

**RFI 098
Pebble Project EIS**

Request for Information

Title/Subject:	TSF Options, Mine Area
Requestor:	AECOM
Date Transmitted:	10/16/2018
Recipient:	Pebble Limited Partnership (PLP)
Response Requested by:	10/22/2018
Rationale:	The PLP response for RFI 069 presented 26 potential TSF locations that were considered near the mine area. Details on feasibility and environmental considerations for these locations are necessary for alternatives screening purposes and for the USACE to evaluate the Least Environmentally Damaging Practicable Alternative (LEPDA).
Describe the Information Requested and Level of Detail:	<p>Please provide an evaluation of each mine area TSF location that was considered and explain why the NFK West and NFK East locations were ultimately selected. Include:</p> <ul style="list-style-type: none"> • Feasibility (technology, economics, logistics, common sense) • Availability (both now and ten years ago during project planning) • Environmental impacts (wetlands/Waters of the US, miles of streams, habitat, fill, dam safety, etc.)

Recipient Response Form

Date Received from USACE:	Click here to enter text.
Response from Recipient (Describe Information Requested to the Level of Detail Requested; Provide Attachments as Needed):	Click here to enter text.
List Number and Type of Response Attachments:	RFI 098_TSF Options_Mine_Area.pdf RFI098_TSF_Options_Spreadsheet.xlsx RFI098_TSF_Options_Mapbook.pdf
Date Returned to USACE:	Click here to enter text.

AECOM Intake Form

Date Response was Received:	11/3/2018
Received by:	AECOM
Describe any Follow-up Related to this RFI:	None at this time



From: James Fuego, Pebble Limited Partnership

To: Shane McCoy, US Army Corps of Engineers

Date: November 13th, 2018

The question presented in RFI 098 on TSF options in the mine area is addressed below:

Please provide an evaluation of each mine area TSF location that was considered and explain why the NFK West and NFK East locations were ultimately selected. Include:

- *Feasibility (technology, economics, logistics, common sense)*
- *Availability (both now and ten years ago during project planning)*
- *Environmental impacts (wetlands/Waters of the US, miles of streams, habitat, fill, dam safety, etc.)*

Evaluation of the various TSF options has been ongoing since the original HDI acquisition of the Pebble Project. Early evaluations (~2004-2006) considered a smaller resource (Pebble West) like the current proposed project. Later evaluations, following the discovery of Pebble East, focused on accommodating larger resources. When PLP made the decision to advance the current proposed project with the focus on the Pebble West resource and the plan for segregated management of bulk and pyritic tailings the layouts were again reviewed to select the best possible option.

During this period substantial amounts of additional baseline data, including wetlands mapping, ground and surface water hydrology, surficial geology, fish habitat, and land status were generated, some of which identified reasons to reject some of the earlier TSF options evaluated.

While all factors were considered in evaluating the options, three of the primary drivers for the evaluation are:

- 1) Minimizing managed water volume by limiting the direct footprint, and the catchment area footprint, associated with each option. Given the observed average annual precipitation (approximately 44 inches net) in the mine vicinity, each 1000 acres has the potential to generate up to 5 cubic feet per second (cfs) of water that would require treatment, or some form of active management at a minimum. Minimizing this number is a priority for safe, efficient, and cost-effective mine operations and is also the most effective way to reduce downstream flow impacts and the resulting habitat impacts.
- 2) Minimizing impacts to fish-bearing streams, particularly anadromous streams, that would be directly impacted by the TSF footprint or indirectly impacted by cutting off fish-bearing stream reaches above the TSF footprint.

- 3) The control of seepage from the TSF embankments. For a flow-through design this requires the ability to effectively control, direct, and collect seepage from the embankments. This factor was a primary reason that the TSF options in the main SFK drainage and its tributaries in the area below Frying Pan Lake are considered unfeasible for PLP's proposed approach to tailings management, which requires a flow through bulk TSF embankment to allow for long term consolidation and safe post closure management of the bulk tailings.

A thick, granular, high permeability, overburden layer consisting predominantly of moraine materials and outwash gravels exists over a large portion of the SFK drainage below Frying Pan Lake. These ground conditions account for the low percentage of mapped wetlands in the area and the ephemeral nature of many of the streams, as much of the water in the stream channels travels as base flow through the gravels. The area is also relatively flat, with limited natural channeling of the groundwater flow. Combined, these factors preclude an effective design for the control and collection of seepage from what would be a relatively long and flat flow-through embankment during operations and also for the long-term management of seepage through the post-closure period. Furthermore, the UTC 119A watershed has year-round flow and ongoing groundwater studies, geological mapping, and related work have now concluded that groundwater in the drainage is hydraulically connected to that portion of the SFK drainage immediately to the north, with a portion of the flow in UTC119A coming across from the SFK basin as groundwater, exposing the UTC drainage to process water impacts to groundwater.

Other specific considerations include:

Minimizing the number of wetlands and stream miles that would be filled by the embankment construction and the storage of tailings.

Proximity of the location to the mill site and the maximum head that would need to be managed for pumping tailings. These factors impact the overall project footprint, the ability to limit the number of drainages directly impacted, the energy consumption for the project, operating efficiencies, spill potential from pipelines, and operating and capital costs.

While geotechnical and dam safety considerations are of primary importance in designing a TSF, in most cases these are factors that can be addressed through appropriate design of the facility. While there can be geotechnical conditions that preclude the construction of a TSF in a certain location (e.g., the presence of an active fault or landslide within the immediate area) to date no such issues have been identified with any of the options that were considered.

All options evaluated are located on State land available for the construction of mine infrastructure through the usual review, permitting, and authorization process. However, many of the options do intersect with the main stems of the SFK, NFK, and UTC drainages that are subject to Mineral Closing Order # 393 (MCO393), which closed to mineral entry and development those portions of the listed streams (stream bed, water column, and riparian area, measured 100' from ordinary high water on each side of the stream) identified as anadromous at the time of the order. While MCO393 does not directly prohibit ADNR from authorizing the storage of tailings in these areas, it is likely that the MCO would need to be removed, or amended, to accommodate the storage of tailings. Accordingly, on that basis, those options which encroached on MCO393 are considered to be unavailable for the storage of tailings.

The map book that accompanies this technical note shows the locations of the 26 TSF options and the proposed project, as well as the associated drainages, proposed mine layout, and other relevant information. The attached spreadsheet includes the directly impacted footprint, wetlands impacted, the total drainage area that would be impacted (upstream of TSF), stream miles impacted, fish-bearing stream miles impacted, anadromous stream miles impacted, watersheds impacted, approximate embankment lengths and estimated maximum heights, tailings capacity as shown, the pumping distance and head forgetting the tails from the mill to the TSF, and land status.

Details specific to the various options are discussed below. Comparisons are against PLP's proposed tailings management infrastructure.

Option 1

- Has a similar impact footprint, but results in less filling of mapped wetlands.
- Fish-bearing and anadromous stream miles impacted are higher for this option and the impacted drainage basin is larger.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.

Option 2

- Has a larger impact footprint than the proposed project and fills more stream miles, but results in less filling of mapped wetlands.
- Impacted fish-bearing and anadromous stream miles, and the impacted drainage basin, are more than doubled for this option.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.

Option 3

- Extends direct impacts into the UTC drainage.
- Has a larger footprint and fills more wetland acres and stream miles than the proposed project.
- The impacted drainage basin is much larger and impacts to fish-bearing and anadromous streams are substantially higher.
- The footprint has extensive overlap with MCO393.

Option 4

- Extends direct impacts into the Lake Clarke drainage.
- Has a larger footprint.
- No PLP or NWI wetlands information for this option is available, so data from the Alaska Wetlands Map (AWM) was used to provide a rough estimate. The wetlands impacts are of a similar order of magnitude (2000 acres) to the proposed project. Stream miles filled are nearly doubled which also suggests that the AWM data may undercount actual wetlands in the area.
- The impacted drainage basin is about three times as large.
- Fish-bearing stream miles impacted are lower, although it should be noted that the level of study in this area is less.
- Tailings would need to be pumped for 17 miles, resulting in significantly higher energy consumption and the overall project footprint would be significantly larger and more dispersed with this option.

Option 5

- Does not have sufficient capacity to store all the tailings for the proposed project.
- A significant portion of the footprint is utilized for the storage of pyritic tailings in the proposed project.

Option 6

- Is coincident with much of the proposed project but has significantly larger impacts in all categories related to the footprint and stream impacts.

Option 7

- Has significantly larger impacts in all categories related to the footprint and stream impacts.
- The footprint encroaches on MCO393.

Option 8

- Fills slightly less mapped wetlands but has a much larger overall footprint and fills nearly three times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- The footprint has extensive overlap with MCO393.

Option 9

- Has significantly larger impacts in all categories related to the footprint and stream impacts.
- The footprint has extensive overlap with MCO393.

Option 10

- Has significantly larger impacts in all categories related to the footprint and stream impacts.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- Long distance for pumping of tails to western embankment.
- The footprint has extensive overlap with MCO393.

Option 11

- Fills slightly less mapped wetlands but has a much larger overall footprint and fills nearly three times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint has extensive overlap with MCO393.

Option 12

- Has significantly larger impacts in all categories related to the footprint and stream impacts.
- The footprint has extensive overlap with MCO393.

Option 13

- Fills less mapped wetlands but has a much larger overall footprint and fills more than two times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint has extensive overlap with MCO393.

Option 14

- Fills less mapped wetlands but has a much larger overall footprint and fills more than two times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint has extensive overlap with MCO393.

Option 15

- Fills less mapped wetlands but has a larger overall footprint and fills nearly two times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint has extensive overlap with MCO393.

Option 16

- Fills less mapped wetlands but has a larger overall footprint and fills nearly two times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint has extensive overlap with MCO393.

Option 17

- Has similar overall impacts in all the measured categories for footprint and stream miles, but with significantly lower wetlands acres filled.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.

Option 18

- Fills less mapped wetlands but has a larger overall footprint and fills more stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- The footprint encroaches on MCO393.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this would be adjusted by dropping the embankment height, which would not significantly change the reported impacts.

Option 19

- Has a smaller overall footprint and fills less mapped wetlands and stream miles, but impacts more fish bearing stream miles.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.

Option 20

- Fills less mapped wetlands but has a larger overall footprint and fills nearly two times as many stream miles.
- The impacted drainage basin and impacts to fish-bearing and anadromous streams are significantly higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this could be adjusted by dropping the embankment height, which would not significantly change the reported impacts.

Option 21

- Fills less mapped wetlands but has a larger overall footprint and similar stream impacts.
- Impacts to fish-bearing and anadromous streams are higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this could be adjusted by dropping the embankment height, which would not significantly change the reported impacts.

Option 22

- Fills less mapped wetlands but has a larger overall footprint and similar stream impacts.
- Impacts to fish-bearing and anadromous streams are higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this could be adjusted by dropping the embankment height, which would not significantly change the reported impacts.

Option 23

- Fills less mapped wetlands but has a larger overall footprint and similar stream impacts.
- Impacts to fish-bearing and anadromous streams are higher.
- Embankment location precludes effective collection of seepage from a flow-through embankment and would have the potential to impact groundwater flows into the SFK and UTC 119A drainages.
- The footprint encroaches on MCO393.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this would be adjusted by dropping the embankment height, which would not significantly change the reported impacts.

Option 24

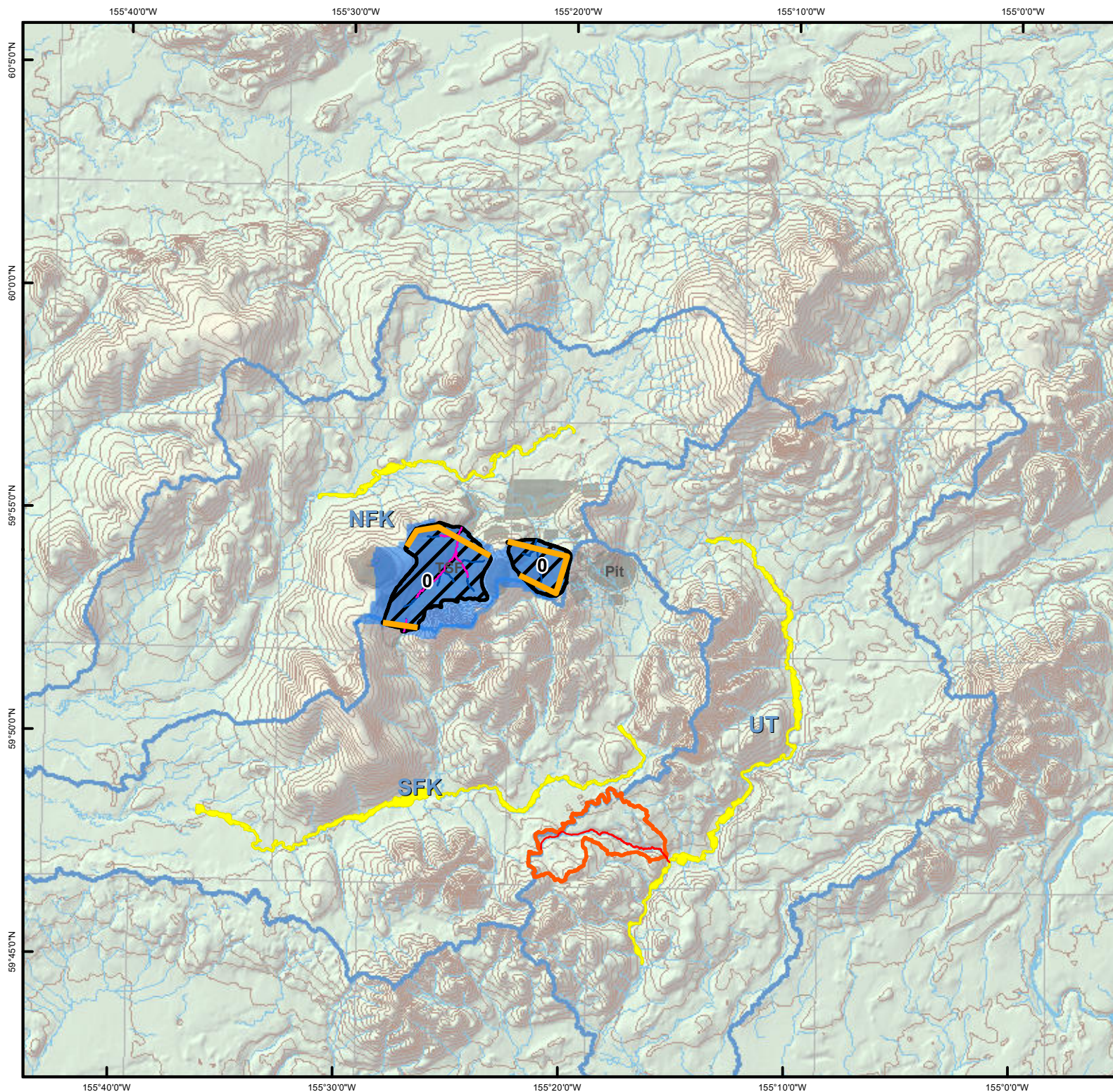
- This option corresponds to Layout Option 1 for the Proposed Project and is broadly similar in measured impacts to the updated proposed project.
- This option was not selected as Layout Option 3 provided for improved long-term post closure management of the tailings and improved long-term post closure dam safety.

Option 25

- Extends direct impacts into the lower portion of the Kaktuli drainage.
- No PLP wetlands and fisheries data are available for this option. NWI wetlands data has been utilized for the spreadsheet analysis.
- Mapped wetlands impacts are lower, but stream related impacts are higher due to the size of the drainage upstream of the embankment.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this could be adjusted by dropping the embankment height. Direct fill impacts would be reduced but overall drainage basin impacts would be unchanged.
- Tailings would need to be pumped for 25 miles and the overall project footprint would be significantly larger and more dispersed with this option.

Option 26

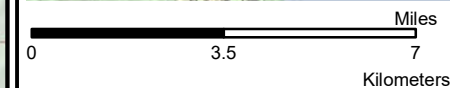
- Extends direct impacts into the Lake Clark drainage.
- No PLP wetlands and fisheries data are available for this option. NWI wetlands data has been utilized for the spreadsheet analysis.
- Mapped impacts are higher in all categories.
- The facility as reported is larger than required to store 1250 million tons of tailings, but this could be adjusted by dropping the embankment height, which would not significantly change the reported impacts due to the low storage efficiency for smaller volumes of tails.
- Tailings would need to be pumped for 20 miles and the overall project footprint would be significantly larger and more dispersed with this option.



TSF OPTION 0

Proposed Project

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

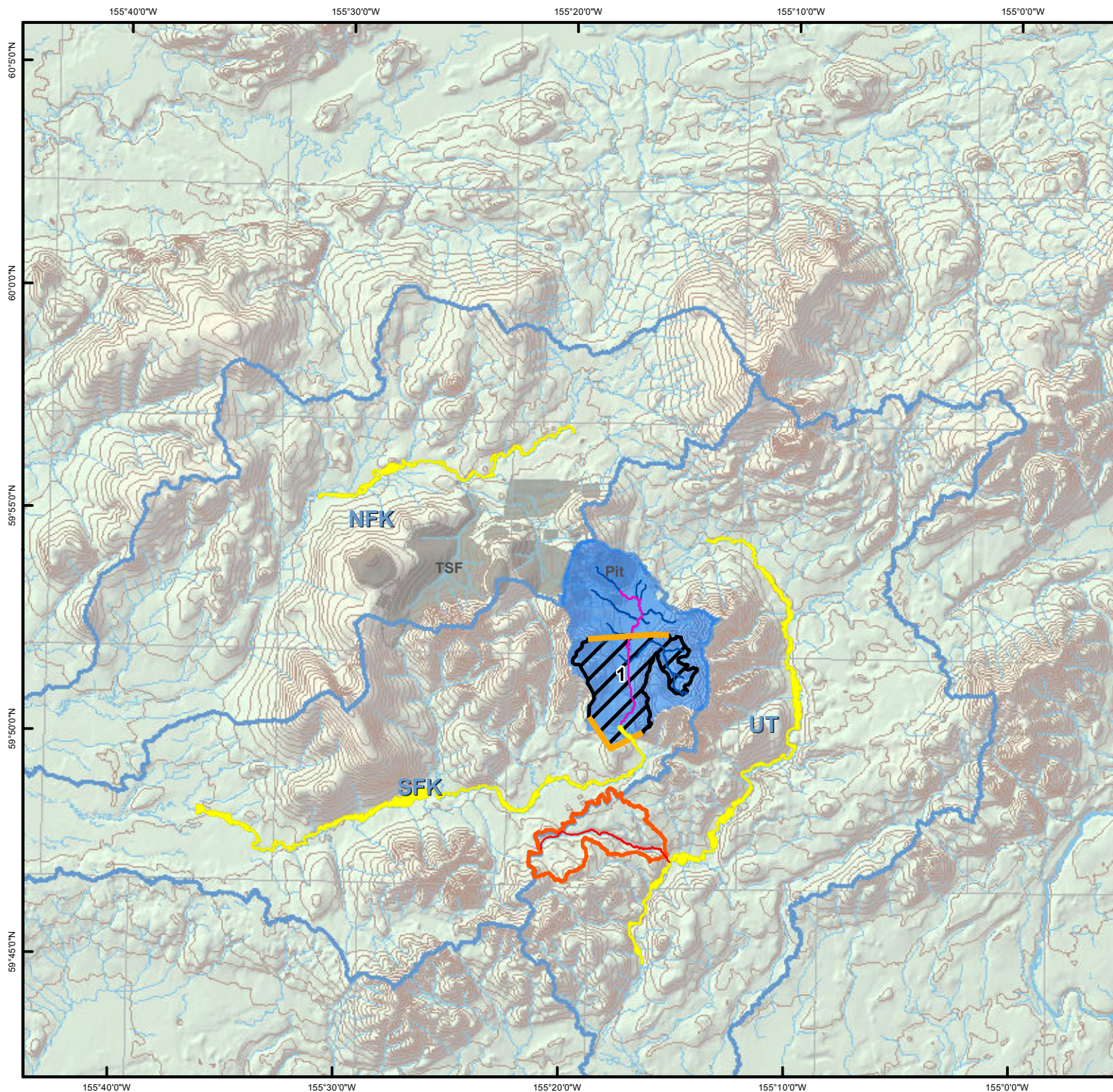


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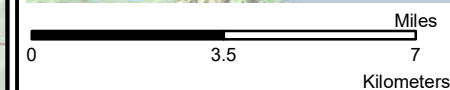
Author: HDR



TSF OPTION 1

A1_OPTION (mdc01)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



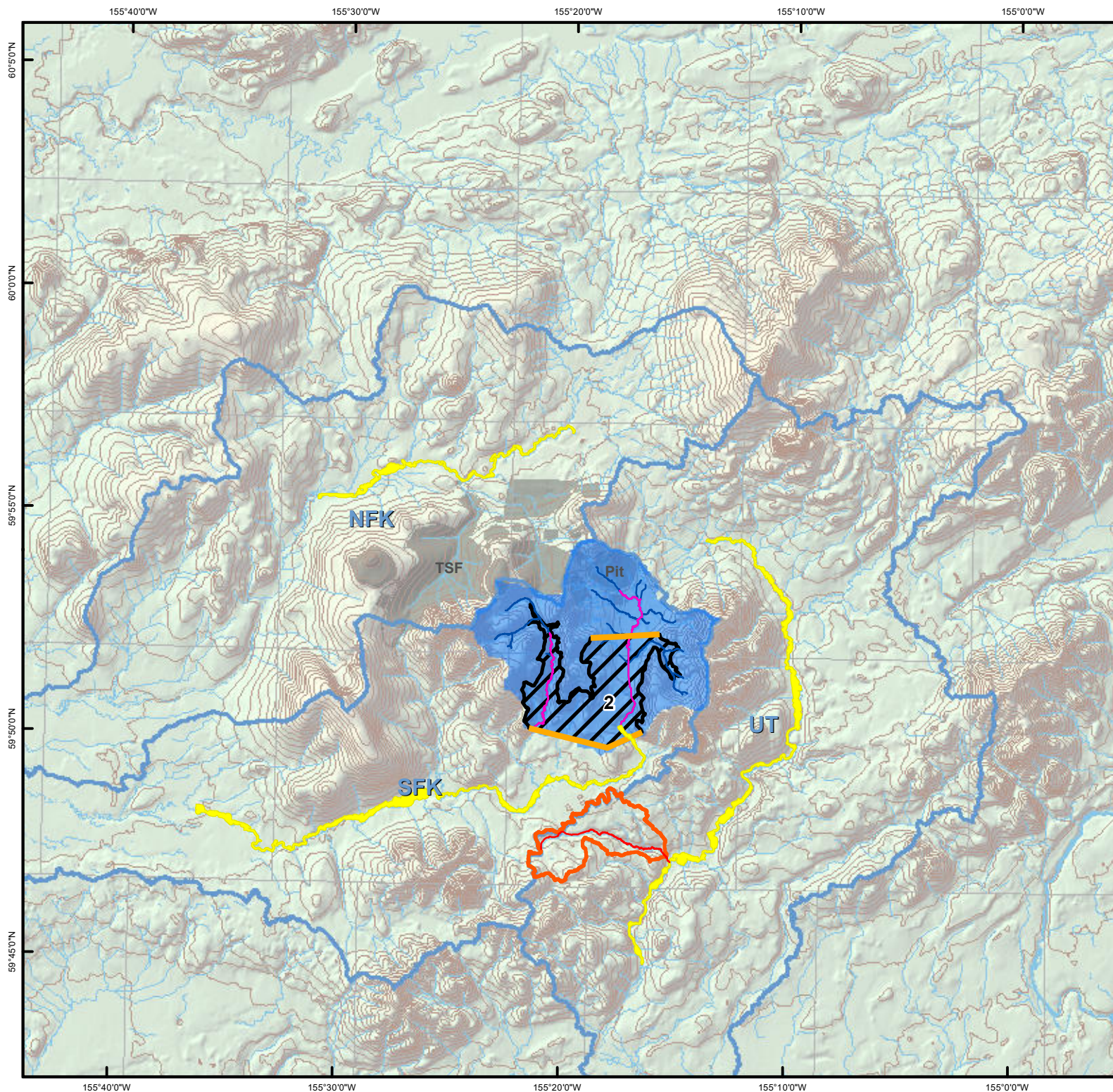
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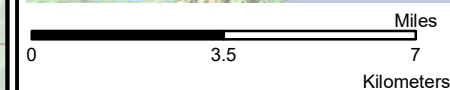
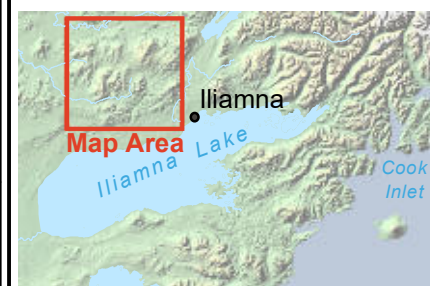
Author: HDR



TSF OPTION 2

A2_OPTION (mdc02)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



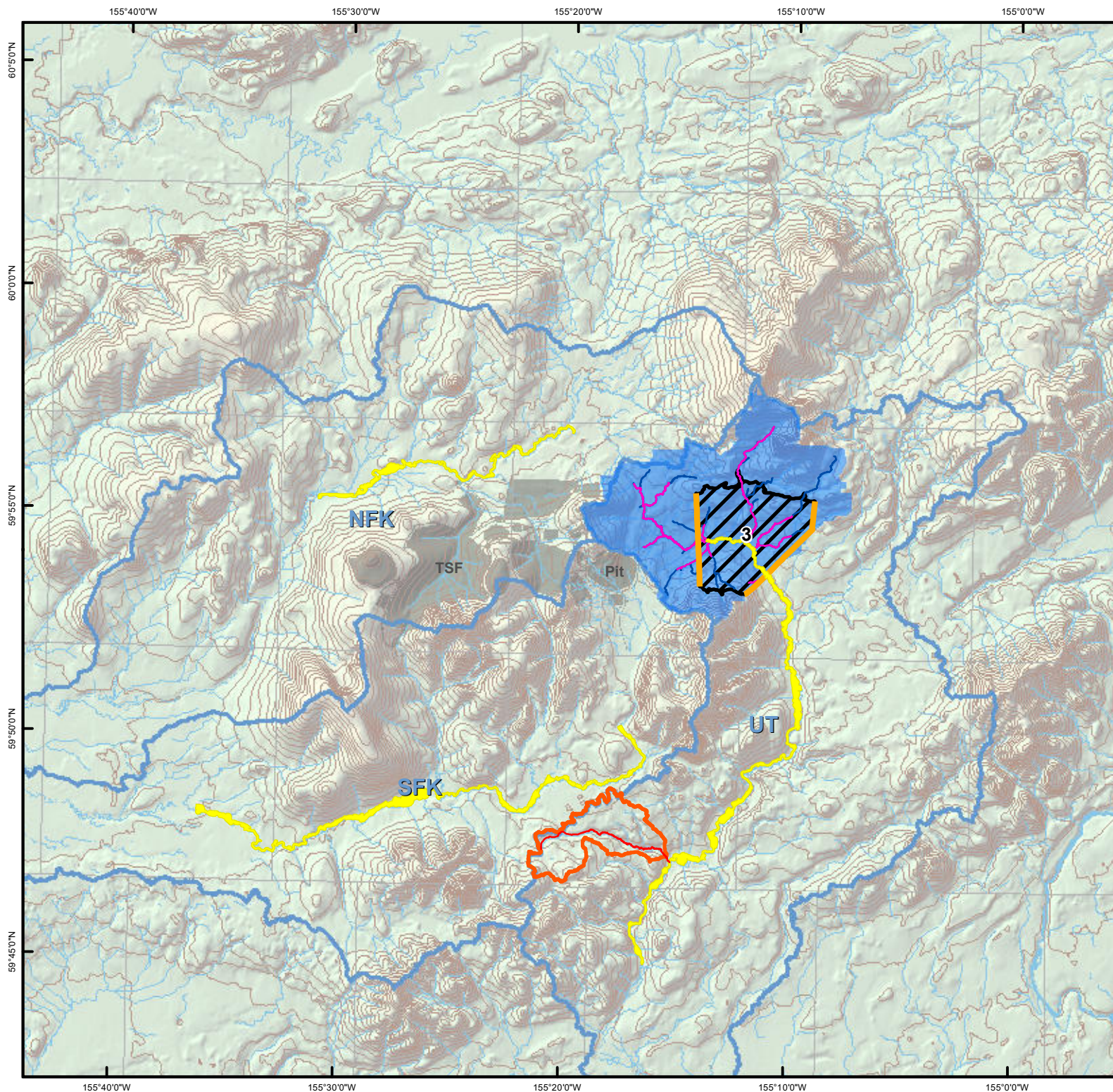
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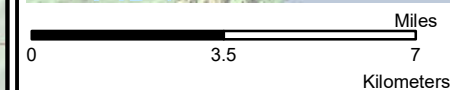
Author: HDR



TSF OPTION 3

B_OPTION (mdc03)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



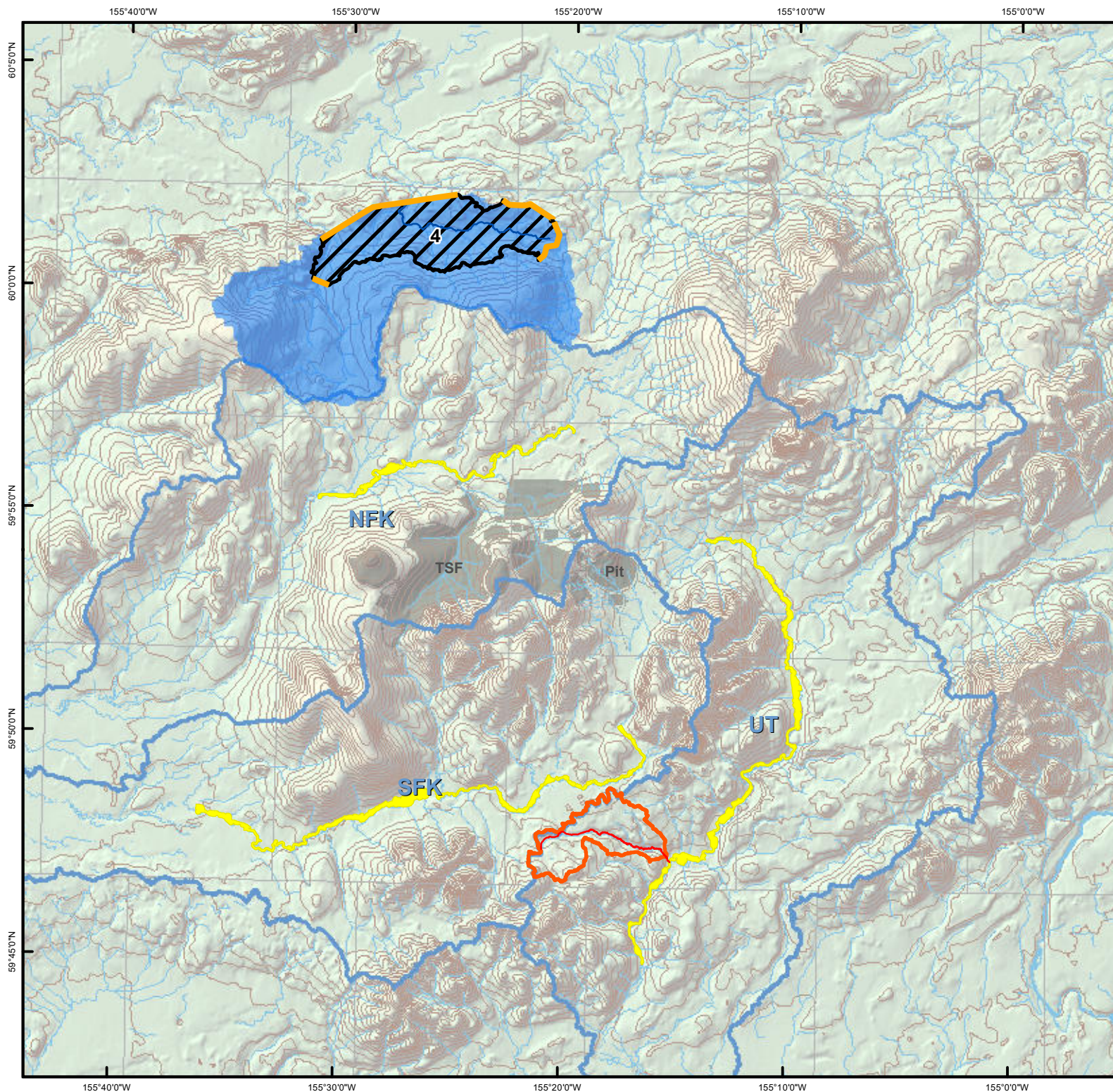
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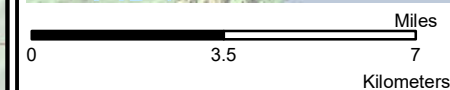
Author: HDR



TSF OPTION 4

F_OPTION (mdc04)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



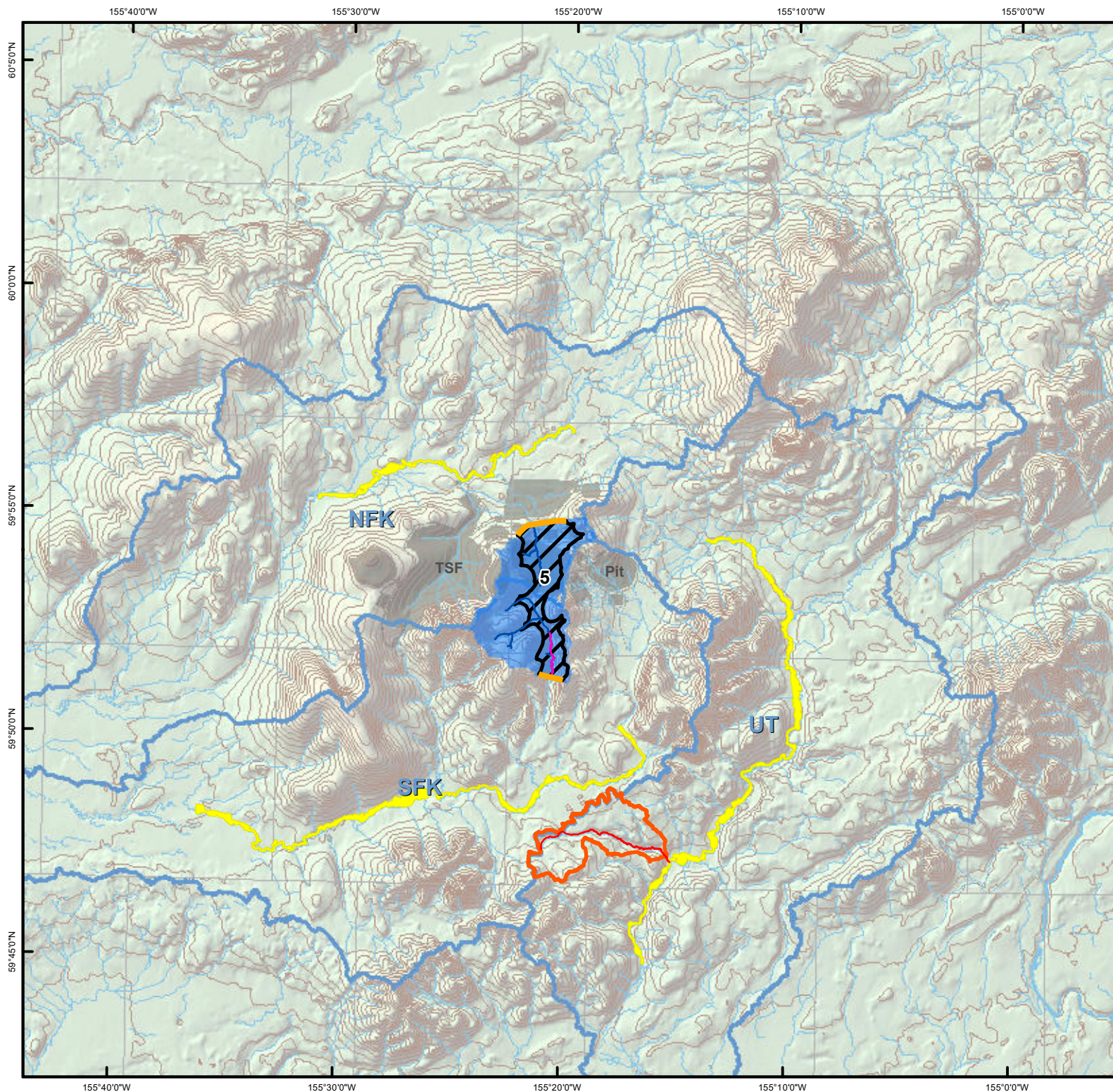
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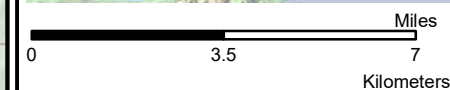
Author: HDR



TSF OPTION 5

E_OPTION (mdc05)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



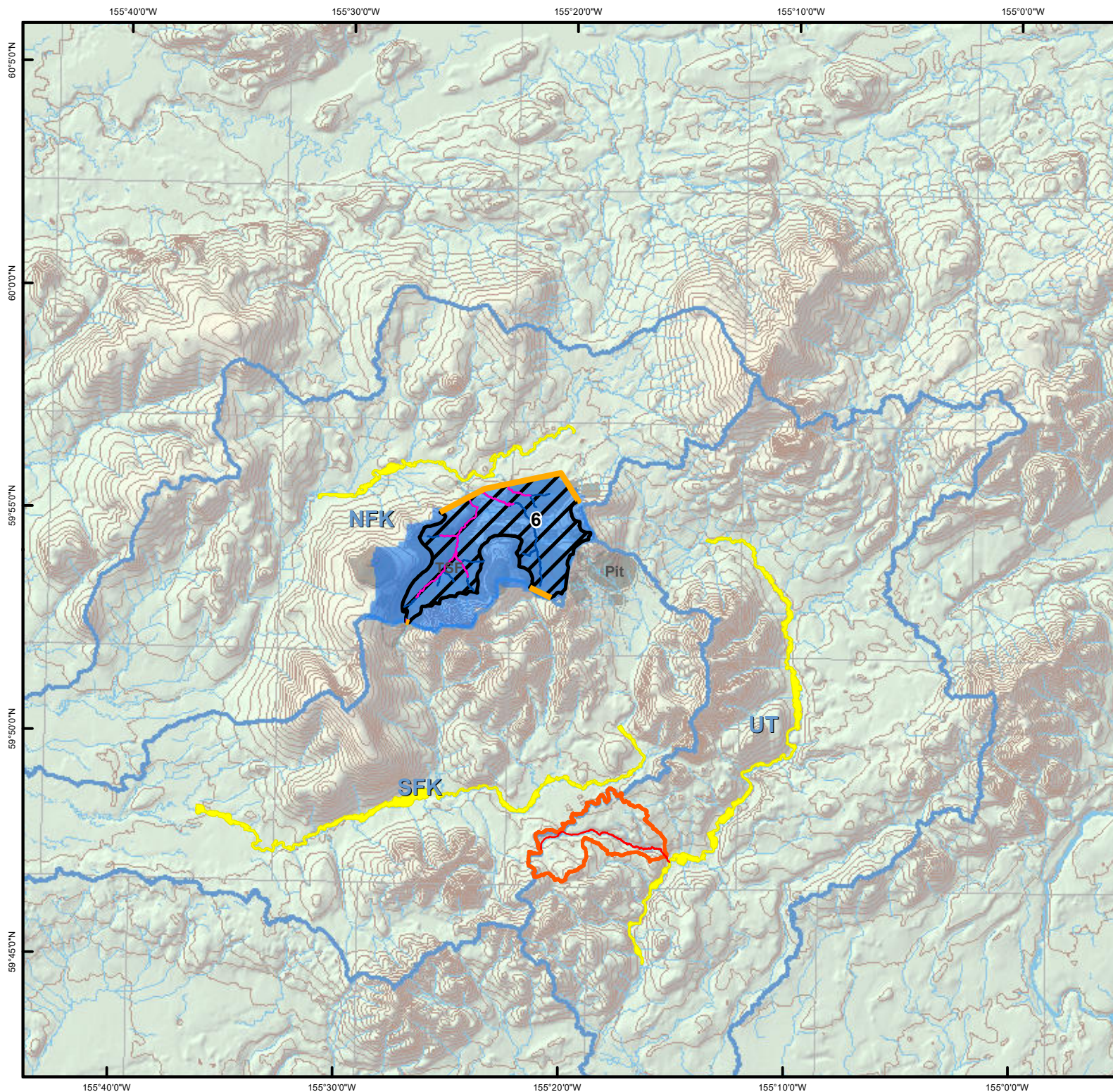
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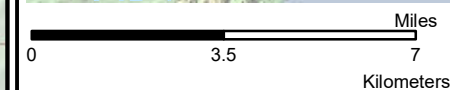
Author: HDR



TSF OPTION 6

GE_OPTION (mdc06)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



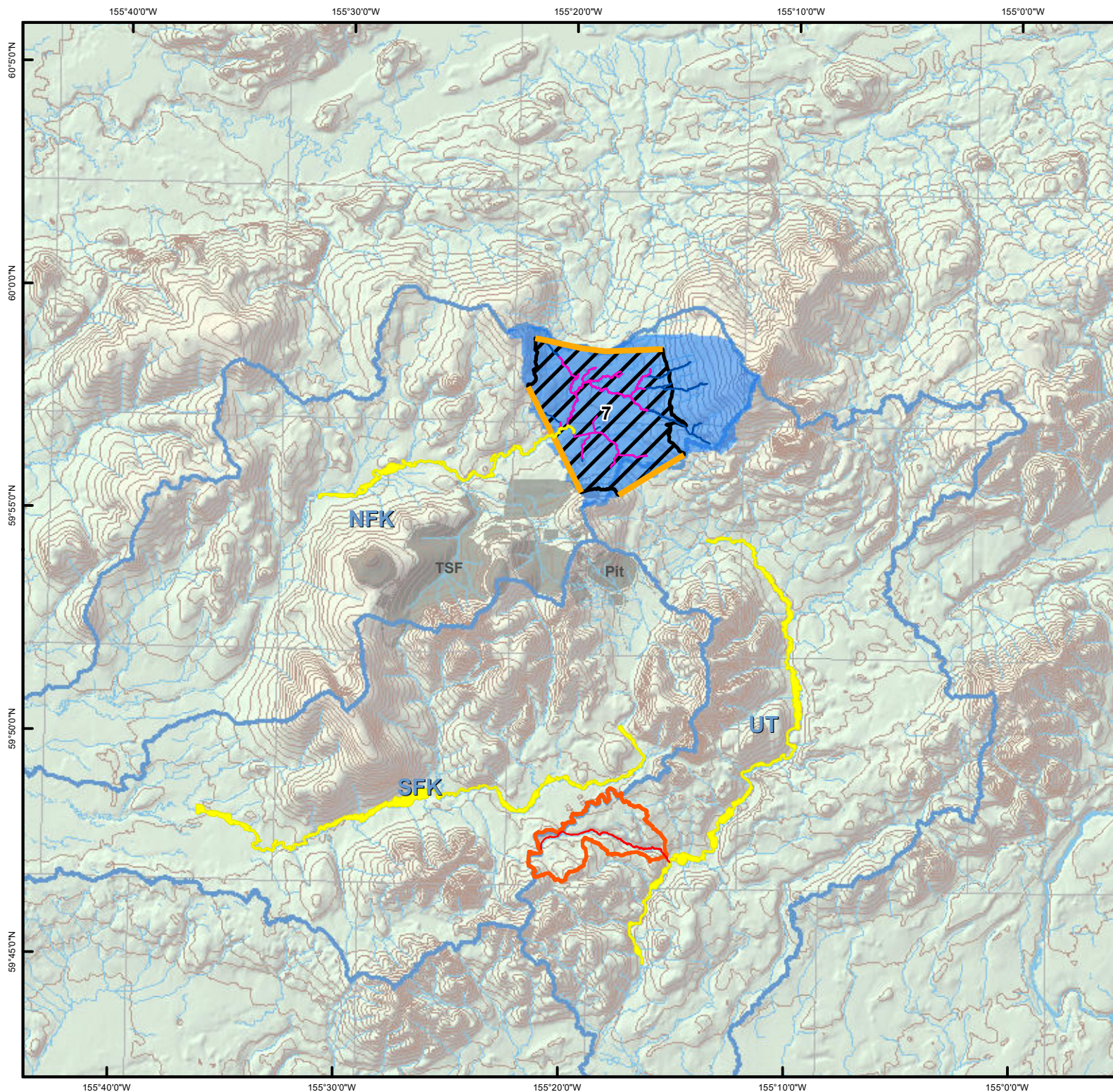
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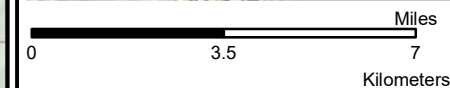
Author: HDR



TSF OPTION 7

H_OPTION (mdc07)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



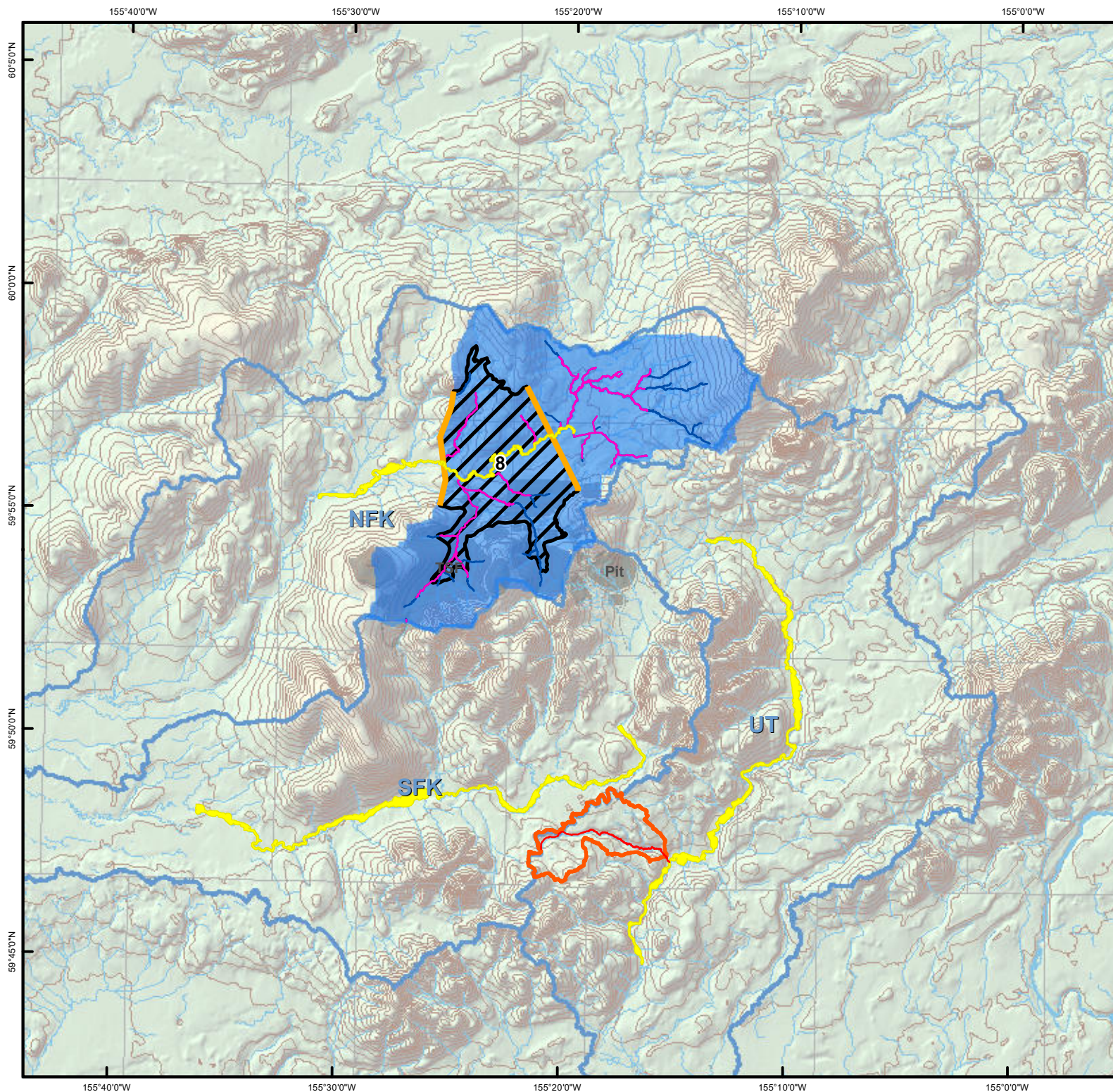
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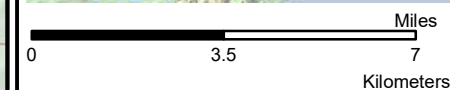
Author: HDR



TSF OPTION 8

I_OPTION (mdc08)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



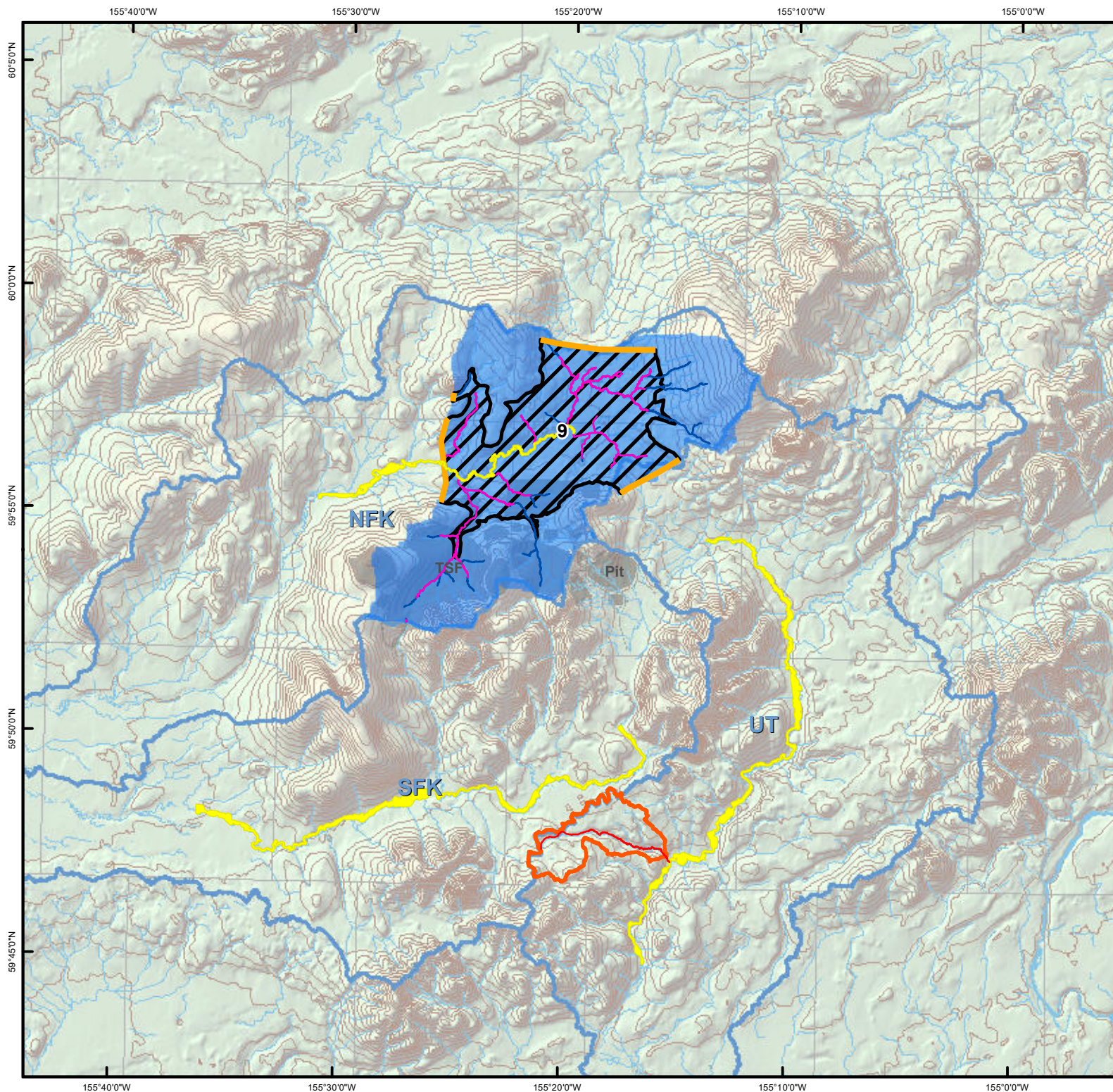
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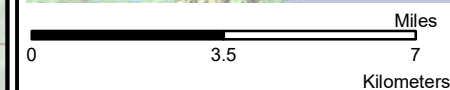
Author: HDR



TSF OPTION 9

HI_OPTION (mdc09)

- TSF Option
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- TSF Option Drainage Area
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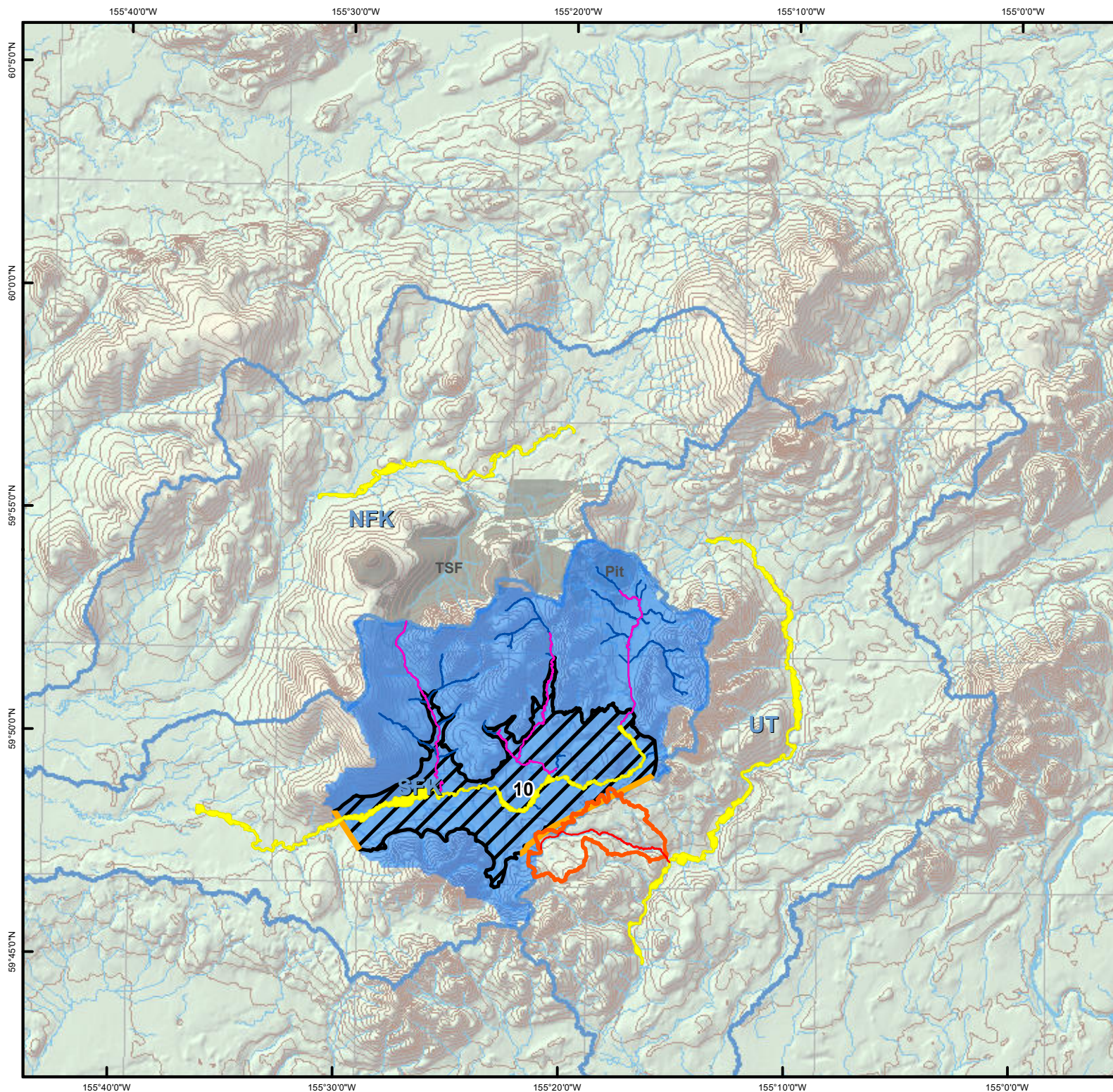
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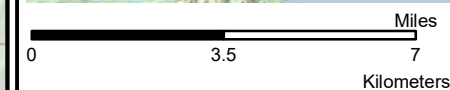
Author: HDR



TSF OPTION 10

J_OPTION (mdc10)

- TSF Option
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- UT119A Watershed
- Mineral Closing Order 393



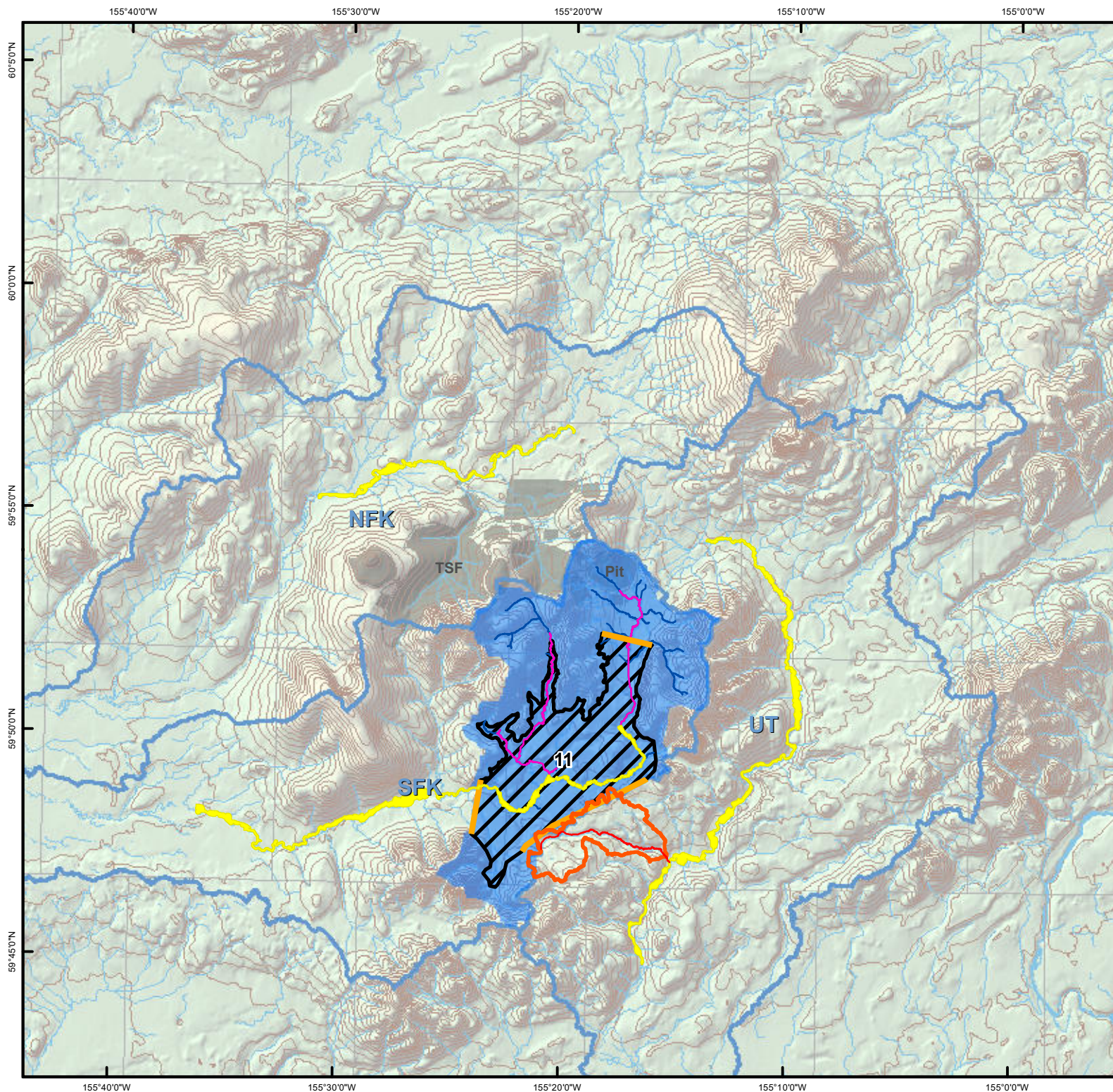
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1983 North American Datum

File: PLP_TSF_Alts_Mapbook.mxd

Date: 11/9/2018

Version: x

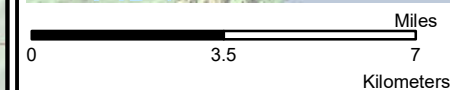
Author: HDR



TSF OPTION 11

J1_OPTION (mdc11)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



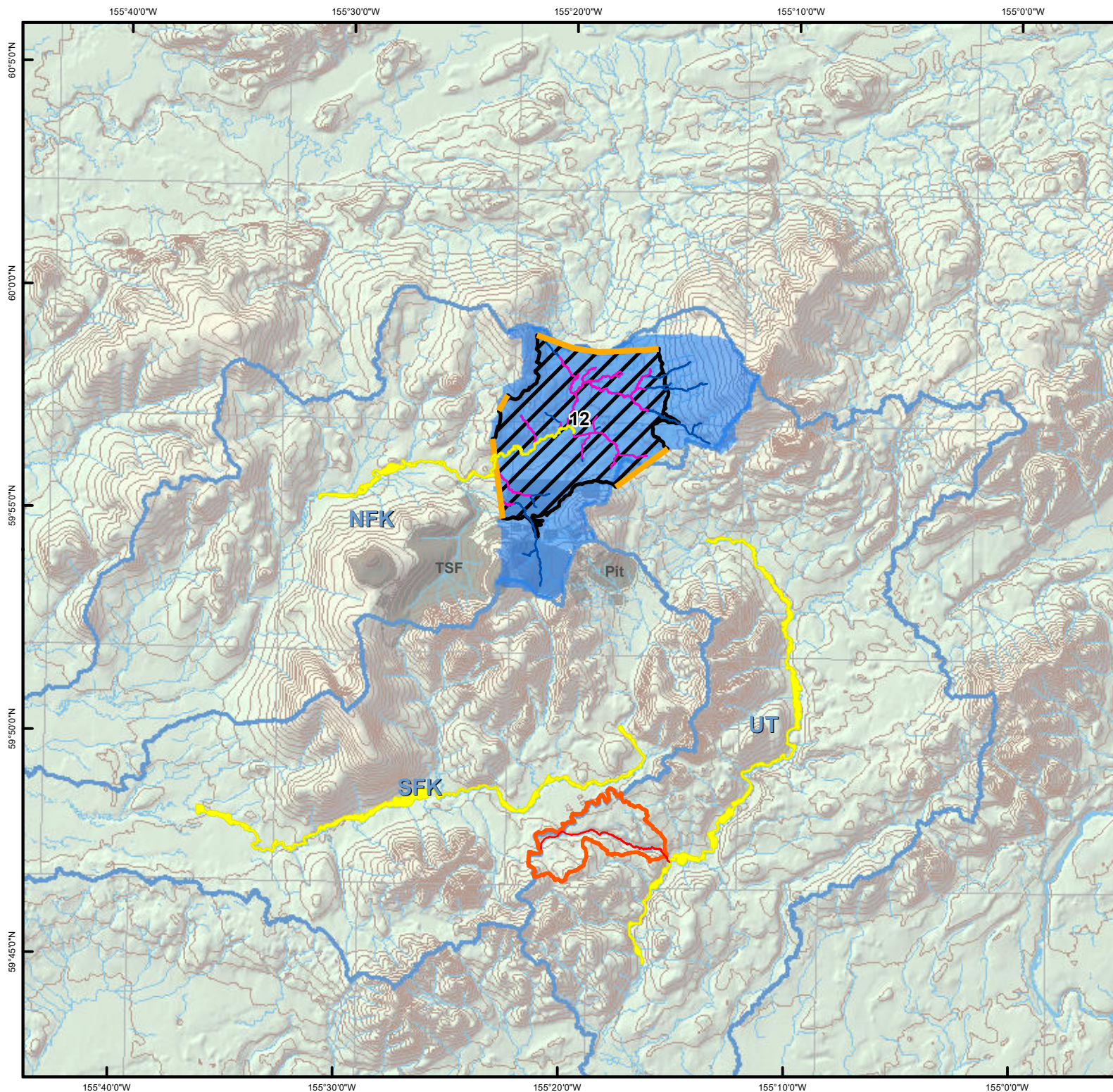
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1983 North American Datum

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Date: 11/9/2018

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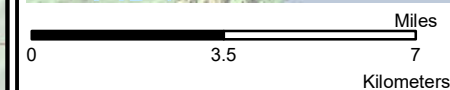
Author: HDR



TSF OPTION 12

K_OPTION (mdc14)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



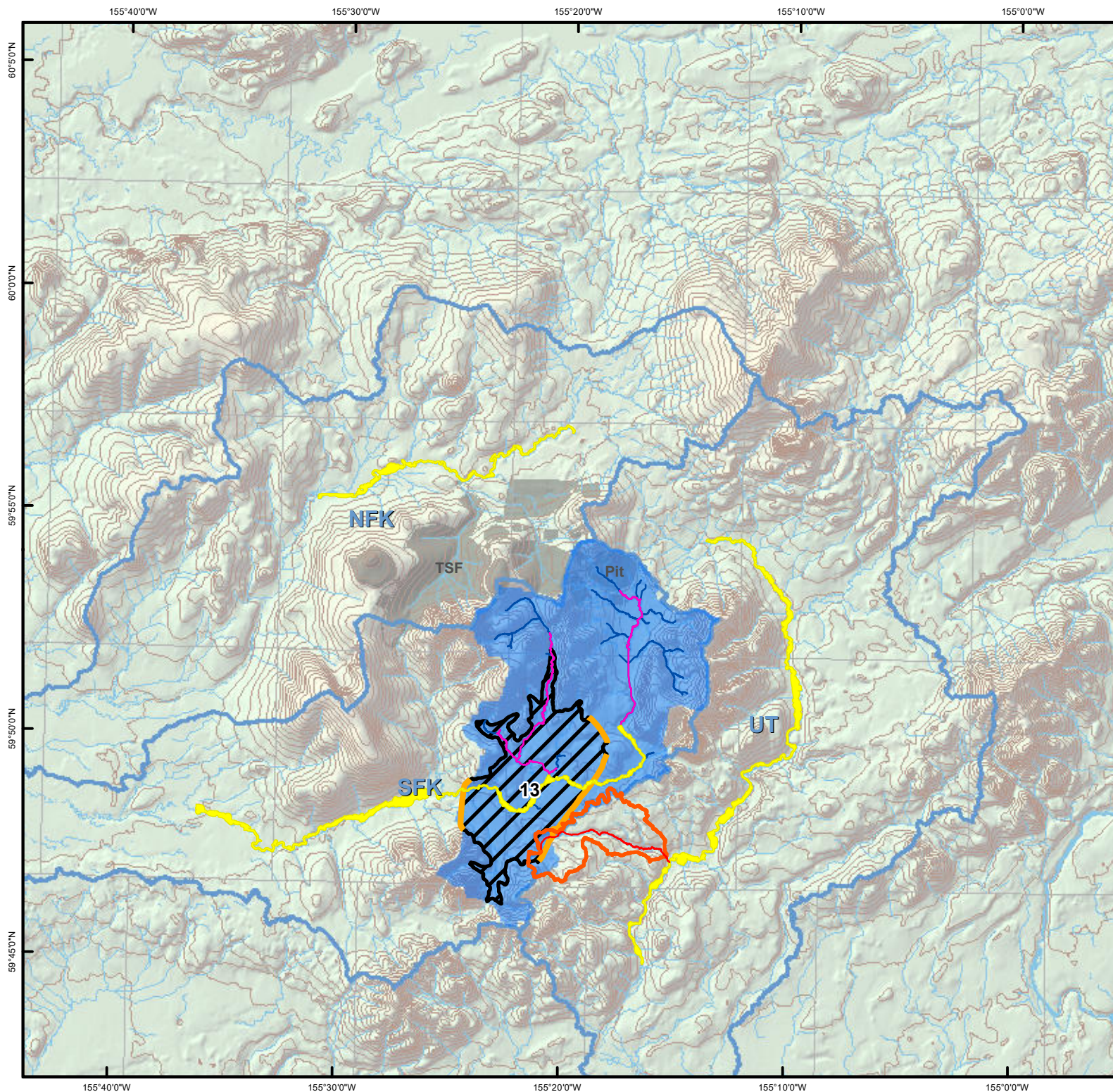
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1983 North American Datum

File: PLP_TSF_Alts_Mapbook.mxd

Date: 11/9/2018

Version: x

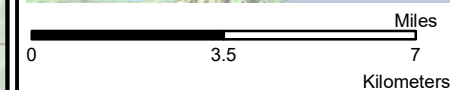
Author: HDR



TSF OPTION 13

J2_OPTION (mdc16)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



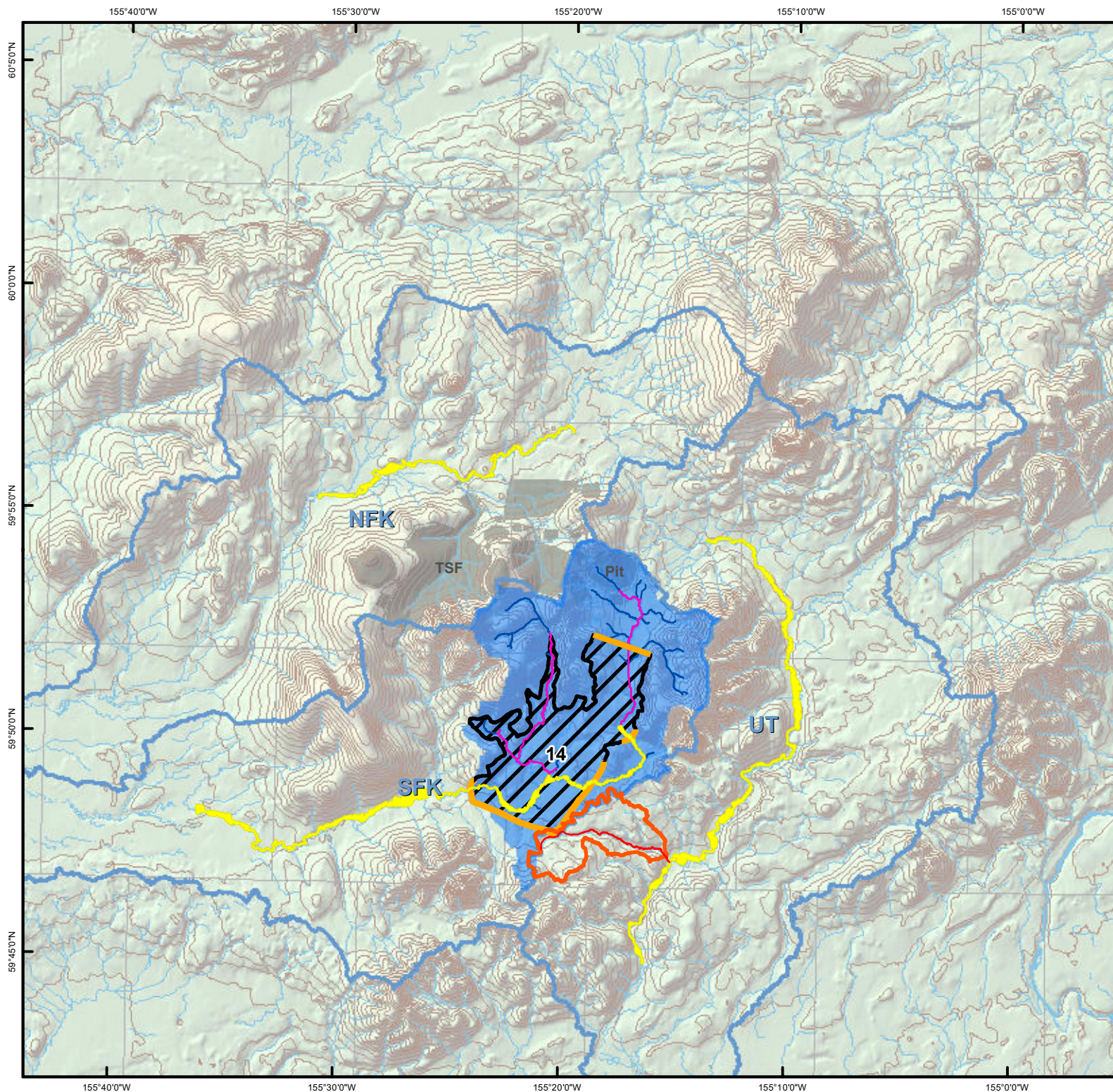
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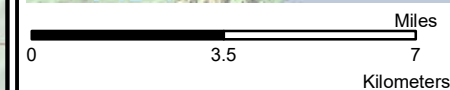
Author: HDR



TSF OPTION 14

A4_OPTION (mdc18)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



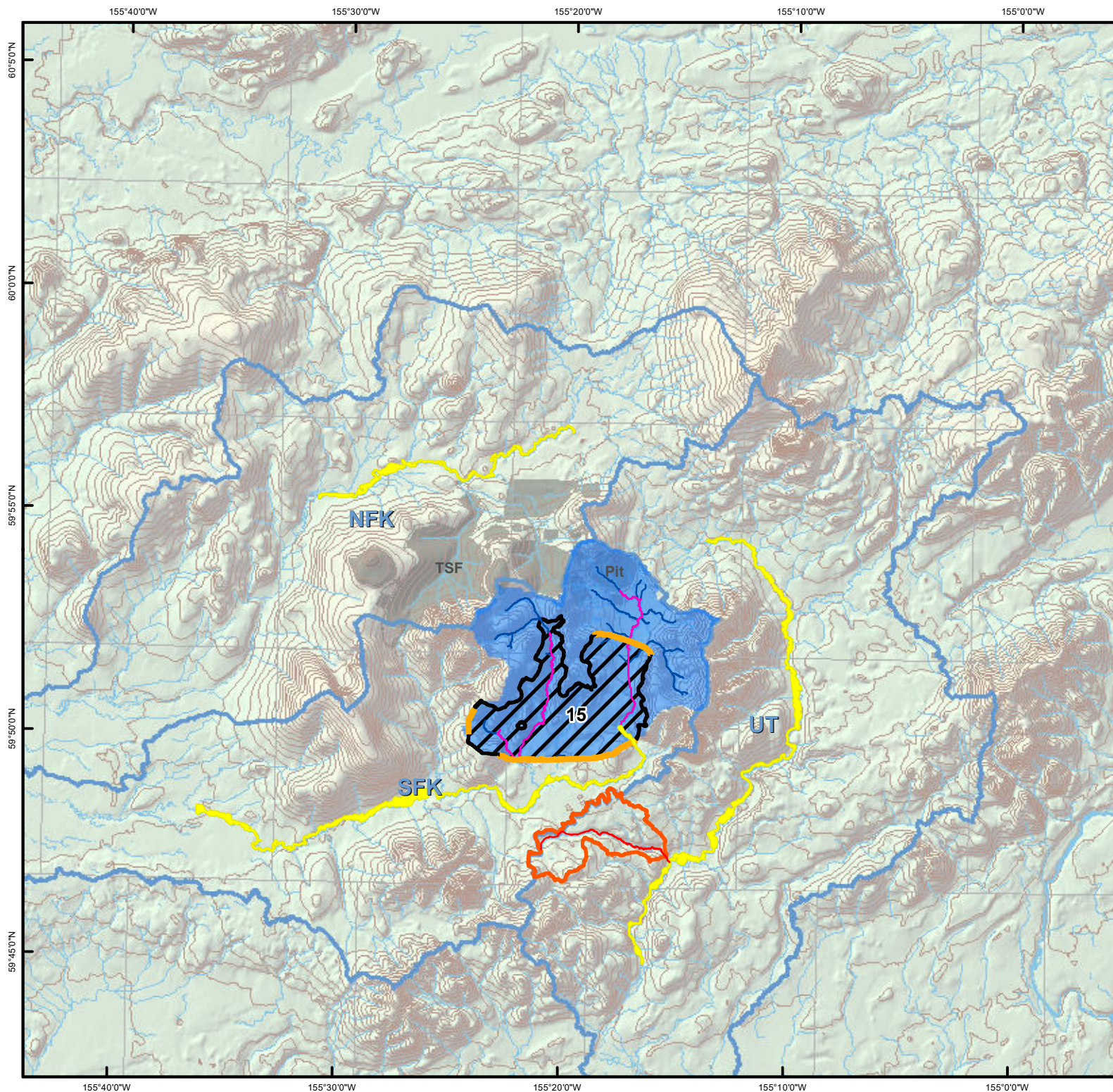
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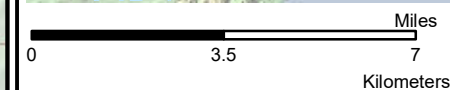
Author: HDR



TSF OPTION 15

A4_N_J5_OPTION

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



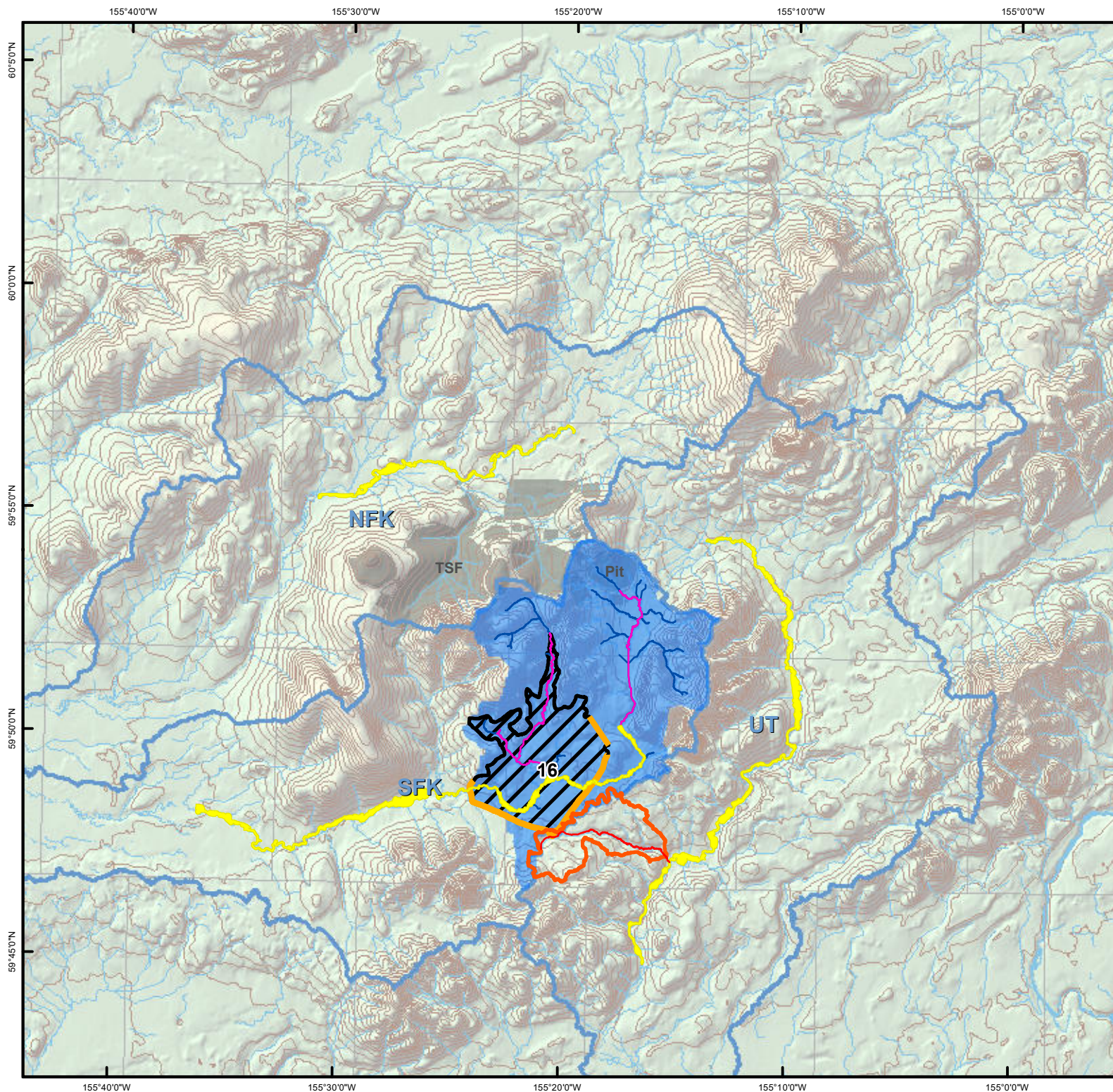
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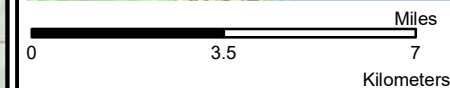
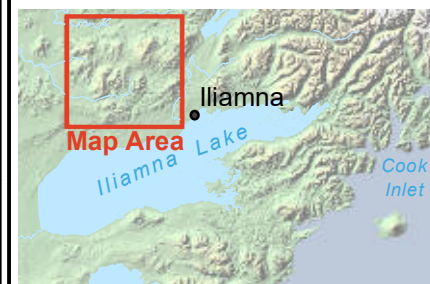
Author: HDR



TSF OPTION 16

J3_OPTION (mdc19)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



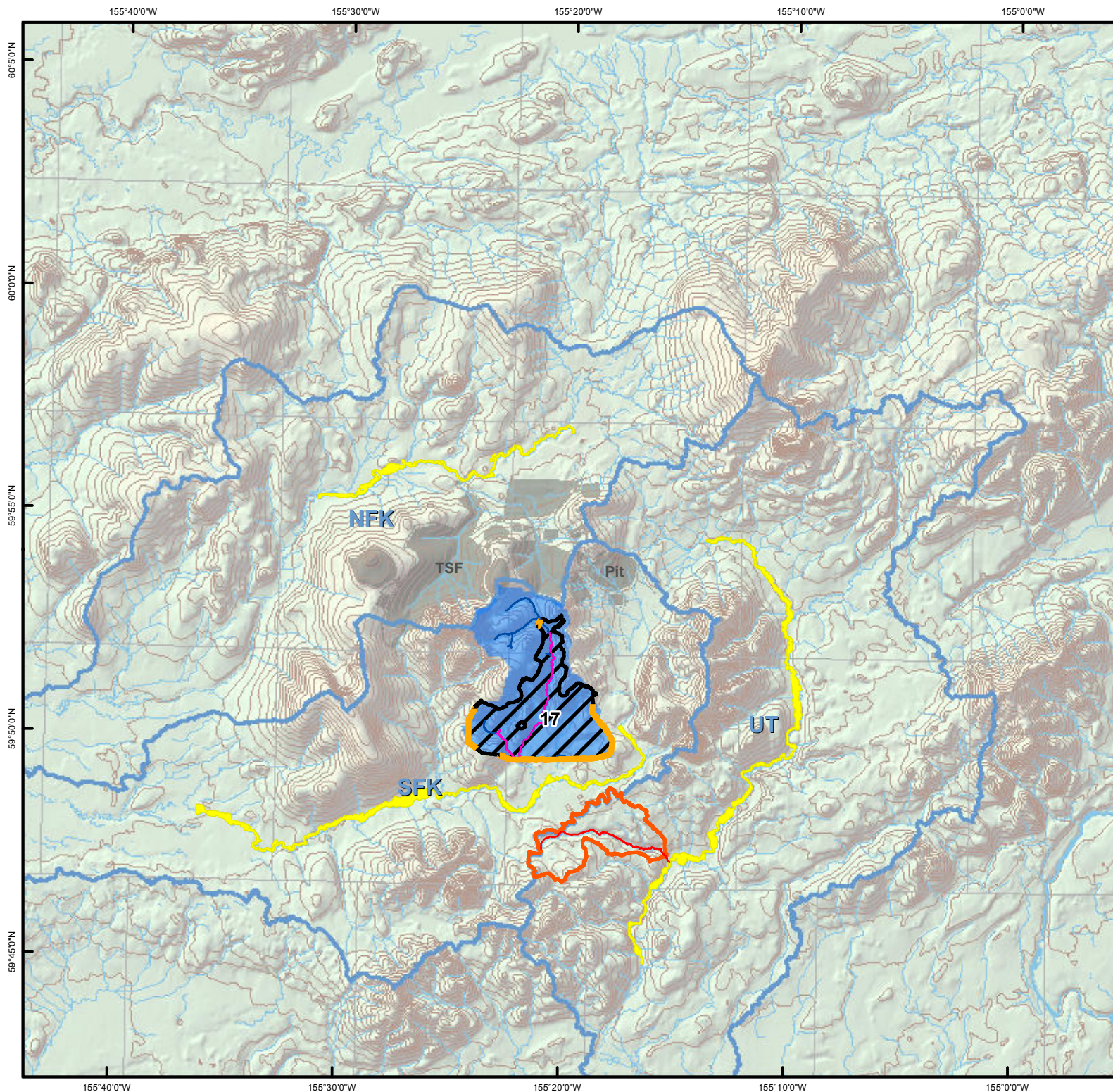
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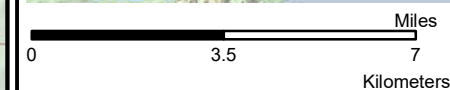
Author: HDR



TSF OPTION 17

J4_OPTION (mdc19bb)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760
Alaska State Plane Zone 5 (units feet)
1983 North American Datum

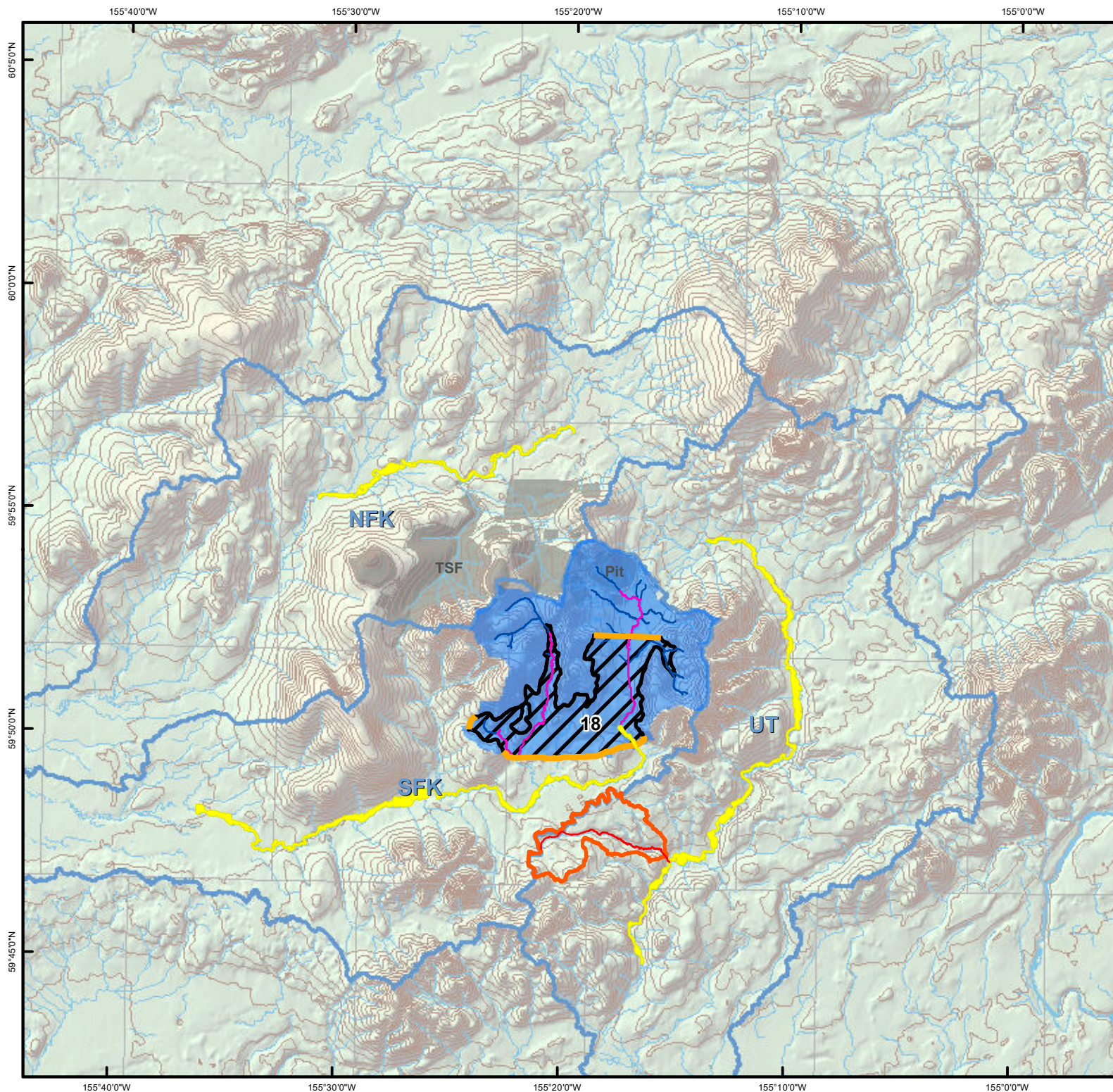


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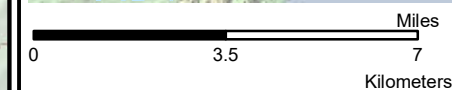
Author: HDR



TSF OPTION 18

A5_OPTION (mdc20)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



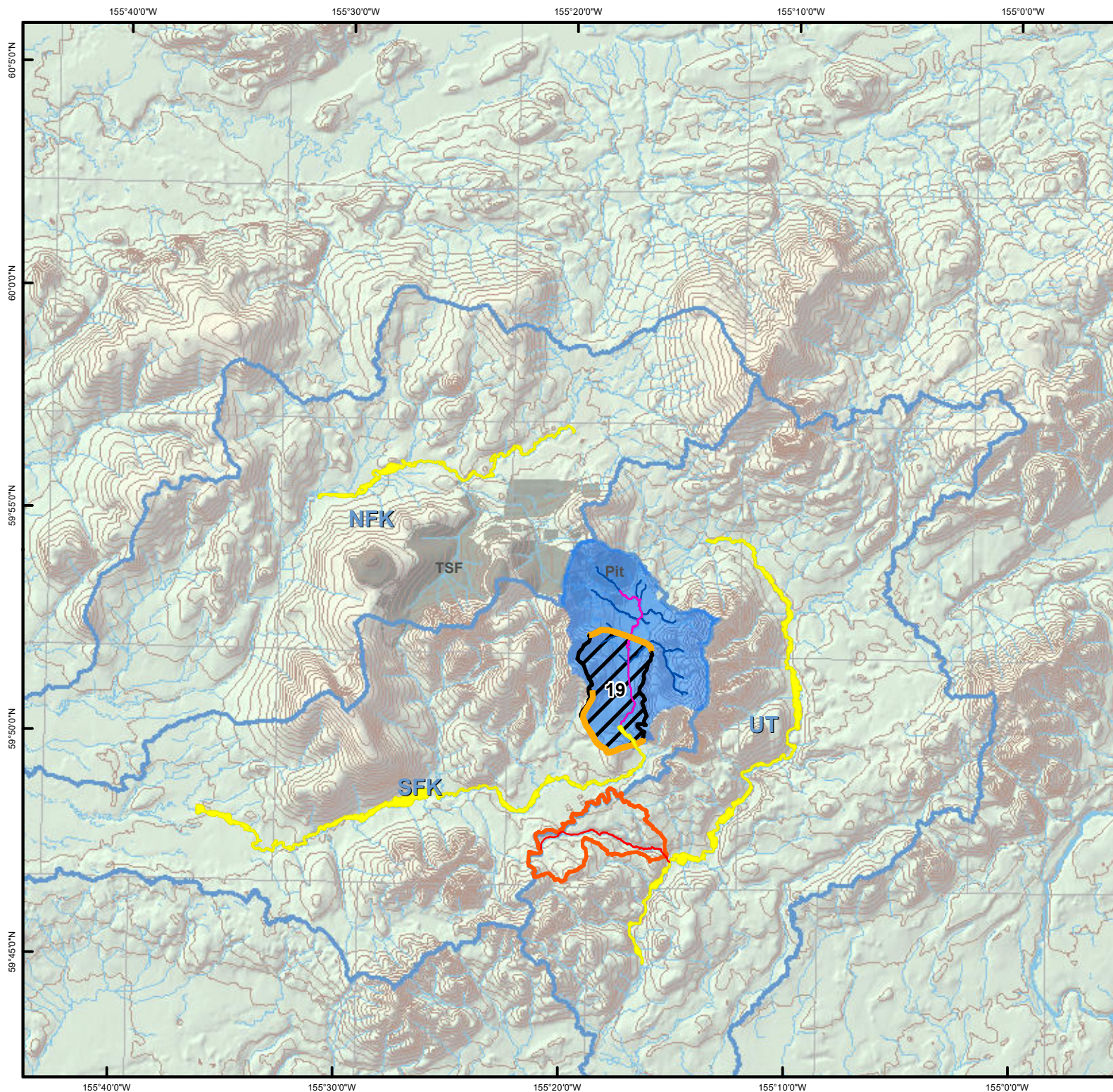
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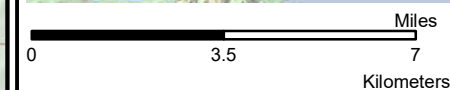
Author: HDR



TSF OPTION 19

A5_OPTION (mdc20bb)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



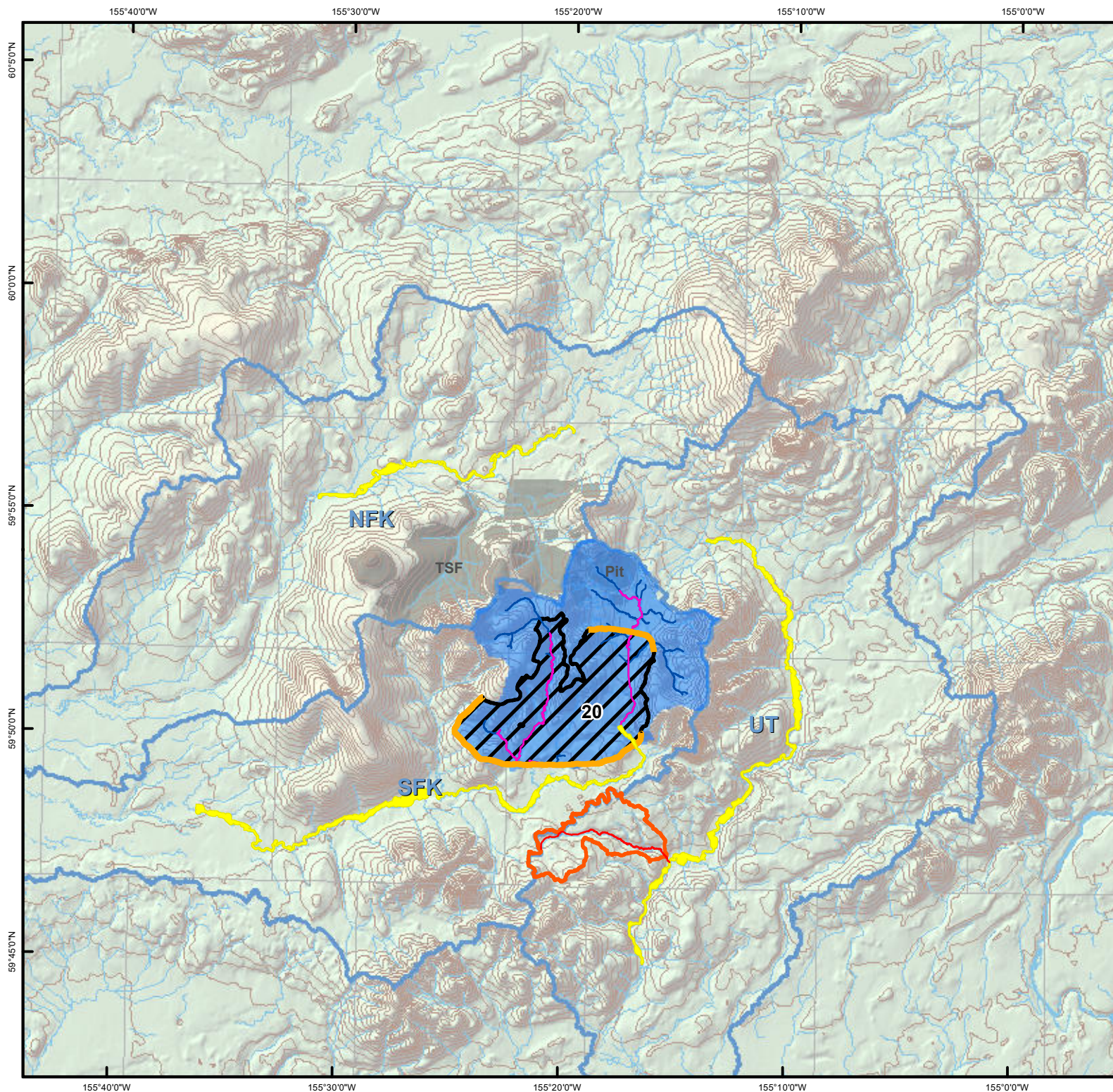
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1983 North American Datum

File: PLP_TSF_Alts_Mapbook.mxd

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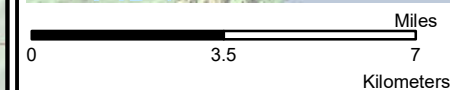
Author: HDR



TSF OPTION 20

TO-21 (mdc21)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

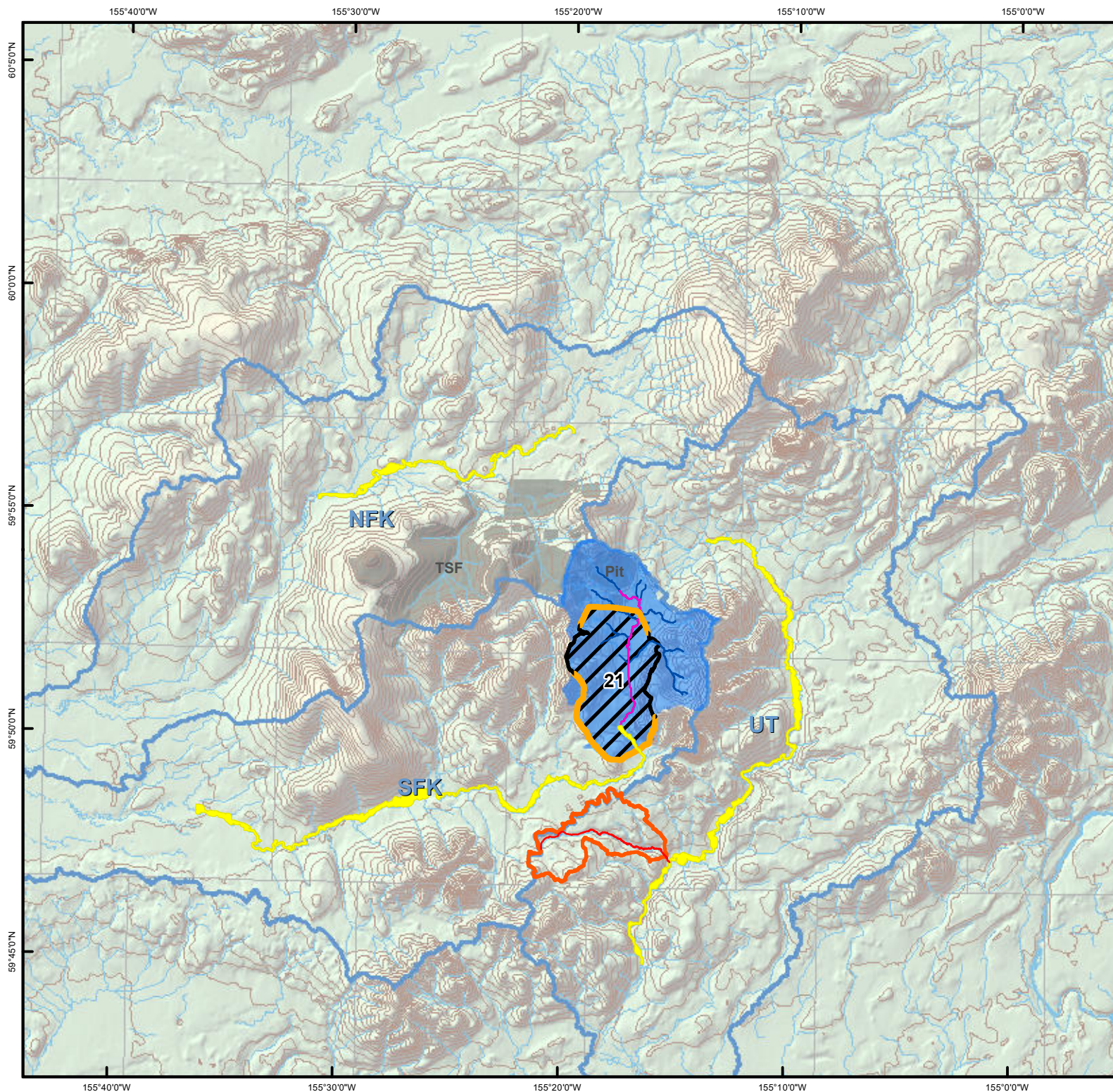


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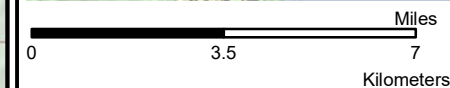
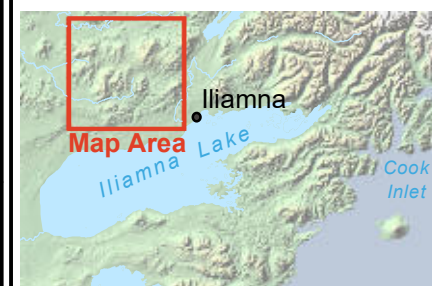
Author: HDR



TSF OPTION 21

TO-23 (mdc23)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

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1983 North American Datum

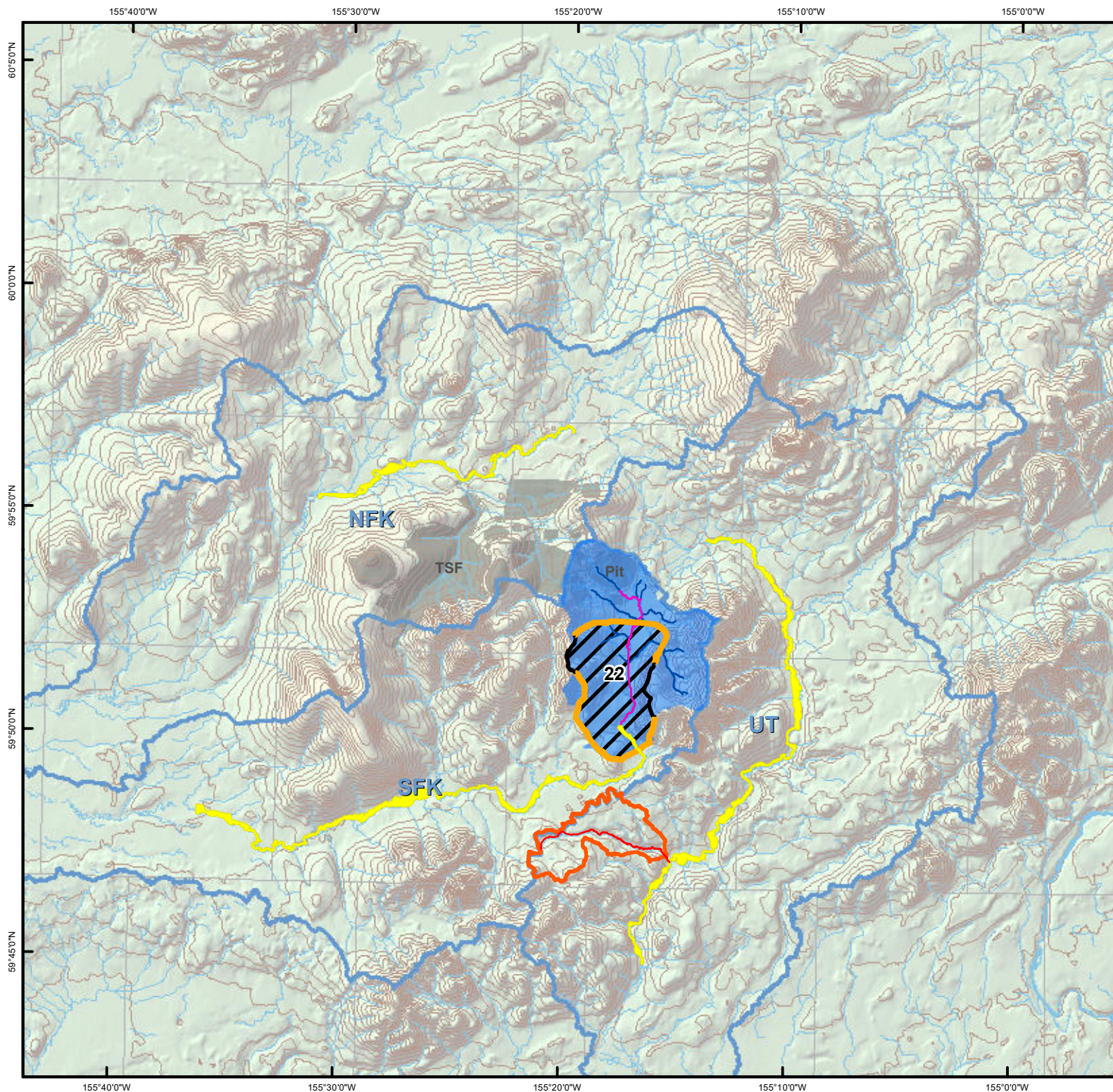


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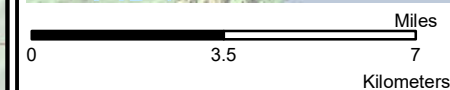
Author: HDR



TSF OPTION 22

TO-24 (mdc24)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

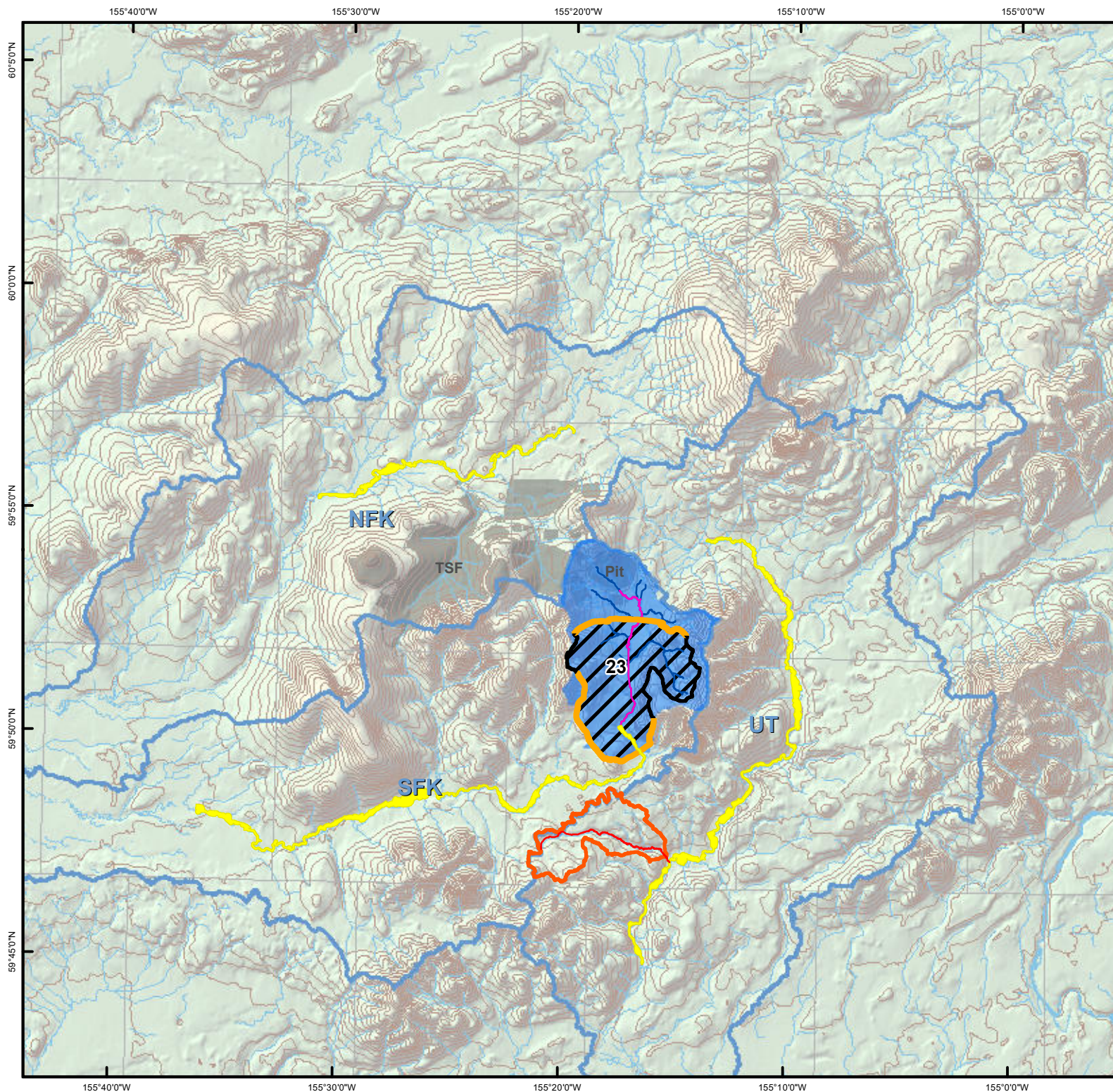
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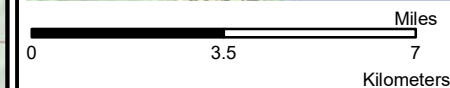
Author: HDR



TSF OPTION 23

TO-25E (mdc25E)

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

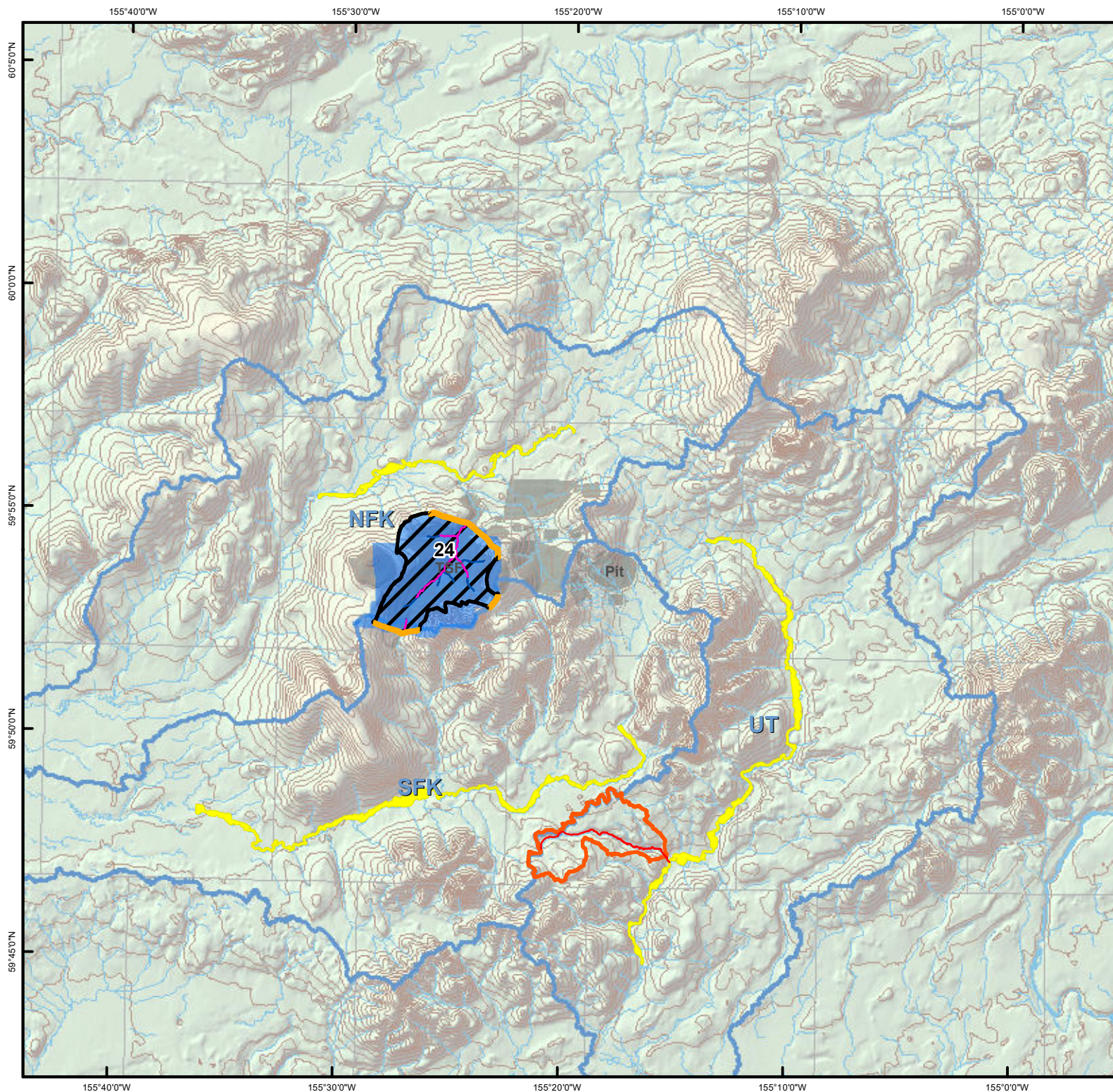
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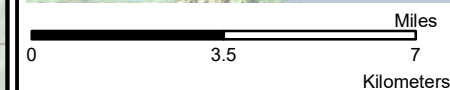
Author: HDR



TSF OPTION 24

TSF Option G

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

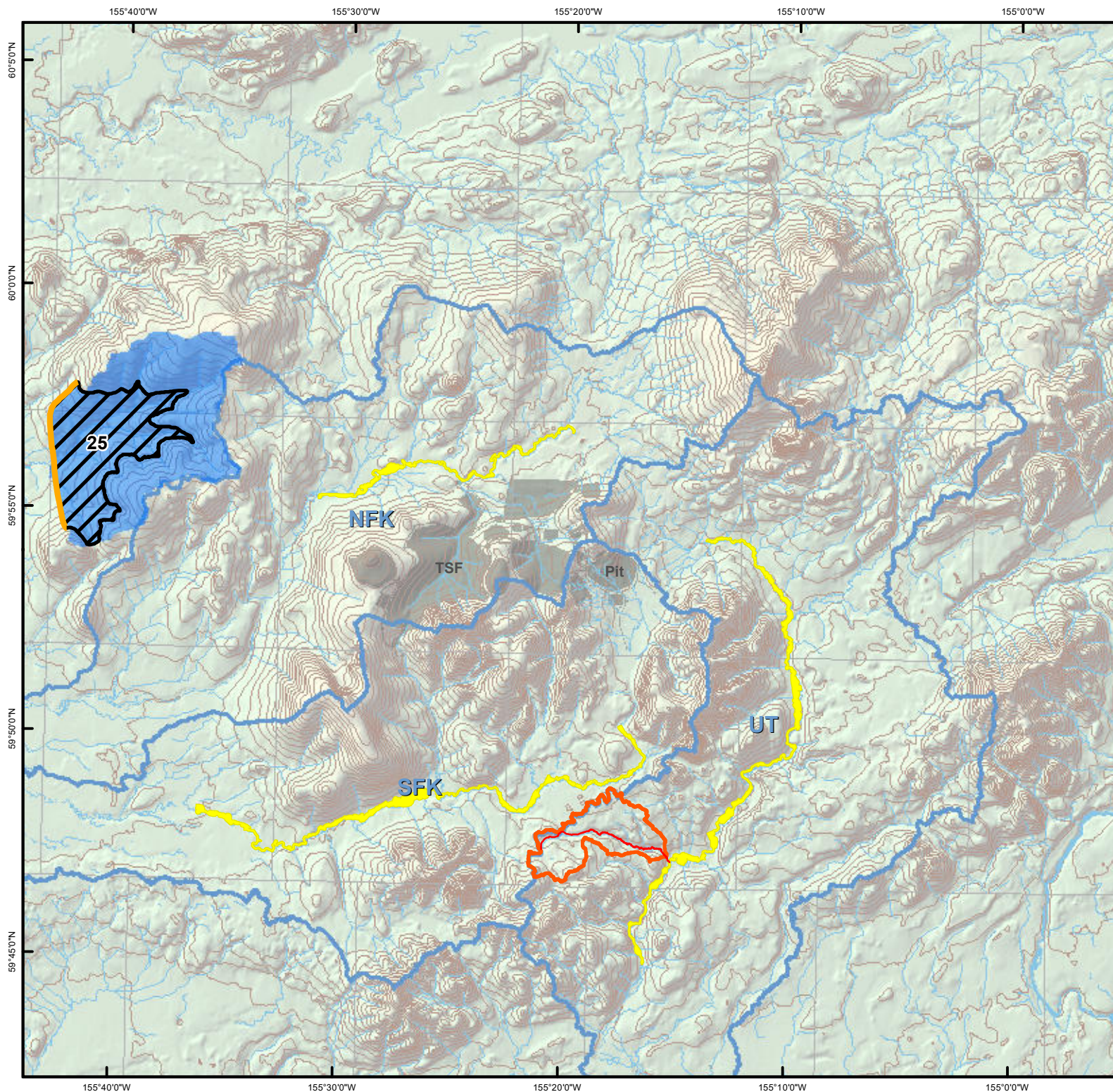


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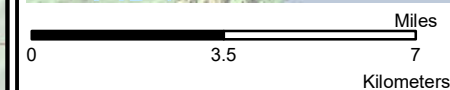
Author: HDR



TSF OPTION 25

TSF Option R

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

Alaska State Plane Zone 5 (units feet)
1983 North American Datum

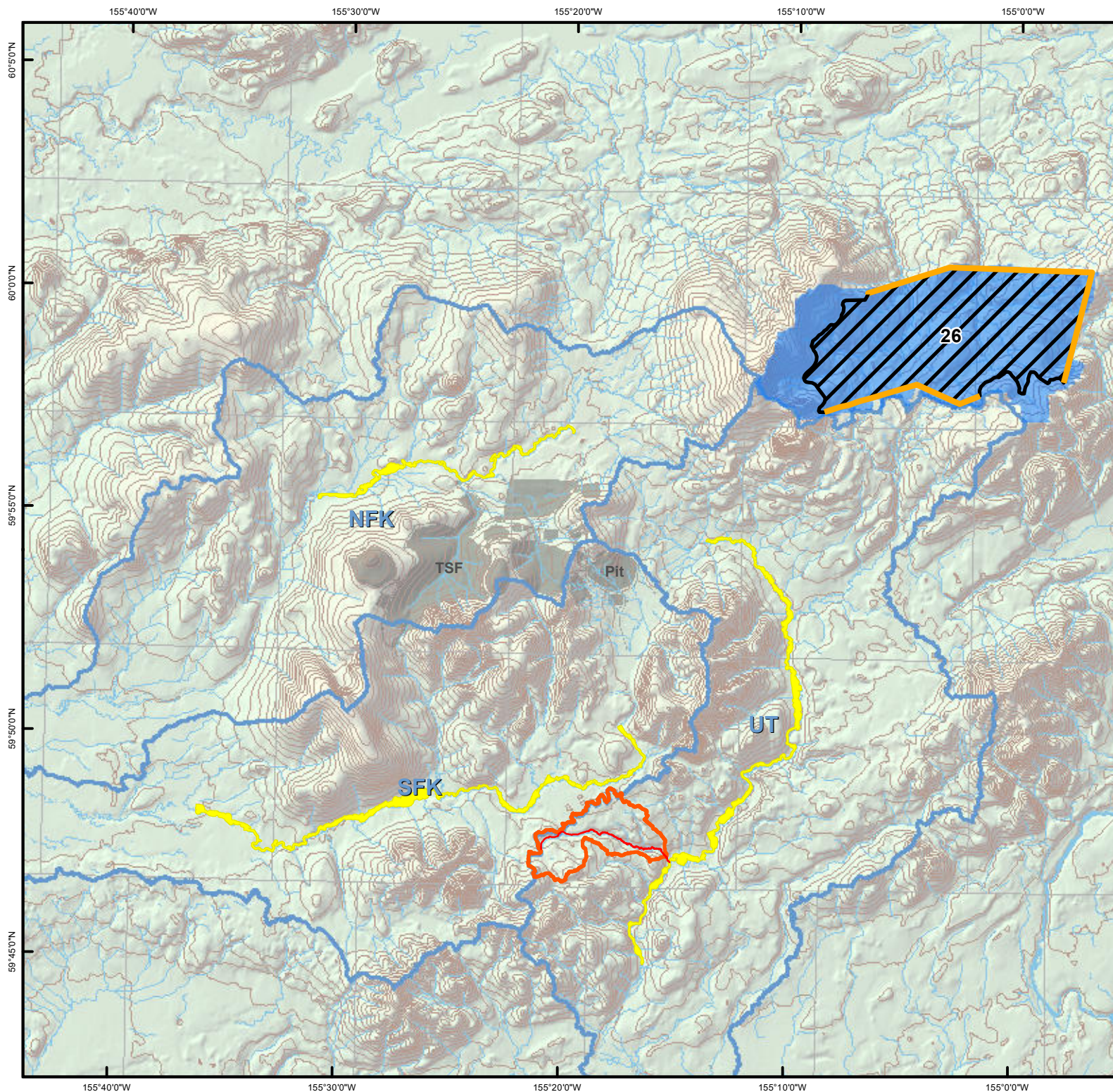


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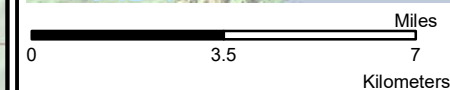
Author: HDR



TSF OPTION 26

M_OPTION

- TSF Option
- TSF Embankments
- TSF Option Drainage Area
- Impacted Anadromous Stream
- Impacted Fish Bearing Stream
- Current Mine Layout Design
- 100' Contour
- UT1.190 Stream
- UT119A Watershed
- Mineral Closing Order 393



Scale 1:221,760

Alaska State Plane Zone 5 (units feet)
1983 North American Datum



File: PLP_TSF_Alts_Mapbook.mxd

Date: 11/9/2018

Version: x

Author: HDR



From: James Fuego, Pebble Limited Partnership

To: Shane McCoy, US Army Corps of Engineers

Date: December 6th, 2018

USACE has requested that PLP confirm the wetlands acreage associated with TSF Option 25 as the percentage of wetlands in the footprint for this option appears anomalously low in comparison to the proposed project. As noted in RFI 98, PLP has not acquired detailed wetlands mapping for the area in TSF Option 25 so the National Wetlands Inventory (NWI) data was used to estimate wetlands.

As noted, the acres of wetlands appear anomalously low. To better quantify the impacts for Option 25, PLP investigated the ratio of NWI to mapped wetlands observed in the proposed bulk TSF location. For the proposed bulk TSF the numbers (acres) are as follows:

Proposed Facility

Total Footprint - 2839

Mapped Wetlands - 1828

NWI Wetlands - 773

Ratio (NWI/Mapped) - 0.423

Percentage Mapped Wetlands in Footprint – 65%

As the physical characteristics of the two areas are similar (valley fill with small streams) it is representative to apply this ratio to Option 25 to approximate what the acreage of mapped wetlands might be.

Option 25

Total Footprint - 4922

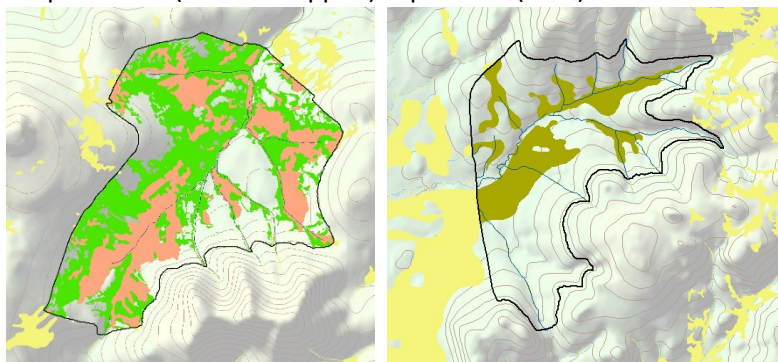
NWI Wetlands - 1193

Use Same Ratio - 0.423

Estimated Wetlands If Mapped – 2820

Estimated Percentage Wetlands in Footprint – 57%

Proposed TSF (NWI & Mapped) Option 25 (NWI)



Based on this analysis it is reasonable to assume that an estimate of 2820 wet acres in the Option 25 footprint is more representative of actual wet acres than the 1193 acres mapped in the NWI.