CITY OF RIVIERA BEACH **CITY MANAGER'S OFFICE**

INTER-DEPARTMENTAL COMMUNICATION

TO: **HONORABLE MAYOR AND CITY COUNCIL MEMBERS**

FROM: **TROY F. PERRY, ASSISTANT TO THE CITY MANAGER**

VIA: **RUTH C. JONES, CITY MANAGER**

DATE: **JUNE 13, 2016**

SUBJECT: **NORTH CHEMICAL BUILIDNG HOPPER**

On November 22, 2013, during an inspection of the North Chemical Building Hopper located at the Utility District, the Executive Director contacted Hazen and Sawyer Environmental Engineers & Scientists to evaluate the structural integrity of the building.

Based on their evaluation and assessment, it was determined that the expansion of lime inside hopper number #3 located on one of the top floors of the building, created outward pressure and as a result, caused the south wall to fail. In an effort to ensure the safety of Utility District personnel, the engineering company made several recommendations that ultimately restrict access to the top three levels of the building. The district currently enforces that recommendation. In memorandum dated February 11, 2014, Jean Paul Silva, P.E. for Hazen and Sawyer proposed developing a temporary brace in the interim to prevent additional failure to the building while a complete plan to address the structural concerns was developed.

In an effort to move forward and determine the extent at which rehabilitation to the North Chemical Building is required, at the next Utility District Meeting in July, staff will recommend that the City Council authorize a scope of work and resolution authorizing the Utility District to initiate a work authorization with C-solutions Inc. to conduct a building assessment, design a technical memorandum and detailed inspection of the North Chemical Building, that would provide the district with specific a roadmap to address the safety and structural integrity of the building.

Should you have any questions, please contact my office.

TFP

C: Danny D. Jones, Deputy City Manager
Giles Rhoads, Assistant Executive Utility Director
Bevin Beaudet, City Consultant
Department file

HAZEN AND SAWYER
Environmental Engineers & Scientists

Hazen and Sawyer, P.C.
2101 N.W. Corporate Blvd.
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Boca Raton, Florida 33431
Bus: 561-997-8070
Fax: 561997-8153

MEMORANDUM

DATE: November 22, 2013

FOR: Lou Aurigemma, P.E., Executive Director / RBUD

FROM: Rob Taylor, P.E. and Jean Paul Silva, P.E. / H&S

SUBJECT: Riviera Beach WTP – North Chemical Building Hopper Failure

On November 13, 2013, at the request of the City of Riviera Beach Utility District (District), we conducted a visual observation of the North Chemical Building at the Riviera Beach Water Treatment Plant. District staff are concerned with the structural integrity of the building and requested that Hazen and Sawyer perform an assessment of the building condition.

The North Chemical Building has a height equivalent to a five story building. The first two stories house chlorine gas cylinders, vacuum filters, and an electrical room while the third floor houses lime slakers. Two lime storage hoppers (Hopper Nos. 3 and 4) occupy the top two stories of the building. The bottom cone-shaped portion of the hopper is of steel construction and is supported on reinforced concrete beams from the fifth floor level. The top section of the hoppers is composed of reinforced concrete walls and top slab. District staff indicated that recent intrusion of water into Hopper No. 3 caused a reaction with the lime which expanded.

Expansion of the lime in Hopper No. 3 caused an outward pressure which caused failure of the south wall. We observed the following:

- South beam supporting the steel lime storage hopper has deflected horizontally and exhibits diagonal cracking on its bottom face at each end of the beam.
- Joint between south wall of Hopper No. 3 and top slab has completely separated. Reinforcing steel that connects wall to slab has completely sheared off. At the center of the wall, horizontal movement was approximately 2 inches.
- Exterior stucco on south wall of Hopper No. 3 exhibits multiple horizontal, vertical, and diagonal cracks.

- Exterior metal stair up to top of lime hoppers moved southward. Bottom support of stair has been compromised as the concrete surrounding the anchor bolts has spalled off and the stair is bearing on approximately 1/2 inch of the edge of the bottom landing.
- Top slab of the hoppers exhibits several cracks. There is evidence that some of these cracks are pre-existing to the lime expansion occurrence. However, it is likely that some of the cracks observed were caused by the lime expansion.

It is our opinion that for safety reasons, based on our observations outlined above, the District should proceed with the following:

- Restrict access to the top three levels of the building.
- Remove top-most metal stair as it is in an unsafe support condition. Removal of this stair will also have the added beneficial effect of restricting access to the top of the hoppers.
- Remove stucco from the top part of the south wall of the building. Stucco removal will prevent loose pieces from falling if they were to become dislodged by vibrations of the nearby railway or by wind.

As requested by the District, we will prepare a proposal to study the need for temporary bracing, removal of portions of the south concrete wall, top slab, Hopper No. 3 or other temporary remedial actions. Consideration of wall bracing, wall removal, or other action will be studied in conjunction with the future process needs and planned modifications.

As our investigation was only a visual inspection, and key portions of the structure were not observable due to the hoppers and our limited vantage point, we suggest District personnel take full precaution when working around the structure, and limit their time in and around the structure as much as possible until further assessment and/or remediation has been completed.

HAZEN AND SAWYER
Environmental Engineers & Scientists

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MEMORANDUM

DATE: February 11, 2014

FOR: Lou Aurigemma, P.E., Executive Director / RBUD

FROM: Jean Paul Silva, P.E. / H&S

SUBJECT: Riviera Beach WTP – North Chemical Building Hopper Failure

On November 13, 2013, at the request of the City of Riviera Beach Utility District (District), Hazen and Sawyer and District representatives conducted a visual observation of the North Chemical Building at the Riviera Beach Water Treatment Plant. Our findings and preliminary recommendations are outlined in a letter dated November 22, 2013. This letter is a follow-up to address long-term stability and integrity of the building.

As outlined in the letter of November 22, 2013, the south wall of the North Chemical Building has failed. Failure of this wall limits the structural capacity of the building to resist both vertical and lateral loads. We understand the District has reduced the loading on the building by removing all lime from the two hoppers and this alleviates some of the distress that may be caused by vertical loads. Further, we understand that the proposed task for evaluating the Lime System is scheduled for Commission approval in March; the proposed task for structural analysis of the North Chemical Building related to the lime system alternatives is likely to be scheduled for Commission approval two months later; that it is likely that the final determination on the need for repair, reconfiguration, or demolition of the building will not occur until the middle of 2014; and that construction work will probably start the early part of 2015. Given that the timeframe noted above will overlap with the hurricane season and that the building is in close proximity to a railroad track that can impart vibratory loads, it is our opinion that for safety reasons the building should be braced while the North Chemical Building Evaluation is developed and the resulting work plan is implemented.

We are prepared to develop a temporary bracing plan to provide minimum required lateral load resistance to the building to prevent additional failure while the Lime System Plan is developed and implemented. Please advise if we should proceed with providing a proposal for developing the temporary bracing.

As stated in our previous letter of November 22, 2013, we suggest District personnel take full precaution when working around the structure, and limit their time in and around the structure as much as possible until further assessment and/or remediation has been completed.

c. *Rob Taylor (H&S)*
Mark Drummond (C Solutions)

Exhibit A
City of Riviera Beach Utility Special District
Scope of Services - Work Authorization No. 24
North Chemical Building Repair Design

Scope of Services

I. BACKGROUND

The North Chemical Building at Riviera Beach Utility Special District (RBUD) Water Treatment Plant has a height equivalent to a five story building in which the first two stories house chlorine gas cylinders, vacuum filters, and an electrical room, the third floor houses lime slakers, and two lime storage hoppers (Hopper Nos. 3 and 4) occupy the top two stories of the building. The bottom cone-shaped portion of the hoppers is of steel construction supported on reinforced concrete beams at the fifth floor level. The top section of the hoppers is composed of reinforced concrete walls and top slab. The RBUD staff indicate that intrusion of water into Hopper No. 3 caused an expansive reaction of the lime. Expansion of the lime in Hopper No. 3 caused an outward pressure which caused failure of the south wall of the building. Additional damage may have occurred but is not visible without a more in-depth inspection. Observations and preliminary recommendations from HAZEN AND SAWYER are documented in two letters to RBUD dated November 22, 2013 and February 11, 2014. The North Chemical Building feeds lime slurry to Hydrotreator No. 3. Currently the hoppers at the North Chemical Building as well as Hydrotreator No. 3 are not in operation. RBUD wishes to place Hydrotreator No. 3 in service, thus the rehabilitation of the North Chemical Building is required. The rehabilitation of the North Chemical Building must restore the structural integrity to the original as-designed level such that the lime storage hoppers can be used.

Under the existing Continuing Professional Utility Consulting Engineering Services Agreement (dated December 4, 2013), C Solutions, Inc. (CONSULTANT) was selected to provide these services as defined below.

II. SCOPE OF SERVICES

The CONSULTANT will perform the scope of services as described herein.

Task 1 Building Assessment

Under this task, a structural condition assessment of the North Chemical Building will be performed to determine the general condition, extent of the damage suffered due to loads induced by the lime expansion within hopper no. 3 and additional damage that may be present due to corrosion caused by chemical attack and aging or other factors, and scope of rehabilitation or modifications needed to ensure the long term service of the structure.

1.1 - Visual Inspection

At the initiation of the project, CONSULTANT shall meet with the Riviera Beach Building Department and review the current known condition of the North Chemical Building and discuss the following: 1) plan for visual inspection; 2) detailed inspection (if determined to be needed) as described in Task 1.2; and 3) and anticipated scope of detailed design and permitting. The purpose of the meeting is to obtain Building Department input to ensure that permitting documents are processed efficiently.

The condition assessment shall include an initial visual inspection by CONSULTANT. A team of two (2) personnel from CONSULTANT shall spend a maximum of one (1), eight hour business day, on site observing and charting the condition of the visible portions of the interior and exterior of the North Chemical Building. Prior to conducting the on-site visual assessment, CONSULTANT shall review the original as-built drawings, subsequent modification drawings and any proposed future modifications to the structure.

The initial visual inspection will include the following:

- Visually inspect all the exposed surfaces of the structure for the following conditions, using the guidelines of ACI 201 and ACI 364, latest editions:
  - Surface conditions
  - Deficiencies in joints
  - Cracks
  - Honeycomb
  - Popouts
  - Scaling
  - Spalling
  - Stratification
  - Delaminations
  - Structural Performance
  - Soundness
  - Extent of corrosion
  - Extent of chemical attack
  - Exposed reinforcing
  - Overall alignment including settlement, deflection, expansion, contraction
  - Other unusual visual evidence of deterioration
- Mark and photograph all deficiencies observed
- Measure all observed conditions and document types of deficiencies observed
- Utilize the following applicable techniques to perform the inspection
  - Hammer sounding (determine local surface delamination and hardness)
  - Chain dragging (determine possible extended surface delamination)
  - Optical aids
  - Impact echo testing (ultrasonic testing) using hand held instrument
- Perform sufficient measurements to determine if plumbness, straightness, settlement, creep, deflection, or displacement of concrete walls, concrete columns, concrete beams,

metal walkways, metal stairs, concrete slabs, masonry, stucco and miscellaneous metals are within serviceable limits.

1.2 - Detailed Inspection

Task 1.2 is a contingency task. Work on Task 1.2 will be performed only if authorized in writing by the RBUD. It is noted that it cannot be determined if Task 1.2 is required until after completion of the Visual Inspection described in Task 1.1.

CONSULTANT shall review the findings of the Initial Visual Inspection with RBUD. If a detailed inspection is determined necessary after the initial visual inspection and RBUD is in concurrence, CONSULTANT shall perform a detailed inspection. The detailed inspection shall be conducted in accordance with ASCE Standard 11-99 "Guideline for Structural Condition Assessment of Existing Buildings", ACI 201 and ACI 364, latest editions. The detailed inspections shall include the following:

CONSULTANT shall retain structural testing subconsultant to perform the following applicable field testing services as deemed necessary:

- Cover meters/pachometers – spot check concrete cover and location of existing rebar at designated locations using Cover Meters/Pachometers at locations (4 ft x 4 ft each) uniformly distributed along the walls.
- Core samples – test for compressive strength and perform petrographic analysis. Core samples shall not penetrate walls or slabs and shall not cut existing reinforcing, if possible. Up to three (3) concrete cores in the walls of the North Chemical Building shall be taken. Two cores shall be used to perform compressive strength tests per ASTM C39 and the remaining core shall be used to perform a petrographic analysis.
- Windsor Probe – provide 8 Windsor Probe tests per ASTM C803.
- Impact Echo – Detect variety of defects within concrete
- Half-Cell Potentials for detecting corrosion of rebar per ASTM C876
- CONSULTANT shall retain structural testing subconsultant to perform the following applicable laboratory testing services:
- Perform compressive stress tests on core samples taken per ASTM C39
- Perform petrographic analysis per ASTM C295 and ASTM C856

TASK 1 Deliverables:

- Meeting minutes documenting meeting with the Riviera Beach Building Department.
- Technical Memorandum with supporting sketches and photographs summarizing the observations of the initial visual inspection with the types of deficiencies observed and recommendations for rehabilitation and repairs, or recommendations for additional destructive and non-destructive testing to be performed as part of a Detailed Inspection as summarized above.
- Technical Memorandum, prepared in accordance with the format outlined in ASCE Standard 11-99, Appendix A, summarizing the conditions found during the Detailed Inspection (if detailed inspection is performed) and shall include supporting drawings and photographs showing an accurate account of deficiencies and recommended repairs to correct deficiencies.

ASSUMPTIONS

This scope of services is based on the following assumptions:

- RBUD will provide information and record drawings on the existing North Chemical Building.
- Rehabilitation of the North Chemical Building will not include upgrades for compliance with current Florida Building Code. Rehabilitation design will restore the building to be in compliance with the Building Code in effect at the time the building was constructed.
- All work associated with the handling, containment, removal and disposal of any hazardous substances (asbestos piping, paint containing lead) is not included in this Authorization other than identifying in the bidding documents the rules and regulations to be followed for the proper handling, containment, removal and disposal of asbestos material and paint containing lead.
- Neither process nor mechanical design/evaluation is included

III. Time of Completion

The Notice to Proceed (NTP) defines the official commencement of the CONSULTANT's contract. All days are defined as calendar days. Two potential schedules are presented below. Schedule 1 assumes that Task 1.2 is found to be needed. Schedule 2 assumes that Task 1.2 is found to not be needed.

Schedule 1 – Assuming Task 1.2 is Needed

Task Description	Completion (Days from NTP)
Task 1.1 – Visual Inspection	30
Task 1.2 – Detailed Inspection[1]	105

Schedule 2 – Assuming Task 1.2 is Not Needed

Task Description	Completion (Days from NTP)
Task 1.1 – Visual Inspection	30

A number of factors affecting the project are beyond the control of CONSULTANT including work by others such as reviews by others and delivery of information to be supplied by others. Consequently, the schedule presented herein is dynamic. The schedule will be updated when appropriate.

IV. Proposed Compensation

The compensation for CONSULTANT engineering services provided under this task order are on a lump sum or a time and material basis as indicated in the table below. Tasks that are time and materials are based on a not-to-exceed amount. A cost breakdown by task is outlined below.

Task Description	Compensation Type	Consultant Fee
Task 1.1 – Visual Inspection	Lump Sum	$10,345
Other Direct Cost (Expenses)	Lump Sum	$300
	SUBTOTAL Lump Sum	$10,645
Task 1.2 – Detailed Inspection[1]	Not to Exceed	$28,120
CONTRACT TOTAL (Lump Sum + Not to Exceed)		**$38,765**

[1] Task 1.2 is a contingency task. Work on Task 1.2 will be performed only if authorized in writing by the RBUD. It is noted that it cannot be determined if Task 1.2 is required until after completion of the Visual Inspection described in Task 1.1.