Village of Lions Bay

Harvey Tank Replacement Project

October 12, 2018

ADDENDUM # 2

This Addendum forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts. The cost of all work contained herein shall be included in the Contract Sum. The following revisions supersede the information contained in the original drawings and specifications issued for the above named project to the extent referenced and shall become part thereof.

Contract Documents

1. Section 13 34 30 – Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank

   DELETE *Section 13 34 30 – Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank* in its entirety and REPLACE with the attached *Section 13 34 30 Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank – REV 1 – ADDENDUM 2.*

Clarification Requests:

Question 1: Can the hatch opening for the tank be 900 mm x 900 mm?
Answer 1: The hatch opening shall be a minimum of 1.065 meters by 1.065 meters.

Question 2: Provide required insulation thickness for the steel tank.
Answer 2: Insulation specification has been removed from Section 13 34 30. Please see revised *Section 13 34 30 Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank – REV 1 – ADDENDUM 2.*

Question 3: Clarify requirements for coating of the Concrete Tank Floor.
Answer 3: Glass coating required. Please see revised *Section 13 34 30 Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank – REV 1 – ADDENDUM 2.*

Question 4: Confirm duration of water leak test on roof.
Answer4: The roof shall be tested for water tightness for 24 hours. Please see revised *Section 13 34 30 Glass-Fused-To-Steel, Bolted Steel Potable Water Storage Tank – REV 1 – ADDENDUM 2.*

Pre-Tender Meeting (October 3, 2018)

Question 1: Can Oceanview Tank be connected to the water distribution system?
Answer 1: The distribution water piping runs from the Harvey site down to the Lions Bay residential area, crossing in front of Oceanview Tank. The existing infrastructure at Harvey Tank site allows for bypassing the Harvey tank. The Oceanview Tank will need to be fully cleaned and disinfected prior to connecting it to the distribution system. Any existing connecting piping/appurtenances that are required to connect Oceanview Tank to the distribution system will need to be fully cleaned and disinfected.

Question 2: Who will operate and maintain the Oceanview Tank for water supply once it is connected to the water distribution system?
Answer 2: The Village of Lions Bay Operations and Maintenance will maintain the Oceanview Tank once it is in service. The Contractor is responsible for taking the Oceanview Tank offline after the new Harvey Tank is put into service.

Question 3: What is the condition of Oceanview Tank?
Answer 3: Oceanview Tank was inspected in 2004. Inspection report is attached. Please note that on the Inspection Report, Oceanview Tank is referred to as Harvey 100,000 Gal Tank. This is not to be confused with the Harvey 400,000 Gal Tank that is proposed for replacement.

Question 4: How far is the rock layer under the existing Harvey Tank foundation?
Answer 4: The geotechnical assessment report is provided in Appendix A and provides information on the sub-surface conditions.

Question 5: Is there a local option for the disposal of the concrete from the Harvey Tank demolition?
Answer 5: The base bid price for the tender shall be based on offsite disposal of the concrete from the Harvey Tank demolition.

Table 2 in Section 00 41 01 includes an Optional Item 8.1.1, Local Disposal of the Concrete from Harvey Tank demolition. Bidder is to provide the amount to be added to, or subtracted from the Base Bid for the Option Item as requested in the tender documents. The location of the Local Disposal Area is shown on drawing G-01-002 and identified as Concrete Disposal Area. Please note that Optional Item 8.1.1 includes crushing the concrete and re-grading the Concrete Disposal Area.

Question 6: It is unclear on where the communication cable is to be installed.
Answer 6: The electrical work required is as per Drawing E-01-200.

End of Addendum #2

1. GENERAL

1.1 Scope of Work

.1 Design, furnish and erect a glass-fused-to-steel, bolted-steel water storage tank, including foundation, tank structure and tank appurtenances as shown on the contract drawings and described herein.

.1 Tank to be installed in accordance with AWWA D103.

.2 A professional engineer registered in the province of British Columbia to sign and seal the design and installation of tank.

.2 All required labour, materials, equipment and construction services shall be included.

1.2 Qualifications of Tank Supplier

.1 The tank manufacturer shall have specialized in the design and fabrication of factory coated Glass-Fused to Steel bolted tanks for at least ten years prior.

.2 The Contractor shall provide a reference list of five tanks presently in potable water service of equal or greater size than that described herein in service for a minimum of 10 years.

.3 The Engineer's selection of factory applied glass-fused-to-steel bolt together tank construction for this facility has been predicated upon specific criteria, construction methods, and optimum coating for resistance to internal and external tank corrosion. Deviations from the specified design, construction or coating details will not be permitted.

.4 The Contractor shall offer a new tank structure as supplied from a manufacturer specializing in the design, fabrication and erection of factory applied glass-fused-to-steel, bolt together tank systems.

.5 The Contractor shall be fully responsible for the entire installation including concrete foundation, tank erection, and the ultimate water tightness of the complete installation.

.6 Strict adherence to the standards of design; fabrication, erection, product quality, and long term performance, established in this Specification will be required by the Owner and Engineer.

1.3 Submittal Drawings and Specifications

.1 Construction shall be governed by the Owner's drawings and specifications showing general dimensions and construction details, after written approval by the Engineer of detailed erection drawings prepared by the Contractor. There shall be no deviation from the drawings and specifications, except upon written order from the Engineer.

.2 The Contractor is required to furnish, for the approval of the Engineer and at no increase in contract price, four (4) sets of complete specifications and construction drawings for all work not shown in complete detail on the design drawings. A complete set of structural

calculations shall be provided by the Contractor to the Engineer for the tank structure and foundation. All such submissions shall be stamped by a Licensed Professional Engineer in the province of British Columbia.

.3 When approved, two sets of such prints and submittal information will be returned to the Contractor marked "**APPROVED FOR CONSTRUCTION**" and these drawings will then govern the work detailed thereon. The approval by the Engineer of Contractor's drawings shall be an approval relating only to their general conformity with the drawings and specifications and shall not guarantee detail dimensions and quantities, which remains the Contractor's responsibility.

.4 The Contractor shall provide the Engineer the tank manufacturer's standard Operation and Maintenance Manual for the tank installed, upon receipt of approved drawings.

1.4 Tank Design Criteria

.1 Bolted steel storage tank design to AWWA D103, 2009 or most current version.

.2 Tank Size - The factory glass-fused-to-steel, bolted-steel water storage tank shall have a nominal diameter of 16.00 meters with a nominal sidewall height (to roof eave) of 12.150 meters.

.3 Tank Capacity - Usable Tank capacity shall be 2.33 million liters at 11.65 meters liquid depth.

.4 Floor Elevation - Finished floor elevation shall be set at Elevation 100.04 m.

.5 Tank Design Standards

.1 The materials, design, fabrication and erection of the bolt together tank shall conform to the AWWA Standard for "Factory-Coated Bolted Steel Tanks For Water Storage" – ANSI/AWWA D103.

.2 The tank coating system shall conform solely to Section 12.4 Glass Coatings of ANSI/AWWA D103.

.3 All materials furnished by the tank manufacturer which are in contact with stored water shall be certified to meet ANSI/NSF Additives Standard No. 61. Certification of a coating type alone will not be sufficient to meet this requirement. Certification of a distributor, and not the tank or coating manufacturer, will not be accepted.

.4 Design Loads

.1 Specific Gravity 1.0 (Min. design shall be 1.0)

.2 Design Freeboard: 0.5 meters.

.3 Tank Roof Live Loads: 1.0 kPa

.4 Seismic Load:

.1 Site Class: Class C

.2 Importance Category: Post Disaster

.3 Importance Factor: $I_E = 1.5$

.4 Standard: AWWA D103 using values from NBCC 2010

.5 Wind Velocity 100 mph (AWWA D103 Std. 100 mph)

.6 Allowable Soil Bearing Capacity:

.1 As per Geotechnical Assessment Report prepared by EXP., November 2017.

.1 Serviceability Limit State (SLS): 150 kPa

.2 Factored Ultimate Bearing Limit (ULS): 225 kPa

.3 Modulus of Subgrade Reaction: 48,000 kN/m3

1.5 Tank Manufacturer's Warranty

.1 The tank manufacturer shall include a warranty for the tank materials and coating. As a minimum, this warranty shall provide assurance against defects in material or workmanship for the minimum period specified.

.2 Structure

.1 The tank manufacturer shall warrant the tank will be free from defects in workmanship and materials, under normal and proper use, maintenance and operation, during the period expiring on the earlier of (i) five years after liquid is first introduced into the tank or (ii) 62 months after a substantial portion of the tank sheets is delivered to site where the tank is erected, if the tank is purchased with the tank manufacturer's cathodic protection system.

2. PRODUCTS

2.1 Bolted Steel Storage Tank Configuration

.1 Tank shall include:

.1 Tank complete with roof, roof access hatch and walkway, shell manway access, all complete with security locks.

.2 Stainless steel inlet, outlet, overflow and drain pipes to latest edition of *AWWA C220 – Stainless Steel Pipes 100 mm and larger*, latest edition. Stainless steel pipes to be Type 316 L, Schedule 10S. Mounting hardware to be stainless steel.

.3 Coating to be Vitrium™ glass-fused to steel or Engineer approved alternative.

.4 Electrical controls

.2 Avoid connection of dissimilar metals. Provide suitable di-electrical isolation where dissimilar metals are in contact to prevent corrosion.

2.2 Plates and Sheets

.1 Plates and sheets used in the construction of the tank shell, tank floor (when supplied) and tank roof, shall comply with the minimum standards of AWWA D103 and as follows:

.1 Design requirements for mild strength steel shall be ASTM A570 Grade 30 with a maximum allowable tensile stress 18,000 psi.

.2 Design requirements for high strength steel shall be ASTM A607 Grade 60 with a maximum allowable tensile stress of 30,000 psi.

.2 The steel tank shell shall be designed for erection on a concrete floor slab. The bottom of the shell shall be bolted to a special anchor continuous ring plate embedded in the concrete during construction of the concrete floor and sealed.

2.3 Rolled Structural Shapes

.1 Material shall conform to minimum standards of ASTM A36 or AISI 1010.

2.4 Horizontal Wind Stiffeners – If Required

.1 If used, intermediate horizontal wind stiffeners shall be of the "web truss" design with extended tail to create multiple layers of stiffener, permitting wind loads to distribute around tank.

.2 Web truss stiffeners shall be of steel with hot dipped galvanized coating.

.3 Rolled steel angle stiffeners are not permitted for intermediate stiffeners.

2.5 Bolt Fasteners

.1 Bolts used in tank lap joints shall be ½" – 13 UNC-2A rolled thread, and shall meet the minimum requirements of AWWA D103, Section 4.2.

.2 Bolt Material

.1 SAE Grade 2 (1" bolt length)

.1 Tensile strength – 74,000 psi Min.

.2 Proof Load – 55,000 psi Min.

.3 Allowable shear stress – 18,163 psi (AWWA D103).

.2 SAE grade 8/ASTM A490 (> 1" bolt length) heat treated to:

.1 Tensile Strength – 150,000 psi Min.

.2 Proof Load – 120,000 psi Min.

.3 Allowable shear stress – 36,818 psi (AWWA D103).

.3 Bolt Finish – Zinc, mechanically deposited.

.1 2.0 Mils Minimum – under bolt head, on shank and threads, in accordance with the latest edition of ASTM B695, class 50, type 1.

.4 Bolt Head Encapsulation

.1 High impact polypropylene copolymer encapsulation of entire bolt head up to the splines on the shank.

.2 Resin shall be stabilized with an ultraviolet light resistant material such that the colour shall appear black. The bolt head encapsulation shall be certified to meet the NSI/NSF Standard 61 for indirect additives.

.5 All bolts on the vertical tank wall shall be installed such that the head portion is located inside the tank, and the washer and nut are on the exterior.

.6 All lap joint bolts shall be properly selected such that threaded portions of the bolts will not be exposed to the "shear plane" between tank sheets.

.7 Bolt lengths shall be sized to achieve a neat and uniform appearance. Excessive threads extending beyond the nut after torquing will not be permitted.

.8 All lap joint bolts shall include a minimum of four (4) splines on the underside of the bolt head at the shank in order to resist rotation during torquing.

2.6 Sealants

.1 The lap joint sealant shall be a one component, moisture cured, polyurethane compound. The sealant shall be suitable for contact with potable water and shall be certified to meet ANSI/NSF Additives Standard 61 for indirect additives.

.2 The sealant shall be used to seal lap joints and bolt connections and edge fillets for sheet notches and starter sheets. The sealant shall cure to a rubber-like consistency, have excellent adhesion to the glass coating, low shrinkage, and be suitable for interior and exterior use.

.3 Sealant curing rate at 730 F and 50% RH

.4 Tack-free time: 6 to 8 hours

.5 Final cure time: 10 to 12 days

.6 Neoprene gaskets and tape type sealer shall not be used.

.7 Sidewall connections shall be by overlapping flat panels and shall not be flange style connection using gasket material to seal.

2.7 Foundation

.1 The tank foundation design shall be provided by the tank supplier, based on AWWA 103, CSA 23.3, and the soil bearing capacity as detailed in the geotechnical report. The design of the tank foundation shall be stamped by a Licensed Structural Professional Engineer in the province of British Columbia.

.2 Foundation shall include:

.1 Design of concrete and reinforcing steel:

.1 Section 03 20 00 – Concrete Steel Reinforcement

.2 Section 03 30 00 – Cast-in-Place Concrete.

.2 Foundation, granular base, subbase, and subgrade to be approved by geotechnical engineer.

2.8 Appurtenances

.1 Pipe Connections

.1 The pipe connections shall be designed to enter the water tank though the tank bottom, including.

.1 250 mm diameter 316L schedule 10S stainless steel water inlet pipe complete with Tideflex variable orifice inlet nozzle (typ.3);

.2 250 mm diameter 316L schedule 10S stainless steel water outlet pipe;

.3 250 mm diameter 316L schedule 10S stainless steel drain pipe;

.4 250 mm diameter 316L schedule 10S stainless steel overflow pipe.

.2 Pipe supports shall be stainless steel. The connection mechanism to the steel tank shall be in accordance to the tank manufacturer specifications.

.2 Outside Tank Ladder

.1 An outside tank ladder shall be furnished and installed as shown on the contract drawings.

.2 Ladders shall be fabricated of aluminum and utilize grooved, skid-resistant rungs.

.3 Safety cage and step-off platforms shall be fabricated of galvanized steel. Ladders shall be equipped with a hinged lockable entry device.

.4 Design stairs to more onerous of AWWA D103 or WorkSafe BC standards.

.3 Access – Roof Openings

.1 One roof top access hatch shall be provided as shown on the contract drawings in accordance with AWWA D103.

.2 The hatch opening shall be a minimum of 1.065 meters by 1.065 meters.

.4 Roof Vent

.1 A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level of sufficient capacity so that at maximum design rate of water fill or withdrawal, the resulting interior pressure or vacuum will not exceed 0.12 kPa.

.2 The overflow pipe shall not be considered to be a tank vent.

.3 The vent shall be constructed of aluminum such that the hood can be unbolted and used as a secondary roof access.

.4 The vent shall prevent the entrance of birds and/or animals by including an expanded aluminum screen (13 mm) opening. An insect screen of 0.7 – 0.8 mm shall be provided and designed to open should the screen become plugged by ice formation.

.5 Identification Plate: A manufacturer's nameplate shall list the tank serial number, tank diameter and height, and maximum design capacity. The nameplate shall be affixed to the tank exterior sidewall at a location approximately 1.5 meters from grade elevation in a position of unobstructed view.

2.9 Cathodic Protection

.1 A passive cathodic protection system shall be designed and supplied by the tank manufacturer if required.

2.10 Geodesic Dome Roof

.1 All structural frame members shall be made from AA6005A-T6, or AA6061-T6.

.2 Roof panels shall be made from AA3003-H16.

.3 Fasteners shall be AA2024-T4 aluminum or series 300 stainless steel as required by the manufacturers.

.4 Provide gaskets or sealants to make roof structure leak tight. Gaskets shall be certified asbestos-free.

2.11 Tank grounding and Lightning Protection

.1 Supply grounding lugs and provide any other recommended grounding protection accessories for the steel tank as required by applicable codes and standards.

3. EXECUTION

3.1 Foundation

.1 Contractor is responsible for the tank foundation design and construction.

.2 Tank footing design shall be based on the soil bearing capacity as determined by geotechnical analysis provided by the Owner.

3.2 Glass-Fused-to-Steel Coating

.1 All structural sheet steel shall be glass coated per the following guidelines.

.1 Sheets shall be media blasted on both sides to the equivalent of SSPC SP-10 (Near White Metal Blast Cleaning). After fabrication and prior to application of the coating, all sheets shall be thoroughly cleaned by washing and hot rinsing followed immediately by hot air drying.

.2 A base coat of glass frit containing nickel oxide shall be applied to both sides of the sheet.

.3 A second coat of milled cobalt blue glass shall be applied to both sides of the sheets.

.4 A third coat of glass shall be applied to all interior shell and floor sheet surfaces which must be a titanium dioxide reinforced mixture, white glass.

.5 The sheets shall be fired at a minimum temperature of 816 °C.

.6 Edge Coat: Prior to sheet glassing, sheet edges shall be rounded in profile per Porcelain Enameling Institute Technical Manual to enable the same glass coating to be applied to all four edges of the sheet and ensure full encapsulation of the sheet edges with a minimum thickness of 5 mils. Sealer or glass overspray as edge coating shall not be an acceptable alternative.

.7 Frits shall be individually tested in accordance with the latest revision of ISO 28706.

.8 Holiday Testing: A volt test is performed on every sheet. Any sheet registering a discontinuity on the interior surface or floor shall be rejected.

.9 Glass Thickness: Minimum glass thickness on the inside surface of the sheet shall be 10.0 mils. Contractor to provide the Engineer with test reports on the areas tested, a minimum of one test for every square meter.

.10 Adherence: The coating shall be tested in accordance with ISO 28765 Class 2 or better. Any sheet that has poor adherence shall be rejected.

.11 Fish Scale Testing: The coating shall be tested for fish scale by placing full size production sheets in an oven at 204 °C for one hour. The sheets will then be examined for signs of fish scale. Any sheet exhibiting this characteristic will be rejected and the entire lot tested.

3.3 Tank Floor

.1 Concrete Floor

.1 The floor design is of reinforced concrete with an embedded glass coated steel starter sheet per the manufacturer’s design and in accordance with AWWA D103, Sec. 13.4, Type 6.

.2 Levelling of the starter ring shall be required and the maximum differential elevation within the ring shall not exceed 0.125 millimeters (one-eighth (1/8) inch), nor exceed 0.0625 millimeters (one-sixteenth (1/16) inch) within any three (3) meters of length.

.3 A levelling plate assembly consisting of two 460 millimeters (8") long foundation bolts, 19 millimeters (3/4") in diameter and a slotted plate 90 millimeters x 280 millimeters x 9.5 millimeters thick (3 ½" x 11" x 3/8" thick) shall be used to secure the starter ring, prior to encasement in concrete. Installation of the starter ring on concrete blocks or bricks, using shims for adjustment, is not permitted.

.4 Place one butyl rubber elastomer waterstop seal on the inside surface of the starter ring below concrete floor line. Place one bentonite impregnated water seal below the butyl rubber seal. Install materials in accordance with tank manufacturer's instructions.

3.4 Sidewall Structure

.1 Field erection of the glass-fused to steel, bolted steel tank shall be in strict accordance with the procedures outlined by the manufacturer and performed by an authorized dealer of the tank manufacturer, regularly engaged in erection of these tanks, using factory trained and certified erectors.

.2 Specialized erection jacks and building equipment developed and manufactured by the tank manufacturer shall be used to erect the tanks.

.3 Particular care shall be taken in handling and bolting of the tank panels and members to avoid abrasion of the coating system. Prior to a liquid test, the Engineer shall visually inspect all surface areas.

.4 An electrical leak test shall be performed during erection using a wet sponge low voltage (max. 9 volt) leak detection device. All electrical leak points found on the inside surface shall be repaired in accordance with manufacturer's published touch up procedures.

.5 The placement of sealant on each panel may be inspected prior to placement of adjacent panels. However, the Engineer's inspection shall not relieve the Contractor from his responsibility for liquid tightness.

.6 No backfill shall be placed against the tank sidewall without prior written approval and design review of the tank manufacturer. Any backfill shall be placed according to the strict instructions of the tank manufacturer.

3.5 Roof

.1 Geodesic Dome Roof

.1 Tank shall include a radially sectioned roof fabricated from aluminum, as produced by the tank manufacturer, and shall be assembled in a similar manner as the sidewall panels utilizing the same sealant and bolting techniques, to assure a weather/air tight assembly. The roof shall be clear-span and self-supporting or centre supported. Both live and dead loads shall be carried by the tank walls and any centre supports.

.2 The manufacturer shall furnish a roof opening which shall be placed near the outside tank ladder and which shall be provided with a hinged cover and a hasp for locking. The opening shall have a clear dimension of at least 1064 meters in one direction and 1064 meters in the other direction. The opening shall have a curb at least 100 millimeters inches in height, and the cover shall have a downward overlap of at least 50 millimeters inches, or a gazetted weather-tight cover in lieu of the 100 millimeter curb and 50 millimeter inch overlap.

.3 The dome and tank shall be designed to act as an integral unit. The tank shall be designed to support an aluminum dome roof including all specified live loads.

.4 The dome shall be clear span and designed to be self-supporting from the periphery structure with primary horizontal thrust contained by an integral tension ring.

.2 Roof Vent

.1 A properly sized vent assembly in accordance with AWWA D103 shall be furnished and installed above the maximum water level as specified.

3.6 Field Testing

.1 Hydrostatic

.1 Following completion of erection and cleaning of the tank, the structure shall be tested for liquid tightness by filling tank to its overflow elevation.

.2 The erector in accordance with the manufacturer's recommendations shall correct any leaks disclosed by this test.

.3 Hold full for 24 hours prior to beginning test.

.4 Test for 72 hours. During test exposed joints to show no signs of leakage and remain dry.

.5 Tank will be deemed watertight if there are no visible leaks and the net drop in the water level does not exceed 3 mm in 72 hours. Leakage calculation to be approved by the Engineer. Leakage to be calculated as the gross water loss with due allowance for evaporation losses and changes in volume due to temperature.

.6 Repair leaks in bolted steel tank in accordance with tank manufacturers recommendations.

.7 Repeat test.

.8 The Owner shall furnish water required for testing at the time of tank erection completion. Dispose of test water by discharging into drain as directed by the Engineer.

.9 Labour and equipment necessary for tank testing is to be included in the price of the tank.

.2 Roof watertightness

.1 Following completion, test dome for water leaks according to procedure detailed in API-650, Appendix G for 24 hours.

3.7 Disinfection

.1 Standards

.1 The tank structure shall be disinfected at the time of testing by chlorination in accordance with AWWA Standard C652 “Disinfection of Water Storage Facilities” as modified by the tank manufacturer.

.2 Disinfection shall not take place until tank sealant is fully cured.

.3 Acceptable forms of chlorine for disinfection shall be:

.1 Liquid chlorine as specified in AWWA C652.

.2 Sodium hypochlorite as specified in AWWA C652.

.3 Calcium hypochlorite (HTH) is not acceptable.

.4 Acceptable methods of chlorination per AWWA C652:

.1 Section 4.1.1.

.2 Section 4.1.2 – chemical feed pump only (4.1.2.1.)

.3 Section 4.3

.5 Section 4.2 is not acceptable.

END OF SECTION

VILLAGE OF LIONS BAY

WATER RESERVOIR
FIELD INSPECTION SHEET

Harvey 100000 Gal Tank

Current inspection		Inspector	Firm	Date (dmy)
Principle ✔	Monitoring	Eric de Fleuriot & Garth Begley	Earth Tech	9 Sep 2004 22 Nov 2004
Last Principle inspection				
Last Monitoring inspection				

Reservoir type: Concrete circular tank constructed above ground
Purpose: Fire reserve
Design volume: 100000 Gals (378540 litres)
Dimensions: 32'dia x 24' high (9.75m x 7.32m)

Built in: ≈1980
Air temperature: 16 °C
Top water level: 13' (3.96m)
Date last cleaned: No records

1. Tank	1.1 Walls				1.2 Roof				1.3 Wall Fdn				1.4 Floor				1.5 Column				1.6 Column foundation				1.7 Wall stability				1.8 Drain sump			
	R(%)				R(%)				R(%)				R(%)				R(%)				R(%)				R(%)				R(%)			
Panels	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1
1	5				100				N				N				X				X				E				N			

Panels	1.9 Guardrail / handrail	1.10 Access hatch	1.11	1.12 Miscellaneous	**2. Joint bet. panels**	2.1 Walls	2.2 Roof	2.3 Floor
1	100	100		X		X	X	X

3. Auxiliary items	3.1 Check valve chamber	3.2 Valves	3.3 Inlet pipe	3.4 Outlet pipe	3.5 Overflow pipe	3.6 Drain pipe	3.7 Dechlor. chamber	3.8 Outlet structure
	N	N	5	5	20	5	X	X
	3.9 Rip-Rap at outlet	3.10 Equip cabinet box	3.11 Access road	3.12 Embankments	3.13 Access ladder	3.14 Roof vents	3.15 Level transducer	3.16 RTU Antenna
	X	X	20	E	20	50	N	X

REMEDIAL WORK ACTIVITY LIST

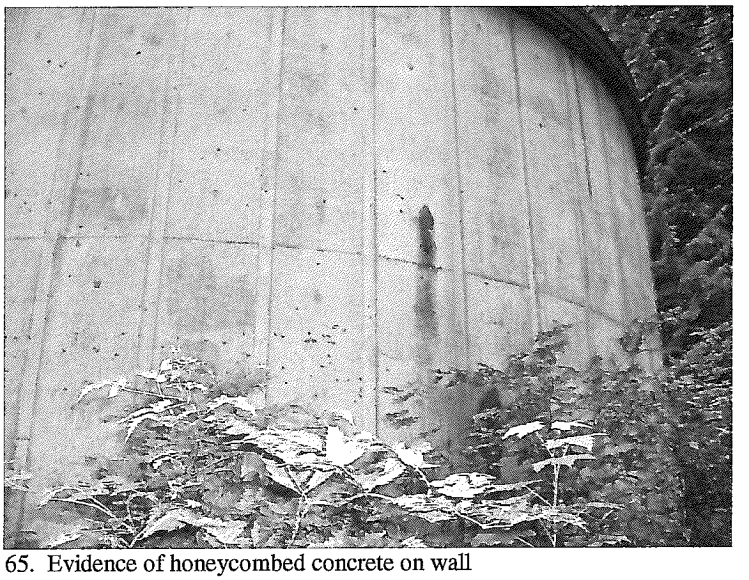
Item	Location	Activity description	Qty	Unit	U	Make safe	Comments	Rep Photo	Mon freq
1.1		Seal wet patch	0.5	m2	M			65	3yrs
1.2		Vegetation / debris – remove	3	m3	R		Algae and moss	67 - 70	
1.9		Wire brush & Power tool - paint	1	m2	R			68	
1.10		Wire brush & Power tool - paint	2	m2	R			68	
1.10		Lock mechanism – replace	1	No	R			68	
3.11		Cracks seal	20	m	R		Cracks in asphalt surface	70	
3.13		Power wash / clean	1	No	R			64, 68	
3.14		Wire brush & Power tool - paint	1	m2	R		Outside access ladder	70	
3.5	IS	Wire brush & Power tool - paint	2	m2	2		Overflow pipe brackets are corroded and small sections of the pipe itself	156	
3.3	IS	Wire brush & Power tool - paint	0.5	m2	2			158	
3.6	IS	Wire brush & Power tool - paint	0.5	m2	2			157	
3.4	IS	Wire brush & Power tool - paint	0.5	m2	2			?	
1.1	IS	Honeycombed concrete - repair	0.01	m3	3		Small area of honeycombed concrete and corroded rebar	162	

Rating "R"		*Structural integrity and safety of user*	*Functionality-secondary to Structural Integrity Does it perform as originally designed?*	*Maintenance priority and urgency of repair*	*Urgency"U"*	
					Monitor	*M*
E		*No defects*	*New condition – no defects*	*Not applicable*	*Routine*	*R*
4	*G*	*Min relevancy*	*Acceptable, functioning as intended but maintenance required*	*Not required before next principle inspection*	*5yrs or >*	*4*
3	*F*		*Functioning as intended. Minor to more extensive rehab required to upgrade to new*	*. Preventative maintenance required within specified period*	*< 3 yrs*	*3*
2	*P*		*Unacceptable, not functioning as intended Minor to Major rehabilitation required*	*Work required within specified time period*	*< 2 yrs*	*2*
1	*V*	*Max relevancy*	*Immediate action. Collapse imminent*	*Danger to users – immediate repair required*	*ASAP*	*1*

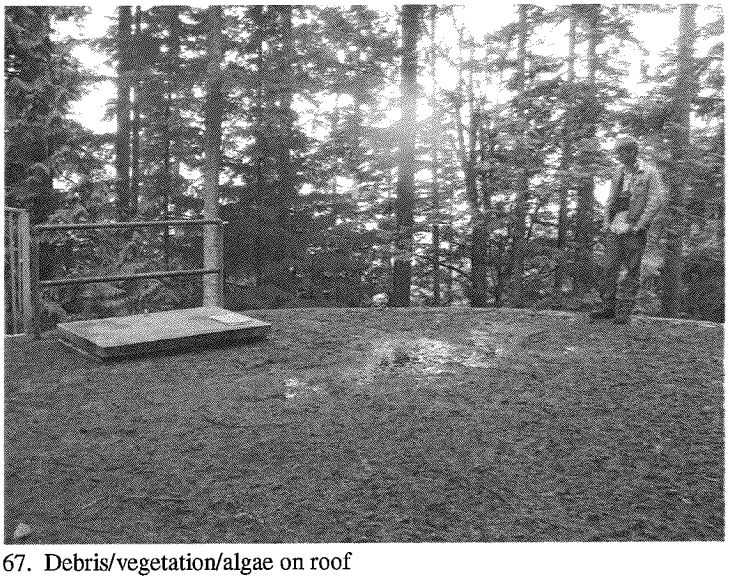
N – Not accessible; X – Not applicable, % - percentage of element representing rating "R"

NP – North Wall Panel; NP1 – panel 1 on north face of reservoir; SP1-6; Panels 1 to 6 on south face of reservoir; RPi – Roof panel "i"; FPi – Floor panel "i"; WS – West Side; AS – All Sides; IS – Inside of tank; R – Roof; F - Floor

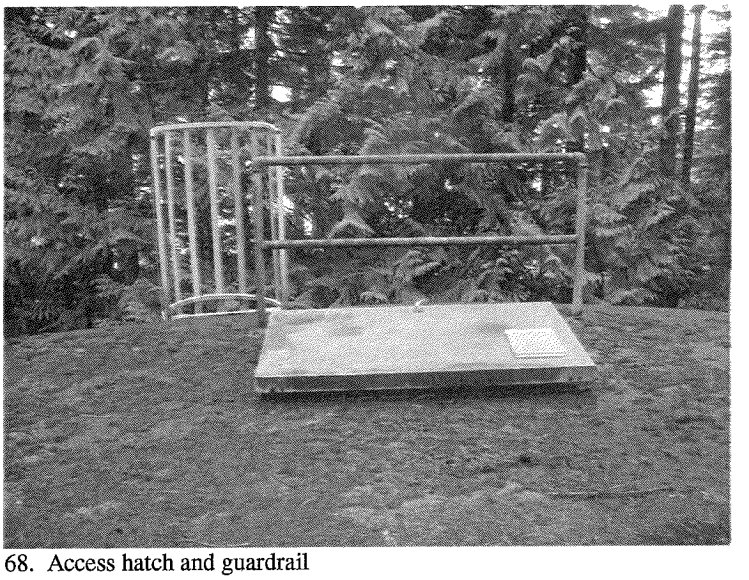
64. General view of tank



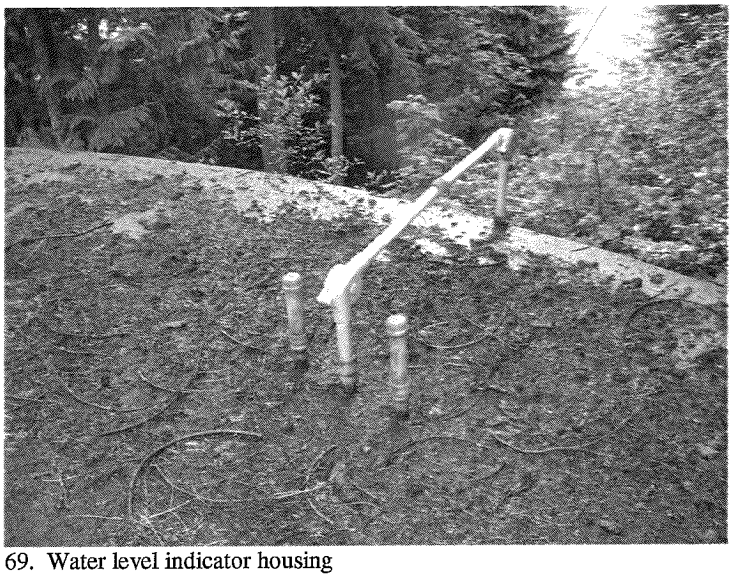
65. Evidence of honeycombed concrete on wall



67. Debris/vegetation/algae on roof

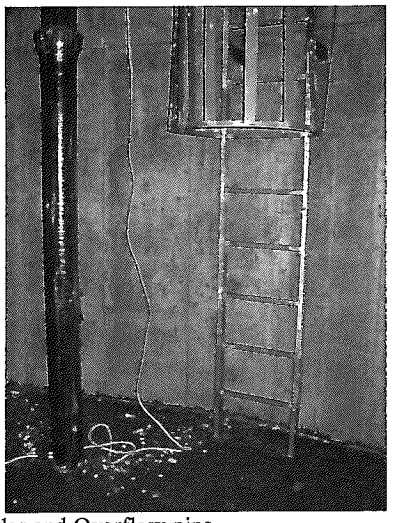


68. Access hatch and guardrail

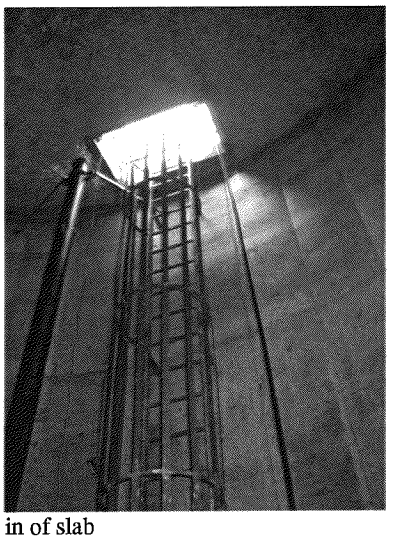


69. Water level indicator housing

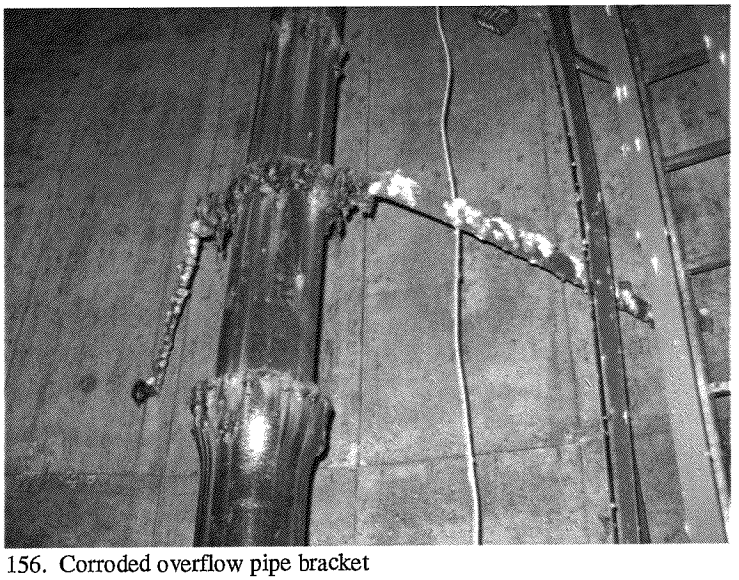
70. Air vent



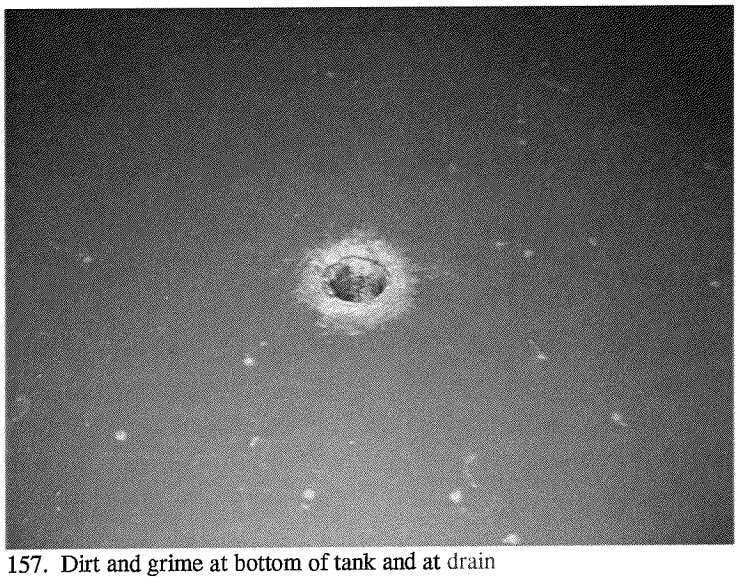
154. Interior ladder and Overflow pipe



155. Access hole in of slab

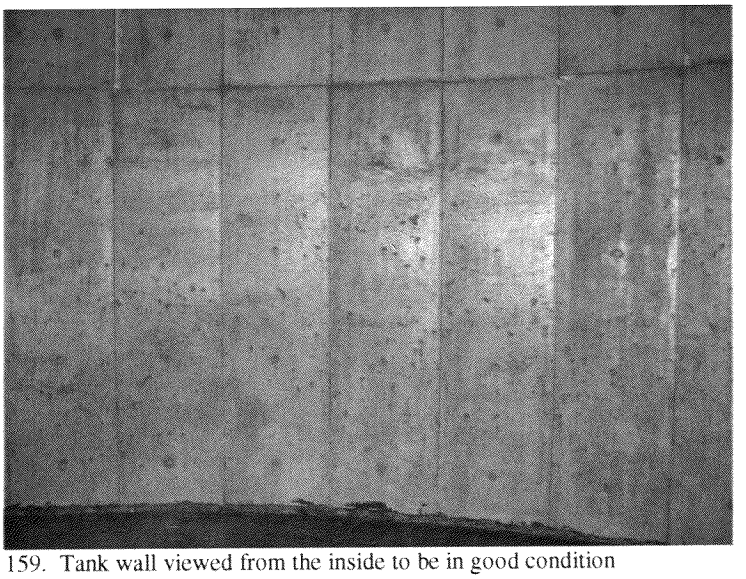


156. Corroded overflow pipe bracket

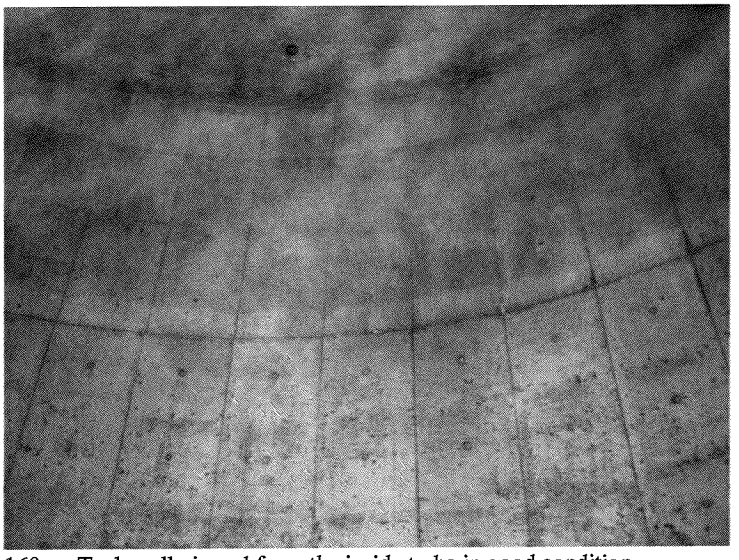


157. Dirt and grime at bottom of tank and at drain

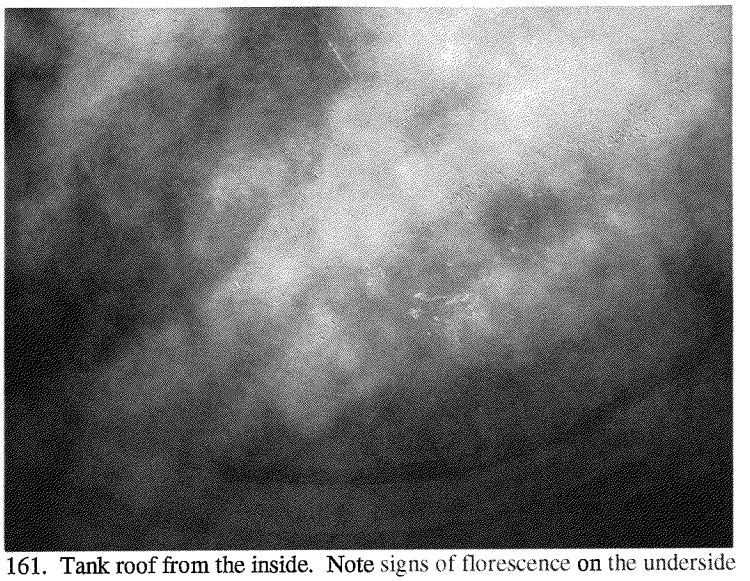
158. Level transducer to the left and inlet pipe



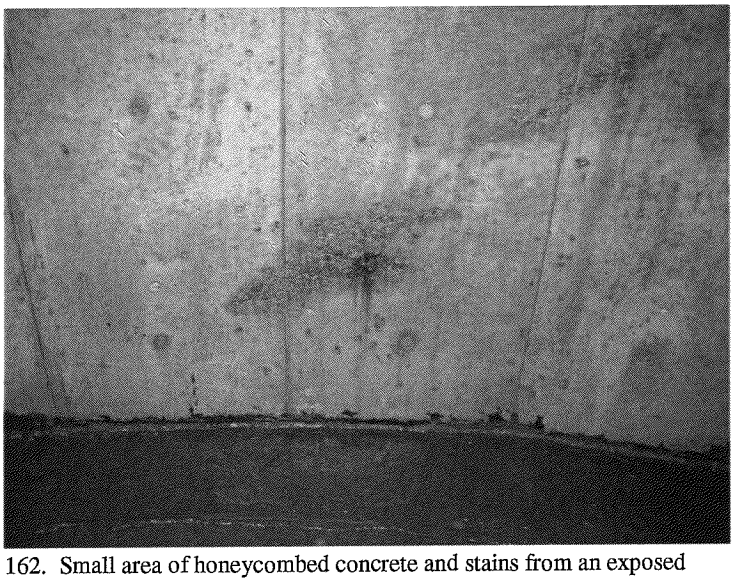
159. Tank wall viewed from the inside to be in good condition



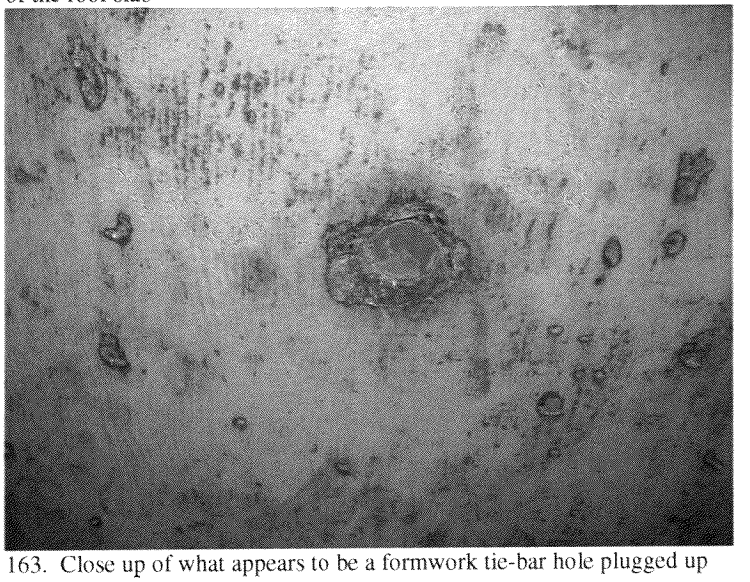
160. . Tank wall viewed from the inside to be in good condition



161. Tank roof from the inside. Note signs of florescence on the underside of the roof slab



162. Small area of honeycombed concrete and stains from an exposed corroded rebar



163. Close up of what appears to be a formwork tie-bar hole plugged up after construction