RSG INC.
TRANSPORTATION

Waterfront North Access Scoping Study

Final Report

March 2009

DATA ■ ANALYSIS ■ SOLUTIONS

Prepared for:
The City of Burlington, Vermont

Report Prepared by:

RSG INC.
TRANSPORTATION
60 Lake Street, Unit 1E ▪ Burlington, Vermont 05401
TEL 802.383.0118 ▪ FAX 802.383.0122 ▪ www.rsginc.com

With Assistance from:

SE GROUP

ENGINEERING VENTURES INC

TABLE OF CONTENTS

LIST OF FIGURES

1.0 INTRODUCTION

This is the final report for the Waterfront North Access Scoping Study in Burlington, Vermont. This study has been conducted by the City of Burlington with assistance from Resource Systems Group, SE Group, and Engineering Ventures. The project study area is shown in Figure 1, bound by North Avenue and Battery Street on the east and by the lakeshore on the west. The study area extends as far north as North Street and as far south as Main Street.

This scoping study follows the VTrans Project Development Process to ensure public participation and includes the following steps:

- Existing Conditions Assessment
- Local Concerns Meeting
- Purpose and Needs Statement
- Alternatives Investigation
- Alternatives Presentation to Public
- Identification of Preferred Alternative

This report describes the process used to identify a preferred alternative. For simplicity, the Existing Conditions Assessment (which includes a summary of public comments from the Local Concerns Meeting) is included as Appendix A.

The body of this report contains

- the Purpose and Needs Statement,
- the Project Description,
- the Alternatives Investigation, and
- the Preferred Alternatives.

Figure 1: Project Study Area

2.0 PURPOSE AND NEEDS

2.1 Purpose

The purpose of the Waterfront North Access Scoping Study is to enhance travel access to and on the Waterfront and to improve connections to the remainder of Downtown. Within this context, the project has six specific objectives:

1. Improve pedestrian accessibility and safety while maintaining adequate traffic flow on Battery Street between the Main Street and Pearl Street intersections.
2. Facilitate pedestrian movement between Battery Street and the entire Waterfront.
3. Promote multimodal use of Depot Street with design for travel access.
4. Improve drainage and stormwater management along Lake Street.

5. Expand capacity for pedestrians and vehicles along the north-south axis of the Waterfront through proposed improvements.
6. Promote multimodal access and connectivity to the lake and northern waterfront to the southern edge of the urban reserve.

2.2 Needs

- Currently there is no safe and convenient pedestrian access to the Waterfront from Battery Street between College Street and Depot Street and there are many constraints to convenient east-west pedestrian travel. These constraints include:
  - the high volume, high speed nature of Battery Street which discourages east-west pedestrian movement; and
  - the grade difference from Battery Street to the Waterfront, ranging from 8-32% within the project area.
- Depot Street has been closed to vehicular traffic for several years but continues to be used by pedestrians and bicyclists. Depot Street is currently in need of basic improvements to continue serving bicycles and pedestrians safely and conveniently. There is a need to review the role of Depot Street in serving access to the Waterfront and to make improvements to it that will make it function efficiently and safely.
- Drainage along the northern portion of Lake Street is poor. Improvements to the stormwater management system in this area are needed to appropriately manage frequently occurring heavy water flows.
- Present connections from the Waterfront to Downtown need to be strengthened.
- North-south movement of vehicles is constrained by the narrowness of Lake Street; additional capacity to move people along this axis, or another parallel axis, needs to be evaluated.
- The transportation infrastructure on the northern portion of the Waterfront is inadequate to provide safe access to the Lake and Urban Reserve.

3.0 PROJECT DESCRIPTION

Given the purpose and needs, the project has been divided into sub areas as shown in Figure 2:

1. The northern Waterfront and access to the Urban Reserve
2. Lake Street stormwater management improvements
3. Access across the central/eastern slope that extends the length of the project area
4. Battery Street improvements between Pearl and Main Streets, particularly for pedestrians

Concurrent with this scoping project are other studies and projects taking place in or adjacent to this area:

- the Moran Plant redevelopment,
- the final design and construction of improvements along and proximate to Lower College Street (west of Battery),
- pedestrian improvements along the Battery Park extension (on the west side of Battery Street between Cherry and College),
- the Burlington Transportation Plan, and
- the Downtown Transit Center.

Figure 2: Project Sub Areas

As appropriate, the Waterfront North Access scoping study accounts for the travel impacts of these projects and studies.

4.0 ALTERNATIVES INVESTIGATION

The long history of the project area required a two step alternatives investigation. First, the numerous ideas developed over the years and during this study process were collected and reviewed to identify the most feasible and attractive alternatives for each sub area. This process is described in Appendix B. The results of this preliminary evaluation advanced to the second stage investigation and are described for each sub area below. An evaluation matrix at the end of each section summarizes the alternatives for that sub area. Detailed cost estimates are in Appendix C.

4.1 Access to Northern Waterfront

As the purpose of this project is to enhance travel access to and on the Waterfront, the potential for redeveloping the northwestern portion of the study area and improving future access to the Urban Reserve requires that the focus of this project be access to that area. The attractors in this area include the fishing pier, skate park, Moran site, Water Department, bike path, Urban Reserve, and dog park. Lake Street is the only access to the area, and as will be described in Section 4.3, Depot Street is likely to remain a bicycle/pedestrian only street.

Based upon public input obtained during public meetings for the Lower College Street scoping project, as well as from the 2 public meetings held for the Waterfront North Access scoping project, there is a widely held point of view that vehicle intrusion into the Waterfront area should be minimized. Complementing this viewpoint is the desire to maintain a park-like setting. One mechanism for achieving this goal is to develop an electronic parking management system. This system would involve notifying drivers when parking for the northern Waterfront is full. Notification would occur via an electronic sign at the Lake-College or Battery-Main and Battery-College intersections to prevent vehicles traveling all the way up Lake Street to the northern Waterfront only to find no parking and then turning around and coming all the way back down Lake Street.

4.1.1 Base Improvements

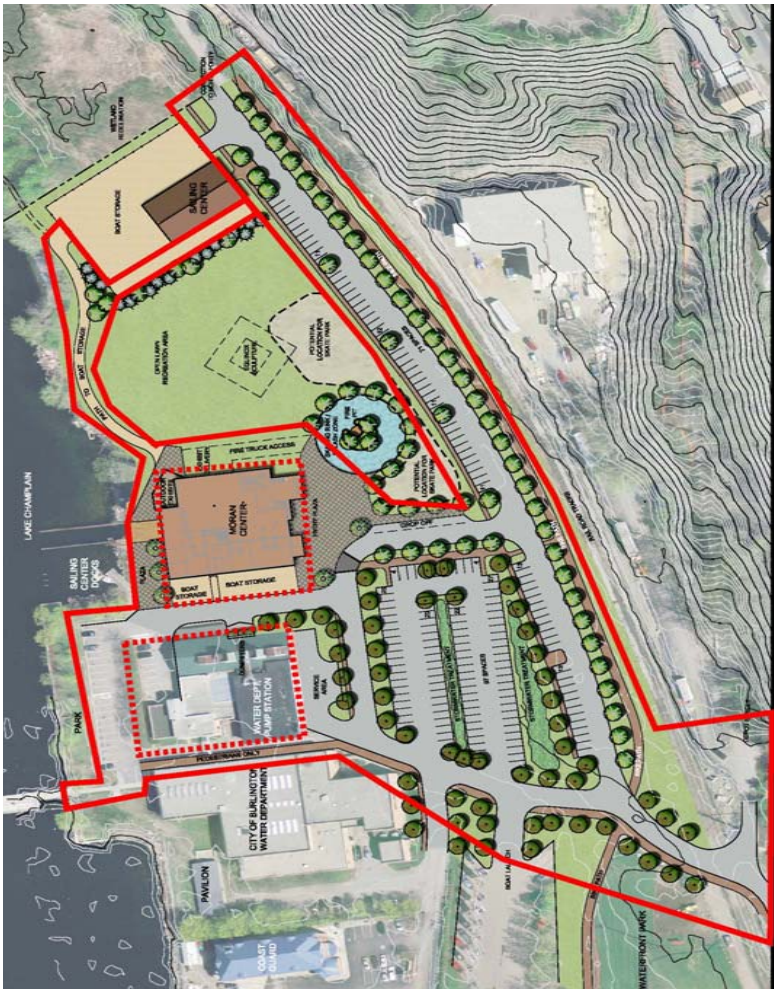
Figure 3: Moran Site Conceptual Plan, March 2008 (SE Group)

The conceptual plan voted on in March 2008 is shown in Figure 3 and contains the following features:

- Vehicle access to the northern Waterfront is via Lake Street.
- New parking is built to accommodate demand.
- The skate park is moved to the north.
- Storage for the Sailing Center is moved to the north.
- Access to the Urban Reserve must be preserved for the future.
- Service/delivery access must be provided for.
- There will be no change to parking at the Fishing Pier.
- The bike path will be realigned.
- The road between the pump station and the Water Department will be closed to vehicles.

Community feedback led to the revised conceptual plan shown in Figure 4. The red lines indicate transportation impact areas.

Figure 4: Revised Conceptual Plan (SE Group) Showing Transportation Impact Areas



The base alternative includes improvements to Lake Street and Penny Lane to accommodate increased traffic. In addition, the bike path would be realigned to minimize conflicts with vehicles and pedestrians. (The precise alignment would be determined during the next phase of the Waterfront North Access study.) Therefore, the base alternative assumes:

- 900′ of new/improved site access/streets
- 1,000′ of sidewalks/pathways
- 850′ bike path realignment
- Underground utilities
- New decorative streetlights
- Stormwater management
- Parking and a parking management system

4.1.2 Alternative Pedestrian Access to the Northern Waterfront

Figure 5 shows an alternative pedestrian access to the northern Waterfront connecting Sherman Street to Depot Street, and then to the west site via a pedestrian bridge crossing over Lake Street and the railroad. Pedestrians from Sherman Street would descend the Sherman Street Stairway (described in Section 4.3.3) and arrive at a landing area on Depot Street, at a point proximate to the eastern landing of the pedestrian bridge. The pedestrian bridge could connect to a proposed parking deck on the Moran site, thereby providing an east-west access from the top of the hill to the northern Waterfront.

This set of pedestrian improvements could be complemented with additional parking along North Avenue in the vicinity of the Burlington Police Department. The Sherman Street Stairway and

pedestrian bridge would connect this parking to the northern part of the Waterfront. This alternative would keep vehicles off of Lake Street and away from the Waterfront, but provide pedestrian access at a location within 500 feet of the northern Waterfront.

Figure 5: Pedestrian Bridge Concept

4.1.3 North-South Transit Line

For several years the concept of small, park-like shuttles serving the north-south spine of the Waterfront has been discussed. The vehicles would be similar in scale to the trams found at amusement parks, as opposed to large city buses. Such a transit line would provide a transit-only vehicular travel alternative to Lake Street, connecting the ECHO Lake Aquarium and Science Center and the northern Waterfront. There would be potential for expansion of the transit line to the north or south as needed. This alternative supports the need to maintain and improve access to the Urban Reserve.

Figure 6: Potential Alignment for North-South Transit

4.1.4 Summary of Northern Waterfront Access Alternatives

The evaluation matrix for this sub area is shown in Table 1.

Table 1: Northern Waterfront Access Evaluation Matrix

	Northern Waterfront Access	Base Improvements	Pedestrian Bridge from Parking to Sherman Street Stairway	North-South Transit Line
COST	Conceptual Cost Estimate (construction cost + contingency)	$913,300	$1,056,000	To Be Determined
ENGINEERING	Utility Impacts	Yes	No	No
	Right of Way Impacts	No	No	No
IMPACTS	Agricultural Lands	No	No	No
	Archaeological	No	No	No
	Historic Structures/Sites	No	No	No
	Floodplain	No	No	No
	Fish and Wildlife	No	No	No
	Rare, Threatened & Endangered	Potential	Potential	Potential
	Public Lands	No	No	No
	Noise	No	No	No
	Wetlands	No	No	No
LOCAL & REGIONAL ISSUES	Community Character	Improve	Improve	Improve
	Economic Impacts	Improve	Improve	Improve
PERMITS	Act 250	No	No	No
	401 Water Quality	No	No	No
	404 Corps of Engineers Permit	No	No	No
	Stream Alteration	No	No	No
	Conditional Use Determination	No	No	No
	Storm Water Discharge	No	No	No
	Shoreland Encroachment	No	No	No
	Endangered & Threatened Species	Potential	Potential	Potential
	VTrans ROW Permit	No	No	No
	SHPO Clearance	No	No	No
	NEPA Process Required	Potential	Potential	Potential

4.2 Stormwater Management

Grading and drainage issues have been an ongoing issue along a portion of Lake Street, centered approximately 1,100 feet north of the College Street Intersection. In this area water frequently collects along the east side of the sidewalk. During colder weather, this leads to ice issues. Also noted are issues with standing water in the swale along the west side of Lake Street. Swale grading appears uneven, and the existing yard drain grate is small, increasing the chance for obstruction.

Stormwater alternatives are described in Appendix D.
As with other facets of this scoping study, stormwater improvements have been developed both as base and enhanced options. The design information presented is based on digital terrain data, which does not provide adequate detail for design. A full survey of these areas will be needed prior to designing any of the components described below:

Recommended Base Improvements

- Re-grade the greenbelt between the existing Maple trees to allow surface runoff reaching the sidewalk to flow west to the street. Survey data is required to determine whether this work alone will correct the issue.
- Remove the existing yard drain and storm line along the west side of Lake Street (north of the pedestrian RR crossing). Install 2 new 24" square concrete catch basins with cast iron grates and regrade the adjacent areas to drain properly.

Potential Enhanced Improvements

- Remove and reconstruct approximately 200' of concrete sidewalk to raise grade, and improve drainage across the greenbelt.
- Add fill to approximately 3,500 sf of open land west of the sidewalk (owned by MainStreet Landing) to avoid standing water.

Table 2: Stormwater Management Evaluation Matrix

	Stormwater Management	Lake Street Base Improvements	Lake Street Enhanced Improvements
COST	Conceptual Cost Estimate (construction cost + contingency)	$12,000 to $18,000	$24,000 to $30,000
ENGINEERING	Utility Impacts	Yes	Yes
	Right of Way Impacts	No	Potential
IMPACTS	Agricultural Lands	No	No
	Archaeological	No	No
	Historic Structures/Sites	No	No
	Floodplain	No	No
	Fish and Wildlife	No	No
	Rare, Threatened & Endangered	No	No
	Public Lands	No	No
	Noise	No	No
	Wetlands	No	No
LOCAL & REGIONAL ISSUES	Community Character	Improve	Improve
	Economic Impacts	Improve	Improve
PERMITS	Act 250	No	No
	401 Water Quality	No	No
	404 Corps of Engineers Permit	No	No
	Stream Alteration	No	No
	Conditional Use Determination	Potential	Potential
	Storm Water Discharge	Yes	Yes
	Shoreland Encroachment	No	No
	Endangered & Threatened Species	No	No
	VTrans ROW Permit	No	No
	SHPO Clearance	No	No
	NEPA Process Required	No	No

4.3 Downslope Access

This sub area involves a two-part assessment:

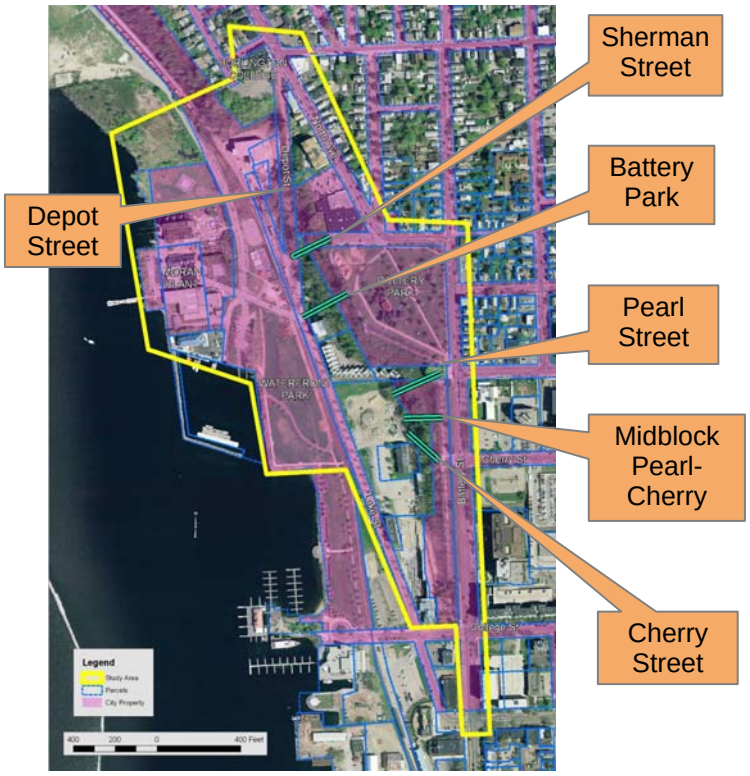
1. alignment alternatives and
2. conveyance alternatives.

Appendix B describes the interim evaluation for these alternatives.

4.3.1 Alignment Alternatives

Six general alignments are identified for gaining downslope access as shown in Figure 7. The magenta overlay in Figure 7 indicates City-owned property; as shown, 4 of the 6 alignments involve significant crossing of private land. For this reason, these alignment options are considered long term and will require coordination with private development initiatives when those are prepared to move forward.

Figure 7: General Alignment Alternatives for Access Across the Slope



The near term alignment alternatives involve those that require little or no right-of-way acquisition. The extension of Sherman Street to the west and the existing Depot Street alignment are particularly attractive for this reason and have been investigated further for appropriate conveyance alternatives.

4.3.2 Conveyance Alternatives

For both the Depot Street and Sherman Street alignments, the best near-term conveyance alternative involves pedestrian improvements. For Sherman Street, a stairway is proposed (to include a bike groove) due to cost, footprint, and ease of construction. For Depot Street, improvements to the existing pavement area are envisioned to improve the street's pedestrian friendliness.

Longer term conveyance alternatives that may be appropriate for the other alignments include a funicular or automated parking structure built into the slope. These options are discussed in more detail below.

4.3.3 Access Alternatives

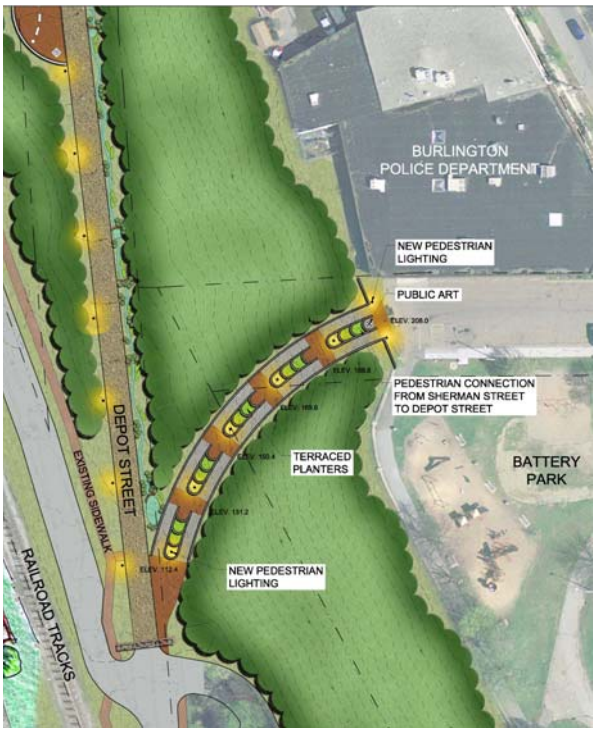
Sherman Street Stairway

A stairway and bike groove extending west from Sherman Street (immediately south of the Burlington Police Department) is the best near-term option because it requires minimal right-of-way acquisition and is the most simple of the conveyance alternatives. There are two possible alignments (straight or curved) and two variations (Basic or Enhanced) within this alternative.

The straight stairway alignment is shown in Figure 8 and the curved alignment is shown in Figure 9.

Figure 8: Sherman Street Stairway-Straight

Figure 9: Sherman Street Stairway-Curved



With either alignment, there is the option of Basic or Enhanced. Elements of the Basic alternative are:

1. Create a steel and wooden tread stairway to move people up and down the vertical grade change.
2. Install new pedestrian lighting.
3. Create mid-level pedestrian landing zones for sitting and views to the Adirondacks.
4. Install ornamental landscaping to provide seasonal highlight and interest.
5. Create locations for public art opportunities.

The Enhanced alternative includes all the elements of the Basic version, but involves a concrete and stone veneered stairway in place of the steel and wooden stairway.

With either option, snow removal has been a concern. However, this is considered a surmountable issue as other snowy cities have similar stairways that are successful connections between destinations. The steps could be heated to prevent snow or ice from accumulating. Alternatively, the steps could be closed for the winter.

Improvements to Depot Street

As discussed in Appendix B, future uses of Depot Street were considered, including re-opening it to vehicle traffic (one-way or two-way). However, this idea was met with significant resistance by the public at the Local Concerns Meetings on 10 July 2008 and by most stakeholders. The widely held sentiment is that Depot Street should remain bicycle/pedestrian-only with access for emergency vehicles and special event traffic.[1] Moreover, opening the Depot Street approach to traffic at the North Avenue-North Street intersection would create an unsafe situation because it is offset from the North Street approach. This safety hazard would require the removal/relocation of large and historic buildings to mitigate. Therefore, improvements to Depot Street focus on bike/ped improvements with emergency vehicle access as shown in Figure 10 and Figure 11. Prior to any design work, the structural integrity of Depot Street will need to be assessed with a geotechnical survey.

The Basic alternative (Figure 10) is to:

- Reduce the width of Depot Street to 16', grind the existing surface and repave.
- Maintain access for emergency vehicles and event egress from Waterfront.
- Maintain access to the private driveways at the top and bottom of Depot Street.
- Install new pedestrian lighting.
- Underground the existing overhead utilities.
- Create pedestrian pocket park for sitting and views to the Adirondacks.
- Selective clearing on west side of Depot Street to enhance views to lake and Adirondacks.
- Create stronger pedestrian connection to sidewalks along Lake Street by installing new sidewalks at the lower end of Depot Street.
- Clean up existing stormwater treatment system on east side.
- Evaluate the existing sand filter-based system used along the Lake Street extension at the foot of Depot Street to see if this system's operation can be improved through maintenance or other activities.

The Enhanced alternative (Figure 11) is to:

- Reduce width of Depot Street to 16' and install brick paving.
- Maintain access for emergency vehicles and event egress from Waterfront.
- Maintain access to the private driveways at the top and bottom of Depot Street.
- Install new pedestrian lighting.
- Underground the existing overhead utilities.
- Create pedestrian pocket park for sitting and views to the Adirondacks.
- Selective clearing on west side of Depot Street to enhance views to lake and Adirondacks.
- Create stronger pedestrian connection to sidewalks along Lake Street by installing new sidewalks at the lower end of Depot Street.

[1] The Chittenden County Transit Authority was consulted to determine their interest in Depot Street serving as a transit-only access. CCTA indicated that Depot Street would not offer any added benefits to their operations. In addition, CCTA buses are not suited to the steep grades along Depot Street.

- Install gateways at the top and bottom of Depot St.
- Create locations for public art opportunities.
- Stormwater improvements could be accomplished through a variety of means:
  - Install perforated drainage pipes at 100' intervals with discharge to the swale east of Depot Street
  - Add 12" crushed stone "choker course" and top with 6" of pervious asphalt (following removal of existing paved surface).
  - Grind existing paved surface, add crushed stone, and re-grade to create a 1% cross-slope to the west.
  - Install 6 tree box filters along the west side of Depot Street, with piped discharge to the swale on the east side of the street.

Figure 10: Depot Street-Basic

Figure 11: Depot Street-Enhanced

Long Term Alternatives

There are other conveyance options besides stairways that may be feasible and should be considered if the appropriate funding mechanisms (such as a public-private partnership) develop. The first of these options is a funicular, which could become a landmark as it has in other cities (Quebec City, Figure 12). To further differentiate Burlington, a water-powered funicular[1] could be considered; in addition to having low energy needs, this option would promote the "green" image of Vermont. The funicular option would be considered at any of the alignments identified above in Figure 7.

Figure 12: Funicular in Quebec City

Another long term alternative that should be considered is an automated parking structure built into the slope immediately west of Battery Street. Automated parking technology has developed in locations where real estate is extremely expensive and space must be conserved. By using a vehicle elevator, an automated parking structure eliminates the space required for ramping and vehicle maneuvering. An example of an automated structure is shown in Figure 13. An automated structure was considered for this project because it would minimize the amount of excavation that would be needed to build the structure into the slope.

Figure 13: Automated Parking Structure (source: Robotic Parking)

Pedestrians and bicyclists would benefit from an in-slope parking structure because it would include an elevator and stairway (with a bike groove) to transport people from Battery Street to the bottom of the slope east of Lake Street. The structure would be built underground so as to avoid interruption of the path along the Battery Park extension.

Conceptual sketches showing approximate footprint and profile are provided in Figure 14 and Figure 15. Given right-of-way constraints, the best location for such a

[1] Such a funicular has been constructed in Wales: http://www.funimag.com/funimag19/CAT01.htm

structure would be in the vicinity of the Pearl or Cherry Street intersections with Battery Street. The concepts shown here assume right-turn-only entrance and exit (similar to interstate on and off ramps).

Figure 14: Conceptual Plan Showing Approximate Footprint of In-Slope Parking Structure Immediately West of Battery-Cherry Intersection (Blue dashed lines indicate parcel boundaries.)

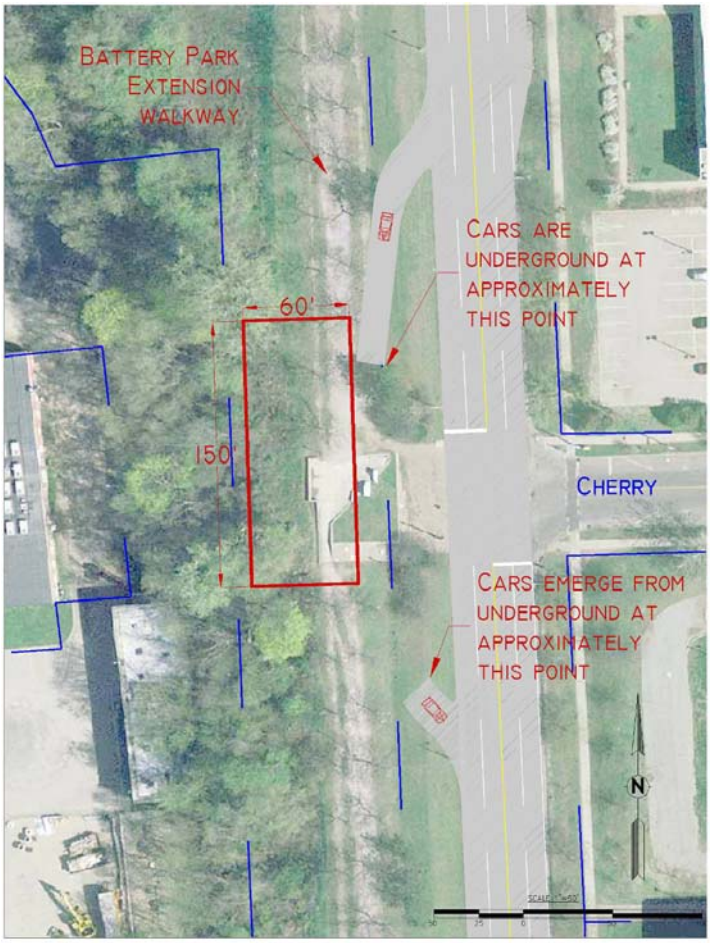


Figure 15: Conceptual Profile of In-Slope Parking Structure (Looking North)

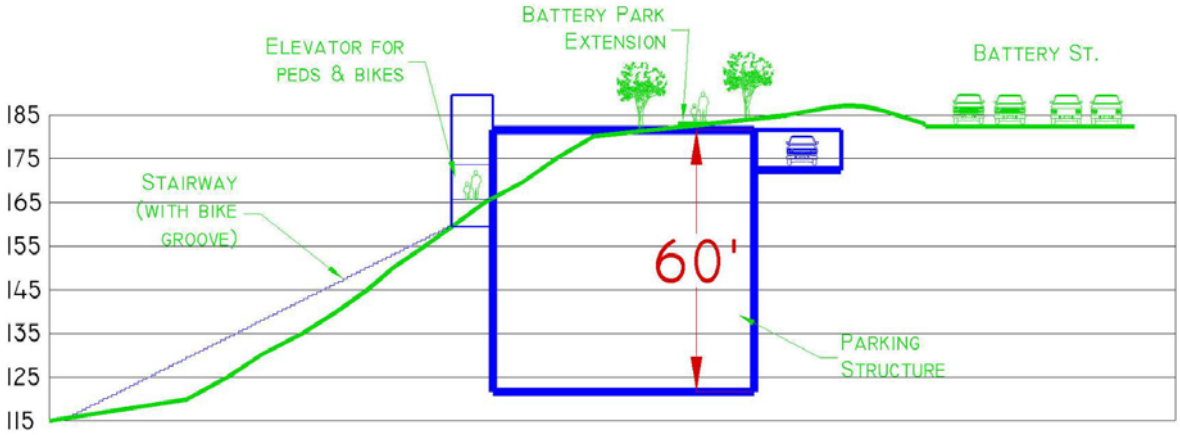


Table 3: Slope Access Evaluation Matrix

	Slope Access	Sherman Street Stairway-Basic (straight or curved)	Sherman Street Stairway-Enhanced (straight or curved)	Depot Street-Basic Improvements	Depot Street-Enhanced Improvements	Funicular	Automated Parking Built into the Slope
COST	Conceptual Cost Estimate (construction cost + contingency)	$411,800	$818,300	$753,800	$1,141,600	$2.5 million	$23 million
ENGINEERING	Utility Impacts	No	No	Yes	Yes	No	No
	Right of Way Impacts	Yes	Yes	No	No	Yes	Potential
IMPACTS	Agricultural Lands	No	No	No	No	No	No
	Archaeological	No	No	Potential	Potential	No	No
	Historic Structures/Sites	No	No	No	No	No	No
	Floodplain	No	No	No	No	No	No
	Fish and Wildlife	No	No	No	No	No	No
	Rare, Threatened & Endangered	Potential	Potential	Potential	Potential	Potential	Potential
	Public Lands	No	No	No	No	No	No
	Noise	No	No	No	No	No	No
	Wetlands	No	No	No	No	No	No
LOCAL & REGIONAL ISSUES	Community Character	Improve	Improve	Improve	Improve	Improve	Improve
	Economic Impacts	Improve	Improve	Improve	Improve	Improve	Improve
PERMITS	Act 250	No	No	No	No	No	No
	401 Water Quality	No	No	No	No	No	No
	404 Corps of Engineers Permit	No	No	No	No	No	No
	Stream Alteration	No	No	No	No	No	No
	Conditional Use Determination	No	No	Potential	Potential	No	No
	Storm Water Discharge	No	No	Yes	Yes	No	No
	Shoreland Encroachment	No	No	No	No	No	No
	Endangered & Threatened Species	Potential	Potential	Potential	Potential	Potential	Potential
	VTrans ROW Permit	No	No	No	No	No	No
	SHPO Clearance	No	No	No	No	No	No
	NEPA Process Required	Potential	Potential	Potential	Potential	Potential	Potential

4.4 Crossing Battery Street

Crossing Battery Street is a vital piece of this project as it connects the Waterfront to the rest of downtown and the 1,630 parking spaces within a 5 minute walk of the Waterfront (and mostly to the east of Battery).[1]

To estimate network performance under various alternatives, RSG developed a traffic simulation model and projected volumes for 2020 (which include trips associated the Moran redevelopment). Weekday AM and PM peak hour volumes were developed as well as Saturday mid-day; since the Saturday volumes were less than either of the weekday peak hour volumes, these conditions were not modeled.

Discussion with City staff indicated that more information will be necessary before making a decision as to which alternative is preferred. A multimodal assessment that balances the benefits to the bicycle and pedestrian users of the system and balances them with vehicular traffic performance is necessary. Current assessment methods focus on levels of service for automobiles only. The City needs to

[1] See Existing Conditions Report, Appendix A for more information.

determine whether it will tolerate a lower level of traffic performance in exchange for improved pedestrian service and facilities.[1]

The four alternatives considered for crossing Battery Street are described below. A summary of the simulation model results is included at the end of this section. Appendix E contains the volume worksheets, trip generation information for Moran, and simulation model results.

4.4.1 Base Improvements

This alternative retains the existing intersection geometries and cross sections; the simulation model results are shown as "Existing Geometry" in Appendix E. The base improvements are:

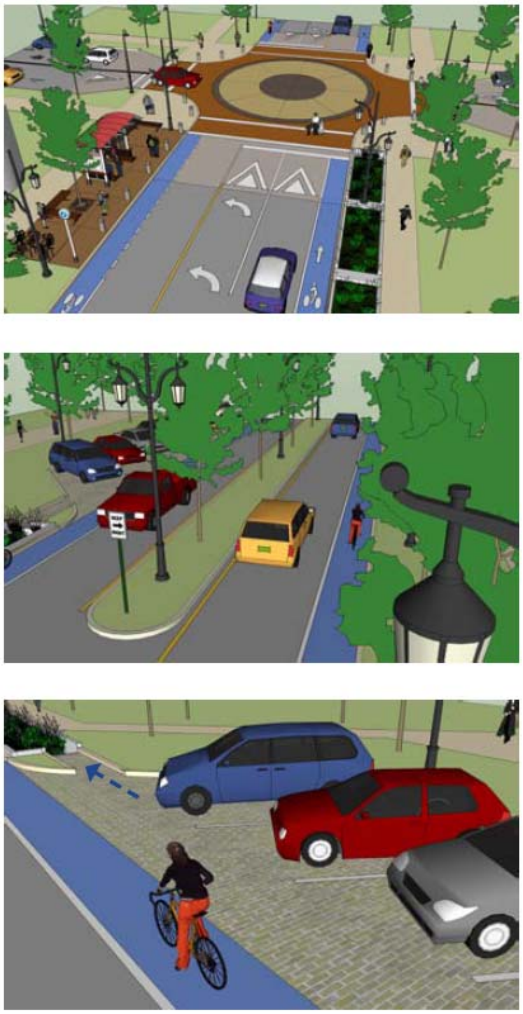
- Upgrading traffic signals along Battery Street for design consistency and to bring the system's hardware up to state-of-the-practice standards. Upgrades would include:
  - Install new 12" LED signal heads for each approach at each intersection
  - Install mastarms and pedestals, as appropriate, to achieve design consistency along Battery Street
  - Install Master Controller at one traffic signal to enable signal coordination.
  - Install advance detection to clear excessive queues along Lake Street.
  - Install Accessible Pedestrian Signal equipment at each location to include countdown timers and accessible pedestrian detection and audible devices.
- Upgrading street lighting along Battery Street for design consistency.
- Upgrading pedestrian crosswalks (replicate Union Street crosswalk by Memorial Auditorium).
- Raising the Battery-College intersection (as suggested in the Burlington Transportation Plan).
- Installing pedestrian countdown timers at each Battery Street crossing.

The base improvements are short-term, low-cost equipment upgrades that would not preclude a longer-term alternative such as transit.

[1] The preliminary alternatives evaluation in Appendix B assumed that a decline in vehicular level of service was a fatal flaw, and consequently ruled out the Complete Streets alternative. However, discussion with City Staff indicated that it would be premature to eliminate that alternative until benefits to other modes are assessed. In addition, a pedestrian underpass alternative was considered in the preliminary alternatives evaluation. This alternative has since been ruled out because it had a lukewarm reception from the public and City staff due to safety concerns and the question as to whether it would actually be used by pedestrians.

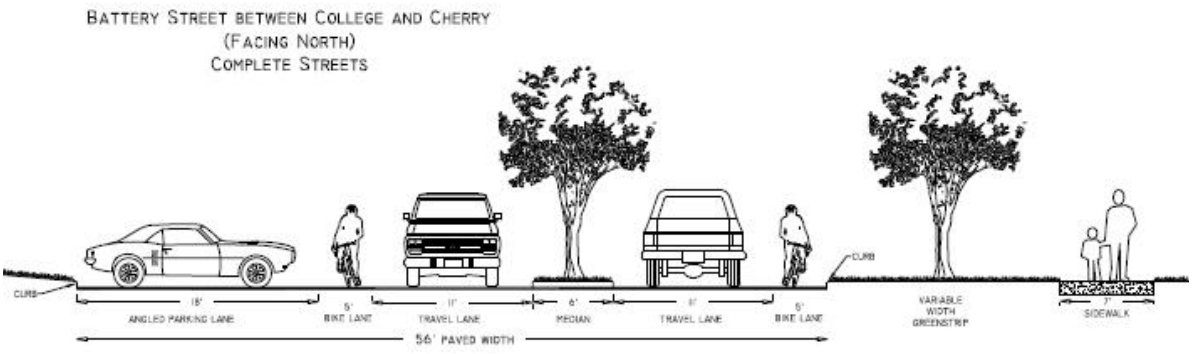
4.4.2 Complete Streets

Figure 16: Complete Streets Concepts from the Burlington Transportation Plan



The Burlington Transportation Plan suggests analyzing a Complete Streets approach to Battery Street, which includes raised plaza-style intersections; on-street parking (reverse angle); lighting, landscaping, and stormwater improvements; and a median (Figure 16). Most significantly for traffic, this scenario involves removing a lane of through traffic in both the northbound and southbound directions, as shown in the cross-section in Figure 17. The simulation model indicated that this scenario would lead to severe peak period congestion, particularly during the AM peak hour, as shown in Appendix E.[1]

Figure 17: Complete Streets Cross Section



[1] The configuration modeled is described on page 80 of the Burlington Transportation Plan Technical Appendix (9/12/07).

4.4.3 Complete Streets "Lite"

A Complete Streets "Lite" alternative was also developed. Under this scenario, the number of northbound lanes is reduced at strategic locations between Pearl and Main Streets while maintaining two southbound lanes (Figure 18 and Figure 19).[1]

The simulation model estimated that 2020 conditions under this alternative are comparable to existing conditions with optimized signal timings (see Appendix E).

Figure 18: Complete Streets Lite Conceptual Plan

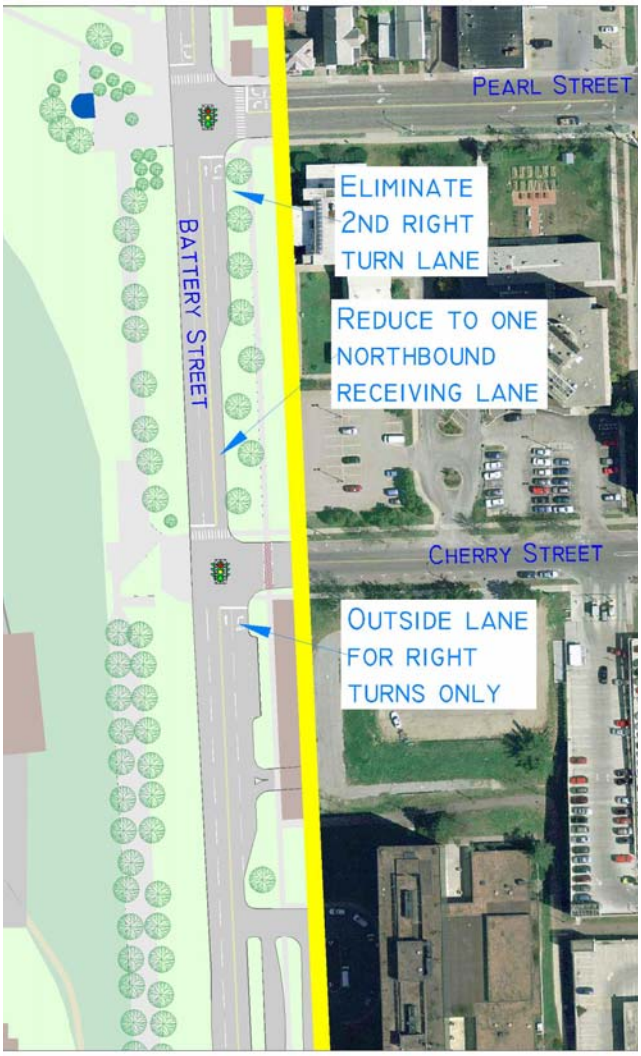
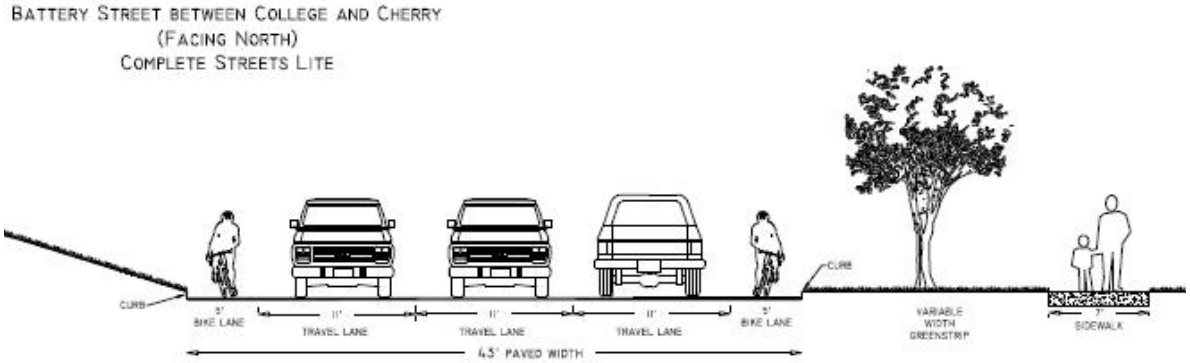


Figure 19: Complete Streets Lite Cross Section



[1] The northbound approach geometries modeled were: shared left-through and right-turn lanes at Main and at College; through and right-turn lanes at Cherry and at Pearl; the second right-turn lane at Pearl was eliminated.

4.4.4 Spot Improvements

Traffic adjustments at two intersections will improve this section of Battery Street:

1. Eliminating one northbound right turn lane on Battery Street at Pearl (shown in Figure 18).
2. Adding a westbound right turn lane on College Street at Battery. This would involve the loss of 3 parking spaces as the existing cross section is re-striped. However, no significant construction would be necessary.

The impacts of this alternative on traffic are shown in Appendix E.

4.4.5 Summary of Battery Street Alternatives

The City will require more information before identifying a preferred alternative for this sub area of the project. Although the City Design Guidelines were used, a more quantitative measure needs to be developed to explore the multimodal performance of the corridor instead of just vehicular traffic. Table 4 includes cost estimates for the final alternatives.

Table 4: Evaluation Matrix for Crossing Battery Street

	Battery Street Improvements	Base Improvements	Complete Streets	Complete Streets "Lite"	Spot Improvements
COST	Conceptual Cost Estimate (construction cost + contingency)	$811,000	$2,591,000	$1,250,000	$1,021,000
ENGINEERING	Utility Impacts	No	Yes	Yes	Yes
	Right of Way Impacts	No	No	No	No
IMPACTS	Agricultural Lands	No	No	No	No
	Archaeological	No	No	No	No
	Historic Structures/Sites	No	No	No	No
	Floodplain	No	No	No	No
	Fish and Wildlife	No	No	No	No
	Rare, Threatened & Endangered	No	No	No	No
	Public Lands	No	No	No	No
	Noise	No	No	No	No
	Wetlands	No	No	No	No
LOCAL & REGIONAL ISSUES	Community Character	Improve	Requires further study	Improve	Improve
	Economic Impacts	Improve	Requires further study	Improve	Improve
PERMITS	Act 250	No	No	No	No
	401 Water Quality	No	No	No	No
	404 Corps of Engineers Permit	No	No	No	No
	Stream Alteration	No	No	No	No
	Conditional Use Determination	No	No	No	No
	Storm Water Discharge	No	No	No	No
	Shoreland Encroachment	No	No	No	No
	Endangered & Threatened Species	No	No	No	No
	VTrans ROW Permit	No	No	No	No
	SHPO Clearance	No	No	No	No
	NEPA Process Required	No	No	No	No

5.0 PREFERRED ALTERNATIVES

The alternatives described in Section 4.0 were discussed with City staff and presented to the public at morning and evening meetings on 20 November 2008. Presentation slides were posted on the City website and the public was encouraged to email comments to staff during a three week period following the alternatives presentation. Public comments are attached as Appendix F.

Given that access to the northern Waterfront most directly fulfills the purpose of this project, the next phase is to use existing funding to immediately pursue the base improvements on the northern Waterfront and stormwater improvements on Lake Street.

The preferred alternative phases in order of priority are:

Phase 1:

1. Re-alignment of lower (northern) Lake Street and the bike path, pedestrian amenities, storm water, under grounding of utilities, street lighting, landscaping and parking. This will improve access to the fishing pier, Skate Park, Moran site, Water Department, bike path, urban reserve and Dog Park.
2. Storm water upgrades to Lake Street that do not preclude future north/south transit opportunities.

Phase 2:

3. Battery Street – spot improvements; such as signal upgrades with hardware and timing.

Phase 3:

4. The Depot Street Improvements & Sherman Street Stairway improvements will be further investigated to determine whether to pursue the enhanced or basic design. These improvements will address public safety, enhance waterfront access from the Old North End, storm water, utilities and street lighting.

Phase 4:

5. North-south transit and waterfront parking should be investigated and a plan developed. The City should stridently pursue additional planning funds for these issues.
6. As part of the next phase of Moran, the pedestrian bridge from Depot Street to the parking near the Moran building should be considered, if appropriate. The City should pursue additional preliminary engineering funds.
7. Battery Street improvements require further investigation to determine if bicycle and pedestrian improvements should be made at the expense of vehicular traffic performance, and at what cost. Particularly since the impacts of such improvements extend beyond the study area of this project, a more comprehensive study that evaluates multimodal levels of service is warranted. The City should vigorously pursue additional planning funds for these concepts.
8. Other valid projects like in-slope parking or a funicular will require private-public partnerships. The City should pursue additional planning funds for these concepts.

APPENDIX A

Existing Conditions Assessment

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

Documentation for:

WATERFRONT NORTH SCOPING STUDY: EXISTING CONDITIONS ASSESSMENT

DRAFT REPORT

Burlington, VT

Prepared for:

City of Burlington, Vermont

16 October 2008

55 Railroad Row, White River Junction, Vermont 05001

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The City of Burlington is conducting the Waterfront North Access scoping study. The project area is shown in Figure 1.

Figure 1: Study Area

This planning effort will focus on the following four issues within the study area:

1. Evaluate Battery Street between Main Street and Pearl Street to improve pedestrian accessibility and safety while maintaining adequate traffic flow;
2. Develop a preferred concept to facilitate pedestrian movement across the grade difference between Battery Street and the Waterfront;
3. Investigate multi-modal usage of Depot Street.
4. Identify stormwater management improvements along Lake Street.

Concurrent with this scoping project are other studies and projects taking place in or adjacent to this area:

- the Moran Plant redevelopment,
- the final design and construction of improvements along and proximate to Lower College Street,
- pedestrian improvements along the Battery Park extension (on the west side of Battery Street between Cherry and College),
- the Burlington Transportation Plan, and
- the Downtown Transit Center.

As appropriate, the Waterfront North Access scoping study will account for the travel impacts of these projects and studies.

This Existing Conditions report has the following sections:

1. Project Purpose and Need Statement

2. Existing Transportation Conditions
3. Existing Environmental Conditions
4. Anticipated Permit Needs
5. Summary of Public Outreach

2.0 PURPOSE & NEED

2.1 PURPOSE

The purpose of the Waterfront North Scoping Study is to enhance travel access to and on the Waterfront and to improve connections to the remainder of Downtown. Within this context, the Study has five specific objectives:

1. Improve pedestrian accessibility and safety while maintaining adequate traffic flow on Battery Street between the Main Street and Pearl Street intersections.
2. Facilitate pedestrian movement between Battery Street and the entire Waterfront.
3. Promote multimodal use of Depot Street for travel access.
4. Improve drainage and stormwater management along Lake Street.
5. Promote multimodal access and connectivity to the lake and northern waterfront to the southern edge of the urban reserve.

2.2 NEED

- Currently there is no safe and convenient pedestrian access to the Waterfront from Battery Street between College Street and Depot Street and there are many constraints to convenient east-west pedestrian travel. These constraints include:
  - the high volume, high speed nature of Battery Street which discourages east-west pedestrian movement; and
  - the grade difference from Battery Street to the Waterfront, ranging from 8-32% within the project area.
- Depot Street has been closed to vehicular traffic for several years but continues to be used by pedestrians and bicyclists. Depot Street is currently in need of basic improvements to continue serving bicycles and pedestrians safely and conveniently. There is a need to review the role of Depot Street in serving access to the Waterfront and to make improvements to it that will make it function efficiently and safely.

- Drainage along the northern portion of Lake Street is poor. Improvements to the stormwater management system in this area are needed to appropriately manage frequently-occurring heavy water flows.
- Present connections from the Waterfront to Downtown need to be strengthened.
- North-south movement of vehicles is constrained by the narrowness of Lake Street; additional capacity to move people along this axis, or another parallel axis, needs to be evaluated.
- All of the limited infrastructure on the northern portion of the Waterfront is inadequate to provide safe access to the Lake and Urban Reserve.

3.0 EXISTING TRANSPORTATION CONDITIONS

Transportation conditions within the project area are evaluated in the following sections:

- Average Annual Daily Traffic
- Design Hour Traffic
- Congestion at Key Intersections
- Safety
- Parking
- Pedestrian Flow
- Transit

3.1 TRAFFIC

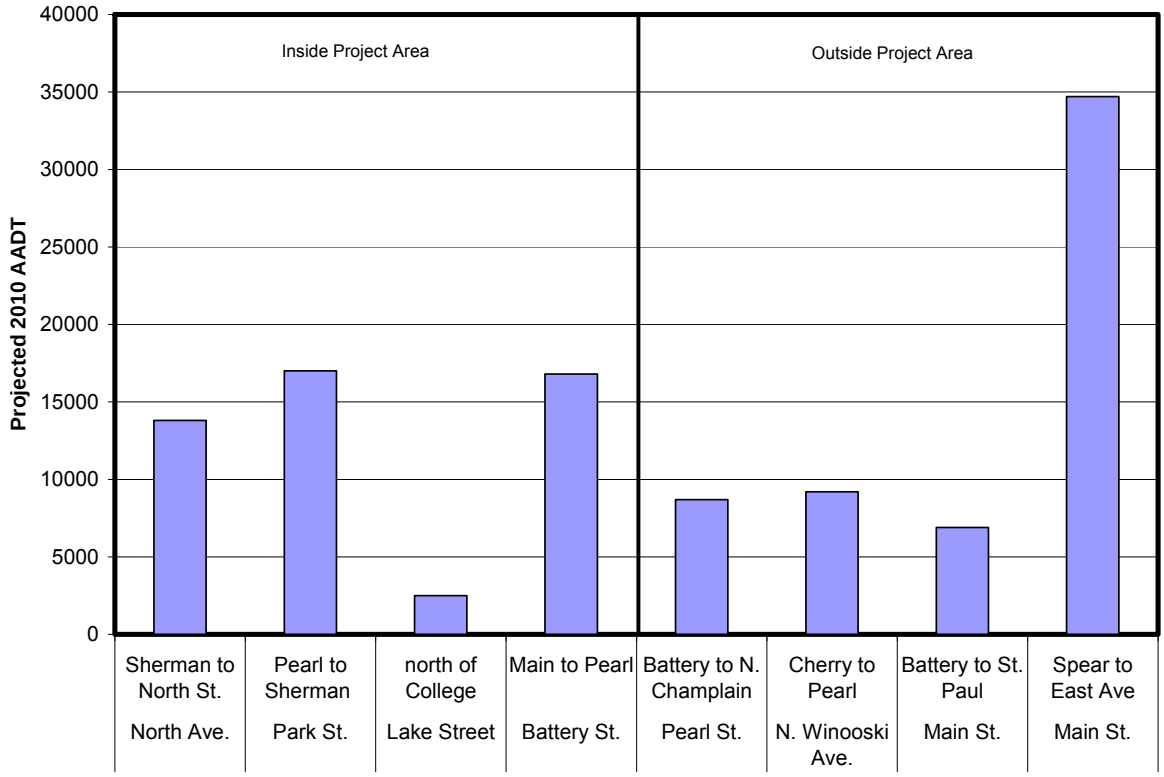
3.1.1 Average Annual Daily Traffic

To gain perspective as to how much traffic the Battery Street corridor carries relative to other local corridors, data on Average Annual Daily Traffic (AADT) was gathered.[1] An annual growth factor was applied to these 2005 values to project the AADT to 2010[2]. The data in Figure 2 show north-south travel within the project area of 13,000-16,000 vehicles per day, with significantly lower traffic levels on Lake Street. For comparison purposes traffic counts for Burlington streets outside the project area are also shown, inclusive of Main Street between Spear and East Avenue which carries the most traffic of any street segment in the City.

[1] The source for this data was the *VTrans 2005 Route Log AADTs*, May 2006.

[2] For the existing conditions analysis, the year 2010 was selected as a base year. For the future conditions analysis, the year 2020 will be used as the forecast year.

Figure 2: Projected 2010 AADT In and Proximate to Study Area



3.1.2 Design Hour Volumes

AM and PM peak period turning movement counts were conducted at seven project area intersections during the last two weeks of January 2008. Saturday peak period counts (2:45-3:45) were collected at the Battery-College and Battery-Pearl intersections in August 2008; these counts were then used to estimate traffic at the other project area intersections to represent the Saturday peak period. These data are adjusted to represent the 2010 base year design hour using two factors:

- A design hour adjustment factor based on VTrans Design Hour Volume (DHV) Policy. The 30th highest hour is considered the design hour volume in Vermont. The DHV adjustments are based on data from three VTrans counters within the study area: S6D446, S6D096, and S6D455. The DHV adjustment factors range from -17% to 26%.
- An annual adjustment factor based on VTrans Urban Growth Factor between 2008 and 2010, which is 1%. This annual adjustment factor increases the raw 2008 volumes to represent 2010 conditions.

In addition to the adjusted turning movement counts at the study intersections, traffic from permitted but not yet built developments estimated to be generating traffic by 2010 are included in the analysis. These "Other Development Volumes" include trips generated by:

- the April Cornell project in the former Waterfront Video building: 26,682 square feet of office space and 12 residential units;
- the ICV project on the southeast corner of King and Battery Streets: 40,000 square feet of office space; and
- the Moran Plant redevelopment project.

3.1.3 Congestion analysis

Level-of-Service (LOS) is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. The 2000 Highway Capacity Manual defines six grades to describe the level of service at an intersection. Level-of-service is based on the average delay per vehicle. Table 1 shows the various level-of-service grades, qualitative descriptions, and quantitative definitions for unsignalized and signalized intersections.

Table 1: LOS Criteria for Intersections

LOS	Characteristics	Unsignalized Delay (sec)	Signalized Delay (sec)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1 - 15.0	10.1 - 20.0
C	Average delays	15.1 - 25.0	20.1 - 35.0
D	Long delays	25.1 - 35.0	35.1 - 55.0
E	Very long delays	35.1 - 50.0	55.1 - 80.0
F	Extreme delays	≥ 50.1	≥ 80.1

SimTraffic (v7), a traffic analysis software package from Trafficware, was used to model the network and estimate congestion and queue lengths of the study intersections. Level of Service and average queue lengths (in feet) are reported for the following intersections:

1. North Street/North Avenue
2. Park Street/Sherman Avenue

3. Battery Street/Park Street/Pearl Street
4. Battery Street/Cherry Street
5. Battery Street/College Street
6. Battery Street/Main Street
7. Lake Street/College Street

All of the intersections are signalized with the exception of Lake Street/College Street, which is all-way stop controlled.

Table 2 below shows the overall level of service, delay, and average queue for the intersections in the study area. The City of Burlington provided up-to-date signal timings which were optimized for the 2010 scenarios.

- The Park-Sherman intersection has the lowest LOS (D) of all the intersections in the AM scenario. The rest of the intersections are LOS A or C.
- The Lake-College intersection is F during the PM peak hour. The analysis assumes peak summer pedestrian volumes, which significantly impact the flow of traffic at the Lake-College and Battery-College intersections.
- Besides the Lake-College intersection, Park-Sherman is the only other LOS F in the PM scenario. Battery-Park-Pearl is LOS E.
- There are two large parking structures accessed via Cherry Street. Vehicles exiting these garages during the PM peak hour partially explains the LOS E at the westbound approach to Cherry at Battery.

Table 2: LOS, Delay, and Queuing for Study Area Intersections

		2010 AM			2010 PM			2010 SAT MIDDAY		
		LOS	Delay (s)	Queue (ft)	LOS	Delay (s)	Queue (ft)	LOS	Delay (s)	Queue (ft)
North St. - North Ave. (signalized)	WB North St.	B	18.5	44	C	20.1	52	C	31.2	69
	NB North Ave.	A	7.9	75	B	10.4	135	B	10.1	119
	SB North Ave.	A	8.3	79	B	13.3	50	A	8.4	59
	OVERALL	A	9.2		B	12.5		B	12	
Park St. - Sherman St. (signalized)	EB Sherman St.	C	21.1	267	E	73.6	280	A	7.2	79
	WB Sherman St.	B	19.7	6	F	436.4	32	D	38.1	13
	NB Park St.	E	75.9	309	D	50.9	452	C	33.4	295
	SB Park St.	D	46.7	252	F	178.8	209	B	17.0	70
	OVERALL	D	42.4		F	85.3		C	20.6	
Battery St./Park St. - Pearl St. (signalized)	WB Pearl St.	C	31	75	C	29.1	73	B	17.9	42
	NB Battery St.	B	12.4	95	D	36.4	293	C	34.1	229
	SB Park St.	C	28.4	350	F	147	497	D	35.8	216
	OVERALL	C	25.5		E	73.4		C	32.7	
Battery St. - Cherry St. (signalized)	WB Cherry St.	D	37.6	56	E	71.7	191	C	28.4	109
	NB Battery St.	A	6.1	71	D	47.8	304	A	9.3	79
	SB Battery St.	A	8.8	158	B	16.2	117	B	12.4	128
	OVERALL	A	9.1		D	39.7		B	13.4	
Battery St. - College St. (signalized)	EB College St.	C	31.1	37	E	62.5	148	C	29.4	97
	WB College St.	C	23.2	63	D	45.6	127	C	26.5	89
	NB Battery St.	B	10.4	70	B	16.6	107	B	10.8	88
	SB Battery St.	D	38.2	426	C	24	151	A	9.7	67
	OVERALL	C	30.4		C	28.6		B	14	
Battery St. - Main St. (signalized)	EB Main St.	B	14.3	24	C	20.4	68	C	26.5	87
	WB Main St.	C	28.5	103	C	33.5	78	C	21.2	59
	NB Battery St.	D	35.5	120	C	20.6	116	C	23.5	112
	SB Battery St.	C	28.7	305	C	27.9	196	C	22.5	200
	OVERALL	C	29.4		C	25.4		C	23.2	
Lake St. - College St. (unsignalized)	EB College St.	A	3.4	3	D	42.3	50	B	12	29
	WB College St.	A	4.8	36	B	10.5	34	B	12.3	61
	NB Lake St.	A	8.3	42	C	34	73	A	8.3	43
	SB Lake St.	A	6.3	35	F	247.5	527	B	19.5	83
	OVERALL	A	6.4		F	132.3		B	13.7	

3.2 SAFETY ANALYSIS

VTrans maintains a statewide database of all reported crashes.[1] VTrans bases its safety analyses on reported crashes that have property damage exceeding $1000, personal injury, and/or fatality.

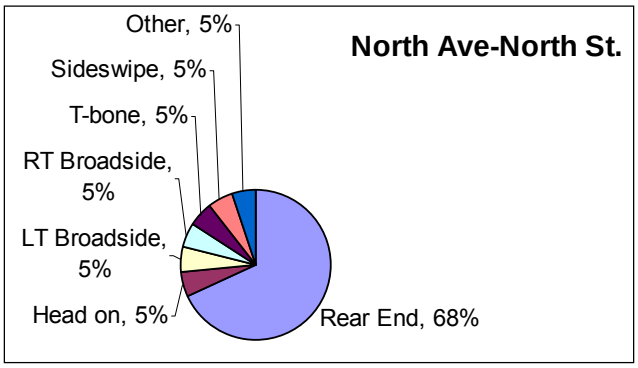
In order to be classified as a High Crash Location (HCL), an intersection or road section (0.3 mile section) must meet the following two conditions: 1) it must have at least 5 crashes over a 5-year period; and 2) the Actual Crash rate must exceed the Critical Crash Rate.

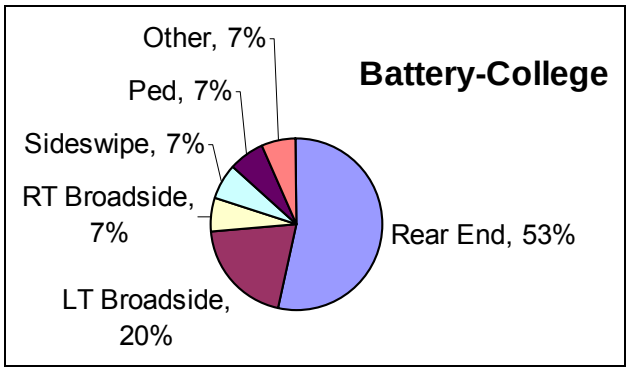
[1] This data is exempt from Discovery or Admission under 23 U.S.C. 409.

The 2001-2005 VTrans High Crash Location Report lists the North Street-North Avenue intersection and the segment of Battery Street between Main Street and College Street as HCLs.

A review of the crash records reveals patterns in the types of crashes at these locations (Figure 3). The North Ave.-North Street intersection experienced 15 crashes over 5 years; of these, 68% were rear-end crashes. The Battery Street segment had 37 crashes over 5 years, with the majority being rear-ends, but a significant number of left-turn broadsides as well.

Figure 3: Crash Patterns at HCLs





3.3 PARKING

There is an ample supply of on-street, surface lot and structured parking spaces serving the Waterfront. Figure 4 and Table 3 summarize the location and number of parking spaces within a 5-minute walk of the Waterfront (approximately 1,630). The City would like visitors and residents to be able to park once and then walk to multiple destinations, rather than making several short vehicle trips.

As shown, much of the parking is on the east side of Battery Street. The City is currently working on a Wayfinding Plan which will help to direct motorists to the parking and subsequently guide them (on foot) to various Burlington districts such as the Waterfront. Improvements to east-west pedestrian crossing of Battery Street should also help to make this parking more accessible.

Figure 4: Parking within a 5-minute Walk of the Waterfront

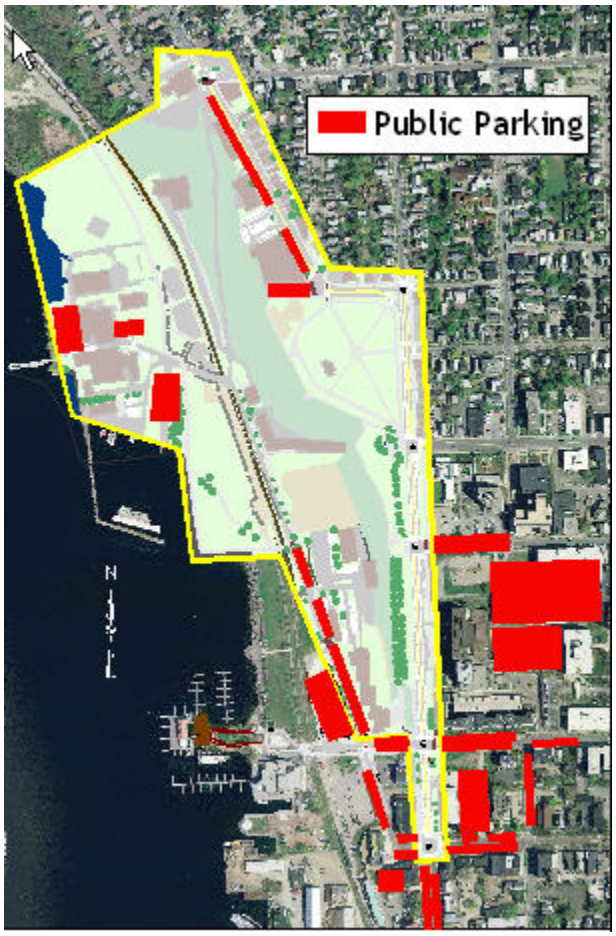


Table 3: Parking within a 5-minute Walk of the Waterfront

Public Parking within a 5-minute walk of the Waterfront

On-Street Spaces	
Battery: North to Sherman	31
Cherry: Battery to Champlain	25
Lake Street north of College	34
Lake Street south of College	31
College: Lake to Battery	11
Battery: Main to King	30
College: Battery to midblock between Champlain and Pine	30
Main: Battery to Champlain	26
S. Champlain: College to Main	12
TOTAL	230
Lots	
Moran/Coast Guard Area	90
Area between BPD and Battery Park	17
Pease Lot	84
TOTAL	191
Structures	
Macy's Lakeview	645
College Street Municipal	491
Gateway Center (10% public)	30
Corner Stone Garage	41
TOTAL	1207
GRAND TOTAL	**1628**

3.4 PEDESTRIAN FLOW

There is a prevailing sense that the Waterfront should not be dominated by vehicles, yet crossing Battery Street on foot can be a significant obstacle to accessing the area. Since a plentiful supply of parking exists to the east of Battery Street, it is critical to address where and how Battery Street can be improved to encourage people to park downtown and walk to the Waterfront. The Wayfinding Plan will help guide motorists and pedestrians to parking and various destinations around the City.

Resource Systems Group conducted east-west pedestrian counts at the Battery Street intersections with Main, College, Cherry, and Pearl during the PM peak hour on Thursday, 5 June 2008 (4-6 PM) and mid-day on Saturday, 7 June 2008 (10:00-1:30 PM). The data indicate that pedestrian volumes were higher during the weekday PM peak hour than during the weekend, despite data collection taking place during a major summer festival in Burlington. Table 4 summarizes the data.

Table 4: East-West Pedestrian Volumes

	Thursday 5 June 2008	Saturday 7 June 2008
Crossing Battery Street at:	Ped Peak Hour: 5:00PM-6:00PM	Ped Peak Hour: 11:30AM-12:30PM
Pearl	122	96
Cherry	92	20
College	373	345
Main	271	123
TOTAL	***858***	***584***

On both Thursday and Saturday, the Battery-College intersection was the busiest crossing for east-west pedestrian movements, followed by Battery-Main, Battery-Pearl, and Battery-Cherry, which had relatively little pedestrian volume. These patterns reflect the fact that College Street is a gateway to the Waterfront, supplemented by access from Main Street.

3.5 TRANSIT

The City is in the process of identifying a preferred site for the Downtown Transit Center, which will improve access to transit and serve as a central hub for Chittenden County Transit Authority (CCTA) buses.

Several routes (shown in Figure 5 and Table 5) travel through the study area, approaching the existing Cherry Street transfer area by heading northbound on Battery Street (from Maple, Main, or College Streets) and turning right onto Cherry Street. The College Street Shuttle provides a free and direct connection to and from the Waterfront from UVM and downtown every 15 minutes.

Figure 5: CCTA Routes within the Waterfront North Study Area

Table 5: Summary of CCTA Transit in/near Study Area

Route	Path	Frequency (weekday)
#1 U-Mall/Airport	WB on Main, turn right onto Battery and right onto Cherry	Every 1/2 hour between 6:15 AM & 6:15 PM, every hour between 6:15 PM and 8:15 PM, last bus at 9:30
#3 Lakeside Commuter	WB on Main, turn right onto Battery and right onto Cherry	6 buses total: 6:05AM, 6:35 AM, 7:05 AM, 4:15 PM, 4:45 PM, & 6:45 PM
#5 Pine Street	WB on Main, turn right onto Battery and right onto Cherry	Every 1/2 hour between 6:15 AM & 6:15 PM, last bus at 6:15
#6 Shelburne Road	WB on Main, turn right onto Battery and right onto Cherry	Every 1/2 hour between 6:15 AM & 6:15 PM, every hour between 6:15 PM and 8:15 PM, last bus at 10:30
#7 North Ave.-weekday	North St. onto North Ave. (both ways) Optional diversion to UHC-Waterman results in WB on College, turn right onto Battery and right onto Cherry	Every 1/2 hour between 5:45 AM & 6:15 PM, every hour between 6:15 PM and 8:15 PM, last bus at 9:20
#8 City Loop	WB on Maple, right onto Battery, right onto Cherry WB on Pearl, right onto Battery, right onto North St.	First bus at 6:45AM, then every 15 min. between 7:15 and 9:45, then every 1/2 hour until 9:15 PM
#11 College Street Shuttle	WB on College, left onto Lake, left on to Battery, right on to College	Every 1/2 hour between 6:30AM & 7:30AM, then every 15min.until 6:00, then every 1/2 hour until 7:00 (Columbus Day to Memorial Day), until 8:30 (Memorial Day to Columbus Day).
#18 Sunday Service (PM)	SB on North Ave and Battery, left onto Cherry	Sunday Only: every hour between 10:45AM & 4:45PM
#76 Middlebury LINK Express	WB on Main, turn right onto Battery and right onto Cherry	Arrives in Burlington at 7:45 & 8:45 AM, and 7:15 & 7:55PM
#86 Montpelier LINK Express	NB & SB on Battery between Maple and Cherry	Leaves Burlington at 6:15AM, 7:00AM, 7:45AM, 4:45PM, 5:15PM, and 6:15PM. Arrives in Burlington 7:00 AM, 7:45AM, 8:40AM, 5:15PM, 6:15PM, and 7:05PM.

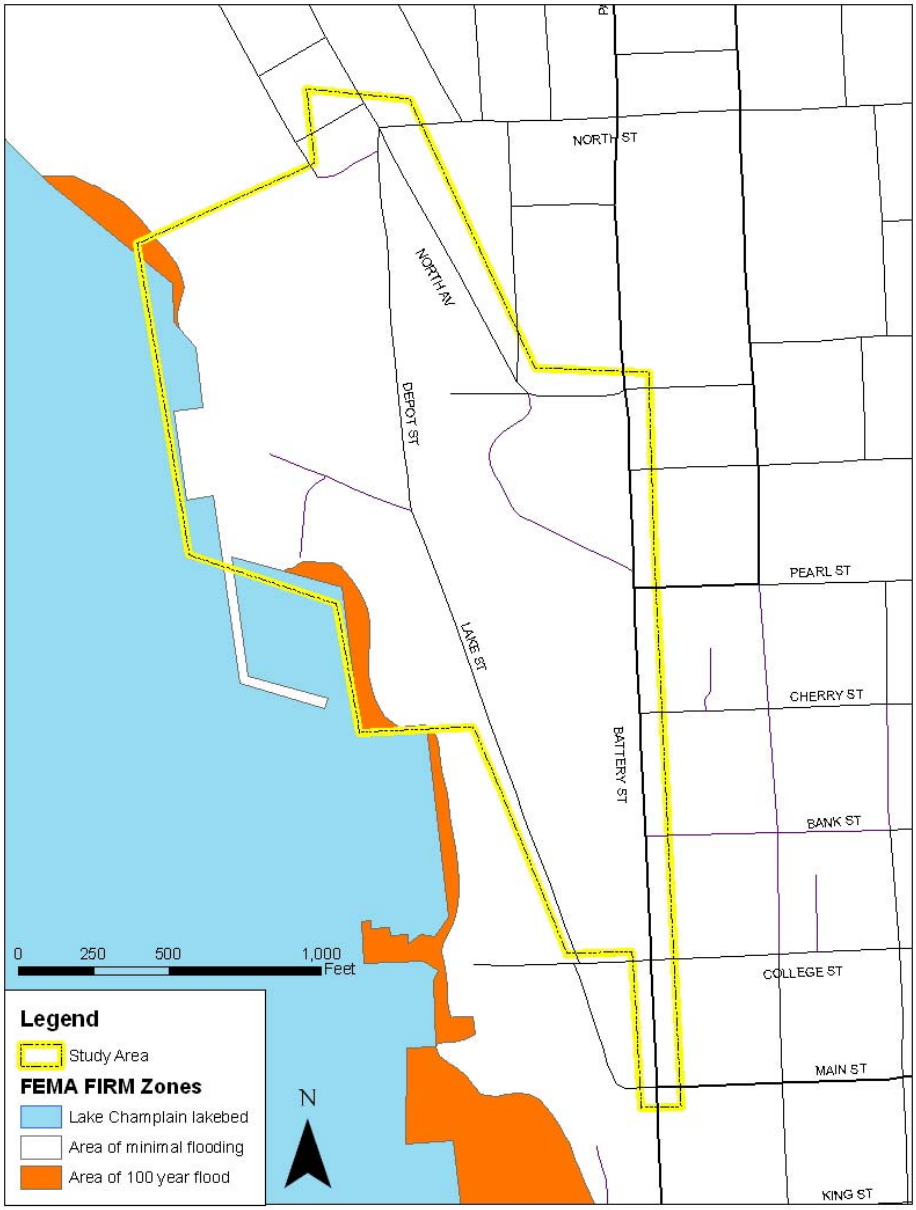
4.0 ENVIRONMENTAL & CULTURAL RESOURCES

The study area was examined for potential environmental, natural, and cultural resource impacts based on site assessments, existing GIS resource coverages, and previous site investigations. This preliminary resource assessment should be revisited during the preliminary and final design stage.

4.1 FLOOD ZONES

Within the study area, the latest Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Burlington identifies a portion of the Waterfront from the Coast Guard Station south to the study area boundary as within the 100-year flood plain. Figure 6 below marks the 100-year flood plain in the study area as well as adjacent areas.

Figure 6: FEMA Flood Insurance Rate Map 100-Year Flood Plain



4.2 WETLANDS

No wetlands were identified within or immediately adjacent to the study area. Based on the Vermont Significant Wetlands Inventory, the closest identified wetlands are located beginning approximately 700 feet south of the study area between Pine Street and Lake Champlain, north of Lakeside Avenue.

4.3 ARCHAEOLOGICAL AND HISTORIC RESOURCES

An Archaeological Resources Assessment has been completed by the University of Vermont Consulting Archaeology Program and is attached as Appendix A. The report is entitled *Archaeological Resources Assessment for the Proposed Burlington Waterfront North Improvement Project, City of Burlington, Chittenden County, Vermont* and is dated 11 March 2008.

The report identifies two known archaeological sites within the study area: one by Burlington College and one at the northeast corner of Main and Battery. The site adjacent to the Main-Battery intersection is a precontact Native American site, but the report says that due to previous disturbances, a date cannot be established.

The report describes the Burlington College site as a "multi-component site":

> *This site is better known as the War of 1812 Cantonment and Military Burial Ground site. A number of historic period human burials have been recovered from this site. In addition, a small number of chert flakes, indicative of precontact Native American tool production and/or maintenance, have been recovered from this site. However, a portion of the intersection of North Avenue and Depot Street may be fill soil... This area was filled in, possibly with the remains of a downtown hotel destroyed by fire, and is now the parking lot for Burlington College....Rumors have also suggested that burials have been encountered near the Burlington College building, but these reports have never been substantiated.*
>
> *One potentially archaeologically sensitive area within the Depot Street portion of the current study area is the top of bluff near the intersection of Depot Street and North Avenue where the project area adjoins a known multi-component site, VT-CH-961. If ground disturbance is proposed in this area, depending on the exact location and nature of the disturbance, it is possible that further archeological evaluation may be necessary. Furthermore, several buildings or portions of buildings are known to have encroached into the right of way of Depot Street. However, in these cases, additional documentary research and/or a site inspection may be able to properly assess potential archaeological significance. Finally, a late 19th century to 20th century railroad engine roundhouse and turntable once stood within this portion of the current project area. However, these structures appear to have been partially or wholly lost to later 20th century construction.* (pages 41-42)

4.4 HAZARDOUS WASTE SITES

The Vermont Agency of Natural Resources' (VT ANR's) Hazardous Site List (November 2007) includes five identified locations within or adjacent to the study area. Management activities for these sites have not yet been declared complete by the Sites Management Section of the Vermont Department of Environmental Conservation. Table 6 and Figure 7 provide a summary of the sites and current project status as of November 2007.

Table 6: VT ANR Active Hazardous Site List-November 2007

ID	Site Name	Site Address	Location Relative to Study Area	Status (as of November 2007)
941585	North 40	CVR Northern Properties	Adjacent	Old Bulk Terminal, development proposed
911003	Coast Guard	Depot Street	Within	Monitoring is ongoing, plan to excavate contaminated soil. Work not being performed.
941722	Spillanes Texaco (currently Burlington Bay Market & Cafe)	125 Battery St.	Adjacent	Gasoline line leak in 1994 resulted in gasoline contamination of soil. Vermont Groundwater Enforcement Standards exceeded in one monitoring well. Continued semiannual groundwater monitoring warranted.
20012933	Lake Champlain Basin Science Center	College Street	Adjacent	Two underground storage tanks removed. Contamination found. Investigation required. Site management activity declared completed in 2001 by Sites Management Section of Vermont Department of Environmental Conservation, with documentation that residual soil contamination remains on site.
20012892	131 Battery St.	131 Battery St.	Adjacent	Soil samples taken. Monitoring wells installed. Groundwater and soils beneath site found to be contaminated with petroleum-related volatile organic compounds, metals, and polynuclear aromatic hydrocarbons. Cleanup needed.

Figure 7: VT ANR Hazardous Sites

Table 7 below provides a summary of underground storage tanks located within or adjacent to the study area site, based on the Vermont Agency of Natural Resources Environmental Interest Locator.

Table 7: VT ANR Underground Storage Tank Site List

Facility ID	Facility Name	Facility Address	Town
8634501	Burlington Water Resources Dept.	Lake Street	Burlington
911003	US Coast Guard Station	Depot Street	Burlington
941722	Spillane's Service Center	125 Battery St.	Burlington
8636841	Sanel Auto Parts, Inc.	131 Battery Street	Burlington
8647999	Main Street Landing Company	1 Main Street	Burlington

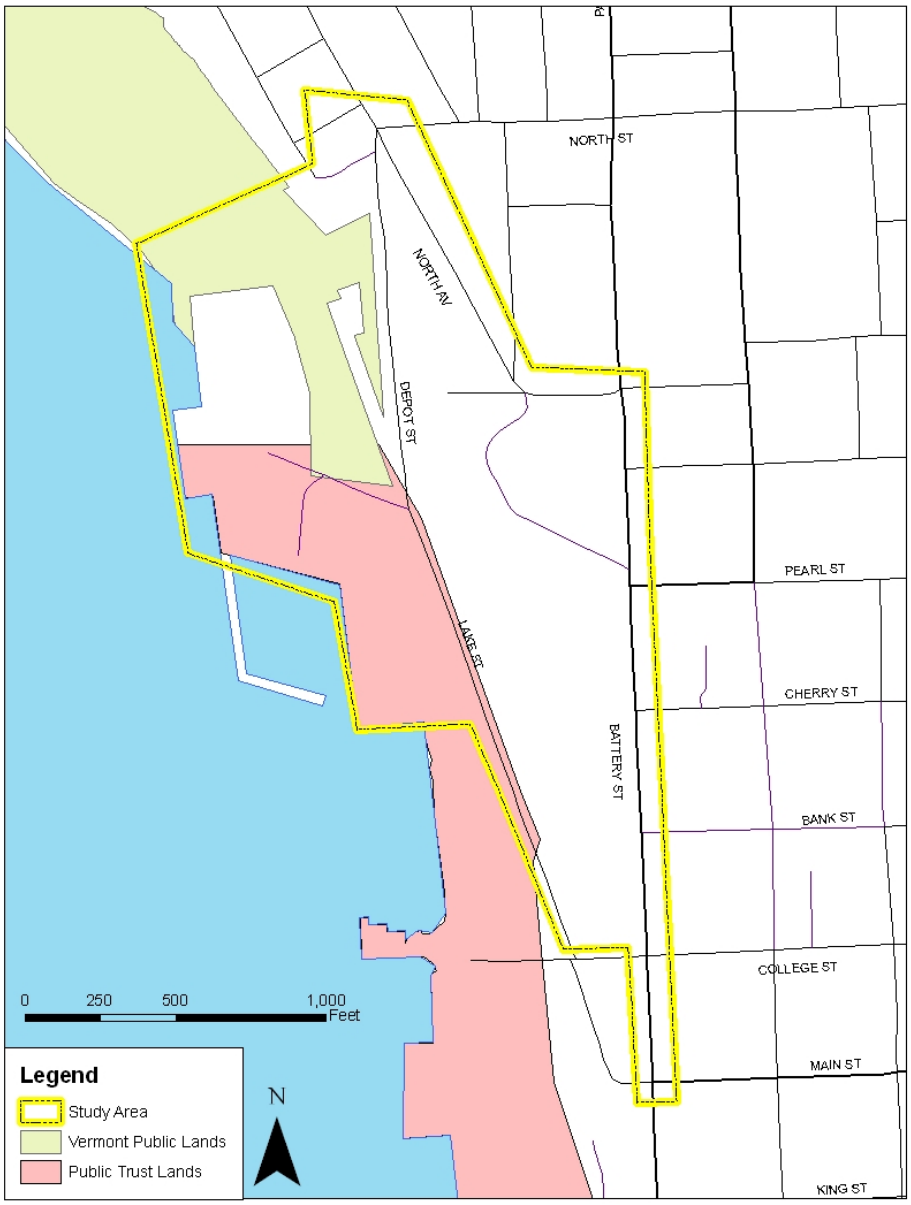
4.5 RARE, THREATENED OR ENDANGERED SPECIES AND SIGNIFICANT COMMUNITIES

Based on the latest assessment released by the Vermont Department of Fish and Wildlife (2006), there are two rare plant species in the study area. The last observations of these plants that are on record are from the early 1980s. There is also a rare plant community immediately northwest of the study area that was last observed in 1999. There are no Significant Natural Communities in or around the study area. On a global scale, each of the plant species is widespread and abundant. Within Vermont, the two species in the study area are ranked as "vulnerable," while the species to the northwest of the study area is "very rare" and at very high risk of extinction.

4.6 PUBLIC LANDS

Waterfront Park is composed of public land owned by the City of Burlington. The Urban Reserve (also known as the North 40) is composed of Vermont Public Lands and extends south into the study area.

Figure 8: Public Lands



4.7 PRIME AGRICULTURAL SOILS

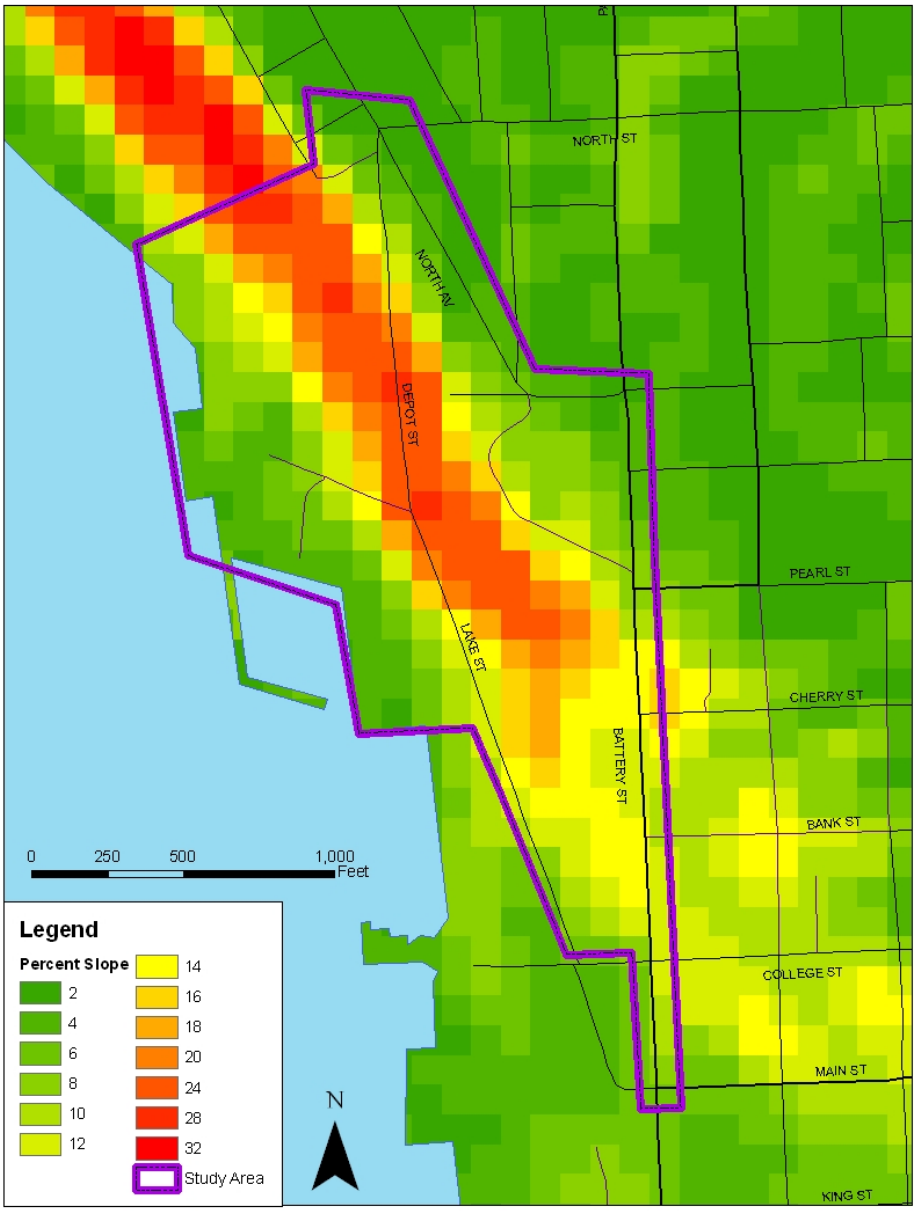
The majority of the study area was originally part of Lake Champlain, but over time was filled in to the shoreline edge as it exists today. The remainder of the study area is identified by the Natural Resource Conservation Service County Soil Surveys as soil of statewide importance. Statewide importance means that the soil is significant for the production of food, feed, fiber, forage, and

oilseed crops. However, the setting of the proposed improvements, within an urban context, is not typically considered for reversion to farmland.

4.8 SLOPES

Based on slope data generated from the USGS National Elevation Database (shown in Figure 9), there is a significant rise in the center of the northern half of the project area. Within the project area slopes range from 8% to 32%.

Figure 9: Slopes within the Project Area



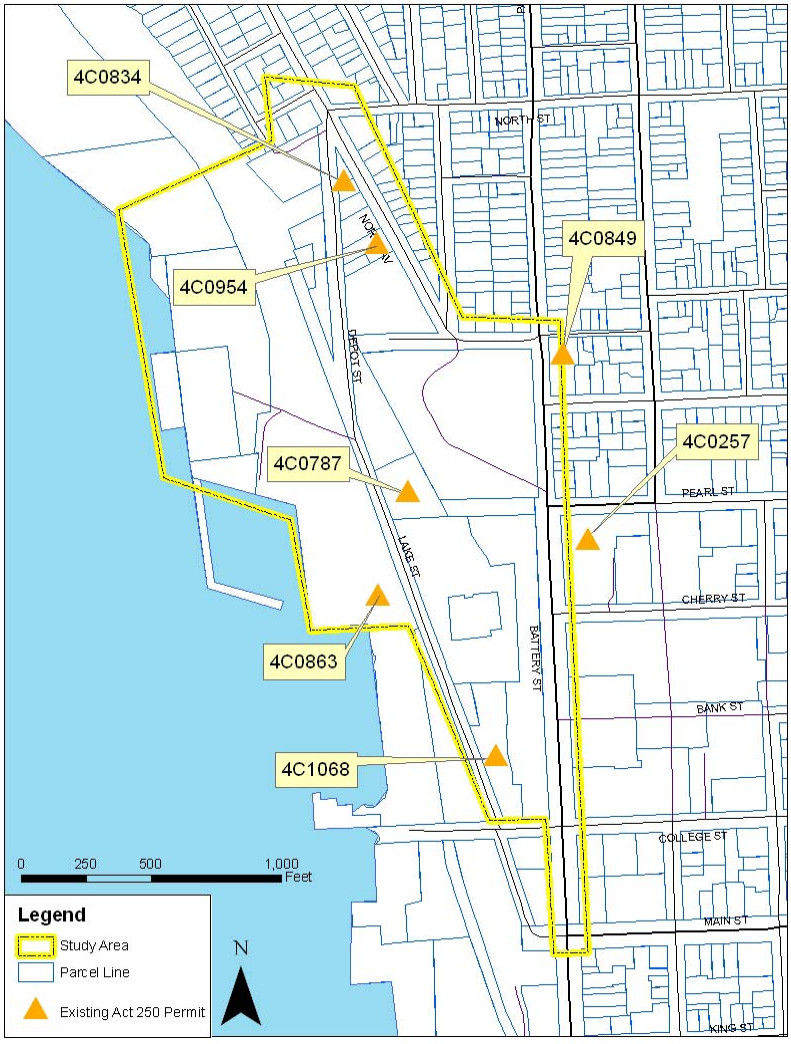
5.0 ANTICIPATED PERMITTING NEEDS

5.1 ACT 250 LAND USE PERMIT

The size of the study area is approximately 58 acres, but the area does not appear to trigger any of the Act 250 permit conditions described in the Vermont Natural Resources Board documents on General Act 250 Information (available at: http://www.nrb.state.vt.us/lup/publications.htm).

An Act 250 permit amendment may be required if a property owner within the potentially impacted area has an Act 250 permit for their property and the proposed improvements constitute a change of use. Figure 10 shows the Act 250 permits that exist within the study area and may potentially be affected by the Waterfront North study alternatives.

Figure 10: Existing Act 250 Permits within the Study Area



5.2 401 WATER QUALITY PERMIT

A 401 Water Quality Permit may potentially be required if alterations to the shoreline of Lake Champlain requiring the placement of dredged or fill materials will occur as part of the project. Such alterations are not anticipated at this time.

5.3 404 CORPS OF ENGINEERS PERMIT

A 404 Army Corps of Engineers permit may potentially be required if alterations to the shoreline of Lake Champlain, including dredging and filling activities or shoreline stabilization beyond the ordinary high water mark, are to take place as part of the project.

5.4 STREAM ALTERATION PERMIT

A Stream Alteration Permit will likely not be required as no streams, rivers, or canals flow through the study area.

5.5 CONDITIONAL USE DETERMINATION

A Conditional Use Determination will likely not be required since any recommended alterations will not impact any Class 1 or Class 2 wetlands or buffer areas.

5.6 STORMWATER DISCHARGE PERMIT

Since alterations to the study area may include additional impervious area or changes to the existing drainage system, a stormwater discharge permit may be required. Additionally, any alterations resulting in the disturbance of more than one acre of land will require a Construction General Permit 3-9020 as of September 13, 2006 to regulate stormwater discharges from construction activities. The City of Burlington is currently working with the Army Corps of Engineers to improve stormwater management in the study area.

5.7 SHORELAND ENCROACHMENT PERMIT

A Shoreland Encroachment Permit may potentially be required if any alterations to the shoreline of Lake Champlain that will encroach beyond the normal summer water level, including the addition to or reconfiguration of any retaining walls or other erosion controls, will occur as part of the project. Such alterations are not anticipated.

5.8 ENDANGERED AND THREATENED SPECIES PERMIT

An Endangered and Threatened Species Permit may potentially be required since the study area encompasses part of the possible range of state-listed, endangered plant communities that could be impacted by project activities.

5.9 VTRANS ACCESS PERMIT

A VTrans Access Permit will likely not be required, as no state right-of-ways are attached to the road network within the study area.

5.10 CATEGORICAL EXCLUSION (CE)

Depending on the extent of any shoreland impacts within the scope of the project, transportation network improvements within the study area may qualify for Categorical Exclusion status. Since federal funds will be used for design and construction of improvements, a Categorical Exclusion Environmental Analysis will need to be submitted to VTrans and the Federal Highway Administration for review and approval.

6.0 PUBLIC OUTREACH

A critical piece of developing a scoping study is public participation. Two Local Concerns meetings were held on 10 July 2008 (morning and evening), attended by approximately 20 people total. The public input is summarized below according to the five focus areas of the scoping study; if the comment was expressed more than once, the number of occurrences is shown in parentheses.

6.1 BATTERY STREET

- Crossing Battery at College is very difficult because the walk signal is too short and because of right-turning traffic.
- Need more visual cues that Battery is a pedestrian area; Battery is too highway-like and is at a large, non-pedestrian scale.
- Battery Street is not bicycle friendly; add bike lanes to it. (2)
- Changes to Battery will affect the other north-south corridors in Burlington (Champlain Street, Park Street, Manhattan Drive).
- Is the double northbound right turn at the Battery-Pearl intersection necessary?
- Consider putting a footbridge over Battery at Pearl (replacing the northern crosswalk).
- Maybe make a reversible flow lane on Battery: bring it down to 3-lanes and have the middle lane reverse direction depending on the major flows at that time of day. Like the Zipper lane in Boston.
- Consider roundabouts at intersections along Battery/North Ave.

6.2 PEDESTRIAN MOVEMENT BETWEEN BATTERY STREET AND THE WATERFRONT

- People try to walk down the slope between Battery and Lake, but it is dangerous and creates erosion problems. There is an existing network of paths on the slope.

- A connection around to the Waterfront at Pearl Street or maybe a little to the south would be good.
- Make a connection with the future Moran site parking garage going over the railroad, like a wide stairway street.
- Create stairway streets: variations include a switchback arboretum or park-like setting; walking paths with fitness stops; or a terraced zig-zag trail with rest spots. (4)
- The connection needs to meet ADA standards; maybe a switchback ramp.
- Is a funicular a financially viable option? What are the maintenance and operations costs of a funicular?
- An aerial tram or gondola-type lift could have several places to embark and disembark, and could be city-wide, not just between Battery and the Waterfront. (3)
- Include a water way like the one at the Montshire Museum in Norwich, VT.

6.3 DEPOT STREET

- Re-opening Depot Street to vehicle traffic will likely create cut-through traffic as motorists attempt to avoid the traffic signals on Battery Street. Depot Street also attracts reckless drivers due to its steep grade. One-way traffic heading uphill might avoid these issues. (2)
- Depot is a critical bicycle-pedestrian connection; maintain its exclusivity for bikes-peds and do not open it to vehicle traffic (except emergency vehicles). (4)
- Improve bike/ped facilities on Depot Street such as the addition of rest stops, surface treatments and visual enhancements. (3)
- Depot Street should have designated bicycle lanes; separate bikes and peds on Depot to avoid conflicts with cyclists coming down the hill. (2)
- Turn Depot Street into a mountain bike obstacle course or a skate board course. Make it a sport attraction.
- North Ave.-North St. intersection is unsafe and confusing; make the Depot St. approach into right-turn only. (2)

6.4 STORMWATER MANAGEMENT ON LAKE STREET

- When the drains on Lake Street are maintained, there is no flooding. However, the Department of Public Works' records do not show any drains there, so they are not being maintained.
- In addition to the drainage issues on Lake St., there are sewage odors on Battery St. next to the new Marriott south of Cherry.

6.5 NORTH-SOUTH MOVEMENTS ON THE WATERFRONT

- The narrowness of Lake Street should be considered before adding more traffic (i.e. Moran).
- Events on the Waterfront close the bike path and divert bikes & peds onto Lake Street.
- People will need to be able to get to the Moran site easily, especially in the winter.
- The Depot/Penny/Lake intersection will need help. Possibly widening.
- How will parking and transportation for Moran be addressed?
- North-south transit within the study area should be small scale, not gasoline-powered; no big buses; should be like the trams at Disney World.
- Why not use the rail line for north-south movements?

6.6 OTHER COMMENTS

- There should be a 'Plan A' and a 'Plan B' depending on what happens with the Moran site.
- Emergency evacuation from Waterfront needs to be considered.
- Keeping cars off the Waterfront excludes older people & people with children; must be accessible for all.
- Lots of people arrive by boat, but no one knows about the free College Street shuttle. Need better signs.
- Balance the needs of current residents within the study area with public needs.
- How will Moran and WFN be integrated into City's Transportation Plan? It's not just transportation into and out of the study area; it's city-wide.
    - Maybe a gondola all the way up to UVM, not just to Battery St. (2)
    - There should be a city-wide Parking and Transportation Management Plan. (2)
    - The new transit center should be included in the WFN plan.
- Signage for parking needs to be improved if parking east of Battery Street is supposed to serve the Waterfront. Also, concerned about using on-street parking in residential areas of the Old North End as inventory to serve the Waterfront.
- Be sure to take an integrated approach to the solution.
- Possibility of regional passenger rail transit through the area? Maybe a light rail line to Charlotte and extending to the north.
- Should Park St. be two-way (instead of one-way, as it is now)? [A previous study analyzed the impacts of making the one-way Champlain-Park St. system into a two-way system; Park Street would get the majority of the traffic if this were to happen.]

- The North St.-North Ave. signal is not responsive to bikes.
- Consider a parking structure or a mechanical parking tray system built into the steep grade west of Battery. The structure could include an elevator to move pedestrians between Battery St. and the Waterfront. (2)
- Consider alternative energy in the design for the Moran Plant, like solar panels for the roof of the parking garage.
- Improve waterfront access for kayakers.
- Improve transportation management for large events like the Fourth of July.
- Improve transit to the Waterfront, such as direct access from Pine Street and North Avenue.

In addition to the Local Concerns meetings, City staff and Resource Systems Group met with representatives from Main Street Landing and Burlington College to gain their input.

7.0 NEXT STEPS

The VTrans Project Development Process is as follows:

1. Project Selection
2. Programming
3. Project Definition/Scoping
4. Project Design
5. Construction

This scoping study falls within the Project Definition step of the Process. Within this step are subtasks:

1. Information Gathering (site visits, environmental assessment, social features, intersection evaluations, and traffic and crash data)
2. Local Concerns Meeting
3. Purpose and Need Statement
4. Investigation of Alternatives (including an assessment of potential impacts
5. Presentation of Alternatives to the Public
6. Identification of Preferred Alternative
7. Final Scoping Report

This report summarizes the existing conditions in the study area (the Information Gathering step); describes the public input from the Local Concerns Meetings; and provides the Purpose and Need

Statement. The next step in the process will be to examine various alternatives, which will then be presented to the public. The results of this scoping study will be summarized in a final report.

APPENDIX A

ARCHAEOLOGICAL RESOURCES ASSESSMENT

Archaeological Resources Assessment
for the Proposed Burlington Waterfront Access North Improvement Project,
City of Burlington, Chittenden County, Vermont

Postcard Collection, Special Collections, Bailey-Howe Library, University of Vermont.

Submitted to:
David Saladino, AICP, EIT
Resource Systems Group
55 Railroad Row
White River Junction, VT 05001

Submitted by:

Kathleen Kenny
And
Charles Knight, Ph.D.

University of Vermont Consulting Archaeology Program
111 Delehanty Hall, 180 Colchester Ave
Burlington, Vermont 05405

Report No.504

March 11, 2008

Archaeological Resources Assessment
for the Proposed Burlington Waterfront Access North Improvement Project,
City of Burlington, Chittenden County, Vermont

Project Description

The City of Burlington is proposing the Waterfront Access North Improvement Project, City of Burlington, Chittenden County, Vermont (Figure 1). The proposed project will improve pedestrian and vehicular access along Battery Street, Lake Street and Depot Street in Burlington's downtown waterfront area. The proposed project encompasses a large irregularly shaped area (approximately 38 acres) located along the eastern shore of Lake Champlain (Figure 1). Presently, the City of Burlington is seeking to improve pedestrian safety along Battery Street, to facilitate pedestrian connections between Battery and Lake Streets, to examine the desirability and feasibility of opening Depot Street to vehicular traffic, and to identify potential stormwater enhancements within this area.

The University of Vermont Consulting Archaeology Program (UVM CAP) conducted an Archaeological Resources Assessment (ARA) of the proposed project as part of the Section 106 permitting process, with the intention of providing a basic historical and cultural context for the study area for preservation planning purposes and for assessing the likelihood of encountering significant archaeological sites during the proposed improvements. The adjacent underwater area was not included in this survey.

Study Goal

The goal of an ARA (or "review") is to identify portions of a specific project's Area of Potential Effects (APE) that have the potential for containing precontact and/or historic sites. The principal sources used in compiling this report included historic maps, photographs, postcards, town reports, newspaper articles, and published histories housed in the Bailey-Howe Library at the University of Vermont in Burlington. In addition, a review of the Vermont Archaeological Inventory (VAI), which is maintained by the Vermont Division of Historical Preservation, was undertaken to locate previously identified precontact Native American and historic Euro-American sites in the general vicinity of the current study area.

Figure 1. Location of the proposed Burlington Waterfront Access North Improvement Project in the City of Burlington, Chittenden County, Vermont.

Table 1. List of known archaeological sites indicated on Figure 1.

Site#	Type	Sub-Type	Time Period	Description
VT-CH-161	Precontact / Historic	Unknown Unknown	Unknown 19th century	Lithic debitage Domestic and architectural material
VT-CH-606	Historic	Shipwreck	Pre-1860	Sailing canal boat
VT-CH-661	Historic	Residential/Commercial	Early 19th century	House and store foundations
VT-CH-732	Historic	Industrial	ca. 1870-1938	Lumber and coal sheds
VT-CH-733	Historic	Industrial	ca. 1870-1938	Lumber shed
VT-CH-734	Historic	Residential	ca. 1885-1912	House
VT-CH-735	Historic	Industrial	ca. 1870-1938+	Lumber shed
VT-CH-736	Historic	Transportation	ca. 1849-1912	Railroad round house and turntable
VT-CH-961	Precontact / Historic	Unknown Military	Unknown 1812-1815	Three chert flakes War of 1812 Cantonment and Burials

Precontact Native American

Burlington's precontact lakefront landscape in the vicinity of the project area consisted of moderately sloping land leading towards an extensive marsh, known as 'the Cove,' in the south and a high dry sandy bluff overlooking the beach and bay to the north (Visser et al. 1990:11). Some precontact Native American sites have already been identified on the higher elevations overlooking Lake Champlain. These include a Terminal Archaic (1300-900 B.C.) period site (VT-CH-847) at the extreme northern end of North Avenue and an incidental discovery of three chert flakes (byproducts of stone tool production) on top of the bluff near the intersection of North Avenue and North Street within the boundaries of the War of 1812 cantonment and military burial ground site VT-CH-961. In addition to the high ground, the shoreline itself "with its abundant supply of fresh water and aquatic flora and fauna would have been an ideal location for prehistoric settlement and/or activity" (Figure 2) (Visser et al. 1990:11). Some of these latter sites, if present, may have become partially or wholly submerged as the mean water level of Lake Champlain has risen about 6.1 m (20 ft) over the past 8000 years effectively moving the shoreline east approximately 381-457.2 m (1250-1500 ft) in this general vicinity (McLaughlin 2000; Visser et al. 1990:11). The terrace edge above the former shoreline of Lake Champlain, where intact, is sensitive for precontact Native American sites.

Figure 2. Early depiction of Burlington's shoreline (Burlington Image File, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Known precontact Native American sites along or adjacent to Burlington's lakeshore include VT-CH-81 and VT-CH-161. The site VT-CH-81 is located along the shoreline in the southern portion of the city between the old Queen City Mills and Cliffside Park. It "was identified in the early twentieth century by a local resident who collected artifacts along the shoreline and underwater in the lake" (Corey and Petersen 1998:13). This site yielded "artifacts attributable to the Late Archaic period, specifically Brewerton points, dated ca. 2700-2500 B.C., and the Middle-Late Woodland periods, specifically Levanna points dated ca. A.D. 800-1600" (Corey and Petersen 1998:13). The other site, VT-CH-161, is located at the northeast corner of Main and Battery Streets close to the original shoreline. This site was identified during construction activity near the historic Holloway Block. Here, a number of stone flakes were observed in an undisturbed context under three feet of historic fill (Visser et al. 1990:11). Unfortunately, "because the site was partially destroyed and not subject to professional analysis, no positive date could be assigned to the remains" (Visser et al. 1990:11).

Historic Background

Burlington's waterfront played a vital role in the city's early economic life and commercial development. Not only was the waterfront home to many industries over the years, principally lumber processing, stone carving, and iron working, it was also an important transportation hub for travelers and bulk goods (i.e. lumber, coal, stone, apples, oil & etc.). There have been several stages of development within different and distinct regions of current study area. Therefore, for ease of discussion, the study area was

broken up into four zones: the Pioneer Shops and the Blodgett Mill; the Yards; Depot Street; and Battery Street (Figure 3).

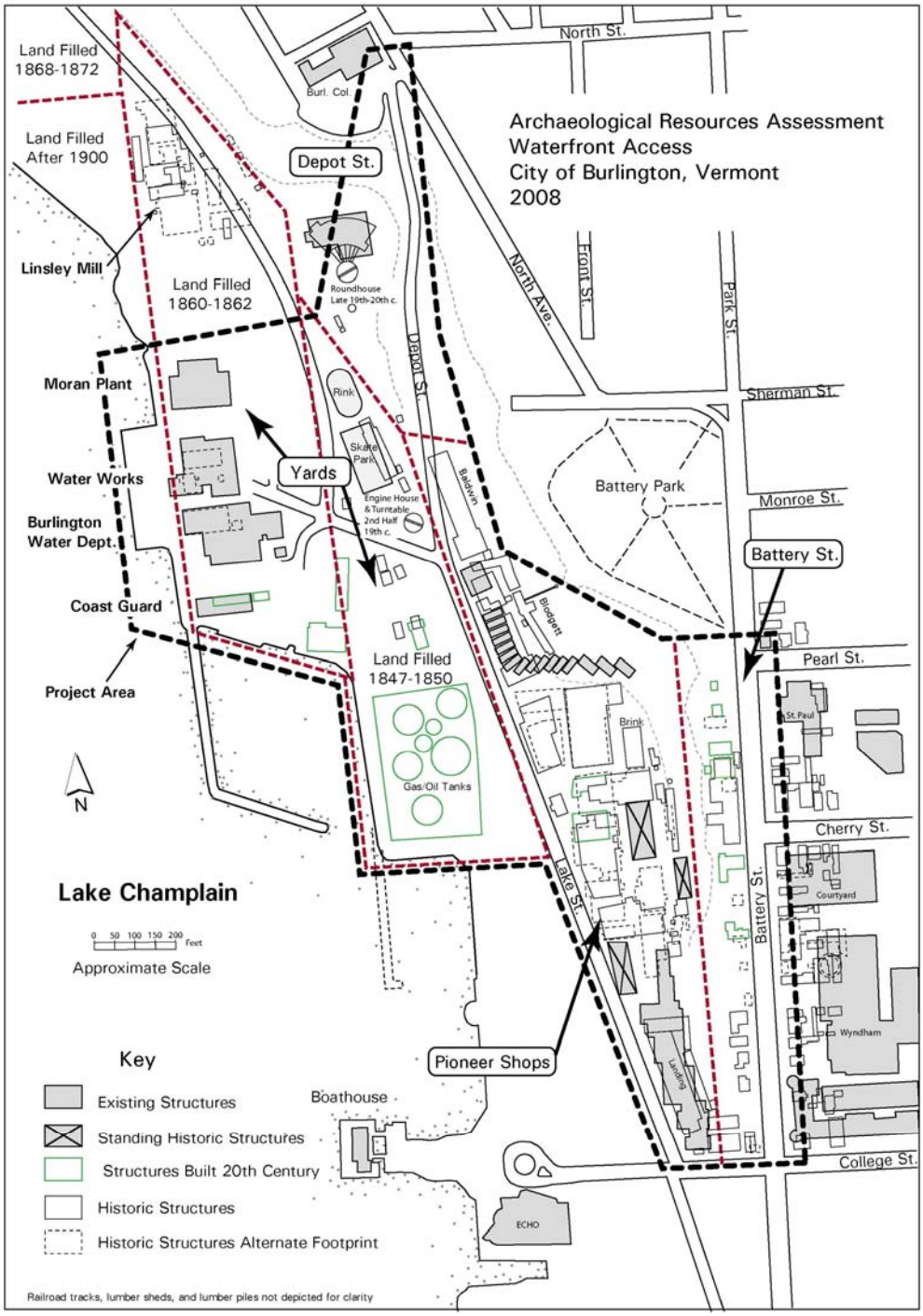


Figure 3. Schematic Map of the project area integrating information from the Fire Insurance Maps produced by the Sanborn Insurance & Publishing Company 1869, 1885, 1889, 1894, 1900, 1906, 1912, 1919, 1926, 1938, 1942, and 1978 as well as the Presdee & Edwards Map of 1853.

Notes on the Waterfront Fill

Any discussion of the potential for archaeology in this part of the City of Burlington must be prefaced by a word about the extensive alterations that have occurred to the land itself. When Euro-American settlers arrived in Burlington, the eastern margin of Lake Champlain was a sandy crescent beach lying at the foot of a bluff. The bluff ranged from about 33 m (100 ft) high at the site of present day Battery Park to a low gentle slope near the foot of Maple Street. In several places, the steep bank ran directly to the waterline (Rann 1886:404). In other places, the water lay an estimated 50 m (165 ft) west of Battery Street (Rann 1886:404). The waterfront remained largely unmodified until ca. 1810 when Curtis Holgate built a wharf at the foot of, what is now known as, Maple Street (Rann 1886:405). However, "the usefulness of the pier was limited due to shallow water [about it] which prohibited all but the lightest boats from tying up" (Rann 1886 404-405; Visser et al. 1990:24). Little changed concerning the physical shoreline over the next two decades. The earliest detailed map of Burlington, created by Ammi B. Young in 1830, shows the relatively unaltered crescent beach and only one wharf (Figure 4).

Shoreline development, especially the creation of filled land, began again in earnest in the 1830s with additional wharf construction that was probably encouraged by the growing regional population and increased water traffic following the opening of the Champlain Canal in 1823. Development accelerated in extent and scale between ca. 1846-1853 with the arrival of the railroads. These early railroad routes required significant fill work along the waterfront. According to one contemporary observer, from the late 1840s to early 1850s "filling was going on . . . as fast as they would crib and then fill in up to the crib making a bulkhead" (Horton 1912). The creation of new land continued rapidly at intervals with the establishment and expansion of waterfront industries from the 1850s through the 1890s (Figures 5-7). The transformation of the landscape in this part of Burlington was so striking that in 1872 a local newspaper commented:

> "probably few of our own citizens even, have any adequate idea of the amount of business done in the portion of our city lying north and west of the Pioneer Shops. A resident of fifteen or twenty years ago, who has not seen or kept informed of the changes in that quarter, would say that there must be a very good reason why there should not be much business done there, in the fact that the area in question consisted either of a nearly perpendicular bank a hundred feet high, or of water. But the fifteen years or more past have wrought great changes there. The bank has been shoveled down into the lake by many thousands of cubic yards, and to-day where many of those who still call themselves young men used to go in swimming, extend miles of planked streets and lanes between the piles of lumber, covering many acres of made land" (*Burlington Free Press* February 24, 1872).

Minor alterations to the shoreline continued into the 1960s. During this whole process, the shallow lake bottom and beach of Burlington was progressively covered and filled to make anywhere from 33 to 183 m (100 to 600 ft) of additional useable land west of the original shoreline (Figure 8) (Horton 1912).

The creation of new land was accomplished in a variety of ways but principally by cribbing or by the construction of bulkheads. Cribbing involved the construction of a series of large squared timber and/or log chambers held together by iron rods or wooden dowel fasteners, which were built or maneuvered into place and filled with stone or sand (Crock 2001; Horton 1912; Visser et al. 1990:18). Bulkheads were linear retaining walls, which had perpendicular "dead man" anchors or ties extending into the fill (Crock 2001; Horton 1912; Visser et al. 1990:18). These were most likely used in wetland areas. However, in some places, "when they wanted to make a new pier they . . . sank a barge and filled it with stone" (Visser et al. 1990:20). In still other areas, such as in natural low-lying areas or small ponds, fill such as sawdust, wood shavings, ashes/cinder, or sand was simply dumped (Crock 2001; Horton 1912). In the 20th century, rock riprap was placed along the waterfront, especially near oil tank sites, or steel sheets were driven near the 20th century buildings (Waterfront Board 1978:9).

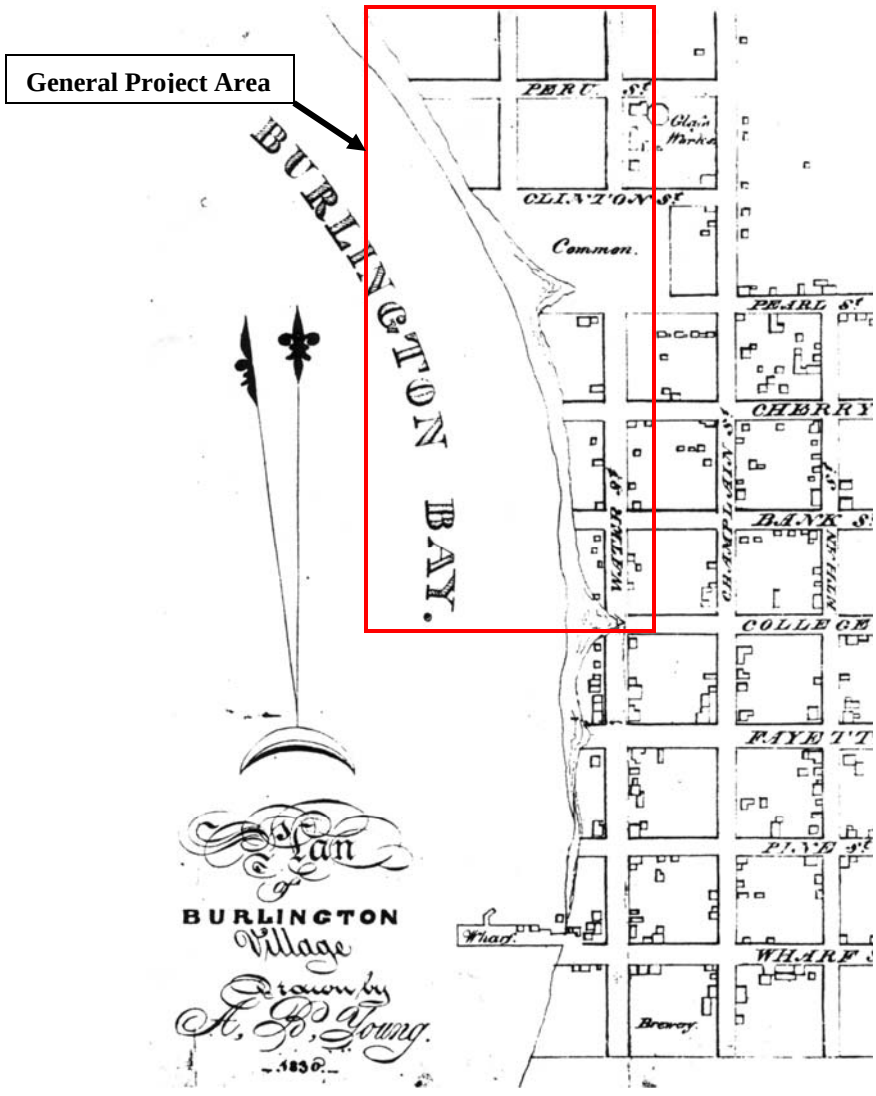


Figure 4. Detail of Ammi B. Young's *Plan of Burlington Village* (1830).

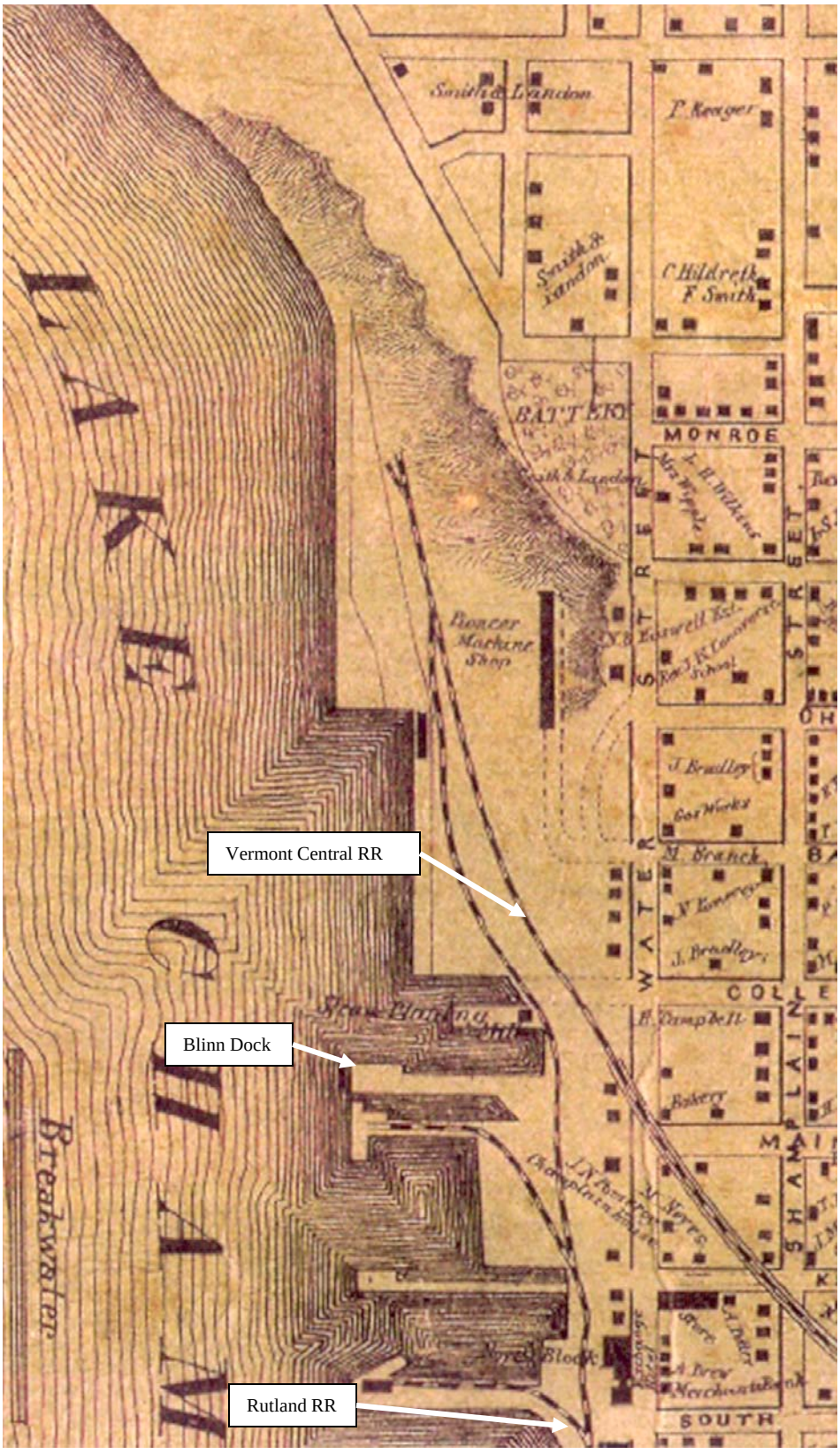


Figure 5. Detail of H.F. Walling's *Map of Chittenden County, Vermont* (1857).

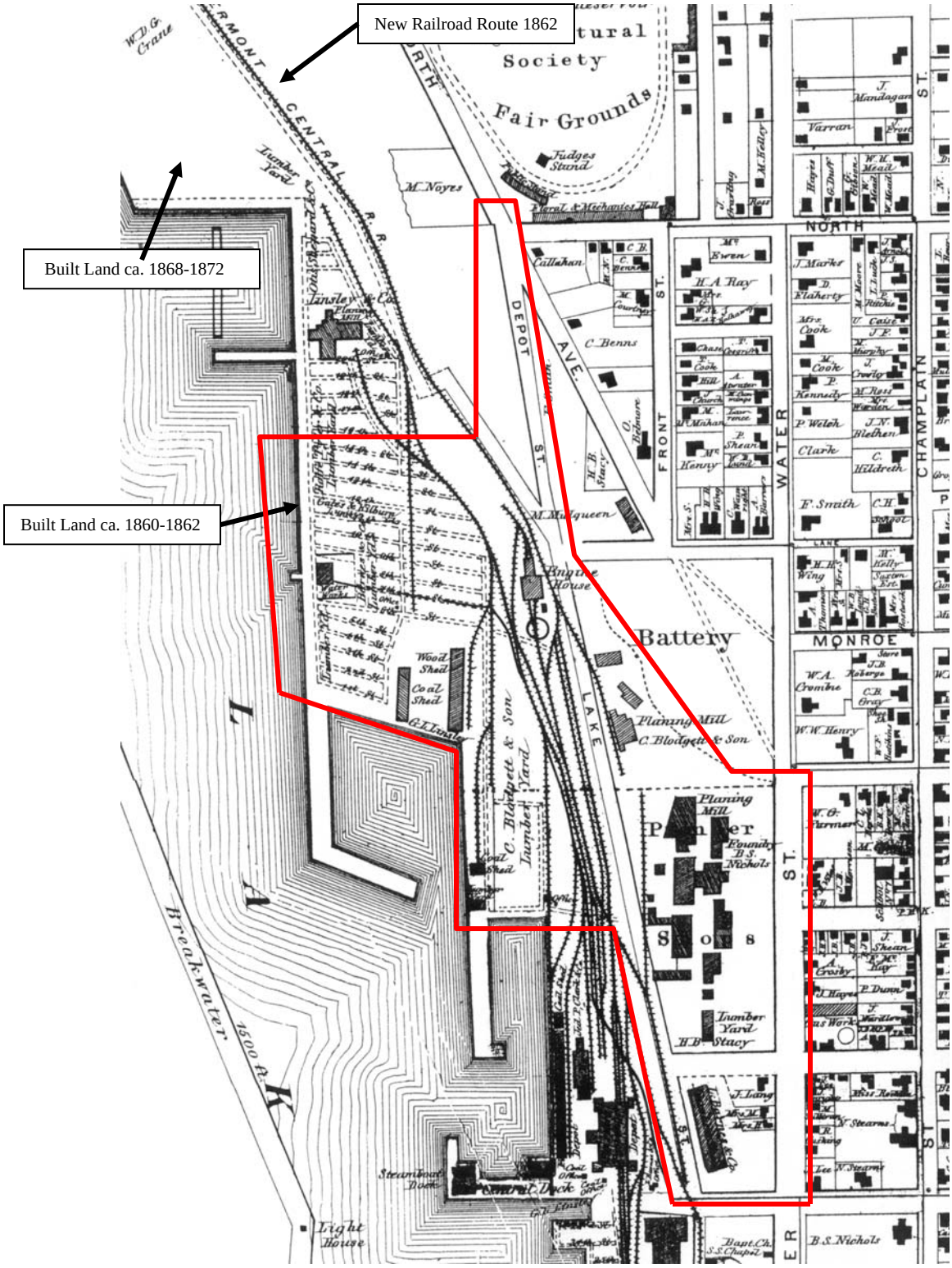


Figure 6. Detail of the 'Plan of the City of Burlington,' in F.W. Beers' *Atlas Chittenden County, Vermont* (1869).

Figure 7. View of the built land just north of current project area ca. 1870. The mill at center is outside of the Area of Potential Effects (APE) of the current project. However, note the large area of un-vegetated sand in foreground. Much of the fill used to build the northern end of Burlington's waterfront was sand removed from the shoreline bluffs. See Appendix 1 at the end of this report for additional information on this image.

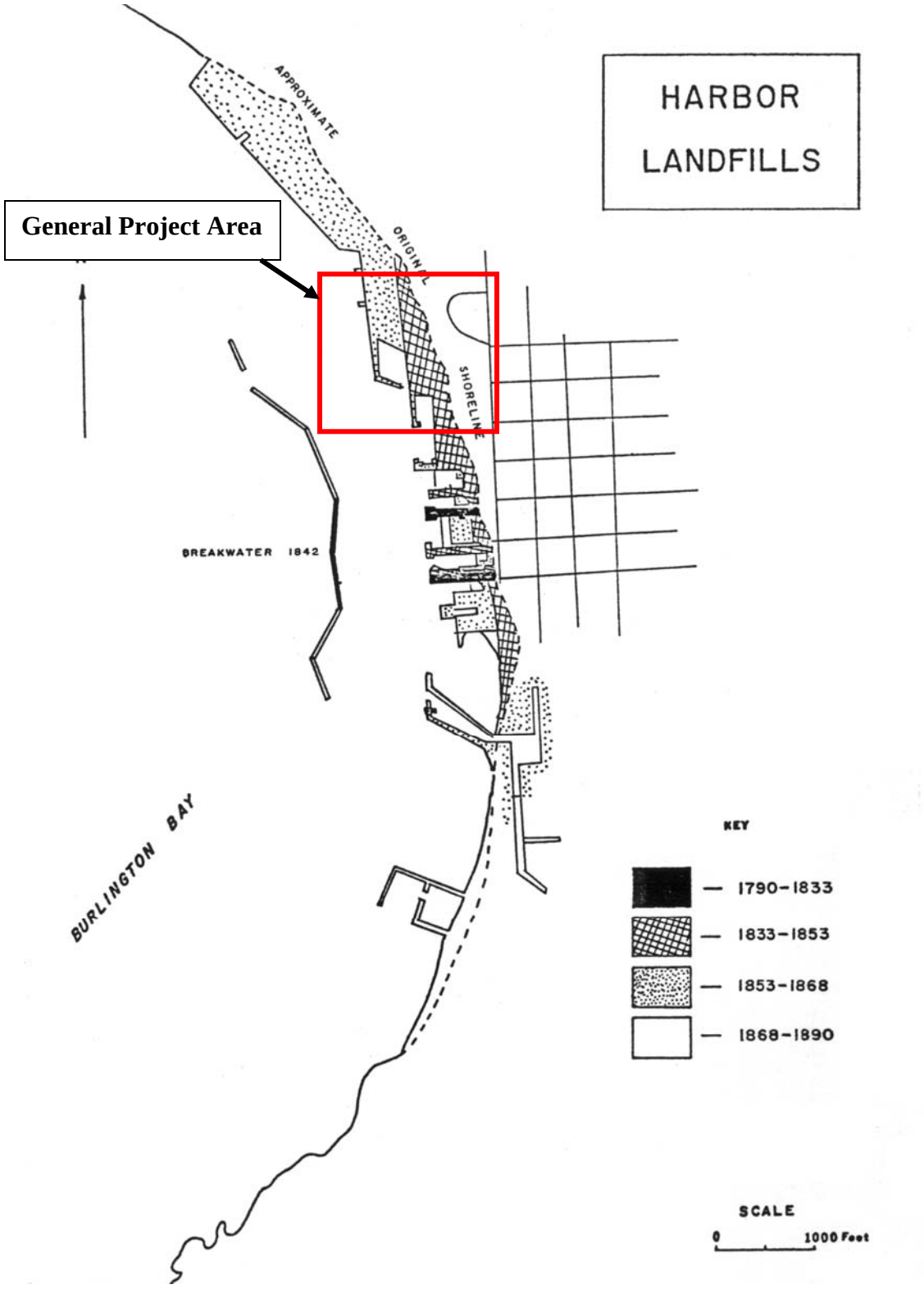


Figure 8. General progression of the Burlington harbor landfills (from Orr 1972:Figure 18).

The Pioneer Shops and the Blodgett Mill

Prior to the mid-1800s, there were no major manufacturing concerns on Burlington's lakeshore and only a few within the limits of the city (Rann 1886:404). Previous to 1850, large-scale industry was confined to the Glass Factory at the top of Battery Street (est.1827), the pottery on Pearl Street (est. 1830), and a mill for cotton and woolen textiles at the Winooski Falls (est.1835) (*Burlington Free Press* January 28, 1872; Rann 1886:462). In addition to an inherent lack of waterpower, the loss of several fledgling companies to arson in the 1830s "had made our capitalists timid about investments in mechanical enterprises" (*Burlington Free Press* January 28, 1872).

The Pioneer Shops

To address the troubling lack of manufacturing in Burlington, on May 31, 1852 a group of prominent citizens moved to form a joint stock company "under the name and style of the Pioneer Mechanics' Shop Company" (Hemenway 1867:514). The purpose of this company was to build a suitable building equipped with a central steam engine and fixtures for running machinery in which shop space and power could be leased to a variety of mechanics and manufacturers on reasonable terms (*Burlington Clipper* March 21, 1895; *Burlington Free Press* April 5, 1858 and January 28, 1872; Hemenway 1867:514). To this cause, Henry P. Hickok, Eliza W. Buell, Henry B. Stacy, and Nathan B. Haswell donated a parcel of land "under the hill . . . at the foot of Pearl Street" (*Burlington Free Press* January 28, 1872; Hemenway 1867:514). Then $30,000 in capital stock (in $25 shares) was raised primarily from the citizens of Burlington (*Burlington Free Press* January 28, 1872; Hemenway 1867:514).

Amid much fanfare, on September 4, 1852 the cornerstone of the building was laid and within a year it was ready for occupancy (*Burlington Free Press* September 7, 1852 and April 2, 1869). The brick building was four stories high, 122 m (400 ft) long 15 m (50 ft) wide and was divided by heavy thick walls into four compartments of 33 m (100 ft) each (Figure 9) (*Burlington Free Press* April 2, 1869, January 28, 1872, and March 20, 1895; Hemenway 1867:514; Rann 1886:462-463). The building had "lines of shafting running through each story" all of which was driven by two powerful steam engines, placed in a separate building located immediately east of the main structure (*Burlington Free Press* January 28, 1872 and March 20, 1895; Hemenway 1867:514). The entire south half of the building was rented by [Cheney] Kilburn & Co. for the manufacture of chairs and chair stock, while the remainder of the building was occupied by various parties who made window sashes, doors, blinds, boxes, axe helves, and patent wheel machines—additional space was occupied by a small mechanic repair shop and a flouring mill (*Burlington Free Press* April 5, 1858 and January 28, 1872; Hemenway 1867:514).

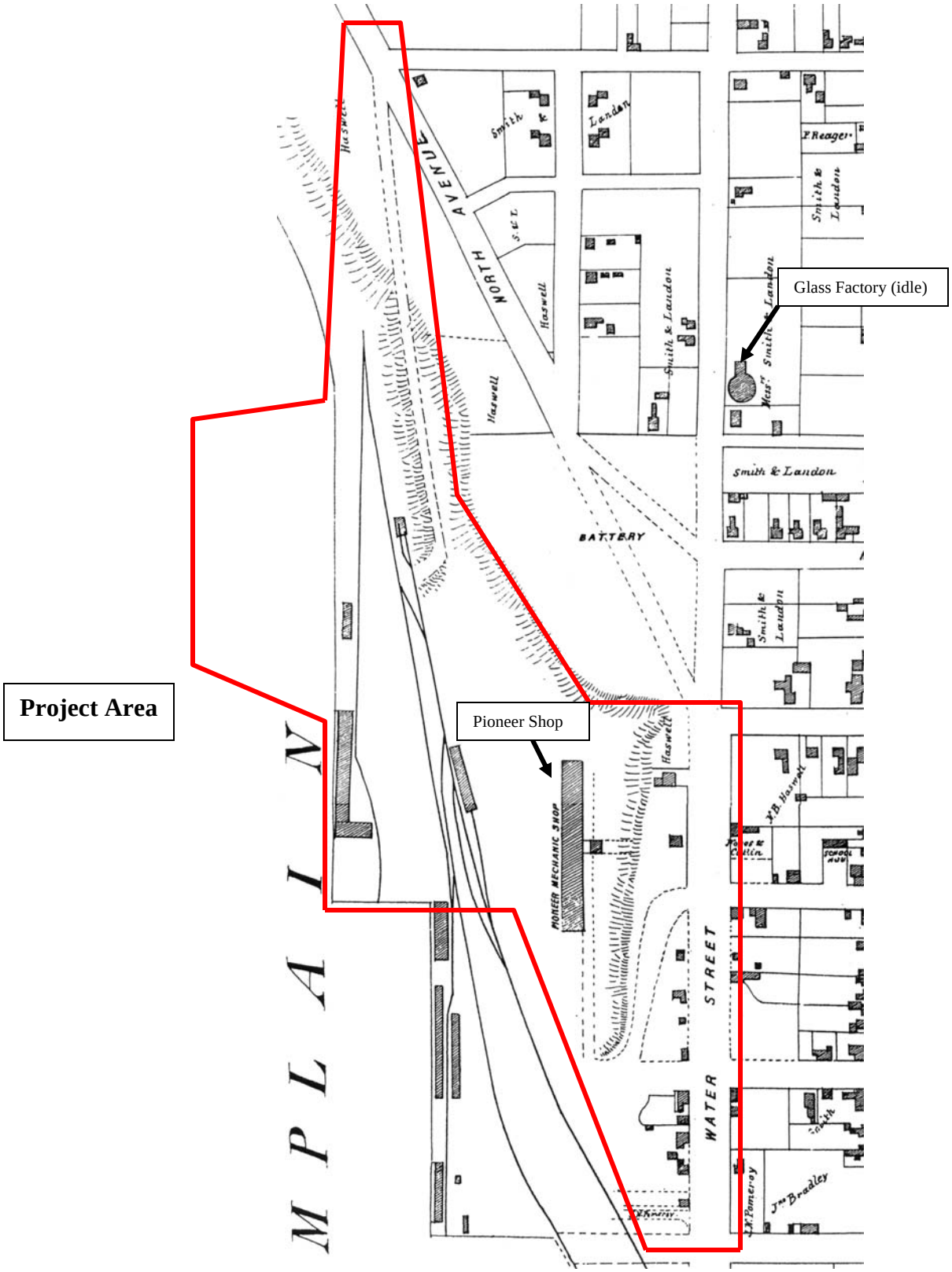


Figure 9. Detail of Presdee & Edwards' *Map of Burlington, Vermont* (1853), showing the location of the current project area and the original Pioneer Mechanics Shop.

The main building of the Pioneer Mechanics' Shop was destroyed with "astonishing rapidity" on the morning of April 2, 1858 after a fire broke out in the second story packing room of the chair factory (*Burlington Free Press* April 5, 1858). Later it was recalled, "the wind was blowing high from the south, and it was with a heavy heart that our citizens hurried to the brow of the hill . . . The building, filled with shavings and dry wood, burned with tremendous fury, and nothing was saved" (*Burlington Free Press* January 28, 1872). Within a few short hours, all that remained of "the whole building and its valuable contents [were] smoldering ruins and blackened walls" (*Burlington Free Press* April 2, 1869). Reportedly "ten different establishments, employing over two hundred men, were thus for a time broken up" (*Burlington Free Press* April 2, 1869). However, the volunteer firemen were able to save the nearby foundry of W.H. Root as well as the engine sheds and car house of the Vermont Central Railroad (*Burlington Free Press* April 5, 1858).

In looking over the ruins a local newspaper noted, "there are three acres of land, in a location, which though it has some drawbacks, has rare and unquestionable advantages. The engine . . . is but little damaged: probably $500 will set it running again. Of the shafting and hangers . . . a considerable portion will doubtless be capable of further service. There are the foundations unhurt and an immense quantity of brick, which can be used again" (*Burlington Free Press* April 5, 1858). Despite the economic depression gripping the United States at the time (ca. 1857-1858), within a week of the disaster the citizens of Burlington, led by Lawrence Barnes (who purchased the ruins) and Henry P. Hickok, raised enough money to restart the project (*Burlington Free Press* April 2, 1869, November 22, 1882, and March 20, 1895; *The Daily Times* June 8, 1858; Hemenway 1867:514). The contract for the reconstruction was given to S. & W. Pattee and the work of rebuilding was begun on or about the 9th of April (*Burlington Free Press* April 9, 1858 and April 15, 1858; *The Daily Times* June 8, 1858). Within days, the lightly damaged foundry of "Mr. Hamilton was rolling out his handsome castings, Plows, Cultivators, Machinery, Stoves, and job work, &c., &c., 'as though nothing had happened'" (*The Daily Times* June 8, 1858; B*urlington Free Press* April 5, 1858 and April 15, 1858).

The plans for the new 'Phoenix' Pioneer Mechanics' Shop called for three separate structures, built on the site of the former works, each two stories high, 33 m (100 ft) long and 15 m (50 ft) wide with "spaces of fifty feet between them" (Figure 10) (*Burlington Free Press* April 9, 1858; April 2, 1869; January 28, 1872; *The Daily Times* June 8, 1858; Rann 1886:464; Wainwright 1862). By April 15, the contractors had "one hundred men at work on the walls" and expressed their intention to "push the work as fast as possible" (*Burlington Free Press* April 15, 1858). Not long afterward, a local newspaper reported "those who thought that sixty days was too short a time set for the completion of the new Mechanic Shops at the Lake . . . did not make sufficient allowance for the energy and ability of the Brothers Pattee . . . It is now five weeks since the work began, and there stand the new shops, almost done. The walls are up, the roofs are on, and the flooring of two of the three buildings down. All will be ready for the introduction of the shafting by the end of this week" (*Burlington Free Press* May 18, 1858). In just 54 days after the fire, the master machinist, Mr. Flanders, and his assistant, Mr. Bancroft,

restated the engine of the Pioneer Shops (*The Daily Times* June 8, 1858). By all accounts, "these buildings are substantially built of brick and iron, and are decidedly superior, in important respects, to their more costly predecessor. They are to be heated, throughout, by steam—five rows of iron pipe extending around the lower, and three rows around the upper rooms. . . . Stoves, therefore, are wholly excluded; [which] . . . greatly diminished danger from fire" (*The Daily Times* June 8, 1858). Other improvements to the site included a "new Engine and Boiler house" (40 x 40 ft), a large two-story dry house (located just north of the engine house), and "a monster Machine shop, 50 feet by 100, just South of the Engine house" (*Burlington Free Press* January 28, 1872; *The Daily Times* June 8, 1858).

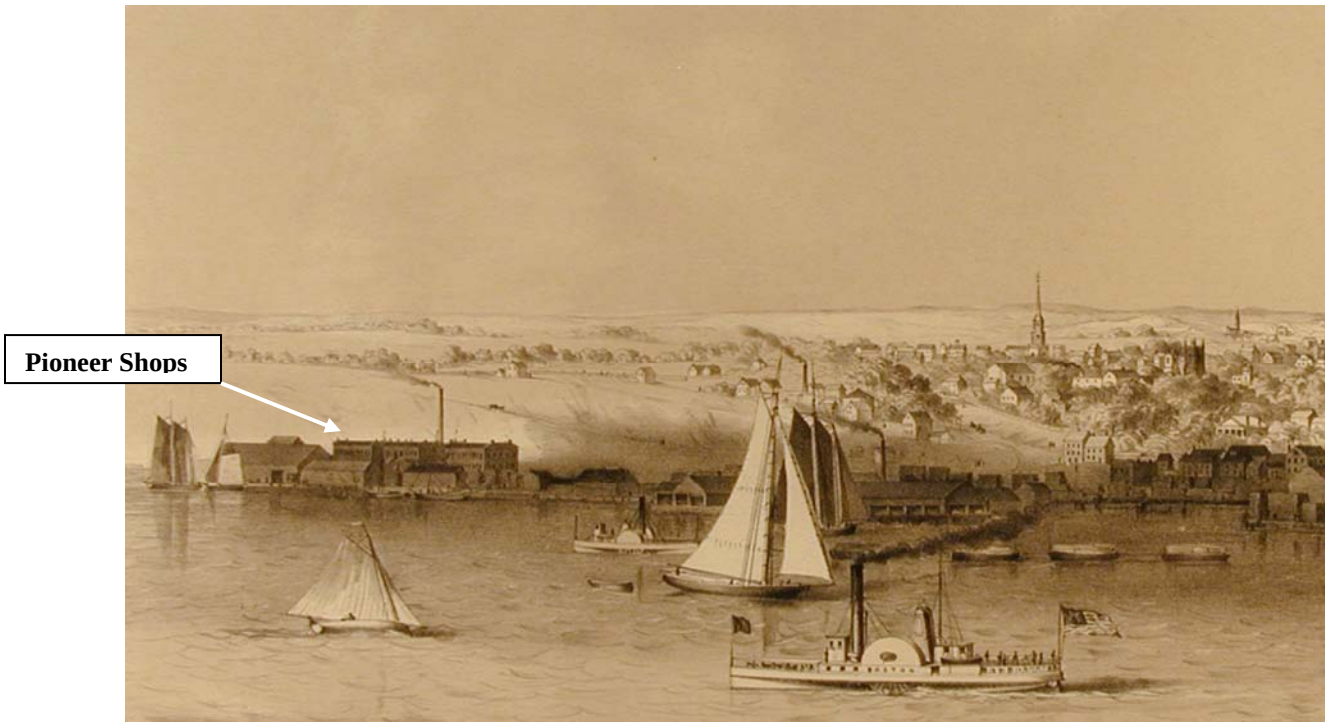


Figure 10. The Phoenix Pioneer Mechanics Shop as seen from the lake ca. 1858. Note the large sheds and storehouses on the edge of the docks (Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

In 1868, the costs of "rental, repairs, insurance & etc" became too great for Lawrence Barnes and he sold the property to Dr. B.S. Nichols for $50,000 (*Burlington Free Press* January 28, 1872 and March 26, 1895). In local opinion, Dr. Nichols "managed the property with energy and excellent judgment" by establishing new lines of business and by adding new buildings, "practically doubling the shop space" (*Burlington Free Press* January 28, 1872). The new buildings were constructed around and in the open spaces between the three main brick structures of the 'Phoenix' works (Figure 11) (*Burlington Free Press* March 20, 1895). The steep bank to the east was cut back as more buildings were added (Meilbek 1877; Sanborn 1869 and 1885). By 1872, two of the three brick buildings had been connected by a 50 ft square structure, another 50 ft square building was added to the north end of the complex and a 35 x 90 ft building was

built to the south at right angles (*Burlington Free Press* January 28, 1872). On the west side of the building several "platform gangways" led to a railroad siding (*The Daily Times* June 8, 1858; Sanborn Insurance & Publishing Company 1869). Other major buildings in the complex included a brick foundry (120 x 40 ft part of two stories and partly of one-story); a brick two story machine shop (90 x 50 ft); a two-story blacksmith shop (36 ft square); a door factory (80 x 50 ft); and, a three story brush factory up on Battery Street (*Burlington Free Press* January 28, 1872). A 234-horsepower Corliss engine driven by five 4 x 25 ft boilers fueled by wood shavings powered the works (*Burlington Free Press* January 28, 1872). The main driving wheel was eighteen feet in diameter and weighed eleven tons and the main belt was thirty-two inches wide and 134 feet in length (*Burlington Free Press* January 28, 1872). The entire complex occupied about seven acres and included 11 buildings; not counting lumber sheds, storehouses, pattern houses, shaving sheds, barns, and other similar buildings (Figures 12-14) (*Burlington Free Press* January 28, 1872).

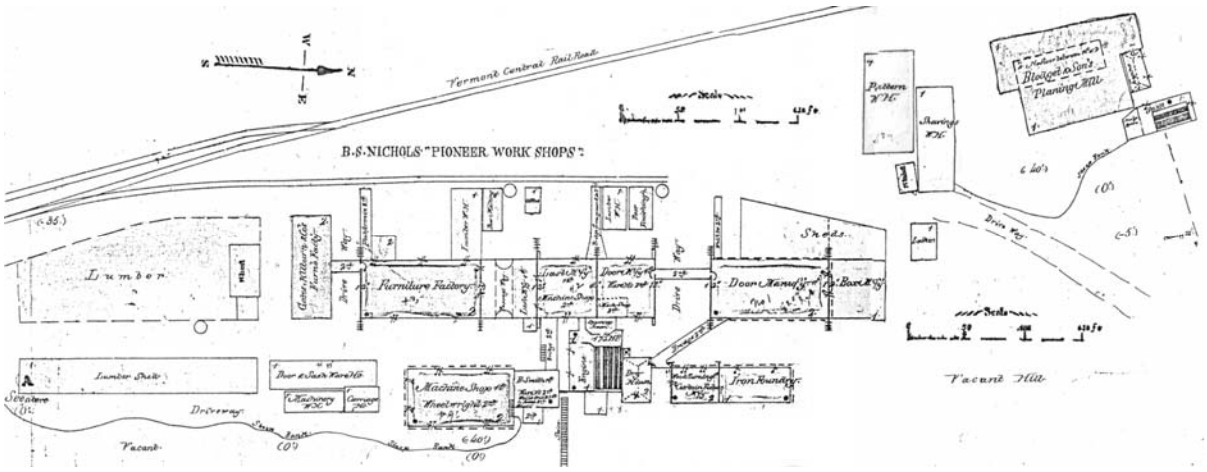


Figure 11. Plan of the 'Phoenix' Pioneer Shops in 1869 (Sanborn Insurance & Publishing Company 1869). Note the Blodgett Mill to the north separated by a "drive," which may have once led up to the area of the Battery. It is possible that this path may have been originally associated with the earlier glass factory on top of the bluff. It is known that in 1828 the Champlain Glass Company was interested in building a 300 x 30 ft wharf and light wooden 'railroad' to be "extended up the hill, say 400 feet" to facilitate their connection with the waterfront (Johnson 1828). However, where or even if this was ever built is not presently known.

Figure 12. The ‘Phoenix’ Pioneer Shops and lumberyards beyond, looking northwards. This image was probably taken in the mid-to-late 1860s.

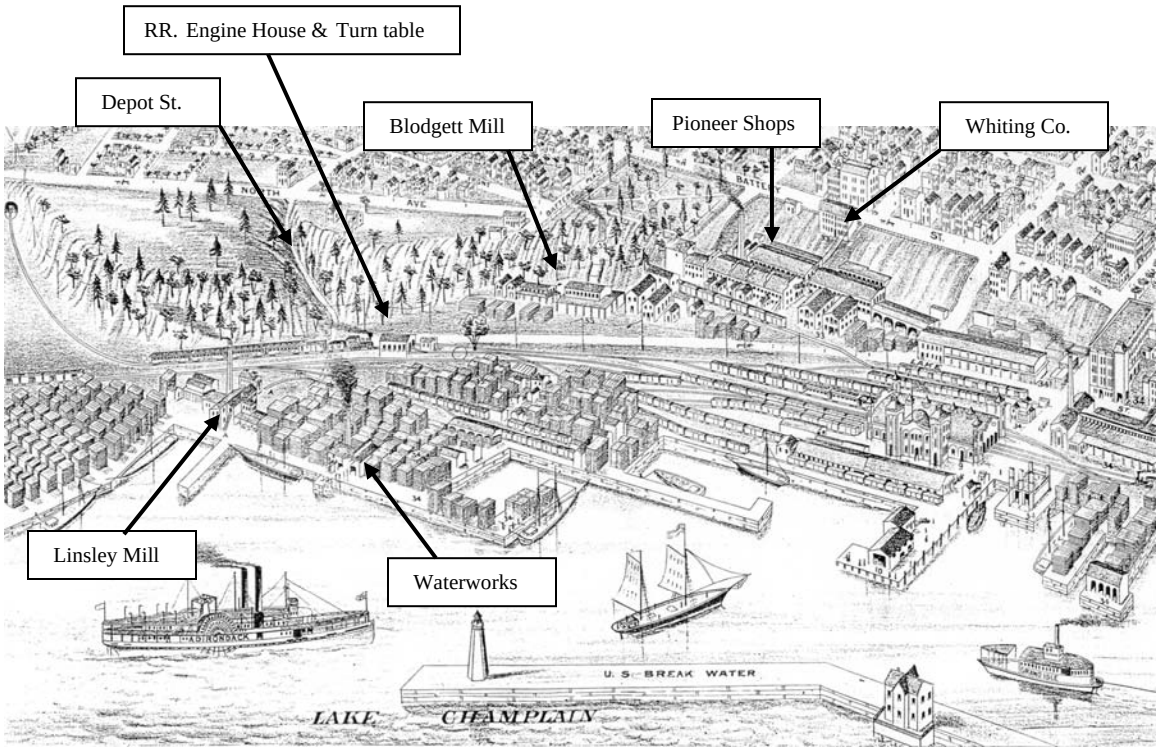


Figure 13. Detail of Meilbek's 1877 Birds-eye View of Burlington (Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). This shows how the Pioneer Shops appeared before the fire of 1882.

Figure 14. The 'Phoenix' Pioneer Works (foreground), looking south from Battery Park ca. 1872-1882 (Stereoview Collection, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). Note the various walkways, shaving chutes, and blower pipes connecting the buildings (*Burlington Free Press* March 20, 1895). The Brink foundry is in the center foreground.

In the mid-to-late 19th century, the primary occupants of the Pioneer Shops and associated structures included: S. & J.H. Gates (furniture), Lawrence Barnes (planing mill), Cromby & Kimball (window sash, doors, and blinds), E.W. Chase & Smith (sash, doors, and blinds, and interior wood-work of all kinds), Wing & Smith (shoe lasts and boot trees), S.C. Kimball & Co. (doors), Mayo & Co. (packing boxes and pickets), D.G. Wright (curtain rolls), Shepard, Davis & Co. (planing lumber), W.H. Brink & Co. (foundry), A. Taft & Co. (doors), Burlington Brush Company (brushes), and B.S. Nichols & Co. (machinery, forging, and manufacturers of steam boilers) (*Burlington Free Press* January 28, 1872; *The Daily Times* June 8, 1858). It was also noted that for a time "large quantities of salt [were] prepared for culinary and dairy purposes at the center shop" (Hemenway 1867:514).

Over the years, the Pioneer Shops were, unfortunately, the site of several tragedies. The first known fatality on the grounds occurred when the original shop was being built. On November 9, 1852, a carpenter and joiner named Joseph L'Hussier "fell from the top scaffolding, 50 feet from the ground . . . and was so much injured that he

lived but about thirty minutes. He stepped upon a plank which was not supported, and which, of course, tipped and precipitated him from the fearful height. He was a worthy man, about 35 years of age, and leaves a widow and two children" (*Burlington Free Press* November 9, 1852). In 1865, the main boiler exploded killing seven men (*Burlington Free Press* March 20, 1895). Another explosion occurred about 1870 with two fatalities (*Burlington Free Press* March 20, 1895). A third boiler explosion occurred in 1881 but resulted in no loss of life (*Burlington Free Press* November 22, 1882). In January of 1881 or 1882, "a cauldron of molten iron was overturned in W.H. Brink's foundry and three men were so dreadfully burned that death ensued" (*Burlington Free Press* November 22, 1882 and March 20, 1895).

Fire also plagued the industrial complex. The "lower building" of the Pioneer Shops was damaged by fire in 1880 (*Burlington Free Press* February 4, 1880). On November 21, 1882, fire destroyed the entire northern section of the complex (*Burlington Free Press* November 22, 1882 and March 20, 1895; Rann 1886:464). During this fire, which reportedly began in a barn on the west side of the complex, the machinery, tools, stock, and patterns of Wing & Smith and S.C. Kimball & Co. both housed in the north Pioneer building; the Brink & Co. foundry to the east; and B.S. Nichols' box shop and planing mill were all destroyed (*Burlington Free Press* November 22, 1882, November 23, 1882, November 24, 1882). The heat of the blaze was so intense that "large blocks of cast iron lying on the ground just outside the brick walls of the foundry were melted, and now lie upon the earth in the form of puddles of iron" (*Burlington Free Press* November 23, 1882). Elsewhere, "a large portion of the strong brick wall had been prostrated, the remaining portions were cracked and seamed as they might have been after a bombardment" (*Burlington Free Press* November 23, 1882). There was also some damage to other nearby structures, but at least "the great engine and boilers, which furnished the motive power for all could, it is thought be put in running order in two or three weeks" (*Burlington Free Press* November 24, 1882). Just after the 1882 fire, the whole property was sold to J.R. Booth, a lumber baron from Ottawa, Canada, who had the whole complex running again by February 1, 1883 (*Burlington Free Press* March 20, 1895).

Another, even more catastrophic and, this time fatal, fire destroyed nearly all the structures from the foot of Pearl Street to Bank Street and east to the railroad (*Burlington Free Press* March 20, 1895). The fire started in J.R. Booth's shavings shed in the early morning of Tuesday March 19, 1895 and was driven by strong winds from the northwest (*Burlington Clipper* March 21, 1895; *Burlington Free Press* March 20, 1895). It consumed J.R. Booth's retail shed, box shop, and planing mill; the engine and boiler house; the Sash, Door, and Blind Shops with glazing shop and storehouse; the Brink Foundry (which was then used for storing lumber); and the sections of the old Shops occupied by the Baldwin Manufacturing Company and the Vermont Shade Roller Factory taking with it an estimated 300-400 jobs (*Burlington Clipper* March 21, 1895; *Burlington Free Press* March 20, 1895). D.I. Talcott of Williston reported finding embers from this conflagration 10 miles east of Burlington one of which was said to have been "two by three inches in size" (*Burlington Free Press* March 27, 1895). Only a few buildings in the whole complex survived the 1895 fire (Figures 15-18) (*Burlington Free*

Press March 20, 1895). However, the loss of the buildings was overshadowed by the death of a 64-year-old William L. Millington, who was attempting to salvage some property in the offices of the Vermont Shade Roller Company (*Burlington Free Press* March 20, 1895 and March 27, 1895; *Burlington Clipper* March 21, 1895). This tragedy directly contributed to the creation of a professional fire department in the City of Burlington (*Burlington Free Press* March 20, 1895 and March 27, 1895; *Burlington Clipper* March 21, 1895). Although three men, T.H. Donlin, Walter Bracken, and Thomas Gorman, were arrested on suspicion of setting the blaze, they were all later released due to lack of evidence (*Burlington Free Press* March 27,1895; April 1, 1895; and April 5, 1895).

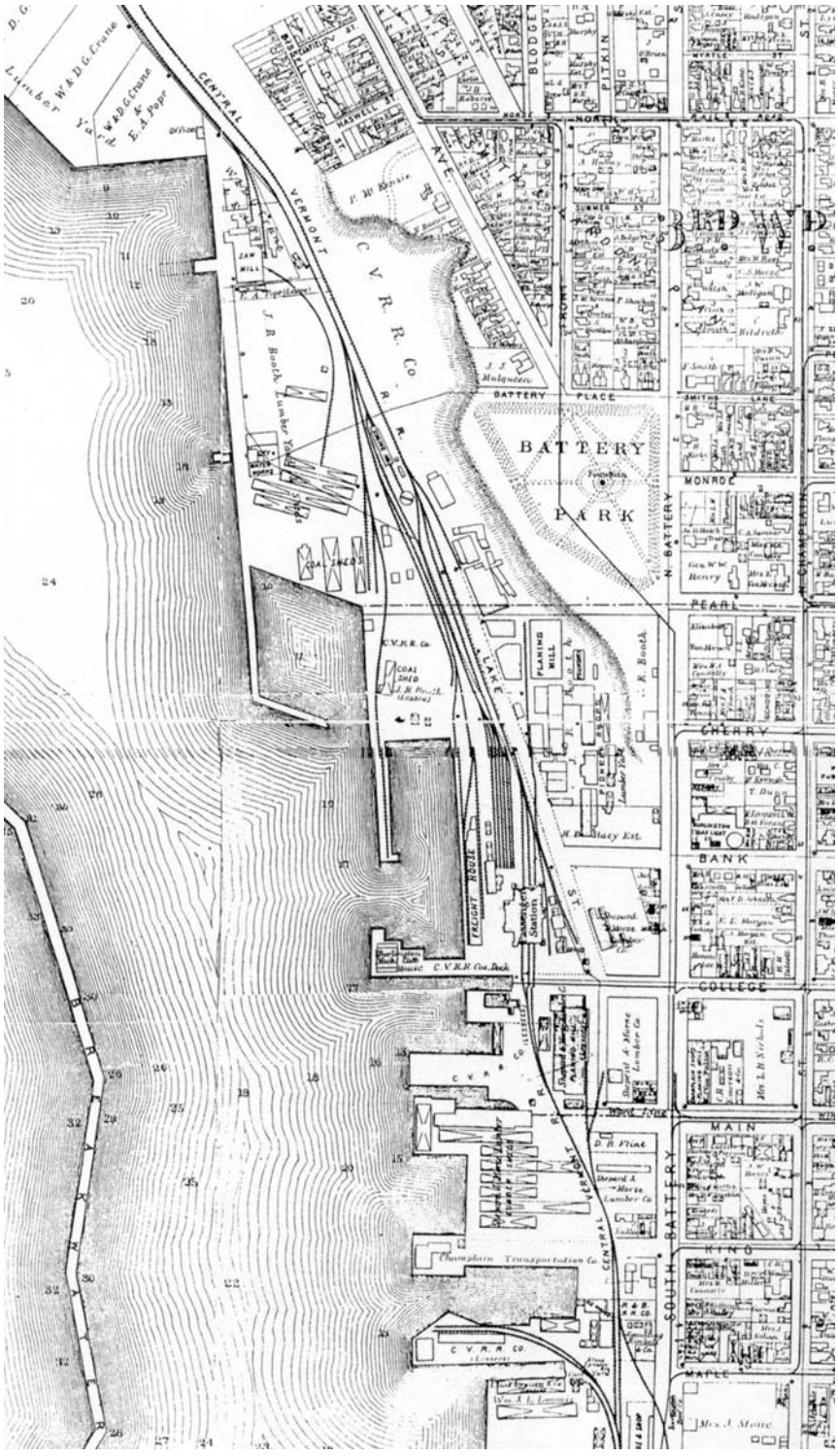


Figure 15. Detail of G.M. Hopkins' *Map of the City of Burlington, Vermont* (1890). This map shows the extent of the Pioneer Shops shortly before the fire of 1895.

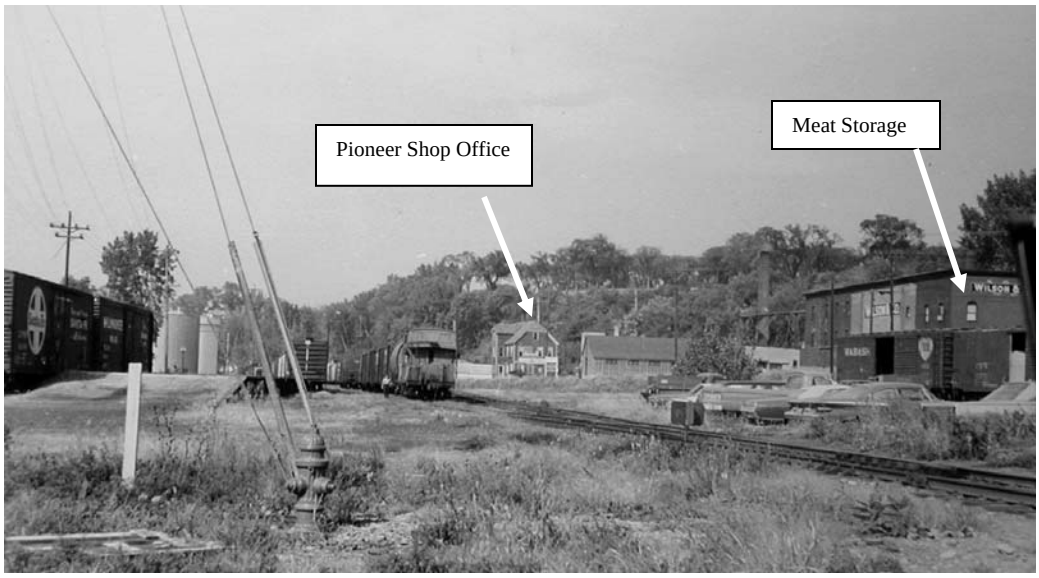


Figure 16. One architectural survivor of the 1895 fire was the office building, which was built in 1888 (*Burlington Free Press* March 20, 1895) (Burlington Photo File 2-19.23, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). This building was razed sometime after 1978 (Sanborn Insurance & Publishing Company 1894, 1900, 1906, 1912, 1919, 1926, 1938, 1942, and 1978). The brick meat storage structure at right, which is still standing, was built between 1894-1900 and was used by several provision companies well into the 20th century (including Wilson & Co., the name of which can be seen on the sign on the south wall in this image) (Sanborn Insurance & Publishing Company 1894, 1900, 1906, 1912, 1919, 1926, 1938, 1942, and 1978).

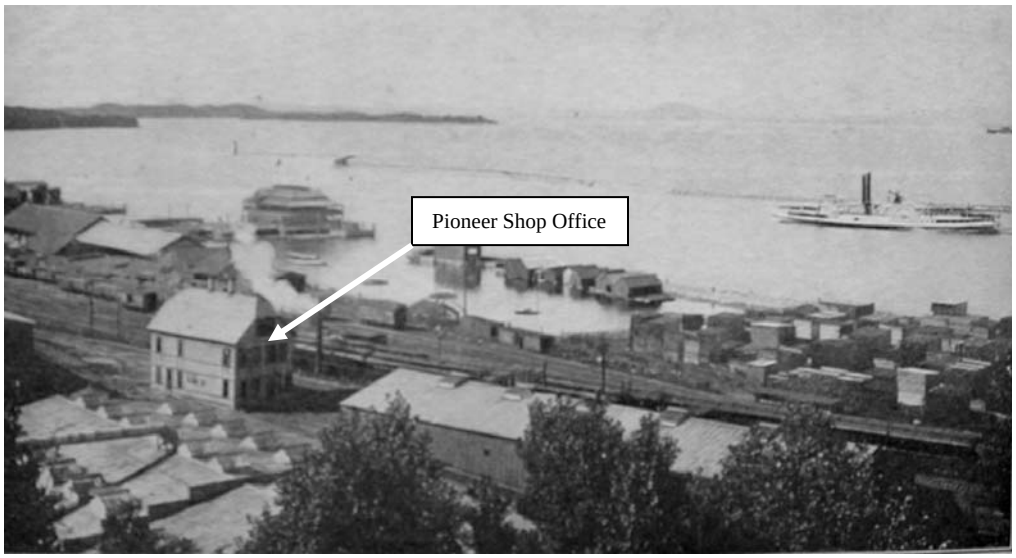


Figure 17. The Pioneer Shop Office, looking southwest (Wilbur Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Figure 18. Another survivor of the 1895 fire stands at right in this image.

After this devastating fire, J. R. Booth, the owner of the property once again began to rebuild; in some cases reusing the old stone foundations (Figure 19) (Sanborn Insurance & Publishing Company 1900, 1912, 1926, 1938, 1942, and 1978). The new complex was leased primarily to the Baldwin Manufacturing Company and Morgan Brothers (makers of doors, sashes, and mouldings) (Sanborn Insurance & Publishing Company 1900, 1906, and 1912). Later in the 20th century, the buildings became home to the John E. Booth Lumber Company and the Burlington Lumber Company (Sanborn Insurance & Publishing Company 1926 and 1938). The northern portion of the complex (the Burlington Lumber Company) was razed or removed by 1978 (Sanborn Insurance & Publishing Company 1978).

Figure 19. Early 20th century postcard (Postcard Collection, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

The Blodgett Mill

Closely associated with the Pioneer Shops was the mill of C. Blodgett, Sons & Co. Calvin Blodgett (1798-1873), a native of Randolph, Vermont, established this company in Burlington in October of 1852 with opening of a wholesale lumberyard (*Burlington Free Press* February 24, 1872 and October 20, 1873). Shortly afterwards, the company purchased the newly constructed H.W. Catlin planing mill located north of the Pioneer Shops (see Figures 11 & 13) (*Burlington Free Press* February 24, 1872). In 1872, the company's property included their mill, which measured "110 feet in length, by (including the shed at the side) 80 in width," and a newly built 84 x 40 ft building for the manufacture of clapboards (*Burlington Free Press* February 24, 1872). The engine house was set into the hill to the east. There, "two large boilers 25 feet long by 5 ½ feet in diameter, supply steam. They run in the mill six double planers, of Wood's patent, planning at once both sides and both edges of a board; one single planer; one large re-sawing machine; one large double clap-board planer and joiner, besides saws, etc" (*Burlington Free Press* February 24, 1872). During the fire of 1882, the saving of the Blodgett mill was seen as "little short of a miracle" (*Burlington Free Press* November 23, 1882). However, time eventually took its toll on the old mill and in 1895 it was reported that the Blodgett Mill had been condemned and was to be "razed to the ground on account of the danger to surrounding property in case of fire" with the exception of the "new part occupied by the Baldwin Refrigerator company" (*The Daily News* June 25, 1895).

As mentioned above, the Baldwin Manufacturing Company (est. 1882), which made a highly successful internationally known dry air refrigerator, had its main shop in the Pioneer Shops (Rann 1886:470). However, the company also leased the Blodgett mill (beginning ca. 1883) and built an additional large warehouse east of Lake Street and north of the Blodgett mill (*Burlington Clipper* March 21, 1895; Rann 1886:470; Sanborn Insurance & Publishing Company 1894 and 1900). The warehouse, which replaced an earlier storehouse, actually extended into the right of way of Depot Street and was either reduced in size or replaced between 1912 and 1926 (Sanborn Insurance & Publishing Company 1912 and 1926). Today, much of the area once occupied by the Blodgett mill and its associated support buildings is now the site of a group of 20th century condominiums (Figure 20).

Figure 20. Looking north along Lake Street in the 1960s (Burlington Photo File 2-19.21, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Note

South of the Pioneer Shop area, in the area presently occupied by the extensive Main Street Landing Building, there were once several 19th century retail lumber sheds and storage lumber sheds as well as small offices belonging to the Shepard & Morse Company. These sites have been largely lost to the present development.

Summary

While the Blodgett mill site appears to have been largely lost to 20th century development, there are some potentially important archaeological sites within the Pioneer Shop area of the APE of the current project. The Pioneer Mechanics Shops was initially

an innovative community financed 'incubator space,' which played an important role in Burlington's early economic development. Although, there have been several destructive fires and subsequent rebuilding episodes on the site, there still are some areas of potential archaeological sensitivity.

For example, the Brink Foundry site (ca. 1850s-1891) may have intact subsurface structural remains that could prove useful in understanding this branch of 19th century industry (see Rolando 1992). Early on in Burlington, foundries were often an uncertain business: they "passed from hand to hand stopped and started again, and ten or twelve different proprietors who conducted the business in turn, all either failed or were glad to sell out" (*Burlington Free Press* January 28, 1872). This trend stabilized somewhat with the arrival W.H. Brink. Little is presently known of the W.H. Brink Company or its possible predecessors (i.e. H.L. Simonds, Fisk and Brick, W.H. Root, Hamilton & Cook, and/or Hamilton & Seaver). However, it has been reported that Wallace H. Brink (1829-1891), a native of Elmira, New York, first established a foundry in Winooski in 1851 before moving his business to a site near the Pioneer Shops in 1857 (*Burlington Free Press* March 28, 1891). This company specialized in heavy castings of iron and brass (*Burlington Free Press* October 22, 1869; Rann 1886:473). A brief description of the Brink foundry appeared in the *Burlington Free Press* in 1872:

> "the building is of brick 120 feet long by 40 wide. The cupola, in which the iron for casting is melted, is one of the largest in the state, and will melt ten tons of iron at a time. The blast is furnished by one of Sturtevant's improved pressure blowers. The largest casting ever made in the State was made a few days since, being an immense circular plate or wheel of iron, twelve feet in diameter and weighing seven tons. . . The concern employs from 12 to 16 hands. The iron used is Scotch and American pig iron, mixed with old scrap. About five hundred tons were melted last year, which shows an active business. The concern furnished the brass and iron castings for five large mills last year including two mills in Ogdensburg and one in Plattsburg. They 'pour' every day in summer and every other day in winter . . . Sundays and holidays excepted" (*Burlington Free Press* January 28, 1872).

The Brink foundry was completely destroyed in the fire of 1882 but was quickly rebuilt on the same site. It eventually ceased operation after the death of Mr. Brink and the building was being used for storing lumber when it was again destroyed by fire in 1895 (*Burlington Free Press* March 20, 1895; Sanborn Insurance & Publishing Company 1894). A wood shaving house was built on the site by 1900--but it was removed between 1912 and 1926 (Sanborn Insurance & Publishing Company 1894, 1900, 1906, 1912, 1919, and 1926).

Also, depending on how the area was developed as an industrial site, there is a possibility of locating shoreline precontact Native American sites in the Pioneer Shops/Blodgett Mill area. Limited subsurface testing in this area should be able to accurately determine archaeological potential for this resource.

The Yards

Much of the current project area lying under and west of Lake Street sits on manmade land created in the mid-19th century (Horton 1912; Visser et. al. 1990). West of the Pioneer Shops, there are two large areas of filled land. The first dates to ca.1847-1850 and the second dates to ca. 1860-1862. Historic maps and documents indicate that most of this fill was directly or indirectly associated with the Central Vermont Railroad (which absorbed both the Vermont Central Railroad and the Vermont & Canada Railroad). The contractors for this section of the Vermont Central, Messrs Brown and Mills, broke ground in Burlington on February 19, 1846 in the north part of town at the "interval bank" on the farm of John N. Pomeroy (*Burlington Free Press* February 20, 1846). That year, some two thousand men were put to work all along the line (*Burlington Free Press* September 4, 1846). An observer noted that "in the vicinity of [Burlington] some two or three hundred are at work [mostly Irish and French from Canada], but the road seems to advance but slowly. They are cutting through sand hills in several places to a depth of 80 or 90 feet; and the whole work is done by hand" (*Burlington Free Press* September 4, 1846).

In October of 1847, while their competitors, the Rutland & Burlington Railroad, were "filling up the Cove opposite the south end of Water Street [Battery], for [their] Depot Grounds and Building, " the Vermont Central, through the agency of Harry Bradley, commenced "constructing the required Quays prepatory to filling the necessary space for the Terminius and Depot Buildings of the Central Road, north of Blinn's Wharf" (see Figure 5) (*Burlington Free Press* October 1, 1847). One local newspaper commented "we have seen drawings of these noble works, which are to be completed in a style and a thoroughness that will render them creditable both to the Corporation and to the Village" (*Burlington Free Press* October 1, 1847).

It appears that a local landowner, Nathan B. Haswell, sued to prevent the Vermont Central/Vermont & Canada from running their tracks further north along the lakeshore forcing the company to take an curious route through a large natural ravine that cut though the center of Burlington in order to connect to their waterfront infrastructure (*Burlington Free Press* September 17, 1850; Horton 1912). In April of 1850 the *Burlington Free Press* reported "the work of grading the line through Burlington, and of filling on the Lake Shore for [the Vermont Central] Depot and Station Buildings, is proceeding with energy and dispatch. The Grounds and Docks of the Company, when completed, will be remarkably spacious and commodious" (*Burlington Free Press* April 22, 1850). In excavating the ravine, the company employed early steam shovels to modify and enhance the ravine to suit their purposes. The *Burlington Free Press* reported in September of 1850:

> "the two steam shovels met and exchanged congratulations some days ago in the excavation north of Pearl Street, looking very much, (in the bowels of the earth as they were) like a pair of subterranean elephants meditating a spree! The North Shovel backed out however, and the other continues soberly and patiently to work on. Both these wonderfully ingenious and powerful machines have attracted crowds of visitors, all summer" (*Burlington Free Press* September 17, 1850).

One “rather inexperienced citizen, from the neighborhood of Ripton, after looking at it [a steam shovel] awhile in profound silence, the other day, observed that he ‘would be gosh darned it that wa’n’t’ bailin’ out the airth accordin’ to Gunter!” And ‘how in thunder that bottom knew enough to fall out, every time, jest over them cars, *he* didn’t know!” (*Burlington Free Press* April 22, 1850). It is possible, even likely, that some of the sandy fill from the ravine excavation was used to build new land on the waterfront.

One source claimed that when the Pioneer Shops was built in the early 1850s the “stones under its southwest corner were in the lake” (*Burlington Free Press* March 20, 1895). If this accurately indicates the location of the original shoreline, it is clear that the land to the west of the shops was soon filled to make room for the terminus of the railroad (see Figure 9) (Presdee and Edwards 1853). Lake Street, which runs along the western edge of the Pioneer Shop complex, was initially opened from Main Street to College Street in 1844 and was later extended northwards as needed (Horton 1912). In 1855, the *Burlington Free Press* reported “the roadway recently completed by the Selectmen from the foot of College Street to the Pioneer Mechanics Shop, is a decided improvement in that Quarter. By it, teams can pass from the Pioneer Shop to Water Street [Battery Street] on an ascent of easy grade and without crossing the railroad track” (*Burlington Free Press* November 3, 1855).

The area of filled land lying immediately west of the Pioneer Shops and the Blodgett Mill was the site of numerous railroad tracks, lightly constructed lumber and coal sheds, and the Vermont Central Railroad’s brick engine house and turntable. However, most of this built land was leased by the railroad company to various lumber companies for their lumber stacks (Figure 21).

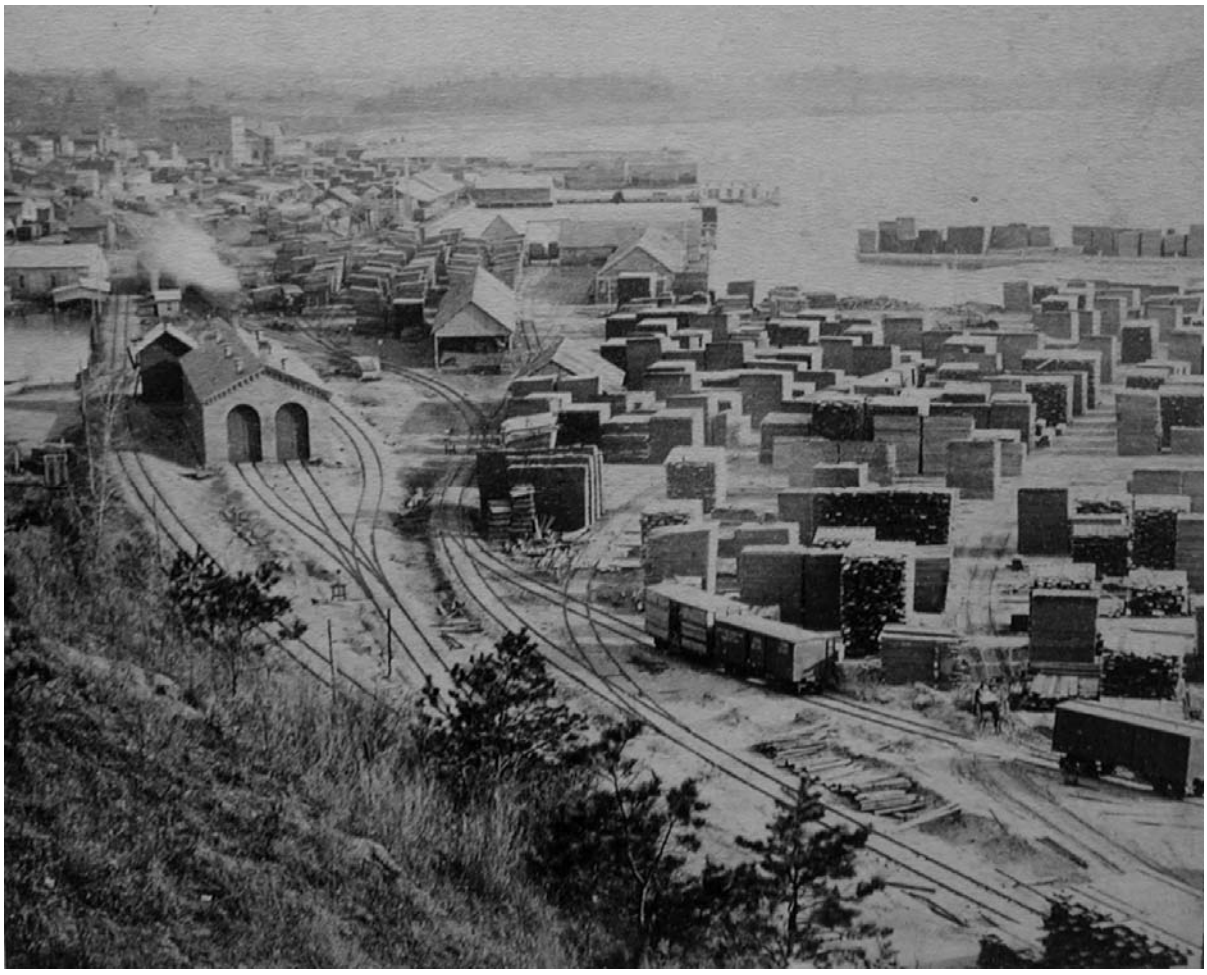


Figure 21. View of the rail yards and lumberyards north of the Pioneer Shops, looking south (Stereoview Collection, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Moving westward there is another large area of filled land, which dates to 1860-1862 (Wainwright 1862; Walling 1857). By the late 1850s, complaints concerning the bridges and street crossings associated with the Vermont Central/Vermont & Canada line through the city and the lack of a physical connection with the Rutland & Burlington Railroad and the Central Railroad forced the Central Vermont to take on the task of creating a new route along the lakeshore, through the high bluff, skirting the Intervale, and crossing the bridge to Winooski (Horton 1912). To create this new route, the railroad company bought much of the bluff that the Lakeview Terrace neighborhood now stands upon. By the latter part of February 1860 it was reported "three gangs of men are now at work on the line of the new connection of the Vt. & Canada with the R. & Burlington Railroads in pursuance of the provisions of the Act of the last session of the Legislature. The workmen are engaged on the heavy cuts and embankments on the farm of J.N. Pomeroy, Esq., north of the village" (Blow 2003:68; *The Daily Times* February 29, 1860).

While H. R. Campbell was the contractor for the technically challenging 300 ft long horseshoe-shaped brick lined tunnel, the chief engineer for the rest of the project, with its extensive embankments, cuts, and wharfing, was D.C. Linsley (*Burlington Free Press* March 2, 1860; *The Daily Times* February 29, 1860). In March of 1860, one local newspaper observed, "work upon the new route through 'the sand bank' north of the village is in active progress. We understand that the grade of the new track will be a descending one of 40 feet to the mile from the bridge over the Winooski to the interval, across which it will pass on a level, then descending again through the sand bank to the lake shore. The contractors for the principal portion of the excavation are Messrs. Charles Linsley & Co. As their contract includes the digging out of a cut some 1500 feet long by 75 to 80 feet deep, it is plain that they have some work before them" (Figure 22) (*Burlington Free Press* March 2, 1860). Work reportedly continued both day and night (*The Daily Times* March 2, 1860). The massive amount of sand removed from the long approach to the tunnel as well as the tunnel itself probably provided much of the fill for the area west of the Vermont Central Railroad's engine house (Figure 23).

Figure 22. View of the cut leading to the railroad tunnel under North Avenue, looking westerly, taken after ca. 1868 (Burlington Photo File 2-6.1, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). The filled land just beyond the cut was created after the image in Figure 23 (next) was taken.

Figure 23. Burlington waterfront looking south; taken ca. 1866-1867, featuring the land built by the railroad ca. 1860-1861 (Burlington Photo File 1-22.43, Wilbur Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

On part of the filled land created ca. 1860-1862 the City of Burlington built its first municipal waterworks in 1867 (Figure 24). Previous to this time, the residents of Burlington obtained their water from a variety of sources. Part of the city was supplied by the Burlington Aqueduct Company (est. 1849), which maintained a reservoir on Pearl Street (Rann 1886:442). Other households relied on springs, wells, cisterns, and even water deliveries from the Lake. The switch to city water was, in part, prompted by growing the concern that private wells could be easily contaminated by seepage from the numerous privies required by an expanding population. Outbreaks of cholera in the 1830s and 1840s that ravaged parts of the United States (although not Burlington) convinced many in more urban areas to make the investment in public water systems (Thayer 1866). On October 21, 1867, the *Burlington Free Press* noted, "the construction of the city water-works [by Spear & Thayer] continues in active progress, and the heaviest portions of the work approach completion" (*Burlington Free Press* October 21, 1867). The pump house on the lakeshore had a 80-85 foot chimney stack and was equipped with an Worthington engine capable of pumping 300,000 gallons up to the large reservoir on Main Street near the University of Vermont in ten hours (*Burlington Free Press* October 21, 1867; Sanborn Insurance & Publishing Company 1869). This facility began operation on December 25, 1867 (*Burlington Free Press* December 26, 1867).

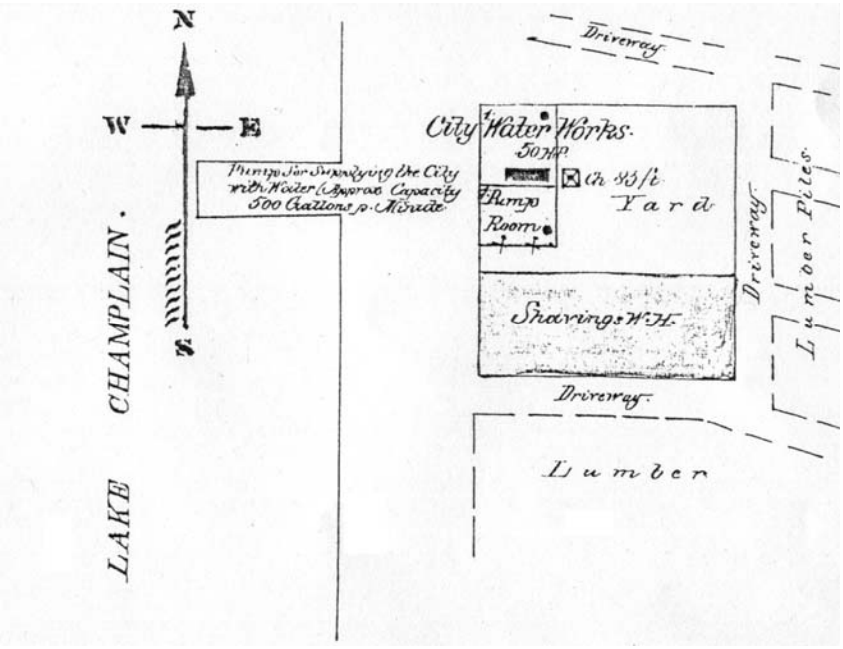


Figure 24. The original City Waterworks (Sanborn Insurance & Publishing Company 1869). This building had iron shutters, iron doors, and a tin roof (*Burlington Free Press* December 25, 1894).

This water system was not an immediate success. Many of Burlington's residents were convinced that the persistence of typhoid fever and intestinal disorders within the city were the result of the close proximity of the plant's water intake pipe to the city's sewage discharge pipe (Perkins 1906:278-280). The problem was not satisfactorily resolved until ca.1894-1895, when an extension of the intake pipe three miles out into the lake to Appletree Point reef put "the purity of [the] water supply . . . beyond question" (*Burlington Free Press* April 2, 1895; Perkins 1906:278-280).

On a very windy Christmas Eve 1894, a fire began "in the old railroad woodshed directly west of the foot of Pearl Street," which was then being used "by the Vermont Shade Roller Company as a storehouse for stock, which was dry and of a size that burned readily" (*Burlington Free Press* December 25, 1894). The fire soon spread to the extensive lumberyard of J.R. Booth. The ensuing firestorm could be seen distinctly in Plattsburg and illuminated the night sky in Essex to the degree (it was said) that a newspaper could be read at Fort Ethan Allen (*Burlington Free Press* December 25, 1894 and December 26, 1894). By the time it was over, more than 15 acres of lumber piles, several woodsheds, two unoccupied offices, and a number of freight cars (some loaded with coal others with barrels of oil) were destroyed and the engine house belonging to the Central Vermont Railroad was slightly damaged (*Burlington Free Press* December 25, 1894 and December 26, 1894). The fire so completely consumed the stacks of lumber that "the strong winds from the south during the fire and from the northwest during the day had scattered the ashes so that the ground was as clean as an open field" (*Burlington Free Press* December 26, 1894).

Despite the fact that it was surrounded on three sides by burning stacks of lumber, the city's pumping station not only survived, but through the efforts of the city engineer, Joel W. Thomas, and his assistant, kept operating (*Burlington Free Press* December 25, 1894 and December 26, 1894). The heat "there was so intense as to crack and splinter the granite coping on top of the well" and warped the iron girders of the adjoining brick fuel shed (*Burlington Free Press* December 25, 1894 and December 26, 1894). "The wooden building over the pump well was destroyed, its tin roof and cinders falling into the well" and the cornice of the waterworks were slightly singed (*Burlington Free Press* December 25, 1894 and December 26, 1894). Following the fire, an agreement was made with the Central Vermont Railroad Company "for the lease of additional ground about the pumping station, which would keep all other buildings or any piles of lumber a sufficient distance [away] to make the pumping station safe in case of another fire" (*Burlington Free Press* December 25, 1894 and April 2, 1895).

After the fires of 1894 and 1895, there "a substantial decline" in Burlington's lumber industry due to western competition and to the dwindling lumber imports from Canada caused by the Dingley Tariff of 1897 (Corey and Petersen 1998:22). Although the Booth Company and others rebuilt some lumber based businesses on the Pioneer Shops site, the industry, never regained its former vitality. In the 20th century portions of the once bustling lumberyards were converted to new uses; specifically for improvements to the city water system, electric power generation, and the storage of petroleum products. In the fall of 1904, the City of Burlington began construction of a municipal electrical light plant immediately east of the waterworks (Figure 25) (City of Burlington 1906:53; Sanborn Insurance & Publishing Company 1900 and 1906). This building was ready for the installation of its steam and electrical equipment in January of 1905 (City of Burlington 1906:53). On April 29, 1905 the Burlington Electric Department began service when current flowed to two circuits of streetlights (City of Burlington 1906:53).

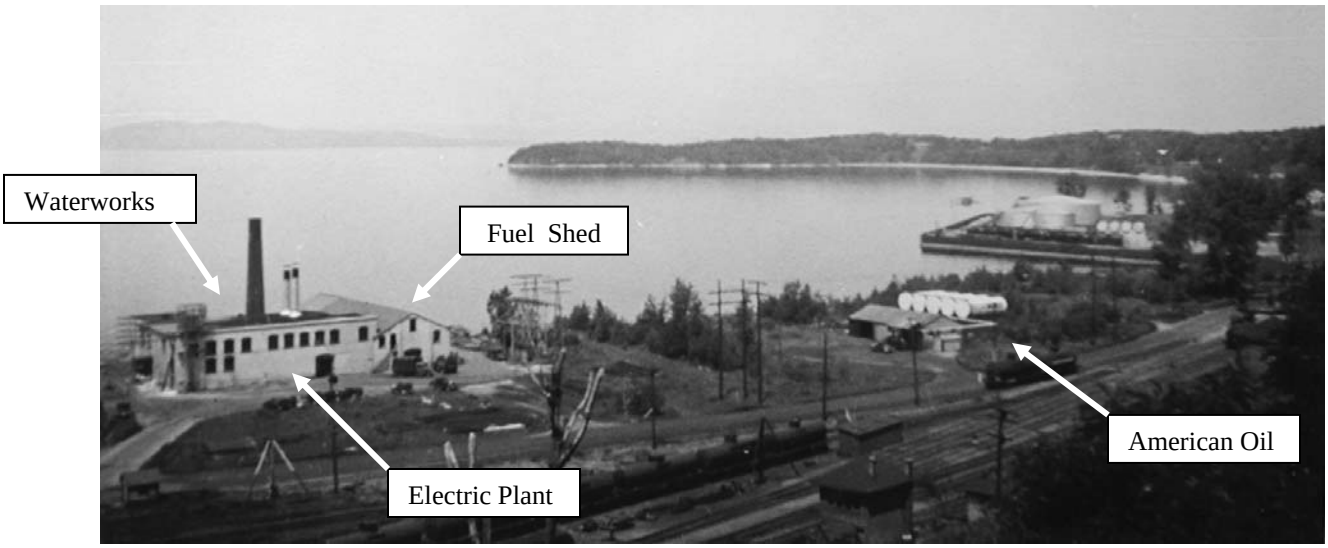


Figure 25. Burlington's first municipal electric plant built 1904-1905 (Burlington Photo File, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). The fuel shed of the city waterworks was originally located on its south side. The present brick building was constructed between 1877 and 1889 (Meilbek 1877; Sanborn Insurance & Publishing Company 1889).

Later in 1905, despite claims made eleven years prior that the extension of the water intake pipe to Appletree Point reef had solved the water supply permanently, the mayor pointed out "since that time our population has largely increased, and, in addition, Fort Ethan Allen has been built and at the present time has about 1,500 people living there. Winooski, also, has increased in population during this time, and when we consider that the sewage caused by this large number of people is all diverted into the water from which we get our supply, is it any wonder the analysis of the government experts recently made report to the effect that we are drinking out of our own cesspool?" (City of Burlington 1906:16). In response, the city built a mechanical water filtration plant south of the water pumping station 1906-1907 (Figure 26) (City of Burlington 1906:16; Sanborn Insurance & Publishing Company 1906 and 1912). The filtration plant structure was eventually replaced by or absorbed into the present building, which now houses the Burlington Water Department Offices.

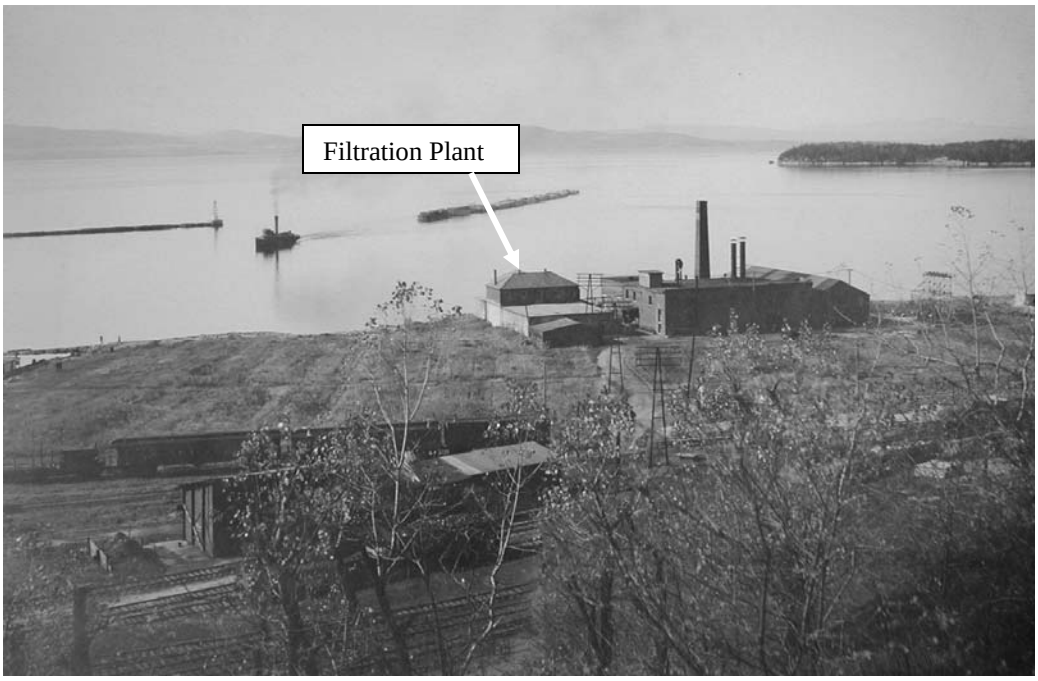


Figure 26. The filtration plant built 1906-1907 (McAllister Collection A3-3-1, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

The old municipal electrical plant, described above, continued in service until the 1950s. However, occasional power shortages in the years after World War II highlighted the need for a new facility. The coal fired J. Edward Moran Generating Plant was built in 1952-1954 immediately north of the city waterworks (Figures 27 & 28) (Blow 2003:69).

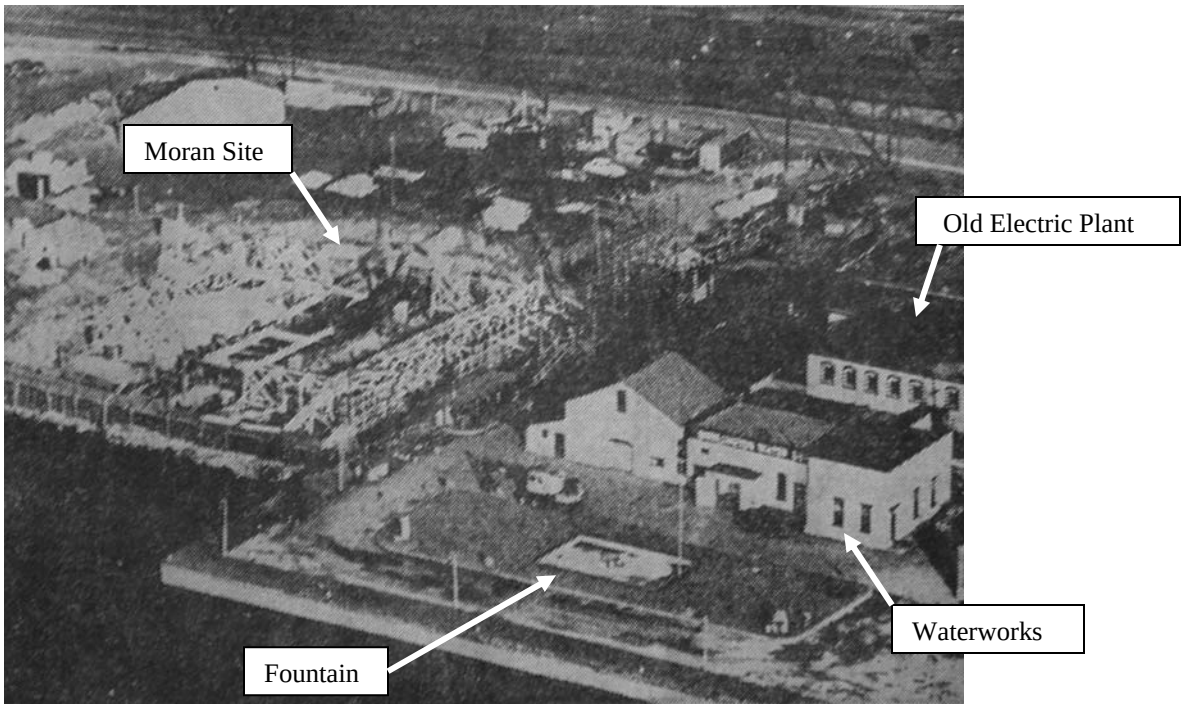


Figure 27. Aerial view of the Moran Generating Plant construction site in January of 1953 (Newspaper Clipping Collection: Burlington, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

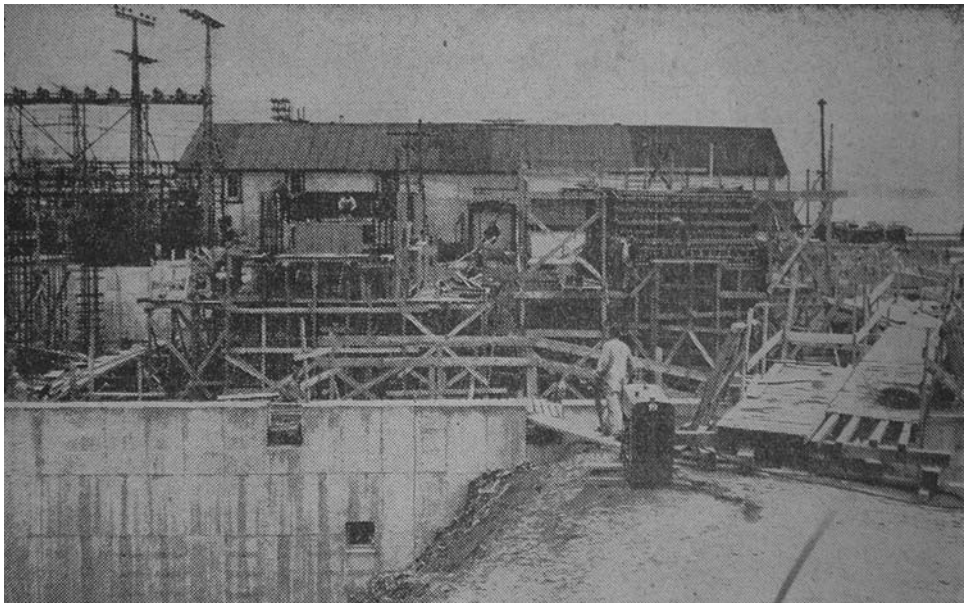


Figure 28. Construction of the Moran Generating Plant, looking south. The north wall and roof of the waterworks fuel shed can be seen in the background (Newspaper Clipping Collection: Burlington, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Unfortunately, placing such a large coal burning plant up wind of the city proved to be problematical. The Lakeview Terrace neighborhood, which began to develop in the late 1880s on the top of the bluff to the east suffered acutely. The plant "regularly spewed out fly-ash and soot that proved difficult to clean up. A large cloud of black smoke hung over the entire neighborhood. Women who hung their clothes outside often found it covered with black fly-ash cinders and soot" (Blow 2003:69). After being cited in 1975 for violating EPA emission limits, the city attempted to convert the Moran plant to a wood burning facility. In 1977, the Moran Plant began burning wood chips as part of an experiment, which eventually led the city to build the McNeil Generating Plant on the Intervale north of the city in the early 1980s (Blow 2003:69, 83). The Moran Plant was shut down in June of 1986 and has stood vacant since (Blow 2003:69).

A U.S Coast Guard Station was built just south of the Burlington municipal water buildings ca. 1948 (Figure 29). The current Coast Guard Station replaced these buildings in 1993. Elsewhere, on the former lumberyards, beginning in the 1930s, there was the construction of numerous large oil tanks (Sanborn Insurance & Publishing Company 1926 and 1938). Eventually, all of these oil tanks were removed and, within the current project area, the present-day Waterfront Park was created.

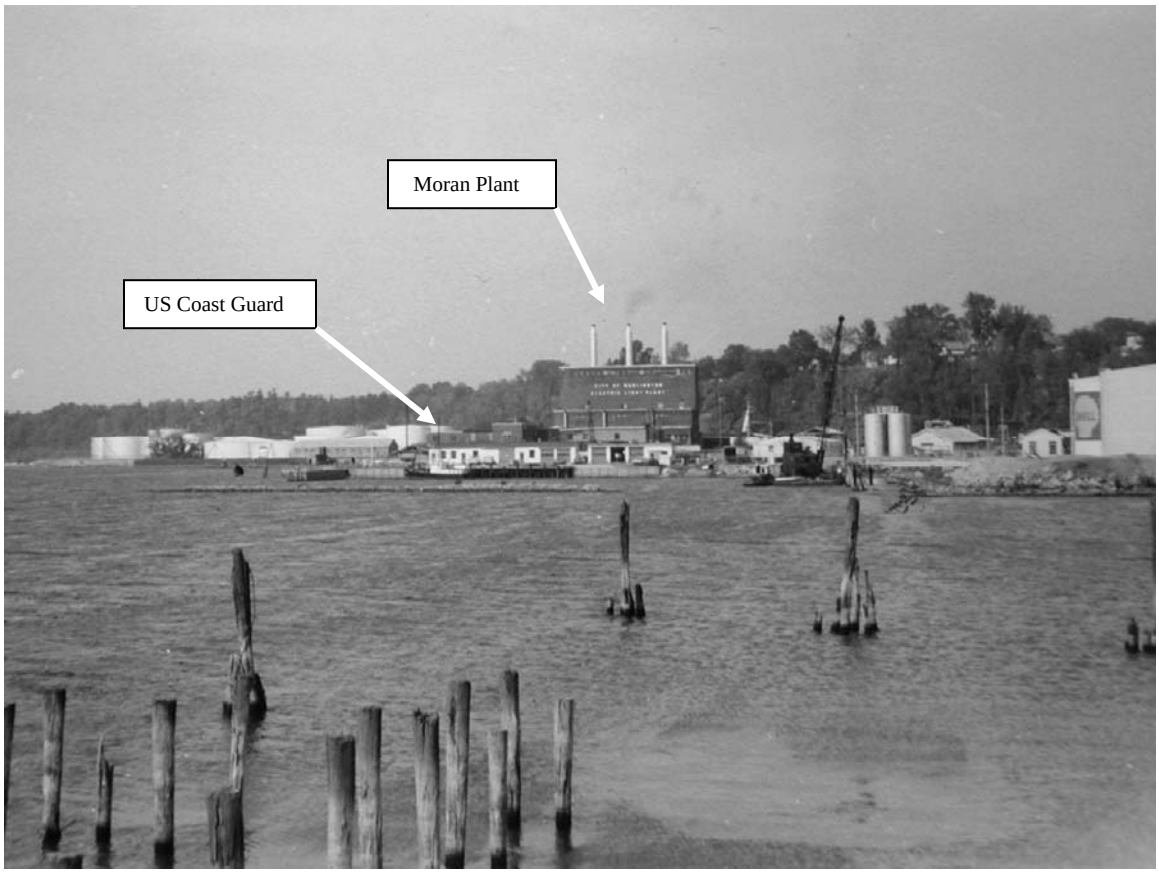


Figure 29. View looking north from the Central or Steamboat Dock at the foot of College Street (Burlington Photo File 1-22.32, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). The towering Moran plant can be seen in the middle distance, the city waterworks and the old Coast Guard building stand in front of it. The large oil tanks at right stand on the site of today's Waterfront Park

Summary

Within the Yard portion of the current study area, the overall potential for archaeology is limited. The land in this area was nearly all manmade, created after ca.1847. Subsequently, much of this land was occupied by railroad tracks, stacks of lumber and numerous coal, lumber, storage, and shaving sheds. Although some substantial 19th or early 20th century structures, such as the City's waterworks, were built in this area, most of these structures have been replaced or integrated into new structures and/or their inherent archaeological potential is low. However, it is possible that some evidence of the earlier Vermont Central Railroad engine house and turntable from the second half of the 19th century may persist near the present skate park. A similar railway turntable was identified in the southern portion of the Burlington waterfront (VT-CH-736) and briefly investigated by archaeologists with the University of Maine in the 1990s (Corey and Petersen 1998). Furthermore, some evidence of old bulkheads (belonging to the 1847-1850 waterfront) may still survive within this part of the project area. Although, theoretically possible it is unlikely that precontact Native American sites, if

present, could be identified in this area. All of this area is fill land and most likely saturated and unstable at depth.

Depot Street

Depot Street was opened in March of 1850 in response to a petition presented to the town selectmen by a number of citizens who pointed out that a "road from the foot of North Street near the ['Fiddler'] Thompson house in a southerly direction to the Central Depot grounds" was desirable. The petitioners noted "it is believed that an exceedingly favorable grade may be obtained and that the road may be now constructed at little or no expense to the town. There is already a large population in the northern division of the town and its business and importance rapidly increasing; and yet singular to say there is at this moment no point north of Main Street from which access can be had to the lake or its business" (*Burlington Free Press* September 17 1852; Burlington Town Records Vol. 30B:115-116). At the time, the land upon which Depot Street was to be laid belonged to Nathan B. Haswell and the Vermont Central Railroad. Neither apparently objected to the creation of the road and Depot Street was laid out four rods (20.1 m or 66 ft) wide from a point 45 links (9.1 m or 30 ft) south of the intersection of North Street and North Avenue and running southwardly to the connection with Lake Street approximately 18 chains (362.1 m or 1188 ft) (Burlington Town Records Vol. 30B:117-119).

In 1909-1910, the city had to initiate four suits of ejectment against "persons infringing upon the public's right upon Depot Street" (City of Burlington 1911:101). As a result of this legal action, H.S. White was "compelled to move his buildings off the highway" while the Baldwin Refrigerator Company, "whose store house projects more than half across the foot of this highway" reached an agreement with the city to "re-fit the street around the north end of the store house" without the City relinquishing any of its rights to the original right of way (City of Burlington 1911:101). The city attorney reported "the two other suits . . . against Daniel Mansur and George Saiger . . . probably will not be pushed, as the needs of the public can be met at present without so doing" (City of Burlington 1911:101). Saiger owned the building that later became Burlington College. The city report for that year (1911) added, "work upon this street has been prosecuted during the winter. It is now passable and of considerable value, especially to dwellers in the northwest section of the city" (City of Burlington 1911:101). During this work "a stairway was built on the west side from a point near the round house to a point about 40 feet easterly therefrom [sic], costing about sixty dollars" (City of Burlington 1911:123).

Just east of the northern end of Depot Street, at the top of the bluff, there is known multi component site (VT-CH-961). This site is better known as the War of 1812 Cantonment and Military Burial Ground site. A number of historic period human burials have been recovered from this site. In addition, a small number of chert flakes, indicative of precontact Native American tool production and/or maintenance, have been recovered from this site. However, a portion of the intersection of North Avenue and Depot Street may be fill soil. There is a large area of fill where the Burlington College parking lot is now located (Figure 30).

Figure 30. A ravine near the upper portion of Depot Street, looking east, ca. 1930s (McAllister Collection, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). This area was filled in, possibly with the remains of a downtown hotel destroyed by fire, and is now the parking lot for Burlington College. The white gas station seen across the street (North Avenue) in this image is part of the War of 1812 Military Burial Grounds. Rumors have also suggested that burials have been encountered near the Burlington College building (at left), but these reports have never been substantiated.

Summary

One potentially archaeologically sensitive area within the Depot Street portion of the current study area is the top of bluff near the intersection of Depot Street and North Avenue where the project area adjoins a known multi-component site, VT-CH-961. If ground disturbance is proposed in this area, depending on the exact location and nature of the disturbance, it is possible that further archeological evaluation may be necessary. Furthermore, several buildings or portions of buildings are known to have encroached into the right of way of Depot Street. However, in these cases, additional documentary research and/or a site inspection may be able to properly assess potential archaeological significance. Finally, a late 19th century to 20th century railroad engine roundhouse and turntable once stood within this portion of the current project area. However, these structures appear to have been partially or wholly lost to later 20th century construction.

Battery Street

Battery Street, formerly Water Street, was an early center of settlement in Burlington. Development was initially concentrated near the businesses that clustered

around the first commercial dock built ca. 1810 at the foot of present day Maple Street. Over the next several decades, a number of residences, taverns, eating saloons, shops, and hotels were built along both sides of the street. Growth along Battery Street was particularly strong in the 1820s to 1830s, after the opening of the Champlain Canal in 1823 and the establishment of the Champlain Glass Company (1827-1848) on at the top of the bluff, just north of the current project area (Liebs 1980:9; Rann 1886:462). As a direct result, lower Battery Street became an important commercial center known for its banks, hotels, wholesale, and retail houses while upper Battery Street assumed a more residential character (Liebs 1980:3, 9). Some additional buildings were added to Battery Street during the years associated with height of Burlington's waterfront industrial era ca. 1850-1900. However, beginning in the early 20th century "both commerce and transportation" shifted away from the waterfront and "with the construction of I-89, the City's orientation away from the waterfront became virtually complete" (Waterfront Board 1978:4). "The blocks between College and Pearl Streets, running from Battery Street east to South Champlain Street was increasingly regarded as a "one of Burlington's main slum areas" (Anonymous 1960:36). In 1958, in a bid to "attract businesses and raise the city property-tax base" the city proposed a radical urban renewal program (Blow 1991:34). The Champlain Street Urban Renewal Project called for the complete redevelopment of seven city blocks (27 acres) in which all the land was acquired and 124 structures were demolished (Burlington Planning Commission 1963:5). Demolition began in the spring of 1966 (Figures 31 & 32) (*Burlington Free Press* May 16, 1966; May 17, 1966). Not even "a flurry of upgrading and deferred maintenance work (including some new construction)" could save the neighborhood (Anonymous 1960:36).

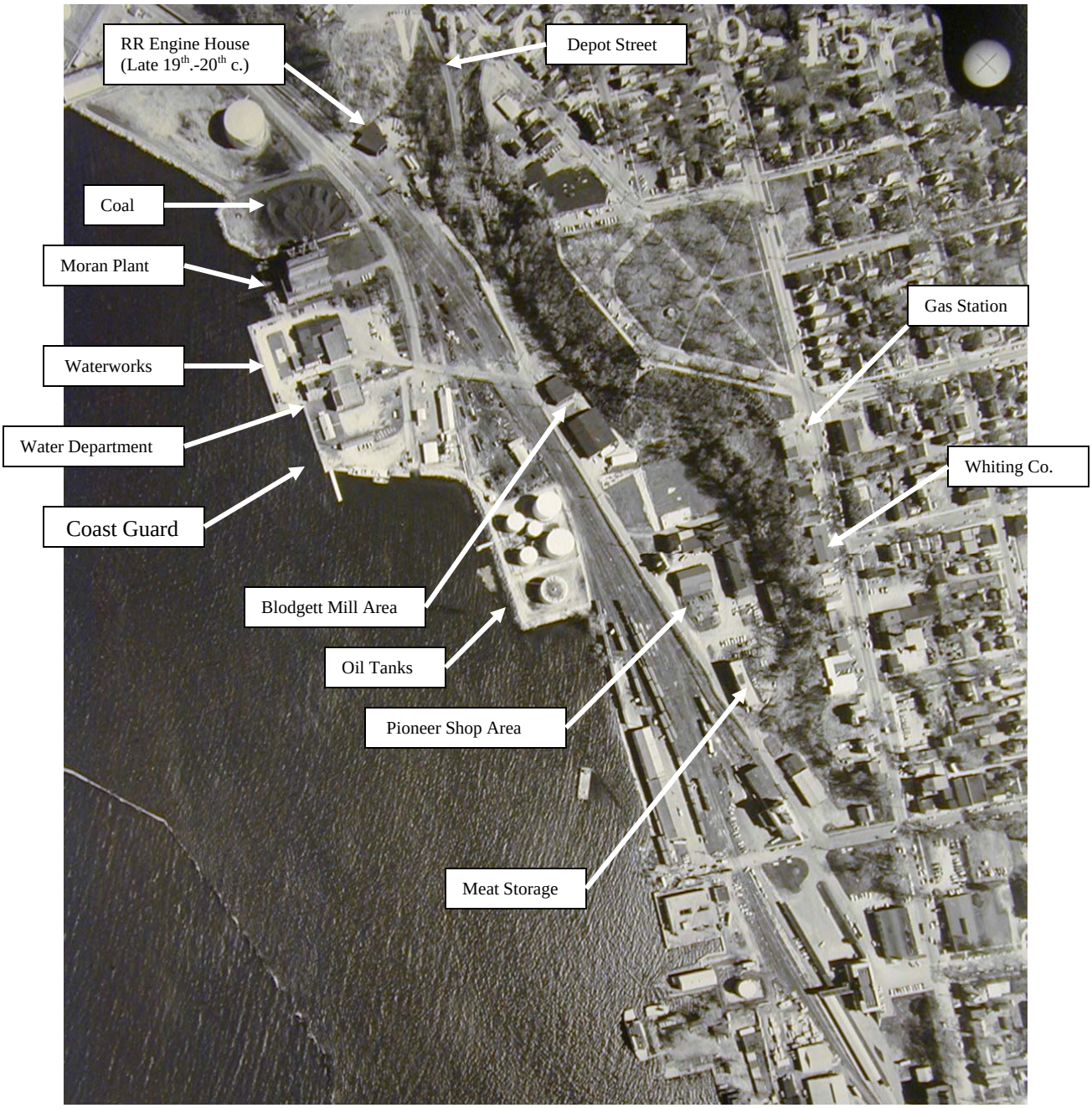


Figure 31. Detail of a 1962 aerial photograph showing study area and various landmarks before urban renewal on Battery Street (Geotechnics Inc. 1962, image on file at the Map Room, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

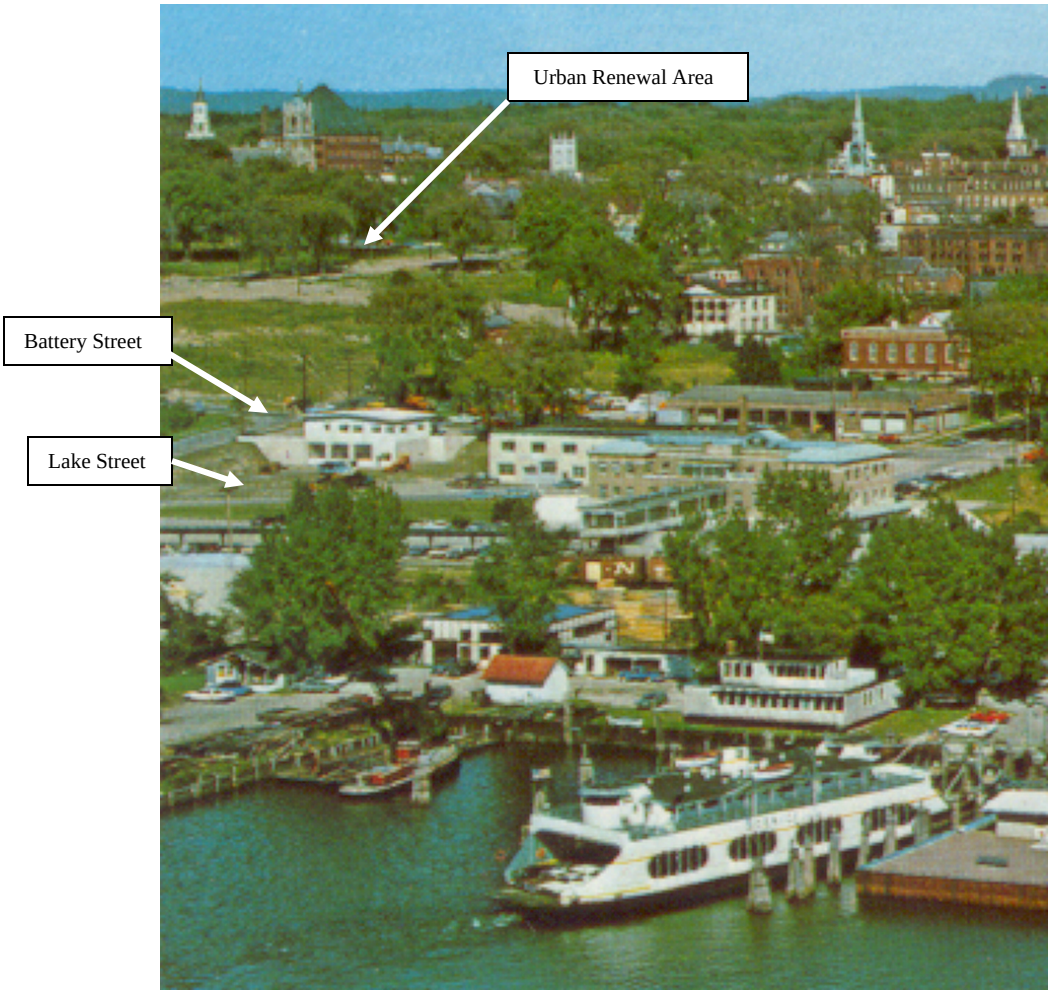


Figure 32. Postcard showing a portion of the current project area after the removal of the buildings within the Urban Renewal area, looking eastward from the lake.

Historic maps indicate that there were several early to mid-19th century structures within the current study area on the west side of Battery Street (see Figures 4, 5, and 9) (Presdee and Edwards 1853; Walling 1857; Young 1830). One structure immediately south of Battery Park belonged to a noted local, Nathan B. Haswell, and appears to pre-date 1830 (Presdee & Edwards 1853; Young 1830). All but three of these buildings appear to have been razed, destroyed, or removed before 1869 (see Figure 6) (Beers 1869). One interesting possibility suggested by the documentary research, is that at least one old two-story house on Battery Street was destroyed in a rather unsuccessful demonstration of the 'Phillips' Fire Anihilator' in September of 1852 (*Burlington Free Press* September 17, 1852 and September 20, 1852).

In the 1870s, a large three-story brush factory powered by the Pioneer Shop engine was built on the west side of Battery Street directly opposite the west end of Cherry Street, this was the original Whiting Company factory (see Figure 13) (*Burlington Free Press* November 23, 1882). A published history from the 1880s noted that the "E.B. & A.C. Whiting practically started a new branch of industry in 1873 by the

manufacture of brush stock, according to inventions which they had patented. They turn out all kinds of brush stock, especially dressed fiber, bristles, horsehair and tampico. Although they sell most of their goods in the United States, they also ship considerably to foreign countries . . . they employ from twenty-five to thirty-five hands" (Rann 1886:469). Later, between 1889 and 1894, this building was converted into a maple syrup and candy factory and was used as such until sometime between 1912 and 1926 (Sanborn Insurance & Publishing Company 1889, 1894, 1900, 1906, 1912, and 1926). It was then used for storage (Sanborn Insurance & Publishing Company 1926 and 1938). Maps suggest that a dwelling house was built just north of the Whiting Company building between 1869 and 1877, but which was removed by 1900 (Meilbek's 1877; Sanborn Insurance & Publishing Company 1889, 1894, and 1900). Between 1926 and 1938 at least four automotive shops, a filling station, and a railway express office popped up along the west side of Battery Street north of Bank Street (Figure 33) (Anonymous 1960:36; Sanborn Insurance & Publishing Company 1926 and 1938). These structures were all removed during urban renewal. The west side of upper Battery Street from Pearl Street to College Street is now part of the southern extension of Battery Park.

Figure 33. Gas station on the west side of Battery Street opposite the end of Pearl Street ca. 1930s (McAllister Collection A11-8-1, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont). This gas station was built between 1926 and 1938 (Sanborn Insurance & Publishing Company 1926 and 1938). Sometime before 1942 a garage was added to the south (Sanborn Insurance & Publishing Company 1942). Both structures were removed during the Urban Renewal project in the 1960s.

Presently, the eastern side of upper Battery Street within the current study area is dominated by structures built during and after the urban renewal program of the 1960s. For example, between Pearl and Cherry Streets stands the Cathedral Church of St. Paul; between Cherry and Bank Streets stands both the Wyndham and Courtyard hotels; and between Bank and College Streets stands a massive commercial and residential building. Before urban renewal, the east side of the street consisted of a mix of tenements, dwellings, shops (often converted houses), and a large woodworking shop at the northeast corner of Bank and Battery (which stood on the site of the old gas works; a superfund site from which all the soil had to be removed)--all of which were characterized as "a hodgepodge of unsubstantial structures" (Figures 34 & 35) (Anonymous 1960:36; Sanborn Insurance & Publishing Company 1900, 1906, and 1912). The activity associated with the removal of the old buildings as well as the subsequent construction has largely eliminated the archaeological potential on the eastern side of Battery Street within the current project area. However, there may be some exceptions.

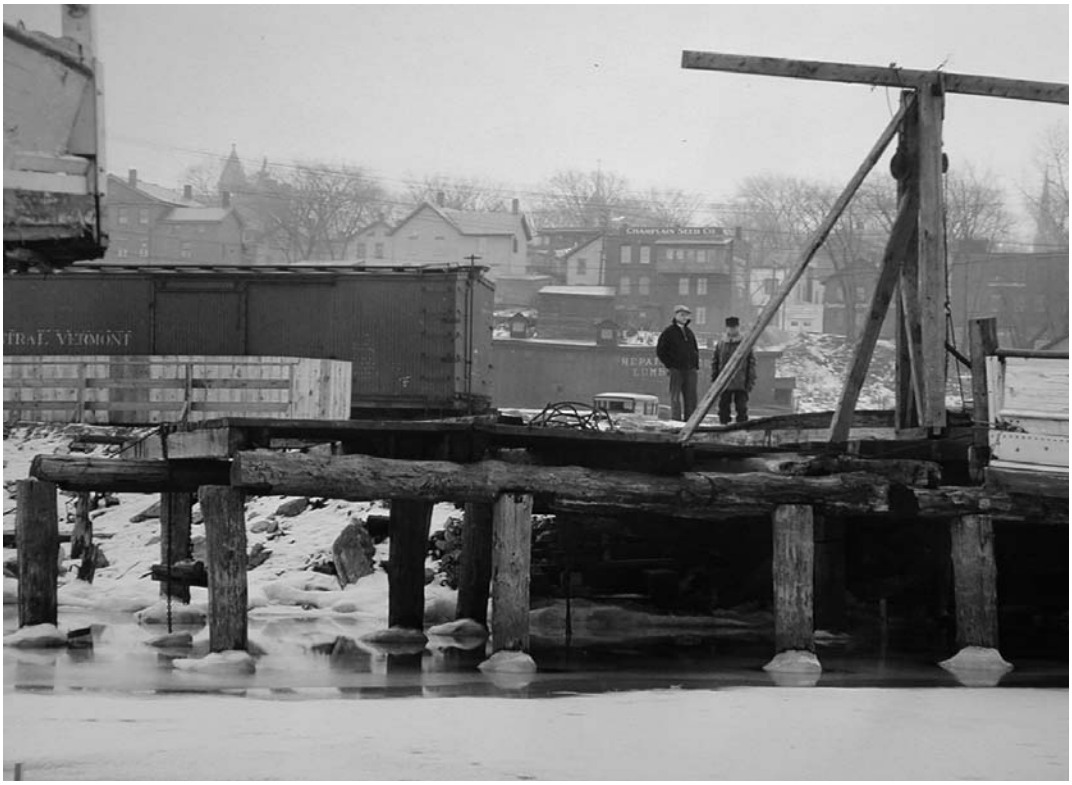


Figure 34. View of the "Goodsell Dock." The buildings in the middle distance stand on Battery Street and were removed during Urban Renewal (McAllister Collection A3-1-8, Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont).

Figure 35. "Is this Vermont's Beautiful Queen City" image from of a campaign in favor of urban renewal. Photo is looking northeast from College and Lake Streets towards the west side of Battery Street (*Burlington Free Press* July 25, 1958; page 10). Note that the same structures can be seen to the left in Figure 34.

Summary

Since Battery Street was established at an early date, it is unlikely that there are historical archaeological resources within or immediately adjacent (i.e. under sidewalks) to the presently traveled way. Furthermore, most of the area on the east side of Battery Street is no longer archeologically sensitive due to the intensive ground disturbances associated with the Urban Renewal Project and subsequent new construction. The west side of Battery Street had a few different phases of development. Before 1850 a number of structures were built along the west side of the street. Some of these structures (especially near the Pioneer Shops) were apparently removed before 1869. Another wave of construction occurred in the 20th century. This consisted primarily of a gas station and a few auto repair shops, which were all razed during the urban renewal project of the 1960s. It is possible that some subsurface remains or features associated with the buildings both built and razed in the 19th century (and not involved with the destructive urban renewal effort in the 1960s) may still exist. However, in these areas further documentary research (to identify, accurately locate, and asses) or minor subsurface testing may determine that potential sites have been disturbed or altered to the point that they are not archaeologically sensitive. It is also possible, even despite the loss of some of the original bluff edge in the 19th and 20th centuries that evidence of precontact Native American occupation could be identified in this portion of the general project area. However, if the proposed undertakings occur within established traveled ways the need for archaeology may be limited if not unnecessary.

Conclusions and Recommendations

The City of Burlington is proposing the Waterfront Access North Improvement Project, City of Burlington, Chittenden County, Vermont. The proposed project will improve pedestrian safety along Battery Street, to facilitate pedestrian connections between Battery and Lake Streets, to examine the desirability and feasibility of opening Depot Street to vehicular traffic, and to identify potential stormwater enhancements within this area.

There are some archaeologically sensitive areas within the broad limits of the current project area. However, the issues pertaining to the currently proposed project are similar to other facets of the overall Burlington Waterfront Development Project. That is, with the very broad Area of Potential Effects (APE), as defined, it is difficult to make specific recommendations. The APE does include areas that are potentially archaeologically significant, but the degree and extent of historic disturbances within these areas may have already destroyed those resources, or has made them inaccessible. As a result, the recommendations we can make based on this ARA are general, at best. For instance, if proposed disturbances are shallow (i.e. less than 12-15" in depth), then there is little chance that significant archaeological resources will be disturbed and no additional work is recommended. If specific disturbances require deeper, or very broad, excavation however, then they should be reviewed on a case-by-case basis. Such a review may require nothing more than a desk review, or, in some cases, a site inspection. In other instances minimal archeological monitoring or photodocumentation may be advisable, while more substantial disturbances near identified historic sites may require further historical research and/or testing to determine whether any archaeological investigations should be perused. In cases where significant disturbance (i.e. foundation construction or new underground services) is proposed within known or suspected fill land, a trench and/or multiple large diameter borings a recommended to record the fill sequence and to identify any sites--particularly possible buried inundated pre-historic Native American sites or even sunken historic boat hulls.

In sum, proposed project elements that will require minimal subsurface disturbance, such as signage and surficial landscaping, are likely not to have an adverse effect on significant cultural resources and no additional archaeological work is recommended. However, project elements that will require substantial subsurface excavation and landscaping may have an adverse effect on significant historic cultural resources, and will likely require additional study. As mentioned above, each proposed project element needs to be considered individually once if has been defined and planned disturbances identified.

Appendix: Additional Information on Figure 7.

The steam mill seen in Figure 7 was commonly known as the Linsley Mill. It was built in 1865-1866 by the S.S. Churchill & Co., on "the filled land of the Vt. & Canada Rail Road" (*Burlington Free Press* February 8, 1866 and February 24, 1872). Originally, this mill specialized in processing dimension building and bridge lumber from logs brought in rafts from Ottawa, Canada (*Burlington Free Press* February 6, 1869). Beginning ca. 1871-1872, W. & D. G. Crane leased this mill to house their box factory (*Burlington Free Press* February 24, 1872; Sanborn Insurance & Publishing Company 1889). This mill was saved in the massive lumberyard fire of December 14, 1894 (*Burlington Free Press* December 25, 1894). Later portions of this mill were leased to other companies, which made packing boxes, shade rollers, and fence stock (*Burlington Free Press* February 24, 1872). This mill complex underwent several changes in layout and extent but was eventually razed between 1926 and 1938 (Sanborn Insurance & Publishing Company 1926 and 1938).

The filled land north of this mill was created primarily by the Vermont Central Railroad ca. 1868-1872, which leased the grounds to various lumber companies for storage. In July of 1868 the *Burlington Free Press* detailed the work being done to fill in the waterfront in this vicinity:

> "we came to the fill of some eight or nine acres now making by the Vermont Central Railroad Company for the increasing business of the Hunterstown Lumber Company, in connection with Messrs Flint and Hall. The western side of this extensive fill is formed by a pier commencing at the northerly side of the railroad company's wharf, and extending into the lake in a north westerly direction 600 ft, thence northerly for the same distance, thence 200 feet towards shore, when it turns northerly again parallel with the beach 400 feet, or nearly to the company's recent purchase of Mr. Howard, where it connects with the shore. This pier will be about 10 feet higher than low water mark. Under the efficient superintendance of Messrs. J. Bigelow and Wm. Smith, foremen of Mr. Whitney, the contractor, but two feet more of the required height is yet to be built of the main portion. A multitude of men and carts are busily dumping into the fill the earth taken from the adjacent sand bank, and a track has just been laid so that dirt carts can be used to hasten the work hereafter" (*Burlington Free Press* July 20, 1868).

In August of the same year, the paper added:

> "tracks are now laid from the sand bank north of the fill, so that dirt cars are constantly running besides horse carts. The work is being very materially advanced by an ingenious and simple but successful arrangement for securing the assistance of water power. A 2 ½ inch pipe connected with the aqueduct main near the pump, is laid part way up the sand where the excavation is being made and there empties itself into a wooden trough 1 ½ feet square, which leads to the fill. The force of this water washes down the dirt to the fill as rapidly as ten laborers can shovel it into the trough, thereby doing away with all necessity of handling the earth more than once" (*Burlington Free Press* August 17, 1868).

In the 1870s, the Vermont Central Railroad continued to build land north of the Linsley Mill. For example, in 1872 it was reported that the Blodgett Company was to lease "six acres of the new Vt. Central fill, putting in the crib-work themselves, while the railroad company does the filling, which will be completed as soon as possible in the spring" (*Burlington Free Press* February 24, 1872).

References Cited

Anonymous

1960 *Study of the Battery Street General Neighborhood Renewal Area Burlington, Vermont.* Manuscript on file Special Collections, Bailey-Howe Library, University of Vermont, Burlington, Vermont.

Beers, F.W.

1869 Plan of City of Burlington and Town of South Burlington, In *Atlas of Chittenden County, Vermont.* F.W. Beers, New York.

Blow, David

1991 *Historic Guide to Burlington Neighborhoods: Volume I.* Chittenden County Historical Society. Queen City Printers Inc., Burlington, Vermont.

1997 *Historic Guide to Burlington Neighborhoods: Volume II.* Chittenden County Historical Society. Queen City Printers Inc., Burlington, Vermont.

2003 *Historic Guide to Burlington Neighborhoods: Volume III.* Chittenden County Historical Society. Queen City Printers Inc., Burlington, Vermont.

Burlington Clipper (Burlington, Vermont)

1895 March 21, "Another Disastrous Fire" 1:3-5

Burlington Free Press (Burlington, Vermont)

1846 February 20, "Central Railroad" 2:5
1846 September 4, "We find the following letter . . . " 2:7
1847 October 1, "Railroad Depot Grounds in Burlington" 2:7
1849 September 20, "The Rutland & Burlington Railroad" 2:1
1850 April, 22, "The Central Road" 2:3
1850 September 17, "The Central Road" 2:1
1852 September 7, "The Corner Stone" 2:1-5, 3:1-2
1852 September 17, "The Fire Anihilator" 2:4-5
1852 September 20, "The Fire Anihilator" 2:4
1852 November 9, "Fatal Accident" 2:5
1852 December 2, "Items at Home and Abroad" 2:4
1855 November 3, "The Roadway" 2:3
1858 April 5, "The Fire" 2:4
1858 April 9, "The Phoenix Mechanic Shops" 2:2
1858 April 15, "The New Shops" 2:4
1858 May 18, "The Phoenix Shops" 2:3
1860 March 2, "VT. & Canada Rail Road—The New Connection" 2:2
1866 February 8, "The New Steam Saw Mill and Planing Mill at the Lake" 4:1
1867 October 21, " Burlington Water Works" 4:1
1867 December 26, "Completion of the City Waterworks" 4:2
1868 July 20, "Down at the Lake Shore" 4:1-2
1868 August 17, "The work of filling . . ." 4:1-2
1869 April 2, "The Pioneer Shops" 3:2
1869 February 6, "The Lumber Trade of Burlington" 3:2

1869 October 22, “The Machine Shop” 3:2
1872 February 24, “Industry of Burlington No. VII” 3:3-4
1872 January 28, “The Industry of Burlington No. IV: The Pioneer Shops”
1873 October 20, “Judge Blodgett” 3:2
1880 February 4, “Burning of a Portion of the Pioneer Shops” 3:2
1882 November 22, “Fire!” 1:3
1882 November 23, “The Fire” 3:3
1882 November 24, “The Pioneer Shops Fire” 3:3
1891 March 28, “The Late Ex-Alderman Brink” 5:2
1894 December 25, “The Fire Fiend” 1:4-5
1894 December 26, “Sparks From the Fire” 5:4, 6:1
1894 December 27, “After the Big Fire” 5:4
1894 December 28, “Origin of the Christmas Fire” 5:3
1895 March 20, “Fire Fiend Again” 1:4-5, 6:1-2
1895 March 26, “The Pioneer Shops and Other Industries As They Existed Years Ago” 6:4.
1895 March 27, “Incendiarism and Insurance” 4:1
1895 March 27, “Are They Fire Bugs?” 6:1
1895 March 27, “D.I. Talcott of Williston . . “ 8:2
1895 April 1, “No Evidence Against Them” 5:2
1895 April 2, “Water Department” 1:6
1895 April 5, “Fire Underwriters” 5:4
1895 April 5, “The insurance adjusters . . .” 8:2
1958 July 25, “Is This Vermont’s Beautiful Queen City?”
1964 November 20, “Homes In Path of Bulldozer?” p.15.
1966, May 16, “Renewal Area Demolition May Start Today.” p. 13.
1966 May 17, “And the Walls Come Tumbling Down.” p.11.
1968 September 24, “Progress in Burlington’s Urban Renewal Area.” p.11.
1978 August 7, “Waterfront Redevelopment Grant” 10A:1 Editorial

Burlington Planning Commission
1963 *Champlain Street Urban Renewal Project, Burlington, Vermont.* Burlington Planning Commission, Burlington. On file Special Collections, Bailey-Howe Library, University of Vermont , Burlington, Vermont.

Burlington Town Records
1802-1865 *Highways and Roads* Vol. 30B. Manuscript of file Burlington City Clerk’s Office, Burlington, Vermont.

The Daily News (Burlington, Vermont)
1895 June 25, “To Be Torn Down”

Dow, A. R.
1887 *Battery Street Sewer*. Burlington City Clerk’s Office, Burlington. Map Slide #5.

Child, Hamilton
1883 *Gazetteer & Business Directory for 1882-1883.* Journal Printing Company, Syracuse.

City of Burlington
1906 *Forty–First Annual Report of the City of Burlington, Vermont, For the Year Ending December 31, 1905.* Free Press Printing Co., Burlington, Vermont.

1911 *Forty–Sixth Annual Report of the City of Burlington, Vermont, For the Year Ending December 31, 1910.* Free Press Printing Co., Burlington, Vermont.

Cohn, Arthur
1984 *Phase I Underwater Archaeological Assessment for the Proposed Burlington Waterfront Redevelopment Project.* The Champlain Maritime Society, Burlington, Vermont.

Corey, Richard P. and James B. Petersen
1998 *An Archaeological Phase IA Study of the C-6 Alignment, Southern Connector Project, MEGC-M5000(1), Burlington, Chittenden County, Vermont.* Submitted to the Vermont Agency of Transportation by the Archaeology Research Center, Department of Social Sciences and Business, University of Maine at Farmington.

Crock, John G.
2001 *Photodocumentation of Historic Cribwork Identified During Construction of the Pine Street Canal Weir, Burlington, Chittenden County, Vermont.* Prepared for *de maximis, inc.* by the Consulting Archaeology Program University of Vermont, Burlington.

The Daily Times (Burlington, Vermont)
1858 June 8, "The New Mechanic Shops" 2:1-3
1860 February 29, "The Vt. & Canada R.R. Connection" 2:2
1860 March 2, "Vt & Canada Road Rushing Things" 2:2

Geotechnics and Resources Inc. (Amman Division)
1962 VT-62 L-9-157 (air photograph). Amman Corp., San Antonio. On file Map Room, University of Vermont Library, Burlington.

Hemenway, Abby Maria (ed)
1867 *The Vermont Historical Gazetteer: A Magazine Embracing A History of Each Town, Civil, Ecclesiastical, Biographical and Military*. Volume I. Published by Miss A.M. Hemenway, Burlington, Vermont.

Hopkins, G.M.
1890 *Map of the City of Burlington, Vermont*. G.M. Hopkins, Philadelphia.

Horton, Guy B.
1912 *Burlington Lakefront Investigation: Report of Investigation of Rights in Streets at Lake Front in Burlington, Vermont*. Manuscript on File Special Collections, Bailey-Howe Library, University of Vermont, Burlington.

Johnson, John
1828 Warf Calculations For Glass Company. John Johnson Collection, Carton 5, File #50. Manuscript on File Special Collections, Bailey-Howe Library, University of Vermont, Burlington.

1833 *Village of Burlington in Vermont from an Actual Survey*. Endicott and Sweet, New York.
1834

Liebs, Chester et. al.
1980 *The Burlington Book.* Historic Preservation Program, University of Vermont, Burlington.

McLaughlin, Scott
2000 The Prospects for Wetland Archaeology in the Champlain Valley. *The Journal of Vermont Archaeology*. The Vermont Archaeological Society. Volume 3: pp.33-51.

Meilbek, E.
1877 *Birds Eye View of Burlington and Winooski, Vt.* J.J. Stoner, Madison, Wisconsin.
1878

Ogden, H.G. and F.D. Granger.
1872 *U.S. Coast Guard Survey, Burlington, Vermont*. Wilbur Special Collections, Bailey-Howe Library, University of Vermont, Burlington.

Orr, David Wallis
1972 *The Port of Burlington, Vermont: Site and Situation A Study in Historical Geography*. Masters Thesis, University of Vermont.

Perkins George H.
1906 The Drinking Waters of Vermont. In the *Report of the State Geologist on the Mineral Industries and Geology of Certain Areas of Vermont 1905-1906*. Argus and Patriot Press, Montpelier.

Presdee & Edwards
1853 *Map of Burlington, Vermont*. Sarony and Major, New York.

Rann, W.S.
1886 *History of Chittenden County, Vermont*. D. Mason & Company, Syracuse.

Rolando, Victor R.
1992 *200 Years of Soot and Sweat: The History and Archaeology of Vermont's Iron, Charcoal, and Lime Industries*. Vermont Archaeological Society. Mountain Publications, Manchester Center, Vermont.

Sanborn Insurance & Publishing Company
(Maps on file Special Collections University of Vermont Library, Burlington).
1869 *Fire Insurance Map, Burlington, Vermont.*
1885 *Fire Insurance Map, Burlington, Vermont.*
1889 *Fire Insurance Map, Burlington, Vermont.*
1894 *Fire Insurance Map, Burlington, Vermont.*
1900 *Fire Insurance Map, Burlington, Vermont.*
1906 *Fire Insurance Map, Burlington, Vermont.*
1912 *Fire Insurance Map, Burlington, Vermont.*
1919 *Fire Insurance Map, Burlington, Vermont.*
1926 *Fire Insurance Map, Burlington, Vermont.*
1926/1938 *Fire Insurance Map, Burlington, Vermont.*
1942 *Fire Insurance Map, Burlington, Vermont.*
1978 *Fire Insurance Map, Burlington, Vermont*

Schaefer, Dave
1965 "Urban Renewal: Violent Solution to Drastic Problems." *Burlington Free Press,* July 21, 1965. p.13.

Thayer, Samuel White M.D.
1865 *City of Burlington Sanitary Inspectors' Records 1860-1869.* Microfilm City of Burlington, Vermont, Miscellaneous Records 1856-1917 on File Reference and Research, general Services Center, Middlesex, Vermont.

1866 City of Burlington Sanitary Inspectors' Report in *Annual Report of Officers and Committees of the City of Burlington for the Financial Year Ending February 1, 1866.* Free Press Steam Job Printing Office, Burlington.

University of Vermont Class of 1888
1886 *Map of Dock Line, Lumber Yards and Breakwater, Burlington Harbor*. Map on File Special Collections, Bailey-Howe Library, University of Vermont, Burlington.

Visser, Thomas, Elizabeth Rosin, Peter Thomas and Pruence Doherty
1989 *Historic Site Review, Burlington Wastewater Treatment Plant Project, Department of Public Works, Burlington, Vermont.* Historic Preservation Program, University of Vermont. Submitted to Department of Public Works, Burlington.

Wainwright, C.
1862 *Village of Burlington.* Burlington Free Press Office, Burlington, Vermont.

Walling, H.F.
1857 *Map of Chittenden County, Vermont*. Baker, Tilden & Co., New York.

Young, Ammi B.
1830 *Plan of Burlington Village.* Pendleton, New York.

APPENDIX B

Interim Alternatives Investigation

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

MEMORANDUM

To: Dan Bradley and Kirsten Merriman-Shapiro
From: Bob Chamberlin and Beth Isler
Subject: Waterfront North Access Study-Interim Alternatives Evaluation-Draft for Internal Review
Date: 28 October 2008

This memorandum summarizes alternatives that have been discussed so far for the Waterfront North Access scoping study and performs a first-round evaluation to identify which alternatives should be advanced for a formal engineering evaluation. The project area is shown in Figure 1.

The overarching objective of the Waterfront North Access project is to facilitate travel movement between the downtown core and the waterfront. Travel for all modes is of concern, but with particular emphasis on pedestrian/bicycle access. Gaining access to the waterfront creates access to several important public amenities, including the Waterfront Park, the Burlington Bicycle Path, the Moran site, the Fishing Pier, the skate park, and the dog park.

Figure 1: Study Area

This interim alternatives evaluation focuses on three major sub-projects:

- Evaluate Battery Street between Main Street and Pearl Street to improve pedestrian accessibility and safety while maintaining adequate traffic flow;
- Develop a preferred concept to facilitate pedestrian movement across the grade difference between Battery Street and the Waterfront; and
- Investigate multi-modal usage of Depot Street.

At this point in the project development process, two local concerns meetings have taken place, as well as several meetings with stakeholders and a design charette with City Staff. The history, ideas and input

55 Railroad Row, White River Junction, Vermont 05001
TEL 802.295.4999 ▪ FAX 802.295.1006 ▪ www.rsginc.com

shared at these meetings are the basis for this memorandum. Due to the unique natures and histories of each of the sub-projects, each has a different evaluation approach. However, the intention of narrowing down the alternatives to three final ones is a common theme.

The next step in this process will be to study the final three alternatives of each sub-project more in-depth and present them to the public.

1.0 CROSSING BATTERY STREET

Facilitating safe pedestrian crossing of Battery Street is a key objective of the Waterfront North project. Six project alternatives have been evaluated, as follows:

Base Improvements

The base improvements include the following elements:

- Upgrading traffic signals along Battery Street for design consistency. Obtain and install Master Controller to enable signal coordination.
- Upgrading street lighting along Battery Street for design consistency.
- Upgrading pedestrian crosswalks (replicate Union Street crosswalk by Memorial Auditorium).
- Installing pedestrian countdown timers at each Battery Street crossing.
- Eliminating one northbound right turn lane on Battery Street at Pearl.

The base improvements will be included as a final alternative because of their relative cost-effectiveness and ease of implementation.

Complete Streets

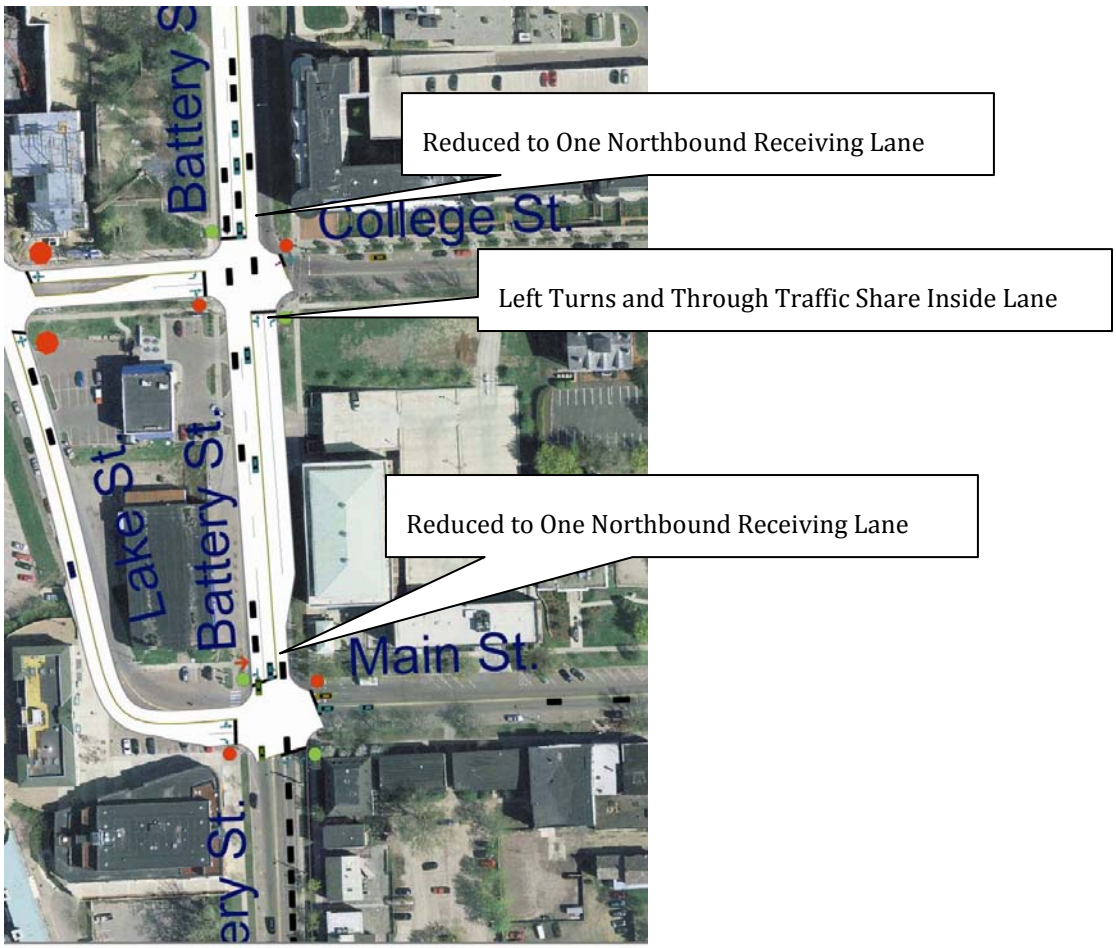
The Burlington Transportation Plan suggests analyzing a Complete Streets approach to Battery Street, which includes raised plaza-style intersections; on-street parking (reverse angle); lighting, landscaping, and stormwater improvements; and a median. However, a preliminary operations analysis of this concept indicates that it would lead to severe peak period congestion, particularly during the AM peak hour.[1] This is considered a fatal flaw and, therefore, this alternative will not proceed to the final evaluation.

[1] The configuration modeled is described on page 80 of the Burlington Transportation Plan Technical Appendix (9/12/07).

Complete Streets "Lite"

A variation on the Complete Streets theme was also modeled, reducing the number of northbound lanes at strategic locations between Pearl and Main Streets, while maintaining 2 southbound lanes.[2] This configuration requires that the northbound approach to each intersection consist of two lanes – a dedicated right turn lane and a through lane or shared left-through lane in the cases of Battery at Main and College (Figure 2).

Figure 2: Simulation Model Interface Showing Complete Streets Lite for Battery Street Northbound



[2] The northbound approach geometries modeled were: shared left-through and right-turn lanes at Main and at College; through and right-turn lanes at Cherry and at Pearl; the second right-turn lane at Pearl was eliminated.

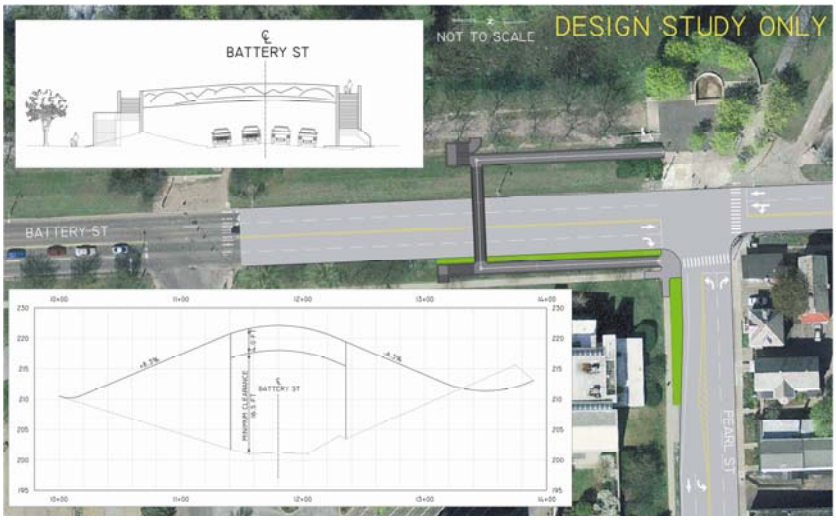
The traffic modeling indicates problems with this design at the 2 southern intersections – at Main and at College – where through traffic and left turning traffic share a lane. This leads to queue blockage of through traffic and storage blocking of traffic wishing to use the dedicated northbound right turn lane. In addition, this roadway geometry would likely lead to unsafe merging and weaving behavior within the section of Battery Street between Main and College and extending north of College to the entrance of the public parking garage.

The analysis suggests, however, that the lane reduction approach is feasible for the segment of Battery Street between Cherry and Pearl. One dedicated right turn lane on Battery at the approach to Pearl Street of approximately 120 feet would be sufficient to serve the projected 2020 traffic demands for that intersection. The remaining length of Battery Street south to Cherry Street need only consist of one northbound lane.

Pedestrian Bridge

Figure 3 shows a schematic of a pedestrian bridge over Battery Street.

Figure 3: Schematic of Pedestrian Bridge over Battery Street near Pearl



Pedestrian Underpass

Figure 4 shows a schematic of a pedestrian tunnel under Battery Street.

Figure 4: Schematic of Pedestrian Underpass, Battery Street near Pearl

Lower Battery Street

At the design charette with City staff, the concept of lowering Battery Street below-grade south of Pearl Street was discussed. This would move all traffic under the existing grade, enabling the creation of a grade-level pedestrian plaza with no vehicle conflicts. However, lowering Battery Street south of Pearl would require increasing the grade of the roadway so much so that it would be too steep for vehicles. The roadway could not be lowered north of Pearl because it would eliminate access to the residences on that block.

The vertical clearance necessary for trucks to travel on the roadway would require approximately 20' high retaining walls on either side of the street. Sight distances would be inadequate due to the vertical curves; intersection sight distances would be inadequate due to the retaining walls. Cherry Street would also need to be lowered to intersect with Battery, and the accesses to the Westlake and the Hilton would be eliminated. Finally, major utility reconstruction would need to take place.

The conclusion with regard to this alternative is that the intensity of this project and its associated cost is excessive given the relatively simple objective of improving east-west pedestrian movements.

Final Three Alternatives

The City's Complete Street[3] Design Guidelines matrix is used to compare these alternatives (below). The matrix has been modified to include potential impacts on traffic flow, right-of-way, view corridors, and relative order-of-magnitude costs. Severe impact on traffic flow is considered a fatal flaw. In the case of the full Complete Streets alternative, severe congestion impacts eliminate this alternative from further consideration. The alternative involving the lowering of Battery Street below grade is dismissed at this time given its large project cost relative to the other alternatives.

[3] The Burlington Transportation Plan defines Complete Streets as "the major corridors leading into and out of Burlington. In the current condition, they are typically four-lane arterials dominated by automobile movement, often creating a hostile environment for pedestrians and bicyclists. Given the significance of these corridors in providing access into and through Burlington, the goal of the Complete Street is to accommodate all modes as effectively as possible within the given curb-to-curb dimension."

Battery Street Evaluation Matrix						
Roadside Zone (Sidewalks and Tree Belt):						
	Base Improvements	Complete Streets "Lite"	Complete Streets-Full	Ped Bridge	Ped Under-pass	Lower Battery Street
Sidewalks: on both sides of street. Minimum width 5 ft.; Minimum Clear zone, 5 ft	o	o	o	o	o	o
Tree Belt: Buffers pedestrians, provides snow storage. Minimum width 5 ft	o	+	++	o	o	o
Street Trees: Adhere to Urban Forestry Master Plan	+	+	+	o	o	o
Street Lighting: Ornamental fixtures at gateways and within high volume pedestrian zones	+	+	+	o	o	+
Furniture: Intended around neighborhood centers, schools and high volume transit stops	+	+	+	o	o	+
Transit Shelters: Priority at high volume stops	o	o	o	o	o	o
Roadway Zone:						
Parking: Recommended in neighborhood centers	o	o	+	o	o	o
Bike Lanes: Preferred width 5 – 6 ft. Minimum width 4 ft.	o	+	+	o	o	o
Vehicle Lanes: Minimum width 10 ft. Typical width 10 to 11 ft. Maximum width 12 ft.	o	o	o	o	o	o
Two-Way Left Turn Lane: Allows for more effective use of street's capacity	o	o	o	o	o	o
Crosswalks: Placed at each intersection.	o	o	o	o	o	o
Median and Pedestrian refuge islands: Recommended at intersection and mid block crossings; Minimum dimensions 6 ft wide x 20 ft long with minimum 5 ft walkway crossing	o	o	+	o	o	o
Curb Return Radii: Should reflect mixed traffic flow	o	o	o	o	o	o
Traffic Flow: Improved from existing Level-of-Service	o	o	Fatal Flaw	o	o	o
Impact on View Corridors: Looking west to Lake Champlain	o	o	o	-	o	o
Right-of-Way Impacts	o	o	o	-	-	--
Cost (Order of Magnitude)	$1.5 million	$1.8 million	$3.1 million	$600,000	$600,000	$210 million
SUMMARY	**3**	**5**	**6**	**-2**	**-1**	**0**

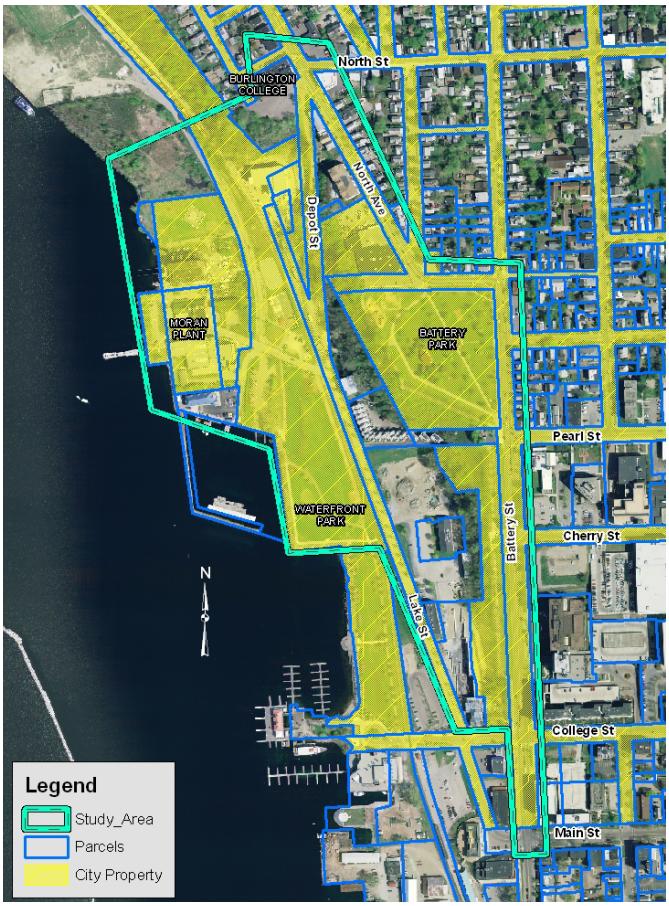
We recommend advancing the following 3 Alternatives:

- Base Improvement Plan
- Complete Streets "Lite;" and
- Pedestrian Underpass.

2.0 BATTERY STREET TO THE WATERFRONT

Negotiating the slope between Battery Street and the Waterfront requires a two-part evaluation. Since property access will be the most constraining factor (see Figure 5), we begin by identifying the most feasible alignments and then considering which conveyance systems are appropriate at the individual locations.

Figure 5: City Property within the Study Area



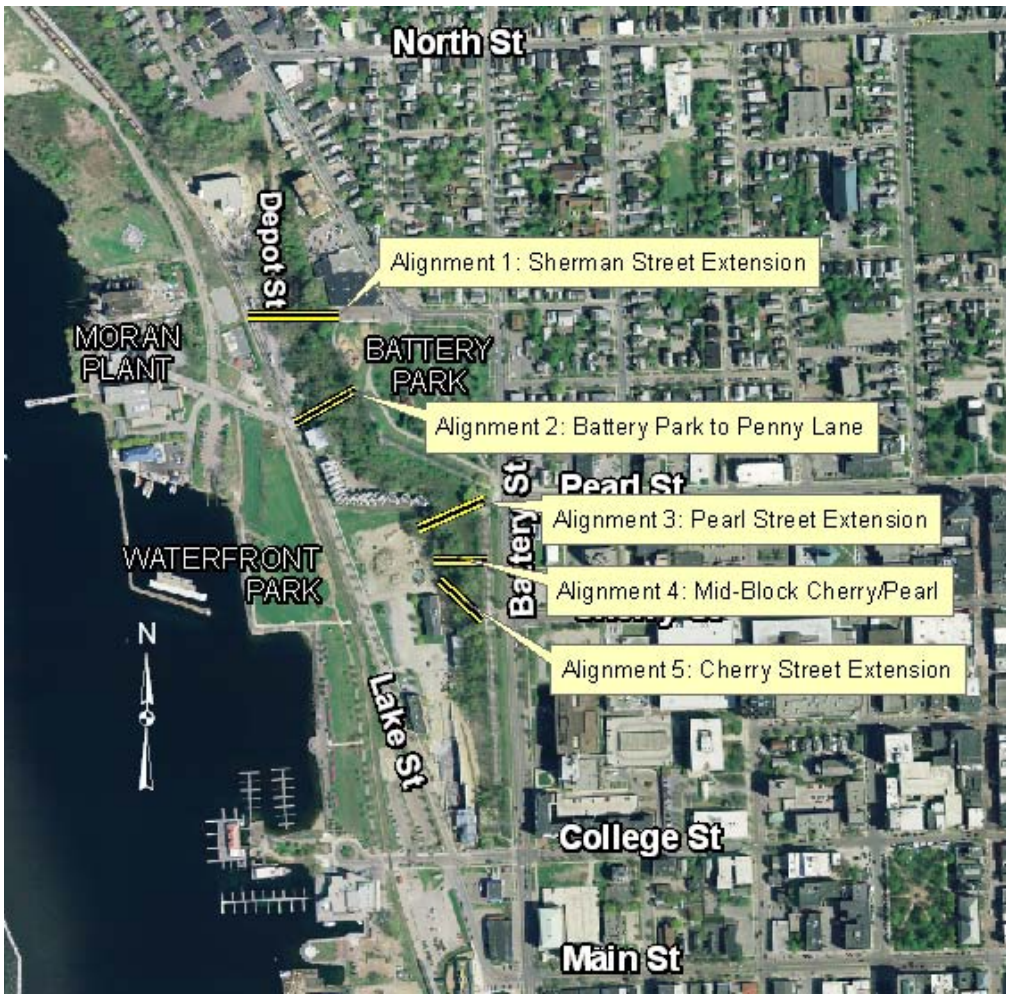
2.1 Alignment Alternatives

There are 5 alignment alternatives (Figure 6):

1. Sherman Street extension
2. Battery Park (lining up with the Penny Lane intersection)

3. Pearl Street extension
4. Mid-block between Cherry and Pearl
5. Cherry Street extension

Figure 6: Alternative Alignments for Accessing the Waterfront from Battery Street



Alignments are evaluated across three dimensions:

1. **Impact on Private Property/Right-of-Way** – alignments that maximize the use of existing public land and/or rights-of-way are favored over those that require use of private land. Acquisition costs are minimized when public land and rights-of-way are more fully utilized.

2. **Balanced Location to Serve Pedestrians** – The two existing routes for pedestrians to access the waterfront are at College Street and Depot Street, which are separated by 3,150 feet. To maximize convenience for pedestrians, the ideal alignment would be located exactly halfway between these two locations.

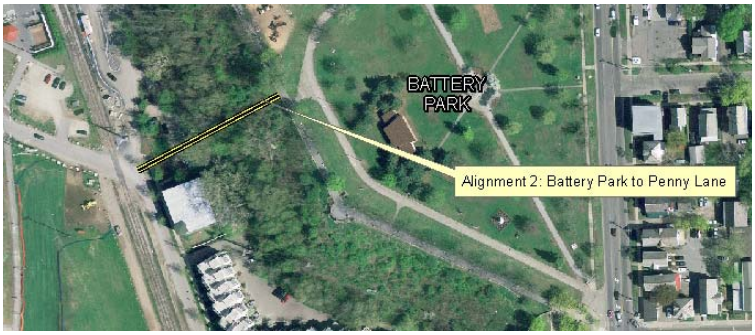
3. **Alignment with Other Transportation Facilities** - Alignments that can convey pedestrians directly to other transportation facilities such as sidewalks and railroad crossings are considered superior since they are most convenient and efficient for pedestrians.

Alignment 1: Sherman Street Extension

A Sherman Street alignment would be situated proximate to the Battery Park parking area and would scale the slope down to Depot Street. Of the five alternatives, this alignment is almost entirely on public land. However, it is the least centrally located of the five alignments, duplicating to some extent the access provided by Depot Street. A Sherman Street alignment would connect to the lower end of Depot Street and would thus be relatively well aligned with the pedestrian facilities on Depot Street.

Alignment 2: Battery Park to Penny Lane

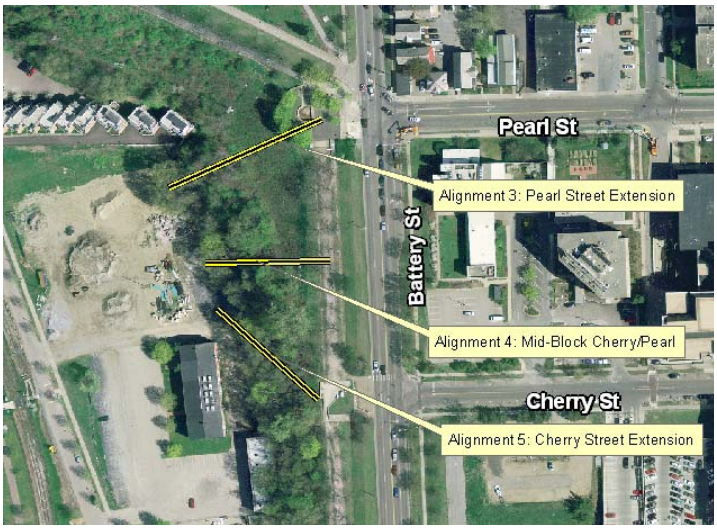
Alignment 2 would begin at a point within Battery Park along the existing bluff sidewalk and would connect to an area roughly defined by the intersection of Penny Lane with Lake Street and Depot Street. Toward the bottom of the slope, Alignment 2 crosses over privately-owned land, requiring that agreements with the private owner be established. Alignment 2 is located approximately 1,800 feet north of College Street and approximately 1,400 feet south of Depot Street and thus represents a well-balanced location from the standpoint of serving pedestrians. Its downhill connection to Depot Street and Penny Lane give it very good alignment with other pedestrian facilities.



Alignment 3: Pearl Street Extension

Alignment 3 would extend Pearl Street as a pedestrian conveyance westerly downslope. The western extension of Pearl Street intersects with private property controlled by Main Street Landing (102 Lake Street). City Staff and RSG have met with Main Street Landing to discuss the potential of a private-public partnership to co-develop pedestrian access in this general location.

Main Street Landing is several years away from planning for the development of 102 Lake Street. For this reason, they cannot at this time agree to developing public access across the parcel as it would unduly encumber its development potential. Main Street Landing has provided for significant public access through and across their other private properties on the Waterfront – One Main Street (Union Station) and the Lake and College Building. At such time when Main Street Landing begins site planning for 102 Lake Street, the City should engage them in a discussion about pedestrian connections.



The location of a pedestrian conveyance from the terminus of Pearl Street is good from the standpoint of pedestrian convenience. It is located approximately 1,200 feet from College Street and at the end of a street that will continue to have good pedestrian flows, particularly when considering the potential future downtown transit center planned for Pearl Street near Pine Street.

The Pearl Street alternative is not well-aligned with railroad crossing opportunities, which are located at the extension of Cherry Street (approximately 300 feet to the south) and at the Lake Street extension (approximately 440 feet to the north).

Main Street Landing was open to the concept of constructing a parking structure in the slope. This concept was not previously feasible because of the footprint that would have been required to ramp vehicles down to the different levels of the structure. However, automated parking systems are now feasible for a multi-level parking structure with a relatively small footprint. A parking structure such as this could include an elevator for pedestrians and bicyclists to travel up and down from Battery Street and the Waterfront.

Alignment 4: Mid-Block Pearl/Cherry

Alignment 4 would be situated mid-block between Pearl and Cherry Streets. Alignment 4 has many of the same attributes as Alignment 3 as it requires crossing of private property and is similarly positioned relative to existing pedestrian railroad crossings. It is not as well located for serving pedestrians, however, as it requires pedestrians who have crossed Battery at Cherry or Pearl to walk another 200 feet to access the alignment.

Alignment 5: Cherry Street Extension

Alignment 5 would extend Cherry Street westerly. The extension due west intersects with an existing historic building that is currently used for offices and services. Alignment 5 would need to slant down in a southerly or northerly direction to avoid conveying pedestrians to the rear parking lot of the building. This alignment is approximately 800 feet from College Street and thus is not ideally located for serving pedestrians efficiently. As you proceed east toward the waterfront there is a grade crossing of the railroad in direct line with Cherry Street, giving this alternative relatively good alignment with other pedestrian facilities that is compromised by the existing building.

Table 1 provides an evaluation matrix for the 5 alignment alternatives.

Table 1: Evaluation of Alignment Alternatives

	Alignment 1 Sherman Street Extension	Alignment 2 Battery Park (aligned with Penny Lane)	Alignment 3 Pearl Street extension	Alignment 4 Mid-Block, Pearl/Cherry	Alignment 5 Cherry Street extension
Right-of-Way, Private Property Impacts	++	0	--	--	--
Balanced Location to Serve Pedestrians	-	+	+	0	-
Alignment with Other Transportation Facilities	+	+	-	-	0

Based on this analysis, Alignments 1 and 2 are the best in addressing the 3 evaluation criteria. The third place alignment is Alignment 3.

2.2 Conveyance Alternatives

Several ideas have been developed over the years to address access to the Waterfront from Battery Street. The 1993 *Burlington Waterfront Pedestrian Linkages Study*[4] included stairways, switchback paths/ramps, and funiculars on alignments including Sherman Street, Pearl Street, Cherry Street, and Bank Street. With the exception of the Bank Street alignment, these concepts have persisted over the

[4] For the Chittenden County Regional Planning Commission and prepared by Dunn Associates, Vanasse Hangen Brustlin, and Stan Clauson Associates.

years and are being revisited in this scoping study. While the switchback path/ramp alternative also resurfaced, it has been dismissed due to the excessive amount of land it would consume to achieve a shallow enough grade to be wheelchair accessible. Furthermore, College Street is a nearby wheelchair access, and if a funicular were built, it would be wheelchair accessible as well.

A variety of concepts that seek to link the Waterfront with other areas of Burlington have been discussed over time, but not seriously investigated. Examples of these concepts are:

- a tunnel system linking the Waterfront and Church Street;
- a gondola or aerial tram linking the Waterfront to Battery Street, and possibly extending to Church Street, UVM, or even Winooski
- a light rail system linking the Waterfront to downtown Burlington and beyond[5].

These concepts extend well beyond the project area of this scoping study and would involve more significant public expenditures. Alternatives that are investigated as part of this scoping study should not preclude these larger infrastructure projects in the future. However, they are considered beyond the scope of this alternatives analysis at this time.

The conveyance alternatives that can be advanced are:

1. Funicular (conventional or water-powered)
2. Stairways (to include a bicycle groove on either side)
3. In slope parking (to include an elevator for pedestrians)

Table 2 summarizes the potential conveyance systems at the 3 potential alignments. A funicular is not considered an option at the Sherman Street alignment due to the constrained space and restricted length of descent. A funicular and stairway are both viable options for the Battery Park and Pearl Street alignments.

The concept of a water-powered funicular is intriguing due to its negligible energy consumption and associated environmental benefits, which would reflect the green image of Vermont. Moreover, this advanced technology could become an attractor to Burlington. There is a water-powered funicular in Wales which could serve as an example.

In slope parking is only under consideration along Battery Street frontage between Pearl and Cherry. It is envisioned that a public access elevator would enable transport of pedestrians down- and up-slope. Drivers would access the parking structure from Battery Street and park their vehicle in a 'transfer room,'

[5] This alternative was evaluated within the Tri-Center Transit Study, conducted by the CCMPO in 1995. The three centers referred to in the project title were Burlington, Winooski, and South Burlington. Other alternatives evaluated in the study were express bus service and HOV lanes.

which looks much like a one-car garage but is actually a vehicle elevator that moves the vehicle down into the parking structure and places it in a slot, as shown in Figure 7. Figure 8 shows the interior of the parking structure, which is more secure than a conventional garage because it is not accessible to people. Drivers retrieve their vehicles from the transfer room, where a computer identifies the correct vehicle and sends the elevator to pick up the vehicle and bring it to the driver waiting in the transfer room (retrieval time is approximately two minutes).

Figure 7: Automated Parking System with Access from Bottom (source: Robotic Parking)

Figure 8: Interior of Automated Parking System (source: SpaceSaver Parking Systems)

Table 2 shows the alignment/conveyance alternatives to be evaluated.

Table 2: Battery to Waterfront Alignment and Conveyance Alternatives

Sherman Street	Battery Park	Pearl Street and proximity
Stairway	Funicular Stairway	Funicular Stairway In-Slope Parking Structure

Although not technically a "Slow Street,"[6] the City's Slow Street Design Guidelines matrix (below) is used to compare these eight alternatives and determine which should move forward for more in-depth evaluation. The matrix has been modified to include potential impacts on property and view corridors, assess the centrality of the alignment (that is, does it align with pedestrian desire lines?) and suggest order of magnitude costs.

[6] Slow Streets are defined in the Burlington Transportation Plan as "located within the pedestrian-oriented downtown core bounded by South Winooski Street, Maple Street, the waterfront and Pearl Street. Within this area, all modes of transportation are in high demand and vehicular traffic must proceed at slow speeds for safety. Cars, buses and bicycles all share the right of way. Pedestrian convenience is of the utmost importance and crossings are frequent. Cars easily pull in and out of curbside spaces. The rich mix of activity is facilitated by the slow speed of traffic on these streets."

Battery to Waterfront Evaluation Matrix

	Sherman Street	Battery Park		Pearl and proximity		
	Stairway	Funicular	Stairway	Funicular	Stairway (incl. sidewalk to Lake Street)	In-Slope Parking
Sidewalk: Wider than in other areas. Sidewalk functions as social gathering spaces as well as a conveyance for pedestrians. Street furniture, sidewalk cafes, transit stops, bicycle parking are all functions that would be expected along the sidewalks of the Slow Street. Whatever functions are accommodated a five-foot clear zone for pedestrian movement must be maintained. While this five foot width forms an absolute minimum width for passage, it is anticipated that a minimum width is more on the order of 8 to 10 feet.	+	+	+	+	+	-
Street Lighting: Ornamental fixtures at gateways and within high volume pedestrian zones	+	+	+	+	+	+
Furniture: Intended around neighborhood centers, schools and high volume transit stops	+	+	+	+	+	o
Transit Shelters: Priority at high volume stops	o	o	o	o	o	+
Impact on View Corridors: Looking west to Lake Champlain	o	-	o	-	o	-
Property Impacts	o	-	-	-	-	--
Centrality of Alignment: Does it serve an underserved area/align with pedestrian desire lines?	-	+	+	+	+	+
Cost (Order of Magnitude)	$330,000	$2.5 million	$390,000	$2.5 million	$910,000	$23 million
SUMMARY	2	2	3	2	3	-1

It would be premature to rule out stairway or funicular at this point in the study since they have similar impacts and footprints. . The final three alternatives are therefore:

1. Stairway at Sherman Street
2. Funicular/stairway at Battery Park
3. Funicular/stairway at Pearl/proximity

3.0 DEPOT STREET

Future uses of Depot Street were considered, including re-opening it to vehicle traffic (one-way or two-way). However, this idea was met with significant resistance by the public (at the Local Concerns Meetings on 10 July 2008) and by some stakeholders. The widely held sentiment is that Depot Street should remain bicycle/pedestrian-only with access for emergency vehicles.[7]

Discussions have ensued as to how Depot Street can be improved to enhance the pedestrian and bicycle experience and safety. The concept that Depot Street can become a gateway to the Waterfront from the Old North End has proved appealing. The "Trampe" bike lift has been considered to assist bicyclists up Depot Street, but this alternative is proving to be a luxury that the City can not afford.

The three final alternatives to be considered for Depot Street are:

1. Basic improvements, including a surface treatment, incorporating public spaces/viewing areas, emergency vehicle access (with the potential for transit-only access in the future if CCTA becomes interested), lighting, stormwater and utility improvements, and a gateway at the top of Depot Street.
2. Ideal improvements, which is a stepped up version of the basic improvements and would use higher quality materials and incorporate more amenities.
3. Base reconstruction, which would involve realigning the intersection of Depot Street and Lake Street/Lake Street extension, and coordinating with a potential Sherman Street alignment down the slope from the Burlington Police Department.

4.0 BASE IMPROVEMENTS

In addition to the overarching alternatives presented above, several other improvements that are not necessarily associated with one particular sub-area have been discussed. These include:

- North/south transit line
- Parking management system for the Waterfront

[7] The Chittenden County Transit Authority was consulted to determine their interest in Depot Street serving as a transit-only access. However, Depot Street would not offer any added benefits to their operations, and its grade may prove difficult to navigate for buses.

- Lighting improvements that are consistent with designs specified by the City
- Intersection pavement treatments that do not require full depth reconstruction in order to avoid utility conflicts
- Replacement of mast-arm signals on Battery Street with pedestal style signals
- Coordination with the Moran site:
    - paving the gravel road adjacent to the bike path north to the edge of the Urban Reserve,
    - accessing Moran parking, and
    - improving access for pedestrians and bicyclists to the entire Interim Development Area.

5.0 SUMMARY

This interim evaluation has identified the final alternatives that will be considered in the Waterfront North Access scoping study. They are:

Battery Street

1. Base improvements
2. Complete Streets 'Lite'
3. To be determined- need to discuss

Battery Street to Waterfront

1. Stairway at Sherman Street
2. Funicular/stairway at Battery Park
3. Funicular/stairway at Pearl/proximity

Depot Street

1. Basic improvements
2. Ideal improvements
3. Base reconstruction

In addition to evaluating these alternatives, the study will recommend pursuing the Base Improvements described in Section 4.0.

APPENDIX C

Cost Estimates

ENGINEERING VENTURES INC

Stormwater Improvement Costs (Section 4.2)

WATERFRONT - NORTH PROJECT - INITIAL COST ESTIMATING

OPTION	COMPONENT	VTRANS ITEM	UNIT	QUANTITY	UNIT PRICE	TOTAL
LAKE STREET -- BASE	RE-GRADING		SY	900	$ 2.50	$ 2,250
	24" SQUARE CONCRETE CB		EA	2	$ 600.00	$ 1,200
	8" HDPE STORM LINE	605.21	LF	250	$ 30.00	$ 7,500
	TOPSOIL, SEED, MULCH		SY	900	$ 1.00	$ 900
	OPTION TOTAL:					$ 11,850
LAKE STREET -- ENHANCED	REMOVE EXISTING CONCRETE SIDEWALK	203.28	CY	19	$ 30.00	$ 556
	NEW CONCRETE SIDEWALK	618.10	SY	111	$ 65.00	$ 7,222
	GRANULAR BORROW	203.30	CY	65	$ 20.00	$ 1,300
	24" SQUARE CONCRETE CB		EA	2	$ 600.00	$ 1,200
	8" HDPE STORM LINE	605.21	LF	250	$ 30.00	$ 7,500
	RE-GRADING		SY	900	$ 2.50	$ 2,250
	TOPSOIL, SEED, MULCH		SY	4,400	$ 1.00	$ 4,400
	OPTION TOTAL:					$ 24,428
DEPOT STREET -- BASE	MILL EXISTING ASPHALT SURFACE	210.10	SY	1,111	$ 3.50	$ 3,889
	RE-SURFACE WITH 4" ASPHALT PAVEMENT	406.25	TN	500	$ 65.00	$ 32,500
	INSPECT/EVALUATE SAND FILTER		LS	1	$ 3,000.00	$ 3,000
	OPTION TOTAL:					$ 39,389
DEPOT -- ENHANCED OPTION 1	ASPHALT REMOVAL /DISP. (4" ASSUMED)	203.28	SY	247	$ 15.00	$ 3,704
	TEST PITTING	204.22*	EA	5	$ 200.00	$ 1,000
	6" PERF. U.D. W/STONE ENVELOPE	605.10	LF	250	$ 32.00	$ 8,000
	12" CRUSHED STONE CHOKER COURSE		CY	741	$ 40.00	$ 29,630
	4" PERVIOUS ASPHALT PAVEMENT		SF	20,000	$ 3.50	$ 70,000
	OPTION TOTAL:					$ 112,333
DEPOT -- ENHANCED OPTION 2	MILL EXISTING ASPHALT SURFACE	210.10	CY	1,111	$ 3.50	$ 3,889
	DENSE-GRADED CRUSHED STONE	301.35	CY	370	$ 38.00	$ 14,074
	TREE BOX FILTERS		EA	6	$ 3,500.00	$ 21,000
	8" HDPE STORM LINE	605.21	LF	150	$ 30.00	$ 4,500
	RE-SURFACE WITH 4" ASPHALT PAVEMENT	406.25	TN	500	$ 65.00	$ 32,500
	OPTION TOTAL:					$ 75,963

NOTES:

1) ABOVE GENERATED FOR CONCEPT LEVEL COMPARISON BETWEEN OPTIONS
2) NO MOBILIZATION/DEMOBILIZATION INCLUDED
3) INCLUSION OF 10% CONTINGENCY RECOMMENDED
4) COSTS FOR PHYSICAL MODIFICATIONS OF SAND FILTERS, AND/OR MEDIA REPLACEMENT EXCLUDED

SE Group
Section 4.3.3: Sherman Street Basic

PROJECT: WFN Access
Sherman Street - Basic
CALCULATED BY: MKW DATE: 12/15/08
CHECKED BY: DATE:

QUANTITY CALCULATIONS

NO.	DESCRIPTION	Unit	Quant Total	Quant Round.	Unit Cost	Cost
201.10	CLEARING AND GRUBBING	LS	1		15,000.00	15,000.00
201.15	REMOVING MEDIUM TREES	EA	30		400.00	12,000.00
301.26	SUBBASE OF CRUSHED GRAVEL, FINE GRADED	CY	306		40.52	12,399.12
406.25	BITUMINOUS CONCRETE PAVEMENT	T	20		97.48	1,949.60
602.25	STONE MASONRY FACING	SF	0		50.00	0.00
608.10	BULLDOZER RENTAL, TYPE I	HR	80		86.05	6,884.00
608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE I	HR	200		86.98	17,396.00
608.30	POWER BROOM RENTAL, TYPE I	HR	80		34.21	2,736.80
608.37	TRUCK RENTAL	HR	200		52.53	10,506.00
618.10	PORTLAND CEMENT CONC. SIDEWALK, 5 INCH	SY	150		64.38	9,657.00
631.16	TESTING EQUIPMENT, CONCRETE	LS	1		850.00	850.00
631.17	TESTING EQUIPMENT, BITUMINOUS	LS	1		540.00	540.00
635.11	MOBILIZATION/DEMOBILIZATION	LS	1		20,000.00	20,000.00
651.15	SEED	SF	5000		0.25	1,250.00
651.25	HAY MULCH	T	2		453.14	906.28
651.35	TOPSOIL	CY	90		35.51	3,195.90
652.10	EPSC PLAN	LS	1		4,500.00	4,500.00
652.20	MONITORING EPSC PLAN	HR	40		115.37	4,614.80
652.30	MAINTENANCE OF EPSC PLAN (N.A.B.I.)	LU	1		8,000.00	8,000.00
653.55	PROJECT DEMARCATION FENCE	LF	160		1.00	160.00
656.30	DECIDUOUS TREES	EA	16		650.00	10,400.00
656.35	DECIDUOUS SHRUBS	EA	150		50.73	7,609.50
656.40	GROUND COVERS AND VINES	EA	500		14.00	7,000.00
656.80	LANDSCAPE BACKFILL, TRUCK MEASUREMENT	CY	75		45.87	3,440.25
678.24	ELECTRICAL WIRING	LF	300		6.00	1,800.00
678.30	ELECTRICAL CONDUIT SLEEVE	LF	300		27.91	8,373.00
679.21	LIGHT POLE BASE	EA	7		800.00	5,600.00
679.45	LIGHT POLE	EA	7		2,171.48	15,200.36
679.50	LUMINAIRE	EA	7		980.00	6,860.00
900.610	S.P. (HEMLOCK BARK MULCH)	CY	5		42.00	210.00
900.620	S.P. (BENCH)	EA	4		1,000.00	4,000.00
900.630	S.P. (TRASH RECEPTACLE)	EA	4		600.00	2,400.00
900.640	S.P. (STRUCTURAL CONCRETE)	CY	130		350.00	45,500.00
900.650	S.P. (BRICK PAVING)	SF	1325		10.00	13,250.00
900.660	S.P. (WELDED WIRE FABRIC REINF. FOR CONC.)	SF	1325		0.35	463.75
900.800	S.P. (METAL HANDRAILS)	LF	320		35.00	11,200.00
900.810	S.P. (METAL SIDE RAILING)	LF	320		33.00	10,560.00
900.820	S.P. (STEEL STAIR STRINGERS)	EA	16		2,000.00	32,000.00
900.830	S.P. (WOODEN STAIR TREADS)	LF	2200		5.00	11,000.00

	SUBTOTAL =	$329,412
25%	CONTINGENCY =	$82,353
	TOTAL =	$411,765

SE Group
Section 4.3.3: Sherman Street Enhanced

PROJECT: WFN Access
Sherman Street - Enhanced
CALCULATED BY: MKW DATE: 12/15/08
CHECKED BY: DATE:

QUANTITY CALCULATIONS

NO.	DESCRIPTION	Unit	Quant Total	Quant Round.	Unit Cost	Cost
201.10	CLEARING AND GRUBBING	LS	1		15,000.00	15,000.00
201.15	REMOVING MEDIUM TREES	EA	30		400.00	12,000.00
301.26	SUBBASE OF CRUSHED GRAVEL, FINE GRADED	CY	306		40.52	12,399.12
406.25	BITUMINOUS CONCRETE PAVEMENT	T	20		97.48	1,949.60
602.25	STONE MASONRY FACING	SF	2300		50.00	115,000.00
608.10	BULLDOZER RENTAL, TYPE I	HR	80		86.05	6,884.00
608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE I	HR	200		86.98	17,396.00
608.30	POWER BROOM RENTAL, TYPE I	HR	80		34.21	2,736.80
608.37	TRUCK RENTAL	HR	200		52.53	10,506.00
618.10	PORTLAND CEMENT CONC. SIDEWALK, 5 INCH	SY	235		64.38	15,129.30
631.16	TESTING EQUIPMENT, CONCRETE	LS	1		850.00	850.00
631.17	TESTING EQUIPMENT, BITUMINOUS	LS	1		540.00	540.00
635.11	MOBILIZATION/DEMOBILIZATION	LS	1		20,000.00	20,000.00
651.15	SEED	SF	5000		0.25	1,250.00
651.25	HAY MULCH	T	2		453.14	906.28
651.35	TOPSOIL	CY	90		35.51	3,195.90
652.10	EPSC PLAN	LS	1		4,500.00	4,500.00
652.20	MONITORING EPSC PLAN	HR	40		115.37	4,614.80
652.30	MAINTENANCE OF EPSC PLAN (N.A.B.I.)	LU	1		8,000.00	8,000.00
653.55	PROJECT DEMARCATION FENCE	LF	160		1.00	160.00
656.30	DECIDUOUS TREES	EA	16		650.00	10,400.00
656.35	DECIDUOUS SHRUBS	EA	50		50.73	2,536.50
656.40	GROUND COVERS AND VINES	EA	250		14.00	3,500.00
656.80	LANDSCAPE BACKFILL, TRUCK MEASUREMENT	CY	50		45.87	2,293.50
678.24	ELECTRICAL WIRING	LF	300		6.00	1,800.00
678.30	ELECTRICAL CONDUIT SLEEVE	LF	300		27.91	8,373.00
679.21	LIGHT POLE BASE	EA	7		800.00	5,600.00
679.45	LIGHT POLE	EA	7		2,171.48	15,200.36
679.50	LUMINAIRE	EA	7		980.00	6,860.00
900.610	S.P. (HEMLOCK BARK MULCH)	CY	5		42.00	210.00
900.620	S.P. (BENCH)	EA	4		1,000.00	4,000.00
900.630	S.P. (TRASH RECEPTACLE)	EA	4		600.00	2,400.00
900.640	S.P. (STRUCTURAL CONCRETE)	CY	200		350.00	70,000.00
900.650	S.P. (BRICK PAVING)	SF	1325		10.00	13,250.00
900.660	S.P. (4" STONE CAP STONE)	LF	350		130.00	45,500.00
900.670	S.P. (WELDED WIRE FABRIC REINF. FOR CONC.)	SF	1325		0.35	463.75
900.680	S.P. (METAL HANDRAILS)	LF	320		35.00	11,200.00
900.690	S.P. (SNOW MELT SYSTEM)	SF	3600		55.00	198,000.00

SUBTOTAL = $654,605
25% CONTINGENCY = $163,651
TOTAL = $818,256

SE Group
Section 4.3.3: Depot Street Basic

PROJECT: WFN Access
Depot Street - Basic
CALCULATED BY: MKW DATE: 12/15/08
CHECKED BY: DATE:

QUANTITY CALCULATIONS

NO.	DESCRIPTION	Unit	Quant Total	Quant Round.	Unit Cost	Cost
201.10	CLEARING AND GRUBBING	LS	1		8,000.00	8,000.00
201.15	REMOVING MEDIUM TREES	EA	12		400.00	4,800.00
203.28	EXCAVATION OF SURFACES AND PAVEMENTS	CY	6000		10.88	65,280.00
301.26	SUBBASE OF CRUSHED GRAVEL, FINE GRADED	CY	1538		40.52	62,319.76
404.65	EMULSIFIED ASPHALT	CWT	1		374.21	374.21
406.25	BITUMINOUS CONCRETE PAVEMENT	T	432		97.48	42,111.36
602.25	STONE MASONRY FACING	SF	570		50.00	28,500.00
608.10	BULLDOZER RENTAL, TYPE I	HR	40		86.05	3,442.00
608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE I	HR	100		86.98	8,698.00
608.30	POWER BROOM RENTAL, TYPE I	HR	80		34.21	2,736.80
608.37	TRUCK RENTAL	HR	200		52.53	10,506.00
609.10	DUST CONTROL WITH WATER	MGL	500		8.08	4,040.00
618.10	PORTLAND CEMENT CONC. SIDEWALK, 5 INCH	SY	140		64.38	9,013.20
621.80	REMOVAL AND DISPOSAL OF GUARDRAIL	LF	325		2.16	702.00
621.81	REMOVAL AND DISPOSAL OF GUIDE POSTS	EA	40		16.96	678.40
630.15	FLAGGERS	HR	500		30.27	15,135.00
631.16	TESTING EQUIPMENT, CONCRETE	LS	1		850.00	850.00
631.17	TESTING EQUIPMENT, BITUMINOUS	LS	1		540.00	540.00
635.11	MOBILIZATION/DEMOBILIZATION	LS	1		20,000.00	20,000.00
641.10	TRAFFIC CONTROL	LS	1		30,000.00	30,000.00
646.31	CROSSWALK MARKING	LF	40		5.52	220.80
651.15	SEED	SF	4000		0.25	1,000.00
651.25	HAY MULCH	T	3		453.14	1,359.42
651.35	TOPSOIL	CY	200		35.51	7,102.00
652.10	EPSC PLAN	LS	1		4,500.00	4,500.00
652.20	MONITORING EPSC PLAN	HR	40		115.37	4,614.80
652.30	MAINTENANCE OF EPSC PLAN (N.A.B.I.)	LU	1		8,000.00	8,000.00
653.55	PROJECT DEMARCATION FENCE	LF	150		1.00	150.00
656.30	DECIDUOUS TREES	EA	6		650.00	3,900.00
656.35	DECIDUOUS SHRUBS	EA	40		50.73	2,029.20
656.40	GROUND COVERS AND VINES	EA	150		14.00	2,100.00
656.80	LANDSCAPE BACKFILL, TRUCK MEASUREMENT	CY	15		45.87	688.05
678.24	ELECTRICAL WIRING	LF	1000		6.00	6,000.00
678.30	ELECTRICAL CONDUIT SLEEVE	LF	1000		27.91	27,910.00
679.21	LIGHT POLE BASE	EA	17		800.00	13,600.00
679.45	LIGHT POLE	EA	17		2,171.48	36,915.16
679.50	LUMINAIRE	EA	17		980.00	16,660.00
900.610	S.P. (HEMLOCK BARK MULCH)	CY	10		42.00	420.00
900.620	S.P. (BIKE RACK)	EA	4		800.00	3,200.00
900.630	S.P. (BENCH)	EA	11		1,000.00	11,000.00
900.640	S.P. (TRASH RECEPTACLE)	EA	4		600.00	2,400.00
900.650	S.P. (UTILITY WORK)	LS	1		50,000.00	50,000.00
900.660	S.P. (BRICK PAVING)	SF	2700		10.00	27,000.00
900.670	S.P. (4" STONE CAP STONE)	LF	170		130.00	22,100.00
900.680	S.P. (WELDED WIRE FABRIC REINF. FOR CONC.)	SF	2700		0.35	945.00

	SUBTOTAL =	$571,541
25%	CONTINGENCY =	$142,885
	TOTAL =	$714,426

SE Group
Section 4.3.3: Depot Street Enhanced

PROJECT: WFN Access
Depot Street - Enhanced
CALCULATED BY: MKW DATE: 12/15/08
CHECKED BY: DATE:

QUANTITY CALCULATIONS

NO.	DESCRIPTION	Unit	Quant Total	Quant Round.	Unit Cost	Cost
201.10	CLEARING AND GRUBBING	LS	1		8,000.00	8,000.00
201.15	REMOVING MEDIUM TREES	EA	12		400.00	4,800.00
203.28	EXCAVATION OF SURFACES AND PAVEMENTS	CY	6000		10.88	65,280.00
301.26	SUBBASE OF CRUSHED GRAVEL, FINE GRADED	CY	1538		40.52	62,319.76
404.65	EMULSIFIED ASPHALT	CWT	4		374.21	1,496.84
406.25	BITUMINOUS CONCRETE PAVEMENT	T	432		97.48	42,111.36
602.25	STONE MASONRY FACING	SF	570		50.00	28,500.00
608.10	BULLDOZER RENTAL, TYPE I	HR	40		86.05	3,442.00
608.25	ALL PURPOSE EXCAVATOR RENTAL, TYPE I	HR	100		86.98	8,698.00
608.30	POWER BROOM RENTAL, TYPE I	HR	80		34.21	2,736.80
608.37	TRUCK RENTAL	HR	200		52.53	10,506.00
609.10	DUST CONTROL WITH WATER	MGL	500		8.08	4,040.00
618.10	PORTLAND CEMENT CONC. SIDEWALK, 5 INCH	SY	140		64.38	9,013.20
621.80	REMOVAL AND DISPOSAL OF GUARDRAIL	LF	325		2.16	702.00
621.81	REMOVAL AND DISPOSAL OF GUIDE POSTS	EA	40		16.96	678.40
630.15	FLAGGERS	HR	500		30.27	15,135.00
631.16	TESTING EQUIPMENT, CONCRETE	LS	1		850.00	850.00
631.17	TESTING EQUIPMENT, BITUMINOUS	LS	1		540.00	540.00
635.11	MOBILIZATION/DEMOBILIZATION	LS	1		20,000.00	20,000.00
641.10	TRAFFIC CONTROL	LS	1		30,000.00	30,000.00
646.31	CROSSWALK MARKING	LF	40		5.52	220.80
651.15	SEED	SF	4000		0.25	1,000.00
651.25	HAY MULCH	T	6		453.14	2,718.84
651.35	TOPSOIL	CY	250		35.51	8,877.50
652.10	EPSC PLAN	LS	1		4,500.00	4,500.00
652.20	MONITORING EPSC PLAN	HR	40		115.37	4,614.80
652.30	MAINTENANCE OF EPSC PLAN (N.A.B.I.)	LU	1		8,000.00	8,000.00
653.55	PROJECT DEMARCATION FENCE	LF	150		1.00	150.00
656.30	DECIDUOUS TREES	EA	6		650.00	3,900.00
656.35	DECIDUOUS SHRUBS	EA	140		50.73	7,102.20
656.40	GROUND COVERS AND VINES	EA	750		14.00	10,500.00
656.80	LANDSCAPE BACKFILL, TRUCK MEASUREMENT	CY	30		45.87	1,376.10
678.24	ELECTRICAL WIRING	LF	1000		6.00	6,000.00
678.30	ELECTRICAL CONDUIT SLEEVE	LF	1000		27.91	27,910.00
679.21	LIGHT POLE BASE	EA	17		800.00	13,600.00
679.45	LIGHT POLE	EA	17		2,171.48	36,915.16
679.50	LUMINAIRE	EA	17		980.00	16,660.00
900.610	S.P. (HEMLOCK BARK MULCH)	CY	50		42.00	2,100.00
900.620	S.P. (BIKE RACK)	EA	4		800.00	3,200.00
900.630	S.P. (BENCH)	EA	11		1,000.00	11,000.00
900.640	S.P. (TRASH RECEPTACLE)	EA	4		600.00	2,400.00
900.650	S.P. (UTILITY WORK)	LS	1		50,000.00	50,000.00
900.660	S.P. (BRICK PAVING)	SF	20214		10.00	202,140.00
900.670	S.P. (4" STONE CAP STONE)	LF	170		130.00	22,100.00
900.680	S.P. (WELDED WIRE FABRIC REINF. FOR CONC.)	SF	20214		0.35	7,074.90
900.690	S.P. (Gateways)	EA	2		20,000.00	40,000.00
900.700	S.P. (Landscape Boulders	EA	50		200.00	10,000.00

	SUBTOTAL =	$822,910
25%	CONTINGENCY =	$205,727
	TOTAL =	$1,028,637

July 1, 2001 - July 1, 2006

RSG: Section 4.4: Crossing Battery Street

ITEM NUMBER	ITEM DESCRIPTION	UNITS	AVERAGE PRICE	Base Improvements		Complete Streets Lite		Complete Streets Full		Spot Improvements	
				Optimized signal timings, pavement treatments on crosswalks, ped detection devices, countdown timers at crosswalks, replace mast-arm signals with pedestals (College and Pearl), raise College St. intersection		The northbound approach geometries modeled were: shared left-through and right-turn lanes at Main and at College; through and right-turn lanes at Cherry and at Pearl; the second right-turn lane at Pearl was eliminated.		page 80 of Burlington Transportation Plan Technical Appendix		Make outer NB lane at Cherry into right-only and drop a NB lane north of the intersection; NB approach at Pearl will be through + 1 right-only storage lane; restripe WB College for right-turn lane	
				Units	Cost	Units	Cost	Units	Cost	Units	Cost
203.28	EXCAVATION OF SURFACES AND PAVEMENTS	CY	$12.54	448.15	$5,619.78	737.22	$9,244.77	1481.48	$18,577.78	273.33	$3,427.60
203.99	SHOULDER BERM REMOVAL	LF	$0.95		$0.00		$0.00	2000	$1,900.00		$0.00
301.15	SUBBASE OF GRAVEL	CY	$22.97		$0.00		$0.00	1244.44	$28,584.89		$0.00
310.20	RECLAIMED STABILIZED BASE	SY	$2.45		$0.00	1474.44	$3,612.39		$0.00	546.67	$1,339.33
401.10	AGGREGATE SURFACE COURSE	CY	$32.32		$0.00		$0.00		$0.00		$0.00
406.25	BITUMINOUS CONCRETE PAVEMENT	TON	$54.22		$0.00		$0.00	1866.67	$101,210.67		$0.00
406.27	MEDIUM DUTY BIT. CONC. PAVEMENT	TON	$55.26		$0.00		$0.00		$0.00		$0.00
406.50	PRICE ADJUSTMENT ASPHALT CEMENT	LU	$1.00		$0.00		$0.00		$0.00		$0.00
490.30	SUPERPAVE BITUMINOUS CONCRETE PAVEMENT	TON	$43.90		$0.00		$0.00		$0.00		$0.00
616.21	VERTICAL GRANITE CURB	LF	$25.91		$0.00	4000	$103,640.00	8000	$207,280.00	410	$10,623.10
616.26	PRECAST REINFORCED CONCRETE CURB, TYPE B	LF	$17.69		$0.00		$0.00		$0.00		$0.00
616.28	CAST-IN PLACE CONCRETE CURB, TYPE B	LF	$20.00		$0.00		$0.00		$0.00		$0.00
616.40	REMOVING AND RESETTING CURB	LF	$21.72		$0.00		$0.00		$0.00		$0.00
616.41	REMOVAL OF EXISTING CURB	LF	$4.78		$0.00	4000	$19,120.00	4000	$19,120.00	410	$1,959.80
616.47	BIT. CONC. GUTTERS & TRAFFIC ISLANDS	TON	$138.74		$0.00		$0.00		$0.00		$0.00
604.40	CHANGING ELEVATION OF DI,CB OR MH	EACH	$549.77		$0.00	8	$4,398.16		$0.00	2	$1,099.54
618.10	PORTLAND CEMENT CONC. SIDEWALK, 5 INCH	SY	$50.00		$0.00		$0.00		$0.00		$0.00
618.20	BRICK PAVING	SY	$139.19	233.33	$32,477.67	233.33	$32,477.67	4444.44	$618,622.22	233.33	$32,477.67
618.30	DETECTABLE WARNING SURFACE	SY	$237.56	10.67	$2,533.97	10.67	$2,533.97	10.67	$2,533.97	10.67	$2,533.97
629.29	HYDRANT, RELOCATE	EACH	$1,157.35		$0.00	3	$3,472.05		$0.00	1	$1,157.35
635.11	MOBILIZATION / DEMOBILIZATION	LS	$112,552.90	1	$112,552.90	1	$112,552.90	1	$112,552.90	1	$112,552.90
641.10	TRAFFIC CONTROL	LS	$58,179.60	1	$20,000.00	1	$58,179.60	1	$58,179.60	1	$58,179.60
646.40	DURABLE 4" WHITE LINE	LF	$0.33		$0.00		$0.00		$0.00		$0.00
646.41	DURABLE 4" YELLOW LINE	LF	$0.34		$0.00		$0.00		$0.00		$0.00
646.414	DURABLE 6" WHITE LINE	LF	$0.89		$0.00		$0.00		$0.00		$0.00
646.415	DURABLE 6" YELLOW LINE	LF	$0.88		$0.00		$0.00		$0.00		$0.00
646.46	DURABLE 24" STOP BAR	LF	$5.16		$0.00		$0.00		$0.00		$0.00
646.50	DURABLE LETTER OR SYMBOL	EACH	$62.50		$0.00		$0.00		$0.00		$0.00
646.51	DURABLE CROSSWALK W/DIAGONAL LINES	LF	$22.05		$0.00		$0.00		$0.00		$0.00
646.82	REMOVAL OF EXISTING PAVEMENT MARKINGS	SF	$1.34		$0.00		$0.00		$0.00		$0.00
648.11	PARKING METER POSTS	EACH	$200.00		$0.00		$0.00		$0.00		$0.00
649.11	GEOTEXTILE FOR ROADBED SUBGRADE SEP.	SY	$1.08		$0.00		$0.00		$0.00		$0.00
651.15	SEED	LB	$7.19		$0.00	33.18	$238.53		$0.00	10.38	$74.60
651.18	FERTILIZER	LB	$1.60		$0.00	13.27	$21.23		$0.00	4.15	$6.64
651.25	HAY MULCH	TON	$513.61		$0.00	0.61	$312.93		$0.00	0.19	$97.86
651.30	SODDING	SY	$3.83		$0.00	1474.44	$5,647.12		$0.00	546.67	$2,093.73
651.35	TOPSOIL	CY	$23.12		$0.00	122.87	$2,840.76		$0.00	38.43	$888.41
652.10	EROSION PREVENT. & SEDIMENT CONTROL PLAN	LS	$5,955.17		$0.00	1	$5,955.17	1	$5,955.17	1	$5,955.17
652.20	MONITOR EROS. PREVEN& SED. CONTROL PLAN	HR	$47.72		$0.00	120	$5,726.40	160	$7,635.20	40	$1,908.80
654.10	EROSION MATTING	SY	$1.65		$0.00	1474.44	$2,432.83		$0.00	546.67	$902.00
656.30	DECIDUOUS TREES	EACH	$159.38		$0.00	25	$3,984.50	50	$7,969.00	8	$1,275.04
656.45	TRANSPLANTING TREES	EACH	$235.23		$0.00		$0.00		$0.00		$0.00
675.20	TRAFFIC SIGNS, TYPE A	SF	$13.60		$0.00		$0.00		$0.00		$0.00
675.341	SQUARE TUBE SIGN POSTS AND ANCHOR	LF	$4.83		$0.00		$0.00		$0.00		$0.00
675.50	REMOVING SIGNS	EACH	$11.10		$0.00	5	$55.50		$0.00		$0.00
675.60	ERECTING SALVAGED SIGNS	EACH	$24.90		$0.00	5	$124.50		$0.00		$0.00
675.61	SETTING SALVAGED POSTS	EACH	$130.07		$0.00	5	$650.35		$0.00		$0.00
679.21	LIGHT POLE BASE	EACH	$825.45		$0.00	50	$41,272.50	50	$41,272.50	50	$41,272.50
679.23	BREAKAWAY FEATURE FOR LIGHT POLE	EACH	$381.78		$0.00	50	$19,089.00	50	$19,089.00	50	$19,089.00
679.45	LIGHT POLE (Lumec Domus, installed with wired conduit, pul	EACH	$1,543.93	24	$216,797.04	50	$77,196.50	50	$77,196.50	50	$77,196.50
679.47	BRACKET ARM	EACH	$665.79		$0.00	50	$33,289.50	50	$33,289.50	50	$33,289.50
679.50	LUMINAIRE	EACH	$825.22		$0.00	50	$41,261.00	50	$41,261.00	50	$41,261.00
	Optimized Signal Timing Plan	LS	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00	1	$7,500.00
	Signal Equipment (per Traffic Signals.xls in Cost Est. folder)	EACH	$146,700.00	1	$146,700.00	2	$146,700.00	2	$146,700.00	2	$146,700.00
	Garbage Receptacles, Battery Park	EACh	$600.00	10	$6,000.00						
678.22	VEHICLE LOOP DETECTOR (video detection assumed for 1	LF	$1,250.00	11	$13,750.00	128	$13,750.00	128	$13,750.00	128	$13,750.00
				Subtotal	*$563,931.36*		*$757,279.83*		*$1,570,179.90*		*$618,611.61*
			Contingency (20%)		$84,589.70		$151,455.97		$314,035.98		$123,722.32
			Engineering/Permitting (20%):		$56,393.14		$151,455.97		$314,035.98		$123,722.32
			Municipal Project Management (10%):		$56,393.14		$75,727.98		$157,017.99		$61,861.16
			Construction Inspection (15%):		$56,393.14		$113,591.98		$235,526.98		$92,791.74
				GRAND TOTAL	$817,700.47		$1,249,511.73		$2,590,796.83		$1,020,709.16

APPENDIX D

Stormwater Improvements

ENGINEERING VENTURES INC
208 Flynn Avenue, Suite 2A ▪ Burlington, VT 05401 ▪ tel. 802.863.6225 ▪ fax 802. 863.6306
85 Mechanic St, Suite 350A ▪ Lebanon, NH 03766 ▪ tel. 603.442.9333 ▪ fax 603.442.9331

Burlington Waterfront North – Lake Street and Depot Street Improvements

The Waterfront North design team has been tasked, in part, to evaluate stormwater and drainage issues along Lake and Depot streets. Conceptual design concepts are provided below, describing both base and enhanced options for each street, along with initial cost estimates. It should be noted that the design information presented is based on digital terrain data, which does not provide adequate detail for design. A full survey of these areas will be needed prior to designing any of the components described below;

Lake Street

Grading and drainage issues have been an ongoing issue along a portion of Lake Street, centered approximately 1,100 feet north of the College Street Intersection. In this area water frequently collects along the east side of the sidewalk. During colder weather, this leads to ice issues.

Also noted were issues with standing water in the swale along the west side of the road. Swale grading appears uneven, and the existing yard drain grate is small, increasing the chance for obstruction

Recommended Base Improvements

- Re-grade the greenbelt between the existing Maple trees to allow surface runoff reaching the sidewalk to flow west to the street. Survey data is required to determine whether this work alone will correct the issue.
- Remove the existing yard drain and storm line along the west side of Lake Street (north of the pedestrian RR crossing). Install 2 new 24” square concrete catch basins with cast iron grates and regrade the adjacent areas to drain properly.

Potential Enhanced Improvements

- Remove and reconstruct approximately 200’ of concrete sidewalk to raise grade, and improve drainage across the greenbelt.
- Add fill to approximately 3,500 sf of open land west of the sidewalk (owned by MainStreet Landing) to avoid standing water.

Depot Street

The existing pavement surface is badly deteriorated, and requires repair. In addition, stormwater runoff in this area is problematic.

Currently, surface runoff from the hillside to the east and approximately half of the runoff from the paved surface is collected by a paved swale running along the east side of the road. With the road slope ranging between 5% and 13%, and approximately 3 AC of hillside contributing above, water moves through the swale at high velocity to a pair of catch basin inlets at the intersection with Lake Street. Leaf debris carried downslope in the swale collects on top of the grates, interfering with inflow.

No stormwater treatment is provided by the paved swale, however water collected by the catch basin inlets flows via underground piping to a sand filter based treatment system located under the residential access road to the west. Some issues have been reported with this treatment system, which have not yet been evaluated.

Recommended Base Improvements

- Grind existing surface and re-pave.
- Evaluate issues with existing sand filter based system with Public Works staff and recommend improvements as needed.

Potential Enhanced Improvements Option 1

- Remove asphalt surface, and test pit to determine sub base conditions.
- Install perforated drainage pipes at 100’ intervals with discharge to the swale east of the road.
- Add 12” crushed stone “choker course” and top with 6” of pervious asphalt.

Potential Enhanced Improvements Option 2

- Grind existing surface, add crushed stone, and re-grade to create 1% cross-slope to west.
- Install 6 tree box filters along the west side of Depot Street, with piped discharge to swale on east side of road.

Also considered was the possibility of installing a series of subsurface detention structures at regular intervals along Depot Street, to provide storage for peak flow mitigation. This option was not pursued, as it would provide limited treatment potential.

APPENDIX E: TRAFFIC ANALYSIS FOR BATTERY STREET ALTERNATIVES

Facilitating safe pedestrian crossing of Battery Street is a key objective of the Waterfront North project. Over the course of the scoping project a total of 6 project alternatives were evaluated. Of these 6, 3 alternatives required significant changes to Battery Street within the existing paved area. These 3 alternatives are:

- Constructing a Complete Street along Battery Street as recommended by the Burlington Long Range Transportation Plan.
- Constructing a variation on the Complete Streets concept, termed "Complete Streets Lite".
- Constructing 2 spot intersection improvements.

These alternatives are relevant to pedestrian access to the Waterfront as they would affect the traffic speeds along Battery Street and, in some places, would reduce the pavement width necessary to cross the street.

Of interest in evaluating each of these 3 approaches to using Battery Street is how projected traffic demand would operate subject to proposed geometric changes. To understand how each of these alternatives will operate the following analysis was conducted:

- AM and PM peak period traffic counts were obtained for the following intersections:
    - Battery/Main
    - Battery/College
    - Battery/Cherry
    - Battery/Pearl
    - Park/Battery/North
    - North Ave./North Street
- Traffic data were balanced and adjusted to represent 2020 design hour volumes.
- Other probable development traffic was added, including traffic associated with the Moran site and traffic associated with the Main Street Landing Phase III development (Union Station parking lot).
- These traffic volumes were then analyzed using Synchro and SimTraffic microsimulation software to determine future operating conditions subject to the different roadway geometries for each of

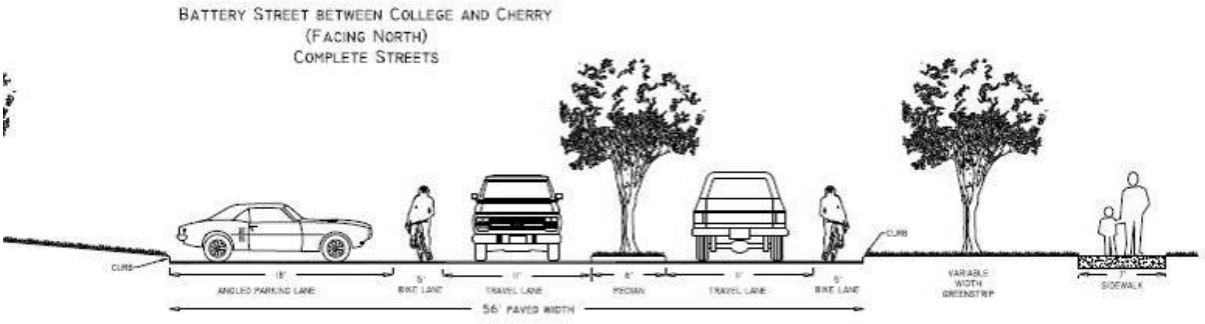
the alternatives. A Base Case was also evaluated, representing existing geometric conditions along Battery Street. For each alternative 5 simulation runs were performed and averaged.

This technical appendix discusses each cross-sectional alternative briefly and then presents the summary traffic operational data associated with each alternative and compared with the Base Case (existing conditions).

Complete Streets

The Burlington Transportation Plan suggests analyzing a Complete Streets approach to Battery Street, which includes raised plaza-style intersections; on-street parking (reverse angle); lighting, landscaping, and stormwater improvements; and a median. The key configuration of a Complete Streets geometry would reduce the cross sectional area of Battery Street from 4 lanes to 3. The 3 remaining lanes would consist of one northbound lane, one southbound lane, and a center lane used for left turns at the approaches to each intersection or as medians for street segments (Figure 1).

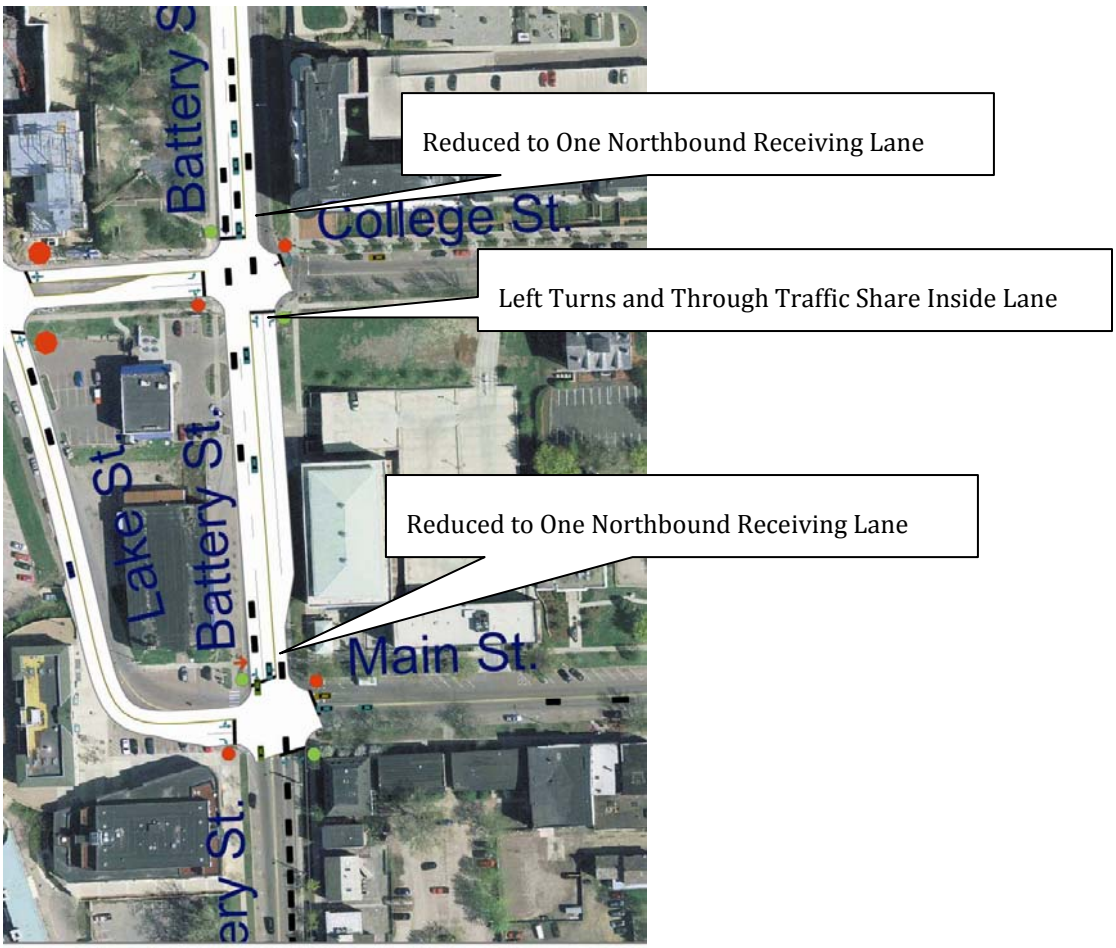
Figure 1: Complete Streets Cross Section for Battery Street



Complete Streets "Lite"

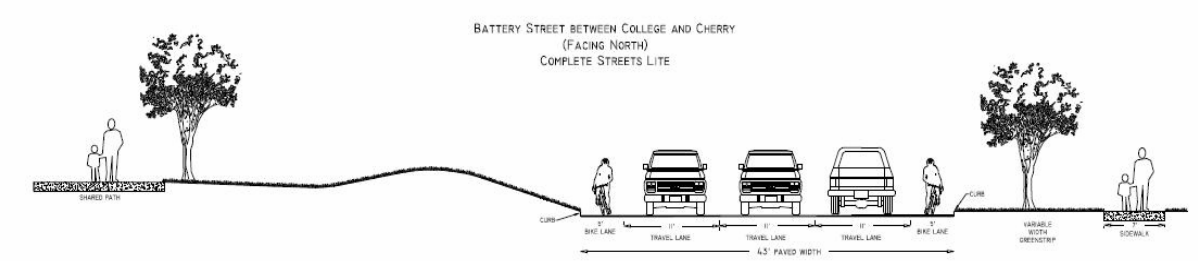
A variation on the Complete Streets theme was also modeled, reducing the number of northbound lanes at strategic locations between Pearl and Main Streets, while maintaining 2 southbound lanes.[1] This configuration requires that the northbound approach to each intersection consist of two lanes – a dedicated right turn lane and a through lane or shared left-through lane in the cases of Battery at Main and College (Figure 2).

Figure 2: Simulation Model Interface Showing Complete Streets Lite for Battery Street Northbound



[1] The northbound approach geometries modeled were: shared left-through and right-turn lanes at Main and at College; through and right-turn lanes at Cherry and at Pearl; the second right-turn lane at Pearl was eliminated.

Figure 3: Complete Streets Lite Cross Section for Battery Street



Spot Improvements

A final street design alternative evaluated in this scoping project was the construction of 2 spot intersection improvements:

- Eliminate one of the two northbound right turn lanes at the Battery Pearl intersection. Battery Street immediately north of Cherry Street will continue to accommodate two lanes northbound. The curbside lane would be dedicated for right turning movements onto Pearl Street.
- Establish an exclusive westbound right turn lane at the Battery/College intersection. This could be accomplished by eliminating 2-3 on street parallel parking spaces at this location, accompanied by appropriate pavement striping.

Operational Analysis

As described above traffic modeling was conducted of the Battery Street corridor using estimated 2020 AM and PM peak hour traffic volumes. Each alternative, including a Base Case scenario assuming no changes to the existing geometry along Battery Street, was modeled using Synchro and SimTraffic, a microscopic traffic simulator. The microsimulation is an important analytical step to understand intersection-to-intersection interactions from queuing and deceleration. Optimized signal timings were estimated for each scenario.

The Measures of Effectiveness that are reported are:

- Total Delay (hours), equal to the travel time minus the time it would take a vehicle with no other vehicles or traffic control devices to conduct their trip through the network, summed over all vehicle trips.
- Delay per Vehicle (seconds/vehicle), equal to the Total Delay divided by the total number of vehicles. This measure is not to be associated with an intersection-level delay per vehicle as it represents the average per vehicle travel time for each trip in the corridor.

- Average Speed is the average speed of vehicles traversing the network, and incorporates stopped time and time associated with vehicles denied entry.
- Fuel Used
- Vehicles Denied Entry is a count of vehicles unable to enter Battery Street due to congestion. This is an artifact of simulation modeling and relates to real world conditions insofar as vehicles denied entry suggest severe congestion with intersection and/or storage lane blocking.

Table 1 and Table 2 report the network-wide results for the 2020 AM and PM peak hours, respectively

Table 1: Summary Network Results, 2020 AM Peak Hour

	2020 AM Peak Hour			
	Base	**Complete Streets**	**Complete Streets Lite**	**Spot Improvements**
Total Delay (hr)	98.5	182.7	87.4	109.8
Delay / Veh (s)	100.3	196.8	89.2	114
Avg Speed (mph)	20	19	19	18
Fuel Used (gal)	211.6	189	173.1	175.1
Vehicles Denied Entry	3	190	12	50

Table 2: Summary Network Results, 2020 PM Peak Hour

	2020 PM Peak Hour			
	Base	**Complete Streets**	**Complete Streets Lite**	**Spot Improvements**
Total Delay (hr)	89.3	65.2	100.7	66.9
Delay / Veh (s)	108.6	79.2	124.6	82.1
Avg Speed (mph)	21	20	17	20
Fuel Used (gal)	211.2	144.9	152.1	144.7
Vehicles Denied Entry	0	0	0	0

Compared to the Base Case, the Complete Streets alternative shows extreme congestion during the AM peak period, as evidenced by the large number of vehicles denied entry to the simulation. Average delay per vehicle is over 3 minutes. In the PM peak hour, with the substantially different traffic flows, the Complete Streets alternative appears to work well, with less overall delay network wide than the Base Case.

The Complete Streets Lite alternative shows acceptable performance in the AM peak hour, with a minor increase in vehicles denied entry. Total Delay, Delay per Vehicle, and Average Speed are all very comparable to the Base Case. The PM peak period shows some moderate increase in Total Delay and an associated reduction in Average Speed as the elimination of the northbound lane reduces overall capacity, but not enough to create apparent adverse queuing (zero Vehicles Denied Entry).

The performance of the Spot Improvements alternative shows very similar performance during the AM peak period and slightly improved performance during the PM peak period when compared to the Base Case.

APPENDIX F

Public Comments from Alternatives Presentation

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

ALTERNATIVES PRESENTATIONS: 11/20/08

(#) = number of times comment was made

Crossing Battery Street

- How would you get people to use the ped bridge/tunnel? People usually bypass bridges/tunnels, so don't bother building one. (2)
- Having a right-turn lane on WB College would present significant safety issues. Vehicles would be looking left (south) for oncoming traffic and not looking for peds.
- The ped actuator at College-Battery isn't working.
- Do an exclusive ped phase at College-Battery.
- Don't put a bike lane on NB Battery. Put bike lanes on other routes extending from Pine Street.
- Put a bike lane on NB Battery.
- I like the new Battery Park Extension/Pedestrian Boulevard, but it could use some trash cans. (2)
- Would the Battery Street cross-section be compatible with a streetcar?
- Take a comprehensive approach to planning; coordinate with other plans and areas of the city.
- Peds and vehicles seem to be competing.
- Lighting- make sure that it is sufficient and maintained. Many of the lights on College St. are dim and burn out and do not get replaced in a timely manner.
- Don't bother adding bike lanes in the Complete Streets Lite or Spot Improvements; they won't be helpful to bicyclists if they are only for one block (Cherry to Pearl).
- Turn College Street into a pedestrian way and bury Battery underneath.
- It could be argued that a median (as shown in Complete Streets) is worth taking 5' of Battery Park extension; that is, maintaining the existing centerline and shifting the lanes on the west side.
- Why is it ok to go down to 1 lane north of Cherry when 2 lanes are needed up to that point?
- I like eliminating the 2nd right-turn lane.
- Create more bike facilities so that bikes don't ride on the sidewalk; support for a bike lane on Battery.
- Need longer ped phases or an exclusive ped phase.
- What about a reversible center lane?
- On-street parking on Battery seems dangerous.

60 Lake Street, Unit 1E ▪ Burlington, Vermont 05401
TEL 802.383.0118 ▪ FAX 802.383.0122 ▪ www.rsginc.com

- College St. and Battery St. intersection is the most vital pedestrian access and it must be improved. The second most vital access is at Cherry and Battery Streets. Construct a pedestrian overpass walkway (wheelchair accessible and well-lighted) that would be closed after dusk. Or a pedestrian tunnel at College and Battery, lighted but closed after 10PM, with emergency phone access included.
  - Must adjust "Walk/Don't Walk" signals at Cherry & Battery and at College & Battery); many close calls for cars trying to turn right on red. Maybe eliminate right-on-red at these two intersections as well as Cherry & S. Winooski and S. Winooski & Bank.
  - Better signage for City Parking Garages. Make better use of the College St. garage entry point on Battery St. and the Lakeview garage on Cherry St.
- Battery St -- I favor the Complete Street Lite design with the elimination of the 2nd right turn lane at Pearl St and the addition of both north and south bound bike lanes. I also like how this design would not widen the street as the complete st would. With the complete st lite design, I see no reason to add a bridge or underpass. I think these two options would be suited for a highway crossing while we should be downsizing Battery St to make the need for costly and unsightly construction unnecessary. Crosswalks with responsive signals would be better.
- Allow room for trolley/light rail circulator to make use of Battery Street. I believe the City, at some point in the near future, should look into developing a trolley/light rail circulator line that links the waterfront, possibly the rail yard, downtown, the new transit center, and the UVM/Fletcher Allen campus. I feel it is important that any plans for Battery Street now being made not preclude, or make more expensive, this possibility. It would be highly likely that a trolley/light rail line would make use of at least a portion of Battery Street.
- I like the Complete Streets Lite option -- a real complete street would be ideal, but I imagine it'd be more expensive and would increase congestion quite a lot. The Lite option accomplishes some important things in terms of providing wider, safer bike lanes and reducing the number of lanes for pedestrians to cross. It might be a good intermediate step on the way to a complete street. Prefer pedestrian bridge to underpass -- bridge is more visible for tourists to find and less creepy -- also provides an opportunity for cool public architecture/design. I would combine base improvements, complete streets lite, and the pedestrian bridge in a final alternative.

Down to Waterfront

- I like the In-Slope parking idea, but would private interests take over or would the general public get to use it?
- Depot St.-improve lighting; make it clear at the bottom of Depot that it is closed to vehicles.
- In-slope parking is too expensive; would have to be a private endeavor, and then it would not be accessible to the public, so what's the point?

- Bikes don't like cobblestones. That would keep them off Depot St.
- Keep maintenance needs (like the Sherman Street Stairway planters and snow removal) in mind when selecting a preferred alternative.
- Enhance Battery Street to attract people from downtown to the Waterfront.
- I like the Sherman Street Stairway. (5+) Great access from Battery Park to Waterfront, especially when there are events/concerts at the Park. Be sure to include bike grooves.
- What about just improving Depot Street from the base of the Sherman Street Stairway south?
- Would there be liability associated with the stairway?
- Include bike grooves with stairways.
- What about a stairway from Burlington College down the bike path? (Along the northern edge of the study area boundary.)
- What about an alignment straight down from Pearl alongside the townhouses?
- Is Depot Street stable enough to be used, even for bike/ped? There appear to be erosion issues on the adjacent slopes.
- It is shortsighted to only use Depot St. for bike/ped. Open it to vehicles to have a northern outlet for the Waterfront.
- What about an alignment coming down from BPD parking lot?
- What about the maintenance issues for a stairway? Snow removal?
- Depot Street is too narrow for traffic and can't be widened.
- Be sure to direct lighting down to avoid light pollution.
- Concern for safety if Sherman Street Stairway empties out into Depot Street when cars are using it during a special event.
- What is the potential ped volume that would be attracted to an improved Depot Street or a Sherman Street Stairway?
- Depot Street or a potential connection at Sherman Street are the only accesses to the Waterfront from points north, particularly the Old North End.
- I like the idea of improving Depot as a bike/ped facility. It's nice to walk down and not worry about cars. It's a great bike/ped access to the Waterfront.
- It only makes sense to open Depot to vehicles if the Moran site is developed.
- I like the idea of burying utilities.
- Is it really necessary to cut down more trees to have an outlook from Depot Street? There are already great views from Battery Park.

- Is a Sherman Street Stairway really the best use of the limited amount of money that will be available, especially compared to improving Battery Street crossings, etc.? Identify priority projects.
- Strong support for pedestrians.
- Construct a marble staircase from Battery Street at the meadow (below Cherry Street). Use a zigzag design with plateaus and benches, landscaping and art. (5) (from Burlingtonpol.com blog)
- Prefer Alternative C of the stairway layouts because it serves people efficiently regardless of the direction they are moving and without the annoying need to double back. Depending on the height and location of the intersection between the stairs and Depot St., this could be a nice plaza if there is a view of the park and lake.
- I don't support in slope parking. This is too industrial and would diminish the values of Battery Park and diminish the pedestrian and bicycle values of the area.
- I support the Sherman St stairway straight design. I think this would be the best addition to accessing the waterfront. Lighting, a pocket park and wetland-based stormwater improvements on Depot St would be great. I would also support narrowing this street to make it more appealing to pedestrians as well as adding planting along the eroded base of the slope.
- I was concerned after hearing the stairway presentation. I think there are significant safety and maintenance concerns (and costs) that would need to be more fully addressed. I also think the very large number of steps, combined with the current proposed location, will lead to low levels of use and poor long-term maintenance. We'd be creating a major long-term headache. At this point, I think a better expenditure would be on the pedestrian route/park between Battery Park and College Street -- with a much shorter stairway installed at some point along this stretch of land. I don't think negotiations with private landowners would be a major obstacle and is worth a closer look.
- Love the Sherman St. stairway -- either option would be great. Minimizing alignment impacts on private lands makes sense -- obviously the more we can space out access/alignments to allow access to waterfront from multiple points along Battery, especially from ONE, the better. Most important alternatives are base fixes to Depot and some sort of stairway. Least important = funicular (though I think it'd be great).
- The proposed waterfront improvements seem ill-conceived. Here's why: First, the change in elevation between Battery Street and Depot Street at the proposed Sherman Street access is unmanageable for any but the most fit individuals. How many people walk eight flights of stairs (the approximate number of flights needed) in business buildings? And, how does one negotiate with a baby carriage, a walker, a cane, or several small children? Second, tourists are never going to walk the length of Battery Street to access the proposed stairway for several reasons- lack of familiarity with the area, lack of parking close by and length of walk uphill. The stairs would be

daunting.
Further, how would one maintain these stairs for winter access? I can see an army of shovel-bearing city employees moving snow from top to bottom, then returning with the snow melt to keep the stairs from being icy. It is impractical, at best, as a snow blower wouldn't work, a bucket loader definitely wouldn't work, etc. Perhaps this would be a "summer only" route, though the indoor climbing wall and ice skating rink are winter activities.
If the planned development, including parking, is on the north end of the waterfront park, with future development planned even more northerly, pedestrian and car access should be developed from the north. Depot Street is a logical starting point. There are no residences along that street until the very bottom of the hill (and none to the westerly, or lake side), so the road could be widened to accommodate two lanes of vehicular traffic plus a pedestrian or bike lane. It most likely would cost no more to re-grade part of that street than it would to build eight flights of stairs into the hill instead, as the same issues need to be addressed either way(soil stabilization, run-off, retaining walls, etc). Though I understand that egress on Battery is a challenge, there is land on the southwest corner of the intersection of Depot and Battery that is open. Perhaps Burlington College would trade parking lots, agreeing to park either on Sherman Street or in the police parking lot.

- The morning following the November presentation I went to the Sherman St site (next to the police station) where it is proposed that a pedestrian stairway be located to Depot St and then to the Moran plant level of the waterfront. My immediate reaction was, "You've got to be kidding. How many people would actually use this?" My reaction was based on both the steepness and the height of the bank from Sherman St to Depot St. This was confirmed by the .pdf map included in the presentation which showed a starting elevation of 208 ft at Sherman St., and a ending elevation of 128 ft at Depot St. --equivalent to an eight story stairway and, I believe, totally unrealistic as "improved access" for the vast majority of residents, visitors, anyone with young children, seniors, handicapped, etc.Just because the city owns this property doesn't mean our taxpayer dollars (federal, state, or local) should be spent there. Looking at the difference in elevation of the Battery St crossing at Cherry and College St. it would appear that a relatively usable tunnel could be built at College St., dropping down ten or a dozen stairs (or ramp equivalent) on the uphill side, going flat under Battery St. and exiting at grade about midway between Battery St and Lake St just to the south of the "Skinny Pancake" restaurant (utilizing both the sidewalk and a few parking spaces on the north side of College St.) This would seem to be a fairly realistic way to improve access on an already popular route utilizing city property.
- The Sherman St. staircase sounds like it could be a good candidate for something similar to this tile mosaic (below) in San Francisco. It could be a neat new landmark in Burlington…

- Depot Street should at least be a seasonal one way exit route for the waterfront. Take the concept you've identified and extend the use from emergency vehicles, occasional transit based on events of a certain magnitude, bikes and peds to emergency vehicles, seasonal one way exit or safety valve, occasional transit based on events of a certain magnitude, bikes and peds. Safety valve on seasonal basis. Sherman Street not the optimum site for stairway.
- Keep Depot the way it is. Can you put a gate somewhere along the road that can be seen before you drive up or down, to discourage someone from driving on Depot but emergency vehicle can get through? Do not want to see it opened to regular two way traffic. Can you have a right turn only at the top so that cars leaving the parking lot and cars leaving Depot can't turn left and screw up the intersection? Use better signage. Make it clear that you can't drive through on Depot. Needs better enforcement.
- I support the work to improve access for pedestrians. I live at 200 Lake Street and have been frustrated by the number of people that cut through my property. There are many paths that lead down and people feel free to do so even though private property signs are posted. They have damaged fencing, dropped garbage and even threatened my family to stop them. So, for me I am grateful to you to recognize the need to provide easier access and I urge the completion of multiple stairways quickly. Also, I would request that some kind of fencing be included in the project to prevent cutting through the woods which also could prevent garbage from blowing down the hill.

Access to Moran

- Bike path should not cross the entrance to the Moran parking garage.
- Don't bother with the bridge from the Sherman stairway to the Moran parking garage.
- Put the bike path on the east side of the Moran parking garage or put garage accesses on east side.
- Lake Street is too narrow. Object to putting more traffic on Lake Street to access Moran. Not a matter of going slow, trucks can't pass each other. Close Lake Street to general traffic and make it for local traffic only.
- Need to prevent people from driving around looking for a parking space.
- Putting access to a parking structure off Sherman Street or North Ave (by BPD) is a great idea.
- I strongly oppose a raised parking structure. Parking is a very poor use of space, particularly green waterfront space. Also, when planning long term structures, we must think long term. Vehicle sales are falling dramatically and vehicles miles traveled (VMT) have been falling for most of the last year for the first time ever. Although we are in a temporary time of cheap oil again, oil will be prohibitively expensive within the lifespan of the parking deck and we will be wondering what to do with it and all its vacant spaces. Please consider more versatile alternatives such as shuttles to other parking that will allow us to adjust capacity to demand, rather than having a mostly empty parking lot most of the winter and one that only handles a tiny portion of big summer event needs. If a multilevel parking deck must be built, I would recommend designing it to support uses other than parking on the top deck. When it is no longer needed for parking, we could use it for commercial or residential development.
- I like the idea of the stairway leading to Moran, but I don't think it's very inviting to have the stairway end at a parking garage. Might be better to arc the stairway, skip the bridge, and have walkers come in via Depot/Lake Street.
- To reiterate the feelings expressed by some of us at the November session, it seems totally unrealistic to promote significantly increased utilization of the northern waterfront without similar commitment to developing new and more direct access to this area-- either through utilisation of Depot St or creation of a new right of way to the north. Funneling vehicular traffic along Lake St where increased pedestrian traffic is being encouraged would seem to be recreating the problem of pedestrian crossing at Battery St -- with the added negative impact of vehicular traffic, noise, pollution, etc. in closer proximity to the lake and waterfront park. There must be a better and more logical alternative.
- I am supportive of use of some transportation improvement funding to enhance the areas around the Moran site. I think that the bike path reconstruction and realignment is critical to maintaining the economic strength of the city. Making the area around the Moran plant safer and more appealing to residents and visitors is essential. Creating lighting, sidewalks, proper paving

and crosswalks with pedestrian improvements is important to establish this area as welcoming to the immediate area as well as the areas beyond... North Beach, Leddy Park and points north. At present the area is a combination of industrial missmash that does not communicate properly to the city and the public. Public art, underground utilities and innovative stormwater treatments are also valuable investments that would be appropriate for the use of the transportation funding.

- I am in favor of improvements to the transportation infrastructure at the Moran site, including paving, streetlights, sidewalks and crosswalks, innovative stormwater treatments, underground utilities, special paving, public art and bike path realignment. These Infrastructure improvements at Moran will economically strengthen Burlington's Waterfront and Downtown, will support public improvements and private investments, and will ensure better pedestrian, bicycle and vehicular access on the Waterfront.
- I would urge we spend infrastructure funding on the waterfront to include improvements to the Moran site like paving, streetlights, sidewalks and crosswalks, innovative storm water treatments, undergrounding utilities, special paving, public art and bike path realignment.
- I advocate for improvements to the Moran site: paving, streetlights, sidewalks and crosswalks, innovative stormwater treatments, underground utilities, special paving, public art and bike path realignment. I am in favor of these types of specific improvements and the prioritization of funds to construct these improvements as desirable. I've heard that the infrastructure currently most lacking is around Moran. The rationale for prioritization of the improvements includes: Infrastructure improvements at Moran will economically strengthen Burlington's Waterfront and Downtown; will support public improvements and private investments; and will ensure better pedestrian, bicycle and vehicular access on the Waterfront. I ride my bike everyday, including all winter long. I support any and all of the aforementioned improvenents to the bike path in and around the Moran Plant.
- I would like to take this opportunity to show my support for improvements to the waterfront, specifically on the moran redevelopment site. The infrastructure around the moran plant could use the most attention and improvements such as paving, streetlights, sidewalks and crosswalks, new stormwater treatments, underground utilities, public art and bike path re-alignment would all go a long way toward improving access to the burlington waterfront. i urge you to prioritize the improvements i mentioned and others on the moran site to benefit burlington and all those who visit.

North-South Transit

- Is there really a need for transit on the Waterfront? CCTA provides paratransit services.
- I like the added mobility of transit and the idea of not adding more cars to the Waterfront. (2)

- I like light rail.
- A transit line on the Waterfront is not warranted. The alignment shown is a reasonable walking distance. (2)
- Tie transit into a loop that would access off-site parking and downtown. (2) Talk to other planners about transit projects.
- Are there any plans to expand the capacity on Lake Street?
- Look into ferry shuttle between King Street and Moran Plant. I think a shuttle ferry / water taxi would be a great service to link two ends of the waterfront. I believe it would be highly valued and used between May and October, and would serve as an additional attraction on the waterfront. I hope this idea can be incorporated into the plan.
- Don't put big city/CCTA buses on the Waterfront.
- Overall I think we should not be working to build up or industrialize the waterfront with parking garages or even pleasure transit systems (such as at a theme park). People go to the waterfront to be on the waterfront, strolling walking etc. Adding a shuttle would decrease this value while adding little value to the visitor. It really isn't a very large area to walk or be rolled around on.
- Would be cool to use the rail line in some way. May be an element that has to wait for a greater build-out of the waterfront following an updated waterfront plan & planning process. Right now, getting between Echo & Moran on foot isn't too bad, but we are able to develop points further south, then a transit solution would really start to have "legs."
- A northern connector is another logical starting point, with people moving equipment installed (either jitneys or pedal-powered transport) on the already existing waterfront park from the south parking lots heading north.
- I believe we can have Amtrak coming into Union Station by 2010. So plans should anticipate the rail usage of tourists but also Vermonters arriving and departing at the foot of Main St. by train.

General

- I prefer limited refiguring of Battery St. auto and pedestrian/bicycle traffic, and very limited access via motorized traffic to Depot St. with safe accommodations for pedestrians and bicycles. I urge that any new street lights have shades that direct light to the pavement and not horizontally. Underground wiring and improved storm water runoff would be desirable. (This in view of the known fragility of the hillside Depot St. traverses.) Unobtrusive parking accommodations, preferably not on but near the waterfront with shuttle transport available must be considered. This more modest plan makes sense to me because more extensive plans should be forthcoming when decisions about use of the North Forty is in the offing.

- While a stanch supporter of alternative modes of transit I also acknowledge that we need up graded thru access of auto travel on Lake St. and College from the traffic trap that currently is... One way out on Depot Street is the obvious solution that has been held hostage by politics for too long... (The not in my backyard syndrome). But the Lake is one of our cities (and States) great assets and it is for all to use not just the handful of residence who moved along Depot Street in the last few years. I believe that the city should also include looking seriously at the back door access to Echo and College St. from King Street along the Road that everyone ignores that parallels the rail Road right of way and comes out of the old Woodbury Lumber property into the Echo parking lot.
- The Burlington Business Association Waterfront Action Group (BBA WAG) Supports the Following Goals of the Project:
  - Improve pedestrian crossings of city streets while maintaining adequate traffic flow
  - Facilitate pedestrian travel down to the Waterfront from Battery Park, including improving conditions along Depot Street.
  - Improve Storm water Management Along Northern Lake Street
  - Enhance travel access to and on the Waterfront and to improve connections to the Downtown
  - Develop north-south travel alternative to Lake Street.
  - Promote access to the Moran site. Provide for future access to the Urban Reserve

  Specific Comments on the Projects Components:

  Battery Street Crossing:

  As to the crossing at Battery St. the BBA WAG supports the alternative titled “Base Improvements” as we believe such improvements will meet goals # 1 and 4 above in the most cost effective manner. This alternative was presented as having the least impact on traffic flow on Battery Street – another point in its favor.

  Battery Park to the Waterfront:

  The BBA WAG supports the goal of improving pedestrian access between Battery St. and the Waterfront. The BBA WAG prefers the alternative of a Sherman Street Stairway among those presented. The BBA WAG has some specific concerns related to this option. They include:
  - That any stairway be adequately lit for safety and ease of passage.
  - That a plan be in place before stairway construction for the structure’s on-going and long term maintenance (especially as it relates to snow and ice removal).
  - That the stairway merges into Depot St. in such a way that safe use of Depot St. is preserved for emergency vehicles and special event use and perhaps its re-opening as a two-way street.

Depot Street:

The BBA WAG supports planned improvements to lighting, pavement and storm water treatment on Depot Street. The BBA WAG supports continued use of this street for emergency access and for access to and from the waterfront during special events. The BBA WAG would encourage that any improvements to Depot St. not eliminate the possibility for the expansion of the street's use for vehicular traffic in the future. The BBA WAG would like to be a part of continued discussions about the possible use of Depot Street for two-way vehicular access with the waterfront.

Moran Redevelopment/Access:

Should redevelopment of the Moran Plant enter additional phases, consideration should be given to traffic generated by the project, traffic patterns of visitors, access to public transportation for visitors, and points of exit and entry on the north end of the Burlington Waterfront. The BBA WAG would like to be a part of additional dialogue and planning for this project.

North/South Transit Line:

The BBA WAG is in favor of additional dialogue and planning for a possible North/South Transit Line.