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DEVIATION REQUEST AND DECISION FORM

Updated: 6/26/2019

PROJECT INFORMATION

Project Name :	Widefield Water and Sanitation District Upper West to East Water Transmission Line
Schedule No.(s) :	
Legal Description :	

APPLICANT INFORMATION

Company :	Widefield Water and Sanitation District
Name :	Robert Bannister
	☒ Owner ☐ Consultant ☐ Contractor
Mailing Address :	Widefield Water and Sanitation District 8495 Fontaine Blvd. Colorado Springs, CO 80925
Phone Number :	719-955-6118
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Email Address :	rob@wwsdonline.com

ENGINEER INFORMATION

Company :	Garver, LLC	
Name :	Paul M. Banschbach	Colorado P.E. Number: 59830
Mailing Address :	5251 DTC Pkwy Suite 420 Greenwood Village, CO 80111	
Phone Number :	303-721-6932	
FAX Number :		
Email Address :	PMBanschbach@GarverUSA.com	

OWNER, APPLICANT, AND ENGINEER DECLARATION

To the best of my knowledge, the information on this application and all additional or supplemental documentation is true, factual and complete. I am fully aware that any misrepresentation of any information on this application may be grounds for denial. I have familiarized myself with the rules, regulations and procedures with respect to preparing and filing this application. I also understand that an incorrect submittal will be cause to have the project removed from the agenda of the Planning Commission, Board of County Commissioners and/or Board of Adjustment or delay review until corrections are made, and that any approval of this application is based on the representations made in the application and may be revoked on any breach of representation or condition(s) of approval.

Signature of owner (or authorized representative) — Date: 12/8/2022

Engineer's Seal, Signature And Date of Signature

COLORADO LICENSED PAUL M. BANSCHBACH 0059830 PROFESSIONAL ENGINEER

12/08/2022

PCD File No. __CDR-2218__

DEVIATION REQUEST (Attach diagrams, figures, and other documentation to clarify request)

A deviation from the standards of or in Section **ECM 4.3.6** of the Engineering Criteria Manual (ECM) is requested.

Identify the specific ECM standard which a deviation is requested:

4.3.6 Underground Utilities Standards

A. Cover and Separation

Cover over underground utilities and the separation between underground utilities shall conform to applicable federal and state regulations, these Standards, and the Standard Drawings in Appendix F.

1. Water Lines
   - Water Mains: At no time shall a water main be placed less than 5 feet in depth measured perpendicularly to the ground line at any point of the road cross section.
   - Water Service Lines: At no time shall water service lines be placed less than 5 feet in depth measured perpendicularly to the ground line, at any point of the road cross section, to the right-of-way line.
   - Meter and Stop Boxes: Meter and stop boxes shall be set at the inside edge of the right-of-way line, but not within curb ramps. Where a utility easement exists adjacent and parallel to the right-of-way, meter and stop boxes shall be placed in the utility easement.
   - Fire Hydrants: Fire Districts must be contacted to determine location, spacing, and equipment standards.

State the reason for the requested deviation:

1. Meet requirements for traffic loadings and trench design at minimum 4 feet depth of pipe cover for the new water lines (refer to attached calculations)
2. Reduce the volume of earthwork and restore the right-of-way more quickly
   a. Overall, increase construction production rate in the neighborhood communities
3. Maximize the horizontal and vertical separation of water lines from potential sources of pollution, within the existing corridor and space constraints, by installing the new water lines at minimum 4 feet depth of pipe cover. For example: If the sanitary sewer top of pipe depth is generally 8 feet minimum, and new water lines (up to 24-inch diameter) are installed parallel at 4 feet depth, then the bottom of the new water line would be up to 6 feet depth, allowing for 2+ feet of vertical separation between the new water lines and existing sanitary sewer line within the corridor.
   a. If the new water lines are installed at 5 feet depth, then vertical separation to potential sources of pollution will be reduced overall, and/or eliminated; the result would be multiple locations and lengths of the corridor with new water lines at similar depth to, or continuously deeper than, potential sources of pollution; therefore, increasing risk of polluting water lines.

Explain the proposed alternative and compare to the ECM standards (May provide applicable regional or national standards used as basis):

The proposed alternative is to install the water lines at 4 feet minimum depth instead of the 5 feet minimum depth.

LIMITS OF CONSIDERATION
(At least one of the conditions listed below must be met for this deviation request to be considered.)

☐ The ECM standard is inapplicable to the particular situation.
☒ Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.
☒ A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

Provide justification:

Due to the existing right-of-way corridor's limited space and existing utilities, and the requirements for separation from potential sources of pollution, a deviation of 4 feet depth of minimum pipe cover is an equivalent alternative that can accomplish the same design objective of 5 feet depth. Pipe deflection calculation results are within 0.005% for 4 feet and 5 feet depths. Additionally, water lines constructed above potential sources of pollution, rather than below, allows for a possible reduction in risk of polluting water lines, and reduces earthwork and construction of protection (e.g., concrete encasement).

A change to the standard is required to reduce the impact to the right-of-way and improve the separation (horizontal and vertical) to potential sources of pollution, given the space constraints of the corridor and the resulting pipe deflection calculations within recommended values of the AWWA M23 manual. If not modified, given the project site conditions and comparable pipe deflection results, the standard will impose an undue hardship on the applicant with little or no material benefit to the public, requiring additional earthwork, additional applicable construction of protection, and additional impact to the existing right-of-way.

CRITERIA FOR APPROVAL

Per ECM section 5.8.7 the request for a deviation may be considered if the request is **not based exclusively on financial considerations**. The deviation must not be detrimental to public safety or surrounding property. The applicant must include supporting information demonstrating compliance with **all of the following criteria**:

The deviation will achieve the intended result with a comparable or superior design and quality of improvement.

Following AWWA Manual M23, the pipe deflection calculation result at 4 feet minimum depth of cover is 0.9643%. At 5 feet depth of pipe cover, the pipe deflection calculation result is the same at 0.9593%. Additionally, the resulting deflection calculations are near to those for 3 feet and 3.5 feet depth of cover: 1.108% and 1.036%, respectively. Therefore, the deviation will achieve the intended result of a pipe-soil system that can effectively support the load on the pipe at 4 feet minimum pipe cover.

The deviation will not adversely affect safety or operations.

With similar pipe deflection calculation results for 4 feet and 5 feet depth of pipe cover of 0.9643% and 0.9593%, respectively, the deviation will not adversely affect safety and operations.

The deviation will not adversely affect maintenance and its associated cost.

At 4 feet depth of cover, instead of 5 feet depth of cover, the deviation will not adversely affect maintenance and its associated cost, due to reduced quantities of earthwork at 4 feet depth of pipe cover for maintenance and its associated cost.

The deviation will not adversely affect aesthetic appearance.

The deviation will not adversely affect aesthetic appearance due to piping being installed underground and not within above-ground visibility.

The deviation meets the design intent and purpose of the ECM standards.

The deviation meets the design intent and purpose of the ECM standards, allowing to deliver potable drinking water at a calculated and comparable depth of pipe cover at composite values, in order to protect and promote public health, safety, and the general welfare of the public; ensuring that public infrastructure meets commonly accepted engineering standards, and maintains consistency and fairness in development review.

The deviation meets the control measure requirements of Part I.E.3 and Part I.E.4 of the County's MS4 permit, as applicable.

The deviation maintains meeting control measure requirements of Part I.E.3 and Part I.E.4 of the County's MS4 permit. Please refer to SWMP included with submitted CDR 2218 documents.

REVIEW AND RECOMMENDATION:

Approved by the ECM Administrator
This request has been determined to have met the criteria for approval. A deviation from Section _____ of the ECM is hereby granted based on the justification provided.

Denied by the ECM Administrator
This request has been determined not to have met criteria for approval. A deviation from Section _____ of the ECM is hereby denied.

ECM ADMINISTRATOR COMMENTS/CONDITIONS:

1.1. PURPOSE

The purpose of this resource is to provide a form for documenting the findings and decision by the ECM Administrator concerning a deviation request. The form is used to document the review and decision concerning a requested deviation. The request and decision concerning each deviation from a specific section of the ECM shall be recorded on a separate form.

1.2. BACKGROUND

A deviation is a critical aspect of the review process and needs to be documented to ensure that the deviations granted are applied to a specific development application in conformance with the criteria for approval and that the action is documented as such requests can point to potential needed revisions to the ECM.

1.3. APPLICABLE STATUTES AND REGULATIONS

Section 5.8 of the ECM establishes a mechanism whereby an engineering design standard can be modified when if strictly adhered to, would cause unnecessary hardship or unsafe design because of topographical or other conditions particular to the site, and that a departure may be made without destroying the intent of such provision.

1.4. APPLICABILITY

All provisions of the ECM are subject to deviation by the ECM Administrator provided that one of the following conditions is met:

- The ECM standard is inapplicable to a particular situation.
- Topography, right-of-way, or other geographical conditions or impediments impose an undue hardship on the applicant, and an equivalent alternative that can accomplish the same design objective is available and does not compromise public safety or accessibility.
- A change to a standard is required to address a specific design or construction problem, and if not modified, the standard will impose an undue hardship on the applicant with little or no material benefit to the public.

1.5. TECHNICAL GUIDANCE

The review shall ensure all criteria for approval are adequately considered and that justification for the deviation is properly documented.

1.6. LIMITS OF APPROVAL

Whether a request for deviation is approved as proposed or with conditions, the approval is for project-specific use and shall not constitute a precedent or general deviation from these Standards.

1.7. REVIEW FEES

A Deviation Review Fee shall be paid in full at the time of submission of a request for deviation. The fee for Deviation Review shall be as determined by resolution of the BoCC.

www.GarverUSA.com

December 5, 2022

Planning and Community Development Department
El Paso County
2880 International Circle
Colorado Springs, CO 80910

Re: Deviation Request and Decision Form
Pipe Deflection Results

1.0 Introduction and Background

This technical memorandum summarizes the pipe deflection calculations at different depths of bury for the Upper West to East Water Transmission Line project for the Widefield Water and Sanitation District. The following sections define the assumptions and design criteria used to calculate the allowable pipeline deflection based on the known site conditions. The evaluation included the derivation of the estimated maximum pipeline deflections based on guidance from the American Water Works Association (AWWA) M23, Third Edition design manual for PVC pipe.

Deflection that results from external loading can cause a pipeline to gradually bend over time in the direction of the applied force. Increased deflection in a pipe will decrease the performance and potentially lead to failure in the pipe. The ability for the pipeline to resist deflection is typically expressed as a percentage of the measured change in diameter against the original outer diameter of the pipe. AWWA M23 defines the allowable deflection limits for PVC pipe as 5% of outside diameter.

Garver calculated the estimated deflection under current loading conditions for the proposed water pipe based on the AWWA M23 design manual, standard PVC pipe characteristics, geotechnical soil reports, and HS-20 load ratings. The following formula was used to determine pipe deflection at different depths of bury.

$$\%\frac{\Delta Y}{D} = \frac{k(T_L W_E + W_L + W_S)}{0149\text{PS} + 0.061E'}(100)$$

where:

$\%\frac{\Delta Y}{D_o}$	=	vertical deflection, %
ΔY	=	vertical deflection or change in diameter, in.
D	=	diameter, in.
k	=	bedding constant, use 0.1
T_L	=	time-lag factor, use 1.0, 1.5, or 2.0
W_E	=	earth load pressure, psi
W_L	=	live load pressure, psi
W_S	=	surcharge pressure, psi
PS	=	pipe stiffness, lbf/in./in.
E'	=	modulus of soil reaction, psi

Figure 1-1: Pipe Deflection Equation (AWWA M23 Design Manual)

2.0 Results

The following table shows the pipe deflection results for PVC pipe at varying depths of bury. The deflection results are within the deflection limits of 5% of outside diameter per the AWWA M23 design manual.

Table 2-1: PVC Pipe Deflection Results

Depth to Top of Pipe (ft)	3	3.5	4	5
D (in)	24	24	24	24
k	0.1	0.1	0.1	0.1
T(L)	1.5	1.5	1.5	1.5
w (pcf)	120	120	120	120
W(E) (psi)	2.5	2.9	3.3	4.2
W(L) (psi)	7.4	6.05	4.7	3.4
W(S) (psi)	0	0	0	0
PS (lbf/in./in.)	364	364	364	364
E' (Composite)	760	760	760	760
Y/D (%)	**1.108**	**1.036**	**0.9643**	**0.9593**

12/08/2022

Paul Banschbach, PE
Garver