APPENDIX A
Agency Correspondence

For the C-470 Corridor
Revised Environmental Assessment

July 2015

SECTION 106 CORRESPONDENCE

Date	From	To	Subject
3-24-2014	Ashley Bushey, CDOT	Jon Chesser, CDOT	Section 106 (NHPA) and Section 4(f) (US DOT Act) processes completed
8-28-2013	Charles Attardo, CDOT	• Edward Nichols, SHPO • Dennis Swain, Littleton Historic Preservation Board • Arapahoe County Commissioners • Dennis Dempsey, Jefferson County • Roger Sherman, C-470 Coalition • Judy Hammer, Douglas County Historic Preservation Board	Requesting concurrence with APE and determinations of eligibility and effect
9-6-2013	Edward Nichols, SHPO	Charles Attardo, CDOT	Determinations of Eligibility and Effects, APE, and Historic Resources Methodology
9-28-2013	Norma Miller, Douglas County	Charles Attardo, CDOT	Concurring with determinations
10-3-2013	Charles Attardo, CDOT	Edward Nichols, SHPO	Additional information regarding Columbine Hills neighborhood
10-16-2013	Edward Nichols, SHPO	Charles Attardo, CDOT	Concurring with finding of *no adverse effect* for Columbine Hills neighborhood
11-26-2013	Charles Attardo, CDOT	• Edward Nichols, SHPO • Dennis Swain, Littleton Historic Preservation Board • Judy Hammer, Douglas County Historic Preservation Board	Requesting written comments regarding proposed Section 4(f) *de minimis* findings for City Ditch
12-5-2013	Edward Nichols, SHPO	Charles Attardo, CDOT	Acknowledging FHWA proposed *de minimis* findings for City Ditch
12-10-2013	Norma Miller, Douglas County	Charles Attardo, CDOT	Concurring with *no adverse effect* determination for City Ditch
1-21-2014	Charles Attardo, CDOT	John M. Cater, FHWA	Requesting concurrence with proposed *de minimis* finding for City Ditch
3-21-2014	John M. Cater, FHWA	Charles Attardo, CDOT	Concurrence signature by John M. Cater, FHWA on Charles Attardo letter dated 1-21-2014

SECTION 106 NATIVE AMERICAN CONSULTATION CORRESPONDENCE

Date	From	To	Subject
3-25-2004	William C. Jones, FHWA	Maxine Natchees, Uintah and Ouray Tribal Business Committee	Example of Native American Consultation letter sent to 31 tribes in 2004
Post-March, 2004	Standing Rock Sioux Tribe	Dan Jepson, CDOT	Example of completed Section 106 Tribal Consultation Interest Response Form
9-27-2013	Jane Hann, CDOT	• Jimmy Newton, Jr, Southern Ute Indian Tribe • Darryll O'Neal, Sr., Northern Arapaho Tribal Business Council	Renewal of Section 106 consultation for C-470 project
10-16-2013	Alden Naranjo, Southern Ute Indian Tribe	Dan Jepson, CDOT	Project would have no effect on properties of religious or cultural significance to the Southern Ute Indian Tribe

SECTION 4(f) *DE MINIMIS* FINDING CORRESPONDENCE

Date	From	To	Subject
12-5-2013	Edward Nichols, SHPO	Charles Attardo, CDOT	Acknowledging FHWA proposed *de minimis* findings for City Ditch
12-10-2013	Norma Miller, Douglas County	Charles Attardo, CDOT	Concurring with *no adverse effect* determination for City Ditch
1-21-2014	Charles Attardo, CDOT	John M. Cater, FHWA	Requesting concurrence with proposed *de minimis* finding for City Ditch
3-21-2014	John M. Cater, FHWA	Charles Attardo, CDOT	Concurrence signature by John M. Cater, FHWA on Charles Attardo *de minimis* finding letter dated 1-21-2014

MEMORANDUM

DEPARTMENT OF TRANSPORTATION

Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

TO: Jon Chesser, Region 1 Environmental Project Manager

FROM: Ashley L. Bushey, Region 1 Historian

DATE: March 24, 2014 3.24.14

RE: C-470 Revised Environmental Assessment; Jefferson, Douglas, and Arapahoe Counties

This memo is to notify you that the Section 106 (NHPA) and Section 4(f) (DOT Act) have been completed for the project referenced above.

Section 106

SHPO Response

CDOT consulted on eligibility and effects with the State Historic Preservation Officer (SHPO), and with the City of Littleton Historic Preservation Board, Arapahoe County Commissioners Office, Jefferson County Historical Commission, CRL Associates, and the Douglas County Historic Preservation Board, in the capacity of Consulting Parties, in letters dated August 28, 2013. In a letter dated September 6, 2013, SHPO concurred with the project Area of Potential Effects (APE), with the recommended determinations of eligibility, and with the recommended effect findings for all but resource 5JF5143, for which SHPO requested additional information to complete their review. A letter of additional information was submitted on October 3, 2013, and SHPO concurred with the recommended finding of *no adverse effect* for resource 5JF5143 by a letter dated October 16, 2013. Consulting party comments were received from the Douglas County Historic Preservation Board in a letter dated September 26, 2013.

In a letter dated November 26, 2013, CDOT notified SHPO of FHWA's intention to complete a Section 4(f) *de minimis* finding relative to resource 5AH254.7/5DA987.1 (City Ditch). The Historic Preservation Commissions representing the City of Littleton and Douglas County were also notified. As the Official with Jurisdiction over this resource, SHPO acknowledged the intention to complete a *de minimis* finding in a letter dated December 5, 2013. Acknowledgement was also received from the Douglas County Historic Preservation Board in a letter dated December 10, 2013.

Tribal Section 106 Consultation

Tribal Consultation requirements under Section 106 were completed by CDOT Environmental Programs Branch. In letters dated September 27, 2013, the Southern Ute Indian Tribe and Northern Arapahoe Tribal Business Council were notified of ongoing changes to the subject Environmental Assessment. A response was received from the Southern Ute Indian Tribe in a letter dated October 16, 2013, confirming no properties of religious or cultural significance to the Southern Ute Indian Tribe would be affected by the project.

Section 4(f) De Minimis

FHWA

CDOT consulted with the Federal Highway Administration (FHWA) regarding the determination of Section 4(f) *de minimis* for resource 5AH254.7/5DA987.1, the City Ditch, in a letter dated December 31, 2013. FHWA concurred with the finding of *de minimis* impact on March 21, 2014.

Clearance to proceed on this project is recommended. As always, please notify me of any changes to the project scope or limits that would require a re-evaluation of the clearance.

Enclosures: Consultation Correspondence

Cc: Dan Jepson, CDOT EPB
Douglas Eberhart, Wilson & Company
Dawn Bunyak, Bunyak Research Associates
File

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Mr. Edward C. Nichols
State Historic Preservation Officer
Colorado Historical Society
1200 Broadway
Denver, CO 80203

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Mr. Nichols:

This letter and enclosed materials constitute a request for concurrence on Determinations of Eligibility and Effects for the project referenced above, which proposes transportation improvements along a 13-mile segment of State Highway C-470 in Jefferson, Arapahoe, and Douglas Counties. The project begins at Kipling Parkway interchange in Jefferson County and extends eastward to and including the Interstate 25 interchange in Douglas County. The Colorado Department of Transportation (CDOT) with the Federal Highway Administration (FHWA) and Douglas County is revising the 2006 C-470 Environmental Assessment (EA) document.

PROJECT DESCRIPTION AND LOCATION

Section 106 and Section 4(f) consultation for the original EA was conducted between March 2004 and December 2005. The final EA was published in February 2006; however no decision documents resulted from the process. The approach identified to complete the planning process includes a revision of the 2006 document.

Since the 2006 EA, a coalition of interested parties and agencies was formed to bring this project to fruition. Formed in February 2011, the C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT, and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to C-470 in Segment 1 (subject project), and ultimately continue improvements along C-470 from Kipling Street to Interstate 70, now referred to as Segment 2.

In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes in Segment 1, but with a revised typical section and revised access concept. The proposed typical section replaces the original barrier separation with a painted (buffer) separation, and increases shoulder widths. The proposed improvements also include the addition of multiple auxiliary lanes at strategic locations along C-470 where on-ramp to off-ramp spacing is close, and where the auxiliary lane will provide an operational improvement to C-470. Thus, some portions of the corridor will have auxiliary lanes, and other portions will not. Access to the tolled express lanes is planned with ingress and egress slip ramps and weaving zones strategically placed along the corridor. Express lane traffic will be monitored by

electronic devices similar to those used on E-470 located on overhead sign bridges and individual transponders mounted on vehicle windshields. No toll collection booths will be required.

AREA OF POTENTIAL EFFECTS (APE) & METHODOLOGY

The Area of Potential Effects (APE) for the undertaking is based on the APE developed in consultation with Colorado SHPO in 2004 for the purpose of the Environmental Assessment published in 2006. Concurrence on the 2004 APE was received from SHPO in May of that year. As in the initial consultation, project activities and proposed improvements will remain within the existing CDOT Right-of-Way (ROW). The APE boundary follows the CDOT ROW with the exception of areas where historic or potentially historic resources are located that may be indirectly affected by project activities. Changes reflected in the 2013 APE are located at the intersection of S. Santa Fe Drive (SH85) and in areas where recently identified historic resources are located. The limits of the APE at the intersection of S. Santa Fe Drive and C-470 has been pared down from the 2006 EA to reflect the current proposed plan. Since 2006, improvements at the Santa Fe intersection, including a flyover onto C-470, have been completed under a separate environmental clearance. During the subject project, there will be no changes at Santa Fe beyond improvements to lanes on C-470. The APE has been expanded in areas to include parcels associated with recently identified historic resources.

METHODOLOGY

In May and June 2013, Dawn Bunyak of Bunyak Research Associates conducted research and field surveys in order to revise the historic resource survey report for the revised EA. Research methodology included a review of the Office of Archeology and Historic Preservation (OAHP) Compass database to update records and findings since the 2006 EA. No additional listings were indicated by that search.

A total of eleven (11) cultural resources constructed during or before 1968 are located within the project APE. The date 1968 (45 years ago) was selected as standard CDOT practice and to allow for a period of completion of final design and construction of the subject project. Five (5) resources are newly identified or recently meet the age requirements for consideration as historic resources. The remaining six (6) resources, including three (3) linear resources with multiple segments occurring within the APE, were identified as eligible resources under the original EA. The current project conducted re-evaluations of these resources on OAHP Form 1405.

DETERMINATIONS OF ELIGIBILITY AND EFFECTS

Determinations of Eligibility

The current cultural resource inventory identified three bridge structures (F-16-HY, F-16-HW, and F-16-HV) not included in the original evaluation. Each of these structures was constructed in 1968 and evaluated as part of the current 2013 Colorado Bridge Inventory, and each was recommended not eligible by that inventory. As that inventory has not yet been submitted for SHPO review, forms for these resources are included with this review for concurrence with the recommended finding.

Two newly identified resources were surveyed for the purpose of this project, the Chatfield Dam and Columbine Hills Subdivision. Chatfield Dam was surveyed on Architectural Inventory Form 1403 and recommended eligible. Columbine Hills Subdivision was surveyed on the Subdivision Inventory Form 1403b and recommended eligible.

Summaries of eligibility for each resource are identified in the table below (Table 1). Please refer to the enclosed Historic Resources Report and inventory forms for detailed descriptions of the eligibility and effects for each site.

Table 1—Summary of Historic Properties & Determination of Eligibility
Newly Identified Properties are in Bold Font

Site Number	Site Name	Address	Description	NRHP Eligibility & Date
5JF188	Hildebrand Ranch Historic District	8500 Deer Creek Road, Littleton	Ranch	National Register (1975)
5JF2613	Selzell Ditch	Arapahoe County, Littleton	Irrigation Ditch	Officially Eligible (2004)
5JF4795	**Massey Draw CBC, F-16-HY**	**Massey Draw**	**Highway Culvert**	**Field Not Eligible (2013)**
5JF5142, 5DA3091	**Chatfield Dam**	**S Wadsworth Blvd**	**Dam**	**Field Eligible (2013)**
5JF5143	**Columbine Hills**	**S Platte Canyon**	**Post-World War II Subdivision**	**Field Eligible (2013)**
5AH254.7	City Ditch Segment	Arapahoe County	Irrigation Ditch	Officially Eligible (1979)
5DA987.1	City Ditch Segment	Douglas County	Irrigation Ditch	Officially Eligible (1979)
5DA2819	**S Platte River Bridge, F-16-HW**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
5DA2826	**S Platte River Bridge, F-16-HV**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
5AH256.4	AT&SF Railroad Segment	Arapahoe County	Railroad Segment	Officially Eligible (1995)
5DA922.1	AT&SF Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA922.2	AT&SF Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1995)
5AH255.2	D&RG Railroad Segment	Arapahoe County, Littleton	Railroad Segment	Officially Eligible (1995)
5AH255.5	D&RG Railroad Segment	Arapahoe County	Railroad Segment	Officially Eligible (2004)
5DA921.1	D&RG Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA600.3	High Line Canal	Douglas County	Irrigation Ditch	Officially Eligible (2004)

Determinations of Effect

Impacts to historic resources were assessed for an Express Lane Alternative. These findings are summarized in the table below (Table 2) and described more fully in the attached Historic Resource Survey C-470-Kipling Parkway to I-25, prepared by Bunyak Research Associates under contract to Wilson & Company, Inc. and CDOT. As the work will remain within the existing CDOT right-of-way, no acquisitions are required to accommodate project activities. Impacts are generally indirect, resulting from anticipated noise levels and visual impacts resulting from the wider highway. Specific data related to noise is not available, as the noise study for the subject project is currently under completion.

Table 2—Summary of Proposed Action Impacts and Determinations of Effect
Newly Identified Properties are in Bold Font

Site Number	Site Name	Proposed Action Impact	Determination of Effects
5JF188	Hildebrand Ranch Historic District	No direct impacts. Limits of construction are 1,957 feet from the District boundary at the closest point. Noise dissipates after 500 feet: no indirect impacts are anticipated from noise. Addition of an express lane in each direction within existing ROW will not substantially alter or diminish the visual setting of the property from this distance.	No historic properties affected
5JF2613	Selzell Ditch	The resource exists within the APE; however no construction impacts are indicated to the resource.	No historic properties affected
5JF4795	**Massey Draw CBC, F-16-HY**	**Resource may be altered or replaced.**	**No historic properties affected**
5JF5142, 5DA3091	**Chatfield Dam**	**No direct impacts. The project will result in additional span of highway visible from the resource and may result in greater traffic noise; noise and visual impacts will not diminish the features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5JF5143	**Columbine Hills**	**No direct impacts. Indirect impacts include a potential for elevated noise levels, which may be mitigated by introduction of sound walls. Sound walls would constitute visual impact. Noise and visual impacts will not diminish the defining features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5AH254.7 5DA987.1	City Ditch Segment	Realignment/reconstruction of non-supporting segment.	No Adverse Effect
5DA2819	**S Platte River Bridge, F-16-HW**	**Resource will be removed and replaced.**	**No historic properties affected**
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5DA600.3	High Line Canal Segment	The existing Concrete Box Culvert (CBC) carrying the resource under C-470 will *not* need to be widened to accommodate the project. The project will require construction of a concrete retaining wall at the edge of the pavement to stabilize the slope and prevent erosion of the canal. The wall will be placed approximately 12' from the CBC and will not alter or diminish the defining features of the resource.	No Adverse Effect

We hereby request your concurrence with the revised APE and determinations of eligibility and effects. Your response is necessary for the Federal Highway Administration's compliance with Section 106 of the National Historic Preservation Act (as amended) and the Advisory Council on Historic Preservation's regulations. Thank you in advance for your prompt attention to this matter. If you require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at (303) 757-9397.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Historic Resource Survey Report, Including APE Map
Inventory forms (Architectural Inventory Form 1403, Subdivision Form 1403b, Revisitation Form 1405)

cc: Douglas Eberhart, Wilson & Company
Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Dennis Swain, Principal Planner
City of Littleton Historic Preservation Board
Community Development Department
2255 West Berry Avenue
Littleton, CO 80165

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Mr. Swain:

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If the Littleton Historic Preservation Board is interested in participating as a consulting party for this revised EA under Section 106, please respond in writing within 30 days of receipt of this letter to Ashley L. Bushey, Region 1 Senior Staff Historian, at the address on the letterhead. We request that your response include a statement of demonstrated interest in historic properties associated with this EA, as stipulated in the Section 106 regulations.

PROJECT DESCRIPTION AND LOCATION

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Determinations of Effect
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5DA600.3	High Line Canal Segment	The existing Concrete Box Culvert (CBC) carrying the resource under C-470 will *not* need to be widened to accommodate the project. The project will require construction of a concrete retaining wall at the edge of the pavement to stabilize the slope and prevent erosion of the canal. The wall will be placed approximately 12' from the CBC and will not alter or diminish the defining features of the resource.	No Adverse Effect

As a local government with a potential interest in this undertaking, we welcome your comments on these determinations. Should you elect to respond, we request you do so within thirty (30) days of receipt of these materials, as stipulated in the Section 106 regulations. For additional information on the Section 106 process, please visit the website of the Advisory Council on Historic Preservation (ACHP) at www.achp.gov. If you have questions or require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at 303.757.9397 or ashley.bushey@state.co.us.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Historic Resource Survey Report, Including APE Map
Inventory forms (Architectural Inventory Form 1403, Subdivision Form 1403b, Revisitation Form 1405)

cc: Douglas Eberhart, Wilson & Company
Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Commissioners' Office
Arapahoe County Government
Administration Building
5334 S. Prince Street
Littleton, CO 80120

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Commissioners:

This letter and enclosed materials constitute a request for comments on Determinations of Eligibility and Effects for the project referenced above, which proposes transportation improvements along a 13-mile segment of State Highway C-470 in Jefferson, Arapahoe, and Douglas Counties. The project begins at Kipling Parkway interchange in Jefferson County and extends eastward to and including the Interstate 25 interchange in Douglas County. The Colorado Department of Transportation (CDOT) with the Federal Highway Administration (FHWA) and Douglas County is revising the 2006 C-470 Environmental Assessment (EA) document. As a consulting party in the 2004—2005 Section 106 consultation for the subject project, we are providing the Arapahoe County Board of County Commissioners with the opportunity to comment on the following revisions to the project.

PROJECT DESCRIPTION AND LOCATION

Section 106 and Section 4(f) consultation for the original EA was conducted between March 2004 and December 2005. The final EA was published in February 2006; however no decision documents resulted from the process. The approach identified to complete the planning process includes a revision of the 2006 document.

Since the 2006 EA, a coalition of interested parties and agencies was formed to bring this project to fruition. Formed in February 2011, the C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT, and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to C-470 in Segment 1 (subject project), and ultimately continue improvements along C-470 from Kipling Street to Interstate 70, now referred to as Segment 2.

In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes in Segment 1, but with a revised typical section and revised access concept. The proposed typical section replaces the original barrier separation with a painted (buffer) separation, and increases shoulder widths. The proposed improvements also include the addition of multiple auxiliary lanes at strategic locations along C-470 where on-ramp to off-ramp spacing is close, and where the auxiliary lane will provide an operational improvement to C-470. Thus, some portions of the corridor will have auxiliary

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AREA OF POTENTIAL EFFECTS (APE) & METHODOLOGY

The Area of Potential Effects (APE) for the undertaking is based on the APE developed in consultation with Colorado SHPO in 2004 for the purpose of the Environmental Assessment published in 2006. Concurrence on the 2004 APE was received from SHPO in May of that year. As in the initial consultation, project activities and proposed improvements will remain within the existing CDOT Right-of-Way (ROW). The APE boundary follows the CDOT ROW with the exception of areas where historic or potentially historic resources are located that may be indirectly affected by project activities. Changes reflected in the 2013 APE are located at the intersection of S. Santa Fe Drive (SH85) and in areas where recently identified historic resources are located. The limits of the APE at the intersection of S. Santa Fe Drive and C-470 has been pared down from the 2006 EA to reflect the current proposed plan. Since 2006, improvements at the Santa Fe intersection, including a flyover onto C-470, have been completed under a separate environmental clearance. During the subject project, there will be no changes at Santa Fe beyond improvements to lanes on C-470. The APE has been expanded in areas to include parcels associated with recently identified historic resources.

METHODOLOGY

In May and June 2013, Dawn Bunyak of Bunyak Research Associates conducted research and field surveys in order to revise the historic resource survey report for the revised EA. Research methodology included a review of the Office of Archeology and Historic Preservation (OAHP) Compass database to update records and findings since the 2006 EA. No additional listings were indicated by that search.

A total of eleven (11) cultural resources constructed during or before 1968 are located within the project APE. The date 1968 (45 years ago) was selected as standard CDOT practice and to allow for a period of completion of final design and construction of the subject project. Five (5) resources are newly identified or recently meet the age requirements for consideration as historic resources. The remaining six (6) resources, including three (3) linear resources with multiple segments occurring within the APE, were identified as eligible resources under the original EA. The current project conducted re-evaluations of these resources on OAHP Form 1405.

DETERMINATIONS OF ELIGIBILITY AND EFFECTS

Determinations of Eligibility

The current cultural resource inventory identified three bridge structures (F-16-HY, F-16-HW, and F-16-HV) not included in the original evaluation. Each of these structures was constructed in 1968 and evaluated as part of the current 2013 Colorado Bridge Inventory, and each was recommended not eligible by that inventory. As that inventory has not yet been submitted for SHPO review, forms for these resources are included with this review for concurrence with the recommended finding.

Two newly identified resources were surveyed for the purpose of this project, the Chatfield Dam and Columbine Hills Subdivision. Chatfield Dam was surveyed on Architectural Inventory Form 1403 and recommended eligible. Columbine Hills Subdivision was surveyed on the Subdivision Inventory Form 1403b and recommended eligible.

Summaries of eligibility for each resource are identified in the table below (Table 1). Please refer to the enclosed Historic Resources Report and inventory forms for detailed descriptions of the eligibility and effects for each site.

Table 1—Summary of Historic Properties & Determination of Eligibility
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Site Number	Site Name	Address	Description	NRHP Eligibility & Date
5JF188	Hildebrand Ranch Historic District	8500 Deer Creek Road, Littleton	Ranch	National Register (1975)
5JF2613	Selzell Ditch	Arapahoe County, Littleton	Irrigation Ditch	Officially Eligible (2004)
5JF4795	**Massey Draw CBC, F-16-HY**	**Massey Draw**	**Highway Culvert**	**Field Not Eligible (2013)**
5JF5142, 5DA3091	**Chatfield Dam**	**S Wadsworth Blvd**	**Dam**	**Field Eligible (2013)**
5JF5143	**Columbine Hills**	**S Platte Canyon**	**Post-World War II Subdivision**	**Field Eligible (2013)**
5AH254.7	City Ditch Segment	Arapahoe County	Irrigation Ditch	Officially Eligible (1979)
5DA987.1	City Ditch Segment	Douglas County	Irrigation Ditch	Officially Eligible (1979)
5DA2819	**S Platte River Bridge, F-16-HW**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
5DA2826	**S Platte River Bridge, F-16-HV**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
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5DA922.1	AT&SF Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
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5DA921.1	D&RG Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA600.3	High Line Canal	Douglas County	Irrigation Ditch	Officially Eligible (2004)

Determinations of Effect

Impacts to historic resources were assessed for an Express Lane Alternative. These findings are summarized in the table below (Table 2) and described more fully in the attached Historic Resource Survey C-470-Kipling Parkway to I-25, prepared by Bunyak Research Associates under contract to Wilson & Company, Inc. and CDOT. As the work will remain within the existing CDOT right-of-way, no acquisitions are required to accommodate project activities. Impacts are generally indirect, resulting from anticipated noise levels and visual impacts resulting from the wider highway. Specific data related to noise is not available, as the noise study for the subject project is currently under completion.

Table 2—Summary of Proposed Action Impacts and Determinations of Effect
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Site Number	Site Name	Proposed Action Impact	Determination of Effects
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5JF2613	Selzell Ditch	The resource exists within the APE; however no construction impacts are indicated to the resource.	No historic properties affected
5JF4795	**Massey Draw CBC, F-16-HY**	**Resource may be altered or replaced.**	**No historic properties affected**
5JF5142, 5DA3091	**Chatfield Dam**	**No direct impacts. The project will result in additional span of highway visible from the resource and may result in greater traffic noise; noise and visual impacts will not diminish the features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5JF5143	**Columbine Hills**	**No direct impacts. Indirect impacts include a potential for elevated noise levels, which may be mitigated by introduction of sound walls. Sound walls would constitute visual impact. Noise and visual impacts will not diminish the defining features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5AH254.7 5DA987.1	City Ditch Segment	Realignment/reconstruction of non-supporting segment.	No Adverse Effect
5DA2819	**S Platte River Bridge, F-16-HW**	**Resource will be removed and replaced.**	**No historic properties affected**
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5AH256.4 5DA922.1 5DA922.2	AT&SF Railroad Segment	The resource parallels the eastern side of US85/Santa Fe Drive and intersects C-470 via a highway overpass. Overpass wingwalls may be expanded, but will not intersect the resource boundary. Bridge piers will remain in their existing locations.	No historic properties affected
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As a local government with a potential interest in this undertaking, we welcome your comments on these determinations. Should you elect to respond, we request you do so within thirty (30) days of receipt of these materials, as stipulated in the Section 106 regulations. For additional information on the Section 106 process, please visit the website of the Advisory Council on Historic Preservation (ACHP) at www.achp.gov. If you have questions or require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at 303.757.9397 or ashley.bushey@state.co.us.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Historic Resource Survey Report, Including APE Map
Inventory forms (Architectural Inventory Form 1403, Subdivision Form 1403b, Revisitation Form 1405)

cc: Douglas Eberhart, Wilson & Company
Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Dennis Dempsey, Long Range Planner
Jefferson County Historical Commission
Planning and Zoning Department
100 Jefferson County Parkway, Suite 3550
Golden, CO 80419

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

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PROJECT DESCRIPTION AND LOCATION

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Region 1 Planning and Environmental Manager

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Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Roger Sherman
CRL Associates
C-470 Coalition
1625 Broadway, Suite 700
Denver, CO 80202

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

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If CRL Associates, on behalf of the C-470 Coalition, is interested in participating as a consulting party for this revised EA under Section 106, please respond in writing within 30 days of receipt of this letter to Ashley L. Bushey, Region 1 Senior Staff Historian, at the address on the letterhead. We request that your response include a statement of demonstrated interest in historic properties associated with this EA, as stipulated in the Section 106 regulations.

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5AH255.5	D&RG Railroad Segment	Arapahoe County	Railroad Segment	Officially Eligible (2004)
5DA921.1	D&RG Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA600.3	High Line Canal	Douglas County	Irrigation Ditch	Officially Eligible (2004)

Determinations of Effect
Impacts to historic resources were assessed for an Express Lane Alternative. These findings are summarized in the table below (Table 2) and described more fully in the attached Historic Resource Survey C-470-Kipling Parkway to I-25, prepared by Bunyak Research Associates under contract to Wilson & Company, Inc. and CDOT. As the work will remain within the existing CDOT right-of-way, no acquisitions are required to accommodate project activities. Impacts are generally indirect, resulting from anticipated noise levels and visual impacts resulting from the wider highway. Specific data related to noise is not available, as the noise study for the subject project is currently under completion.

Table 2—Summary of Proposed Action Impacts and Determinations of Effect
Newly Identified Properties are in Bold Font

Site Number	Site Name	Proposed Action Impact	Determination of Effects
5JF188	Hildebrand Ranch Historic District	No direct impacts. Limits of construction are 1,957 feet from the District boundary at the closest point. Noise dissipates after 500 feet: no indirect impacts are anticipated from noise. Addition of an express lane in each direction within existing ROW will not substantially alter or diminish the visual setting of the property from this distance.	No historic properties affected
5JF2613	Selzell Ditch	The resource exists within the APE; however no construction impacts are indicated to the resource.	No historic properties affected
5JF4795	**Massey Draw CBC, F-16-HY**	**Resource may be altered or replaced.**	**No historic properties affected**
5JF5142, 5DA3091	**Chatfield Dam**	**No direct impacts. The project will result in additional span of highway visible from the resource and may result in greater traffic noise; noise and visual impacts will not diminish the features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5JF5143	**Columbine Hills**	**No direct impacts. Indirect impacts include a potential for elevated noise levels, which may be mitigated by introduction of sound walls. Sound walls would constitute visual impact. Noise and visual impacts will not diminish the defining features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5AH254.7 5DA987.1	City Ditch Segment	Realignment/reconstruction of non-supporting segment.	No Adverse Effect
5DA2819	**S Platte River Bridge, F-16-HW**	**Resource will be removed and replaced.**	**No historic properties affected**
5DA2826	**S Platte River Bridge, F-16-HV**	**Resource will be removed and replaced.**	**No historic properties affected**
5AH256.4 5DA922.1 5DA922.2	AT&SF Railroad Segment	The resource parallels the eastern side of US85/Santa Fe Drive and intersects C-470 via a highway overpass. Overpass wingwalls may be expanded, but will not intersect the resource boundary. Bridge piers will remain in their existing locations.	No historic properties affected
5AH255.2 5AH255.5 5DA921.1	D&RG Railroad Segments	The resource parallels the eastern side of US85/Santa Fe Drive and intersects C-470 via a highway overpass. Overpass wingwalls may be expanded, but will not intersect the resource boundary. Bridge piers will remain in their existing locations.	No historic properties affected
5DA600.3	High Line Canal Segment	The existing Concrete Box Culvert (CBC) carrying the resource under C-470 will *not* need to be widened to accommodate the project. The project will require construction of a concrete retaining wall at the edge of the pavement to stabilize the slope and prevent erosion of the canal. The wall will be placed approximately 12' from the CBC and will not alter or diminish the defining features of the resource.	No Adverse Effect

As a local organization with a potential interest in this undertaking, we welcome your comments on these determinations. Should you elect to respond, we request you do so within thirty (30) days of receipt of these materials, as stipulated in the Section 106 regulations. For additional information on the Section 106 process, please visit the website of the Advisory Council on Historic Preservation (ACHP) at www.achp.gov. If you have questions or require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at 303.757.9397 or ashley.bushey@state.co.us.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Historic Resource Survey Report, Including APE Map
Inventory forms (Architectural Inventory Form 1403, Subdivision Form 1403b, Revisitation Form 1405)

cc: Douglas Eberhart, Wilson & Company
Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9929
(303) 757-9036 FAX

August 28, 2013

Judy Hammer
Douglas County Historic Preservation Board
Community Planning and Sustainable Development
100 3rd Street
Castle Rock, CO 80104

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Ms. Hammer:

This letter and enclosed materials constitute a request for comments on Determinations of Eligibility and Effects for the project referenced above, which proposes transportation improvements along a 13-mile segment of State Highway C-470 in Jefferson, Arapahoe, and Douglas Counties. The project begins at Kipling Parkway interchange in Jefferson County and extends eastward to and including the Interstate 25 interchange in Douglas County. The Colorado Department of Transportation (CDOT) with the Federal Highway Administration (FHWA) and Douglas County is revising the 2006 C-470 Environmental Assessment (EA) document. As a consulting party in the 2004—2005 Section 106 consultation for the subject project, we are providing the Douglas County Historic Preservation Board with the opportunity to comment on the following revisions to the project.

PROJECT DESCRIPTION AND LOCATION

Section 106 and Section 4(f) consultation for the original EA was conducted between March 2004 and December 2005. The final EA was published in February 2006; however no decision documents resulted from the process. The approach identified to complete the planning process includes a revision of the 2006 document.

Since the 2006 EA, a coalition of interested parties and agencies was formed to bring this project to fruition. Formed in February 2011, the C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT, and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to C-470 in Segment 1 (subject project), and ultimately continue improvements along C-470 from Kipling Street to Interstate 70, now referred to as Segment 2.

In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes in Segment 1, but with a revised typical section and revised access concept. The proposed typical section replaces the original barrier separation with a painted (buffer) separation, and increases shoulder widths. The proposed improvements also include the addition of multiple auxiliary lanes at strategic locations along C-470 where on-ramp to off-ramp spacing is close, and where the auxiliary lane will provide an operational improvement to C-470. Thus, some portions of the corridor will have auxiliary

lanes, and other portions will not. Access to the tolled express lanes is planned with ingress and egress slip ramps and weaving zones strategically placed along the corridor. Express lane traffic will be monitored by electronic devices similar to those used on E-470 located on overhead sign bridges and individual transponders mounted on vehicle windshields. No toll collection booths will be required.

AREA OF POTENTIAL EFFECTS (APE) & METHODOLOGY

The Area of Potential Effects (APE) for the undertaking is based on the APE developed in consultation with Colorado SHPO in 2004 for the purpose of the Environmental Assessment published in 2006. Concurrence on the 2004 APE was received from SHPO in May of that year. As in the initial consultation, project activities and proposed improvements will remain within the existing CDOT Right-of-Way (ROW). The APE boundary follows the CDOT ROW with the exception of areas where historic or potentially historic resources are located that may be indirectly affected by project activities. Changes reflected in the 2013 APE are located at the intersection of S. Santa Fe Drive (SH85) and in areas where recently identified historic resources are located. The limits of the APE at the intersection of S. Santa Fe Drive and C-470 has been pared down from the 2006 EA to reflect the current proposed plan. Since 2006, improvements at the Santa Fe intersection, including a flyover onto C-470, have been completed under a separate environmental clearance. During the subject project, there will be no changes at Santa Fe beyond improvements to lanes on C-470. The APE has been expanded in areas to include parcels associated with recently identified historic resources.

METHODOLOGY

In May and June 2013, Dawn Bunyak of Bunyak Research Associates conducted research and field surveys in order to revise the historic resource survey report for the revised EA. Research methodology included a review of the Office of Archeology and Historic Preservation (OAHP) Compass database to update records and findings since the 2006 EA. No additional listings were indicated by that search.

A total of eleven (11) cultural resources constructed during or before 1968 are located within the project APE. The date 1968 (45 years ago) was selected as standard CDOT practice and to allow for a period of completion of final design and construction of the subject project. Five (5) resources are newly identified or recently meet the age requirements for consideration as historic resources. The remaining six (6) resources, including three (3) linear resources with multiple segments occurring within the APE, were identified as eligible resources under the original EA. The current project conducted re-evaluations of these resources on OAHP Form 1405.

DETERMINATIONS OF ELIGIBILITY AND EFFECTS

Determinations of Eligibility

The current cultural resource inventory identified three bridge structures (F-16-HY, F-16-HW, and F-16-HV) not included in the original evaluation. Each of these structures was constructed in 1968 and evaluated as part of the current 2013 Colorado Bridge Inventory, and each was recommended not eligible by that inventory. As that inventory has not yet been submitted for SHPO review, forms for these resources are included with this review for concurrence with the recommended finding.

Two newly identified resources were surveyed for the purpose of this project, the Chatfield Dam and Columbine Hills Subdivision. Chatfield Dam was surveyed on Architectural Inventory Form 1403 and recommended eligible. Columbine Hills Subdivision was surveyed on the Subdivision Inventory Form 1403b and recommended eligible.

Summaries of eligibility for each resource are identified in the table below (Table 1). Please refer to the enclosed Historic Resources Report and inventory forms for detailed descriptions of the eligibility and effects for each site.

Table 1—Summary of Historic Properties & Determination of Eligibility
Newly Identified Properties are in Bold Font

Site Number	Site Name	Address	Description	NRHP Eligibility & Date
5JF188	Hildebrand Ranch Historic District	8500 Deer Creek Road, Littleton	Ranch	National Register (1975)
5JF2613	Selzell Ditch	Arapahoe County, Littleton	Irrigation Ditch	Officially Eligible (2004)
5JF4795	**Massey Draw CBC, F-16-HY**	**Massey Draw**	**Highway Culvert**	**Field Not Eligible (2013)**
5JF5142, 5DA3091	**Chatfield Dam**	**S Wadsworth Blvd**	**Dam**	**Field Eligible (2013)**
5JF5143	**Columbine Hills**	**S Platte Canyon**	**Post-World War II Subdivision**	**Field Eligible (2013)**
5AH254.7	City Ditch Segment	Arapahoe County	Irrigation Ditch	Officially Eligible (1979)
5DA987.1	City Ditch Segment	Douglas County	Irrigation Ditch	Officially Eligible (1979)
5DA2819	**S Platte River Bridge, F-16-HW**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
5DA2826	**S Platte River Bridge, F-16-HV**	**S Platte River**	**Highway Bridge**	**Field Not Eligible (2013)**
5AH256.4	AT&SF Railroad Segment	Arapahoe County	Railroad Segment	Officially Eligible (1995)
5DA922.1	AT&SF Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA922.2	AT&SF Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1995)
5AH255.2	D&RG Railroad Segment	Arapahoe County, Littleton	Railroad Segment	Officially Eligible (1995)
5AH255.5	D&RG Railroad Segment	Arapahoe County	Railroad Segment	Officially Eligible (2004)
5DA921.1	D&RG Railroad Segment	Douglas County	Railroad Segment	Officially Eligible (1990)
5DA600.3	High Line Canal	Douglas County	Irrigation Ditch	Officially Eligible (2004)

Determinations of Effect
Impacts to historic resources were assessed for an Express Lane Alternative. These findings are summarized in the table below (Table 2) and described more fully in the attached Historic Resource Survey C-470-Kipling Parkway to I-25, prepared by Bunyak Research Associates under contract to Wilson & Company, Inc. and CDOT. As the work will remain within the existing CDOT right-of-way, no acquisitions are required to accommodate project activities. Impacts are generally indirect, resulting from anticipated noise levels and visual impacts resulting from the wider highway. Specific data related to noise is not available, as the noise study for the subject project is currently under completion.

Table 2—Summary of Proposed Action Impacts and Determinations of Effect
Newly Identified Properties are in Bold Font

Site Number	Site Name	Proposed Action Impact	Determination of Effects
5JF188	Hildebrand Ranch Historic District	No direct impacts. Limits of construction are 1,957 feet from the District boundary at the closest point. Noise dissipates after 500 feet: no indirect impacts are anticipated from noise. Addition of an express lane in each direction within existing ROW will not substantially alter or diminish the visual setting of the property from this distance.	No historic properties affected
5JF2613	Selzell Ditch	The resource exists within the APE; however no construction impacts are indicated to the resource.	No historic properties affected
5JF4795	**Massey Draw CBC, F-16-HY**	**Resource may be altered or replaced.**	**No historic properties affected**
5JF5142, 5DA3091	**Chatfield Dam**	**No direct impacts. The project will result in additional span of highway visible from the resource and may result in greater traffic noise; noise and visual impacts will not diminish the features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5JF5143	**Columbine Hills**	**No direct impacts. Indirect impacts include a potential for elevated noise levels, which may be mitigated by introduction of sound walls. Sound walls would constitute visual impact. Noise and visual impacts will not diminish the defining features of the resource qualifying it for inclusion on the NRHP.**	**No Adverse Effect**
5AH254.7 5DA987.1	City Ditch Segment	Realignment/reconstruction of non-supporting segment.	No Adverse Effect
5DA2819	**S Platte River Bridge, F-16-HW**	**Resource will be removed and replaced.**	**No historic properties affected**
5DA2826	**S Platte River Bridge, F-16-HV**	**Resource will be removed and replaced.**	**No historic properties affected**
5AH256.4 5DA922.1 5DA922.2	AT&SF Railroad Segment	The resource parallels the eastern side of US85/Santa Fe Drive and intersects C-470 via a highway overpass. Overpass wingwalls may be expanded, but will not intersect the resource boundary. Bridge piers will remain in their existing locations.	No historic properties affected
5AH255.2 5AH255.5 5DA921.1	D&RG Railroad Segments	The resource parallels the eastern side of US85/Santa Fe Drive and intersects C-470 via a highway overpass. Overpass wingwalls may be expanded, but will not intersect the resource boundary. Bridge piers will remain in their existing locations.	No historic properties affected
5DA600.3	High Line Canal Segment	The existing Concrete Box Culvert (CBC) carrying the resource under C-470 will *not* need to be widened to accommodate the project. The project will require construction of a concrete retaining wall at the edge of the pavement to stabilize the slope and prevent erosion of the canal. The wall will be placed approximately 12' from the	No Adverse Effect

Site Number	Site Name	Proposed Action Impact	Determination of Effects
		CBC and will not alter or diminish the defining features of the resource.	

As a local government with a potential interest in this undertaking, we welcome your comments on these determinations. Should you elect to respond, we request you do so within thirty (30) days of receipt of these materials, as stipulated in the Section 106 regulations. For additional information on the Section 106 process, please visit the website of the Advisory Council on Historic Preservation (ACHP) at www.achp.gov. If you have questions or require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at 303.757.9397 or ashley.bushey@state.co.us.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Historic Resource Survey Report, Including APE Map
Inventory forms (Architectural Inventory Form 1403, Subdivision Form 1403b, Revisitation Form 1405)

cc: Douglas Eberhart, Wilson & Company
Jon Chesser, Region 1 Environmental Project Manager

HISTORY Colorado

September 6, 2013

Charles Attardo
Region 1 Planning and Environmental Manager
Colorado Department of Transportation, Region 6
2000 South Holly Street
Denver, CO 80222

Re: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe Counties (CHS #43929)

Dear Mr. Attardo:

Thank you for your correspondence dated and received on August 28, 2013 by our office regarding the consultation of the above-mentioned project under Section 106 of the National Historic Preservation Act (Section 106).

After review of the provided additional information, we do not object to the proposed Area of Potential Effects (APE) for the proposed project. After review of the provided survey information, we concur with the recommended findings of National Register eligibility for the resources listed below.

- 5JF.5142/5DA.3091
- 5JF.5143
- 5JF.4795
- 5DA.2826
- 5DA.2819
- 5JF.188
- 5DA.987.1
- 5DA.922.2
- 5DA.922.1
- 5DA.921.1
- 5DA.600.3
- 5AH.256.4
- 5AH.255.5
- 5AH.254.7

After review of the provided scope of work and assessment of adverse effect, we concur with the recommended finding of *no historic properties affected* [36 CFR 800.4(d)(1)] for the resources listed below.

- 5JF.188
- 5JF.2613
- 5JF.4795
- 5DA.2819
- 5DA.2826
- 5AH. 256.4
- 5DA.922.1
- 5DA.922.2
- 5AH.255.2
- 5AH.255.5
- 5DA.921.1

After review of the provided scope of work and assessment of adverse effect, we concur with the recommended finding of *no adverse effect* [36 CFR 800.5(b)] for the resources listed below.

- 5JF.5142/5DA.3091
- 5AH.254.7/5DA.987.1
- 5DA.600.3

We are not able to concur with the assessment of adverse effect for the resources listed below.

- 5JF.5143 Page 47 of the survey report states that a noise wall is expected and will affect the properties on W. Alder Avenue. In order to better understand the effect of introducing a new feature into/adjacent to the historic setting, please provide more information on how close the noise wall will be to the W. Alder Avenue properties. Will the noise walls be installed south of W. Chatfield Ave?

If unidentified archaeological resources are discovered during construction, work must be interrupted until the resources have been evaluated in terms of the National Register criteria, 36 CFR 60.4, in consultation with this office.

We request being involved in the consultation process with the local government, which as stipulated in 36 CFR 800.3 is required to be notified of the undertaking, and with other consulting parties. Additional information provided by the local government or consulting parties might cause our office to re-evaluate our eligibility and potential effect findings.

Please note that our compliance letter does not end the 30-day review period provided to other consulting parties. If we may be of further assistance, please contact Amy Pallante, our Section 106 Compliance Manager, at (303) 866-4678.

Sincerely,

Edward C. Nichols
State Historic Preservation Officer

DOUGLAS COUNTY
COLORADO

Department of Community Development
Douglas County History Repository

www.douglas.co.us

26 September 2013

Charles Attardo
Region 1 Planning and Environmental Manager
CDOT
2000 South Holly Street
Denver, CO 80222

Re: File #/Name: Section 106 Request for Historic Resource Survey C-470

Dear Mr. Attardo:

Per your request for comment on the Determinations of Eligibility and Effects survey, please be advised a Compass file search was conducted on the sections affected in Douglas County. The following sets out the findings, concerns and recommendations on the referenced property.

We are satisfied that Dawn Bunyak Research Associates has done thorough research and concur with their determinations on the Douglas County properties.

Very Sincerely,

Norma Miller

Norma Miller

Archaeology Consultant/Curator, Douglas County History Repository

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION

Region 1, Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9385
(303) 757-9036 FAX

October 3, 2013

Mr. Edward C. Nichols
State Historic Preservation Officer
History Colorado
1200 Broadway
Denver, CO 80203

SUBJECT: Additional Information, Determinations of Eligibility and Effects, APE, Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe Counties (SHS #43929)

Dear Mr. Nichols:

This letter is in response to correspondence from your office dated September 6, 2013 regarding the project referenced above. Your office concurred with the recommended Area of Potential Effects (APE), with the recommended determinations of Eligibility, and with determinations of Effect for all but one resource included in our initial submission of August 28, 2013. That resource, Columbine Hills Filings 2 and 4/Trend Homes of Columbine Hills (5JF5143), is the subject of this correspondence.

In the above-referenced communication of September 6, 2013, your office requested additional information regarding a noise wall anticipated for installation in the vicinity of the subject resource, 5JF5143. An assessment of the Columbine Hills neighborhood was included in the 2005 Environmental Assessment (EA) prepared for the subject project. The neighborhood was not evaluated as a historic district at that time due to its age. The project consultant completing the historic component of the current EA revision consulted with the noise specialist for the project to confirm that the 2005 recommendations with regard to noise will carry over to the 2013 recommendations: A 20-foot-tall sound wall will be installed along C-470 south of the subject resource boundary and south of West Chatfield Avenue. Properties within the Columbine Hills Subdivision Historic District front West Alder Avenue. Please refer to the attached excerpts from the 2005 EA for additional details.

The characteristics of resource 5JF5143 qualifying it for inclusion in the National Register of Historic Places enable the property to reflect a cohesive, planned community based on a master plan. As outlined in the property survey on OAHP Form 1403b, these characteristics include layout of curvilinear street and cul-de-sacs, relation to the topography, layouts of setbacks and orientation of the houses to the street, scale of houses, and architectural types for the period of significance of 1959 to 1968.

Introduction of a sound wall beyond the historic boundary of the resource to the south of West Chatfield Avenue will offer a minor visual setting intrusion, but will not detract from the character defining features of the resource outlined above. The setting of the resource beyond its historic boundary has been in constant flux since the close of the period of significance in 1968; including introduction of highway C-470 between 1967 and 1973, introduction of the Chatfield Dam and Reservoir south of the resource in the

early 1970s, introduction of the South Platte Reservoir east of the resource in 2007-2008, and introduction of more modern subdivision developments to the north and west of the resource between the mid-1970s and 1990s. Significance of this resource is concentrated on the integrity of the subdivision master plan and representation of key architectural types. Introduction of the subject sound wall will not diminish the features of the resource qualifying it for inclusion in the National Register of Historic Places.

Given the additional information provided, we request concurrence with the determination of *no adverse effect* for the subject resource outlined in the initial correspondence dated August 29, 2013 and received by your office on August 30, 2013. Should you have questions or require additional information, please contact CDOT Region 1 Senior Staff Historian Ashley L. Bushey at (303) 757-9397.

Sincerely,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures: Excerpts from 2005 EA

Cc: Jon Chesser, R1 Project Manager
Dawn Bunyak, Bunyak Research Associates

HISTORY Colorado

October 16, 2013

Charles Attardo
Region 1 Planning and Environmental Manager
Colorado Department of Transportation, Region 6
2000 South Holly Street
Denver, CO 80222

Re: Additional Information: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe Counties (CHS #43926)

Dear Mr. Attardo:

Thank you for your correspondence dated October 3, 2013 and received on by our office on October 4, 2013 regarding the consultation of the above-mentioned project under Section 106 of the National Historic Preservation Act (Section 106). After review of the provided additional information, we concur with the recommended finding of *no adverse effect* [36 CFR 800.5(b)] under Section 106 for resource 5JF.5143.

If unidentified archaeological resources are discovered during construction, work must be interrupted until the resources have been evaluated in terms of the National Register criteria, 36 CRF 60.4, in consultation with this office.

We request being involved in the consultation process with the local government, which as stipulated in 36 CFR 800.3 is required to be notified of the undertaking, and with other consulting parties. Additional information provided by the local government or consulting parties might cause our office to re-evaluate our eligibility and potential effect findings.

Please note that our compliance letter does not end the 30-day review period provided to other consulting parties. If we may be of further assistance, please contact Amy Pallante, our Section 106 Compliance Manager, at (303) 866-4678.

Sincerely,

Edward C. Nichols
State Historic Preservation Officer

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9385
(303) 757-9907 FAX

November 26, 2013

Mr. Edward C. Nichols
State Historic Preservation Officer
Colorado Historical Society
1200 Broadway
Denver, CO 80203

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Mr. Nichols:

This letter and the attached materials constitute the Federal Highway Administration's (FHWA) request for concurrence from your office that the effects to historic resources resulting from implementation of the proposed C-470 Environmental Assessment would be "de minimis" for the purposes of Section 4(f) of the Department of Transportation Act of 1966.

In August 2013, FHWA and the Colorado Department of Transportation (CDOT) consulted with your office, pursuant to Section 106 of the National Historic Preservation Act (NHPA), on the potential effects to historic properties as a result of the proposed C-470 Kipling Parkway to I-25 Environmental Assessment (EA), currently under revision. Concurrence on determinations of eligibility and effect with regard to the project was received from your office on October 16, 2013. Copies of the consultation with your office and appropriate consulting parties under Section 106 are attached to this submission.

Notification of Section 4(f) *De Minimis* Determination

City Ditch (5AH254.7 and 5DA987.1): The subject segments are considered *non-supporting* of the overall eligibility of the City Ditch resource. Consultation under Section 106 determined the work indicated at this resource will result in a determination of *no adverse effect*. Though no easement or right-of-way acquisition is indicated at this location, the project will require realignment and reconstruction of the Ditch resource to accommodate highway construction: this action constitutes a "use" under Section 4(f) because it requires the permanent incorporation of a small area of land associated with the resource into the transportation infrastructure.

The finding of *no adverse effect* under Section 106 reflects a conclusion that those effects will not "alter, directly or indirectly, any of the characteristics of [the] historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" as described in 36 CFR § 800.5(a)(1). Based on this finding, FHWA intends to make a *de minimis* finding for the Section 4(f) requirements for the historic resources listed above.

Request for Concurrence
FHWA requests concurrence from your office with the above-described finding of de minimis impact on historic resources. This written concurrence will be evidence that the concurrence and consultation requirements of Section 6009 of SAFETEA-LU, as they will be codified at 23 U.S.C. § 138(b)(2)(B) and (C) and 49 U.S.C. § 303(d)(2)(B) and (C) are satisfied. Concurrence can be provided either by signing and dating the signature block at the end of this letter, or by separate letter from your office.

Thank you for your time and consideration in facilitating this request for concurrence. If you require additional information, please contact Region 1 Senior Staff Historian Ashley L. Bushey at (303) 757-9397.

Sincerely,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures: Section 106 Consultation Correspondence

Cc: Jon Chesser, Region 1 Environmental Project Manager

Concurrence
The Colorado State Historic Preservation Officer hereby concurs that the Office has consulted with FHWA on the impacts to historic resources of the proposed C-470 Environmental Assessment, and that the Officer concurs with FHWA's finding that the Project will have a *de minimis* impact on the property identified for the purposes of Section 6009 SAFETEA-LU [23 U.S.C. § 138(b)(2)(B) and (C) and 49 U.S.C. § 303(d)(2)(B) and (C)].

I concur _____ Date: _____

Mr. Edward C. Nichols
Colorado State Historic Preservation Officer

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9385
(303) 757-9907 FAX

November 26, 2013

Dennis Swain, Principal Planner
City of Littleton Historic Preservation Board
Community Development Department
2255 West Berry Avenue
Littleton, CO 80165

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology
C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Mr. Swain:

This letter and the attached materials constitute the Federal Highway Administration's (FHWA) request for comments from your office that the effects to historic resources resulting from implementation of the proposed C-470 Environmental Assessment would be "de minimis" for the purposes of Section 4(f) of the Department of Transportation Act of 1966.

In August 2013, FHWA and the Colorado Department of Transportation (CDOT) consulted with your office, pursuant to Section 106 of the National Historic Preservation Act (NHPA), on the potential effects to historic properties as a result of the proposed C-470 Kipling Parkway to I-25 Environmental Assessment (EA), currently under revision. Concurrence on determinations of eligibility and effect with regard to the project was received from Colorado SHPO on October 16, 2013. Copies of the consultation correspondence under Section 106 are attached to this submission.

Notification of Section 4(f) *De Minimis* Determination

Background: In addition to Section 106 of the NHPA, FHWA must comply with Section 4(f), which is codified at both 49 U.S.C § 303 and 23 U.S.C. § 138. Congress amended Section 4(f) when it enacted the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (Public Law 109-59, enacted August 10, 2005) ("SAFETEA-LU"). Section 6009 of SAFETEA-LU added a new subsection to Section 4(f), which authorizes FHWA to approve a project that uses Section 4(f) lands that are part of a historic property without preparation of an Avoidance Analysis, if it makes a finding that such uses would have "*de minimis*" impacts upon the Section 4(f) resource, with the concurrence of the SHPO.

On December 12, 2005, the Federal Highway Administration issued its "Guidance for Determining *De Minimis* Impacts to Section 4(f) Resources" which indicates that a finding of *de minimis* can be made when the Section 106 process results in a *no adverse effect* or *no historic properties affected* determination, when the SHPO is informed of the FHWA's intent to make a *de minimis* impact finding based on their written concurrence in the Section 106 determination, and when FHWA has considered the views of any Section 106 consulting parties participating in the Section 106 process. This new provision of Section 4(f) and the associated guidance are in part the basis of this letter, and of FHWA's

determination and notification of *de minimis* impacts with respect to the proposed project. At this time we are notifying the Section 106 consulting parties per section 6009(b)(2)(C). On March 12, 2008, FHWA issued a Final Rule on Section 4(f), which clarifies and implements the procedures for determining a *de minimis* impact. In addition the Final Rule moves the Section 4(f) regulation to 23 CFR 774.

City Ditch (5AH254.7 and 5DA987.1): The subject segments are considered *non-supporting* of the overall eligibility of the City Ditch resource. Consultation under Section 106 determined the work indicated at this resource will result in a determination of *no adverse effect*. Though no easement or right-of-way acquisition is indicated at this location, the project will require realignment and reconstruction of the Ditch resource to accommodate highway construction: this action constitutes a "use" under Section 4(f) because it requires the permanent incorporation of a small area of land associated with the resource into the transportation infrastructure.

The finding of *no adverse effect* under Section 106 reflects a conclusion that those effects will not "alter, directly or indirectly, any of the characteristics of [the] historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" as described in 36 CFR § 800.5(a)(1). Based on this finding, FHWA intends to make a *de minimis* finding for the Section 4(f) requirements for the historic resources listed above.

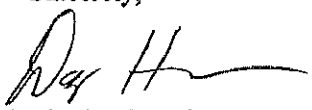
Request for Comments

FHWA requests written comments from your office with the above-described finding of de minimis impact on historic resources. This written comments will be evidence that the concurrence and consultation requirements of Section 6009 of SAFETEA-LU, as they will be codified at 23 U.S.C. § 138(b)(2)(B) and (C) and 49 U.S.C. § 303(d)(2)(B) and (C) are satisfied. Your written response can be provided to FHWA, via the CDOT Region 1 Planning and Environmental Office, at the following address:

Mr. Charles Attardo, Planning and Environmental Manager
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222

Thank you for your time and consideration in facilitating this request for concurrence. If you require additional information, please contact Region 1 Senior Staff Historian Ashley L. Bushey at (303) 757-9397.

Sincerely,



fo / Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures: Section 106 Consultation Correspondence

Cc: Jon Chesser, Region 1 Environmental Project Manager

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9385
(303) 757-9907 FAX

November 26, 2013

Judy Hammer
Douglas County Historic Preservation Board
Community Planning and Sustainable Development
100 3rd Street
Castle Rock, CO 80104

SUBJECT: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology
C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties, (CHS# 43926)

Dear Ms. Hammer:

This letter and the attached materials constitute the Federal Highway Administration's (FHWA) request for comments from your office that the effects to historic resources resulting from implementation of the proposed C-470 Environmental Assessment would be "de minimis" for the purposes of Section 4(f) of the Department of Transportation Act of 1966.

In August 2013, FHWA and the Colorado Department of Transportation (CDOT) consulted with your office, pursuant to Section 106 of the National Historic Preservation Act (NHPA), on the potential effects to historic properties as a result of the proposed C-470 Kipling Parkway to I-25 Environmental Assessment (EA), currently under revision. Concurrence on determinations of eligibility and effect with regard to the project was received from Colorado SHPO on October 16, 2013. Comments were received from your office on September 26, 2013. Copies of the consultation correspondence under Section 106 are attached to this submission.

Notification of Section 4(f) *De Minimis* Determination

Background: In addition to Section 106 of the NHPA, FHWA must comply with Section 4(f), which is codified at both 49 U.S.C § 303 and 23 U.S.C. § 138. Congress amended Section 4(f) when it enacted the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (Public Law 109-59, enacted August 10, 2005) ("SAFETEA-LU"). Section 6009 of SAFETEA-LU added a new subsection to Section 4(f), which authorizes FHWA to approve a project that uses Section 4(f) lands that are part of a historic property without preparation of an Avoidance Analysis, if it makes a finding that such uses would have "*de minimis*" impacts upon the Section 4(f) resource, with the concurrence of the SHPO.

On December 12, 2005, the Federal Highway Administration issued its "Guidance for Determining *De Minimis* Impacts to Section 4(f) Resources" which indicates that a finding of *de minimis* can be made when the Section 106 process results in a *no adverse effect* or *no historic properties affected* determination, when the SHPO is informed of the FHWA's intent to make a *de minimis* impact finding based on their written concurrence in the Section 106 determination, and when FHWA has considered the views of any Section 106 consulting parties participating in the Section 106 process. This new provision

of Section 4(f) and the associated guidance are in part the basis of this letter, and of FHWA's determination and notification of *de minimis* impacts with respect to the proposed project. At this time we are notifying the Section 106 consulting parties per section 6009(b)(2)(C). On March 12, 2008, FHWA issued a Final Rule on Section 4(f), which clarifies and implements the procedures for determining a *de minimis* impact. In addition the Final Rule moves the Section 4(f) regulation to 23 CFR 774.

City Ditch (5AH254.7 and 5DA987.1): The subject segments are considered *non-supporting* of the overall eligibility of the City Ditch resource. Consultation under Section 106 determined the work indicated at this resource will result in a determination of *no adverse effect*. Though no easement or right-of-way acquisition is indicated at this location, the project will require realignment and reconstruction of the Ditch resource to accommodate highway construction: this action constitutes a "use" under Section 4(f) because it requires the permanent incorporation of a small area of land associated with the resource into the transportation infrastructure.

The finding of *no adverse effect* under Section 106 reflects a conclusion that those effects will not "alter, directly or indirectly, any of the characteristics of [the] historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" as described in 36 CFR § 800.5(a)(1). Based on this finding, FHWA intends to make a *de minimis* finding for the Section 4(f) requirements for the historic resources listed above.

Request for Comments

FHWA requests written comments from your office with the above-described finding of de minimis impact on historic resources. This written comments will be evidence that the concurrence and consultation requirements of Section 6009 of SAFETEA-LU, as they will be codified at 23 U.S.C. § 138(b)(2)(B) and (C) and 49 U.S.C. § 303(d)(2)(B) and (C) are satisfied. Your written response can be provided to FHWA, via the CDOT Region 1 Planning and Environmental Office, at the following address:

Mr. Charles Attardo, Planning and Environmental Manager
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222

Thank you for your time and consideration in facilitating this request for concurrence. If you require additional information, please contact Region 1 Senior Staff Historian Ashley L. Bushey at (303) 757-9397.

Sincerely,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures: Section 106 Consultation Correspondence

Cc: Jon Chesser, Region 1 Environmental Project Manager

HISTORY Colorado

December 5, 2013

Charles Attardo
Region 1 Planning and Environmental Manager
Colorado Department of Transportation, Region 1
2000 South Holly Street
Denver, CO 80222

Re: Determination of Eligibility and Effect, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe counties (CHS #43926)

Dear Mr. Attardo:

Thank you for your correspondence dated and received on November 26, 2013 by our office regarding the consultation of the above-mentioned project under Section 106 of the National Historic Preservation Act (Section 106).

After review of the provided additional information, we acknowledge that FHWA intends to make a *de minimis* determination in respect to the requirements of Section 4(f) in regards to City Ditch/5AH.254.7 and 5DA.987.1. If we may be of further assistance, please contact Amy Pallante, our Section 106 Compliance Manager, at (303) 866-4678.

Sincerely,

Edward C. Nichols
State Historic Preservation Officer

DOUGLAS COUNTY
COLORADO

Department of Community Development
History Repository

www.douglas.co.us

10 December 2013

Charles Attardo
Region 1 Planning and Environmental Manager
CDOT
2000 South Holly Street
Denver, CO 80222

Re: Determinations of Eligibility and Effects, APE, and Historic Resource Survey Methodology C-470 Revised Environmental Assessment, Jefferson, Douglas, and Arapahoe Counties, (CHS#43926)

Dear Mr. Attardo:

We are responding to your letter of November 26, 2013. Initially we were concerned that site 5DA987.1, part of the City Ditch, was subject to adverse effects as stated in your letter by realignment and reconstruction of the resource to accommodate highway construction. This seems to be in direct conflict with your designation of no adverse effect and no alteration of the property.

However, since this section of the Ditch has heavy disturbance and is considered non-contributing to the existing historic district, we would concur with SHPO that no adverse effect on the district is the correct designation. We have no concerns and appreciate the opportunity to review the proposed project in conjunction with its potential adverse effects to prehistoric and historic resources in Douglas County.

Very Sincerely,

Norma Miller

Norma Miller
Archaeology Consultant/Curator, Douglas County History Repository

Cc, via email: Judy Hammer, Douglas County Historic Preservation Board Administrator

EXAMPLE OF NATIVE AMERICAN CONSULTATION LETTER SENT TO 31 TRIBAL REPRESENTATIVES IN 2004 (MAILING LIST FOLLOWS)

EXAMPLE OF NATIVE AMERICAN CONSULTATION LETTER SENT TO 31 TRIBAL REPRESENTATIVES IN 2004 (MAILING LIST FOLLOWS)

U.S. Department
Of Transportation
Federal Highway
Administration

Colorado Federal Aid Division
555 Zang Street, Room 250
Lakewood, CO 80228-1040

March 25, 2004

Ms. Maxine Natchees
Chairwoman, Uintah and Ouray
Tribal Business Committee
P.O. Box 190
Fort Duchesne, UT 84026

Dear Ms. Natchees:

Subject: Request for Section 106 Consultation; C-470 Environmental Assessment, Arapahoe, Douglas and Jefferson Counties, Colorado

The Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) are preparing an Environmental Assessment (EA) that will address the effects of proposed improvements to State Highway 470 (C-470) between Kipling Parkway and Interstate 25, a distance of approximately 13.5 miles. The project, located in a largely developed suburban part of the south Denver, Colorado, metropolitan area, will examine transit alternatives that provide congestion relief, reduce traveler delay, and improve reliability along this highly congested corridor. Pursuant to the National Environmental Policy Act (NEPA) of 1969 and the Council on Environmental Quality (CEQ) implementing regulations (40 CFR 1500-1508), FHWA and CDOT are documenting the potential social, economic and environmental consequences of this action. Please refer to the enclosed maps for specific locational information.

The Federal Highway Administration will serve as the lead agency for this project, and CDOT staff will facilitate the tribal consultation process. However, the US Army Corps of Engineers (USACE), which administers property along a portion of the C-470 corridor, is an integral partner in the undertaking and has an established interest in the Section 106 compliance process. By deferring the coordination of Native American consultation to FHWA and CDOT, USACE does not relinquish its obligations in this regard as mandated by federal statute. The Corps will maintain an active interest in the consultation process, especially if cultural resources of concern are located on lands under its jurisdiction.

The agencies are seeking the participation of regional Native American tribal governments in cultural resources consultation for the undertaking, as described in Section 106 of the National Historic Preservation Act and implementing regulations 36 CFR 800 et seq. As a consulting party, you are offered the opportunity to identify concerns about cultural resources and comment on how the project might affect them. Further, if it is found that the project will impact cultural resources that are eligible for inclusion on the National Register of Historic Places and are of religious or cultural significance to your tribe, your role in the consultation process would include participation in resolving how best to avoid, minimize, or mitigate those impacts. It is

our hope that by describing the proposed undertaking we can be more effective in protecting areas important to American Indian people. If you have interest in this undertaking and in cultural resources that may be of religious or cultural significance to your tribe, we invite you to be a consulting party.

As noted above, the project area traverses a largely developed suburban landscape that includes residential subdivisions and commercial properties, with periodic sections of undeveloped land. The Area of Potential Effect (APE) for the project, as defined by 36 CFR 800.16(d), will generally be 500 feet on either side of the existing highway centerline. (Please note, however, that the "½-mile study area" identified on the enclosed aerial photograph is much wider than the APE.) A comprehensive survey and assessment of historic properties in the APE will be conducted. Any information you may have regarding the location of cultural resources in this area would assist us in this effort.

The Denver metropolitan area is home to a significant number of urban Indian people. As such, if you are aware of members of your tribe living in proximity to the C-470 study area who would be interested in participating in the NEPA consultation process on some level, please notify us so that we may facilitate that interaction.

We are committed to ensuring that tribal governments are informed of, and involved, in decisions that may impact places with cultural significance. If you are interested in becoming a consulting party for the C-470 project, please complete and return the enclosed Consultation Interest Response Form to CDOT Native American consultation liaison Dan Jepson **within 60 days** at the address or facsimile number listed at the bottom of that sheet. Mr. Jepson can also be reached via Email at Daniel.Jepson@dot.state.co.us or by telephone at (303) 757-9631. The 60-day period has been established to encourage your participation at this early stage in project development. Failure to respond within this time frame will not prevent your tribe from becoming a consulting party at a later date. However, studies and decision-making will proceed and it may become difficult to reconsider previous determinations or findings, unless significant new information is introduced.

Thank you for considering this request for consultation.

Sincerely yours,

Michael E Vandehoef
for

William C. Jones
Dvision Administrator

Enclosures

cc: Ms. Betsy Chapoose, Director, Cultural Rights & Protection Office
E. LaDow, FHWA
J. Paulmeno, CDOT Region 6
D. Jepson, CDOT Env. Prog.
F. Rios, USACE
A. Brown, PBS&J

BUCKLE UP AMERICA

MS. MAXINE NATCHEES
CHAIRWOMAN, UINTAH & OURAY
TRIBAL BUSINESS COMMITTEE
P.O. BOX 190
FORT DUCHESNE, UT 84026

MR. BURTON HUTCHINSON
CHAIRMAN, NORTHERN
ARAPAHO TRIBE BUSINESS COUNCIL
P.O. BOX 396
FORT WASHAKIE, WY 82514

MS. ROXANNE SAZUE
CHAIRWOMAN
CROW CREEK SIOUX TRIBAL COUNCIL
P.O. BOX 658
FORT THOMPSON, SD 57325

MR. GEORGE E. HOWELL
PRESIDENT
PAWNEE NATION OF OKLAHOMA
P.O. BOX 470, BLDG. 64
PAWNEE, OK 74058

MR. CLIFFORD MCKENZIE
CHAIRMAN
KIOWA TRIBE OF OKLAHOMA
P.O. BOX 369
CARNEGIE, OK 73015

MR. HOWARD RICHARDS
CHAIRMAN
SOUTHERN UTE INDIAN TRIBE
P.O. BOX 737
IGNACIO, CO 81137

MS. GERI SMALL
CHAIRWOMAN
NORTHERN CHEYENNE TRIBE
P.O. BOX 128
LAME DEER, MT 59043

MR. WILLIAM KINDLE
PRESIDENT
ROSEBUD SIOUX TRIBE
P.O. BOX 430
ROSEBUD, SD 57570

MR. HAROLD CUTHAIR
ACTING CHAIRMAN
UTE MOUNTAIN UTE TRIBE
P.O. BOX 348
TOWAOC, CO 81334

MR. WALLACE COFFEY
CHAIRMAN, COMANCHE TRIBAL
BUSINESS COMMITTEE
P. O. BOX 908
LAWTON, OK 73502

MR. ROBERT TABOR
CHAIRMAN, CHEYENNE &
ARAPAHO BUS COMMITTEE
PO BOX 38
CONCHO, OK 73022

MR. HAROLD C. FRAZIER
CHAIRMAN
CHEYENNE RIVER SIOUX TRIBAL COUNCIL
P.O. BOX 590
EAGLE BUTTE, SD 57625

MR. JOHN YELLOWBIRD
PRESIDENT
OGLALA SIOUX TRIBAL COUNCIL
P.O. BOX H
PINE RIDGE, SD 57770

MS. MARY JANE YAZZIE
CHAIRWOMAN
WHITE MESA UTE TRIBAL COUNCIL
P.O. BOX 7096
WHITE MESA, UT 84511

MR. CHARLES W. MURPHY
CHAIRMAN, STANDING
ROCK SIOUX TRIBAL COUNCIL
P.O. BOX D
FORT YATES, ND 58538

Original Letter sent to each of the above

MR WILLIAM L PEDRO
NAGPRA REPRESENTATIVE
CHEYENNE & ARAPAHO TRIBES
OF OKLAHOMA
PO BOX 41
CONCHO OK 73022

MR GORDON YELLOWMAN
NHPA/TRANSPORTATION PLANNER
CHEYENNE & ARAPAHO TRIBES/OKLA
ROADS CONSTRUCTION PROGRAM
PO BOX 137
CONCHO OK 73022

MR JIMMY ARTERBERRY
THPO/NAGPRA – DIRECTOR
COMANCHE NATION OF OK
PO BOX 908
LAWTON OK 73502

MS ALICE ALEXANDER
TRIBAL HISTORIC PRESERVATION
OFFICER, PAWNEE NATION/OKLA
PO BOX 470
PAWNEE, OK 74058

MR TERRY G KNIGHT
NAGPRA REPRESENTATIVE
UTE MOUNTAIN UTE INDIAN TRIBE
PO BOX 102
TOWAOC, CO 81334

TERRY GRAY (ROSEBUD SIOUX)
NAGPRA COORDINATOR
SGU HERITAGE CENTER
BOX 675 MISSION
RSTSCRM COMMITTEE
ROSEBUD, SD 57555

MR JOE BIG MEDICINE
NAGPRA REPRESENTATIVE
CHEYENNE & ARAPAHO TRIBES
OF OKLAHOMA
500 S LEACH, APT 36
WATONGA OK 73772

MR GILBERT BRADY
TRIBAL HISTORIC PRESERVATION
OFFICER
NORTHERN CHEYENNE TRIBE
P.O. BOX 128
LAME DEER MT 59043

MR ROBERT GOGGLES
NAGPRA REPRESENTATIVE
NORTHERN ARAPAHO TRIBE
PO BOX 396
FORT WASHAKIE, WY 82514

MR NEIL CLOUD
NAGPRA REPRESENTATIVE
CULTURE PRESERVATION OFFICE
SOUTHERN UTE INDIAN TRIBE
P.O. BOX 737
IGNACIO, CO 81137

MR JIM PICOTTE
NAGPRA REPRESENTATIVE
CHEYENNE RIVER SIOUX TRIBE
PO BOX 590
EAGLE BUTTE, SD 57625

MR ALONZO SANKEY
NAGPRA REPRESENTATIVE
CHEYENNE & ARAPAHOE TRIBES/OKLA
P. O. BOX 836
CANTON, OK 73724

REVEREND GEORGE DAINGKAU
NAGPRA REPRESENTATIVE
KIOWA TRIBE OF OKLAHOMA
118 N STEPHENS
HOBART OK 73015

MR HOWARD BROWN, CHAIR
ECONOMIC DEVELOPMENT COMMISSION
NORTHERN ARAPAHOE TRIBE
PO BOX 9079
ARAPAHOE, WY 82510

MS BETSY CHAPOOSE, DIRECTOR
CULTURAL RIGHTS & PROTECTION
OFFICE
NORTHERN UTE TRIBE
PO BOX 190
FT DUCHESNE UT 84026

TIM MENTZ
STANDING ROCK SIOUX TRIBE
CULTURAL RESOURCE PLANNER
PO BOX D
FT YATES, ND 58538

List of Individuals Who Received Copies
of Letter based on Tribe

EXAMPLE OF COMPLETED SECTION 106 TRIBAL CONSULTATION RESPONSE FORM RECEIVED BY CDOT IN 2004

FEDERAL HIGHWAY ADMINISTRATION/COLORADO DEPARTMENT OF TRANSPORTATION
SECTION 106 TRIBAL CONSULTATION INTEREST RESPONSE FORM

PROJECT: C-470 Environmental Assessment

The Standing Rock Sioux Tribe Tribe [is / (is not) **(circle one)** interested in becoming a consulting party for the Colorado Department of Transportation project referenced above, for the purpose of complying with Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR 800). If your tribe will be a consulting party, please answer the questions below.

Signed: Jim Mentz Sr.

Name and Title

Tribal Historic Preservation Officer

CONSULTING PARTY STATUS [36 CFR §800.2(c)(3)]

Do you know of any specific sites or places to which your tribe attaches religious and cultural significance that may be affected by this project?

Yes (No) If yes, please explain the general nature of these places and how or why they are significant (use additional pages if necessary). Locational information is not required.

SCOPE OF IDENTIFICATION EFFORTS [36 CFR §800.4(a)(4)]

Do you have information you can provide us that will assist us in identifying sites or places that may be of religious or cultural significance to your tribe?

Yes (No) If yes, please explain.

CONFIDENTIALITY OF INFORMATION [36 CFR §800.11(c)]

Is there any information you have provided here, or may provide in the future, that you wish to remain confidential?

Yes No If yes, please explain.

Please complete and return this form within 60 days via US Mail or fax to:

Dan Jepson, Section 106 Native American Liaison
Colorado Department of Transportation
Environmental Programs Branch
4201 E. Arkansas Ave.
Denver, CO 80222
FAX: (303)757-9445

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Environmental Programs Branch
4201 East Arkansas Avenue
Shumate Building
Denver, Colorado 80222
(303) 757-9281

DEPARTMENT OF TRANSPORTATION

September 27, 2013

Mr. Jimmy Newton, Jr., Chairman
Southern Ute Indian Tribe
P.O. Box 737
Ignacio, CO 81137

SUBJECT: Renewal of Section 106 Consultation, Revised C-470 Environmental Assessment, Arapahoe, Douglas and Jefferson Counties, Colorado

Dear Mr. Newton:

In early 2006 the Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) published an Environmental Assessment (EA) for the project referenced above. The EA documented the social, economic and environmental consequences of proposed improvements to a 13-mile segment of State Highway 470 (C-470), which bisects a largely developed suburban part of the south Denver metropolitan area. The project begins at the Kipling Parkway interchange in Jefferson County and extends eastward roughly along the Douglas/Arapahoe County line, ending at the Interstate 25 interchange (refer to enclosed Figure 1). In May 2004, your tribe indicated a desire to be a consulting party for the project under Section 106 of the National Historic Preservation Act. Due to a variety of factors, a decision document was not finalized at that time and therefore the environmental documentation process as outlined under the National Environmental Policy Act has remained incomplete.

In the intervening years a coalition of interested parties and agencies was formed to bring the project to fruition. The C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to the project corridor, and ultimately to continue improvements along the highway further to the west and north. In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes as well as multiple auxiliary lanes at strategic locations.

As a consulting tribe for the project, FHWA and CDOT want to ensure you are aware that the EA documentation is being revised and that the tribe will have an opportunity to participate as the process moves forward. As noted in a March 22, 2007 letter to your office regarding the project, no Native American sites eligible for listing on the National Register of Historic Places are present within the Area of Potential Effects established for cultural resources studies. In addition, the Southern Ute Indian Tribe did not previously indicate a specific concern about any resources within or near the project corridor. However, information you may have regarding places or sites important to your tribe that are located in proximity to the highway would assist us in our efforts to comprehensively identify and evaluate historic properties.

We are committed to ensuring that consulting tribal governments are informed of and involved in decisions that may impact places with cultural significance. If you have questions regarding the revised EA, please contact CDOT Native American Liaison Dan Jepson at (303) 757-9631 or

daniel.jepson@state.co.us, or FHWA Colorado Division Environmental Program Manager Stephanie Gibson at (720) 963-3013 or stephanie.gibson@dot.gov. Thank you for your time and consideration.

Very truly yours,

for Jane Hann, Manager
Environmental Programs Branch

Enclosures (map)

cc: M. Urban & S. Gibson, FHWA
A. Bushey, CDOT Region 1
A. Naranjo, Tribal Cultural Heritage Program

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Environmental Programs Branch
4201 East Arkansas Avenue
Shumate Building
Denver, Colorado 80222
(303) 757-9281

DEPARTMENT OF TRANSPORTATION

September 27, 2013

Mr. Darryll O'Neal, Sr., Chairman
Northern Arapaho Tribal Business Council
P.O. Box 396
Ft. Washakie, WY 82514

SUBJECT: Renewal of Section 106 Consultation, Revised C-470 Environmental Assessment, Arapahoe, Douglas and Jefferson Counties, Colorado

Dear Mr. O'Neal:

In early 2006 the Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) published an Environmental Assessment (EA) for the project referenced above. The EA documented the social, economic and environmental consequences of proposed improvements to a 13-mile segment of State Highway 470 (C-470), which bisects a largely developed suburban part of the south Denver metropolitan area. The project begins at the Kipling Parkway interchange in Jefferson County and extends eastward roughly along the Douglas/Arapahoe County line, ending at the Interstate 25 interchange (refer to enclosed Figure 1). In April 2004, your tribe indicated a desire to be a consulting party for the project under Section 106 of the National Historic Preservation Act. Due to a variety of factors, a decision document was not finalized at that time and therefore the environmental documentation process as outlined under the National Environmental Policy Act has remained incomplete.

In the intervening years a coalition of interested parties and agencies was formed to bring the project to fruition. The C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to the project corridor, and ultimately to continue improvements along the highway further to the west and north. In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes as well as multiple auxiliary lanes at strategic locations.

As a consulting tribe for the project, FHWA and CDOT want to ensure you are aware that the EA documentation is being revised and that the tribe will have an opportunity to participate as the process moves forward. As noted in a March 22, 2007 letter to your office regarding the project, no Native American sites eligible for listing on the National Register of Historic Places are present within the Area of Potential Effects established for cultural resources studies. In addition, the Northern Arapaho Tribe did not previously indicate a specific concern about any resources within or near the project corridor. However, information you may have regarding places or sites important to your tribe that are located in proximity to the highway would assist us in our efforts to comprehensively identify and evaluate historic properties.

We are committed to ensuring that consulting tribal governments are informed of and involved in decisions that may impact places with cultural significance. If you have questions regarding the revised EA, please contact CDOT Native American Liaison Dan Jepson at (303) 757-9631 or

daniel.jepson@state.co.us, or FHWA Colorado Division Environmental Program Manager Stephanie Gibson at (720) 963-3013 or stephanie.gibson@dot.gov. Thank you for your time and consideration.

Very truly yours,

for Jane Hann, Manager
Environmental Programs Branch

Enclosures (map)

cc: M. Urban & S. Gibson, FHWA
A. Bushey, CDOT Region 1
D. Conrad, Tribal Historic Preservation Officer

SOUTHERN UTE INDIAN TRIBE

Southern Ute Cultural & Preservation Department
P O. Box 737, Mail Stop #73, Ignacio Co 81137
970-563-0100: Fax. 970-563-1098

Mr. Dan Jepson
CDOT Native American Liaison
State of Colorado
4201 East Arkansas Avenue
Denver, CO 80222

October 16, 2013

Re: Renewal of Section 106 Consult, Revised C-470 Environmental Assessment, Arapahoe, Douglas and Jefferson Counties, Colorado

Dear Mr. Jepson,

I have reviewed your letter requesting input on the intent to purchase large land parcels in the County's open space program. The Southern Ute Indian Tribe offers the following response as indicated by the box that is checked.

- ☐ **NO INTEREST:** I have determined that there is not a likelihood of eligible properties of religious and cultural significant to the Southern Ute Indian Tribe.
- ☒ **NO EFFECT:** I have determined that there are no properties of religious and cultural significance to the Southern Ute Indian Tribe that are listed on the National Register within the area of potential effect or that the proposed project will have no effect on any such properties that may be present.
- ☐ **NO ADVERSE EFFECT:** I have identified properties of cultural and religious significance within the area of effect that I believe are eligible for listing in the National Register, for which there would be no adverse effect as a result of the proposed tower construction project.
- ☐ **ADVERSE EFFECT:** I have identified properties of cultural and religious significance within the Area of Potential Effect (APE) that are eligible for listing in the National Register. I believe the proposed communication tower construction project would cause an adverse effect on these properties.
- ☐ **REQUEST FOR ADDITIONAL INFORMATION:** The Southern Ute Indian Tribe requests additional information on the planned site for its impact on properties of religious & cultural importance to the Tribe as follows:

_____.

Please contact me at 970-563-0100, ext. 2257, if you have any questions or concerns.

Sincerely,

Alden Naranjo
NAGPRA Coordinator

STATE OF COLORADO

DEPARTMENT OF TRANSPORTATION
Region 1 Planning and Environmental
2000 South Holly Street
Denver, CO 80222
(303) 757-9385
(303) 757-9907 FAX

January 21, 2014

Mr. John M. Cater
Division Administrator
FHWA - Colorado Division
12300 W. Dakota Avenue, Suite 180
Lakewood, CO 80228

SUBJECT: Finding of Section 4(f) *De Minimis,* CDOT Project C-470 Revised Environmental Assessment; Jefferson, Douglas, and Arapahoe Counties

Dear Mr. Cater:

This letter and the attached materials constitute a request for concurrence with a finding of *de minimis* impact for the project referenced above, which proposes transportation improvements along a 13-mile segment of State Highway C-470 in Jefferson, Arapahoe, and Douglas Counties. The project begins at Kipling Parkway interchange in Jefferson County and extends eastward to and including the Interstate 25 interchange in Douglas County. The Colorado Department of Transportation (CDOT) with the Federal Highway Administration (FHWA) is revising the 2006 C-470 Environmental Assessment (EA) document.

Project Description

Section 106 and Section 4(f) consultation for the original EA was conducted between March 2004 and December 2005. The final EA was published in February 2006; however no decision documents resulted from the process. The approach identified to complete the planning process includes a revision of the 2006 document.

Since the 2006 EA, a coalition of interested parties and agencies was formed to bring this project to fruition. Formed in February 2011, the C-470 Corridor Coalition is a cooperative effort involving FHWA, CDOT, and local governments. The Coalition's purpose is to recommend and implement a plan to fund improvements to C-470 in Segment 1 (subject project), and ultimately continue improvements along C-470 from Kipling Street to Interstate 70, now referred to as Segment 2.

In February 2013 the Coalition Policy Committee unanimously approved a new option to implement tolled express lanes in Segment 1, but with a revised typical section and revised access concept. The proposed typical section replaces the original barrier separation with a painted (buffer) separation, and increases shoulder widths. The proposed improvements also include the addition of multiple auxiliary lanes at strategic locations along C-470 where on-ramp to off-ramp spacing is close, and where the auxiliary lane will provide an operational improvement to C-470. Thus, some portions of the corridor will have auxiliary lanes, and other portions will not. Access to the tolled express lanes is planned with ingress and egress slip ramps and weaving zones strategically placed along the corridor. Express lane traffic will be monitored by electronic devices similar to those used on E-470 located on overhead sign bridges and individual transponders mounted on vehicle windshields. No toll collection booths will be required.

Area of Potential Effects

The Area of Potential Effects (APE) for the undertaking is based on the APE developed in consultation with Colorado SHPO in 2004 for the purpose of the Environmental Assessment published in 2006. Concurrence on the 2004 APE was received from SHPO in May of that year. As in the initial consultation, project activities and proposed improvements will remain within the existing CDOT Right-of-Way (ROW). The APE boundary follows the CDOT ROW with the exception of areas where historic or potentially historic resources are located that may be indirectly affected by project activities. Changes reflected in the 2013 APE are located at the intersection of S. Santa Fe Drive (SH85) and in areas where recently identified historic resources are located. The limits of the APE at the intersection of S. Santa Fe Drive and C-470 has been pared down from the 2006 EA to reflect the current proposed plan. Since 2006, improvements at the Santa Fe intersection, including a flyover onto C-470, have been completed under a separate environmental clearance. During the subject project, there will be no changes at Santa Fe beyond improvements to lanes on C-470. The APE has been expanded in areas to include parcels associated with recently identified historic resources. Please refer to the attached APE Map for additional details.

Resource Descriptions

A total of eleven (11) cultural resources dating before 1968 are located within the project APE. The date of 1968 (45 years ago) was selected to allow for a period of completion of design and construction for the subject property. Five (5) resources are newly identified or recently meet the age requirements for consideration as historic resources. These are the Chatfield Dam (5JF5142/5DA3091), Columbine Hills Subdivision (5JF5143), and Bridge Structures F-16-HY (5JF4795), F-16-HW (5DA2819), and F-16-HV (5DA2826). The remaining six (6) resources were identified as National Register of Historic Places-Eligible under the original EA.

In consultation with the Colorado State Historic Preservation Office and Section 106 Consulting Parties, a finding of *no adverse effect* was established regarding the project and its effects to four (4) resources: Chatfield Dam (5JF5142/5DA3091), Columbine Hills Subdivision (5JF5143), City Ditch (5AH254.7 and 5DA987.1), and High Line Canal (5DA600.3). A Section 4(f) *use* is only applicable for work occurring at the City Ditch, discussed below. The remaining resources are not further discussed in this submission.

City Ditch Segment (5AH254.7 and 5DA987.1): The City Ditch was initially constructed in the 1860s, with Richard S. Little, founder of Littleton, serving as surveyor and engineer on the project. Little owned the land at the ditch headgate on the South Platte River. The Ditch runs through Littleton, Englewood, and Denver, providing water for Washington Park and City Park. Much of the historic open channel has been piped underground, including the subject segment. Due to this loss of integrity, the subject segment has been determined *non-supporting* of the overall eligibility of the resource.

***De Minimis* Use**

City Ditch Segment (5AH254.7 and 5DA987.1): Though no easement or right-of-way acquisition is indicated at this location, the project will require realignment and reconstruction of the Ditch resource to accommodate highway construction: this action constitutes a "use" under Section 4(f) because it requires the permanent incorporation of a small area of land associated with the resource into the transportation infrastructure.

Finding of *De Minimis* Impact

CDOT consulted with the SHPO, as well as the City of Littleton Historic Preservation Board, the Arapahoe County Board of County Commissioners, Jefferson County Historical Commission, C-470 Coalition, and Douglas County Historic Preservation Board, in the capacity of consulting parties, in letters dated August 28, 2013. In correspondence dated September 6, 2013, SHPO concurred with the recommended findings of eligibility and effect for all but one resource, 5JF5143, for which additional

information was requested. Additional information was provided by a letter dated October 3, 2013, and concurrence from SHPO was received by a letter dated October 16, 2013. Notification of the finding of *de minimis* impact was forwarded to SHPO and the consulting parties by letters dated November 26, 2013.

Through the above consultation under NHPA Section 106, the project has been determined to have *no adverse effect* to resource 5AH254/5DA987, the City Ditch, including segment 5AM254.7/5DA987.1

Based on the information presented above and in the attached documentation, the effects of this proposed improvement on the properties described above constitute a *de minimis* impact and the requirements of 23 USC 138, 49 USC 303, and 23 CFR 774 have been satisfied. This finding is considered valid unless new information is obtained or the proposed effects change to the extent that consultation under Section 106 must be reinitiated.

If you concur with this finding, please sign below.

Very truly yours,

for Charles Attardo
Region 1 Planning and Environmental Manager

Enclosures:
Section 106 Correspondence
Site forms
APE Map

Cc: File

I concur:

John M. Cater, P.E.
Colorado Division Administrator

3/21/14
Date

APPENDIX B
Wetland Finding

For the C-470 Corridor
Revised Environmental Assessment

June 2015

Submitted To:
CDOT Region 1
2000 S. Holly Street
Denver, CO 80222

Submitted By:
Wilson & Company
1675 Broadway, Suite 200
Denver, CO 80202

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LIST OF FIGURES AND TABLES

1.0 INTRODUCTION

The following is a wetland finding for the C-470 Corridor Revised Environmental Assessment (EA) (Project # NH4701-103 (14222) and has been written in compliance with Executive Order 11990, "Protection of Wetlands", and is in accordance with 23 CFR 771, 23 CFR 777, and Technical Advisory T6640.8A.

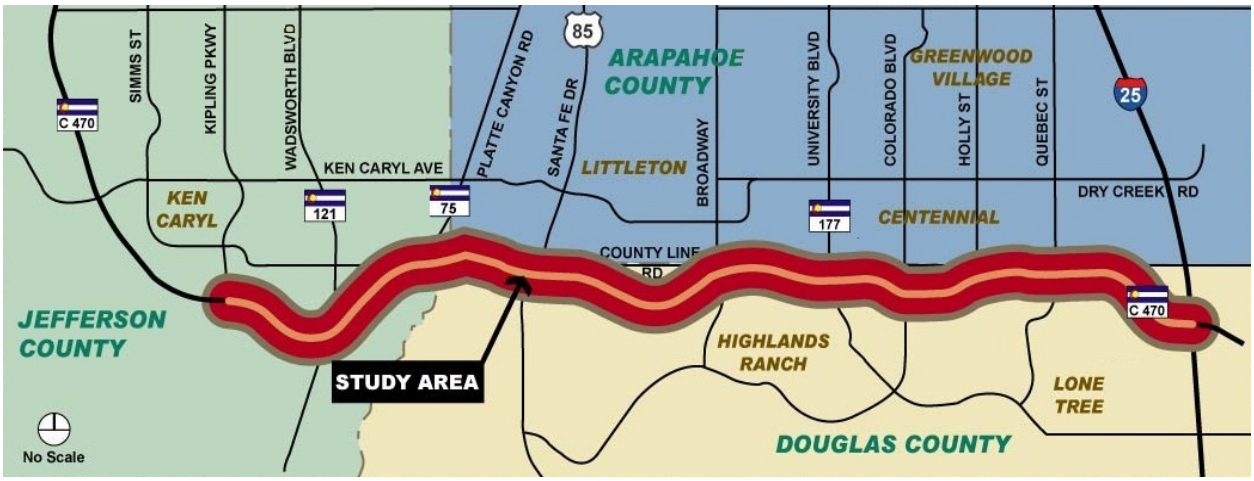
1.1 Project Location

The wetland study corridor for this project includes C-470 between Kipling Parkway (MP 12.449) and I-25 (MP 26.195). The study corridor is shown on Figure 1. The study corridor is located on the Parker, Highlands Ranch, and Littleton USGS quadrangles. The study corridor is located within the following sections, townships, and ranges:

- T6S, R67W, Sections 3, 4, 5, and 6
- T6S, R68W, Sections 1,2,3,4,5,and 6
- T5S, R68W, Section 31
- T5S, R69W, Section 36
- T6S, R69W, Sections 1, 2, and 3

The study corridor is located in Jefferson, Douglas, and Arapahoe counties.

Figure 1. C-470 Study Corridor



1.2 Project Description

The Federal Highway Administration (FHWA) and Colorado Department of Transportation (CDOT) have initiated the Revised EA for the 13-mile portion of C-470 between Kipling Parkway and Interstate 25 (I-25) to address congestion and delay, and to improve travel time reliability for C-470 users. The Proposed Action in the 2013 Revised EA differs slightly from the Express Lanes alternative identified in the previous EA that was approved by CDOT and FHWA in 2006.

Conceptual design plans have been prepared for the revised EA. Therefore, the wetland impacts identified in this document are preliminary and will change during the design-build process. The impacts identified in this document should be reduced during final design as opportunities for avoidance and minimization are identified. Mitigation described in this document is also preliminary and should be considered a conceptual description of mitigation for project wetland impacts.

The proposed action or preferred alternative described in this EA will result in impacts to jurisdictional and non-jurisdictional wetlands from the construction of new lanes, expansion of existing bridge capacity, increasing culvert size and installation of new culverts, increasing capacity of existing stormwater detention ponds and constructing new stormwater ponds, and upgrading and building new stormwater outfalls. Streams in the corridor will also be impacted by these roadway improvements. Indirect impacts will result from shading resulting from larger bridge decks, water quality impacted from increase in impervious surface and chemical applications during winter storms, and hydrology changes from increase in impervious surface, increased stormwater detention, and new or replacement outfalls.

The preliminary permanent and temporary wetland impacts presented on conceptual design plans are provided in Appendix A.

1.3 Project Alternatives

In addition to the No-Action Alternative, one action alternative, referred to as the Proposed Action, was evaluated in the EA.

The existing C-470 freeway includes two general purpose lanes in each direction with a depressed median, resulting in a typical cross section approximately 110 feet wide. This width expands near grade-separated interchanges to include off-ramps, on-ramps, and in some cases, auxiliary lanes. In the No-Action Alternative, this configuration would remain unchanged, but would receive maintenance as needed to maintain the safety and functionality of the existing four-lane freeway.

The Proposed Action would add two tolled Managed Express Lanes in each direction, expanding the four-lane freeway to an eight-lane freeway. To aid motorists in merging onto or off of the highway, auxiliary lanes will be provided between closely spaced interchanges (e.g., one mile apart). The typical cross-section will vary from 154 feet without auxiliary lanes to 174 feet in areas with auxiliary lanes. The Proposed Action does not include any new interchanges or any major interchange modifications. However, it adds new direct-connect ramps carrying northbound and southbound I-25 traffic into the westbound C-470 express lanes without having to merge across other lanes of traffic on westbound C-470.

Relative to wetlands, a key feature of the Proposed Action is that it would demolish and replace two parallel bridges that carry C-470 traffic over the South Platte River. Geometric improvements to C-470 alignment result in the need to replace these two old bridges, which cross over the highest-functioning wetlands found in the project area.

To minimize impacts to wetlands and other natural resources, the Proposed Action was developed to fit primarily within the existing right-of-way. The conceptual design process did consider avoidance and minimization of wetland impacts. Where possible, wetlands were avoided through steeping slopes and widening to the inside of the existing roadway. Perpendicular alignment of bridge structures shortened the bridges and reduced wetland and stream impacts. New and upgraded stormwater detention facilities will capture additional runoff and pollutants that have degraded some of the corridor wetlands and streams. Temporary impacts to wetlands were difficult to minimize at this stage of design because construction easements and other details have not yet been finalized for the project. The design-build phase of the project will provide more opportunities to avoid and minimize impacts to wetlands.

2.0 WETLANDS

Robert Belford, Senior Biologist with Wilson & Company, conducted a wetland delineation of the study corridor in accordance with U.S. Army Corps of Engineers (USACE) wetland definitions on July 2, 3, 17, 22, and 27, 2013. Wetlands were delineated using the procedures outlined in the "*1987 Corps of Engineers Wetland Delineation"* and the "*Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region"* (USACE 2010). The study area for wetlands is defined as the area within the existing CDOT C-470 right of way between Kipling Boulevard and I-25.

The weather during the 2013 field review was generally sunny with scattered afternoon clouds. Temperatures ranged from the upper 80s to middle 90s. No precipitation occurred during the field visits.

Wetland delineations were completed in January 2015 in response to design changes that added or enlarged existing stormwater detention facilities outside the 2013 Wetland Study Area. These delineations were also completed by Robert Belford, now a Senior Biologist with ENERCON.

The January 2015 wetland delineation was completed during an abnormally warm period that had highs reaching the low 70s under generally sunny skies. Wetland data collection during January is not typically initiated because of the dormant plants and frozen soils. Therefore, this wetland delineation was initiated with the assumption that some soils and plant data may not be available to the delineator. This assumption was verified in the field, as some wetland sites had frozen soils and desiccated plants. Plants were present at each site that could be identified by species for the wetland determination form. While in locations with frozen soils, the delineator noted when the soil profile condition and indicators could not be documented on the data form.

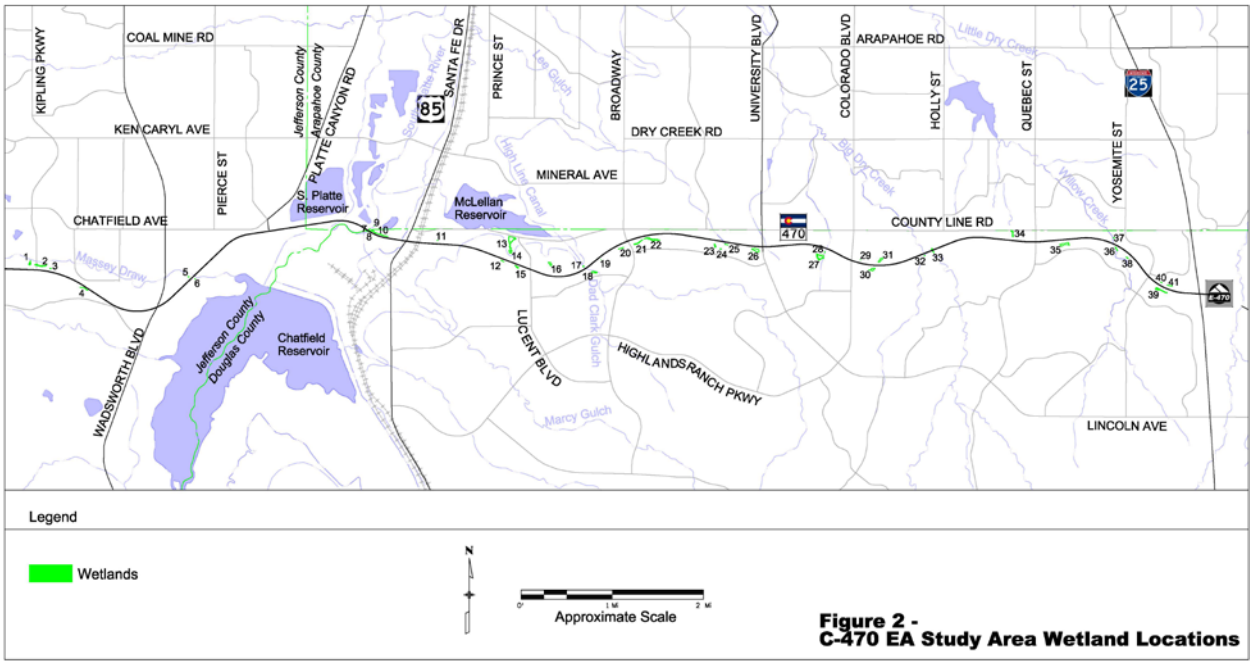
All study area wetlands were delineated with a handheld GPS unit that collects data to sub-meter accuracy. All dominant plants were recorded and the wetland indicator status was determined by sourcing the "*2012 Great Plains National Wetland Plant List*" (USACE 2012). All plant, soil, and hydrology data were recorded on the USACE Great Plains Region Data Forms.

2.1 Description of Wetlands

The study area wetlands encompass a total of 12.7 acres. The wetlands identified in this section include both jurisdictional and non-jurisdictional wetlands. A U.S. Army Corps of Engineers (USACE) jurisdictional determination has not been completed for study area wetlands. The wetlands present in the study area were present along river and stream corridors, and also at detention ponds, drainage basins, and roadside depressions.

Figure 2 shows the location of the wetlands. Representative wetland photographs are provided in Appendix B.

Figure 2. C-470 EA Study Area Wetland Locations



Using the standard wetland classification system (Cowardin et al. 1979) the wetland areas in the study area are classified as:

- palustrine emergent (PEM)
- palustrine scrub/shrub (PSS)
- combination of palustrine emergent and palustrine scrub/shrub (PEM/PSS).

The PEM/PSS wetland areas are composed of equal parts PEM and PSS attributes. Wetland vegetation mostly occurs along narrow overbank areas along study area streams and in existing stormwater drainage basins. The drainage basin and roadside wetland features are not likely to be jurisdictional; but the preliminary or final jurisdictional designation will need to be completed by USACE.

2.2 Study Area Wetlands

The following section identifies the 41 wetland areas that were delineated in the study area, totaling 12.7 acres. Table 1 lists wetlands by location from west to east.

Each wetland in Table 1 is categorized by size range strictly to provide an overview of the size distribution. About half (20) of the 41 project area wetlands are smaller than one tenth of an acre. Another 30% (12) of the wetlands range in size from 0.1 to 0.5 acre, and the final 20% (9 wetlands) are in the size range of a half-acre up to 1.3 acres.

The jurisdictional and non-jurisdictional determinations identified in this document are not based on input from the USACE. Jurisdictional status was determined by connectivity to streams in corridor.

Summed by type, the 12.7 total wetland acres are comprised of 36% PEM, 34% PEM/PSS, and 30% PSS.

The following descriptions identify size, location, dominant vegetation, soil characteristics, and hydrological indicators for each wetland area. The wetland areas are identified in geographic order from west to east, consistent with the numbering of wetland areas on Figure 2.

The abbreviations OBL and FACW in the following descriptions refer to indicator status codes for obligate (OBL), meaning that the plant occurs only in wetlands, or facultative wetland (FACW), meaning that the plant usually occurs in wetlands but may also occur in non-wetland areas.

Wetland Area 1 (0.29 acre)

Wetland Area 1 is located on the west side of Kipling Boulevard along Massey Draw.

Dominant Vegetation:

Sandbar willow (*Salix exigua*) – OBL
Reed canary grass (*Phalaris arundinacea*) – OBL
Sedge (*Carex sp*.) – OBL/FACW

Soils: Soils consist of a silty loam texture with minimal organic content.

***Hydrology*:** Soils are saturated in the 2 – 6 inch soil profile. The drainage does convey higher flows during precipitation events as drift deposits were observed.

Table 1. Summary of Project Area Wetlands within C-470 Right of Way

ID	Association	Type	Jurisdictional[1]	Size in Acres		
				Less than 0.1 acre	0.1 to 0.5 acre	0.5 to 1.3 acre(s)
1	Massey Draw	PSS	yes		0.29	
2	Massey Draw	PSS	yes			0.61
3	Massey Draw	PEM	yes	0.05		
4	Massey Draw	PSS	yes		0.18	
5	Massey Draw	PEM/PSS	yes	0.02		
6	Massey Draw	PEM/PSS	yes	0.01		
7	South Platte R.	PSS	yes	0.07		
8	South Platte R.	PSS	yes	0.05		
9	South Platte R.	PEM/PSS	yes	0.002		
10	South Platte R.	PEM/PSS	yes		0.44	
11	Erickson Blvd.	PEM	no	0.02		
12	Lucent Blvd.	PEM	no	0.05		
13	Lucent Blvd.	PEM	no			0.84
14	Lucent Blvd.	PEM	no		0.43	
15	Lucent Blvd.	PEM	no		0.23	
16	E. of Lucent	PSS	no		0.49	
17	Broadway	PEM	yes	0.06		
18	Dad Clark Gulch	PEM	yes		0.14	
19	Broadway	PEM	no	0.005		
20	Broadway	PEM	no	0.09		
21	Broadway	PEM/PSS	no		0.42	
22	Broadway	PEM/PSS	no			1.08
23	University	PSS	no		0.26	
24	University	PEM	no	0.06		
25	University	PEM	no	0.07		
26	University	PEM/PSS	no			1.23
27	East of U.	PEM/PSS	no			1.17
28	East of U.	PEM	no	0.02		
29	Colorado-Holly	PSS	no	0.007		
30	Colorado-Holly	PEM	no			0.59
31	Colorado-Holly	PEM	no			0.65
32	Big Dry Creek	PSS	yes		0.29	
33	Big Dry Creek	PSS	yes	0.08		
34	Quebec St.	PSS	no		0.41	
35	East of Quebec St.	PEM	no			1.29
36	Willow Creek	PSS	yes		0.11	
37	Willow Creek	PSS	yes	0.02		
38	Willow Creek	PSS	yes	0.04		
39	Yosemite St.	PSS	no			0.71
40	Yosemite St.	PSS	no	0.03		
41	Yosemite St.	PSS	no	0.09		

[1] The jurisdictional identification is based on the wetland connection to a stream, not on a preliminary or final determination from the USACE. The USACE is the agency responsible for a jurisdictional determination. Potentially jurisdiction wetlands are shaded in green and total approximately 2.5 of the 12.6 total acres in the project area.

Wetland Area 2 (0.61 acre)

Wetland Area 2 is located on the east side of Kipling Boulevard along Massey Draw.

Dominant Vegetation:
Sandbar willow – OBL
Common cattail (*Typha angustifolia*) – OBL
Soft-stemmed bulrush - (*Scirpus validas*) – OBL

Soils: Soils consist of a silty loam texture with a distinct depleted matrix.

Hydrology: Soils are saturated in the 2 – 4 inch soil profile. The drainage is a perennial stream that has flows dependent on precipitation events. Sediment deposits were observed along the banks of the stream that were significantly higher than current flows.

Wetland Area 3 (0.05 acre)

Wetland Area 3 is located on the east side of Kipling Boulevard along a drainage that discharges to Massey Draw.

Dominant Vegetation: Common cattail – OBL

Soils: Soils consist of a silty loam texture with a distinct depleted matrix.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile. Drift deposits were observed in the wetlands. This drainage did not have water currently and likely only conveys flows during precipitation events.

Wetland Area 4 (0.18 acre)

Wetland Area 4 is located along C-470 eastbound between Kipling Boulevard and Wadsworth Boulevard. It is located along a drainage that conveys flows during precipitation events.

Dominant Vegetation: Sandbar willow – OBL; Reed canary grass – OBL

Soils: The soils consist of a course loam texture with minimal organic content.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile. Drift deposits were observed in the wetlands.

Wetland Area 5 (0.02 acre)

Wetland Area 5 is located just west of Wadsworth Boulevard. It is associated with Massey Draw that flows under C-470.

Dominant Vegetation:

Sandbar willow – OBL
Reed canary grass – OBL
Baltic rush (*Juncus arcticus*) – FACW
Redtop (*Agrostis alba*) – FACW

Soils: Soils consist of a silty loam texture and a depleted matrix.

Hydrology: Soils are saturated in the 1 – 4 inch soil profile. Sediment and drift deposits were observed in and adjacent to the wetland.

Wetland Area 6 (0.01 acre)

Wetland Area 6 is an extension of the overbank Wetland Area 5 located along Massey Draw.

Dominant Vegetation:
Sandbar willow – OBL
Baltic rush – FACW
Redtop – FACW
Reed canary grass – OBL

Soils: Soils consist of a silty loam texture and a depleted matrix.

Hydrology: Soils are saturated in the 1 – 2 inch soil profile. Drift deposits were observed in and adjacent to the wetland.

Wetland Area 7 (0.07 acre)

Wetland Area 7 is located on the west bank of the South Platte River and is located upstream and downstream of the C-470 Bridge at this location.

Dominant Vegetation:
Sandbar willow – OBL
Baltic Rush – FACW
Nebraska sedge (*Carex nebrascensis*) – OBL

Soils: Soils consist of a sandy/silty loam texture with a depleted dark surface.

Hydrology: Soils are saturated within the one inch of the soil surface. Drift and sediment deposits were observed in and adjacent to the wetland.

Wetland Area 8 (0.05 acre)

Wetland Area 8 is located on the east bank of the South Platte River. It extends both upstream and downstream of the C-470 Bridge at this location.

Dominant Vegetation: Sandbar willow – OBL; Baltic rush – FACW

Soils: Soils consist of a sandy/silty loam texture with a depleted matrix.

Hydrology: Soils are saturated within one-inch of the soil surface. Drift and sediment deposits were observed along the wetland edge.

Wetland Area 9 (0.002 acre)

Wetland Area 9 is located on the northeast bank of the South Platte River. The wetland area is located downstream of the C-470 Bridge. This wetland area was delineated in January 2015 and was being considered as the location for a stormwater outfall.

Dominant Vegetation: Sandbar willow – OBL; Baltic rush – FACW

Soils: Soils consist of a sandy loam texture with a depleted matrix.

Hydrology: Saturated soils were present within one-inch of the soil surface. Sediment and drift deposits were also present.

Wetland Area 10 (0.44 acre)

Wetland Area 10 is located along a drainage that is east of the South Platte River and is located on the north side of C-470. This drainage flows into the South Platte River.

Dominant Vegetation:
Sandbar willow – OBL
Common Cattail – OBL
Nebraska sedge – OBL
Reed canary grass - OBL
Watercress (*Nasturtium officina*l) – OBL

Soils: Soils consist of a sandy loam texture with a depleted matrix.

Hydrology: Soils are saturated within one inch of the soil surface.

Wetland Area 11 (0.02 acre)

Wetland Area 11, located on the northwest corner of Erickson Boulevard, is a small drainage ditch or basin.

Dominant Vegetation: Common Cattail – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 7 inch soil profile.

Wetland Area 12 (0.05 acre)

Wetland Area 12 is located along eastbound C-470 along the Lucent Boulevard exit. The wetland is associated with a drainage feature.

Dominant Vegetation: *Narrow-leaf cattail (*Typha latifolia*) – OBL*

Soils: Soils consist of a sandy loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 13 (0.84 acre)

Wetland Area 13 appears to be an older detention basin that is located adjacent to Lucent Boulevard and is north of C-470. Vegetated wetland was located around the edge of the pond, with open water present for the most of the wetland acreage.

Dominant Vegetation: Common Cattail – OBL

Soils: This site was delineated in January 2015 when soils were frozen. Therefore, no soil data was collected.

Hydrology: Soils appeared to be saturated at the surface. Surface water was also noted in the wetland area.

Wetland Area 14 (0.43 acre)

Wetland Area 14 is an older detention basin that is located adjacent to Wetland Area 13. The two basins are connected and appear to be the same age based on the condition of the vegetation.

Dominant Vegetation: Common Cattail – OBL; Sandbar Willow – OBL

Soils: This site was delineated in January 2015 when soils where frozen. Therefore, no soil data was collected.

Hydrology: Soils appear to be saturated at the surface. Some surface water was also noted in the wetland area.

Wetland Area 15 (0.23 acre)

Wetland Area 15 is located at the C-470 eastbound Lucent Boulevard exit. The wetland is a detention pond that is located between the exit ramp and C-470.

Dominant Vegetation:
Narrow-leaf cattail – OBL
Nebraska sedge – OBL
Reed Canary Grass – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 2 – 3 inch soil profile. Sediment deposits were observed in the wetland.

Wetland Area 16 (0.49 acre)

Wetland Area 16 is located along westbound C-470 east of the Lucent Boulevard exit. This wetland is a detention pond located in an area bordered by commercial buildings.

Dominant Vegetation:
Sandbar willow – OBL
Reed canary grass – OBL
Horsetail (*Equisetum hyemale L*.) – FACW

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile.

Wetland Area 17 (0.06 acre)

Wetland 17 is located on westbound C-470 before the Broadway exit. The wetland area is a detention basin and receives hydrology via a large culvert that is installed under C-470.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 18 (0.14 acre)

Wetland 18 is located on or adjacent to Dad Clark Gulch. It appears to be a detention facility that is supported by a culvert that is installed under Plaza Drive.

Dominant Vegetation: Sandbar willow – OBL; Nebraska Sedge – OBL

Soils: Soils consist of a silty loam texture with a depleted matrix.

Hydrology: Soils are saturated in the top one-inch of the soil profile.

Wetland Area 19 (0.005 acre)

Wetland Area 19 is located adjacent to eastbound C-470 before the Broadway Exit. It is a small "ditch" wetland.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of silty-loam texture.

Hydrology: Soils were saturated within the top 4-5 inches of the surface.

Wetland Area 20 (0.08 acre)

Wetland Area 20 is located adjacent to the C-470 Broadway exit ramp. The wetland is associated is associated with ditch or drainage area adjacent to the exit ramp.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 5 – 6 inch soil profile.

Wetland Area 21 (0.42 acre)

Wetland Area 21 is located adjacent to the Broadway eastbound C-470 ramp. The wetland is associated with a drainage feature that appears to receive sufficient hydrology to support woody vegetation.

Dominant Vegetation: Sandbar willow – OBL; Knotted rush – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 1 – 3 inch soil profile.

Wetland Area 22 (1.08 acre)

Wetland Area 22 is connected to Wetland Area 22.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils consist of a silty textures with a gleyed matrix.

Hydrology: Soils are saturated in the 1-3 inch soil profile.

Wetland Area 23 (0.26 acre)

Wetland Area 23 is a detention basin located adjacent to eastbound C-470 near University Boulevard. This wetland area was delineated in January 2015.

Dominant Vegetation: Sandbar Willow – OBL

Soils: The soils were frozen when this wetland delineation was completed in January 2015. Therefore, no soils data was collected.

Hydrology: The soils at this site appear to be seasonally saturated in response to stormwater runoff. Drift lines and sediment deposits were noted in the January 2015 fieldwork.

Wetland Area 24 (0.06 acre)

Wetland Area 24 is a small detention basin located adjacent to a school. A small outfall is located on the feature.

Dominant Vegetation: Common cattail – OBL

Soils: The soils were frozen when the wetland delineation was completed in January 2015. Therefore, no soils data was collected.

Hydrology: The soils at the site appear to be seasonally saturated in response to stormwater runoff. Some surface water was noted in the feature.

Wetland Area 25 (0.07 acre)

Wetland Area 25 is located along eastbound C-470 between Broadway and University Boulevard.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of a silty texture.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile.

Wetland Area 26 (1.23 acres)

Wetland Area 26 is located on eastbound C-470 at the University Boulevard Interchange. It is a drainage basin that collects run-off from the roadway and adjacent commercial development.

Dominant Vegetation:
Sandbar willow – OBL
Narrow-leaf cattail – OBL
Baltic rush – FACW
Cloaked bulrush (*Scirpus pallidis*) – OBL

Soils: Soils consist of a silty texture with a depleted matrix.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile.

Wetland Area 27 (1.17 acre)

Wetland Area 27 is located along eastbound C-470 between University Boulevard and Colorado Boulevard. The feature is a drainage basin that collects stormwater runoff from adjacent residential development. This feature was delineated in January 2015.

Dominant Vegetation: Sandbar willow – OBL; Reed canary grass – OBL

Soils: The soils were frozen when the delineation was conducted in January 2015. Therefore, no soils data was collected.

Hydrology: Soils appear to be seasonally saturated during episodes of storm runoff. Drift deposits were noted during January 2015 fieldwork.

Wetland Area 28 (0.02 acre)

Wetland area 28 is located adjacent to Wetland Area 28. The feature is outlet area associated with Wetland Area 27.

Dominant Vegetation: Sandbar willow – OBL

Soils: Soils were frozen during the January 2015 fieldwork.

Hydrology: Drift deposits and sediment deposits were observed.

Wetland Area 29 (0.007 acre)

Wetland Area 29 is located on westbound C-470 at Colorado Boulevard.

Dominant Vegetation: Narrow-leaf cattail – OBL

Soils: Soils consist of a silty texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 30 (0.59 acre)

Wetland Area 30 is located along eastbound C-470 between Colorado Boulevard and Holly Street. It is a large detention facility that captures run-off from adjacent commercial and residential development.

Dominant Vegetation:
Sandbar willow – OBL
Reed canary grass – OBL
Narrow-leaf cattail – OBL

Soils: Soils consist of a silty loam texture.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 31 (0.65 acre)

Wetland Area 31 is a drainage basin located along westbound C-470 between Colorado and Holly Street. The feature is supported by a culvert that is installed under C-470. This feature was delineated in January 2015.

Dominant Vegetation:
Sandbar Willow – OBL
Nebraska sedge – OBL
Reed canary grass – OBL

Soils: Soils were frozen in January 2015. Therefore no soils data was collected.

Hydrology: Soils appeared saturated in the top 1-2 inches as some surface water was observed in the wetland area. Drift deposits were observed in the feature.

Wetland Area 32 (0.29 acre)

Wetland Area 32 is located along eastbound C-470 near Holly Street.

Dominant Vegetation:
Nebraska sedge – OBL
Baltic rush – FACW
Watercress – OBL
Reed canary grass – OBL

Soils: Soils consist of a silty texture with a depleted matrix.

Hydrology: Soils are saturated in the upper one-inch soil profile.

Wetland Area 33 (0.08 acre)

Wetland Area 33 is associated with Big Dry Creek that flows under east and west bound C-470. It is located along the banks of Big Dry Creek and is connected to the riparian floodplain of the creek. These wetlands are “overbank” features that form along the edge of stream banks in this region.

Dominant Vegetation:
Sandbar willow – OBL
Nebraska sedge – OBL
Baltic rush – FACW
Reed canary grass – OBL

Soils: Soils in the wetland areas consist of silty to sandy loam texture. A depleted matrix was observed in some of the soils.

Hydrology: Soils are generally saturated in the 3 – 4 inch soil profile. Drift and sediment deposits were observed within and adjacent to the wetlands.

Wetland Area 34 (0.41 acre)

Wetland Area 34 is associated with a detention pond located along westbound C-470 near Quebec Street.

Dominant Vegetation:
Sandbar willow – OBL
Reed canary grass – OBL
Narrow-leaf cattail – OBL

Soils: Soils in the wetland consist of a sandy loam texture. A depleted matrix was observed in the soils.

Hydrology: Soils are saturated in the 4 – 5 inch soil profile.

Wetland Area 35 (1.29 acres)

Wetland Area 35 is associated with a detention pond located along eastbound C-470 near Quebec Street. The feature was delineated in January 2015.

Dominant Vegetation: Common cattail – OBL; Reed canary grass – OBL

Soils: Soils were frozen in January 2015. Therefore, no soils data was collected.

Hydrology: Soils are seasonally flooded during stormwater runoff. Drift deposits were observed. Some surface saturation was also observed in the feature.

Wetland Area 36 (0.11 acre)

Wetland Area 36 is located along eastbound C-470 at Willow Creek. It is associated with a narrow strip of the riparian vegetation zone along the stream.

Dominant Vegetation:
Sandbar willow – OBL
Reed canary grass – OBL
Baltic rush – FACW

Soils: Soils in the wetland consist of a sandy loam texture.

Hydrology: Soils are saturated in the 1-2 inch soil profile.

Wetland Area 37 (0.02 acre)

Wetland Area 37 is located along westbound C-470 at Willow Creek. It is associated with the narrow riparian corridor along Willow Creek.

Dominant Vegetation:
Sandbar willow – OBL
Reed canary grass – OBL
Common three-square (*Schoenoplectus pungens*) – OBL

Soils: Soils in the wetland consist of a silty loam texture.

Hydrology: Soils are saturated in the 1 – 2 inch soil profile.

Wetland Area 38 (0.04 acre)

Wetland Area 38 is located along eastbound C-470 at Willow Creek. It is located along the northeast bank of Willow Creek.

Dominant Vegetation:
Sandbar willow – OBL
Reed Canary grass – OBL
Horsetail – FACW
Common three-square – OBL

Soils: Soils in the wetland consist of a silty texture. A depleted matrix was observed in the soils.

Hydrology: Soils are saturated in the 3 – 4 inch soil profile. Drift deposits were observed in the wetland.

Wetland Area 39 (0.71 acre)

Wetland Area 39 is a detention basin located east of Yosemite Street. The wetland is adjacent to eastbound C-470. This feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL: Narrow-leaf cattail – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Soils appear to have some surface saturation. Drift deposits were observed in the wetland area.

Wetland Area 40 (0.03 acre)

Wetland Area 40 is a narrow drainage feature located along westbound C-47 near Yosemite Street. The feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Soils were visually saturated. Some drift deposits were observed.

Wetland Area 41 (0.09 acre)

Wetland Area 41 is a narrow drainage feature connected to Wetland Area 40. The feature was delineated in January 2015.

Dominant Vegetation: Reed canary grass – OBL

Soils: Soils were frozen during the January 2015 field study. Therefore, no soils data was collected.

Hydrology: Some saturation in the soils was observed. Drift deposits were also observed.

3.0 WETLAND FUNCTION

FACWet is an assessment tool for rating wetland conditions through evaluation of ecological stressors that drive wetland functions. Each variable is rated on a scale of 0.0 to 1.0. This tool was used to evaluate the impacted wetlands that occur along the South Platte River, Big Dry Creek, and Willow Creek. In addition, all of the impacted wetlands associated with stormwater detention facilities and minor roadside depressions were evaluated together in one FACWet assessment. These wetlands were all primarily supported by stormwater and had identical characteristics that are evaluated in the FACWet analysis. The results of the analysis were as follows:

- South Platte River wetlands 0.78 (high end of functioning)
- Big Dry Creek wetlands 0.75 (high end of functioning)
- Willow Creek wetlands 0.71 (low end of functioning)
- Non-jurisdictional wetlands 0.60 (low end/impaired)

The completed FACWet version 3.0 worksheets for these wetlands are provided in Appendix C.

4.0 WETLAND IMPACTS

Table 2 identifies the permanent and temporary impacts at each mapped wetland in the study corridor. The wetlands are presented from west to east in the table. These impacts are preliminary because the roadway design completed for this revised EA is conceptual.

Table 2. C-470 Preliminary Wetland Impacts Based on Conceptual Design

#	Association	Jurisdictional	FACWET Score	Permanent Impacts (Acres)	Temporary Impacts (Acres)
4	Massey Draw		0.60	0.18	
7	South Platte River	Yes	0.78	0.03	
8	South Platte River	Yes		0.02	
10	South Platte River	Yes		0.02*	0.3*
12	Lucent Blvd.		0.60	0.04	
15	Lucent Blvd.			0.07	
19	Broadway			0.0001	
20	Broadway			0.01	
21	Broadway				0.18
22	Broadway			0.01	0.63
23	University Blvd.			0.13	
25	University Blvd.			0.01	
26	University Blvd.			0.14	
31	Colorado to Holly			0.004	
33	Big Dry Creek	Yes	0.75	0.03	
36	Willow Creek	Yes	0.71	0.002	
39	Yosemite Street		0.60	0.11	
40	Yosemite Street			0.02	
41	Yosemite Street			0.09	
		Total Jurisdictional*	5 wetlands	0.102*	0.3*
		Total Non-Jurisdictional	14 wetlands	0.8141	0.81
		Overall Totals	19 wetlands	0.9161	1.11

** Wetland 10 is possibly jurisdictional, but assumed so, subject to USACE determination*

Table 1 indicated that approximately 12.7 acres of wetlands had been identified within CDOT right-of-way along the 13.75-mile C-470 project corridor. A total of 0.91 acre of permanent impacts and 1.11 acres of temporary impacts were identified during the revised EA conceptual design process. Impacts to five jurisdictional wetlands would total approximately one-tenth of one-acre. These potential jurisdictional wetlands are identified with green shading in Table 2.

Direct impacts to wetlands were determined by overlaying conceptual roadway design onto wetlands. If any of the roadway design that includes cut –and-fill areas and installation of concrete or other materials were placed in wetlands it was considered a direct permanent impact. Indirect impacts also were included as permanent impacts where increases in the bridge decking resulted in a larger shadow that could result in the loss of wetland vegetation.

Temporary impacts were calculated based on the potential exposure of soil, buffers for construction access, and temporary removal of vegetation. Since the design was only conceptual during this National Environmental Policy Act process, temporary impacts will change during the design-build process.

Indirect impacts to corridor wetlands and streams that are not quantifiable will result from the increase in impervious surface from C-470 roadway improvements. Increases in impervious surfaces result in larger sediment releases, and increases runoff that contributes to erosion and transport of pollutants to wetlands and streams. The indirect impacts resulting from the roadway construction activities could include increases in sedimentation and erosion, resulting in temporary indirect impacts to corridor wetlands and streams. With larger road surfaces, an increase in winter traction sanding and deicing could contaminate wetlands via increased impervious surface runoff.

4.1 Other Waters of the U.S.

The proposed C-470 Project will cross other waters of the U.S. as defined by the USACE. The USACE typically will claim jurisdiction on any river or stream that is shown as a blue line on a topographical map. These regulated streams can be perennial, intermittent, or ephemeral. Within the study area the following streams and rivers will be defined as jurisdictional by the USACE:

- South Platte River
- Massey Draw
- Dad Clark Gulch
- Lee Gulch
- Big Dry Creek
- Willow Creek

These streams will be under USACE regulatory jurisdiction for any proposed actions within their ordinary high water mark (OHWM). No permanent or temporary impacts to these streams were identified during the conceptual design phase of this project.

However, impacts to these streams will likely be identified during the C-470 design-build process.

4.2 Permitting

The study area jurisdictional wetlands and streams will be subject to USACE Section 404 permitting. Permitting will likely be completed under a Nationwide (NWP) 14 for Transportation Projects. The NWP 14 will be completed during the design-build phase of the project when final impacts are calculated for the project.

5.0 WETLAND MITIGATION

The C-470 Proposed Action will result in 0.91 acre of permanent impacts to wetlands. This total includes both jurisdictional and non-jurisdictional wetlands. Impacts to jurisdictional and non-jurisdictional wetlands will be required to be mitigated at a 1:1 ratio.

Two mitigation options were considered for permanent impacts to study area wetlands. These included onsite mitigation and purchase of wetland mitigation bank credits from a USACE approved mitigation bank. Since this project was only at the conceptual design phase, this discussion of potential mitigation should be considered preliminary and subject to change during the design-build phase of the project.

Onsite mitigation opportunities are limited in the corridor, as they are primarily focused on the perennial streams and stormwater detention ponds found in the corridor. Most of the potential stream sites would not present good mitigation opportunities because the riparian wetland habitats are in good condition. Therefore, stream mitigation sites were eliminated from consideration.

Since onsite mitigation is not viable, the 0.91 acre of permanent wetland impacts will be mitigated through the purchase of wetland mitigation bank credits. This option represents the best solution for the required wetland mitigation.

Temporary impacts to wetlands and other waters of the U.S. will also be mitigated. During development of the design-build plans, wetland scientists will work closely with project engineers to avoid and minimize impacts to wetlands and waters of the U.S. In addition the following wetland mitigation commitments are typically implemented for CDOT projects:

- In designated temporary work areas within wetlands and riparian areas, shrubs (primarily willows) will be trimmed to the ground level (not grubbed), and then covered with a geo-textile fabric and an additional layer of straw. These areas (including wetlands) will then be covered with a minimum of 2 feet of clean fill. As soon as possible, all temporary fill will be removed to an upland location. This will protect riparian shrub rootstock and wetland seed banks. If possible, temporary fill of wetlands will occur during periods when plants are dormant or toward the end of the growing season.

- Wetland areas not temporarily impacted by the project will be protected from construction activities by temporary and/or construction limit fencing.

- Sediment control measures will be installed where needed to prevent sediment filling wetlands.

- Fertilizers or hydro-mulching will not be allowed within 50 feet of a wetland.

- All disturbed areas will be revegetated with native grass and forb species. Seed, mulch, and mulch tackifier will be applied in phases throughout construction.

- Where permanent seeding operations are not feasible because of seasonal constraints (e.g., summer and winter months), disturbed areas will have mulch and mulch tackifier applied to prevent erosion.

- A stormwater management plan will be developed with best management practices to minimize adverse effects to water quality.

- Erosion bales, erosion logs, silt fence, or other sediment control devices will be used as sediment barriers and filters adjacent to wetlands, surface waterways, and at inlets where appropriate.

- Construction staging areas will be located at a distance of greater than 50 feet from adjacent stream/riparian areas to avoid disturbance to existing vegetation, avoid point source discharges, and to prevent spills from entering the aquatic ecosystem (including concrete washout).

- Temporary impacts to waters of the U.S. and adjacent habitat will be reclaimed with native plants and shrubs. In addition, this project will likely require a Senate Bill 40 (SB 40) Certification from Colorado Parks and Wildlife (part of the Colorado Department of Natural Resources), to protect riparian habitat.

6.0 CONCLUSION

Out of 12.7 acres of wetlands delineated on CDOT right-of-way in the C-470 project area, the Proposed Action is expected to have 0.91 acre of permanent impacts and 1.11 acres of temporary impacts. Extensive efforts were undertaken in conceptual design to avoid wetland areas and to minimize impacts. CDOT will mitigate for these impacts in accordance with its “no net loss” policy and will undertake various Best Management Practices (temporary and permanent) to minimize adverse effects to wetlands. Alternatives to the Proposed Action were screened out based on ability to meet project purpose and need, so the Revised EA addresses only the Proposed Action and the No-Action Alternative.

Based on the above considerations, it is determined that there is no practicable alternative to the proposed new construction in wetlands and that the Proposed Action

includes all practicable measures to minimize harm to wetlands which may result from such use.

7.0 REFERENCES

Cowardin, Lewis M., Virginia Carter, Frances C. Golet, and Edward T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Department of the Interior, U.S. Fish and Wildlife Service, FWS/OBS – 79/31.

Lichvar, R.W. 2012. *The National Wetland Plant List*. ERDC/CRREL TR-12-11. Hanover, NH: U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory.

U.S. Army Corps of Engineers. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Great Plains Region*.

APPENDIX A
Wetland Impacts on Conceptual Design Plans

Wetland Exhibit 1

Wetland Area: 0.2936 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 2

Wetland Area: 0.6084 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 3

Wetland Area: 0.0536 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

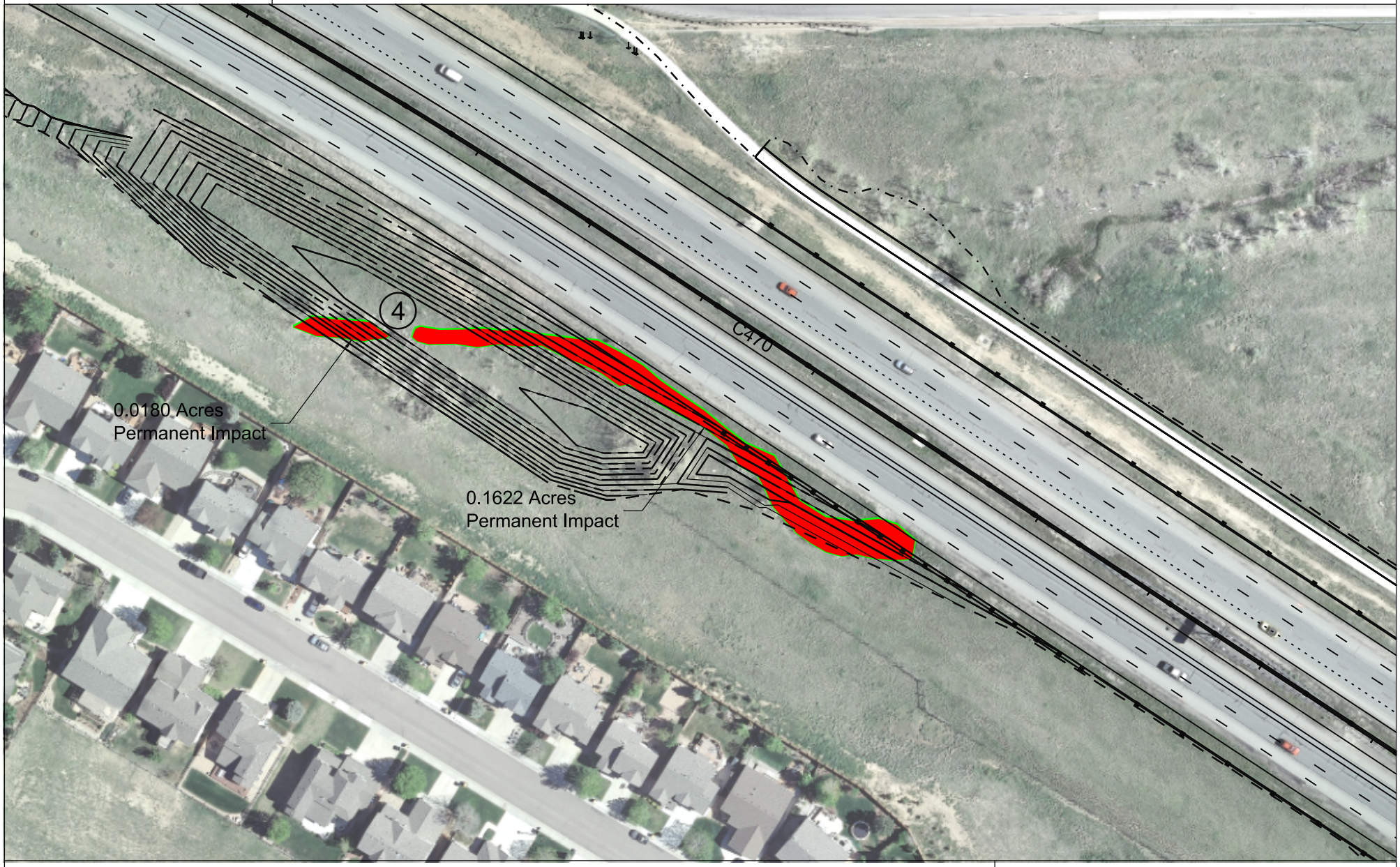
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 4

Wetland Area: 0.1802 Acres
Permanent Impact Area: 0.1802 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

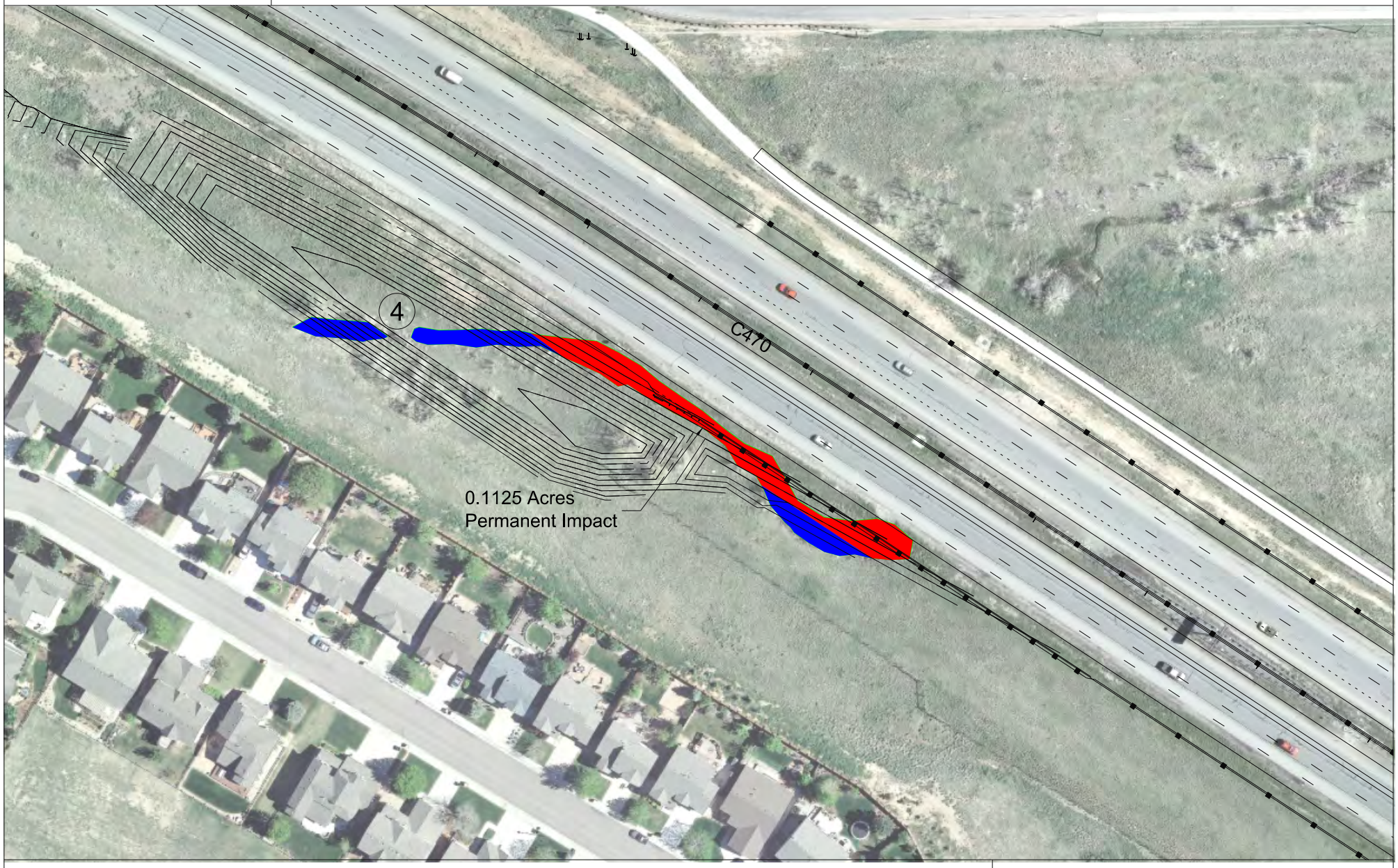
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 4

Wetland Area: 0.1802 Acres
Permanent Impact Area: 0.1125 Acres Temporary Impact Area: 0.0677 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 5

Total Wetland Area: 0.0230 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 6

Total Wetland Area: 0.0135 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

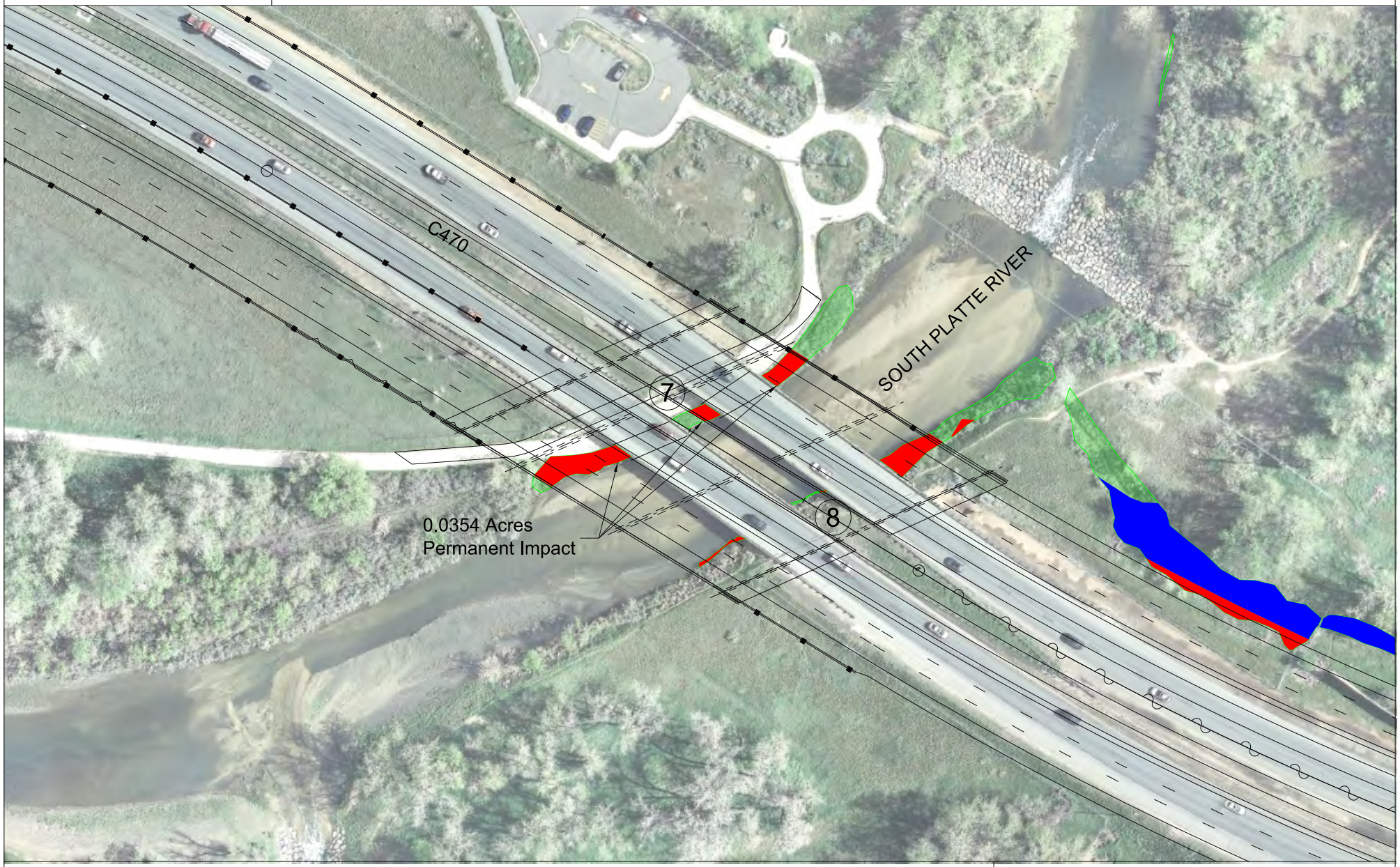
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 7

Total Wetland Area: 0.0660 Acres
Permanent Impact Area: 0.0354 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

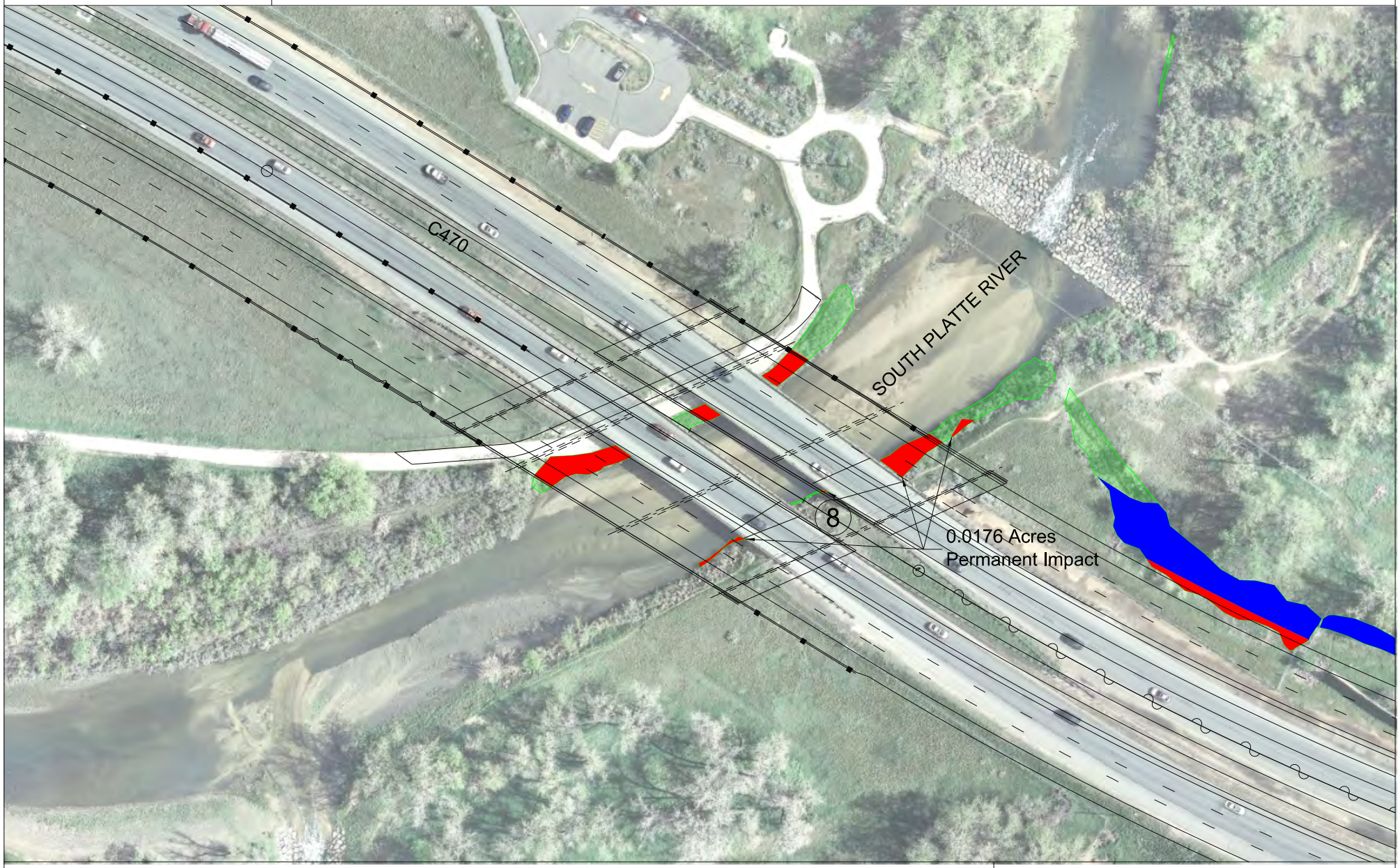
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 8

Total Wetland Area: 0.0516 Acres
Permanent Impact Area: 0.0176 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 9

Total Wetland Area: 0.0023 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

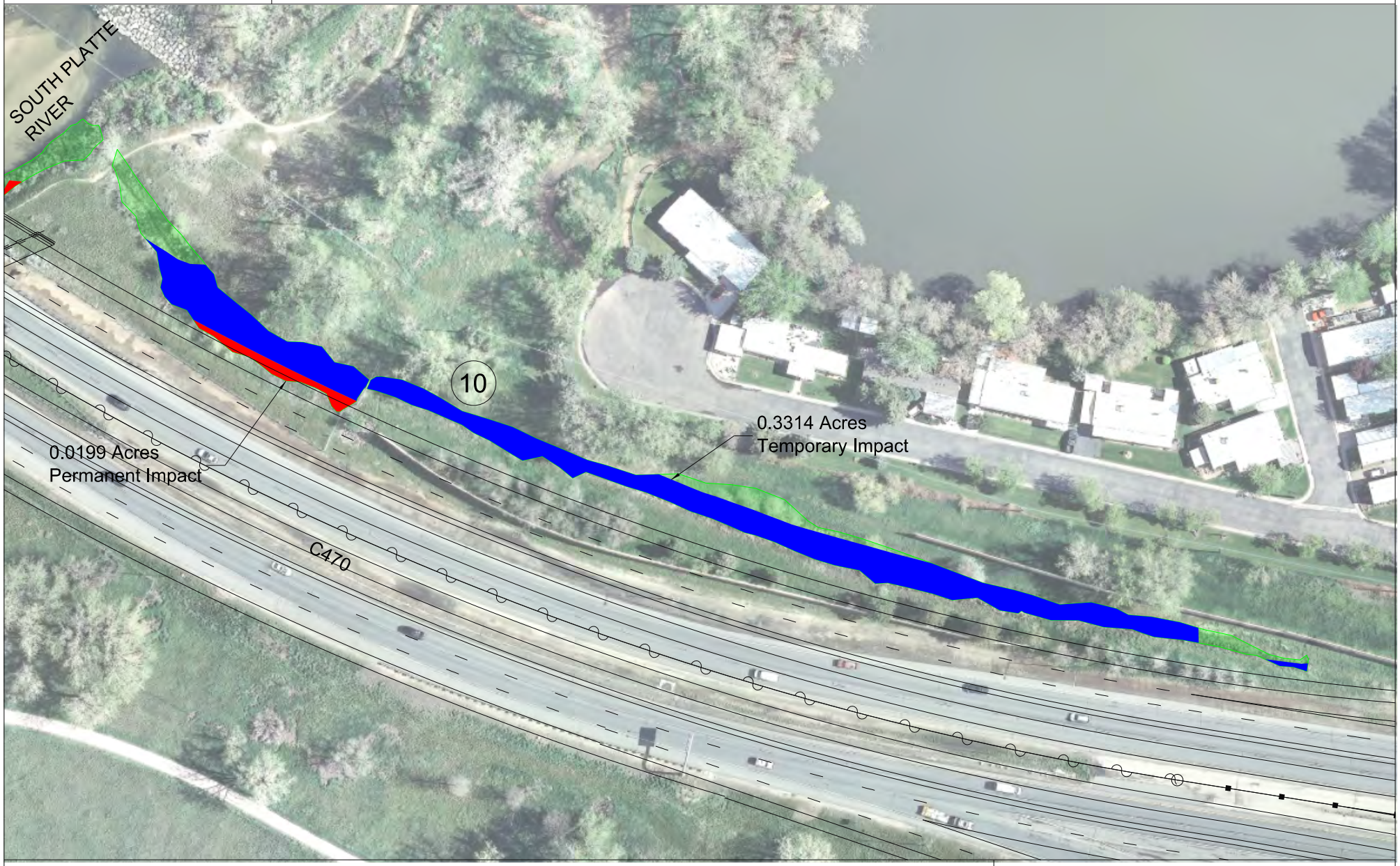
Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 10

Total Wetland Area: 0.4392 Acres
Permanent Impact Area: 0.0199 Acres Temporary Impact Area: 0.3314 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 11

Total Wetland Area: 0.0160 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

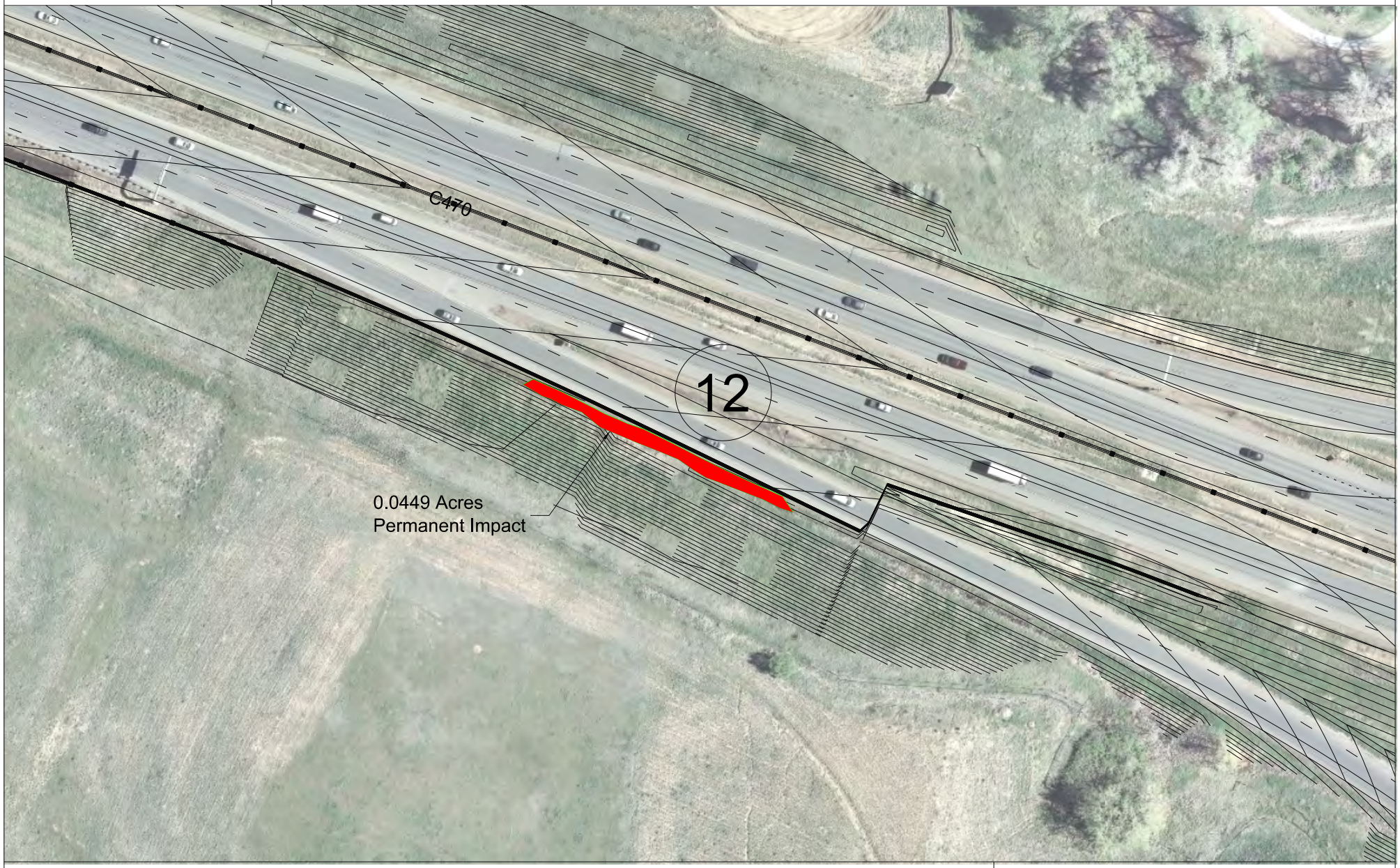
Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 12

Total Wetland Area: 0.0449 Acres
Permanent Impact Area: 0.0449 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibits
13 & 14

Total Wetland Area: 1.270 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

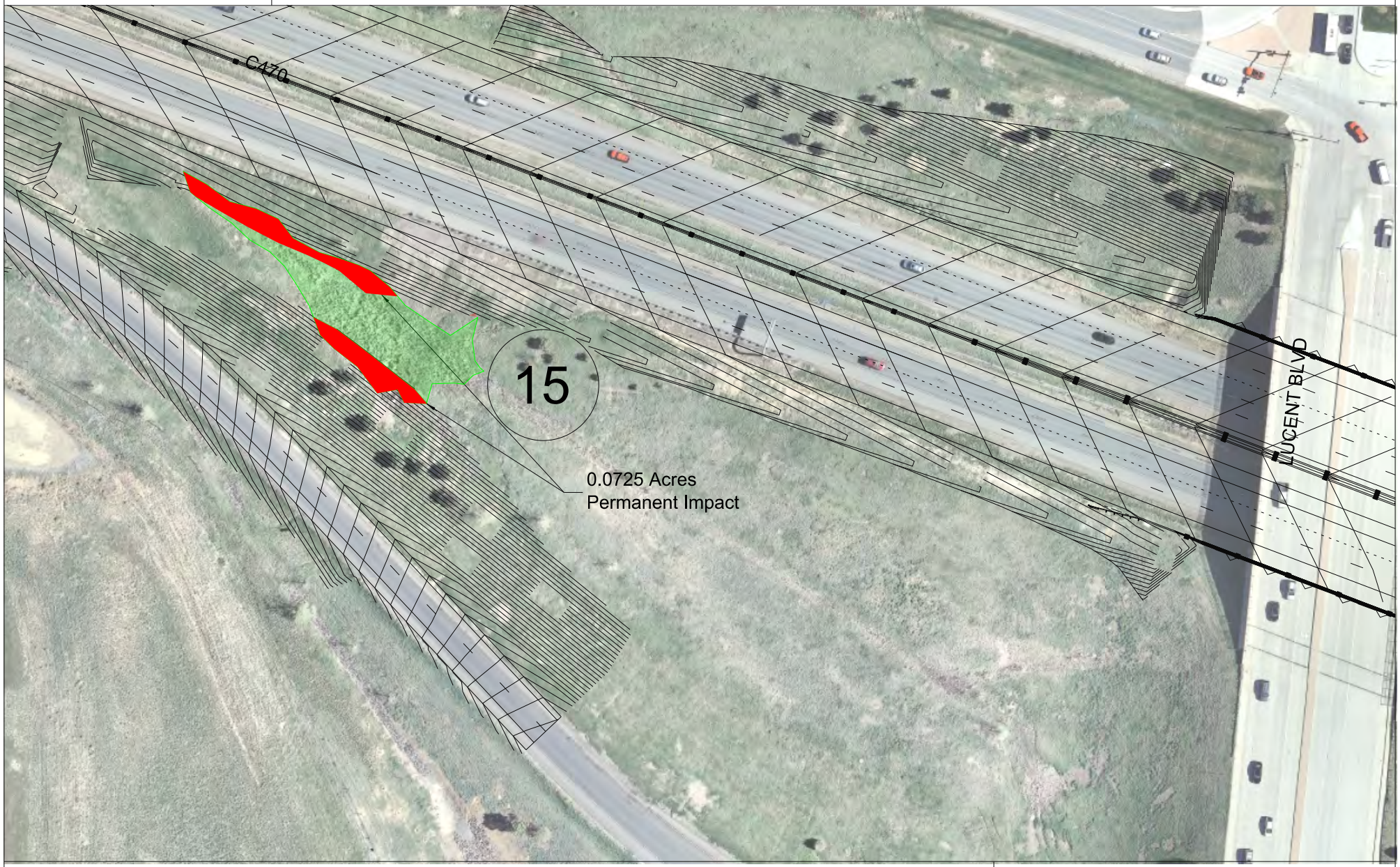
Unimpacted Wetland Area

N

0' 100' 200' 400'

Wetland Exhibit 15

Total Wetland Area: 0.2290 Acres
Permanent Impact Area: 0.0725 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 16

Total Wetland Area: 0.4883 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 17

Total Wetland Area: 0.0582 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 18

Total Wetland Area: 0.1396 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 19

Total Wetland Area: 0.0051 Acres
Permanent Impact Area: 0.0001 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

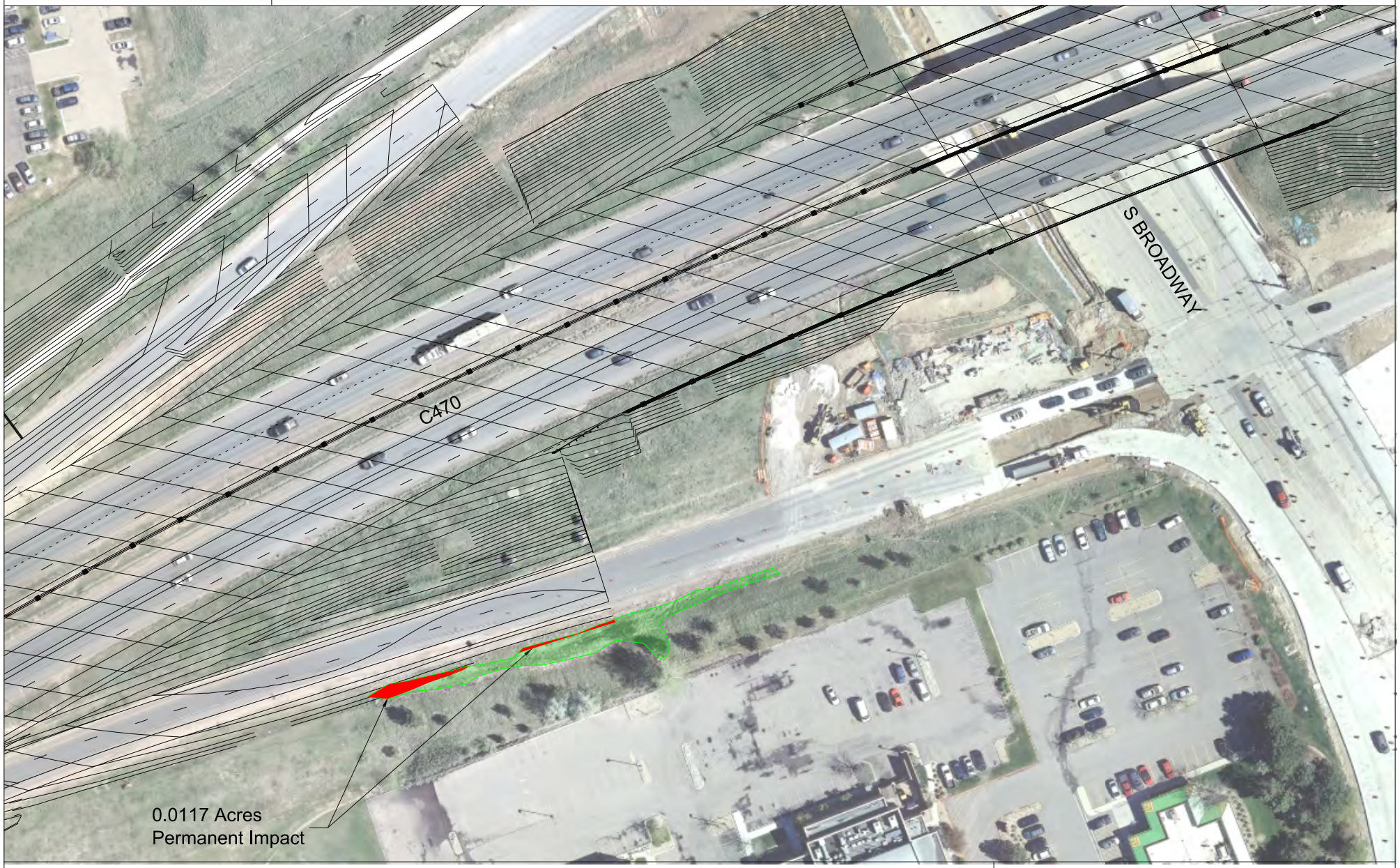
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 20

Total Wetland Area: 0.0887 Acres
Permanent Impact Area: 0.0117 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 21

Total Wetland Area: 0.4253 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.1843 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 22

Total Wetland Area: 1.086Acres
Permanent Impact Area: 0.0129 Acres Temporary Impact Area: 0.6377 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 23

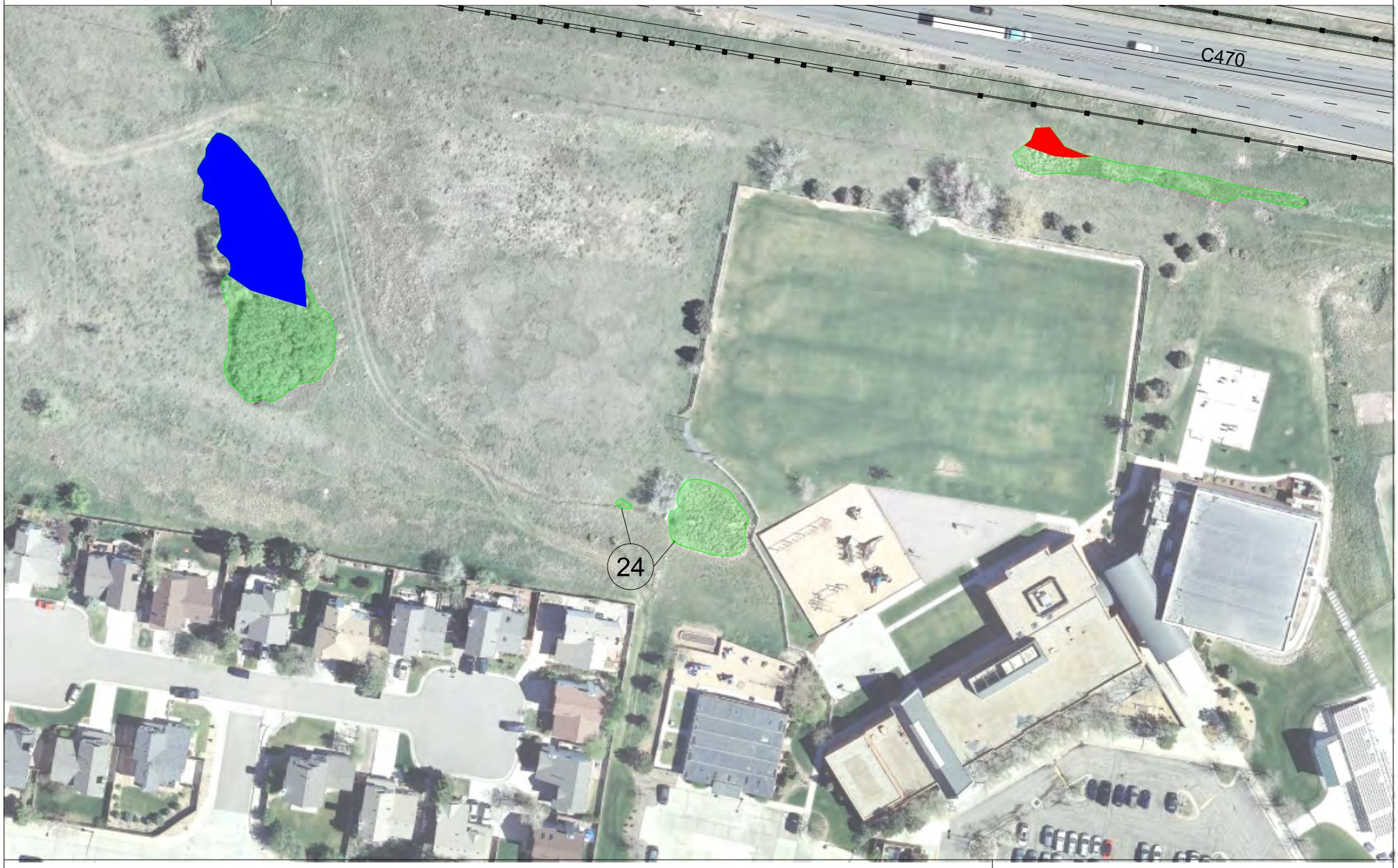
Total Wetland Area: 0.2609 Acres
Permanent Impact Area: 0.1338 Acres Temporary Impact Area: 0.0 Acres

Wetland Exhibit 23

Total Wetland Area: 0.2609 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.1338 Acres

Wetland Exhibit 24

Total Wetland Area: 0.0606 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres



Legend

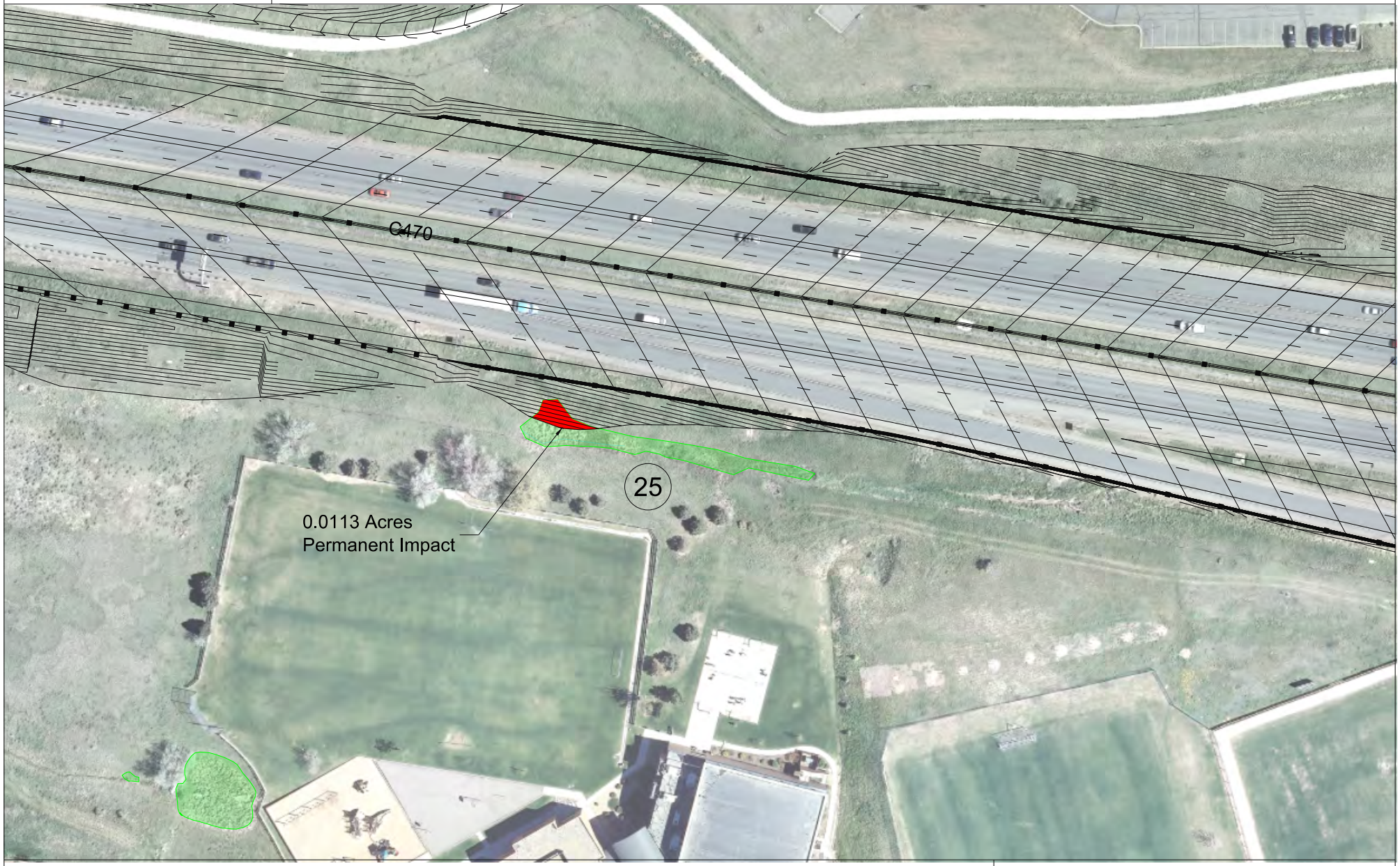
Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 25

Total Wetland Area: 0.0708 Acres
Permanent Impact Area: 0.0113 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

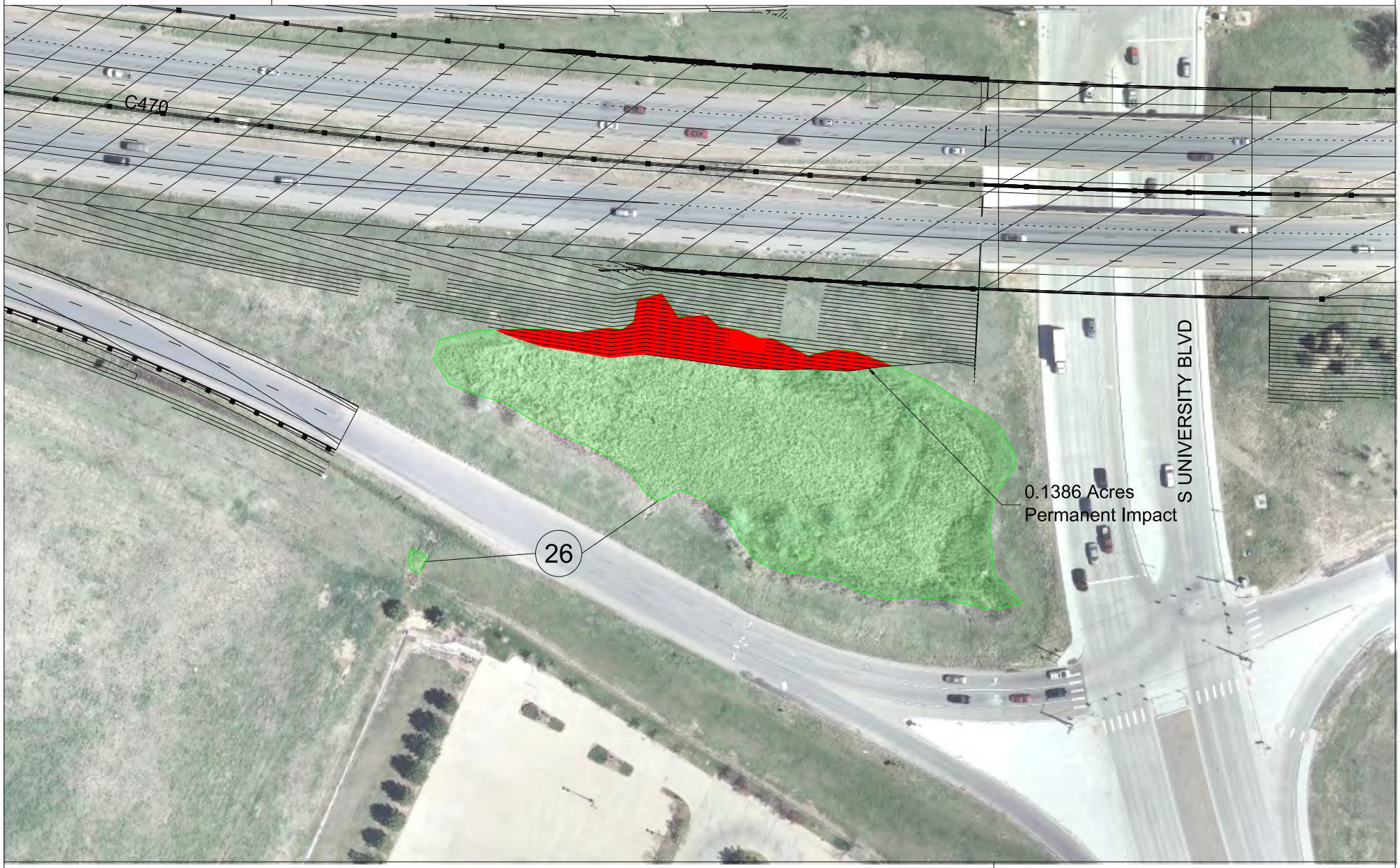
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 26

Total Wetland Area: 1.230 Acres
Permanent Impact Area: 0.1386 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibits
27 & 28

Total Wetland Area: 1.199 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 29

Total Wetland Area: 0.007 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 30

Total Wetland Area: 0.5863 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 31

Total Wetland Area: 0.6450 Acres
Permanent Impact Area: 0.0044 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 31

Total Wetland Area: 0.6450 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0044 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 32

Total Wetland Area: 0.0286 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 33

Total Wetland Area: 0.0802 Acres
Permanent Impact Area: 0.0346 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 34

Total Wetland Area: 0.4082 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 35

Total Wetland Area: 1.292 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 36

Total Wetland Area: 0.1125 Acres
Permanent Impact Area: 0.0020 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 37

Total Wetland Area: 0.0212 Acres
Permanent Impact Area: 0.0 Acres Temporary Impact Area: 0.0 Acres

Legend

Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 38

Total Wetland Area: 0.0443 Acres
Permanent Impact Area: 0.0 Acres
Temporary Impact Area: 0.0 Acres

Legend

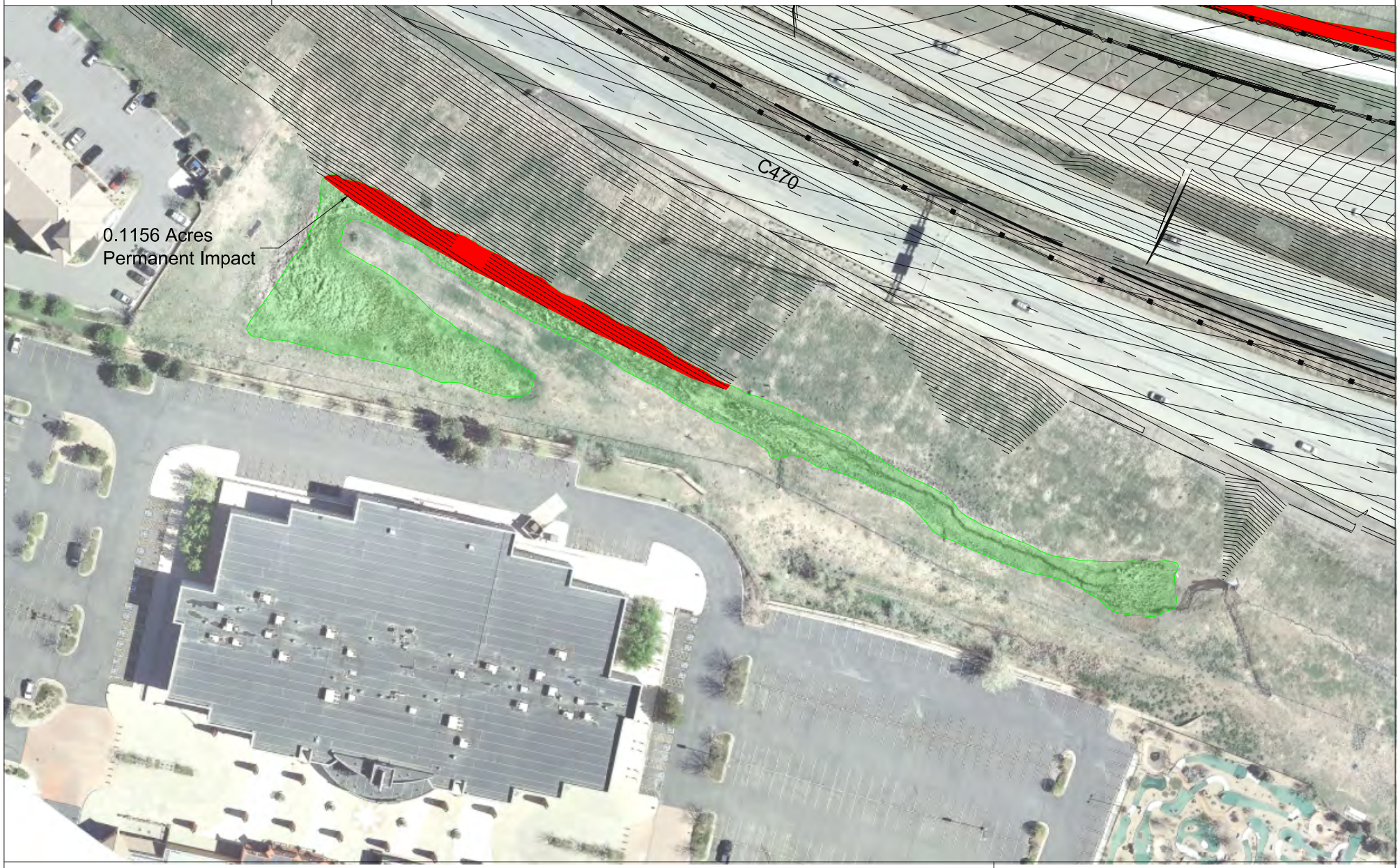
Temporary Wetland Impact
Permanent Wetland Impact
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 39

Total Wetland Area: 0.7070 Acres
Permanent Impact Area: 0.1156 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

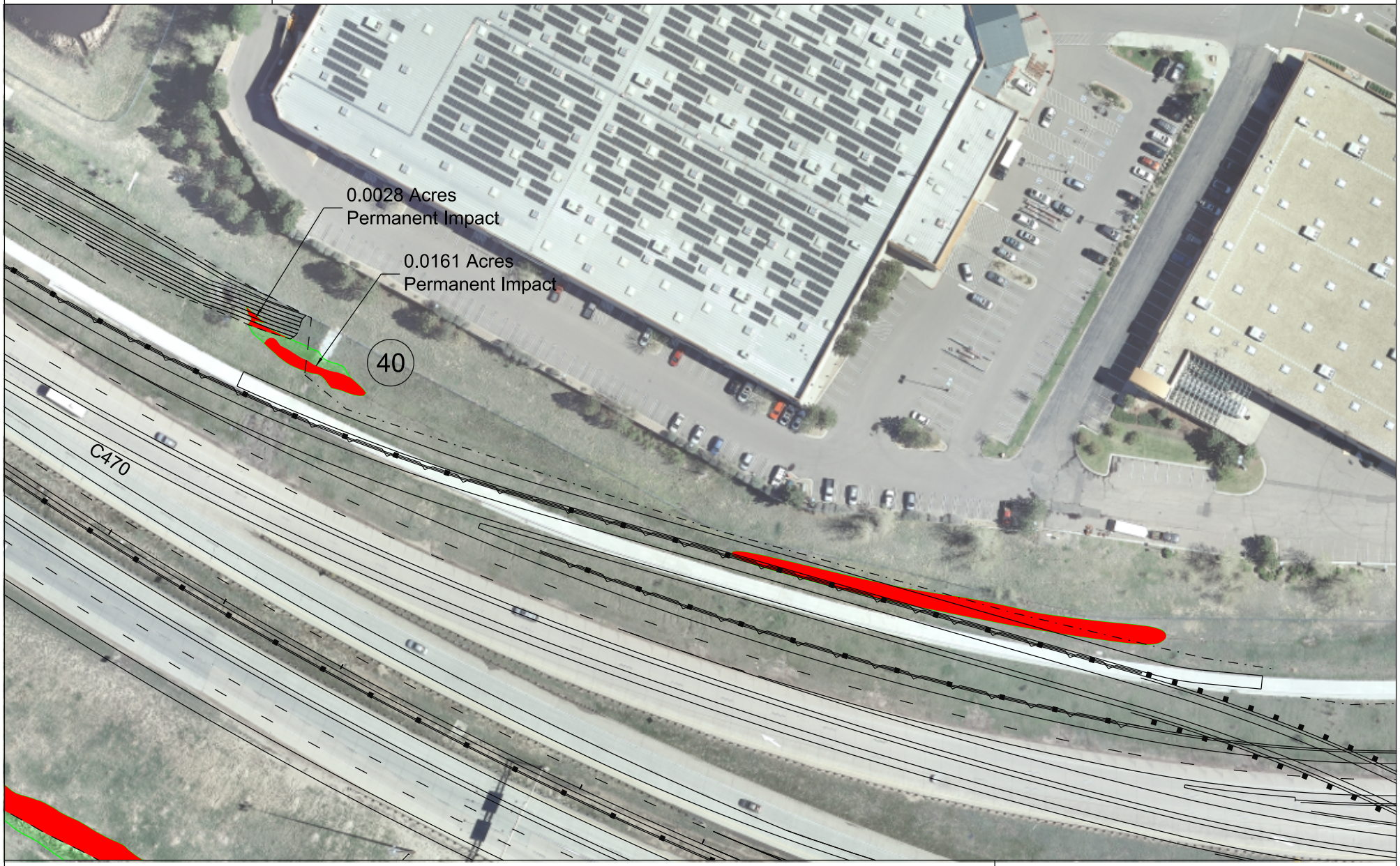
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 40

Total Wetland Area: 0.0316 Acres
Permanent Impact Area: 0.0189 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

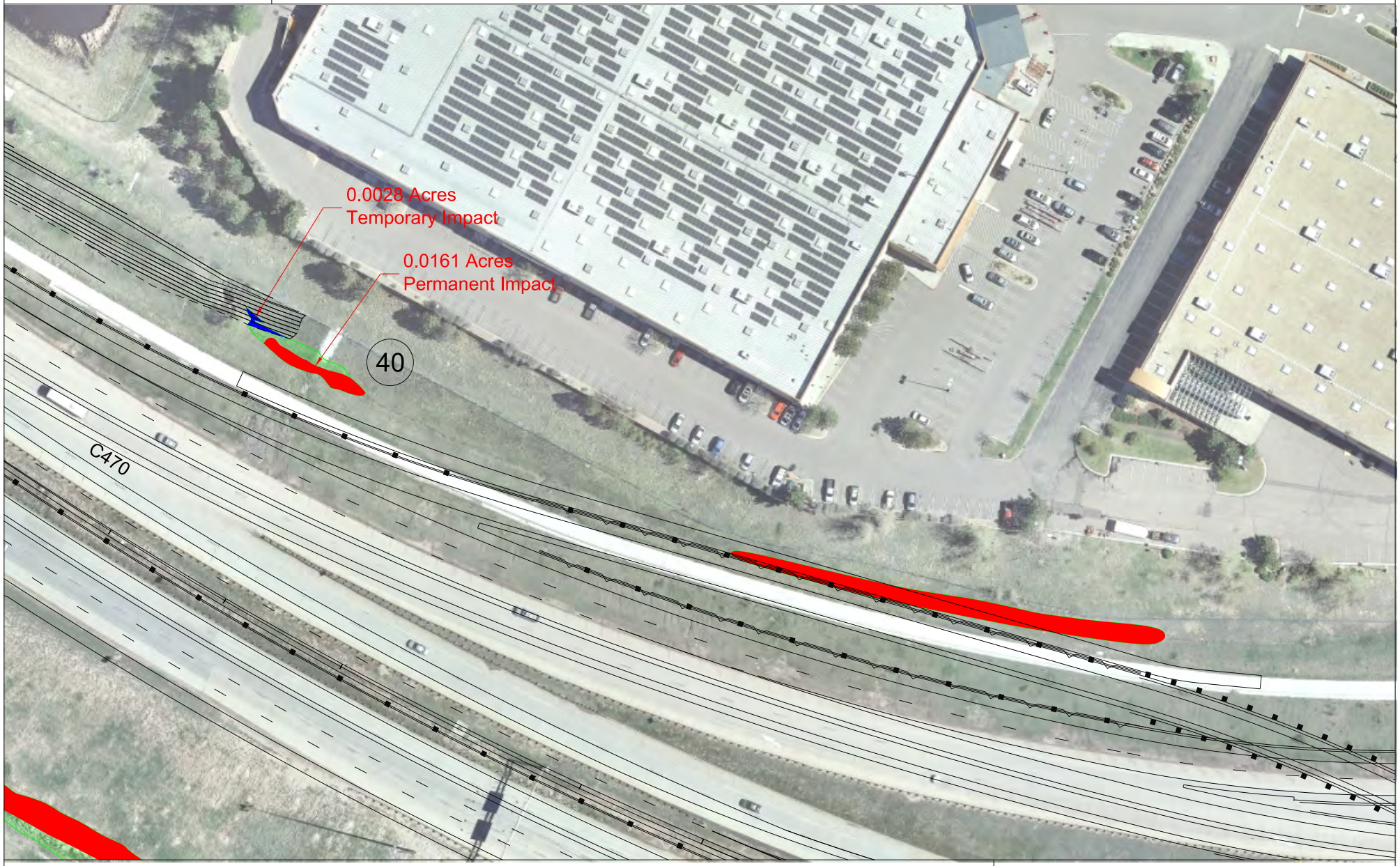
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 40

Total Wetland Area: 0.0316 Acres
Permanent Impact Area: 0.0161 Acres Temporary Impact Area: 0.0028 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

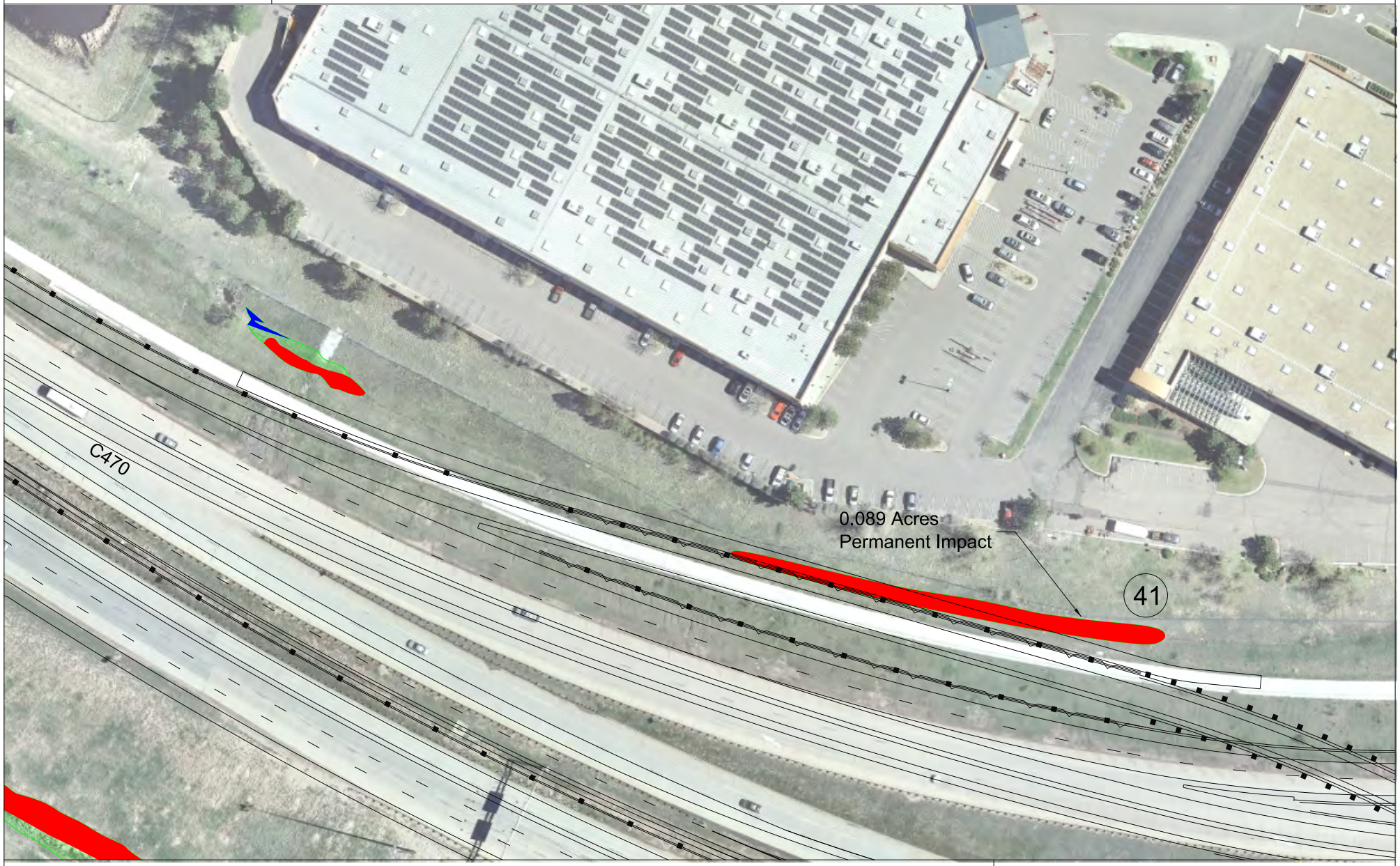
Unimpacted Wetland Area

N

0' 50' 100' 200'

Wetland Exhibit 41

Total Wetland Area: 0.089 Acres
Permanent Impact Area: 0.089 Acres Temporary Impact Area: 0.0 Acres



Legend

Temporary Wetland Impact

Permanent Wetland Impact

Unimpacted Wetland Area

N

0' 50' 100' 200'

APPENDIX B
Representative Wetland Photographs

Photographs
C-470 EA Revision Wetland Delineation

Photograph 1- Willow Creek overbank wetlands at the eastbound C-470 Bridge.

Photograph 2- Willow Creek wetlands downstream of C-470 Bridge.

Photograph 3- Big Dry Creek wetland and riparian communities.

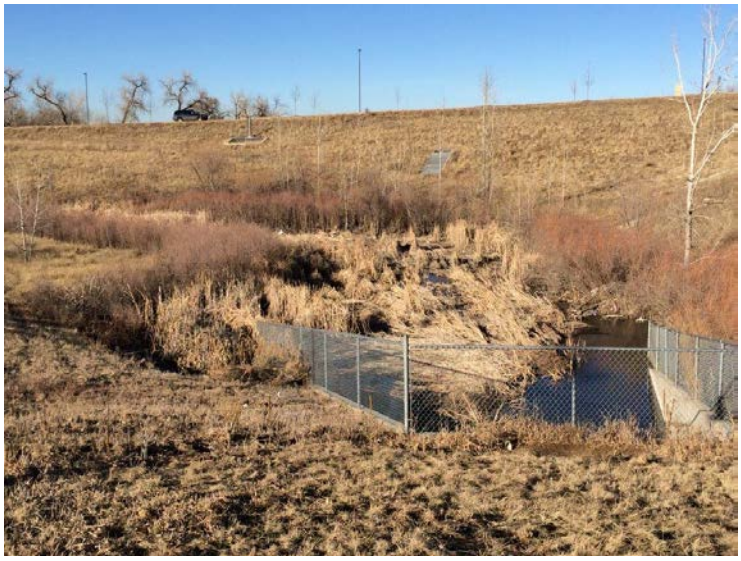
Photograph 4 – South Platte River Bridge wetland and riparian communities on southeast side of the bridge.

Photograph 5 – Northeast side of South Platte River Bridge. Narrow strip of riparian and wetlands are present along river bank.

Photograph 6 – Northwest side of South Platte River Bridge. Wetlands present along shore and bank of the river.

Photograph 7 – Massey Draw wetlands near Kipling Parkway

Photograph 8 – Detention pond wetlands near eastbound interchange to Lucent Boulevard. This wetland is representative of other larger detention pond and roadway created wetlands in the study corridor



Photograph 9 – Detention Pond Site delineated in January 2015

Photograph 10 – Detention Pond Site near Lucent Boulevard. Delineated in January 2015

APPENDIX C
FACWet Data Sheet

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	4/14/15
Site Name or ID:	C-470 Project	Project Name:	C-470 Revised EA
404 or Other Permit Application #:		Applicant Name:	Douglas County
Evaluator Name(s):	Robert Belford	Evaluator's professional position and organization:	Senior Biologist ENVERCON

Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):		Geographic Datum Used (NAD 83):	NAD83
		Elevation	5,400 feet
Location Information:	C-470 South Platte River Bridge		
Associated stream/water body name:	South Platte River	Stream Order:	2
USGS Quadrangle Map:	Highlands Ranch	Map Scale: (Circle one)	1:24,000 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	10190003	Wetland Ownership:	Private

Project Information:

This evaluation is being performed at: *(Check applicable box)*
- [X] *Project Wetland*
- [ ] *Mitigation Site*

Purpose of Evaluation (check all applicable):
- [X] *Potentially Impacted Wetlands*
- [ ] *Mitigation; Pre-construction*
- [ ] *Mitigation; Post-construction*
- [ ] *Monitoring*
- [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* ☐ Restoration ☐ Enhancement ☐ Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	.50 ac.	[X]	Measured	GPS wetland polygons near C-470 S. Platte River Bridge			
		[ ]	Estimated				
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	.5 miles of S. Platte River ac.	[ ]	Measured	ac.	ac.	ac.	ac.
		[ ]	Estimated	ac.	ac.	ac.	ac.
Characteristics or Method used for AA boundary determination:	The AA includes all of the S. Platte River River bank and adjacent wetlands near the C-470 S. Platte River Bridge.						

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- ☐ Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- ☐ Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- ☐ Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- ☐ The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- ☐ Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.

_____

_____

- ☐ Federally threatened or endangered species are **SUSPECTED** to occur in the AA?

_____

_____

_____

- ☐ Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- ☐ The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- ☒ Other special concerns (please describe)

Located adjacent to Chatfield R

HYDROGEOMORPHIC SETTING

- ☒ AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- ☐ AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- ☐ AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	(Surface flow)	Groundwater	Precipitation	Unknown	
	Hydrodynamics	(Unidirectional)	Vertical	Bi-directional		
	Wetland Gradient	(0 - 2%)	2-4%	4-10%	>10%	
	# Surface Inlets	(Over-bank)	0	1	2	3 >3
	# Surface Outlets		0	1	2	3 >3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetlands occur in a riverine setting. South Platte River is a second order stream. The wetlands are present along the banks of the stream and adjacent drainages.				
	HGM class	(Riverine)	Slope	Depressional	Lacustrine	

Historical Conditions

Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Riverine	Palustrine	EM/SS	Sand/Mud	E	—	—

Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features. See figures 7, 8, 9, and 10 in Appendix A

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline **all** existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers

✓	Stressors	Comments/description
	Major Highway	
✓	Secondary Highway	C-470
	Tertiary Roadway	
	Railroad	
✓	Bike Path	
	Urban Development	
	Agricultural Development	
	Artificial Water Body	
	Fence	
	Ditch or Aqueduct	
✓	Aquatic Organism Barriers	Check dam on S. Platte downstream from C-470 Bridge

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	***B*** *Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	***C*** *Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.7 - 0.6	***D*** *Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	***F*** *Non-functioning*	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	0.85
SV 1.2 Score	0.72

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score 0.78

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have ≥5m of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

0.8 ***SV 2.1 - Buffer Condition Score***

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	*Highly Functioning*	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispursed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	*Functioning*	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate distrbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	*Functioning Impaired*	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	*Non-functioning*	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

65 Precent of AA with Buffer

.77 ***SV 2.2 - Buffer Extent***

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	*Reference Standard*	90 - 100% of AA with Buffer
<0.9 - 0.8	*Highly Functioning*	70-90% of AA with Buffer
<0.8 - 0.7	*Functioning*	51-69% of AA with Buffer
<0.7 - 0.6	*Functioning Impaired*	26-50% of AA with Buffer
<0.6	*Non-functioning*	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

	1	2	3	4	5	6	7	8	
Buffer Width (m)	15	18	21	12	15	22	32	30	20
Line #									Avg. Buffer Width (m)

.70

SV 2.3 - Average Buffer Width Score

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Average Buffer width is 190-250m
<0.9 - 0.8	*Highly Functioning*	Average Buffer width is 101-189m
<0.8 - 0.7	*Functioning*	Average Buffer width is 31-100m
<0.7 - 0.6	*Functioning Impaired*	Average Buffer width is 6-30m
<0.6	*Non-functioning*	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.88

SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes

✓	Stressors	Comments/description
	Industrial/commercial	
	Urban	
	Residential	
	Rural	
	Dryland Farming	
	Intensive Agriculture	
	Orchards or Nurseries	
	Livestock Grazing	
✓	Transportation Corridor	
✓	Urban Parklands	
	Dams/impoundments	
	Artificial Water body	
	Physical Resource Extraction	
	Biological Resource Extraction	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	***B*** *Highly Functioning*	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	***C*** *Functioning*	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	***D*** *Functioning Impaired*	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	***F*** *Non-functioning*	The Surrounding Landscape is essentially comletely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) **Surrounding Land Use**

(.70 + .88) ÷ 2 = **Variable 2 Score** .79

Variable 3: Water Source

*This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.*

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
✓	Dams	Check dam and Chatfield R. Dam
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
	Increased Drainage Area	
	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	*A Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	*B Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	*C Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	*D Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or**
<0.6	*F Non-functioning*	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score 0.78

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity ***within*** *the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.*

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, ***in most cases the Water Source variable score will define the upper limit Water Distribution score****. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.

2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	Chatfield Reservoir Dam constricts water flows
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	C-470
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	Rip-rap at C-470 S. Platte R. Bridge
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	***A*** *Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	***B*** *Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	***C*** *Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	***D*** *Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	***F*** *Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score 0.79

Variable 5: Water Outflow

This variable is concerned with ***down-gradient*** *hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability it support down-gradient habitats in a manner consistent with their HGM (regional) subclass.*

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, ***in most cases the Water Source variable score will define the upper limit Water Outflow score****.*

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	Chatfield Reservoir Dam
	Ditches	
	Dikes/Levees	
✓	Road Grades	C-470
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Artificial Stream Banks	
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	***B*** *Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	***C*** *Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	***D*** *Functioning Impaired*	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	***F*** *Non-functioning*	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score 0.80

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e, small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, ***do not*** *include these resultant effects of geomorphic change; rather focus on the physical impacts* ***within the footprint*** *of the alteration* ***within the AA*** *– For example, the width and depth of a ditch or the size of a levee* ***within the AA*** *would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant but not immediately obvious.*

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
✓	General	Fill, including dikes, road grades, etc	C-470 S. Platte R. Bridge
	General	Grading	
	General	Compaction	
	General	Plowing/Disking	
	General	Excessive Sedimentation	
	General	Dumping	
	General	Hoof Shear/Pugging	
	General	Aggregate or Mineral Mining	
	General	Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
	Channels Only	Excessive Bank Erosion	
	Channels Only	Channelization	
	Channels Only	Reconfigured Stream Channels	
✓	Channels Only	Artificial Banks/Shoreline	Rip-Rap at C-470 S. Platte River Bridge
	Channels Only	Beaver Dam Removal	
	Channels Only	Substrate Embeddedness	
	Channels Only	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	*B Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	*C Functioning*	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	*D Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	*F Non-functioning*	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6 Score 0.80

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✔	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.72
	Agricultural Runoff			
	Septic/Sewage	✓		
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✓		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			0.75
	Excessive Deposition	✓		
	Fine Sediment Plumes	✓		
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			0.75
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List	✓		
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			0.80
	Lack of Shading			
	Reservoir/Power Plant Discharge	✓	Below Chatfield Dam	
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			0.80
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	***B*** *Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	***C*** *Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	***D*** *Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	***F*** *Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
.72	+	.75	+	.75	+	.81	+	.80	=	3.82

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules		
		Single Factor		**Composite Score**
1.0 - 0.9	***A*** *Reference Standard*	No single factor scores < 0.9		The factor scores sum > 4.5
<0.9 - 0.8	***B*** *Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9		The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	***C*** *Functioning*	Any single factor scores ≥ 7.0 but < 0.8		The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	***D*** *Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7		The factor scores sum >3.0 but ≤3.5
< 0.6	***F*** *Non-functioning*	Any single factor scores < 0.6		The factor scores sum < 3.0

Variable 7 Score .75

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.
3. Estimate and record the current coverage of each vegetation layer at the top of the table.
4. Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
5. Enter the percent cover values as decimals in the row of the stressor table labeled " Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
6. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
7. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
8. Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores.*
9. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Current % Coverage of Layer	1%	60%	35%		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds		✓	✓		
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering		✓	✓		
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	1%	+ .60%	+ .35%	+	= .96%		
	X	X	X	X			
Veg. Layer Sub-variable Score	.72	.80	.80			÷	**See sub-variable scoring guidelines on following page**
	=	=	=	=			
Weighted Sub-variable Score	.007	+ 0.48	+ .28	+	= 0.77		

Variable 8 Score 0.80

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	0.78
	Variable 2:	Contributing Area (CA)	0.79
Hydrology	Variable 3:	Water Source (Source)	0.78
	Variable 4:	Water Distribution (Dist)	0.79
	Variable 5:	Water Outflow (Outflow)	0.80
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	0.80
	Variable 7:	Chemical Environment (Chem)	0.75
	Variable 8:	Vegetation Structure and Complexity (Veg)	0.80

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$V1_{connect}$	+	$V2_{CA}$	+	$(2 \times V8_{veg})$	+		+		=	Total Functional Points	÷ 4 =	FCI
0.78	+	0.79	+	1.6	+		+		=	3.17	÷ 4 =	0.79

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$(3 \times V3_{source})$	+	$(2 \times V4_{dist})$	+	$(2 \times V5_{outflow})$	+	$V6_{geom}$	+	$V7_{chem}$	+		=		÷ 9 =	
2.34	+	1.58	+	1.6	+	.80	+	.75	+		=	7.07	÷ 9 =	0.78

Function 3 -- Flood Attenuation

$V2_{CA}$	+	$(2 \times V3_{source})$	+	$(2 \times V4_{dist})$	+	$(2 \times V5_{outflow})$	+	$V6_{geom}$	+	$V8_{veg}$	=		÷ 9 =	
0.79	+	1.56	+	1.58	+	1.6	+	.80	+	.80	=	7.13	÷ 9 =	0.79

Function 4 -- Short- and Long-term Water Storage

$V3_{source}$	+	$(2 \times V4_{dist})$	+	$(2 \times V5_{outflow})$	+	$V6_{geom}$	+		+		=		÷ 6 =	
0.78	+	1.58	+	1.6	+	.80	+		+		=	4.76	÷ 6 =	0.79

Function 5 -- Nutrient/Toxicant Removal

$(2 \times V2_{CA})$	+	$(2 \times V4_{dist})$	+	$V6_{geom}$	+	$V7_{chem}$	+		+		=		÷ 6 =	
1.58	+	1.58	+	.80	+	.75	+		+		=	4.71	÷ 6 =	0.78

Function 6 -- Sediment Retention/Shoreline Stabilization

$V2_{CA}$	+	$(2 \times V6_{geom})$	+	$(2 \times V8_{veg})$	+		+		+		=		÷ 5 =	
0.79	+	1.6	+	1.6	+		+		+		=	3.99	÷ 5 =	0.79

Function 7 -- Production Export/Food Chain Support

$V1_{connect}$	+	$(2 \times V5_{outflow})$	+	$V6_{geom}$	+	$V7_{chem}$	+	$(2 \times V8_{veg})$	+		=		÷ 7 =	
0.78	+	1.6	+	.80	+	.75	+	1.6	+		=	5.53	÷ 7 =	0.79

Sum of Individual FCI Scores 5.51

Divide by the Number of Functions Scored ÷ 7

Composite FCI Score 0.78

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	4/14/15
Site Name or ID:	C-470 Project	Project Name:	C-470 Revised EA
404 or Other Permit Application #:		Applicant Name:	Douglas County
Evaluator Name(s):	Robert Belford	Evaluator's professional position and organization:	Senior Biologist ENERCON

Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):		Geographic Datum Used (NAD 83):	NAD83
		Elevation	5,300 feet
Location Information:	C-470 Big Dry Creek Bridge Crossing		
Associated stream/water body name:	Big Dry Creek	Stream Order:	1
USGS Quadrangle Map:	Littleton	Map Scale: (Circle one)	1:24,000 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	10190003	Wetland Ownership:	Private

Project Information:

This evaluation is being performed at: *(Check applicable box)*
- [x] *Project Wetland*
- [ ] *Mitigation Site*

Purpose of Evaluation (check all applicable):
- [x] *Potentially Impacted Wetlands*
- [ ] *Mitigation; Pre-construction*
- [ ] *Mitigation; Post-construction*
- [ ] *Monitoring*
- [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* ☐ Restoration ☐ Enhancement ☐ Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.37 ac.	[x] Measured GPS [ ] Estimated					
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	0.50 ac.	[ ] Measured	ac.	ac.	ac.	ac.
		[x] Estimated	ac.	ac.	ac.	ac.
Characteristics or Method used for AA boundary determination:	Expanded the wetland area in the AA to cover wetland area on the downstream side of the Big Dry Creek C-470 Bridge wetland area.						

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- ☐ Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- ☐ Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- ☐ Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- ☐ The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- ☐ Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.

_____

_____

- ☐ Federally threatened or endangered species are **SUSPECTED** to occur in the AA?

_____

_____

_____

- ☐ Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- ☐ The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- ☐ Other special concerns (please describe)

_____

HYDROGEOMORPHIC SETTING

- ☒ AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- ☐ AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- ☐ AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	(Surface flow)	Groundwater	Precipitation		Unknown
	Hydrodynamics	(Unidirectional)	Vertical	Bi-directional		
	Wetland Gradient	(0 - 2%)	2-4%	4-10%	>10%	
	# Surface Inlets	(Over-bank)	0	1	2	3	>3
	# Surface Outlets		0	1	2	3	>3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetlands occur in a riverine setting. Big Dry Creek is a first order stream. Wetlands are present along banks of stream.				
	HGM class	(Riverine)	Slope	Depressional		Lacustrine

Historical Conditions

Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation		Unknown
	Hydrodynamics	Unidirectional	Vertical			
	Geomorphic Setting (Narrative Description)					
	Previous HGM Class	Riverine	Slope	Depressional		Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Riverine	Palustrine	EM/SS	Cobble-Gravel	E	—	—

Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i), Organic(g); Mineral(n), Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features. See figure 33 in wetland finding Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss
(Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE)**.
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).

- Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.

5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	*B Highly Functioning*	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	*C Functioning*	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	*D Functioning Impaired*	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	*F Non-functioning*	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline **all** existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers

✓	Stressors	Comments/description
	Major Highway	
✓	Secondary Highway	C-470
	Tertiary Roadway	
	Railroad	
	Bike Path	
✓	Urban Development	
	Agricultural Development	
	Artificial Water Body	
	Fence	
	Ditch or Aqueduct	
✓	Aquatic Organism Barriers	Check dam on upstream side of bridge

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A* *Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	*B* *Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	*C* *Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.7 - 0.6	*D* *Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	*F* *Non-functioning*	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	.72
SV 1.2 Score	.70

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score 0.71

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have ≥5m of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

.75 ***SV 2.1 - Buffer Condition Score***

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	*Highly Functioning*	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispursed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	*Functioning*	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate distrbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	*Functioning Impaired*	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	*Non-functioning*	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

70 Precent of AA with Buffer

.80 ***SV 2.2 - Buffer Extent***

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	*Reference Standard*	90 - 100% of AA with Buffer
<0.9 - 0.8	*Highly Functioning*	70-90% of AA with Buffer
<0.8 - 0.7	*Functioning*	51-69% of AA with Buffer
<0.7 - 0.6	*Functioning Impaired*	26-50% of AA with Buffer
<0.6	*Non-functioning*	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Line #	1	2	3	4	5	6	7	8	Avg. Buffer Width (m)
Buffer Width (m)	18	19	21	11	9	15	20	22	17

.68

SV 2.3 - Average Buffer Width Score

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Average Buffer width is 190-250m
<0.9 - 0.8	*Highly Functioning*	Average Buffer width is 101-189m
<0.8 - 0.7	*Functioning*	Average Buffer width is 31-100m
<0.7 - 0.6	*Functioning Impaired*	Average Buffer width is 6-30m
<0.6	*Non-functioning*	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.72

SV 2.4 - Surrounding Land Use Score

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes

✓	Stressors	Comments/description
	Industrial/commercial	
✓	Urban	
✓	Residential	
	Rural	
	Dryland Farming	
	Intensive Agriculture	
	Orchards or Nurseries	
✓	Livestock Grazing	
✓	Transportation Corridor	
	Urban Parklands	
✓	Dams/impoundments	Check dam on upstream side of bridge
	Artificial Water body	
	Physical Resource Extraction	
	Biological Resource Extraction	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	***B*** *Highly Functioning*	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	***C*** *Functioning*	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	***D*** *Functioning Impaired*	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	***F*** *Non-functioning*	The Surrounding Landscape is essentially comletely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) **Surrounding Land Use**

(.68 + .72) ÷ 2 = **Variable 2 Score** .70

Variable 3: Water Source

*This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.*

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
✓	Dams	Check dam
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
✓	Increased Drainage Area	Commercial and residential
	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	*A Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	*B Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	*C Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	*D Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or**
<0.6	*F Non-functioning*	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score 0.77

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity ***within*** *the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.*

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, ***in most cases the Water Source variable score will define the upper limit Water Distribution score****. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.

2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	Bridge
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	At bridge piers and check dam
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	***A*** *Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	***B*** *Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	***C*** *Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	***D*** *Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	***F*** *Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score 0.76

Variable 5: Water Outflow

*This variable is concerned with **down-gradient** hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability it support down-gradient habitats in a manner consistent with their HGM (regional) subclass.*

*Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, **in most cases the Water Source variable score will define the upper limit Water Outflow score**.*

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Dikes/Levees	
✓	Road Grades	C-470
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
✓	Artificial Stream Banks	At check dam - concrete anchor into banks
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	***B*** *Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	***C*** *Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	***D*** *Functioning Impaired*	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	***F*** *Non-functioning*	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score .75

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e, small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, ***do not*** *include these resultant effects of geomorphic change; rather focus on the physical impacts* ***within the footprint*** *of the alteration* ***within the AA*** *– For example, the width and depth of a ditch or the size of a levee* ***within the AA*** *would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant but not immediately obvious*

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
✓		Fill, including dikes, road grades, etc	Bridge at C-470
✓		Grading	C-470
		Compaction	
		Plowing/Disking	
		Excessive Sedimentation	
		Dumping	
		Hoof Shear/Pugging	
		Aggregate or Mineral Mining	
		Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
		Excessive Bank Erosion	
		Channelization	
		Reconfigured Stream Channels	
✓		Artificial Banks/Shoreline	At check dam
		Beaver Dam Removal	
		Substrate Embeddedness	
		Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	***B*** *Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	***C*** *Functioning*	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	***D*** *Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	***F*** *Non-functioning*	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6 Score 0.77

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✔	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			0.72
	Agricultural Runoff			
	Septic/Sewage	✔	Golf Course on SW side of bridge	
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✔		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion	✔	Incised channel	0.75
	Excessive Deposition	✔	From Urban runoff	
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			0.75
	Nearby Industrial Sites			
	Road Drainage/Runoff	✔		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✔		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List	✔		
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			0.80
	Lack of Shading			
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			0.80
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	*B Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	*C Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	*D Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	*F Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
.72	+	.75	+	.75	+	.80	+	.80	=	3.82

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules		
		Single Factor		Composite Score
1.0 - 0.9	*A Reference Standard*	No single factor scores < 0.9		The factor scores sum > 4.5
<0.9 - 0.8	*B Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9		The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	*C Functioning*	Any single factor scores ≥ 7.0 but < 0.8		The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	*D Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7		The factor scores sum >3.0 but ≤3.5
< 0.6	*F Non-functioning*	Any single factor scores < 0.6		The factor scores sum < 3.0

Variable 7 Score .75

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.
3. Estimate and record the current coverage of each vegetation layer at the top of the table.
4. Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
5. Enter the percent cover values as decimals in the row of the stressor table labeled " Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
6. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
7. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
8. Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores.*
9. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Current % Coverage of Layer	3%	55%	30%		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds	✓	✓			
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	.03	+	.55	+	.30	+		=	.88
	x		x		x		x		
Veg. Layer Sub-variable Score	.80		.80		.80			÷	
	=		=		=		=		
Weighted Sub-variable Score	0.02	+	0.44	+	0.24	+		=	.70

See sub-variable scoring guidelines on following page

Variable 8 Score .79

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	***B*** *Highly Functioning*	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	***C*** *Functioning*	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	***D*** *Functioning Impaired*	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	***F*** *Non-functioning*	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.71
	Variable 2:	Contributing Area (CA)	.70
Hydrology	Variable 3:	Water Source (Source)	.77
	Variable 4:	Water Distribution (Dist)	.76
	Variable 5:	Water Outflow (Outflow)	.75
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.77
	Variable 7:	Chemical Environment (Chem)	.75
	Variable 8:	Vegetation Structure and Complexity (Veg)	.79

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$V1_{connect}$	+ $V2_{CA}$	+ (2 x $V8_{veg}$)				= Total Functional Points	÷ 4 = FCI
.71	+ .70	+ 1.58	+	+	+	= 2.99	÷ 4 = .74

Function 2 -- Support of Characteristic Fish/aquatic Habitat

(3 x $V3_{source}$)	+ (2 x $V4_{dist}$)	+ (2 x $V5_{outflow}$)	+ $V6_{geom}$	+ $V7_{chem}$			
2.31	+ 1.52	+ 1.5	+ .77	+ .75	+	= 6.85	÷ 9 = .76

Function 3 -- Flood Attenuation

$V2_{CA}$	+ (2 x $V3_{source}$)	+ (2 x $V4_{dist}$)	+ (2 x $V5_{outflow}$)	+ $V6_{geom}$	+ $V8_{veg}$		
.70	+ 1.54	+ 1.52	+ 1.5	+ .77	+ .79	= 6.82	÷ 9 = .75

Function 4 -- Short- and Long-term Water Storage

$V3_{source}$	+ (2 x $V4_{dist}$)	+ (2 x $V5_{outflow}$)	+ $V6_{geom}$				
.77	+ 1.52	+ 1.5	+ .77	+	+	= 4.56	÷ 6 = .76

Function 5 -- Nutrient/Toxicant Removal

(2 x $V2_{CA}$)	+ (2 x $V4_{dist}$)	+ $V6_{geom}$	+ $V7_{chem}$				
1.4	+ 1.52	+ .77	+ .75	+	+	= 4.44	÷ 6 = .74

Function 6 -- Sediment Retention/Shoreline Stabilization

$V2_{CA}$	+ (2 x $V6_{geom}$)	+ (2 x $V8_{veg}$)					
.70	+ 1.54	+ 1.58	+	+	+	= 3.82	÷ 5 = .76

Function 7 -- Production Export/Food Chain Support

$V1_{connect}$	+ (2 x $V5_{outflow}$)	+ $V6_{geom}$	+ $V7_{chem}$	+ (2 x $V8_{veg}$)			
.71	+ 1.5	+ .77	+ .75	+ 1.58	+	= 5.31	÷ 7 = .75

Sum of Individual FCI Scores 5.26

Divide by the Number of Functions Scored ÷ 7

Composite FCI Score .75

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	4/14/15
Site Name or ID:	C-470 Project	Project Name:	C-470 Revised EA
404 or Other Permit Application #:		Applicant Name:	Douglas County
Evaluator Name(s):	Robert Belford	Evaluator's professional position and organization:	Senior Biologist ENERCON

Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):		Geographic Datum Used (NAD 83):	NAD 83
		Elevation	5,300 feet
Location Information:	C-470 Willow Creek Bridge Crossing		
Associated stream/water body name:	Willow Creek	Stream Order:	1
USGS Quadrangle Map:	Parker	Map Scale: (Circle one)	1:24,000 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	10190003	Wetland Ownership:	Private

Project Information:

This evaluation is being performed at: (Check applicable box)
- [X] *Project Wetland*
- [ ] *Mitigation Site*

Purpose of Evaluation (check all applicable):
- [X] *Potentially Impacted Wetlands*
- [ ] *Mitigation; Pre-construction*
- [ ] *Mitigation; Post-construction*
- [ ] *Monitoring*
- [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* ☐ Restoration ☐ Enhancement ☐ Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	0.17 ac.	[X]	Measured	GPS			
		[ ]	Estimated				
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	.50 ac.	[ ]	Measured	ac.	ac.	ac.	ac.
		[X]	Estimated	ac.	ac.	ac.	ac.
Characteristics or Method used for AA boundary determination:	AA includes riparian habitat connected to 0.17 ac delineated wetland on the upstream side of the C-470 Willow Creek Bridge.						

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- ☐ Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- ☐ Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- ☐ Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- ☐ The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- ☐ Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.

_____

_____

- ☐ Federally threatened or endangered species are **SUSPECTED** to occur in the AA?

_____

_____

_____

- ☐ Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- ☐ The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- ☐ Other special concerns (please describe)

_____

HYDROGEOMORPHIC SETTING

- ☒ AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- ☐ AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- ☐ AA wetland was created from an upland setting.

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	(Surface flow)	Groundwater	Precipitation	Unknown		
	Hydrodynamics	(Unidirectional)	Vertical	Bi-directional			
	Wetland Gradient	(0 - 2%)	2-4%	4-10%	>10%		
	# Surface Inlets	(Over-bank)	0	1	2	3	>3
	# Surface Outlets		0	1	2	3	>3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	The wetland occurs in a reverine setting. Willow Creek is a first order stream. Wetlands are present along banks of stream.					
	HGM class	(Riverine)	Slope	Depressional	Lacustrine		

Historical Conditions

Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Riverine	Palustrine	EM/SS	Cobble-Gravel	E	—	—

Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features. See figures 36, 37, and 38 in Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss
(Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE).**
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).

- Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.

5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	*B Highly Functioning*	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	*C Functioning*	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	*D Functioning Impaired*	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	*F Non-functioning*	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline **all** existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers

✔	Stressors	Comments/description
	Major Highway	
✓	Secondary Highway	
	Tertiary Roadway	
	Railroad	
✓	Bike Path	Extends under C-470 bridge
✓	Urban Development	
	Agricultural Development	
	Artificial Water Body	
	Fence	
	Ditch or Aqueduct	
	Aquatic Organism Barriers	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A* *Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	*B* *Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	*C* *Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian
<0.7 - 0.6	*D* *Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	*F* *Non-functioning*	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	.74
SV 1.2 Score	.75

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score .74

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have ≥5m of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

.72 ***SV 2.1 - Buffer Condition Score***

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	*Highly Functioning*	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispursed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	*Functioning*	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate distrbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	*Functioning Impaired*	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	*Non-functioning*	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

60% Precent of AA with Buffer

.72 ***SV 2.2 - Buffer Extent***

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	*Reference Standard*	90 - 100% of AA with Buffer
<0.9 - 0.8	*Highly Functioning*	70-90% of AA with Buffer
<0.8 - 0.7	*Functioning*	51-69% of AA with Buffer
<0.7 - 0.6	*Functioning Impaired*	26-50% of AA with Buffer
<0.6	*Non-functioning*	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Line #	1	2	3	4	5	6	7	8	Avg. Buffer Width (m)
Buffer Width (m)	12	11	13	12	14	15	16	18	14

.63 ***SV 2.3 - Average Buffer Width Score***

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Average Buffer width is 190-250m
<0.9 - 0.8	*Highly Functioning*	Average Buffer width is 101-189m
<0.8 - 0.7	*Functioning*	Average Buffer width is 31-100m
<0.7 - 0.6	*Functioning Impaired*	Average Buffer width is 6-30m
<0.6	*Non-functioning*	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.68 ***SV 2.4 - Surrounding Land Use Score***

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes

✓	Stressors	Comments/description
✓	Industrial/commercial	
✓	Urban	
✓	Residential	
	Rural	
	Dryland Farming	
	Intensive Agriculture	
	Orchards or Nurseries	
	Livestock Grazing	
✓	Transportation Corridor	
✓	Urban Parklands	
	Dams/impoundments	
	Artificial Water body	
	Physical Resource Extraction	
	Biological Resource Extraction	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	***B*** *Highly Functioning*	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	***C*** *Functioning*	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	***D*** *Functioning Impaired*	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	***F*** *Non-functioning*	The Surrounding Landscape is essentially comletely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) **Surrounding Land Use**

(.63 + .68) ÷ 2 = **Variable 2 Score** .65

Variable 3: Water Source

*This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.*

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
	Dams	
	Diversions	
	Groundwater pumping	
	Draw-downs	
	Culverts or Constrictions	
	Point Source (urban, ind., ag.)	
	Non-point Source	
✓	Increased Drainage Area	
✓	Storm Drain/Urban Runoff	
✓	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	*A Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	*B Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	*C Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	*D Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or**
<0.6	*F Non-functioning*	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score .70

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity ***within*** *the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.*

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, ***in most cases the Water Source variable score will define the upper limit Water Distribution score****. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.

2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Ponding/Impoundment	
	Culverts	
✓	Road Grades	C-470
	Channel Incision/Entrenchment	
✓	Hardened/Engineered Channel	
	Enlarged Channel	
✓	Artificial Banks/Shoreline	At C-470 Bridge
	Weirs	
	Dikes/Levees/Berms	
	Diversions	
	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	***A*** *Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	***B*** *Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	***C*** *Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	***D*** *Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	***F*** *Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score .71

Variable 5: Water Outflow

This variable is concerned with ***down-gradient*** *hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability it support down-gradient habitats in a manner consistent with their HGM (regional) subclass.*

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, ***in most cases the Water Source variable score will define the upper limit Water Outflow score*** *.*

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
	Alteration of Water Source	
	Ditches	
	Dikes/Levees	
✓	Road Grades	
	Culverts	
	Diversions	
	Constrictions	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
✓	Artificial Stream Banks	C-470 Bridge
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	***B*** *Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	***C*** *Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	***D*** *Functioning Impaired*	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	***F*** *Non-functioning*	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score .70

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e, small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, ***do not*** *include these resultant effects of geomorphic change; rather focus on the physical impacts* ***within the footprint*** *of the alteration* ***within the AA*** *– For example, the width and depth of a ditch or the size of a levee* ***within the AA*** *would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant but not immediately obvious.*

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
✓	General	Fill, including dikes, road grades, etc	C-470
	General	Grading	
	General	Compaction	
	General	Plowing/Disking	
	General	Excessive Sedimentation	
	General	Dumping	
	General	Hoof Shear/Pugging	
	General	Aggregate or Mineral Mining	
	General	Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
	Channels Only	Excessive Bank Erosion	
	Channels Only	Channelization	
✓	Channels Only	Reconfigured Stream Channels	At C-470 Bridge
✓	Channels Only	Artificial Banks/Shoreline	C-470 Bridge
	Channels Only	Beaver Dam Removal	
	Channels Only	Substrate Embeddedness	
	Channels Only	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	*B Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	*C Functioning*	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	*D Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	*F Non-functioning*	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6 Score .72

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✔	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			.72
	Agricultural Runoff			
	Septic/Sewage			
	Excessive Algae or Aquatic Veg.			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List	✓		
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			.74
	Excessive Deposition			
	Fine Sediment Plumes	✓		
	Agricultural Runoff			
	Excessive Turbidity			
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			.74
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			.73
	Lack of Shading	✓		
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation			.73
	Mechanical Soil Disturbance			
	Dumping/introduced Soil			
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	*A* *Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	*B* *Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	*C* *Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	*D* *Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	*F* *Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential	=	Sum of Sub-variable Scores
.72	+	.74	+	.74	+	.73	+	.73	=	3.66

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules		
		Single Factor		Composite Score
1.0 - 0.9	*A* *Reference Standard*	No single factor scores < 0.9		The factor scores sum > 4.5
<0.9 - 0.8	*B* *Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9		The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	*C* *Functioning*	Any single factor scores ≥ 7.0 but < 0.8		The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	*D* *Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7		The factor scores sum >3.0 but ≤3.5
< 0.6	*F* *Non-functioning*	Any single factor scores < 0.6		The factor scores sum < 3.0

Variable 7 Score .74

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.
3. Estimate and record the current coverage of each vegetation layer at the top of the table.
4. Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
5. Enter the percent cover values as decimals in the row of the stressor table labeled " Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
6. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
7. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
8. Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores.*
9. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Current % Coverage of Layer	1%	40%	35%		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds	✓	✓	✓		
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer	.01	+ .40	+ .35	+	=	.76
	x	x	x	x		
Veg. Layer Sub-variable Score	.72	.78	.78		÷	
	=	=	=	=		
Weighted Sub-variable Score	.007	+ .31	+ .27	+	=	.58

See sub-variable scoring guidelines on following page

Variable 8 Score .76

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	***B*** *Highly Functioning*	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	***C*** *Functioning*	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	***D*** *Functioning Impaired*	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	***F*** *Non-functioning*	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.74
	Variable 2:	Contributing Area (CA)	.65
Hydrology	Variable 3:	Water Source (Source)	.70
	Variable 4:	Water Distribution (Dist)	.71
	Variable 5:	Water Outflow (Outflow)	.70
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.72
	Variable 7:	Chemical Environment (Chem)	.74
	Variable 8:	Vegetation Structure and Complexity (Veg)	.76

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$V1_{connect}$	+ $V2_{CA}$	+ $(2 \times V8_{veg})$				= Total Functional Points	÷ 4	= FCI
.74	+ .65	+ 1.52	+	+	+	= 2.91	÷ 4	= .72

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$(3 \times V3_{source})$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V7_{chem}$			= Total Functional Points	÷ 9	= FCI
2.1	+ 1.42	+ 1.4	+ .72	+ .74	+		= 6.38	÷ 9	= .70

Function 3 -- Flood Attenuation

$V2_{CA}$	+ $(2 \times V3_{source})$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V8_{veg}$	= Total Functional Points	÷ 9	= FCI
.65	+ 1.4	+ 1.42	+ 1.4	+ .72	+ .76	= 6.35	÷ 9	= .70

Function 4 -- Short- and Long-term Water Storage

$V3_{source}$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$			= Total Functional Points	÷ 6	= FCI
.70	+ 1.42	+ 1.4	+ .72	+	+	= 4.24	÷ 6	= .70

Function 5 -- Nutrient/Toxicant Removal

$(2 \times V2_{CA})$	+ $(2 \times V4_{dist})$	+ $V6_{geom}$	+ $V7_{chem}$			= Total Functional Points	÷ 6	= FCI
1.3	+ 1.42	+ .72	+ .74	+	+	= 4.18	÷ 6	= .69

Function 6 -- Sediment Retention/Shoreline Stabilization

$V2_{CA}$	+ $(2 \times V6_{geom})$	+ $(2 \times V8_{veg})$				= Total Functional Points	÷ 5	= FCI
.65	+ 1.44	+ 1.52	+	+	+	= 3.61	÷ 5	= .72

Function 7 -- Production Export/Food Chain Support

$V1_{connect}$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V7_{chem}$	+ $(2 \times V8_{veg})$		= Total Functional Points	÷ 7	= FCI
.74	+ 1.4	+ .72	+ .74	+ 1.52	+	= 5.12	÷ 7	= .73

Sum of Individual FCI Scores 4.96

Divide by the Number of Functions Scored ÷ 7

Composite FCI Score .71

FACWet Version 3.0
Arpil 2013

ADMINISTRATIVE CHARACTERIZATION

General Information			
		Date of Evaluation:	4/14/15
Site Name or ID:	C-470 Project	Project Name:	C-470 Revised EA
404 or Other Permit Application #:		Applicant Name:	Douglas County
Evaluator Name(s):	Robert Belford	Evaluator's professional position and organization:	Senior Biologist ENERCON

Location Information:			
Site Coordinates (Decimal Degrees, e.g., 38.85, -104.96):		Geographic Datum Used (NAD 83):	NAD 83
		Elevation	5,200 +-
Location Information:	Non-jurisdictional wetlands along C-470 Revised EA Study Corridor		
Associated stream/water body name:	Non-Jurisdictional wetlands along C-470 Corridor - Stormwater	Stream Order:	N/A
USGS Quadrangle Map:	Parker, Highlands Ranch, Littleton	Map Scale: (Circle one)	1:24,000 1:100,000 Other 1:
Sub basin Name (8 digit HUC):	10190003	Wetland Ownership:	Private

Project Information:

This evaluation is being performed at: (Check applicable box)
- [X] *Project Wetland*
- [ ] *Mitigation Site*

Purpose of Evaluation (check all applicable):
- [X] *Potentially Impacted Wetlands*
- [ ] *Mitigation; Pre-construction*
- [ ] *Mitigation; Post-construction*
- [ ] *Monitoring*
- [ ] *Other (Describe)*

Intent of Project: *(Check all applicable)* [ ] Restoration [ ] Enhancement [ ] Creation

Total Size of Wetland Involved: (Record Area, Check and Describe Measurement Method Used)	10.20 ac.	[X]	Measured GPS				
		[ ]	Estimated				
Assessment Area (AA) Size (Record Area, check appropriate box. Additional spaces are used to record acreage when more than one AA is included in a single assessment)	ac.	[ ]	Measured	ac.	ac.	ac.	ac.
		[ ]	Estimated	ac.	ac.	ac.	ac.
Characteristics or Method used for AA boundary determination:	Only wetland area mapped in delineation. This FACWet covers all of the non-jurisdictional wetlands along corridor.						

ECOLOGICAL DESCRIPTION 1

Special Concerns

Check all that apply

- ☐ Organic soils including Histosols or Histic Epipedons are present in the AA (i.e., AA includes core fen habitat).
- ☐ Project will directly impact organic soil portions of the AA including areas possessing either Histosol soils or histic epipedons.
- ☐ Organic soils are known to occur anywhere within the contiguous wetland of which the AA is part.
- ☐ The wetland is a habitat oasis in an otherwise dry or urbanized landscape?
- ☐ Federally threatened or endangered species are **KNOWN** to occur in the AA? List Below.
- ☐ Federally threatened or endangered species are **SUSPECTED** to occur in the AA?
- ☐ Species of concern according to the Colorado Natural Heritage (CNHP) are known to occur in the AA?
- ☐ The site is located within a potential conservation area or element occurrence buffer area as determined by CNHP?
- ☐ Other special concerns (please describe)

HYDROGEOMORPHIC SETTING

- ☐ AA wetland maintains its fundamental natural hydrogeomorphic characteristics
- ☐ AA wetland has been subject to change in HGM classes as a result of anthropogenic modification
  If the above is checked, please describe the original wetland type if discernable using the table below.
- ☒ AA wetland was created from an upland setting. (Detention Pond etc)

Current Conditions

Describe the hydrogeomorphic setting of the wetland by circling all conditions that apply.

HGM Setting	**Water source**	Surface flow	Groundwater	(Precipitation)	Unknown	
	Hydrodynamics	Unidirectional	Vertical	(Bi-directional)		
	Wetland Gradient	0 - 2%	(2-4%)	4-10%	>10%	
	# Surface Inlets	Over-bank	0	(1) – (2)	3	>3
	# Surface Outlets		0	(1) – (2)	3	>3
	Geomorphic Setting (Narrative Description. Include approx. stream order for riverine)	These wetlands were created from stormwater detention facilities + roadside depressions. This wetlands are primarily created by stormwater				
	HGM class	Riverine	Slope	(Depressional)	Lacustrine	

Historical Conditions

Previous wetland typology	**Water source**	Surface flow	Groundwater	Precipitation	Unknown
	Hydrodynamics	Unidirectional	Vertical		
	Geomorphic Setting (Narrative Description)				
	Previous HGM Class	Riverine	Slope	Depressional	Lacustrine

Notes (include information on the AA's HGM subclass and regional subclass):

ECOLOGICAL DESCRIPTION 2

Vegetation Habitat Description

US FWS habitat classification according as reported in Cowardin et al. (1979).

System	Subsystem	Class	Subclass	Water Regime	Other Modifiers	% AA
Palustrine	Palustrine	EM-SS	Sand / Mud	A		

Lacustrine	Littoral; Limnoral	Rock Bot. (RB) Uncon Bottom(UB) Aquatic Bed(AB) Rocky Shore(RS) Uncon Shore(US) Emergent(EM) Shrub-scrub(SS) Forested (FO)	Floating vascular; Rooted vascular; Algal; Persistent; Non-Persistent; Broad-leaved deciduous; Needle-leaved evergreen; Cobble - gravel; Sand; Mud; Organic	**Examples** Temporarily flooded(A); Saturated(B); Seasonally flooded(C); Seas.-flood./sat.(E); Semi-Perm. flooded(F); Intermittently exposed(G); Artificially flooded(K); Sat./semiperm./Seas. (Y); Int. exposed/permenant(Z)	Hypersaline(7) ; Eusaline(8); Mixosaline(9); Fresh(0); Acid(a); Circumneutral(c); Alkaline/calcareous(i); Organic(g); Mineral(n); Beaver(b); Partially Drained/ditched(d); Farmed(f); Diked/impounded(h); Artificial Substrate(r); Spoil(s); Excavated(x)	
Palustrine	Palustrine					
Riverine	Lower perennial; Upper perennial; Intermittent					

Site Map

Scale: 1 sq. =

Draw a sketch map of the site including relevant portions of the wetland, AA boundary, structures, habitat classes, and other significant features. See Appendix A

Variable 1: Habitat Connectivity

The Habitat Connectivity Variable is described by two sub-variables – Neighboring Wetland and Riparian Habitat Loss and Barriers to Migration and Dispersal. These sub-variables were treated as independent variables in FACWet Version 2.0. The merging of these variables makes their structure more consistent with that of other composite variables in FACWet. The new variable configuration also makes this landscape variable more accurately reflect the interactions amongst aquatic habitats in Colorado's agricultural and urbanized landscapes, which have a naturally low density of wetlands. The two Habitat Connectivity Sub-variables are scored in exactly the same manner as their FACWet 2.0 counterparts, as described below. The Habitat Connectivity Variable score is simply the arithmetic average of the two sub-variable scores which is entered on the second page of the Variable 1 data form. If there is little or no wetland or riparian habitat in the Habitat Connectivity Envelope (defined below), then Sub-variable 1.1 is not scored.

SV 1.1 - Neighboring Wetland and Riparian Habitat Loss
(Do not score if few or no wetlands naturally exist in the HCE)

This sub-variable is a measure of how isolated from other naturally-occurring wetlands or riparian habitat the AA has become as the result of habitat destruction. To score this sub-variable, estimate the percent of naturally-occurring wetland/riparian habitat that has been lost (by filling, draining, development, or whatever means) within the 500-meter-wide belt surrounding the AA. This zone is called the Habitat Connectivity Envelope (HCE). In most cases the evaluator must use best professional judgment to estimate the amount of natural wetland loss. Historical photographs, National Wetland Inventory (NWI) maps, hydric soil maps can be helpful in making these determinations. Floodplain maps are especially valuable in river-dominated regions, such as the Front Range urban corridor. Evaluation of landforms and habitat patterns in the context of perceivable land use change is used to steer estimates of the amount of wetland loss within the HCE.

Rules for Scoring:

1. On the aerial photo, create a 500 m perimeter around the AA.
2. The area within this perimeter is the **Habitat Connectivity Envelope (HCE).**
3. Within the HCE, outline the current extent of naturally occurring wetland and riparian habitat. Do not include habitats such as excavated ponds or reservoir induced fringe wetlands.
4. Outline the historical extent of wetland and riparian habitats (i.e., existing natural wetlands plus those that have been destroyed).

- Use your knowledge of the history of the area and evident land use change to identify where habitat losses have occurred. Additional research can be utilized to increase the accuracy of this estimate including consideration of floodplain maps, historical aerial photographs, soil maps, etc.

5. Calculate the area of existing and historical wetlands. Divide the area of existing wetland by the total amount of existing and historical wetland and riparian habitat, and determine the variable score using the guidelines below. Enter sub-variable score at the bottom of p.2 of the Habitat Connectivity data form.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	*A Reference Standard*	Wetland losses are absent or negligible or there is no evidence to suggest the native landscape within the HCE historically contained other wetland habitats
<0.9 - 0.8	*B Highly Functioning*	More than 80% of historical wetland habitat area within the HCE is still present (less than 20% of habitat area lost).
<0.8 - 0.7	*C Functioning*	80 to 60% of historical wetland habitat area within the HCE is still present (20% to 40% of habitat area lost).
<0.7 - 0.6	*D Functioning Impaired*	Less than 60 to 25% of historical wetland habitat area within the HCE is still present (more than 40 to 75% of habitat area lost).
<0.6	*F Non-functioning*	Less than 25% of the historical wetland habitat area within the HCE still in existence (more than 70% of habitat lost).

Notes:

Variable 1: Habitat Connectivity p. 2

SV 1.2: Migration/Dispersal Barriers

This sub-variable is intended to rate the degree to which the AA has become isolated from existing neighboring wetland and riparian habitat by artificial barriers that inhibit migration or dispersal of organisms. On the aerial photograph, identify the man-made barriers within the HCE that intercede between the AA and surrounding wetlands and riparian areas, and identify them by type on the stressor list. Score this variable based on the barriers' impermeability to migration and dispersal and the amount of surrounding wetland/riparian habitat they affect.

Rules for Scoring:

1. On the aerial photo, outline **all** existing wetland and riparian habitat areas within the HCE. This includes naturally occurring habitats, as well as those purposefully created or induced by land use change.

2. Identify artificial barriers to dispersal and migration of organisms within the HCE that intercede between the AA and surrounding habitats. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

3. Considering the composite effect of all of identified barriers to migration and dispersal (i.e., stressors), assign an overall variable score using the scoring guidelines.

Stressors = artificial barriers	✔	Stressors	Comments/description
		Major Highway	
	✓	Secondary Highway	
		Tertiary Roadway	
		Railroad	
	✓	Bike Path	
	✓	Urban Development	
		Agricultural Development	
	✓	Artificial Water Body	
		Fence	
		Ditch or Aqueduct	
		Aquatic Organism Barriers	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable barriers exist between the AA and other wetland and riparian habitats in the HCE; or there are no other wetland and riparian areas in the HCE.
<0.9 - 0.8	***B*** *Highly Functioning*	Barriers impeding migration/dispersal between the AA and up to 33% of surrounding wetland/riparian habitat highly permeable and easily passed by most organisms. Examples could include gravel roads, minor levees, ditches or barbed-wire fences. More significant barriers (see "functioning category below) could affect migration to up to 10% of surrounding wetland/riparian habitat.
<0.8 - 0.7	***C*** *Functioning*	Barriers to migration and dispersal retard the ability of many organisms/propagules to pass between the AA and up to 66% of wetland/riparian habitat. Passage of organisms and propagules through such barriers is still possible, but it may be constrained to certain times of day, be slow, dangerous or require additional travel. Busy two-lane roads, culverted areas, small to medium artificial water bodies or small earthen dams would commonly rate a score in this range. More significant barriers (see "functioning impaired" category below) could affect migration to up to 10% of surrounding wetland/riparian
<0.7 - 0.6	***D*** *Functioning Impaired*	Barriers to migration and dispersal preclude the passage of some types of organisms/propagules between the AA and up to 66% of surrounding wetland/riparian habitat. Travel of those animals which can potential negotiate the barrier are strongly restricted and may include a high chance of mortality. Up to 33% of surrounding wetland/riparian habitat could be functionally isolated from the AA.
<0.6	***F*** *Non-functioning*	AA is essentially isolated from surrounding wetland/riparian habitat by impermeable migration and dispersal barriers. An interstate highway or concrete-lined water conveyance canal are examples of barriers which would generally create functional isolation between the AA and wetland/riparian habitat in the HCE.

SV 1.1 Score	.70
SV 1.2 Score	.70

Add SV 1.1 and 1.2 scores and divide by two to calculate variable score

Variable 1 Score .70

Variable 2: Contributing Area

The AA's Contributing Area is defined as the 250-meter-wide zone surrounding the perimeter of the AA. This variable is a measure of the capacity of that area to support characteristic functions of high quality wetland habitat. Depending on its condition, the contributing area can help maintain wetland condition or it can degrade it. Contributing Area condition is evaluated by considering the AA's Buffer and its Surrounding Land Use. Buffers are strips or patches of more-or-less natural upland and/or wetland habitat more than 5m wide. Buffers are contiguous with the AA boundary and they intercede between it and more intensively used lands. The AA Buffer is characterized with three sub-variables: Buffer Condition, Buffer Extent, and Average Buffer Width. The Surrounding Land Use Sub-variable considers changes within the Contributing Area that limit its capacity to support characteristic wetland functions. Many of the acute, on-site effects of land use change in the Contributing Area are specifically captured by Variables 3 - 8.

Rules for Scoring:

1. Delimit the Contributing Area on an aerial photograph as the zone within 250 meters of the outer boundary of the AA.
2. Evaluate and then rate the Buffer Condition sub-variable using the scoring guidelines. Record the score in the cell provided on the datasheet.
3. Indicate on the aerial photograph zones surrounding the AA which have ≥5m of buffer vegetation and those which do not.
4. Calculate the percentage of the AA which has a Buffer and record the value where indicated on the data sheet.
5. Rate the *Buffer Extent* Sub-variable using the scoring guidelines.
6. Determine the average Buffer width by drawing a line perpendicularly from the AA boundary to the outer extent of the buffer habitat. Measure line length and record its value on the data sheet. Repeat this process until a total of 8 lines have been sampled.
7. Calculate the average buffer width and record value on the data form. Then determine the sub-variable score using the scoring guidelines.
8. Score the Surrounding Land Use sub-variable by recording land use changes on the stressor list that affect the capacity of the landscape to support characteristic wetland functioning.
9. Enter the **lowest** of the three Buffer sub-variable scores along with the Surrounding Land Use Sub-variable score in the Contributing Area Variable scoring formula at the bottom of p. 2 of the data form. The Contributing Area Variable is the average of the two sub-variable scores.

SV 2.1 - Buffer Condition

.59 ***SV 2.1 - Buffer Condition Score***

Subvariable Score	Condition Grade	Buffer Condition Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Buffer vegetation is predominately native vegetation, human-caused disturbance of the substrate is not evident, and human visitation is minimal. Common examples: Wilderness areas, undeveloped forest and range lands.
<0.9 - 0.8	*Highly Functioning*	Buffer vegetation may have a mixed native-nonnative composition, but characteristic structure and complexity remain. Soils are mostly undisturbed or have recovered from past human disturbance. Little or only low-impact human visitation. Buffers with higher levels of substrate disturbance may be included here if the buffer is still able to maintain predominately native vegetation. Common examples: Dispursed camping areas in national forests, common in wildland parks (e.g. State Parks) and open spaces.
<0.8 - 0.7	*Functioning*	Buffer vegetation is substantially composed of non-native species. Vegetation structure may be somewhat altered, such as by brush clearing. Moderate substrate distrbance and compaction occurs, and small pockets of greater disturbance may exist. Common examples: City natural areas, mountain hay meadows.
<0.7 - 0.6	*Functioning Impaired*	Buffer vegetation is substantially composed of non-native species and vegetation structure has been strongly altered by the complete removal of one or more strata. Soil disturbance and the intensity of human visitation are generally high. Common examples: Open lands around resource extraction sites (e.g., gravel mines), clear cut logging areas, ski slopes.
<0.6	*Non-functioning*	Buffer is nearly or entirely absent.

SV 2.2 - Buffer Extent

20 Precent of AA with Buffer

.59 ***SV 2.2 - Buffer Extent***

Subvariable Score	Condition Class	% Buffer Scoring Guidelines
1.0 - 0.9	*Reference Standard*	90 - 100% of AA with Buffer
<0.9 - 0.8	*Highly Functioning*	70-90% of AA with Buffer
<0.8 - 0.7	*Functioning*	51-69% of AA with Buffer
<0.7 - 0.6	*Functioning Impaired*	26-50% of AA with Buffer
<0.6	*Non-functioning*	0-25% of AA with Buffer

Variable 2: Contributing Area (p. 2)

SV 2.3 - Average Buffer Width

Record measured buffer widths in the spaces below and average.

Line #	1	2	3	4	5	6	7	8	Avg. Buffer Width (m)
Buffer Width (m)	5	5	5	5	5	5	5	5	5

.58 ***SV 2.3 - Average Buffer Width Score***

Subvariable Score	Condition Grade	Buffer Width Scoring Guidelines
1.0 - 0.9	*Reference Standard*	Average Buffer width is 190-250m
<0.9 - 0.8	*Highly Functioning*	Average Buffer width is 101-189m
<0.8 - 0.7	*Functioning*	Average Buffer width is 31-100m
<0.7 - 0.6	*Functioning Impaired*	Average Buffer width is 6-30m
<0.6	*Non-functioning*	Average Buffer width is 0-5m

SV 2.4 - Surrounding Land Use

.58 ***SV 2.4 - Surrounding Land Use Score***

Catalog and characterize land use changes in the surrounding landscape and score.

Stressors = Land Use Changes

✓	Stressors	Comments/description
✓	Industrial/commercial	
✓	Urban	
✓	Residential	
	Rural	
	Dryland Farming	
	Intensive Agriculture	
	Orchards or Nurseries	
	Livestock Grazing	
✓	Transportation Corridor	
✓	Urban Parklands	
	Dams/impoundments	
✓	Artificial Water body	
	Physical Resource Extraction	
	Biological Resource Extraction	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	No appreciable land use change has been imposed Surrounding Landscape.
<0.9 - 0.8	***B*** *Highly Functioning*	Some land use change has occurred in the Surrounding Landscape, but changes have minimal effect on the the landscape's capacity to support characteristic aquatic functioning, either because land use is not intensive, for example haying, light grazing, or low intensity silviculture, or more substantial changes occur in approximately less than 10% of the area.
<0.8 - 0.7	***C*** *Functioning*	Surrounding Landscape has been subjected to a marked shift in land use, however, the land retains much of its capacity to support natural wetland function and it is not an overt source of pollutants or sediment. Moderate-intensity land uses such as dry-land farming, urban "green" corridors, or moderate cattle grazing would commonly be placed within this scoring range.
<0.7 - 0.6	***D*** *Functioning Impaired*	Land use changes within the Surrounding Landscape has been substantial including the a moderate to high coverage (up to 50%) of impermeable surfaces, bare soil, or other artificial surfaces; considerable in-flow urban runoff or fertilizer-rich waters common. Supportive capacity of the land has been greatly diminished but not totally extinguished. Intensively logged areas, low-density urban developments, some urban parklands and many cropping
<0.6	***F*** *Non-functioning*	The Surrounding Landscape is essentially comletely developed or is otherwise a cause of severe ecological stress on wetland habitats. Commercial developments or highly urban landscapes generally rate a score of less than 0.6.

Buffer Score (Lowest score) | **Surrounding Land Use**

(.58 + .58) ÷ 2 = **Variable 2 Score** .58

Variable 3: Water Source

*This variable is concerned with **up-gradient** hydrologic connectivity. It is a measure of impacts to the AA's water source, including the quantity and timing of water delivery, and the ability of source water to perform work such as sediment transport, erosion, soil pore flushing, etc. To score this variable, identify stressors that alter the source of water to the AA, and record their presence on the stressor list. Stressors can impact water source by depletion, augmentation, or alteration of inflow timing or hydrodynamics. This variable is designed to assess water quantity, power and timing, not water quality. Water quality will be evaluated in Variable 7.*

Scoring rules:

1. Use the stressor list and knowledge of the watershed to catalog type-specific impairments of the AA's water source. Mark the stressors present with a check in the first column and describe the general nature, severity and extent of each. List additional stressors in empty rows at the bottom of the table and explain.

2. Considering the composite effect of stressors on the water source, rate the condition of this variable with the aid of the scoring guidelines.

✔	Stressors	Comments/description
	Ditches or Drains (tile, etc.)	
	Dams	
	Diversions	
	Groundwater pumping	
✓	Draw-downs	
	Culverts or Constrictions	
✓	Point Source (urban, ind., ag.)	
✓	Non-point Source	
	Increased Drainage Area	
✓	Storm Drain/Urban Runoff	
	Impermeable Surface Runoff	
	Irrigation Return Flows	
	Mining/Natural Gas Extraction	
	Transbasin Diversion	
✓	Actively Managed Hydrology	

Variable Score	Condition Grade	Depletion	Augmentation
1.0 - 0.9	***A*** *Reference Standard*	Unnatural drawdown events minor, rare or non-existent, very slight uniform depletion, or trivial alteration of hydrodynamics.	Unnatural high-water events minor, rare or non-existent, slight uniform increase in amount of inflow, or trivial alteration of hydrodynamics.
<0.9 - 0.8	***B*** *Highly Functioning*	Unnatural drawdown events occasional, short duration and/or mild; or uniform depletion up to 20%; or mild to moderate reduction of peak flows or capacity of water to perform work.	Occasional unnatural high-water events, short in duration and/or mild in intensity; or uniform augmentation up to 20%; or mild to moderate increase of peak flows or capacity of water to perform work.
<0.8 - 0.7	***C*** *Functioning*	Unnatural drawdown events common and of mild to moderate intensity and/or duration; or uniform depletion up to 50%; or moderate to substantial reduction of peak flows or capacity of water to perform work.	Common occurrence of unnatural high-water events, of a mild to moderate intensity and/or duration; or uniform augmentation up to 50%; or moderate to substantial increase of peak flows or capacity of water to perform work.
<0.7 - 0.6	***D*** *Functioning Impaired*	Unnatural drawdown events occur frequently with a moderate to high intensity and/or duration; or uniform depletion up to 75%; or substantial reduction of peak flows or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or lower.**	Common occurrence of unnatural high-water events, some of which may be severe in nature or exist for a substantial portion of the growing season; or uniform augmentation more than 50% or capacity of water to perform work. **Wetlands with actively managed or wholly artificial hydrology will usually score in this range or**
<0.6	***F*** *Non-functioning*	Water source diminished enough to threaten or extinguish wetland hydrology in the AA.	Frequency, duration or magnitude of unnaturally high-water great enough to change the fundamental characteristics of the wetland.

Variable 3 Score .60

Variable 4: Water Distribution

This variable is concerned with hydrologic connectivity ***within*** *the AA. It is a measure of alteration to the spatial distribution of surface and groundwater within the AA. These alterations are manifested as local changes to the hydrograph and generally result from geomorphic modifications within the AA. To score this variable, identify stressors within the AA that alter flow patterns and impact the hydrograph of the AA, including localized increases or decreases to the depth or duration of the water table or surface water.*

Because the wetland's ability to distribute water in a characteristic fashion is fundamentally dependent on the condition of its water source, ***in most cases the Water Source variable score will define the upper limit Water Distribution score****. For example, if the Water Source variable is rated at 0.85, the Water Distribution score will usually have the potential to attain a maximum score of 0.85. Additional stressors within or outside the lower end of the AA effecting water distribution (e.g., ditches and levees) will reduce the score from the maximum value.*

Scoring rules:

1. Identify impacts to the natural distribution of water throughout the AA and catalog them in the stressor table.

2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. In most cases, the Water Source variable score will set the upper limit for the Water Distribution score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	
	Ditches	
✓	Ponding/Impoundment	
	Culverts	
	Road Grades	
	Channel Incision/Entrenchment	
	Hardened/Engineered Channel	
	Enlarged Channel	
	Artificial Banks/Shoreline	
	Weirs	
✓	Dikes/Levees/Berms	
	Diversions	
✓	Sediment/Fill Accumulation	

Variable Score	Condition Grade	Non-riverine	Riverine
1.0 - 0.9	***A*** *Reference Standard*	Little or no alteration has been made to the way in which water is distributed throughout the wetland. AA maintains a natural hydrologic regime.	Natural active floodplain areas flood on a normal recurrence interval. No evidence of alteration of flooding and subirrigation duration and intensity.
<0.9 - 0.8	***B*** *Highly Functioning*	Less than 10% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in less than a 2 in. (5 cm) change in mean growing season water table elevation.	Channel-adjacent areas have occasional unnatural periods of drying or flooding; or uniform shift in the hydrograph less than typical root depth.
<0.8 - 0.7	***C*** *Functioning*	Between 10 and 33% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 4 in. (5 cm) or less change in mean growing season water table elevation.	In channel-adjacent area, periods of drying or flooding are common; or uniform shift in the hydrograph near root depth.
<0.7 - 0.6	***D*** *Functioning Impaired*	33 to 66% of the AA is affected by *in situ* hydrologic alteration; or more widespread impacts result in a 6 in. (15 cm) or less change in mean growing season water table elevation. Water table behavior must still meet jurisdictional criteria to merit this rating.	Adjacent to the channel, unnatural periods of drying or flooding are the norm; or uniform shift in the hydrograph greater than root depth.
<0.6	***F*** *Non-functioning*	More than 66% of the AA is affected by hydrologic alteration which changes the fundamental functioning of the wetland system, generally exhibited as a conversion to upland or deep water habitat.	Historical active floodplain areas are almost never wetted from overbank flooding, and/or groundwater infiltration is effectively cut off.

Variable 4 Score .60

Variable 5: Water Outflow

This variable is concerned with ***down-gradient*** *hydrologic connectivity and the flow of water and water-borne materials and energy out of the AA. In particular it illustrates the degree to which the AA can support the functioning of down-gradient habitats. It is a measure of impacts that affect the hydrologic outflow of water including the passage of water through its normal low- and high-flow surface outlets, infiltration/groundwater recharge, and the energetic characteristics of water delivered to dependent habitats. In some cases, alteration of evapotranspiration rates may be significant enough of a factor to consider in scoring. Score this variable by identifying stressors that impact the means by which water is exported from the AA. To evaluate this variable focus on how water, energy and associated materials are exported out of the AA and their ability it support down-gradient habitats in a manner consistent with their HGM (regional) subclass.*

Because the wetland's ability to export water and materials in a characteristic fashion is to a very large degree dependent the condition of its water source, as with the Water Distribution variable, ***in most cases the Water Source variable score will define the upper limit Water Outflow score****.*

Scoring rules:

1. Identify impacts to the natural outflow of water from the AA and catalog them in the stressor table.

2.Considering all of the stressors identified, assign an overall variable score using the scoring guidelines. Take in to account the cumulative effect of stressors on the wetland's ability to export water and water-borne materials. In most cases the Water Source variable will set the upper limit for the Water Outflow score.

✓	Stressors	Comments/description
✓	Alteration of Water Source	
	Ditches	
	Dikes/Levees	
	Road Grades	
✓	Culverts	
	Diversions	
✓	Constrictions	
	Channel Incision/Entrenchment	
✓	Hardened/Engineered Channel	
	Artificial Stream Banks	
	Weirs	
	Confined Bridge Openings	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors have little to no effect on the magnitude, timing or hydrodynamics of the AA water outflow regime.
<0.9 - 0.8	***B*** *Highly Functioning*	High- or low-water outflows are mildly to moderately affected, but at intermediate ("normal") levels flow continues essentially unaltered in quantity or character.
<0.8 - 0.7	***C*** *Functioning*	High- or low-water outflows are moderately affected, mild alteration of intermediate level outflow occurs; or hydrodynamics moderately affected.
<0.7 - 0.6	***D*** *Functioning Impaired*	Outflow at all stages is moderately to highly impaired resulting in persistent flooding of portions of the AA or unnatural drainage; or outflow hydrodynamics severely disrupted.
<0.6	***F*** *Non-functioning*	The natural outflow regime is profoundly impaired. Down-gradient hydrologic connection severed or nearly so. Alterations may cause widespread unnatural persistent flooding or dewatering of the wetland system.

Variable 5 Score .58

Variable 6: Geomorphology

This variable is a measure of the degree to which the geomorphic setting has been altered within the AA. Changes to the surface configuration and natural topography constitute stressors. Such stressors may be observed in the form of fill, excavation, dikes, sedimentation due to absence of flushing floods, etc. In riverine systems, geomorphic changes to the stream channel should be considered if the channel is within the AA (i.e, small is size). Alterations may involve the bed and bank (substrate embeddedness or morphological changes), stream instability, and stream channel reconfiguration. Geomorphic changes are usually ultimately manifested as changes to wetland surface hydrology and water relations with vegetation. Geomorphic alterations can also directly affect soil properties, such as near-surface texture, and the wetland chemical environment such as the redox state or nutrient composition in the rooting zone. In rating this variable, ***do not*** *include these resultant effects of geomorphic change; rather focus on the physical impacts* ***within the footprint*** *of the alteration* ***within the AA*** *– For example, the width and depth of a ditch or the size of a levee* ***within the AA*** *would describe the extent of the stressors. The secondary effects of geomorphic change are addressed by other variables. All alterations to geomorphology should be evaluated including small-scale impacts such as pugging, hoof sheer, and sedimentation which can be significant but not immediately obvious.*

Scoring Rules:

1. Identify impacts to geomorphological setting and topography within the AA and record them on the stressor checklist.
2. Considering all of the stressors identified, assign an overall variable score using the scoring guidelines.

✓		Stressors	Comments
	General	Dredging/Excavation/Mining	
✓	General	Fill, including dikes, road grades, etc	
✓	General	Grading	
	General	Compaction	
	General	Plowing/Disking	
	General	Excessive Sedimentation	
	General	Dumping	
	General	Hoof Shear/Pugging	
	General	Aggregate or Mineral Mining	
	General	Sand Accumulation	
	Channels Only	Channel Instability/Over Widening	
	Channels Only	Excessive Bank Erosion	
	Channels Only	Channelization	
	Channels Only	Reconfigured Stream Channels	
	Channels Only	Artificial Banks/Shoreline	
	Channels Only	Beaver Dam Removal	
	Channels Only	Substrate Embeddedness	
	Channels Only	Lack or Excess of Woody Debris	

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Topography essentially unaltered from the natural state, or alterations appear to have a minimal effect on wetland functioning and condition. Patch or microtopographic complexity may be slightly altered, but native plant communities are still supported.
<0.9 - 0.8	***B*** *Highly Functioning*	Alterations to topography result in small but detectable changes to habitat conditions in some or all of the AA; or more severe impacts exist but affect less than 10% of the AA.
<0.8 - 0.7	***C*** *Functioning*	Changes to AA topography may be pervasive but generally mild to moderate in severity. May include patches of more significant habitat alteration; or more severe alterations affect up to 20 % of the AA.
<0.7 - 0.6	***D*** *Functioning Impaired*	At least one important surface type or landform has been eliminated or created; microtopography has been strongly impacted throughout most or all of the AA; or more severe alterations affect up to 50% of the AA. Evidence that widespread diminishment or alteration of native plant community exist due to physical habitat alterations. Most incidentally created wetland habitat such as that created by roadside ditches and the like would score in this range or lower.
<0.6	***F*** *Non-functioning*	Pervasive geomorphic alterations have caused a fundamental change in site character and functioning, commonly resulting in a conversion to upland or deepwater habitat.

Variable 6 Score .60

Variable 7: Water and Soil Chemical Environment

This variable concerns the chemical environment of the soil and water media within the AA, including pollutants, water and soil characteristics. The origin of pollutants may be within or outside the AA. Score this variable by listing indicators of chemical stress in the AA. Consider point source and non-point sources of pollution, as well as mechanical or hydrologic changes that alter the chemical environment. Because water quality frequently cannot be inferred directly, the presence of stressors is often identified by the presence of indirect indicators. Five sub-variables are used to describe the Water and Soil Chemical Environment: Nutrient Enrichment/Eutrophication/Oxygen; Sedimentation/Turbidity; Toxic Contamination/pH; Temperature; and Soil Chemistry and Redox Potential. Utilization of web-based data mining tools is highly recommended to help inform and support variable scores.

Scoring rules:

1. Stressors are grouped into sub-variables which have a similar signature or set of causes.
2. Use the indicator list to identify each stressor impacting the chemical environment of the AA.
3. For each sub-variable, determine its score using the scoring guideline table provided on the second page of the scoring sheet. Scoring sub-variables is carried out in exactly the same way as normal variable scoring.
   -If the AA is part of a water body that is recognized as impaired or recommended for TMDL development for one of the factors, then score that sub-variable 0.65 or lower.
4. Transcribe sub-variable scores to the following variable scoring page and compute the sum.
5. The lowest sub-variable score sets the letter grade range. The composite of sub-variables influences the score within that range.

Sub-variable	Stressor Indicator	✔	Comments	Sub-variable Score
SV 7.1 Nutrient Enrichment/ Eutrophication/ Oxygen (D.O.)	Livestock			.60
	Agricultural Runoff			
	Septic/Sewage			
	Excessive Algae or Aquatic Veg.	✓		
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.2 Sedimentation/ Turbidity	Excessive Erosion			.58
	Excessive Deposition	✓		
	Fine Sediment Plumes			
	Agricultural Runoff			
	Excessive Turbidity	✓		
	Nearby Construction Site			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.3 Toxic contamination/ pH	Recent Chemical Spills			.60
	Nearby Industrial Sites			
	Road Drainage/Runoff	✓		
	Livestock			
	Agricultural Runoff			
	Storm Water Runoff	✓		
	Fish/Wildlife Impacts			
	Vegetation Impacts			
	Cumulative Watershed NPS			
	Acid Mine Drainage			
	Point Source Discharge			
	CDPHE Impairment/TMDL List			
	Metal staining on rocks and veg.			
SV 7.4 Temperature	Excessive Temperature Regime			.58
	Lack of Shading	✓		
	Reservoir/Power Plant Discharge			
	Industrial Discharge			
	Cumulative Watershed NPS			
	CDPHE Impairment/TMDL List			
SV 7.5 Soil chemistry/ Redox potential	Unnatural Saturation/Desaturation	✓		.60
	Mechanical Soil Disturbance	•		
	Dumping/introduced Soil	✓		
	CDPHE Impairment/TMDL List			

Variable 7: Water and Soil Chemical Environment p.2

Sub-variable Scoring Guidelines

Variable Score	Condition Class	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stress indicators not present or trivial.
<0.9 - 0.8	***B*** *Highly Functioning*	Stress indicators scarcely present and mild, or otherwise not occurring in more than 10% of the AA.
<0.8 - 0.7	***C*** *Functioning*	Stress indicators present at mild to moderate levels, or otherwise not occurring in more than 33% of the AA.
<0.7 - 0.6	***D*** *Functioning Impaired*	Stress indicators present at moderate to high levels, or otherwise not occurring in more than 66% of the AA
<0.6	***F*** *Non-functioning*	Stress indicators strongly evident throughout the AA at levels which apparently alter the fundamental chemical environment of the wetland system

Input each sub-variable score from p. 1 of the V7 data form and calculate the sum.

Nutrient enrichment/ Eutrophication/ Oxygen (D.O.)		Sedimentation/ Turbidity		Toxic contamination/ pH		Temperature		Soil chemistry/ Redox potential		Sum of Sub-variable Scores
.60	+	.58	+	.60	+	.58	+	.60	=	2.96

Use the table to score the Chemical Environment Variable circling the applicable scoring rules.

Variable Score	Condition Grade	Scoring Rules		
		Single Factor		**Composite Score**
1.0 - 0.9	***A*** *Reference Standard*	No single factor scores < 0.9		The factor scores sum > 4.5
<0.9 - 0.8	***B*** *Highly Functioning*	Any single factor scores ≥ 0.8 but < 0.9		The factor scores sum >4.0 but ≤4.5
<0.8 - 0.7	***C*** *Functioning*	Any single factor scores ≥ 7.0 but < 0.8		The factor scores sum >3.5 but ≤ 4.0
<0.7 - 0.6	***D*** *Functioning Impaired*	Any single factor scores ≥ 0.6 but <0.7		The factor scores sum >3.0 but ≤3.5
< 0.6	***F*** *Non-functioning*	Any single factor scores < 0.6		The factor scores sum < 3.0

Variable 7 Score .58

Variable 8: Vegetation Structure and Complexity

This variable is a measure of the condition of the wetland's vegetation relative to its native state. It particularly focuses on the wetland's ability to perform higher-order functions such as support of wildlife populations, and influence primary functions such as flood-flow attenuation, channel stabilization and sediment retention. Score this variable by listing stressors that have affected the structure, diversity, composition and cover of each vegetation stratum that would normally be present in the HGM (regional) subclass being assessed. For this variable, stressor severity is a measure of how much each vegetation stratum differs functionally from its natural condition or from the natural range of variability exhibited the HGM subclass or regional subclass. This variable has four sub-variables, each corresponding to a stratum of vegetation: Tree Canopy; Shrub Layer; Herbaceous Layer; and Aquatics.

Rules for Scoring:

1. Determine the number and types of vegetation layers present within the AA. Make a judgment as to whether additional layers were historically present using direct evidence such as stumps, root wads or historical photographs. Indirect evidence such as local knowledge and expert opinion can also be used in this determination.
2. Do not score vegetation layers that would not normally be present in the wetland type being assessed.
3. Estimate and record the current coverage of each vegetation layer at the top of the table.
4. Record the Reference Standard or expected percent coverage of each vegetation layer to create the sub-variable weighting factor. The condition of predominant vegetation layers has a greater influence on the variable score than do minor components.
5. Enter the percent cover values as decimals in the row of the stressor table labeled " Reference/expected Percent Cover of Layer". Note, percentages will often sum to more than 100% (1.0).
6. Determine the severity of stressors acting on each individual canopy layers, indicating their presence with checks in the appropriate boxes of the stressor table. The difference between the expected and observed stratum coverages is one measure of stratum alteration.
7. Determine the sub-variable score for each valid vegetation layer using the scoring guidelines on the second page of the scoring sheet. Enter each sub-variable score in the appropriate cell of the row labeled "Veg. Layer Sub-variable Score". If a stratum has been wholly removed score it as 0.5.
8. Multiply each layer's *Reference Percent Cover of Layer* score by its Veg. Layer Sub-variable scores and enter the products in the labled cells. These are the weighted sub-variable scores. Individually sum the *Reference Percent Cover of Layer* and *Weighted Sub-variables scores.*
9. Divide the sum of "Veg. Layer Sub-variable Scores" by the total coverage of all layers scored. This product is the Variable 8 score. Enter this number in the labeled box at the bottom of this page.

	Vegetation Layers				
Current % Coverage of Layer		20%	65%		
Stressor	**Tree**	**Shrub**	**Herb**	**Aquatic**	**Comments**
Noxious Weeds					
Exotic/Invasive spp.					
Tree Harvest					
Brush Cutting/Shrub Removal					
Livestock Grazing					
Excessive Herbivory					
Mowing/Haying					
Herbicide					
Loss of Zonation/Homogenization					
Dewatering					
Over Saturation					
DIFFERENCE BETWEEN CURRENT COVERAGE AND REFERENCE/EXPECTED					

Reference/Expected % Cover of Layer		+ .20	+ .65	+	= .85	
	X	X	X	X		
Veg. Layer Sub-variable Score		.65	.63		÷	**See sub-variable scoring guidelines on following page**
	=	=	=	=		
Weighted Sub-variable Score		+ .13	+ .40	+	= .53	

Variable 8 Score .62

Variable 8: Vegetation Structure and Complexity p. 2

Sub-variable 8 Scoring Guidelines:

Based on the list of stressors identified above, rate the severity of their cumulative effect on vegetation structure and complexity for each vegetation layer.

Variable Score	Condition Grade	Scoring Guidelines
1.0 - 0.9	***A*** *Reference Standard*	Stressors not present or with an intensity low enough as to not detectably affect the structure, diversity or composition of the vegetation layer.
<0.9 - 0.8	***B*** *Highly Functioning*	Stressors present at intensity levels sufficient to cause detectable, but minor, changes in layer composition. Stress related change should generally be less than 10% for any given attribute (e.g., 10% cover of invasive, 10% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as high as 33% for a given attribute if stressors are confined to patches comprising less than 10% of the wetland.
<0.8 - 0.7	***C*** *Functioning*	Stressors present with enough intensity to cause significant changes in the character of vegetation, including alteration of layer coverage, structural complexity and species composition. The vegetation layer retains its essential character though. AA's with a high proportion of non-native grasses will commonly fall in this class. Stress related change should generally be less than 33% for any given attribute (e.g., 33% cover of invasive, 33% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 66% for a given attribute if stressors are confined to patches comprising less than 25% of the wetland.
<0.7 - 0.6	***D*** *Functioning Impaired*	Stressor intensity severe enough to cause profound changes to the fundamental character of the vegetation layer. Stress-related change should generally be less than 66% for any given attribute (e.g., 66% cover of invasive, 66% reduction in richness or cover) if the stressor is evenly distributed throughout the wetland. Stress related change could be as much as 80% of a given attribute if stressors are confined to patches comprising less than 50% of the wetland.
<0.6	***F*** *Non-functioning*	Vegetation layer has been completely removed or altered to the extent that is no longer comparable to the natural structure, diversity and composition.

FACWet Score Card

Scoring Procedure:

1. Transcribe variable scores from each variable data sheet to the corresponding cell in the variable score table.
2. In each Functional Capacity Index (FCI) equation, enter the corresponding variable scores in the equation cells. Do not enter values in the crossed cells lacking labels.
3. Add the variable scores to calculate the total functional points achieved for each function.
4. Divide the total functional points achieved by the functional points possible. The typical number of total points possible is provided, however, if a variable is added or subtracted to FCI equation the total possible points must be adjusted
5. Calculate the Composite FCI, by adding the FCI scores and dividing by the total number of functions scored (usually 7).
6. If scoring is done directly in the Excel spreadsheet, all values will be transferred and calculated automatically.

VARIABLE SCORE TABLE

Buffer & Landscape Context	Variable 1:	Habitat Connectivity (Connect)	.70
	Variable 2:	Contributing Area (CA)	.58
Hydrology	Variable 3:	Water Source (Source)	.60
	Variable 4:	Water Distribution (Dist)	.60
	Variable 5:	Water Outflow (Outflow)	.58
Abiotic and Biotic Habitat	Variable 6:	Geomorphology (Geom)	.60
	Variable 7:	Chemical Environment (Chem)	.58
	Variable 8:	Vegetation Structure and Complexity (Veg)	.62

Functional Capacity Indices

Function 1 -- Support of Characteristic Wildlife Habitat

$V1_{connect}$	+ $V2_{CA}$	+ $(2 \times V8_{veg})$				= Total Functional Points	÷ 4	= FCI
.70	+ .58	+ 1.24	+	+	+	= 2.52	÷ 4	= .63

Function 2 -- Support of Characteristic Fish/aquatic Habitat

$(3 \times V3_{source})$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V7_{chem}$				
1.8	+ 1.2	+ 1.16	+ .60	+ .58	+	= 5.34	÷ 9	= .59

Function 3 -- Flood Attenuation

$V2_{CA}$	+ $(2 \times V3_{source})$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V8_{veg}$			
.58	+ 1.2	+ 1.2	+ 1.16	+ .60	+ .62	= 5.36	÷ 9	= .59

Function 4 -- Short- and Long-term Water Storage

$V3_{source}$	+ $(2 \times V4_{dist})$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$					
.60	+ 1.2	+ 1.16	+ .60	+	+	= 3.56	÷ 6	= .59

Function 5 -- Nutrient/Toxicant Removal

$(2 \times V2_{CA})$	+ $(2 \times V4_{dist})$	+ $V6_{geom}$	+ $V7_{chem}$					
1.16	+ 1.2	+ .60	+ .58	+	+	= 3.54	÷ 6	= .59

Function 6 -- Sediment Retention/Shoreline Stabilization

$V2_{CA}$	+ $(2 \times V6_{geom})$	+ $(2 \times V8_{veg})$						
.58	+ 1.2	+ 1.24	+	+	+	= 3.02	÷ 5	= .60

Function 7 -- Production Export/Food Chain Support

$V1_{connect}$	+ $(2 \times V5_{outflow})$	+ $V6_{geom}$	+ $V7_{chem}$	+ $(2 \times V8_{veg})$				
.70	+ 1.16	+ .60	+ .58	+ 1.24	+	= 4.28	÷ 7	= .61

Sum of Individual FCI Scores [redacted]4.2

Divide by the Number of Functions Scored ÷ 7

Composite FCI Score .60

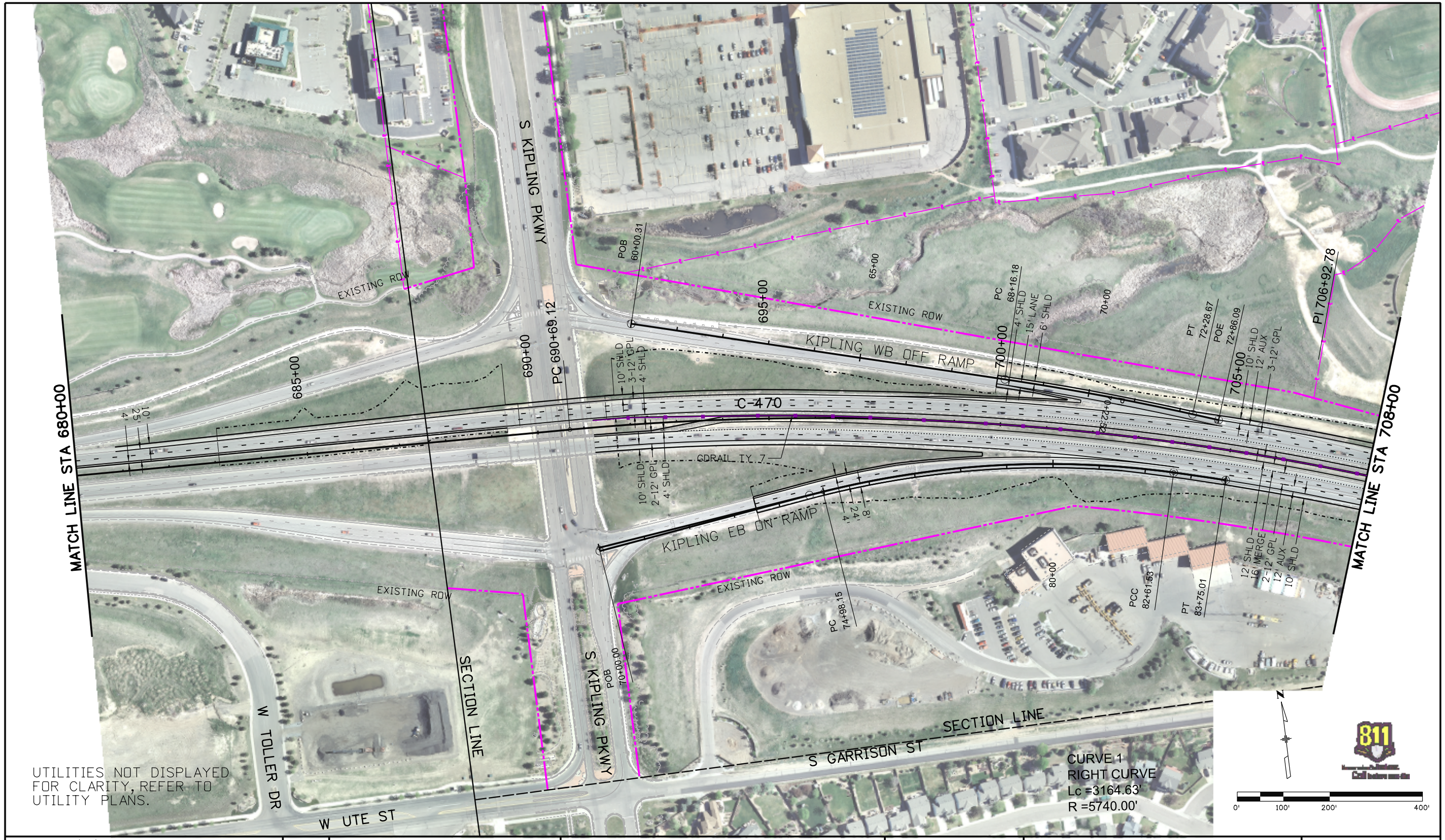
APPENDIX C
Conceptual Design of the Proposed Action

For the C-470 Corridor
Revised Environmental Assessment

June 2015

UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

Print Date: 6/19/2015		Sheet Revisions			Colorado Department of Transportation	As Constructed	C-470 - ULTIMATE ROADWAY PLAN SHEET			Project No./Code
File Name: 18999RDWY_ULT_Plan001		Date:	Comments	Init.	2000 South Holly Street Denver, CO 80222 Phone: 303-757-9295 FAX: 303-757-9963	No Revisions:				C4701 124
Horiz. Scale: 1:200 Vert. Scale: As Noted						Revised:	Designer: BSH	Structure Numbers		18999
Unit Information Unit Leader Initials					Region 1 JKE	Void:	Detailer: DWS			Sheet Number
							Sheet Subset: ULT PLAN	Subset Sheets: 1 of 30		



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Unit Information Unit Leader Initials				

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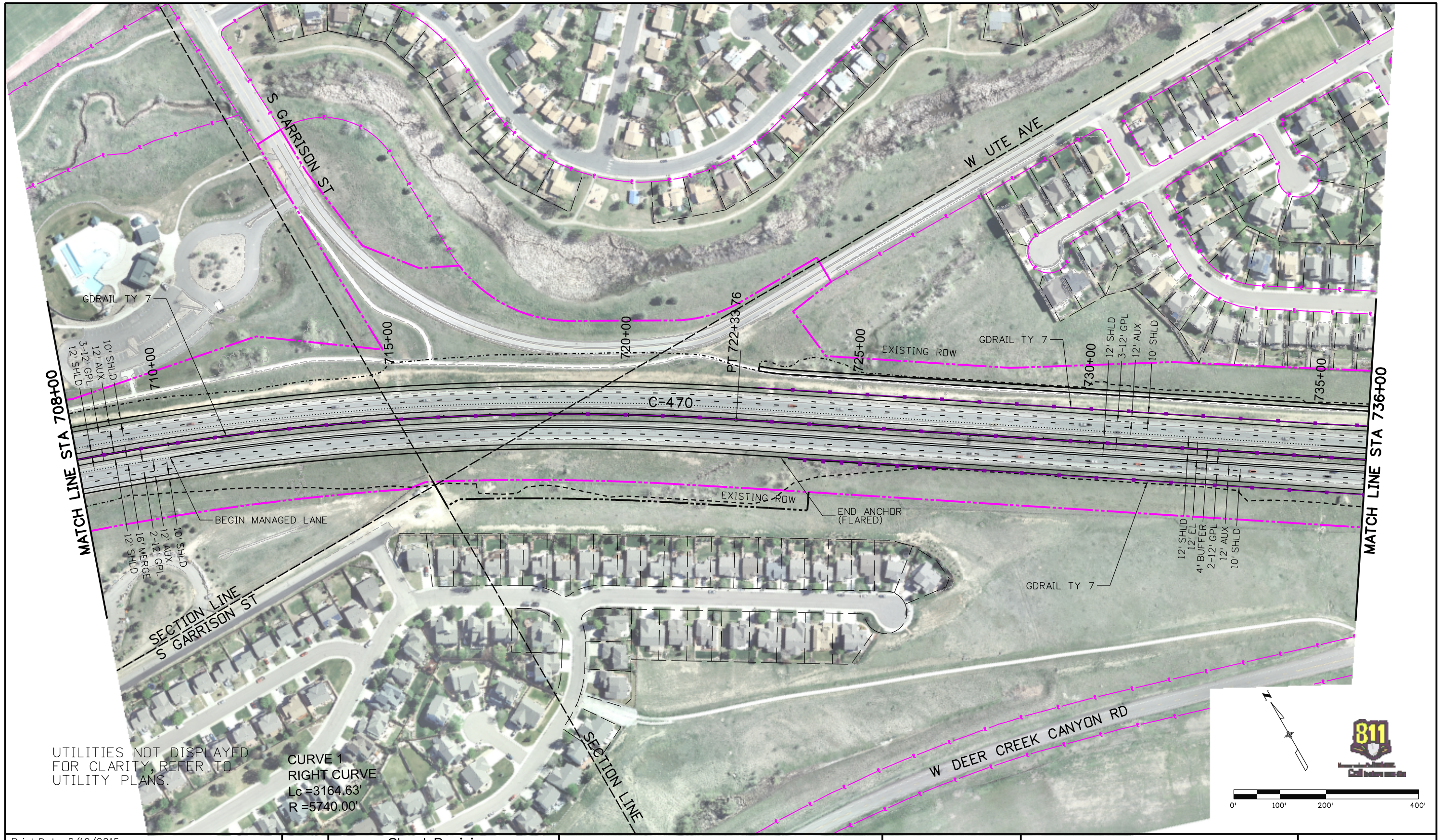
C-470 - ULTIMATE ROADWAY PLAN SHEET

Designer: BSH
Detailer: DWS
Sheet Subset: ULT PLAN
Structure Numbers:
Subset Sheets: 2 of 30

Project No./Code
C4701 124
18999
Sheet Number



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Unit Information Unit Leader Initials			

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C-470 - ULTIMATE
ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets: 3 of 30	

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C4701 124
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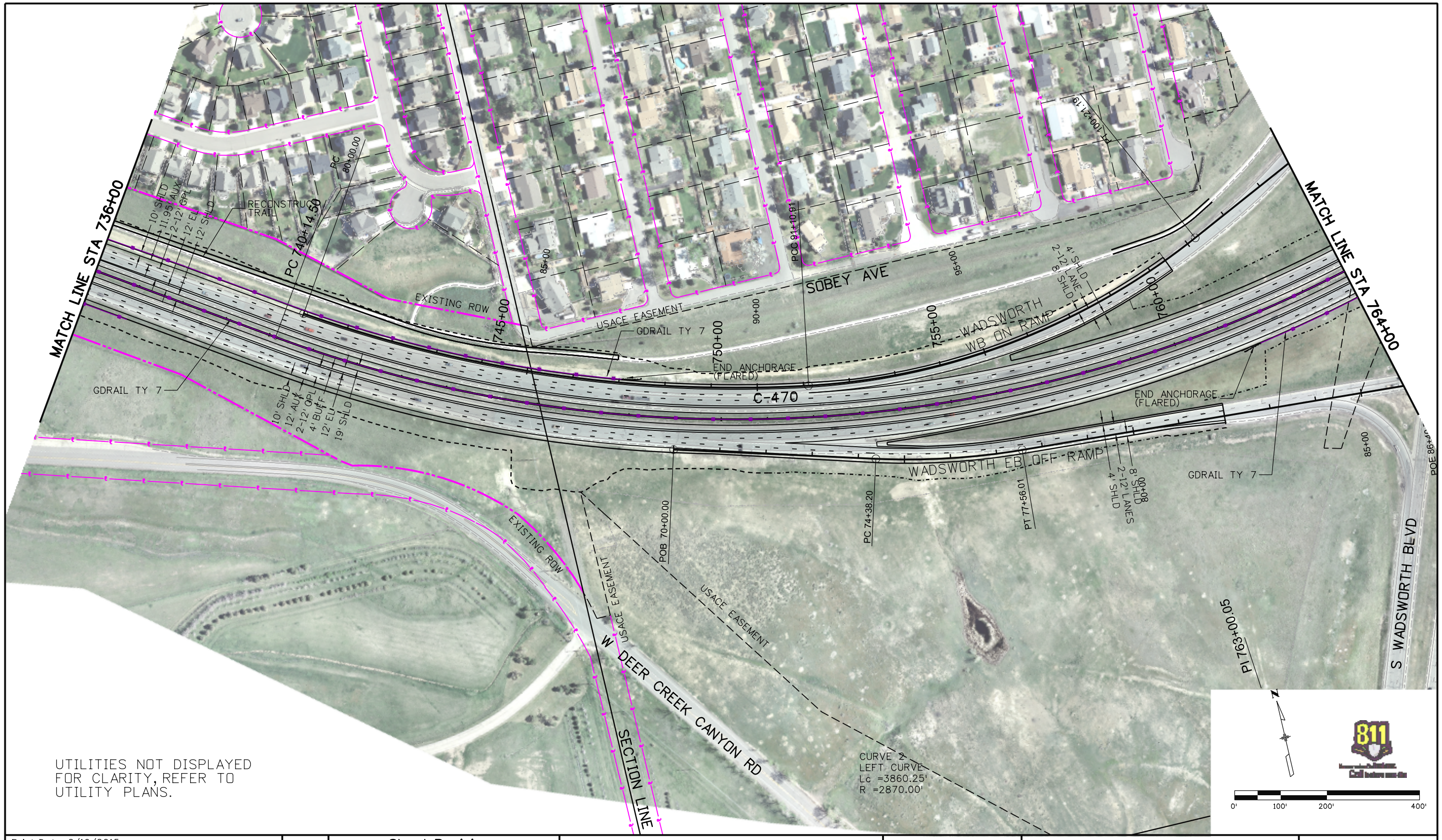

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C-470 - ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets: 4 of 30	

Project No./Code
C4701 124
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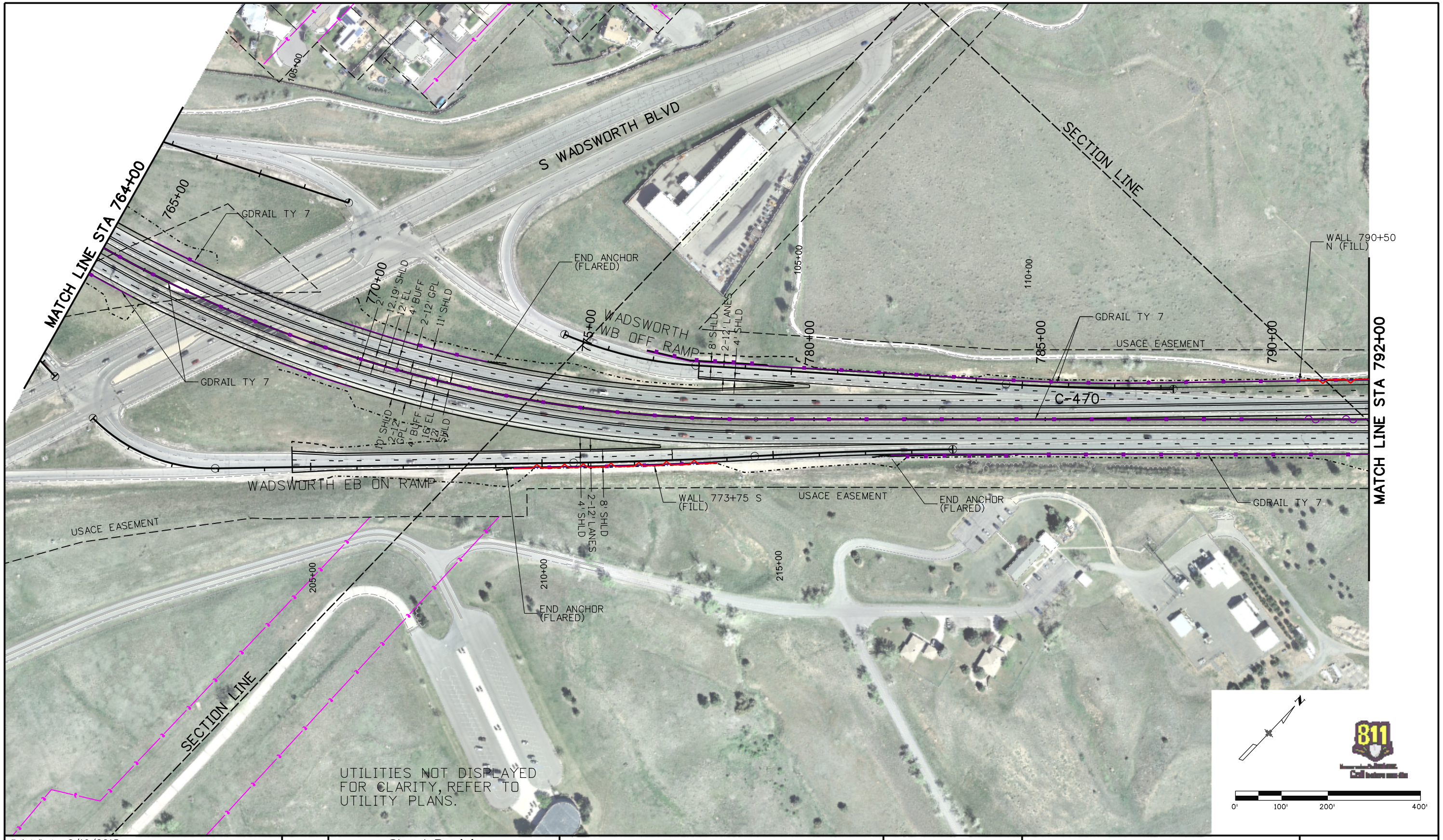

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C-470 - ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets: 5 of 30	

Project No./Code
C4701 124
18999
Sheet Number

Print Date: 6/19/2015

File Name: 18999RDWY_ULT_Plan006

Horiz. Scale: 1:200 Vert. Scale: As Noted

Unit Information Unit Leader Initials

Sheet Revisions		
Date:	Comments	Init.

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JKE

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No. Revisions:

Revised:

Void:

C-470 - ULTIMATE
ROADWAY PLAN SHEET

Designer: BSH
Detailer: DWS
Sheet Subset: ULT PLAN
Subset Sheets: 6 of 30

Structure Numbers

Project No./Code: C4701 124

Sheet Number: 18999

UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

SECTION LINE

SECTION LINE

MATCH LINE STA 792+00

MATCH LINE STA 820+00

END ANCHOR (NON FLARED)

USACE EASEMENT

TENSIONED CABLE BARRIER

GDRAIL TY 7

WALL

10' SHLD
12' AUX
2-12' GPL
4' BUFFER
12' ELL
12' SHLD

C-470

NOISE WALL

USACE EASEMENT

END ANCHOR (NON FLARED)

GDRAIL TY 7

WALL 790+50 N (FILL)

14' MEDIAN
12' SHLD
12' EL
4' BUFFER
2-12' GPL
12' AUX
10' SHLD

S OTIS CT

S OTIS ST

S PIERCE WAY

W SAN JUAN PL

820+00

815+00

810+00

805+00

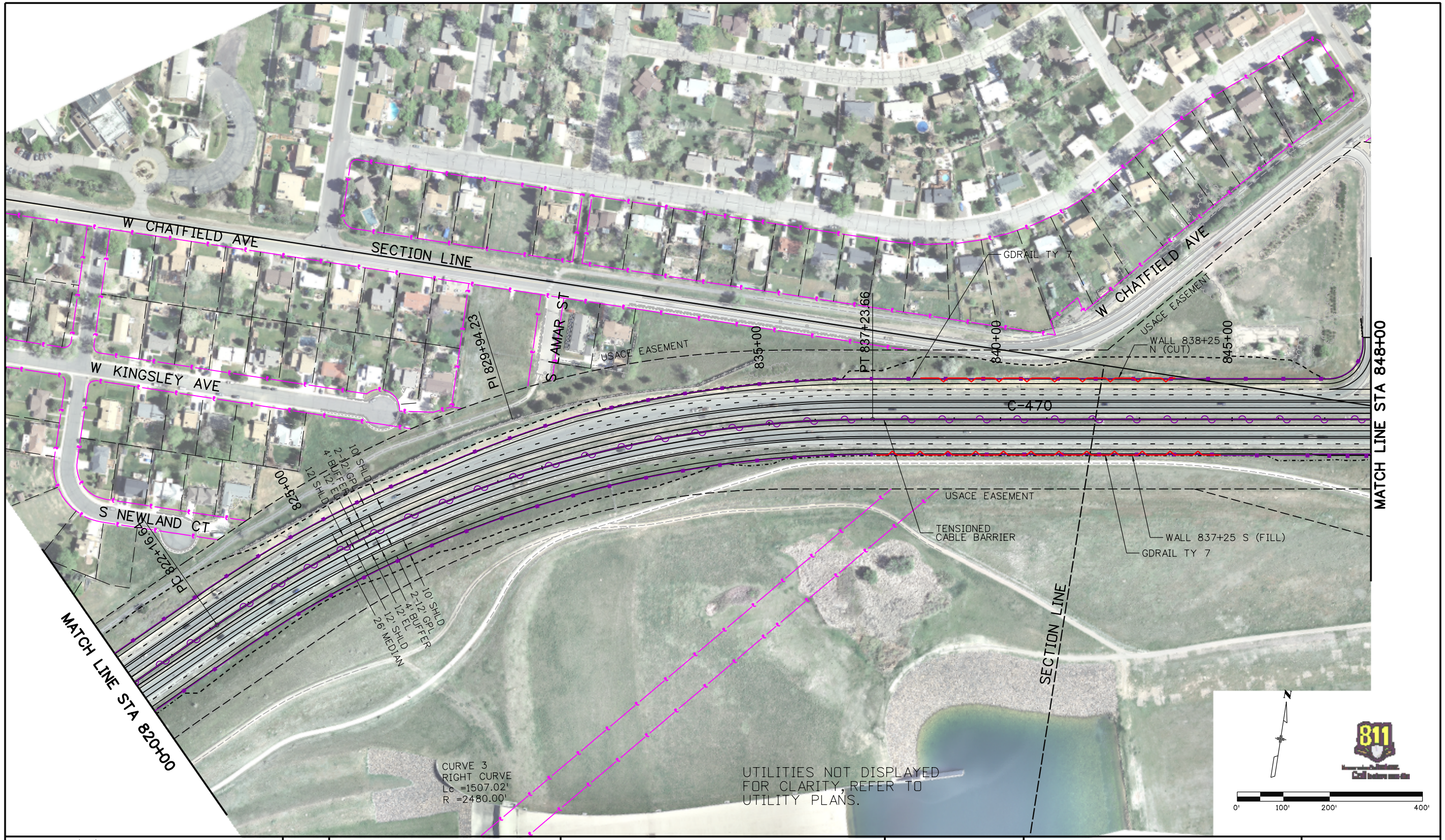
800+00

795+00

0' 100' 200' 400'

N

811 Call Before You Dig



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Unit Information Unit Leader Initials			Void:

C-470 - ULTIMATE ROADWAY PLAN SHEET			Project No./Code
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Detailer: DWS			18999
Sheet Subset: ULT PLAN	Subset Sheets: 7 of 30		Sheet Number

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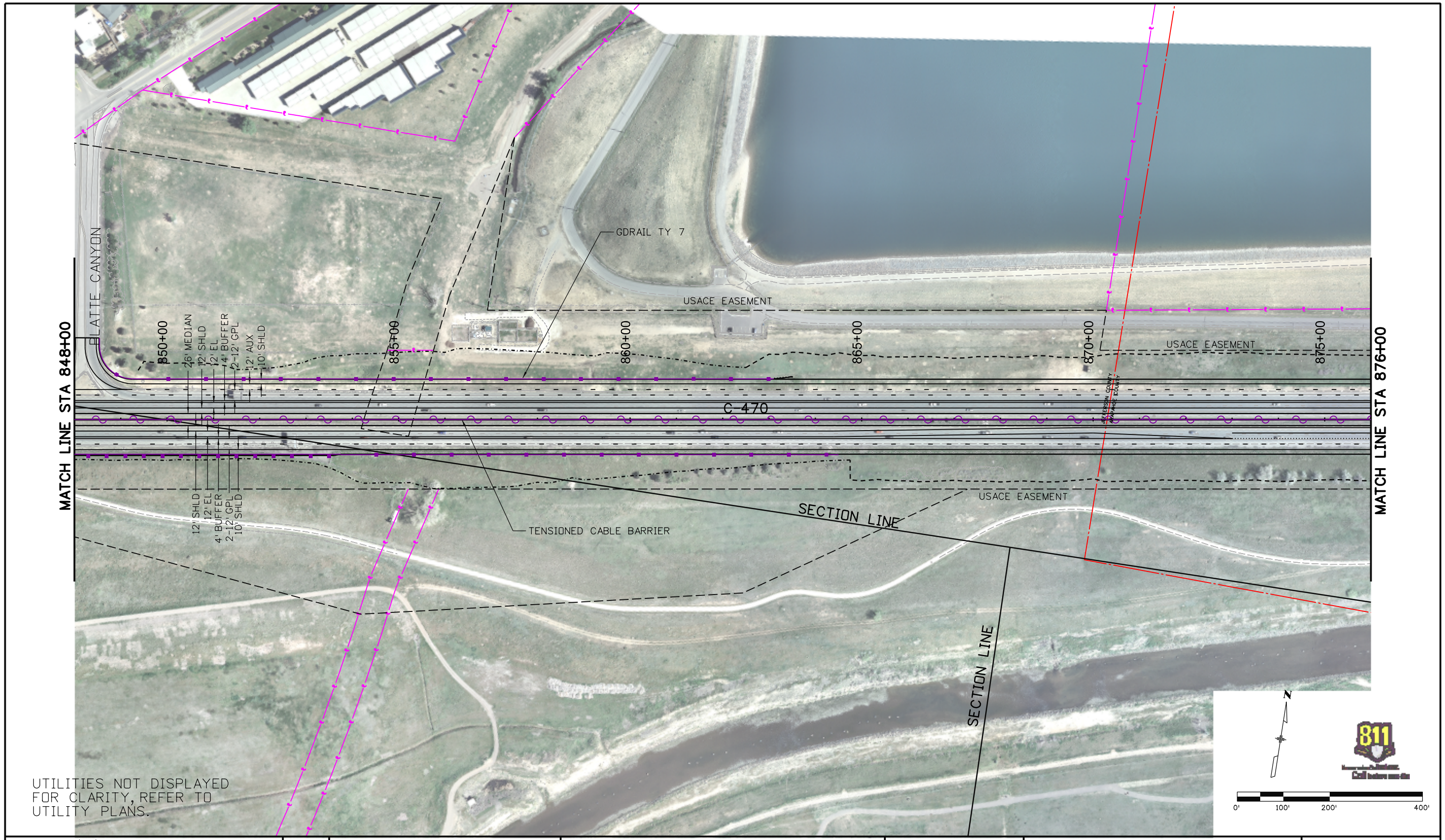

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Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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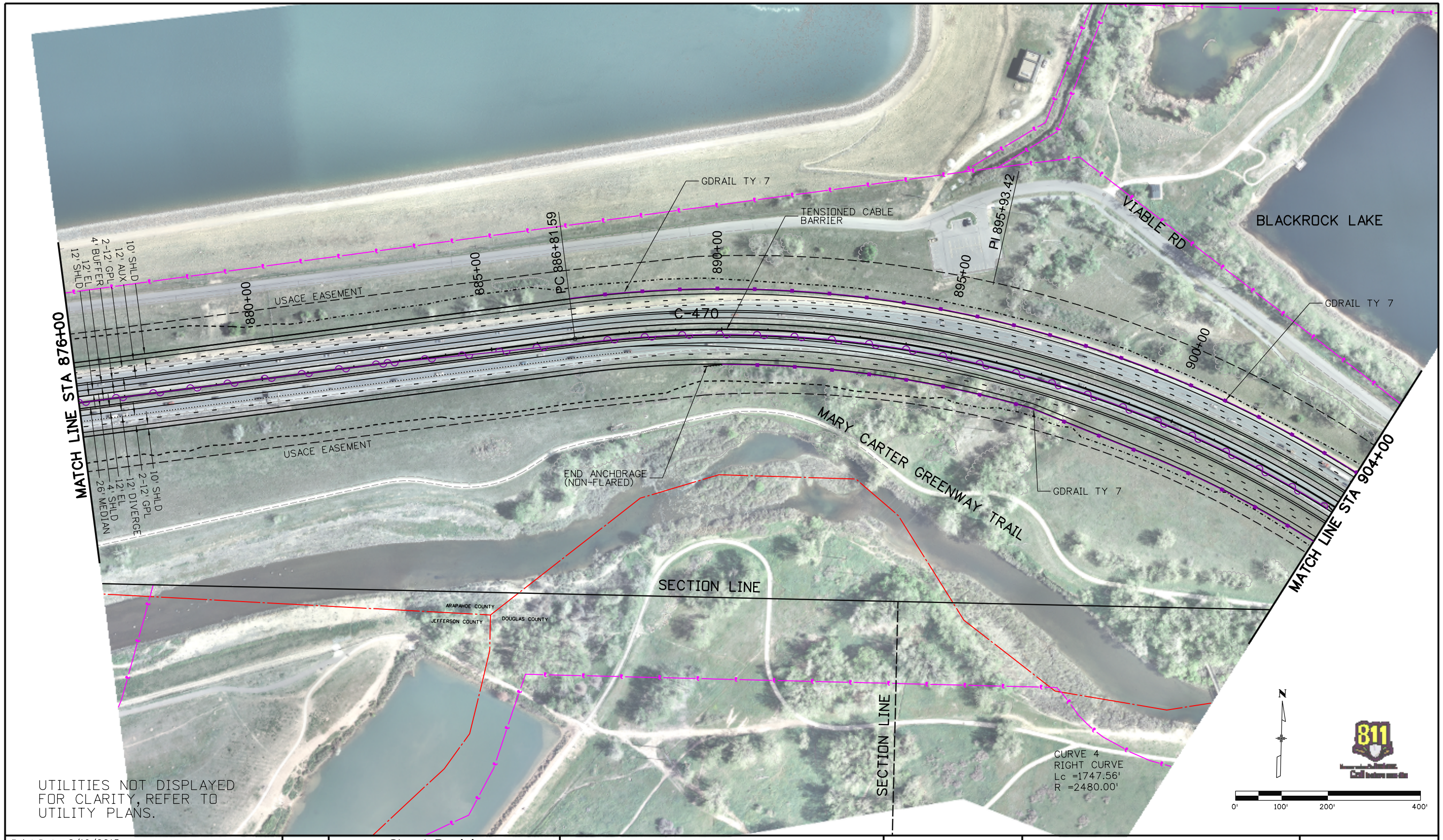
C-470 - ULTIMATE
ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets: 8 of 30	

Project No./Code
C4701 124
18999
Sheet Number



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Horiz. Scale: 1:200 Vert. Scale: As Noted		Phone: 303-757-9295 FAX: 303-757-9963
Unit Information Unit Leader Initials		Region 1 JKE

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Revised:	Detailer: DWS		18999
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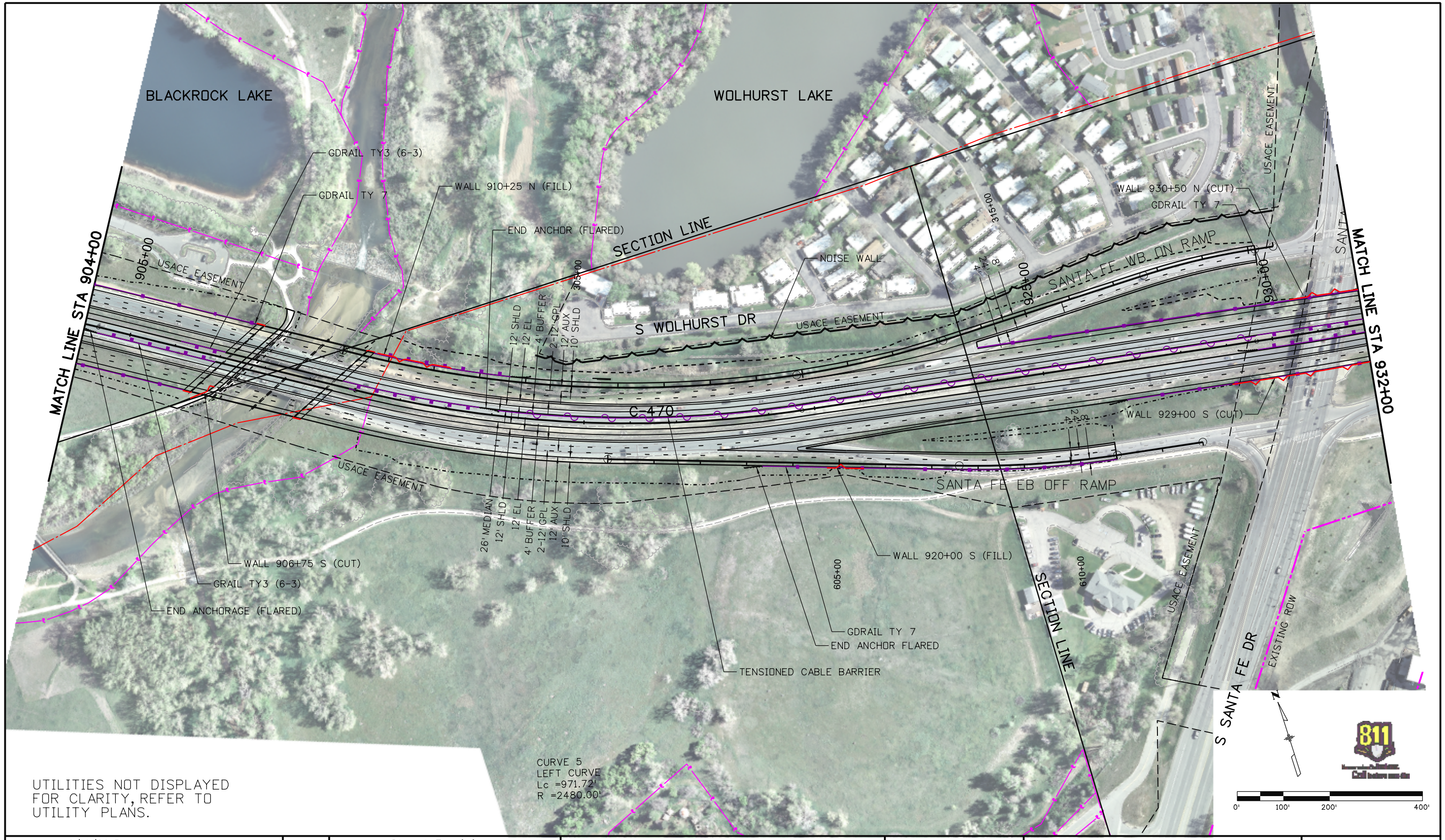

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Horiz. Scale: 1:200	Vert. Scale: As Noted
Unit Information	Unit Leader Initials

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Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets: 10 of 30	

Project No./Code
C4701 124
18999
Sheet Number

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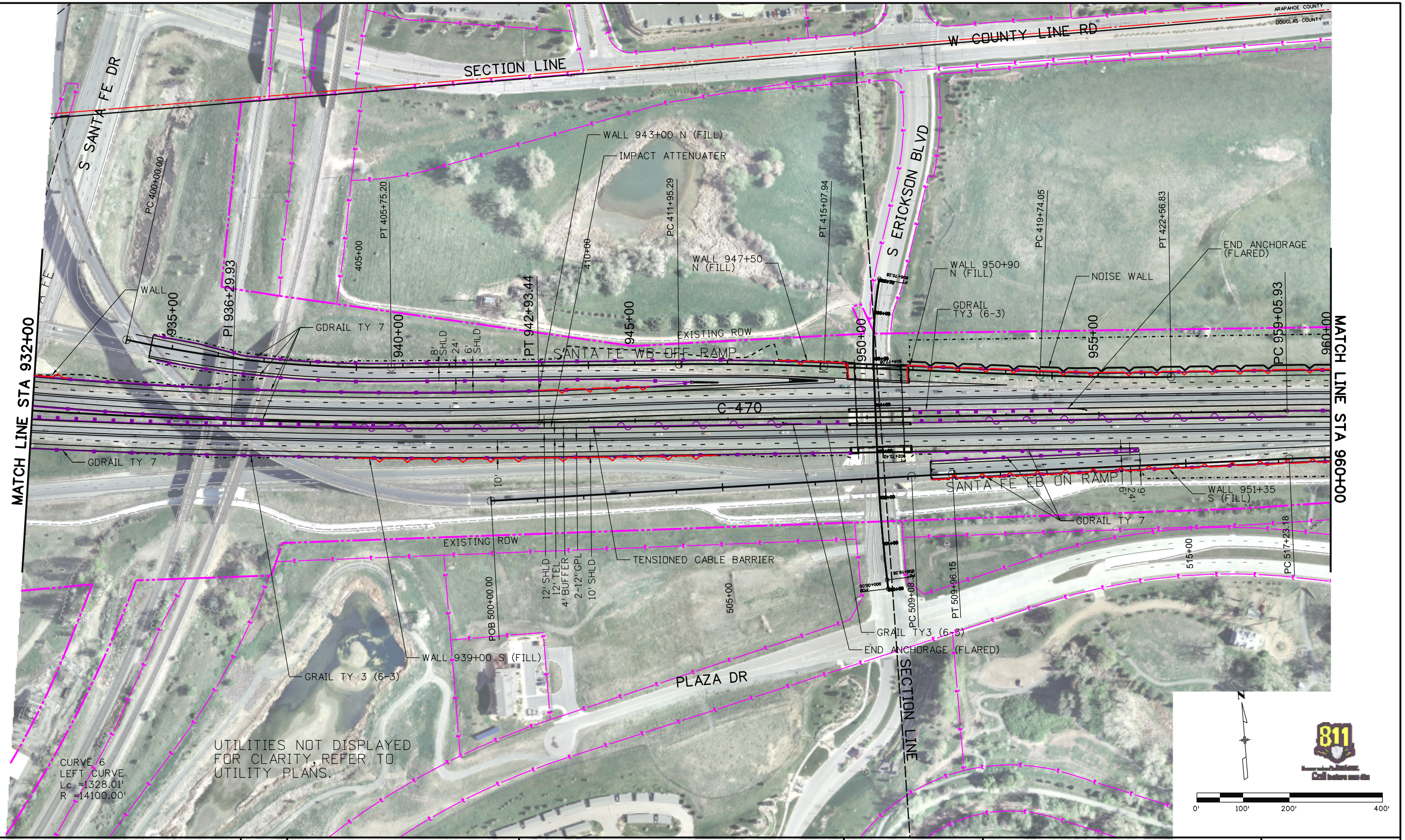

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Unit Information Unit Leader Initials			

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No Revisions:	Designer: BSH	Structure Numbers		C4701 124
Revised:	Detailer: DWS			18999
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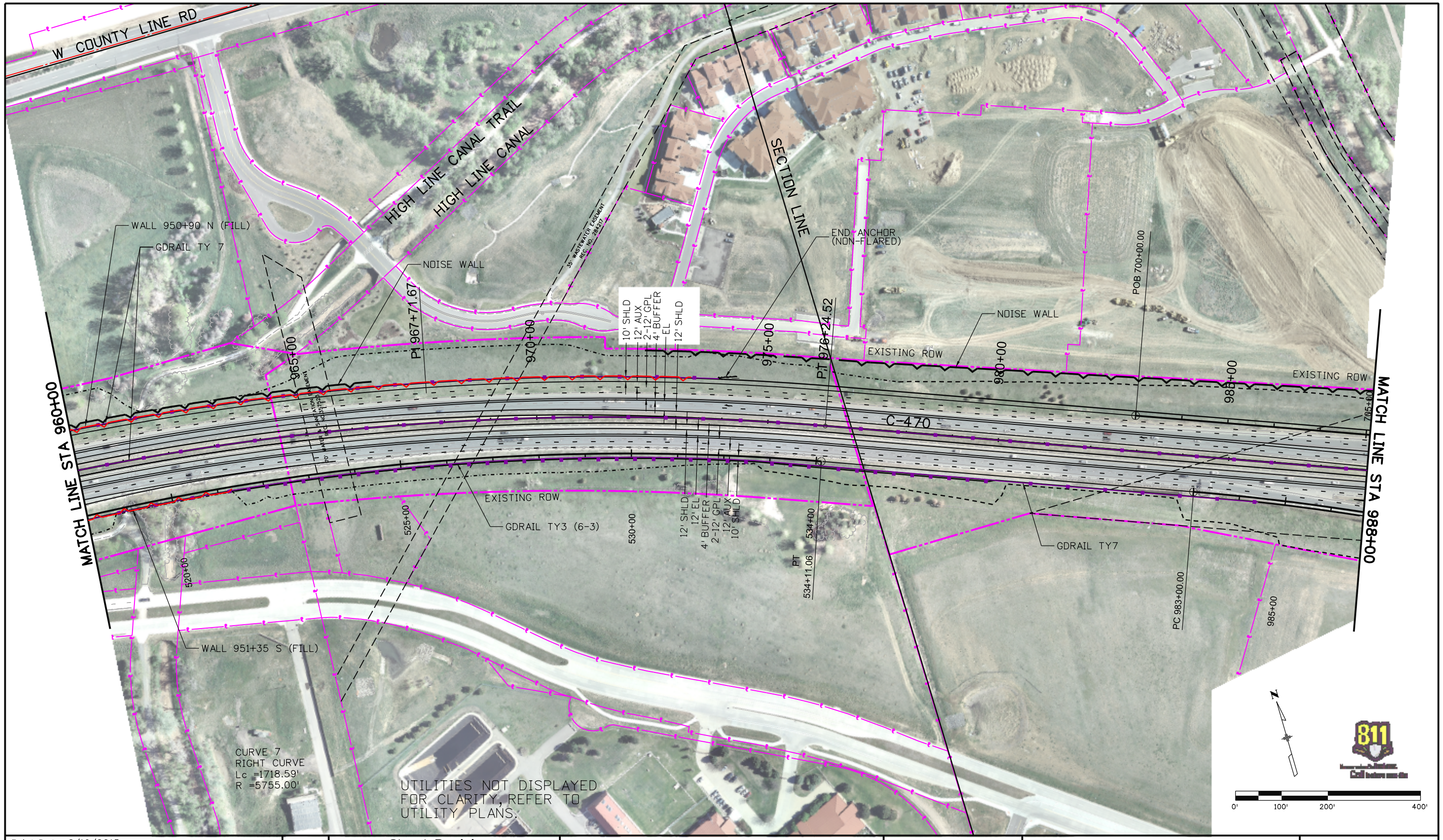

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Print Date: 6/19/2015			
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Unit Information	Unit Leader Initials		

Sheet Revisions		
Date:	Comments	Init.

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C-470 - ULTIMATE
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Designer:	BSH	Structure Numbers	
Detailer:	DWS		
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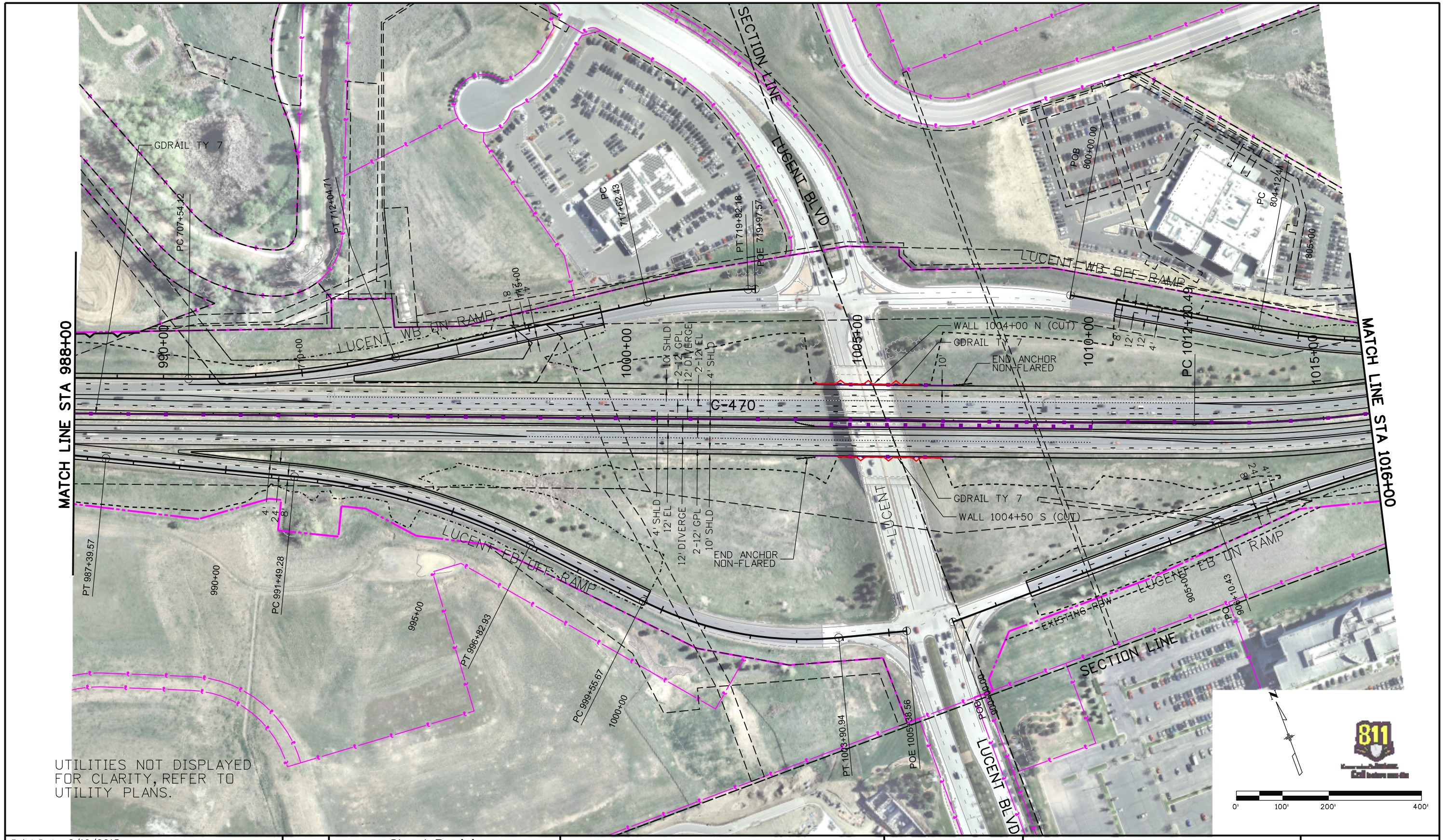
Project No./Code
C4701 124
18999
Sheet Number



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Unit Information Unit Leader Initials			

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C-470 ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
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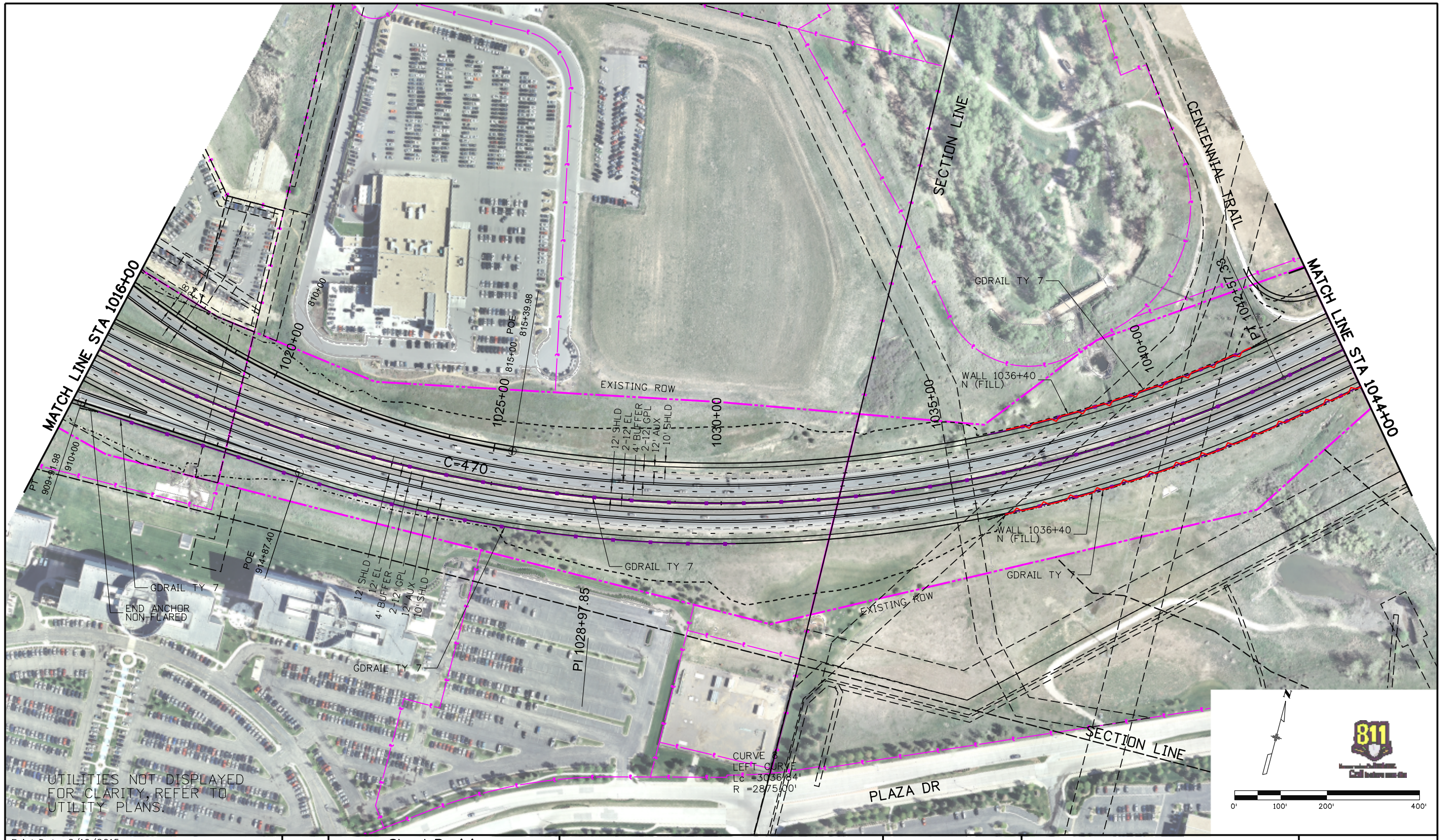
Sheet Subset:	ULT PLAN	Subset Sheets:	13 of 30

Project No./Code
C4701 124
18999
Sheet Number



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Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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C-470 ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset: ULT PLAN		Subset Sheets: 14 of 30	

Project No./Code
C4701 124
18999
Sheet Number

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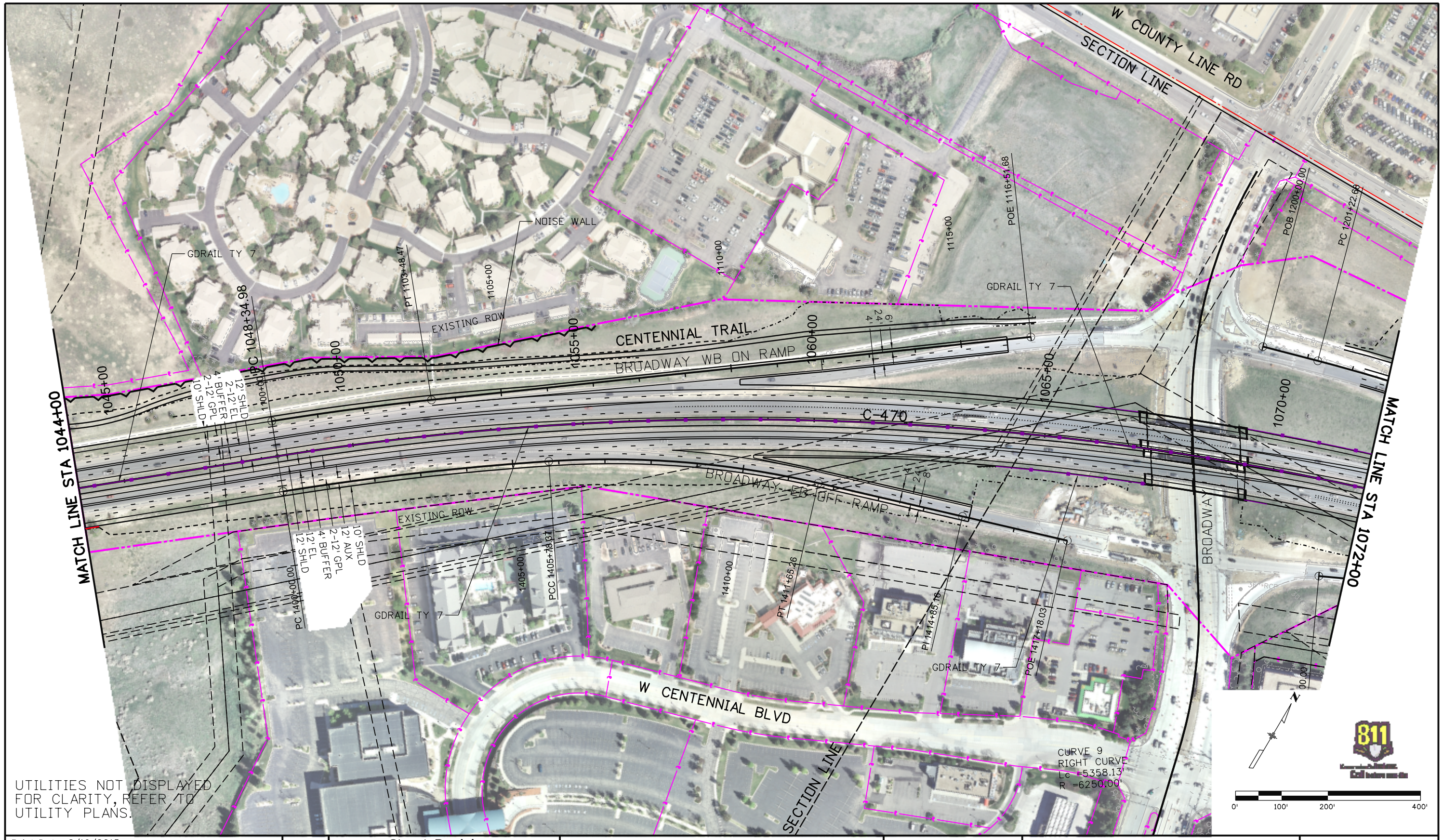

UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

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Unit Information	Unit Leader Initials

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Date:	Comments	Init.

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Detailer:	DWS		
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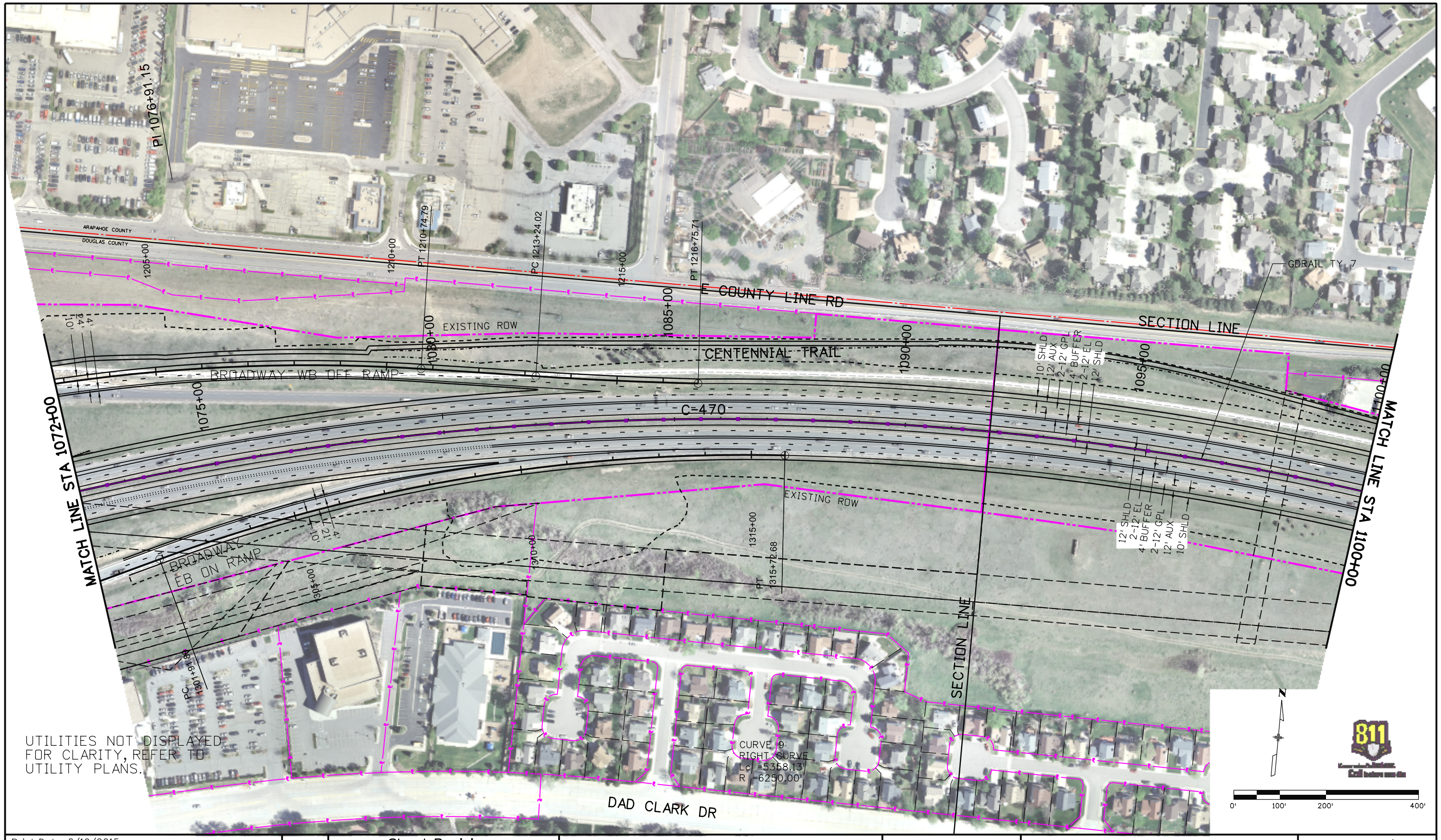
Project No./Code
C4701 124
18999
Sheet Number



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Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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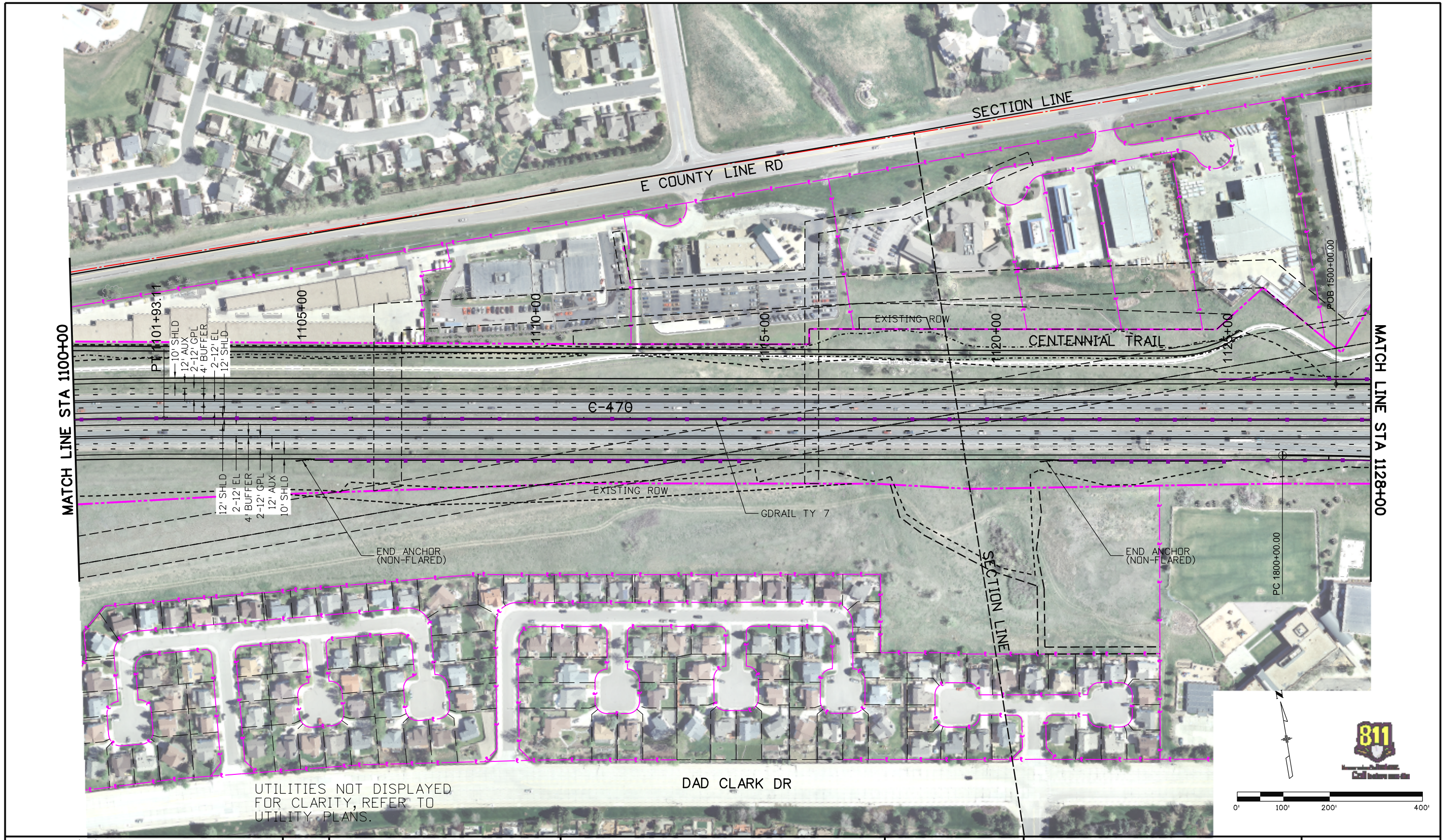
No Revisions:	Designer: BSH	Structure Numbers		C4701 124
Revised:	Detailer: DWS			18999
Void:	Sheet Subset: ULT PLAN	Subset Sheets: 16 of 30		Sheet Number



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File Name: 18999RDWY_ULT_Plan017	Date:	Comments	Init.
Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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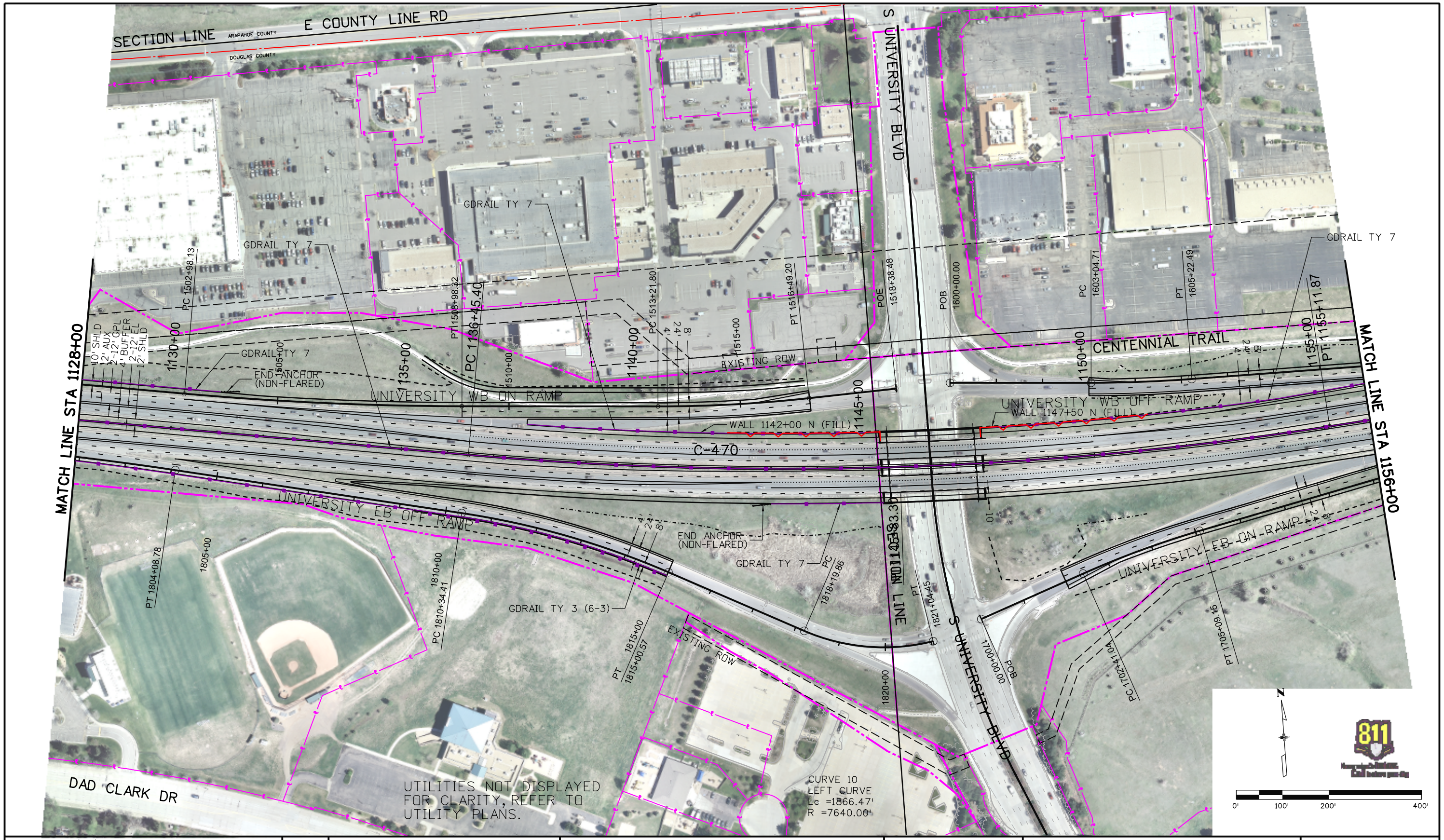
Designer: BSH
Detailer: DWS
Sheet Subset: ULT PLAN
Structure Numbers
Subset Sheets: 17 of 30

Project No./Code
C4701 124
18999
Sheet Number



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Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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C-470 ULTIMATE ROADWAY PLAN SHEET

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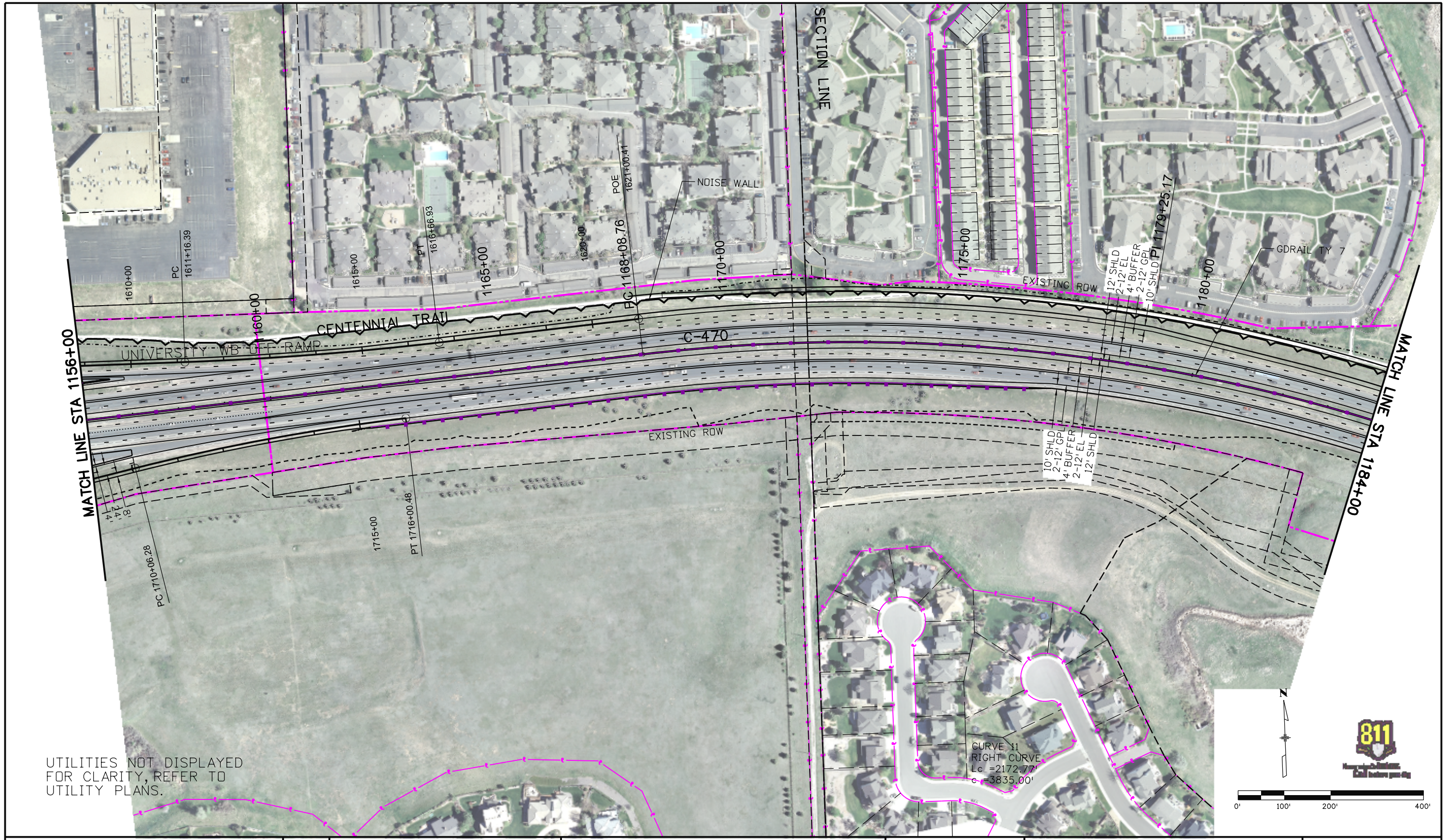
Project No./Code
C4701 124
18999
Sheet Number



Print Date: 6/19/2015	Sheet Revisions		
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Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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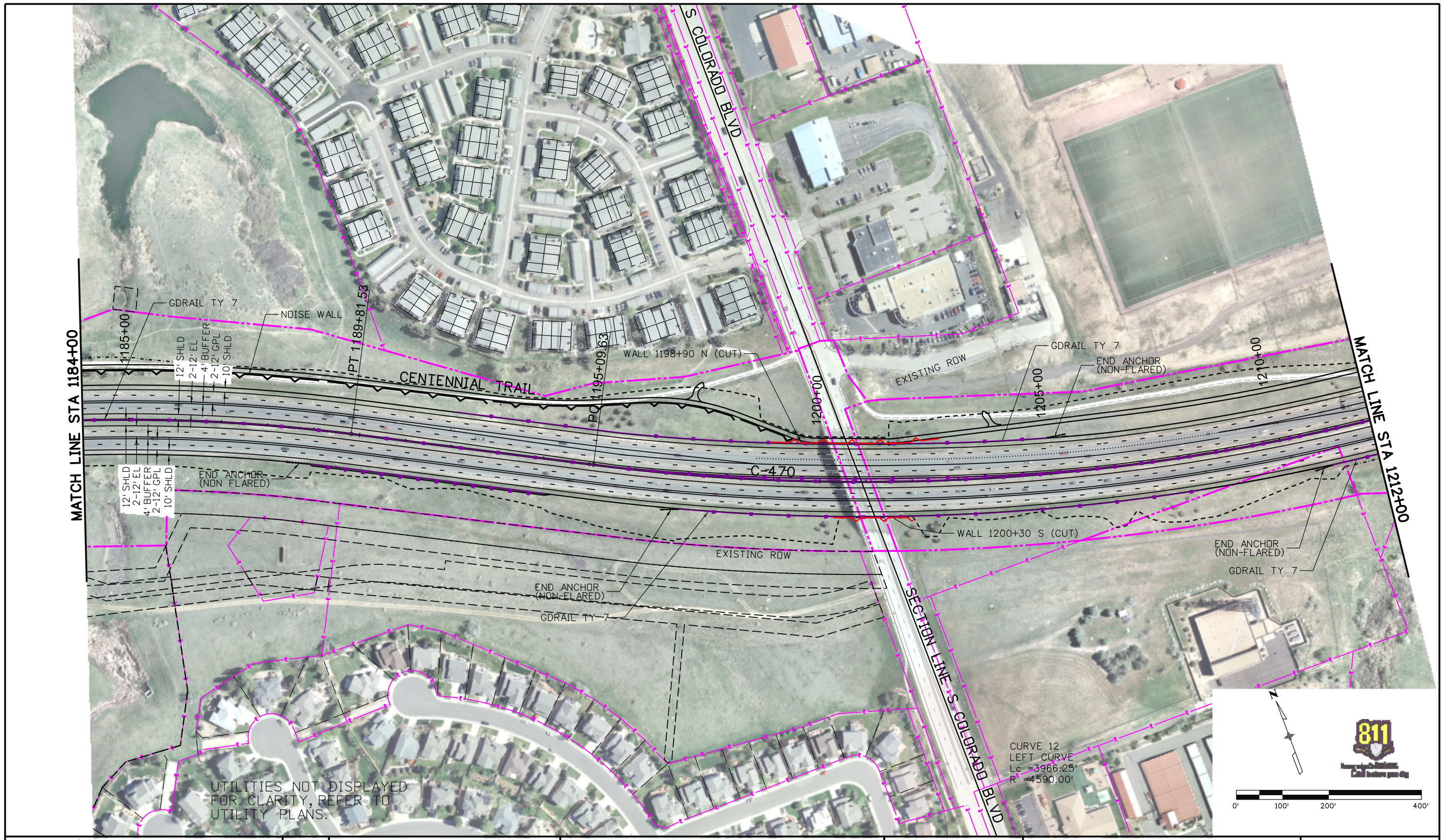
Designer: BSH
Detailer: DWS
Sheet Subset: ULT PLAN
Structure Numbers
Subset Sheets: 19 of 30

Project No./Code
C4701 124
18999
Sheet Number



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Horiz. Scale: 1:200	Vert. Scale: As Noted				Region 1 JKE
Unit Information	Unit Leader Initials				

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No Revisions:				C4701 124
Revised:	Designer: BSH	Structure Numbers		18999
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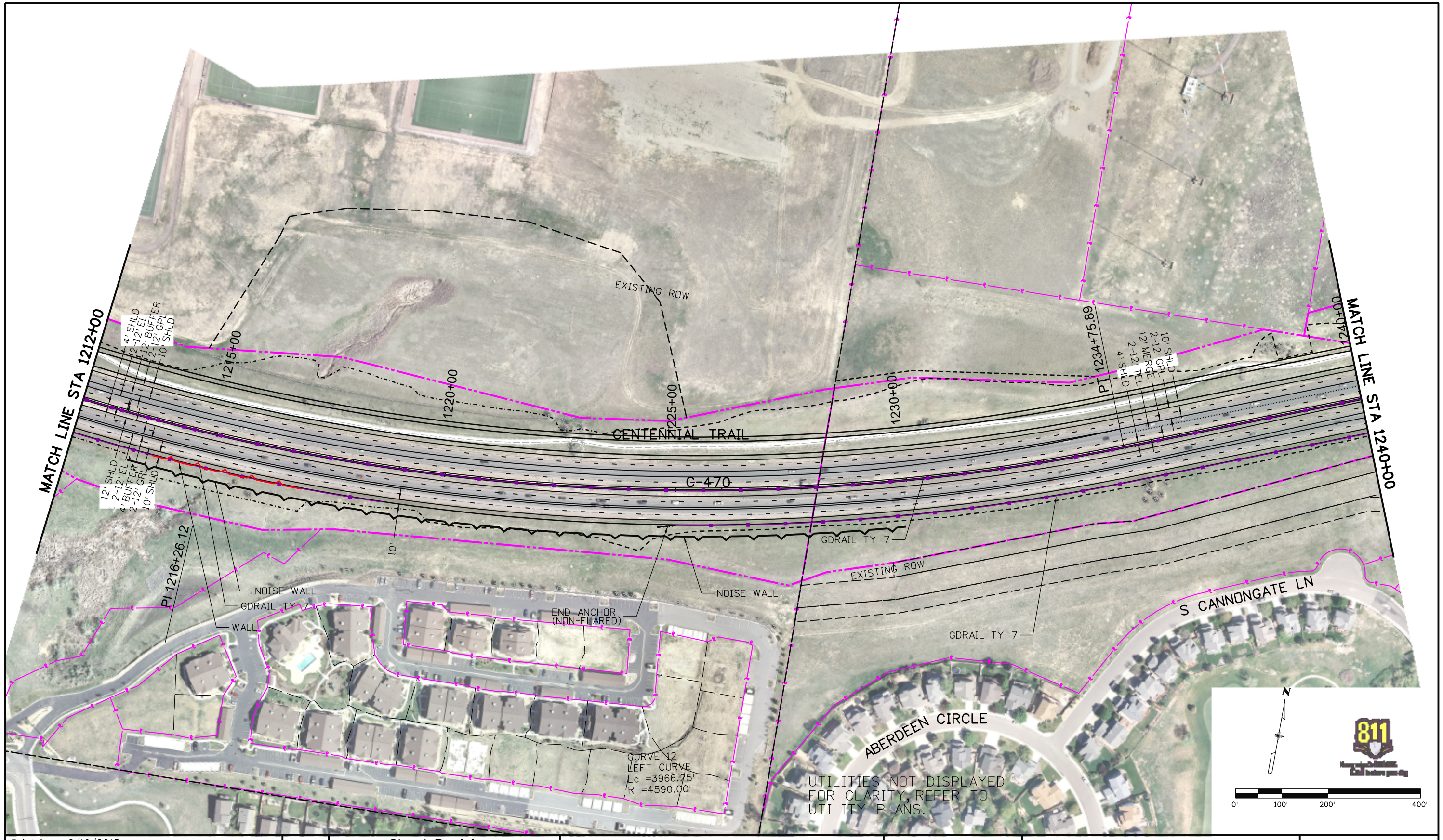

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Horiz. Scale: 1:200 Vert. Scale: As Noted		Denver, CO 80222	Revised:
Unit Information Unit Leader Initials		Phone: 303-757-9295 FAX: 303-757-9963	Void:
		Region 1 JKE	

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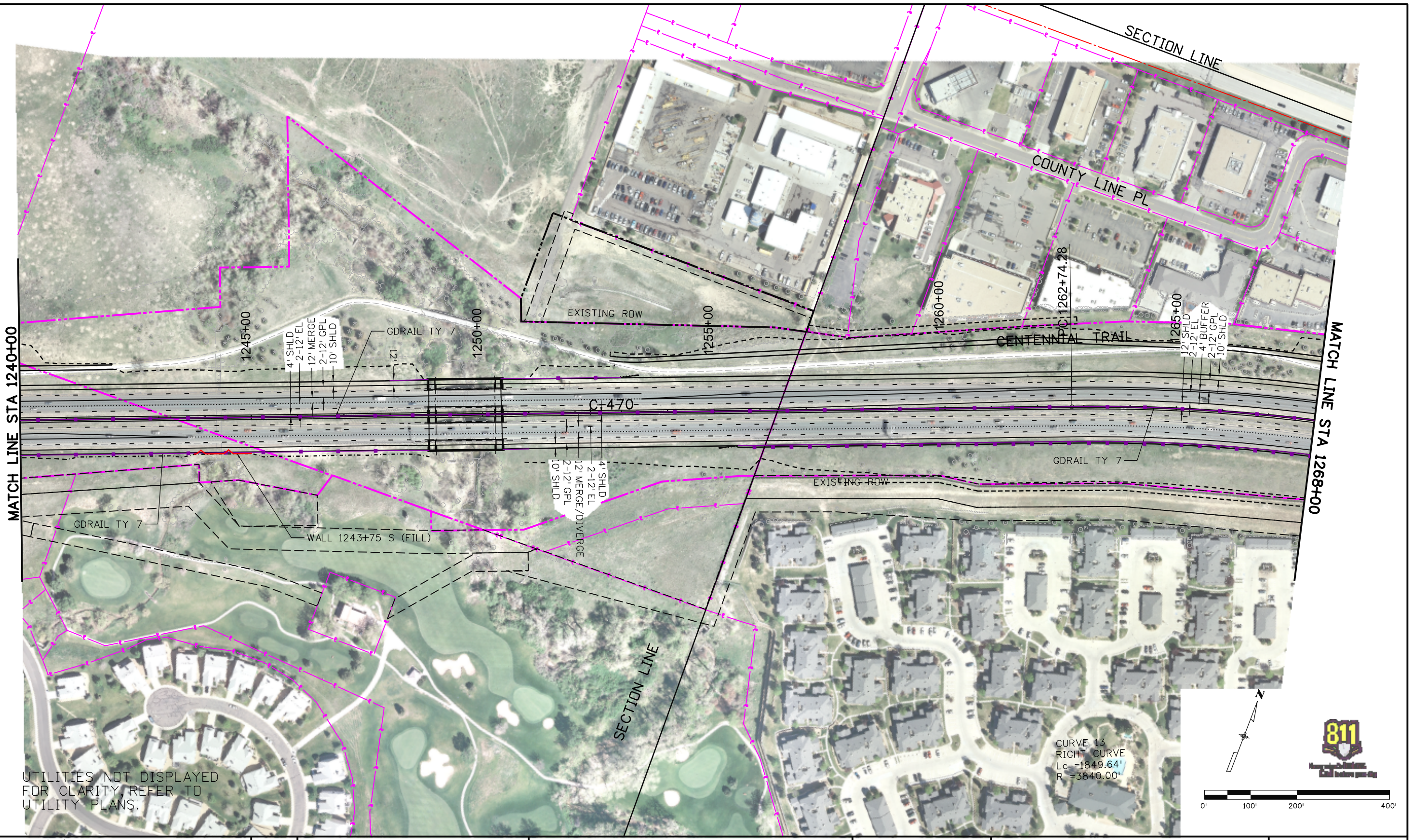
Designer: BSH	Structure Numbers		C4701 124
Detailer: DWS			18999
Sheet Subset: ULT PLAN	Subset Sheets: 21 of 30		Sheet Number



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File Name: 18999RDWY_ULT_Plan022	Date:	Comments	Init.
Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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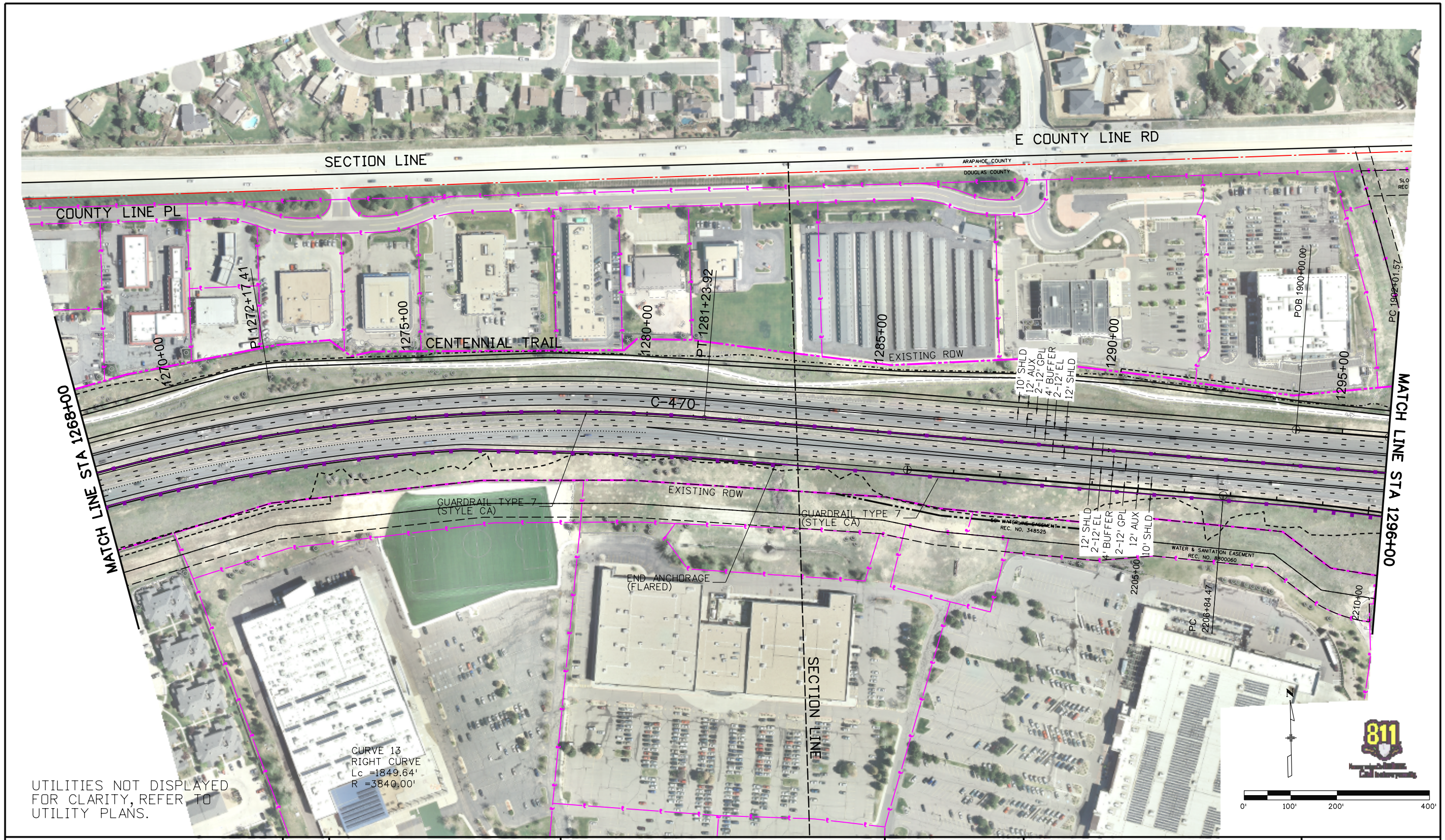
Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset: ULT PLAN		Subset Sheets: 22 of 30	

Project No./Code
C4701 124
18999
Sheet Number



UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

Print Date: 6/19/2015			
File Name: 18999RDWY_ULT_Plan023			
Horiz. Scale: 1:200	Vert. Scale: As Noted		
Unit Information	Unit Leader Initials		

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Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets:	23 of 30

Project No./Code
C4701 124
18999
Sheet Number

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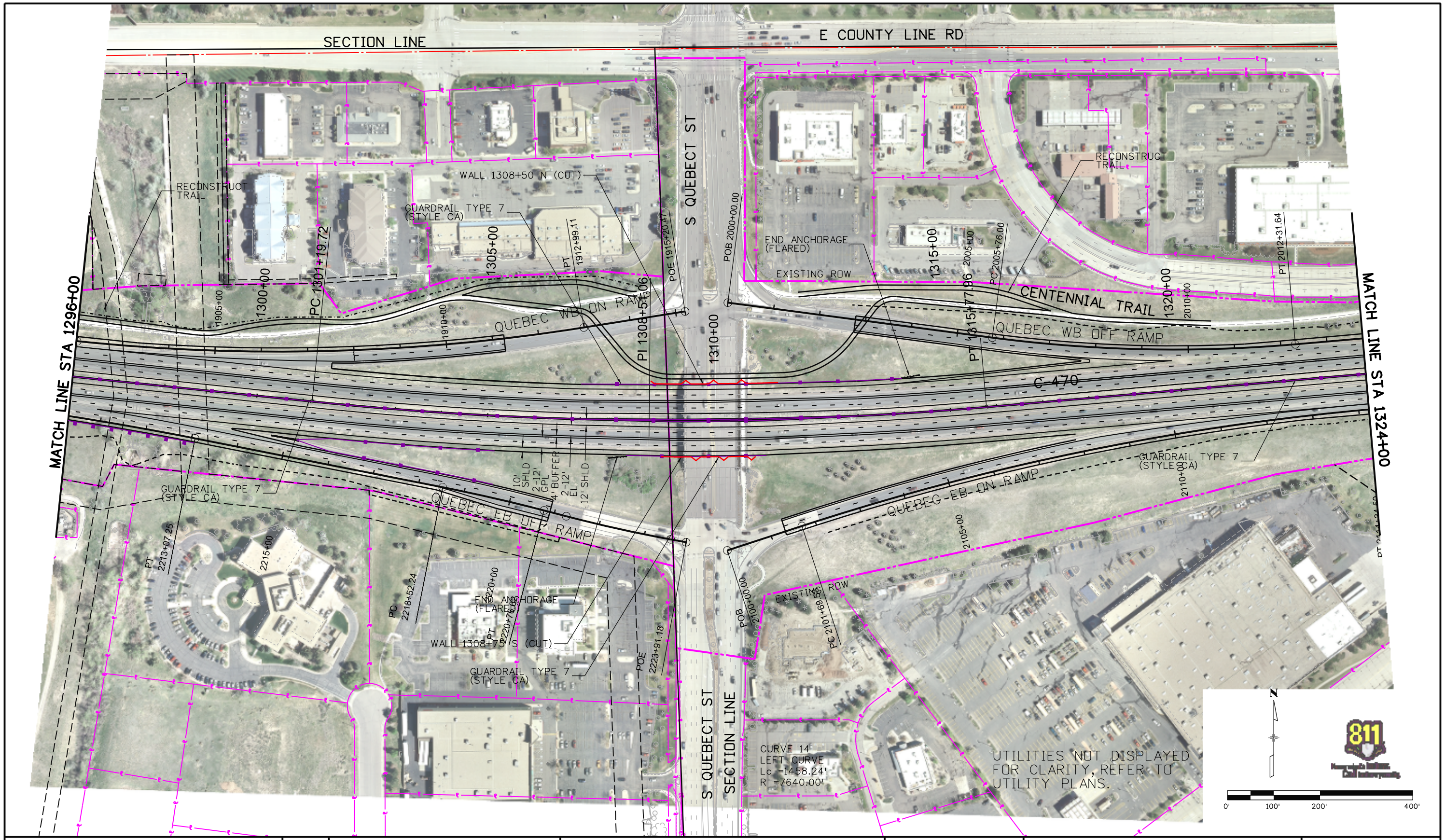

Print Date: 6/19/2015		Sheet Revisions			Colorado Department of Transportation
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Horiz. Scale: 1:200	Vert. Scale: As Noted				Region 1 JKE
Unit Information	Unit Leader Initials				

As Constructed	C-470 ULTIMATE ROADWAY PLAN SHEET			Project No./Code
No Revisions:	Designer: BSH	Structure Numbers		C4701 124
Revised:	Detailer: DWS			18999
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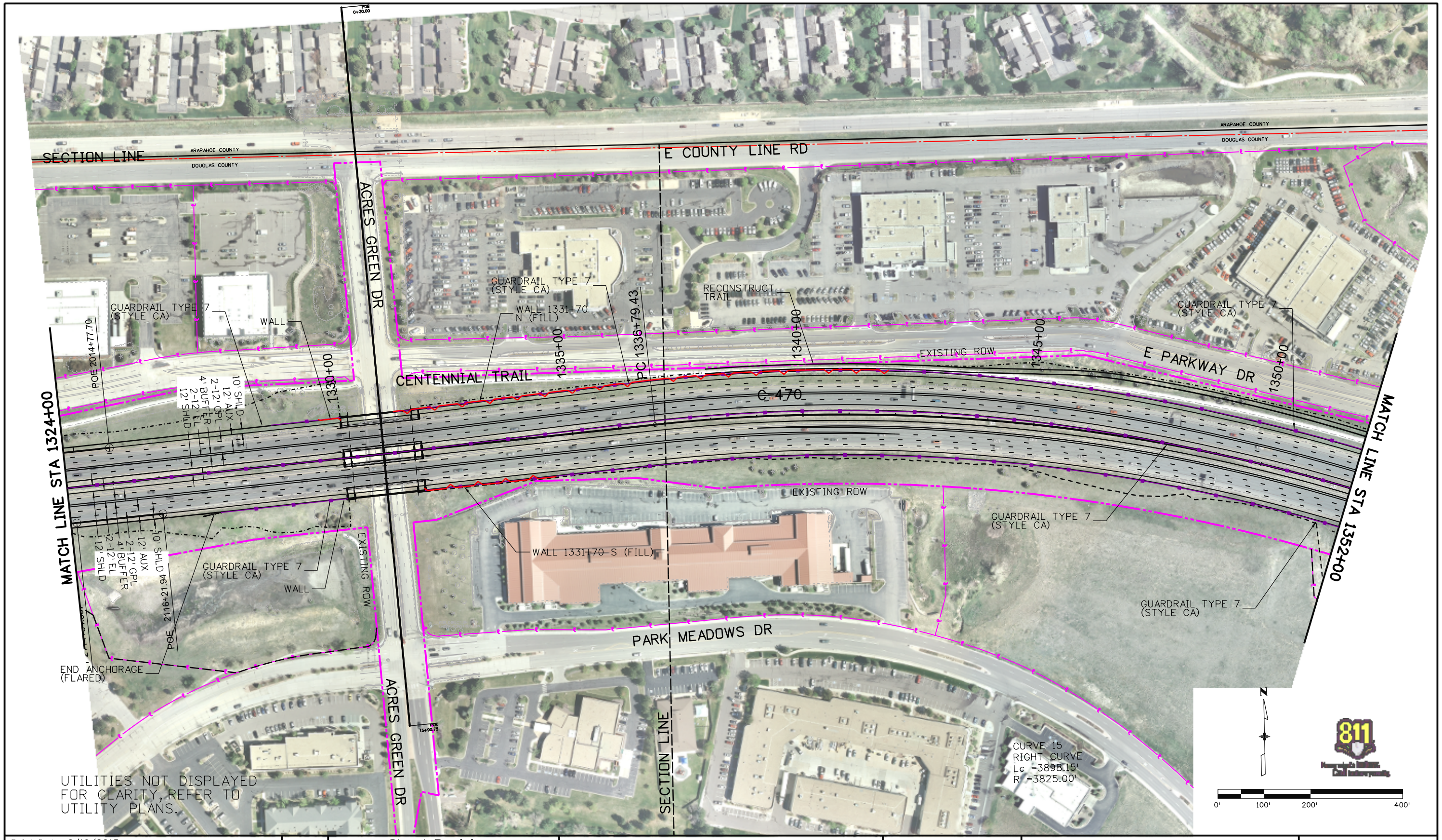

Print Date: 6/19/2015		Sheet Revisions			Colorado Department of Transportation
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Horiz. Scale: 1:200	Vert. Scale: As Noted				Region 1 JKE
Unit Information	Unit Leader Initials				

As Constructed	C-470 ULTIMATE ROADWAY PLAN SHEET			Project No./Code
No Revisions:	Designer: BSH	Structure Numbers		C4701 124
Revised:	Detailer: DWS			18999
Void:	Sheet Subset: ULT PLAN	Subset Sheets: 25 of 30		Sheet Number

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Print Date: 6/19/2015			
File Name: 18999RDWY_ULT_Plan026			
Horiz. Scale: 1:200	Vert. Scale: As Noted		
Unit Information	Unit Leader Initials		

Sheet Revisions

Date:	Comments	Init.

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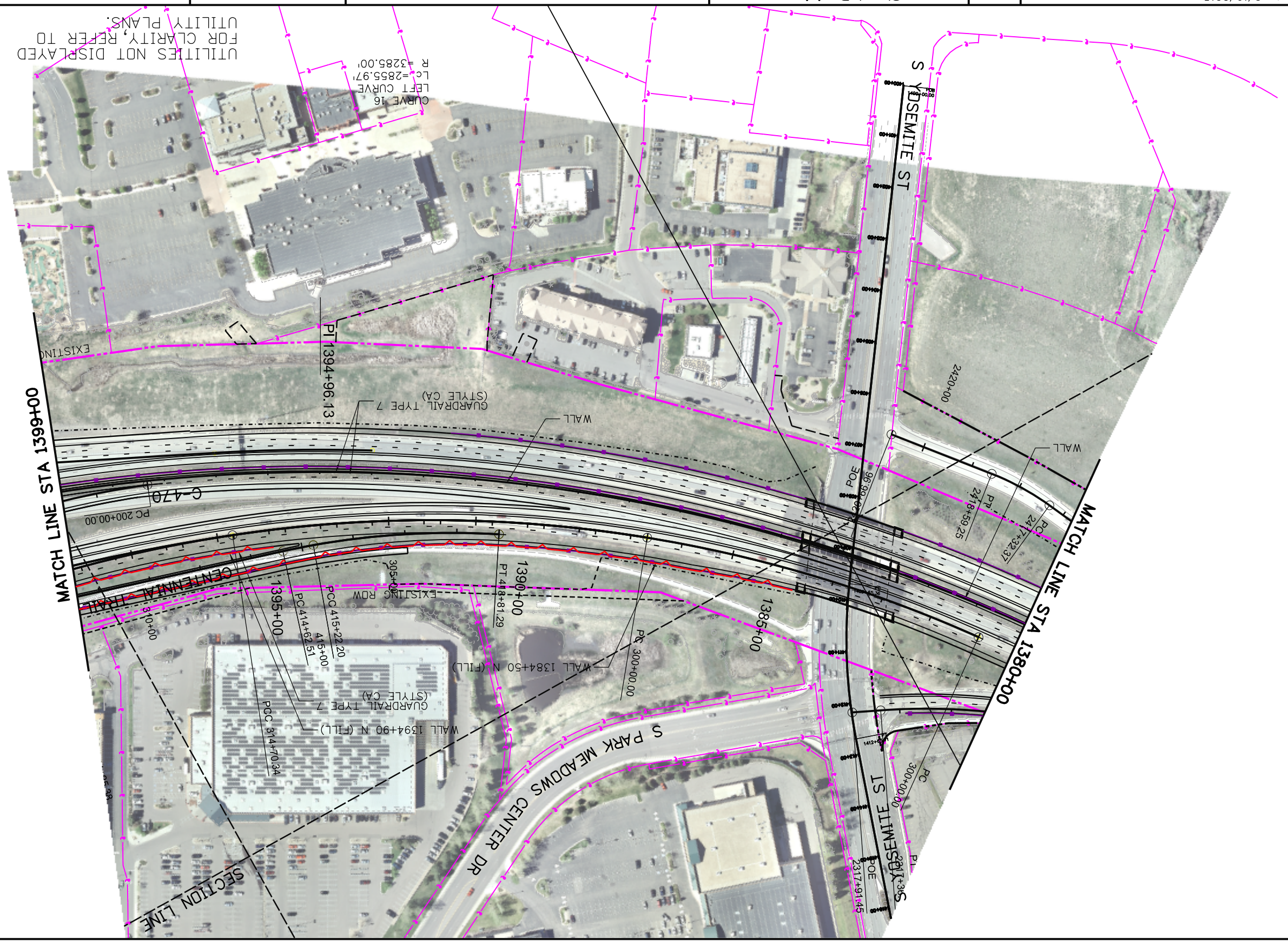
C-470 ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets:	26 of 30

Project No./Code
C4701 124
18999
Sheet Number



UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

Sheet Revisions		
Date:	Comments	Init.

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Print Date: 6/19/2015	
File Name: 18999RDWY_ULT_Plan027	
Horiz. Scale: 1:200	Vert. Scale: As Noted
Unit Information	Unit Leader Initials

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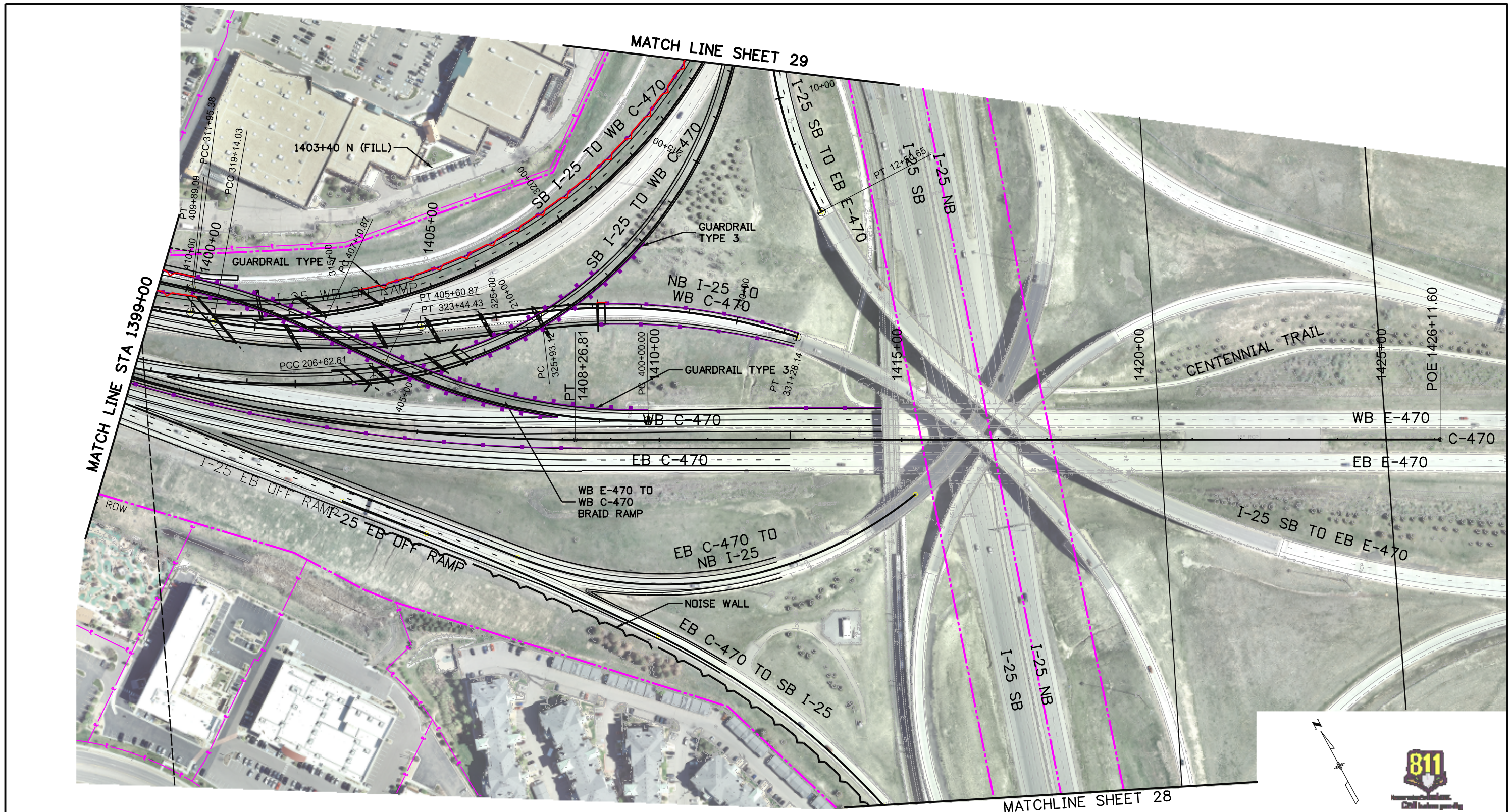
ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset: ULT PLAN		Subset Sheets: 27 of 30	

Project No./Code	Sheet Number
C4701 124	18999



UTILITIES NOT DISPLAYED FOR CLARITY, REFER TO UTILITY PLANS.

Print Date: 6/19/2015		Sheet Revisions			Colorado Department of Transportation
File Name: 18999RDWY_ULT_Plan028		Date:	Comments	Init.	2000 South Holly Street
Horiz. Scale: 1:200 Vert. Scale: As Noted					Denver, CO 80222
Unit Information Unit Leader Initials					Phone: 303-757-9295 FAX: 303-757-9963
					Region 1 JKE

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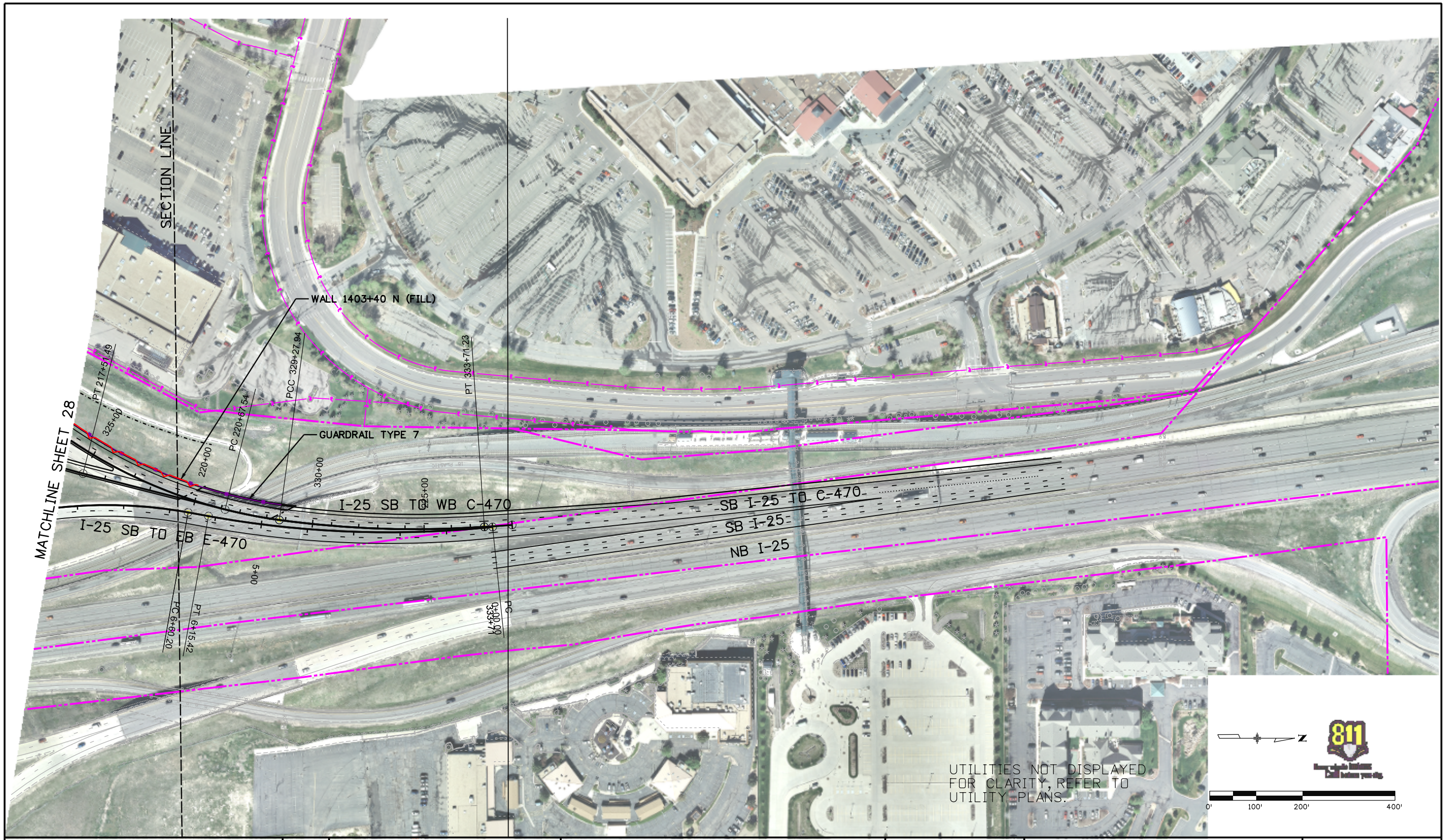
No Revisions:	Designer: BSH	Structure Numbers	C4701 124
Revised:	Detailer: DWS		18999
Void:	Sheet Subset: ULT PLAN	Subset Sheets: 28 of 30	Sheet Number



Print Date: 6/19/2015	Sheet Revisions		
File Name: 18999RDWY_ULT_Plan029	Date:	Comments	Init.
Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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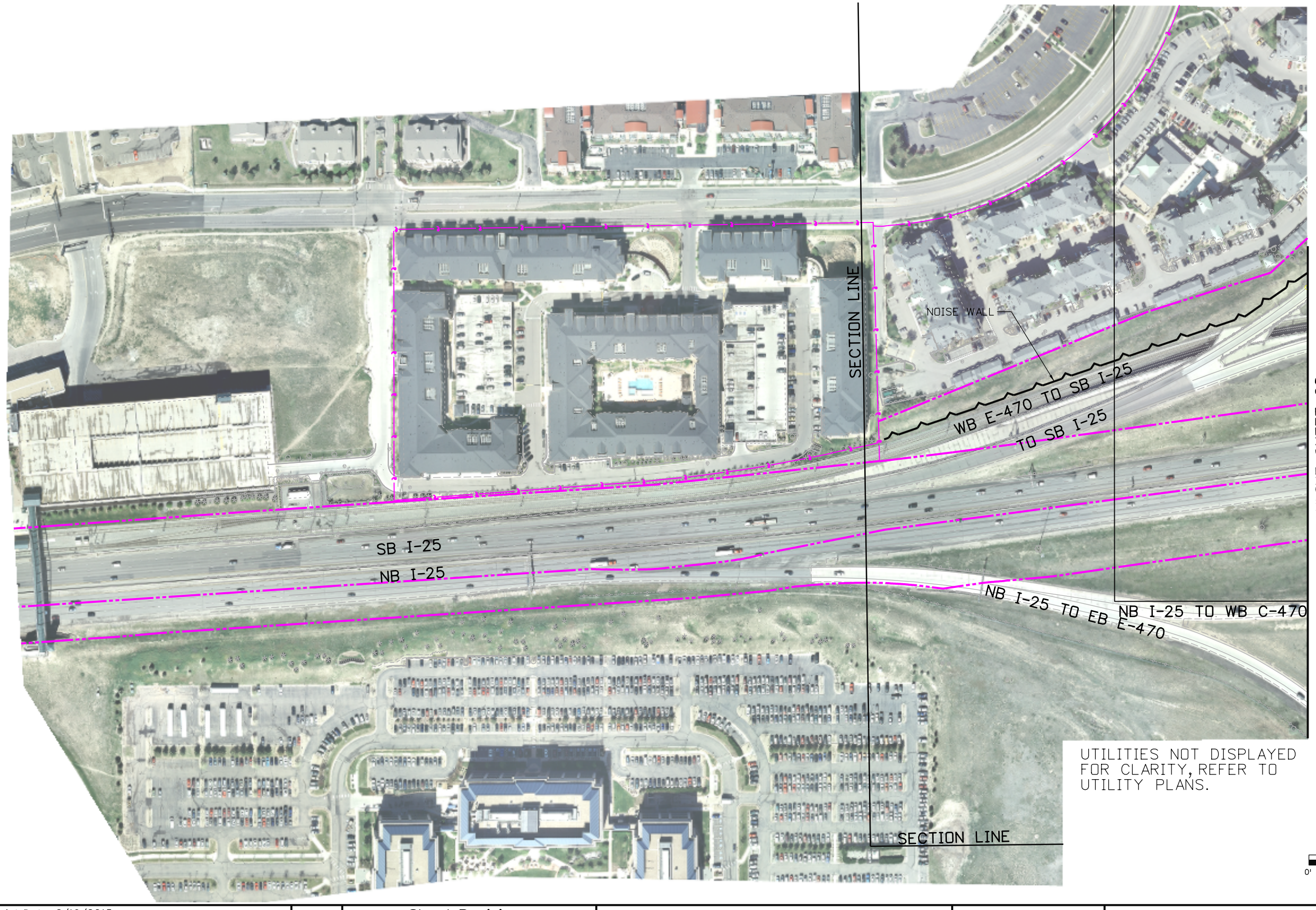
C-470 ULTIMATE ROADWAY PLAN SHEET

Designer:	BSH	Structure Numbers	
Detailer:	DWS		
Sheet Subset:	ULT PLAN	Subset Sheets:	29 of 30

Project No./Code
C4701 124
18999
Sheet Number



Print Date: 6/19/2015	Sheet Revisions		
File Name: 18999RDWY_ULT_Plan030	Date:	Comments	Init.
Horiz. Scale: 1:200 Vert. Scale: As Noted			
Unit Information Unit Leader Initials			

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As Constructed
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Revised:
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C-470 ULTIMATE
ROADWAY PLAN SHEET

Designer: BSH
Detailer: DWS
Sheet Subset: ULT PLAN
Structure Numbers
Subset Sheets: 30 of 30

Project No./Code
C4701 124
18999
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APPENDIX D
Noise Analysis Abatement Details

For the C-470 Corridor
Revised Environmental Assessment

July 2015

PURPOSE AND CONTENTS OF THIS APPENDIX

Table 4-9 in the C-470 Revised Environmental Assessment indicates the results of noise abatement analysis for a number of sites along the corridor. The 17 pages which follow provide additional detail regarding the noise abatement analysis. This information is presented here in concise form for the reader's convenience. Additional technical detail for each site, including predicted future sound levels for individual receptors, is contained in the full Noise Technical Report in **Appendix E**.

The discussion presented in this appendix covers the following analyses in the order listed below.

Location	Exceeds Noise Criterion		Potential Mitigation		
	No-Action	Proposed Action	Feasible	Reasonable	Recommended
RESIDENTIAL AREAS (west to east)					
Redstone Ranch	No	No	n/a	n/a	No
Chatfield Bluffs	Yes	Yes	Yes	No	No
Meadowbrook	Yes	Yes	Yes	No	No
Chatfield Avenue	Yes	Yes	Yes	Yes	**YES**
Columbine Hills	Yes	Yes	Yes	No	No
Wolhurst	No	No	n/a	n/a	**REPLACE**
Littleton Commons	Yes	Yes	Yes	Yes	**YES**
Villas at Verona	Yes	Yes	Yes	Yes	**YES**
Bluffs Apartments	Yes	Yes	Yes	Yes	**YES**
Township at Highlands Ranch	No	Yes	No	n/a	No
Highlands Ranch Dad Clark	Yes	Yes	Yes	No	No
Highlands Ranch, Venneford Ranch	Yes	Yes	Yes	No	No
Three Complexes* (listed below)	Yes	Yes	Yes	Yes	**YES**
Shadow Canyon	Yes	Yes	Yes	Yes	**YES**
Gleneagles Village	No	Yes	Yes	No	No
Palomino Park	Yes	Yes	Yes	No	No
Crest	Yes	Yes	Yes	Yes	**YES**
PARKS AND RECREATION AREAS					
16 resources	Please see Noise Technical Report				No
COMMERCIAL OUTDOOR AREAS					
On the Border, LODO, and Brothers	Please see Noise Technical Report				No

* Autumn Chase, Copper Canyon and Copper Ranch apartments

Redstone Ranch

Redstone Ranch is a multi-storied residential complex north of C-470 between Wadsworth Boulevard and Kipling Parkway. Noise levels were predicted at each of 41 receptor locations for both existing and Proposed Action conditions. No receptors equal or exceed CDOT impact criteria for residential properties. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

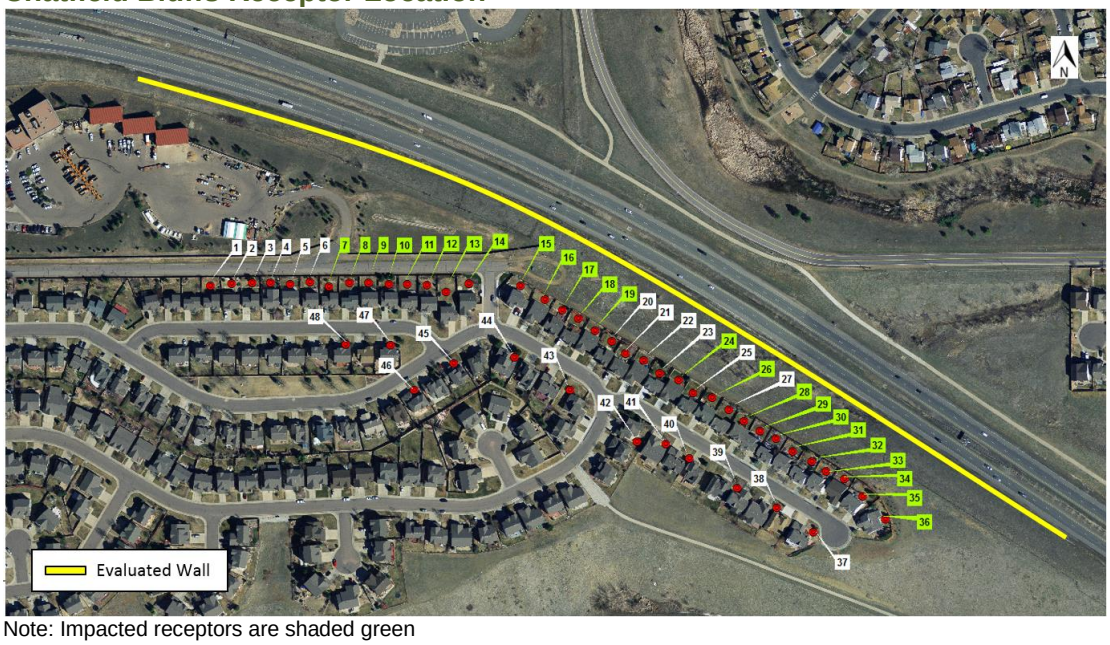
Redstone Ranch Receptor Locations

Note: Impacted receptors are shaded green

Chatfield Bluffs

Chatfield Bluffs is a single-family residential development south of C-470 between Wadsworth Boulevard and Kipling Parkway. Noise levels were predicted at each receptor location for both existing and Proposed Action conditions.

Chatfield Bluffs Receptor Location



Note: Impacted receptors are shaded green

Chatfield Bluffs Noise Impact Assessment

Twenty-four receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,500 feet long averaging and 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$2,081,250	(Cost of wall = 2,500 feet long x 18.5 feet tall x $45/sf = $2,081,250)
÷ 165.8	(Total dB(A) reduction for the 24 receptors with equal to or greater than 5 dB(A) reduction)
$12,553	(Cost Benefit Index, cost per dB(A) per receptor)

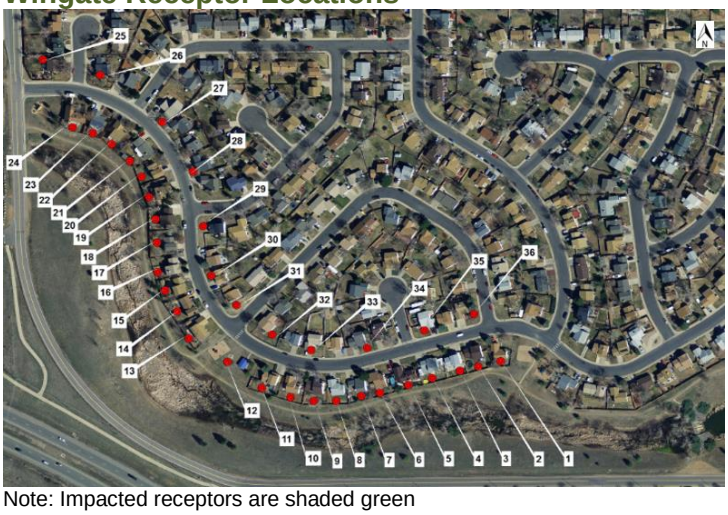
The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wingate

Wingate is a single-family residential development north of C-470 between Wadsworth Boulevard and Kipling Parkway.

No receptors equal or exceed CDOT impact criteria for residential properties. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wingate Receptor Locations

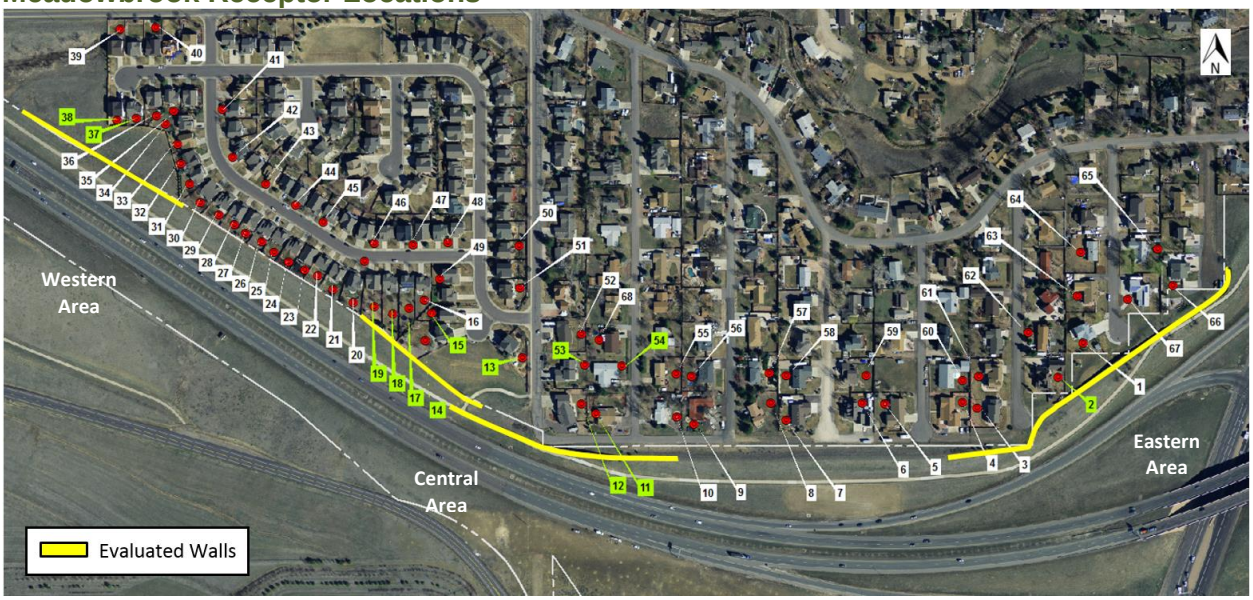


Note: Impacted receptors are shaded green

Meadowbrook

Meadowbrook is a single-family residential development north of C-470 between Wadsworth Boulevard and Kipling Parkway.

Meadowbrook Receptor Locations



Note: Impacted receptors are shaded green

Thirteen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The impacted receptors were grouped in three distinct areas: the western area beyond the existing rise in the topography; the central area between the western rise in topography and the eastern berm; and the eastern area of the community near Wadsworth Avenue.

Western - The optimal wall providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 485 feet long and averaging 18.4 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$401,580	(Cost of wall = 485 feet long x 18.4 feet tall x $45/sf = $401,580)
÷ 18.9	(Total dB(A) reduction for the 3 receptors with equal to or greater than 5 dB(A) reduction)
$21,248	(Cost Benefit Index, cost per dB(A) per receptor)

Central – The optimal wall configuration, providing the greatest noise reduction for impacted receptors per square foot of wall, was a combination of a 485 long wall with an average height of 13.5 feet and 340 foot long wall with an average height of 19.2, and a 410 foot long extension of the existing wall with and average extension of 8 feet. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$294,638	(Cost of 1st segment of combined wall = 485 feet long x 13.5 feet tall x $45/sf = $294,638)
$293,760	(Cost of 2nd segment of combined wall = 340 feet long x 19.2 feet tall x $45/sf = $293,760)
$147,600	(Cost of 3rd segment of combined wall = 410 feet long x 8 feet tall x $45/sf = $147,600)
$735,998	Total
÷ 58.3	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
$12,624	(Cost Benefit Index, cost per dB(A) per receptor)

Eastern - The optimal wall providing the greatest noise reduction was a combination of filling in the gap between two existing noise walls (68 foot long by 12 feet high) and an extension up of on existing wall (400 feet long by 10 feet high). The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$36,720	(Cost of gap segment of combined wall = 68 feet long x 12 feet tall x $45/sf = $36,720)
$180,000	(Cost of extension segment of combined wall = 400 feet long x 10 feet tall x $45/sf = $180,000)
$216,720	Total
÷ 7.0	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
$30,960	(Cost Benefit Index, cost per dB(A) per receptor)

In summary, the Cost Benefit Index for walls in each of these area is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Chatfield Avenue

Chatfield Avenue is a single family residential development north of C-470 between Santa Fe Drive and Wadsworth Boulevard.

Chatfield Avenue Receptor Locations

Note: Impacted receptors are shaded green

Chatfield Avenue Noise Impact Assessment

Fourteen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 900 feet long and averaging 13.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$546,750	(Cost of wall = 900 feet long x 13.5 feet tall x $45/sf = $546,750)
÷ 83.1	(Total dB(A) reduction for the 14 receptors with equal to or greater than 5 dB(A) reduction)
$6,579	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Columbine Hills

Columbine Hills is a single-family residential development north of C-470 between Santa Fe Drive and Wadsworth Boulevard.

Columbine Hills Receptor Locations

Note: Impacted receptors are shaded green

Ten receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, which is an extension of the existing wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,200 feet long and 20 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

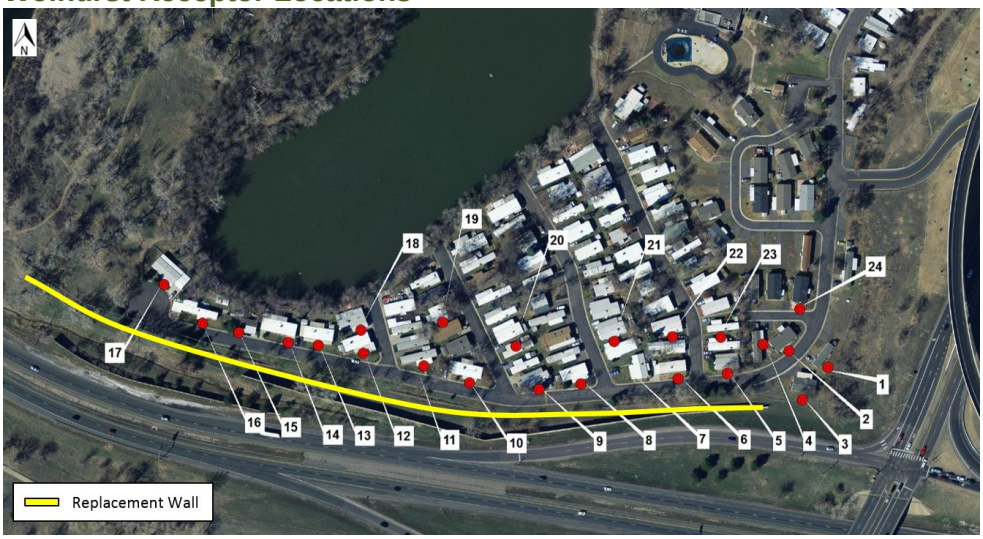
$1,080,000	(Cost of wall = 1,200 feet long x 20 feet tall x $45/sf = $1,080,000)
÷ 5.6	(Total dB(A) reduction for all receptors with equal to or greater than 5 dB(A) reduction)
$192,857	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Wolhurst

Wolhurst is a single family residential development on the northwest quadrant of C-470 and Santa Fe Drive. The Wolhurst community has a pair of overlapping noise walls adjacent to C-470 totaling approximately 1,675 linear feet that were installed as part of the Santa Fe interchange improvements. These existing noise walls will be impacted by the Proposed Action due to the realignment of the westbound on-ramp and will be relocated and replaced in kind as part of this project. Preliminary analysis indicates the need for a single, continuous wall approximately 1,500 feet long and 15.5 feet tall.

Wolhurst Receptor Locations



Littleton Commons

Littleton Commons is a multi-storied residential complex currently under construction, with approved plans from the City of Littleton, north of C-470 between Broadway and Santa Fe Drive.

Littleton Commons Receptor Locations (each site has multiple levels)

Note: Impacted receptors are shaded green

Twenty-seven receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. Much of the complex is well below the grade of the roadway, thus the optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,200 feet long and 7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

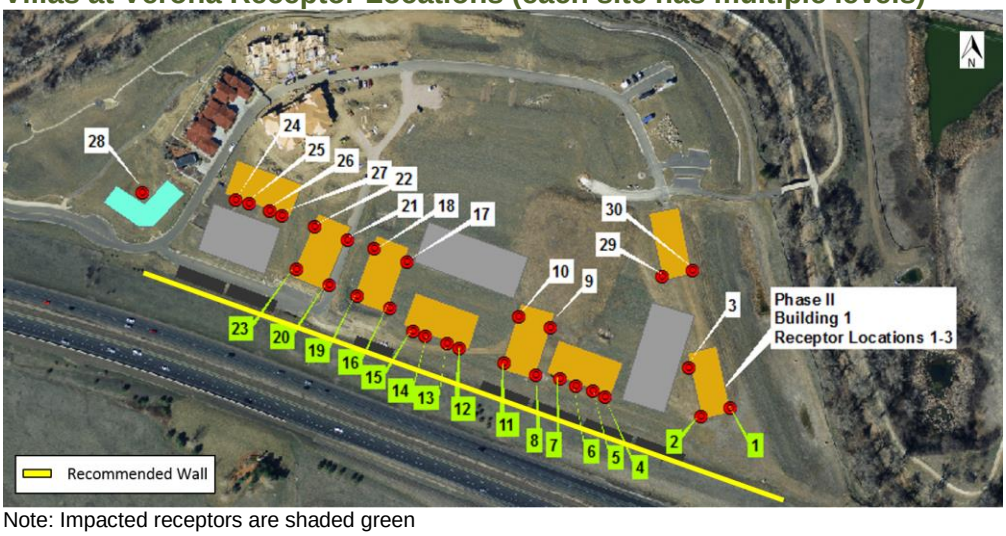
$693,000	(Cost of wall = 2,200 feet long x 7 feet tall x $45/sf = $693,000)
÷ 226.7	(Total dB(A) reduction for the 36 receptors with equal to or greater than 5 dB(A) reduction)
$3,057	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Villas at Verona

Villas at Verona is a multi-storied residential complex currently under construction north of C-470 between Broadway and Santa Fe Drive.

Villas at Verona Receptor Locations (each site has multiple levels)



Note: Impacted receptors are shaded green

Fifty-nine receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,720 feet long and 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$1,431,900	(Cost of wall = 1,720 feet long x 18.5 feet tall x $45/sf = $693,000)
÷ 647.8	(Total dB(A) reduction for the 74 receptors with equal to or greater than 5 dB(A) reduction)
$2,210	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Bluffs at Highlands Ranch

Bluffs at Highlands Ranch is a multi-storied residential complex north of C-470 between Broadway and Santa Fe Drive.

Bluffs at Highlands Ranch Receptor Locations (each site has multiple levels)

Note: Impacted receptors are shaded green

Twenty-eight receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,200 feet long and 17.7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$955,800	(Cost of wall = 1,200 feet long x 17.7 feet tall x $45/sf = $955.800)
÷ 151.3	(Total dB(A) reduction for 28 receptors with equal to or greater than 5 dB(A) reduction)
$6,317	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Township at Highlands Ranch

Township at Highlands Ranch is a single-family residential development north of C-470 and County Line Road between University Boulevard and Broadway.

Township at Highlands Ranch Receptor Locations

Note: Impacted receptors are shaded green

Twelve receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. A 1,700 feet long and 20 feet tall wall was evaluated along C-470 right-of-way. This wall was predicted to not provide the design goal of 7 dB(A) noise reduction or the minimum of 5 dB(A) of noise reduction (insertion loss) for any receptors. The lack of acoustic efficiency of the wall along C-470 is primarily due to the County Line Road traffic noise generated at a far closer proximity to the residences than C-470. This wall would cost $1,530,000. Because this wall does not provide the design goal noise reduction to any receptors, there is no Benefit Cost Index for this wall within CDOT ROW. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further need to be evaluated.**

Highlands Ranch Dad Clark

Highlands Ranch Dad Clark area is a single-family residential development south of C-470 between University Boulevard and Broadway. While this is one neighborhood, the existing berm located in the middle of the neighborhood frontage splits these homes from a noise perspective. Thus in an effort to focus on the specific needs of each area the evaluation was split into the western and eastern sections.

Highlands Ranch Dad Clark Receptor Locations

Note: Impacted receptors are shaded green

Western Highlands Ranch Dad Clark Receptor Locations

Note: Impacted receptors are shaded green

Seventeen receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,400 feet long and averaging 16.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$1,039,500	(Cost of wall = 1,400 feet long x 16.5 feet tall x $45/sf = $1,039,500)
÷ 112.2	(Total dB(A) reduction for the 18 receptors with equal to or greater than 5 dB(A) reduction)
$9,265	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Eastern Highlands Ranch Dad Clark Receptor Locations

Note: Impacted receptors are shaded green

Twenty-seven receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, is 1,900 feet long and averaging 18.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

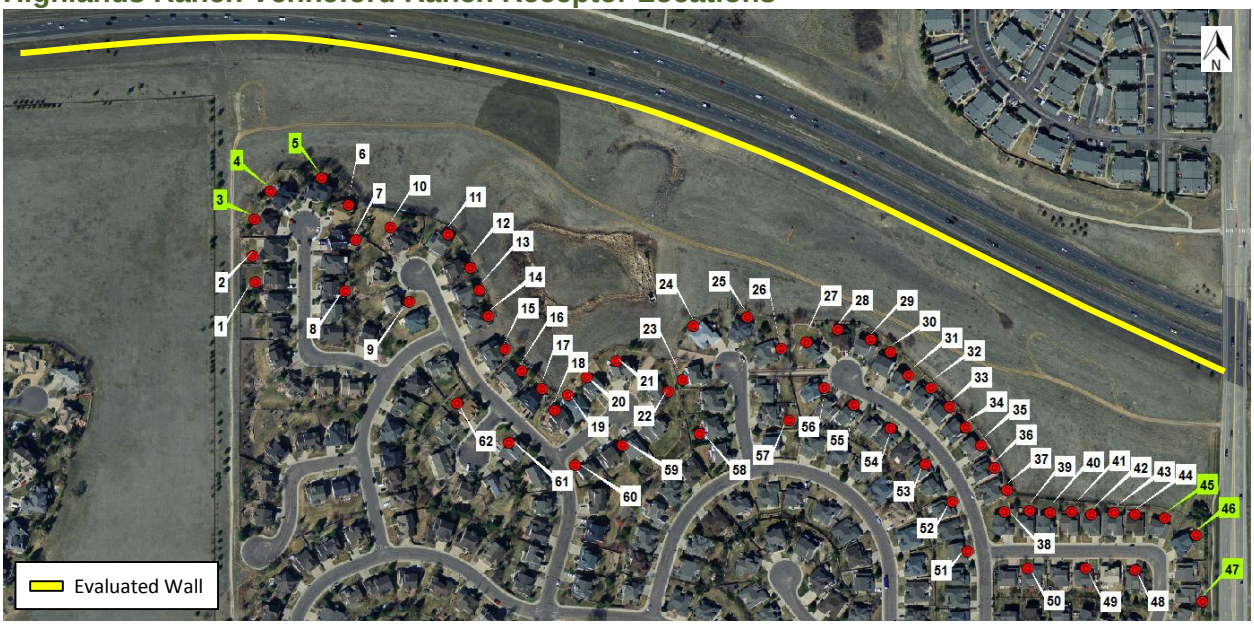
$1,581,750	(Cost of wall = 1,900 feet long x 18.5 feet tall x $45/sf = $1,581,750)
÷ 163.5	(Total dB(A) reduction for the 26 receptors with equal to or greater than 5 dB(A) reduction)
$9,674	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Highlands Ranch Venneford Ranch

Highlands Ranch Venneford Ranch is a single-family residential development south of C-470 between Colorado Boulevard and University Avenue.

Highlands Ranch Venneford Ranch Receptor Locations



Note: Impacted receptors are shaded green

Six receptors equal or exceed CDOT impact criteria for residential and thus per CDOT policy are considered impacted. A 3,330 feet long and 20 feet tall wall was evaluated along C-470 right-of-way from Colorado Boulevard west. This wall was predicted to be the optimal wall providing the most positive Cost Benefit Index calculation for the impacted receptors in addition to providing benefits to approximately 20 additional non-impacted residences which improved the Cost Benefit Index calculation. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$2,997,000	(Cost of wall = 3,330 feet long x 20.0 feet tall x $45/sf = $2,997,000)
÷ 119.4	(Total dB(A) reduction for the 22 receptors with equal to or greater than 5 dB(A) reduction)
$25,101	(Cost Benefit Index, cost per dB(A) per receptor)

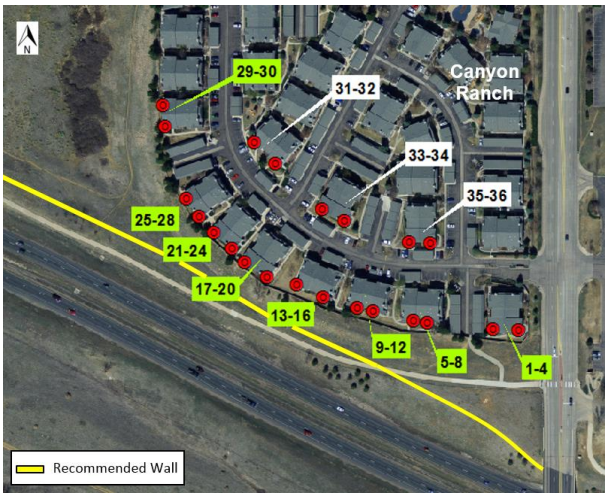
The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier and the design goal of 7 dB(A) was not achieved with the 20 foot wall. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Autumn Chase, Copper Canyon, and Canyon Ranch (ACC)

Autumn Chase, Copper Canyon and Canyon Ranch are a series of multi-storied residential complexes north of C-470, extending from Colorado Boulevard approximately 3,800 feet west. Based on the close proximity of these complexes the mitigation for these sites is interrelated and thus they were evaluated together.

Autumn Chase, Copper Canyon and Canyon Ranch Receptor Locations

Note: Impacted receptors are shaded green



Note: Impacted receptors are shaded green

One hundred receptors equal or exceed CDOT Impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal combination of walls providing the greatest noise reduction for impacted receptors per square foot of wall, was a 4,330 feet long and 15.75 feet tall wall north of C-470 and a 390 foot long 8 feet high wall west of Colorado Boulevard all within CDOT ROW. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$3,068,888	(Cost of wall = 4,330 feet long x 15.75 feet tall x $45/sf = $3,068,888)
÷ 724.5	(Total dB(A) reduction for the 87 receptors with equal to or greater than 5 dB(A) reduction)
$4,236	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Shadow Canyon

Shadow Canyon is a multi-storied residential complex south of C-470 between Colorado Boulevard and Quebec.

Shadow Canyon Receptor Location

Note: Impacted receptors are shaded green

Forty-one receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,700 feet long and averaging 18.7 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$1,430,550	(Cost of wall = 1,700 feet long x 18.7 feet tall x $45/sf = $1,430,550)
÷ 251.7	(Total dB(A) reduction for the 39 receptors with equal to or greater than 5 dB(A) reduction)
$5,684	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Gleneagle Village

Gleneagle Village is a single-family residential development south of C-470.

Gleneagle Village Receptor Locations

Note: Impacted receptors are shaded green

Seven receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 1,100 feet long and averaging 16.9 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$836,550	(Cost of wall = 1,100 feet long x 16.9 feet tall x $45/sf = $836,550)
÷ 54.6	(Total dB(A) reduction for the 9 receptors with equal to or greater than 5 dB(A) reduction)
$15,321	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Palomino Park

Palomino Park is a multi-storied residential complex south of C-470 between Colorado Boulevard and Quebec.

Palomino Park Receptor Locations

Note: Impacted receptors are shaded green

Eight receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 800 feet long and 17.5 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$630,000	(Cost of wall = 800 feet long x 17.5 feet tall x $45/sf = $630,000)
÷ 42.0	(Total dB(A) reduction for the 8 receptors with equal to or greater than 5 dB(A) reduction)
$15,000	(Cost Benefit Index, cost per dB(A) per receptor)

The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at this location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Crest

Crest is a multi-storied residential complex in the southwest quadrant of C-470 and I-25.

Crest Receptor Locations (each site has multiple levels)

Note: Impacted receptors are shaded green

Seventy-six receptors equal or exceed CDOT impact criteria for residential, primarily on the upper floors, and thus per CDOT policy are considered impacted. The optimal wall, providing the greatest noise reduction for impacted receptors per square foot of wall, was roughly 2,300 feet long and 18.2 feet tall. The Benefit Cost Index for this wall location within CDOT ROW is calculated as:

$1,883,700	(Cost of wall = 2,300 feet long x 18.2 feet tall x $45/sf = $1,883,700)
÷ 493.0	(Total dB(A) reduction for the 82 receptors with equal to or greater than 5 dB(A) reduction)
$3,821	(Cost Benefit Index, cost per dB(A) per receptor)

This wall does meet CDOT/FHWA feasibility criteria and the Cost Benefit Index is within the $6,800 threshold for a reasonable barrier. **Mitigation, a noise wall, at this location is recommended.**

Recreational Resources

Recreational resources are distributed across the entire C-470 corridor. These resources include a pool, golf courses, athletic fields, trails, playgrounds, and non-profit institutional offices. One receptors was identified for each location adjacent to C-470 where people congregate, e.g. golfing tee boxes, golfing greens, pools, benches, major path connections, and athletic fields. Noise levels were developed for these outdoor use areas.
Noise mitigation at these location does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.

4.8 Noise Sensitive Commercial Properties

This corridor has mix of residential and commercial land uses along the entire length. Four noise sensitive commercial properties were identified. Walls were reviewed for each impacted site. The Cost Benefit Index is over the $6,800 threshold and thus fails the criteria for a reasonable barrier. **Noise mitigation at these locations does not meet CDOT/FHWA criteria for implementation and thus mitigation at this location is not recommended and no further abatement criteria need to be evaluated.**

Statement of Likelihood and Summary of Recommendations

The feasibility and reasonableness of the mitigation recommendations in this document are based on the preliminary analysis using current level of design and available information. The ultimate feasibility and reasonableness determinations may change due to changes in final project design after approval of the environmental document. The preliminary location and physical description of noise abatement measures determined to be feasible and reasonable are described throughout this document and summarized in the table and figure which follow. The final noise abatement decision will be made during the completion of the project's final design and the public involvement processes.

Summary of Recommended Noise Mitigation

Location	NAC	Type	Mitigation Type	Description (approximate)
Chatfield Avenue	B	Single Family	Wall	900 feet long x 13.5 feet tall
Wolhurst (replacement)	B	Single Family	Wall	1,500 feet long x 15.5 feet tall
Littleton Commons	B	Multi-family	Wall	2,200 feet long x 7 feet tall
Villas at Verona	B	Multi-family	Wall	1,720 feet long x 18.5 feet tall
Bluffs at Highlands Ranch	B	Multi-family	Wall	1,200 feet long x 17.7 feet tall
Autumn Chase, Copper Canyon, and Canyon Ranch	B	Multi-family	Wall	4,330 feet long x 15.75 feet tall
Shadow Canyon	B	Multi-family	Wall	1,700 feet long x 18.7 feet tall
Crest	B	Multi-family	Wall	2,300 feet long x 18.2 feet tall

Location of Residential Sites Analyzed and Recommended Mitigation