

City of Stockton Municipal Utilities Department (MUD)  
Delta Water Supply Intake Pump Station  
Monitoring Field Survey Report



May 2023  
Prepared By:  
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May 2023**

**Introduction**

Kjeldsen, Sinnock & Neudeck, Inc., (KSN), was retained by the City of Stockton to provide surveying services at the Delta Water Supply Intake Pump Station Facility, located on Empire Tract, in San Joaquin County. The services included recovering and surveying features observed by KSN in March of 2021 and setting new points for future observations.

**Observations**

The following table identifies the points from KSN’s March 2021 survey, which were recovered and observed as part of the requested services.

<b>2021 Survey Coordinates and Elevations</b>				
<b>Point Number</b>	<b>Description</b>	<b>Northing</b>	<b>Easting</b>	<b>Elevation</b>
11105 (105)	CHISLED SQUARE WITH +	2204025.51	6274881.47	13.263
11118	TOP CENTERLINE OF OLD PIPE FLANGE NO PAINT OR PUNCH FOUND	2204034.02	6274849.80	6.813
11031	UNDER NEW I BEAM - LOCATED TOP CENTERLINE OF NEW PIPE FLANGE AT SAME ELEVATION	2204031.97	6274825.06	10.543
11034	TOP CENTERLINE OF OLD PIPE FLANGE NO PAINT OR PUNCH FOUND	2204031.55	6274818.80	8.858
11044	PAINT MARK TOP OF PIPE IN VAULT	2204028.69	6274795.62	8.189
11107	PAINT MARK AT TOP CORNER WALL FOUNDATION	2204018.98	6274781.27	13.502
11104	SCRIBED + ON CONCRETE DOWN 0.5 FEET IN NEW GRAVEL RAMP	2204016.59	6274797.33	13.240
11108	TOP OF WALL FOUNDATION NO PAINT OR MARKS	2204015.38	6274748.24	12.268

A field survey was initiated by KSN on May 2, 2023, and completed with a follow up site visit on May 17, 2023. The primary survey control established during KSN’s 2021 survey was utilized and included control points 106, 111, 502, 503, 11109, and 11110. The field activities included coordinating access to the site; search and recovery of features identified in the March 2021 survey performed by KSN; setting new points for future use; and observations of the survey control points and features.

**Control and Field Procedures**

The horizontal coordinates for control points 106, 111, 502, 503, 11109, and 11110 from KSN’s March 2021 survey were held fixed for horizontal control. The record elevation for control point 11105 (105) was held as the point of reference for vertical control. This point was also used as the controlling benchmark for KSN’s 2021 survey, and the previous surveys performed by others in 2013.

A Trimble S6 3-second total station was used for conventional observations. Survey control was verified at each station setup by checking the existing primary survey control. All monitoring points (existing or new) were directly observed from control point 106, 111, or 11109. Observations were given a 10,000 series

point name offset from the 2021 surveyed point numbers (i.e. 11000 (2021 survey) is 21000 (2023 survey)). The primary control point numbers remained unchanged from the 2021 survey.

Elevations were referenced to the historic elevation at control point 105 (13.263'), from which a closed level loop was performed with a Trimble Dini digital level. The digital level loop closed within 0.007' and included points 502, 11109, 11110, 21104, 604, 605, 606, 607, 608, 609, 610, 611, 612, 613, 614, 615, 21105 (105), 106 and 503. Benchmark 105 was selected because it is the reference benchmark used for previous surveys and it is located on the slab of the pump station structure. The adjusted elevations from the closed level loop were assigned to the primary project survey control points (106, 502, 503, 11109 and 11110). The table below shows a comparison between the 2021 elevations and the 2023 adjusted elevations on the primary control points. Also included are check observations at two USACE benchmarks on the pump station slab. Note, this assumes that the pump station reference benchmark (105) is not moving.

Primary Survey Control						
Point Number	2021 Northing	2021 Easting	2023 Elevation	Description	2021 Elevation	Change 2021 to 2023
105	2204025.51	6274881.47	13.263	FOUND CHISLED SQUARE	13.263	0.000
106	2204050.27	6274931.17	10.427	120D SPIKE WITH PUNCH	10.537	-0.110
111	2203980.86	6274413.32	9.467	EMPIRE 1997 RESET 2012	9.589	-0.122
502	2204460.95	6274110.88	9.176	SET REBAR AND CAP KSN CONTROL	9.327	-0.151
503	2204009.36	6275215.86	9.369	SET REBAR AND CAP KSN CONTROL	9.436	-0.067
11109	2204035.64	6274734.74	11.066	120D SPIKE WITH PUNCH	11.172	-0.106
11110	2204009.26	6274592.49	10.465	120D SPIKE WITH PUNCH	10.594	-0.129
*601	2204008.71	6274882.96	13.740	FOUND BDISK USACE 5105I	13.74	0.00
*602	2204019.09	6274824.35	13.684	FOUND BDISK USACE 5105H	13.68	0.00

\*Check to USACE Benchmarks not included in level loop; these were observed with a conventional setup.

The final comparative observations for this survey are listed in the table below and show the horizontal and vertical deviations between 2021 and 2023 at the eight (8) monitoring locations. Note the difference at 21107. This point is a mark on the wall foundation, which we observed on May 2<sup>nd</sup> and again on May 17<sup>th</sup>. There is no visual indication that movement has occurred at this point since the 2021 observation. No other unexpected results were identified.

May 2023 Observations					March 2021 vs. May 2023		
Point Number	Description	Northing	Easting	Elevation	dN	dE	dZ
21105 (105z)	FOUND CHISLED SQUARE	2204025.54	6274881.51	13.263	0.03	0.04	0.00
21118	TOP OF FLANGE	2204033.97	6274849.84	6.711	-0.05	0.04	-0.10
21031	TOP OF FLANGE	2204032.01	6274825.37	10.543	0.04	0.31	0.00
21034	TOP OF FLANGE	2204031.56	6274818.73	8.759	0.01	-0.07	-0.10
21044	TOP OF FLANGE	2204028.58	6274795.63	8.077	-0.11	0.01	-0.11
21107	MARK ON WALL	2204018.93	6274781.27	12.576	-0.05	0.00	-0.93
21104	BM ON SLAB	2204016.61	6274797.35	13.241	0.02	0.02	0.00
21108	MARK ON WALL	2204015.37	6274748.18	12.143	-0.01	-0.06	-0.13

\*See enclosures for additional information.



**Results and Conclusions**

Prior to the final adjustment, an attempt was made to utilize the 2021 elevation on 111 as the vertical point of reference for this survey. This was considered because all control checks to 111 were acceptable and the point is located away from the pump station; it was perceived that 111 was a stable vertical control point. However, the results showed that the pump station slab would have lifted approximately 0.12' since the 2021 survey. This did not fit with our understanding of the pump station being constructed on piles, and we concluded that the survey control around the site must have settled following the 2021 survey, rather than the pump station slab rising. This conclusion resulted in the readjustment of the observations holding elevation 13.263' on control point 105, a chiseled square located on the pump station slab. The final comparison results between the 2021 and 2023 surveys, using 105 as the reference benchmark, are noted in the tables above. These results fit well with 21104 and the two USACE disks located on the pump station slab (601 and 602).

Twelve new locations were marked for future observations and two locations were observed at the west ramp of the facility. This information is shown on the attached exhibits V-102 and V-203 and the set control points are identified on the following table.

2023 New Observation Control Points				
Point Number	Description	Northing	Easting	Elevation
604	SET MAG NAIL	2204020.04	6274781.19	13.520
605	SET SCRIBE	2204021.50	6274793.84	13.569
606	SET MAG NAIL	2204023.75	6274811.71	13.513
607	SET SCRIBE	2204024.53	6274823.98	13.573
608	SET SCRIBE	2204027.73	6274827.06	11.412
609	SET SCRIBE	2204040.15	6274816.60	11.397
610	SET SCRIBE	2204029.85	6274840.03	11.685
611	SET SCRIBE	2204037.79	6274851.25	11.679
612	SET SCRIBE	2204025.73	6274855.20	11.651
613	SET SCRIBE	2204026.07	6274859.47	11.649
614	SET MAG NAIL	2204031.50	6274886.03	12.617
615	SET SCRIBE	2204003.37	6274888.94	13.751

**Survey Statement:**

This survey was prepared under my personal direction and supervision. The notes and data contained herein are true copies of the original.

KJELDTSEN, SINNOCK & NEUDECK, INC.

Kris F. Nehmer, PLS #8123





FILE SPEC: P:\2063\_Delta\_Water\_Supply\_Project\0030\_Intake\_PS\_Monitoring\07\_Survey\100\_Control\Exhibit\Holding-105\230525-Control.dwg  
 PLOT DATE: May 30, 2023 - 1:08pm



PRIMARY SURVEY CONTROL  
 OBSERVATIONS 2021 VS 2023  
 SET NEW MONITOR POINTS 2023

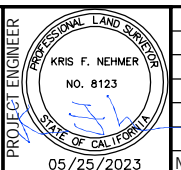
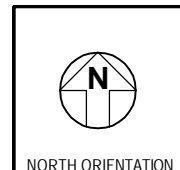
POINT	2021 NORTHING	2021 EASTING	2023 ELEVATION	DESCRIPTION	2021 ELEVATION	Change 2021 to 2023
105	2204025.51	6274881.47	13.263	FOUND CHISLED SQUARE	13.263	0.000
106	2204050.27	6274931.17	10.427	120D SPIKE WITH PUNCH	10.537	-0.110
111	2203980.86	6274413.32	9.467	EMPIRE 1997 RESET 2012	9.589	-0.122
502	2204460.95	6274110.88	9.176	SET REBAR AND CAP KSN CONTROL	9.327	-0.151
503	2204009.36	6275215.86	9.369	SET REBAR AND CAP KSN CONTROL	9.436	-0.067
11109	2204035.64	6274734.74	11.066	120D SPIKE WITH PUNCH	11.172	-0.106
11110	2204009.26	6274592.49	10.465	120D SPIKE WITH PUNCH	10.594	-0.129
* 601	2204008.71	6274882.96	13.747	FOUND BDISK USACE 5105I	13.740	0.007
* 602	2204019.09	6274824.35	13.699	FOUND BDISK USACE 5105H	13.684	0.015

\*CHECK TO USACE BENCHMARKS, THESE WERE NOT INCLUDED IN THE LEVEL LOOP AND VERIFIED WITH CONVENTIONAL SETUPS.  
 BASIS OF SURVEY CONTROL NOTE:  
 THIS HORIZONTAL SURVEY CONTROL IS BASED ON THE CALIFORNIA COORDINATE SYSTEM OF 1983, ZONE 3 (CCS83-Z3) SURVEY FEET UNITS, AND ALL COORDINATES ARE ASSUMED TO BE GRID. THE ORIGINAL COORDINATE SYSTEM MONITORING DETAILS WERE PREPARED OTHERS, BUT THE GRIDGROUND SCALE FACTOR, EPOCH DATE, AND VERTICAL DATUM WERE NOT PROVIDED TO KSN.  
 THE SURVEY CONTROL COORDINATES NOTED ABOVE, ARE THE BASIS OF HORIZONTAL CONTROL. ELEVATIONS IN THE TABLE ABOVE ARE UPDATED FROM KSN'S BASELINE 2021 SURVEY BASED ON AN ADJUSTED DIGITAL LEVEL LOOP PERFORMED BY KSN IN MAY OF 2023 HOLDING THE ELEVATION OF 9.589 AT CONTROL POINT 111 (EMPIRE 1997 RESET, 2012).

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SUBMITTAL	
%	Date

NOTE: BACKGROUND IMAGE IS INTENDED FOR INFORMATION ONLY AND MAY NOT ALIGN WITH SURVEYED FEATURES.



NO.	DESCRIPTION	DATE	APPR.

DESIGN BY KFN	DRAWING SCALE
DRAWN BY KFN	1"=40'
CHECK BY KFN	ORIGINAL DRAWING SCALE
HORIZONTAL DATUM CCS83, ZONE 3	0 1/2" 1"
VERTICAL DATUM N/A	

**KJELDEN S INNOCK NEUDECK inc.**  
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 916-403-5900

DELTA WATER SUPPLY INTAKE  
 CITY OF STOCKTON  
 MUNICIPAL UTILITIES DEPARTMENT  
 SETTLEMENT MONITORING  
 LOCAL SITE SURVEY CONTROL EXHIBIT

DATE MAY 2023
SHEET IDENTIFICATION <b>V-101</b>
SHEET 1 OF 3
KSN PROJECT FILE NO. 2063-0030



FILE SPEC: P:\2063\_Delta\_Water\_Supply\_Project\0030\_Intake\_PS\_Monitoring\07\_Survey\100\_Control\Exhibit\Holding-105\230525-Control.dwg  
 PLOT DATE: May 30, 2023 - 10:54am



2023 POINT	2023 NORTHING	2023 EASTING	2023 ELEVATION	DESCRIPTION	2021 ELEVATION	CHANGE 2021 to 2023
20001	2203970.58	6274619.37	13.034	GROUND TOP OF RAMP	N/A	N/A
20002	2203980.14	6274639.97	13.257	GROUND TOP OF RAMP	N/A	N/A
20003	2203980.16	6274640.76	13.507	CONCRETE CORNER	N/A	N/A
20004	2203970.36	6274619.25	13.24	CONCRETE CORNER	N/A	N/A
20005	2203991.19	6274605.39	10.461	AC AT BOTTOM OF RAMP	N/A	N/A
20006	2204001.93	6274627.97	10.651	AC AT BOTTOM OF RAMP	N/A	N/A
21031	2204032.01	6274825.37	10.543	TOP OF FLANGE	10.543	0.000
21034	2204031.56	6274818.73	8.759	TOP OF FLANGE	8.858	-0.099
21044	2204028.58	6274795.63	8.077	TOP OF PIPE	8.189	-0.112
21104	2204016.61	6274797.35	13.241	BENCHMARK ON SLAB	13.240	0.001
21105	2204025.54	6274881.51	13.263	CHISELED SQUARE	13.263	0.000
21107	2204018.93	6274781.27	12.576	MARK ON BUILDING CORNER	13.502	-0.926
21108	2204015.37	6274748.18	12.143	MARK ON WALL	12.268	-0.125
21118	2204033.97	6274849.84	6.711	TOP OF FLANGE	6.813	-0.102

**CALL BEFORE YOU DIG**  
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 UNDEVELOPED SERVICE AREA

SUBMITTAL	
%	Date

NOTE: BACKGROUND IMAGE IS INTENDED FOR INFORMATION ONLY AND MAY NOT ALIGN WITH SURVEYED FEATURES.



PROJECT ENGINEER  
 KRIS F. NEHMER  
 NO. 8123  
 PROFESSIONAL LAND SURVEYOR  
 STATE OF CALIFORNIA

NO.	DESCRIPTION	DATE	APPR.

DESIGN BY	KFN	DRAWING SCALE	1"=20'
DRAWN BY	KFN	ORIGINAL DRAWING SCALE	0 1/2" 1"
CHECK BY	KFN		
HORIZONTAL DATUM	CCS83, ZONE 3		
VERTICAL DATUM	N/A		

**KJELDEN SINNER NEUDECK inc.**  
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 916-403-5900

DELTA WATER SUPPLY INTAKE  
 CITY OF STOCKTON  
 MUNICIPAL UTILITIES DEPARTMENT

SETTLEMENT MONITORING  
 2021 VS. 2023 COMPARISON

DATE	SHEET IDENTIFICATION
MAY 2023	V-102
	SHEET 2 OF 3
	KSN PROJECT FILE NO. 2063-0030



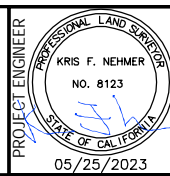
FILE SPEC: P:\2063\_Delta\_Water\_Supply\_Project\0030\_Intake\_PS\_Monitoring\07\_Survey\100\_Control\Exhibit\Holding-105\230525-Control.dwg  
 PLOT DATE: May 30, 2023 - 10:54am



2023 POINT	2023 NORTHING	2023 EASTING	2023 ELEVATION	DESCRIPTION
604	2204020.04	6274781.19	13.520	SET MAG NAIL ON WOOD HEADER
605	2204021.50	6274793.84	13.569	SET SCRIBE ON GRATE
606	2204023.75	6274811.71	13.513	SET MAG NAIL ON WOOD POST
607	2204024.53	6274823.98	13.573	SET SCRIBE ON GRATE
608	2204027.73	6274827.06	11.412	SET SCRIBE ON CONCRETE
609	2204040.15	6274816.60	11.397	SET SCRIBE ON CONCRETE
610	2204029.85	6274840.03	11.685	SET SCRIBE ON CONCRETE
611	2204037.79	6274851.25	11.679	SET SCRIBE ON CONCRETE
612	2204025.73	6274855.20	11.651	SET SCRIBE ON CONCRETE
613	2204026.07	6274859.47	11.649	SET SCRIBE ON CONCRETE
614	2204031.50	6274886.03	12.617	SET MAG NAIL ON WOOD POST
615	2204003.37	6274888.94	13.751	SET SCRIBE ON GRATE

SUBMITTAL	
%	Date

NOTE: BACKGROUND IMAGE IS INTENDED FOR INFORMATION ONLY AND MAY NOT ALIGN WITH SURVEYED FEATURES.



NO.	DESCRIPTION	DATE	APPR.

DESIGN BY	KFN	DRAWING SCALE	1"=20'
DRAWN BY	KFN	ORIGINAL DRAWING SCALE	0 1/2" 1"
CHECK BY	KFN		
HORIZONTAL DATUM	CCS83, ZONE 3		
VERTICAL DATUM	N/A		

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DELTA WATER SUPPLY INTAKE  
 CITY OF STOCKTON  
 MUNICIPAL UTILITIES DEPARTMENT  
 SETTLEMENT MONITORING  
 NEW MONITORING LOCATIONS (2023)

DATE	MAY 2023
SHEET IDENTIFICATION	V-103
	SHEET 3 OF 3
	KSN PROJECT FILE NO. 2063-0030



2021 vs.2023

March, 2021					May, 2023					March 2021 vs. May 2023		
Point Number	Description	Northing	Easting	Elevation	Point Number	Description	Northing	Easting	Elevation	dN	dE	dZ
11105	CHISLED SQUARE WITH +	2204025.51	6274881.47	13.263	21105	FOUND CHISLED SQUARE	2204025.54	6274881.51	13.263	0.03	0.04	0.000
11118	TOP CENTERLINE OF OLD PIPE FLANGE NO PAINT OR PUNCH	2204034.02	6274849.80	6.813	21118	TOP OF FLANGE	2204033.97	6274849.84	6.711	-0.05	0.04	-0.102
11031	UNDER NEW I BEAM - LOCATED TOP CENTERLINE OF NEW PIPE FLANGE AT SAME ELEVATION	2204031.97	6274825.06	10.543	21031	TOP OF FLANGE	2204032.01	6274825.37	10.543	0.04	0.31	0.000
11034	TOP CENTERLINE OF OLD PIPE FLANGE NO PAINT OR PUNCH	2204031.55	6274818.80	8.858	21034	TOP OF FLANGE	2204031.56	6274818.73	8.759	0.01	-0.07	-0.099
11044	PAINT MARK TOP OF PIPE IN VAULT	2204028.69	6274795.62	8.189	21044	TOP OF FLANGE	2204028.58	6274795.63	8.077	-0.11	0.01	-0.112
11107	PAINT MARK AT TOP CORNER WALL FOUNDATION	2204018.98	6274781.27	13.502	21107	MARK ON WALL	2204018.93	6274781.27	12.576	-0.05	0.00	-0.926
11104	SCRIBED + ON CONCRETE DOWN 0.5 FEET IN NEW GRAVEL RAMP	2204016.59	6274797.33	13.240	21104	BM ON SLAB	2204016.61	6274797.35	13.241	0.02	0.02	0.001
11108	TOP OF WALL FOUNDATION NO PAINT OR MARKS	2204015.38	6274748.24	12.268	21108	MARK ON WALL	2204015.37	6274748.18	12.143	-0.01	-0.06	-0.125
601	FOUND BDISK 3.5IN USACE 5105I	2204008.708	6274882.96	13.740	601	FOUND BDISK 3.5IN USACE 5105I	2204008.71	6274882.96	13.747	0.00	0.00	0.007
602	FOUND BDISK 3.5IN USACE 5105H	2204019.086	6274824.35	13.684	602	FOUND BDISK 3.5IN USACE 5105H	2204019.09	6274824.35	13.699	0.00	0.00	0.015
604 - 615 Were Set in 2023					604	SET MAG NAIL	2204020.04	6274781.19	13.520	N/A	N/A	N/A
					605	SET SCRIBE	2204021.50	6274793.84	13.569	N/A	N/A	N/A
					606	SET MAG NAIL	2204023.75	6274811.71	13.513	N/A	N/A	N/A
					607	SET SCRIBE	2204024.53	6274823.98	13.573	N/A	N/A	N/A
					608	SET SCRIBE	2204027.73	6274827.06	11.412	N/A	N/A	N/A
					609	SET SCRIBE	2204040.15	6274816.60	11.397	N/A	N/A	N/A
					610	SET SCRIBE	2204029.85	6274840.03	11.685	N/A	N/A	N/A
					611	SET SCRIBE	2204037.79	6274851.25	11.679	N/A	N/A	N/A
					612	SET SCRIBE	2204025.73	6274855.20	11.651	N/A	N/A	N/A
					613	SET SCRIBE	2204026.07	6274859.47	11.649	N/A	N/A	N/A
					614	SET MAG NAIL	2204031.50	6274886.03	12.617	N/A	N/A	N/A
					615	SET SCRIBE	2204003.37	6274888.94	13.751	N/A	N/A	N/A