1st time
8/26/2015
SWIMS: 2/15/16

Wisconsin DNR – Lake Level Monitoring

Staff Gage Calibration Data Sheet

Lake Information

Lake Name: Horseshoe Lake County: Polk

Local Coordinator and Organization (if known)

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark Information

Reference Mark #1 (RM1) Reference Mark Type:

Latitude: 45-26-00.43" Longitude: 92-10-44.704 Mean Sea Level Yes ☒ No ☐ Elevation: 1214.30 Photograph ☒

Location Description: LARGE Boulder Easterly of LANDING, Triangle Chipped IN boulder at highest point

Reference Mark #2 (RM2) Reference Mark Type:

Latitude: 45-26-00.576 Longitude: 92-10-45.117 Mean Sea Level Yes ☒ No ☐ Elevation: 1212.38 Photograph ☒

Location Description: Northwesterly Corner of Slotted Concrete LANDING, precast portion.

Reference Mark #3 (RM3) Reference Mark Type:

Latitude: 45-26-01.185 Longitude: 92-10-46.238 Mean Sea Level Yes ☒ No ☐ Elevation: 1218.82 Photograph ☒

Location Description: Gin Spike on East Side of 24" W. OAK on Edge of gravel drive NWLY of LANDING

Initial Calibration*

Date: 8-26-2015 Time: 9AM AM/PM Check one: Install ☒ Midseason ☐ Removal ☐

Survey Equations: HI = Assigned Elevation + BS Calculated Elevation = HI - FS

Reference Mark	Assigned Elevation (ft)	Backsite (BS)	Height (ft) of Instrument (HI)	Foresite (FS)	Calculated Elevation (ft)
RM1	1214.30	5.98	1220.28		
RM2				7.89	1212.39
RM3				1.43	1218.85
Staff Gage				9.76	1210.52 •
RM1	1214.30	5.98	1220.28		
			WATER	8.27	1212.01

Secondary Calibration

Date: 8-26-2015 Time: 9:10 (AM)/PM Check one: Install ☒ Midseason ☐ Removal ☐

Survey Equations: HI = BS + Assigned Elevation Calculated Elevation = HI - FS

Reference Mark	Assigned Elevation (ft)	Backsight (BS)	Height of Instrument (HI)	Foresight (FS)	Calculated Elevation (ft)
RM1	1214.30	5.62	1219.92		
RM2				7.54	1212.38
RM3				1.09	1218.83
Staff Gage				9.42	1210.50
RM1	1214.30	5.62			
			WATER	7.94	1211.98

*Accept the initial calibration - use value for the remainder of the season to compare observations from subsequent calibrations (unless the gage moves).

**Shaded boxes do not need to be filled in during the survey process

Lake Level Reading: 1.51 ft

Mn Water ELEV 1212.00 *

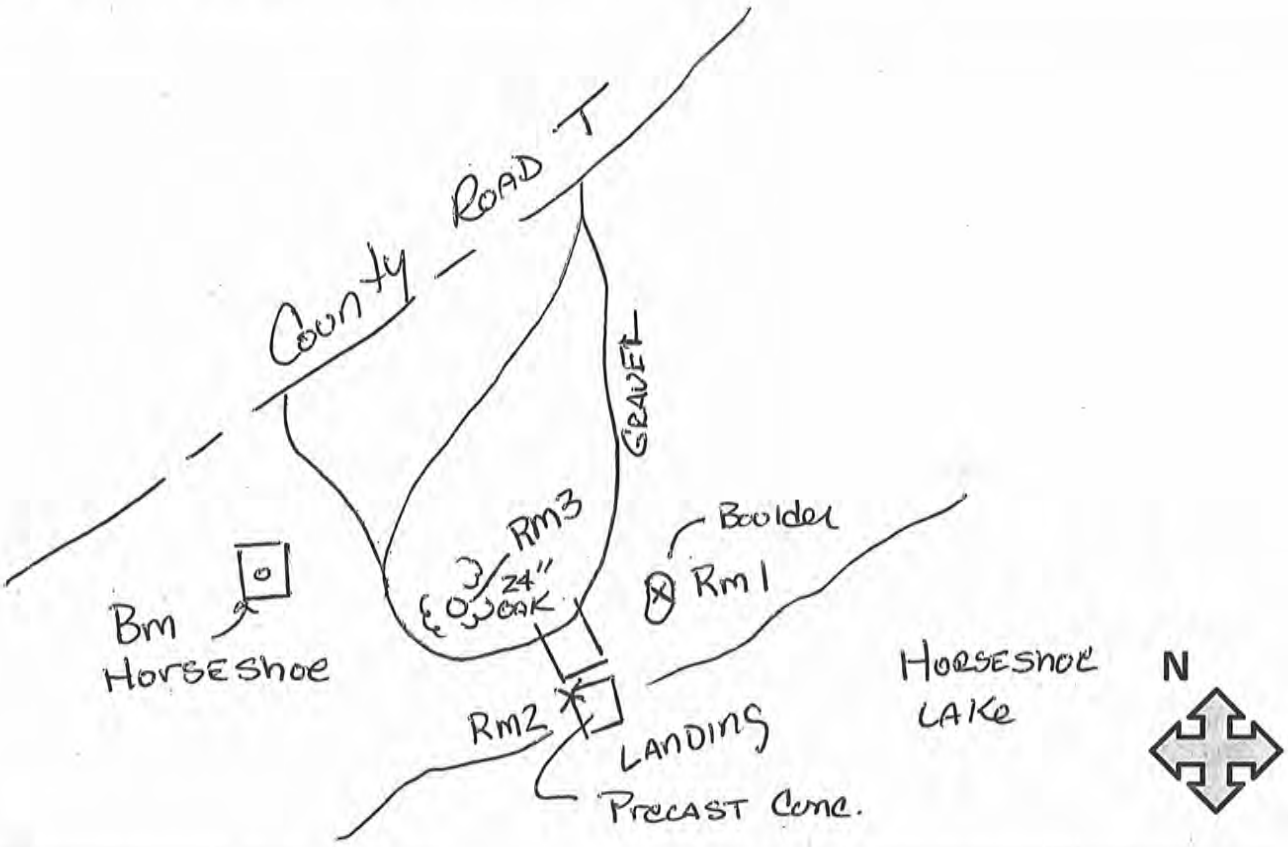
Calculated Elevation = 1210.47

Entered into SWIMS

Wisconsin DNR – Lake Level Monitoring

Staff Gage Calibration Data Sheet

Site Diagram including Staff Gage and Reference Marks



Notes

Bm HORSESHOE IS the top of a 5" DIAmeter steel plate on a iron pipe up 6" From a 5'8" x 6' Concrete SCAB, Southerly of Southerly entrance to LANDING. ELEVATION run from GPS STATION Beaver NE.

ELEVATION = 1226.53' NAVD88

Data Management

Survey Data uploaded to SWIMS?	Yes ☒ No ☐	Date: 2-15-16	Name: Katelin Holm
Photographs uploaded to SWIMS?	Yes ☐ No ☐	Date:	Name:
Data Sheet scan uploaded to SWIMS?	Yes ☒ No ☐	Date: 12-5-16	Name: Katelin Anderson

Equipment Maintenance

Replace bolts/screws on staff gage?	Yes ☐ No ☐	Date:	Name:
Replace gage plate on staff gage?	Yes ☐ No ☐	Date:	Name:
Replace post or wooden board?	Yes ☐ No ☐	Date:	Name:

2ND Shot

Wisconsin DNR – Lake Level Monitoring

Staff Gage Calibration Data Sheet

Lake Information

Lake Name: Horseshoe Cake County: Polk

Local Coordinator and Organization (if known)

Data Collectors

Primary Data Collector | Email | Phone No. ( ) -

Additional Data Collector(s)

Reference Mark Information

Reference Mark #1 (RM1) Reference Mark Type: ✓

Latitude: _____ Longitude: _____ Mean Sea Level Yes ☑ No ☐ Elevation: _____ Photograph ☐

Location Description: _____

Reference Mark #2 (RM2) Reference Mark Type: ✓

Latitude: _____ Longitude: _____ Mean Sea Level Yes ☑ No ☐ Elevation: _____ Photograph ☐

Location Description: _____

Reference Mark #3 (RM3) Reference Mark Type: ✓

Latitude: _____ Longitude: _____ Mean Sea Level Yes ☑ No ☐ Elevation: _____ Photograph ☐

Location Description: _____

Initial Calibration*

Date: 8-26-2015 Time: 1 PM AM/PM Check one: Install ☑ Midseason ☐ Removal ☐

Survey Equations: HI = Assigned Elevation + BS Calculated Elevation = HI - FS

Reference Mark	Assigned Elevation (ft)	Backsite (BS)	Height (ft) of Instrument (HI)	Foresite (FS)	Calculated Elevation (ft)
RM1	1214.30	5.80	1220.10		
RM2				7.73	1212.37
RM3				1.26	1218.84
Staff Gage				9.60	1210.50 •
RM1	1214.30	5.80	1220.10		

Secondary Calibration

Date: 8 Time: 1:10 PM AM/PM Check one: Install ☑ Midseason ☐ Removal ☐

Survey Equations: HI = BS + Assigned Elevation Calculated Elevation = HI - FS

Reference Mark	Assigned Elevation (ft)	Backsight (BS)	Height of Instrument (HI)	Foresight (FS)	Calculated Elevation (ft)
RM1	1214.30	5.39	1219.69		
RM2				7.31	1212.38
RM3				0.85	1218.84
Staff Gage				9.19	1210.50
RM1	1214.30	5.39	1219.69		

*Accept the initial calibration - use value for the remainder of the season to compare observations from subsequent calibrations (unless the gage moves).

**Shaded boxes do not need to be filled in during the survey process

Lake Level Reading: 1.51 ft

Entered into SWIMS

11-10-2015
Previous gage was lowered by .2[illegible]
SWIMS = 2/15/16

Wisconsin DNR – Lake Level Monitoring

Staff Gage Calibration Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE

County: POLK

Local Coordinator and Organization (if known): ____________

Data Collectors

Primary Data Collector: ____________ Email: ____________ Phone No. (   ) -

Additional Data Collector(s): ____________

Reference Mark Information

Reference Mark #1 (RM1) Reference Mark Type: ____________
Latitude: ________ Longitude: ________ Mean Sea Level Yes ☐ No ☐ Elevation: ______ Photograph ☐
Location Description: ____________

Reference Mark #2 (RM2) Reference Mark Type: ____________
Latitude: ________ Longitude: ________ Mean Sea Level Yes ☐ No ☐ Elevation: ______ Photograph ☐
Location Description: ____________

Reference Mark #3 (RM3) Reference Mark Type: ____________
Latitude: ________ Longitude: ________ Mean Sea Level Yes ☐ No ☐ Elevation: ______ Photograph ☐
Location Description: ____________

Initial Calibration*

Date: 11-10-2015 Time: 11:42 (AM)/PM Check one: Install ☐ Midseason ☐ Removal ☒

Survey Equations: **HI = Assigned Elevation + BS** **Calculated Elevation = HI - FS**

Reference Mark	Assigned Elevation (ft)	Backsite (BS)	Height (ft) of Instrument (HI)	Foresite (FS)	Calculated Elevation (ft)
RM1	1214.30	5.38	1219.68		
RM2				7.30	1212.38
RM3				0.83	1218.85
Staff Gage				9.43	1210.25 •
RM1	1214.30	5.38	1219.68		

WATER FS. 7.30 1212.38

Secondary Calibration

Date: 11-10-2015 Time: 12:00 (AM)/PM Check one: Install ☐ Midseason ☐ Removal ☒

Survey Equations: **HI = BS + Assigned Elevation** **Calculated Elevation = HI - FS**

Reference Mark	Assigned Elevation (ft)	Backsight (BS)	Height of Instrument (HI)	Foresight (FS)	Calculated Elevation (ft)
RM1	1214.30	5.17	1219.47		
RM2				7.09	1212.38
RM3				0.61	1218.86
Staff Gage				9.22	1210.25
RM1	1214.30	5.17	1219.47		

*Accept the initial calibration - use value for the remainder of the season to compare observations from subsequent calibrations (unless the gage moves).
**Shaded boxes do not need to be filled in during the survey process

WATER ELEV 1212.38

Lake Level Reading: 2.15 ft
↳ entered into SWIMS

Calculated Elevation 1 = 1210.23

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: Horseshoe Lake County: Polk/Barron

Data Collectors

Primary Data Collector | Email | Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°26'53.175" Longitude: 92°08'33.399" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.15' Photograph ☑
Location Description: Highest Point of 2nd Natural Rock Step lead uphill Easterly from Dock Area

Reference Mark #2 (RM2) Reference Mark Type:
Latitude: 45°26'53.165" Longitude: 92°08'33.686" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.62' Photograph ☑
Location Description: NW Corner of 1st Concrete step above concrete landing leading south from Dock Area to Easterly end of Cabin

Reference Mark #3 (RM3) Reference Mark Type:
Latitude: 45°26'53.079" Longitude: 92°08'33.094" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.205 Photograph ☑
Location Description: Highest Point of a 3'x2' Boulder on Point @ NE Corner of Yard

Staff Gauge
Latitude: 45°26'53.657" Longitude: 92°08'33.614" Mean Sea Level Yes ☒ No ☐ Elevation: 1211.94 Photograph ☑
Location Description: Staff Gauge is located on South side of bench area of Dock on the shore side of the Lounge Area @ end of Dock

Date: 17 June 16 Time: 930 (AM)/PM Check one: Install ☑ Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1 4		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.09			
Height of Instrument (HI1)	1220.24	- Staff Gauge	8.30	= 1211.94
	HI1	- Ref Mark 2 5	2.62	= 1217.62
	HI1	- Ref Mark 3 6	3.04	= 1217.20

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.94 ←			
Back sight 2 (BS2)	+ 8.66			
Height of Instrument (HI2)	1220.60	- Ref Mark 1 4	3.45	= 1217.15
	HI2	- Ref Mark 2 5	2.98	= 1217.62
	HI2	- Ref Mark 3 6	3.39	= 1217.21

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: BS1 3.09 FS1 8.30
GE = CE2 BS2 + 8.66 FS2 + 3.45
11.75 = 11.75

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Calculated Elevation 1 = 1211.92

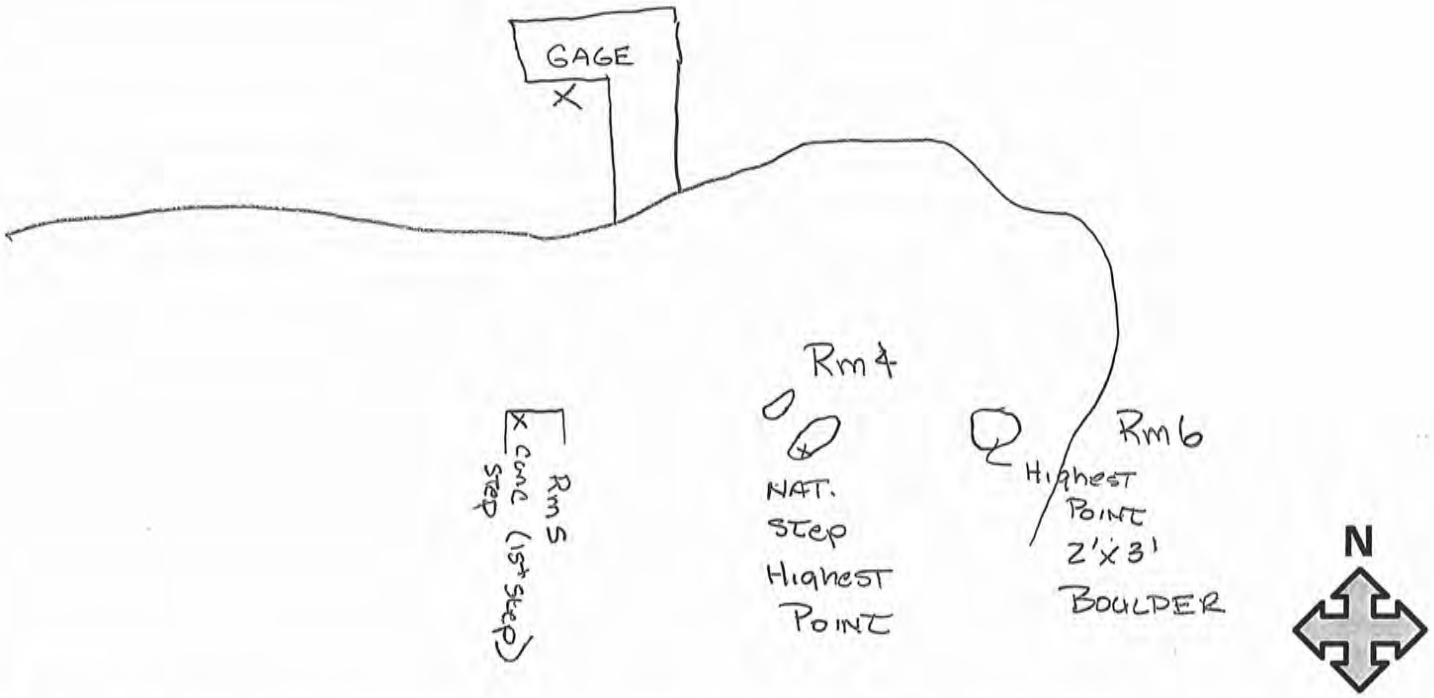
Lake Level Reading: 1213.44 ft

GAGE 1:52' 6/17/2016
Lowered into swims

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Site Diagram (including Staff Gauge and Reference Marks)



Notes

Data Management

Survey Data uploaded to SWIMS?	Yes ☒ No ☐	Date: 2/13/17	Name: KA
Photographs uploaded to SWIMS?	Yes ☒ No ☐	Date: "	Name: "
Data Sheet scan uploaded to SWIMS?	Yes ☒ No ☐	Date: "	Name: "

Equipment Maintenance

Replace bolts/screws on staff gauge?	Yes ☐ No ☐	Date:	Name:
Replace gauge plate on staff gauge?	Yes ☐ No ☐	Date:	Name:
Replace post or wooden board?	Yes ☐ No ☐	Date:	Name:

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: PORK / BARRON

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1)
Latitude: 45°26'53.175" Longitude: 92°08'33.399" Reference Mark Type:
Mean Sea Level Yes ☑ No ☐ Elevation: 1217.15 Photograph ☑
Location Description: Highest Point of 2nd Natural Rock Step leading uphill Easterly from Dock Area.

Reference Mark #2 (RM2)
Latitude: 45°26'53.165" Longitude: 92°08'33.686" Reference Mark Type:
Mean Sea Level Yes ☑ No ☐ Elevation: 1217.62 Photograph ☑
Location Description: NW Corner of 1st Concrete step above Concrete landing leading South from Dock Area to Easterly End of Cabin

Reference Mark #3 (RM3)
Latitude: 45°26'53.079" Longitude: 92°08'33.094" Reference Mark Type:
Mean Sea Level Yes ☑ No ☐ Elevation: 1217.205 Photograph ☑
Location Description: Highest Point of a 3'x2' Boulder on Point @ Northeast corner of Yard

Staff Gauge
Latitude: 45°26'53.657 Longitude: 92°08'33.614" Mean Sea Level Yes ☑ No ☐ Elevation: 1211.94 Photograph ☑
Location Description: Staff Gauge is located on South Side of bench area of Dock on the on the Shore side of the Lounge Area @ End of Dock

Date: 10/11/2016 Time: 1210 AM (PM) Check one: Install ☐ Midseason ☐ Removal ☒

Survey Stage 1 – Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.78			
Height of Instrument (HI1)	1220.93	- Staff Gauge	8.99	= 1211.94
	HI1	- Ref Mark 2	3.31	= 1217.62
	HI1	- Ref Mark 3	3.72	= 1217.21

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.94 ←			
Back sight 2 (BS2)	+ 8.77			
Height of Instrument (HI2)	1220.71	- Ref Mark 1	3.56	= 1217.15
	HI2	- Ref Mark 2	3.08	= 1217.63
	HI2	- Ref Mark 3	3.50	= 1217.21

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: BS1 3.78 FS1 8.99
GE = CE2 BS2 + 8.77 FS2 + 3.56
12.55 = 12.55

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Calculated Elevation 1 = 1211.93

Lake Level Reading: 1213.29 ft

WATER FS 7.42

GAGE 1.36 10/11/2016 ventured into swans

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: POLK

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45-26-53.175" Longitude: 92-08-33.399" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.15 Photograph ☐
Location Description: Highest Point of 2nd Natural Rock Step leading uphill Easterly from Dock Area

Reference Mark #2 (RM2) Reference Mark Type:
Latitude: 45-26-53.165" Longitude: 92-08-33.6826 Mean Sea Level Yes ☑ No ☐ Elevation: 1217.62 Photograph ☐
Location Description: NW Corner of 1st Concrete Step above Concrete landing leading South from Dock Area to Easterly End of Cabin.

Reference Mark #3 (RM3) Reference Mark Type:
Latitude: 45-26-53.079" Longitude: 92-08-33.094" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.205 Photograph ☐
Location Description: Highest Point of 3'x2' Boulder on Point @ NE Corner of Yard

Staff Gauge
Latitude: 45-26-53.657" Longitude: 92-08-33.614" Mean Sea Level Yes ☑ No ☐ Elevation: 1211.92 Photograph ☐
Location Description: Staff Gauge is located on South Side of Bench Area of Dock on the Shore side of the Lounge Area @ End of Dock

Date: June 21, 2017 Time: 10:23 (AM)/PM Check one: Install ☑ Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.58			
Height of Instrument (HI1)	1220.73	- Staff Gauge	8.81	= 1211.92
	HI1	- Ref Mark 2	3.11	= 1217.62
	HI1	- Ref Mark 3	3.53	= 1217.20

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.92 ←			
Back sight 2 (BS2)	+ 8.44			
Height of Instrument (HI2)	1220.36	- Ref Mark 1	3.22	= 1217.14
	HI2	- Ref Mark 2	2.74	= 1217.62
	HI2	- Ref Mark 3	3.16	= 1217.20

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: BS1 3.58 FS1 8.81
GE = CE2 BS2 + 8.44 FS2 + 3.22
12.02 = 12.03

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

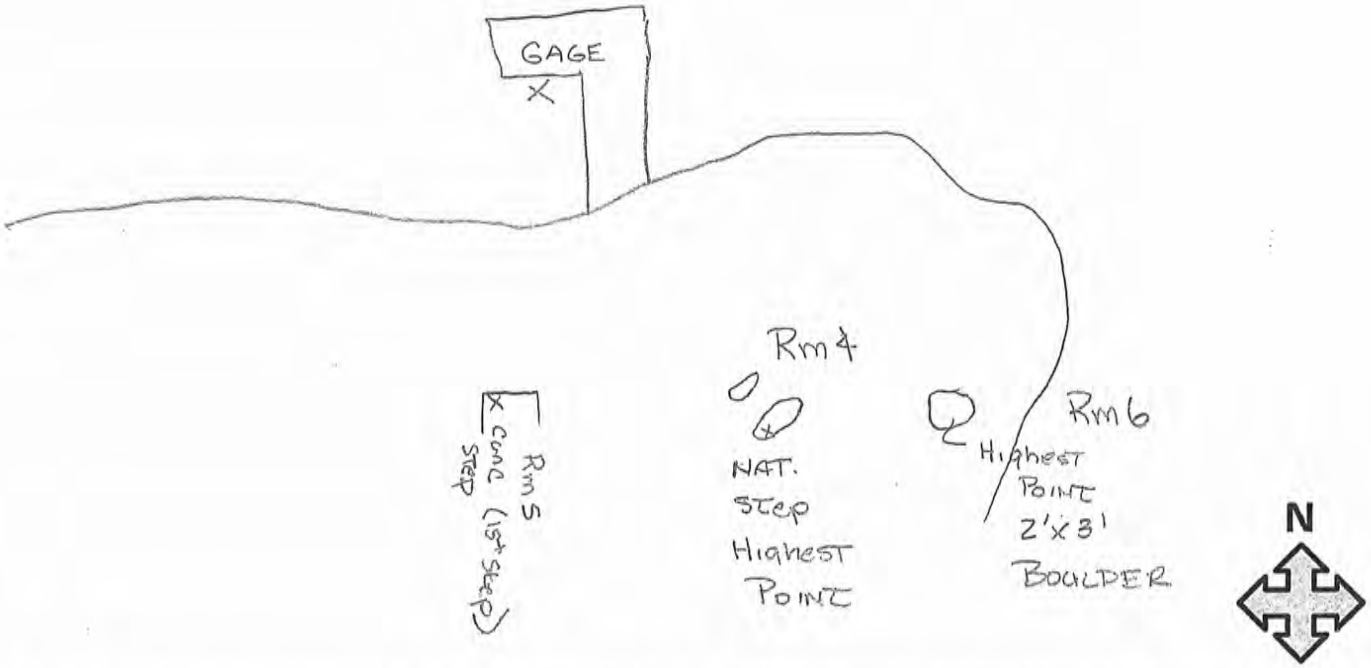
*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1.93 ft GAGE 1.93

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Site Diagram (including Staff Gauge and Reference Marks)



Notes

Data Management

Survey Data uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Photographs uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Data Sheet scan uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____

Equipment Maintenance

Replace bolts/screws on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace gauge plate on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace post or wooden board?	Yes ☐ No ☐	Date: _____	Name: _____

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: POLK/Barron

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type: _____

Latitude: 45-26-53.175 Longitude: 92-08-33.399 Mean Sea Level Yes ☑ No ☐ Elevation: 1217.15 Photograph ☐

Location Description: Highest Point of 2nd Natural Rock Step leading uphill Easterly from Dock Area

Reference Mark #2 (RM2) Reference Mark Type: _____

Latitude: 45-26-53.165 Longitude: 92-08-33.686 Mean Sea Level Yes ☑ No ☐ Elevation: 1217.62 Photograph ☐

Location Description: NW Corner of 1st Concrete Step above Concrete Landing leading South from dock area to Easterly end of Cabin

Reference Mark #3 (RM3) Reference Mark Type: _____

Latitude: 45-26-53.079 Longitude: 92-08-33.094 Mean Sea Level Yes ☑ No ☐ Elevation: 1217.205 Photograph ☐

Location Description: Highest Point of 3'x2' Boulder on Point @ NE Corner of Yard

Staff Gauge

Latitude: 45-26-53.657" Longitude: 92-08-33.614" Mean Sea Level Yes ☑ No ☐ Elevation: 1211.92 Photograph ☐

Location Description: Staff Gauge is located on South Side of Bench Area of Dock on the Shore Side of the Lounge Area @ End of Dock.

Date: 10/17/2017 Time: 10:30 (AM)/PM Check one: Install ☐ Midseason ☐ Removal ☑

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.62			
Height of Instrument (HI1)	1220.77	- Staff Gauge	8.85	= 1211.92
	HI1	- Ref Mark 2	3.15	= 1217.62
	HI1	- Ref Mark 3	3.56	= 1217.21

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.92 ←			
Back sight 2 (BS2)	+ 8.54			
Height of Instrument (HI2)	1220.46	- Ref Mark 1	3.32	= 1217.14
	HI2	- Ref Mark 2	2.84	= 1217.62
	HI2	- Ref Mark 3	3.26	= 1217.20

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1:	BS1	3.62	FS1	8.85
GE = CE2	BS2 +	8.54	FS2 +	3.32
		12.16	=	12.17

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

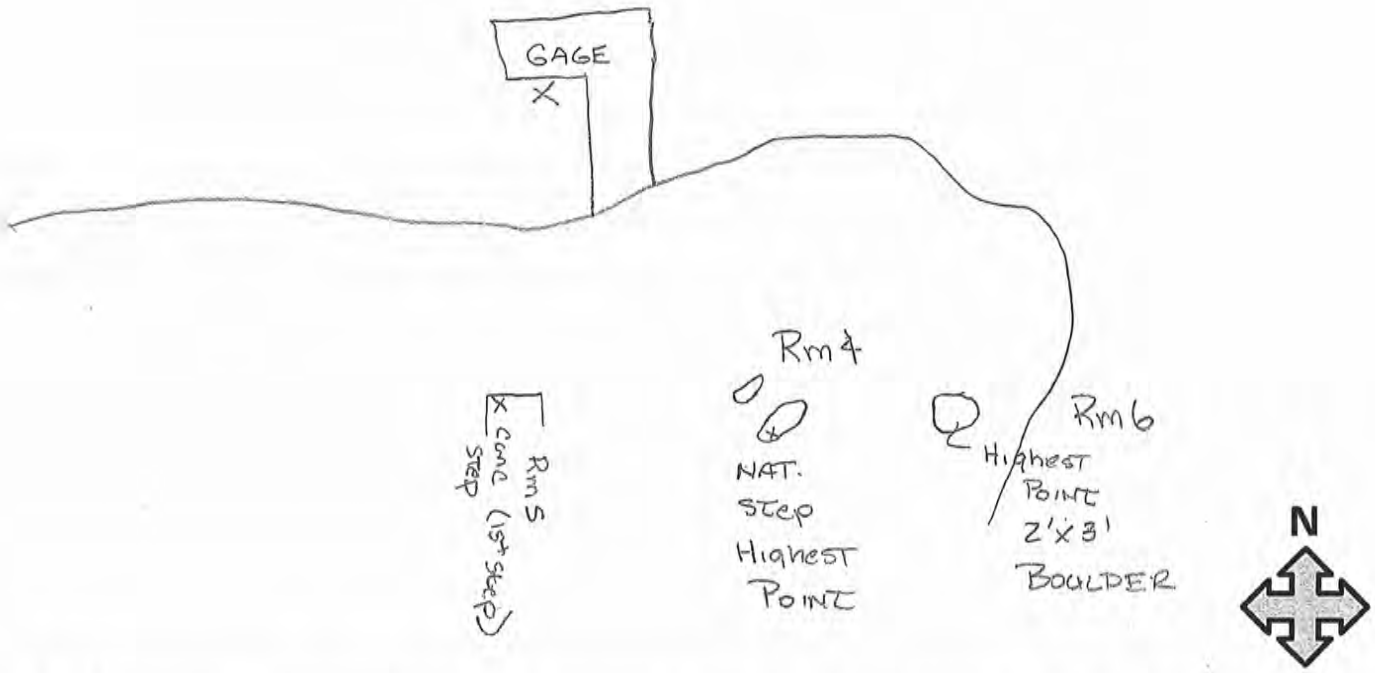
*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1.41 ft

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Site Diagram (including Staff Gauge and Reference Marks)



Notes

Data Management

Survey Data uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Photographs uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Data Sheet scan uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____

Equipment Maintenance

Replace bolts/screws on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace gauge plate on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace post or wooden board?	Yes ☐ No ☐	Date: _____	Name: _____

SWIMS 2/27/19

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: Horseshoe Lake County: Pol/K/Barron

Data Collectors

Primary Data Collector | Email | Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°26'53.175" Longitude: 92°08'33.399" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.15" Photograph ☑
Location Description: Highest Point of 2nd Natural Rock Step leading uphill Easterly from Dock Area.

Reference Mark #2 (RM2) Reference Mark Type:
Latitude: 45°26'53.165" Longitude: 92°08'33.686" Mean Sea Level Yes ☑ No ☐ Elevation: 1217.62 Photograph ☑
Location Description: NW Corner of 1st Concrete step above concrete landing leading South From Dock Area to Easterly end of Cabin

Reference Mark #3 (RM3) Reference Mark Type:
Latitude: 45°26'53.079" Longitude: 92°08'33.094" Mean Sea Level Yes ☐ No ☐ Elevation: 1217.205' Photograph ☑
Location Description: Highest Point of a 3'x2' Boulder on Point @ NE Corner of Yard

Staff Gauge
Latitude: 45°26'53.657" Longitude: 92°08'33.614" Mean Sea Level Yes ☑ No ☐ Elevation: 1211.94' Photograph ☑
Location Description: Staff Gauge is located on South Side of bench area of Dock on the shore side of the Lounge Area @ End of Dock

Date: 6-4-2018 Time: 10:45 (AM)/PM Check one: Install ☑ Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.51			
Height of Instrument (HI1)	1220.66	- Staff Gauge	8.04	= 1212.62
	HI1	- Ref Mark 2	3.03	= 1217.63
	HI1	- Ref Mark 3	3.45	= 1217.21

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1212.62 ←			
Back sight 2 (BS2)	+ 8.34			
Height of Instrument (HI2)	1220.96	- Ref Mark 1	3.82	= 1217.14
	HI2	- Ref Mark 2	3.34	= 1217.62
	HI2	- Ref Mark 3	3.76	= 1217.20

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: BS1 3.51 FS1 8.04
GE = CE2 BS2 + 8.34 FS2 + 3.82
11.85 = 11.86

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1213.73 ft

2ND HI – FS WATER – 7.23

GAGE 1.14

Calculated Elevation 1 = 1212.59

Swims C2 3/10/2020 Signed 3/23/2020

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: Polk

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:

Latitude: 45°26'53.175" Longitude: 92°08'33.399" Mean Sea Level Yes ☒ No ☐ Elevation: 1217.15 Photograph ☐

Location Description: Highest Point of 2nd Natural Rock Step leading uphill Easterly from Dock Area

Reference Mark #2 (RM2) Reference Mark Type:

Latitude: 45°26"53.165' Longitude: 92°08'33.686" Mean Sea Level Yes ☒ No ☐ Elevation: 1217.62 Photograph ☐

Location Description: NW Corner of 1st Concrete step above concrete landing leading South From Dock Area to Easterly end of Cabin.

Reference Mark #3 (RM3) Reference Mark Type:

Latitude: 45°26'53.079" Longitude: 92°08'33.094" Mean Sea Level Yes ☒ No ☐ Elevation: 1217.20 Photograph ☐

Location Description: Highest Point of a 3'x2' Boulder on Point @ NE Corner of Yard

Staff Gauge

Latitude: 45°26'53.657" Longitude: 92°08'33.614" Mean Sea Level Yes ☒ No ☐ Elevation: 1212.21' Photograph ☐

Location Description: Staff Gage is located on South Side of bench area of Dock on the shore side of the Lounge Area @ end of Dock

Date: [illegible]/19 Time: 1:30 AM/PM Check one: Install ☒ Midseason ☐ Removal ☐

Survey Stage 1 – Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1217.15			
Back sight 1 (BS1)	+ 3.88			
Height of Instrument (HI1)	1221.03	- Staff Gauge	8.82	= 1212.21
	HI1	- Ref Mark 2	3.40	= 1217.63
	HI1	- Ref Mark 3	3.83	= 1217.20

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1212.21 ←			
Back sight 2 (BS2)	+ 8.54			
Height of Instrument (HI2)	1220.75	- Ref Mark 1	3.60	= 1217.15
	HI2	- Ref Mark 2	3.17	= 1217.63
	HI2	- Ref Mark 3	3.55	= 1217.20

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: GE = CE2

BS1 3.88 FS1 8.82
BS2 + 8.54 FS2 + 3.60
12.42 = 12.42

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 2.02 ft

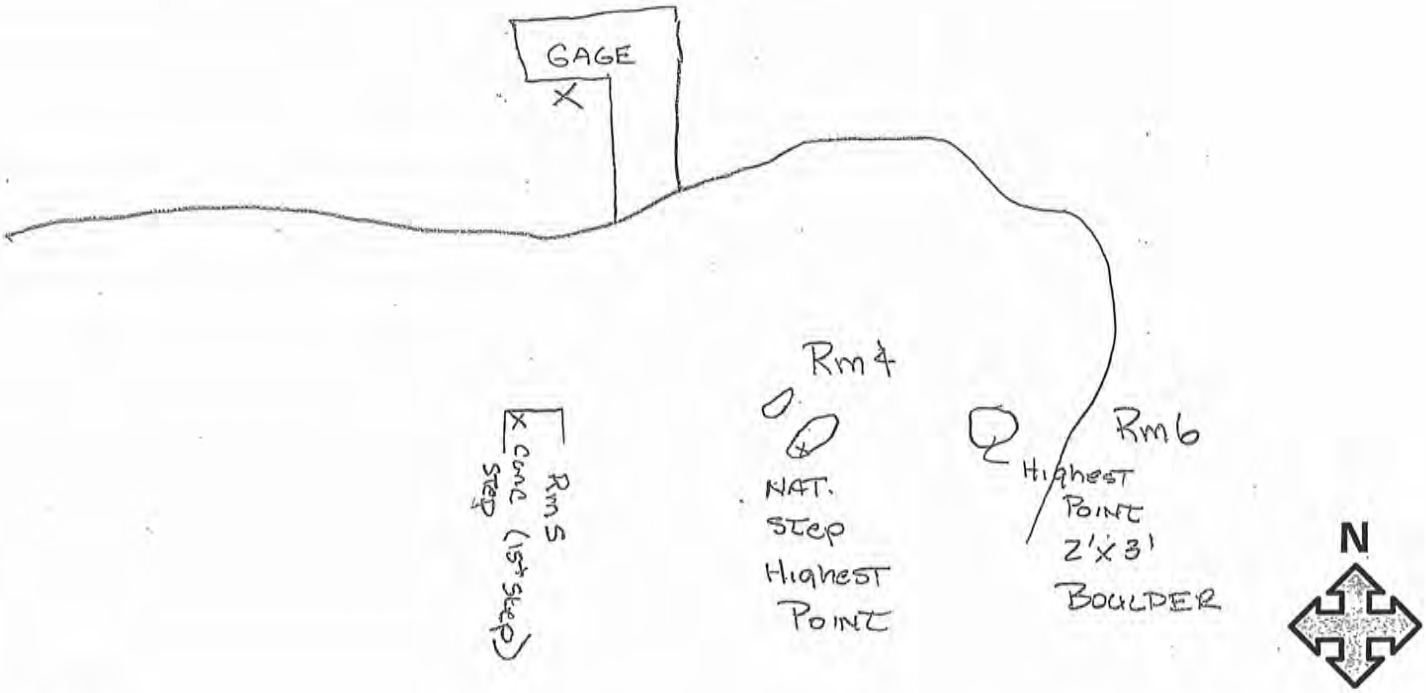
Calculated Elevation 1 = 1212.2

WATER - 6.53 - 1214.27 - ELEV

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Site Diagram (including Staff Gauge and Reference Marks)



Notes

Data Management

Survey Data uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Photographs uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Data Sheet scan uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____

Equipment Maintenance

Replace bolts/screws on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace gauge plate on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace post or wooden board?	Yes ☐ No ☐	Date: _____	Name: _____

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: POLK

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s): SWIMS 1/22/2021

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°-26'-07.474" Longitude: 92°-09'-42.162" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.09 Photograph ☐
Location Description: PK NAIL IN Top of 1' DIAMETER Stump 10' Easterly of Shoreline

Reference Mark #2 (RM2) Reference Mark Type:
Latitude: 45°-26'-07.280" Longitude: 92°-09'-42.264" Mean Sea Level Yes ☒ No ☐ Elevation: 1220.41 Photograph ☐
Location Description: PK NAIL IN Top of 6"x6" Retaining WALL ON Easterly side of 14" OAK, 10' E. of Lake

Reference Mark #3 (RM3) Reference Mark Type:
Latitude: 45°-26'-07.128" Longitude: 92°-09'-42.386" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.01 Photograph ☐
Location Description: Bottom STAIR of Stairway to Lower DECK IN Front of Bottom post of HAND RAIL

Staff Gauge
Latitude: 45°-26'-07.609" Longitude: 92°-09'-42.297" Mean Sea Level Yes ☒ No ☐ Elevation: 1211.80 Photograph ☐
Location Description: Northerly of Northern Dock, Bottom BOLT on FACE of GAUGE

Date: 7/15/2020 Time: 9:25 AM/PM Check one: Install ☒ Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1218.09			
Back sight 1 (BS1)	+ 4.15			
Height of Instrument (HI1)	1222.24	- Staff Gauge	10.44	= 1211.80
	HI1	- Ref Mark 2	1.83	= 1220.41
	HI1	- Ref Mark 3	4.23	= 1218.01

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.80 ←			
Back sight 2 (BS2)	+ 11.01			
Height of Instrument (HI2)	1222.81	- Ref Mark 1	4.73	= 1218.08
	HI2	- Ref Mark 2	2.41	= 1220.40
	HI2	- Ref Mark 3	4.80	= 1218.01

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: BS1 4.15 FS1 10.44
GE = CE2: BS2 + 11.01 FS2 + 4.73
15.16 = 15.17

Calculated Elevation 1 = 1211.78

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 If QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1.93 ft

WATER ELEV 1213.71

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

10/20/2020 9:20 AM

Lake Information

Lake Name: HORSESHOE LAKE County: POLK

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s) 45.43541 92.16171 SWIMS 1/23/2021

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°-26'-07.474" Longitude: 92°-09'-42.162" Mean Sea Level Yes [X] No [ ] Elevation: 1218.09 Photograph [ ]
Location Description: PK NAIL IN Top of 1' DIAMeter Stump 10' Easterly of Shoreline

Reference Mark #2 (RM2) 92.16177 Reference Mark Type:
Latitude: 45°-26'-07.280" Longitude: 92°-09'-42.264" Mean Sea Level Yes [X] No [ ] Elevation: 1220.41 Photograph [ ]
Location Description: PK NAIL IN Top of 6" x 6" Retaining WALL ON Easterly Side of 14" OAK

Reference Mark #3 (RM3) 92.16177 Reference Mark Type:
Latitude: 45°-26'-07.128" Longitude: 92°-09'-42.386" Mean Sea Level Yes [X] No [ ] Elevation: 1218.01 Photograph [ ]
Location Description: Bottom STAIR OF Stairway to Lower DECK IN Front of Bottom post of HAND RAIL

Staff Gauge 92.16175
Latitude: 45°-26'-07.609" Longitude: 92°-09'-42.297" Mean Sea Level Yes [X] No [ ] Elevation: 1211.80 Photograph [ ]
Location Description: Northerly of Northern Dock, Bottom BOLT on FACE OF GAUGE

45.43536 45.43531 45.43545

Date: / / Time: AM/PM Check one: Install [ ] Midseason [ ] Removal [ ]

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1218.09			
Back sight 1 (BS1)	+ 5.83			
Height of Instrument (HI1)	1223.92	- Staff Gauge	12.09	= 1211.83
	HI1	- Ref Mark 2	3.48	= 1220.44
	HI1	- Ref Mark 3		=

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1211.83 ←			
Back sight 2 (BS2)	+ 11.87			
Height of Instrument (HI2)	1223.70	- Ref Mark 1	5.61	= 1218.09
	HI2	- Ref Mark 2	3.25	= 1220.45
	HI2	- Ref Mark 3		=

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks

Reference Mark 1: GE = CE2

BS1 5.83 FS1 12.09
BS2 + 11.87 FS2 + 5.61
17.70 = 17.70

Calculated Elevation 1 1211.81

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 If QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1.92 ft

WATER 9.97 1213.73

BM Covered up By Dock

BOLT ON FACE

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

7/1/2021

Lake Information

Lake Name: HORSESHOE LAKE

County: POLK

Data Collectors

Primary Data Collector: ____ Email: ____ Phone No. ( ) -

Additional Data Collector(s): 45.435409 -92.161709

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:

Latitude: 45-26'-07.474" Longitude: 92-09'-42.152" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.09 Photograph ☐

Location Description: PK NAIL IN TOP OF 1' DIAMETER STUMP 10' Easterly of ShoreLine -92.16174

Reference Mark #2 (RM2) 45.435356 Reference Mark Type:

Latitude: 45-26'-07.280" Longitude: 92-09-42.264 Mean Sea Level Yes ☒ No ☐ Elevation: 1220.41 Photograph ☐ Δ.04

Location Description: PK NAIL IN TOP OF 6"x6" RETAINING WALL ON Easterly Side of 14" OAK

Reference Mark #3 (RM3) 45.435313 Reference Mark Type: -92.161774

Latitude: 45-26'-07.128" Longitude: 92-09'-42.386" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.01 Photograph ☐ Δ.04

Location Description: Bottom STAIR OF StairWAY to Lower DECK IN Front of Bottom post of HAND RAIL

Staff Gauge 45.435447 -92.161749

Latitude: 45-26'-07.609" Longitude: 92-09'-42.297" Mean Sea Level Yes ☒ No ☐ Elevation: 1212.16 (2021) 1211.80 (2020) Photograph ☐

Location Description: Northerly of NortherN Dock, Bottom BOLT on FACE of GAUGE

Date: 7/1/21 Time: 7:00 AM/PM Check one: Install ☒ Midseason ☐ Removal ☐

Survey Stage 1 – Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1218.09			
Back sight 1 (BS1)	+ 3.45			
Height of Instrument (HI1)	1221.54	- Staff Gauge	9.38	= 1212.16
	HI1	- Ref Mark 2	1.08	= 1220.46
	HI1	- Ref Mark 3	3.49	= 1218.05

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1212.16			
Back sight 2 (BS2)	+ 9.14			
Height of Instrument (HI2)	1221.30	- Ref Mark 1	3.21	= 1218.09
	HI2	- Ref Mark 2	.85	= 1220.45
	HI2	- Ref Mark 3	3.26	= 1218.04

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Swift

Quality Assurance Checks

Reference Mark 1:
GE = CE2

BS1 3.45	FS1 9.38
BS2 + 9.14	FS2 + 3.21
12.59	= 12.59

QA Equations:
Calculated Elevation 1 = $BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
1212.14
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 1.11 ft

WATER ① 8.28 1213.26 WATER ② 8.06 1212.24

BOLT on FACE

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

9/23/2021 9:16AM

Lake Information

Lake Name: HORSESHOE LAKE County: POLK

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s) 45.43540949 92.16254222

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°-26'-07.474" Longitude: 92°-09'-42.152" Mean Sea Level Yes [X] No [ ] Elevation: 1218.09 Photograph [ ]
Location Description: PK NAIL IN TOP OF 1' DIAMETER STUMP 10' Easterly of Shoreline -92.16174000

Reference Mark #2 (RM2) 45.43535611 Reference Mark Type:
Latitude: 45°-26'-07.280" Longitude: 92°-09'-42.264" Mean Sea Level Yes [X] No [ ] Elevation: 1220.41 Photograph [ ]
Location Description: PK NAIL IN TOP OF 6"x6" Retaining WALL ON Easterly side of 14" OAK 92.16177357

Reference Mark #3 (RM3) 45.43531333 Reference Mark Type:
Latitude: 45°-26'-07.128" Longitude: 92°-09'-42.386" Mean Sea Level Yes [X] No [ ] Elevation: 1218.01 Photograph [ ]
Location Description: Bottom STAIR OF Stairway to Lower DECK IN Front of Bottom post of HAND RAIL

Staff Gauge 45.43544694 92.16174917 1212.16 (2021) 1211.80 (2020)
Latitude: 45°-26'-07.609" Longitude: 92°-09'-42.297" Mean Sea Level Yes [X] No [ ] Elevation: ____ Photograph [ ]
Location Description: Northerly of Northern Dock, Bottom BOLT on FACE of GAUGE

Date Time AM/PM Check one: Install [ ] Midseason [X] Removal [ ]

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1218.09			
Back sight 1 (BS1)	+ 4.15			
Height of Instrument (HI1)	1222.24	- Staff Gauge	10.08	= 1212.16
	HI1	- Ref Mark 2	1.79	= 1220.45
	HI1	- Ref Mark 3	4.19	= 1218.05

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 - Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1212.16			
Back sight 2 (BS2)	+ 9.93			
Height of Instrument (HI2)	1222.09	- Ref Mark 1	4.01	= 1218.08
	HI2	- Ref Mark 2	1.64	= 1220.45
	HI2	- Ref Mark 3	4.04	= 1218.05

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks

Reference Mark 1: GE = CE2

BS1 4.15 FS1 10.08
BS2 + 9.93 FS2 + 4.01
14.08 = 14.09

Calculated Elevation 1 = 1212.145

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 0.70 ft

WATER 1st 9.40 1212.84 WATER 2ND 9.24 1212.85

TOP OF BOARD

8:30AM

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

8/4/2022

Lake Information

Lake Name: HORSESHOE LAKE

County: POLK

Data Collectors

Primary Data Collector | Email | Phone No. ( )

Additional Data Collector(s)

45.435409
-92.161709

Reference Mark and Staff Gauge

Reference Mark #1 (RM1)

Latitude: 45°-26'-07.474" Longitude: 92°-09'-42.152" Reference Mark Type: | Mean Sea Level Yes ☒ No ☐ Elevation: 1218.09 | Photograph ☐

Location Description: PK NAIL IN Top of 1' DIAMETER Stump 10' Easterly of Shoreline

Reference Mark #2 (RM2)

Latitude: 45°-26'-07.280" Longitude: 92°-09'-42.264" M... | on: 1220.41 | Photograph ☐

Location Description: PK NAIL IN T... ON Easterly side of 14' ... etaining WALL

45.435356
-92.16174

Reference Mark #3 (RM3)

Latitude: 45°-26'-07.128" Longitude: 92°-09'-42.386" ... Mark Type: | tion: 1218.01 | Photograph ☐

Location Description: Bottom STAIR o... Front of Bottom po... ower DECK IN

45.435313
92.161774

Staff Gauge

Latitude: 45-26-07.609 Longitude: 92°-09'-42.297 ... Elevatio... | Photograph ☐

Location Description:

45.435447
-92.161749

Date: 8/4/2022 Time: 8:30 AM/PM | Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})2	1220.41			TOP OF BOARD
Back sight 1 (BS1)	+ 0.26	Rm 2		
Height of Instrument (HI1)	1220.67	- Staff Gauge	5.12	= 1215.55
	HI1	- Ref Mark 2		=
	HI1	- Ref Mark 3	2.70	= 1217.97

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 – Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1215.55 ←			
Back sight 2 (BS2)	+ 5.02			
Height of Instrument (HI2)	1220.57	- Ref Mark 1		=
	HI2	- Ref Mark 2	0.16	= 1220.41
	HI2	- Ref Mark 3	2.60	= 1217.97

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1: GE = CE2

BS1 0.26 FS1 5.12
BS2 + 5.02 FS2 + 0.16
5.28 = 5.28

Calculated Elevation 1 = 1211.67

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

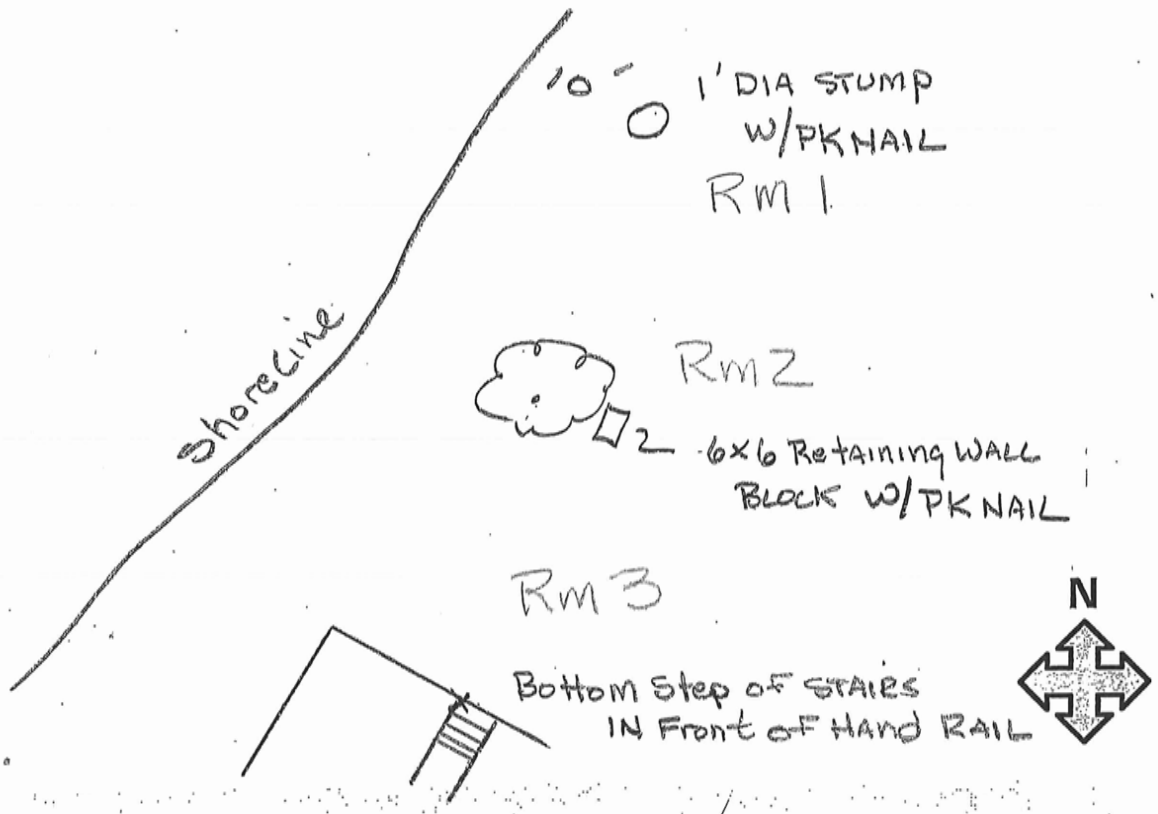
Lake Level Reading: 0.93 ft

WATER 8.06 1212.61 7.98 1212.59

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Site Diagram (including Staff Gauge and Reference Marks)



Notes

Data Management

Survey Data uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Photographs uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____
Data Sheet scan uploaded to SWIMS?	Yes ☐ No ☐	Date: _____	Name: _____

Equipment Maintenance

Replace bolts/screws on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace gauge plate on staff gauge?	Yes ☐ No ☐	Date: _____	Name: _____
Replace post or wooden board?	Yes ☐ No ☐	Date: _____	Name: _____

Top of Board
10/4/2022
932 AM

Wisconsin DNR – Lake Level Monitoring

Staff Gauge Survey Data Sheet

Lake Information

Lake Name: HORSESHOE LAKE County: POLK

Data Collectors

Primary Data Collector Email Phone No. ( ) -

Additional Data Collector(s)

Reference Mark and Staff Gauge Information

Reference Mark #1 (RM1) Reference Mark Type:
Latitude: 45°-26'-07.474" Longitude: 92°-09'-42.162" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.09 Photograph ☐
Location Description: PK NAIL IN Top of 1' Diameter Stump 10' Easterly of Shoreline Destroyed

Reference Mark #2 (RM2) Reference Mark Type:
Latitude: 45°-26'-07.280" Longitude: 92°-09'-42.264" Mean Sea Level Yes ☒ No ☐ Elevation: 1220.41 Photograph ☐
Location Description: PK NAIL IN Top of 6"x6" Retaining WALL ON Easterly Side of 14" OAK

Reference Mark #3 (RM3) Reference Mark Type:
Latitude: 45°-26'-07.128" Longitude: 92°-09'-42.386" Mean Sea Level Yes ☒ No ☐ Elevation: 1218.01 Photograph ☐
Location Description: Bottom STAIR OF Stairway to Lower DECK IN Front of Bottom post of HAND RAIL

Staff Gauge
Latitude: 45°-26'-07.609" Longitude: 92°-09'-42.297" Mean Sea Level Yes ☒ No ☐ Elevation: _____ Photograph ☐
Location Description:

Date: Time: AM/PM Check one: Install ☐ Midseason ☐ Removal ☐

Survey Stage 1 - Instrument at first height*

	Reference Mark 1		Fore sight (FS1)	Calculated Elevation (CE1)
Given Elevation (GE_{RM1})	1220.41			
Back sight 1 (BS1)	+ 1.49			
Height of Instrument (HI1)	1221.90	- Staff Gauge	6.34	= 1215.56
	HI1	- Ref Mark 2		=
	HI1	- Ref Mark 3	3.91	= 1217.99

Survey Equations:
$HI1 = GE_{RM1} + BS1$
$CE1 = HI1 - FS1$

Survey Stage 2 - Reset instrument at different height

	Staff Gauge		Fore sight (FS2)	Calculated Elevation (CE2)
Calculated Elevation1	1215.56 ←			
Back sight 2 (BS2)	+ 6.53	- Ref Mark 1		=
Height of Instrument (HI2)	1222.09 HI2	- Ref Mark 2	1.69	= 1220.40
	HI2	- Ref Mark 3	4.10	= 1217.99

Survey Equations:
$HI2 = CE_{SG1} + BS2$
$CE2 = HI2 - FS2$

Quality Assurance Checks:

Reference Mark 1:
GE = CE2

BS1 1.49 FS1 6.34
BS2 + 6.53 FS2 + 1.69
8.02 = 8.03

Calculated Elevation 1 = 1211.66

QA Equations:
$BS1 + BS2 = FS1_{SG} + FS2_{RM1}$
$GE_{RM1} = CE2_{RM1}$

*Accept Survey Stage 1 if QA checks within 0.01 ft. Use calculated elevations 1 for the rest of the season unless the gauge moves.

Lake Level Reading: 0.61 ft

WATER 1212.27

WATER 9.62 1212.28 9.83 1212.26

8-27-2015

LEUEL From Bm Horseshoe
To Rm 1 (Rock)

STA	BS		FS	
Bm Horseshoe	1.14	1227.67		1226.53
			12.01	1215.66
	4.90	1220.56		
Rm 3			1.74	1218.82
Rm 2			8.18	1212.38
Rm 1			6.26	1214.30
	5.95	1220.25		
			4.48	1215.77
	11.54	1227.31		
Bm Horseshoe			.79	1226.52
	23.53		23.54	Δ.01

24" OAK

Conc Corner GPS (1212.50)

Rock. GPS (1214.36)

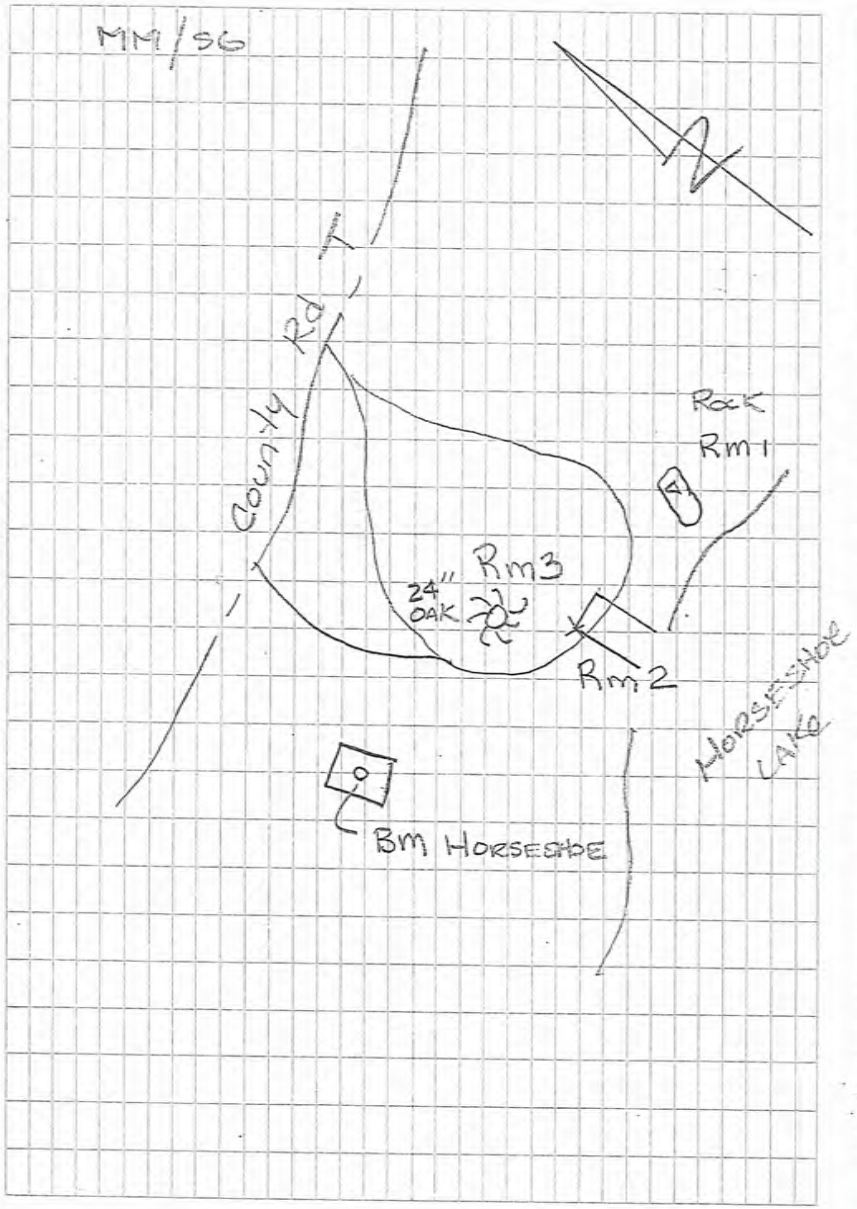
HORSESHOE LAKE 8-26-2015

Rm 1 - LARGE BOULDER Easterly of LANDING Triangle chipped IN BOULDER at Highest Point

Rm 2 - NWLY Corner of SLOCLED Concrete LANDING (PRECAST Conc.)

Rm 3 - Gin Spike on East Side of 24" W.OAK on Edge of Drive, NWLY of LANDING

Bm HORSESHOE - 5" DIAMeter Steel plate on IRON pipe up 6" from 5'8"x6' Concrete SLAB Southerly of Southerly Entrance to public LANDING



8-27-2015

STA	BS	FS
GPS	7.80	
		3.54
	6.71	
		3.70
	6.25	
		3.78
	4.98	
		4.97
	4.25	
		4.67
	3.70	
		5.10
	4.31	
		4.79
	3.54	
		5.34
	3.50	
		6.56
	2.10	
		8.44
	1.57	
		6.24

LEVEL Run From GPS Beaver NE To BM Horseshoe

GPS Mon Beaver NE (407)

STA	BS		FS		
	5.23				
			3.81		
	7.94				
			3.36		
	3.97				
			5.85		
	1.13				
			7.95		
	6.23				
			0.33		INV.
INV.	6.57				
BM			3.17		
	79.78		81.60		
	FWD	DE =	-1.82		

CULVERT PIPE

BM CAPPED PIPE BM HORSESHOE

STA	BS	FS
Bm	2.91	
		6.32
	0.84	
		6.73
	8.07	
		1.24
	6.29	
		4.42
	3.36	
		7.95
	3.66	
		5.08
	6.21	
		1.54
	8.42	
		2.09
	6.62	
		3.55
	5.16	
		3.36
	4.80	

Bm INV Capped Pipe Bm Horseshoe

STA	BS		FS
			4.32
	5.34		
			3.95
	4.67		
			4.24
	4.73		
			4.73
	3.53		
			5.99
	3.62		
			6.63
	3.31		
GPS			7.57
	81.54		79.71

Bck DE = +1.83
FWD DE = -1.82
Δ .01
MN DE = -1.825

Beaver NE <407> 1228.352'
Geoid03 NAVD88

1228.352
- 1.825
1226.527 Bm Horse Shoe