

West Broadway SURGE Facility Plan

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DEPARTMENT OF ECOLOGY
EASTERN REGIONAL OFFICE



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Project No. 2007188
Date: 16 September 2009

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EXPIRES 8/4/2010

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1. INTRODUCTION

1.1. Project Overview and Study Purpose

West Broadway is the first project chosen for the Spokane Urban Runoff Greenway Experiment (SURGE). SURGE is a demonstration program to determine the suitable criteria for retrofitting existing curb and gutter systems with plant-based Low Impact Development (LID) stormwater treatment systems in Spokane's urban environment. Based on the very successful SW 12th Avenue project of "Green Streets" program in Portland, Oregon, this SURGE project will demonstrate how a similar system will function in Spokane's colder and drier climate.

This will be the first installation of pervious concrete sidewalk by the City of Spokane. The project results will be used to develop design criteria for future LID design retrofits. SURGE will benefit the city and its citizens by reducing runoff entering the combined sewer system; improving water quality of the infiltrating runoff; and meeting the NPDES Phase II stormwater permit requirements.

Currently, stormwater in Broadway Avenue is collected into the combined sewer system and conveyed to the Riverside Park Water Reclamation Facility (RPWRF), or overflows to the Spokane River during large storm events. West Broadway SURGE proposes separating stormwater from the combined sewer system for treatment and disposal.

The purpose of this report is to provide a description of the existing site conditions, a summary of the proposed design alternatives and specific recommendations for project facilities necessary to provide stormwater flow mitigation and pollutant treatment.

1.2. Site Description

West Broadway SURGE is located within Section 13 of Township 25 North, Range 42 East within the City of Spokane, Washington. The entire West Broadway Avenue project encompasses approximately 1.3 acres and is located between Elm Street and Oak Street in the fully developed West Central Neighborhood. The project site and adjacent developments are within Centers and Corridors Type 1 zoning and no changes are planned for the landuse. Broadway Avenue and the surrounding neighborhood consist of a relatively flat slope with a gradient of about 0.5 percent slope. Figure 1 identifies the project vicinity.

1.3. Problem Identification and CSO Facility Information

The City of Spokane implemented a program to address Combined Sewer Overflow (CSO) discharges to the Spokane River beginning with the *Facilities Planning Report for Sewer Overflow Abatement* (reference 1). Based upon this plan the City (in the 1980's) implemented a \$43 million storm separation construction program which reduced annual CSO volume by 491 million gallons. Sixty-four percent of the City's developed sewer service area was separated.

In response to their 1992 NPDES Permit requirements, the City developed the *Combined Sewer Overflow Reduction Plan* (reference 2) which reviewed the status of CSO reduction efforts and proposed additional actions and improvements for CSO reduction.

In March 2000, the CSO program was updated to provide a comprehensive review of the combined sewer systems (CSS) and the interceptor system. The objective was to maximize the use of both interceptor and the Riverside Park Water Reclamation Facility (RPWRF) and provide sufficient CSO reduction to comply with State of Washington regulations (Chapter 173-245 WAC). The *Combined Sewer Overflow Reduction System Wide Alternative Report* (reference 3, hereafter referred to as the CSO Reduction Alternative Report) by AECOM (formerly CTE) and dated 2005 was subsequently approved by the Department of Ecology.

One of four applicable technologies identified in the CSO Reduction Alternative Report is partial separation. For this report partial separation is defined as: “Partial sanitary storm separation discharges to treatment bio-swales which eventually is discharged to the ground”. The West Broadway SURGE project incorporates partial separation technology.

The City of Spokane’s NPDES wastewater permits have included a provision for CSO compliance. The following is an excerpt from the current draft permit that is under review:

“E. CSO Compliance Schedule

In order to achieve the greatest reasonable reduction of combined sewer overflows at the earliest possible date, the City shall implement all portions of the approved CSO reduction plan and amendments dated December 4, 1998, March 10, 2000 and any subsequent amendments as approved by Ecology. The following elements of the approved combined sewer overflow reduction plan shall be accomplished in accordance with the following schedule of milestone dates.

- 1. Implementation of the approved schedule shall begin immediately.*
- 2. No later than December 31, 2017, any discharge of CSO shall meet all final State and Federal requirements applicable to such discharges.”*

The City of Spokane has less than nine years to bring their CSO system and discharges in compliance with State and Federal requirements.

West Broadway SURGE project is located within Combined Sewer Overflow (CSO) Basin 23. The CSO 23 regulator is located in the Cedar Street and Ide Avenue intersection, and the outfall pipe travels west and south to a discharge on the north bank Spokane River, about 450 feet east (up river) of the Maple Street Bridge. In 2007, CSO 23 experienced 18 overflows. These overflow events discharged approximately 815,045 gallons of untreated combined stormwater and sanitary sewage flows into the Spokane River; an average of 45,280 gallons per overflow event. Figure 2 identifies CSO Basin 23 and the project site.

West Broadway SURGE has the potential to produce a reduction in the CSO Basin 23 regulator discharges to the Spokane River and reduce the volume of stormwater to be

treated. The SURGE project will also remove and treat stormwater borne pollutants that would impact the Riverside Park Water Reclamation Facility and potentially the Spokane River. One goal of the West Broadway SURGE is to demonstrate the cost-effectiveness and environmental benefits of “partial separation” technology within the CSO basin system.

1.4. Reference Studies

The following studies were utilized in the preparation of this study:

The *Facilities Planning Report for Sewer Overflow Abatement* (reference 1) prepared by AECOM and dated 1977 was used to provide basin and cost information regarding CSO Basin 24a.

The *Combined Sewer Overflow Reduction System Wide Alternative Report* (reference 3, hereafter referred to as the CSO Reduction Report) prepared by AECOM and dated December 2005 was used to provide stormwater information for CSO Basin 23.

2. METHODOLOGY

2.1. Compliance

The stormwater design methodologies used in the preparation of this study are in compliance with the *Spokane Regional Stormwater Manual* (reference 5, hereafter referred to as the Regional Stormwater Manual) and with the *Stormwater Management Manual for Eastern Washington* (reference 6, hereafter referred to as the EW Stormwater Manual). Stormwater was analyzed for both water quality treatment and hydrology. Stormwater Technical Information Report is contained in Appendix B.

2.2. Water Quality Treatment Design

Bio-infiltration areas are required to treat the volume equivalent of the 6-month National Resources Conservation Service (NRCS) Type II 24-hour design storm, the water quality treatment flow volume (first flush). The Alternative Hydrograph Method was used to determine required treatment volume for the storm garden bio-infiltration cells. This method provides an approximation of the NRCS Type II 24-hour storm. Volume calculations were computed using:

$$V=1133AP^{1.53} \text{ (equation 6-1a; Regional Stormwater Manual)}$$

Where:

V = required treatment volume in cubic feet

P = precipitation in inches (since this is 1 inch for the Spokane region it is eliminated from the formula)

A = hydraulically connected impervious area in acres

Equation 6-1a is recommended where the subgrade soils have less than 12% fines and have an infiltration rate greater than 0.15 in/hr.

West Broadway SURGE and surrounding areas are located within the Garrison gravelly loam moderately deep 0 to 5 percent slopes. Garrison soils belong to Hydrological Soil Group (HSG) B and are classified as well drained soils. An infiltration rate of 10 inches per hour is initially assumed for the design. On-site soils information for Broadway Avenue were obtained by field investigation. Since all soils within the bio-infiltration treatment areas will be imported, the infiltration rate and other physical soil characteristics are based upon project specifications. Geotechnical information is contained in the appendix of the Stormwater Technologic Information Report (see Appendix B).

The “first flush” will be infiltrated through the treatment soil, but when stormwater runoff flow exceeds the infiltration rate of the top layer, stormwater will overflow into a vertical pipe that connects to two perforated pipes. Flows will then infiltrate into the soil. Storm gardens are uniformly sized to treat 29 cubic feet of runoff. The storm garden design depth is 5 inches; and therefore a minimum surface area required is 70 square feet.

Flows bypassing the storm gardens will be collected by the existing storm system grate inlets located downstream of the proposed treatment and conveyed to the combined sewer system.

2.3. Hydrologic Analysis

Peak flow, total volume and hydrograph routing analysis were performed for West Broadway SURGE project. The project site is required to infiltrate the stormwater runoff up to the 10-year, 24-hour event. The computations for each analysis are contained in the Stormwater Technical Information Report located in Appendix B.

2.3.1. Peak Flow and Total Volume—Curve Number (CN) Method

The Curve Number (CN) Method was used to estimate peak flow rates and volumes.

$$S = \left[\frac{1000}{CN} \right] - 10 \quad (\text{Equation 5-1, Regional Stormwater Manual})$$

Where:

S = maximum storage volume of water on and within the soil (inches)

CN = curve number (dimensionless)

$$Q = \frac{(P - 2S)}{(P + 0.8S)} \quad (\text{Equation 5-2; Regional Stormwater Manual})$$

Where:

Q = runoff (inches)

P = precipitation (inches)

Hydrologic Soil Group Classification: West Broadway SURGE and surrounding areas are located within the Garrison gravelly loam moderately deep, 0 to 5 percent slopes type soils (GgA). Garrison soils belong to Hydrological Soil Group (HSG) B and are classified as well drained soils.

Curve Numbers: Curve Numbers (CNs) indicate the runoff potential of a drainage basin. Runoff for the West Broadway SURGE project will be entirely from impervious surfaces. A CN of 98 for average antecedent conditions was used for calculations.

Design Storm Distribution: A rainfall distribution and associated precipitation was chosen based on the Regional Stormwater Manual requirements for sizing flow control facilities. The NRCS Type 1a 24-hour storm was selected for sizing the storm gardens.

2.3.2. Hydrograph Routing—the Level Pool Routing Method

The Level Pool Routing Method was used to size the detention capacity of the storm gardens. The storm gardens are five feet wide and 14 feet long (inside dimensions) with 2.5 feet (depth) of structural soil mix. Stormwater will be stored on top of the treatment soil and in the structural soil layer beneath the treatment soil. Stormwater storage was calculated in the structural soil based on a 30 percent void ratio. When stormwater flows exceed the infiltration rate of the treatment soil, water will begin to pond and when the water surface elevation rises to 5 inches above the treatment soil, it will overflow to a drain system in the structural soil.

Storm gardens are uniformly sized to store 73.5 cubic feet of runoff. With an infiltration rate of 10 inches per hour and 70 square feet surface area, the resulting maximum outflow rate is 0.016 cubic feet per second. The level pool routing method results in a maximum storage depth of 1.2 inches, which exceeds the 100-year, 24-hour event.

3. ALTERNATIVE DESIGN ANALYSIS

3.1. Background Information

Several areas within the City of Spokane were considered for the first Spokane Urban Runoff Greenway Experiment (SURGE) project. The criteria established for site selection included:

1. Located within a CSO Basin;
2. Part of or adjacent to a construction project;
3. Neighborhood interest; and
4. Feasible to implement a plant-based Low Impact Development (LID) stormwater treatment systems

Broadway Avenue between Elm and Oak Streets easily met these criteria. The project is located within CSO Basin 23. This block is the next phase of the Broadway Streetscape. The West Central Neighborhood (WCN) constructed Broadway Streetscape between Oak and Ash Street in 2008. The neighborhood planned to construct a streetscape improvement from Elm to Oak Street when funding could be obtained and are very excited about having a SURGE project. This block on Broadway Avenue could use a treatment and storage system similar to the SW 12th Avenue Green Street project in Portland, Oregon (a project description is contained in Appendix C).

3.2. Alternative Development and Evaluation

Three design alternatives were evaluated to reduce the stormwater volume entering the existing combined sewer system (CSS) of CSO Basin 23. The three alternatives used the same design basis: a series of planters would be constructed between the curb and the street right-of-way to capture, treat and infiltrate street runoff. The planters are called “storm gardens.” A storm garden is similar to rain garden in function, but is adapted to Spokane’s drier summers and colder winters than experienced in Portland and Seattle. The storm gardens on this project will include a street tree and native or adapted plants.

The design alternatives differ from one another by the placement and size of the storm garden; however, several factors are the same for all the alternatives. The width of the storm gardens was limited by the existing curb and right-of-way location and was set at five feet to provide appropriate sidewalk width of eight feet. A 12-inch treatment soil depth and 30-inches of structural soil are standard for each alternative. The storm garden variations of the three alternatives are summarized in Table 1.

Table 1: Storm Garden Variation for Each Alternative			
Alternative	Placement	Length	Wall Depth
1	Tree street spacing—24” OC	Varies	18 inches
2	Determined by hydrologic analysis	16 feet	60 inches
3	Determined by hydrologic analysis	16 feet	30 inches

Layouts of these alternatives are shown in Appendix D.

3.2.1. Alternative 1

The first alternative located the storm gardens based on street tree spacing. The City’s standard spacing for street trees along Broadway Avenue is 24 feet. The planters are each located with a street tree in the center and the length was varied to fit between existing driveways and trees. A standard 18-inch curb wall is used around the planter. Runoff enters through a level concrete splash pad.

One of the purposes of SURGE is to establish design criteria for future projects. Using a varying length storm garden would not provide a standard for treatment and storage. Construction would also not be standard.

3.2.2. Alternative 2

The second alternative located the storm gardens based on hydrological analysis. A standard sized storm garden of 13 feet-8 inches long by 5 feet depth is located to provide

the necessary treatment. Runoff enters through 5-foot deep concrete sediment trap. The depth of the box will facilitate soil replacement.

This alternative provides a standard design with a specific treatment and storage capacity. Broadway Avenue has a low pollutant loading classification and the additional cost for the extra depth could not be justified.

3.2.3. Alternative 3

The third alternative is similar to the Alternative 2; a standard sized storm garden of 14-foot long is located to provide the necessary treatment, but has 30-inch concrete walls around the storm garden. Runoff enters through a level concrete splash pad.

This alternative provides a standard design with a specific treatment and storage capacity at the lowest cost.

3.2.4. Alternative Evaluation

Alternative 3 was selected because it provides the greatest amount of storage at the lowest cost and provides a standard design.

Table 2: Design Alternative Summary

Alternative	Storm Garden Description	Estimated Volume Removed from CSS	Estimated Cost	Comments
1	Placement: street tree spacing Wall Depth: 18 inches	25,000 gallons	\$359K	Pros: Stormwater to CSS reduced; “first flush” treatment; highest storage volume Cons: Storm garden of non-uniform size
2	Placement: hydrologic analysis Wall Depth: 60 inches	15,500 gallons	\$363K	Pros: Stormwater to CSS reduced; “first flush” treatment; uses standard size storm garden to establish standard Cons: 5-foot planter wall increased construction cost; lowest storage volume
3	Placement: hydrologic analysis Wall Depth: 60 inches	17,000 gallons	\$344K	Pros: Stormwater to CSS reduced; “first flush” treatment; uses standard size storm garden to establish standard Cons: moderate storage volume

4. EXISTING CONDITIONS

4.1. Existing Site Condition

Broadway Avenue between Elm Street and Oak Street is located in the northwest area of the city, west of Spokane County offices. The existing terrain is relatively flat with a slope of about 0.5 percent slope. Broadway Avenue, classified as a minor arterial, has a pavement width of 50 feet within 80 feet of right-of-way. A five-foot planting strip separates the five foot sidewalk from the pavement. The condition of the sidewalks and curbs vary from good to deteriorating.

All but one of the properties along Broadway Avenue are fully developed with mixed use. The major use (75 percent) of the properties is commercial including professional and financial services, retail, a restaurant and a church. Both multiple unit and single unit residential properties comprise the remaining 25 percent.

4.2. Existing Drainage

Storm runoff generated in Broadway Avenue is conveyed at the curb (no existing gutters) to the low point at the Oak Street intersection. Storm flows are collected by three grate inlets at this intersection and are conveyed to the existing combined sewer system. The existing combined sewer system is 18 inches in diameter and flows to the south in Oak Street.

Properties along Broadway Avenue do not contribute to the street runoff and are considered hydraulically unconnected. In accordance with the EW Stormwater Manual and the Regional Stormwater Manual, the hydraulically unconnected pollutant generating areas were removed from the contributing basin delineation.

5. PROPOSED DESIGN

5.1. Scope

The proposed West Broadway SURGE includes the demolition of existing curbs and sidewalks and replacing with curb and gutter, pervious concrete sidewalk and pavers. The project will also construct a series of “storm gardens” to collect, treat and infiltrate stormwater runoff from the adjacent impervious surfaces. Design plans are shown in Appendix E.

5.2. Proposed Facilities and Innovative Technologies

Curb and Gutter

Integral cement concrete curb and gutter will be constructed to replace the existing curb. Although the City of Spokane Design Standards allow replacement of existing curb with

similar curb, curb and gutter was selected for this project in view of the fact that the relatively flat slope and to better control flow into the storm gardens.

Pedestrian Buffer Strip

A two-foot wide pedestrian buffer strip will be constructed adjacent to the curb. The purpose of this buffer is to allow safe exit and entrance to vehicles parked along the street and for pedestrian movement. Concrete pavers or colored pervious concrete will cover the pedestrian strip.

Storm Gardens

Between the pedestrian buffer strip and the pervious sidewalk, 27 storm gardens will be constructed on both sides of Broadway Avenue. The storm gardens are designed to collect, treat, and infiltrate stormwater runoff. Storm gardens have four distinct features with each designed to address a specific purpose.

1. Curb Inlet and Splash Pad

The gutter flow line will depress at the curb inlet to direct flow into the storm garden. The 18-inch wide curb inlet will be covered with a traffic-rated grate through the pedestrian strip. The runoff will enter the storm garden on an 18-inch wide level concrete splash pad. The splash pad will provide an area for sediment to settle. A level spreader will be constructed downstream of and 2-inches above the splash pad to provide uniform flow conveyance into the storm garden.

2. Treatment Soil Mix and Surface Storage Area

Soils provide the basis for stormwater treatment. A specified soil mix will fill the top 12-inches of the 14-foot long by 5-foot wide surface area storm garden. The designated soil mix will provide Cation Exchange Capacity (CEC) and organic matter content required per the Regional Stormwater Manual. Organic matter content will be added to the treatment soil approximately every four years to allow sufficient CEC. Testing will be completed to substantiate the treatment soil composition during construction.

The wall around the storm garden will retain up to 5 inches of stormwater, which is one inch below the curb inlet flow line elevation. In addition, a fine composting mixture is specified in the treatment soil to retain soil moisture and to promote healthy plant growth. Soil infiltration rates allow the cell to be completely drained within 24 hours following a storm, but are slow enough to promote adequate pollutant treatment and to attenuate flows for infiltration.

3. Structure Soil Mix and Overflow Pipe

Below the treatment soil, 2.5 feet of structural soil will provide short-term storage to allow stormwater to infiltrate. This soil mix has 30 percent voids for storage of water and was used for street trees installed during the Broadway Streetscape project east of the SURGE project. A similar mix was developed by Cornell University to provide street trees a better growing environmental rather than typically compacted soil for street construction. A description of Cornell University's Structural Soil is contained in Appendix F.

When the water elevation rises above the 5-inches storage, an overflow pipe will drain stormwater directly to the structural soil. The 5-inch depth is designed to

provide “first flush” water treatment. The overflow will be used by runoff from storms greater than the 6-month treatment design storm.

4. Landscaping plants

To provide a Low Impact Development (LID) design, the planting palette was specially designed to thrive without the addition of irrigation, chemical pesticides and fertilizers. Native and locally adapted species are specified in the mixtures to provide varieties that are drought tolerant in addition to some plants that can survive with occasional “wet feet”. “Adapted” means the specific species is a relative of a plant that is native to the area. Adapted species are cultivars that have been bred to strengthen specific characteristics, such as drought tolerance. The selected plants are listed in Table 3.

Plant	Type	Benefits
<i>Nyssa sylvatica</i> (Sour Gum Tree)	Drought Tolerant (not native)	Small pyramidal, seasonal color, and drought tolerant
<i>Calamagrostis x acutiflora</i> ‘Karl Foster’ (Feather Reed Grass)	Adaptive Native	Other <i>Calamagrostis</i> species are native to area
<i>Festuca Glauca</i> ‘Elija Blue’ (Blue Fescue)	Adaptive Native	True native alternative may be <i>Festuca Idahoensis</i> , but <i>Glauca</i> is fuller and more attractive and equally drought tolerant
<i>Hemerocallis x ‘stella do oro’</i> (Stella De Oro Daylily)	Adaptive Native	<i>Hemerocallis</i> species native to area
<i>Iris Missouriensis</i> ‘Rocky Mountain’ (Western Blue Iris)	Native	<i>Iris Missouriensis</i> is <u>native</u> to Spokane area
<i>Mahonia repens</i> (Creeping Mahonia)	Native	<u>Native</u> to the Spokane area
<i>Pennisetum alopecuroides</i> (Fountain Grass)	Adaptive Native	<i>Pennisetum</i> species native to area
<i>Veronica Pectinata</i> (Woolly Creeping Speedwell)	Adaptive Native	<i>Veronica</i> species native to area

These plants require approximately 1 inch of water per week during the hot summer months. Rather than installing a temporary irrigation system for plant establishment, the construction contract for West Broadway SURGE will require the contractor to maintain the plants and trees for two full summers. Following the establishment period the plants should require little water beyond natural rainfall.

Paver and Landscape Strips

Landscaping and pavers will fill the areas between the storm gardens. While the storm gardens have a uniform length of 15 feet (outside dimension), existing features such as driveways and trees are variable in location and size. The landscape strips will be placed on both ends of the storm gardens to increase the amount of planting area and vegetative

material. Pathways between the curb and the sidewalks will be six feet wide and covered with concrete pavers or colored pervious concrete.

Pervious Sidewalk

The existing sidewalk will be replaced with six-foot wide pervious concrete sidewalk. Pervious concrete has the same components as standard Portland cement concrete, but has a drier mix that creates more voids. The voids allow movement of water through the sidewalk. The pervious sidewalk has rougher appearing finished surface. Precipitation will infiltrate through the sidewalk, rather than creating runoff.

5.3. Innovative Technologies

The West Broadway SURGE project will be the first installation of storm gardens and pervious concrete within the City of Spokane. Innovations within this project include the following:

1. Treatment soil mix;
2. Trees within infiltration facility;
3. Structural soil for stormwater detention;
4. Landscape plantings within a stormwater facility;
5. Use of native and adaptive plants for a street planting strip; and
6. Pervious concrete sidewalk.

6. Environmental Conditions

6.1.1. Existing Environmental Conditions

Broadway Avenue between Elm Street and Oak Street is a fully developed, mixed used block in the West Central neighborhood. Building density and hardscape increases along the 650 feet block from the west to east. A variety of businesses are located among residences along the block which include offices, retail services, a medical facility and a tavern. Houses contain both single dwelling and multiple dwelling residences. Many of the original brick street and homes along the block were constructed over 50 years ago, and a few houses date back nearly 100 years. All construction work for the project will be on previously disturbed land within the public right-of-way.

A summary of the pertinent existing environmental conditions is provided below.

Soils Information

Basic soils information for the project was obtained from the USDA Natural Resource Conservation Service *Soil Survey for Spokane County, Washington* (reference 7). This survey delineates soil types and provides the Hydrological Soil Group (HSG) for each soil unit. Exhibit A1 depicts the project site in relation to the soil units and is located in Appendix A. West Broadway SURGE and surrounding areas are located within the

Garrison gravelly loam moderately deep 0 to 5 percent slopes type soils. Garrison soils belong to Hydrological Soil Group (HSG) B and are classified as well drained soils.

Air Quality

The project is located within Spokane County's Air Quality Maintenance Area for both particulate matter and carbon monoxide. Exhibits A2 and A3 depict the project site in relation to the two air quality maintenance areas, which can be found in Appendix A. Pedestrian facilities that will be constructed as a part of West Broadway SURGE project are exempt from Air Quality conformity requirements according to Title 40 of the Code of Federal Regulations (CFR) Protection of the Environment, Section 93.126 in Appendix A.

Flood Plains or Ways

The project site is not located within a FEMA designated Special Flood Hazard Area (SFHA) 100-year flood plain or 500-year floodway. Exhibit A4 depicts the project site in relation to the flood plain and floodway, and is located in Appendix A.

Safe Drinking Water Act

West Broadway is located over the Spokane Rathdrum sole-source aquifer and within the Spokane County Critical Aquifer Recharge Area. Exhibit A5 depicts the project site in relation to the aquifer and is found in Appendix A. The Department of Health (DOH) has no concerns regarding the West Broadway SURGE project. The DOH correspondence is located in Appendix A. The project is not located within a wellhead protection area.

Surface Water

No surface water is located within the project area nor will it be affected by the project. Surface stormwater runoff generated by Broadway Avenue between Elm Street and Oak Street are currently intercepted by three grated inlets at the intersections of Oak Street and Broadway Avenue. The runoff is collected into the combined sewer system and conveyed to the Riverside Park Water Reclamation Facility (RPWRF), or during large storm events will overflow to the Spokane River. During larger or intense storm events, street runoff not collected by the existing combined sewer system flows south into Oak Avenue.

Wild and Scenic Rivers, and Wetlands

No wetlands or wild and scenic rivers are located within the project area nor will they be affected by the project. Exhibit A6 lists the wild and scenic rivers; no wild and scenic river is located within Spokane County. Exhibit A7 depicts the project site in relation to wetlands. These exhibits are located in Appendix A.

Biological Assessment

Existing trees along Broadway Avenue between Elm Street and Oak Street were assessed by the city's Urban Forestry in March 2008. The three street trees evaluated along the project were determined to be in good health and should be preserved during construction. The Upper Columbia Office of the U.S. Fish and Wildlife Service (USFWS) provides a list of endangered, threatened and species of concern for eastern Washington. Exhibit A8 shows the species listed by USFWS for Spokane County. No endangered species are listed for Spokane County. Critical Habitat map for Spokane County from USFWS website shows no critical habitat in the county. This map is located in Appendix A. No federally listed, proposed, or candidate species are known to

occur within the project site. A copy of the Updated Species List for the City of Spokane Corporate Limits, Spokane County, Washington is provided in Appendix A.

Resource Lands

No agricultural lands or forest lands are located within the project area nor will they be affected by the project. All work of the project will be on previously disturbed land and within the city limits of Spokane.

Environmental Health

West Broadway SURGE will require excavation below the existing sidewalk for installation of pervious sidewalk, storm gardens and landscaping. Four sites on the Confirmed and Suspected Contaminated Sites List (CSCSL) are within one-mile radius of the site. Two of these sites are listed on the Voluntary Cleanup Program. The two sites within a ½ mile radius of the project are listed on the Leaking Underground Storage Tanks (LUST); however, both sites are reported cleaned up. There is no potential for this project to generate contaminated soils or groundwater. These CSCSL sites are shown on Exhibit A9 in relationship to the project site.

Land Use

The project site and adjacent developments are within Centers and Corridors Type 1 zoning and no changes are planned for the landuse in the future. There are 24 parcels adjoining the project along Broadway Avenue. Exhibit A10 depicts land use and zoning in relation to the project. The major use (75 percent) of the properties is commercial including from professional and financial services, a restaurant and a church. Both multiple unit and single unit residential properties comprise the remaining 25 percent. West Broadway SURGE will not require changes to the existing residents or businesses.

Noise and Visual Quality

West Broadway SURGE will not change the roadway horizontally or vertically or increase the traffic volumes. Noise will not be increased by this project. The project will not negatively impact visual aspects such as aesthetics, light, glare or night sky from existing conditions today.

Cultural Resources/Historic Structures

The effect of the West Broadway SURGE project on cultural and historic resources has been evaluated. All work of the project is within the existing right-of-way for Broadway Avenue street and sidewalks and has been previously disturbed land. The project will replace existing curb and sidewalk, and install storm gardens within the previous disturbed right-of-way. Six building along Broadway Avenue were researched by the Department of Archeological and Historic Preservation (DAHP). The properties are not currently listed in the Washington Heritage Register or National Register of Historic Places. These six properties are not eligible for the National Register. The SURGE project was found to result in no historic properties impact. The letter from DAHP dated August 27, 2009 is placed in Appendix A as Exhibit A11.

Transportation

West Broadway SURGE will result in no changes to transportation. Broadway Avenue is a minor arterial with an average daily traffic count of 3,700 vehicles. On street parking along Broadway Avenue as well as the Spokane Transit Authority bus stop located at the

northeast corner of the intersection with Oak Street will be preserved by the SURGE project.

Environmental Justice

Environmental Justice is defined by the EPA as “*the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.*” West Broadway SURGE is located in the West Central Neighborhood with a low-income population. The SURGE project will benefit this neighborhood by providing, low-impact development stormwater facilities, enhancements of trees and plants in storm gardens and education.

Education will be addressed in several ways. An interpretive sign will be installed near a storm garden on Broadway Avenue. The sign will provide information about storm gardens, storm water treatment, combined sewer overflows and landscape plantings. Meetings with the neighborhood will inform the purpose and benefit of the SURGE program. Additional, City Cable 5 produced an introduction to West Broadway SURGE in their June 2009 Spokane Insight program. Two follow-up programs are planned both during and after construction.

6.1.2. Proposed Environmental Consideration

A summary of the environmental conditions during the construction phase and for the proposed project are detailed in below.

Air Quality

An increase in particulates and diesel exhaust emissions are possible during construction. Watering and other dust control measures will be used during construction. Post construction levels will be similar to preconstruction levels.

Storm Water

Surface stormwater generated by Broadway Avenue will be collected by the storm gardens. The initial storm flows (first flush) will be collected within the storm gardens, treated for pollutants and infiltrate. The larger storm flows will enter the existing combined sewer system as they do today. Existing condition flows to the combined sewer system will be reduced for most storms and potentially eliminated during small storm events. West Broadway SURGE will improve stormwater quality by capturing and treating the pollutant loaded “first flush.” It is anticipated that less sediment and pollutants will reach the Spokane Rathdrum Aquifer and the wastewater treatment facility.

Ground Water

Broadway Avenue traffic volumes are less than 3,700 vehicles per day giving it a low pollutant loading classification. Little commercial traffic traverses this section of Broadway Avenue and no commercial traffic generators exist between this section of roadway and the connecting arterials to the west. While no pretreatment was required per the UIC Manual, a minimum of 12-inches of bio-infiltration treatment soil is provided in each storm garden.

The bio-infiltration treatment soils contain organic carbon and the cation exchange capacity necessary for nitrogen treatment. The specified soil mix will provide treatment for total suspended solids, total petroleum hydrocarbons and metals. To supplement the

treatment soil, an information campaign will be used to inform property owners of proper maintenance and treatment of storm gardens, such as not applying fertilizers or over watering. The stormwater treatments provided are beyond what is required for groundwater protection.

Biological Effect

West Broadway SURGE will plant street trees within and adjacent to storm gardens. Sour gum (*Nyssa Sylvatica*) trees have been selected for this project to provide seasonal color and a large canopy while not impacting sidewalk and streets with an evasive root structure. Trees reduce stormwater runoff. The sour gum tree is a drought tolerant species, meaning its natural requirements are appropriate for the Spokane region of eastern Washington.

The plants are specially designed to thrive without the addition of supplemental water, chemical pesticides and fertilizers. In addition, plants are selected that can survive with occasional “wet feet”. Native species and locally adapted species are specified in the palettes. The U.S. Fish and Wildlife Service defines native species “With respect to a particular ecosystem, a species that, other than as a result of an introduction, historically occurred or currently occurs in that ecosystem” (Reference 8). Because the availability of the quantity of native plants in the appropriate sizes necessary for this project are not readily available, locally adapted species are also used.

Locally adapted species are plants that were native to the Spokane region, but have been bred for improvements, such as drought tolerance or ornamental characteristic. The plants for this project have been chosen to give the businesses and home owners an urban landscape with scale, texture and interest. And because this will be a very visible project, the selection was also made for the site look appealing from the dedication as well as several years in the future.

The landscaping plants for the West Broadway SURGE are listed in Table 3 in Section 5.2. The plants require approximately 1 inch of water per week during the hot summer months for a 2 year establishment period. Following the establishment period, the plants should require little water beyond natural rainfall.

Construction of West Broadway SURGE will be in proximity of two ash trees on the north side and a maple tree on the south side of Broadway Avenue. Air spading is specified during trench excavation and 10 inches of wood chip bedding will be placed around the base of the trees to protect them from construction equipment. Construction under the drip line will be avoided whenever possible.

Aesthetics

West Broadway SURGE includes artistic elements. Colored and stamped concrete or unit pavers will surround each storm garden. The colors have been selected to match the colored concrete in the blocks to the east of Oak Street along Broadway Avenue. The grate over the curb inlet has been selected to have a wave pattern to artistically depict stormwater flow. Landscape plantings have also been arranged to create symmetry and color balance.

A coordinated maintenance program will be developed with the City’s Wastewater Management Department and the West Central Neighborhood. Trash collection and

sediment will be removed three times annually. Planting will be pruned or replaced on an annual basis. In addition, 4 inches of composted mulch will be added every four years to amend the organic matter in the soil. The treatment capacity of soil, specifically the Cation Exchange Capacity, depends on a sufficient of organic material.

6.1.3. Environmental Compliance

All federally funded projects must consider the potential impacts of the project on the environment. The State Environmental Review Process (SERP) is used to evaluate the environment impacts of a project and projects must meet the SERP requirements. The environmental information contained in this facility plan is intended to provide the appropriate documentation to meet the SERP requirements.

A Categorical Exclusion (CE) is determined when a project does not have the potential to significantly affect the quality of the environment; and will not change the upstream or downstream function of the project or the receiving waters. The West Broadway SURGE project will not significantly affect the environment or the receiving waters.

7. CONCLUSIONS & RECOMMENDATIONS

1. The West Broadway SURGE design will remove up to 17,000 gallons of stormwater runoff from the existing combined sewer system of CSO Basin 23. The reduced stormwater volume will relieve the wastewater treatment burden at the Riverside Park Water Reclamation Facility and may reduce the number of combined sewer overflows into the Spokane River. In 2007, CSO Basin 23 experienced an average of 45,280 gallons per overflow event. West Broadway SURGE could potentially reduce the overflow volume from CSO Basin 23 by over 30 percent.
2. Storm garden detention capacity exceeds the volume produced by the NRCS Type 1a 100-year, 24-hour event.
3. The design will collect and treat the 6-month NRCS Type II, 24-hour design storm, the water quality treatment volume (first flush).
4. Three design alternatives were evaluated. The alternative selected will construct standardized storm gardens, pervious concrete and native landscaping. Storm garden are low-impact development (LID) stormwater facilities that collect, treat and infiltrate runoff.
5. Stormwater runoff that bypasses the storm gardens will be collected into the existing combined sewer system. The existing stormwater collection system and combined sewer system will not be altered by this project. Since the proposed design reduces the flow to the existing system, it does not present an adverse impact to the downstream properties and facilities.
6. Environmental information has been submitted to the Washington State Department of Ecology for review and approval.

8. REFERENCES

1. *Facilities Planning Report for Sewer Overflow Abatement*. AECOM, 1977.
2. *Combined Sewer Overflow Reduction Plan*. AECOM, 1994.
3. *Combined Sewer Overflow Reduction System Wide Alternative Report*. AECOM, December 2005.
4. *City of Spokane Design Standards Manual*. City of Spokane, February 2007.
5. *Spokane Regional Stormwater Manual*, prepared by Spokane County, The City of Spokane, and The City of Spokane Valley, dated April 2008.
6. *Stormwater Management Manual for Eastern Washington*. Washington State Dept. of Ecology, September 2004.
7. *Soil Survey of Spokane County, Washington*. U.S. Department of Agriculture, National Resource Conservation Service, July 1985.
8. *Invasive Defined—The Big Picture: Volunteers and Invasive Plants*,
<http://www.fws.gov/invasives/volunteersTrainingModule/bigpicture/invasives.html>,
09/16/2009



West Broadway SURGE Project Area

West Central Neighborhood

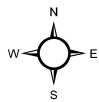
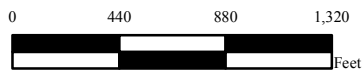
Peaceful Valley Neighborhood

Spokane River

Riverside Neighborhood

County Courthouse

City Hall



Legend

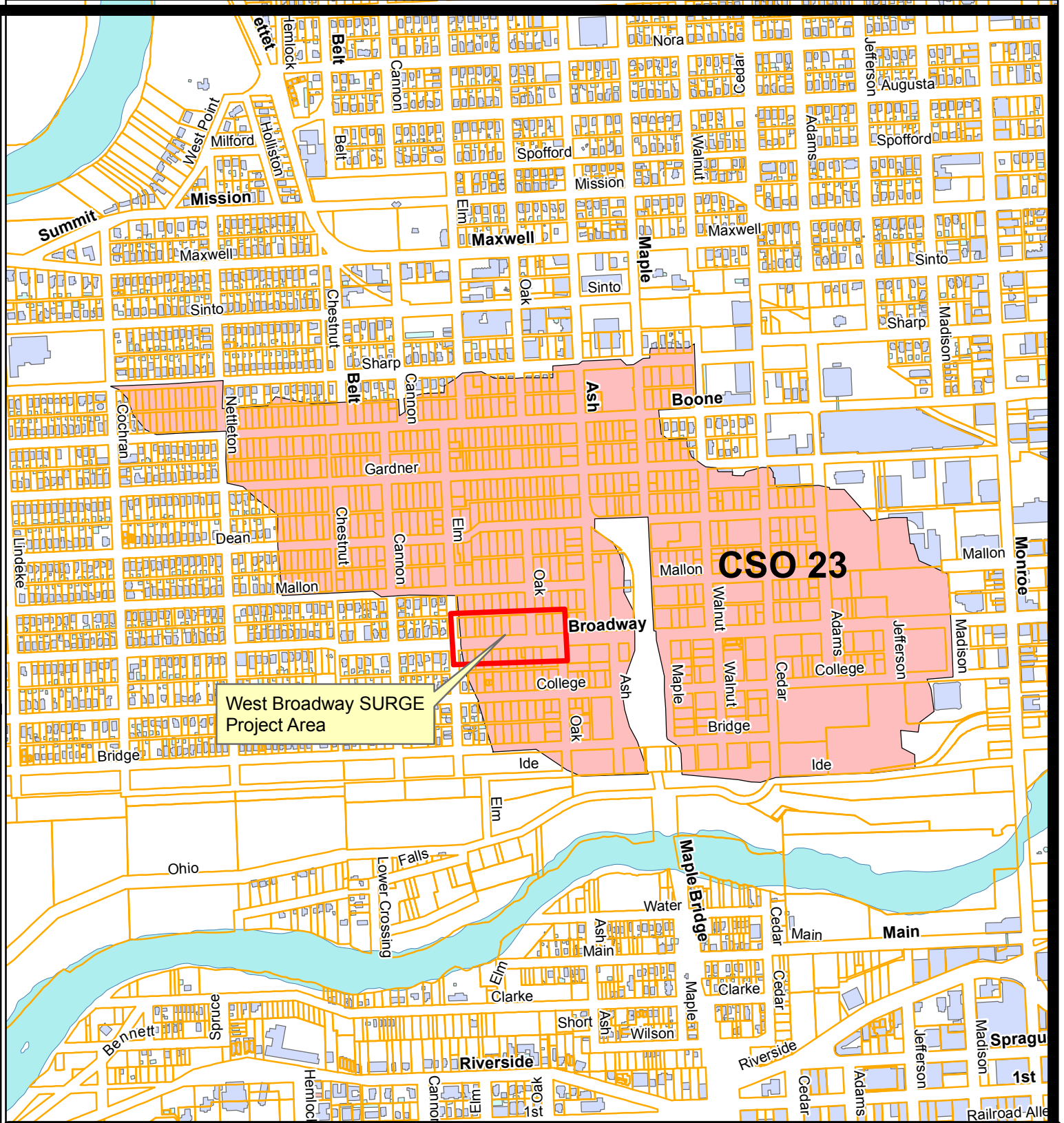
- | | | |
|-----------------------|---------------------|------------------|
| Airport | Fairgrounds | Other |
| COPS Shop | Golf Course | Post Office |
| Cemetery | Government Building | Public Building |
| College or University | Hospital | Senior Center |
| Community Center | Library | Shopping Center |
| Convention Center | Military Facility | Stadium or Arena |
| | Museum | broadwaysurgeCSC |

Figure 1
Vicinity Map
West Broadway SURGE

9-15-09

Susan King for
Marcia Davis

THIS IS NOT A LEGAL DOCUMENT:
The information shown on this map is compiled from various sources and is subject to constant revision. Information shown on this map should not be used to determine the location of facilities in relationship to property lines, section lines, streets, etc.



West Broadway SURGE
Project Area

CSO 23



*THIS IS NOT A LEGAL DOCUMENT:
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streets, etc.*

Legend

- West Broadway SURGE
- CSO Basin 23

FIGURE 2
West Broadway SURGE
CSO Basin 23

9-16-09

Susan King for
Marcia Davis