

Exhibit B – Special Provision for Protection and Monitoring of Davis and Weber Aqueducts

PART 1 GENERAL

1.1 THE REQUIREMENTS

- A. The work in this section includes specific measures required to protect the Davis Aqueduct and Weber Aqueduct from potential damages during construction of the Proposed Project.
- B. Davis Aqueduct and Weber Aqueduct are owned by the United States Bureau of Reclamation (BOR) and operated and maintained by the Weber Basin Water Conservancy District (WBWCD).
- C. The Davis Aqueduct and/or Weber Aqueduct is located within the limits of the Proposed Project. Horizontal and vertical alignment, based upon BOR design drawings, shall be shown on the Proposed Project plans. Limits of the BOR right-of-way shall be shown on the Proposed Project plans.
- D. The existing aqueduct was constructed in the 1950's primarily using the following types of pipe:
- Reinforced Concrete Pipe (RCP): This is referred to as precast concrete “non-cylinder type” pipe on the BOR design drawings. The majority of the Davis Aqueduct and Weber Aqueduct are constructed of RCP.
 - Reinforced Concrete Cylinder Pipe (RCCP): This is referred to as “Cylinder Pipe” on the BOR design drawings. This type of pipe includes a steel cylinder and additional reinforcement embedded in concrete. RCCP is primarily used in areas of higher pressure on the aqueducts.
 - Modified Pretensioned Concrete Cylinder Pipe (PCCP): This pipe is primarily used in small diameters on the aqueducts (33 inch and 21 inch).
- E. The BOR design drawings label each pipe segment with a numbering system that denotes the Soil Loading Class of Pipe (A, B or C), Diameter (X”), Pipe Type (“NC” for Non-Cylinder or “C” for Cylinder) and the maximum allowable pressure head rating in feet X’). For example, B78NC100 denotes:
- Class B soil loading
 - 78” diameter
 - NC = Non-cylinder pipe

- 100 = 100 feet allowable pressure head rating

- F. The age of the aqueducts, rubber gasketed joints, and lack of joint restraint require that extreme caution be exercised when operating equipment and constructing facilities along or adjacent to the BOR right-of-way. Excessive vibration, loading, or settlement of the aqueduct may cause joints to leak and the pipeline to fail. Each aqueduct must continuously convey raw water for a significant portion of the population of Davis County and Weber County. The aqueduct cannot be taken out of service for maintenance and repair without significant advance planning and expense, and then only during limited (low wintertime demand) periods of the year.
- G. Requirements of this Section are based upon the Exhibit A - BOR Protection Criteria, and the U.S. Department of the Interior Bureau of Reclamation Engineering and O&M Guidelines for Crossings. Copies of these documents shall be included with this Section for reference.
- H. Note that this Section is intended to provide a summary of the key requirements of the above documents as they relate to the Proposed Project. It is not intended to be a comprehensive list of BOR requirements. All requirements of these documents shall be adhered to when operating along or adjacent to the Davis Aqueduct, Weber Aqueduct and United States right-of-way.

1.2 RELATED SECTIONS

- A. NOT USED

1.3 REFERENCES

- A. Engineering and O&M Guidelines for Crossings – Bureau of Reclamation Water Conveyance Facilities, April 2008
- B. Exhibit A – Protection Criteria
- C. Standard Form 299 – Application for Transportation and Utility Systems and Facilities on Federal Lands
- D. Easement Encroachment Application for Davis or Weber Aqueduct
- E. 29 CFR 1926: OSHA Safety and Health Regulations for Construction

1.4 DEFINITIONS Not Used

1.5 SUBMITTALS

- A. Submit a detailed protection and monitoring plan, including working drawings which identify the specific equipment, equipment specifications, drum weights, axle weights, calculations of live and dead loads, and construction procedures including excavation and haul off, placement of materials, and compaction methods that will be used for all phases of the construction that occur within the BOR right-of-way.
- B. Where roadways or significant structures are proposed across or adjacent to BOR right-of-way, submit a detailed geotechnical report to show anticipated settlement along the centerline of the aqueduct caused by construction. Reference Section 3.5 – Special Protections for Potential Ground Settlement for requirements.
- C. Before beginning any construction work near the aqueduct, provide training to drivers, equipment operators, subcontractors and employees regarding the requirements of the approved protection and monitoring plan. Provide WBWCD and BOR with 48-hours minimum notice of training events associated with the aqueduct. Provide all individuals with a hard hat sticker (to be provided by WBWCD) to indicate successful completion of training prior to beginning work.
- D. Upon completion of construction, provide both WBWCD and BOR with one hard copy and one electronic copy of as-built drawings showing actual improvements in, on, or along the rights-of-way. For large highway type construction projects, drawing format shall meet BOR record drawing requirements. Contact the BOR Provo Area Office for detailed requirements.

1.6 QUALITY CONTROL

- A. Assign full time personnel responsible to monitor and verify that the approved protection plan is being followed at all times while operating within the BOR rights-of-way.
- B. As a first item of work, “pothole excavations” should be made to field locate and identify the alignment of the aqueduct and its appurtenant structures within the construction zone. Provide 48-hours advance notification and conduct all pothole excavation work in the presence of BOR and/or WBWCD staff. All pothole work within 18 inches of the aqueduct should be done using hand-held tools or vac truck only.
- C. Clear visual marking shall be continuously maintained along the aqueduct centerline and limits of the Load Restricted Area (12-feet each side of centerline of the aqueduct) within the BOR right-of-way at all times during construction. Assign a full-time responsible person to continuously

maintain visual marking indicators during all construction activities impacting the aqueduct right-of-way. Use orange construction barrels or equivalent devices that can be moved and replaced rapidly to facilitate construction. Locating paint is not sufficient during active construction.

- D. All individuals operating equipment within the BOR right-of-way must display a hard hat sticker to indicate that they have successfully completed necessary training per Section 1.5 C prior to beginning work. Stickers should be clearly visible to on-site field representatives.

PART 2 PRODUCTS Not Used

PART 3 EXECUTION

3.1 BOR/WBWCD ENCROACHMENT APPLICATION PROCESS

- A. A WBWCD Easement Encroachment Application for Davis or Weber Aqueduct Right-of-Way must be completed for all encroachments within the Davis Aqueduct or Weber Aqueduct easement. This form is attached to this section and can be obtained electronically at WBWCD's Web site.
- B. Requirements for obtaining a use authorization to cross BOR project land are in the Code of Federal Regulations (CFR) at 43 CFR 429 and Reclamation Manual LND 08-01. Applicants must complete the Standard Form (SF) 299, "Application for Transportation and Utility Systems and Facilities on Federal Lands." The form is attached to this section and can be obtained electronically at BOR's Web site at: <http://www.usbr.gov/pmts/lands>.
- C. Standard encroachment request process:
 - a. Request for encroachment is applied for by delivering two forms to WBWCD (Standard Form 299 & Easement Encroachment Application for Davis or Weber Aqueduct Right-of-Way), providing the necessary plan & profile exhibits and paying the associated fees.
 - b. Once the application has been accepted by WBWCD, a preliminary review process begins and redlines and comments are returned to the applicant prior to formal submittal to BOR. WBWCD requires up to three (3) weeks per revision for review and processing of encroachment requests.

- c. Applicant resubmits with updated plan & profiles that either incorporate ALL of the comments for revision of design or the applicant can request a variance to the criteria to be further reviewed.
- d. WBWCD will then either proceed with permitting through BOR or continue with further review and comment, in which case steps c & d are repeated.
- e. Both forms must be approved in writing prior to construction being authorized within the Davis Aqueduct or Weber Aqueduct easement.

3.2 CONSTRUCTION WITHIN THE BOR DAVIS AQUEDUCT RIGHTS-OF-WAY

- A. All new construction shall meet requirements of the Exhibit A – Protection Criteria, included at the end of this Section for reference.
- B. All new construction and utility crossings shall meet requirements of the Engineering and O&M Guidelines for Crossings by the U.S. Department of the Interior Bureau of Reclamation, included at the end of this Section for reference.
- C. All requests for encroachments on BOR land, facility, or water body must obtain a written land use authorization from WBWCD and BOR.
- D. Where pipe type is rated for surcharge loads, surface structures that will generally be allowed to be constructed within the BOR rights-of-way include, asphalt pavement, non-reinforced parking areas, curbs, gutters, sidewalks, walkways and driveways, and removable barriers. **However, it is understood that all surface structures shall be analyzed and considered on an individual basis.**
- E. Structures that may not be constructed in, on, or along the BOR rights-of-way include but are not limited to permanent structures such as retaining walls, street light standards, supports for large signs, power or communication poles, buildings, permanent foundations, permanent traffic barriers, cement or rock walls, sound walls, and longitudinal fences.
- F. Parallel utilities are not permitted within the BOR rights-of-way.
- G. Trees or vines are not permitted within the BOR rights-of-way.
- H. Storage of hazardous materials is not permitted within the BOR rights-of-way.

- I. All temporary and permanent changes in ground surfaces within the BOR rights-of-way are considered to be encroaching structures and must be handled as such.
- J. If existing drainage features are to be modified during construction, detailed drawings showing the proposed drainage replacement/restoration should be submitted with the application for review and approval.
- K. Notify Weber Basin Water Conservancy District (WBWCD) at (801) 771-1677 at least forty-eight (48) hours in advance of commencing construction to permit inspection by the BOR and/or WBWCD.
- L. Notify WBWCD immediately upon any evidence of suspected damage to the aqueduct so that emergency response efforts can be initiated as determined necessary. Maintain 24-hour emergency contract information on-site at all times.

3.2.2 Utility Crossings

- 1. Any non-metallic encroaching structure below ground level shall be accompanied with a metallic strip within the BOR rights-of-way.
- 2. The points where proposed crossing utilities enter and exit the BOR rights-of-way should be plainly and permanently marked by sign posts. Sign posts should contain the name of the owner/operator, contents of the pipeline, utility identification, and emergency contact phone number.
- 3. Utilities including electrical and communication lines, and pipelines containing sewage, oil, gasoline, natural gas, contaminated waters, non-potable waters, or hazardous materials should only **cross perpendicular (between 70 and 90 degrees)** to the aqueduct.
- 4. Utilities crossing above the aqueduct should maintain a vertical clearance between the utility and aqueduct of **at least of 18 inches**. Utilities crossing below the aqueduct should maintain a vertical clearance between the utility and aqueduct of **at least of 48 inches**.
- 5. Sanitary sewer crossings shall be contained within steel pipe casings within the BOR right-of-way.
- 6. Potable water, secondary water, and other wet utility crossings shall be contained within steel pipe casings within the BOR right-of-way. Where steel pipe casings are not feasible, jointless piping may be allowed instead.

7. No vertical or horizontal bends will be permitted on utilities within the BOR right-of-way.
8. Overhead wires across BOR rights-of-way should be at least 32 feet above all ground levels. For electrical power lines of 69 kilovolts (kV) or higher voltage, the minimum clearance should be 40 feet plus 0.25 inch per kV of line-to-line voltage above 450 kV. Poles or towers are not allowed within the BOR rights-of-way.
9. High voltage, direct current powerlines are generally not permitted to encroach on the BOR rights-of-way for the Weber and Davis Aqueducts, except in unusual circumstances and with proper cathodic protection considerations.
10. Refer to the Engineering and O&M Guidelines for Crossings for specific cathodic protection requirements within the BOR rights-of-way.

3.3 LOAD RESTRICTIONS WITHIN BOR DAVIS AQUEDUCT AND WEBER AQUEDUCT RIGHTS-OF-WAY

- A. Load restrictions must be carefully observed to protect the aqueduct from damages that could be caused by excessive live or dead loading or vibrations during construction. The Load Restricted Area surrounding the aqueduct is defined as a zone within 12-feet of both sides of the centerline of the pipeline (24-feet total width).
- B. Limit equipment, operation, procedures, and methods of construction within the Load Restricted Area to ensure that any combination of either live loads or dead loads does not exceed the design capabilities of the aqueduct. Comply with the following constraints, procedures, and load restrictions which apply to all construction activities and operations located within this zone.
- C. The largest equipment loading (live load) which shall be permitted within the Load Restricted Area is HS-20 with a minimum soil cover of 4-feet or greater.
- D. Prevent heavy equipment (exceeding an HS-20 loading) from encroaching within the Load Restricted Area. Dynamic loading of equipment, including soil compaction equipment, shall not exceed HS-20 loading with a minimum of 4 feet of cover.
- E. Operation of backhoes, augers, excavation or lifting equipment which may impose point loads from outriggers, wheels, or jacks is not permitted within the Load Restricted Area.

- F. The allowable soil loading (dead load) or depth of cover over the aqueduct is restricted to a minimum of 4 feet and a maximum of 5 feet for Class A pipe, 10 feet for Class B, 15 feet for Class C, and 20 feet for Class D. Note that the aqueduct changes pipe class frequently along its alignment. Class changes are based upon the original design depth of cover that was present along the aqueduct. **Class “A” sections of pipe must be surveyed and fenced off to keep construction traffic off of Class “A” pipe sections.**
- G. Where roadway or driveway crossings of Davis and Weber Aqueduct are proposed, the allowable soil loading shall take into account the anticipated live loads due to an HS-20 Loading as shown in the following table:

Height of Earth Cover (feet)	Total equivalent earth cover for H-20 Wheel Loading (feet)
2	15.1
3	9.1
4	7.8
5	8.1
6	8.6
7	9.2
8	9.9

For example, for Class B pipe, 10 feet of soil loading is typically allowed. However, when adjusted for an H-20 live load only 8 feet of cover would be allowed because the equivalent earth cover for H-20 loading at 8 foot earth cover is 9.9 feet. The applicant may request a variance to the above table by submitting engineering reports or documentation stamped by a licensed professional engineer to show that a combination of special materials or construction practices will mitigate the impacts of traffic loading, but in no case shall the proposed height of earth cover exceed the allowable soil loading of the pipe as shown in (F) above. **Class A pipe is not rated for any traffic and must include bridging or other approved protective measures if traffic is proposed.**

- H. All backfill material within the BOR rights-of-way shall be compacted to a minimum of 95-percent maximum density specified by ASTM Part 19, D-698, method A; unless otherwise shown.
- I. Backfilling of any excavation or around any structure within the BOR rights-of-way shall be compacted in layers not exceeding 6-inches thick if hand compacted or 8-inches thick if power compacted to the following requirements: (1) cohesive soils to 95 percent maximum density specified by ASTM Part 19, D-698, method A; or (2) noncohesive soils to 95 percent relative compaction specified by ASTM D 7382-08.
- J. Maintain existing ground cover over the aqueduct unless special exceptions are approved which allow for modifications during construction.

- K. Do not place fill or temporarily stockpile construction materials in the Load Restricted Area within 12-feet of the centerline of the aqueduct.

3.4 SPECIAL PROTECTIONS FOR TEMPORARY LOW COVER CONDITIONS

- A. Special protections are required during conditions when temporary low cover is present over the Davis Aqueduct or Weber Aqueduct, such as when replacement of an existing roadway requires the pavement section and subgrade to be removed and replaced for development of the new roadway section over the aqueduct.
- B. Temporary low cover conditions are present any time that the depth of soil over the aqueduct is less than the allowable 3-foot minimum.
- C. Coordinate planned subgrade elevations with Davis Aqueduct and/or Weber Aqueduct pothole depths. Submit cross sections in low cover areas illustrating the identified depth of cover and proposed subgrade elevation at 25-foot intervals.
- D. Excavation over the aqueduct shall take place from the adjacent existing pavement to allow removal of excavated material while maintaining minimum cover between the top of aqueduct and construction equipment.
- E. For placement of granular borrow materials, utilize the adjacent existing pavement for material delivery and place import material using one of the following methods:
 - a. Side dump trucks, placing material directly on grade.
 - b. Belly dump trucks, placing material on the existing pavement and blading off of pavement onto grade.
- F. Backfill within 18-inches of the aqueduct shall be compacted using light, hand operated compactors and rollers. Mechanical compaction shall not be allowed within 6-inches of the aqueduct.
- G. Once a working platform has been established, a low ground pressure Dozer/Grader (less than 7 psi) shall be used to spread material across the sub grade while maintaining a minimum of 18 inches of cover over the aqueduct.
- H. Utilize static rolling compaction methods with light weight equipment (less than 8,000 lbs) within the low cover zone between 18-inches and 36-inches. Vibratory compaction shall not be used within the Load

Restricted Area when cover over the existing aqueduct is less than 36-inches.

3.5 SPECIAL PROTECTIONS FOR POTENTIAL GROUND SETTLEMENT

- A. Definitions:
 - a. Differential Settlement: Difference in ground settlement that is observed between points located along the centerline of the aqueduct over a specified length at any given location within the construction zone.
 - b. Total Settlement: Total measured ground settlement that is observed along the centerline of the aqueduct within the limits of the construction zone.
- B. All necessary precautions should be taken to prevent ground settlement from occurring which could be damaging to the existing aqueduct. No settlement or excessive vibration will be allowed along the aqueduct.
- C. Note that internal joint seals may be installed in the aqueduct (if approved by WBWCD and BOR) as a preventative measure only. The temporary seals provide flexibility at the joint to help prevent leakage and failure of the aqueduct in the event of settlement or excessive vibrations during construction. They do not prevent damage to the aqueduct caused by settlement or vibration from occurring.
- D. Contractor shall be responsible for all damages to the aqueduct as a result of construction, including damages to joints and the interior mortar lining of the aqueduct, regardless of the presence of internal joint seals.

3.6 SPECIAL PROTECTIONS FOR VIBRATION CONTROL DURING CONSTRUCTION

- A. Do not exceed the following special vibration limits for the aqueduct:
 - a. 0.1 in/sec for both steady state and impact vibrations along the centerline of the aqueduct where internal joint seals are not in place.
 - b. 0.25 in/sec for steady state vibrations along the centerline of the aqueduct where internal joint seals are in place.
 - c. 0.5 in/sec for impact vibrations along the centerline of the aqueduct where internal joint seals are in place.

- B. For purposes of these special aqueduct vibration limits, steady state vibrations will be considered as all continuous and frequent intermittent sources including pogo stick compactors, vibratory pile drivers, and vibration compaction equipment.
- C. For purposes of these special aqueduct vibration limits, impact vibrations will be considered as all transient sources which create a single isolated event such as impact pile driving, blasting or other non-recurring heavy drop impact.

END OF SECTION