CALIFORNIA INFRASTRUCTURE CONSULTANCY

INTRODUCTION

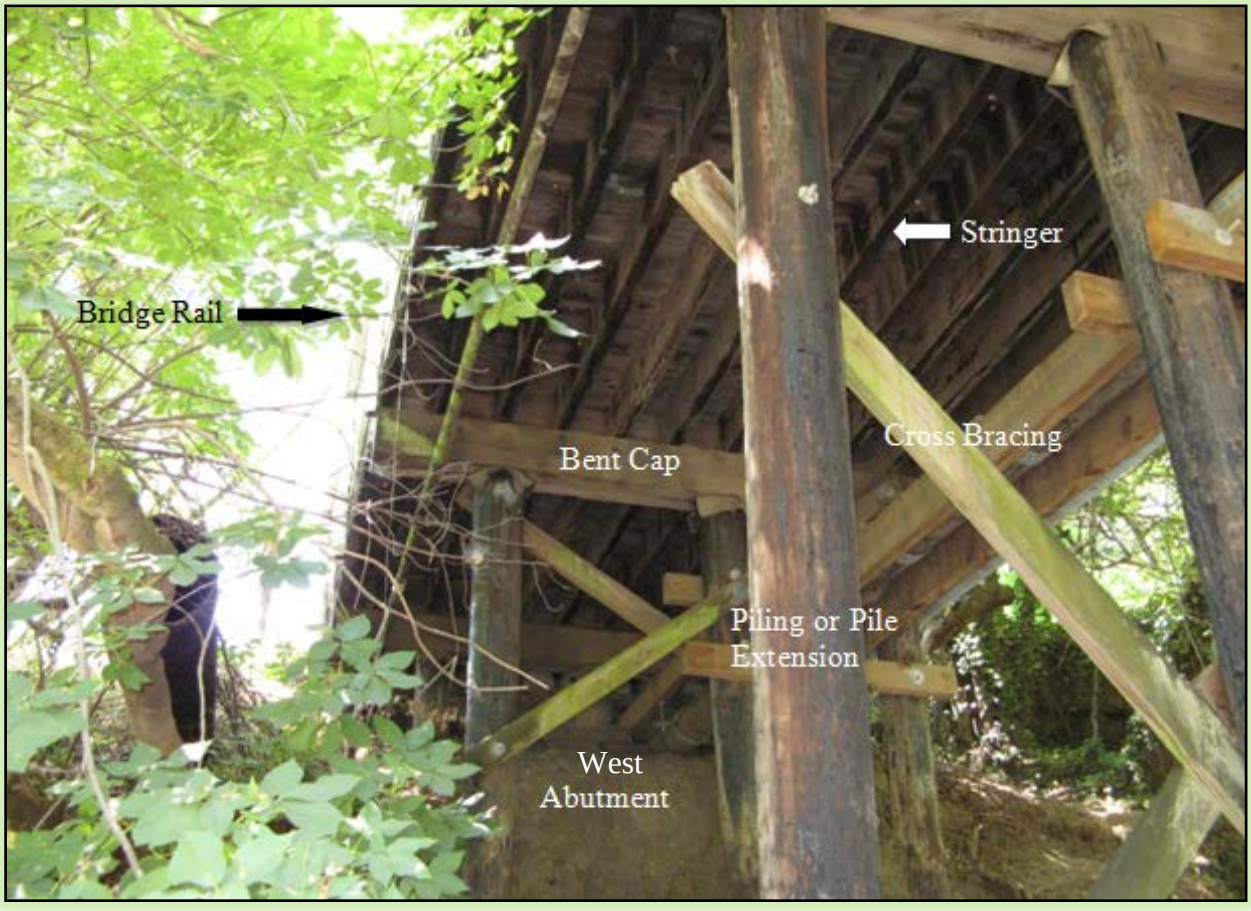
We are glad to be providing this response to the neighborhood's compiled set of questions and comments regarding Meadow Way Bridge, initially emailed on September 4, 2013 by Mr. Alexander Binik to the Council. Town staff summarized the list of questions and comments and presented it to the City Council in October 2, 2013. The new form of the questions to be responded to was accepted by Mr. Binik in a subsequent email. At the October 2, 2013 Council meeting, the Council agreed that the core options to be considered are: 1) repair the existing wooden bridge, 2) replace the bridge with a one-lane wooden bridge, and 3) replace the bridge with a one lane concrete/steel bridge.

CIC agreed it would do its best to explore options and answer questions with minimal field inspections (e.g., no structural testing or geotechnical studies). However, many of the responses are more general in nature because CIC is unable to collect the data necessary to prepare more specific answers. CIC has prepared this report with the goal of providing background information to neighborhood prior to the November 20, 2013 workshop.

The objective of the workshop will be to answer questions, gather input regarding assessment reports and studies to be conducted, and explore options for the repair or replacement of the Bridge.

EXISTING CONDITIONS

Below are definitions of some of the bridge terms used in this response:



As part of providing a direct response to the questions on condensed list, it is worthwhile to describe the bridge and explain the circumstances and specifics leading to this project. This bridge is believed to have been constructed in early 1950s by the U.S. Army Corps of Engineers. Its basic structural elements are wood and few steel beams. It's a narrow bridge with a total width of 14 feet, with about 10 feet for automobiles, 2.5 feet for pedestrians and the rest for railings and a separator strip. No plans for the bridge exist in the Town's archives or at Caltrans.

The Town of Fairfax applied for federal funds to address the bridge's problems back in 2007-2008, during a different public works and town management period. Since then, the Town has maintained and reapplied for the funds and has been saving for its required 11.5% matching funds.

This Fairfax bridge is in the National Bridge Inventory (NBI) which make sit eligible for various federal and state programs designated for such locally owned bridges. The bridge is not considered to be a historic structure, a special federal designation reserved for structures fitting a certain definition. Being in NBI, the bridge is eligible for a biennial inspection program, performed by Caltrans on behalf of Federal Highway Administration (FHWA) for such local agency bridges in California. A Bridge Inspection Report (BIR) is compiled every two years. The inspection program evaluates the various attributes of the bridge, such as its deck geometry, approach road alignment and clearances over creek bed or the street below (when applicable); adequacy of its waterway opening; structural condition of the bridge deck, super- and substructure; erosion (or scour) around its supports and foundations, and other issues. The inspection process assigns scores to these bridge attributes. Certain inspected bridge structural and

geometric elements, if scoring below certain thresholds, will earn the bridge the label of Functionally Obsolete (FO) or Structurally Deficient (SD). The latest BIR for the bridge has been placed on the public outreach web site for these projects.

Based on the biennial inspections, Caltrans assigns a score of 0 to 9 to the various elements making up the bridge, some of which are named above. The highest value represents ideal performance while a value of 0 would indicate the bridge is or should be closed. Based on a weighted approach to these elemental scores, as well as the traffic load bearing capacity of the bridge, the BIR reports a total score for the overall condition of the bridge, called Sufficiency Rating (SR). A brand new, flawless bridge will have an ideal SR of 100. In combination with the SR value and the rating from certain important bridge attributes after the biennial inspections, such as its structural evaluation, deck geometry, approach road alignment, waterway opening adequacy, etc., the following scenarios can form:

Sufficiency Rating (SR) Value	Score of Individual Bridge Element	Resulting Bridge Condition & Flag	Action Recommended and Funded by State/Fed
Greater than 80	Usually above defined thresholds	All is functioning within safe zone	None
Below 80 but greater than 50	Above defined thresholds	Bridge has inadequacies but functions in safe zone	None
Below 80 but greater than 50	Below defined thresholds	Bridge is either FO or SD	Repair bridge to fix FO or SD
Below 50	Below defined thresholds	Bridge is either FO or SD	Replace bridge

In addition to the deficiencies of the elements named above, there are also two very important conditions that need to be considered. One is possible erosion around the bridge foundations (scour) and the other is the bridge's seismic vulnerabilities. Neither condition enters into the above evaluations and is handled separately. In other words, a bridge can have a high SR and not be FO or SD and still be "scour-critical" or seismically vulnerable, or it can have all or combination of these conditions at the same time, leaving the bridge vulnerable to earthquakes and/or scour even after what had led to the FO or SD flag. If a bridge is scour-critical or seismically vulnerable but not FO or SD, separate federal programs to address these deficiencies are available to the local agencies.

SPECIFICS OF MEADOW WAY BRIDGE

Meadow Way Bridge has an SR of 44.1 and is flagged as Functionally Obsolete. Its place in the above table is in the very bottom row. For this reason, when the Town of Fairfax applied for grant dollars to address the needs of the bridge, the funds were provided to replace it because of the bridge's SR and the general view that replacement would be more cost-effective than rehabilitation. The low SR score of 44.1 stems from the traffic load bearing capacity of the bridge as well as its low elemental scores for structural evaluation (4), deck geometry (2) approach alignment (4) and waterway adequacy (5), all out of maximum value of 9. The FO flag is specifically due to the deck geometry value of 2. That being said, the Town has committed to not deciding to replace the bridge without first conducting an assessment and discussing the issue with the community.

In 2010, under a mandate by the Federal Highway Administration (FHWA) and Caltrans, the Town of Fairfax retained CIC to inspect the bridge for scour and prepare a Scour Plan of Action (POA) report for

Caltrans. This report found scour present as deep as 3.5 feet at the bridge pile extensions and dangerous undermining of the easterly bridge abutment, classified the bridge as scour-critical and recommended scour countermeasures. These conditions are depicted in the photo on page 2. This report was filed after the funding application for bridge replacement had already been approved. In response, Caltrans stated that the scour condition would be addressed with bridge replacement and did not agree to a separate fix before the bridge was replaced.

The seismic condition of the bridge has never been specifically evaluated, although Caltrans may have screened the bridge out in early 1990s through the application of a general algorithm for local agency bridges, without looking at the bridge, its condition, connection of its super- and substructure, scour and its foundations. Plans for the bridge do not exist, leading such long-distance, sight-unseen evaluations to somewhat of a guesswork. For example, scour and the erosion of the soils around the timber piles exacerbate the seismic vulnerabilities of the bridge since the wooden piles are no longer embedded in the ground as long as they were when the bridge was first built. The combination of shorter embedment and the higher exposed lengths doubly weaken the bridge seismically. In addition, the fortifications at the easterly abutment, currently scoured under, can give way during a seismic event leading to the collapse of the abutment area and possible collapse of the bridge.

Two other important conditions, also specific to Meadow Way Bridge, are the creosote coating on the timbers and the underground condition of the wood pilings. The former will make any kind of repair work hazardous, requiring special and costly precautionary work conduct and disposal measures. After all is said and done, creosote will still be around. As far as the underground segments of the timber piles are concerned, their soundness cannot be accurately determined without invasive testing, but based on our experience they are most likely in a deteriorated condition (see page 5 for example). However, their embedded lengths are impossible to surmise without plans.

ALTERNATIVE OPTIONS

1. ***Comments: Retaining a wooden bridge: evaluate repairs needed to maintain structural integrity in its current form and width including cost estimates, life cycle costs, and funding sources; explore if viable to replace portions of the existing structure with other materials, such as replacing deck with concrete; and evaluate ability to widen bridge using current structure, including potential width.***

The existing bridge can be retained at an upfront repairs and retrofit cost and regular maintenance expenditures throughout its remaining life. However, the potential issue of creosote at the site will remain unanswered. Coal-tar creosote, having stronger properties than other types of creosote, has chiefly been used as a preservative for wood in the past and has been determined to be toxic and carcinogenic.

To fix the bridge, the cause of its functional obsolescence needs to be addressed. The obsolesce has to do with bridge's deck width, which if were to be made proper, even as a one lane bridge, would require shutting down the existing bridge and using a temporary bridge during the repairs. Extensive inspections, structural evaluations and lab tests will need to be performed prior to engineering the repairs. Repairs and retrofits will need to address proper lane and sidewalk width issues, ADA compliance, seismic deficiencies and bridge foundation scour issues, as well as creek bank erosion up- and downstream of the bridge. Full federal state and federal environmental clearances (according to CEQA and NEPA legislations) and regulatory agency permits need to be acquired.

In spite of these efforts, several significant issues will remain standing in the way of accomplishing safe and reasonable repairs:

- The repairs cannot rid the structure of its creosote contamination.
- The depth of the driven timber pilings in the ground cannot be determined. The ground around the pilings has eroded 3-4 feet since they were installed over 60 years ago and has reduced their safe embedment lengths by that much. The remaining depth, whatever it is, will likely not meet today's engineering criteria.
- The condition of the piles underground cannot be determined. The underground segments of the pilings may be entirely rotted and hollowed out beyond the one inch or so of creosote penetration. Below are a couple of photos of similar pilings recently extracted from a site in Sausalito by CIC's geotechnical subconsultant. The piles at Meadow Way may be in similar condition and the structure will need to be propped up with auxiliary pilings.

- The character of the bridge will change, additional pilings and substructure elements will be introduced for safety, the bridge will remain a maintenance burden on the Town and still have a limited life remaining.

Without specific tests, analysis and engineering, but based on our experience with similar situations, it is our opinion the extensive repairs and retrofits will be costly, even without the potential presence of creosote throughout the bridge. Creosote contamination will add another dimension to the costs. To explore the process further, CIC will need to continue with a more detailed assessment report that will consider all of the issues and corresponding repair and retrofit elements. The cost of such repairs will be estimated along with the remaining life of the bridge and its lifecycle (maintenance) costs. CIC will also estimate the remaining life of the bridge without any repair or improvements. CIC will not conduct any field or lab tests, but will rely on existing studies and its professional experience with such projects. CIC anticipates that repair costs will be close to the cost to replace the structure.

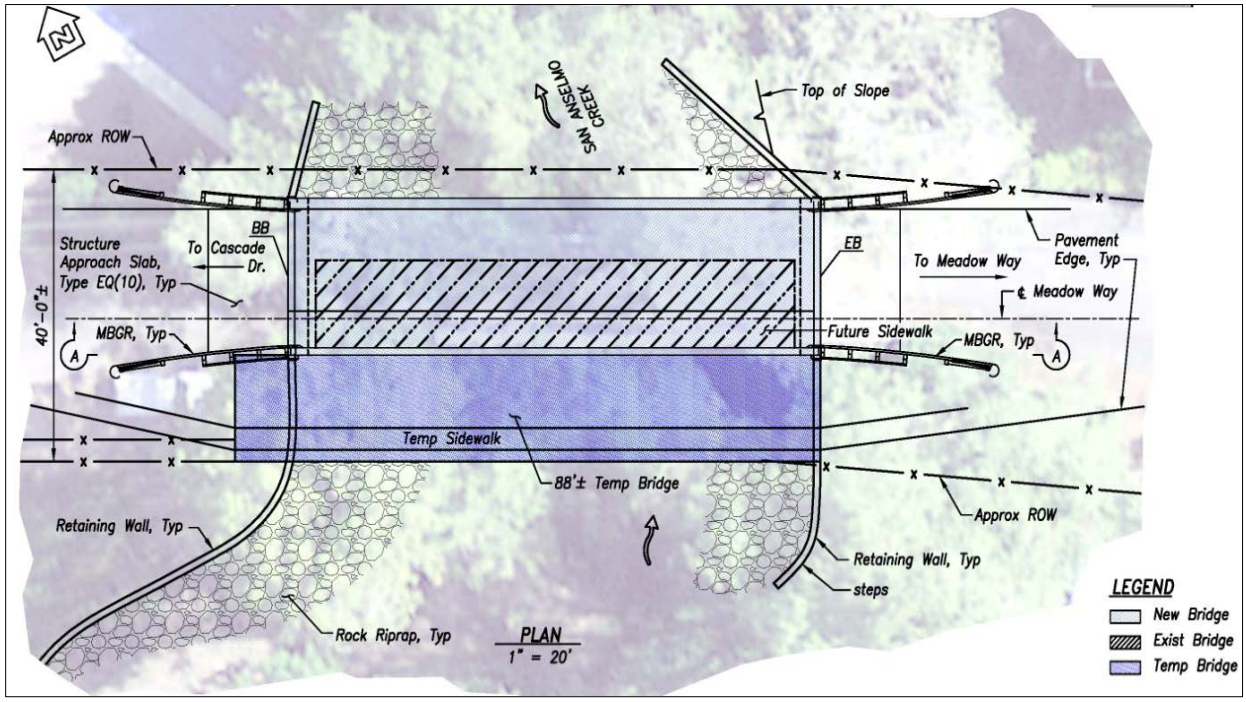
Caltrans approval is required to obtain funding to repair the bridge. CIC believes this type of repair will be subject to heavy scrutiny by Caltrans because of its high cost, the reallocation of funds from replacement to repair, and the presence of the creosote. Specifically, Caltrans will require the Town to

provide an estimate for replacement to allow them to compare to the cost of repair. If the costs approach the cost of replacement, Caltrans will typically suggest the Town replace the bridge and will require strong justification in order to support the repair scenario. The presence of creosote by itself may be a top-ranked game stopper by Caltrans environmental staff. In addition, the environmental regulatory agencies may not grant permits due to the continuing presence of creosote during the repair process. Given these challenges of design and construction and the short- and long-term costs, Caltrans may find it hard to justify redirection of the grant funds from replacement to repairs. However, the Town Council will consider making a case to Caltrans for repair after CIC completes its Phase I work and the Council has the information required to make a better informed decision.

2. ***Comments: Replace with a one-lane bridge that meets State/Federal bridge standards and reflects the character of the area; explore feasibility of replacing the current bridge with a wooden bridge; explore feasibility of replacing the current bridge with a concrete/steel bridge.***

CIC negotiated the case for a one-lane bridge with Caltrans during the initial funding application in 2007-2008 timeframe and was successful securing funds for a one-lane bridge as long as it had a standard sidewalk at least on one side and crashworthy railings on each edge of the deck. However, the Council has indicated it will not make a decision on the bridge until the Phase I work is completed by CIC and community input received on the matter.

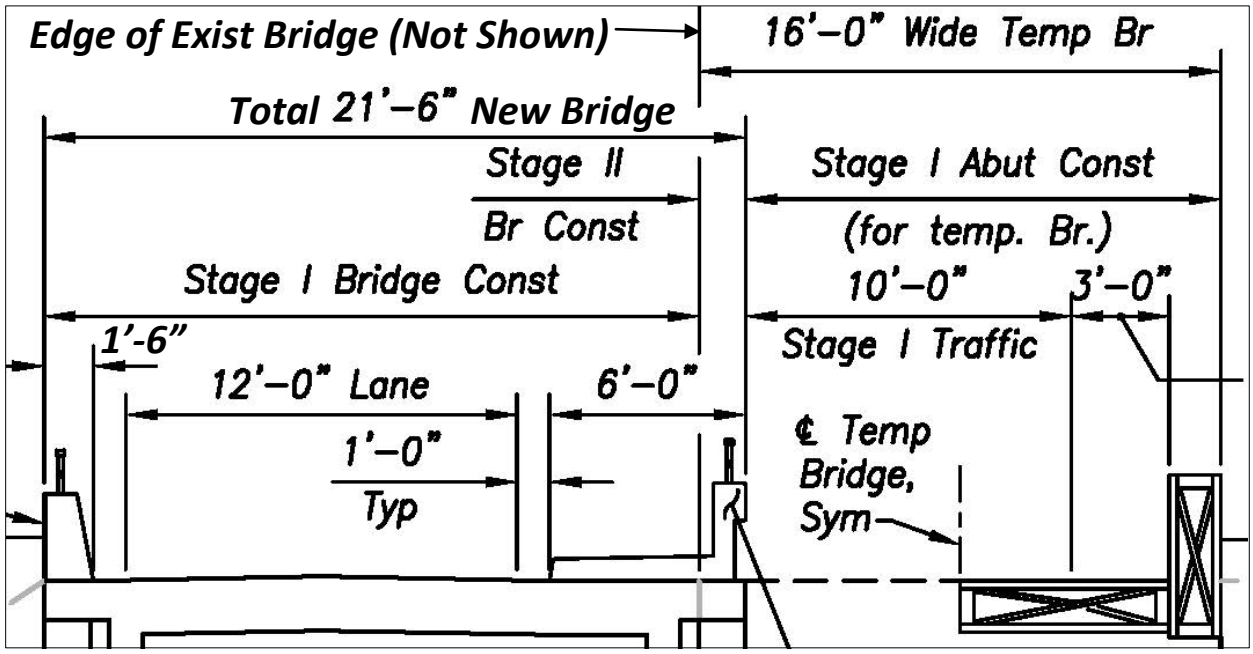
Wooden as well as other types of bridges made from concrete or steel are all feasible at this site. The ideal bridge would clear-span the creek, obviating the need for supports in the creek that impede the flows and collect debris and drift. Bridge replacement will require a temporary bridge alongside of the existing, as shown on the plan view (looking down on the bridge), below:



The temporary and permanent bridge footprints will remain within the public right-of-way, which will be accurately established during the future phase of the project. The construction sequence will entail constructing the abutments and retaining walls on the south side and placing a single-span temporary bridge right alongside of the existing bridge with the aid of one or two cranes. Depending on the

creosote issue, we may consider cutting a 2-foot wide strip out of the south edge of the existing bridge to place the temporary bridge that much farther away from the homes on the south side. This will happen just before the temporary bridge is lifted to be placed on its abutments. Subsequently, the local traffic will be directed to the temporary bridge and the existing bridge will be removed. The existing bridge will likely need to be taken down piece-by piece and isolated to control the spread of contaminants. Once the bridge is totally removed, the abutments for the new bridge and the retaining walls on the north side of it will be constructed, making way for construction of the new bridge superstructure. The deck of the new bridge may have to be constructed in two stages, the bulk of which will be done in the first stage. A narrow edge strip overlapping with the temporary bridge may be constructed after traffic is placed back on new bridge and the temporary bridge is removed.

The CIC team has performed preliminary studies and cost analysis of three bridge concepts made from wood, concrete or steel. Each bridge will clear-span the creek. The new bridge may have one standard 12' lane, a 1' shy-away strip on each side of the lane, a 5'-wide sidewalk on the south side and safety rails on each side of the deck, as shown below:

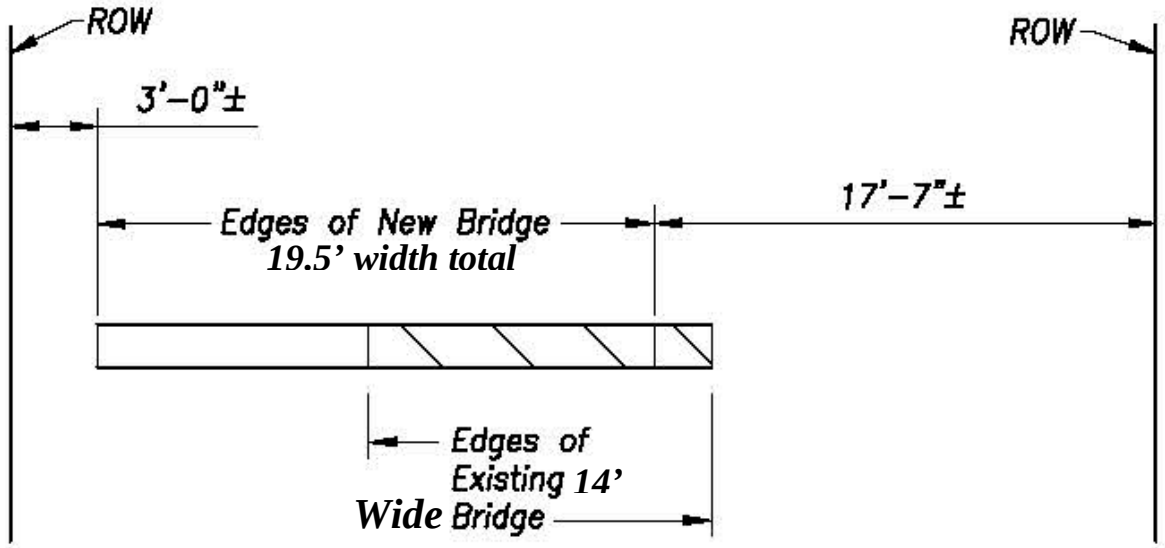


Cross Section of the New and Temporary Bridges

The bridge will have a span of 70-80 feet supported by abutments on the creek banks at each end. Flanking these abutments will be retaining walls on each side to stabilize the creek bank approaches to the bridge. The foot of the retaining walls and bridge abutment walls and the creek banks housing the walls will be armored with rock riprap. (See the plan view on page 6.)

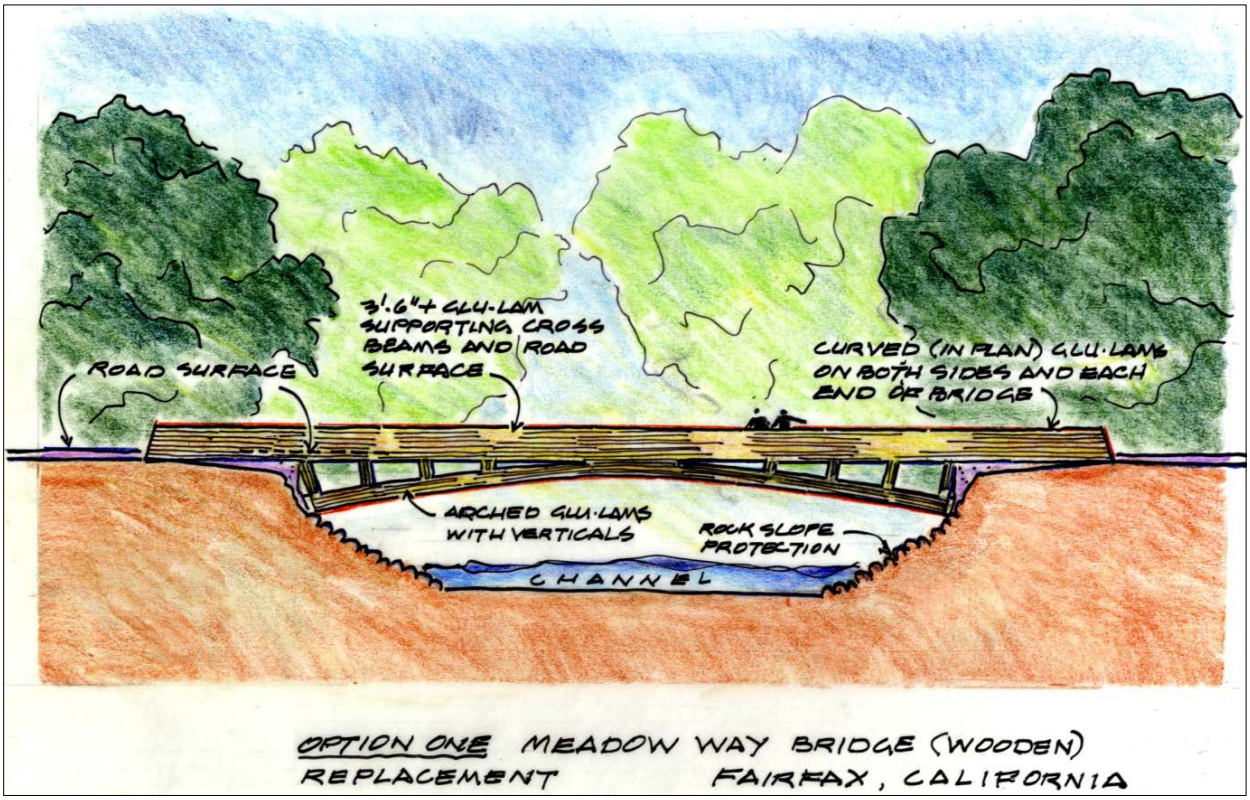
The one-lane provision will still need to be approved by Caltrans as a "Design exception," but we believe the existing conditions would support such a request. In comparison, the existing bridge is 14 feet wide with a 10-foot lane for traffic, 2.5 feet for pedestrian walkway, and 1.5 total feet for railings and a separator strip. The minimum Caltrans standard for a new bridge is 19.5 feet wide with 12 feet for traffic lane, 5 feet for pedestrians/bikes, and 2.5 feet total for safety rails on both sides. The diagram below shows the dimensions and relative locations of the existing bridge and a new bridge of minimum width,

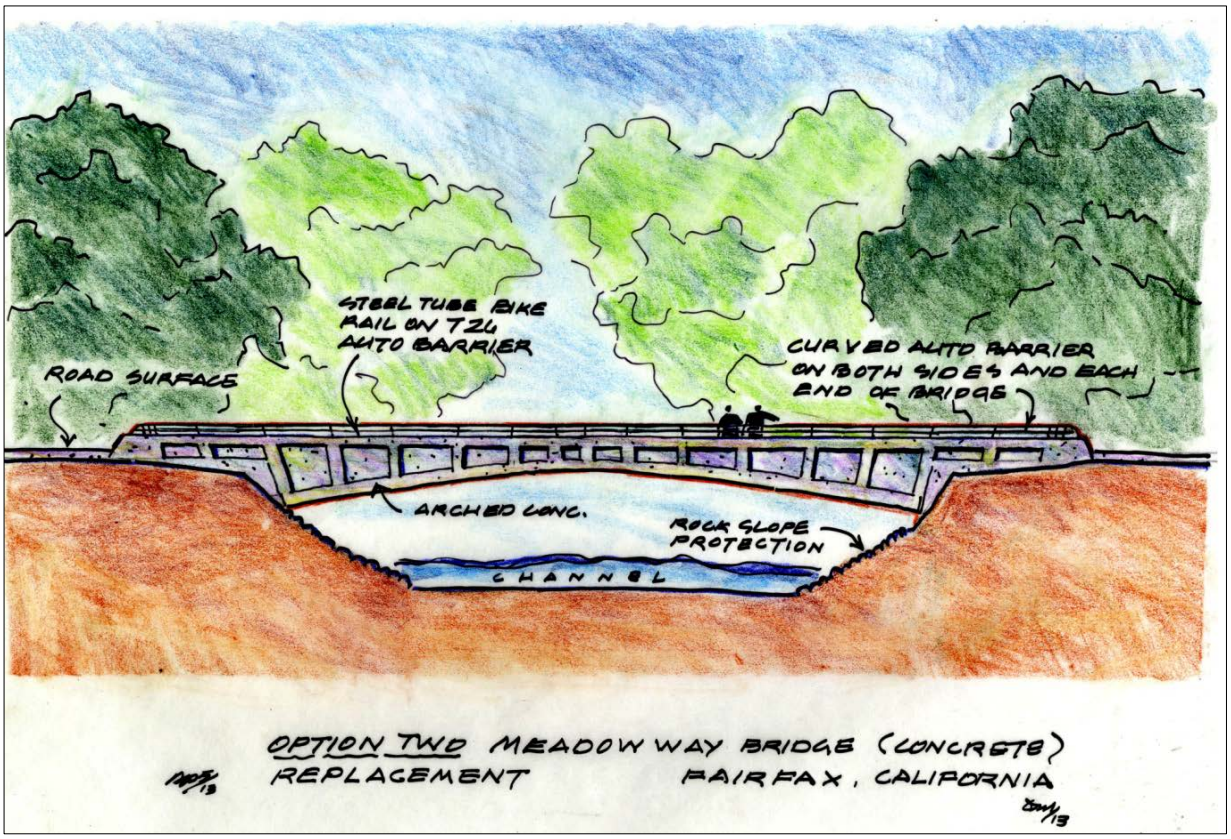
as well as public right-of-way (ROW). Since the traffic has come closer to the public ROW on the north side, CIC can consider switching the location of the sidewalk to that side to bring the cars closer to the middle of the street and farther away from the homes on the north side.

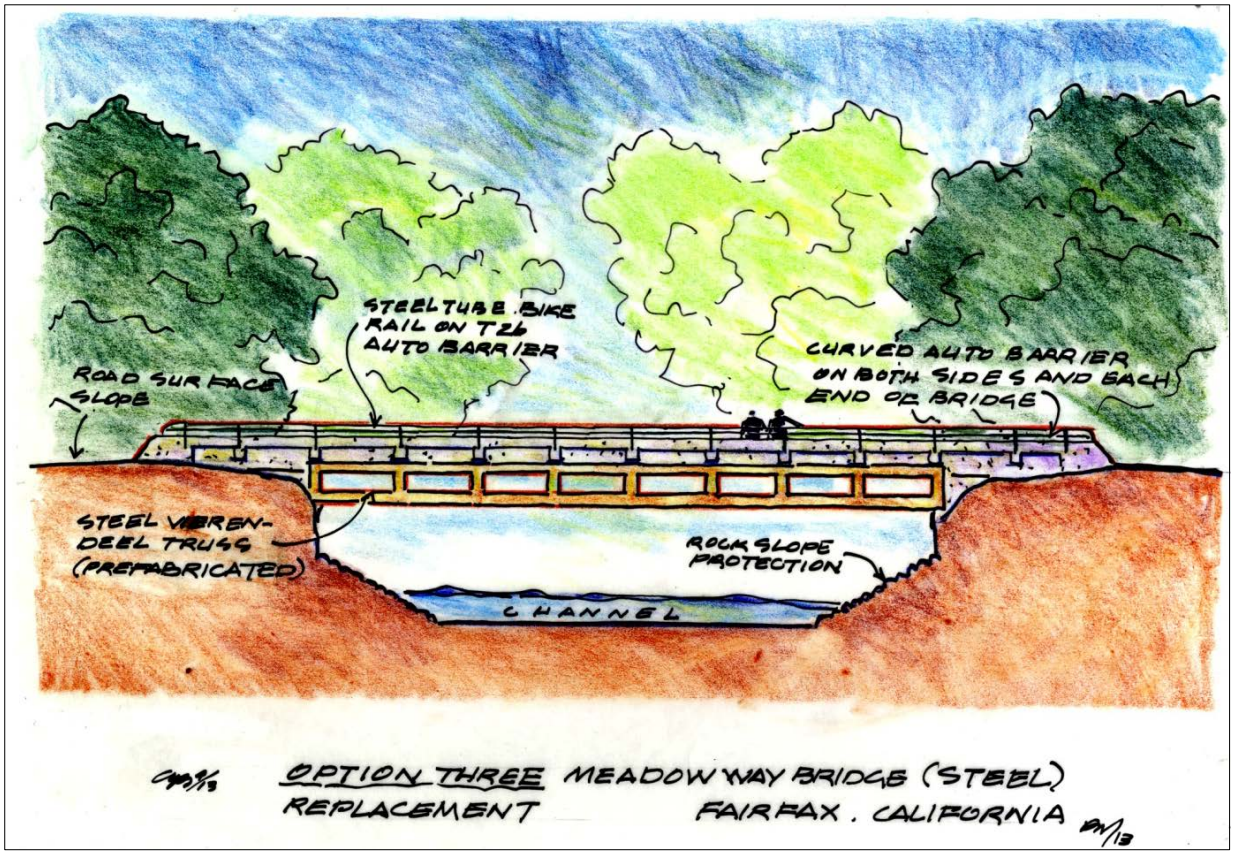


Relative Locations of New and Existing Bridges

Shown below and on the following page are the three architectural concepts of bridges for Meadow Way, made from wood, concrete and steel.




STEEL TUBE BIKE RAIL ON T26 AUTO BARRIER
ROAD SURFACE
CURVED AUTO BARRIER ON BOTH SIDES AND EACH END OF BRIDGE
ARCHED CONC.
ROCK SLOPE PROTECTION
CHANNEL
OPTION TWO MEADOW WAY BRIDGE (CONCRETE)
REPLACEMENT
FAIRFAX, CALIFORNIA


STEEL TUBE BIKE RAIL ON T26 AUTO BARRIER
ROAD SURFACE SLOPE
CURVED AUTO BARRIER ON BOTH SIDES AND EACH END OF BRIDGE
STEEL VIERENDEEL TRUSS (PREFABRICATED)
ROCK SLOPE PROTECTION
CHANNEL
OPTION THREE MEADOW WAY BRIDGE (STEEL)
REPLACEMENT
FAIRFAX, CALIFORNIA

The preliminary cost estimates for these three bridge types, not considering the cost of approach roadways or other ancillary items is approximately $1 million.

QUESTIONS BY THE NEIGHBORHOOD

A. Impacts to vegetation such as which trees will probably need to be removed.

Response – The Town's design team includes environmental staff and landscape architects who will be assessing the environmental impacts of the project and provide for restoration planting after the construction contractor has finished. Mitigation will be in the form of restoration with native, drought-resistant plants and possible removal of invasive species, if any.

As seen on the plan view of the structure on page 5, the footprint of the temporary bridge extends to the south and that of the permanent bridge extends to the north. To place the temporary bridge, the existing vegetation on both banks of the creek and the tree on the southwest corner will need to be cleared. This tree is not a protected tree. On the north side, there is an old oak tree at the northeast end and a cluster of bay trees at the northwest corner. The former will be preserved, but the bay trees will be in the way and will need to be removed. As CIC moves through the design process, we can mark which trees will need to be removed in the field.

B. Compare options to one another.

Response – any bridge constructed will have one lane, a 5' sidewalk and safety railing on both sides. Currently, our concepts show a section through the bridge being comprised of a 1.5-foot wide railing on the north side, a 1-foot shy-away strip, a 12' lane, another 1-foot shy-away, a 5-foot sidewalk and a 1-foot railing on the south edge, producing a total edge-to-edge width of 21.5 feet. This is shown on cross section view on page 7. We can delete the two 1-foot shy-away strips, which are there for additional safety, to reduce the width to 19.5 feet, which is the minimum width Caltrans may approve. As noted earlier, the total width of the existing bridge is 14 feet.

The existing bridge is assumed to be in the middle of the presumed 40'-wide street right-of-way. (Right-of-way information will be researched and verified for this project in the next phase.) The center of the new bridge will be approximately 5.75 feet offset to the north from the center of street. In other words, if the 21.5-foot wide bridge is selected, the north edge of the bridge will be 16.5 feet north of the centerline and the south edge of the bridge will be 5 feet south of the street centerline. If the 19.5-foot wide bridge is selected, the north edge will be 14.5 offset from the street centerline and the south edge remains 5 south of the street center. Considering the fact that each half of the public right-of-way is 20'(to be confirmed), the bridge will remain within the street boundaries.

The current paved area of the approach roadway on each side of the bridge is wider than the existing bridge and we do not expect the pavement to be made much wider, if any at all. For the short detour to the temporary bridge, temporary pavements will need to be put down, which can be removed once the new bridge is built. At any rate, both the temporary and permanent bridges, as well as the approach roadways will be staying within the Town's right-of-way.

C. Impact to Meadow Way roadway approach to the bridge including potential impact to adjacent properties and parking.

Response – The pavement section of the approach roadway will be renewed, as needed, up to a distance away from the bridge on each side. As noted above, we do not anticipate increasing the pavement width. However, the bridge will be shifted north because of the need for room for a temporary bridge during construction. Parking on the south side of Meadow Way will not be affected and, in fact, more street width will become available on this side. On the north side parking will not be

possible right after the ends of the bridge, which is not possible now anyway because of a private driveway east and a drop-off west of the bridge. Overall, we do not anticipate street parking capacity to change much at all, if any. Traffic calming through signage and pavement markings will be emphasized.

Our task will be to not allow impact or harm to the adjacent properties during construction or any time after. For further notes on this, please see questions labeled E and F below.

D. Estimated time of construction for above options and temporary bridge including the time period to work in the creek and proposed construction hours during the day.

Response – Barring unforeseen complications, construction is targeted to start in spring of 2016 and be finished within a year from this date. The season for working in the creek is usually April 15th through October 15th, also referred to as the "dry season." This means that the supports for the temporary and permanent bridges will be finished and any temporary supports for the new bridge will be placed in and taken out of the creek within this period. The design team will only consider bridge types that will be finished in one season. The contractor will likely be working above the creek during and beyond the April to October period to finish the project elements at the roadway level.

The hours of work will be normally 7 a.m. till 6 p.m. during the week. During the dry season, the Town may consider granting the contractor similar Saturday work hours occasionally if circumstances beyond the contractor's control impede the progress of the project and jeopardize the allowable time window for working in the creek.

E. Construction impacts to residents for the above options including a temporary bridge.

Response – A project of this magnitude will temporarily change the routine in the area immediately surrounding the project. These could include higher noise and dust levels and traffic slow-downs. The temporary bridge will bring the through traffic south and closer to the resident on that side for a while. Dealing with contaminated materials will require careful approach to avoid negative impacts. The Town will specify a multitude of measures in the contract documents to minimize construction impacts to the neighborhood as well as the environment. These include, but are not limited to:

- Having a construction management and inspection team on the ground throughout the construction period to look after the conduct of construction.
- Allowing for routine and emergency traffic through the site by maintaining the temporary bridge open 24/7.
- Not allowing driven piles but drilled piles, which are infinitely quieter and vibration free.
- Using the orange plastic fence to separate the residential frontage from the temporary traffic.
- Maintaining strict construction hours.
- Delineating the construction zone and staying within it.
- Maintaining site safety 24/7.
- Protecting the trees and other vegetation outside of the construction zone and marking those to be removed.
- Maintaining creek water and soil quality.
- Dust control through certain measures, such as keeping the surfaces damp during the dry season.
- Safe demolition of the existing bridge through controlled removal of the creosote-laden wood members.

F. Measures to mitigate construction impacts.

Response – This project will actually leave this locale better than it finds it. The project will leave behind a facility that is both auto and people friendly and will not require frequent maintenance attention. The

design team has on board environmental scientists to analyze any construction impacts to fauna and flora and to recommend mitigation measures that will be implemented by other team members such as the landscape architects and the creek geomorphologist. Other mitigation measures, in addition to those mentioned previously, include:

- Conducting safe traffic passage during construction by signage and pavement markings.
- Restoration of any native vegetation disturbed by construction.
- Creation of shaded pool(s) in the creek at the bridge to support aquatic life.

Regardless of the type, the new bridge will be infinitely better looking through incorporation of architectural design and treatment, safer, better for the creek and longer-lasting.

G. Need and location for a temporary bridge including size and length of time needed.

In order to do anything about the existing bridge, a temporary one will be needed. The temporary bridge will sit tight against the south side of the existing bridge. It will likely have a clear span of 70 to 80 feet, be approximately 14 to 16 feet wide to allow for both auto and foot traffic, and have safety rails on both sides. It will be located entirely within the public right-of-way. Please see the diagram on page 7. It will be needed for the entire construction period, or approximately one year.

H. Process for removing current creosote-laden bridge piles and other potential environmental issues.

Response – Wood samples from each typical bridge member, as well as soil samples, will be tested for hazardous compounds such as creosote and lead paint. Wholesale demolition of the bridge with heavy equipment will not be allowed and the existing bridge superstructure will be dismantled and removed board by board and beam by beam. The pile extensions will be sawed off at least 3 feet below the existing creek bed, while the saw dust is collected to disallow its mixing with the soil. The cut pilings will be lifted with cranes and hauled away. All hazardous materials will be placed in special landfill using specific methods of disposal. The new bridge will not have on it any hazardous chemicals commonly used in the past, such as creosote, lead paint or asbestos.

I. Material questions: For wooden structures, are materials available such that pressure-treated wood (or wood containing or coated with other toxic materials) will not be needed? Can pervious concrete on the deck be used?

Response – If wood is used, it will likely be glue-laminated (glulam) beams treated with the same varnishes and compounds that are commonly used in home construction today.

The current environmental rules do not allow the migration of untreated bridge deck runoff into the creek because of the contamination with hydrocarbons from automobiles. A deck drainage system of catch basins and pipes will be designed to collect the runoff and convey it to the Town's storm drain system on each side of the bridge.

***J. Describe level of bank stabilization work included as part of the project and impact to the cre*ek.**

On the upstream west bank of the creek, a retaining wall extending approximately 75 feet from the bridge and connecting with the bridge abutment will be built to replace the existing dilapidated wooden retaining wall and control the severe creek erosion there. On the same side but downstream, the retaining wall will extend for 15-20 feet past the bridge. Upstream and on the east bank of the creek, a 40-foot long retaining wall, connecting with the east bridge abutment will be built. The wall will continue approximately 25-30 feet downstream of the bridge on this side. The bridge abutments and these walls will be protected with heavy rock riprap, ensuring the stability of the creek banks for generations to come. Walls allowing the growth of greenery will be considered for these elements.