

Introduction

Stream crossings are structures designed to allow the movement of people or equipment across streams. The long-term effectiveness of a stream crossing generally depends on the applicability of the crossing type, proper design and installation, and long-term maintenance needs.

This document is intended to provide general information and technical guidance on the process for designing and constructing a permanent, private stream crossing in Larimer County. It does not substitute for the use of sound engineering judgment nor does it relieve the user of the responsibility of identifying site specific considerations. In the event of a conflict with an adopted regulation (e.g., on some technical detail or procedural question), the adopted regulation shall govern.

Section I provides basic information on getting started with the permitting process. Section II walks through the various steps of the permitting process and explains purpose of each step. Section III provides technical guidance for meeting Larimer County Engineering Standards.

SECTION I – GETTING STARTED

Starting a stream crossing project can be a daunting task. Getting in touch with the right people at the outset can help process go more smoothly. The following are the first points-of-contact that should be established before proceeding with a private stream crossing design.

Community Development Block Grant – Disaster Recovery (CDBG-DR)

Residents may be eligible to receive Community Development Block Grant – Disaster Recovery (CDBG-DR) funds for home access repair or replacement. Home Access can include private roads, bridges, culverts and driveways. All owner-occupied home owners with private access needs are invited to apply. Applicants may contact the Loveland Housing Authority, the managing agent for *CDBG-DR individual assistance funds*, at 970-667-3232 and request to speak to a Disaster Recovery staff person. You may email them at airwi@lovelandhousing.org with questions or to receive an application.

Applicants are strongly encouraged to meet with one of the contacts above **before** starting any bridge or culvert project due to strict eligibility requirements associated with funding.

Engineering Consultant

Most Applicants with a private access stream crossing will need the assistance of a Professional Engineer (P.E.) registered in the State of Colorado. Stream crossing designs typically require specialized knowledge of stream hydraulics and structural design. In general, hydraulic analyses are conducted to ensure that a crossing is sufficient for passing minor floods, will not adversely affect other property owners, and will not cause water to scour the streambed or the crossing during flood events. Structural analyses ensure that a crossing can safely carry its design loads (e.g., pedestrians, vehicular traffic, emergency vehicles, etc.). If the project qualifies for the Home Access funding administered by the Loveland housing Authority this engineering design support will be managed by Larimer County.

Larimer County

Larimer County Staff and their engineering consultants will review and evaluate all documents submitted to the County for the purpose of obtaining County permits for permanent stream crossings. Larimer County Engineering Staff will be the primary point of contact for the Applicant since the floodplain requirements can be complex and may require significant technical guidance. The primary points of contacts for Larimer County Engineering Staff are Eric Tracy at (970)498-5729, etracy@larimer.org or Crystal Lesmeister at (970) 498-5732, clesmeister@larimer.org.

SECTION II – THE PERMITTING PROCESS

The permitting process for permanent private stream crossings involves several steps and requires coordination with a number of different entities. The following provides an outline of the general steps for obtaining the appropriate permits and approvals for the installation of a private stream crossing in Larimer County. Please remember that this list may not be all inclusive. Requirements may vary depending on site specific considerations.

Pre-Application Meeting

Prior to beginning any work on a stream crossing, an initial meeting between the Applicant, the Applicant's P.E., and the Larimer County Engineering Department Staff is required. The purpose of this meeting is to explain the general permitting process, gain a better understanding of design considerations, outline permitting requirements, and agree upon the best available data and the modeling approach. Engineering Staff will also go over the Stream Crossing Application with the Applicant and their Engineer to address any concerns about floodplain modeling requirements.

Permit Applications

A permanent stream crossing typically requires a number of different permits from various agencies. The following is a summary of the most common types of permits and their general requirements. Keep in mind that permit requirements are site specific and the requirements for your project may differ from this list.

Larimer County Stream Crossing Application

The Larimer County [Stream-Crossing Application](#) is used to by the Engineering Department to record pertinent project information to outline site specific engineering design considerations.

Prior to the pre-application meeting, the Applicant should submit the Stream Crossing Application to the Larimer County Engineering Department. Engineering Staff will perform an initial evaluation of the proposed crossing, outline the floodplain modeling requirements, and identify any known special or unique circumstances. In some instances, Engineering Staff may recommend that the project be placed on hold if adjacent county road or state highway work could impact the crossing design.

Typically, the Stream Crossing Application form will be reviewed, agreed upon, and finalized by Engineering Staff, the Applicant, and the Applicant's Engineer during the pre-application meeting. This will serve as a basis for any hydrologic or hydraulic modeling that is required the Larimer County Engineering Department.

Floodplain Special Review

Stream crossings typically require a [Flood Review Board Application](#) to the Flood Review Board through the [Floodplain Special Review process](#). The application fee is \$400.

In some instances, such as flood recovery, a [Floodplain Special Review waiver](#) may be granted to expedite the review process. If a Floodplain Special Review waiver is obtained, the application will be reviewed by County Engineering Staff or by the County's engineering consultants rather than the Flood Review Board. The waiver fee is \$400. Please note that even if a waiver is granted, the Applicant is still responsible for meeting all Floodplain Special Review criteria outlined in Larimer County [Land Use Code Section 4.2.2.G.6](#).

Larimer County Floodplain Development Permit

A Larimer County Floodplain Development Permit is required for any work within the regulatory floodplain. The purpose of the Floodplain Development Permit is to ensure the project is in compliance with the National Flood Insurance Program (NFIP) requirements and meets the Larimer County floodplain regulations outlined in Section 4.2.2 of the Larimer County Land Use Code. There is no application fee for a [Floodplain Development Permit](#).

Please keep in mind that the issuance of a Floodplain Development Permit often requires hydrologic and/or hydraulic modeling analysis. The modeling and the associated calculations and certifications must be stamped by a Colorado P.E. Modeling requirements may vary depending on site specific requirements and the availability of existing data. Typically, the modeling requirements and available data will be discussed and agreed upon during the pre-application meeting. The Applicant's P.E. should work with Engineering Department Staff to address any modeling questions and to obtain the best available data for the project area. The primary points of contact for Larimer County Engineering are Eric Tracy at (970) 498-5729, etracy@larimer.org or Crystal Lesmeister at (970)498-5732, clesmeister@larimer.org. More information on typical floodplain modeling requirements is provided in Section III.

Larimer County Building Permit

A Larimer County Building Permit is required for new construction of a stream crossing or for repairs to a crossing when the work is not already covered under a separate County permit and when the proposed crossing meets any of the criteria below:

1. Any vehicular bridge, including a private bridge on private land.
2. Any pedestrian bridge that is intended for public use.
3. Any culvert or private pedestrian bridge that crosses a drainage shown on the County [Major Drainage Area of Interest Map](#).

For more information on the Larimer County Building Permit requirements for stream crossings, contact:

Eric Fried, Chief Building Official
Building Department
200 West Oak Street – 3rd Floor
Fort Collins, CO 80522
(970)498-7705

Additional information is available regarding [private pedestrian or vehicular bridges and culverts](#) in Larimer County.

U.S. Army Corp of Engineers 404 Permit

A permit from the U.S. Army Corp of Engineers (USACE) may be required for work in or around rivers. Under Section 404 of the Clean Water Act, a permit is required for the discharge of dredged or fill material into waters of the United States. Many waterbodies and wetlands in the nation are waters of the United States and are subject to the USACE's regulatory authority. The USACE regulatory office for Larimer County is the Denver Regulatory Office located in Littleton, CO. The Denver Regulatory Office can be contacted at:

Denver Regulatory Office
9307 South Wadsworth Blvd
Littleton, CO 80128
(303)979-4120

More detailed information regarding USACE permits can be found online at <http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/ObtainPermit.aspx>.

Access

If the stream crossing or associated work is located on someone else's property, permission from the property owner(s) is needed. The type of permission that is required will depend on the owner(s) and the type of access desired. The following describes some of the most common access scenarios.

Private Property Owners

If the stream crossing will be located on someone else's property, a road or access easement may be needed. A road or access easement allows access across land that is not under the same ownership. The area and use covered by the easement is usually clearly defined. The easement can then be attached to the property deed so that it will persist even when the property is transferred or sold.

If the installation of the stream crossing or any work related to the installation occurs on someone else's property, a temporary construction easement may be needed. The easement should clearly outline the agreed upon terms and conditions.

Larimer County

A Larimer County [Access Permit](#) is needed for any access onto a mainline (numbered) county road, a County maintained subdivision road, or a Public Improvement District (PID) road with no curb and gutter. An access permit is required whenever a new access is proposed, an existing access is upgraded (paving, new culvert, etc), or a change in use of an existing access (i.e., changing a field access to a residential access, etc.) is requested. Acquisition of the permit is required before any work is done.

Colorado Department of Transportation

To construct, relocate, close, or modify access to a State Highway or when there are changes in the use of such an access point, an Application for Access Permit must be submitted to the Colorado Department of Transportation (CDOT) or to the local jurisdiction serving as the issuing authority for State Highway Access Permits. To obtain more information about CDOT access permits, go to the [CDOT website](#) or contact:

Region 4 (Northeast Colorado)
Colorado Department of Transportation
Region 4 Access Management Unit
1420 2nd Street
Greeley, CO 80631
(970)350-2148 or (970)350-2163
Gloria.Hice-idler@state.co.us
Timothy.Bilobran@state.co.us

Emergency Access

If the crossing is intended to serve as an access for emergency vehicles, it is recommended that the Applicant consult with their local fire department. Factors such as the width and load capacity of the stream crossing may affect response time during an emergency. Consulting with the local fire department helps ensure that the structure meets the needs of emergency responders during a fire or medical emergency.

FEMA Mapping

A FEMA map revision may be required if the proposed stream crossing is located within a Federal Emergency Management Agency (FEMA) regulatory floodplain and it causes a change in the Base Flood Elevations (BFEs), the regulatory floodplain, or the floodway. If a change occurs, it must be shown that the crossing complies with FEMA floodplain regulations by providing a “no-rise” comparison between the existing conditions and the proposed, post-project conditions or by receiving a Conditional Letter of Map Revision (CLOMR) from FEMA. Both demonstrating “no-rise” and applying for a CLOMR generally require a hydraulic computer model that compares existing conditions to proposed conditions and conforms to Larimer County [Land Use Code Section 4.2.2](#). No-rise certifications and CLOMR applications do require certification by a P.E. licensed in Colorado. Further information on CLOMRs can be found in Section III of this document.

Stream Crossing Permit Checklist

When the stream crossing design is complete, review the “[Stream Crossing Checklist](#)” to ensure all applicable requirements have been met and all necessary supporting documents are complete and accurate.

Permit Issuance, Construction, Inspection, and Approval

Once all applicable permits are approved and issued, construction of the stream crossing may begin. Upon completion of construction, documentation is needed for Larimer County approval and permit close-out.

A qualified Colorado registered engineer must provide the Building Department a letter with an original wet stamp verifying:

1. The bridge was inspected during the construction process.
2. The bridge construction was completed pursuant to the approved set of building plans.

To close out the Floodplain Development Permit, the Engineering Department needs the following:

1. As-built plans of the completed stream crossing.
2. As-built hydraulic model.
3. Sign-off for inspection and approval.

SECTION III – TECHNICAL GUIDANCE

The following section provides general technical guidance to meet typical Larimer County Engineering Standards. Please be aware that this general guidance may not apply to every situation and additional design considerations may apply. It is strongly recommended that the Applicant and the Applicant’s P.E. discuss their design plans with Engineering Staff before proceeding with any technical analyses.

Minimum Design Flow Capacity

All new stream crossings must accommodate a minimum design flow capacity. For single property access, a 10-yr design flow is required. For multiple property access, the flow capacity is based on the Larimer County [Rural Area Road Standards](#).

**Larimer County Rural Area Road Standards
Table 6-1 Minimum Standard Design Frequencies**

Peak Flow at Structure (cfs)	Recurrence Interval for Design (years)
Q50 ≤ 500	10
500 CFS < Q50 < 4000	25
Q50 ≥ 4000	50

The most up-to-date hydrology available should be used to meet this criteria. To obtain the appropriate hydrologic data contact the Larimer County Engineering Staff.

Floodplain Modeling

Floodplain modeling may be required to show that the stream crossing adequately accommodates the minimum design flow capacity and meets other applicable design standards. Floodplain modeling may consist of hydrologic modeling, hydraulic modeling, or a combination of the two. Hydrologic modeling is generally required only if applicable hydrologic data are unavailable. Hydraulic modeling, at a minimum, requires an effective/existing conditions simulation and a proposed, post-project conditions simulation. Additional simulations may be required for some situations. The Applicant’s P.E. is encouraged to work with Larimer County Engineering Staff to ensure that current data, appropriate guidelines, and acceptable modeling techniques are used for the floodplain modeling and the Floodplain Development Permit Application.

A FEMA map revision may be required if the proposed stream crossing is located within a regulatory floodplain and it causes a change in the BFEs, the regulatory floodplain, or the floodway. The following describes the two revision processes that may be required by FEMA.

Conditional Letter of Map Revision (CLOMR)

A CLOMR is typically required when floodplain modeling shows that the stream crossing will cause a rise in flood heights. A CLOMR is FEMA's comment on a proposed project that would, upon construction, affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective Base BFEs, or the Special Flood Hazard Area (SFHA). CLOMRs must be submitted by a P.E. licensed in Colorado. A CLOMR does not revise an effective regulatory map, it simply indicates whether the project, if built as proposed, would be recognized by FEMA. Consult with Larimer County Engineering Staff before proceeding with a CLOMR. In some instances where there are other projects nearby, it may be possible to combine several projects into a single CLOMR submittal, which could reduce costs.

Letter of Map Revision (LOMR)

A LOMR is typically required if completion of the project shows physical changes in the BFEs, the regulatory floodplain, or the floodway. In general, a LOMR is required if the project received CLOMR approval or if the BFEs increased or decreased by more than 0.3 foot. The LOMR officially revises the effective Flood Insurance Rate Map (FIRM), or Flood Boundary and Floodway Map (FBFM), or both. LOMRs are generally based on the implementation of physical measures that affect the hydrologic or hydraulic characteristics of a flooding source and thus result in the modification of the existing regulatory floodway, the effective BFEs, or the SFHA. Consult with Larimer County Engineering Staff to determine if a LOMR is needed and what the submittal requirements would be.

Floodplain modeling is also needed to demonstrate that the new or reconstructed stream crossing does not adversely impact adjacent roads or properties. Adverse impacts could be caused by an increase in flood stages, flood velocity, flows, the potential for erosion and sedimentation, degradation of water quality, cost of public services, etc.

Once Engineering Department Staff has determined that the floodplain modeling is sufficient and that the proposed crossing location is feasible, the Applicant may proceed with the structural design of the crossing. Please note that there may be some very specific instances where a proposed stream crossing may not be feasible. In that event, the Engineering Department Staff will work with the Applicant and their P.E. on an alternative solution.

Other Design Considerations

When designing a stream crossing there are many design factors to consider. The following describes some common design considerations. Please be aware that design considerations can be very site specific. For more detailed information on crossing designs, please consult the Colorado Department of Transportation (CDOT) [Drainage Design Manual](#).

Type of Crossing

Stream crossings come in many different shapes and sizes. Selecting an appropriate type of crossing is dependent on factors such as topography, river characteristics, building standards, permitting requirements, legal considerations, construction and maintenance costs, aesthetics, and environmental considerations. Bridges and culverts are the two most common types of stream crossings. The Applicant should work with their P.E. to identify the most cost effective solution that meets all applicable design criteria. Regardless of the type of bridge or culvert selected, these structures should not raise the stream bed elevation, constrict the channel or floodplain, or cause stream bank erosion problems.

Freeboard

A minimum clearance or freeboard shall be provided between the design approach water surface elevation and the low girder of the bridge. The freeboard is required to allow for wave action, ice, debris and uncertainty in estimated stage. Freeboard for bridges is based on the Colorado Department of Transportation (CDOT) [Drainage Design Manual](#).

Based on the CDOT manual, the minimum freeboard in feet for a bridge is typically calculated using the equation below.

$$\text{Freeboard} = 0.1 Q^{0.3} + 0.008 V^2$$

where, Q is design discharge in cfs and V is the mean velocity of the design flow through the bridge in ft/s (16ft/s max.). If the mean velocity is greater than 16 ft/s, the bridge must be widened.

Erosion Protection

It must be shown that the stream crossing is stable and can withstand high velocity flood flows. Appropriate erosion protection measures should be included in the stream crossing design to ensure that the crossing is adequately protected from the erosive forces of flood flows. Erosion protection measures should be designed using appropriate and widely accepted technical engineering methods and should provide protection for both the channel and proposed structure. Erosion protection measures could include a scour analysis and countermeasures design plan, a grading and armoring design plan, the installation of headwalls and endwalls, etc. Guidance on erosion protection can be found in the CDOT [Drainage Design Manual](#).

Maintenance

Bridges and culverts are like any other structure or building; they need routine monitoring and periodic maintenance to avoid long-term problems and costly repairs. Be sure to consider ongoing maintenance and repair costs when designing the stream crossing. Keep in mind that clear span structures such as bridges and box culverts may have an advantage in terms of long term-maintenance because these types of structures are less susceptible to debris blockage.

Engineer's Report

If engineering design work is necessary, an Engineer's Report summarizing the design and analysis must be submitted to the Larimer County Engineering Department as part of the Floodplain Development Permit Application. Larimer County Engineering Staff will review the submitted report packet prior to issuing the Floodplain Development Permit. The report packet should include the analysis, the design drawings, the models, and all other supporting documentation. The Engineer's Report typically includes the following:

1. A project description;
2. A summary of previous studies;
3. Discharges and modeled flood recurrence intervals;
4. A summary of methods and approaches used;
5. A description of the hydraulic models;
6. A table comparing the effective, existing, and proposed water surface elevations;
7. A response to the review criteria for Floodplain Special Review; and
8. An Appendix.

The level of detail needed in the Engineer's Report will depend on the analysis. For additional guidance on what may be required for an Engineer's Report, please refer to the [Floodplain Special Review Procedural Guide](#).