

# TECHNICAL MEMORANDUM



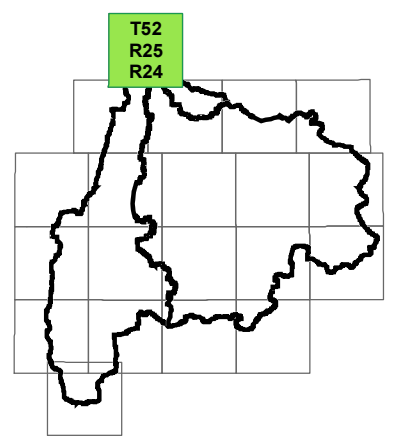
## Appendix G - Wetland Inventory and Alberta Wetland Classification





**Legend:**  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-1**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

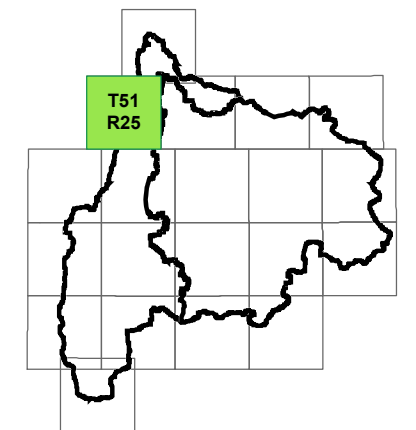
<b>AE PROJECT No.</b>	2016-3785
<b>SCALE</b>	1:37,000
<b>APPROVED DATE</b>	2016 OCTOBER
<b>REV DESCRIPTION</b>	ISSUED FOR REPORT

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 DATE: 2016-10-05



**Legend:**  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study

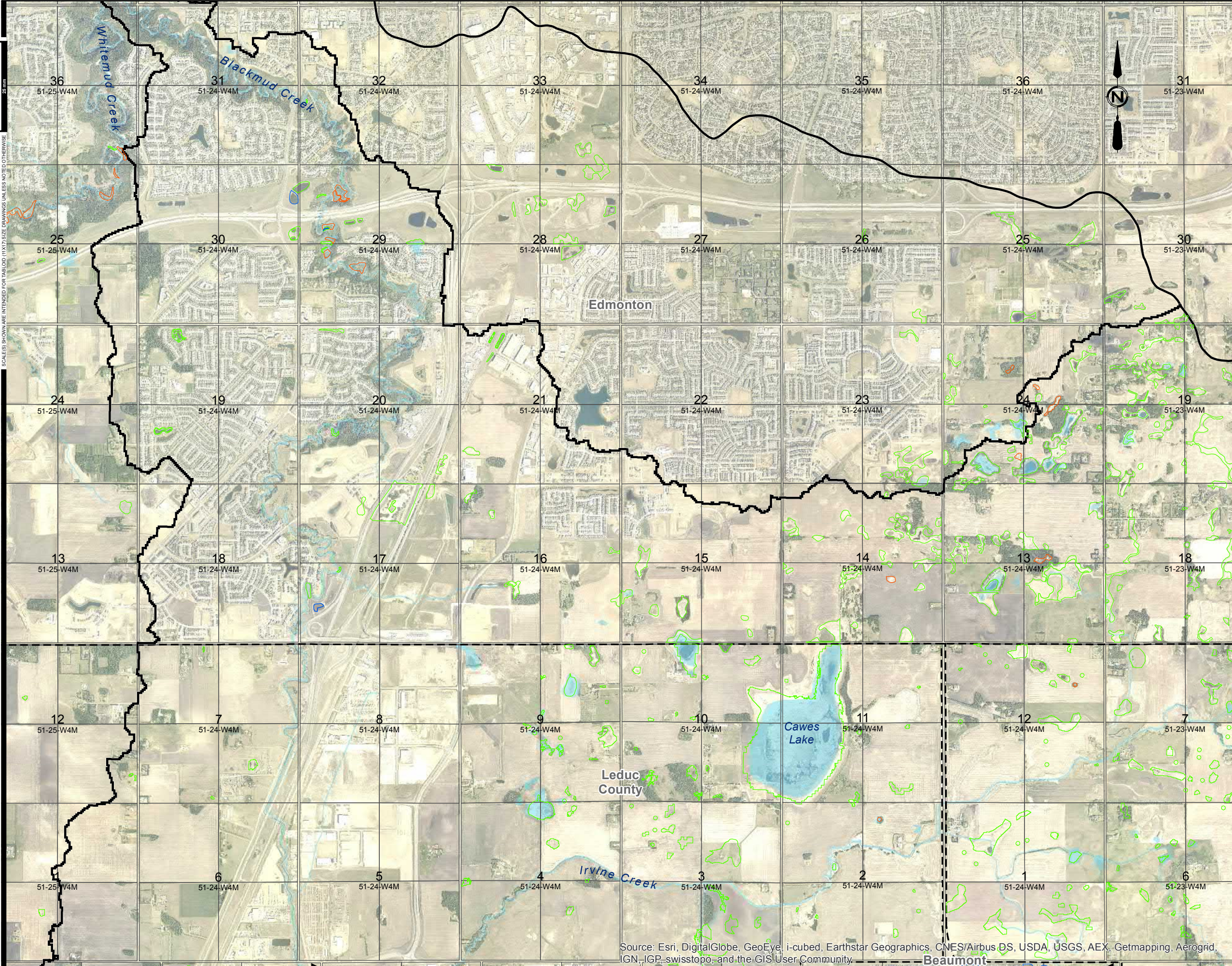


**FIGURE No. F-2**

BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY

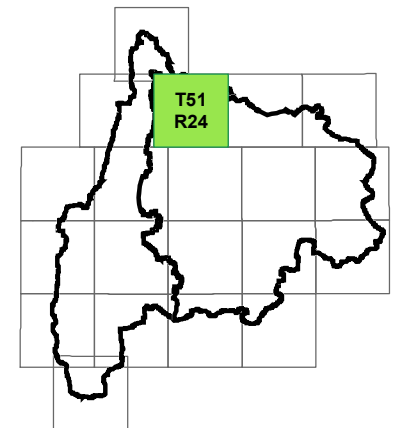
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
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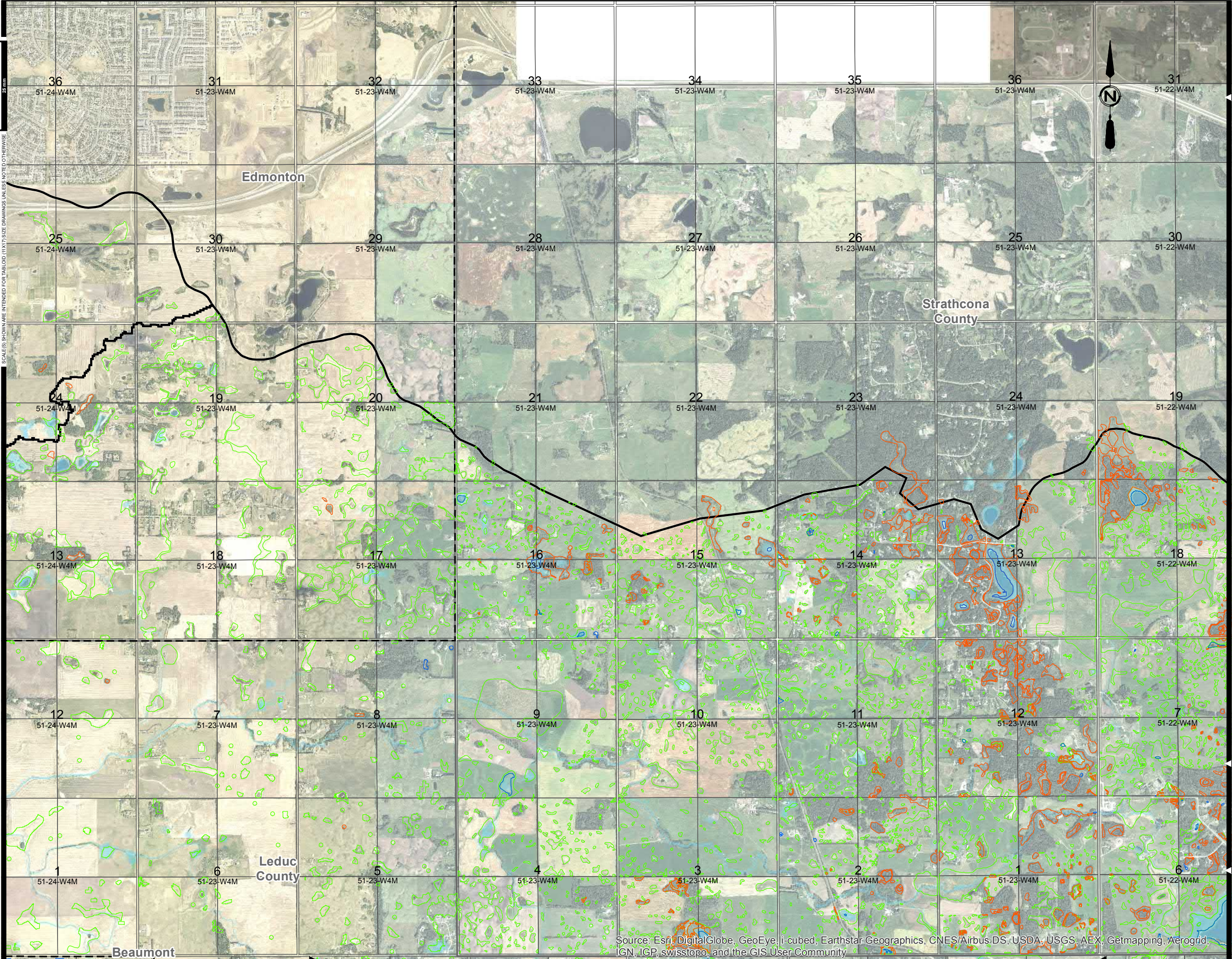
Legend:  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-3**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

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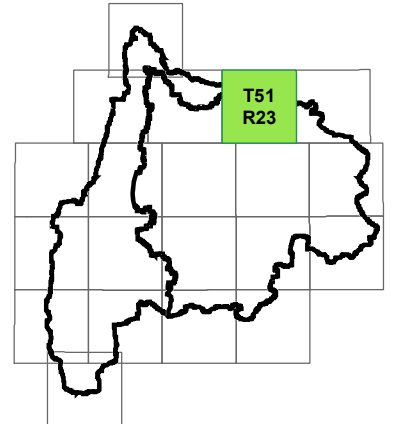


Legend:

**Alberta Wetland Classification**

**ABWetClass**

- Marsh
- Swamp
- Open Water
- Study



**FIGURE No. F-4**

**BLACKMUD/WHITEMUD CREEK WATERSHED MANAGEMENT STUDY**

**WETLAND INVENTORY & FUNCTION ANALYSIS**

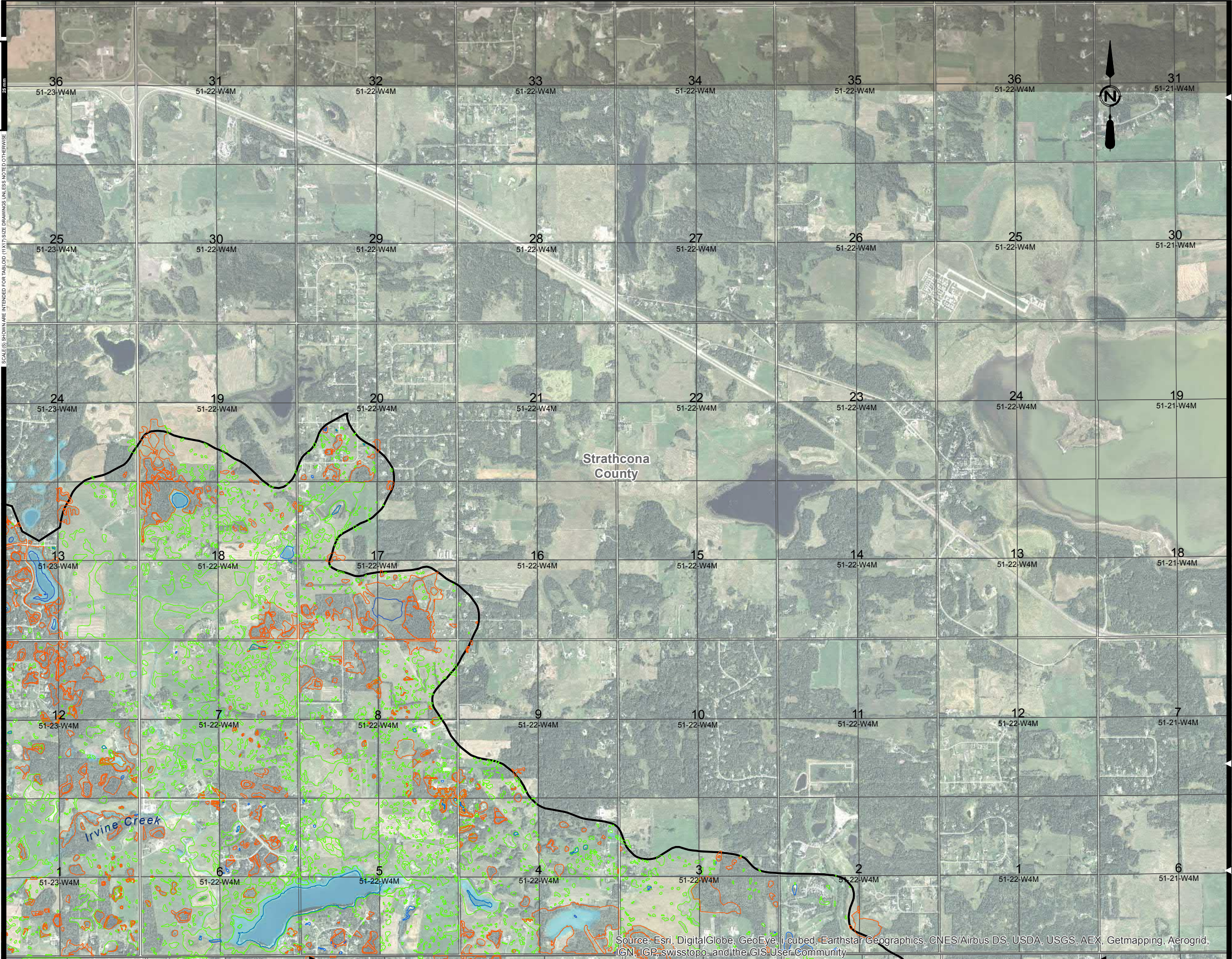
**HYDROLOGIC FUNCTIONS**

<b>AE PROJECT No.</b>	2016-3785
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<b>APPROVED DATE</b>	2016 OCTOBER
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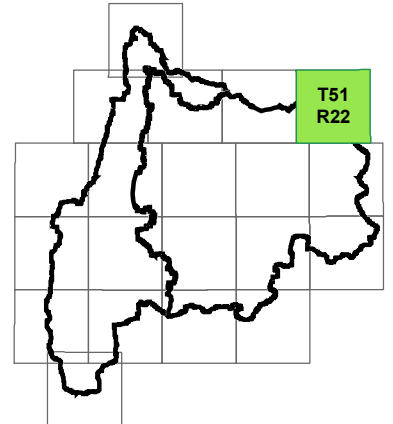
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 DATE: 2016-10-05

IF NOT 20 mm AS SHOWN SCALES  
 SCALES(S) SHOWN ARE INTENDED FOR TABLORD (11X17) SIZE DRAWINGS UNLESS NOTICED OTHERWISE



**Legend:**  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



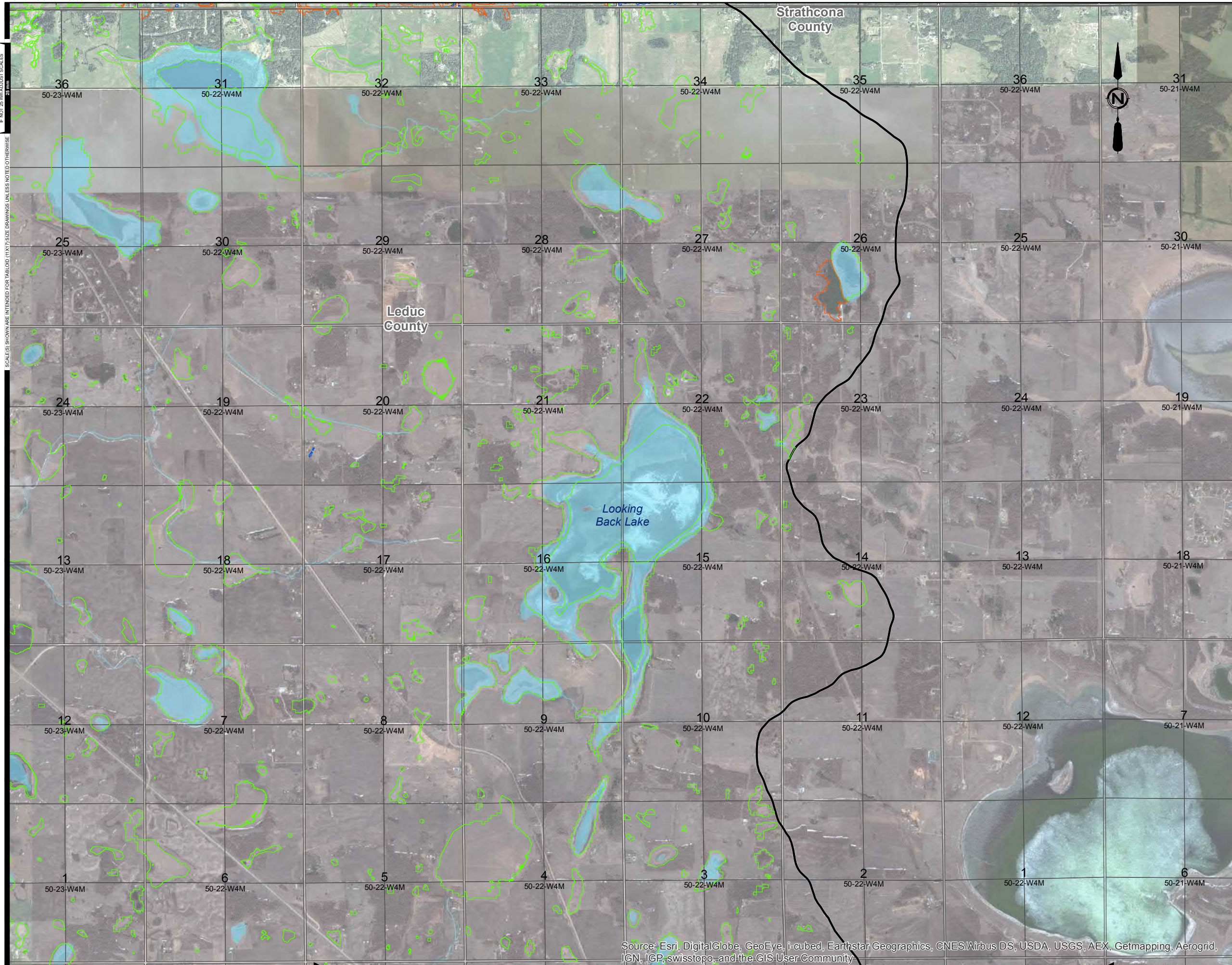
**FIGURE No. F-5**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
<b>SCALE</b>	1:37,000
<b>APPROVED DATE</b>	2016 OCTOBER
<b>REV DESCRIPTION</b>	ISSUED FOR REPORT

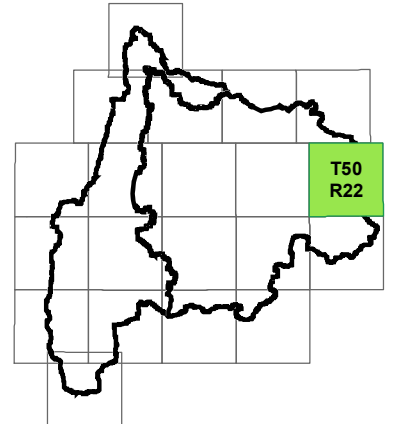
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DATE: 2016-10-05

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IF NOT 20 mm AS SHOWN SCALES



- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



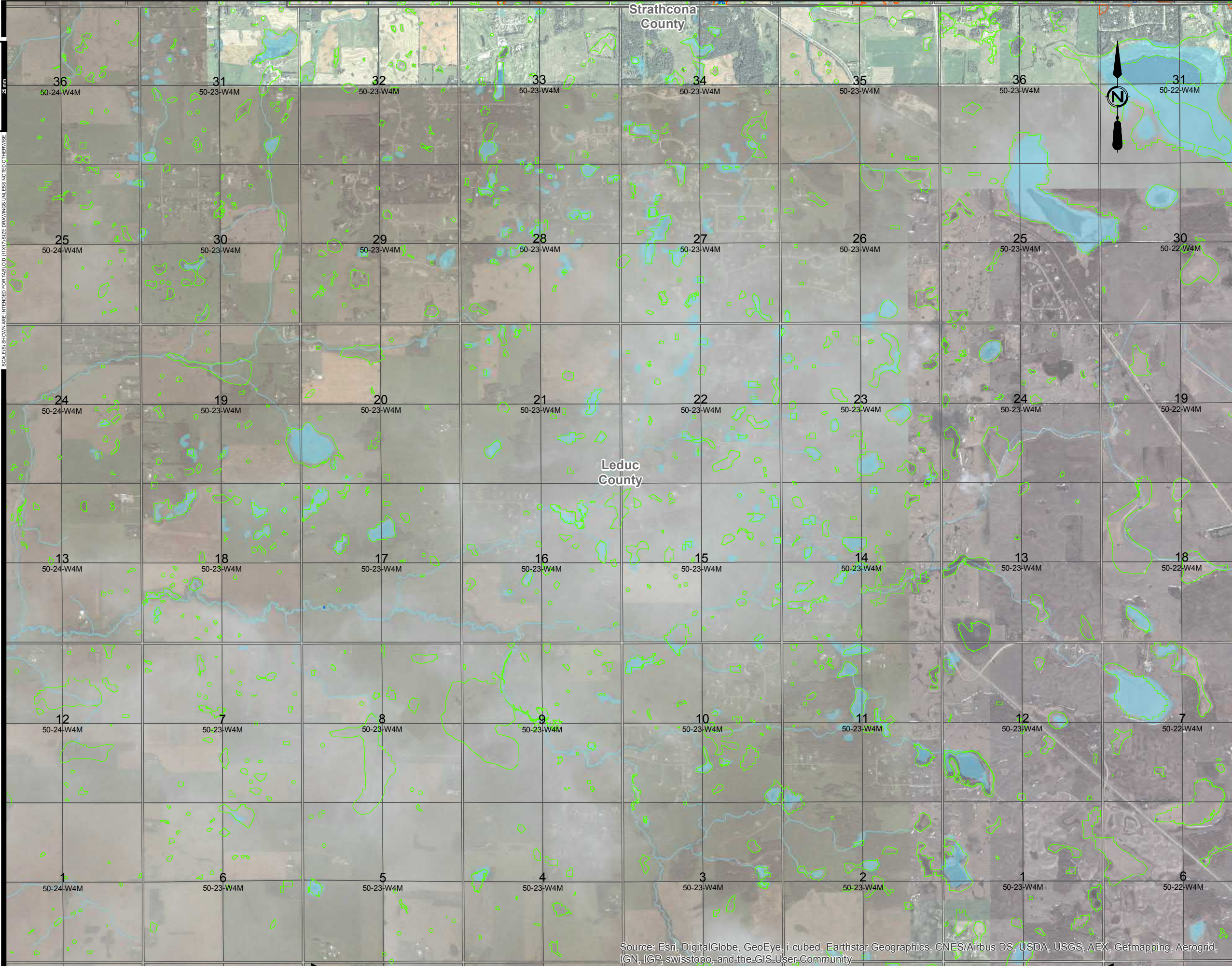
**FIGURE No. F-6**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
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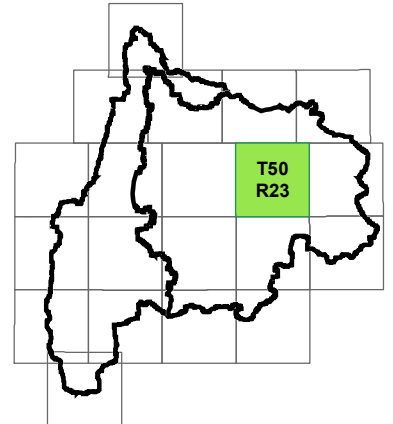
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 DATE: 2016-10-05





- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- █ Marsh
  - █ Swamp
  - █ Open Water
  - Study



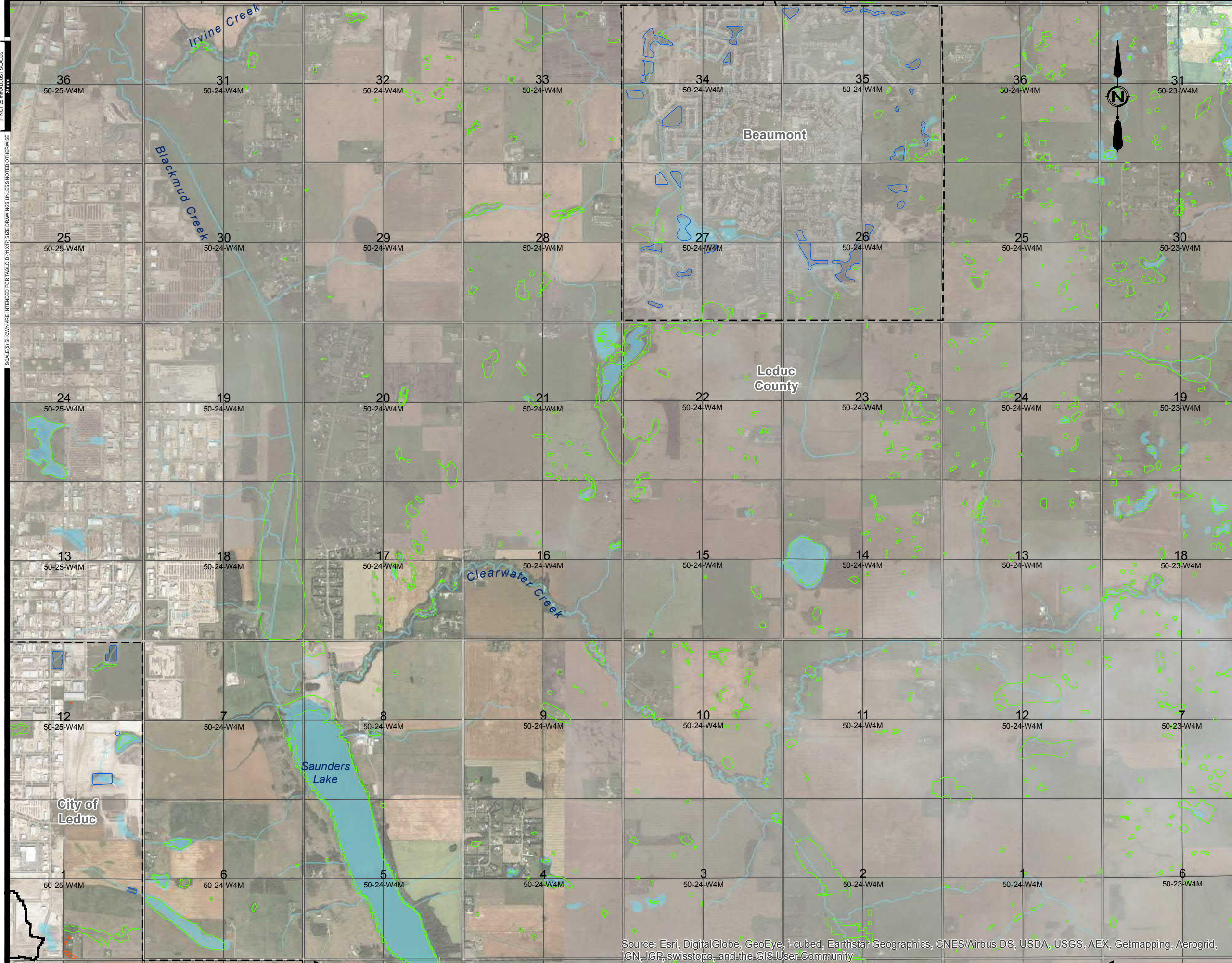
**FIGURE No. F-7**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
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<b>APPROVED DATE</b>	2016 OCTOBER
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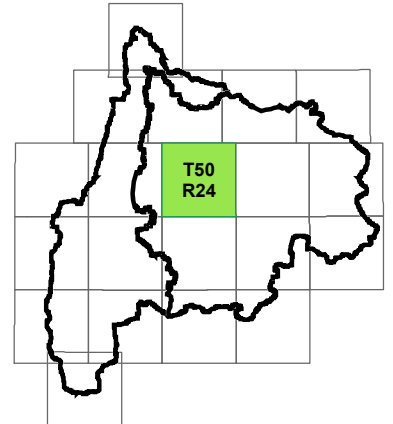


Legend:

**Alberta Wetland Classification**

**ABWetClass**

- █ Marsh
- █ Swamp
- █ Open Water
- Study



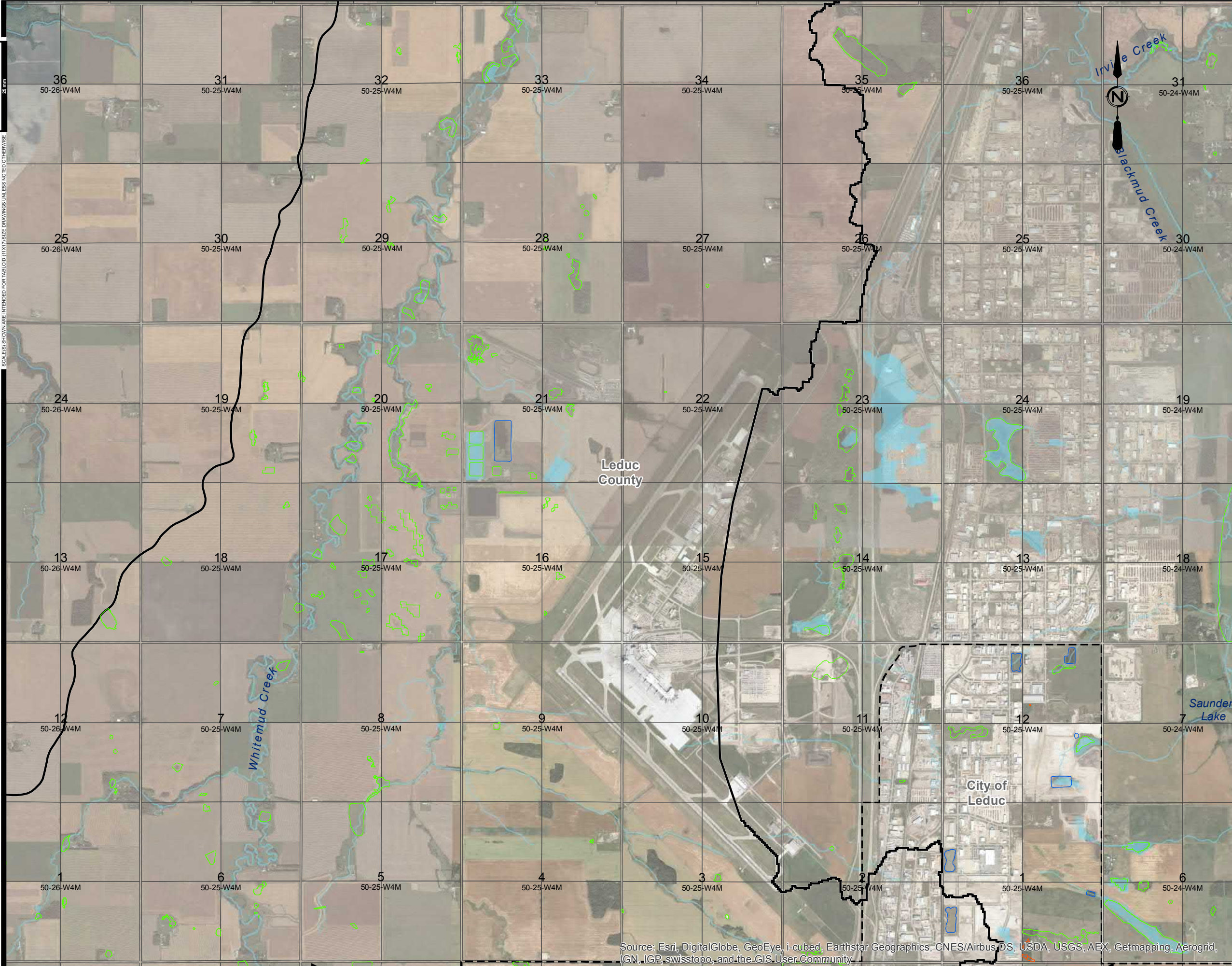
**FIGURE No. F-8**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

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<b>APPROVED DATE</b>	2016 OCTOBER
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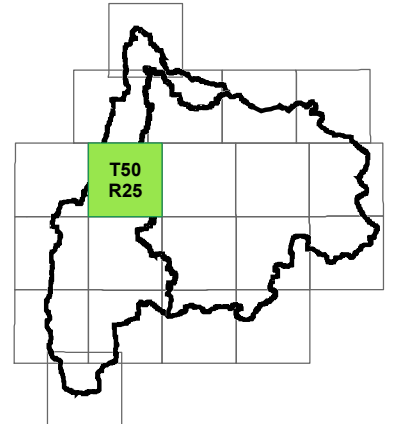
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 DATE: 2016-10-05

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- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



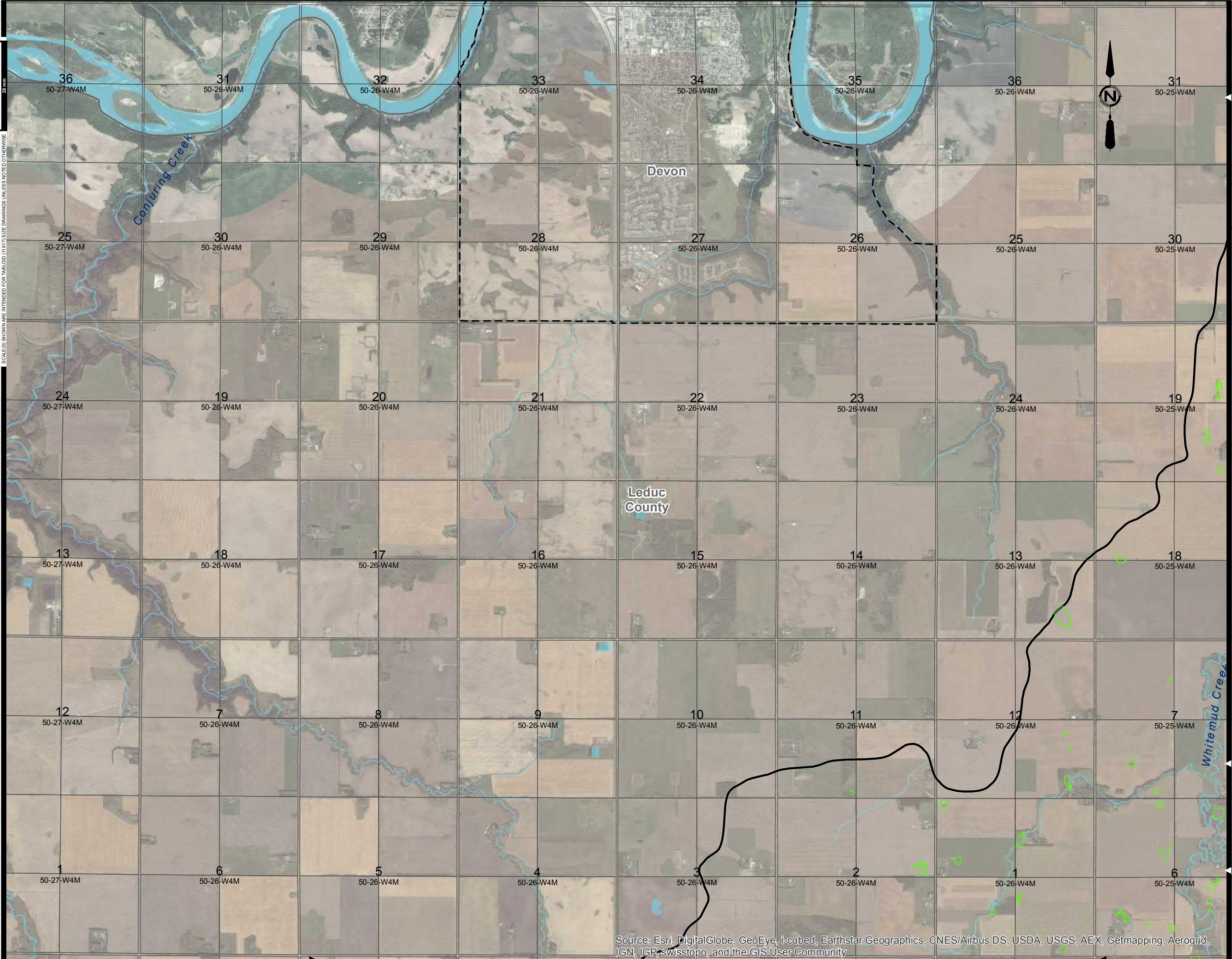
**FIGURE No. F-9**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

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<b>REV DESCRIPTION</b>	ISSUED FOR REPORT

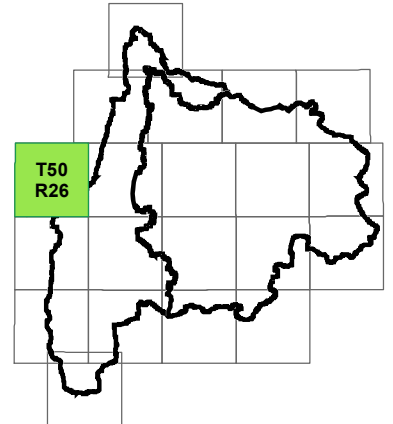
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 DATE: 2016-10-05

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- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



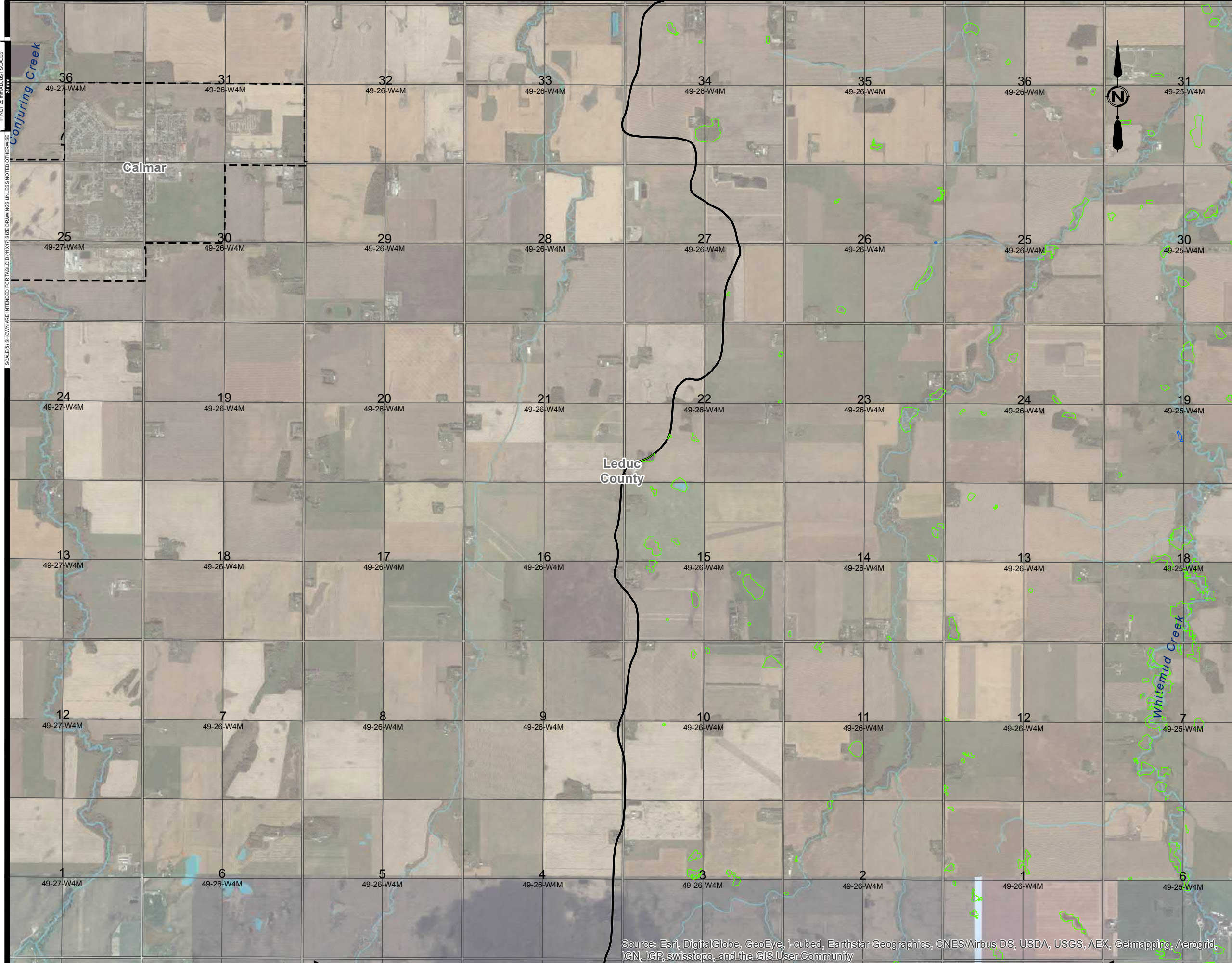
**FIGURE No. F-10**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

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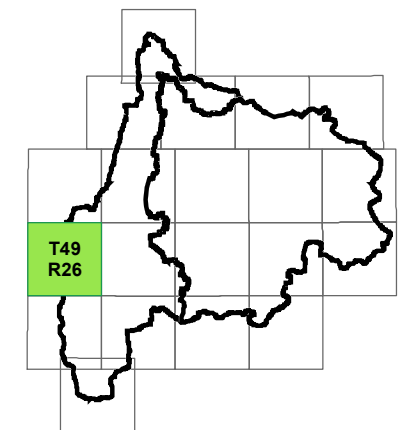
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 IF NOT 20 mm AS SHOWN SCALES



Legend:  
**Alberta Wetland Classification**

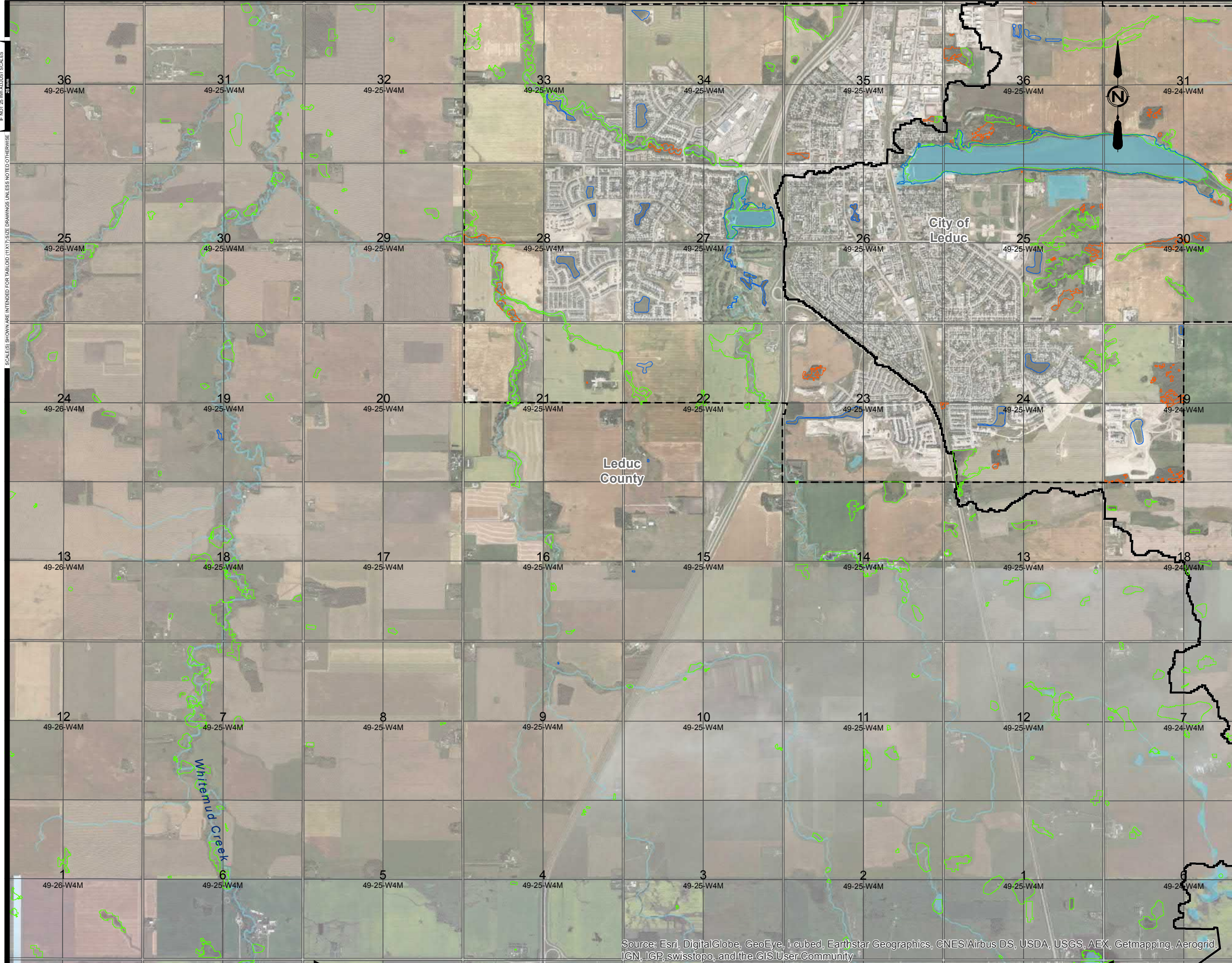
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-11**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

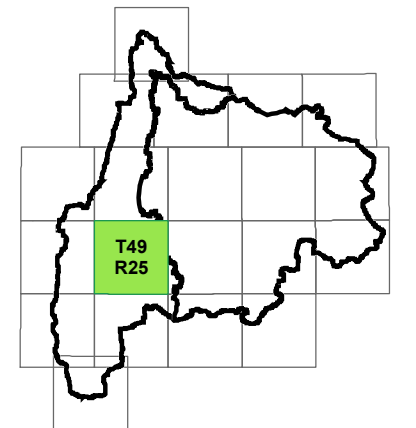
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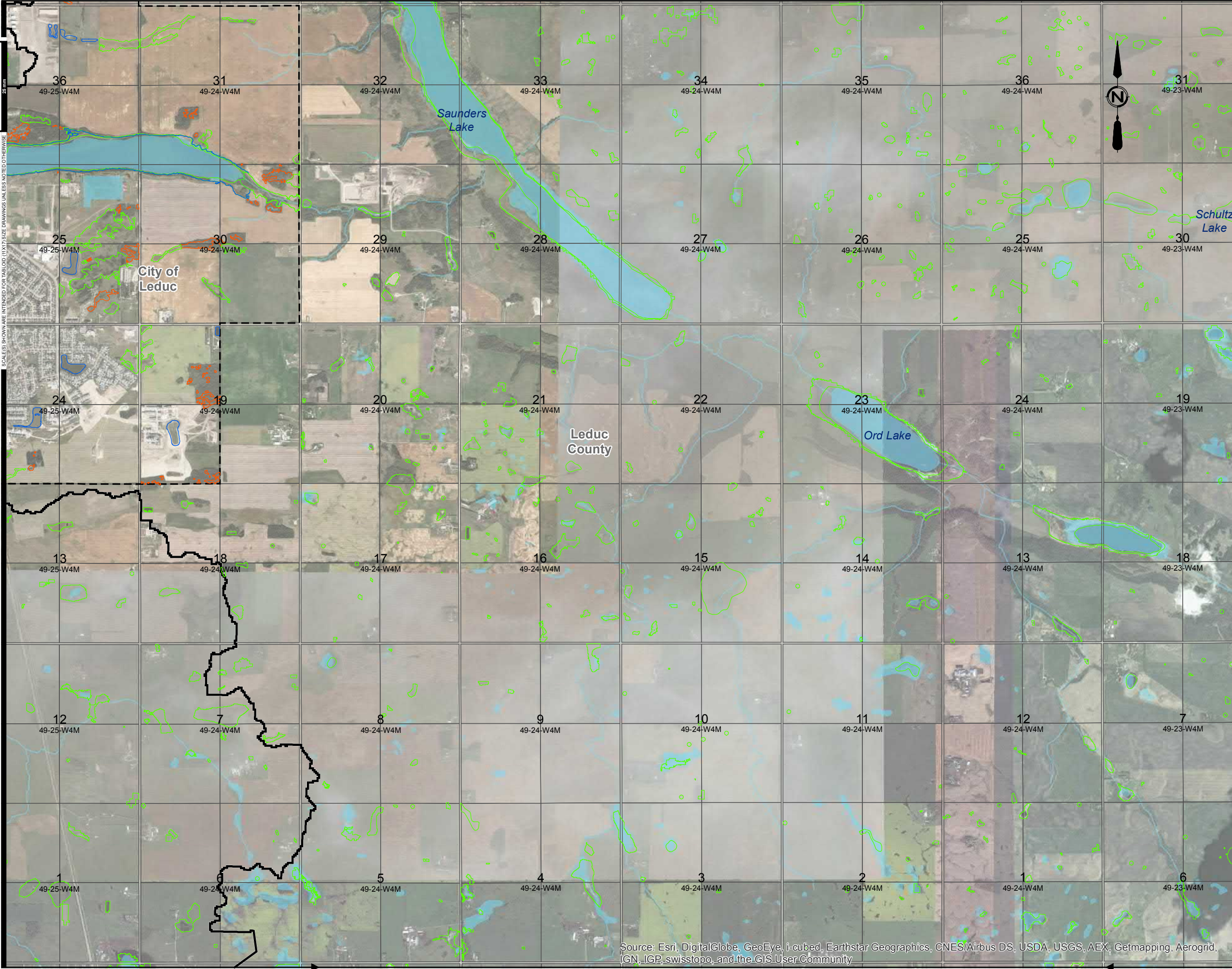
Legend:  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



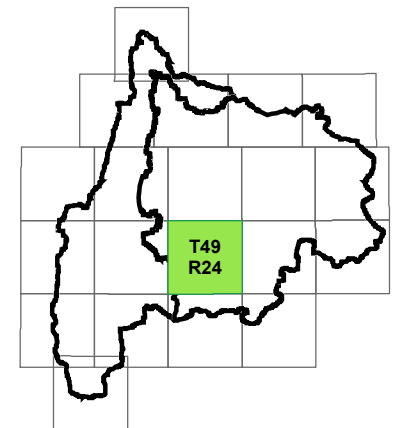
**FIGURE No. F-12**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

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Legend:  
**Alberta Wetland Classification**

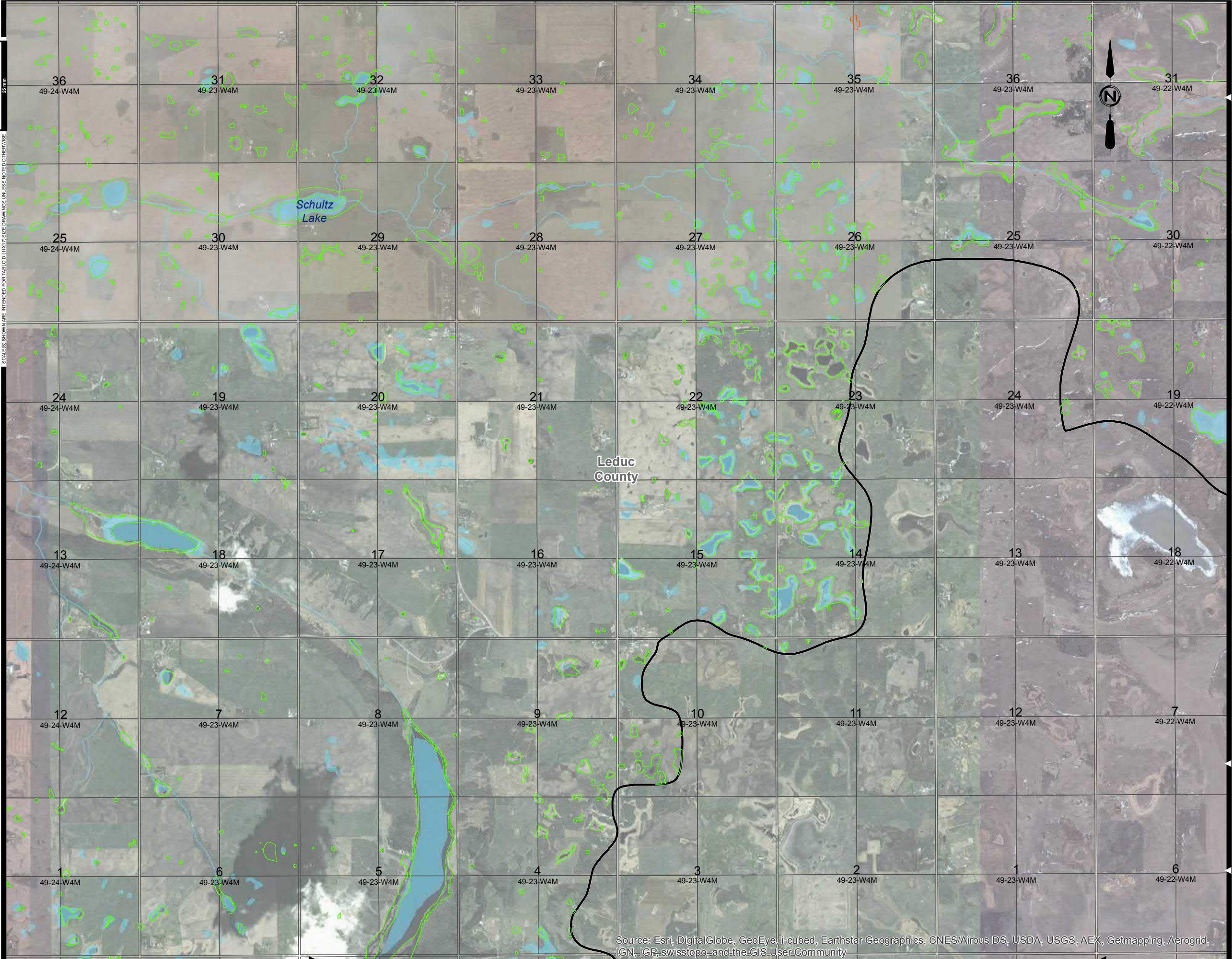
- ABWetClass**
- █ Marsh
  - █ Swamp
  - █ Open Water
  - Study



**FIGURE No. F-13**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

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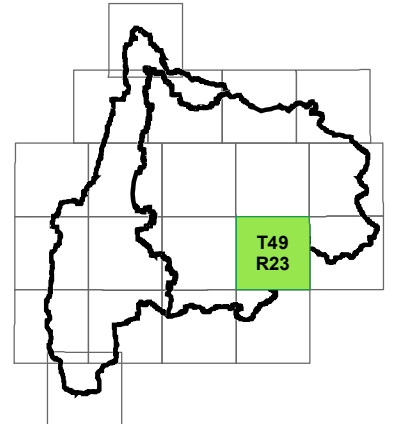


Legend:

**Alberta Wetland Classification**

**ABWetClass**

- Marsh
- Swamp
- Open Water
- Study



**FIGURE No. F-14**

BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY

WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

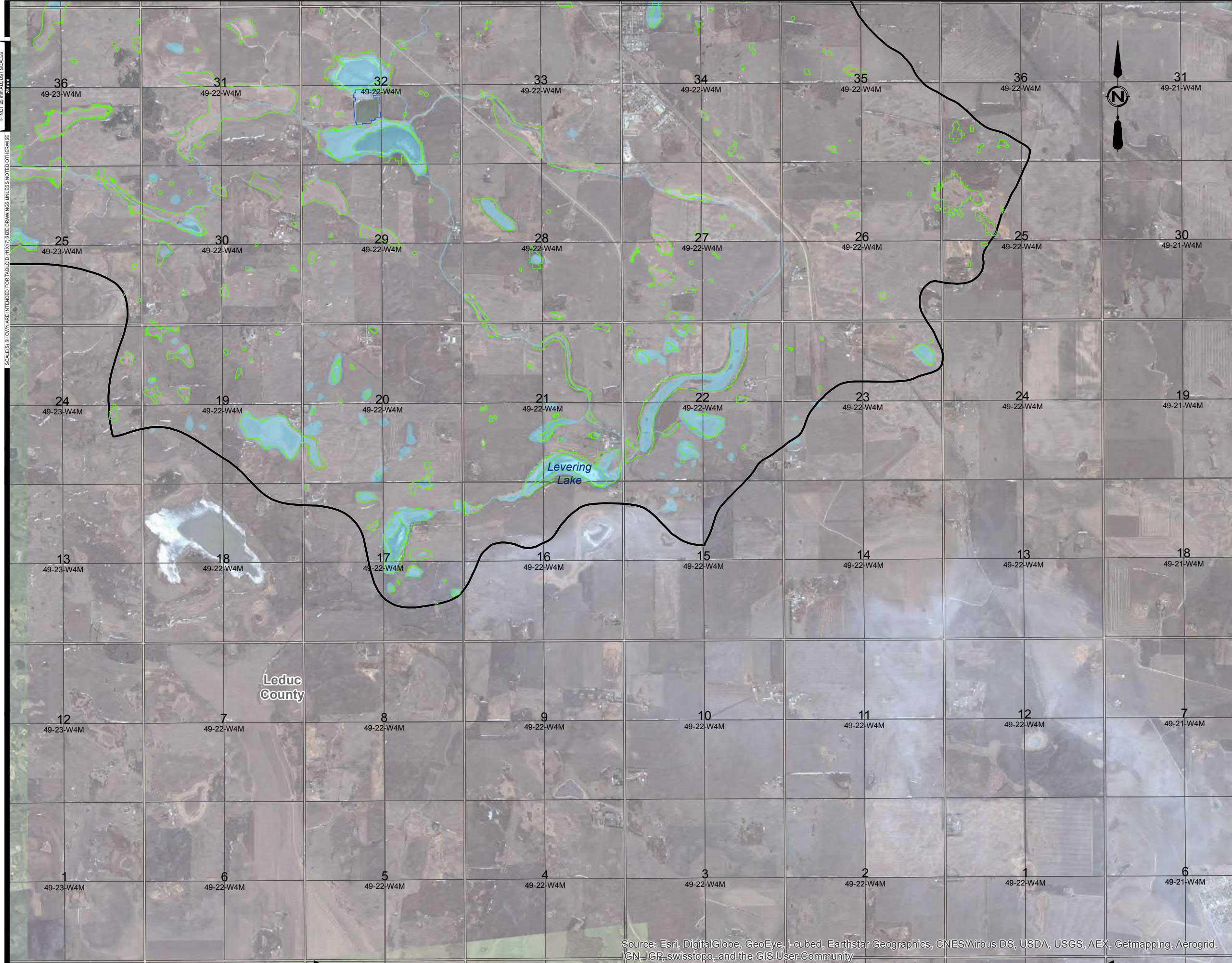
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DATE: 2016-10-05

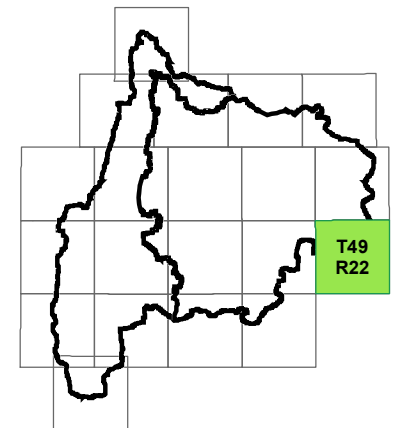
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IF NOT 20"=1" AS SHOWN SCALES





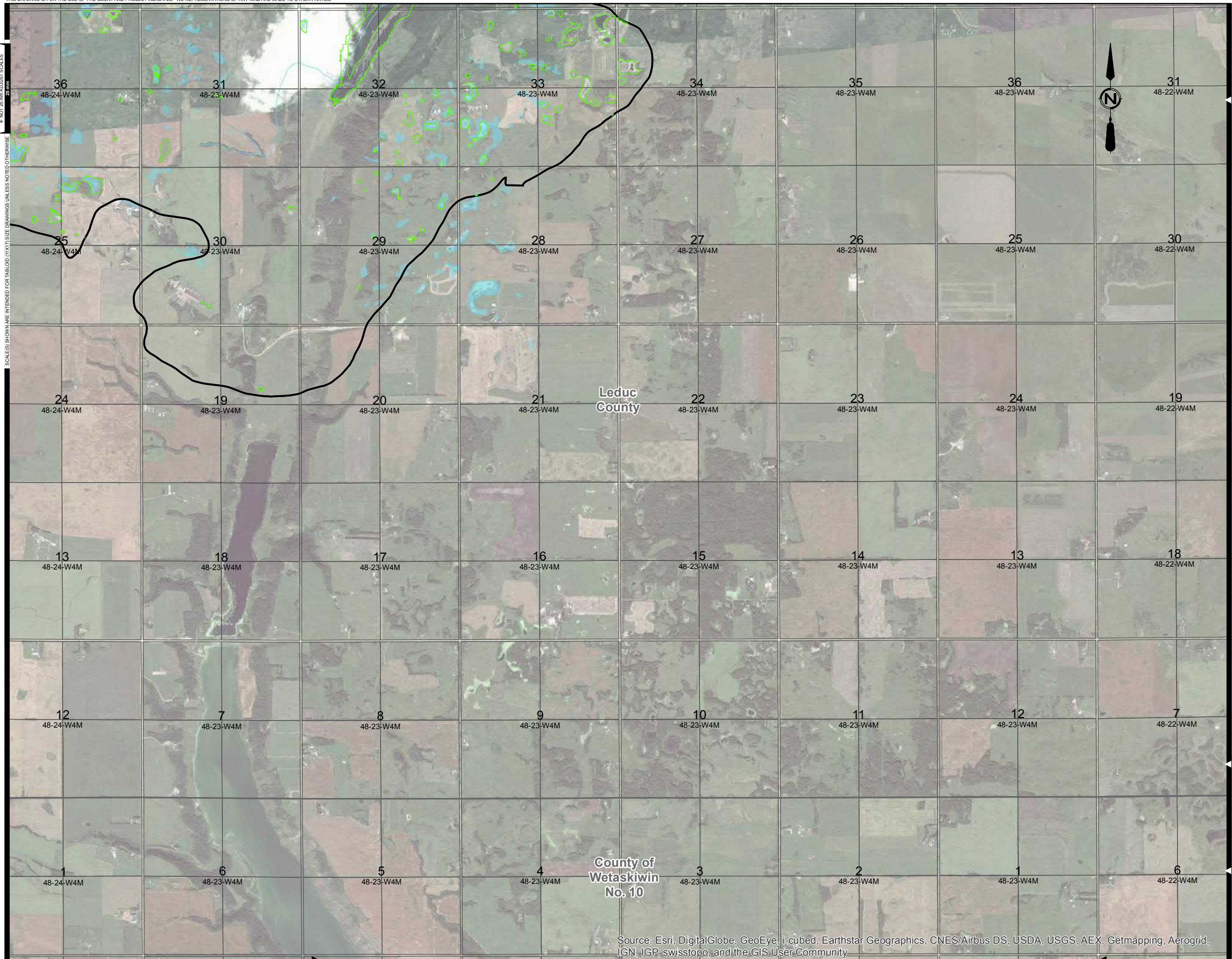
Legend:  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



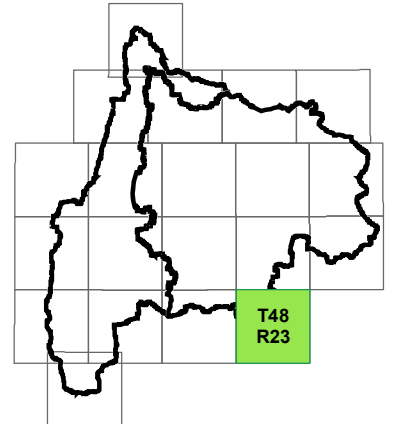
**FIGURE No. F-15**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

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Legend:  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study

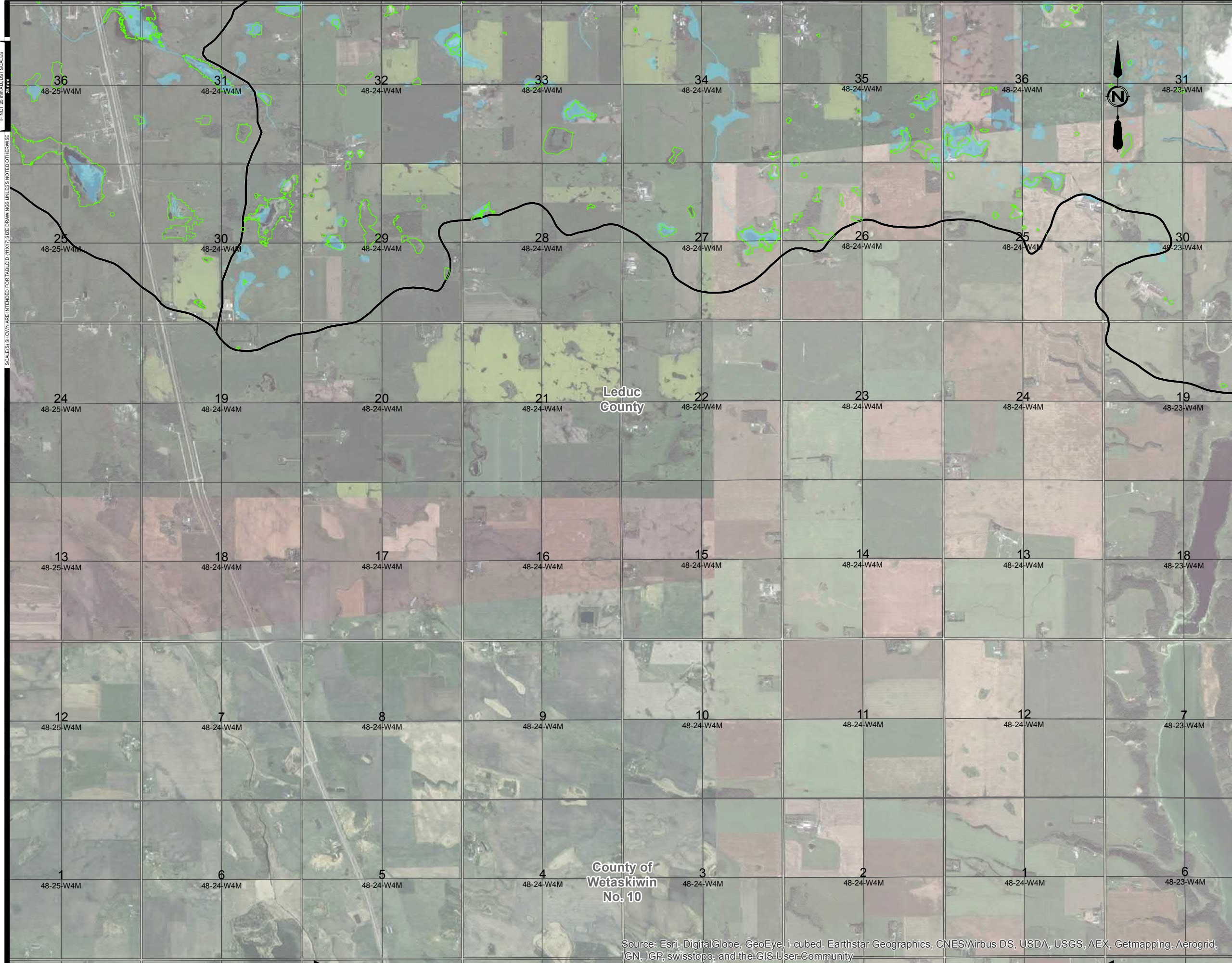


**FIGURE No. F-16**  
 BLACKMUD/WHITEMUD CREEK  
 WATERSHED MANAGEMENT STUDY  
 WETLAND INVENTORY & FUNCTION ANALYSIS  
 HYDROLOGIC FUNCTIONS

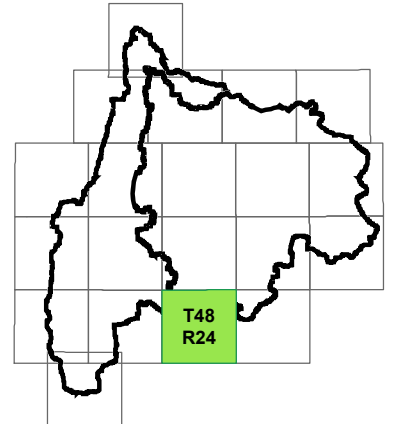
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- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-17**

BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY

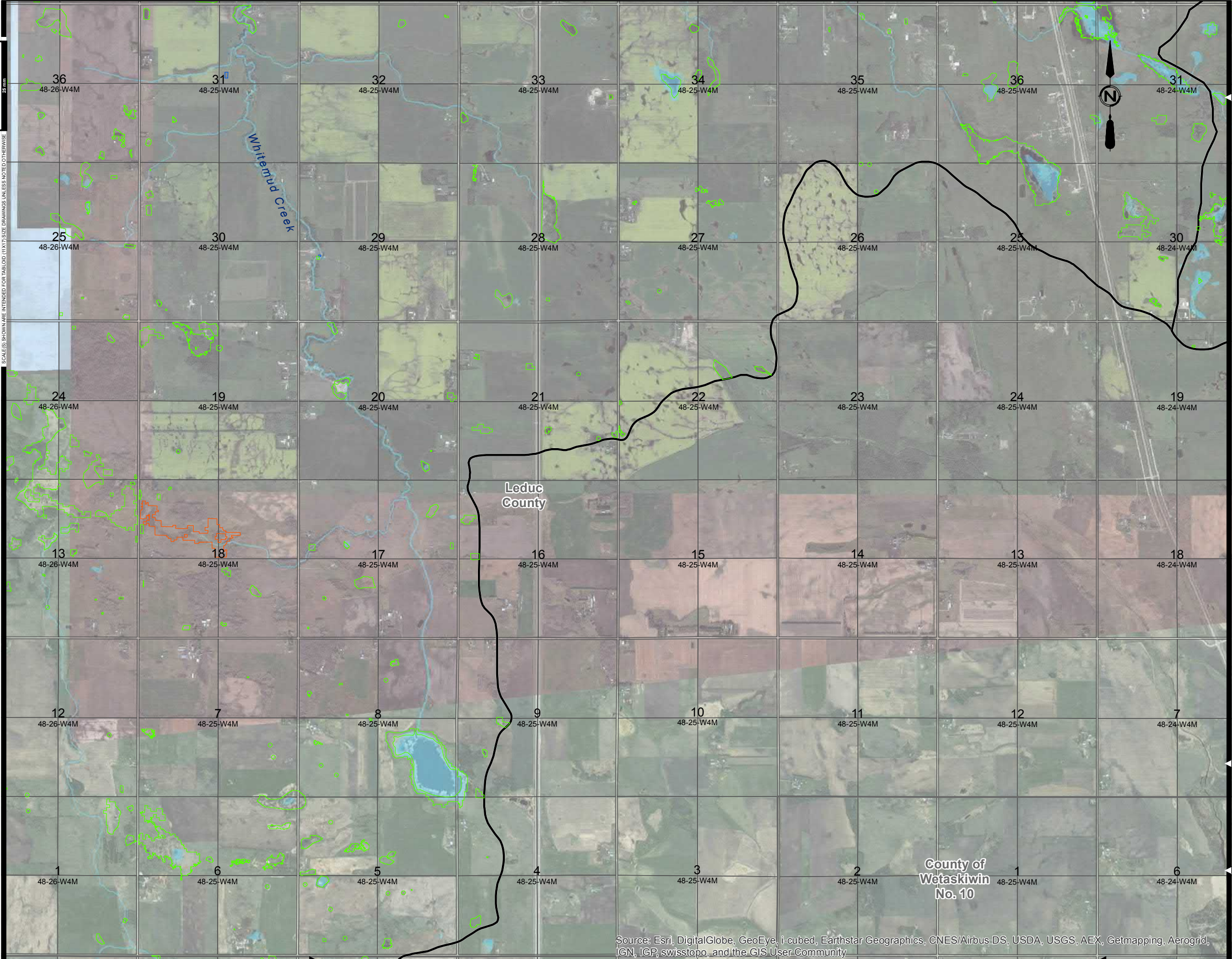
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
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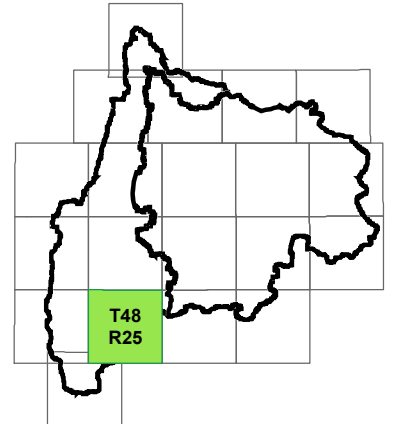


Legend:

**Alberta Wetland Classification**

**ABWetClass**

- Marsh
- Swamp
- Open Water
- Study



**FIGURE No. F-18**

BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY

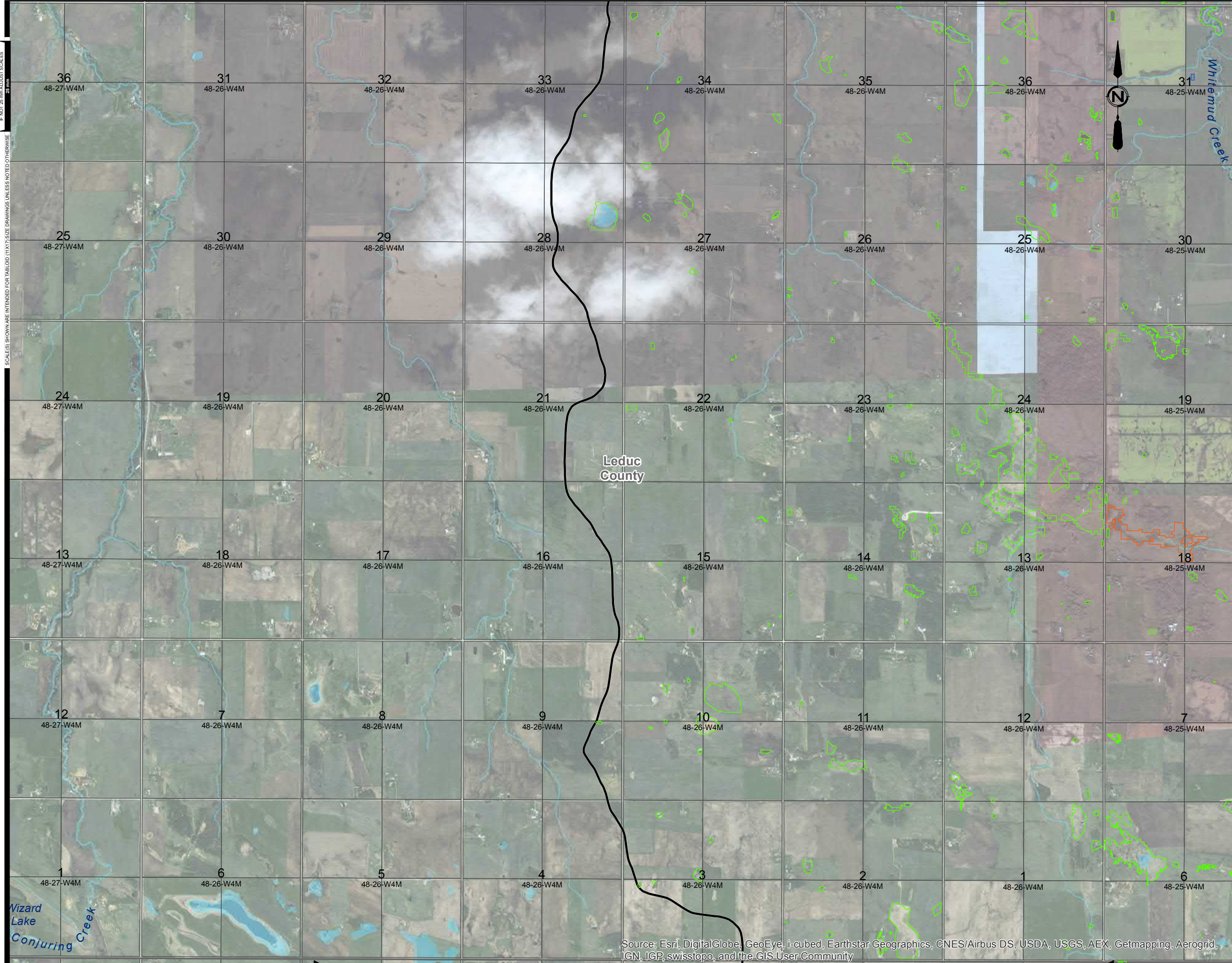
WETLAND INVENTORY & FUNCTION ANALYSIS  
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<b>REV DESCRIPTION</b>	ISSUED FOR REPORT

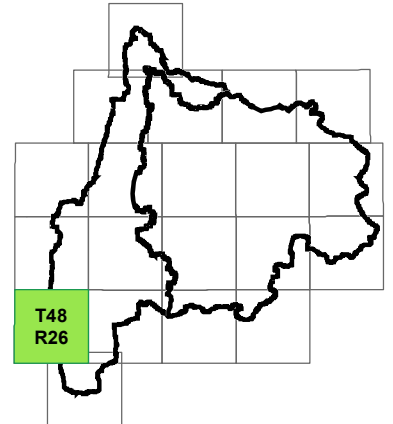
Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

I:\s-erh-fe-01\projects\20163785\02\_Blackmud\_Whitemud\Working\_Dwg\010\_GIS\Map01\_EnvironmentalMap\_WetlandInventory\_WetlandClassification.mxd  
DATE: 2016-10-05

IF NOT 20 mm AS SHOWN SCALES  
SCALES(S) SHOWN ARE INTENDED FOR TABLOID (11X17) SIZE DRAWINGS UNLESS NOTED OTHERWISE



- Legend:
- Alberta Wetland Classification**
- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-19**

BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY

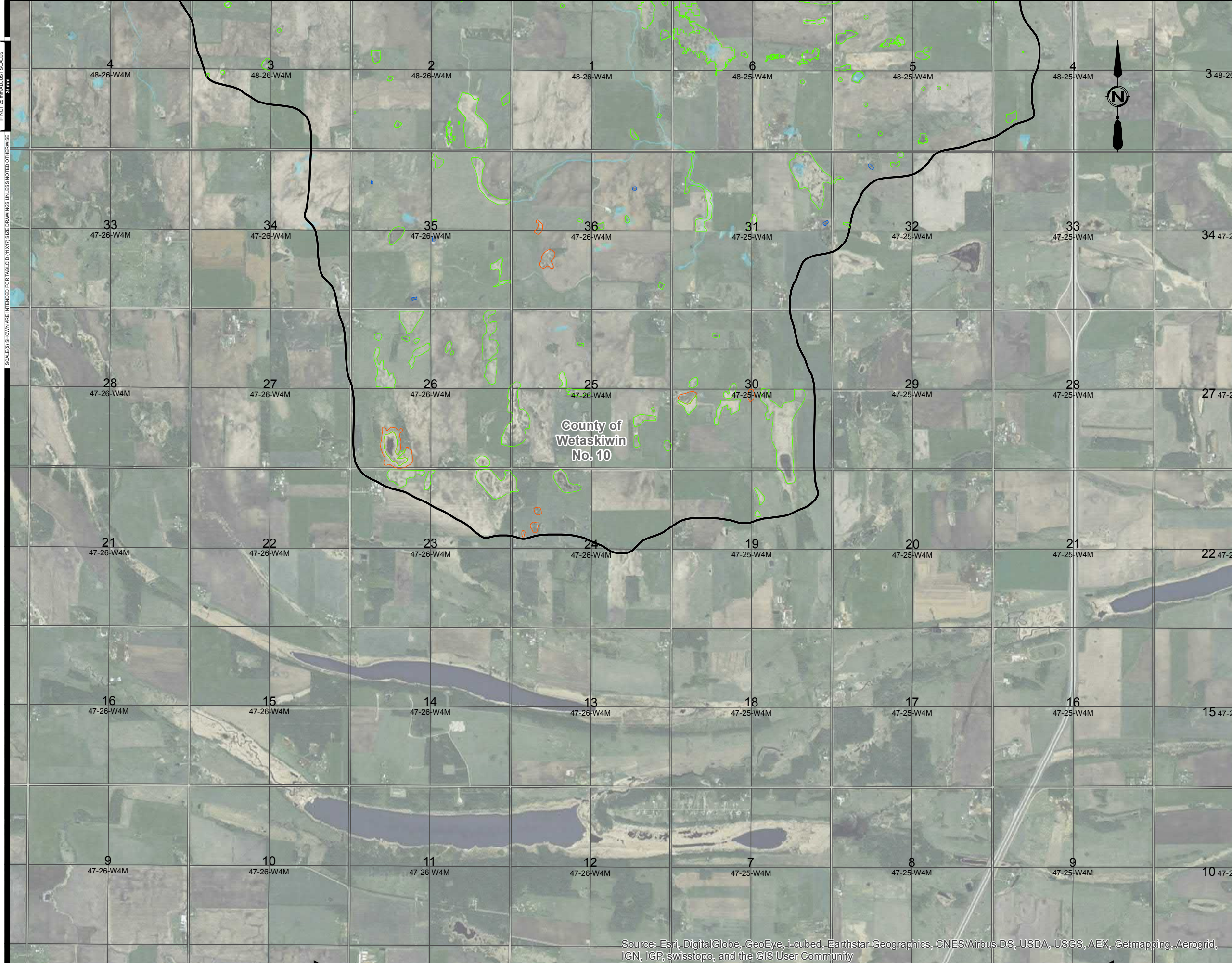
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
<b>SCALE</b>	1:37,000
<b>APPROVED DATE</b>	2016 OCTOBER
<b>REV DESCRIPTION</b>	ISSUED FOR REPORT

Source: Esri, DigitalGlobe, GeoEye, i-cubed, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

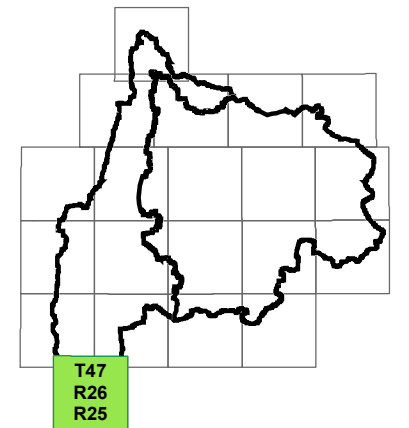
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 DATE: 2016-10-05

IF NOT 20 mm AS SHOWN SCALES  
 SCALES(S) SHOWN ARE INTENDED FOR TABLORD (11X17) SIZE DRAWINGS UNLESS NOTICED OTHERWISE



**Legend:**  
**Alberta Wetland Classification**

- ABWetClass**
- Marsh
  - Swamp
  - Open Water
  - Study



**FIGURE No. F-20**  
BLACKMUD/WHITEMUD CREEK  
WATERSHED MANAGEMENT STUDY  
WETLAND INVENTORY & FUNCTION ANALYSIS  
HYDROLOGIC FUNCTIONS

<b>AE PROJECT No.</b>	2016-3785
<b>SCALE</b>	1:37,000
<b>APPROVED</b>	
<b>DATE</b>	2016 OCTOBER
<b>REV</b>	
<b>DESCRIPTION</b>	ISSUED FOR REPORT

# TECHNICAL MEMORANDUM



## Appendix H - Water Quality Data

**Table H-1**  
**Water quality data for the Blackmud/Whitemud watershed (pre-1985)**

Parameter	Units	Sites				
		Location A	Location B	Location C	Location D	Location E
Total Dissolved Solids	mg/L	482	422	154	206	741
Sulphate	mg/L					208
Chloride	mg/L	14	11	19	21	120
Iron	mg/L					0.67
Phenols	mg/L					0.014
Phosphate	mg/L					0.58
Calcium	mg/L					89
Lead	mg/L					0.013
Coliforms (Total)	MPN/100 mL			>2400	>2400	2650
Biochemical Oxygen Demand	mg/L			14	23	
Chemical Oxygen Demand	mg/L			36	28	
Orthophosphate	mg/LP	0.4	0.6	0.21	0.7	
Total Nitrogen	mg/L			1.5	1.9	
Suspended Solids	mg/L			784	168	



**Table H-2**  
**Water quality data for the Blackmud/Whitemud watershed (1985-2010)**

Parameter	Units	Site						
		Location F	Location G	Location H	Location I	Location J	Location K	Location L
Dissolved Oxygen	mg/L	8.5						
pH	pH units	8.2						
Conductivity	( $\mu$ S/cm)	839						
Turbidity	NTU	51						
Ammonium-N	mg/L	1.87						
Total Kjeldahl Nitrogen	mg/L	7	2.33	3.2	1.91	1.76	1.44	1.76
Phosphorus Total	mg/L	0.85	0.48	0.61	0.34	0.19	0.22	0.34
Cyanide Dissolved	mg/L	0.00075						
Calcium Total	mg/L	39.4						
Iron Total	mg/L	2.47						
Magnesium Total	mg/L	9.35						
Manganese Total	mg/L	0.428						
Potassium Total	mg/L	11.45						
Silicon Total	mg/L	3.43						
Sodium Total	mg/L	207.5						
Sulfur Total	mg/L	7.55						

Parameter	Units	Site						
		Location F	Location G	Location H	Location I	Location J	Location K	Location L
Mercury Total	mg/L	0.000075						
Aluminum Total	mg/L	1.65						
Antimony Total	mg/L	0.00012						
Arsenic Total	mg/L	0.0034						
Barium Total	mg/L	0.154						
Beryllium Total	mg/L	<0.0001						
Bismuth Total	mg/L	<0.0005						
Boron Total	mg/L	0.07						
Cadmium Total	mg/L	0.00005						
Chromium Total	mg/L	0.0023						
Cobalt Total	mg/L	0.0013						
Copper Total	mg/L	0.0045						
Lead Total	mg/L	0.0029						
Lithium Total	mg/L	0.025						
Molybdenum Total	mg/L	0.002						
Nickel Total	mg/L	0.0064						
Selenium Total	mg/L	<0.0002						
Silver Total	mg/L	0.00003						

Parameter	Units	Site						
		Location F	Location G	Location H	Location I	Location J	Location K	Location L
Strontium Total	mg/L	0.26						
Thallium Total	mg/L	<0.00005						
Tin Total	mg/L	<0.001						
Titanium Total	mg/L	0.0184						
Uranium Total	mg/L	0.0014						
Vanadium Total	mg/L	0.0051						
Zinc Total	mg/L	0.022						
Calcium Dissolved	mg/L	38.2						
Magnesium Dissolved	mg/L	9.2						
Sodium Dissolved	mg/L	208.5						
Potassium Dissolved	mg/L	10.9						
Iron Dissolved	mg/L	0.038						
Manganese Dissolved	mg/L	0.25						
Chloride Dissolved	mg/L	255						
Nitrate-N	mg/L	0.0625						
Nitrite-N	mg/L	0.0048						

Parameter	Units	Site						
		Location F	Location G	Location H	Location I	Location J	Location K	Location L
Nitrate and Nitrite-N	mg/L	0.063	0.51	0.89	0.54	0.32	0.02	0.36
Sulfate (SO4) Dissolved	mg/L	22						
Hydroxide	mg/L	<5						
Carbonate	mg/L	8						
Bicarbonate	mg/L	285						
P-Alkalinity as CaCO3	mg/L	6.75						
T-Alkalinity as CaCO3	mg/L	245						
Total Dissolved Solids	mg/L	693						
Hardness Dissolved as CaCO3	mg/L	134						
Ionic Balance Dissolved	%	96.5						
Benzene	mg/L	<0.001						
Toluene	mg/L	<0.001						
Ethylbenzene	mg/L	<0.001						
Total Xylenes (m,p,o)	mg/L	<0.001						
F1 BTEX	mg/L	<0.2						
F1 C6-C10	mg/L	<0.2						
F2 C10-C16	mg/L	<0.1						

Parameter	Units	Site						
		Location F	Location G	Location H	Location I	Location J	Location K	Location L
F3C16-C34	mg/L	<0.1						
F3+ C34+	mg/L	<0.1						
Total Suspended Solids	mg/L		26.4	145	56.3	19	34	173
Ammonia as N-NH3	mg/L		0.42	0.68	0.28	0.31	0.1	0.23
Chloride Total	mg/L		76.4	41.7	29	31	26	75
Biochemical Oxygen Demand	mg/L		5.2	7	5.8	2.9	1.4	6.3
<i>E. Coli</i>	MPN/100 mL		22.3		993			1349

**Table H-3  
Water quality data for the Blackmud/Whitemud watershed (2011-2015)**

Parameter	Units	Site							
		Location G2	Location I2	Location L2	Location M	Location N	Location O	Location P	Location Q
Dissolved Oxygen	mg/L				7.23	8.86	6.52	8.82	8.07
pH	pH units					8.000	8.0	8.10	7.98
Conductivity	( $\mu$ S/cm)				1005	1066	904	670	850
Turbidity	NTU				6.50	6.98	5.41	22.3	18.0
Total Kjeldahl Nitrogen	mg/L	2.54	2.50	2.28					
Phosphorus Total	mg/L	0.52	0.53	0.66				0.07	0.07
Nitrate-N	mg/L							0.03	0.04
Nitrate and Nitrite-N	mg/L	0.60	0.58	0.68					
Total Dissolved Solids	mg/L							568	674
Total Suspended Solids	mg/L	63	44	497					
Ammonia as N-NH3	mg/L	0.43	0.44	0.29				0.15	0.15
Chloride Total	mg/L	46	35	42					
Biochemical Oxygen Demand	mg/L	7.1	10.3	9.0					