

National Petroleum Reserve Alaska 2006 Lake Surveys

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NOTE

Per 12 AAC 36.111 All Bathymetric mapping and georeferenced data including acquisition of field data was performed under the direct supervision of a Professional Land Surveyor licensed by the State of Alaska.

Submissions -

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ENPRA Survey Area

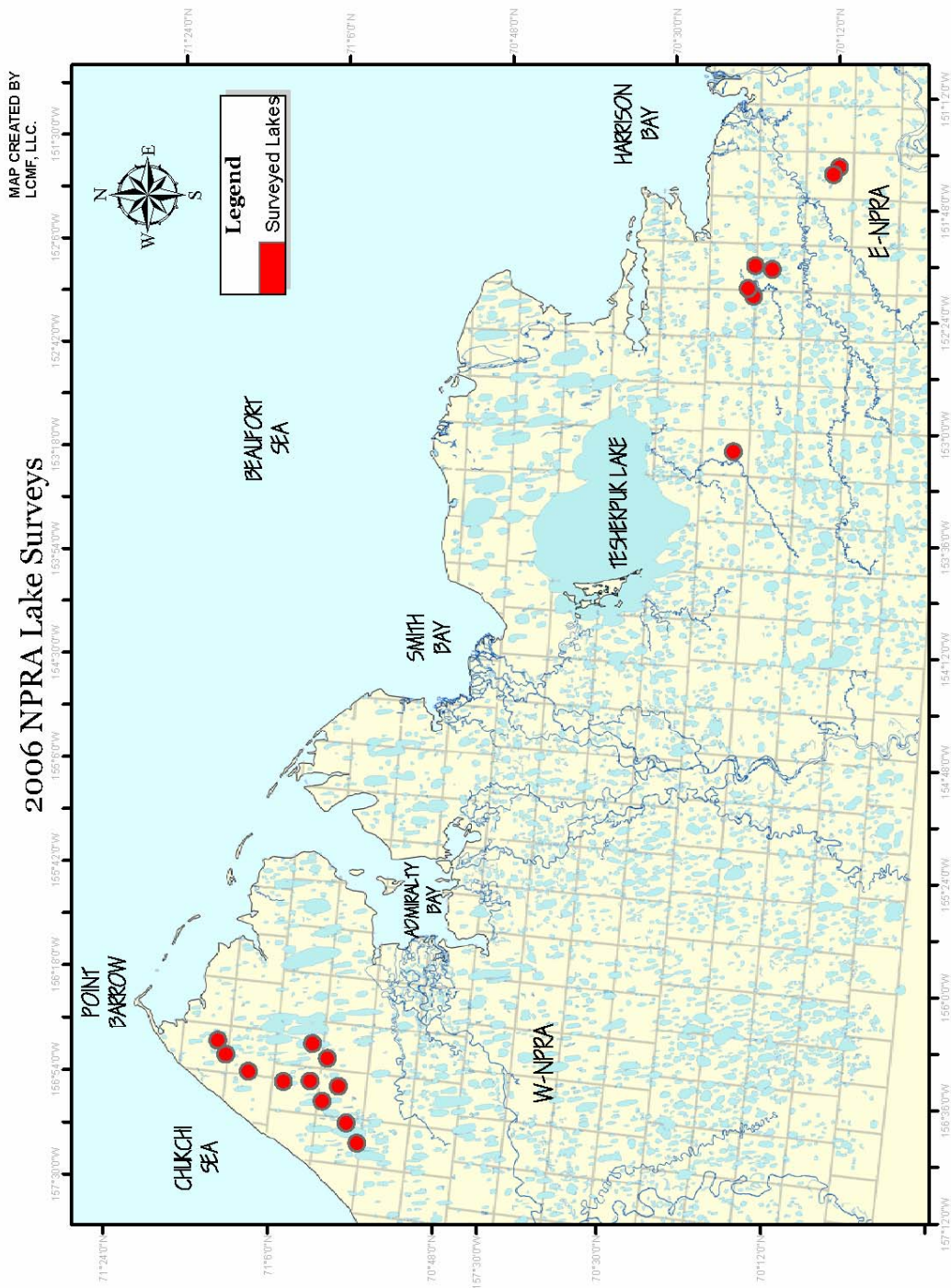
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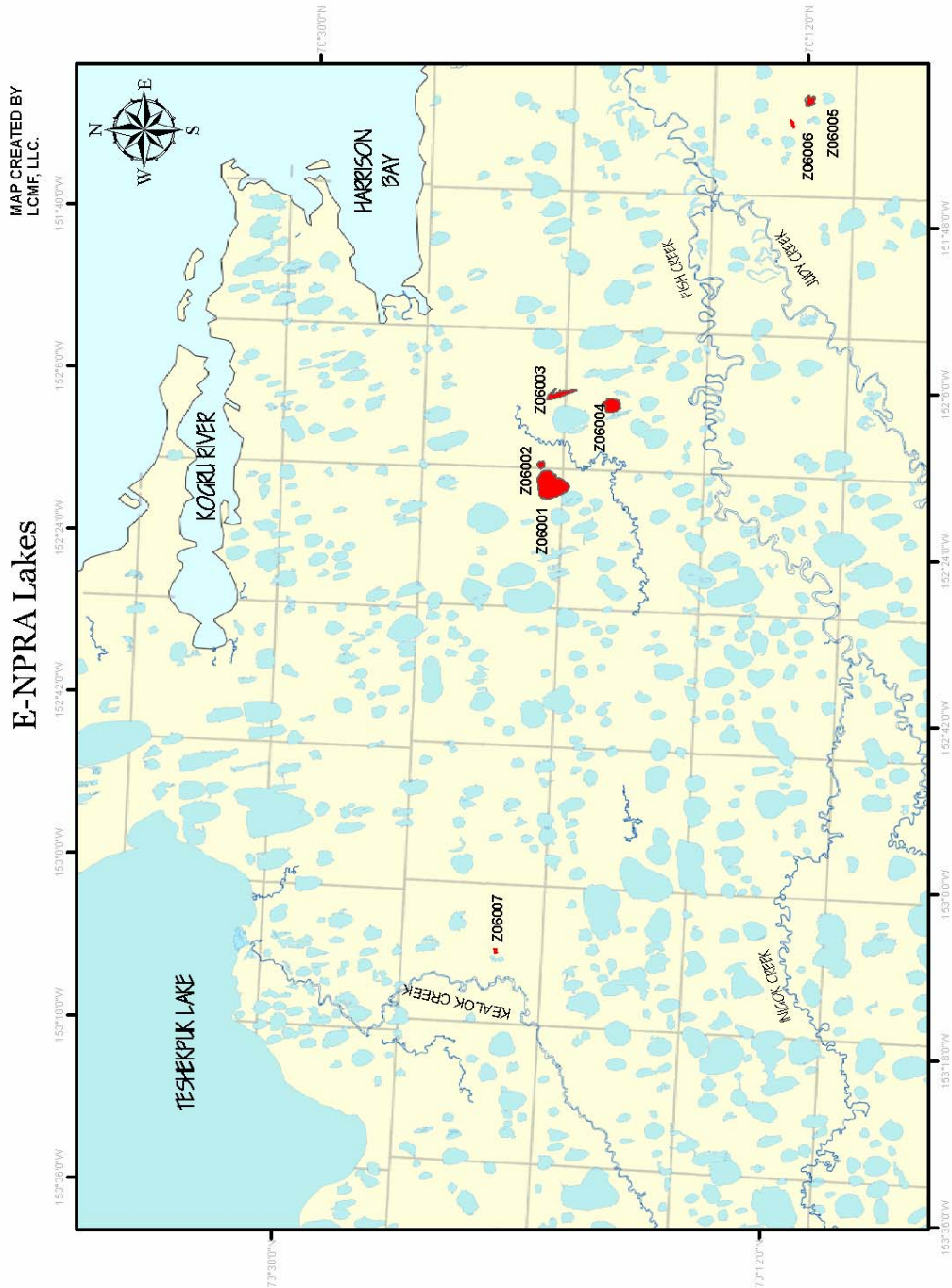
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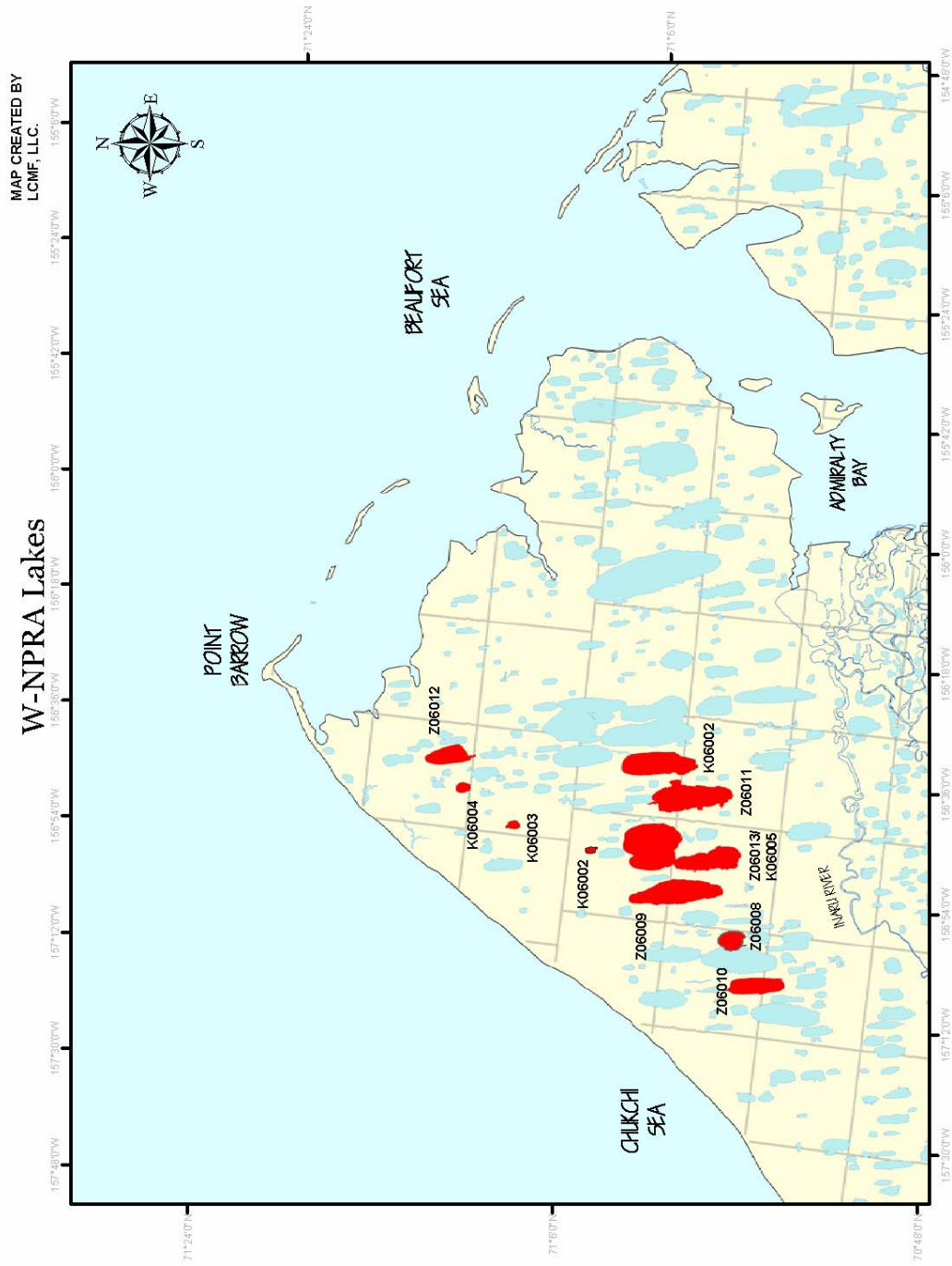
2006 National Petroleum Reserve Alaska (NPRA) Lake Surveys



2006 National Petroleum Reserve Alaska (NPRA) East Lake Surveys



2006 National Petroleum Reserve Alaska (NPRA) West Lake Surveys



1.0 Introduction

ConocoPhillips Alaska, Inc. (CPAI) holds oil and gas leases throughout the National Petroleum Reserve Alaska (NPRA), and plans to drill exploratory wells during the winter of 2006/2007. Freshwater is required for industrial use for exploration including ice road development, well drilling, and ice pad construction. LCMF, LLC and OASIS Environmental, Inc., collected the required bathymetric and biological information via the non-uniform bathymetric survey procedure (Baker 2003) and appropriate fish sampling techniques (Moulton 2006). Lakes sampled were greater than four feet in depth, not previously surveyed, and within a 2 mile radius of the proposed exploration sites.

The objectives of this study are to identify fish species present, and winter habitat availability to coincide with water use for industrial purposes. Specific objectives include:

1. Collect bathymetric data on lakes not previously surveyed;
2. Identify fish species inhabiting lakes potentially used for water withdrawal;
3. Collect water chemistry parameters.

The information provided in this report is required for ConocoPhillips Alaska, Inc. to comply with water withdrawal permits for winter oil and gas exploration on the North Slope of Alaska. The Department of Natural Resources issues a permit, which requires specific data to be collected on lakes that may potentially be used for water withdrawal for exploration and development. Industry water uses include ice road construction, pad construction, well drilling, and water use for camps at well sites. Managing the fishery resource and the demand for water withdrawal during construction activities is required to protect overwintering fish habitat, and the overwintering fish. Criteria for water withdrawal during winter have been developed based on the sensitivity of fish species to habitat changes associated with such water use. Some fish species are more sensitive to environmental alterations than others (Arctic grayling, and whitefish), and hold specific stipulations. These parameters have been quantified and will be combined with the water chemistry, and bathymetric data to be discussed in detail in this report.



Aerial photo of Z06008 Lake in the WNPRA

2.0 Methods

The NPRA lake surveys were divided into two areas, the East National Petroleum Reserve Alaska (ENPRA), and the West National Petroleum Reserve Alaska (WNPRA) (Fig 1). Seven lakes were surveyed at five proposed well locations in the ENPRA including the Cassin complex, Spark 9, and Noatak. Eleven lakes were surveyed in the WNPRA, which included all lakes within a 2 mile radius of the three proposed Intrepid well locations and several lakes along the potential ice road corridor in the WNPRA. The ENPRA lake surveys occurred from August 9 to 15 and the WNPRA from August 23 to September 5.

There are two types of fish found in Arctic lakes as defined by ADF&G, resistant and sensitive species. Resistant species include nine-spine stickleback (*Pungitius pungitius*) and Alaska blackfish (*Dallia pectoralis*). They are typically defined by having the ability to resist changes in their environment such as reduced dissolved oxygen and changes in water chemistry. Sensitive species include lake trout (*Salvelinus namaycush*), Arctic grayling (*Thymallus arcticus*), and all species of whitefish (*Coregonus sp.* & *Prosopium sp.*). These species are more susceptible to changes in their environment from water withdrawal, and therefore fall under different and usually more restrictive permit stipulations for industrial water use.

Permit stipulations were developed by ADF&G to protect fish in their overwintering habitat. These stipulations are defined by the presence of resistant and/or sensitive species of fish in the lakes potentially to be used. When sensitive species are found, water withdrawal is limited to 15% of the volume below (deeper than) 7 feet (Winters 2006). When resistant species are found, up to 30% of the water volume below (deeper than) 5 feet is allowed for winter withdrawal (Winters 2006). When no fish are found, there is currently no limit on the amount of water to be withdrawn. Typically, industrial water use will begin in the early winter when ice thickness is approximately 4 feet.

2.1 Bathymetry

Data points were collected using a Garmin 178C integrated GPS Chart Plotter and Sounder and were then entered into Autodesk Land Desktop 2006. Rectified Aerial photography was used to determine the Lake shoreline delineation which was assigned an elevation of zero feet. The GPS sounder data points are references to the surface elevation and a Digital Terrain Model (DTM) was generated as surface one. A second surface was then generated using the shoreline data points as zero. The Land Desktop software was then able to compute volumes based upon the two surfaces. Autodesk Land Desktop provides three volume calculation methods for performing calculations: Grid, Composite Surface and Section (which can be done with both Average End and Prismoidal methods). All three volume calculation types were used as redundancy and quality checks. The Grid method calculates the volumes using a grid overlaid on two surfaces by using a prismoidal volume of all grids. The Composite Surface method re-triangulates a new surface based on points from both surfaces. It uses the points from both surfaces, as well as any location where the triangle edges between the two surfaces cross, then calculates the new composite surface elevation based on the difference between the elevations of the two surfaces. The Section method calculates cross sections from the two surfaces as the current stratum, and generates volumes using the Prismoidal method.

Once the DTM's were created for the entire lake and the volumes calculated using the three methods, Land Desktop allows calculations to be made by excluding data points either above or below a specific elevation. This enables volumes to be calculated at

depths below four feet, five feet and seven feet, depending on what species of fish inhabit the lakes.

An inflatable zodiac with a 15 horsepower motor was used to collect the bathymetric and biological data throughout each lake. A Garmin GPS sounder 178C with an antenna was installed on the transom of the vessel. The Garmin collected waypoints every 10 seconds, which recorded the boat position and depth of the lake. Waypoints were also actively stored along each transect to capture abrupt changes in depth quickly. Transects were patterned to suffice the minimum traverse distance to provide accurate volume estimates (Baker 2003).

2.2 Fish

Fish capture techniques used included experimental gill nets, hook and line, and baited minnow traps. The experimental multi-mesh monofilament gill nets used were 125 feet long with five, 25 foot panels of varying mesh size. The mesh size ranged from 0.5 to 1.5 inches squared. At each lake, two experimental gill nets were deployed at locations most likely to catch fish. Typically, they were set at the deepest part of the lake and at the confluence of any outlets/inlets. The gill nets were monitored closely with net checks every hour to prevent any fish or avian mortality. Hook and line sampling was targeted for adult grayling, and did not prove to be successful, although this method was rarely used. Minnow trapping was used to identify fish that would be too small to be captured by gill nets. Minnow traps used had 0.75 inch funnel openings, with 0.125 inch mesh size, baited with salmon roe. Three to five minnow traps were deployed in each lake in various habitats along the shoreline to maximize the probability of catching fish. All data was recorded on "rite in the rain" datasheets, and later transferred into the database and scanned through the CPAI data checker program.

2.3 Water Chemistry

Water chemistry was measured to identify water quality for suitability of the water for construction and domestic use. Water chemistry was sampled with a YSI 556 meter at the deepest part of the lake typically at 6, 4 and 2 foot depths. Specific conductance, temperature, dissolved oxygen, and pH were all recorded. Turbidity was sampled at one foot below the surface, and measured with a Hach model 2100 P turbidity meter.

2.4 Photographs

Photos were taken from the air when weather permitted to document lake characteristics including outlets/inlets, depths, topography and vegetation. Photos documenting methods used, and species caught were recorded, labeled and stored in the database daily. Careful notes were taken to document length of time gear was fishing, where gear was set, and species caught. It was also documented if there were loons on the lake or any other diving waterfowl that could potentially be caught in the gill nets.



Measuring Ninespine stickleback



Minnow trapping

3.0 Results

3.1 ENPRA

3.1.1 Bathymetry

Results for the ENPRA sampling event are included in Appendix 1.

3.1.2 Fish

Arctic grayling and ninespine stickleback are the only species captured during the lake sampling effort. Our results indicate that of the seven lakes sampled, three (Z06004, Z06005, and Z06006) were confirmed to have ninespine stickleback, two (Z06001, and Z06003) contained Arctic grayling, and two (Z06002, and Z06007) did not have any fish (Tables 1-7). Arctic grayling were typically found in lakes with active stream connections. Ninespine sticklebacks were found in nearly all the lakes, except for two small lakes. No whitefish species or lake trout were captured in any of the lakes sampled within the ENPRA. Tables 1-7 identifies the type of gear used, date, hours of effort, species caught, and fork length of fish caught for each lake.



Arctic grayling measurements



Arctic grayling

3.1.3 Water Chemistry

The water chemistry parameters that were collected include temperature, dissolved oxygen, specific conductance, pH, and turbidity. We found that our results were within the expected range of values characteristic for Arctic lakes (Anderson 2001). All lakes sampled were saturated with oxygen, and were neutral to slightly basic. The lakes were

quite turbid on windy days. The water temperature ranged from 6.91°C to 11.93°C, the pH ranged from 7.44 to 8.37, and the dissolved oxygen readings in all lakes were over 100%. The specific conductance ranged from 44 to 195 microS/cm (Tables 1-7).



Water Chemistry sample



Turbidity meter readings

3.2 WNPRA

3.2.1 Bathymetry

Results for the WNPRA sampling event are included in Appendix 1.

3.2.2 Fish

Lakes were sampled in priority for well exploration drilling, then as a source of water for ice roads. Of the nine lakes sampled for fish presence, four (Z06010, K06002, K06003, and K06004) were found to have resistant fish (ninespine stickleback), four lakes (Z06009, Z06013, K06001, and K06005) had least cisco present, and one (Z06008) had Arctic grayling. Therefore, four lakes are subject to the 30% volume below 5 foot depth restrictions, and five lakes (Z06009, Z06013, K06001, K06005, and Z06008) are restricted to 15% water use below 7 foot depths (Tables 8-18). Arctic grayling were found in Z06008, and depths were less than 4 feet, therefore, no water will be available for industrial use (Table 8). For lakes Z06011, and Z06012, bathymetric data was the only sampling required for the 2006 sampling event (Tables 11 and 12). Fish sampling and water chemistry was completed previously by others for these lakes. Sensitive species inhabit these lakes (Rothwell 2006); therefore, water use is restricted to 15% below 7 foot depths. Lake K06002 was less than 4 feet when an initial transect was collected, although minnow traps were set prior to depth confirmation. Data from minnow trap collection is included in Table 15; however, no water will be available for industrial use.



Arctic grayling caught in gill net



Least cisco

3.2.3 Water Chemistry

Measurements were taken at varying depths in the lake to identify stratified changes. Typically, 6, 4 and 2 foot depths were sampled at each lake. The temperature in the lakes ranged from 4.43°C to 5.76°C, dissolved oxygen was saturated at or above 100%, and specific conductance ranged 39 to 310 microS/cm. The pH levels in the lakes were between 6.66 and 8.05. During some of the sampling, the specific conductance readings were erratic and labeled with an “N” in the data to indicated equipment not reading accurately (Tables 8-18).

After analysis of the water chemistry data, it is apparent that only minor changes occurred while sampling at varying depths throughout the water column. OASIS Environmental, Inc. would recommend for future data collection, that only a single water chemistry sample at a mean lake depth would be necessary.

Table 1

3.3 Lake Summary Tables

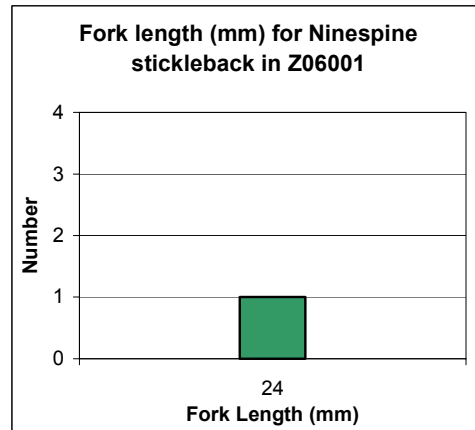
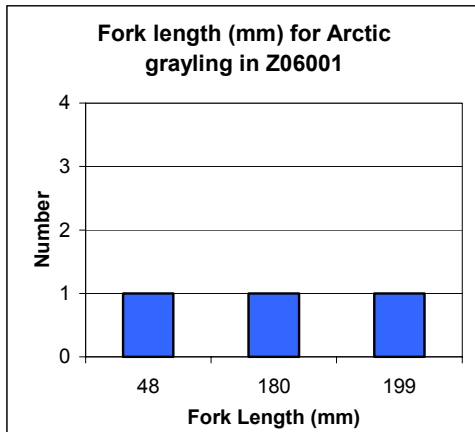
Lake: Z06001
Well location: Cassin 3
Other Name: none known
Location: 70°21'02.03"N 152°17'39.33" W
 T11N, R2W, UM, sec 1 & 2
 T12N, R2W, UM, sec 25, 26, 35, & 36
USGS Quad Map: Harrison Bay B-4 (AK)
Habitat: Drainage lake
Area (acres): 750.34
Max Depth (feet): 6.6
Active outlet: yes
Calculated Volume: 445.04 million gallons
Permittable Volume: 0 gallons

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6 feet	140	8.37	130	11.93	N	Turbidity not taken
4 feet	141	8.23	115	11.82		
2 feet	147	8.24	116	11.76		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	10-Aug-06	4	none	0		
2	GN	10-Aug-06	4.6	none	0		
3	GN	10-Aug-06	0.25	gray	2	199, 180	
1	MT	10-Aug-06	4.6	gray	1	48	
2	MT	10-Aug-06	4.7	nssb	3	24, N, N	no measurements
3	MT	10-Aug-06	4.7	gray	2	N, N	no measurements
4	MT	10-Aug-06	3.8	none	0		
5	MT	10-Aug-06	3.8	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

Table 2

Lake: Z06002
Well location: Cassin 3
Other Name: none known
Location: 70°21'25.09"N 152°15'03.90"W
 T12N, R1W, UM, sec 30 & 31
 T12N, R2W, UM, sec 25 & 36
USGS Quad Map: Harrison Bay B-4 (AK)
Habitat: Tundra lake
Area (acres): 50.67
Max Depth (feet): 8.2
Active outlet: no
Calculated Volume: 59.76 million gallons
Permittable Volume: 59.76 million gallons Vol below 4 feet= 43.55 million gallons

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
8 feet	195	8.25	114	11.64	0.99	
6 feet	195	8.28	111	11.89		
4 feet	195	8.28	111	11.89		
2 feet	195	8.28	111	11.93		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	11-Aug-06	2.4	none	0		
2	GN	11-Aug-06	2.4	none	0		
1	MT	11-Aug-06	20	none	0		
2	MT	11-Aug-06	20	none	0		
3	MT	11-Aug-06	20	none	0		
4	MT	11-Aug-06	19	none	0		

Table 3

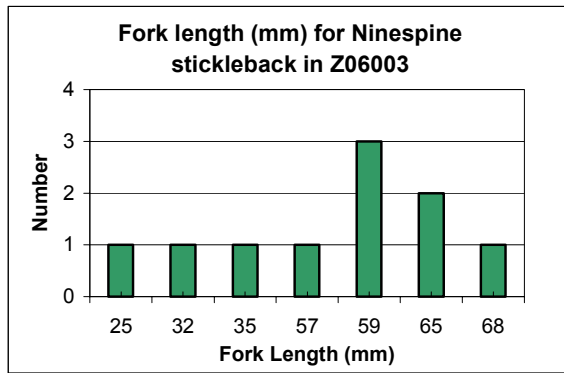
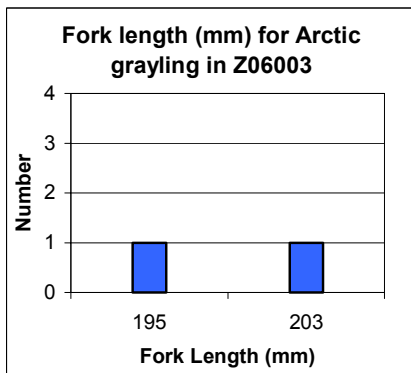
Lake: Z06003
Well location: Cassin 1
Other Name: none known
Location: 70°21'01.96"N 152°07'31.19"W
 T11N, R1W, UM, sec 3
 T12N, R1W, UM, sec 34
USGS Quad Map: Harrison Bay B-4 (AK)
Habitat: Drainage lake
Area (acres): 161.31
Max Depth (feet): 11.6
Active outlet: yes
Calculated Volume: 245.50 million gallons
Permittable Volume: 0.75 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6 feet	129	8.21	106	11.32	1.79	
4 feet	128	8.15	105	11.28		
2 feet	128	8.09	104	11.26		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	11-Aug-06	1.2	none	0		
2	GN	11-Aug-06	1	none	0		
3	GN	11-Aug-06	2.4	none	0		
4	GN	11-Aug-06	2.4	gray	2	203, 195	
1	MT	11-Aug-06	17	nssb	1	57	
2	MT	11-Aug-06	18	nssb	1	24	
3	MT	11-Aug-06	17	nssb	5	65, 59, 59, 65, 32	
4	MT	11-Aug-06	17.1	nssb	3	68, 35, 59	
5	MT	11-Aug-06	17.4	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

Table 4

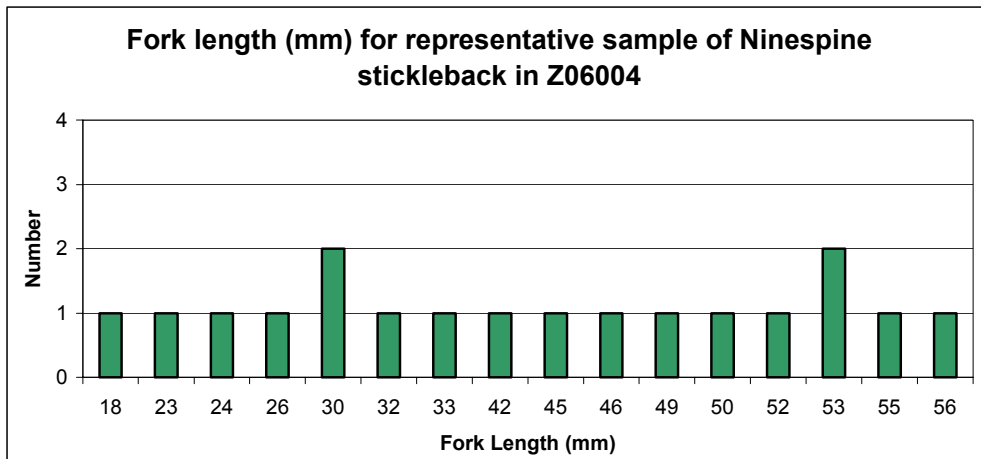
Lake: Z06004
Well location: Cassin 2
Other Name: none known
Location: 70°18'50.89"N 152°08'27.71"W
 T11N, R1W, UM, sec 9, 10, 15, & 16
USGS Quad Map: Harrison Bay B-4 (AK)
Habitat: Drainage lake
Area (acres): 217.85
Max Depth (feet): 10.9
Active outlet: yes
Calculated Volume: 378.10 million gallons
Permittable Volume: 28.39 million gallons 30% volume below 5 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
8 feet	46	7.51	120	9.96	2.37	
6 feet	45	7.44	116	9.96		
4 feet	44	7.44	111	9.95		
2 feet	45	7.44	107	9.99		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	12-Aug-06	3.5	none	0		
2	GN	12-Aug-06	3.5	none	0		
1	MT	12-Aug-06	2.2	nssb	9	18-45	
2	MT	12-Aug-06	18	nssb	9	46-66	
3	MT	12-Aug-06	18.5	nssb	190	23-65	did not include all 190 fish lengths in graph
4	MT	12-Aug-06	16.8	nssb	1	30	



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco
 none – no fish caught using that method
 N – Equipment not reading accurately

Table 7

Lake: Z06007
Well location: Noatak 2
Other Name: none known
Location: 70°22'19.29"N 153°08'29.72"W
 T12N, R5W, UM, sec 22, 27
USGS Quad Map: Teshekpuk B-1 (AK)
Habitat: Tundra lake
Area (acres): 16.43
Max Depth (feet): 6.3
Active outlet: no
Calculated Volume: 15.46 million gallons
Permittable Volume: 15.46 million gallons Vol below 4 feet= 0.70 million gallons

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6 feet	N	7.67	114	6.91	2.12	
4 feet	N	7.69	110	6.93		
2 feet	N	7.69	109	6.94		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	14-Aug-06	2.8	none	0		
2	GN	14-Aug-06	2.8	none	0		
1	MT	14-Aug-06	2	none	0		
2	MT	14-Aug-06	2	none	0		
3	MT	14-Aug-06	2	none	0		
4	MT	14-Aug-06	1	none	0		
5	MT	14-Aug-06	1	none	0		

Table 8

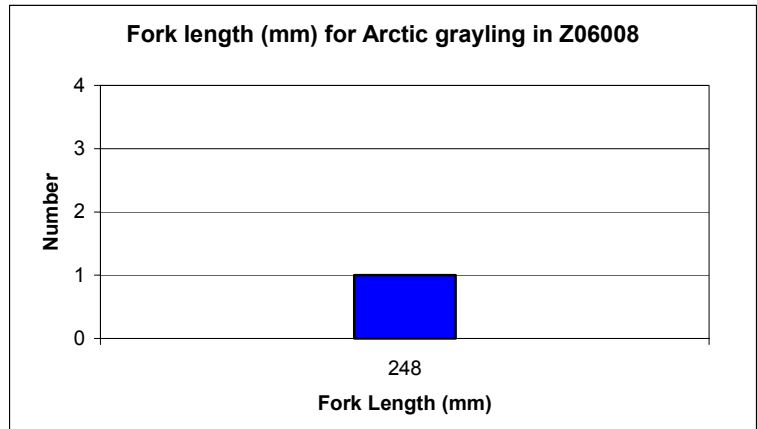
Lake: Z06008
Well location: Intrepid 3
Other Name: Kilusiktok Lake
Location: 70°58'50.78"N 157°01'00.69"W
 T19N, R19W, UM, sec 23, 24, 25 & 26
USGS Quad Map: Meade River D-2 (AK)
Habitat: Drainage lake
Area (acres): unk
Max Depth (feet): unk
Active outlet: yes
Calculated Volume: unk
Permittable Volume: 0 gallons

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
						not sampled < 4 feet

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	26-Aug-06	6.6	gray	1	248	< 4 feet
1	MT	26-Aug-06	7.2	none	0		
2	MT	26-Aug-06	6	none	0		
3	MT	26-Aug-06	20.5	none	0		



not sampled – lake too shallow to be used as a water source (<4 feet deep)
 bathymetry only – Lake requiring bathymetric measurements only
 N – Equipment not reading accurately
 unk- Unknown

Table 9

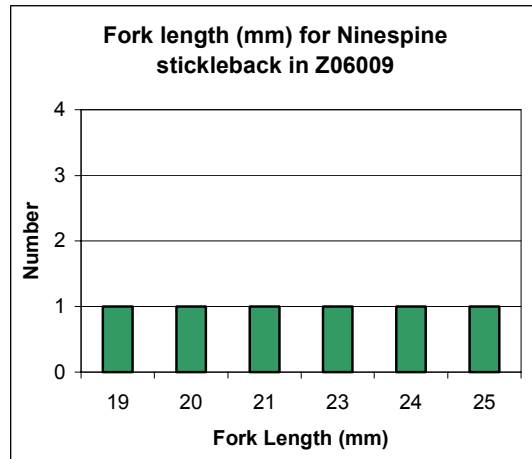
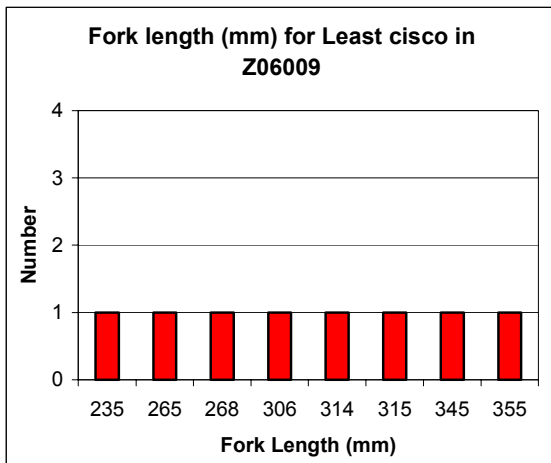
Lake: Z06009
Well location: Intrepid 1
Other Name: none known
Location: 71°02'09.70"N 156°55'25.30"W
 T19N, R19W, UM, sec 4, 5, 8, 9, 16, 17, 20, & 21
 T20N, R19W, UM, sec 19, 20, 29, 30, 31, 32, & 33
USGS Quad Map: Barrow A-5 (AK)
Habitat: Tundra lake
Area (acres): 3479.54
Max Depth (feet): 8.1
Active outlet: no
Calculated Volume: 6.35 billion gallons
Permittable Volume: 33.49 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	N	7.15	100	5.36	19.5	very windy, turbid water
4	N	7.14	99	5.36		
2	N	7.12	98	5.36		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	27-Aug-06	1.2	lscs	8	265-355	
2	GN	27-Aug-06	3.3	none	0		
1	MT	27-Aug-06	6.6	nssb	3	24, 20, 25	
2	MT	27-Aug-06	6.1	nssb	1	21	
3	MT	27-Aug-06	5.1	nssb	2	19, 23	
4	MT	27-Aug-06	4.7	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

Table 10

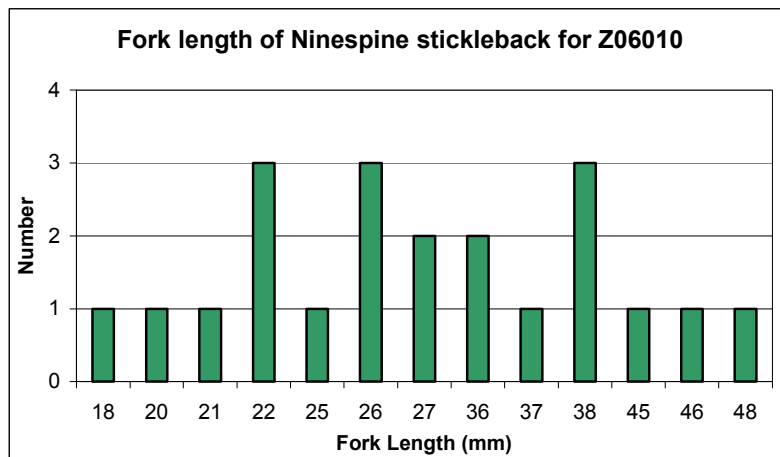
Lake: Z06010
Well location: Intrepid 3
Other Name: none known
Location: 70°57'22.05"N 157°07'38.78"W
 T18N, R20W, UM, sec 3, 4, 9, 10
 T19N, R20W, UM, sec 21, 27, 28, 33, & 34
USGS Quad Map: Meade River D-2 (AK)
Habitat: Drainage lake
Area (acres): 1705.74
Max Depth (feet): 7.9
Active outlet: yes
Calculated Volume: 3.35 billion gallons
Permittable Volume: 237.1 million gallons 30% vol below 5 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	N	7.36	103	5.75	4.01	
4	N	7.37	102	5.76		
2	N	7.33	102	5.76		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	29-Aug-06	3.3	none	0		
2	GN	29-Aug-06	4.6	none	0		
3	GN	29-Aug-06	3.7	none	0		
1	MT	29-Aug-06	6.6	nssb	17	21-51	
2	MT	29-Aug-06	6.1	nssb	2	20, 45	
3	MT	29-Aug-06	5.1	nssb	4	18, 65, 27, 37	
4	MT	29-Aug-06	4.7	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback none – no fish caught using that method
 lscs – Least Cisco N – Equipment not reading accurately

Table 11

Lake: Z06011
Well location: Intrepid Ice Road
Other Name: Evrulivik Lake
Location: 71°01'34.54"N 156°40'31.99"W
 T19N, R18W, UM, sec 5, 6, 7, 8, 9, 16, 17 & 20
 T20N, R18W, UM, sec 29, 30, 31, 32, & 33
USGS Quad Map: Barrow A-4 (AK)
Habitat: Drainage lake
Area (acres): 3623.12
Max Depth (feet): 7.4
Active outlet: yes
Calculated Volume: 7.21 billion gallons
Permittable Volume: 23 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
						* not sampled bathymetry only

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
							* not sampled bathymetry only

* fish sampling and water chemistry for this lake was collected previously by others

Table 12

Lake: Z06012
Well location: Intrepid Ice Road
Other Name: Ikroavik Lake
Location: 71°13'47.93"N 156°38'18.60"W
 T22N, R18W, UM, sec 22, 23, 26, 27, 34 & 35
USGS Quad Map: Barrow A-4 (AK)
Habitat: Tundra lake
Area (acres): 1365.94
Max Depth (feet): 8.4
Active outlet: no
Calculated Volume: 2.86 billion gallons
Permittable Volume: 36 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
						not sampled bathymetry only

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
							not sampled bathymetry only

* fish sampling and water chemistry for this lake was collected previously by others

Table 13

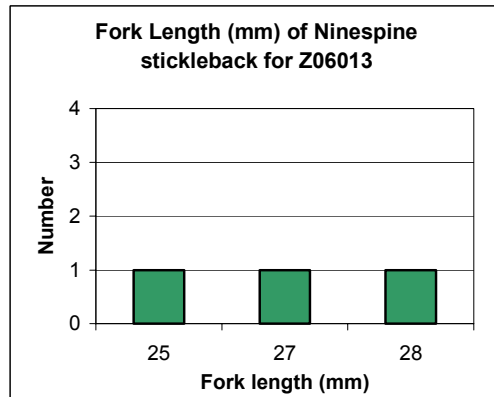
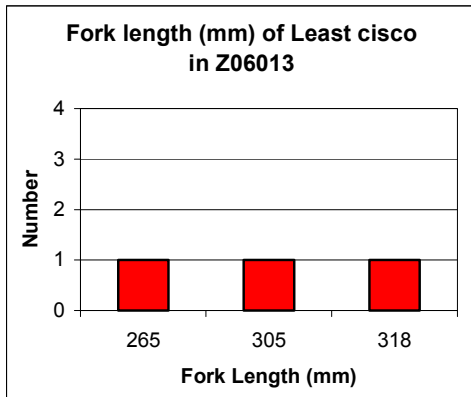
Lake: Z06013
Well location: Intrepid Ice Road
Other Name: none known
Location: 71°00'05.73"N 156°49'38.96"W
 T19N, R19W, UM, sec 2, 3, 10, 11, 14, 15, 22, & 23
USGS Quad Map: Barrow A-4 (AK)
Habitat: Drainage lake
Area (acres): 2418.72
Max Depth (feet): 7.1
Active outlet: yes
Calculated Volume: 4.36 billion gallons
Permittable Volume: 7.68 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	310	7.37	109	4.5	7.16	
4	309	7.42	108	4.5		
2	309	7.45	107	4.5		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	31-Aug-06	6.7	none	0		
2	GN	31-Aug-06	3.5	lscs	3	265, 305, 318	
1	MT	31-Aug-06	6.7	nssb	2	25, 27	
2	MT	31-Aug-06	6.6	none	0		
3	MT	31-Aug-06	2	none	0		
4	MT	31-Aug-06	1.3	none	0		
5	MT	31-Aug-06	2.6	nssb	1	28	



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

Table 14

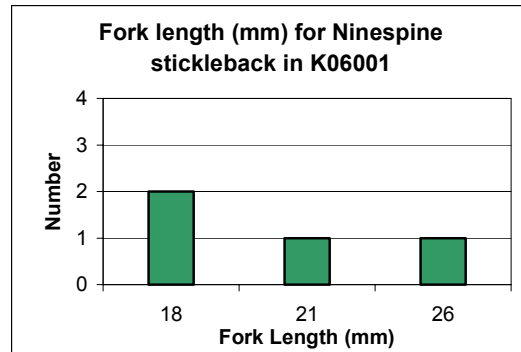
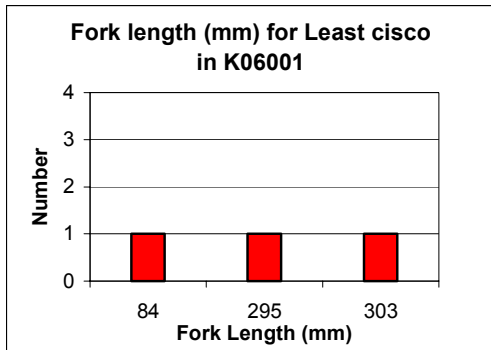
Lake: K06001
Well location: Intrepid Ice Road
Other Name: none known
Location: 71°03'12.34"N 156°35'28.78"W
 T19N, R18W, UM, sec 3 & 4
 T20N, R18W, UM, sec 15, 16, 21, 22, 27, 28, 33, & 34
USGS Quad Map: Barrow A-4 (AK)
Habitat: Drainage lake
Area (acres): 3017.42
Max Depth (feet): 8.1
Active outlet: yes
Calculated Volume: 6.05 billion gallons
Permittable Volume: 14.78 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	141	6.66	106.4	4.46	3.65	
4	142	6.67	105.8	4.47		
2	142	6.69	105.3	4.47		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	1-Sep-06	0.8	lscs	3	284, 295, 303	
1	MT	1-Sep-06	6.1	nssb	4	26, 18, 18, 21	
2	MT	1-Sep-06	5.7	none	0		
3	MT	1-Sep-06	4.9	none	0		
4	MT	1-Sep-06	4.2	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

Table 15

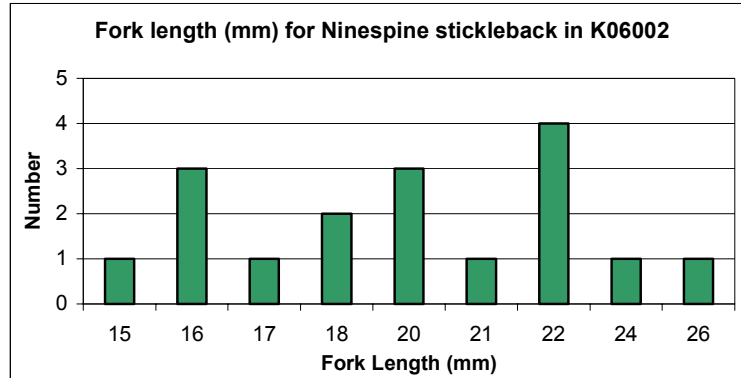
Lake: K06002
Well location: Intrepid Ice Road
Other Name: none known
Location: 71°06'12.87"N 156°50'01.58"W
 T20N, R19W, UM, sec 3 & 10
USGS Quad Map: Barrow A-4 (AK)
Habitat: Tundra lake
Area (acres): unk
Max Depth (feet): less than 4
Active outlet: no
Calculated Volume: unk
Permittable Volume: 0 gallons

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
						not sampled

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	MT	2-Sep-06	0.8	nssb	5	20-26	* less than 4 feet
2	MT	2-Sep-06	0.8	nssb	7	15-24	
3	MT	2-Sep-06	0.7	nssb	2	16, 21	
4	MT	2-Sep-06	0.6	nssb	3	16-22	
5	MT	2-Sep-06	0.8	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 iscs – Least Cisco
 none – no fish caught using that method
 N – Equipment not reading accurately
 unk - Unknown

* lake less than 4 feet deep, not a viable water source. MT's set initially before bathymetry was measured

Table 16

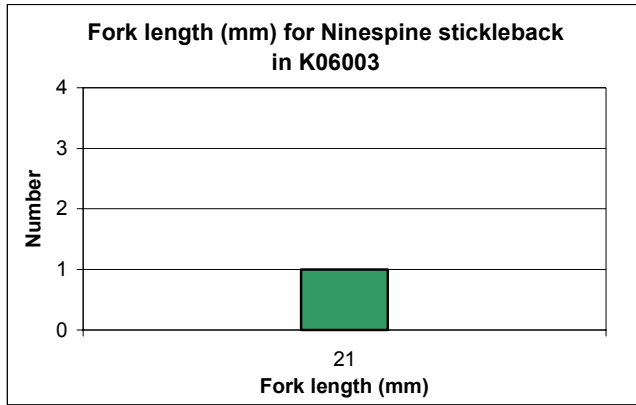
Lake: K06003
Well location: Intrepid Ice Road
Other Name: none known
Location: 71°10'08.89"N 156°47'38.58"W
 T21N, R18W, UM, sec 18 & 19
USGS Quad Map: Barrow A-4 (AK)
Habitat: Tundra lake
Area (acres): 192.65
Max Depth (feet): 5.7
Active outlet: no
Calculated Volume: 242.8 million gallons
Permittable Volume: 2.46 million gallons 30% vol below 5 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	126	7.28	121	4.45	3.12	
4	131	7.22	118	4.45		
2	N	7.09	116	4.43		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	2-Sep-06	1.8	none	0		
2	GN	2-Sep-06	1.6	none	0		
1	MT	2-Sep-06	1.1	nssb	1	21	
2	MT	2-Sep-06	1.1	none	0		
3	MT	2-Sep-06	1.1	none	0		



gray – Arctic Grayling none – no fish caught using that method
 nssb – Ninespine stickleback N – Equipment not reading accurately
 lscs – Least Cisco

Table 17

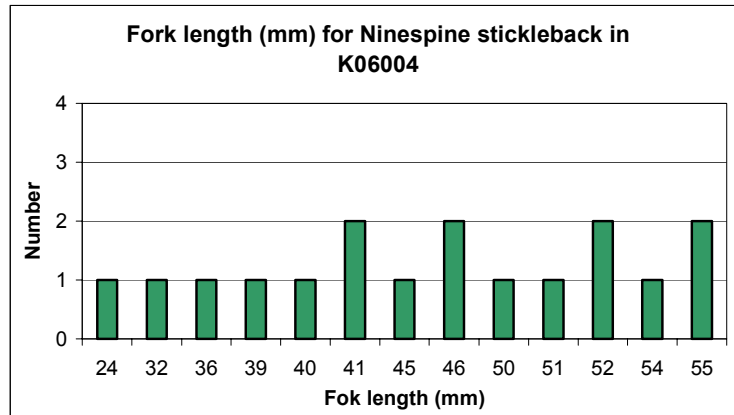
Lake: K06004
Well location: Intrepid Ice Road
Other Name: none known
Location: 71°13'00.11"N 156°42'33.16"W
 T21N, R18W, UM, sec 4
 T22N, R18W, UM, sec 33
USGS Quad Map: Barrow A-4 (AK)
Habitat: Tundra lake
Area (acres): 251.47
Max Depth (feet): 6.5
Active outlet: no
Calculated Volume: 418 million gallons
Permittable Volume: 17.21 million gallons 30% vol below 5 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	39	7.07	117.3	4.45	2.9	
4	39	6.92	115.6	4.45		
2	39	6.82	114.5	4.45		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	2-Sep-06	0.4	none	0		
2	GN	2-Sep-06	0.3	none	0		
1	MT	2-Sep-06	3.1	nssb	3	45-55	
2	MT	2-Sep-06	3.1	nssb	2	50, 52	
3	MT	2-Sep-06	3	nssb	3	41, 46, 55	
4	MT	2-Sep-06	2.9	nssb	9	21-54	
5	MT	2-Sep-06	2.9	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback none – no fish caught using that method
 lscs – Least Cisco N – Equipment not reading accurately

Table 18

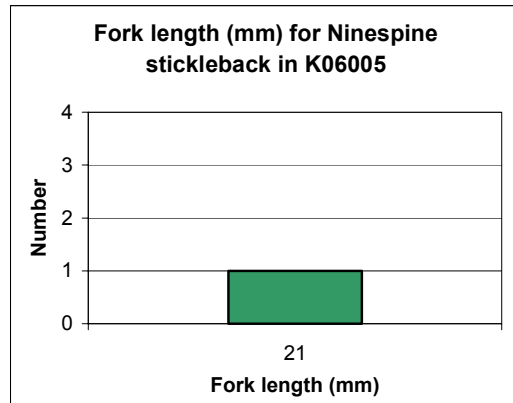
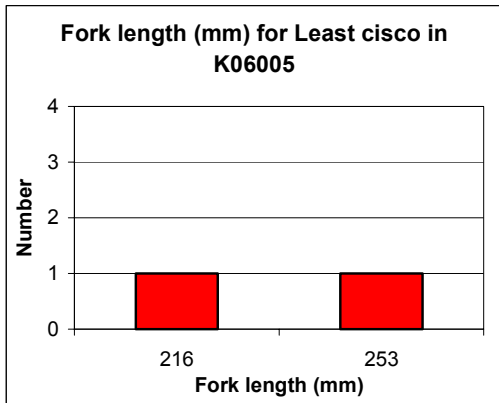
Lake: K06005
Well location: Intrepid Ice Road
Other Name: Sukok Lake
Location: 71°03'12.10"N 156°47'59.15"W
 T19N, R19W, UM, sec 1, 2, & 3
 T20N, R19W, UM, sec 21,22,23,24,25,26,27,28,33,34,35,&36
USGS Quad Map: Barrow A-4 (AK)
Habitat: Tundra lake
Area (acres): 4590.81
Max Depth (feet): 12.2
Active outlet: yes
Calculated Volume: 7.69 billion gallons
Permittable Volume: 11.62 million gallons 15% vol below 7 feet

Water Chemistry

Depth	Sp Conductance (microS/cm)	pH	DO%	Temp (°C)	Turbidity (NTU)	Comments
6	298	8.05	111	5.06	9.85	
4	297	8.03	111	5.04		
2	297	8.02	111	5.04		

Catch Record

Set	Gear	Date	Effort (hours)	Species	# caught	Fork Length (mm)	Comments
1	GN	4-Sep-06	0.9	lscs	2	253, 216	
1	MT	4-Sep-06	4	none	0		
2	MT	4-Sep-06	4	none	0		
3	MT	4-Sep-06	4	nssb	1	21	
4	MT	4-Sep-06	4.1	none	0		



gray – Arctic Grayling
 nssb – Ninespine stickleback
 lscs – Least Cisco

none – no fish caught using that method
 N – Equipment not reading accurately

4.0 References

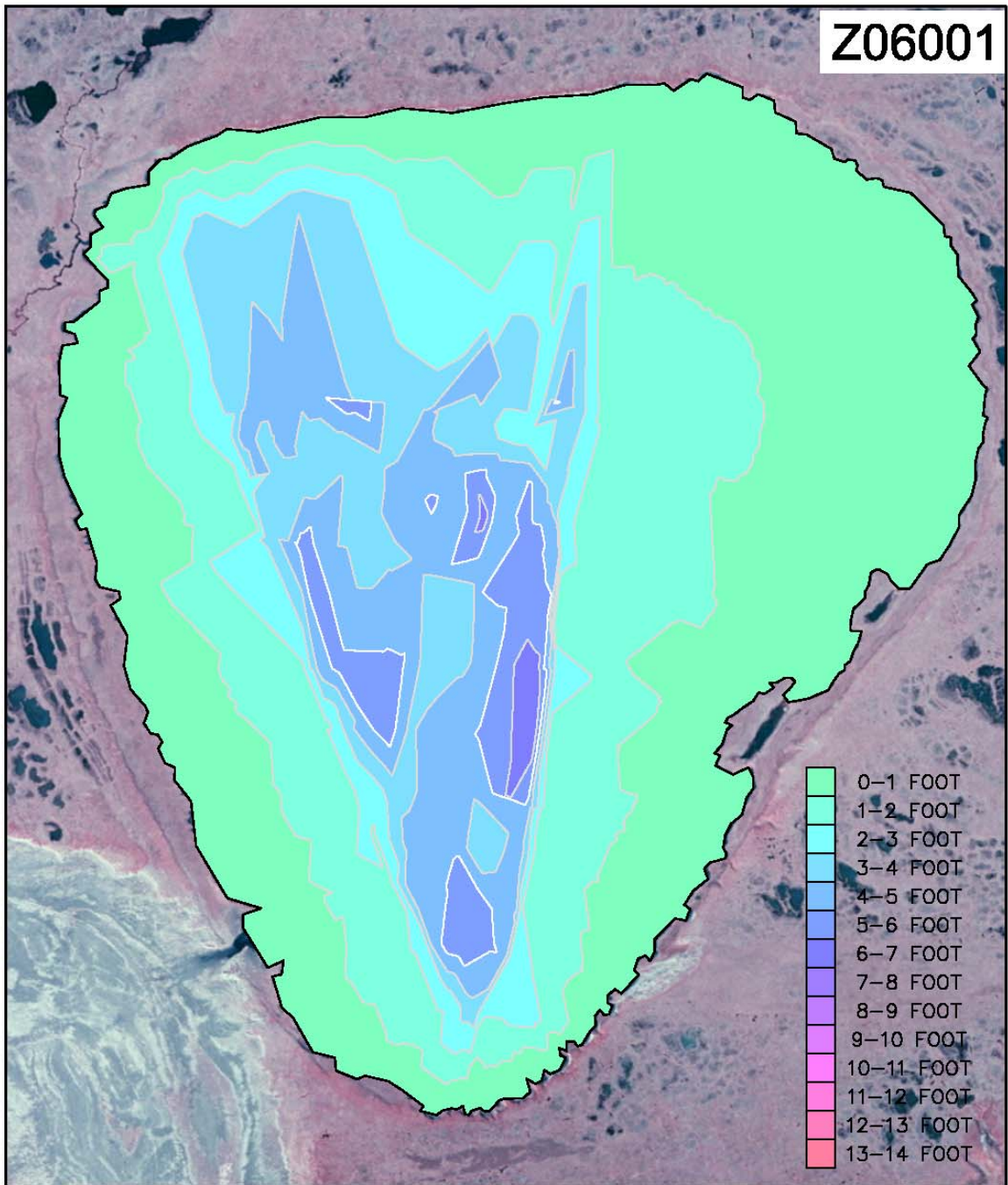
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Appendix 1

Lake Drawings Index

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Z06001



1000 0 1000 2000 3000 4000

Depth Contours of Lake Z06001 Are Calculated Based Upon A Bathymetric Survey Conducted August 10, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°20'46.3" North 152°17'14.5" West (NAD 83)

Township 11 North, Range 2 West, Sections 1 & 2
Township 12 North, Range 2 West, Sections 25, 26, 35 & 36

Z06001



Depth Contours of Lake Z06001 Are Calculated Based Upon A Bathymetric Survey Conducted August 10, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°20'46.3" North 152°17'14.5" West (NAD 83)

Township 11 North, Range 2 West, Sections 1 & 2

Township 12 North, Range 2 West, Sections 25, 26, 35 & 36

Z06001



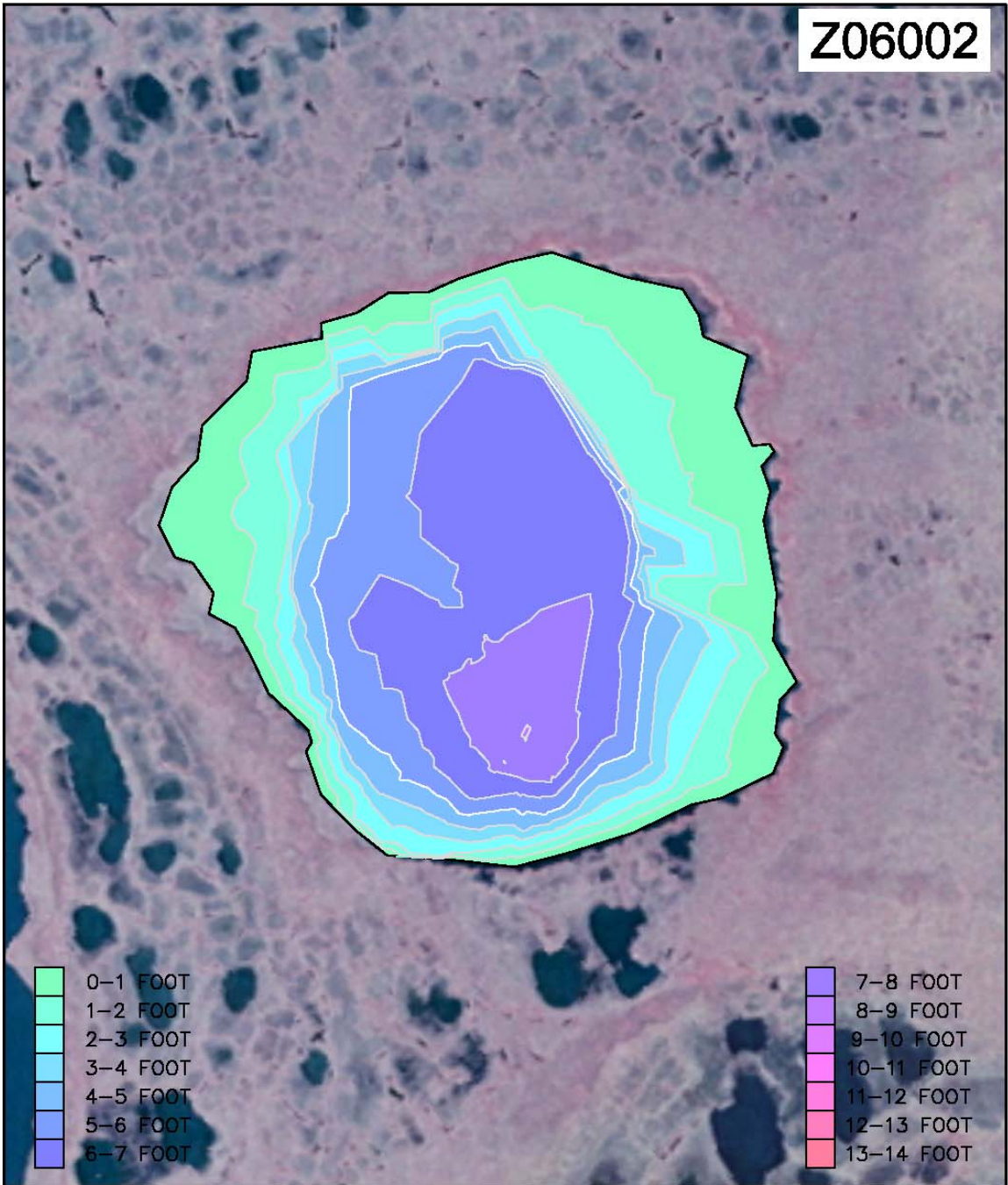
Depth transects surveyed at Lake Z06001 August 10, 2006

Maximum Depth Location: 70°20'46.3" North 152°17'14.5" West (NAD 83)

Township 11 North, Range 2 West, Sections 1 & 2

Township 12 North, Range 2 West, Sections 25, 26, 35 & 36

Z06002



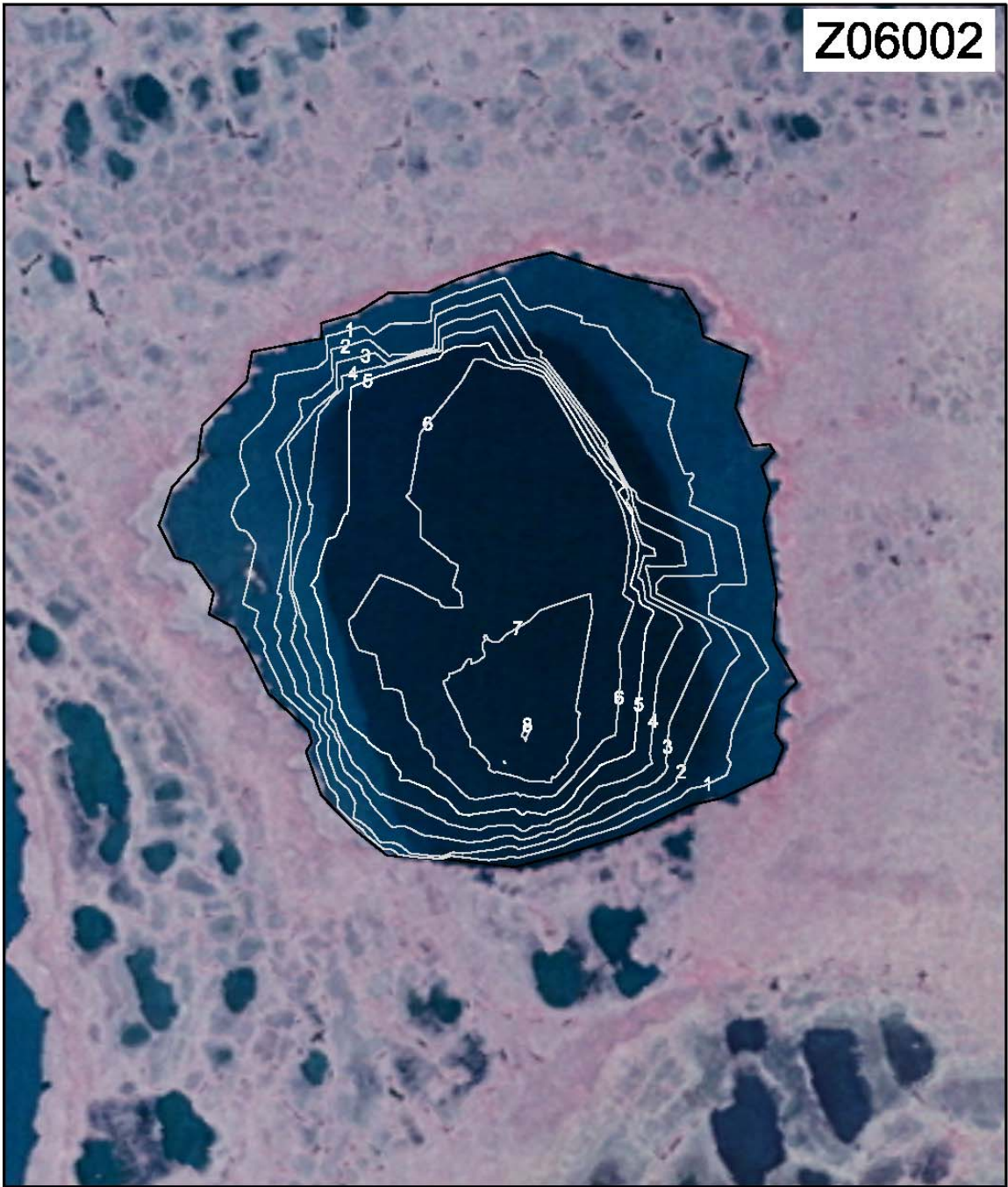
Depth Contours of Lake Z06002 Are Calculated Based Upon A Bathymetric Survey Conducted August 11, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°21'20.6" North 152°15'02.5" West (NAD 83)

Township 12 North, Range 1 West, Sections 30 & 31

Township 12 North, Range 2 West, Sections 25 & 36

Z06002



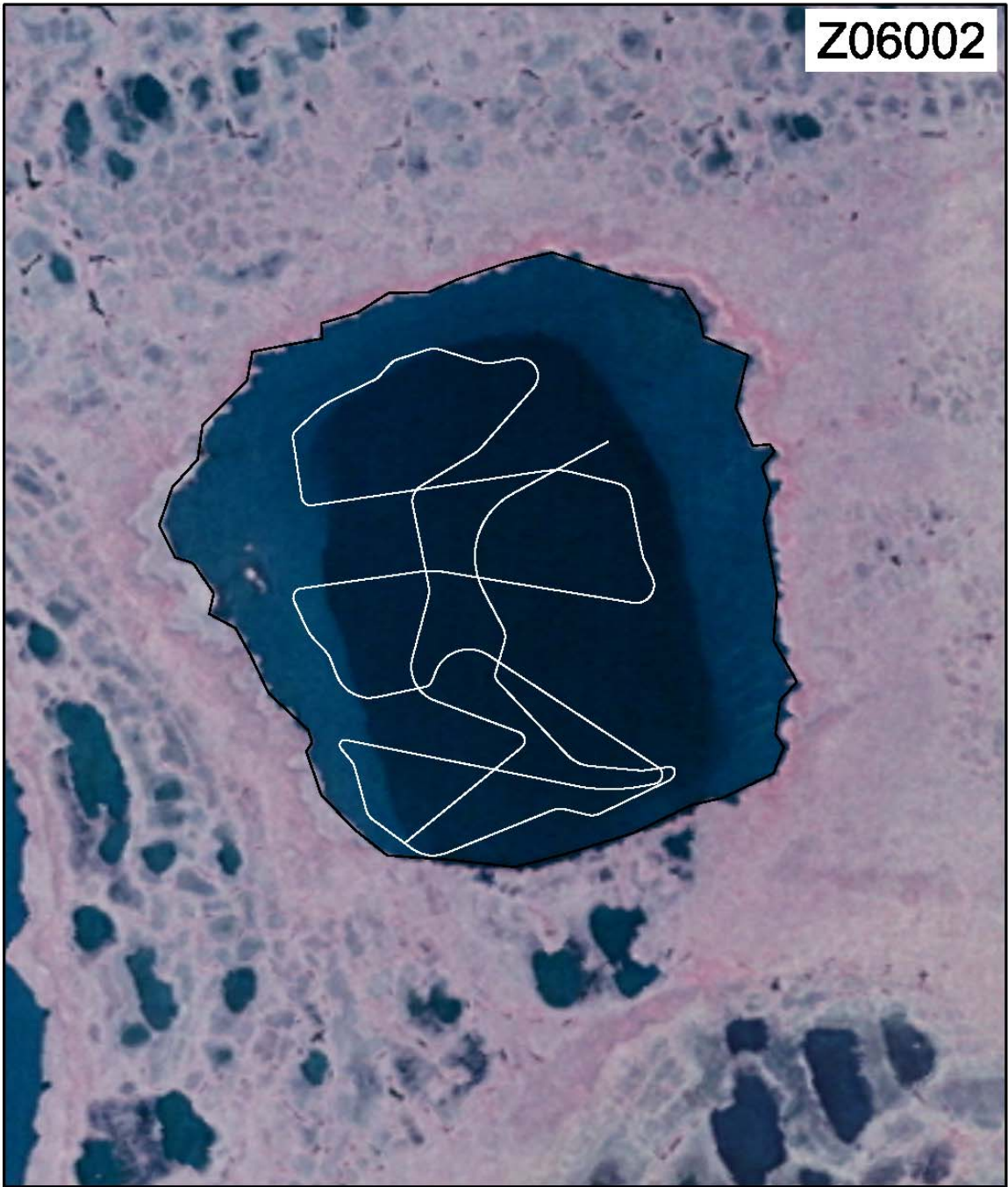
Depth Contours of Lake Z06002 Are Calculated Based Upon A Bathymetric Survey Conducted August 11, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°21'20.6" North 152°15'02.5" West (NAD 83)

Township 12 North, Range 1 West, Sections 30 & 31

Township 12 North, Range 2 West, Sections 25 & 36

Z06002



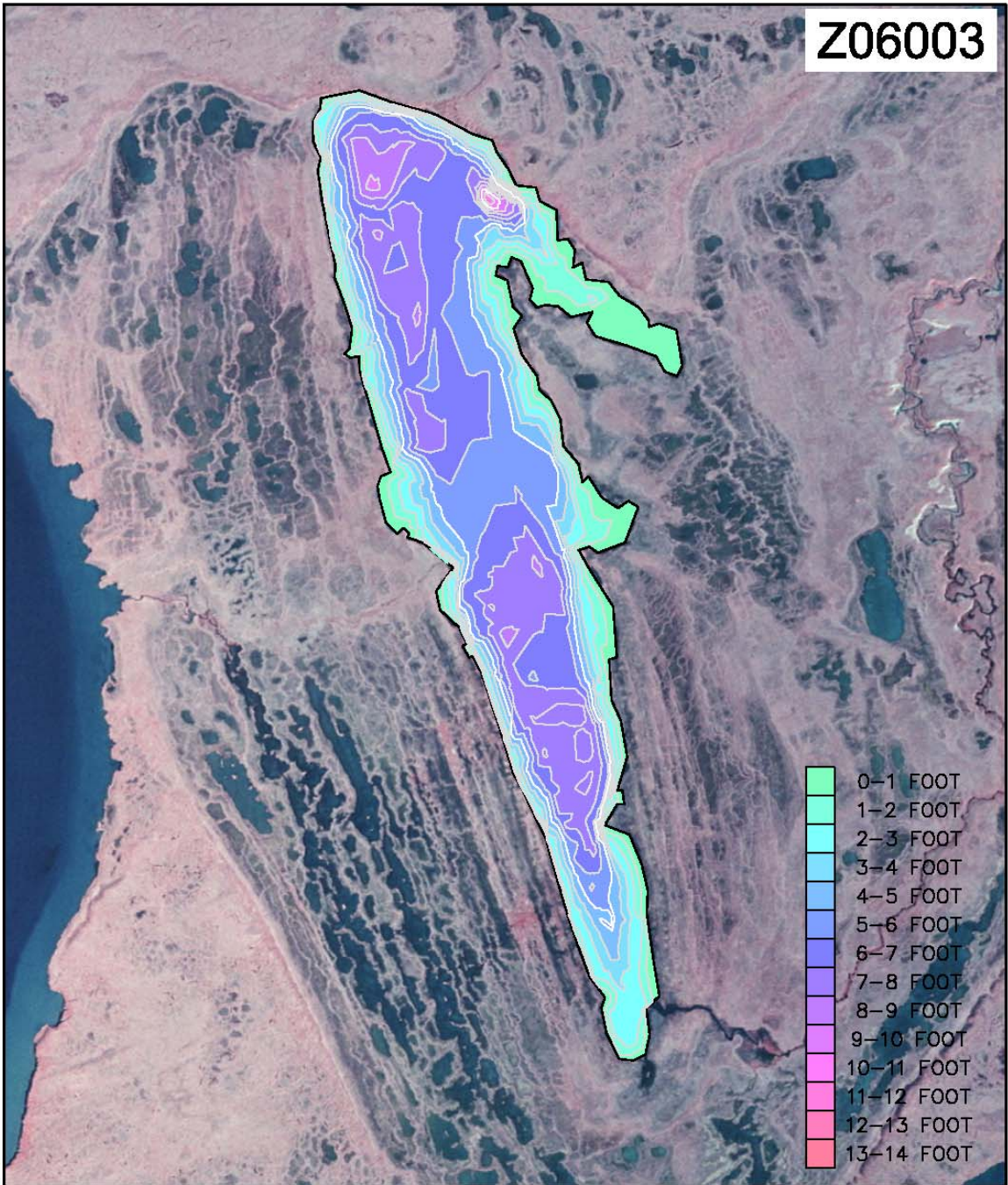
Depth transects surveyed at Lake Z06002 August 11, 2006

Maximum Depth Location: 70°21'20.6" North 152°15'02.5" West (NAD 83)

Township 12 North, Range 1 West, Sections 30 & 31

Township 12 North, Range 2 West, Sections 25 & 36

Z06003



- 0-1 FOOT
- 1-2 FOOT
- 2-3 FOOT
- 3-4 FOOT
- 4-5 FOOT
- 5-6 FOOT
- 6-7 FOOT
- 7-8 FOOT
- 8-9 FOOT
- 9-10 FOOT
- 10-11 FOOT
- 11-12 FOOT
- 12-13 FOOT
- 13-14 FOOT



Depth Contours of Lake Z06003 Are Calculated Based Upon A Bathymetric Survey Conducted August 12, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°21'10.4" North 152°07'22.6 West (NAD 83)

Township 11 North, Range 1 West, Section 3

Township 12 North, Range 1 West, Section 34

Z06003



Depth Contours of Lake Z06003 Are Calculated Based Upon A Bathymetric Survey Conducted August 12, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°21'10.4" North 152°07'22.6 West (NAD 83)

Township 11 North, Range 1 West, Section 3

Township 12 North, Range 1 West, Section 34

Z06003



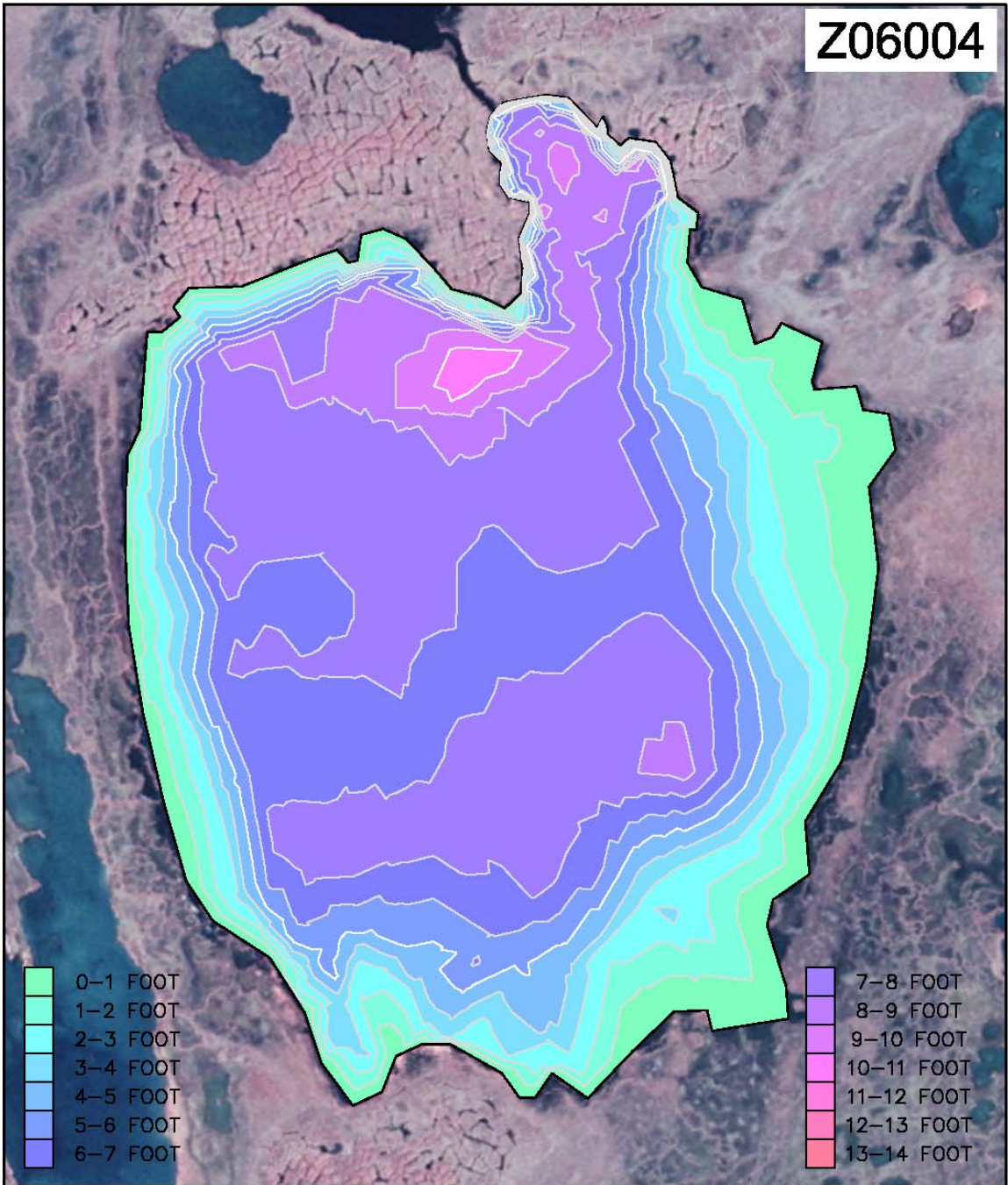
Depth transects surveyed at Lake Z06003 August 12, 2006

Maximum Depth Location: 70°21'10.4" North 152°07'22.6 West (NAD 83)

Township 11 North, Range 1 West, Section 3

Township 12 North, Range 1 West, Section 34

Z06004



- 0-1 FOOT
- 1-2 FOOT
- 2-3 FOOT
- 3-4 FOOT
- 4-5 FOOT
- 5-6 FOOT
- 6-7 FOOT

- 7-8 FOOT
- 8-9 FOOT
- 9-10 FOOT
- 10-11 FOOT
- 11-12 FOOT
- 12-13 FOOT
- 13-14 FOOT

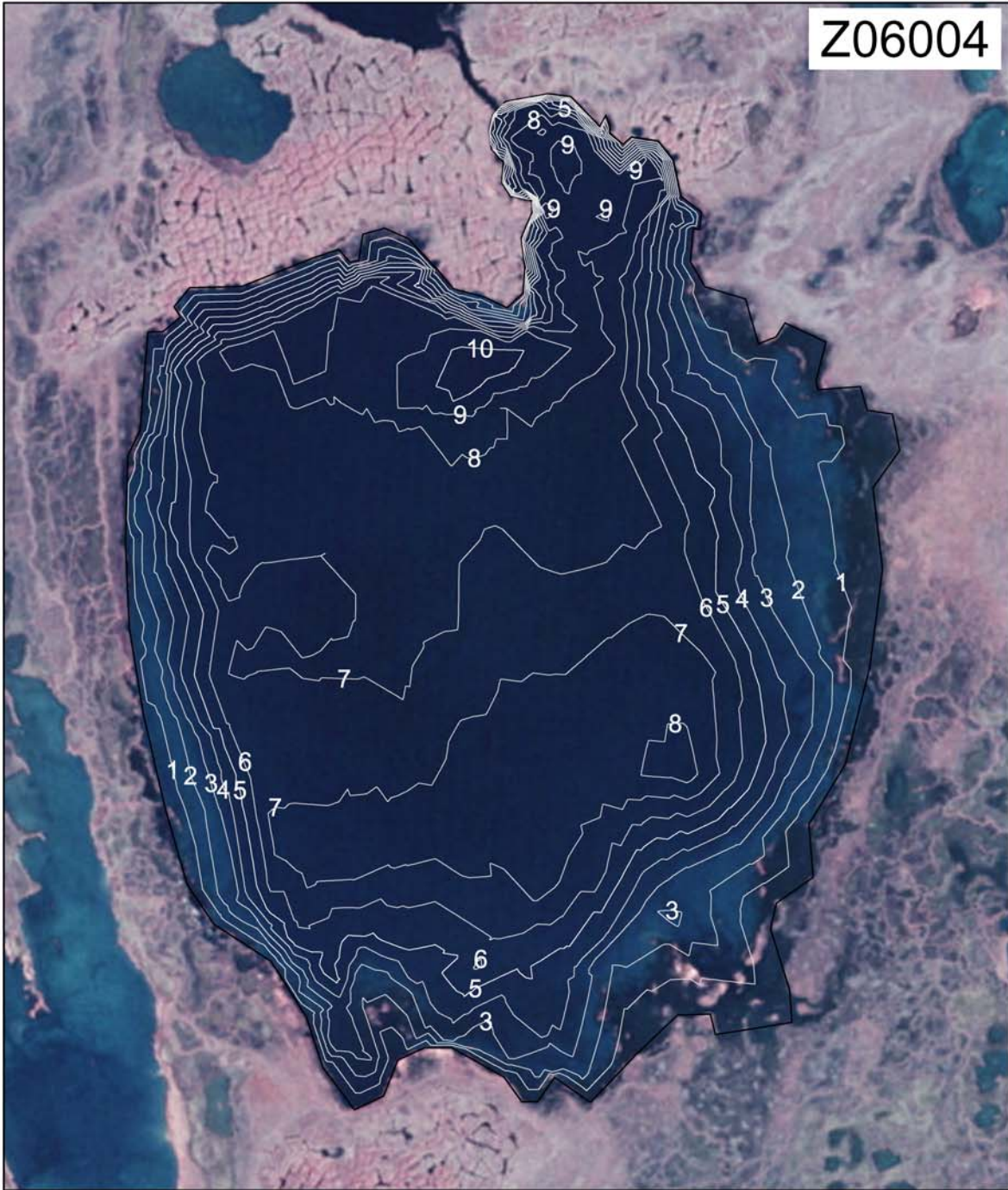


Depth Contours of Lake Z06004 Are Calculated Based Upon A Bathymetric Survey Conducted August 12, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°19'04.2" North 152°08'25.2" West (NAD 83)

Township 11 North, Range 1 West, Sections 9, 10, 15 & 16

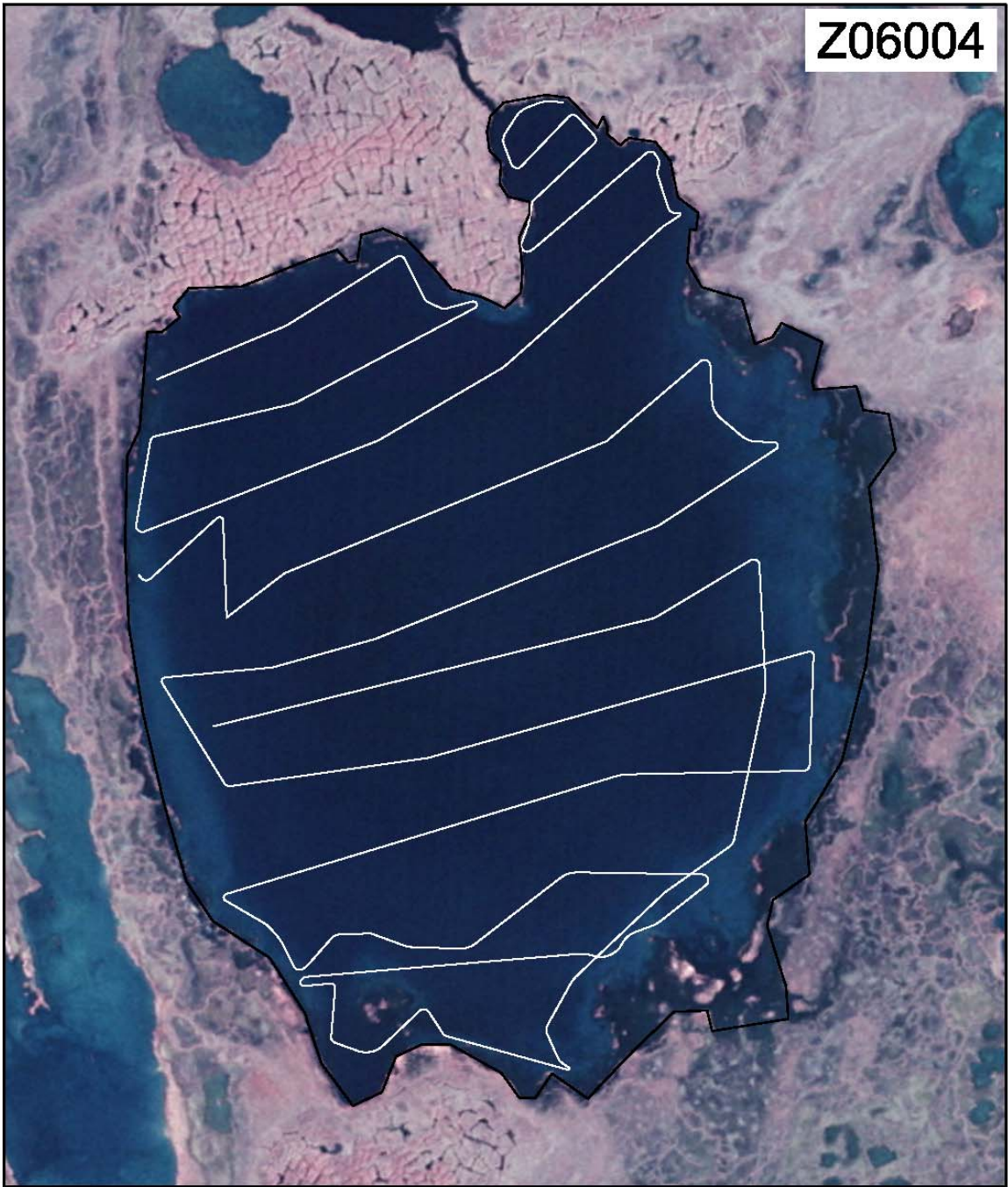
Z06004



Depth Contours of Lake Z06004 Are Calculated Based Upon A Bathymetric Survey Conducted August 12, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°19'04.2" North 152°08'25.2" West (NAD 83)

Z06004

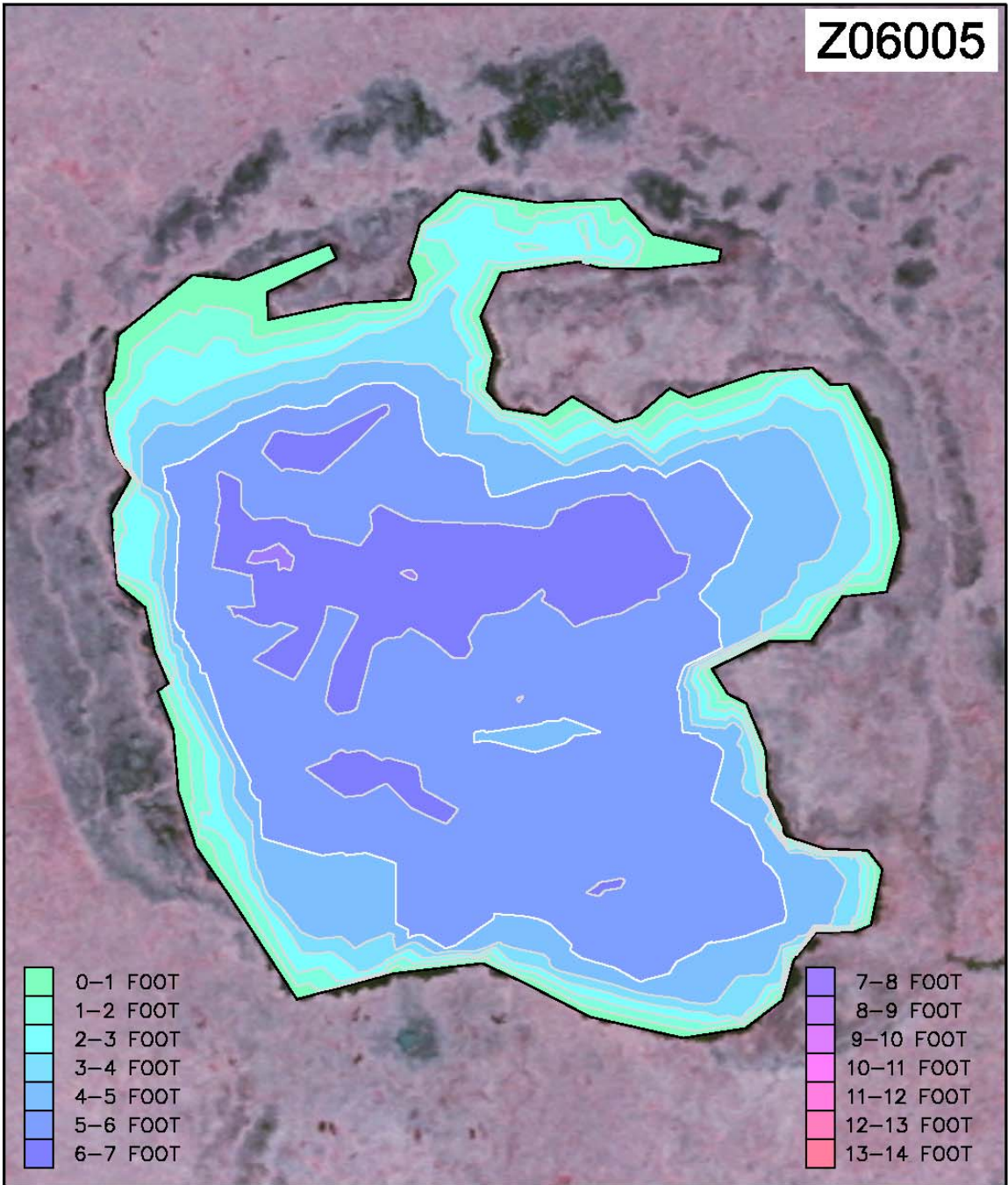


Depth transects surveyed at Lake Z06004 August 12, 2006

Maximum Depth Location: 70°19'04.2" North 152°08'25.2" West (NAD 83)

Township 11 North, Range 1 West, Sections 9, 10, 15 & 16

Z06005



Depth Contours of Lake Z06005 Are Calculated Based Upon A Bathymetric Survey Conducted August 13, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°11'56.6" North 151°34'48.5" West (NAD 83)

Township 10 North, Range 2 East, Sections 22, 23, 26 & 27

Z06005



Depth Contours of Lake Z06005 Are Calculated Based Upon A Bathymetric Survey Conducted August 13, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°11'56.6" North 151°34'48.5" West (NAD 83)

Township 10 North, Range 2 East, Sections 22, 23, 26 & 27

Z06005

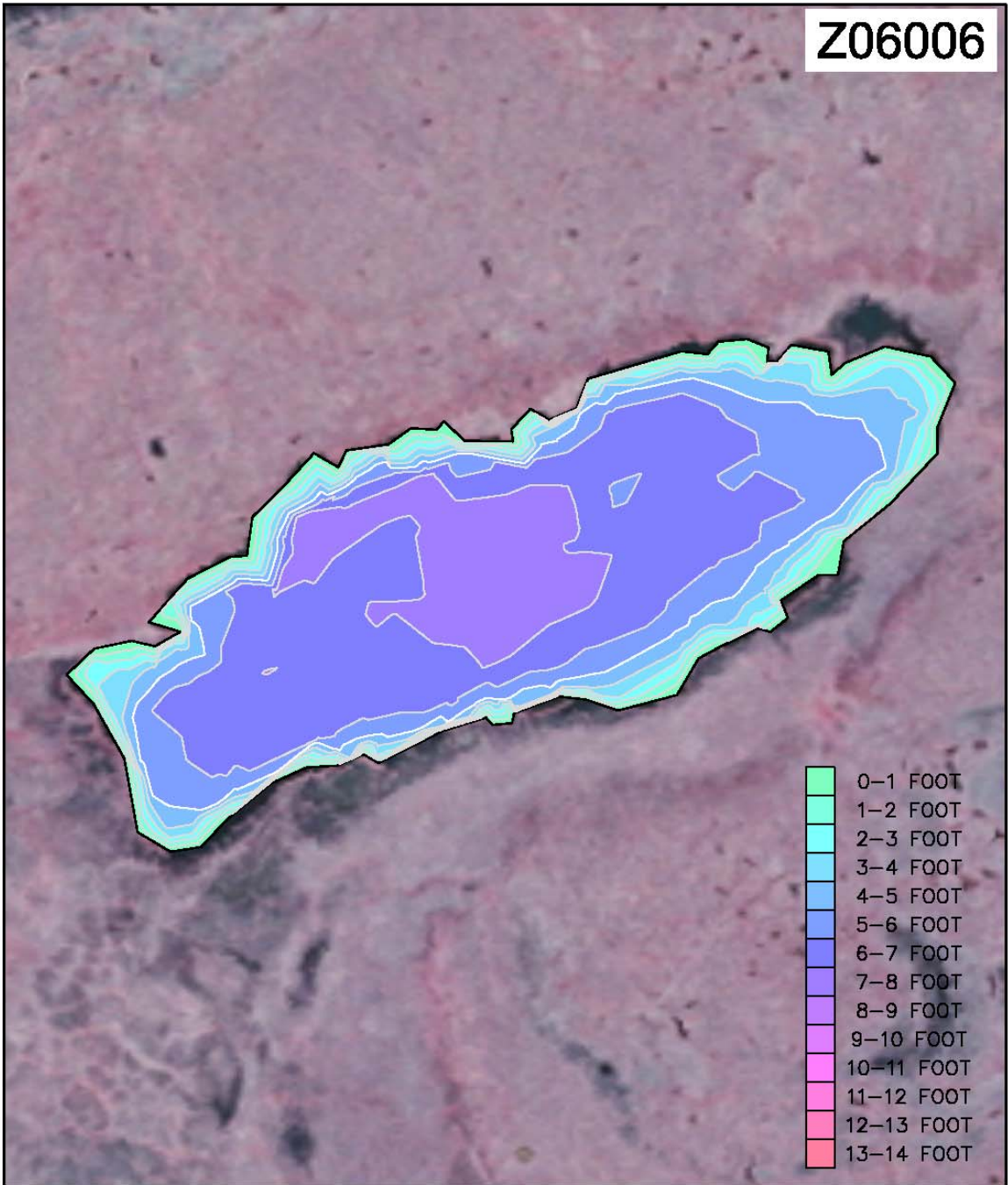


Depth transects surveyed at Lake Z06005 August 13, 2006

Maximum Depth Location: 70°11'56.6" North 151°34'48.5" West (NAD 83)

Township 10 North, Range 2 East, Sections 22, 23, 26 & 27

Z06006

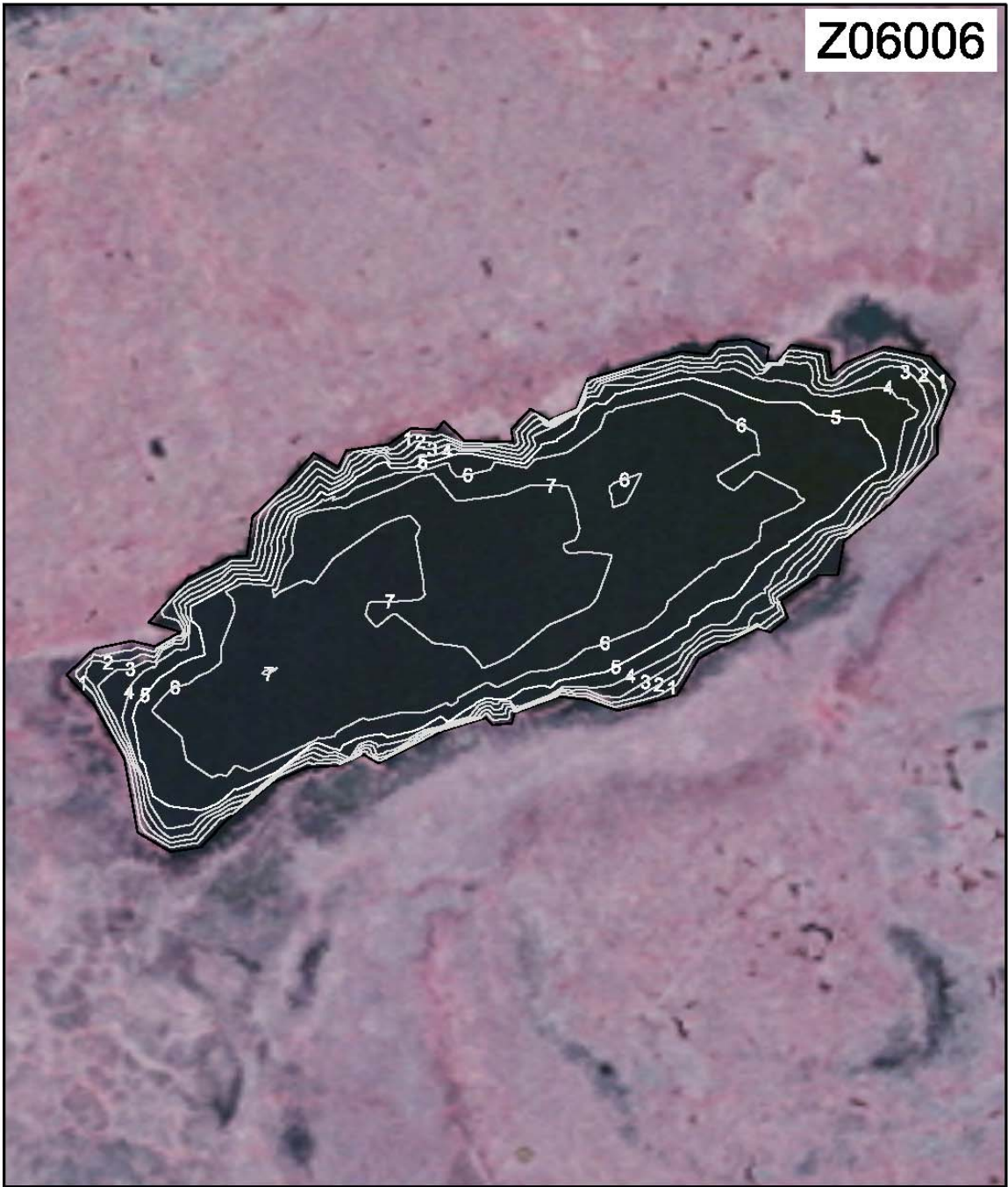


Depth Contours of Lake Z06006 Are Calculated Based Upon A Bathymetric Survey Conducted August 13, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°12'32.6" North 151°37'07.4" West (NAD 83)

Township 10 North, Range 2 East, Sections 21 & 22

Z06006



Depth Contours of Lake Z06006 Are Calculated Based Upon A Bathymetric Survey Conducted August 13, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°12'32.6" North 151°37'07.4" West (NAD 83)

Township 10 North, Range 2 East, Sections 21 & 22

Z06006

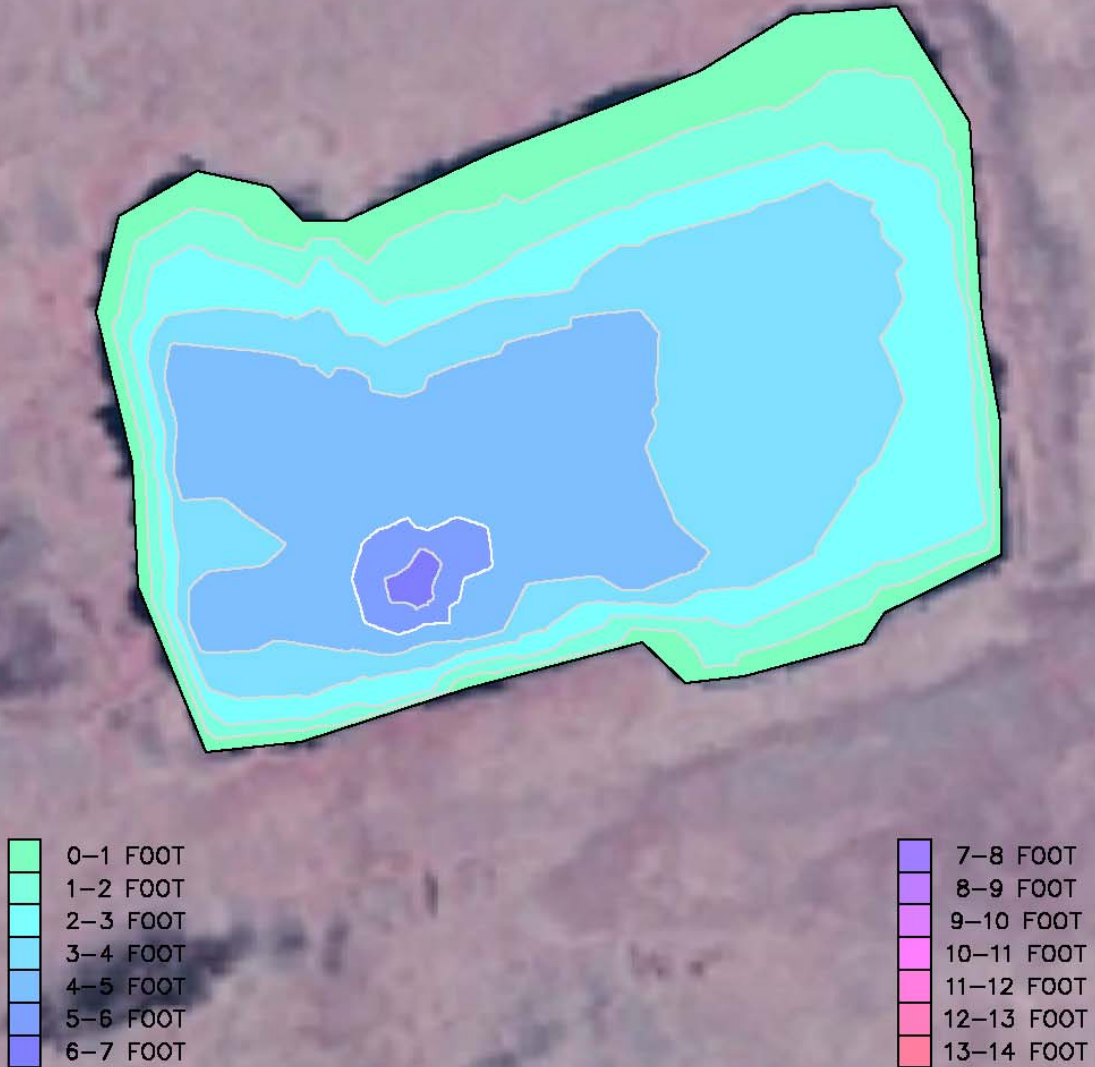


Depth transects surveyed at Lake Z06006 August 13, 2006

Maximum Depth Location: 70°12'32.6" North 151°37'07.4" West (NAD 83)

Township 10 North, Range 2 East, Sections 21 & 22

Z06007



Depth Contours of Lake Z06007 Are Calculated Based Upon A Bathymetric Survey Conducted August 14, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°22'16.8" North 153°08'33.7" West (NAD 83)

Township 12 North, Range 5 West, Sections 22 & 27

Z06007



Depth Contours of Lake Z06007 Are Calculated Based Upon A Bathymetric Survey Conducted August 14, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°22'16.8" North 153°08'33.7" West (NAD 83)

Township 12 North, Range 5 West, Sections 22 & 27

Z06007

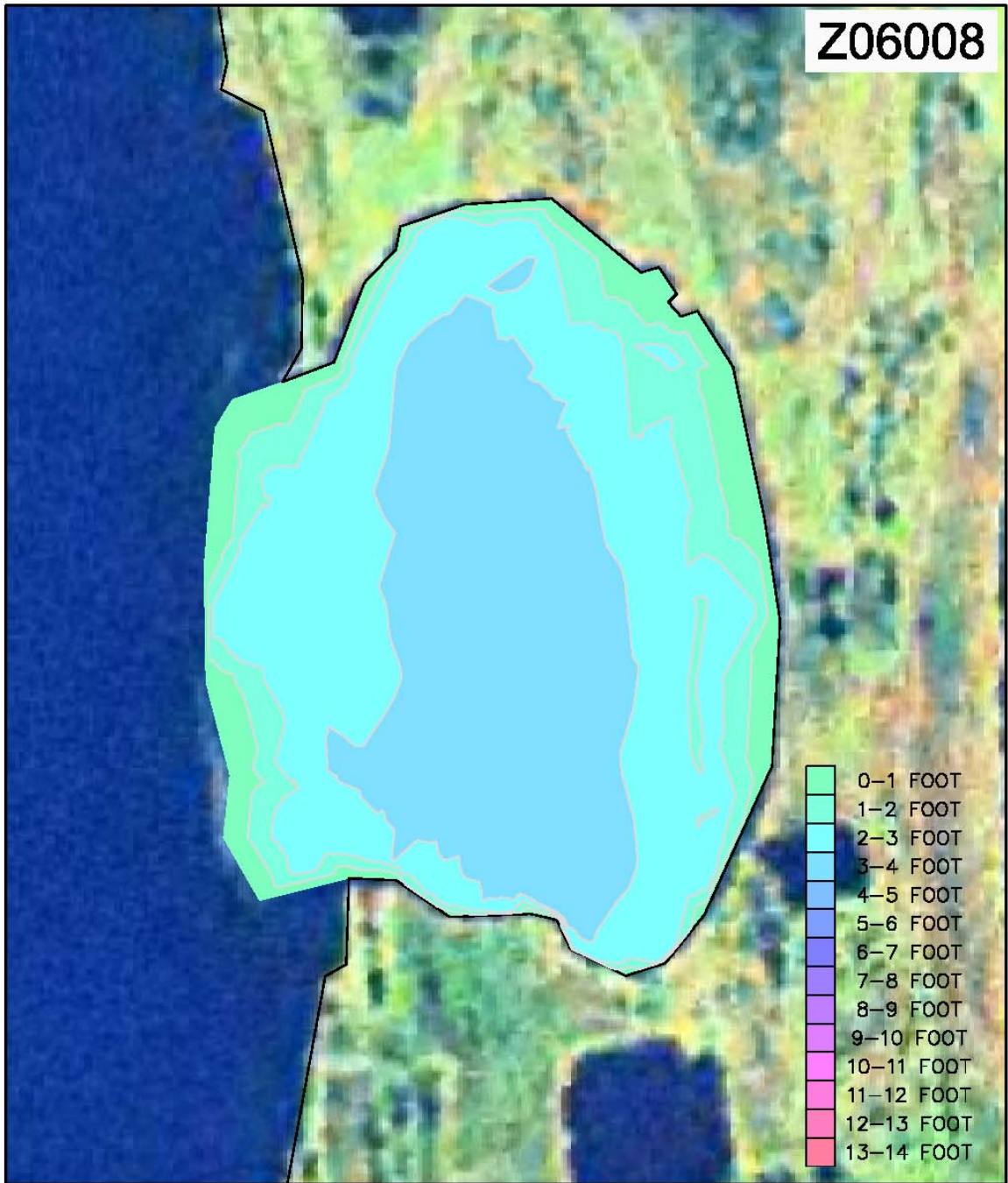


Depth transects surveyed at Lake Z06007 August 14, 2006

Maximum Depth Location: 70°22'16.8" North 153°08'33.7" West (NAD 83)

Township 12 North, Range 5 West, Sections 22 & 27

Z06008



0-1 FOOT
1-2 FOOT
2-3 FOOT
3-4 FOOT
4-5 FOOT
5-6 FOOT
6-7 FOOT
7-8 FOOT
8-9 FOOT
9-10 FOOT
10-11 FOOT
11-12 FOOT
12-13 FOOT
13-14 FOOT

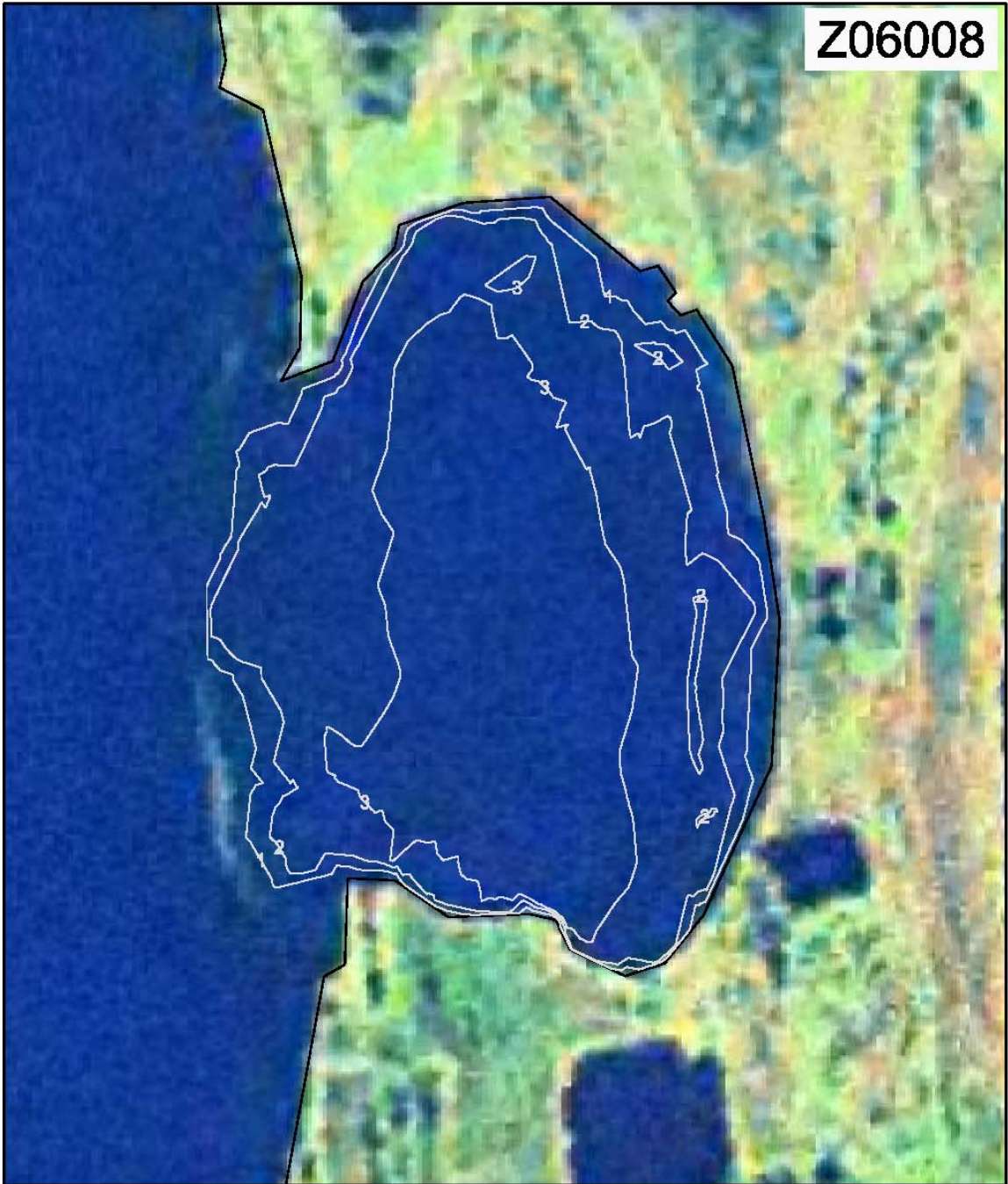


Depth Contours of Lake Z06008 Are Calculated Based Upon A Bathymetric Survey Conducted August 26, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°58'43.7" North 157°01'38.6" West (NAD 83)

Township 19 North, Range 19 West, Sections 23, 24, 25 & 26

Z06008

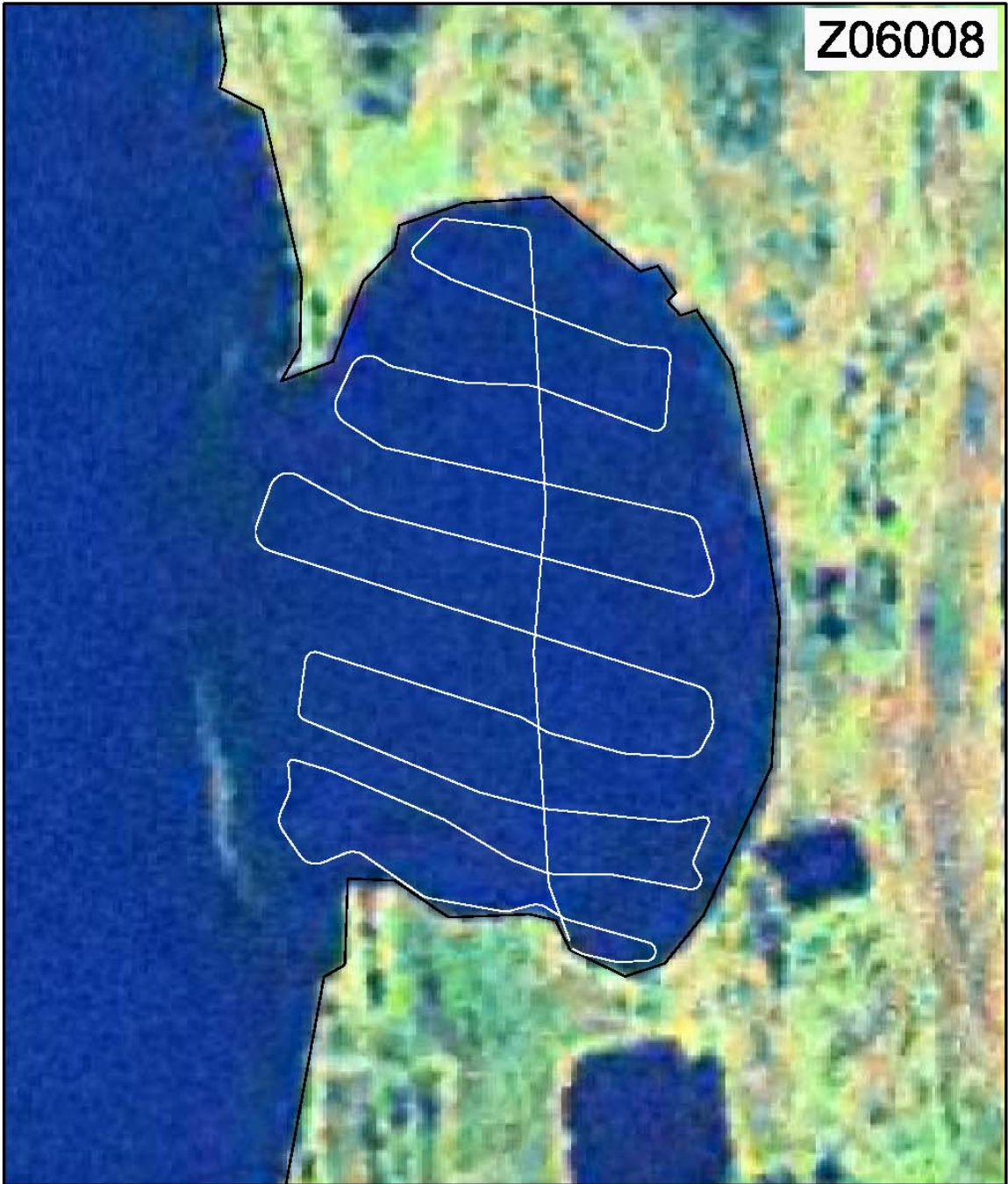


Depth Contours of Lake Z06008 Are Calculated Based Upon A Bathymetric Survey Conducted August 26, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°58'43.7" North 157°01'38.6" West (NAD 83)

Township 19 North, Range 19 West, Sections 23, 24, 25 & 26

Z06008

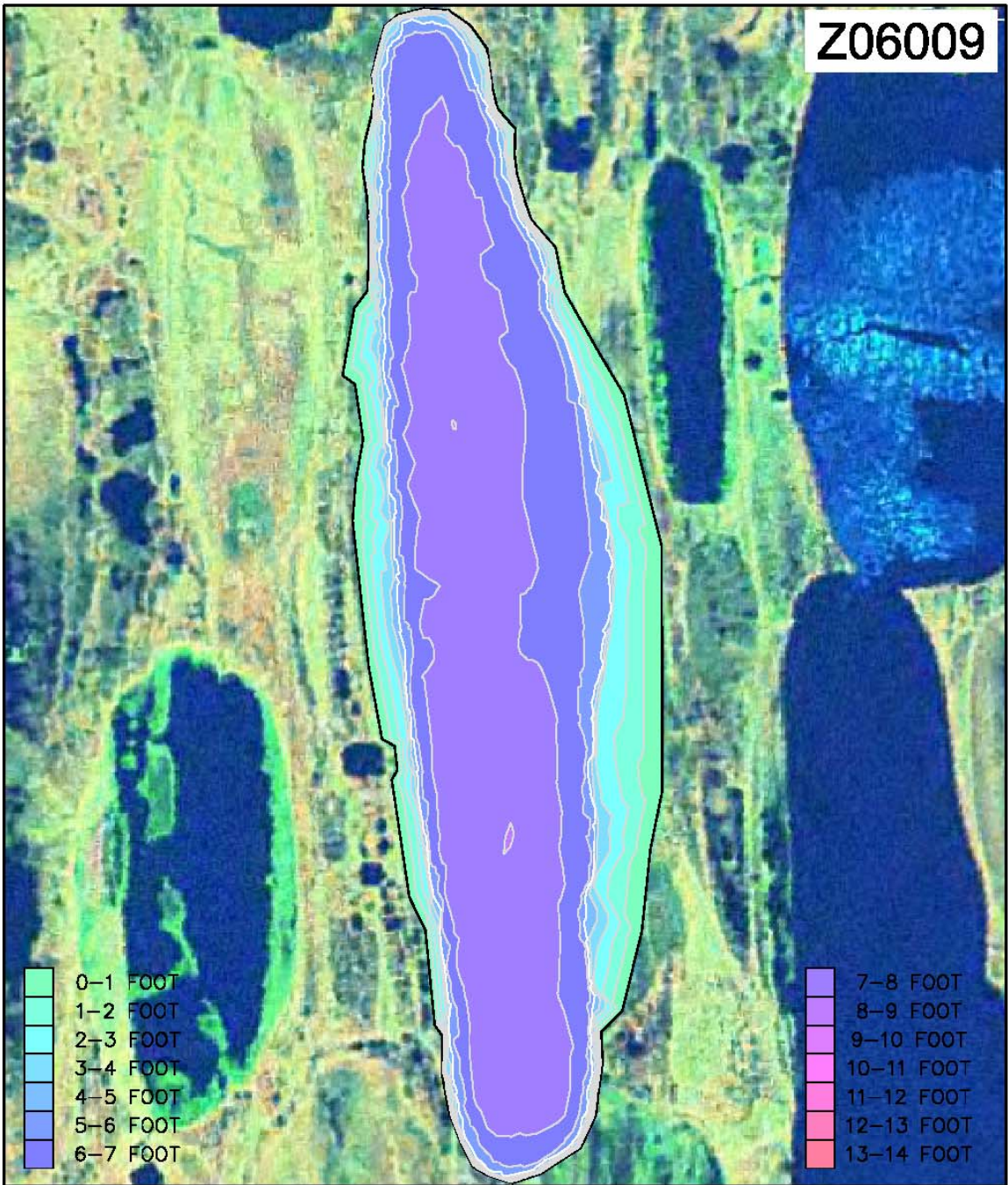


Depth transects surveyed at Lake Z06008 August 26, 2006

Maximum Depth Location: 70°58'43.7" North 157°01'38.6" West (NAD 83)

Township 19 North, Range 19 West, Sections 23, 24, 25 & 26

Z06009



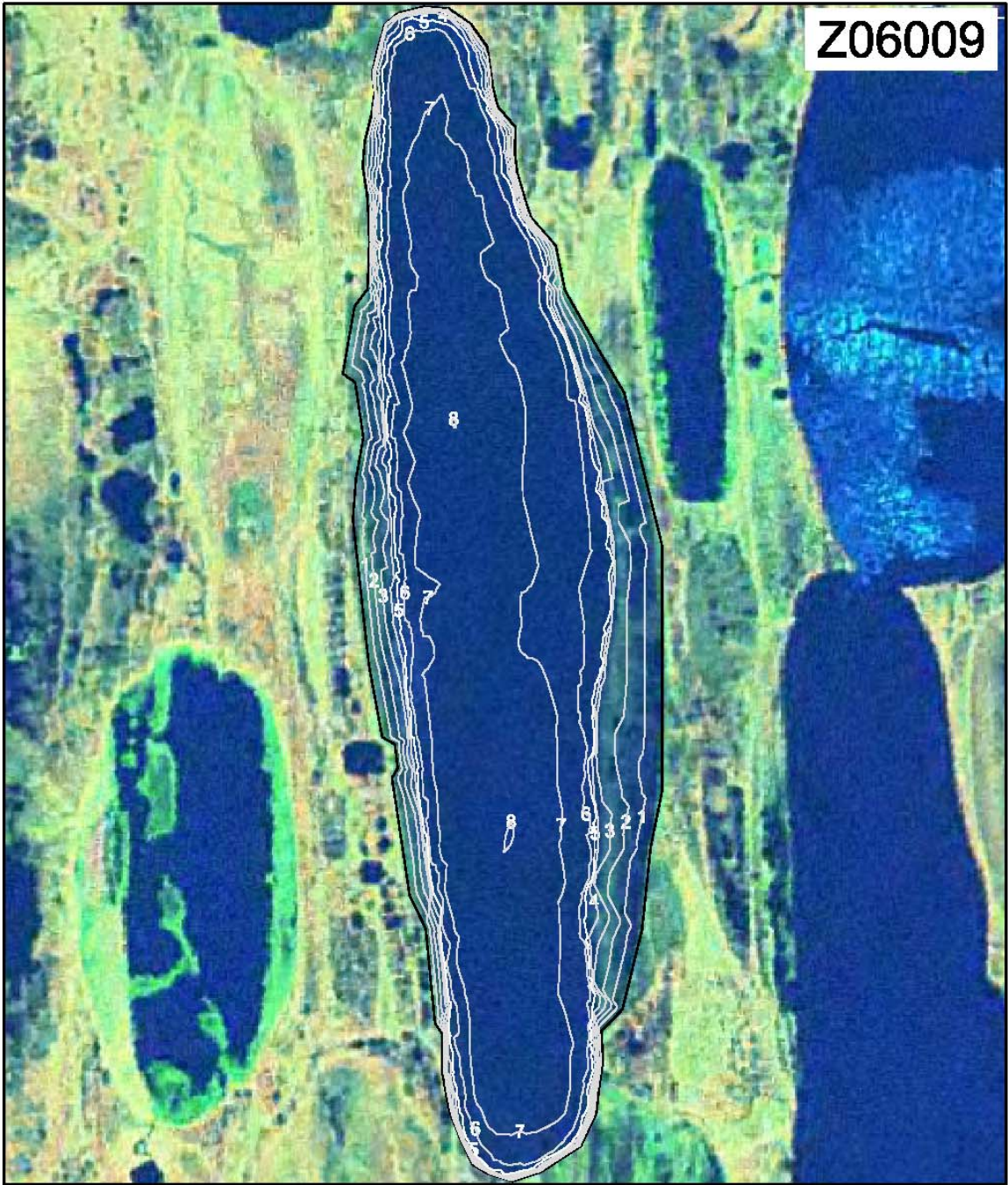
3500 0 3500 7000 10500 14000

Depth Contours of Lake Z06009 Are Calculated Based Upon A Bathymetric Survey Conducted August 27, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'26.1" North 156°55'50.0" West (NAD 83)

Township 19 North, Range 19 West, Sections 4, 5, 8, 9, 16, 17, 20 & 21

Township 20 North, Range 19 West, Sections 19, 20, 29, 30, 31, 32 & 33

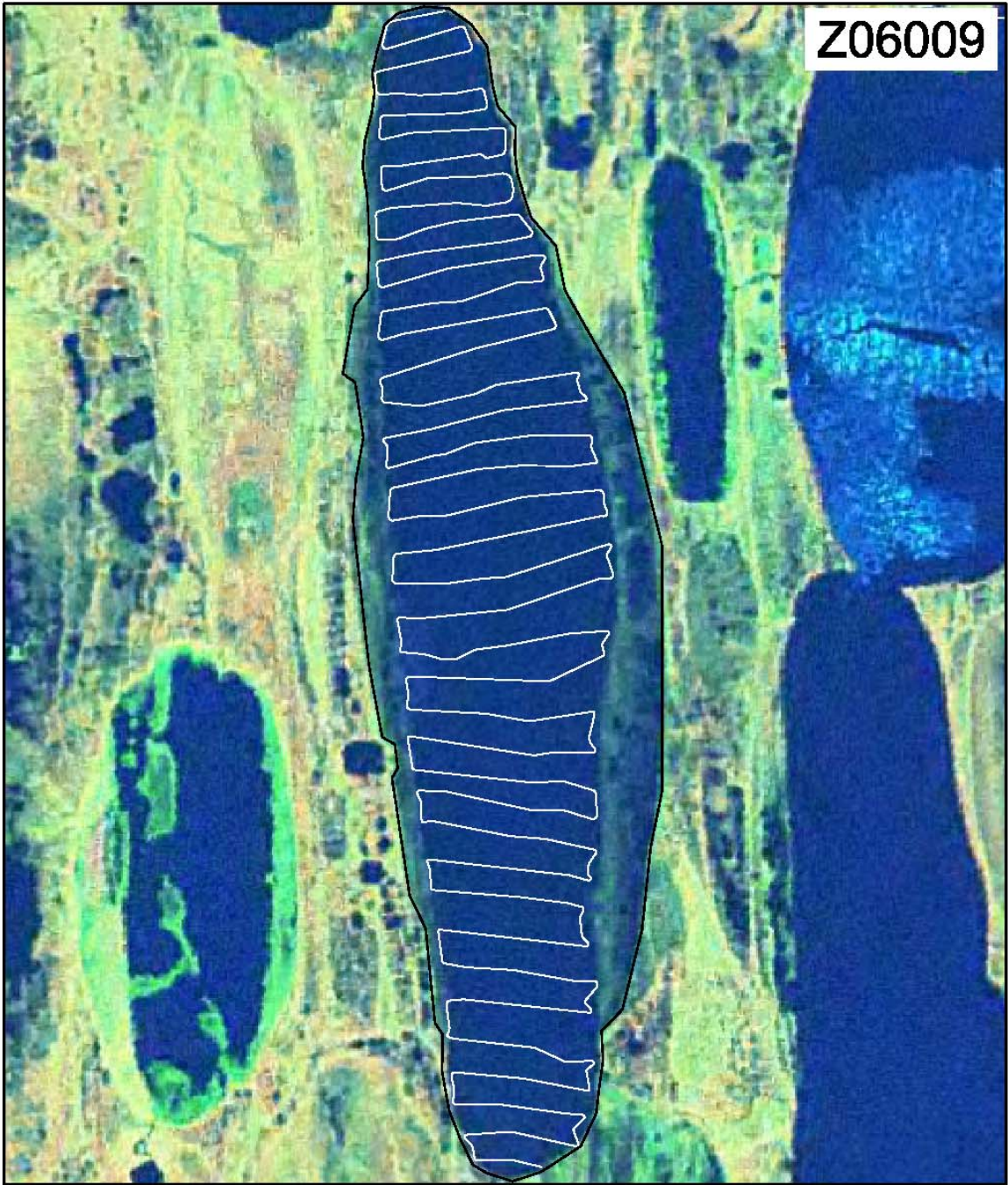


Depth Contours of Lake Z06009 Are Calculated Based Upon A Bathymetric Survey Conducted August 27, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'26.1" North 156°55'50.0" West (NAD 83)

Township 19 North, Range 19 West, Sections 4, 5, 8, 9, 16, 17, 20 & 21

Township 20 North, Range 19 West, Sections 19, 20, 29, 30, 31, 32 & 33



Depth transects surveyed at Lake Z06009 August 27, 2006

Maximum Depth Location: 71°02'26.1" North 156°55'50.0" West (NAD 83)

Township 19 North, Range 19 West, Sections 4, 5, 8, 9, 16, 17, 20 & 21

Township 20 North, Range 19 West, Sections 19, 20, 29, 30, 31, 32 & 33

Z06010



2500 0 2500 5000 7500 10000

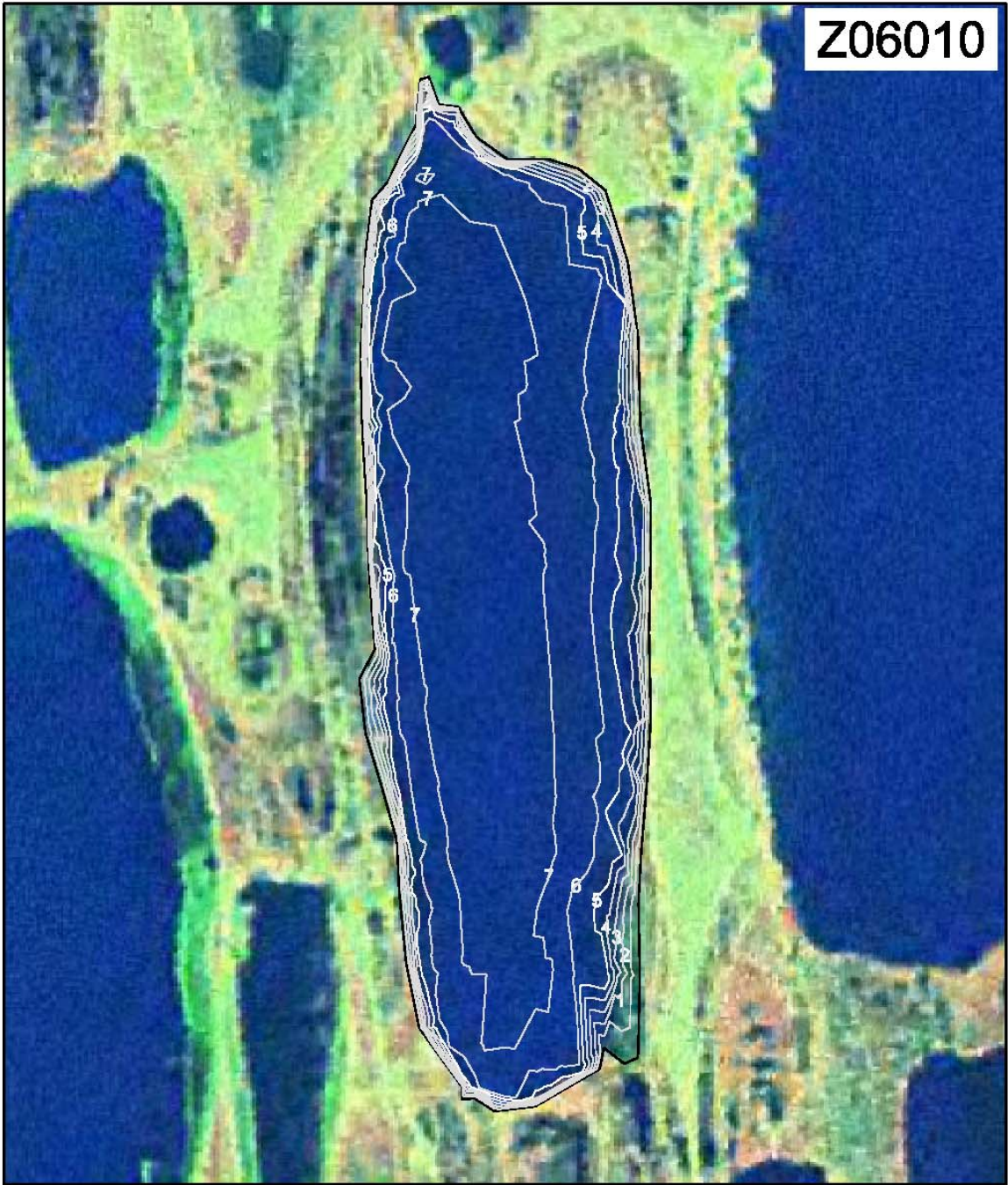
Depth Contours of Lake Z06010 Are Calculated Based Upon A Bathymetric Survey Conducted August 29, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°56'55.3" North 157°07'17.3" West (NAD 83)

Township 18 North, Range 20 West, Sections 3, 4, 9 & 10

Township 19 North, Range 20 West, Sections 21, 27, 28, 33 & 34

Z06010



2500 0 2500 5000 7500 10000

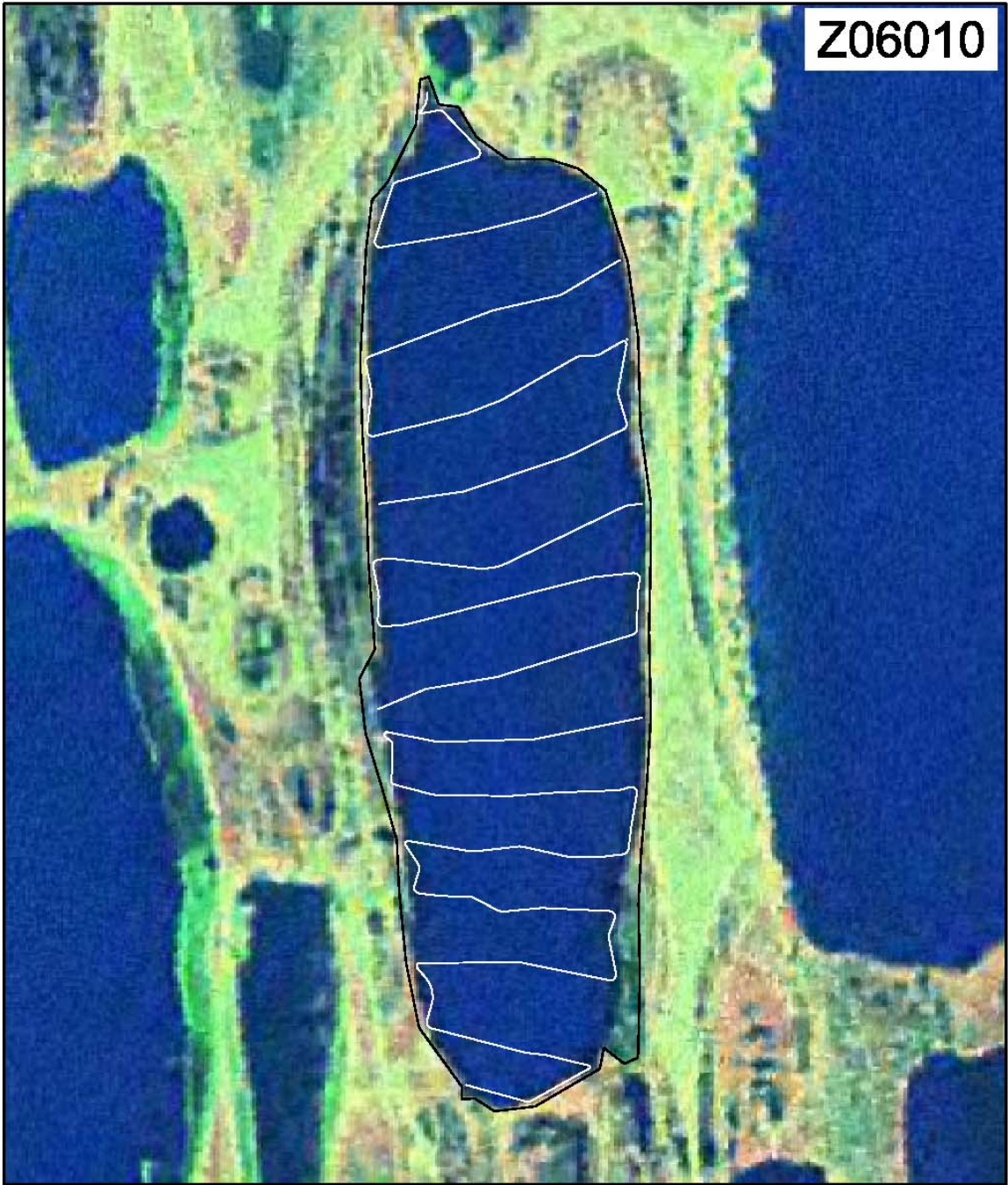
Depth Contours of Lake Z06010 Are Calculated Based Upon A Bathymetric Survey Conducted August 29, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 70°56'55.3" North 157°07'17.3" West (NAD 83)

Township 18 North, Range 20 West, Sections 3, 4, 9 & 10

Township 19 North, Range 20 West, Sections 21, 27, 28, 33 & 34

Z06010



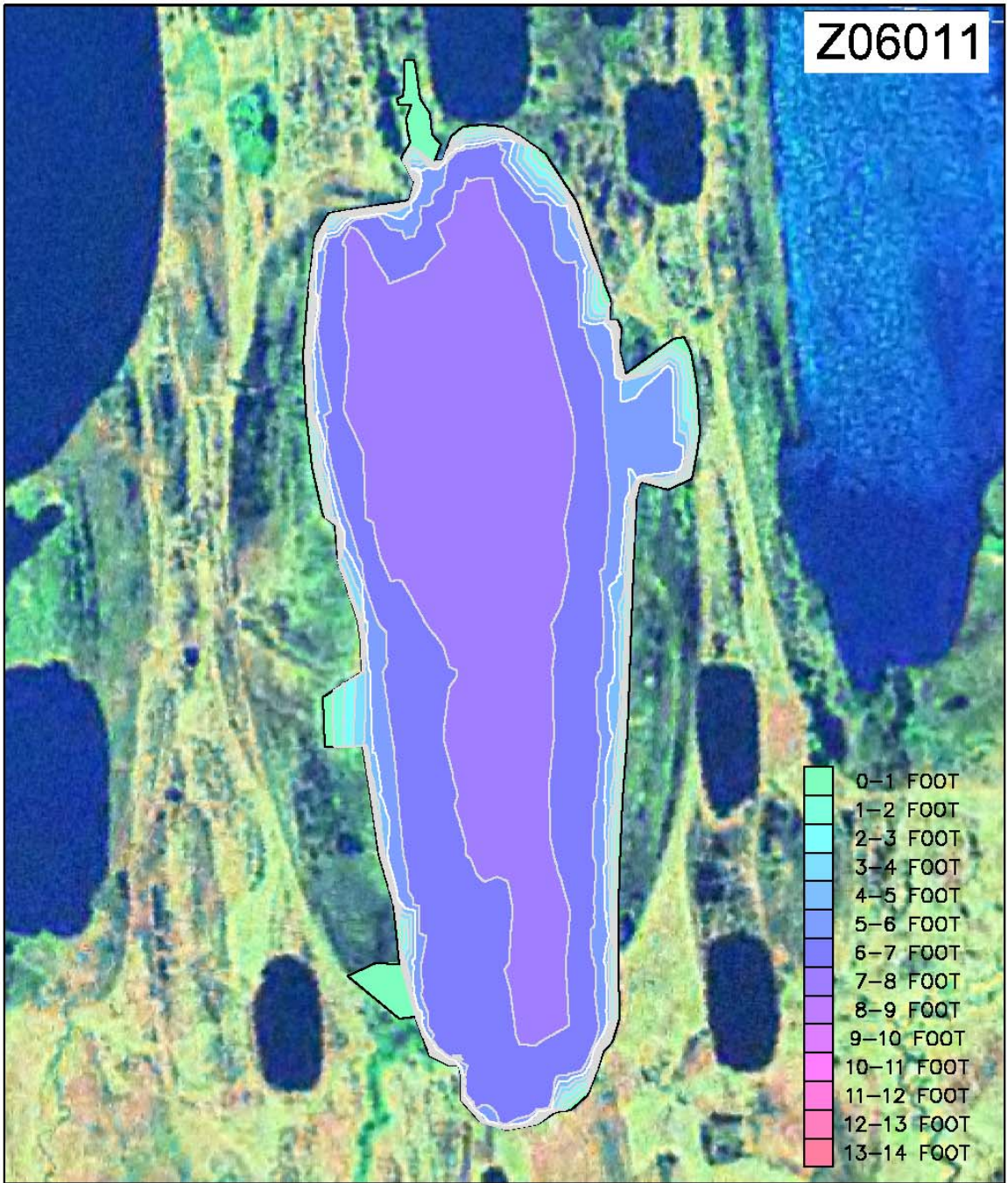
2500 0 2500 5000 7500 10000

Depth transects surveyed at Lake Z06010 August 29, 2006

Maximum Depth Location: 70°56'55.3" North 157°07'17.3" West (NAD 83)

Township 18 North, Range 20 West, Sections 3, 4, 9 & 10

Township 19 North, Range 20 West, Sections 21, 27, 28, 33 & 34



Depth Contours of Lake Z06011 Are Calculated Based Upon A Bathymetric Survey Conducted August 30, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'15.7" North 156°40'05.0" West (NAD 83)
 Township 19 North, Range 18 West, Sections 5, 6, 7, 8, 9, 16, 17 & 20
 Township 20 North, Range 18 West, Sections 29, 30, 31, 32 & 33



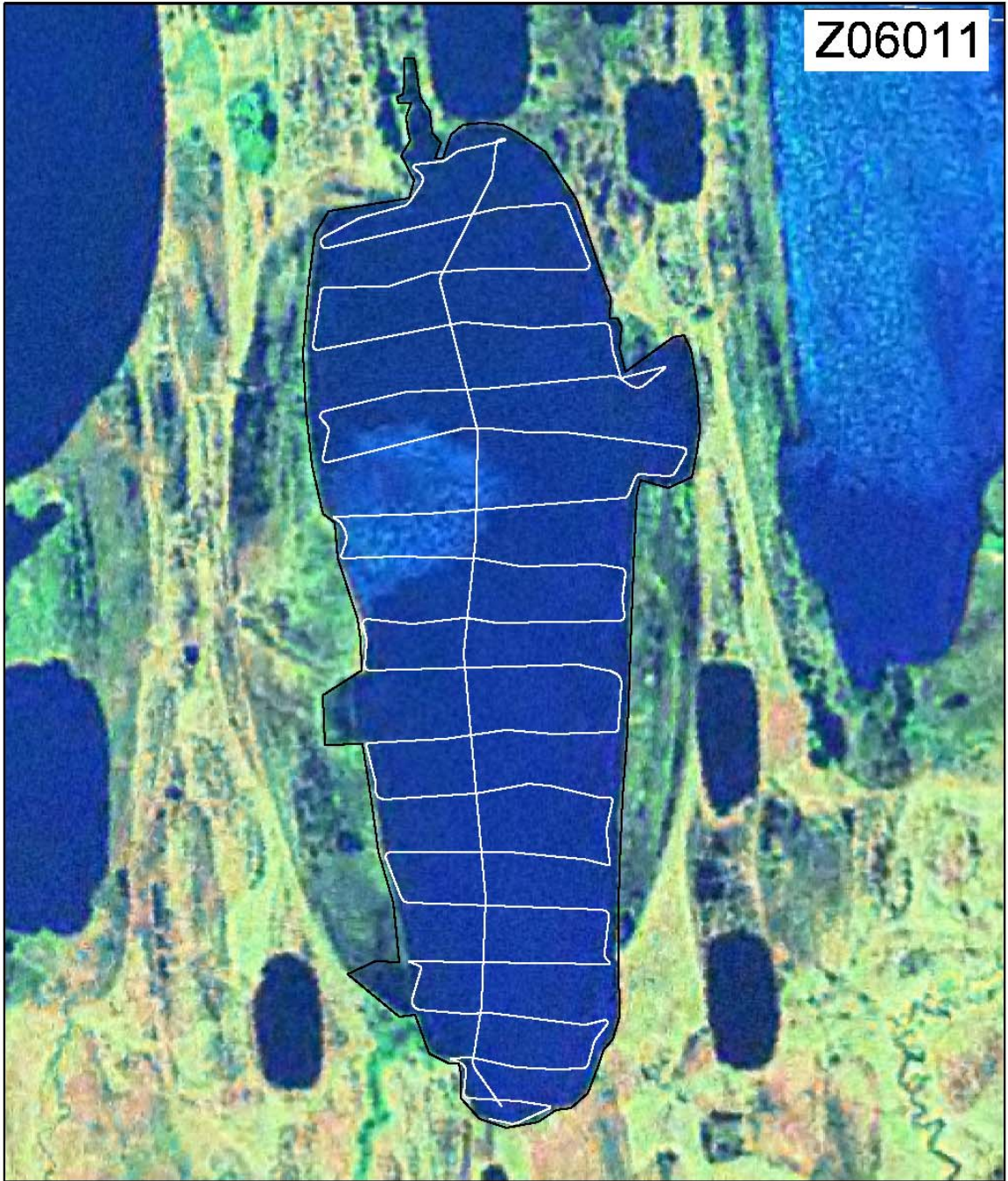
Depth Contours of Lake Z06011 Are Calculated Based Upon A Bathymetric Survey Conducted August 30, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'15.7" North 156°40'05.0" West (NAD 83)

Township 19 North, Range 18 West, Sections 5, 6, 7, 8, 9, 16, 17 & 20

Township 20 North, Range 18 West, Sections 29, 30, 31, 32 & 33

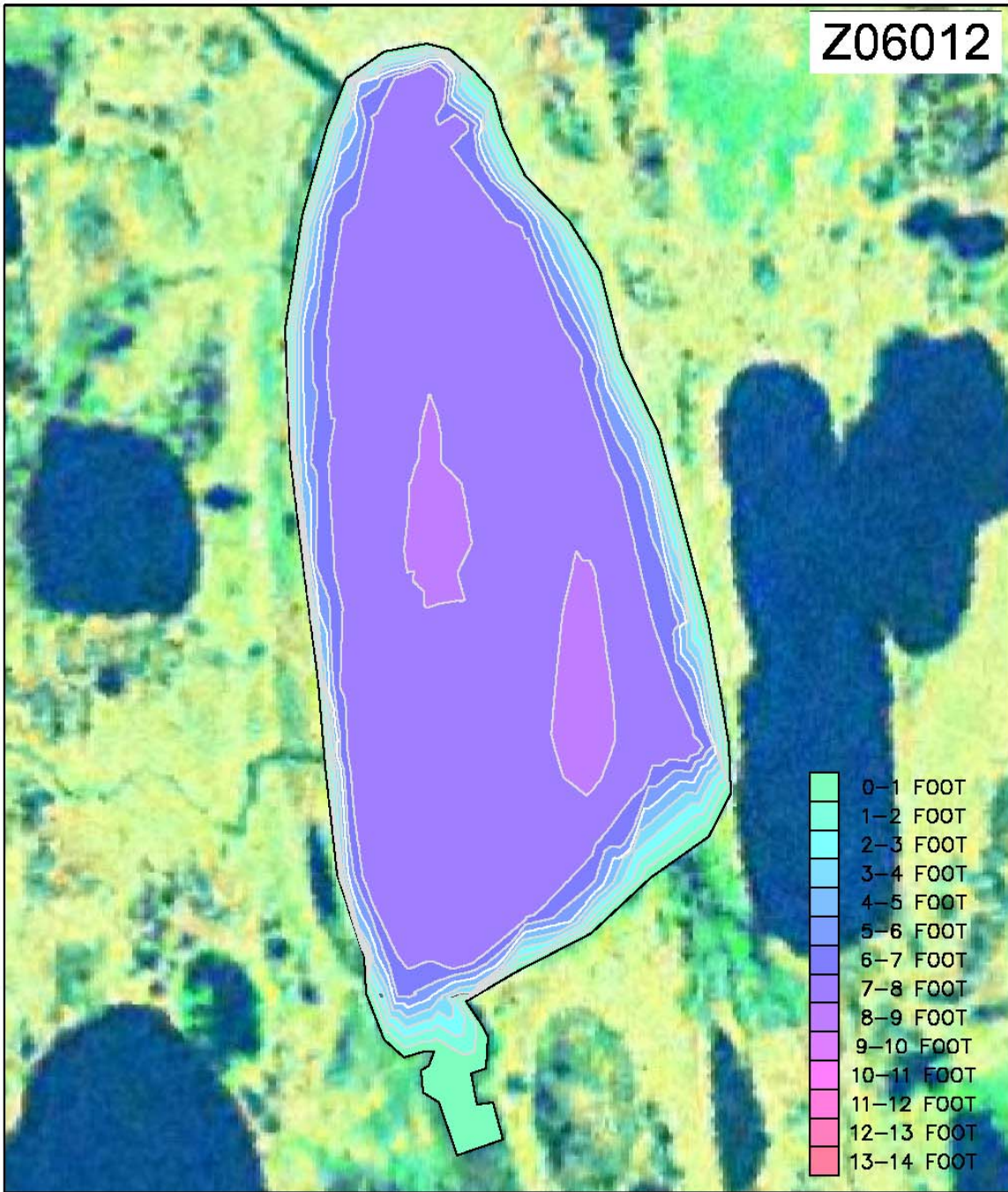
Z06011



Depth transects surveyed at Lake Z06011 August 30, 2006

Maximum Depth Location: 71°02'15.7" North 156°40'05.0" West (NAD 83)
Township 19 North, Range 18 West, Sections 5, 6, 7, 8, 9, 16, 17 & 20
Township 20 North, Range 18 West, Sections 29, 30, 31, 32 & 33

Z06012



Depth Contours of Lake Z06012 Are Calculated Based Upon A Bathymetric Survey Conducted August 31, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°13'23.7" North 156°37'12.4" West (NAD 83)

Township 22 North, Range 18 West, Sections 22, 23, 26, 27, 34 & 35

Z06012

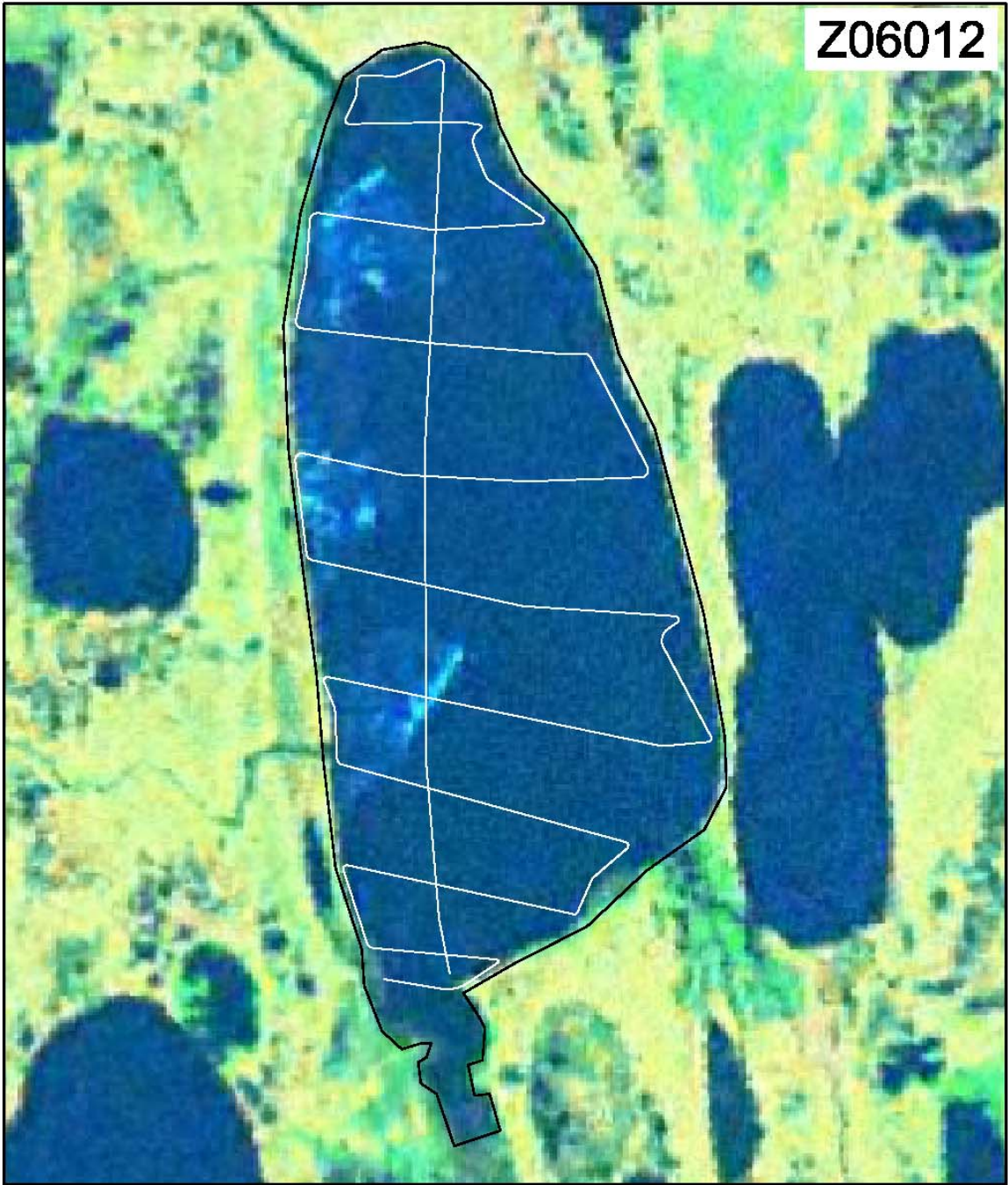


Depth Contours of Lake Z06012 Are Calculated Based Upon A Bathymetric Survey Conducted August 31, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°13'23.7" North 156°37'12.4" West (NAD 83)

Township 22 North, Range 18 West, Sections 22, 23, 26, 27, 34 & 35

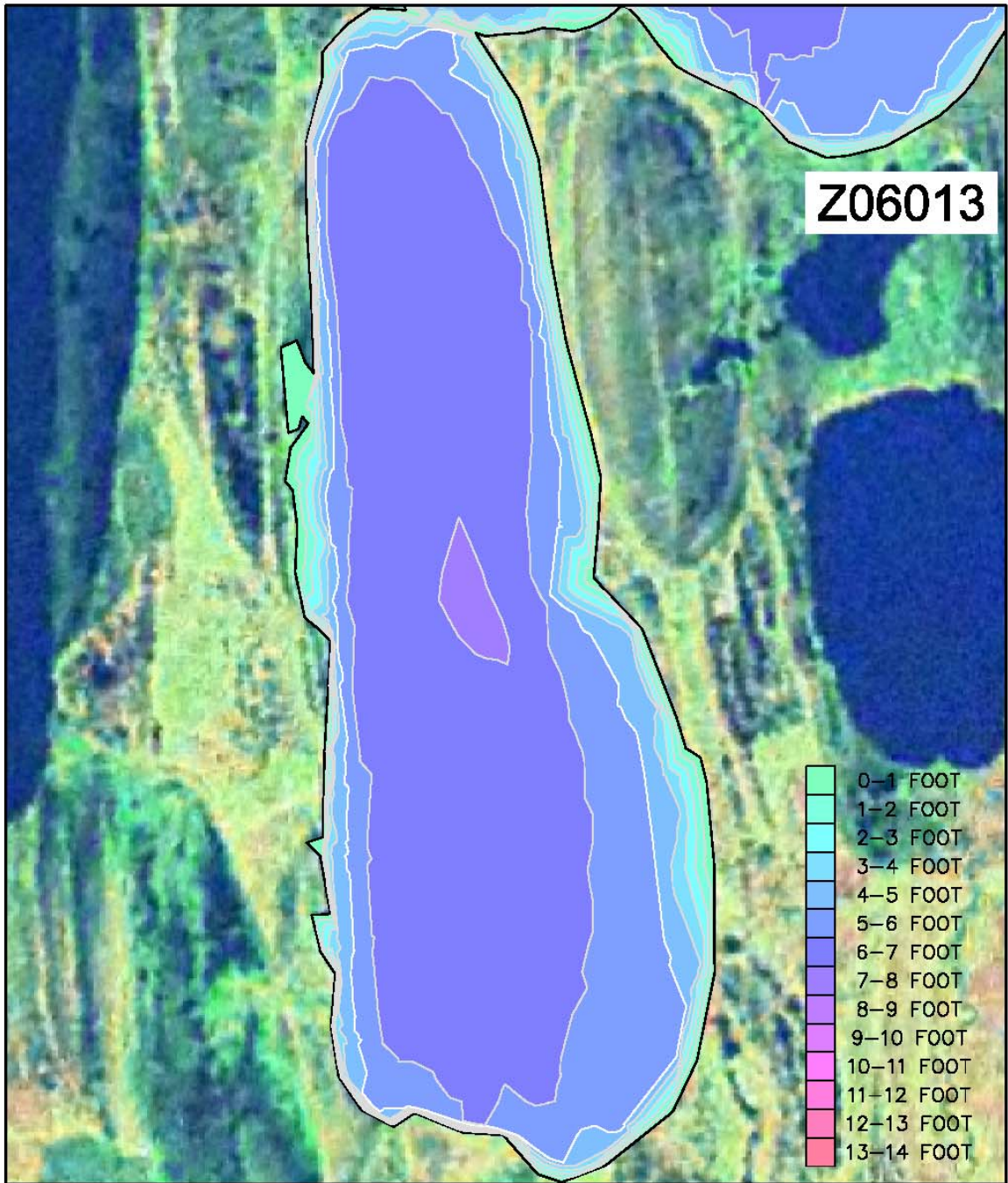
Z06012



Depth transects surveyed at Lake Z06012 August 31, 2006

Maximum Depth Location: 71°13'23.7" North 156°37'12.4" West (NAD 83)

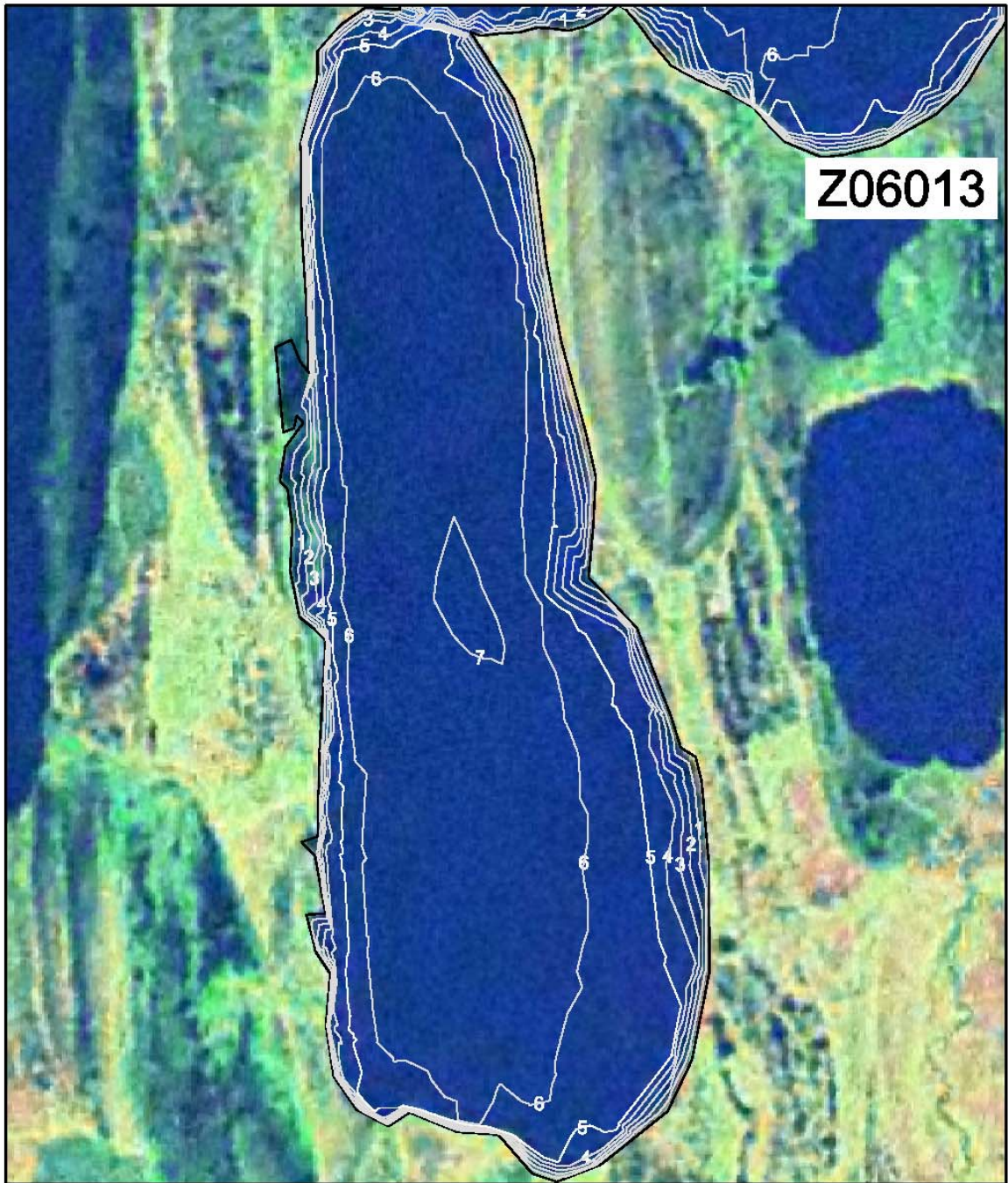
Township 22 North, Range 18 West, Sections 22, 23, 26, 27, 34 & 35



Depth Contours of Lake Z06013 Are Calculated Based Upon A Bathymetric Survey Conducted August 31, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°00'25.3" North 156°49'34.8" West (NAD 83)

Township 19 North, Range 19 West, Sections 2, 3, 10, 11, 14, 15, 22 & 23



Depth Contours of Lake Z06013 Are Calculated Based Upon A Bathymetric Survey Conducted August 31, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°00'25.3" North 156°49'34.8" West (NAD 83)

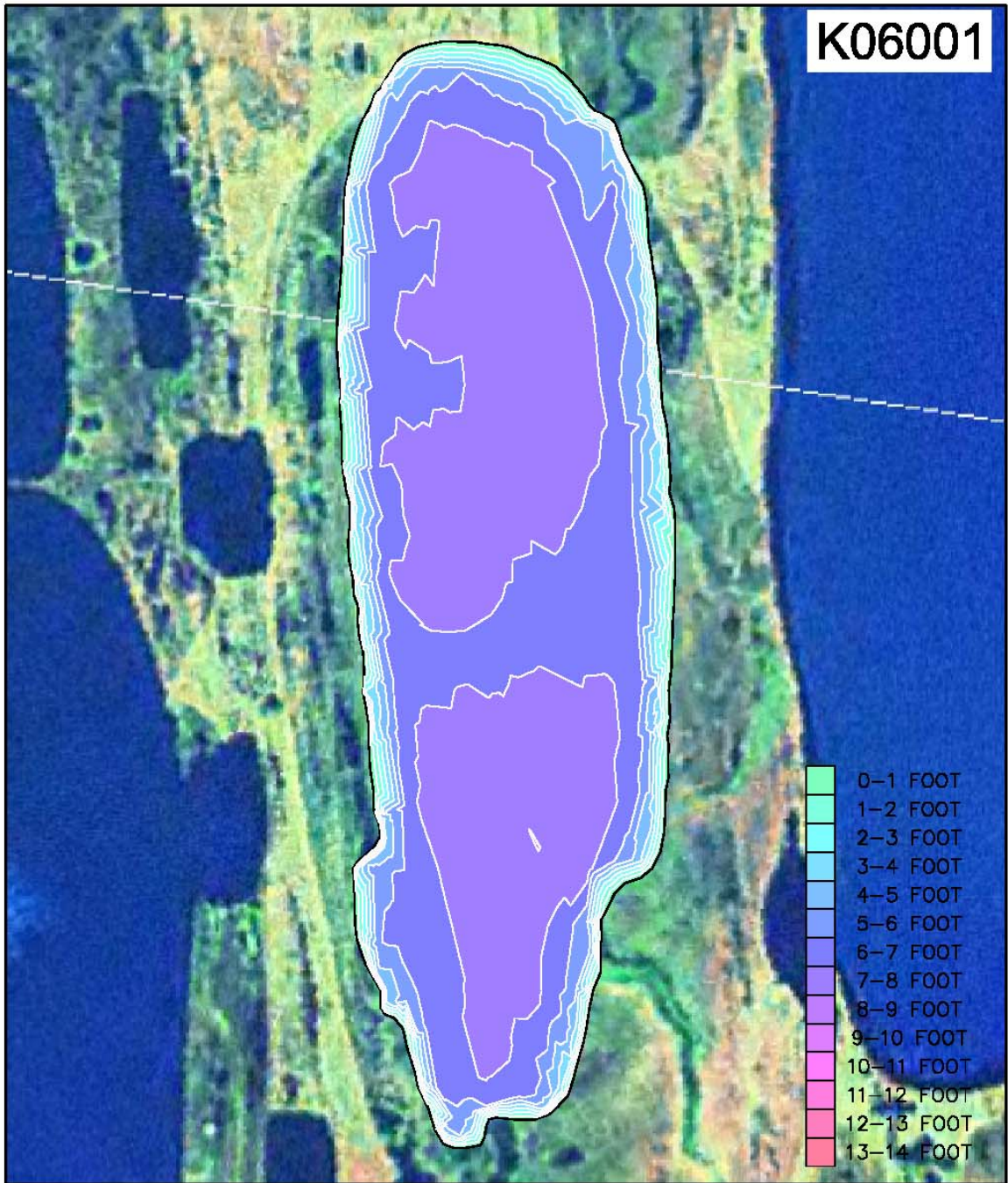
Township 19 North, Range 19 West, Sections 2, 3, 10, 11, 14, 15, 22 & 23



Depth transects surveyed at Lake Z06013 August 31, 2006

Maximum Depth Location: 71°00'25.3" North 156°49'34.8" West (NAD 83)

Township 19 North, Range 19 West, Sections 2, 3, 10, 11, 14, 15, 22 & 23



Depth Contours of Lake K06001 Are Calculated Based Upon A Bathymetric Survey Conducted September 1, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'26.5" North 156°35'09.6" West (NAD 83)

Township 19 North, Range 18 West, Sections 3 & 4

Township 20 North, Range 18 West, Sections 15, 16, 21, 22, 27, 28, 33 & 34



K06001



Depth Contours of Lake K06001 Are Calculated Based Upon A Bathymetric Survey Conducted September 1, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'26.5" North 156°35'09.6" West (NAD 83)

Township 19 North, Range 18 West, Sections 3 & 4

Township 20 North, Range 18 West, Sections 15, 16, 21, 22, 27, 28, 33 & 34



K06001



Depth transects surveyed at Lake K06001 September 1, 2006

Maximum Depth Location: 71°02'26.5" North 156°35'09.6" West (NAD 83)

Township 19 North, Range 18 West, Sections 3 & 4

Township 20 North, Range 18 West, Sections 15, 16, 21, 22, 27, 28, 33 & 34

K06002



0-1 FOOT
1-2 FOOT
2-3 FOOT
3-4 FOOT
4-5 FOOT
5-6 FOOT
6-7 FOOT
7-8 FOOT
8-9 FOOT
9-10 FOOT
10-11 FOOT
11-12 FOOT
12-13 FOOT
13-14 FOOT



Depth Contours of Lake K06002 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°06'15.0" North 156°49'55.9" West (NAD 83)

Township 20 North, Range 19 West, Sections 3 & 10

K06002



Depth Contours of Lake K06002 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°06'15.0" North 156°49'55.9" West (NAD 83)
Township 20 North, Range 19 West, Sections 3 & 10

K06002

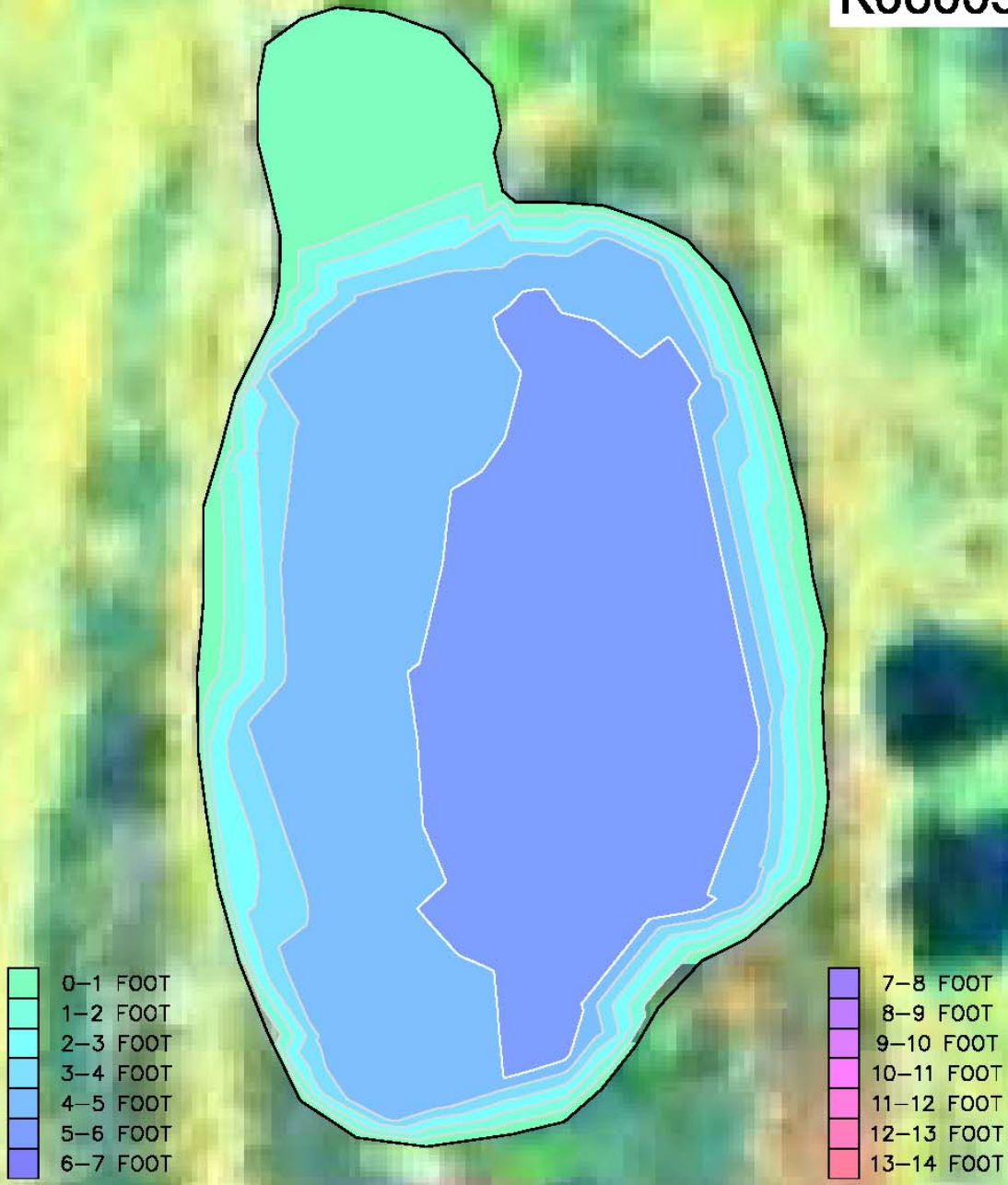


Depth transects surveyed at Lake K06002 September 2, 2006

Maximum Depth Location: 71°06'15.0" North 156°49'55.9" West (NAD 83)

Township 20 North, Range 19 West, Sections 3 & 10

K06003



Depth Contours of Lake K06003 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°10'12.0" North 156°47'12.7" West (NAD 83)

Township 21 North, Range 18 West, Sections 18 & 19

K06003

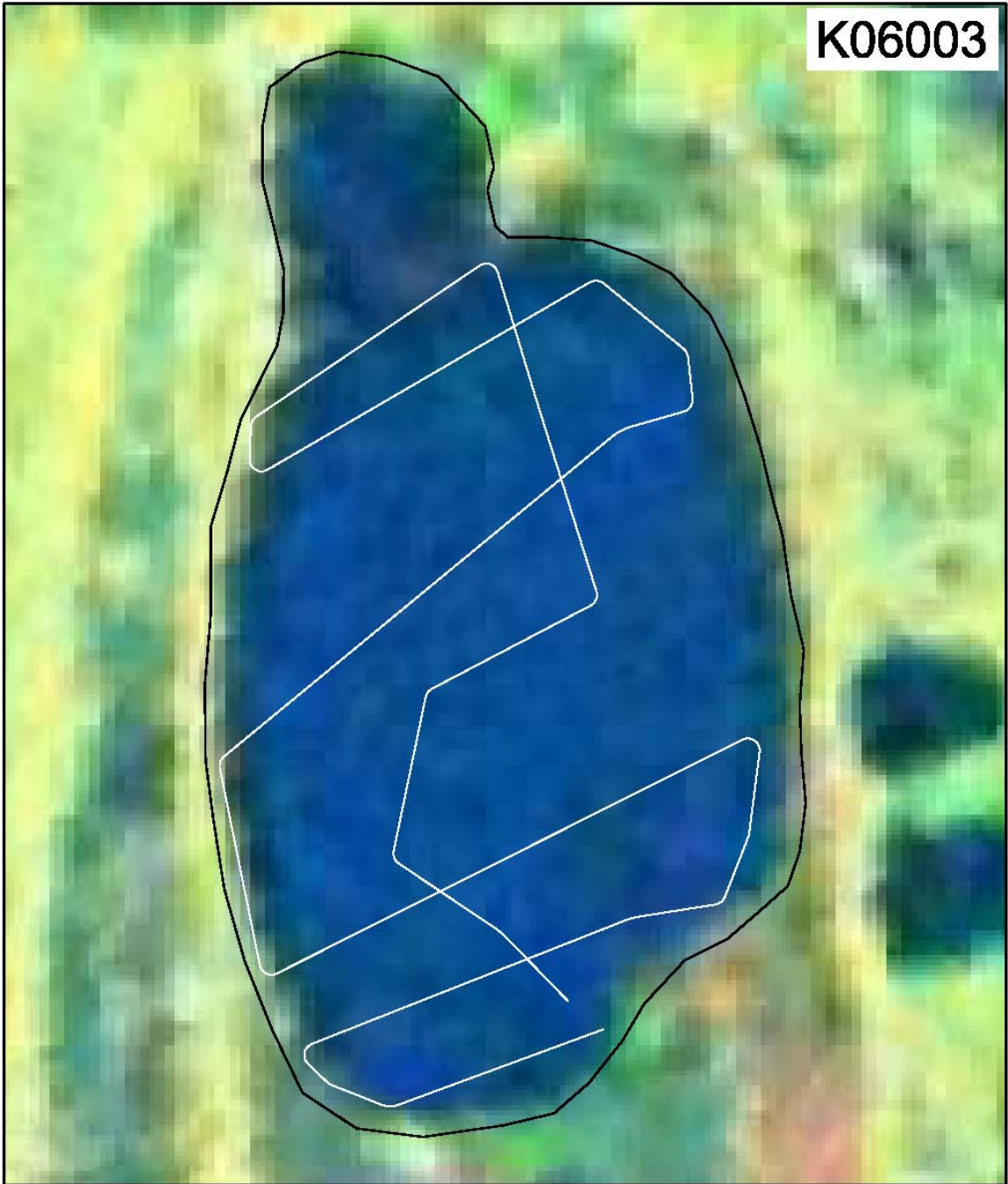


Depth Contours of Lake K06003 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°10'12.0" North 156°47'12.7" West (NAD 83)

Township 21 North, Range 18 West, Sections 18 & 19

K06003

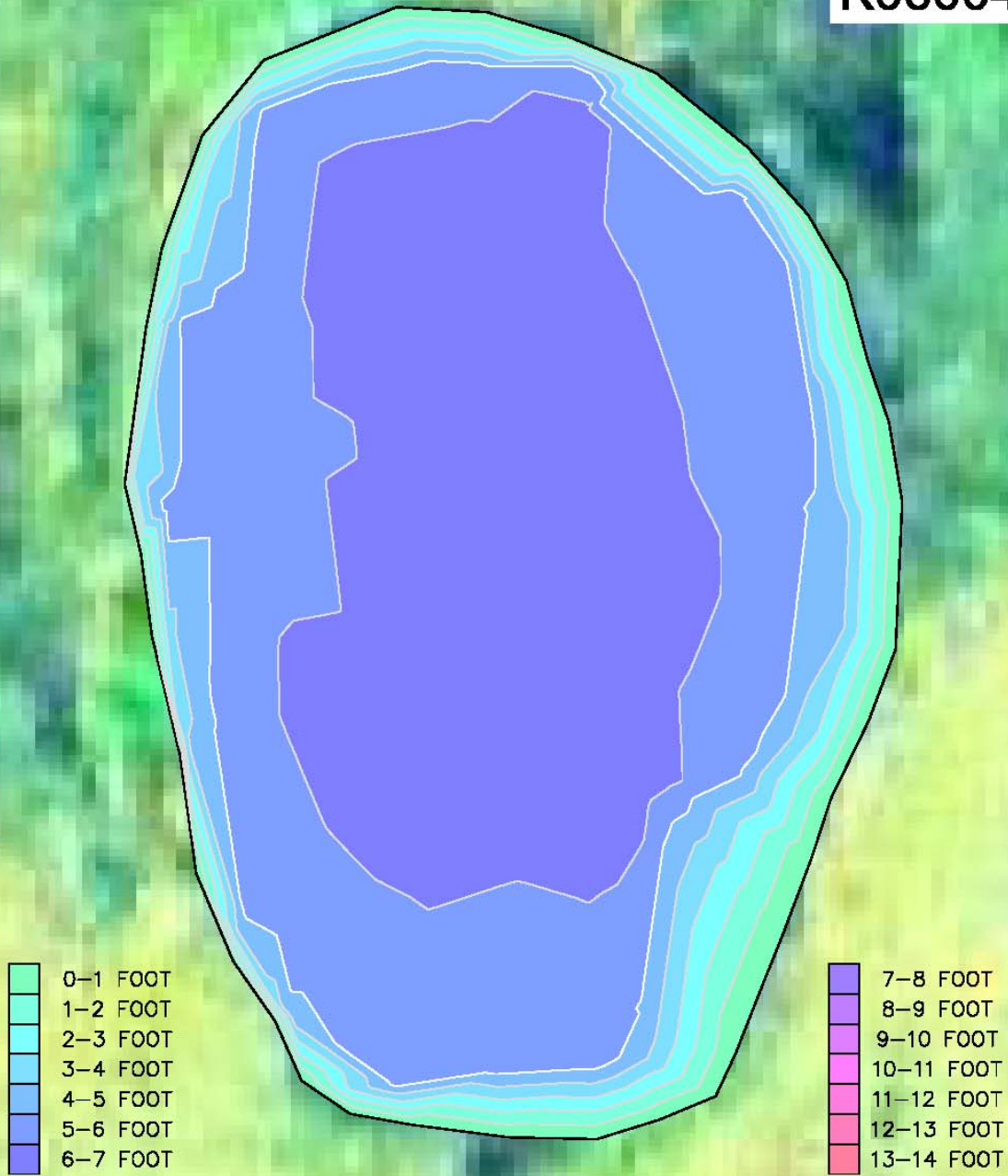


Depth transects surveyed at Lake K06003 September 2, 2006

Maximum Depth Location: 71°10'12.0" North 156°47'12.7" West (NAD 83)

Township 21 North, Range 18 West, Sections 18 & 19

K06004



Depth Contours of Lake K06004 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°12'52.1" North 156°42'36.8" West (NAD 83)

Township 21 North, Range 18 West, Section 4
Township 22 North, Range 18 West, Section 33

K06004



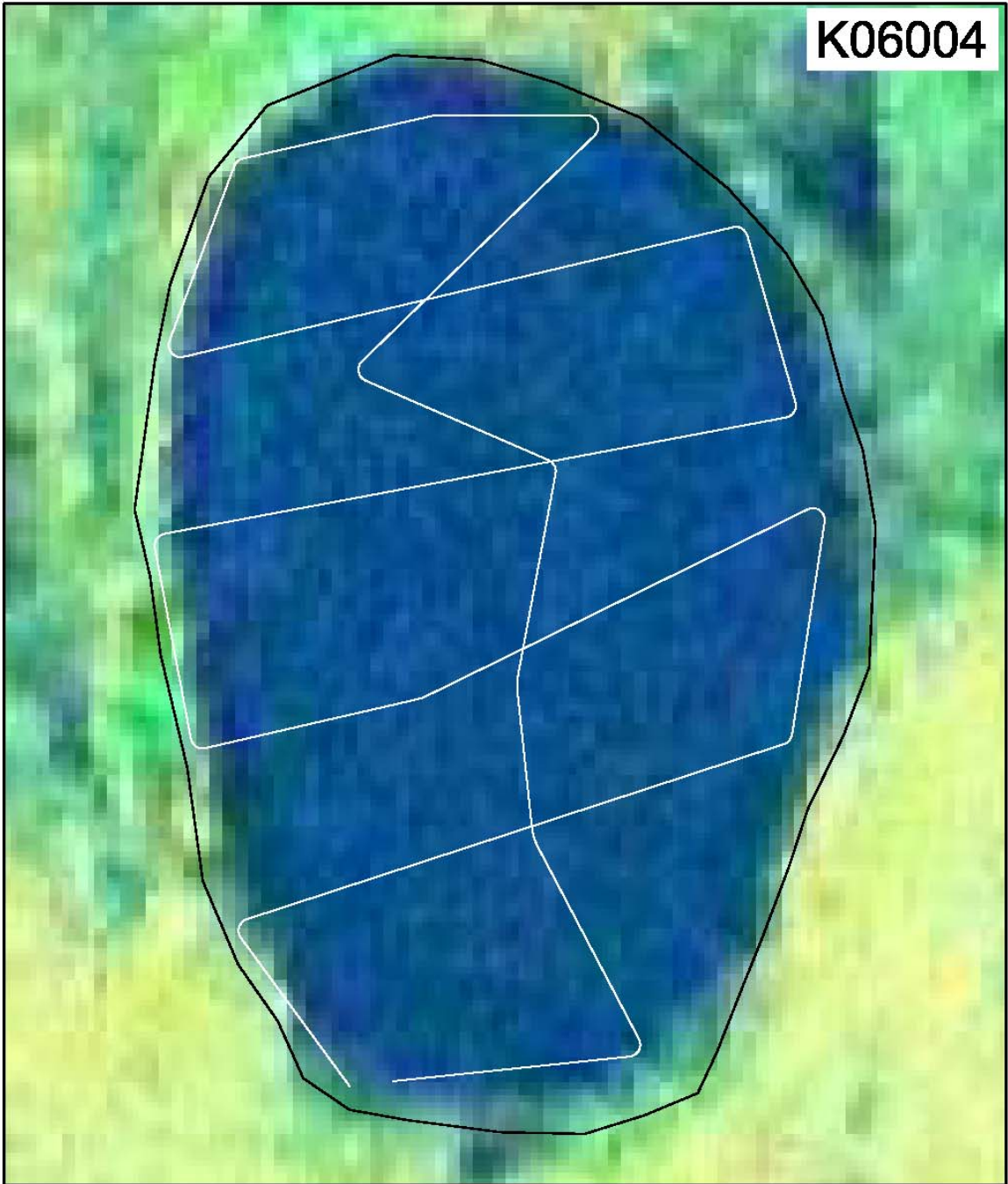
Depth Contours of Lake K06004 Are Calculated Based Upon A Bathymetric Survey Conducted September 2, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°12'52.1" North 156°42'36.8" West (NAD 83)

Township 21 North, Range 18 West, Section 4

Township 22 North, Range 18 West, Section 33

K06004



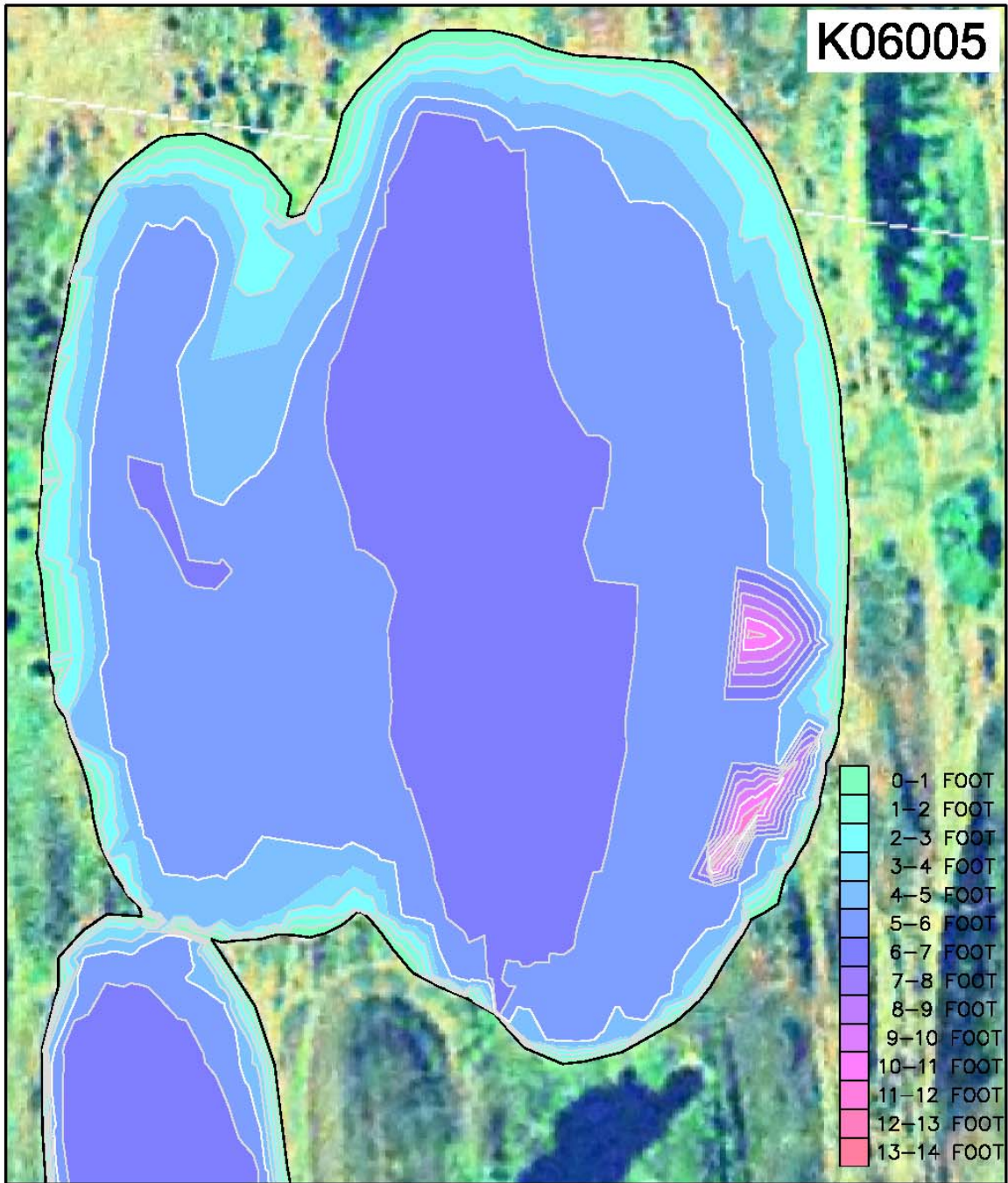
Depth transects surveyed at Lake Z06004 August 12, 2006

Maximum Depth Location: 71°12'52.1" North 156°42'36.8" West (NAD 83)

Township 21 North, Range 18 West, Section 4

Township 22 North, Range 18 West, Section 33

K06005

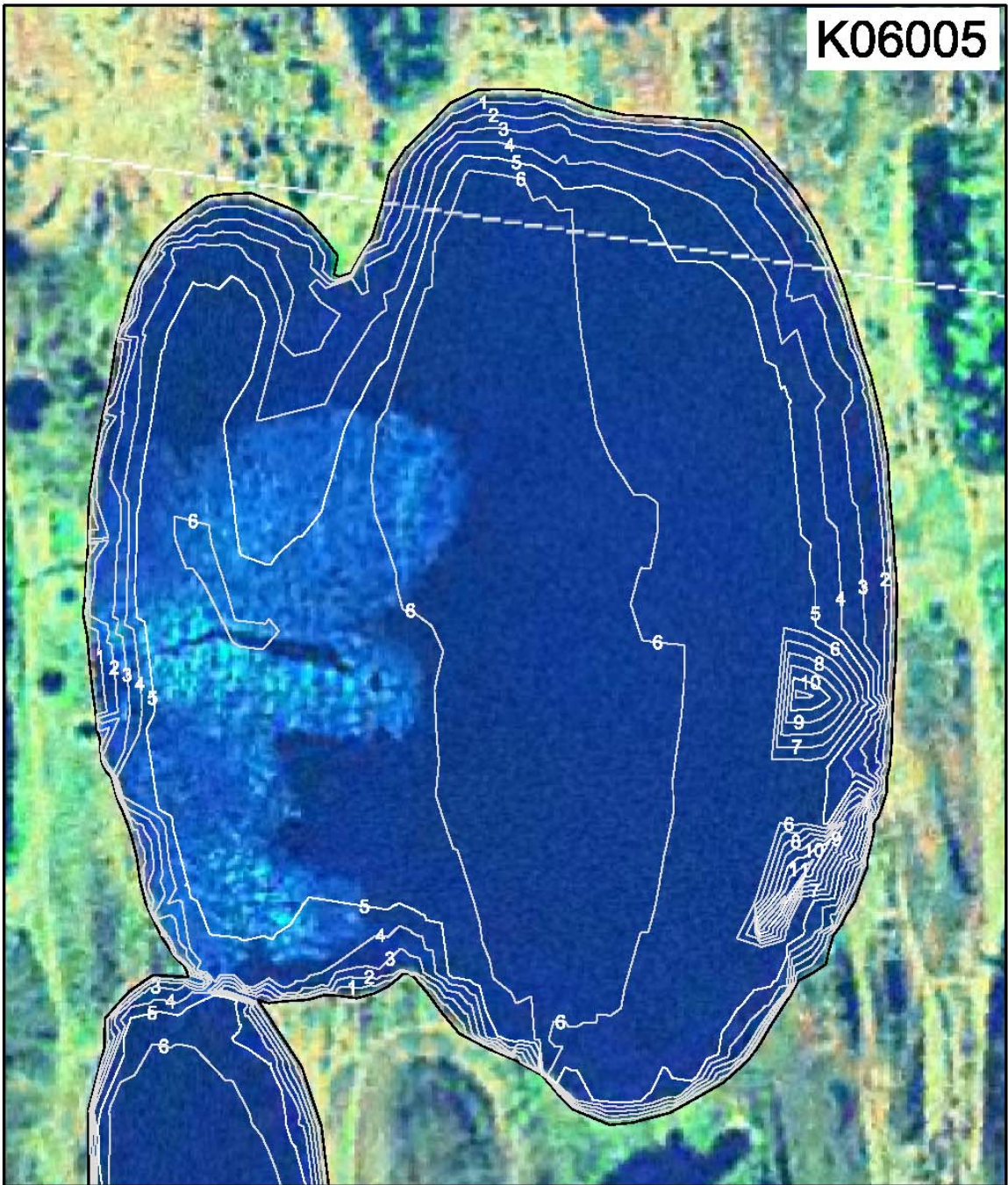


2500 0 2500 5000 7500 10000

Depth Contours of Lake K06005 Are Calculated Based Upon A Bathymetric Survey Conducted September 4, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'21.6" North 156°45'49.0" West (NAD 83)
Township 19 North, Range 19 West, Sections 1, 2 & 3; Township 20 North, Range 19 West, Sections 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35 & 36

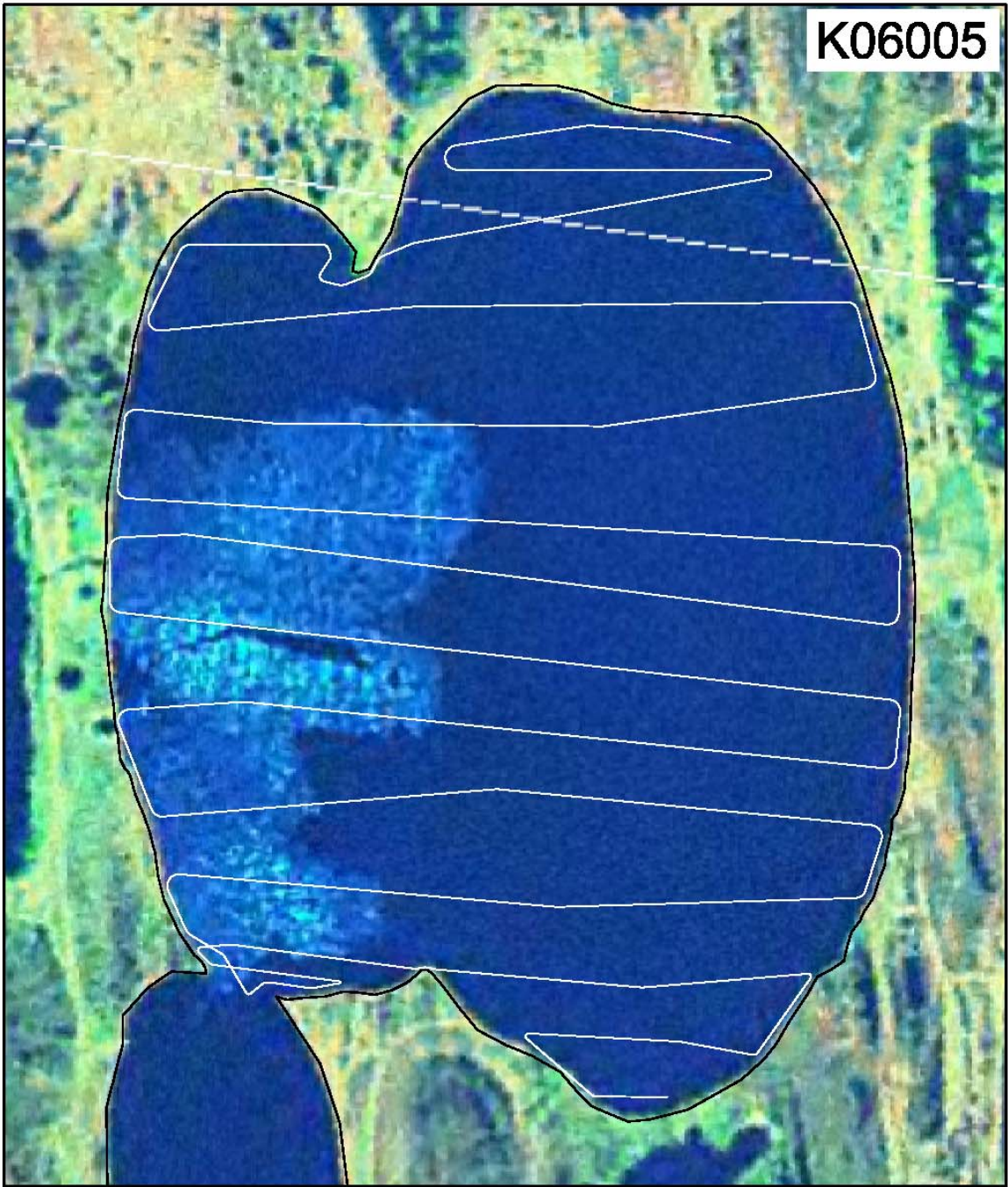
K06005



Depth Contours of Lake K06005 Are Calculated Based Upon A Bathymetric Survey Conducted September 4, 2006 And Are An Accurate Representation of Transect Measurements As Shown on Sheet 3 of 3

Maximum Depth Location: 71°02'21.6" North 156°45'49.0" West (NAD 83)
Township 19 North, Range 19 West, Sections 1, 2 & 3; Township 20 North, Range 19 West, Sections 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35 & 36

K06005



Depth transects surveyed at Lake K06005 September 4, 2006

Maximum Depth Location: 71°02'21.6" North 156°45'49.0" West (NAD 83)
Township 19 North, Range 19 West, Sections 1, 2 & 3; Township 20 North,
Range 19 West, Sections 21, 22, 23, 24, 25, 26, 27, 28, 33, 34, 35 & 36