GeoSyntec Consultants

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COMPUTATION COVER SHEET

Client: IUC **Project:** Tailings Cell 4A **Project/Proposal #:** SC0349 **Task #:** 03

Title of Computations: Pipe Strength Calculations

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Revisions: (Number and Initial All Revisions)

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1	5	8/22/06	JF	GTC	GTC

Written by: Jennifer Ferguson Date: 05/10/27 (YY/MM/DD) Reviewed by: GTC Date: 05/11/23 (YY/MM/DD)

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Wall Buckling

Wall buckling, a longitudinal wrinkling in the pipe wall, can occur when the external vertical pressure exceeds the critical buckling pressure of the pipe/bedding aggregate system. Wall buckling can be calculated using the following equation:

$$P_{cr} = \frac{2E}{(DR-1)^3}$$ (Attachment B, 7/8)

where:

P_{cr} Buckling pressure, psi

E Modulus of elasticity = 400,000 psi (Attachment E, 2/2)

DR Standard dimension ratio $= \frac{D_o}{t} = \frac{4.500}{0.237} = 19.0$

Therefore,

$$P_{cr} = \frac{2(400000)}{(19.0-1)^3} = 137 \text{ psi}$$

Comparing the above estimated value to the maximum loading allowed under ring deflection criteria (~~136~~ 37.5 GTC psi) provides:

FS_{WC} = 137/37.5
= 3.6

This value is greater than the acceptable factor of safety of 2.

SUMMARY AND CONCLUSIONS

Using the Modified Iowa Formula as outlined in the Uni-Bell Plastic Pipe Association Handbook on PVC Pipe, the maximum load on the buried pipe assumed to be 37.5 psi will only cause a ring deflection of 3.5 percent, which is below the acceptable ring deflection of 7.5 percent. Acceptable factor of safety values against wall crushing and wall buckling were also evaluated using methods outlined in Uni-Bell Plastic Pipe Association Handbook on PVC Pipe. Therefore, schedule 40 PVC pipe with 4-in diameter is suitable for this application.