

**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- Gully
- Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

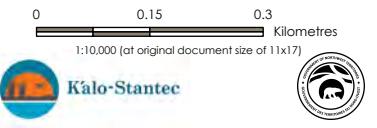
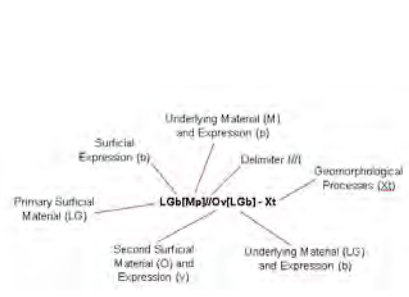
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- ^ Geomorphological process initiation zone
- A Active

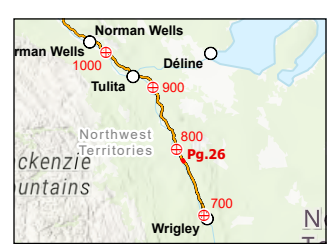
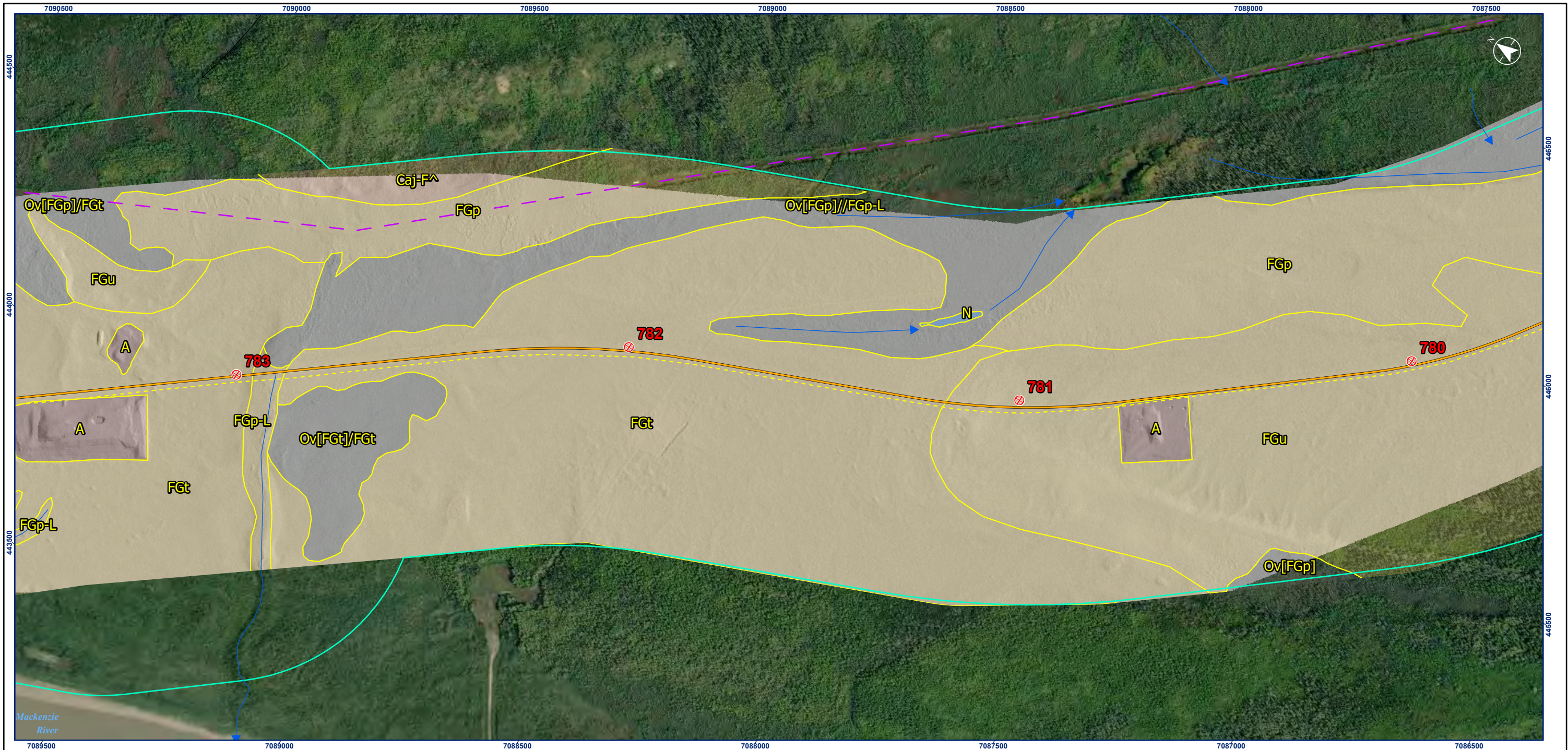
**Geomorphological Process**

<b>Permafrost Process</b>	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
<b>Mass Movement Process</b>	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
<b>Hydrological Process</b>	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.25**  
 Title: **LSA Terrain Mapping**



**Notes**  
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- Fluvial Material
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- Glaciolacustrine Material
- Morainal Material (till)
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- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
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**Surficial Material**

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Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

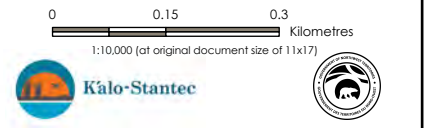
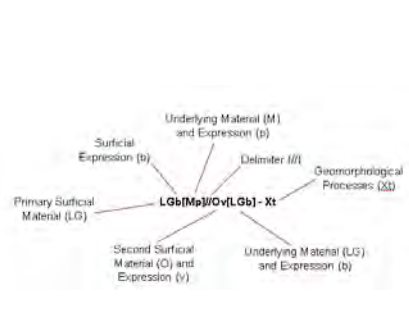
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fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
vener (< 1 m)	v

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⊕	Active

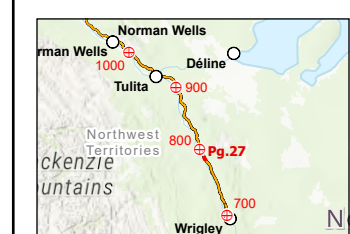
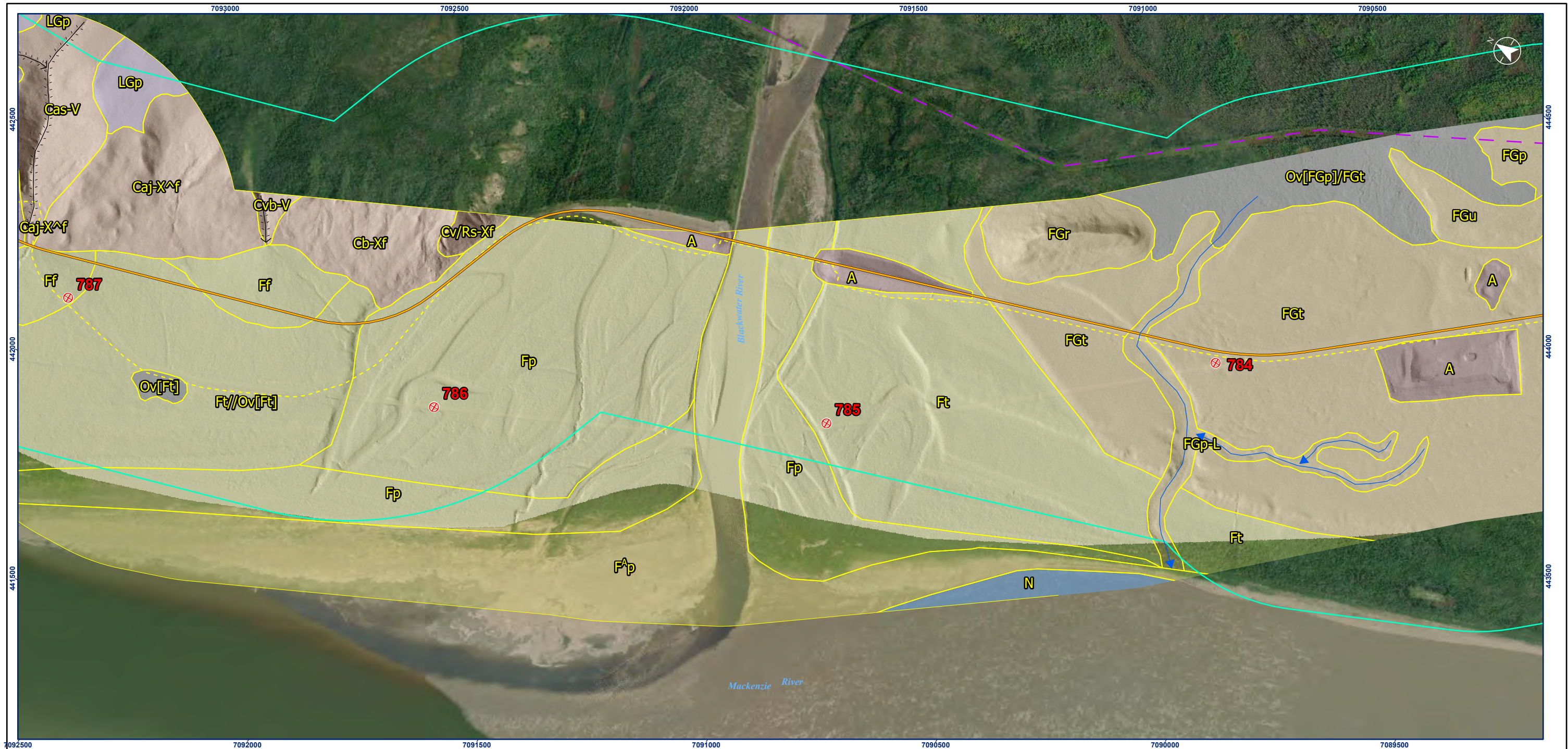
**Geomorphological Process**

<b>Permafrost Process</b>	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
<b>Mass Movement Process</b>	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
<b>Hydrological Process</b>	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



Project Location: Wrigley to Norman Wells, NWT  
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Client/Project: 144903025-0065 REV A  
 Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. B.26  
 Title: LSA Terrain Mapping



**Notes**  
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- ➔ Seepage Flow Direction
- ⇨ Gully
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- Surficial Material**
- Anthropogenic Material
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- Colluvium
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- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ⬜ District Boundary
- ⬜ Region Boundary
- ⬜ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

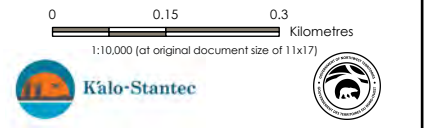
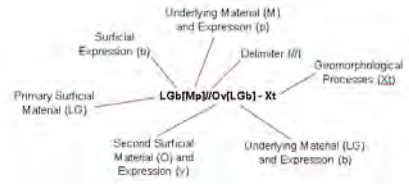
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

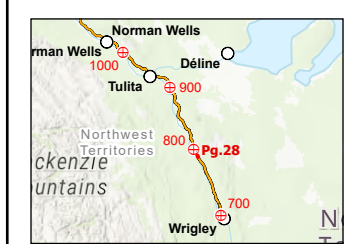
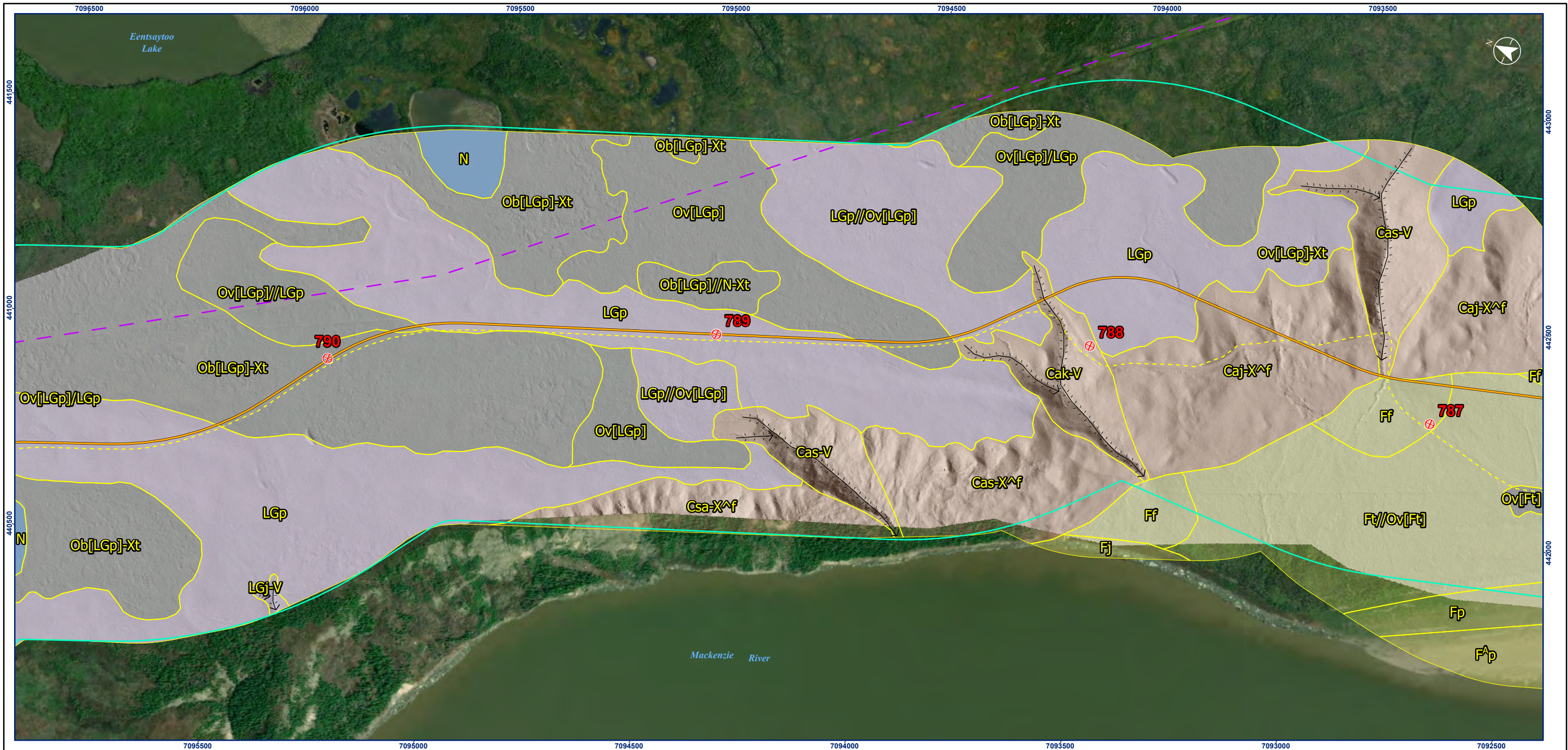
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- A Active

**Geomorphological Process**

- Permafrost Process**
- Thermokarst Xt
  - Thaw flow Xf
  - Ice wedge Xw
  - Thermo-erosion Xe
- Mass Movement Process**
- Slow mass movement F
  - Tension crack Fk
  - Rapid mass movement R
  - Rockfall Rb
  - Debris flow Rd
  - Debris slide/avalanche Rr
  - Rotational slump Ru
- Hydrological Process**
- Channeled by meltwater E
  - Kettled H
  - Surface seepage L
  - Inundation U
  - Gully V



Project Location: Wrigley to Norman Wells, NWT  
 Client/Project: 144903025-0065 REV A  
 Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. B.27  
 Title: LSA Terrain Mapping



**Notes**  
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- ➔ Seepage Flow Direction
- ⇒ Gully
- ↳ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

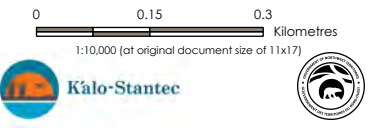
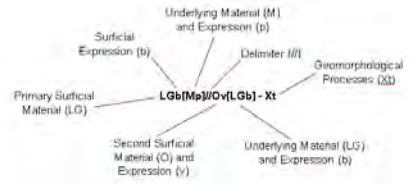
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
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hummocky	h
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plain	p
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steep slope (>70%)	s
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undulating	u
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**Delimiter and Qualifier**

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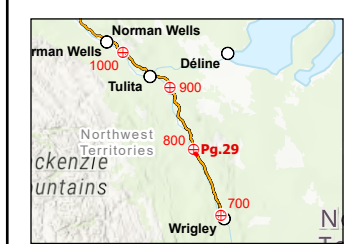
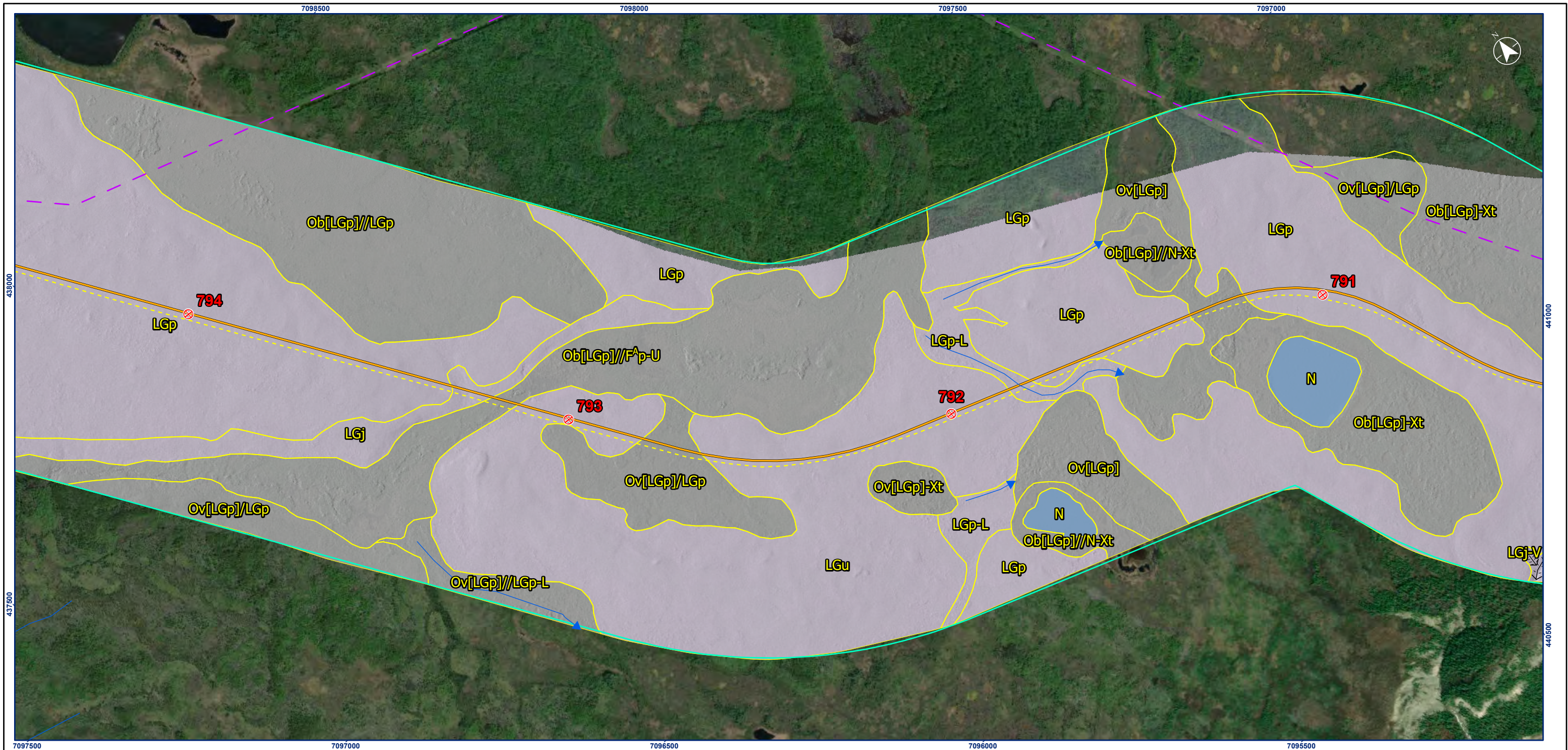
**Geomorphological Process**

- Permafrost Process**
- Thermokarst Xt
  - Thaw flow Xf
  - Ice wedge Xw
  - Thermo-erosion Xe
- Mass Movement Process**
- Slow mass movement F
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  - Debris flow Rd
  - Debris slide/avalanche Rr
  - Rotational slump Ru
- Hydrological Process**
- Channeled by meltwater E
  - Kettled H
  - Surface seepage L
  - Inundation U
  - Gully V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. B.28  
 Title: LSA Terrain Mapping



**Notes**  
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- ➔ Seepage Flow Direction
- ⚡ Gully
- ⚡ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
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- ⬜ District Boundary
- ⬜ Region Boundary
- ⬜ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

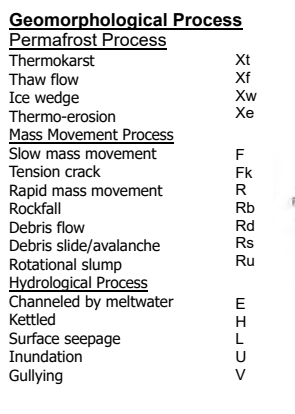
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

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^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

Permafrost Process	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
Mass Movement Process	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
Hydrological Process	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	

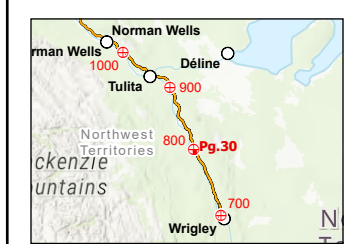
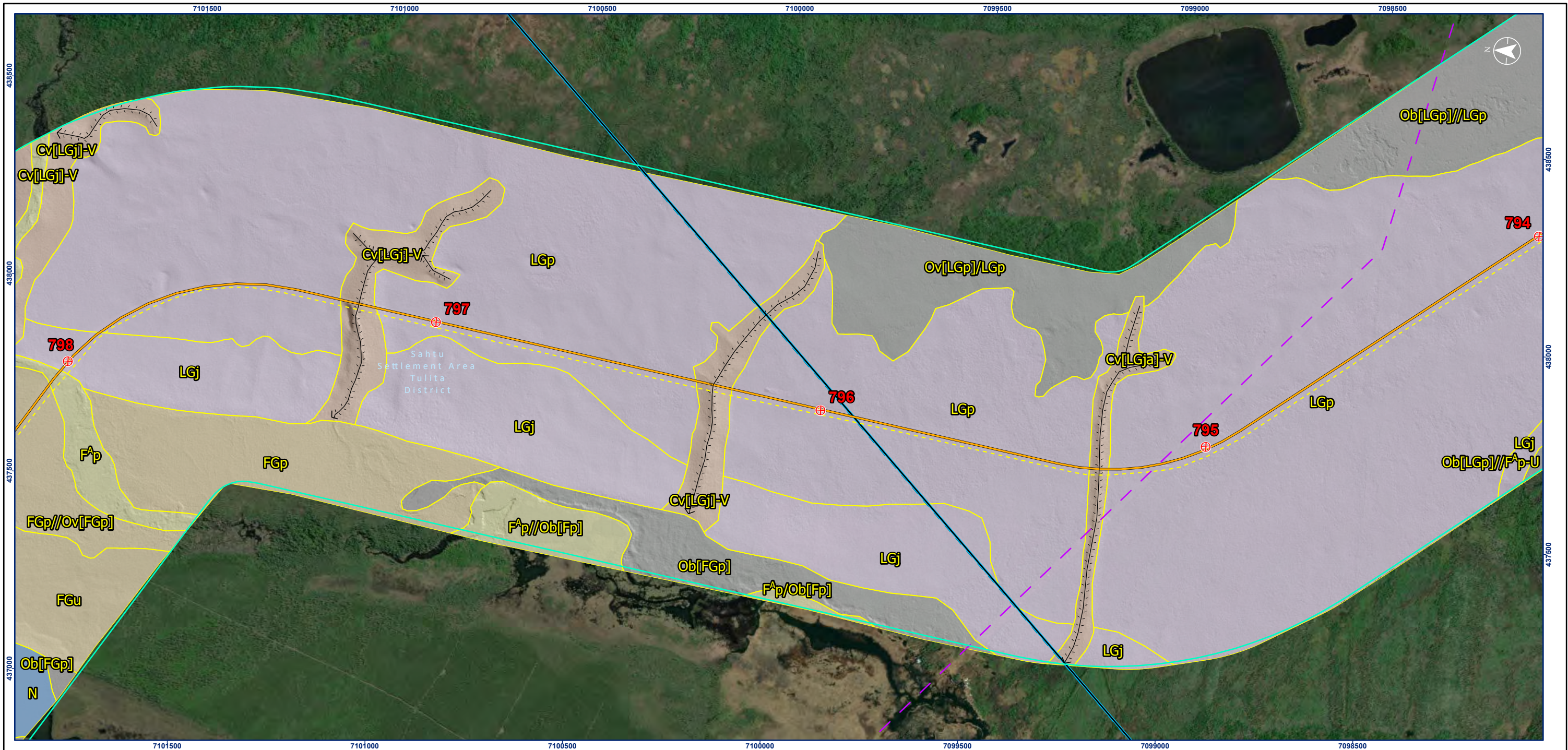


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Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: Government of Northwest Territories  
 Mackenzie Valley Highway

Figure No.: **B.29**  
 Title: **LSA Terrain Mapping**



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**Surface Expression**

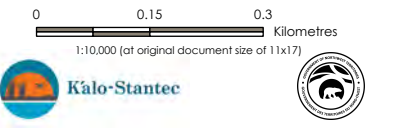
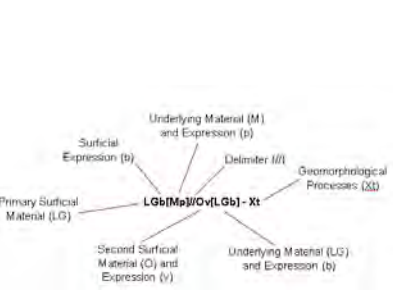
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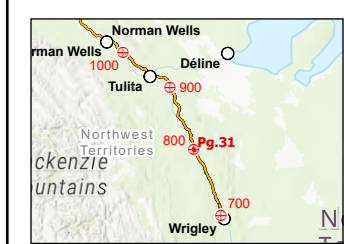
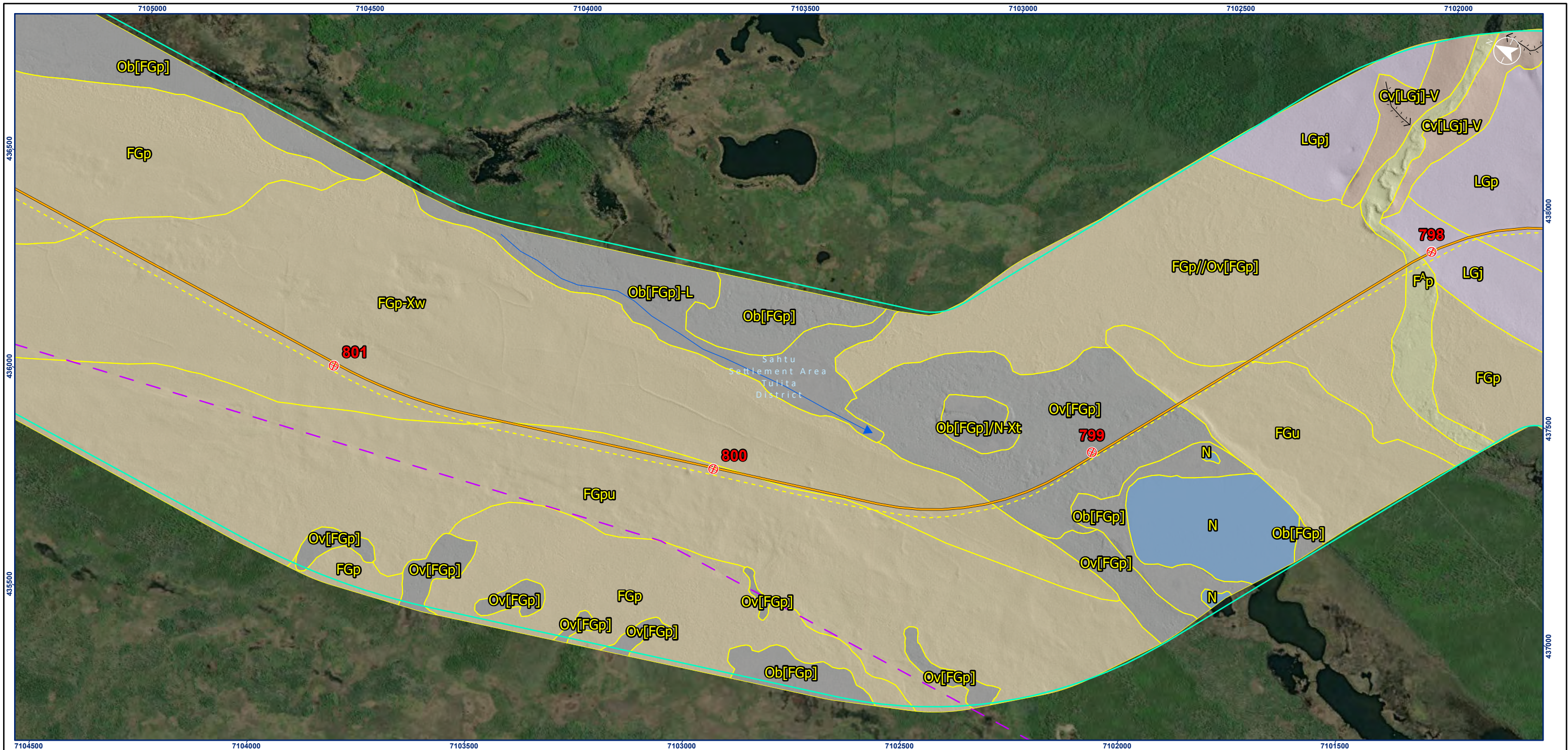
**Geomorphological Process**

<b>Permafrost Process</b>	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
<b>Mass Movement Process</b>	F
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Debris slide/avalanche	Ru
Rotational slump	
<b>Hydrological Process</b>	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



Project Location: Wrigley to Norman Wells, NWT  
 Client/Project: Mackenzie Valley Highway  
 Figure No.: B.30  
 Title: LSA Terrain Mapping

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**Surficial Material**

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Eolian	E
Fluvial	F
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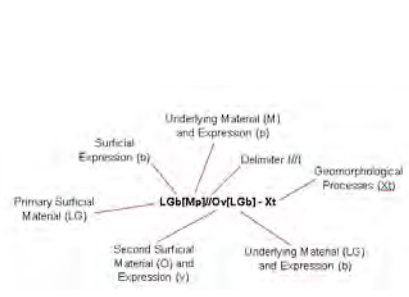
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gentle slope (6-26%)	j
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plain	p
ridged	r
steep slope (>70%)	s
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**Geomorphological Process**

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Slow mass movement	Fk
Tension crack	R
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Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



0 0.15 0.3 Kilometres  
 1:10,000 (at original document size of 11x17)

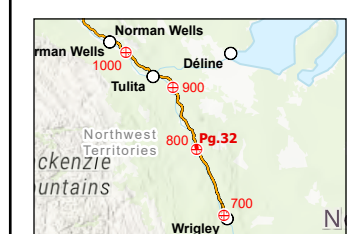
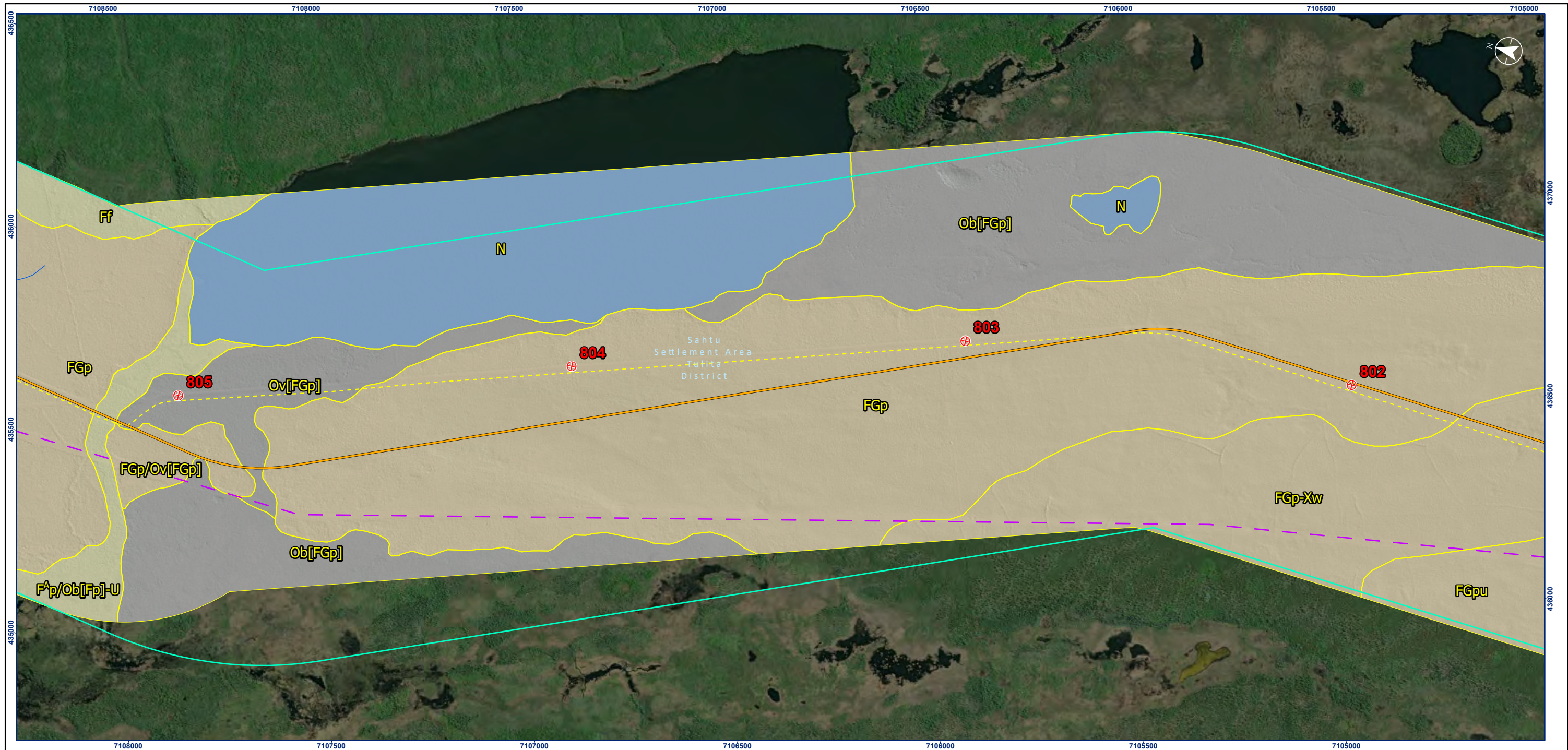
**Kalo-Stantec**

Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway

Figure No. **B.31**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⇒ Gully
- ↳ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainial Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainial (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

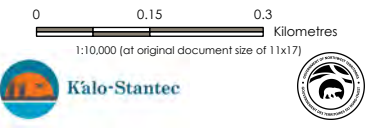
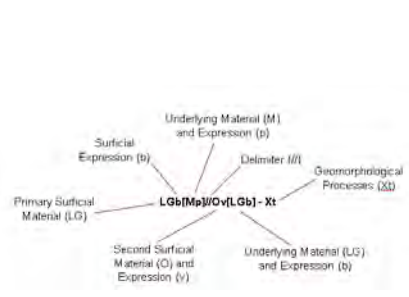
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- A Geomorphological process initiation zone
- Active

**Geomorphological Process**

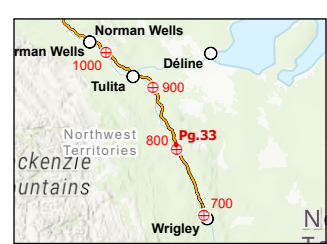
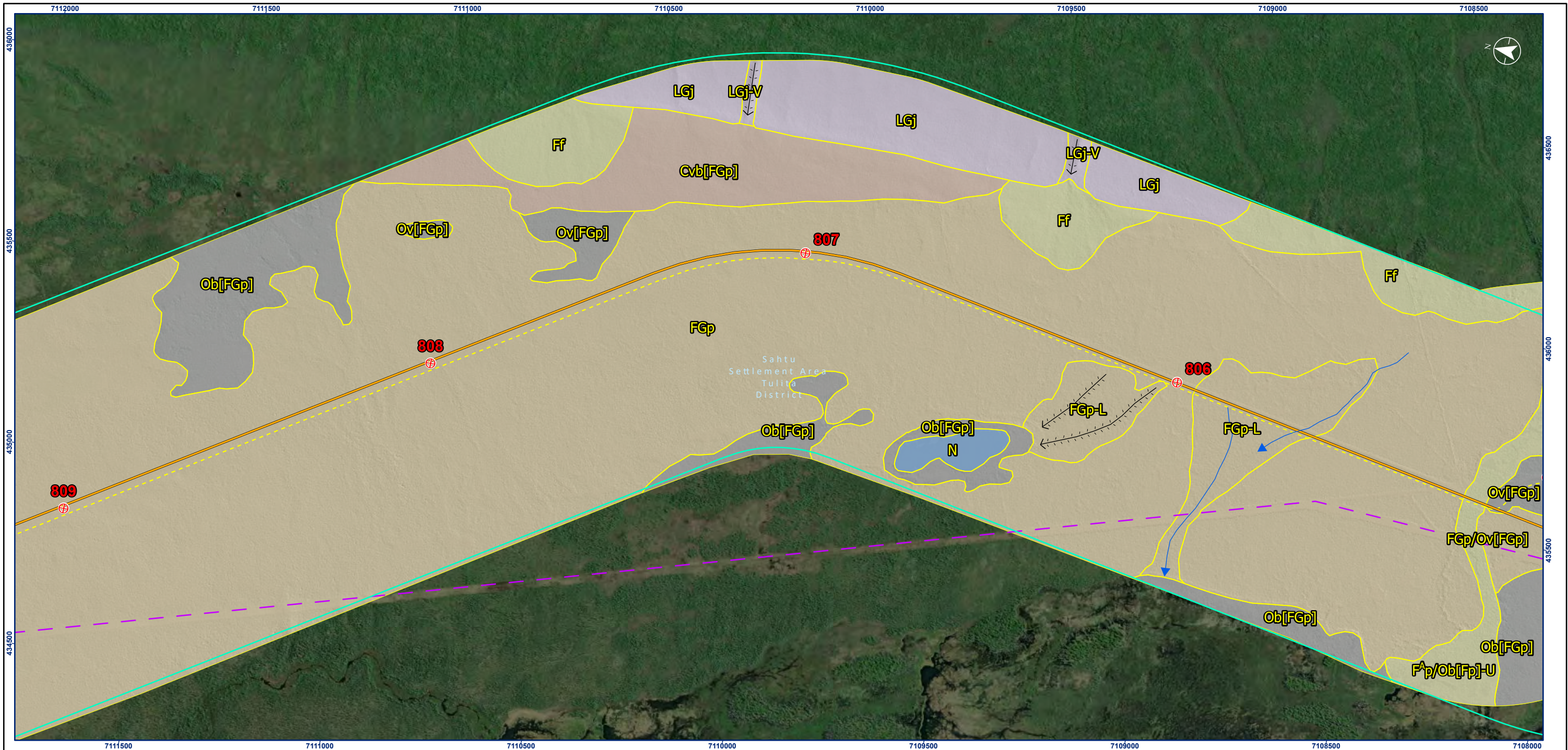
<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.32**  
 Title: **LSA Terrain Mapping**





**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
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 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⇨ Gully
- ↳ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ▭ District Boundary
- ▭ Region Boundary
- ▭ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

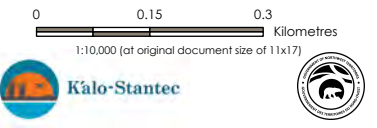
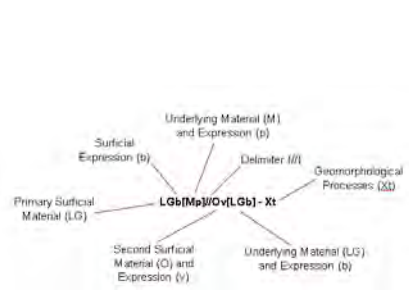
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

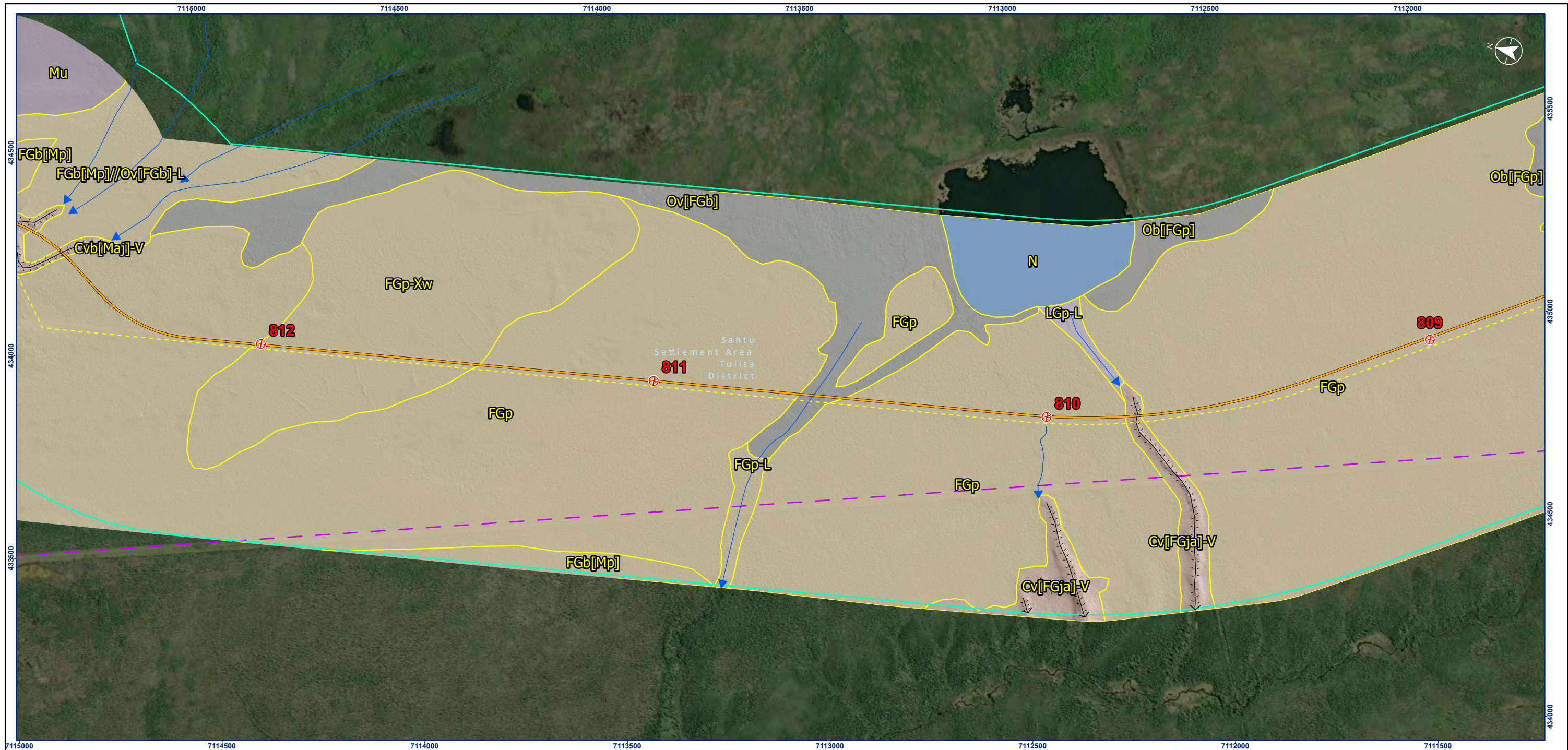
/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
A	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

<b>Permafrost Process</b>	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
<b>Mass Movement Process</b>	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettle	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Client/Project: 144903025-0065 REV A  
 Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.33**  
 Title: **LSA Terrain Mapping**



**Notes**

- Coordinate System: NAD 1983 UTM Zone 10N
- Data Sources: Government of Northwest Territories
- Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
- World Imagery: Maxar
- World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT
- Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

**Legend**

- Seepage Flow Direction
- Gully
- Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Delimiter and Qualifier**

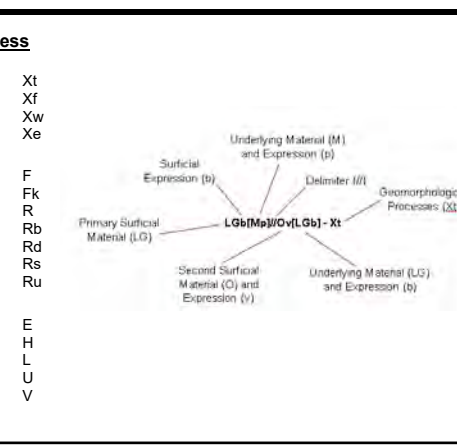
- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- A Geomorphological process initiation zone
- Active

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



0 0.15 0.3 Kilometres  
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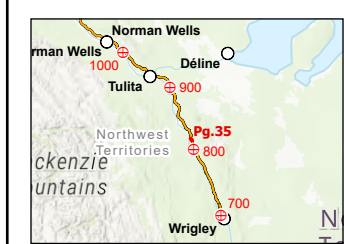
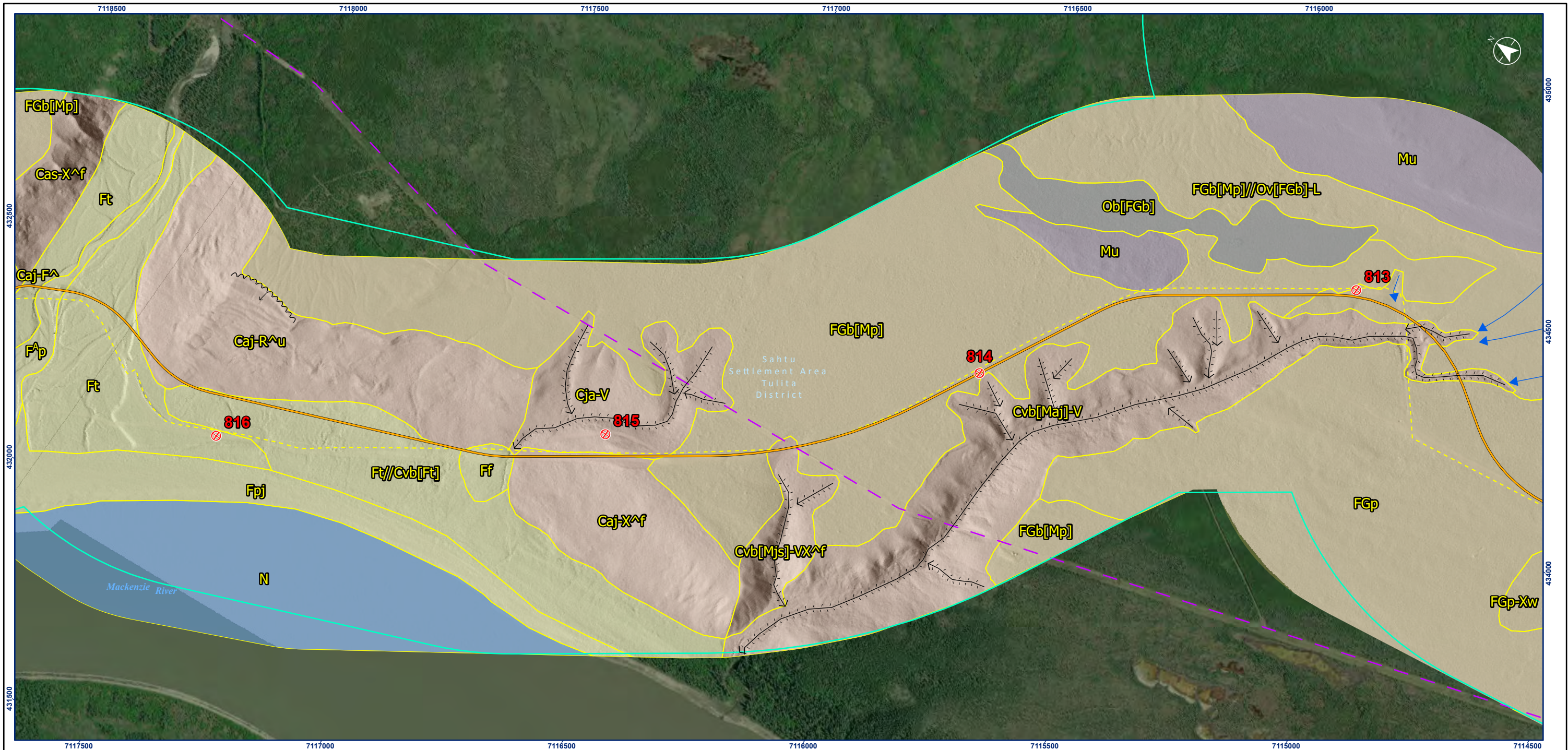
Project Location: Wrigley to Norman Wells, NWT  
Prepared by CES on 2021-02-08  
TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
Mackenzie Valley Highway

Figure No. **B.34**  
Title: **LSA Terrain Mapping**

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**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⤵ Gully
- ⤴ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ⬛ District Boundary
- ⬛ Region Boundary
- ⬛ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Delimiter and Qualifier**

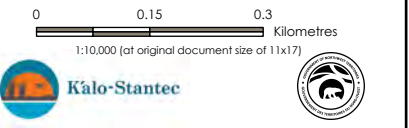
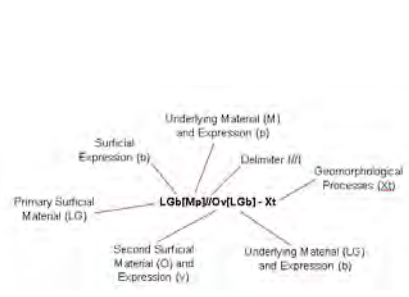
/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
A	Geomorphological process initiation zone
^	Active

**Surface Expression**

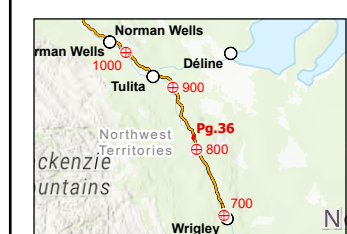
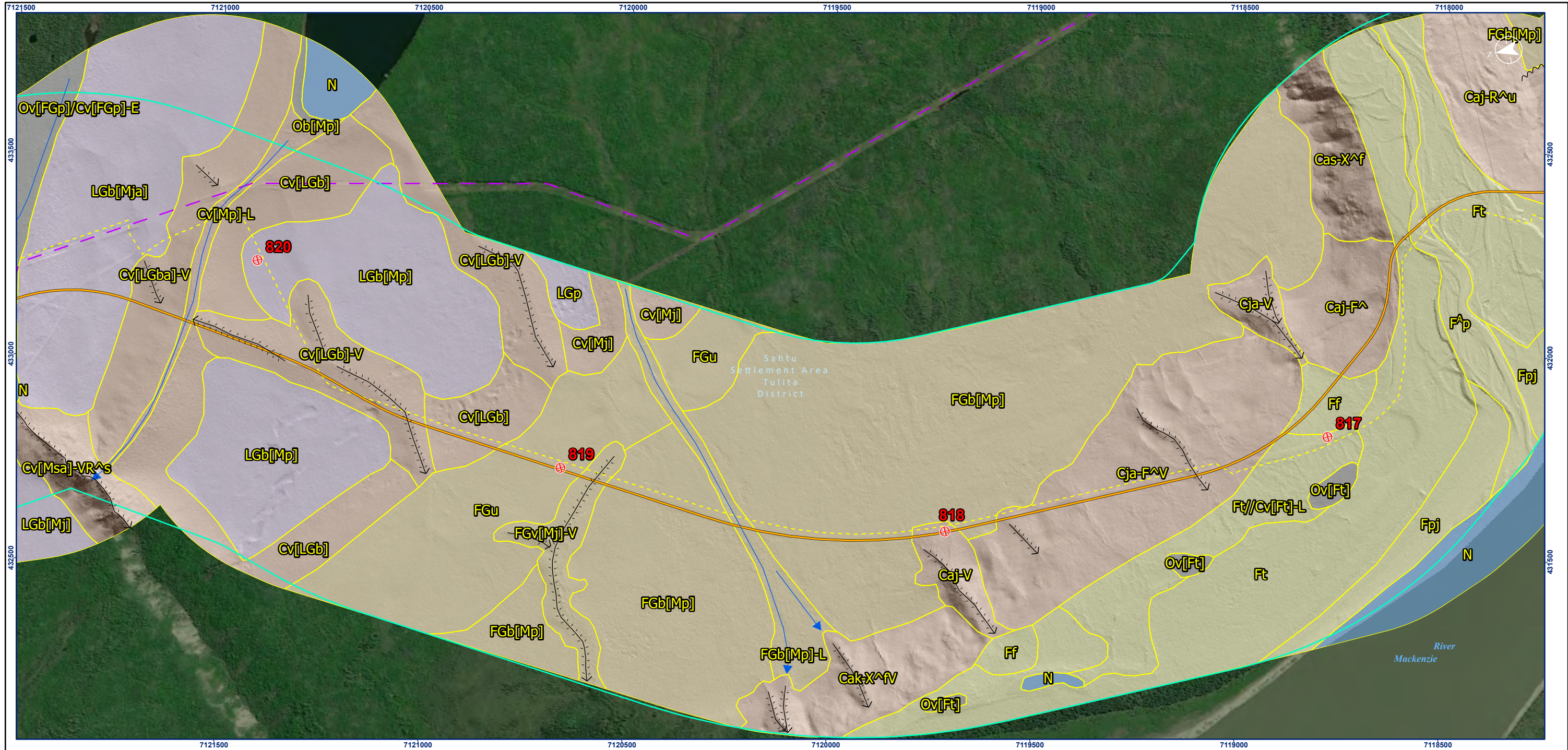
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Client/Project: 144903025-0065 REV A  
 Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.35**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⤵ Gully
- ⤴ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ⬜ District Boundary
- ⬜ Region Boundary
- ⬜ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

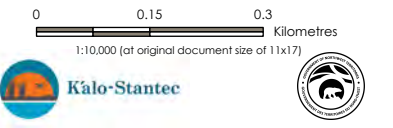
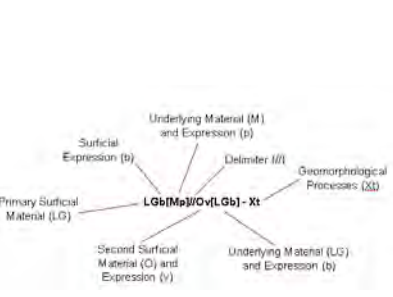
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
A	Geomorphological process initiation zone
A	Active

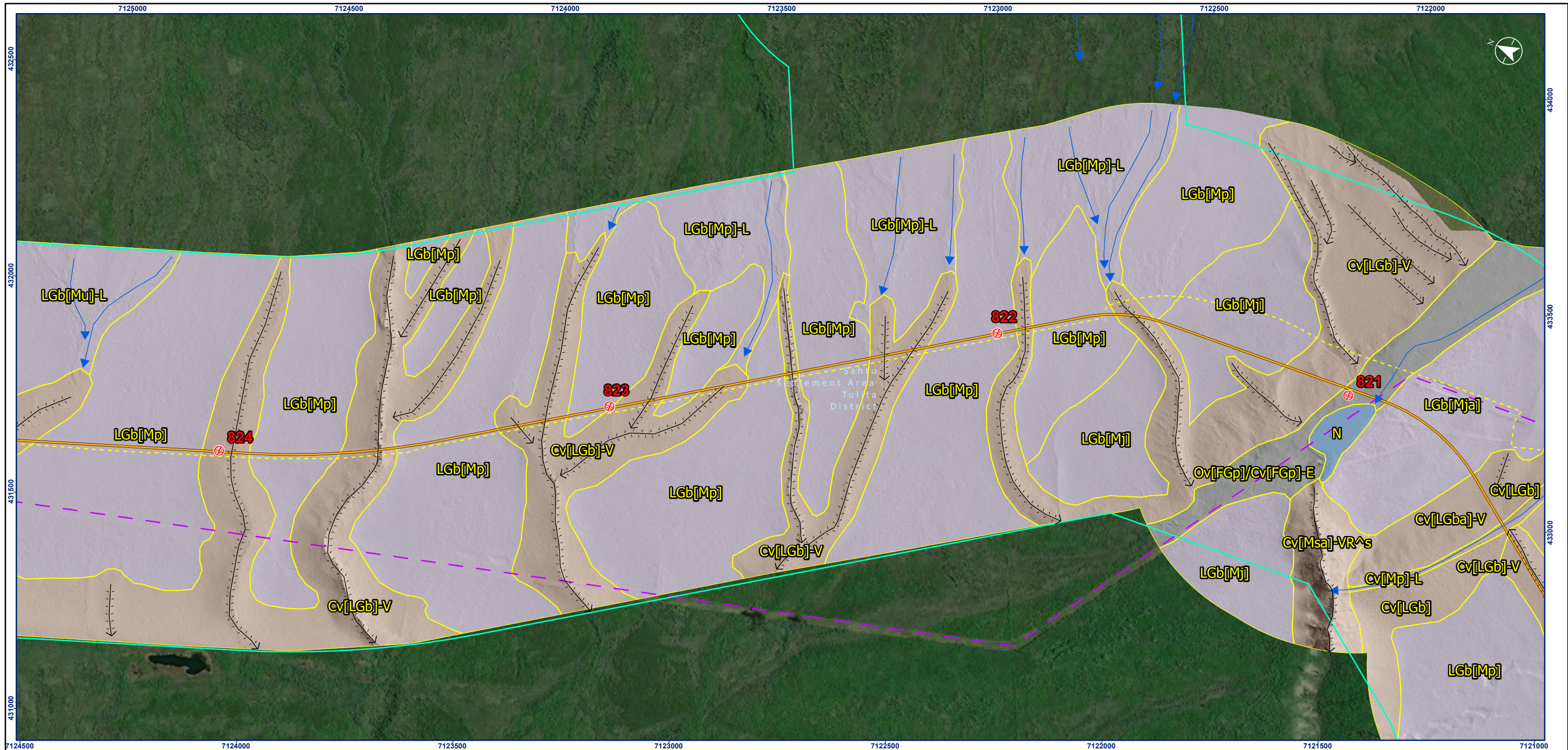
**Geomorphological Process**

Permafrost Process	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
Mass Movement Process	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
Hydrological Process	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



Project Location  
 Wrigley to Norman Wells, NWT  
 Client/Project  
 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No.  
**B.36**  
 Title  
**LSA Terrain Mapping**



**Notes**

- Coordinate System: NAD 1983 UTM Zone 10N
- Data Sources: Government of Northwest Territories
- Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
- Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

World Imagery: Maxar  
World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT

**Legend**

- Seepage Flow Direction
- Gully
- Landslide Scar
- Surficial Material**
  - Anthropogenic Material
  - Bedrock
  - Colluvium
  - Eolian
  - Fluvial Material
  - Glaciofluvial Material
  - Glaciolacustrine Material
  - Morainal Material (till)
  - Organic Material
  - Water
  - Terrain Mapping

- Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Delimiter and Qualifier**

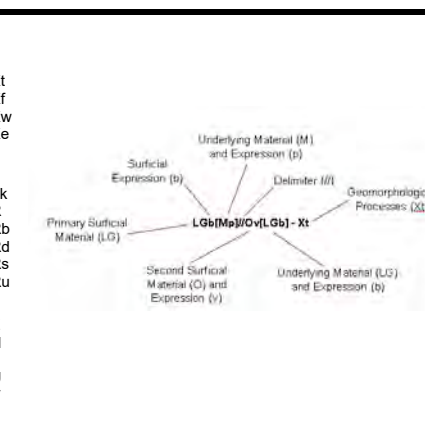
- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- A Geomorphological process initiation zone
- Active

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



0 0.15 0.3 Kilometres  
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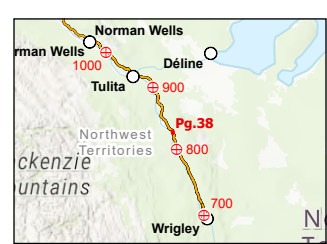
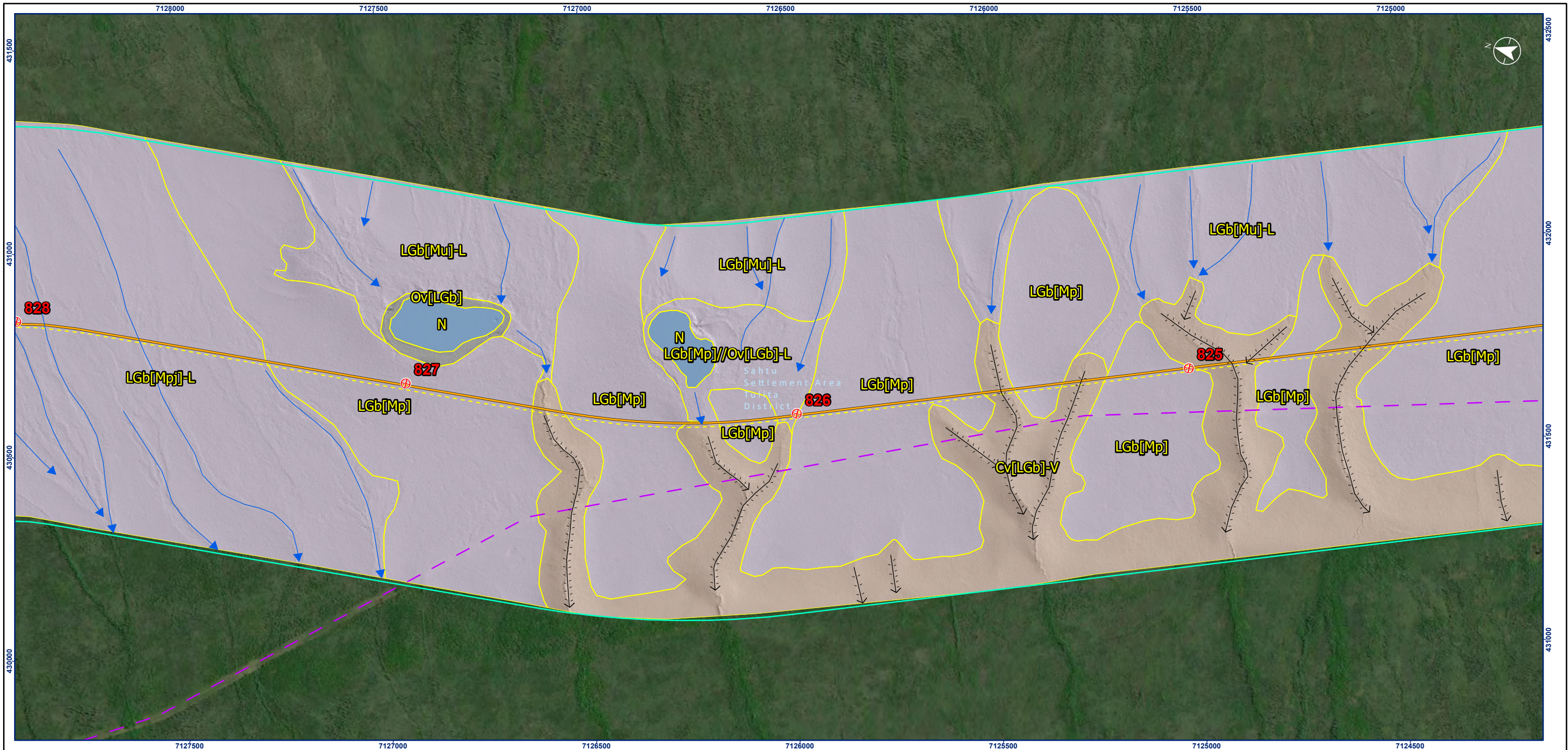
**Kalo-Stantec**

Project Location: Wrigley to Norman Wells, NWT  
Prepared by CES on 2021-02-08  
TR by OP on 2023-03-14

Client/Project: 144903025-0065 REVA

Government of Northwest Territories  
Mackenzie Valley Highway  
Figure No. **B.37**  
Title: **LSA Terrain Mapping**

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**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
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- ➔ Seepage Flow Direction
- ⇄ Gully
- ⌋ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

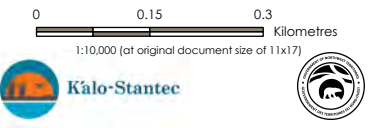
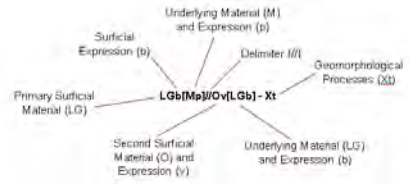
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- ^ Geomorphological process initiation zone
- A Active

**Geomorphological Process**

- Permafrost Process**
- Thermokarst Xt
  - Thaw flow Xf
  - Ice wedge Xw
  - Thermo-erosion Xe
- Mass Movement Process**
- Slow mass movement F
  - Tension crack Fk
  - Rapid mass movement R
  - Rockfall Rb
  - Debris flow Rd
  - Debris slide/avalanche Rs
  - Rotational slump Ru
- Hydrological Process**
- Channeled by meltwater E
  - Kettled H
  - Surface seepage L
  - Inundation U
  - Gully V

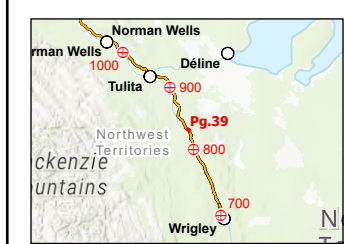
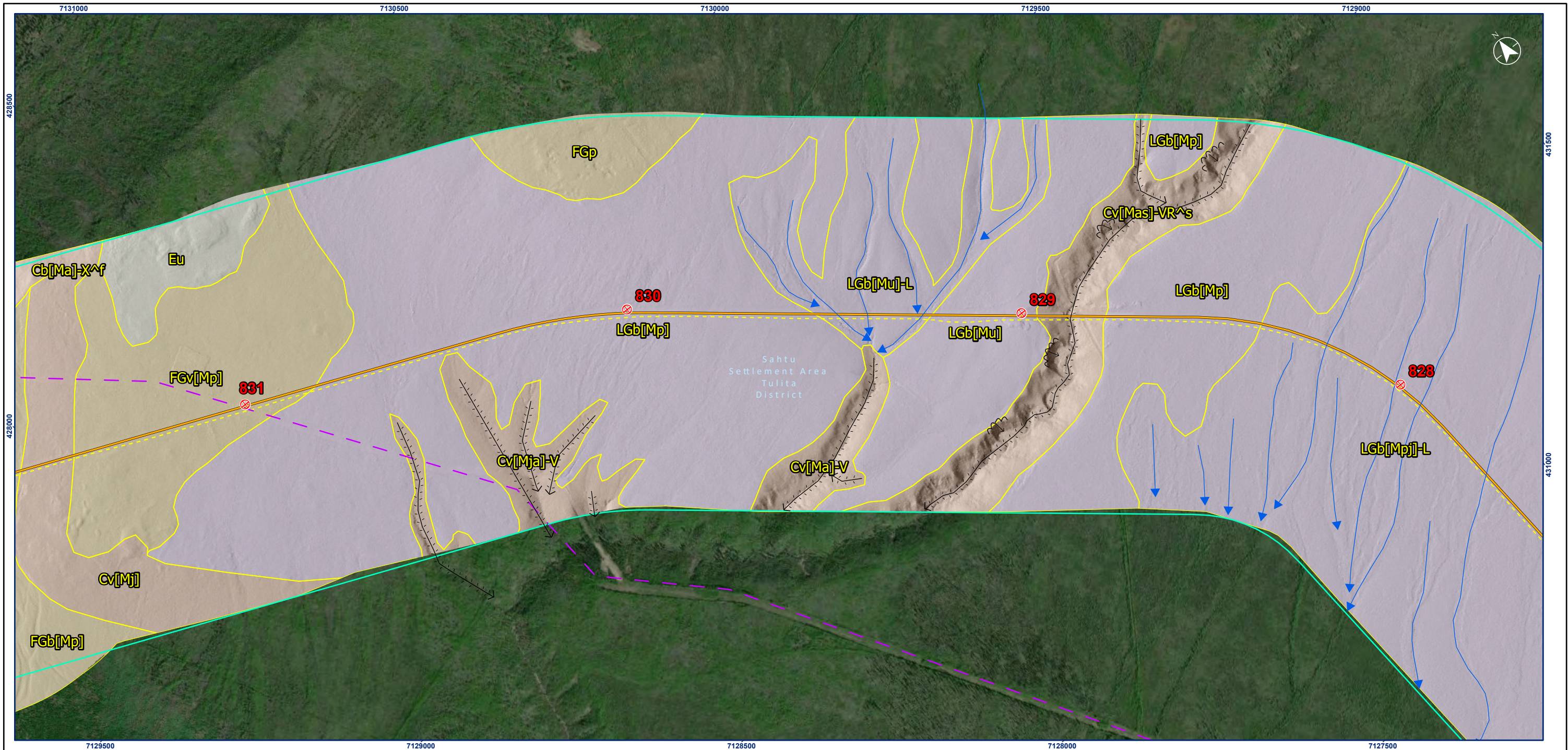


Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway

Figure No. **B.38**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⇄ Gully
- ↳ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ⊔ District Boundary
- ⊔ Region Boundary
- ⊔ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

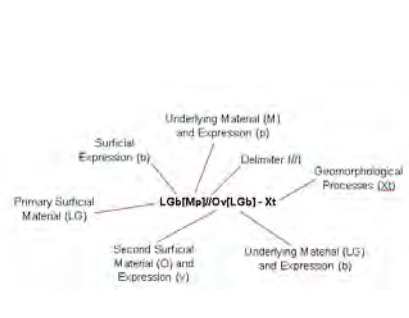
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

Permafrost Process	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
Mass Movement Process	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
Hydrological Process	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



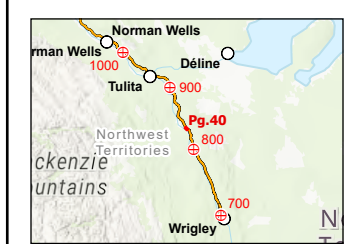
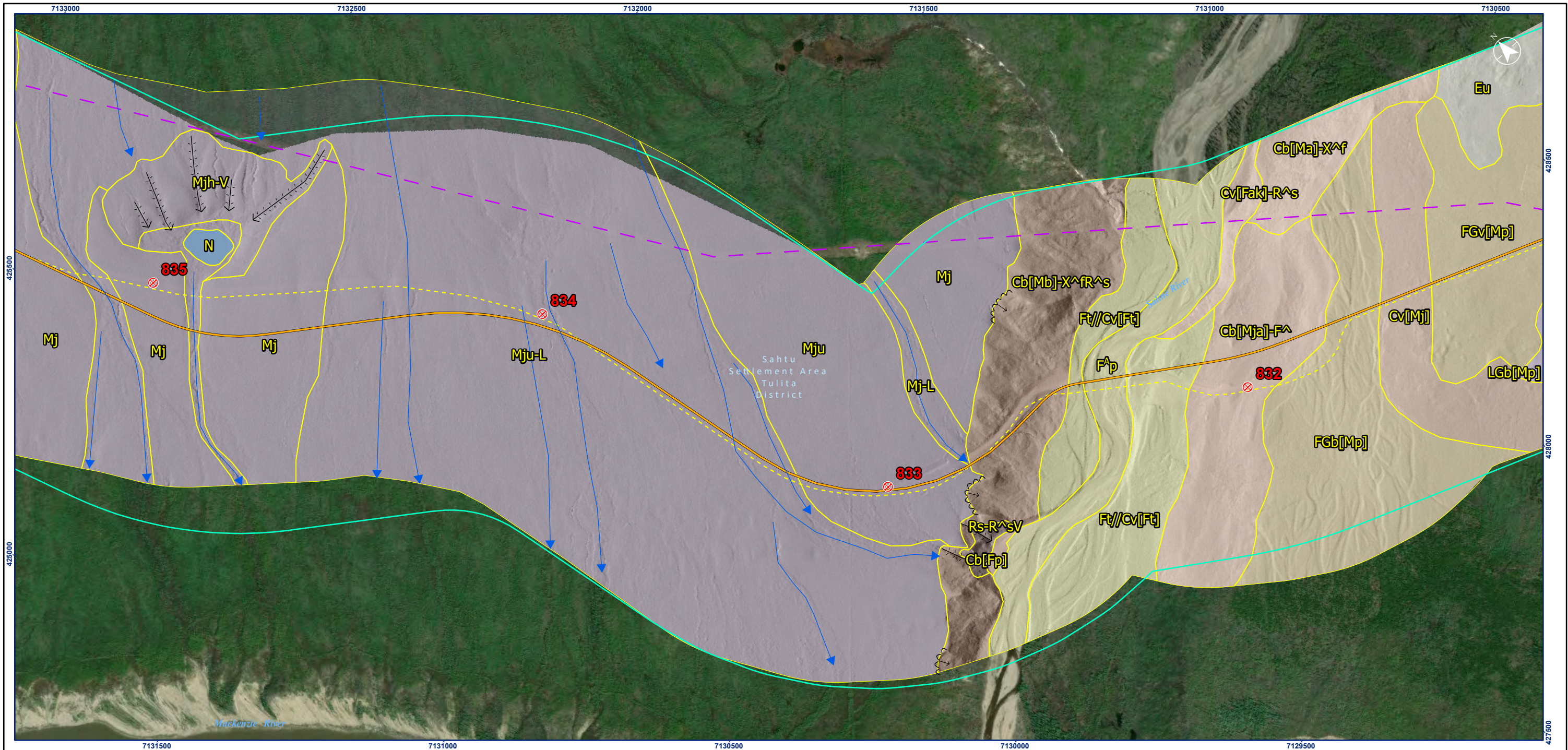
0 0.15 0.3 Kilometres  
 1:10,000 (at original document size of 11x17)

**Kalo-Stantec**

Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.39**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⤵ Gully
- ⤵ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

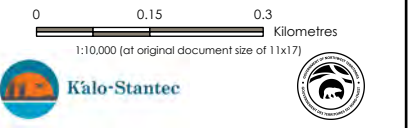
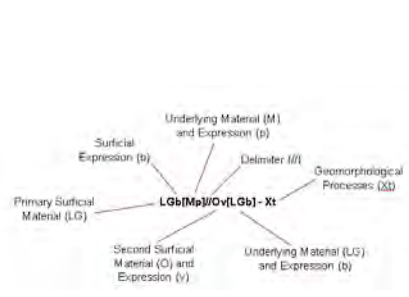
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

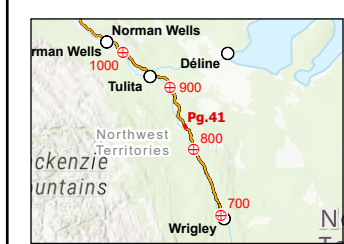
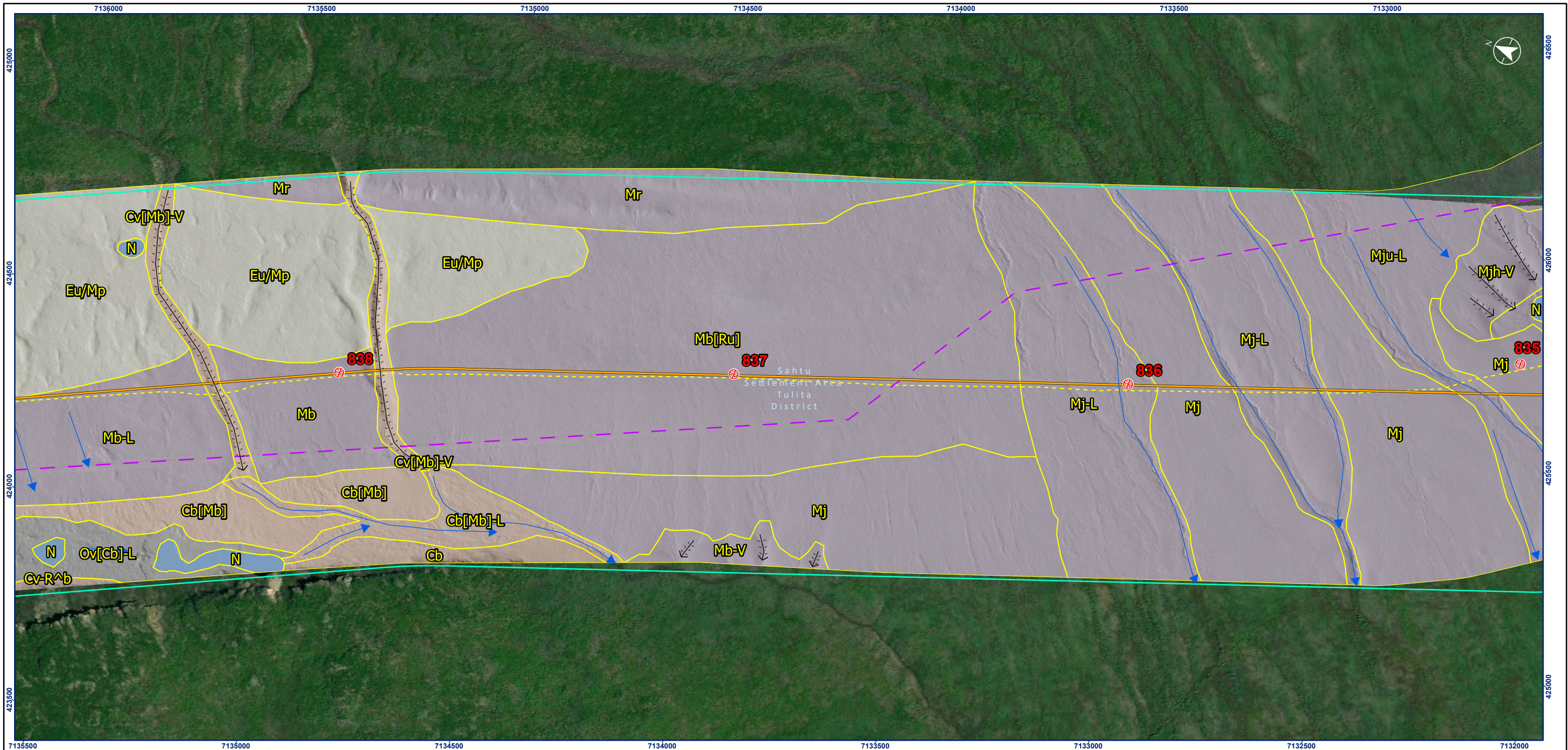
Permafrost Process	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
Mass Movement Process	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
Hydrological Process	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.40**  
 Title: **LSA Terrain Mapping**





**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- Seepage Flow Direction
- ⇩ Gully
- ⇩ Landslide Scar
- ⇩ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Delimiter and Qualifier**

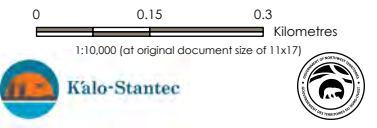
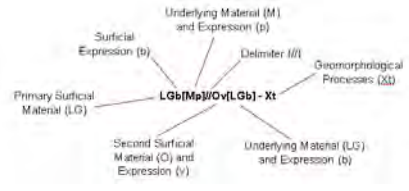
- / The component in front of the symbol is more extensive than the one that follows
- // The component in front of the symbol is considerably more extensive than the component that follows
- ^ Geomorphological process initiation zone
- A Active

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

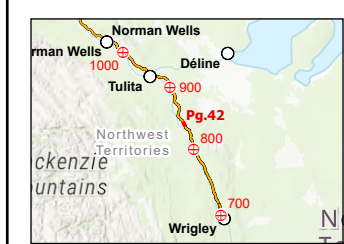
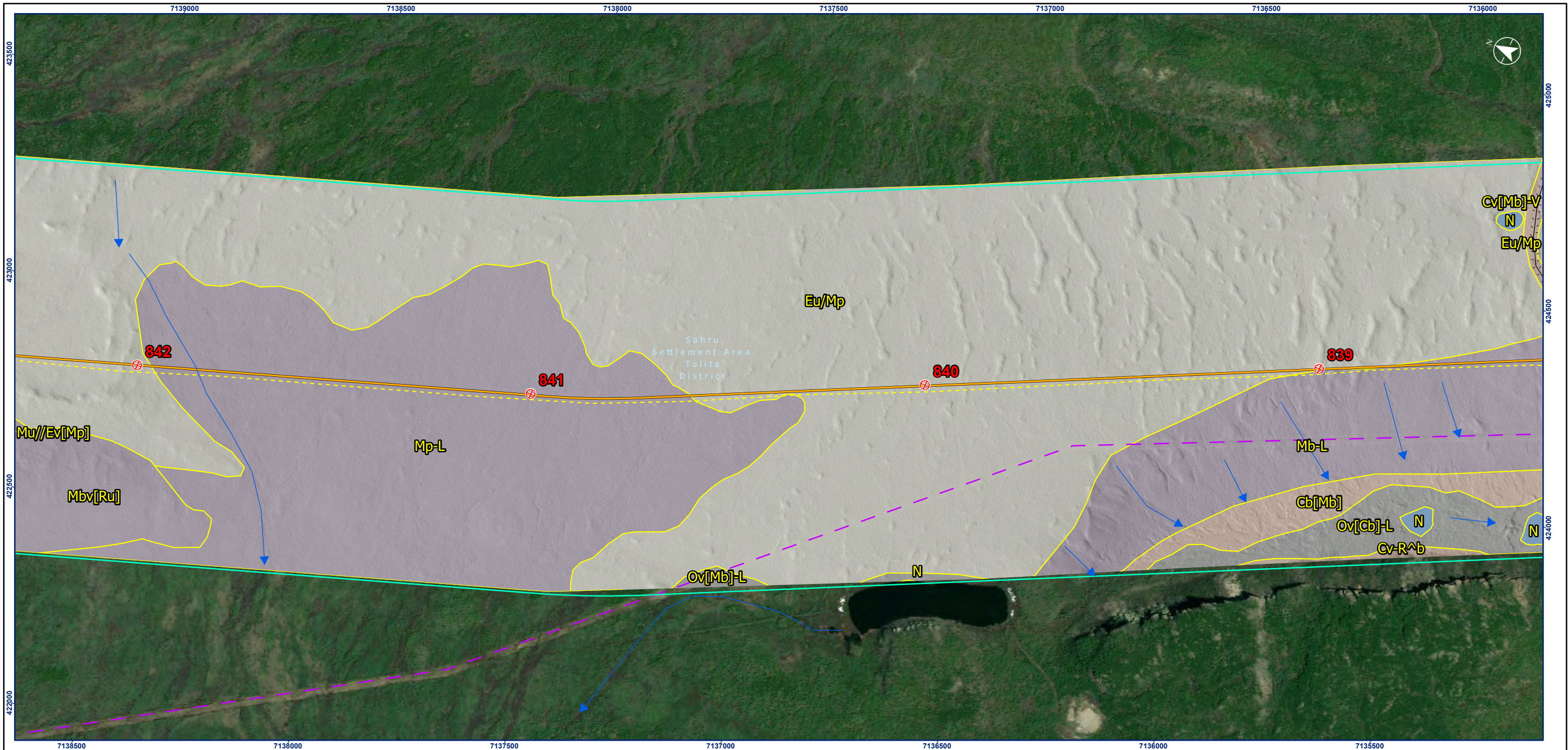
**Geomorphological Process**

- Permafrost Process**
- Thermokarst Xt
  - Thaw flow Xf
  - Ice wedge Xw
  - Thermo-erosion Xe
- Mass Movement Process**
- Slow mass movement F
  - Tension crack Fk
  - Rapid mass movement R
  - Rockfall Rb
  - Debris flow Rd
  - Debris slide/avalanche Rs
  - Rotational slump Ru
- Hydrological Process**
- Channeled by meltwater E
  - Kettled H
  - Surface seepage L
  - Inundation U
  - Gully V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REVA

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.41**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- ➔ Seepage Flow Direction
- ⤵ Gully
- ⤴ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

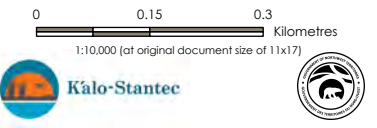
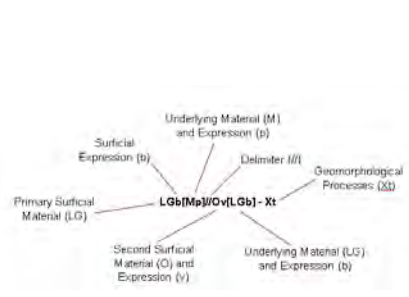
**Delimiter and Qualifier**  
 / The component in front of the symbol is more extensive than the one that follows  
 // The component in front of the symbol is considerably more extensive than the component that follows  
 A Geomorphological process initiation zone  
 A Active

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

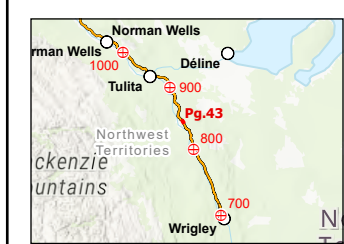
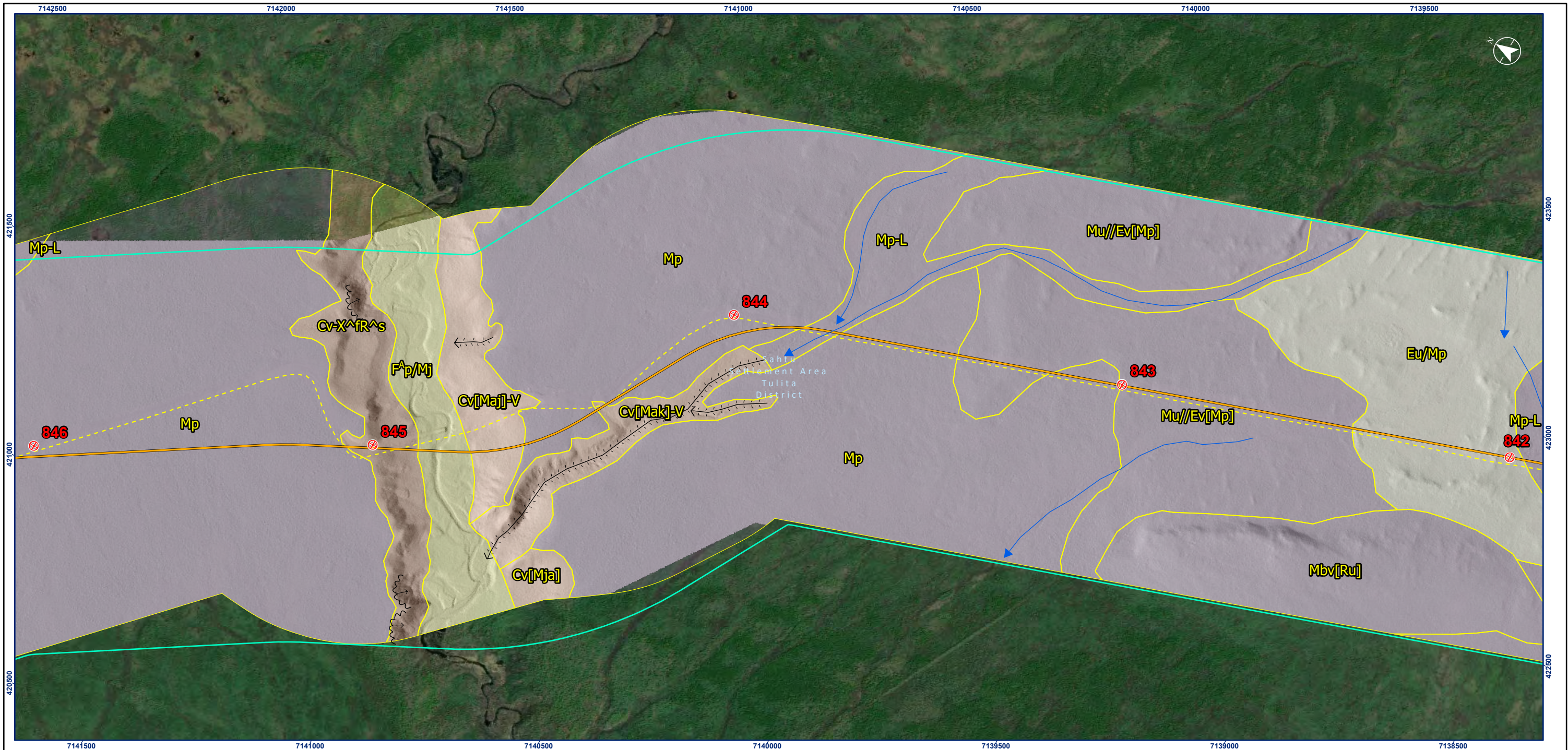
**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REVA

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.42**  
 Title: **LSA Terrain Mapping**



**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 World Imagery: Maxar  
 World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- Seepage Flow Direction
- ⇄ Gully
- ⇄ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

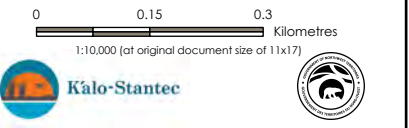
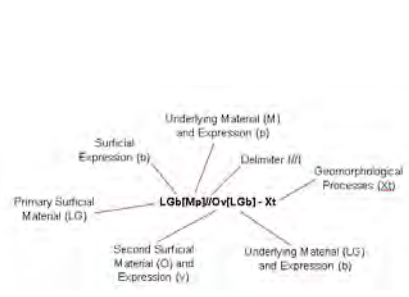
**Delimiter and Qualifier**  
 / The component in front of the symbol is more extensive than the one that follows  
 // The component in front of the symbol is considerably more extensive than the component that follows  
 A Geomorphological process initiation zone  
 A Active

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

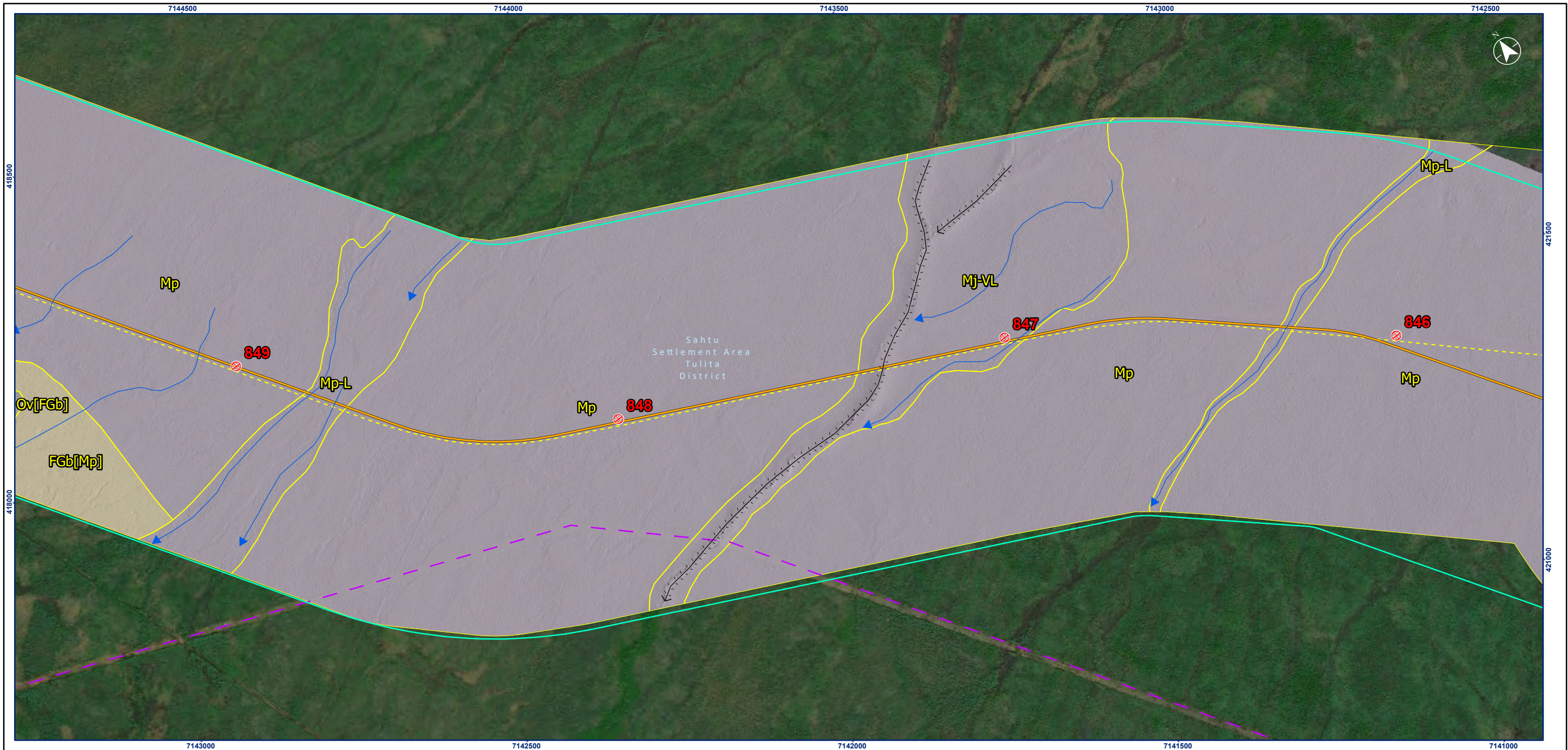
**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14  
 Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.43**  
 Title: **LSA Terrain Mapping**



**Notes**

1. Coordinate System: NAD 1983 UTM Zone 10N
2. Data Sources: Government of Northwest Territories
3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada
4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

World Imagery: Maxar  
World Hillshade: Esri, USGS and LIDAR-derived hillshade provided by GNWT

- ➔ Seepage Flow Direction
  - ⤵ Gully
  - ⤵ Landslide Scar
- Surficial Material**
- Anthropogenic Material
  - Bedrock
  - Colluvium
  - Eolian
  - Fluvial Material
  - Glaciofluvial Material
  - Glaciolacustrine Material
  - Morainal Material (till)
  - Organic Material
  - Water
  - Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ⬛ District Boundary
- ⬛ Region Boundary
- ⬛ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

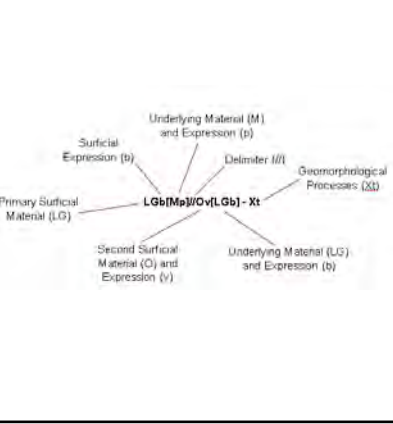
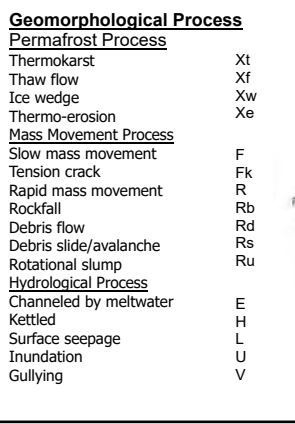
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

Permafrost Process	Xt
Thermokarst	Xf
Thaw flow	Xw
Ice wedge	Xe
Thermo-erosion	
Mass Movement Process	F
Slow mass movement	Fk
Tension crack	R
Rapid mass movement	Rb
Rockfall	Rd
Debris flow	Rs
Debris slide/avalanche	Ru
Rotational slump	
Hydrological Process	E
Channeled by meltwater	H
Kettled	L
Surface seepage	U
Inundation	V
Gully	



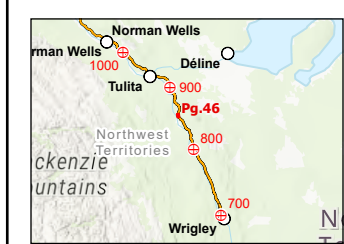
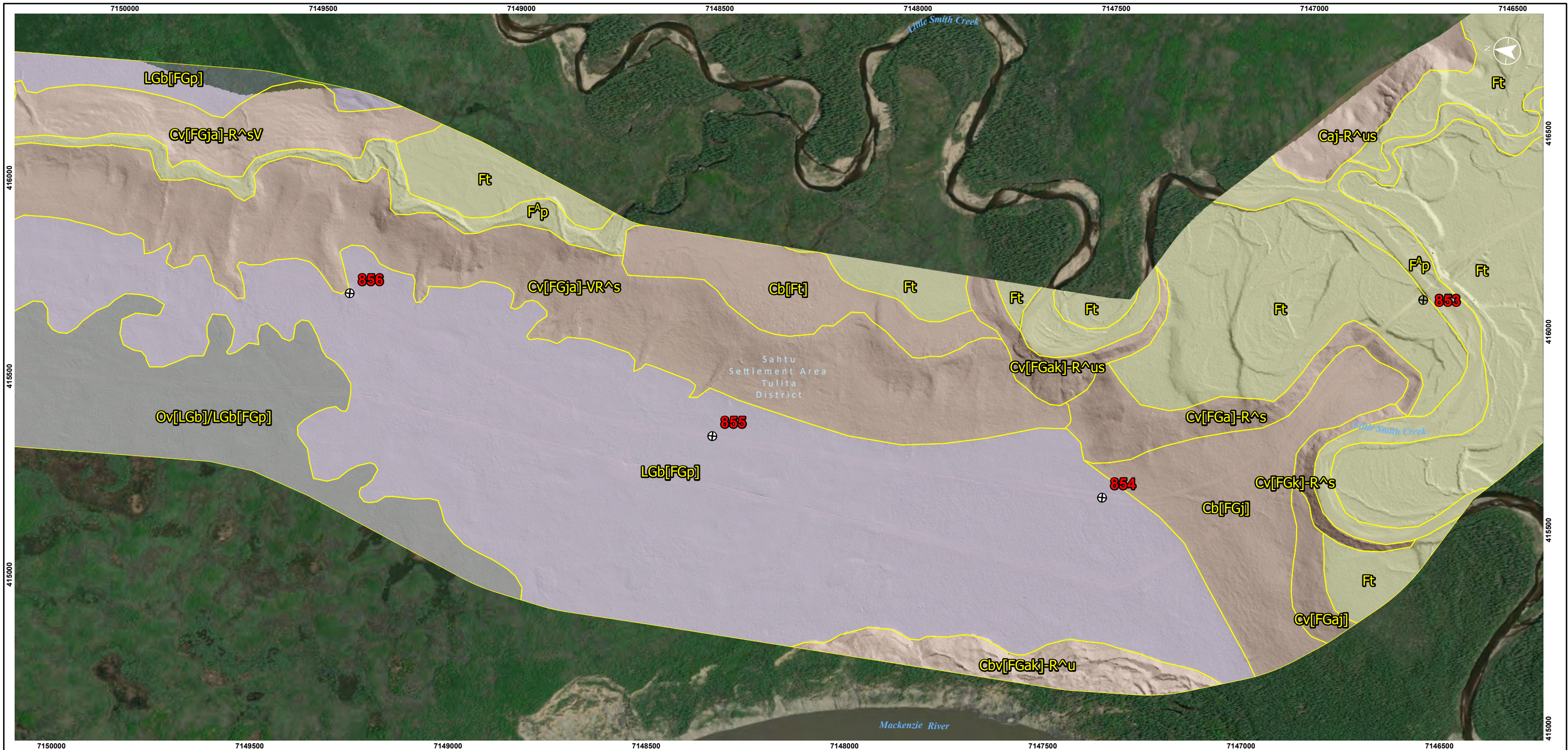
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Project Location: Wrigley to Norman Wells, NWT  
Prepared by CES on 2021-02-08  
TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
Mackenzie Valley Highway  
Figure No. **B.44**  
Title: **LSA Terrain Mapping**





**Notes**  
 1. Coordinate System: NAD 1983 UTM Zone 10N  
 2. Data Sources: Government of Northwest Territories  
 3. Background: World Topographic Map: Northwest Territories, Esri, HERE, Garmin, FAO, NOAA, USGS, EPA, NRCAN, Parks Canada  
 4. Terrain mapping conducted in 2D using available airphotos, ortho-imagery and LIDAR data. Refer to Soils, Terrain and Permafrost TDR for detailed methodology

- Seepage Flow Direction  
 Gully  
 Landslide Scar
- Surficial Material**
- Anthropogenic Material
  - Bedrock
  - Colluvium
  - Eolian
  - Fluvial Material
  - Glaciofluvial Material
  - Glaciolacustrine Material
  - Morainial Material (till)
  - Organic Material
  - Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- ┌┐ District Boundary
- ┌└ Region Boundary
- ┌└ Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainial (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

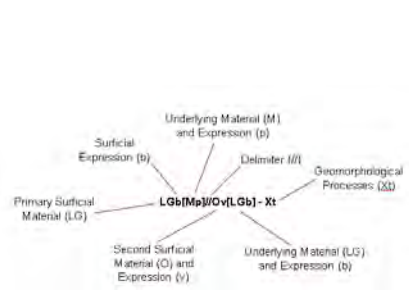
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



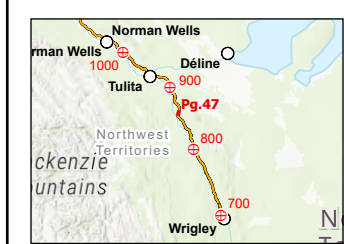
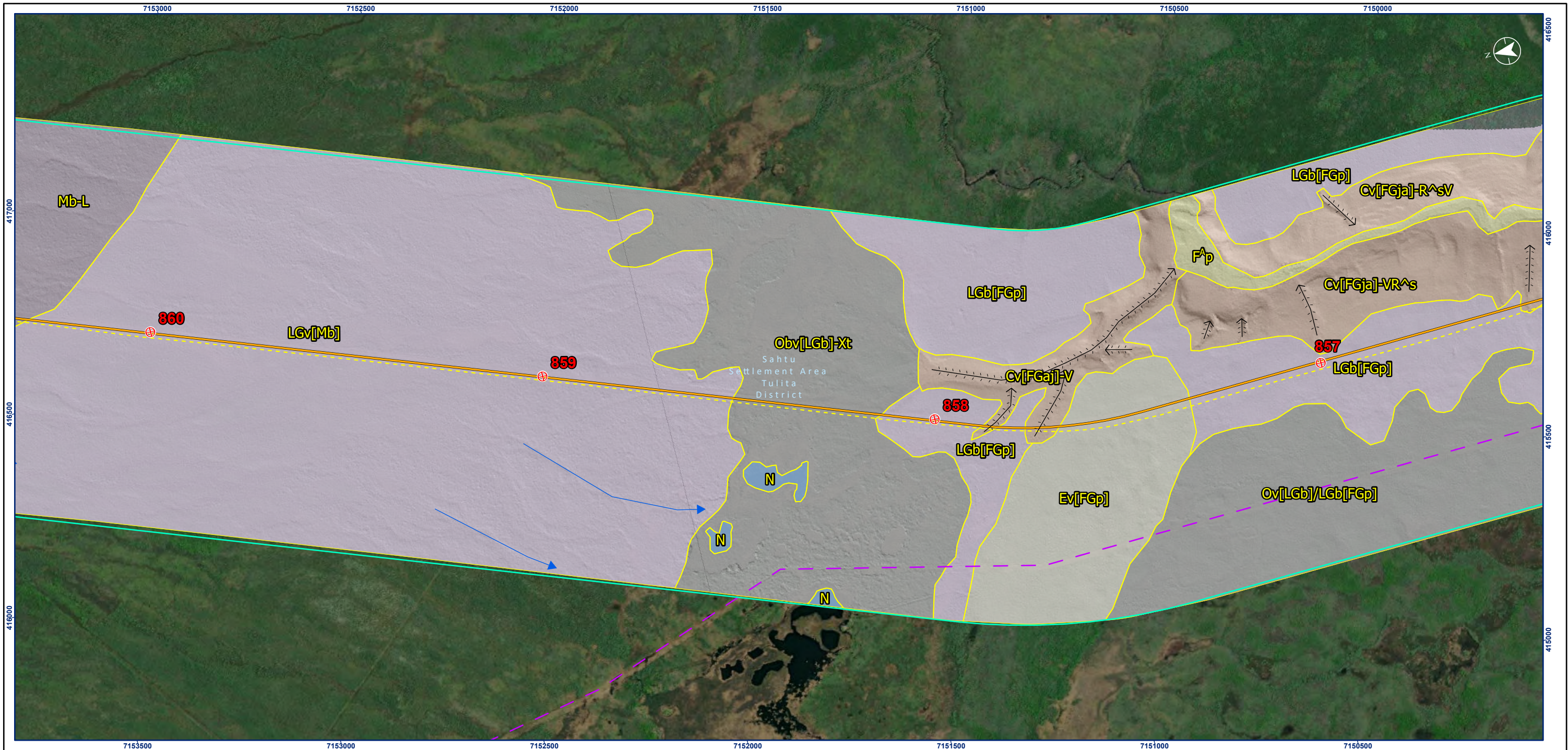
0 0.15 0.3 Kilometres  
 1:10,000 (at original document size of 11x17)

**Kalo-Stantec**

Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.46**  
 Title: **LSA Terrain Mapping**



- ➔ Seepage Flow Direction
- ⇒ Gully
- ↯ Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainal Material (till)
- Organic Material
- Water
- Terrain Mapping

- ⊕ Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainal (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

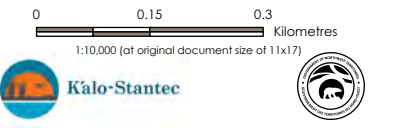
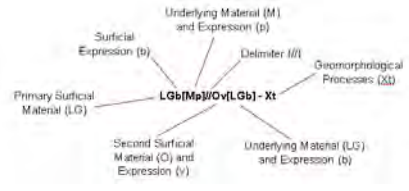
moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
^	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

<b>Permafrost Process</b>	
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe
<b>Mass Movement Process</b>	
Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru
<b>Hydrological Process</b>	
Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Client/Project: 144903025-0065 REVA

Government of Northwest Territories  
 Mackenzie Valley Highway  
 Figure No. **B.47**  
 Title: **LSA Terrain Mapping**

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- Seepage Flow Direction
- Gully
- Landslide Scar
- Surficial Material**
- Anthropogenic Material
- Bedrock
- Colluvium
- Eolian
- Fluvial Material
- Glaciofluvial Material
- Glaciolacustrine Material
- Morainial Material (till)
- Organic Material
- Water
- Terrain Mapping

- Mackenzie Valley Highway Kilometre Post
- Mackenzie Valley Highway Extension Project
- Local Study Area
- All-Season Road
- Winter Road
- Mackenzie Valley Fibre Link
- Norman Wells to Zama Lake Pipeline (Enbridge)
- District Boundary
- Region Boundary
- Settlement Area Boundary

**Surficial Material**

Anthropogenic	A
Colluvium	C
Eolian	E
Fluvial	F
Glaciofluvial	FG
Glaciolacustrine	LG
Morainial (till)	M
Water Body	N
Organic	O
Bedrock	R

**Surface Expression**

moderate slope (27-49%)	a
blanket (> 1 m)	b
cone	c
depression	d
fan	f
hummocky	h
gentle slope (6-26%)	j
moderate steep slope (50-70%)	k
rolling	m
plain	p
ridged	r
steep slope (>70%)	s
terraced	t
undulating	u
veneer (< 1 m)	v

**Delimiter and Qualifier**

/	The component in front of the symbol is more extensive than the one that follows
//	The component in front of the symbol is considerably more extensive than the component that follows
A	Geomorphological process initiation zone
A	Active

**Geomorphological Process**

**Permafrost Process**

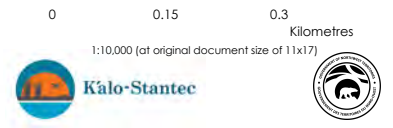
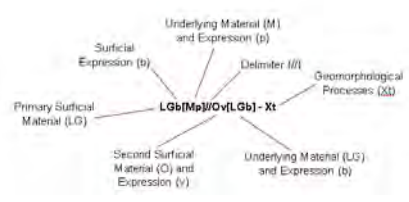
Thermokarst	Xt
Thaw flow	Xf
Ice wedge	Xw
Thermo-erosion	Xe

**Mass Movement Process**

Slow mass movement	F
Tension crack	Fk
Rapid mass movement	R
Rockfall	Rb
Debris flow	Rd
Debris slide/avalanche	Rs
Rotational slump	Ru

**Hydrological Process**

Channeled by meltwater	E
Kettled	H
Surface seepage	L
Inundation	U
Gully	V



Project Location: Wrigley to Norman Wells, NWT  
 Prepared by CES on 2021-02-08  
 TR by OP on 2023-03-14

Client/Project: 144903025-0065 REV A  
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 Mackenzie Valley Highway  
 Figure No. **B.48**  
 Title: **LSA Terrain Mapping**