CIVIL CONSULTANTS MEMORANDUM

TO: **Mr. Keith Trefethen – Town Manager, Town of Berwick**

FROM: **Geoffrey R. Aleva, PE – Structural / Sr. Project Engineer**

SUBJECT: **Initial Visual Review of Town of Berwick Fire Station**

DATE: **JANUARY 11, 2011**

PROJECT: **10-225.00 TOWN OF BERWICK / FIRE STATION**

At the request of Jon St. Pierre, PE, Town Engineer, I conducted a visual inspection of the Fire Station located at 10 School Street on December 20, 2010.

I was accompanied by Chief Plante during the visual review of the structure. The Chief pointed out the visible deficiencies that have been a concern in the past and newer issues that have been discovered within the past couple of months. The Chief indicated that the second floor side door (south elevation) needs to be adjusted on a routine basis due to movement of the adjacent framing. This is an indication that the building is experiencing settlement or movement due to deteriorating structural systems.

The Fire Station structure is a two story masonry block building with large door openings along the front (west elevation) for emergency vehicle access. This elevation has a brick façade, the remaining three sides are comprised of exposed masonry block. The foundation system is poured in place concrete. The second floor is framed with timber joists and steel beams. The flat roof is framed with horizontal chord timber trusses spaced approximately 5 feet on center. A single story radio room addition is located off the southern elevation of the building. Building plans were not available during the initial review.

Based on the construction type, the building is approximately 40 to 50 years old. This type of structure was designed for a service life of approximately 50 to 60 years. The concrete block masonry and wood framing are exhibiting stress and age cracks throughout the perimeter and roof system. The structure is nearing the end of its design life as exhibited by the structural concerns listed below.

The Fire Chief indicated that the building experiences significant moisture leaks along the northeastern corner of the building during most rain events. He indicated that this section of the building is unusable for several days and staff needs to clean the area to prevent mold growth due to the water infiltration.

The visual inspection of the building from the main floor level revealed numerous vertical and staggered cracks along the masonry walls and concrete foundations. These types of cracks are characteristic of a building of this age. Typically buildings of this age and type have minimal reinforcing in the concrete block walls. Over time, due to age, weather and settlement, the mortar joints can deteriorate. This deterioration allows moisture to enter the building. This moisture leads to an accelerated decline in the stability of the concrete block wall system. This deterioration is evidenced by cracks in the mortar joints, staggered joints and delamination of the

block. Once the block has reached this stage of deterioration, the rehabilitation costs can be prohibitive.

The review of the roof trusses revealed several issues that are of significant concern. The wood trusses are fabricated with dimensional lumber bolted together with vertical top and bottom chords. The staff has indicated that during winter months when snow is on the roof, large cracking and popping sounds have been heard.

Several of the bearing ends of the trusses exhibit moisture staining and crushing of the wood fibers. As the wood becomes wet due to the moisture infiltration, the structural capacity is reduced due to the deterioration of the wood fibers. This deterioration can lead to localized settlement, which can further damage and diminish the structural capacity of the truss and roof system.

Review of several of the trusses revealed damaged and failing connections. The wood members are cracked through connections in several locations. These cracks compromise the load capacity of the truss members and roofing system.

Fire Department staff indicated that during training sessions on the second floor they have heard loud cracking and popping sounds. This is most likely due to movement and movement and settlement of the floor joists along the perimeter walls. The movement is most likely due to the moisture damage at the joist ends in the perimeter concrete block wall.

Per the International Building Code (IBC) this structure is considered an Essential Facility due its use as the fire station. It is my opinion that if this building is renovated for continued use, the work will require a full upgrade to current code requirements for structural loading, including seismic and snow loads. Typically, the cost to rehabilitate under reinforced masonry structures becomes extremely expensive and does not provide a cost effective payback return.

This memorandum is a preliminary initial review of the structure. A more comprehensive, detailed review should be completed to provide an inclusive listing of the negative building issues. This should involve further interviews with building users, detailed plans of the building and a more specific review of structural issues.

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