, it is vital to consider the answers to these questions in conjunction with those about how cycling infrastructure has developed.

All of the investigations in this section provide what Klein and Kleinman (2002) identify as the structural considerations in a SCOT study. Examining them here allows this research to put those considerations in place as the established system that cycling infrastructure operates and is constructed within. The analysis in this chapter also goes some way toward answering the two secondary research questions about the relationship of the bicycle and other factors external to the social construction of cycling infrastructure to the development of that infrastructure.

Vancouver: The "Setting Waiting for a City"

The greater Vancouver area has been the topic of numerous inquiries; several books have been dedicated to its unique development and achievements in urban planning (e.g. Punter, 2003; Berelowitz, 2005), and volumes of visitor information,

recreational guides and realty listings refer to its spectacular natural surroundings. The history of Vancouver is a multifarious one, from the 1886 incorporation of the City of Vancouver to the fire that destroyed most of the small settlement the same year, and from twice getting passed over as the site of the capital of British Columbia to being named the most liveable city in the world for the fifth straight year (National Post, February 22, 2011). It is a city of many personalities, and although it is a young one even by North American standards, it has developed a character all its own. For the purposes of this research, the "City" refers broadly to the incorporated body that governs the geographic area of Vancouver, and the "city" refers to the collective of people, places and things within those geographic boundaries.

Since cities must be examined as sociotechnologies, it is important to understand Vancouver as more than just an urban centre. It is also the social construct of policies, physical characteristics and social interaction. These factors in turn make up the foundation upon which transportation infrastructure is built, providing the boundaries and the rule systems that relevant social groups operate within. Planning for development in Vancouver has been a significant part of this construction process, and it has happened in several stages.

Around the turn of the 20th century, Vancouver was little more than an industrial town at the end of the Canadian Pacific Railway. In this early stage of development, not long after the city's 1886 incorporation, the bicycle was a popular form of transportation. According to the writings of Major James Skitt Matthews from July 31, 1931:

> The "machines" were so numerous that the City Council ordered special bicycle paths constructed on those streets which were most frequently used. These paths were invariably cinder surfaced, and rolled flat, and ran along the edge of the street between the gutter and wooden sidewalk. They were about six feet wide, and constantly kept in order, level and smooth, by city workmen.
>
> (Matthews, 2011, p. 80)

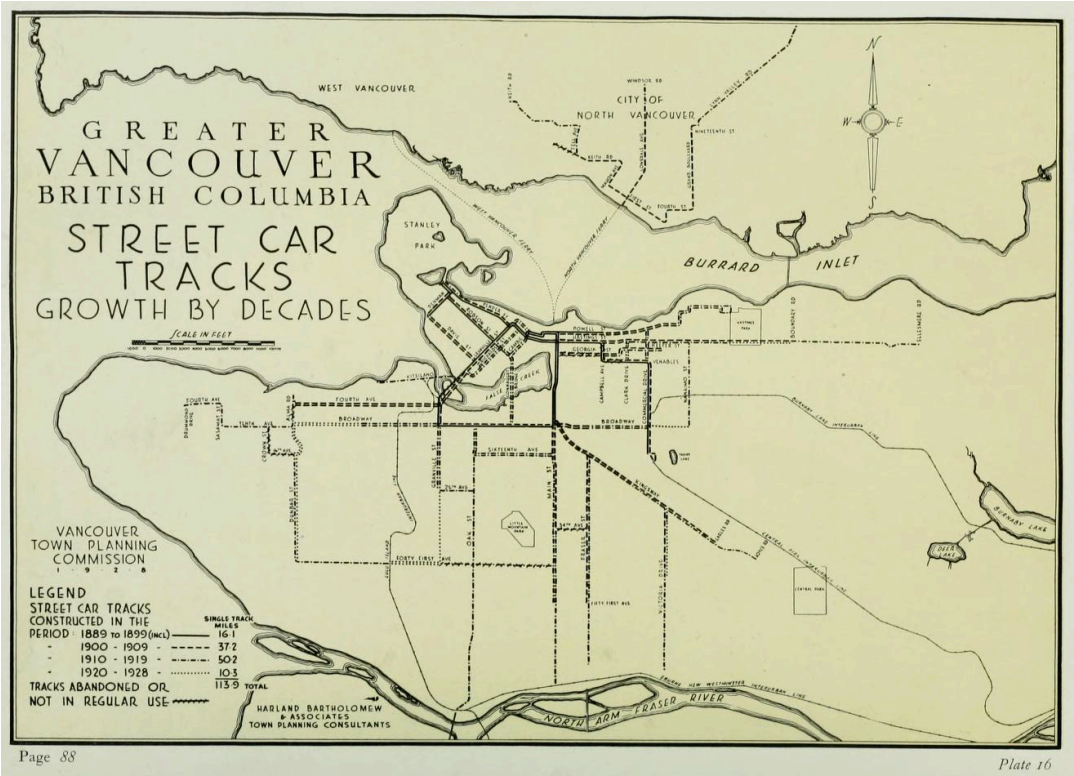
The popularity of the bicycle at the time should not come as a surprise considering that the first mass production of the automobile had just taken place by Oldsmobile in 1901, and Henry Ford's improvement of techniques that helped to drive down the price of the auto would be more than a decade in coming. As Matthews put it:

> The bicycle "craze" was prevalent in Vancouver, as elsewhere, about 1900; almost every family had at least one, some had more… It was a convenient mode of travel in a city as yet unprovided with a full street car service; a growing city badly scattered, and among a people who, as yet, had acquired no individual wealth to speak of. Motor cars were still some years off, many had neither facilities, room, nor means to possess stables or buggies. The bicycle was no longer the unwieldy "penny-ha'penny," big wheel small wheel affair. The "safety" bicycle had come, and with it the Dunlop pneumatic tire; and the "coaster brake" was soon coming. Both wheels were the same size now; it was easily mounted and dismounted, and a fall from it rarely gave much hurt, as the old high wheel, hard tire "wheel" did.
>
> (Matthews, 2011, pp. 79-80)

The bicycle did not retain its status as a favourite mode of transportation as the auto grew more prevalent and affordable, but a number of Vancouver's early transportation developments would prove beneficial to its re-emergence later in the twentieth century. John Punter, whose 2003 book *The Vancouver Achievement: Urban Planning and Design* details the planning history of the city, suggests that the designation of the streetcar lines in the late nineteenth century played a significant role in creating the city's modern gridded street layout. This system as it was in 1929 is depicted in Figure 2.

Although Vancouver's first street, Kingsway, strikes a roughly southeast diagonal through the region, the remainder of the street system consists largely of a regular grid oriented roughly along the lines of the compass. Some parts of the grid overlap unevenly, creating blocks where the streets intersect somewhere in between the streets opposite. Also, in a few areas, such as the downtown peninsula, the grid operates in a closer orientation to the angle of Kingsway than to the compass, making its intersection with the street network just outside of the downtown core a more irregular and disorienting space. While the mesh of roadways in Vancouver is not a perfectly regular grid, it is close enough so as to have allowed Vancouver to develop a very different transportation system than some of its North American contemporaries. I will discuss this further in Chapter 2 in relation to cycling infrastructure specifically.

Figure 2. Streetcar Grid



Vancouver's streetcar lines as depicted in the 1928 city plan by the Vancouver Town Planning Commission and Harland Bartholomew and Associates (p. 88). Copyright held by the City of Vancouver.

Vancouver's streetcar system largely predated the design of its modern street layout. In the early 1900s, many cities had not yet begun adapting their transportation infrastructure to the soon-to-be-dominant mode of transportation, the motor vehicle. In Vancouver, this process had not started until the 1928 *A Plan for the City of Vancouver, British Columbia, Including a General Plan for the Region*, henceforth referred to as the "1928 City Plan" (Vancouver Town Planning Commission & Harland Bartholomew and Associates). Notably, Harland Bartholomew received much acclaim for his achievements in urban planning. By the time he had joined forces with the Vancouver Town Planning Commission, he was already well known for his work in other cities. As Jeffery Brown notes, "no single individual's career better represents the planning vision than that of Harland Bartholomew. An engineer by training, Bartholomew was one of the leading figures in the early development of city planning" (2005, p. 4).

Among its many measures, the 1928 City Plan called for extensive road widening to establish an arterial road network: “in common with most other cities on this continent, Vancouver is coming face to face with the problem of adjusting its street plan to the modern automobile age” (p. 260). It also called for a new zoning system for residential development that would grow to become a hallmark of Vancouver’s city planning. Although it may not be intuitive, the zoning system has also shaped the city’s ability to embrace the bicycle. This will be discussed further below.

Since they had already been established by the streetcar, the streets in Figure 2 would have made intuitive choices as arterial streets in the 1928 City Plan. Not only were their greater use and width advantageous, but also the high volumes of Vancouverites travelling upon them daily made the streets good locations for business owners. Punter notes, “the streetcars established the grid of commercial arterial roads whose fine grain of commercial enterprises is one of the endearing qualities of the city today” (2003, p. 5). So, the establishment of the streetcar grid not only influenced the shape of Vancouver’s roadway network, but also helped establish the intervals of commercial streets.

To serve the residential areas, the streetcar had to run at intervals that were easily covered on foot. For this reason, the streetcar routes were typically close together, especially nearest to the parts of the city with the greatest population density of the day. At the time Harland Bartholomew and Associates in conjunction with the Vancouver Town Planning Commission put together their 1946 *Transit Planning* report there were still numerous neighbourhoods in want of greater service, but their goal was to ensure there was transit within a half mile of the city’s residential neighbourhoods.

In 1953, the Province of British Columbia granted The Vancouver Charter, which “gave the city much greater powers of self-government than other British Columbian or Canadian cities, which remain subservient to provincial municipal acts” (Punter, 2003, p. 13). Although legislation at the provincial level like the Motor Vehicle Act does influence Vancouver’s transportation, the City has been able to set its own planning and policy agendas. Some significant decisions affecting Vancouver’s transportation infrastructure predate the City’s charter independence, and others have almost certainly been shaped by it.

One of these important moments for transportation in Vancouver was in the late 1960s to early 1970s. As former Vancouver City Councillor Gordon Price put it in a personal interview, “by far the most important thing that never happened was connecting the continental freeway system into the city” (March, 21, 2012). After a great deal of pressure from residents to forego the construction of the freeway, intended to run through the historic Strathcona and Chinatown neighbourhoods, the plan was overturned by an incoming Council. The Non-Partisan Association (NPA) had dominated Vancouver City Council for 34 years, but began losing seats to The Electors Action Movement (TEAM) and the Coalition of Progressive Electors (COPE) in the 1968 election before losing the remainder of its seats in 1972 to a TEAM majority (Punter, 2003, p. 26). The new TEAM Council had campaigned on development issues, and fulfilled their promise to put an end to the proposed freeway. The Dunsmuir and Georgia Street viaducts had already been constructed in 1971 as freeway entrances into the downtown core, and the monstrous sentinels still serve as tokens of what transportation in Vancouver might have become. As Punter puts it, they are “constant reminders of the severe urban design problems that the completed freeway system could have proposed” (p. 25).

The Electors Action Movement held onto control of Council for a little over a decade, succumbing to the Non-Partisan Association in 1986. However, Punter notes that over its tenure, “TEAM made significant changes to the way Vancouver was managed, strengthening the mayor’s role, and giving council committees more influence – though not control – over their departments” (2003, p. 26). Punter is concerned specifically with city planning practices, which focus primarily upon the use of private spaces and have as a key tool Vancouver’s much-praised discretionary zoning system. However, Punter makes an important observation about how the TEAM council restructured processes at the City that is important for understanding the relationships between City staff, which includes planners and engineers, and Council. He notes that:

> while the TEAM council was determined to wrest the direction of policy away from the old bureaucracy … it did not wish to interfere in the management of planning programs of the everyday tasks of development control. So once council had defined the direction of policy, it delegated decision-making powers to the planning director, subject to a system of checks and balances and due process.
>
> (Punter, 2003, p. 56)

The decision to forego the construction of a freeway through the City of Vancouver limited the ability of vehicles to enter the city's downtown core, which has long been the economic centre of Vancouver and remains the number one trip destination in the Lower Mainland. Eliminating the possibility of a freeway also allowed Vancouver to maintain the social cohesiveness established by its fabric of commercial streets and residential neighbourhoods.

Although transportation policy and design choices throughout Vancouver's history have established the foundation for examining cycling infrastructure, other factors have also shaped the city's ability to embrace the bicycle as a form of utilitarian transport. One of these is the city's natural geography. The Greater Vancouver area is constrained for growth on three sides. The Burrard Inlet and North Shore Mountains border it to the north, the Georgia Straight to the west and the Fraser River to the south. Although this southern border serves as more of a gate than a wall, it does tend to form a conceptual barrier for what constitutes the Greater Vancouver area, and in those cases where this is not true, the nearby US border serves as a definitive boundary. These geographic constraints have forced Vancouver to avoid the extent of suburbanization that has characterized many other urban centres across North America.

In the 1980s, the bicycle became part of the City of Vancouver's endeavour to consider alternatives to the single occupant vehicle, partially due to the geographic constraints discussed above. The 1988 *Vancouver Comprehensive Bicycle Plan* frames cycling as a form of transportation that could benefit the city's congestion, the public's health and the environment. This document serves as the starting point for closer examination in the next chapter, but that it is framed as a transportation alternative that might benefit the environment deserves further attention. Vancouver has a history of environmental activism that dates back at least as far as the early 1970s, when Greenpeace, perhaps the world's most visible environmental organization, was founded here. As a whole, the city's constituents have largely stayed true to their label as the "left coast", and this tendency has almost certainly aided in embedding environmental concerns in municipal policy.

Vancouver's gorgeous natural setting has shaped the city in numerous ways, not the least among those being its creation of the "cult of the view." Development in the

downtown core has oriented itself not to the sunshine, of which Vancouver gets relatively little, but to the mountains and the water (Berelowitz, 2005; Punter, 2003). This is particularly true in the neighbourhoods known as the West End and Yaletown, both part of the downtown peninsula and bordering on English Bay and False Creek, respectively. Contemporary to this writing, residential apartment buildings in these neighbourhoods tower over street level markets, cafes and restaurants. This planning feat by discretionary zoning has come to be known as “Vancouverism” (Montgomery, 2006).

This type of zoning is not unique to the downtown peninsula, but figures prominently on many of the commercial streets established by the streetcar network. Most importantly for considering the suitability of cycling infrastructure, these types of dense developments contribute to the ability of Vancouver’s residents to travel by bicycle. As John Pucher and Ralph Buehler (2006) suggest, greater urban density equates to shorter trip distances, including more within the three to eight kilometer radius that is the bicycle’s forte (Gardener, 1998; Carnall, 2000), making denser cities more bikeable than their sprawling urban counterparts.

Since the streetcar system helped to establish a relatively regular network of commercial arterial roads, which the finer mesh of neighbourhood streets filled in, Vancouver’s transportation system has been slowly evolving to meet with its contemporary form to support alternatives to the personal automobile. The way this infrastructure has developed, with geographical constraints for growth and no highway into the city core, has forced the city to take the bicycle seriously. Given its dense development, mild climate and green streak, the two-wheeled transport seems to be right at home in Vancouver. Even so, the shape of the infrastructure that would carry it has met with a great deal of interpretive flexibility between 1988 and 2011, and bicycles themselves have changed over this time period as well.

What is a “Cyclist”?

Within the North American context of this case study, the popularity of the bicycle has fluctuated since its invention, so that “cycling was practically dead by the late 1950s, but bounced back at least several hundredfold to return to being a recognized form of

transportation" (Forester, 1994, p. 15). When the City of Vancouver Engineering Department published the *Vancouver Comprehensive Bicycle Plan* in 1988 they felt compelled to note that, "in recent years, the bicycle has become recognized as an efficient and convenient mode of transportation. No longer is its use confined to children and those without a driver's license" (p. 1). This estimate may be somewhat optimistic, as it is contestable that cycling had adequately shed this reputation by the time of the report. In a personal interview, bike designer Tim McDermott admitted that in 2012 he still feels like he is contending with the reputation of the bicycle as low-income transport (March 21, 2012). So, the optimism of the City of Vancouver engineer in 1988 demonstrates the interpretive flexibility of the bicycle and some lack of stability in its social construction at the time.

Gordon Price, who served as a Councillor at the City of Vancouver from 1986 to 2002, noted in a personal interview that around the mid-1980s, the 10-speed bicycle became to cycling what the Nike Waffle trainer was to running, recasting the bicycle in the guise of an urban workout machine as well as a mode of personal transportation (March 21, 2012). This observation is difficult to prove empirically, but has implications for the analysis of the relevant social group of cyclists, as will be discussed later in this chapter. Regardless of the speed or the penetration of the bicycle's comeback as utilitarian transport, these examples demonstrate a willingness by at least some Vancouver locals to see the bicycle as an object of individual, local transportation by 1988, the beginning of the case study period. Of particular importance, they see it as an artefact that is acceptable for adults who are well enough off that they could choose to drive if they preferred.

In his study on the social construction of mountain bikes (1993), Paul Rosen offers an explanation of the bicycle's development that is useful for understanding its varied place in contemporary Western society. Rosen is examining the mountain bike specifically, but he might as well be discussing the bicycle in general. He notes that the mountain bike has continued to be a contested technology, and that what constitutes a "mountain bike" had not reached stabilization among users by the time of his writing.

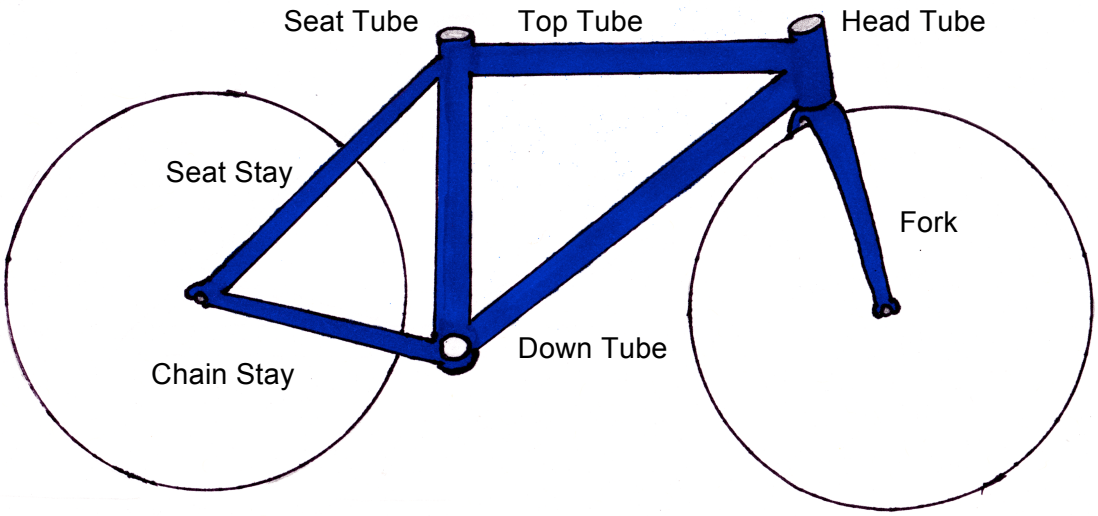
> This situation is the reverse of that described by Pinch & Bijker, where technological developments served to eliminate the problems experienced by RSGs, until all appear to have become happy with the

> same artefact. In contrast, since mass production of mountain bikes began, the technology has diversified with the appearance of each new RSG, so that now there is no longer just one 'mountain bike'; rather, there is a different artefact for each RSG, and there appears to be no prospect, need or desire for the stability Pinch & Bijker describe.
>
> (Rosen, 1993, p. 505)

It is not clear from this example whether Rosen is confusing the concepts of “stability,” which would be referring to the intragroup interpretations among “mountain bikers”, and “closure,” which would be achieved between different RSGs, such as “mountain bikers” and “bike designers”. Nonetheless his observation raises an important point about the place of interpretive flexibility and the relevance of RSGs agreeing upon the form of an artefact. Rosen’s observations were echoed in my interview with Tim McDermott, who noted that some of the greatest innovation in bike design since he moved to Vancouver to work for Rocky Mountain Bicycles has been in the mountain category, with the introduction of elements like full suspension. “Basically every 20 millimeters of travel [in the bike’s suspension], you have a new category of bike, each with its own kind of design focus” (personal communication, March 21, 2012).

The trend Rosen has described in mountain bike production toward greater diversification has been persistent, and not just in the category of mountain bikes. Frame geometry, materials, componentry and accessories have continued to specialize so that there is now a particular bike for all cycling activities and a wide variety of budgets. Figure 3 shows a typical diamond bicycle frame, which is the most common contemporary frame design partly because of its strength (McDermott, personal communication, March 21, 2012), with recumbent and folding bicycles occupying a comparatively small portion of the North American market. Although the diamond frame has reached the greatest stabilization as the basis of the artefact “bicycle”, its final form is anything but stable. Diamond frame bicycles typically fall somewhere on a spectrum between what is considered a “road bike” and what constitutes a “mountain bike”.

Figure 3. Diamond Bicycle Frame



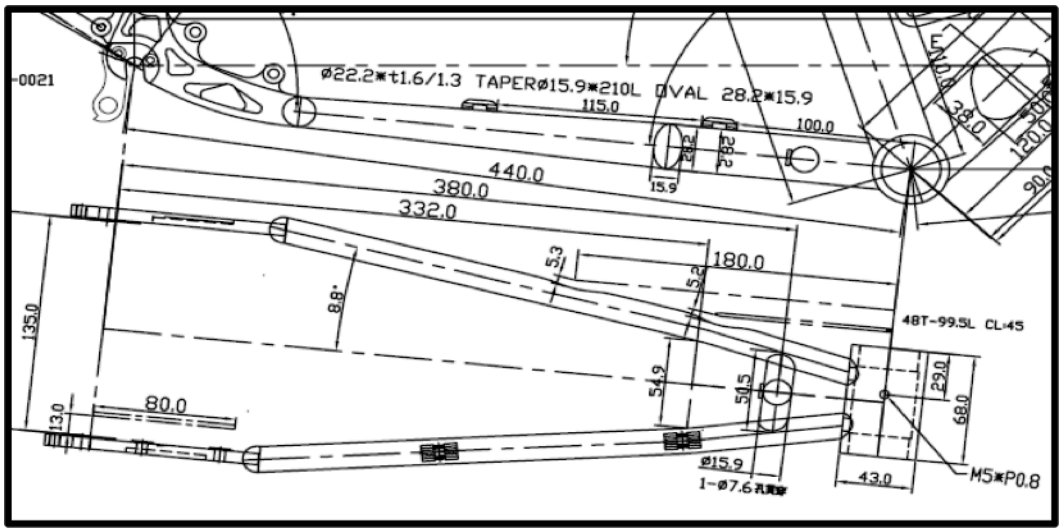
The rough image above depicts a basic diamond frame. Lengths and angles of various tubes have numerous effects upon the feel and performance of the bicycle.

Drop bars, 700c wheels and a tight, rigid frame geometry characterize the typical road bike. In Figure 3, note the division of the frame's diamond into two triangles by the seat tube. The rear triangle, composed of seat tube, seat stays and chain stays, will be shorter on a typical road bike than on its mountain cousin because extra length in the chain stays (depicted in Figure 4) means greater frame flexibility and thus a loss of power with each stroke of the pedal. Conversely, the mountain bike sports flat bars, 26-inch wheels and less rigid, but more comfortable, frame geometry. The bike's smaller wheels make it slower than a road bike, but contribute to more clearance between wheel and frame to accommodate the fatter tires better suited to trail riding. The mountain bike also tends to have a slacker head tube angle, which puts the front wheel further out in front of the bars and gives it a wider wheelbase. This not only keeps the rider's centre of gravity further back for descending hills, but it also makes the steering slower and more deliberate.

Somewhere in between these are two bike designs that have become popular choices for urban transportation and cycle-touring. The rigid road frame is good for

preserving power, but has as a consequence a higher degree of reverberation that can be felt in the saddle. The “cross” bike solves this with its longer chain stay and wider wheelbase, making it a more comfortable ride. What constitutes a cross bike has not reached stabilization among all bike designers, but they are generally a variation of the road bike like the one developed for cyclo-cross racing, a type of bicycle racing that combines trail and road terrain. Cross bikes have become popular in the commuter and touring markets for their comfortable frames, wider-than-average road tires and inclusion of drop bars, which give distance riders multiple riding posture options. Where cross bikes might be considered modified road bikes, the “hybrid” bike tends to be more of a modified mountain bike. A typical hybrid bike has the more relaxed geometry of a mountain bike along with its flat bars, but it usually has the faster 700c wheels and the same wider road tires as the cross bike. Hybrids are common choices for commuters who want speed without the crouched, sporty riding posture offered by drop bars.

Figure 4. Chain Stays



Intellectual property of bike designer Tim McDermott, used with permission. The schematic depicts the chain stays from the side (top) and from above (bottom). Notable in this cross bike design are the braze-ons for disc brakes (top left), which are not permitted in cyclo-cross racing but are advantageous for commuting and cycle-touring.

Both these types of bike fit well into the commuter or urban bike categories, and along with other variations, they were not popular until more recently. Tim McDermott recalled that the cross frame design has been around for some time, but that it was visually unappealing, and up until seven or eight years ago designers had to spec cross

bikes with mountain bike components because manufacturers were not making appropriate road group sets for them. This meant that riders could readily pick up enough speed on their 700c wheels to outpace their fastest gears.

Urban bike categories have grown with the market of cycle-commuters, and their increasing popularity demonstrates a greater acceptance of the bicycle as a utilitarian object. Further, contemporary cyclists are willing to pay more for their bikes than some people in the bicycle industry would have believed. When Tim McDermott sourced a high-end internal hub from Shimano, he was warned not to make the bike more expensive than $1000, because it would not sell at that price. McDermott reflected “I just kind of thought that if you can make a really appealing bike, that the price point doesn’t matter that much” (personal communication, March 21, 2012). So, he put together a hybrid bike using Shimano’s Alfine hub and other high-end components, including a carbon fork and hydraulic disc brakes, and launched it in 2009 with a $1,250 price tag. Even though he brought out a more affordable version of the bicycle at the same time, using cheaper componentry, v-brakes and an aluminum fork, his high-end hybrid turned out to be Canadian outdoor retailer Mountain Equipment Co-op’s top selling bike.

These trends demonstrate a shift in the construction of the bicycle that relates to a parallel shift in cycling culture away from the “cyclist by necessity” stereotype. It also supports Rosen’s (1993) observation that the stability of an artefact within a relevant social group may not be desirable, and Michael Khoo’s (2005) similar assertion about closure among RSGs. Instead of each relevant social group agreeing on the same artefact or interpretation of the artefact “bicycle,” the technology has diversified and a physically distinct artefact with the properties desirable to each relevant social group of bike users is available.

The bicycle as an artefact has clearly meant a great many things to its myriad of users and non-users. It has experienced a revival as a form of transportation, but its uses as a leisure object and as a sport object are also alive, well and at some points overlap with the bicycle as commuter vehicle. Though the focus of this research is upon cycling as urban transportation, it is important to understand its practice and interpretation by various relevant social groups as informed by these other practices like sport cycling and recreational cycling, as well as at points directly in conflict with it. As

cultural elements, these belong within the sociotechnical frame and will affect the interpretations and practices of relevant social groups in different ways depending upon their subjective positions. At points these elements will also divide RSGs into more specialized categories. This is particularly true in a city like Vancouver, where cycling activities translate into numerous established subcultures.

Sport cycling comprises a significant portion of cycling as a whole. Although to many the idea of cycle racing immediately brings to mind spandex shorts, road bikes and international events like the Tour de France, cross-country and downhill mountain bike racing have become prevalent sports, as has recreational mountain biking. In Vancouver, this popularity is punctuated by the accessibility of trails on the North Shore Mountains, easily within 30 minutes of the city. As Gordon Price noted "you say North Shore in any mountain biking community in the world and you don't have to specify that it's Vancouver" (personal communication, March 21, 2012). Further, Vancouver residents are within reasonable proximity to Whistler Mountain, which is also widely regarded for its world class mountain biking. Mountain bike races occur annually on the North Shore, in Squamish and in Whistler.

Because of this multitude of activities and cultures related to cycling, answering the question about what constitutes a cyclist is a good deal harder than it might seem. For one thing, many users of the bicycle attach a variety of signifiers of identity to the concept of a 'cyclist' and therefore may not consider it an appropriate label for themselves, or they may police the definition and refuse to attribute the signifier to others. In their chapter of *Cycling and Society*, "Hell is Other Cyclists," David Skinner and Paul Rosen observe that "cycle commuters may in fact resist altogether an identity as 'a cyclist', especially when their choice to cycle is rooted in a variety of values not intrinsically linked to cycling" (2007, p. 92). For another, cycling as a practice is divided into numerous sub-categories. So, for instance, sport riders may more accurately be called "road racers" or "mountain bikers" depending upon their particular activity. For the purposes of this research, "cyclist" will be an umbrella category, synonymous with that of "users" of the bicycle. When appropriate, further descriptors will be added to denote that the users under discussion ride the bicycle for transportation, recreation or sport. Although groups of cyclists are often divided and discussed by behaviour, active participation is neither a precursor nor the defining characteristic of relevant social

groups. Rather, as discourses and identities cohere around technologies, and vice versa, so too are behavioural patterns and activities part of the reciprocal social constructions of technologies and society.

Inclusion becomes an important concept here, since belonging to the category of "utilitarian cyclist" does not exclude an individual from also belonging to the groups "mountain biker", "vehicle driver" or "unicyclist", for that matter. Although a sport cyclist may commute to work during the week, their inclusion in the sociotechnical frame of the relevant social group of road racers might be higher than their inclusion in a utilitarian cyclist's frame. As such, where one might expect them to support initiatives like separated bike lanes, they may instead oppose them on the grounds that they believe cyclists belong in traffic or that it is "wimpy" to avoid routes because of traffic speeds and volumes.

So, it is no more possible nor desirable to pin down a singular understanding of what it is to be a cyclist than it is to determine the stability of the bicycle as a single artefact. These categories are mutually evolving and changes in one affect the construction of the other. What is important to note is that the bicycle as an object has diversified over the last decades to include technologies that support urban transportation specifically, and based upon the success of some of these changes, it is clear that cyclists as a relevant social group have been willing to accept these developments, if they are not themselves directly responsible for fuelling them.

Relevant Social Groups

Using a SCOT approach to the study of technology and society requires a detailed understanding of the social forces shaping technology, and thus of the relevant social groups involved. As discussed in the previous chapter, for the purposes of this research relevant social groups are identified both as broad social categories as in other SCOT studies (e.g. Bijker, 1995; Rosen, 1993), and also as particular organizations (Pinch & Bijker, 1984). For some SCOT studies, RSGs will not have such definitive boundaries as formalized organizational membership in civic bodies or non-profit organizations. However, within the current case study it will be useful to examine these

organizations as RSGs since important decisions have at many points been made by them or in their names. By way of example, the particular place in society for “Vancouver City Council” cannot be sufficiently represented by a group like “politicians” or “government” within the case study, despite that such categorizations may be more useful for later cross-comparative work. This is particularly important because as a case study this research has clearer temporal and physical boundaries than some SCOT studies, especially those that are completely retrospective. Even so, this classification poses some challenges, since, for instance, regular municipal elections put a different city council in place every few years. This means that the sociotechnical frame of the incumbent group may differ dramatically from the one that came before it, or the one that comes after. Although challenging, examining these differences where they are relevant to the development of cycling infrastructure will prove insightful, and the role of the group will have some stability over time since some elements of the sociotechnical frame will remain the same.

In order to use relevant social groups as an analytical tool, some generalizations about their composition are necessary. This is not to say that all individual members of a relevant social group will feel or act the same way or in a predictable manner. Further, no group is completely homogeneous and characteristics or interests attributed to an RSG will not describe all members. However, since it is the meanings an RSG attributes to an artefact that define them (Pinch & Bijker, 1984), distinctiveness of other characteristics are bound to become blurred. This is particularly true where subjective identities are concerned, especially since the identities attributed to a relevant social group are not always self-ascribed. With the intention of maintaining this understanding of RSGs as generalized collections comprised of individuals, the concept of inclusion in various relevant social groups and in various sociotechnical frames is again very useful (Bijker, 1995). Categories like “engineer” and “cycling advocate” are in no way mutually exclusive and actors find ways to either separate or integrate their various subjective positions.

To delimit the groups relevant to the construction of cycling infrastructure in Vancouver, I have relied upon several sources of information; interviews, public documents and mass media were utilized both to identify RSGs and to describe their characteristics. This has allowed for an understanding of relevant social groups as

viewed from inside and from outside of membership in those groups. Interests and meanings may be attributed to relevant social groups whether or not there is physical or documented evidence to suggest it, so long as a member of another relevant social group has indicated this. As Rosen notes “it is sufficient simply for other actors to perceive hidden interests for this to shape the meanings they construct for an artefact” (1993, p. 508).

This is certainly the case between groups relevant to cycling infrastructure in Vancouver. For example, members of the groups “automobile drivers” and “utilitarian cyclists” often attribute road rage or aggressive behaviors to the other, and their perceptions affect their constructed understanding of what it means to belong to the other group. The understanding of cycling as transportation by necessity for lower income individuals is also this type of construction. In this way, the identities of relevant social groups are shaped both by RSG members and by other RSGs.

Although it is useful to maintain a chronological order of events in a case study so as not to confuse occurrences and outcomes, it is important to begin here with a description of various relevant social groups before recounting their roles in relation to the events of the case study in Vancouver. Structuring the study this way allows for the richer analysis of RSGs that Rosen (1993) calls for and also provides an opportunity to mention groups whose direct actions have not warranted such detailed inclusion in the case period description, but whose presence and involvement in Vancouver’s cycling community has most certainly shaped it in ways indiscernible from historical documentary analysis and interviews conducted for this study. Not to at least mention them would most certainly constitute structural exclusion.

Users and Non-Users of the Bicycle

Vehicle drivers: It is perhaps most fitting to begin with the largest and most significant category of road users both in relation to transportation generally and by way of direct opposition to bicycles. Vehicle drivers are an important relevant social group in Vancouver for their tendency to push back against initiatives to develop more cycling infrastructure. What is more, drivers are often the ones in whose name transportation decisions are made, especially at the level of the political arena. They also have a

cultural role, as car culture is often in direct conflict with bike culture (Interviewee C, personal communication, February 1, 2012). It would be unusual to meet a cyclist who has spent much time on the road and not had some kind of conflict or another with someone in a motor vehicle.

However, despite that the relevant social group of vehicle drivers occupies the symbolic opposite for the categories of bicycle users, it is important to maintain an understanding of the group as heterogeneous. As Skinner and Rosen note:

> Cycling campaigners and policymakers, media personalities ranting against cyclists and even the authors of this book (ourselves included), routinely identify people who use bicycles as 'cyclists' and people who use cars as 'motorists', even though most of us do both of these things and are therefore not uniquely attached to any single mode of transport. (2007, p. 90)

It is therefore worth mentioning here again that individual inclusion in the sociotechnical frames of various groups will determine the extent to which they construct certain meanings for artefacts and roles for other relevant social groups. While the person who solely relies upon the automobile for transportation might best typify members of the group "vehicle drivers", this does not exclude cyclists from participation in this RSG. However, a user of an artefact who constructs meanings for the artefact entirely inconsistent with those that define the group does not rightly belong to that category despite the behavioural associations. Technologies place their users in a particular role while they are using the artefact, but this does not determine the meanings they construct for it. The operator of a motor vehicle may well reject the socially constructed meaning of the artefact as well as the identity that corresponds to the group of drivers, and thus cannot claim membership in the relevant social group.

Utilitarian Cyclists: This group will be understood for the purposes of this study as those people using the bicycle for the transportation of themselves or cargo within or through the City of Vancouver. This geographic distinction is significant because cycling cultures develop varying characteristics in different localities, something noted in my interview with Interviewee A (January, 16, 2012), who has observed a dramatically more integrated cycling community in Montreal. It is the relevant social group of utilitarian cyclists that the City has hoped to grow by the pursuit of their policy and engineering

strategies. Utilitarian cyclists exist across a wide age range and are culturally diverse. The stereotypical young “hipster” riding a fixed gear bicycle belongs to this category as much as the older commuter with their “one less car” sticker and yellow MEC rain jacket. Arguably, however, it is the latter that has most defined the construct of the commuter cyclist in Vancouver over the period of this case study, considering the extent to which discourses about environment and sustainability permeate the concept of urban utilitarian cycling.

“Near market” for cycling: This category as employed in this study comes from a 2010 publication by Dr. Meghan Winters and Dr. Kay Teschke as part of the Cycling in Cities studies. The near market for cycling consists of those who rarely ride a bicycle and those who might like to start riding. The near market rider’s frequency of utilitarian cycling is affected by elements like confidence riding in traffic and the perceived safety of existing routes. While the term “near market” is relatively new, it accounts for a group of current and potential cyclists who have long been a target of cycling transportation planning. Many of the measures taken to improve cycling infrastructure are done so as to increase the cycling mode share, or the percent of the daily trips completed by bicycle as opposed to other forms of transportation. This is also called the “trip share” or the “modal split”. The near market represents the area for greatest potential growth for cycling mode share, and is one of the only groups in this study that is not self-constructed, but rather entirely constructed by members of other RSGs.

Visible minority cyclists: For the purposes of this study, visible minorities will include both women and ethnic minorities. Both of these groups were mentioned again and again in interviews as members of the cycling demographic significantly on the rise over the period covered by the case study. Recent immigrants to Canada were also discussed as a group resistant to embracing the bicycle and underserved by current cycling initiatives in the city.

The City of Vancouver

For the purposes of this research, “The City of Vancouver” refers generally to the bodies that have policy and infrastructural decision-making authority under the Vancouver Charter, which includes, but is not limited to, Council and the planning and

engineering staff. It shall be synonymous in this report with the “City” and with the abbreviation “CoV”. This is not to be confused with the use of “Vancouver”, or the “city” which refers to the physical location or to the actions and sentiments of residents.

City of Vancouver Planning: Vancouver’s Planning department is responsible for the discretionary zoning that has shaped the city’s various districts. They do some work with the engineering department, but their role in the development of transportation infrastructure is a minimal one, especially because Engineering has its own internal planners. Even so, the Planning department is responsible for the city’s greenways, and it is Planning who is tasked with regulating the infrastructural elements that exist outside of the roadways, such as the bike parking facilities that are required in all new developments in the city.

City of Vancouver Engineering: It is from Engineering that all of the city’s transportation plans spring, and it is the City’s engineers who design and build cycling infrastructure in Vancouver, and monitor its use. In 1996, Vancouver’s engineering department created a distinct alternative transportation division that would play a significant role in shaping cycling infrastructure. As applied scientists, engineers on the whole rely upon an empirical understanding of what constitutes truth, and this has shaped the way they have constructed meanings for cycling routes throughout the case study.

Vancouver City Council: Since the City of Vancouver is an independent municipality, thanks to its 1953 Vancouver Charter, Vancouver City Council has greater power to set policy direction than many other municipal governments in British Columbia. As such, they have had a great deal of influence upon how the city is structured. Although Engineering is responsible for managing traffic and keeping up road facilities, Council is responsible for setting the policy agenda and for creating the budget. As former Councillor Gordon Price noted, funding is “a real test of Council’s sincerity. You can get up and say anything you’d like, and the staff will sit back and wait until you put a budget line item on it, because if you don’t, it’s not real” (personal communication, March 21, 2012).

Bicycle Advisory Committee (BAC): Established in 1985, the Bicycle Advisory Committee owes its existence to the major restructuring at the city level that occurred in the 1970s. Members of the BAC have come from the community at large, as well as from key groups. Liaisons from Council, the Vancouver Police Department, the Vancouver Area Cycling Coalition and the Cycling in Cities research project have been among these. The relationship of the BAC to Council has fluctuated depending upon the receptiveness of the members of Council to cycling related issues (personal communications, 2012) and as well their powers as a citizen's advisory committee have evolved over their 26 years in existence. While the Bicycle Advisory Committee has been absorbed into a new Active Transportation Committee starting at the beginning of 2012, it played an active role in advising Council on cycling related issues until the end of 2011 and thus throughout the period of this case study.

Provincial Government

The Province of British Columbia: Although the Vancouver Charter that granted the city a level of independence is over 50 years old, the Province maintains some power when it comes to transportation infrastructure and safety. The Motor Vehicle Act, which includes the bicycle helmet law, has certainly affected cycling transportation in Vancouver. Further, the Province has been responsible for some, albeit minimal, funding for cycling infrastructure. Although Vancouver is not British Columbia's capital, it is its largest city and primary economic centre, and cycling groups that lobby at the Provincial level are often based in Vancouver or at minimum will have prominent members who are.

Law Enforcement

Vancouver Police Department (VPD): The VPD comes up in numerous cycling transportation references partly for their role as traffic enforcers, and partly for their development of a cycling squad. Because the VPD is responsible for covering such a large geographic area, it is not practical for all officers to complete their duties on bicycles. However, as Constable Pat Allen noted in a personal interview (February 22, 2012), the bike squad is a useful tool for enforcement due both to the bicycle's stealth in comparison to motor vehicles and its ability to navigate areas crowded with traffic or

pedestrians. The VPD considers their role in relation to cycling in Vancouver to be a dual one: part enforcement, and part education about safety as well as the laws and regulations that govern the use of the bicycle on the roadways. The treatment of educational enforcement campaigns like those that have occurred during Bike Month in Vancouver have not been dissimilar to those targeting other modes of transportation, including walking, and thus jaywalking.

Community and Advocacy Organizations

Better Environmentally Sound Transport (BEST): According to City of Vancouver engineer Peter Stary, BEST began as an organization of young idealists, several of whom had just graduated from university. Their shared interest in cycling gave them an initial focus upon issues of utilitarian cycling, but Stary notes that the organization quickly evolved into one more focused upon generating contracts and thus job opportunities for the members involved. This corresponds with the assertion by another participant, Interviewee A (personal communication, December 20, 2011), who noted that BEST shifted its focus away from the local toward the provincial level and more importantly away from cycling specifically. Even so, BEST still operates cycling-related services in Vancouver, including the Bike Valet, which is a free, secure bicycle parking set-up for outdoor events.

Pedal Energy Development Alternatives (PEDAL): In 1999, BEST gave up their Our Community Bikes (OCB) initiative to the newly formed non-profit PEDAL. OCB is a community bike shop and bicycle parts recycling depot founded in 1993, and serves as the model for the UBC Bike Kitchen that PEDAL also helped develop (PEDAL website). Their do-it-yourself bike shop gives cyclists access to tools, parts and guidance on repairs, and charges different rates based upon the amount of time the bike is in the stand and on the amount of assistance needed from staff. The PEDAL group now runs a larger bike parts depot, taking in used parts as donations and selling them. It is often one of the best places to find parts for older bikes, which regularly have compatibility issues with new parts.

Vancouver Area Cycling Coalition (VACC): According to the VACC website the group was founded after several events pertaining to cycling unfolded in Vancouver in

the mid 1990's. They were officially incorporated in 1998, and filled the local cycling advocacy void in Vancouver left by BEST. The VACC has evolved over its 13 yeas in existence from an entirely volunteer-based group to an organization with a board and a small group of dedicated staff under an executive director. At the end of 2011, the VACC was working to obtain charitable non-profit status, which would allow it to secure donations and better fund its operations (Interviewee B, personal communication, January 30, 2012). Like many small advocacy organizations, the VACC has struggled to maintain consistent, sustainable funding for its programs. As of this writing, the VACC has just received its charitable organization status and newly rebranded itself as "HUB".

British Columbia Cycling Coalition (BCCC): The BC Cycling Coalition is the counterpart of the Vancouver area Cycling coalition for cycling transportation advocacy at the provincial level. According to the organization's website, they were founded in 1998 by the province's local cycling coalitions to become an umbrella organization for cycling advocacy in BC.

Cycling British Columbia: Although primarily a sport cycling organization, Cycling BC has played a significant role in cycling advocacy at the local and provincial levels. Their role was particularly important before the 1998 creation of the BCCC, and as will be discussed in the next chapter, they intervened at critical junctions.

Others

Researchers: A number of studies have played a key role in shaping cycling infrastructure in Vancouver. Individuals and groups at local universities initiated these studies, and they examine aspects of cycling in Vancouver specifically. Included among these were the Vancouver Bikeway Network Group and the Cycling in Cities researchers. Like the engineers, manufacturers and scientists relevant to other SCOT studies (e.g. Bijker, 1995; Rosen, 1993), this relevant social group has been significant in the design and innovation stages of shaping cycling routes in Vancouver, as well as in the all-important policy process that structures urban transportation. The researcher category is one in which members have a great deal of inclusion in other relevant social groups, but their ability to intervene in policy debates as outside experts, and their particular problem-solving orientation make them unique and significant.

Media: Communicating policies and changes to transportation patterns is an important part of the political process, but newspapers, radio and television are also sites of culture, debate and controversy. It would be a mistake not to consider media as a relevant social group, even when they do not themselves have a stake in the development of a technology, because they represent those who do. The way media choose to relate developments, procedures and controversies to society certainly impacts the public's consciousness. Vancouver is home to several large newspaper and television outlets, but it also boasts small independent publications like *Momentum Magazine*, a periodical dedicated to cycling.

Translink: Formerly BC Transit, which operated as a Crown Corporation, Translink has paid special attention to supporting cycling infrastructure. This has much to do with its inclusion of such in its mandate (personal communication, February 15, 2012), and for this reason Translink also financially supports cycling initiatives in the Metro Vancouver area. This includes some support for the educational programming run by the Vancouver Area Cycling Coalition.

Local bike shops: As with some of the other RSGs, it is difficult to discuss the role of local, private bike and accessory dealers in relation to the development of cycling infrastructure. However, their wellbeing can serve as an indicator of health of the local cycling market. Further, bike shops are most certainly part of the social and cultural fabric of any local cycling community. Although PEDAL has been supporting spaces where cyclists can build and repair their own bicycles, bike shops keep cycling accessible for those with no time or interest in performing necessary maintenance.

Chapter 2 Discussion

From the earliest stages of its existence, the City of Vancouver's development and planning have affected its contemporary ability to implement its cycling program. The streetcar grid with its commercial arterials mapped out the road network while relevant social groups like Vancouver's City Council and their electorate kept a major highway from dividing the downtown peninsula. Even the city's natural geography seems to have conspired to constrain the infinite sprawl that has characterized other

contemporary North American cities, forcing Vancouver to consider alternatives to the automobile as well as denser substitutions to the suburban cul-de-sac design. These factors constitute what Rosen (2001) calls the city as sociotechnology, and what Klein and Kleinman (2002) would identify as the necessary structural considerations in a SCOT analysis. With these elements established as pre-existing frameworks that the construction of cycling infrastructure operates within, this study can avoid the criticism of social determinism (MacKenzie & Wajcman, 1999) that plagues some SCOT studies.

The mutually re-enforcing relationships between relevant social groups, bicycles and cycling infrastructure are also important structural considerations. These relationships have been evident in the common trajectory of their development, and over the period of time covered by this case study bicycle designs have evolved to include models ideal for the urban commuter. What it means to be a cyclist has expanded as its users have become more diverse, but many discourses and identity signifiers have remained attached to the bicycle and its riders that are in conflict with one another. Is the bicycle a leisure, utility or sport machine? Are its users elite sportsmen or are they impoverished users by necessity? Bicycles and cyclists are in truth not any one, but rather all of these things, in some combination or another, to various relevant social groups.

The development of cycling infrastructure in Vancouver has played out with all of these debates and cultural conflicts ongoing. In many ways, it seems, they are echoed in the conflicts played out on the municipal political stage. Having touched on the varied construction of the cyclist, the development history of Vancouver and the relevant social groups related to the city's cycling infrastructure, it is possible to move on to discuss the events of the case study period.

Chapter 3
Comprehensive Bicycle Plan: 1988-1997

> Cycling Transportation Engineering is the foundation on which a successful comprehensive bicycle plan is based. In summary, the cyclist requires two basic facilities. These are: 1) Direct, convenient and safe access to destination. 2) End-of-trip facilities.
>
> (City of Vancouver Engineering, 1988, p. 3)

July of 1988 marked the publication of Vancouver, British Columbia's first major policy document focused specifically upon the bicycle as a commuter vehicle. The *Vancouver Comprehensive Bicycle Plan* (City of Vancouver Engineering, 1988), which will be referred to hereafter as the "1988 Bicycle Plan," discussed cycling as a form of transportation that had considerable room to grow in the city. As the first of its kind in Vancouver, the 1988 Bicycle Plan is a significant document and its publication serves as the point of origin for this case study. However, as discussed in the previous chapter, it is important to acknowledge that this plan itself is indebted to the social forces and policy decisions that came before it, as well as to the circumstances surrounding its creation.

According to Peter Stary, an engineer with the City of Vancouver and a long time cycling advocate, the circumstances leading up to the 1988 Bicycle Plan were political as much as anything else:

> The 1988 plan was basically one young engineer sitting in an office, pulling information out of whatever existed in the North American context and cobbling it together, that's it…. the City committed to doing the plan, so the City Engineer of the day pointed at this kid and said "go and do it"… I'm not even really counting the 1988 plan when I talk about the planning processes.
>
> (personal communication, March 9, 2012)

Even so, the 1988 Bicycle Plan set an initial agenda for cycling transportation planning in Vancouver, and foreshadowed a number of significant policies and controversies that would come after it. As such, it remains an important document in the chronology of

cycling transportation development in the city. Several of the elements it identifies have been impressively enduring, especially considering that it was largely the work of one individual.

One of these enduring elements was its use of the "4 Es" to frame the necessary support structure for cycling transportation. Each “E” corresponds to a specific set of roles and responsibilities for aiding the growth of the cycling mode share, or the percent of daily utilitarian trips in Vancouver made by bicycle. The first is engineering, which covers the design, integration and construction of all infrastructure related to bicycle commuting. The second is enforcement, which relates to the need to compel both vehicle drivers and cyclists to adhere to applicable laws. The third, encouragement, refers to the promotional aspects of supporting cycling. The final area, education, covers the development of proficiencies in areas like commuter skills, laws and safety. Many of these categories overlap, which builds in some helpful redundancy. For instance, providing an education program to help commuters learn to ride in traffic might also make them feel safer riding more regularly, and thus relates to encouragement.

Many areas of improvement discussed in the 1988 Bicycle Plan have been addressed since, and these tell us as much about local and provincial priorities as do those things that were more resistant to action. As discussed below, the implementation of a mandatory helmet law was one of these elements identified in 1988 that did eventually come to fruition. A significant portion of the plan was dedicated to accident statistics, and it was the opinion of the author that mandatory helmet legislation would reduce the frequency of hospitalization and death resulting from bicycle accidents.

The report also identified a few core cultural controversies within the cycling community, albeit in the most objective and detached language possible as suits the more technical writing style of an engineering report as well as the sociotechnical frame of the City Engineers. One of these controversies is around the intended use and inevitable interpretive flexibility of bicycle facilities:

> The difficulty encountered when designing bicycle facilities is the evident wide range of users. The fast commuter cyclist who may blend in nicely with traffic on our roadway system can cause havoc on a recreational route. And in turn, the slow leisure/recreational cyclist who fits ideally on designated recreational routes can cause conflicts and congestion on the

roadway system.

(City of Vancouver Engineering, 1988, p. 13)

Another such cultural controversy surrounds the level of experience of cyclists, and their comfort riding with vehicle traffic. The portion of cyclists with more experience, including those with more sport riding experience in conjunction with utilitarian cycling, have often been the representatives of the whole group of utilitarian cyclists since they are so visible in their practice of using the road facilities. However, their priorities and concerns are not representative of the whole in this way. This struggle to define who belongs to the group of utilitarian cyclists undergirds the construction of cycling infrastructure, as will be apparent in the next section.

From Arterial Integration to a Regional Bicycle Network

For cyclists familiar with existing infrastructure in Vancouver, one element of the 1988 Bicycle Plan will be particularly striking. While many of the plan's recommendations were carried out or pursued in some fashion, the infrastructural strategy was not. The recommendations of the 1988 Bicycle Plan followed those of Palo Alto, California transportation and traffic engineer John Forester (1984) to integrate cyclists into existing roadways. More specifically, these recommendations based upon Forester's work were to widen the curb lanes, or the outermost lanes, on arterial streets so that cyclists could have quick and direct routes for travel, but could be easily overtaken by faster motor vehicles. The now decades old bicycle network in Vancouver bears almost no relationship to this design, although cyclists are still legally entitled to use the arterial streets, whose curb lanes are indeed often wider to serve as vehicle parking facilities during non-peak hours.

Below I reference a different volume of Forester's bicycle transportation work to discuss his views on cycling routes than that the 1988 Bicycle Plan refers to. In it, Forester spends more time developing his arguments about cycling routes than in *Effective Cycling* (1984), much of which is dedicated to detailing riding strategies, bicycle maintenance and enjoying cycling. Choosing this volume gives a clearer picture of the debate between those who favour arterial integration versus those who favour

segregating cyclists on their own routes. Since this debate has been ongoing, and Forester's assessments have proven quite controversial, it is appropriate and indeed desirable to refer to Forester's later work.

In his book *Bicycle Transportation: A Handbook for Cycling Transportation Engineers* (1994), Forester details his understanding of the two competing strategies for cycling transportation engineering. One he refers to as the "vehicular-cycling principle", and the other he names the "cyclist-inferiority superstition". According to Forester, "practically all the scientifically-valid evidence supports the vehicular-cycling principle; none supports the cyclist-inferiority superstition. That superstition can be understood only in terms of psychology and politics" (p. 1). Considering that those who adhere to Forester's cyclist-inferiority superstition aim to make cyclists feel safer on the roadways, it is somewhat understandable that he would reject it as psychology and politics.

However, for the purposes of more neutral analysis, these perspectives will be referred to here as the "integrationist" and "segregationist" strategies where Forester's school of thought to include cyclists on arterial streets is the integrationist strategy. These terms for the two strategies were also the ones used by interviewees for this study (e.g. Price, March 21, 2012; Rawsthorne, March 12, 2012) and in "The Bikeway Solution" (Vancouver Bikeway Network Group, 1991). Infrastructural development in Vancouver has existed all over the integration-segregation spectrum, but as the case study will demonstrate, it has slowly moved toward more segregationist strategies.

The integrationist strategy is based upon an understanding of the cyclist as a capable vehicle driver that should behave and be treated as just that on the roadways: a vehicle. For engineers like Forester, bicycle integration allows for the safest, speediest transportation possible, which is consistent with an engineer's objectives when creating transportation infrastructure. Considering that in places like the UK at the time of Forester's 1994 publication, segregationist strategies were pursued to the exclusion of integration, in that bicycles were not allowed on main roads, it is no wonder that he would consider integrationist and segregationist strategies completely incompatible. However, one of the criticisms levelled against staunch integrationists is that the creation of separate cycling infrastructure does not have to mean the exclusion of bicycles from arterial roadways (Vancouver Bicycle Network Group, 1991).

Integrationist strategies have had much stronger support from the engineering community than they have had from the public at large. Forester admitted that most governments in the United States and Europe operated according to segregationist strategies and that advocacy and public expression had been in strong support of the same (1994, p. 1). Some cyclists do prefer arterial streets, and in British Columbia they are currently allowed to use them, with the exception of most of the Trans Canada Highway.

The concept of inclusion in a sociotechnical frame becomes an important one for understanding the support from various relevant social groups of either integrationist or segregationist strategies. Forester as well as two City of Vancouver engineers interviewed for this study cite evidence as an integral factor in determining what kinds of facilities they design for cyclists. As applied scientists, engineers have strong inclusion in the sociotechnical frame of their field, which most certainly includes positivist modes of inquiry.

Forester claims that segregationist arguments against integration are based upon fear rather than fact, since he could find no evidence to support the claims against integration that more cars passing cyclists from behind meant greater risk to the cyclists. By examining accident statistics, Forester notes that a very low percentage of accidents (5.6%) occur when a vehicle comes into conflict with a cyclist riding a parallel route in an urban setting. According to his data, rather, 86% of accidents between a bike and a vehicle in an urban setting occur when the cyclist is crossing a lane or an intersection, or turning. His data for rural accidents between cyclists and vehicles shows a significant difference in these statistics, however, with turning and crossing accidents accounting for 56.1% compared to parallel accidents' 28.9% (1994, p. 49). This discrepancy could demonstrate a number of things, ranging from the quality of driver and cyclist education to the state of driving and riding facilities. In any case, such a significant discrepancy calls for further research, especially considering that Foresters research itself has been called into question (e.g. Reynolds, Harris, Teschke, Cripton & Winters, 2009; Chen, C., Chen, L., Srinivasan, McKnight, Ewing, & Roe, 2012).

Some elements of Forester's research are pertinent, if unashamedly biased, and it is not wholly surprising that when creating the 1988 Bicycle Plan the engineer at the

City of Vancouver would have come across and taken seriously his recommendations. As will be discussed again in Chapter 5, this debate between segregation and integration as it pertains to Vancouver did not begin and end with the 1988 Bicycle Plan, nor did it find resolution in the decade after. However, the interpretive flexibility of cycling infrastructure did stabilize somewhat in the early 1990s and one relevant social group, the Vancouver Bikeway Network Group (VBNG), would prove to have an enormous impact upon its development.

The members of the Vancouver Bikeway Network Group (VBNG) did not support the recommendations to integrate cyclists onto arterial streets made by the 1988 Bicycle Plan, and in May of 1991 they produced "The Bikeway Solution" as a proposal to the Vancouver City Council to pursue a different strategy. The VBNG included members from a number of other key groups, including City Engineering, the University of British Columbia, local news media, and liaisons to the Bicycling Association of BC (BABC) and Bicycle Advisory Committee (p. 23). Peter Stary was the engineer and liaison to the BABC, and in a personal interview he credited UBC Physics professor Lorne Whitehead with getting the VBNG started. In "The Bikeway Solution" the VBGN notes the controversy introduced at the beginning of this chapter:

> There is one main drawback to the [1988 Bicycle Plan]. It caters largely to those who already cycle. It proposes that bicycles and cars should travel on the same arterial roads, rather than try to stay apart on separate rights-of-way. As a result, it has not led to a significant increase in cycling in Vancouver, nor do we believe it is likely to.
>
> …Even if we were to adopt Forester's view that main roads are safe for cycling (which we haven't), most people still don't see it that way. Perceptions are powerful. Even among the 600 experienced cyclists surveyed for the [1988 Bicycle Plan], 87 per cent wanted more segregated bike lanes or paths. To encourage more people to cycle regularly, a network of bicycle routes that are perceived as safe are necessary.
>
> (Vancouver Bikeway Network Group, 1991, pp. 3-4)

The Vancouver Bikeway Network Group proposed instead of integration on arterial streets somewhat of a compromise between the integrationist strategies favoured at the time and segregationist strategies aimed at making cyclists feel safer and more comfortable on the road. *The Bikeway Solution* suggests that facilities for bikes might be constructed on streets parallel to and very near the arterial street

network. In creating these bikeways, the City might provide the direct and sufficiently speedy routes desired by cyclists while encouraging those potential riders who would increase the city's cycling mode share. What's more, the plan would not severely reduce vehicle capacities, and it would be less expensive than further segregated alternatives.

"The Bikeway Solution" includes in its appendix a list of possible questions about the proposal. Among these are two of particular interest. In one, the VBNG addressed the concern that giving cyclists separated facilities would encourage policymakers to give in to the wants of some vehicle drivers to ban cyclists from the arterial roadways. The other key question addressed in this section was "who supports the Vancouver Bikeway Network?" The VBNG sought approval from several key groups, including the Bicycle Advisory Committee and the Bicycling Association of British Columbia. They even went so far as to seek out the most likely source of disapproval by including a telephone interview with John Forester. In this conversation, he:

> indicated that [the bicycle network] plan would not be his personal choice, but acknowledged his view is very much in the minority. He agreed that [the bicycle network] plan would be more successful in encouraging more people to commute by bicycle than his idea of urging cyclists to travel on busy thoroughfares.
>
> (Vancouver Bikeway Network Group, 1991, p. 18)

That Vancouver has a mostly regular street grid with regular commercial arteries made the bikeway network concept possible, a fact both of the engineers interviewed for this study mentioned (Stary, March 9, 2012; Rawsthorne, March 12, 2012). In those cities where the residential cul-de-sac form dominates and interrupts the street network, or where raised highways divide the urban area, a network of neighbourhood bikeways is likely to be either impossible or undesirable. In conjunction with the suitability of the city's layout for such a plan, it was a clever relevant social group, the VBNG, and their ability to ask and answer all of the right questions to get the attention of Council and engineers that gave the idea life.

Later in 1991, the City's engineering department in conjunction with the Bicycle Network Subcommittee (BNSC) of the BAC came out with their report *Options for Cycling Improvements in Vancouver* (1991). According to a 1999 bicycle plan (City of Vancouver), the BNSC was primarily composed of VBNG members and the two groups

became synonymous (p. 4), but it is important to note that the VBNG acted independently in the beginning, not as an advisory subcommittee to Council. In *Options for Cycling Improvements in Vancouver*, four route types were put forward: arterial integration, local street integration, bike lanes and bike paths. Of these options, local street bikeways were thought to be the best, most economical option. By 1993, Vancouver had its first neighbourhood bikeway running from east to west along Adanac Street. The bikeway network has continued to expand, and in 2012 its lattice covers most of the city.

Clouds of Change

As discussed in Chapter 2, Vancouver has an established history with environmental activism. In 1990, this tendency turned toward local political action when the City released its *Clouds of Change* report. Among the 35 adopted recommendations were a number directed at reducing carbon emissions, including Recommendation 11, which pertained to support for bicycle transportation. The *Clouds of Change* report is regularly referred to in Vancouver's transportation documents (e.g. City of Vancouver, 1997; 1999) and was mentioned in personal interviews.

The document demonstrates an understanding of bicycle transportation as not only a method for reducing the city's traffic congestion problem due to its growth constraints (City of Vancouver Engineering, 1988; City of Vancouver, 1997), but also as a way of addressing the problem of pollution. The *Clouds of Change* report also makes express the City's acceptance of the problem of climate change, and positions them to enact policies to combat it. In this way, the environment has become further embedded as a justification for supporting the expansion of cycling infrastructure and as a taken-for-granted element of relevant social groups' sociotechnical frames surrounding it.

Cycling Advocacy

In a personal interview (March 9, 2012), Stary noted that a particular event in early 1992 proved to be a watershed moment for cycling advocacy in Vancouver.

January of that year marked the opening of the Cassiar Connector, a project that boasted the removal of one of the last traffic lights on the Trans Canada Highway, which skirts the easternmost part of Vancouver. Stary notes that there were promises made with regard to cycling in conjunction with the multi-million dollar project, and that the Province failed to make good on those promises. When the minister got up to address the crowd at the opening, the cyclists in attendance began to ring their bells over his speech. To Stary, this was a moment that galvanized the city's cycling advocacy. Although the Province and not the local municipality was the source of agitation in this case, the proximity of the project and the fact that Vancouver serves as headquarters for many of the groups that lobby for cycling at the provincial level made the issue local.

1996 Burrard Bridge Trial

When Gordon Price reflected on the one-week bike lane trial on the Burrard Bridge in June of 1996, he noted that it was perhaps one of the bigger mishaps of his career on Council (personal communication, March 21, 2012). Due to what he attributes to a lack of adequate advance warning, many vehicle commuters were surprised to find that a lane of vehicle traffic had been sectioned off for bicycles on the four-lane bridge. Mr. Price's thoughts are also reflected in an administrative report to Council from the General Manager of Engineering Services following the trial, which notes that:

> There was a standard complaint that there was simply not enough information or advance warning on the pilot bike lane installation. While this may have some validity for the one-day Sunday opening, there was extensive advertising and advance warning for the Environment Week trial period. Nonetheless, many people were surprised by the installation, and had little understanding of the role of the bike network and the importance of developing alternatives to the single occupant vehicle.
>
> (General Manager of Engineering Services, 1996)

As the most westerly of three bridges joining the downtown peninsula to the more southern and western neighbourhoods in Vancouver, the Burrard Bridge is a major connector to the downtown business district. Price noted that by the end of the first day the question was not one of whether to keep the trial lane in operation, but whether to take it away immediately or allow it to stay for the whole week as planned. The former

Councillor also commented that it was an interesting moment politically since by then enough people had cellular phones that on the first day of the trial they were inundating the Mayor's office with calls made while stuck in traffic to complain about the delays.

1996 Helmet Law

In September of 1996, British Columbia passed its mandatory bicycle helmet legislation as an amendment to the Motor Vehicle Act, which requires all bike riders to wear the protection. Some exceptions apply for those whose religious practices or medical situations prevent them from complying with the law, and for children riding three or four wheeled cycles that are not chain driven. Otherwise, choosing to forgo wearing a helmet may result in a fine. Peter Stary (personal communication, March 9, 2012) noted that the legislation was largely the result of lobbying efforts at the provincial level. Even though the circumstances around the helmet legislation were driven by a smaller group of individuals, its implementation had been suggested much earlier. The 1988 bike plan discussed mandatory helmet use as a way to lower the number of fatal injuries, and studies have supported bicycle helmet use as brain injury prevention in adults (Della-Giustina, 1998), and children (American Academy of Pediatrics, 2001), although helmets must be worn properly to have this effect (Wellbery, 2004). However, the law remains extremely contentious and one researcher suggests that helmets might not prevent brain injury (Curnow, 2003), and other studies have suggested that the net public health benefit achieved by greater bicycle use where there is no helmet law outweighs the risk of head injury the helmet might prevent (De Jong, 2012; Robinson, 1996).

Helmet use remains a major point of contention even outside of contestation about how well the devices protect the wearer. Several of the people interviewed for this study mentioned the problem of cyclist non-compliance with the law. Whether the interviewees were for or against mandatory use, they pointed out how the law had been used to damage cyclists' reputations. The discourse goes something like "if not all cyclists are wearing their helmets, then perhaps they are all miscreants and they do not belong on the road" (Interviewee C, personal communication, February 1, 2012).

Perhaps the biggest point of contention around the helmet law is its perceived impact upon the number of people cycling. Interviewee C spoke at length about their opposition to the legislation, citing overheating and concern for appearances among reasons the mandatory law adversely affects the numbers of people cycling. To this interviewee, the question of appearance is a cultural issue as well as a class one. In a contemporary case study that looked at major cycling cities across North America, Vancouver was the only example with mandatory helmet legislation for adults (Pucher, Buehler, & Seinen, 2011).

Helmet legislation is also a contemporary concern for those who would see Vancouver have a citywide bicycle sharing program. Cities like Montreal, Paris, Barcelona, Stockholm and Copenhagen all have successful bike share programs, which both serve as affordable access to a bicycle and as an extension of public transit systems (Doster, 2008; Lin & Yang, 2011). Copenhagen in particular is widely known for the resounding success of its cycling initiatives, and boasts an approximately 30% mode share for cycling (Gardener, 1998; Block, 2010). Melbourne, Australia became the first city subject to national bike helmet legislation to implement a bicycle sharing program, but helmets have been a barrier for the program to increase cycling mode share as similar initiatives have in other cities (Kerin, 2010). To some, this challenge is due to the deterrent to cycling provided by the helmet legislation as well as the logistical difficulty of providing clean, undamaged helmets at unattended bicycle sharing docks (Interviewee C, personal communication, February 1, 2012; Van Der Ereden, 2011). Contemporary to this writing, Vancouver has just approved its first bike sharing program, which is to be operated by Alta Bicycle Share, an affiliate of the Portland based group, Alta Planning + Design. As one of only a few such cities operating bike shares under a helmet law (Bicycle Helmet Research Foundation), the success or failure of the new program could have consequences for the future of the requirement in other jurisdictions.

Helmet legislation remains a contentious issue in British Columbia, with cases upcoming for the provincial legislature to challenge the mandatory helmet law. The debate seems to hinge upon the answer to the question of whether it is better for public health that more people cycle, or that those who cycle have less incidence of serious injury. It is not an argument that is expected to reach resolution quickly. However, Stary notes that at the time of the creation of the province's helmet legislation, Cycling BC, of

which he was a member and which opposed the legislation, advocated for several benefits for cyclists in exchange for not making their opposition to the incoming law a public affair (personal communication, March 9, 2012).

One of the concessions made was to allow cyclists legal use of the road shoulder, which Stary related had proved quite problematic up to that juncture.

> There was a case in the upper Fraser Valley that I became aware of through my involvement with Cycling BC, where a 13 year old boy was cycling along the Lougheed Highway on a nice wide shoulder. He arrived at an intersection with a rural road, a driver pulling a trailer turned from the highway onto the rural road and collided with the boy, injuring him and destroying the bicycle. ICBC declined to find the driver at fault because the boy shouldn't have been on the shoulder, he should have been on the roadway. That was the reasoning if you can believe that.
>
> (personal communication, March 9, 2012)

Another of the benefits negotiated was to change the legislation that banned cyclists from roadways where bike paths were nearby. Stary noted that the designation "bike path" meant very little about how direct or well maintained the facility would be, making it desirable in many cases for the cyclist to choose the road. The final concession was for the development of a cycling education curriculum to be included in public schools. In our interview (March 9, 2012), Stary recalled that there was no time limit agreed upon, and that the program was cancelled after only a few years, but that the materials are still available somewhere.

The 1997 Transportation Plan

In the expert opinion of City of Vancouver engineer Peter Stary (personal communication, March 9, 2012), it was the 1997 *City of Vancouver Transportation Plan*, henceforth "1997 Transportation Plan," that was the first significant transportation plan out of the City concerning cycling in Vancouver. This is in part because in 1996, the city's engineering department reorganized its transportation engineering branch, creating a separate and now cohesive force of engineers who were to focus upon non-traditional transportation, which includes cycling.

A quotation from the 1997 Transportation Plan aptly illustrates the environmental tone of the document: “since the decision in the late 1960s not to build freeways in the city, Council’s policy has been evolving towards a concern for the impacts of the car” (City of Vancouver, 1997, p. 7). Cycling figures along with walking, transit and goods movement as areas where future improvements will be necessary, with no provisions for the expansion of transportation capacities for the single occupancy vehicle. In reference to cycling, it asserts “there is scope for an expansion of biking in the city, both as local neighbourhood transportation and longer distance commuter transportation” (p. 26), and it calls for the growth of the bikeway network and the “Greenways” program, which would include more recreational and often multi-use paths such as the one around Vancouver’s seawall. Perhaps more significantly, it calls for bike lanes to be marked on streets that provide access to the city’s downtown core:

> With downtown neighbourhoods covering a large area, facilities for biking could make this an attractive form of transport for downtown residents. Yet narrow and congested lanes and quickly moving traffic make cycling an uncomfortable experience on most downtown streets. Bike lanes on some downtown streets, and calmer downtown traffic are proposed to make cycling easier. Improved bridge crossings for cyclists would also help improve access from adjoining neighbourhoods.
>
> (City of Vancouver, 1997, p. 31)

This quote says quite a lot about the attitude of the Council at the time of this report. First, they cite the problem of quickly moving traffic and cyclist comfort, which further embeds segregationist principles in local policy, even if bike lanes on major streets still represent a bit of a compromise of these competing strategies. Second, despite the failure of the 1996 Burrard Bridge trial, the document has identified the need to improve cycling facilities on the bridge crossings.

The 1997 Transportation Plan provided several recommended cycling initiatives for the City that were to be completed in the following six years. These include painted bike lanes on some streets, painted bike logos on existing bikeways, a request to BC Transit to include bike racks on buses, the expansion of the bikeway network, and the instalment of bike racks “on each block of commercial frontage and at major bus stops” (p. 45). Many of these provisions were completed in the following years, but the push for

bicycle parking was slow to expand in some areas, partially due to the cost-sharing requirement between the city and the businesses these racks would sit in front of.

Chapter 3 Discussion

In the first decade of the case study period, the city's cycling landscape changed dramatically. For one, an ongoing international debate was introduced and engaged with in Vancouver over whether it is better to integrate cyclists into arterial traffic or to segregate them for the comfort of the cyclists. Engineers have been the strongest supporters of integration, citing little or no correlation between accidents and riding parallel routes to automobiles on arterial streets. The sociotechnical frame of this RSG contains several elements related to the field of engineering, most notably a more positivist understanding of what constitutes knowledge and a need for evidence based decision-making.

The assertion of the Vancouver Bikeway Network Group that integrationist strategies cater to current cyclists introduces a kind of interpretive flexibility to the examination of cycling infrastructure over the question of who the technology is for. Since City Engineering has jurisdiction over the roadways, they have a certain amount of power over these decisions and their conceptions regarding who rides a bicycle have most certainly shaped cycling infrastructure in Vancouver. Even so, a regional cycling network began to take form, thanks largely to the efforts of the VGBN as well as to the suitability of Vancouver's mostly even street grid with regular commercial street intervals.

Over this time period, the City also established its grounds for supporting cycling as an alternative to the automobile. The bicycle was seen as a possible solution to both the constraint on the expansion of the roadways for the automobile, and also as an environmental measure for combatting the pollution of the auto. The Vancouver Engineering Department's restructuring of its transportation division in the mid 1990s granted further legitimacy to cycling as an alternative mode of transportation in the city. Although Vancouver's 1996 trial to commit a lane of traffic to cycling on the Burrard Bridge failed, the 1997 Transportation Plan included recommendations for expanding

infrastructure into the downtown core and the bridge crossings that would set the tone for policy to follow in the coming years.

At the provincial level, the 1996 legislation for mandatory helmet use by cyclists came with a few benefits, thanks to the efforts of Cycling BC. One of these was the repeal of a law that required cyclists to ride on bike paths where they were available, an intervention which further entrenched bicycles as vehicles belonging on the roadways, even if they also won the special privilege to ride on the shoulder. These rulings demonstrate the importance of the Province of British Columbia as a relevant social group. Even though the City of Vancouver has charter independence to direct its resources and policies, the Province has tools such as the Motor Vehicle Act that affect transportation in Vancouver.

Chapter 4
"Reviewing the Past, Planning the Future": 1998-2008

> With the turn of the millennium upon us and Greater Vancouver's population nearing two million, transportation alternatives need to be provided to alleviate the pressure on our overloaded roadway network. Since City Council's historic 1968 decision not to build a freeway network in Vancouver, Council has continued to support transportation alternatives to the private automobile.
>
> (City of Vancouver, 1999, p. 1)

The years between 1998 and 2008 were relatively quiet regarding developments affecting cycling infrastructure as compared to the previous decade. However, the bicycle network did continue its steady expansion and relevant social groups completed necessary groundwork for future development. The story of this period is then more about the development of the sociotechnical ensemble surrounding cycling in Vancouver than it is about changes in the social construction of cycling routes. Bicycles themselves, however, which cycling infrastructure is dependent upon, did continue to develop at this time, as discussed in Chapter 2.

Although relevant social groups and cycling cultures have formed, adapted and expanded both throughout and in advance of this case study's temporal boundaries, it is most fitting to discuss them here so that they might be positioned as both causes of and responses to the policy and environmental changes taking place around them. Further, although interviewees were included whose participation in Vancouver's cycling community spanned the length of this case study, many were unable to confine their social observations to any particular period, making it difficult and impractical to discuss cycling cultures and social circumstances as if they had such temporal boundaries.

Even with several transportation plans in place at the City with recommendations in support of cycling transportation, community proponents of the bicycle continued to

work to establish themselves in Vancouver. Although it is difficult to measure the contributions made by relevant social groups where those contributions do not leave documentation and physical evidence, it is nonetheless important to discuss their roles as part of the social and cultural fabric of the city.

That Vancouver is home to numerous bike shops, advocacy organizations and cycling education initiatives most certainly indicates a level of vitality in the cycling community as a whole. Several bicycle designers and manufacturers have made a home in the area over the years as well, including Rocky Mountain, Norco and most recently Canadian outdoor retail giant Mountain Equipment Co-op. Unfortunately, contemporary to this writing few if any of these companies make even their high-end frames in Canada any longer, as most production has moved to Taiwan where it is also cheaper. Bikes that once proudly proclaimed “made in Canada” now indicate that they were built or designed domestically instead.

Cycling as Identity, Bicycle as Signifier

The development of cycling cultures in Vancouver has certainly not been bound by the 1998-2008 period examined in this chapter. However, they are worth examining here for their coherence by 1998 and because the cycling community’s relevant social groups provided necessary cultural elements of the sociotechnical frame surrounding cycling infrastructure relevant to the final chapter of the case study. Each interviewee questioned for this study was asked to describe the cycling community in Vancouver. With the exception of one person who started by describing the group of young “hipsters” riding fixed gear bicycles as one of the more visible contemporary components of the cycling community, every one first identified it as diverse before going on to define some of its characteristics. Interviewees described “hard core” cyclists who commute no matter the weather, cycling activists resisting car culture, “roadies” in spandex and “mountain bikers” on the North Shore. They also described the anecdotal changes they observed over the years in cycling demographics, noting what seemed to be an increase in the number of women riding as well as greater racial diversity.

For many users of the bicycle, a coherent identity constructed around their use of the artefact will be neither desirable nor possible. However, recalling Rosen's (1993) assertion that relevant social groups need only ascribe interests to another relevant social group for those interests to take up meaning in relation to an artefact, and further, the way in which the reciprocal relationship between subject and artefact signifies meaning in one direction and subjectivity in another, it is possible to examine the bicycle as an artefact that signifies social or cultural inclusion. So, while many individuals reject the identity "cyclist" for its various and conflicting affiliations with sport, poverty, or childhood, the bicycle is also a symbol of "hipster" identity, the DIY aesthetic (Furness, 2010), "Copenhagen chic", and a rejection of automobile culture. An observation by Pierre Bourdieu about the potential of an individual's participation in a given sport is apt here, and applies to the practice of cycling as a whole:

> The probability of practising the different sports depends, to a different degree for each sport, primarily on economic capital and secondarily on cultural capital and spare time; it also depends on the affinity between the ethical and aesthetic dispositions characteristic of each class or class fraction and the objective potentialities of ethical or aesthetic accomplishment which are or seem to be contained in each sport.
>
> (1978, p. 836)

Although in relation to the practice of cycling, Bourdieu's emphasis upon the importance of class and economic capital is perhaps overstated, his comments apply equally well to characteristics of various social groups, whose understanding of the "ethical or aesthetic accomplishment" signified by each set of practices that cohere around the bicycle as an artefact will relate to their willingness to participate and thus be themselves signified by the activity. Interviewee C commented on identity in relation to the mandatory helmet legislation, which the interviewee saw as a major deterrent to cycling: "it's also a problem in that it gives the message that cycling is for young, fit, racing type people and [that] it's a sport, it's not a legitimate form of transportation for people of all ages, including seniors" (personal communication, February 1, 2012). So for Interviewee C, it is not just bicycles themselves that operate as signifiers, but also related artefacts like helmets.

Although for those who participate in various cycling activities, identities and signifiers related to different cycling subcultures are distinct, they are often amalgamated

by outsiders so that any and all interests and behaviours might be attributed to users of the bicycle. Often, these perceptions are levelled against cyclists in mass media so that poor behaviour by some cyclists is provided as evidence to reject all cycling practices. Further, as Skinner and Rosen note in their chapter of *Cycling and Society*, bicycle commuters often have vastly different perceptions of themselves as safe road users than they do of drivers and of other cyclists. “Other cyclists, it is claimed, often cycle at night without lights, they move around on the road unpredictably and without indicating… and because of this they give all cyclists a bad name (2007, p. 92).

Despite the observations by interviewees that the cycling demographic was beginning to include greater racial and gender diversity, inclusion of these groups remains a concern for proponents of cycling transportation. As with gender, the issue of racial diversity among cyclists is a cultural one, but it is also often equated with conceptions of class. Several interviewees noted that recent immigrants to Vancouver, which is an international city with a healthy Asian and South Asian population, were reluctant to take up the bicycle when they moved to Canada because it was associated with poverty in their country of origin. This is consistent with observations made in a recent Canadian Broadcasting Corporation (CBC) radio segment on “Q with Jian Ghomeshi” examining the decline in popularity of cycling in Beijing, partially due to increasing affluence and a corresponding rise in automobile ownership and use (April 25, 2012). Further, Interviewee C recalled a conversation with a female participant in the VACC’s adult cycling program in which the woman indicated that she had not been allowed to ride a bicycle in her country of origin because the practice was only suitable for men (personal communication, February 1, 2012). Research in the United Kingdom has also demonstrated links between class, gender and racial identities and likelihood to cycle (Steinbach, Green, Datta & Edwards, 2011).

Because of the diversity of the cycling community, it is problematic that the practice of cycling by one relevant social group of cyclists could position them to speak on behalf of the whole community. However, for part of Vancouver’s recent history this seems to have been exactly what happened. This relevant social group I will call “experienced cyclists” and note that it is comprised to a large extent of those who ride road bikes for sport or fitness. Such representation is evidenced by the extent to which policymakers have relied upon road racing organizations in Vancouver to stand in for the

group of cyclists riding for utilitarian purposes. As in the 1988 Bicycle Plan, they have often been the targets of cyclist surveys, perhaps for the ease of data collection and perhaps for the visibility of this group. That the results of these early surveys would support more integrated strategies is not surprising given the elements of physical achievement and virility contained in the sociotechnical frames of sport cyclists, and that community groups representing a different and more diverse perspective would come into existence around the same time is equally unsurprising.

Cycling as a Social Movement

If, as Peter Stary suggested, the opening of the Cassiar Connector in 1992 galvanized cycling advocacy in Vancouver, then between that time and 2008 was when it matured and took shape. Interviewee C (personal communication, February 1, 2012) went so far as to compare the push to support utilitarian cycling in Vancouver and elsewhere to other major social movements that have taken place over the last century, including the women's rights movement. Given similar comments made by Gordon Price regarding the role of cyclists as a symbol of the legitimacy of the climate change issue and thus a threat to the automotive way of life (personal communication, March 21, 2012), Interviewee C's assertion seems fitting. Furness too supports this association of the bicycle with an affront to "automobility", noting that "indeed, there is a distinctly political impetus spurring many of today's bicycling advocates to challenge the institutions and practices of automobility as well as the spaces in which the automobile is materially and ideologically constructed as king of the road" (2010, p. 8). The link between cycling and environmentalism has been well established by policy makers, and also by those cyclists who see it as their purpose for choosing self-powered transportation. In this way, the bicycle, as well as the practice of cycling, comes to signify a green consciousness and a rejection of oil reliance.

Media and Radical Media

To John Downing (2000), social movements and radical media are closely intertwined, so it should come as no surprise that cycling as a social movement should produce performative texts based upon everyday social practice. The most infamous of

these is certainly Critical Mass, a mobile monthly protest that takes place in cities across the globe, clogging arterial vehicle traffic at rush hour. The practice began in San Francisco in 1992 (Blickstein & Hanson, 2001), but a local group, The Bicycle People, had staged similar demonstrations in Vancouver before the city's first formal Critical Mass rides in the mid 1990s. Similarly, performative actions such as the annual World Naked Bike Ride, a comment on the indecency of petroleum reliance, and appearances by the local group Dinosaurs Against Fossil Fuels, contribute to culture jamming and participate in environmental discourses related to cycling transportation in Vancouver. Even less overtly environmental action such as the shows put on by the local bicycle performance troop, the B:C:Clettes, who cycle around the province while on tour, contribute to these mass discourses about sustainable transportation practices.

As Downing suggests, social movements often produce their own media, and although not all of the cycling media produced in Vancouver is as overtly radical as that described by Zach M. Furness (2010) in the United States, publications like Momentum, a cycling culture and fashion magazine distributed locally five times per year, contribute to the social and cultural discourses that make up the sociotechnical ensembles surrounding cycling in Vancouver. Further, mass media participate in these discourses both by producing media, as the CBC does when they air the annual commuter challenge on Radio One, or by serving as a platform for public debate, as Vancouver newspapers and local blogs have done. A modest list of such resources is included in Appendix D.

The Vancouver Area Cycling Coalition

Without advocacy organizations like the VACC, cycling could hardly have gained social movement status in Vancouver. According to their website, the Vancouver Area Cycling Coalition began to form in 1996 before becoming an official organization in 1998. Their formation roughly coincides with a direction change by BEST, whereby they began to focus their efforts at the Provincial level and paid more attention to other types of sustainable transport. Further, as interviewees noted, BEST began to pursue more contract work and stepped back from their advocacy role (Ashley Jones, personal communication, March 15, 2012). This left a formal advocacy gap in Vancouver for a group to take on local and regional issues specifically related to cycling. Like PEDAL,

who took over the Our Community Bikes initiative, the VACC has taken over this local advocacy role as well as the bi-annual Bike to Work Week from BEST.

The Vancouver Area Cycling Coalition's focus extends to the whole Metro Vancouver region, despite the fact that they began in Vancouver's Kitsilano neighbourhood and that most of its members and volunteers are in Vancouver. The organization has gone through a metamorphosis since its founding so that it now employs a small handful of staff overseen by a board of directors (Interviewee B, personal communication, January 30, 2012). The VACC runs several programs that address needs identified in relation to the four "E's" of cycling. Contemporary to this writing, the organization is one of the only groups addressing cycling education in Vancouver, and subject to funding they have conducted a range of programs including education curriculums in Vancouver schools, learn to ride programs for adults, and commuter skills programs. The VACC has had little funding support and even less funding security, and although they have a small office, many of their staff members have worked from home using their own computers. Even so, the group has become a significant and resilient part of the cycling community in Vancouver.

The BAC

Although the Bicycle Advisory Committee is supposed to have been just a neutral citizens' advisory committee to Council, the group plays an important role in the cycling movement in Vancouver. As representatives of the cycling community and the municipal constituency, the BAC has more access to the political process than an advocacy organization. In this advisory capacity they have been acting in throughout their history, they have at numerous points been consulted on developments related to everything ranging from parking standards to the construction and expansion of the bikeway network. In October of 2005 they were given new powers: "that the Bicycle Advisory Committee be consulted on any new development that has an impact on existing or proposed bicycle routes" (Standing Committee of Council on Transportation and Traffic, 2005, p. 2). This gave them the jurisdiction to work with planners and developers on issues such as what sort of parking facilities should accompany new developments. Although this was an opportunity for the BAC to have more of an impact, as several

interviewees noted, these new responsibilities drew the focus of the committee to the minutia of cycling issues and away from their traditional role of broader policy advisory.

In 2006, residents of Vancouver elected an NPA-run Council. Despite the fact that NPA members such as Gordon Price had been strong advocates for cycling transportation for many years, one interviewee noted that this was a difficult term for the Bicycle Advisory Committee:

> Our liaisons for that term were Peter Ladner and Susanne Anton. You can look at their record on things like the Burrard Bridge, and you can figure out that a lot of what they said they supported, when it came down to a vote, wasn't always the same thing. In fact, it often wasn't. So that was a little disheartening for most of us during that term because …we still had a very good process in place. To me it looked very much like staff [mostly engineers] wanted to get on and do stuff, and actually in some ways I think they managed to get things in kind of under the radar.
>
> (Interviewee A, personal communication, December 20, 2011)

So, although the Bicycle Advisory Committee is supposed to have the ear of Council, their power as consultants is still limited by the willingness of Council to heed their recommendations. Further, although the City engineers have jurisdiction over the roadways, it is Council who directs policy and allocates the engineering budget, as well as hires or terminates the City Engineer.

Municipal Transportation Plans

Although support from Council for cycling improvements has fluctuated over the period of the case study, possibly having to do with the perceived political risk associated with cycling after the 1996 Burrard Bridge trial, policy supporting alternatives to the single occupancy vehicle stayed in place, and the adoption of two further plans by Council around the turn of the century provided the detail as to how the city's policy support for cycling transportation might be translated into action. The *1999 Bicycle Plan: Reviewing the Past, Planning the Future* (City of Vancouver, 1999), henceforth the "1999 Bicycle Plan", represents a major victory in local cycling research. It is also a follow-up to the 1997 Transportation Plan, which called for further development of the city's cycling infrastructure. Building upon and systematically reviewing past policies and research, the

1999 plan sets the agenda for the years to follow, and analyses Vancouver's bikeway network. The 1999 Bicycle Plan states its purpose as follows:

> It is now time to step back and review the existing network to determine its effectiveness, both in terms of economics and in encouraging people to cycle. In addition to answering these two important questions, this report will review the existing bicycle network, update the bicycle master plan, solicit feedback from both users of the bicycle facilities and residents living along the bikeways, and identify future bicycle facilities and initiatives.
>
> (City of Vancouver, 1999, p. 1)

The 1999 Bicycle Plan credits a report it calls the "Bicycle Network Study", available from the Vancouver Public Library as *Options for Cycling Improvements in Vancouver* (1991), as responsible for demonstrating the suitability of the bikeway network in Vancouver. This report does compare the four different types of bike routes, discussing the feasibility and cost of each option, but as discussed in Chapter 3, it was the Vancouver Bikeway Network Group that introduced the concept of a grid of local street bikeways earlier in 1991. This is a significant distinction even if, as the 1999 Bicycle Plan suggests, the group eventually became synonymous with the Bicycle Network Subcommittee that collaborated on *Options for Cycling Improvements in Vancouver* with the City engineers.

Apart from this error, the research conducted as part of this bicycle plan was extensive. For instance, to account for the margin of error of sensors on the roadway, which fail to count bikes going either too slowly so as not to activate the sensor, or too quickly so as to be counted as a car, the City conducted manual counts along the bikeways. Perhaps most notable about the 1999 Bicycle Plan is its systematic review of local organizations, and its surveys of cyclists and residents. In response to complaints levelled against the neighbourhood street bikeway network, the City conducted a survey of locals living along its routes. These complaints included that the bikeways would increase congestion and car volume, decrease property value, increase crime and take away from the peace of the neighbourhood. However, in relation to each concern, the resident surveys supported the success of the neighbourhood bikeways.

From a retrospective standpoint, one of the more significant pieces of data collected for the 1999 Bicycle Plan came from residents who were asked where they would most like to see cycling routes in Vancouver. The greatest portion, 27% of those surveyed, wanted to see cycling routes in the downtown core, followed by another 16% who wanted to see improvements on the bridges and 11% who wanted to see improvements specifically on Burrard Street, which presumably includes both the bridge and downtown portion of the major thoroughfare. Considering that the next greatest response at 9% was "everywhere/anywhere" with percentages dwindling from 6% thereafter, this concern for facilities in the downtown core was quite statistically significant. It should come as no surprise that three years after the 1999 Bicycle Plan the city would include cycling facilities in its downtown transportation plan.

The City of Vancouver's 2002 *Downtown Transportation Plan* expressed similar concerns for limiting the expansion of the automobile as were included in the 1997 Transportation Plan. The document includes developments to improve cycling facilities into and through the downtown peninsula as well as those for transit and pedestrians. Provisions for motor vehicles are included not as a capacity expansion, but rather for management. Such measures include the use of one-way streets, which can contribute to safer, speedier traffic flow. Like the 1997 Transportation Plan before it, this proposal as adopted by Council uses both congestion and the environment as justifications for limiting the growth of vehicle traffic:

> Things may look good now, but with the increasing population and employment downtown, the number of trips into downtown is expected to increase significantly. Without any intervention, this could mean a lot more cars driving around the downtown. This would not only increase congestion, but the general desirability of the downtown as a place to work, live or play diminishes. As well, building more roads to accommodate more traffic is not only difficult and expensive in a densely developed environment, but it is not sustainable. Many North American cities with extensive freeway systems are a testament to the fact that building more roads induces more people to drive and does not solve congestion problems.
>
> (City of Vancouver, 2002, p. 41)

In regard to cycling, the 2002 Downtown Transportation Plan calls for significant improvements in the central business area, citing the resident survey conducted as part

of the 1999 Bicycle Plan that demonstrated the overwhelming desire for improvements to happen downtown. The plan employed two guiding principles for determining where the City would either paint bicycle lanes, or include wide shoulder lanes to accommodate cyclists:

> a) To provide direct connections to existing routes and key destinations in and around the downtown. Particularly important are links from the central business district, where the majority of cyclists are destined, to all the bridges, the Seaside Bike Route, and the Adanac and Ontario Bikeways
>
> b) To minimize the impact to the transportation network by avoiding the removal of traffic lanes and, where possible, not significantly affecting the on-street parking inventory.
>
> (City of Vancouver, 2002, p. 96)

While these principles allowed for the broad expansion of bike lanes in the downtown core, they did not represent any bold reallocations of space. Bike lanes consist of painted lines separating bikes from vehicular traffic on one side and parking as well as transit stops on the other. In practice, these facilities cater to those cyclists who are comfortable riding in vehicle traffic and do little more than legitimize the cyclist's place on the roadway. The question of segregated facilities in this plan was simply off the table.

Of note, this plan appeared shortly before the City of Vancouver won the bid to host the 2010 Winter Olympic and Paralympic Games. Hosting an event of the magnitude of the Games regularly comes with a considerable spike in development, and Vancouver was no exception in this regard. High profile public transit projects were expedited to prepare the city to welcome masses of people from all over the world, and much of this affected traffic and transportation in the downtown core as well as along Cambie Street where the "cut and cover" technique was used to dig the underground route for the Canada Line light rail that currently runs from downtown Vancouver out to Richmond and the Vancouver International Airport. This facility does not appear in the 2002 Downtown Transportation plan, while provisions such as a trolley line that feature prominently in the plan had not even begun as of early 2012. When asked whether the Games had had any impact upon the levels of funding available for cycling infrastructure, interviewees replied in the negative. However, improvements to the ability of mass transit in Vancouver to accommodate the bicycle were made since 2002, such

as bike racks on electric buses, and the inclusion of a bike area on Canada Line trains. Unlike the Millennium and Expo Skytrain lines, the Canada Line allows bicycles at all operating times in all directions.

Following the 1999 and 2002 municipal plans, a new route was approved in 2003 as part of the expansion of the bikeway network in order to achieve a grid of neighbourhood routes no more than one kilometer apart (General Manager Engineering Services, February 23, 2003). The route would follow 10th Avenue parallel to the busy Broadway corridor. What surprised the City was the popularity of this route after its completion, especially considering that the "Off Broadway" route only a few blocks north had been established early in the development of the bikeway network. Retrospectively, it is easier to see how the direct and relatively flat 10th Ave. route would be preferable to the nearby but meandering Off Broadway route with its significant loss and immediate regain of elevation near Clark Street as well as the gain in elevation necessary to return to the Broadway corridor in the Mount Pleasant area. Such route preference information, as well as other motivators and deterrents to cycling have since been the topic of inquiry for several of the studies coming out of the University of British Columbia as part of the Cycling in Cities research (Winters, Brauer, Setton & Teschke, 2007; Winters, Friesen, Koehoorn & Teschke, 2010; Winters, Davidson, Kao & Teschke, 2011). One of these studies suggests that the built environment should be considered a fifth "E" of cycling transportation planning considering its significance as a cycling motivator or deterrent (Winters, Davidson et al, 2011).

Chapter 4 Discussion

While few changes to the social construction of cycling infrastructure in Vancouver occurred during the period between 1999 and 2008, relevant social groups participated in an increasingly rich and diverse cycling culture in Vancouver. Interviewees identified numerous subcultures within the city's cycling community, each of which assume signifiers of identity in relation to their cycling practice. Although at some points these cultural elements of the sociotechnical ensembles of relevant social groups are conflicting, various groups, especially those with an orientation to advocacy, have worked to create a coherent set of social discourses around the practice of

utilitarian cycling in Vancouver. This is particularly true around the issue of the environment, which most certainly undergirds the cycling social movement that has been alive and well in Vancouver throughout the case study.

The 1999 Bike Plan and 2002 Downtown Transportation Plan reflect a related and continuing concern for supporting alternatives to the single occupancy vehicle and increasing the cycling transportation mode share in Vancouver. They identified the downtown peninsula as an important and desirable site for improvements to cycling infrastructure, which would be increasingly significant and controversial in the years to follow. While bike lanes in the downtown core were installed following the 2002 plan, these facilities still catered to those cyclists who were comfortable cycling alongside vehicle traffic, a characteristic that corresponds strongly with more experienced cyclists, who often belong to the group of road cyclists.

Although interviewees who participated in cycling activities in Vancouver throughout the period of the case study made personal observations about the greater variation of gender and ethnicities of people riding bicycles, the inclusion of these groups remains a concern for bicycle transportation proponents due to variations related to gender roles, as well as perceptions of affluence. The City of Vancouver's goal to increase the cycling mode share could be significantly impacted by these social and cultural limitations in the future.

Chapter 5
A Vision for Vancouver: 2009-2011

> [The Burrard Bridge] was the epitome of the sort of struggle between the two cultures, bike culture and car culture.
>
> (Interviewee C, personal communication, February 1, 2012)

In 2009, Gregor Robertson began his first term as Mayor of Vancouver primarily in the company of Councillors from his Vision party and coalition partner COPE, who occupied all but the single Council seat held by NPA member Susanne Anton. Mayor Robertson is himself a utilitarian cyclist, and he positioned himself as a strong advocate for cycling during his campaign. The now two-term Mayor even attended a controversial Critical Mass ride in 2008, a fact that did not go unnoticed by those Vancouver residents who disapprove of the monthly collection of cycling protestors.

Vision came into power with a platform to make Vancouver a more sustainable city, and to do so they created the “Greenest City Action Plan”, also called “Vision 2020”. The goal of this plan is an ambitious one, to make Vancouver the most sustainable city in the world by the year 2020. More than three years into their plan, and with their second term as the majority of Council under way at the time of this writing, Vision has made good on a number of their promises, not the least of which were those pertaining to cycling.

The Burrard Bridge: Take Two

According to former City of Vancouver Councillor Gordon Price, that the Vision party campaigned on the issue of improving cycling infrastructure on the Burrard Street Bridge could not have been more important. When reflecting on the 1996 trial, Price said, “in terms of political consequences though, that ended any discussion about whether there would be separated lanes. No one was going to go through ‘Burrard

Bridge' again. So it took another ten years before the idea came back" (personal communication, March 21, 2012). Coming into power with a mandate to improve cycling infrastructure allowed Vision to take on the political risk necessary to remove a lane of vehicle traffic on the bridge to put in the bike lane. Price also commended the City for the way they handled the trial in 2009:

> They did something actually brilliant, which was to repave Pacific [a major road connecting the downtown peninsula to the bridge] a day or two ahead of time, so there was already disruption related to the repaving, so by the time Monday came around people had already made some adjustments.
>
> (personal communication, March 21, 2012)

City engineer David Rawsthorne noted another important difference between the way the 2009 Burrard Bridge trial was conducted as opposed to its 1996 predecessor: "we didn't put down orange plastic cones that you can pick up in two hours, we put down concrete barricades, that granted if we were told to get rid of them they could be gone in a week… so we built it in a more permanent-looking way" (personal communication, March 12, 2012).

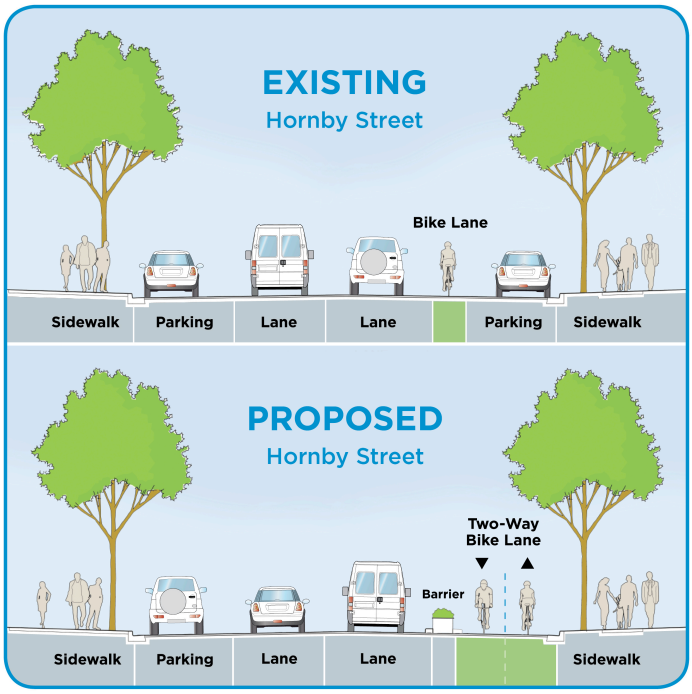
Downtown Segregated Bike Lanes

On February 4th, 2010, the Standing Committee on City Services and Budgets received an administrative report from the General Manager of Engineering Services recommending that a cycling route be constructed on the Dunsmuir Viaduct, and that facilities be constructed connecting the Viaduct and the Burrard Bridge to the central business district. In particular it notes:

> In response to [the Greenest City Action Team], the *Cycling in Cities* study, outstanding items from the [1997] Vancouver Transportation Plan and the [2002] Downtown Transportation Plan, discussions with local cycling groups and the Bicycle Advisory Committee, and experiences from other cities, staff have developed plans for implementing separated bike facilities in Vancouver.
>
> (General Manager of Engineering Services, 2010, p. 2)

Council approved the recommendations in this administrative report, and the construction of the lane on the Dunsmuir Viaduct went ahead following the four week closure of the viaduct during Vancouver's hosting of the 2010 Olympic and Paralympic Winter Games. The extension of the route into downtown followed that summer, with an official opening in June of 2010. The construction of the Dunsmuir cycling route was followed by the December 2010 opening of the Hornby bike lane, which connects to the Burrard Bridge and runs to the opposite side of the peninsula. On both of these sites, the City installed fully segregated bike paths on the street, taking up what once was a lane of parking, or of traffic at peak hours (see Figure 5). This type of on street facility separated from vehicle traffic is also referred to as a cycle track, as in Pucher, Buehler, & Seinen (2011).

Figure 5. Hornby Street Segregated Bike Lane



Depicts the street configuration before and after the installation of the segregated bike facility on Hornby Street. Courtesy of the City of Vancouver.

It was surprising to multiple interviewees that it was the last of these cycle tracks, the Hornby bike lane, that created the greatest controversy in its installation. The opposition came primarily from the business community, who cited the loss of parking,

the possible impact of the lanes on truck deliveries, and a presumed loss of revenue as objections to the facilities. During this time, the Vancouver Area Cycling Coalition put together a committee to mediate the concerns of businesses, and the committee's measures included a campaign to increase the numbers of cyclists shopping the area (Interviewee C, personal communication, February 1, 2012). Several business associations in the downtown also hired Stantec Consulting Ltd. to conduct an impact study on the effect of the lanes on businesses along Dunsmuir and Hornby. The report does demonstrate a decrease in revenues, but also admits that the 2009 downturn in the economy, increases in parking fees and other factors affected the data, and that it relied upon self-reported survey data from business owners, meaning bias may well have impacted the data collected (Stantec Consulting Ltd., July 20, 2011).

The decision to install the downtown segregated lanes marks a major turning point in cycling transportation engineering in Vancouver. It also marks a significant shift in the stability of cycling routes toward favouring more segregated facilities. Such a shift would not have been possible without the input and influence of some notable relevant social groups, however. The election of a sympathetic Council has already been discussed, but perhaps chief among influential relevant social groups when it comes to the shift toward segregation is the Cycling in Cities research group. Based out of the University of British Columbia (UBC), the Cycling in Cities study is an ongoing research project on cycling and health promotion that has already published on a number of topics related to urban cycling. The group has had cooperation from numerous other RSGs in Vancouver, including Translink and the City. The lead researcher on the study is Dr. Kay Teschke of UBC's School of Population and Public Health, and in 2010 she and Dr. Meghan Winters published the results of their research on cycling route preference among adult cyclists.

In this article on route preference, Winters and Teschke identify an important relevant social group related to cycling infrastructure that had been implicit up until their definition. They call it the "near market" for cycling, and they note,

> A strategic approach for increasing mode share is to survey the 'near market' for cycling, that is, members of the population most likely to be willing and interested to make changes in their travel behavior. This group includes current cyclists who could cycle more frequently as well as

> noncyclists who are willing to start cycling.
>
> (2010, p. 41)

By focusing on this population, their study was able to deliver information about the most important group for meeting the City's goals for increasing the cycling mode share in Vancouver. This conception has certainly become more important to the City staff as well. As David Rawsthorne commented: "who we see as our 'customers' if you will, has really broadened in the last few years, from providing facilities for people who are riding their bikes to providing facilities and promoting cycling for everybody" (personal communication, March 12, 2012). Winters and Teschke were able to demonstrate that there was a marked disparity between the kinds of facilities that the near market required and the types of facilities that the City had provided (p. 45).

> This study found similar route preferences across frequent, occasional, and potential cyclists, making it straightforward to focus future infrastructure development. The top route types were paved off-street paths; cycle paths next to major streets separated by a barrier; and residential streets marked as bike routes, with traffic calming… This set of preferred route types would provide a variety of options to cyclists and transportation facility designers.
>
> (Winters and Teschke, 2010, p. 46)

The application of this research in Vancouver's downtown core, however, left only one of these preferred options. In an area as dense and as highly developed as the central business district, off-street paths like the city's seawall and the regional Central Valley Greenway are not physically achievable. Equally, the neighbourhood routes that characterize the bikeway network are impossible with downtown's zoning and high traffic volumes. With painted lanes like those that followed the 1997 Transportation Plan and the 2002 Downtown Transportation Plan ruled out by the near market, segregated facilities were the only remaining option for significantly improving the cycling facilities in downtown Vancouver. More importantly, for the first time City engineers and policymakers had the evidence they required to support this type of facility.

Although their support of segregated facilities was still based upon quantitative data, this does represent a shift in the sociotechnical frame of the City's engineers. When discussing the debate between integrated and segregated facilities in our interview, CoV engineer David Rawsthorne noted it was his opinion that "some of it is

ideological and some of it is based on empirical evidence of good engineering…if you look at separated facilities historically, they haven't performed well from a safety point of view where they connect with streets" (personal communication, March 12, 2012). This understanding is most certainly echoed in Forester's controversial writing, and although Rawsthorne acknowledged that Forester did not speak for the cycling community, he indicated that the view had been typical among transportation engineers.

In this way, the debate for engineers is still strongly centred around a need for factual evidence, but Rawsthorne also admitted that the discussion gets more ideological around the question of whether it is better to take on the risk that more people might get injured or if it is better to convince more people to cycle and thus take on the benefits of increased physical activity of the population and the benefits to the environment from reduced carbon emissions. Since these benefits have been well established (e.g. Maitland, 2012; Carnall, 2000; Woodcock et al, 2007), it was a matter of determining what was necessary to convince more people to choose cycling as a mode of transportation, and then taking one of the ideological positions. This was where the Cycling in Cities research and the will of Council were indispensible, respectively.

As a new technology within the city of Vancouver, segregated bike lanes were bound to meet with interpretive flexibility by relevant social groups. Two relevant social groups in particular saw the new lanes as technologies that could be used for something other than bicycle travel. One of these is the group of scooter and motorcycle riders who make use of the facilities, as well as of the bicycle parking facilities the City recently expanded. Both for cutting ahead of vehicle traffic at peak times and for similar perceptions of safety affecting cyclist preferences, use of the segregated bike facilities has been desirable for this group, and because these vehicles are narrow enough, they are legally allowed to use the lanes. In order to privilege cyclists, the City could require that bike lane users be self-powered, but many scooters come with removable pedals and thus meet this criteria. Even more problematically, new electric assist motors, which make cycling more accessible for a wide variety of riders, could be negatively affected by such limitations. So far, the City has not defined any upper limits for electric assistance that would distinguish a bicycle using this technology from a low powered scooter. When they do, their definition could have consequences for licensing, bike route use and cycling mode share.

A second interpretation of the segregated bike lanes has led a group of Simon Fraser University students to explore a business opportunity. The group, Shift Urban Cargo Delivery, has purchased a number of cargo tricycles from a company in Portland, Oregon to start a cargo tricycle courier business (Canadian Broadcasting Corporation, March 22, 2011). Like the scooters, the cargo trikes do not exceed the width limit for legal use of the downtown segregated bike lanes, but unlike traditional bike couriers carrying smaller loads, there is little reason to think these tricycles will operate alongside vehicle traffic on the roadways when segregated routes are available. Their use of the segregated facilities could have implications for the routes in the future, not dissimilar from recent reports in the world's premier bike city, Copenhagen. A September 9, 2011 blog post on *The Guardian's* webpage reported that overcrowding on the city's well-used cycling routes has recently made them feel less pleasant and safe for Copenhagen's residents.

The Vancouver Police Department (VPD)

Although their inclusion among the relevant social groups related to cycling in Vancouver is less intuitive than with other groups, the VPD is an important group referenced in multiple transportation plans and identified in multiple interviews. Their role in relation to cycling is one of enforcement, as included in the four "E's" of cycling transportation. They represent the law, and their ability to write traffic citations in conjunction with their presence at Critical Mass protests and on bike routes, or even just the threat of their presence, affects the users of cycling infrastructure. Because they represent the law, Vancouver Police are often the targets of aggression from vehicle drivers and cyclists alike.

In a personal interview, Constable Pat Allen was open about the level of venom directed at him as the VPD liaison to the Bicycle Advisory Committee. He acknowledges that some members supported him and kept order, specifically the Committee's Chair Kari Hewett, while others personally attacked him (personal communication, February 22, 2012). Having heard from other interviewees who were on the BAC at the time, it sounds as if the biggest point of controversy for many cycling proponents is related to

the use of enforcement as an education tool by the Vancouver Police Department during bike month.

June is bike month in Vancouver, and in 2009 the Vancouver Police Department pursued their public cycling education strategy, which met with a great deal of contention. They positioned officers at intersections along cycling routes with high commuter traffic, such as the intersection of Main Street and 10th Avenue, and stopped cyclists for various infractions. Since it was bike month, many, if not the majority of the tickets for these infractions were for educational purposes and carried no monetary cost for the cyclist. However, this was at the discretion of the officers.

In advance of this effort, the Vancouver Sun published an article noting the various infraction types and cost of the tickets associated with them (Ryan, 2009). This article misinterpreted an infraction for failing to ride astride the bike as one that meant the rider must remain seated and thus could not stand up on his or her pedals. Since this is done often by cyclists who are starting from a complete stop at intersections or trying to power up hills, this misinterpretation inflamed an already tense relationship between cyclists and enforcers. Constable Allen noted that he often hears from cyclists who wonder why the VPD is focused upon cyclist infractions when they are the at-risk road user (personal communication, February 22, 2012). It is likely that these bicycle riders are unaware of how close this behaviour from the VPD is to the recommendations in transportation planning as far back as the 1988 Bike Plan.

The law is often used against the cycling community in quite a different way than the real or perceived threat of a traffic citation, however. Several interviewees noted the problem of perception created by those members of the cycling community who do not follow the laws (personal communications, December 20, 2011; February 1, 2012). Over their 2009-2011 term, this included Mayor Robertson, who ran a stop sign and was recognized by a bus driver, and Councillor Geoff Meggs, who got into an accident with a vehicle when he too failed to obey a stop sign. To Interviewee A (personal communication, December 20, 2011), such infractions create real questions of legitimacy. These incidents and the daily interactions between vehicle drivers and cyclists committing infractions such as failure to wear a helmet or riding on the sidewalk contribute to the construction of the “cyclist” by the relevant social group of non-users of

the bicycle as an unruly lawbreaker. By extension, these non-users tend to think of cyclists more as risky than at risk road users, fuelling the tension between the two groups.

2011 Municipal Election

As noted by a number of interviewees, and as was well covered in the media at the time, the political parties Vision and the Non-Partisan Association drew a proverbial line in the sand over the issue of bike lanes in the 2011 Vancouver municipal elections. Gordon Price noted (personal communication, March 21, 2012) that this was largely due to the influence of NPA Fundraising Chair and well-known developer Rob Macdonald. As Chief Executive Officer of the Macdonald Development Corporation, Macdonald is a successful businessman who counts among his properties the St. Regis Hotel located on Dunsmuir at Seymour Street. Notably, this hotel sits along a portion of Dunsmuir that was included when the separated bike lanes were installed in 2010.

In February of 2011, Macdonald demonstrated both his outspoken nature and his vehement opposition to the downtown core's new segregated cycling facilities in an article in the *Vancouver Sun* entitled "Downtown bike lanes are a disaster". Although some of his facts were grossly overstated, such as his assertion that the two separated lanes cost "$25 million of taxpayers' hard-earned money", his critiques did strike a chord with those Vancouverites opposed to cycling infrastructure expansion. At the end of his article appears a note indicating that Macdonald "is an avid cyclist and financially supports cycling events in Vancouver". Although this is clearly intended to position him as a proponent of cycling who happens to be against the separated bike facilities, Macdonald is a randonneur, or a long distance road rider, and his inclusion in the sociotechnical frame of utilitarian cyclists, if his comments are any indication, is much lower than that in the sociotechnical frame of road racers. As such, he serves as an excellent example of how members of a cycling subculture might use their cycling practice to speak as if for the cycling community as a whole, or comment on other cycling practices. In this case, Macdonald was conflating his sport cycling inclusion with that of utilitarian cycling.

Susanne Anton, the would-be NPA mayor, is also herself a cyclist and she served as a liaison to the Bicycle Advisory Committee. However, as mentioned in relation to her 2006 to 2008 term as BAC Council liaison, she had already proven to be a lackluster supporter of cycling initiatives in Vancouver. In 2011 she towed the new NPA party line set by Macdonald on the segregated bike lanes, which were thought to be the hot-button issue of the campaign, and subsequently lost the election to Mayor Robertson. In the 2011 election, Vision gained a second majority of Council, but lost all of its COPE coalition partners. This victory for cycling transportation in Vancouver's political arena demonstrates at least a temporary acceptance of the acquisition of space for cycling in Vancouver's dense urban core and some level of closure of cycling routes as segregated facilities.

Chapter 5 Discussion

The period between 2009 and 2011 proved to be a monumental one for shifts in the social construction of cycling transportation in Vancouver. The procurement of space for the bicycle in the city's downtown core, strained as it is for growth, demonstrates a radical political risk. That this reallocation of vehicular traffic and parking championed by the Vision Party has survived a subsequent election demonstrates that Vancouver constituents are taking the bicycle, as well as the signified environmental and health discourses, seriously. This shift in the social construction of cycling routes in Vancouver also demonstrated the importance of the sociotechnical frame, and of the ability of different relevant social groups to exercise power. The city as an overarching sociotechnology structures social relations so that the greatest power to make decisions directly affecting the shape of Vancouver's transportation infrastructure rests with two relevant social groups: City engineers and Council. Where engineers have jurisdiction over the roadways as per the Vancouver Charter, Council controls the budget and has the power to replace the City Engineer.

However, it was another relevant social group, the Cycling in Cities researchers, who ultimately directed cycling route designs toward segregation in Vancouver. They identified the "near market" for cycling, which has long been an implicit relevant social group. The Cycling in Cities both defined the near market and demonstrated the

importance of the group, which is poised to increase the cycling mode share in Vancouver. The researchers also showed that the near market overwhelmingly desires segregated facilities, and thereby they helped shift the social construction of cycling routes in Vancouver. Where the facilities were once designed to accommodate those already cycling, the purpose of the facilities has now expanded to include the encouragement of the near market.

Chapter 6
Conclusions

When Vancouver's cycling infrastructure is examined as a technology in the way that Kirkpatrick (2002) has defined it, as both a social construction and sociological determiner, it is apparent that multiple relevant social groups in the city have been engaged in a struggle to define the form of cycling routes over most of the period of the case study. Between the years 1988 and 2011, what constitutes the 'best' form for cycling routes has never reached complete closure between RSGs, especially in the most contested spaces: Vancouver's downtown core and the bridges connecting it to the rest of Vancouver. Conversely, cycling routes had reached varying stabilities *within* different RSGs. For City engineers, cycling routes were facilities for direct and safe bicycle travel, while for Council they had become a political risk and at points a party platform. For cycling transportation advocates, cycling facilities represented a municipal commitment to sustainable transportation, and one that often did not go far enough. The shift in the sociotechnical frame that finally allowed the technology to reach a sort of closure between RSGs had two primary components.

First, as numerous people I interviewed note, the 2009 election of an overwhelming Vision majority led by cycling proponent Mayor Gregor Robertson put a Council in place that had based their campaign upon the improvement of cycling infrastructure as part of a sustainable city action plan. The understanding of political risk is an important element of the sociotechnical frame of politicians, and the failure of the 1996 Burrard Bridge bike lane trial effectively increased the risk associated with major reallocations of space for the bicycle. The choice by the Vision Party to include cycling improvements in their platform effectively reduced that risk. At the end of 2011, the election of a second majority Vision Council further demonstrates the success of that platform. Their policy guidance and power to allot finances allowed the City Engineering staff to proceed with cycling infrastructure developments into and through the downtown peninsula.

Secondly, the research conducted as part of the Cycling in Cities project at the University of British Columbia put factual evidence on the side of infrequent and potential cyclists. It demonstrated the importance of the near market for cycling, and that this group as well as more regular cyclists preferred more segregated facilities. This finally tipped the balance on the practical and ideological debates between integrationist and segregationist strategies of cycling infrastructure development in Vancouver by giving the City's engineers the empirical data they needed to support segregated cycling routes.

It is clear that four relevant social groups were most responsible for the social construction of cycling infrastructure in Vancouver over the period of this case study. Engineers, Vancouver City Council and the Cycling in Cities researchers all had explicit influences. The fourth, the near market for cycling, has often been implicit, or not recognized at all, but it is for them that cycling routes eventually reached closure as segregated facilities in the downtown core.

Even with these circumstances in place, it is important to give credence to more secondary relevant social groups. Organizations that include, but are not limited to, the Bicycle Advisory Committee, the Vancouver Area Cycling Coalition, Cycling BC, and Better Environmentally Sound Transport have long sought the ear of engineers and policy-makers, or have been contacted by them for their expertise. Prior to the Cycling in Cities study, and the kind of research data compiled in the 1999 Bicycle Plan, these groups often represented the will of the cycling community.

Although they lie outside the time period of this case study, it is also important to acknowledge several parameters established by planning and transportation choices prior to 1988, and by the natural characteristics of the Vancouver area. These are the structural considerations (Klein & Kleinman, 2002) necessary for an examination that acknowledges the city as a sociotechnology in and of itself (Rosen, 2001) that necessarily shapes the relationships between transportation technologies and society. One of these parameters in Vancouver was the streetcar system, which helped shape both the gridded street layout and the network of arterial, commercial streets that made the city suitable for the bikeway network, which was a critical intervention at a time when the City planned to integrate cyclists into arterial traffic. Another is the discretionary

zoning system that helped create the density necessary for the success of utilitarian bicycle transport, given the bicycle's forte for shorter trips. Perhaps the most important parameter has been the lack of a freeway serving Vancouver's central business district and number one trip destination. This is punctuated by the restrictions placed upon the downtown peninsula by its geography.

Active Transportation: 2012 and Beyond

One of the more notable developments at the time of this writing is that the City of Vancouver's Bicycle Advisory Committee has been eliminated by Council. The BAC has been around for more than a quarter of a century, but following perhaps the most significant Council term for cycling in Vancouver's recent history, it has been dissolved to become a part of the new Active Transportation Advisory Committee (ATAC). This new committee, I am told, will focus primarily on pedestrians in its first term. When asked to reflect on this, Interviewee A noted that there was still more work for the BAC to do and considered its disbandment premature. Although ATAC would not be excluding the bicycle from its scope, Thompson's understanding was that its members would not be chosen for their expertise on cycling issues, at least for the inaugural term (personal communication, December 20, 2011).

This comes on the heels of what several interviewees identified as a tense term for the Bicycle Advisory Committee. Some mentioned the 2005 decision that gave the BAC the right to consultation on developments next to cycling routes. These BAC members felt that this took the focus of the group too far into the minutia of development issues and created unnecessary tension. Others discussed the role of cycling advocacy organizations in this tension, wondering if these members were unable to separate their role as activists from their role as mostly neutral advisors to Council.

In any case, when asked whether any group of Vancouverites had been left underserved by the City's cycling programs, each interviewee in this study had something to reflect upon. Some discussed a need to reach out to recent immigrants, while others discussed the need to finish extending the bikeway network to the southern parts of Vancouver. One interviewee even saw these two issues as related, since

census data from 2006 showed very low bicycle usage in some of these south Vancouver neighbourhoods, which also have some of the city's highest densities of recent immigrants. By far the greatest concern of interviewees was for cycling education. Every person interviewed for this research echoed this desire.

While education has been in cycling plans in Vancouver from the beginning (City of Vancouver Engineering Department, 1998), the responsibility to administer it has been a bit of a finger pointing exercise. Some interviewees felt it should be the responsibility of the Province, who should include it in primary and secondary education. Others saw a role for local community centres, or for the VACC, who has made perhaps the most valiant effort of any relevant social group in Vancouver to fill this gap. As of this writing, the Vancouver Area Cycling Coalition has just rebranded itself as "HUB" and received its charitable organization status, which may allow the organization to more easily maintain the kind of funding necessary to provide educational programming.

Limitations

This study has endeavoured to demonstrate the suitability of a social construction of technologies approach to examining urban cycling transportation. The social constructivist philosophy has been praised for addressing technological determinism, but criticised for failing to account for the role of technologies to in turn structure society (Kirkpatrick, 2008). However, following Feenberg's dual aspect theory (1991) in an understanding of both technologies and society as participants in the process of social construction provides a foundation upon which the social construction of technologies as a methodology might be employed for understanding these relationships.

Despite Bijker's assertion that structural exclusion can be avoided, it has been a significant challenge in this study to ascertain whether this has been the case. As both a researcher and member of the community in which my research is situated, it is difficult for me to take an objective position and thus easier for me to take some groups for granted. However, being an insider in this way does privilege me in knowing more about the operations of the community as a whole and has allowed me to ask more targeted

questions. Even so, at the conclusion of this research, I cannot assert that no groups have been excluded from my analysis, despite my best efforts to mention even those RSGs, such as bike shops, whose presence and influence cannot be determined using the SCOT method. The SCOT approach is perhaps more suitable to meta analyses in this way, and future studies might include survey data or other more quantifiable social research methods for determining the impact of technology cultures in creating the sociotechnical ensembles.

Although the SCOT approach has limits, it has been a fitting method for describing various relationships between technologies and society. For one, it has suited the examination of the structural factors (Klein & Kleinman, 2002) asserted on cycling transportation by the social and physical limitations the City of Vancouver has placed upon it. Further, it was flexible enough to include an understanding of the influence of the social construction of the bicycle itself as a related technology. With these understandings in place the urban form provided the boundaries within which the technology could develop, and the political structure of the City of Vancouver determined which relevant social groups had greater power to influence transportation development. Similarly, the bicycle as a cultural artefact structured social relations as part of the mutual influences between artefact and society as mediated by the sociotechnical frame.

Implications for Further Research

This case study examination has focused upon how cycling infrastructure technologies have been constructed in Vancouver, British Columbia, focusing specifically upon the period between 1988 and 2011. In doing so, it has begun to address a gap in Canadian cycling research related to social research methods, and comparative case study analysis in particular similar to that identified in the United Kingdom (Rosen, 2003). It is my hope that this research will be the beginning of a cross comparative analysis of cycling infrastructural development in cities across Canada and North America using the social construction of technologies framework.

Doing so would not only contribute to a stronger body of cycling research across disciplines and methodologies in Canada, but it would provide the basis for an analysis

of larger social factors affecting contemporary transportation planning, in which a multi-level perspective (Geels, 2002) might be fruitful. Research should focus on cities that have implemented strategies for supporting cycling as a mode of transportation, as this one has done, as well as on those cities that have failed to enact such strategies. Further, these analyses should be compared to examinations of any cities where cycling as transportation is losing support rather than growing it, as appears to be happening in Beijing (Canadian Broadcasting Corporation, April 25, 2012).

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Appendix A.

Interviewees

Name/Pseudonym	Date(s) Interviewed	Affiliation(s)
Interviewee A	December 20, 2011 and January 16, 2012	Bicycle Advisory Committee
Interviewee B (pseudonym)	January 30, 2012	Vancouver Area Cycling Coalition
Interviewee C (pseudonym)	February 1, 2012	Vancouver Area Cycling Coalition
Ashley Jones (pseudonym)	February 15, 2012	Pedal Energy Alternatives
Constable Pat Allen	February 22, 2012	Vancouver Police Department, Bicycle Advisory Committee
Interviewee D (pseudonym)	February 23, 2012	Bicycle Advisory Committee
Ron Richings	February 24, 2012	Velopalooza, Momentum Magazine, Vancouver Area Cycling Coalition
Peter Stary	March 9, 2012	City of Vancouver Engineering, Cycling BC, cycling research groups, Vancouver Area Cycling Coalition
David Rawsthorne	March 12, 2012	City of Vancouver Engineering
Gordon Price	March 22, 2012	Vancouver City Council
Tim McDermott	March 22, 2012	Bicycle design, manufacturing and sales

Representation by Interviewees of Relevant Social Groups

Because a number of individuals interviewed for this study chose to be referred to by a pseudonym, I have not included all of their affiliations in the list above. The case study covers a small enough niche that associating individual's comments with their multiple organizational affiliations over time might violate their confidentiality. Instead, I have included some of the organizational affiliations with the individuals identified by name above and offered a list below of other relevant social groups whose perspectives interviewees have represented. Although some anonymous interviewees represent numerous perspectives, they have been referred to in the study by only their most relevant association to the quotes chosen. Their broader contributions to framing my analysis and in directing data collection are thus not apparent in the case study analysis, but they were not trivial.

Better Environmentally Sound Transport.

Research groups

Translink

Utilitarian, road, mountain, and recreational cyclists; and vehicle drivers.

Appendix B

Ethics Documents

Below I have imported the final research approval from Simon Fraser University's Office of Research Ethics, as well as the consent form given to interviewees.

SFU OFFICE OF RESEARCH ETHICS

Street Address
Simon Fraser University
Discovery 2
Room 230, 8900 Nelson Way
Burnaby, BC Canada
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Burnaby, BC Canada
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DIRECTOR 778.782.6593
MANAGER 778.782.3447
FAX 778.782.6785

dore@sfu.ca
http://www.sfu.ca/vp-research/ethics/

July 19, 2012

Erica Hirschberger
Graduate Student
School of Communications
Simon Fraser University

Dear Erica:

RE: From Arterial Integration to Segregated Lanes: A 1988-2011 Case Study of Cycling Routes in Vancouver, British Columbia
- Appl. #2011s0496
Social Sciences and Humanities Research Council of Canada
Grant title: Joseph-Armond Bombardier Canada Graduate Scholarship
Title Change

In response to your request, I am pleased to approve, on behalf of the Research Ethics Board, the title change amendment in the research protocol of the above referenced Request for Ethical Approval of Research originally approved on August 25, 2011.

Note: The data collection for this project is complete and the file has been closed. This title change is for the same research project that was approved on August 25, 2011.

If there is an adverse event, the principal investigator must notify the Office of Research Ethics within five (5) days. An Adverse Events Form is available electronically by contacting dore@sfu.ca.

All correspondence with regards to this application will be sent to your SFU email address.

Sincerely,

Dr. Hal Weinberg, Director
Office of Research Ethics

c: Dr. Zoe Druick, Supervisor
/jmy

SIMON FRASER UNIVERSITY ENGAGING THE WORLD

Title of Study: The Social Construction of Cycling Infrastructure in Vancouver: 1988-2011
Principal Investigator: Erica Hirschberger, MA student, Simon Fraser University
Purpose of Study: To understand the social forces shaping the development of cycling infrastructure so as to better understand how cities may support cycling as an alternative means of transportation.

I, _____, understand that I am being asked to participate in a semi-structured interview where I will, to the best of my knowledge, truthfully answer questions about the development and implementation of cycling infrastructure and policies related to cycling in Vancouver between 1988 and now.

As an interviewee in this study, I am a volunteer and may withdraw my consent to participate at any time without prejudice. This may be done verbally before or during the interview, or in writing to the principal investigator at: erica_hirschberger@sfu.ca.

During the interview, I may ask for comments to be stricken from the record at any time. The interview will be recorded and anything not stricken from the record will be transcribed. As per the policy of Simon Fraser University's Research Ethics Board, these audio and transcription data will be stored in a locked cabinet for the minimum of two years, after which time it will be destroyed. As a participant, I understand that I am not being assured confidentiality, but that I may choose to be quoted or referred to by a pseudonym in the published thesis that will be the outcome of this inquiry.

I understand that here are no physical or psychological risks associated with this study, and Simon Fraser University's Research Ethics Board has classified it as minimal risk. Meanwhile, I may benefit by helping further the understanding of cycling infrastructure development in Vancouver and elsewhere.

To obtain the results of this study, I may contact the principal investigator after September 2012 or check Simon Fraser University's institutional repository.

Any complaints about the principal investigator's conduct as a researcher may be directed to:

Primary Contact:
Dr. Zoë Druick, Supervisor
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I understand the above informed consent details and agree to participate in this study. I would like to be referred to by a pseudonym in any quotations. ____ Yes ____ No.

_____ _____
Signature Date

Appendix C

Cycling Media and Resources

The intention of the list below is not to provide an exhaustive inventory of the cycling media and resources popular in and/or related to Vancouver, but rather to provide an idea as to the character and breadth of the material available. Some of the media included are entirely local, or have a page specific to Vancouver, and others are national or global in scale.

Blogs

Copenhagenize: A blog by Copenhagen's Mikael Colville-Anderson well known globally.
http://www.copenhagenize.com

DavyMac Blog: Example of local engagement in cycling issues outside mainstream media.
http://www.davemacdonald.ca/2010/07/bicycle-helmet-law-in-bc-who-in-vancouver-has-noticed/

Pricetags: Personal blog of the former Councillor Gordon Price that regularly features cycling.
http://pricetags.wordpress.com

Vancouver Cycle Chic Blog: A local chapter of Mikael Colville-Anderson's cycling fashion blog.
http://vancouvercyclechic.blogspot.ca/

Webpages and Forums

Bicycle Helmet Research Foundation: Seems largely to oppose mandatory helmet legislation, collecting current events and research from around the globe.
http://www.cyclehelmets.org/1192.html

City of Vancouver cycling page: Useful for learning about current policies and initiatives.
http://vancouver.ca/engsvcs/transport/cycling

HUB webpage: A great resource for cyclists new to the city.
http://bikehub.ca

Metro Vancouver cycling route planner: Created by the Cycling in Cities team at UBC.
http://www.cyclevancouver.ubc.ca/cv.aspx

Momentum Magazine:
http://momentummag.com

Pinkbike: Cycling community resource for buying and selling bicycles, parts and accessories across North America.
http://www.pinkbike.com/forum

"Talk Green to Us": City of Vancouver forum used to engage locals in the Greenest City initiative.
http://www.talkgreentous.ca/index.php