

May Creek Drainage Improvement Project (9A1205)
King County Water and Land Resources Division

**Stream and Wetland
Impact Analysis and Mitigation Plan**

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Executive Summary

King County Water and Land Resources Division (WLRD) is proposing to improve flow conditions along May Creek between River Mile (RM) 4.3 and 4.9 in the May Valley located in southeastern King County near the cities of Renton and Newcastle. One large riverine wetland, referred to as May Creek #5 in the King County Wetland Inventory (1990) and three tributaries to May Creek are within the proposed project area. May Creek in this area is nearly flat and flows through large wetlands, many of which are currently used as pastures for horses.

Historically, May Valley provided floodwater storage for tributaries draining the upper May Creek basin. May Creek was then ditched into a uniform channel in order to use the floodplain for agricultural purpose. Limited capacity to transport sediment through the flat valley allowed sediment to accumulate. Landowners periodically cleared the stream of sediment and in-channel plants until about the 1940s (King County 1995). Since then, development in the upper watershed to the north and south of May Valley has increased stormwater run-off, leading to an increase in the frequency and duration, but not magnitude, of flooding in May Valley (King County 1995). In addition, invasive non-native vegetation has choked the channel exacerbating the duration of flooding. The flat May Valley reach of May Creek stores stormwater and sediment, releasing both to a higher gradient ravine downstream of the study reach. Slow water and cover from overhanging vegetation in the study reach provide rearing and refuge habitat for fish.

To improve flow conditions in May Creek, King County WLRD is proposing to remove accumulated sediment and channel-blocking vegetation in May Creek, as well as reconstruct a portion of Long Marsh Creek to provide sediment storage. As a result of the proposed vegetation and sediment removal, aquatic and wildlife species may be temporarily or permanently degraded in May Creek. Vegetation removal in these areas would degrade riparian habitat by reducing canopy cover, organic inputs, prey sources, bank stability, and future large wood recruitment. May Creek would experience localized hydraulic changes within the project area when the willow, reed canarygrass and sediment removal occurs. Riparian and in-stream habitat associated with Long Marsh Creek would also be temporarily degraded as a result of the channel reconstruction.

King County has designed the project to avoid and minimize impacts to wetlands, streams, and buffers to the greatest extent possible. Impacts that cannot be avoided and minimized must be compensated for by constructing mitigation. The mitigation goal for this project is to achieve no overall net loss in habitat functions in the May Creek sub-basin. This would be accomplished with out-of-kind mitigation by enhancing approximately five acres of riparian buffer and riverine wetland. The enhancements would include planting native riparian/wetland vegetation, reed canary grass suppression,

construction of two off-channel alcoves, placement of large woody debris (76 pieces), and installation of snags in the wetland. The mitigation is considered out-of-kind, because the majority of the impacts are to in-stream habitat, while the proposed mitigation enhances riparian and wetland habitat.

1. Introduction

King County Water and Land Resources Division (WLRD) proposes to improve in-stream flow of May Creek in May Valley between about RM 4.3 and 4.9 in southeastern King County, near the cities of Renton and Newcastle (Figure 1) Sections 2 and 3, Township 23N, Range 5E. Sediment accumulation and in-stream vegetation (e.g., reed canarygrass and willows) throughout the valley reach of May Creek have been gradually decreasing channel flow capacity, causing a backwater effect. This is increasing the duration of flooding in actively used horse pastures on adjacent rural residential properties, with standing water and wet pastures now persisting into the summer months. The goal of this project is to reduce the duration of flooding on these properties at both the start and end of the wet season by removing in-stream channel obstructions. This effort should help alleviate the duration of localized flooding on adjacent properties during low to moderate storm events and should allow the pastures to drain more effectively when flooding does occur.

The reach proposed for improvement begins on the south side of SE May Valley Road about 0.1 mile downstream of 148th Avenue SE in Renton and includes the main stem of May Creek extending upstream about 2,900 feet to a point just downstream from the confluence of May Creek with Indian Meadow Creek. One large riverine wetland, May Creek #5, May Creek, and three tributaries to May Creek are within the proposed project area. The project area is located in the Watershed Resource Inventory Area (WRIA) 8 Lake Washington Basin. The existing conditions of streams and wetlands are described in more detail in Section 3.

The King County current zoning classification in the majority of the project area is RA-5 and RA-10, rural residential with future development limited to rural uses with maximum densities of one house per five acres and ten acres, respectively. There is also a designated open space tract on the west side of 148th Avenue SE within the City of Renton where the majority of the compensatory mitigation would be constructed.

Currently, small horse farms and open space are the primary land uses in the project area. A large portion of the riverine wetland in May Valley was converted to agriculture in the early 1900s, and May Creek was regularly dredged to support agriculture. About 50 years ago, regular dredging ceased in May Creek, and agricultural production has ceased as a result of increased flooding. The small farms in the project area are flooded during most months of the year. Many of these pastures are located within the delineated wetland boundary.

The purpose of this report is to analyze the potential stream and wetland impacts associated with the project, and to describe how the mitigation has been designed to avoid, minimize, and compensate for these impacts.

2. Project Description

The project proposal consists of four components: vegetation removal, sediment removal, sediment management, and stream/wetland mitigation. The vegetation/sediment removal and the sediment management would negatively impact existing in-stream fish habitat and riparian buffer functions, so mitigation has been proposed to offset these impacts. The project components are described below.

Vegetation Removal: The first component of the project includes removal of flow obstructing in-stream vegetation and debris that have been identified as choking the channel and creating a backwater effect, causing flooding on adjacent properties during small storm events. Invasive reed canarygrass is the dominant vegetation that would be removed from the channel and banks. In addition, willows, located in multiple locations throughout the project area, currently have branches crossing over the stream channel at selected locations within the winter flow elevation, further contributing to the backwater effect. A portion of the willows that are identified as obstructing flow would also be removed. The willows on the west side of 148th Avenue SE would be primarily removed by hand, but some small, hand-held, mechanized machinery may be used to assist. Willows and reed canarygrass on the east side of 148th Avenue SE would be removed in conjunction with the sediment removal using machinery, most likely a low impact spyder hoe, operated from the stream bank. Prior to removal of in-stream vegetation using machinery, the stream would be diverted around the construction site and erosion and sediment control best management practices would be used during construction to minimize temporary downstream water-quality impacts (King County July 2011). The impacts associated with the vegetation removal are described in Section 4.

Sediment Removal: Sediment would be removed from the stream channel using machinery, most likely a low impact spyder hoe, operated from the stream bank. The stream would be diverted around the construction site and erosion and sediment control best management practices would be used during construction to minimize temporary downstream water-quality impacts (King County July 2011). Construction techniques, such as, using existing access roads and requiring all machinery to be tracked or rubber tired, would be used to minimize temporary impacts to adjacent wetlands. Sediment would be first placed in on-site soil drying areas and then would be disposed of on-site in a stable, non-erosive manner outside flood prone and sensitive areas. The impacts associated with the sediment removal are described in Section 4.

Sediment Management: To increase the longevity of the project, 300 feet of the Long Marsh Creek channel and its confluence with May Creek would be reconstructed to allow

sediment to drop out more naturally prior to reaching the mainstem of May Creek. This reconstruction would include an approximately 100 foot long side channel adjacent to May Creek. Based on the sediment yield rate in Long Marsh Creek over the past eight years (2002 to 2010), the channel reconstruction would provide approximately 70 years of sediment storage capacity.

Stream/Wetland Mitigation: The final component of the project includes providing mitigation to avoid, minimize, and compensate for in-stream and wetland habitat impacts. The following mitigation would be implemented and is further described in Section 5:

- During construction, the stream flow would be diverted around the work area, and in-water work would only be conducted during summer low flow when fish are less likely to be present. King County staff would be onsite during construction to monitor water quality. Water quality monitoring and protection procedures are described in the project's *Construction Water Quality Protection and Monitoring Plan* (King County July 2011).
- Construction techniques, such as using existing access roads and requiring all machinery to be tracked or rubber tired would minimize disturbance to existing vegetation. In addition, direct access to the stream channel by equipment would be in specific areas where vegetation disturbance can be minimized and removal of mature trees can be avoided. Excavation would likely be performed by spyder hoe, which is excavator designed for rough terrain and low impact operation in sensitive areas. Stream access points would be limited to avoid removal of mature trees.
- Prior to sediment removal, approximately 60 linear feet of streambed gravels located in May Creek (Station 15+60 to 16+30) near the confluence of Long Marsh Creek, would be removed and saved so that they can be placed back in the same reach of stream channel after the sediment removal is complete.
- A buffer of native vegetation (primarily wetland vegetation) would be restored for approximately 15 feet on each side of May Creek east and west of 148th Avenue SE for a total of approximately two acres. This buffer is intended to minimize reed canarygrass infestation and to compensate for the cover that would be lost by removing flow-obstructing willows and reed canarygrass. Native vegetation would be planted in areas where, under existing conditions, only reed canarygrass exists. In most of the project area, the regulatory stream buffer is contained within the delineated wetland boundary, which means that stream buffer enhancement could also be considered wetland enhancement. Fencing would be installed around the planting areas to eliminate livestock access to the newly planted areas and to the stream.

- In addition to the two acres of riparian buffer planting, an additional three acres of wetland enhancement would be constructed on the west side of 148th Avenue SE to compensate for impacts associated with the sediment removal. This enhancement would include construction of approximately 0.24 acres of off-channel wetland alcoves along May Creek, reed canarygrass suppression, placement of large woody debris (LWD) (76 pieces), two snags, and planting native vegetation. This would provide out-of-kind mitigation for impacts to in-stream habitat functions by enhancing wetland habitat functions.
- King County would protect the mitigation areas in perpetuity by recording a conservation easement, or similar document, on the title of each property.

May Creek Drainage Improvement Project

Project Vicinity

-  Study Area
-  Mile Markers
-  Stream
-  Incorporated Areas
-  Cougar Mountain Wildland Park



March 2010



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Figure 1

3. Existing Conditions

This section describes the existing geology, stream, wetland and hydrologic conditions in the project area.

3.1. Geology

The wide and relatively flat May Valley (RM 3.9 to RM 7.0) was created by glacial ice-melt runoff and is part of the “Kennydale Channel”. The recessional phase of the Vashon Glaciation created a series of drainage channels. As the Vashon Glacier receded, the outlet drainage continued to shift to the northwest through the Cedar Grove, Kennydale, and Eastgate Channels (now occupied by I-90). The valley is underlain by recent alluvium and wetland deposits over recessional outwash deposits and compacted glacial till. These recent deposits overlie Eocene Tukwila Formation. The Tukwila Formation is composed of volcanic tuff, fine-grained volcanic sandstone and volcanic tuff-breccia. The formation is reported to outcrop east of 146th Avenue Southeast and forms a physical boundary between the downstream ravine and May Valley upstream. The compacted glacial materials and bedrock are resistant to erosion by May Creek in the valley. Surface water infiltration into the glacial till and bedrock is limited due to low permeability.

3.2. Stream Habitat Conditions

May Creek is about 11.3 kilometers (seven miles) long, with about 30.6 km (19 miles) of tributary streams, draining about 38.3 square kilometers (14 square miles). It is classified as a Type F Water (fish present) under the King County Critical Area Code, requiring a 50.3 m (165-ft) regulatory buffer. Under City of Renton Critical Area Code, May Creek is considered a Class 2 stream (salmonid bearing) requiring a 100-foot buffer. Three tributary creeks (Indian Meadow Creek, Long Marsh Creek, and Greenes Creek) join the mainstem of May Creek in the project area, which flows through the valley and into a narrow, erosive canyon before flowing into Lake Washington.

May Valley was historically an area of sediment deposition and flood storage, and the stream channel braided through extensive wetlands. The stream was put in a ditched single-strand channel so the surrounding floodplain could be used for agriculture and was regularly dredged until about 50 years ago. The May Valley provides stormwater storage, which helps control erosion downstream of the project area (King County 2001, Anchor QEA 2010).

Riparian areas adjacent to May Creek are mostly wetland that has been converted to agriculture (wetlands are described in Section 3.3). These riparian areas are primarily dominated by reed canarygrass; however, the stream in the western reach of the project is beginning to revert to more natural conditions due to the presence of an undisturbed buffer of willows (*Salix spp.*) and red alder (*Alnus rubra*) about 50 to 75 feet wide. These woody plants stabilize stream banks, provide shade, food, and hiding cover, and increase in-stream

habitat complexity by providing hard points that create a mixture of slow-water and fast-water areas. The channel in the upstream portion of the project reach lacks woody plants and is almost exclusively vegetated with reed canarygrass. The channel in this reach is more uniform and has filled in with sediment so it is more prone to flooding. Figure 3 shows the vegetation units in the project area.

In-stream habitat in the surveyed reach of May Creek is influenced by riparian plant communities. Aquatic habitat is more complex in places where the riparian corridor has woody plants, such as willows, engaged with the stream channel and connected floodplain. Overhanging or rooted willow branches or stems provide cover and hard points necessary for bedform complexity, producing both turbulent and non-turbulent flow areas, and creating six of the nine pools identified in the project area (King County 2010b). Terrestrial insects falling from the willow canopy provide food for fish living in the stream, and fallen leaves provide nutrients. Areas with no woody riparian plants are much more uniform and tend to have accumulations of fine sediments in the channel.

May Creek within the surveyed stream reach was dominated by slow-water glides (Figure 2). Pools made up approximately 25 percent of the surface area in Reaches One and Two, approximately ten percent of the area in Reach Three, and approximately 13 percent of the area over the entire surveyed reach; no pools were present in Reach Four. All of the pools were lateral scour pools except one mid-channel pool in Reach One. Fast water was limited to a single low-gradient riffle at the 148th Avenue SE Bridge, and a couple of pool tail-outs in Reach One.

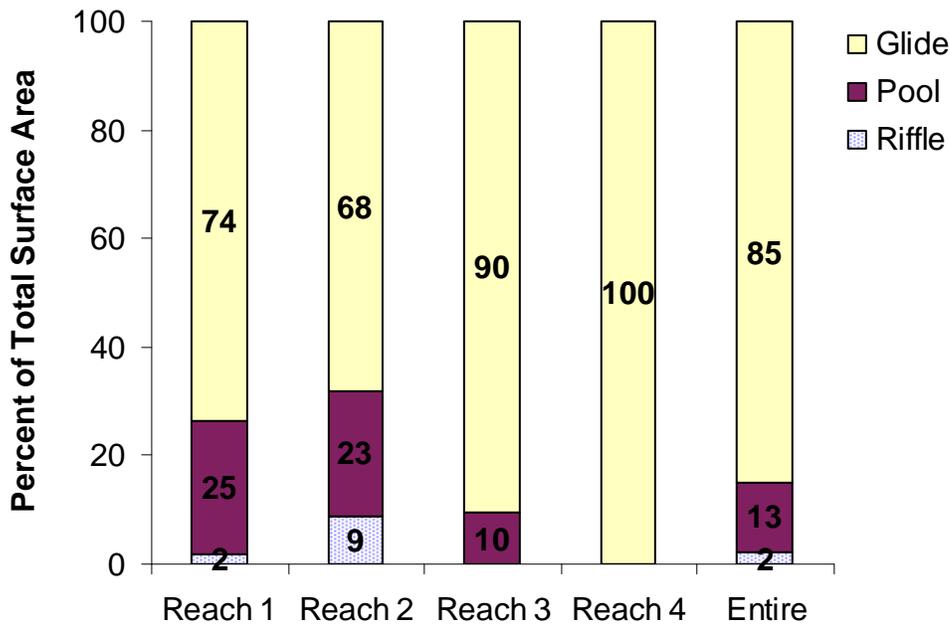


Figure 2: Habitat Unit Proportions, as surface area (m²). Dotted area is fast water; solid area is slow water. Water flows from Reach 4 to Reach 1.

Many of the areas inventoried as glide during the low-flow stream survey in August 2010 had both turbulent and non-turbulent flow during the February 2010 stream reconnaissance. This is most apparent in Reach Two, which has a relatively wide, mature, willow-dominated riparian corridor. Dense willow branches cross the stream channel throughout this reach, functioning like a debris complex and creating numerous backwater areas during higher flows. This reach is well-connected with its floodplain, and some floodplain terracing is present, which also increases habitat complexity during higher flows. The wider forested riparian area has shaded out reed canarygrass. In areas where reed canarygrass dominates, such as Reach Four, the channel tends to be deeper and has much thicker accumulations of fine sediment.

May Creek historically was an important salmon stream in the Lake Washington Basin (WDF 1975). The stream supported five species of salmonids: Chinook (*Oncorhynchus Tschawytscha*), sockeye (*O. nerka*), and coho (*O. kisutch*) salmon, and rainbow/steelhead (*O. mykiss*) and cutthroat (*O. clarki*) trout (King County 1995). Salmon still use the stream and its tributaries even though their numbers have decreased (King County 1995). Chinook and sockeye salmon are found in the lower reaches of May Creek and in May Canyon; they most likely do not travel upstream as far as May Valley (King County 1995). Coho salmon and rainbow/steelhead and cutthroat trout rear in May Valley and use it as a travel corridor to upstream spawning habitat in the North Fork, Cabbage and Country Creeks, and Tributary 0291A (upstream of proposed project) (King County 1995).

Although we did not conduct a formal census of fish in the surveyed reach of May Creek, we observed many schools of salmonids during the August 2010 habitat survey (Appendix B). Most schools were about 10 to 30 individual juvenile fish, and appeared to have both coho salmon and trout.

3.3. Wetlands Conditions

One large riverine wetland, referred to as May Creek #5 in the King County Wetland Inventory (1990), is located in the project study area. This wetland is about 140 acres in total size; about 25 acres are contained in the project study area.

The portion of the wetland located in the project area was delineated by King County wetland biologists in early 2010, and the entire wetland was also rated at that time (King County 2010a). May Creek #5 is a Category II riverine wetland with a 110-foot buffer under the King County Critical Area Code. The majority of the wetland is located in unincorporated King County; however, the portion west of 148th Avenue SE is located in the City of Renton. Under the City of Renton Critical Area Code this is a Category 3 wetland with a regulatory buffer width of 25 feet.

The wetland is located in the 100-year floodplain of May Creek. Primary sources of hydrology to the May Creek #5 wetland are a combination of overbank flooding and a high groundwater table. While the wetland still received a high rating, it has been degraded over the years by adjacent farming and agriculture. Many areas of the wetland are actively mowed and used for grazing horses and other livestock. In the farm areas on the north side of the wetland, the wetland boundary closely follows a line of fill that appears to have been placed in the wetland over the years to allow pasturing. On the south side of the wetland, the wetland boundary more closely follows valley topography, and multiple groundwater seeps were visible on the valley walls at higher elevations. In the majority of the wetland not regularly mowed and maintained as pasture, the dominant vegetation was reed canarygrass, which grew as thick blankets with almost 100-percent coverage. The only unmowed areas without reed canarygrass were in the scrub-shrub/forested components of the wetland near May Creek where the reed canarygrass was shaded out. The width of the scrub-shrub/forested buffer along the stream was about 50 to 75 feet in areas where the reed canarygrass was shaded out (i.e., 25 to 37 feet wide on each side of the stream).

3.4. Hydraulic Conditions

May Creek valley experiences out of bank flooding that last several days to weeks at a time on a routine basis every wet season. The stream course is essentially in a bowl for approximately 2100 feet (river mile 4.6 to 5.0) between a footbridge upstream of Parcel #0223059005 property down to Long Marsh Creek confluence where a sediment delta has built up, just upstream of another footbridge. Long Marsh Creek is primarily a forested basin with steep gradients. This characteristic gives the tributary the ability to

deposit gravels large enough such that May Creek is not capable to redistribute gravels downstream. Thus stream bed elevations at this location rise as more gravel is deposited. This accumulation causes May Creek to backwater upstream causing more deposition of fines and decaying vegetation subsequently reducing conveyance capacity and increasing frequency of valley flooding.

Two types of models were used to perform hydraulic and hydrologic analyses for current conditions and proposed drainage improvement scenarios, HEC-RAS for hydraulics and HSPF (Bicknell 2005) for hydrology. Both models used were adapted from existing models and updated to reflect current conditions. HEC-RAS (USACE 2008) was used to evaluate channel conveyance capacities and flooding inundations, while HSPF was used to provide statistical measures of durations and magnitudes of events used for defining boundary conditions in the HEC-RAS model.

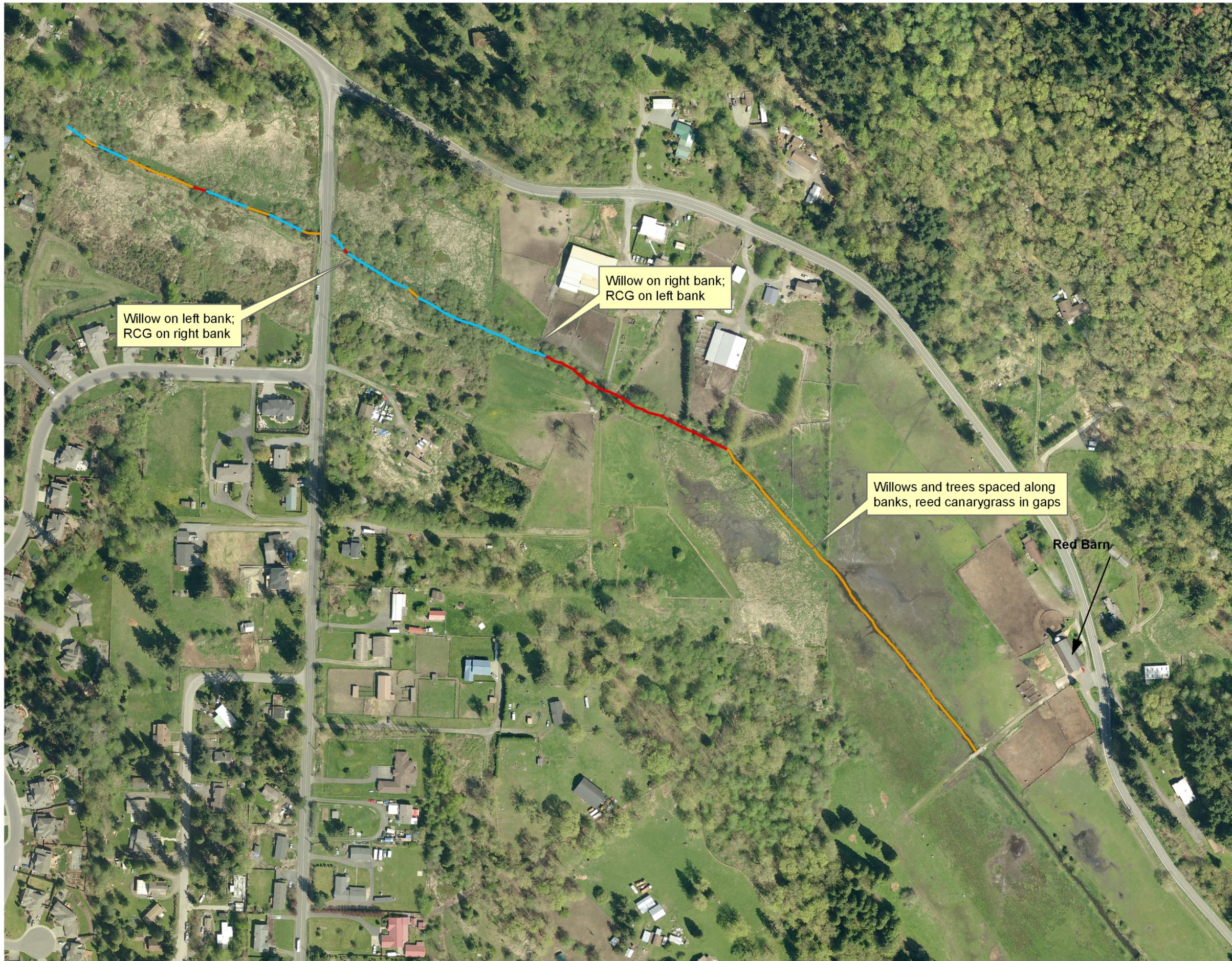
The analysis shows that during mean annual flows (8.6 cfs through the study area), control points include vegetation choking points in the wetland downstream of 148th Avenue SE bridge and mildly so upstream of 148th Avenue SE and gravel deposition where Long Marsh Creek enters into May Creek at approximately river mile 4.64, just upstream of a footbridge. This high point of gravels controls the water surface elevation upstream approximately for 2000 feet to a footbridge located approximately at river mile 5.04. Similarly for flows above the one year event, Long Marsh Creek again controls water surfaces upstream for the same reach length.

Downstream of 148th Avenue SE, hydraulic model runs show the natural constriction change from open wetland on valley floor to well defined channel entering into the ravine controls storm events flows of one year return interval and greater. Removal of vegetation choke points in the wetland produce a few tenths of a foot change in water surface, within the range of model accuracy and very small amount of lost storage, this natural land form constriction downstream of the proposed restoration channel activities is the control for erosion in the ravine. Flows below the one year flood event would have a slightly longer duration but not higher velocity. The flows at these lower events are below levels that cause channel erosion below May Valley (AnchorQEA, 2010).

May Creek Drainage Improvement Project

Legend

-  Willow (893')
-  Willow/RCG Mix (580')
-  Reed Canarygrass (RCG) (1360')



December 2010



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Figure 3

Existing Riparian and In-Stream Vegetation

May Creek Drainage Improvement Project

Legend

- Study Area
- River Mile

Habitat Units

- ▬ GLD
- ▬ LGR
- ▬ LSP
- ▬ MCP
- ▬ T
- Streets
- Streams
- Wetlands
- Cougar Mountain Wildland Park



December 2010



0 90 180 360 540 720 Feet

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Figure 4

4. Impact Analysis

The unavoidable stream and wetland impacts associated with the project are described in this section.

4.1. Stream Impacts

As a result of vegetation and sediment removal, the aquatic and terrestrial habitat features within May Creek and its buffer may be temporarily or permanently degraded. Vegetation removal in these areas would degrade riparian habitat by reducing canopy cover, organic inputs, prey sources, bank stability, and future large wood recruitment. The stream would experience localized hydraulic changes within the project area when the willow and reed canarygrass removal and sediment removal occurs. These changes have the potential to modify fish habitat in May Creek, such as the locations and depths of pools, quantity and quality of coho and trout rearing and refuge habitat, and quantity of local spawning gravel. Impacts to Long Marsh Creek as a result of the sediment management activities include temporarily disturbed in-stream habitat and riparian buffer. These impacts are described in more detail below and are summarized in Table 2 at the end of this section.

4.1.1. Impacts from Sediment Removal

Sediment removal would occur in May Creek from Station 5+40 to 26+26 (2,086 linear feet) and would have both short- and long-term effects on the stream. As part of the sediment removal, the stream channel would be excavated to a uniform elevation of 308 feet. The following list summarizes the potential impacts that could occur as part of the sediment removal operations:

- removal of stream bank and aquatic vegetation
- removal, release, or rearrangement of silts and sediments
- reduction of water quality
 1. remobilization of contaminants (if any were to exist in project area)
 2. increased turbidity
 3. increased erosion and sedimentation
- alteration of fish habitat
 1. elimination of habitat type (channel complexity)
 2. alteration of fish-spawning habitat
 3. alteration of benthic habitat
 4. disruption or removal of benthic communities

Several factors influencing the magnitude of the effects of dredging-type activities such as this include: size of the dredging operation, frequency of dredging, stream channel size and depth, size of material, background levels of water and sediment quality,

suspended sediment, turbidity, stream velocity, design of final contours, and stability of channel up- and down-stream from the dredging operation.

The list of impacts above may occur at May Creek. Sediment removal would occur along 72 percent of the proposed project area and would impact in-stream habitat, spawning habitat, water quality, and alter the timing and magnitude of silt and sediment migration. Sediment removal would have its biggest impact on Reach Two because this reach is well-connected with its floodplain, has some floodplain terracing, and is well vegetated. Sediment removal would reduce the stream’s floodplain connection during smaller flow events and would remove functioning riparian vegetation. Sediment removal in Reach Three, which includes the alluvial fan of Long Marsh Creek, would temporarily disturb spawning gravels in May Creek.

4.1.2. Impacts from Vegetation Removal

In combination with sediment removal impacts, the stream would also be negatively impacted by removal of in-stream and bankside willows and reed canarygrass throughout the entire project area. Table 1 describes the type and location of vegetation removal associated with this project.

Table 1: Type and Location of Vegetation Removal

Type of Vegetation Removal	Station From	Station To
May Creek		
In-stream Willow Pruning (hand removal)	0+00	0+30
In-stream Reed Canary Grass Removal (mechanized)	0+30	0+70
In-stream Willow Pruning (hand removal)	0+70	1+50
In-stream Reed Canary Grass Removal (mechanized)	1+50	3+00
In-stream Willow Pruning (hand removal)	3+00	4+50
In-stream Reed Canary Grass Removal (mechanized)	4+50	4+90
In-stream Willow Pruning (hand removal)	4+90	5+40
In-stream Vegetation and Sediment Removal (mechanized)	5+40	26+26
In-stream Reed Canary Grass Removal (mechanized)	26+26	29+00
Long Marsh Creek		
Riparian Buffer Clearing for Channel Reconstruction	0+00	2+75

As mentioned in the *May Creek Drainage Improvement Baseline Stream Conditions Report* (King County 2010b), in-stream habitat in the surveyed reach of May Creek is greatly influenced by riparian plant communities. Aquatic habitat is much more complex in places where the riparian corridor has woody plants, such as willows, actively engaged with the stream channel and connected floodplain. Areas with no woody riparian plants are much more uniform and tend to have accumulations of fine sediments in the channel. This is most evident when comparing reaches with just reed canarygrass versus reaches with native riparian vegetation, such as willows. In areas where reed canarygrass

dominates, such as Reach Four, the channel tends to be deeper and is 100 percent glide habitat. In Reaches One and Two, where some native willows grow along the stream banks and interact with the stream channel, some pools are also present.

The proposed removal of willows (Table 1) includes willows obstructing flow within the channel. This removal of willows actively engaged with the stream channel would reduce the number of pools within the surveyed reach of May Creek; it would also reduce or eliminate channel complexity within Reach Two. Six out of nine surveyed pools were formed by scour against willows. These six pools would be eliminated by the proposed project. Furthermore, dense willow branches crossing the stream in Reach Two function like a debris complex, creating numerous backwater areas during higher flows. As with pools, this habitat would be eliminated with willow removal. Willow removal would reduce pool formation and channel complexity. Eliminating these complexities would reduce available fish habitat.

In addition to the removal of in-stream habitat components, willow removal would eliminate some streamside vegetation that shades the stream to maintain cool temperatures, and contributes organic debris and leaf litter, which support many stream food webs. This likewise would reduce fish (and other aquatic organism) habitat quality. Overhanging plants provide cover for fish rearing and seeking refuge along the streambanks. Over 80 percent of both streambanks have either reed canarygrass or willows, identified as obstructing flow hanging over the channel (2010b King County). Reed canarygrass, while undesirable from a native plant and diversity ecological perspective, does provide abundant cover for fish and it also shades the water to reduce water temperature.

The entire project length would have its flow obstructing overhanging and in-stream vegetation removed. Fish and other aquatic organisms would lose the habitat provided by overhanging or in-stream vegetation until newly planted riparian areas can again begin to provide these needed functions after a few growing seasons. Typically these types of vegetation removal impacts would be considered temporary because the riparian area cleared would be replanted and would begin to provide the lost functions within a few growing seasons. However, in Table 2, these impacts were also considered permanent due to the lost functions that may not be restored within a few growing seasons. These permanent impacts include lost fish habitat from removal of reed canarygrass and willow. Willow branch complexes have taken 15 to 20 years to establish themselves in this manner and would not replicate pool-forming functions within a few growing seasons. Furthermore, the intent of the proposed riparian buffer plantings is to shade out reed canarygrass, thus the habitat function provided by reed canarygrass would be permanently lost and replaced by different types of vegetation (native plant species) that would likely provide different types of habitat.

In addition, adjacent to Long Marsh Creek, sixteen trees over 6-inch dbh (primarily red alder) would be removed to reconstruct the channel for sediment management. This riparian buffer area would be replanted with native vegetation, but the temporal functional loss associated with removal of mature trees would take years to replace so this is being considered a permanent impact.

4.2. Wetland Impacts

The proposed project would not permanently impact the wetland; however, there would be areas of temporary impacts within the wetland and wetland buffer. These consist of reed canarygrass and willow removal and construction of access roads. The primary wetland functions impacted include loss of grass and shrub habitat that may currently be used by birds, small mammals, amphibians, reptiles, and resident fish during certain times of the year.

This project is not expected to change the amount of wet pasture or wetland in the project vicinity. Because of the high groundwater table in May Valley and no measureable difference in the geographical extent of overbank flooding (just the duration of flooding at the start and end of the rainy season) the wetland should not be affected. To confirm this, King County WLRD has installed five groundwater monitoring wells in various locations throughout the wetland to monitor pre- and post-project groundwater levels.

Table 2: Summary of Stream and Wetland Impacts

Resource	Resource Type	Impact Area	Impact Type	Functional Impact
May Creek Channel	Type F	45,300 square feet**	<i>Permanent Impact</i> Excavation of sediment and reshaping of the May Creek channel.	Alteration of stream channel resulting in the loss of in-stream habitat and complexity.
May Creek Vegetation	Type F	14,500 square feet***	<i>Permanent Impact</i> Removal of in-stream and overhanging willow and reed canarygrass	Loss of in-stream habitat including fish rearing habitat and six pools formed by willow branches.
May Creek Vegetation	Type F	14,500 square feet***	<i>Temporary Impact</i> Removal of in-stream and overhanging willow and reed canarygrass	Loss of hiding cover, loss of thermal cover, loss of bank stability, loss of surface water runoff filtration until buffer planting is established.
May Creek Floodplain	Type F	May Creek	<i>Permanent Impact</i> Reduced connection between May Creek and the floodplain.	The reduced connection of May Creek to its floodplain in May Valley will result in loss of off-channel rearing and refuge habitat for coho salmon and trout during smaller flow events.
May Creek Sediment Transport	Type F	May Creek	<i>Temporary Impact</i> Increased sediment transport downstream to May Canyon and Lake Washington.	During construction and during the first storm event after the construction is complete, the following impacts may occur: 1. Increased turbidity. 2. Spawning gravels or salmon redds covered with sand or silt (fines). 3. Increased deposition in the alluvial fan in Lake Washington (fines).

Table 2 Continued

Resource	Resource Type	Impact Area	Impact Type	Functional Impact
May Creek Wetland #5	Category II	5,922 square feet	<i>Temporary Impact</i> Fill for construction access roads.	Disturbance to existing wildlife habitat (mostly reed canarygrass), soil compaction.
Buffer*	Wetland Stream	8,992 square feet	<i>Temporary Impact</i> Fill for construction access roads.	Disturbance to existing wildlife habitat (mostly reed canarygrass and pasture grasses), soil compaction.
May Creek / Long Marsh Creek Confluence	Type F	60 linear feet	<i>Temporary Impact</i> Excavation of gravels and change in channel geometry at the confluence.	Disturbance to existing in-stream habitat, including an existing pool at the confluence.
Long Marsh Buffer	Type F	16,520 square feet	<i>Temporary Impact</i> Stream channel excavation, removal of 16 trees over 6" dbh (primarily red alders) as well as ground cover.	Disturbance of existing stream habitat: 1. Loss of shade 2. Loss of habitat 3. Creation of new off-channel habitat.

* Wetland and stream buffers overlap throughout the project area so for simplicity wetland buffer and stream buffer impacts have been combined.

** This area calculation is based on the width from top of bank to top of bank for the entire length of proposed sediment removal.

*** The area was calculated by using 5,800 linear feet (2,900 linear feet on each bank) and assuming 2.5 feet of disturbance on each bank as part of the invasive vegetation removal. Willow removal is also included in this overall impact area.

5. Mitigation Approach

5.1. Impact Avoidance and Minimization

King County has designed the project to avoid and minimize impacts to wetlands, streams, and buffers to the greatest extent possible. Total avoidance through design was not possible because the purpose of the project is to reduce the duration of flooding on local property owners by removing in-stream channel obstructions. To avoid and minimize impacts during construction, appropriate Best Management Practices (BMPs) would be used. Proposed construction limitations and BMPs include the following:

1. Construction would comply with the King County (2009) Surface Water Design Manual for erosion and sediment-control features. Erosion- and sediment-control features include the use of ground covers such as plastic, fabrics (jute, excelsior, woven straw, or synthetic fiber), hydroseeding, sediment traps, silt fences, check dams, inlet protection and other proven techniques for minimizing erosion and sedimentation. The temporary sediment and erosion control (TESC) plan prepared for the project would include standard BMPs as well as site-specific measures to prevent and control erosion within the project area.
2. A Spill Prevention Control and Countermeasures (SPCC) Plan would be prepared prior to start of construction to address specific potential sources of spills, spill prevention and containment methods, spill response procedures and on-site materials and equipment, reporting, site security measures, and inspection procedures.
3. When practicable, all equipment fueling and maintenance would occur outside the wetland, stream, and buffer. All vehicles operated within sensitive areas would be inspected daily for fluid leaks before leaving the vehicle staging area. Any leaks detected would be repaired before the vehicle resumes operation. When not in use, vehicles would be stored in the vehicle staging areas outside the buffers.
4. The contractor would install temporary high-visibility fencing and silt fencing to demarcate and protect critical areas in the approved TESC plan. Any work that is required in critical areas would only be done at the engineer's direction and per the design plans. When the fencing is no longer needed, or at the engineer's direction, the contractor would completely remove and dispose of temporary high-visibility fencing and silt fencing.
5. Whenever possible, construction equipment would use existing farm access roads to cross the wetland and access the stream.
6. When wetland or stream access is needed outside of existing farm roads tracked or rubber tired machinery would be used to minimize ground disturbance and to

avoid the need to construct additional access roads. Direct access to the stream channel by equipment would only be allowed in specific areas where disturbance to vegetation can be minimized and removal of mature trees can be avoided.

7. In-water work would be done during low-flow stream conditions, in accordance with the regulatory in-stream work window.
8. During the sediment removal, the stream would be temporarily diverted around the work area as part of the temporary erosion- and sediment-control plan. This diversion may involve using one or more gas-powered pumps to remove water from the channel just upstream of the work area. The water would then be discharged downstream of the work area, in a safe, non-erosive manner.
9. May Creek would be protected during construction of the off-channel alcoves by leaving an earth plug between the existing stream channel and the excavation area for the alcove. Prior to removing the earth plug and connecting the alcove to the existing channel, a turbidity curtain would be installed to protect the stream from sediment and turbidity during the connection.

A more detailed description of construction BMPs can be found in the project's *Construction Water Quality Protection and Monitoring Plan* (King County July 2011).

5.2. Compensatory Mitigation

Impacts that cannot be avoided and minimized must be compensated for by constructing compensatory mitigation. The majority of the impacts to May Creek, Long Marsh Creek and the associated wetlands would occur in unincorporated King County, while the compensatory mitigation would be constructed in both King County and the City of Renton.

5.2.1. Mitigation Ratios

The wetland impacts associated with this project are all temporary, and all the impacted wetland areas would be restored to equivalent or better function after construction. For this reason, mitigation ratios for wetlands were not applied to this project.

King County and City of Renton mitigation requirements for streams are approximately equivalent (King County Code 21A.24.380 and City of Renton Municipal Code 4-3-050-L1), with King County Code being slightly more stringent. For this reason, and because the majority of the stream impacts are located in King County, King County mitigation ratios are referenced in this report. The King County Critical Area Code specifies that any mitigation for impacts to streams must achieve equivalent or greater functions. Typically a 1:1 mitigation ratio is applied for in-kind stream mitigation performed onsite; however, the project cannot offer onsite in-kind stream mitigation because adding

mitigation in the May Creek channel conflicts with project goal of flood reduction. For this reason, onsite out-of-kind mitigation in the form of riparian buffer and wetland enhancement is being proposed to compensate for in-stream impacts. King County and City of Renton code does not provide specific mitigation ratios for out-of-kind mitigation, but because out-of-kind mitigation replaces different functions from those that are impacted, the replacement ratios typically must be higher in order for mitigation to achieve equivalent or greater functions.

For this project, the proposed replacement ratio is approximately three acres of wetland enhancement for one acre of in-stream impact to the May Creek channel (3:1 ratio). The proposed replacement ratio for impacts to in-stream and riparian vegetation is approximately two acres of riparian buffer planting for 1/3 acre impact to May Creek vegetation (6:1 ratio). The proposed replacement ratio for impacts to trees along Long Marsh Creek is approximately 2 trees replanted for each tree removed (2:1).

5.2.2. Mitigation Functions

The proposed compensatory mitigation (Table 3) is focused on enhancing wetland and riparian habitat functions in May Valley. The wetland enhancement includes off-channel alcoves that would increase fish habitat complexity in the wetland during high flows and would partially replace some in-stream habitat functions lost due to the in-stream sediment and vegetation removal. The wetland enhancement also includes suppression of reed canarygrass and replanting of native vegetation, which would improve general wildlife habitat complexity in May Valley.

The riparian buffer planting would improve buffer function in the long-term by minimizing reed canarygrass infestation and providing native vegetation that would shade the stream, provide bank stability, capture sediment from pasture runoff, and provide wildlife habitat. The riparian buffer plantings would be installed in many areas where only reed canarygrass or pasture grass currently exists.

While the proposed mitigation does not provide the same functions as those being impacted (impacted functions are primarily in-stream habitat while mitigation is focused on wetland/riparian habitat function), it does provide an improvement over existing conditions over a large area (approximately 5 acres total). A more detailed discussion of the functions provided by the mitigation is provided in Section 5.5.

The mitigation proposed for this project is summarized in Table 3.

Table 3: Mitigation Ratios and Proposed Mitigation Areas

Impacted Resource	Impact Area	Impact Type	Proposed Mitigation	Proposed Replacement Ratio
May Creek Channel	45,300 square feet	<i>Permanent</i> Excavation of sediment and reshaping of the May Creek channel.	3 acres of out-of-kind wetland enhancement west of 148th Avenue SE including off-channel alcoves, reed canarygrass suppression, replanting with native vegetation, and LWD placement.	3:1
May Creek Vegetation	14,500 square feet	<i>Permanent and Temporary</i> Removal of in-stream and overhanging willow and reed canarygrass.	2 acres of riparian/wetland buffer planting for 15 feet on both sides of May Creek, protected by fencing (to restrict livestock access) and permanent conservation easements.	6:1
May Creek Floodplain	May Creek	<i>Permanent</i> Reduced connection between May Creek and the floodplain	Compensation is included in the 3.0 acres of proposed wetland enhancement west of 148th Avenue SE by constructing off-channel alcoves to provide fish habitat during higher flows.	Included in the 3:1 ratio above.
May Creek Sediment Transport	May Creek	<i>Temporary</i> Increased sediment transport downstream to May Canyon and Lake Washington.	Off-channel alcoves in the wetland enhancement area would provide sediment storage for the temporary pulse.	Included in the 3:1 ratio above.
May Creek Wetland #5	5,922 square feet	<i>Temporary</i> Fill for construction access roads.	Construction access areas would be restored to previous condition using native plants or appropriate seed mixes.	Area would be restored.

Table 3 Continued

Impacted Resource	Impact Area	Impact Type	Proposed Mitigation	Proposed Replacement Ratio
Buffer*	8,992 square feet	<i>Temporary</i> Fill for construction access roads.	Construction access areas would be restored to previous condition using native plants or appropriate seed mixes.	Area would be restored.
May Creek / Long Marsh Confluence	16,520 square feet	<i>Temporary</i> Excavation of gravels in May Creek and change in channel geometry at confluence.	Channel and confluence would be reconstructed and restored to include a wider channel with streambed gravels, and LWD.	Area would be restored.
Long Marsh Buffer	16,520 square feet (16 trees greater than 6-inch dbh removed).	<i>Permanent</i> Stream channel excavation, removal of 16 trees over 6” dbh (primarily red alders) and groundcover.	Buffer replanting with 32 trees, 150 willow stakes, and 156 shrubs, and 282 emergents / groundcover.	Area would be restored. Trees Replaced at a 2:1 Ratio

*Wetland and stream buffers overlap throughout the project area so for simplicity wetland buffer and stream buffer impacts have been combined.

5.3. Compensatory Mitigation Goals

The mitigation goal for this project is to achieve no overall net loss in habitat functions in the May Creek subbasin.

5.4. Compensatory Mitigation Objectives

The objectives listed in this section were selected after analyzing multiple potential mitigation alternatives. Some of the mitigation alternatives considered but not selected included:

- In-stream LWD: Enhancement to in-stream habitat by placing LWD in the stream channel was considered, but this option was eliminated because placing LWD in the channel is counterproductive to the primary project goal of removing flow obstructions. As a compromise, LWD would be placed in off-channel alcoves adjacent to the stream where it would not obstruct flow, but would provide habitat during higher flows (see Objective 1 below) and would also be placed throughout the wetland enhancement area.
- Side Channels/Floodplain Terraces: Creation of side channels and/or floodplain terraces in the open space area west of 148th Avenue SE was considered, but this option was eliminated due to the lack of elevation change and potential for sediment accumulation on this property. The lack of elevation change and sediment accumulation posed a potential risk of fish stranding in side channels and terraces during the summer low-flow.

The final mitigation objectives for the project include:

1. Objective 1 – Wetland Habitat: Enhance approximately three acres of riverine wetland on the west side of 148th Avenue SE to increase fish habitat complexity during high flows and general wildlife habitat complexity year-round.
Enhancement would include:
 - a. Construction of approximately 0.24 acres of off-channel alcoves along May Creek with emergent wetland vegetation, LWD (16 pieces), two snags, and streambed gravels.
 - b. Suppression of approximately three acres of reed canary grass using weed fabric, planting of native wetland vegetation, and placement of LWD (60 pieces).
2. Objective 2 – Riparian Habitat: Enhance approximately two acres of riverine wetland/riparian buffer by suppressing invasive species and planting a 15-foot wide fenced buffer of native vegetation along both banks of May Creek

throughout the project limits (approximately 2,900 linear feet) east and west of 148th Avenue SE.

5.5. Compensatory Mitigation Description / Design

Compensatory mitigation for temporary wetland impacts and permanent stream impacts along May Creek would focus on restoring wetland and riparian habitat in May Valley. Please note that in the majority of the project area, the stream buffer for May Creek is contained within the delineated wetland boundary. For this reason the riparian enhancement could also be considered wetland enhancement, but they are discussed separately below.

5.5.1. Riparian Enhancement Area

The riparian enhancement area encompasses a 15-foot wide planting area along each side of May Creek for the entire project length (approximately 2,900 linear feet) for a total of approximately two acres.

In planting areas where reed canarygrass is the dominant vegetation, the grass would first be mowed if necessary, and covered with a weed barrier fabric intended to shade out the grass in the short-term. The new plants (primarily trees and willow stakes) (Appendix A - Sheet 18) would be planted through the temporary weed barrier fabric. This would improve long-term function of the riparian area as a whole by establishing populations of tree and shrub species that would, in time, serve as perches, nesting habitat, snags and provide a native seed bank. Establishing vegetation would also create a dynamic stability to the stream bank and would help filter out sediment that is suspended in runoff from the adjacent farms and pastures.

5.5.2. Wetland Enhancement Area

The wetland enhancement area is located on the west side of 148th Avenue SE (Appendix A – Sheet 14) in a designated open-space tract in the City of Renton owned by the Stonegate Homeowners Association. In addition to the riparian buffer planting described in the previous section, approximately three more acres of enhancements would be constructed on the west side of 148th Avenue SE and include:

1. In-stream Enhancements: Approximately 0.24 acre of off-channel alcoves would be constructed along May Creek in the wetland on the west side of 148th Avenue SE. The existing banks would be replaced with a terrace (wide bench) and gradual slopes. Within this terrace, an alcove would be created that incorporates woody debris (Appendix A – Sheet 14) and streambed gravels would be placed for the first 15 feet adjacent to May Creek. Jute matting would be placed in the alcoves beyond 15 feet to minimize erosion, and the alcoves would be densely planted with emergent and scrub-shrub wetland plants. This would increase the amount of available instream habitat and would decrease flow velocities, thus improving the

quality of off-channel overwintering habitat. During a flood, water would inundate the terrace and interact with the woody debris and vegetation. Sediment deposition would occur outside of the main channel in the alcoves. The woody debris and vegetation would trap and hold sediment and then allow a more gradual pulsing of sediment back into the channel over time.

This mitigation would improve winter rearing habitat for salmonid and other fish species in areas adjacent to the mainstem of May Creek. The mitigation would increase biological functions for riparian species within May Creek through introduction of woody debris; woody debris would also provide substrate for invertebrates, hiding habitat for juvenile fish, perching habitat for riparian birds, and desirable niches for river otters, other mammals, and crustaceans.

The proposed mitigation is also designed to enhance refuge and rearing habitat through the establishment of habitat features along May Creek. Such enhancements would make these habitat features available to salmonids and other wildlife species at a wider range of flow rates on May Creek. In addition, willows and other native shrubs would be planted along streambanks and confluence margins to increase cover of overhanging branches above the waterways. Lastly, the removal of reed canarygrass and root system from the floodplain would create additional area for sediment deposition, thereby allowing some decrease in fines downstream.

2. Wetland Habitat Enhancements: In addition, to the 0.24 acres of off-channel alcoves, approximately 2.75 acres of wetland habitat enhancement would occur on the west side of 148th Avenue SE. In this area, reed canarygrass would be suppressed using a weed barrier fabric and native vegetation (cottonwood, willow, and dogwood) would be planted through the fabric. LWD (76 pieces) would also be placed throughout the wetland. These activities would improve the wildlife habitat complexity in the wetland, providing habitat for mammals and riparian birds. It would also increase the native seed bank in May Valley and provide a future source for LWD.

6. Performance Standards, Monitoring, Maintenance, and Contingencies

King County WLRD would provide monitoring services during and after construction of the proposed project.

6.1. Performance Standards

1. Regulated Noxious Weeds: If noxious weeds are discovered during monitoring, they would be treated according to currently established standards.
2. Invasive Weeds: The percentage of buffer and wetland planting areas covered by non-regulated invasive weeds would not exceed ten percent through the monitoring period, except for reed canarygrass. Due to the existing 100-percent coverage of reed canarygrass in the project area, it would not be possible to achieve less than ten percent coverage of this species during the monitoring period. Over the long-term, reed canarygrass would be reduced in density by meeting the *Vegetation Coverage* performance standard below.
3. Vegetation Coverage: Within the wetland and buffer planting areas, woody native vegetative cover shall be 80% by the end of the monitoring period.
4. Vegetation Survival: Within the wetland and buffer planting areas, inspections for plant mortality would be conducted annually by an ecologist during the monitoring period. During monitoring years one and two, 100 percent of dead plants would be replaced. During subsequent monitoring years, dead plants would be replaced as needed to ensure that coverage performance standards are met.

6.2. Monitoring

Construction Monitoring

Construction-phase monitoring would focus on protection of water quality and important vegetation that is to be preserved. King County WLRD prepared a *Construction Water Quality Protection and Monitoring Plan* (King County July 2011) which describes the construction monitoring techniques and best management practices that would be utilized to monitor and protect water quality.

Post-construction Monitoring

During the first year after construction an As-Built report will be prepared and submitted to the agencies.

Vegetation would be monitored throughout the ten-year monitoring period. Post-construction monitoring would be conducted to establish whether performance standards

for the mitigation have been met. Monitoring reports would be submitted at the end of years one, two, three, five, seven, and ten. These reports would describe and, to the extent possible, quantify the level of success of the mitigation. Data collected on physical and biological parameters would be compared to the established performance standards defined in Section 6.1.

6.3. Maintenance

All planted areas would be watered through the first year of installation as needed. Other maintenance activities would be performed for ten years as needed, including weeding, watering and fabric maintenance. After vegetation has matured enough to reduce the reed canarygrass density (about two to three growing seasons) the weed fabric would be removed by hand.

6.4. Protection

The mitigation areas would be fully fenced to restrict livestock access and would be demarcated with wetland protection signage. King County would also protect the mitigation areas in perpetuity by recording a conservation easement, or similar document, on the title of each property.

6.5. Contingencies

Based on the data collected during annual monitoring of the completed mitigation site, it may be necessary to implement contingency measures to ensure that the established mitigation performance standards are met. These include mitigation objectives for plant survival, vegetation cover, and amount of invasive species, all of which help to define viable riparian functions. Several factors, both artificial and natural, could have detrimental effects on the success of the mitigation sites. These factors include changes in hydrology from drought or flooding, water pollution from excessive nutrients or toxicants, erosion of soil during flood events, plant mortality, and competition from invasive plants.

King County would commit to the maintenance, monitoring, reporting, and the replacement of dead plants as required to meet the established performance standards for plant cover and survival and for measures to control invasive species.

7. References

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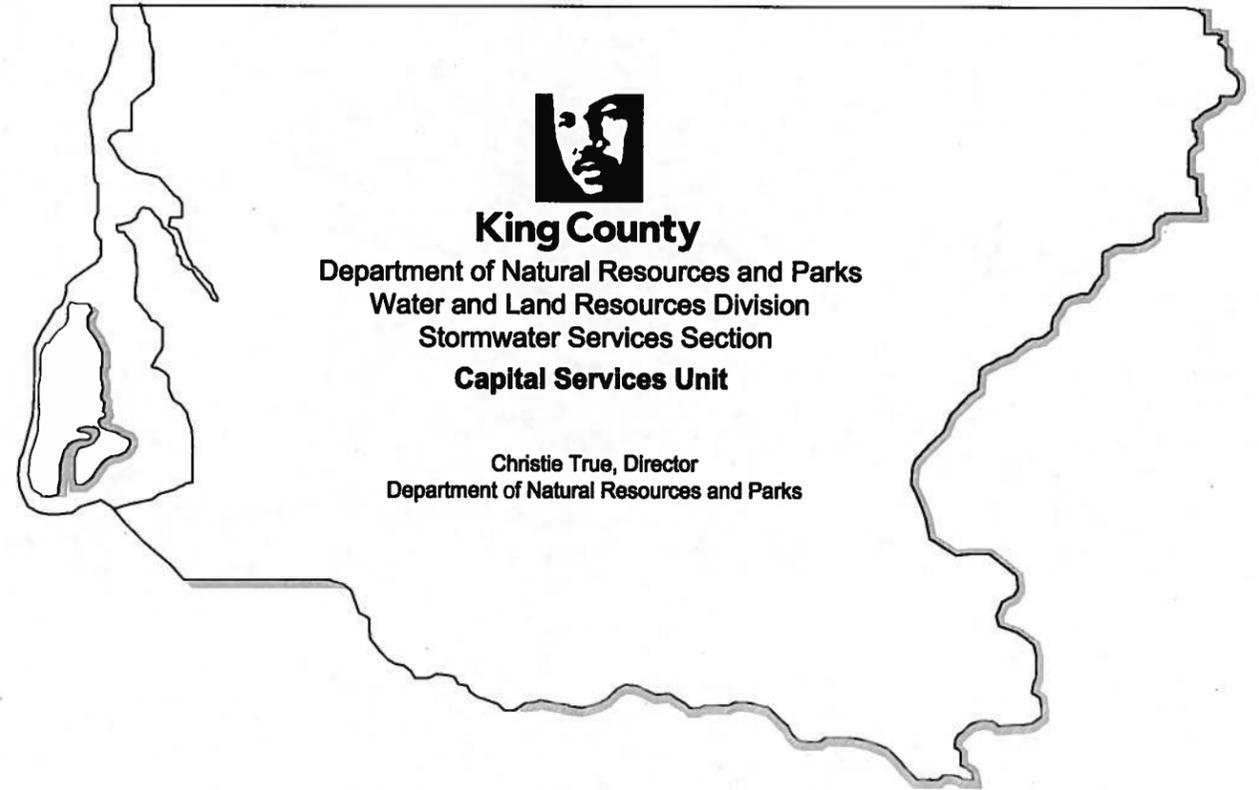
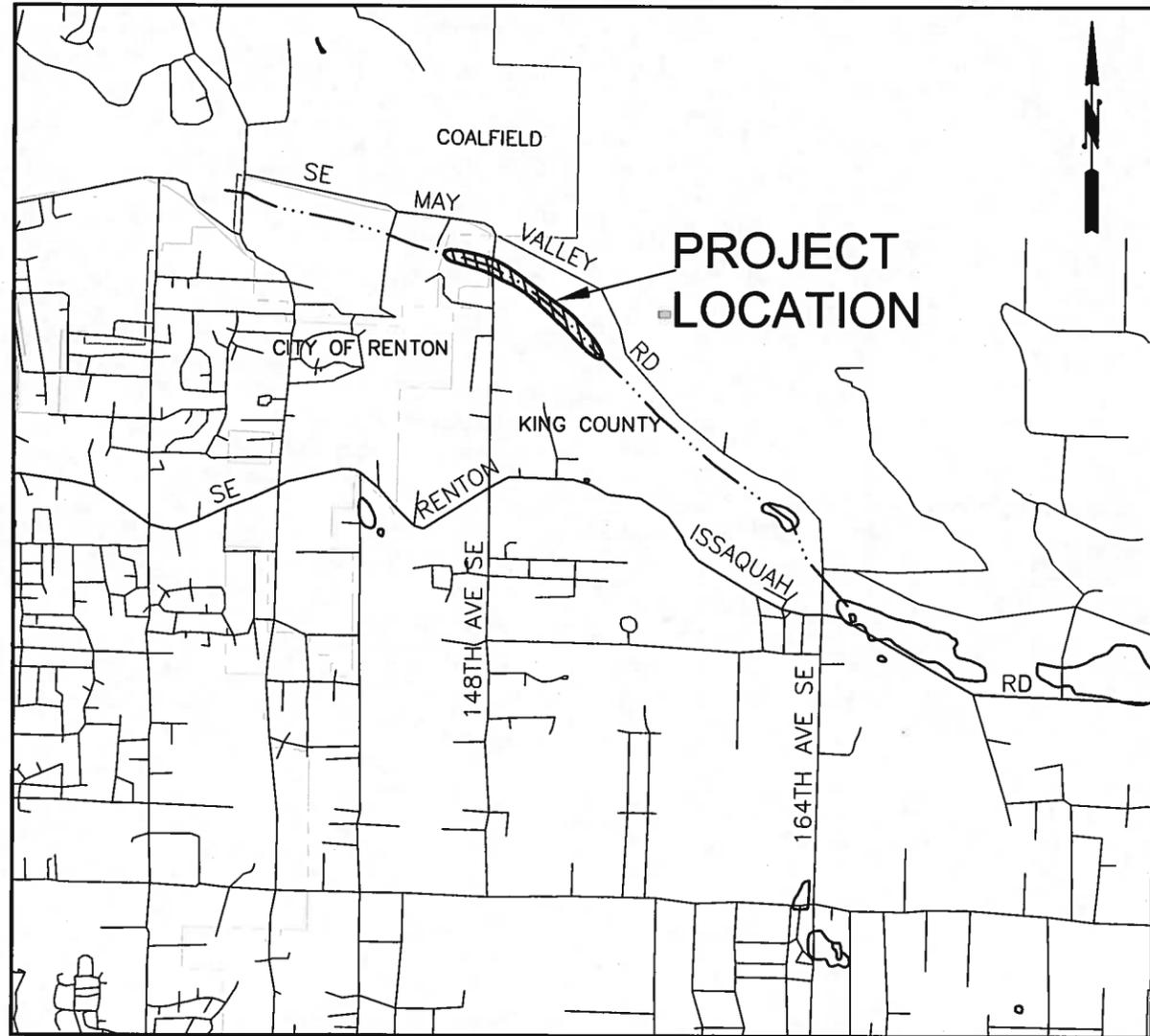
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Appendix A – May Creek Drainage Improvement Design Plans

VICINITY MAP



MAY CREEK DRAINAGE IMPROVEMENT
SE May Valley Rd. + 148th Ave SE

INDEX

SHEET	DESCRIPTION
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4.	EXISTING CONDITIONS, SHEET KEY, LEGEND, CONSTRUCTION NOTES
5.	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN AND LEGEND
6.	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN
7.	TESC SEDIMENT DISPOSAL AND PUMPING LOCATIONS (draft version)
8.	TEMPORARY EROSION AND SEDIMENT CONTROL NOTES AND DETAILS
9.	TEMPORARY EROSION AND SEDIMENT DETAILS
10.	PLAN AND PROFILE STA. 0+00 TO STA 8+00
11.	PLAN AND PROFILE, STA. 8+00 TO STA. 16+20
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14.	WETLAND AND RIPARIAN MITIGATION PLAN
15.	CROSS SECTIONS AND HABITAT MITIGATION DETAILS
16.	CROSS SECTIONS AND HABITAT MITIGATION DETAILS
17.	FISH HABITAT ENHANCEMENT INSTALLATION DETAILS AND NOTES
18.	PLANTING TABLES
19.	PLANTING PLAN

FIELD BOOK:	09056	01-2010
SURVEYED:	KING COUNTY	01-2010
SURVEY BASE MAP:	KING COUNTY	02-2010
CHECKED:	TREVOR CRAY, PLS	02-2010
	DALE NELSON	02-2010

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9-12-11

NUM.	REVISION	BY	DATE

APPROVED:	DON ALTHAUSER, P.E.	9/2011
PROJECT MANAGER:	DOUG CHIN	9/2011
DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

KCFCZD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT
VICINITY MAP AND INDEX

SHEET
1
OF
19
SHEETS

2006-16

SYMBOL	DESCRIPTION	EXISTING	SYMBOL	DESCRIPTION
●	MONUMENT IN CASE (MIC)		---	EXISTING DRIVEWAY, EDGE OF ASPHALT
■	HUB AND TACK		---	PROPERTY LINE
⊕	REBAR AND CAP KING COUNTY		—OHW—OHW—	O.H.W.M. LINE
●	BERNTSEN NAIL		-x-x-x-x-x-	FENCE- WIRE, BARBED WIRE, SPLIT RAIL
●	FORMER FENCE POSTS, GATE POSTS		—o—o—o—o—o—o—	GUARDRAIL
—	EXISTING LOGS		---	TOE OF CHANNEL -MAY, LONG MARSH, AND INDIAN MEADOW CREEKS
○	UTILITY POLE WITH OR WITHOUT UNDERGROUND CONNECTIONS		---	ROCK RETAINING WALL AT TSEGAY ENTRANCE
↑	GUY WIRE		—v—v—v—	EXISTING WETLAND BOUNDARY
4	SIGN		---	EXISTING WETLAND BUFFER
⊕	TELEPHONE RISER		---	EXISTING STREAM BUFFER
⊗	WATER VALVE		---	100 YR. FLOODPLAIN LINE
●	LARGE ROCK/BOULDER			
☼	TREE DECIDUOUS			
★	SNAG (DEAD TREE)			
★	TREE BUSH/SHRUB			
★	TREE EVERGREEN			

DESIGN LEGEND

	SEDIMENT REMOVAL AREA
	IN-STREAM WILLOW PRUNING AREA
	PLANTING MITIGATION LINE (15' BUFFER) and PROPOSED CONSERVATION EASEMENT
	CONSERVATION EASEMENT/PLANTING MITIGATION FENCING

ABBREVIATIONS

ABBREVIATION	DEFINITION
SEC	SECTION
TWN	TOWNSHIP
R. E	RANGE EAST
W.M.	WILLAMETTE MERIDIAN
STA.	STATION
R-O-W	RIGHT OF WAY



**TEMPORARY
EROSION
SEDIMENTATION
CONTROL**

SYMBOL	DESCRIPTION	SYMBOL	DESCRIPTION
	CONSTRUCTION ACCESS ROAD		SPOILS AREA
	STAGING AREA		
—C&G—	CLEARING AND GRADING LIMITS		
—o—o—o—o—o—o—	WEIGHTED SILT CURTAIN		
-x-x-x-x-x-	SILT FENCE		

- NOTES:**
1. PARCEL LINES SHOWN ARE KING COUNTY GIS PARCEL LINES AND ARE SHOWN FOR VISUAL PURPOSES ONLY. THESE PARCEL LINES ARE NOT ACCURATE ENOUGH TO BE USED FOR PURPOSES OF SURVEYING, DEED TAKES, OR ANY OTHER LAND TRANSACTIONS OR DELINEATIONS.
 2. BASIS OF BEARING FOR THIS PROJECT IS N2°01'12"E, THE INVERSE BETWEEN KING COUNTY CONTROL POINTS 3871 (N188995.987, E1318885.925) AND 3705 (N191108.582, E1316780.441)(NAD 83/91 COORDINATE VALUES).
 3. BENCH MARK IS KING COUNTY CONTROL POINT NUMBER 3871, WITH A NAVD88 ELEVATION OF 405.42.

FIELD BOOK:	09056	01-2010
SURVEYED:	KING COUNTY	01-2010
SURVEY BASE MAP:	KING COUNTY	02-2010
CHECKED:	TREVOR CRAY, PLS	02-2010
	DALE NELSON	02-2010

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APPROVED:	DON ALTHAUSER, P.E.	9/2011
PROJECT MANAGER:	DOUG CHIN	9/2011
DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

KCFCZD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT

LEGENDS AND ABBREVIATIONS

SUMMARY OF QUANTITIES

PROJECT LIMITS:

LENGTH: x

ITEM NO.	TOTAL QUANTITY	UNIT	STD. ITEM NO.	ITEM	PROJECT NUMBERS					AS-BUILT	
					X						
				PREPARATION							
				GRADING							
				DRAINAGE							
				STRUCTURES							
				CEMENT CONCRETE PAVEMENT							
				ASPHALT CONCRETE PAVEMENT							
				EROSION CONTROL AND LANDSCAPING							

ITEM NO.	TOTAL QUANTITY	UNIT	STD. ITEM NO.	ITEM	PROJECT NUMBERS					AS-BUILT	
				TRAFFIC							
				OTHER ITEMS							

DRAFT
REVISION
PLEASE HOLD

NOTE: FOR SPECIAL FEATURES SEE SPECIAL PROVISIONS

FIELD BOOK: 09058 01-2010
 SURVEYED: KING COUNTY 01-2010
 SURVEY BASE MAP: KING COUNTY 02-2010
 TREVOR CRAY, PLS 02-2010
 CHECKED: DALE NELSON 02-2010

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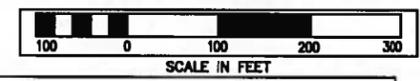
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King County
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 Water and Land Resources Division
 Stormwater Services Section
 Capital Services Unit
Christie Trus, Director

MAY CREEK DRAINAGE IMPROVEMENT

SUMMARY OF QUANTITIES

SHEET
3
OF
19
SHEETS
2006-16

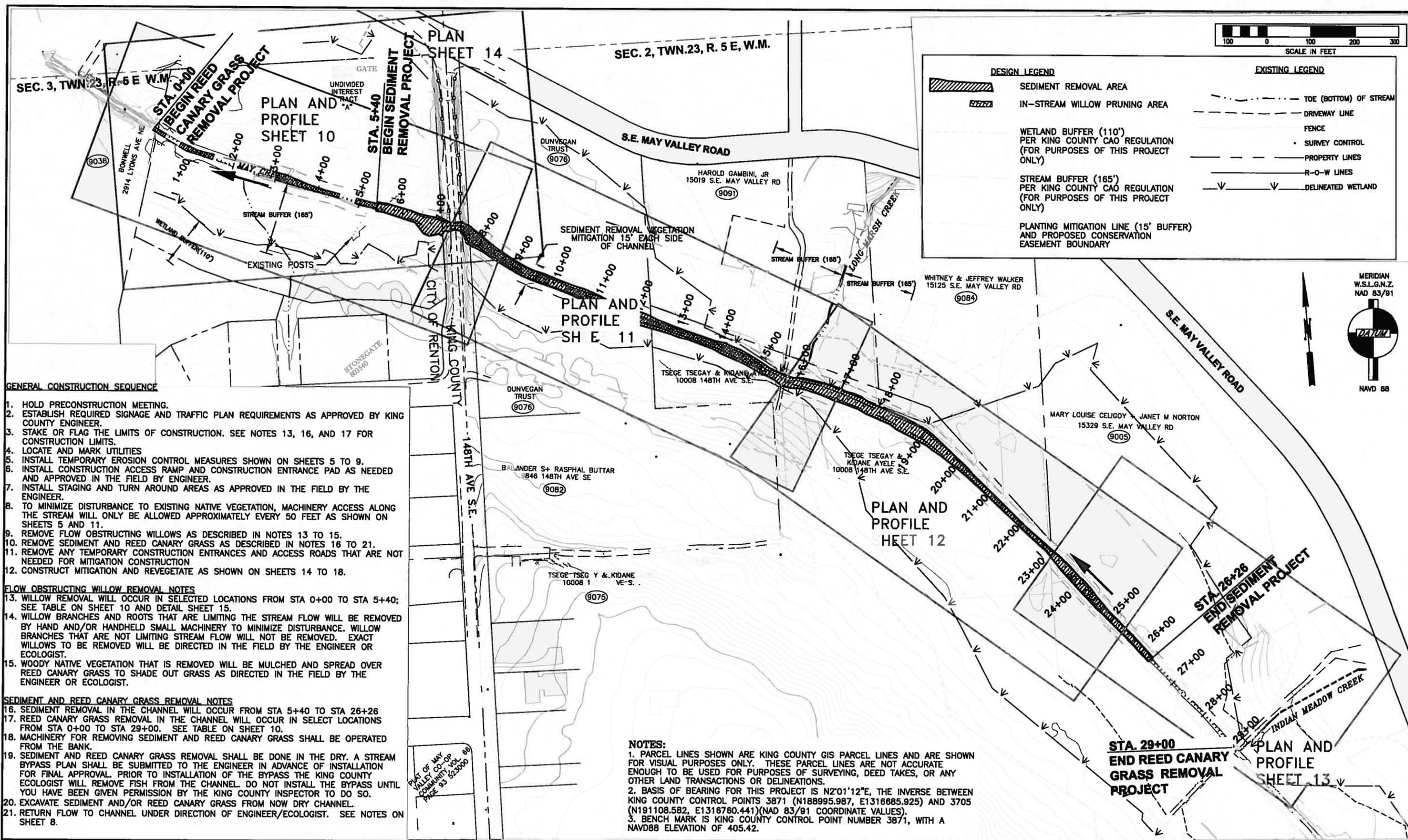


DESIGN LEGEND

- SEDIMENT REMOVAL AREA
- IN-STREAM WILLOW PRUNING AREA
- WETLAND BUFFER (110') PER KING COUNTY CAO REGULATION (FOR PURPOSES OF THIS PROJECT ONLY)
- STREAM BUFFER (165') PER KING COUNTY CAO REGULATION (FOR PURPOSES OF THIS PROJECT ONLY)
- PLANTING MITIGATION LINE (15' BUFFER) AND PROPOSED CONSERVATION EASEMENT BOUNDARY

EXISTING LEGEND

- TOE (BOTTOM) OF STREAM
- DRIVEWAY LINE
- FENCE
- SURVEY CONTROL
- PROPERTY LINES
- R-O-W LINES
- DELINEATED WETLAND



GENERAL CONSTRUCTION SEQUENCE

- HOLD PRECONSTRUCTION MEETING.
- ESTABLISH REQUIRED SIGNAGE AND TRAFFIC PLAN REQUIREMENTS AS APPROVED BY KING COUNTY ENGINEER.
- STAKE OR FLAG THE LIMITS OF CONSTRUCTION. SEE NOTES 13, 16, AND 17 FOR CONSTRUCTION LIMITS.
- LOCATE AND MARK UTILITIES
- INSTALL TEMPORARY EROSION CONTROL MEASURES SHOWN ON SHEETS 5 TO 9.
- INSTALL CONSTRUCTION ACCESS RAMP AND CONSTRUCTION ENTRANCE PAD AS NEEDED AND APPROVED IN THE FIELD BY ENGINEER.
- INSTALL STAGING AND TURN AROUND AREAS AS APPROVED IN THE FIELD BY THE ENGINEER.
- TO MINIMIZE DISTURBANCE TO EXISTING NATIVE VEGETATION, MACHINERY ACCESS ALONG THE STREAM WILL ONLY BE ALLOWED APPROXIMATELY EVERY 50 FEET AS SHOWN ON SHEETS 5 AND 11.
- REMOVE FLOW OBSTRUCTING WILLOWS AS DESCRIBED IN NOTES 13 TO 15.
- REMOVE SEDIMENT AND REED CANARY GRASS AS DESCRIBED IN NOTES 16 TO 21.
- REMOVE ANY TEMPORARY CONSTRUCTION ENTRANCES AND ACCESS ROADS THAT ARE NOT NEEDED FOR MITIGATION CONSTRUCTION
- CONSTRUCT MITIGATION AND REVEGETATE AS SHOWN ON SHEETS 14 TO 18.

FLOW OBSTRUCTING WILLOW REMOVAL NOTES

- WILLOW REMOVAL WILL OCCUR IN SELECTED LOCATIONS FROM STA 0+00 TO STA 5+40; SEE TABLE ON SHEET 10 AND DETAIL SHEET 15.
- WILLOW BRANCHES AND ROOTS THAT ARE LIMITING THE STREAM FLOW WILL BE REMOVED BY HAND AND/OR HANDHELD SMALL MACHINERY TO MINIMIZE DISTURBANCE. WILLOW BRANCHES THAT ARE NOT LIMITING STREAM FLOW WILL NOT BE REMOVED. EXACT WILLOWS TO BE REMOVED WILL BE DIRECTED IN THE FIELD BY THE ENGINEER OR ECOLOGIST.
- WOODY NATIVE VEGETATION THAT IS REMOVED WILL BE MULCHED AND SPREAD OVER REED CANARY GRASS TO SHADE OUT GRASS AS DIRECTED IN THE FIELD BY THE ENGINEER OR ECOLOGIST.

SEDIMENT AND REED CANARY GRASS REMOVAL NOTES

- SEDIMENT REMOVAL IN THE CHANNEL WILL OCCUR FROM STA 5+40 TO STA 26+26
- REED CANARY GRASS REMOVAL IN THE CHANNEL WILL OCCUR IN SELECT LOCATIONS FROM STA 0+00 TO STA 29+00. SEE TABLE ON SHEET 10.
- MACHINERY FOR REMOVING SEDIMENT AND REED CANARY GRASS SHALL BE OPERATED FROM THE BANK.
- SEDIMENT AND REED CANARY GRASS REMOVAL SHALL BE DONE IN THE DRY. A STREAM BYPASS PLAN SHALL BE SUBMITTED TO THE ENGINEER IN ADVANCE OF INSTALLATION FOR FINAL APPROVAL. PRIOR TO INSTALLATION OF THE BYPASS THE KING COUNTY ECOLOGIST WILL REMOVE FISH FROM THE CHANNEL. DO NOT INSTALL THE BYPASS UNTIL YOU HAVE BEEN GIVEN PERMISSION BY THE KING COUNTY INSPECTOR TO DO SO.
- EXCAVATE SEDIMENT AND/OR REED CANARY GRASS FROM NOW DRY CHANNEL.
- RETURN FLOW TO CHANNEL UNDER DIRECTION OF ENGINEER/ECOLOGIST. SEE NOTES ON SHEET 8.

- NOTES:**
- PARCEL LINES SHOWN ARE KING COUNTY GIS PARCEL LINES AND ARE SHOWN FOR VISUAL PURPOSES ONLY. THESE PARCEL LINES ARE NOT ACCURATE ENOUGH TO BE USED FOR PURPOSES OF SURVEYING, DEED TAKES, OR ANY OTHER LAND TRANSACTIONS OR DELINEATIONS.
 - BASIS OF BEARING FOR THIS PROJECT IS N2°01'12"E, THE INVERSE BETWEEN KING COUNTY CONTROL POINTS 3871 (N188995.987, E1316685.925) AND 3705 (N191108.582, E1316760.441)(NAD 83/91 COORDINATE VALUES).
 - BENCH MARK IS KING COUNTY CONTROL POINT NUMBER 3871, WITH A NAVD88 ELEVATION OF 405.42.

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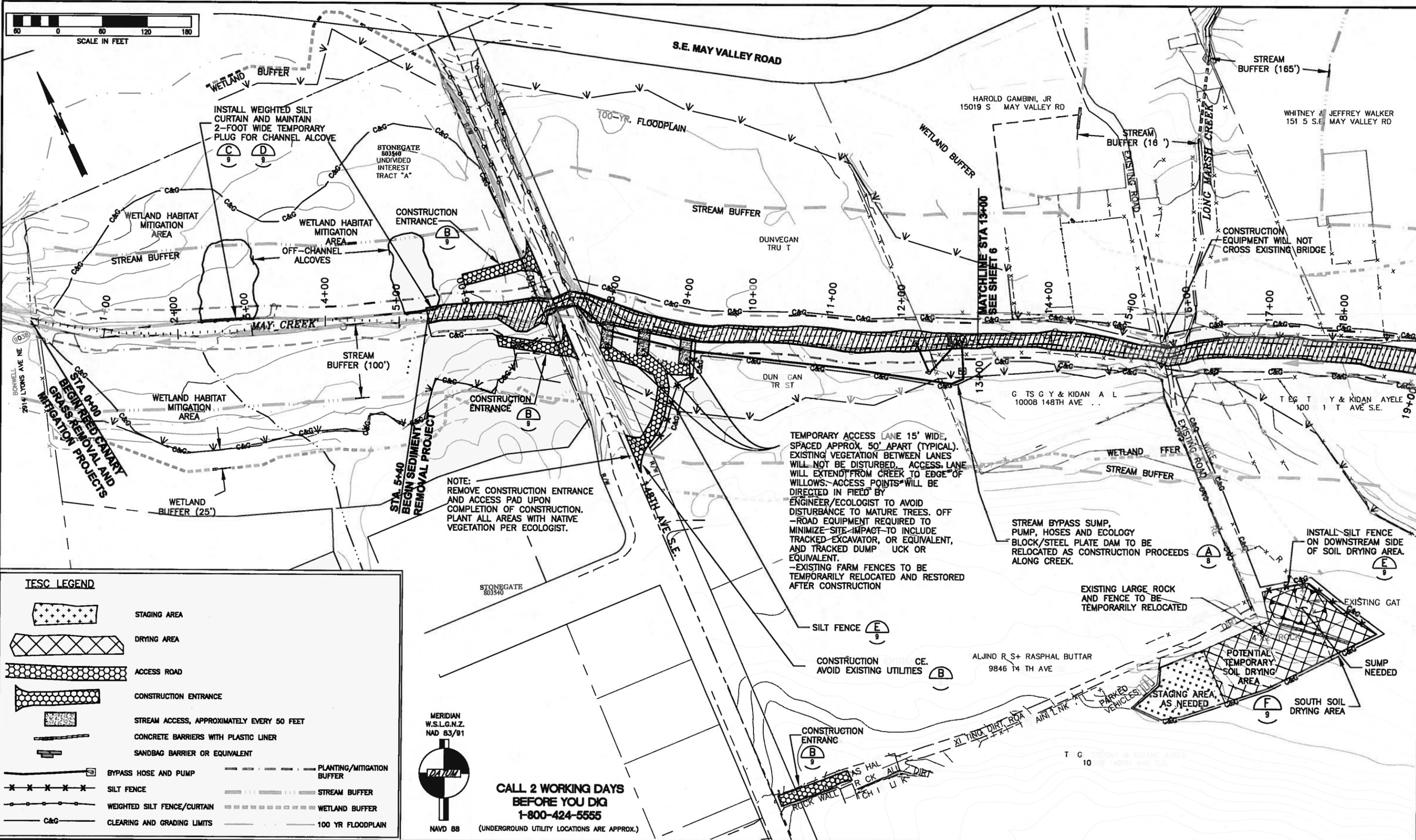
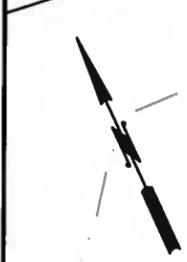
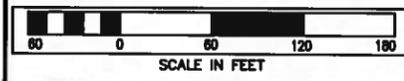
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MAY CREEK DRAINAGE IMPROVEMENT

EXISTING CONDITIONS, SHEET KEY,
LEGEND, CONSTRUCTION NOTES

SHEET
4
OF
19
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2006-16



TESC LEGEND

	STAGING AREA		PLANTING/MITIGATION BUFFER
	DRYING AREA		STREAM BUFFER
	ACCESS ROAD		WETLAND BUFFER
	CONSTRUCTION ENTRANCE		100 YR FLOODPLAIN
	STREAM ACCESS, APPROXIMATELY EVERY 50 FEET		
	CONCRETE BARRIERS WITH PLASTIC LINER		
	SANDBAG BARRIER OR EQUIVALENT		
	BYPASS HOSE AND PUMP		
	SILT FENCE		
	WEIGHTED SILT FENCE/CURTAIN		
	C&G CLEARING AND GRADING LIMITS		



CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-424-5555
 (UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

TEMPORARY ACCESS LANE 15' WIDE, SPACED APPROX. 50' APART (TYPICAL). EXISTING VEGETATION BETWEEN LANES WILL NOT BE DISTURBED. ACCESS LANE WILL EXTEND FROM CREEK TO EDGE OF WILLOWS. ACCESS POINTS WILL BE DIRECTED IN FIELD BY ENGINEER/ECOLOGIST TO AVOID DISTURBANCE TO MATURE TREES. OFF-ROAD EQUIPMENT REQUIRED TO MINIMIZE SITE IMPACT TO INCLUDE TRACKED EXCAVATOR, OR EQUIVALENT, AND TRACKED DUMP TRUCK OR EQUIVALENT. EXISTING FARM FENCES TO BE TEMPORARILY RELOCATED AND RESTORED AFTER CONSTRUCTION

NOTE: REMOVE CONSTRUCTION ENTRANCE AND ACCESS PAD UPON COMPLETION OF CONSTRUCTION. PLANT ALL AREAS WITH NATIVE VEGETATION PER ECOLOGIST.

STREAM BYPASS SUMP, PUMP, HOSES AND ECOLOGY BLOCK/STEEL PLATE DAM TO BE RELOCATED AS CONSTRUCTION PROCEEDS ALONG CREEK.

EXISTING LARGE ROCK AND FENCE TO BE TEMPORARILY RELOCATED

INSTALL SILT FENCE ON DOWNSTREAM SIDE OF SOIL DRYING AREA.

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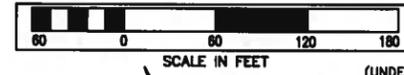
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MAY CREEK DRAINAGE IMPROVEMENT
TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN, LEGEND

SHEET **5** OF **19** SHEETS
2006-16

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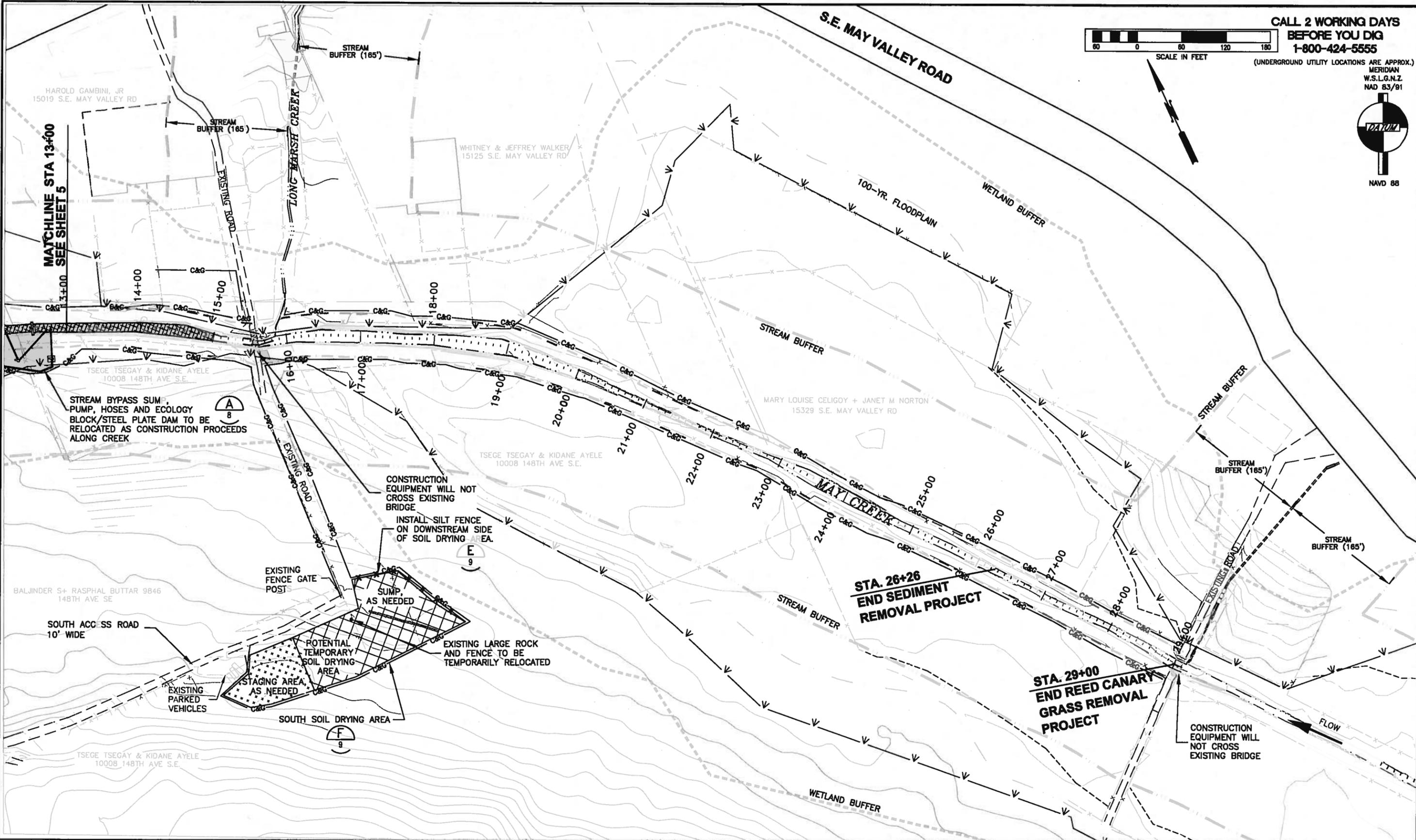


(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

MERIDIAN
W.S.L.G.N.Z.
NAD 83/91



NAVD 88



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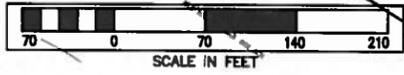
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MAY CREEK DRAINAGE IMPROVEMENT
TEMPORARY EROSION AND SEDIMENTATION CONTROL PLAN

SHEET
6
OF
19
SHEETS
2006-16



EROSION CONTROL SEED MIXES	
WETLAND AREA	
67%	Dwarf Tall Fescue
10%	Seaside Colonial Bentgrass
10%	Meadow Foxtail
5%	Western Mannagrass
6%	Red Fescue
2%	Clover
UPLAND AREA	
20%	Dwarf Tall Fescue
30%	Dwarf Perennial Ryegrass "Barclay"
30%	Red Fescue
10%	White Clover
10%	Colonial Bentgrass

NOTES

1. TURBID WATER DISPERSION AREA: TO PROMOTE INFILTRATION, USE A PERFORATED PIPE MANIFOLD OR EQUIVALENT TO DISPERSE DISCHARGE FLOW OVER THE AREA.
2. THE SEDIMENT DISPOSAL AREAS WILL BE STABILIZED USING THE UPLAND AREA EROSION CONTROL SEED MIX SPECIFIED ON THIS SHEET. TO MINIMIZE THE REMOBILIZATION OF THIS MATERIAL PRIOR TO SEED GERMINATION, A SILT FENCE WILL BE INSTALLED AROUND THE SEDIMENT DISPOSAL AREA AND WILL BE REMOVED ONCE THE GRASS HAS REACHED 80% COVERAGE.

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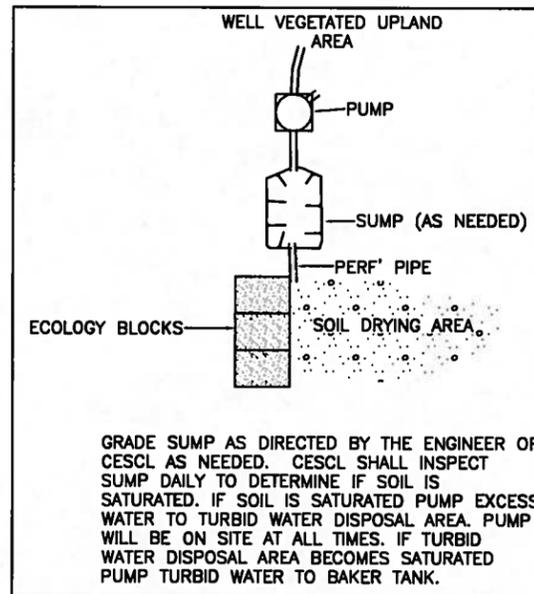
MAY CREEK DRAINAGE IMPROVEMENT

TESC SEDIMENT DISPOSAL AND TURBID WATER DISPERSION LOCATIONS

SHEET
7
 OF
19
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2006-16

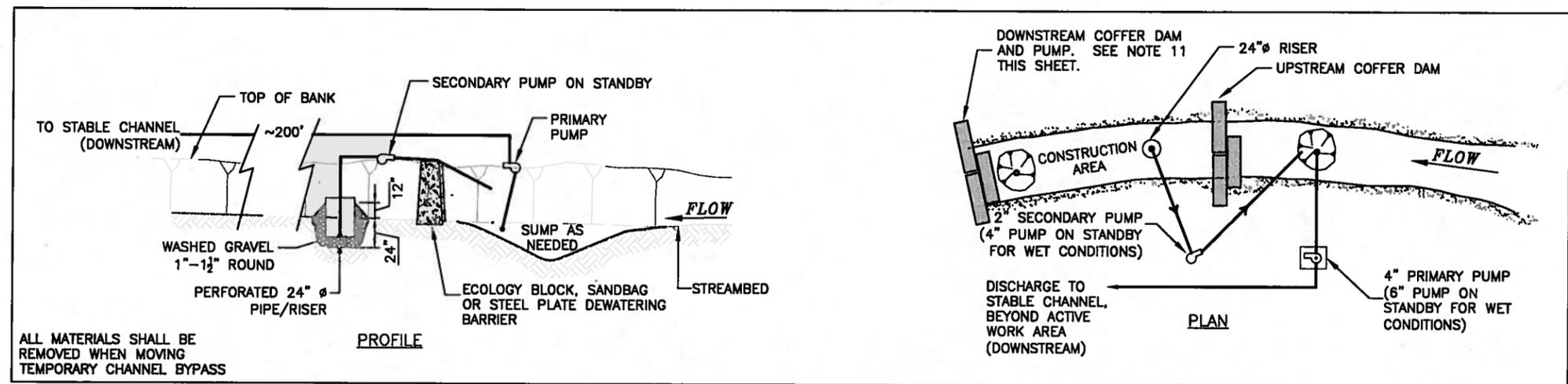
TEMPORARY EROSION AND SEDIMENT CONTROL NOTES:

1. THE IMPLEMENTATION OF THESE ESC PLANS AND THE CONSTRUCTION, MAINTENANCE, REPLACEMENT, AND UPGRADING OF THESE ESC FACILITIES IS THE RESPONSIBILITY OF THE CERTIFIED EROSION SEDIMENT CONTROL LEAD (CESCL) UNTIL ALL CONSTRUCTION IS APPROVED.
2. THE BOUNDARIES OF THE CLEARING LIMITS SHOWN ON THIS PLAN SHALL BE CLEARLY FLAGGED BY SURVEY TAPE OR FENCING, WHERE DETERMINED NECESSARY BY ECOLOGIST, PRIOR TO CONSTRUCTION (2009 SWDM APPENDIX D). DURING THE CONSTRUCTION PERIOD, NO DISTURBANCE BEYOND THE CLEARING LIMITS SHALL BE PERMITTED. THE CLEARING LIMITS SHALL BE MAINTAINED BY THE CERTIFIED EROSION SEDIMENT CONTROL LEAD FOR THE DURATION OF CONSTRUCTION.
3. THE ESC FACILITIES SHOWN ON THIS PLAN MUST BE CONSTRUCTED PRIOR TO OR IN CONJUNCTION WITH ALL CLEARING AND GRADING TO ENSURE THAT THE TRANSPORT OF SEDIMENT TO SURFACE WATERS, DRAINAGE SYSTEMS AND ADJACENT PROPERTIES IS MINIMIZED.
4. THE ESC FACILITIES SHOWN ON THIS PLAN ARE THE MINIMUM REQUIREMENTS FOR ANTICIPATED SITE CONDITIONS. DURING THE CONSTRUCTION PERIOD, THESE ESC FACILITIES SHALL BE UPGRADED AS NEEDED FOR UNEXPECTED STORM EVENTS AND MODIFIED TO ACCOUNT FOR CHANGING SITE CONDITION (e.g. ADDITIONAL COVER MEASURES, ADDITIONAL SUMP PUMPS, RELOCATION OF DITCHES AND SILT FENCES, PERIMETER PROTECTION, ETC.) AS DIRECTED BY THE PROJECT ENGINEER/ECOLOGIST.
5. THE ESC FACILITIES SHALL BE INSPECTED DAILY BY THE CERTIFIED EROSION SEDIMENT CONTROL LEAD AND MAINTAINED TO ENSURE CONTINUED PROPER FUNCTIONING. WRITTEN RECORDS SHALL BE KEPT OF DAILY REVIEWS OF THE ESC FACILITIES.
6. WHERE APPROPRIATE, AREAS OF EXPOSED SOILS, INCLUDING EQUIPMENT ROUTES, THAT WILL NOT BE DISTURBED FOR TWO CONSECUTIVE DAYS DURING THE WET SEASON OR SEVEN DAYS DURING THE DRY SEASON SHALL BE IMMEDIATELY STABILIZED WITH THE APPROVED ESC METHODS (e.g., SEEDING, MULCHING, PLASTIC COVERING, ETC.)
7. TEMPORARY PATHS USED FOR EQUIPMENT ACCESS WILL BE RESTORED TO ORIGINAL CONDITIONS ONCE CONSTRUCTION IS COMPLETED USING THE APPROPRIATE UPLAND OR WETLAND SEED MIX (SHEET 7). ONLY TRACK VEHICLES OR APPROVED EQUIPMENT ARE ALLOWED BEYOND ACCESS, LANDINGS AND STAGING AREAS.
8. ISOLATE MAY CREEK FROM CONSTRUCTION AREA BY USING COFFER DAM, AS DETERMINED FROM SITE CONDITIONS DURING CHANNEL EXCAVATION. INSTALL A CLEAN SUMP UPSTREAM OF COFFER DAM AND PUMP FROM SUMP TO SUITABLE LOCATION AS DETERMINED BY ENGINEER OR ECOLOGIST.
9. SECONDARY PUMP WILL BE USED IF EXCESSIVE GROUNDWATER IS ENCOUNTERED DURING CONSTRUCTION. SECONDARY PUMP WILL BE ON SITE AT ALL TIMES.
10. PUMP SYSTEM/SETUP TO BE FIELD ADJUSTED AS NEEDED AND DIRECTED BY PROJECT ENGINEER/ECOLOGIST.
11. REINTRODUCE STREAM FLOW TO THE EXCAVATED CHANNEL SLOWLY. DO NOT REINTRODUCE FLOW INTO THE EXISTING STREAM UNTIL THE FLOW MEETS STATE WATER QUALITY STANDARDS. PUMP TURBID WATER TO THE DESIGNATED VEGETATED UPLAND AREA OR A BAKER TANK.
12. MOVE PUMP SYSTEM/SETUP DOWNSTREAM AS CONSTRUCTION PROCEEDS AND AS DIRECTED BY PROJECT ENGINEER/ECOLOGIST.
13. MONITOR MAY CREEK UPSTREAM AND DOWNSTREAM OF THE CONSTRUCTION AREA TO MAKE SURE THAT STATE WATER QUALITY STANDARDS ARE MET AT ALL TIMES DURING CONSTRUCTION ACTIVITY. IF WATER QUALITY THRESHOLDS ARE EXCEEDED STOP CONSTRUCTION ACTIVITY AND MODIFY BMP'S TO BECOME COMPLIANT AS DIRECTED BY PROJECT ENGINEER/ECOLOGIST.
14. PRESERVE EXISTING NATIVE VEGETATION IN CLEARING AREA UNDER DIRECTION OF ECOLOGIST.



SOIL DRYING SUMP DETAIL

NTS



**PLAN AND PROFILE VIEWS
TEMPORARY CHANNEL BYPASS
PUMP, DAM AND PIPE DETAIL (TYP.)**

NOT TO SCALE

A
5,6

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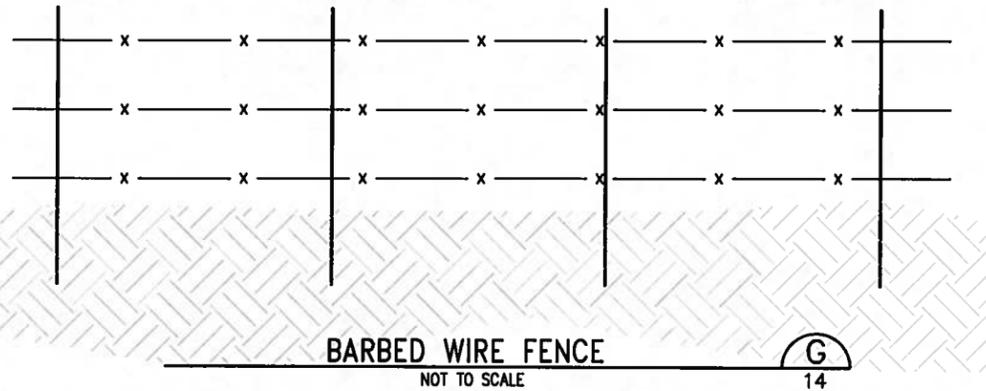
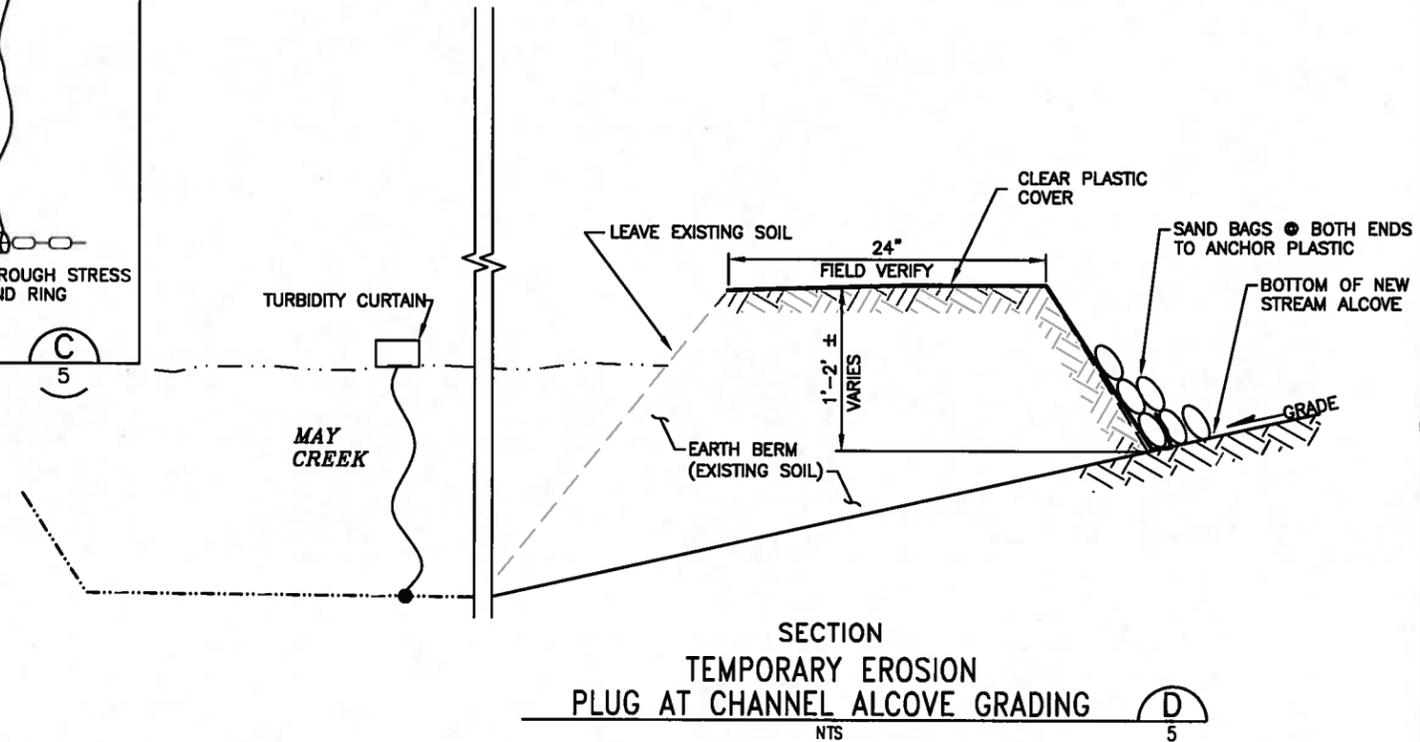
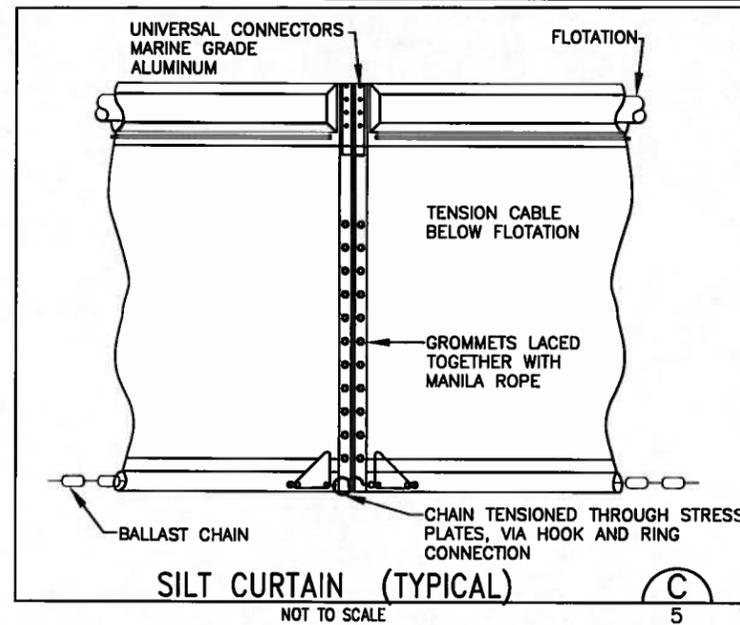
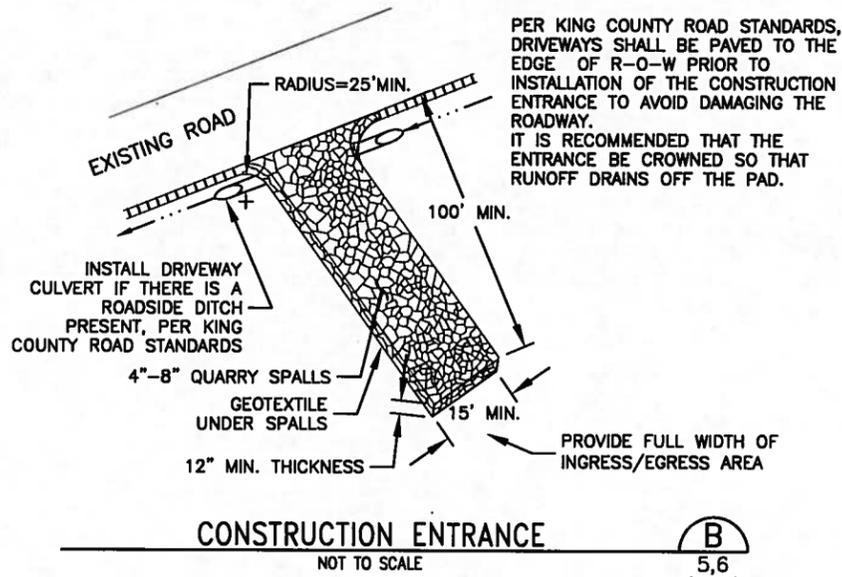
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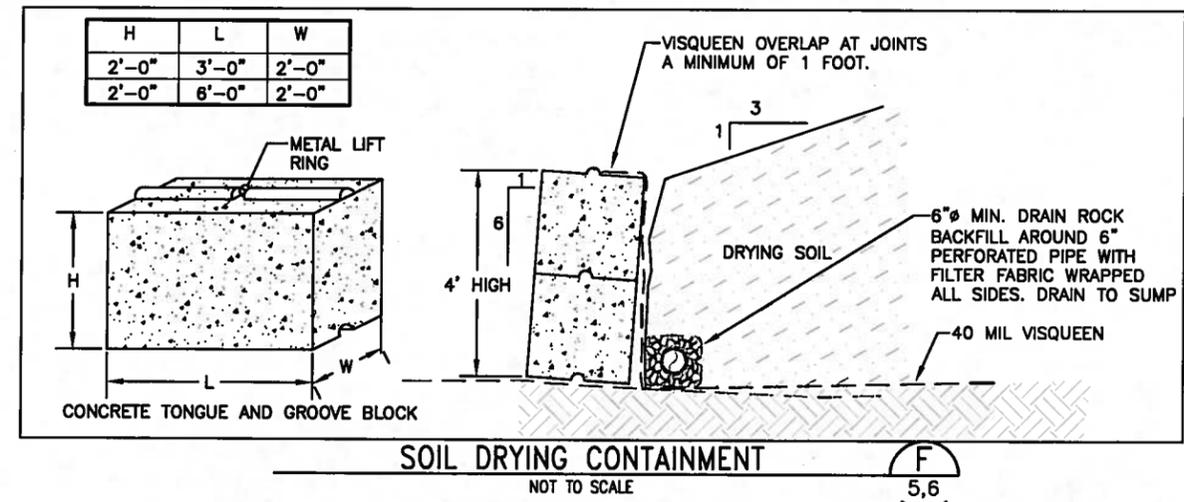
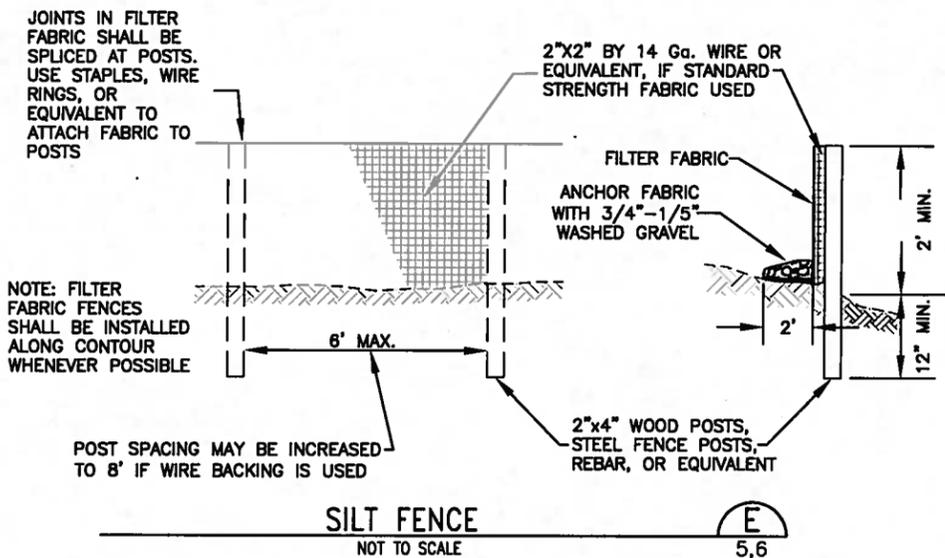
MAY CREEK DRAINAGE IMPROVEMENT

**TEMPORARY EROSION AND SEDIMENTATION
NOTES AND DETAILS**

SHEET
8
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19
SHEETS
2006-16



- BARBED WIRE FENCE INSTALLATION NOTES:**
1. INSTALL ON PERIMETER OF WETLAND MITIGATION AREA PER SHEET 14.
 2. INSTALL ON PERIMETER OF CONSERVATION EASEMENT, BOTH BANKS, FROM STATION 7+50 TO STATION 29+00.
 3. USE EXISTING PROPERTY FENCING WHERE AVAILABLE.

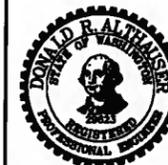


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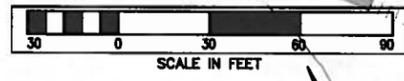
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MAY CREEK DRAINAGE IMPROVEMENT
TEMPORARY EROSION AND SEDIMENT CONTROL DETAILS



STA. 0+00 BEGIN REED CANARY GRASS EMOVAL PROJECT

REMOVE VEGETATION OBSTRUCTING CHANNEL FLOW AND REED/CANARY GRASS AT THE DIRECTION OF ECOLOGIST OR ENGINEER PER VEGETATION REMOVAL CROSS SECTION DETAIL ON SHEET 15 AND TABLE 2 ON THIS SHEET.

NOTES:
 1. SEDIMENT REMOVAL FROM STA. 5+40 TO STA. 26+26
 2. STAGING AREA SHOWN ON SHEET 5 (SEGAY PROPERTY)

REMOVE SEDIMENT STA. 5+40 TO 26+26 SEE TYPICAL SECTION SHEET 15

MATCHLINE STA 8+00 SEE SHEET 11

PRUNE IN STREAM VEGETATION AT STATIONS LISTED IN TABLE 1 BELOW AND PER VEGETATION REMOVAL CROSS SECTION DETAIL SHEET 15

TABLE 1
Stationing of the In-Stream Willow Pruning for May Creek

Station From	Station To

TABLE 2
Stationing of the In Stream Reed Canary Grass Removal

Station From	Station To
0+30	0+70
1+50	3+00
4+50	4+90
26+26	29+00

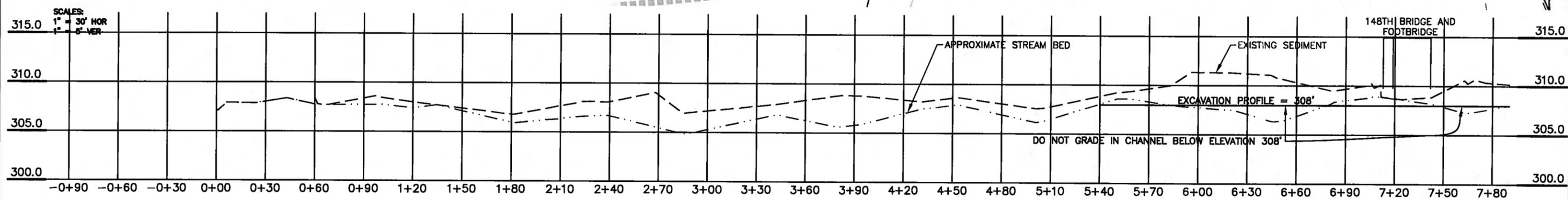
TABLE 3
Stationing of Sediment and Vegetation Removal

Station From	Station To
5+40	26+26

APPROX. LOCATION GREEN CREEK

STA. 5+40 BEGIN SEDIMENT REMOVAL PROJECT

EXISTING GUYWIRE



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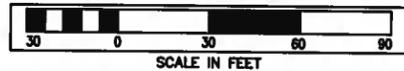
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APPROVED:	DON ALTHAUSER, P.E.	9/2011
PROJECT MANAGER:	DOUG CHIN	9/2011
DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

KCFCZD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT
 PLAN AND PROFILE
 STA 0+00 TO STA 8+00



NOTE:

- IMPACTS TO MATURE VEGETATION WILL BE MINIMIZED OR AVOIDED TO THE MAXIMUM EXTENT POSSIBLE UNDER THE DIRECTION OF ECOLOGIST IN THE FIELD. NO MATURE TREES SHALL BE REMOVED.
- METHOD TO AVOID IMPACT: APPROXIMATELY EVERY 50 FEET, AT ONE SIDE. EXCAVATOR WILL ACCESS CREEK AT THE DIRECTION OF ENGINEER OR ECOLOGIST. SEE BELOW.

MATCHLINE STA 8+00
SEE SHEET 10

MATCHLINE STA 16+20
SEE SHEET 12

STREAM BUFFER

INSTALL 3-STRAND BARBED WIRE FENCE WITH T-POSTS; CONNECT TO EXISTING FENCE AS NEEDED TO DELINEATE BOUNDARY OF CONSERVATION EASEMENT

REMOVE SEDIMENT STA. 5+40 TO STA. 26+26 SEE TYPICAL SECTION, SHEET 15

PLANTING MITIGATION - SEE SHEETS 18,19

PLANTING MITIGATION BUFFER

PLANTING MITIGATION - SEE SHEETS 18,19

TEMPORARY ACCESS LANE 15' WIDE, SPACED APPROX. 50' APART (TYPICAL). EXISTING VEGETATION BETWEEN LANES WILL NOT BE DISTURBED. ACCESS LANE WILL EXTEND FROM CREEK TO EDGE OF WILLOWS. ACCESS POINTS WILL BE DIRECTED IN FIELD BY ENGINEER/ECOLOGIST TO AVOID DISTURBANCE TO MATURE TREES. OFF-ROAD EQUIPMENT REQUIRED TO MINIMIZE SITE IMPACT TO INCLUDE TRACKED EXCAVATOR, OR EQUIVALENT, AND TRACKED DUMP TRUCK OR EQUIVALENT. -EXISTING FARM FENCES TO BE TEMPORARILY RELOCATED AND RESTORED AFTER CONSTRUCTION

INSTALL 3-STRAND BARBED WIRE FENCE WITH T-POSTS; CONNECT TO EXISTING FENCE AS NEEDED TO DELINEATE BOUNDARY OF CONSERVATION EASEMENT

IN CONJUNCTION WITH SEDIMENT, ALSO REMOVE VEGETATION OBSTRUCTING CHANNEL FLOW AND REED CANARY GRASS AT THE DIRECTION OF ECOLOGIST OR ENGINEER PER CROSS SECTION DETAIL SHEET 15 ALONG STATIONS 5+40 THROUGH STA 29+00.

REMOVE AND RETAIN GRAVEL FROM CHANNEL BOTTOM PRIOR TO SEDIMENT REMOVAL. OVEREXCAVATE AND REPLACE GRAVELS IN CHANNEL TO REACH FINAL GRADE, APPROX. STATIONS 15+60 TO 16+30

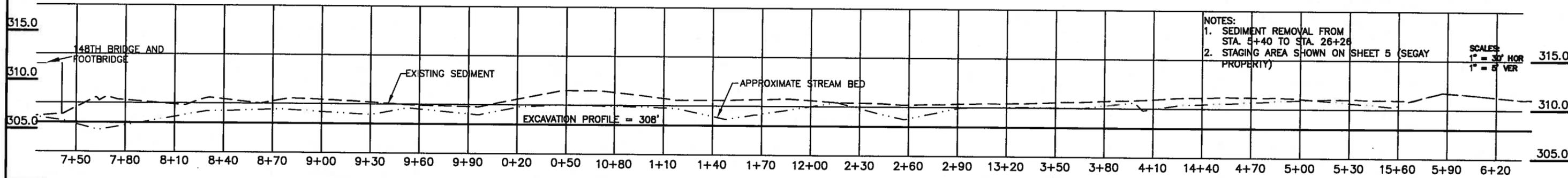
STREAM BUFFER

WETLAND BUFFER

EXISTING GUYWIRE

CALL 2 WORKING DAYS BEFORE YOU DIG
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)



NOTES:

1. SEDIMENT REMOVAL FROM STA. 5+40 TO STA. 26+26 (PROPERTY)
2. STAGING AREA SHOWN ON SHEET 5 (SEGAY PROPERTY)

SCALES:
1" = 30' HOR
1" = 8' VER

FIELD BOOK:	09056	01-2010
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DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

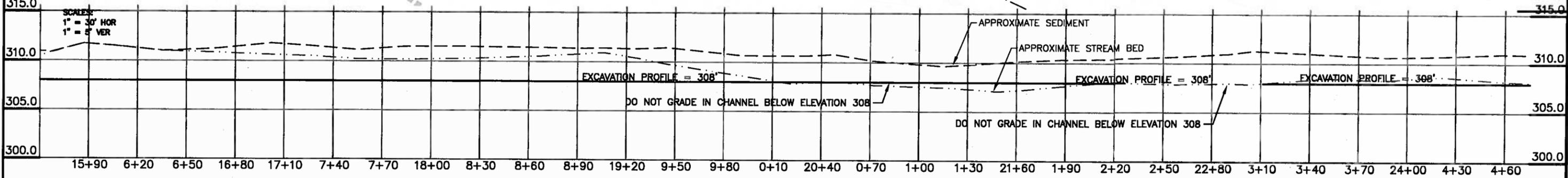
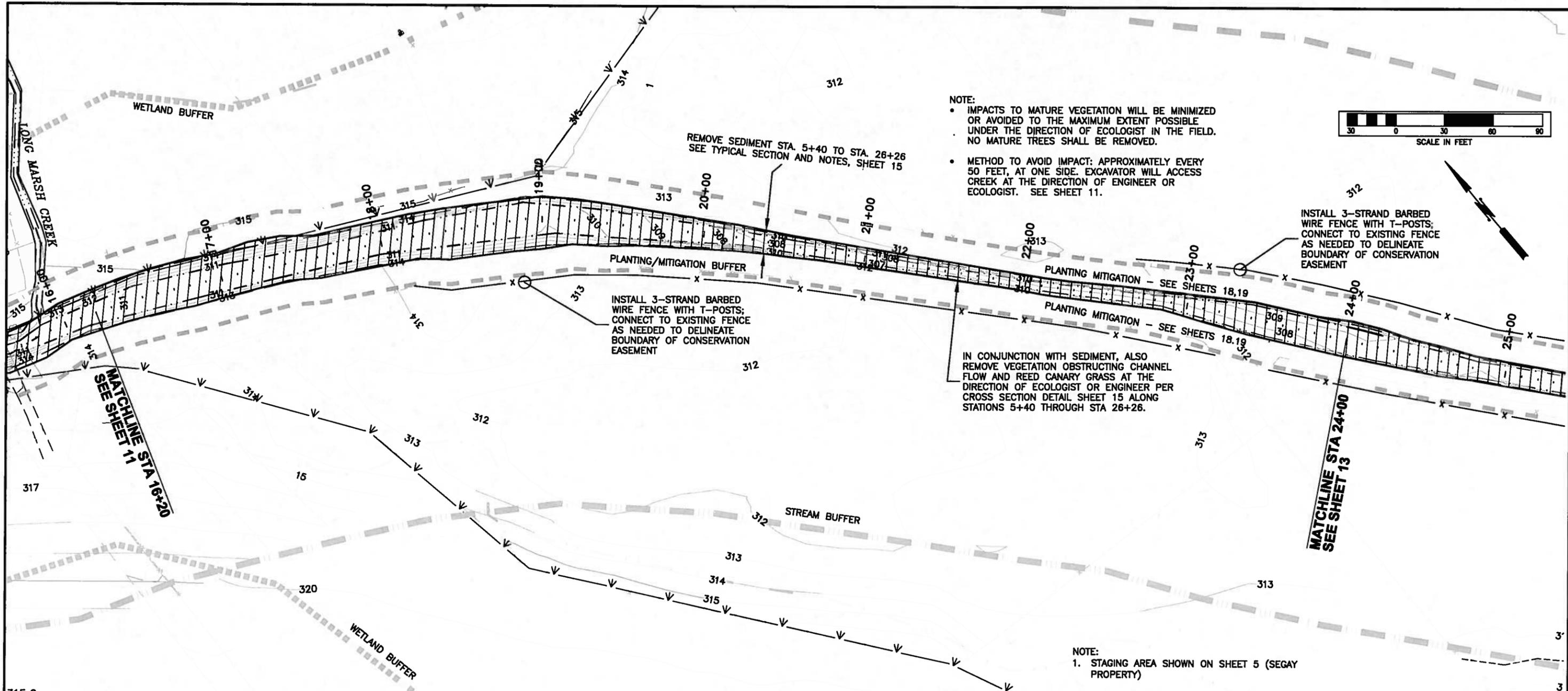
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PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT

PLAN AND PROFILE
STA 8+00 TO STA 16+20

SHEET
11
OF
19
SHEETS
2006-16



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BEFORE YOU DIG
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

FIELD BOOK:	09058	01-2010
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DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

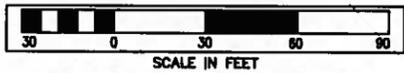
KCFCZD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT

**PLAN AND PROFILE
STA 16+20 TO STA 24+00**

SHEET
12
OF
19
SHEETS
2006-16



NOTE:

- IMPACTS TO MATURE VEGETATION WILL BE MINIMIZED OR AVOIDED TO THE MAXIMUM EXTENT POSSIBLE UNDER THE DIRECTION OF ECOLOGIST IN THE FIELD. NO MATURE TREES SHALL BE REMOVED.
- METHOD TO AVOID IMPACT: APPROXIMATELY EVERY 50 FEET, AT ONE SIDE, EXCAVATOR WILL ACCESS CREEK AT THE DIRECTION OF ENGINEER OR ECOLOGIST. SEE SHEET 11.

IN CONJUNCTION WITH SEDIMENT, ALSO REMOVE VEGETATION OBSTRUCTING CHANNEL FLOW AND REED CANARY GRASS AT THE DIRECTION OF ECOLOGIST OR ENGINEER PER CROSS SECTION DETAIL SHEET 15 ALONG STATIONS 5+40 THROUGH STA 26+26.

INSTALL 3-STRAND BARBED WIRE FENCE WITH T-POSTS; CONNECT TO EXISTING FENCE AS NEEDED TO DELINEATE BOUNDARY OF CONSERVATION EASEMENT

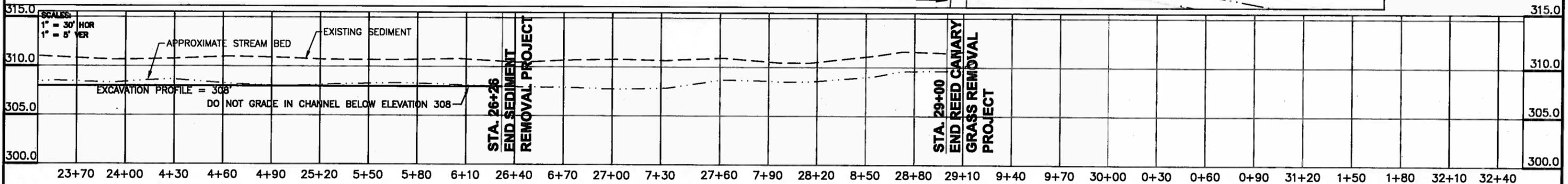
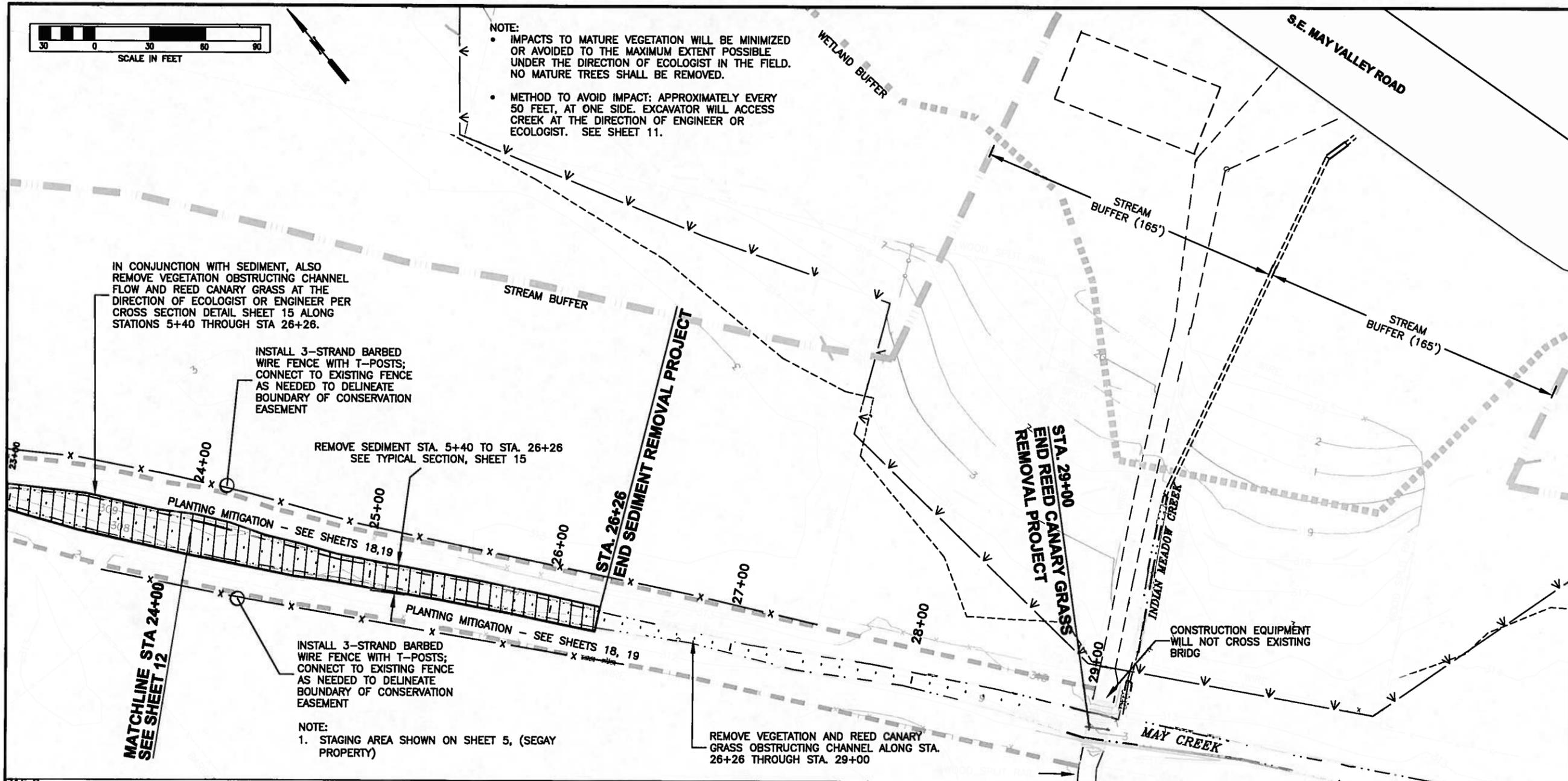
REMOVE SEDIMENT STA. 5+40 TO STA. 26+26 SEE TYPICAL SECTION, SHEET 15

PLANTING MITIGATION - SEE SHEETS 18,19

INSTALL 3-STRAND BARBED WIRE FENCE WITH T-POSTS; CONNECT TO EXISTING FENCE AS NEEDED TO DELINEATE BOUNDARY OF CONSERVATION EASEMENT

NOTE:
1. STAGING AREA SHOWN ON SHEET 5, (SEGAY PROPERTY)

REMOVE VEGETATION AND REED CANARY GRASS OBSTRUCTING CHANNEL ALONG STA. 26+26 THROUGH STA. 29+00



CALL 2 WORKING DAYS BEFORE YOU DIG
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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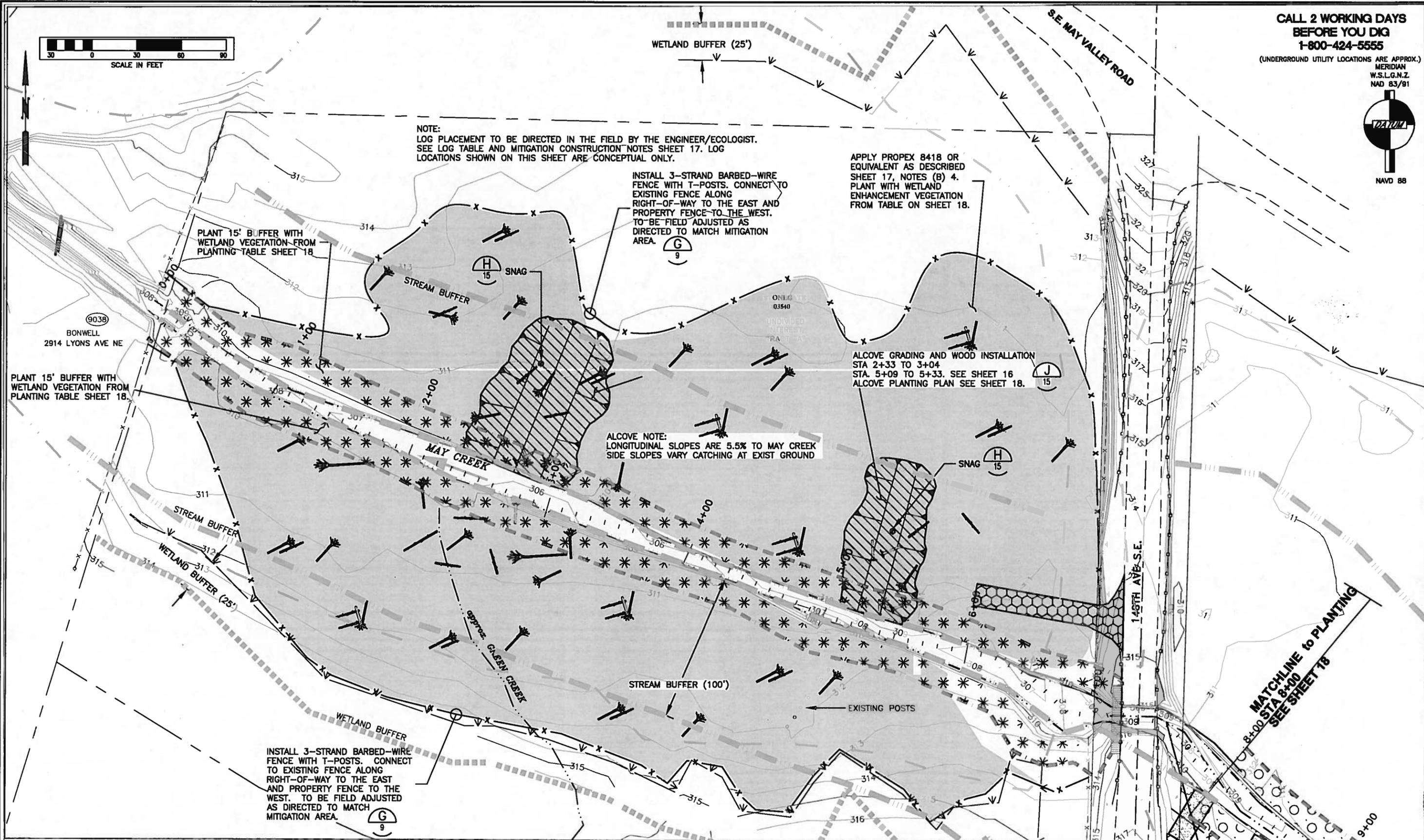
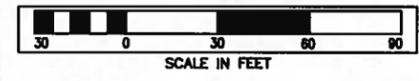
King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie Trus, Director

MAY CREEK DRAINAGE IMPROVEMENT

**PLAN AND PROFILE
STA 24+00 TO STA 29+00**

SHEET
13
OF
19
SHEETS
2006-16

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BEFORE YOU DIG
1-800-424-5555
(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)
MERIDIAN
W.S.L.G.N.Z.
NAD 83/91



NOTE:
LOG PLACEMENT TO BE DIRECTED IN THE FIELD BY THE ENGINEER/ECOLOGIST.
SEE LOG TABLE AND MITIGATION CONSTRUCTION NOTES SHEET 17. LOG
LOCATIONS SHOWN ON THIS SHEET ARE CONCEPTUAL ONLY.

INSTALL 3-STRAND BARBED-WIRE
FENCE WITH T-POSTS. CONNECT TO
EXISTING FENCE ALONG
RIGHT-OF-WAY TO THE EAST AND
PROPERTY FENCE TO THE WEST.
TO BE FIELD ADJUSTED AS
DIRECTED TO MATCH MITIGATION
AREA. (G)

APPLY PROPEX 8418 OR
EQUIVALENT AS DESCRIBED
SHEET 17, NOTES (B) 4.
PLANT WITH WETLAND
ENHANCEMENT VEGETATION
FROM TABLE ON SHEET 18.

ALCOVE GRADING AND WOOD INSTALLATION
STA 2+33 TO 3+04
STA. 5+09 TO 5+33. SEE SHEET 16
ALCOVE PLANTING PLAN SEE SHEET 18. (J)

ALCOVE NOTE:
LONGITUDINAL SLOPES ARE 5.5% TO MAY CREEK
SIDE SLOPES VARY CATCHING AT EXIST GROUND

INSTALL 3-STRAND BARBED-WIRE
FENCE WITH T-POSTS. CONNECT
TO EXISTING FENCE ALONG
RIGHT-OF-WAY TO THE EAST
AND PROPERTY FENCE TO THE
WEST. TO BE FIELD ADJUSTED
AS DIRECTED TO MATCH
MITIGATION AREA. (G)

PLANT 15' BUFFER WITH
WETLAND VEGETATION FROM
PLANTING TABLE SHEET 18.

PLANT 15' BUFFER WITH
WETLAND VEGETATION FROM
PLANTING TABLE SHEET 18.

MATCHLINE TO PLANTING
8+00 STA 8+00
SEE SHEET 18

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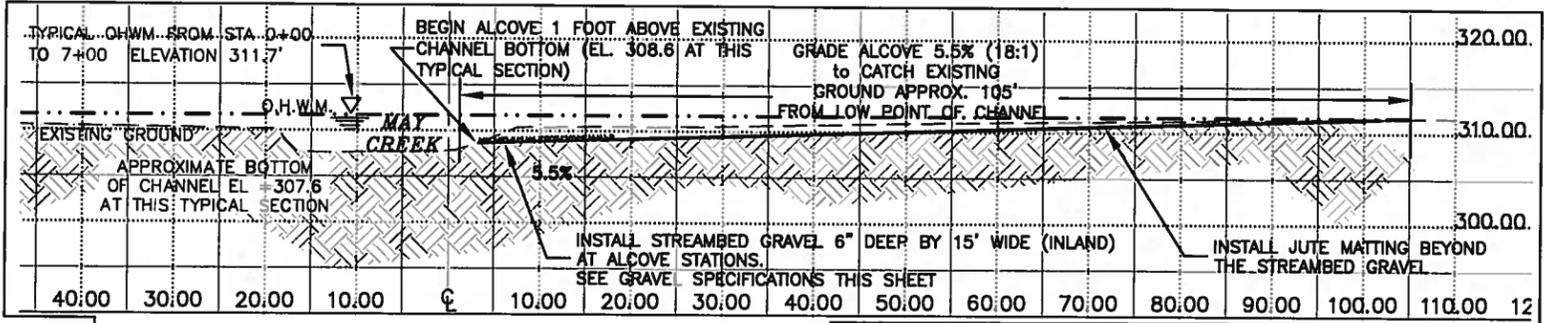
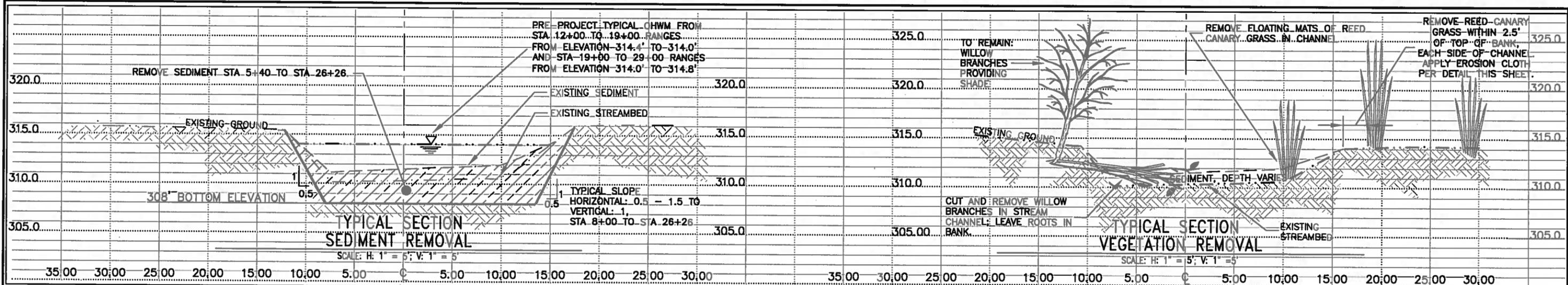
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King County
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Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie Truse, Director

MAY CREEK DRAINAGE IMPROVEMENT

WETLAND AND RIPARIAN MITIGATION
STA. 0+00 - STA 7+00

SHEET
14
OF
19
SHEETS
2006-16



**TYPICAL SECTION
HABITAT MITIGATION ALCOVE GRADING
STATIONS 2+33 TO 3+04 AND 5+09 TO 5+53**
SCALE: H: 1"=10', V: 1"=10'

OHWM NOTE:
OLSON, P. AND E. STOCKDALE. 2010. DETERMINING THE ORDINARY HIGH WATER MARK ON STREAMS IN WASHINGTON STATE. SECOND REVIEW DRAFT. WASHINGTON STATE DEPARTMENT OF ECOLOGY, SHORELANDS 7 ENVIRONMENTAL ASSISTANCE PROGRAM, LACEY, WA. ECOLOGY PUBLICATION #08-08-001. FIELD STAKED BY KING COUNTY ENGINEER III, ENVIRONMENTAL UNIT MARCH 2011.

STREAMBED GRAVEL FOR ALCOVE APPLICATION:

US STD. SIEVE SIZE	PERCENT PASSING BY WEIGHT
6 INCHES	70-80
4 INCHES	55-70
1 1/2 INCH	45-60
3/4 INCH	30-50
3/8 INCH	25-35
NO. 4	16-30
NO. 40	15-20
NO. 200	0-5

COBBLES MAY BE INCLUDED IN THE GRAVEL AND ALL COBBLES LARGER THAN 4 INCHES IN DIAMETER SHALL BE EXCLUDED FROM THE GRADATION TEST. GRAVEL AND COBBLES SHALL BE ROUNDED.

**CALL 2 WORKING DAYS
BEFORE YOU DIG
1-800-424-5555**

(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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King County
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Capital Services Unit
Christie True, Director

MAY CREEK DRAINAGE IMPROVEMENT

**CROSS-SECTIONS AND
HABITAT MITIGATION DETAILS**

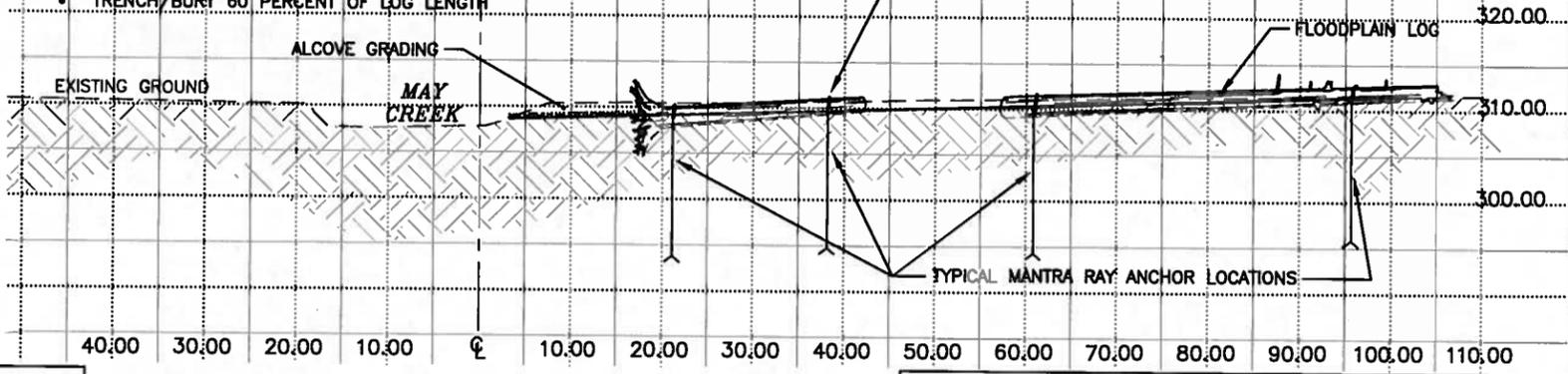
SHEET
15
OF
19
SHEETS
2006-16

LWD INSTALLATION NOTES:

THE FOLLOWING METHODS OR COMBINATIONS THEREOF WILL BE USED TO REDUCE MOBILITY OF LWD:

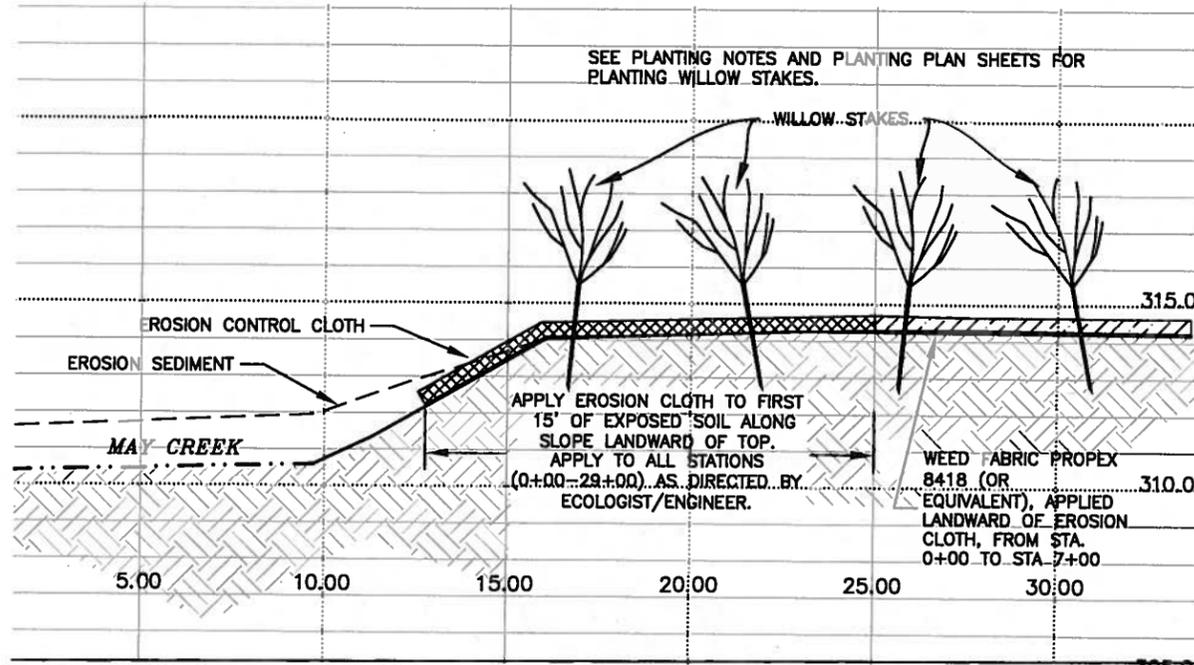
- MANTRA RAY MR-1 ANCHORS
- EMBEDMENT OF 50 PERCENT SURFACE AREA OF LOGS
- TRENCH/BURY 60 PERCENT OF LOG LENGTH

ALCOVE LOG EMBEDDED;
30 FOOT LOG, MIN. 12" DBH,
ANCHOR AS SHOWN ON DETAIL "J", SHEET 17.



**TYPICAL SECTION - HABITAT MITIGATION LOG PLACEMENT
HABITAT FLOODPLAIN AREA AND
ALCOVE STATIONS 2+33 TO 3+04 AND 5+09 TO 5+53**

SCALE: H: 1"=10', V: 1"=10'



**TYPICAL SECTION
FABRIC APPLICATION**

SCALE: H: 1" = 2.5'; V: 1" = 2.5'

SEE PLANTING NOTES AND PLANTING PLAN SHEETS FOR PLANTING WILLOW STAKES.

WILLOW STAKES

EROSION CONTROL CLOTH

EROSION SEDIMENT

MAY CREEK

APPLY EROSION CLOTH TO FIRST
15' OF EXPOSED SOIL ALONG
SLOPE LANDWARD OF TOP.
APPLY TO ALL STATIONS
(0+00 TO 29+00) AS DIRECTED BY
ECOLOGIST/ENGINEER.

WEED FABRIC PROPEX
8418 (OR
EQUIVALENT), APPLIED
LANDWARD OF EROSION
CLOTH, FROM STA.
0+00 TO STA. 7+00

**CALL 2 WORKING DAYS
BEFORE YOU DIG
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

FIELD BOOK:	09058	01-2010	70% DESIGN PROGRESS COPY 9-12-11	APPROVED:	DON ALTHAUER, P.E.	9/2011
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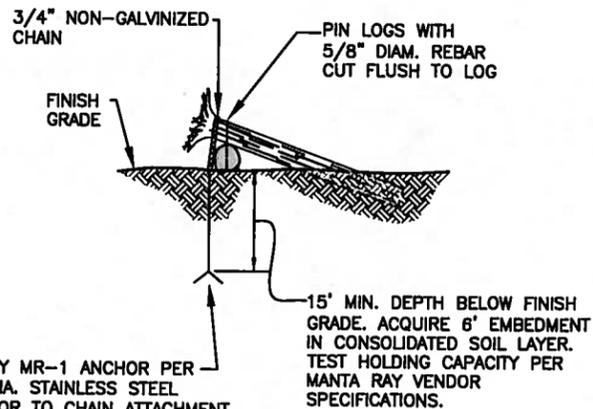
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Department of Natural Resources and Parks
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Stormwater Services Section
Capital Services Unit
Christie Trus, Director

MAY CREEK DRAINAGE IMPROVEMENT

**CROSS-SECTIONS AND
HABITAT MITIGATION DETAILS**

SHEET
16
OF
19
SHEETS

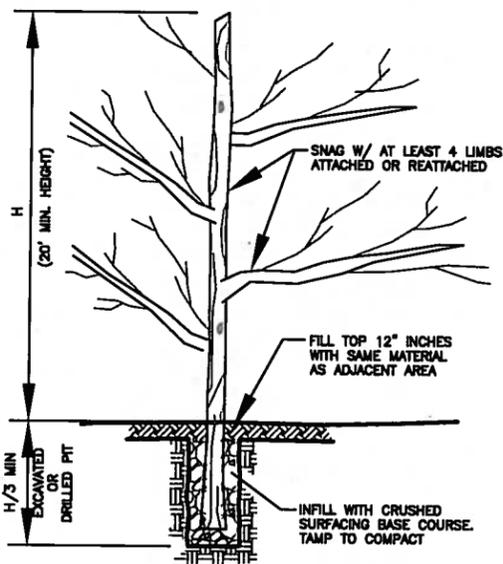
2006-16



PROVIDE MANTA RAY MR-1 ANCHOR PER LOG WITH 5/16" DIA. STAINLESS STEEL CABLE FROM ANCHOR TO CHAIN ATTACHMENT EYE AT EXISTING GRADE. CONNECT WITH LOK-A-LOY 10 CONNECTING LINK OR EQUIVALENT.

SECTION LOG WITH ANCHORS

NTS



SNAG DETAIL

NTS



SNAG NOTES:

1. WILDLIFE SNAG TO BE PLACED AS DIRECTED BY ENGINEER OR ECOLOGIST. ALL SNAGS SHALL BE WESTERN RED CEDAR OR DOUGLAS-FIR TREES WITH A SUBSTANTIAL PORTION OF THEIR LIMBS LEFT INTACT. DO NOT TRIM TOPS, AS DAMAGED OR BROKEN TOPS ARE PREFERRED. PROVIDE LOGS WITH NUMEROUS UNTRIMMED LIMBS, WITH A MINIMUM OF 6 LIMBS. LOGS USED FOR SNAGS MAY BE PARTIALLY HOLLOW AND CONTAIN CAVITIES AS LONG AS THEY ARE GENERALLY SOUND AND INTACT.
2. SNAGS SHALL BE A MINIMUM OF 10 INCHES IN DIAMETER AT BREST HEIGHT (DBH) WHEN INSTALLED AND SHALL BE PLACED INTO THE GROUND TO A DEPTH EQUAL TO 1/3 OF TREE HEIGHT BELOW GROUND.
3. SNAGS WITH SUBSTANTIAL ROOT MASSES ATTACHED MAY BE PLACED TO THE DEPTH INDICATED AND BACKFILLED WITH QUARRY SPALLS AND SOIL ONLY UPON APPROVAL BY THE ENGINEER.

LOG TABLE			
# of LOGS	LOG SIZE	LOG LENGTH	ROOTWAD OR WITHOUT (W/OUT)
ALCOVE AREAS			
7	18"-24" dbh	30'	rootwads
5	16"-18" dbh	30'	rootwads
4	12"-18" dbh	30'	rootwads
16 total			
FLOODPLAIN ROUGHNESS			
30	12"-14" dbh	30'	w/out
30	12"-18" dbh	30'	rootwads
60 total			
2		27'min	snags
78 total			



WETLAND PROTECTION SIGNAGE

NTS

MITIGATION PLAN NOTES

(A) CONSTRUCTION NOTES

1. TREES TO BE PRESERVED WILL BE FLAGGED IN THE FIELD BY THE ECOLOGIST.
2. INSTALL SILT FENCES WHERE DESIGNATED ON THE PLANS. INSTALL ANY OTHER EROSION AND SEDIMENT CONTROL MEASURES AS REQUESTED BY THE ENGINEER
3. ELEVATIONS SHOWN ARE FINAL GRADE; 6 INCHES OF OVER-EXCAVATION WILL OCCUR AND BE BACKFILLED WITH STREAMBED GRAVELS WHERE INDICATED ON PLANS.
4. EXCAVATION OF ALCOVES ADJACENT TO THE STREAM CHANNEL SHALL TAKE PLACE ONLY DURING THE FISH WINDOWS AS DESIGNATED IN THE PERMITS. WHEN EXCAVATING ADJACENT THE STREAM CHANNEL AN EARTH PLUG SHALL BE LEFT BETWEEN THE EXISTING STREAM CHANNEL AND THE EXCAVATION AREA. PRIOR TO REMOVING THE EARTH PLUG AND CONNECTING THE EXCAVATED CHANNEL, A TURBIDITY CURTAIN SHALL BE INSTALLED AS SHOWN IN THE DETAILS TO PROTECT THE STREAM FROM SEDIMENT AND TURBIDITY DURING CONNECTION.
5. IF ANY GROUNDWATER IS ENCOUNTERED DURING EXCAVATION, DEWATER BY PUMPING AND BROADCASTING TURBID WATER THROUGH PERFORATED PIPE MANIFOLD OR EQUIVALENT AND DISSIPATED OVER VEGETATED STRIP IN UPLAND AREAS OF THE SITE. IF GROUND BECOMES SATURATED A BAKER TANK SHALL BE USED.
6. ELEVATIONS ASSOCIATED WITH CONTOURING ALCOVE AND FLOODPLAIN AREAS IS TO BE DIRECTED BY ECOLOGIST IN THE FIELD.
7. PARTIALLY BURY AND PLACE LOGS IN THE EXCAVATED ALCOVE, LOG PLACEMENT SHOWN IN THE PLANS ARE SCHEMATIC; ACTUAL PLACEMENT AND ARRANGEMENT TO BE DETERMINED BY THE ECOLOGIST IN THE FIELD. ANCHOR AS SHOWN IN PLAN DETAILS.
8. PLACE 6 INCHES OF STREAMBED GRAVELS WITHIN THE ALCOVE AREA, PER TYPICAL SECTION, SHEET 15.
9. PLANT EMERGENTS AND SHRUBS IN ALCOVES ACCORDING TO PLANTING PLAN.
10. REMOVE TEMPORARY STABILIZED CONSTRUCTION ENTRANCES AND REMOVE HIGH-VISIBILITY FENCES, AND ANY OTHER EROSION CONTROL MEASURES STILL INSTALLED AT THE SITE.
11. CONTRACTOR SHALL PROVIDE STREAM ISOLATION / TURBIDITY CURTAIN PER WASHINGTON DEPARTMENT OF ECOLOGY STANDARDS.

(A) PLANTING NOTES

1. MITIGATION PLANTING PLANS REPRESENT A CONCEPTUAL PLANT LAYOUT. ALL MITIGATION PLANTING PREPARATION WILL BE DIRECTED IN THE FIELD BY THE ECOLOGIST.
2. PLANTING SHALL TAKE PLACE DURING THE DORMANT SEASON (NOVEMBER 1ST THROUGH FEBRUARY 28TH). PLANTING MAY BE ALLOWED AT OTHER TIMES AFTER REVIEW AND WRITTEN APPROVAL BY THE ECOLOGIST.
3. APPLY JUTE EROSION CONTROL FABRIC AS DIRECTED BY ECOLOGIST WITHIN THE FLOODPLAIN EXCAVATION AREAS AND ALL PLANTING AREAS WHERE REED CANARY GRASS HAS BEEN COMPLETELY REMOVED.
4. IN ALL PLANTING AREAS WHERE REED CANARY GRASS IS PRESENT, FIRST MOW THE GRASS. COVER MOWED REED CANARY GRASS WITH PROPEX 8418 (OR A SIMILAR BARRIER MATERIAL AS APPROVED BY THE ECOLOGIST) AS NEEDED AND DIRECTED BY ECOLOGIST. AND STAKE IN PLACE USING LIVE STAKES.
5. PLANT STAKES AND TREES AS DIRECTED BY THE ECOLOGIST THROUGH THE PROPEX (OR EQUIVALENT).
6. ALL PLANTS SHALL BE NURSERY GROWN A MINIMUM OF ONE YEAR. PLANT MATERIAL IS TO BE SUPPLIED BY COMMERCIAL NURSERIES THAT SPECIALIZE IN PLANTS NATIVE TO THE PACIFIC NORTHWEST. PLANT MATERIAL SUBSTITUTIONS ARE SUBJECT TO APPROVAL BY THE ECOLOGIST.
7. NO TACKIFIER, HERBICIDE, OR FERTILIZER SHALL BE USED IN THE PLANTING AREAS.

(A) GENERAL NOTES

1. TO PREVENT REESTABLISHMENT OF INVASIVE VEGETATION, THE TOP 24 INCHES OF EXCAVATED SOIL IS NOT TO BE REUSED AS FILL ANYWHERE ON THE PROJECT SITE.

(D) KING COUNTY WETLAND/STREAM PROTECTION SIGN INSTALLATION NOTES:

- THE WETLAND/STREAM PROTECTION SIGNS SHALL BE POSTED ON THE BOUNDARY OF THE MITIGATION AREA AND/OR THE CONSERVATION EASEMENT.
- ONE SIGN SHALL BE POSTED FOR EVERY 150- FEET OF THE BOUNDARY OF THE MITIGATION AREA AND/OR THE CONSERVATION EASEMENT IN A PROMINENT LOCATION. SIGNS MAY ALSO BE ATTACHED TO NEW AND EXISTING FARM FENCES.
- SIGNS ARE AVAILABLE FOR \$9.22 FROM: KING COUNTY DEPARTMENT OF DEVELOPMENT AND ENVIRONMENTAL SERVICES 900 OAKSDALE AVENUE SOUTHWEST RENTON, WA 98055-1219

CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-424-5555

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MAY CREEK DRAINAGE IMPROVEMENT
HABITAT MITIGATION ENHANCEMENT
INSTALLATION DETAILS AND NOTES

SHEET
17
OF
19
SHEETS
2006-16

**May Creek Riparian Buffer Planting-
Seasonally Saturated Areas,
Stations 0+00 to 7+00, 13+50 to 19+00**

*** PLANTING ***

Latin Name	Common Name	Size/Specifications	Quantity
Trees			
<i>Alnus rubra</i>	Red alder	6-8' Height Plant 9' O.C.	105
<i>Picea sitchensis</i>	Sitka spruce	5 gal., 5-6' Height Full Dense Foliage Plant 9' O.C.	105
<i>Populus balsamifera</i> spp. <i>trichocarpa</i>	Black cottonwood	6' stake, top on, 1" diameter Plant 9' O.C.	105
<i>Thuja plicata</i>	Western red cedar	5 gal., 5-6' Height Full Dense Foliage Plant 9' O.C.	105
Shrubs/Willows			
<i>Cornus sericea</i>	Red-osier dogwood	Live Stakes, 3' Long, 1/2"-1" Diameter Plant 3' O.C.	1100
<i>Salix lasiandra</i>	Pacific willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	1100
<i>Salix sitchensis</i>	Sitka willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	1100

**May Creek Riparian Buffer Planting-
Permanently Saturated Areas,
Stations 7+00 to 13+50, 19+00 to 29+00**

*** PLANTING ***

Latin Name	Common Name	Size/Specifications	Quantity
TREES			
<i>Fraxinus latifolia</i>	Oregon Ash	5'-6' height Plant 9' O.C.	625
SHRUBS			
<i>Cornus sericea</i>	Red-osier dogwood	Live Stakes 3' long, 1/2"-1" diameter. Plant 3' O.C.	1,700
<i>Salix lasiandra</i>	Pacific willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	1,700
<i>Salix sitchensis</i>	Sitka willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	1,700

**May Creek Alcoves Planting Plan -
west of 148th Avenue SE**

Latin Name	Common Name	Size/Specifications	Quantity
Emergents - for alcoves near stream			
<i>Scirpus acutus</i>	Hardstem bulrush	Plug (Plant 12" O.C.)	500
<i>Eleocharis palustris</i>	Common spike-rush	Plug (Plant 12" O.C.)	500
<i>Carex stipata</i>	Sawbeak sedge	Plug (Plant 12" O.C.)	500
Shrubs/Willows			
<i>Cornus sericea</i>	Red-osier dogwood	Bare root, mi. 12" long Plant 3' O.C.	175
<i>Physocarpus capitatus</i>	Pacific ninebark	Bare root, mi. 12" long Plant 3' O.C.	150
<i>Rosa pisocarpa</i>	Pea fruited rose	Bare root, mi. 12" long Plant 3' O.C.	250
<i>Rubus spectabilis</i>	Salmonberry	Bare root, mi. 12" long Plant 3' O.C.	150
<i>Salix sitchensis</i>	Sitka willow	Live Stakes Minimum 6' Long 3/4-1" Diameter Plant 3' O.C.	300
<i>Salix lasiandra</i>	Pacific willow	Live stakes Minimum 6' long Minimum 3/4"-1" diameter Plant 3' O.C.	300
<i>Populus trichocarpa</i>	Black Cottonwood	Live pole cutting Minimum 6' long Minimum 3/4"-1" diameter Plant 3' O.C.	250

**May Creek Wetland Enhancement Planting *
Plan - west of 148th Ave SE**

Latin Name	Common Name	Size/Specifications	Quantity
Total Area: Approximately 130,880 square feet (3 acres)			
<i>Populus trichocarpa</i>	Black Cottonwood	6' stake, top on, 1" diameter Plant 9' O.C.	7,000
<i>Cornus sericea</i>	Red-osier dogwood	Bare root, Minimum 12" Long Plant 3' O.C.	300
<i>Salix lasiandra</i>	Pacific willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	8,000
<i>Salix sitchensis</i>	Sitka willow	Live Stakes, 6' Long, 1/2-1" Diameter Plant 3' O.C.	3,000

*PLANTS WILL BE INSTALLED THROUGH PROPEX (OR EQUIVALENT). SEE NOTES ON SHEET 16.

**CALL 2 WORKING DAYS
BEFORE YOU DIG
1-800-424-5555**

(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

FIELD BOOK: 09056	01-2010			APPROVED: DON ALTHAUSER, P.E.	9/2011
SURVEYED: KING COUNTY	01-2010			PROJECT MANAGER: DOUG CHIN	9/2011
SURVEY BASE MAP: KING COUNTY	02-2010			DESIGNED: DALE NELSON	9/2011
TREVOR CRAY, PLS	02-2010			DESIGN ENTERED: M. RADELLA	9/2011
CHECKED: DALE NELSON	02-2010				
NUM.	REVISION	BY	DATE		

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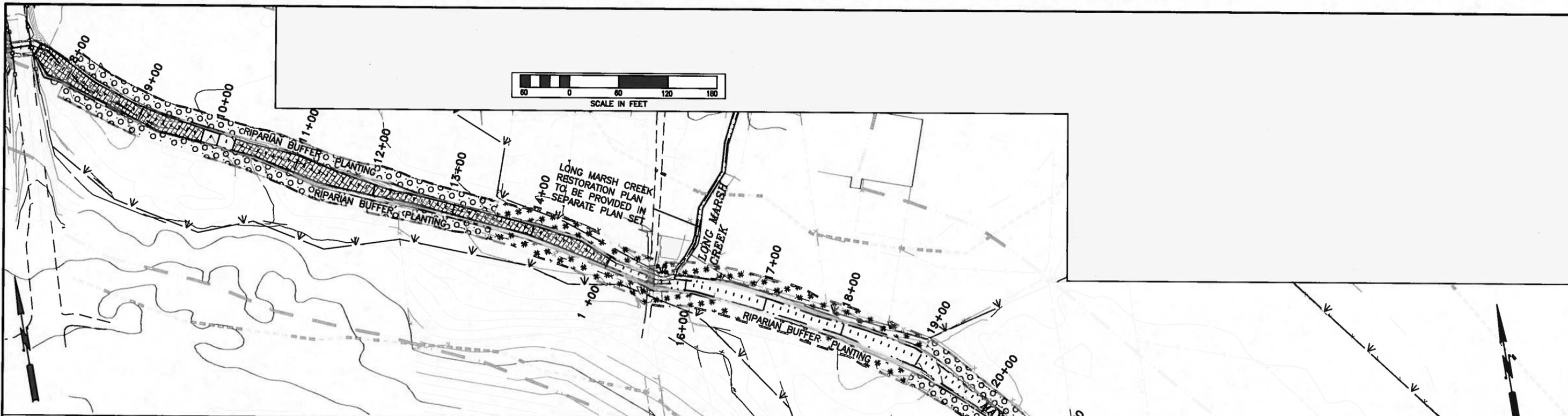
KCFCD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie Truse, Director

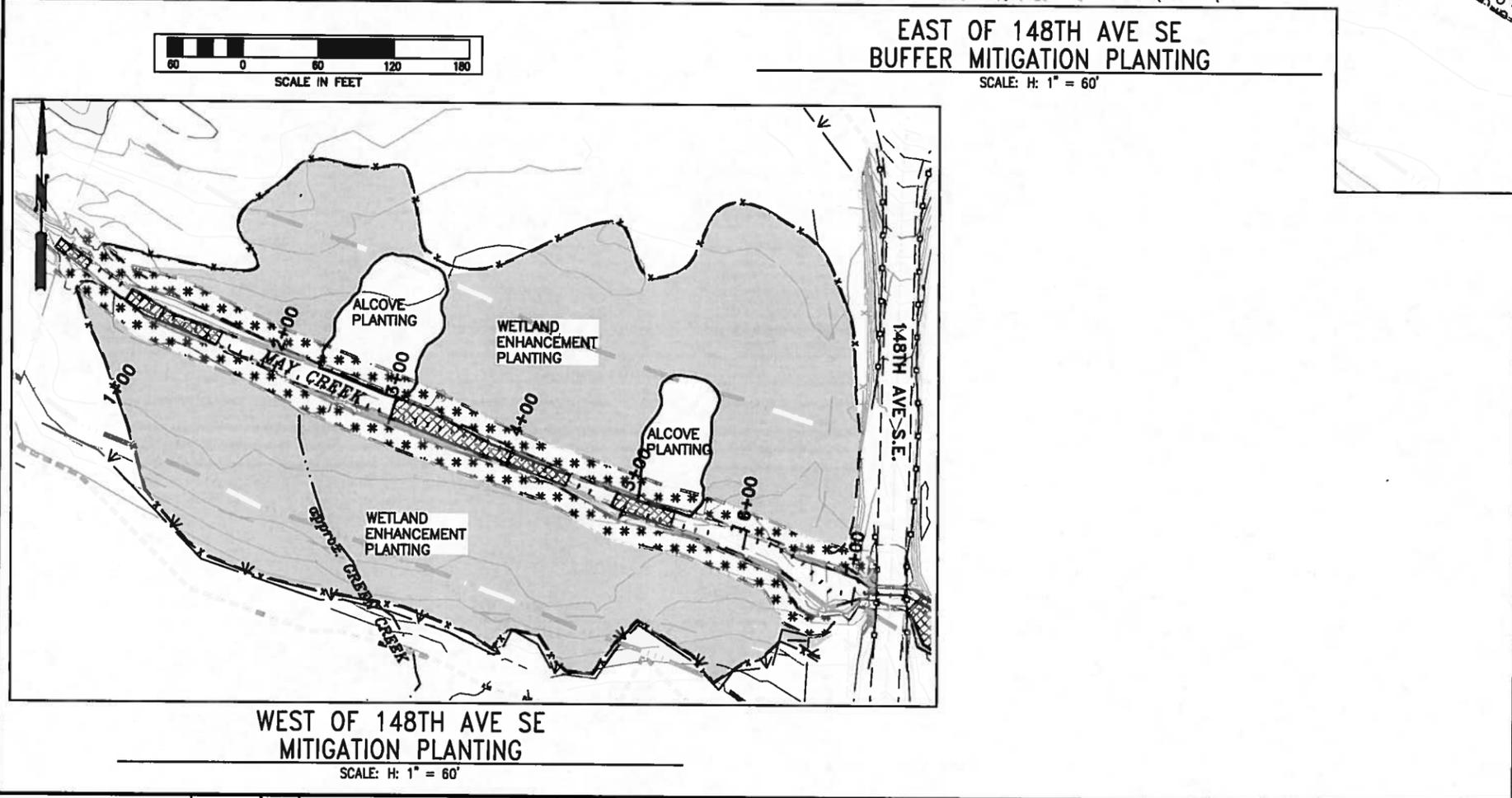
MAY CREEK DRAINAGE IMPROVEMENT
PLANTING TABLES

SHEET
18
OF
19
SHEETS

2006-16



EAST OF 148TH AVE SE
 BUFFER MITIGATION PLANTING
 SCALE: H: 1" = 60'



WEST OF 148TH AVE SE
 MITIGATION PLANTING
 SCALE: H: 1" = 60'



FIELD BOOK:	09056	01-2010
SURVEYED:	KING COUNTY	01-2010
SURVEY BASE MAP:	KING COUNTY	02-2010
TREVOR CRAY, PLS	02-2010	
CHECKED:	DALE NELSON	02-2010

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DESIGNED:	DALE NELSON	9/2011
DESIGN ENTERED:	M. RADELLA	9/2011

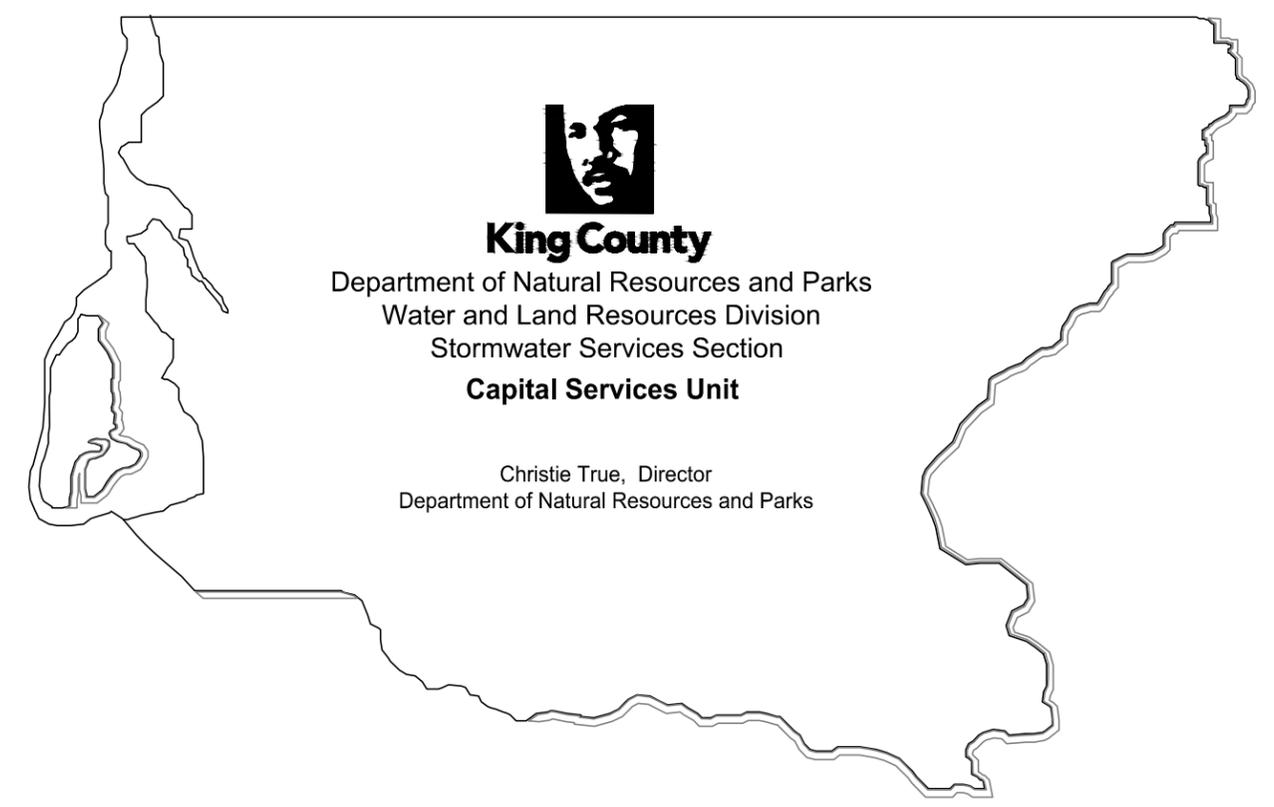
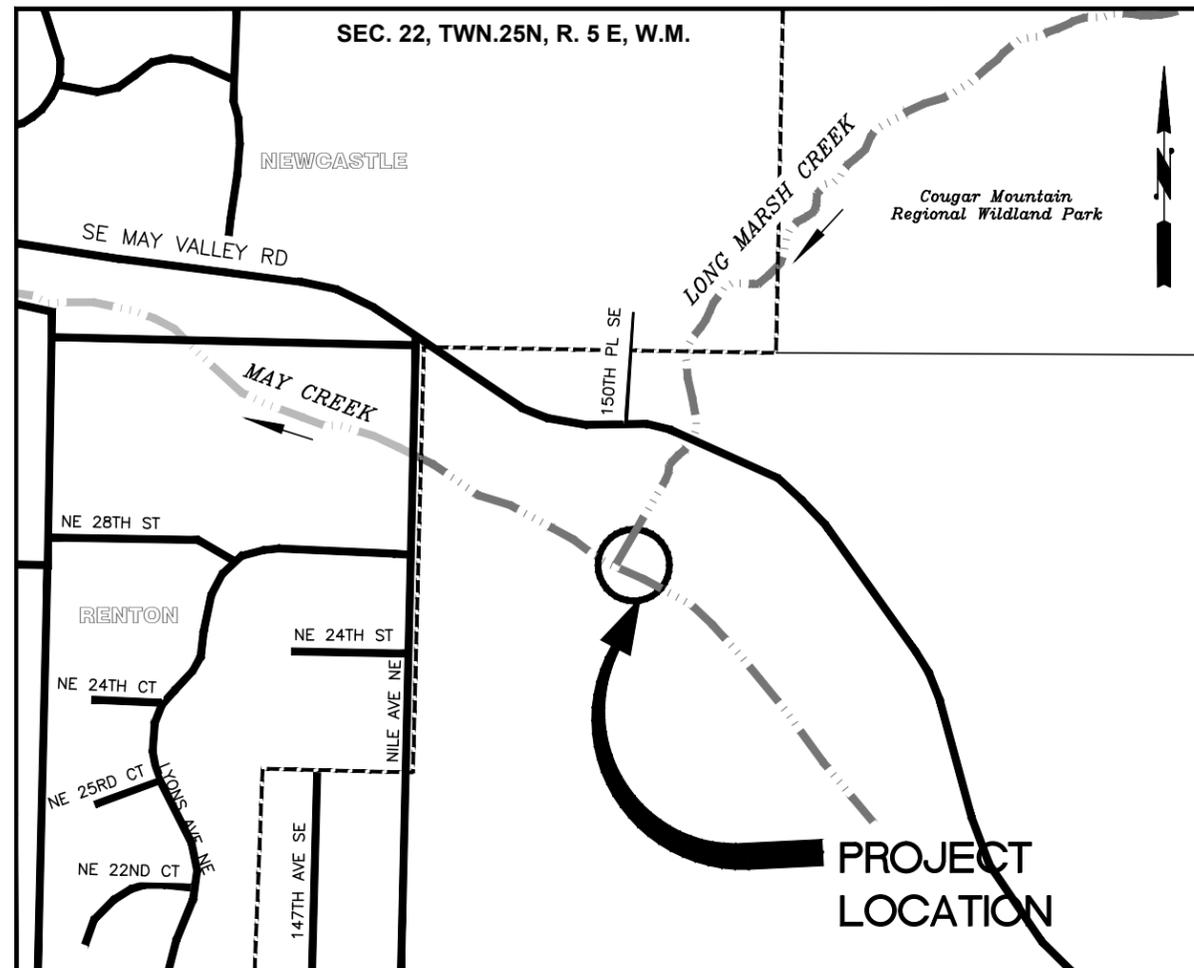
KCFCZD No.	
PROJECT No.	9A1205
SURVEY No.	
MAINTENANCE DIVISION No.	4



MAY CREEK DRAINAGE IMPROVEMENT
 PLANTING PLAN

Appendix B – Long Marsh Creek Restoration Design Plans

VICINITY MAP



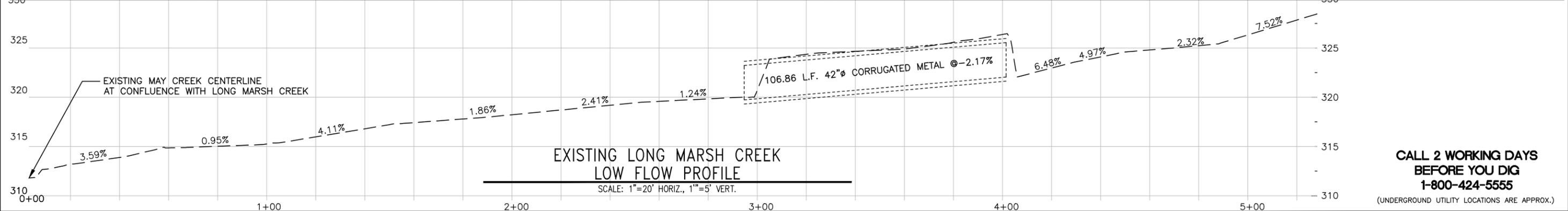
LONG MARSH CREEK RESTORATION

CONFLUENCE TO RIVER MILE 0.05

INDEX

SHEET	DESCRIPTION
G1	VICINITY MAP AND SHEET INDEX
C1	EXISTING CONDITIONS PLAN, CHANNEL PROFILE, LEGEND AND ABBREVIATIONS
C2	GRADING PLAN AND PROFILE – LONG MARSH CREEK AND MAY CREEK SIDE CHANNEL
C3	CROSS SECTIONS AND LOG DETAILS
SWPP1	TEMPORARY EROSION AND SEDIMENT CONTROL PLAN AND NOTES
SWPP2	TEMPORARY EROSION AND SEDIMENT CONTROL DETAILS
L1	PLANTING PLAN AND NOTES
L2	PLANTING SCHEDULE AND DETAILS

FIELD BOOK: 2010-2	9-2010	70% DESIGN PROGRESS COPY 7-20-2011	APPROVED: Don Althausser, P.E.	7-2011	PROJECT No. 1C1205	MAINTENANCE DIVISION No. 4	 Department of Natural Resources and Parks Water and Land Resources Division Stormwater Services Section Capital Services Unit <i>Christie True, Director</i>	LONG MARSH CREEK RESTORATION CONFLUENCE TO R.M. 0.05 VICINITY MAP AND SHEET INDEX	SHEET G1 OF 8 SHEETS 2006-42
SURVEYED: Goulet, Radella	8-2010		PROJECT MANAGER: Doug Chin	7-2011					
SURVEY BASE MAP: Radella	9-2010		DESIGNED: WES KAMEDA, P.E.	7-2011					
CHECKED: Dale Nelson	9-2010		Julia Turney L.G.	7-2011					
NUM.	REVISION	BY	DATE	DESIGN ENTERED: L. TRAXINGER	7-2011				



CALL 2 WORKING DAYS BEFORE YOU DIG
 1-800-424-5555
 (UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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SURVEY BASE MAP:	Radella	9-2010
CHECKED:	Dale Nelson	9-2010

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 7-20-2011**

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PROJECT MANAGER:	Doug Chin	7-2011
DESIGNED:	WES KAMEDA, P.E. Julia Turney L.G.	7-2011 7-2011
DESIGN ENTERED:	L. TRAXINGER	7-2011

PROJECT No.	1C1205
MAINTENANCE DIVISION No.	4

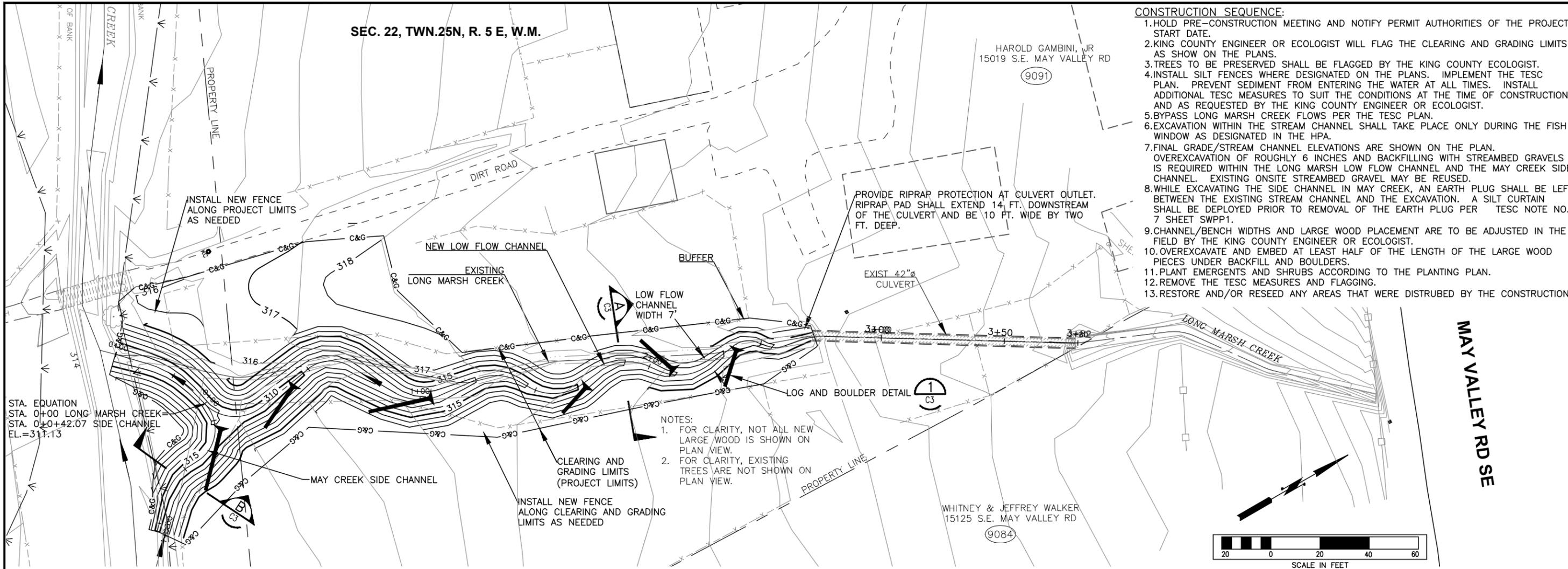
King County
 Department of Natural Resources and Parks
 Water and Land Resources Division
 Stormwater Services Section
 Capital Services Unit
 Christie True, Director

**LONG MARSH CREEK RESTORATION
 CONFLUENCE TO R.M. 0.05**

**EXISTING CONDITIONS PLAN, CHANNEL PROFILE
 LEGEND AND ABBREVIATIONS**

SHEET
C1
 OF
8
 SHEETS
2006-42

SEC. 22, TWN.25N, R. 5 E, W.M.

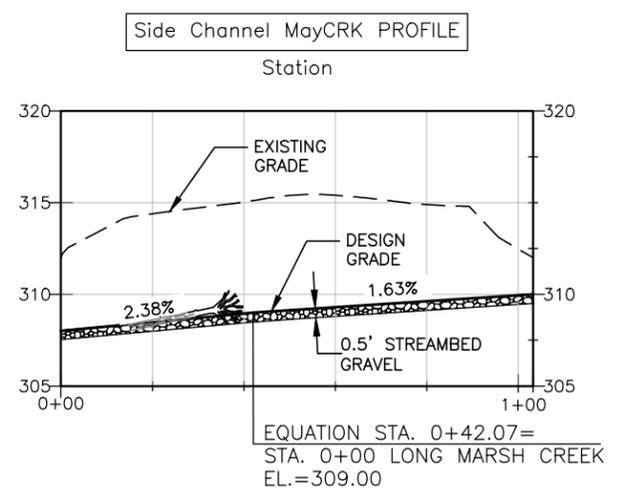
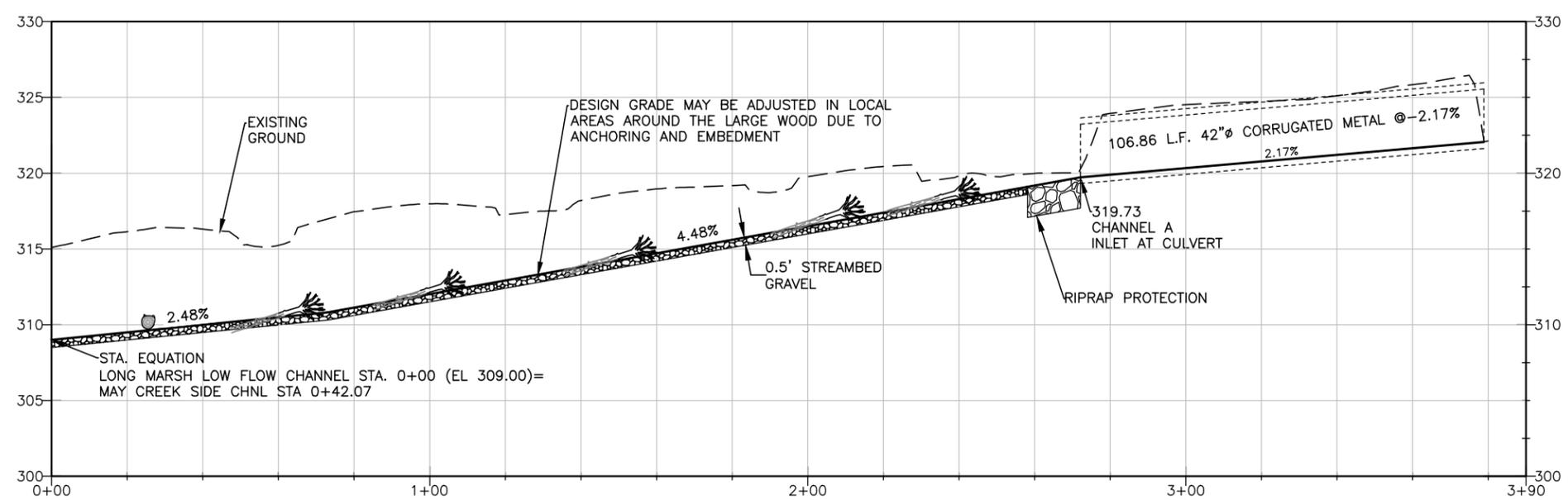
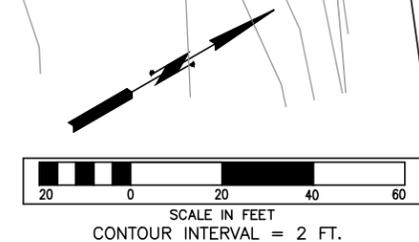


CONSTRUCTION SEQUENCE:

- HOLD PRE-CONSTRUCTION MEETING AND NOTIFY PERMIT AUTHORITIES OF THE PROJECT START DATE.
- KING COUNTY ENGINEER OR ECOLOGIST WILL FLAG THE CLEARING AND GRADING LIMITS AS SHOWN ON THE PLANS.
- TREES TO BE PRESERVED SHALL BE FLAGGED BY THE KING COUNTY ECOLOGIST.
- INSTALL SILT FENCES WHERE DESIGNATED ON THE PLANS. IMPLEMENT THE TESC PLAN. PREVENT SEDIMENT FROM ENTERING THE WATER AT ALL TIMES. INSTALL ADDITIONAL TESC MEASURES TO SUIT THE CONDITIONS AT THE TIME OF CONSTRUCTION AND AS REQUESTED BY THE KING COUNTY ENGINEER OR ECOLOGIST.
- BYPASS LONG MARSH CREEK FLOWS PER THE TESC PLAN.
- EXCAVATION WITHIN THE STREAM CHANNEL SHALL TAKE PLACE ONLY DURING THE FISH WINDOW AS DESIGNATED IN THE HPA.
- FINAL GRADE/STREAM CHANNEL ELEVATIONS ARE SHOWN ON THE PLAN. OVEREXCAVATION OF ROUGHLY 6 INCHES AND BACKFILLING WITH STREAMBED GRAVELS IS REQUIRED WITHIN THE LONG MARSH LOW FLOW CHANNEL AND THE MAY CREEK SIDE CHANNEL. EXISTING ONSITE STREAMBED GRAVEL MAY BE REUSED.
- WHILE EXCAVATING THE SIDE CHANNEL IN MAY CREEK, AN EARTH PLUG SHALL BE LEFT BETWEEN THE EXISTING STREAM CHANNEL AND THE EXCAVATION. A SILT CURTAIN SHALL BE DEPLOYED PRIOR TO REMOVAL OF THE EARTH PLUG PER TESC NOTE NO. 7 SHEET SWPP1.
- CHANNEL/BENCH WIDTHS AND LARGE WOOD PLACEMENT ARE TO BE ADJUSTED IN THE FIELD BY THE KING COUNTY ENGINEER OR ECOLOGIST.
- OVEREXCAVATE AND EMBED AT LEAST HALF OF THE LENGTH OF THE LARGE WOOD PIECES UNDER BACKFILL AND BOULDERS.
- PLANT EMERGENTS AND SHRUBS ACCORDING TO THE PLANTING PLAN.
- REMOVE THE TESC MEASURES AND FLAGGING.
- RESTORE AND/OR RESEED ANY AREAS THAT WERE DISTURBED BY THE CONSTRUCTION.

STA. EQUATION
STA. 0+00 LONG MARSH CREEK=
STA. 0+0+42.07 SIDE CHANNEL
EL.=311.13

NOTES:
1. FOR CLARITY, NOT ALL NEW LARGE WOOD IS SHOWN ON PLAN VIEW.
2. FOR CLARITY, EXISTING TREES ARE NOT SHOWN ON PLAN VIEW.



CALL 2 WORKING DAYS BEFORE YOU DIG
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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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CHECKED:	Dale Nelson	9-2010

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APPROVED:	Don Althausser, P.E.	7-2011
PROJECT MANAGER:	Doug Chin	7-2011
DESIGNED:	WES KAMEDA, P.E.	7-2011
	Julia Turney L.G.	7-2011
DESIGN ENTERED:	L. TRAXINGER	7-2011

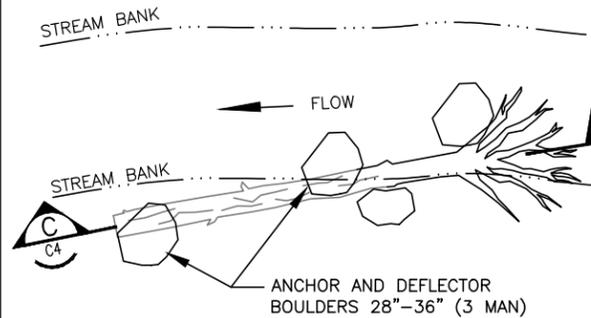
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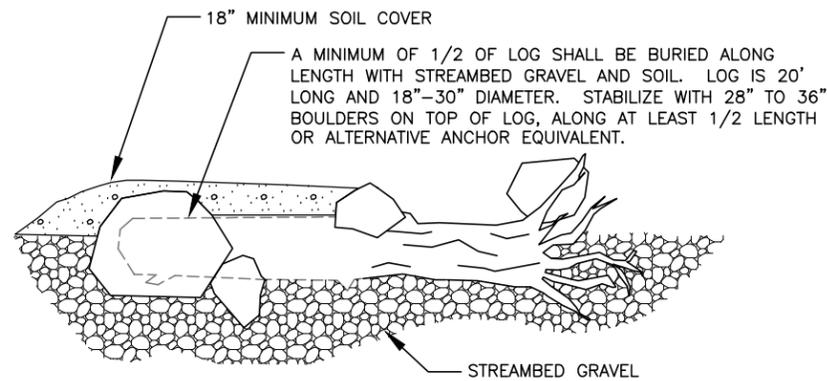
LONG MARSH CREEK RESTORATION CONFLUENCE TO R.M. 0.05
GRADING PLAN AND PROFILE
LONG MARSH CREEK-MAY CREEK SIDE CHANNEL

SHEET **C2** OF **8** SHEETS
2006-42

- LOG & BOULDER NOTES:**
1. USE LOGS WITH ROOT WAD ATTACHED.
 2. LOGS MUST BE BETWEEN 18-INCHES TO 30-INCHES IN DIAMETER AND BETWEEN 12- FEET TO 20- FEET IN LENGTH.
 3. LOGS SHALL BE WESTERN RED CEDAR OR DOUGLAS FIR.
 4. BOULDERS SHALL BE GLACIALLY WORN AND ROUNDED AND 28-INCHES TO 38-INCHES IN DIAMETER.
 5. LOGS WILL BE EXCAVATED OR INCORPORATED INTO THE SURROUNDING BANK CONTOURING OR TERRACES WITH A MIN. OF 18" SOIL COVER.
 6. BOULDERS WILL BE USED TO AID IN ANCHORING LOGS AND TO INCREASE HABITAT COMPLEXITY.
 7. THE EXACT PLACEMENT OF LOGS AND BOULDERS IS TO BE DIRECTED BY THE ENGINEER IN THE FIELD.



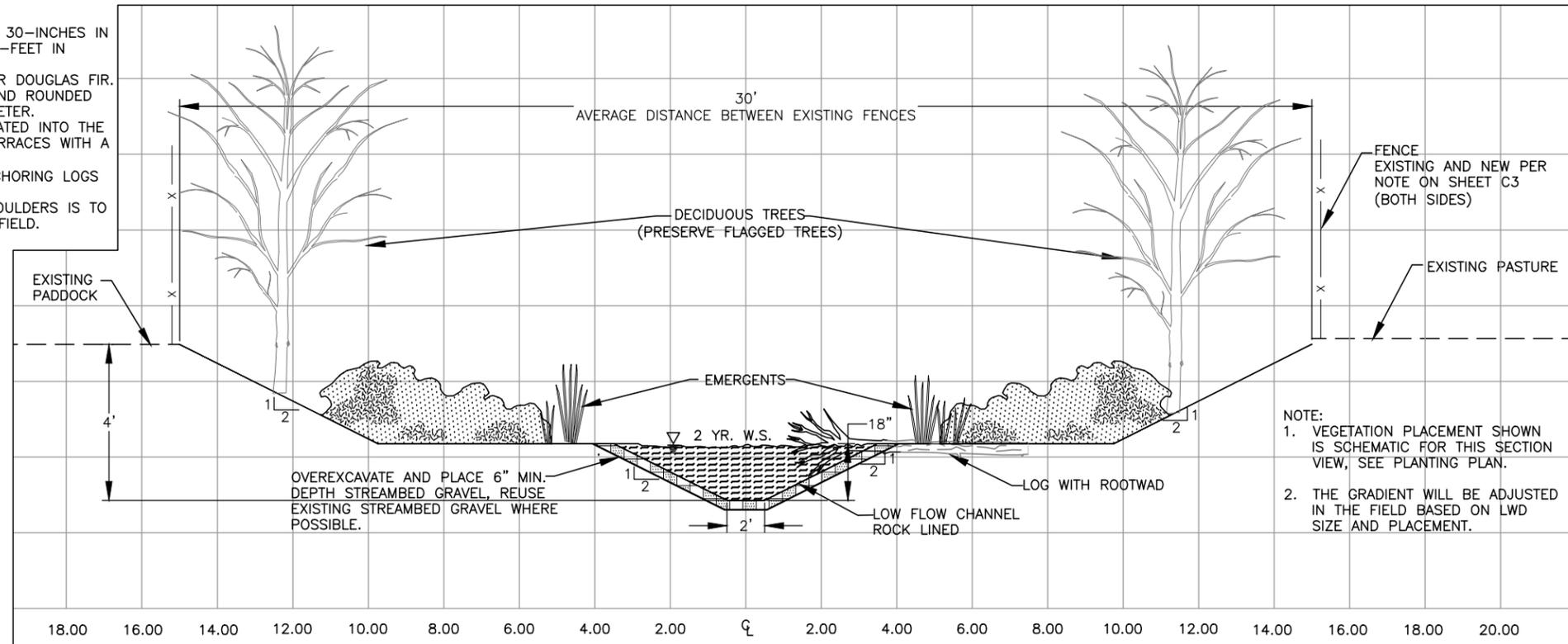
LOG AND BOULDER PLACEMENT DETAIL
NTS



STREAMBED GRAVEL		
WEIGHT	US STD. SIEVE SIZE	PERCENT PASSING BY
	18 INCHES	95-100
	12 INCHES	90-95
	9 INCHES	80-90
	6 INCHES	70-80
	4 INCHES	55-70

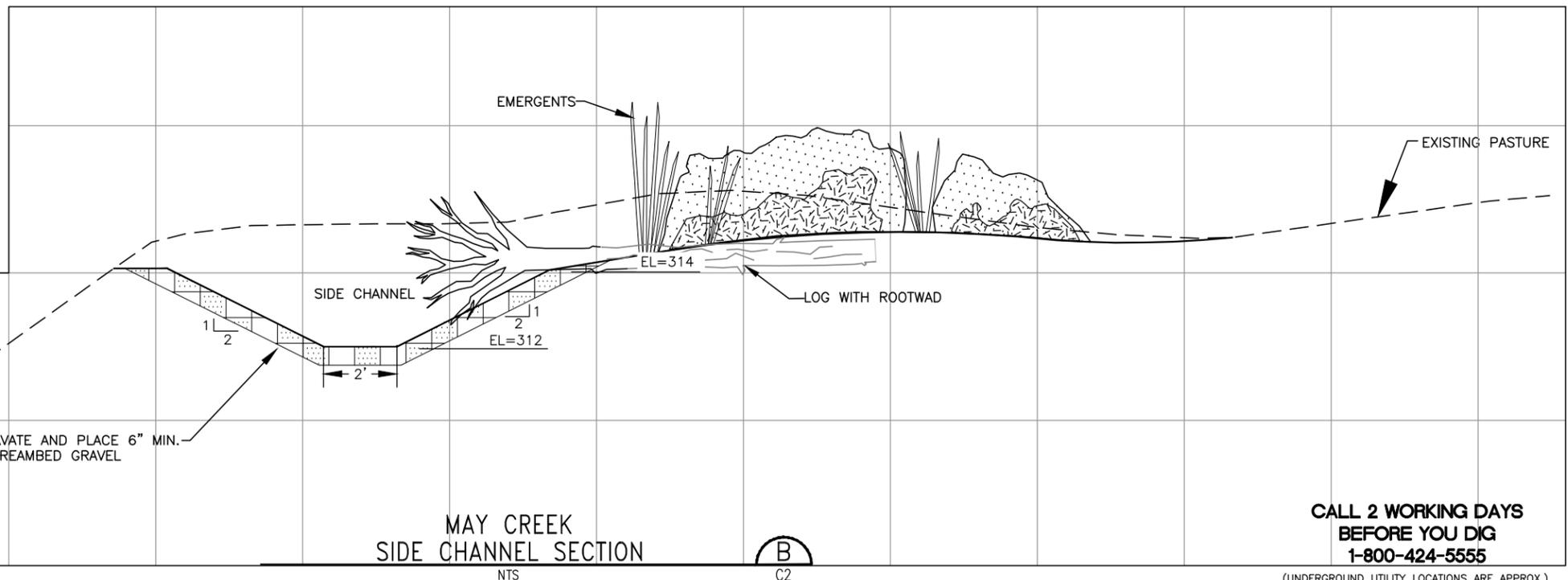
1 1/2 INCHES	45-60
3/4 INCHES	30-50
3/8 INCHES	25-35
NO. 4	16-30
NO. 40	15-20
NO. 200	0-5
18 INCHES	18 INCHES

LOG AND BOULDER PLACEMENT SECTION
NTS



- NOTE:**
1. VEGETATION PLACEMENT SHOWN IS SCHEMATIC FOR THIS SECTION VIEW, SEE PLANTING PLAN.
 2. THE GRADIENT WILL BE ADJUSTED IN THE FIELD BASED ON LWD SIZE AND PLACEMENT.

LONG MARSH CREEK TYPICAL CHANNEL SECTION
NTS



MAY CREEK SIDE CHANNEL SECTION
NTS

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	Julia Turney L.G.	7-2011
DESIGN ENTERED:	L. TRAXINGER	7-2011

PROJECT No.	1C1205
MAINTENANCE DIVISION No.	4

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie True, Director

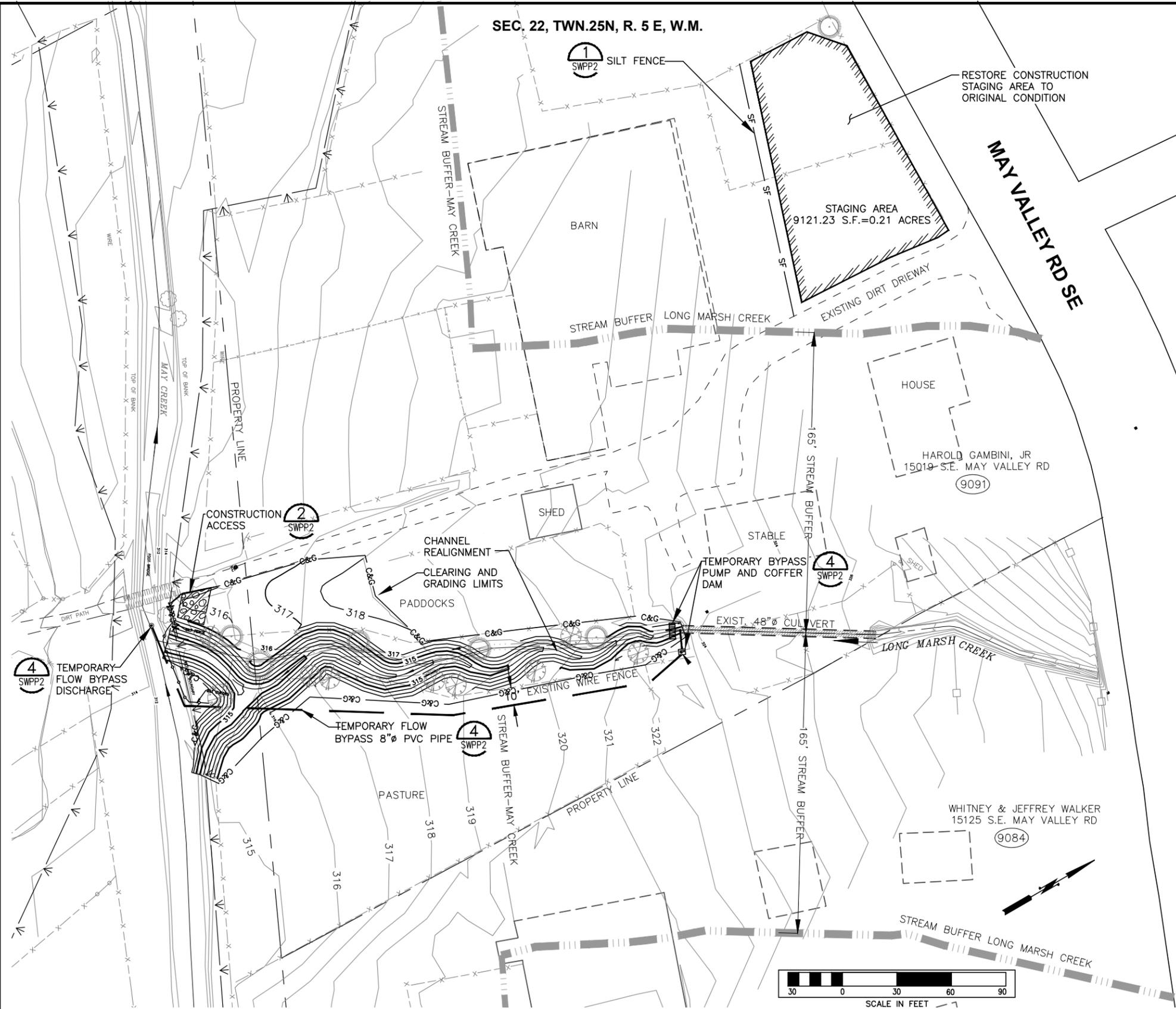
LONG MARSH CREEK RESTORATION CONFLUENCE TO R.M. 0.05

CROSS SECTIONS AND LOG DETAILS LONG MARSH CREEK-MAY CREEK SIDE CHANNEL

SHEET
C3
OF
8
SHEETS

2006-42

SEC. 22, TWN.25N, R. 5 E, W.M.

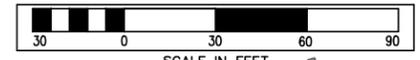


TEMPORARY EROSION AND SEDIMENT CONTROL NOTES :

1. ALL WORK ON PRIVATE PROPERTY WILL BE CONSTRUCTED USING A TEMPORARY CONSTRUCTION EASEMENT. THE DRAINAGE SYSTEM ON PRIVATE PROPERTY WILL NOT BE MAINTAINED BY KING COUNTY AFTER COMPLETION OF THE PROJECT.
2. THE ESC FACILITIES MUST BE CONSTRUCTED IN CONJUNCTION WITH ALL CLEARING AND GRADING ACTIVITIES, AND IN SUCH A MANNER AS TO INSURE THAT SEDIMENT LADEN WATER DOES NOT ENTER THE DRAINAGE SYSTEM OR VIOLATE APPLICABLE WATER STANDARDS. (KCC 9.04.020 AA, KCRS 7.09 D).
3. THE PROJECT SHALL BE SCHEDULED FOR CONSTRUCTION IN DRY CONDITIONS. LONG MARSH CREEK SHALL BE BYPASSED AROUND THE CONSTRUCTION AREA.
4. ALL WORK SHALL COMPLY WITH THE WASHINGTON STATE DEPARTMENT OF FISH AND WILDLIFE HYDRAULIC PERMIT APPROVAL CONDITIONS.
5. THE PROPERTY OWNERS SHALL BE CONTACTED ONE WEEK PRIOR TO CONSTRUCTION.
6. AFTER COMPLETION OF CONSTRUCTION, THE STAGING AREA AND THE DIRT PATH SHALL BE RESTORED TO ORIGINAL CONDITIONS. ALL OTHER DISTURBED AREAS, SHALL BE SCARIFIED, MULCHED AND SEEDED.
7. A SILT CURTAIN, AS DIRECTED BY THE WLRD ECOLOGIST OR ENGINEER, SHALL BE DEPLOYED IN THE EVENT OF TURBIDITY PRODUCING ACTIVITY.
8. SEDIMENT LADEN WATER SHALL BE PUMPED INTO AN UNPAVED UPLAND AREA WHERE IT CAN SHEET FLOW THROUGH VEGETATION PRIOR TO RE-ENTRY INTO MAY CREEK.
9. ALL PAVED ROADS USED FOR INGRESS AND EGRESS SHALL BE KEPT FREE FROM SEDIMENT ACCUMULATION BY SWEEPING AND/OR WASHING AT LEAST ONCE PER DAY.
10. HAND BROOMS AND OTHER APPROPRIATE TOOLS SHALL BE USED TO REMOVE SOIL AND ROCKS FROM CONSTRUCTION VEHICLE TIRES PRIOR TO EXITING THE SITE.
11. THE FOLLOWING BMP'S SHALL BE ONSITE OR READILY ACCESSIBLE DURING CONSTRUCTION:
 - MULCH, STRAW WATTLES AND/OR STRAW BALES
 - SILT FENCING AND SILT CURTAIN
 - SPILL RESPONSE KIT
12. THE CONSTRUCTION LIMITS OF THIS PROJECT SHALL BE DEFINED BY THE CULVERT ON THE UPSTREAM END, THE EXISTING WIRE FENCE ON BOTH SIDES OF LONG MARSH CREEK AND THE SILT FENCE ON THE DOWNSTREAM END, EXCEPT FOR AN ADDITIONAL 5 FT BEYOND THE FENCE AT THE MAY CREEK SIDE CHANNEL AND A PORTION OF THE SOUTH SIDE OF LONG MARSH CREEK.

TESC LEGEND

- TEMPORARY BYPASS PUMP
- TEMPORARY 8" BYPASS PIPE
- SILT FENCE
- SILT CURTAIN
- TEMPORARY BYPASS PIPE/HOSE
- CLEARING LIMITS LINE
- EXISTING WETLAND BOUNDARY
- EXISTING STREAM/CREEK
- CONSTRUCTION ACCESS ROAD
- CLEARING AND GRADING LIMITS



SCALE IN FEET
CONTOUR INTERVAL = 1 FT.

CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-424-5555

(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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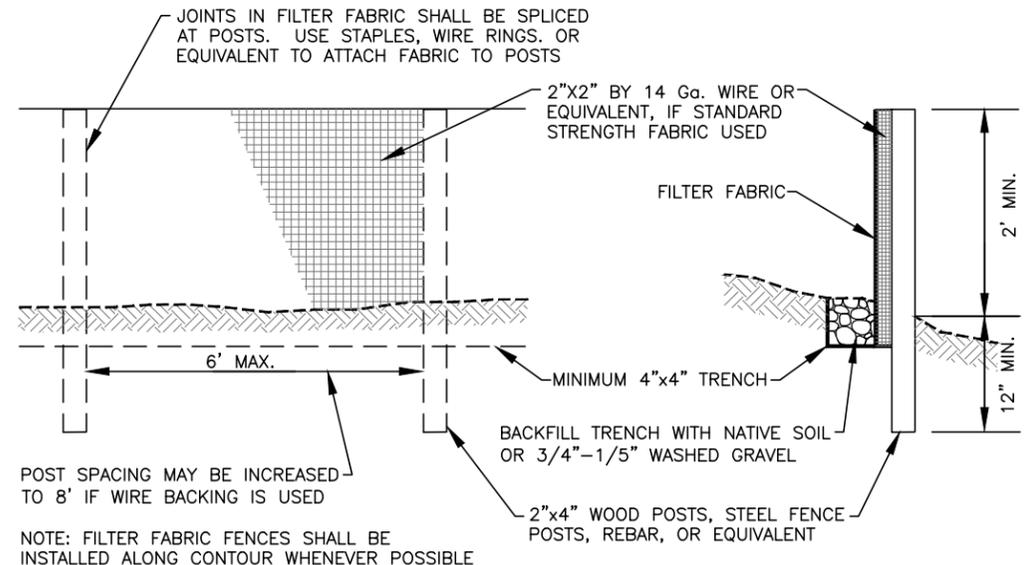
PROJECT No.	1C1205
MAINTENANCE DIVISION No.	4

King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie True, Director

**LONG MARSH CREEK RESTORATION
CONFLUENCE TO R.M. 0.05**

**TEMPORARY EROSION AND SEDIMENT
CONTROL PLAN AND NOTES**

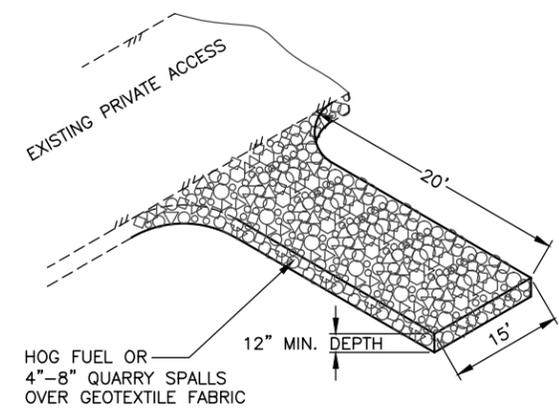
SHEET
SWPP1
OF
8
SHEETS
2006-42



SILT FENCE DETAIL

NTS

1
SWPP1



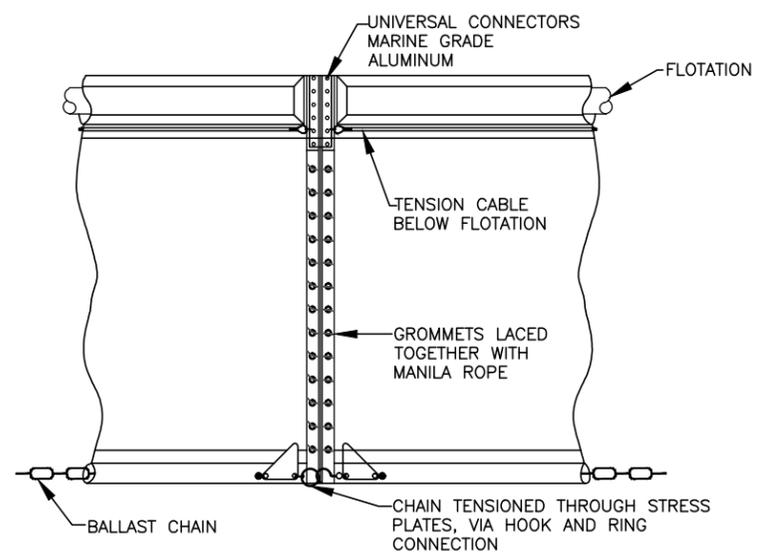
TEMPORARY CONSTRUCTION ACCESS

NTS

CONSTRUCTION ACCESS NOTES:

1. THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOW OF MUD ONTO PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH 2" STONE, AS CONDITIONS DEMAND, AND REPAIR AND/OR CLEAN-OUT OF ANY STRUCTURES USE TO TRAP SEDIMENT.
2. ALL MATERIALS SPILLED, DROPPED, WASHED OR TRACKED FROM VEHICLES ONTO ROADWAYS OR INTO STORM DRAINS MUST BE REMOVED IMMEDIATELY.
3. PROVIDE TRAFFIC CONTROL AND ROAD SIGNAGE FOR CONSTRUCTION VEHICLES ENTERING AND LEAVING SITE.
4. COORDINATE WITH THE PROPERTY OWNER REGARDING THE EXACT SIZE AND LOCATION OF THE TEMPORARY CONSTRUCTION ACCESS TO AVOID DISRUPTION OF THE HORSE BOARDING ACTIVITY ON THIS PROPERTY. REMOVAL OF THE QUARRY SPALLS MAY BE REQUIRED AFTER THE CONSTRUCTION.
5. HOG FUEL MAY BE SUBSTITUTED FOR THE QUARRY SPALLS DEPENDING ON WEATHER CONDITIONS, AT THE DIRECTION OF THE WLRD SITE REPRESENTATIVE.

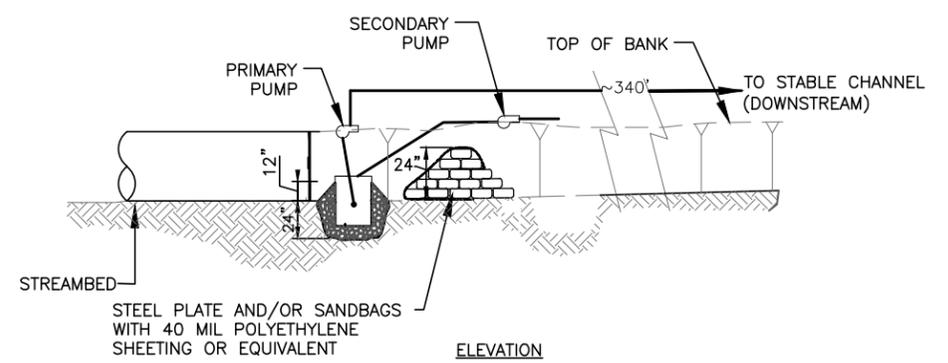
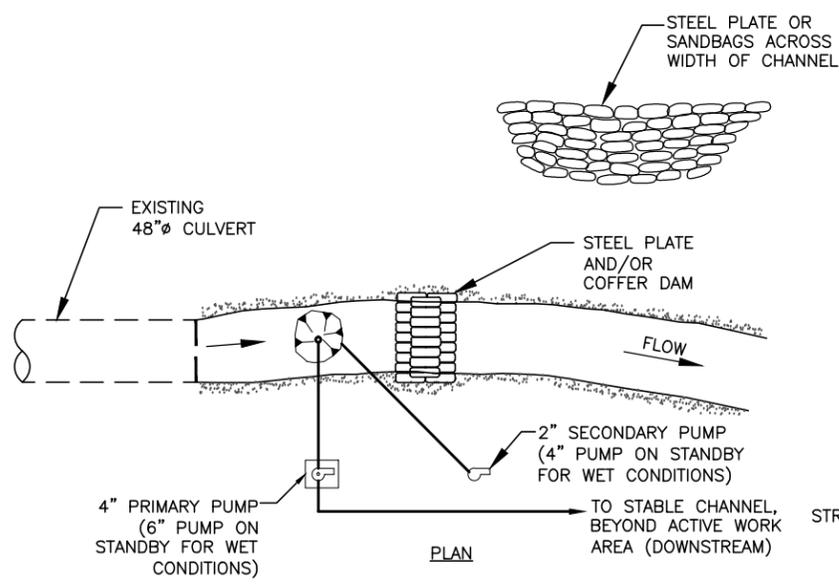
2
SWPP1



SILT CURTAIN (TYPICAL)

NOT TO SCALE

3
SWPP1



TEMPORARY STREAM BYPASS PUMP, DAM AND PIPE DETAIL

NTS

4
SWPP1

FIELD BOOK:	2010-2	9-2010
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PROJECT No.	1C1205
MAINTENANCE DIVISION No.	4

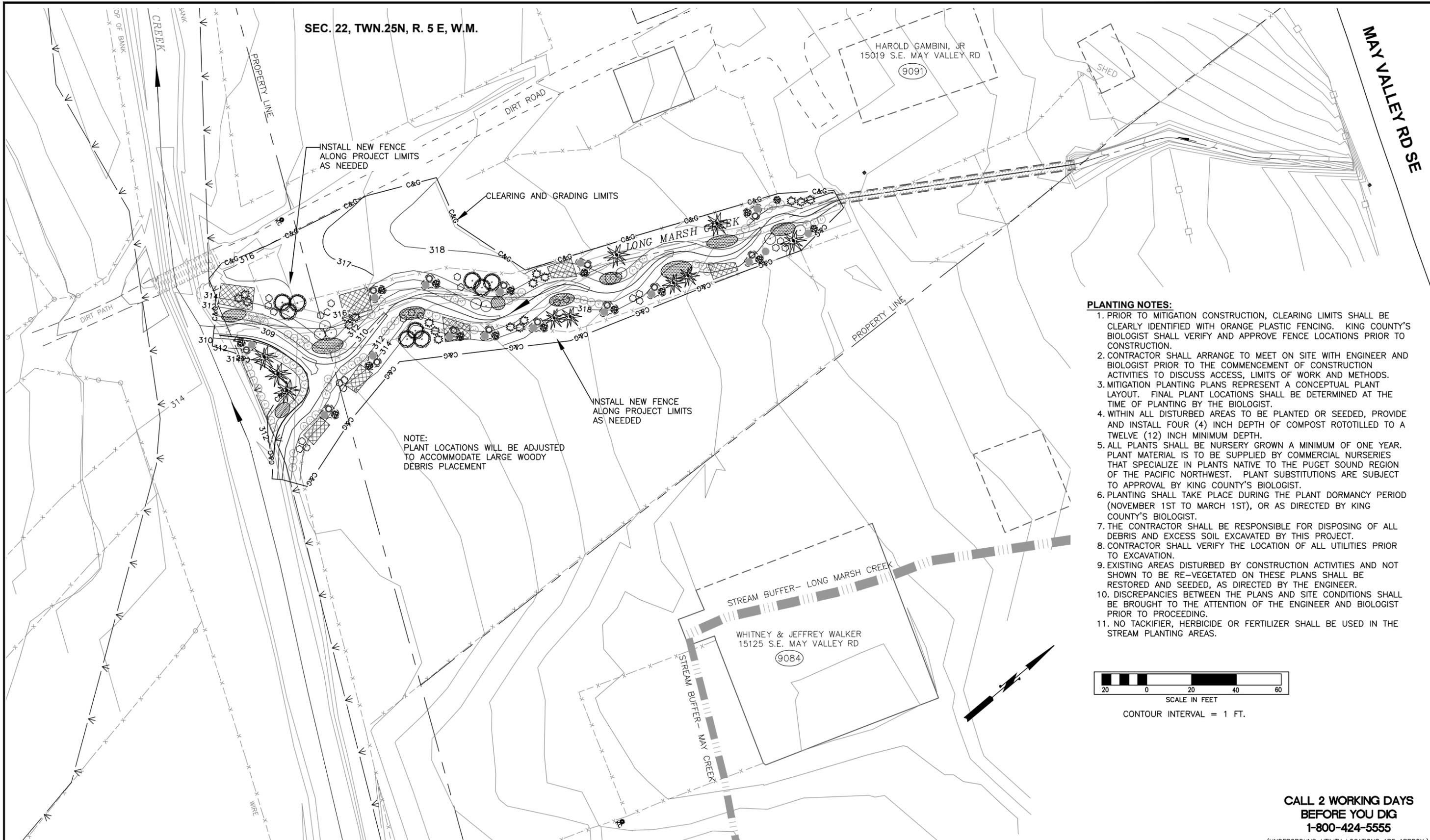


**LONG MARSH CREEK RESTORATION
CONFLUENCE TO R.M. 0.05**

**TEMPORARY EROSION AND SEDIMENT
DETAILS**

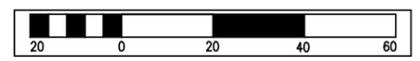
SHEET
SWPP2
OF
8
SHEETS
2006-42

SEC. 22, TWN.25N, R. 5 E, W.M.

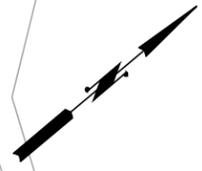


PLANTING NOTES:

1. PRIOR TO MITIGATION CONSTRUCTION, CLEARING LIMITS SHALL BE CLEARLY IDENTIFIED WITH ORANGE PLASTIC FENCING. KING COUNTY'S BIOLOGIST SHALL VERIFY AND APPROVE FENCE LOCATIONS PRIOR TO CONSTRUCTION.
2. CONTRACTOR SHALL ARRANGE TO MEET ON SITE WITH ENGINEER AND BIOLOGIST PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES TO DISCUSS ACCESS, LIMITS OF WORK AND METHODS.
3. MITIGATION PLANTING PLANS REPRESENT A CONCEPTUAL PLANT LAYOUT. FINAL PLANT LOCATIONS SHALL BE DETERMINED AT THE TIME OF PLANTING BY THE BIOLOGIST.
4. WITHIN ALL DISTURBED AREAS TO BE PLANTED OR SEEDED, PROVIDE AND INSTALL FOUR (4) INCH DEPTH OF COMPOST ROTOTILLED TO A TWELVE (12) INCH MINIMUM DEPTH.
5. ALL PLANTS SHALL BE NURSERY GROWN A MINIMUM OF ONE YEAR. PLANT MATERIAL IS TO BE SUPPLIED BY COMMERCIAL NURSERIES THAT SPECIALIZE IN PLANTS NATIVE TO THE PUGET SOUND REGION OF THE PACIFIC NORTHWEST. PLANT SUBSTITUTIONS ARE SUBJECT TO APPROVAL BY KING COUNTY'S BIOLOGIST.
6. PLANTING SHALL TAKE PLACE DURING THE PLANT DORMANCY PERIOD (NOVEMBER 1ST TO MARCH 1ST), OR AS DIRECTED BY KING COUNTY'S BIOLOGIST.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DISPOSING OF ALL DEBRIS AND EXCESS SOIL EXCAVATED BY THIS PROJECT.
8. CONTRACTOR SHALL VERIFY THE LOCATION OF ALL UTILITIES PRIOR TO EXCAVATION.
9. EXISTING AREAS DISTURBED BY CONSTRUCTION ACTIVITIES AND NOT SHOWN TO BE RE-VEGETATED ON THESE PLANS SHALL BE RESTORED AND SEEDED, AS DIRECTED BY THE ENGINEER.
10. DISCREPANCIES BETWEEN THE PLANS AND SITE CONDITIONS SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AND BIOLOGIST PRIOR TO PROCEEDING.
11. NO TACKIFIER, HERBICIDE OR FERTILIZER SHALL BE USED IN THE STREAM PLANTING AREAS.



SCALE IN FEET
CONTOUR INTERVAL = 1 FT.



CALL 2 WORKING DAYS BEFORE YOU DIG
1-800-424-5555

(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

FIELD BOOK:	2010-2	9-2010
SURVEYED:	Goulet, Radella	8-2010
SURVEY BASE MAP:	Radella	9-2010
CHECKED:	Dale Nelson	9-2010

**70% DESIGN
PROGRESS COPY
7-20-2011**

APPROVED:	Don Althausen, P.E.	7-2011
PROJECT MANAGER:	Doug Chin	7-2011
PLANTING DESIGN:	Julia Turney, L.G. Lindsey Miller	7-2011 7-2011
DESIGN ENTERED:	L. Traxinger	7-2011

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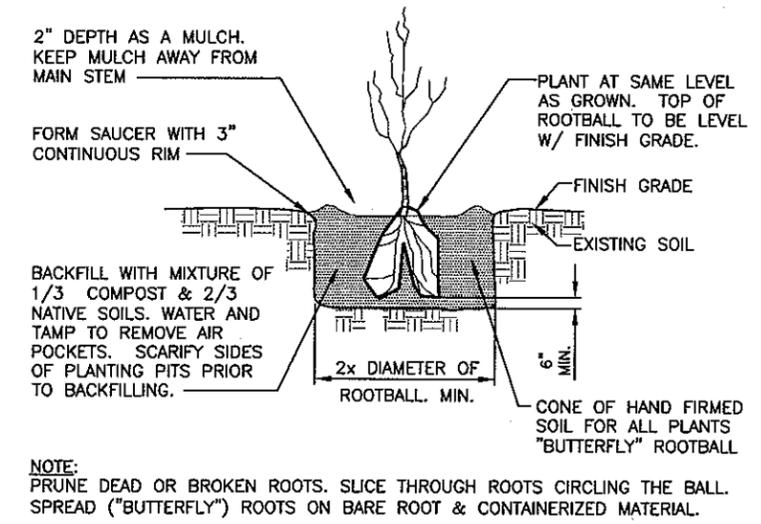
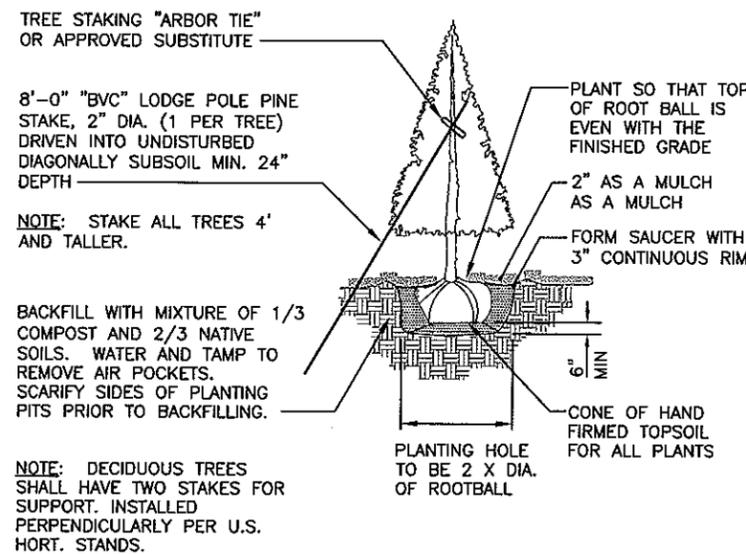
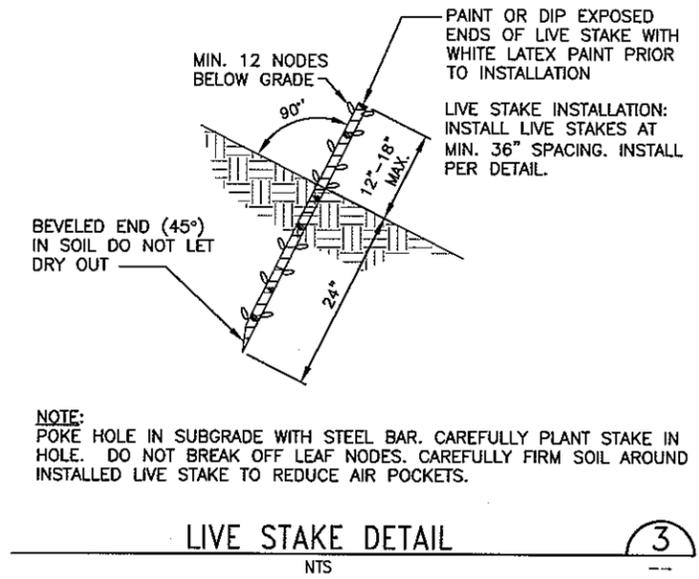
King County
Department of Natural Resources and Parks
Water and Land Resources Division
Stormwater Services Section
Capital Services Unit
Christie True, Director

**LONG MARSH CREEK RESTORATION
CONFLUENCE TO R.M. 0.05**
PLANTING PLAN AND NOTES

SHEET
L1
OF
8
SHEETS
2006-42

Scientific Name	Common Name	Quantity	Size Conditions	Plant Spacing
Long Marsh Creek				
<i>Thuja plicata</i>	Western Red Cedar	10	Container min 18" ht, full, dense foliage, symmetrical crown	High flow channel, slope edge locate in cluster of willows
<i>Betula papyrifera</i>	Paper Birch	9	B&B 5-6' ht, full, dense foliage, symmetrical crown	High flow channel within 50 feet of May Creek
<i>Fraxinus latifolia</i>	Oregon Ash	10	B&B 5-6' ht, full, dense foliage, symmetrical crown	High flow channel, base of slope
<i>Cornus sericea</i>	Red Osier Dogwood	27	Container 18" -21" ht and spread, min two stems	Clusters of three on high flow channel
<i>Acer circiantum</i>	Vine Maple	30	Container 18" -21" ht and spread, min two stems	Clusters of three on high flow channel
<i>Salix lasiandra</i>	Pacific Willow	55	Live stake, min 36" long at 1/2" to 3/4" diameter, min 12 lateral buds per stake	3' oc staggered. Stakes driven into high flow channel distributed along creek
<i>Salix sitchensis</i>	Sitka Willow	55	Live stake, min 36" long at 1/2" to 3/4" diameter, min 12 lateral buds per stake	3' oc staggered Stakes driven into high flow channel distributed along creek
<i>Rubus spectabilis</i>	Salmonberry	30	Container 18" -21" ht and 15" spread, dense, multiple stems	Clusters of three on high flow channel
<i>Symphoricarpos albus</i>	Snowberry	30	Container 15"-18" ht spread, full	Clusters of three on upper bank of high flow channel
<i>Rosa nutkana</i>	Nootka Rose	30	Container 15"-18" ht spread, full	Clusters of three on upper bank of high flow channel
<i>Polystichum munitum</i>	Western Sword Fern	40	1 Gallon container min 3 fronds	Distributed
<i>Achillea millefolium</i>	Yarrow	40	10 cubic inch Plugs or 4" pot	Distributed
<i>Aruncus dioicus</i>	Goat's Beard	40	10 cubic inch Plugs or 4" pot	Distributed
<i>Tellima grandiflora</i>	Fringecup	40	10 cubic inch Plugs or 4" pot	Distributed
<i>Carex lenticularis</i>	Shore Sedge	30	10 cubic inch plugs	Clusters adjacent to low flow channel
<i>Scripus microcarpus</i>	Small-fruited Bulrush	30	10 cubic inch plugs	Clusters adjacent to low flow channel
<i>Oxalis oregano</i>	Wood-sorrel	50	4" pot	Distributed

May Creek Side Channel					
<i>Thuja plicata</i>	Western Red Cedar	3	Container min 18" ht, full, dense foliage, symmetrical crown	"Island" between main and side channel	
<i>Cornus sericea</i>	Red Osier Dogwood	3	1 gal Container min two stems	"Island" between main and side channel	
<i>Symphoricarpos albus</i>	Snowberry	6	1 gal Container min two stems	"Island" between main and side channel	
<i>Carex lenticularis</i>	Shore Sedge	6	10 cubic inch plugs	Low bank along island between main and side channel	
<i>Scripus microcarpus</i>	Small-fruited Bulrush	6	10 cubic inch plugs	Low bank along island between main and side channel	
<i>Salix lasiandra</i>	Pacific Willow	20	Live stake, min 36" long at 1/2" to 3/4" diameter, min 12 lateral buds per stake	3' oc staggered. Stakes driven into banks distributed along island between May Creek main and side channel	
<i>Salix sitchensis</i>	Sitka Willow	20	Live stake, min 36" long at 1/2" to 3/4" diameter, min 12 lateral buds per stake	3' oc staggered Stakes driven into banks distributed along creek	



CONIFEROUS TREE PLANTING
NTS

SMALL TREE, SHRUB AND GROUND COVER PLANTING
NTS

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(UNDERGROUND UTILITY LOCATIONS ARE APPROX.)

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SURVEY BASE MAP: Radella	9-2010		PLANTING DESIGN: Julia Turney, L.G.	7-2011
CHECKED: Dale Nelson	9-2010		DESIGN: Lindsey Miller	7-2011
			DESIGN ENTERED: L. Traxinger	7-2011
NUM.	REVISION	BY	DATE	

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King County
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**LONG MARSH CREEK RESTORATION
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PLANTING SCHEDULE AND DETAILS