Contract ID: SC-INF01-1469
Our File#:18-304

Sanayut Consulting Professional Engineers Corporation

Juk Territorial Park Tower
Foundation Pile Condition Assessment

PREPARED BY:

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Covering Letter

August 14, 2018

Government of the Northwest Territories
Department of Infrastructure
Projects Division
3rd floor, GNWT Multiuse Building
Bag Service #1
106 Veterans Way
Inuvik, NT X0E 0T0
Attn: Joao Nuncio

Dear Sir:

Regarding: **Existing Pile Foundation Investigation – Juk Territorial Park Tower**
Location: **Juk Territorial Park, near Inuvik, NT**

Sanayut Consulting Professional Engineers Corporation (**Sanayut**) is pleased to provide the following report regarding the foundation pile condition assessment for the above-referenced structure.

This report has been prepared under my direct supervision.

We appreciate the opportunity to work with you. Please feel free to contact us if you have any questions regarding the enclosed report.

Sincerely,
Sanayut Consulting Professional Engineers Corporation

Mark Hasegawa, P.Eng.
Enclosures
MH/cms

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EXECUTIVE SUMMARY

An assessment of the existing pile foundation of the lookout tower at the Juk Territorial Park located approximately five km outside Inuvik, NT was conducted on July 30, 2018.

The wooden pile foundation that formerly supported the tower had been removed and replaced with steel piles supporting steel beams spanning under the tower. During the pile inspection on July 30, 2018, the location and condition of each pile supporting the lookout tower was observed and documented. An assessment of the extent of pile deterioration was conducted on each pile by exposing buried portions of each pile and observing conditions. In addition, an evaluation of existing overland drainage patterns was conducted. The drainage flows form northwest to southeast and no ponding or puddling was observed around or beneath the tower.

The results of this report indicate that the steel piles are in relatively good condition with minor rust and flaking on the surface. Based on this analysis the foundation appears to be performing as designed.

1. EXISTING CONDITIONS

The Juk Territorial Park tower rests on six, 10-inch diameter exterior steel piles and one, 14" diameter, large central steel pile/column that support steel beams that in turn support the wood frame tower structure. The dimensions and pile spacings are shown on **Figure 1**, Appendix A and further described in subsequent sections.

2. METHODOLOGY

The following section includes a summary of assessment methodology for the existing pile conditions as documented in the previous section.

2.1 Project Objectives

The project objectives stated in the TOR are as follows:

"The GNWT requires consultant engineering services to complete a foundation investigation for wooden pile foundations for Beaufort Delta and Sahtu buildings and to determine remedial work required which may include the change of foundation type as part of a final report."

2.2 Project Implementation

The following is the action taken to fulfill the scope of work set forth in the TOR.

2.2.1 Data Acquisition

No design or construction documentation of the building such as as-builts, building plans or date of construction could be identified.

2.2.2 Code Review and References

Code and reference reviews were conducted of key codes and regulations and include the following applicable Acts, Standards and Guidelines:

1. *Good Building Practice for Northern Facilities*, Government of the Northwest Territories
2. National Building Code 2010
3. *GNWT Deteriorated Untreated Wood Piles: Cause, Detection and Correction* document
4. Pile remediation contractors.

Since the tower had already been repaired and there are no wood piles, no costing or recommendations with respect to repairs were made.

2.2.3 Site Visit

A site visit and inspection of each pile was conducted on July 30, 2018. The inspection for each pile included:

- Visual observation of the site and existing overland drainage patterns. Site drainage was observed to determine if it was potentially impacting the piles and possibly enhancing pile deterioration.
- Observations and measurements as to the general building footprint, pile types, sizes, and dimensions between piles (this information is summarized on **Figure 1**)
- Excavation around each pile up to 180 degrees and down to a depth of 500mm below ground surface
- Photographs were also taken and a selection of photos illustrating findings is attached (refer to Appendix B–Photographs).

Steel Pile Inspection

- Visual inspection of pile condition
- Scratch test with screwdriver to determine depth of rust penetration if any present.

3. SUMMARY OF OBSERVATIONS

The results of this analysis are summarized in **Figure 1** (Appendix A) and **Table 1** (below) and the pile inventory form in Appendix A. The piles have been classified based on the structural criteria set forth in the previous section. Key parameters evaluated included:

- Diameter of pile
- Depth of deterioration
- Vertical extent of deterioration
- Existence of drainage issues or standing water.
- Remaining pile diameter with solid material

The tower is currently supported by 6 exterior steel piles, each being 10 inches in diameter. The central pile/column is a 14" diameter steel pile (refer to Figure 1). The ground around each pile was excavated to a maximum depth of 500mm below ground ensuring that each pile was exposed up to 180 degrees around for inspection. A visual inspection as well as a "scratch" test was performed for each steel pile. The results of the site inspection showed that each steel pile had minimal surface rust with no penetration or flaking steel. There was no standing surface water observed at the site and the overland drainage direction appears to be to the southeast.

Table 1. Summary of Pile Observations

	Number of piles	Recommendations
Total Piles	**7**	
< 10% damage		
10-25% damage		
25-50% damage		
>50% damage		
Replaced with steel piles	7	none
Not inspected		

4. REPAIR/REPLACEMENT RECOMMENDATIONS

Based on this analysis, the existing steel piles are in good working condition and any observed rust or deterioration was minimal and not of concern. No repair or replacement action is recommended at this time.

5. COST ANALYSIS

No cost analysis was performed as no repair or replacement actions are recommended at this time.

6. SUMMARY AND CONCLUSIONS

An assessment of the foundations of the office located at the aforementioned address was conducted. An area map showing the location of the site is shown in **Figure 1**, Appendix A.

The wooden pile foundation that formerly supported the tower had been removed and replaced with 7 steel piles supporting steel beams spanning under the structure. The location and condition of the piles were documented. An assessment of the extent of pile deterioration was conducted on each pile by exposing buried potions of the pile and observing conditions. In addition, an evaluation of existing drainage patterns was conducted. The drainage flows from northwest to southeast and no ponding or puddling was observed. No changes to the site grading around and/or beneath the existing building are recommended.

The results of this report indicate that the steel piles are in relatively good condition with only surface rust observed on the exterior of the steel piles. Based on this analysis, the foundation appears to be performing as designed and no repairs or replacement actions are recommended at this time.

REFERENCES

1. *Untreated Submerged Timber Pile Foundations: Part 1: Understanding Biodegradation and Compressive Strength* Dec, 2013 By Giuliana Zelada-Tumialan, P.E., William Konicki, P.E., Philip Westover, P.E. and Milan Vatovec, Ph.D., P.E. In *Articles, Structural Forensics.*

2. *Untreated Submerged Timber Pile Foundations: Part 2 – Estimating Remaining Service Life* Jan, 2014 By Giuliana Zelada-Tumialan, P.E., William Konicki, P.E., Philip Westover, P.E. and Milan Vatovec, Ph.D., P.E. In *Articles, Structural Forensics.*

3. *Deteriorated Untreated Wood Piles: Cause, Detection and Correction*. By Technical Support Services, Asset Management Division, Public Works and Services, Government of the NWT http://www.pws.gov.nt.ca

APPENDIX A

PILE INVENTORY FORM & FIGURE

Pile Inventory Form

BUILDING ASSET NUMBER:
BUILIDNG NAME: JUK PARK TOWER, INUVIK, NT
TOTAL NUMBER OF PILES: 7
DATE INSPECTED: 19-Jun-18

WATER PONDING UNDER BUILDING: No
YEAR OF PILE INSTALLATION: Unknown
ADDITION: No
SKIRTING AROUND BUILDING (Y/N): No

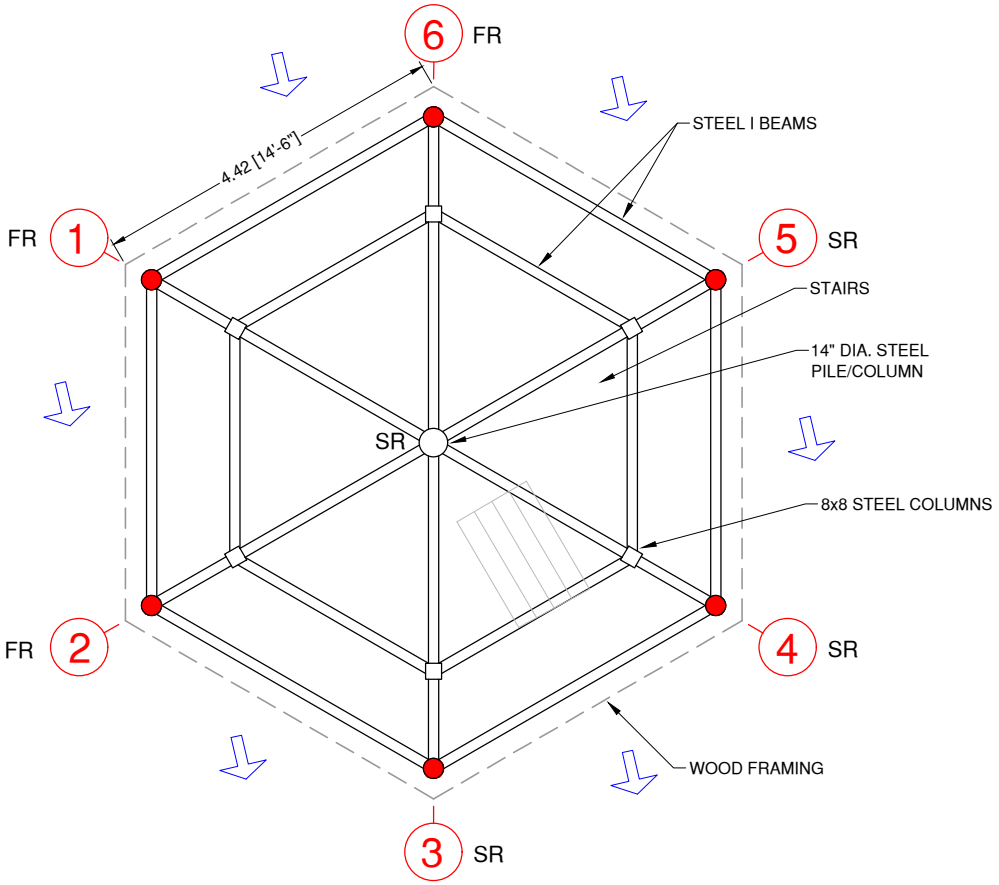
WEATHER CONDITIONS: Overcast

TEMPERATURE: 8ºC

PILE TYPE	
W	WOOD
S	STEEL
C	CONCRETE

	Definition - Pile Condition	Range of Rot	Count in each range	Percentage in each Range
A	Little or no rot detected, No repair req'd	0 - 10%	N/A	N/A
B	Rotted, requires monitoring	10 - 25%	N/A	N/A
C	Rotted, requires repair	25 - 50%	N/A	N/A
D	Rotted, requires immediate blocking	50 to 100%	N/A	N/A

No.	Pile Type	Pile Currently Blocked	Previously Repaired	Depth of Rot Detected	Pile Diameter	Pile Circumference	Original Area (Cross section)	Cross sectional Area of Rot	Percent Rot (Cross section)	Moisture	Pile Condition		Date Pile Blocked	Date Pile Repaired	Date Boron Treatment	Comments/Remarks
	W, S, C	Y/N	Y/N	inches	inches	inches	square inches	square inches	%	%	Def	Date				
1	S	N	Y		10							2018-06-19				Surface rust
2	S	N	Y		10							2018-06-19				Surface rust/some flaking
3	S	N	Y		10							2018-06-19				Surface rust/some flaking
4	S	N	Y		10							2018-06-19				Surface rust
5	S	N	Y		10							2018-06-19				Surface rust/some flaking
6	S	N	Y		10							2018-06-19				Surface rust/some flaking
7	S	N	Y		14							2018-06-19				Surface rust



LEGEND

- STEEL PILE - 10" DIAMETER
- 1 PILE NUMBER
- NR NO RUST
- SR SURFACE RUST
- FR FLAKING RUST
- OVERLAND DRAINAGE DIRECTION

NOTE:
- BUILDING DIMENSIONS SHOWN ARE APPROXIMATE AND FOR REFERENCE ONLY
- NO STANDING WATER OR PONDING OBSERVED AT THE SITE

DRAWING STATUS: FOR REPORT

#	REVISION	DATE	BY

NOTES

CONTRACTOR TO CHECK AND VERIFY ALL DIMENSIONS BEFORE CONSTRUCTION, ANY ERRORS AND OMISSIONS SHALL BE REPORTED TO THE ENGINEER IMMEDIATELY

DRAWING SHALL NOT BE USED FOR CONSTRUCTION UNTIL APPROVED

DO NOT SCALE THE DRAWING

ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE LATEST CODES, MAY IT BE CONSTRUCTION, MECHANICAL, ETC

CLIENT: GOVERNMENT OF NWT

PROJECT TITLE: PILE ASSESSMENT
JULY 30, 2018

DRAWING TITLE: JUK TERRITORIAL
PARK TOWER
INUVIK, NT

HASEGAWA
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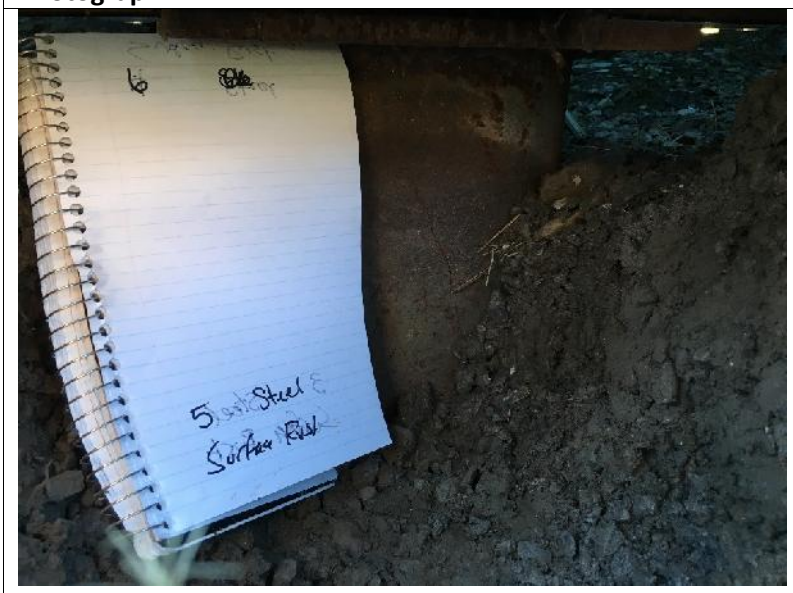
INSPECTED BY	MO
DRAWN	MO
CHECKED	MH
APPROVED	MH
SCALE	NTS

PROJECT NUMBER	18-304
VERSION NUMBER	IFA1-1
DATE DRAWN	JULY 30, 2018
SHEET NUMBER	FIG. 1

APPENDIX B

PHOTOGRAPHS

 **Photograph 1**	Pile #1 Flaking rust observed
 **Photograph 2**	Pile #2 Flaking rust observed
 **Photograph 3**	Pile #3 Surface rust observed

 **Photograph 4**	Pile #4 Surface rust observed
 **Photograph 5**	Pile #5 Surface rust observed
 **Photograph 6**	Pile #6 Flaking rust observed

 **Photograph 7**	Center Pile/Column Surface rust observed
 **Photograph 8**	Exterior of tower

 **Photograph 9**	Interior steel beam framework of tower with center column visible in foreground.