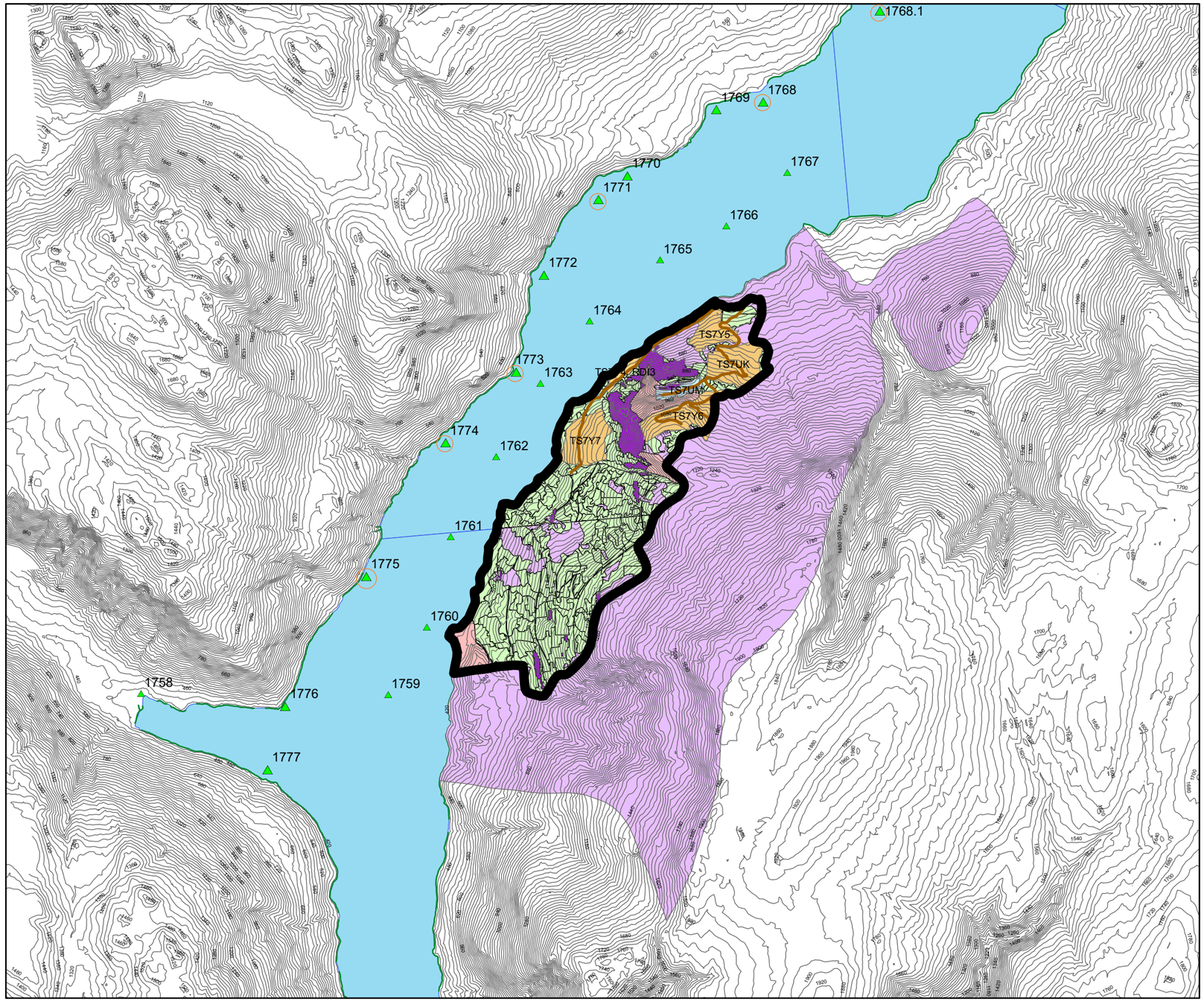

BC Timber Sales - Kamloops Business Area
Tshinakin Creek Integrated Visual Design Phase 1
prepared by
RDI Resource Design Inc
October, 2012

- Tshinakin_Op_area
- RDI_Roads_Phase_1
- Phase_1_PC_Main
- Phase_1_PC
- Phase_1_CC
- Mature_Avail_S
- FSP_OGMA_Op_Area
- Steep_Slope_Op_Area
- GPS2
- GPS1
- AdamsLk
- LakePolys

N

0 1,375 2,750 5,500
Meters

Tshinakin Creek Integrated Visual Design - Phase 1 - November 5, 2012

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Integrated Visual Design Planning Process

1 Introduction

RDI Resource Design Inc was contracted by BC Timber Sales, Kamloops Business Area to prepare an Integrated Visual Design for the Tshinakin Creek Operating Area. The 1518 ha operating area is located midway on the lower half of the east side of Adams Lake within the 6150 ha Visual Sensitivity Unit (VSU) 477, opposite from and just north of Agate Bay. The north end of the VSU wraps around Spillman Beach Marine Provincial Park on a separate landform. The large VSU has been assigned the Visual Quality Objective (VQO) of Retention (R). The KLRMP VSU is actually a composite of 4 MFLNRO VSUs (557, 1875, 1880, 1884), all assigned R (under FRPA 181: DM 03 July 2003). The portion of the KLRMP unit behind Spillman Beach on a separate landform made known as VSU 557 in the MoF inventory is isolated from the operating area. The operating area sits within only two of the original VSUs: 1875 and 1880, these having a total area of 3809 ha. VSU 1875 has a Visual Sensitivity Class (VSC) of 3 while VSU 1880 is VSC 2. The operating area is concentrated on the lower parts of the landforms (in the western half of the VSUs), occupying just 28% of the two VSUs combined, the greatest proportion being within VSU 1880.

Retention means an alteration of a forest landscape resulting from the presence of cutblocks or roads, such that when assessed from a viewpoint that is representative of significant public viewing opportunities, the alteration

(a) is difficult to see,
(b) is small in scale, and
(c) has a design that mimics natural occurrences.

The VQO of Retention assigned to VSU 477 is unlike several other landforms on the east side Adams Lake and along the entire south-west side of the lake which has the less restrictive VQO of Partial Retention. The portion of the VSU east of the park sits on a distinct landform, separated from the main landform and, as such has not entered into the analysis, and sits well outside of the operating area.

The intent of an Integrated Visual Design Plan is to provide long-term direction for the
development of the timber resources for an area of 5,000 hectares or less in a manner consistent with higher-level planning direction and respectful of other resource values. Integrated Visual Design employs a process that considers all resource values simultaneously in an integrated fashion. It is applied in both the plan and perspective view so as to address visual quality concerns while optimising harvest opportunities in visually sensitive areas. A procedural document for IVD can be found at:

http://www.for.gov.bc.ca/hfp/values/visual/Publications/legislation_policy/FIA-Standards-Final.pdf.

According to the source document, an Integrated Visual Design plan must:

1. Define the visual design unit.
2. Establish management objectives to be achieved.
3. Assemble all available resource inventory information.
4. Conduct a resource analysis, which must include visual force and land feature analyses.
5. Develop a concept design
6. Produce a detailed design
7. Test the design through visual simulations

The Tshinakin Creek IVD had the following planning steps:

1. **The Tshinakin Creek Operating Area was as defined by BCTS.**

2. **The management objectives were to produce an IVD plan capable of meeting the established VQO of Retention over the short and longer term, while meeting other key resource management and operational objectives.**

3. **All available resource inventory information was acquired from BCTS. This information included:**
   - **Mature Forest Available (1070 ha)**
   - **Depletion**
   - **FSP 2004 OGMA**
   - **Steep Slopes >60%**
   - **Kamloops VQOs**
   - **Operating Area**
   - **Contours**
   - **"Existing" block plan**
   - **VRI Forest Cover**
   - **BCTS roads**
   - **No information was received about wildlife, winter range, etc.**

   In addition, panoramic photography was taken by RDI from viewpoints set by RDI to capture the full operating unit from points mid-lake and along the west side of the lake. The boat was provided by BCTS. Additional viewpoints/photo-points were located along the Forest Service Road on the west side of the lake.

   The data was assembled in ArcGIS and in Visual Nature Studio (VNS):
   - **Clip data for Operating Area**
   - **Build terrain model TIN and 20m GRID from contours**
   - **Assign viewpoints from GEO-tagged imagery from lake**
   - **Build the Visual Nature Studio (VNS) 3-D Model:**
   - **Build VNS DEM from ArcGRID.**

4. **The resource analysis was conducted in both ArcGIS and VNS**
   - **Import "available" forest, assign heights from HEIGHT_PROJ**
   - **Import Constraints and Opportunities; VSU**
   - **Import "Existing" block plan**
   - **Prepared a resource analysis, including visual force and land features**

5. **A concept plan was developed by testing the capability of the "existing" block plan for meeting VQO by applying tree-retention patterns as Phase 1 of the IVD plan. The concept plan for Phase 1 provides the foundation for a discussion of the application and implications with BCTS for subsequent phases to be completed.**

6. **A detailed plan, including roading suggestions, will evolve from the conceptual approach and applied subsequently to the remainder of the visual design unit (the operating area). The plan stops short of being a field-ready logging plan, but will provide much guidance and advance implications on visual quality to those charged with the actual field planning.**

7. **The concept and detailed plans were and will be tested iteratively using Visual Nature Studio visual simulation techniques throughout the planning steps described above.**

2 Tshinakin Creek Integrated Visual Design - Phase 1 Procedures

BCTS encouraged RDI to firstly examine the potential of the "existing" block plan to meet the Retention VQO. The blocks had been identified some years earlier. The blocks had the following harvest methods, silviculture systems and identifier numbers:

Cable-based, clearcut: TS7Y4 and TS7UM
Ground-based, partial cut: TS7Y5, TS7Y6, TS7Y7, TS7UK

At the outset of the investigation, it was determined by using 3-D visual techniques that TS7Y4 would create difficulties as a clearcut in meeting the VQO where it entered steep slopes (>60%) at the north and south ends, creating high visibility. RDI reconfigured the block to keep it within lower slopes (<60%), thereby making it available for ground-based, partial cut operations. Total gross area of the partial cuts would then be 228.6 ha. Only TS7UM (14.7 ha) would be acceptable as a clearcut in the Phase 1 plan as it is mainly hidden behind a small knoll from all but three of the viewpoints tested - viewpoints 1772, 1773 and 1774, each presenting views of only a tiny portion of the block. The gross area for all blocks would be 243.3 ha or 22.74% of the gross 1070 ha "available mature forest" area and 16.03% of the 1518 ha operating area.

While visual quality expectations were considered paramount, the interests of silviculture, ecosystem health, biodiversity, and operational requirements were, by necessity, also considered to be integral to this plan. The large scale and concentration (pattern) of the blocks required that an innovative variable retention approach be devised for the conceptual IVD plan.

RDI tested varying patterns of retained trees ranging from 10% to 30% in groups and then also applied 10% hybrid which has 90% of the trees in groups and 10% randomly dispersed. For simplicity:

10% grouped + 10% dispersed = 20% retention scenario
20% grouped + 10% dispersed = 30% retention scenario
30% grouped + 10% dispersed = 40% retention scenario
An additional scenario of dispersed 25% retention was also tested separately (100 TPH of 400 TPH full cover).

To create the groups patterning in Visual Nature Studio, a black and white image was draped over the cutblocks, scaled to 1500mx1500m, and tiled to cover all of the openings at the same time. The images started with the 30% grouped retention, then successively nibbled back the patches to achieve the 20% and 10% grouped retention. The hybrid applied a grey tone which applied dispersed tree retention in the VNS model along with patches. VNS reads the black as tree patches (400tph) and the grey tone as percent dispersal (5% density approx.). The separate random dispersed 25% retention treatment simply assigns 100 tph, with randomizing done internally in the VNS model when producing each image.

The comparative visual effects of the 4 scenarios were examined in renderings of each from a single viewpoint, viewpoint 1768, in summer and winter (snow on ground).The rendered images were produced with the summer sun as located on June 21 at 1:30 pm. The blocks are oriented from west-facing to north-facing, encouraging deep landform shading and shadows casts across any mainly small openings for most if not all of the day. The shadow casting procedure was not activated in the model, thereby increasing the degree of visibility of bare ground and its colour contrast with the surrounding vegetation. The time of day and season of year will cause great variations the amount of visibility. In winter snow conditions the patterns will be more distinct.

3 Phase 1 Results

Results are presented for comparison of each scenario (20, 30, 40 % grouped retention; 35% dispersed retention) in the close-in images produced from viewpoint 1768. The 40% scenario was considered best capable of most closely meeting the Retention VQO and was therefore examined from each of 6 viewpoints located along the west side of the lake travelling from north to south (viewpoints 1768.1, 1768, 1771, 1773, 1774, and 1775). The 40% retention scenario provided an intricate pattern of leave areas and edges with some ground exposure. In consideration of the visual results, the 40% retention pattern appears best at creating an intricate pattern of leave areas and edges with limited ground exposure and very low visual presence, if noticeable at all, and best capable of potentially meeting the Retention VQO.

The intent of the preferred 40% retention scenario is to provide sufficient flexibility for harvest operations while allowing sufficient open ground for reforestation. Rapid and healthy re-growth will allow the units in Phase 1 to achieve visually effective green-up (VEG) within a shorter time period, thereby providing for the ability of the landscape to accept subsequent harvesting phases. The VR design is not intended to provide final layout locations, however the patterns could be translated to field layout as an additional project beyond the IVD. Perhaps better, the patches and dispersed retention might be best left to contractor/faller discretion. The visual result of operations on visual quality is determined by water-based viewing, therefore monitoring of operations, as they proceed, would be advantageous and highly recommended. Only in this way can the approach be validated, the density and opacity/permeability of the residual tree canopy determined, and adjustments made for greater or lesser tree retention as required to satisfactorily achieve the Retention VQO definition of (a) difficult to see, (b) small in scale, and (c) a design that mimics natural occurrences.

The results of the 40% retention scenario are presented as seen from the west-side array of viewpoints (1768.1, 1768, 1771, 1773, 1774, 1775 - travelling from north to south). There was no ground cover or low residuals added to any texture. In reality the amount of low vegetation left undisturbed would have a significant greening effect, and will be added to subsequent Phases if BCTS considers the amounts and heights to be significant.

The net area removed in the 40% retention scenario leaves 60% of the 228.6 ha gross area = 137.2 ha, and total net area (including the 15 ha clearcut) would be 151.9 ha = 14.2% of the 1070 ha mature available forest in the first phase and 10% of the entire 1518 ha operating area).

The other measure of achieving the VQO is percent alteration - a limit of 1.5% of the VSU or landform. The VSU is complex, comprising several small landforms (knolls) within one large one. The Phase 1 blocks are located on a smaller landform; block TS7UM sits between two knolls. Seen in isolation, a small degree of alteration can easily dominate the small landform components of the VSU. It is somewhat of a judgement call as to the landform measure and can vary amongst those doing the measuring, such as in a post-harvest audit. The retention texture of leave trees is assumed to avoid significant, measurable bare ground - particularly at the 40% level.

Post-harvest audits also apply a separate measure of VQO achievement called the Visual Quality Effectiveness Evaluation (VQEE), available at:

http://www.for.gov.bc.ca/hfp/frep/site_files/indicators/Indicators-VisualQuality-Protocol-Nov2008.pdf .

The evaluation procedure combines ratings for design together with percent alteration and levels of tree retention to establish the measure of VQO achievement. The evaluation has considerable sensitivity and results can swing in either direction fairly easily, depending on the experience and responses of the evaluator, raising or lowering the VQO achieved (or achievable if applied in advance of operations). The form is included in the VQEE document. If some of a partial cut is visible, the evaluator determines by ocular estimate what percent of the volume has been removed from the landform and applies a clearcut equivalent based on tree height and that percent (different from the planimetric percent due to tree screening and slope). For the Tshinakin, with tree height averaging around 30m within the initial Phase 1 block strategy, the volume removed (visually) from the landform will have to be seen to be 20% or under to reach Retention VQO. This target is considered by RDI to be achievable given the density of retained patches, additional presence of dispersed tree retention, terrain angles relative to the viewpoints, aspect and shading. Winter snow conditions can raise visibility and possibly push it over the limit of the Retention VQO.

The Tshinakin landscape was photographed from most of these viewpoints by RDI. A further 9 viewpoints were photographed while travelling mid-lake from south to north (viewpoints 1759-1767), and 2 more travelling south along the far shore (1776 and 1777 by Agate Bay). The closer viewpoints would provide some closer viewing but also more intervening screening, so were left for spot analysis. As well, Several viewpoints were determined and photographed along the west-side Forest Service road. These views were considered to be temporal and brief amidst roadside screening, with no real stopping points. As such, they weren't considered for the analysis.

RDI used the existing old road network for access in Phase 1. The roads show in the forest cover and have been drawn on the key maps. The lower road connects to the more southern set of roads provided by BCTS. Subsequent roading will be determined for the remainder of the operating unit when design blocks are identified for the next phase(s).

4. Conclusions

RDI concludes that the original BCTS plan can be accommodated, generally, as Phase 1 of the IVD while meeting the VQO, provided that innovative tree-retention patterns of 40% or more are assigned to all blocks other than TS7Y6 which can be clearcut. Block TS7Y4 should avoid the steep slopes at either end of the original configuration, substituting instead the small RDI block and applying partial cutting.

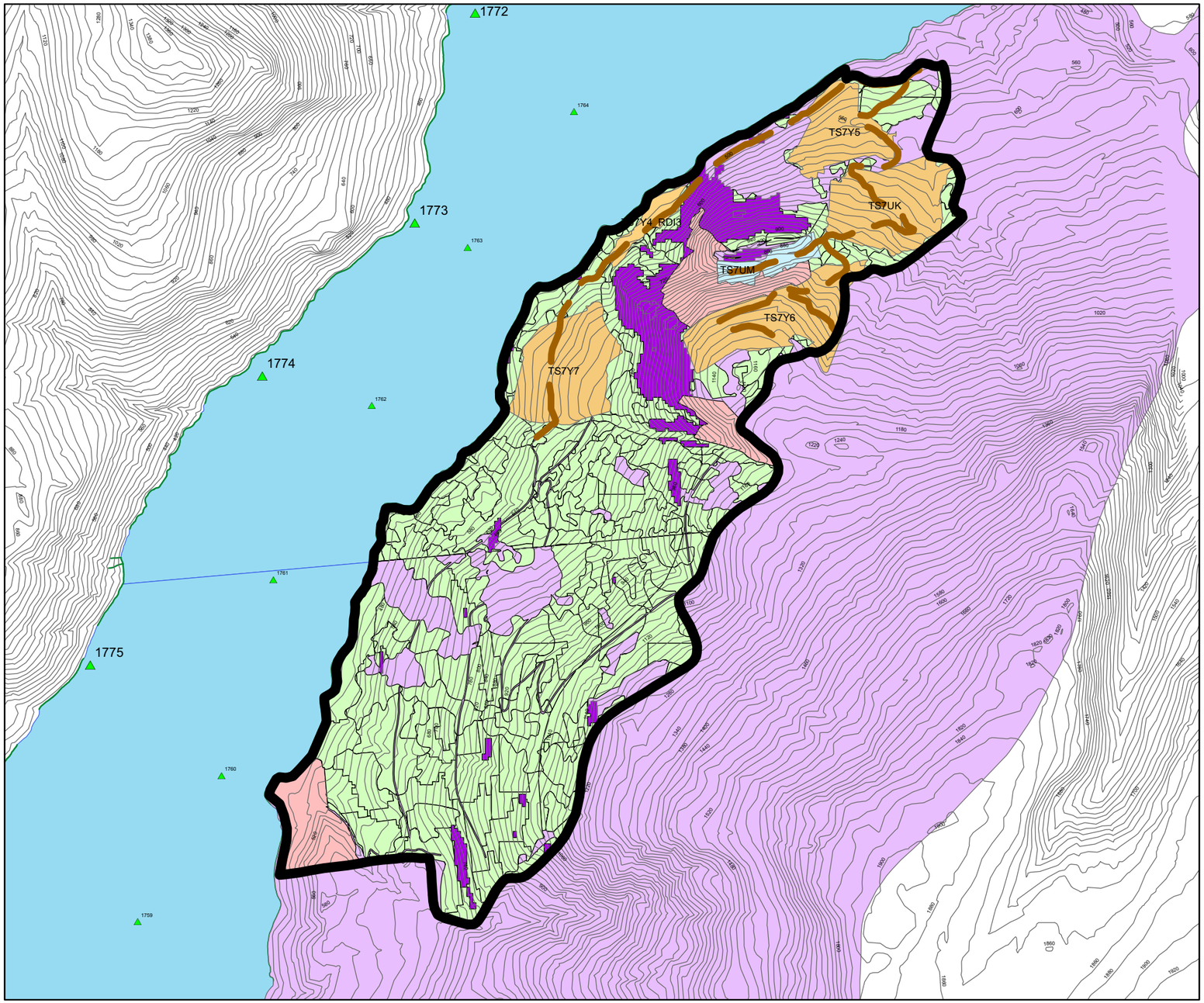
Retention of 40% or greater is likely required in order to meet the Retention VQO. Snow on ground contrasts might cause the perceived visual quality to go beyond the Retention VQO. When and where the overall pattern might be seen, the blocks appear to flow down and around the central knoll, emulating the visual force lines.

Subsequent phases to access the remaining mature available forest areas will be brought into the design following discussions with BCTS as to the ability to achieve the retention patterns during operations.

As the first continuation of the plan, TS7Y5 might be expanded into the large contiguous available forest patch to the north-east of TS7Y5, depending on implementation of the retention pattern.

The approach offered in Phase 1 is without knowledge or consideration of wildlife or forest health issues. These can be brought in to Phase 1 and subsequent phases if made known.

Ken B. Fairhurst, PhD RPF
RDI Resource Design Inc



Tshinakin Creek Integrated Visual Design Phase 1

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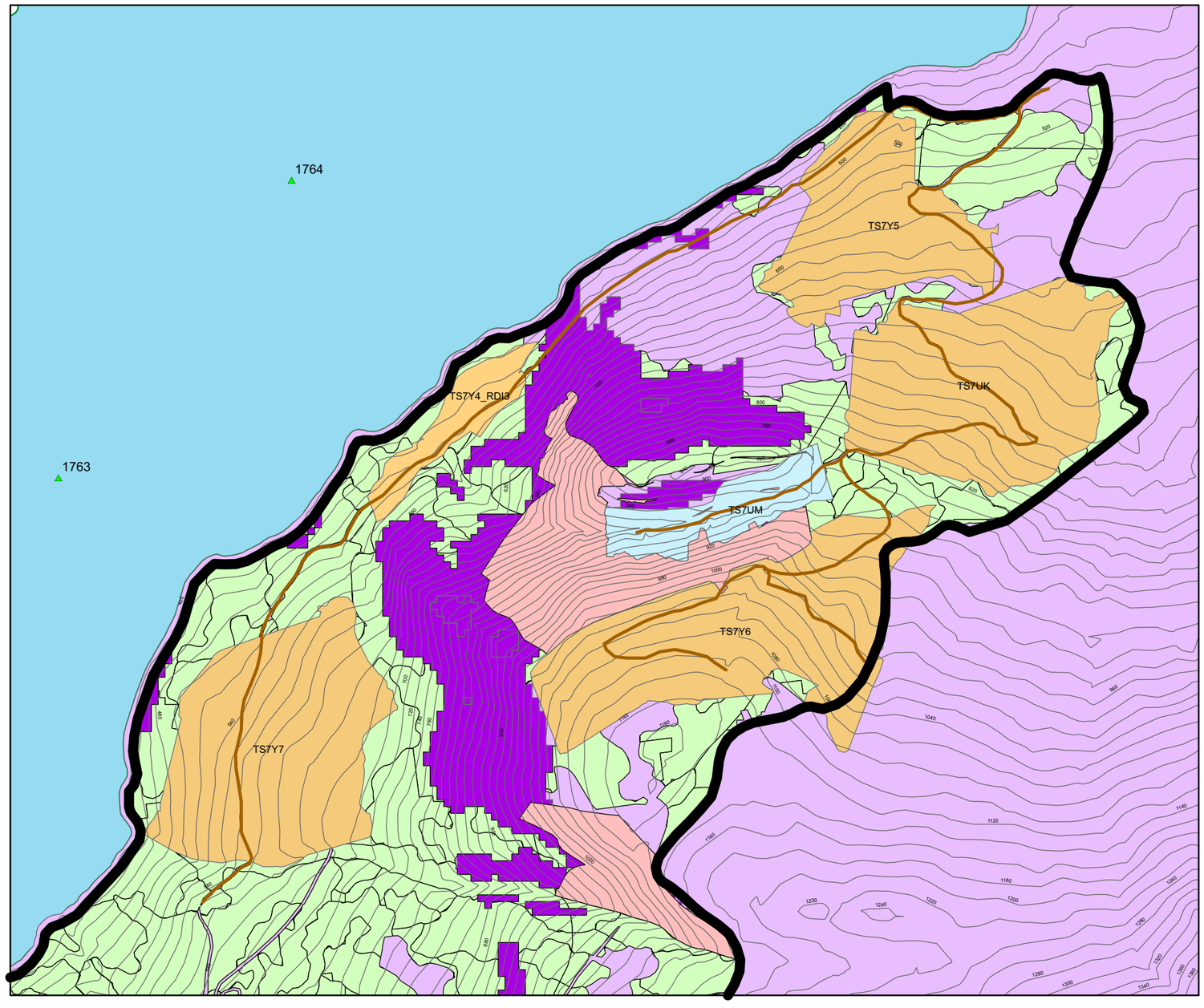
- RDI_TRIM20K_contours
- Phase_1_PC_Main
- Phase_1_PC
- Phase_1_CC
- Mature_Avail_S
- FSP_OGMA_Op_Area
- Steep_Slope_Op_Area
- GPS2
- GPS1
- AdamsLk
- LakePolys

0 625 1,250 2,500

Meters

N

Tshinakin Creek Integrated Visual Design - Phase 1



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- Steep_Slope_Op_Area
- GPS2
- GPS1
- AdamsLk
- LakePolys

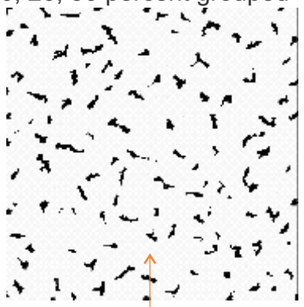
N

0 290 580 1,160
Meters

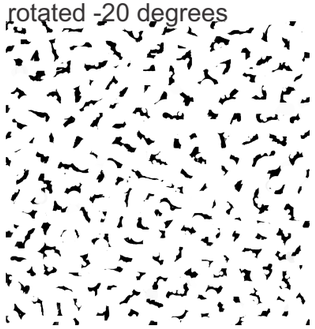
Tshinakin Creek Integrated Visual Design - Phase 1

Partial Retention Textures in Visual Nature Studio Simulations Trials from Viewpoint 1768

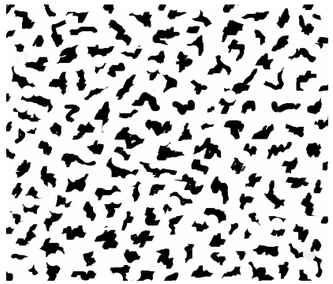
10% hybrid dispersed (of 400 tph)
plus 10% tiled across the blocks
applied together with
10, 20, 30 percent grouped



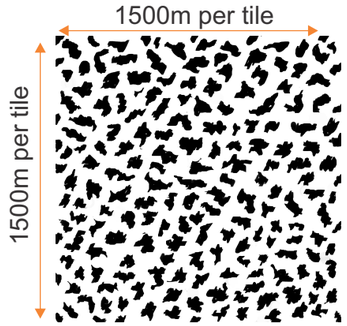
10% grouped retention (of 400 tph)
tiled across the blocks,
rotated -20 degrees



20% grouped retention (of 400 tph)
tiled across the blocks,
rotated -20 degrees



30% grouped retention (of 400 tph)
tiled across the blocks,
rotated -20 degrees



25% fractal-randomized (in VNS)
dispersed retention (of 400 tph)
no tiling image used

10% hybrid dispersed (of 400 tph)
plus 10% tiled across the blocks
applied together with each of
10, 20, 30 percent grouped

10% hybrid dispersed (of 400 tph)
plus 10% tiled across the blocks
applied together with
10, 20, 30 percent grouped

20% grouped retention (of 400 tph)
plus 10% hybrid dispersed tiled
across the blocks,
rotated -20 degrees

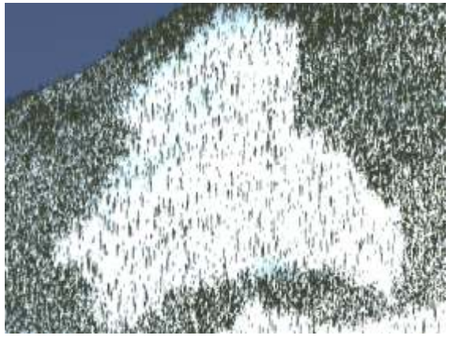
30% grouped retention (of 400 tph)
plus 10% hybrid dispersed tiled
across the blocks,
rotated -20 degrees

25% fractal-randomized (in VNS)
dispersed retention (of 400 tph)

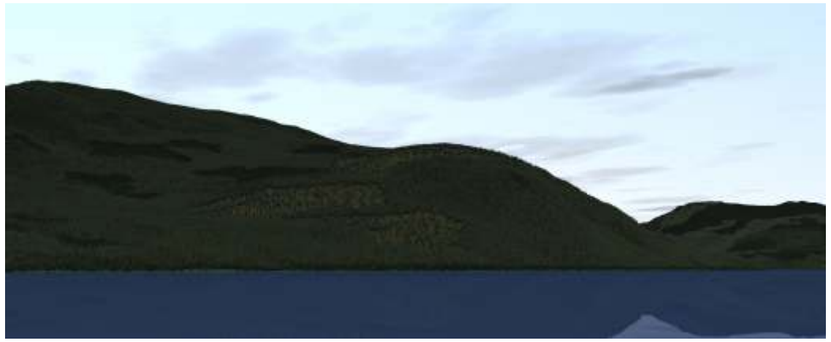
10%+10% Hybrid

20%+10% hybrid

30%+10% hybrid

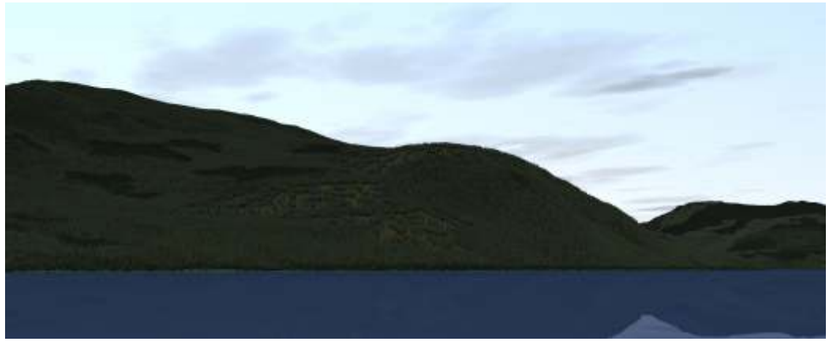


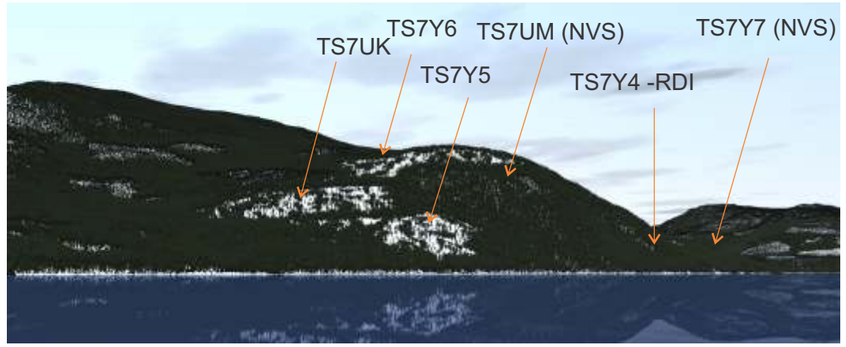
25% Fractal Dispersed



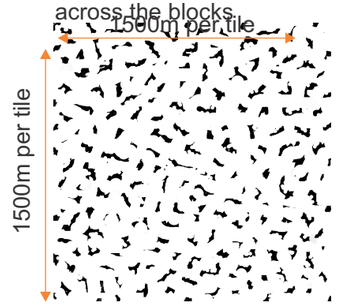
25% Dist.

100 tph (25%)
fractal-randomized residuals
across block

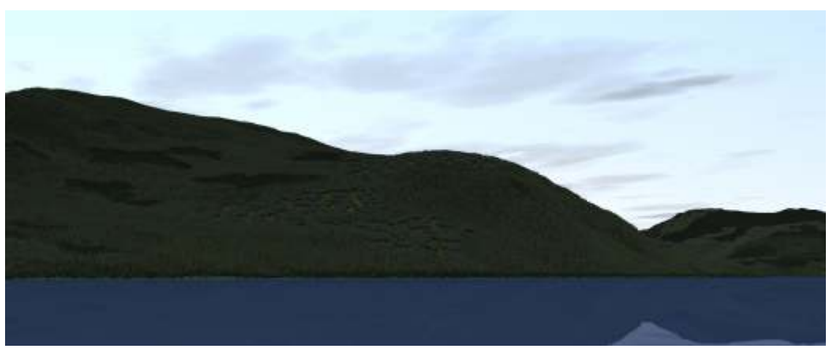




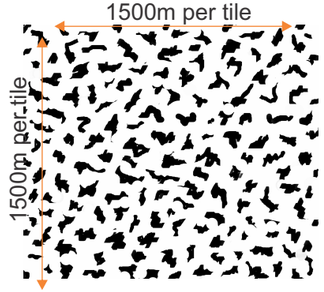
10% grouped retention (of 400 tph)
plus 10% hybrid dispersed tiled
across the blocks



10%

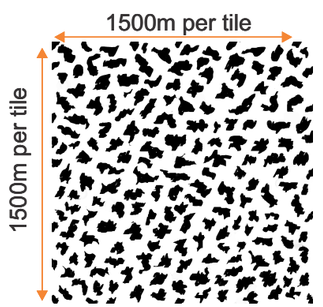


20% grouped retention (of 400 tph)
plus 10% hybrid dispersed tiled
across the blocks



20%

30% grouped retention (of 400 tph)
plus 10% hybrid dispersed tiled
across the blocks

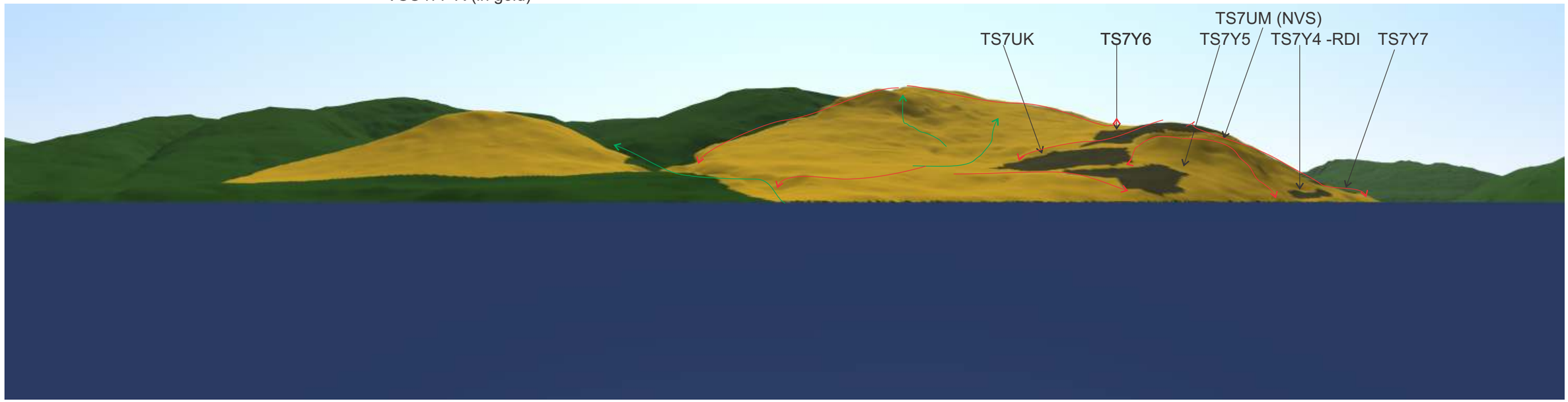


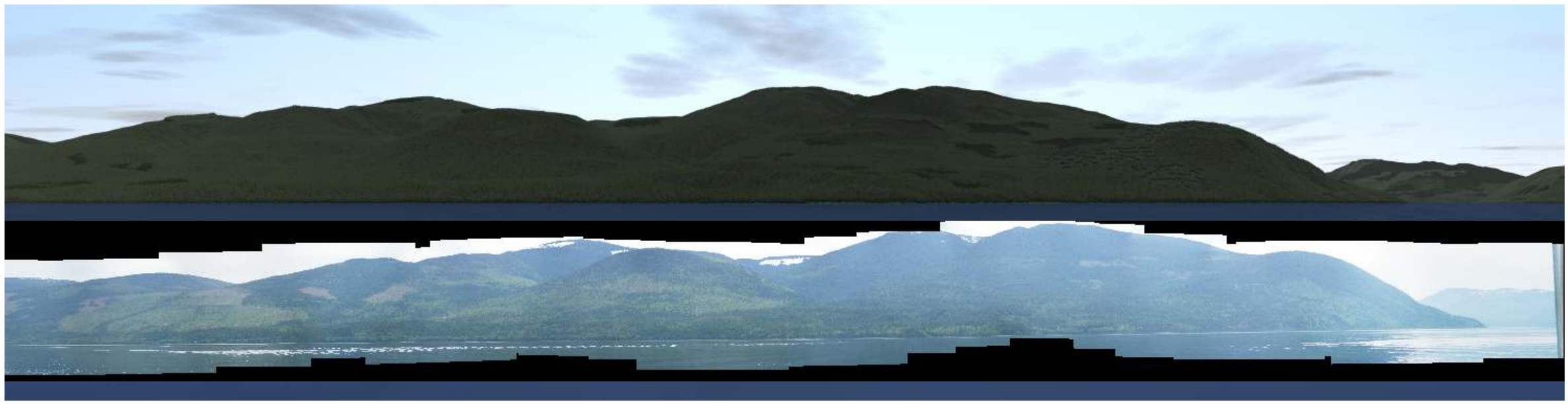
30%

no shadows, understory or ground cover

1768

VSU477-R (in gold)





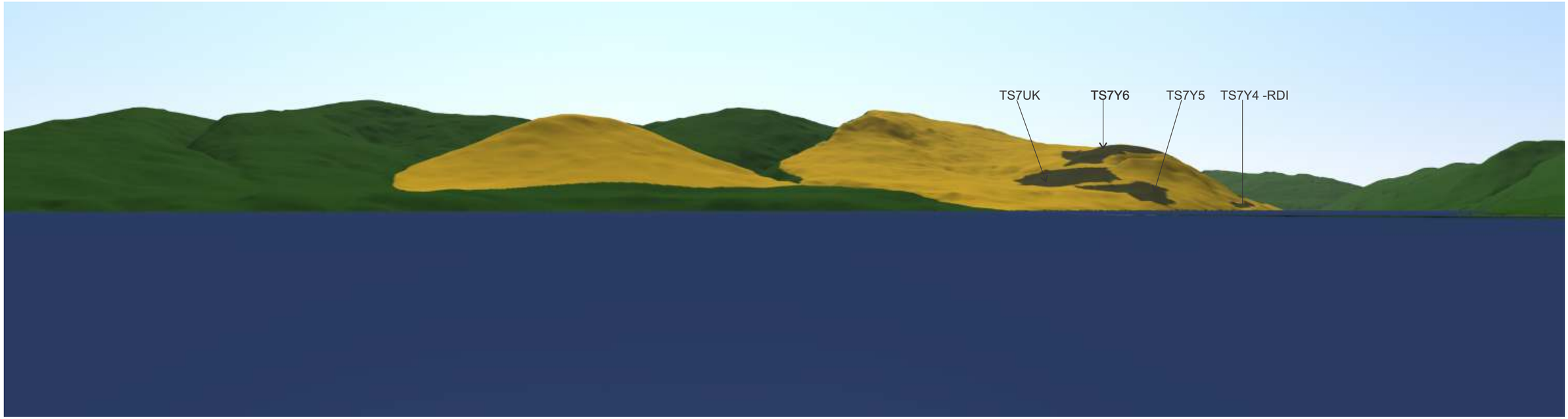
no shadows, understory or ground cover

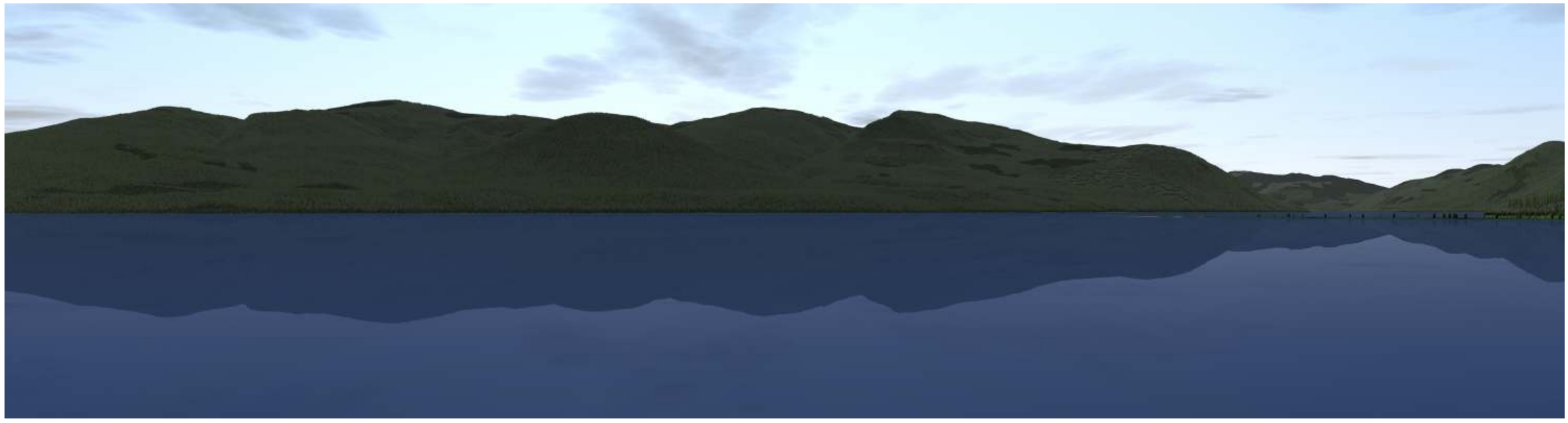
30% clumped retention + 10% hybrid dispersed

→ Visual Force Convexity

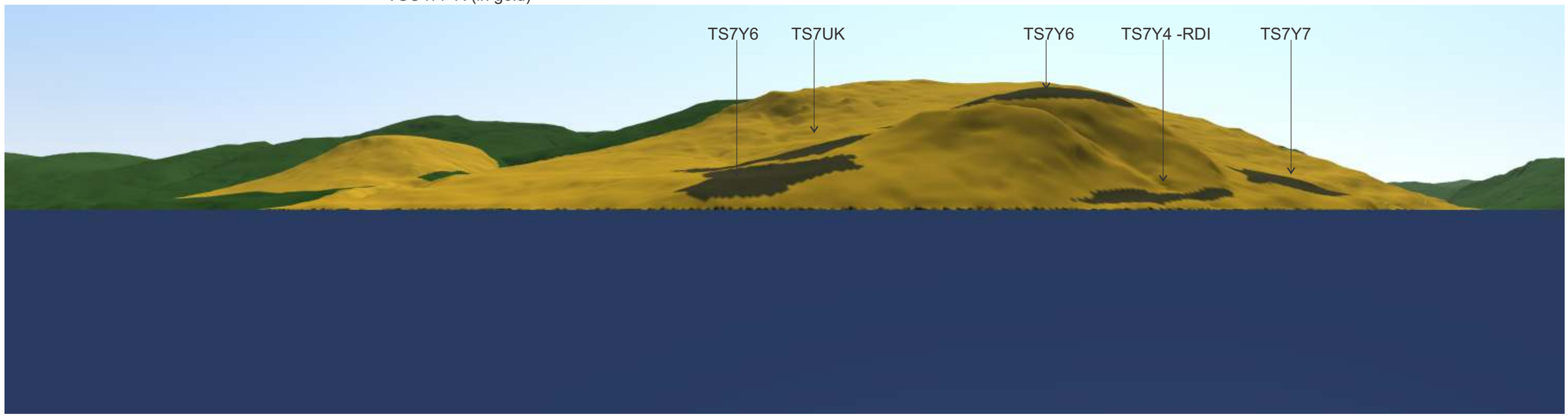
→ Visual Force Convexity

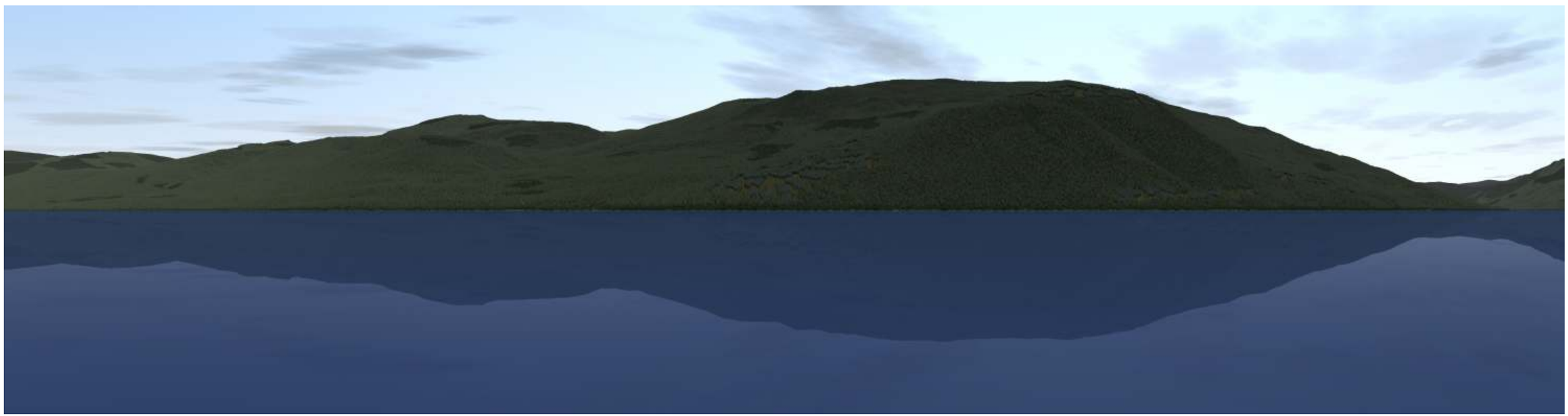
1768


TS7UK
TS7Y6
TS7Y5
TS7Y4 -RDI



VSU477-R (in gold)



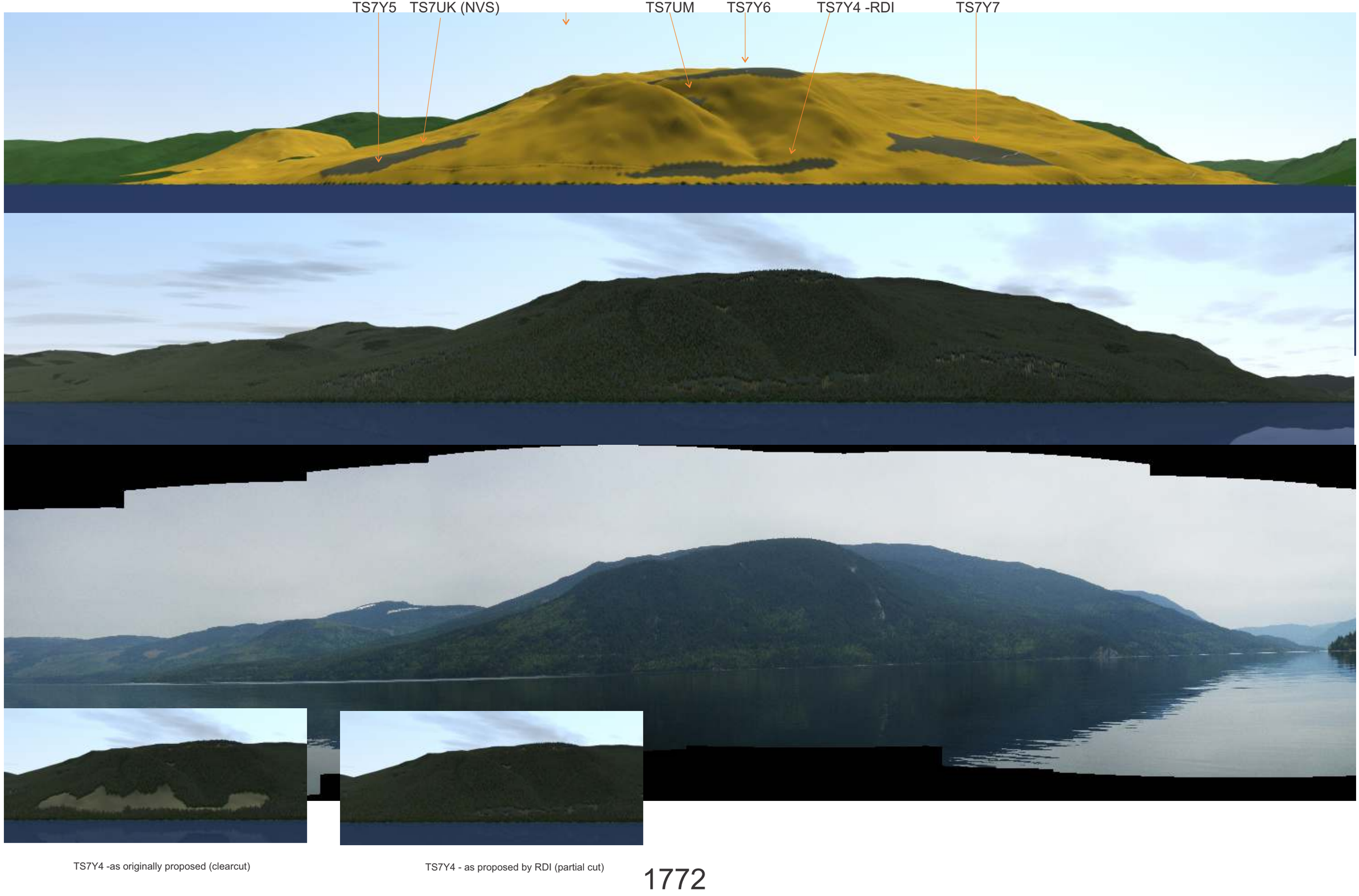


no shadows, understory or ground cover

30% clumped retention + 10% hybrid dispersed

1771

TS7Y5 TS7UK (NVS) TS7UM TS7Y6 TS7Y4 -RDI TS7Y7



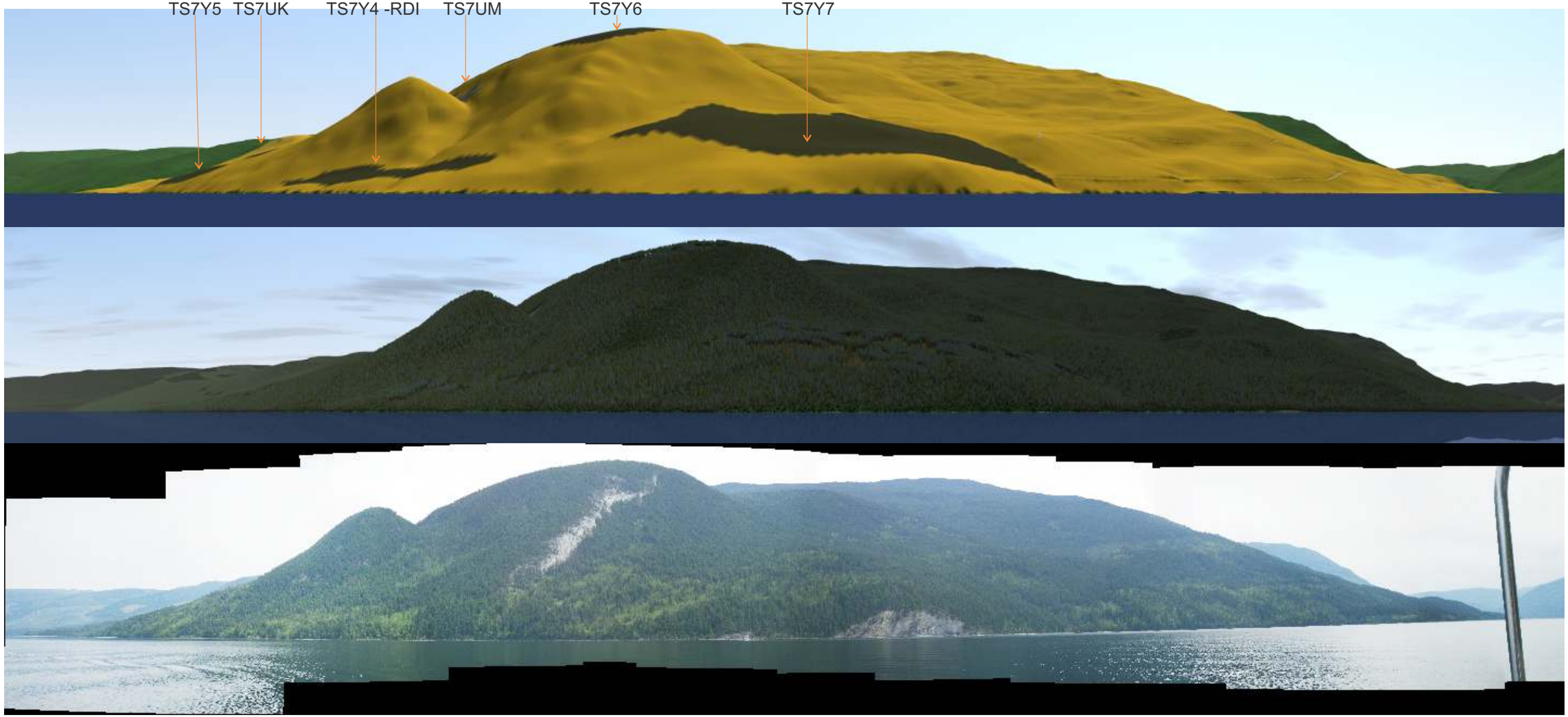
TS7Y4 -as originally proposed (clearcut)

TS7Y4 - as proposed by RDI (partial cut)

1772

VSU477-R (in gold)

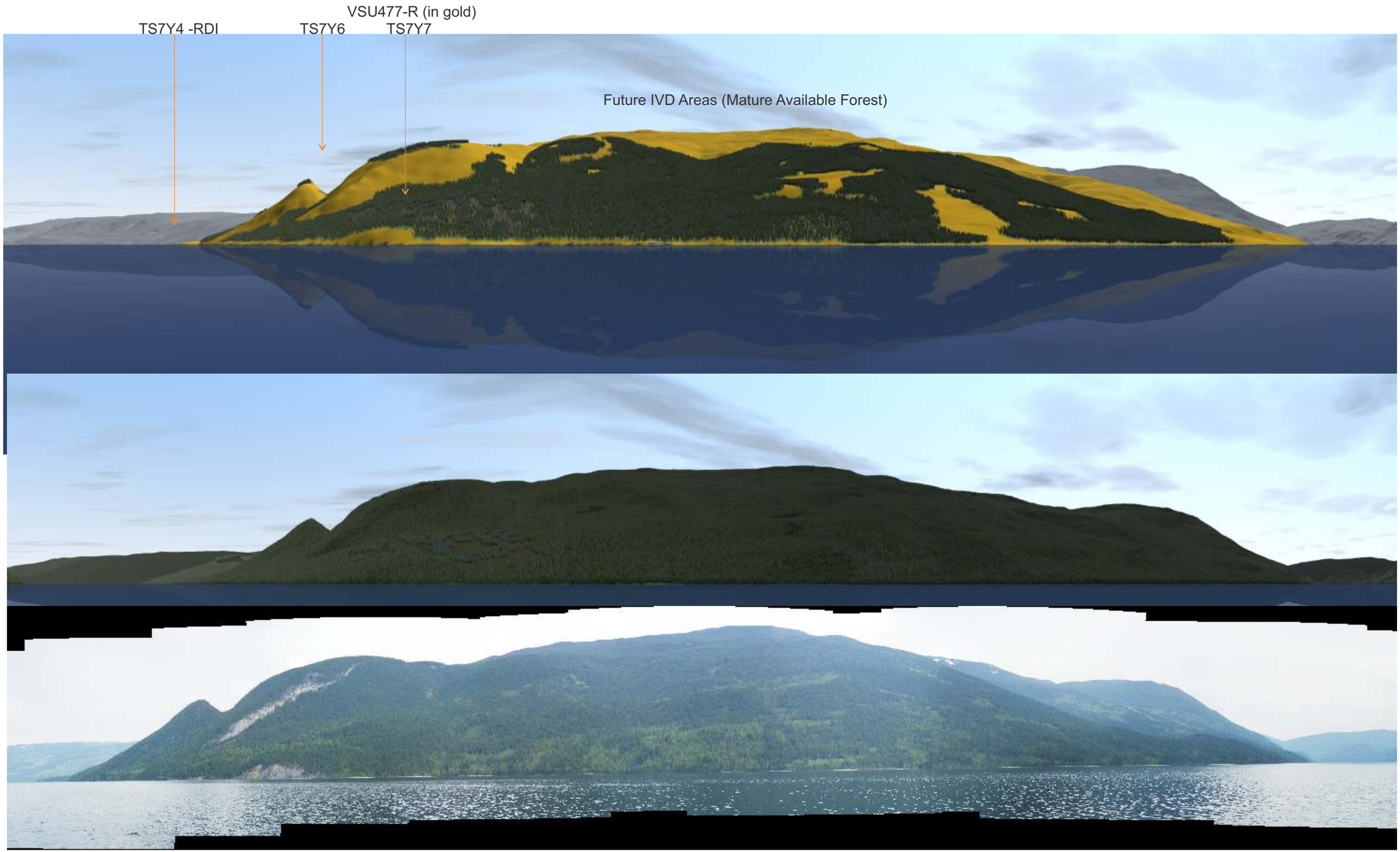
TS7Y5 TS7UK TS7Y4 -RDI TS7UM TS7Y6 TS7Y7



no shadows, understory or ground cover

30% clumped retention + 10% hybrid dispersed

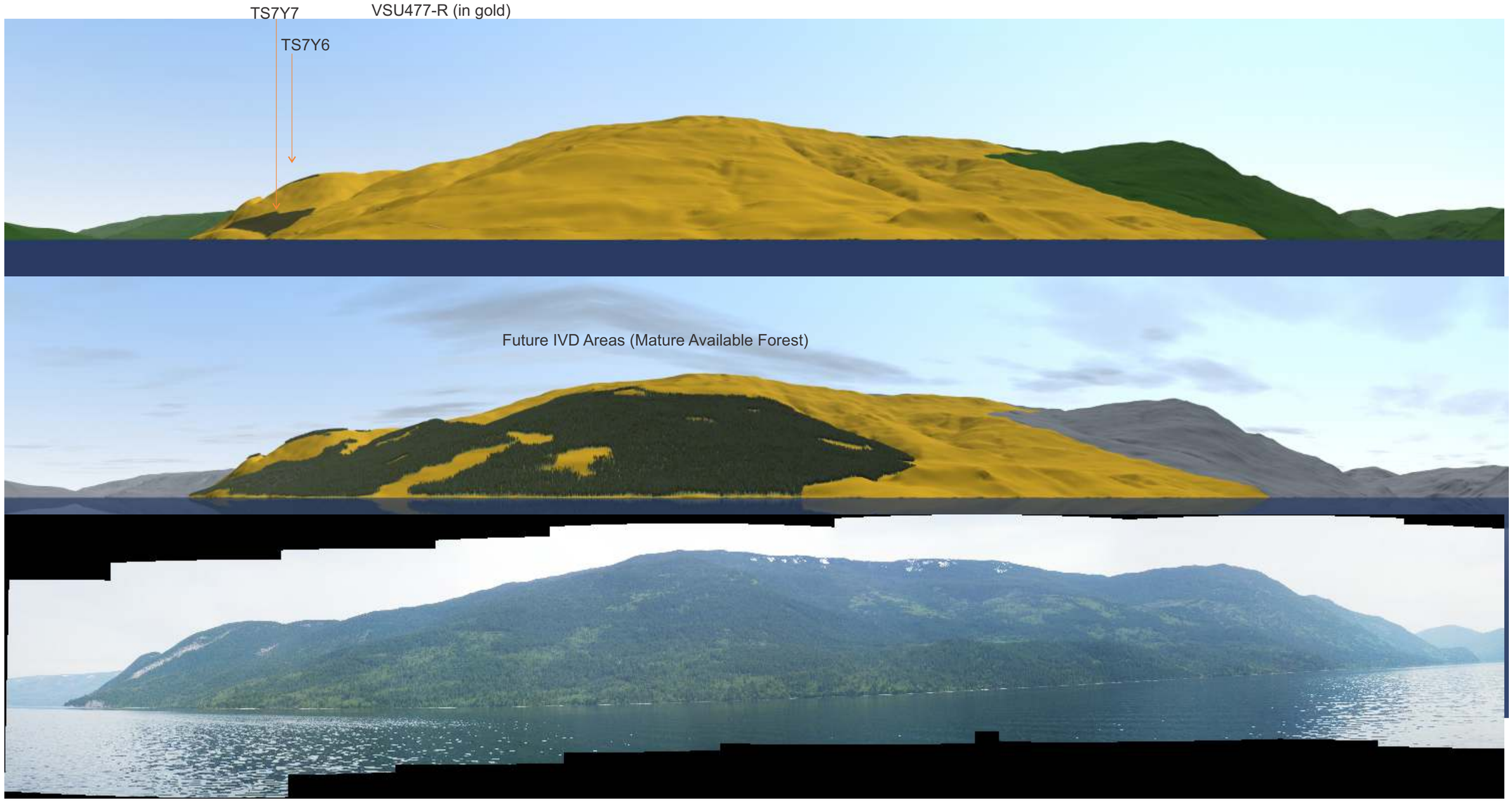
1773



no shadows, understory or ground cover

30% clumped retention + 10% hybrid dispersed

1774



no shadows, understory or ground cover

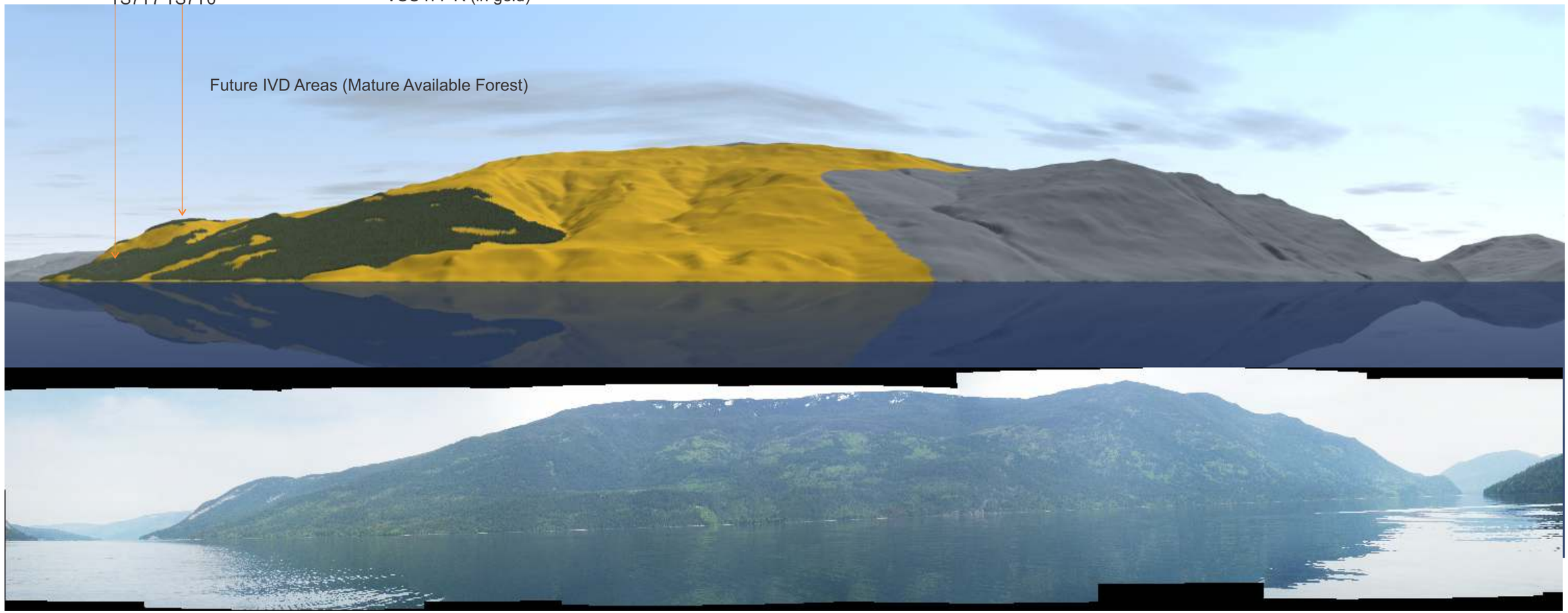
30% clumped retention + 10% hybrid dispersed

1775

TS7Y7 TS7Y6

VSU477-R (in gold)

Future IVD Areas (Mature Available Forest)



no shadows, understory or ground cover

30% clumped retention + 10% hybrid dispersed

1776