



**United States Department of the Interior  
California Department of Toxic Substances Control**



**ELECTRONIC SUBMISSION**

December 23, 2014

**Subject:** Directives on Outstanding Issues on the Basis of Design Report/ Pre-Final Design (90% Design) Supplemental Package for PG&E Topock Compressor Station Remediation Site.

Dear Ms. Meeks:

The Department of the Interior (DOI) and the Department of Toxic Substances Control (DTSC) jointly as lead agencies (the Agencies) have deliberated on input from Tribes<sup>1</sup> and stakeholders, information provide during the October 29 & 30 and December 10, 2014 Technical Working Group (TWG) Meetings, correspondence received from the Tribes on December 1 & 2, 2014, and on information provided in the Basis of Design Report and Pre-Final (90%) Groundwater Remedy Design submittal in providing our direction to Pacific Gas and Electric Company (PG&E) concerning elements requiring further development in the pre-final design stage. These elements are to be addressed in the supplemental design package under development by PG&E. This letter provides the Agencies' preliminary directives for proceeding with the 90% groundwater remedy supplemental design document. Final direction will be based on the Agencies review of comments from Tribes and stakeholders and information gained during DOI and the Bureau of Land Management (BLM) consultation meetings with Tribal Councils and with the Topock Project Tribal Representatives. This direction will be provided by the Agencies during the comment and response to comments periods of the 90% design package.

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<sup>1</sup> The Topock project area is culturally and spiritually significant to nine federally-recognized tribes. Of the nine tribes in the area, the Chemehuevi Indian Tribe, Cocopah Indian Tribe, Colorado River Indian Tribes ("CRIT"), Fort Mojave Indian Tribe ("FMIT") and Hualapai Tribal Nation (hereafter collectively referred to as "the Tribes") have taken the most interest in the project and regularly participate in meetings and provide detailed comments on issues pertaining to site cleanup.

## Remedy Monitoring

### I. Arsenic Monitoring Wells

PG&E originally proposed a location for MW-EE during the February 11, 2014 TWG Meeting. Tribal input received during subsequent discussion was that the Tribes were opposed to that location. On November 18 and subsequently discussed in the November 19<sup>th</sup> TWG meeting, the Tribes proposed a Tribal Alternative MW-EE location on a .pdf map. In the final input matrix received from the Tribes on December 1, 2014, the Tribes proposed that Tribal Alternative well MW-EE should be considered a “future provisional” well depending on groundwater monitoring data from other wells due to the disturbance that would be required with respect to cultural values. The Agencies agree that installation of MW-EE can be considered a provisional well and installation will be evaluated further based on data received during construction of the IRL wells and remedy monitoring. MW-EE will be installed if data from any arsenic monitoring wells 150 feet from their respective injection point indicate an exceedance of the water quality criterion (MCL of 10 mcg/liter). Based on review of monitoring data, the Agencies will either direct PG&E to install the well at the predetermined Tribal Alternative MW-EE location or, working with PG&E and the Tribes, determine an alternative location that better matches the desired outcome. For the purpose of the supplemental design, PG&E should consider the Tribal input tabulated in the December 1 matrix and specify all locations of proposed arsenic monitoring wells in the supplemental design package. As stated, further discussion will be held with the Tribes during consultation meetings and the agencies will provide final direction to PG&E during our comment and response to comments period of the 90% design package.

### II. Groundwater Plume Boundary Monitoring

In order to delineate the western most edge of the groundwater plume, additional monitoring wells MW-U and MW-V were proposed and discussed at the June 18 and 19, 2014 Technical Working Group meeting. A second site walk was also held during the October 16 Technical Working Group meeting to confirm the location of MW-V. Although the Tribes final well location matrix of December 1 identified a changed location for MW-V, the Agencies request that PG&E retain the field location identified during the October 16 meeting in the supplemental design based on the known plume boundary. The Agencies will further consider the timing of installation and location of this well after additional discussions with Tribes and PG&E. Agencies anticipate MW-V to be installed only if necessary based on monitoring well data collected during remedy construction.

### III. Groundwater Capture Zone Monitoring

The capture zone monitoring in the 60% Design was inadequate. Capture zone monitoring must provide definitive criteria and sufficient data that would allow DTSC to meet the plume control determination as specified in Exhibit A5a of the DTSC 2012 settlement with FMIT and to enable DTSC to reach findings required under Exhibit A1 and A2 for decommissioning of IM-3. As stated in Exhibit A5a of the settlement agreement, PG&E must demonstrate consistency of model projections of the groundwater flow with transport model and field data.

To reiterate the Agencies position described in the April 4, 2014 directive letter, the capture zone must be clearly defined and illustrated in three dimensions. Well gradient pairs must be established that will provide sufficient information to determine whether groundwater extraction is providing the hydraulic influence and capture. Our April 4 letter suggested the use of slant wells under the river for use in hydraulic assessment. The agencies have re-evaluated this position when considering technical input received during the July and October TWG meetings and direct PG&E to include monitoring wells MW-X and MW-Y, located along the access road adjacent to the Colorado River, in the supplemental design package. Further discussion will be held with the Tribes during consultation meetings and the agencies will provide final direction to PG&E during the comment and response to comment periods of the 90% design package.

#### Injection Wells

The Fort Mojave, Cocopah and Hualapai Indian Tribes provided short descriptions of alternative locations for inner recirculation loop injection well IRL-1 and freshwater well FW-1 in letters and tables provided on December 1 & 2, 2014. The Agencies would like PG&E to evaluate these alternative locations, determine if they are feasible, and provide a write-up in the supplemental design package regarding this evaluation and the preferred locations for these wells.

#### Construction Staging Areas

With respect to construction staging areas, the Agencies acknowledge the need for PG&E to have sufficient staging and material storage within close proximity to areas of construction. After considering all proposed areas near the areas of construction, the Agencies provided direction to PG&E to identify the minimum number of locations necessary in the 90% design when considering input from the Tribes found in the January 2014 version of the soil staging and storage area matrix. The Fort Mojave, Cocopah and Hualapai Indian Tribes provided written input on these locations in letters and tables provided on December 1 & 2, 2014. The Agencies direct PG&E to further examine and consider the Tribal input provided in the attached tables (Attachments 1 – 3 from FMIT, Cocopah and Hualapai Indian Tribes respectively) and provide clarification on the construction/staging/soil storage terminology and to provide detailed descriptions of the proposed use of the areas opposed by the Tribes as well as justification for the necessity of using these areas during construction and remedy implementation. Based on this information and further consultation with the Tribes, the agencies will provide final direction to PG&E as part of the comment and response to comments period of the design.

#### Bat Cave Wash Crossing

The current design package includes aboveground pipe bridges for aerial crossing of Bat Cave Wash—one pipe bridge crosses the southern portion of the wash near the TCS and the other pipe bridge crosses the northern portion of the wash in the uplands. During the October 29 & 30 TWG meetings, PG&E provide information regarding installation of pipes and conduits through box culverts located in the IM-3 access road, an alternative for the northern crossing. The Hualapai Tribe provided additional options for the

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northern crossing of Bat Cave Wash in their December 3, 2014 transmittal (Attachment 4) but defer to the Fort Mojave Indian Tribe, as the land owner in that area. To date, the Agencies have not received any input on this matter from the Fort Mojave Indian Tribe; therefore, PG&E is directed to proceed with their preferred design for the Bat Cave Wash crossing, considering all input received to date.

The Agencies hereby direct PG&E to provide the complete supplemental design package for review by the Agencies, Tribes and stakeholder. Once received, DTSC will forward the package to all reviewing parties for an additional 30 day review prior to concluding the 90% design comment period. BLM will concurrently provide the supplemental design package to the nine federally-recognized Tribes for Section 106 consultation for 30 days. PG&E is directed to submit the supplemental design package to the Agencies for distribution by February 2, 2015.

If you have any questions, please contact Pamela Innis at (303) 445-2502 or Aaron Yue at (714) 484-5439.

Sincerely,



Pamela S. Innis  
DOI Topock Remedial Project Manager



Aaron Yue  
Project Manager  
Department of Toxic Substances Control

Attachments

cc: PG&E Topock Consultative Work Group  
PG&E Topock Geo/Hydro Technical Work Group  
Tribal Representatives in PG&E Project Contact List  
Technical Review Committee  
DOI Topock Administrative Record

Item	Area ID/Name	USE (STORAGE OR STAGING)	ACREAGE	LOCATIONS & NOTES	Tribes' Final Position / Conditions with specific conditions to each area *Unacceptable with specific conditions to each area	*Acceptable STATUS AT 90% BOD
Soils Storage	1-5	Soils Storage	11.1	All in Park Moabi Area	Acceptable (1/14/14) - areas 2,3, and 4 are within the Beale Slough Riparian and Cultural ACEC (Approved BLM Lake Havasu RMP, 2007) This is acceptable only contingent upon the Tribe being provided an acceptable land use plan for the ACEC. How will rehabilitation be handled in the final design for this specific area? As we have not received any information we will reserve any comments until information is received. CEQA document will need to be amended. Inconsistencies in maps (4.2.3 and 4.5-1 within the C/RAWP). Areas have never been culturally and archaeologically surveyed.	3, 4, 5 on C/RAWP Fig. 4.2-3
	6	Soils Storage	0.67	Across from IM-3 WTP	Unacceptable as soils storage (1/14/14) - No Storing, Construction or Staging; allowable access only to MW AA and MW P	Listed on C/RAWP Fig. 4.2-3
	7	Soils Storage	0.28	East of # 6	Unacceptable: NO SOILS STAGING OR CONSTRUCTION IN THIS AREA Limited access only to MW-41 as mapped by tribes.	Listed on C/RAWP Fig. 4.2-3
	8	Soils Storage	0.17	Southeast of #7	Acceptable as soils storage (6/4/14) - Existing waddies must be left in place to contain activities. Areas outside of TCVA .	Listed on C/RAWP Fig. 4.2-3
	13	Soils Storage	0.15		Unacceptable as soils storage area (1/14/14) - Tribes proposed allowable access only to CW-01 as provided map	Listed on C/RAWP Fig. 4.2-3
Construction/ Staging	9	Construction/ Staging	approx. 1.0		Acceptable as construction/staging (1/14/14) Need exact acreage of this area. Allowable area not to exceed beyond the road north toward the water tanks.	Listed on C/RAWP Fig. 4.2-3
	10	Construction/ Staging	0.51		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	11	Construction/ Staging	5.69		Unacceptable as construction/staging area on the east side (1/14/14) - Acceptable only on the west side inside fenced area. Roadway to the Ponds is becoming fragile and tortoise habitat has increased in area, very obvious now. Need monitoring for tortoise - more traffic will degradate area - road restoration plan prior to construction - monitoring plan for biological sensitivity once a month - plan needed for road rehab for the duration of the final remedy plan.	Listed on C/RAWP Fig. 4.2-3
	12	Construction/ Staging	1.53		Unacceptable as construction/staging (1/14/14) - Only allowable access to existing wells as mapped by Tribes - Site Boundary and cultural clearance should be extended to area mapped by Tribes - Tribes proposed new location for FW 1 - See Map attached	Listed on C/RAWP Fig. 4.2-3
	14	Construction/ Staging	0.28	This is CA-SBR-11862H. BLM is the agency responsible for any determinations of eligibility, contrary to PG&E (2013) report (p.22-25). Maze features are visible slightly southwest of the boundary of CA-SBR-11862H (see p. 25 map).	Eastern side acceptable as construction/staging (6/4/14). Acceptable as long as K rails are in place along SW edge to protect concrete pad. When this area is specifically demarcated with the Tribal Monitors, the temporary use area should NOT extend any further westward than approximately 20' east of the existing historic concrete pad as protection of historic site and the existing vegetation.	Listed on C/RAWP Fig. 4.2-3
	15	Construction/ Staging	1.11	On the map, this site is across the ONTH along the River, and at the end of Bat Cave Wash, there is crosote present. Wildlife get water at the outlet. There is a rock-lined walkway and a small beach during low River stages.	Unacceptable as construction/staging (3/14/14) - This area was eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating areas 15, 16 and 19 from further consideration. These areas removed from the 90% design.	Listed on C/RAWP Fig. 4.2-3
	16	Construction/ Staging	0.06		Unacceptable for construction/staging - too close to loci B Unacceptable for construction/staging (3/14/14) - This area was eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	
	17	Construction/ Staging	0.1		Acceptable as construction/staging with J-rails (3-14-14)	Listed on C/RAWP Fig. 4.2-3
	18	Construction/ Staging	1.28		Acceptable as construction/staging (1-14-14) on MW 20 Bench - Construct of IM 2 - Determined under IM2 by the agencies without tribal consultation.	
	19	Construction/ Staging	0.15	Located across from the southern tip of CA-SBR-219 Maze Locus B. Downslope to the west, there is a better, large and level location with a well (MW-25). Proposed IRL-7 is nearby, as well as N(?).	Unacceptable for construction/staging (3/14/14) - This area was eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	Listed on C/RAWP Fig. 4.2-3
	20	Construction/ Staging	0.1		Unacceptable as construction/staging (3/14/14) - PG&E does not want to use this area. Can see Maze from this location. Direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating this area from further consideration. Tribes concur with this decision.	Listed on C/RAWP Fig. 4.2-3

Legend
Soils Storage
Construction Staging
Wells
Other

	21	Construction/ Staging	11.57	Compressor station area.	Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	22	Construction/ Staging	0.58		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3

	23	Construction/ Staging	0.4		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	24	Construction/ Staging	0.55		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	25	Construction/ Staging	0.25		Unacceptable as construction/staging (1/14/14) - Direct impact to historic site.	Listed on C/RAWP Fig. 4.2-3
	26	Construction/ Staging	0.74		Acceptable, as construction/staging, upon Tribes provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	27	Construction/ Staging	0.61		Acceptable, as construction/staging, upon Tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	28	Construction/ Staging	1.2		Acceptable, as construction/staging, upon Tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	29	Construction/ Staging	0.63		Acceptable, as construction/staging, upon Tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
<b>Wells</b>						
	CW-01				Move access road to well CW-01 on west side of cleared area (10' road) - only used as access route to well - road must go straight to well and back out. Proposed changed access route mapped by Tribes.	
	MW AA	Monitoring Well		150' Arsenic Well for IRL 1	Tribes proposed new location for IRL 1. Shifted south. See map provided *See comments for soil storage area 6	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW BB and MW CC	Monitoring Well		Located within Rt 66 - well will be in the road - some cut and fill necessary for drill rig - PGE meeting with SW Gas about locations - PGE should notify Tribes of SW Gas decision	Waiting on SW Gas decision - need to be informed of decision regardless of the decision - Tribes prefer both to be in the road - No alts.	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW BB alt. and MW CC alt.	Monitoring Well			Both locations are unacceptable. The MW-CC-alt location would require cut and fill of a slope to allow rig stabilization for MW installation. Special care would be needed and require a cultural clearance as possible artifacts, may have washed down slope into the wash adjacent to the road.	
	MW DD and MW DD alt.	Monitoring Well			Both of these locations are acceptable, however they are in close proximity to sensitive cultural areas and require a cultural clearance and Tribal Monitors during delineation of the work area for the installation of either of these proposed well locations. Any access to work area should be constrained to the existing access route.	MW DD - SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW EE and MW EE alt.	Monitoring Well		Nov. 7th Tribal visit IRL3. GPS taken for access route in and out. CA-SBR 11938 reviewed and surveyed north edge of wash to polygon site area. Expanded boundaries to include wash. Will request and require BLM to amend DPR site record.	Tribes would prefer NO well installed on the IRL-3 225' circle; as this area is extremely sensitive. MW-EE is unacceptable, culturally sensitive area. MW-EE-alt - may be acceptable as provisional location for the outer ring arsenic well, but would only be installed if groundwater data indicates the provisional well must be installed per SWQCB. This location should be shown in the 90 % supplement with TWO PROVISIONS: 1) following system startup and operation, data under operational condition can be collected, and used to evaluate the actual flow lines for an operating IRL-3. Based on operational data, the provisional location for the outer As well can be re-evaluated to see if there is a better provisional location for this well. This re-evaluation of the provisional location should be done with consultation with the Tribes.  2) If groundwater data from inner-ring arsenic monitoring wells indicates the provisional well must be installed per SWQCB, THEN protective engineering measures such as protective textile, mats, etc. will be used to protect the natural desert surface during installation, and along the access route. MWEE wash is unacceptable and tribes propose an alternative MWEE location. (reference maps to be provided by tribes) - MW DD alt place mats where work will take place - Tribes prepared an alternative MWEE well location - MW DD wash not preferred by Tribes - Area will be severally impacted and require Fish and Game have to consent.	MW EE- SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells

	MW DD wash and MW EE wash	Monitoring Well			Both MWEE Wash and MW DD Wash are unacceptable and should be eliminated from consideration - Tribes prepared an alternative MWEE well location (reference maps to be provided by tribes)	
	MW V			Southern end of BCW across from TCS	Proposed location of the well is in a culturally and environmentally sensitive area. If MW-V is required, tribal preference is to locate the well in the middle of the lowered berm. Proposed activity in the area would require biological monitoring.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW X and Y			senry wells across the river, on peninsula along Topock Marsh to monitor WQ and hydraulics	Not acceptable. These areas were considered in 2007 for MWs, and the FMIT raised objections to any wells in this area based on identified areas of cultural significance. This was discussed in AZ SHPO to ADEQ letter. Copy of the letter was provided by Dr. Leonhart for FMIT and forwarded on to DTSC.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW Z			also staging area 14 North side of mouth of BCW, area of former road house	Well location MW-Z is acceptable providing that they stay within the foot print laid out in staging area 14. K rails should be put in place along west edge to protect the concrete pad and should NOT extend any farther westward than approximately 20' of the historic concrete pad.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW 50 cluster TW 05 MW 19				All OK - in wash area below Loci B - could be moved into the road	
	IRL 1			Across from IM 3 plant	Tribes proposed new well location - moved south into road	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW P			Across from IM 3 plant	Tribes proposed new well location - moved east to keep in alignment with IRL 1 and MW AA - only allow limited access into this area *see comments for soil storage area 6	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW 41				Acceptable (6/4/14) only for access to existing MW 41 monitoring wells. Tribal map with new access route points attached. Eastern side unacceptable; western side acceptable (3/14/14) (reference maps to be provided by tribes)	
				All areas would need to have a defined cultural clearance through consultation with the Tribes.	There will be areas within this matrix that will require additional consultation under the EIR / CEQA. Impacts must be addressed under appropriate compliance laws.	

Item	Area ID/Name	USE (STORAGE OR STAGING)	ACREAGE	LOCATIONS & NOTES	Tribes' Final Position / Conditions with specific conditions to each area *Unacceptable with specific conditions to each area	*Acceptable STATUS AT 90% BOD
Soils Storage	1-5	Soils Storage	11.1	All in Park Moabi Area	Acceptable (1/14/14) - areas 2,3, and 4 are within the ACEC - request that management plan be updated as part of the remedy, want to see property management plan considering these are both within and without and ACEC and APE area - How will rehabilitation be handled in the final design for this specific area? As we have not received any information we will reserve any comments until information is received- CEQA document will need to be amended - inconsistencies in map (4.2.3 and 4.5-1 in the C/RAWP) - areas have never been culturally and archaeologically surveyed	3, 4, 5 on C/RAWP Fig. 4.2-3
	6	Soils Storage	0.67	Across from IM-3 WTP	Unacceptable for soils storage (1/14/14) - <b>No Storing, Construction or Staging</b> , only access to MW AA and MW P	Listed on C/RAWP Fig. 4.2-3
	7	Soils Storage	0.28	East of # 6	- <b>Unacceptable: NO SOILS STAGING OR CONSTRUCTION IN THIS AREA</b> limited access only to MW-41 as mapped by tribes.	Listed on C/RAWP Fig. 4.2-3
	8	Soils Storage	0.17	Southeast of #7	Acceptable as soils storage (6/4/14) - Existing waddies must be left in place to contain activities. Areas outside of TCVA .	Listed on C/RAWP Fig. 4.2-3
	13	Soils Storage	0.15		Unacceptable for soils storage area (1/14/14)-Tribes proposed allowable access only to CW-01 as provided map	Listed on C/RAWP Fig. 4.2-3
Construction/ Staging	9	Construction/ Staging	1		Acceptable as construction/staging (1/14/14) Need exact acreage for this area. Not to exceed beyond the road to water tanks.	Listed on C/RAWP Fig. 4.2-3
	10	Construction/ Staging	0.51		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	11	Construction/ Staging	5.69		Unacceptable as construction/staging area on the east side (1/14/14) - Acceptable only on the west side inside fenced area. Roadway to the Ponds is becoming fragile - tortoise habitat in the area obvious now (they are there now more often) Need monitoring for tortoise - more traffic will degrade area - road restoration plan prior to construction - monitoring plan for biological sensitivity once a month - plan needed for road rehab for the duration of the final remedy plan	Listed on C/RAWP Fig. 4.2-3
	12	Construction/ Staging	1.53		Unacceptable for construction/staging (1/14/14) - Only allowable access to existing wells as mapped by Tribes - Site Boundary and cultural clearance should be extended to area mapped by Tribes - Tribes proposed new location for FW 1 - See Map attached	Listed on C/RAWP Fig. 4.2-3
	14	Construction/ Staging	0.28	This is CA-SBR-11862H. BLM is the agency responsible for any determinations of eligibility, contrary to PG&E (2013) report (p.22-25). Maze features are visible slightly southwest of the boundary of CA-SBR-11862H (see p. 25 map).	Eastern side acceptable for construction/staging (6/4/14) Acceptable as long as K rails are in place along SW edge to protect concrete pad - When this area is specifically demarcated with the Tribal Monitors, the temporary use area should NOT extend any farther westward than approximately 20' east of the existing historic concrete pad, to protect the historic site and the existing vegetation.	Listed on C/RAWP Fig. 4.2-3
	15	Construction/ Staging	1.11	On the map, this site is across the ONTH along the River, and at the end of Bat Cave Wash, there is cressote present. Wildlife get water at the outlet. There is a rock-lined walkway and a small beach during low River stages.	Unacceptable for construction/staging (3/14/14) - This area was been eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	Listed on C/RAWP Fig. 4.2-3
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	19	Construction/ Staging	0.15	Located across from the southern tip of CA-SBR-219 Maze Locus B. Downslope to the west, there is a better, large and level location with a well (MW-25). Proposed IRL-7 is nearby, as well as N(?)	Unacceptable for construction/staging (3/14/14) - This area was been eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	Listed on C/RAWP Fig. 4.2-3
	20	Construction/ Staging	0.1		Unacceptable for construction/staging (3/14/14) - PG&E does not want to use this area - Can see Maze from this location. Direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating this area from further consideration. Tribes concur with this decision.	Listed on C/RAWP Fig. 4.2-3
	21	Construction/ Staging	11.57	Compressor station area.	Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	22	Construction/ Staging	0.58		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3

**Legend**

Soil Storage

Construction Staging

Wells

Other

	23	Construction/ Staging	0.4		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	24	Construction/ Staging	0.55		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
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Wells						
	CW-01				Move road to well CW-01 on west side of cleared area (10' road) - only used as access route to well - road must go straight to well and back out.	
	MW AA	Monitoring Well		150' Arsenic Well for IRL 1	Tribes proposed new location for IRL 1. Shifted south. See map provided *see comments for soil storage area 6	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW BB and MW CC	Monitoring Well		located within Rt 66 - well will be in the road - some cut and fill necessary for drill rig - PGE meeting with SW Gas about locations - PGE should notify Tribes of SW Gas decision	Waiting on SW Gas decision - need to be informed of decision regardless of the decision - Tribes prefer both to be in the road - No alts.	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW BB alt. and MW CC alt.	Monitoring Well			Both locations are unacceptable. The MW-CC-alt location would require cut and fill of a slope to allow rig stabilization for MW installation. Special care would be needed and require a cultural clearance as possible artifacts, may have washed down slope into the wash adjacent to the road.	
	MW DD and MW DD alt.	Monitoring Well			Both of these locations are acceptable, however they are in close proximity to sensitive cultural areas and require a cultural clearance and Tribal Monitors during delineation of the work area for the installation of either of these proposed well locations. Any access to work area should be constrained to the existing access route.	MW DD - SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW EE and MW EE alt.	Monitoring Well		Nov. 7th: Tribal visit IRL3. GPS taken for access route in and out. CA-SBR 11938 reviewed and surveyed north edge of wash to polygon site area. Expanded boundaries to include wash. Will request and require BLM to amend DPR site record.	Tribes would prefer NO well installed on the IRL-3 225' circle; as this area is extremely sensitive. MW-EE is an unacceptable, culturally sensitive area. MW-EE-alt - may be acceptable as provisional location for the outer ring arsenic well, but would only be installed if groundwater data indicates the provisional well must be installed per SWQCB. This location should be shown in the 90 % supplement with TWO PROVISIONS: 1) following system startup and operation, data under operational condition can be collected, and used to evaluate the actual flow lines for an operating IRL-3. Based on operational data, the provisional location for the outer As well can be re-evaluated to see if there is a better provisional location for this well. This re-evaluation of the provisional location should be done with consultation with the Tribes. 2) If groundwater data from inner-ring arsenic monitoring wells indicates the provisional well must be installed per SWQCB, THEN protective engineering measures such as protective textile, mats, etc. will be used to protect the natural desert surface during installation, and along the access route. MWEE wash is unacceptable and tribes propose an alternative MWEE location. (reference maps to be provided by tribes) - MW DD alt place mats where work will take place - Tribes prepared an alternative MWEE well location - MW DD wash not preferred by Tribes - Area will be severely impacted and require Fish and Game have to consent.	MW EE- SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells

	MW DD wash and MW EE wash	Monitoring Well			Both MWEE Wash and MW DD Wash are unacceptable and should be eliminated from consideration - Tribes prepared an alternative MWEE well location (reference maps to be provided by tribes)	
	MW V			Southern end of BCW across from TCS	Proposed location of the well is in a culturally and environmentally sensitive area. If MW-V is required, tribal preference is to locate the well in the middle of the lowered berm. Proposed activity in the area would require biological monitoring.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW X and Y			senry wells across the river, on peninsula along Topock Marsh to monitor WQ and hydraulics	Not acceptable. These areas were considered in 2007 for MWs, and the FMIT raised objections to any wells in this area based on identified areas of cultural significance. This was discussed in AZ SHPO to ADEQ letter. Copy of the letter was provided by Dr. Leonhart for FMIT and forwarded on to DTSC.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW Z			also staging area 14 North side of mouth of BCW, area of former road house	Well location MW-Z is acceptable providing that they stay within the foot print laid out in staging area 14. K-ralls should be put in place along west edge to protect the concrete pad and should NOT extend any farther westward than approximately 20' of the historic concrete pad.	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW S0 cluster TW 05 MW 19 IRL 1			Across from IM 3 plant	All OK - in wash area below LocI B - could be moved into the road	
	MW P			Across from IM 3 plant	Tribes proposed new well location - moved south into road	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW P			Across from IM 3 plant	Tribes proposed new well location - moved east to keep in alignment with IRL 1 and MW AA - only allow limited access into this area - unac *see comments for soil storage area 6	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
Other	MW-41	TBD	TBD		Acceptable (6/4/14) only for access to existing MW 41 monitoring wells - Tribes GPSed acceptable new access route. Map with new access route points proposed by the tribes is attached. Eastern side unacceptable; western side acceptable (3/14/14) (reference maps to be provided by tribes)	
				All areas would need to have a defined cultural clearance through consultation with the Tribes.	There will be areas within this matrix that will require additional consultation under the EIR / CEQA and Impacts must be addressed and additional mitigation will be explored	

Item	Area ID/Name	USE (STORAGE OR STAGING)	ACREAGE	LOCATIONS & NOTES	Tribes' Final Position / Conditions *Acceptable with specific conditions to each area *Unacceptable with specific conditions to each area	STATUS AT 90% BOD
Soils Storage	1-5	Soils Storage	11.1	All in Park Moabi Area	Acceptable (1/14/14) - areas 2,3, and 4 are within the ACEC - request that management plan be updated as part of the remedy. want to see property management plan considering these are both within and without and ACEC and APE area - How will rehabilitation be handled in the final design for this specific area? As we have not received any information we will reserve any comments until information is received- CEQA document will need to be - amended - inconsistencies in map (4.2.3 and 4.5-1 in the C/RAWP) - areas have never been culturally and archaeologically surveyed	3, 4, 5 on C/RAWP Fig. 4.2-3
	6	Soils Storage	0.67	Across from IM-3 WTP	Unacceptable for soils storage (1/14/14) - <b>No Storing, Construction or Staging</b> only access to MW AA and MW P	Listed on C/RAWP Fig. 4.2-3
	7	Soils Storage	0.28	East of # 6	- <b>Unacceptable: NO SOILS STAGING OR CONSTRUCTION IN THIS AREA limited access only to MW-41 as mapped by tribes.</b>	Listed on C/RAWP Fig. 4.2-3
	8	Soils Storage	0.17	Southeast of #7	Acceptable as soils storage (6/4/14) - Existing waddles must be left in place to contain activities. Areas outside of TCVA .	Listed on C/RAWP Fig. 4.2-3
	13	Soils Storage	0.15		Unacceptable for soils storage area (1/14/14) -Tribes proposed to	Listed on C/RAWP Fig. 4.2-3
Construction/ Staging	9	Construction/ Staging	1		Acceptable as construction/staging (1/14/14) Need exact acreage for this area. Not to exceed beyond the road to water tanks.	Listed on C/RAWP Fig. 4.2-3
	10	Construction/ Staging	0.51		Acceptable as construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	11	Construction/ Staging	5.69		Unacceptable as construction/staging area on the east side (1/14/14) - Acceptable only on the west side inside fenced area. Roadway to the Ponds is becoming fragile - tortoise habitat in the area obvious now (they are there now more often) Need monitoring for tortoise - more traffic will degradate area - road restoration plan prior to construction - monitoring plan for biological sensitivity once a month - plan needed for road rehab for the duration of the final remedy plan	Listed on C/RAWP Fig. 4.2-3
	12	Construction/ Staging	1.53		Unacceptable for construction/staging (1/14/14) - Only allowable access to existing wells as mapped by Tribes - Site Boundary and cultural clearance should be extended to area mapped by Tribes - Tribes proposed new location for FW 1 - See Map attached	Listed on C/RAWP Fig. 4.2-3
	14	Construction/ Staging	0.28	This is CA-SBR-11862H. BLM is the agency responsible for any determinations of eligibility, contrary to PG&E (2013) report (p.22-25). Maze features are visible slightly southwest of the boundary of CA-SBR-11862H (see p. 25 map).	Eastern side acceptable for construction/staging (6/4/14) Acceptable as long as K rails are in place along SW edge to protect concrete pad - When this area is specifically demarcated with the Tribal Monitors, the temporary use area should NOT extend any farther westward than approximately 20' east of the existing historic concrete pad, to protect the historic site and the existing vegetation.	Listed on C/RAWP Fig. 4.2-3
	15	Construction/ Staging	1.11	On the map, this site is across the ONTH along the River, and at the end of Bat Cave Wash, there is creosote present. Wildlife get water at the outlet. There is a rock-lined walkway and a small beach during low River stages.	Unacceptable for construction/staging (3/14/14) - This area was been eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	Listed on C/RAWP Fig. 4.2-3
	16	Construction/ Staging	0.06		Unacceptable for construction/staging - too close to loci B Unacceptable for construction/staging (3/14/14) - This area was been eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	
	17	Construction/ Staging	0.1		Acceptable for construction/staging with J-rails (3-14-14)	Listed on C/RAWP Fig. 4.2-3
	18	Construction/ Staging	1.28		Acceptable for construction/staging (1-14-14) on MW 20 Bench - part of IM 2 - Determined under IM2 by the agencies without tribal consultation.	
	19	Construction/ Staging	0.15	Located across from the southern tip of CA-SBR-219 Maze Locus B. Downslope to the west, there is a better, large and level location with a well (MW-25). Proposed IRL-7 is nearby, as well as N(?).	Unacceptable for construction/staging (3/14/14) - This area was been eliminated from the project by DOI on March 14 at the CHPMP meeting in Lake Havasu. Re-stated the direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating 15 16 and 19 from further consideration. It is no longer in 90% design	Listed on C/RAWP Fig. 4.2-3
	20	Construction/ Staging	0.1		Unacceptable for construction/staging (3/14/14) -PG&E does not want to use this area - Can see Maze from this location. Direction provided to PGE in the April 2014 DOI/DTSC letter, eliminating this area from further consideration. Tribes concur with this decision.	Listed on C/RAWP Fig. 4.2-3
21	Construction/ Staging	11.57	Compressor station area.	Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3	

**Legend**

Soil Storage

Construction Staging

Wells

Other

	22	Construction/ Staging	0.58		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
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	23	Construction/ Staging	0.4		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	24	Construction/ Staging	0.55		Acceptable for construction/staging (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	25	Construction/ Staging	0.25		Unacceptable for construction/staging (1/14/14) - Direct impact to historic site.	Listed on C/RAWP Fig. 4.2-3
	26	Construction/ Staging	0.74		Acceptable for construction/staging provided that tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	27	Construction/ Staging	0.61		Acceptable for construction/staging provided that tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	28	Construction/ Staging	1.2		Acceptable for construction/staging provided that tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
	29	Construction/ Staging	0.63		Acceptable for construction/staging provided that tribes be provided authorization that Agencies have permission from property owners to use this land. (1/14/14)	Listed on C/RAWP Fig. 4.2-3
<b>Wells</b>						
	CW-01				Move road to well CW-01 on west side of cleared area (10' road) - only used as access route to well - road must go straight to well and back out.	
	MW AA	Monitoring Well		150' Arsenic Well for IRL 1	Tribes proposed new location for IRL 1. Shifted south. See map provided *see comments for soil storage area 6	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
	MW BB and MW CC	Monitoring Well		located within Rt 66 - well will be in the road - some cut and fill necessary for drill rig - PGE meeting with SW Gas about locations - PGE should notify Tribes of SW Gas decision	Waiting on SW Gas decision - need to be informed of decision regardless of the decision - Tribes prefer both to be in the road - No alts.	SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
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	MW DD and MW DD alt.	Monitoring Well			Both of these locations are acceptable, however they are in close proximity to sensitive cultural areas and require a cultural clearance and Tribal Monitors during delineation of the work area for the installation of either of these proposed well locations. Any access to work area should be constrained to the existing access route.	MW DD - SECTION 3 DESIGN BASIS AND ASSUMPTIONS TABLE 3.6-1 Preliminary Construction of Proposed Groundwater Monitoring Wells
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	MW 50 cluster TW 05 MW 19				All OK - in wash area below Loci B - could be moved into the road	
	IRL 1			Across from IM 3 plant	Tribes proposed new well location - moved south into road	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
	MW P			Across from IM 3 plant	Tribes proposed new well location - moved east to keep in alignment with IRL 1 and MW AA - only allow limited access into this area - unac *see comments for soil storage area 6	TABLE ES-2B Estimated Borehole Count Associated with Well Construction: Count Details
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				All areas would need to have a defined cultural clearance through consultation with the Tribes.	There will be areas within this matrix that will require additional consultation under the EIR / CEQA and Impacts must be addressed and additional mitigation will be explored	

***Technical Memorandum from Topock Technical Review Committee  
Design Alternatives – Bat Cave Wash Crossing – Topock Compressor Station  
Groundwater Remediation Project***

***Prepared by Charlie Schlinger***

***November 12, 2014***

***Background***

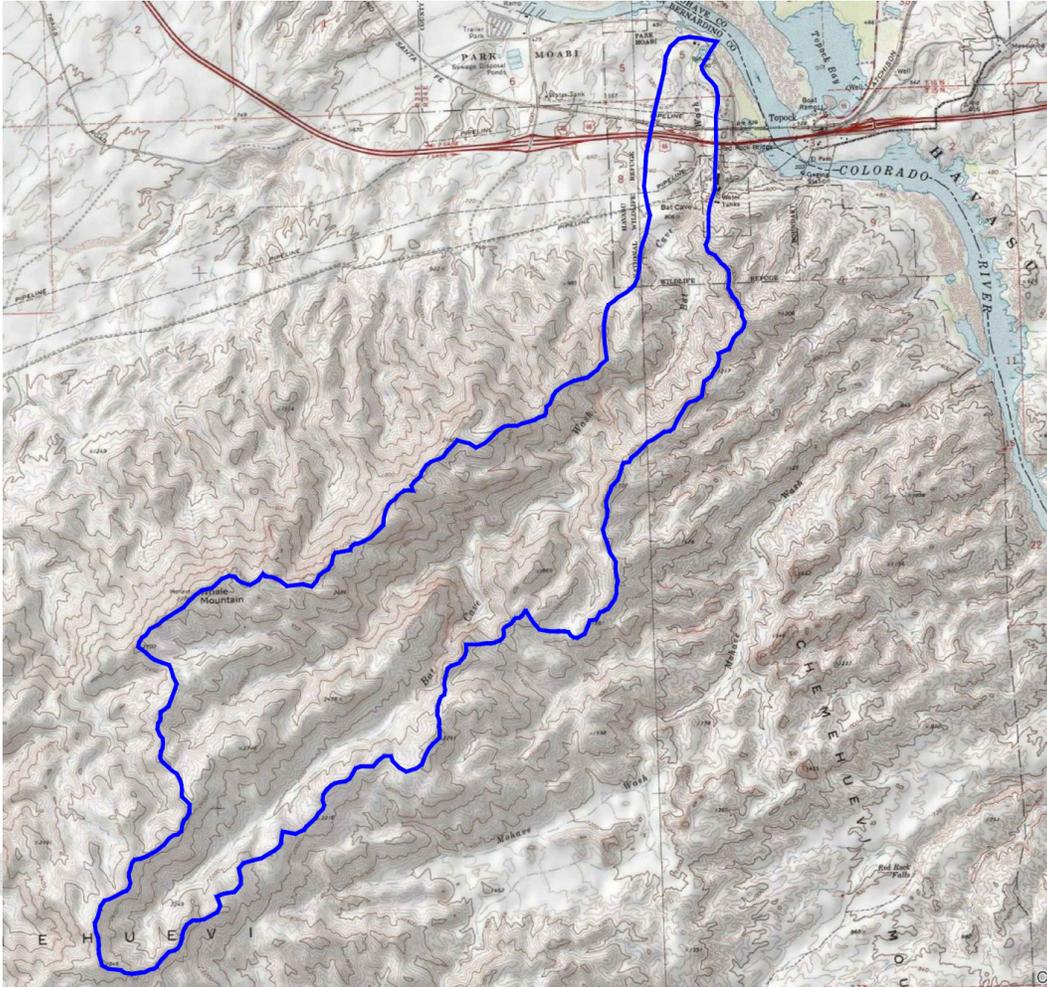
Presently, PG&E is considering a 90% Design alternative for the roadway crossing of Bat Cave Wash along an old un-named alignment of Route 66. Currently, the crossing is culverted, with six 42-inch corrugated metal pipe (CMP) drainage structures, complete with flared end sections and limited embankment erosion protection, which incorporates ungrouted rip-rap and geosynthetic filter fabric. See the image below. Such a crossing is considered to be a “vented” low water stream crossing, as the roadway dips to almost the channel bottom, and drainage structures (the six CMPs) with a modest capacity are provided to pass the low flows.



View looking downstream of existing crossing CMPs. From PG&E.

Bat Cave Wash does not have (or warrant) a stream flow gage, however, anecdotal information indicates that it flows several times a year and that the cumulative period of high flow (greater than

approximately several cubic feet per second, or cfs) is probably on the order of one day. The watershed area tributary to flow in Bat Cave Wash at the point where it enters the Colorado River is estimated at 4.3 mi<sup>2</sup>. Thus Bat Cave Wash drains a significant area of the Chemehuevi Mountains. Given that much of the area tributary to runoff that flows in the wash is relatively impervious igneous/metamorphic rock, Bat Cave Wash flow is “flashy”, and significant flows are characterized as flash flooding.



Approximate Bat Cave Wash Watershed Delineation

The roadway itself is little used by the traveling public, but it is used by PG&E, the BNSF, and other pipeline and utility companies. It is definitely a low-traffic road, though traffic count data are unknown to the author. Signs announcing the closure of the road are present at both ends (National Trails Highway; Park Moabi Road), and have apparently stood for nearly 9 years, presumably since the time of IM-3 facility construction.

As part of the 90% Basis of Design Report, PG&E is planning for an “aerial” pipe bridge to carry remedy infrastructure conduits and piping above the ground and across the wash, to avoid setting the infrastructure directly in the ground at this location, which occasionally experience flash flooding. PG&E has indicated that the existing structure is prone to damage by high flows and that it has had to be reconstructed on several occasions. This existing structure probably has a capacity for flows somewhere

in the range of 50% (1 in 2) to 10% (1 in 10) annual exceedance probability (AEP). It appears as though recent flows have dropped considerable sediment in the channel upstream of the structure.

### ***Alternatives Development***

As an alternative to the aerial pipe bridge, PG&E has proposed to replace the CMPs with larger box culverts and a bridge. See the image below (from PG&E) that shows a visual simulation of how this bridge might be designed and constructed – utilizing two 6-ft-high by 20-ft-wide box culverts. The remedy infrastructure would be placed above the box culverts, in the bridge deck. The grade would need to be raised nearly 2-3-ft and the approaches would need to be raised and graded accordingly. We understand that this structure would have an approximate conveyance capacity for flows with a 4% (1 in 25) annual exceedance probability. Storms with lower annual exceedance probability would overtop the structure, which presumably would be armored to endure the higher flows.



Visual simulation of a proposed box culvert / bridge replacement for crossing on Bat Cave Wash. Image from PG&E.

There are a number of other alternatives that should be considered as part of the alternatives development, and these are as follows.

- 1) A box culvert / bridge similar to that being considered, with the remedy infrastructure (pipes/conduits) hung on the side of the bridge, or placed under the bridge, in a large-diameter conduit or other structure, to reduce, by approximately 2 feet, the vertical distance that the road grade must be raised.
- 2) Reconstruct the existing culverted drainage structure and place the remedy infrastructure within trench boxes or within a large diameter conduit beneath it, and use grouted rip-rap, or some other armoring method on the upstream and downstream embankment faces.

- 3) Construct a Portland Cement Concrete (or another material) paved unvented low water stream crossing (also known as a “ford”) with the infrastructure set in trench boxes within the crossing, or beneath it, within a large diameter conduit.

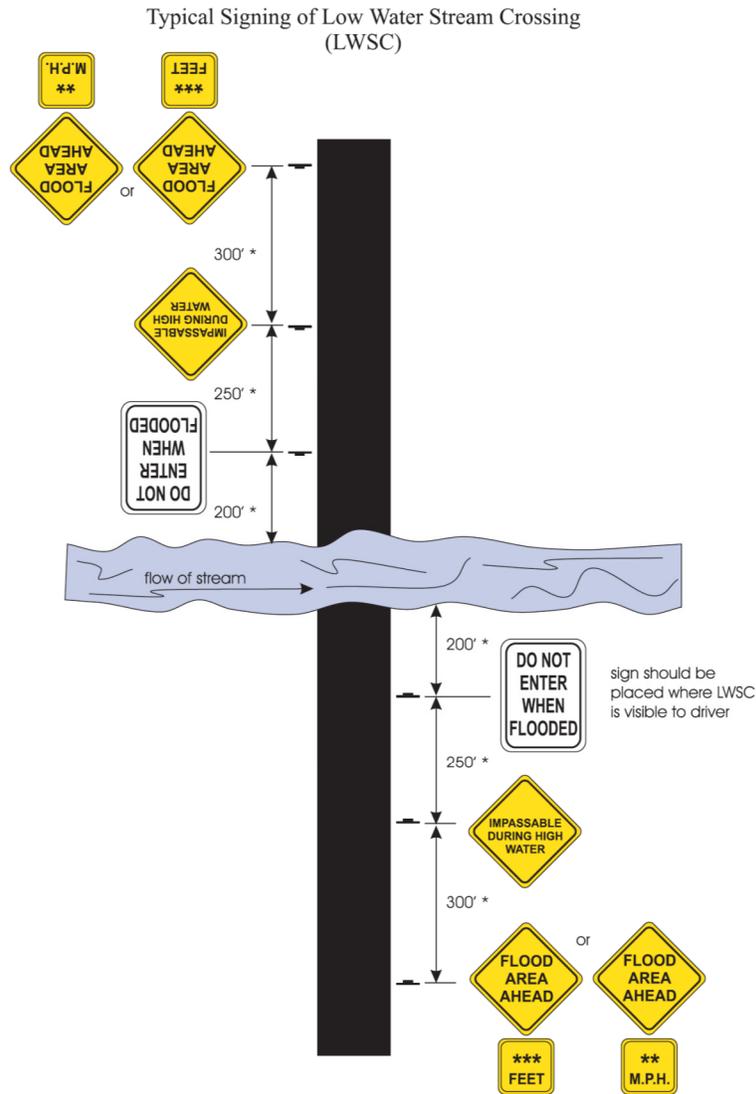
It is important to remember that none of the above alternatives, the recently proposed design, or the existing crossing of Bat Cave Wash, are maintenance free. Ruling out a massive high bridge across the wash that would pass any flow without any impediment, the reality is that any drainage structure placed in the channel will impede sediment-laden high flows. Thus sediment will eventually accumulate upstream and within the drainage conduits beneath the road – thus necessitating maintenance, and, the structure will be overtopped or otherwise bypassed by flows exceeding its capacity.

A low water stream crossing at Palo Duro Canyon Park in Texas is shown in the image below. It is probably vented – that is, it likely has some smaller-diameter pipes, not visible in the image, to convey low flows, and thus it is similar to the existing low water stream crossing on Bat Cave Wash. However, it is well-armored to allow higher flows to pass over it without damaging it. It has warning signs at the approaches and there is a water depth gage to indicate the flow depth to drivers of vehicles approaching from either direction.



An unvented low water stream crossing will likely require that approaches have slopes less than 10% and a properly-designed vertical curve to facilitate passage of trailers and other vehicles. It is possible that not all long trailers (“lowboys”) could cross; however, there is an alternate route for such infrequent instances. Depending on the design, there would be more or less disturbance associated with regrading of the approaches. The principal objection to a low water crossing may involve risk, perceived or real, during infrequent flood events. It is important to remember that a drainage such as Bat Cave Wash presents significant risk during low-frequency high-magnitude flood events no matter the type of crossing. Regardless of the crossing installed, it would be beneficial to sign the crossing

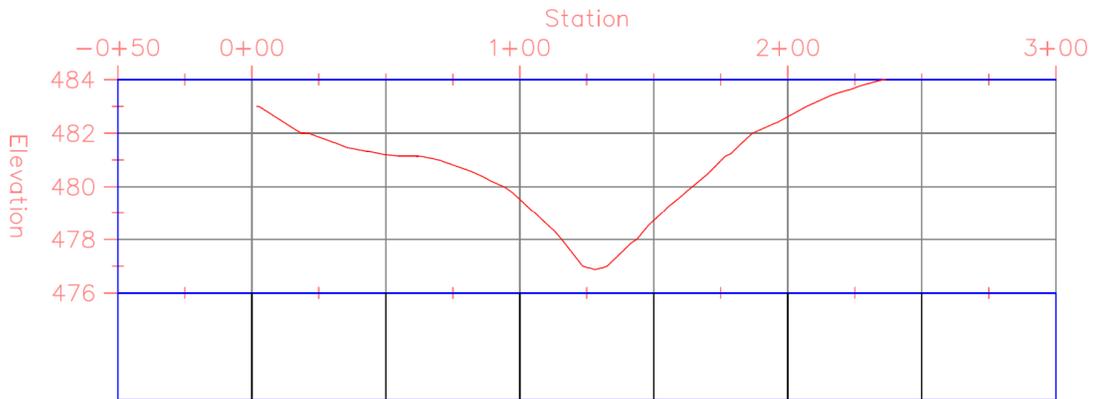
appropriately (see example below) and, possibly, to install a system that would warn drivers when there is water flowing in the wash.



\* Nominal distance (other distance may be used if engineering study indicates).

Possible signing of low-water crossing (from: *Low Water Stream Crossings: Design & Recommendations*, Sponsored by the Iowa Department of Transportation and the Iowa Highway Research Board, CTRE Project 01-78, Iowa DOT Project TR-4532001)

A possible roadway design profile for an unvented low water stream crossing on Bat Cave Wash is shown below, with stationing increasing in an easterly direction, and is based on a Civil 3D drawing pictured in Appendix 1.



Possible unvented low water stream crossing profile at Bat Cave Wash. Horizontal distances are in stations, and elevations are in feet. Stationing is used to represent horizontal distance along roads, channels and other linear features. One station represents 100 feet. The distance between two successive full stations, such as 1+00 or 2+00 is 100 feet. Stations need not have even numbers. Station 2+75.46 is 75.46 feet from station 2+00 and 24.44 feet from station 3+00.

An Arizona Department of Transportation (ADOT) Standard Design detail for a low water stream crossing is supplied in Appendix 2. Several DOTs, including ADOT, no longer use such stream crossings, as the agency responsibilities almost always involve higher traffic roads for which low water stream crossings are unsuitable. The USDA NRCS, Forest Service and other U.S. agencies, in addition to organizations across the globe, continue to utilize low-water crossings for remote low-traffic roads.

### **Recommendations**

A low-impact low-visibility alternative would be to reconstruct the existing vented low water stream crossing, inclusive of a Portland Cement concrete roadway slab and upstream & downstream embankment armoring, and to place the remedy infrastructure in a large diameter conduit under the crossing. Signage should be added and routine removal of accumulate sediment should be done. This would require little or no change in approach grades, and quite possibly, it is the alternative involving the lowest construction disturbance.

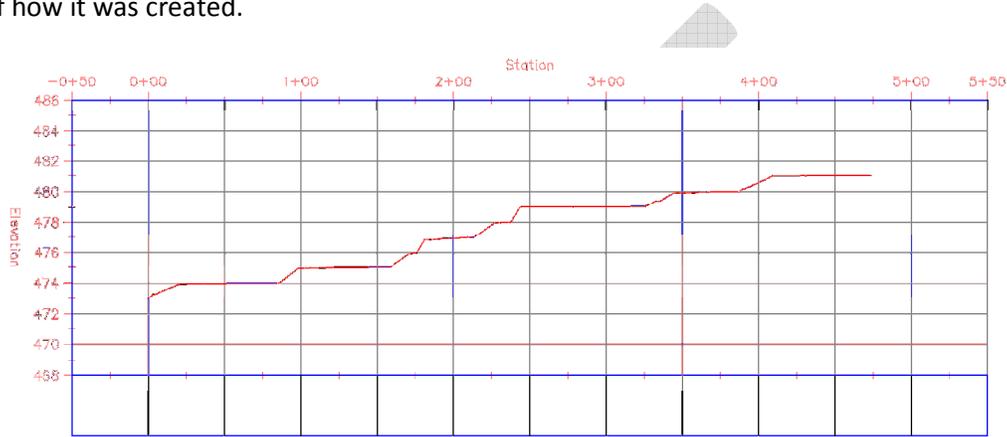
Installation of an unvented (no pipes) low water stream crossing with a Portland Cement concrete roadway slab and a similar treatment for the remedy infrastructure would yield a crossing that could be easily maintained.

The box culvert bridge approach yields lower maintenance but, due to the higher elevation of the crossing, it will require an increased construction and maintenance disturbance, both within the channel area and in the areas of the approaches. Of all the alternatives, it represents another incremental step (“improvement”) in the transition from a sacred landscape, as valued by the Tribal stakeholders, to an industrial/recreational landscape, as perceived by many of the other parties on the project, with near all-weather access for vehicles of almost any size or weight.

The road should be closed to public vehicular traffic in order to reduce the likelihood of disturbance of culturally sensitive areas. This does not rule out bicycle, equestrian or pedestrian access by the public and neither does it rule out vehicular access by the companies and agencies who truly need it.

The Operations and Maintenance Plan for the groundwater remedy should include an element for this crossing that provides for regular and episodic (post-flooding) maintenance of any drainage conduits.

As part of any design, the geomorphology and sediment regime of Bat Cave Wash should be examined, so that the flow line of the drainage at the drainage structure is set appropriately. An approximate profile of the existing condition along the channel is shown below – with the existing crossing at approximate station 2+00 (200 ft), and with stationing increasing from downstream to upstream – the alignment for this profile is shown on the Civil 3D drawing in Appendix 1. Due to the limited number of contours available in the drawing used to generate this profile, the channel profile appears stepped – an artifact of how it was created.

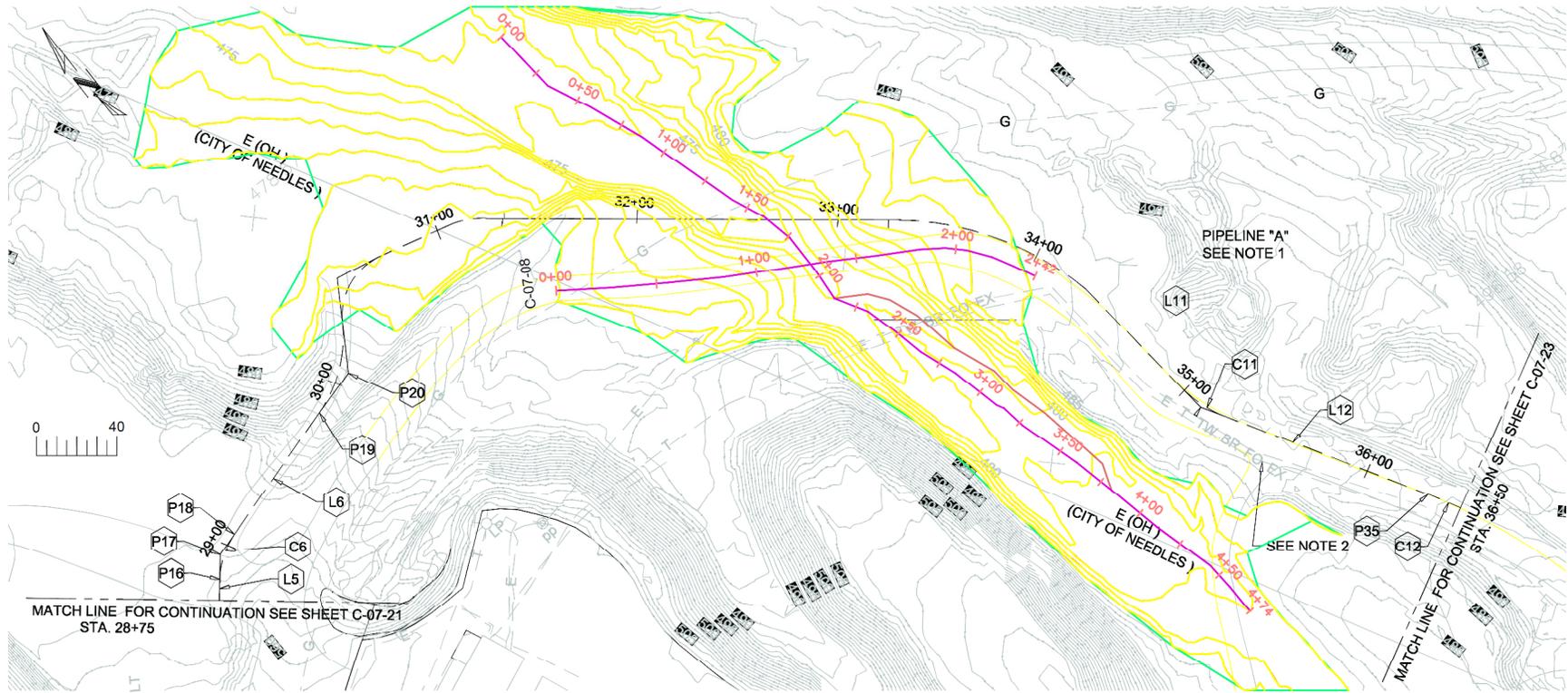


Channel profile at existing culverted Bat Cave Wash crossing. Horizontal distances are in stations, and elevations are in feet.

**Appendix 1**

***CADD Drawing of Possible Low Water Stream Crossing on Bat Cave Wash***

DRAFT



**PIPELINE "A" - PLAN**

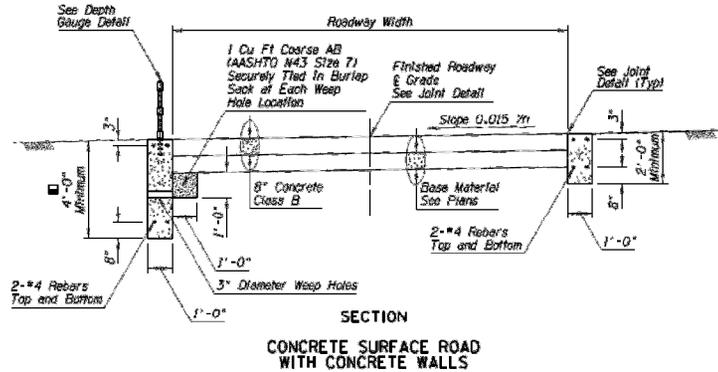
Civil 3D drawing with profile alignments along former Route 66, and along Bat Cave Wash. The 90% Basis of Design Report Pipeline A alignment with approximate stations running from 29+00 to 36+00 is indicates, as are alignments for profiles of an unvented low water stream crossing (with stations ranging from 0+00 to 2+42) and the Bat Cave Wash channel in the vicinity of the crossing (with stations ranging from 0+00 to 4+74). This drawing was created using a PDF plan sheet from the 90% Basis of Design Report.

**Appendix 2**

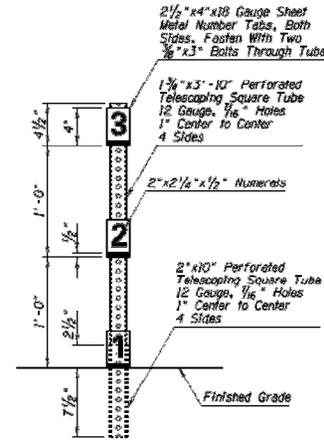
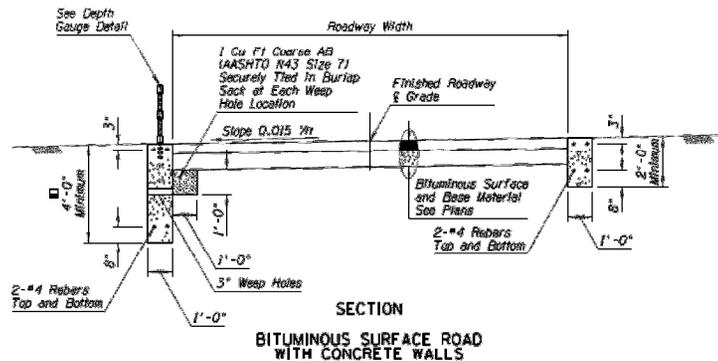
**2007 ADOT Construction Standard Drawings for Unvented Low Water Stream Crossing (Ford)**

DRAFT

NO.	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	REVISION STD AS SHOWN SHEET 1 OF 2	HLF	5/04
2	ADDED GENERAL NOTE 4	HLF	5/04
3			
4			

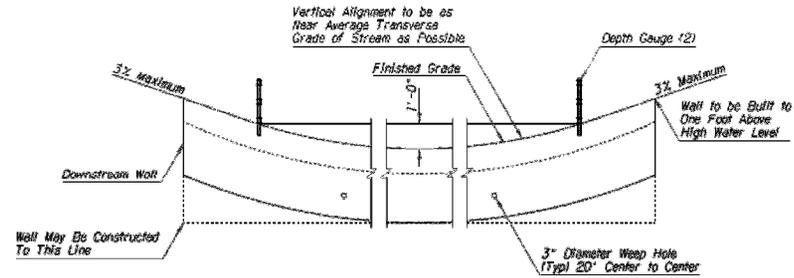
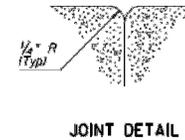


□ Min Distance Below Stream Bed



DEPTH GAUGE DETAIL

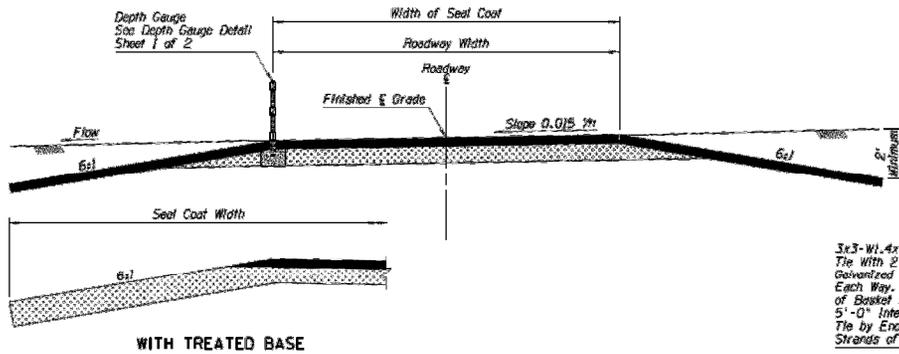
- GENERAL NOTES**
1. Ford walls shall be Class B concrete.
  2. Depth gauge tubing shall be protected against concrete entering through bottom or perforations.
  3. Depth gauge tubing and both sides of numeral tabs shall be painted with two coats of white enamel. Numerals and markers shall be painted with one coat of glass black enamel.
  - ④ 4. Depth gauge foundation may be utility concrete.



ELEVATION LOOKING UPSTREAM

APPROVED FOR DESIGN <i>[Signature]</i>	STATE OF ARIZONA DEPARTMENT OF TRANSPORTATION ROADWAY STANDARD DRAWINGS	REV. 5/07
APPROVED FOR IMPLEMENTATION <i>[Signature]</i>	FORD CONCRETE WALLS	SHOWING NO. C-191D Sheet 1 of 2

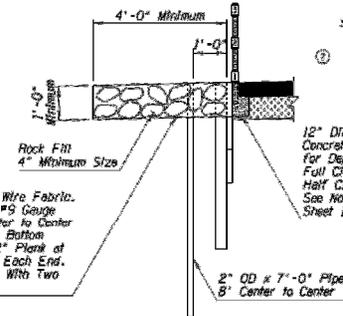
NO.	DESCRIPTION OF REVISIONS	MADE BY	DATE
1	REISSUED STD AS C-1910L SHEET 2 OF 2	RLF	8/04
2	DELETED GENERAL NOTE	RLF	9/04
3			
4			



WITH TREATED BASE

TYPE 1  
BITUMINOUS SURFACE ROAD

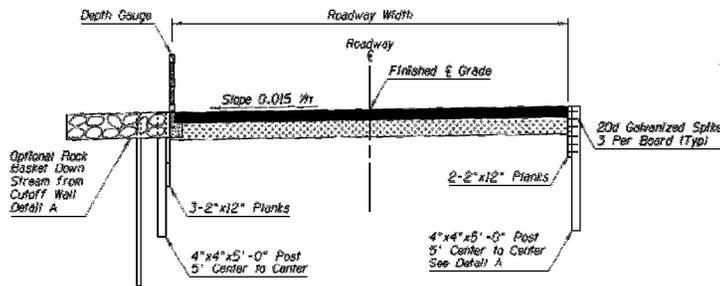
3x3-W1.4xW1.4 Welded-Wire Fabric.  
Tie With 2 Strands of #9 Gauge  
Galvanized Wire 2" Center to Center  
Each Way. Tie Top and Bottom  
of Basket to Top 2"x12" Plank at  
5'-0" Intervals and at Each End.  
Tie by Encircling Plank With Two  
Strands of #9 Wire



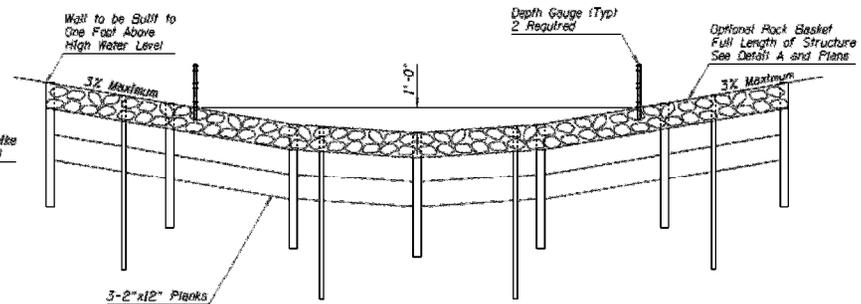
DETAIL A

GENERAL NOTES

- All timber shall be rough, pressure treated and unpainted.
- Rock basket, full length of structure, shall be included only when called for on plans.
- See plans for alternative surface and base material details.



TYPE 2  
BITUMINOUS SURFACE FORD  
TIMBER CUTOFF WALLS



ELEVATION - TYPE 2

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APPROVED FOR INSTALLATION <i>[Signature]</i>	FORD TYPES 1 AND 2	ISSUED NO. C-1910 Sheet 2 of 2