

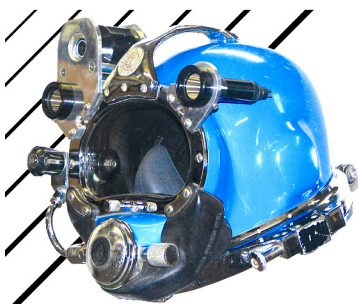


Carson Reserve *Reservoir* **Skamania County PUD**

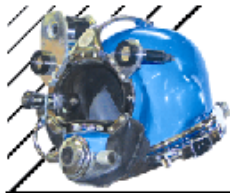
**Report of Findings
From the
Diving Operations
Conducted on**

June 22, 2011

By



LIQUIVISION
TECHNOLOGY
DIVING SERVICES



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Underwater Inspection Of Carson Reserve Reservoir

June 22, 2011

Tom Vance
Skamania County PUD
P.O. Box 500
Carson, WA 98610

Following is the report of findings during the underwater work conducted on your reservoir.

It will focus on issues of concern or areas that need attention. In order to see a complete and detailed inspection, please view each video.

Color images of all plumbing fixtures, components and areas of concern were taken via underwater digital camera. The images should give you a clear view of the conditions described. The video may give you another view and a clearer understanding of any area that you may wish to look at more closely.

METHODOLOGY:

Disinfection of All Equipment With 200ppm+ Chlorine Solution Immediately Prior to Entering System: This process prevents contamination of the water supply. All LVT equipment was properly disinfected prior to entering the potable water system.

Full-Time Voice Communication between surface and Diver: The system allowed for constant communication between the diver, and all surface personnel. In addition, customers were able to communicate with the diver at any time. For purposes of a more efficient inspection, cleaning, and repair program, that enabled the diver to immediately discuss any observations he made inside the reservoir.

Full-Time Live High Resolution Color Video: Allowed for constant viewing of the diver's work and observations. This also enabled the district personnel to view what the diver in the reservoir was witnessing.

Carson Reserve Reservoir

TERMINOLOGY:

When describing the features or areas of interest inside the reservoir, an image number is placed next to the description that corresponds with the inspection findings. The diagram is shown in a view looking from the top down. The entry hatch is referred to as the 12:00 o'clock position.

Following the diagram are pictures of the pertinent areas of the reservoir and the locations where the pictures were taken. Each picture is described and numbered.

The standards used to evaluate the condition of the reservoir include: Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces – SSPC-Vis 2-82 & ASTM D 610-85
NACE Standard RP0196-96 & RP0388-2001 or Condition of Concrete In-service – ACI 201.1R-92.

Carson Reserve Reservoir

OVERVIEW OF RESERVOIR INSPECTED:

Customer Name: Skamania County PUD

Reservoir Name: Carson Reserve

Manager: Tom Vance

Construction: OG Welded

Job Number: WA3002111R1T2

Capacity (gal.): 750,000

Date of Inspection: June 22, 2011

Diameter or L x W: 61'

Report Writer: John Shaneyfelt

Height: 34'

Diver: Ryan Torgerson

Floor Square FT: 2922.4

Tender: Kevin Wiens

Date Built: Unknown

N/A –not applicable **Excellent** (Ex.) –like new condition, no repairs needed. **Good** – Cosmetic only problems, repairs if wanted. **Fair**-Minor problems, repairs needed, not immediate. **Poor** –Major problems, structural or like, immediate repairs needed.

1. Rust Grades

Grades	% of Surface Rusted	Description
10	0% - 0.01%	No rusting or less than 0.01% of surface rusted
9	0.01% - 0.03%	Minute rusting, less than 0.03% of surface rusted
8	0.03% - 0.1%	Few isolated rust spots, less than 0.1% of surface rusted
7	0.1%- 0.3%	Less than 0.3% of surface rusted
6	0.3% - 1%	Extensive rust spots, but less than 1% of surface rusted
5	1% - 3%	Rusting to the extent of 3% of surface rusted
4	3% - 10%	Rusting to the extent of 10% of surface rusted
3	10% - 16%	Approximately one sixth of the surface rusted (16%)
2	16% - 33%	Approximately one third of the surface rusted (33%)
1	33% - 50%	Approximately one half of the surface rusted (50%)
0	50% - 100%	Approximately 100% of the surface rusted

2. Weld Deformities

Unable to Evaluate	Good Condition	Porosity	Incomplete Fusion	Incomplete Penetration	Undercut	Underfill	Overlap	Cracks	Convexity / Concavity	Spatter
UE	GC	PS	IF	IP	UC	UF	OL	CK	CC	SP

3. Concrete Deformities

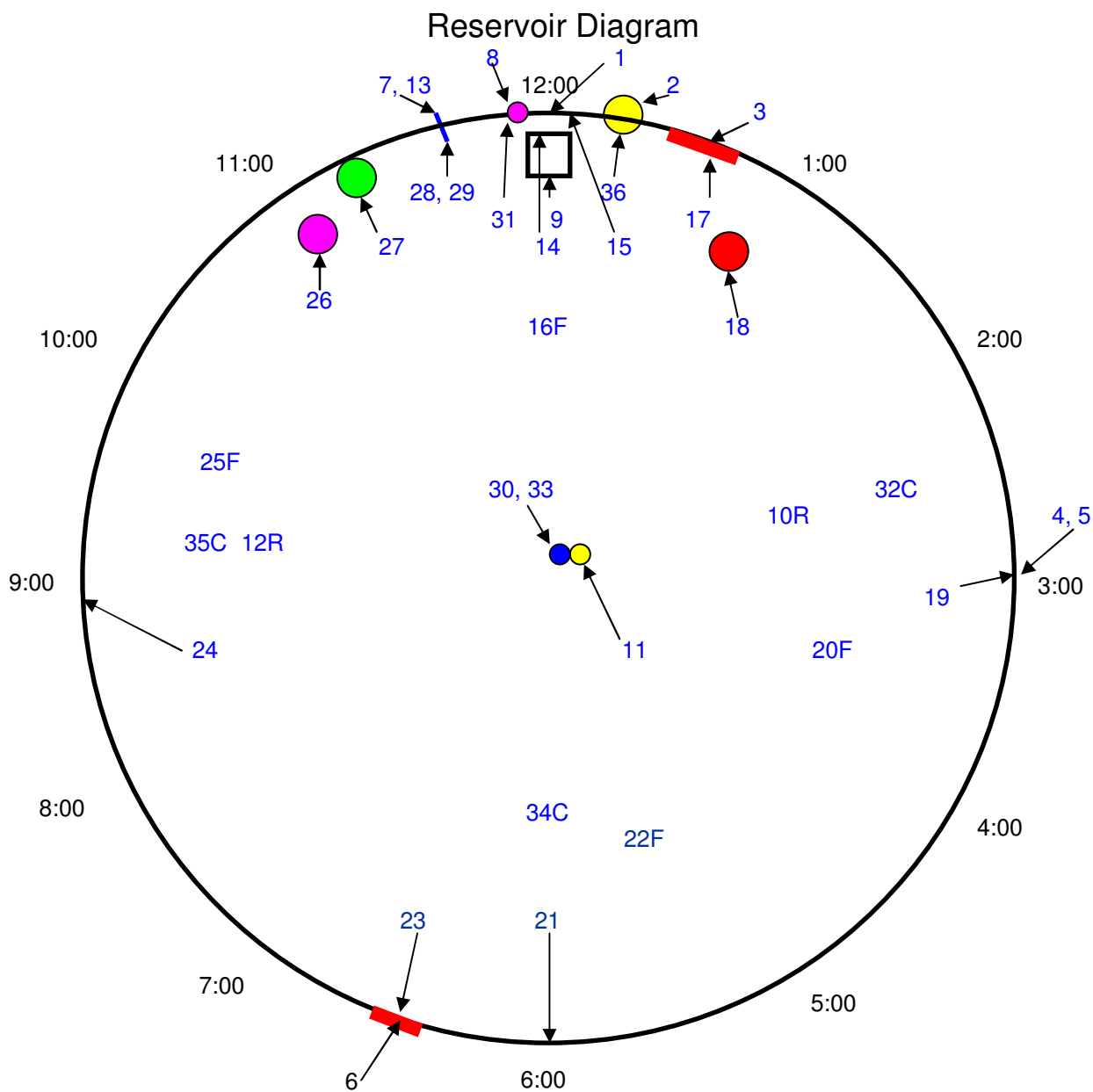
Unable to Evaluate	Good Condition	Cracks	Blistering	Chalking	De-Lamination	Pitting	Popouts	Scaling	Spalling	Warping
UE	GC	CK	BL	CH	DL	PT	PO	SC	SP	WA

Carson Reserve Reservoir











RECOMMENDATIONS:

Recommendation	Estimated Time - Hrs.
Remove the existing interior coating and apply a new NSF approved epoxy type coating. The existing interior coating was in such disrepair that it would not be cost effective to attempt to patch all of the problem areas.	Please contact our sales office for an estimate.
Perform a regular cleaning, inspection and repair cycle every 2-3 years in order to ensure superior water quality and proper maintenance of coating condition and appurtenances is performed.	Please contact our sales office for an estimate.
Total Estimated Hours	

Carson Reserve Reservoir



Drawing Not To Scale

	Entry Hatch		Overflow		Support Column
	Inlet		Man Entry		Telemetry
	Outlet		Liquid Level Indicator		Air Vent
	Drain/Scour				

Carson Reserve Reservoir

Image #1

Ladder 12:00

Condition:
Rust Grade¹ 8.

Description:
Ladder appears to be in good condition with a minor amount of corrosion.

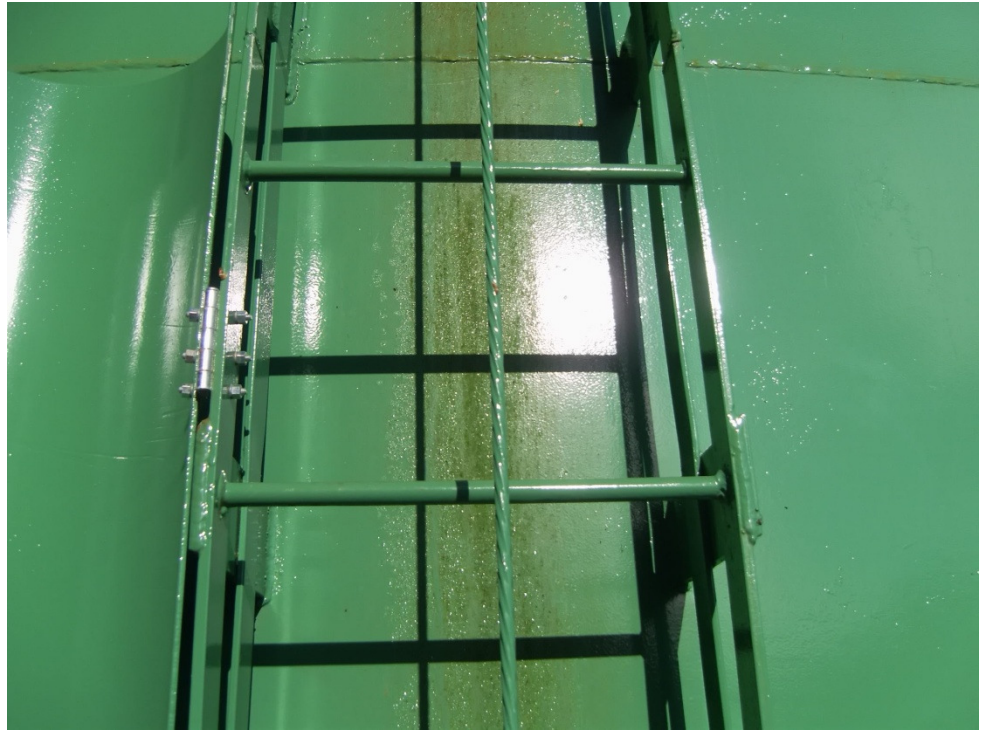


Image #2

Overflow 12:15

Condition:
Rust Grade¹ 8.

Description:
8" Overflow appears to be in good condition with a minor amount of corrosion.



Carson Reserve Reservoir

Image #3

Man Way 12:30

Condition:
Rust Grade¹ 9.

Description:
Man Way appears to be in good condition with a minor amount of corrosion.



Image #4

Exterior Base 3:00

Condition:
Rust Grade¹ 8.
Concrete Deform⁵ GC.

Exterior Base appears to be in good condition with a minor amount of corrosion and no signs of concrete problems.



Carson Reserve Reservoir

Image #5

Exterior Wall 3:00

Condition:
Rust Grade¹ 9.

Description:
Exterior Wall appears to be in good condition with a minor amount of corrosion.



Image #6

Man Way 6:30

Condition:
Rust Grade¹ 8.

Description:
Man Way appears to be in good condition with a minor amount of corrosion.



Carson Reserve Reservoir

Image #7

*Liquid Level Indicator
Reader board 11:45*

Condition:
Rust Grade¹ 8.

Description:
Liquid Level Indicator
Reader board appears
to be in good condition
with a minor amount of
corrosion.



Image #8

*Telemetry Penetration
11:55*

Condition:
Rust Grade¹ 9.

Description:
1" Telemetry
Penetration appears to
be in good condition
with a minor amount of
corrosion.



Carson Reserve Reservoir

Image #9

Hatch 12:00

Condition:
Rust Grade¹ 8.

Description:
24" x 24" Hatch appears to be in good condition with a minor amount of corrosion.

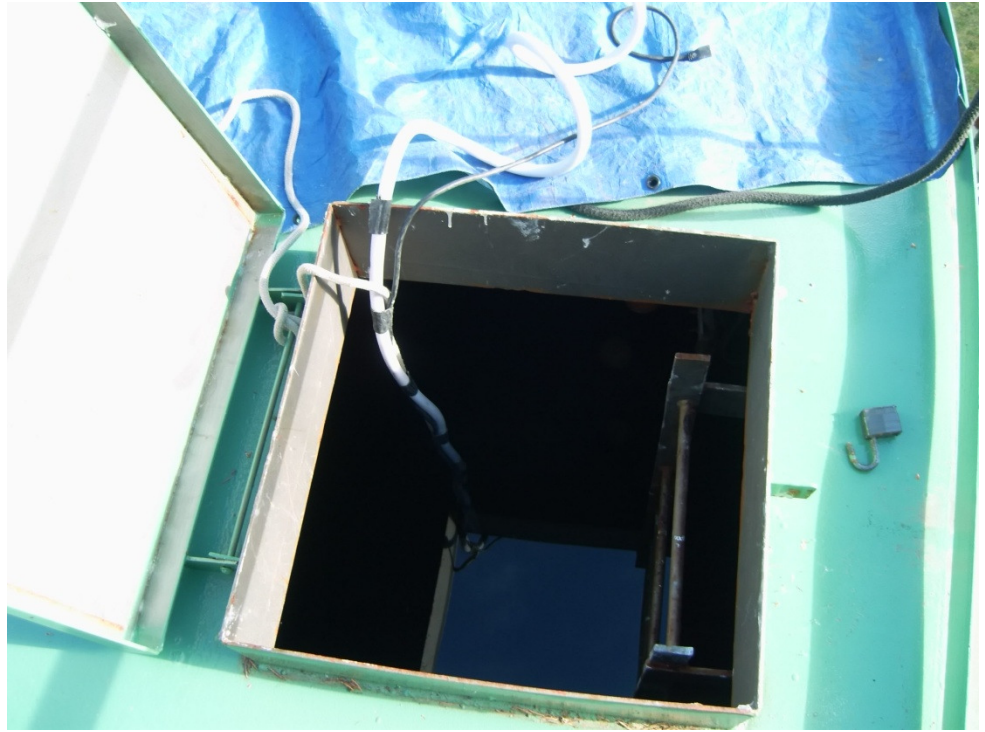


Image #10

Roof 3:00

Condition:
Rust Grade¹ 9.

Description:
Roof appears to be in good condition with a minor amount of corrosion.



Carson Reserve Reservoir

Image #11

Vent Center

Condition:
Rust Grade¹ 9.

Description:
24" Vent appears to be in good condition with a minor amount of corrosion. A fine mesh screen was observed to be in place and in tack.

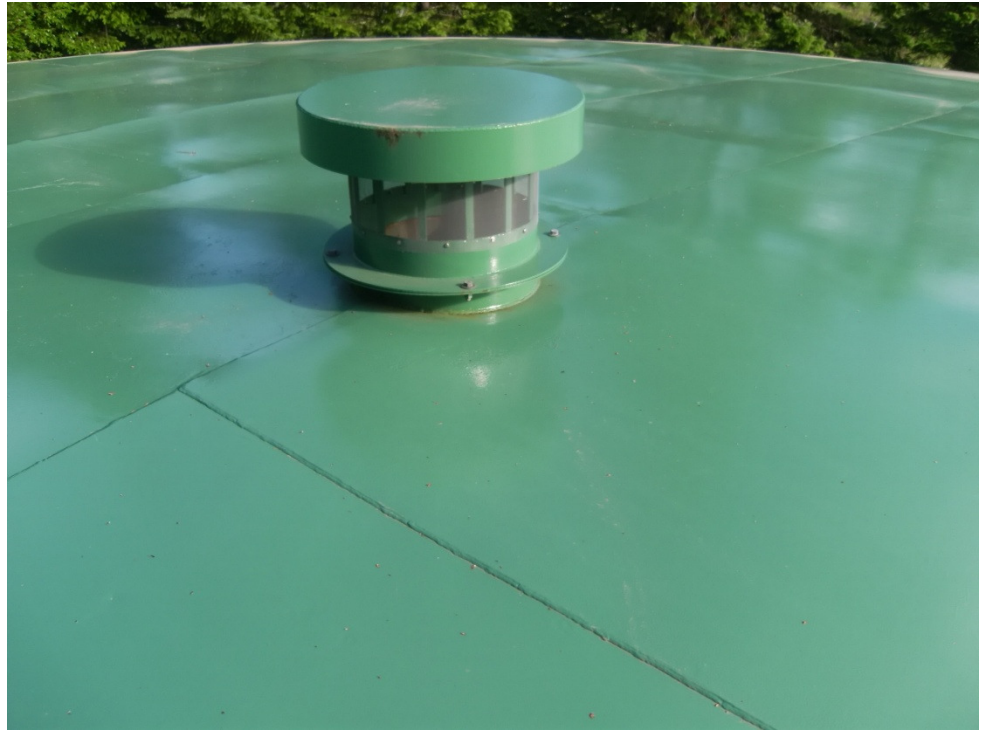


Image #12

Roof 9:00

Condition:
Rust Grade¹ 9.

Description:
Roof appears to be in good condition with a minor amount of corrosion.



Carson Reserve Reservoir

Image #13

*Liquid Level Indicator
penetration 11:45*

Condition:
Rust Grade¹ 9.

Description:
1" Liquid Level
Indicator penetration
appears to be in good
condition with a minor
amount of corrosion.



Image #14

Ladder 12:00

Condition:
Rust Grade¹ 5.

Description:
Ladder appears to be
in fair condition with a
moderate amount of
corrosion. Rust
nodules were observed.



Carson Reserve Reservoir

Image #15

Wall 12:00

Condition:
Rust Grade¹ 2.

Description:
Wall appears to be in fair condition with a minor amount of corrosion. Minor blistering was observed.

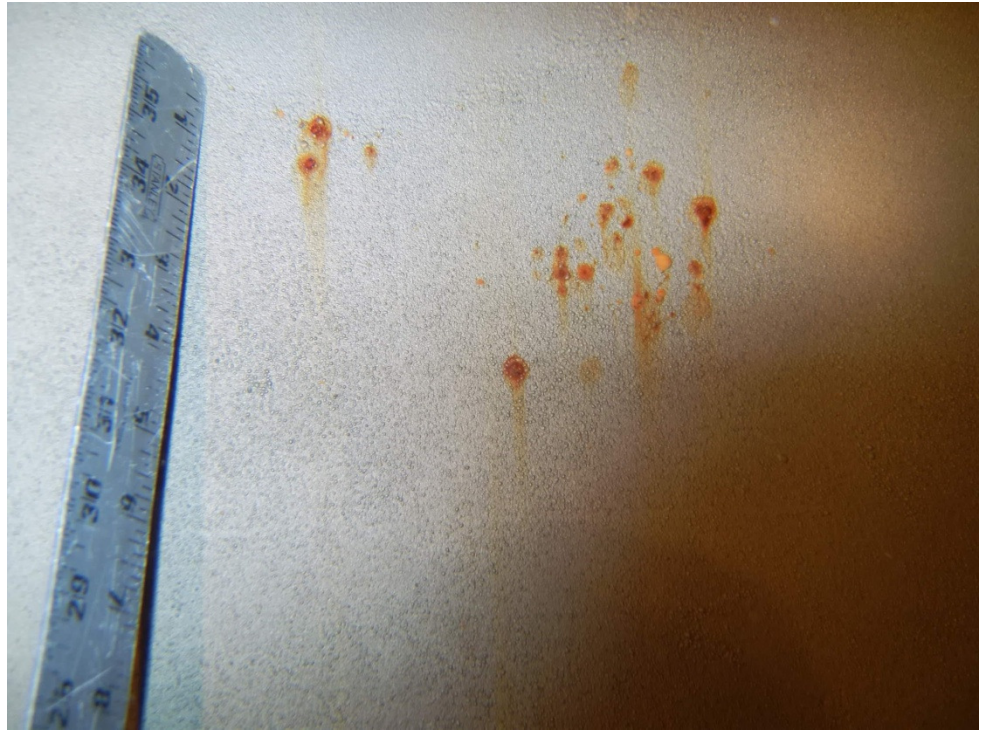
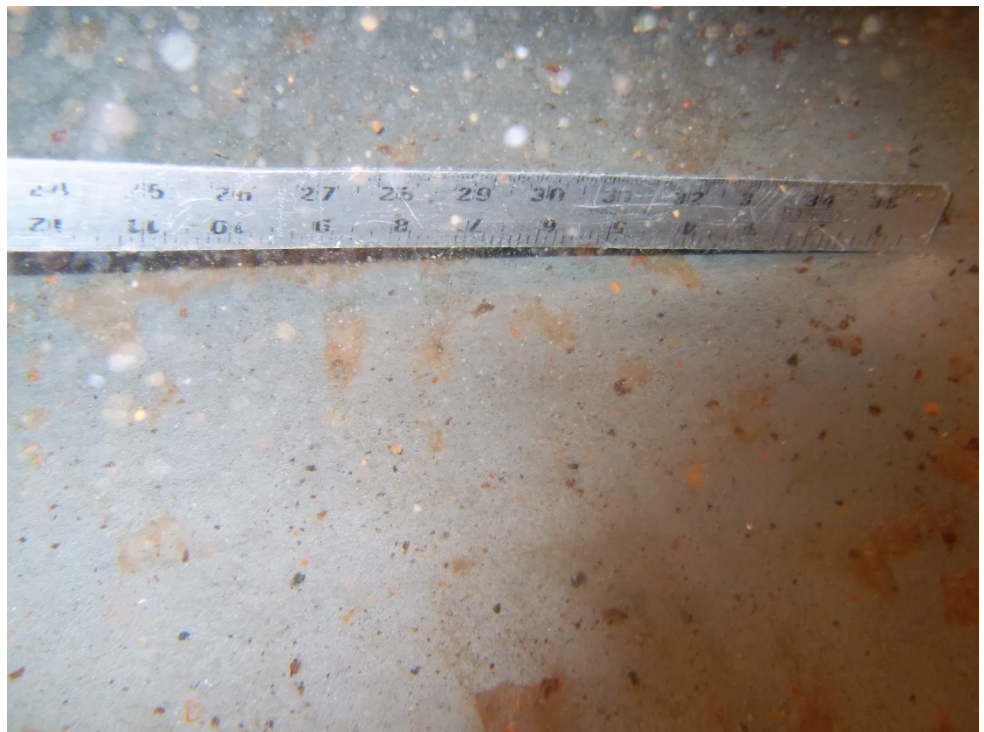


Image #16

Floor 12:00

Condition:
Rust Grade¹ 2.

Description:
Floor appears to be in poor condition with a heavy amount of corrosion. Heavy blistering was observed.



Carson Reserve Reservoir

Image #17

Man Way 12:30

Condition:
Rust Grade¹ 6.

Description:
Man Way appears to be in fair condition with a minor amount of corrosion. Moderate blistering was observed.

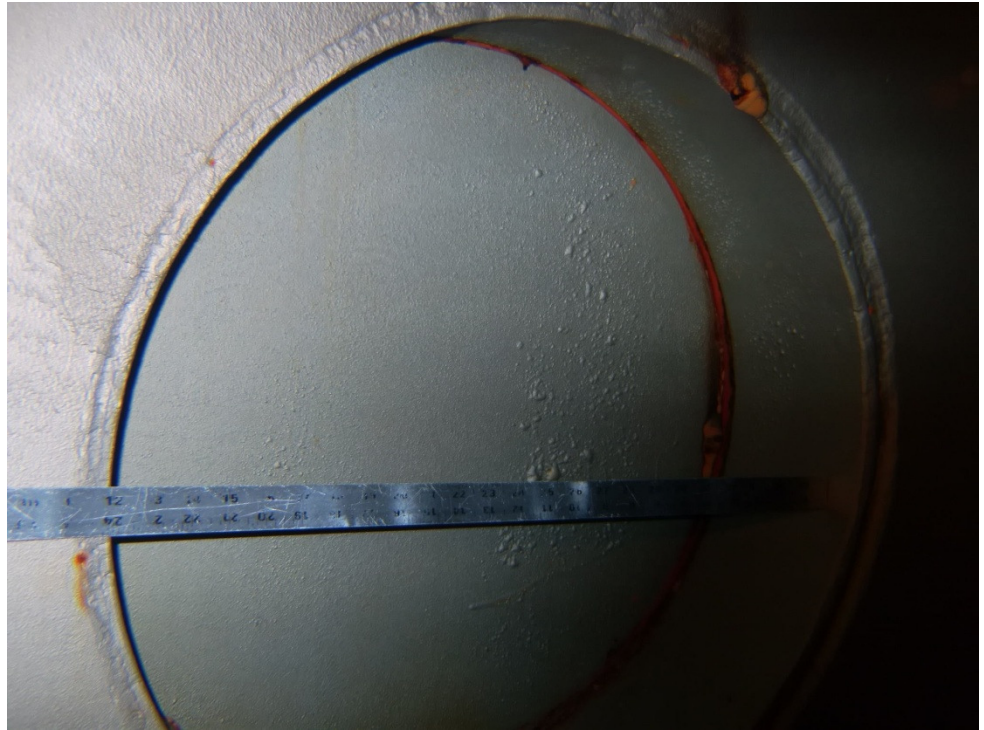
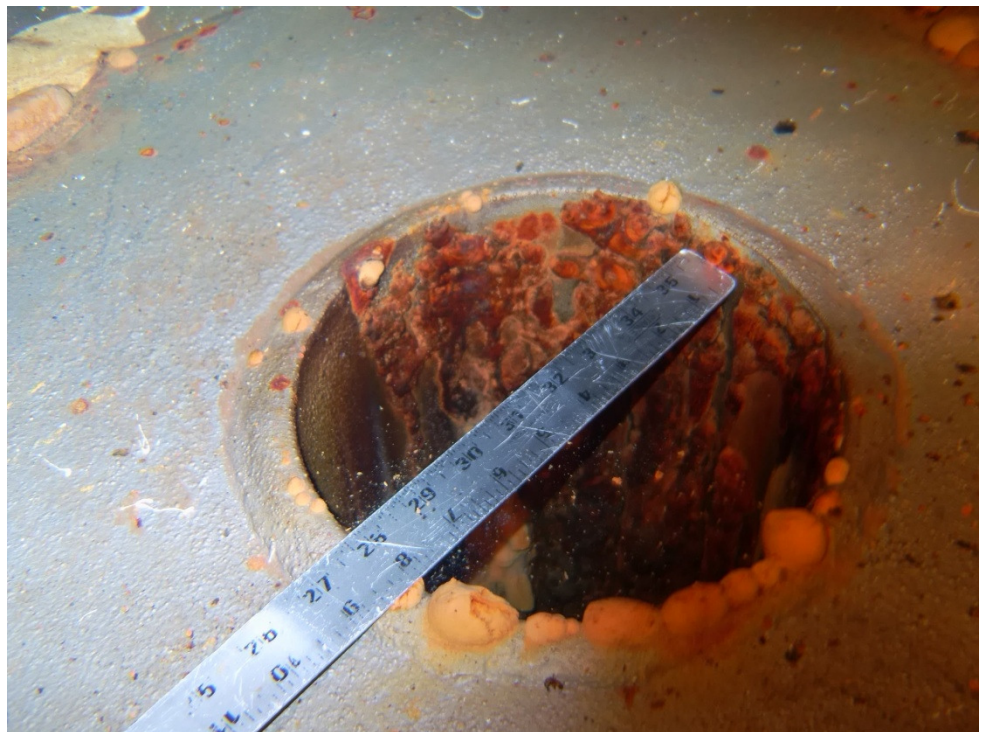


Image #18

Drain 1:00

Condition:
Rust Grade¹ 0.

Description:
8" Drain appears to be in poor condition with a heavy amount of corrosion.



Carson Reserve Reservoir

Image #19

Wall 3:00

Condition:
Rust Grade¹ 7.

Description:
Wall appears to be in fair condition with a minor amount of corrosion. Moderate blistering was observed.

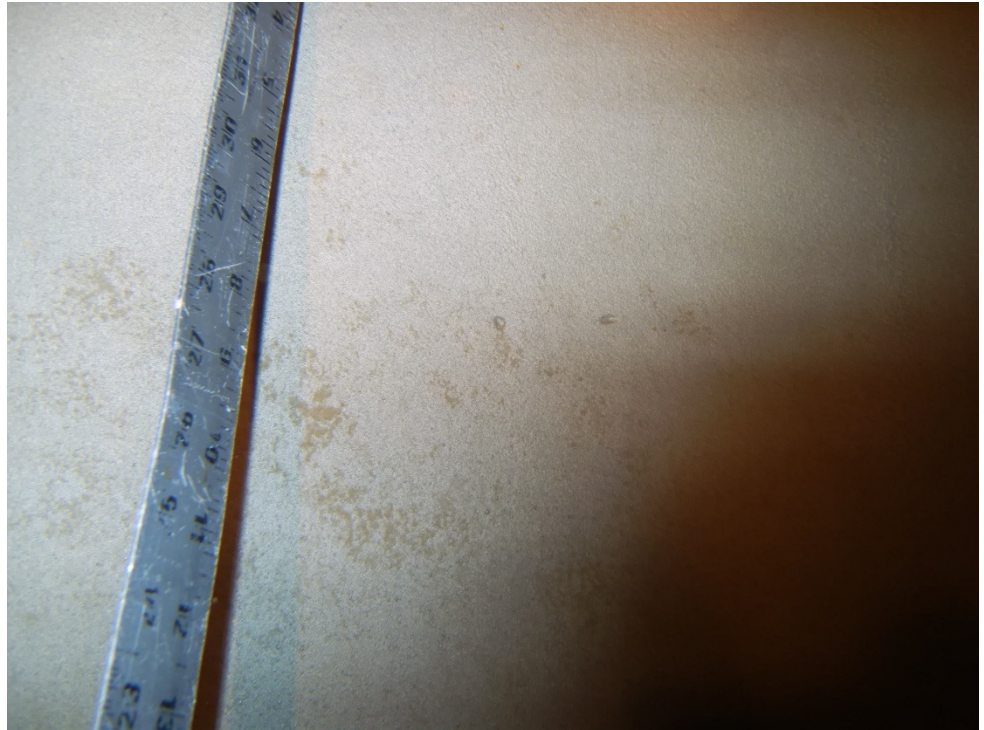
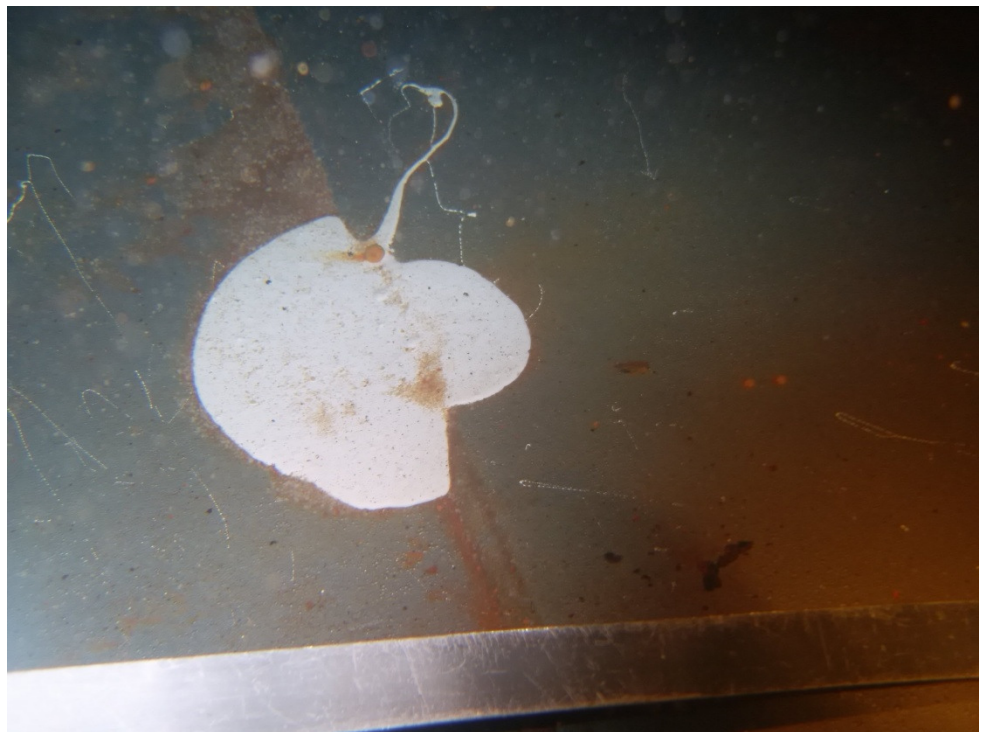


Image #20

Floor 3:00

Condition:
Rust Grade¹ 2.

Description:
Floor appears to be in poor condition with a heavy amount of corrosion. Heavy blistering was observed.



Carson Reserve Reservoir

Image #21

Wall 6:00

Condition:
Rust Grade¹ 7.

Description:
Wall appears to be in fair condition with a minor amount of corrosion. Moderate blistering was observed.

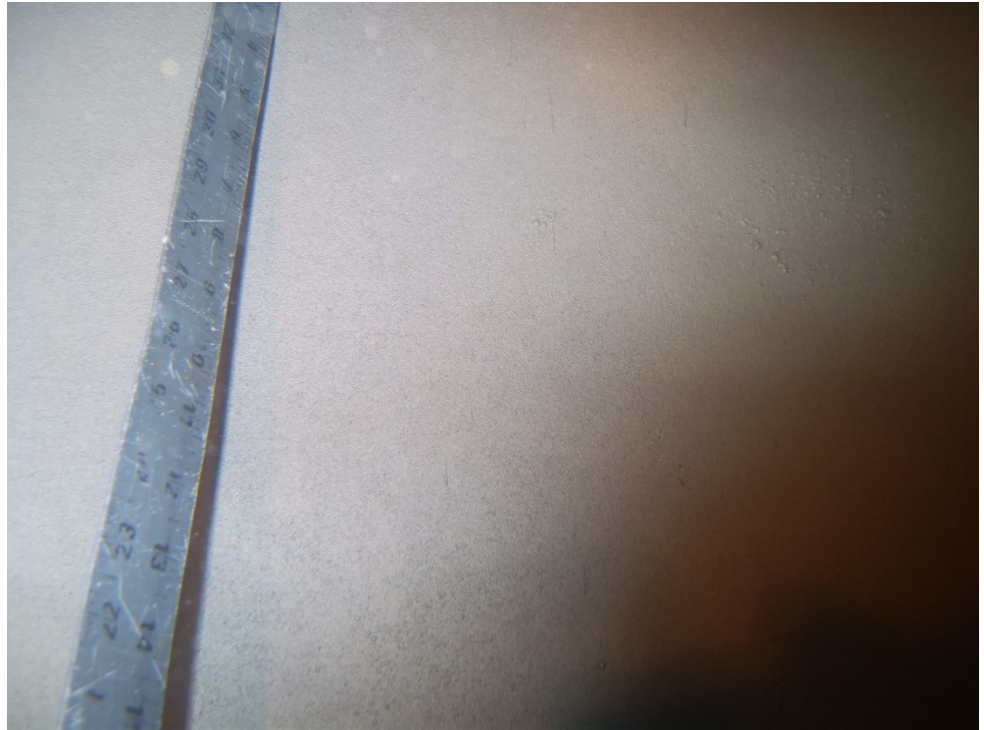


Image #22

Floor 6:00

Condition:
Rust Grade¹ 2.

Description:
Floor appears to be in poor condition with a heavy amount of corrosion. Heavy blistering was observed.



Carson Reserve Reservoir

Image #23

Man Way 6:30

Condition:
Rust Grade¹ 5.

Description:
Man Way appears to be in fair condition with a moderate amount of corrosion. Moderate blistering was observed.

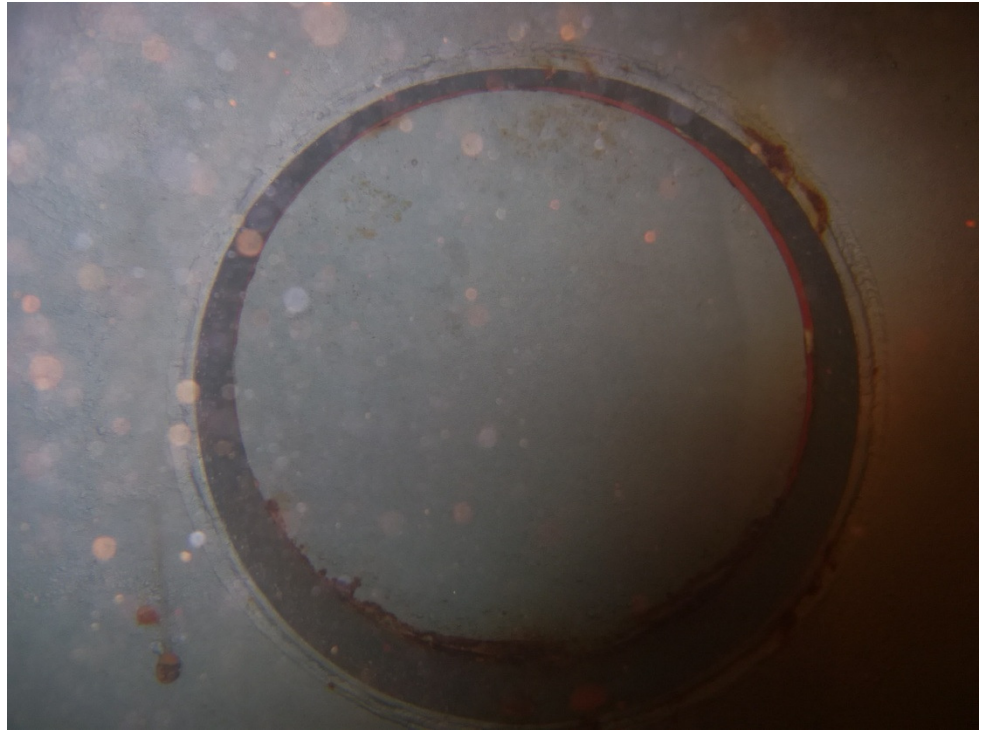
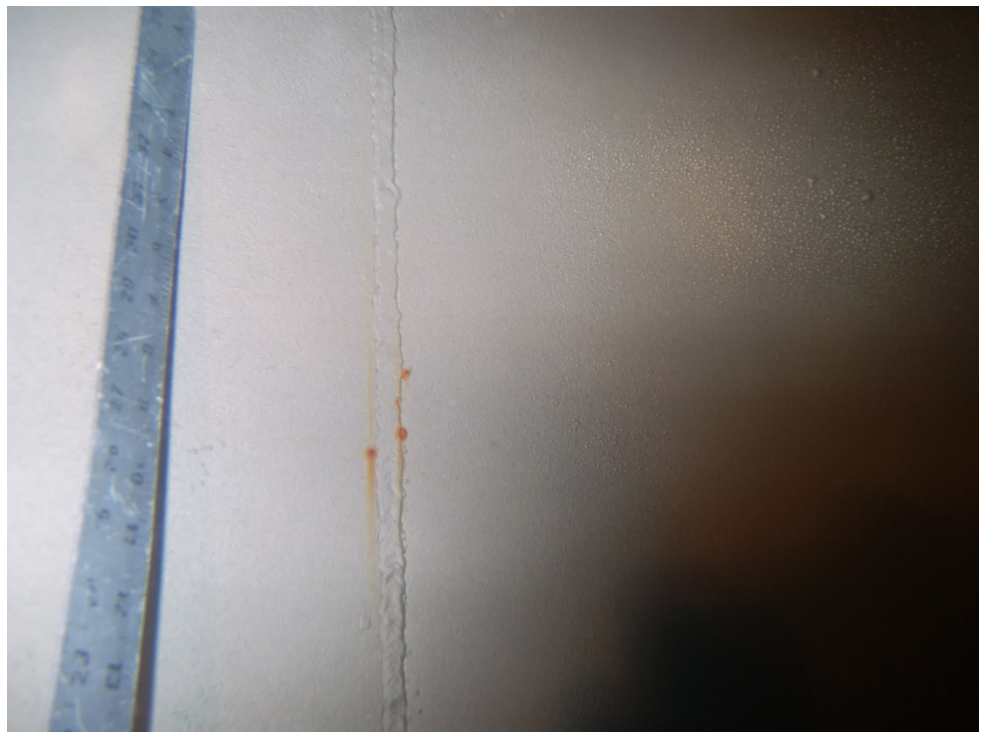


Image #24

Wall 9:00

Condition:
Rust Grade¹ 7.

Description:
Wall appears to be in fair condition with a minor amount of corrosion. Moderate blistering was observed.



Carson Reserve Reservoir

Image #25

Floor 10:30

Condition:
Rust Grade¹ 2.

Description:
Floor appears to be in poor condition with a heavy amount of corrosion. Heavy blistering was observed.

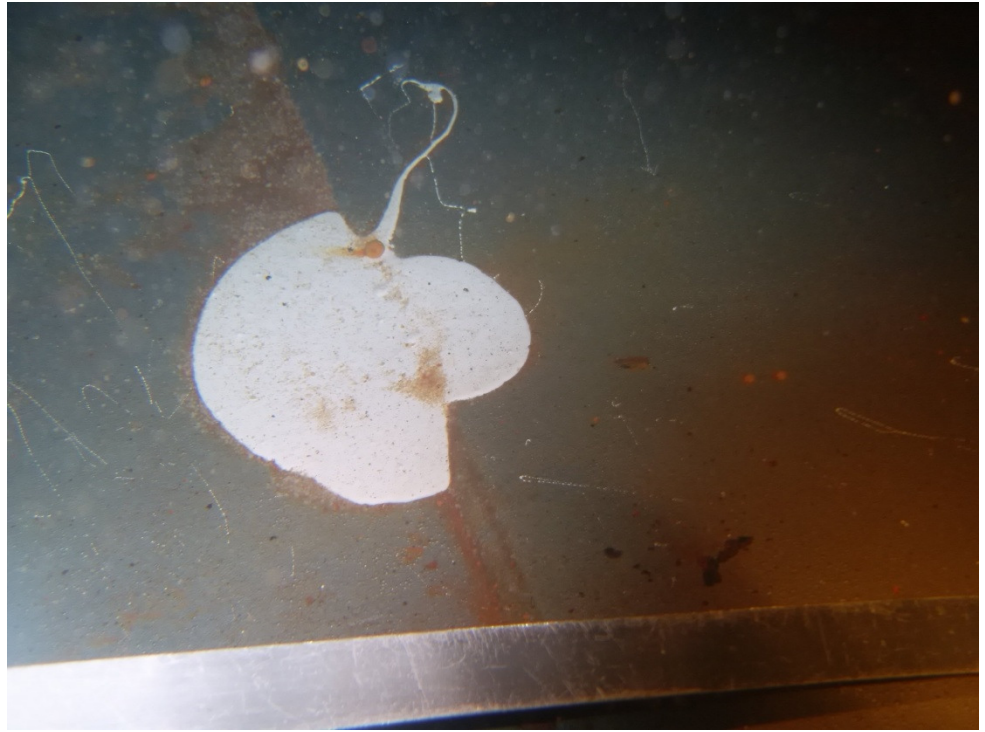


Image #26

Outlet 11:00

Condition:
Rust Grade¹ 5.

Description:
10" Outlet with a 4" sediment ring appears to be in fair condition with a moderate amount of corrosion.



Carson Reserve Reservoir

Image #27

High Fill 11:15

Condition:
Rust Grade¹ 7.

Description:
8" High Fill appears to be in good condition with a minor amount of corrosion.



Image #28

*Liquid Level Indicator
Guide Wires 11:45*

Condition:
Rust Grade¹ 9.

Description:
Liquid Level Indicator Guide Wires appears to be in fair condition with a minor amount of corrosion.



Carson Reserve Reservoir

Image #29

*Liquid Level Indicator
Float 11:45*

Condition:
Rust Grade¹ 9.

Description:
24" Liquid Level Indicator Float appears to be in good condition with a minor amount of corrosion.

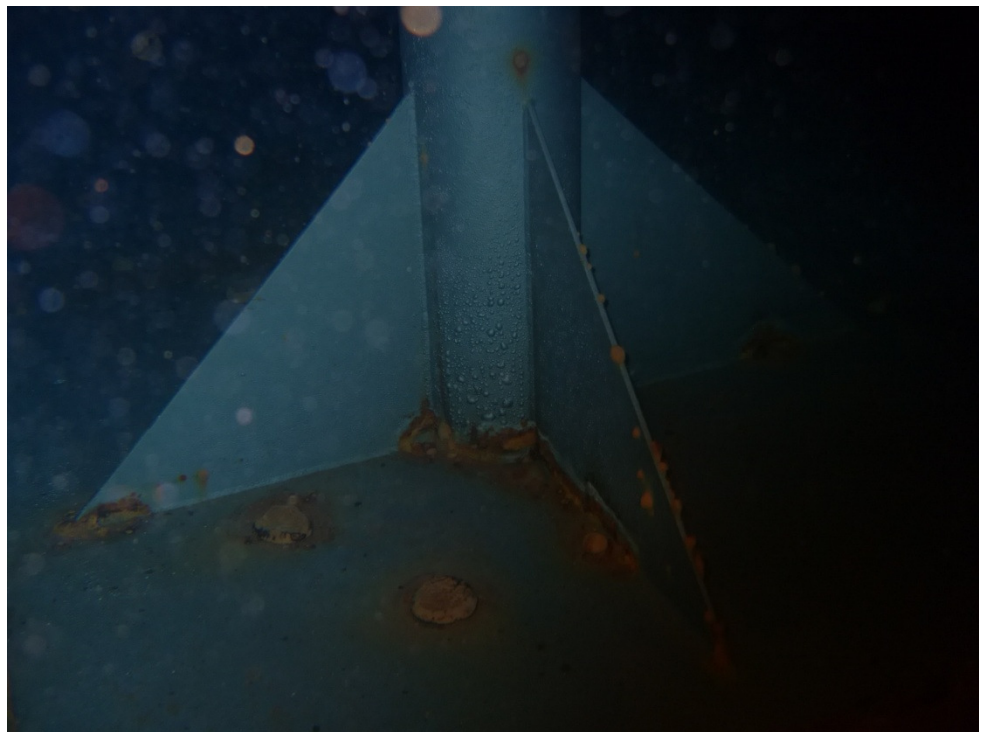


Image #30

Column Center

Condition:
Rust Grade¹ 5.

Description:
8" Column appears to be in fair condition with a moderate amount of corrosion.



Carson Reserve Reservoir

Image #31

Telemetry 11:55

Description:

Telemetry appears to be in good condition and properly suspended.



Image #32

Ceiling 3:00

Condition:
Rust Grade¹ 2.

Description:

Ceiling appears to be in fair condition with a heavy amount of corrosion.



Carson Reserve Reservoir

Image #33

*Column Center
Ceiling*

Condition:
Rust Grade¹ 5.

Description:
Column appears to be
in fair condition with a
moderate amount of
corrosion.

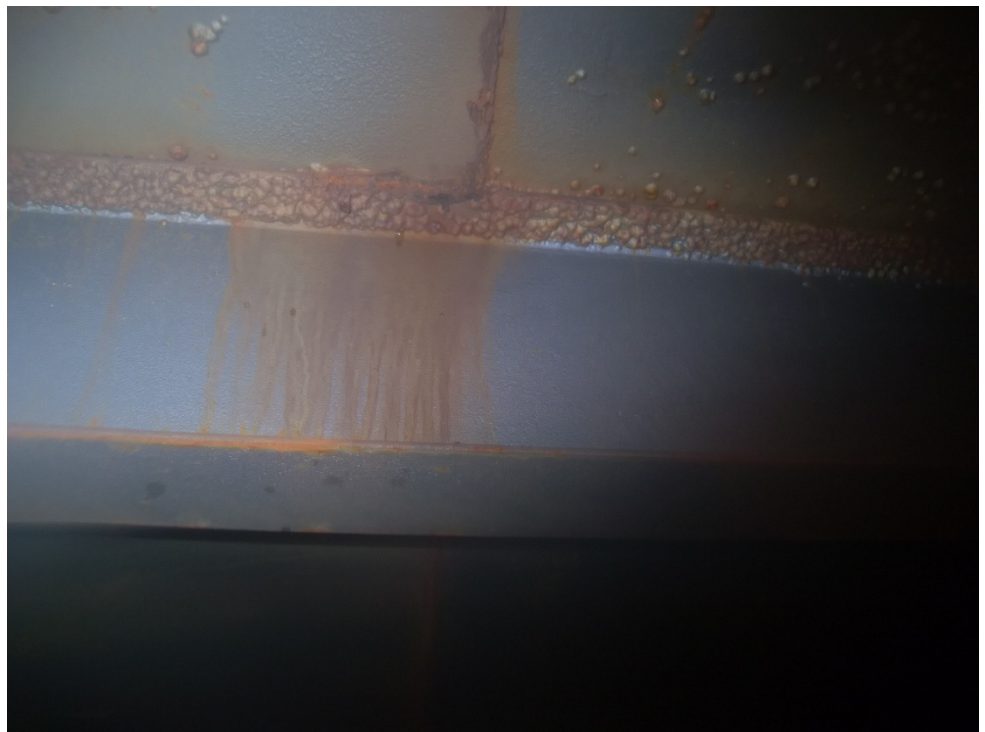


Image #34

Ceiling 6:00

Condition:
Rust Grade¹ 2.

Description:
Ceiling appears to be
in fair condition with a
heavy amount of
corrosion.



Carson Reserve Reservoir

Image #35

Ceiling 9:00

Condition:
Rust Grade¹ 2.

Description:
Ceiling appears to be in poor condition with a heavy amount of corrosion.



Image #36

Overflow 12:15

Condition:
Rust Grade¹ 2.

Description:
8" Overflow appears to be in good condition with a moderate amount of corrosion.




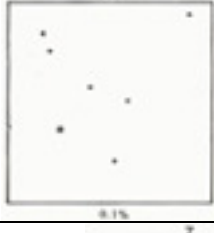
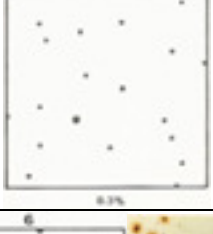
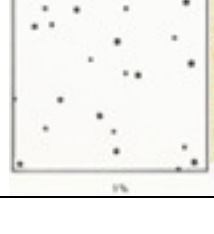
Carson Reserve Reservoir

REFERENCES:

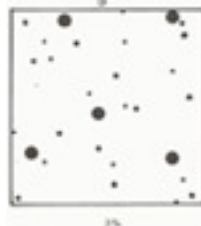
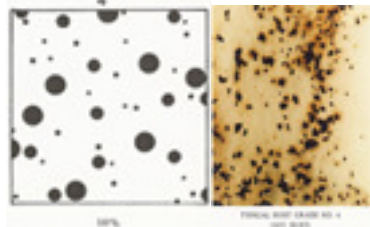


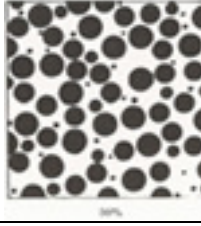
Standard Method of Evaluating Degree of Rusting on Painted Steel Surfaces – SSPC-Vis 2-82 & ASTM D 610-85 (1989)

The graphical representations show examples of area percentages, which may be helpful in rust grading. The use of photographic reference standards requires the following precautions:

1. Some finishes are stained by rust. This staining must not be confused with the actual rusting involved.
2. Accumulated dirt or other material may make accurate determination of the degree of rusting difficult.
3. Certain types of deposited dirt that contain iron or iron compounds may cause surface discoloration that should not be mistaken for corrosion.
4. It must be realized that failure may vary over a given area and discretion must therefore be used in applying these reference standards.
5. In evaluating surfaces, consideration shall be given to the color of the finish coating, since failures will be more apparent on a finish that shows color contrast with rust, such as white, than on a similar color, such as iron oxide finish.
6. The photographic reference standards are not required for use of the rust-grade scale since the scale is based upon the percent of the area rusted and any method of assessing area rusted may be used to determine the rust grade.

Rust Grades ^A	Description	Graphical Representation
10	No rusting or less than 0.01% of surface rusted	Unnecessary
9	Minute rusting, less than 0.03% of surface rusted	
8	Few isolated rust spots, less than 0.1% of surface rusted	
7	Less than 0.3% of surface rusted	
6	Extensive rust spots, but less than 1% of surface rusted	

Carson Reserve Reservoir

5	Rusting to the extent of 3% of surface rusted	
4	Rusting to the extent of 10% of surface rusted	
3	Approximately on sixth of the surface rusted (16%)	
2	Approximately one third of the surface rusted (33%)	
1	Approximately one half of the surface rusted (50%)	
0	Approximately 100% of the surface rusted	Unnecessary