Appendix A

Waln Creek Enhancement and Battle Creek Culvert Removal Project Mitigation Plan

Salem Umbrella Mitigation Bank Instrument

Bank Sponsor:
City of Salem
Public Works Department
1410 20th Street SE
Salem OR 97302-1200

Prepared By:
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May 8, 2014

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Waln Creek Enhancement and Battle Creek Culvert Removal Project Mitigation Plan

Salem Umbrella Mitigation Bank Instrument

I. Introduction

This project is located on the former Battle Creek Golf Course; a once privately-owned course in south Salem that opened in 1962 and closed in 2007. The approximately 83-acre property is surrounded by single and multi-family housing and is characterized by open fields (former fairways), a number of mature trees, several wetlands, and four creeks. The largest creek is Battle Creek, which flows west to east through the site. Tributaries to Battle Creek include Powell Creek, Scotch Creek, and Waln Creek; all of which converge near the center of the property. Battle Creek flows offsite under Fairway Avenue, Commercial Street, and Interstate 5 before flowing into Mill Creek, near the City of Turner.

In 2008, the City of Salem purchased 38.52 acres in the southern portion of the golf course. The purpose of the purchase was to create a multi-purpose open space, with improved seasonal flood storage, enhanced creeks and riparian areas, and passive recreation opportunities. The acquisition was funded with utility rate funds as part of the City's stormwater management system. In October 2010, the City acquired an additional 29.4 acres of the golf course north of the previously purchased area. Of this new area, 10.6 acres was subsequently sold to the Salem-Keizer School District for the construction of an elementary school, which opened in September 2012.

The Waln Creek Enhancement and Battle Creek Culvert Removal Project is Phase 1 of two inter-related projects that will be constructed on the site of the former Battle Creek Golf Course. This project includes benching the banks of Waln Creek, creating a new, sinuous stream channel for a portion of Waln Creek, grading to create new floodplain, incorporating large woody material into the stream banks, and replanting the riparian area with native trees and shrubs. The removal of two culverts on Battle Creek, at the upstream and downstream ends of the former golf course, is also included in the Phase 1 project. The Phase 2 project, which is not part of this mitigation proposal, is the enhancement of Battle Creek to include benching portions of the banks, grading to create new floodplain, and replanting the riparian area with native trees and shrubs. Both phases will contribute to meeting City floodplain and stormwater management requirements. The Waln Creek enhancements and culvert removal on Battle Creek, which is the subject of this document, are described in more detail below. The Phase 2 enhancements on Battle Creek will be considered separately in the future.

II. Site Information

a. Site Location Map: Figure 1

b. Latitude and Longitude: 44.86398; -123.02364,

c. Legal Description: T 8S, R 3W, Sec. 23B, Tax Lots 100, 200, 400. (Figure 2)

d. Aerial Photo: Figure 3

e. Site Ownership: The City of Salem is the legal landowner of the property south of the new collector road bridge (Tax Lot 200, 400).

The portion of the Waln Creek project area north of the bridge is on property owned by Terry Kelly and Mary Renfro (Tax Lot 100). The City holds a restrictive drainage easement on the project area, which prohibits any development or other disturbance to the creek and riparian area (see Attachment B). Restoration activities on the Kelly-Renfro Property are not included in the mitigation bank credit calculations.

f. Land Use Affidavit: Attachment C

g. Adjacent Landowners: Attachment D

III. Project Need

Upon closure of the Battle Creek Golf Course, initial plans proposed redevelopment of the entire area to residential and commercial land uses. The rezoning, however, concerned adjacent property owners, who primarily were worried that any new development would exacerbate the property's periodic flooding and increase traffic on neighborhood streets. Through negotiations with the property owners, the City acquired the southern portion of the property (38.52 acres) to address flooding concerns. Subsequently, a rezone of their remaining property from PA (Public Amusement) to RS (Residential Single Family), RM-1 (Residential Multi-Family), and CR (Commercial Retail) was filed. Responding to citizen concerns, the Salem City Council adopted on July 13, 2009, Conditions of Approval (COA) (Order No. 2009-05-CPC/NPC/ZC) that included the following:

a. The construction of a new collector street to serve future site development.

b. Future development of the property is subject to a ―zero net rise restriction, which requires compensatory flood storage to be provided for any fill placed below the 100-year flood elevation.

c. Waln Creek shall be improved by allaying the banks and creating sinuosity.

d. Required implementation of projects that are in the City's Stormwater Master Plan, including the removal of culverts and stream enhancements.

After purchasing the additional area (29.4 acres) north of Battle Creek in 2010, the City, as a landowner, became subject to the COA adopted by the City Council. The Waln Creek enhancement project will address the flooding concerns of adjacent property owners by creating additional floodplain area and reconnecting the stream with a functional floodplain. The project will also meet all of the COAs described above, for which the City is responsible.

There are no federal or state permit requirements, other than for the permitted work, or mitigation credits associated with the project.

IV. Permits

The following permits have been issued for the project:

a. Corps No.: NWP-2011-100; issued March 16, 2012

b. DSL Permit No. 47781-RF; issued November 3, 2011

V. Compensatory Stream Mitigation Plan (CSM)

a. Baseline Conditions for the CSM Site:

i. Summary of Physical and Biological Characteristics of the Mitigation Site: The project site contains four perennial creeks. Battle Creek is the principal creek within the property and flows from west to east across the approximate center of the project site. The other creeks are Waln Creek, which flows from the northern property boundary south, Powell Creek, which is located to the south of Battle Creek and flows from west to east, and Scotch Creek, which is also south of Battle Creek and which flows south to north. All three creeks flow into Battle Creek almost at the same location.

The property encompasses a portion of a former golf course that opened in 1962 and closed in 2007. As is typical of a golf course, through the years the property's site drainage and vegetation were managed to facilitate the game of golf. Alterations include the excavation of several shallow ponds along Powell Creek and the straightening of all of the creeks, especially Waln Creek, which is essentially a ditch. The historic course of Waln Creek may be reflected in a shallow, linear wetland (Wetland F) located farther to the east of the existing channel. This wetland was one of seven wetlands delineated in 2007 and concurred with on June 24, 2008, by the Department of State Lands.

Little maintenance occurred on the golf course since it closed in 2007. This lack of maintenance may have resulted in additional wetlands forming in a portion of the property. On January 31 and February 15, 2011, wetland scientists from PHS conducted an on-site review of the wetland delineation boundaries within the project site. They found a larger area of wetland to the south of the Powell Creek channel and to the west of its confluence with Waln and Scotch Creeks. The modified wetland is 2.61 acres, approximately 2.00 acres larger than the previously concurred boundary. This brings the total area of wetlands within the study area to 3.55 acres.

Detailed Waln Creek conditions are contained in Attachment E: Geomorphic Reconnaissance for Waln Creek, which includes photographs of pre-existing conditions.

ii. Approximate Location of Water Features (e.g., wetlands, streams, lakes): Figure 4

iii. Jurisdictional Determination/Delineation Report: DSL concurrence letter – WD #08-0034 (2008) and WD #2008-0034 Addendum (2001) is provided as Attachment F

iv. Description of the Major Plant Communities: Golf course fairways are dominated by mowed, non-native grasses. The creek banks are generally lacking woody riparian vegetation, though Douglas spiraea is found below the top of bank along portions of Waln Creek. All of the wetlands are palustrine emergent (Slope and Flats) and are dominated by non- native grasses (e.g. reed canarygrass, meadow foxtail) and soft rush.

v. CSM Site Constraints or Limitations: There are no known site constraints or any liens or easements that might conflict with bank objectives. Any impacts to the mitigation bank that might result from any future infrastructure improvements that might occur will be restored to pre-impact conditions.

vi. Functional Assessment: The project will improve flood storage, water quality, aquatic and riparian habitat, and conveyance functions, all of which have been impacted in streams throughout much of the watershed.

The project includes the realignment of Waln Creek into a new sinuous channel with more gently sloped banks and the creation of floodplain adjacent to Waln Creek. This will result in improved connectivity of the stream to its floodplain and provide for improved flood attenuation capability. All of this will reduce the risk of periodic flooding of adjacent properties, which occurred prior to project construction.

The project includes replanting the riparian corridor with native trees and shrubs for a distance of 50 feet on either side of Waln Creek. As this woody vegetation matures, it will provide increased shade to the stream channel, which will contribute to lower water temperatures and improved water quality. Construction of the new stream channel also includes the placement of streambed gravel on the new channel bottom. The replacement of fine-grained substrates with coarser gravels will reduce scour, and this reduced scour will also contribute to improved water quality within the watershed.

Prior to project construction, substrate in the Waln Creek channel consisted primarily of hardpan clay and silt. The replacement of these substrates with gravel will improve habitat for aquatic macroinvertebrates, which provide food for fish and other organisms. Cutthroat trout are known to occur within the project area in Battle Creek, and they likely move from Battle Creek into Waln Creek as flows allow. The gravel substrates in the new Waln Creek channel will also provide improved spawning habitat for cutthroats and other fish species. Large woody material, which is incorporated into the banks of the new stream channel, will also provide habitat for aquatic macroinvertebrates, and it will also provide shelter for fish during periods of high flows. As noted above, native trees and shrubs in the riparian area will contribute to reduced stream temperatures, which will improve aquatic habitat for native species. This revegetated riparian corridor will also provide habitat for terrestrial organisms, and it will provide a source of organic material, which will provide a basis of nutrients for the aquatic food web.

Removal of the culverts in Battle Creek at the upstream and downstream ends of the project site will remove fish passage barriers and provide improved connectivity along the stream corridor, allowing fish to move along longer reaches of streams within the watershed. The removal of these culverts will also improve conveyance along the stream and within the watershed.

b. Goals and Objectives of the CSM: Goals of the Waln Creek Enhancement and Battle Creek Culvert Removal Project are as follows:

- Restore floodplain function.
- Improve Waln Creek channel and habitat conditions.
- Improve conveyance within Battle Creek.

These goals were accomplished through implementation of the following objectives:

- Approximately 800 feet downstream of the northern property boundary, a new sinuous creek channel was excavated to the east of the existing creek. The new channel has a bottom width of approximately 8 feet and 2:1 side slopes. The bed of the new creek was lined with coir material for erosion control, with native gravels placed in the bottom of the channel.

- A compacted soil plug with a volume of 450 cubic yards and a length of 200 feet was placed in the existing channel to divert flows into the realigned channel. Approximately 300 feet of the existing channel downstream of the soil plug was left intact as backwater refugia from Battle Creek.

- Floodplain benching occured along the length of Waln Creek. From the northern property boundary south approximately 950 feet, the bench is fifty-feet wide. Starting at the upstream end of the compacted soil plug, the benching become increasingly wider and will eventually include benching along Battle Creek. The total benched area will cover 5.69 acres.

- This entire area was seeded with native herbaceous cover, and the first fifty feet either side of Waln Creek (including the new sinuous portion of the channel) was planted with native trees and shrubs. The total area planted with trees and shrubs is 3.28 acres.

- Two culverts were removed on Battle Creek near the western and eastern property boundaries. During large storm events, water flowed over both culverts. To improve conveyance within the creek, both culverts were removed and the channel bottom and banks regraded to match the surrounding elevations. The western culvert had a diameter of 36 inches and was approximately 121 feet long. The eastern culvert also had a diameter of 36 inches and was approximately 102 feet long. Removal of the submerged culvert at the eastern property line improved fish passage during low flows. Once the culverts were removed and the creek regraded, the new surfaces were seeded with a native seed mix and planted with native trees and shrubs.

c. Site Selection Information: Summary of the project selection criteria from Appendix B. The project meets the site section criteria from Appendix B of the MBI as follows:

Connectivity of Aquatic Resources Criteria

- *Where primarily in-channel mitigation is proposed, associated floodplain and associated riparian corridor is unconstrained and fully functioning, or mitigation includes restoration of floodplain and riparian corridor.* The project restores floodplain and riparian corridor along Waln Creek.
- *Site is fully hydrologically connected with its floodplain (where floodplain exists depending on stream type) or floodplain restoration of floodplain connectivity is included in proposed actions.* The project reconnects Waln Creek to its floodplain within the project site.

- *Access to site by aquatic organisms (not limited to fish) is not limited by downstream man-made passage barriers or includes passage remedy, if appropriate to the functions being replaced/restored.* Removal of the culvert at the downstream end of the former Battle Creek Golf Course will remove a fish passage barrier downstream of the project site; however other barriers to passage are present downstream of this culvert.

Function Specificity Criteria

- *Site provides opportunity to improve functions identified as priorities for restoration in the sub-basin, or functions that are most likely to influence and enhance other functions, as indicated by their influence rank.* The project will improve flood storage, water quality and habitat functions. Grading to create new floodplain will reconnect Waln Creek to its floodplain and alleviate flooding problems that existed at the site prior to project construction. The re-establishment of native trees and shrubs within 50 feet of the stream will increase shade, which will help to lower stream temperatures, which are a pollutant of concern throughout Salem's streams. Replacing the straightened channel with a sinuous channel and replacing the existing hardpan and silty substrate with coarser materials will improve habitat for fish and aquatic invertebrates.
- *Site provides opportunity to improve multiple functions identified as limiting or constrained in a watershed context.* The project improves water quality and flood attenuation functions within the watershed.
- *Site provides opportunity to fully mitigate loss of full extent of each specific function at impact site.* With the construction of the future Phase 2 improvements on Battle Creek, the project improves flood attenuation and water quality functions for the Waln Creek and Battle Creek reaches throughout the site.
- *Site provides opportunity to remove environmental constraints (e.g., armored banks, levees, impoundments, diversions, grade control, infrastructure, adjacent deleterious land use practices, etc.) or to improve stream functions identified as limited or constrained at the site.* The project removes two culverts on Battle Creek at the upstream and downstream limits of the former Battle Creek Golf Course. The project also replaces the non-native, herbaceous-dominated riparian plant communities with native trees and shrubs, which will help to lower stream temperatures and improve the water quality function of the stream.

Durability Criteria

- *Site provides for enduring and sustainable benefits through existing or new protections such as easements or public ownership.* The project site has been purchased by the City to ensure its protection into the future.
- *Site represents a high probability of success in meeting mitigation objectives relative to other site options for same objectives.* Prior to construction of the project, adjacent properties experienced periodic flooding when Waln Creek overtopped its banks. Creation of the new floodplain adjacent to Waln Creek was designed to reduce this periodic flooding. There are no other site options for creating additional floodplain to reduce flooding on properties adjacent to the project site.

d. Site Protection Instrument: The City will own or control through legal agreements all SMB Project sites in perpetuity and will serve as the long-term steward of the SMB Project sites, ensuring long-term maintenance of each SMB project through a City-approved management plan or integrated natural resource plan, as described in Section III.D. of the Umbrella MBI.

e. Mitigation Work Plan:

i. Design Criteria, Specifications and Alternatives Analysis: Design criteria, specifications and a discussion of alternative designs are contained in Otak's Geomorphic Analysis Memorandum, which is included as Attachment E

ii. Construction Methods and Schedule: Construction above the ordinary high water of the creeks started in January 2012. As weather conditions allowed, excavation above the ordinary high water for floodplain benching occurred in early spring 2012. Excavated material was stockpiled on site and covered until the summer and fall of 2012, when the berms along the east and south sides of the property were constructed.

The excavation of the new sinuous Waln Creek channel began June 1, 2012, which is the start of the in-water work period (the in-water work period for all of the creeks within the property is June 1 through October 15). The majority of the channel was constructed ―in the dry with no connection to Waln Creek upstream and Battle Creek downstream. While still dry, the bed and banks of the channel were lined with coir fabric and native gravel material (0.67-feet deep) was placed in the bottom of the new channel

The downstream end of the new channel was first connected to Battle Creek and then the upstream end of the channel connected to Waln Creek. To ensure minimal erosion within the channel, the work area within Waln Creek was isolated from stream flow. The isolation extended upstream of the realignment to downstream of the soil plug placed within the creek.

Although anadromous fish are not present within the creek due to blockages downstream, cutthroat trout are present. As such, the creek was first isolated with block nets upstream and downstream of the work area. Fish present within the work area were removed using a backpack electroshocker and placed into Battle Creek. The block nets were left in place across the width of the creek upstream and downstream of check dams that were temporarily placed in the creek to ensure the work area is dry. A bypass pipe re-routed the creek flow downstream in Waln Creek. Coir mats were placed downstream of the bypass pipe to ensure there was no erosion.

All areas were hydroseeded upon the completion of grading with the seed mixes listed in Figure 8A. Tree and shrub planting occurred between December 2012 – January 2013.

iii. Site Plan(s): Waln Creek Improvements - Figures 5, 5A-B; Battle Creek Culvert Removal - Figures 9, 9A-B

iv. Cross-Sections (existing and proposed contours): Figures 5C, 9A-B

v. Planting Plan: Figures 8, 8A-B

vi. Schematic of Any Proposed In-stream Structures: Figures 7, 7A-D

VI. Proposed Performance Standards

a. Performance Standards for Riparian Plantings: Although there is variation with the proposed standards listed in Exhibit C of the MBI, the following performance standards, approved in Department of State Lands permit number 47781-RF, will apply to the project:

i. Permanent Monitoring Locations: Permanent plot locations must be established during the first annual monitoring in sufficient number and locations to be representative of the site. The permanent plot locations must be clearly identified on the ground.

ii. Native Species Cover: The cover of native species, as defined in the USDA Plants Database, in the herbaceous stratum is at least 60%.

iii. Invasive Species Cover: The cover of invasive species is no more than 10%. A plant species should automatically be labeled as invasive if it appears on the current Oregon Department of Agriculture noxious weed list, plus known problem species including *Phalaris arundinacea*, *Mentha pulegium*, *Holcus lanatus*, *Anthoxanthum odoratum*, and the last crop if it is non-native. Non-native plants should be labeled as such if they are listed as non-native on the USDA Plants Database. Beginning in Year 2 of monitoring, DSL will consider a non-native plant species invasive if it comprises more than 15% cover in 10% or more of the sample plots in any habitat class, and increases in cover or frequency from the previous monitoring period. Plants that meet this definition will be considered invasive for all successive years of monitoring. After the site has matured to the stage when desirable canopy species reach 50% cover, the cover of invasive understory species may increase but not exceed 30%.

iv. Bare Substrate Cover: Bare substrate represents no more than 20% cover.

v. Woody Vegetation: The density of woody vegetation is at least 1,600 live native plants (shrubs) and/or stems (trees) per acre or the cover of native woody vegetation on site is at least 50%. Native species volunteering on the site may be included, dead plants do not count, and the standard must be achieved for 2 years without irrigation.

vi. Species Diversity: By Year 3 and thereafter, there are at least 6 different native species. To qualify, a species must have at least 5% average cover in the habitat class, and occur in at least 10% of the plots sampled.

b. Performance Standards for Instream Improvements: Additionally, the following measures will be used to evaluate stream channel conditions. These performance standards and the methods to measure them are based on performance standards and measurement methods described in *A Function-based Framework for Stream Assessment and Restoration Projects* (EPA 843-K-12-006, May 2012).

i. Permanent Monitoring Locations: Four permanent cross sections will be established on Waln Creek during the first monitoring year, as follows:

- One near the upstream end of the restoration, south of the newly constructed connector road (Waln Drive, SE);
- One near the downstream of the project reach, immediately upstream of Waln Creek's confluence with Battle Creek; and
- Two within the newly realigned, meandering portion of Waln Creek.

The permanent cross section locations will be clearly marked so they can be easily relocated in subsequent monitoring years.

ii. Lateral Stability and Bank Erosion/Migration: Lateral stability and bank erosion/migration will be assessed through annual cross-sectional surveys done at permanently established cross section locations. Comparison of cross sections to those done in previous years shall indicate that bank erosion is not occurring at a rate that would result in lateral instability or excessive channel migration. Bank erosion at the cross section locations shall remain at <0.1 ft. /yr., as measured by the cross section surveys.

iii. Incision and Floodplain Connectivity: The degree of incision and floodplain connectivity will be assessed through the annual cross-sectional surveys done at permanently established cross section locations. Comparison of cross sections to those done in previous years shall indicate that the streambed is not downcutting and that the stream remains connected to its floodplain at the 1.2-year recurrence interval, as designed. The bank height ratio (BHR), which is a direct measure of channel incision, will be calculated from the cross sections. The BHR shall remain between 1.0 and 1.2 to confirm that the channel is not incising and remains connected to the floodplain benches.

VII. Site-Specific Monitoring Plan

Monitoring will be conducted annually at permanently established monitoring locations to assess whether the mitigation is meeting the performance standards described above. Riparian performance standards will be assessed at permanently established monitoring plots, and instream performance standards will be assessed at permanently established cross section locations. These permanent monitoring plots and cross sections will be established during the first monitoring year. Riparian vegetation monitoring and cross-sectional surveys will be performed annually for a minimum period of seven years, as described in Section IV.F. of the Umbrella MBI. The results of the monitoring effort will be included in the annual monitoring report, as described in Section III.F. of the Umbrella MBI.

VIII. Maintenance Plan

a. Initial Maintenance: Maintenance during the establishment period will be conducted on an as-needed basis to ensure permit compliance and achievement of site-specific performance criteria. In-water (habitat) structures will be maintained to ensure the function of the structure as designed. Riparian vegetation will be maintained to ensure establishment of the approved native plant communities and control noxious/invasive weeds. Because there is a constant seed source for invasive species from upstream areas, which is beyond the control of this project, it will be essential to establish a healthy native plant community early in the project. Typically, herbicide

application will be used two to three times a year (summer, fall) combined with periodic mowing to control weedy species and reduce competition from grasses for woody species.

Herbicide use will comply with all applicable federal/state standards. Maintenance will also include irrigation, as necessary, during the establishment period, and protection against herbivore and other damage. Supplemental planting will be conducted as necessary to ensure compliance with performance standards.

b. Contingency and/or Adaptive Management Plans: If it is determined modification of a structure or performance standard is necessary, a request will be submitted to the co-chair/permitting agencies for review and approval prior to implementing the modifications. Contingency actions will follow the guidelines listed in Part V.B. of the MBI, and be based on an evaluation of changes to site conditions that have affected the initial designs.

c. Long-term Maintenance: The goal of long-term maintenance of city Natural Areas is to ensure the continued ecological functions and social values of the sites are maintained, as well as continued compliance with federal, state, and local regulations.

On-going maintenance of these and other city mitigation and areas is conducted by a dedicated city crew specialized in natural area maintenance. Long-term maintenance will follow the same basic approach as maintenance during the establishment period, with site treatments based on periodic inspections. Except as where otherwise provided, management activity will follow the best management practices listed in the City of Salem, Parks Operations, *Sensitive Study Management Practice Handbook*.

d. Funding: Initial/establishment maintenance costs are budgeted and provided for in the project construction budget. Long-term maintenance funding is budgeted annually based on projected activity and provided through utility rate funds as part of the City's stormwater management program.

IX. Credit Determination and Credit Release Schedule

Credits for the project will be quantified using the Salem Stream Mitigation Process Credit Calculation Worksheet. A total of 10,741 credits will be generated from the project, as summarized in Table 1. The Credit Calculation Worksheets used to quantify credits are included as Attachment G.

Table 1. Summary of Credits for the Waln Creek Enhancement and Battle Creek Culvert Removal Project

Mitigation Reach	Instream Credits	Riparian Credits	Total Credits
Lower Waln Creek – Reach 1	6,567	1,151	7,718
Middle Waln Creek - Reach 2	1,765	446	2,211
Battle Creek - Reach 1	135	0	135
Battle Creek - Reach 2	0	368	368
Battle Creek - Reach 3	309	0	309
Total:	**8,776**	**1,965**	**10,741**

Credits will become available according to the following schedule:

- Upon approval of the "as-built" certification, up to 30 percent of the total expected can be released upon agency approval of the as-builts and completion of initial plantings.
- Upon achievement, and approval by the Corps and DSL, of performance standards in each of the first through seventh year monitoring reports 10 percent of credits (45 percent total) will be released.
- Upon approval of the long-term management plan 25 percent of credits will be released. This release may occur after approval of the third year monitoring report and credit release.

X. Long-Term Management Plan

A Long-term Management Plan will be prepared in accordance with Section V of the Umbrella MBI. The Waln Creek Enhancement and Battle Creek Culvert Removal Project has been designed to be self-sustaining. Once monitoring confirms that performance standards and project objectives have been met, the City will manage the site as a "Conservation Area."

Prior to release of at least 25 percent of the mitigation credits, the City shall develop a Long-term Management Plan for the project site for review and approval by the co-chair agencies, in consultation with the IRT. The site management plan, which will be developed in accordance with the City's "Sensitive Areas Management Handbook", will be designed to be adaptive, addressing changing conditions on and surrounding the site. The Long-term Management Plan shall include the following five components:

1. Identification of long-term management needs and annual cost estimates for these needs;
2. A long-term funding mechanism to meet these needs, such as a non-wasting endowment fund;
3. A site protection instrument such as transfer of title or a conservation easement conveyed to an appropriate long-term steward;
4. Identification of the party(s) responsible for ownership and all long-term management of the bank site, including a summary of the selected steward's capacity to implement the management plan; and
5. Procedures for future amendment of the Long-term Management Plan to allow for adaptive management, defining such situations in which review and approval of regulatory agencies would be necessary.

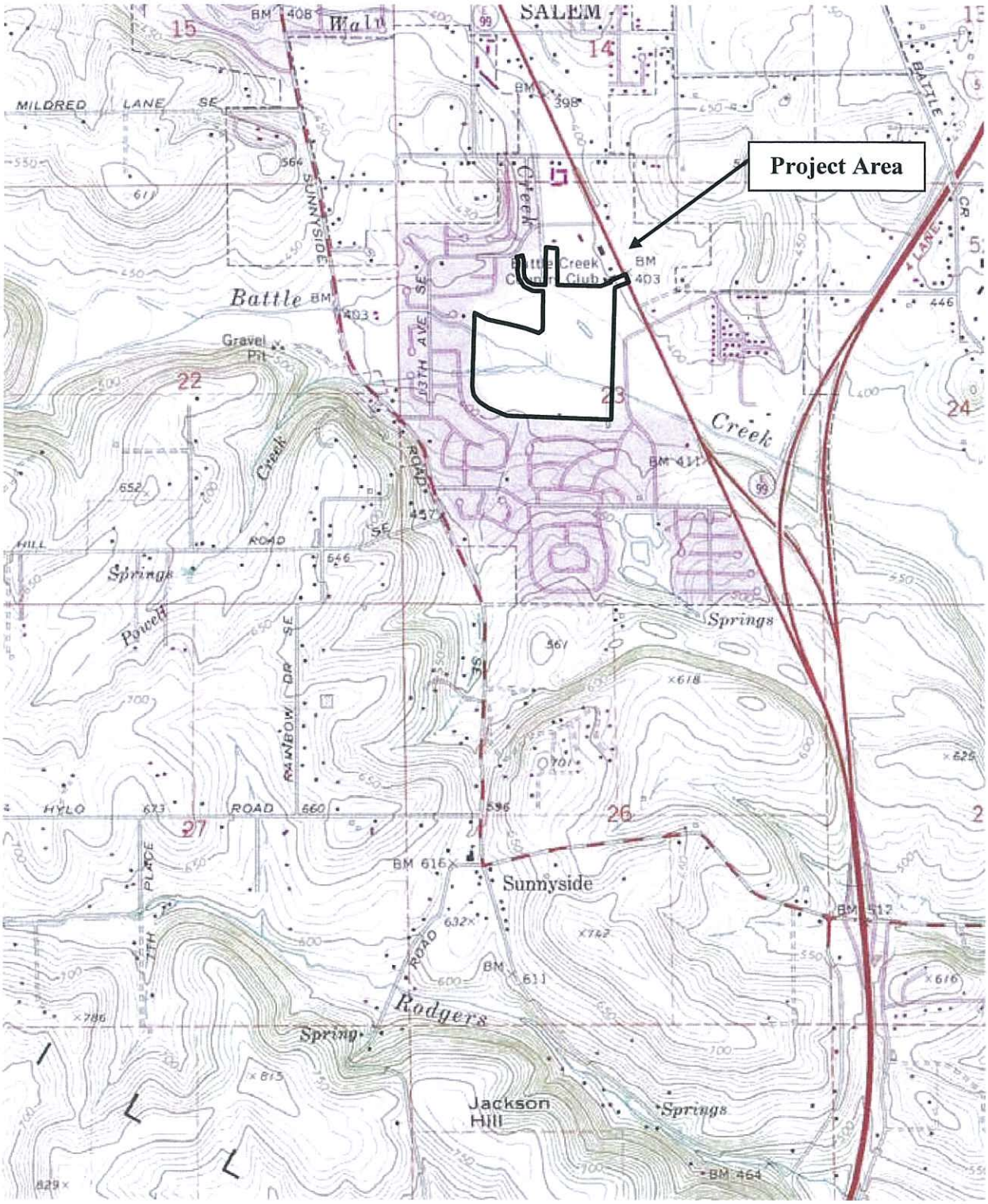
The City of Salem's Public Works Department will be responsible for maintaining the projects, consistent with the appropriate mitigation plan, to ensure its long-term viability as a functional aquatic resource. The mitigation site will be managed in coordination with existing and future adjacent restoration projects to achieve watershed goals. The City shall retain such responsibility unless and until the long-term project responsibility is formally transferred to an approved long-term steward; such a transfer would require pre-approval by the co-chair agencies.

XI. Service Area

The Service Area for the Waln Creek Enhancement and Battle Creek Culvert Removal Project will be the 6th Field HUC within which the project is located – HUC 170900070203 (McKinney Creek). A map showing the service area is provided as Attachment H.

Attachment A

Figures from Joint Permit Application



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General location and topography for the proposed Waln Creek and Battle Creek enhancement project in Salem, Oregon. (Sidney, Oregon quadrangle, 1970, photorevised 1986).

FIGURE 1

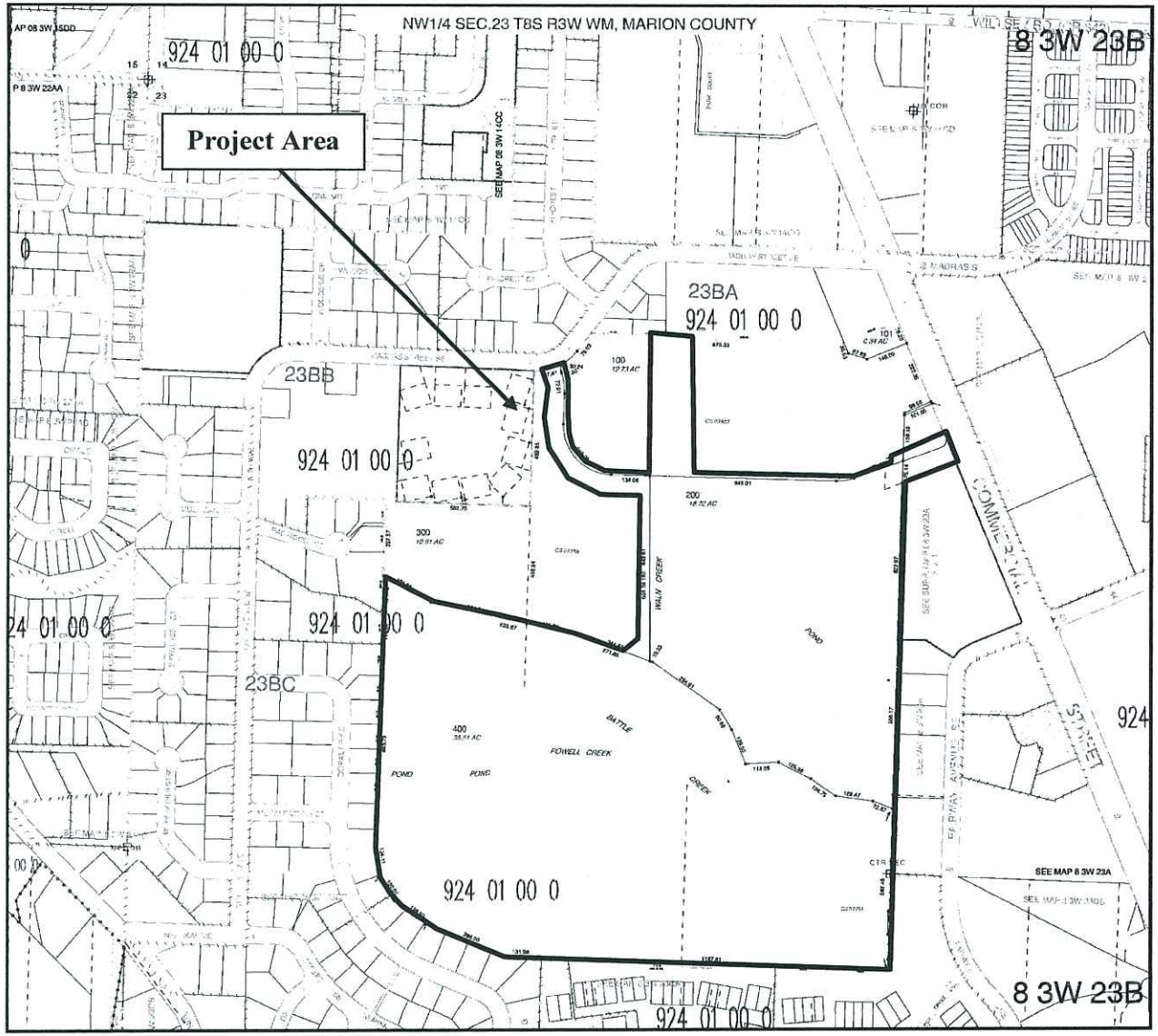

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FIGURE 2

Tax lot map for the proposed Waln Creek and Battle Creek enhancement project in Salem, Oregon.

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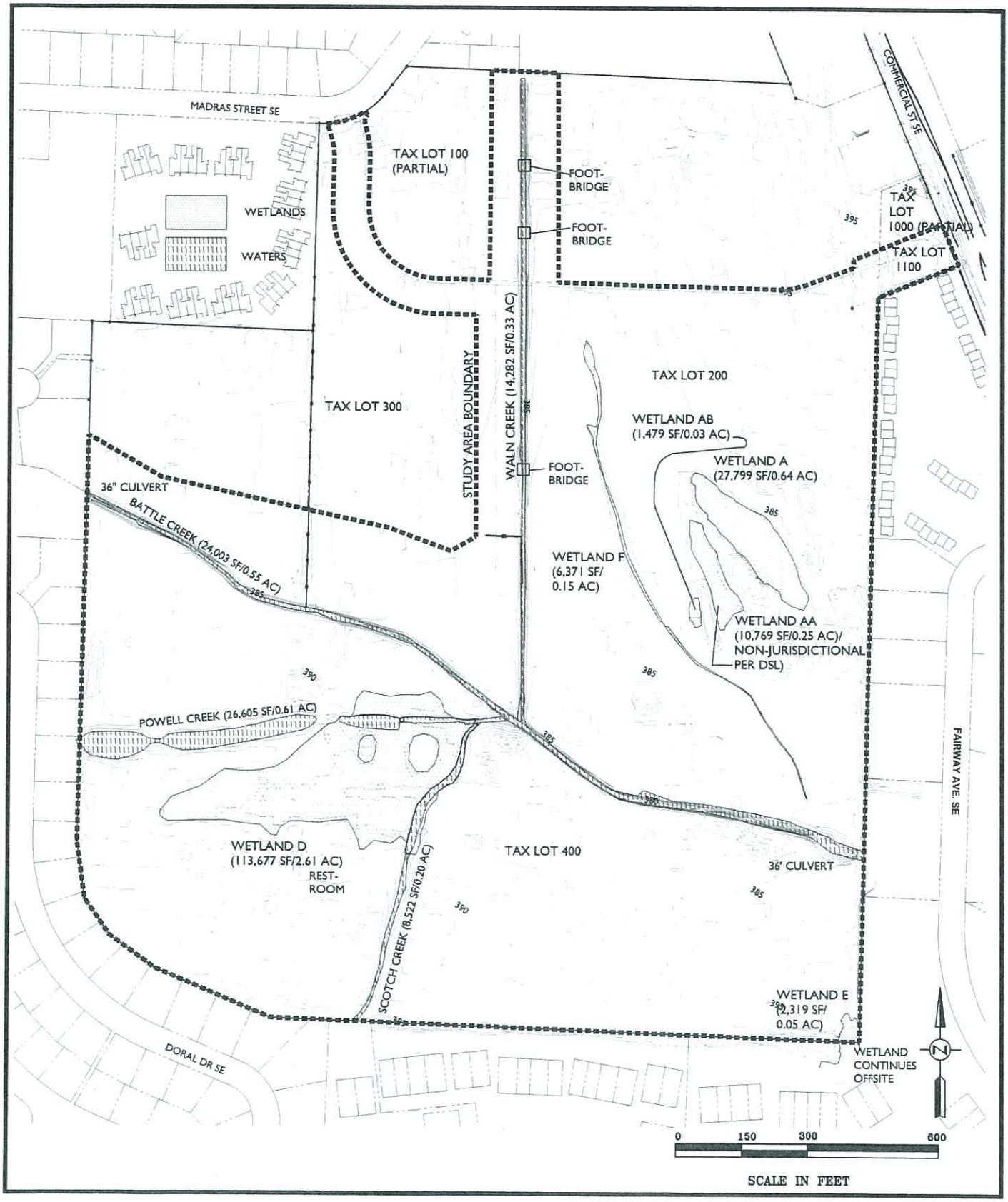
Aerial photograph of the proposed Waln Creek and Battle Creek enhancement project in Salem, Oregon. (Google Maps, 2011).

FIGURE 3



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Existing conditions at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 4

Pacific Habitat Services, Inc.

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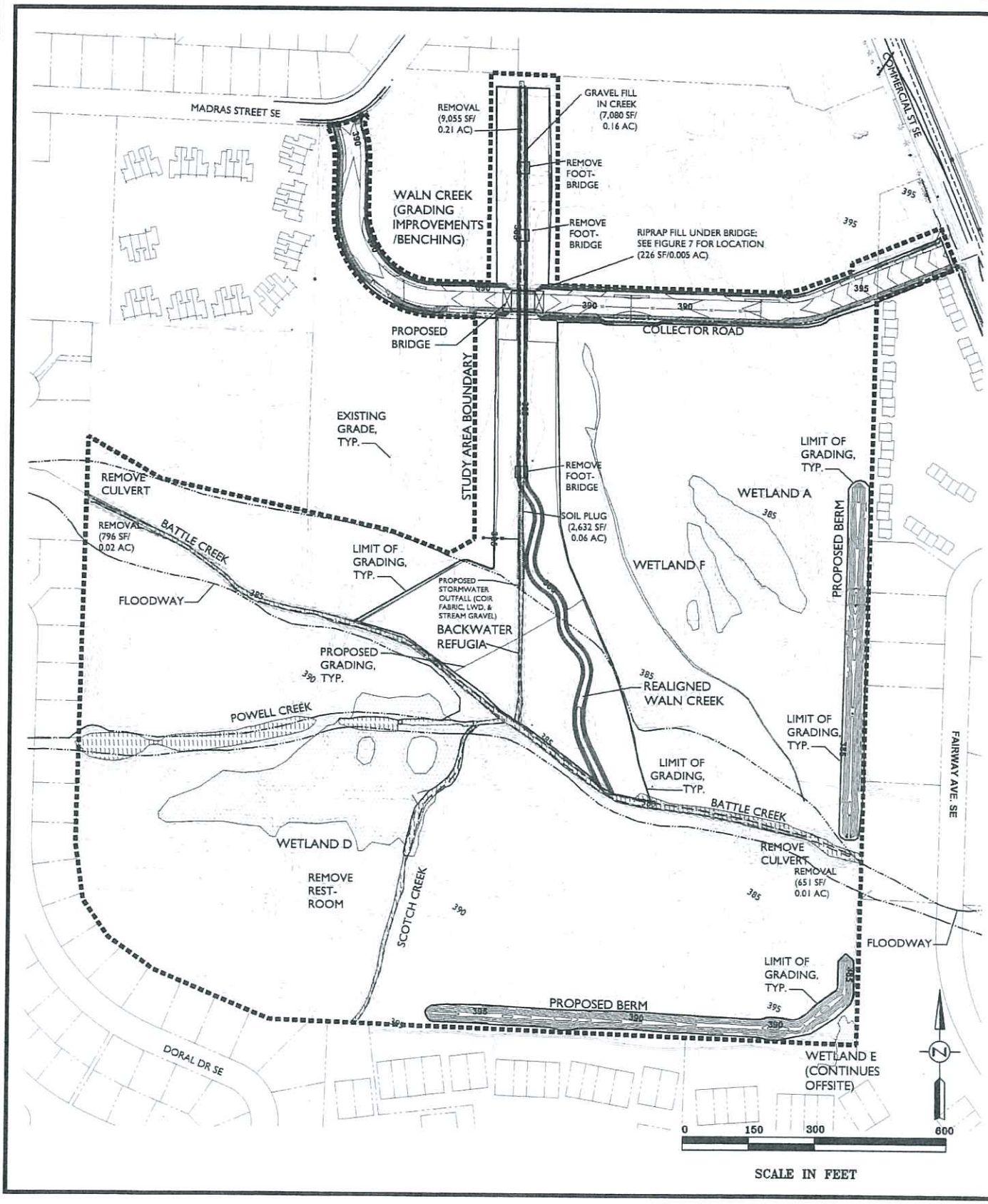

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Proposed grading and site plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 5

Pacific Habitat Services, Inc.

Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig rev 070111 project basemap.dwg, 7/12/2011 9:03:50 AM, Letter, 1:1

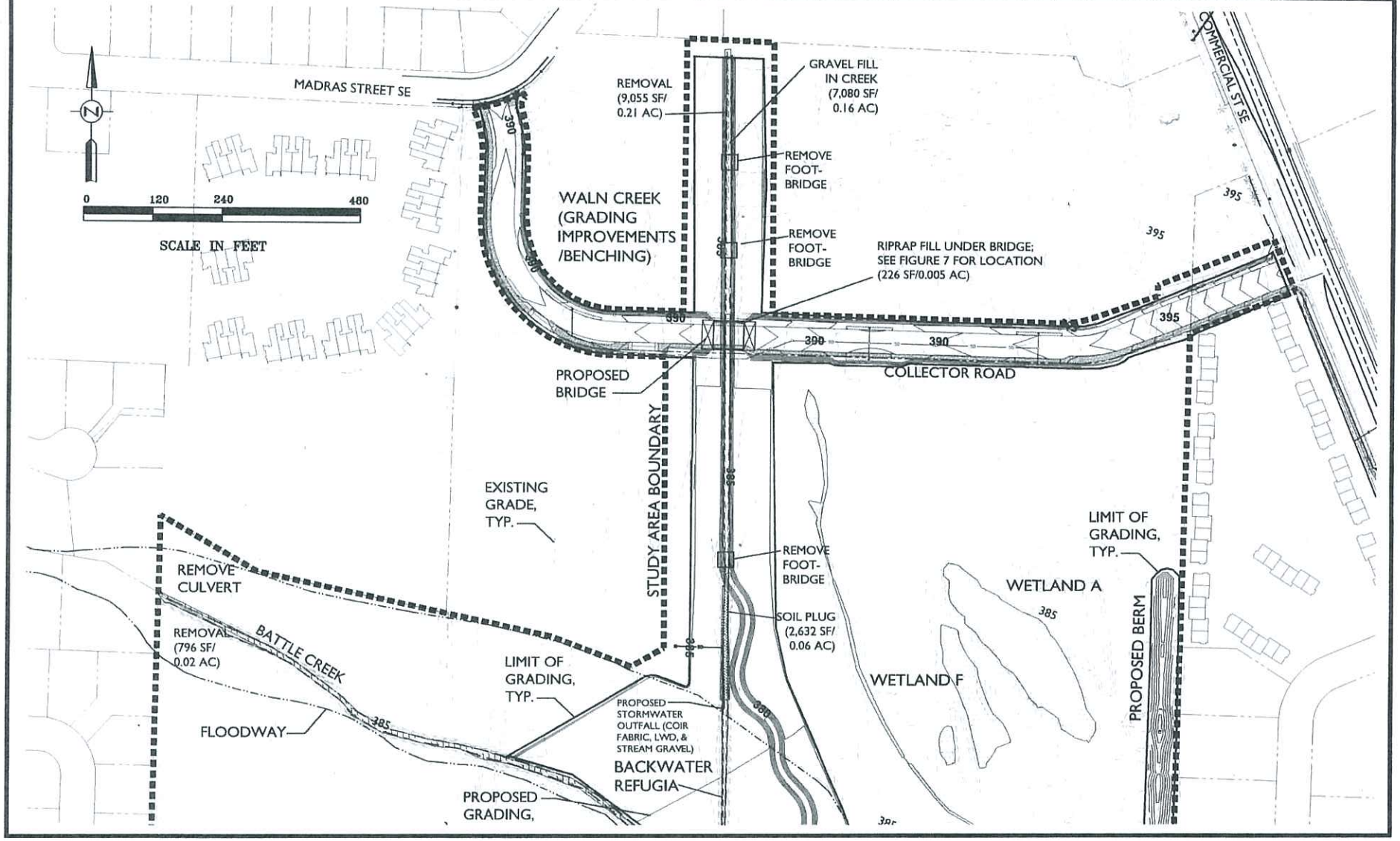

FIGURE 5A

Detail of proposed grading and site plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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Pacific Habitat Services, Inc.

Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig rev 070111 project basemap.dwg, 7/12/2011 9:05:09 AM, Letter, 1:1

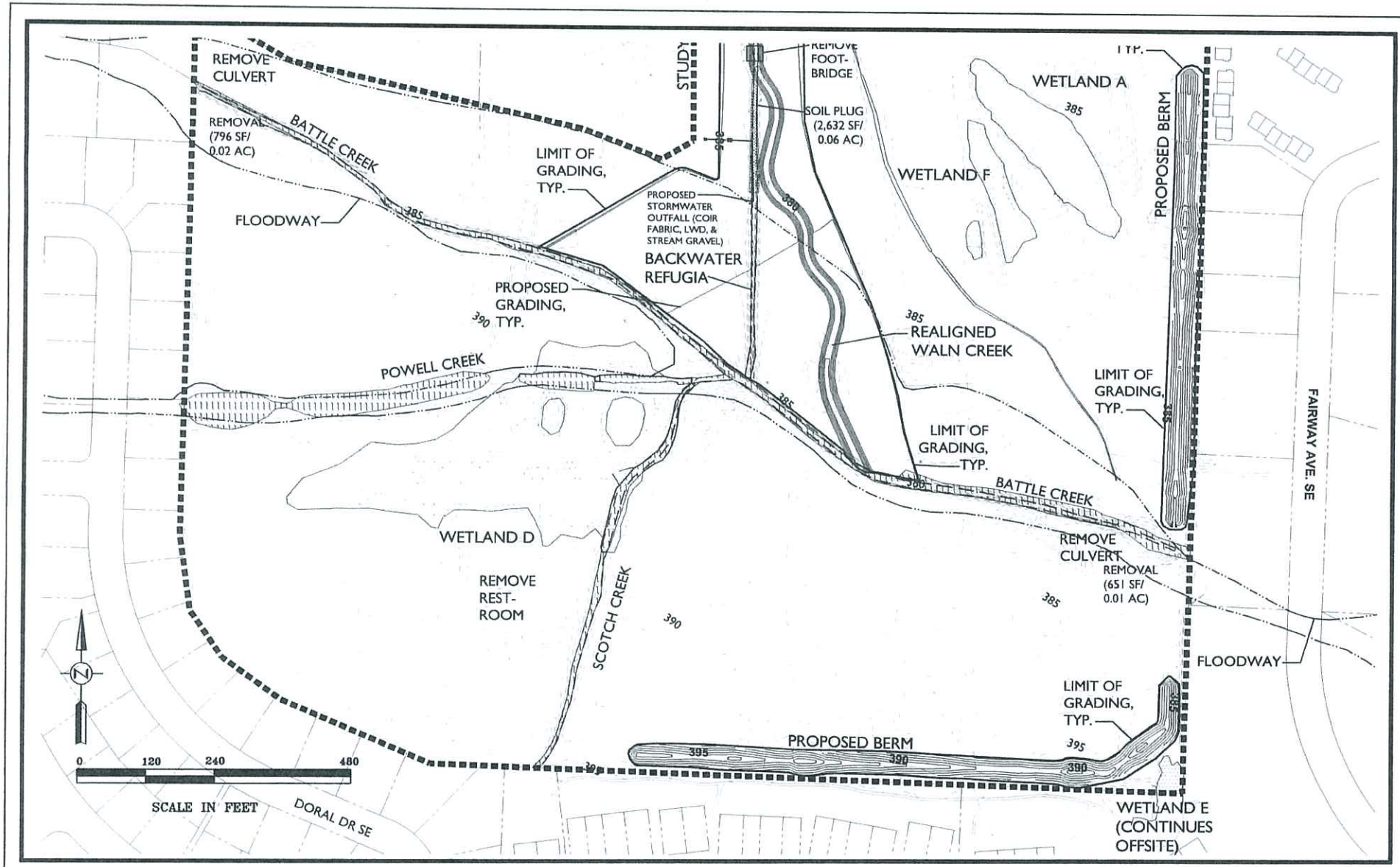

FIGURE 5B

Detail of proposed grading and site plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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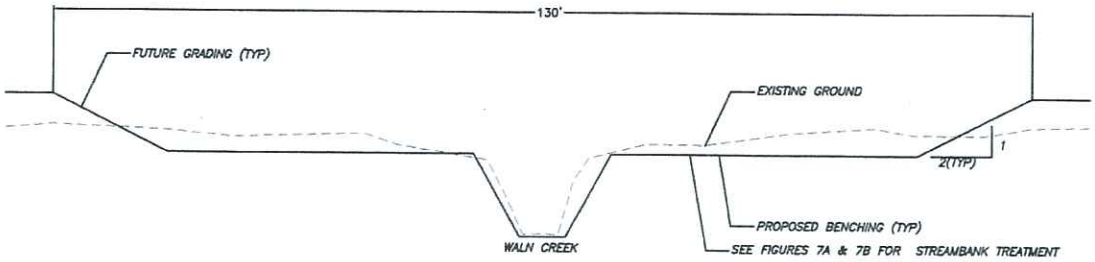
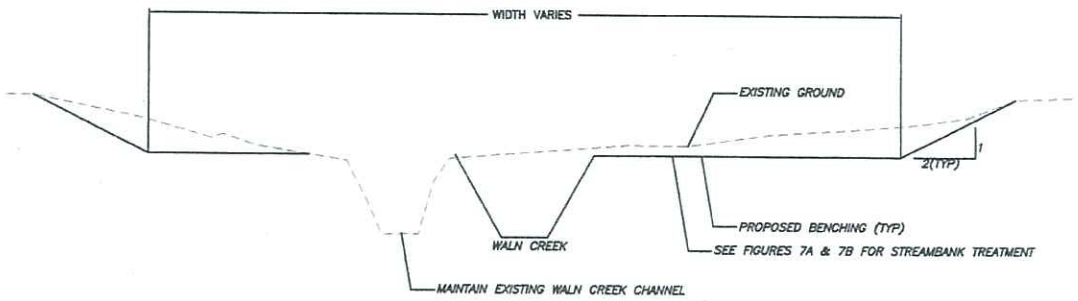
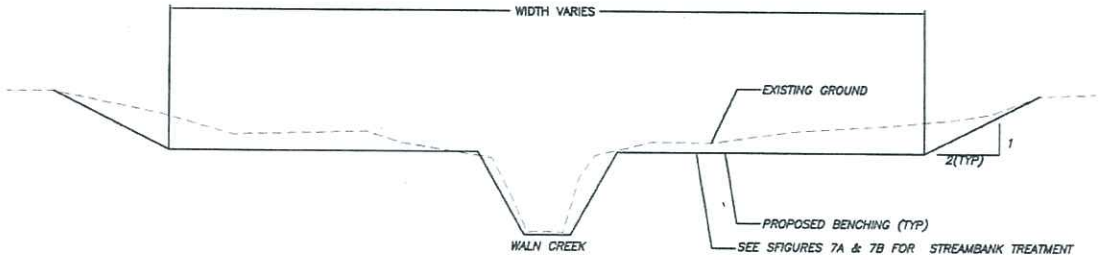


TYPICAL BENCHING (NORTH OF COLLECTOR)
N.T.S



TYPICAL BENCHING (INSIDE FLOOD WAY)
N.T.S



TYPICAL BENCHING (OUTSIDE FLOOD WAY)
N.T.S

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PHS

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Cross-sections of proposed streambank benching at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 5C

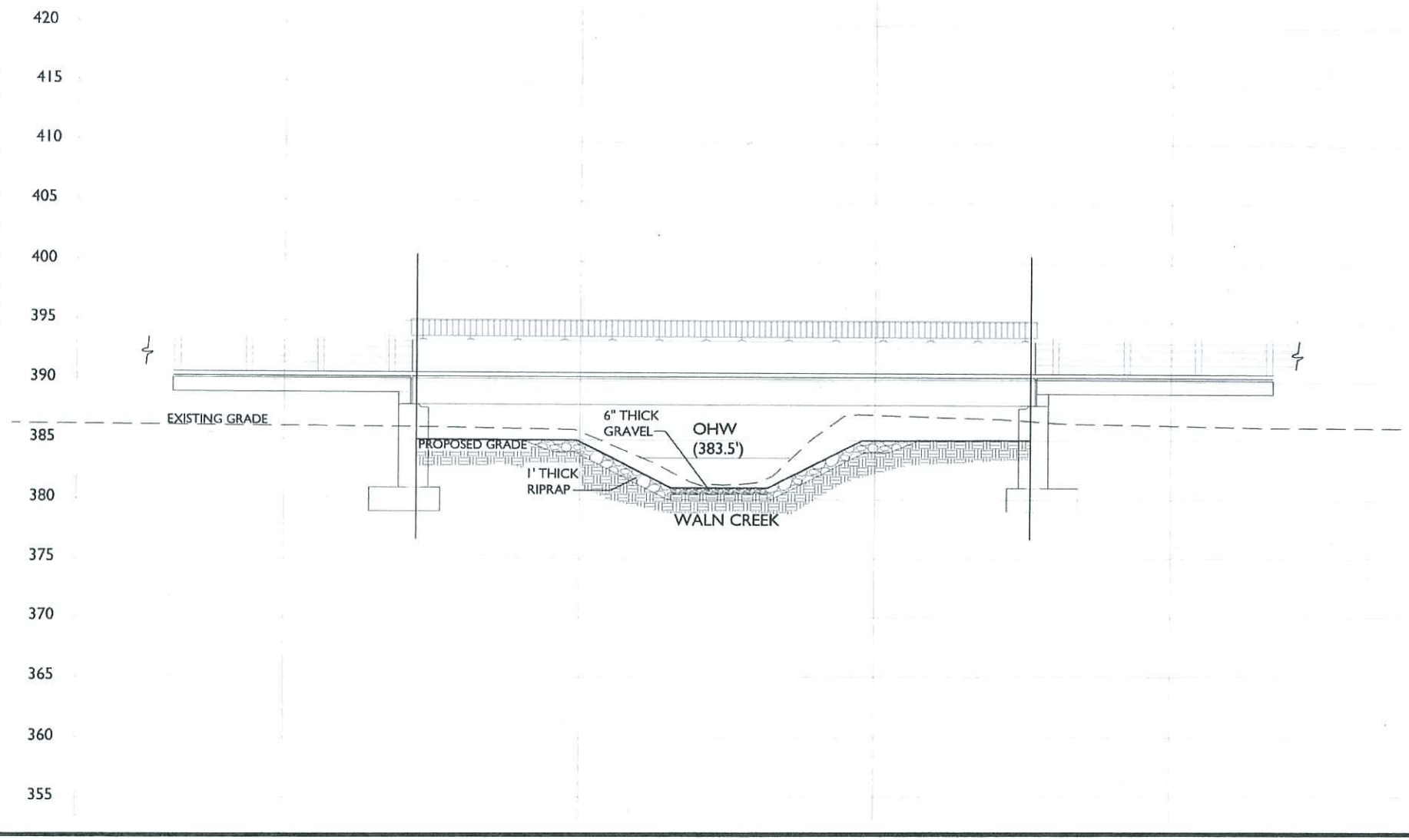

FIGURE 6

Elevation view of collector street bridge crossing at Waln Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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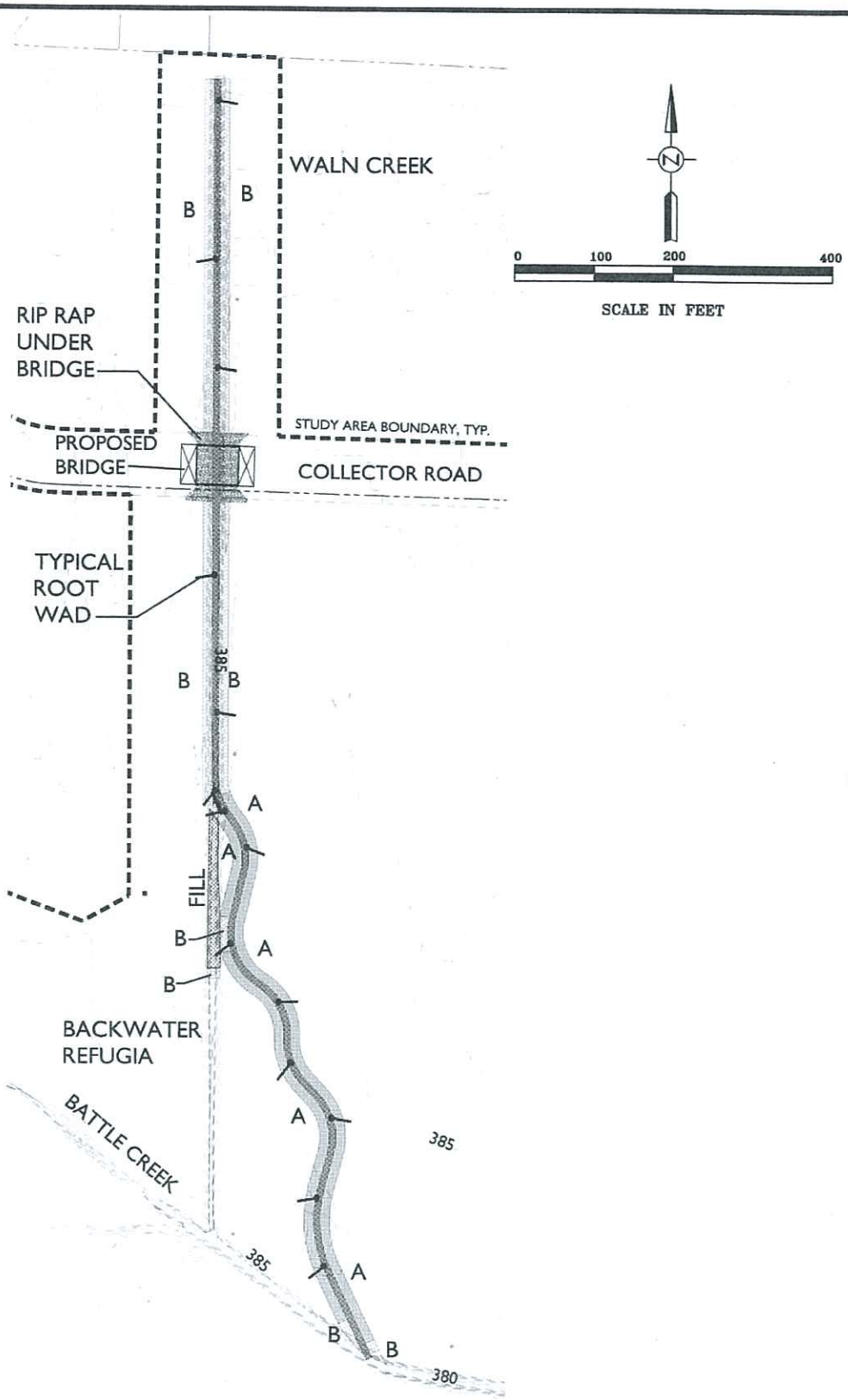

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Streambank treatments and location of root wads for Waln Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. See cross-sections of streambank treatments on Figures 7A and 7B. Provided by OTAK, Inc., 2011.

FIGURE
7

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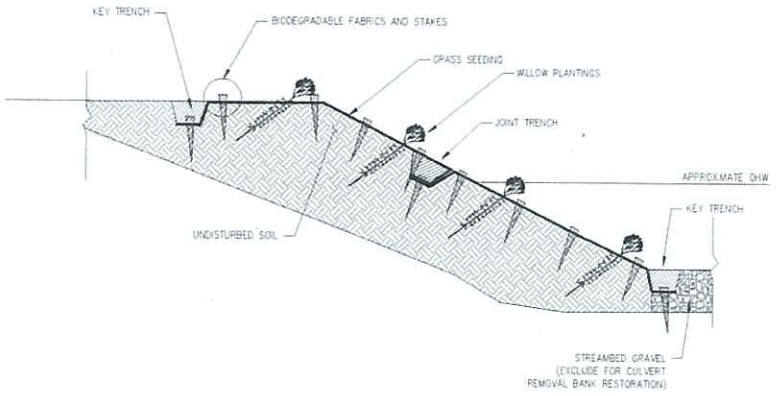
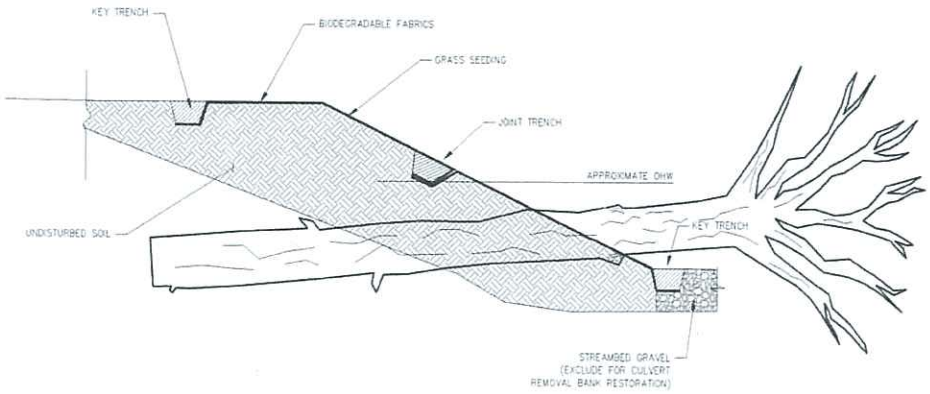


BANK TYPE A



BANK TYPE A ROOT WAD SECTION

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Cross–sections of Streambank treatment A at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE
7A

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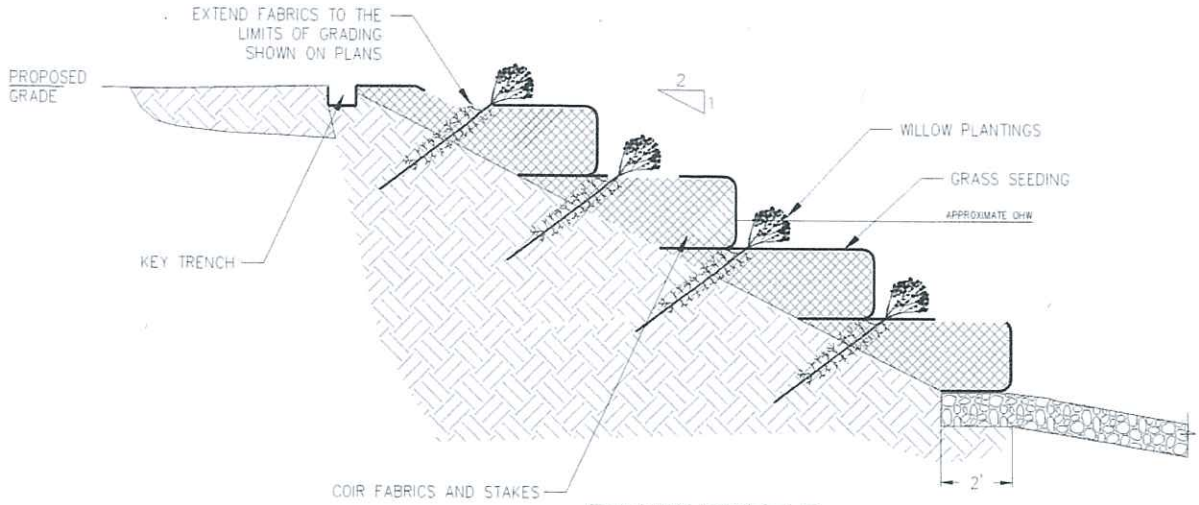
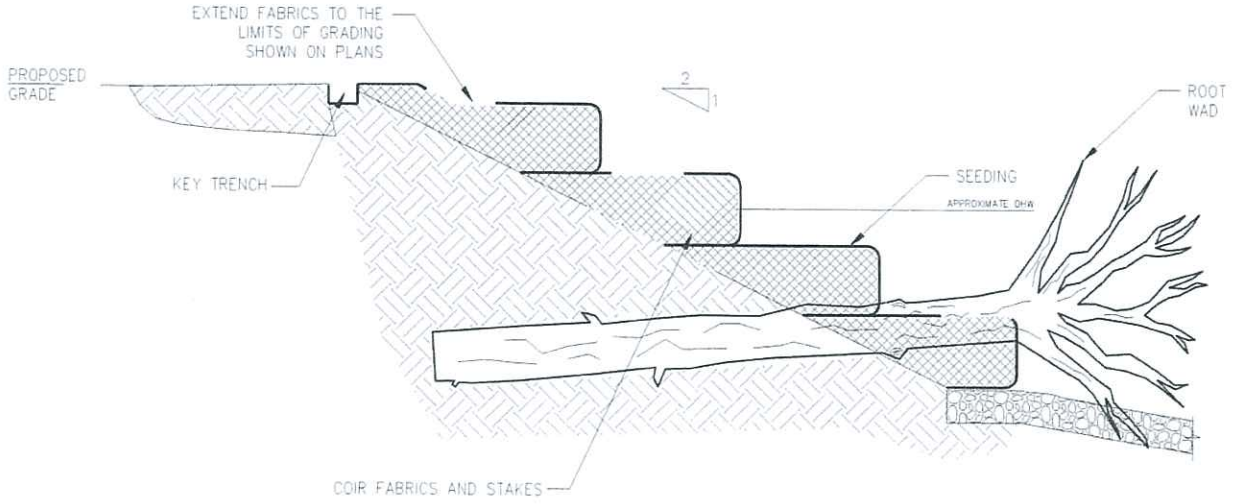


BANK TYPE B



BANK TYPE B - ROOT WAD SECTION

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Cross–sections of Streambank treatment B at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 7B

Pacific Habitat Services, Inc.

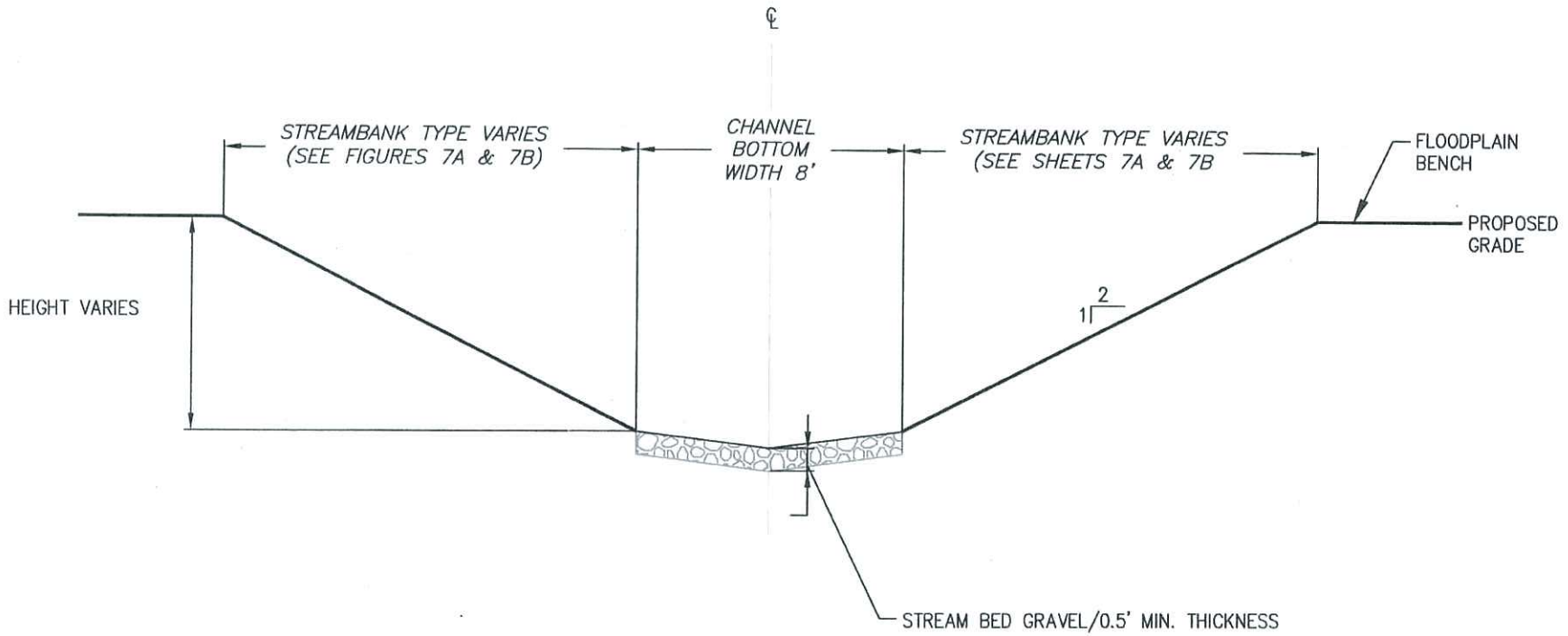

FIGURE 7C

Typical cross–section of streambed for Waln Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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Pacific Habitat Services, Inc.

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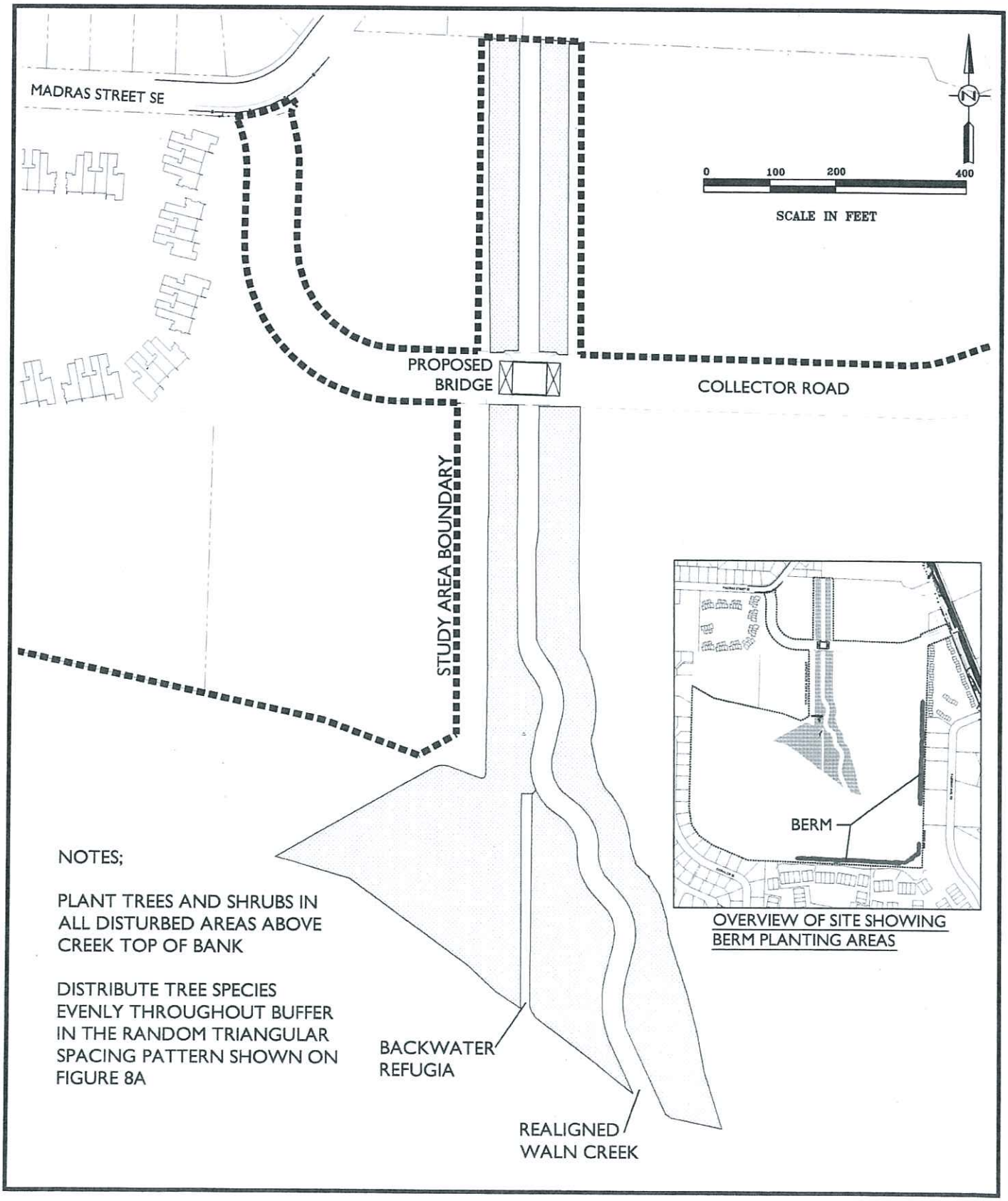

OVERVIEW OF SITE SHOWING BERM PLANTING AREAS

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Proposed riparian planting plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. See plant lists and typical tree and shrub planting patterns on Figures 8A and 8B. Provided by OTAK, Inc., 2011.

FIGURE 8

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Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig rev 070111 project basemap.dwg, 7/12/2011 9:35:43 AM, Letter, 1:1

TREES

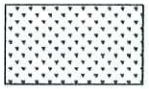
QUANTITY	COMMON NAME / Botanical name:	Size and Description	Spacing
* 1,511	OREGON ASH / Fraxinus latifolia	Bare root	7.2' o.c.
1,209	WHITE ALDER / Alnus rhombifolia	Bare root	7.2' o.c.
302	DOUGLAS HAWTHORNE / Crataegus douglasii	Bare root	7.2' o.c.
302	WESTERN CRABAPPLE / Malus fusca	Bare root	7.2' o.c.
* 605	WESTERN RED CEDAR / Thuja plicata	Bare root	7.2' o.c.
* 1,209	BLACK COTTONWOOD / Populus trichocarpa	Bare root	7.2' o.c.
907	BIG LEAF MAPLE / Acer macrophyllum	Bare root	7.2' o.c.

* Plant Closer to Stream

SHRUBS

QTY	ABBREV.	COMMON NAME / Botanical name:	Size and description	Spacing
557	CORSEA	RED-OSIER DOGWOOD / Cornus sericea	Bare root	4.7' o.c.
557	LONINV	TWINBERY / Lonicera involucrata	Bare root	4.7' o.c.
371	SPIDOU	DOUGLAS SPIREA / Spiraea douglasii	Bare root	4.7' o.c.
557	PHYCAP	PACIFIC NINEBARK / Physocarpus capitatus	Bare root	4.7' o.c.
371	SAMCER	BLUE ELDERBERRY / Sambucus cerulea	Bare root	4.7' o.c.
334	ROSNUT	NOOTKA ROSE / Rosa nutkana	Bare root	4.7' o.c.
334	ROSPIS	SWAMP ROSE / Rosa pisocarpa	Bare root	4.7' o.c.
631	SYMALB	SNOWBERRY / Symphoricarpos albus	Bare root	4.7' o.c.

SEED MIX

SYMBOL	QUANTITY	COMMON NAME / Botanical name:	LBS / ACRE
	5.69 Acres	SPIKE BENTGRASS / Agrostis exarata	2.18 lbs / acre
	247,643 SF	TUFTED HAIRGRASSE / Deschampsia cespitosa	2.18 lbs / acre
		SLENDER HAIRGRASS / Deschampsia elongata.	2.18 lbs / acre
		WESTERN FESCUE / Festuca occidentalis	8.71 lbs / acre
		TALL MANNAGRASS / Glyceria elata	2.18 lbs / acre
		MEADOW BARLEY / Hordeum brachyantherum	43.56 lbs / acre
		STREMBANK LUPINE / Lupinus rivularis	13.07 lbs / acre

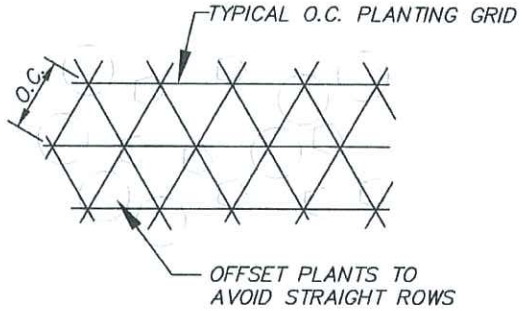


FIGURE 8A

Plant list and planting grid at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011. See Figure 8 for riparian and disturbance planting limits and Figure 8B for shrub species distribution and notes.

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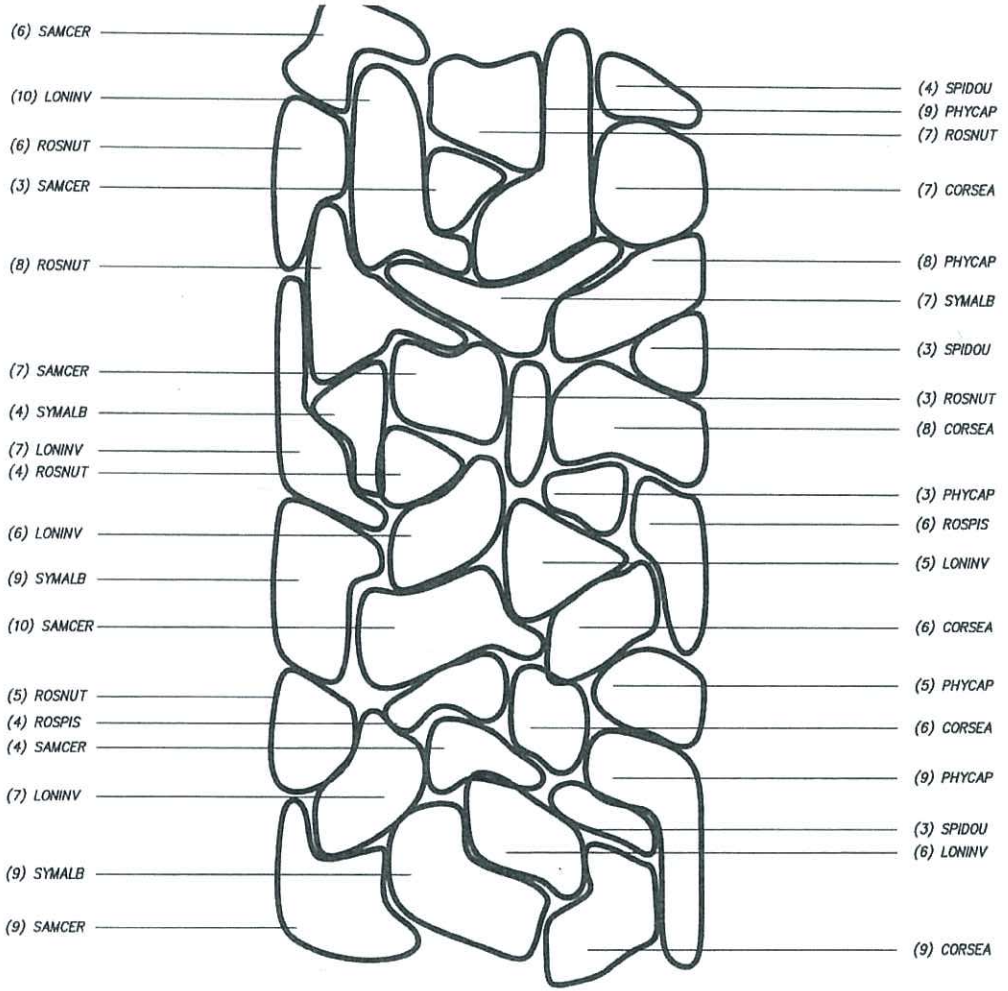

SHRUB SPECIES DISTRIBUTION

RESTORATION PLANTING NOTES:

TOPSOIL: EXISTING SITE SOIL SHALL BE PREPARED AND AMENDED IN ACCORDANCE WITH THE DETAILS AND SPECIFICATIONS. PLACE STOCKPILED TOPSOIL TO A DEPTH OF 6" THROUGHOUT ENTIRE PLANTING AREA.

PROVIDE 12" POROUS WEED BARRIER AROUND ALL SHRUBS AND TREES. COVER WITH
3 INCH DEPTH FINE–MEDIUM GRADE FIR/HEMLOCK BARK. KEEP BARK CLEAR OF TREE AND SHRUB STEM BASE.

PLANTING POCKETS: BACK FILL PLANT HOLE WITH SOIL EXCAVATED FROM HOLE. DO NOT ADD ADDITIONAL AMENDMENTS.

LEAVE PLANT NAME IDENTIFICATION TAGS ON TEN PERCENT OF ALL TREES AND SHRUBS INSTALLED TO AID INSPECTORS IN VERIFYING THAT SPECIFIED PLANTS HAVE BEEN INSTALLED.

PLANT CENTER OF SHRUBS A MINIMUM OF 24 INCHES FROM ADJACENT PAVING. PLANT CENTER OF GROUND COVERS A MINIMUM OF 18 INCHES FROM ADJACENT PAVING.

WHERE PLANT BED SLOPE IS LESS THAN 3% MOUND PLANTING BED AREAS 3% MINIMUM FOR POSITIVE DRAINAGE.

RIPARIAN BUFFER ZONE – TYPICAL PLANTING PLAN

RIPARIAN BUFFER PLANTING EXTENDS THROUGHOUT ENTIRE PLANTED AREA ON BOTH SIDES OF WALN CREEK. SEVEN SPECIES OF TREES AND NINE SPECIES OF SHRUBS SHALL BE PLANTED THROUGHOUT AT THE QUANTITIES AND SPACING LISTED BELOW.

TREES AND SHRUBS SHALL BE EVENLY DISTRIBUTED THROUGHOUT THE BUFFER AND BE PLANTED IN A RANDOM TRIANGULAR SPACING PATTERN AS SHOWN ON FIGURE 8A.

DISTRIBUTE ALL TREE SPECIES EVENLY THROUGHOUT ENTIRE BUFFER.
PLANT EACH SHRUB SPECIES IN GROUPS OF AT LEAST THREE AND NO MORE THAN TEN.

SEED MIX ON FIGURE 8A SHALL BE PLANTED THROUGHOUT THE BUFFER AND ON THE BERMS.

FIGURE 8B

Proposed riparian shrub plant distribution and planting notes at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011. See Figure 8 for riparian and disturbance planting limits and Figure 8A for plant lists.

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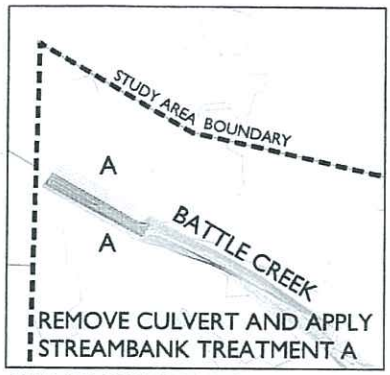
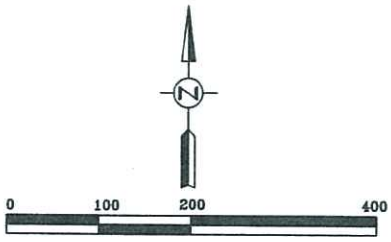
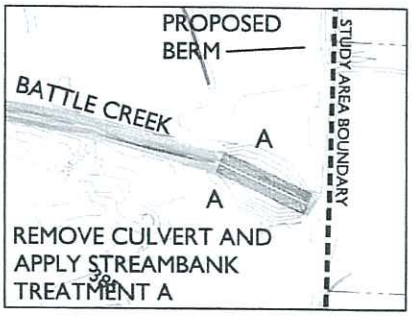


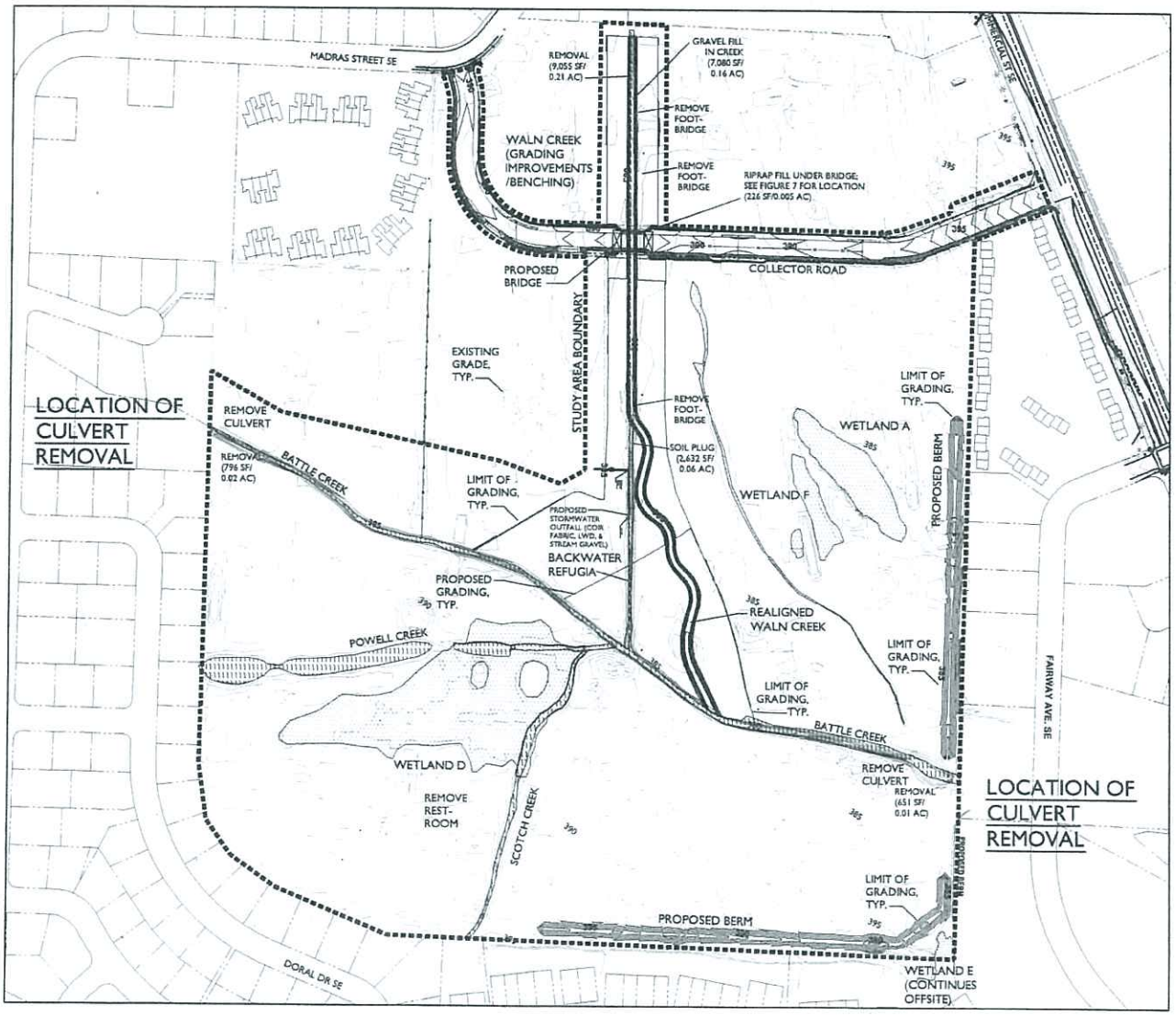
CULVERT REMOVAL ON WEST END OF BATTLE CREEK



SCALE IN FEET



CULVERT REMOVAL ON EAST END OF BATTLE CREEK



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Culvert removal areas and streambank treatments on Battle Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011. See cross-sections and profiles on Figures 9A and 9B.

FIGURE 9

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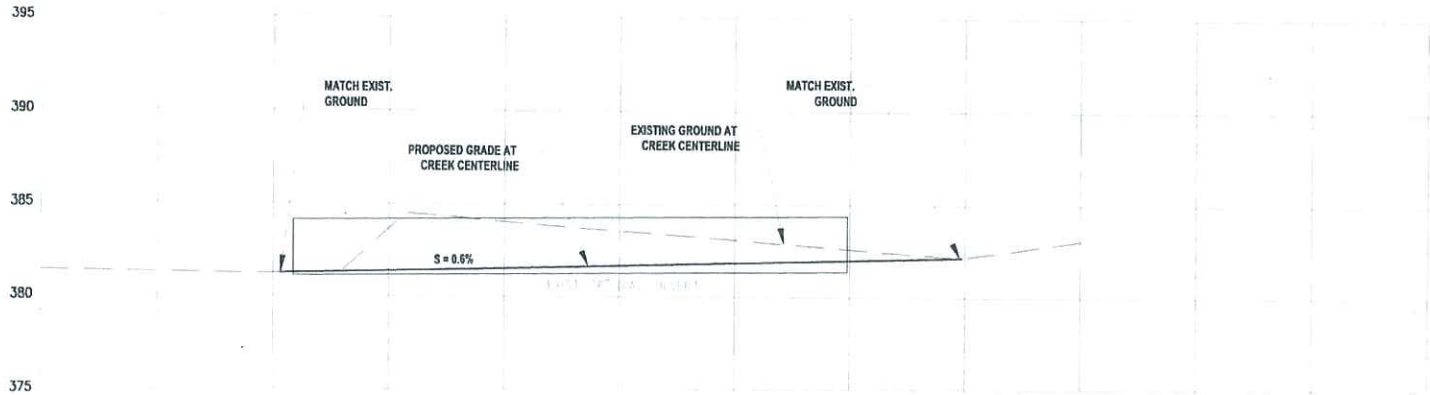
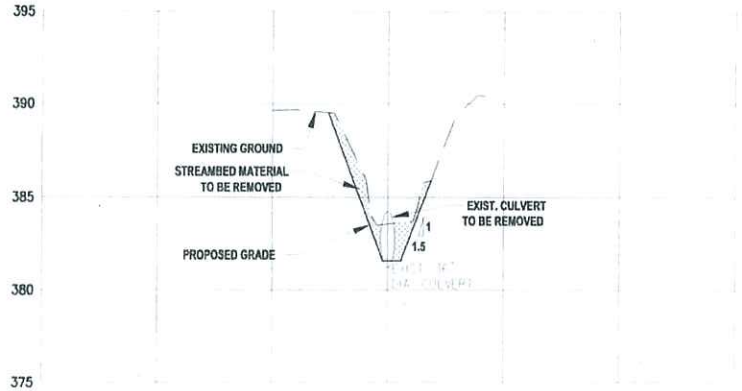
Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig rev 070111 project basemap.dwg, 7/12/2011 9:40:14 AM, Letter, 1:1



WESTERN CULVERT REMOVAL PROFILE:
Horiz. Scale: 1"=40'
Vert. Scale: 1"=10'



WESTERN CULVERT XSEC PROFILE:
Horiz. Scale: 1"=40'
Vert. Scale: 1"=10'

FIGURE 9A

Cross-section and profile for western culvert removal area on Battle Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011. See location of cross-section and profile on Figure 9.

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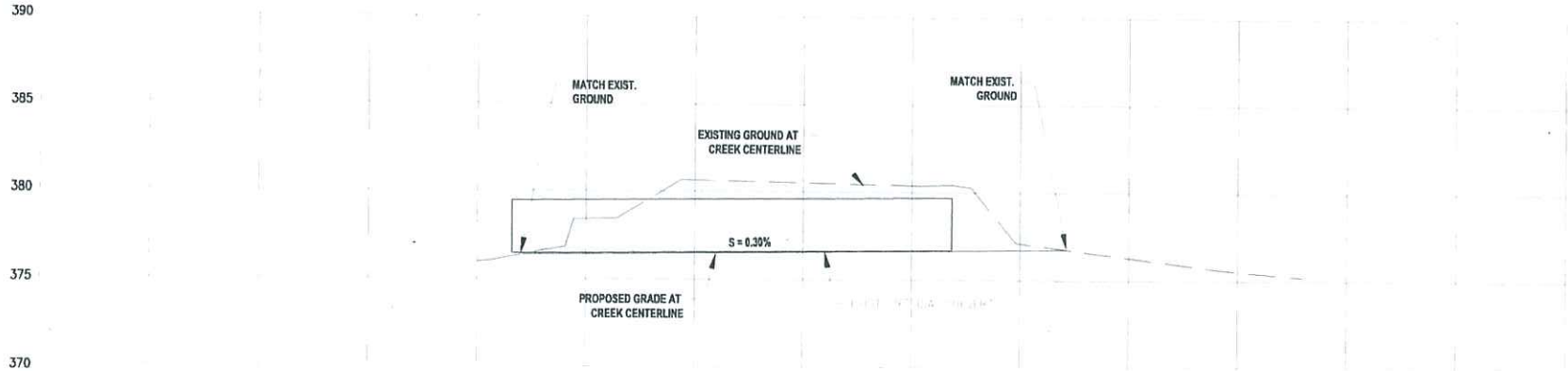
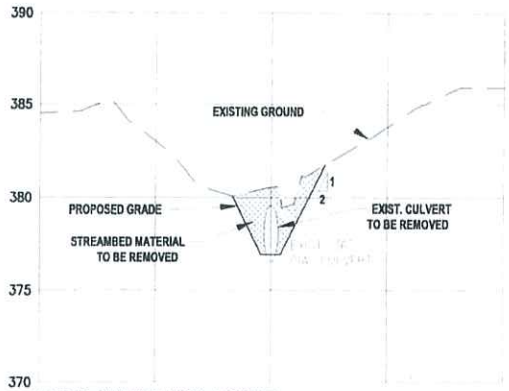


EASTERN CULVERT REMOVAL PROFILE:
Horiz. Scale: 1"=40'
Vert. Scale: 1"=10'



LOWER CULVERT XSEC PROFILE:
Horiz. Scale: 1"=40'
Vert. Scale: 1"=10'

FIGURE 9B

Cross–section and profile for eastern culvert removal area on Battle Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011. See location of cross–section and profile on Figure 9.

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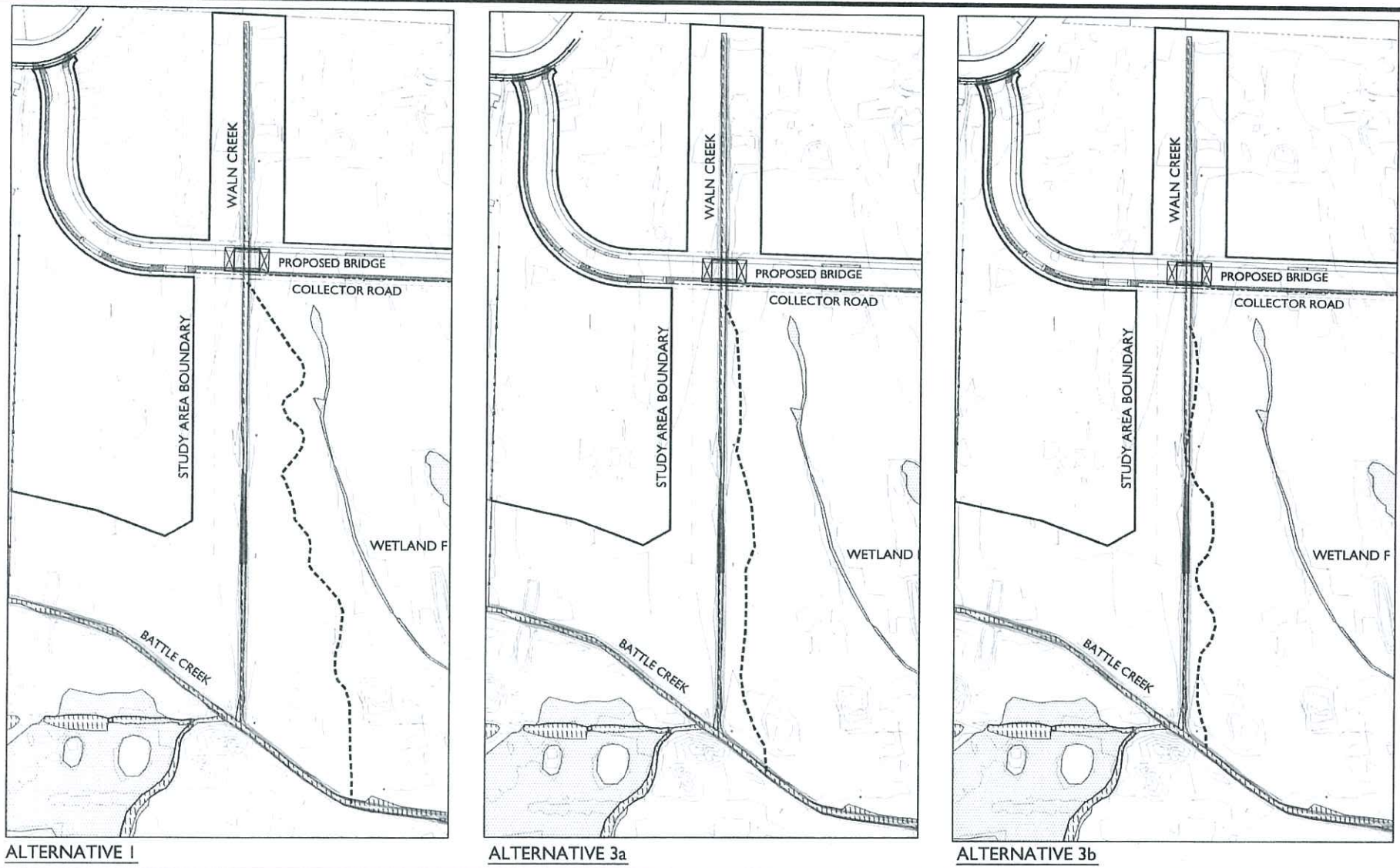

FIGURE 10

Alternative thalweg locations for Waln Creek at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

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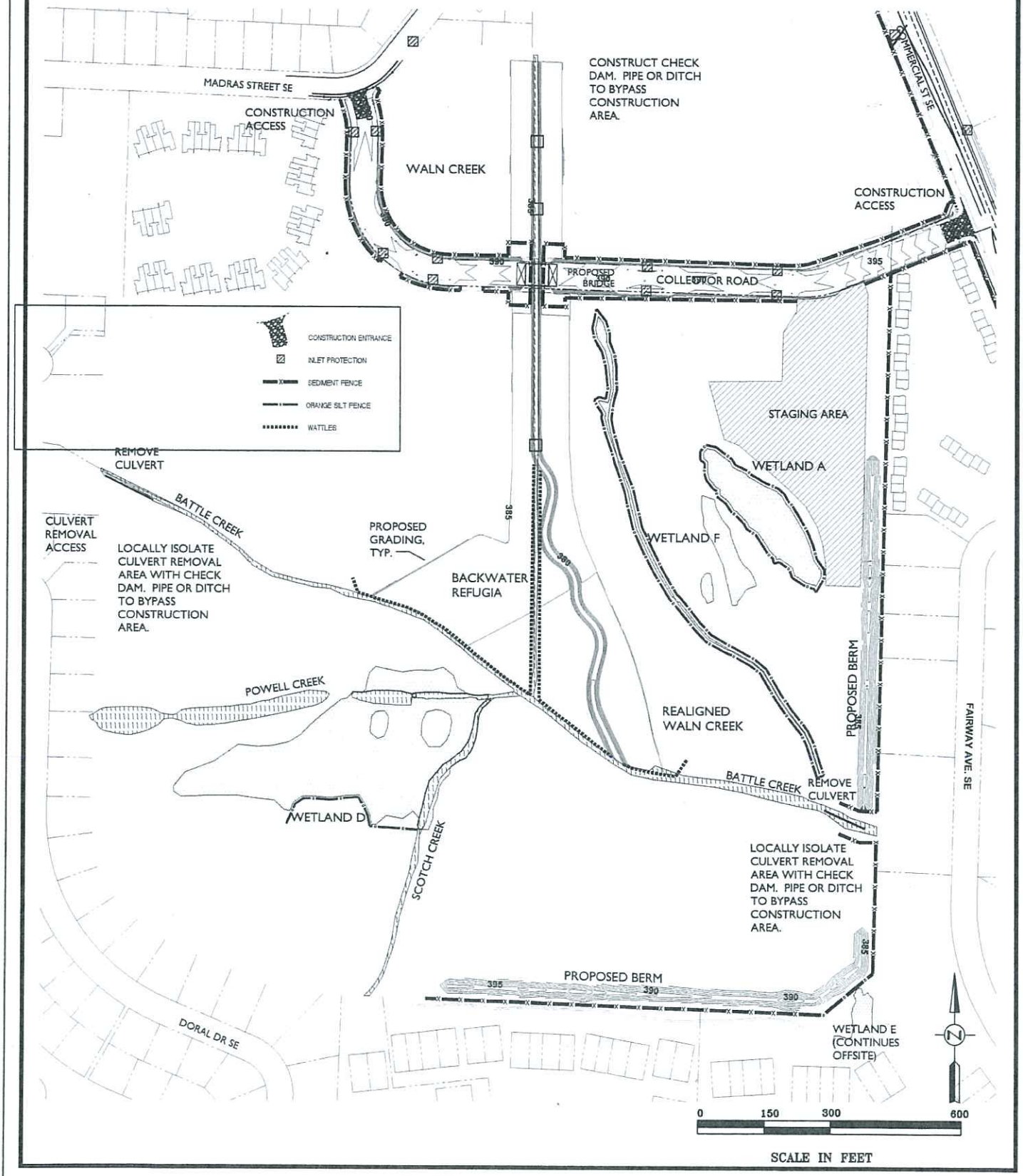
Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig per project basemap alts.dwg, 7/8/2011 2:32:10 PM, Letter, 1:1



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Proposed erosion control plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 11

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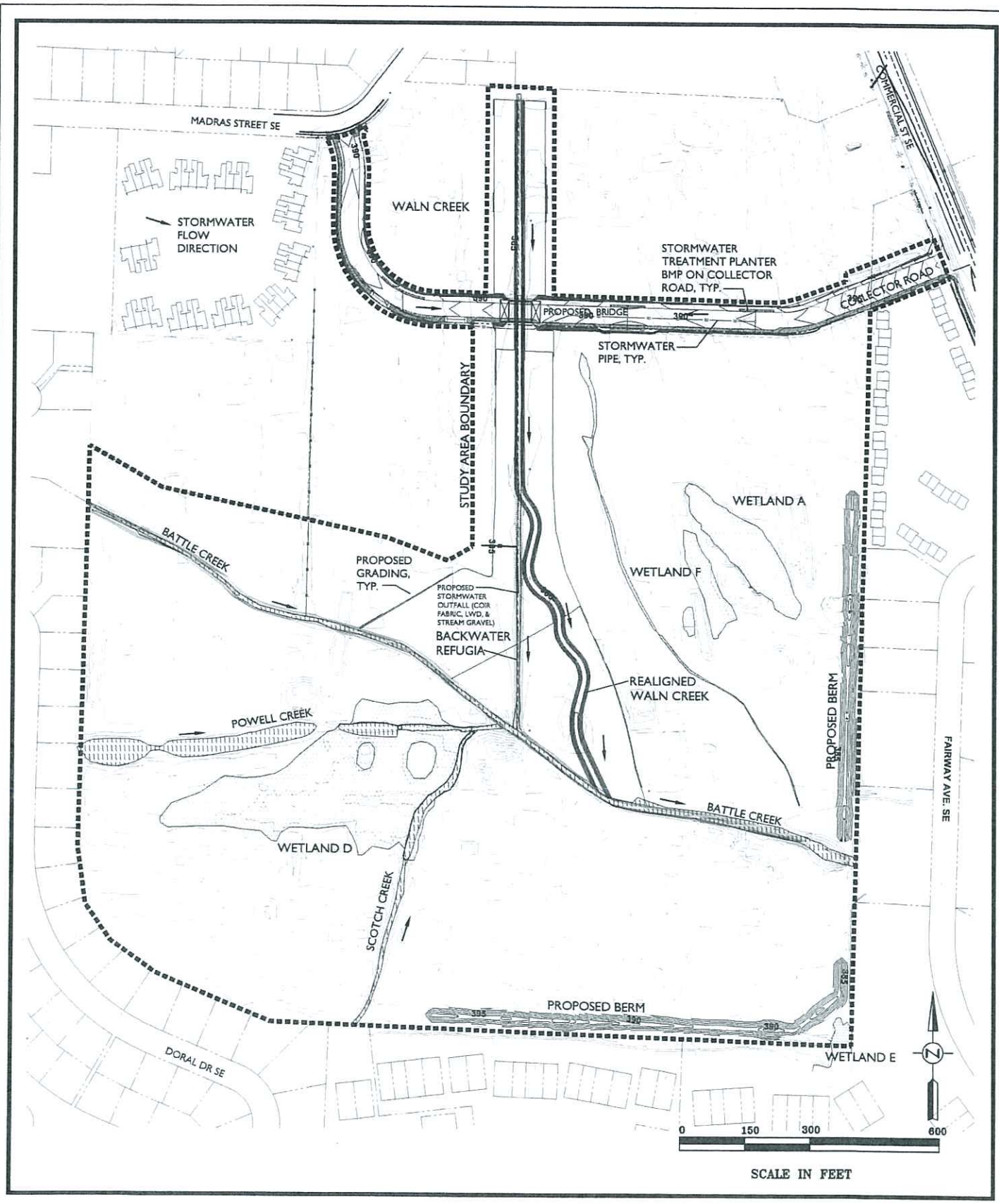
Y:\AUTOCAD\4700\4704 Battle Creek golf course\FIG 050411_ftp\fig rev 070111 project basemap.dwg, 7/11/2011 11:09:21 AM, Letter, 1:1



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Proposed stormwater plan at the Waln Creek and Battle Creek enhancement project in Salem, Oregon. Provided by OTAK, Inc., 2011.

FIGURE 12

Pacific Habitat Services, Inc.

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Attachment B

Drainage Easement Kelly-Renfro Property

DRAINAGE AND SEWER PIPELINE EASEMENT

This Drainage and Sewer Pipeline Easement is between Terry J. Kelly and Mary L. Rentfro (Grantor), and the City of Salem, an Oregon municipal corporation (Grantee).

1. Grant of Easement. Grantor for the consideration for no money, but for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, do forever grant unto the Grantee, a permanent easement over and along the full width and length of the premises described as follows, to-wit:

See Exhibit A attached, which is hereafter referred to as "Easement Area" and is as shown on the attached map as Exhibit B.

2. Permanent Easement. The permanent easement shall include the right, privilege, and authority of Grantee to:

A. Construct, build, excavate, install, patrol, operate, maintain, repair, replace, and inspect a drainage control facility or facilities within said Easement Area, with all appurtenances incident thereto or necessary therewith, for the purpose of carrying, detaining, conveying, cleaning, or protecting water, and for similar uses in, under, over, across, and through the Easement Area. As used herein, drainage facility includes natural drainage facilities, constructed drainage facilities, and any combination thereof;

B. Construct, place, operate, maintain, repair, replace, relocate, inspect, and remove an underground sanitary sewer pipeline with all appurtenances incident thereto or necessary therewith, including manholes, for the purpose of conveying sewage waste under said premises, together with the right of Grantee to place, excavate, replace, repair, install, maintain, operate, inspect, and relocate pipelines and necessary appurtenances, and make excavations therefor from time to time, in, under, and through the above-described premises within said easement;

C. Plant, install, establish, maintain, remove, and replace vegetation as necessary within the Easement Area;

D. Remove from the Easement Area any vegetation, buildings, structures, fences, fill, or other materials or obstructions, or appurtenances attached to or connected therewith, for any reason; and

E. The right of ingress and egress in, under, over, across, and through the Easement Area at any and all times for any purpose. Grantor shall at all times upon reasonable notice from Grantee remove any surface obstructions or open gates which would otherwise prevent ingress or egress by Grantee.

3. Prohibited Activities. The Grantor is prohibited from engaging in any activity within the Easement Area, or use of the Easement Area, or allowing another to engage in or use the

After recording, return to:
City Recorder
555 Liberty Street SE, Room 205
Salem OR 97301-3513

Easement Area, in any manner inconsistent with the purposes of this Easement or detrimental to the Grantee's use of the Easement, including but not limited to:

A. Excavating, filling, disturbing, damaging, or removing vegetation from the Easement Area without the prior express written consent of Grantee.

B. Placing, installing, or constructing any buildings, structures, fences, fill, plantings, or other materials or obstructions without the express prior written consent of Grantee.

4. No Waiver of Grantee's Rights. Failure of Grantee to exercise its rights under this Easement in the event of any breach of any term of this Easement by the Grantor shall not be deemed or construed to be a waiver by Grantee of such term or of any subsequent breach of the same or any other term of this Easement or of any of Grantee's rights under this Easement. No delay or omission by Grantee in the exercise of any right or remedy upon any breach by the Grantor shall impair such right or remedy or be construed as a waiver.

5. Representations and Warranties. Grantor represents and warrants that, after reasonable investigation and to the best of its knowledge:

A. Grantor warrants that it holds fee title to the Easement Area and that Grantee may peaceably enjoy the rights and benefits of this Easement;

B. Grantor, its successors and assigns, shall indemnify and hold harmless the Grantee, its officers, employees, and agents against any and all liabilities, damages, penalties, losses, claims, demands, actions, suits, and judgments (including attorney fees and costs), and any costs or expenses incurred resulting from the presence of hazardous waste onto or from the Easement Area, including any and all costs associated with clean up or remediation that may be required. This provision shall not apply to a release of hazardous waste onto or from the Easement Area caused by the officers, employees, or agents of Grantee. Any action taken pursuant to this provision shall not constitute an admission of liability or waiver of any defenses to liability. "Hazardous waste" has the same meaning as provided in Oregon Revised Statutes 466.005(7) (2009 ed.);

C. There is no pending or threatened litigation in any way affecting, involving, or relating to the Easement Area.

6. Indemnification. To the extent permitted by the Oregon Constitution and the Oregon Tort Claims Act, Grantee shall indemnify and hold harmless Grantor, its heirs and assigns, from claims of injury to person or property as a result of the negligence of Grantee, its officers, employees, or agents, relating to Grantee's activities within the Easement Area.

7. Easement and Agreements Run with the Land. This Easement, and the covenants and agreements contained in this Easement, shall run with the land and inure to the benefit of and be binding and obligatory upon the heirs, executors, administrators, successors, and assigns of the respective parties.

TERRY J. KELLY

STATE OF Oregon)
)
County of Marion)

This instrument was acknowledged before me on December 16 2011, by Terry J. Kelly.

OFFICIAL SEAL
JOHN A GIBSON
NOTARY PUBLIC - OREGON
COMMISSION NO. 441683
MY COMMISSION EXPIRES AUG. 9, 2013

Notary Public - State of Oregon
My commission expires: 8/9/13

MARY L. RENTFRO

STATE OF Oregon)
)
County of Marion)

This instrument was acknowledged before me on December 16 2011, by Mary L. Rentfro.

OFFICIAL SEAL
JOHN A GIBSON
NOTARY PUBLIC - OREGON
COMMISSION NO. 441683
MY COMMISSION EXPIRES AUG. 9, 2013

Notary Public - State of Oregon
My commission expires: 8/9/13

ACCEPTED ON BEHALF OF THE
CITY OF SALEM BY:

APPROVED AS TO FORM:

City Attorney

Checked by:
Project Number: 710504
Date: 12/20/11

Tax Lot 100, Map 8 3W 23B
Terry J. Kelly and Mary L. Rentfro
September 23, 2011

EXHIBIT A

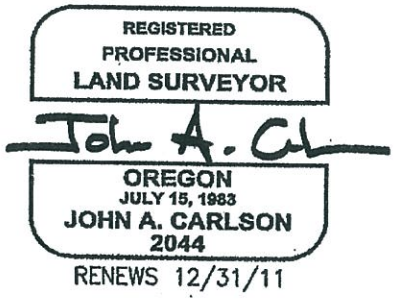
Tract 1 – Drainage and Sewer Pipeline Easement

A strip of land, 130 feet wide, in the northwest one-quarter of Section 23, Township 8 South, Range 3 West, Willamette Meridian, Marion County, Oregon, being a portion of that property described as Property 1 in Exhibit "A" of that Property Line Adjustment Deed recorded in Reel 3216, Page 401, Marion County Records; and being more particularly described as follows:

Beginning at a point on the southerly line of said Reel 3216, Page 401 Property 1 property, said point also being the easterly northeast corner of that property described in that Statutory Warranty Deed to Marion County District 24J, recorded in Reel 3220, Page 60, Marion County Records, being Property #1 PLA Case #10-13 MCSR 37868; thence North 01°39'16" West, a distance of 485.75 feet to the northerly line of said Reel 3216, Page 401 Property 1 property; thence South 89°10'50" East along said northerly line, a distance of 130.12 feet; thence leaving said northerly line South 01°39'16" East, a distance of 484.14 feet to the southerly line of said Reel 3216, Page 401 Property 1 property; thence North 89°53'20" West along said southerly line, a distance of 130.06 feet to the Point of Beginning.

The strip of land to which this description applies contains 63,043 square feet, more or less.

Bearings are based on Marion County Survey Record No. 37867.



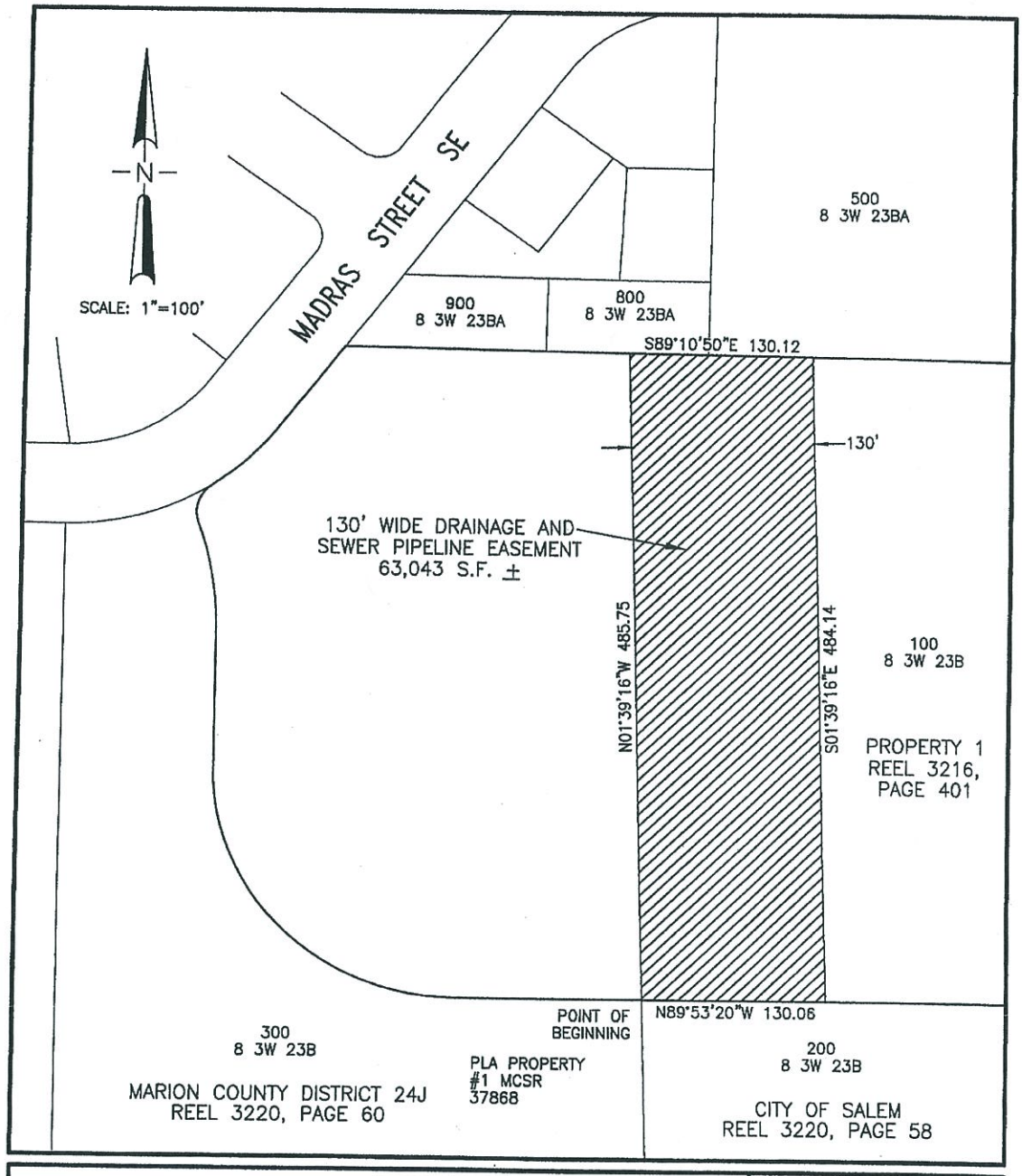


EXHIBIT B
ACQUISITION SKETCH
DRAINAGE AND SEWER PIPELINE EASEMENT

PROJECT NO.	SHEET NO.	DATE	REVISION NO.	DRAWN BY	CHECKED BY
13853C	1 OF 1	9/23/2011	000	J. CARLSON	G. PAUL

otak

17355 S.W. BOONES FERRY ROAD
LAKE OSWEGO, OREGON 97035
(503)635-3618 FAX (503)635-5395

REEL: 3346 **PAGE: 308**

January 03, 2012, 02:47 pm.

CONTROL #: 307461

State of Oregon
County of Marion

I hereby certify that the attached instrument was received and duly recorded by me in Marion County records:

FEE: $ 66.00

BILL BURGESS
COUNTY CLERK

THIS IS NOT AN INVOICE.

Attachment C

Land Use Affadavit

(7) CITY/COUNTY PLANNING DEPARTMENT AFFIDAVIT
*(TO BE COMPLETED BY LOCAL PLANNING OFFICIAL) **

I have reviewed the project outlined in this application and have determined that:

- ☐ This project is not regulated by the comprehensive plan and land use regulations.
- ☒ This project is consistent with the comprehensive plan and land use regulations.
- ☐ This project will be consistent with the comprehensive plan and land use regulations when the following local approval(s) are obtained.
  - ☐ Conditional Use Approval
  - ☐ Development Permit
  - ☐ Other

This project is not consistent with the comprehensive plan. Consistency requires a

- ☐ Plan Amendment
- ☐ Zone Change
- ☐ Other

An application has ☐ has not ☐ been filed for local approvals checked above.

Local planning official name (print)	Signature	Title	City / County	Date
Amy J. Dixon	[redacted]	Assoc Planner	Salem	6/29/11

Comments:

(8) COASTAL ZONE CERTIFICATION *

If the proposed activity described in your permit application is within the Oregon coastal zone, the following certification is required before your application can be processed. A public notice will be issued with the certification statement, which will be forwarded to the Oregon Department of Land Conservation and Development for its concurrence or objection. For additional information on the Oregon Coastal Zone Management Program, contact the department at 635 Capitol Street NE, Suite 150, Salem, Oregon 97301 or call 503-373-0050.

CERTIFICATION STATEMENT

I certify that, to the best of my knowledge and belief, the proposed activity described in this application complies with the approved Oregon Coastal Zone Management Program and will be completed in a manner consistent with the program.

Print /Type Name	Title
Applicant Signature	Date

Source: Corps/DSL Joint Permit Application

Attachment D

Adjacent Landowners

083W14CD02100 LARRY L SCHNELL PO BOX 51900 SPARKS NV 89435	083W14CD02200, 2201 MADRAS PROPERTIES INC WALTER B WELLS,TRE PO BOX 56 TURNER OR 97392	083W23A 01000, 01100, 083W23B 00100, 00101, 083W23BA00400 TERRY J KELLY 6448 DORAL DR SE SALEM OR 97306
083W23A 00801 SPIRIT MASTER FUNDING II LLC PO BOX 3125 SALEM OR 97302	083W23A 00802 DAV II INVESTMENT GROUP PO BOX 3308 SALEM OR 97302	083W23A 01200, 01300, 01400, 01600 JONES LT LESLIE J BRAME 2027 RIVERKNOLL CT WEST LINN OR 97068
083W23A 01800 BATTLECREEK INVESTMENTS OF OREG PO BOX 1159 WILSONVILLE OR 97070	083W23A 90000 U S HOUSING & DEVELOPMENT CORP 1469 CAPITOL ST NE SALEM OR 97303	083W23A 90001 NANCY R RAY 6371 FAIRWAY AV SE SALEM OR 97306
083W23A 90002 ALAN J BEYER 6369 FAIRWAY AV SE SALEM OR 97306	083W23A 90003 DAVID W WEINER 6367 FAIRWAY AV SE SALEM OR 97306	083W23A 90004 BRENDA BROOKS POST 6487 VILLAGE PKWY ANCHORAGE AK 99504
083W23A 90005 ANNA M GREVEN 6383 FAIRWAY AV SE SALEM OR 97306	083W23A 90006 VIRGIL E ANDERSON 6361 FAIRWAY AV SE NO 6 SALEM OR 97306	083W23A 90007 TERRI L CHAPMAN 6359 FAIRWAY AV SE SALEM OR 97306
083W23A 90008 LINDA BEMIS 6357 FAIRWAY AV SE SALEM OR 97306	083W23A 90009 GAYLE L ALLEN-RUDDELL 6355 FAIRWAY AV SE SALEM OR 97306	083W23A 90010 LISA E TAYLOR 6353 FAIRWAY AV SE SALEM OR 97306
083W23A 90011 LAURIE J POST 6351 FAIRWAY AV SE SALEM OR 97306	083W23A 90012 ASHLEY YOUNG 6349 FAIRWAY AV SE SALEM OR 97306	083W23A 90013 ERIC MITCHELL ELROD LT C/O DIANE GORDON 500 WEST HARBOR DR NO 512 SAN DIEGO CA 92101
083W23A 90014 JOHN J MISA 6345 FAIRWAY AVE SE SALEM OR 97306	083W23A 90015 CHRISTINE E PARTAIN 6343 FAIRWAY AV SE SALEM OR 97306	083W23A 90016 SHARON K ELLIOTT 6341 FAIRWAY AVE SE SALEM OR 97306
083W23A 90017 LARRY H BOSELL 48 NORTH JOHN ST BLOOMFIELD IN 47424	083W23A 90018 MICHAEL J TUEL 6337 FAIRWAY AV SE SALEM OR 97306	083W23A 90019 DAVID B TULLIS 6335 FAIRWAY AV SE SALEM OR 97306
083W23A 90020, 083W23CA 10800 JONG C YEE 1920 SPICETREE LN SE SALEM OR 97306	083W23A 90021 SHAWN E BATY 6331 FAIRWAY AV SE SALEM OR 97306	083W23A 90022 DAVID R WESTMARK 6329 FAIRWAY AV SE SALEM OR 97306

083W23A 90023 ROGER S MINTEN 6327 FAIRWAY AV SE SALEM OR 97306	083W23A 90024 WILLIAM R IMPEY 5511 SE SCENIC LN NO 203 VANCOUVER WA 98661	083W23A 90025 MATTHEW S CAUDILLO 6323 FAIRWAY AVE SE NO 25 SALEM OR 97302
083W23A 90026 FEDERAL NATIONAL MORTGAGE ASSC 888 E WALNUT ST PASADENA CA 91101	083W23A 90027 JAMES G LOVE 6319 FAIRWAY AV SE SALEM OR 97306	083W23A 90028 MICHELLE C LETOUMEAU 6317 FAIRWAY AV SE SALEM OR 97306
083W23A 90029 LINDA L OSKO 6315 FAIRWAY AVE SE SALEM OR 97306	083W23A 90030 WILLIAM R IMPEY 57395 COLONIAL LA QUINTA CA 92253	083W23A 90031 PATRICIA C PEARSON REV TR 6311 FAIRWAY AV SE SALEM OR 97306
083W23A 90032 ELLEN CORBELL 6309 FAIRWAY AV SE SALEM OR 97306	083W23A 90033 BUCKNELL FAM TR RICHARD G BUCKNELL 6307 FAIRWAY AV SE SALEM OR 97306	083W23A 90034 LAURA J BERTELSON 6305 FAIRWAY AV SE SALEM OR 97306
083W23A 90035 DORENE A KUTSCH 1078 KERRISDALE DR SE ALBANY OR 97322	083W23A 90036 DALE L VAN LYDEGRAF LT PO BOX 4369 SALEM OR 97302	083W23A 90037 CAROL A RUSSELL 6251 FAIRWAY AV NE SALEM OR 97306
083W23A 90038 PATRICK J BRADLEY 1971 CHURCH ST NE SALEM OR 97301	083W23A 90039 GRACETTA THOMPSON 6255 FAIRWAY AV SE SALEM OR 97306	083W23A 90040 JENNIFER L OHTA 6257 FAIRWAY AV SE SALEM OR 97306
083W23A 90041 CATHLEEN J BOWERSOX 6259 FAIRWAY AV SE SALEM OR 97306	083W23A 90042 DAVID J JACKSON 6261 FAIRWAY AV SE SALEM OR 97306	083W23A 90043 JAMES LEROY EVANS 18895 FROST RD DALLAS OR 97338
083W23A 90044 SCOTT A LUDVIKSEN 6267 FAIRWAY AV SE SALEM OR 97306	083W23A 90045 DAVID L MELSHA 3465 CONTINENTAL DR SE TURNER OR 97392	083W23A 90046 RON HELMS PO BOX 3456 SOLDOTNA AK 99669
083W23A 90047 LAURIE K BOYLE 6273 FAIRWAY AVE SE SALEM OR 97306	083W23A 90048 CHERYL L SIMPSON PO BOX 13493 SALEM OR 97309	083W23A 90049 REBECCA J LEITHOLD 6277 FAIRWAY AVE SE SALEM OR 97306

083W23A 90050 FRANCES B BROWN TR C/O MARY BROWN 1165 ACADEMY ST MT ANGEL OR 97362	083W23A 90051 ETTA ARCHER GROSS 6281 FAIRWAY AV SE SALEM OR 97306	083W23A 90052 CAROL R BAKER 6283 FAIRWAY AV SE SALEM OR 97306
083W23A 90053 RAYMOND FISHER TR <RANDALL D JEFFERS 10668 CROSBY RD NE WOODBURN OR 97071	083W23A 90054 KELLY B ALBRECHT KEITH W NUTTER 21641 SE MAIN ST GRESHAM OR 97030	083W23A 90055 ROBIN D MORTON 106 OLYMPIC AV SE SALEM OR 97306
083W23A 90056 CHRISTINA L BASSO-LENZ 6291 FAIRWAY AV SE SALEM OR 97306	083W23A 90057 JUSTIN BRETT HUTCHINSON 5678 SUGAR PLUM AV SE SALEM OR 97306	083W23A 90058 S FRANK THOMPSON 6295 FAIRWAY AVE SE SALEM OR 97306
083W23A 90059 CHARLOTTE L RYAN 6297 FAIRWAY AV SE SALEM OR 97306	083W23A 90060 RONDA R COUCH-EBERZ 6299 FAIRWAY AV SE SALEM OR 97306	083W23B 00300 SALEM-KEIZER SCHOOL DIST 24J 3630 STATE ST SALEM OR 97301
083W23BA00500 VILLA FORTY LLC PO BOX 2285 SALEM OR 97308	083W23BA00600, 00700, 00800, 00900, 1000, 01100 LOWELL A SMITH 4120 CROISAN CREEK RD S SALEM OR 97302	083W23BA01300 DAVID A BOWMAN 7840 LIBERTY RD S SALEM OR 97306
083W23BA01400 JAMES F SMITH 6754 RIPPLING BROOK DR SE SALEM OR 97301	083W23BA03400 CRYSTAL L CORNEJO 1585 MADRAS ST SE SALEM OR 97306	083W23BB03500, 03600, WILLIAM H CHARNHOLM RT BETTY J CHARNHOLM RT 1323 CHEMEKETA ST NE SALEM OR 97301
083W23BB03700 RYAN WHITSON 6220 13TH AVE SE SALEM OR 97306	083W23BB90001 GERRITT HOUDYSHELL 695 WINDING WAY SE SALEM OR 97302	083W23BB90002 CHERYL L HOPKINS 1478 MADRAS ST SE SALEM OR 97306
083W23BB90003 RONALD D ALLOWITZ 1480 MADRAS ST SE SALEM OR 97306	083W23BB90004 MAUREEN SMITH 1482 MADRAS ST SE SALEM OR 97306	083W23BB90005 DESMOND HARPSTER 1484 MADRAS ST SE SALEM OR 97306
083W23BB90006 CAROLYNNE J PHILLIPS 1486 MADRAS ST SE SALEM OR 97306	083W23BB90007 R DEAN MANWARING 1488 MADRAS ST SE SALEM OR 97306	083W23BB90008 JOAN L FRYE TR 1490 MADRAS ST SE SALEM OR 97306

083W23BB90009 NORMA J OSTRANDER PO BOX 296 TURNER OR 97392	083W23BB90010 MARY E COULTER 1494 MADRAS SE SALEM OR 97306	083W23BB90011 JOHN J SCHMITZ 1496 MADRAS SE SALEM OR 97306
083W23BB90012 MARGOT L CROW 1498 MADRAS ST SE SALEM OR 97306	083W23BB90013 MICHAEL J WAUGE 1500 MADRAS ST SE SALEM OR 97306	083W23BB90014 BARBARA J LANGE 1502 MADRAS ST SE SALEM OR 97306
083W23BB90015 KATHERINE L HANCOCK 1504 MADRAS ST SE SALEM OR 97306	083W23BB90016 CONNIE R NESSL 1506 MADRAS ST SE SALEM OR 97306	083W23BB90017 ALMA WAUGE 1508 MADRAS ST SE SALEM OR 97306
083W23BB90018 NANCY A WEBER 1510 MADRAS ST SE SALEM OR 97306	083W23BB90019 INEZ R HALVERSON 1512 MADRAS ST SE SALEM OR 97306	083W23BB90020 S DAHLIA HAN 1514 MADRAS ST SE SALEM OR 97306
083W23BB90021 THOMAS FAMILY TR 1516 MADRAS ST SE SALEM OR 97306	083W23BB90022 GREGORY L GOYINS 4724 BRADFORD LP SE SALEM OR 97302	083W23BB90023 NIOMA JEAN CUTLER 1520 MADRAS ST SE SALEM OR 97306
083W23BB90024 HSBC MORTGAGE SERVICES INC 2929 WALDEN AV DEPEW NY 14043	083W23BB90025 MICHAEL L MANNING 1754 CUMULUS CT NW SALEM OR 97304	083W23BB90026 ELIZABETH L EKSTROM 1526 MADRAS ST SE SALEM OR 97306
083W23BB90027 MARNI S WATTS 1528 MADRAS ST SE SALEM OR 97306	083W23BB90028 SUSAN BERG 2427 CORAL AV NE APT D SALEM OR 97305	083W23BB90029 JOHN R COCHENOUR 1532 MADRAS ST SE SALEM OR 97306
083W23BB90030 SUNNY RONDA RAE 1534 MADRAS SE SALEM OR 97306	083W23BB90031 MURPHY FAM TR 1536 MADRAS ST SE SALEM OR 97306	083W23BB90032 PAUL D KRISSEL 1675 HIGH ST SE SALEM OR 97302
083W23BB90033 FEDERAL HOME LOAN C/O RECONTRUST COMPANY 400 COUNTRYWIDE WY SV 35 SIMI VALLEY CA 93065	083W23BB90034 SHIRLEY J HERRMANN, TRUSTEE 1560 MADRAS ST SE SALEM OR 97306	083W23BB90035 KEVIN B WIENHOFF 1558 MADRAS ST SE SALEM OR 97306

083W23BB90036 KENNETH M STEWART 1556 MADRAS ST SE SALEM OR 97306	083W23BB90037 AMPARO SIMS TESTAMENTARY TR 1554 MADRAS ST SE SALEM OR 97306	083W23BB90038 KATHRYN E KENEFICK 1552 MADRAS ST SE SALEM OR 97306
083W23BB90039 G ELAINE SELBERG 1550 MADRAS ST SE SALEM OR 97306	083W23BB90040 KENNETH B PITMAN 1548 MADRAS ST SE SALEM OR 97306	083W23BB90041 DALY JRLT ELISABETH, DALY TRE 1546 MADRAS ST SE SALEM OR 97306
083W23BB90042 STEVEN W TUTTLE 1544 MADRAS ST SE SALEM OR 97306	083W23BB90043 RICHARD L ODELL 5513 DEAN COURT SE SALEM OR 97301	083W23BB90044 CYNTHIA FREEMAN 1540 MADRAS ST SE SALEM OR 97306
083W23BC00500 DONALD R CAUSEY PO BOX 12488 SALEM OR 97309	083W23BC00700 DIANA L LARONT 1475 PACWOOD CT SE SALEM OR 97306	083W23BC00800 JOSEPH C DAVIDSON 1480 PACWOOD CT S SALEM OR 97306
083W23BC01400 KAY PATRICIA RENTCHLER 6386 13TH AV SE SALEM OR 97302	083W23BC01900 CITY OF SALEM 350 COMMERCIAL ST NE SALEM OR 97301	083W23BC02000 EVA H SLINKER LT 6418 DORAL DR SE SALEM OR 97306
083W23BC02100 RICHARD A & GLORIA J ROSENAU 6428 DORAL DR SE SALEM OR 97306	083W23BC02200 MOLLY F WOOLARD PO BOX 4132 SALEM OR 97302	083W23BC02300 MARY L RENTFRO 6448 DORAL DR SE SALEM OR 97306
083W23BC02400 ETHEL V PATRICK TR 6458 DORAL DR SE SALEM OR 97306	083W23BC02500 JAMES J BRIGGS 6468 DORAL DR SE SALEM OR 97306	083W23BC02600 ROBERT & CLARISE WARREN, TRUSTEE 6488 DORAL DRIVE SE SALEM OR 97306
083W23CA00100 BATTLECREEK COMMONS ASSOCIATION 6585 FAIRWAY AV SE SALEM OR 97306	083W23CA00200 HOWARD E & CLETA L HEINKEL 1825 LEXINGTON CIRCLE SE SALEM OR 97306	083W23CA00300 NANCY S GUTH 1827 LEXINGTON CR SE SALEM OR 97306
083W23CA00400 MARY FORD 1829 LEXINGTON CR SE SALEM OR 97306	083W23CA00500 THOMAS A TURNER 1831 LEXINGTON CR SE SALEM OR 97306	083W23CA00600 ROBERT R & ROSALIND E HELBER 1833 LEXINGTON CIRCLE SE SALEM OR 97306

083W23CA00700 LEA N SPENCER 1835 LEXINGTON CR SE SALEM OR 97306	083W23CA00800 ALBERT JASSO 1795 FAIRMOUNT AV S SALEM OR 97302	083W23CA00900 CORNELIUS C & MICKEY K PUCKETT 1839 LEXINGTON CIRCLE SE SALEM OR 97306
083W23CA01000 DONALD H SMITH 1841 LEXINGTON CR SE SALEM OR 97306	083W23CA01100 MARTHA A HOWELL 1843 LEXINGTON CR SE SALEM OR 97306	083W23CA01200 DAVID D PALLETT, ET AL 11871 SE EOLA HILLS DR AMITY OR 97101
083W23CA01300 BARBARA A TURNER 1847 LEXINGTON CR SE SALEM OR 97306	083W23CA01400 KARIN E NILSSON 1849 LEXINGTON CIR SE SALEM OR 97306	083W23CA01500 FRANCIS C & ANITA L FARNELL 1851 LEXINGTON CIRCLE SE SALEM OR 97306
083W23CA01600 SHIRLEY A SOBIE 1853 LEXINGTON CR SE SALEM OR 97306	083W23CA01700 YVONNE KELLEY 1855 LEXINGTON CR SE SALEM OR 97306	083W23CA01800 KATHERINE ANDERSON 1857 LEXINGTON CR SE SALEM OR 97306
083W23CA01900 JANICE E ROBERTS 1859 LEXINGTON CR SE SALEM OR 97306	083W23CA02000 JOYCE A MURRAY 1861 LEXINGTON CR SE SALEM OR 97306	083W23CA02100 ANNETTE HENRY 1863 LEXINGTON CIR SE SALEM OR 97306
083W23CA02200 THOMAS C PAULUS 1865 LEXINGTON CIR SE SALEM OR 97306	083W23CA02300 DIANE STOUT 1867 LEXINGTON CR SE SALEM OR 97306	083W23CA02400 DONNA LOCKE 1869 LEXINGTON CR SE SALEM OR 97306
083W23CA02500 PAUL MCCOUBREY 6635 CONTINENTAL CR SE SALEM OR 97306	083W23CA02600 JAMES E EARHART 1873 LEXINGTON CR SE SALEM OR 97306	083W23CA02700 EDWARD C HALL 1669 ANKENY HILL RD SE JEFFERSON OR 97352
083W23CA02800 CUNNINGHAM LT DONNA J CUNNINGHAM, TRE 1877 LEXINGTON CR SE SALEM OR 97306	083W23CA02900 KEITH G EDDY 1879 LEXINGTON CR SE SALEM OR 97306	083W23CA03000 ROBERT R JOHNSON 4050 12TH ST CUTOFF NO 132 SALEM OR 97302
083W23CA03100 RONALD W DEPUY 1883 LEXINGTON CR SE SALEM OR 97306	083W23CA03200 ARTHUR A & MARY H BIRKBY 1885 LEXINGTON CR SE SALEM OR 97306	083W23CA03300 GARY E UPHAM PO BOX 245 RHODODENRON OR 97049

083W23CA03400 GLEN W KNICKERBOCKER 1889 LEXINGTON CR SE SALEM OR 97306	083W23CA03500 ANDER RT C/O HAGERMAN,GEORGETTE 3264 LIBERTY RD S SALEM OR 97302	083W23CA03600 FL PATRICK RLT 1893 LEXINGTON CR SE SALEM OR 97306
083W23CA03700 LAVERNA J SHEPHERD 1895 LEXINGTON CR SE SALEM OR 97306	083W23CA03800 BATTLECREEK COMMONS ASSOCIATION 1823 LEXINGTON CR SE SALEM OR 97306	083W23CA03900 MAE CULVER 6587 FAIRWAY AV SE SALEM OR 97306
083W23CA04000 JAMES J BURNETTE 6589 FAIRWAY AV SE SALEM OR 97306	083W23CA04100 DOROTHY J OLSON RLT 6591 FAIRWAY AV SE SALEM OR 97306	083W23CA04200 HOLLAND REVOCABLE LIVING TRUST 6611 FAIRWAY AV SE SALEM OR 97306
083W23CA04300 ARLENE D BENNETT 6615 FAIRWAY AV SE SALEM OR 97306	083W23CA04400 LINDA H NORRIS 6700 CONTINENTAL CR SE SALEM OR 97306	083W23CA04500 MARY S MACDONALD 6706 CONTINENTAL CR SE SALEM OR 97306
083W23CA04600 WARREN W COOLEY BYPASS TR ANNE S COOLEY, TRE 6710 CONTINENTAL CR SE SALEM OR 97306	083W23CA04700 J W & MARY LOU BARTOSZ 6716 CONTINENTAL CR SE SALEM OR 97306	083W23CA04800 MARY K SCHROEDER 6720 CONTINENTIAL CR SE SALEM OR 97306
083W23CA04900 PHIL B FORD 6726 CONTINENTAL CR SE SALEM OR 97306	083W23CA05000 SANDRA A SIEWERT 6756 CONTINENTAL CIR SE SALEM OR 97306	083W23CA05100 RICHARD A & SHARRON M SEIDEMAN 6750 CONTINENTAL CR SE SALEM OR 97306
083W23CA05200 HILDEGARD REGINA SERRATT RLT 4616 GOLDENROD AV NE SALEM OR 97305	083W23CA05300 BETTY-COE DEBROKERT 1931 YOLANDA AV SPRINGFIELD OR 97477	083W23CA05400 WILLIAM PRITCHETT 6686 CONTINENTAL CR SE SALEM OR 97306
083W23CA05500 GLADYS J HARTMAN RLT 6680 CONTINENTAL CR SE SALEM OR 97302	083W23CA05600 JOSEPH LEO THIMM JR TR 6746 CONTINENTAL CR SE SALEM OR 97306	083W23CA05700 MICHAEL A MCCAFFREY 6740 CONTINENTAL CIR SE SALEM OR 97306
083W23CA05800 LEE A DAVIS PO BOX 706 SALEM OR 97308	083W23CA05900 MARY E RUE TRUST 6730 CONTINENTAL CR SE SALEM OR 97306	083W23CA06000 JOSEPH C &EDITH W-TR BENNINGHOFF 6676 CONTINENTAL CIR SE SALEM OR 97306

083W23CA06100 PETER GARTLAN 6670 CONTINENTAL CR SE SALEM OR 97306	083W23CA06200 SANDRA R MELHORN 6666 CONTINENTAL CR SE SALEM OR 97306	083W23CA06300 WILLIAM ZIRBES 6660 CONTINENTAL CR SE SALEM OR 97306
083W23CA06400 RUTH A LONDBERG LT 6785 CONTINENTAL CR SE SALEM OR 97306	083W23CA06500 CATHY KOUGH EVAN TYLOR YOUNG 6775 CONTINENTAL CR SE SALEM OR 97306	083W23CA06600 ANNE D JETER 6765 CONTINENTAL CR SE SALEM OR 97306
083W23CA06700 REX O DART 6755 CONTINENTAL CR SE SALEM OR 97306	083W23CA06800 LAVERNE G NELSON 6745 CONTINENTAL CR SE SALEM OR 97306	083W23CA06900 ELEANOR THOMPSON FAM TR JOHN S THOMPSON TR 6735 CONTINENTAL CR SE SALEM OR 97306
083W23CA07000 ROLAND & MARJORIE GORHAM FAM TR 6725 CONTINENTAL CR SE SALEM OR 97306	083W23CA07100 MITTI D HINZ 6715 CONTINENTAL CR SE SALEM OR 97306	083W23CA07200 DAVID L WOOD 6705 CONTINENTAL CR SE SALEM OR 97306
083W23CA07300 ROBERT F MCNALLY, SR 6695 CONTINENTAL CR SE SALEM OR 97306	083W23CA07400 MARCIA F HERRING 6685 CONTINENTAL CR SE SALEM OR 97306	083W23CA07500 KATHRYN L STOPHER 5773 FLAIRSTONE DR SE SALEM OR 97306
083W23CA07600 MICHAEL A CULBERTSON 6665 CONTINENTAL CR SE SALEM OR 97306	083W23CA07700 BOWERSOX FAM TR JUNE A BOWERSOX, TRE 6655 CONTINENTAL CR SE SALEM OR 97306	083W23CA07800 LLOYD S & JUDITH W SMITH, TRUST 6645 CONTINENTAL CIRCLE SE SALEM OR 97306
083W23CA07900 PATRICIA L BOURSON 6635 CONTINENTAL CR SE SALEM OR 97306	083W23CA08000 JEAN M RENNEBOHM TR 6625 CONTINENTAL CR S SALEM OR 97306	083W23CA08100 AMARYLLIS LILLES POWELL 6615 CONTINENTAL CIR SE SALEM OR 97306
083W23CA08200 NORMAN R MILLER 6620 CONTINENTAL CR SE SALEM OR 97306	083W23CA08300 DENNIS D LEE 5014 S MOUNTAIN TERRACE WY PORT ANGELES WA 98362	083W23CA08400 JO ANN RUNYON, TRUSTEE 6630 CONTINENTAL CR SE SALEM OR 97306
083W23CA08500 JOHN W DAY RLT 6636 CONTINENTAL CR SALEM OR 97306	083W23CA08600 RICHARD & ANGELYN BYLSMA, TRUST 6640 CONTINENTAL CIRCLE SE SALEM OR 97306	083W23CA08700 JUNE G MCCALLISTER, TRUST 6646 CONTINENTAL CIR SE SALEM OR 97306

083W23CA08800 DORIS R REYNOLDS RLT 6650 CONTINENTAL CR SE SALEM OR 97306	083W23CA08900 PAUL MCCOUBREY 2008 TR 6656 CONTINENTAL CR SE SALEM OR 97306	083W23CA09100 RHODES S & JEAN L SKILLMAN, TRUST 6520 HUNTINGTON CIR SE SALEM OR 97306
083W23CA09200 JILL READ 6524 HUNTINGTON CR SE SALEM OR 97306	083W23CA09300 ELIZABETH R COLLINS, TRUST 6530 HUNTINGTON CR SE SALEM OR 97306	083W23CA09400 SANDRA KAY HAYNES 7483 SW LAKESIDE LP WILSONVILLE OR 97070
083W23CA09500 GREEN LT KATHLEEN M GREEN, TRE 6540 HUNTINGTON CR SE SALEM OR 97306	083W23CA09600 CHARLOTTE R MARTIN, TRUSTEE 6544 HUNTINGTON CR SE SALEM OR 97306	083W23CA09700 PEG 6550 HUNTINGTON CR SE SALEM OR 97306
083W23CA09800 ARLYCE J BURKE TR 6554 HUNTINGTON CR SE SALEM OR 97306	083W23CA09900 EDEN WEST LLC 6560 HUNTINGTON CR SE SALEM OR 97306	083W23CA10000 STEVEN K STARKEY 6564 HUNTINGTON CR SE SALEM OR 97306
083W23CA10100 HENRY E SHOUDY 1033 TWIN HILLS DR SE JEFFERSON OR 97352	083W23CA10200 SALLY A HOLCOMB CREDIT SHELTER T C/O GREG KUPILLAS 18487 S VALLEY VISTA RD MULINO OR 97042	083W23CA10300 HOWARD R HANNAN 6580 HUNTINGTON CR SE SALEM OR 97306
083W23CA10400 NANCY C CLARK 6584 HUNTINGTON CR SE SALEM OR 97306	083W23CA10500 AGNES DIRKSEN 6590 HUNTINGTON CR SE SALEM OR 97306	083W23CA10600 HELEN D WEST TR 6594 HUNTINGTON CR SE SALEM OR 97306
083W23CB00900 JOHN C SHEPARD, JR LYNANN L SHEPARD 6596 DORAL DRIVE SE SALEM OR 97306	083W23CA10900 MELVIN J & B JEAN DOWNING 6599 HUNTINGTON CIRCLE SE SALEM OR 97306	083W23CA11000 RAYMOND C NORVELL 6514 HUNTINGTON CR SE SALEM OR 97306
083W23CA11100 DONNA M POLIVKA 6510 HUNTINGTON CIRCLE SE SALEM OR 97306	083W23CA11200 RUTH L JOHNSON RLT 6504 HUNTINGTON CR SE SALEM OR 97306	083W23CA11300 DONALD & BARBARA L EDWARDS 6500 HUNTINGTON CR SE SALEM OR 97306
083W23CA11400 PHYLLIS E NYGAARD 6674 HUNTINGTON CR SE SALEM OR 97306	083W23CA11500 DONALD LEE ANDERSON 6670 HUNTINGTON CR SE SALEM OR 97306	083W23CA11600 RICHARD & MARY T DALKE, TR/TRE 6664 HUNTINGTON CR SALEM OR 97306
083W23CA11700 DARREL TOWERY 6660 HUNTINGTON CR SE SALEM OR 97306	083W23CA11800 SUSAN KRAGT 6654 HUNTINGTON CR SE SALEM OR 97306	083W23CA11900 MARY LOU BECK 6650 HUNTINGTON CR SE SALEM OR 97306

083W23CA12000 EMMA L PFEIFFER TRUST 6644 HUNTINGTON CR SE SALEM OR 97306	083W23CA12100 PHILLIP R & VIRGINIA A COLGAN, TR 6640 HUNTINGTON CR SE SALEM OR 97306	083W23CA12200 WARREN J THOMPSON 6634 HUNTINGTON CR SE SALEM OR 97306
083W23CA12300 SHIRLEY J BITTNER GARY V BITTNER 6630 HUNTINGTON CR SE SALEM OR 97306	083W23CA12400 JOHANNA B RUGGLES 6614 HUNTINGTON CIRCLE SE SALEM OR 97306	083W23CA12500 DORIS M POWERS FAM TR 6610 HUNTINGTON CR SE SALEM OR 97306
083W23CA12600 MICHAEL P CAMPBELL 6604 HUNTINGTON CR SE SALEM OR 97306	083W23CA12700 BAUER LT CATHERINE E BAUER, TRE 74670 GAUCHO WAY THOUSAND PALMS CA 92276	083W23CA12900 THOMAS H GREGSON 1805 B ST HOOD RIVER OR 97031
083W23CA13000 DALTON LT JEANNE R DALTON, TRE 6619 HUNTINGTON CR SE SALEM OR 97306	083W23CA13100 PHYLLIS D TARTER, TRUSTEE 6625 HUNTINGTON CIRCLE SE SALEM OR 97306	083W23CA13200 DONALD F & JANET L ELLIOTT 6629 HUNTINGTON CIR SE SALEM OR 97306
083W23CA13300 LOIS M TUTTLE 6675 HUNTINGTON CR SE SALEM OR 97306	083W23CA13400 ROBERT F SASSEEN 6677 HUNTINGTON CR SE SALEM OR 97306	083W23CA13500 JOHN KONOPASEK, JR PO BOX 4194 SALEM OR 97302
083W23CA13600 CHARLES F WARREN 6681 HUNTINGTON CR SE SALEM OR 97306	083W23CA13800 JULIE B GOSS TR C/O JEFFREY CLARK 100 N BROADWAY MO2-100-07-18 ST LOUIS MO 63102	083W23CA13900 DANIEL P & F JUANITA HEIKEN 6684 HUNTINGTON CIRCLE SE SALEM OR 97306
083W23CA14000 JAMES L & HOPE L TACCHINI LT HOPE L TACCHINI, TRE 6690 HUNTINGTON CR SE SALEM OR 97306	083W23CA14100 L DAVID SHERMAN 6694 HUNTINGTON CR SE SALEM OR 97306	083W23CA14200 WILLIAM F MARQUARDT 6700 HUNTINGTON CR SE SALEM OR 97306
083W23CA14300 WILLIAM H ROTH 6704 HUNTINGTON CR SE SALEM OR 97306	083W23CA14400 RICK L SCOTT 3685 LACHS CT S SALEM OR 97302	083W23CA14600 SHERRIE ANN KENER 6720 HUNTINGTON CIR SE SALEM OR 97306
083W23CA14700 BLANCHE E RATHE LE GURCHE RLT 6724 HUNTINGTON CR SE SALEM OR 97306	083W23CA14800 ARTHUR J DURASKI 6734 HUNTINGTON CIR SE SALEM OR 97306	083W23CA14900 GIERING FAM TR EVA M GIERING, TRE PO BOX 261 LINCOLN CITY OR 97367

083W23CA15000 KIRBY FAM TR 6750 HUNTINGTON CR SE SALEM OR 97306	083W23CA15100 ABNER O & MYRNA Y WALDRON 6754 HUNTINGTON CR SE SALEM OR 97306	083W23CA15300 COSENTINO FAM TRUST OF 1994 JO ANN COSENTINO, TRE 774 SCENIC HEIGHTS DR SE SALEM OR 97306
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083W23CA15700 GERALDINE M BOWER 6791 HUNTINGTON CR SE SALEM OR 97306	083W23CA15800 SHELLEE A LOWERY 1623 LEEWOOD AV NE KEIZER OR 97303	083W23CA15900 CHARLES E & MARCELLA G REYNOLDS 6797 HUNTINGTON CIR SE SALEM OR 97306
083W23CA16000 JOANNA LYNN PEARL 6799 HUNTINGTON CIR SE SALEM OR 97306	083W23CA16100 MARGARET DUNN HILL RLT 6770 HUNTINGTON CR SE SALEM OR 97306	083W23CA16200 SHARON K BOLDT RLT 6774 HUNTINGTON CR SE SALEM OR 97306
083W23CA16300 PHYLLIS G HANN RLT 6780 HUNTINGTON CR SE SALEM OR 97306	083W23CA16400 BOBBI H KUREK 6784 HUNTINGTON CIRCLE SE SALEM OR 97306	083W23CA16500 COLLEEN J MOHR 6790 HUNTINGTON CR SE SALEM OR 97306
083W23CA16600 MARY M & CRAIG S SPILLMAN 6794 HUNTINGTON CIR SE SALEM OR 97306	083W23CB00100 JON M & THERESA K PETERSON 6498 DORAL DR SE SALEM OR 97306	083W23CB00200 WILLIAM C RAND PO BOX 490 SILVERTON OR 97381
083W23CB00300 CITY OF SALEM 555 LIBERTY ST RM NO 230 SALEM OR 97301	083W23CB00400 JAMES SCOTT WOOLSEY 6546 DORAL DR SE SALEM OR 97306	083W23CB00500 CARLOS N BROULLON RLT 522 BOULEVARD WY PIEDMONT CA 94610
083W23CB00600 PATRICIA A DUNLAP 6566 DORAL DR SE SALEM OR 97306	083W23CB00700 DONALD E BUCKENDORF 6576 DORAL DR SE SALEM OR 97306	083W23CB00800 LYNN L BAXTER 6586 DORAL DR SE SALEM OR 97306

Attachment E

Geomorphic Analysis Memorandum

Technical Memorandum

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To: Allen Dannen, City of Salem
Tim Kraft, Otak

From: Nicholas Allmendinger, PhD P.G.

Copies: Ryan Billen; Gary Wolff

Date: May 9, 2011

Subject: Geomorphic Reconnaissance for Waln Creek

Project No.: 13853B

1. Executive Summary

A geomorphic site reconnaissance was conducted on November 18, 2010 at the Battle Creek Property to assess the geomorphic constraints for channel improvements on the reach of Waln Creek between Madras Street SE and its confluence with Battle Creek. This reconnaissance included preliminary measurements of flow velocity, channel morphology, bank characteristics, and stability indicators. Flow velocity in the channel was approximately 1.6 fps with a reach-averaged discharge of 12 cfs. The channel has an average sinuosity of 1.05 over a length of roughly 1,230 feet. The average depth of flow estimated from two cross-sections was 2.5 feet and the average water surface width was 8.3 feet, creating an average wetted area of 21 square feet. The channel banks are relatively high and steep with an average side slope of 1:1.8. Roughness associated with the channel is due largely to the effects of vegetation on the banks which gives the channel a reach-averaged manning's n value of 0.045. Waln Creek is currently in a fairly stable condition as a result of its protected banks, and lack of woody vegetation within the channel. The upstream half of the channel is in channel evolution stage II (degradation) and the downstream reach is in evolution stage V (aggradation). The change in evolutionary stage may be the result of backwater effects from Waln Creeks confluence with Battle Creek.

Provided that the width and depth of the effective discharge are not changed significantly, and the gradient of the channel increases to become slightly greater than the minimum energy surface slope, it will be possible to increase the sinuosity of the channel of Waln Creek to approximately 1.2. It is likely that these objectives can be accomplished by lengthening and realigning the lower half of Waln Creek and establishing a new confluence with Battle Creek approximately 250 feet further downstream (southeast) from the existing one.

Conditions to avoid during construction would include exacerbation of incision in the downstream reach, inadequate or excessive bank armoring, replacement of bank sediment with less cohesive material, establishing an energy slope that is higher or dramatically lower than the bed gradient, exacerbating flooding issues by adding too much sinuosity, and relying heavily on empirical equations for alluvial channel design.

2. Reconnaissance Methods

2.1. Flow Conditions

Current velocity was approximated using the float method. The velocity of wood debris floating on the surface was measured using a digital stop watch and a portable "pocket" stadia rod. The velocities from ten trials were averaged and the mean value was multiplied by a velocity adjustment coefficient related to channel roughness to determine the mean velocity for each cross-section (Harrelson, et al., 1994).

2.2. Channel Morphology

The project reach was divided into two sub-reaches based on the presence and absence of a low vegetated bench. These benches are absent in the upper segment (615 feet) of the project reach and present in the lower segment (575 feet). The two segments are separated by a pedestrian bridge that is located at 44.8638°N and 123.0236°W (NAD27). Preliminary channel planform analysis was conducted using open source air photo and map resources including Google earth and USGS Stream Stats.

Channel dimensions were measured in two locations. The upstream cross-section (XS01) was measured near the upstream end of the reach near the proposed location for the new bridge, and the downstream cross-section (XS02) was measured approximately 500 feet upstream from the confluence with Battle Creek closer to the middle of the reach.

2.3. Channel Instability Assessment

A procedure to assess the potential for channel instability was used that includes observations of hydrology, hydraulics, geomorphic form and process, and riparian vegetation (Simon and Downs, 1995). This assessment was used to develop a list of alternative modifications that will (1) promote the restoration of riparian function by allowing the channel to recover more of its natural form and (2) manage the factors that generate instability. An "instability index" was used to rate two segments of the channel based on their potential for change. In this system, high scores have a high potential for changes that could undermine structures, erode banks, and scour or bury habitat (Thorne et al., 1996).

3. Results

3.1. Discharge and Velocity

On the day of our visit the water surface elevation was approximately at the top of the low benches in the downstream reach. The average surface velocity observed was 1.6 feet per second. This value has been adjusted for channel roughness using the methods described by Harrelson, et al. (1994). Using cross-sectional areas from typical cross-sections (see section 3.2) calculated discharges are 10 cfs for the upstream section and 14 cfs for the downstream section.

3.2. Channel Morphology

Based on aerial photographs from Google Earth, the upstream reach has a channel length of 612 feet and a straight line length of 607 feet. Dividing the channel length by the straight line distance, the sinuosity for this

segment is 1.01. The downstream reach has a channel length of 619 feet and a straight line length of 573 feet. Dividing the channel length by the straight line distance, the sinuosity for this segment is 1.08.

Parameters from both cross-sections are presented in table 1 and figure 2 in Appendix B. In general, cross-section 01 had steeper upper banks that were covered with denser herbaceous vegetation than cross-section 02. Cross-section 02 had a low bench along the left bank and a stand of dense willows growing on the right bank. Water depth and width are slightly greater in cross-section 2 resulting in a larger cross-sectional area of flow.

Table 1. Geomorphic and Hydraulic Data from Waln Creek Cross-sections (November 18, 2010)

Parameter	XS01	XS02
Maximum Depth in feet (d)	2.5	2.8
Mean Depth in feet (h)	2.1	2.9
Water Surface Width in feet (Bw)	8	8.5
Top Width in feet (W)	23	21.5
Area of Flow in square feet (A)	17.1	24.4
Left/Right Bank Angles (1:V)	1.3/1.6	1.5/2.8
Left/Right roughness values (n)	0.035/0.035	0.030/0.100
Cross-section Velocity in feet per second (U)	0.61	0.58
Cross-section Discharge in cubic feet per second (Q)	10	14

3.3. Channel Instability Assessment Results

Data collected for the channel instability assessment are presented in table 2. The upstream reach of Waln Creek has a total instability score (TIS) of 11.5/36 (32%) and the downstream reach has a total instability score of 12.5/36 (35%). The TIS for the downstream reach is slightly higher than the upstream reach because of its more advanced stage of channel evolution (stage V- aggradation as compared with stage III - degradation). The primary evidence for aggradation in the downstream reach is the presence of the low benches that may be the result of flooding due to a backwater effect from the confluence with Battle Creek. The TIS for both of these reaches are well below 36 (the maximum value) and even lie below the 50% level for the assessment implying that the reach does not have a high potential for channel instability.

As a guideline for channel design, the results found in table 2 suggest that improvements in channel stability could be made by lowering the scores for bed material, bed protection, stage of channel evolution, and percentage of woody cover. The bed material score can be improved by using the coarsest feasible grain size distribution. The bed protection score can be improved by adding grade control to the bed and removing as much bank protection as possible. The channel evolution stage score can be improved by designing a channel with morphology typical of the "restabilized" stage of channel evolution. This stage is characterized by stable, alternate channel bars, flattened bank angles, development of a new floodplain, and establishment of a flow line that is high relative to the top of the bank (Simon, 1989). The percentage of woody vegetative cover score can be improved by increasing the woody canopy cover in the riparian zone.

Table 2. Channel Instability Assessment Results

Parameter	Upstream Reach	Downstream Reach
Bed Material (0-4)	Unknown (3.5)	Unknown (3.5)
Bed Protection (0-3)	No, 2 banks protected (3)	No, 2 banks protected (3)
Stage of Channel Evolution (0-4)	III Degradation (2)	Aggradation (3)
Percentage of Channel Constriction (0-4)	0-5 (0)	0-5 (0)
Number of Piers in Channel (0-2)	0 (0)	0 (0)
% Blockage: horizontal, vertical, total (0-4)	0-4 (0),0-4 (0),0-4 (0); (Σ/3)	0-4 (0),0-4 (0),0-4 (0); (Σ/3)
Bank Erosion for Each Bank (0-2)	None (0)	None (0)
Meander Impact Point from Bridge (m) (0-3_	N/A (0)	N/A (0)
Pier Skew for Each Pier (sum for all piers (0-1)	N/A (0)	N/A (0)
Mass Wasting at Pier (calculated per pier) (0-3)	N/A (0)	N/A (0)
High-flow Angle of Approach (o) (0-3)	N/A (0)	N/A (0)
Percentage of Woody vegetative Cover (0-3)	0-15 (3)	0-15 (3)
Total Instability Score (out of 36):	11.5 (32%)	12.5 (35%)

3.3.1. Bed material

The highest scores (and most critical values) in the channel instability index are assigned to the finest sediment. Because point counts were not conducted on the bed during the field visit, a value of 3 to 5 was assigned for this parameter (category 5 is "unknown alluvium"). This range of values is likely to be appropriate and can be supported by two independent observations. First, when the bed was disturbed on the day of our visit the water instantly became extremely turbid which suggests that a large amount of fines are present on the bed. Second, when depth measurements were made, the base of the rod did not come into contact with any large grains of gravel, suggesting that the solid surface of the stream was fine gravel or smaller.

3.3.2. Bed Protection

The highest scores are assigned to channels with bed protection and with some form of armoring on both banks. In this reach of Waln Creek there was no visible evidence of sudden changes in bed elevation that would indicate the presence of bed controls such as weirs, large rocks, or woody debris in the bed. The banks throughout this reach were covered by herbaceous vegetation consisting of reed canary grass and Himalayan blackberry, and shrubby vegetation that included young willows.

3.3.3. Stage of Channel Evolution

The lowest score for this parameter is assigned to the natural condition or "pre-modified stage". The highest score is assigned to the threshold condition between the "degradation stage" in which the channel is still responding to upstream changes by incising and scouring its banks, and the "aggradation stage" in which a slightly over-incised channel begins to deposit sediment to attain a stable morphology. Because the banks in the upstream segment of the Waln Creek reach are so high and steep, and there are no low benches present which signify deposition, this segment is likely to be in the degradation stage. The downstream reach has high steep banks, but low benches are present in the cross-section, making it more likely to be in the aggradation stage.

3.3.4. Percentage of Woody Vegetative Cover

The lowest score for this parameter is for channels with forested floodplains and canopies that cover 100% of their surface area. The proposed project reach of Waln Creek has less than 16% woody vegetative cover, and therefore falls into the highest category for this parameter.

4. Design Recommendations

4.1. Channel Dimensions

The design width for the effective discharge (which corresponds roughly to the 0.33 year flow event) should remain at between 8 and 8.5 feet. In order to minimize the energy slope of the water surface as well as to maintain Froude numbers below critical values during low magnitude high frequency flow events, the corresponding depth should vary between 1.5 feet in shallow areas (i.e. riffles) to no more than 3.5 feet in pools. To simulate a natural alluvial channel, these should be incorporated into the design at intervals of roughly 5 to 7 channel widths so that each pool would be approximately 40 to 60 feet downstream from the previous one and separated from it by a riffle. The bed slope for this channel could be anywhere between 0.004 and 0.005, however lower Froude numbers and improved sediment continuity will be achieved by keeping the slope closer to the low end of this range.

4.2. Channel Sinuosity

Floodplain soils in this area are mapped by the USDA as Waldo silty clay loam (27 to 40% clay; 40 to 72% silt). These soils are typical of alluvial floodplains with slopes of 0 to 3%, and are classified as poorly drained. A typical profile for these soils includes an upper unit of approximately 10 inches of silty clay loam above 10 to 60 inches of predominantly clay soil. Silt:clay ratios in silty clay loams can range between 1.1 and 2.7 with an average value of 1.8. One empirical study in the Great Plains related channel sinuosity to the silt:clay ratio of bank sediments using the relationship in equation 1 (Schumm, 1963). The average value of si:cl for silty clay loams yields a value of 1.08 for sinuosity which corresponds well to the value measured for the downstream reach of Waln Creek.

$s = 0.94 \times (si/cl)^{0.25}$ equation 1

where s is the sinuosity of the channel
si is the silt content of the bank sediment
cl is the clay content of the bank sediment

4.3 Channel Gradient

Because the energy that drives the flow comes predominantly from the valley gradient (Sv) it is derived from historical processes. The valley gradient is imposed upon the channel and the river must adjust to using the water and sediment supplied from upstream (Huang et al., 2004). The current alignment of Waln Creek causes it to flow directly down its valley and the valley is providing energy that can be described by equation 2.

$\Omega v = \gamma Q Sv$ equation 2

where Ωv is the power derived from the valley

γ is the specific weight of water
Q is the flow discharge
Sv is the valley gradient

The valley gradient in the project area is very low (0.003) and is likely to be approximately equal to the minimum energy surface slope for Waln Creek. In order to enhance the streams ability to convey water and sediment, the designed channel should be lengthened as much as possible so that it joins Battle Creek at a point further downstream along Battle Creek's course. The new confluence location can be chosen so that the total elevation drop will out-balance the increase in channel length, and the overall gradient will actually increase. These changes are likely to increase the bed gradient by as much as 0.002 so it will be slightly greater than the minimum energy surface slope.

5. Conditions to Avoid

5.1. Renewed Incision

The downstream reach may be in the aggradation stage of channel evolution as a result of flooding caused by backwater effects from the confluence with Battle Creek. If this is the case, alleviating the flooding may result in continued incision, and merely bring the channel back to stage III or even IV.

5.2. Inadequate or Excessive Bank Armoring

If the vegetation were to be removed from the banks, the bank erosion for each bank is likely to increase, and would be fluvial in nature. That would raise the score (section 3.3.4) for either reach by 1. It will be important to balance the increased channel sinuosity with sufficient roughness along the scour points to prevent the channel from actively meandering. Excessive armoring of the banks may actually induce further incision, so the appropriate roughness value will be important to establish, as will grade control.

5.3. Altering Bank Sediment

It can be inferred from this relationship that the sinuosity of the channel would be higher if the relative amount of clay in the channel perimeter were lower. This is probably an oversimplification from the perspective of the channel designer. If the entire perimeter were removed and replaced with sediment that had higher silt content, the result would be more erodible banks which would result in higher sinuosity. This is not the ideal way to attain a higher degree of sinuosity.

5.4. Higher Energy Slope than Bed Gradient

The minimum amount of energy required for transporting the imposed water load (Q) and sediment load (Qs) without causing erosion and deposition is represented by the minimum energy slope (Sf_{min}). If the minimum energy slope in the Waln Creek reach is significantly greater than the valley slope, there will not be sufficient energy to transport the sediment supplied, and the system will not achieve equilibrium. Excessive deposition and bed aggradation are likely to occur in this case and the channel may become braided or develop a laterally migrating meandering planform. Equilibrium in this case could only be achieved through increasing the stream power by increasing flow discharge or channel gradient or by reducing the sediment load.

5.5. Excessive Sinuosity

Channel planform is a constituent of total flow resistance. Straight channels provide very little planform resistance and highly sinuous channels provide a great deal of resistance. Because each bend in the river is an obstacle for flow, intense excessive sinuosity may exacerbate flooding conditions in the downstream reach by reducing water velocities even further.

5.6. Use of Empirical Equations

Waln Creek is an urban stream and shows evidence of the impacts of this land use throughout the project reach. This evidence includes water and sediment blockages such as channel incision near the confluence with Battle Creek (photograph 2 in Appendix A) and the concrete weir on the north side of Madras Street SE (photograph 3 in Appendix A). Given its altered hydrology, it is unlikely that water in Waln Creek reaches the elevation of the most prominent "floodplain" feature (the golf course surface) with a 1.5- to 2-year frequency. It is also unlikely that the discharge observed on the day of our visit (water surface elevation reaching the top of the low bench) occurs with that frequency. It is more likely that the observed stage (which is tempting to call "bankfull") occurs multiple times in any one year.

Further, the banks of Waln Creek are lined with dense vegetation which limits the ability of the channel to erode its banks which limits our ability to classify the channel as alluvial. The distinctions made here about the bankfull conditions and the non-alluvial nature of the channel are important ones because they restrict the applicability of empirical design relationships.

6. Preliminary Alternatives

Alternative 0 does not alter the channel. Sinuosity, channel surface area, channel slope remain the same. No floodplain trees are removed.

Alternative 1 involves abandoning the existing alignment approximately 50 feet downstream from the proposed bridge location and establishing a new confluence with Battle Creek approximately 250 feet east of the existing one. This option adds the most sinuosity and channel surface area, reduces slope by 0.0002, requires removal of 4 floodplain trees.

Alternative 2 involves abandoning the existing alignment approximately 420 feet downstream from the proposed bridge location (downstream from the waypoint designated "Manhole 1" during the 11/18/2010 field visit) and establishing a new confluence with Battle Creek approximately 250 feet east of the existing one. This option increases sinuosity and channel surface area, but doesn't reduce the slope by as much (0.0001), requires removal of 8 floodplain trees.

Alternative 3a involves abandoning the existing alignment approximately 90 feet upstream from the current confluence with Battle Creek and establishing a new confluence approximately 75 feet to the east. This option increases sinuosity and channel surface area to a much smaller extent, but (somehow) increases slope by 0.0002 requires removal of 13 floodplain trees.

Alternative 3b involves maintaining the existing alignment and deflecting the thalweg to the southeast approximately 60 feet to the east. This option adds the least amount of sinuosity and channel surface area, reduces slope by 0.0004, requires removal of 13 floodplain trees.

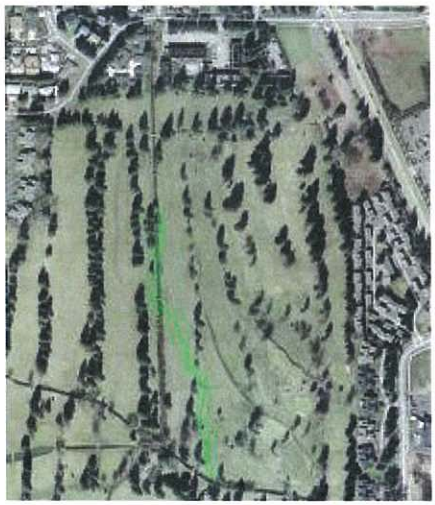
Table 3. Parameters Associated with 5 Preliminary Waln Creek Alternatives

Alternative	L_{th} (ft)	L_v (ft)	Sin	Sfc A (ft^2)	Δ Sfc A (ft^2)	S	Δ S
0	940	911	1.03	7,990	-	0.0034	0
1	1285	1154	1.11	10,923	2,933	0.0032	-0.0002
2	1245	1154	1.08	10,583	2,593	0.0033	-0.0001
3a	1113	1036	1.07	9,461	1,471	0.0036	0.0002
3b	1049	984	1.07	8,917	927	0.0030	-0.0004

Lth: Length of the thalweg; Lv: length of the valley; Sin: sinuosity; Sfc A: surface area of the channel; S: slope

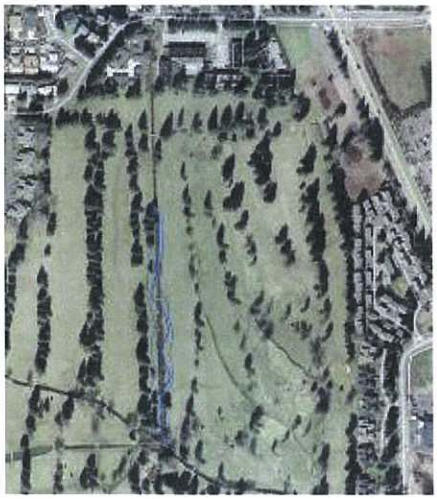
Sketches of Preliminary Alternatives

Alternative 1



Alternative 2

Alternative 3a



Alternative 3b

7. Conclusion

The preferred option for further design is Alternative 2. This alternative involves lengthening the channel by 305 feet increasing the sinuosity of the channel by 0.05, increasing the channel surface area by 2,593 square feet, reducing the slope by 0.0001, and establishing a new confluence with Battle Creek approximately 250 feet east of the existing one. This option is also likely to require the removal of 8 floodplain trees.

8. References

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Appendix A - Photographs

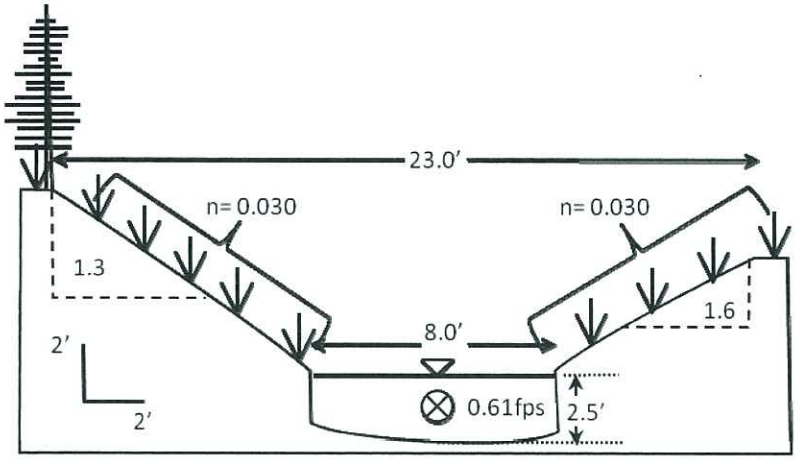
Figure 1. Cross-section photographs. **Left**: view of upstream cross-section (XS- 01) looking downstream (top), from right bank looking across the channel (middle) and from left bank looking across the channel (bottom). **Right**: view of downstream cross-section (XS- 02) looking upstream (top), from left bank looking downstream at left bank (middle) and from left bank looking upstream at right bank (bottom).

Figure 2. Bank scour and trees established well below ordinary high water mark (evidence of channel incision) along the right bank near the downstream end of Waln Creek.

Figure 3. A weir upstream from Madras Road and the project area on Waln Creek. This structure limits the ranges of flows in the project reach as well as the influx of sediment.

Appendix B

(a)



(b)

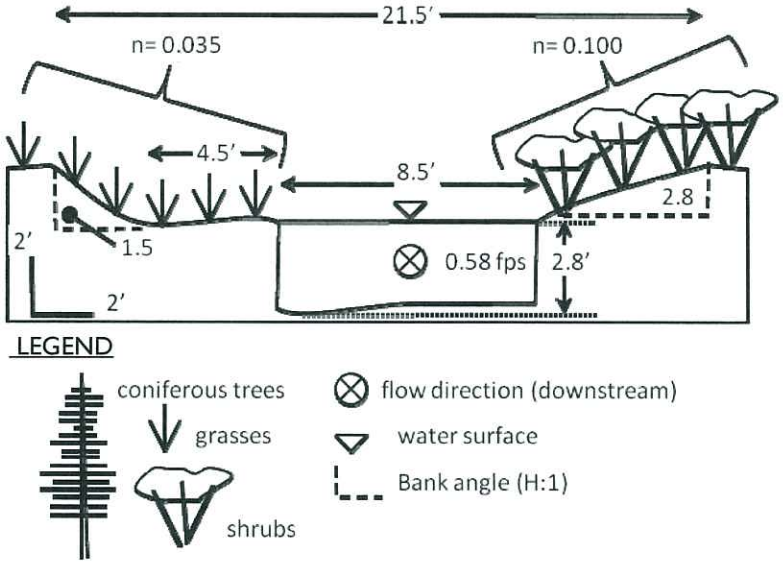


Figure 2. Geomorphic Cross-sections with dimensions, (a) the upstream cross-section (XS01) looking downstream, and (b) the downstream cross-section (XS02) looking downstream.

Attachment F

DSL Wetland Delineation Approvals

Oregon
Theodore R. Kulongoski, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us.

June 24, 2008

Terry Kelly and Mary Rentfro
Battle Creek Golf Course
4676 Commercial Street SE PMB #261
Salem, OR 97302

Re: Wetland Delineation Report for Salem, Marion County,
T8S R3W Sec. 23, Sec. 23A, Tax Lots 900, 1000, 1100; Sec. 23B,
Tax Lots 100, 101, 200, 300, 400; Sec. 23BA, Tax Lot 400;
WD #08-0034, Salem/Keizer Local Wetlands Inventory wetland BC-F

Dear Mr. Kelly and Ms. Rentfro:

The Department of State Lands has reviewed the wetland delineation report prepared by Applied Technology Wetlands and Forestry Consultants for the site referenced above. Based upon the information presented in the report, a site visit on May 8, 2008 and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 6A – 6E of the report. Please replace all copies of the preliminary wetland map with this final Department-approved map. Within the study area, seven wetlands (totaling approximately 1.55 acres) and five waterways (Battle Creek, Powell Creek, Waln Creek, Scotch Creek and "box culvert") were identified. The wetlands and waterways are subject to the permit requirements of the state Removal-Fill Law. A state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined). Wetland Aa is not subject to the permit requirements of the state Removal-Fill Law under OAR 141-085-0015(7).

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter, unless new information necessitates a revision. Circumstances under which the Department may change a determination and procedures for renewal of an expired determination are found in OAR 141-090-0045 (available on our web site or upon request). The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within 60 calendar days of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5297 if you have any questions.

Sincerely,

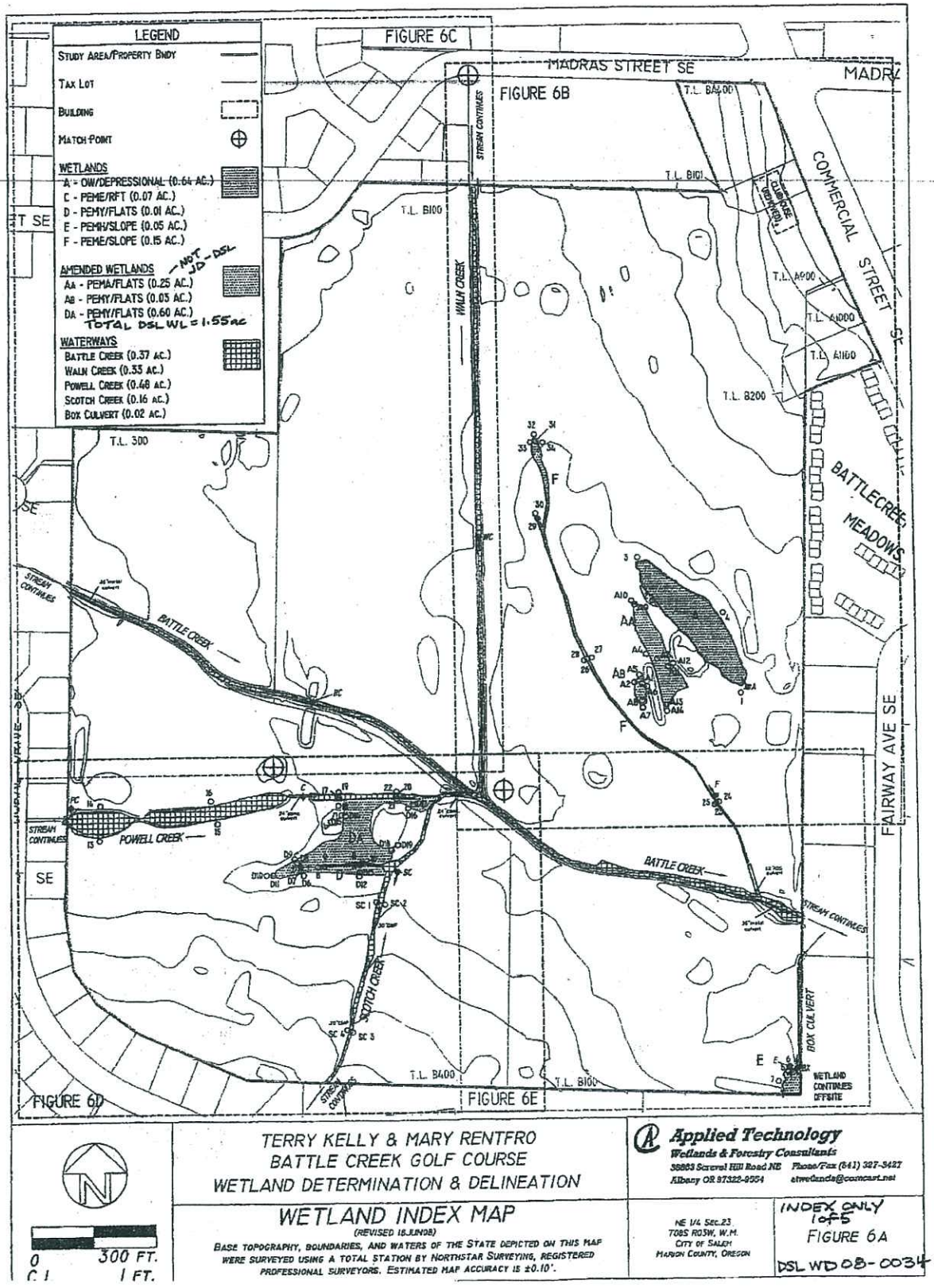
Jevra Brown
Wetland Specialist

Approved by Janet C. Morlan
Janet C. Morlan, PWS
Wetlands Program Manager

Enclosures

cc: Tim Acker, Applied Technology Wetlands and Forestry Consultants
City of Salem Planning Department (Maps enclosed for updating LWI)
James Holm, Corps of Engineers Portland office
Shannen Chapman, DSL

G:\WWC\Wetlands Program\WD Letters\2008\08-0034.doc


LEGEND
STUDY AREA/PROPERTY BNDY
TAX LOT
BUILDING
MATCH POINT
WETLANDS
A - OW/DEPRESSIONAL (0.64 AC.)
C - PEME/RFT (0.07 AC.)
D - PEMY/FLATS (0.01 AC.)
E - PEMH/SLOPE (0.05 AC.)
F - PEME/SLOPE (0.15 AC.)
AMENDED WETLANDS
AA - PEMA/FLATS (0.25 AC.)
AB - PEMY/FLATS (0.03 AC.)
DA - PEMY/FLATS (0.60 AC.)
WATERWAYS
BATTLE CREEK (0.37 AC.)
WALN CREEK (0.33 AC.)
POWELL CREEK (0.48 AC.)
SCOTCH CREEK (0.16 AC.)
BOX CULVERT (0.02 AC.)
NOT JD - DSL
TOTAL DSL WL = 1.55ac
FIGURE 6C
FIGURE 6B
FIGURE 6D
FIGURE 6E
MADRAS STREET SE
COMMERCIAL STREET SE
FAIRWAY AVE SE
BATTLECREEK MEADOWS
WALN CREEK
BATTLE CREEK
POWELL CREEK
SCOTCH CREEK
STREAM CONTINUES
BOX CULVERT
WETLAND CONTINUES OFFSITE
T.L. 300
T.L. 8100
T.L. 8200
T.L. 8400
0 300 FT.
C.I 1 FT.
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
WETLAND INDEX MAP
(REVISED 18-JUN08)
BASE TOPOGRAPHY, BOUNDARIES, AND WATERS OF THE STATE DEPICTED ON THIS MAP WERE SURVEYED USING A TOTAL STATION BY NORTHSTAR SURVEYING, REGISTERED PROFESSIONAL SURVEYORS. ESTIMATED MAP ACCURACY IS ±0.10'.
Applied Technology
Wetlands & Forestry Consultants
35863 Several Hill Road NE
Albany OR 97322-9554
Phone/Fax (541) 327-3427
atwetlands@comcast.net
NE 1/4 SEC. 23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
INDEX ONLY
1 OF 5
FIGURE 6A
DSL WD 08-0034

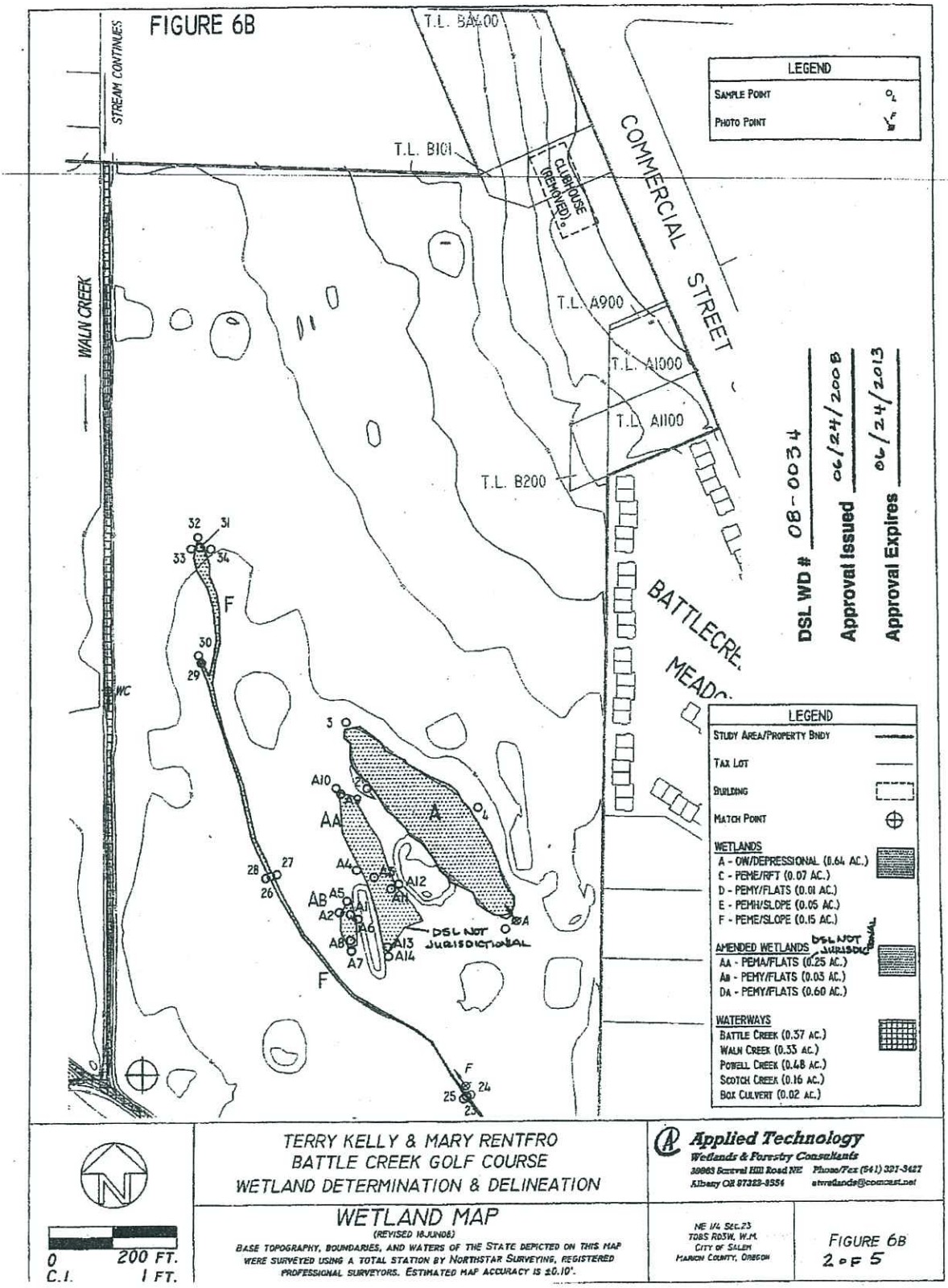


FIGURE 6B
STREAM CONTINUES
WALN CREEK
T.L. BA400
T.L. B101
CLUBHOUSE (REMOVED)
COMMERCIAL STREET
T.L. A900
T.L. A1000
T.L. A1100
T.L. B200
BATTLECREEK
MEADOWS
DSL WD # 08-0034
Approval Issued 06/24/2008
Approval Expires 06/24/2013
LEGEND
SAMPLE POINT
PHOTO POINT
LEGEND
STUDY AREA/PROPERTY BNDY
TAX LOT
BUILDING
MATCH POINT
WETLANDS
A - OW/DEPRESSIONAL (0.64 AC.)
C - PEME/RFT (0.07 AC.)
D - PEMY/FLATS (0.01 AC.)
E - PEMH/SLOPE (0.05 AC.)
F - PEME/SLOPE (0.15 AC.)
AMENDED WETLANDS
DSL NOT JURISDICTIONAL
AA - PEMA/FLATS (0.25 AC.)
AB - PEMY/FLATS (0.03 AC.)
DA - PEMY/FLATS (0.60 AC.)
WATERWAYS
BATTLE CREEK (0.37 AC.)
WALN CREEK (0.33 AC.)
POWELL CREEK (0.48 AC.)
SCOTCH CREEK (0.16 AC.)
BOX CULVERT (0.02 AC.)
DSL NOT JURISDICTIONAL
0 200 FT.
C.I. 1 FT.
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
WETLAND MAP
(REVISED 18JUN08)
BASE TOPOGRAPHY, BOUNDARIES, AND WATERS OF THE STATE DEPICTED ON THIS MAP WERE SURVEYED USING A TOTAL STATION BY NORTHSTAR SURVEYING, REGISTERED PROFESSIONAL SURVEYORS. ESTIMATED MAP ACCURACY IS ±0.10'.
Applied Technology
Wetlands & Forestry Consultants
NE 1/4 SEC.23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
FIGURE 6B
2 OF 5

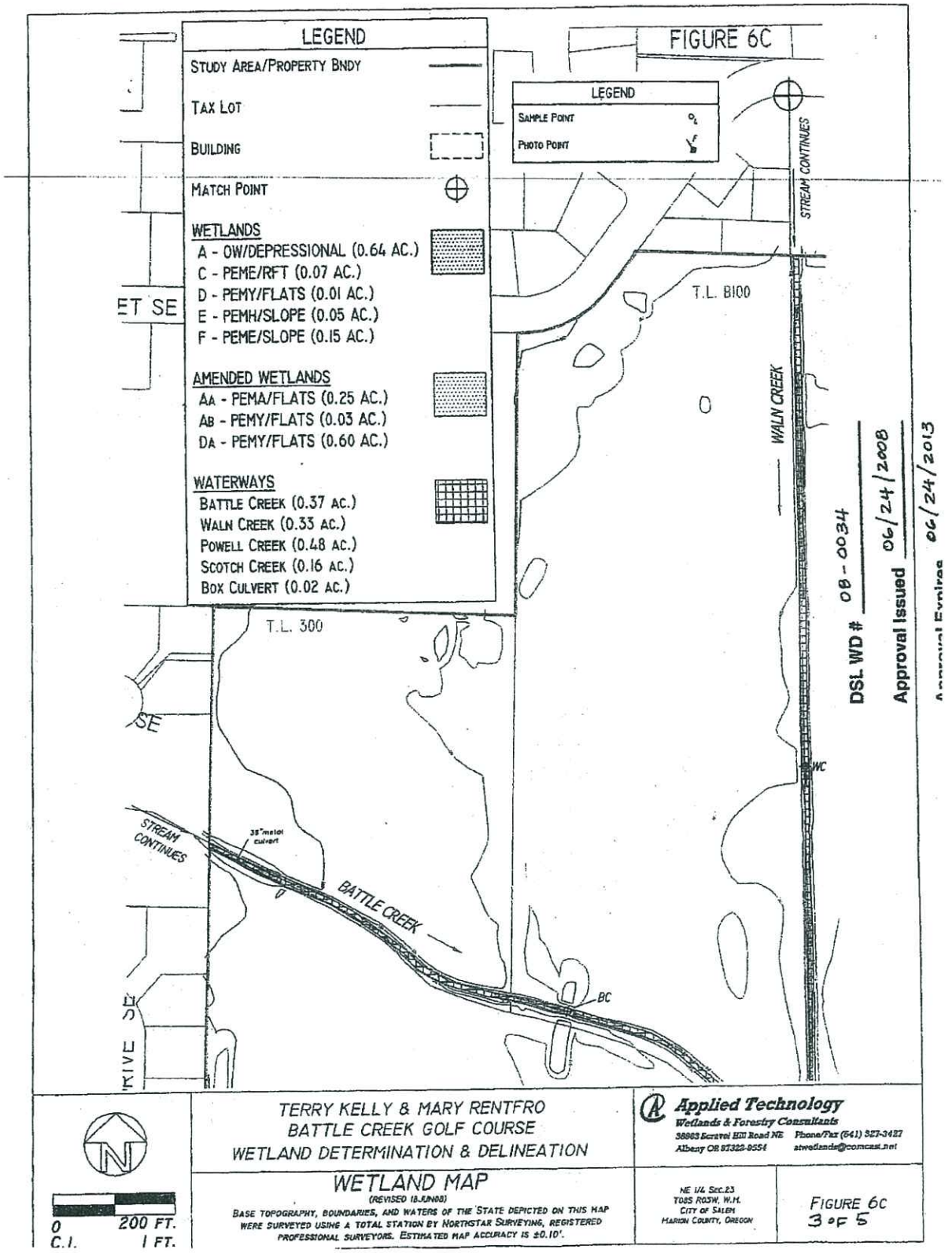
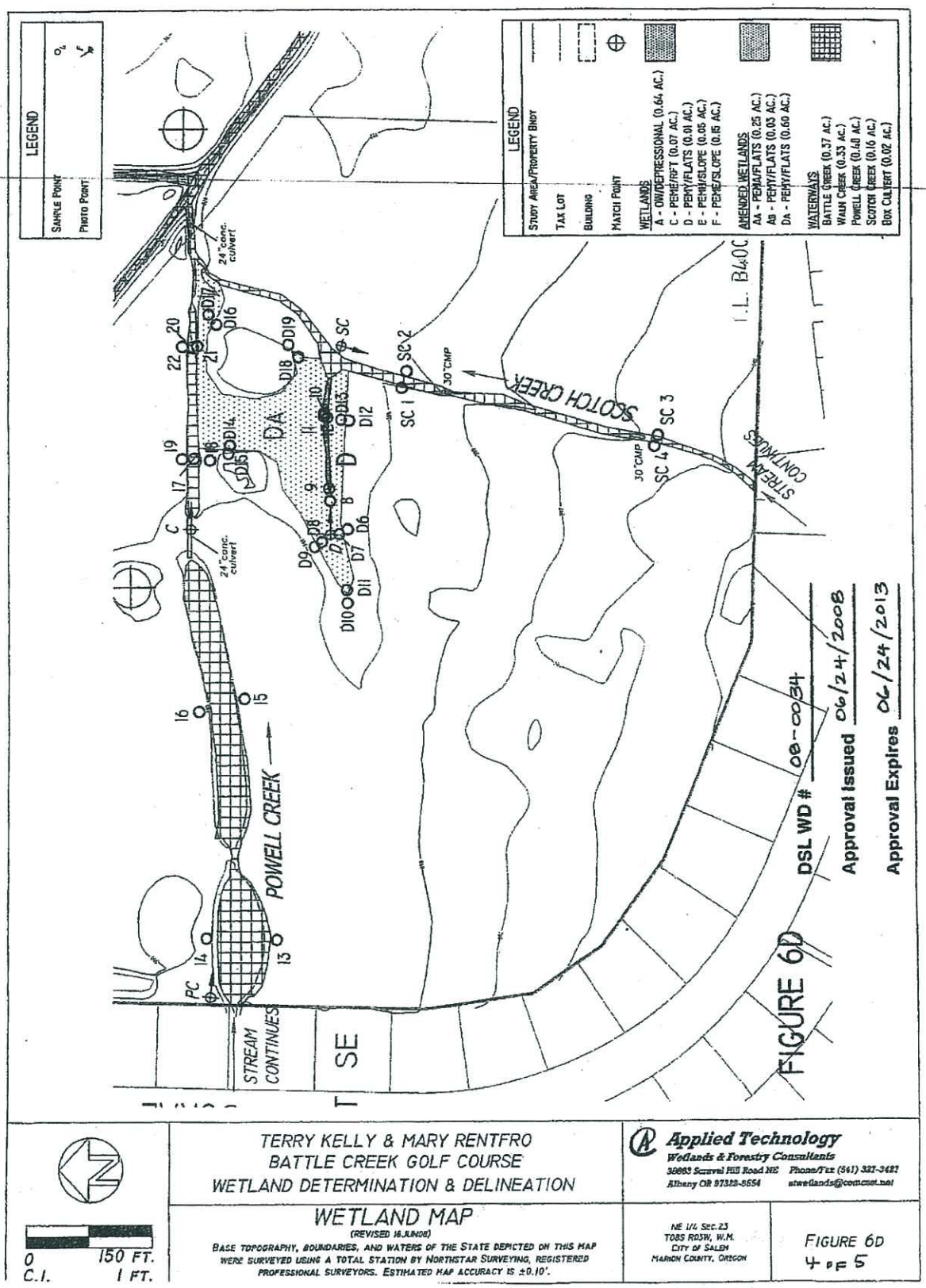
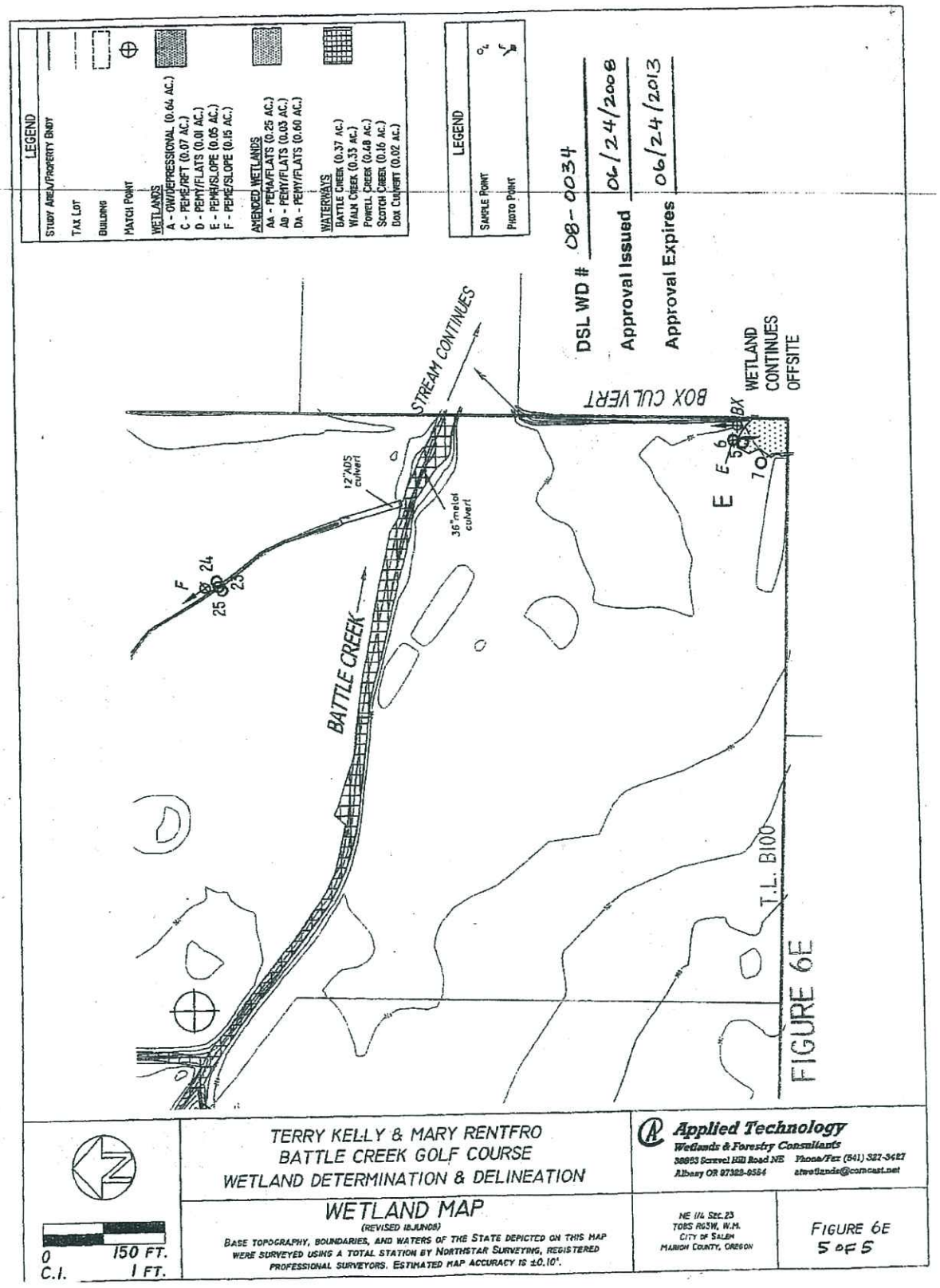
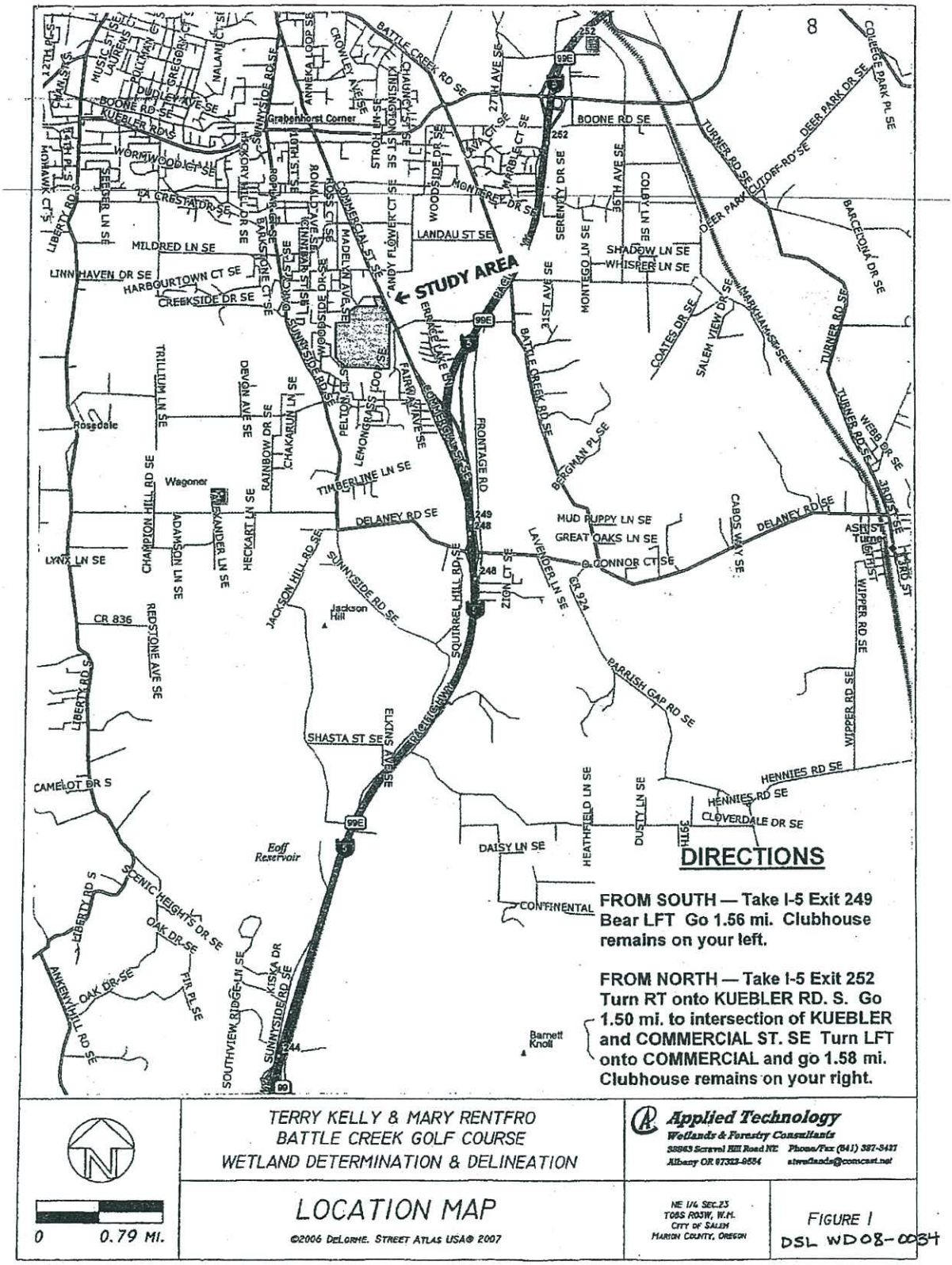


FIGURE 6C
LEGEND
STUDY AREA/PROPERTY BNDY
TAX LOT
BUILDING
MATCH POINT
WETLANDS
A - OW/DEPRESSIONAL (0.64 AC.)
C - PEME/RFT (0.07 AC.)
D - PEMY/FLATS (0.01 AC.)
E - PEMH/SLOPE (0.05 AC.)
F - PEME/SLOPE (0.15 AC.)
AMENDED WETLANDS
AA - PEMA/FLATS (0.25 AC.)
AB - PEMY/FLATS (0.03 AC.)
DA - PEMY/FLATS (0.60 AC.)
WATERWAYS
BATTLE CREEK (0.37 AC.)
WALN CREEK (0.33 AC.)
POWELL CREEK (0.48 AC.)
SCOTCH CREEK (0.16 AC.)
BOX CULVERT (0.02 AC.)
LEGEND
SAMPLE POINT
PHOTO POINT
STREAM CONTINUES
T.L. 8100
WALN CREEK
T.L. 300
STREAM CONTINUES
36" metal culvert
BATTLE CREEK
BC
WC
DSL WD # 08-0034
Approval Issued 06/24/2008
Approval Expires 06/24/2013
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
Applied Technology
Wetlands & Forestry Consultants
WETLAND MAP
(REVISED 18-JUN08)
BASE TOPOGRAPHY, BOUNDARIES, AND WATERS OF THE STATE DEPICTED ON THIS MAP WERE SURVEYED USING A TOTAL STATION BY NORTHSTAR SURVEYING, REGISTERED PROFESSIONAL SURVEYORS. ESTIMATED MAP ACCURACY IS ±0.10'.
NE 1/4 SEC.23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
FIGURE 6C
3 OF 5
0 200 FT.
C.I. 1 FT.


LEGEND
SAMPLE POINT
PHOTO POINT
LEGEND
STUDY AREA/PROPERTY BNDY
TAX LOT
BUILDING
MATCH POINT
WETLANDS
A - DW/DEPRESSIONAL (0.64 AC.)
C - PEME/BF (0.07 AC.)
D - PEMY/FLATS (0.01 AC.)
E - PEMH/SLOPE (0.05 AC.)
F - PEME/SLOPE (0.15 AC.)
AMENDED WETLANDS
AA - PEMA/FLATS (0.25 AC.)
AB - PEMY/FLATS (0.03 AC.)
DA - PEMY/FLATS (0.60 AC.)
WATERWAYS
BATTLE CREEK (0.37 AC.)
WALN CREEK (0.33 AC.)
POWELL CREEK (0.48 AC.)
SCOTCH CREEK (0.16 AC.)
BOX CULVERT (0.02 AC.)
24" conc. culvert
SCOTCH CREEK
30" CMP
STREAM CONTINUES
POWELL CREEK
STREAM CONTINUES
SE
T
I.L. 8400
SC 1
SC 2
SC 3
SC 4
SC
DA
D
C
PC
DSL WD # 08-0034
Approval Issued 06/24/2008
Approval Expires 06/24/2013
FIGURE 6D
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
Applied Technology
Wetlands & Forestry Consultants
38663 Scravel Hill Road NE Phone/Fax (541) 327-3421
Albany OR 97322-8554 atwetlands@comcast.net
WETLAND MAP
(REVISED 16JUN08)
BASE TOPOGRAPHY, BOUNDARIES, AND WATERS OF THE STATE DEPICTED ON THIS MAP WERE SURVEYED USING A TOTAL STATION BY NORTHSTAR SURVEYING, REGISTERED PROFESSIONAL SURVEYORS. ESTIMATED MAP ACCURACY IS ±0.10'.
NE 1/4 SEC. 23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
FIGURE 6D
4 OF 5
0 150 FT.
C.I. 1 FT.


LEGEND
STUDY AREA/PROPERTY BNDY
TAX LOT
BUILDING
MATCH POINT
WETLANDS
A - OW/DEPRESSIONAL (0.64 AC.)
C - PEMF/RFT (0.07 AC.)
D - PEMY/FLATS (0.01 AC.)
E - PEMA/SLOPE (0.05 AC.)
F - PEMF/SLOPE (0.15 AC.)
AMENDED WETLANDS
AA - PEMA/FLATS (0.25 AC.)
AD - PEMY/FLATS (0.03 AC.)
DA - PEMY/FLATS (0.60 AC.)
WATERWAYS
BATTLE CREEK (0.37 AC.)
WALN CREEK (0.33 AC.)
POWELL CREEK (0.48 AC.)
SCOTCH CREEK (0.16 AC.)
DOX CULVERT (0.02 AC.)
LEGEND
SAMPLE POINT
PHOTO POINT
DSL WD # 08-0034
Approval Issued 06/24/2006
Approval Expires 06/24/2013
STREAM CONTINUES
BOX CULVERT
WETLAND CONTINUES OFFSITE
12" ADS culvert
36" metal culvert
BATTLE CREEK
T.L. 8100
FIGURE 6E
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
Applied Technology
Wetlands & Forestry Consultants
38953 Sorvel Hill Road NE
Albany OR 97322-9584
Phone/Fax (541) 327-3427
atwetlands@comcast.net
WETLAND MAP
(REVISED BOUNDS)
BASE TOPOGRAPHY, BOUNDARIES, AND WATERS OF THE STATE DEPICTED ON THIS MAP WERE SURVEYED USING A TOTAL STATION BY NORTHSTAR SURVEYING, REGISTERED PROFESSIONAL SURVEYORS. ESTIMATED MAP ACCURACY IS ±0.10'.
NE 1/4 SEC. 23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
FIGURE 6E
5 OF 5
0 150 FT.
C.I. 1 FT.


8
STUDY AREA
DIRECTIONS
FROM SOUTH — Take I-5 Exit 249 Bear LFT Go 1.56 mi. Clubhouse remains on your left.
FROM NORTH — Take I-5 Exit 252 Turn RT onto KUEBLER RD. S. Go 1.50 mi. to intersection of KUEBLER and COMMERCIAL ST. SE Turn LFT onto COMMERCIAL and go 1.58 mi. Clubhouse remains on your right.
BATTLE CREEK RD SE
BOONE RD SE
KUEBLER RD S
COMMERCIAL ST SE
LANDAU ST SE
MILDRED LN SE
LINN HAVEN DR SE
HARBOURTOWN CT SE
CREEKSIDE DR SE
SUNNYSIDE RD SE
FRONTAGE RD
DELANEY RD SE
JACKSON HILL RD SE
SQUIRREL HILL RD SE
SHASTA ST SE
CAMELOT DR S
LIBERTY RD S
REDSTONE AVE SE
CR 836
SCENIC HEIGHTS DR SE
OAK DR SE
ANKENY HILL RD SE
SOUTHVIEW RIDGE LN SE
KISKA DR
FIR PL SE
HENNIES RD SE
CLOVERDALE DR SE
DAISY LN SE
PARRISH GAP RD SE
WIPPER RD SE
CABOS WAY SE
MUD PUPPY LN SE
GREAT OAKS LN SE
O'CONNOR CT SE
LAVENDER LN SE
CR 824
TIMBERLINE LN SE
CHAMPION HILL RD SE
HECKART LN SE
ADAMSON LN SE
RAINBOW DR SE
CHAKARUN LN SE
DEVON AVE SE
PELTON CT SE
LEMONGRASS LOOP SE
FAIRVIEW AVE SE
ERMINE LAKE DR
BERGMAN PL SE
MONTEGO LN SE
SERENITY DR SE
SHADOW LN SE
WHISPER LN SE
COATES DR SE
SALEM VIEW DR SE
MARKHAM AVE SE
TURNER RD SE
DEER PARK DR SE
DEER PARK CUTOFF RD SE
COLLEGE PARK PL SE
BARCELONA DR SE
WEBB DR SE
ASHLEY LN SE
HEATHFIELD LN SE
DUSTY LN SE
Rosedale
Wagoner
Jackson Hill
Eoff Reservoir
Barnett Knoll
Grabenhorst Corner
99E
5
0 0.79 MI.
TERRY KELLY & MARY RENTFRO
BATTLE CREEK GOLF COURSE
WETLAND DETERMINATION & DELINEATION
LOCATION MAP
©2006 DeLorme. Street Atlas USA® 2007
Applied Technology
Wetlands & Forestry Consultants
33963 Scravel Hill Road NE Phone/Fax (541) 367-5427
Albany OR 97322-9554 atwetlands@comcast.net
NE 1/4 SEC.23
T08S R03W, W.M.
CITY OF SALEM
MARION COUNTY, OREGON
FIGURE 1
DSL WD08-0034

Oregon
John A. Kitzhaber, MD, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregonstatelands.us

July 6, 2011

City of Salem, Public Works Department
Attn: Allen Dannen
555 Liberty Street SE, Room 325
Salem, Oregon 97301

Re: Wetland Delineation Report for Salem, Marion County, T8S R3W Sec. 23, Sec. 23A, Tax Lots 900, 1000, 1100; Sec. 23B, Tax Lots 100, 101, 200, 300, 400; Sec. 23BA, Tax Lot 400; WD #08-0034 Addendum, Salem/Keizer Local Wetlands Inventory wetland BC-F

Dear Mr. Dannen:

The Department of State Lands has reviewed the wetland delineation report Addendum prepared by Pacific Habitat Services and partially revising the earlier report prepared by Applied Technology Wetlands and Forestry Consultants for the site referenced above. Based upon the information presented in the May 23, 2011 report addendum, and additional information submitted in a July 1, 2011 memorandum, we concur with the wetland and waterway boundaries as mapped in revised Figure A of the memorandum. Please replace all copies of the previously approved wetland map with this revised Department-approved map. Within the study area, seven wetlands (totaling approximately 3.48 acres) and five waterways (Battle Creek, Powell Creek, Waln Creek, Scotch Creek and "box culvert") were identified. The wetlands and waterways are subject to the permit requirements of the state Removal-Fill Law. A state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in the wetlands or below the ordinary high water line (OHWL) of a waterway (or the 2 year recurrence interval flood elevation if OHWL cannot be determined). Wetland AA is not subject to the permit requirements of the state Removal-Fill Law under OAR 141-085-0015(7).

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. The Army Corps of Engineers will review the report and make a determination of jurisdiction for purposes of the Clean Water Act at the time that a permit application is submitted. We recommend that you attach a copy of this concurrence letter to both copies of any subsequent joint permit application to speed application review.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Because measures to avoid and minimize wetland impacts may

include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of the original approval, until June 24, 2013, unless new information necessitates a revision. Circumstances under which the Department may change a determination and procedures for renewal of an expired determination are found in OAR 141-090-0045 (available on our web site or upon request). The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within 60 calendar days of the date of this letter.

Thank you for having the site evaluated. Please phone me at 503-986-5297 if you have any questions.

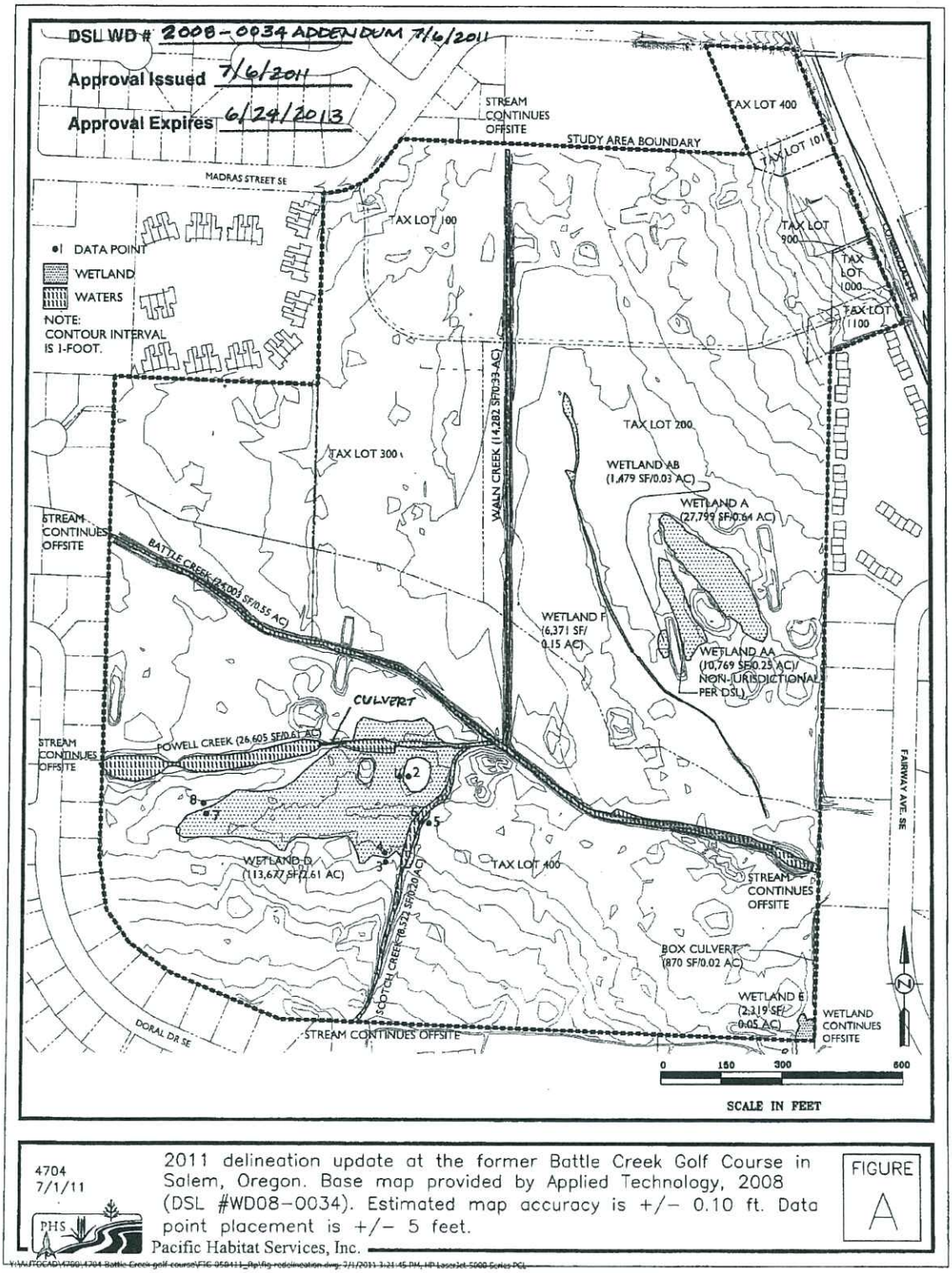
Sincerely,

Jevra Brown
Wetland Specialist

Approved by Anna Buckley
Anna Buckley
Acting Wetlands Program Manager

Enclosures

cc: Shawn Eisner, Pacific Habitat Services
City of Salem Planning Department (Maps enclosed for updating LWI)
Karla Ellis, Corps of Engineers Portland office
Dan Cary, DSL



4704
7/1/11

PHS

2011 delineation update at the former Battle Creek Golf Course in Salem, Oregon. Base map provided by Applied Technology, 2008 (DSL #WD08-0034). Estimated map accuracy is +/- 0.10 ft. Data point placement is +/- 5 feet.

Pacific Habitat Services, Inc.

FIGURE
A

Attachment G

Stream Mitigation Process Worksheets

CITY OF SALEM STREAM MITIGATION PROCESS - Page 1

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

The Salem, Oregon Stream Mitigation Process is a rapid assessment methodology that quantifies impacts to streams and riparian areas and determines an appropriate level of mitigation. The process requires knowledge of stream and riparian conditions to complete four tables (2 for debit calculations and 2 for credit calculations). This worksheet is protected - no password is required to unprotect.

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**1**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section calculates the amount of credit achieved as a result of proposed instream mitigation activities.

Table C -1A: Instream Credits

	Factors				
Stream Type (A)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**A**	**0.7**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (B)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**B**	**0.4**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal or state protected areas.		

Table C-1B - Instream Net Improvement Factors

				Improvement width	Linear Feet of Specific Improvement	Improvement Weight	Improvement Value	Net Improvement Factor
Bankfull Width	**C**	**25**						
Instream Net Improvement Factors - Above Bankfull Elevation								
Laying back bank above bankfull elevation (Right Side):	**[Improvement weight = 0.21*(D/C)]**		**D**			**0.21*(D/C)**		
Laying back bank above bankfull elevation (Left Side):	**[Improvement weight =0.21*(E/C)]**		**E**			**0.21*(E/C)**		
Instream Net Improvement Factors - At or Below Bankfull Elevation								
Bioengineering below bankfull elevation (Left Side) where not part of any other improvement:			**F**			**0.34**		
Bioengineering below bankfull elevation (Right Side) where not part of any other improvement:			**G**			**0.34**		
Changing straightened channel to an appropriate conformation			**H**			**1.34**		
Adding habitat structures (including large wood):			**I**			**0.15**		
Removal of bank armoring below bankfull elevation (Right Side) (must be stabilized with bioengineering)			**J**			**0.34**		
Removal of bank armoring below bankfull elevation (Left Side) (must be stabilized with bioengineering)			**K**			**0.34**		
Replacing undersized culvert with fish-passable culvert or bridge:			**L**		**101**	**0.80**	**0.80**	**80.80**
Installing fish ladders (If "yes", enter "Y",if "no" leave blank)		0	**M**			**0.80**		
Removing man-made structures that impound streams:			**N**			**1.34**		
Increasing culvert size or adding culverts to increase floodplain connectivity (If "yes", enter "Y", if "no" leave blank)**:**			**O**			**0.05**		
Bench creation at bankfull elevation (Left Side):	**[Improvement weight =0.76*(P/C)]**		**P**			**0.76*(P/C)**		
Bench creation at bankfull elevation (Right Side):	**[Improvement weight =0.76*(Q/C)]**		**Q**			**0.76*(Q/C)**		
Laying back bank below bankfull elevation (Left Side):	**[Improvement weight =0.33*(R/C)]**		**R**	**11.50**	**105**	**0.33*(R/C)**	**0.15**	**0.00**
Laying back bank below bankfull elevation (Right Side):	**[Improvement weight =0.33*(S/C)]**		**S**	**12.50**	**105**	**0.33*(S/C)**	**0.17**	**0.00**
Average above bankfull elevation: Net Improvement=Sum of above bankfull Net Improvement Factors/Sum of above bankfull linear feet of specific improvements			**T**					
Average below bankfull elevation: Net Improvement=Sum of below bankfull Net Improvement Factors/Sum of below bankfull linear feet of specific improvements			**U**					**0.80**
Above Bankfull Elevation Credits=Average above bankfull Net Improvement*Sum of above bankfull linear feet of specific improvements			**V**					
Below Bankfull Elevation Credits=Average below bankfull Net Improvement*Sum of below bankfull linear feet of specific improvements			**W**					**135.34**
Total Instream Credits = Above bankfull elevation credits + Below bankfull elevation credits			**X**					**135.34**

Mitigation Site Assessment

Mitigation plans must be accompanied by data that supports the mitigation design.

CITY OF SALEM STREAM MITIGATION PROCESS - Page 2

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**1**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section determines how much credit is gained from enhancing a riparian area in low or medium value condition. There is no limit to the length of the enhancement area, but credit given only within 50 feet of the stream (as measured perpendicular from the ordinary high water).

Table C-2A: Riparian Vegetation Net Improvement Factors within 50 feet of Edge of Stream

1. **Provide the length of the riparian area that will be enhanced along each bank.**
2. **Estimate the area (in square feet) of each existing plant community type (i.e. low or medium) to be enhanced.**

1. Length of riparian area to be enhanced (not more than a 50 feet wide)		Functional Value	2. Area (in square feet) of each type of existing plant stratum				Improvement Action	3. Area (in square feet) of each type of enhancement					Plant CommunityNet Improvement Factors			
Left	Right		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub	Weight	Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub
Y1	Y2	Low					Low to High					0.54				
		Medium					Medium to High					0.27				
		High					Riparian Mitigation Net Improvement Factors (Z3, Z4, Z5, Z6)=sum o Plant Community Net Improvement Factors						Y3	Y4	Y5	Y6

Average Stream Flow Direction across mitigation site in degrees east of north*

*Measured every 100 feet along riparian enhancement Area

Table C-2B: Additional Riparian Mitigation Factors

				Riparian Mitigation Area Scores	
Stream Type (Z)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**Z**	**0.70**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (AA)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**AA**	**0.40**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal o state protected areas.		
			Left Riparian Credit (BB) =Y1*(Y3+Y4+(0.2*Z)+(0.34*AA))	**BB**	
			Right Riparian Credit (CC) =Y2*(Y5+Y6+(0.2*Z)+(0.34*AA))	**CC**	
			Total Riparian Credits (DD) = BB+CC	**DD**	

CITY OF SALEM STREAM MITIGATION PROCESS - Page 3

CREDIT CALCULATION PROJECT SUMMARY AND SCORES

Project Name:	Waln Creek Enhancement and Battle Creek Culvert Removal Project	Date:	08/01/13
Mitigation Stream Name:	Battle Creek	Reach #:	1
Location:	Salem, Oregon	Evaluator(s):	CET

Table C-3A: Project Summary

INSTREAM NET IMPROVEMENT FACTORS - ABOVE BANKFULL STAGE

Laying back bank:	Right Side		Left Side	

INSTREAM NET IMPROVEMENT FACTORS - AT OR BELOW BANKFULL STAGE

Bioengineering:	Left Side		Right Side		Changing straightened channel to an appropriate conformation:		Adding habitat structures		
Removal of bank armoring:	Right Side		Left Side		Replacing undersized culvert with fish-passable culver or bridge:	101	Removing dams or adding fish ladders		
Removing man-made debris below ordinary high water:					Increasing culvert size or adding culverts to increase floodplain connectivity:				
Bench Creation:	Left Side		Right Side		Laying back bank:	Right Side 105	Left Side	105	

Riparian area to be enhanced:	Low	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	
	Medium	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	

Total Instream Credits (from Table C-1B):	X	135
Total Riparian Credits (from Table C-2B):	DD	
Total Credits: Y+EE	EE	135

CITY OF SALEM STREAM MITIGATION PROCESS - Page 1

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

The Salem, Oregon Stream Mitigation Process is a rapid assessment methodology that quantifies impacts to streams and riparian areas and determines an appropriate level of mitigation. The process requires knowledge of stream and riparian conditions to complete four tables (2 for debit calculations and 2 for credit calculations). This worksheet is protected - no password is required to unprotect.

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**2**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section calculates the amount of credit achieved as a result of proposed instream mitigation activities.

Table C -1A: Instream Credits

	Factors				
Stream Type (A)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**A**	**0.7**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (B)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**B**	**0.4**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal or state protected areas.		

Table C-1B - Instream Net Improvement Factors

				Improvement width	Linear Feet of Specific Improvement	Improvement Weight	Improvement Value	Net Improvement Factor
Bankfull Width	**C**	**25**						
Instream Net Improvement Factors - Above Bankfull Elevation								
Laying back bank above bankfull elevation (Right Side):	**[Improvement weight = 0.21*(D/C)]**		**D**			**0.21*(D/C)**		
Laying back bank above bankfull elevation (Left Side):	**[Improvement weight =0.21*(E/C)]**		**E**			**0.21*(E/C)**		
Instream Net Improvement Factors - At or Below Bankfull Elevation								
Bioengineering below bankfull elevation (Left Side) where not part of any other improvement:			**F**			**0.34**		
Bioengineering below bankfull elevation (Right Side) where not part of any other improvement:			**G**			**0.34**		
Changing straightened channel to an appropriate conformation			**H**			**1.34**		
Adding habitat structures (including large wood):			**I**			**0.15**		
Removal of bank armoring below bankfull elevation (Right Side) (must be stabilized with bioengineering)			**J**			**0.34**		
Removal of bank armoring below bankfull elevation (Left Side) (must be stabilized with bioengineering)			**K**			**0.34**		
Replacing undersized culvert with fish-passable culvert or bridge:			**L**			**0.80**		
Installing fish ladders (If "yes", enter "Y",if "no" leave blank)		0	**M**			**0.80**		
Removing man-made structures that impound streams:			**N**			**1.34**		
Increasing culvert size or adding culverts to increase floodplain connectivity (If "yes", enter "Y", if "no" leave blank)**:**			**O**			**0.05**		
Bench creation at bankfull elevation (Left Side):	**[Improvement weight =0.76*(P/C)]**		**P**			**0.76*(P/C)**		
Bench creation at bankfull elevation (Right Side):	**[Improvement weight =0.76*(Q/C)]**		**Q**			**0.76*(Q/C)**		
Laying back bank below bankfull elevation (Left Side):	**[Improvement weight =0.33*(R/C)]**		**R**			**0.33*(R/C)**		
Laying back bank below bankfull elevation (Right Side):	**[Improvement weight =0.33*(S/C)]**		**S**			**0.33*(S/C)**		
Average above bankfull elevation: Net Improvement=Sum of above bankfull Net Improvement Factors/Sum of above bankfull linear feet of specific improvements							**T**	
Average below bankfull elevation: Net Improvement=Sum of below bankfull Net Improvement Factors/Sum of below bankfull linear feet of specific improvements							**U**	
Above Bankfull Elevation Credits=Average above bankfull Net Improvement*Sum of above bankfull linear feet of specific improvements							**V**	
Below Bankfull Elevation Credits=Average below bankfull Net Improvement*Sum of below bankfull linear feet of specific improvements							**W**	
Total Instream Credits = Above bankfull elevation credits + Below bankfull elevation credits							**X**	

Mitigation Site Assessment

Mitigation plans must be accompanied by data that supports the mitigation design.

CITY OF SALEM STREAM MITIGATION PROCESS - Page 2

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**2**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section determines how much credit is gained from enhancing a riparian area in low or medium value condition. There is no limit to the length of the enhancement area, but credit given only within 50 feet of the stream (as measured perpendicular from the ordinary high water).

Table C-2A: Riparian Vegetation Net Improvement Factors within 50 feet of Edge of Stream

1. **Provide the length of the riparian area that will be enhanced along each bank.**
2. **Estimate the area (in square feet) of each existing plant community type (i.e. low or medium) to be enhanced.**

1. Length of riparian area to be enhanced (not more than a 50 feet wide)				Functional Value	2. Area (in square feet) of each type of existing plant stratum				Improvement Action	3. Area (in square feet) of each type of enhancement					Plant CommunityNet Improvement Factors			
Left		Right			Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub	Weight	Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub
Y1	499	Y2		Low	24952				Low to High	24952	24952			0.54	0.162	0.30		
				Medium					Medium to High					0.27				
				High					Riparian Mitigation Net Improvement Factors (Z3, Z4, Z5, Z6)=sum o Plant Community Net Improvement Factors						Y3	0.162	Y4	0.30	Y5		Y6	

Average Stream Flow Direction across mitigation site in degrees east of north*
135

*Measured every 100 feet along riparian enhancement Area

Table C-2B: Additional Riparian Mitigation Factors

				Riparian Mitigation Area Scores	
Stream Type (Z)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**Z**	**0.70**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (AA)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**AA**	**0.40**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal o state protected areas.		
Left Riparian Credit (BB) =Y1*(Y3+Y4+(0.2*Z)+(0.34*AA))				**BB**	**368.27**
Right Riparian Credit (CC) =Y2*(Y5+Y6+(0.2*Z)+(0.34*AA))				**CC**	
Total Riparian Credits (DD) = BB+CC				**DD**	**368.27**

CITY OF SALEM STREAM MITIGATION PROCESS - Page 3

CREDIT CALCULATION PROJECT SUMMARY AND SCORES

Project Name:	Waln Creek Enhancement and Battle Creek Culvert Removal Project	Date:	08/01/13
Mitigation Stream Name:	Battle Creek	Reach #:	2
Location:	Salem, Oregon	Evaluator(s):	CET

Table C-3A: Project Summary

INSTREAM NET IMPROVEMENT FACTORS - ABOVE BANKFULL STAGE

Laying back bank:	Right Side		Left Side	

INSTREAM NET IMPROVEMENT FACTORS - AT OR BELOW BANKFULL STAGE

Bioengineering:	Left Side		Right Side		Changing straightened channel to an appropriate conformation:		Adding habitat structures	
Removal of bank armoring:	Right Side		Left Side		Replacing undersized culvert with fish-passable culver or bridge:		Removing dams or adding fish ladders	
Removing man-made debris below ordinary high water:					Increasing culvert size or adding culverts to increase floodplain connectivity:			
Bench Creation:	Left Side		Right Side		Laying back bank:	Right Side	Left Side	

Riparian area to be enhanced:	Low	Left Herb/Low Shrubs	24952	Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	
	Medium	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	

Total Instream Credits (from Table C-1B):	X	
Total Riparian Credits (from Table C-2B):	DD	368
Total Credits: Y+EE	EE	368

CITY OF SALEM STREAM MITIGATION PROCESS - Page 1

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

The Salem, Oregon Stream Mitigation Process is a rapid assessment methodology that quantifies impacts to streams and riparian areas and determines an appropriate level of mitigation. The process requires knowledge of stream and riparian conditions to complete four tables (2 for debit calculations and 2 for credit calculations). This worksheet is protected - no password is required to unprotect.

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**3**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section calculates the amount of credit achieved as a result of proposed instream mitigation activities.

Table C -1A: Instream Credits

	Factors				
Stream Type (A)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**A**	**0.7**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (B)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**B**	**0.4**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal or state protected areas.		

Table C-1B - Instream Net Improvement Factors

				Improvement width	Linear Feet of Specific Improvement	Improvement Weight	Improvement Value	Net Improvement Factor
Bankfull Width	**C**	**25**						
Instream Net Improvement Factors - Above Bankfull Elevation								
Laying back bank above bankfull elevation (Right Side):	**[Improvement weight = 0.21*(D/C)]**		**D**			**0.21*(D/C)**		
Laying back bank above bankfull elevation (Left Side):	**[Improvement weight =0.21*(E/C)]**		**E**			**0.21*(E/C)**		
Instream Net Improvement Factors - At or Below Bankfull Elevation								
Bioengineering below bankfull elevation (Left Side) where not part of any other improvement:			**F**			**0.34**		
Bioengineering below bankfull elevation (Right Side) where not part of any other improvement:			**G**			**0.34**		
Changing straightened channel to an appropriate conformation			**H**			**1.34**		
Adding habitat structures (including large wood):			**I**			**0.15**		
Removal of bank armoring below bankfull elevation (Right Side) (must be stabilized with bioengineering)			**J**			**0.34**		
Removal of bank armoring below bankfull elevation (Left Side) (must be stabilized with bioengineering)			**K**			**0.34**		
Replacing undersized culvert with fish-passable culvert or bridge:			**L**		**121**	**0.80**	**0.80**	**96.80**
Installing fish ladders (If "yes", enter "Y",if "no" leave blank)		0	**M**			**0.80**		
Removing man-made structures that impound streams:			**N**			**1.34**		
Increasing culvert size or adding culverts to increase floodplain connectivity (If "yes", enter "Y", if "no" leave blank)**:**			**O**			**0.05**		
Bench creation at bankfull elevation (Left Side):	**[Improvement weight =0.76*(P/C)]**		**P**			**0.76*(P/C)**		
Bench creation at bankfull elevation (Right Side):	**[Improvement weight =0.76*(Q/C)]**		**Q**			**0.76*(Q/C)**		
Laying back bank below bankfull elevation (Left Side):	**[Improvement weight =0.33*(R/C)]**		**R**	**5.00**	**121**	**0.33*(R/C)**	**0.07**	**7.99**
Laying back bank below bankfull elevation (Right Side):	**[Improvement weight =0.33*(S/C)]**		**S**	**5.00**	**121**	**0.33*(S/C)**	**0.07**	**7.99**
Average above bankfull elevation: Net Improvement=Sum of above bankfull Net Improvement Factors/Sum of above bankfull linear feet of specific improvements			**T**					
Average below bankfull elevation: Net Improvement=Sum of below bankfull Net Improvement Factors/Sum of below bankfull linear feet of specific improvements			**U**					**0.31**
Above Bankfull Elevation Credits=Average above bankfull Net Improvement*Sum of above bankfull linear feet of specific improvements			**V**					
Below Bankfull Elevation Credits=Average below bankfull Net Improvement*Sum of below bankfull linear feet of specific improvements			**W**					**308.79**
Total Instream Credits = Above bankfull elevation credits + Below bankfull elevation credits			**X**					**308.79**

Mitigation Site Assessment

Mitigation plans must be accompanied by data that supports the mitigation design.

CITY OF SALEM STREAM MITIGATION PROCESS - Page 2

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Battle Creek**	**Reach #:**	**3**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section determines how much credit is gained from enhancing a riparian area in low or medium value condition. There is no limit to the length of the enhancement area, but credit given only within 50 feet of the stream (as measured perpendicular from the ordinary high water).

Table C-2A: Riparian Vegetation Net Improvement Factors within 50 feet of Edge of Stream

1. **Provide the length of the riparian area that will be enhanced along each bank.**
2. **Estimate the area (in square feet) of each existing plant community type (i.e. low or medium) to be enhanced.**

1. Length of riparian area to be enhanced (not more than a 50 feet wide)		Functional Value	2. Area (in square feet) of each type of existing plant stratum				Improvement Action	3. Area (in square feet) of each type of enhancement					Plant CommunityNet Improvement Factors			
Left	Right		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub	Weight	Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub
Y1	Y2	Low					Low to High					0.54				
		Medium					Medium to High					0.27				
		High					Riparian Mitigation Net Improvement Factors (Z3, Z4, Z5, Z6)=sum o Plant Community Net Improvement Factors						Y3	Y4	Y5	Y6

Average Stream Flow Direction across mitigation site in degrees east of north*
121

*Measured every 100 feet along riparian enhancement Area

Table C-2B: Additional Riparian Mitigation Factors

				Riparian Mitigation Area Scores	
Stream Type (Z)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**Z**	**0.70**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (AA)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**AA**	**0.40**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal o state protected areas.		
			Left Riparian Credit (BB) =Y1*(Y3+Y4+(0.2*Z)+(0.34*AA))	**BB**	
			Right Riparian Credit (CC) =Y2*(Y5+Y6+(0.2*Z)+(0.34*AA))	**CC**	
			Total Riparian Credits (DD) = BB+CC	**DD**	

CITY OF SALEM STREAM MITIGATION PROCESS - Page 3

CREDIT CALCULATION PROJECT SUMMARY AND SCORES

Project Name:	Waln Creek Enhancement and Battle Creek Culvert Removal Project	Date:	08/01/13
Mitigation Stream Name:	Battle Creek	Reach #:	3
Location:	Salem, Oregon	Evaluator(s):	CET

Table C-3A: Project Summary

INSTREAM NET IMPROVEMENT FACTORS - ABOVE BANKFULL STAGE

Laying back bank:	Right Side		Left Side	

INSTREAM NET IMPROVEMENT FACTORS - AT OR BELOW BANKFULL STAGE

Bioengineering:	Left Side		Right Side		Changing straightened channel to an appropriate conformation:		Adding habitat structures	
Removal of bank armoring:	Right Side		Left Side		Replacing undersized culvert with fish-passable culver or bridge:	121	Removing dams or adding fish ladders	
Removing man-made debris below ordinary high water:					Increasing culvert size or adding culverts to increase floodplain connectivity:			
Bench Creation:	Left Side		Right Side		Laying back bank:	Right Side 121	Left Side	121

Riparian area to be enhanced:	Low	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	
	Medium	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	

Total Instream Credits (from Table C-1B):	X	309
Total Riparian Credits (from Table C-2B):	DD	
Total Credits: Y+EE	EE	309

CITY OF SALEM STREAM MITIGATION PROCESS - Page 1

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

The Salem, Oregon Stream Mitigation Process is a rapid assessment methodology that quantifies impacts to streams and riparian areas and determines an appropriate level of mitigation. The process requires knowledge of stream and riparian conditions to complete four tables (2 for debit calculations and 2 for credit calculations). This worksheet is protected - no password is required to unprotect.

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Waln Creek**	**Reach #:**	**1**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section calculates the amount of credit achieved as a result of proposed instream mitigation activities.

Table C -1A: Instream Credits

	Factors				
Stream Type (A)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**A**	**0.7**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (B)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**B**	**0.4**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal or state protected areas.		

Table C-1B - Instream Net Improvement Factors

				Improvement width	Linear Feet of Specific Improvement	Improvement Weight	Improvement Value	Net Improvement Factor
Bankfull Width	**C**	**30**						
Instream Net Improvement Factors - Above Bankfull Elevation								
Laying back bank above bankfull elevation (Right Side):	**[Improvement weight = 0.21*(D/C)]**		**D**			**0.21*(D/C)**		
Laying back bank above bankfull elevation (Left Side):	**[Improvement weight =0.21*(E/C)]**		**E**			**0.21*(E/C)**		
Instream Net Improvement Factors - At or Below Bankfull Elevation								
Bioengineering below bankfull elevation (Left Side) where not part of any other improvement:			**F**			**0.34**		
Bioengineering below bankfull elevation (Right Side) where not part of any other improvement:			**G**			**0.34**		
Changing straightened channel to an appropriate conformation			**H**		**805**	**1.34**	**1.34**	**1078.70**
Adding habitat structures (including large wood):			**I**		**124**	**0.15**	**0.15**	**18.60**
Removal of bank armoring below bankfull elevation (Right Side) (must be stabilized with bioengineering)			**J**			**0.34**		
Removal of bank armoring below bankfull elevation (Left Side) (must be stabilized with bioengineering)			**K**			**0.34**		
Replacing undersized culvert with fish-passable culvert or bridge:			**L**			**0.80**		
Installing fish ladders (If "yes", enter "Y",if "no" leave blank)		0	**M**			**0.80**		
Removing man-made structures that impound streams:			**N**			**1.34**		
Increasing culvert size or adding culverts to increase floodplain connectivity (If "yes", enter "Y", if "no" leave blank)**:**			**O**			**0.05**		
Bench creation at bankfull elevation (Left Side):	**[Improvement weight =0.76*(P/C)]**		**P**	**56.00**	**805**	**0.76*(P/C)**	**1.42**	**1142.03**
Bench creation at bankfull elevation (Right Side):	**[Improvement weight =0.76*(Q/C)]**		**Q**	**145.00**	**805**	**0.76*(Q/C)**	**3.67**	**2957.03**
Laying back bank below bankfull elevation (Left Side):	**[Improvement weight =0.33*(R/C)]**		**R**			**0.33*(R/C)**		
Laying back bank below bankfull elevation (Right Side):	**[Improvement weight =0.33*(S/C)]**		**S**			**0.33*(S/C)**		
Average above bankfull elevation: Net Improvement=Sum of above bankfull Net Improvement Factors/Sum of above bankfull linear feet of specific improvements							**T**	
Average below bankfull elevation: Net Improvement=Sum of below bankfull Net Improvement Factors/Sum of below bankfull linear feet of specific improvements							**U**	**2.05**
Above Bankfull Elevation Credits=Average above bankfull Net Improvement*Sum of above bankfull linear feet of specific improvements							**V**	
Below Bankfull Elevation Credits=Average below bankfull Net Improvement*Sum of below bankfull linear feet of specific improvements							**W**	**6567.42**
Total Instream Credits = Above bankfull elevation credits + Below bankfull elevation credits							**X**	**6567.42**

Mitigation Site Assessment

Mitigation plans must be accompanied by data that supports the mitigation design.

CITY OF SALEM STREAM MITIGATION PROCESS - Page 2

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Waln Creek**	**Reach #:**	**1**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section determines how much credit is gained from enhancing a riparian area in low or medium value condition. There is no limit to the length of the enhancement area, but credit given only within 50 feet of the stream (as measured perpendicular from the ordinary high water).

Table C-2A: Riparian Vegetation Net Improvement Factors within 50 feet of Edge of Stream

1. **Provide the length of the riparian area that will be enhanced along each bank.**
2. **Estimate the area (in square feet) of each existing plant community type (i.e. low or medium) to be enhanced.**

1. Length of riparian area to be enhanced (not more than a 50 feet wide)				Functional Value	2. Area (in square feet) of each type of existing plant stratum				Improvement Action	3. Area (in square feet) of each type of enhancement					Plant CommunityNet Improvement Factors			
Left		Right			Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub	Weight	Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub
Y1	805	Y2	805	Low	40250		40250		Low to High	40250	40250	40250	40250	0.54	0.162	0.30	0.16	0.25
				Medium					Medium to High					0.27				
				High					Riparian Mitigation Net Improvement Factors (Z3, Z4, Z5, Z6)=sum o Plant Community Net Improvement Factors						Y3	0.162	Y4	0.30	Y5	0.16	Y6	0.25

Average Stream Flow Direction across mitigation site in degrees east of north*
166

*Measured every 100 feet along riparian enhancement Area

Table C-2B: Additional Riparian Mitigation Factors

				Riparian Mitigation Area Scores	
Stream Type (Z)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**Z**	**0.70**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (AA)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**AA**	**0.40**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal o state protected areas.		
			Left Riparian Credit (BB) =Y1*(Y3+Y4+(0.2*Z)+(0.34*AA))	**BB**	**594.09**
			Right Riparian Credit (CC) =Y2*(Y5+Y6+(0.2*Z)+(0.34*AA))	**CC**	**556.61**
			Total Riparian Credits (DD) = BB+CC	**DD**	**1150.70**

CITY OF SALEM STREAM MITIGATION PROCESS - Page 3

CREDIT CALCULATION PROJECT SUMMARY AND SCORES

Project Name:	Waln Creek Enhancement and Battle Creek Culvert Removal Project	Date:	08/01/13
Mitigation Stream Name:	Waln Creek	Reach #:	1
Location:	Salem, Oregon	Evaluator(s):	CET

Table C-3A: Project Summary

INSTREAM NET IMPROVEMENT FACTORS - ABOVE BANKFULL STAGE

Laying back bank:	Right Side		Left Side	

INSTREAM NET IMPROVEMENT FACTORS - AT OR BELOW BANKFULL STAGE

Bioengineering:	Left Side		Right Side		Changing straightened channel to an appropriate conformation:	805	Adding habitat structures	124
Removal of bank armoring:	Right Side		Left Side		Replacing undersized culvert with fish-passable culver or bridge:		Removing dams or adding fish ladders	
Removing man-made debris below ordinary high water:					Increasing culvert size or adding culverts to increase floodplain connectivity:			
Bench Creation:	Left Side		Right Side	805	Laying back bank:	Right Side	Left Side	

Riparian area to be enhanced:	Low	Left Herb/Low Shrubs	40250	Left Tree/Tall Shrub		Right Herb/Low Shrub	40250	Right Tree/Tall Shrub	
	Medium	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	

Total Instream Credits (from Table C-1B):	X	6567
Total Riparian Credits (from Table C-2B):	DD	1151
Total Credits: Y+EE	EE	7718

CITY OF SALEM STREAM MITIGATION PROCESS - Page 1

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

The Salem, Oregon Stream Mitigation Process is a rapid assessment methodology that quantifies impacts to streams and riparian areas and determines an appropriate level of mitigation. The process requires knowledge of stream and riparian conditions to complete four tables (2 for debit calculations and 2 for credit calculations). This worksheet is protected - no password is required to unprotect.

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Waln Creek**	**Reach #:**	**2**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section calculates the amount of credit achieved as a result of proposed instream mitigation activities.

Table C -1A: Instream Credits

	Factors				
Stream Type (A)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**A**	**0.7**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (B)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**B**	**0.4**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal or state protected areas.		

Table C-1B - Instream Net Improvement Factors

				Improvement width	Linear Feet of Specific Improvement	Improvement Weight	Improvement Value	Net Improvement Factor
Bankfull Width	**C**	**30**						
Instream Net Improvement Factors - Above Bankfull Elevation								
Laying back bank above bankfull elevation (Right Side):	**[Improvement weight = 0.21*(D/C)]**		**D**			**0.21*(D/C)**		
Laying back bank above bankfull elevation (Left Side):	**[Improvement weight =0.21*(E/C)]**		**E**			**0.21*(E/C)**		
Instream Net Improvement Factors - At or Below Bankfull Elevation								
Bioengineering below bankfull elevation (Left Side) where not part of any other improvement:			**F**			**0.34**		
Bioengineering below bankfull elevation (Right Side) where not part of any other improvement:			**G**			**0.34**		
Changing straightened channel to an appropriate conformation			**H**			**1.34**		
Adding habitat structures (including large wood):			**I**			**0.15**		
Removal of bank armoring below bankfull elevation (Right Side) (must be stabilized with bioengineering)			**J**			**0.34**		
Removal of bank armoring below bankfull elevation (Left Side) (must be stabilized with bioengineering)			**K**			**0.34**		
Replacing undersized culvert with fish-passable culvert or bridge:			**L**			**0.80**		
Installing fish ladders (If "yes", enter "Y",if "no" leave blank)		0	**M**			**0.80**		
Removing man-made structures that impound streams:			**N**			**1.34**		
Increasing culvert size or adding culverts to increase floodplain connectivity (If "yes", enter "Y", if "no" leave blank)**:**			**O**			**0.05**		
Bench creation at bankfull elevation (Left Side):	**[Improvement weight =0.76*(P/C)]**		**P**	65.00	345	**0.76*(P/C)**	1.65	568.10
Bench creation at bankfull elevation (Right Side):	**[Improvement weight =0.76*(Q/C)]**		**Q**	43.00	345	**0.76*(Q/C)**	1.09	375.82
Laying back bank below bankfull elevation (Left Side):	**[Improvement weight =0.33*(R/C)]**		**R**	10.00	345	**0.33*(R/C)**	0.11	37.95
Laying back bank below bankfull elevation (Right Side):	**[Improvement weight =0.33*(S/C)]**		**S**	10.00	345	**0.33*(S/C)**	0.11	37.95
Average above bankfull elevation: Net Improvement=Sum of above bankfull Net Improvement Factors/Sum of above bankfull linear feet of specific improvements							**T**	
Average below bankfull elevation: Net Improvement=Sum of below bankfull Net Improvement Factors/Sum of below bankfull linear feet of specific improvements							**U**	**0.74**
Above Bankfull Elevation Credits=Average above bankfull Net Improvement*Sum of above bankfull linear feet of specific improvements							**V**	
Below Bankfull Elevation Credits=Average below bankfull Net Improvement*Sum of below bankfull linear feet of specific improvements							**W**	**1765.02**
Total Instream Credits = Above bankfull elevation credits + Below bankfull elevation credits							**X**	**1765.02**

Mitigation Site Assessment

Mitigation plans must be accompanied by data that supports the mitigation design.

CITY OF SALEM STREAM MITIGATION PROCESS - Page 2

MITIGATION SITE - CREDIT CALCULATION WORKSHEET

Project Name:	**Waln Creek Enhancement and Battle Creek Culvert Removal Project**	**Date:**	**08/01/13**
Mitigation Stream Name:	**Waln Creek**	**Reach #:**	**2**
Location:	**Salem, Oregon**	**Evaluator(s):**	**CET**

This section determines how much credit is gained from enhancing a riparian area in low or medium value condition. There is no limit to the length of the enhancement area, but credit given only within 50 feet of the stream (as measured perpendicular from the ordinary high water).

Table C-2A: Riparian Vegetation Net Improvement Factors within 50 feet of Edge of Stream

1. **Provide the length of the riparian area that will be enhanced along each bank.**
2. **Estimate the area (in square feet) of each existing plant community type (i.e. low or medium) to be enhanced.**

1. Length of riparian area to be enhanced (not more than a 50 feet wide)				Functional Value	2. Area (in square feet) of each type of existing plant stratum				Improvement Action	3. Area (in square feet) of each type of enhancement					Plant CommunityNet Improvement Factors			
Left		Right			Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub		Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub	Weight	Left Bank Herbaceous/ Low Shrub	Left Bank Tree Canopy/Tall Shrub	Right Bank Herbaceous/ Low Shrub	Right Bank Tree Canopy/Tall Shrub
Y1	345	Y2	345	Low	17250		14835		Low to High	17250	17250	14835	14835	0.54	0.162	0.30	0.14	0.14
				Medium					Medium to High					0.27				
				High					Riparian Mitigation Net Improvement Factors (Z3, Z4, Z5, Z6)=sum o Plant Community Net Improvement Factors						Y3	0.162	Y4	0.30	Y5	0.14	Y6	0.14

Average Stream Flow Direction across mitigation site in degrees east of north*
0

*Measured every 100 feet along riparian enhancement Area

Table C-2B: Additional Riparian Mitigation Factors

				Riparian Mitigation Area Scores	
Stream Type (Z)	**Ephemeral** 0.2	**Intermittent** 0.5	**Perennial** 0.7	**Z**	**0.70**
	Ephemeral streams flow only in direct response to precipitation. Water typically flows only during and shortly after large precipitation events. Ephemeral streams may or may not have a well-defined channel, the stream bed is always above the water table, and stormwater runoff is the primary source of water. Ephemeral streams typically lack the the biological, hydrological, and physical characteristics commonly associated with the continuous or intermittent conveyance of water.	Intermittent streams contain water for only part of the year, typically during the winter and spring when the stream bed may be below the water table and/or when snowmelt from surrounding uplands provides sustained flow. The channels may or may not be well-defined. The flows may vary greatly with stormwater runoff. Intermittent streams may lack the biological and hydrological characteristics commonly associated with the continuous conveyance of water.	Perennial streams contain water continuously during a year of normal rainfall, often with the stream bed located below the water table for most of the year. Groundwater supplies the baseflow for perennial streams, but flow is also supplemented by stormwater runoff and snowmelt. Perennial stream exhibit the typical biological, hydrological, and physical characteristics commonly associated with the continuous conveyance of water.		
Stream Status (AA)	**Tertiary** 0.1	**Secondary** 0.4	**Primary** 0.8	**AA**	**0.40**
	Tertiary Waters are streams that are documented as non-game-fish-bearing.	Secondary Waters are game-fish-bearing streams that do not meet the criteria for Primary Waters.	Primary Waters are streams designated as Essential Salmonid Habitat; Critical Habitat; streams supporting state-listed or federally listed threatened, endangered or special concern species; and streams within federal o state protected areas.		
Left Riparian Credit (BB) =Y1*(Y3+Y4+(0.2*Z)+(0.34*AA))				**BB**	**254.61**
Right Riparian Credit (CC) =Y2*(Y5+Y6+(0.2*Z)+(0.34*AA))				**CC**	**191.35**
Total Riparian Credits (DD) = BB+CC				**DD**	**445.96**

CITY OF SALEM STREAM MITIGATION PROCESS - Page 3

CREDIT CALCULATION PROJECT SUMMARY AND SCORES

Project Name:	Waln Creek Enhancement and Battle Creek Culvert Removal Project	Date:	08/01/13
Mitigation Stream Name:	Waln Creek	Reach #:	2
Location:	Salem, Oregon	Evaluator(s):	CET

Table C-3A: Project Summary

INSTREAM NET IMPROVEMENT FACTORS - ABOVE BANKFULL STAGE

Laying back bank:	Right Side		Left Side	

INSTREAM NET IMPROVEMENT FACTORS - AT OR BELOW BANKFULL STAGE

Bioengineering:	Left Side		Right Side		Changing straightened channel to an appropriate conformation:		Adding habitat structures		
Removal of bank armoring:	Right Side		Left Side		Replacing undersized culvert with fish-passable culver or bridge:		Removing dams or adding fish ladders		
Removing man-made debris below ordinary high water:					Increasing culvert size or adding culverts to increase floodplain connectivity:				
Bench Creation:	Left Side		Right Side	345	Laying back bank:	Right Side	345	Left Side	345

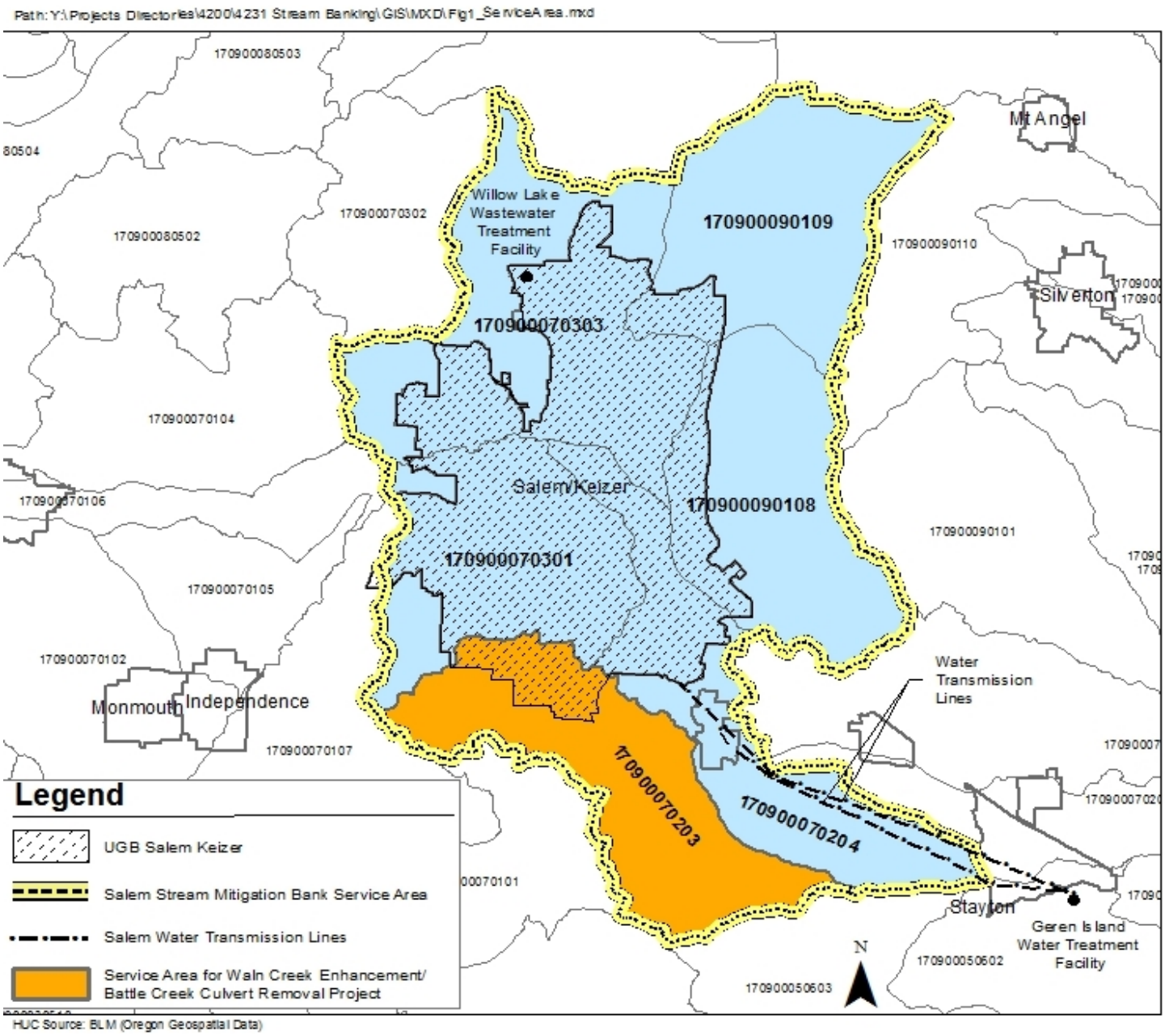
Riparian area to be enhanced:	Low	Left Herb/Low Shrubs	17250	Left Tree/Tall Shrub		Right Herb/Low Shrub	14835	Right Tree/Tall Shrub	
	Medium	Left Herb/Low Shrubs		Left Tree/Tall Shrub		Right Herb/Low Shrub		Right Tree/Tall Shrub	

Total Instream Credits (from Table C-1B):	X	1765
Total Riparian Credits (from Table C-2B):	DD	446
Total Credits: Y+EE	EE	2211

Attachment H

Service Area Map

ATTACHMENT H



6th Field HUCs within Service Area
170900070203 - McKinney Creek
170900070204 - Lower Mill Creek
170900070301 - Croisan Creek (includes Pringle Creek)
170900070302 - Glenn Creek (includes Claggett Creek)
170900090109 - Lower Little Pudding River
170900090108 - Upper Little Pudding River

SERVICE AREA

Waln Creek Enhancement and Battle Creek Culvert Removal Project