UC RIVERSIDE UNIVERSITY OF CALIFORNIA

Addendum #1 to Final Environmental Impact Report for the Glen Mor 2 Student Apartments Project (SCH# 2010081020)

Project Title: Glen Mor 2 Student Apartments
Project Number: 956334
Project Location: The project is located on the University of California, Riverside (UCR) campus, generally northwest of Big Springs Road and Valencia Hill Drive. The site is south of the existing Glen Mor 1 and Pentland Hills residential complexes and east of Lothian residence hall.

City: Riverside
County: Riverside

Prior Project Approval: Design approval of the Glen Mor 2 Student Apartments Project and certification of EIR (SCH#. 2010081020)

Project Description:

UCR is constructing a student housing community on approximately 21 acres of University-owned property on the eastern edge of campus at the northwest corner of Big Springs Road and Valencia Hill Drive. While the housing community was designed to avoid encroachment into the arroyo open space feature that defines the north edge of the development site, several associated improvements referred to collectively as the "Arroyo Improvements" were acknowledged as requiring both temporary and permanent encroachments into the arroyo, which were analyzed in the certified EIR and approved as part of the University's May 2011 design approval.

Proposed Action:

Subsequent to certification of the EIR and approval of the Glen Mor 2 project, it was discovered that physical conditions have changed due to continued erosion along the arroyo banks. In particular, bank erosion in the vicinity of the long pedestrian bridge has altered conditions to the extent that the north abutment is no longer outside the regulated stream channel. Field review in October 2011 and April 2012 revealed considerable changes along the banks on both sides of the arroyo compared to the topographic survey that was the basis of design for the improvements addressed in the EIR. This has resulted in extension and enhancement of the recommended stabilization elements at the two locations on the north bank identified in the certified EIR and addition of a third stabilization area on the south bank. There have also been a number of minor refinements to other aspects of the arroyo improvements as engineering design has progressed. In addition, the project refinements require modification of adopted mitigation measures.

The University is considering approval of a budget augmentation that, in part, will fund the modified schedule of improvements for the arroyo and amend Mitigation Measures BIO 3 and BIO 4 adopted as part of the approved Mitigation Monitoring and Reporting Program as follows:

A. Bank stabilization at three locations along the arroyo – two on the north bank and one on the south bank. The nature and extent of these improvements has intensified from that anticipated at the time of preparation of the certified EIR. The improvements as previously proposed were based upon a 2008 topographic survey as to conditions along the arroyo. Based upon existing conditions the civil and geotechnical engineers have recommended an enhanced program of improvements to stabilize the arroyo banks. The current recommendations include:

Upstream Gabion Wall – entails approximately 125 feet of gabion wall along the north arroyo bank, south of the Glen Mor 1 recreational fields. At this location, the gabion wall would be up to 4 feet in height above finished grade, with an additional depth of wall extending approximately 6 feet below grade for scour protection. The face of the gabion wall would closely follow the existing bank along the downstream half of the wall, with the upstream half situated within a bench outside the existing stream zone. The erosional feature extending landward toward the recreational fields would be backfilled to establish a uniformly sloping finished ground surface.

Central Gabion Wall – entails approximately 250 feet of gabion wall along the north arroyo bank, just south of Glen Mor 1 and Pentland Hills. At this location, the gabion wall would be up to 6 feet in height above finished grade, with an additional depth of wall extending approximately 6 feet below grade for scour protection. The position of the proposed wall meanders both landward and streamward of the existing arroyo bank. Where the wall is placed within the existing streambed, grading will provide compensating channel bottom width and establish a new bank on the opposing side.

Downstream Gabion Wall – entails approximately 225 feet of gabion wall along the south arroyo bank, upstream of the shorter of the two proposed bridges. At this location, the gabion wall would be up to 9 feet in height above finished grade. Where exposed wall height is 6 feet or less there is an additional depth of wall extending approximately 6 feet below grade for scour protection. Where exposed wall height exceeds 6 feet there is an additional depth of wall extending approximately 9 feet below grade for scour protection. The proposed work would complete a flowline transition along a snaking section of the channel at the upstream end of the proposed wall section that has been substantially accomplished by natural processes. In the central portion of the new wall, a shallow bench along the existing flowline would be excavated to broaden the channel bottom. Grading would recontour the channel bottom along most of the length of the wall and establish a new north bank along the downstream half.

Construction will entail delivery of collapsed gabion baskets and rock (estimated volume of rock for the three walls is approximately 1,350 cubic yards). Excavation is required to expose the work limits and to prepare the foundation for the buried elements of the wall. Due to the nature of soils within the work limits, the geotechnical engineer has recommended a layback of 1.5:1 for excavation of the work limits. Shoring may be employed at limited locations in proximity to the existing Glen Mor 1 building and fire access roads if the existing setback does not accommodate the layback slope. Approximately 6,250 cubic yards of earth will be excavated for construction of the three walls. Approximately 873 yards of excess soil is expected to remain after the temporary work limits are backfilled around the new walls. Equipment is expected to include a crane, bobcat track loader, bobcat excavator, and vibratory tampers or plates (bobcat size or smaller).

B. Two **bridges** to accommodate pedestrian circulation. With these bridges in place, current foot traffic through the bottom of the arroyo would be eliminated. The proposed bridges would be supported on concrete abutments and would be able to accommodate golf cart-type service vehicles. The bridge improvements have not changed substantially from those addressed in the certified EIR. The following summarizes adjustments in the bridge details:

Bridge 2 (Short Bridge) – rip-rap has been added at each of the abutments for scour protection. The finished ground surface around each abutment will consist of ungrouted rip-rap. Temporary excavation will be required to place rip-rap below grade to a depth of approximately 5 feet. The excavation work will require a work limit of about 10 feet around each abutment and can be accomplished without encroaching into the jurisdictional streambed.

Bridge 1 (Long Bridge) - due to ongoing erosion, the north abutment now extends into the jurisdictional streambed. The limits of completed improvements and associated work areas for the north abutment lie entirely within the impact limits for the Central Gabion Wall.

C. **Removal of exotic plant species and revegetation** to create an arroyo zone that would be representative of ephemeral riparian features in this region. The proposed gabion wall improvements will establish exposed rock surfaces for an area of approximately 0.04 acres within the Arroyo Zone (total area of 2.5 acres). The overall aesthetic and planting schemes for the arroyo enhancement program would be the same as presented in the certified EIR.

D. **Culvert modifications** are largely as described in the certified EIR (downstream culvert clean-out, path/culvert removal, and Valencia Hill culvert extension). It has since been determined that no work is required on the downstream side for the culvert clean-out at the downstream project limits. Also, the design for the Valencia Hill Drive culvert extension has been refined to reduce the area of permanent impact within the streambed. While the impact limits have been reduced, the revised design incorporates a retaining wall element that will increase the duration of construction activity from Valencia Hill Drive (3 to 5 days versus the single day assumed in the certified EIR). Also, while the impact footprint for the Valencia Hill Drive culvert extension has been reduced, more detailed examination of the root structure of the large cottonwood tree identified for avoidance under Mitigation Measure BIO 3 has led to a determination that the tree may not survive damage within the root zone. Modifications to adopted Mitigation Measures BIO 3 and BIO 4 are identified to address this changed circumstance.

E. A **water quality feature** adjacent to the south bank at the short bridge. The design incorporates the outfall structure within the wall of the treatment unit, thereby eliminating the previously proposed storm drain outlet and associated stream encroachment.

The north bank recontouring element addressed in the certified EIR is no longer part of the project.

While the scope and scale of proposed arroyo bank stabilization improvements has intensified, the overall concept and finished condition would maintain the objectives to preserve and enhance this designated campus open space feature.

Public Agency Approving Project: The Regents of University of California or its delegate (the University)

Agency Carrying Out Project: University of California, Riverside

Relevant CEQA Provisions: Public Resources Code Section 21166 ("CEQA); CEQA Guidelines Sections 15162 – Subsequent EIRs and Negative Declarations, 15163 – Supplements to EIRs and 15164 – Addendum to an EIR or Negative Declaration

ENVIRONMENTAL REVIEW

This environmental analysis has been prepared in accordance with CEQA, the CEQA Guidelines, and University of California Guidelines for the Implementation of CEQA, to determine the appropriate level of environmental review for the changes to the project and to document that determination. When an EIR has been certified for a project, no additional environmental review is required except as provided for in Section 15162 of the California Environmental Quality Act (CEQA) Guidelines (Title 14, California Code of Regulations, Sections 15000 et seq), which sets forth the circumstances under which a project may warrant a Subsequent EIR or Negative Declaration:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;
(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or Negative Declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or
(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the Negative Declaration was adopted, shows any of the following:
    (A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;
    (B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;
    (C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible, and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or
    (D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

Under Section 15163, a supplement to a certified EIR may be prepared when any of the conditions requiring preparation of a subsequent EIR are met, but only minor additions or changes would be necessary to make the previous EIR adequately apply to the project in the changed situation. Under Section 15164, in cases where only minor technical changes or additions are necessary to make the

previous EIR adequately apply to the project and none of the conditions calling for a subsequent or supplemental EIR have occurred, an EIR addendum may be prepared. If none of the above conditions are present, no further environmental review is required.

This analysis finds the Proposed Action would not cause any new significant environmental effects that were not considered in the certified Project EIR, nor increase the severity of any impact previously found significant in the certified Project EIR, and that no new information of substantial importance, which was not known at the time the Project EIR was certified, has become available. Accordingly, the University has determined that an Addendum to the Project EIR is the appropriate level of environmental review for the Proposed Action. The analysis in support of this conclusion is set forth below.

ANALYSIS SUPPORTING ADDENDUM

The University of California certified the Final Environmental Impact Report (FEIR) for the Glen Mor 2 Student Apartments on May 17, 2011. The Glen Mor 2 EIR was prepared as a tiered project EIR, being tiered from the certified program EIR for the 2005 Long Range Development Plan (certified November 17, 2005, SCH# 2005041164).

Three general circumstances involving changes in the setting and the proposed improvements have occurred subsequent to certification. First, it was discovered that continued erosion along the arroyo banks has altered baseline conditions. In particular, bank erosion in the vicinity of the long bridge has altered conditions to the extent that the north abutment is no longer outside the regulated stream channel. Field review in October 2011 and April 2012 revealed considerable changes along the banks on both sides of the arroyo compared to the topographic survey that was the basis of design for the improvements addressed in the certified EIR. As a result, the recommended arroyo stabilization elements have been expanded at the two locations on the north bank identified in the certified EIR, and a third stabilization area has been added on the south bank. Second, there have been a number of minor refinements to other aspects of the arroyo improvements as engineering design progressed, which have decreased impacts within the arroyo zone for these elements. Third, a more detailed understanding of the physical condition of the mature cottonwood tree identified for avoidance under Mitigation Measure BIO 3 has placed into question ability to implement the mitigation measure as adopted.

On the basis of the analysis below, the modified arroyo improvements and amendments to the adopted Mitigation Monitoring and Reporting Program to revise mitigation measures BIO 3 and BIO 4 are determined to require some changes and additions to the certified EIR, but none of the conditions described in CEQA Guidelines Sections 15162 or 15163 are present.

The project description provided above and the updated analysis, mitigation measures, tables, figures and references presented herein constitute an addendum to the May 2011 certified EIR. The discussion below incorporates new references which are identified in the attached Added Reference document (Attachment a), which updates Chapter 7 of the certified EIR (beginning on page 7-1 of Volume 2). Full copies of these reports are also attached to this Addendum as Attachments c, f, p, q, and s. In addition to the added references, several figures and tables from the certified EIR document have been updated and are attached to this Addendum.

Air Quality

The certified EIR recognized the project as a source of emissions in the construction period, at a project level (Impact 3.2-2, beginning on page 3.2-10 of the Draft EIR Volume), as a contributor to significant, unavoidable cumulative effects under the LRDP (Impact 3.2-4, beginning on page 3.2-14 of the Draft EIR Volume), and as a source of substantial pollutant concentrations for sensitive receptors (Impact 3.2-5, beginning on page 3.2-15 of the Draft EIR Volume). For project-level construction impacts, the certified EIR determined that impacts would be less than significant with application of LRDP EIR PPs 4.3-2(a) and (b), LRDP EIR MM 4.3-2, and project-specific mitigation measures AQ 1 and AQ 2. These measures detail a collection of practices to reduce air pollutant emissions from campus construction projects and establish standard procedures to ensure implementation. These same measures are identified as the available feasible means to reduce impacts related to cumulative construction emissions in a non-attainment area and construction emissions affecting sensitive receptors; the certified EIR found that potential impacts for these latter two circumstances would remain significant and unavoidable after application of mitigation.

For the construction-period sources of emissions that are of concern in this circumstance, air quality is assessed on the basis of maximum daily emissions. The air quality analysis in the certified EIR considered a "worst-case" period of activity involving overlapping construction phases with grading, parking garage construction, utility construction, building construction and concrete pouring occurring at the same time across the approximately 20-acre Glen Mor 2 site. The analysis considered a substantial inventory of full-size construction equipment (graders, dozers, scrapers tractors/loaders/backhoes, on-road and off-road trucks) and up to 178 truck trips per day for hauling of 30,000 cubic yards of excavated soil.

The nature and scale of daily construction activity for the arroyo improvements is substantially diminished from that considered for the overall construction site. The gabion wall element would entail the most intensive construction activity, utilizing a substantially smaller inventory of bobcat-size and hand-held equipment. Truck activity will also be substantially more limited, with approximately 140 total truck trips to deliver materials (gabion baskets and approximately 1,350 cubic yards of rock) and approximately 100 total truck trips to remove approximately 1,000 cubic yards of excess excavated soil. The most intensive elements of the residential site construction have since been completed (clear/grub/demo and parking garage overexcavation/recompaction), substantially reducing potential sources of emissions from concurrent activity on the balance of the site.

On the basis of the substantially more limited scale of construction activity, the proposed project modification does not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts to air quality. LRDP EIR PPs 4.3-2(a) and (b), LRDP EIR MM 4.3-2, and project-specific mitigation measures AQ 1 and AQ 2, will continue to apply to this aspect of project construction, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

Biological Resources

The characterization of existing conditions for biological resources in the certified EIR includes information about the arroyo stream channel and associated riparian resources that are subject to regulation under the federal Clean Water Act and state Fish and Game Code. Due to observed changes in the physical conditions within the Great Glen Arroyo since certification of the EIR in May 2011, an updated delineation of jurisdictional waters was prepared to support this addendum (see September 10, 2012 ICF letter report attached hereto and incorporated as EIR Appendix I.1). The descriptions of Waters of the United States and CDFG Jurisdiction at certified EIR pages 3.3-5 and 3.3-6 are replaced with the parallel content in the updated delineation. The attached updated Figure 3.3-2 and 3.3-3 replace the figures printed with the certified EIR. Figure 3.3-1 has also been updated to reflect changes in riparian vegetation cover based upon the updated delineation field work (copy attached).

The updated delineation documents changes in the extent of jurisdictional limits and the horizontal position of the stream channel, particularly in the central reach within the project limits. Since the 2010 delineation conducted in support of the certified EIR, lateral limits of Waters of the United States have increased by 0.04 acre as scour has widened the channel bed in certain reaches. Total area of DFG streambed has decreased by 0.32 acres as the channel bed has become further incised and bank-to-bank width has narrowed. Total area of DFG riparian habitat has increased by 0.12 acre due to both an increase in the extent of previously mapped riparian patches and development of new patches.

The certified EIR addresses potential impacts upon several sensitive plant and animal species, namely Parry's spineflower, long-spined spineflower, San Bernardino Aster, rosy boa, coastal western whiptail, Los Angeles pocket mouse, northwestern San Diego pocket mouse, and San Diego black-tailed jack rabbit. While no individuals of these species were observed during surveys of the project site, these species are all known to occur within the region and are associated with habitats found within the Great Glen Arroyo, (see Impacts 3.3-1, 3.3-3, 3.3-4, 3.3-5, and 3.3-6 on pages 3.3-9 through 3.3-12 of the Draft EIR Volume). Potential impacts to these species were characterized as less than significant, with no requirement for mitigation, in recognition of the limited extent of impact, the limited nature of ground disturbance within the arroyo, the finished habitat conditions that would exist with completion of the arroyo enhancement program, and status of regional populations. The proposed modifications to the arroyo improvements will increase the area of impact within the arroyo and will involve more intensive disturbance within those impact limits. The following substantiates the determination for each species that the modified arroyo improvements do not present the potential for new significant impacts or result in a substantial increase in the severity of previously identified impacts:

- Parry's spineflower and long-spined spineflower – impacts were deemed less than significant based upon the limited percentage of potential habitat within disturbance limits and the limited nature of proposed ground disturbance within those areas. These species are associated with sandy soils within the arroyo stream channel, corresponding to the approximately 0.42 acre of Department of Fish and Game jurisdictional streambed. The modified arroyo improvements will increase temporary impacts upon the streambed by approximately 0.1 acre (from 0.1 acre) and increase permanent impacts by approximately 0.015 acre (from 0.03 acre). In the context of the total area of approximately 0.4 acre of habitat within the arroyo zone and considering the approximately 0.05 acre that will be added to the streambed with bank recontouring at the gabion walls, the nominal increase in magnitude of impact upon potentially suitable habitat for these species would not alter the conclusion that the impact is less than significant and that no mitigation is required.

- San Bernardino aster – impacts were deemed less than significant based upon the limited percentage of suitable habitat impacted and the improved habitat conditions that would be achieved with implementation of the arroyo enhancement program. The modified arroyo improvements will increase temporary impacts upon suitable habitat by approximately 0.3 acre (from 0.15 acre) and increase permanent impacts by approximately .025 acre (from 0.025 acre). In the context of the total area of approximately 2.5 acres of suitable habitat within the arroyo, the nominal increase in magnitude of impact upon potentially suitable habitat for this species would not alter the conclusion that the impact is less than significant and that no mitigation is required.
- Rosy boa and coastal western whiptail – impacts were deemed less than significant in recognition of limited impacts upon riparian habitat with which these species are associated and the enhanced habitat conditions that would be achieved under the arroyo enhancement program. The modified arroyo improvements will increase temporary impacts upon riparian habitat by approximately 0.1 acre (from 0.1 acre) and increase permanent impacts by approximately .01 acre (from 0.01 acre). In the context of the total area of approximately one acre of riparian habitat within the arroyo zone, the nominal increase in magnitude of impact upon potentially suitable habitat for these species would not alter the conclusion that the impact is less than significant and that no mitigation is required.
- Los Angeles pocket mouse and Northwestern San Diego pocket mouse – impacts were deemed less than significant in recognition of proposed finished conditions within the arroyo. The modified arroyo improvements would alter the proposed finished ground conditions within a very limited area of the arroyo by establishing rock surfaces along the gabion walls and at both abutments of the short pedestrian bridge. These rock surfaces would constitute approximately 0.06 acre of the approximately 2.5-acre arroyo zone and would not substantially alter the finished condition with respect to habitat value for this species. The nominal increase in magnitude of impact upon potentially suitable habitat for these species would not alter the conclusion that the impact is less than significant and that no mitigation is required.
- San Diego black-tailed jack rabbit – impacts were deemed less than significant based upon the status of the regional population of this species. The increased limits of disturbance within the Glen Mor 2 project site would not alter this circumstance or the conclusion that the impact is less than significant and that no mitigation is required for this species.

Impact 3.3-7 (on page 3.3-12 of the Draft EIR Volume) addresses potential impacts upon nesting birds as a result of removal of trees and other vegetation. The removal of mature trees and other vegetation is identified as a potential significant impact warranting mitigation. LRDP EIR mitigation measures 4.4-4(a) and (b) and project-specific Mitigation Measure BIO 2 detail pre-construction surveys to confirm the absence of active nests in disturbance areas, as well as conditional provisions that are to be implemented if active nests are identified. The modified arroyo improvements will increase the number of trees to be removed and extend the disturbance limits for ground-level vegetation that may also support nests. Inasmuch as LRDP EIR mitigation measures 4.4-4(a) and (b) and project-specific Mitigation Measure BIO 2 provide for avoidance, the areal extent of impacts has no bearing on the potential magnitude of impacts. On this basis, the modified arroyo improvements do not present the potential for new significant impacts or substantially more severe impacts. LRDP EIR mitigation measures 4.4-4(a) and (b) and project-specific Mitigation Measure BIO 2 will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

Impact 3.3-8 (beginning on page 3.3-13 of the Draft EIR Volume) addresses potential impacts upon riparian habitat. The certified EIR identifies potential temporary impacts upon approximately 0.21 acres and permanent impacts of approximately 0.02 acre. Impacts were deemed less than significant with incorporation of LRDP EIR PP 4.4-2(a), LDRP EIR Mitigation Measure 4.4-3(b), and project-specific mitigation measures BIO 3 and BIO 4 which establish measures to be implemented during construction to minimize encroachment upon sensitive resources within the arroyo and which establish a revegetation program that would result in superior functions and values within restored and enhanced habitat. The modified arroyo improvements make several changes in the nature and extent of impacts upon riparian habitat. An updated evaluation of impacts upon vegetation communities, including riparian habitat, was conducted for the modified improvements. The results are summarized in the attached updated Tables 5 and 6 (replace Tables 5 and 6 on page 5-6 of Appendix I in Volume 3 of the certified EIR). The relationship of proposed improvements to mapped vegetation communities is illustrated in the attached updated Figure 3.3-4 (replaces Figure 3.3-4 following page 3.3-8 of the Draft EIR Volume). The updated analysis identifies temporary impacts of approximately 0.30 acre and permanent impacts of approximately 0.01 acre. While temporary impacts are increased with the modified arroyo improvements (by approximately 0.09 acre), permanent impacts are decreased – primarily due to reduction of the footprint of permanent improvements for the Valencia Hill Drive culvert extension. The requirements under LRDP EIR PP 4.4-2(a), LDRP EIR Mitigation Measure 4.4-3(b), and project-specific mitigation measures BIO 3 and BIO 4 (as amended by this Addendum, see below) ensure that impacts are minimized and that finished conditions include replacement plantings of similar type and acreage. Considering the nominal increase in temporary impacts, the reduction of permanent impacts, and the minimization and compensation measures provided for in the adopted mitigation monitoring and reporting programs, the modified arroyo improvements do not present the potential for new significant impacts or substantially more severe impacts upon riparian vegetation.

The updated assessment of temporary impacts to riparian habitat includes potential loss of the mature cottonwood tree at the Valencia Hill Drive culvert extension. Adopted Mitigation Measure BIO 3 requires minimization of temporary construction impacts and specifically identifies avoidance of this cottonwood tree. Review of field conditions and detailed design plans as part of ongoing project mitigation monitoring has identified a substantial encroachment into the root zone of this tree. The arborist and landscape architect reviewing these circumstances cannot say with certainty that the tree will survive the proposed construction activity. Based upon the recommendations of the arborist and landscape architect, modifications to adopted mitigation measures BIO 3 and BIO 4 are included as part of this action to elaborate upon construction avoidance measures and to specify replacement plantings in the event the tree ultimately fails (see September 12, 2012 ICF memorandum and modified versions of mitigation measures attached hereto). The discussion of impacts upon riparian habitat in the certified EIR (page 3.3-13 of the Draft EIR Volume) acknowledges temporary impacts associated with removal of riparian habitat in the arroyo zone and concludes that the restoration of disturbed functions and values through Mitigation Measure BIO 4 would reduce impacts to less than significant. This mitigation measure is also applicable to potential loss of the cottonwood tree.

The modifications to the adopted mitigation measures to address potential loss of this tree have also been considered in light of the remaining impact categories addressed in the certified EIR to evaluate the potential for any new impacts or more severe impacts. This change would have no bearing on greenhouse gas emissions, hazards and hazardous materials, public services, recreation, or utilities and service systems. The following addresses each remaining resource topic:

- Aesthetics – the discussion of environmental setting for aesthetics on page 3.1-1 of the certified

EIR (Volume 2) notes the contribution of the arroyo area and associated vegetation to the natural open space character of the site. The modification to adopted Mitigation Measure BIO 3 acknowledges the possibility that the cottonwood tree may be irretrievably damaged by construction activity, which in turn would remove a large area of riparian canopy near the campus edge. Adopted Mitigation Measure BIO 4 requires plantings to replace habitat of equal coverage to offset impacts upon biological resources. The proposed modifications to Mitigation Measure BIO 4 elaborate upon replacement plantings for this specific circumstance and ensures that the offset for biological resources also addresses aesthetic concerns at this location (by reestablishing comparable canopy cover within the footprint of the removed cottonwood tree and introducing new cottonwood plantings in the immediate area). The certified EIR also addressed the potential impact upon views of the Carillon Tower from off-campus areas along Valencia Hill Drive (Impact 3.1-1, beginning on page 3.1-5 of the Draft EIR Volume). Such impacts were determined to be less than significant with implementation of Mitigation Measure AES 1, which requires detailed review of planting plans for the northeast quadrant of the Glen Mor 2 project site to ensure that mature plantings would not block the existing views into the campus core. With the modifications to Mitigation Measure BIO 3 to elaborate upon specific measures to avoid the possible loss of the cottonwood tree, the modifications to Mitigation Measure BIO 4 to elaborate upon specific measures to compensate for the unavoidable loss of the cottonwood tree, and with adopted Mitigation Measure AES 1 to ensure replacement plantings do not block the existing view corridor, implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.

- Air Quality – if removal of the tree is ultimately required, it would entail the use of earthmoving equipment to remove the trunk and roots, handheld power tools to remove the limbs and canopy, and a limited number of truck trips to haul the debris from the site. The level of activity to remove this single tree is no more intense than the level of activity associated with construction of the culvert extension at this location that was considered in the analysis in the certified EIR (see Air Quality on page 6 of this addendum). LRDP EIR PPs 4.3-2(a) and (b), LRDP EIR MM 4.3-2, and project-specific mitigation measures AQ 1 and AQ 2, will continue to apply to this aspect of project construction, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum). Implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.
- Cultural Resources – the potential removal of this tree would introduce additional areas of excavation to the project, but would not alter the underlying potential for presence of buried resources. As addressed under Cultural Resources on page 14 of this addendum, project-specific Mitigation Measure CULT 1 is applicable to all elements of the Glen Mor 2 project, including the modified arroyo improvements and would continue to provide for a Less than Significant with Mitigation determination.
- Geology and Soils – removal of the tree would disrupt the existing ground conditions at this location, with the corresponding potential for creation of an unstable condition and/or increased soil erosion. The certified EIR (Impact 3.5-4, beginning on page 3.5-6 of the Draft EIR Volume) addresses potential impacts arising from unstable conditions and concludes that impacts for the Glen Mor 2 project would be Less than Significant with Implementation of LRDP PP 4.6-1(a), which requires preparation of site-specific geotechnical studies and incorporation of resulting recommendations in project design and construction. The project-specific geotechnical investigation prepared in support of the certified EIR (Appendix L of the certified EIR, Volume 4)

includes general recommendations for site preparation and slope stability that will ensure a stable finished condition. The adopted Mitigation Monitoring and Reporting Program for the LRDP provides an established mechanism to ensure implementation of the geotechnical engineer's recommendations if removal of the tree is necessary. Implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.

- Hydrology and Water Quality – as noted with respect to geology and soils, removal of the tree would disrupt existing ground conditions and thereby increase potential for soil erosion. The LRDP EIR (Impact 3.8-1, beginning on page 3.8-10) recognized this potential and determined that impacts would be less than significant with implementation of LRDP mitigation measures 4.8-3 (b) and (d). These measures require minimization of impacts limits in campus open space areas and implementation of best management practices to minimize erosion. The adopted Mitigation Monitoring and Reporting Program for the LRDP provides an established mechanism to ensure implementation of these requirements if removal of the tree is necessary. Implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.
- Land Use and Planning – The discussion of Impact 3.9-2, beginning on page 3.9-11 of the certified EIR (Volume 2) includes consideration of project consistency with LRDP PP 4.9-1(c), which requires preservation or relocation of mature specimen trees where feasible. The campus landscape architect identified only one specimen tree on the Glen Mor 2 project site, a large oak along the Big Springs Road frontage (certified EIR Volume 2, page 3.1-10). The cottonwood tree is not considered a specimen tree and, on this basis, the potential loss of this tree and implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact related to land use and planning.
- Noise - removal of the tree would require the use of earthmoving equipment to remove the trunk and roots, handheld power tools to remove the limbs and canopy, and a limited number of truck trips to haul the debris from the site. The level of activity to remove this single tree is no more intense than the level of activity associated with the culvert extension activity at this location that was considered in the analysis in the certified EIR, as addressed under Noise on page 17 of this addendum. LRDP EIR PP 4.10-2, LRDP EIR mitigation measure 4.10-2(a), and project-level mitigation measure NOI 1 will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum). Implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.
- Transportation and Traffic - removal of the tree would require a limited number of truck trips to haul debris from the site. The level of activity to remove this single tree is no more intense than the level of activity associated with demolition activity at this location that was considered in the analysis in the certified EIR (Impact 3.13-2, page 3.13-12 of Volume 2) and for which the impact was determined to be less than significant with implementation of LDRP PP 4.14-2 (consider traffic from overlapping construction projects). LRDP EIR PP 4.12-2 will continue to apply in accordance with the adopted Mitigation Monitoring and Reporting Program for the LRDP. Implementation of the revised mitigation measures would not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.

With the clarifications regarding measures to maximize likelihood of survival and contingency provisions to provide replacement plantings, the modified arroyo improvements do not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts due to potential loss of the mature cottonwood tree near Valencia Hill Drive. This analysis is similarly applicable to this potential impact with respect to *Naturalistic Open Space* (Impact 3.3-9) and jurisdictional resources (Impact 3.3-10).

Impact 3.3-9 (beginning on page 3.3-15 of the Draft EIR Volume) addresses potential impacts upon *Naturalistic Open Space* as designated under the LRDP. The certified EIR identifies potential temporary impacts upon approximately 0.3 acres of the 2.5 acres within the *Naturalistic Open Space* designation, and permanent impacts of approximately 0.02 acre. Impacts were deemed less than significant with incorporation of LRDP EIR PP 4.4-1(b) and project-level mitigation measures BIO 3 through BIO 7, which establish various measures to be implemented during construction to minimize encroachment upon sensitive resources and which establish a revegetation program that would result in superior functions and values within restored and enhanced habitat. The modified arroyo improvements make several changes in the nature and extent of impacts upon *Naturalistic Open Space*. An updated evaluation of impacts upon *Naturalistic Open Space* was conducted for the modified improvements, with the results summarized in the attached updated Table 7 (replaces Table 7 on page 5-10 of Appendix I in Volume 3 of the certified EIR). The updated analysis identifies temporary impacts of approximately one acre and permanent impacts of approximately 0.07 acre. While both temporary and permanent impacts are increased with the modified arroyo improvements, the requirements under mitigation measures BIO 3 through BIO 7 ensure that impacts are minimized and that finished conditions provide superior functions and values. The increased extent of permanent impacts corresponds to the contained rock surface associated with the gabion walls and the rip-rap at the abutments of the short pedestrian bridge. These rock areas would not detract from the general aesthetic appearance or function of the restored *Naturalistic Open Space*. On this basis, the modified arroyo improvements do not present the potential for new significant impacts or substantially more severe impacts upon *Naturalistic Open Space*. LRDP EIR PP 4.4-1(b) and project-level mitigation measures BIO 3 through BIO 7, will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

Impact 3.3-10 (beginning on page 3.3-17 of the Draft EIR Volume) addresses potential impacts upon jurisdictional water resources. The certified EIR identifies potential temporary impacts upon approximately 0.03 acre of waters of the United States, 0.07 acre of DFG jurisdictional streambed, and 0.40 acre of DFG riparian habitat, with approximately 375 linear feet of streambed impacted. Permanent impacts are identified as approximately 0.01 acre of waters of the United States, 0.02 acre of DFG jurisdictional streambed, and 0.02 acre of DFG riparian habitat, with approximately 107 linear feet of streambed impacted. Impacts were deemed less than significant with incorporation of LRDP EIR PP 4.4-2(a) and mitigation measure 4.4-3(b) and project-level mitigation measures BIO 3 (as proposed to be revised, above), and BIO 4 through BIO 7 which establish measures to be implemented during construction to minimize encroachment upon sensitive resources within the arroyo and which establish a revegetation program that would result in superior functions and values within restored and enhanced habitat.

The modified arroyo improvements make several changes in the nature and extent of impacts upon jurisdictional stream resources habitat. An updated evaluation of impacts upon jurisdictional resources, was conducted for the modified improvements. The results are summarized in the attached updated Table 8 (replaces Tables 8 on page 5-17 of Appendix I in Volume 3 of the certified EIR). The relationship of proposed improvements to mapped jurisdictional resources is illustrated in the attached updated Figure

3.3-5, including new detail figures 3.3-5a, 3.3-5b, and 3.3-3c (replaces Figure 3.3-5 following page 3.3-8 of the Draft EIR Volume). Impacts are increased, typically by factors of two to three times for all components, except impacts to DFG riparian. Despite the magnitude of the increases, the overall magnitude of impacts remains limited, with total temporary impacts to approximately 0.12 acre of waters of the United States (844 feet of streambed) and 0.45 acre of DFG jurisdiction (825 feet of streambed), and permanent impacts to approximately 0.03 acre of waters of the United States (373 feet of streambed) and 0.05 acre of DFG jurisdiction (467 feet of streambed). The increased impacts primarily arise from the added gabion wall components and the associated temporary excavation limits. The requirements under Mitigation Measures BIO 3 through 7 ensure that impacts are minimized and that finished conditions include replacement plantings of similar type and acreage. The proposed modifications to Mitigation Measures BIO 3 and BIO 4 merely elaborate on aspects related to a specific tree and do not alter the conclusion as to significance of impacts after mitigation. Considering the limited magnitude of impacts, together with the minimization and compensation measures provided for in the adopted mitigation monitoring and reporting program, the modified arroyo improvements do not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts to jurisdictional water resources. LRDP EIR PP 4.4-2(a), LRDP EIR mitigation measure 4.4-3(a), and project-level mitigation measures BIO 3 through BIO 7, will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

The certified EIR determined that the Glen Mor 2 project would not conflict with the Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) and determined that impacts in this regard would be less than significant with incorporation of project mitigation measures BIO 1 through BIO 7 (Impact 3.3-11, beginning on page 3.3-18 of the Draft EIR Volume). Since certification of the EIR in May 2011, nothing has changed with respect to provisions of the MSHCP or the potential for occurrence of animal and plant species protected under the plan at the Glen Mor 2 site. The relevant MSHCP provisions relate to riparian resources associated with the arroyo. The modified arroyo improvements will involve increased impacts within the arroyo for construction of the gabion walls (approximately one acre of temporary impacts compared to approximately 0.3 acres identified at the time of the certified EIR). As considered in the determination in the certified EIR, work within the arroyo zone remains subject to project-specific mitigation measures BIO 3 through BIO 7, which establish various measures to be implemented during construction to minimize encroachment upon sensitive resources and which establish a revegetation program that would result in superior functions and values within restored and enhanced habitat. . The proposed modifications to Mitigation Measures BIO 3 and BIO 4 merely elaborate on aspects related to a specific tree and do not alter the conclusion as to significance of impacts after mitigation. Finished conditions in the arroyo with the proposed modified improvements will only differ in that approximately 0.05 acre of the 2.5-acre arroyo zone will have rock surface. This change is inconsequential to the desired functions and values. On this basis, impacts are not materially changed from those identified in the certified EIR; the proposed project modifications do not present the potential for new significant impacts or substantially more severe impacts.

Cultural Resources

The certified EIR (Impact 3.4-2, page 3.4-6 of the Draft EIR Volume) recognized the potential for discovery of buried artifacts in excavation areas and concluded that the project would result in a less than significant impact with implementation of Mitigation Measure CULT 1 (Protection and Recovery of Buried Artifacts). The proposed addition of three sections of gabion wall along the arroyo will introduce additional areas of excavation to the project, but will not alter the underlying potential for presence of buried resources. Project-specific Mitigation Measure CULT 1 is applicable to all elements of the Glen Mor 2 project, including the modified arroyo improvements and would also provide for a Less than Significant with Mitigation determination for the modified project element. The proposed excavations for the modified arroyo improvements are consistent with the general setting and nature excavation contemplated for the overall Glen Mor 2 project and do not present the potential for new significant impacts or a substantial increase in the severity of previously identified significant effects.

Geology and Soils

The certified EIR (page 3.5-1 of the Draft EIR Volume) includes a characterization of the scale of vertical slopes along the arroyo, noting a maximum height of 4 feet. The last sentence under the heading "Site-Specific Setting" on this page should be amended to read:

> The slope gradients in the hillside portions vary from approximately 20 to 30 percent, with near-vertical slopes up to 11 feet high along portions of the arroyo.

This is an update of factual information regarding the project setting. Associated impact ramifications are addressed in the following discussion of Impact 3.5-4.

The certified EIR (Impact 3.5-4, beginning on page 3.5-6 of the Draft EIR Volume) addresses potential impacts arising from a site being located on a potentially unstable geologic unit and concludes that impacts for the Glen Mor 2 project would be Less than Significant with Implementation of LRDP PP 4.6-1(a), which requires preparation of site-specific geotechnical studies and incorporation of resulting recommendations in project design and construction. The addition of gabion walls as part of the Glen Mor 2 arroyo improvements is the result of a such a project-specific evaluation (see July 2012 CHJ geotechnical report attached hereto and incorporated as EIR Appendix L.2), and the recommendations of this report have been incorporated into the project design (see August 2012 Berger ABAM report attached hereto and incorporated as EIR Appendix L.3). The adopted Mitigation Monitoring and Reporting Program for the LRDP provides an established mechanism to ensure the gabion walls are implemented as recommended. The proposed improvement modifications do not present the potential for new significant impacts or a substantial increase in the severity of a previously identified impact in this regard.

Hydrology/Water Quality

The certified EIR (page 3.8-1 of Draft EIR Volume) identifies supporting studies for the analysis of hydrology and water quality. The discussion is amended to include reference to an additional study prepared in support of the design of the added gabion walls (see August 2012 Berger ABAM report

attached to hereto and incorporated as EIR Appendix L.3). The Berger ABAM report includes updated 100-year inundation limits for the Great Glen Arroyo, reflecting stream channel alignment and morphology from the 2012 updated topographic survey. The updated evaluation shows flow depths and overflow limits consistent with the information presented in the certified EIR. The updated Preliminary HEC-RAS Workmap exhibit attached hereto replaces Attachment C of Appendix P (referenced on page 3.8-8 of Volume 2 of the certified EIR). The characterization of existing conditions with respect to flooding in the certified EIR (Draft EIR Volume, pages 3.8-4 and 3.8-5) remains valid.

The certified EIR (Impact 3.8-1, beginning at the last paragraph of page 3.8-10 of the Draft EIR Volume) characterizes the nature of anticipated construction activity within the arroyo zone and the stream channel in the context of associated water quality impacts, concluding that impacts would be less than significant with implementation of LRDP EIR PPs 4.8-3(b) and (d). At that time, it was anticipated that work within the arroyo and stream channel would be accomplished primarily with manual labor. The added gabion wall improvements will require use of mechanical equipment within approximately one-third of the overall length of the stream channel through the project limits. While this level of activity is more intense than that considered in the certified EIR, the work will continue to be subject to the minimization measures under LRDP PP 4.8-3(b) and the provisions of a project-specific stormwater pollution prevention plan under LRDP PP 4.8-3(d). Considering these established standard minimization measures and best management practices, as well as the ephemeral nature of the stream feature and limitation of work to periods when there is no stream flow, the changed circumstance of use of mechanical equipment within the arroyo and stream channel areas would not present the potential to violate water quality standards. The proposed improvement modifications do not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts in this regard.

The certified EIR (Impact 3.8-3, on pages 3.8-12 and 3.8-13 of the Draft EIR Volume) addresses potential impacts related to erosion and siltation as a result of drainage pattern changes, concluding that impacts would be less than significant with implementation of LRDP EIR PP 4.8-3(d) which requires preparation and implementation of a project-specific stormwater pollution prevention plan. Drainage pattern changes are addressed with respect to discharges from the completed development site and direct alterations within the Great Glen Arroyo stream channel. The proposed modified arroyo improvements do not change the design for collection and disposition of drainage from the development site. The modified improvements include a minor change in the design of the outlet to the Great Glen Arroyo; incorporating a direct outfall from the water treatment unit to a rip-rap zone, compared to the pipe outlet and rip-rap zone under the design evaluated in the certified EIR. This change is inconsequential as to erosion potential. LRDP EIR PP 4.8-3(d) will continue to apply, in accordance with the adopted LRDP Mitigation Monitoring and Reporting Program.

The certified EIR identifies project elements contributing to direct alteration of drainage patterns within the stream channel as the Valencia Hill Drive culvert extension, culvert/path removal, culvert clean-out, and bank stabilization elements. While the Valencia Hill Drive culvert extension improvements have been modified slightly, potential impacts in this regard are unchanged for the three culvert-associated elements. The former bank stabilization element would be replaced with the proposed gabion wall elements. The gabion wall improvements affect a more extended length of the channel banks (approximately 620 feet at three locations versus the 195 feet at two locations identified in the certified EIR), and also involve new elements to regrade approximately 210 feet of stream bank and recontour approximately 225 feet of channel bottom. The finished gabion wall faces consist of contained rock that is not subject to erosion and the recontoured stream bottom creates a finished condition that is not materially altered from the existing condition (the existing stream bottom is sandy substrate without vegetation). While the newly

graded stream banks in the recontour areas will be exposed to erosion, the length of newly created stream bank is substantially shorter than the length of new gabion wall, resulting in an overall situation with reduced exposure to erosion. As with the former bank stabilization element, the revised gabion wall improvements are intended to correct an existing erosion hazard and would not alter existing drainage patterns in a manner that presents the potential for substantial erosion. As noted in the certified EIR, the various project design features noted in this discussion are elements of the post-construction stormwater management program required under LRDP Program and Practice 4.8-3(d). The proposed bank stabilization modifications do not present the potential for new significant impacts or substantial increase in the severity of previously identified impacts in this regard.

The certified EIR (Impact 3.8-5 on pages 3.8-15 and 3.8-16 of the Draft EIR Volume) addresses potential impacts related to work within mapped floodplains. Impacts were deemed less than significant, with no mitigation measures required. As discussed at the beginning of this section, an updated evaluation of the 100-year inundation limits associated with the Great Glen Arroyo has been prepared (Berger ABAM 2012) and illustrates limited changes in inundation limits under current conditions. Minor design changes related to the outlet from the water quality feature at the shorter pedestrian bridge and addition of rip-rap at the abutments of this bridge, do not alter the analysis or conclusions regarding the effect of these improvements on the floodplain limits. For the bank stabilization elements, the discussion in the certified EIR addresses two locations that correspond to the upstream gabion wall and the central gabion wall elements of the proposed modified arroyo improvements. While the improvements have been modified at these locations, the resultant adjustments to the floodplain limits and conditions within adjacent areas within the arroyo bottom are not changed. For the downstream gabion wall, the proposed improvements occur along a vertical embankment that defines the south boundary of the floodplain. The proposed gabion wall will displace approximately 400 square feet of the existing floodplain limits where the wall lies within the existing streambed, and where flow depths range from approximately one foot to approximately 1.75 feet. The recontouring aspect of the wall improvements in this location will remove soil from an area of approximately 700 square feet, with removal depths ranging up to approximately 4 feet. Accordingly, the floodplain volume displaced by the wall improvements would be more than offset by removals for the recontouring. The proposed bank stabilization modifications do not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts in this regard.

Noise

The certified EIR recognized the potential for construction-period noise and vibration impacts to both campus users and nearby residents as a result of on-site construction activity and traffic delivering materials and hauling excess material. At the time of preparation of the certified EIR, it was assumed that work within the arroyo zone would be accomplished with manual labor and hand tools. The added gabion wall elements will require use of motorized construction equipment and vibratory compaction equipment in proximity to the Pentland Hills and Glen Mor 1 dorms. This modification to the construction scenario has been addressed in a supplemental evaluation of noise and vibration impacts (see August 27, 2012 ICF memorandum attached hereto and incorporated as EIR Appendix Q.1).

Construction-related vibration impacts are addressed in the certified EIR under Impact 3.10-2 (beginning on page 3.10-9 of the Draft EIR Volume). The analysis acknowledges the significant and unavoidable finding in the LRDP EIR, and the construction timing restrictions and notification procedures established in LRDP PP 4.10-2 and LRDP Mitigation Measure 4.10-2(a) to reduce potential impacts to the extent

feasible. The project-level analysis in the certified EIR for the Glen Mor 2 project determined that potential vibration levels at on-campus residential uses would exceed those identified in the LRDP EIR and would remain significant and unavoidable at the project level. An additional project-specific measure was adopted to reduce vibration impacts upon on-campus residential areas to the extent feasible (Mitigation Measure NOI 1 – schedule high-vibration generating activity when students are not in residence, if feasible). The supplemental analysis conducted for this addendum identifies potential vibration levels at the closest campus residential receptors exceeding the 80 VdB threshold, but lower than the 100 VdB maximum anticipated in the EIR analysis. With projected maximum vibration levels lower that those identified in the certified EIR, the proposed modifications to the arroyo improvements do not present the potential for new significant impacts or a substantial increase in the severity of previously identified impacts in this regard. LRDP EIR PP 4.10-2, LRDP EIR mitigation measure 4.10-2(a), and project-level mitigation measure NOI 1 will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

Construction-related noise impacts are addressed in the certified EIR under Impact 3.10-7 (beginning on page 3.10-15 of the Draft EIR Volume). The analysis acknowledges the significant and unavoidable finding in the LRDP EIR, and numerous LRDP programs and practices (4.10-2; 4.10-7(a), (b), (c) and (d); 4.10-8) to reduce potential impacts to the extent feasible. The project-level analysis in the certified EIR for the Glen Mor 2 project determined that potential noise levels at on-campus residential uses would exceed those identified in the LRDP EIR and would remain significant and unavoidable at the project level. Additional project level mitigation measures (NOI 2 through NOI 7) were adopted as part of the Glen Mor 2 project to reduce construction noise impacts to the extent feasible. The project-level analysis in the certified EIR was based upon an assumed most intensive period of activity involving overlapping grading and construction activity. A total of 53 pieces of construction equipment were assumed to be operating simultaneously, with resultant noise levels projected at both the nearest edge of activity and the acoustic center. As with vibration impacts, construction activity was assumed to remain south of the arroyo. The added gabion wall improvements will involve use of mechanical equipment closer to the Pentland Hills and Glen Mor 1 residences. The analysis in the certified EIR included a model receptor in the Glen Mor 1 community (ST-7), as well as one at Lothian Hall adjacent to the construction site (MR-2). Predicted construction noise levels at the Glen Mor 2 receptor were between 77 dBA Leq and 82 dBA Leq, while predicted levels at the Lothian receptor were between 86 dBA Leq and 104 dBA Leq. The supplemental analysis conducted for this addendum predicts noise levels between 69 dBA Leq and 87 dBA Leq. While the projected maximum noise levels at the Glen Mor 2 receptor have increased, they remain lower that the levels projected in the certified EIR for the closest residential receptor. With projected maximum noise levels at the nearest campus residential receptor lower than those identified in the certified EIR, the proposed modifications to the arroyo improvements do not present the potential for new significant impacts or substantially more severe impacts in this regard. LRDP EIR PPs 4.10-2, 4.10-7(a), 4.10-7 (b), 4.10-7 (c), 4.10-7 (d) and project-level mitigation measures NOI 2 through NOI 7, will continue to apply, in accordance with the adopted Mitigation Monitoring and Reporting Programs for both the LRDP and the Glen Mor 2 project (as amended by this Addendum).

Noise impacts associated with construction-related haul traffic are addressed in the certified EIR under Impact 3.10-8 (beginning on page 3.10-19 of the Draft EIR Volume). The analysis in the certified EIR concluded that noise levels would temporarily increase by up to 4 dBA along the haul route. Because this project increase is less than the identified threshold (10 dBA increase) impacts were determined to be less than significant, and no mitigation was warranted. Access for the modified arroyo improvements will require extension of the construction haul route to include Linden Street east of Aberdeen Drive, Pentland Way south of Aberdeen Drive, and maintenance roads around the perimeter of the Glen Mor 1 recreation

fields (see revised Figure 3.13-2 attached hereto). The receptors located along this route are similar to those considered in the EIR analysis and the level of activity will be more limited (240 total truck trips for duration of construction versus the 178 trucks per day assumed in the EIR). On this basis, the proposed project modification does not present the potential for new significant impacts or substantial increase in the severity of previously identified impacts.

Transportation/Traffic

The certified EIR addresses impacts of construction-related vehicle trips on the local circulation system (Impact 3.13-2, page 3.13-12 of the Draft EIR Volume), concluding that impacts would be less than significant with implementation of LRDP PP 4.14-2 which requires the campus to consider combined traffic from overlapping construction projects. Analysis identifies the most intensive phase of construction for traffic as the excavation phase, when approximately 178 trucks per day were anticipated to remove excess soil from the residential development site. The modified arroyo improvements are expected to require approximately 100 total truck trips to remove excess soil material and 140 total truck trips to deliver materials. Hauling activity will involve additional segments of Linden Street, Pentland Way, and campus maintenance drives (see revised Figure 3.13-2 attached hereto); however, the intersections affected will not differ from those considered in the EIR. Affected intersections all currently operate at high levels of service (A or B) and would not be reduced to an unacceptable due to the limited volume of construction-related traffic. Inasmuch as site grading and hauling for the residential development site is completed and the volume of traffic for the arroyo improvements is more limited, the proposed project modification does not present the potential for new significant impacts or a substantial increase in the severity of previously identified significant impacts. LRDP EIR PP 4.12-2 will continue to apply in accordance with the adopted Mitigation Monitoring and Reporting Program for the LRDP.

Remaining Impact Categories

The certified EIR also addresses impacts for aesthetics, greenhouse gas emissions, hazards and hazardous materials, land use and planning, public services, recreation and utilities and service systems. Impacts for these resource categories relate to the general project location and the residential nature of the project. The changes to the proposed project with the modified arroyo improvements will not alter existing conditions or post-project conditions that were assumed in the original analysis or that are relevant to potential impacts upon these resources.

The certified EIR determined there was no potential for impacts upon agricultural/forestry resources and mineral resources based upon lack of such resources in the project area (See Volume 3, pages 7 and 28 of initial study in Appendix A). For population and housing impacts, the Glen Mor 2 project was acknowledged as being consistent with the scale of residential development and campus growth anticipated in the LRDP and the associated program EIR and therefore adequately addressed in that earlier document (See Volume 3, page 31 of initial study in Appendix A). These determinations remain valid.

Determination:

The University has reviewed the proposed modified Arroyo Improvements and revised mitigation measures BIO 3 and BIO 4 in accordance with the California Environmental Quality Act (CEQA) and the University's procedures for the implementation of CEQA. Based on that review the University finds that the project does not raise any of the qualifying circumstances identified in Public Resources Code Section 21166 or California Environmental Quality Act Guidelines Section 15162 that would require preparation of subsequent documentation.

Attachments:

a. Added References
b. Revised Figure 2-5
c. September 12, 2012 ICF Memorandum
d. Revised Mitigation Measures BIO 3 and BIO 4
e. Revised Figure 2-7
f. ICF Delineation Update, September 10, 2012
g. Revised Figure 3.3-2, USACE Jurisdictional Delineation
h. Revised Figure 3.3-3, DFG Jurisdictional Delineation
i. Revised Figure 3.3-1, Vegetation Communities
j. Revised Table 5, Permanent Vegetation Impacts
k. Revised Table 6, Temporary Vegetation Impacts
l. Revised Figure 3.3-4, Vegetation Community Impacts
m. Revised Table 7, *Naturalistic Open Space* Impacts
n. Revised Table 8, Impacts on Jurisdictional Areas
o. Revised Figure 3.3-5 (includes new 3.3-5a, b, and c)
p. CHJ Consultants, Geotechnical Report, July 12, 2012
q. Berger ABAM, Scour Report, August 2012
r. Updated Arroyo Floodplain Limits
s. Supplemental Noise Memorandum (ICF, 8/27/ 2012)
t. Revised Figure 3.13-2

Glen Mor 2 Student Apartments Project
Addendum #1 (Modified Arroyo Improvements)

Addendum Attachments

Attachment a

Added References

Chapter 7
References

Added References for Modified Arroyo Improvements Addendum

7.1 Printed References

Berger ABAM, Flores Lund Consultants, 2012. *Glen Mor 2 Housing Complex – Proposed Scour Protection Improvements*. August. Prepared for: University of California, Riverside.

CHJ Incorporated, 2012. *Revised Report of Geotechnical Consulting, Proposed Arroyo Mitigation Project, Glen Mor 2*. July. Prepared for University of California, Riverside.

ICF International, 2012. *Addendum to Biological Resources Assessment for the University of California, Glen Mor 2 Student Apartments*. Letter report dated September10, 2012. Prepared for University of California, Riverside.

7.2 Personal Communications

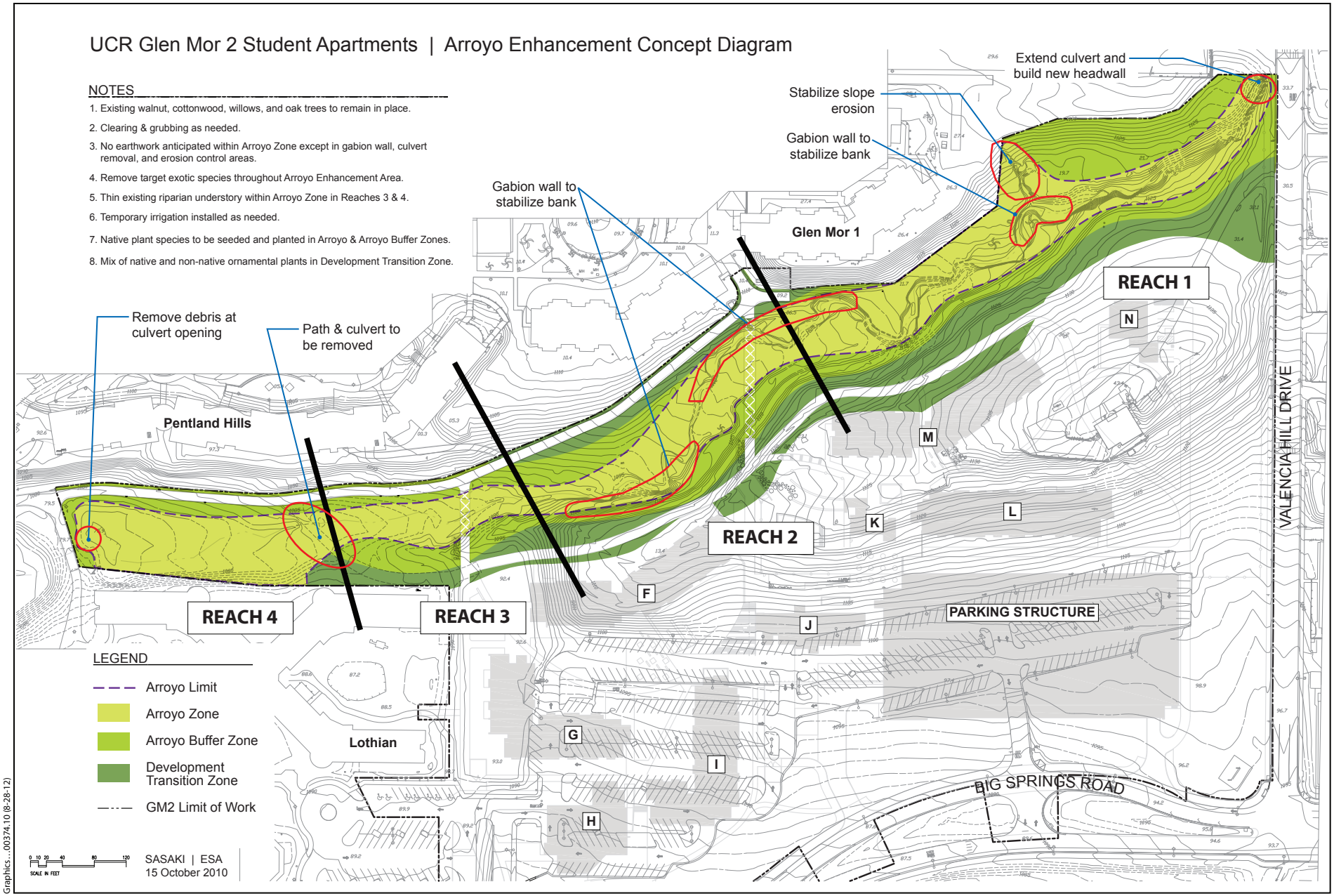
Gilmore, Ryan and Thomas Cherry, ICF International. September 12, 2012—memorandum to Kathleen Dale regarding cottonwood tree.

Hardie, Peter, ICF International. August 27, 2012—memorandum to Kathleen Dale regarding supplemental evaluation of noise and vibration for gabion walls.

These materials are available for review at the UCR Capital Resource Management offices, 1223 University Avenue, Suite 200, Riverside, California.

Attachment b

Revised Figure 2-5



ICF INTERNATIONAL

Figure 2-5
Proposed Arroyo Improvements
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Attachment c

September 12, 2012 ICF Memorandum

Memorandum

Date:	September 12, 2012
To:	Kathleen Dale, Regulatory Compliance Specialist
From:	Ryan Gilmore, Arborist Thomas M. Cherry, Landscape Architect
Subject:	**Glen Mor 2 Project – Cottonwood Tree**

Upon field inspection of the tree and the current improvement limits for the culvert extension at Valencia Hill Drive, it appears that there will be a substantial encroachment into the root zone of the cottonwood tree identified for avoidance in adopted Mitigation Measure BIO 3. As a general rule, a tree of this nature may be able to withstand loss of up to 25 percent of the canopy or 25 percent of the root zone (or 25 percent combined loss of canopy and root zone). At this juncture, it is not possible to say with certainty that the tree will survive the proposed disturbance.

To minimize disturbance to the tree, the following program of avoidance measures should be implemented prior to start of construction:

1. Establishment and demarcation of a tree protection zone. This should be accomplished under the guidance of an International Society of Arboriculture (ISA) certified arborist and employ a protective barrier consisting of 3-foot- high orange construction fencing. The preferred protection zone shall encompass a buffer of 5 feet beyond the dripline, or 15 feet from trunks, whichever is greater. Where the proposed improvements extend into the preferred protection zone, placement of the protective barrier shall minimize encroachment into the preferred protection zone to the maximum extent practical.
2. Pruning of tree roots, limbs and canopy prior to start of construction, under the guidance of an ISA certified arborist and in accordance with ISA pruning standards (for instance, cuts made clean and to the bark collar of the closest joint on the branch). Pruning should occur during the dormant period (approximately November to March).
3. Construction of the Valencia Hill culvert extension should be monitored by an ISA certified arborist. The arborist may require implementation of best management practices to minimize disturbance within the work limits, including but not limited to padding of vehicles, minimizing soil removal or addition, and use of protective matting.

Upon completion of construction, the tree shall be evaluated by an ISA certified arborist. Evaluations shall occur quarterly for one full year to monitor for signs of failure (including canopy dieback, reduced size or number of leaves, premature fall color). If in the opinion of the arborist, the tree is not showing

signs of failure, it shall be determined that the avoidance measures have been successful and no further action shall be required.

If post-construction monitoring indicates the tree has failed, the following measures are recommended to replace the lost functions and values. The existing cottonwood tree has an extensive root system extending into the stream channel and culvert. New plantings on the bank area would not enjoy the same access to water and would likely require supplemental irrigation for an extended period of time. The replanting recommendations below are intended to reestablish the lost canopy cover and retain cottonwoods as an element of the riparian zone. These elements would be implemented under the revegetation plan required under adopted Mitigation Measure BIO 4:

1. Replacement planting of three coast live oaks on the upper bank within the removed canopy area. Replacement trees shall be at least 6 inch caliper and 10 feet in height.
2. Replacement planting of Fremont's cottonwood (15 gallon minimum) along the stream channel within the area immediately downstream of the extended culvert. The total number of replacement trees (live oak and cottonwood) shall provide a minimum 1:1 replacement ratio based on the 85-inch diameter at breast height (DBH) measurement of the existing cottonwood tree. It is expected compliance with this measure would require planting of approximately 25 to 30 cottonwood trees.

Attachment d

Revised Mitigation Measures BIO 3 and BIO 4

Impact 3.3-8: Proposed project improvements within the Arroyo would result in temporary and permanent impacts on riparian habitat.	Significant	PP 4.4-2(a) MM 4.4-3(b)	**BIO 3: Minimize Temporary Impacts.** Prior to initiation of ground disturbance activities, disturbance limits adjacent to or within the Arroyo shall be clearly staked, including disturbance limits associated with Arroyo improvements. Access to the Arroyo shall be limited to existing roads and shall be fenced to ensure unnecessary encroachment to the Arroyo does not occur. Prior to initiation of ground disturbance activities within the Arroyo (excluding Arroyo enhancement), a qualified biologist (defined as a biologist with demonstrated experience with the resources being avoided) will identify biological resources to be avoided during construction, including jurisdictional streambeds and riparian habitat. The qualified biologist should review the final design plan and conduct a site visit to all areas within and adjacent to the Arroyo where construction activities would take place. Silt fencing or similar avoidance fencing shall be placed around the disturbance limits required for each project component within or adjacent to the Arroyo. No impacts on the Arroyo shall occur outside of staked disturbance limits. CDFG jurisdictional streambed at the tree removal area for Bridge 1 shall be avoided if practicable. At a minimum, the following areas shall be avoided: • riparian vegetation adjacent to the path/culvert removal; • riparian vegetation located at the northwest side of the south abutment temporary work area for Bridge 2; • CDFG jurisdictional streambed located on the south side of the bank recontouring area. • The mature cottonwood tree near the Valencia Hill culvert extension work limit.	Less than significant

The following measures will be implemented to minimize disturbance to the cottonwood tree at the Valencia Hill culvert work area:

1. Establishment and demarcation of a tree protection zone. This should be accomplished under the guidance of an International Society of Arboriculture (ISA) certified arborist and employ a protective barrier consisting of 3-foot- high orange construction fencing. The preferred protection zone shall encompass a buffer of 5 feet beyond the dripline, or 15 feet from trunks, whichever is greater. Where the proposed improvements extend into the preferred protection zone, placement of the protective barrier shall minimize encroachment into the preferred protection zone to the maximum extent practical.
2. Pruning of tree roots, limbs and canopy prior to start of construction, under the guidance of an ISA certified arborist and in accordance with ISA pruning standards (for instance, cuts made clean and to the bark collar of the closest joint on the branch). Pruning should occur during the dormant period (approximately November to March).
3. Construction of the Valencia Hill culvert extension should be monitored by an ISA certified arborist. The arborist may require implementation of best management practices to minimize disturbance within the work limits, including but not limited to padding of vehicles, minimizing soil removal or addition, and use of protective matting.

Upon completion of construction, the tree shall be evaluated by an ISA certified arborist. Evaluations

shall occur quarterly for one full year to monitor for signs of failure (including canopy dieback, reduced size or number of leaves, premature fall color). If in the opinion of the arborist, the tree is not showing signs of failure, it shall be determined that the avoidance measures have been successful and no further action shall be required.

If post-construction monitoring indicates the tree has failed, the measures provided for in MM BIO 4 below shall be implemented to replace the lost functions and values.

BIO 4: Prepare and Implement Revegetation Plan.

All areas identified as temporarily affected by construction activities shall be revegetated with native vegetation. All areas with riparian habitat shall be revegetated with similar riparian vegetation. Other vegetated areas (i.e., ruderal and annual grassland communities) that are temporarily affected shall be revegetated with native vegetation suitable to that location. If trees/riparian vegetation cannot be replanted within the disturbance limits of the respective project component, a suitable area within the Arroyo shall be selected for restoration. The restoration location will, at a minimum, provide replacement habitat of equal acreage as the affected location.

Prior to removal of vegetation, a qualified biologist shall conduct an assessment of functions and values for the Arroyo, including all areas where vegetation removal will be conducted. Areas assessed will be of sufficient area and number to assess functions and values of the entire Arroyo to demonstrate success of the Arroyo enhancement program. The monitoring component of the revegetation plan shall include

functions and values that are of equal or greater value than existing conditions as performance criteria.

Prior to initiation of ground disturbance activities, a revegetation plan shall be prepared and submitted to the relevant agencies (i.e., USACE, CDFG). The revegetation plan should be sufficient to meet agency requirements and at a minimum shall include the following:

- a map and acreage of vegetation to be temporarily affected,
- location of revegetation area,
- functions and values assessment of areas to be affected,
- functions and values assessment of entire Arroyo within the project footprint,
- plant palette,
- performance criteria, and
- monitoring guidelines.

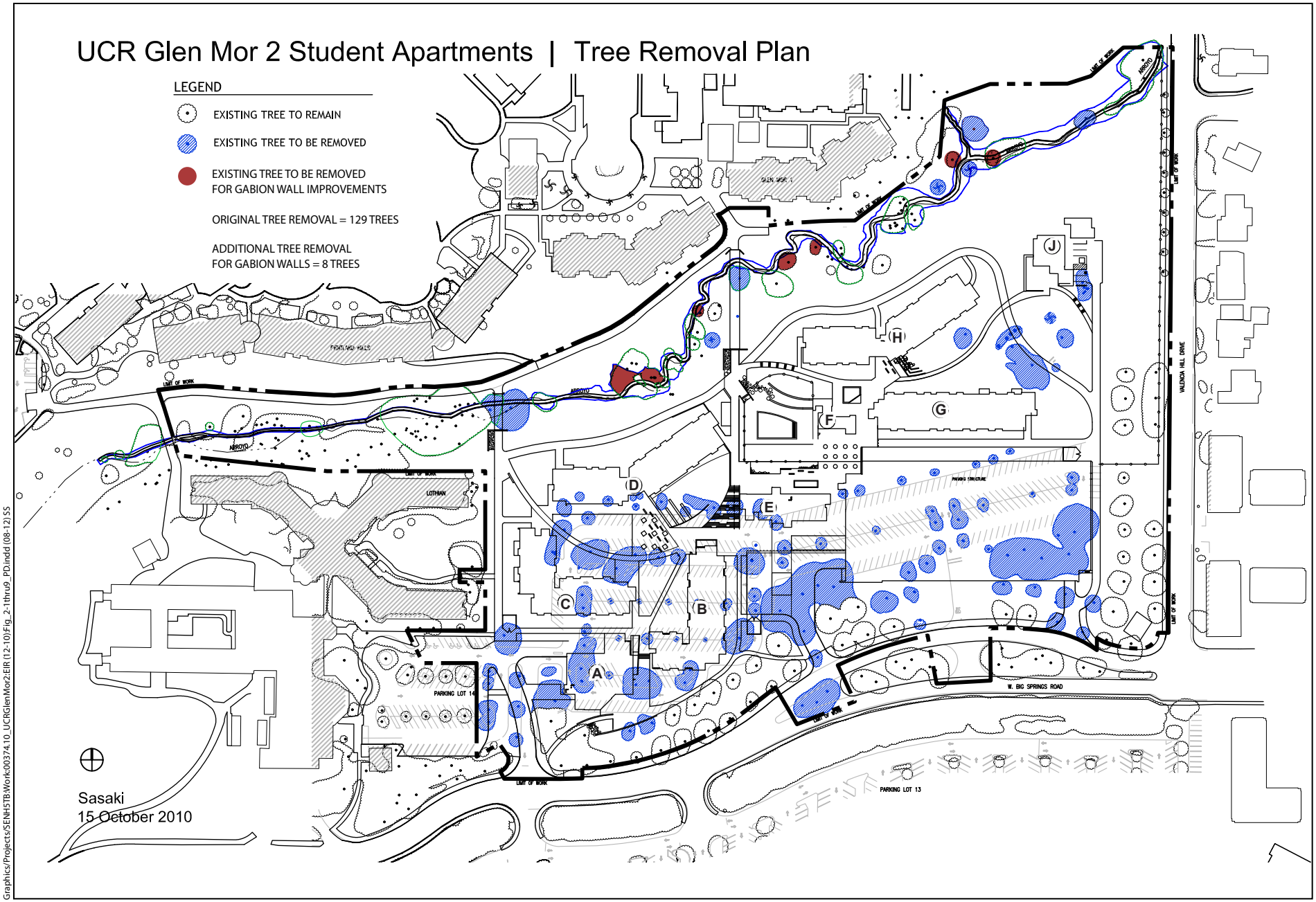
In the event the mature cottonwood tree at the Valencia Hill culvert extension is determined to have failed (see MM BIO 3, above), the revegetation plan shall include the following measures to replace the lost functions and values:

1. Replacement planting of three coast live oaks on the upper bank within the removed canopy area. Replacement trees shall be at least 6 inch caliper and 10 feet in height.
2. Replacement planting of Fremont's cottonwood (15 gallon minimum) along the stream channel within the area immediately downstream of the extended culvert. The total number of replacement trees (live oak and cottonwood) shall

		provide a minimum 1:1 replacement ratio based on the 85-inch diameter at breast height (DBH) measurement of the existing cottonwood tree. It is expected compliance with this measure would require planting of approximately 25 to 30 cottonwood trees.

Attachment e

Revised Figure 2-7



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Note: Cottonwood tree at Valencia Hill Drive culvert extension is to be avoided if at all feasible. If construction activities cause tree to fail, there will be one additional impacted tree

Figure 2-7
Tree Removal Plan
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Attachment f

ICF Delineation Update

September 10, 2012

Tricia D. Thrasher, ASLA
Capital Resource Management
University of California Riverside
1223 University Avenue, Suite 200
Riverside, CA 92507

Subject: Addendum to the BIOLOGICAL RESOURCES ASSESSMENT FOR THE UNIVERSITY OF CALIFORNIA, RIVERSIDE GLEN MOR 2 STUDENT APARTMENTS

Dear Ms. Thrasher:

This letter report provides the methods and results of an updated routine delineation for the proposed University of California, Riverside Glen Mor 2 Student Apartments Project (Project). This update has been prepared to address changes in both the physical conditions within the Project limits and in the nature and location of proposed improvements within the on-site jurisdictional feature. The purpose of this delineation is to assess the limits of state and federal jurisdiction within and adjacent to the project site in support of the resource-agency permitting process for the proposed channel improvements within the Great Glen Arroyo (arroyo). This report describes the resources subject to regulation by the U.S. Army Corps of Engineers (USACE) pursuant to Section 404 of the Clean Water Act, Regional Water Quality Control Board (RWQCB) pursuant to Section 401 of the Clean Water Act, and California Department of Fish and Game (DFG) pursuant to Division 2, Chapter 6, Section 1600 of the Fish and Game Code.

Project Location

The proposed project is located on the UCR campus within the City of Riverside in Riverside County, California, approximately 2.5 miles southeast of the State Route 91/Interstate 215/State Route 60 interchange (Figure 1). The proposed project consists of a 21-acre site within the East Campus portion of UCR. The proposed project site is located northwest of the Valencia Hill Drive/Big Springs Road intersection and bordered by existing campus housing and recreational fields to the north and west, Big Springs Road and surface parking lots to the south, and Valencia Hill Drive and off-campus residential development to the east. The proposed project is found within Section 20, Township 2 South, and Range 4 West of the Public Land Survey System of the Riverside East 7.5-minute quadrangle. It can also be found in the current Thomas Guide on page 686, cell E5. Figure 2 shows the project vicinity.

Methodology

Prior to beginning the field delineation the *Biological Resources Assessment for the University of California, Riverside Glen Mor 2 Student Apartments* dated January 2011 (ICF), a 100-scale color aerial photograph, and the previously cited USGS topographic map were analyzed to determine the locations of potential areas of USACE, RWQCB, and DFG jurisdiction. ICF Regulatory Specialist Zackry West conducted the jurisdictional delineation on May 2 and 7, 2012, as an update to the delineation that was conducted in June 2010, as included within the *Biological Resources Assessment for the University of California, Riverside Glen Mor 2 Student Apartments*. Potentially jurisdictional features (USACE 2011) within the arroyo (study area) were evaluated for the presence of a definable channel and/or wetland vegetation, soils and hydrology. Focus was directed to areas identified for improvements. The Project area was analyzed for areas of potential wetlands that could have developed since the original delineation, using the methodology set forth in the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual (Wetland Manual) (Environmental Laboratory 1987) and the 2008 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Arid West Region Version 2.0 (Arid West Supplement) (USACE 2008a). Lateral limits of non-wetland waters were identified using field indicators of an Ordinary High Water Mark (OHWM) (USACE 2008b). DFG jurisdiction was delineated by measuring the outer width and length boundaries of potentially jurisdictional areas, consisting of the greater of either the top of bank measurement or the extent of associated riparian vegetation. Vascular plant species within the study area were identified using The Jepson Manual: Vascular Plants of California (Baldwin). While in the field, potentially jurisdictional features were mapped using a sub-meter accuracy hand-held global positioning satellite (GPS) unit.

Results

Table 1. Summary of Preliminary Jurisdiction within the Study Area

Non-wetland waters			CDFG			Linear
USACE	RWQCB	Wetland	Streambed	Riparian	Total	Feet
0.27 acre	0.27 acre	---	0.42 acre	1.05 acre	1.32 acre[1]	2,204 feet

[1] Total CDFG area is not the sum of Streambed and Riparian because the riparian overlaps the streambed in areas.

I. USACE Jurisdiction

One ephemeral drainage totaling 0.27acre and 2,204 linear feet of non-wetland waters of the United States (Figure 3) is located within the arroyo, and is potentially subject to USACE jurisdiction. The drainage enters the study area on the northeastern corner of the Project area and meanders westerly for approximately 2,204 linear feet until evidence of an OHWM dissipates temporarily in the ruderal field located west of the Lothian residence hall. The drainage connects via sheet flow over a distance of approximately 400 feet to a downstream feature known as the Junction Basin. The Junction Basin discharges via culvert to a surface channel along North Campus Drive, which opens into another basin feature known as the Glade Basin, a turf landscaped feature at the northeast corner of Aberdeen Drive and Campus Drive. Flows from the Glade Basin discharge into an underground storm drain which emerges approximately 1,300 feet downstream at the Gage Basin, a riparian zone at the northwest corner of Canyon Crest Drive and University Avenue that is the terminal feature of the stormwater management system for this portion of the campus. Water from the Gage Basin enters the city storm drain system, which discharges to the Santa Ana River, a tributary of the Pacific Ocean.

Runoff from upstream tributary areas enters the ephemeral drainage via a 43-inch concrete drain with brick and mortar headwall at Valencia Hill Drive. From this point, the drainage is unvegetated and deeply incised for approximately 1,517 linear feet until flowing across a dirt path. After crossing the dirt path, the channel becomes shallow, and meanders through the cottonwood-willow riparian habitat for approximately 179 linear feet until encountering a second path with a sediment-choked 12-inch concrete culvert. Some flows continue through the culvert; however, it is apparent from the riparian vegetation community that ponding is occurring in this area, and not all flows are conveyed to the downstream portion. Evidence of an OHWM is very poor downstream of this culvert. From this point, the drainage meanders downstream through a predominantly non-native riparian vegetation community for approximately 377 linear feet and through a 48-inch concrete culvert that passes under a paved path. Downstream of the 48-inch culvert, the OHWM is more discernible and continues for approximately 131 linear feet before dissipating in a field. As stated above, the channel connects via sheet flow to downstream drainage features and into the city storm drain system. The substrate of the ephemeral drainage is sandy, and the OHWM varies in width between 1 and 17 feet and is evidenced by break in bank slope, shelving, changes in soil characteristics, and destruction of terrestrial vegetation.

Since the original delineation was conducted in June 2010, lateral limits of potential USACE jurisdictional areas have increased from the original 0.23 acre by 0.04acre of non-wetland waters of the United States, as scour has eroded the arroyo banks in certain reaches and widened these portions of the channel bed.

No areas exhibiting potential to meet the three-parameter definition of a wetland were observed to have developed within the study area since the original June 2010 delineation.

II. DFG Jurisdiction

DFG jurisdiction within the survey area totals 1.32 acre, including 0.42 acre of unvegetated streambed, and 1.05 acre of vegetated riparian habitat (Figure 4). The DFG streambed is the ephemeral drainage within the arroyo. The upstream portion of the jurisdictional streambed ranges in width from 3to 28 feet from bank to bank. The downstream portion of the jurisdictional streambed, approximately from the dirt footpath located north of Lothian Hall downstream, is

incised with a width ranging from 1 to 5 feet. With the exception of the riparian patches discussed below, the bed of the channel is unvegetated. The streambed is best described in four segments: an upstream reach of approximately 1,517 feet, a riparian reach of 179 feet, a 377 linear-foot reach between two culverts, and a downstream reach of approximately 131 linear feet.

The banks of the entire channel are dominated by non-native ruderal vegetation including red brome (*Bromus madritensis* ssp. *rubens*), ripgut grass (*Bromus diandrus*), redstem filaree (*Erodium cicutarium*), bull thistle (*Cirsium vulgare*), common fiddleneck (*Amsinckia menziesii*), jimson weed (*Datura stramonium*), prickly lettuce (*Lactuca serriola*), shortpod mustard (*Hirshfeldia incana*), and Russian thistle (*Salsola tragu*). Associated riparian vegetation and overstory cover is described below for each segment.

The 1,517-foot upstream segment has an unvegetated bed with dominant vegetation on the adjacent terraces and banks consisting of Fremont cottonwood (*Populus fremontii* ssp. *fremontii*), mulefat (*Baccahris salicifolia*), hybridized California black/eastern walnut (*Jugluns californica* x *Jugluns nigra*), blue elderberry (*Sambucus nigra*), coast live oak (*Quercus agrifolia*), Mexican palo verde (*Parkinsonia aculeata*), brittlebush (*Encelia farinosa*), Mexican fan palm (*Washingtonia robusta*), and tree tobacco (*Nicotiana glauca*).

The 179-foot long riparian segment is dominated by Fremont cottonwood, Gooding's black willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), desert wild grape (*Vitis girdiana*), saltcedar (*Tamarix ramosissima*), and hybridized California black/eastern walnut.

The 377-foot reach adjacent downstream of the riparian area has an unvegetated bed. Vegetation on the banks of this reach consist of one arroyo willow, one Mexican palo verde, castor bean (*Ricinus communis*), eucalyptus (Eucalyptus sp.), and pine tree (*Pinus* sp.). Although this area has a high percentage of non-native species; the canopy cover it provides adjacent to the drainage, combined with the native riparian species, results in this area functioning as riparian habitat and it was included as riparian vegetation associated with a DFG jurisdictional streambed.

The 131-foot downstream segment of the drainage has an unvegetated bed. Dominant vegetation associated with the banks of this segment consists of black willow, mulefat, and eucalyptus.

Since the original delineation was conducted in June 2010, the lateral limits of DFG unvegetated streambed have increased in certain reaches of the arroyo, as scour has widened portions of the channel bed by eroding associated banks. There are also reaches where the lateral limits of DFG unvegetated streambed have narrowed, as the channel bed has become further incised, thus containing flows within the incised portions of the channel and reducing top-of-bank width measurements. Overall, DFG unvegetated streambed has decreased by 0.32acre from the original 0.74 acres, resulting in a current total of 0.42acres of DFG unvegetated streambed within the study area. The area of DFG riparian habitat has increased from 0.92 to 1.04 acre, reflecting both an increase in the extent of previously identified habitat patches and development of new patches.

III. Regional Water Quality Control Board

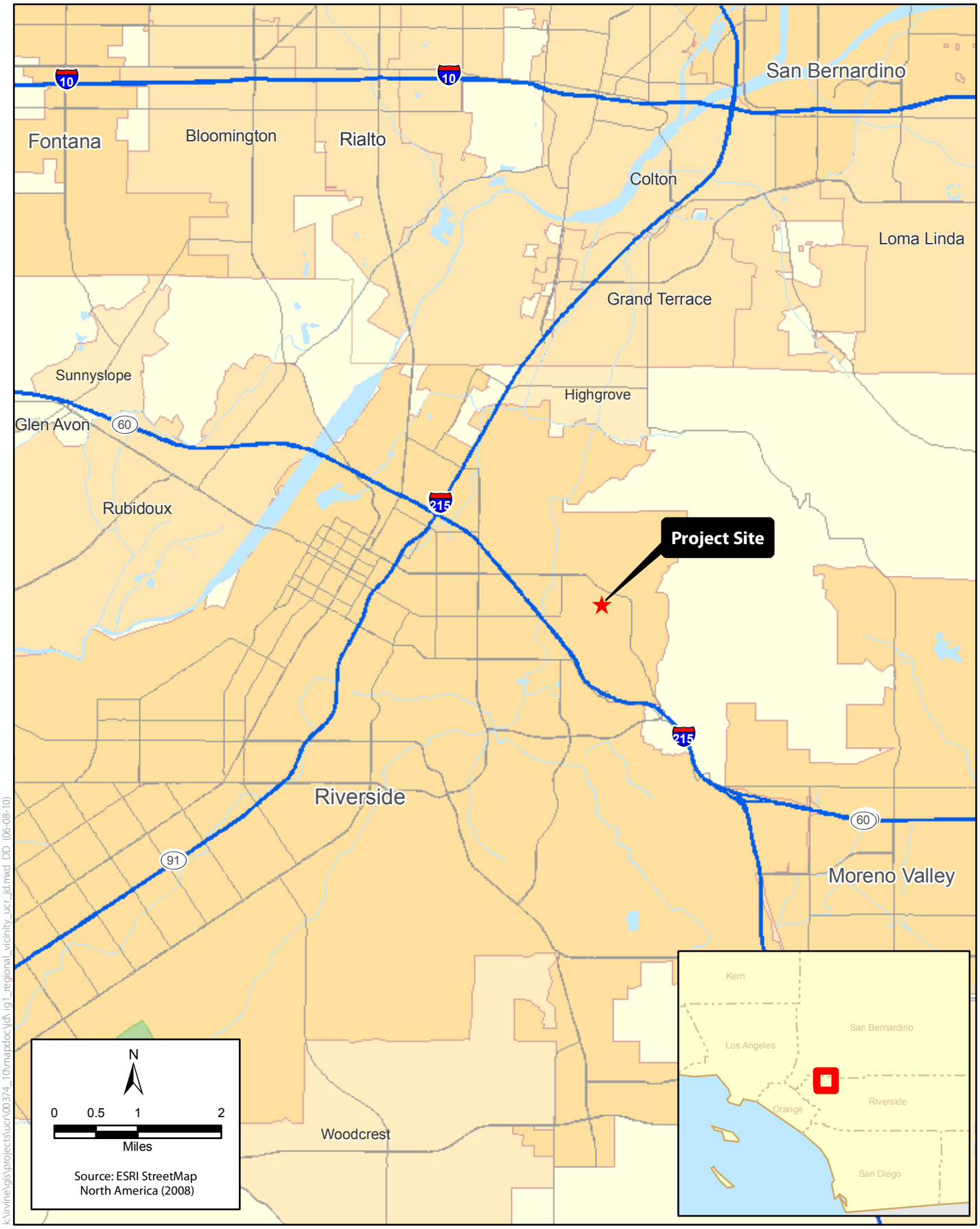
RWQCB jurisdiction associated with the project site is concurrent with jurisdiction of the USACE, as described above. No isolated features potentially subject to RWQCB jurisdiction pursuant to Section 13260 of the Porter-Cologne Act were identified on site.

If you have any questions about this letter report, please contact me at (951) 683-2356.

Sincerely,

Zackry West
Senior Regulatory Specialist/Biologist

Enclosures: Figure 1 - Regional Vicinity Map
Figure 2 – USGS Riverside East 7.5 Minute Quadrangle
Figure 3 – USACE Jurisdictional Delineation
Figure 4- DFG Jurisdictional Delineation
References



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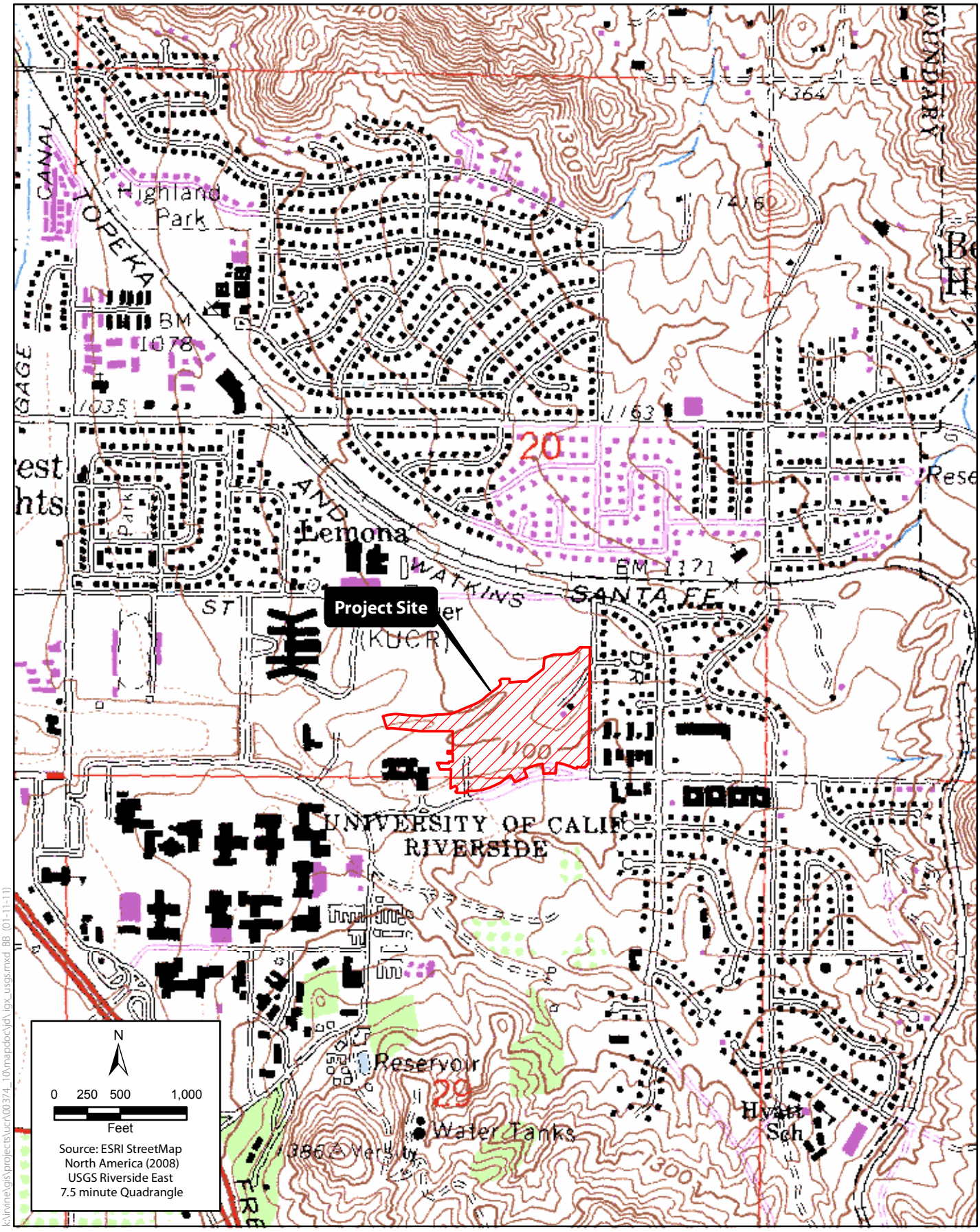
ICF INTERNATIONAL

Figure 1
Regional Vicinity Map
Glen Mor 2 Student Apartments Project
University of California, Riverside, California



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ICF INTERNATIONAL

Figure 2
USGS Riverside East 7.5 Minute Quadrangle
Glen Mor 2 Student Apartments Project
University of California, Riverside, California

33.978267,
-117.318212

33.977329,
-117.32016

33.976514,
-117.323476

5
3
2
4
5
17
10
5
1
1
4
5

VALENCIA HILL DRIVE

BIG SPRINGS ROAD

Legend

- Glen Mor 2 Project Footprint
- USACE WoUs
- UCR Glen Mor Contours
- USACE WoUS width (feet)

Map Created on 9/10/2012

N

0 50 100 200

Feet

1 " = 120 '

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Figure 3
USACE Jurisdictional Delineation 2012 Update
Glen Mor 2 Student Apartments Project

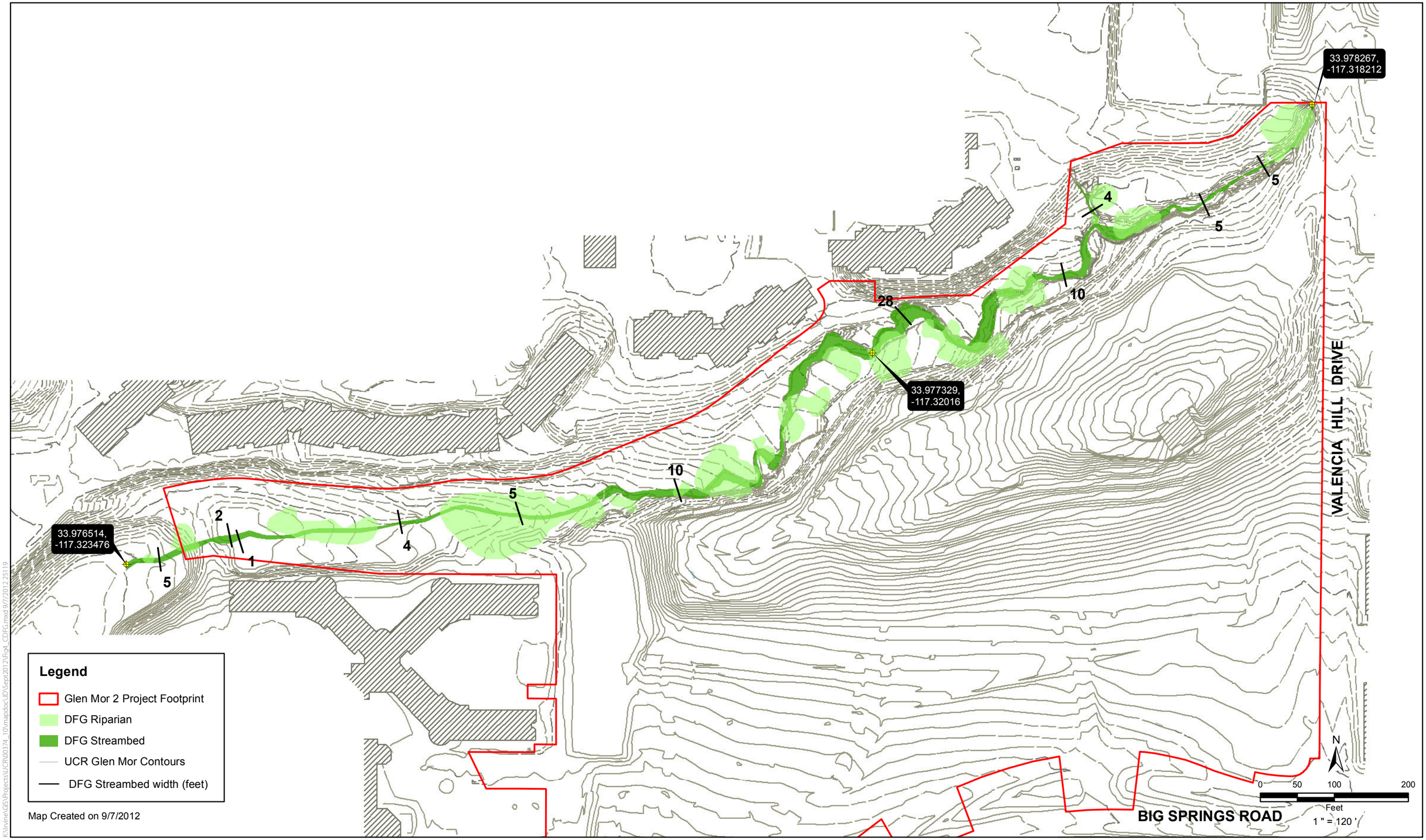

Figure 4
DFG Jurisdictional Delineation 2012 Update
Glen Mor 2 Student Apartments Project

References

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Attachment g

Revised Figure 3.3-2

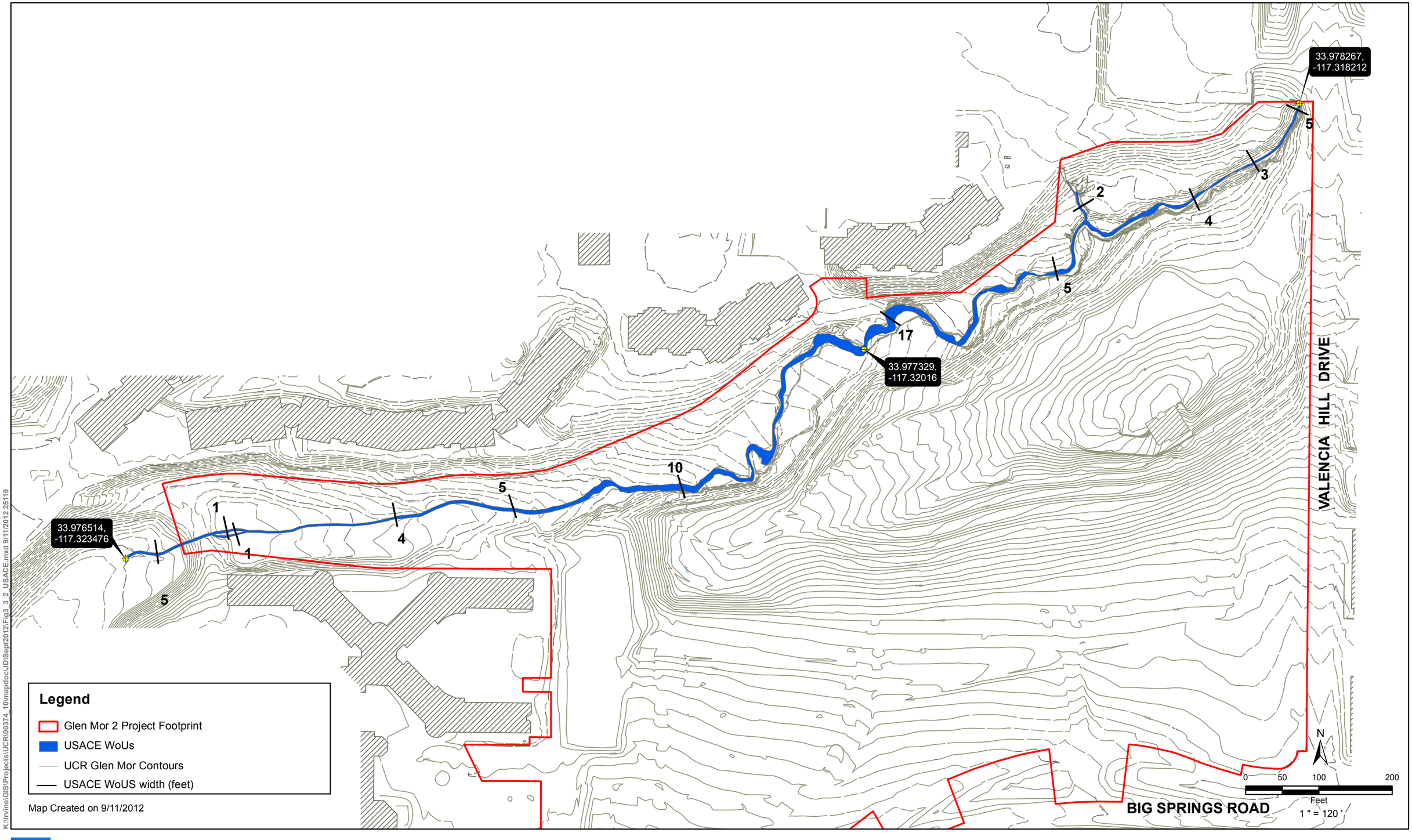

Figure 3.3-2
USACE Jurisdictional Delineation
Glen Mor 2 Student Apartments Project
Revised September 2012 for Arroyo Improvements Addendum

Attachment h

Revised Figure 3.3-3

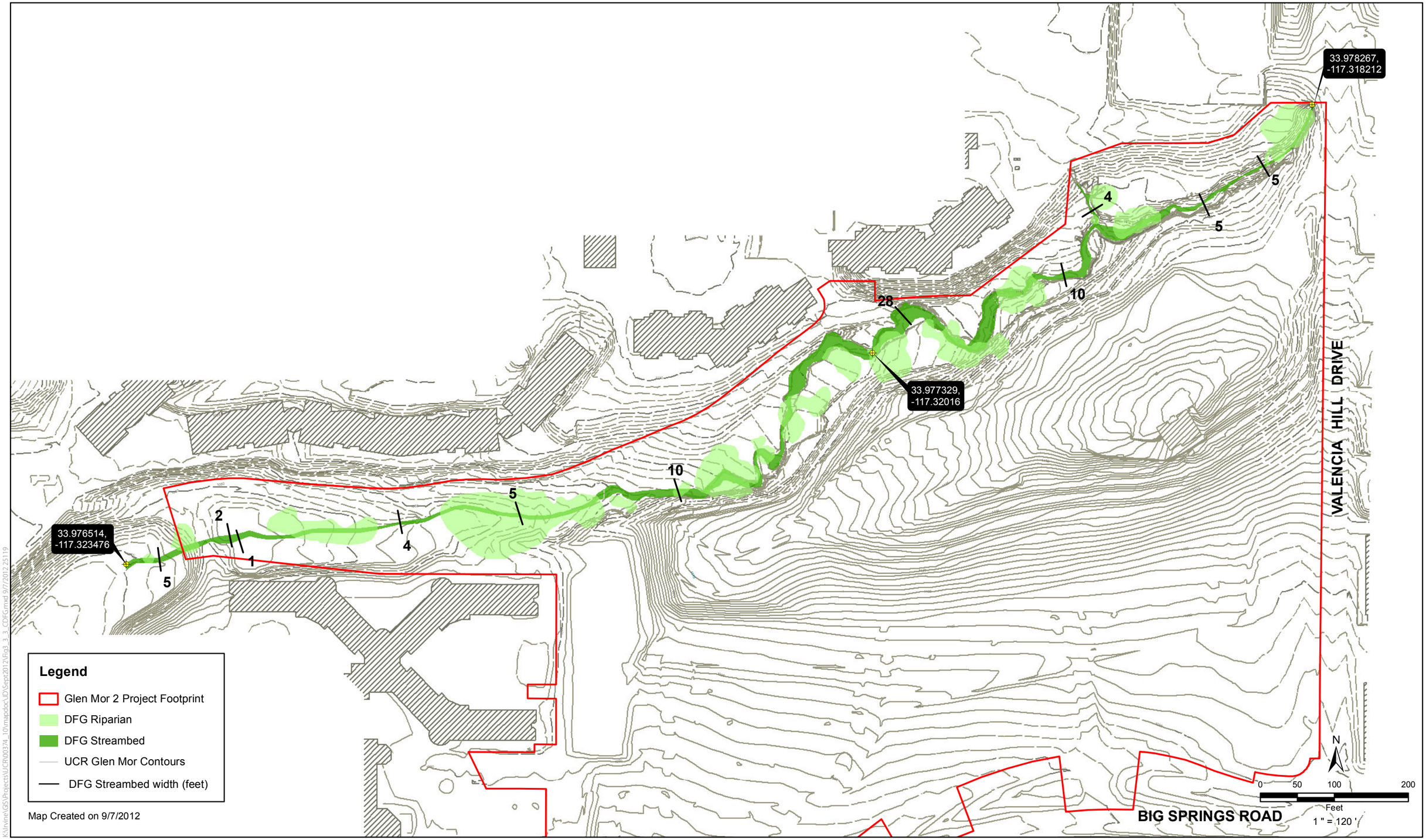

Figure 3.3-3
DFG Jurisdictional Delineation
Glen Mor 2 Student Apartments Project
Revised September 2012 for Arroyo Improvements Addendum

Attachment i

Revised Figure 3.3-1

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Figure 3.3-1
Vegetation Communities
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Attachment j

Revised Table 5

This table replaces Table 5 as contained within Appendix I, Volume 3 of the certified Final EIR (page 5-6)

Table 5. Proposed Project Permanent Impacts on Vegetation Communities (acres)

Proposed Project Impact	Rip - WW	Rip - Non-WW	ANG	RUD	LAND	DEV	Total
Residential Development Site							
Buildings, circulation, parking structure, landscaping	---	---	5.9448	0.0290	2.2024	4.4268	12.6030
Arroyo Improvements							
Culvert Extension (concrete, rip-rap)	---	0.0056	0.0002	0.0006	---	---	0.0064
Upstream Gabion Wall (125 feet)	---	0.0024	---	0.0062	---	---	0.0086
Central Gabion Wall (250 feet)	---	0.0011	---	0.0162	---	---	0.0173
Downstream Gabion Wall (222 feet)	---	0.0042	---	0.0111	---	---	0.0153
Bridge 1 (abutments)	---	---	0.0363		---	---	0.0363
Bridge 2 (abutments and rip-rap)	---	---	---	0.0303	---	---	0.0303
Arroyo Improvements Total							***0.1142***
Total Permanent	---	**0.01**	**5.98**	**0.09**	**2.20**	**4.43**	**12.72**

Rip – Riparian
WW – Walnut Woodland
ANG –Annual Grassland
RUD – Ruderal
LAND - Landscape
DEV – Developed

Attachment k

Revised Table 6

This table replaces Table 6 as contained within Appendix I, Volume 3 of the certified Final EIR (page 5-6)

Table 6. Proposed Project Temporary Impacts on Vegetation Communities (acres)

Proposed Project Impact	Rip - WW	Rip - Non-WW	ANG	RUD	LAND	DEV	Total
Temporary							
Culvert Extension (work area)	---	0.056[1]	0.165	0.212	---	0.004	0.4370
Upstream Gabion Wall (work area[2])	---	0.0302	---	0.0600	---	---	0.0902
Central Gabion Wall (work area)	0.0239	0.0312	---	0.3134	0.0057	---	0.3742
Downstream Gabion Wall (work area)	---	0.0485	0.017	0.0684	---	---	0.1339
Erosional Fill (at Upstream Gabion Wall)	0.0241	---	---	0.0338	---	---	0.0579
Bridge 1 South Abutment[3]	---	---	---	0.0227		---	0.0227
Bridge 2 Abutments	---	---	---	0.034	0.0041	---	0.0381
Bridge 1 Tree Removal	0.0333[4]	---	---	---	---	---	0.0333
Bridge 2 Tree Removal	---	0.0510	---	---	---	---	0.0510
Path/Culvert Removal	---	---	---	0.0246	---	0.0162	0.0408
Culvert Debris Removal	---	---	---	0.0143	---	---	0.0143
Temporary Total	**0.08**	**0.22[1]**	**0.18**	**0.78**	**0.01**	**0.02**	**1.29**

Rip – Riparian
WW – Walnut Woodland
ANG –Annual Grassland
RUD – Ruderal
LAND - Landscape
DEV – Developed

[1] Temporary impacts at the Valencia Hill culvert extension include loss of the large cottonwood tree. In the event impacts to this tree are avoided as intended under MM BIO 3, impacts would be reduced by 0.04 acre.

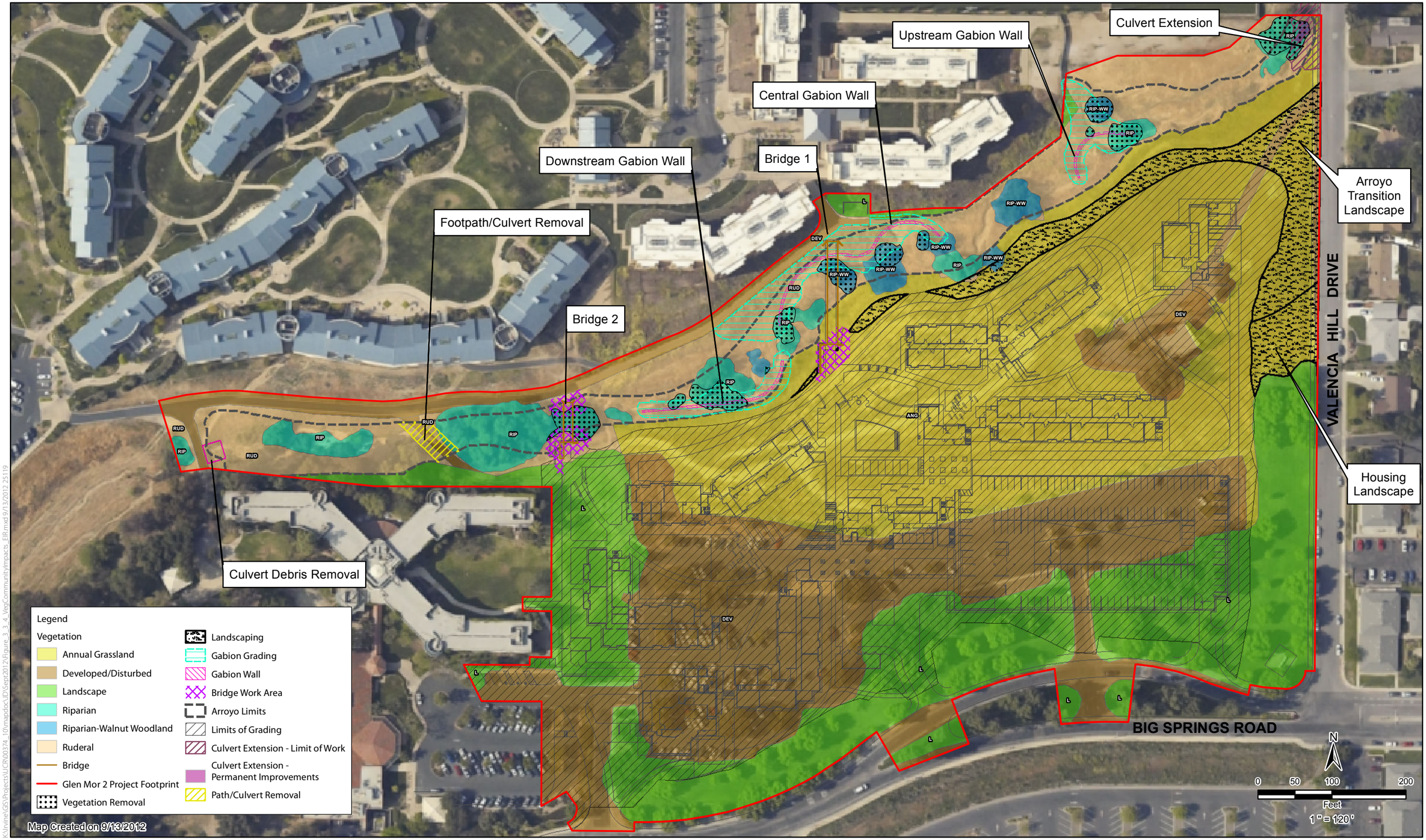
[2] "Work Area" for gabion walls includes excavation, bank recontouring and channel bottom grading

[3] Temporary impacts for Bridge 1 north abutment lie entirely within temporary work area for Central Gabion Wall

[4] This tree would also be impacted by the Central Gabion Wall bank recontouring work. Impacts are accounted for one time with the bridge.

Attachment I

Revised Figure 3.3-4



Note: Vegetation Removal limits at the Culvert Extension adjacent to Valencia Hill Drive reflect the possibility that the large cottonwood tree at this location may be lost due to work within the tree's root zone. Monitoring activities during and after construction will be directed at preserving this tree in accordance with MM BIO 3. However, in the event the tree fails despite all reasonable measures, replacement plantings will be implemented in accordance with MM BIO 4.

Figure 3.3-4
Vegetation Community Impacts
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Attachment m

Revised Table 7

This table replaces Table 7 as contained within Appendix I, Volume 3 of the certified Final EIR (page 5-10)

Table 7. Proposed Project Impacts on Naturalistic Open Space (acres)

Proposed Project Impact	Rip - WW	Rip Non-WW	ANG	RUD	LAND	DEV	Total
Permanent							
Culvert Extension	---	0.0056	---	0.0006	---	---	0.0062
Upstream Gabion Wall	---	0.0024	---	0.0062	---	---	0.0086
Central Gabion Wall	---	0.0011	---	0.0162	---	---	0.0173
Downstream Gabion Wall	---	0.0042	---	0.0111	---	----	0.0153
Bridge 1 North Abutment[1]	---	---	---	0.0022	---	---	0.0022
Bridge 2 Abutments	---	---	---	0.0161	---	---	0.0161
Permanent Total	***---***	***0.0133***	***---***	***0.0524***	***---***	***---***	***0.0657***
Temporary							
Culvert Extension	---	0.056[2]	---	0.212	---	---	0.268
Upstream Gabion Wall	---	0.0302	---	0.0600	---	---	0.0902
Central Gabion Wall[3]	0.0239	0.0312	---	0.2196	---	---	0.2747
Downstream Gabion Wall	---	0.0485	---	0.0684	---	---	0.1169
Erosional Fill (at Upstream Gabion Wall)	0.0241	---	---	0.0338	---	---	0.0579
Bridge 2 Abutments	---	---	---	0.0311	---	---	0.0311
Bridge 1 Tree Removal	0.0333[4]	---	---	---	---	---	0.0333
Bridge 2 Tree Removal	---	0.0510	---	---	---	---	0.0510
Path/Culvert Removal	---	---	---	0.0244	---	0.0162	0.0406
Culvert Debris Removal	---	---	---	0.009	---	---	0.009
Temporary Total	***0.0813***	***0.2169[2]***	***---***	***0.6583***	***---***	***0.0162***	***0.9727***

Rip – Riparian
WW – Walnut Woodland
ANG –Annual Grassland
RUD – Ruderal
LAND - Landscape
DEV – Developed

[1] The south abutment of this bridge is outside the Naturalistic Open Space boundary

[2] Temporary impacts at the Valencia Hill culvert extension include loss of the large cottonwood tree. In the event impacts to this tree are avoided as intended under MM BIO 3, impacts would be reduced by 0.04 acre

[3] Temporary impacts for the north abutment of Bridge 1 are accounted for with the work limits for the Central Gabion Wall

[4] This tree would also be impacted by the Central Gabion Wall bank recontouring work. Impacts are accounted for one time with the bridge.

Attachment n

Revised Table 8

This table replaces Table 8 as contained within Appendix I, Volume 3 of the certified Final EIR (page 5-17)

Table 8. Proposed Project Impacts on Jurisdictional Areas

	USACE/RWQCB			DFG		
Proposed Project Impact[1]	Linear Feet[2]	Acres	Total DFG Acres[3]	DFG Streambed Only	DFG Riparian Total	Linear Feet
Permanent						
Culvert Extension	37	0.0025	0.0089	*0.0042*	*0.0089*	37
Upstream Gabion Wall	30	0.0014	0.0033	*0.0033*	---	66
Central Gabion Wall	165	0.0145	0.0273	*0.0273*	---	223
Downstream Gabion Wall	66	0.0038	0.0060	*0.0060*	---	66
Erosional Fill (Upstream Gabion Wall)	75	0.0033	0.0038	*0.0038*	---	75
Path/Culvert Removal	---	---	---	---	---	---
Culvert Debris Removal	---	---	---	---	---	---
Permanent Total	**373**	**0.0255**	**0.0493**	***0.0446***	***0.0089***	**467**
Temporary						
Culvert Extension – Limit of Work	27	0.0018	0.0528[4]	*0.0030*	*0.0528*[4]	27
Upstream Gabion Wall (work limits)	140	0.0142	0.0653	*0.0317*	*0.0336*	140
Central Gabion Wall (work limits)	325	0.0562	0.1275	*0.0873*	*0.0562*	325
Downstream Gabion Wall (work limits)	218	0.0338	0.0814	*0.0441*	*0.0533*	218
Erosional Fill at Upstream Gabion Wall (tree removal)	---	---	0.0241	---	*0.0241*	---
Bridge 1 (tree removal) [5]	---	---	0.0333	---	*0.0333*	---
Bridge 2 (tree removal)	55	0.0063	0.0510	*0.0063*	*0.0510*	55
Path/Culvert Removal	34	0.0031	0.0043	*0.0043*	---	34
Culvert Debris Removal	45	0.0032	0.0052	*0.0052*	---	26
Temporary Total	**844**	**0.1186**	**0.4449**[4]	***0.1819***	***0.3043***[4]	**825**

[1] Encroachments associated with the north abutment of Bridge 1 are entirely within the impact zone associated with the Central Gabion Wall. Improvement limits and work areas for the remaining bridge improvements are outside the jurisdictional stream limits. Impacts associated with tree removal for the bridge spans are included under temporary impacts.

[2] Total length of impact for OHWM and DFG Streambed is less than the sum of the combined total distance for temporary and permanent impacts. This is due to overlap of temporary and permanent impacts along the existing stream for gabion wall elements.

[3] Total DFG is not additive of DFG Streambed and DFG Riparian because riparian overlaps streambed.

[4] Temporary impacts at the Valencia Hill culvert extension include loss of the large cottonwood tree. In the event impacts to this tree are avoided as intended under MM BIO 3, impacts would be reduced by 0.04 acre.

[5] This tree would also be impacted by the Central Gabion Wall bank recontouring work. Impacts are accounted for one time with the bridge.

Attachment o

Revised Figure 3.3-5

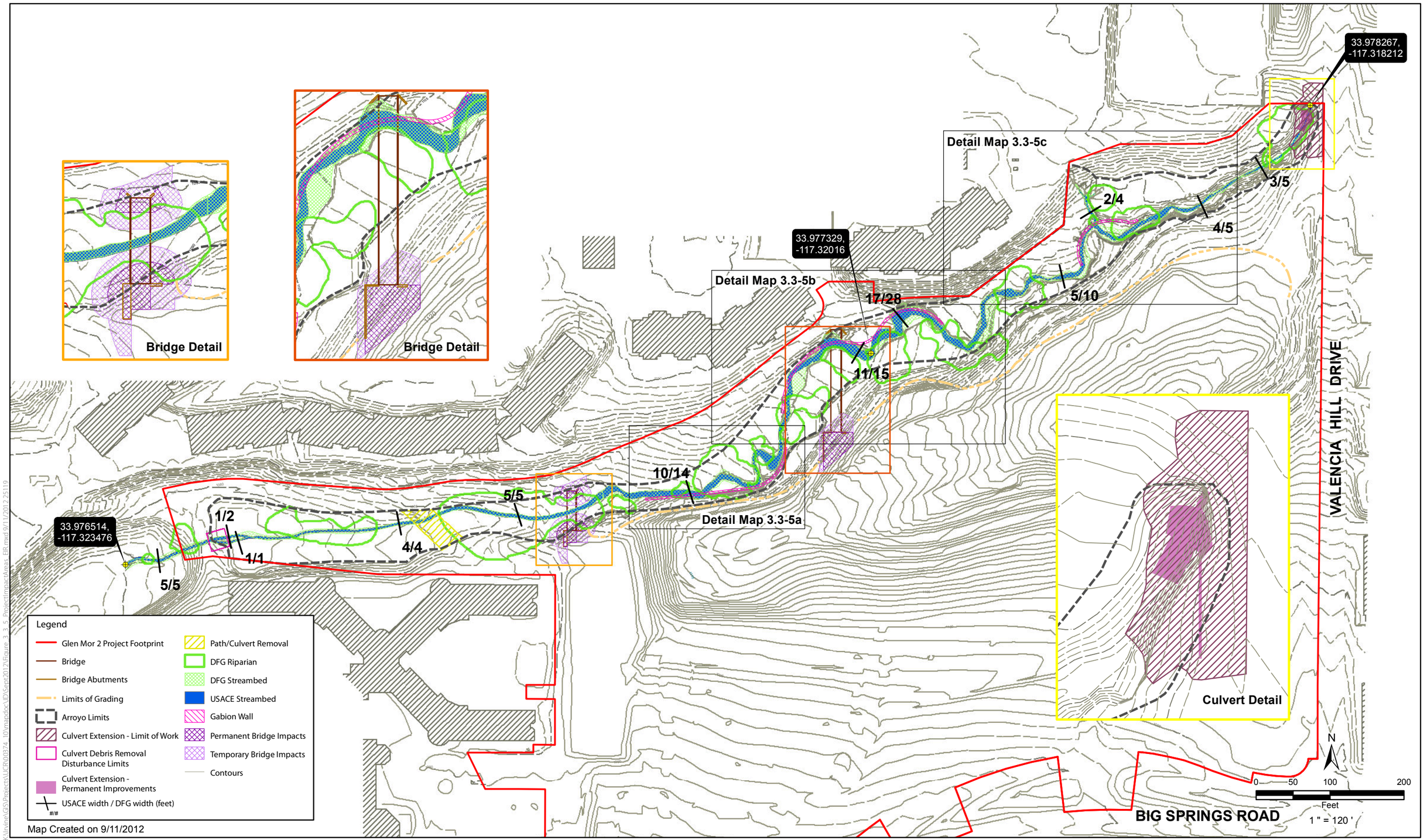


Figure 3.3-5
Arroyo and Jurisdictional Water Impacts
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

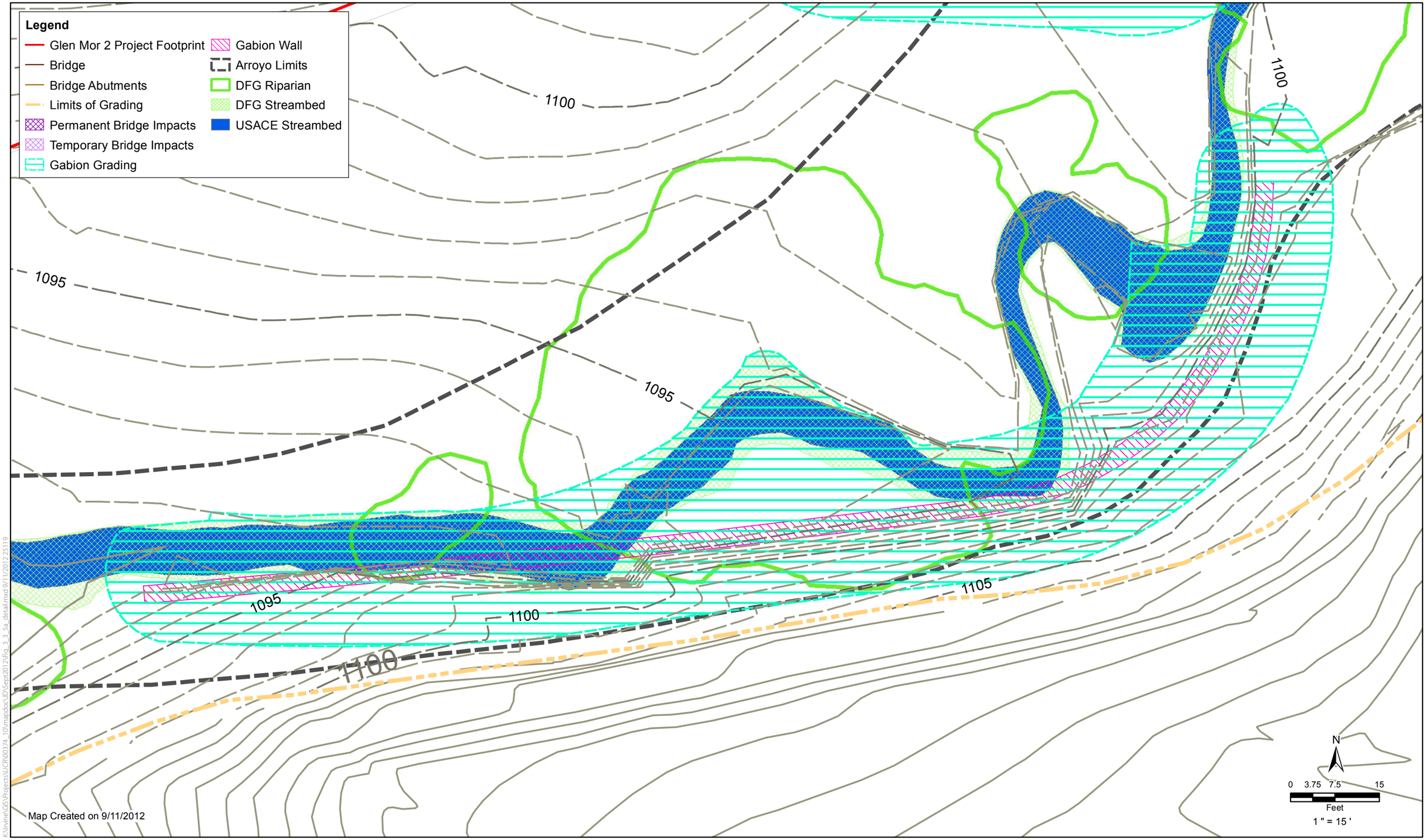


Figure 3.3-5a
Arroyo and Jurisdictional Water Impacts (Downstream Gabion Wall)
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

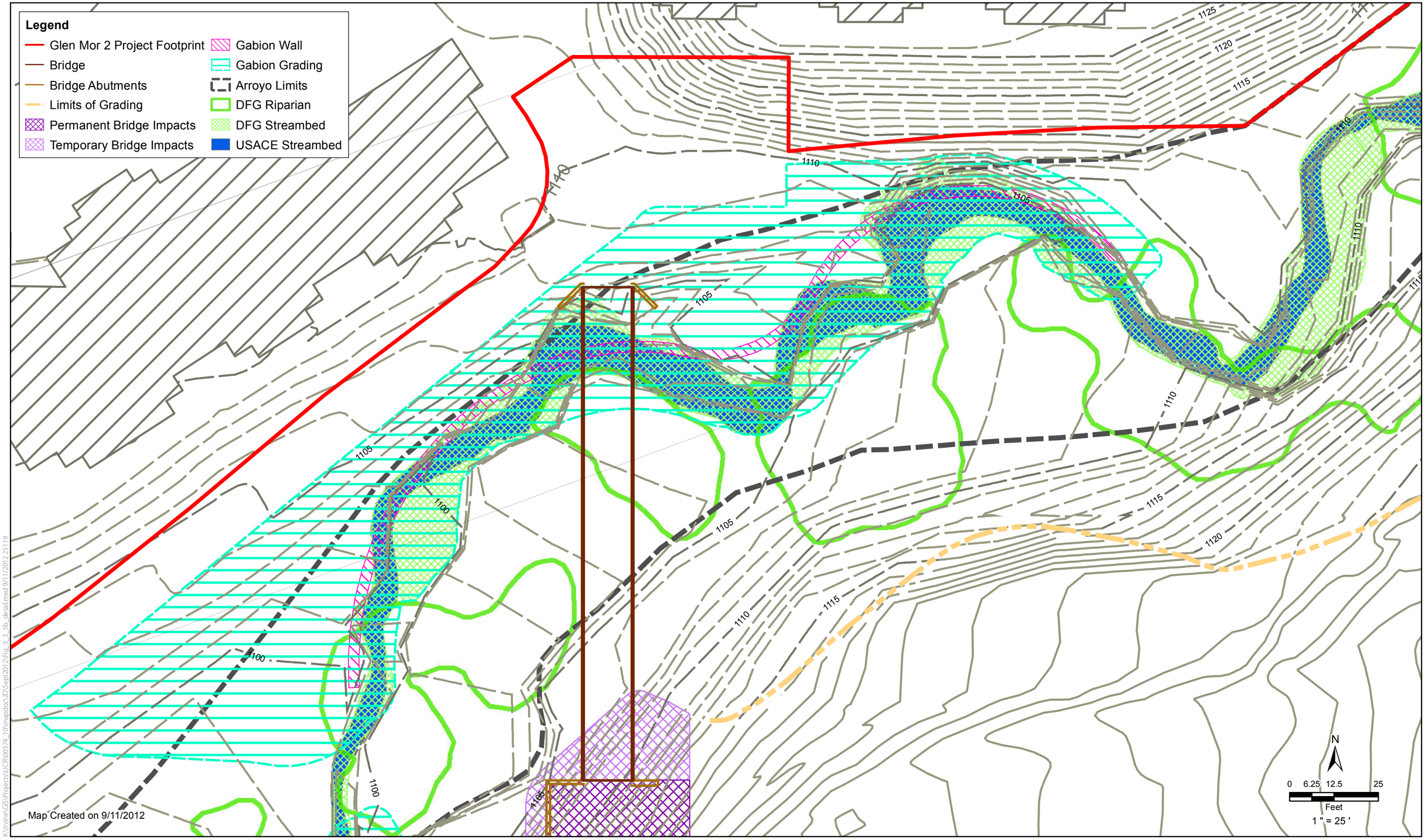


Figure 3.3-5b
Arroyo and Jurisdictional Water Impacts (Central Gabion Wall)
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

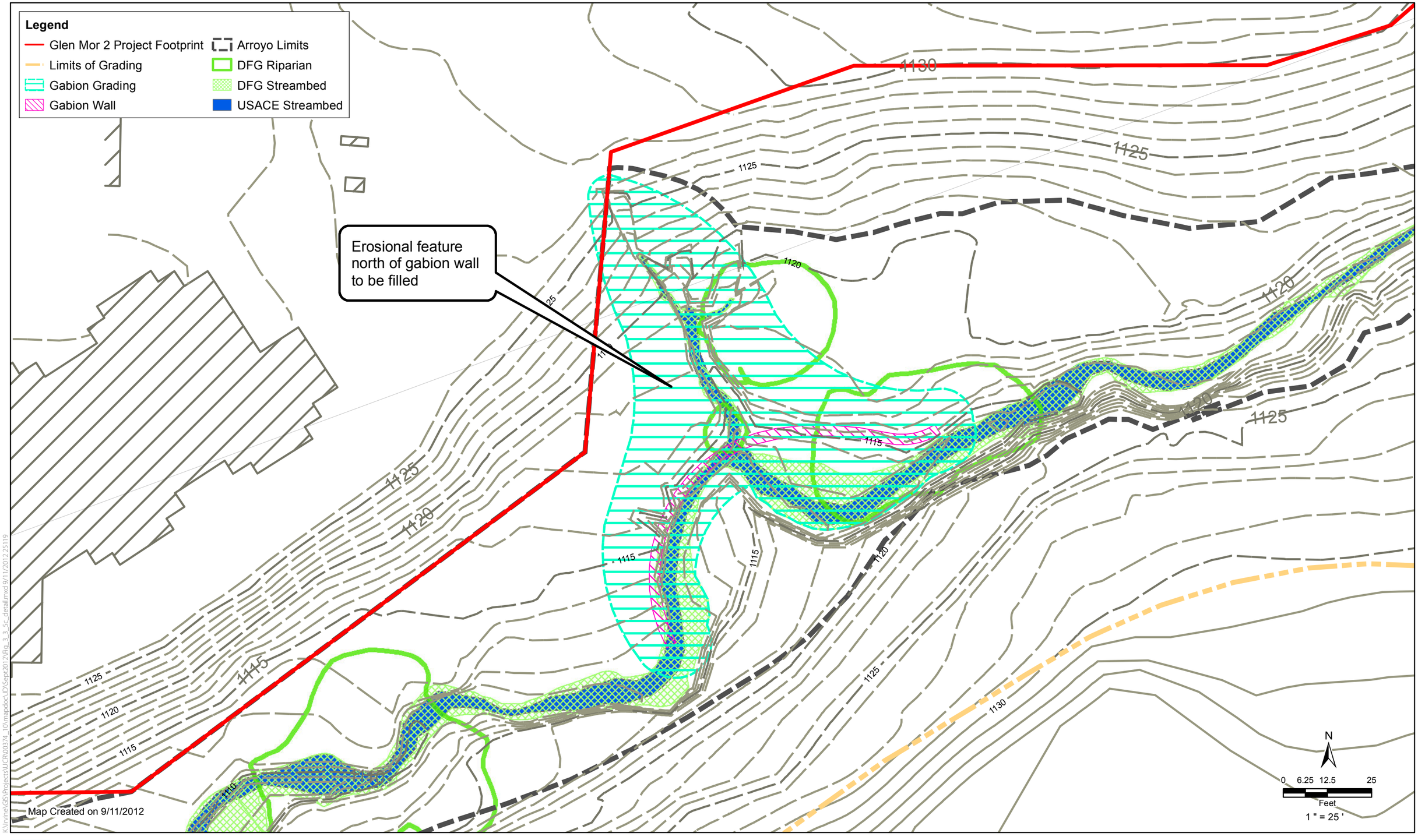


Figure 3.3-5c
Arroyo and Jurisdictional Water Impacts (Upstream Gabion Wall)
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Attachment p

CHJ Consultants Geotechnical Report

REVISED REPORT OF GEOTECHNICAL CONSULTING
PROPOSED ARROYO MITIGATION PROJECT
GLEN MOR 2
UNIVERSITY OF CALIFORNIA CAMPUS
RIVERSIDE, CALIFORNIA
UCR PROJECT NO. 9556334
PSA-2010-41 (AMENDMENT NO. 4)
PREPARED FOR
UNIVERSITY OF CALIFORNIA, RIVERSIDE
JOB NO. 12218-3

CHJ Consultants
1355 E. Cooley Drive, Suite C, Colton, CA 92324 ◆ Phone (909) 824-7311 ◆ Fax (909) 503-1136
15345 Anacapa Road, Suite D, Victorville, CA 92392 ◆ Phone (760) 243-0506 ◆ Fax (760) 243-1225
77-564A Country Club Drive, Suite 122, Palm Desert, CA 92211 ◆ Phone (760) 772-8234 ◆ Fax (909) 503-1136

July 12, 2012

University of California, Riverside
Office of Design & Construction
1223 University Avenue, Suite 240
Riverside, California 92507
Attention: Mr. David Forman

Job No. 12218-3

Dear Mr. Forman:

Per the request of your client, C.H.J., Incorporated (CHJ Inc. Job No. G2012-037-3), attached herewith is the Revised Report of Geotechnical Consulting Services, prepared for the proposed Arroyo Mitigation project, Glen Mor 2, University of California, Riverside Campus, Riverside, California (UCR Project 9556334, PSA-2010-41 - Amendment No. 4). This is a revision of our original report dated June 21, 2012. The revisions reflect changes on page nos. 2 and 6 to clarify and correct the professional responsibilities of some of the parties involved in the project.

We trust this information is as requested. Should questions arise, please feel free to contact this firm at your convenience.

Respectfully submitted,
CHJ CONSULTANTS

Jay J. Martin, E.G.
Vice President

JM:tlw

REVISED REPORT OF GEOTECHNICAL CONSULTING SERVICES
PROPOSED ARROYO EROSION MITIGATION PROJECT
GLEN MOR 2
UNIVERSITY OF CALIFORNIA, RIVERSIDE CAMPUS
RIVERSIDE, CALIFORNIA
UCR PROJECT NO. 9556334, PSA-2010-41 (AMENDMENT NO. 4)
PREPARED FOR
UNIVERSITY OF CALIFORNIA, RIVERSIDE
JOB NO. 12218-3

INTRODUCTION AND SCOPE

This report has been prepared as formal presentation of our geotechnical consulting services for the proposed arroyo erosion mitigation project. Recent erosion has occurred within the relatively-undisturbed arroyo located along the north side of the Glen Mor 2 project site. The eroded areas impinge in close proximity to proposed road improvements for Glen Mor 2, along the south side of the arroyo, and also impinge on the area of the proposed bridge connecting Glen Mor 2 with Glen Mor 1, along the north side of the arroyo. Immediately east of the proposed bridge area, erosion has begun to impinge into the toe of a structural fill placed for one of the Glen Mor 1 buildings. The areas of concern include both sides of the arroyo, and the installation of gabions is under consideration as a mitigation measure for erosion in the arroyo, including the eroded structural fill area. The gabions would serve as a permanent buttress-type repair in the eroded structural fill area.

The following items were requested from this firm in an email received from Mr. Adolph Lugo, of Flores Lund Consultants, on April 3, 2012. The requested services include preparation of three cross sections through the proposed gabion locations.

- Existing topo (shaded back) with the superimposed gabion wall and any grading behind the wall associated with its construction (i.e. back fill limits, etc.).
- At the most-easterly pedestrian bridge abutment, the gabion height will match the arroyo top of bank of the realigned channel. A copy of Sasaki's (Meghen's) grading will be sent to you.
- At the location where the structural fill is in jeopardy, please provide the gabion design that will meet your expectations concerning the stability of the slope. Also, please notify the University of your findings and concerns.
- Provide grain size distributions at the two sample locations within the arroyo channel (Bold black circles) that are shown on the Exhibit.
- These figures need to fit on an 8.5" x 11" size sheet for inclusion in the EIR report.

In addition to the above services, we also sampled the surface soils likely to be in contact with the proposed gabions (two soil types) and conducted corrosion testing on them.

It was indicated by Mr. Lugo that the footprint of the proposed improvements needs to be as small as practical to minimize the potential environmental impact of construction in the arroyo. Based on the results of discussions between this firm, the University and the University's consultants, we recommended a 1.5 horizontal to 1 vertical [1.5(h) to 1(v)] backcut angle, consistent with Cal-OSHA requirements for Type C (cohesionless) soils. As such, we have provided gabion sections that utilize a 1.5(h) to 1(v) backcut angle. A steep batter of the gabions is utilized to minimize the footprint. As per the requirements of the design civil engineer (Flores Lund Consultants), we utilized a bottom of gabions of 6 feet below existing grade to accommodate potential scour plus a safety factor for scour.

We understand that concrete v-ditches (interceptor drains) may be installed at the tops of the gabions in the areas where slopes drain toward the gabions.

STREAM CHANNEL GRADATIONS

Bag samples were obtained in the stream channel at the downstream and upstream locations designated by Flores Lund Consultants. As requested the samples were taken in the youngest stream channel alluvium from the ground surface to a depth of 1 foot. The locations of the samples are shown on the Site Map, Enclosure "A-1". The gradation curves are included as Enclosure "B-1".

The downstream sample consisted of fine to medium sand. The upstream sample consisted of fine to medium sand with silt. The gradation curves were transmitted to Flores Lund on April 10, 2012, for use in their scour analysis.

SOIL STRENGTH AND DENSITY PARAMETERS

Key soil strength and density values were obtained from borings and test data included in a nearby geotechnical investigation prepared for the Glen Mor 2 project (C.H.J., Incorporated, June 25, 2010).

That investigation included density and direct shear testing for the older alluvium (canyon walls) and younger alluvium (stream bed deposits).

The following parameters were utilized for the slope stability calculations:

Soil Parameters for Slope Stability Calculations

Material	γ m (pcf)	Cohesion (psf)	Φ (°)
Older Alluvium	116.9	1	30
Younger Alluvium	120.2	1	33
Fill (backfill)	111.0	1	33
Gabion	117.4	--	--
Fill (slope face)	127.5	50*	33

*Minimum cohesion required for construction of slope face at 2(h) to 1(v)

The gabions were assigned an infinite strength. Gabion design calculations provided by Maccaferri Inc. (Reddy Karnati, Senior Engineer) are included in Appendix "D".

SLOPE STABILITY CALCULATIONS

The stability of cross sections A and C (Enclosures "A-2" and "A-4", respectively) were analyzed for static and seismic conditions for circular failures utilizing the SLIDE computer program, version 6.0 (Rocscience, Inc., 2011). The seismic stability calculations were performed using a lateral pseudostatic coefficient "k" of 0.15. The factor of safety was calculated by Spencer's method which is considered the most conservative of the available methods.

Both sections analyzed meet required factors of safety for static (minimum 1.50) and seismic (minimum 1.10) conditions. Plots of the results of the analyses are included as Enclosures "C-1" through "C-4".

Cross section B (Enclosure "A-3") has a gabion face height of only 3 feet and is considered stable by inspection.

RECOMMENDATIONS

GENERAL SITE GRADING:

It is imperative that no clearing and/or grading operations be performed without the presence of a representative of the soils engineer. An on-site pre-job meeting with the owner, the contractor, and the soils engineer should occur prior to all grading related operations. Operations undertaken at the site without the soils engineer present may result in exclusions of affected areas from the final compaction report for the project.

Grading for the proposed gabions should be performed, at a minimum, in accordance with these recommendations and with applicable portions of the California Building Code (CBC). The following recommendations are presented for your assistance in establishing proper grading criteria.

INITIAL SITE PREPARATION:

All areas to be graded should be stripped of significant vegetation and other deleterious materials. These materials should be removed from the site for disposal. In addition, any unsuitable fills and/or disturbed soils encountered during construction should be completely removed, cleaned of significant deleterious materials prior to reusing as compacted fill.

Cavities created by removal of subsurface obstructions should be thoroughly cleaned of loose soil, organic matter and other deleterious materials, shaped to provide access for construction equipment, and backfilled as recommended for site fill.

The removed materials can be reused as compacted fill provided they are cleaned of organic and other deleterious material and have been brought to within the above recommended moisture content range.

PREPARATION OF FILL AREAS:

Prior to placing fill, the surfaces of all areas to receive fill should be sufficiently moisture treated to a depth of at least 6 inches. The moisture treated soils should be brought to between optimum moisture content and 2 percent above and densified to a minimum relative compaction of 90 percent (ASTM D1557).

COMPACTED FILLS:

The on-site soils should provide adequate quality fill material provided they are free from organic matter and other deleterious materials. Unless approved by the soils engineer, rock or similar irreducible material with a maximum dimension greater than 6 inches should not be buried or placed in fills.

Import fill, if needed should be inorganic, non-expansive granular soil free from rocks or lumps greater than 8 inches in maximum dimension. Sources for any import fill that may be necessary should be observed and approved by the soils engineer prior to their use.

Fill should be spread in near-horizontal layers, approximately 8 inches in thickness. Thicker lifts may be approved by the soils engineer if testing indicates that the grading procedures are adequate to achieve the required compaction. Each lift should be spread evenly, thoroughly mixed during spreading to attain uniformity of the material and moisture in each layer, brought to between optimum moisture content and 2 percent above, and compacted to a minimum relative compaction of 90 percent (ASTM D 1557).

SLOPE CONSTRUCTION:

Fill slopes should be constructed no steeper than 2(h):1(v). Fill slopes should be overfilled during construction and then cut back to expose fully compacted soil. A suitable alternative would be to compact the slopes during construction and then roll the final slopes to provide dense, erosion-resistant surfaces.

Our slope stability calculations indicate that select material (minimum cohesion of 50 pcf) will be required to mitigate the potential for shallow failure in finished slope faces. Some of the on-site older

alluvium may meet this requirement and should be tested during or prior to grading. Import fill may be required to finish the slope faces should suitable cohesive material not be found on site.

SLOPE PROTECTION:

Inasmuch as the native materials are susceptible to erosion by running water, it is our recommendation that the unlined slopes be planted or armored as soon as possible after completion. The use of native vegetation or other drought resistant ground cover is recommended.

Measures should be provided to prevent surface water from flowing over slope faces.

A large quantity of rodent burrows was observed on the site. Rodent infestation can be a serious issue with respect to slope stability. Rodent tunneling and burrowing alters the strength of the soil and can allow water to infiltrate the soil, resulting in ultimate slope failure. Rodent burrows can also provide direct access for surface water to the slope face, causing surficial slope "blowouts". Although a maintenance issue, we recommend that measures be taken to prevent rodent infestation in slopes.

GABION CONSTRUCTION AND DRAINAGE:

Details regarding gabion construction, prepared by Maccaferri, are included in Appendix "E". Maccaferri provided a design option (Option 2) which would include a 12 feet wide gabion apron and reduce the required gabion depth by 3 feet; this option was rejected by the University.

A geotextile should be placed between the slope side of the gabions and the backfill. This should consist of Tencate Mirafi 180N or equivalent. Since the gabions are free-draining, additional drainage measures should not be necessary.

CORROSIVITY:

The proposed improvements will consist of PVC-coated galvanized wire mesh gabions and may include concrete v-ditches (interceptor drains).

Selected samples of materials were delivered to HDR|Schiff for soil corrosivity testing. Laboratory testing consisted of pH, resistivity and major soluble salts commonly found in soils. The results of the laboratory tests performed by HDR|Schiff appear in Enclosure "B-2".

These tests have been performed to screen the site for potentially corrosive soils. Although CHJ Consultants does not practice corrosion engineering, values from the soil tested are considered potentially "mildly corrosive" to ferrous metals at as-received and saturated conditions. Specific corrosion control measures are considered to be needed if there is a potential for saturated soils.

Results of the soluble sulfate testing indicate a "negligible" anticipated exposure to sulfate attack. Based upon the criteria from Table 4.3.1 of the ACI Manual of Concrete Practice (2000), no special measures, such as specific cement types, water-cement ratios, etc., will be needed for this "negligible" exposure to sulfate attack.

The soluble chloride content of the soils tested was not at levels high enough to be of concern with respect to corrosion of reinforcing steel. The results should be considered in combination with the soluble chloride content of the hardened concrete in determining the effect of chloride on the corrosion of reinforcing steel.

Testing indicated that the ammonium and nitrate levels were not considered corrosive to copper.

CHJ Consultants does not practice corrosion engineering. If further information concerning the corrosion characteristics, or interpretation of the results submitted herein, are required, then a competent corrosion engineer could be consulted.

CONSTRUCTION OBSERVATION:

All grading operations, including site clearing and stripping, should be observed by a representative of the soils engineer. The presence of the soils engineer's field representative will be for the purpose of providing observation and field testing, and will not include any supervising or directing of the actual work of the contractor, his employees or agents. Neither the presence of the soils engineer's field representative nor the observations and testing by the soils engineer shall excuse the contractor in any way for defects discovered in his work. It is understood that the soils engineer will not be responsible for job or site safety on this project, which will be the sole responsibility of the contractor.

LIMITATIONS

CHJ Consultants has striven to perform our services within the limits prescribed by our client, and in a manner consistent with the usual thoroughness and competence of reputable geotechnical engineers and engineering geologists practicing under similar circumstances. No other representation, express or implied, and no warranty or guarantee is included or intended by virtue of the services performed or reports, opinion, documents, or otherwise supplied.

This report reflects the testing conducted on the site as the site existed during the investigation, which is the subject of this report. However, changes in the conditions of a property can occur with the passage of time, due to natural processes or the works of man on this or adjacent properties. Changes in applicable or appropriate standards may also occur whether as a result of legislation, application, or the broadening of knowledge. Therefore, this report is indicative of only those conditions tested at the time of the subject investigation, and the findings of this report may be invalidated fully or partially by changes outside of the control of CHJ Consultants. This report is therefore subject to review and should not be relied upon after a period of one year.

The conclusions and recommendations in this report are based upon observations performed and data collected at separate locations, and interpolation between these locations, carried out for the project and the scope of services described. It is assumed and expected that the conditions between locations observed and/or sampled are similar to those encountered at the individual locations where observation and sampling was performed. However, conditions between these locations may vary significantly. Should conditions be encountered in the field, by the client or any firm performing services for the client or the client's assign, that appear different than those described herein, this firm should be contacted immediately in order that we might evaluate their effect.

If this report or portions thereof are provided to contractors or included in specifications, it should be understood by all parties that they are provided for information only and should be used as such.

The report and its contents resulting from this investigation are not intended or represented to be suitable for reuse on extensions or modifications of the project, or for use on any other project.

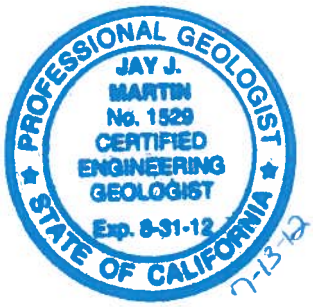
CLOSURE

We appreciate this opportunity to be of service and trust this report provides the information desired at this time. Should questions arise, please do not hesitate to contact this office.

Respectfully submitted,

CHJ CONSULTANTS

Jay J. Martin, E.G. 1529
Vice President



Allen D. Evans, G.E. 2060
Vice President

JJM/ADE:jjm

Appendices: "A" - Site Map and Cross Sections
"B" - Laboratory Test Results
"C" - Slope Stability Calculations
"D" - Gabion Design Calculations by Maccaferri
"E" - Gabion Details and Specifications by Maccaferri

REFERENCES

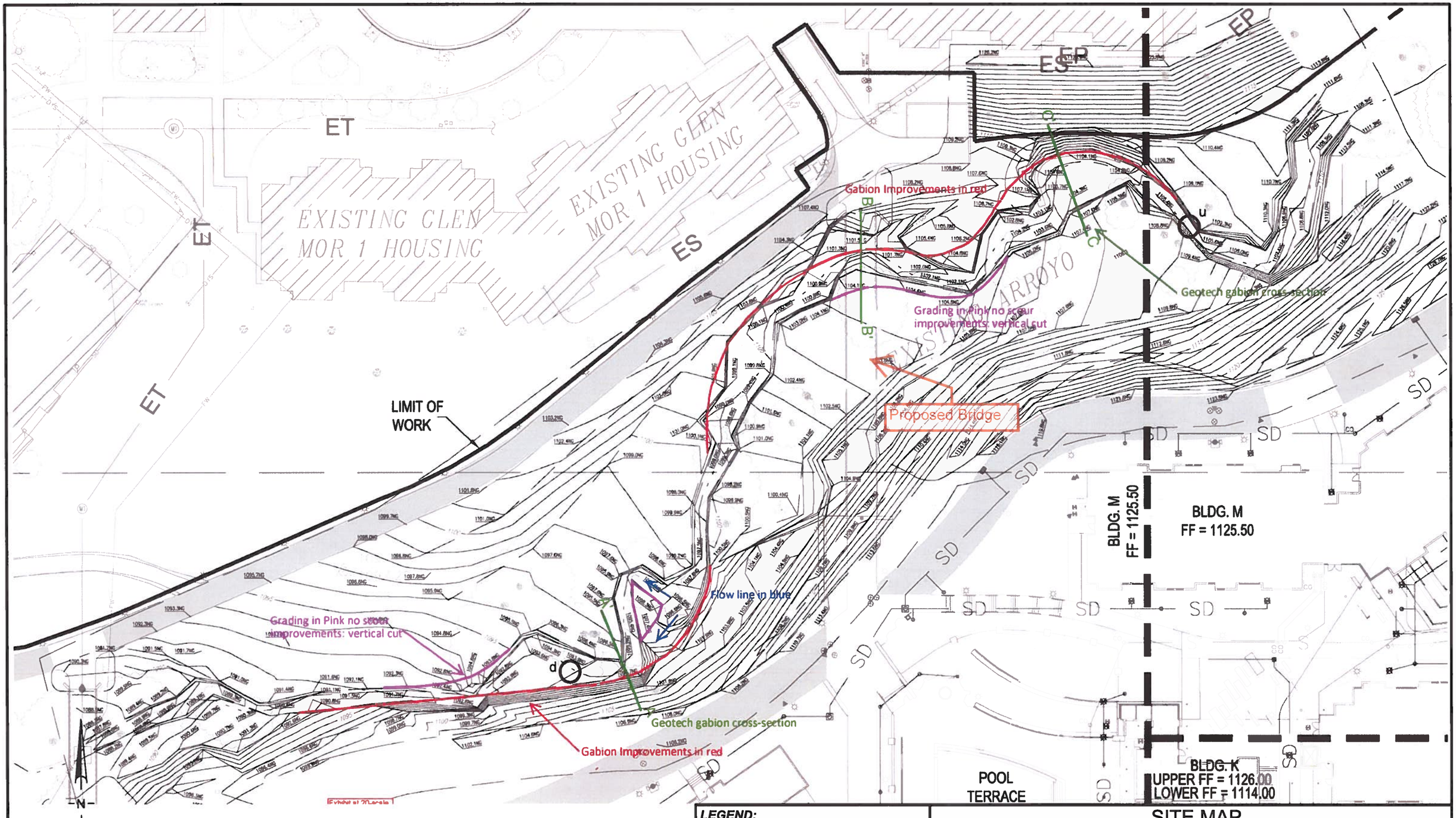
American Concrete Institute, 2000, Manual of Concrete Practice, Part 3, Table 4.3.1.

C.H.J., Incorporated, June 25, 2010, Geotechnical Investigation, Proposed Glen Mor 2 Student Apartments, University of California, Riverside, Project No. 956334, Job No. 10325-3.

Rocscience, 2011, SLIDE ver 6.0: 2D Limit equilibrium slope stability for soil and rock slopes (computer program).

APPENDIX "A"

SITE MAP AND CROSS SECTIONS



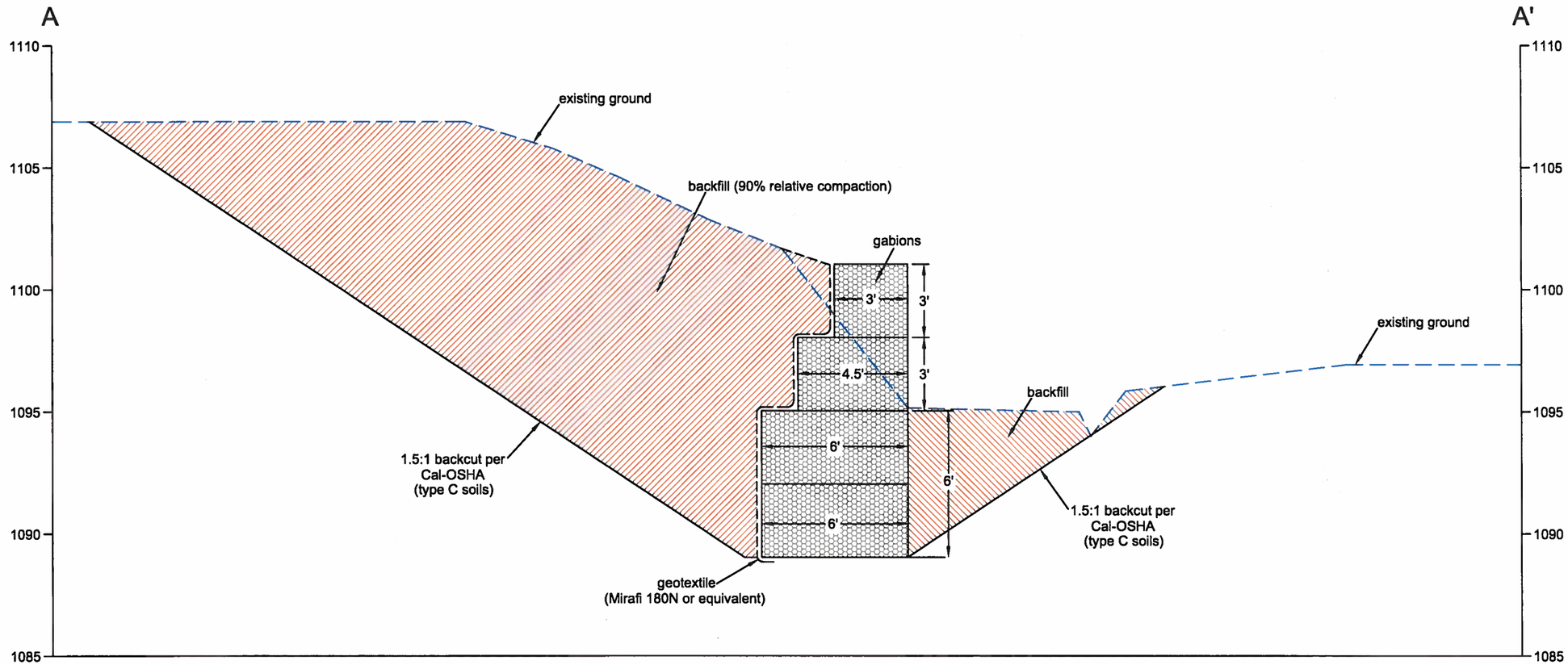
LEGEND:

- Location of gradation test of stream channel alluvium. u = upstream, d = downstream
- C ——— C' Location of Gabion Cross Sections

SITE MAP

FOR: UCR	ARROYO MITIGATION PROJECT GLEN MOR 2 U.C. RIVERSIDE CAMPUS RIVERSIDE, CALIFORNIA	ENCLOSURE "A-1"
DATE: JUNE 2012		JOB NUMBER 12218-3

CHJ Consultants

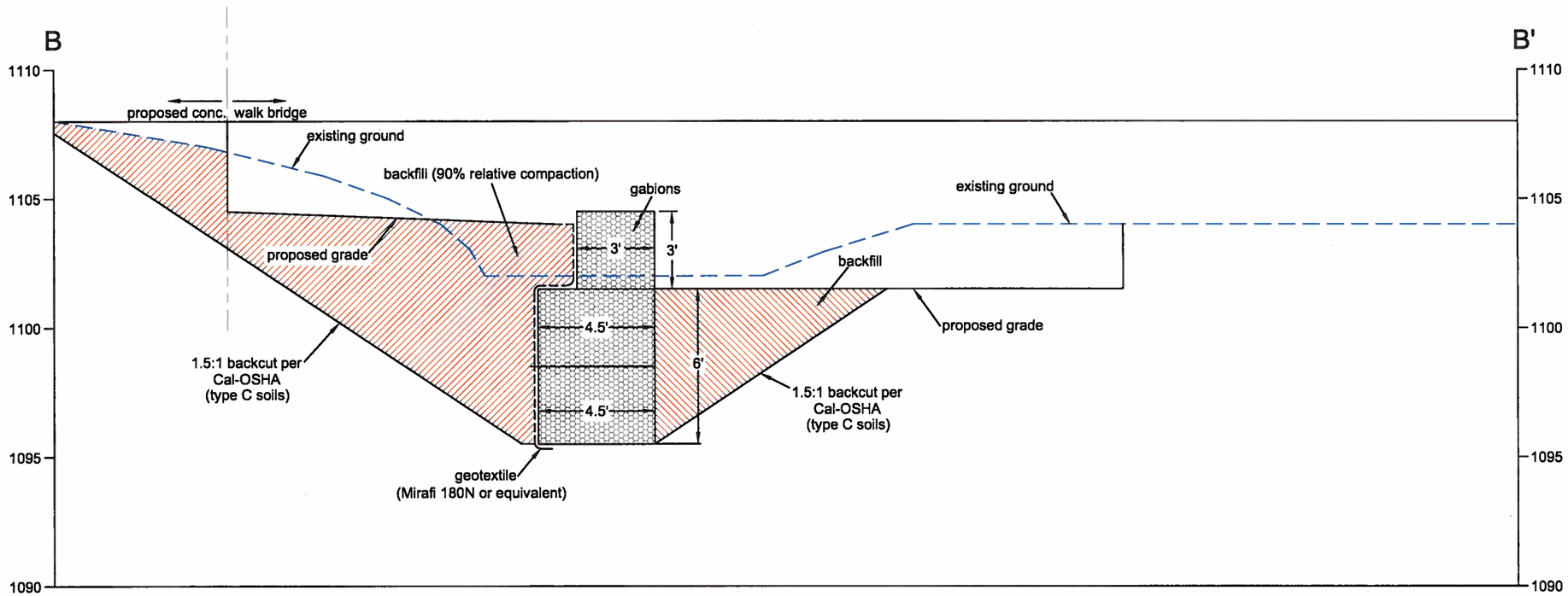


SCALE: 1" = 5'

CROSS SECTION A-A'

FOR: UCR	ARROYO MITIGATION PROJECT GLEN MOR 2 U.C. RIVERSIDE CAMPUS RIVERSIDE, CALIFORNIA	ENCLOSURE "A-2"
DATE: JUNE 2012		JOB NUMBER 12218-3

CHJ Consultants

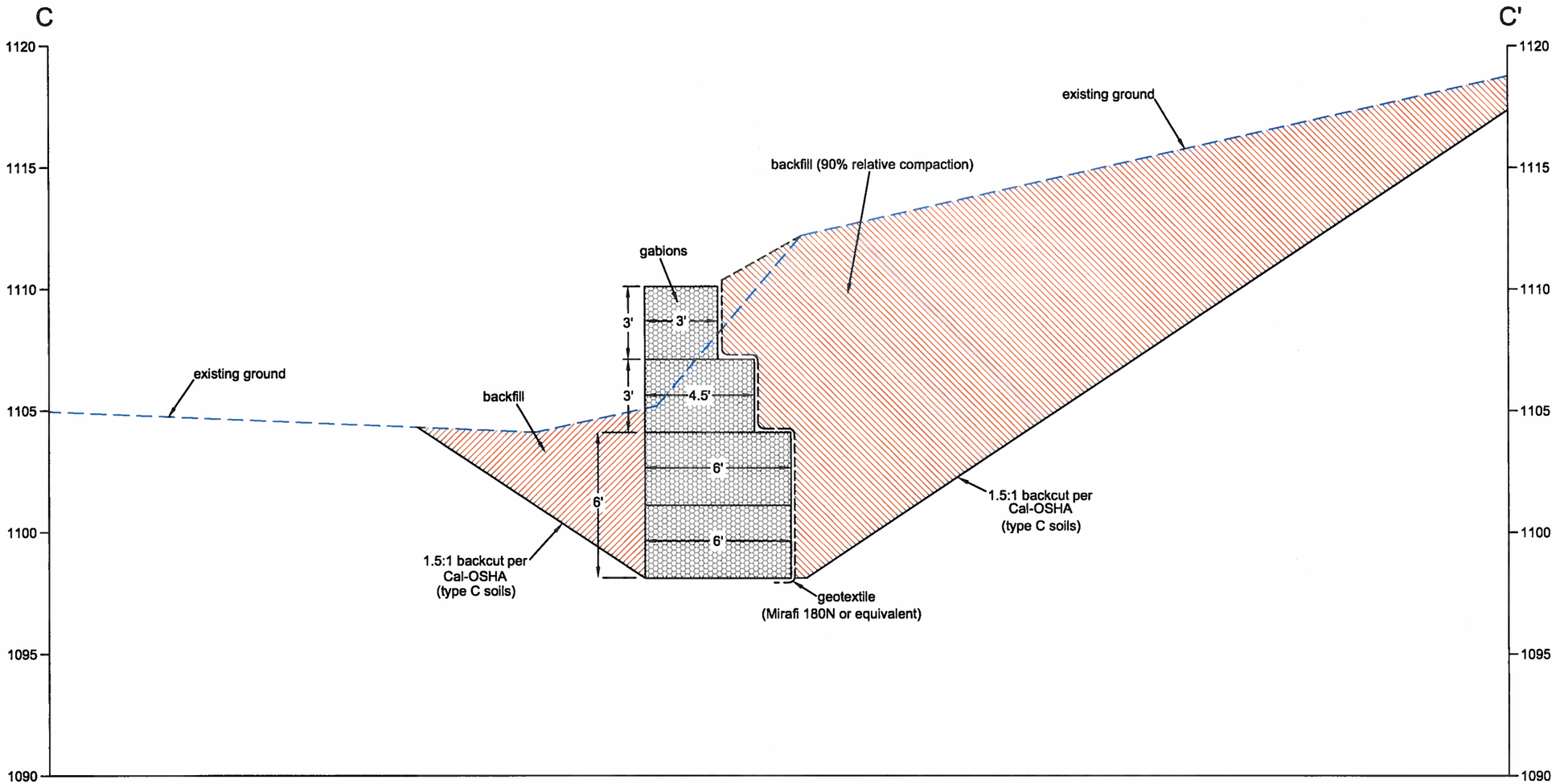


SCALE: 1" = 5'

CROSS SECTION B-B'

FOR: UCR	ARROYO MITIGATION PROJECT GLEN MOR 2 U.C. RIVERSIDE CAMPUS RIVERSIDE, CALIFORNIA	ENCLOSURE "A-3"
DATE: JUNE 2012		JOB NUMBER 12218-3

CHJ Consultants



SCALE: 1" = 5'

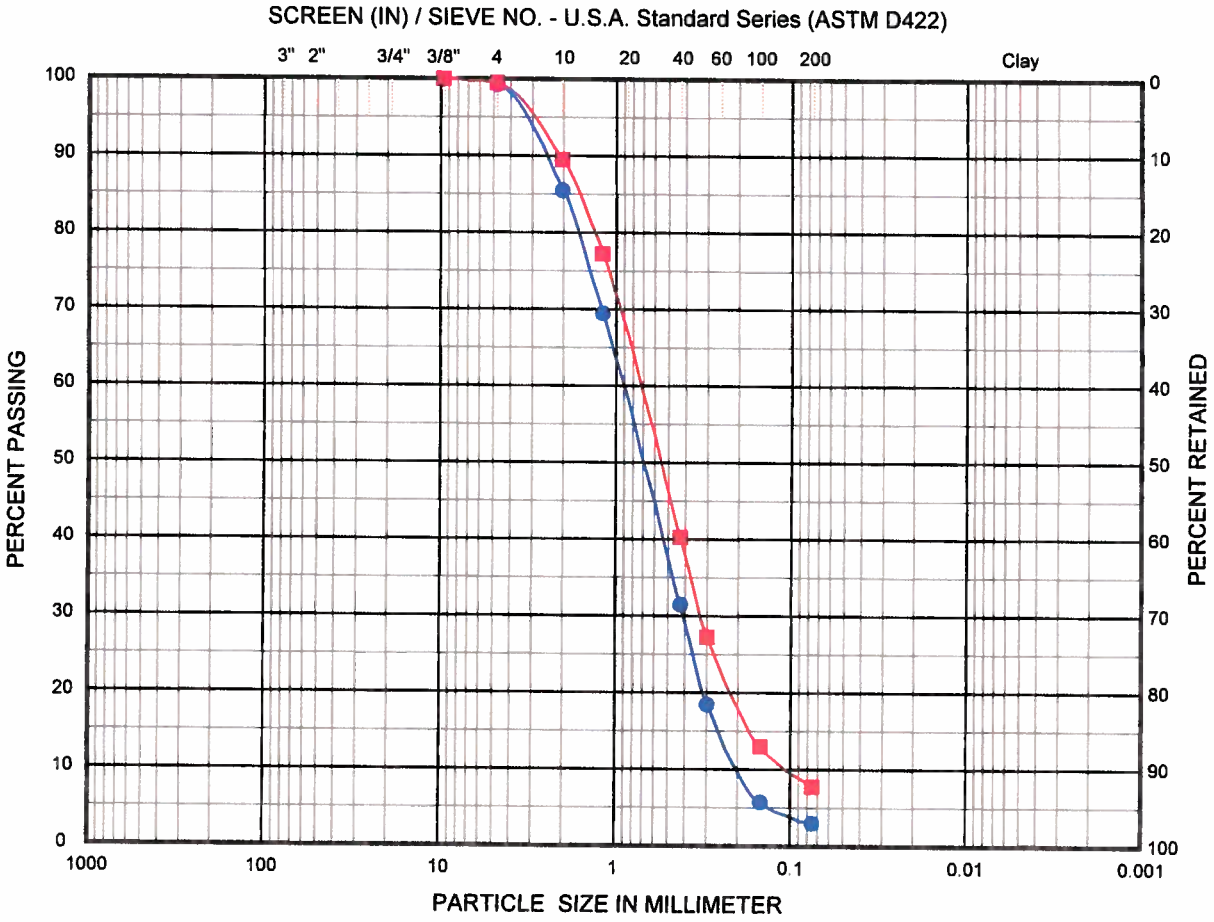
CROSS SECTION C-C'

FOR: UCR	ARROYO MITIGATION PROJECT GLEN MOR 2 U.C. RIVERSIDE CAMPUS RIVERSIDE, CALIFORNIA	ENCLOSURE "A-4"
DATE: JUNE 2012		JOB NUMBER 12218-3

CHJ Consultants

APPENDIX "B"

LABORATORY TEST RESULTS



Cobbles & Boulders	Gravel		Sand			Silt	Clay
	Coarse	Fine	Coarse	Medium	Fine		

	Sample No.	Depth	Gravel	Sand	Fines	Clay	D_{10}	D_{30}	D_{50}	D_{60}	C_u	C_c
●	Down	stream	0.7	96.4	2.9		0.2060	0.409	0.69	0.90	0.9	4.4
	(SP) Poorly-graded sand, fine to medium											
■	Up	stream	0.6	91.6	7.8		0.1055	0.327	0.55	0.71	1.4	6.7
	(SP-SM) Poorly-graded sand with silt, fine to medium											

PARTICLE SIZE DISTRIBUTION (ASTM D422)

Project:	Proposed Arroyo Erosion Mitigation Project, Glen Mor 2				
Location:	University of California Riverside Campus, Riverside, California				
Job Number:	12218-3	Engineer:		Enclosure:	B-1

G:\2012\12218-3 UCR - Arroyo Gabions - An INC job\LabSuite_12218-3.csv

®LabSuite Version 4.0.0.37 Developed by Fred Yi, PhD, PE, GE
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Prepared at 4/10/2012 1:39:48 PM

HDR | SCHIFF

www.hdrinc.com
Corrosion Control and Condition Assessment (C3A) Department

Table 1 - Laboratory Tests on Soil Samples

C.H.J. Inc.
Your #12218-3, HDR|Schiff #12-02941.AB
10-Apr-12

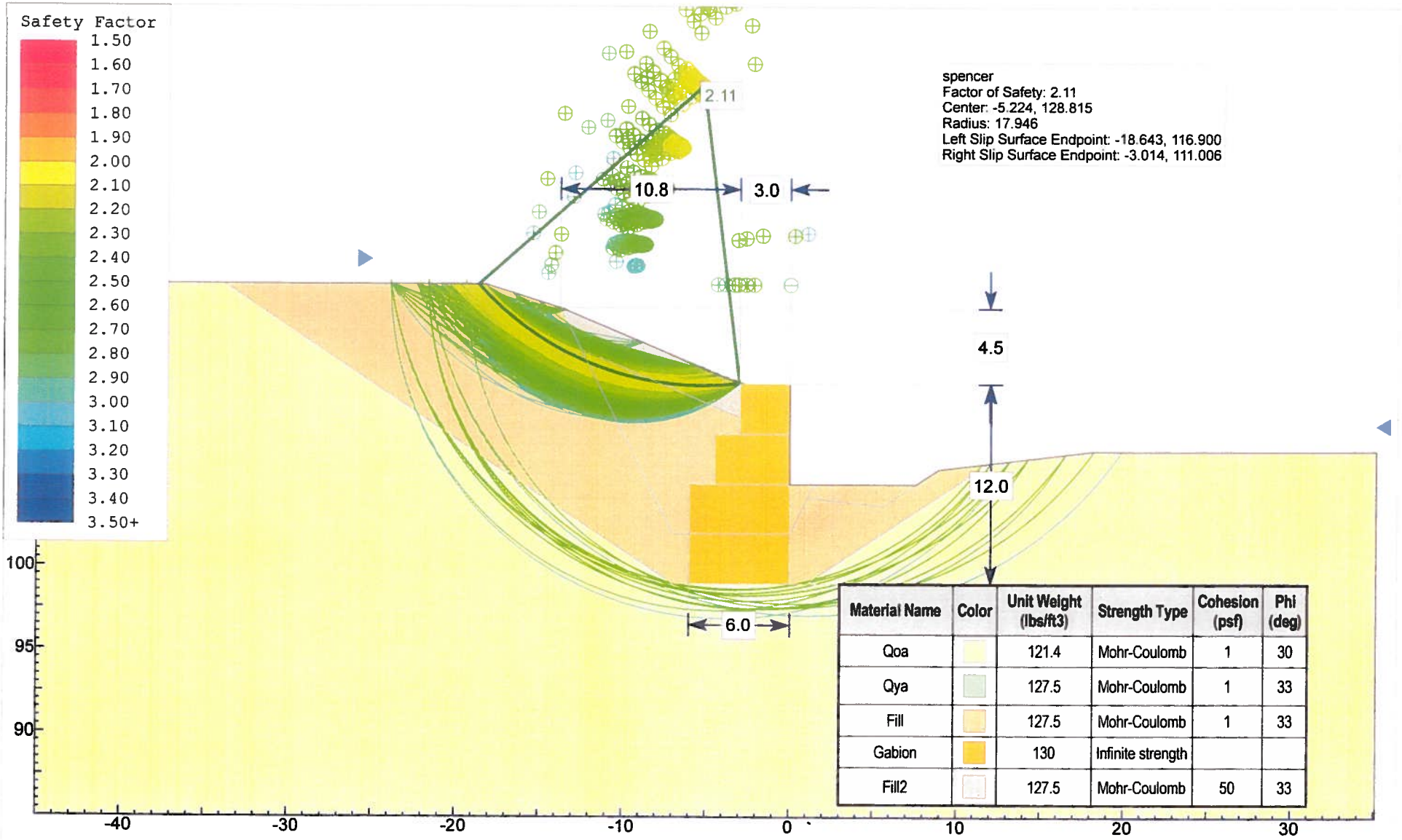
Sample ID

			Qoa	Up Stream
Resistivity		**Units**		
as-received		ohm-cm	4,400,000	96,000
saturated		ohm-cm	10,000	28,400
pH			6.8	7.1
Electrical Conductivity		mS/cm	0.04	0.02
Chemical Analyses				
Cations				
calcium	Ca^{2+}	mg/kg	38	24
magnesium	Mg^{2+}	mg/kg	5.6	3.1
sodium	Na^{1+}	mg/kg	7.6	2.6
potassium	K^{1+}	mg/kg	9.2	7.8
Anions				
carbonate	CO_3^{2-}	mg/kg	ND	ND
bicarbonate	HCO_3^{1-}	mg/kg	40	37
fluoride	F^{1-}	mg/kg	1.7	0.8
chloride	Cl^{1-}	mg/kg	4.1	0.9
sulfate	SO_4^{2-}	mg/kg	10	2.9
phosphate	PO_4^{3-}	mg/kg	6.9	4.9
Other Tests				
ammonium	NH_4^{1+}	mg/kg	1.0	0.5
nitrate	NO_3^{1-}	mg/kg	21	4.1
sulfide	S^{2-}	qual	na	na
Redox		mV	na	na

Electrical conductivity in millisiemens/cm and chemical analysis were made on a 1:5 soil-to-water extract
mg/kg = milligrams per kilogram (parts per million) of dry soil
Redox = oxidation-reduction potential in millivolts
ND = not detected
na = not analyzed

APPENDIX "C"

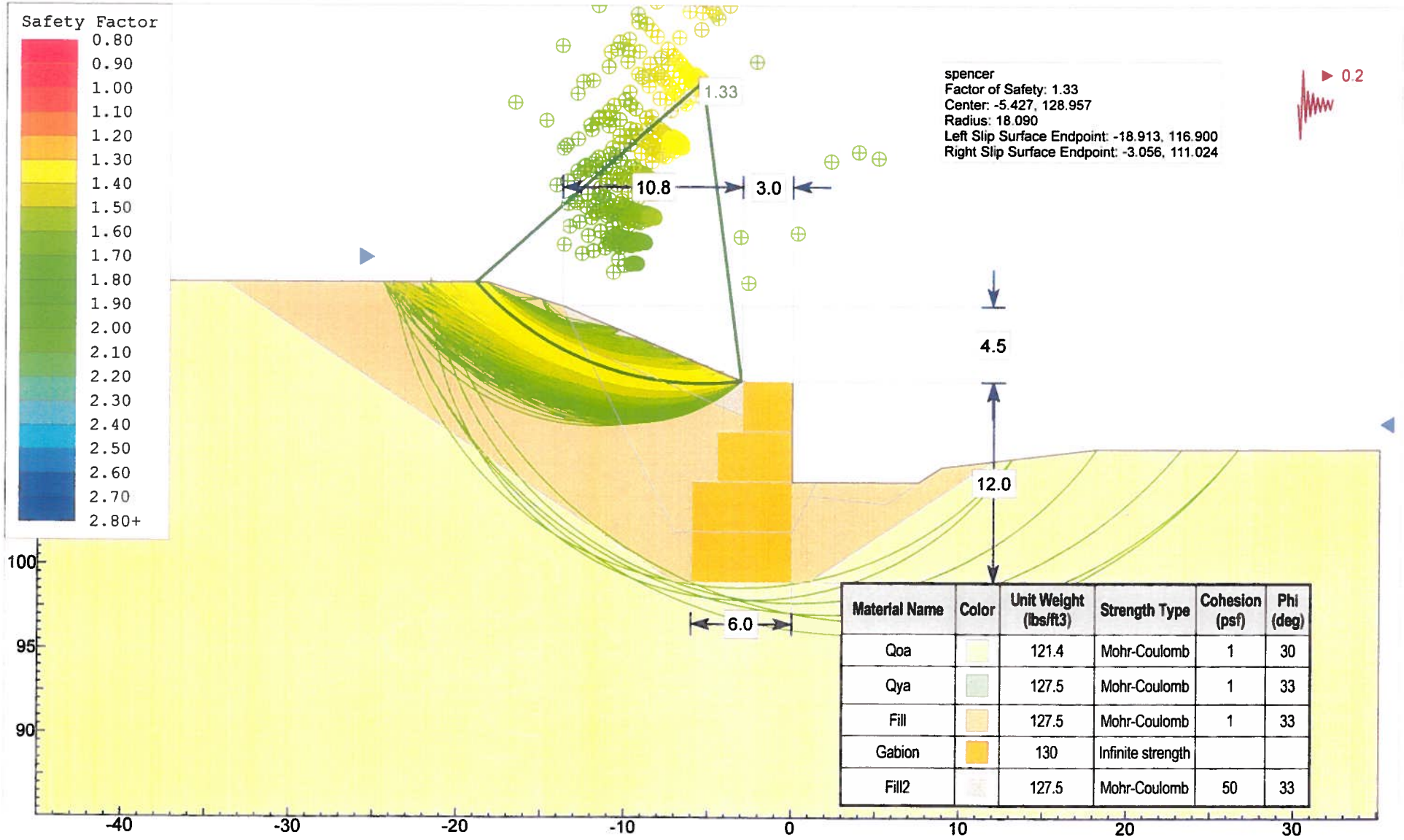
SLOPE STABILITY CALCULATIONS



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qoa		121.4	Mohr-Coulomb	1	30
Qya		127.5	Mohr-Coulomb	1	33
Fill		127.5	Mohr-Coulomb	1	33
Gabion		130	Infinite strength		
Fill2		127.5	Mohr-Coulomb	50	33

SLIDEINTERPRET 6.017

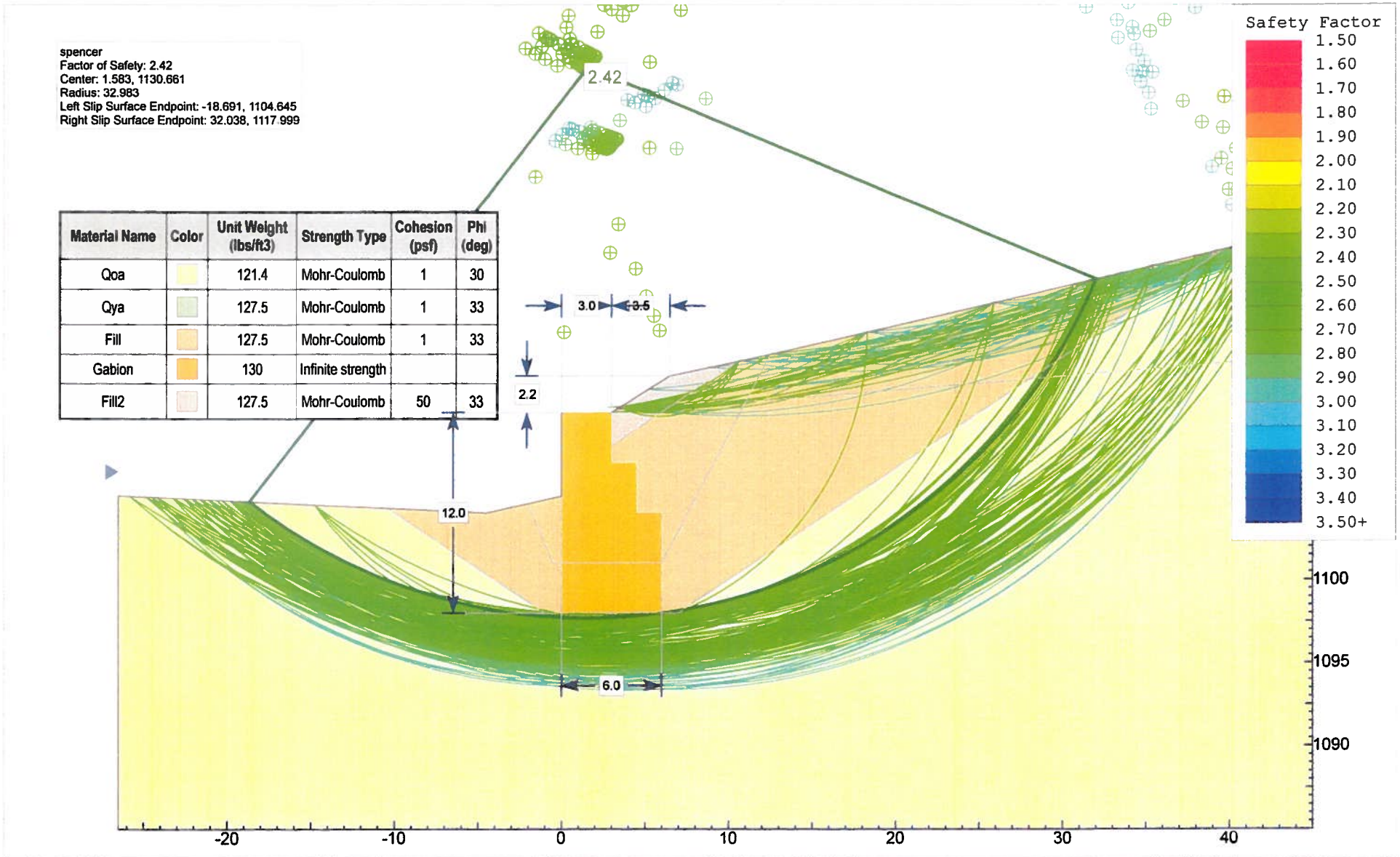
Project	Arroyo Erosion Mitigation Project, Glen Mor 2		
Analysis Description	Slope Stability Analysis of Gabion Wall		
Drawn By	C.H.J., Incorporated	Author: Fred Yi, GE	Scale: 1:100
File Name	12218-3 Slope Stability_Section A_6-20-12.slim	Date: 6/20/2012	Enclosure: "C-1"



Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qoa		121.4	Mohr-Coulomb	1	30
Qya		127.5	Mohr-Coulomb	1	33
Fill		127.5	Mohr-Coulomb	1	33
Gabion		130	Infinite strength		
Fill2		127.5	Mohr-Coulomb	50	33

SLIDEINTERPRET 6.017

Project	Arroyo Erosion Mitigation Project, Glen Mor 2		
Analysis Description	Slope Stability Analysis of Gabion Wall		
Drawn By	C.H.J., Incorporated	Author	Fred Yi, GE	Scale	1:100
File Name	12218-3 Slope Stability_Section A_6-20-12.slim	Date	6/20/2012	Enclosure	"C-2"



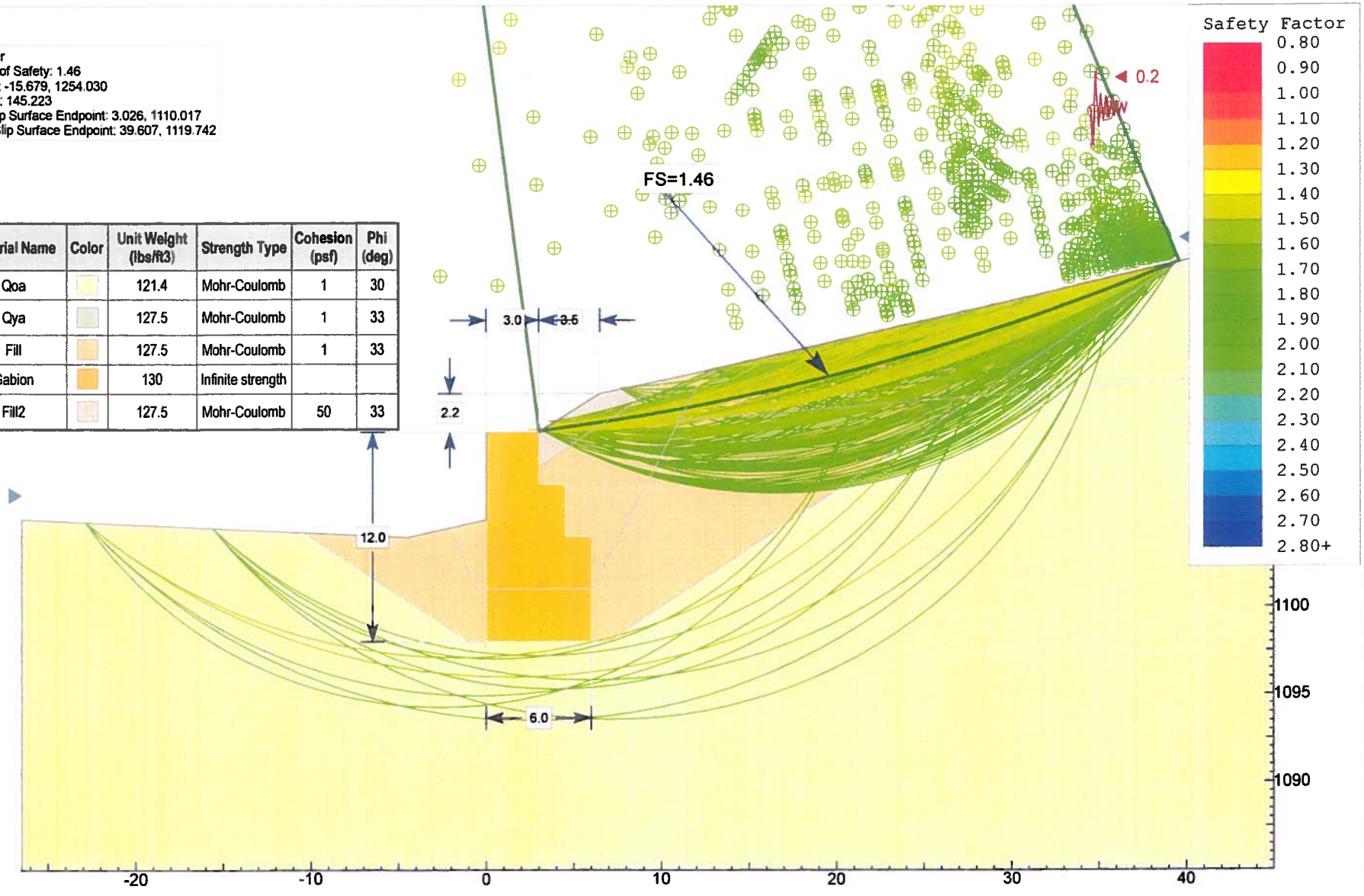
Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qoa		121.4	Mohr-Coulomb	1	30
Qya		127.5	Mohr-Coulomb	1	33
Fill		127.5	Mohr-Coulomb	1	33
Gabion		130	Infinite strength		
Fill2		127.5	Mohr-Coulomb	50	33

SLIDEINTERPRET 6.017

Project	Arroyo Erosion Mitigation Project		
Analysis Description	Slope Stability Analysis of Gabion Wall		
Drawn By	C.H.J., Incorporated	Author	Fred Yi, GE
File Name	12218-3 Slope Stability_Section C_6-20-12.slim	Date	6/20/2012
Scale	1:100	Enclosure	"C-3"

spencer
Factor of Safety: 1.46
Center: -15.679, 1254.030
Radius: 145.223
Left Slip Surface Endpoint: 3.026, 1110.017
Right Slip Surface Endpoint: 39.607, 1119.742

Material Name	Color	Unit Weight (lbs/ft3)	Strength Type	Cohesion (psf)	Phi (deg)
Qoa		121.4	Mohr-Coulomb	1	30
Qya		127.5	Mohr-Coulomb	1	33
Fill		127.5	Mohr-Coulomb	1	33
Gabion		130	Infinite strength		
Fill2		127.5	Mohr-Coulomb	50	33



SLIDEINTERPRET 6.017

Project	Arroyo Erosion Mitigation Project		
Analysis Description	Slope Stability Analysis of Gabion Wall		
Drawn By	C.H.J., Incorporated	Author	Fred Yi, GE
File Name	12218-3 Slope Stability_Section C_6-20-12.slim	Date	6/20/2012
Scale	1:100	Enclosure	"C-4"

APPENDIX "D"

GABION DESIGN CALCULATIONS BY MACCAFERRI

GawacWin 2003

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 6ftAGL Section A - Option 1

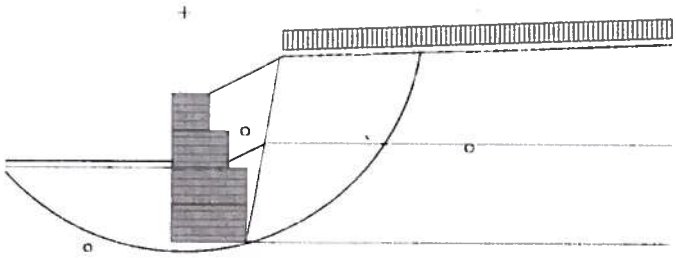
Date: 6/14/2012

INPUT DATA

Wall data

Wall batter	:	0.00 deg
Rockfill unit weight	:	150.00 lb/ft³
Porosity of gabions	:	30.00 %
Geotextile in the backfill	:	Yes
Friction reduction	:	15.00 %
Geotextile on the base	:	Yes
Friction reduction	:	15.00 %
Mesh and the wire diam.:	:	8x10, ø 2.70 mm

Layer	Length ft	Width ft	Offset ft
1	6.00	3.00	-
2	6.00	3.00	0.00
3	4.50	3.00	0.00
4	3.00	3.00	0.00



Backfill soil data

Inclination of Stretch 1	:	27.00 deg
Length of stretch 1	:	6.00 ft
Inclination of Stretch 2	:	2.00 deg
Soil unit weight	:	120.00 lb/ft³
Soil friction angle	:	30.00 deg
Soil cohesion	:	0.00 lb/ft²

Additional Backfill Layers

Layer	Initial height ft	Incl. angle deg	Unit weight lb/ft³	Cohesion lb/ft²	Friction angle deg
1	0.00	80.00	120.00	0.00	30.00

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GawacWin 2003

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 6ftAGL Section A - Option 1

Date: 6/14/2012

Foundation data

Top surface height	:	6.00 ft
Top surface init. length	:	12.00 ft
Top surface incl. angle	:	0.00 deg
Soil unit weight	:	120.00 lb/ft³
Soil friction angle	:	30.00 deg
Soil cohesion	:	0.00 lb/ft²
Foundation allowable pressure	:	lb/ft²
Water table height	:	6.50 ft

Additional Foundation Layers

Layer	Depth ft	Unit weight lb/ft³	Cohesion lb/ft²	Friction angle deg

Water profile data

Initial height	:	6.50 ft
Inclination of the 1st stretch	:	27.00 deg
Length of the 1st stretch	:	3.00 ft
Inclination of the 2nd stretch	:	0.00 deg
Length of the 2nd stretch	:	0.00 ft

Loads data

Distributed loads on backfill			First stretch	:	lb/ft²
			Second stretch	:	100.00 lb/ft²
Distributed loads on wall			Load	:	lb/ft²
Line loads on backfill					
Load 1	:	lb/ft	Distance from wall face	:	ft
Load 2	:	lb/ft	Distance from wall face	:	ft
Load 3	:	lb/ft	Distance from wall face	:	ft
Line load on wall					
Load	:	lb/ft	Distance from wall face	:	ft

Seismic action data

Horizontal coefficient	:		Vertical coefficient	:

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GawacWin 2003

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 6ftAGL Section A - Option 1

Date: 6/14/2012

STABILITY ANALYSIS RESULTS

Active and Passive Thrust

Active Thrust	:	5406.65 lb/ft
Point of application ref. to X axis	:	4.92 ft
Point of application ref. to Y axis	:	4.33 ft
Direction of the thrust ref. to X axis	:	39.54 deg
Passive Thrust	:	3783.11 lb/ft
Point of application ref. to X axis	:	0.00 ft
Point of application ref. to Y axis	:	2.00 ft
Direction of the thrust ref. to X axis	:	0.00 deg

Sliding

Normal force on the base	:	8480.19 lb/ft
Point of application ref. to X axis	:	2.17 ft
Point of application ref. to Y axis	:	0.00 ft
Shear force on the base	:	386.62 lb/ft
Resisting force on the base	:	7944.75 lb/ft
Sliding Safety Coefficient	:	**1.91**

Overturning

Overturning Moment	:	18044.16 lb/ft x ft
Restoring Moment	:	36459.96 lb/ft x ft
Overturning Safety Coefficient	:	**2.02**

Stresses Acting on Foundation

Eccentricity	:	0.83 ft
Normal stress on outer border	:	2584.16 lb/ft²
Normal stress on inner border	:	242.57 lb/ft²
Max. allowable stress on the foundation	:	3859.14 lb/ft²

Maccaferri INC is not responsible for the reliability of the geotechnical parameters assumed, or the improper use of the software. The program takes into account the physical characteristics of materials as manufacturated by the Maccaferri group; its results will not be realistic if a different material is used.

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 6ftAGL Section A - Option 1

Date: 6/14/2012

Overall Stability

Initial distance at pivot leftside	:	ft
Initial distance at pivot rightside	:	ft
Initial depth referred to base	:	ft
Max depth allowed in calculation	:	ft
Center of the arch referred to X axis	:	0.92 ft
Center of the arch referred to Y axis	:	18.60 ft
Radius of the arch	:	19.42 ft
Number of search surfaces	:	70
Overall Stability Safety Coefficient	**:**	**1.83**

Internal Stability

Layer	H ft	N lb/ft	T lb/ft	M lb/ft x ft	τ_{Max} lb/ft²	τ_{All} lb/ft²	σ_{Max} lb/ft²	σ_{All} lb/ft²
1	9.00	6563.55	2767.12	14241.58	461.19	1098.58	1512.48	11080.12
2	6.00	3359.67	1258.45	6064.41	279.66	881.14	930.62	
3	3.00	1077.25	277.27	1531.85	92.42	638.54	378.78	

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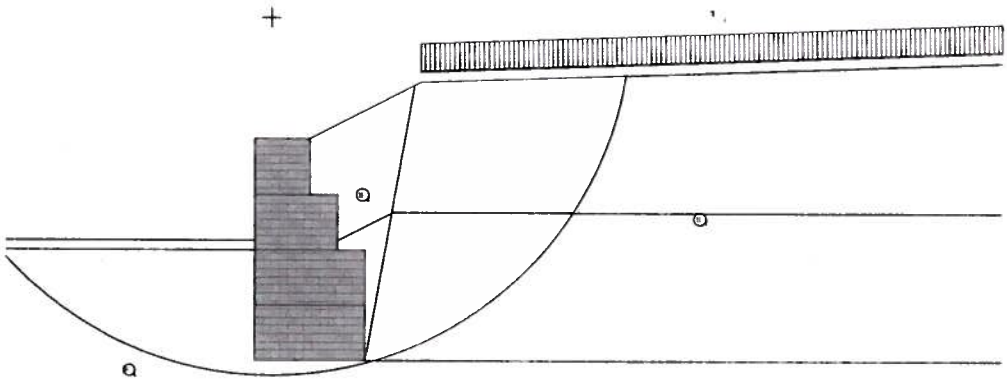
GawacWin 2003

Summary

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 6ftAGL Section A - Option 1

Date: 6/14/2012



SOIL DATA

Soil	γ lb/ft³	c lb/ft²	ϕ deg	Soil	γ lb/ft³	c lb/ft²	ϕ deg
B_S	120.00	0.00	30.00	F_S	120.00	0.00	30.00
B_1	120.00	0.00	30.00				

LOADS

Load	Value lb/ft²	Load	Value lb/ft
q_2	100.00		

STABILITY CHECKS

Sliding Safety Coefficient	1.91	Base normal stress (left)	2584.16lb/ft²
Overturning Safety Coefficient	2.02	Base normal stress (right)	242.57lb/ft²
Overall Stability Safety Coefficient	1.83	Max. allowable stress	3859.14lb/ft²

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GawacWin 2003

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 3ftAGLSection B - Option 1

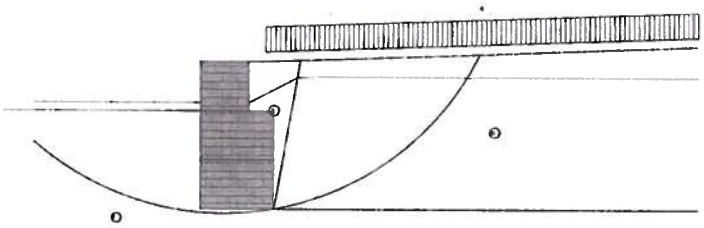
Date: 6/14/2012

INPUT DATA

Wall data

Wall batter	:	0.00 deg
Rockfill unit weight	:	150.00 lb/ft³
Porosity of gabions	:	30.00 %
Geotextile in the backfill	:	Yes
Friction reduction	:	15.00 %
Geotextile on the base	:	Yes
Friction reduction	:	15.00 %
Mesh and the wire diam.:	:	8x10, ø 2.70 mm

Layer	Length ft	Width ft	Offset ft
1	4.50	3.00	-
2	4.50	3.00	0.00
3	3.00	3.00	0.00



Backfill soil data

Inclination of Stretch 1	:	0.00 deg
Length of stretch 1	:	1.00 ft
Inclination of Stretch 2	:	2.00 deg
Soil unit weight	:	120.00 lb/ft³
Soil friction angle	:	30.00 deg
Soil cohesion	:	0.00 lb/ft²

Additional Backfill Layers

Layer	Initial height ft	Incl. angle deg	Unit weight lb/ft³	Cohesion lb/ft²	Friction angle deg
1	0.00	80.00	120.00	0.00	30.00

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Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 3ftAGLSection B - Option 1 Date: 6/14/2012

Foundation data

Top surface height	:	6.00 ft
Top surface init. length	:	12.00 ft
Top surface incl. angle	:	0.00 deg
Soil unit weight	:	120.00 lb/ft³
Soil friction angle	:	30.00 deg
Soil cohesion	:	0.00 lb/ft²
Foundation allowable pressure	:	lb/ft²
Water table height	:	6.50 ft

Additional Foundation Layers

Layer	Depth ft	Unit weight lb/ft³	Cohesion lb/ft²	Friction angle deg

Water profile data

Initial height	:	6.50 ft
Inclination of the 1st stretch	:	27.00 deg
Length of the 1st stretch	:	3.00 ft
Inclination of the 2nd stretch	:	0.00 deg
Length of the 2nd stretch	:	0.00 ft

Loads data

Distributed loads on backfill
First stretch : lb/ft²
Second stretch : 100.00 lb/ft²

Distributed loads on wall
Load : lb/ft²

Line loads on backfill

Load 1	:	lb/ft	Distance from wall face	:	ft
Load 2	:	lb/ft	Distance from wall face	:	ft
Load 3	:	lb/ft	Distance from wall face	:	ft

Line load on wall

Load	:	lb/ft	Distance from wall face	:	ft

Seismic action data

Horizontal coefficient : Vertical coefficient :

Maccaferri INC. is not responsible for the reliability of the geotechnical parameters assumed, or the improper use of the software. The program takes into account the physical characteristics of materials as manufacturated by the Maccaferri group; its results will not be realistic if a different material is used.

GawacWin 2003

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 3ftAGLSection B - Option 1

Date: 6/14/2012

STABILITY ANALYSIS RESULTS

Active and Passive Thrust

Active Thrust	: 2109.02 lb/ft
Point of application ref. to X axis	: 3.97 ft
Point of application ref. to Y axis	: 3.17 ft
Direction of the thrust ref. to X axis	: 34.96 deg
Passive Thrust	: 3783.11 lb/ft
Point of application ref. to X axis	: 0.00 ft
Point of application ref. to Y axis	: 2.00 ft
Direction of the thrust ref. to X axis	: 0.00 deg

Sliding

Normal force on the base	: 4270.43 lb/ft
Point of application ref. to X axis	: 3.02 ft
Point of application ref. to Y axis	: 0.00 ft
Shear force on the base	:-2054.71 lb/ft
Resisting force on the base	: 5878.81 lb/ft
Sliding Safety Coefficient	**: 3.40**

Overturning

Overturning Moment	: 5485.42 lb/ft x ft
Restoring Moment	:18375.75 lb/ft x ft
Overturning Safety Coefficient	**: 3.35**

Stresses Acting on Foundation

Eccentricity	: -0.77 ft
Normal stress on outer border	: 943.17 lb/ft²
Normal stress on inner border	: 0.00 lb/ft²
Max. allowable stress on the foundation	: 4051.69 lb/ft²

Warning. Not all base is used!

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Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 3ftAGLSection B - Option 1

Date: 6/14/2012

Overall Stability

Initial distance at pivot leftside	:	ft
Initial distance at pivot rightside	:	ft
Initial depth referred to base	:	ft
Max depth allowed in calculation	:	ft
Center of the arch referred to X axis	:	1.47 ft
Center of the arch referred to Y axis	:	17.18 ft
Radius of the arch	:	17.48 ft
Number of search surfaces	:	90
Overall Stability Safety Coefficient	:	**2.91**

Internal Stability

Layer	H ft	N lb/ft	T lb/ft	M lb/ft x ft	τ Max lb/ft²	τ All lb/ft²	σ Max lb/ft²	σ All lb/ft²
1	6.00	2887.82	959.07	5023.88	213.13	815.49	829.99	11080.12
2	3.00	1008.76	192.58	1449.32	64.19	624.25	351.06	

Maccaferri INC. is not responsible for the reliability of the geotechnical parameters assumed, or the improper use of the software. The program takes into account the physical characteristics of materials as manufacturated by the Maccaferri group; its results will not be realistic if a different material is used.

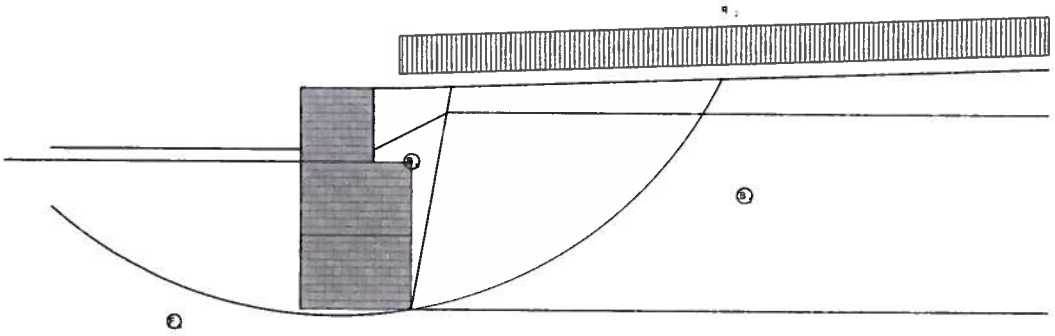
GawacWin 2003

Summary

Program released in license to: Maccaferri Inc

Project: UCR Arroyo Gabions
File: 3ftAGLSection B - Option 1

Date: 6/14/2012



SOIL DATA

Soil	γ lb/ft³	c lb/ft²	ϕ deg	Soil	γ lb/ft³	c lb/ft²	ϕ deg
B_s	120.00	0.00	30.00	F_s	120.00	0.00	30.00
B_1	120.00	0.00	30.00				

LOADS

Load	Value lb/ft²	Load	Value lb/ft
q_2	100.00		

STABILITY CHECKS

Sliding Safety Coefficient	3.40	Base normal stress (left)	943.17lb/ft²
Overturning Safety Coefficient	3.35	Base normal stress (right)	0.00lb/ft²
Overall Stability Safety Coefficient	2.91	Max. allowable stress	4051.69lb/ft²

Maccaferri INC. is not responsible for the reliability of the geotechnical parameters assumed, or the improper use of the software. The program takes into account the physical characteristics of materials as manufacturated by the Maccaferri group; its results will not be realistic if a different material is used.

APPENDIX "E"

GABION DETAILS AND SPECIFICATIONS BY MACCAFERRI

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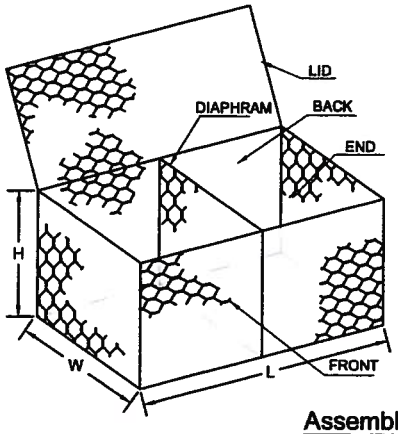


Assembled
Gabion Basket

NOTES:

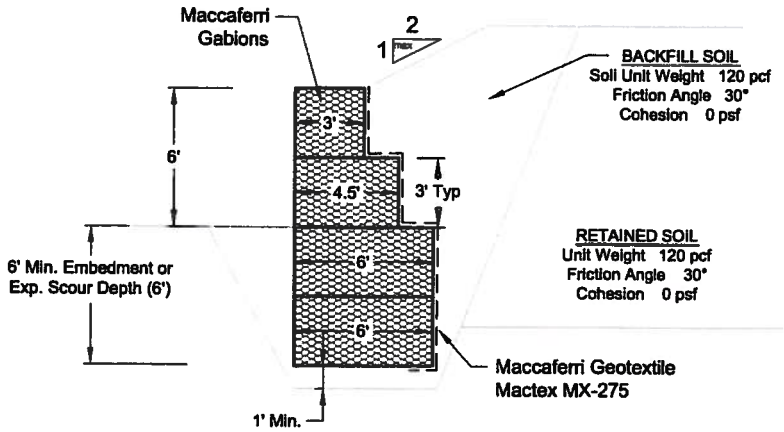
1. All Dimensions in ft unless otherwise specified.
2. Maccaferri Gabions to ASTM A975.
3. Gabions used shall be Zinc+PVC Coated.
4. Fasteners used for assembly and installation of units on the fill shall be tested for compliance with the ASTM A975 section 13.1.2.2 pull-apart resistance.
5. Compaction:

5.1. Backfill and Foundation Soil shall be compacted to minimum 90% of modified proctor density (ASTM D1557) at moisture content of ± 2% of OMC.

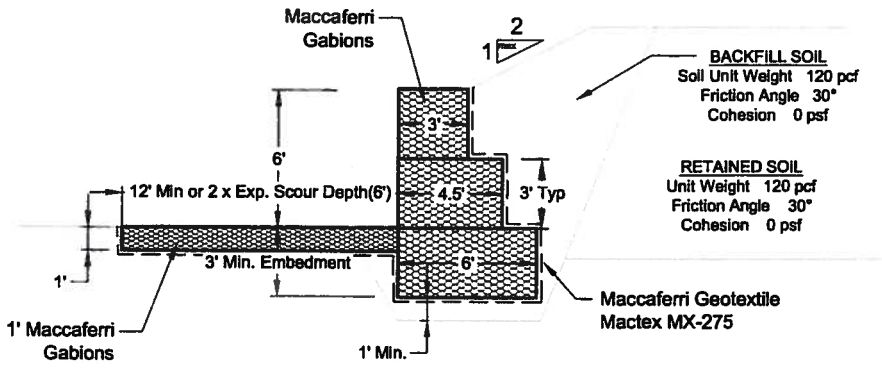
6. Gabion Fill to ASTM D6711:

6.1. Rock Size	4" to 8", D50 = 6"
6.2. Rock Unit Weight	150 pcf min.
6.3. Voids	30% max.
7. Loads	
7.1. Seismic Acceleration	0g
7.2. Traffic load	100psf.

8. This is typical design and is valid only for the stated soil parameters. Any variation from the stated design parameters renders the design void and will required a new design.
9. It is the responsibility of the Owner or the Owner's Representative to verify the soil parameters and Foundation Bearing Capacity prior to construction.



A 6' AGL TYPICAL CROSS SECTION - OPTION 1
Maccaferri Gabion Wall



A 6' AGL TYPICAL CROSS SECTION - OPTION 2
Maccaferri Gabion Wall

Maccaferri Inc. assumes no responsibility for the drawings and calculations it provides, as they must be intended as a general indication to suggest the proper use of its products.

Rev:	Issue / Revision:	Drawn:	App:	Date:

MACCAFERRI
Maccaferri, Inc.
10303 Governor Lane Blvd.
Williamsport, MD 21795-3116 USA
Ph. (301) 223-6910 Fax (301) 223-6134

Designed: RK	Date: 06/14/12	Project Title: UCR ARROYO GABIONS	Title: Typical Cross Section Maccaferri Gabion
Drawn: SG	Date: 06/14/12	Client: CHJ Consultants	Scale: NTS; Project No: -
Checked: SM	Date: 06/14/12	NOT FOR CONSTRUCTION	Rev: 1; Printed on: 6/14/12; Units: Feet; Drawing No: 1 / 2

Enclosure "E-1"
Job No. 12218-3

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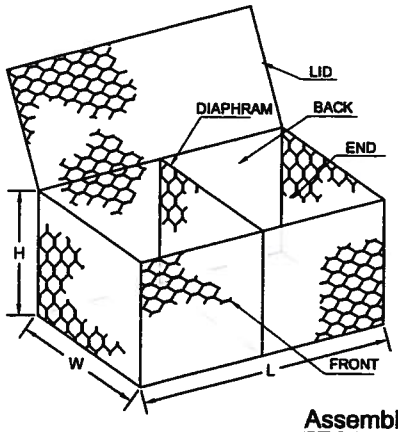


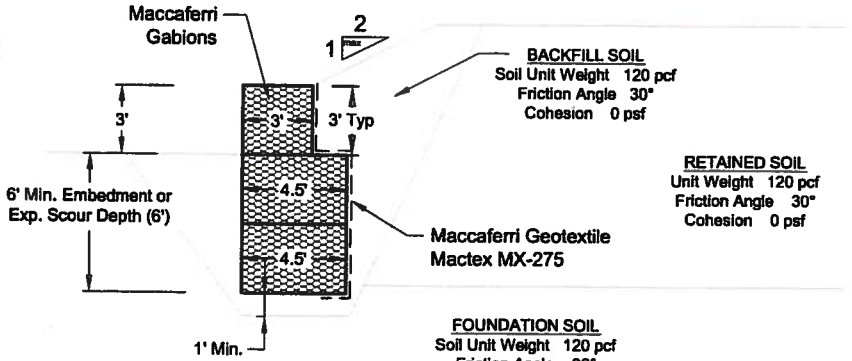
Assembled
Gabion Basket

NOTES:

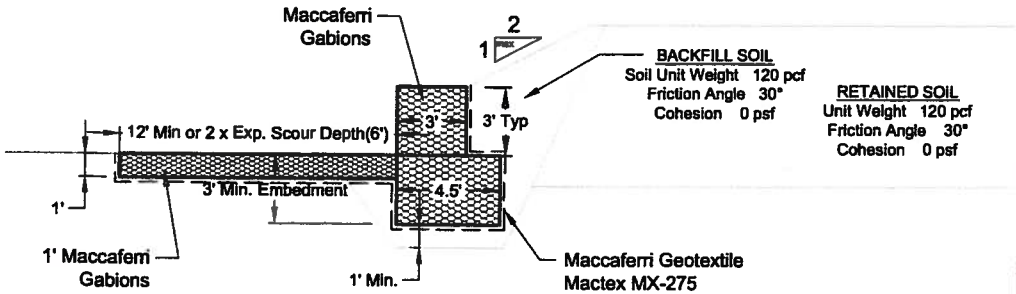
1. All Dimensions in ft unless otherwise specified.
2. Maccaferri Gabions to ASTM A975.
3. Gabions used shall be Zinc+PVC Coated.
4. Fasteners used for assembly and installation of units on the fill shall be tested for compliance with the ASTM A975 section 13.1.2.2 pull-apart resistance.
5. Compaction:
5.1. Backfill and Foundation Soil shall be compacted to minimum 90% of modified proctor density (ASTM D1557) at moisture content of ± 2% of OMC.
6. Gabion Fill to ASTM D6711:

6.1. Rock Size	4" to 8", D50 = 6"
6.2. Rock Unit Weight	150 pcf min.
6.3. Voids	30% max.
7. Loads	
7.1. Seismic Acceleration	0g
7.2. Traffic load	100psf.

8. This is typical design and is valid only for the stated soil parameters. Any variation from the stated design parameters renders the design void and will required a new design.
9. It is the responsibility of the Owner or the Owner's Representative to verify the soil parameters and Foundation Bearing Capacity prior to construction.



B 3' AGL TYPICAL CROSS SECTION - OPTION 1
Maccaferri Gabion Wall



B 3' AGL TYPICAL CROSS SECTION - OPTION 2
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Designed: RK	Date: 06/14/12	Project Title: UCR ARROYO GABIONS	Title: Typical Cross Section Maccaferri Gabion
Drawn: SG	Date: 06/14/12	Client: CHJ Consultants	Scale: NTS; Project No: -
Checked: SM	Date: 06/14/12	NOT FOR CONSTRUCTION	Rev: 1; Units: Feet; Drawing No: 2 / 2

Printed on: 6/14/12

Enclosure "E-1"
Job No. 12218-3

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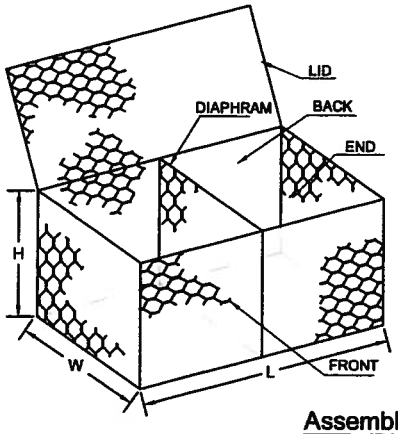

Assembled
Gabion Basket

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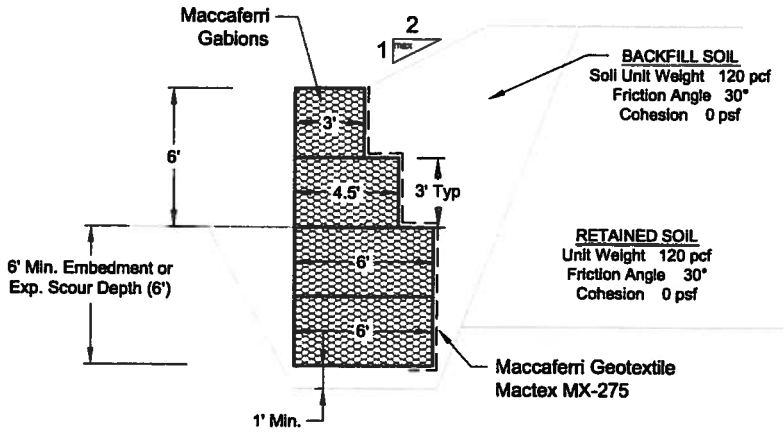
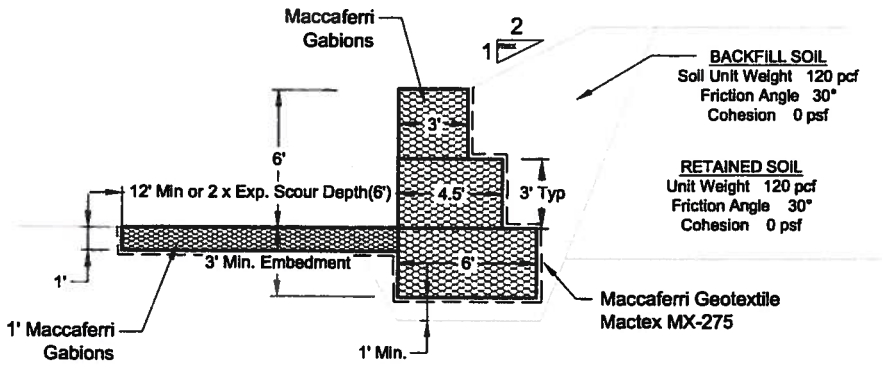


A 6' AGL TYPICAL CROSS SECTION - OPTION 1
Maccaferri Gabion Wall



A 6' AGL TYPICAL CROSS SECTION - OPTION 2
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Enclosure "E-1"
Job No. 12218-3

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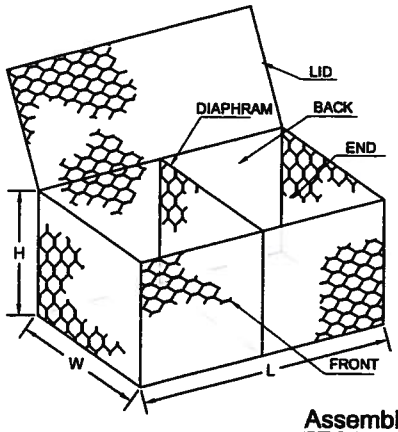

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Gabion Basket

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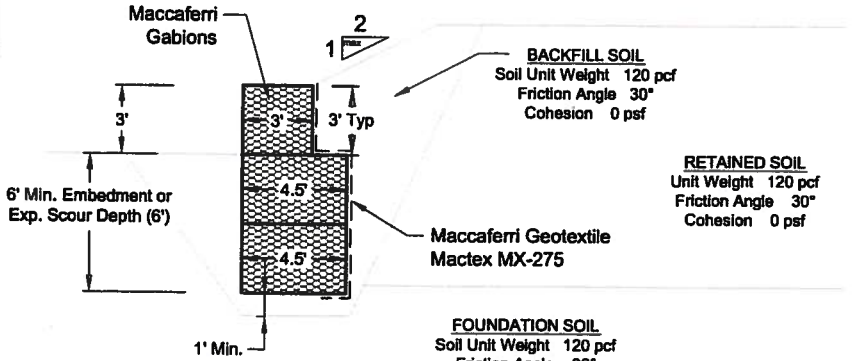
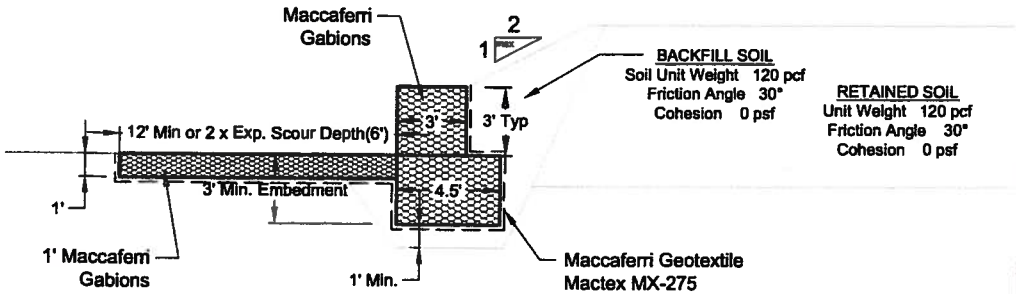


B 3' AGL TYPICAL CROSS SECTION - OPTION 1
Maccaferri Gabion Wall



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Printed on: 6/14/12

Enclosure "E-1"
Job No. 12218-3

Attachment q

Berger ABAM Scour Report

BergerABAM
FLORES LUND
CONSULTANTS

University of California at Riverside

Glen Mor 2 Housing Complex - Proposed Arroyo Scour Protection Improvements

DRAFT

Date: August 14, 2012

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- Bobcat Information – Photos; Compact excavator and compact tract loader

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1 Introduction

This document addresses the proposed improvement of the Arroyo Wash (Arroyo), which traverses the University of California at Riverside (UCR) campus, along the northerly boundary of the Glen Mor 2 project (Project). Specifically, the Arroyo is bounded by the following: 1) to the north by the existing Glen Mor 1 Housing Complex, 2) to the south by the Project, and 3) to the east and west by Valencia Hills Drive and the existing Lothian Residence Hall, respectively. The proposed Arroyo improvements will be constructed for the protection of the Project and offsite existing infrastructure from scour. At this juncture in the entitlement/design process, the proposed Arroyo scour countermeasure improvements will consist of gabion walls, riprap pads, and realignment of the Arroyo flowline at key locations. *(See Exhibit 1* - Proposed Arroyo Improvements, *for the location of the Arroyo and Project Site)*

Exhibit 1 also shows the approximate location and extent of the Arroyo improvements, as well as the estimated construction zone footprint. The aforementioned scour countermeasures are proposed at the following locations:

- The protection of the structural slope that is being constructed as a part of the Project.
- The protection of the two Project pedestrian bridges that free-span the Arroyo. **Bridge No.1** is located between the Lothian Residence Hall and the Project, while **Bridge No. 2** is located about 300 feet to the east of **Bridge No. 1**.
- The protection of the existing/proposed sidewalk (i.e., the rehabilitation of the existing sidewalk) that is located alongside the existing Pentland Hills and Glen Mor 1 Housing Complexes to the north, and the Arroyo to the south. Note that the new sidewalk provides access to the Project's pedestrian bridges.
- The protection of the manufactured/structural slope, which was constructed in conjunction with the most easterly Glen Mor 1 housing unit. This slope has been scoured by Arroyo flood flows.
- The mitigation of a natural tributary gully that drains to the Arroyo. The gully is approximately located between landscaping that surrounds the most easterly Glen Mor 1 housing unit and the Arroyo.

This document was formatted to address the proposed Arroyo improvements via the partitioning of the Arroyo into Reach's 1-4. Note that a separate report section was prepared for each reach, which provides a discussion concerning: 1) the existing Arroyo conditions that led to the proposed improvement of the Arroyo, 2) the extent of the proposed Arroyo improvements, and 3) the proposed construction footprint and staging area. *(See Exhibit 1 for the Reach designations. Note that Figure 1 shows an 11- by 17- inch version of the Exhibit 1 to facilitate the review of this document)*

2 Arroyo Background - Previous Hydraulic Analyses and Geomorphology

An existing conditions hydraulic analysis was performed of the Arroyo in 2008/2010, using 2008 topography. Since the 2008/2010 study and 2008 field work, the project team has conducted two

Arroyo site investigations. The results of these investigations indicate that segments of the Arroyo may have shifted laterally due to scour, thereby, exacerbating the scouring of the Arroyo alongside the above referenced infrastructure improvements. Note that this change in Arroyo topography will require the re-analysis of the existing conditions Arroyo with updated topography. Note that the 2010 preliminary hydraulic study is included Appendix 1. The latter document is included herein in support of the 100-year storm flow hydrology that will be used in the evaluation of the Arroyo hydraulics.

In addition to the re-analysis of the existing conditions Arroyo, a proposed conditions Arroyo analysis (i.e., with Arroyo improvements) will also be performed to: 1) determine the Arroyo Base Flood Elevations (BFE's) that will be used to secure the low-chord elevation of the pedestrian bridges, 2) finalize the alignment and extent of the gabion and Arroyo grading improvements, and 3) determine the scour depths that will be used for the design of the gabion wall entrenchment below the flowline of the Arroyo. From a geomorphologic standpoint, the preliminary alignments of the gabion improvements were designed to closely resemble the existing alignment of the Arroyo. This approach was used to maintain, as much as possible, existing Arroyo flood patterns and hydraulic/scour conditions.

The project team will finalize the Arroyo hydraulic analyses after we receive preliminary review comments from the California Department of the Fish and Game (CDF&G), USACOE, or the RWQCB. This approach will allow the design team to address critical path Arroyo planning and analysis concerns, if any, in order to expedite the approval of the CEQA permit and the final design of the scour protection improvements.

The existing and proposed conditions Arroyo analyses will be performed after we receive preliminary review comments from the California Department of the Fish and Game (CDF&G). This approach will allow the design team to address critical path Arroyo planning and analysis concerns, in order to expedite the approval of the CEQA permit and the final design of the scour protection improvements.

2.1.1 Geotechnical Preliminary Gabion Design Support

Flores Lund Consultants (FLC) conducted a field investigation in March 2012 with CHJ Consultants (CHJ), the Project's geotechnical engineering firm. The investigation was used to evaluate the use gabion wall systems for the Project. Since the investigation, CHJ has been in contact with Maccaferri Gabion Inc. to acquire the design criteria required for the preliminary design of the gabion wall system. These designs are reflected in the typical gabion wall cross-sections that are included in this report.

It's important to note that the extent of the proposed gabion improvements have been conservatively estimated, and are being implemented solely for the protection of proposed Project and existing infrastructure improvements. However, Arroyo's by nature can be quite dynamic when responding to external and/or man-made modifications, such as: 1) the realignment of the flowline, 2) a decrease or increase in incoming storm flow or sediment, due to the construction of a detention basin or retention basin, and/or 3) a decrease in watershed sediment yield to the Arroyo, due to development.

Therefore, we recommend that UCR implement an aggressive post-storm event Arroyo monitoring program to assess the performance of the proposed Arroyo improvements and any other changes in the alignment of the Arroyo that may require the implementation of additional scour improvements.

3 Reach 1 - Arroyo Gabion Improvements

3.1 Existing Arroyo Conditions

The Reach 1 Arroyo improvements are being proposed to protect the structural slope that was constructed as a part of the Glen Mor 2 Project. Although this fill slope does not directly encroach into the Arroyo wash, it day-lites onto the existing slope, which over time has been incised by the Arroyo. This incision has resulted in the formation of a scarp that ranges between 5 and 14 feet in depth.

The Projects' housing units and infrastructure improvements are currently under construction. From a geotechnical perspective, there is reason for concern as it relates to the proximity of the Project to the edge of the fill slope, which ties into the incised Arroyo scarp. To mitigate geotechnical concerns concerning the stability of the slope/scarp, a gabion wall retaining system is proposed for Reach 1. *(See Figure 2 for photographs of the existing scarp along the Project's boundary)*

The following narrative addresses the proposed improvement of the Reach 1 Arroyo. This includes: 1) the limited realignment/grading of the Arroyo, 2) the preliminary design of the gabion wall system, and 3) the construction of the wall system as it relates to site access and construction zone footprint. *(See Figure 9; Detail 1, for the plan view design of the gabion wall and the grading/realignment of the Arroyo)*

3.2 Reach 1 - Proposed Arroyo Improvements

Gabion wall improvements are proposed for the entire length of Reach 1, inclusive of the minor realignment of the Arroyo flowline at **Location 1** and **Location 2**. The latter grading is being implemented to mitigate the potential for scour along the gabion wall. *(See Figure 9; Detail 1, for the alignment of the Arroyo flowline along the gabion wall)*

- **Location 1**: The grading at this location will provide for the smooth conveyance of flow along the gabion wall. This new flow regime will mitigate the potential for scour along the wall by removing the existing near 90 degree impingement of flow at the base of the scarp. *(See Figure 3 for a photograph of the Arroyo impingement)*.

  Without the proposed curved alignment of the Arroyo, the wall would run the risk of being undermined, thereby exposing the gabion wall and Project slope to potential failure. *(See Exhibit 1 for **Location 1** and Figure 9; Detail 1, for the grading of the Arroyo flowline)*

- **Location 2**: The grading of the Arroyo at this location will add the conveyance area that will be removed as a result of the construction of the gabion wall. This grading will also mitigate the potential for scour along the gabion wall. *(See Exhibit 1 for **Location 2** and Figure 9; Detail 1, for the grading of the Arroyo flowline)*

The gabion wall through Reach 1 will range between 5 and 15 feet. The wall entrenchment depth below the Arroyo flowline will be based on the calculated total sour depth. Note that an additional 2-3 feet of depth will be added to the total scour depth, since the base of the wall must reside below this depth. *(See Figure 9; Detail 4, for a typical cross-section view of the proposed gabion wall)*

In addition to the aforementioned improvements, Reach 1 also includes the protection of the **Bridge No. 1** abutments. Both abutments will be protected with irregularity shaped riprap pads, in lieu of gabions mattresses.

3.3 Reach 1 – Scour Analysis

Existing and proposed scour depths have been analyzed utilizing both the Lacey and Blench equations, average depths of scour based on the two methods have been used for determining depth of scour below the streambed. Depths of scour have been reduced within the reach on a range of 0.1' to 1.5' as a result of minor channel grading and gabion placement. The total average depth of scour is calculated to be approximately 3.5' within the reach, a safety factor of 2' has been added to the calculated depth for a minimum burial depth of 5.5' within this reach, see scour tables in appendix 1.

3.4 Reach 1 - Construction Access and Construction Zone

Due to the construction of the Arroyo improvements, it is anticipated that the entire length of the Arroyo flowline will be temporarily disturbed. In order to limit the area of the gabion construction zone, it is assumed that a track hoe or truck mounted crane, within the Project site, can be used to lower the gabion materials and equipment that are needed for the construction of the wall. Figure 9; Detail 1, shows the approximate limits of Arroyo grading, due to the wall construction. *(See Exhibit 1 for the proposed location of the staging area and the construction zone footprint)*

Additionally, we anticipate that the staging area for the storage of the gabion baskets and rock, and the Bridge No.1 abutment riprap protection will be located within the westerly Project boundary. Note that the contractor is to submit a final staging plan to UCR's Capital Resources Management and Architects/Engineers departments for approval, prior to the start of construction. *(See Figure 8 for the proposed offsite access route to the staging area)*

It is important to note that the contractor is ultimately responsible for the "methods and means" by which the gabion wall is to be constructed. In this particular case, we recommend that the contactor coordinate the construction effort with geotechnical engineer, to be certain that the Project pad and uphill gabion slope are able to maintain the weight of the crane during construction.

3.5 Reach 1 - Construction Equipment

To minimize the construction zone footprint we anticipate that the construction work will be accomplished using the smaller footprint Bobcat track loader and excavator for the grading of the Arroyo flowline (per plan), and for the excavation of gabion wall foundation. Additionally, we anticipate that gabion trench and backfill compaction requirements will be accomplished using vibratory tampers or vibratory plates. We recommend that the contractor coordinate the

construction effort with the geotechnical engineer concerning shoring and compaction requirements, and the selection of the construction equipment.

It is important to note, that the construction effort/approach and the selection of the equipment that will be used is solely the responsibility of the contractor, i.e., "methods and means".

Appendix 2 contains manufacturer's information from the BOMPAG FAYAT GROUP, a retailer of compaction equipment. Included is an assortment of vibratory tamper and vibratory plates that perhaps could be used for the Project. Also included in Appendix 2 are manufactures photos from Bobcat, concerning compact tract loaders and compact excavators.

4 Reach 2: Arroyo Gabion Improvements

4.1 Reach 2 - Existing Arroyo Conditions

Reach 2 is located along a major bend of the Arroyo, which for discussion purposes is described in this document as **Bend No. 1**. The existing topography, per Exhibit 1, in conjunction with the review of aerial photographs, provides an indication of the scouring that has historically occurred within this bend. Exhibit 1 shows that **Bend No. 1** contains two minor bends, i.e., **Bend No. 2** and **Bend No. 3**. The scouring of the outer edge of these bends/radii has placed a number of existing infrastructure improvements at risk of failure. The affected improvements include*: (See Exhibit 1 for the locations of Reach 2, and **Bends No.1, 2**, and **3**)*

- The existing sidewalk that is located between the Glen Mor 1 Housing Complex and **Bend No. 2**. *(See Figure 4 for photographs of the sidewalk along **Bend No. 2**)*
- The manufactured/structural slope within **Bend No. 3**, which was constructed in conjunction with the most easterly Glen Mor 1 housing unit. (*See Figure 5 for photographs of the structural slope and the incised along **Bend 3)***

The following narrative addresses the proposed improvement of that Reach 2 Arroyo. This includes: 1) the realignment/grading of the Arroyo, 2) the preliminary design of the gabion wall system, and 3) the construction of the wall system as it relates to site access and construction zone footprint.

4.2 Reach 2 - Proposed Arroyo Improvements

The Reach 2 Arroyo improvements are proposed for the scour protection of the Project's proposed right overbank **Bridge No. 2** abutment, which is located within the Arroyo's right overbank, and sidewalk improvements. Additionally, the Arroyo improvements are also being implemented to protect the structural fill that was constructed as part of the Glen Mor 1 Housing Complex. The improvements that are proposed for Reach 2 include the construction of gabions and the realignment of the Arroyo flowline. *(See Exhibit 1 for the Reach 2 Arroyo improvements)*

Note that the gabion improvements are limited to the outer edge of **Bend No.1**, whereas a small segment of the inner Arroyo radii/wall of **Bend No. 1** will be graded to regain the Arroyo capacity that was lost, due to the construction of the bridge abutment. Due to these improvements, it's anticipated

that the Arroyo will adjust its profile and geometry through Reach 2. Note that from a geomorphologic perspective, the new Arroyo realignment was designed to closely resemble the flood patterns associated with its current alignment. Moreover, the new Arroyo alignment allows for the smoother conveyance of flow through the Arroyo, thereby mitigating the potential for scour. This design approach was used to maintain, as much as possible, current Arroyo hydraulic conditions. *(See Exhibit 1 for **Bends No. 1** and **No. 2**)*

The following narrative provides additional detail concerning the Arroyo scour improvements that are planned for the Reach 2. *(See Figure 10: Detail 1, for the plan view design of the gabion wall and the grading/realignment of the Arroyo)*

Bend No. 2

The Bridge 2 abutment will be located within the right overbank of the **Bend No. 2 Arroyo.** Based on site constraints, this bend will need to be realigned to allow for the construction of the bridge's right abutment and the gabion wall scour protection. The gabion wall will prohibit the lateral movement of the bend, thereby protecting the abutment and the sidewalk from failure.

Moreover, it's our understanding that the current sidewalk will be replaced by a new sidewalk as a part of this project. The gabion wall protection will also provide for the protection of this new infrastructure improvement. *(See Figure 4 for photographs that show current scour conditions within **Bend No. 2**)*

Figure 10 show the grading associated with the construction of the gabion wall within **Bend No. 2**, the alignment of the gabion wall, the position of the new abutment, and the proposed fire access/sidewalk improvements. Note that the gabion wall height within **Bend No. 2** ranges between 3 and 4- feet above the flowline of the Arroyo. The height of the wall will be approximately set at the height of the adjacent Arroyo bank. *(See Figure 10: Detail 4, for a typical gabion wall cross-section through **Bend No. 2**)*

Bend No. 3

A small segment of the Arroyo between the **Bends No. 2** and **3** has been realigned to mitigate the upstream scouring of the structural slope within **Bend No. 3**. The realignment, which is shown as Figure 10: Detail 1, was achieved via the removal of a bank that currently protrudes into **Bend No. 3**. This protrusion exacerbates the scouring of the existing bank at the immediate downstream end of **Bend No. 3**. A second bank protrusion was also removed just downstream of this location, thereby, allowing for smooth conveyance of flow along the Arroyo's gabion wall. *(See Figure 5 for photographs that show the bank protrusion and current scour conditions along **Bend No. 3**)*

The gabion wall height within **Bend No. 3** ranges between 6 and 12 feet. The height of the wall the will be approximately set at the height of the eroded slope scarp. *(See Figure 10: Detail 2, for a typical gabion wall cross-section through **Bend No. 3**)*

The gabion wall entrenchment depth, below the Arroyo flowline, will be based on the calculated total sour depth. Note that an additional 2-3 feet of depth will be added to the total scour depth, since the base of the wall must reside below this depth.

4.3 Reach 2 – Scour Analysis

Existing and proposed scour depths have been analyzed utilizing both the Lacey and Blench equations, average depths of scour based on the two methods have been used for determining depth of scour below the streambed. Depths of scour have been reduced within the reach on a range of 0.1' to 1' as a result of minor channel grading and gabion placement. The total average depth of scour is calculated to be approximately 3.8' within the reach, a safety factor of 2' has been added to the calculated depth for a minimum burial depth of 5.8' within this reach, see scour tables in appendix 1.

4.4 Reach 2 - Construction Access and Construction Zone

The construction of the Reach 2 improvements will disturb the Arroyo and the adjacent right overbank of the Arroyo, throughout the entire length of the gabion wall alignment. Since these improvements are located adjacent to the Glen Mor 1 Housing Complex, it is assumed that the staging area for the storage of the gabion baskets and rock will be located alongside the existing fire access road, i.e., the right overbank of the Arroyo. Figure 9; Detail 1, shows the approximate limits of Arroyo grading, due to the wall construction. *(See Exhibit 1 for the proposed location of the staging area and the construction zone footprint)*

From a construction standpoint, Arroyo egress and ingress is achievable via the staging area. In order to limit the area of the construction zone footprint, it is assumed that a Bobcat/backhoe will be used for the construction of the wall. Note that the contractor is to submit a final staging plan to UCR's Capital Resources Management and Architects/Engineers departments for approval, prior to the start of construction. *(See Figure 8 for the proposed offsite access route to the staging area)*

It is important to note that the contractor is ultimately responsible for the "methods and means" by which the gabion wall is to be constructed. We recommend that the contactor coordinate the construction effort with geotechnical engineer concerning specific geotechnical compaction requirements associated with the gabion wall.

4.5 Reach 2 - Construction Equipment

To minimize the construction zone footprint we anticipate that the construction work will be accomplished using the smaller footprint Bobcat track loader and excavator for the grading of the Arroyo flowline (per plan), and for the excavation of gabion wall foundation. Additionally, we anticipate that gabion trench and backfill compaction requirements will be accomplished using vibratory tampers or vibratory plates. We recommend that the contractor coordinate the construction effort with the geotechnical engineer concerning shoring and compaction requirements, and the selection of the construction equipment.

It is important to note, that the construction effort/approach and the selection of the equipment that will be used is solely the responsibility of the contractor, i.e., "methods and means".

Appendix 2 contains manufacturer's information from the BOMPAG FAYAT GROUP, a retailer of compaction equipment. Included is an assortment of vibratory tamper and vibratory plates that perhaps could be used for the Project. Also included in Appendix 2 are manufactures photos from Bobcat, concerning compact tract loaders and compact excavators.

5 Reach 3: Arroyo Gabion Improvements

5.1 Reach 3 - Existing Arroyo Conditions

The gabion wall improvements through Reach 3 of the Arroyo are proposed for the mitigation of an existing scoured gully that drains into the adjacent Arroyo. The gully developed, due to the concentration of offsite runoff that drains to the Arroyo. The head-cut that developed as a result of this drainage traverses the existing right overbank of the Arroyo. Eventually, the gully will also cut into the upstream landscape area if scour mitigation measures are not implemented. This landscaped area was constructed as a part of the Glen Mor 1 Housing Complex. *(See Exhibit 1 for the location of Reach 3)*

5.2 Reach 3 - Proposed Arroyo Improvements

The mitigation of the gully begins with the construction of a gabion that will protect the downstream Arroyo bend from scour/lateral migration. Note that the top of the gabion wall will be approximately set at the elevation of the Arroyo overbank, and will be designed to support the gully backfill behind the wall. The new gully backfill will be graded to promote sheet flow over the gabion wall, which will mitigate the development of gullies along the backside of the wall. . *(See Figure 9; Detail 2, for the plan view design of the gabion wall)*

The height of the gabion wall ranges between 3 and 4 feet. The wall entrenchment depth below the Arroyo flowline will be based on the total sour depth. An additional 2-3 feet of depth will be added to the total scour depth, since the base of the wall must reside below this depth. (*See Figure 9: Detail 5, for a typical gabion wall cross-section through Reach 3)*

5.3 Reach 3 – Scour Analysis

Existing and proposed scour depths have been analyzed utilizing both the Lacey and Blench equations, average depths of scour based on the two methods have been used for determining depth of scour below the streambed. Depths of scour have been reduced within the reach on a range of 1.2' to 1.8' as a result of minor channel grading and gabion placement. The total average depth of scour is calculated to be approximately 3.9' within the reach, a safety factor of 2' has been added to the calculated depth for a minimum burial depth of 5.9' within this reach, see scour tables in appendix 1.

5.4 Reach 3 - Construction Access and Construction Zone

The Arroyo, and a portion of the adjacent right overbank of the Arroyo, will be disturbed along the entire length of the proposed gabion wall. Since these improvements are located across from the adjacent Glen Mor 1 Housing Units, we anticipate that the staging area for the storage of the gabion baskets and rock will be located on top of the graded pad that overlooks the construction zone. Figure 9: Detail 2, shows the approximate limits of Arroyo grading, due to the wall construction. *(See Exhibit 1 for the proposed location of the staging area and the construction zone footprint)*

From a construction standpoint, egress and ingress to the gully and the Arroyo is achievable via the staging area. In order to limit the area of construction zone footprint, it is assumed that a Bobcat/backhoe will be used for the grading of the gully (backfill) and the construction of the wall. Note that the contractor is to submit a final staging plan to UCR's Capital Resources Management and Architects/Engineers departments for approval, prior to the start of construction. *(See Figure 8 for the proposed offsite access route to the staging area)*.

It is important to note that the contractor is ultimately responsible for the "methods and means" by which the gabion wall is to be constructed. We recommend that the contactor coordinate the construction effort with the geotechnical engineer concerning specific geotechnical compaction requirements associated with the gabion wall.

5.5 Reach 3 - Construction Equipment

To minimize the construction zone footprint we anticipate that the construction work will be accomplished using the smaller footprint Bobcat track loader and excavator for the excavation of gabion wall foundation, and the backfilling of the gully. Additionally, we anticipate that gabion trench and backfill compaction requirements will be accomplished using vibratory tampers or vibratory plates. We recommend that the contractor coordinate the construction effort with the geotechnical engineer concerning compaction requirements, and the selection of the construction equipment.

It is important to note, that the construction effort/approach and the selection of the equipment that will be used is solely the responsibility of the contractor, i.e., "methods and means".

Appendix 2 contains manufacturer's information from the BOMPAG FAYAT GROUP, a retailer of compaction equipment. Included is an assortment of vibratory tamper and vibratory plates that perhaps could be used for the Project. Also included in Appendix 2 are manufactures photos from Bobcat, concerning compact tract loaders and compact excavators.

6 Reach 4 - Proposed Arroyo Drainpipe Extension and Riprap Protection

6.1 Reach 4 - Existing Arroyo Conditions

There is an existing storm drainpipe that crosses Valencia Hills, prior to discharging into the Arroyo. The Arroyo, which is fully vegetated through this reach, is fairly deep due to the Valencia Hills Drive roadway

embankment. The existing pipe slope is approximately 1.7% with a Q 100 of 96 CFS, this produces a velocity of 14.9 fps exiting the pipe into the arroyo. There are two significantly long wing walls that currently direct storm flows from the drainpipe through the Arroyo. These wing walls will be removed with the proposed extension of the existing drainpipe. *(See Exhibit 1 for the location of Reach 4 and Figure 7 for photos of Valencia Hill Drive, the existing drainpipe, and downstream Arroyo vegetation)*

The following narrative addresses the proposed improvement of the Reach 4 Arroyo. This includes: 1) the preliminary design of the drainpipe and the riprap pad, and 2) the construction of these improvements as it relates to site access and construction zone footprint.

6.2 Reach 4 - Proposed Arroyo Improvements

The Reach 4 Arroyo improvements consist of: 1) the proposed extension of the existing 42-inch drainpipe, which currently discharges into the Arroyo via Valencia Hills Drive, and 2) the Arroyo/drainpipe riprap scour protection. Based on our field investigation and site topography, the Arroyo alignment is fairly straight and in-line with the alignment of the drainpipe outfall. The Arroyo and the drainpipe will be protected by a 1 ton riprap pad that is approximately 15 feet in length and 10.5 feet in width based on Caltrans rip rap design guidelines.

6.3 Reach 4 - Construction Access and Construction Zone

The Arroyo will be disturbed along the entire length of the proposed riprap pad and new head wall. Since these improvements are located adjacent to Valencia Hill Drive, it is assumed that the staging area for the storage of the riprap and drainpipe construction materials will be located within the Project. Figure 11 shows the approximate limits of Arroyo grading, due to the construction of the drainpipe and riprap pad. *(See Exhibit 1 for the proposed location of the staging area and the construction zone footprint)*

From a construction standpoint, egress and ingress to the Arroyo is achievable via the staging area. In order to limit the area of the construction zone, it is assumed that a Bobcat/backhoe will be used for the grading and the construction of the drainpipe and riprap pad. Note that the contractor is to submit a final staging plan to UCR's Capital Resources Management and Architects/Engineers departments for approval, prior to the start of construction. *(See Figure 8 for the Valencia Hills Drive offsite access route to the staging area)*.

It is important to note that the contractor is ultimately responsible for the "methods and means" by which the gabion wall is to be constructed. We recommend that the contactor coordinate the construction effort with the geotechnical engineer concerning specific geotechnical compaction requirements associated with the construction of these improvements.

6.4 Reach 4 - Construction Equipment

To minimize the construction zone footprint we anticipate that the construction work will be accomplished using the smaller footprint Bobcat track loader and excavator for the grading of the Arroyo flowline (per plan), and for the excavations of drainpipe trench and the riprap pad.

Additionally, we anticipate that drainpipe trench and riprap pad compaction requirements will be accomplished using vibratory tampers or vibratory plates. We recommend that the contractor coordinate the construction effort with the geotechnical engineer concerning shoring and compaction requirements, and the selection of the construction equipment.

It is important to note, that the construction effort/approach and the selection of the equipment that will be used is solely the responsibility of the contractor, i.e., "methods and means".

Appendix 2 contains manufacturer's information from the BOMPAG FAYAT GROUP, a retailer of compaction equipment. Included is an assortment of vibratory tamper and vibratory plates that perhaps could be used for the Project. Also included in Appendix 2 are manufactures photos from Bobcat, concerning compact tract loaders and compact excavators.

7 Conclusion

This document addresses the proposed improvement of an Arroyo that traverses the UCR campus along the length of the Project. The proposed Arroyo improvements will be constructed for the protection of the Project and select offsite infrastructure improvements from scour. At this juncture in the design process, the scour countermeasures will consist of gabion walls, riprap pads, and realignment of the Arroyo flowline at key locations.

The extent of the proposed Arroyo improvements has been conservatively estimated, and is being implemented solely for the protection of the proposed Project and existing infrastructure improvements. However, Arroyo's can be quite dynamic when responding to external and/or man-made modifications. *As a result, a proactive Arroyo monitoring program should be implemented by UCR to assess the performance of the proposed scour improvements and any other changes in the alignment of the Arroyo that would require the implementation of additional scour improvements.*

The project team will finalize the Arroyo hydraulic analysis after we receive preliminary review comments from the CDF&G. This approach will allow the design team to address critical path Arroyo planning and analysis concerns in order to expedite the approval of the CEQA permit and the final design of the scour protection improvements.

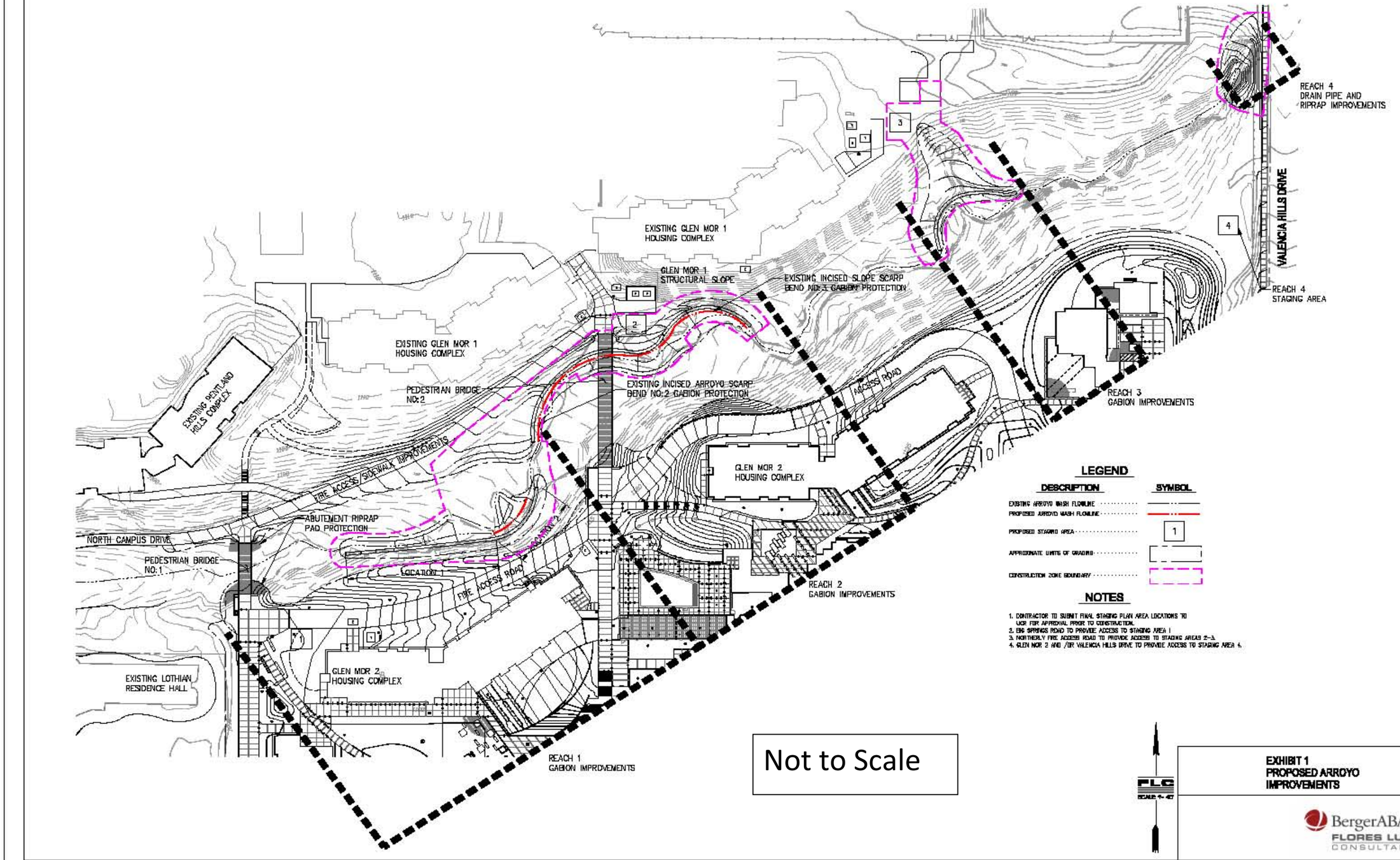


Figure 1: Exhibit 1-Proposed Arroyo Scour Protection Improvements

Figure 2: Reach 1 - Existing Arroyo Site Conditions

Figure 3: Reach 1 - Existing Conditions 90 Degree Angle of Attack at Slope Scarp

Figure 4: Reach 2 - Bend 2 Existing Arroyo Site Conditions

Figure 5: Reach 2 - Bend 3 Existing Arroyo Site Conditions and Glen Mor 1 Structural Fill Scarp

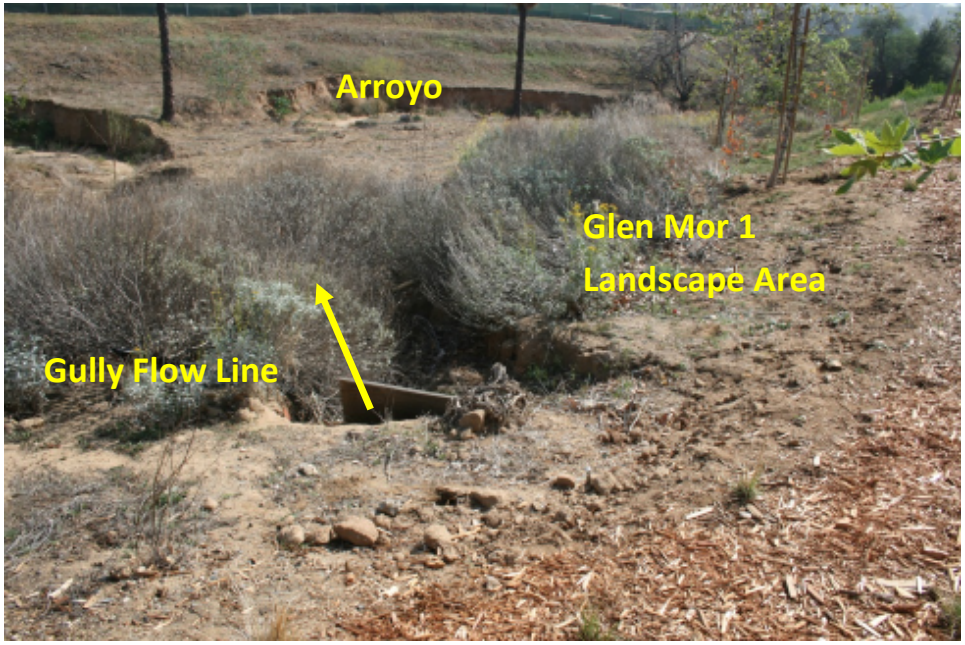
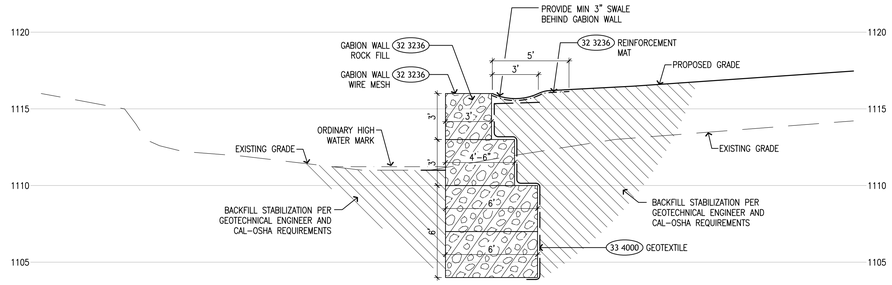


Figure 6: Reach 3 - Existing Gully and Arroyo Site Conditions

Figure 7: Reach 4 - Existing Arroyo Conditions and Drainpipe at Valencia Hills Drive

Figure 8: Proposed Project Access Routes to Staging Area Locations 1-4



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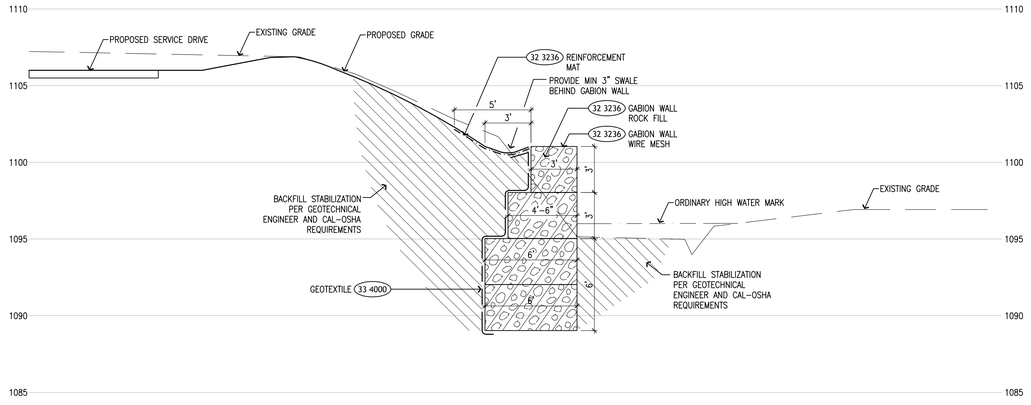

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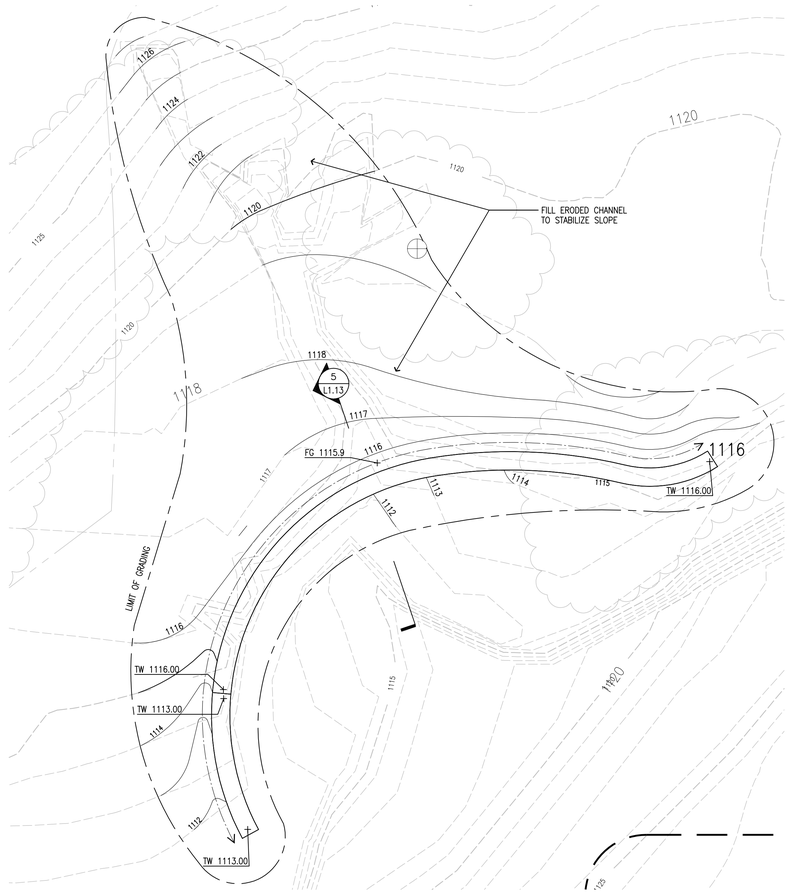

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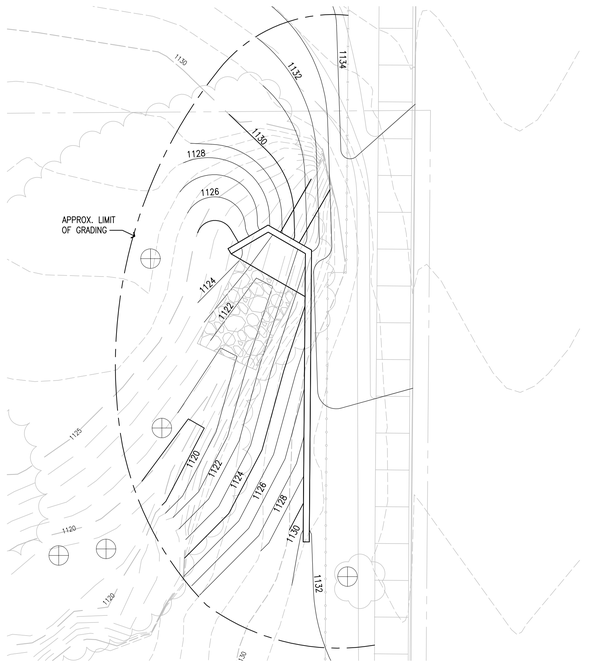

ARROYO CULVERT EXTENSION

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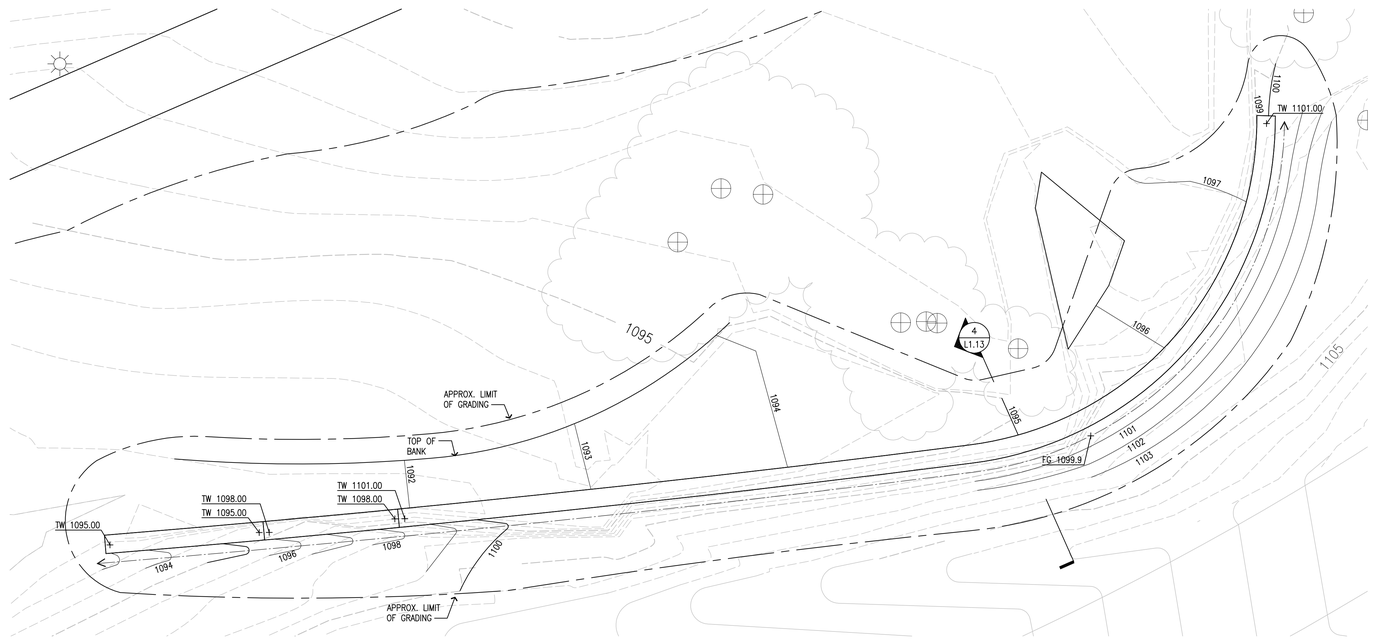

ARROYO GABION WALL

SCALE: 1"=10'-0"

1

0 5 10 20 40 60

SCALE IN FEET

SASAKI

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Quinn landscape architecture
1610 Sutter Street | 303 | San Francisco, CA | 94109
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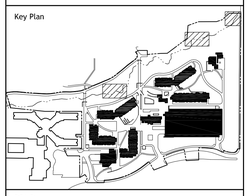
NOTES:

1. SEE SHEET L0.01 FOR GRADING NOTES AND LEGEND.
2. SEE SHEET L1.00 FOR ALTERNATE GRADING AND DRAINAGE KEY PLAN AND GENERAL NOTES.

Key Plan



DSA Stamp

SFM Stamp

No.	Description	Date
	ISSUED FOR CONSTRUCTION	08/03/2012

DWG ISSUE & REVISION HISTORY

Stamp

LICENSED LANDSCAPE ARCHITECT
JAMES A. JACOBS
No. 4462
SIGNATURE
30 JUNE 2013
RENEWAL DATE
23 SEPT 2011
DATE
STATE OF CALIFORNIA

Project Title:
UNIVERSITY OF CALIFORNIA

UC RIVERSIDE GLEN MOR 2 STUDENT HOUSING

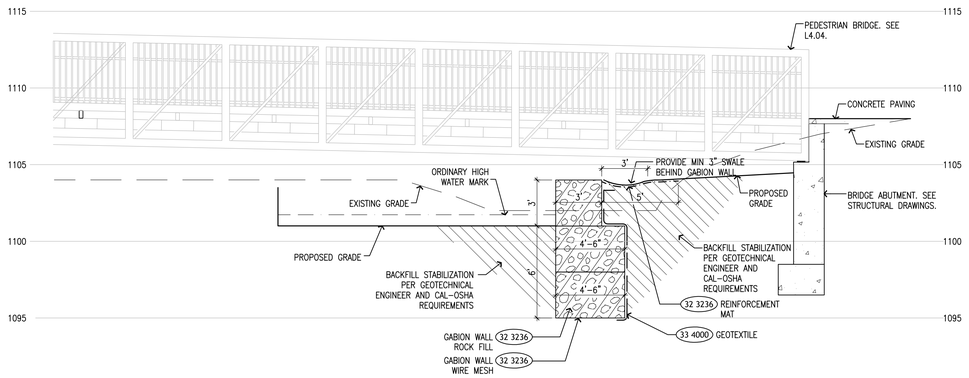
PROJECT NUMBER: 956334

Drawing Title:
ALTERNATE: ARROYO GABION WALLS FINE GRADING AND DRAINAGE PLAN

Project No.	SA 06031.00 SCB 2012011	Drawn By:	
Scale:	AS SHOWN	Checked By:	
Date:	08/03/2012	Approved By:	

Drawing No.
L1.13

Project Directory:



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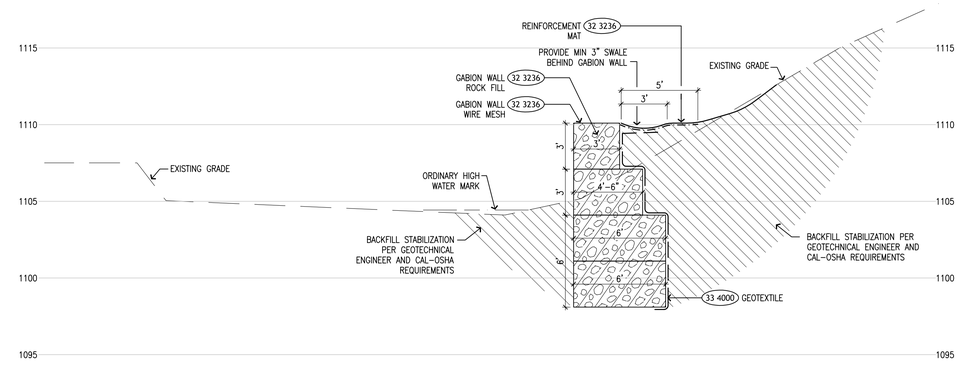

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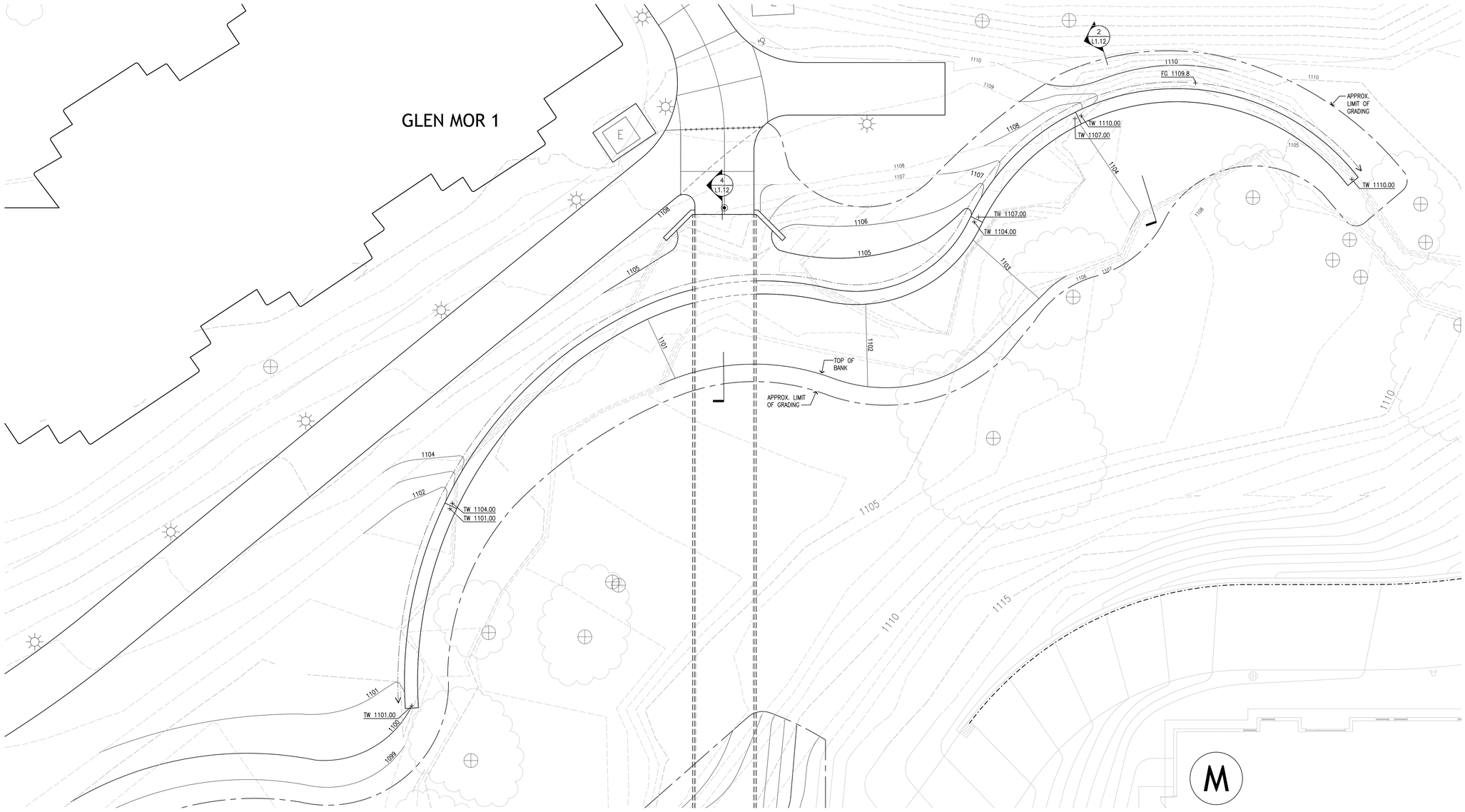

ARROYO GABION WALL
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0 5 10 20 40 60
SCALE IN FEET

SASAKI
77 GEARY STREET, FOURTH FLOOR, SAN FRANCISCO, CA 94108 USA
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t 415 290 5496
www.qlarch.com

NOTES:

1. SEE SHEET L0.01 FOR GRADING NOTES AND LEGEND.
2. SEE SHEET L1.00 FOR ALTERNATE GRADING AND DRAINAGE KEY PLAN AND GENERAL NOTES.

Key Plan

DSA Stamp

SFM Stamp

No.	Description	Date
	ISSUED FOR CONSTRUCTION	08/03/2012

DWG ISSUE & REVISION HISTORY

Stamp

LICENSED LANDSCAPE ARCHITECT
JAMES A. JACOBS
No. 4405
SIGNATURE
30 JUNE 2013
RENEWAL DATE
23 SEPT 2011
DATE
STATE OF CALIFORNIA

Project Title:
UNIVERSITY OF CALIFORNIA

UC RIVERSIDE GLEN MOR 2
STUDENT HOUSING

PROJECT NUMBER: 956334

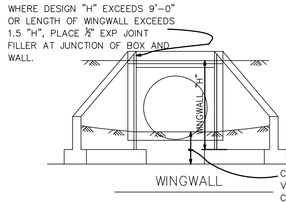
Drawing Title:

ALTERNATE: ARROYO GABION WALLS FINE GRADING AND DRAINAGE PLAN

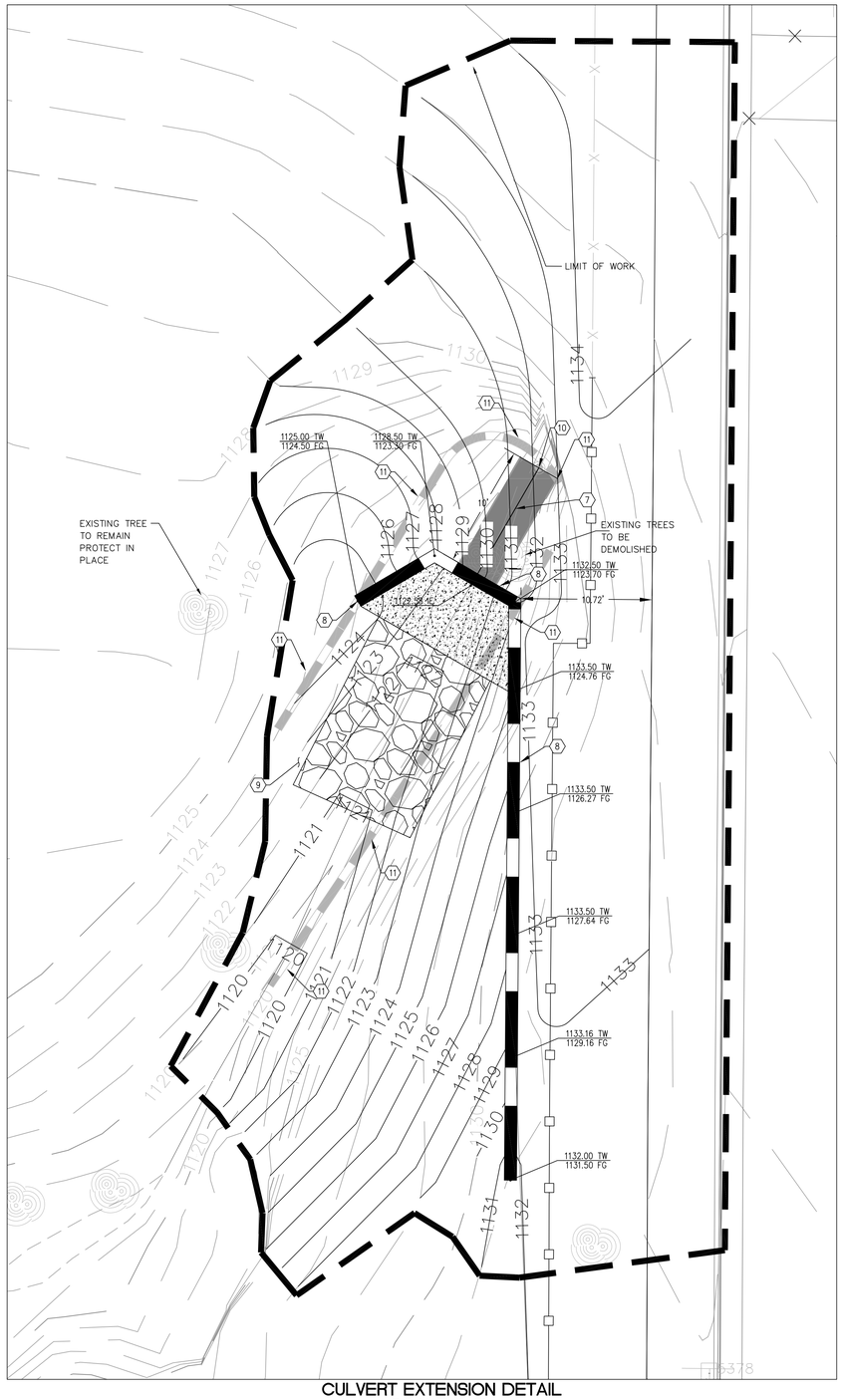
Project No.	SA 06031.00 SCB 2012011	Drawn By:	
Scale:	AS SHOWN	Checked By:	
Date:	08/03/2012	Approved By:	

Drawing No.
L1.12

Project Directory:



REFER TO CALTRANS D84
BOX CULVERT WINGWALLS TYPES A, B AND C
FOR WINGWALL SPECIFICATIONS



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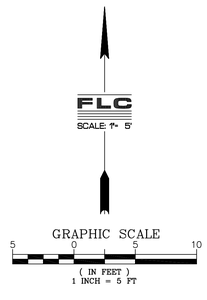

GENERAL NOTES

A.	THE CONTRACTOR SHALL NOTIFY DIGALERT (1-800-227-2600) AT LEAST TWO DAYS PRIOR TO STARTING WORK AND SHALL ARRANGE FOR AND COORDINATE SHUT DOWN, DISCONNECTION AND CAPPING OF EXISTING UTILITIES WITH THE APPROPRIATE UTILITY OWNERS PRIOR TO COMMENCING THE WORK.
B.	PROTECT IN PLACE ALL EXISTING IMPROVEMENTS, STRUCTURES AND UNDERGROUND UTILITIES WHICH ARE TO REMAIN. MAINTAIN UTILITY SERVICES TO ALL EXISTING FACILITIES AT ALL TIMES, UNLESS OTHERWISE SPECIFIED.
C.	THE LOCATION AND EXISTENCE OF EXISTING UNDERGROUND FACILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM A SEARCH OF AVAILABLE RECORD DRAWINGS. THE CONTRACTOR SHALL POTHOLE EXISTING UTILITIES AT POINTS OF CONNECTIONS AND ALL UTILITY CROSSINGS TO DETERMINE EXACT LOCATION PRIOR TO STARTING ANY WORK.
D.	COORDINATE LOCATION OF ALL UNDERGROUND UTILITIES AND STORM DRAINS WITH NEW TREE LOCATIONS, MECHANICAL/ELECTRICAL FACILITIES, AND OTHER INSTALLATIONS. REFER TO LANDSCAPE, PLUMBING, ARCHITECTURAL AND ELECTRICAL DRAWINGS FOR ADDITIONAL INFORMATION.
E.	ALL EXISTING "DRY" UTILITIES SHOWN HEREON ARE FOR INFORMATION PURPOSES ONLY. REFER TO ELECTRICAL PLANS AND APPROPRIATE UTILITY COMPANY PLANS FOR ANY WORK ON OR WITH THESE UTILITIES.
F.	REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

DRAINAGE KEY NOTES

7	INSTALL 42" RCP D-1250 STORM DRAIN.
8	INSTALL WING WALL PER DETAIL THIS SHEET.
9	INSTALL 1 TON RIP RAP 4.3' THICK PER PLAN. (APPROXIMATELY 10.5' WIDE BY 15' LONG WITH 6' CONCRETE APRON AT PIPE OUTLET.) UNDERLAIN BY NONWOVERN CLASS 8 RSP-FABRIC.
10	CONNECT TO EXISTING 42" RCP.
11	DEMOLISH AND REMOVE EXISTING WALL INCLUDING FOOTING.

SASAKI
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FLC FLORES LUND CONSULTANTS
7220 TRADE STREET, SUITE 120
SAN DIEGO, CALIFORNIA 92121-2325
TEL (858) 566-0626
FAX (858) 566-0627

DATE: 11:15 P	6/4/12
FLC PROJECT NO.	C0841
DESIGN BY:	JRC
DRAWN BY:	JB
REVIEWED BY:	JRC

Key Plan

DSA Stamp

SFM Stamp

No.	Description	Date
	100% CONFORMED SET	02/24/2012

DWG ISSUE & REVISION HISTORY

Stamp

REGISTERED PROFESSIONAL ENGINEER
JEFF R. CROSS
NO. 67530
Expires 6/30/2013
CIVIL
STATE OF CALIFORNIA

Project Title: UNIVERSITY OF CALIFORNIA

UC RIVERSIDE GLEN MOR 2 STUDENT HOUSING

PROJECT STATUS

Drawing Title:

CULVERT EXTENSION

Project No.	06031.00	Drawn By:	EKM
Scale:	1" = 20'	Checked By:	JRC
Date:	02/24/2012	Approved By:	JRC

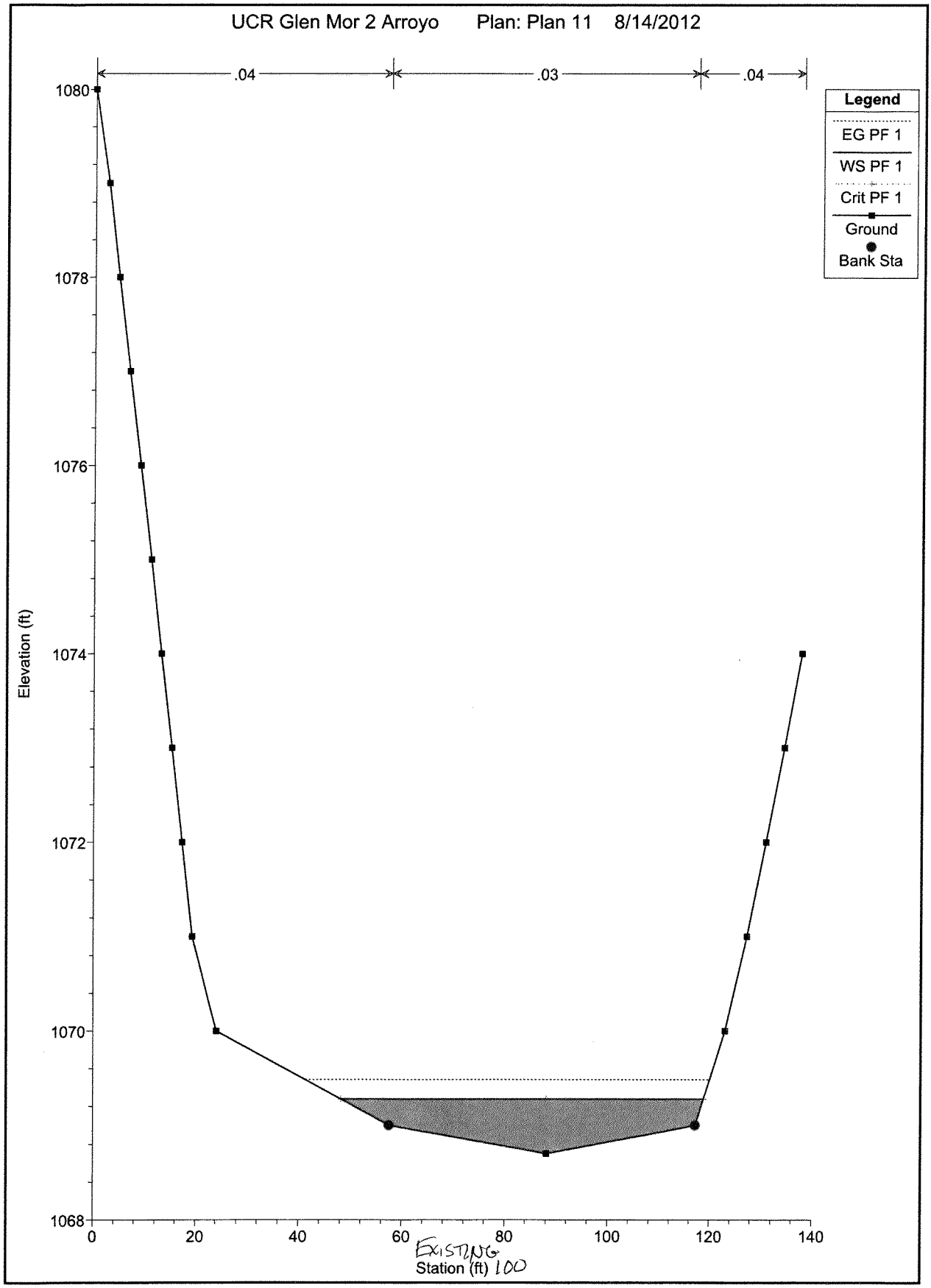
Drawing No.

C5.02

Appendices

Appendix 1

Preliminary UCR Mor 2 - Arroyo Hydraulic Sections and Analyses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.04
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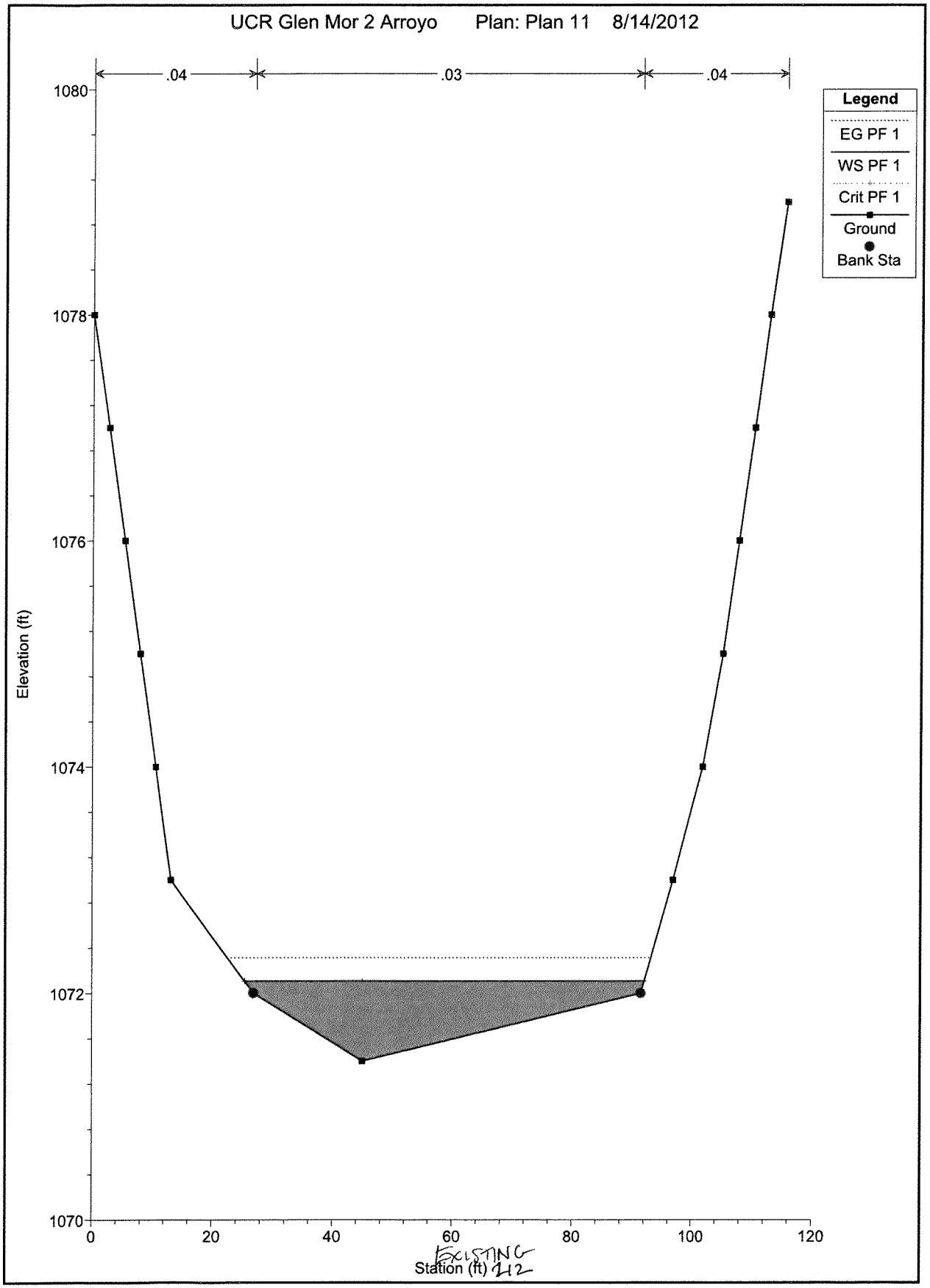
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Crit PF 1
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80
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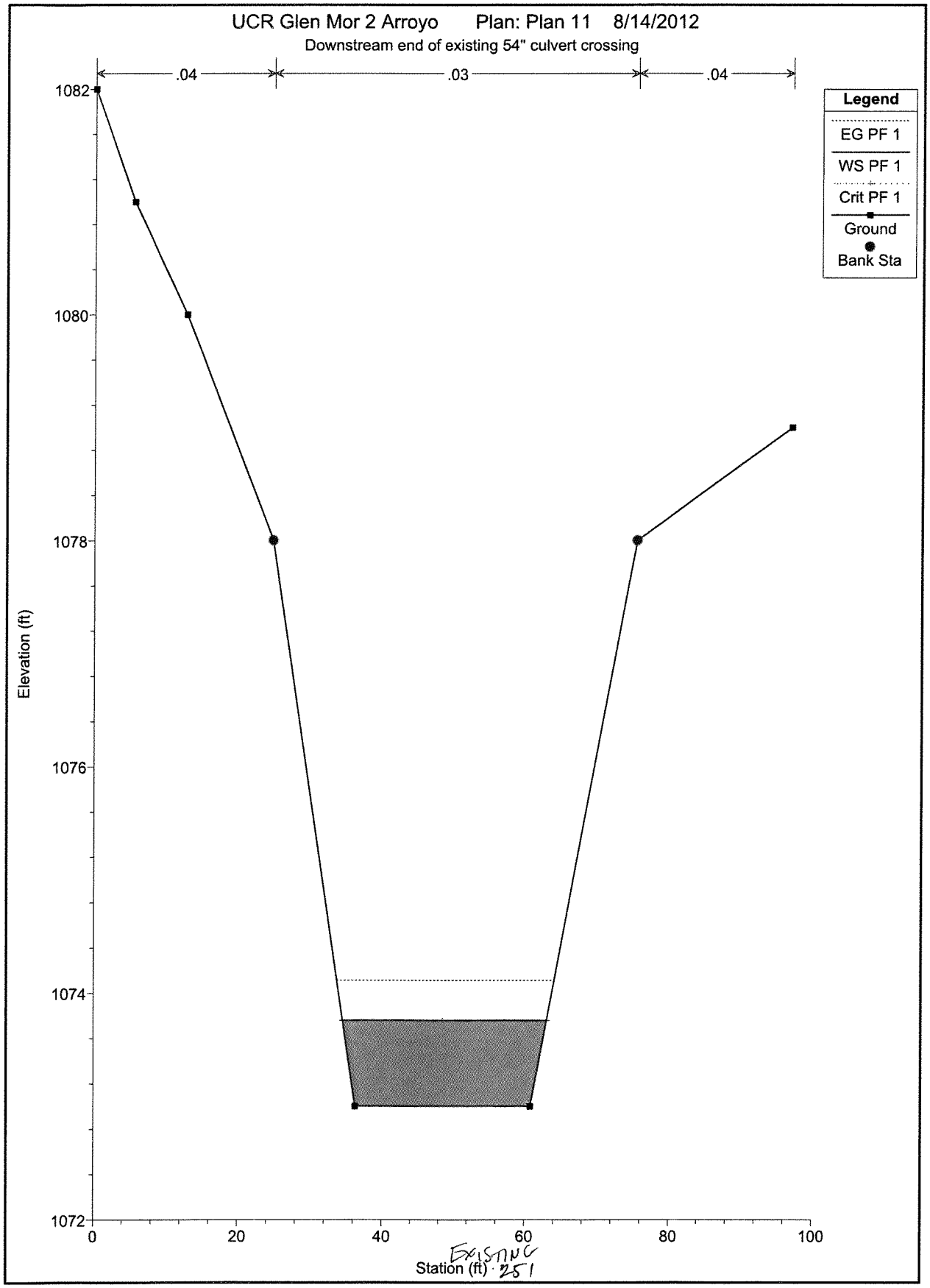
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.04
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40
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80
100
Station (ft)
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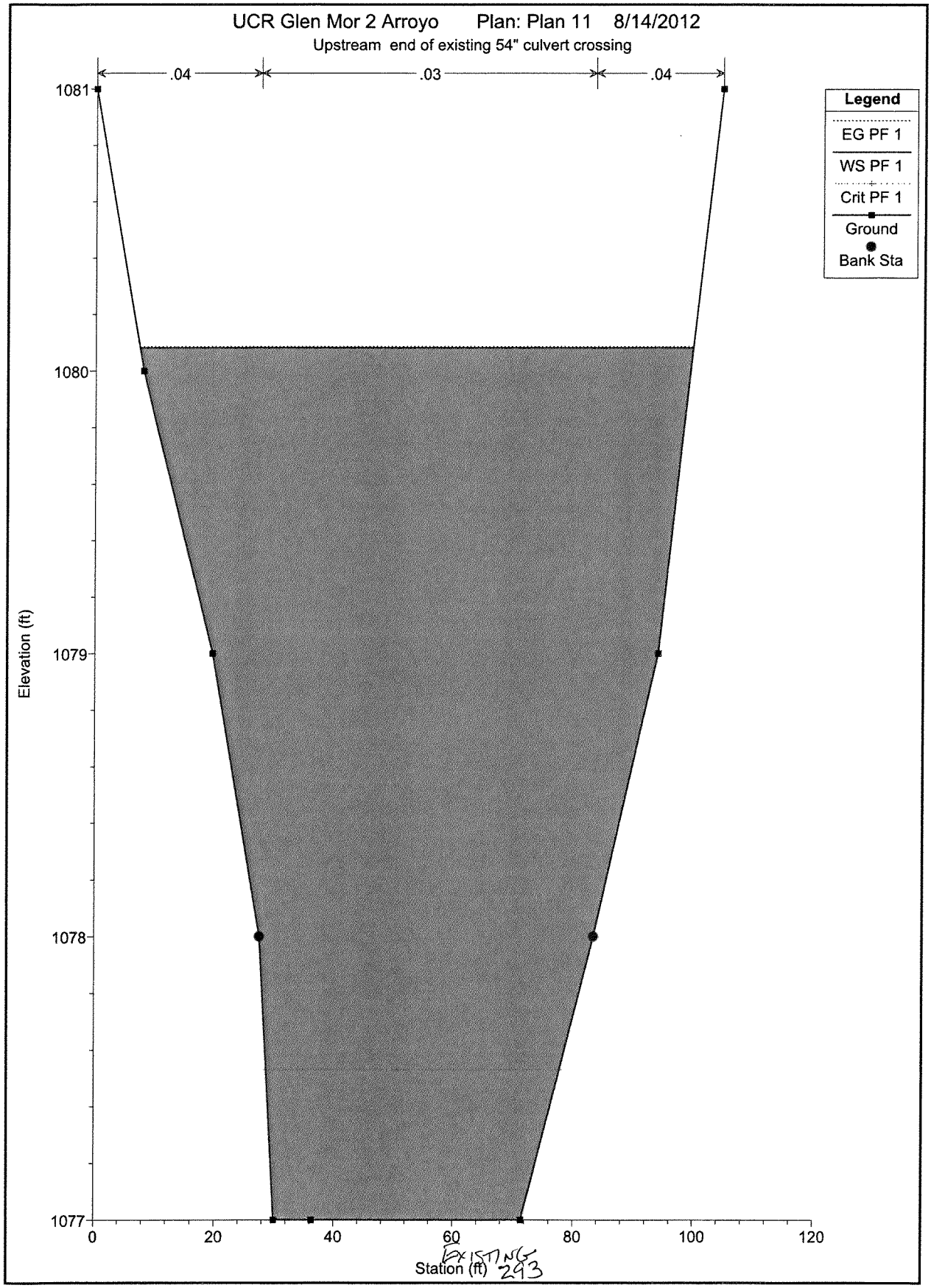
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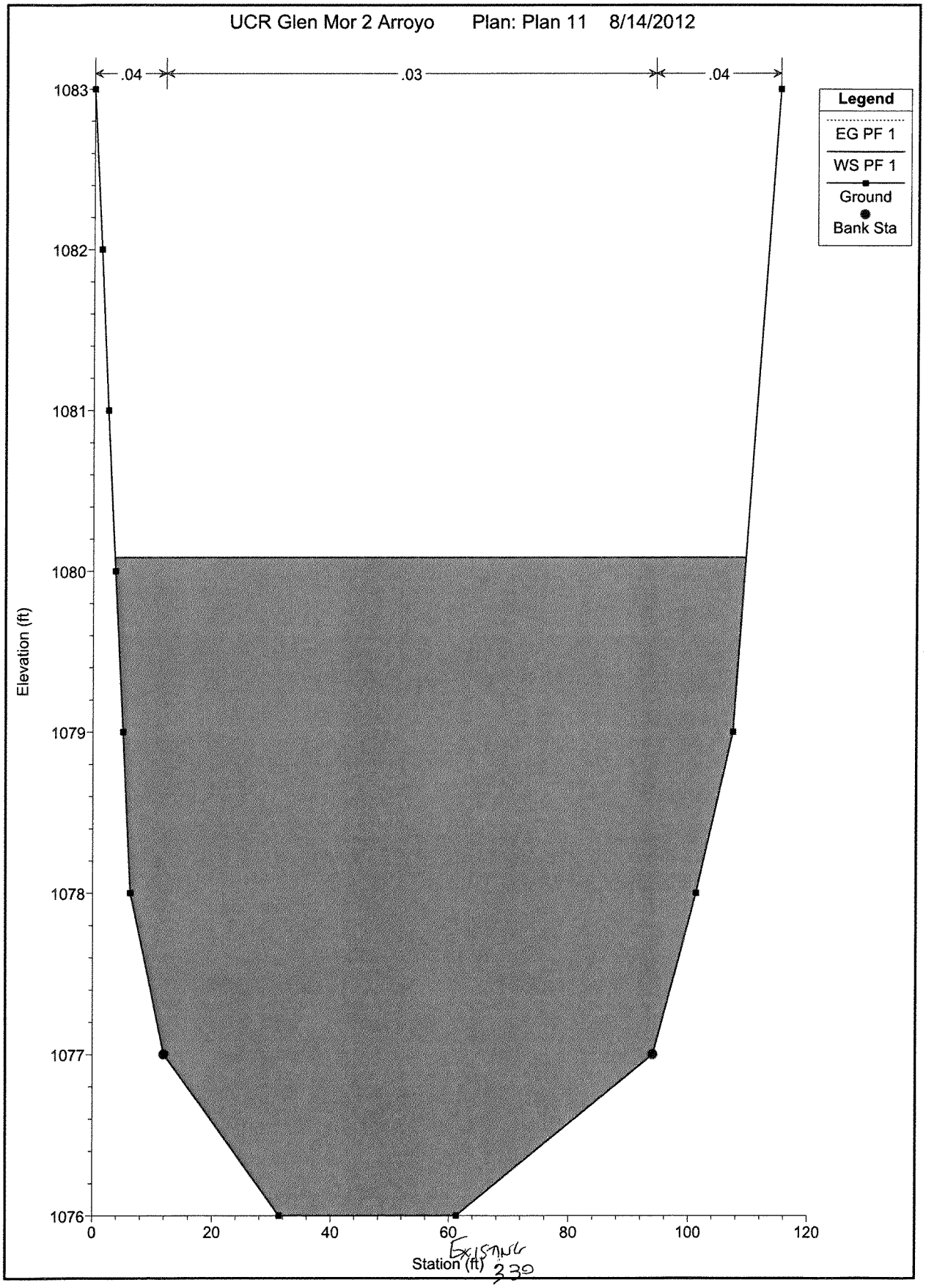
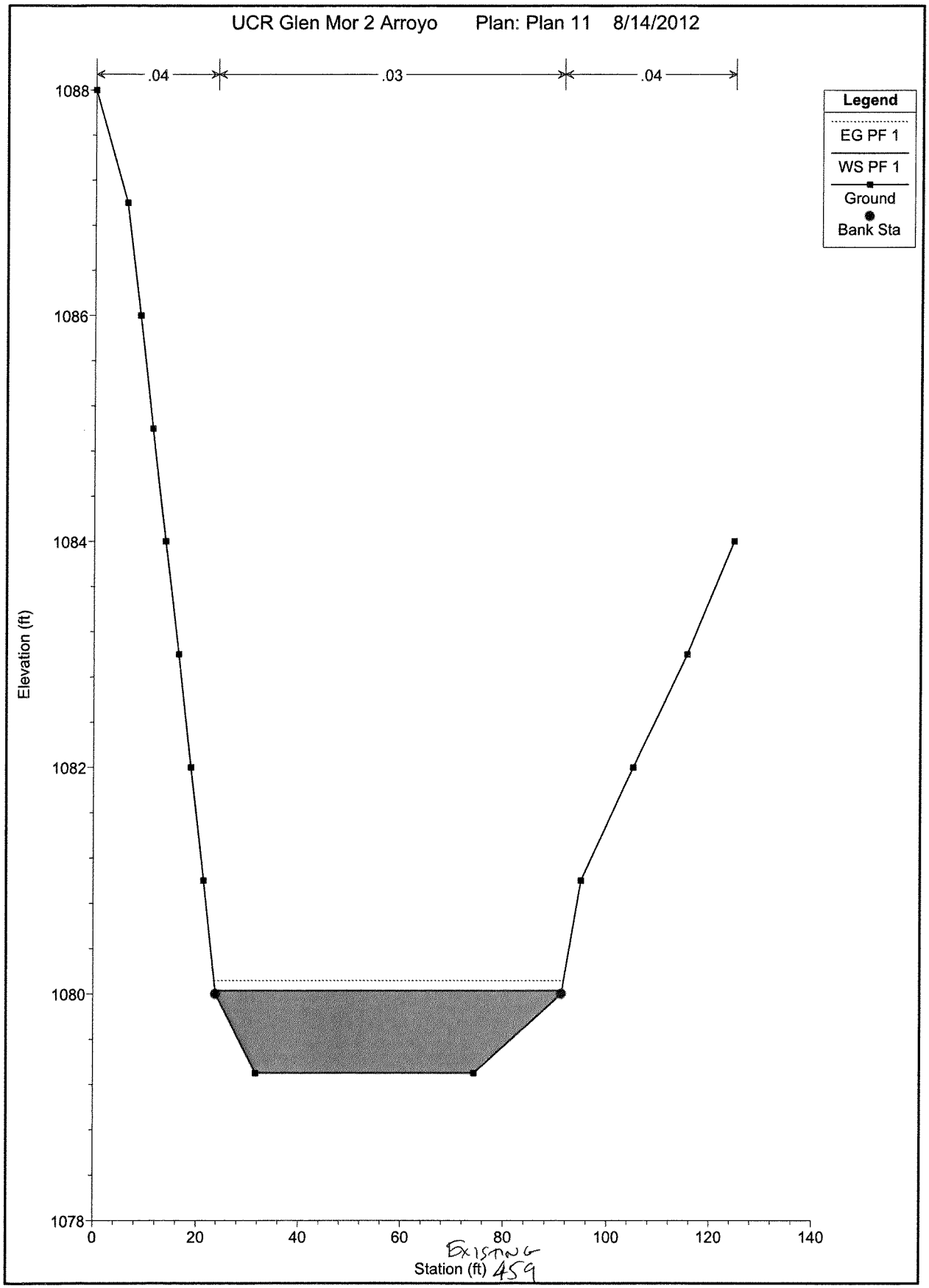
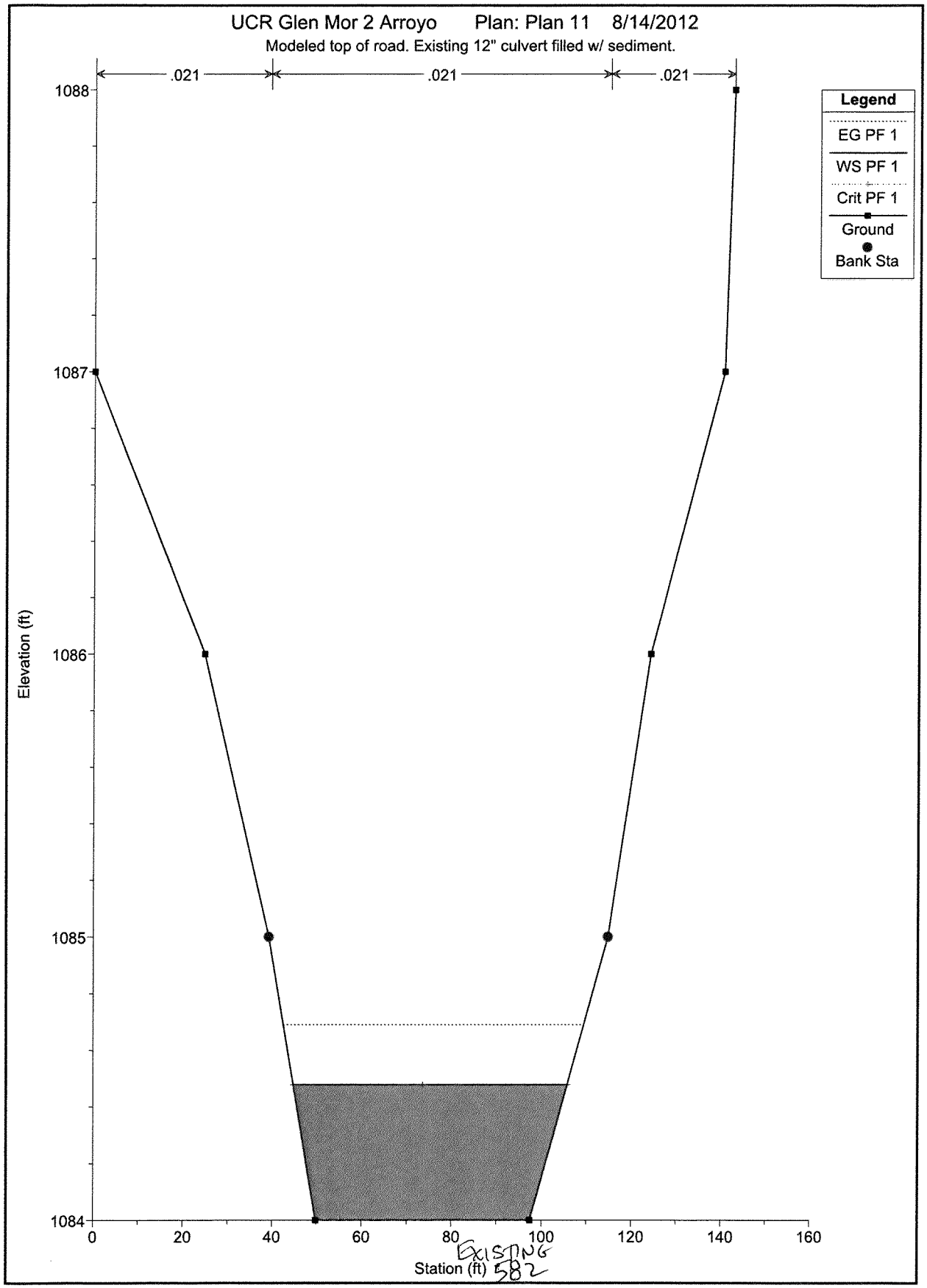
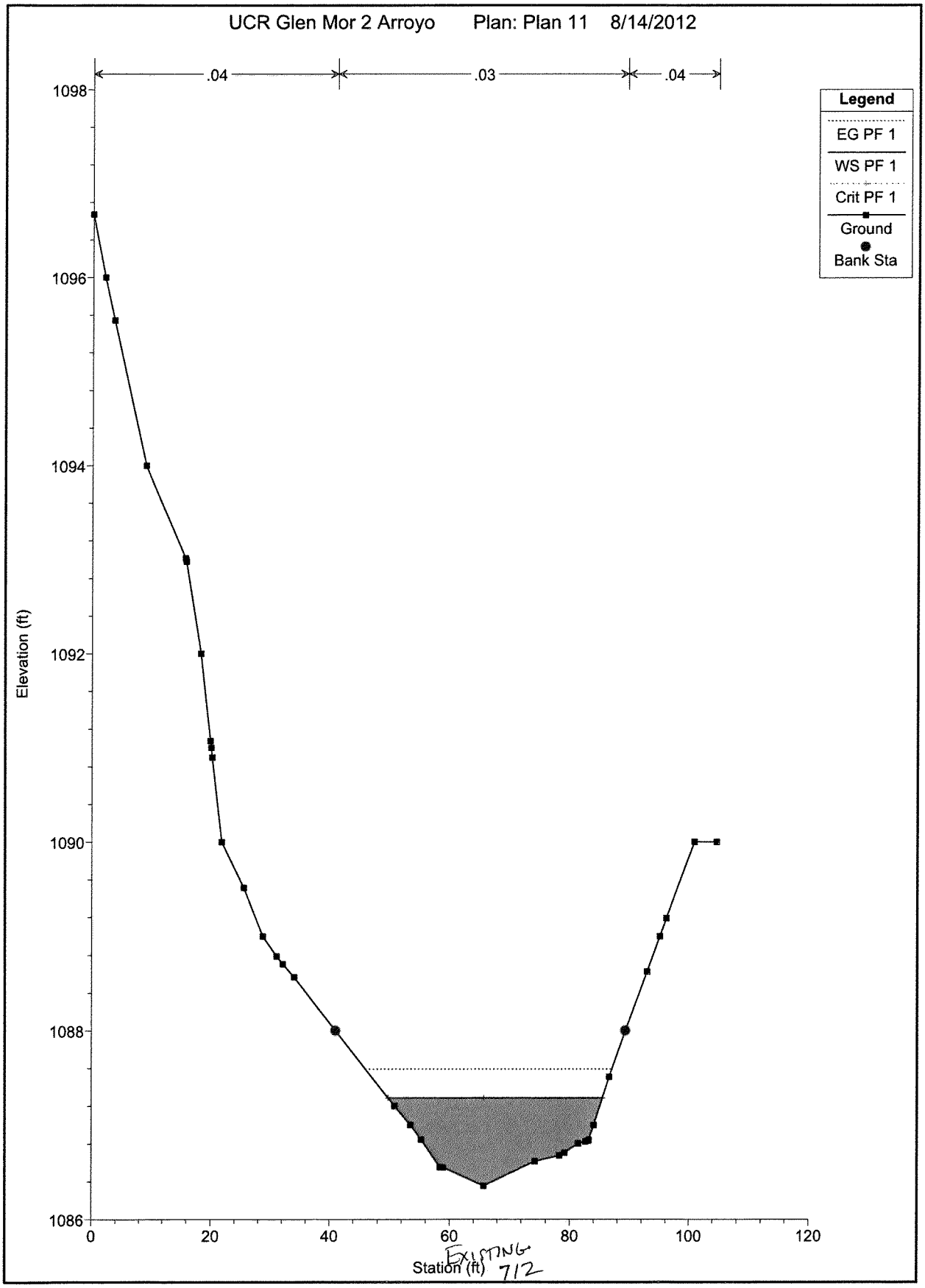
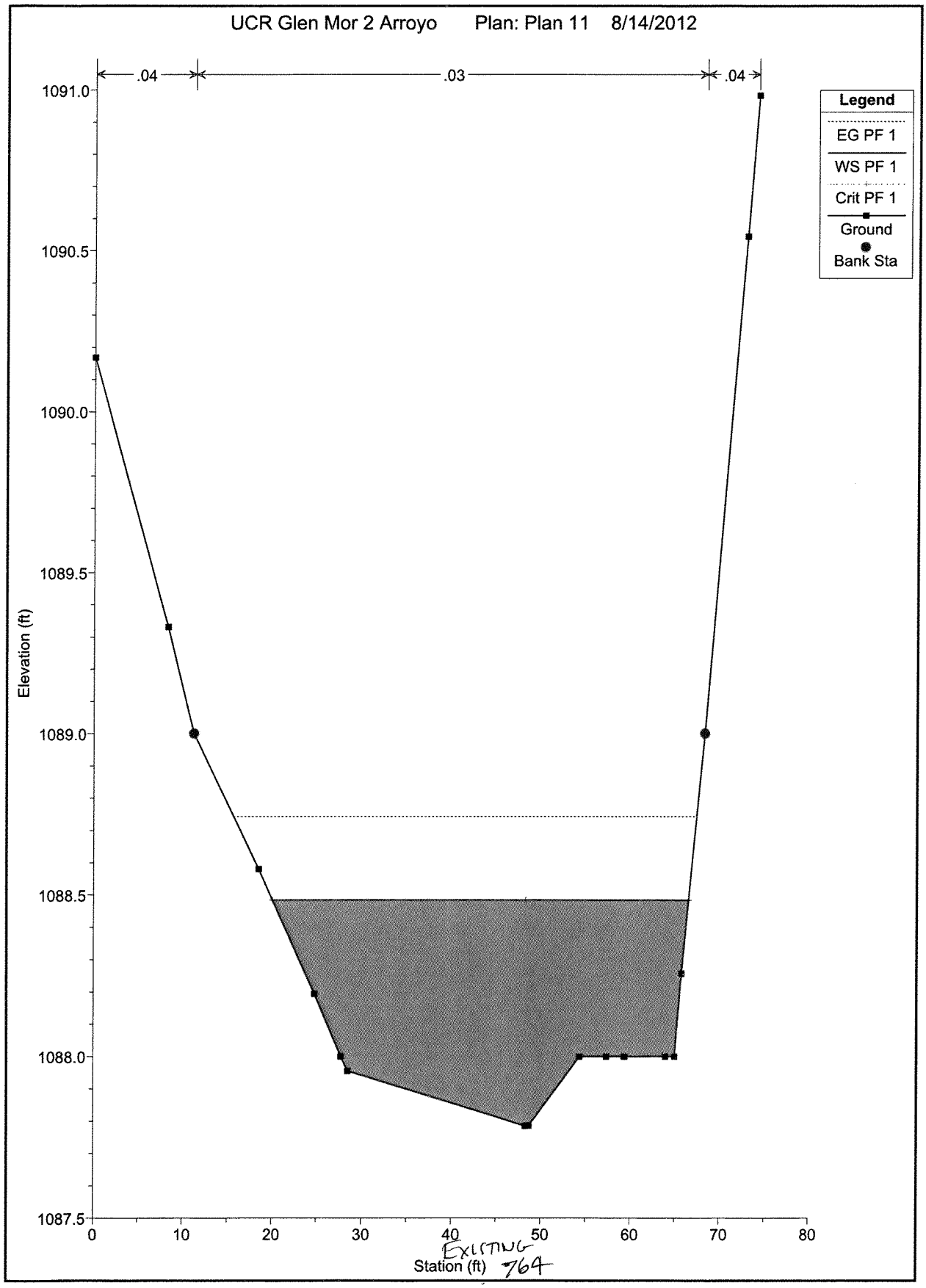
Upstream end of existing 54" culvert crossing
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1081
1080
1079
1078
1077
0
20
40
60
80
100
120
Station (ft)
EXISTING
293

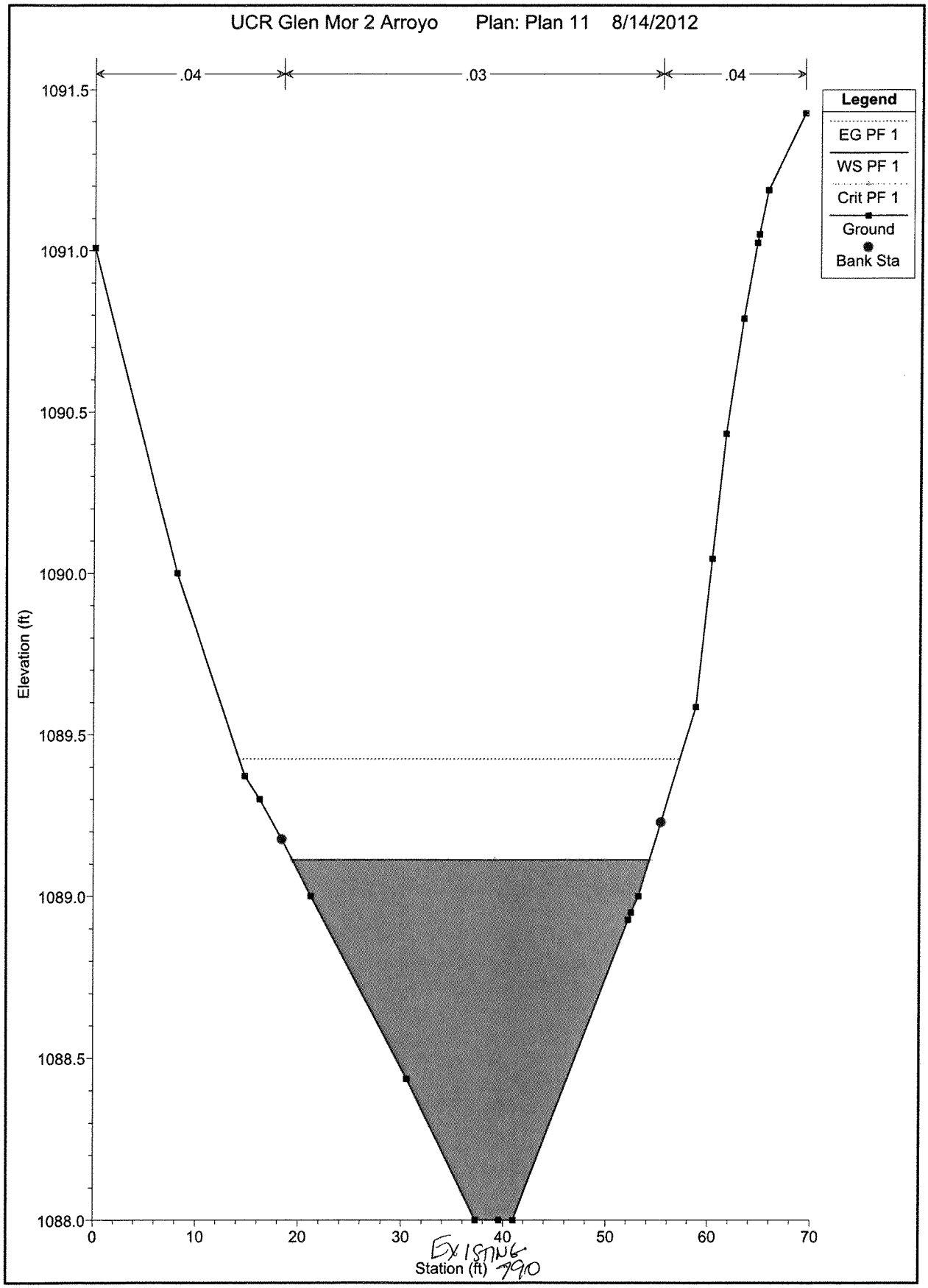

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1083
1082
1081
1080
1079
1078
1077
1076
0
20
40
60
80
100
120
Station (ft)
Existing
339

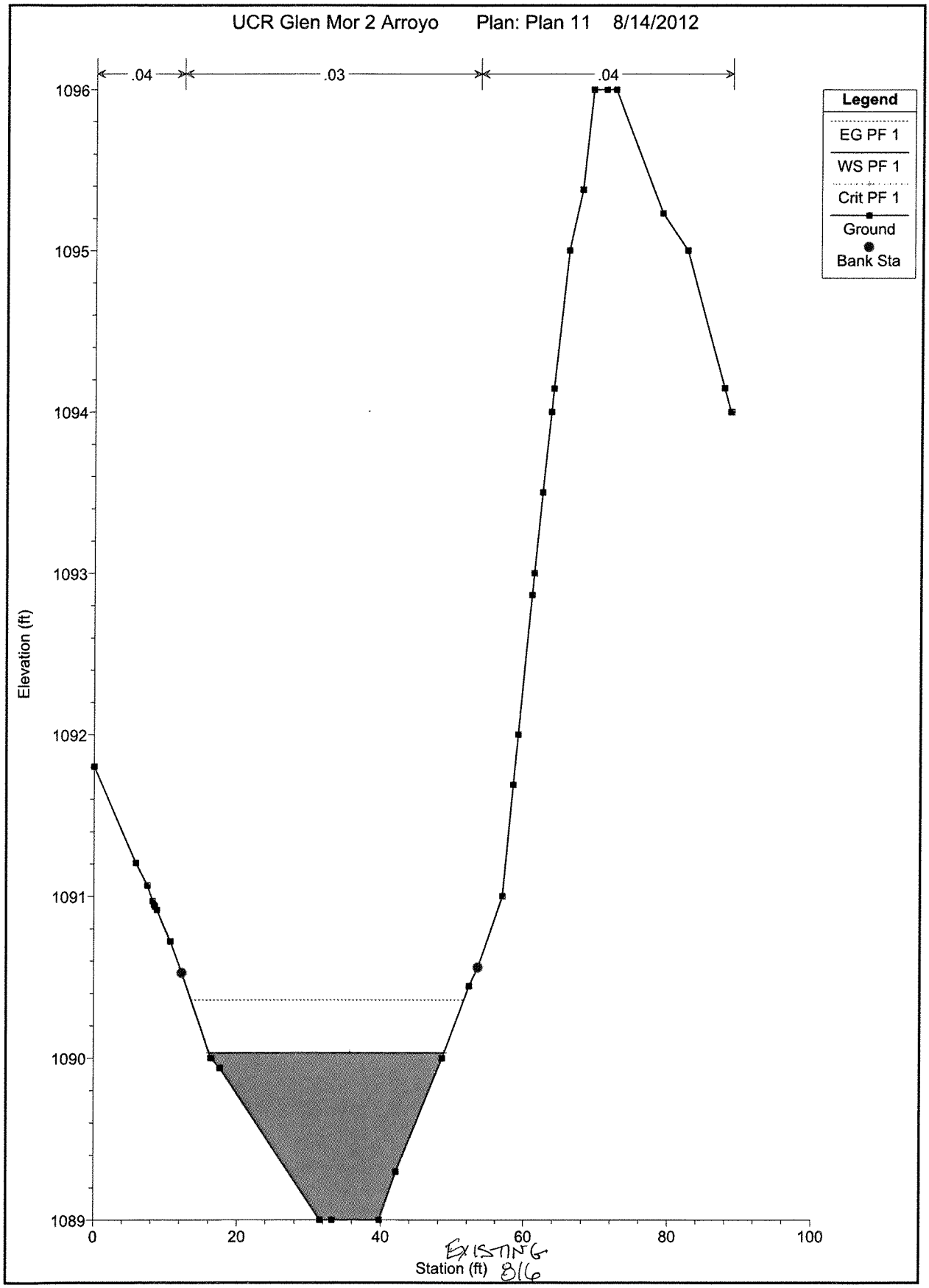

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1088
1086
1084
1082
1080
1078
Elevation (ft)
0
20
40
60
80
100
120
140
Station (ft)
Existing
459

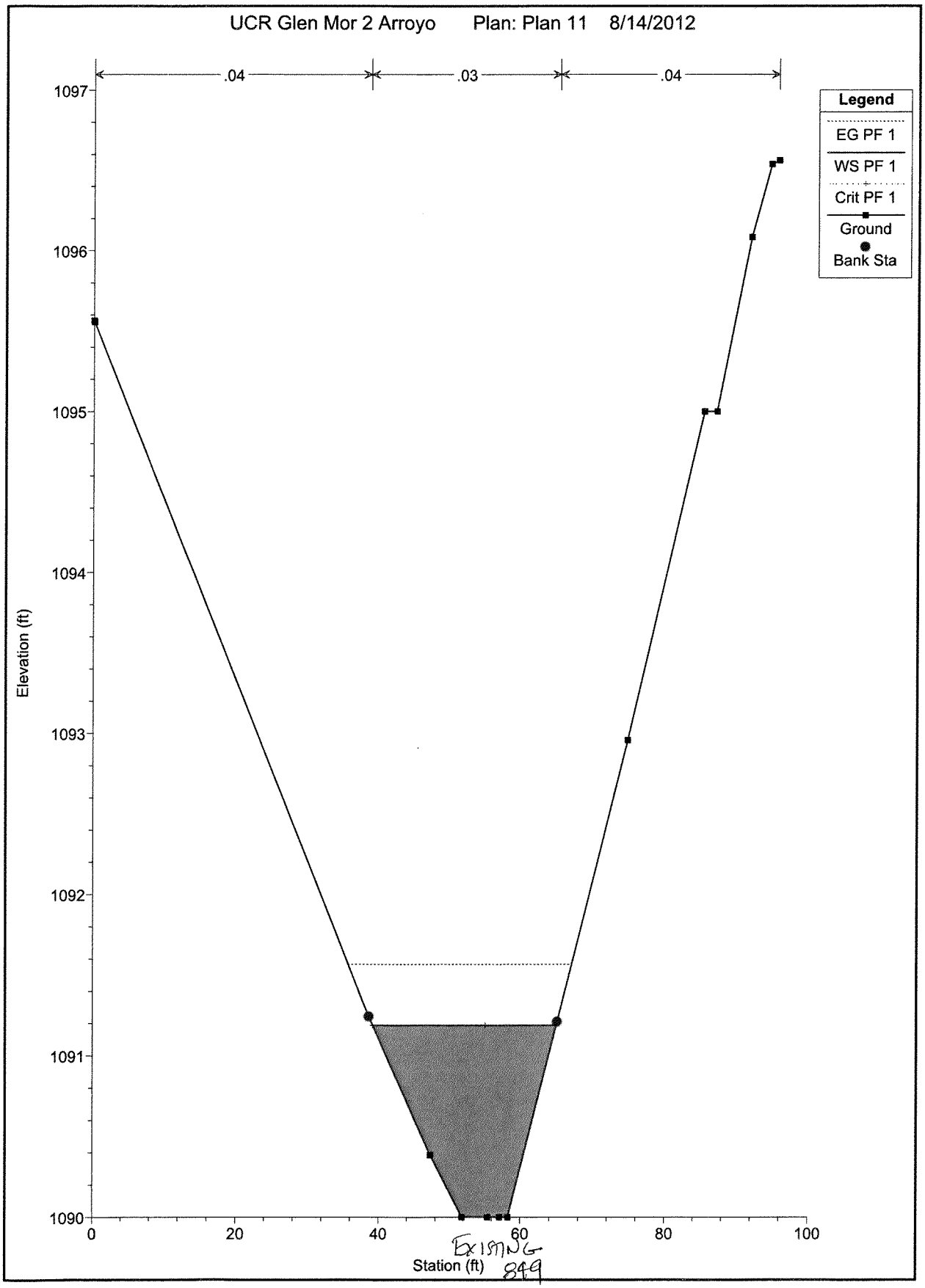

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
Modeled top of road. Existing 12" culvert filled w/ sediment.
.021
.021
.021
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1088
1087
1086
1085
1084
0
20
40
60
80
100
120
140
160
Station (ft)
EXISTING
582

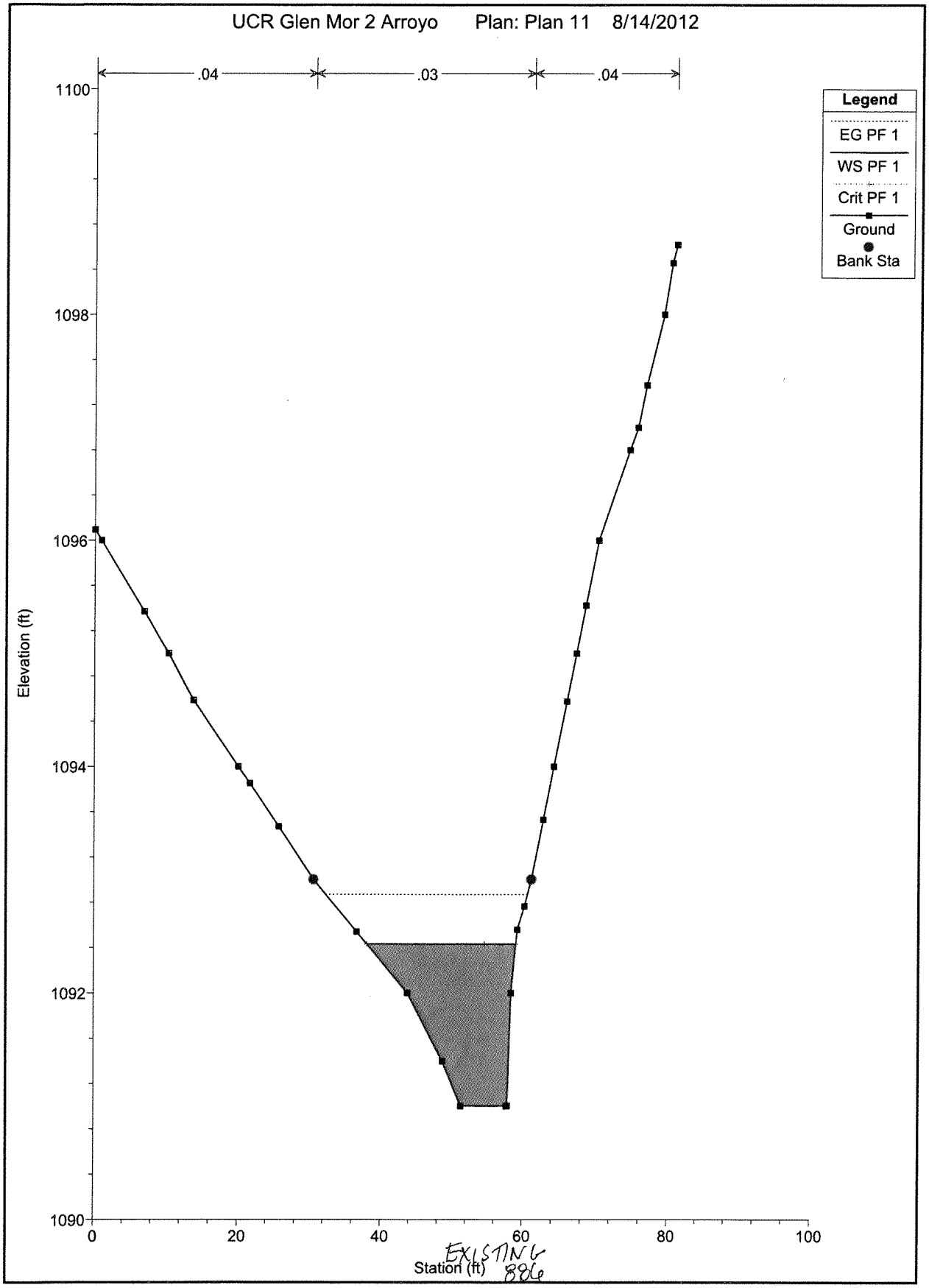

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1098
1096
1094
1092
1090
1088
1086
0
20
40
60
80
100
120
Station (ft)
EXISTING
712

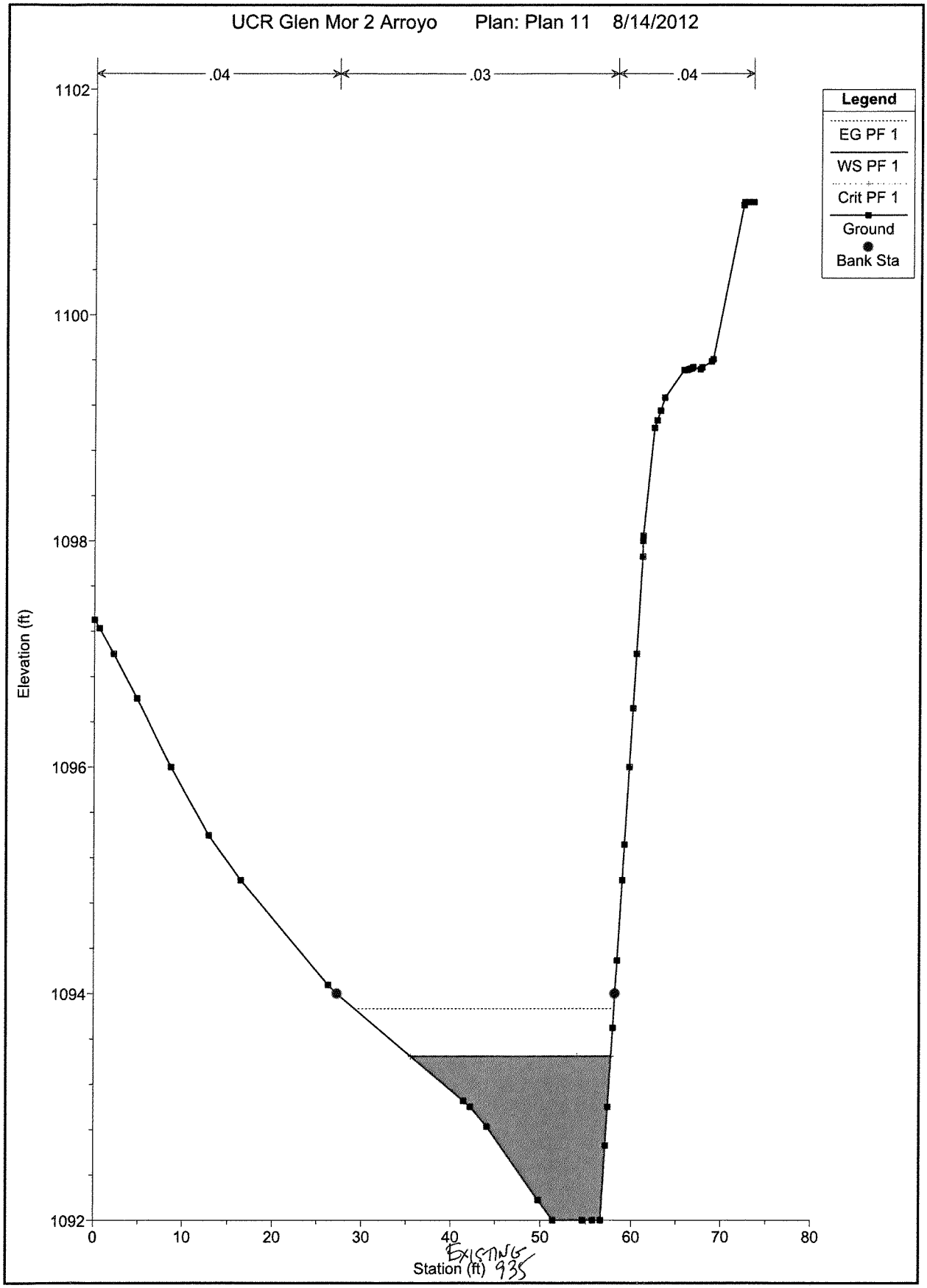

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1091.0
1090.5
1090.0
1089.5
1089.0
1088.5
1088.0
1087.5
Elevation (ft)
0
10
20
30
40
50
60
70
80
Station (ft)
EXISTING 764

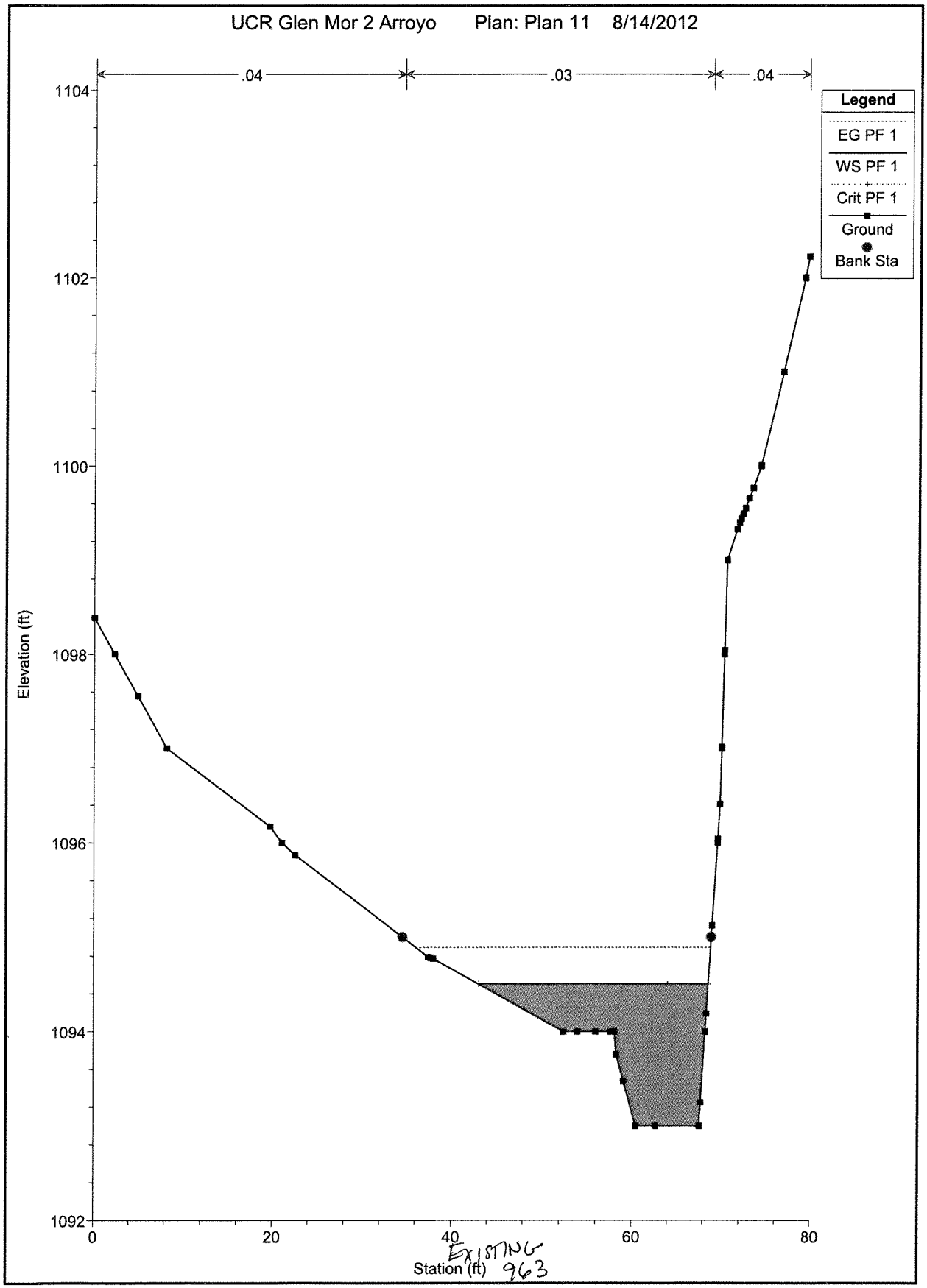

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1091.5
1091.0
1090.5
1090.0
1089.5
1089.0
1088.5
1088.0
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
EXISTING 7910

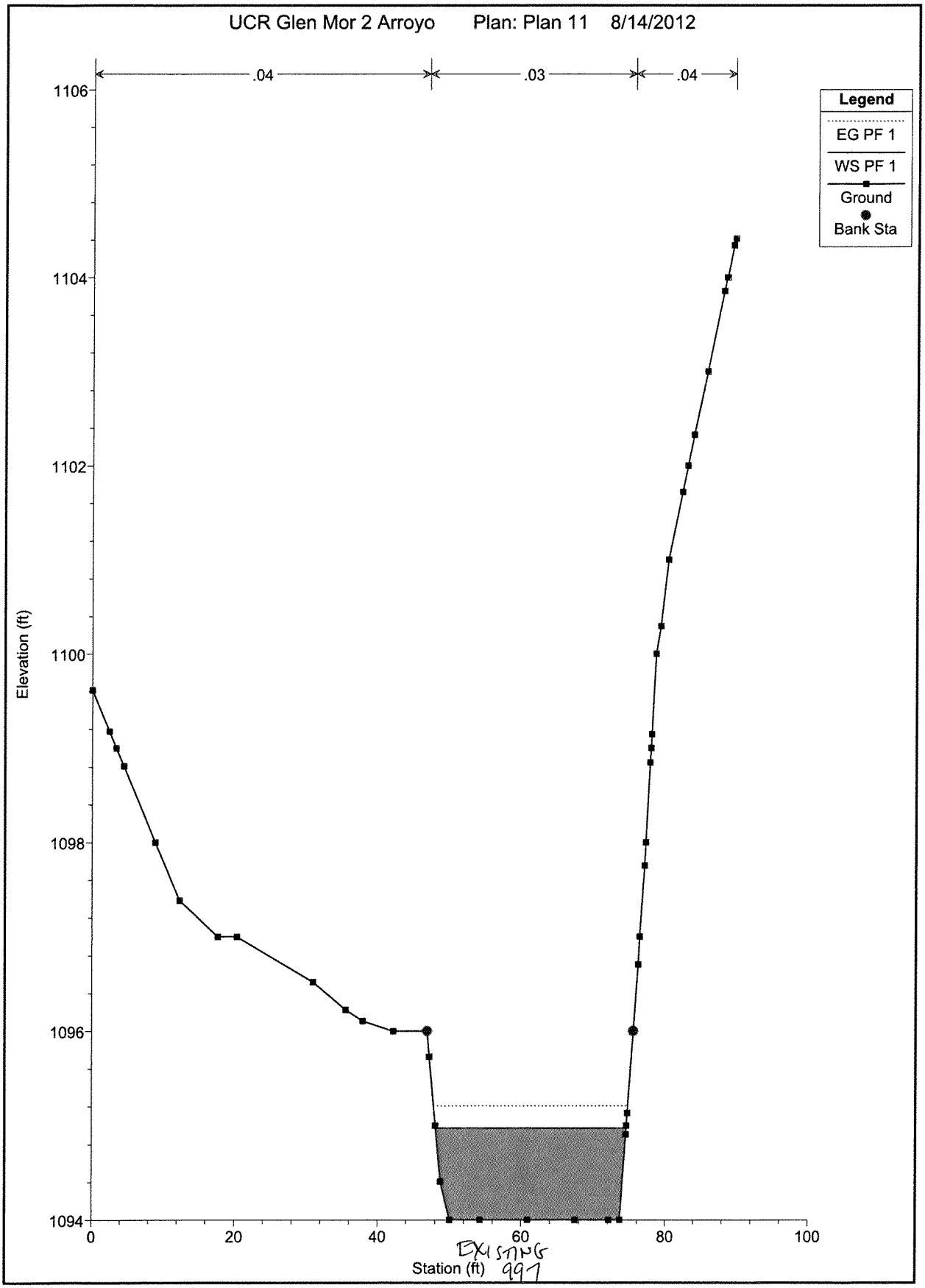

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1096
1095
1094
1093
1092
1091
1090
1089
0
20
40
60
80
100
Station (ft)
EXISTING
816

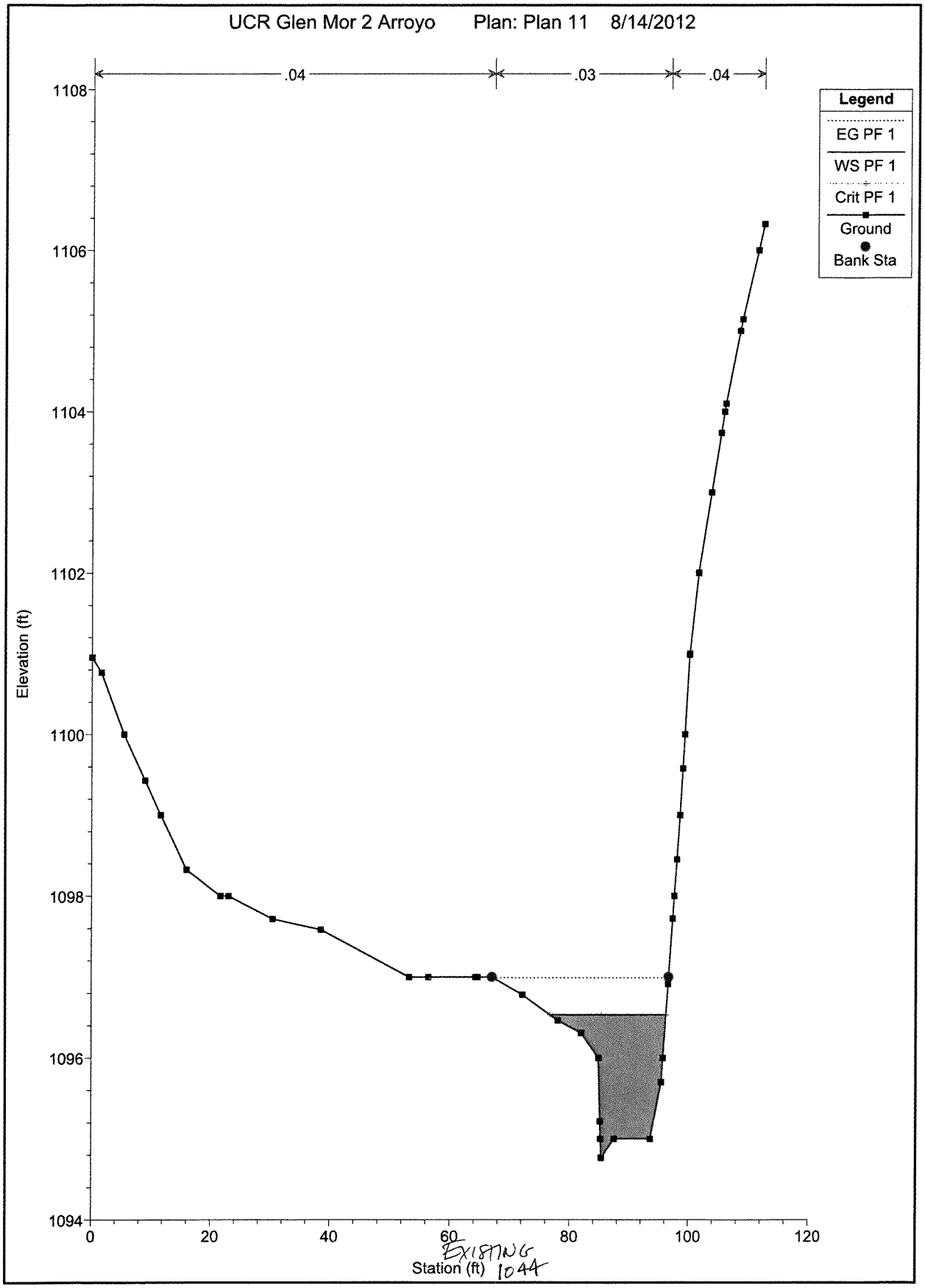

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1097
1096
1095
1094
1093
1092
1091
1090
0
20
40
60
80
100
Station (ft)
EXISTING
849

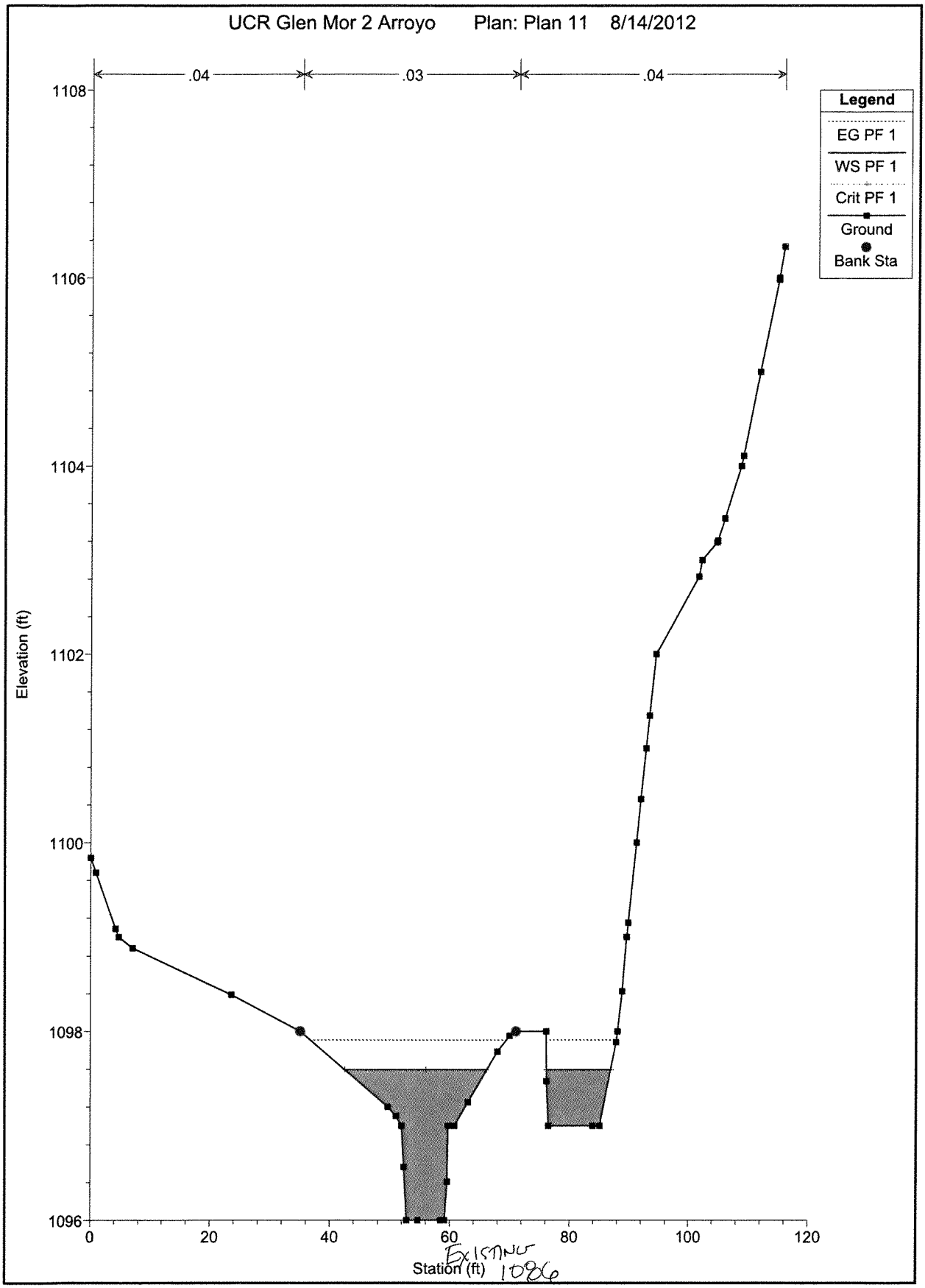

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1100
1098
1096
1094
1092
1090
Elevation (ft)
0
20
40
60
80
100
Station (ft)
EXISTING
886

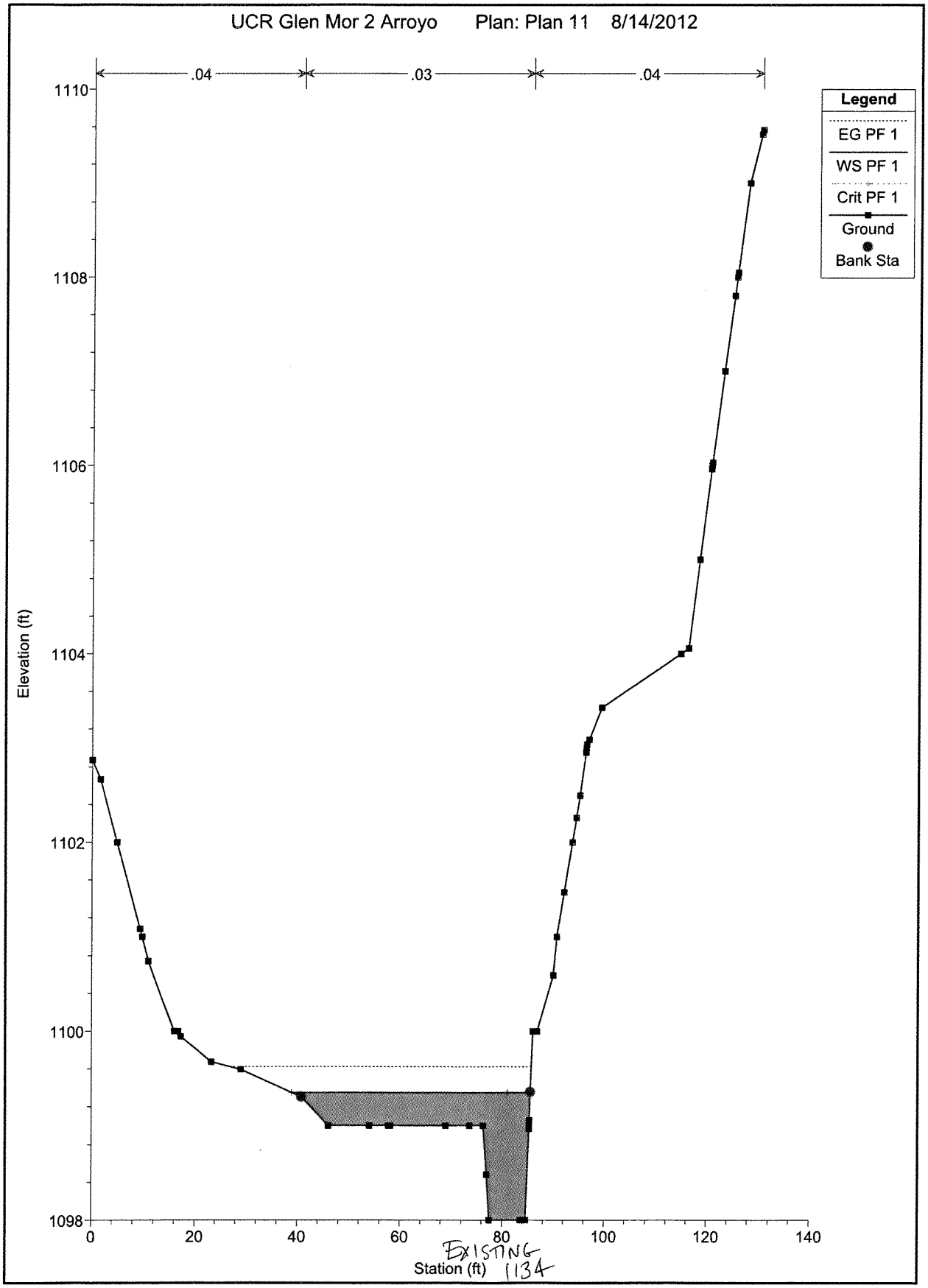

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1102
1100
1098
1096
1094
1092
0
10
20
30
40
50
60
70
80
Station (ft)
EXISTING
935

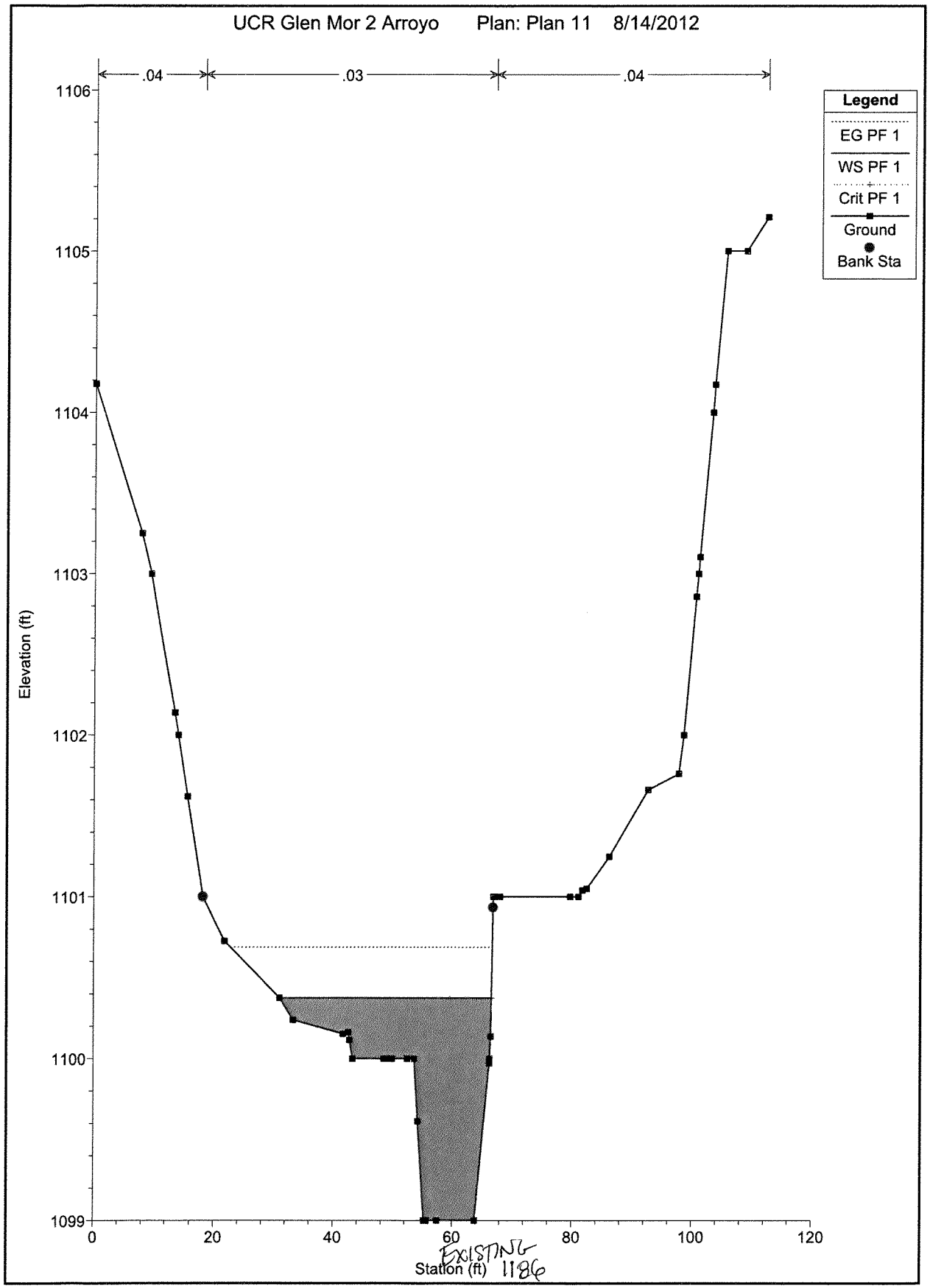

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1104
1102
1100
1098
1096
1094
1092
Elevation (ft)
0
20
40
60
80
Station (ft)
EXISTING
963

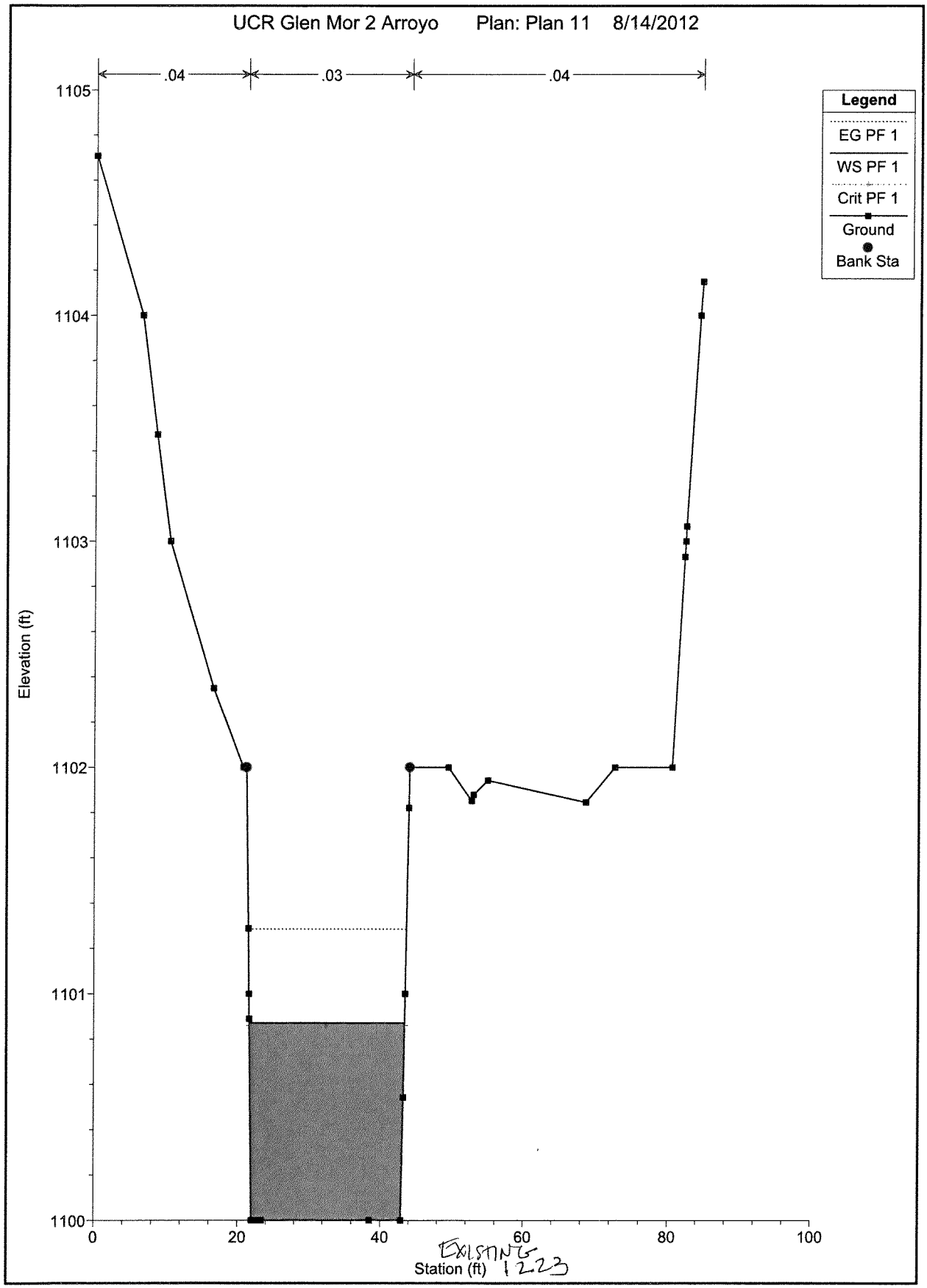

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1106
1104
1102
1100
1098
1096
1094
0
20
40
60
80
100
Station (ft)
EXISTING
997

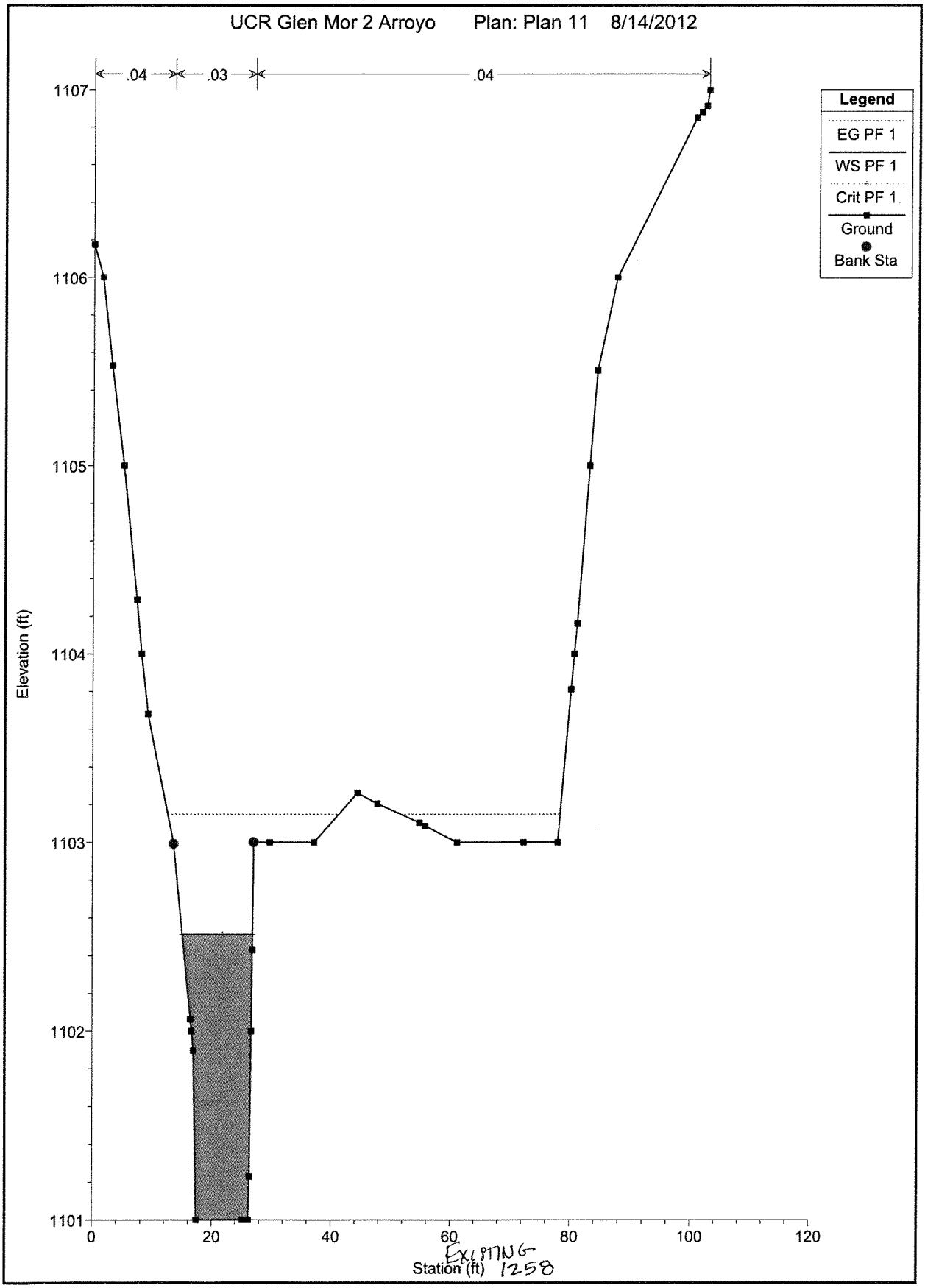

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1108
1106
1104
1102
1100
1098
1096
1094
0
20
40
60
80
100
120
Station (ft)
EXISTING
1044

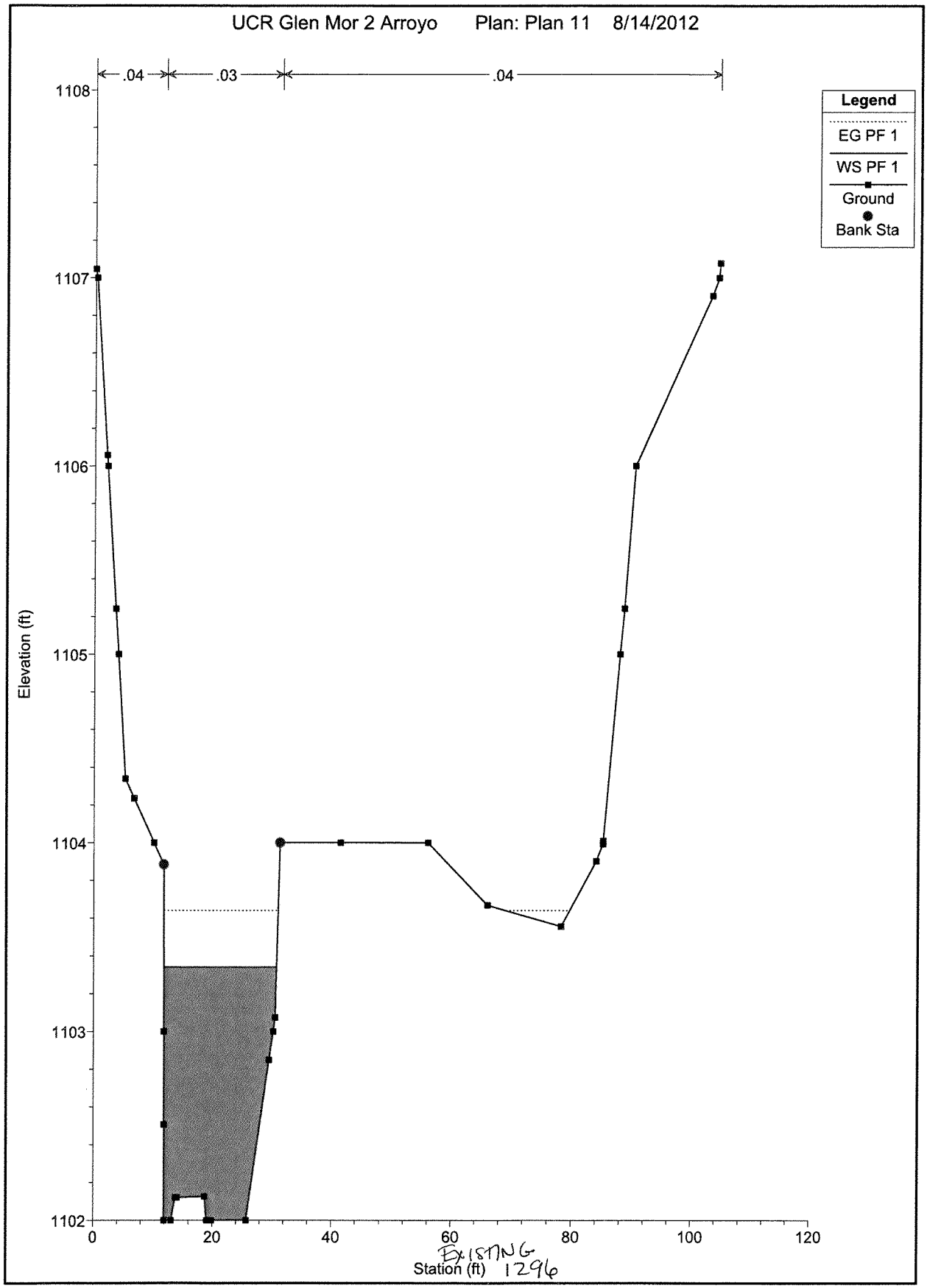

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1108
1106
1104
1102
1100
1098
1096
0
20
40
60
80
100
120
Station (ft)
EXISTING 1086

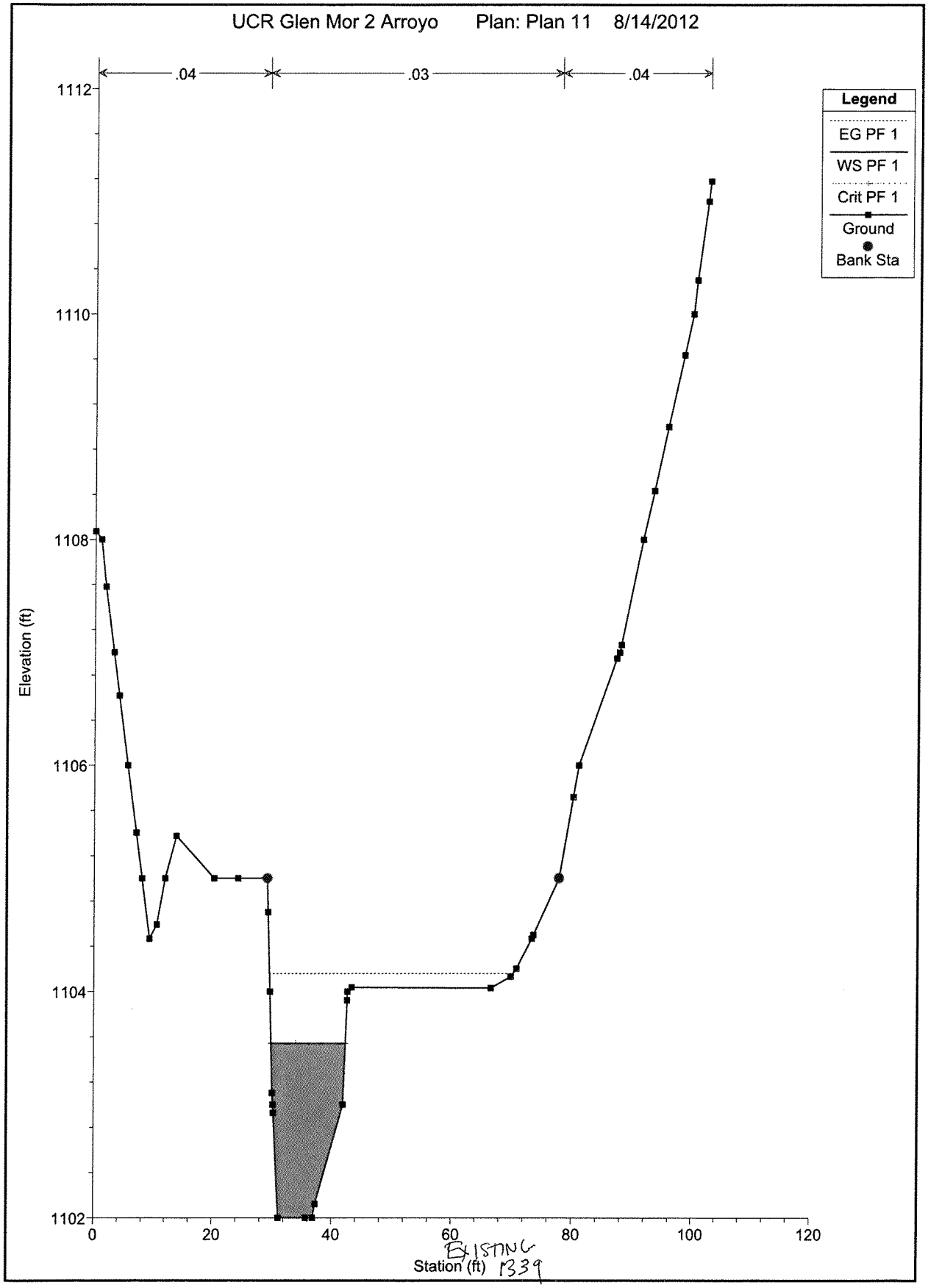

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1110
1108
1106
1104
1102
1100
1098
0
20
40
60
80
100
120
140
Station (ft)
EXISTING
1134

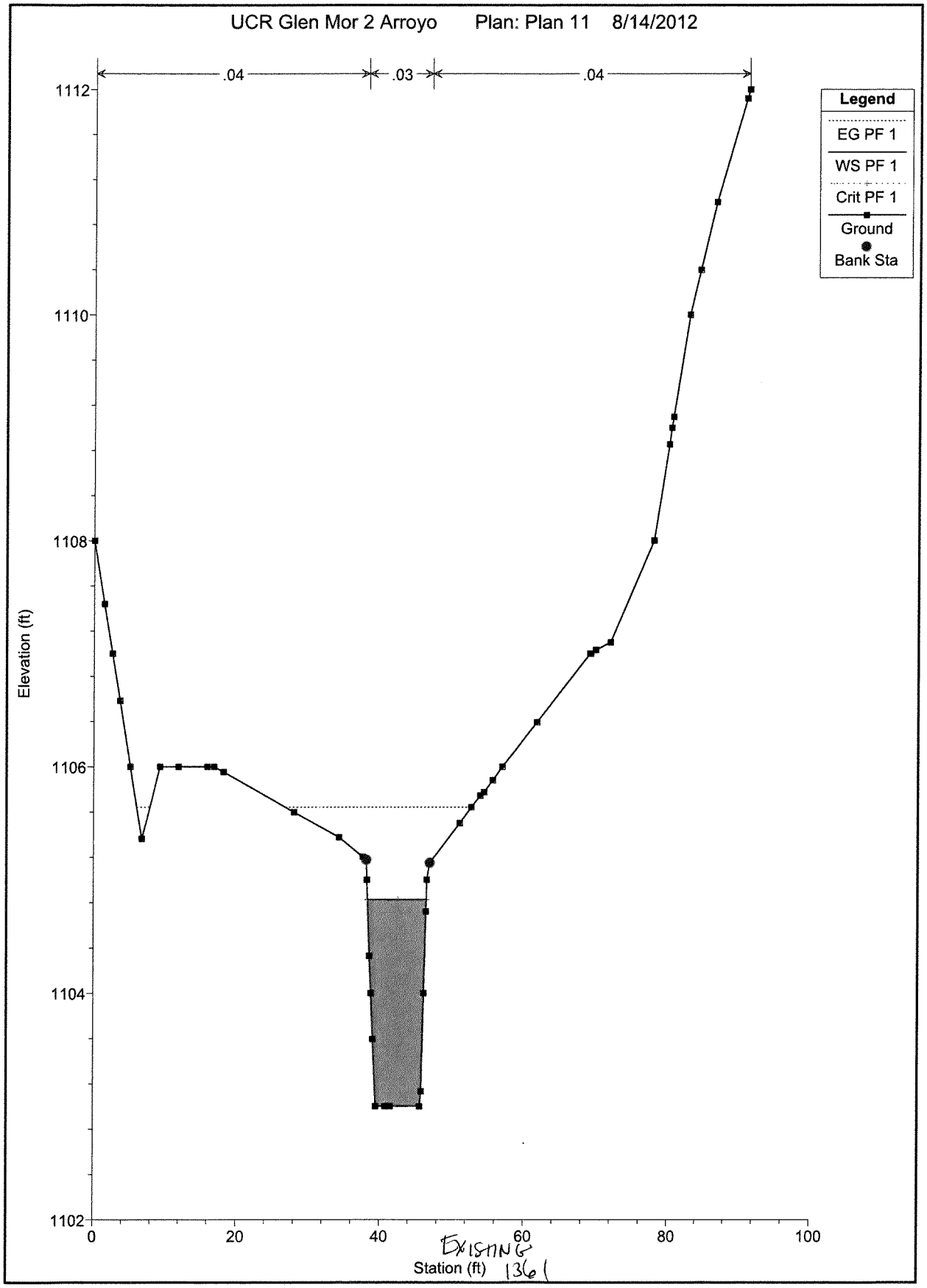

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1106
1105
1104
1103
1102
1101
1100
1099
0
20
40
60
80
100
120
Station (ft)
EXISTING 1186

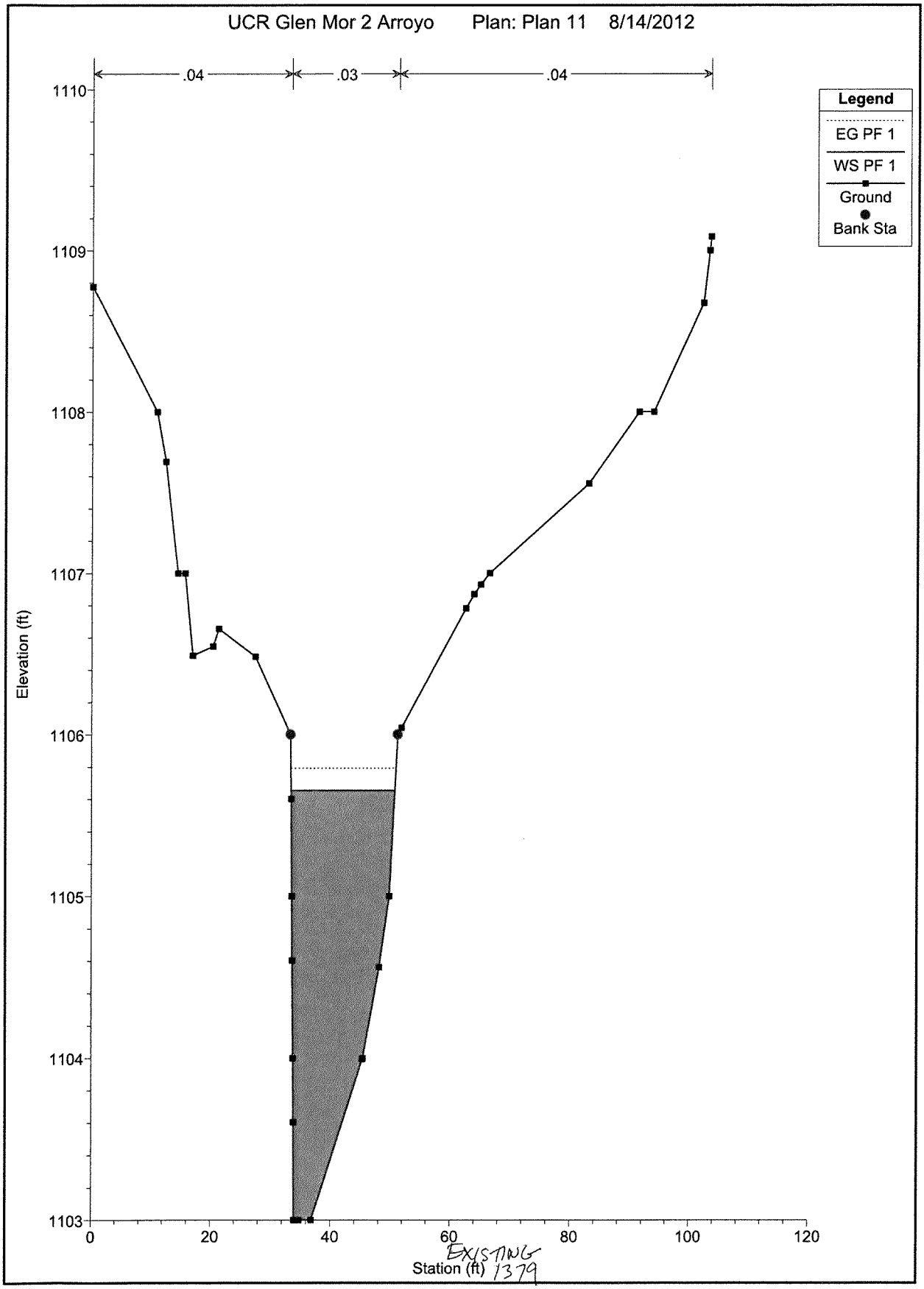

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1105
1104
1103
1102
1101
1100
Elevation (ft)
0
20
40
60
80
100
Station (ft)
EXISTING 1223

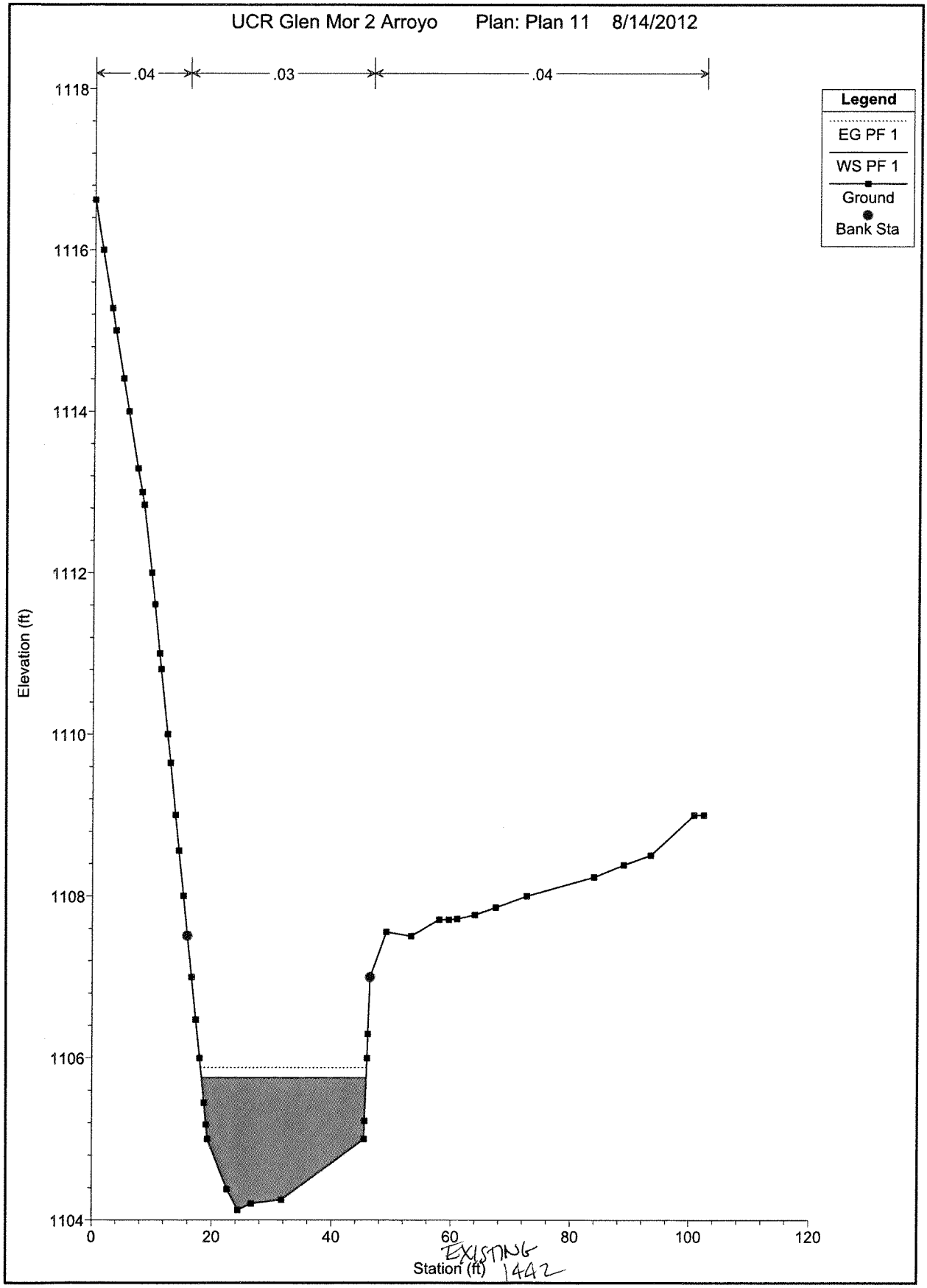

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1107
1106
1105
1104
1103
1102
1101
0
20
40
60
80
100
120
Station (ft)
EXISTING
1258

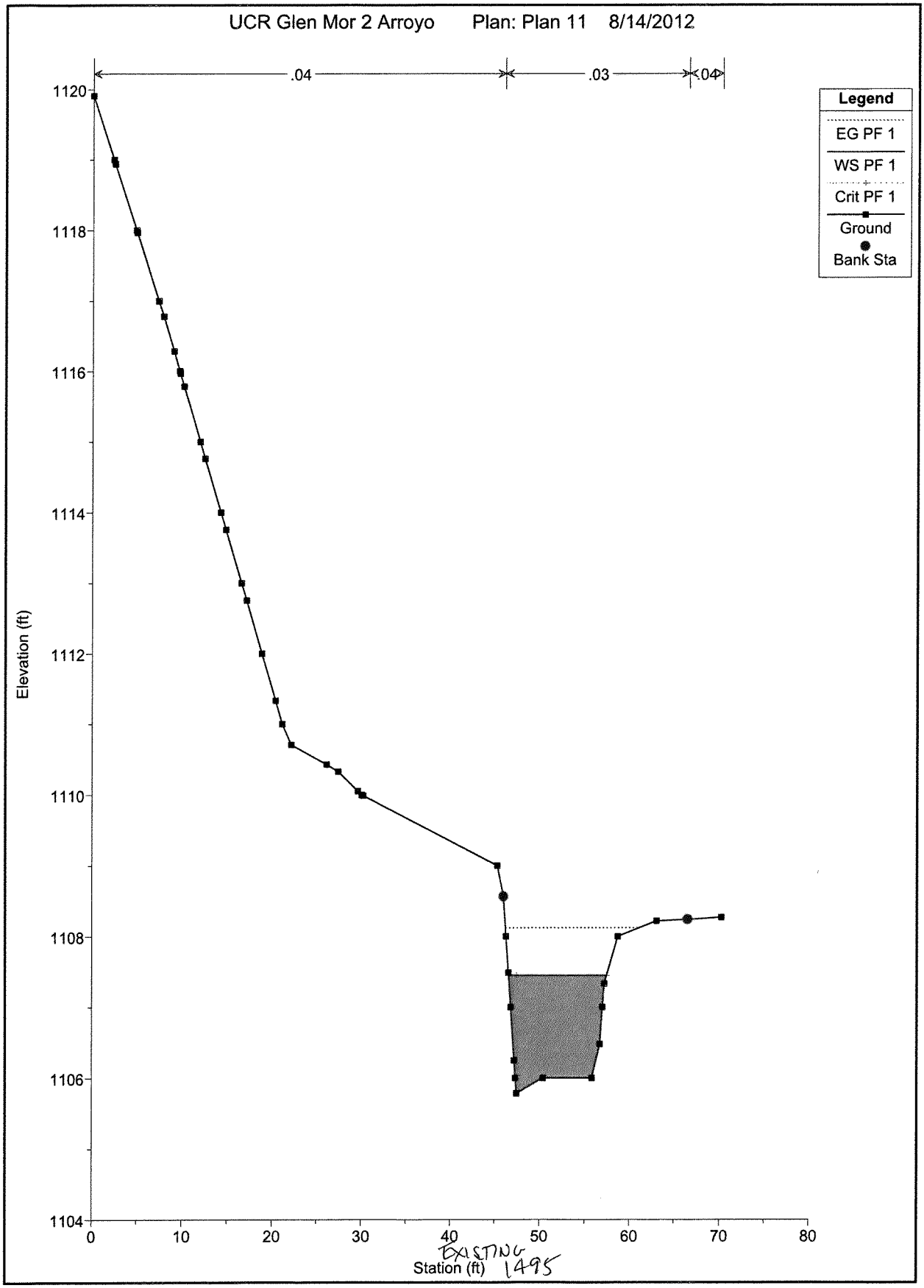

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1108
1107
1106
1105
1104
1103
1102
0
20
40
60
80
100
120
Station (ft)
EXISTING 1296

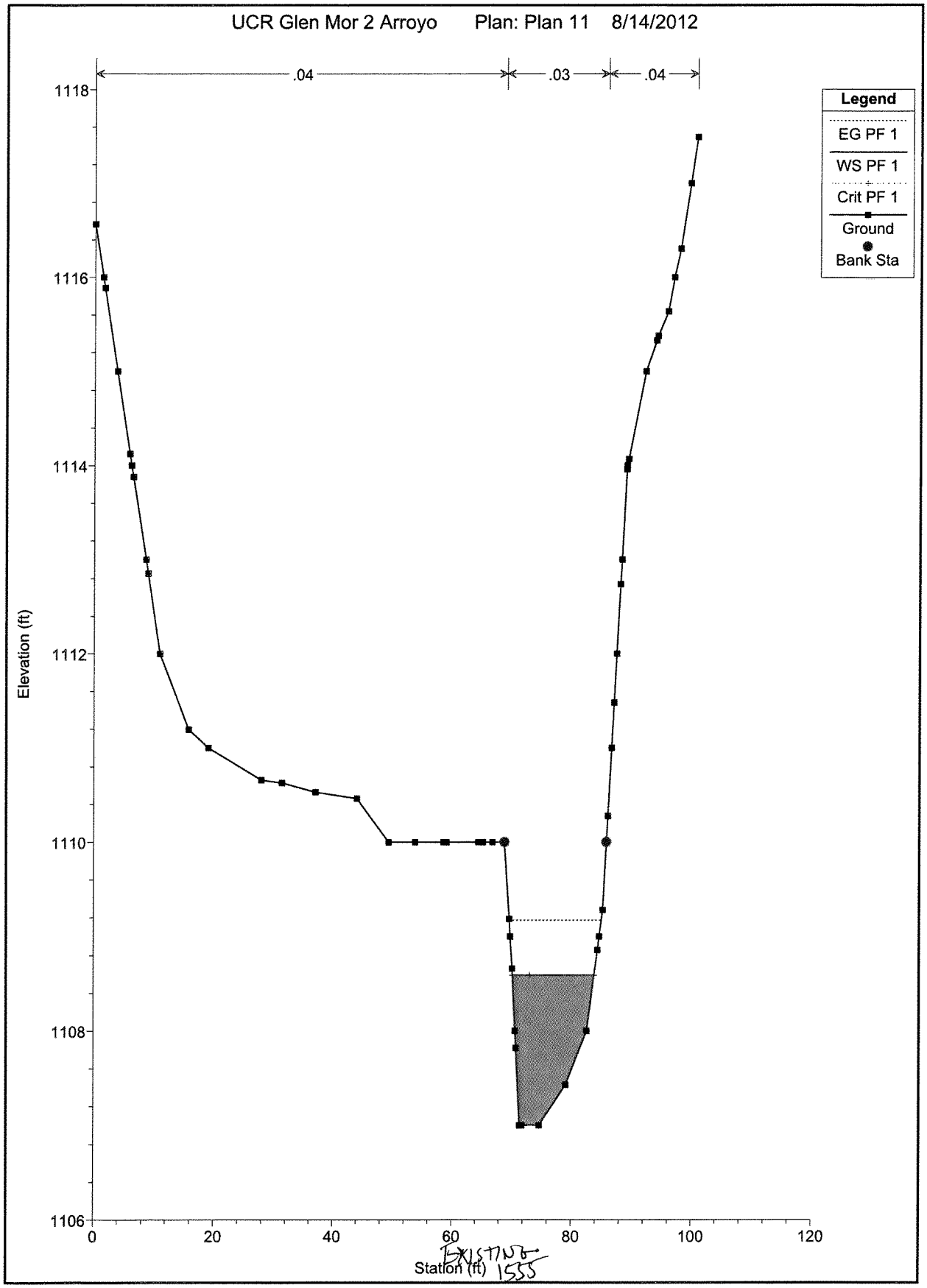

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1112
1110
1108
1106
1104
1102
0
20
40
60
80
100
120
Station (ft)
EXISTING
1339

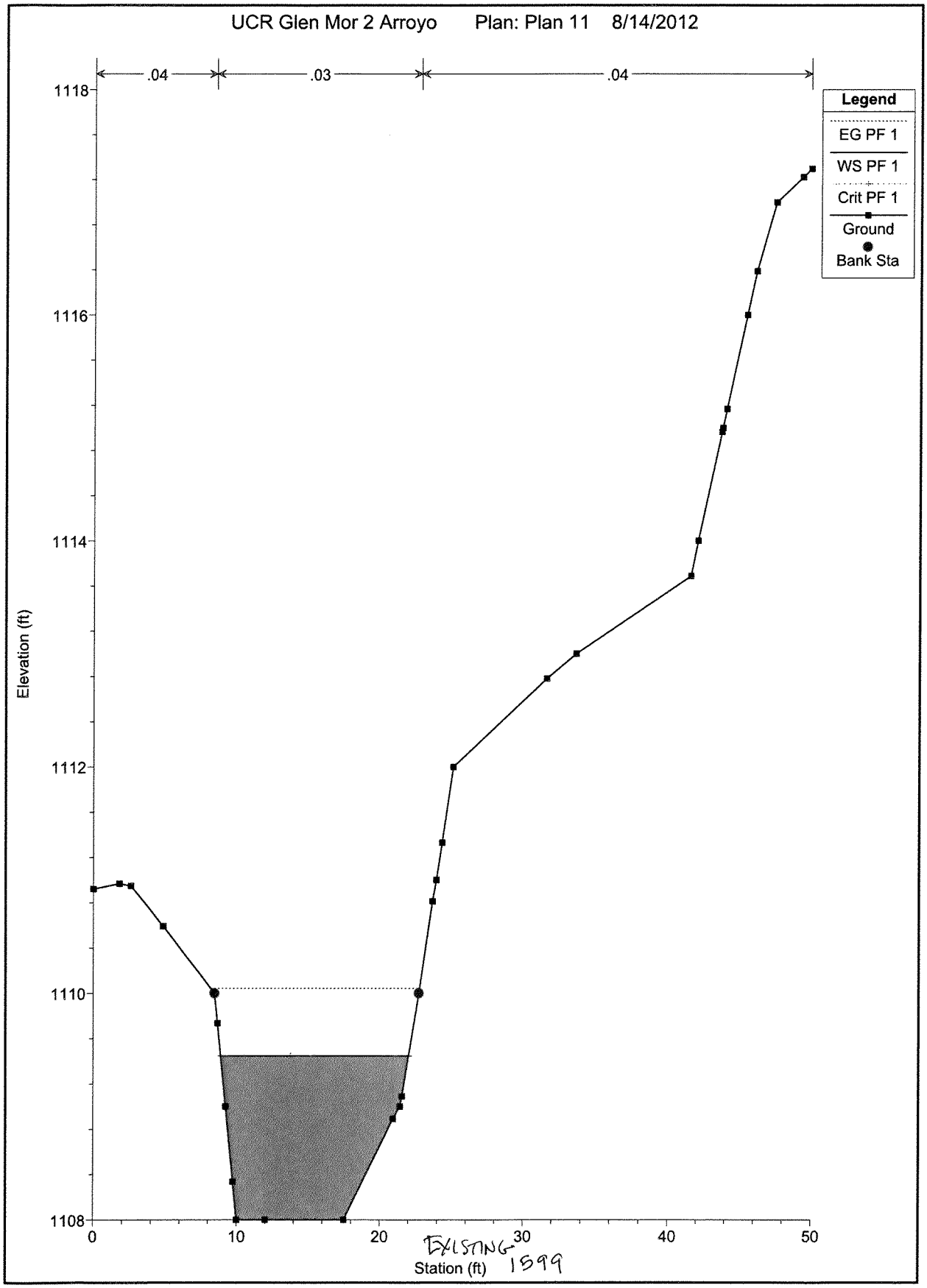

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1112
1110
1108
1106
1104
1102
Elevation (ft)
0
20
40
60
80
100
Station (ft)
EXISTING
136

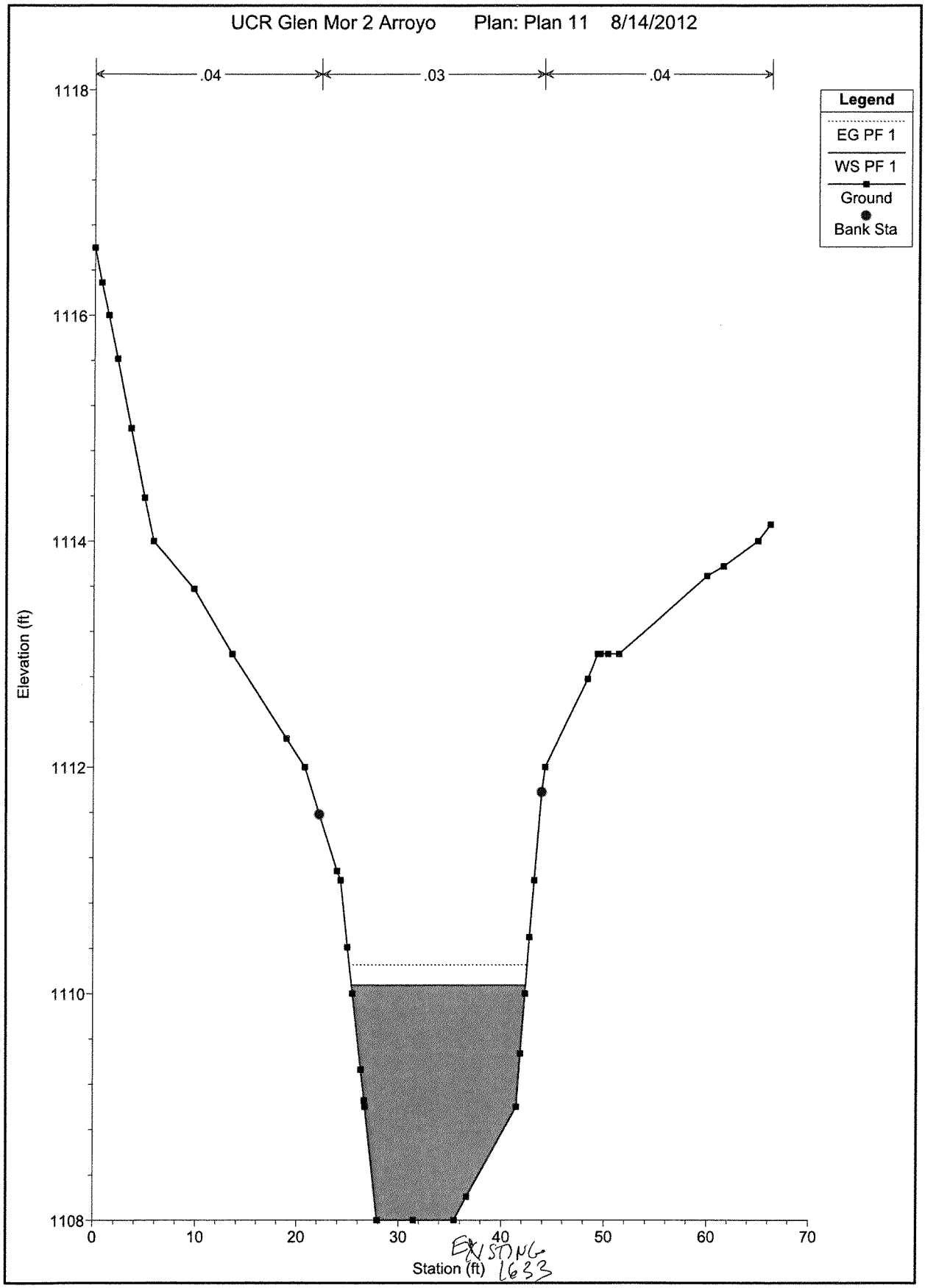

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1110
1109
1108
1107
1106
1105
1104
1103
0
20
40
60
80
100
120
Station (ft)
EXISTING
1379

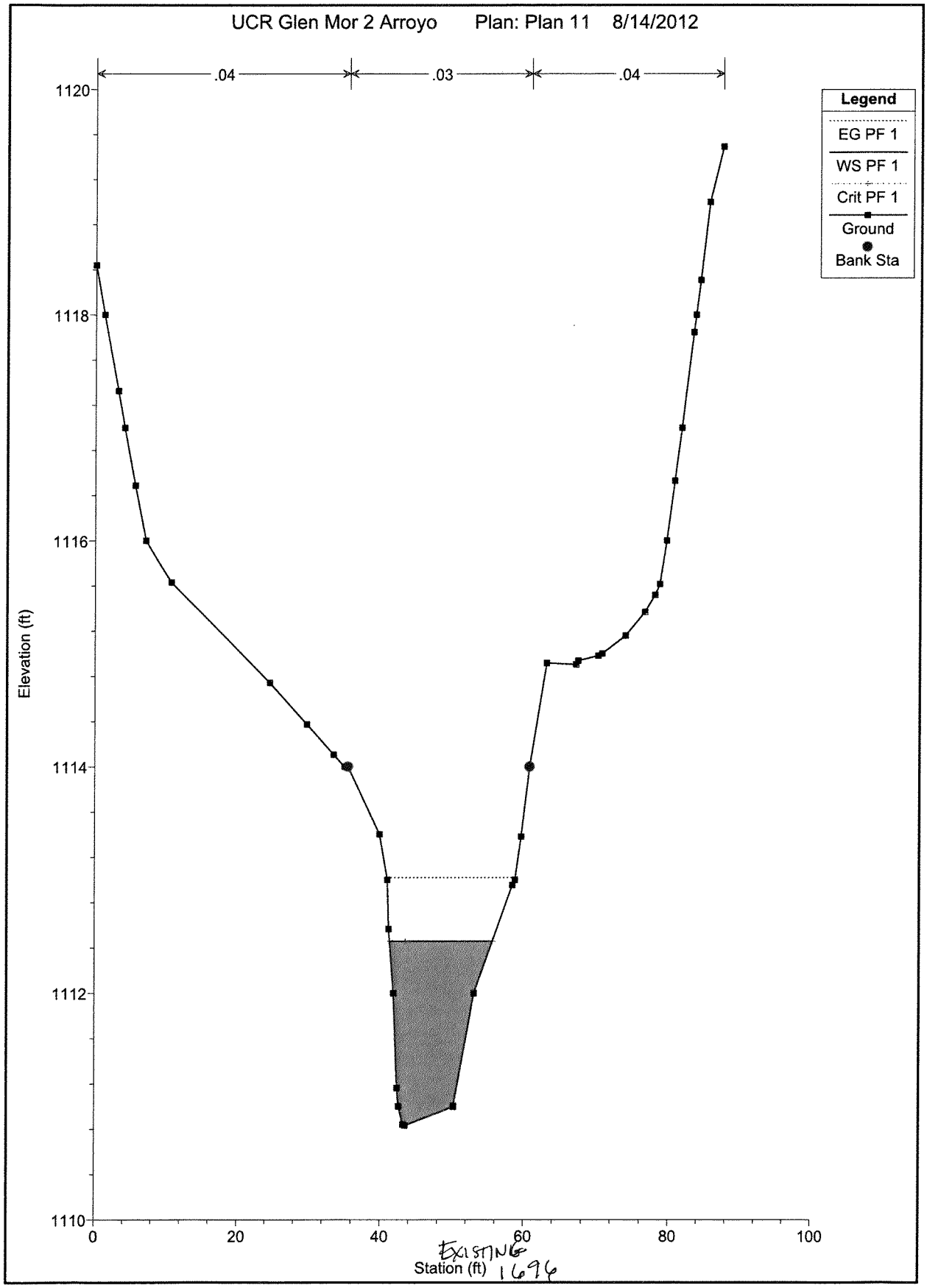

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1118
1116
1114
1112
1110
1108
1106
1104
0
20
40
60
80
100
120
Station (ft)
EXISTING
1442

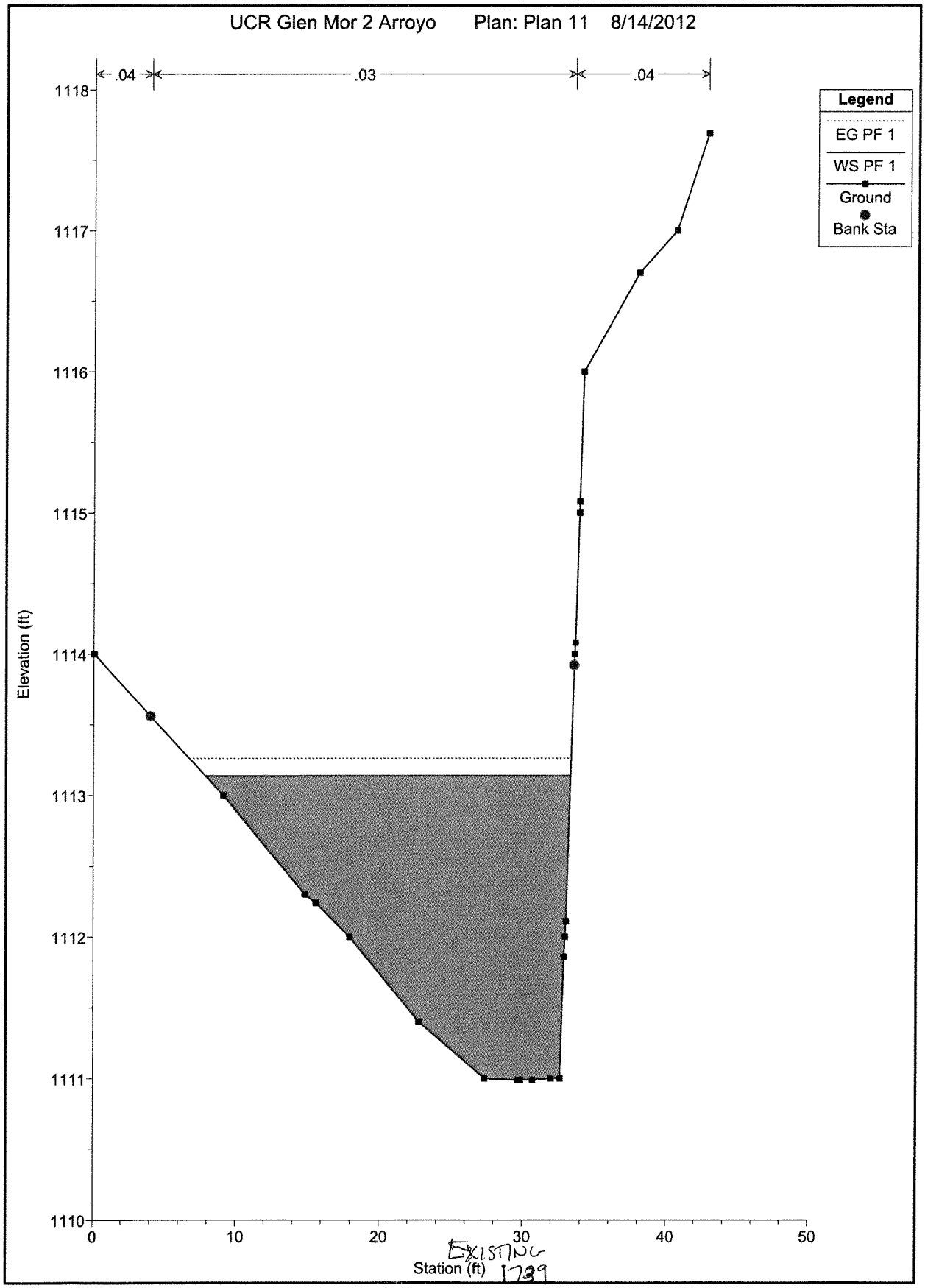

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1120
1118
1116
1114
1112
1110
1108
1106
1104
0
10
20
30
40
50
60
70
80
Station (ft)
EXISTING 1495

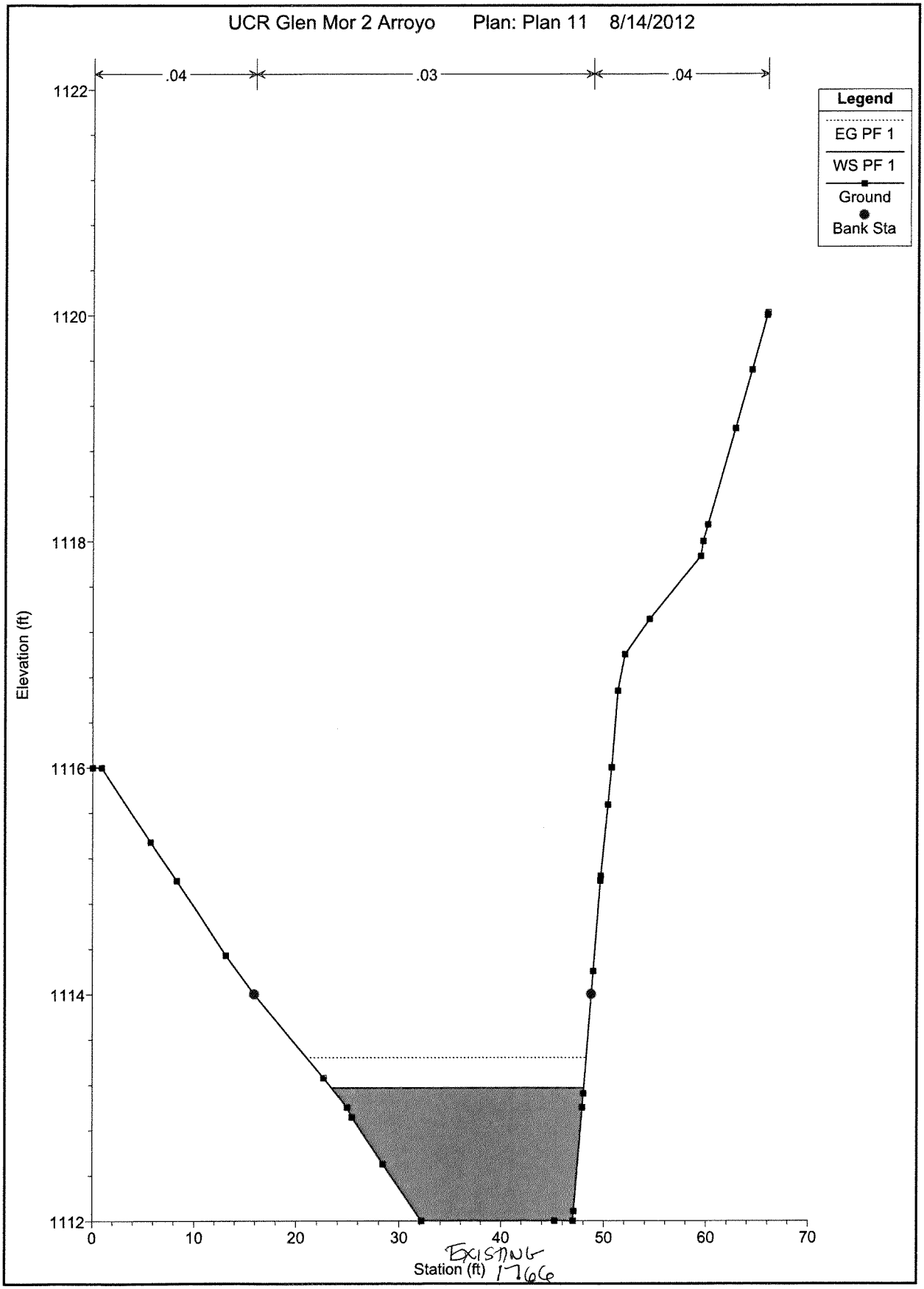

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1118
1116
1114
1112
1110
1108
1106
0
20
40
60
80
100
120
Station (ft)
EXISTING
1555

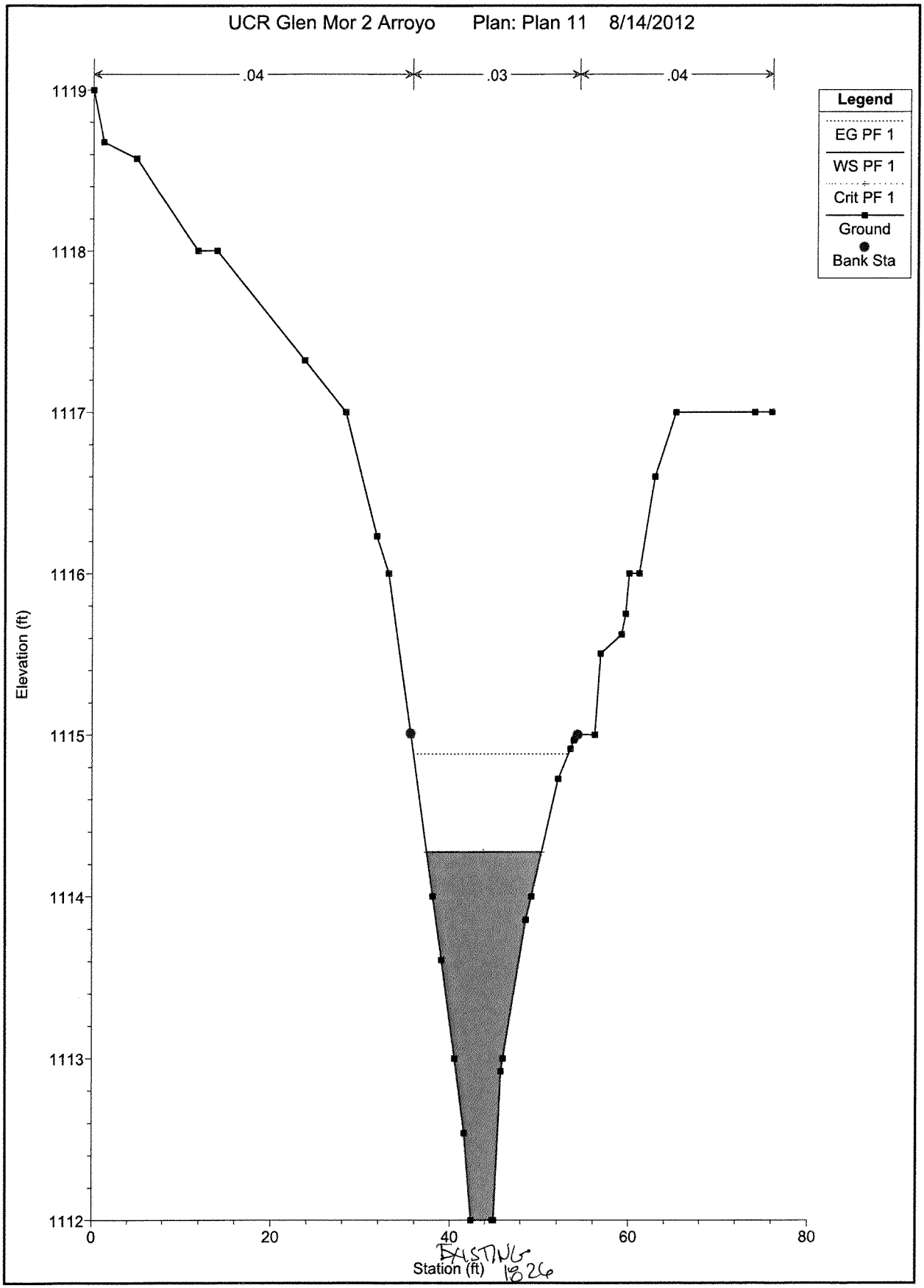

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1118
1116
1114
1112
1110
1108
Elevation (ft)
0
10
20
30
40
50
Station (ft)
EXISTING 1599

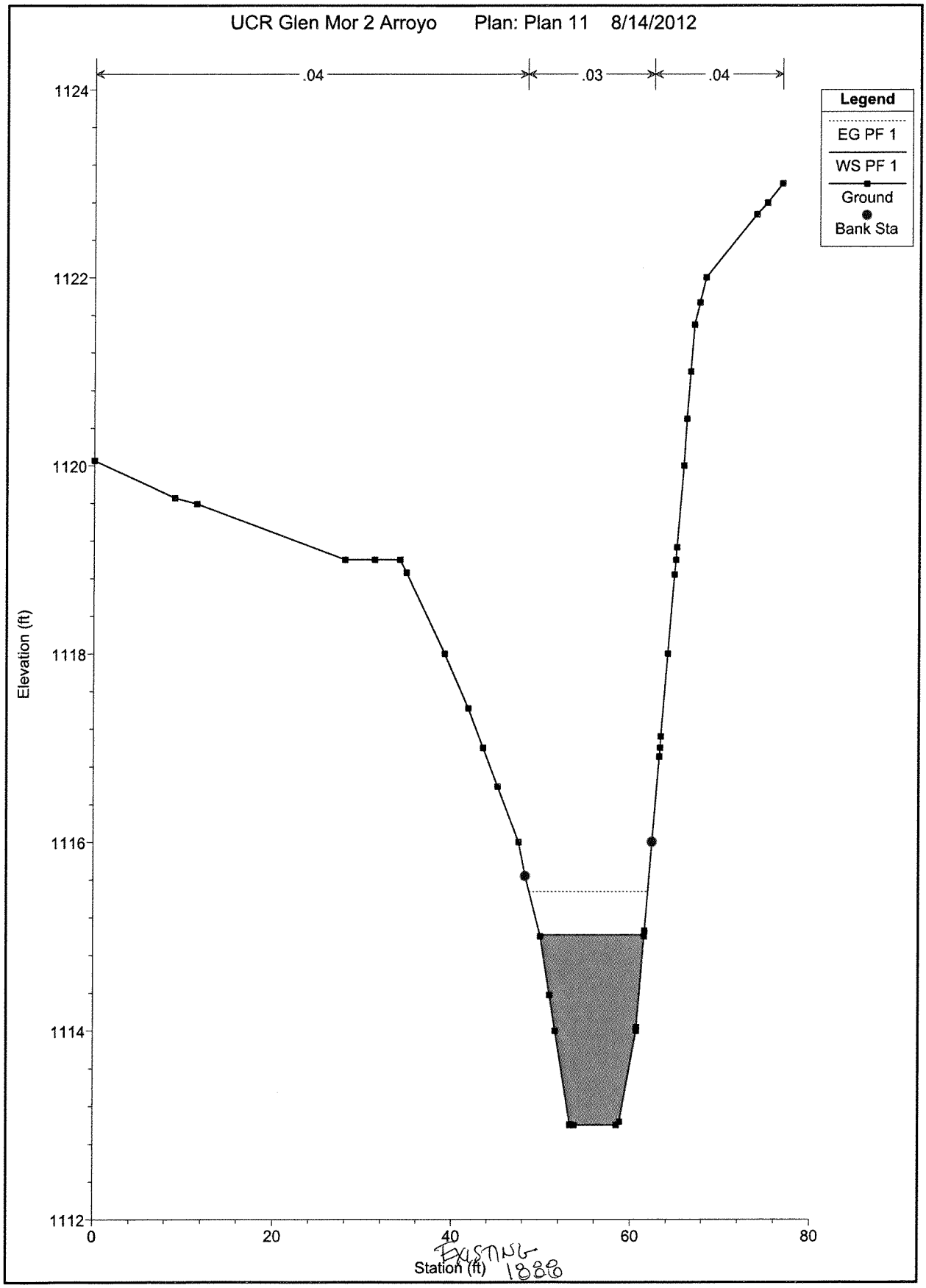

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1118
1116
1114
1112
1110
1108
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
EXISTING
1633

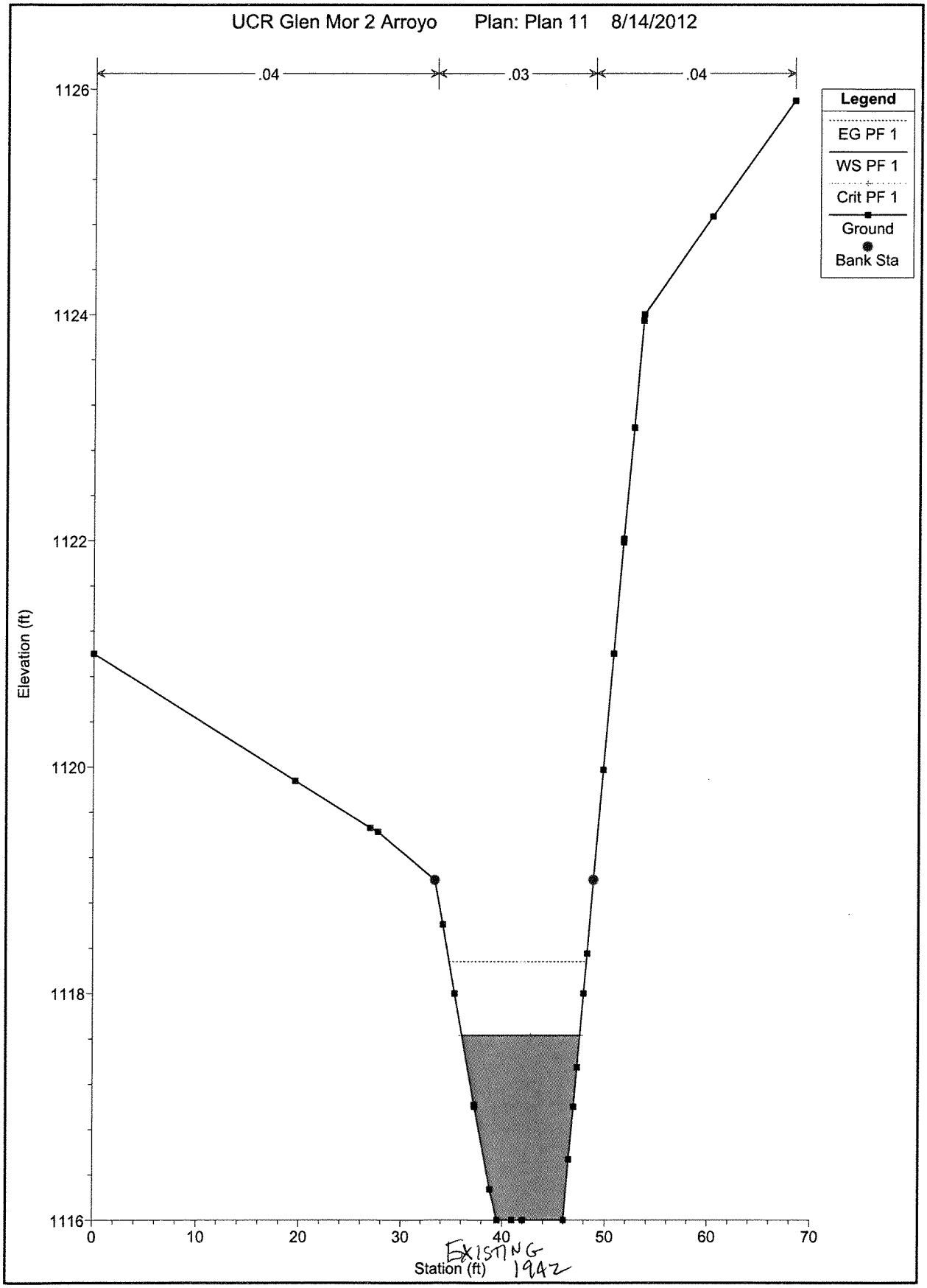

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1120
1118
1116
1114
1112
1110
Elevation (ft)
0
20
40
60
80
100
Station (ft)
EXISTING 1696

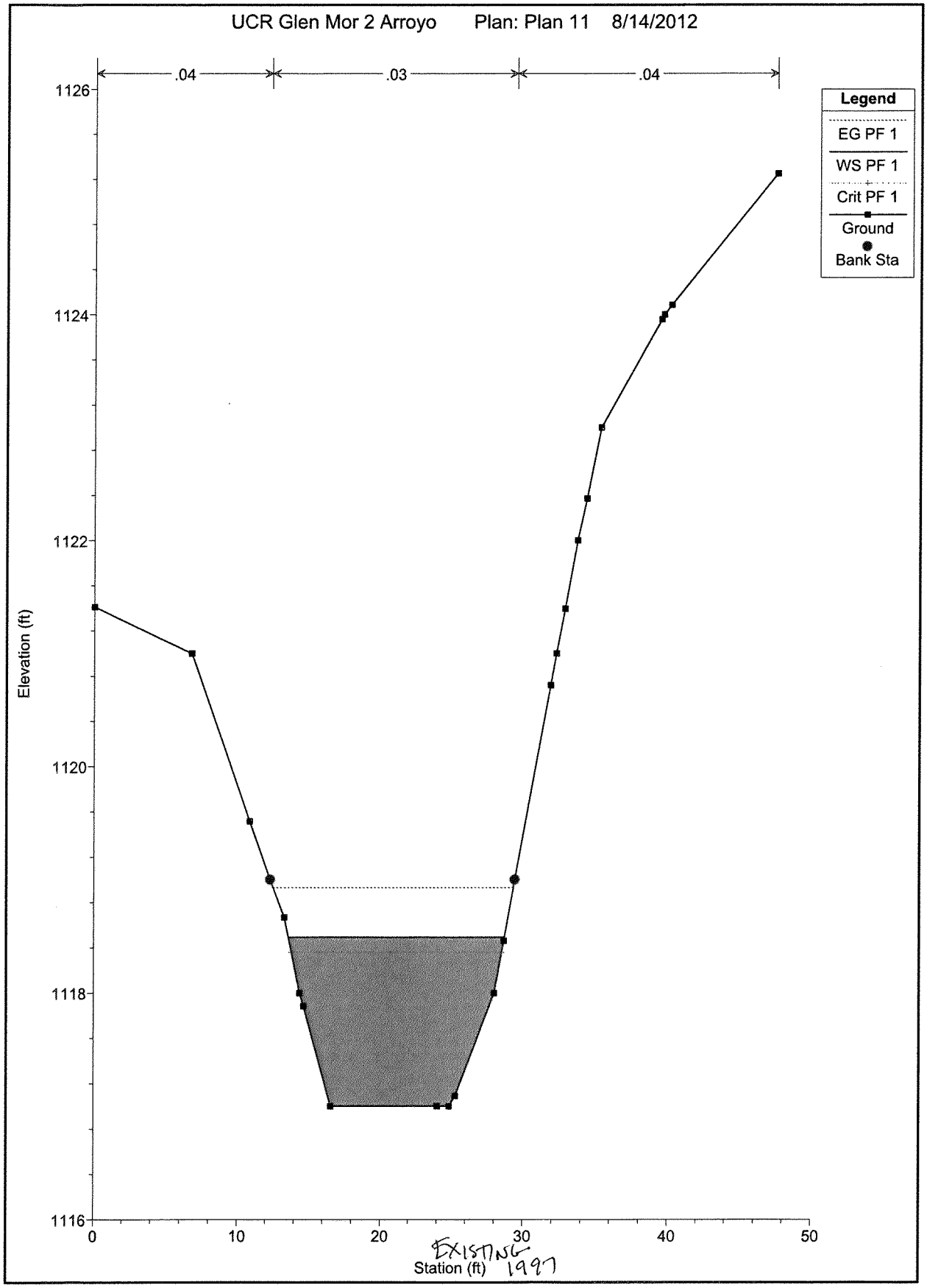

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1118
1117
1116
1115
1114
1113
1112
1111
1110
0
10
20
30
40
50
Station (ft)
EXISTING
1739

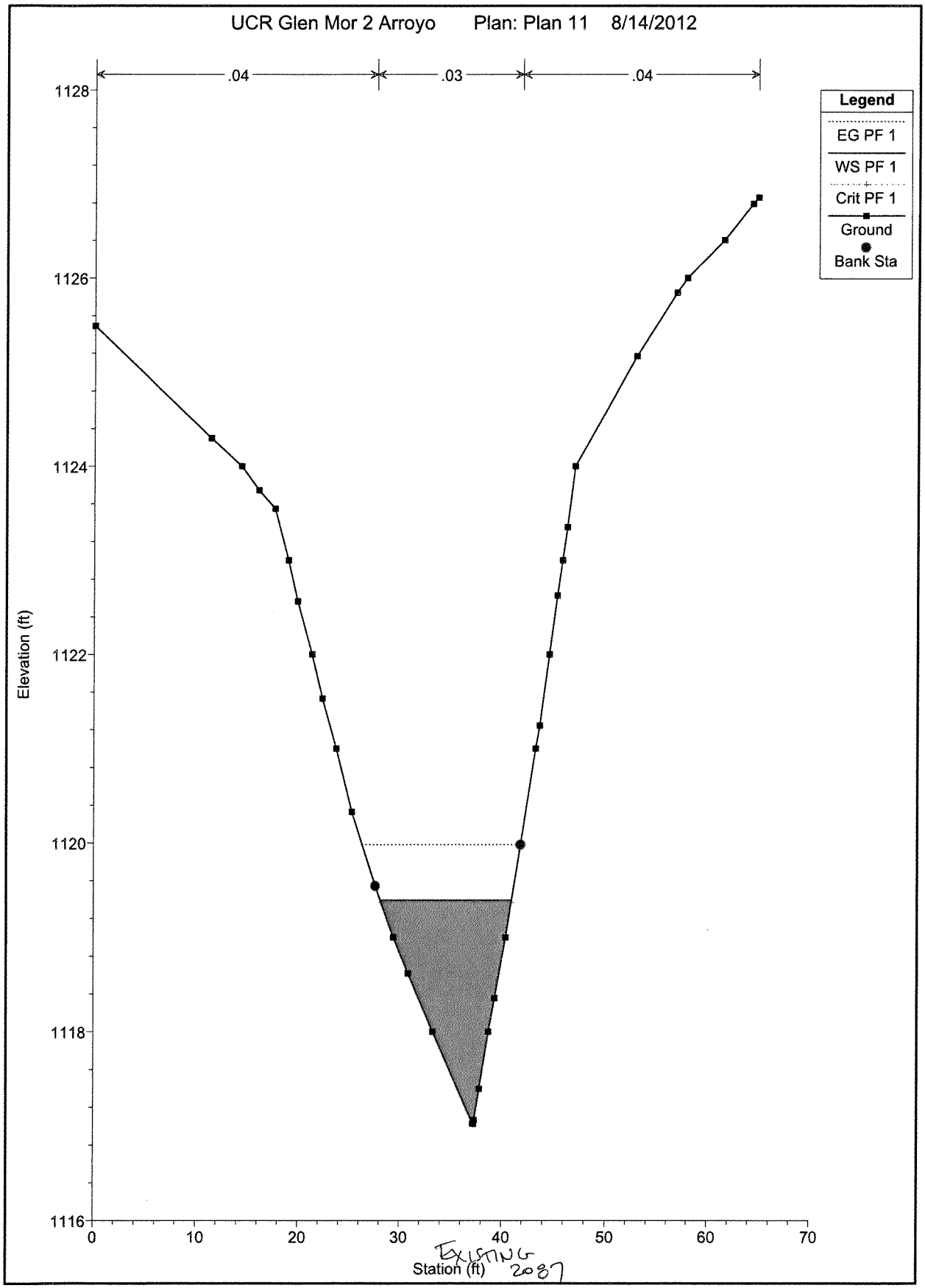

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1122
1120
1118
1116
1114
1112
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
EXISTING 1766

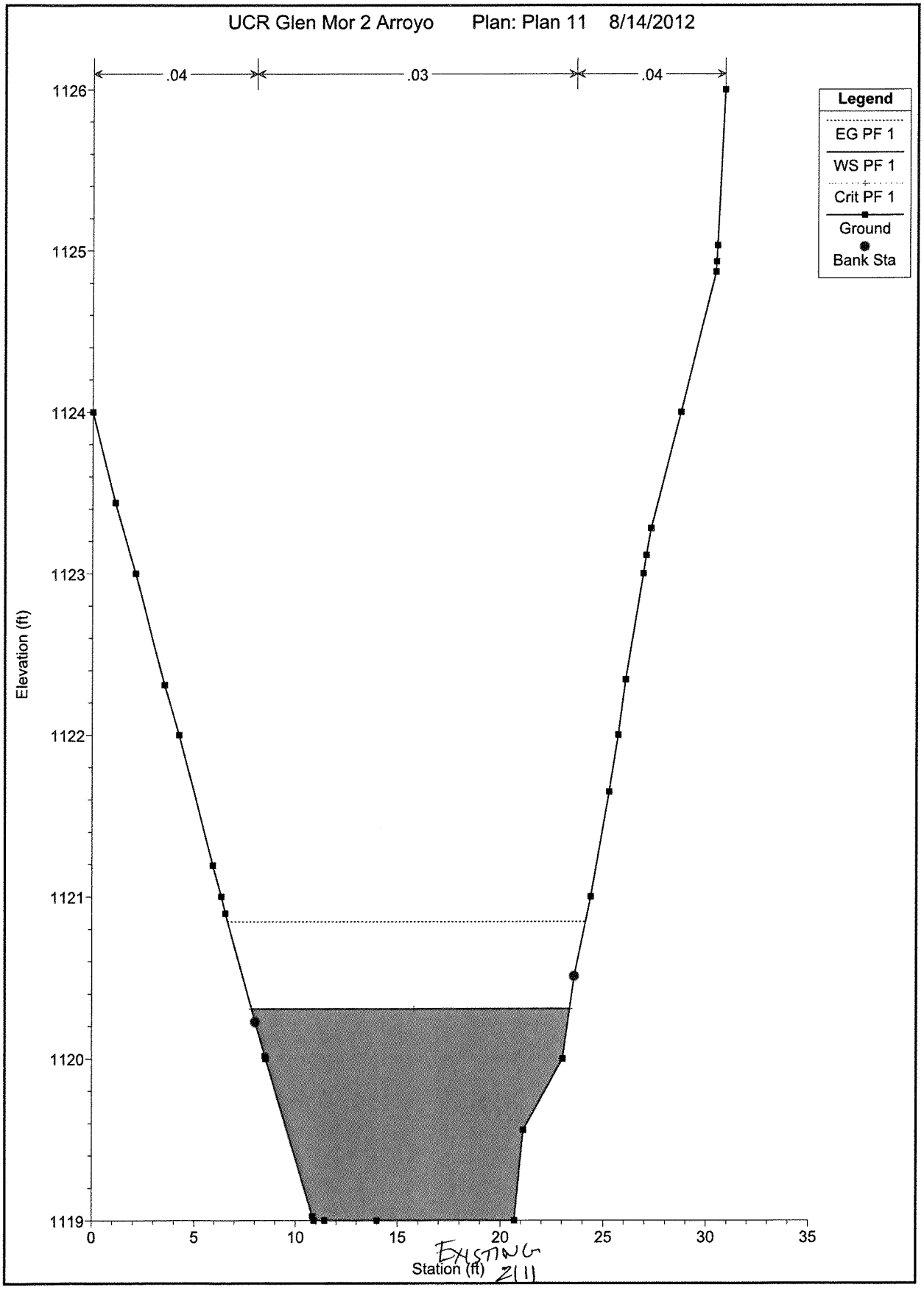

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1119
1118
1117
1116
1115
1114
1113
1112
Elevation (ft)
0
20
40
60
80
Station (ft)
EXISTING
1826

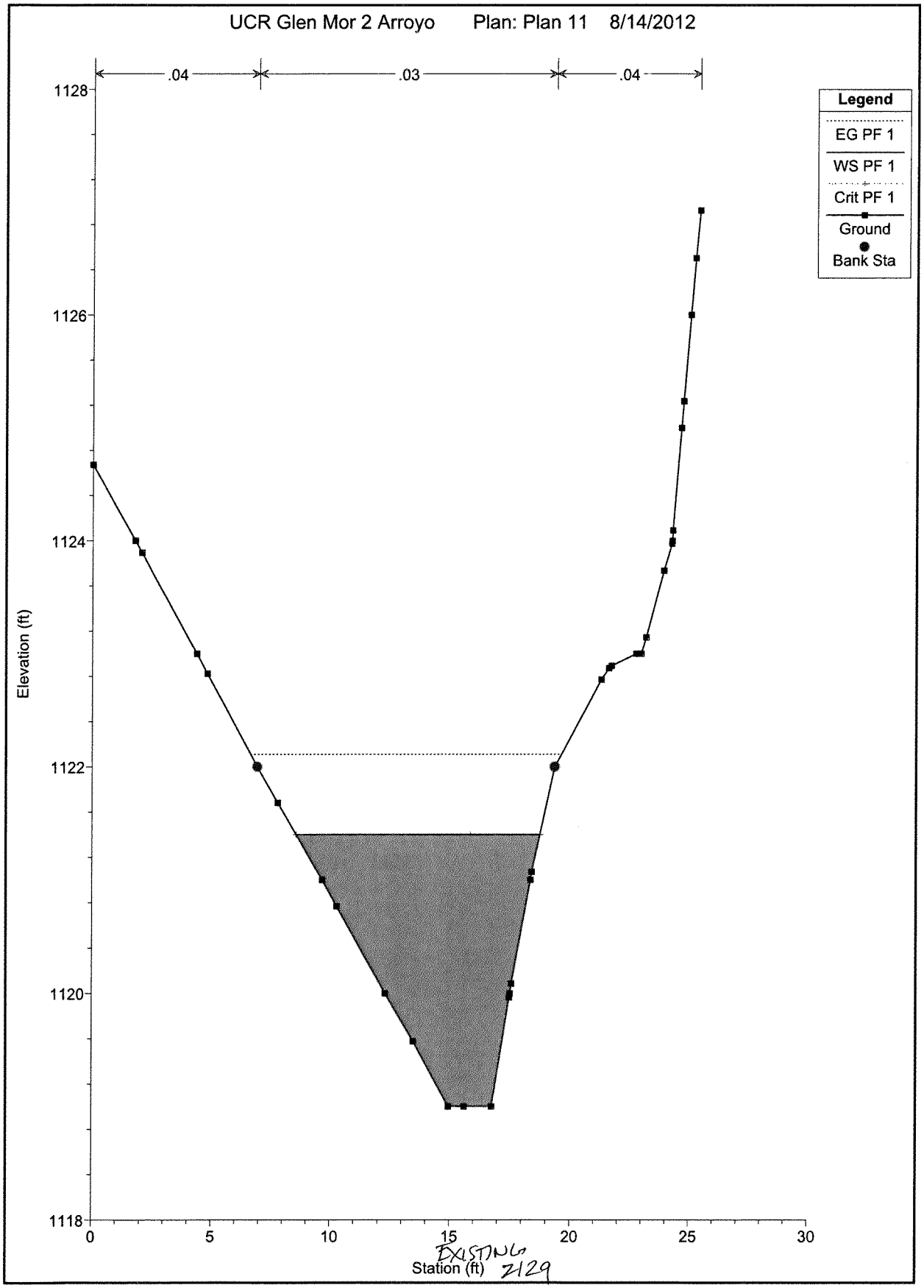

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1124
1122
1120
1118
1116
1114
1112
Elevation (ft)
0
20
40
60
80
Station (ft)
EXISTING
1888

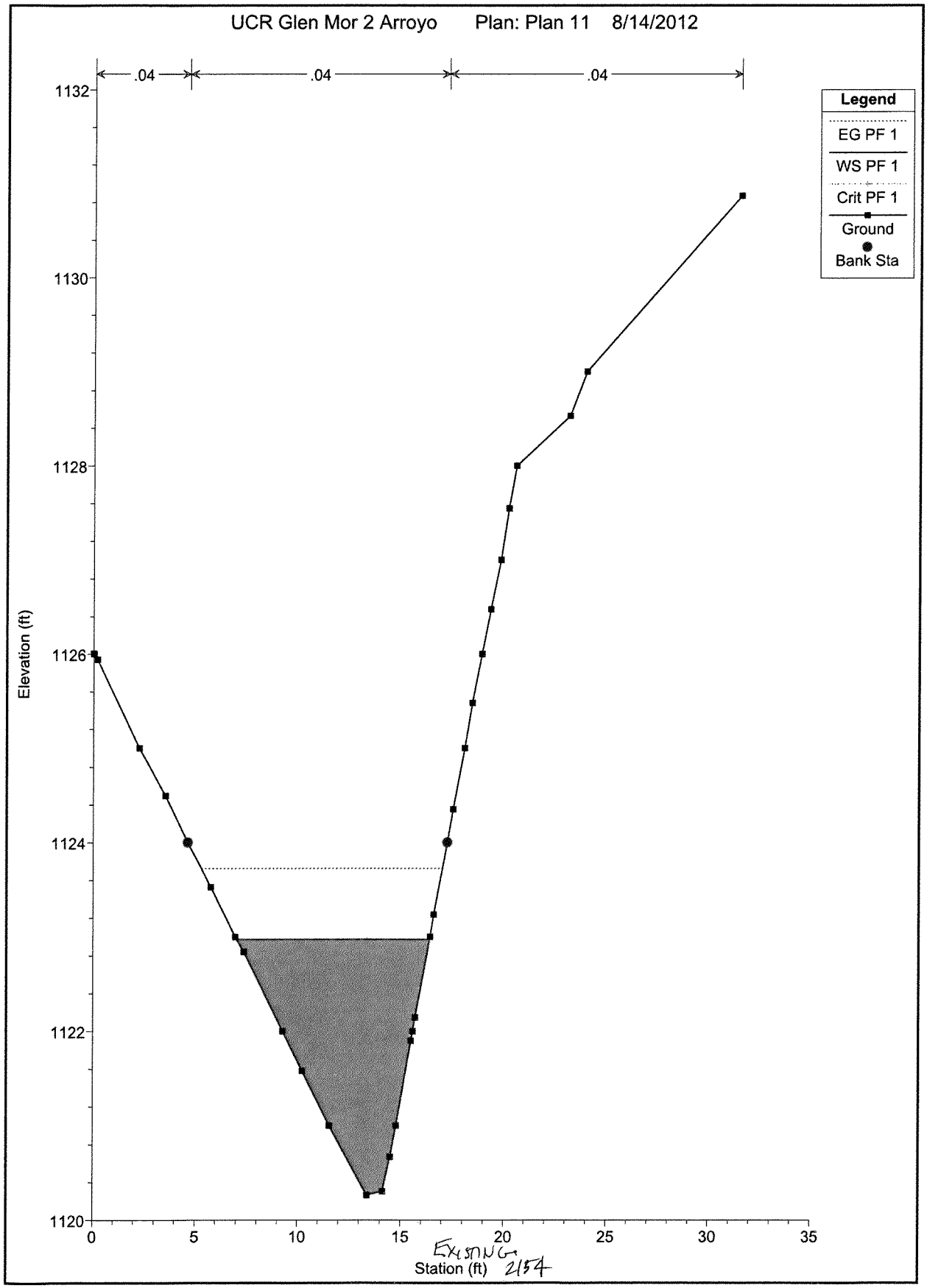

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1126
1124
1122
1120
1118
1116
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
EXISTING 1942

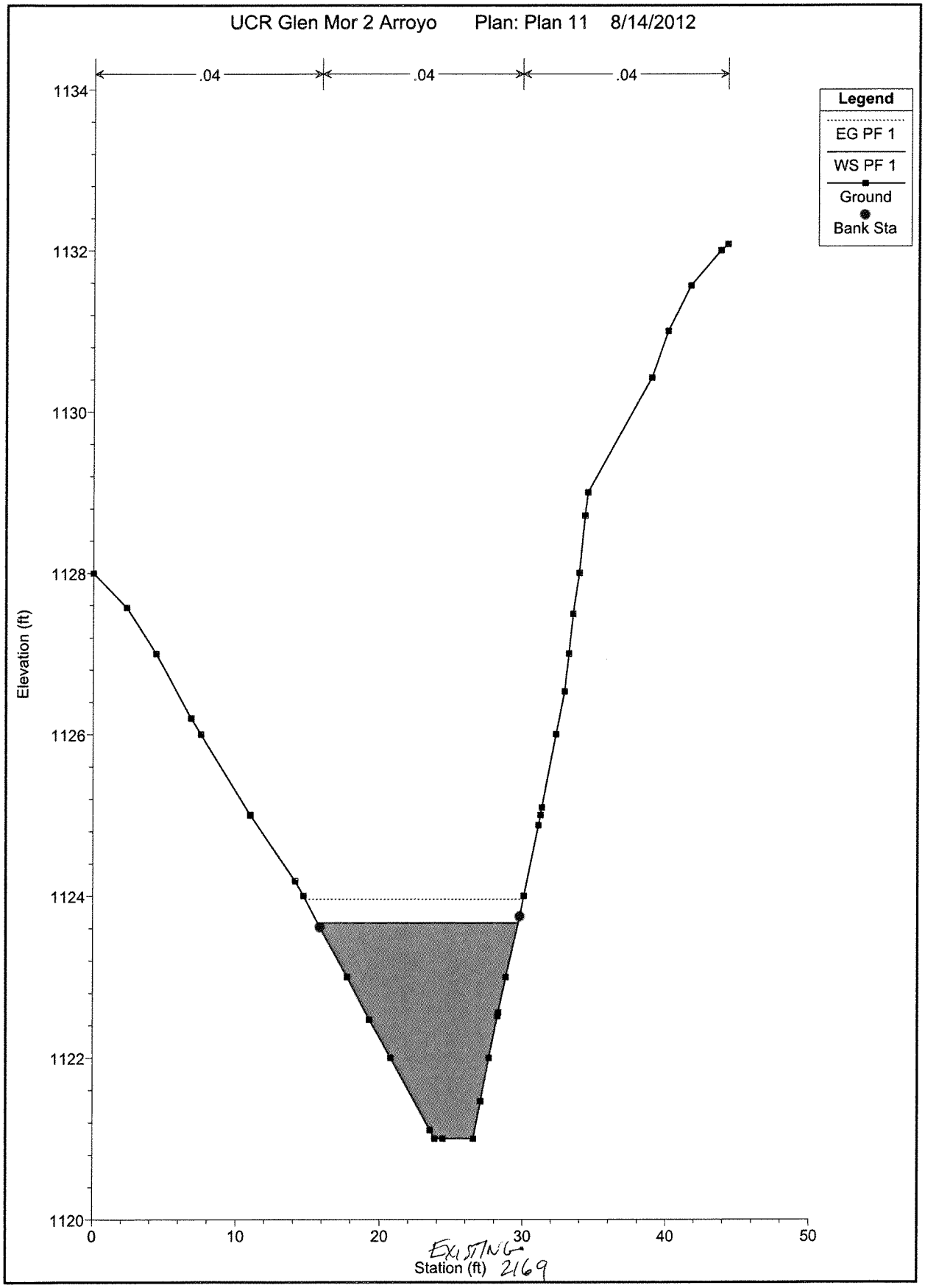

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1126
1124
1122
1120
1118
1116
Elevation (ft)
0
10
20
30
40
50
Station (ft)
EXISTING 1997

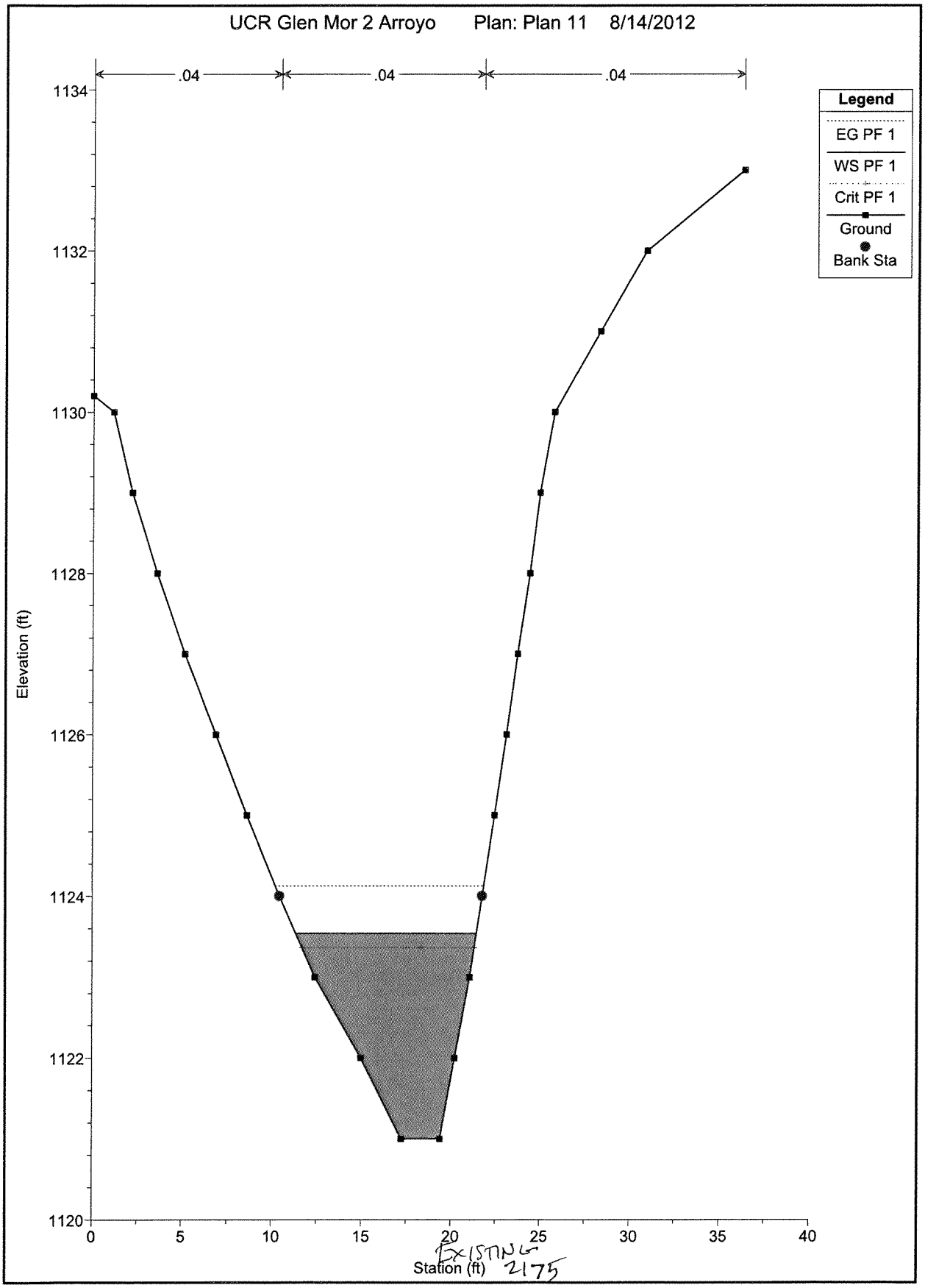

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1128
1126
1124
1122
1120
1118
1116
0
10
20
30
40
50
60
70
Station (ft)
EXISTING
2087

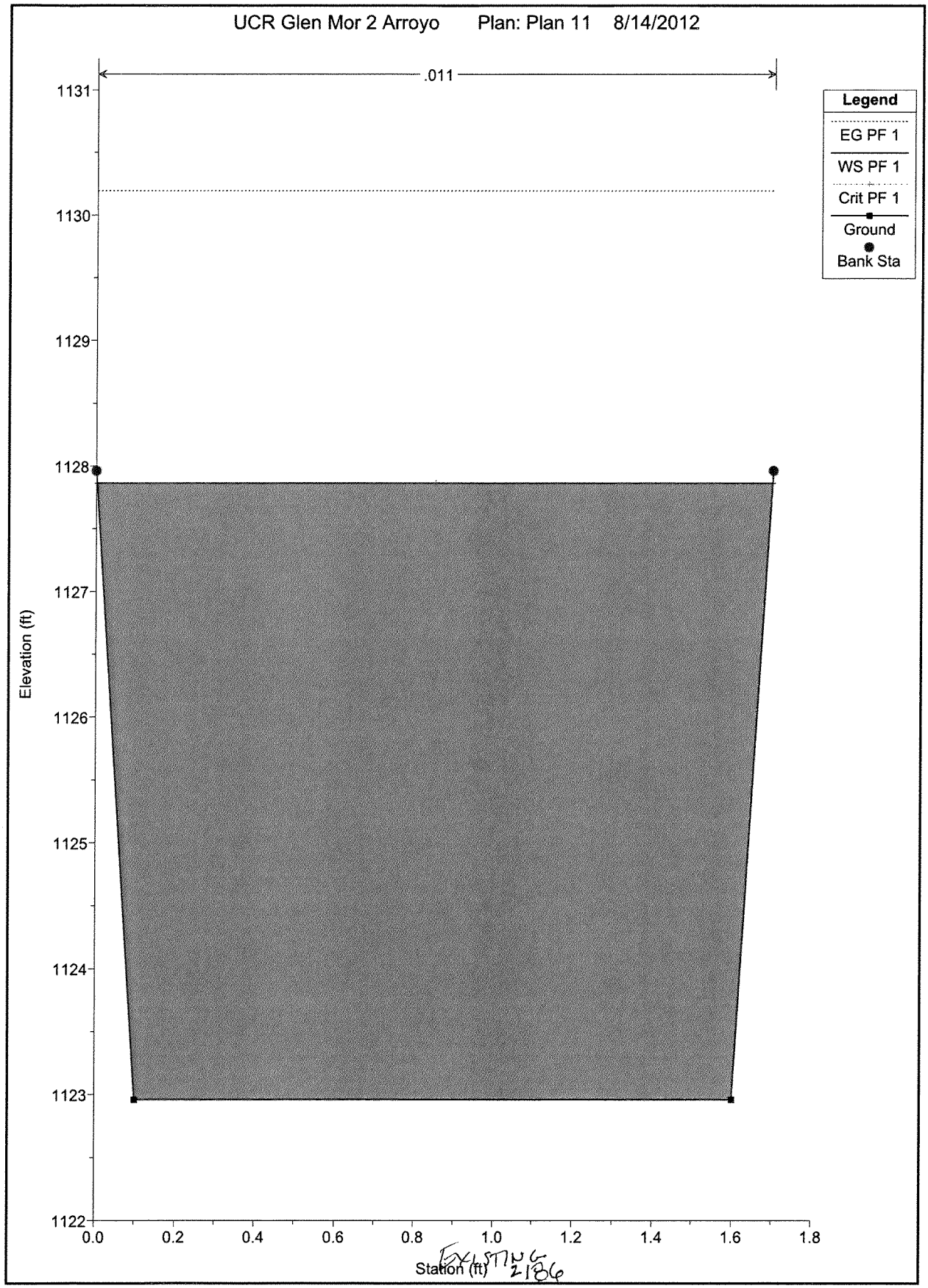

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1126
1125
1124
1123
1122
1121
1120
1119
0
5
10
15
20
25
30
35
Station (ft)
EXISTING
2011

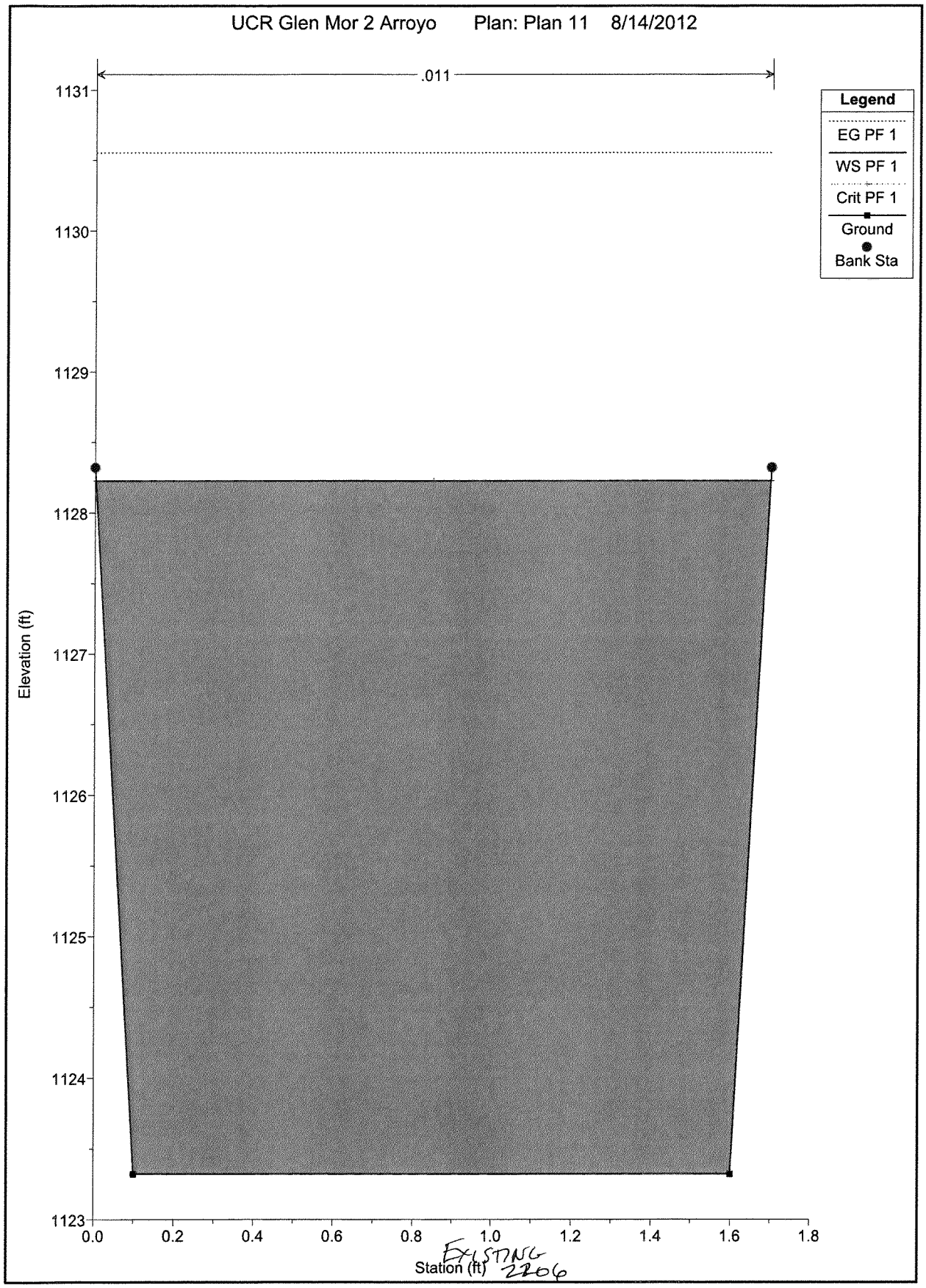

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1128
1126
1124
1122
1120
1118
Elevation (ft)
0
5
10
15
20
25
30
Station (ft)
EXISTING
7129

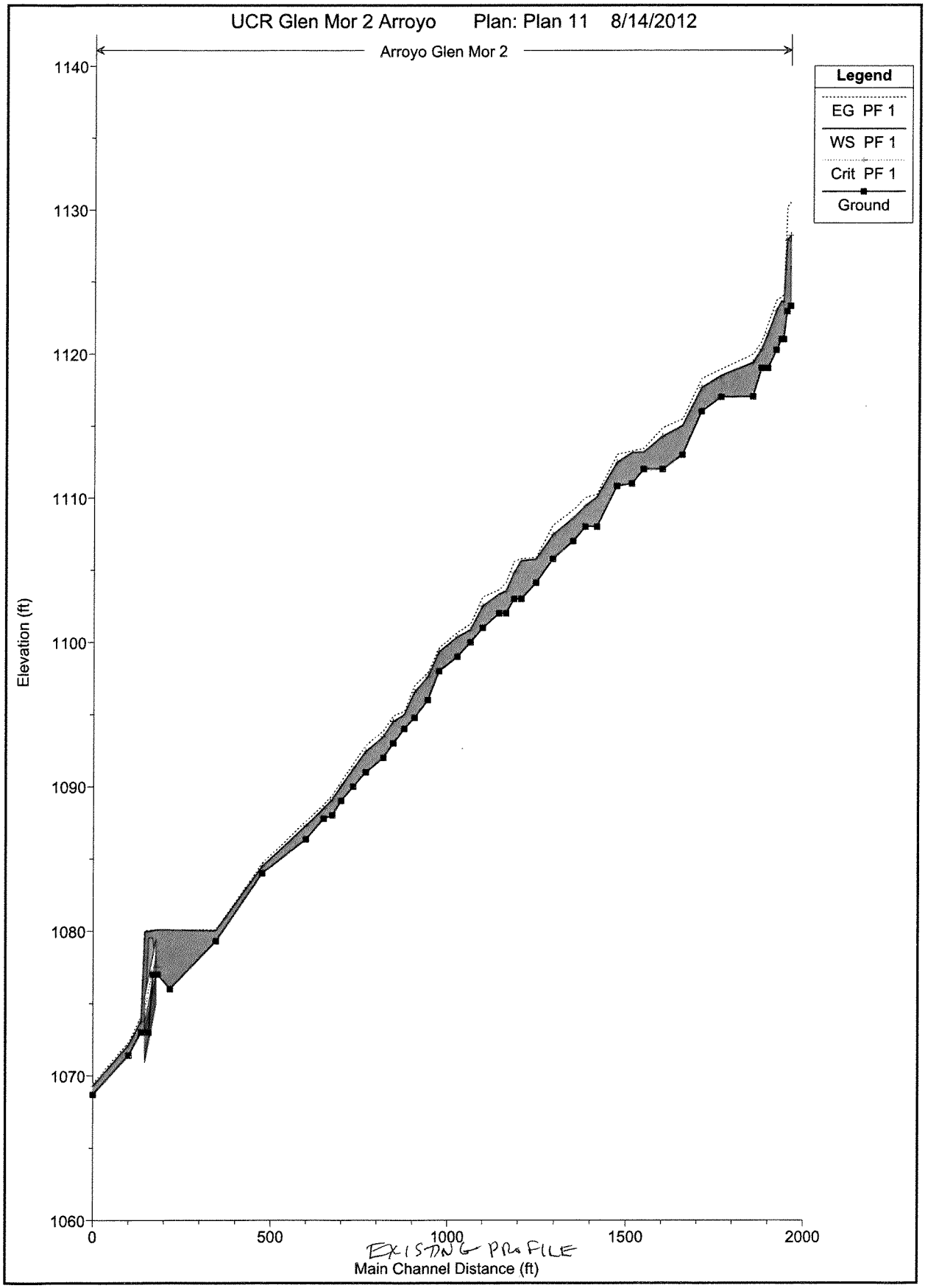

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1132
1130
1128
1126
1124
1122
1120
0
5
10
15
20
25
30
35
Station (ft)
EXISTING
2154

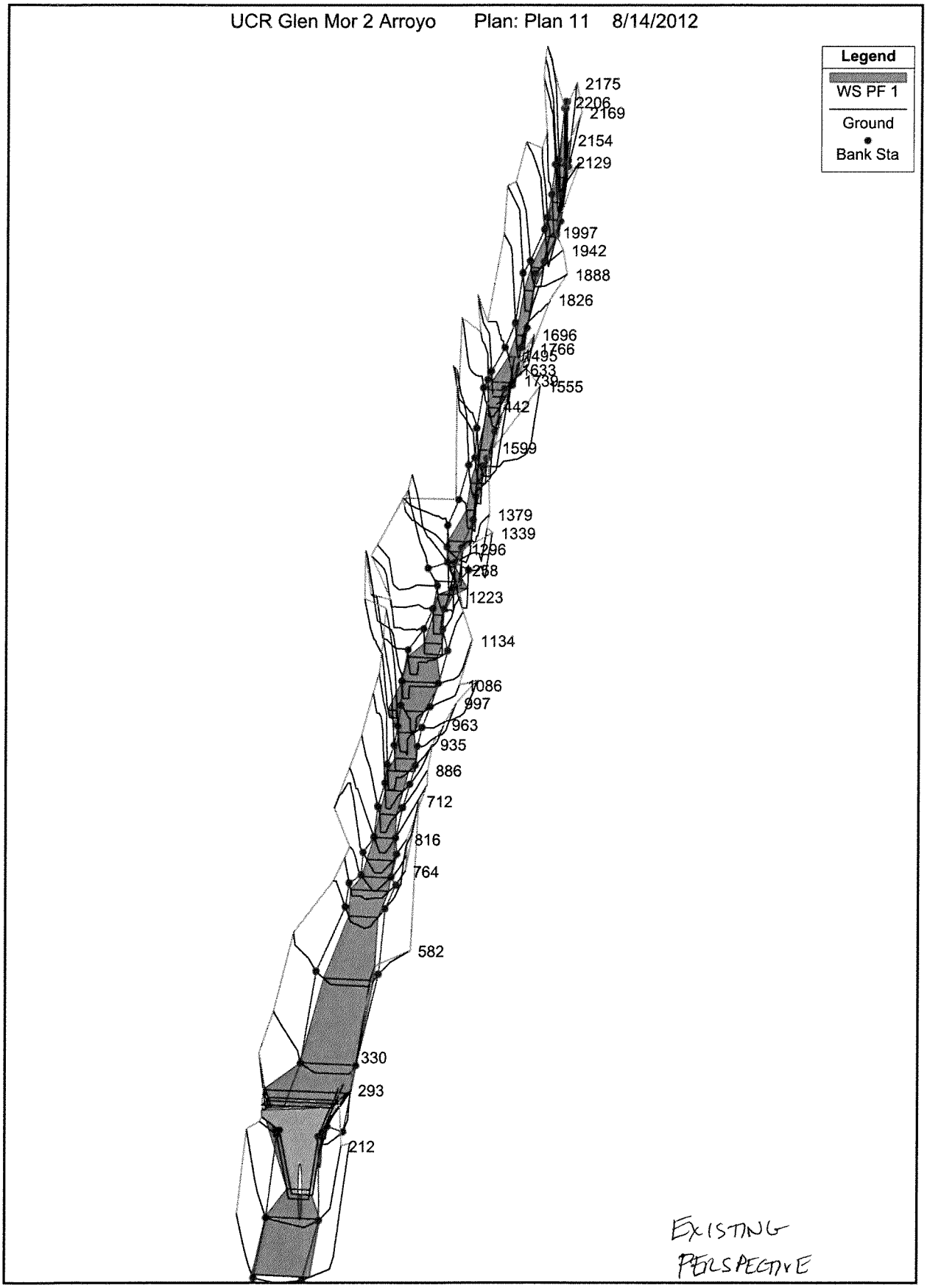

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1134
1132
1130
1128
1126
1124
1122
1120
Elevation (ft)
0
10
20
30
40
50
Station (ft)
EXISTING 2169


UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1134
1132
1130
1128
1126
1124
1122
1120
0
5
10
15
20
25
30
35
40
Station (ft)
EXISTING
2175


UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.011
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
Station (ft)
1131
1130
1129
1128
1127
1126
1125
1124
1123
1122
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8


UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
.011
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1131
1130
1129
1128
1127
1126
1125
1124
1123
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
Station (ft)
EXISTING 2206

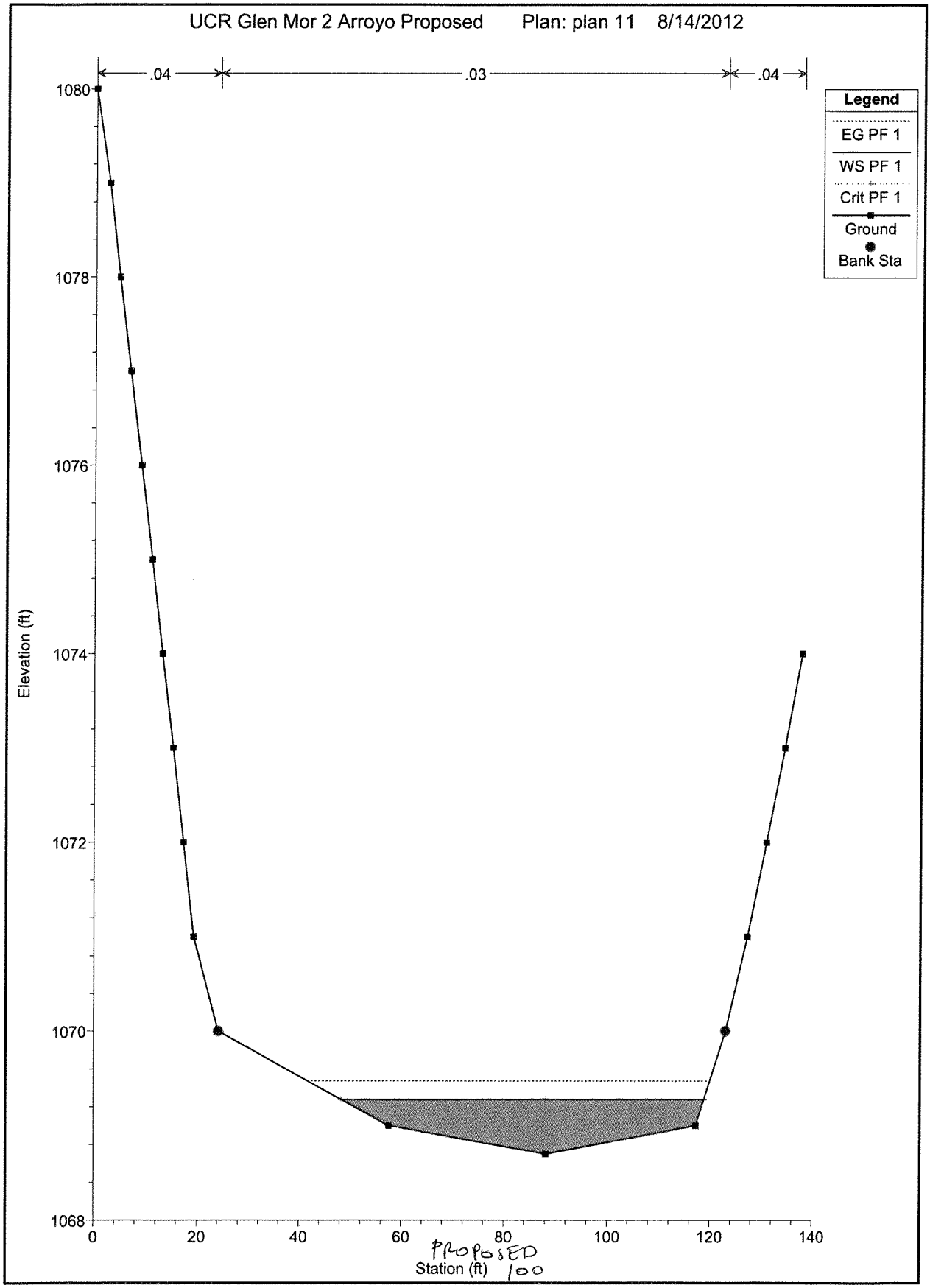

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
Arroyo Glen Mor 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
1140
1130
1120
1110
1100
1090
1080
1070
1060
0
500
1000
1500
2000
Main Channel Distance (ft)
EXISTING PROFILE

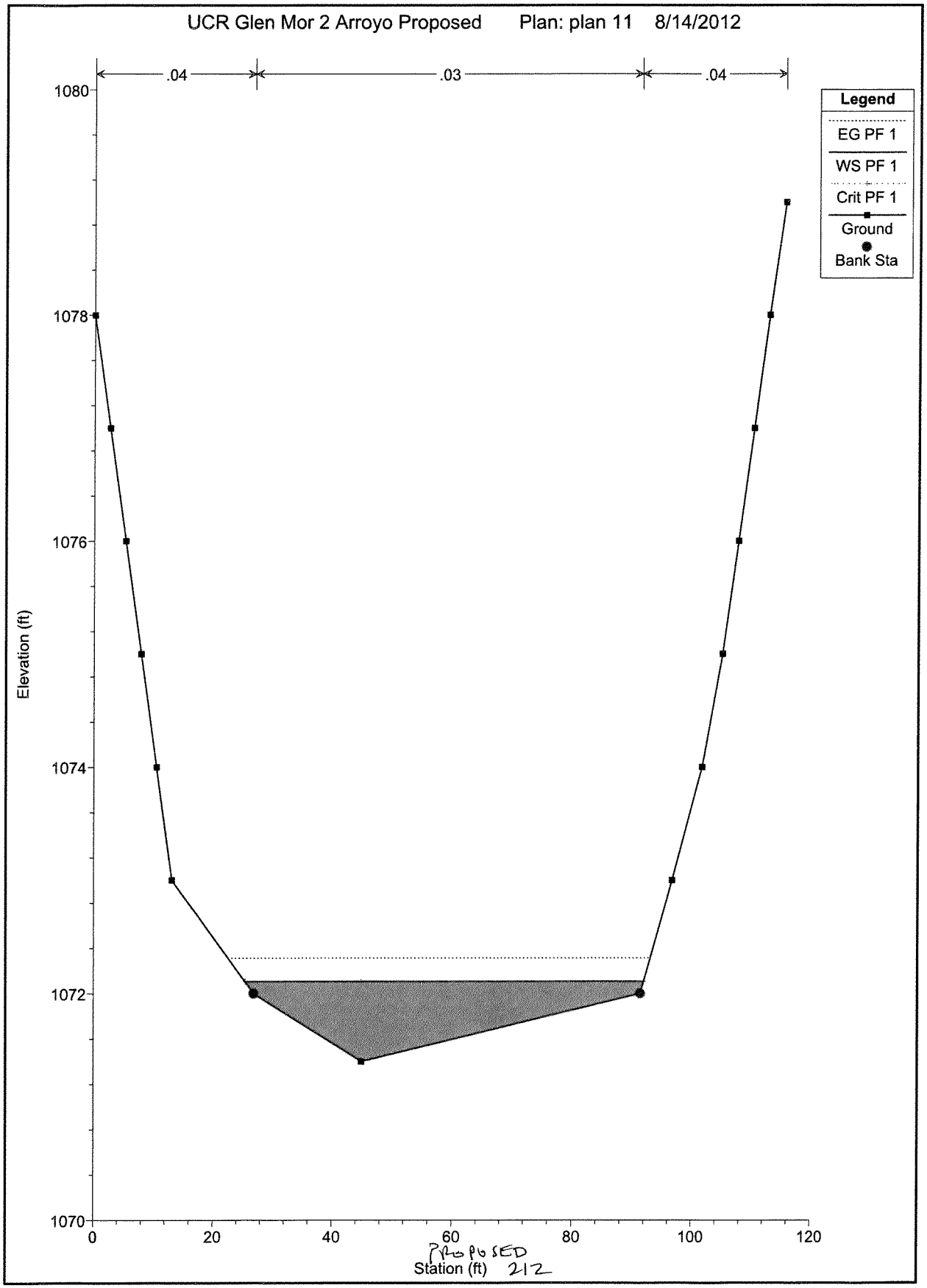

UCR Glen Mor 2 Arroyo Plan: Plan 11 8/14/2012
Legend
WS PF 1
Ground
Bank Sta
2175
2206
2169
2154
2129
1997
1942
1888
1826
1696
1766
1633
1555
1599
1379
1339
1296
1223
1134
1086
997
963
935
886
712
816
764
582
330
293
212
EXISTING
PERSPECTIVE

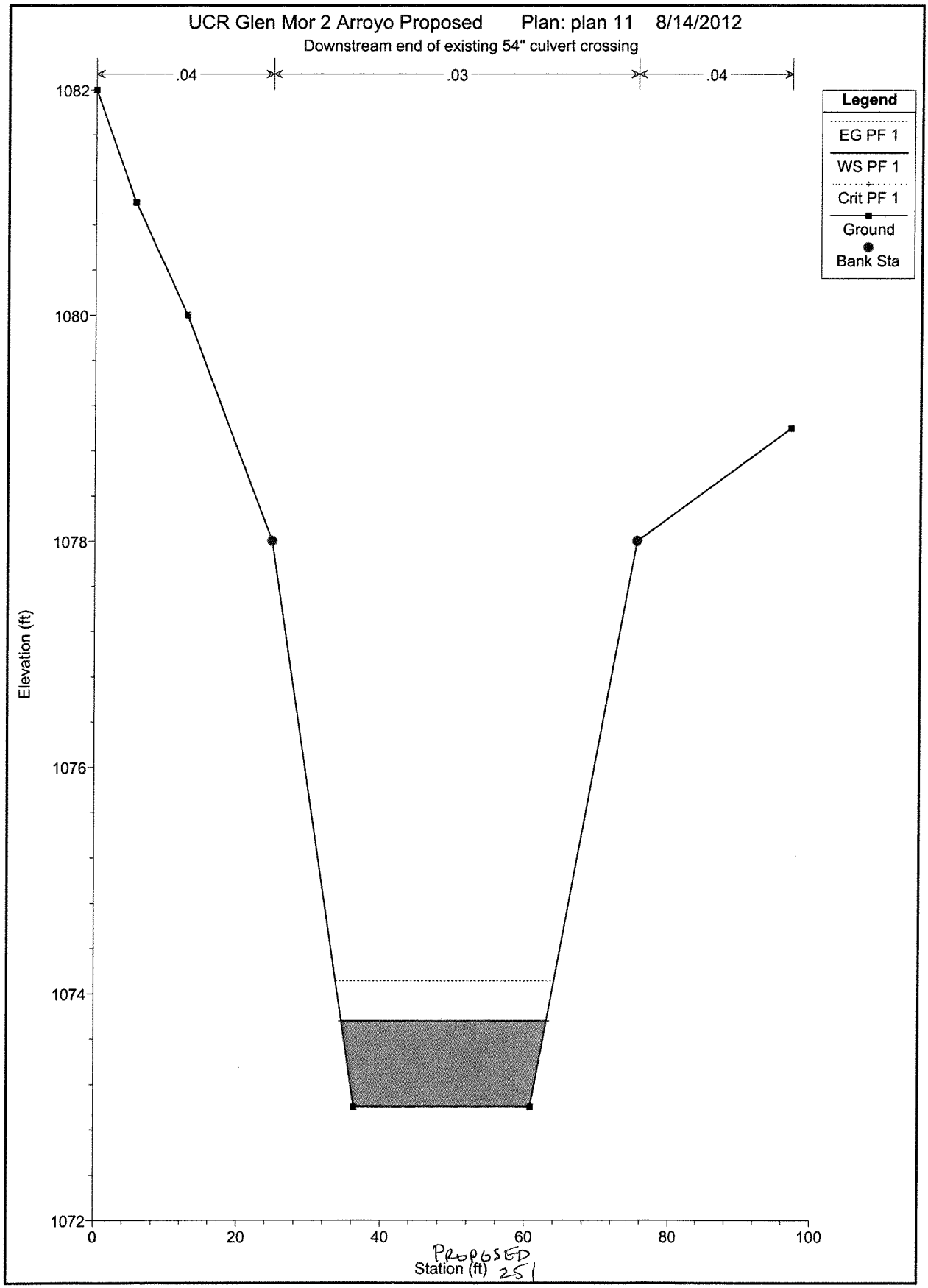
HEC-RAS Plan: Plan 11 River: Arroyo Reach: Glen Mor 2 Profile: PF 1

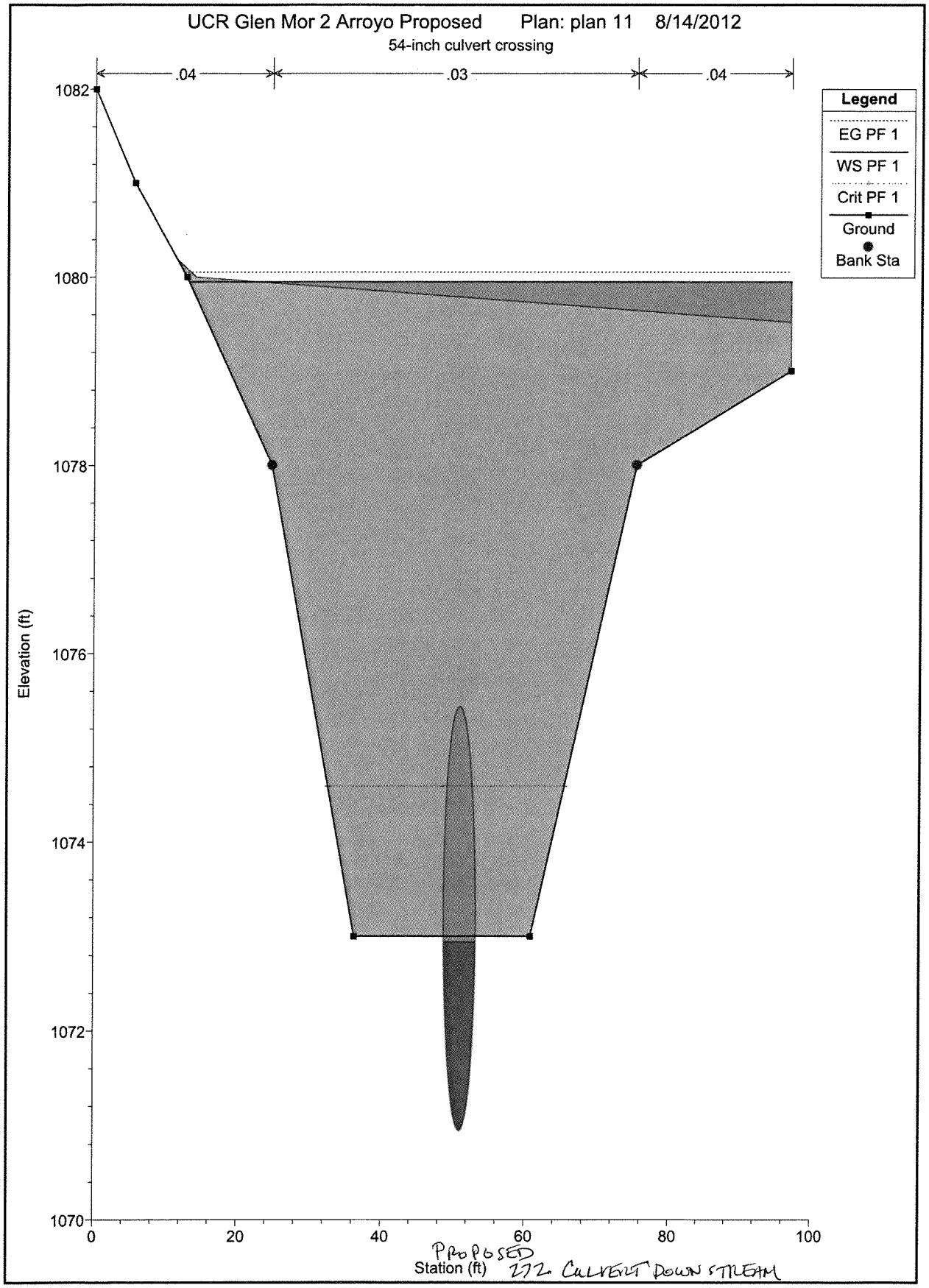
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Mor 2	2206	PF 1	96.00	1123.32	1128.23	1128.23	1130.55	0.013401	12.25	7.84	1.70	1.00
Glen Mor 2	2186	PF 1	96.00	1122.96	1127.86	1127.86	1130.19	0.013424	12.25	7.83	1.70	1.00
Glen Mor 2	2175	PF 1	96.00	1121.00	1123.54	1123.36	1124.12	0.018781	6.14	15.64	10.06	0.87
Glen Mor 2	2169	PF 1	96.00	1121.00	1123.67		1123.96	0.008329	4.35	22.09	13.98	0.61
Glen Mor 2	2154	PF 1	96.00	1120.26	1122.97	1122.97	1123.72	0.026394	6.95	13.80	9.36	1.01
Glen Mor 2	2129	PF 1	96.00	1119.00	1121.40	1121.40	1122.11	0.014494	6.76	14.19	10.18	1.01
Glen Mor 2	2111	PF 1	96.00	1119.00	1120.31	1120.31	1120.85	0.013820	5.89	16.31	15.52	1.01
Glen Mor 2	2087	PF 1	96.00	1117.02	1119.39	1119.37	1119.98	0.013270	6.17	15.56	12.84	0.99
Glen Mor 2	1997	PF 1	96.00	1117.00	1118.49	1118.36	1118.93	0.009599	5.31	18.07	15.11	0.86
Glen Mor 2	1942	PF 1	96.00	1116.00	1117.63	1117.63	1118.28	0.013761	6.48	14.83	11.55	1.01
Glen Mor 2	1888	PF 1	96.00	1113.00	1115.02		1115.47	0.007852	5.43	17.68	11.59	0.77
Glen Mor 2	1826	PF 1	96.00	1112.00	1114.27	1114.27	1114.88	0.014121	6.25	15.35	12.89	1.01
Glen Mor 2	1766	PF 1	96.00	1112.00	1113.17		1113.44	0.007936	4.16	23.08	24.59	0.76
Glen Mor 2	1739	PF 1	96.00	1110.99	1113.14		1113.26	0.002458	2.84	33.77	25.44	0.43
Glen Mor 2	1696	PF 1	96.00	1110.83	1112.46	1112.46	1113.02	0.013832	6.01	15.96	14.31	1.00
Glen Mor 2	1633	PF 1	96.00	1108.00	1110.07		1110.25	0.002664	3.41	28.17	16.99	0.47
Glen Mor 2	1599	PF 1	96.00	1108.00	1109.45	1109.45	1110.04	0.013854	6.20	15.48	13.14	1.01
Glen Mor 2	1555	PF 1	96.00	1107.00	1108.59	1108.59	1109.17	0.013981	6.14	15.64	13.61	1.01
Glen Mor 2	1495	PF 1	96.00	1105.78	1107.45	1107.45	1108.12	0.014558	6.59	14.56	10.91	1.01
Glen Mor 2	1442	PF 1	96.00	1104.12	1105.76		1105.88	0.002655	2.86	33.58	27.49	0.46
Glen Mor 2	1379	PF 1	96.00	1103.00	1105.65		1105.79	0.001894	2.98	32.21	17.29	0.38
Glen Mor 2	1361	PF 1	96.00	1103.00	1104.82	1104.82	1105.64	0.015479	7.25	13.24	8.17	1.00
Glen Mor 2	1339	PF 1	96.00	1102.00	1103.54	1103.54	1104.16	0.013949	6.31	15.22	12.46	1.01
Glen Mor 2	1296	PF 1	96.00	1102.00	1103.34		1103.64	0.007234	4.40	21.84	18.99	0.72
Glen Mor 2	1258	PF 1	96.00	1101.00	1102.51	1102.51	1103.15	0.014567	6.41	14.98	11.84	1.00
Glen Mor 2	1223	PF 1	96.00	1100.00	1100.87	1100.86	1101.29	0.014325	5.17	18.59	21.74	0.98
Glen Mor 2	1186	PF 1	96.00	1099.00	1100.38	1100.38	1100.69	0.016572	4.49	21.40	35.55	1.02
Glen Mor 2	1134	PF 1	96.00	1098.00	1099.35	1099.35	1099.62	0.018156	4.20	22.90	46.61	1.04
Glen Mor 2	1086	PF 1	96.00	1096.00	1097.59	1097.59	1097.91	0.016207	4.79	22.15	34.38	1.01
Glen Mor 2	1044	PF 1	96.00	1094.77	1096.53	1096.53	1096.99	0.014964	5.43	17.67	19.43	1.00
Glen Mor 2	997	PF 1	96.00	1094.00	1094.97		1095.21	0.007133	3.91	24.55	26.48	0.72
Glen Mor 2	963	PF 1	96.00	1093.00	1094.50	1094.50	1094.89	0.015571	4.98	19.27	25.57	1.01
Glen Mor 2	935	PF 1	96.00	1092.00	1093.45	1093.45	1093.87	0.014822	5.21	18.43	22.19	1.01
Glen Mor 2	886	PF 1	96.00	1091.00	1092.43	1092.43	1092.87	0.014779	5.31	18.07	20.97	1.01
Glen Mor 2	849	PF 1	96.00	1090.00	1091.19	1091.19	1091.57	0.014566	4.93	19.45	25.78	1.00
Glen Mor 2	816	PF 1	96.00	1089.00	1090.03	1090.03	1090.36	0.015565	4.59	20.93	32.64	1.01
Glen Mor 2	790	PF 1	96.00	1088.00	1089.11	1089.11	1089.43	0.015765	4.49	21.40	34.83	1.01
Glen Mor 2	764	PF 1	96.00	1087.79	1088.48	1088.48	1088.74	0.016920	4.08	23.51	46.48	1.01
Glen Mor 2	712	PF 1	96.00	1086.35	1087.29	1087.29	1087.59	0.015882	4.45	21.56	35.70	1.01
Glen Mor 2	582	PF 1	96.00	1084.00	1084.48	1084.48	1084.69	0.008514	3.69	25.98	61.00	1.00
Glen Mor 2	459	PF 1	96.00	1079.30	1080.03		1080.12	0.004508	2.37	40.53	67.54	0.54
Glen Mor 2	330	PF 1	96.00	1076.00	1080.09		1080.09	0.000006	0.29	356.16	105.83	0.03
Glen Mor 2	293	PF 1	96.00	1077.00	1080.08	1077.53	1080.09	0.000028	0.53	204.13	92.33	0.05
Glen Mor 2	272		Culvert									
Glen Mor 2	251	PF 1	96.00	1073.00	1073.76	1073.76	1074.11	0.015019	4.78	20.09	28.47	1.00
Glen Mor 2	212	PF 1	96.00	1071.40	1072.11	1072.11	1072.31	0.018118	3.66	26.34	66.59	1.01
Glen Mor 2	100	PF 1	96.00	1068.70	1069.28	1069.28	1069.48	0.016841	3.66	27.21	70.71	0.98

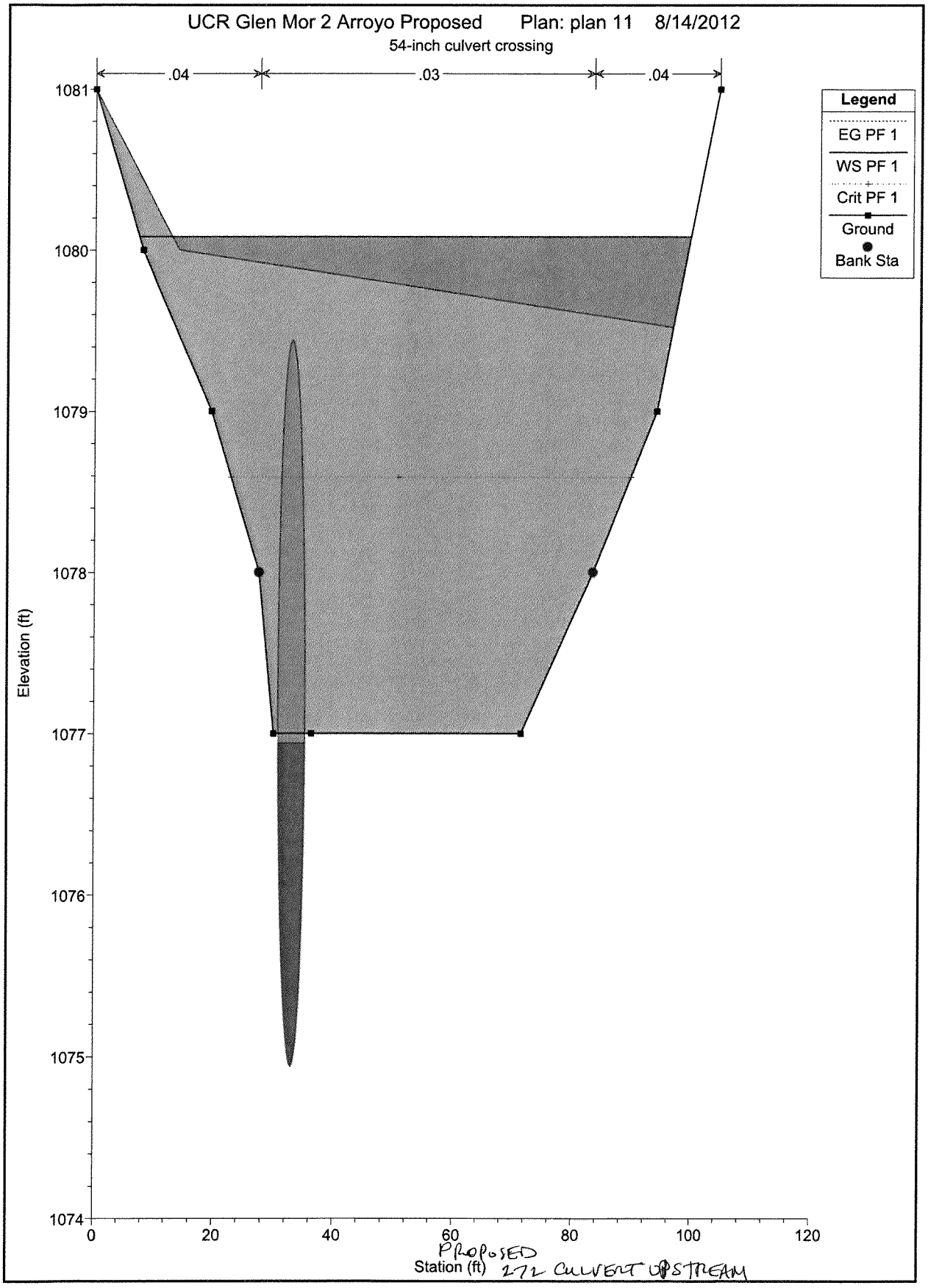
EXISTING PROFILE
OUTPUT TABLE

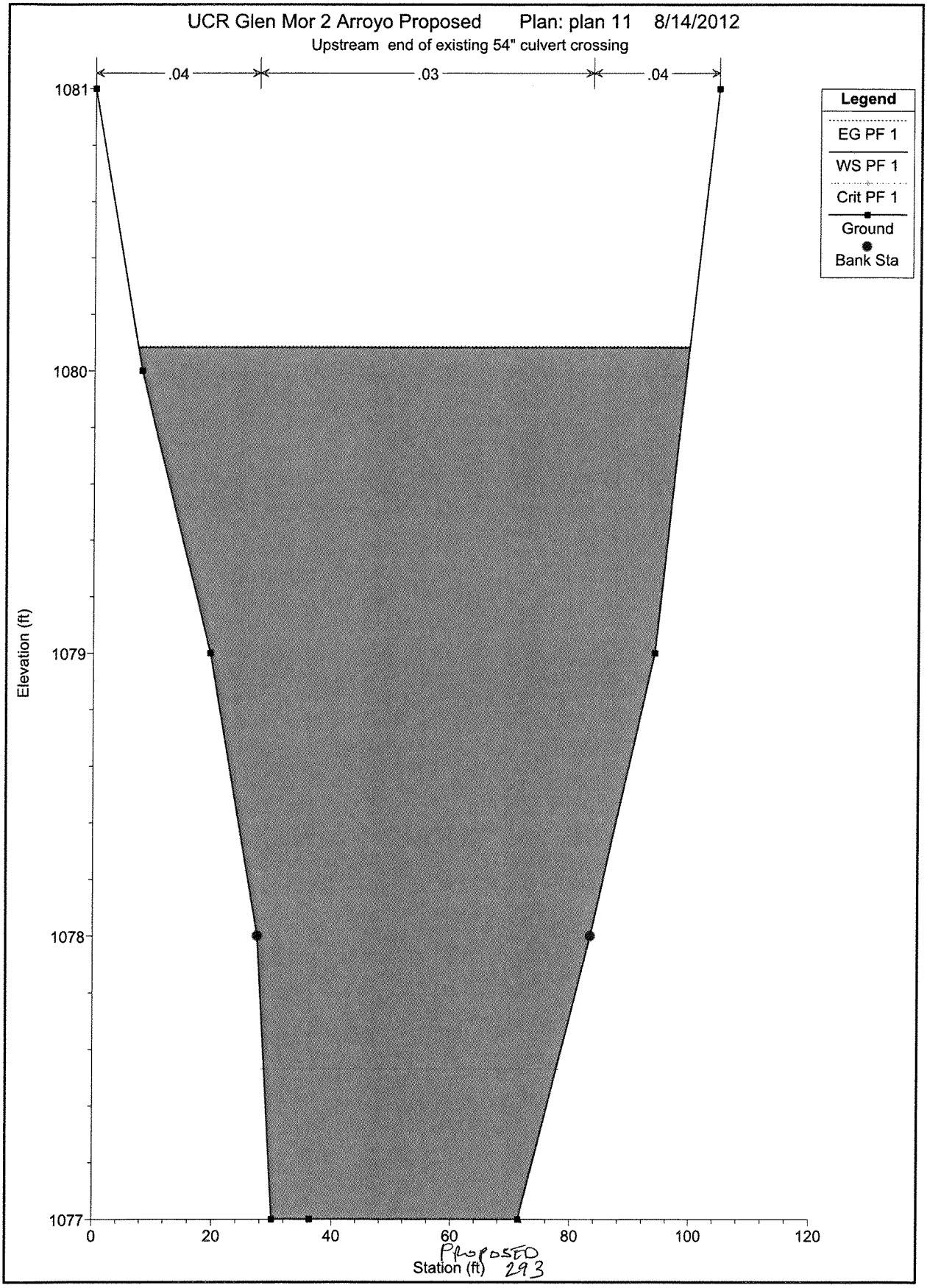

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1080
1078
1076
1074
1072
1070
1068
0
20
40
60
80
100
120
140
Station (ft)
PROPOSED
100

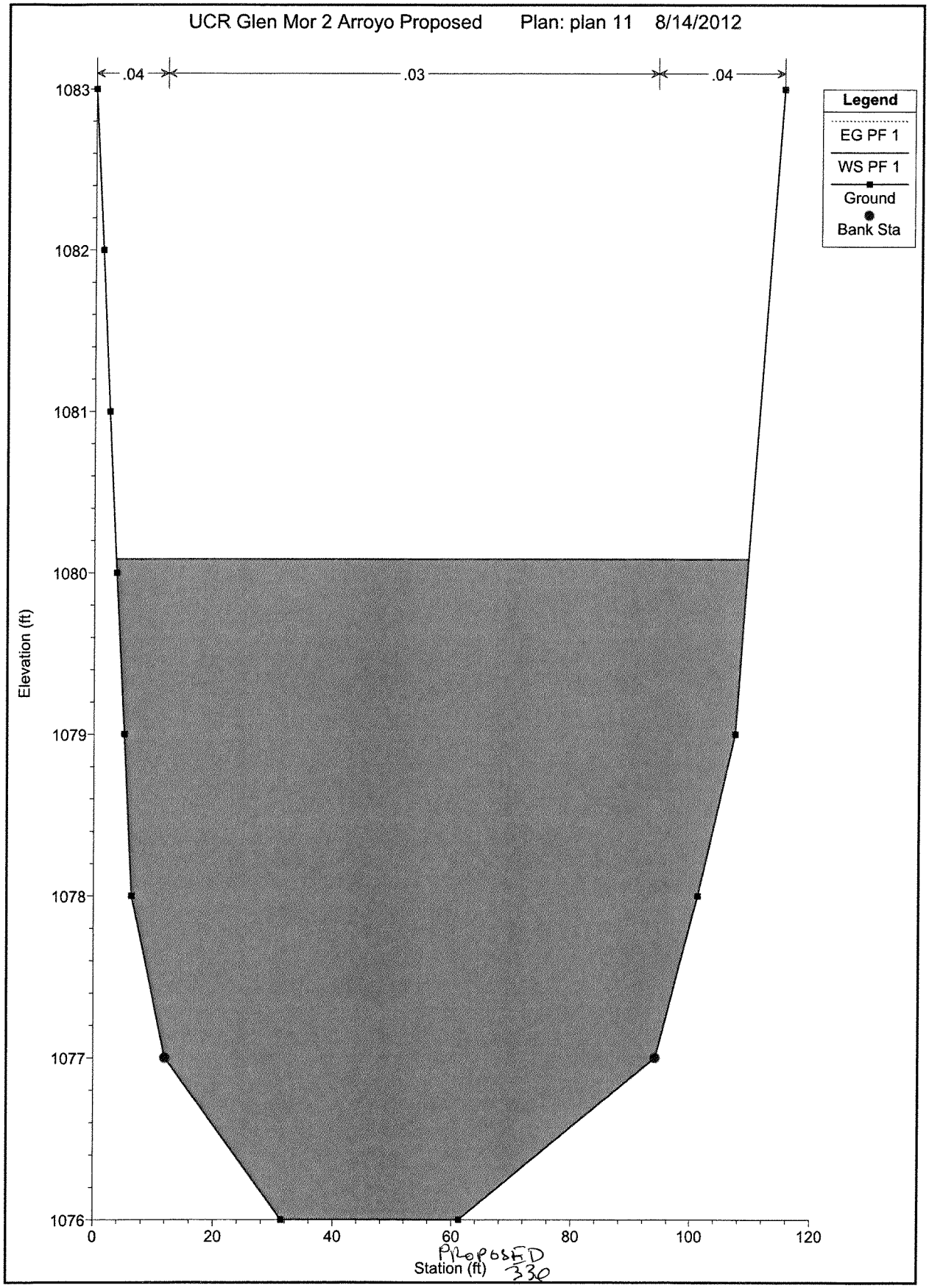

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1080
1078
1076
1074
1072
1070
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)
PROPOSED
212

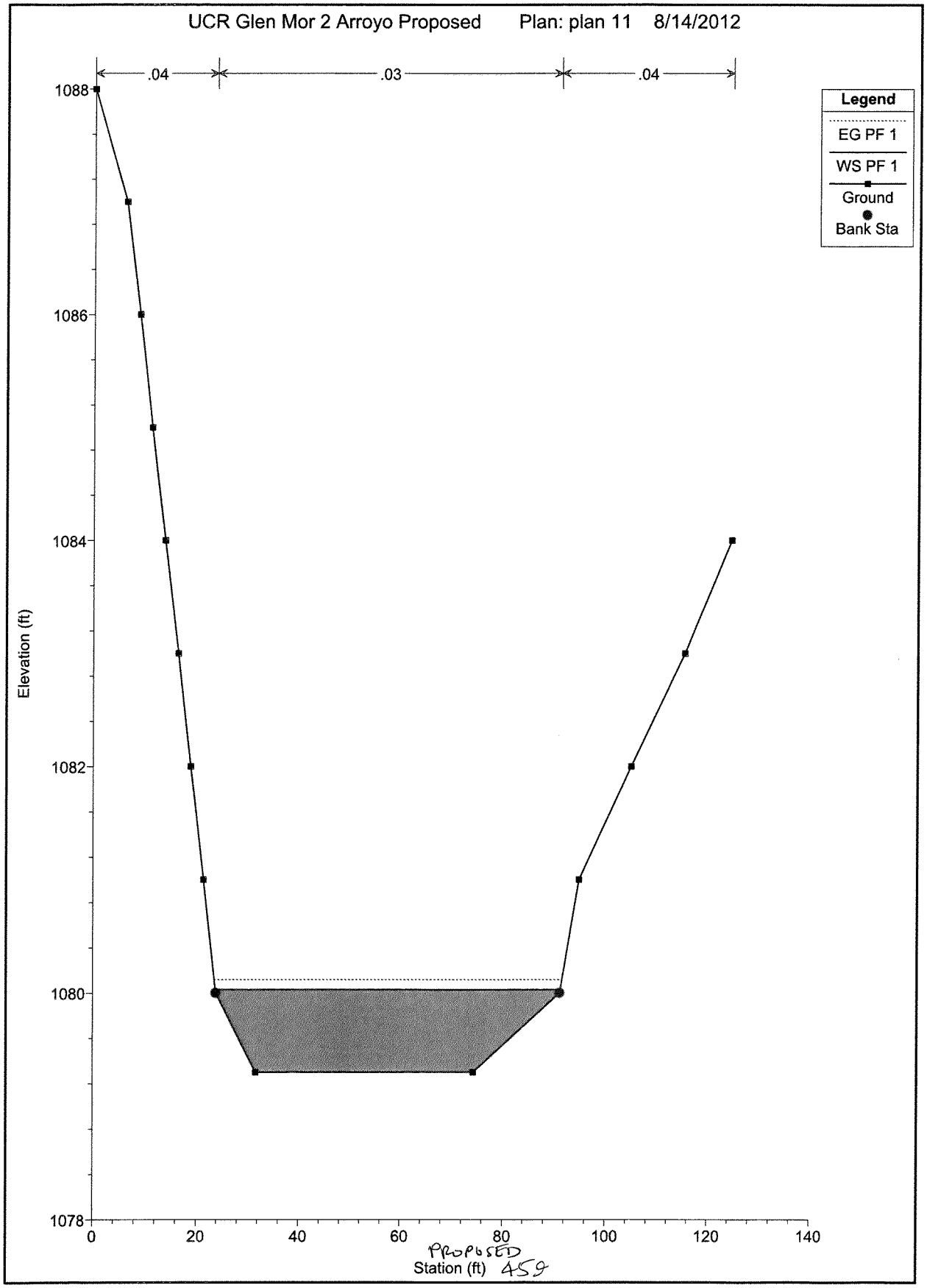

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
Downstream end of existing 54" culvert crossing
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1082
1080
1078
1076
1074
1072
0
20
40
60
80
100
Station (ft)
PROPOSED
25'

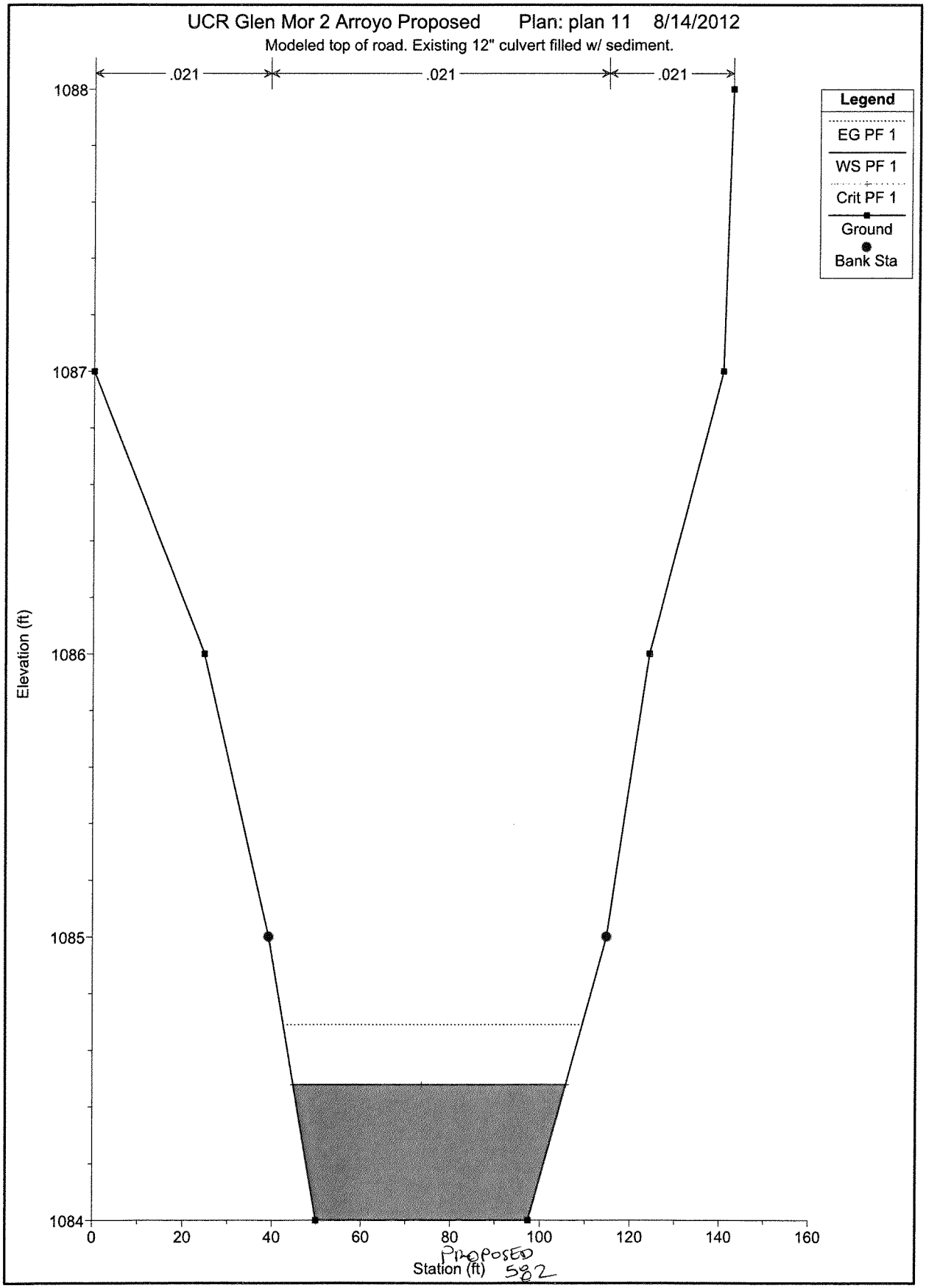

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
54-inch culvert crossing
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1082
1080
1078
1076
1074
1072
1070
0
20
40
60
80
100
Station (ft)
PROPOSED 72" CULVERT DOWNSTREAM

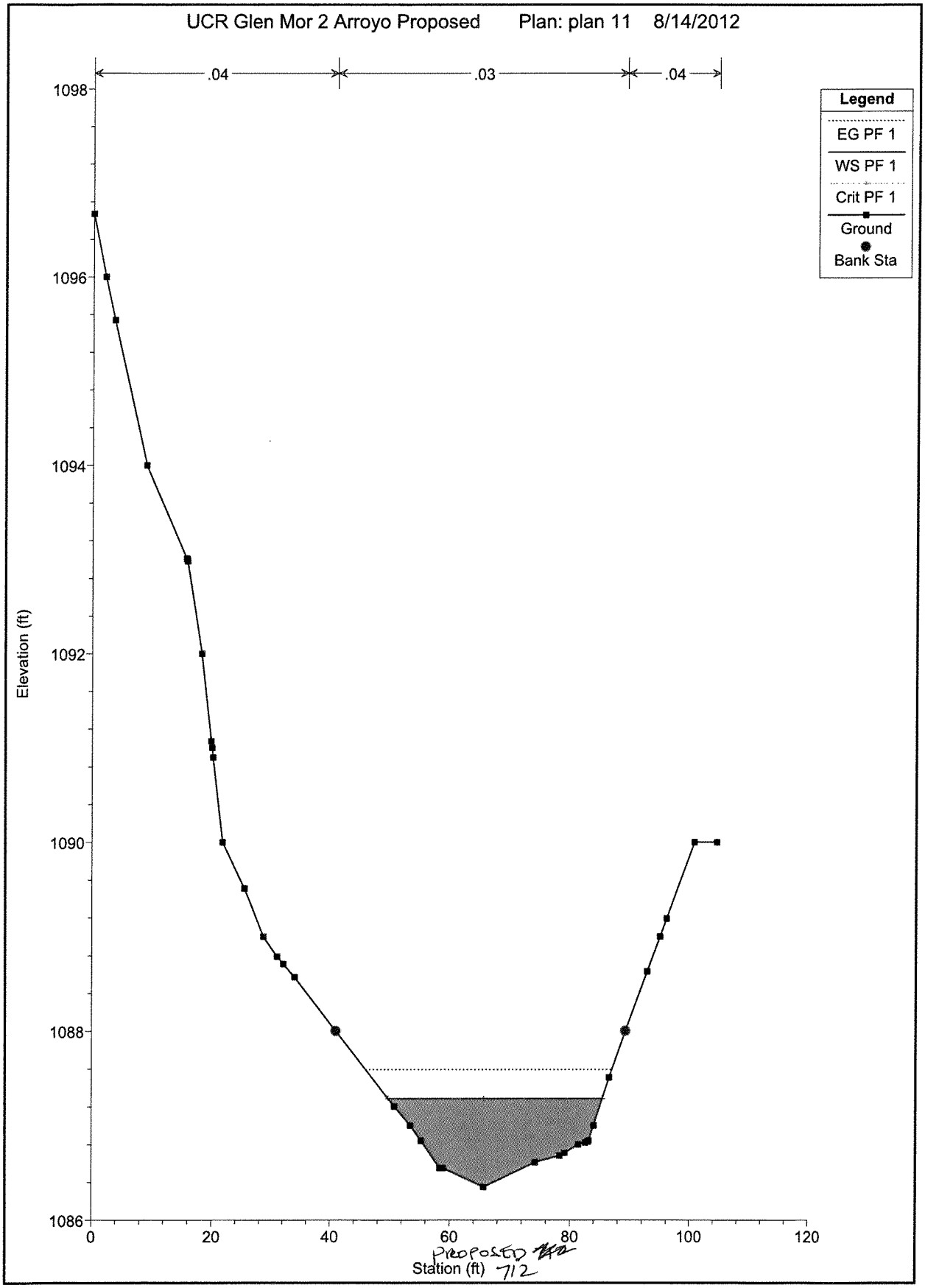

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
54-inch culvert crossing
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1081
1080
1079
1078
1077
1076
1075
1074
0
20
40
60
80
100
120
Station (ft)
PROPOSED 72 CULVERT UPSTREAM

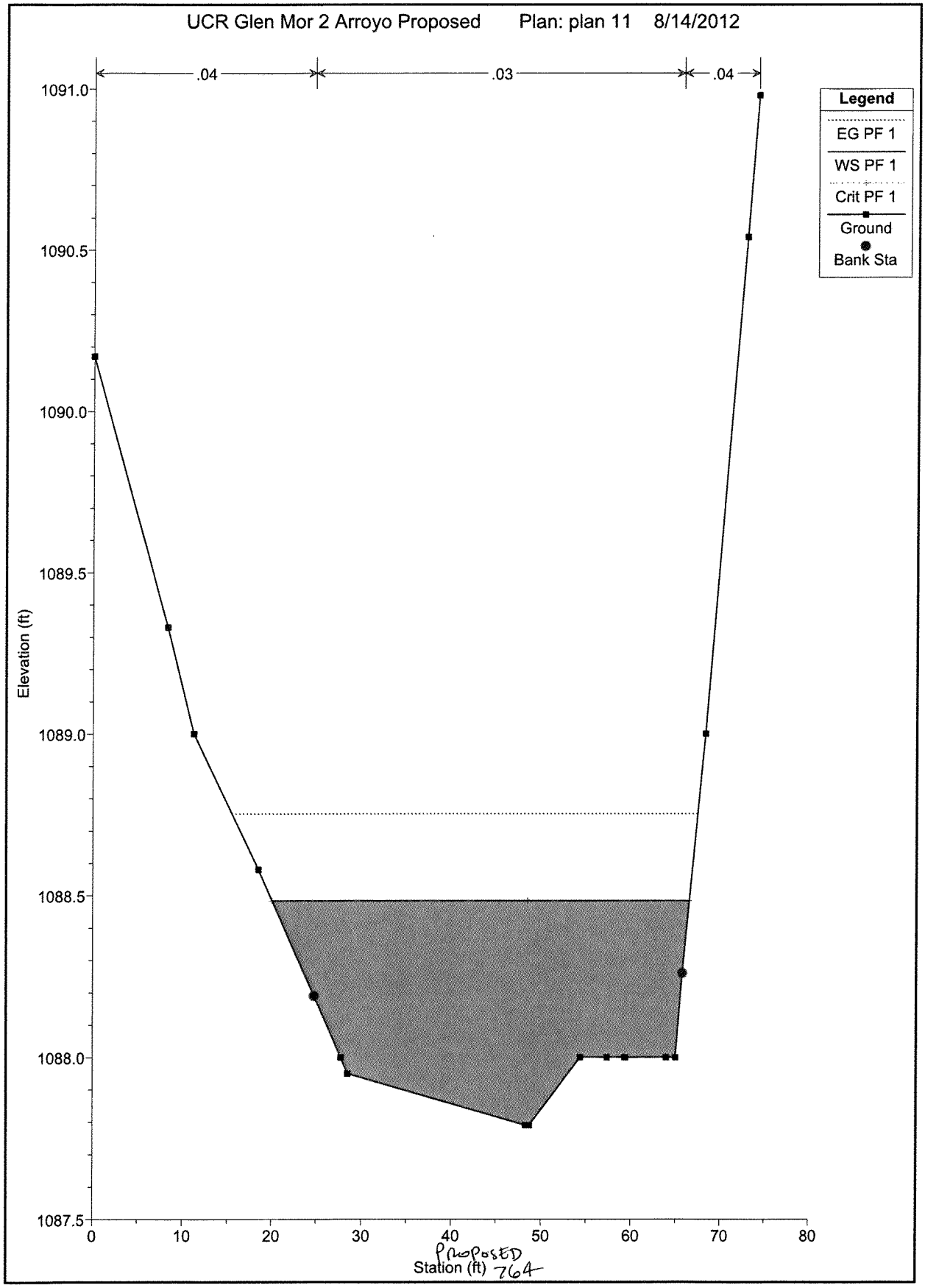

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
Upstream end of existing 54" culvert crossing
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1081
1080
1079
1078
1077
0
20
40
60
80
100
120
Station (ft)
PROPOSED
293

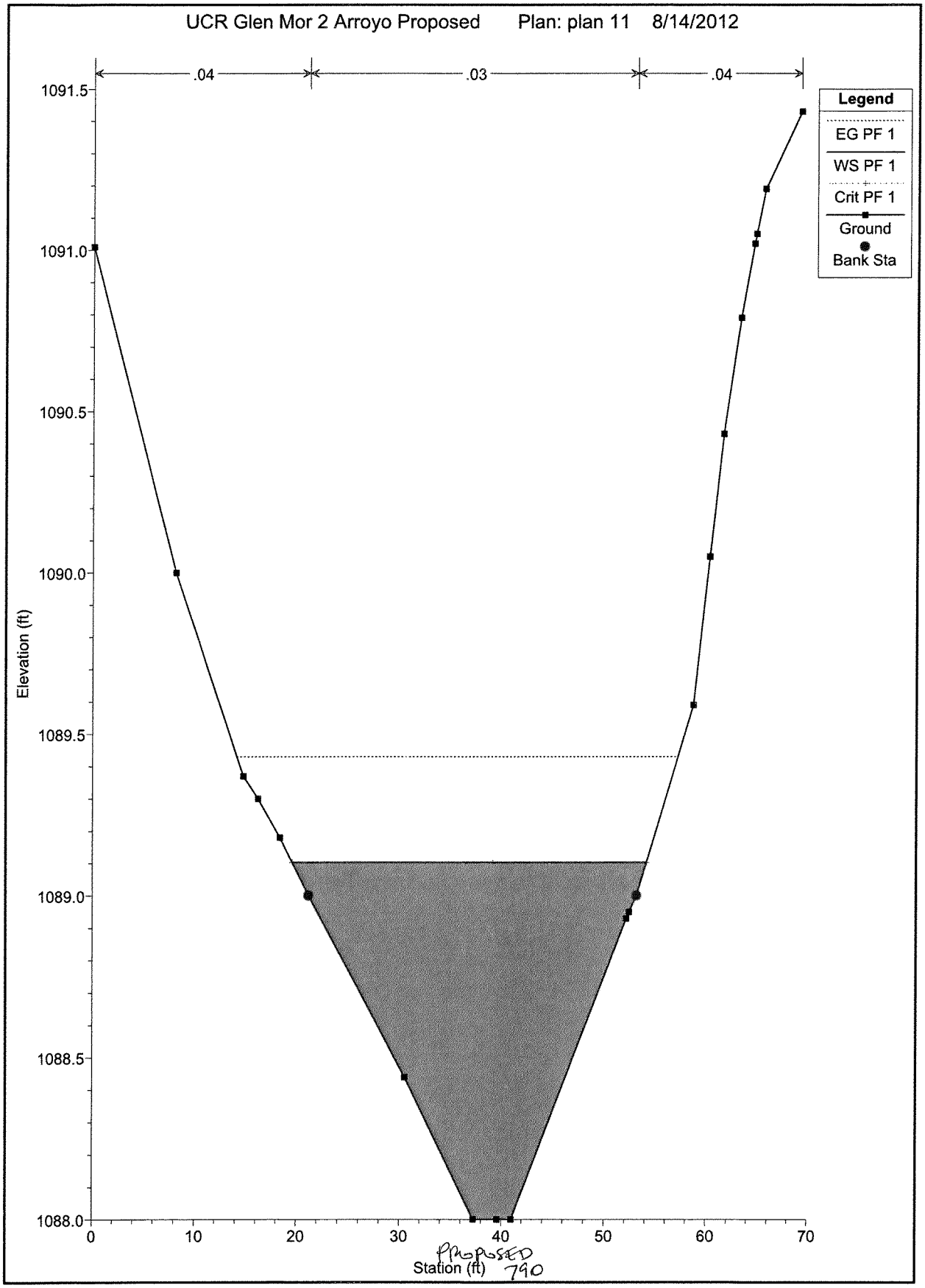

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1083
1082
1081
1080
1079
1078
1077
1076
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)
PROPOSED
330

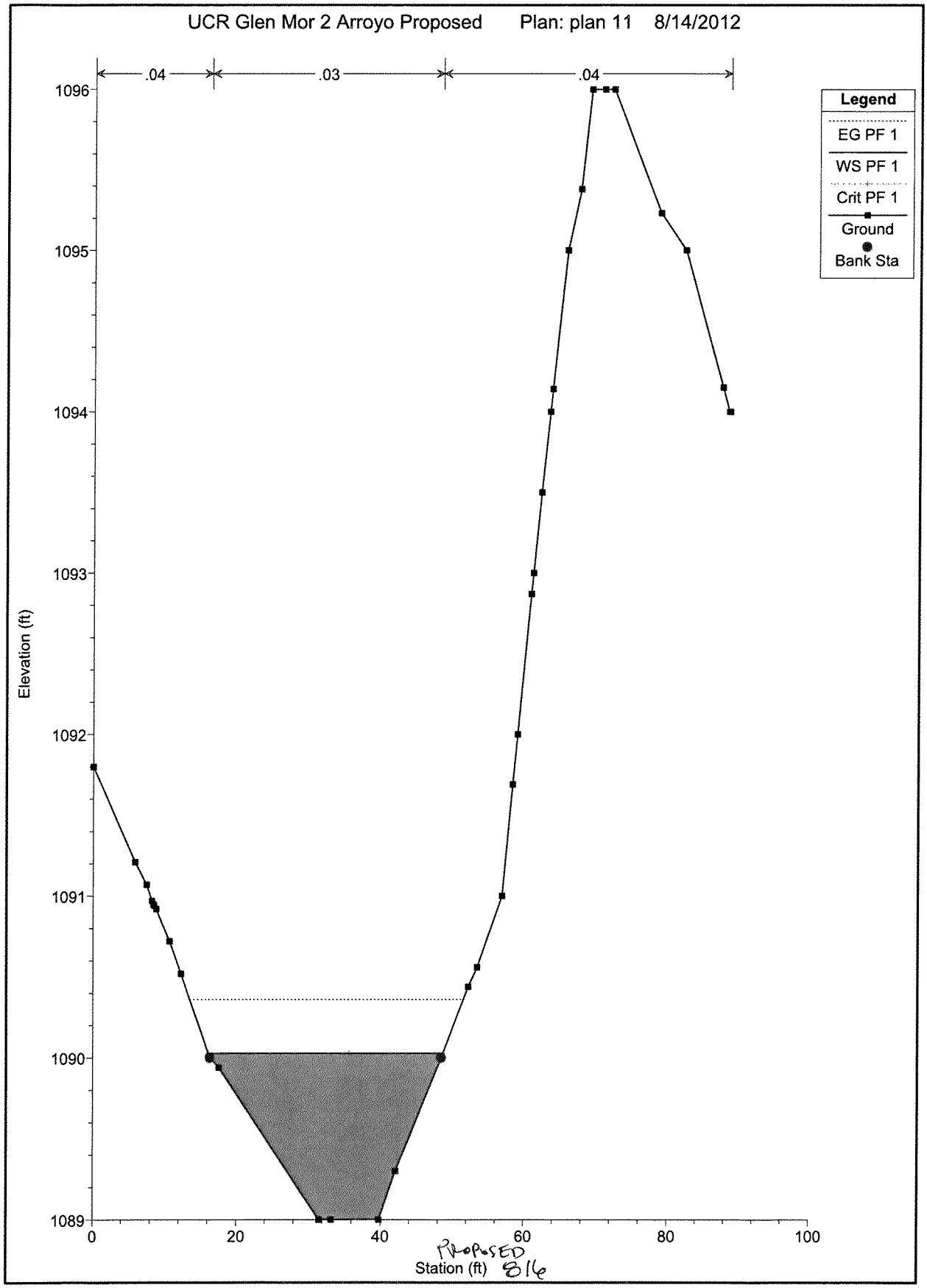

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1088
1086
1084
1082
1080
1078
0
20
40
60
80
100
120
140
Station (ft)
PROPOSED
459

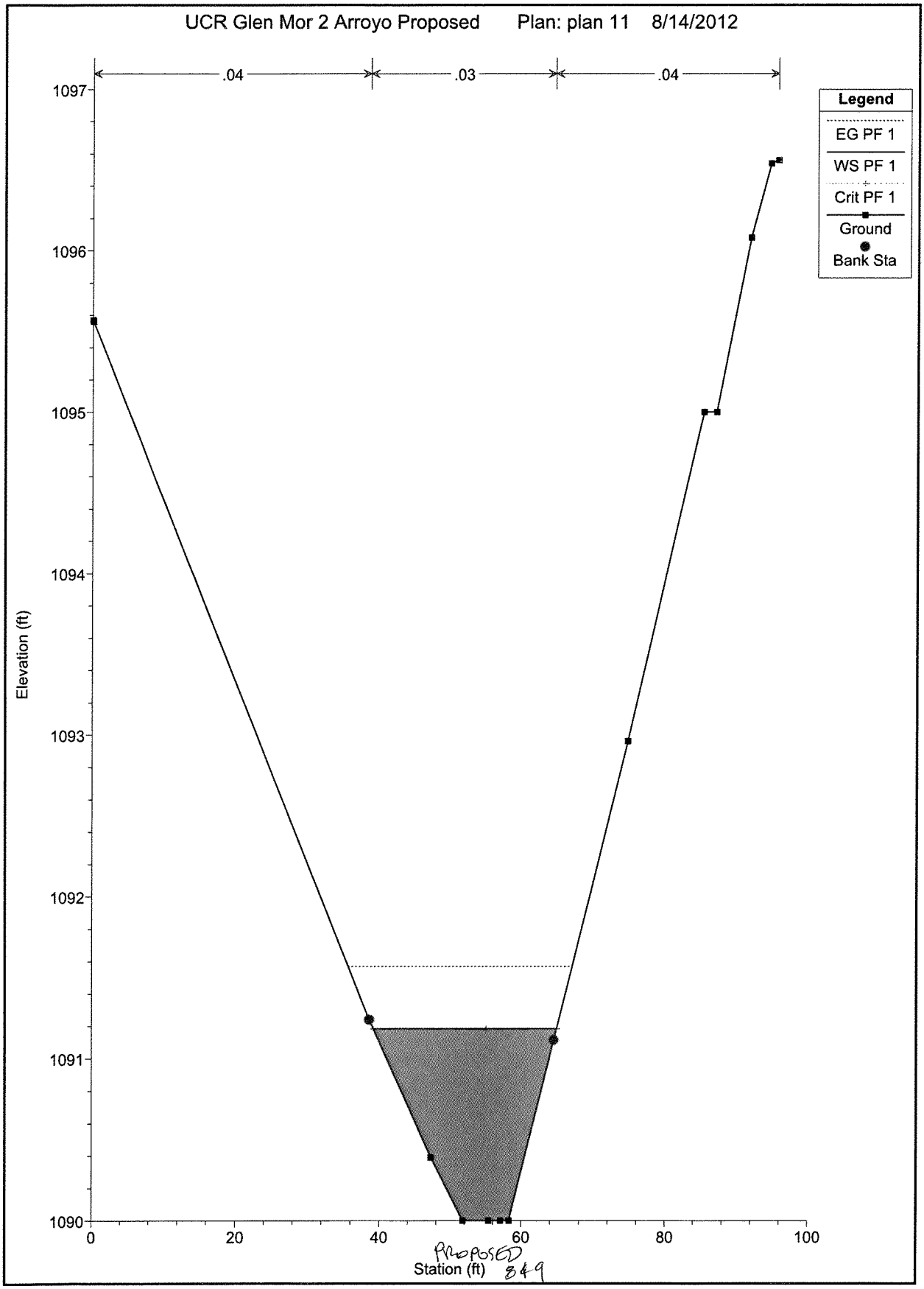

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
Modeled top of road. Existing 12" culvert filled w/ sediment.
.021
.021
.021
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1088
1087
1086
1085
1084
0
20
40
60
80
100
120
140
160
Station (ft)
PROPOSED
582

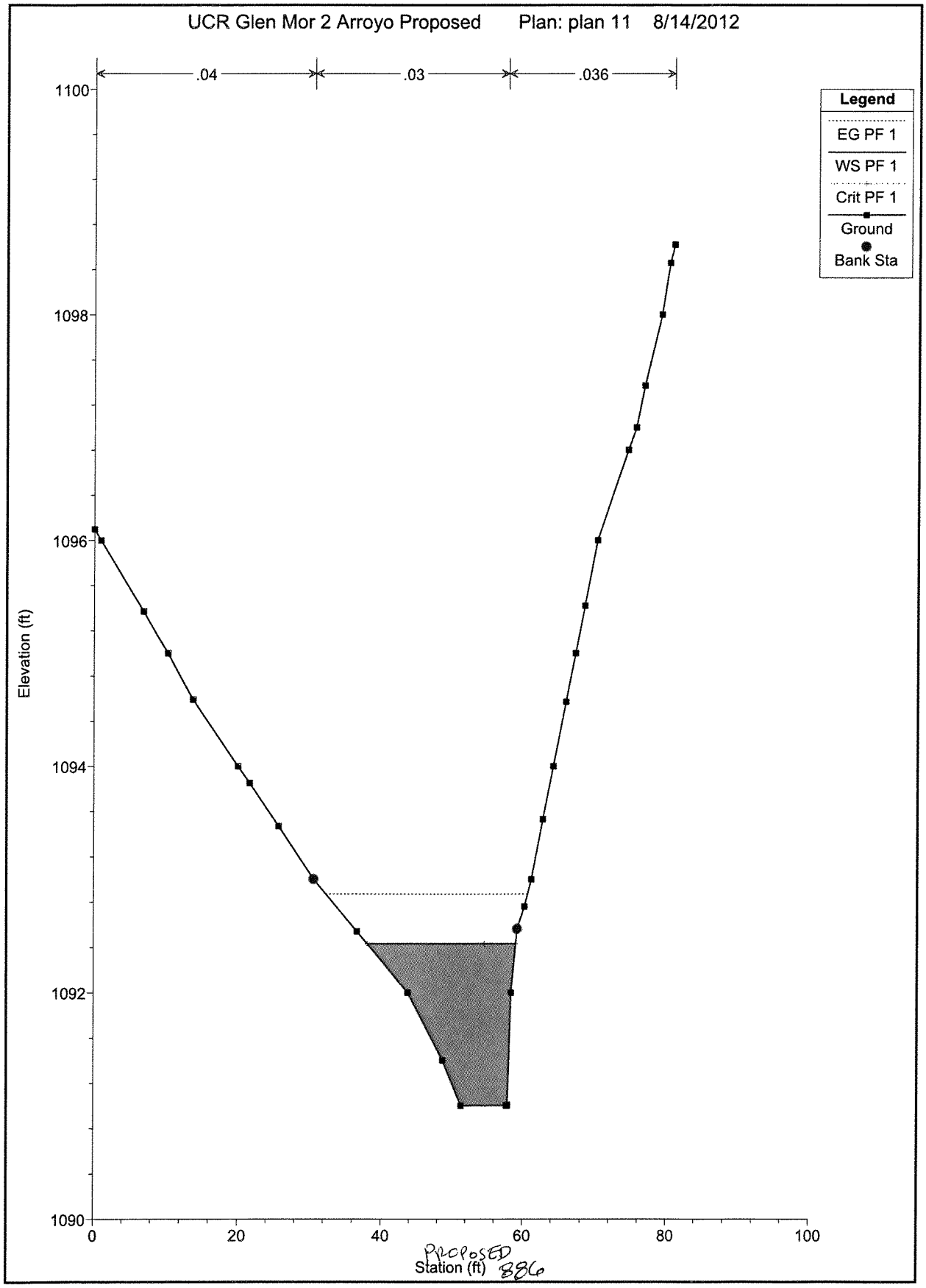

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1098
1096
1094
1092
1090
1088
1086
0
20
40
60
80
100
120
Station (ft)
PROPOSED
7/2

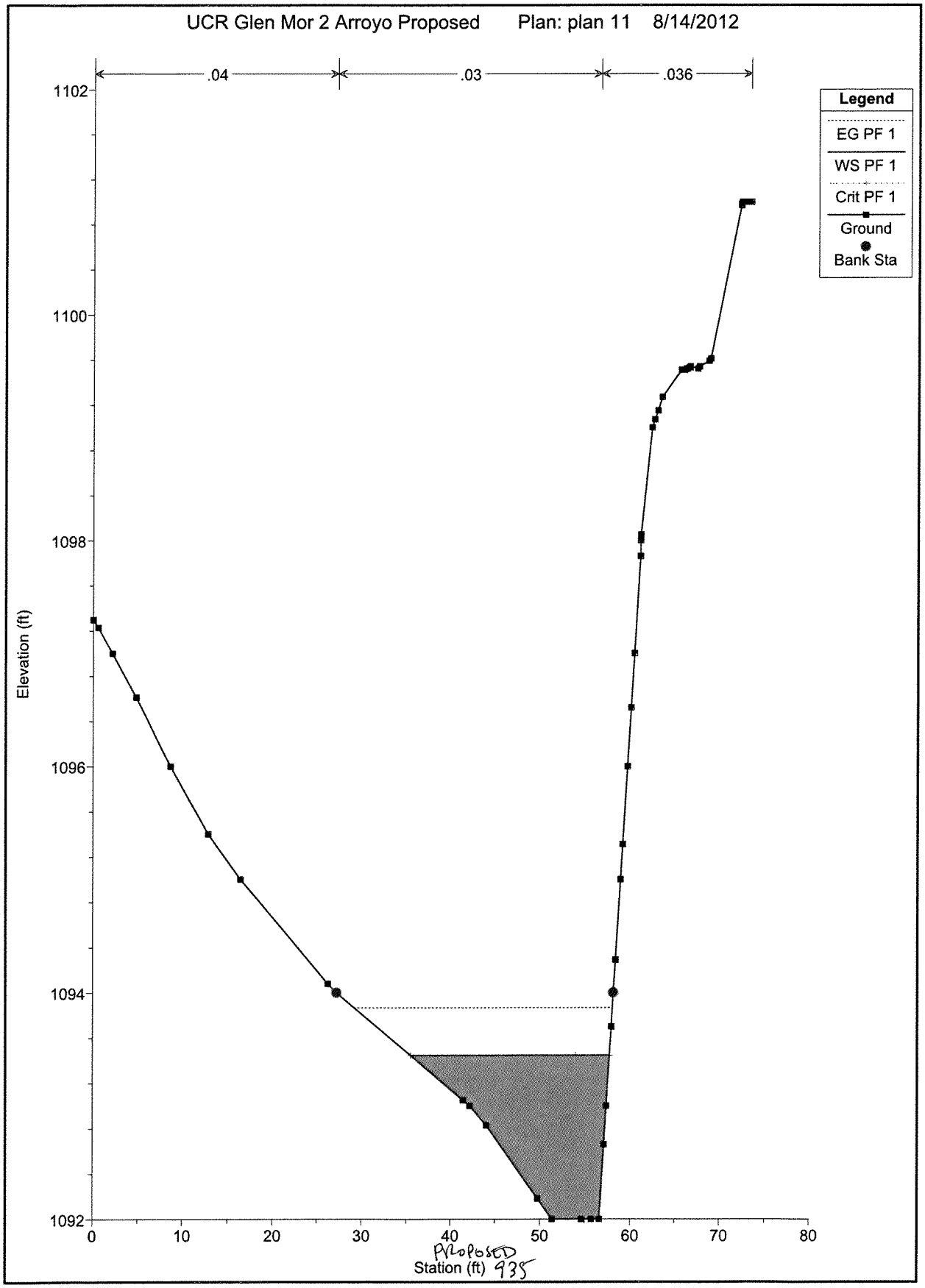

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1091.0
1090.5
1090.0
1089.5
1089.0
1088.5
1088.0
1087.5
Elevation (ft)
0
10
20
30
40
50
60
70
80
Station (ft)
PROPOSED
764

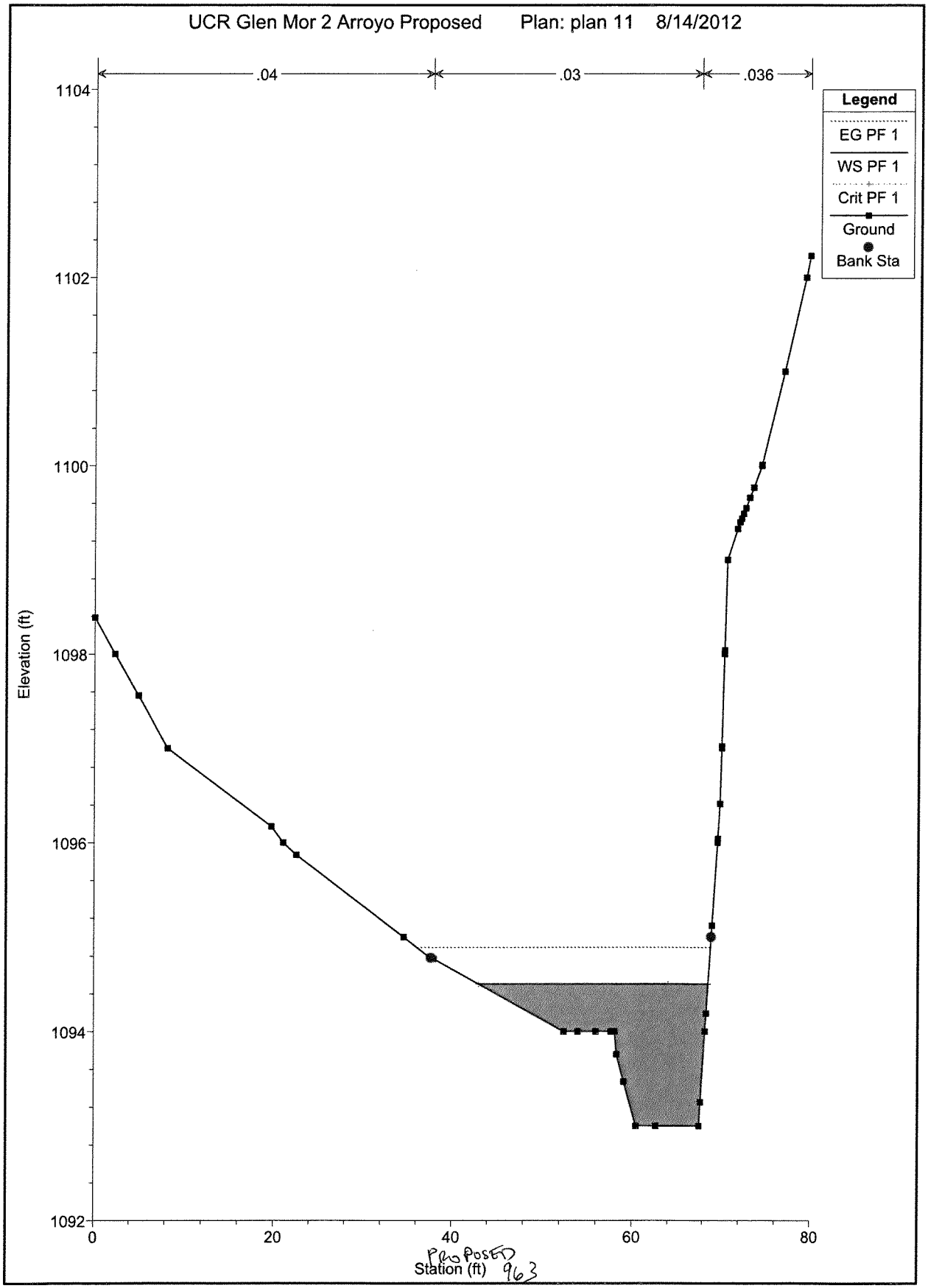

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1091.5
1091.0
1090.5
1090.0
1089.5
1089.0
1088.5
1088.0
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED
790

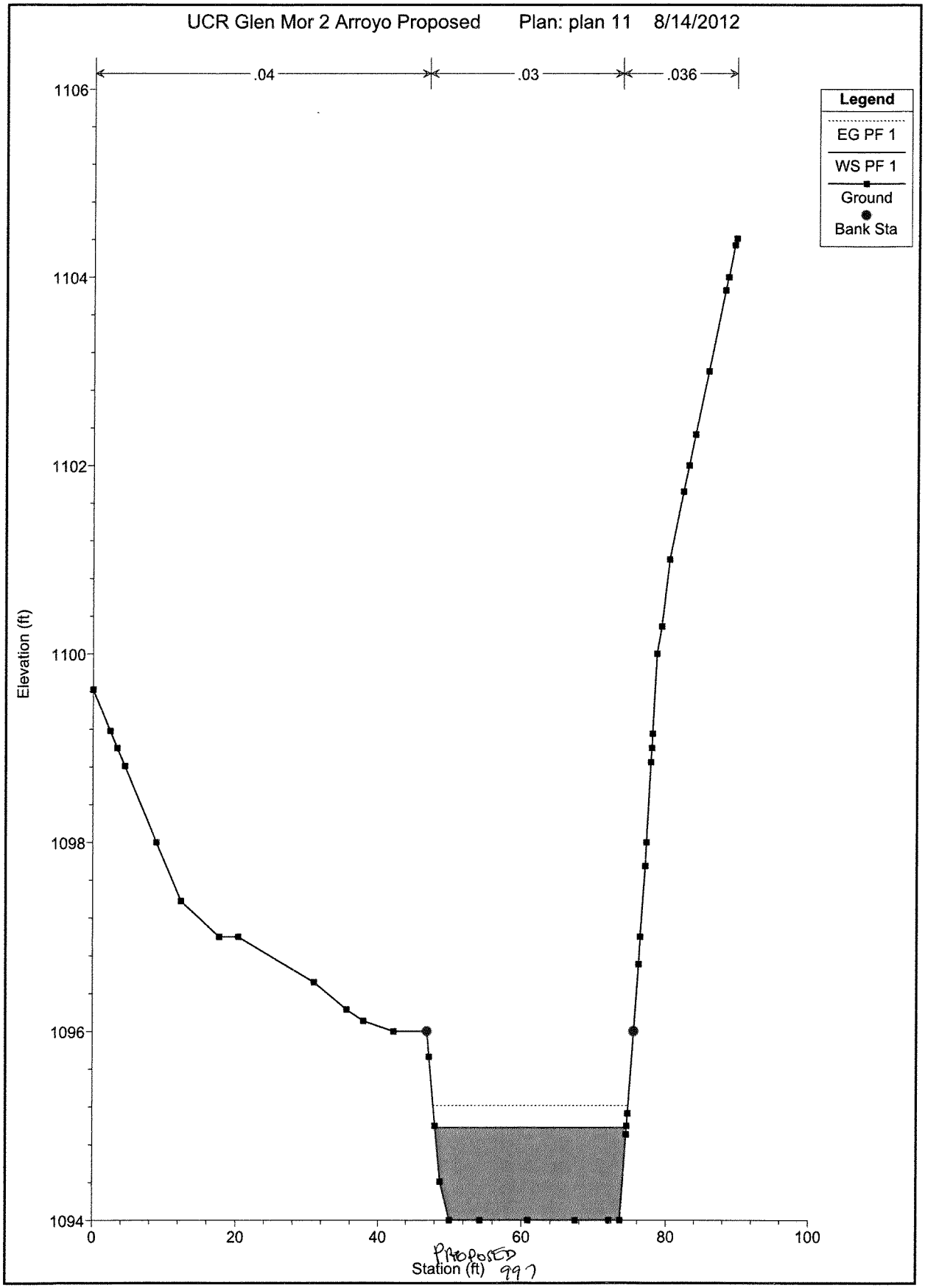

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1096
1095
1094
1093
1092
1091
1090
1089
0
20
40
60
80
100
Station (ft)
PROPOSED
8/16

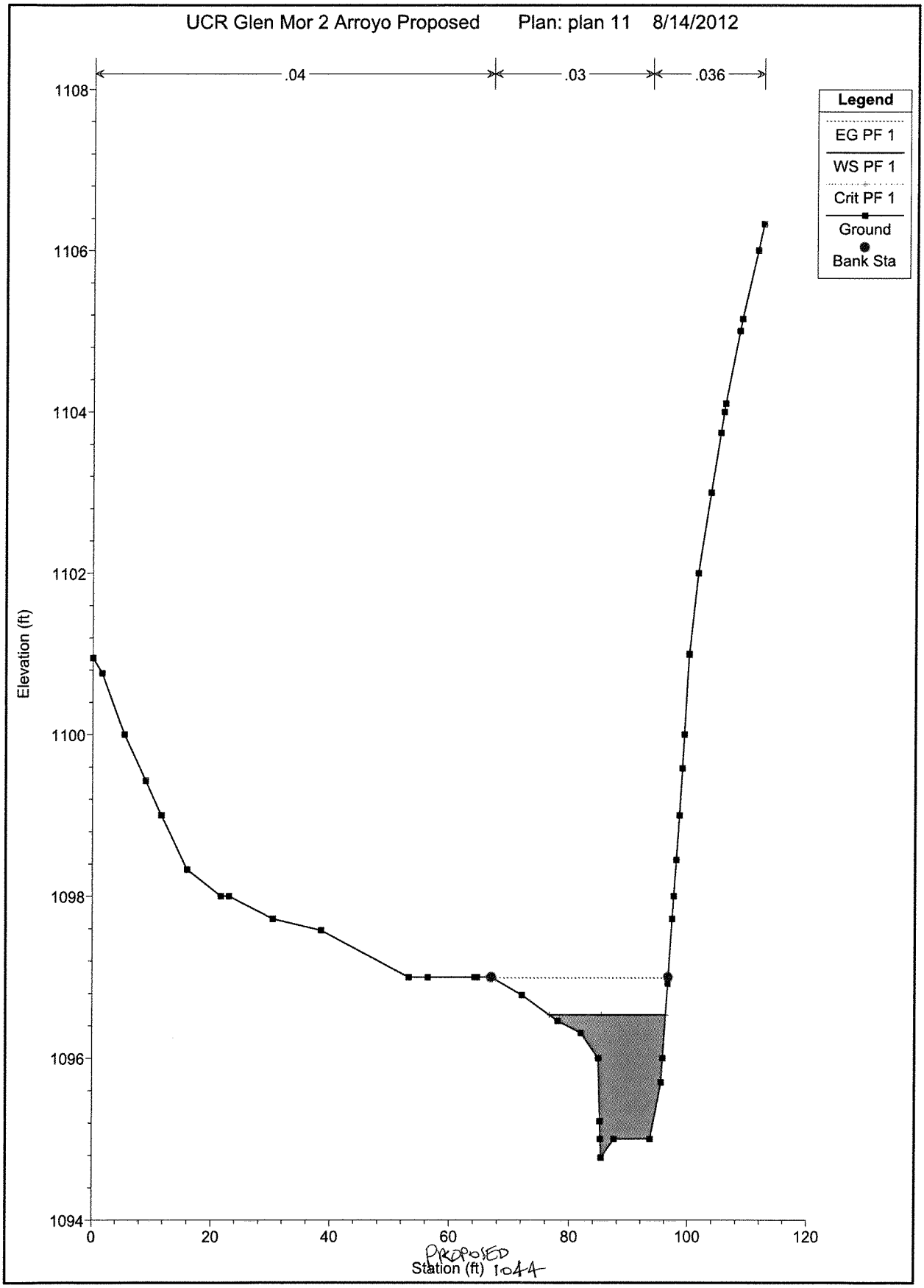

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1097
1096
1095
1094
1093
1092
1091
1090
0
20
40
60
80
100
Station (ft)
PROPOSED
8+9

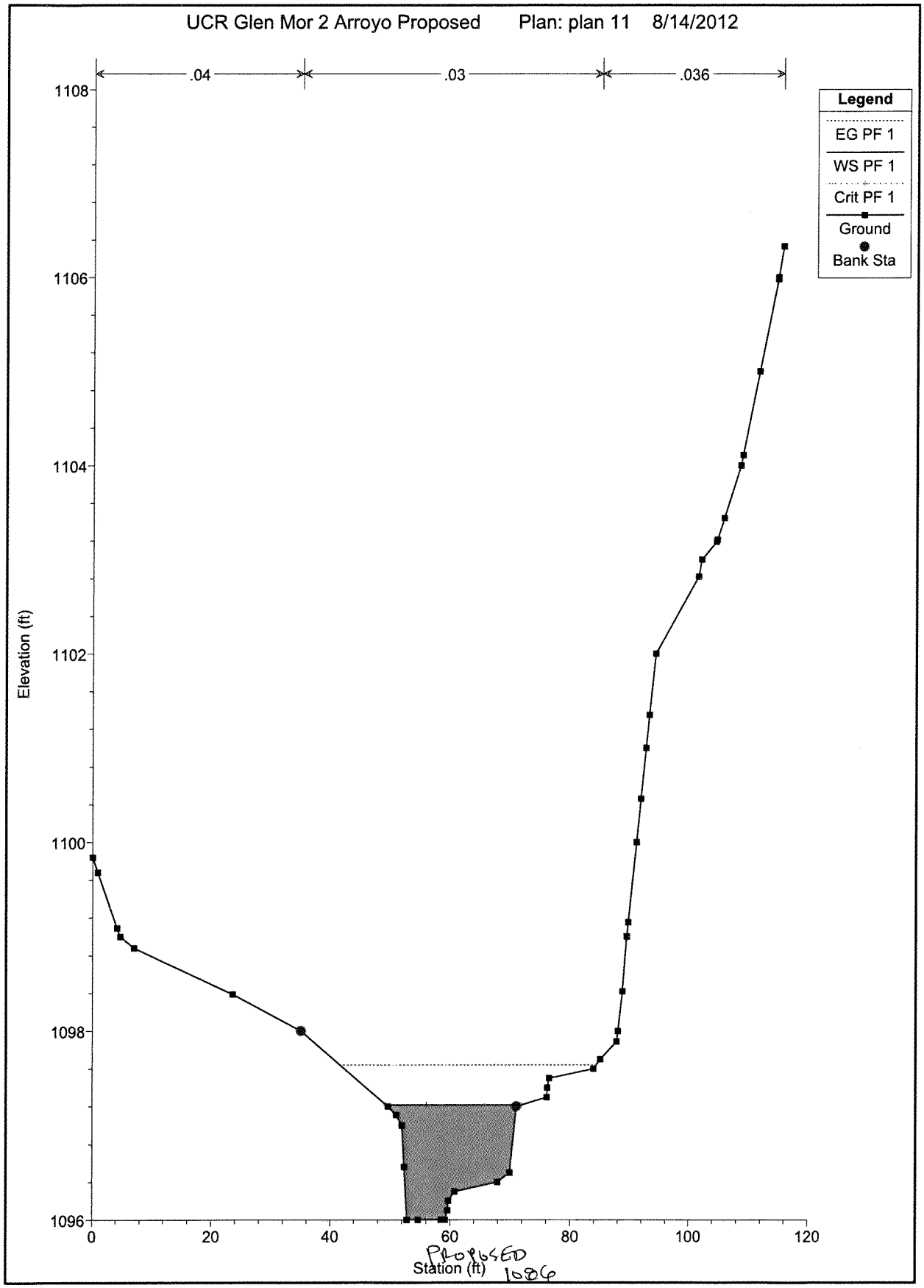

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1100
1098
1096
1094
1092
1090
Elevation (ft)
0
20
40
60
80
100
Station (ft)
PROPOSED
886

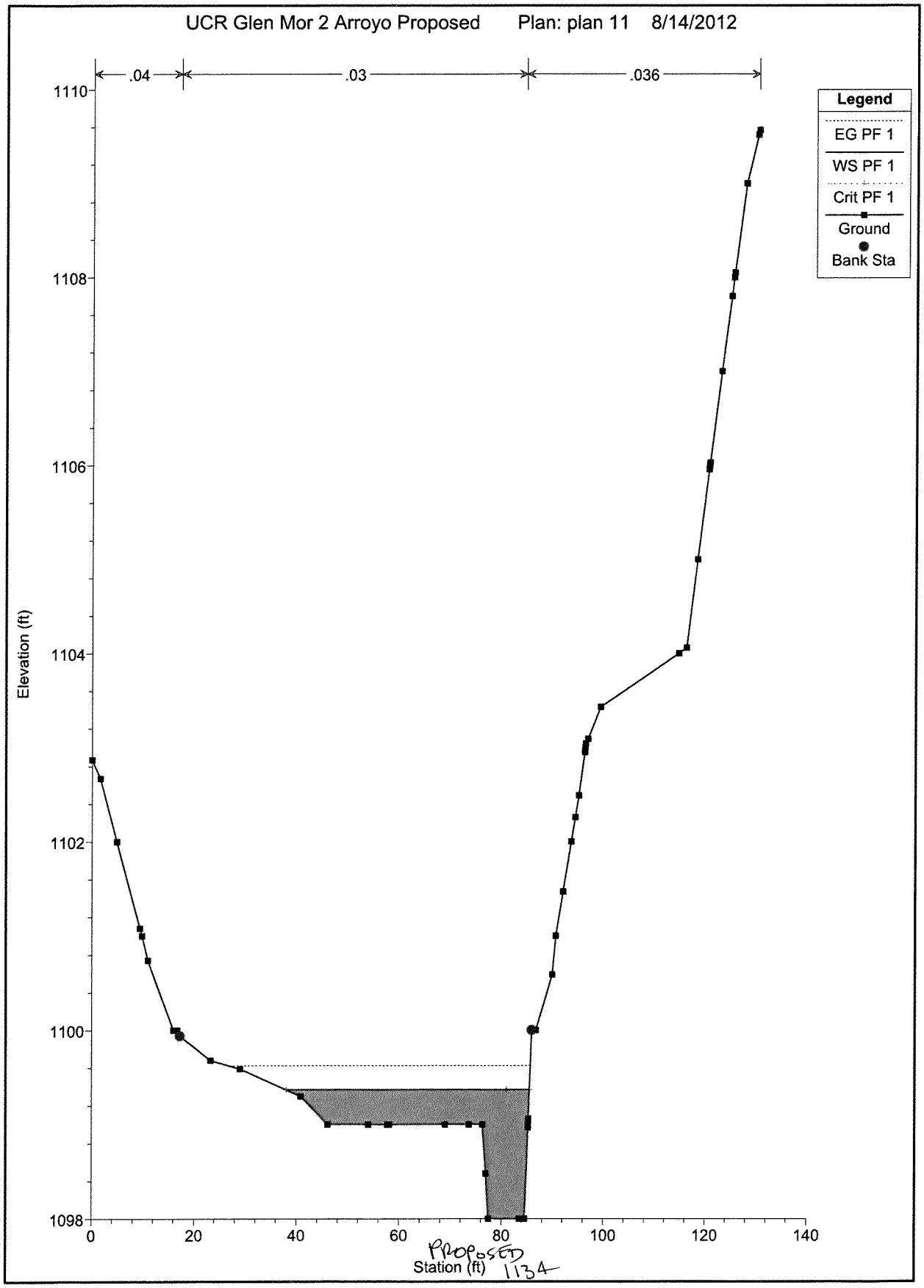

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1102
1100
1098
1096
1094
1092
0
10
20
30
40
50
60
70
80
Station (ft)
PROPOSED
935

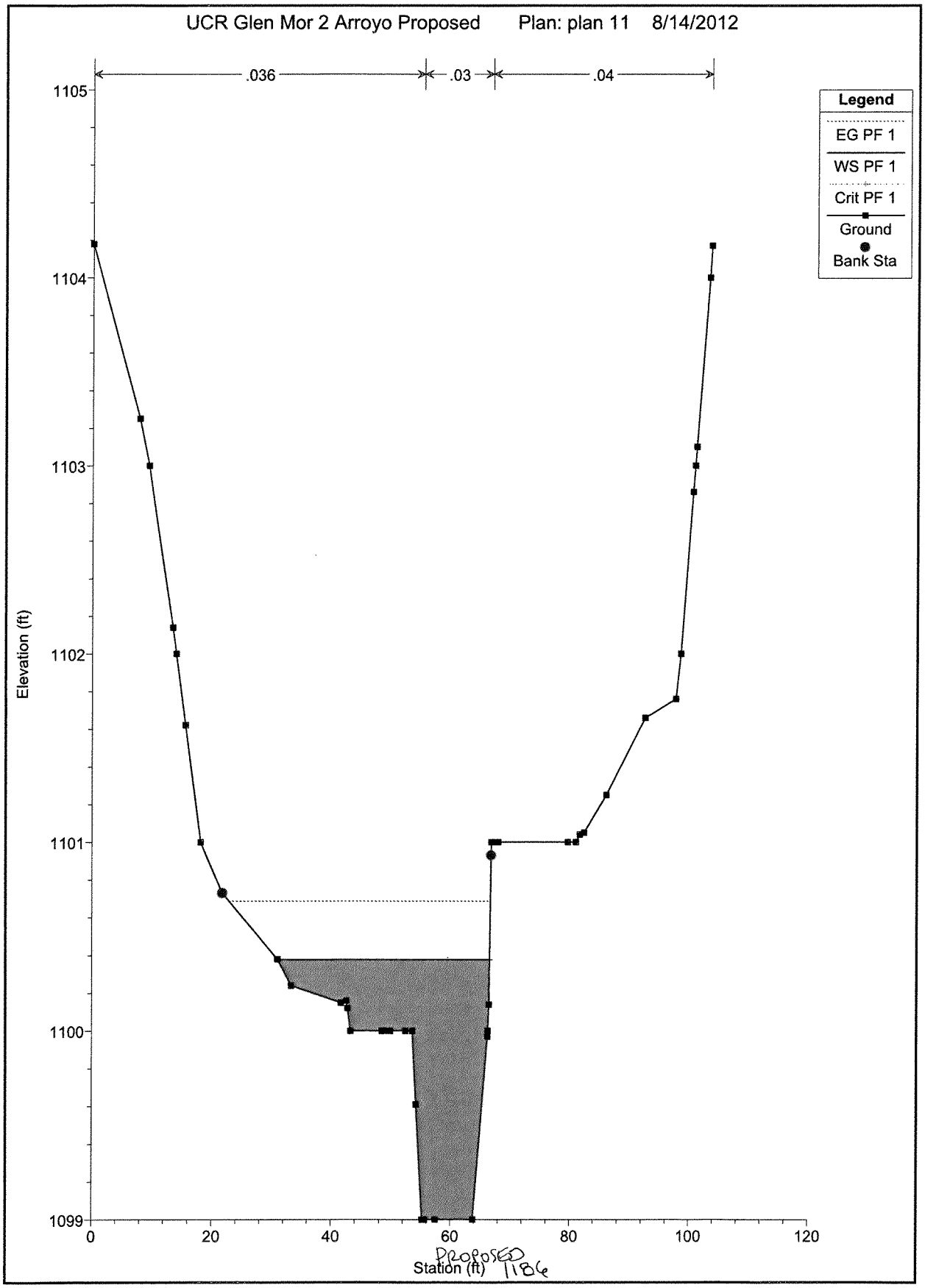

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1104
1102
1100
1098
1096
1094
1092
0
20
40
60
80
Station (ft)
PROPOSED
963

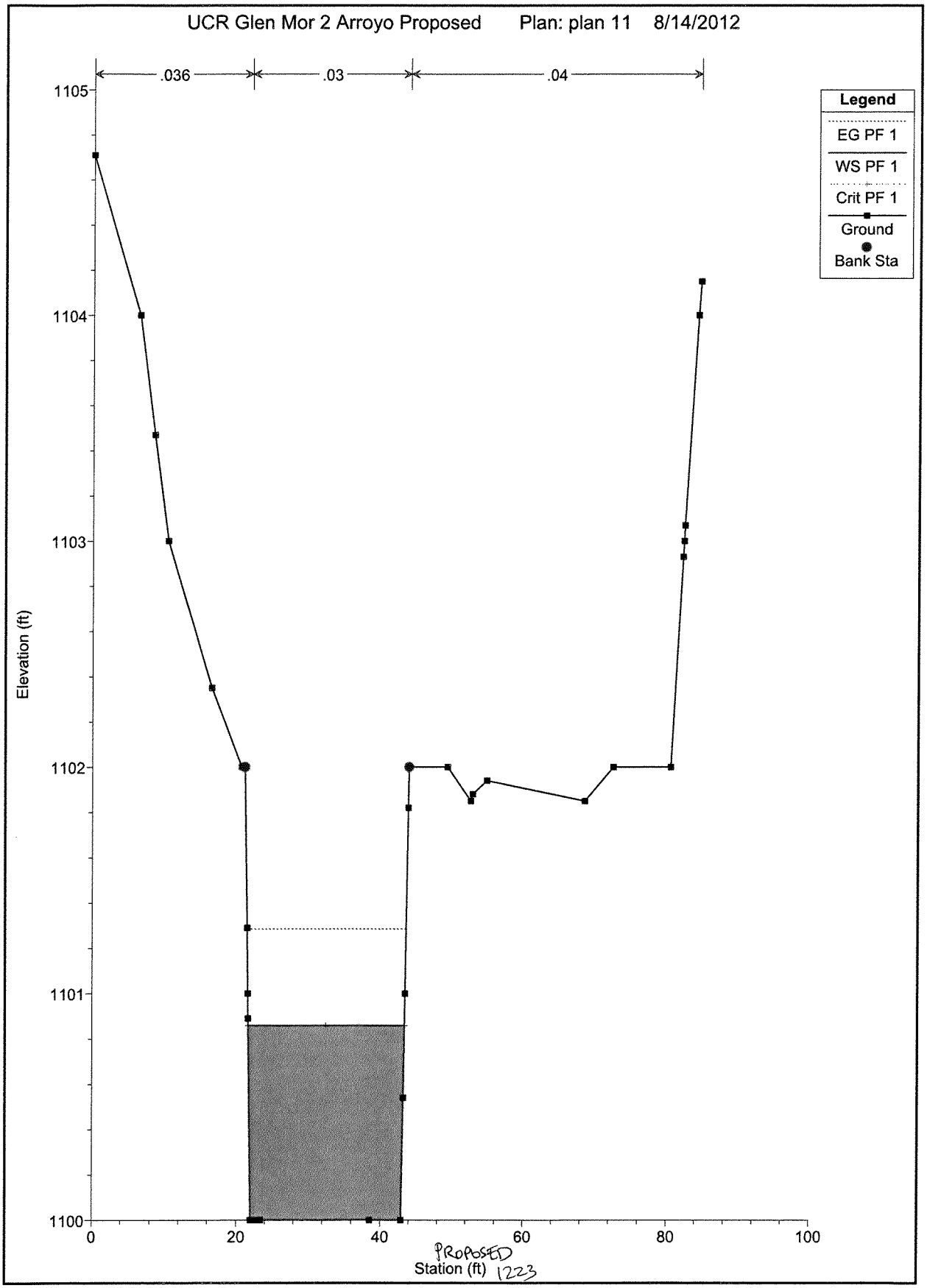

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1106
1104
1102
1100
1098
1096
1094
0
20
40
60
80
100
Station (ft)
PROPOSED
997

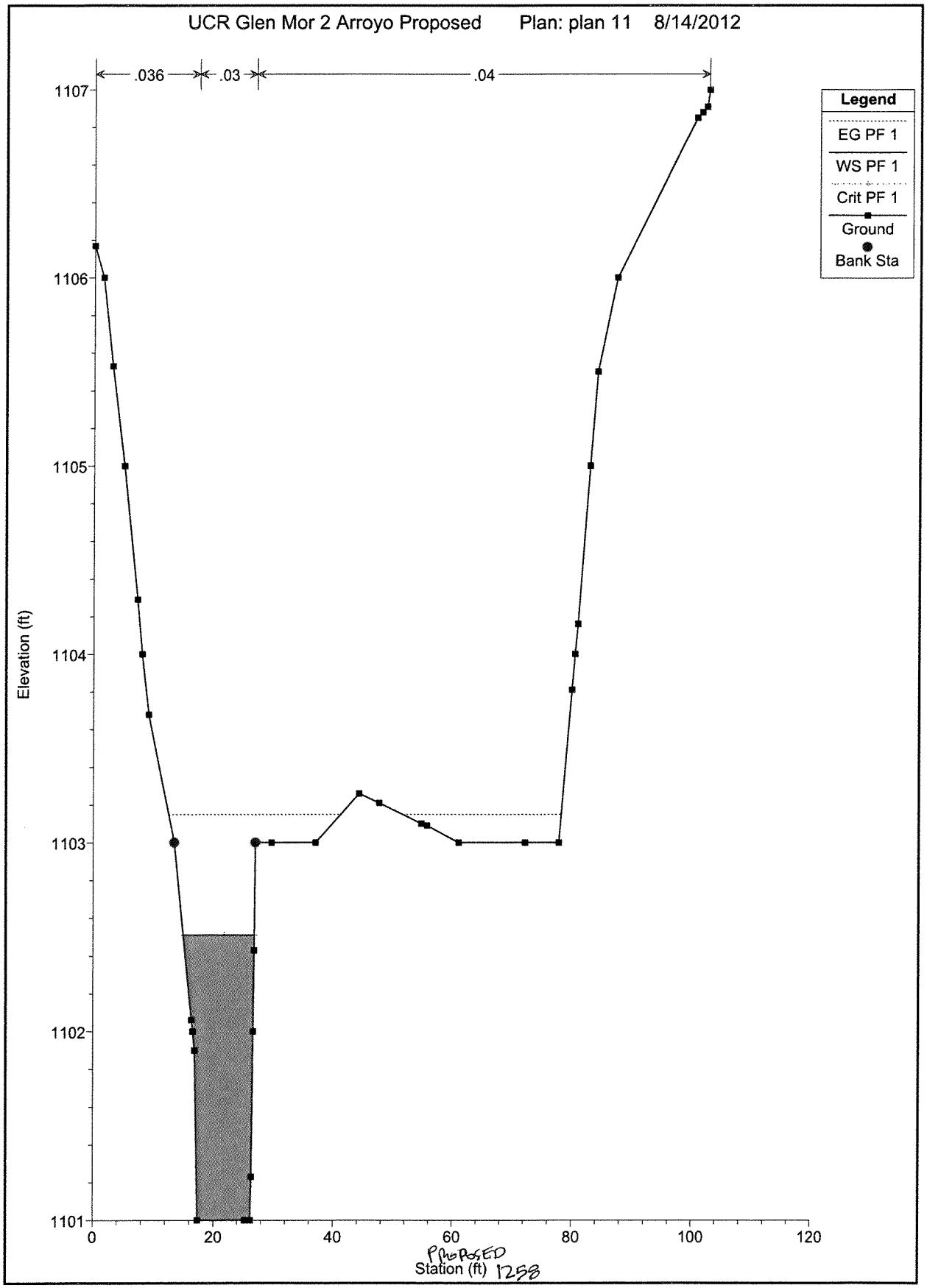

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1108
1106
1104
1102
1100
1098
1096
1094
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1044

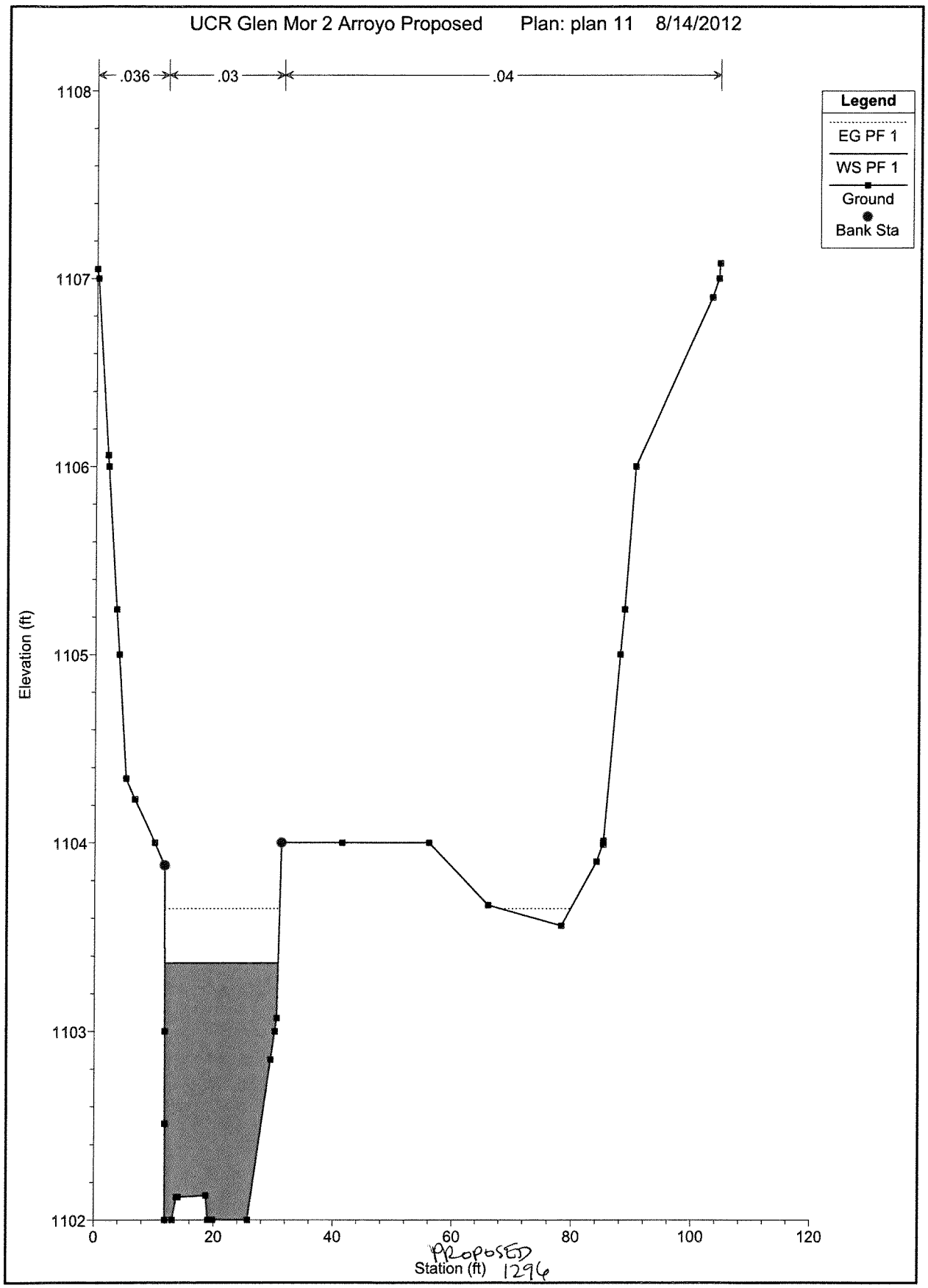

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1108
1106
1104
1102
1100
1098
1096
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1086

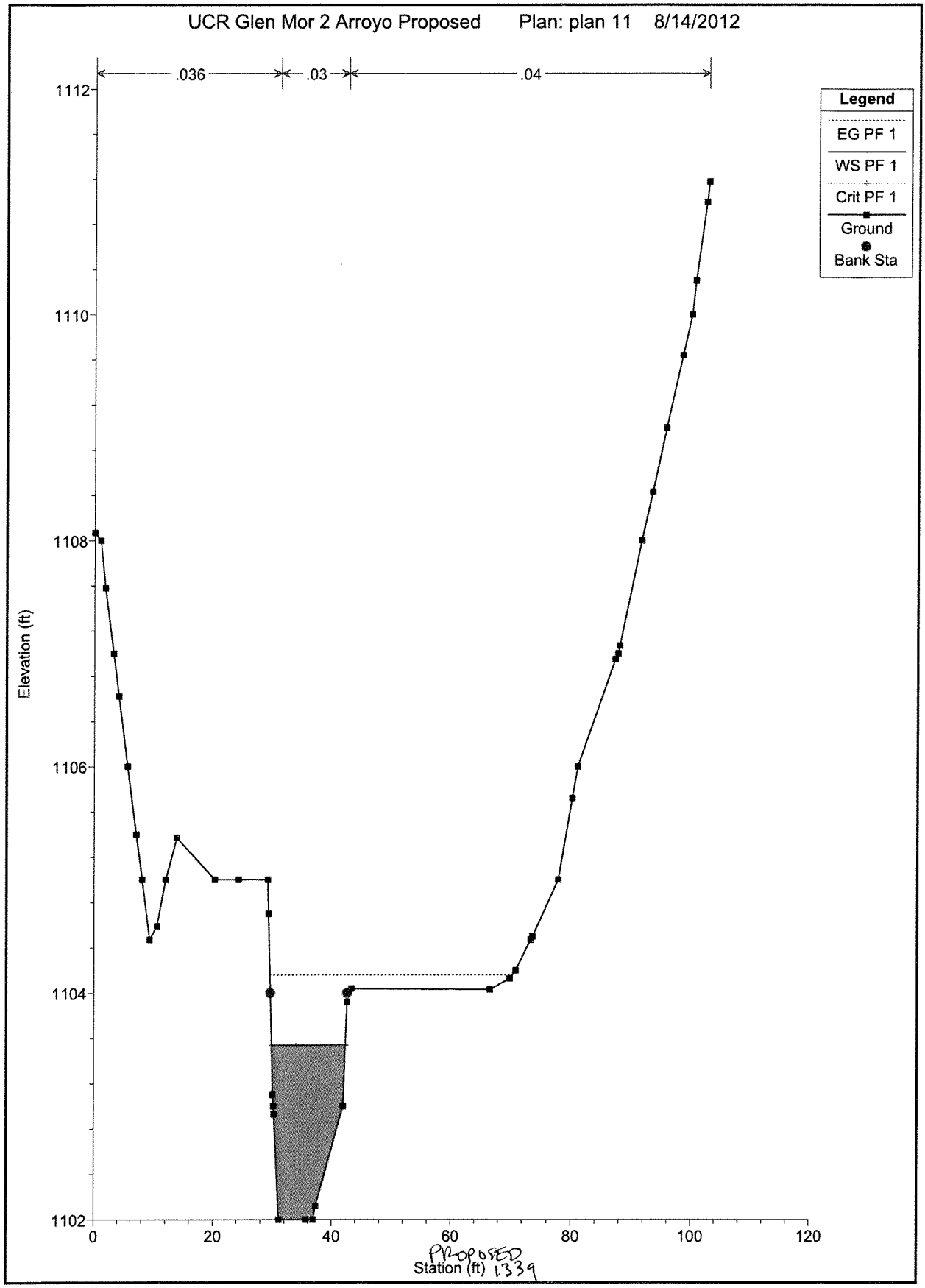

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.036
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1110
1108
1106
1104
1102
1100
1098
0
20
40
60
80
100
120
140
Station (ft)
PROPOSED
1134

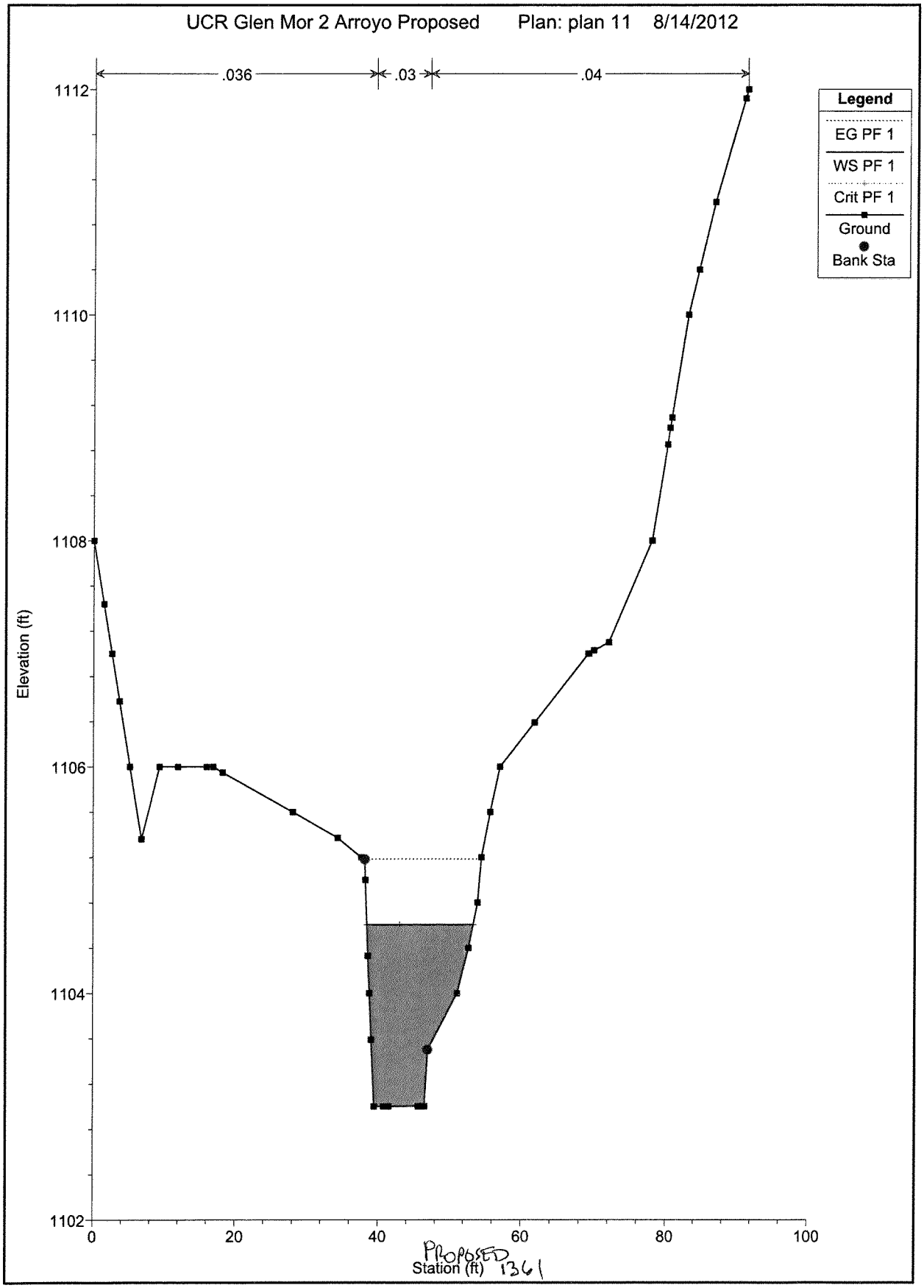

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1105
1104
1103
1102
1101
1100
1099
0
20
40
60
80
100
120
Station (ft)
PROPOSED 1186

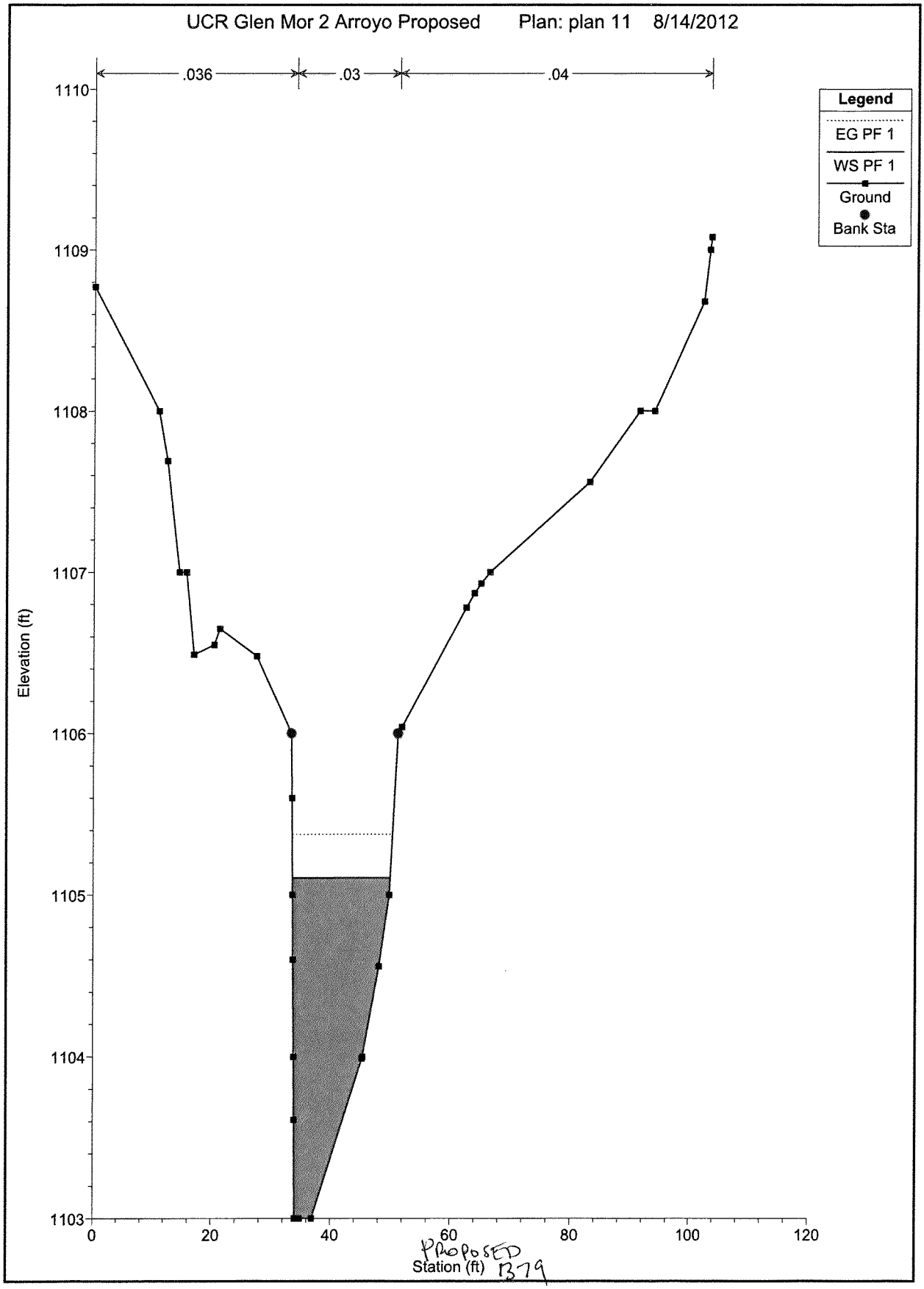

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1105
1104
1103
1102
1101
1100
Elevation (ft)
0
20
40
60
80
100
Station (ft)
PROPOSED
1223

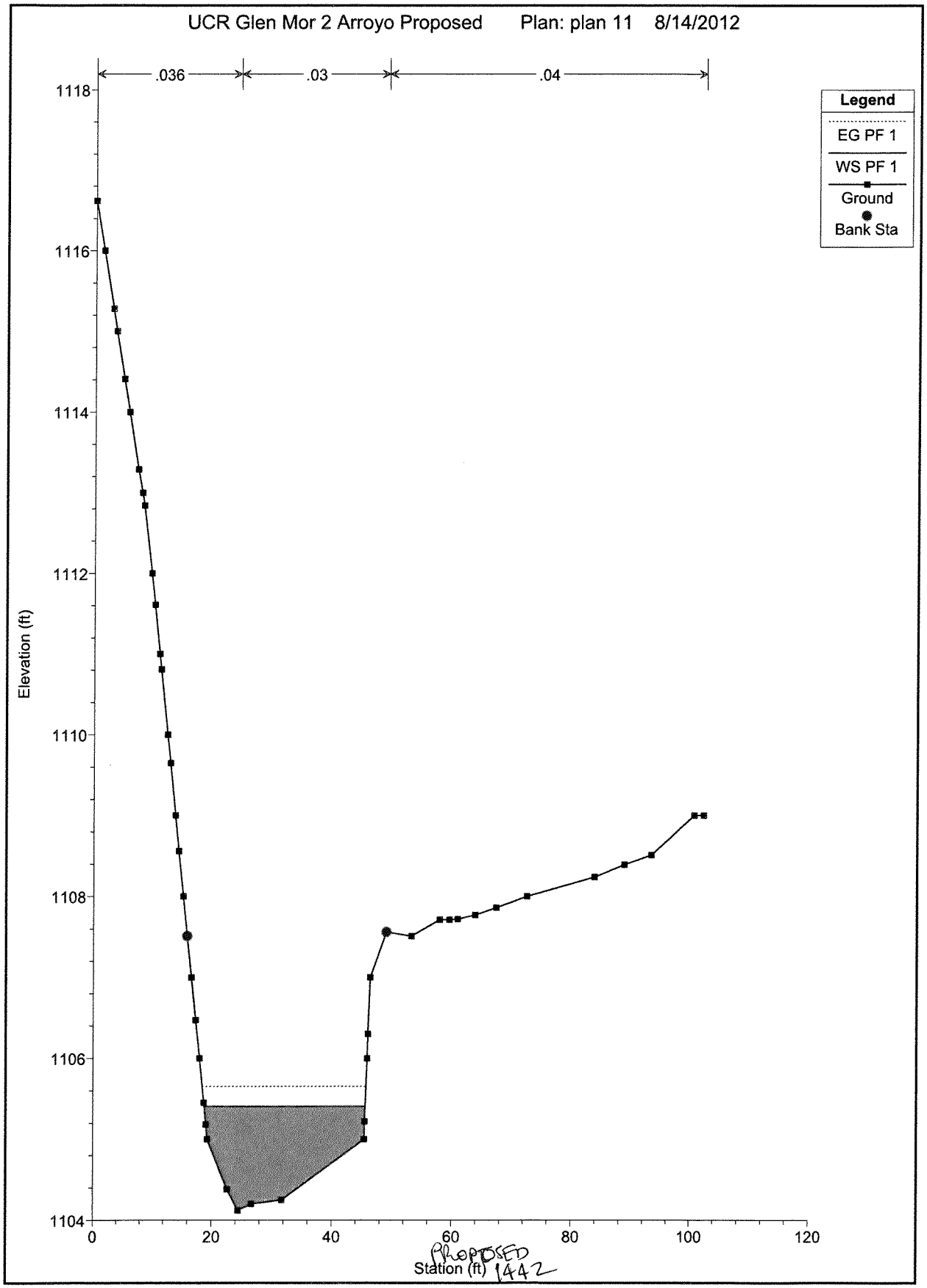

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1107
1106
1105
1104
1103
1102
1101
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1258

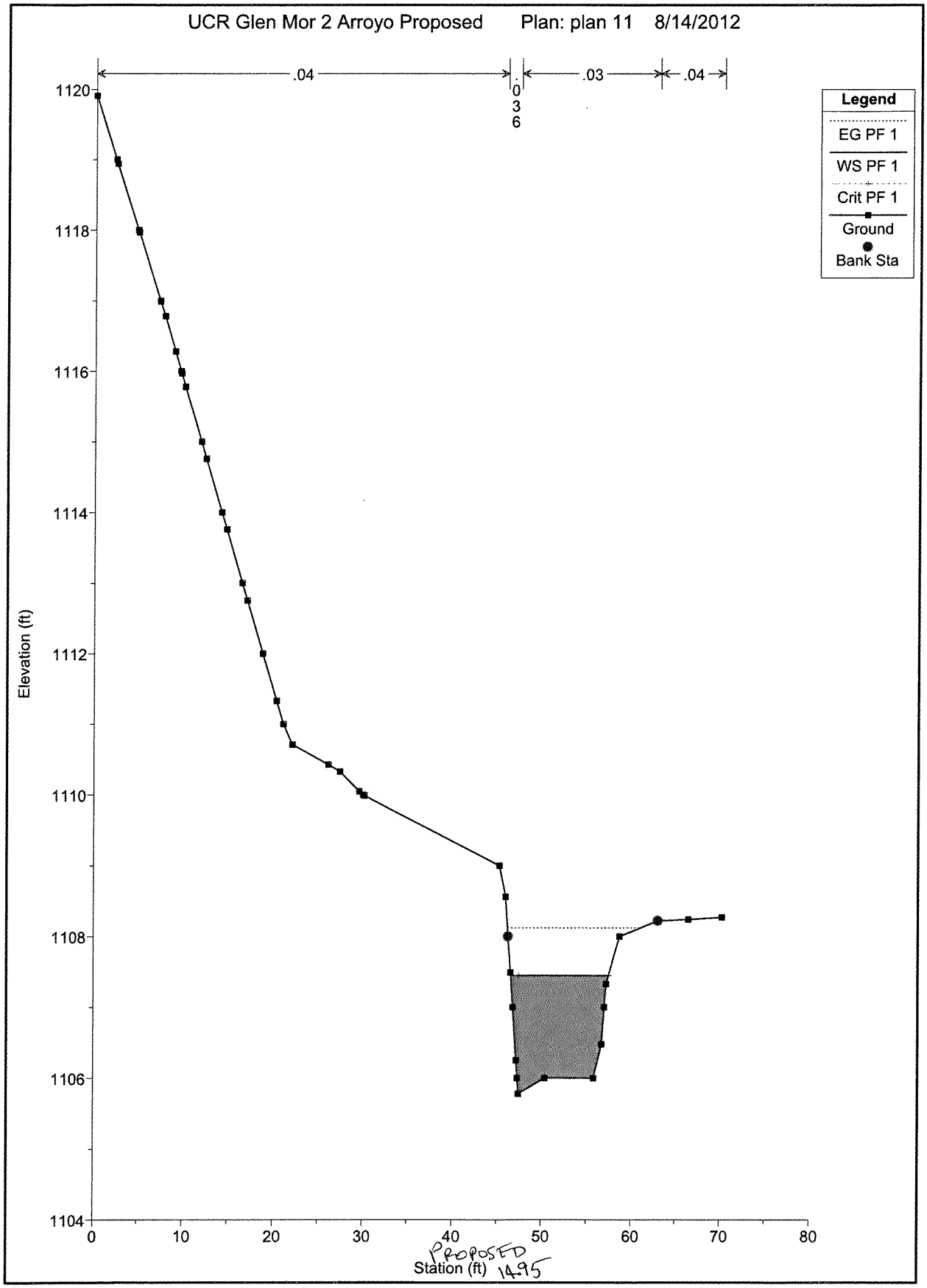

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1108
1107
1106
1105
1104
1103
1102
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1296

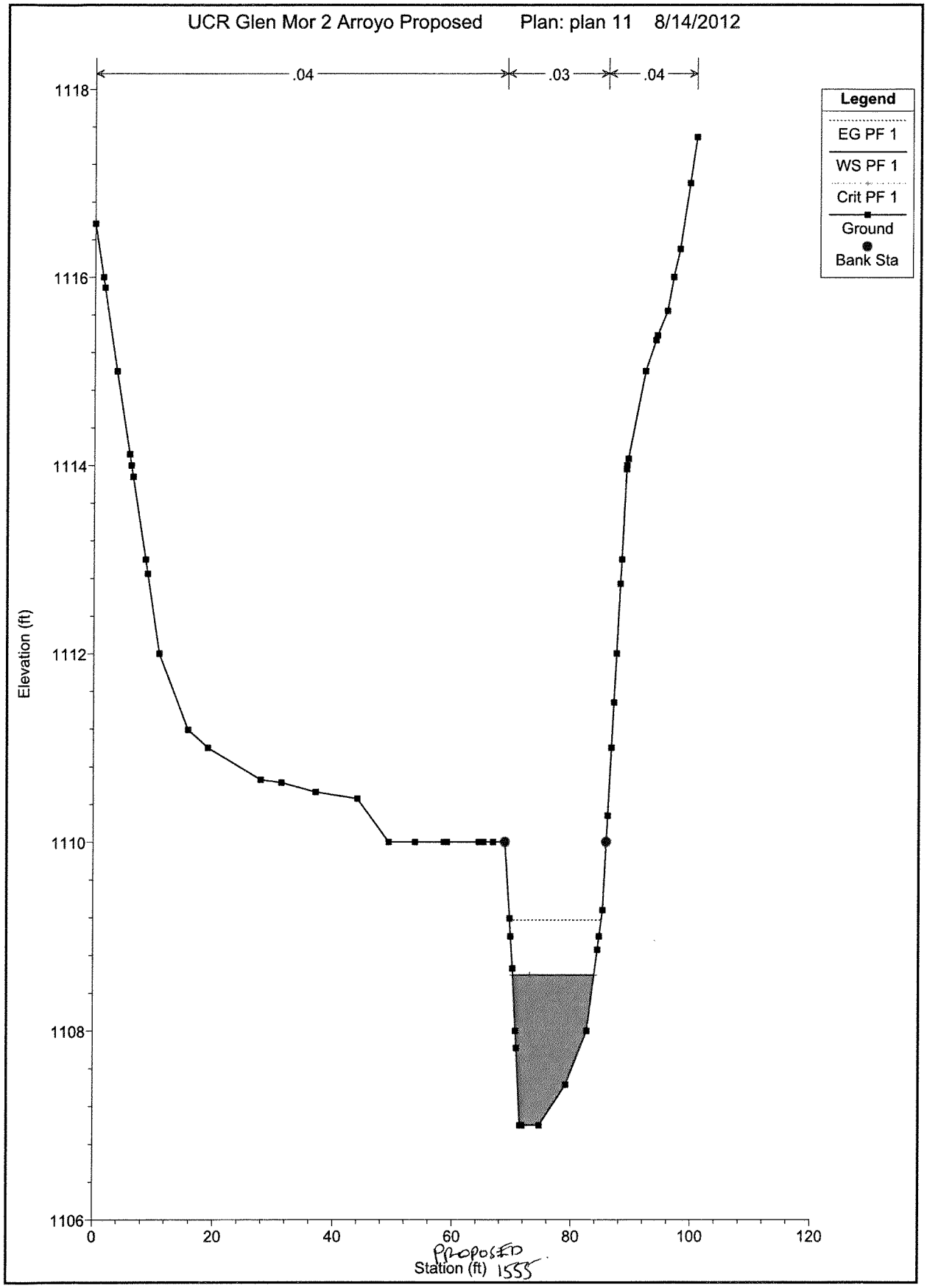

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1112
1110
1108
1106
1104
1102
Elevation (ft)
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1339

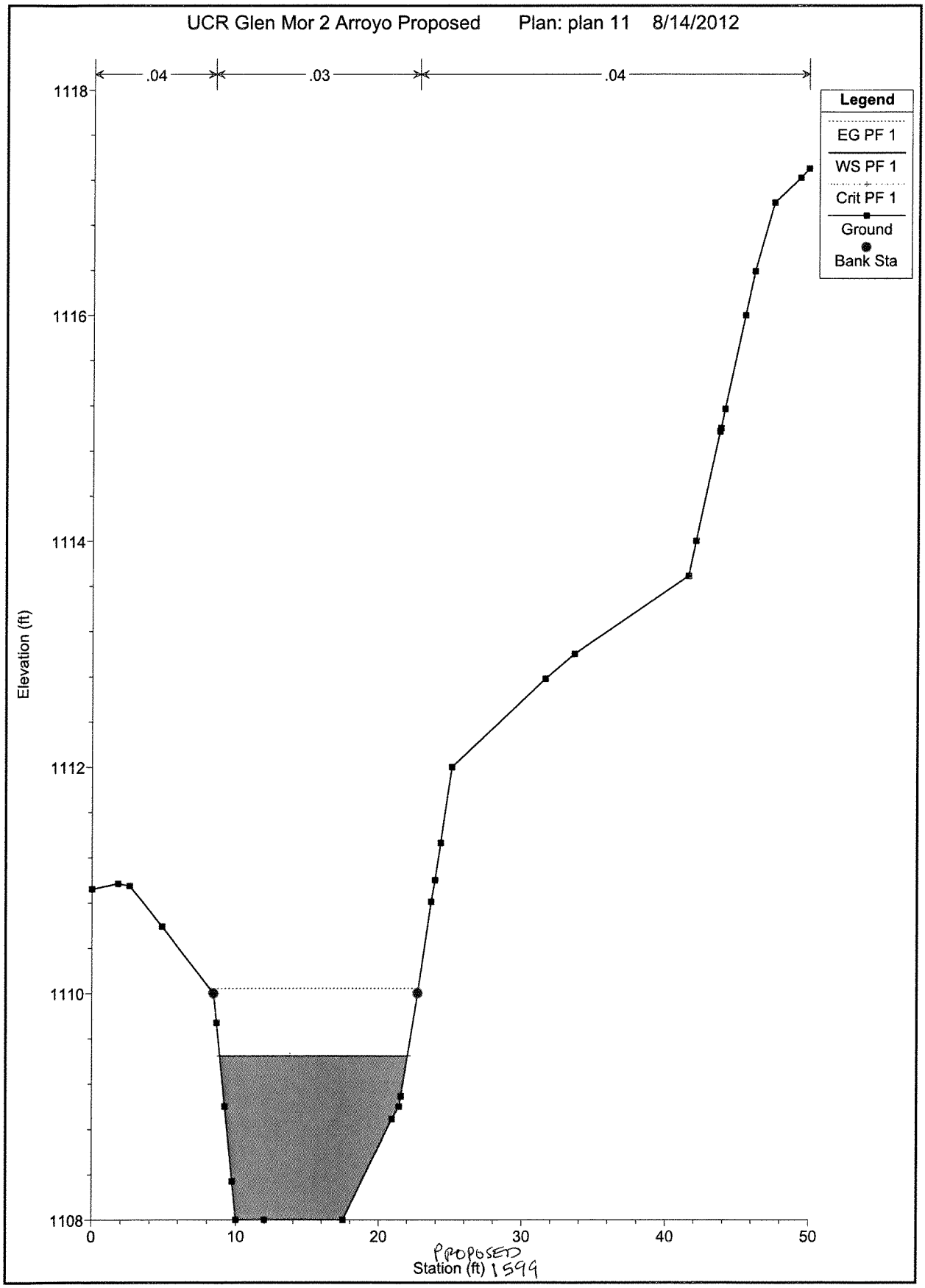

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1112
1110
1108
1106
1104
1102
0
20
40
60
80
100
Station (ft)
PROPOSED 1361

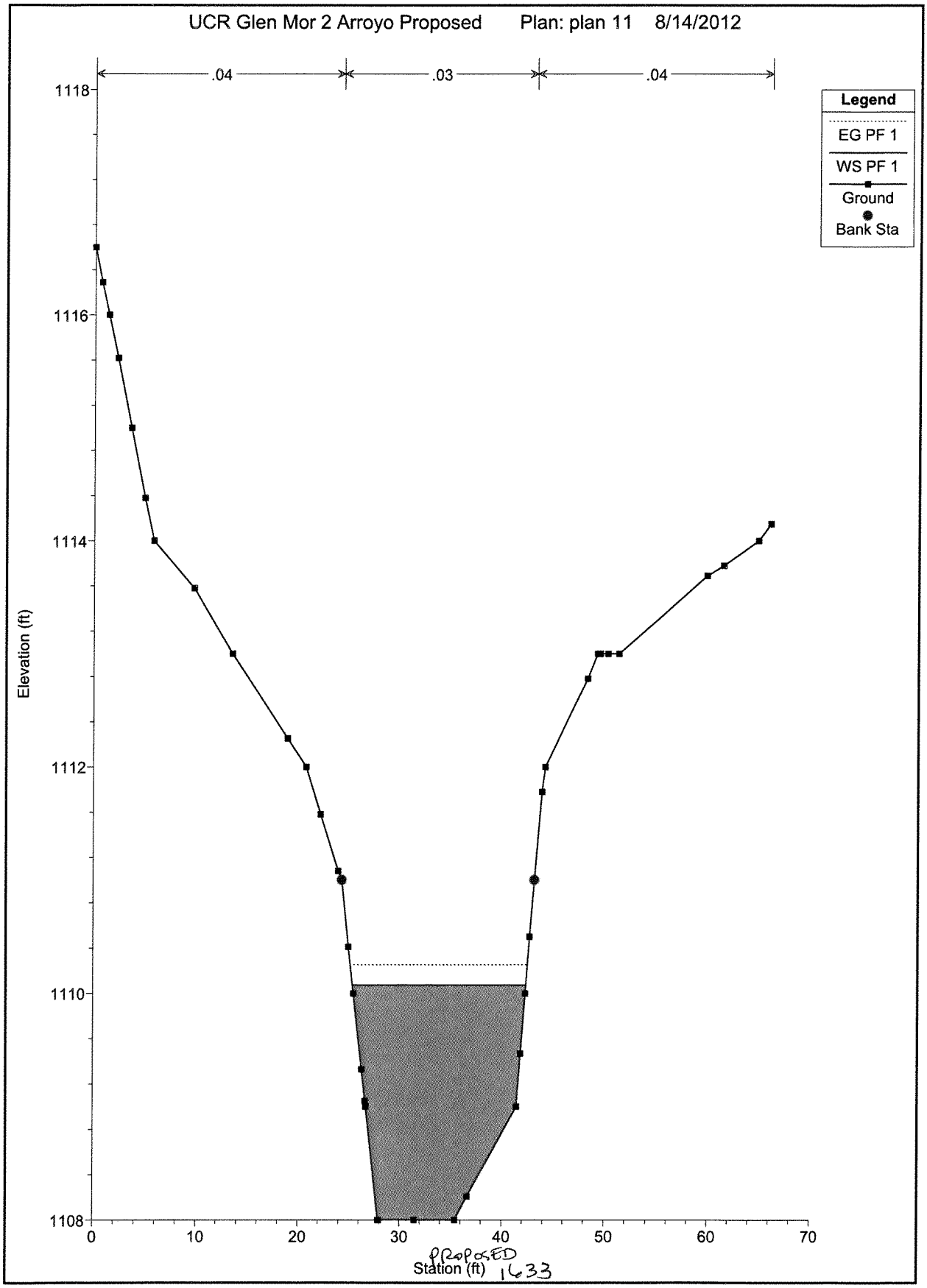

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1110
1109
1108
1107
1106
1105
1104
1103
0
20
40
60
80
100
120
Station (ft)
PROPOSED
B79

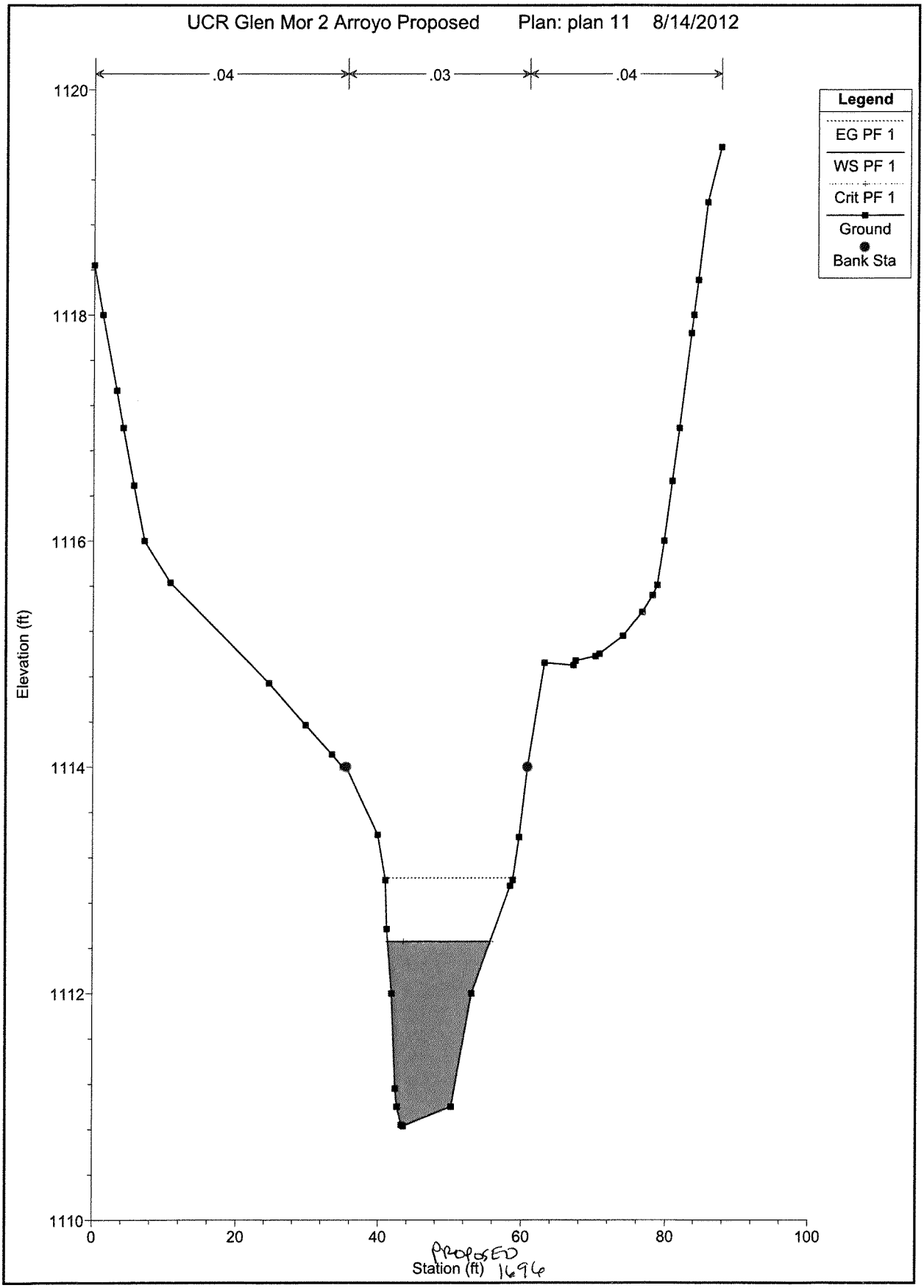

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.036
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1118
1116
1114
1112
1110
1108
1106
1104
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1442

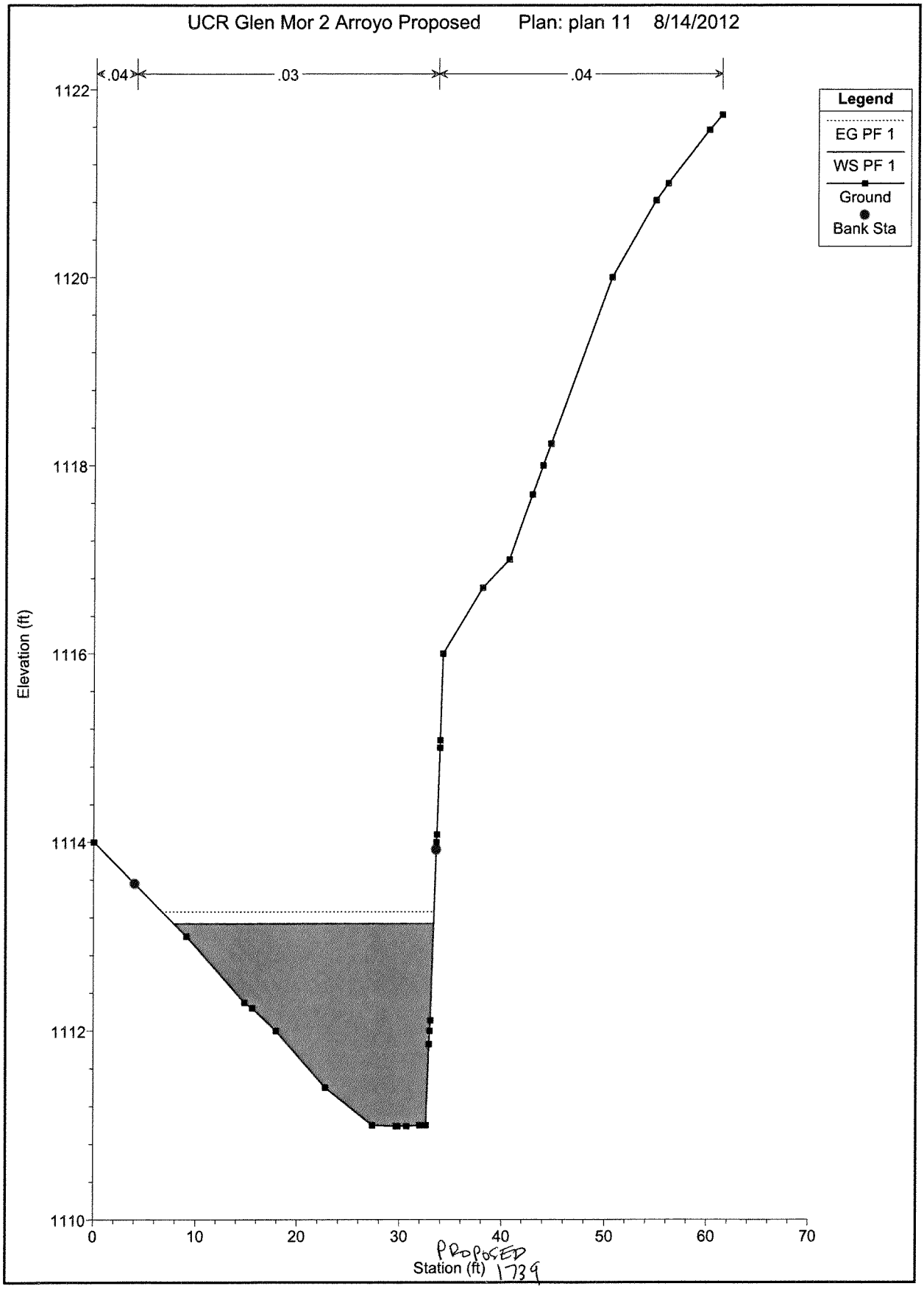

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
0
3
6
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1120
1118
1116
1114
1112
1110
1108
1106
1104
0
10
20
30
40
50
60
70
80
Station (ft)
PROPOSED
14.95

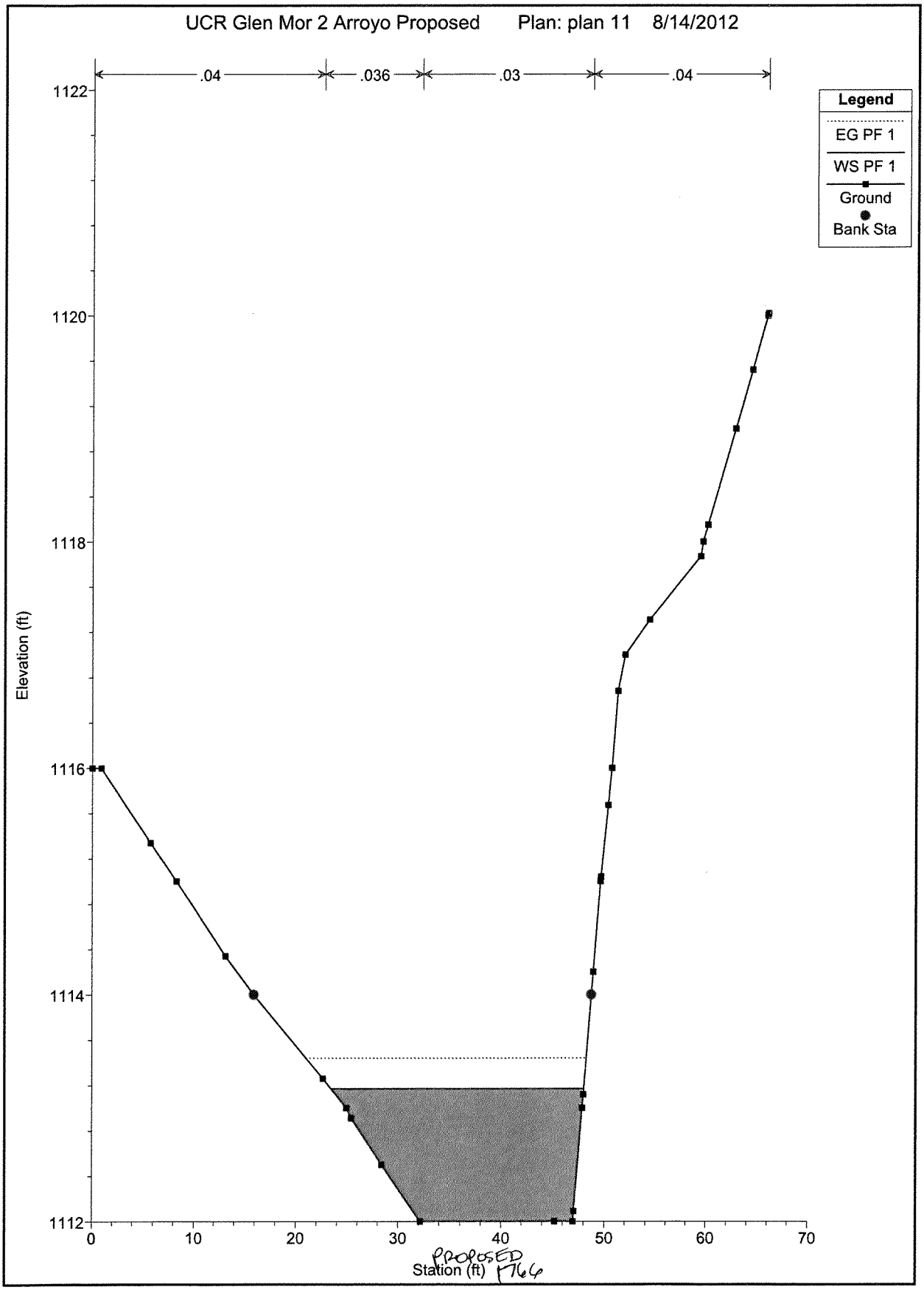

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1118
1116
1114
1112
1110
1108
1106
0
20
40
60
80
100
120
Station (ft)
PROPOSED
1555

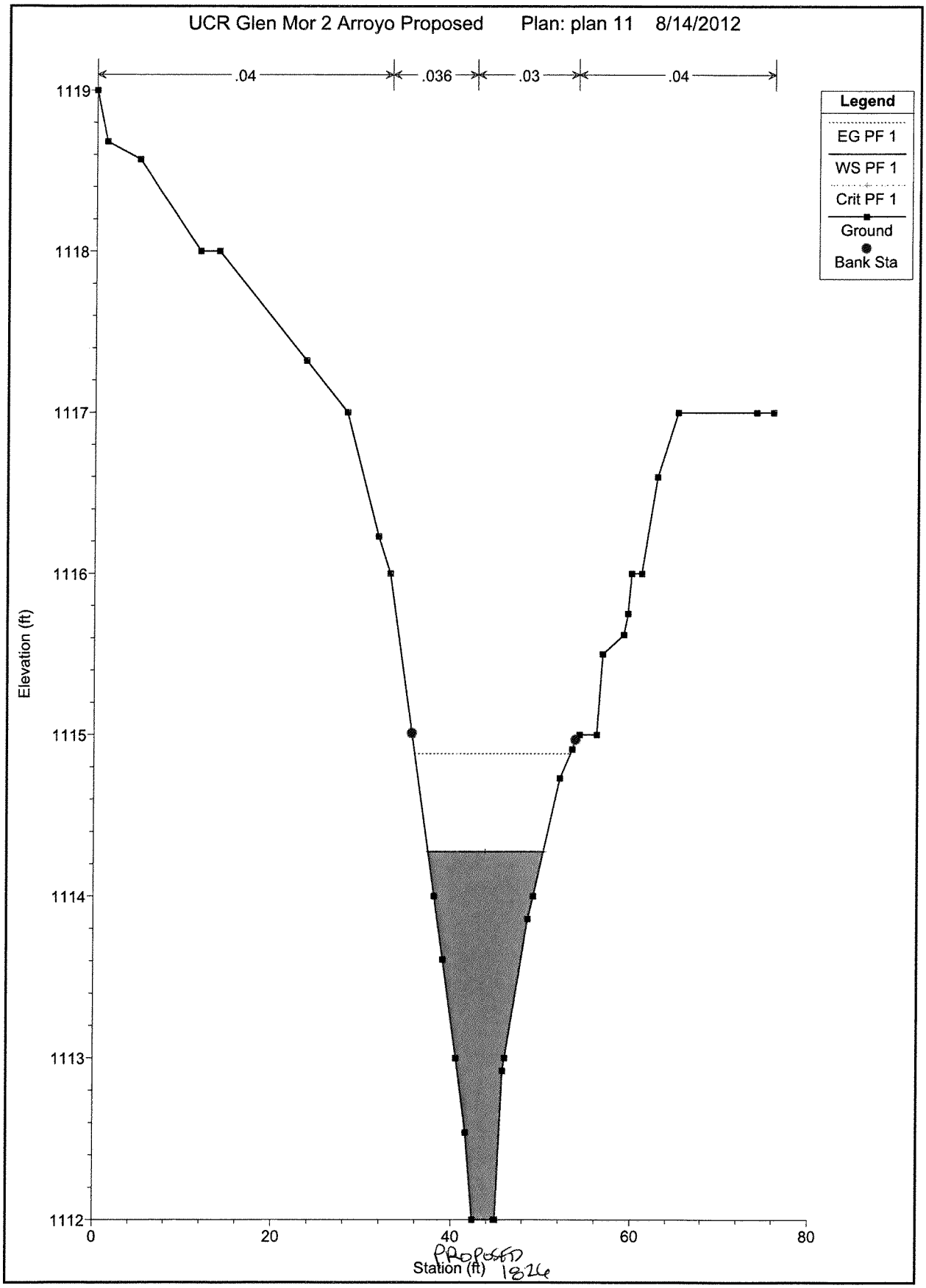

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1118
1116
1114
1112
1110
1108
Elevation (ft)
0
10
20
30
40
50
Station (ft)
PROPOSED
1599

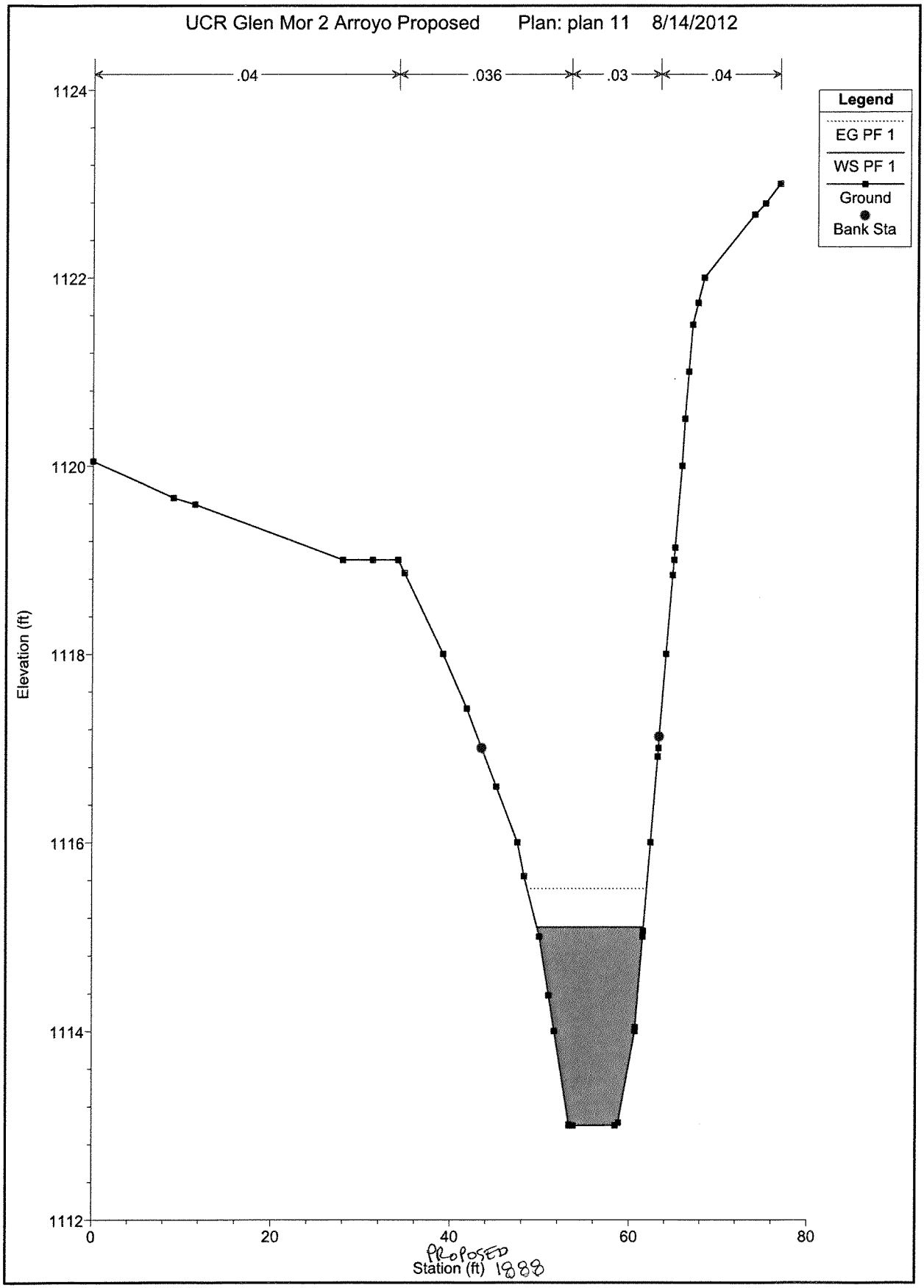

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1118
1116
1114
1112
1110
1108
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED
1633

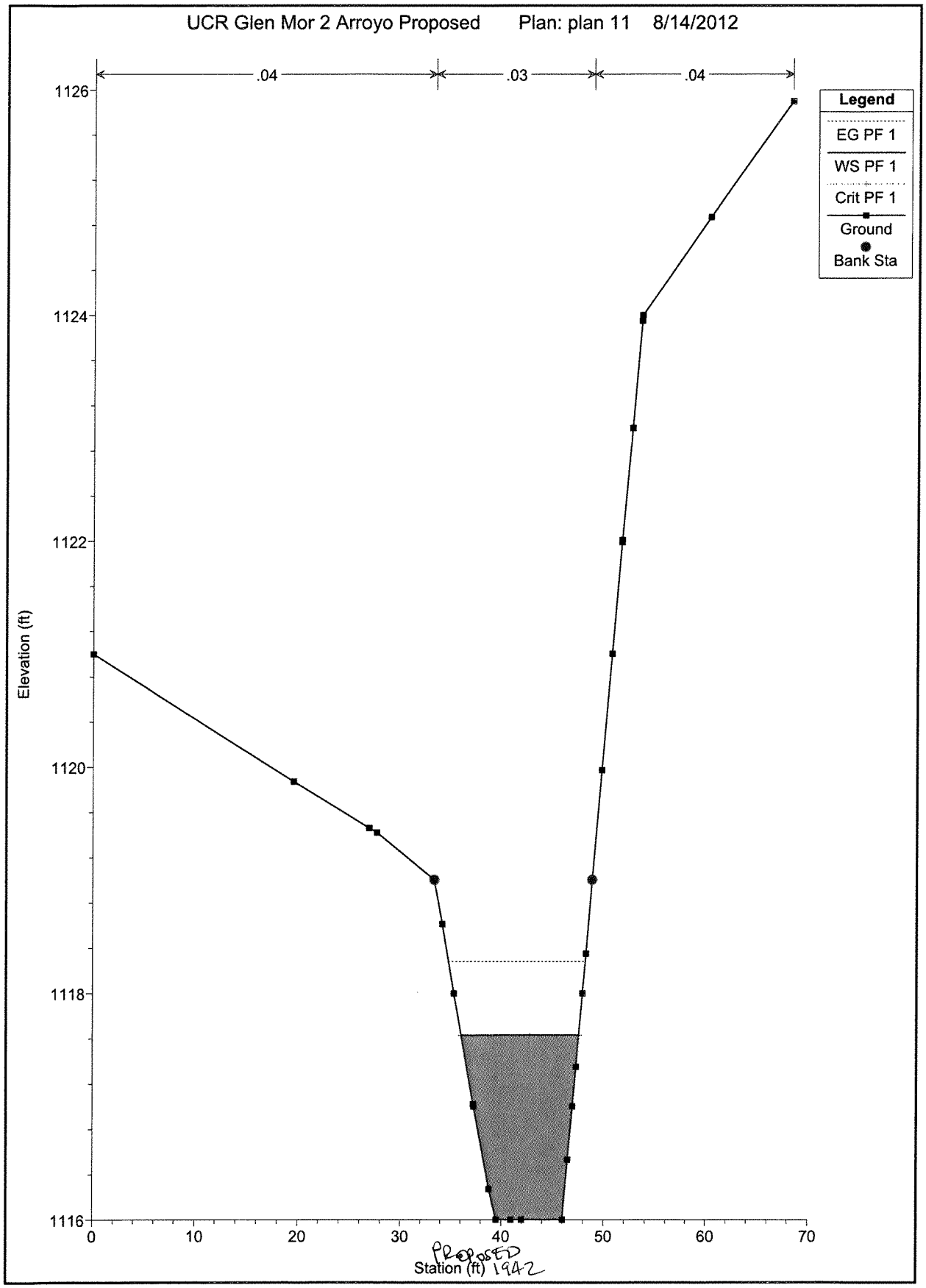

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1120
1118
1116
1114
1112
1110
Elevation (ft)
0
20
40
60
80
100
Station (ft)
PROPOSED
1696

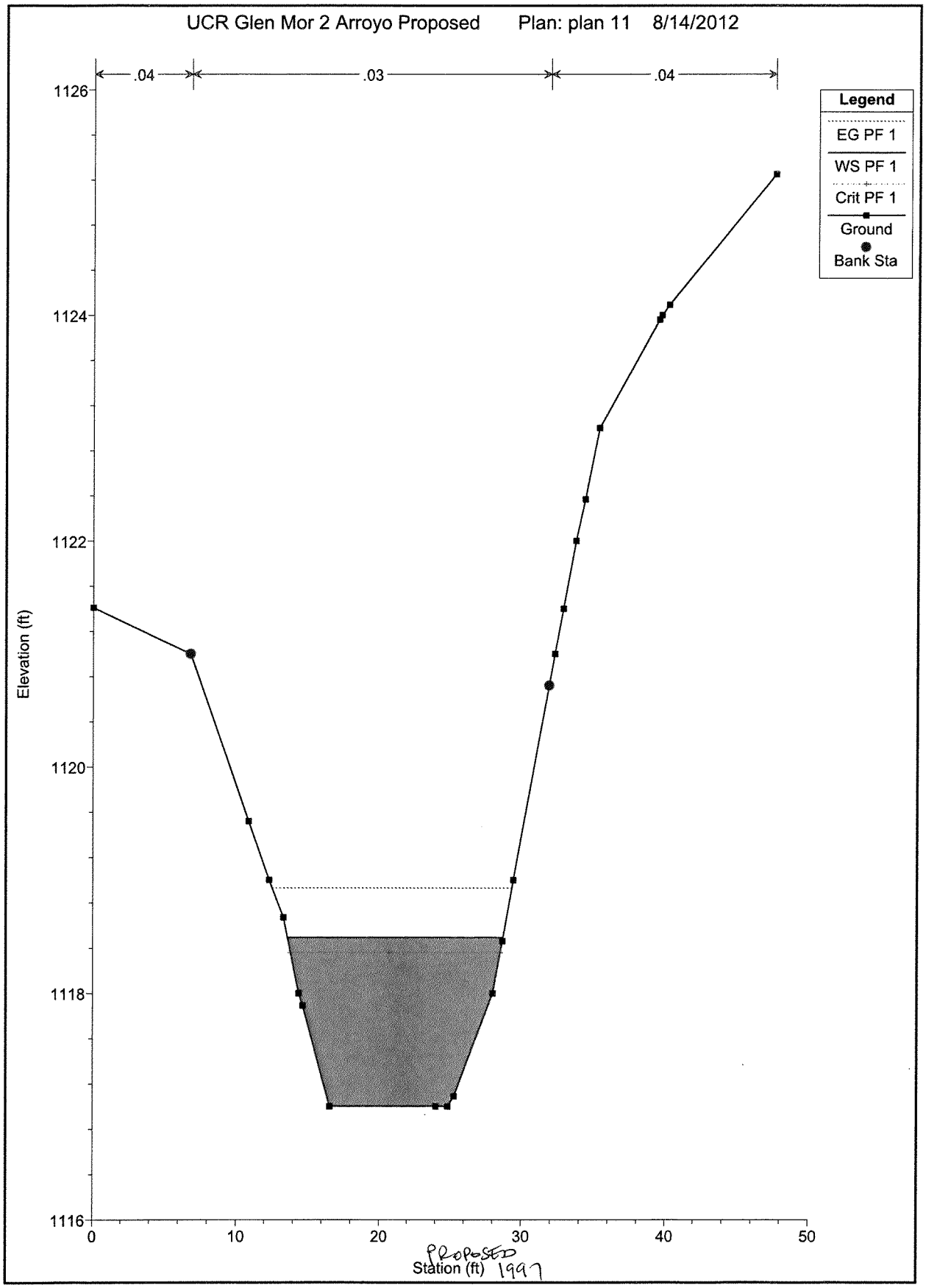

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
Elevation (ft)
1122
1120
1118
1116
1114
1112
1110
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED
1739

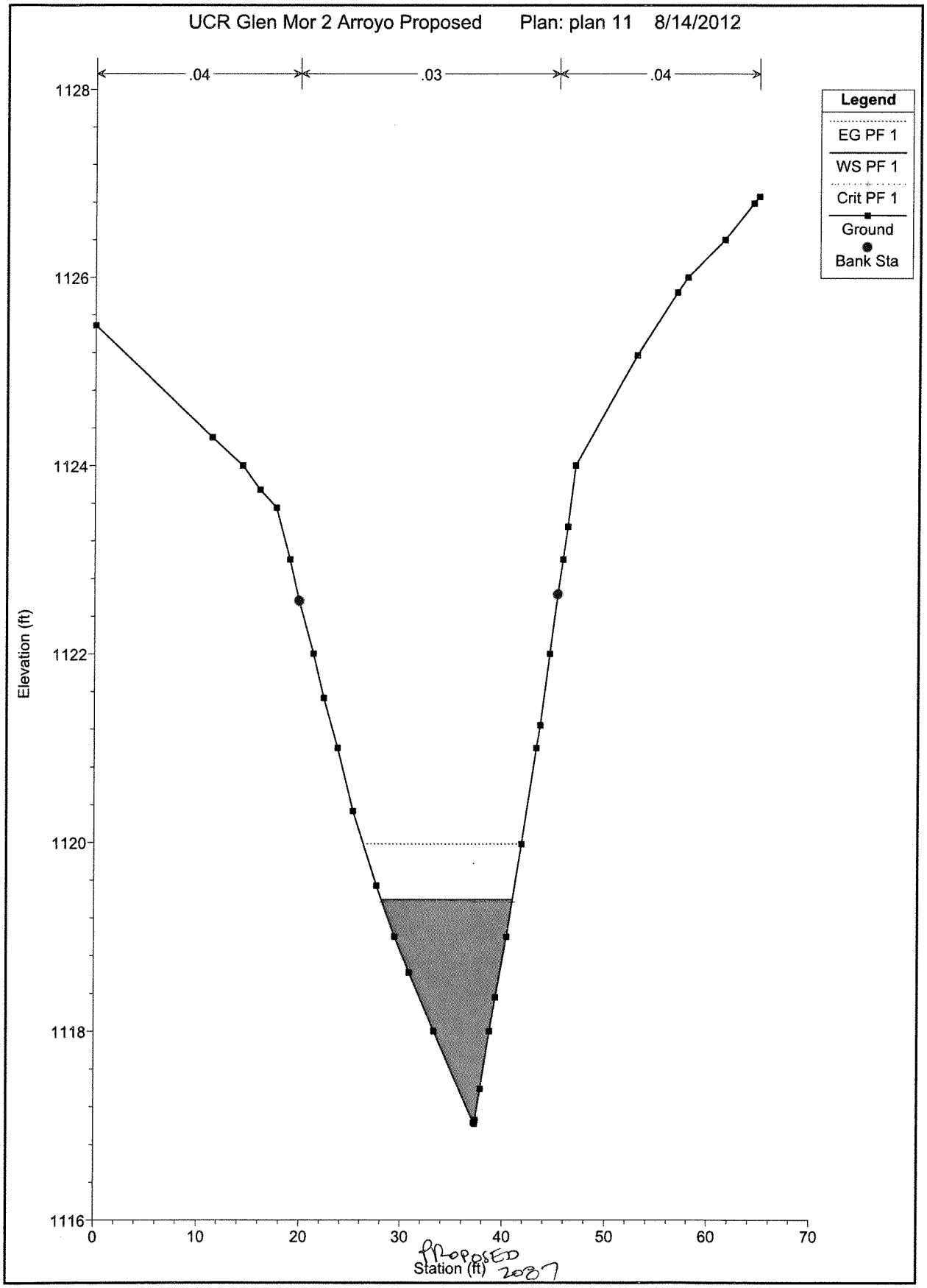

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.036
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1122
1120
1118
1116
1114
1112
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED
1766

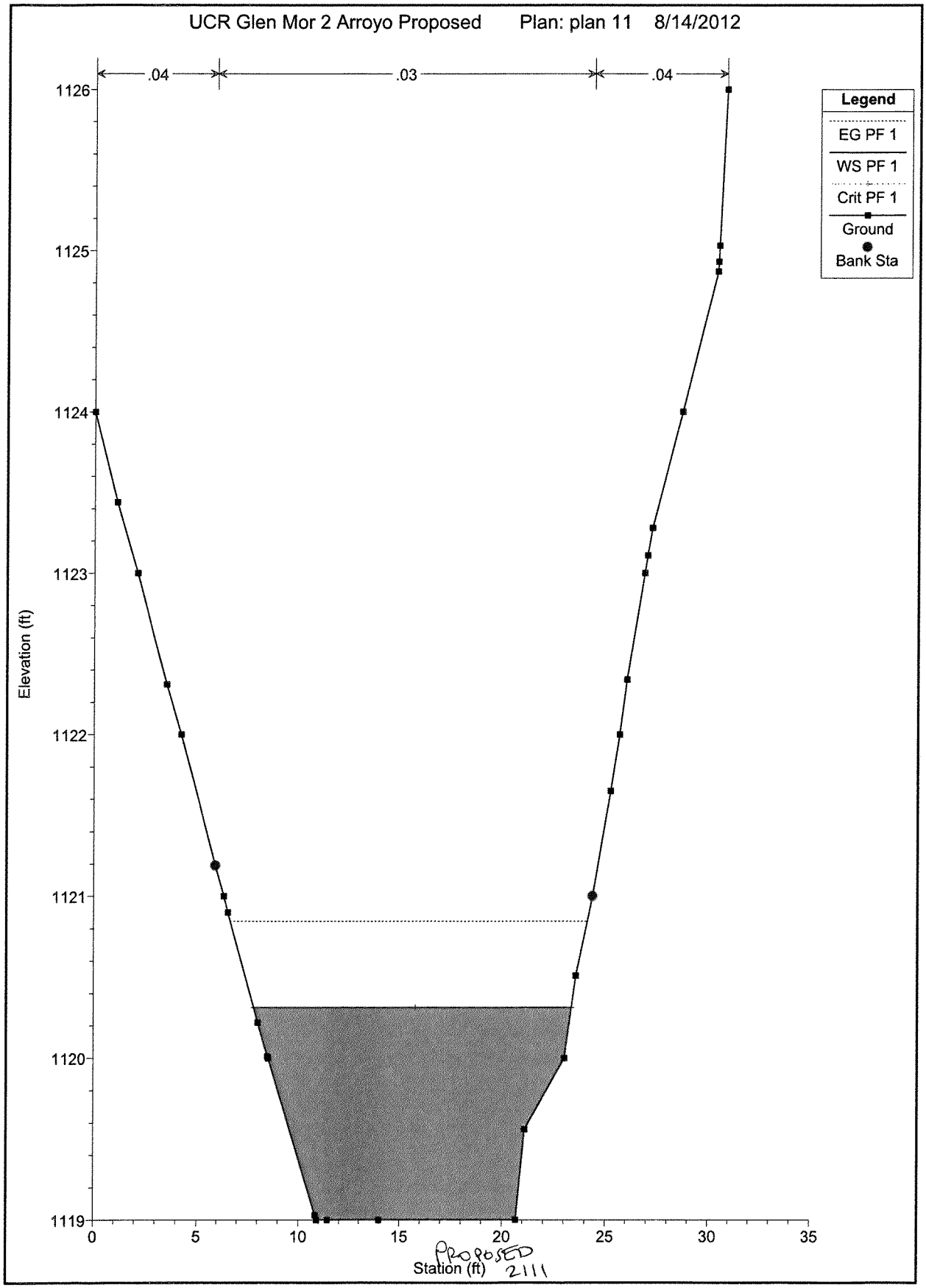

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.036
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1119
1118
1117
1116
1115
1114
1113
1112
0
20
40
60
80
Station (ft)
PROPOSED 1826

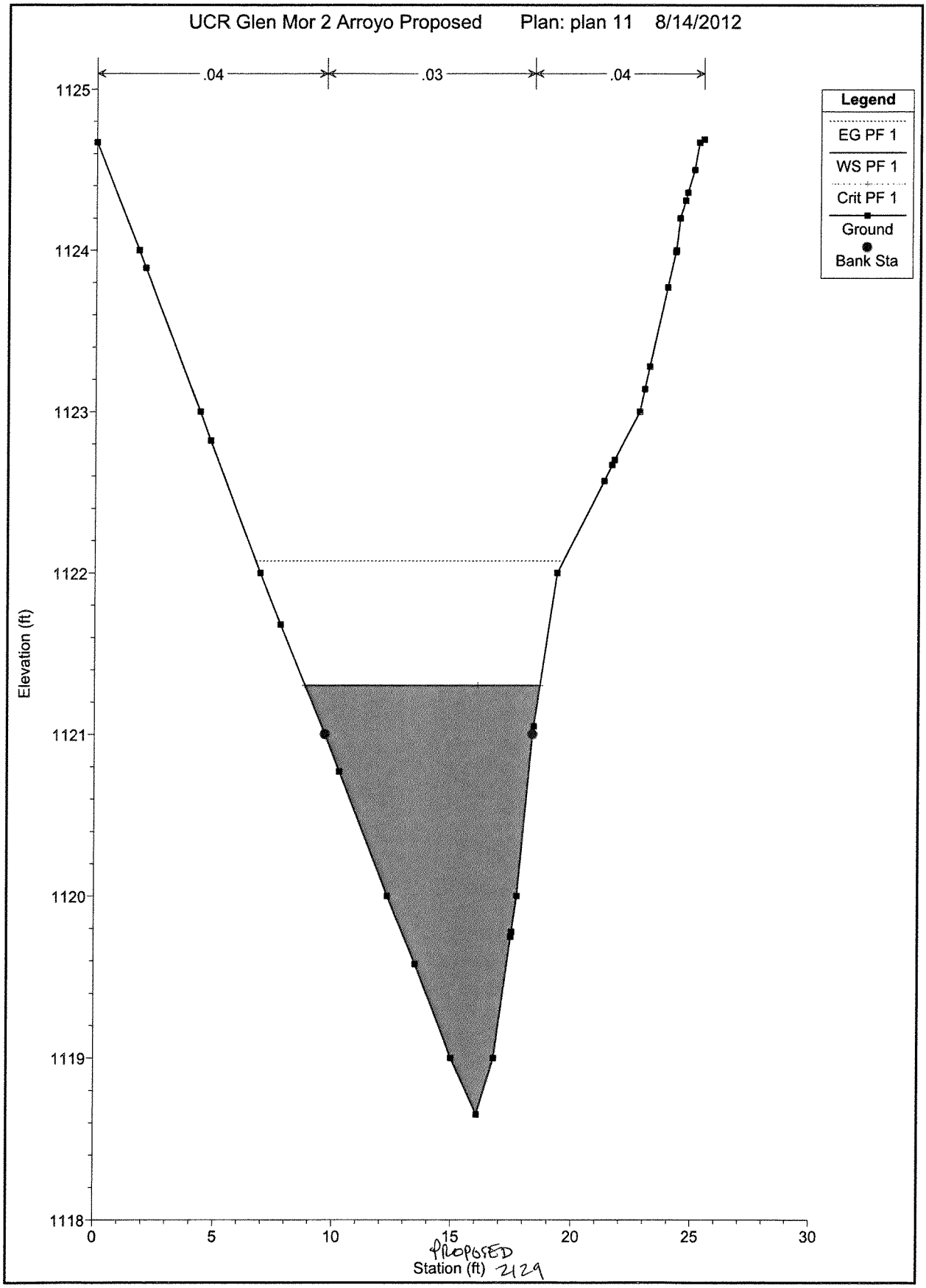

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.036
.03
.04
Legend
EG PF 1
WS PF 1
Ground
Bank Sta
1124
1122
1120
1118
1116
1114
1112
Elevation (ft)
0
20
40
60
80
Station (ft)
PROPOSED
1888

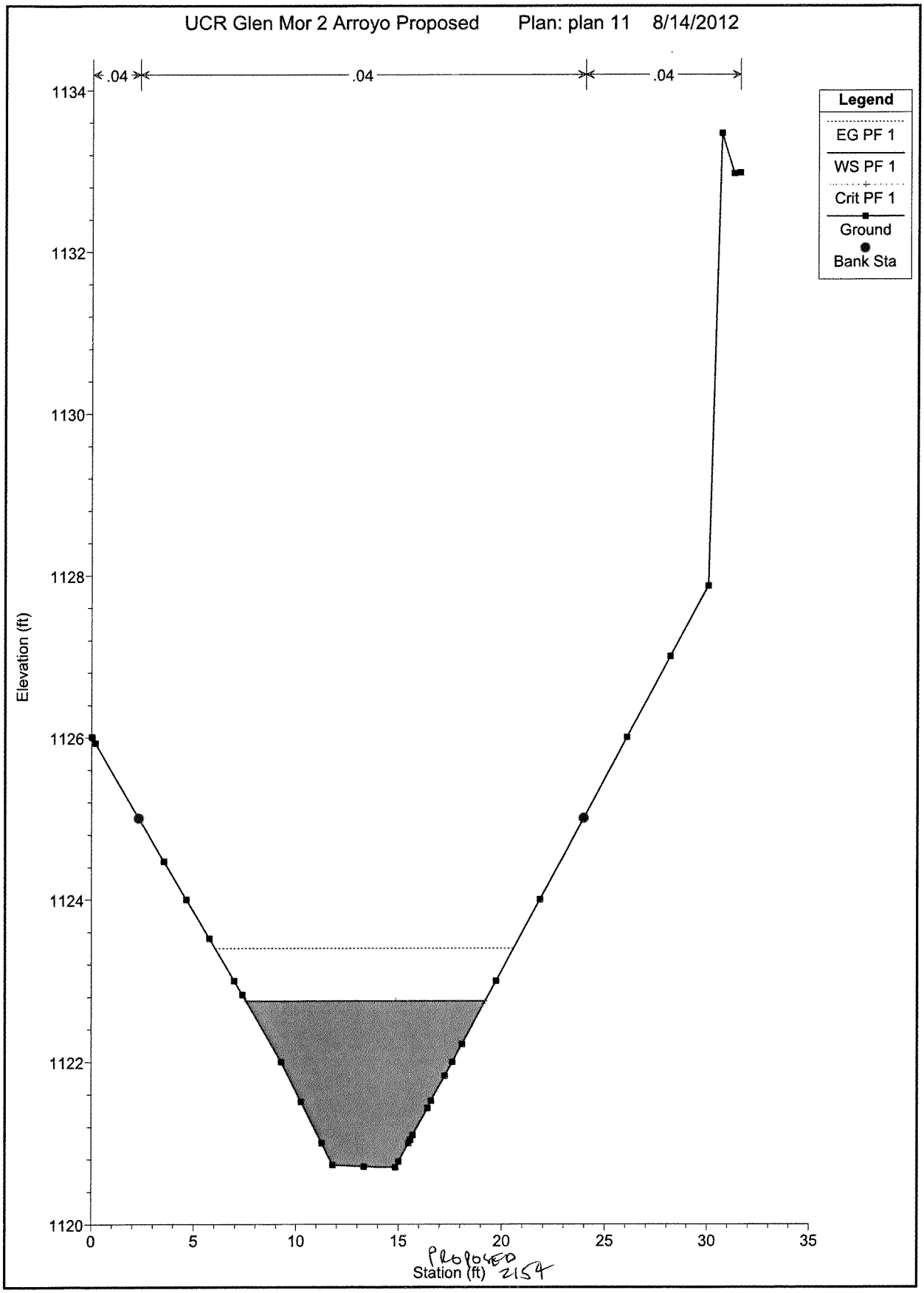

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1126
1124
1122
1120
1118
1116
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED 1942

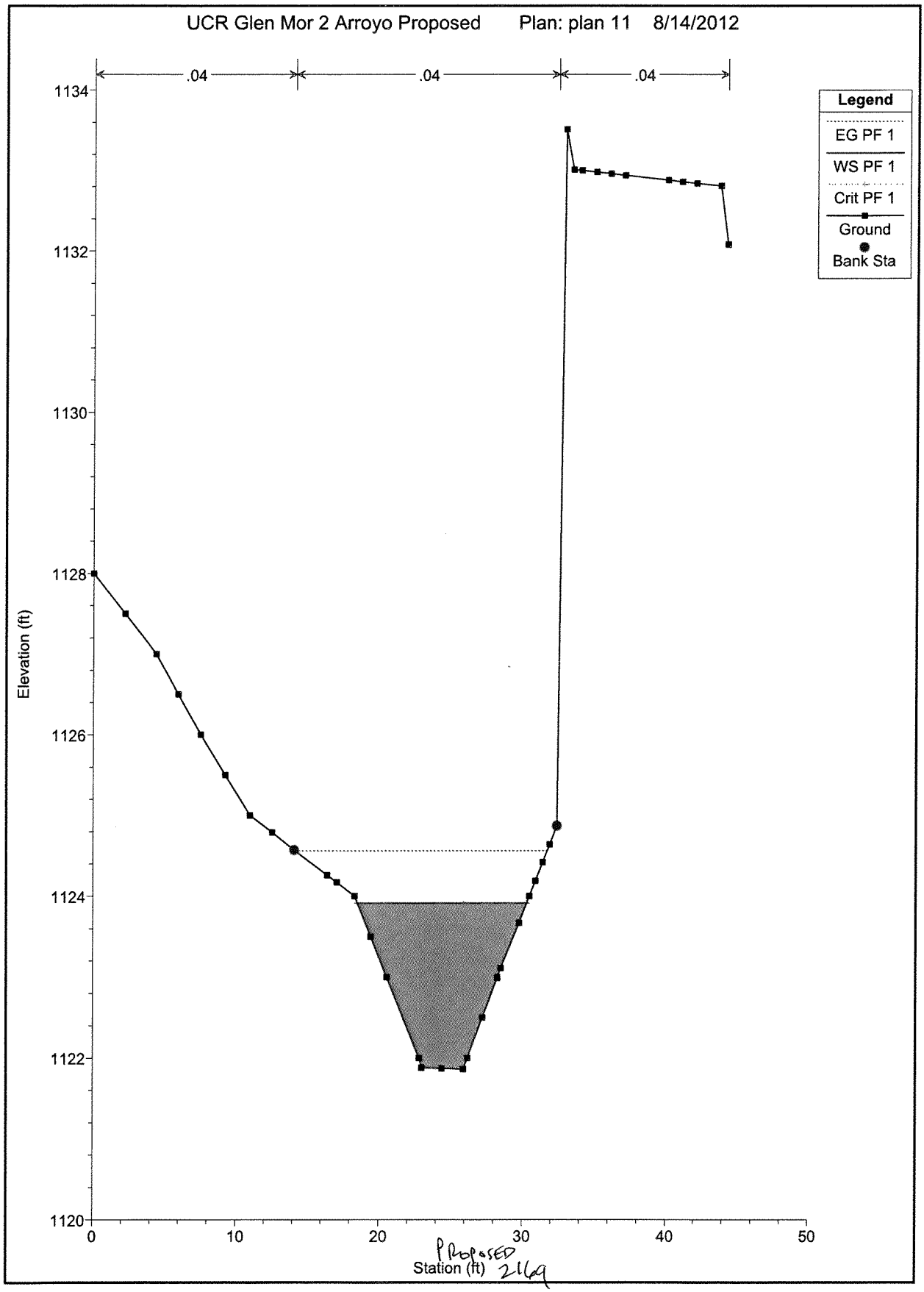

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1126
1124
1122
1120
1118
1116
Elevation (ft)
0
10
20
30
40
50
Station (ft)
PROPOSED 1997

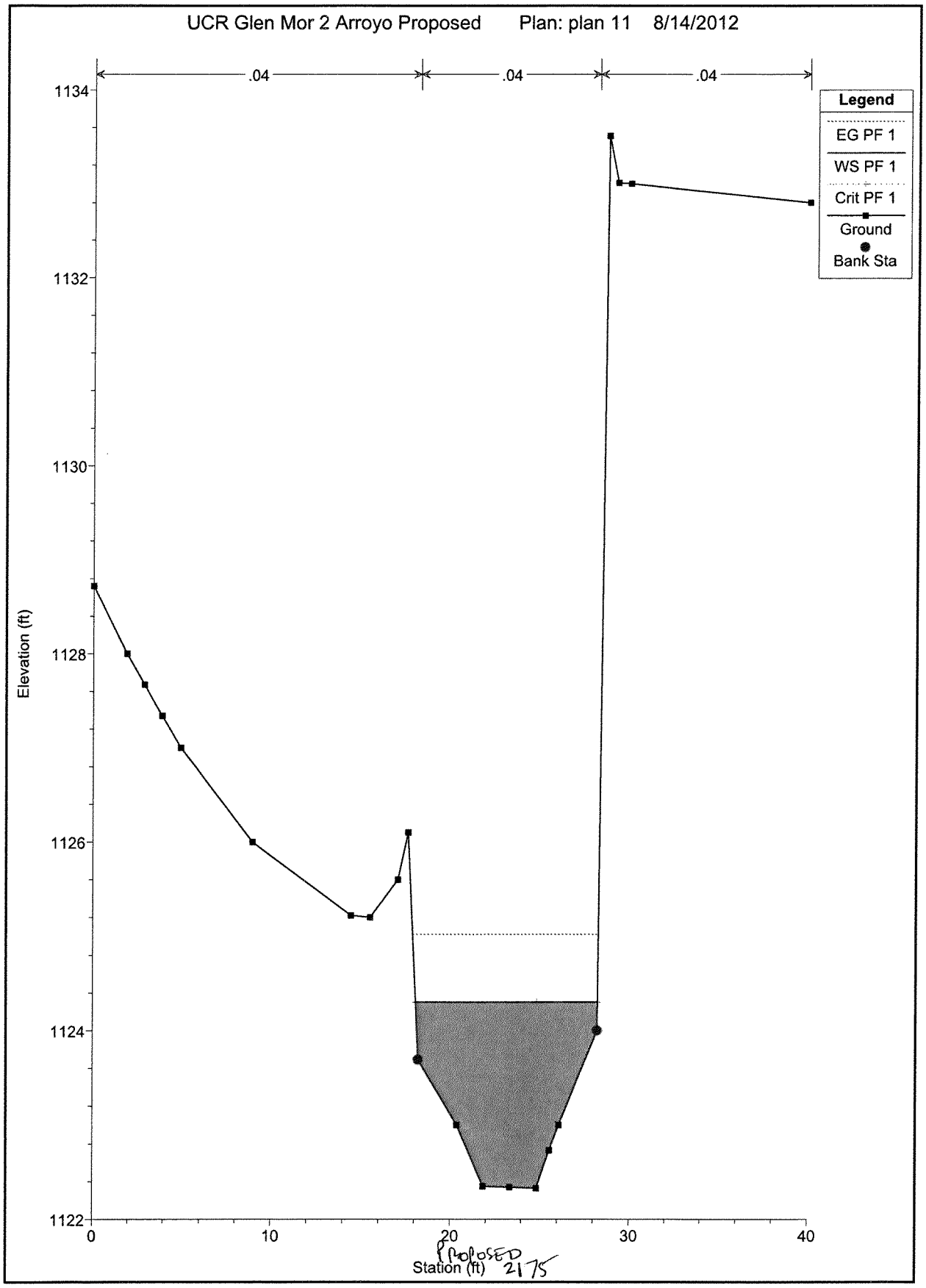

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1128
1126
1124
1122
1120
1118
1116
0
10
20
30
40
50
60
70
Station (ft)
PROPOSED 2087

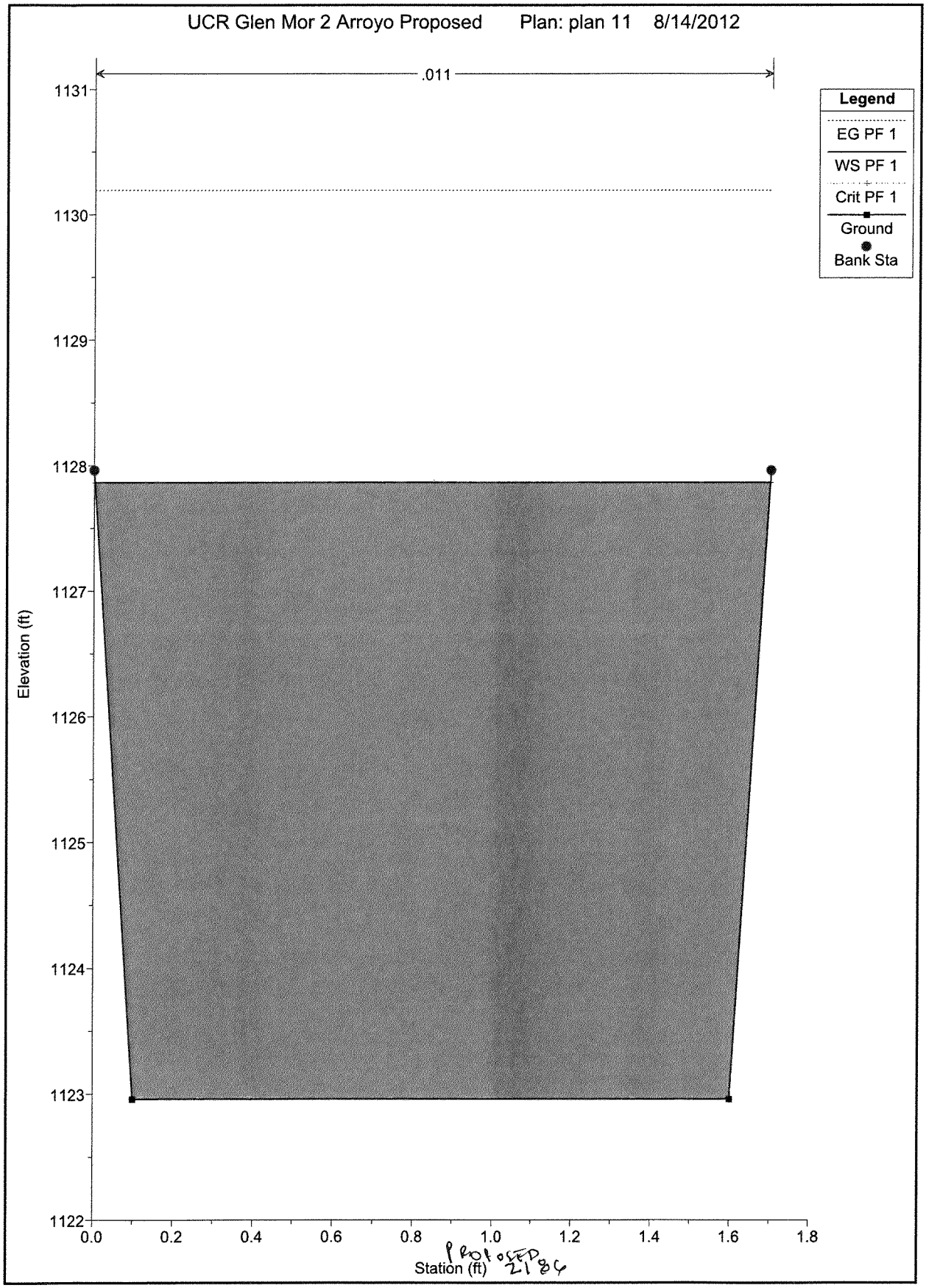

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1126
1125
1124
1123
1122
1121
1120
1119
0
5
10
15
20
25
30
35
Station (ft)
PROPOSED
2111

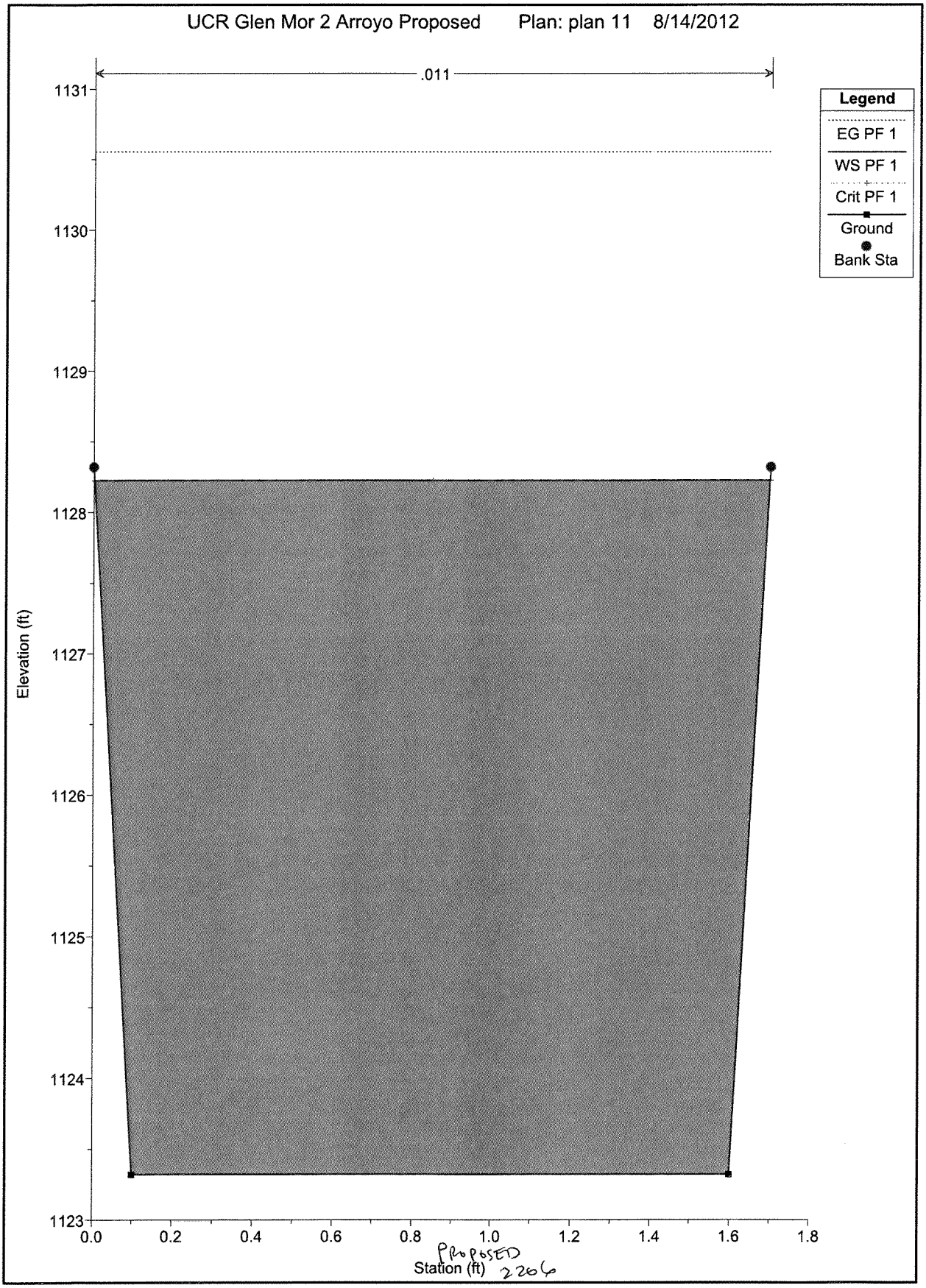

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.03
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1125
1124
1123
1122
1121
1120
1119
1118
0
5
10
15
20
25
30
Station (ft)
PROPOSED
2129

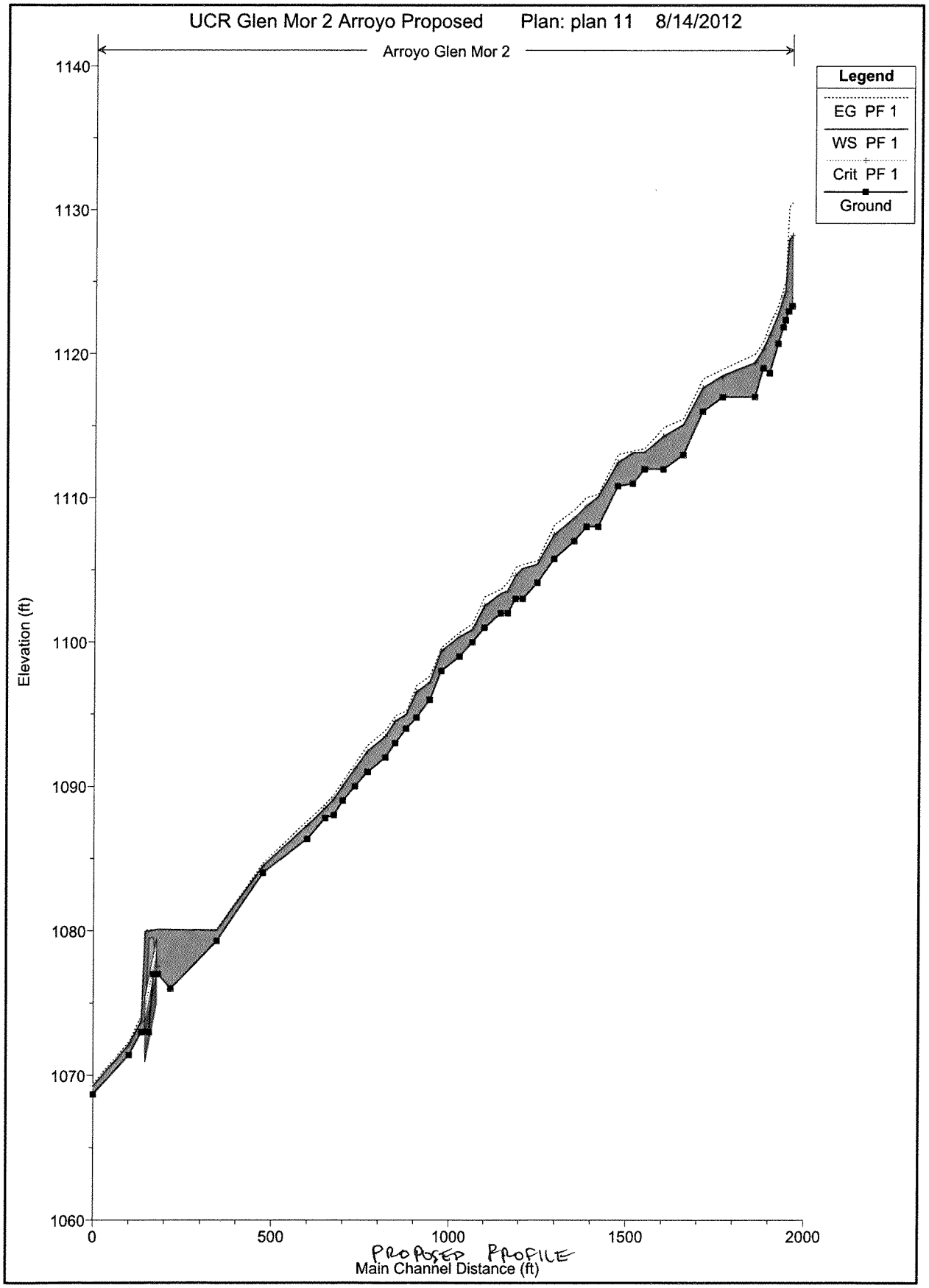

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1134
1132
1130
1128
1126
1124
1122
1120
0
5
10
15
20
25
30
35
Station (ft)
PROPOSED 2154

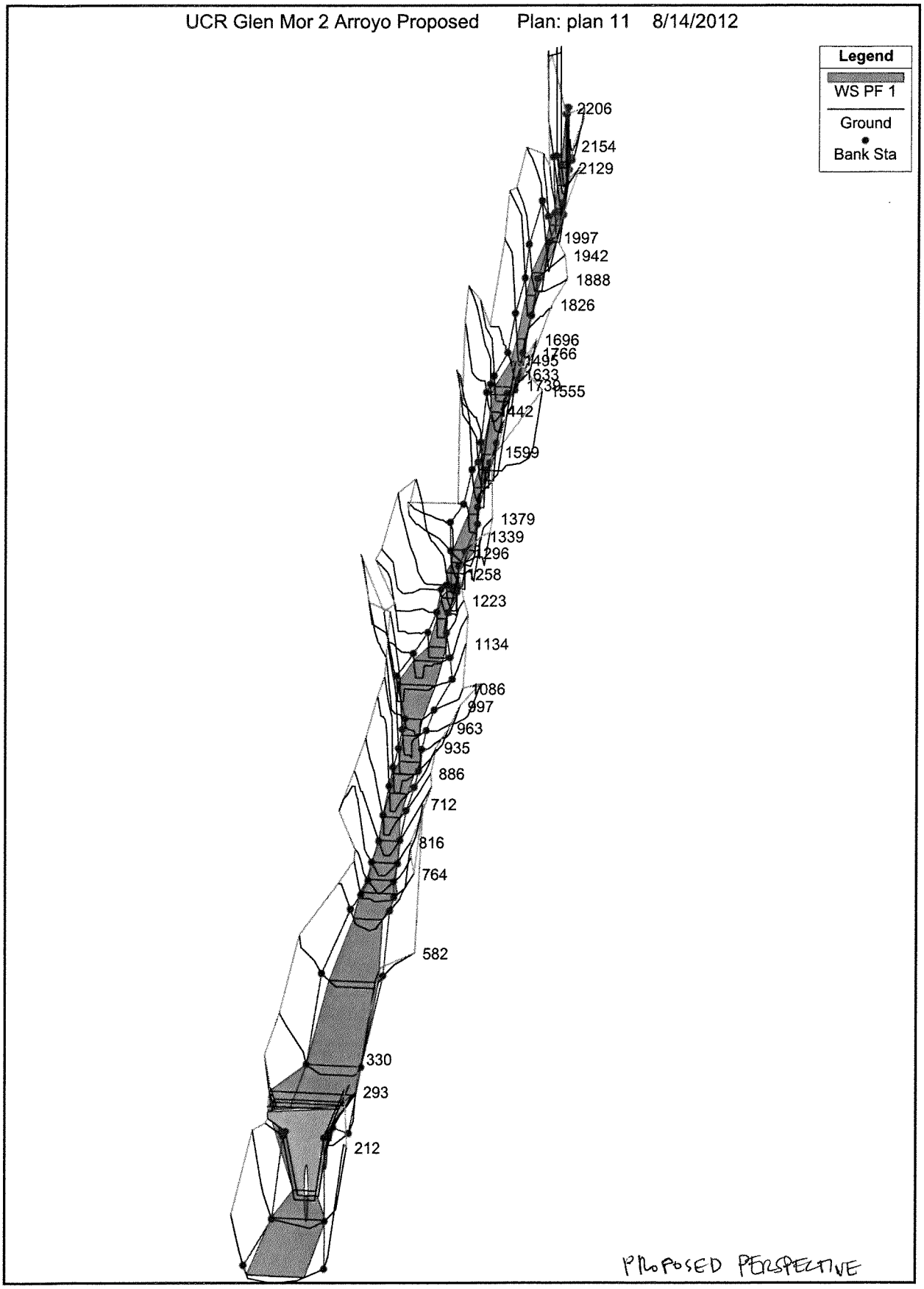

UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1134
1132
1130
1128
1126
1124
1122
1120
Elevation (ft)
0
10
20
30
40
50
Station (ft)
Proposed
2169


UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.04
.04
.04
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
1134
1132
1130
1128
1126
1124
1122
Elevation (ft)
0
10
20
30
40
Station (ft)
PROPOSED 2175


UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.011
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1131
1130
1129
1128
1127
1126
1125
1124
1123
1122
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
Station (ft)
PROPOSED 2180


UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
.011
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
Elevation (ft)
1131
1130
1129
1128
1127
1126
1125
1124
1123
0.0
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
Station (ft)
PROPOSED
2206


UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
Arroyo Glen Mor 2
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Elevation (ft)
1140
1130
1120
1110
1100
1090
1080
1070
1060
0
500
1000
1500
2000
Main Channel Distance (ft)
PROPOSED PROFILE


UCR Glen Mor 2 Arroyo Proposed Plan: plan 11 8/14/2012
Legend
WS PF 1
Ground
Bank Sta
2206
2154
2129
1997
1942
1888
1826
1696
1766
1495
1633
1738
1555
1442
1599
1379
1339
1296
1258
1223
1134
1086
997
963
935
886
712
816
764
582
330
293
212
PROPOSED PERSPECTIVE

HEC-RAS Plan: plan 11 River: Arroyo Reach: Glen Mor 2 Profile: PF 1

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
Glen Mor 2	2206	PF 1	96.00	1123.32	1128.23	1128.23	1130.55	0.013401	12.25	7.84	1.70	1.00
Glen Mor 2	2186	PF 1	96.00	1122.96	1127.87	1127.87	1130.19	0.013404	12.25	7.84	1.70	1.00
Glen Mor 2	2175	PF 1	96.00	1122.33	1124.30	1124.30	1125.02	0.023023	6.80	14.16	10.18	1.01
Glen Mor 2	2169	PF 1	96.00	1121.86	1123.91	1123.91	1124.56	0.024472	6.47	14.85	11.75	1.01
Glen Mor 2	2154	PF 1	96.00	1120.70	1122.75	1122.75	1123.40	0.024222	6.46	14.86	11.66	1.01
Glen Mor 2	2129	PF 1	96.00	1118.65	1121.30	1121.30	1122.08	0.013841	7.06	13.74	9.83	1.00
Glen Mor 2	2111	PF 1	96.00	1119.00	1120.31	1120.31	1120.85	0.013858	5.86	16.38	15.54	1.01
Glen Mor 2	2087	PF 1	96.00	1117.02	1119.39	1119.37	1119.98	0.013281	6.17	15.56	12.85	0.99
Glen Mor 2	1997	PF 1	96.00	1117.00	1118.49	1118.36	1118.93	0.009600	5.31	18.07	15.11	0.86
Glen Mor 2	1942	PF 1	96.00	1116.00	1117.63	1117.63	1118.28	0.013763	6.48	14.82	11.54	1.01
Glen Mor 2	1888	PF 1	96.00	1113.00	1115.10		1115.51	0.007701	5.14	18.67	11.89	0.72
Glen Mor 2	1826	PF 1	96.00	1112.00	1114.28	1114.28	1114.88	0.016501	6.25	15.36	12.90	1.01
Glen Mor 2	1766	PF 1	96.00	1112.00	1113.17		1113.44	0.007750	4.17	23.03	24.58	0.76
Glen Mor 2	1739	PF 1	96.00	1110.99	1113.14		1113.26	0.002458	2.84	33.78	25.45	0.43
Glen Mor 2	1696	PF 1	96.00	1110.83	1112.46	1112.46	1113.02	0.013843	6.01	15.96	14.32	1.00
Glen Mor 2	1633	PF 1	96.00	1108.00	1110.07		1110.25	0.002665	3.41	28.17	16.99	0.47
Glen Mor 2	1599	PF 1	96.00	1108.00	1109.45	1109.45	1110.04	0.013890	6.21	15.47	13.13	1.01
Glen Mor 2	1555	PF 1	96.00	1107.00	1108.59	1108.59	1109.17	0.013977	6.14	15.65	13.61	1.01
Glen Mor 2	1495	PF 1	96.00	1105.78	1107.45	1107.45	1108.12	0.015488	6.59	14.56	10.92	1.01
Glen Mor 2	1442	PF 1	96.00	1104.12	1105.40		1105.65	0.008445	4.00	24.01	26.83	0.74
Glen Mor 2	1379	PF 1	96.00	1103.00	1105.11		1105.38	0.005504	4.17	23.00	16.43	0.62
Glen Mor 2	1361	PF 1	96.00	1103.00	1104.61	1104.61	1105.18	0.012686	6.46	17.04	14.94	0.93
Glen Mor 2	1339	PF 1	96.00	1102.00	1103.54	1103.54	1104.16	0.014826	6.31	15.21	12.46	1.01
Glen Mor 2	1296	PF 1	96.00	1102.00	1103.36		1103.65	0.007029	4.32	22.24	19.01	0.70
Glen Mor 2	1258	PF 1	96.00	1101.00	1102.51	1102.51	1103.15	0.015971	6.41	14.98	11.84	1.00
Glen Mor 2	1223	PF 1	96.00	1100.00	1100.86	1100.86	1101.29	0.015260	5.24	18.32	21.73	1.01
Glen Mor 2	1186	PF 1	96.00	1099.00	1100.38	1100.38	1100.69	0.010857	4.47	21.45	35.50	1.01
Glen Mor 2	1134	PF 1	96.00	1098.00	1099.37	1099.37	1099.62	0.017464	4.04	23.79	47.51	1.01
Glen Mor 2	1086	PF 1	96.00	1096.00	1097.22	1097.22	1097.64	0.014564	5.23	18.36	22.54	1.00
Glen Mor 2	1044	PF 1	96.00	1094.77	1096.53	1096.53	1096.99	0.015898	5.43	17.69	19.49	1.00
Glen Mor 2	997	PF 1	96.00	1094.00	1094.98		1095.21	0.007101	3.88	24.74	26.50	0.71
Glen Mor 2	963	PF 1	96.00	1093.00	1094.50	1094.50	1094.89	0.016114	4.99	19.23	25.56	1.01
Glen Mor 2	935	PF 1	96.00	1092.00	1093.45	1093.45	1093.87	0.015287	5.20	18.46	22.23	1.01
Glen Mor 2	886	PF 1	96.00	1091.00	1092.43	1092.43	1092.87	0.015391	5.32	18.06	20.97	1.01
Glen Mor 2	849	PF 1	96.00	1090.00	1091.18	1091.18	1091.57	0.014613	4.97	19.31	25.72	1.00
Glen Mor 2	816	PF 1	96.00	1089.00	1090.03	1090.03	1090.36	0.015636	4.62	20.77	32.57	1.01
Glen Mor 2	790	PF 1	96.00	1088.00	1089.10	1089.10	1089.43	0.015213	4.59	21.02	34.55	1.00
Glen Mor 2	764	PF 1	96.00	1087.79	1088.48	1088.48	1088.75	0.015688	4.18	23.50	46.49	0.99
Glen Mor 2	712	PF 1	96.00	1086.35	1087.28	1087.28	1087.59	0.015908	4.46	21.54	35.65	1.01
Glen Mor 2	582	PF 1	96.00	1084.00	1084.48	1084.48	1084.69	0.008514	3.69	25.98	61.00	1.00
Glen Mor 2	459	PF 1	96.00	1079.30	1080.03		1080.12	0.004508	2.37	40.53	67.54	0.54
Glen Mor 2	330	PF 1	96.00	1076.00	1080.09		1080.09	0.000006	0.29	356.16	105.83	0.03
Glen Mor 2	293	PF 1	96.00	1077.00	1080.08	1077.53	1080.09	0.000028	0.53	204.13	92.33	0.05
Glen Mor 2	272		Culvert									
Glen Mor 2	251	PF 1	96.00	1073.00	1073.76	1073.76	1074.11	0.015019	4.78	20.09	28.47	1.00
Glen Mor 2	212	PF 1	96.00	1071.40	1072.11	1072.11	1072.31	0.018118	3.66	26.34	66.59	1.01
Glen Mor 2	100	PF 1	96.00	1068.70	1069.28	1069.28	1069.47	0.018466	3.55	27.05	70.62	1.01

PROPOSED PROFILE
~~DATA~~ OUTPUT TABLE

UCR Glen Mor 2 Arroyo Existing Conditions

HEC-RAS X-section	General Scour - Lacey Equation						General Scour - Blench Equation								[2]Average General Scour Below Streambed
	ds	Z	dm	Q	f	Dm	Dm	Q	TW	qf	Fbo	ds	Z	dfo	
	Depth of Scour Below Streambed (ft)	Multiplying Factor	Mean Depth *(ft)*	Design Discharge *(cfs)*	Lacey's Silt Factor	Mean Grain Size of Bed Material *(mm)*	Mean Grain Size of Bed Material *(mm)*	Design Discharge *(cfs)*	HEC-RAS [1]TW *(cfs/ft)*	Design Flood Discharge Per Unit Width *(cfs/ft)*	Blench's "Zero Bed Factor" *(ft/s2)*	Depth of Scour Below Streambed *(ft)*	Multiplying Factor	Depth for Zero Bed Sediment Transport	*(ft)*
Reach 1 - General Scour Analysis															
1134	***1.87***	1	1.87	96	1.46	0.69	0.69	96	44.84	2.14	1.64	***1.76***	1.25	1.41	***1.82***
1086	***1.87***	1	1.87	96	1.46	0.69	0.69	96	23.89	4.02	1.64	***2.68***	1.25	2.14	***2.27***
1044	***1.87***	1	1.87	96	1.46	0.69	0.69	96	15.02	6.39	1.64	***3.65***	1.25	2.92	***2.76***
997	***1.12***	0.6	1.87	96	1.46	0.69	0.69	96	25.3	3.79	1.64	***1.24***	0.60	2.06	***1.18***
963	***1.12***	0.6	1.87	96	1.46	0.69	0.69	96	25.58	3.75	1.64	***1.23***	0.60	2.05	***1.18***
935	***1.12***	0.6	1.87	96	1.46	0.69	0.69	96	16.92	5.67	1.64	***1.62***	0.60	2.70	***1.37***
886	***1.12***	0.6	1.87	96	1.46	0.69	0.69	96	19.67	4.88	2.64	***3.33***	1.60	2.08	***2.23***
849	***1.12***	0.6	1.87	96	1.46	0.69	0.69	96	21.14	4.54	1.64	***1.40***	0.60	2.33	***1.26***
Reach 2 - General Scour Analysis															
1495	***1.16***	0.6	1.94	96	1.31	0.55	0.55	96	10.73	8.95	1.50	***2.26***	0.60	3.76	***1.71***
1442	***1.94***	1	1.94	96	1.31	0.55	0.55	96	22.67	4.23	1.50	***1.37***	0.60	2.29	***1.66***
1379	***1.16***	0.6	1.94	96	1.31	0.55	0.55	96	17.3	5.55	1.50	***1.64***	0.60	2.74	***1.40***
1361	***1.94***	1	1.94	96	1.31	0.55	0.55	96	8.17	11.75	1.50	***2.71***	0.60	4.52	***2.33***
1339	***1.16***	0.6	1.94	96	1.31	0.55	0.55	96	11.76	8.16	1.50	***2.13***	0.60	3.54	***1.64***
1296	***1.94***	1	1.94	96	1.31	0.55	0.55	96	18.99	5.06	1.50	***1.54***	0.60	2.57	***1.74***
1258	***1.46***	0.75	1.94	96	1.31	0.55	0.55	96	11.84	8.11	1.50	***2.12***	0.60	3.53	***1.79***
1223	***1.46***	0.75	1.94	96	1.31	0.55	0.55	96	21.37	4.49	1.50	***1.43***	0.60	2.38	***1.44***
1186	***1.16***	0.6	1.94	96	1.31	0.55	0.55	96	35.44	2.71	1.50	***1.02***	0.60	1.70	***1.09***
Reach 3 - General Scour Analysis															
1888	***1.94***	1	1.94	96	1.31	0.55	0.55	96	9.1	10.55	1.50	***5.25***	1.25	4.20	***3.60***
1826	***1.94***	1	1.94	96	1.31	0.55	0.55	96	12.89	7.45	1.50	***4.16***	1.25	3.33	***3.05***
1766	***1.94***	1	1.94	96	1.31	0.55	0.69	96	20.74	4.63	1.50	***3.03***	1.25	2.43	***2.49***

UCR Glen Mor 2 Arroyo Proposed Conditions

HEC-RAS X-section	General Scour - Lacey Equation						General Scour - Blench Equation								[(2)]Average General Scour Below Streambed
	ds	Z	dm	Q	f	Dm	Dm	Q	TW	qf	Fbo	ds	Z	dfo	
	Depth of Scour Below Streambed (ft)	Multiplying Factor	Mean Depth *(ft)*	Design Discharge *(cfs)*	Lacey's Silt Factor	Mean Grain Size of Bed Material *(mm)*	Mean Grain Size of Bed Material *(mm)*	Design Discharge *(cfs)*	HEC-RAS [(1)]TW *(cfs/ft)*	Design Flood Discharge Per Unit Width *(cfs/ft)*	Blench's "Zero Bed Factor" *(ft/s2)*	Depth of Scour Below Streambed *(ft)*	Multiplying Factor	Depth for Zero Bed Sediment Transport	*(ft)*
					Reach 1 - General Scour Analysis										
1134	***1.40***	0.75	1.87	96	1.46	0.69	0.69	96	44.09	2.18	1.64	***0.85***	0.60	1.42	***1.13***
1086	***0.93***	0.5	1.87	96	1.46	0.69	0.69	96	24.13	3.98	1.64	***1.28***	0.60	2.13	***1.11***
1044	***0.93***	0.5	1.87	96	1.46	0.69	0.69	96	17.16	5.59	1.64	***1.60***	0.60	2.67	***1.27***
997	***0.93***	0.5	1.87	96	1.46	0.69	0.69	96	25.3	3.79	1.64	***1.24***	0.60	2.06	***1.09***
963	***0.93***	0.5	1.87	96	1.46	0.69	0.69	96	25.56	3.76	1.64	***1.23***	0.60	2.05	***1.08***
935	***0.93***	0.5	1.87	96	1.46	0.69	0.69	96	17.02	5.64	1.64	***1.61***	0.60	2.69	***1.27***
886	***0.47***	0.25	1.87	96	1.46	0.69	0.69	96	20.97	4.58	1.64	***1.40***	0.60	2.34	***0.94***
					Reach 2 - General Scour Analysis										
1495	***0.49***	0.25	1.94	96	1.31	0.55	0.55	96	10.92	8.79	1.50	***2.23***	0.60	3.72	***1.36***
1442	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	22.51	4.26	1.50	***1.38***	0.60	2.30	***1.17***
1379	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	17.31	5.55	1.50	***1.64***	0.60	2.74	***1.31***
1361	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	8.17	11.75	1.50	***2.71***	0.60	4.52	***1.84***
1339	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	11.78	8.15	1.50	***2.12***	0.60	3.54	***1.55***
1296	***1.46***	0.75	1.94	96	1.31	0.55	0.55	96	19.01	5.05	1.50	***1.54***	0.60	2.57	***1.50***
1258	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	11.84	8.11	1.50	***2.12***	0.60	3.53	***1.54***
1223	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	21.38	4.49	1.50	***1.43***	0.60	2.38	***1.20***
1186	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	34.5	2.78	1.50	***1.04***	0.60	1.73	***1.00***
					Reach 3 - General Scour Analysis										
1888	***0.97***	0.5	1.94	96	1.31	0.55	0.55	96	9.11	10.54	1.50	***2.52***	0.60	4.20	***1.74***
1826	***1.46***	0.75	1.94	96	1.31	0.55	0.55	96	12.89	7.45	1.50	***2.00***	0.60	3.33	***1.73***
1766	***0.97***	0.5	1.94	96	1.31	0.55	0.69	96	20.95	4.58	1.50	***1.45***	0.60	2.41	***1.21***

UCR Glen Mor 2 Arroyo Proposed Conditions

HEC-RAS X-section	Design Discharge (cfs)	Long-term Scour (LT) (ft)	Average General Scour Below Streambed (GS) (ft)	Local Scour (LS) (ft)	Total Scour (TS) (ft)	Entrenchment Depth (TS-plus 2 feet) (ft)
Reach 1						
1134	96	N/A	1.13	2.34	**3.47**	**5.47**
1086	96	N/A	1.11	2.34	**3.44**	**5.44**
1044	96	N/A	1.27	2.34	**3.61**	**5.61**
997	96	N/A	1.09	2.34	**3.42**	**5.42**
963	96	N/A	1.08	2.34	**3.42**	**5.42**
935	96	N/A	1.27	2.34	**3.61**	**5.61**
886	96	N/A	0.94	2.34	**3.27**	**5.27**
Reach 2						
1495	96	N/A	1.36	2.43	**3.79**	**5.79**
1442	96	N/A	1.17	2.43	**3.60**	**5.60**
1379	96	N/A	1.31	2.43	**3.73**	**5.73**
1361	96	N/A	1.84	2.43	**4.27**	**6.27**
1339	96	N/A	1.55	2.43	**3.97**	**5.97**
1296	96	N/A	1.50	2.43	**3.93**	**5.93**
1258	96	N/A	1.54	2.43	**3.97**	**5.97**
1223	96	N/A	1.20	2.43	**3.63**	**5.63**
1186	96	N/A	1.00	2.43	**3.43**	**5.43**
Reach 3						
1888	96	N/A	1.74	2.43	**4.17**	**6.17**
1826	96	N/A	1.73	2.43	**4.15**	**6.15**
1766	96	N/A	1.21	2.43	**3.63**	**5.63**

Appendix 2

- BOMBAG Manufacturers' Information
- BOBCAT Manufacturer Photographs

BOMAG
FAYAT GROUP

LIGHT EQUIPMENT

The world of compaction is changing, and BOMAG is at the heart of the process. Always the innovator, BOMAG continues to explore exciting new products and new applications. At the same time, we continue to improve existing products based on feedback from our customers around the world.

In markets both old and new, BOMAG is helping to shape the future of compaction equipment. That's because we are the specialist in an industry of generalists. Where other manufacturers diversify across the spectrum of construction machinery, BOMAG is focused solely on compaction solutions.

Nowhere is this more true than in the area of light compaction equipment. BOMAG offers a full range of light compaction products, from the smallest tampers and plates to ride-on rollers. Whatever your application, we have the product to fit your needs.

BOMAG. The Compaction Specialist

For more information, call us at

1-800-78-BOMAG

or visit us at

www.gobomag.com

BOMAG LIGHT EQUIPMENT

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BT 60/4 · BT 65/4

- Backfill around footings and foundations
- Subbase and base preparation
- Compaction of underground sewer, water, telephone and electrical lines
- Backfilling trenches

FEATURES & BENEFITS

- Four-cycle engine offers convenience while maintaining high stroke and impact force.
- Low oil system helps to prevent premature engine damage.
- Dual fuel filter system for higher reliability.
- Engine design allows transportation in any position without concern for fuel contamination.
- Six interchangeable shoe sizes provide a variety of compaction widths.
- Dual air filters system protects engine in dusty conditions.
- Hour / Tachometer with integrated service indicator
- All around engine guard protection to reduce expensive repair costs.
- Acceleration pump for efficient power curve.

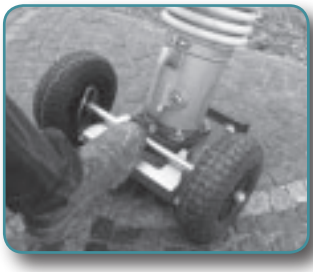
Four Cycle Tampers

SPECS

	BT 60/4	BT 65/4
Operating weight	137 lbs 62 kg	150 lbs 68 kg
Length	28.9 in 73.5 cm	28.9 in 73.5 cm
Height	37.8 in 96 cm	39.4 in 100 cm
Width	13.8 in 35 cm	13.8 in 35 cm
Working width	11 in 28 cm	11 in 28 cm
Impact force	3035 lbs 13.5 kN	3642 lbs 16.2 kN
Frequency	600 - 708 bpm 10 - 11.8 Hz	600 - 708 bpm 10 - 11.8 Hz
Max. working speed*	66 ft/min 20 m/min	66 ft/min 20 m/min
Engine / Power Power rating ISO 9249	Honda 3.4 hp 2.5 kW	Honda 3.4 hp 2.5 kW
Max. compaction depth*	21.7 in 55 cm	25.6 in 65 cm

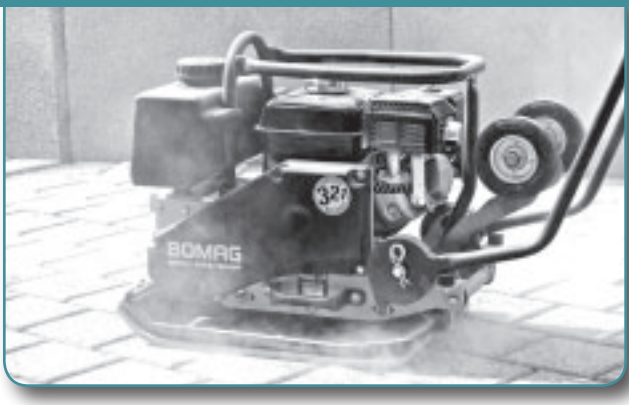
* Depending on soil conditions

BT 65/4 with special extension



BT 65/4 with transport wheels

BVP 10/36 · BVP 18/45



- Compaction of a wide variety of sand, gravel and granular base materials.
- Hot and cold asphalt patching.

FEATURES & BENEFITS

- Powerful and reliable Honda engine guarded with protection frame.
- High-density polyfiber belt guard and closed drive prevents V-belt damage and extends belt life.
- Sealed exciter housing offers greater service life.
- Self-cleaning, wear-resistant base plate ensures reduced maintenance and long service life.
- Removable handle permits easy loading into pickup, car trunk or SUV.
- Shock absorbing handle reduces operator fatigue.
- Foldable steering handle enhances maneuverability.
- Compact design allows compaction work close to curbs and retaining walls.
- Optional water spray system and transport device offers flexibility on job sites.
- Optional Vulcolan mat protects against damage to paving blocks.

Single Directional Plates

SPECS

	BVP 10/36	BVP 18/45
Operating weight	183 lbs 83 kg	201 lbs 91 kg
Length	43.9 in 111.5 cm	43.9 in 111.5 cm
Height	36 in 91.5 cm	36 in 91.5 cm
Working width	14.2 in 36 cm	17.7 in 45 cm
Centrifugal force	2250 lbs 10 kN	4050 lbs 18 kN
Frequency	5400 vpm 90 Hz	5400 vpm 90 Hz
Max. working speed*	82 ft/min 25 m/min	82 ft/min 25 m/min
Max. gradeability*	30%	30%
Engine / Power Power rating ISO 9249	Honda 3.5 hp 2.6 kW	Honda 4.8 hp 3.6 kW

* Depending on soil conditions

BVP 10/36

BVP 18/45

BP 10/35 · BP 12/40 · BP 12/50A

- Compaction of a wide variety of sand, gravel and granular base materials.
- Hot and cold asphalt patching.

FEATURES & BENEFITS

- Powerful and reliable Honda engine.
- Closed drive prevents V-belt damage and extends belt life.
- Sealed exciter housing offers greater service life.
- Self-cleaning, wear-resistant base plate ensures reduced maintenance and long service life.
- Removable handle permits easy loading into pickup, car trunk or SUV.
- Shock absorbing handle reduces operator fatigue.
- Standard water sprinkler center mounted handle and special base plate shape optimized for work on asphalt (BP 12/50 A).
- Compact design allows compaction work close to curbs and retaining walls.
- Optional water spray system and transport device offers flexibility on job sites.
- Optional Vulcolan mat protects against damage to paving blocks.

Single Directional Plates

SPECS

	BP 10/35	BP 12/40	BP 12/50 A
Operating weight	143 lbs 65 kg	159 lbs 72 kg	165 lbs 75 kg
Length	42.7 in 108.4 cm	42.7 in 108.4 cm	42.7 in 108.4 cm
Height	37.9 in 96.2 cm	37.9 in 96.2 cm	37.9 in 96.2 cm
Working width	13.8 in 35 cm	15.7 in 40 cm	19.7 in 50 cm
Centrifugal force	2250 lbs 10 kN	2700 lbs 12 kN	2700 lbs 12 kN
Frequency	5400 vpm 90 Hz	5400 vpm 90 Hz	5400 vpm 90 Hz
Max. working speed*	82 ft /min 25 m/min	82 ft/min 25 m/min	72 ft/min 22 m/min
Max. gradeability*	30%	30%	30%
Engine / Power Power rating ISO 9249	Honda 3.5 hp 2.6 kW	Honda 3.5 hp 2.6 kW	Honda 3.5 hp 2.6 kW

* Depending on soil conditions

BP 10/35

BP 12/50 A

BP 20/50 · BP 25/50

- Compaction of a wide variety of sand, gravel and granular base materials.
- Hot and cold asphalt patching.

FEATURES & BENEFITS

- Powerful and reliable Honda engine guarded with protection frame.
- High-density polyfiber belt guard and closed drive prevents V-belt damage and extends belt life.
- Sealed exciter housing offers greater service life.
- Self-cleaning, wear-resistant base plate ensures reduced maintenance and long service life.
- Removable handle permits easy loading into pickup, car trunk or SUV.
- Shock absorbing handle reduces operator fatigue.
- Foldable steering handle enhances maneuverability.
- Compact design allows compaction work close to curbs and retaining walls.
- Optional water spray system and transport device offers flexibility on job sites.
- Optional Vulcolan mat protects against damage to paving blocks.

Single Directional Plates

SPECS

	BP 20/50	BP 25/50
Operating weight	209 lbs 95 kg	238 lbs 108 kg
Length	42.7 in 108.4 cm	42.7 in 108.4 cm
Height	37.9 in 96.2 cm	37.9 in 96.2 cm
Working width	19.7 in 50 cm	19.7 in 50 cm
Centrifugal force	4500 lbs 20 kN	5620 lbs 25 kN
Frequency	5400 vpm 90 Hz	5520 vpm 92 Hz
Max. working speed*	98 ft/min 30 m/min	98 ft/min 30 m/min
Max. gradeability*	30%	30%
Engine / Power Power rating ISO 9249	Honda 4.8 hp 3.6 kW	Honda 4.8 hp 3.6 kW

* Depending on soil conditions

BP 20/50

BP 25/50

BPR 25/40 - BPR 25/40 D

- Compaction of granular, cohesive and mixed soils
- Landscaping
- Sidewalks
- Patio sub-base material
- Setting of patio block and pavers
- Asphalt compaction in confined areas

FEATURES & BENEFITS

- Hydraulic travel-control system provides simple operation and ensures a smooth transition from forward to reverse travel modes.
- Height-adjustable steering rod accommodates any operator and is lockable in both transport and working positions.
- Heavy-duty, nodular cast iron base plates feature reinforced edges for strength and long life.
- Totally enclosed V-belts minimize maintenance.
- Maintenance-free transistor ignition and large-volume dry air filter with cyclone-type pre-cleaner (BPR25/40).
- Semi-automatic decompression for easier starting (BPR25/40D).
- Optional transport wheels allow for one-person movement around the jobsite.
- Optional Vulcolan mat prevents scuffing when setting patio block or pavers.

Reversible Vibratory Plates

SPECS

	BPR 25/40	BPR 25/40 D
Operating weight	245 lbs 111 kg	284 lbs 129 kg
Length Adjustable handle	57.5 in 146 cm	57.5 in 146 cm
Height Adjustable handle	34.3 in 87 cm	34.3 in 87 cm
Working width	15.7 in 40 cm	15.7 in 40 cm
Centrifugal force	5620 lbs 25 kN	5620 lbs 25 kN
Frequency	5100 vpm 85 Hz	5100 vpm 85 Hz
Max. working speed*	82 ft/min 25 m/min	82 ft/min 25 m/min
Max. gradeability*	30%	30%
Engine / Power Power rating ISO 9249	Honda 4.8 hp 3.6 kW	Hatz 4.2 hp 3.1 kW

* Depending on soil conditions

BPR 25/40

BPR 35/60 · BPR 35/60 D · BPR 35/60 D/E

- Compaction of granular, cohesive and mixed soils.
- Compaction of backfill around footings and foundations.
- Backfilling trenches.
- Setting of patio block and pavers
- Asphalt compaction in confined areas.

FEATURES & BENEFITS

- High-strength, grain-refined steel hood protects engine from job site and transportation damage.
- Hydraulic travel-control system provides simple operation and ensures a smooth transition from forward to reverse travel modes.
- Heavy-duty, wear-resistant base plates feature reinforced edges for strength and long life.
- Totally enclosed V-belts minimize maintenance.
- Height-adjustable steering rod accommodates any operator and has lockable in both transport and working positions.
- Automatic low-oil shutdown on gasoline model prevents engine damage.
- Optional transport wheels allow for one-person movement around the jobsite.
- Optional Vulcolan mat prevents scuffing when setting patio block or pavers.

Reversible Vibratory Plates

SPECS

	BPR 35/60	BPR 35/60 D	BPR 35/60 D/E
Operating weight	430 lbs 195 kg	485 lbs 220 kg	531 lbs 241 kg
Length Adjustable handle	59.4 in 151 cm	59.4 in 151 cm	59.4 in 151 cm
Height Adjustable handle	32.3 in 82 cm	32.3 in 82 cm	32.3 in 82 cm
Working width	23.6 in 60 cm	23.6 in 60 cm	23.6 in 60 cm
Centrifugal force	7868 lbs 35 kN	7868 lbs 35 kN	7868 lbs 35 kN
Frequency	4800 vpm 80 Hz	4800 vpm 80 Hz	4800 vpm 80 Hz
Max. working speed *	89 ft/min 27 m/min	89 ft/min 27 m/min	89 ft/min 27 m/min
Max. gradeability *	32%	32%	32%
Engine / Power Power rating ISO 9249	Honda 4.8 hp 3.6 kW	Hatz 4.2 hp 3.1 kW	Hatz 4.2 hp 3.1 kW

* Depending on soil conditions

BPR 35/60 D

BPR 45/55 D/E · BPR 55/65 D/E

- Compaction of granular, cohesive and mixed soils
- Backfill around footings and foundations
- Backfilling trenches
- Compaction of base material for driveways and sidewalks

FEATURES & BENEFITS

- Powerful Diesel engine with E-Start provides faster working speed, constant centrifugal force and increased gradeability.
- Fully-enclosed hood made of high-strength, grain-refined steel protects engine and internal components from damage.
- Height adjustable steering rod accommodates any operator and is lockable in both the transport and working positions.
- Hydraulic travel control system simplifies operation and ensures a smooth, easy transition from forward to reverse travel modes.
- Standard wear strips increase working width, adding versatility.
- Optional ECONOMIZER soil stiffness indicator providing greater productivity and reduced machine wear.
- Fully-protected V-belt, lifetime lubricated vibration bearings and reinforced self-adjusting centrifugal clutch reduce maintenance and service.

Reversible Vibratory Plates

SPECS

		BPR 45/55 D/E	BPR 55/65 D/E
Operating weight		873 lbs 396 kg	1005 lbs 456 kg
Length Adjustable handle		66.9 in 170 cm	66.9 in 170 cm
Height Adjustable handle		31.5 in 80 cm	31.5 in 80 cm
Working width		21.7 in 55 cm	25.6 in 65 cm
Centrifugal force		10116 lbs 45 kN	12364 lbs 55 kN
Frequency		4200 vpm 70 Hz	3960 vpm 66 Hz
Max. working speed*		92 ft/min 28 m/min	92 ft/min 28 m/min
Max. gradeability*		35%	35%
Engine / Power Power rating ISO 9249	Lombardini	8.9 hp 6.6 kW	8.9 hp 6.6 kW

* Depending on soil conditions

BPR 45/55 D/E

BPR 55/65 D/E

BPR 70/70 D/E · BPR 100/80 D/E

- Compaction of granular, cohesive and mixed soils
- Backfill around footings and foundations
- Backfilling trenches
- Compaction of base material for driveways and sidewalks

FEATURES & BENEFITS

- Fully-enclosed hood made of high-strength, grain-refined steel protects engine and internal components from damage.
- Powerful Diesel engines provide faster working speed, greater centrifugal force and increased gradeability.
- Hydraulic travel control system with exclusive thumb-tip operating lever ensures a smooth, easy transition from forward to reverse travel modes.
- Automatic backup protection switch engages forward travel if operator backs into an obstacle while traveling in reverse.
- Height adjustable steering rod accommodates any operator and is lockable in both the transport and working positions.
- Standard electric start features warning buzzer to switch off ignition.
- Automatic low oil level shutdown feature helps prevent engine damage.
- ECONOMIZER (Optional BPR 70/70 D/E) soil stiffness indicator providing greater productivity and reduced machine wear.

Reversible Vibratory Plates

SPECS

	BPR 70/70 D/E	BPR 100/80 D/E
Operating weight	1276 lbs 579 kg	1570 lbs 712 kg
Length Adjustable handle	73.2 in 186 cm	74.4 in 189 cm
Height Adjustable handle	40.6 in 103 cm	42.5 in 108 cm
Working width	27.6 in 70 cm	31.5 in 80 cm
Centrifugal force	15736 lbs 70 kN	22481 lbs 100 kN
Frequency	4020 vpm 67 Hz	3360 vpm 56 Hz
Max. working speed*	92 ft/min 28 m/min	92 ft/min 28 m/min
Max. gradeability*	35%	35%
Engine / Power Power rating ISO 9249	Hatz 12.5 hp 9.3 kW	Hatz 13.8 hp 10.3 kW

* Depending on soil conditions

BPR 70/70 D/E

BPR 100/80 D/E

BPH 80/65 S D/E

- Compaction of granular and mixed soils
- Backfilling trenches
- Compaction of backfill around pipelines
- Asphalt compaction

FEATURES & BENEFITS

- Standard umbilical remote operation allows operator to remain safely out of the trench.
- Optional cable/radio remote provides additional working range.
- Hydraulic travel and vibration control system provides responsive steering capabilities.
- Standard wear extension plates increase working widths and add versatility.
- Low center of gravity and operating height enhance stability and allow operation in reduced-ceiling and confined environments.
- Heavy-duty steel hood protects against on-site conditions and transport hazards.
- Single, balanced lifting point provides simple loading and unloading.
- Lockable engine cover and dashboard discourage vandalism.

Remote Reversible Plates

SPECS

	BPH 80/65 S D/E
Operating weight	1638 lbs 743 kg
Length	42.8 in 108 cm
Height	30.9 in 79 cm
Working width	31.5 in 80 cm
Centrifugal force	18000 lbs 80 kN
Frequency	3300 vpm 55 Hz
Max. working speed*	92 ft/min 28 m/min
Max. gradeability*	30%
Engine / Power Power rating ISO 9249	Hatz 15.2 hp 11.3 kW

* Depending on soil conditions

BPH 80/65 S D/E

BW 55 E

- Asphalt repair and maintenance
- Pothole patching
- Asphalt compaction in confined areas such as paths, driveways and parking lots

FEATURES & BENEFITS

- Adjustable steering handle easily accommodates any operator.
- Ergonomic control layout ensures easy operation.
- Large diameter drum reduces scuffing and tearing when working on asphalt.
- Narrow lateral overhang ensures maximum compaction near walls and curbs.
- Dual scraper bars prevent material pick-up.
- Thick drum shell provides maximum compaction strength and extended service life.
- Large-capacity removable water tank increases jobsite productivity by extending time between fills.

Walk Behind Rollers

SPECS

	BW 55 E
Operating weight	355 lbs 161 kg
Length Adjustable handle	43.3 in 110 cm
Height Adjustable handle	35.4 in 90 cm
Width	26.7 in 68 cm
Working width	22 in 56 cm
Static linear load	16.2 pli 2.9 kg/cm
Centrifugal force	2250 lbs 10 kN
Frequency	4620 vpm 77 Hz
Amplitude	0.020 in 0.5 mm
Max. gradeability*	
without vibration	25%
with vibration	20%
Engine / Power	Honda 3.5 hp
Power rating ISO 9249	2.6 kW

* Depending on conditions

BW 55 E

BW 55 E

BW 65H D/E

- Construction backfill
- Trench work
- Shoulder work
- Asphalt repair

FEATURES & BENEFITS

- Counter-phased eccentric weights direct maximum compactive force downward into to compacted material.
- Dual drum vibration ensures high compaction performance and running behavior.
- Powerful Diesel engine with electrical start provides optimal compaction performance.
- Hydrostatic drive provides infinitely-variable rolling speeds.
- Narrow lateral overhang permits compaction around obstructions.
- Hydrodynamic braking holds machine position, even on grade.
- Two scrapers per drum prevent material pick-up.
- Ergonomic-control layout places travel direction, engine throttle and vibration controls within easy reach of operator.
- Vibration-isolated steering handle enhances operator comfort.
- Large-diameter drum minimizes scuffing and tearing of asphalt mat.

Walk Behind Rollers

SPECS

	BW 65H D/E
Operating weight	1668 lbs 757 kg
Length Adjustable handle	91.3 in 232 cm
Height Adjustable handle	47.6 in 121 cm
Width	30 in 76 cm
Working width	25.6 in 65 cm
Static linear load	32.6 pli 5.8 kg/cm
Centrifugal force	4950 lbs 22 kN
Frequency	3300 vpm 55 Hz
Amplitude	0.018 in 0.45 mm
Max. gradeability* without vibration with vibration	 40% 35%
Engine / Power Power rating ISO 9249	Hatz 8.3 hp 6.2 kW

* Depending on conditions

BW 65H D/E

BMP 851 · BMP 8500

- Base preparation
- Compaction and backfilling around footings and foundations
- Backfilling of trenches
- Compaction of difficult soils where high maneuverability is required

FEATURES & BENEFITS

- Standard umbilical cord / radio remote control increase versatility and enhance safety.
- Standard bolt-on drum extensions increase versatility.
- Front and rear scrapers on each drum prevent material pick-up.
- High amplitude and centrifugal force provide versatility in many cohesive types of soil.
- Easily accessible lifting point provides easy loading and unloading.
- Swing-out and -up covers expose 90 percent of components providing quick and easy maintenance.
- Automatic exciter rotation direction change increases gradeability (BMP851).
- High compaction output because of two exciter shafts per drum and directed forces into compacted material (BMP8500).
- Rigid frame with skid (BMP851) or articulated (BMP8500) steering for excellent maneuverability.

Multi-Purpose Compactors

SPECS

	BMP 851	BMP 8500
Operating weight	3413 lbs 1548 kg	3622 lbs 1643 kg
Length	69.3 in 176 cm	74.7 in 190 cm
Height	47.2 in 120 cm	50.2 in 128 cm
Working width	24 in / 33.5 in 61 cm / 85 cm	24 in / 33.5 in 61 cm / 85 cm
Centrifugal force	18000 lbs 80 kN	8000 lbs / 16000 lbs 36 kN / 72 kN
Frequency	1920 vpm 32 Hz	2520 vpm 42 Hz
Amplitude	0.083 in 2.1 mm	0.022 in / 0.044 in 0.56 mm / 1.12 mm
Max. gradeability*		
without vibration	55%	55%
with vibration	45%	45%
Engine / Power	Hatz 18.8 hp	Kubota 19.4 hp
Power rating ISO 9249	14 kW	14.5 kW

* Depending on conditions

BMP 851

BMP 8500

BW 900-50

- Sub-base preparation
- Asphalt repair and maintenance
- Parking Areas
- Path and Driveways

FEATURES & BENEFITS

- High clearance on both sides permits compaction close to obstructions from either direction.
- Lockable engine cover and vandal-protected instrument panel increase jobsite security.
- Clear operation and indicator controls with a new ergonomic steering wheel for maximum comfort.
- The standard foldable ROPS offers flexibility for transport and storage.
- Maintenance free bolt on articulated and oscillating joint.
- Single-lever travel / vibration control simplifies operation.
- 65-inch (162 cm) turning radius ensures excellent maneuverability.
- Mechanical hand brake for increased driving flexibility.
- Water system with internal timer allows operator to control water flow to drums.
- 36-gallon (137 liter) water tank minimizes downtime for refills.

Tandem Ride-On Rollers

SPECS

	BW 900-50
Operating weight	2639 lbs 1197 kg
Length	77.4 in 197 cm
Height	90.2 in 229 cm
Width	37.8 in 96 cm
Working width	35.4 in 90 cm
Static linear load	37.3 pli 6.7 kg/cm
Centrifugal force	3395 lbs 15.1 kN
Frequency	4200 vpm 70 Hz
Working speed with vibration	0 - 2.5 mph 0 - 5.4 kmph
Amplitude	0.02 in 0.5 mm
Max. gradeability*	
without vibration	40%
with vibration	30%
Engine / Power	Honda 16.6 hp
Power rating ISO 9249	12.4 kW

* Depending on conditions

BW 900-50 with new comfort steering wheel.

BW 900-50 with foldable ROPS Standard.

BW 90 AD-5 · BW 100 ADM-5

- Sub-base preparation
- Asphalt repair and maintenance
- Parking Areas
- Path and Driveways

FEATURES & BENEFITS

- Narrow lateral overhang ensures maximum compaction near walls and curbs.
- Lockable engine cover and vandal protected instrument panel increase jobsite security.
- Clear operation and indicator controls with a new ergonomic steering wheel for maximum comfort.
- Maintenance free bolt on articulated and oscillating joint.
- Travel-control lever with integrated vibration thumb tip control provides sensitive operation.
- Double drum SAHR brake system increases jobsite safety.
- Water system with internal timer allows operator to control water flow to drums.

Tandem Ride-On Rollers

SPECS

	BW 90 AD-5	BW 100 ADM-5
Operating weight	3527 lbs 1600 kg	3638 lbs 1650 kg
Length	86.4 in 219.4 cm	86.4 in 219.4 cm
Height	90.7 in 230.4 cm	90.7 in 230.4 cm
Width	37.6 in 95.6 cm	41.6 in 105.6 cm
Working width	35.4 in 900 cm	39.4 in 100 cm
Static linear load	49.8 pli 8.9 kg/cm	46.2 pli 8.3 kg/cm
Centrifugal force (Each Drum)	3822 lbs 17 kN	3822 lbs 17 kN
Frequency	3780 vpm 63 Hz	3780 vpm 63 Hz
Working speed with vibration	0-2.8 mph 0-4.5 kmph	0-2.8 mph 0-4.5 kmph
Amplitude	0.020 in 0.50 mm	0.016 in 0.40 mm
Max. gradeability*		
without vibration	40%	40%
with vibration	30%	30%
Engine / Power Power rating ISO 14396	Kubota 20.2 hp 15.1 kW	Kubota 20.2 hp 15.1 kW

* Depending on conditions

BW 90 ADM-5

BW 100 ADM-5

BW 100 AD-4

- Sub-base preparation
- Asphalt repair and maintenance
- Parking Areas
- Path and Driveways

FEATURES & BENEFITS

- Powerful 33.8-horsepower water-cooled engine provides faster working speed and greater centrifugal force.
- Two vibration frequencies allow use on a variety of materials.
- Standard crab walk feature offsets rear drum 1.5 inches in either direction for superior performance when compacting joints or rolling into and out of turns.
- Oscillating, articulating center joint enables full drum contact on irregular surfaces.
- Rear drum vibration lockout permits compaction of thin lifts of material.
- Comfortable, laterally sliding three-way adjustable seat allows operator to see drum edges without leaning over.
- Increased fuel tank and water tank capacities reduce downtime for refills and refueling.
- Lockable anti-vandal dashboard protection enhances job site security.

Tandem Ride-On Rollers

SPECS

	BW 100 AD-4
Operating weight	5291 lbs 2400 kg
Length	97.4 in 248 cm
Height	97.4 in 248 cm
Width	42.4 in 108 cm
Working width	39.4 in 100 cm
Static linear load	67.2 pli 12 kg/cm
Centrifugal force (per drum)	5175 lbs / 8550 lbs 23 kN / 38 kN
Frequency	3300 vpm / 4200 vpm 55 Hz / 70 Hz
Working speed with vibration	0 - 4.0 mph 0 - 6.5 kmph
Amplitude	0.02 in 0.5 mm
Max. gradeability*	
without vibration	40%
with vibration	30%
Engine / Power	Kubota 33.8 hp
Power rating ISO 9249	25.2 kW

* Depending on conditions

BW 100 AD-4

BW 100 AD-4

BW 120 AD-4

- Sub-base preparation
- Asphalt repair and maintenance
- Parking Areas
- Path and Driveways

FEATURES & BENEFITS

- Powerful 33.8-horsepower water-cooled engine provides faster working speed and greater centrifugal force.
- Two vibration frequencies allow use on a variety of materials.
- Standard crab walk feature offsets rear drum 1.5 inches in either direction for superior performance when compacting joints or rolling into and out of turns.
- Oscillating, articulating center joint enables full drum contact on irregular surfaces.
- Rear drum vibration lockout permits compaction of thin lifts of material.
- Comfortable, laterally sliding three-way adjustable seat allows operator to see drum edges without leaning over.
- Standard FOPS /ROPS with safety seat belts offers additional operator safety.
- Lockable anti-vandal dashboard protection enhances job site security.

Tandem Ride-On Rollers

SPECS

	BW 120 AD-4
Operating weight	5732 lbs 2600 kg
Length	97.2 in 247 cm
Height	98.0 in 249 cm
Width	50.2 in 127.6 cm
Working width	47.2 in 120 cm
Static linear load	60.7 pli 11 kg/cm
Centrifugal force (per drum)	6300 lbs / 10125 lbs 28 kN / 45 kN
Frequency	3300 vpm / 4200 vpm 55 Hz / 70 Hz
Working speed with vibration	0 - 4.0 mph 0 - 6.5 kmph
Amplitude	0.02 in 0.5 mm
Max. gradeability*	
without vibration	40%
with vibration	30%
Engine / Power	Kubota 33.8 hp
Power rating ISO 9249	25.2 kW

* Depending on conditions

BW 120 AD-4

BW 120 AD-4

BW 124 DH-40 · BW 124 PDH-40

- Site preparation
- Embankment compaction
- Trench compaction
- Soil compaction in road construction

FEATURES & BENEFITS

- Bolt-on center articulation joint provides easy service and optimum steering and oscillation angles.
- Standard drum drive ensures maximum gradeability.
- Powerful, fuel-efficient, Tier 4i compliant 3-cylinder Deutz diesel engine minimizes routine maintenance.
- Console-mounted joystick provides one-hand control of travel directions and speed as well as drum vibration.
- Floor-mounted foot pedals raise and lower optional leveling blade for optimal productivity.
- ROPS/FOPS with standard sun canopy and adjustable seat with seat belt maximize operator comfort and safety.

Single Drum Vibratory Rollers

SPECS

	BW 124 DH-40	BW 124 PDH-40
Operating weight	7010 lbs 3180 kg	7120 lbs 3230 kg
Operating weight w/blade	N/A N/A	8050 lbs 3650 kg
Length	136.0 in 345 cm	136.0 in 345 cm
Length w/blade	N/A N/A	157.5 in 400 cm
Height	97.3 in 247.1 cm	97.3 in 247 cm
Width	51.6 in 131 cm	51.6 in 131 cm
Width w/blade	N/A N/A	59.6 in 151 cm
Working width	47.2 in 120 cm	47.2 in 120 cm
Centrifugal force (per drum)	18540 lbs 82.5 kN	18540 lbs 82.5 kN
Frequency	2460 vpm 41 Hz	2460 vpm 41 Hz
Working speed	0 - 5.6 mph 0 - 9 kmph	0 - 5.6 mph 0 - 9 kmph
Amplitude	0.067 in 1.7 mm	0.063 in 1.6 mm
Max. gradeability*	55%	55%
Engine / Power Power rating SAE J1995	Deutz 45 hp 33 kW	Deutz 45 hp 33 kW
Number of Pad Feet	N/A	70

* Depending on conditions

BW 124 PDH-40

BW 124 PDH-40 With Blade

The BOMAG online
Community

The BOMAG Community forum is helping us develop and improve our product line around you our customer. This website is an opportunity to share your opinions, ideas and concerns directly with us. Visit **www.gobomag.com** and click on the **BOMAG Community** link to share what matters to you.

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Photo – Bobcat Company – Compact Excavator

Photo – Bobcat Company – Compact Excavator

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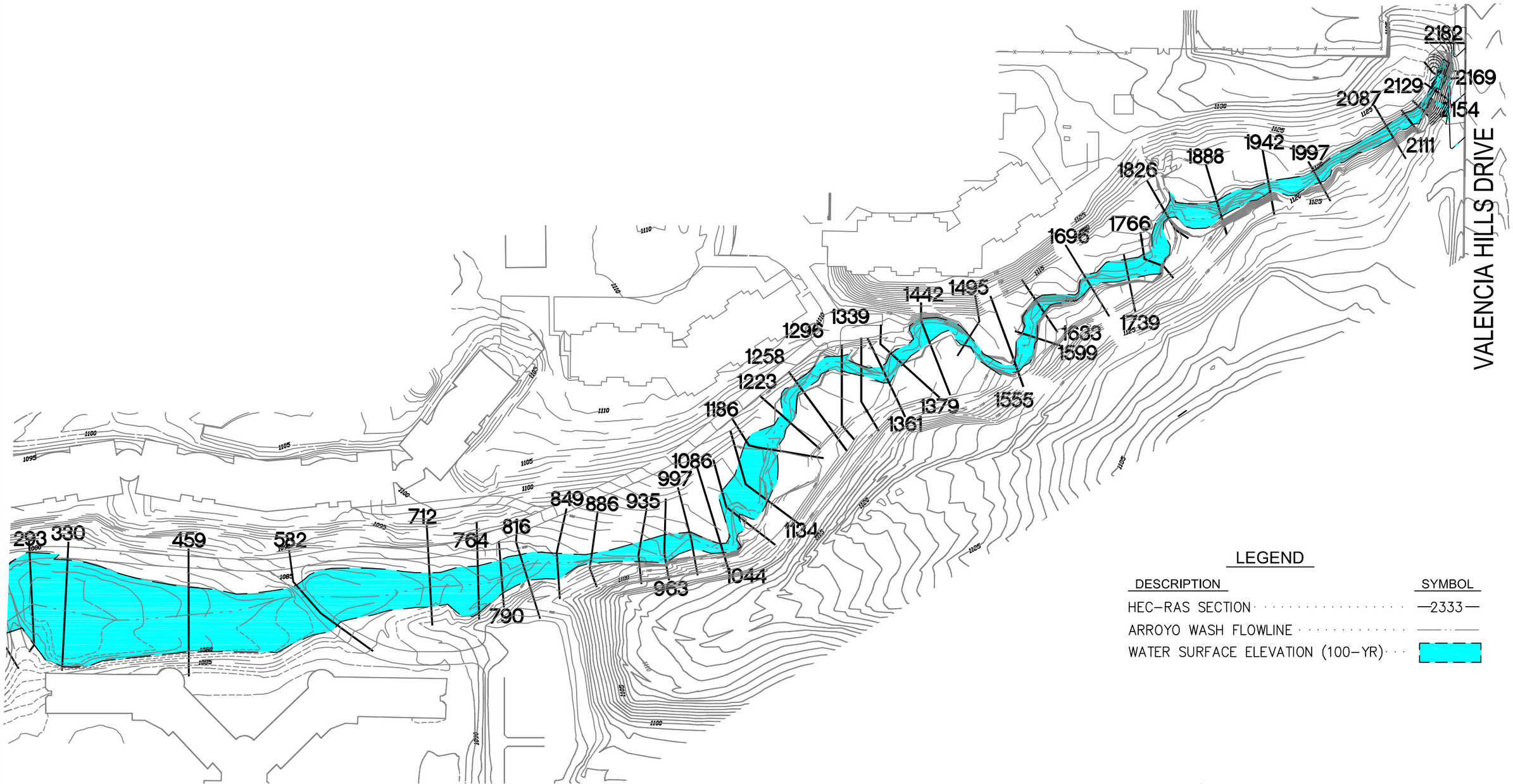
Attachment r

Updated Arroyo Floodplain Limits



LEGEND

DESCRIPTION	SYMBOL
HEC–RAS SECTION	—2333—
ARROYO WASH FLOWLINE	
WATER SURFACE ELEVATION (100–YR)	

FLC
SCALE 1" = 100'

GLEN MOR 2 DRAINAGEWAY
EXISTING CONDITION
HEC-RAS WORKMAP
SEPTEMBER 2012

BergerABAM
FLORES LUND
CONSULTANTS

Attachment s

Supplemental Noise Memorandum

Memorandum

Date:	August 27, 2012
To:	Kathleen Dale Regulatory Compliance Specialist
From:	Peter Hardie Noise Analyst
Subject:	**Glen Mor 2 Project Gabion Walls – Supplemental Evaluation of Noise and Vibration**

This memorandum has been prepared in support of the updated CEQA evaluation for the added gabion wall elements for the Arroyo Improvements component of the Glen Mor 2 Student Apartments project. This evaluation focuses in particular on the changed circumstance of use of mechanical equipment during the construction phase in closer proximity to the existing Glen Mor 1 and Pentland Hills residential buildings. This memorandum is a supplement to the technical report entitled "Noise Technical Report – Glen Mor 2 Student Apartments", dated January 2011.

Proposed Project

The proposed project would use a hydraulic excavator to trench and excavate the work are for three gabion walls to shore up the eroded arroyo bank. Due to the nature of soils within the work limits, the geotechnical engineer has recommended a conservative excavation layback of 1.5:1. A crane will be used to lower equipment and materials to the work area in the arroyo bottom. Compact equipment (Bobcat size and hand tools) will be used for backfill and compaction. During construction equipment would be located within approximately 25 feet of existing residential halls located on the University of California Riverside (UCR) campus.

Impact Analysis

Vibration

Construction could occur as close as 25 feet to residence halls immediately to the north of the arroyo. Table 1 below shows the vibration level (in terms of velocity decibels [Vdb) of typical pieces of construction equipment that likely would be used for the proposed project, as measured at a reference distance of 25 feet.

Table 1. Typical Vibration from Construction Equipment

Equipment	Approximate Lv[1] (VdB) at 25 Feet
Vibratory roller	94

Source: Federal Transit Administration *Transit Noise and Vibration Impact Assessment*, May 2006
[1] Lv: Velocity Level, re 1 micro-inch per second

The criterion for a significant vibration impact level referenced in the EIR for the proposed Glen Mor 2 project was a vibration level of 80 VdB at residences and student housing buildings.

The Glen Mor 2 EIR analyzed construction vibration levels at distances of as close as 16 feet to Lothian residence hall. Construction related vibration levels were estimated at approximately 100 VdB at portions of the Lothian residence hall due to the proximity of construction equipment. Construction vibration levels associated with the proposed arroyo improvements would likely have similar vibration levels due to the proximity of construction equipment to existing residential structures. Table 2 below presents the calculated vibration levels for the proposed gabion wall construction at the furthest distance from the nearest residential structure, the acoustical center, and the closest distance to residential structures.

Table 2. Calculated Vibration from Construction Equipment at Distance

Location	Approximate Lv[1] (VdB) at residential structure
Furthest Distance (205 Feet)	67
Acoustical Center (45 Feet)	86
Closest Distance (25 Feet)	94

Source: Federal Transit Administration *Transit Noise and Vibration Impact Assessment*, May 2006
[1] Lv: Velocity Level, re 1 micro-inch per second

Vibration levels at the furthest distance construction equipment could be from residential structures would be approximately 67 VdB which would not exceed the 80 VdB threshold set forth in the Glen Mor 2 EIR. However vibration levels at both the acoustical center of construction (45 feet) and the nearest distance to residential structures (25 feet), levels would be approximately 86 and 94 VdB respectively. These vibration levels[1] would exceed the 80 VdB threshold set forth in the Glen Mor 2 EIR. Mitigation measures identified in the January 2011 technical report remain the reasonably

[1] The vibration criteria levels are reference levels of human annoyance as opposed to damage related criteria.

feasible measures to reduce construction vibration levels associated with the added gabion wall element.

Construction Noise

As stated above, construction would likely involve equipment such as a crane, vibratory roller, and other smaller "bobcat sized" equipment. Construction equipment could be as close as 25 feet and as far as approximately 205 feet from nearby residential structures.

Table 3 below uses the Roadway Construction Noise Model (RCNM) to analyze noise levels from three distances; the furthest distance to residential structure, the acoustical center, and the closest distance.

Table 3. Calculated Noise Levels from Construction Equipment at Distance

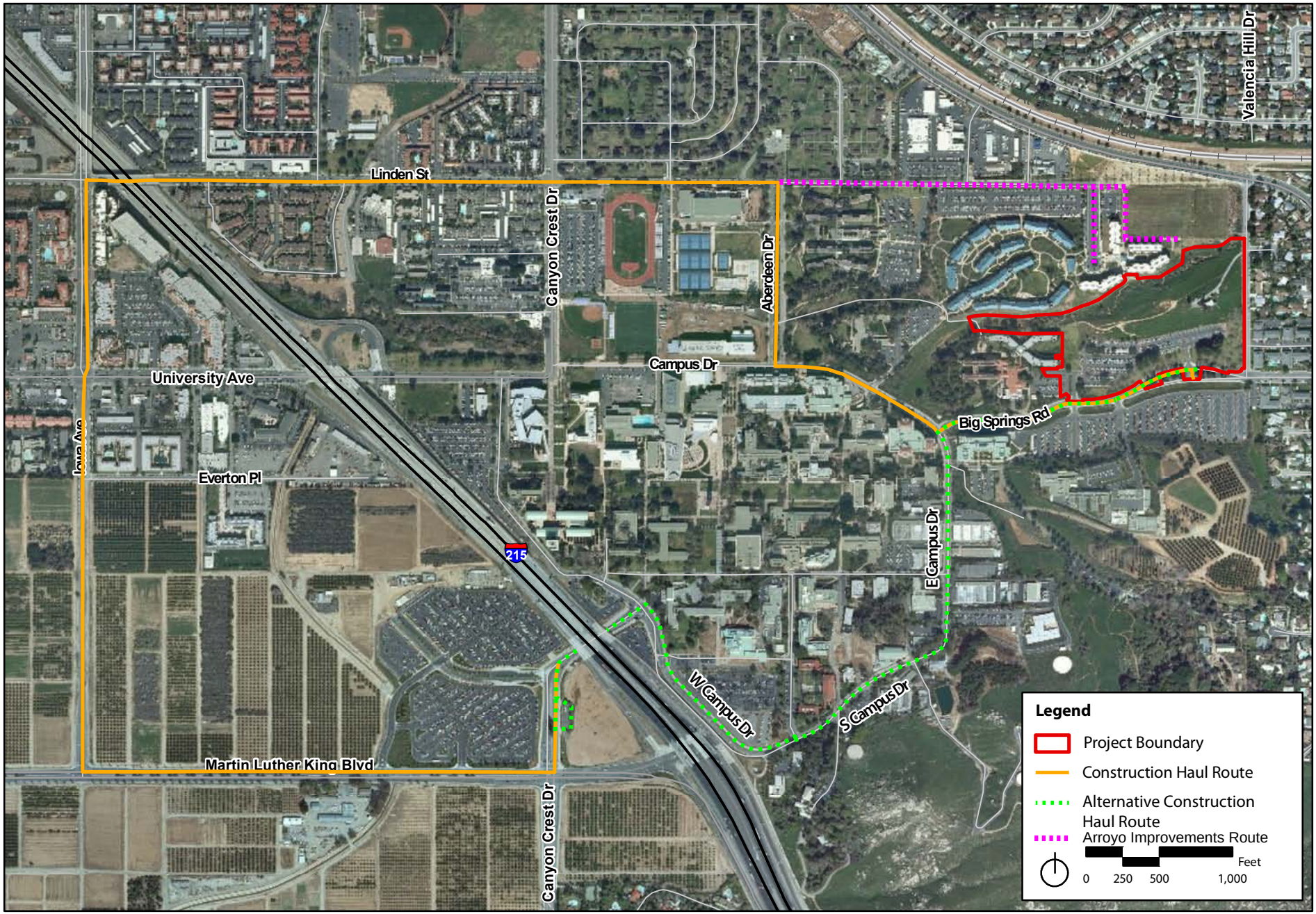
Location	Modeled Noise Level (hourly dBA L_{eq}) [1]
Furthest Distance (205 Feet)	69
Acoustical Center (45 Feet)	82
Closest Distance (25 Feet)	87

[1] The RCNM has a limited construction equipment list. Therefore construction equipment that is similar in size and nature was substituted for pieces of equipment not presented in the RCNM database.

Modeled noise levels from the furthest distance, the acoustical center, and closest distance would range from approximately 69 dBA L_{eq} up to 87 dBA L_{eq}. Noise levels of this nature would likely be considerably higher than the existing noise level at any of the closest residential structures and would completely dominate the existing noise environment during construction. Noise levels of this nature would be similar to construction noise modeled in the Glen Mor 2 EIR. Noise levels of this nature would likely exceed the 10 dBA significance threshold and would require mitigation. Mitigation measures identified in the January 2011 technical report remain the reasonably feasible measures to reduce construction noise levels associated with the added gabion wall element.

Attachment t

Revised Figure 3.13-2



Graphics\Projects\ 00374.10 EIR Addendum (8-2011) JD

Source: Riverside County 2007; ESRI 2008

ICF INTERNATIONAL

Figure 3.13-2
Construction Haul Routes
Glen Mor 2 Student Apartments
Revised September 2012 for Arroyo Improvements Addendum

Glen Mor 2 Student Apartments Project
Addendum #1 (Modified Arroyo Improvements)
Mitigation Measures BIO 3 and BIO 4

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
Monitoring Triggers 1. Design stage 2. Construction documents 3. Construction 4. Commencement of occupancy 5. Post-construction 6. On-going through Project operation		Responsible Entities CPP – Capital and Physical Planning ODC – Office of Design & Construction TAPS – Transportation and Parking Services					
Biological Resources							
Impact 3.3-8: Proposed project improvements within the Arroyo would result in temporary and permanent impacts on riparian habitat.	**<u>BIO 3: Minimize Temporary Impacts.</u>** Prior to initiation of ground disturbance activities, disturbance limits adjacent to or within the Arroyo shall be clearly staked, including disturbance limits associated with Arroyo improvements. Access to the Arroyo shall be limited to existing roads and shall be fenced to ensure unnecessary encroachment to the Arroyo does not occur.	ODC	2	Once to confirm inclusion in final bid specifications			
	Prior to initiation of ground disturbance activities within the Arroyo (excluding Arroyo enhancement), a qualified biologist (defined as a biologist with demonstrated experience with the resources being avoided) will identify biological resources to be avoided during construction, including jurisdictional streambeds and riparian habitat. The qualified biologist should review the final design plan and conduct a site visit to all areas within and adjacent to the Arroyo where construction activities would take place. Silt fencing or similar avoidance	ODC	3	One time, prior to start of construction to define disturbance limits			
		ODC, Construction Manager	3	Once to review requirements at pre-construction meeting			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	fencing shall be placed around the						
	disturbance limits required for each project component within or adjacent to the Arroyo. No impacts on the Arroyo shall occur outside of staked disturbance limits. CDFG jurisdictional streambed at the tree removal area for Bridge 1 shall be avoided if practicable. At a minimum, the following areas shall be avoided: • riparian vegetation adjacent to the path/culvert removal; • riparian vegetation located at the northwest side of the south abutment temporary work area for Bridge 2; • CDFG jurisdictional streambed located on the south side of the bank recontouring area. • The mature cottonwood tree near the Valencia Hill culvert extension work limit.	ODC, Construction Manager	3	Daily during construction to confirm fencing remains intact and avoidance limits are observed			
	<u>The following measures will be implemented to minimize disturbance to the cottonwood tree at the Valencia Hill culvert work area:</u> 1. <u>Establishment and demarcation of a tree protection zone. This should be accomplished under the guidance of an International Society of Arboriculture (ISA) certified arborist and employ a protective barrier consisting of 3-foot- high orange</u>	<u>ODC, Construction Manager, Arborist</u>	<u>3</u>	<u>One time, prior to start of construction to define tree protection zone and complete pruning</u>			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	construction fencing. The preferred protection zone shall encompass a buffer of 5 feet beyond the dripline, or 15 feet from trunks, whichever is greater. Where the proposed improvements extend into the preferred protection zone, placement of the protective barrier shall minimize encroachment into the preferred protection zone to the maximum extent practical. 2. Pruning of tree roots, limbs and canopy prior to start of construction, under the guidance of an ISA certified arborist and in accordance with ISA pruning standards (for instance, cuts made clean and to the bark collar of the closest joint on the branch). Pruning should occur during the dormant period (approximately November to March).						
	3. Construction of the Valencia Hill culvert extension should be monitored by an ISA certified arborist. The arborist may require implementation of best management practices to minimize disturbance within the work limits, including but not limited to padding of vehicles, minimizing soil removal or addition, and use of protective matting.	ODC, Construction Manager, Arborist	3	Daily during construction			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	Upon completion of construction, the tree shall be evaluated by an ISA certified arborist. Evaluations shall occur quarterly for one full year to monitor for signs of failure (including canopy dieback, reduced size or number of leaves, premature fall color). If in the opinion of the arborist, the tree is not showing signs of failure, it shall be determined that the avoidance measures have been successful and no further action shall be required. If post-construction monitoring indicates the tree has failed, the measures provided for in MM BIO 4 below shall be implemented to replace the lost functions and values.	ODC, Arborist	5 (limited)	Quarterly for one year following completion of construction			
	BIO 4: Prepare and Implement Revegetation Plan. All areas identified as temporarily affected by construction activities shall be revegetated with native vegetation. All areas with riparian habitat shall be revegetated with similar riparian vegetation. Other vegetated areas (i.e., ruderal and annual grassland	ODC, Restoration Specialist	2	One time prior to disturbance of native vegetation to confirm completion of pre-disturbance assessment			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	communities) that are temporarily affected shall be revegetated with native vegetation suitable to that location. If trees/riparian vegetation cannot be replanted within the disturbance limits of the respective project component, a suitable area within the Arroyo shall be selected for restoration. The restoration location will, at a minimum, provide replacement habitat of equal acreage as the affected location. Prior to removal of vegetation, a qualified biologist shall conduct an assessment of functions and values for the Arroyo, including all areas where vegetation removal will be conducted. Areas assessed will be of sufficient area and number to assess functions and values of the entire Arroyo to demonstrate success of the Arroyo enhancement program. The monitoring component of the revegetation plan shall include functions and values that are of equal or greater value than existing conditions as performance criteria.	ODC, Restoration Specialist	2	Once prior to disturbance of native vegetation to confirm completion of plan consistent with measure, including any outside agency approvals			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	Prior to initiation of ground disturbance activities, a revegetation plan shall be prepared and submitted to the relevant agencies (i.e., USACE, CDFG). The revegetation plan should be sufficient to meet agency requirements and at a minimum shall include the following: • a map and acreage of vegetation to be temporarily affected, • location of revegetation area, • functions and values assessment of areas to be affected, • functions and values assessment of entire Arroyo within the project footprint, • plant palette, • performance criteria, and • monitoring guidelines.	ODC, Restoration Specialist	3	Once, prior to completion of construction to confirm planting in accordance with approved plan			
		ODC, Restoration Specialist, Permitting Agencies	5 (limited)	Periodically, in accordance with monitoring component of approved revegetation plan until final success criteria are achieved			
	<u>In the event the mature cottonwood tree at the Valencia Hill culvert extension is determined to have failed (see MM BIO 3, above), the revegetation plan shall include the following measures to replace the lost functions and values:</u>	<u>ODC, Arborist</u>	<u>5</u>	<u>Once at conclusion of monitoring period under MM BIO 3 to determine applicability</u>			

Impact	Mitigation Measures	Responsible Entity	Monitoring Triggers	Frequency of Reporting	Verification of Compliance		
					Signature	Date	Remarks
	1. Replacement planting of three coast live oaks on the upper bank within the removed canopy area. Replacement trees shall be at least 6 inch caliper and 10 feet in height. 2. Replacement planting of Fremont's cottonwood (15 gallon minimum) along the stream channel within the area immediately downstream of the extended culvert. The total number of replacement trees (live oak and cottonwood) shall provide a minimum 1:1 replacement ratio based on the 85-inch diameter at breast height (DBH) measurement of the existing cottonwood tree. It is expected compliance with this measure would require planting of approximately 25 to 30 cottonwood trees.	ODC, Restoration Specialist	5	Once, to confirm planting in accordance with provisions			
		ODC, Restoration Specialist	5 (limited)	Periodically, in conjunction with monitoring of approved revegetation plan for other temporary construction impacts			