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June 21, 2016 (Revised September 16, 2016)

Beatty Development Group
1300 Thames Street, Suite 10
Baltimore, MD 21231

Attention: Mr. Jonathan Flesher

Re: Engineering Evaluation Report
Wills Street Wharf Building and Ramp
Harbor Point Areas 1 and 2
Baltimore, Maryland
MRCE File No. 12582

Gentlemen:

This Engineering Evaluation (EE) document summarizes analysis of planned development construction for protection of the corrective measures at Area 1. The analyses and evaluations are presented in the attached EE memoranda which summarize detailed assumptions, calculations, and findings.

Memoranda

Memoranda prepared to illustrate the Engineering Evaluation are:

EE Memo 1 – Estimated Settlement and Stress on MMC from Development Fill
EE Memo 2 – Engineering Evaluation of Existing Vaults 3 and 4
EE Memo 3 – Loading on Promenade Sheet Piles
EE Memo 4 – Diverted Flow in Drainage Net from Foundation Construction

1. Estimated Settlement Under Development Fill

Regular weight controlled granular fill is proposed to raise existing grades below Wills Street south of the elevated Plaza Garage structure. The Wills Street alignment is above the S-B Barrier and toe drain straddling the east edge of Area 1 multimedia cap and the west edge of Area 2. The fill will contain development utilities. Existing grade is at Elev. +10 at the south foot of the future Wills Street (inboard of the perimeter embankment) to Elev. +15 at the Plaza Garage interface. Proposed grade is Elev. +13 at the south foot of Wills Street to Elev. +28 at the Plaza Garage. Retaining walls will be constructed to contain the fill at the west and edges. The east face will be supported by the basement walls of new buildings constructed along the east side of the street on Area 2.

Retaining wall foundation types are dictated by the resultant bearing stress on the drainage net and future development adjacent to the retaining wall. Retaining walls bearing on shallow foundations may be used for top of wall less than 11 feet above the drainage net. Retaining walls bearing on pile caps may be used for top of wall between 11 and 16 feet above the drainage net. Fill supported on a relieving platform must be used for top of wall greater than 16 feet above the drainage net.

From the joint with the Plaza Garage to about 300 feet south, the Wills Street alignment is underlain by granular fill over compact sand cretaceous deposits. Proposed grades result in fill heights of 3 to 13 feet. Settlement of less than ½ inch is computed for this condition.

In the area of the turnaround at the south end of Wills Street the granular fill is underlain by organic clay of Stratum O. Proposed grade results in fill heights of about 3 feet. Portions of this area were pre-loaded to Elev. +15 prior to construction of the multimedia cap covering Area 1 (former Baltimore City Pier).

Where planned grades are below the pre-load elevation, settlement results only from recompression and is computed to be less than ½ inch. Where planned grades are above the pre-load elevation, settlement results from virgin compression and secondary compression and is computed to be on the order of 1.5 to 2.0 inches. Settlement magnitude can be tolerated by the MMC and does not result in negative slope at the geomembrane.

2. Loading on Vaults 3 and 4

Regular weight fill is proposed to raise street grades in the immediate vicinity of Vaults 3 and 4. Original design of the vaults assumed a maximum of 5 feet of fill load above the vault. Based on the proposed grades, Vault 3 will receive approximately 13.4 feet of fill which induces unacceptable load. Vault 4 will receive less than 5 feet of fill and induces an acceptable amount of load.

Based on the applied load, the roof and walls of Vault 3 will need to be reinforced or methods for reducing load applied to the vault may be used. For reinforcement, it would be feasible to place a reinforced concrete cap and lightweight fill above the geomembrane to support the fill above the vault.

3. Loading on Promenade Sheet Piles

Regular weight fill is proposed to raise grades and extend the existing Thames Street Wharf Promenade west to the proposed Wills Street Turnaround. The Promenade will run along the alignment of the existing steel sheet pile wall. Achieving proposed grades using granular fill produces unacceptable deflection and induces marginal stability of the sheet pile wall. Additional reinforcement or methods for reducing applied load may be used, A pile supported platform with concrete retaining wall to the south will support the additional fill and not allow for additional loading to the existing sheet pile wall.

4. Diverted Flow in Drainage Net from Foundation Construction

   Given the contours of the drainage net provided in the record drawings, planned pile cap obstructions to drainage net are acceptable, with drainage net flow capacity having a factor of safety above 2.0 for infiltration computed for the 100 year storm.

5. Hydraulic Conductivity of Sheet Pile Barrier

   Sealed interlock steel sheet piles within the existing S-B Barrier are proposed to allow pile driving in close proximity to the barrier. Sheet pile installation should remove any existing arching stresses within the backfill. Prior calculations for the Exelon development demonstrated that an interlocking sheet pile barrier performs as well as the existing soil-bentonite backfill if the soil-bentonite fails to perform due to arching or long-term chemical degradation.

6. Protection of Multimedia Cap from Construction Vehicle Loading

   This analysis evaluated loads from construction vehicles and equipment/concrete supply trucks. A dynamic load was added to the static load. HS-20 and 12 cy concrete truck loading distributed through the 30 inch soil cover imposes bearing stresses below 2,000 lb/sf at the synthetic layers. The cover soil provides a stable environment at the synthetic layers by virtue of high bearing capacity safety factor. Rutting should be repaired to maintain the existing 30 inches of cover soil. Paving is recommended at primary vehicle pathways and where material containers will be repeatedly loaded onto truck carriages to protect against rutting and reduce dust. Large construction equipment requires individual review. For example, driver crawler cranes will require mats to spread concentrated loads when lifting load, but not when moving across the site without load.

We trust that the attached analyses will document allowable construction conditions questions regarding the proposed development on the corrective measures. Please do not hesitate to contact us with any questions.

Very truly yours,

MUESER RUTLEDGE CONSULTING ENGINEERS

By: _____
Peter W. Deming, P.E.

Attachments

AMD\PWD\F:\125\12582\Engineering Evaluation\EE Summary Letter.docx cc: Marco Greenberg (BDG)
Chris French (Honeywell)