DG3 Capital Costs Overview

Presentation to MWH, Independent Engineer

22-October-2012

Boundless Energy

nalcor energy

Confidential and Commercially Sensitive

Safety Moment

Purpose / Objectives

- To present the Decision Gate 3 capital cost estimate.
- To review key drivers of Decision Gate 3 capital cost estimate.

Presentation Outline

- The Project Today
  - Project Execution Roadmap
  - Project Execution Update
  - Project Definition since Decision Gate 2

- Decision Gate 3 Cost Estimate
  - Process and Outcome
  - Review Key Changes since Decision Gate 2

Key Messages

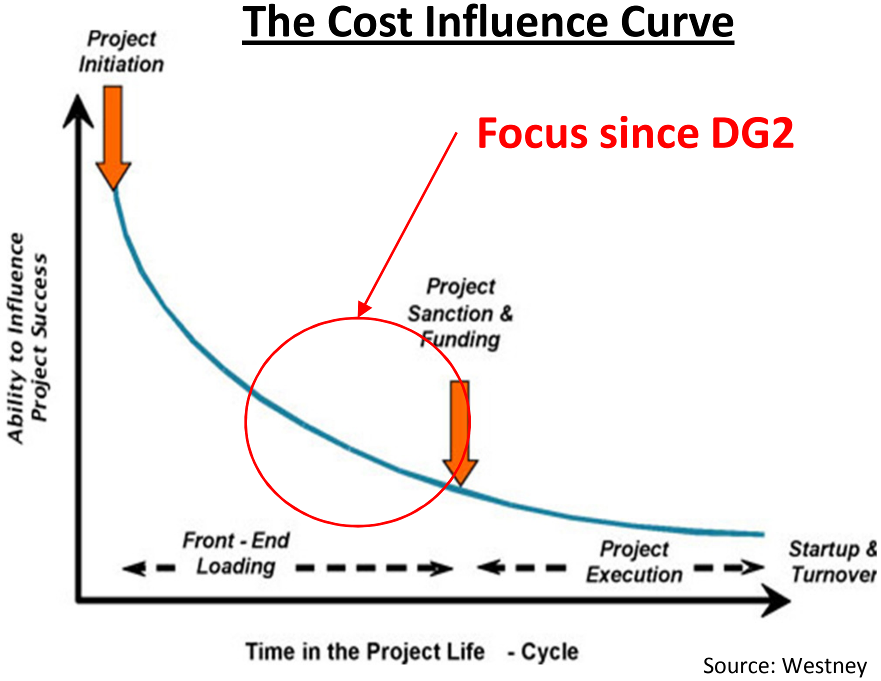
1. We are following our Gateway process
   - Our process is structured, organized and follows project execution best practices:
     - Independent reviews confirm best practices
     - Project Execution Roadmap
     - Project Definition refinements since DG2
2. Review of the DG3 Cost Estimate
   - Robustness of the estimating process and outcome
   - Greater cost certainty based on over 50% engineering
   - Estimate reflects a fixed and firm design
   - Key changes since DG2 and main drivers of change

Project Execution Roadmap

Application of Industry Best Practice

- Front-end loading to confirm project scope and align with business objectives
  - Advanced Project Definition through completion of substantial engineering
    - Target engineering completion prior to start of construction
  - Extensive execution and construction planning
  - Adopt contracting strategies that minimizes and optimally allocates risk
  - Firming key prices through bidding before Sanction
- Early and continued focus on de-risking the projects
  - Shaped engineering, execution planning, contracting strategies, and decision to commence Early Infrastructure Works

The Cost Influence Curve

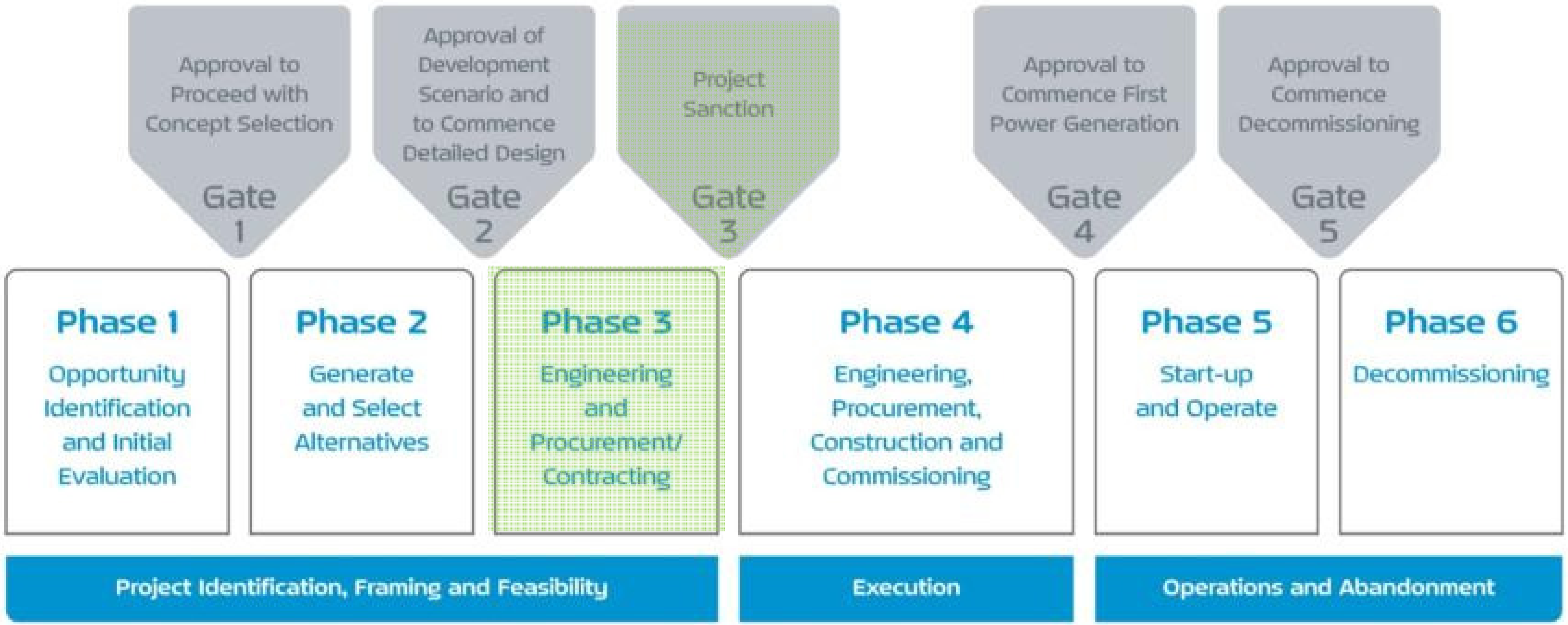


Source: Westney

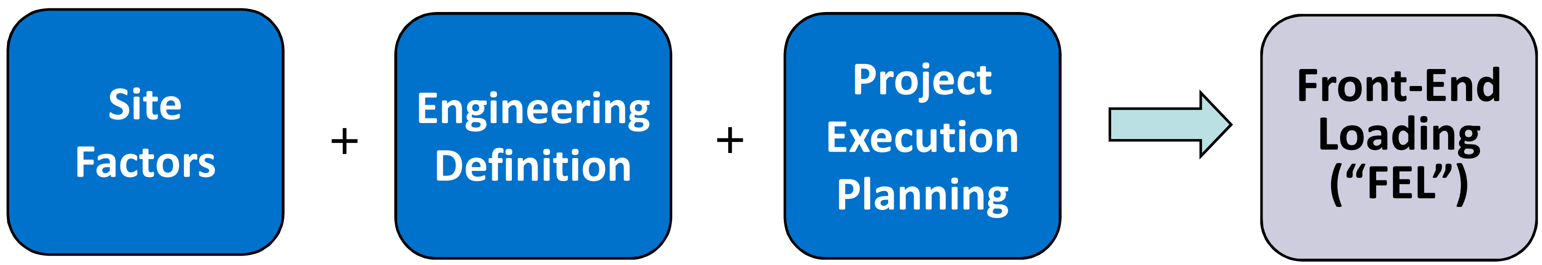
> *"… the LCP Gate 3 estimate in its current state is one of the best mega-project "base" estimates that this reviewer has seen in some time."*
>
> \- John K. Hollmann, PE CCE CEP, Owner – Validation Estimating LLC
> April 2012

Nalcor's Stage-Gate Process

Structured, front-end loading process that enables risk-informed decision making at Decision Gates by completing critical analysis in the Phase leading to the Decision Gate, while ensuring a balance of analysis with capital pre-investment



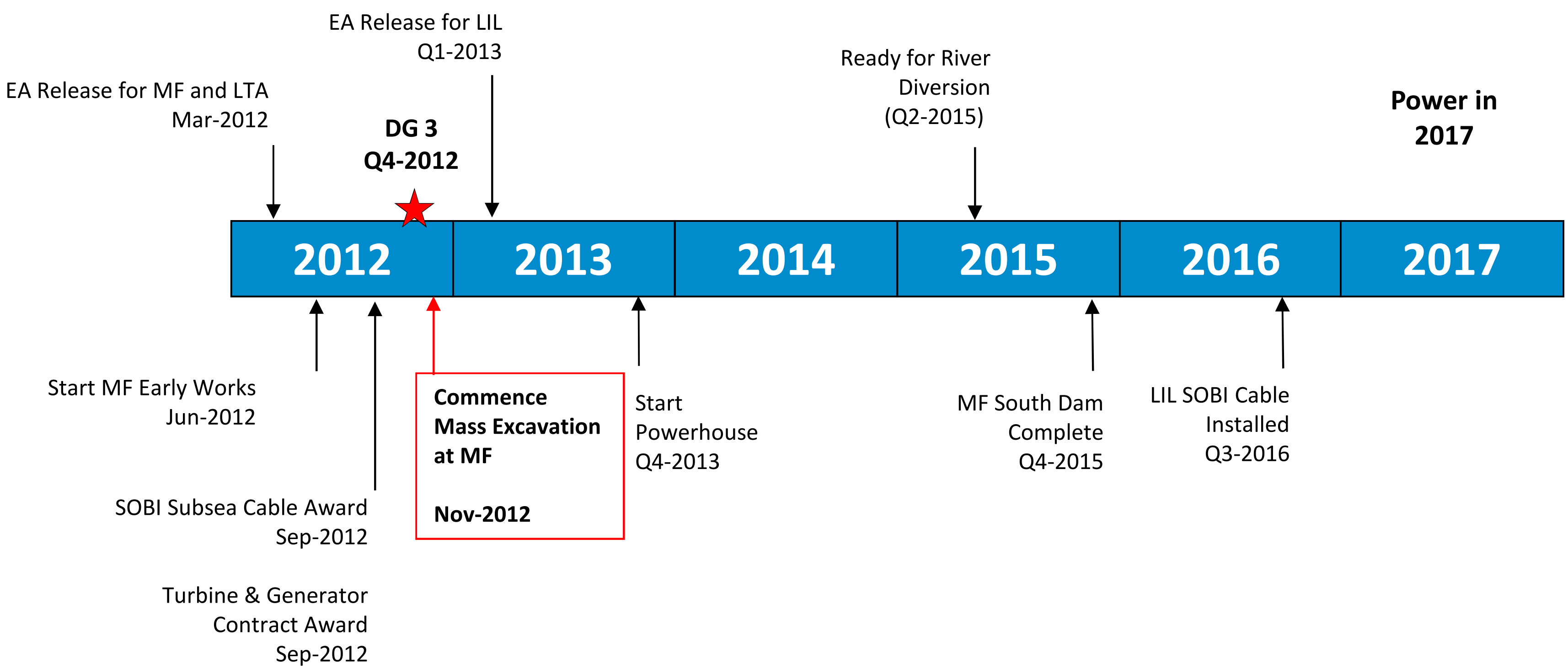
Front-End Loading: *#1 Predictor of Project Outcome*



- Gateway Phase 3 focus directed towards completing the level of front-end loading to confirm the project definition and a "Sanction-quality" Class 3 cost estimate.
- We are tracking industry best practices which suggest expending 4 to 6% of total invested capital in FEL activities pre-DG3
  - ~$250 million expended to-date
  - Engineering and detailed design is now well advanced and greater than 50% complete

Front-End Loading Overview

Making Progress Against Plan



Project Execution Update

Environmental Assessment

- MF/LTA
  - Released from EA in March 2012
  - Conditions of EA Release being implemented – no showstoppers
- LIL
  - Environmental Impact Statement ("EIS") submitted for review
  - Awaiting Ministerial feedback
  - EA Release anticipated in Q1-2013

Aboriginal Affairs

- Innu Nation
  - Innu Nation ratified and signed the IBA
  - Implementation of IBA underway
    - Significant contracts awarded to Innu companies
- Other Aboriginal Groups
  - Implementation of consultation plan for LIL EIS through various community engagement agreements
  - Over 500 Aboriginals trained in required trades

Labour

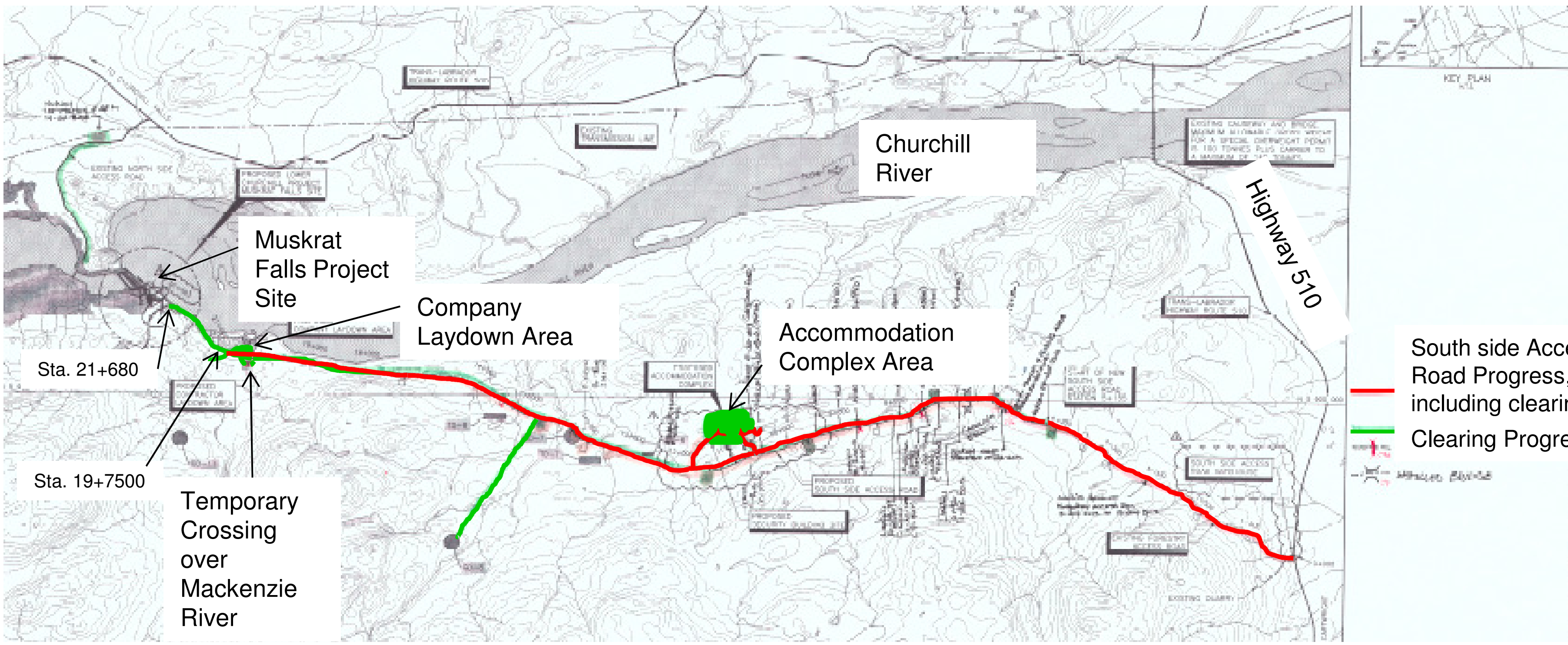
- Labour Availability
  - Labour agreements which will provide:
    - Attractive rotation cycles, shorter travel times than to Alberta
    - Competitive wage rates - comparable to Alberta
    - Top quality camp and facilities - comparable to Alberta
    - Foreign worker options
    - Lessons learned from other labour agreements across Canada
  - We are sponsoring training programs for traditionally under represented groups in the workforce – many local to the site
- Labour Relations
  - Legislation passed in the Spring session of the NL Legislature to enable overlapping Special Project Orders
  - Negotiation of collective agreements currently underway
  - Special Project Orders will be enacted in 2013

Engineering & Procurement / Contracting

Overall engineering is greater than 50% complete, with over $2 billion of procurement activity already awarded/pending or underway

Contracts Awarded/LOI	Awards Pending	RFPs Issued
• Turbines & Generators ("T&G") • SOBI Cable Supply & Install • AC Tower Steel • MF South Side Access Road • MF Construction Power • EPCM Services	• MF Accommodations Complex • Bulk Excavation • MF Medical Services • MF Security Services • LTA Foundation Steel	• MF Powerhouse/Intake & Spillway • LTA Right-of-Way Clearing • LTA Construction • LTA Conductors • LTA Hardware
Approx. Value $850 million	Approx. Value $300 million	Approx. Value $900 million

South Side Access Road Construction Progress



Early Works: South Side Access Road

- The South side access road is approximately 21 km and is needed to gain access to the Muskrat Falls site
- The road is used to bring in the heavy equipment for construction
- Progress to date is 20 km out of 21 km

Early Works: Cleared Accommodations Complex Area

- The accommodations complex will be where we have the camp, catering, recreation facilities
- We have purchased a starter camp and will be bringing that in over the coming months
- Our target is to have this available up and running for the work mid-2013

Performance Security & Insurance

- Strategy as presented in November 2011 is being implemented
- Performance security approach has been utilized in key contracts already awarded (e.g., T&G and SOBI)
- Early Works insurance in place
- Market submission prepared for placement of full project insurance

Performance Security in Awarded Contracts

Turbines & Generators	SOBI Cable
• Performance Bond (50%) with rider • Rider confirms liquidated damages are included and eliminates notice requirements for scope changes • Bond to be issued by Zurich Canada • Letters of Credit (15%) to be issued by Schedule I Bank with S&P minimum credit rating of A-	• 15% Standby Documentary Credit issued by Schedule I Bank • 50% Performance Bond with rider issued by a surety with S&P minimum credit rating of A-

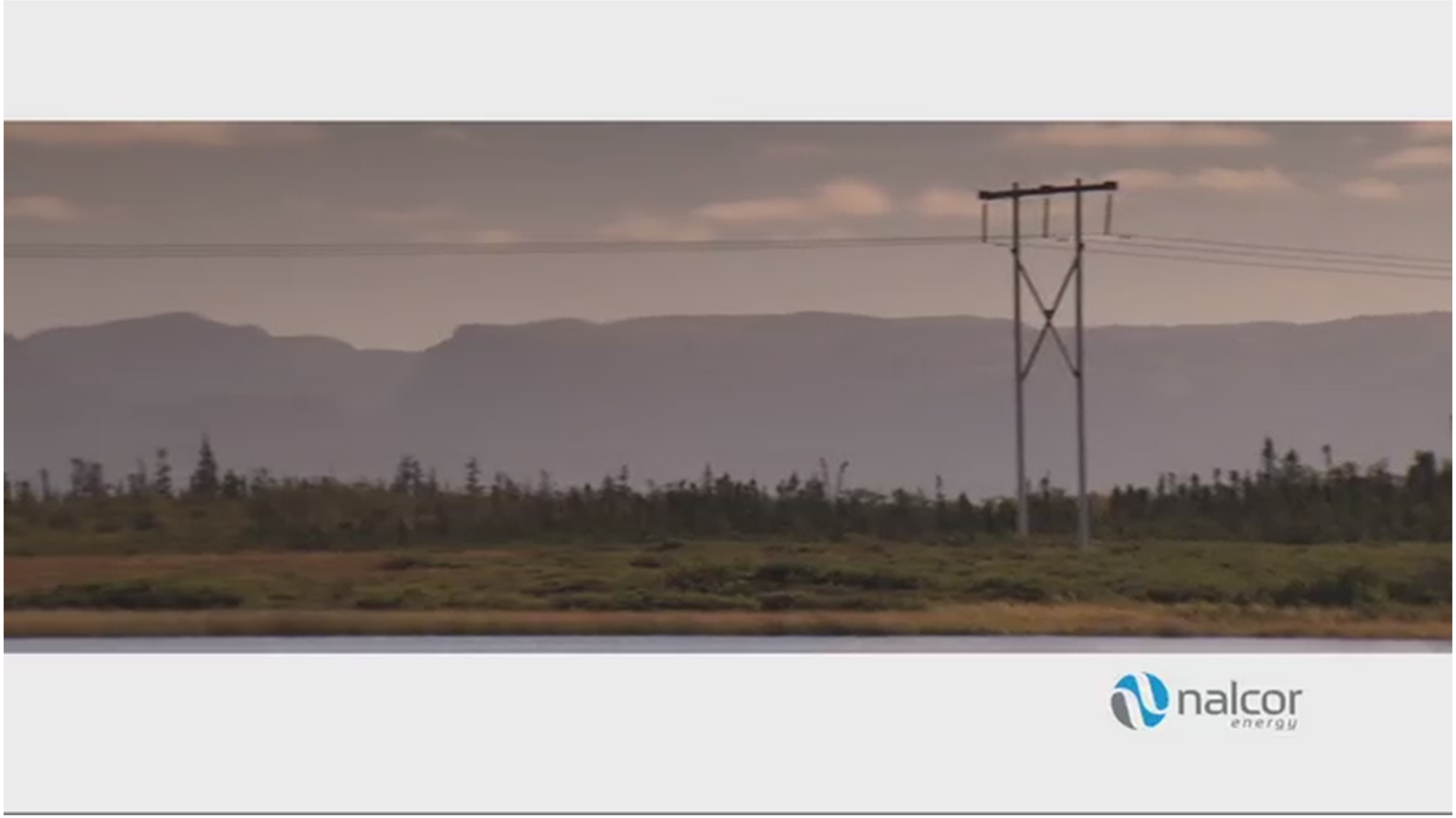
Project Definition Since DG2

Significant Engineering has been completed since Decision Gate 2

- Followed work plan established at DG2 with early engineering directed towards areas of uncertainty
  - ~400 FTEs employed
  - Currently >45% engineering and detailed design complete – 1000+ document & drawings issued
- Project scope and execution plan have been confirmed, thereby allowing:
  - well-informed decision at DG3
  - more accurate cost estimate
  - matured risk awareness
  - enhanced capital predictability

Project Definition – HVdc Transmission

HVdc Overview

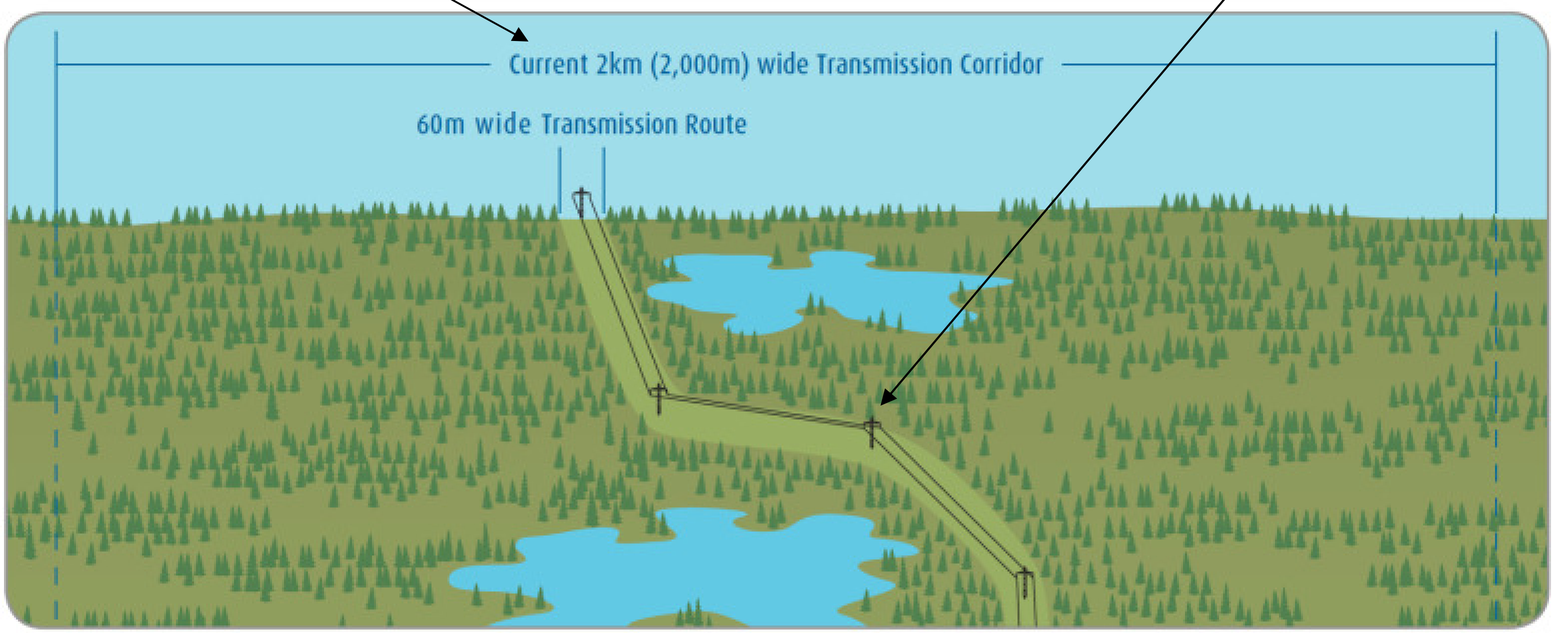


A Closer Look: HVdc Transmission

Significant engineering design development complete

DG2: Working with general knowledge of corridor only

Now: Individual tower locations selected

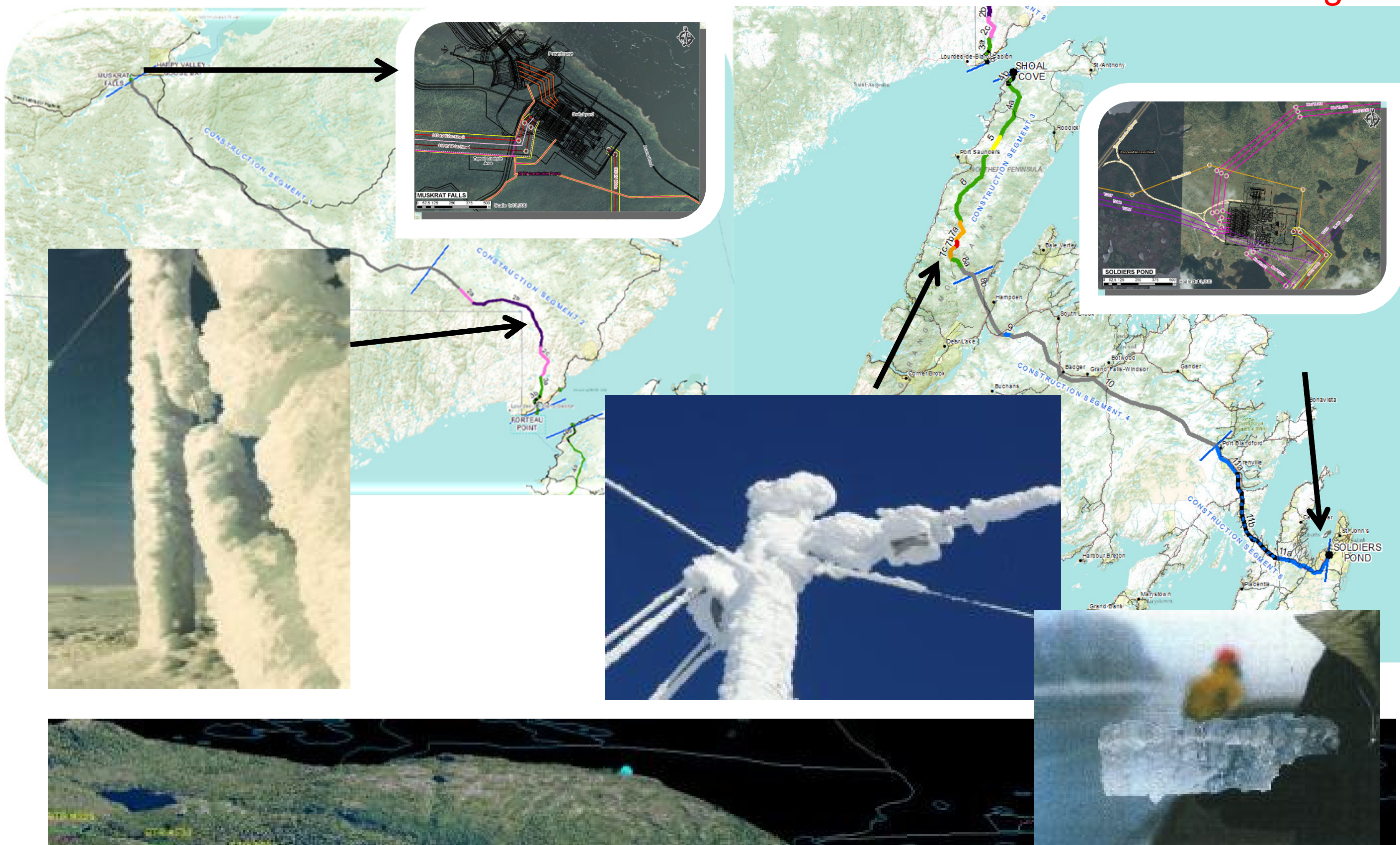


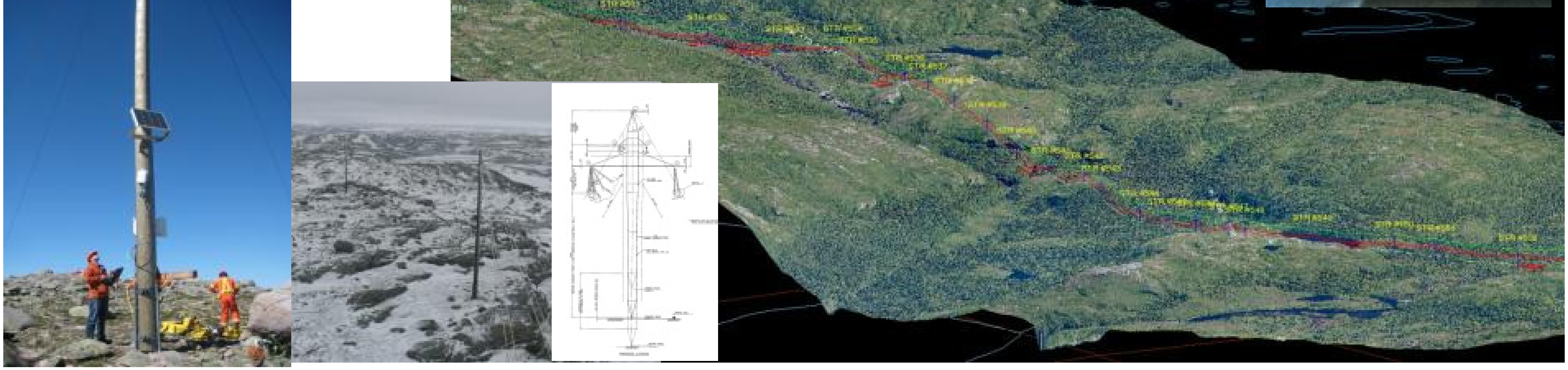
HVdc Engineering & Design Progress

Decision Gate 2	Decision Gate 3
• Preliminary 2 km wide transmission corridor selected and basic geotechnical data obtained • Generic tower configurations – not specific to our line • Used empirical formulae to estimate tower weighs and quantities due to lack of engineering analysis meaning incomplete tower design • Utilized typical Hydro transmission construction costs factored from analysis using 230 kV guyed-V tower construction during Avalon Upgrade • Typical 50/50 mix of materials vs. construction used to verify estimate • Data collection and analysis in progress • Conceptual execution plan • Preliminary conductor selection • Budgetary quotes for tower steel and conductor	• Lidar topography survey complete of corridor • Line routing within corridor complete • Individual tower locations selected • Harsh climatic conditions of southern Labrador and Long Range Mountains confirmed with meteorological data and / or modelling • 13 tower loading cases identified resulting in significant number of tower designs • Foundation designs in-progress • Conductor optimization and system stability studies complete • Detailed right-of-way (“ROW “) clearing plans in-place • Acquisition of property for marshalling yards underway • All line crossings and property easements identified • System tie-in points being designed • Insulator and tower hardware designs progressing • Multiple budgetary quotes for all material • Detailed construction plan in-place • Materials vs. construction balance shifted to approximately 30/70 from historical 50/50

Meteorological Conditions

- 3,650 towers
- 350,000 insulators
- 3,000,000 m of conductor
- 13 distinct wind and ice combination zones developed from multiple desktop report and existing network of test towers/ test spans
- 170 km of high alpine (Rime) ice and wind loading, 180 km heavy glaze ice
- 250 km of remote inaccessible line in central Labrador

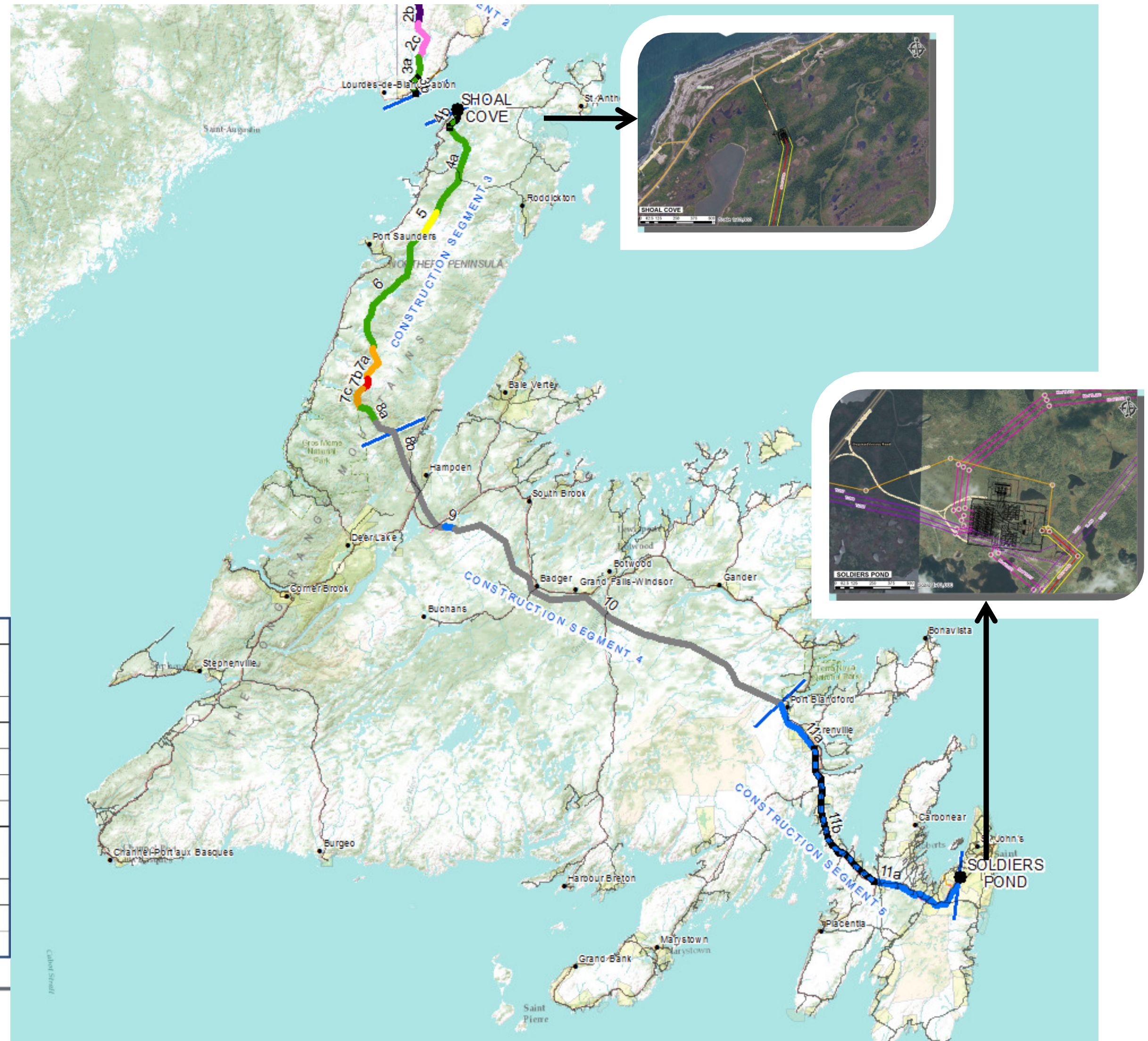


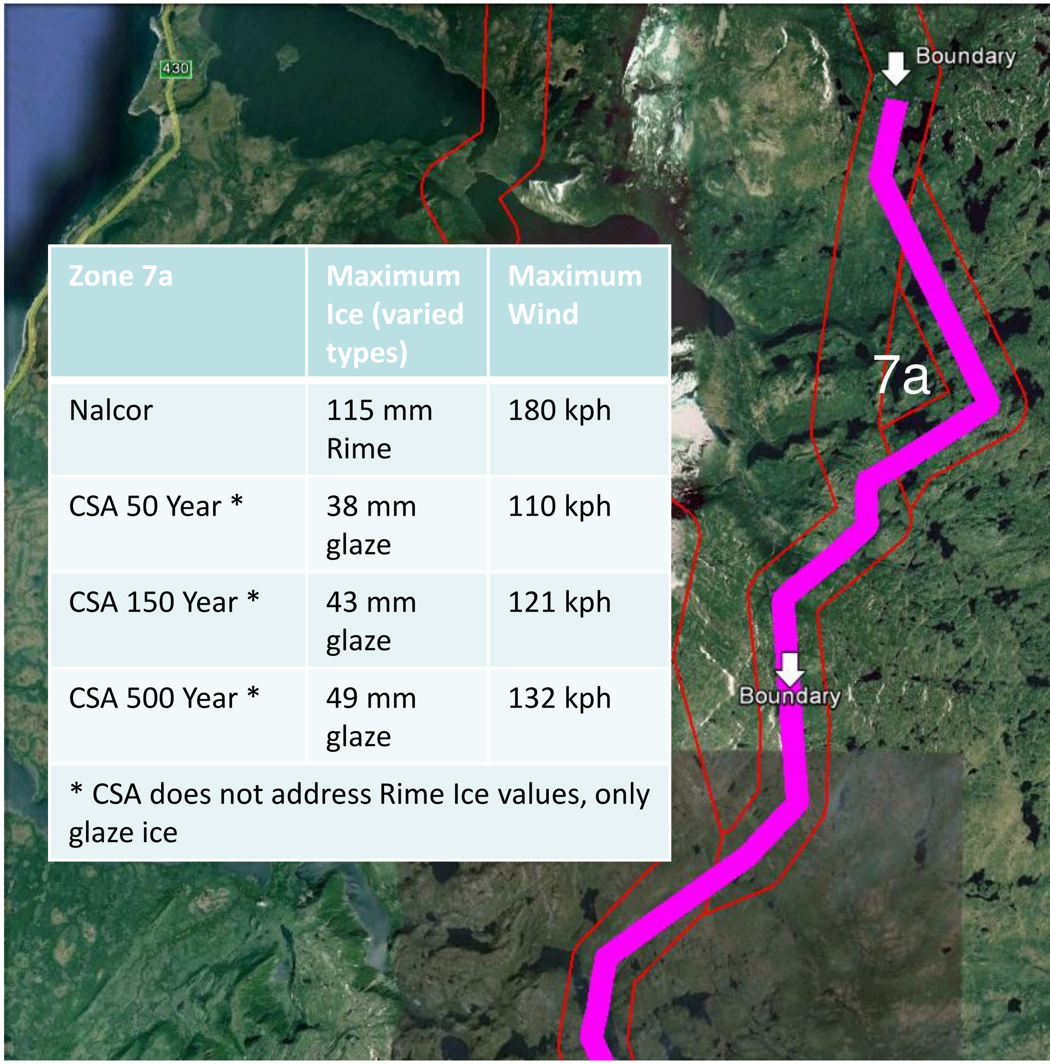


Island Meteorological Loading Cases

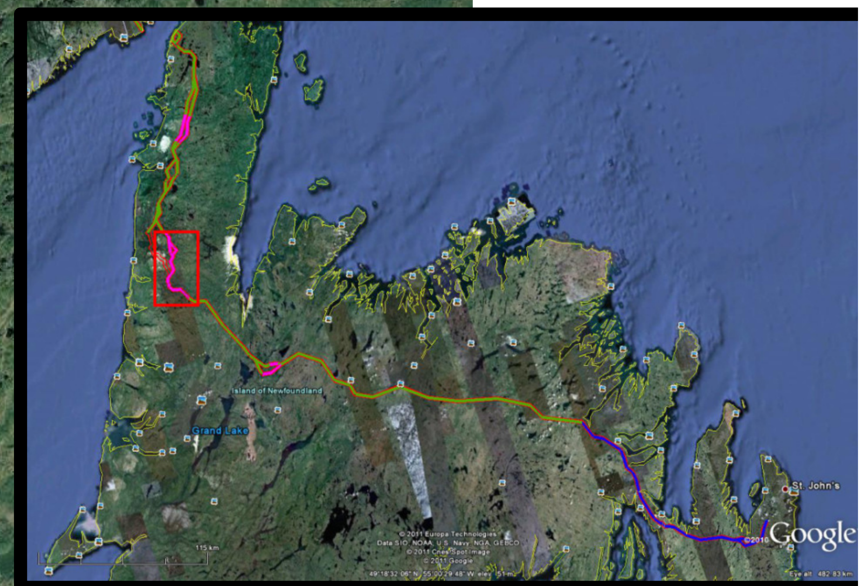
- 696 km from Shoal Cove to Soldiers Pond
- Long Range Mountains
- Avalon higher population density, more existing infrastructure
- 13 Meteorological loading cases (135mm Rime Ice and 180 km/h winds)

Newfoundland	③	4b	Average Zone 2	12.5	50	Glaze	120	N	Coastal	40	F10
		4a	Average Zone 2	56.4	50	Glaze	120	N	Inland	300	F5
		5	HOSJ High Alpine	18.9	115	Rime	150	N	Inland	500	F12
		6	Average Zone 2	72.6	50	Glaze	120	N	Inland	480	F5
		7a	LRM High Alpine	21.1	115	Rime	180	N	Inland	590	F9
		7b	LRM Extreme Alpine	7.1	135	Rime	180	N	Inland	630	F6
		7c	LRM High Alpine	12.8	115	Rime	180	N	Inland	600	F9
		8a	Average Zone 2	12.9	50	Glaze	120	N	Inland	550	F5
	④	8b	Average Zone 1	74.9	50	Glaze	105	N	Inland	490	F4
		9	Alpine	7.8	75	Glaze	130	N	Inland	430	F7
		10	Average Zone 1	221.0	50	Glaze	105	N	Inland	360	F4
	⑤	11a	Eastern Zone	89.4	75	Glaze	130	N	Inland	280	F7
		11b	Eastern Zone	88.8	75	Glaze	130	N	Coastal	210	F8





Zone 7a	Maximum Ice (varied types)	Maximum Wind
Nalcor	115 mm Rime	180 kph
CSA 50 Year *	38 mm glaze	110 kph
CSA 150 Year *	43 mm glaze	121 kph
CSA 500 Year *	49 mm glaze	132 kph
* CSA does not address Rime Ice values, only glaze ice		



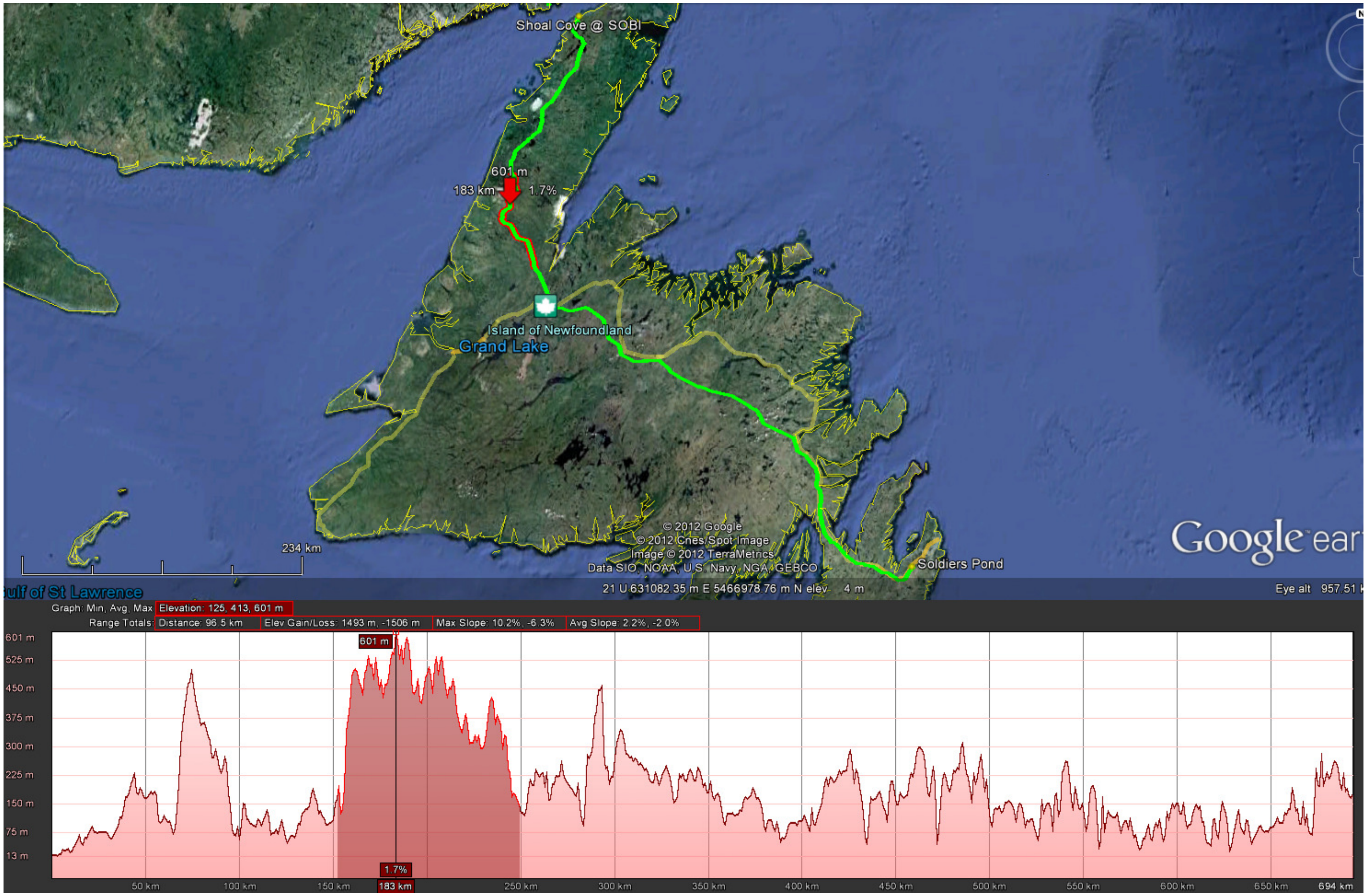
Zone 7a – Long Range Mountains Crossing

High Alpine Meteorological Loading Zone (Eastern Corridor Alternative Only)

Maximum Ice: 115 mm (Rime), Maximum Wind: 180 km/h, Combined Ice and Wind: 60 mm (Rime) and 125 km/h

Detailed Topography Mapped

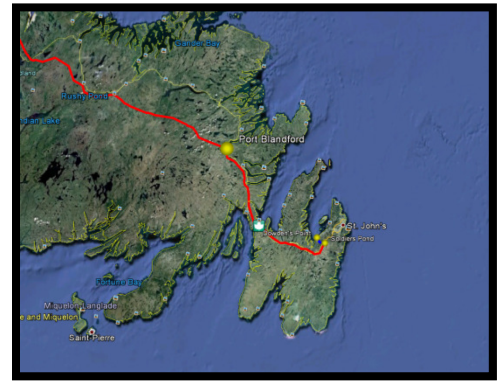
Significant Elevation Change in Long Range Mtns



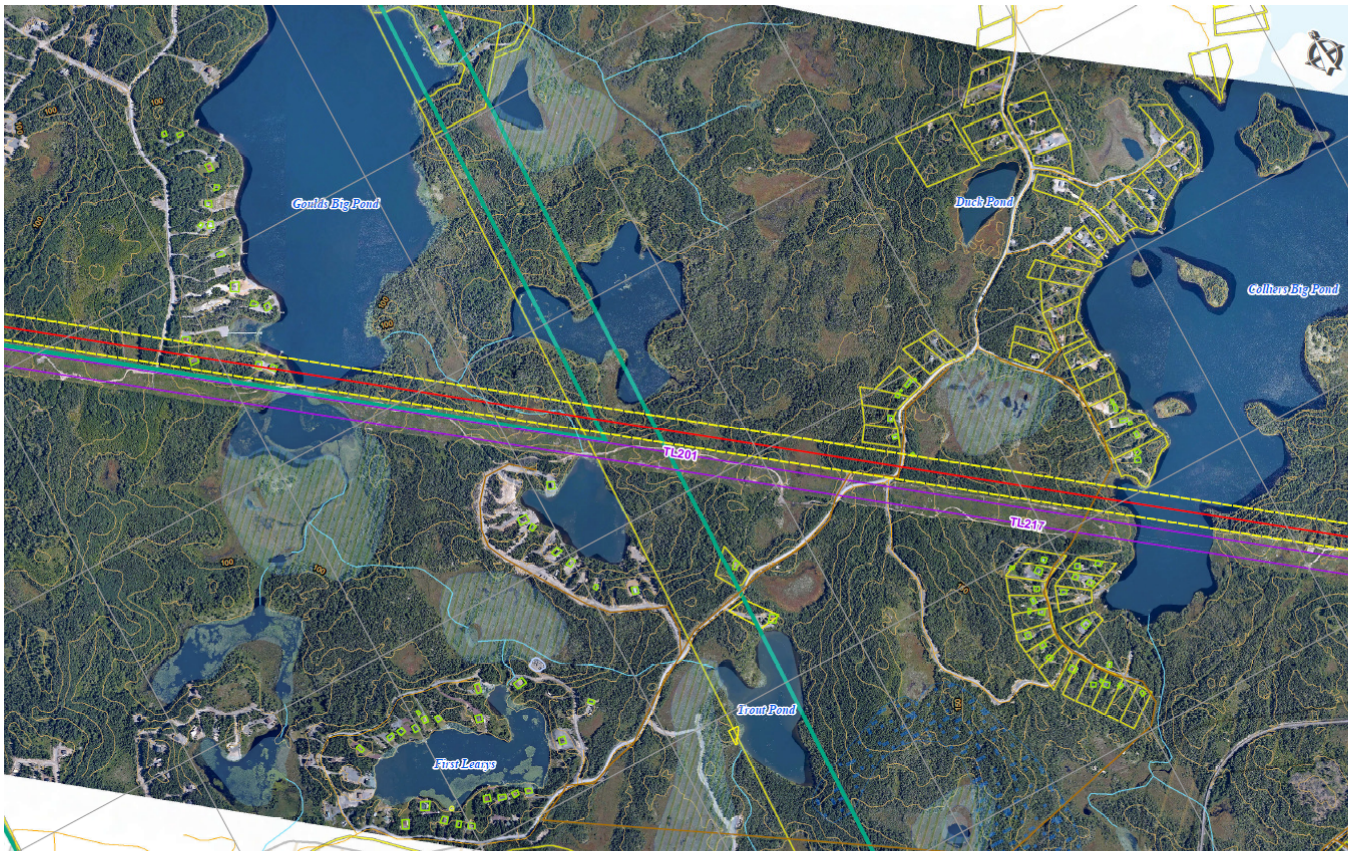
Elevation ranges from 0m to 630m above Mean Sea Level (MSL)

Lidar Terrain Mapping

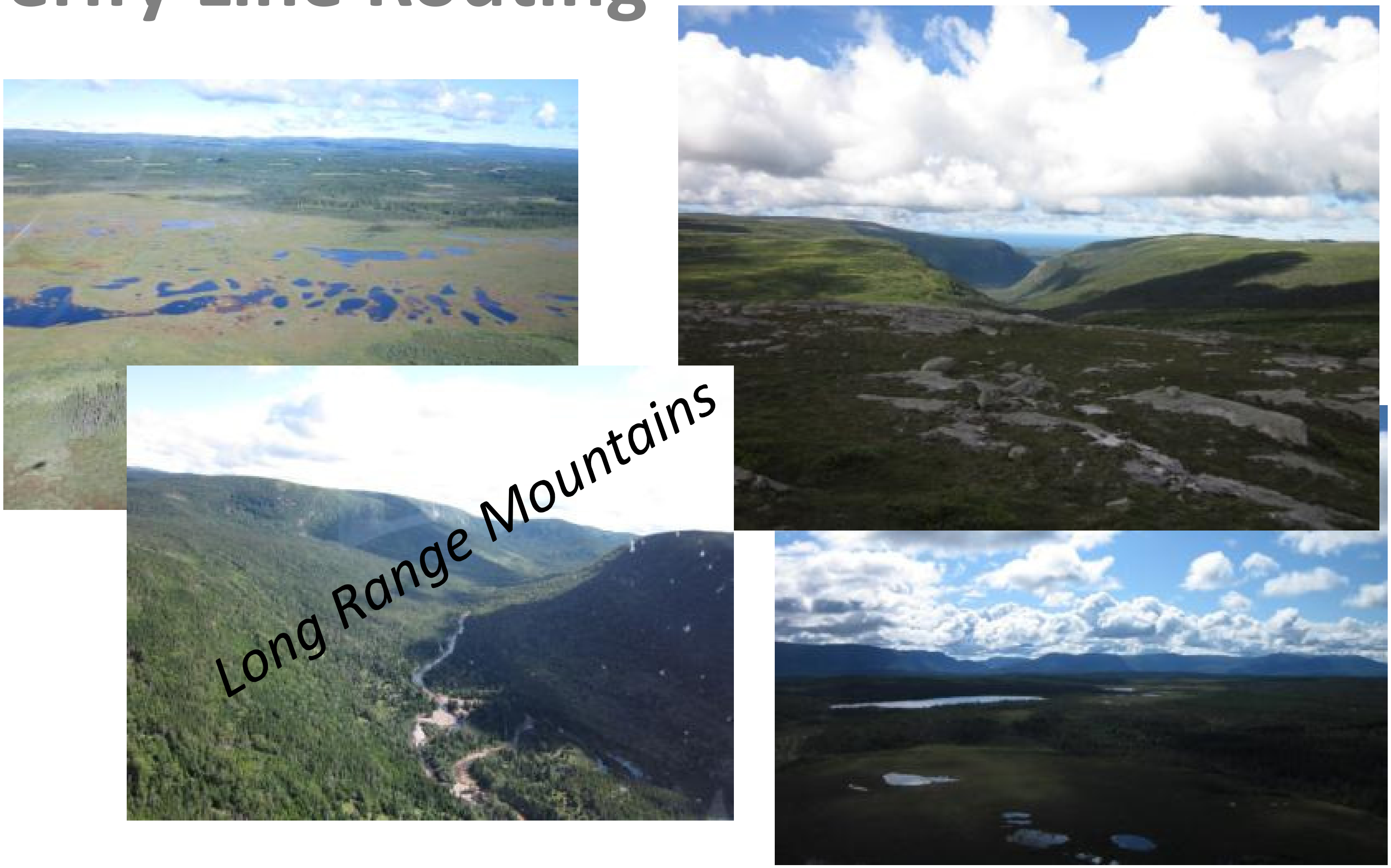
(Lidar = Aircraft based remote sensing technology to detect terrain conditions)



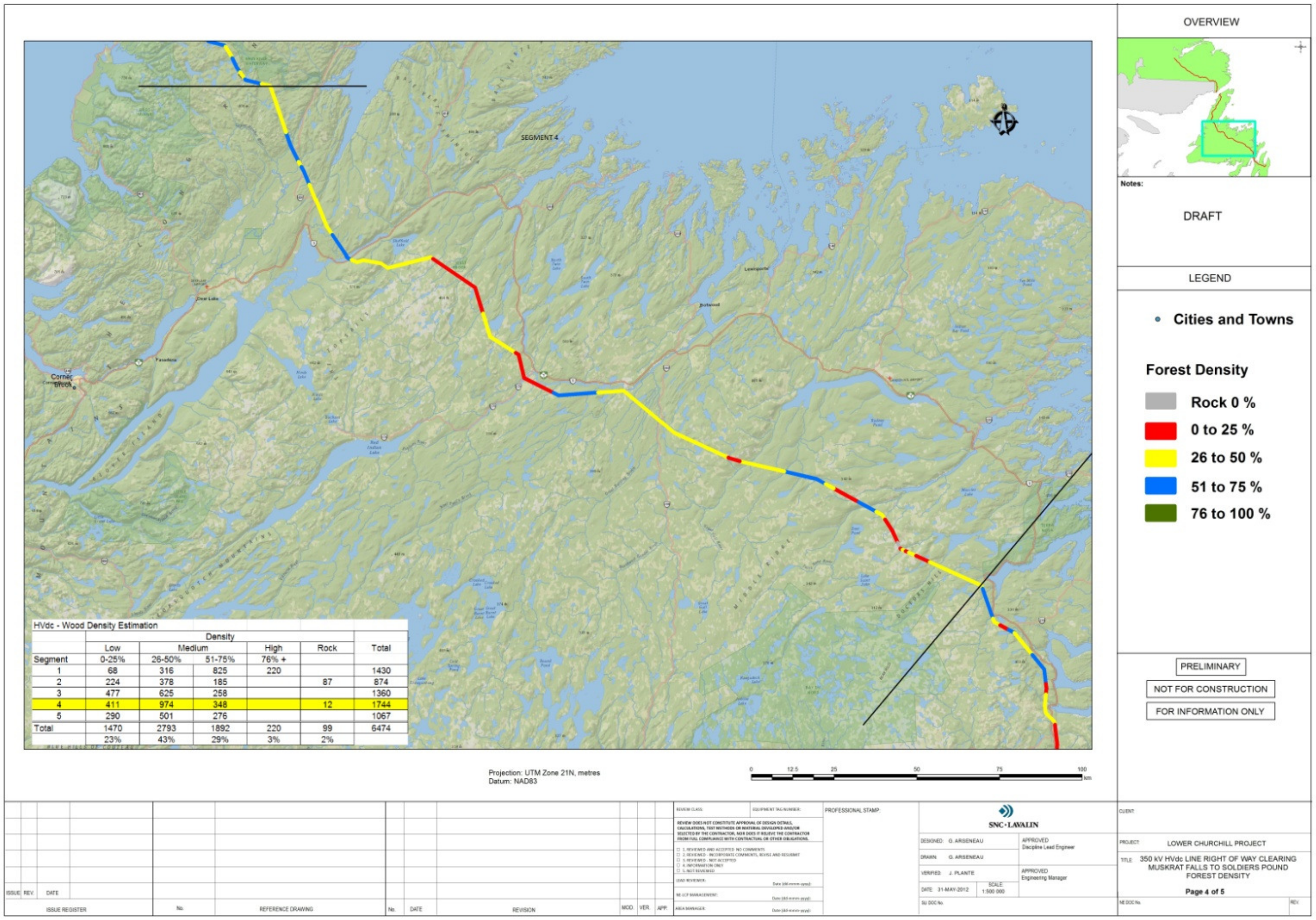
Avalon - Starting at Port Blandford, higher population density, more infrastructure and land use constraints



Field Assessment of Terrain to Verify Line Routing



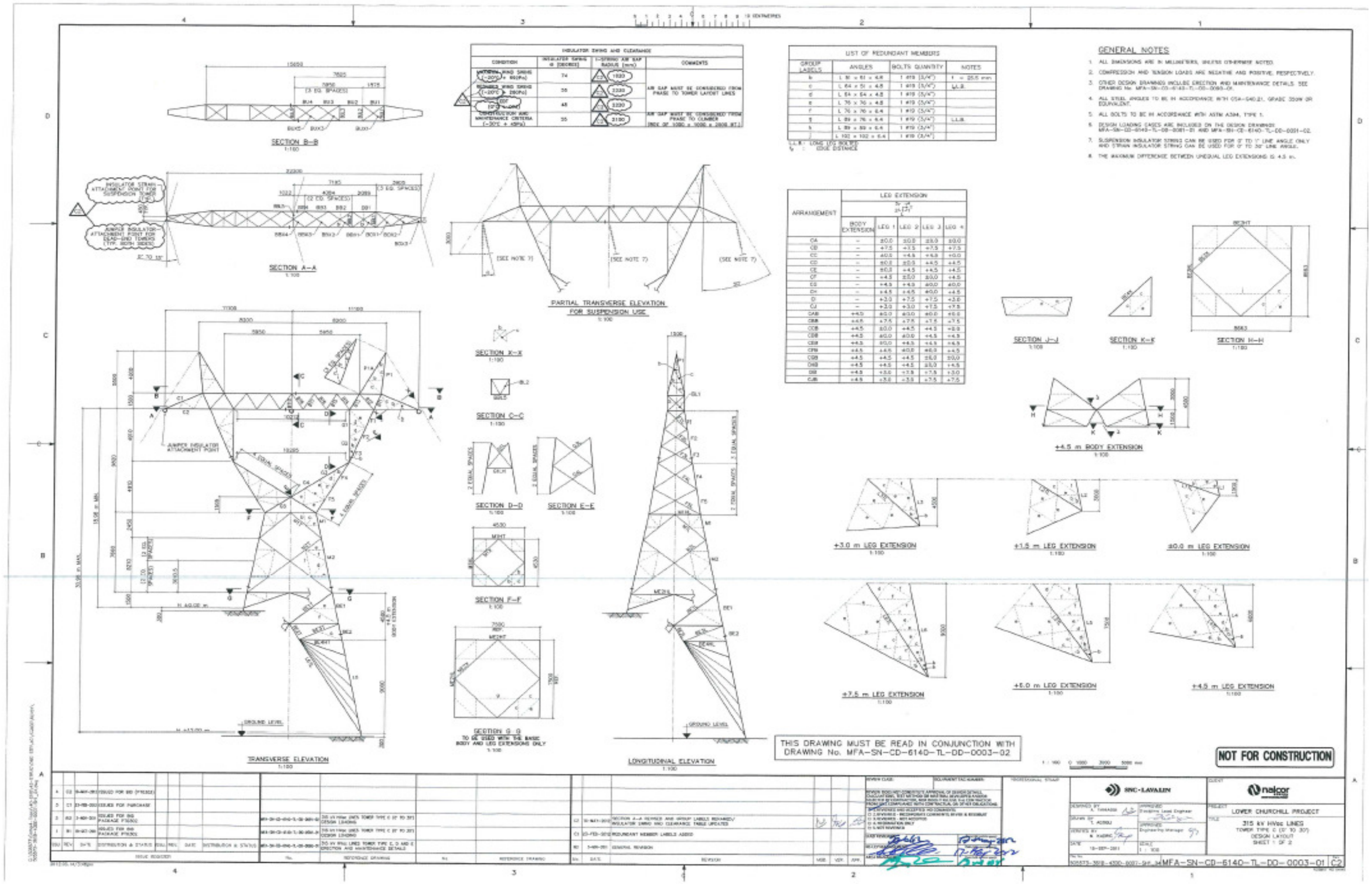
Lidar Leveraged for ROW Clearing Studies



HVdc - Wood Density Estimation

	Density					
	Low	Medium		High	Rock	Total
Segment	0-25%	26-50%	51-75%	76% +		
1	68	316	825	220		1430
2	224	378	185		87	874
3	477	625	258			1360
4	411	974	348		12	1744
5	290	501	276			1067
Total	1470	2793	1892	220	99	6474
	23%	43%	29%	3%	2%	

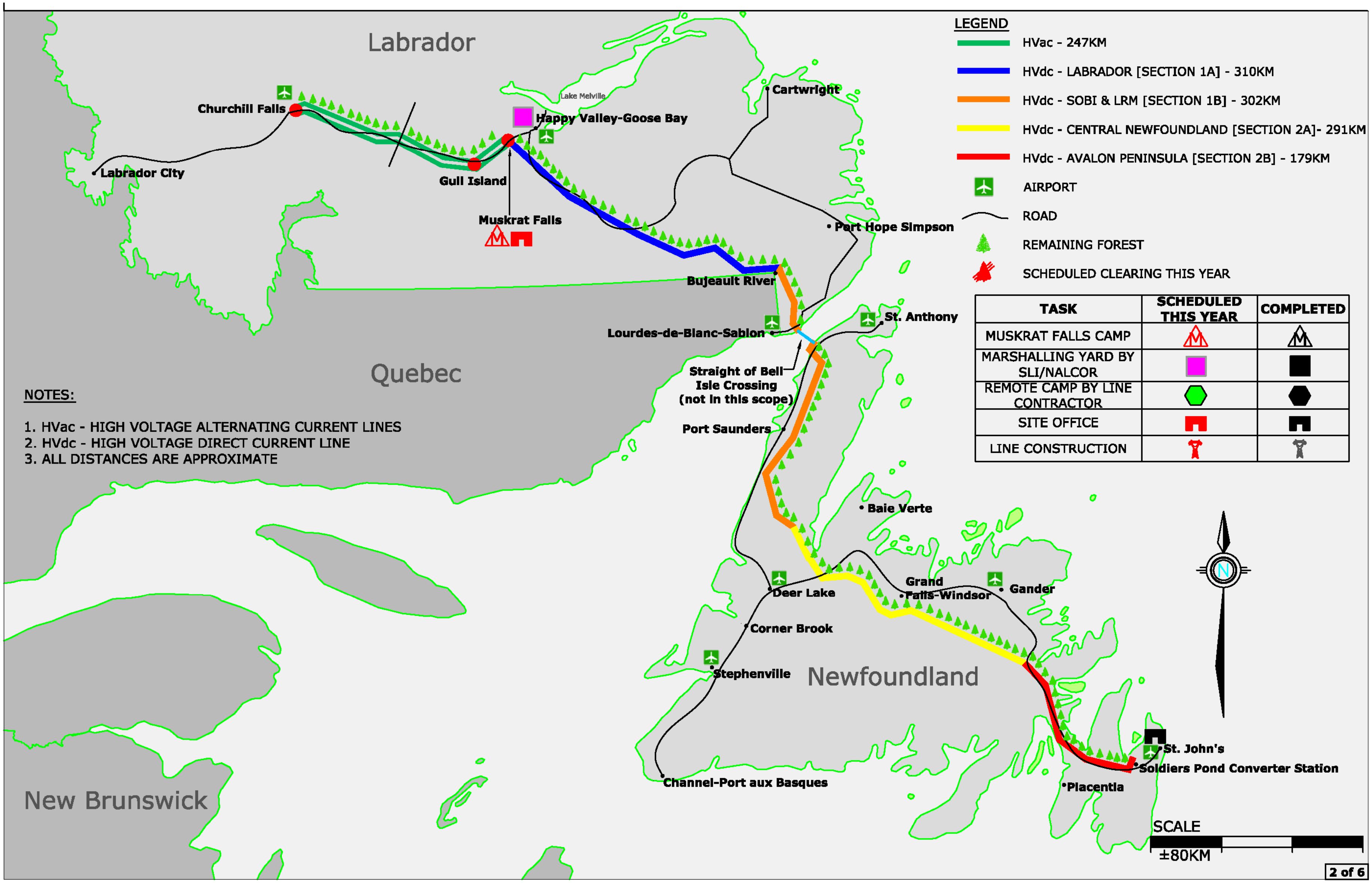
Resultant Information used in Tower Design



HVdc and HVac Transmission Construction Sequence

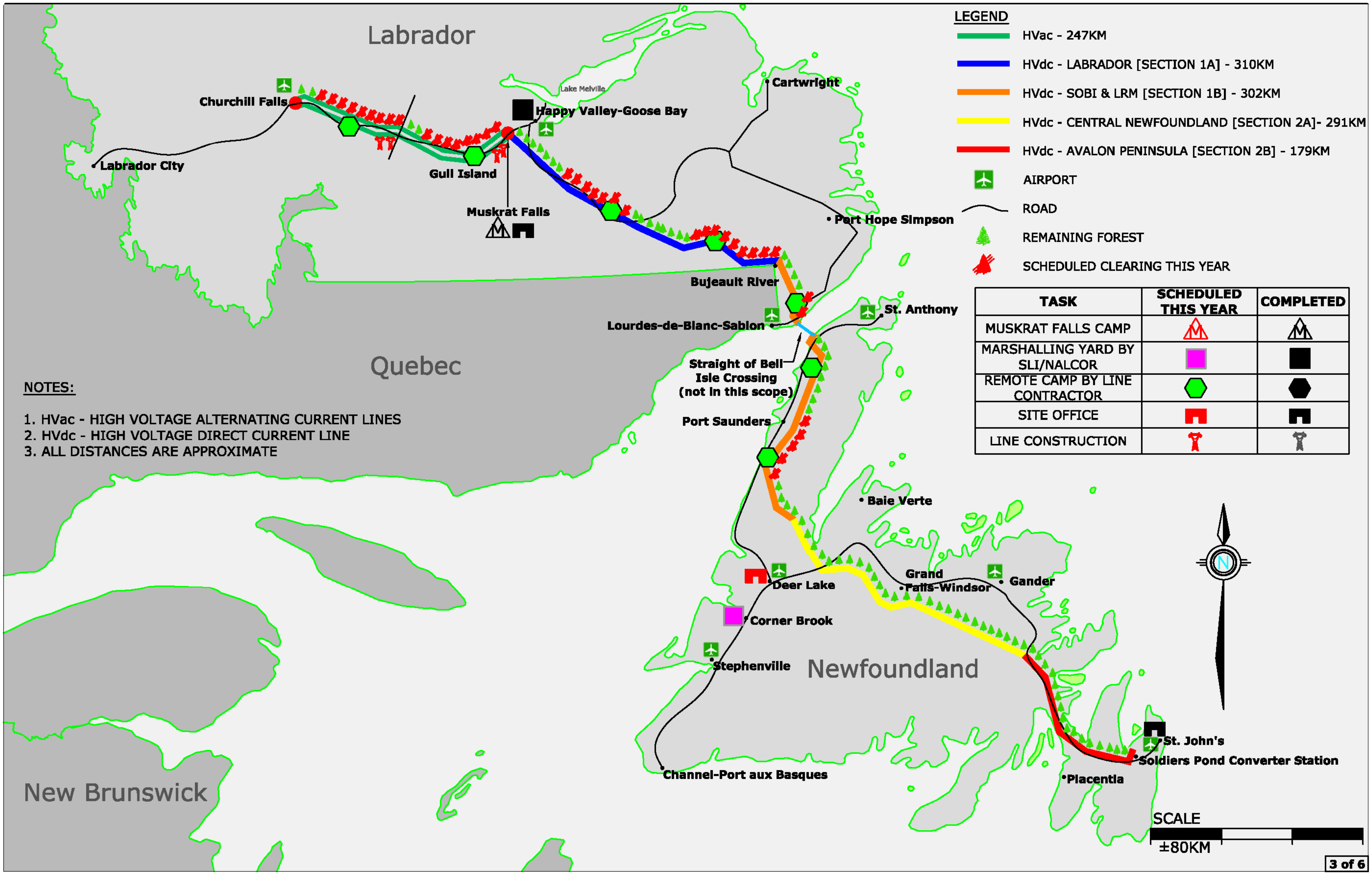
Construction Build Sequence – 2012

Establish Infrastructure in Labrador



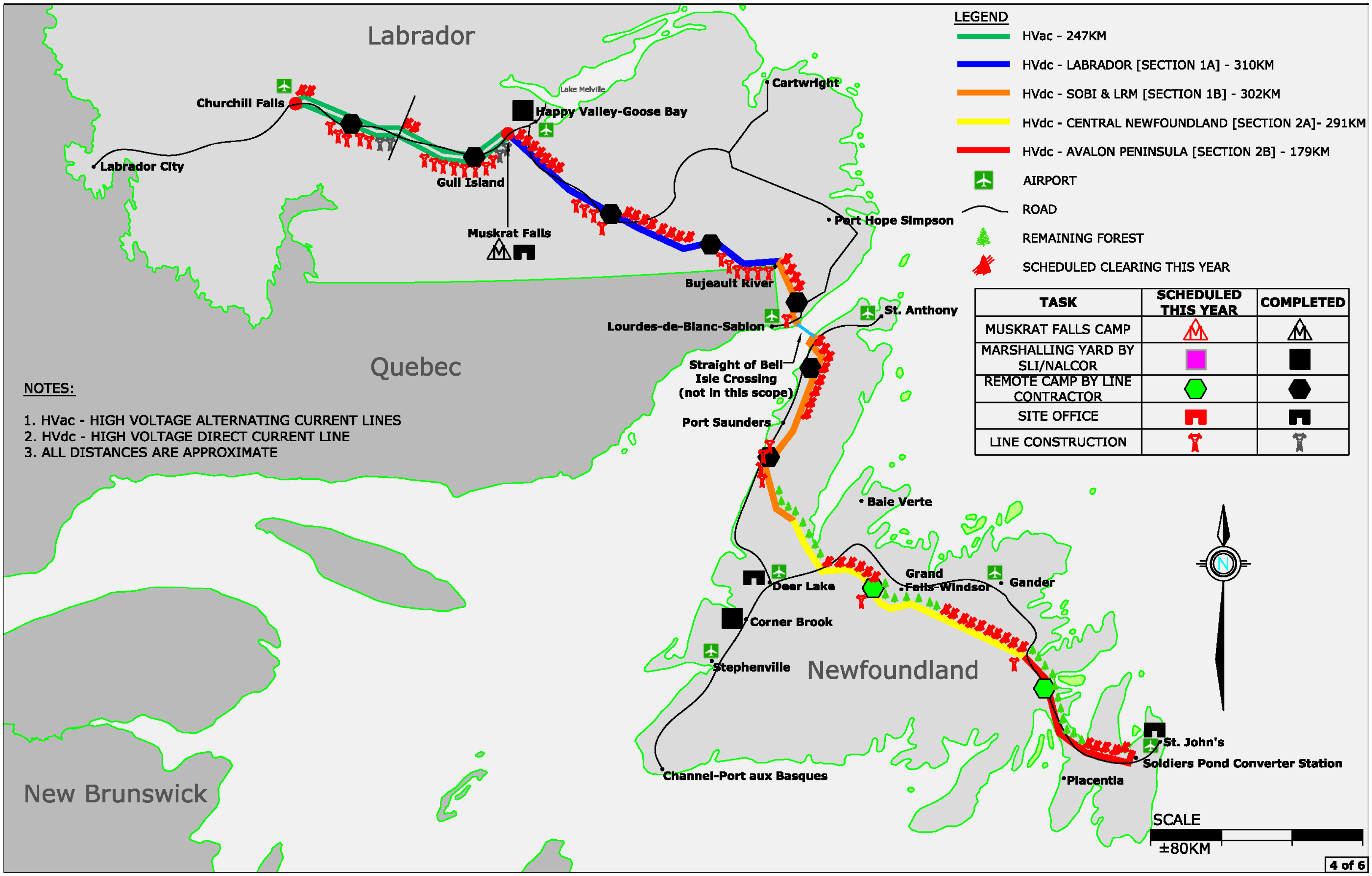
Construction Build Sequence – 2013

HVac ROW Clearing Well Advanced



Construction Build Sequence – 2014

Remote Access Get First Priority



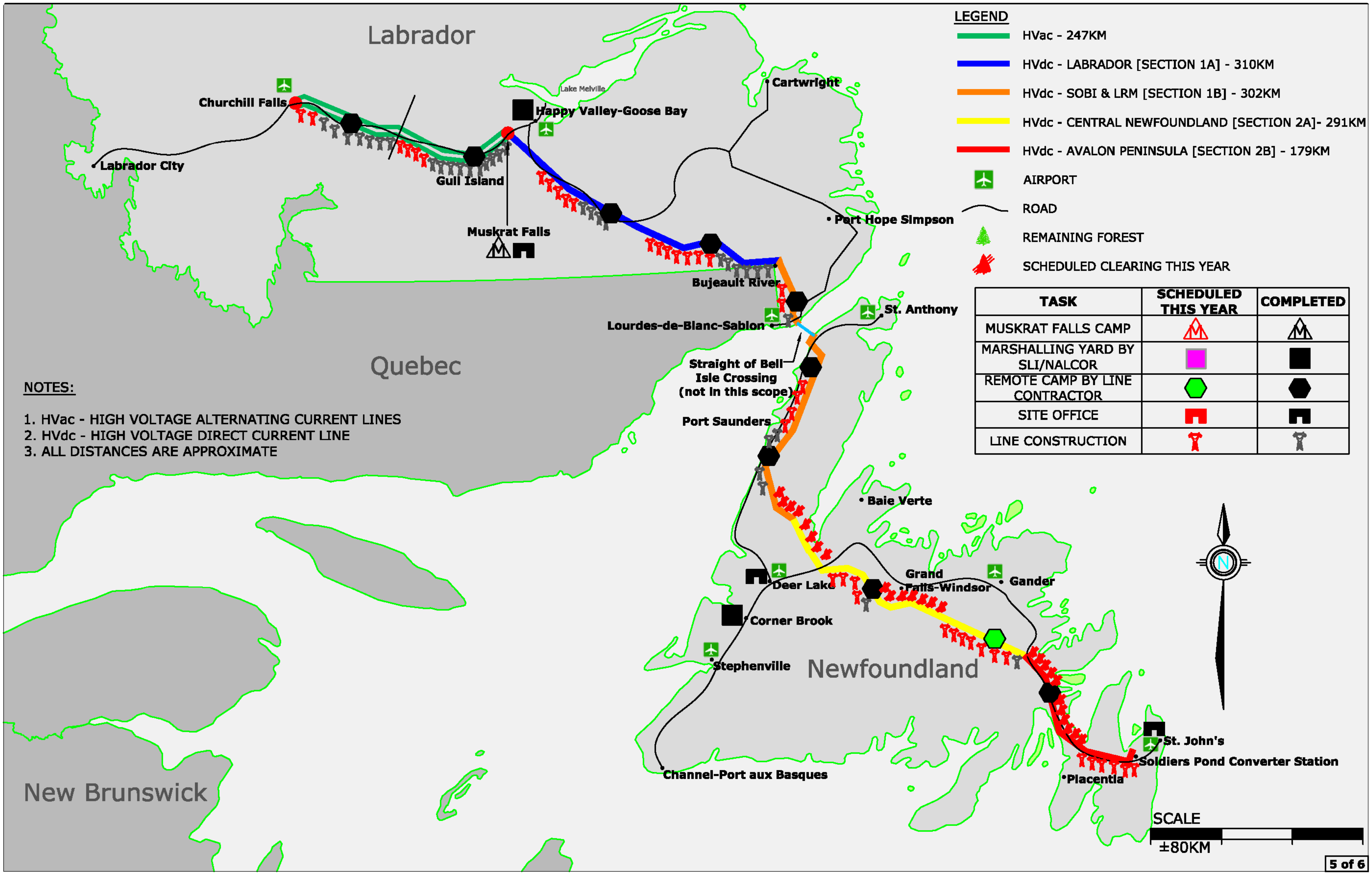
TASK	SCHEDULED THIS YEAR	COMPLETED
MUSKRAT FALLS CAMP		
MARSHALLING YARD BY SLI/NALCOR		
REMOTE CAMP BY LINE CONTRACTOR		
SITE OFFICE		
LINE CONSTRUCTION		

NOTES:

1. HVac - HIGH VOLTAGE ALTERNATING CURRENT LINES
2. HVdc - HIGH VOLTAGE DIRECT CURRENT LINE
3. ALL DISTANCES ARE APPROXIMATE

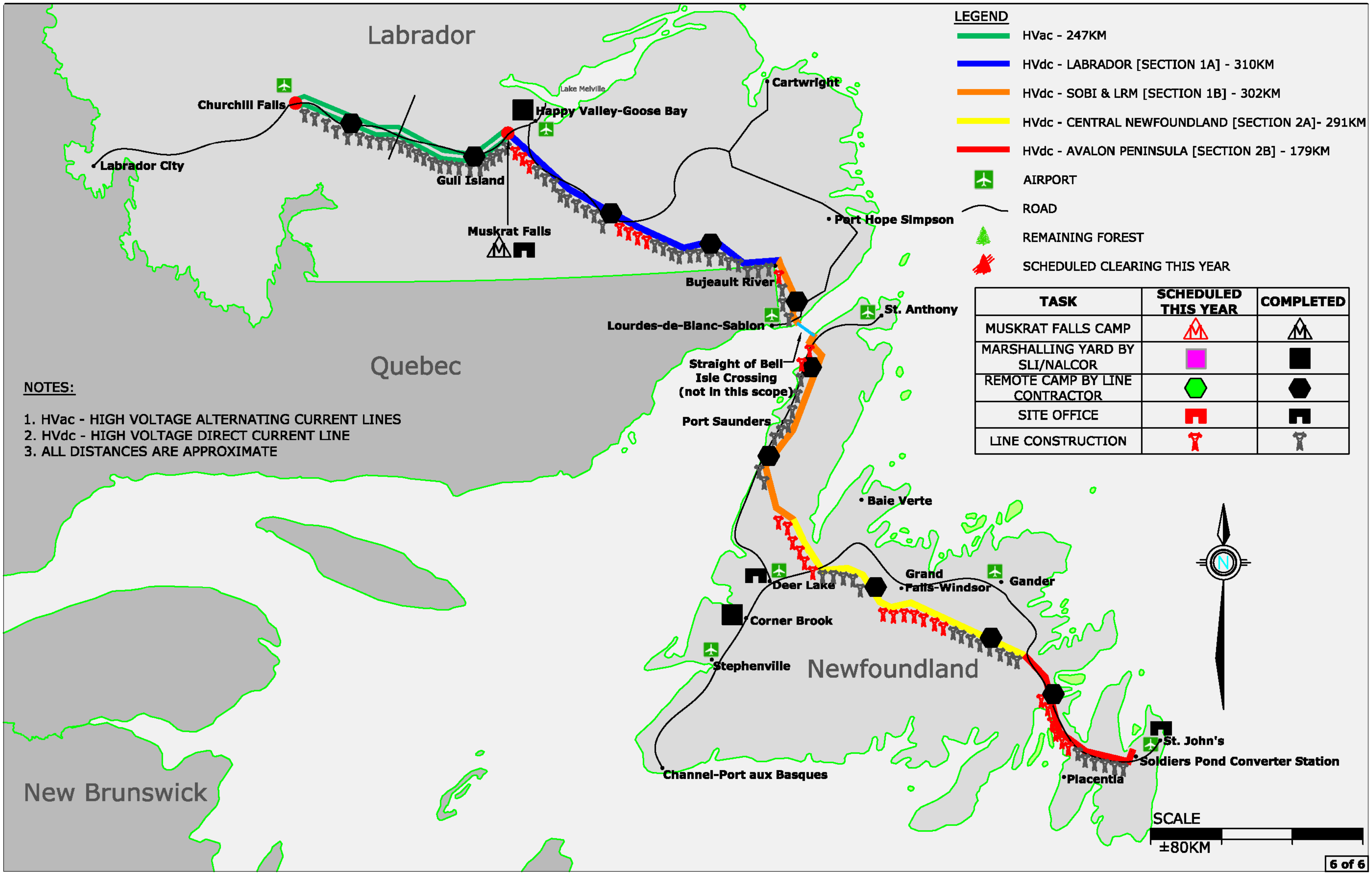
Construction Build Sequence – 2015

HVac Construction is completed



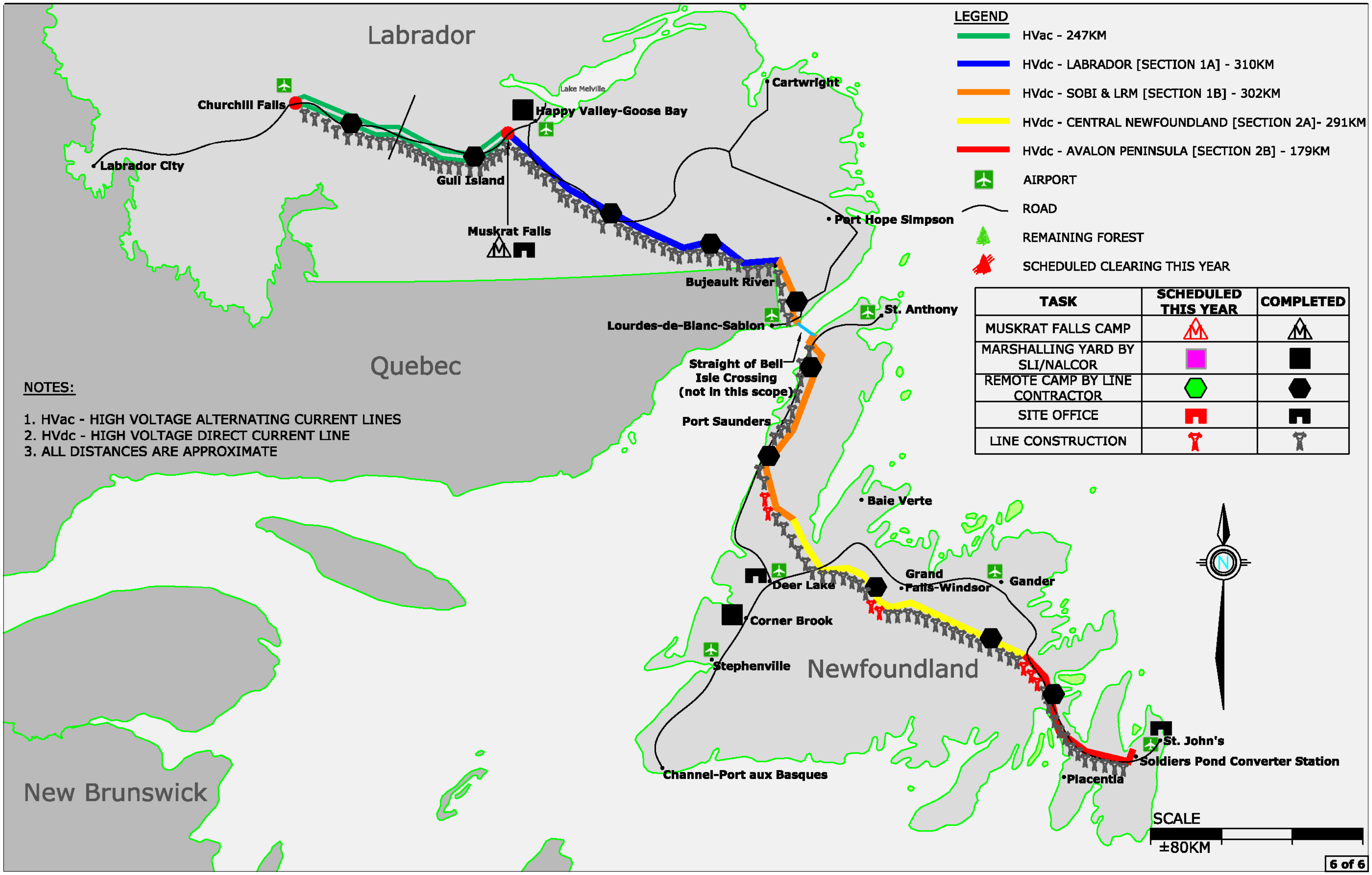
Construction Build Sequence – 2016

HVdc Construction is substantially complete



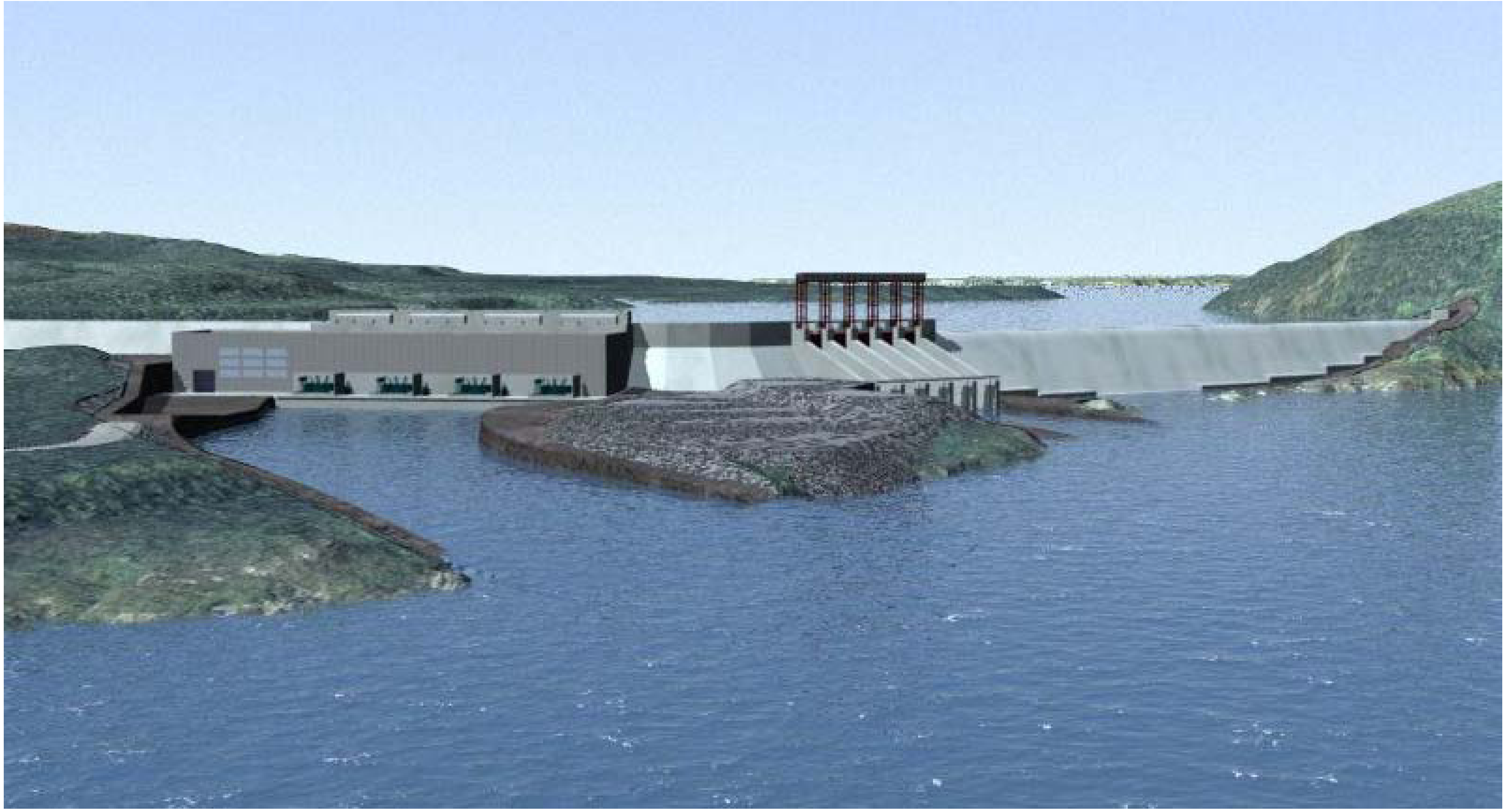
Construction Build Sequence – 2017

Winter reserved for final completion

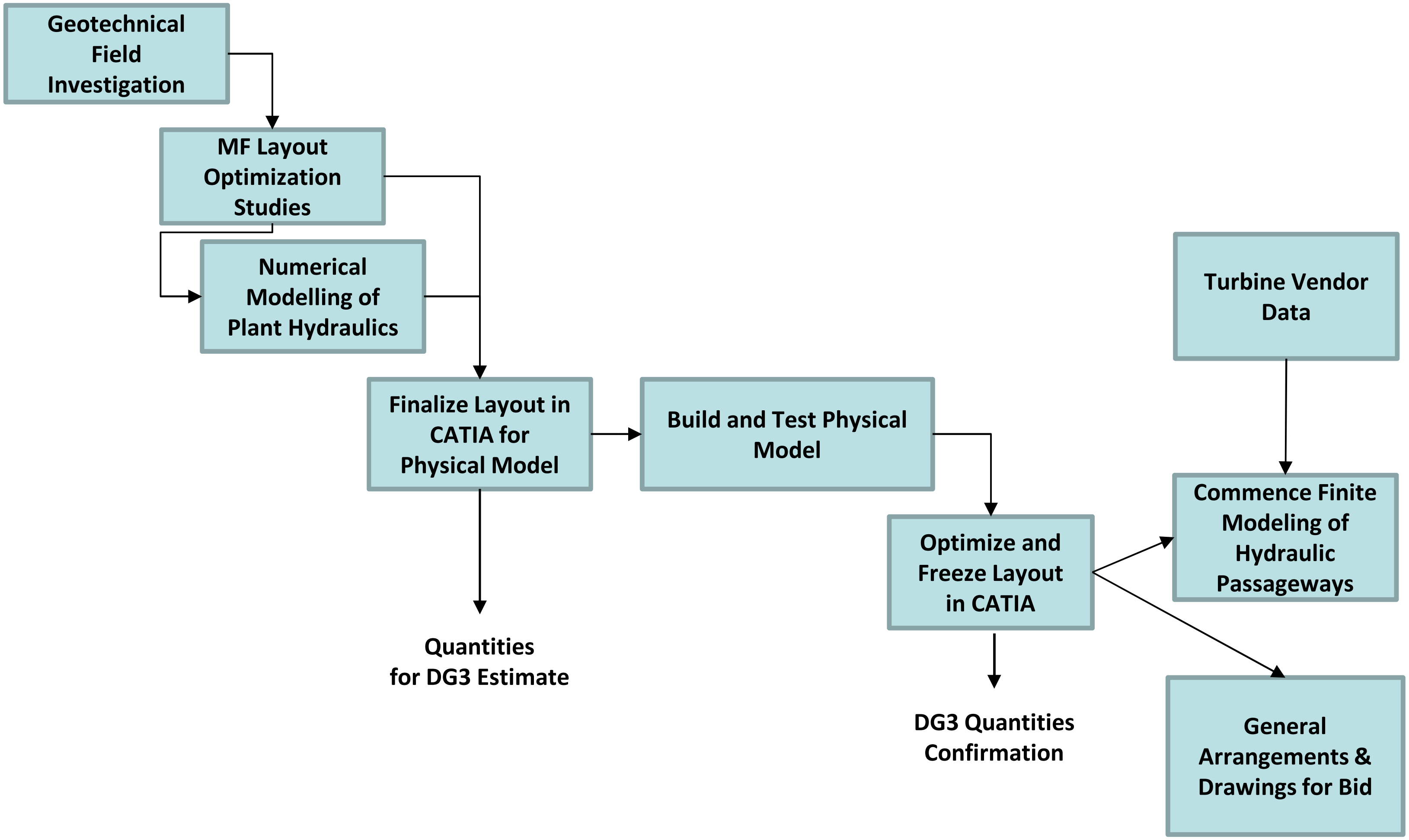


Project Definition – Muskrat Falls

Muskrat Falls (as Currently Envisioned)



Completed Muskrat Falls Engineering Work Plan



MF Engineering & Planning Progress

Decision Gate 2

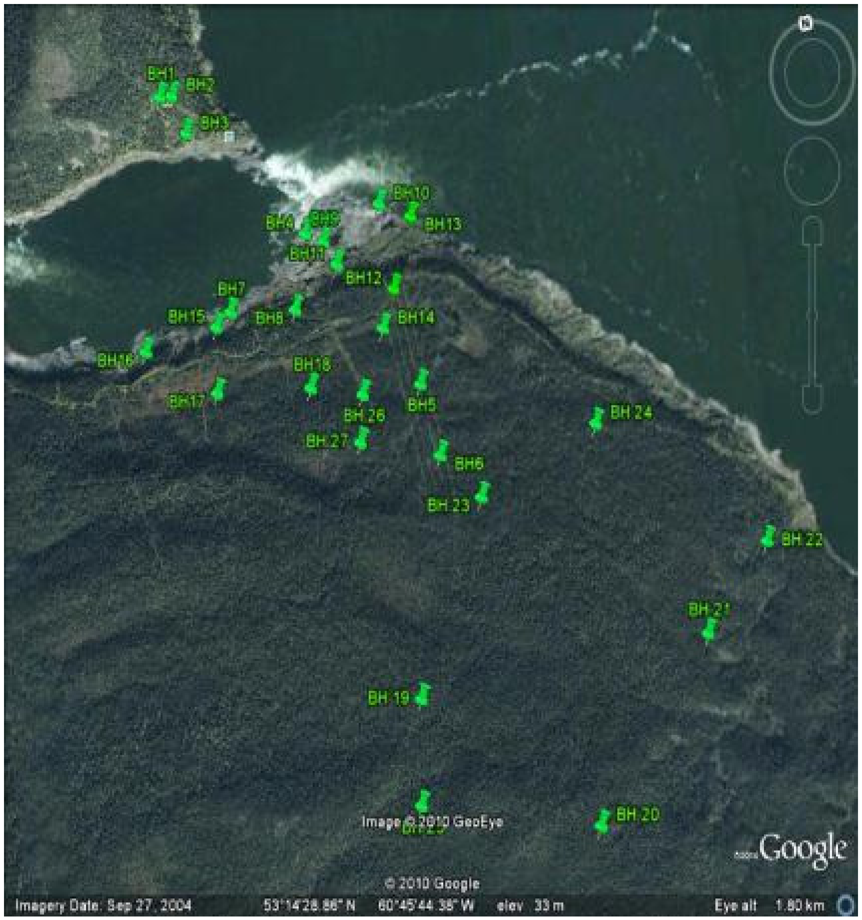
- Desktop studies complete based upon early field work to confirm development variant
- Quantities calculated using 1998 feasibility studies
- River and ice management studies underway
- 1998 geotechnical investigations
- Leverage Gull Island studies for infrastructure works

Decision Gate 3

- Numerical modeling of hydraulic passages completed
- Geotechnical investigations for powerhouse completed
- Site layout optimized to ensure operational reliability and long-term asset integrity
- All structures modeled in CATIA 3D to produce quantities of rock excavation and concrete
- Scaled physical model testing completed to verify layout and various river management operations (e.g., temporary diversion)
- Turbine efficiency model testing completed and incorporated into contractual commitments
- Detailed constructability optimizations completed / underway
- Turbine & Generator contract has been awarded
- Engineering completed for infrastructure works

Geotechnical Investigations Confirm Sub-Surface Conditions

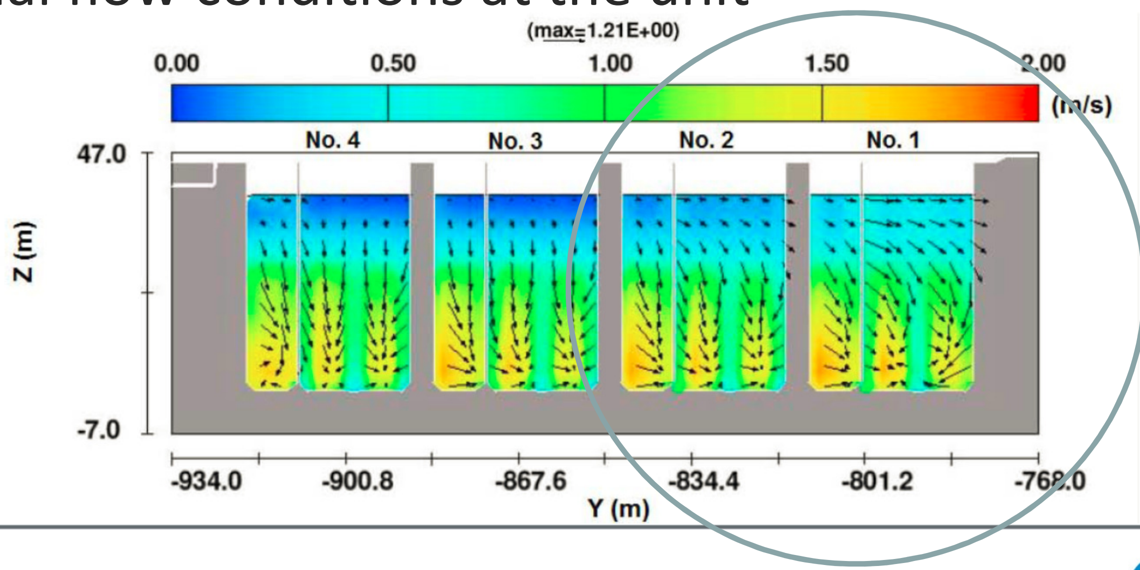
Borehole Locations at Muskrat Falls



Borehole Operations at Muskrat Falls

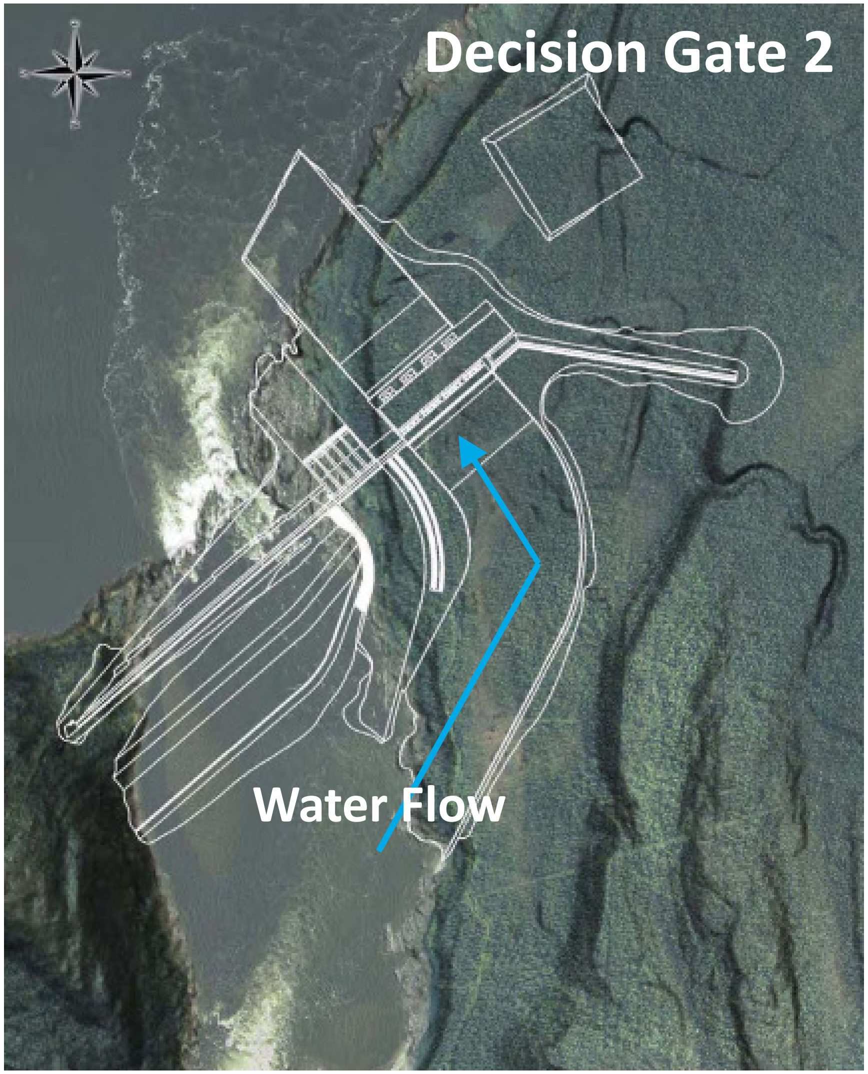
Numerical Modeling Identified Potential Operational Integrity Issues

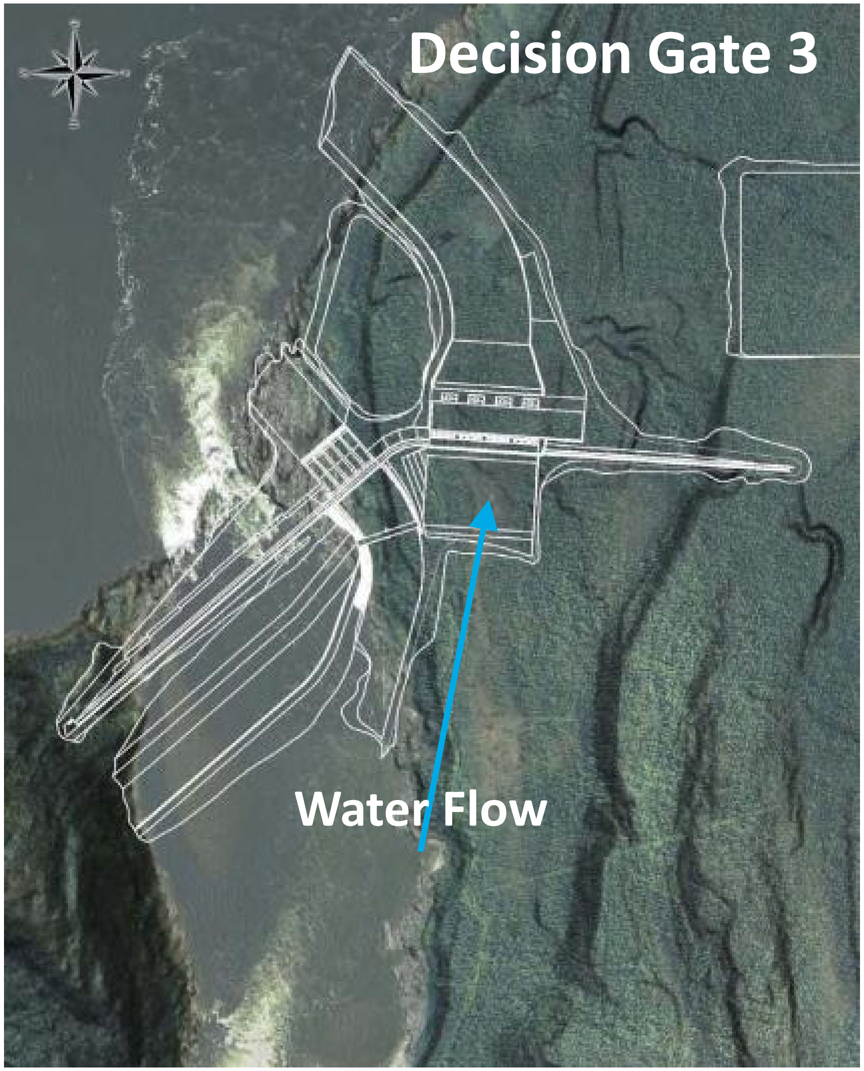
- Hydraulic conditions near the surface upstream of the intake indicated the presence of eddies and flow velocity parallel to the intake at Unit 1 (at the top of the graph)
- These conditions indicate a potential problem at this unit, including the possibility of a vortex, increase of head losses at the intake or non-optimal flow conditions at the unit



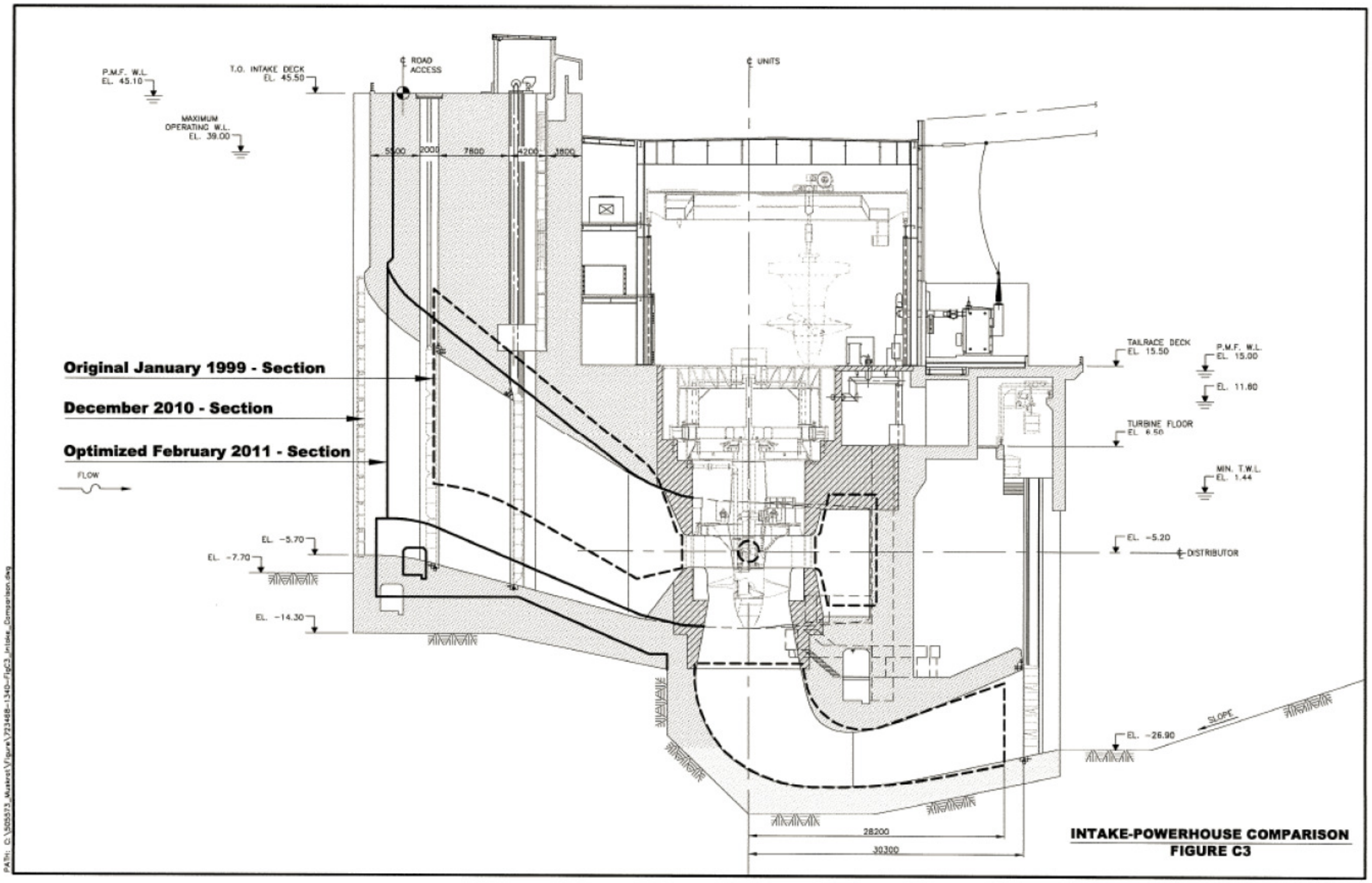
Arrows show non laminar flow patterns at Units 1 and to a lessor degree at Unit 2

Solution: Plant Reorientation by 30º

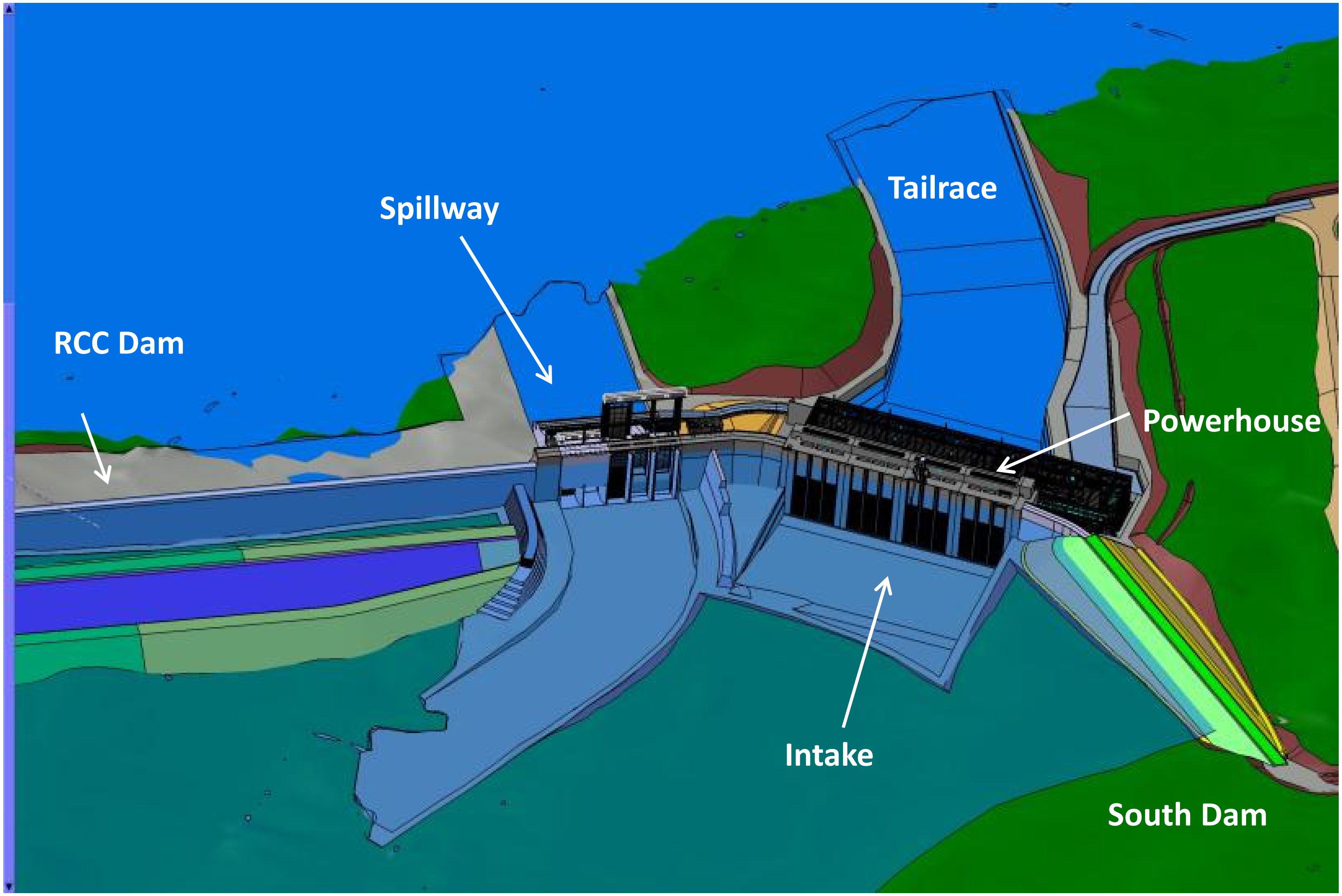




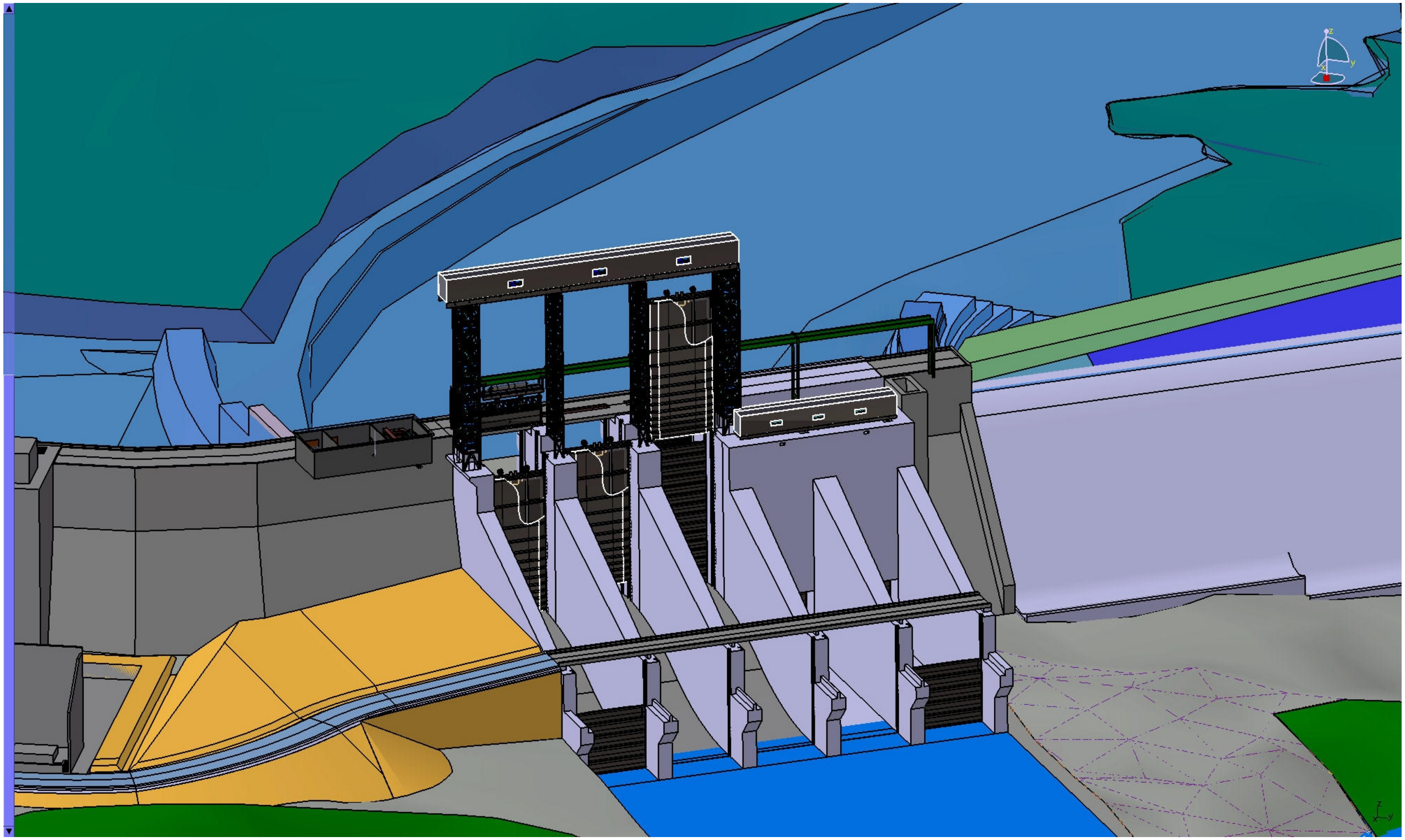
Intake/PH Stability Analysis



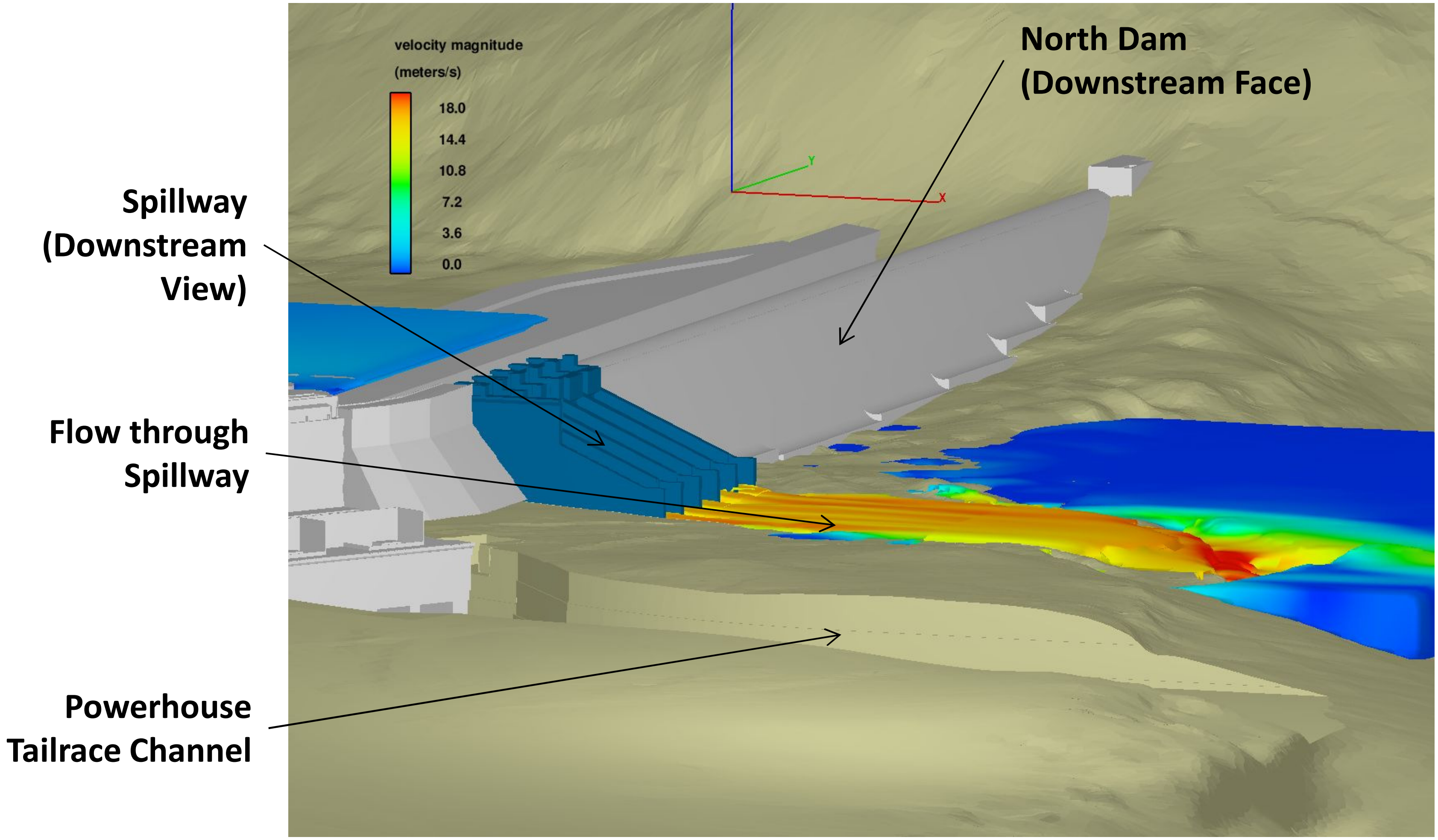
Revised Layout Designed in 3D CAD



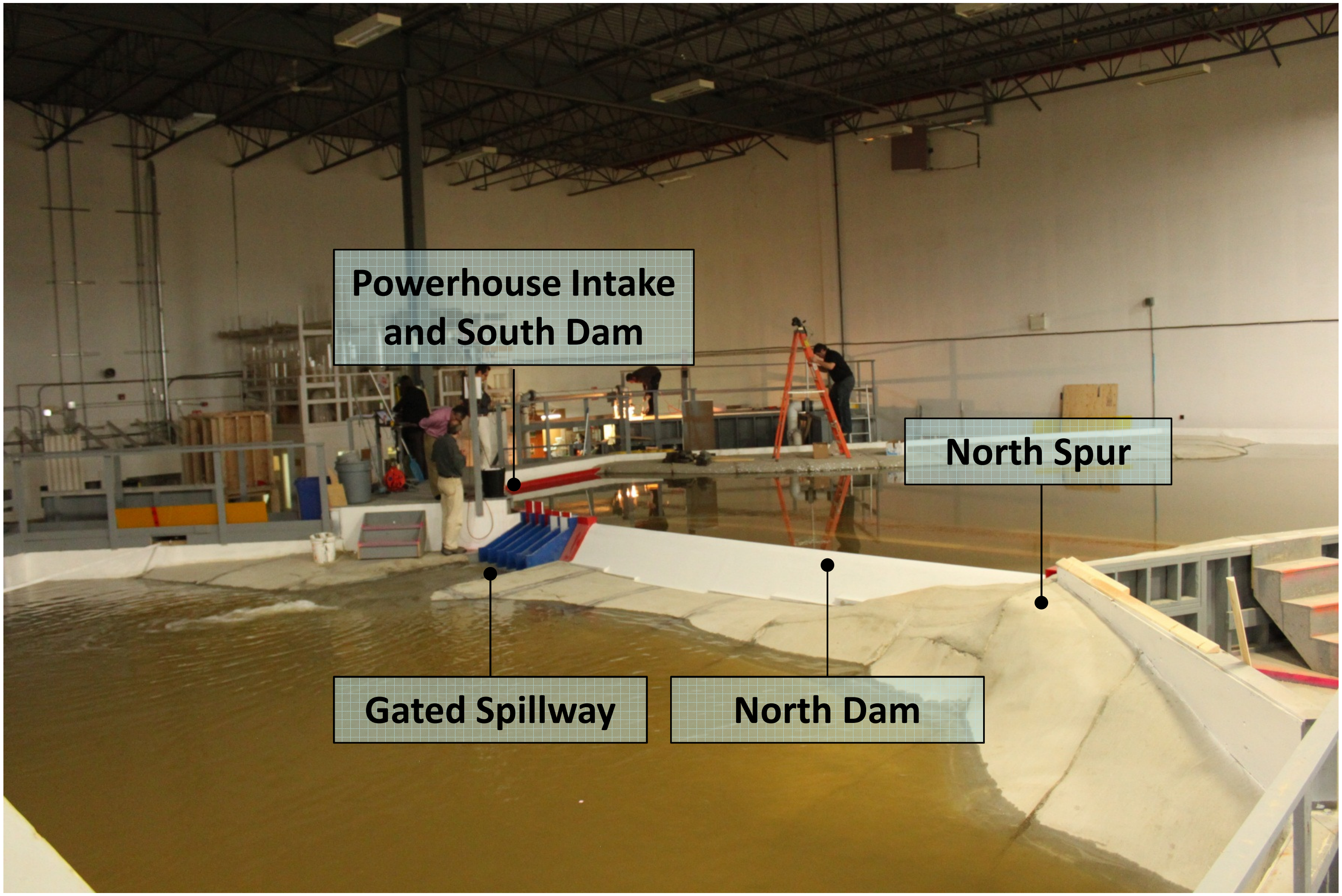
Design Optimization Continued
(Radial versus Vertical Spillway Gates)



Spillway – Assessing Downstream Erosion

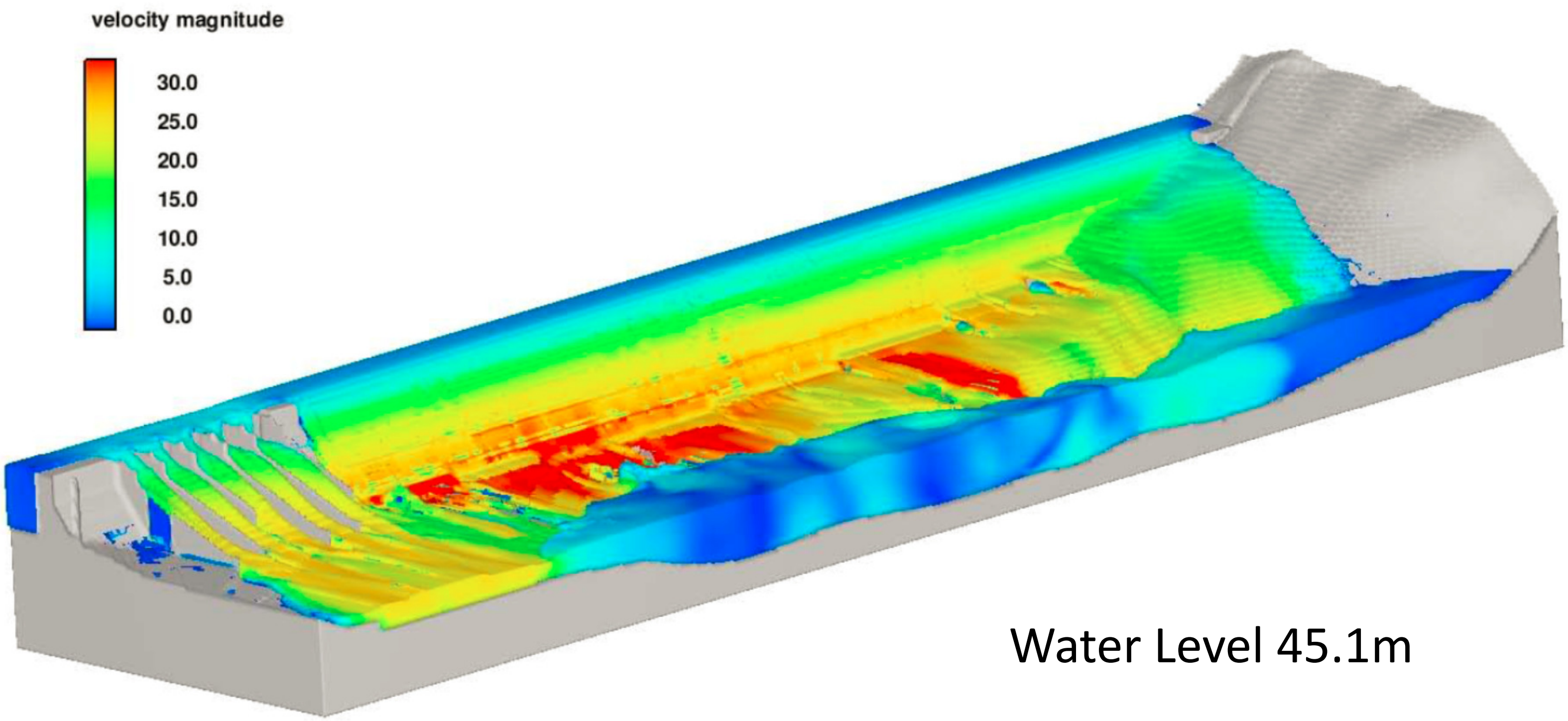


Layout Verified by Scaled Operational Model



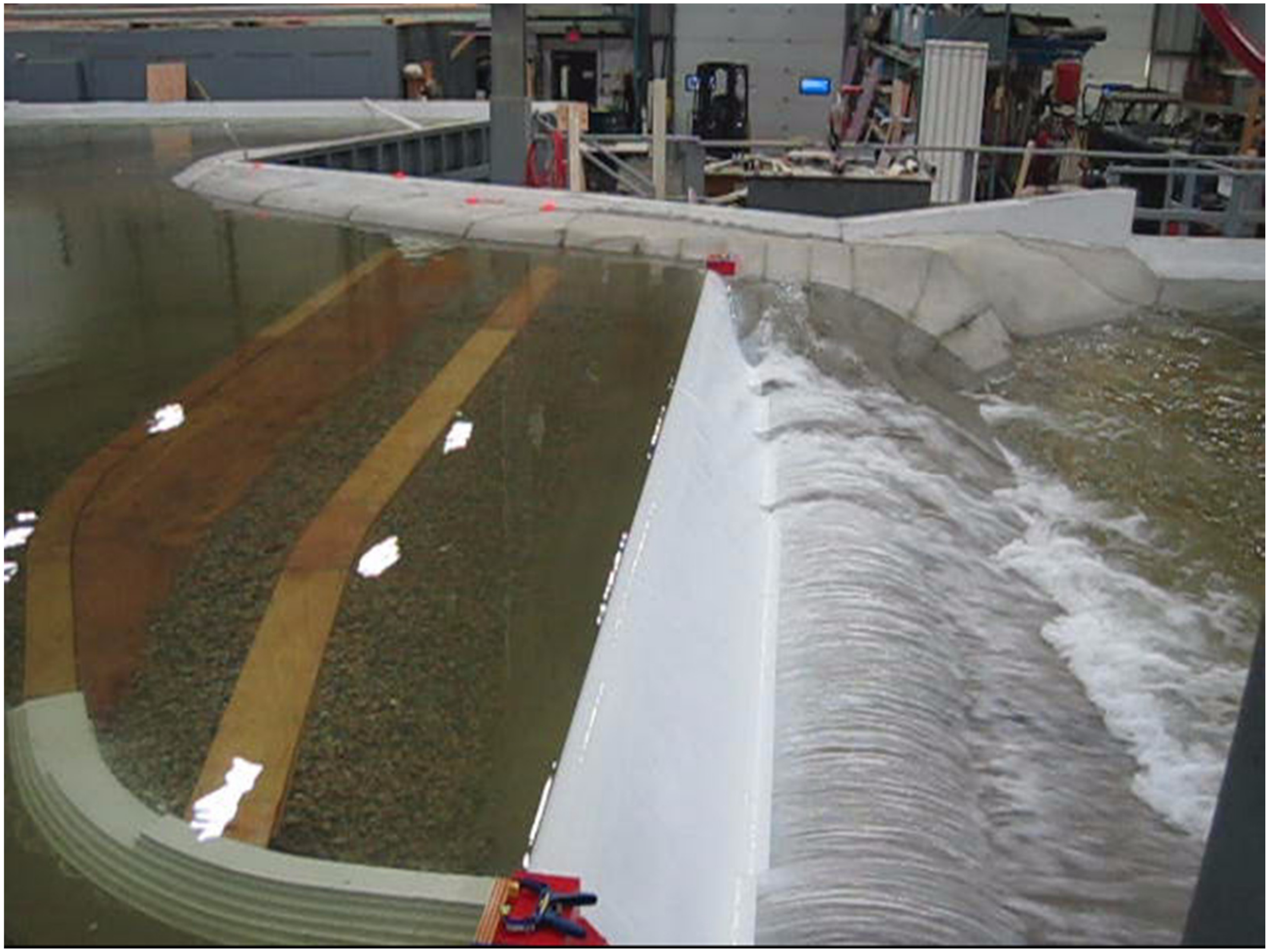
Muskrat Falls Spillway

Numerical Modelling of PMF Event



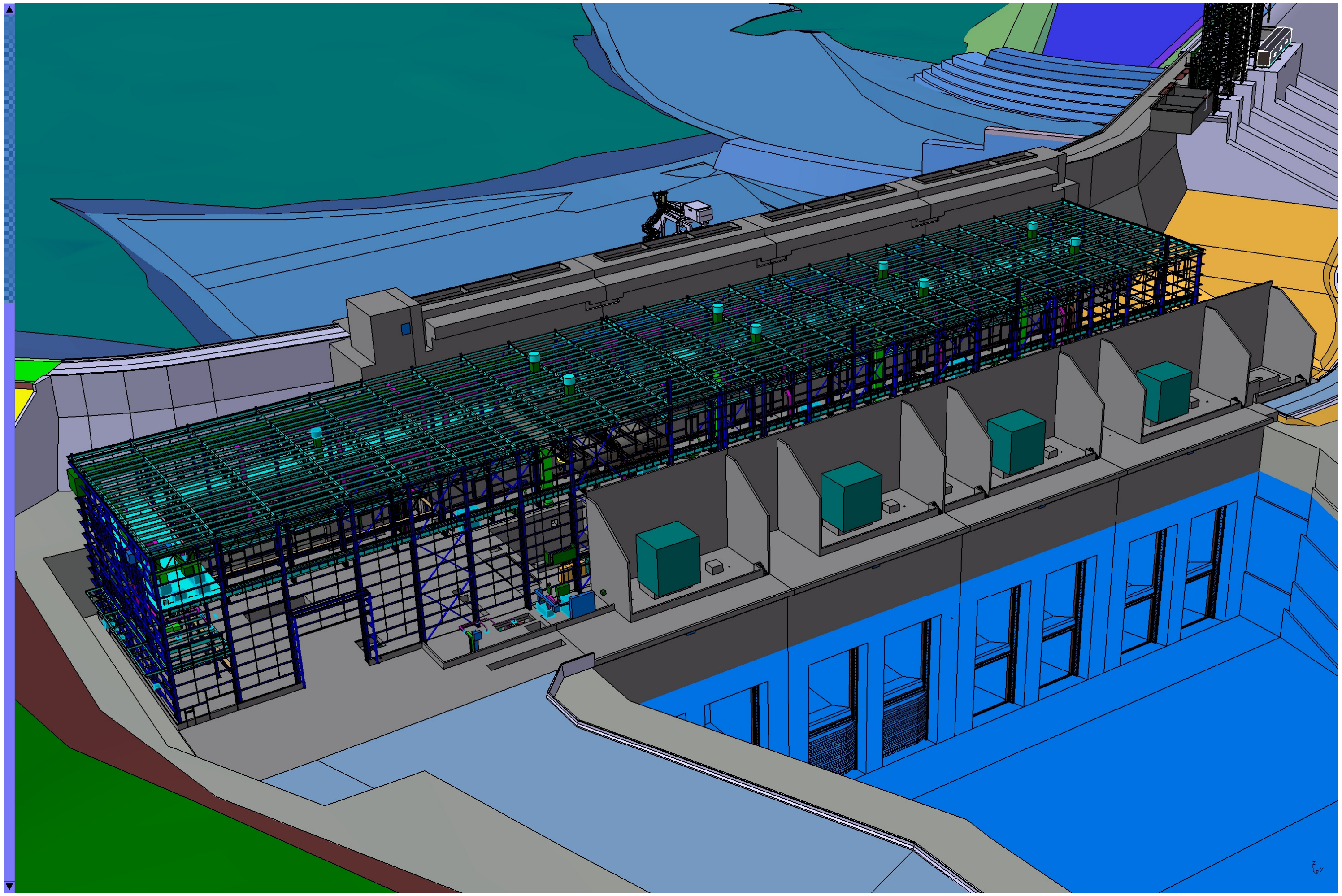
PMF – Probable Maximum Flow as defined under criteria established by Canadian Dam Association

Rare Operational Events Modelled
(North RCC Dam – Secondary Spillway)

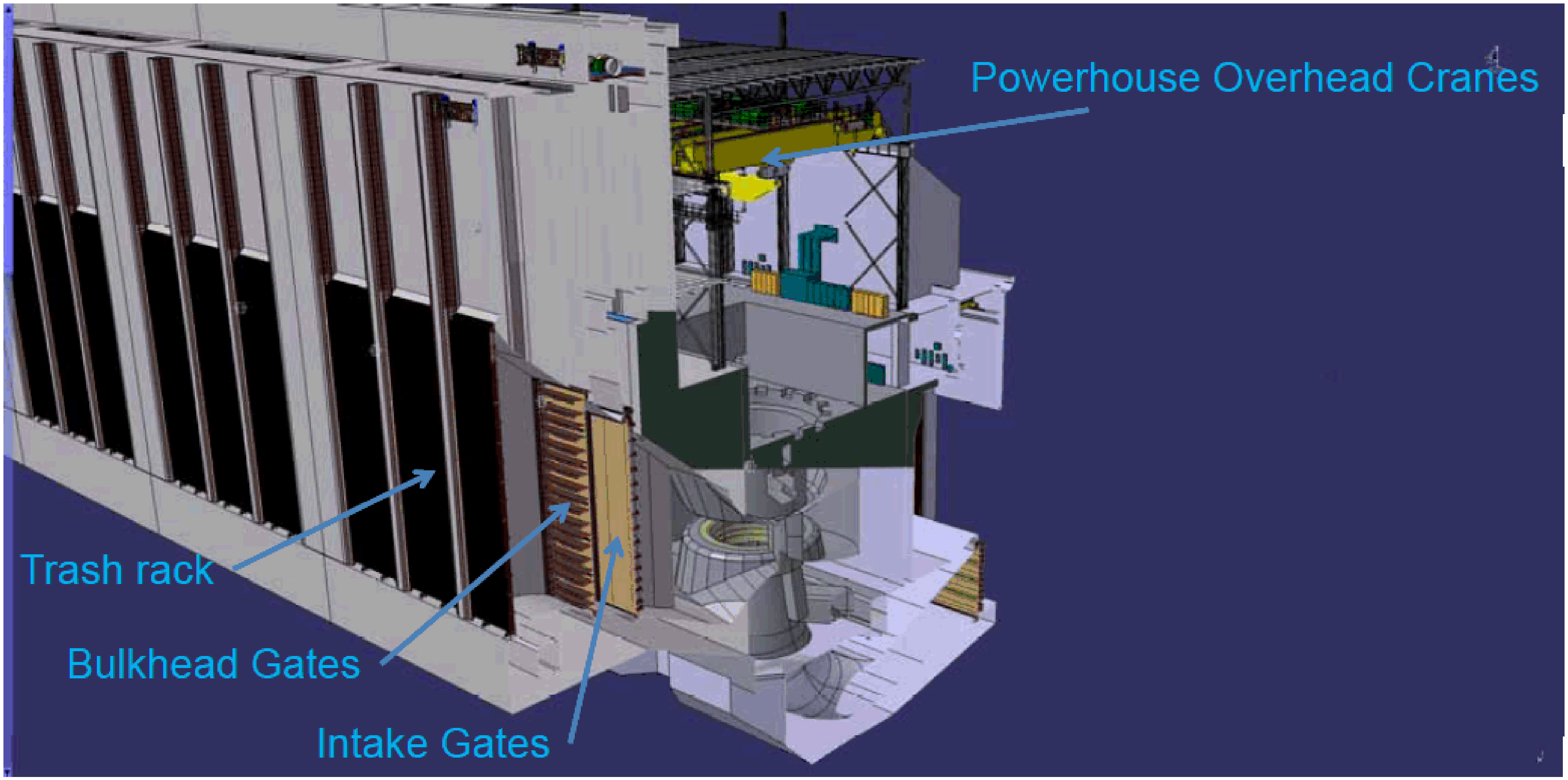


Video

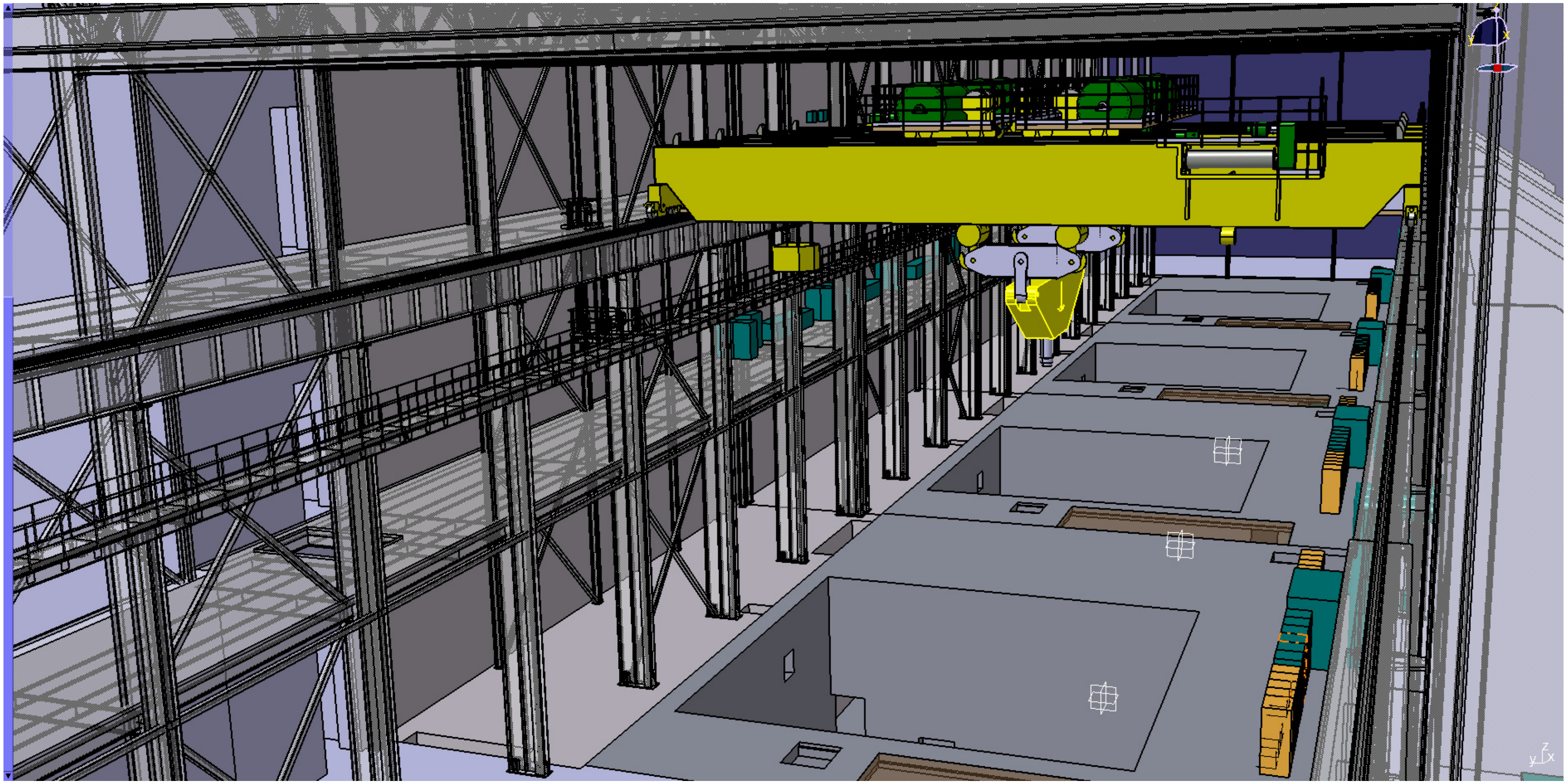
3D Model used for Construction Planning
(Superstructure under Construction)



Powerhouse Cross-Section

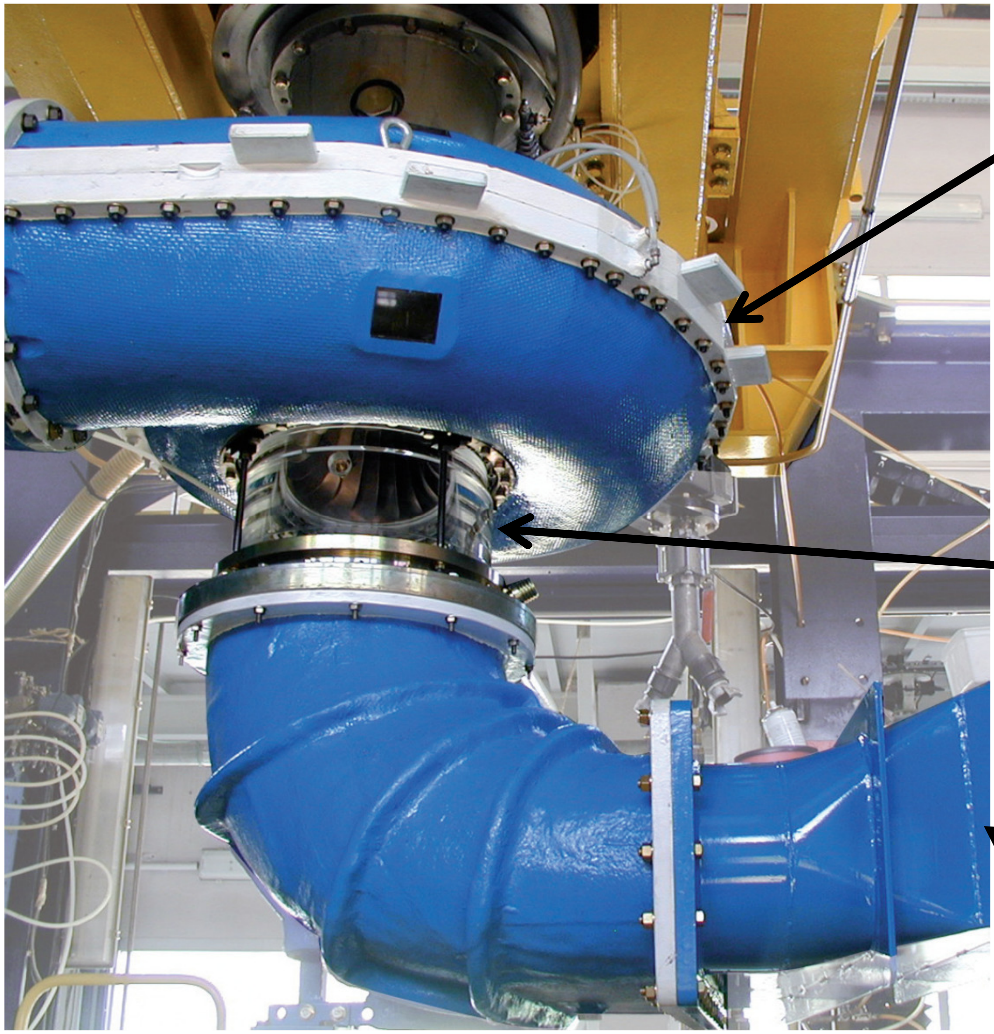


Powerhouse Cranes
(2 x 350 tons Working in Tandem)

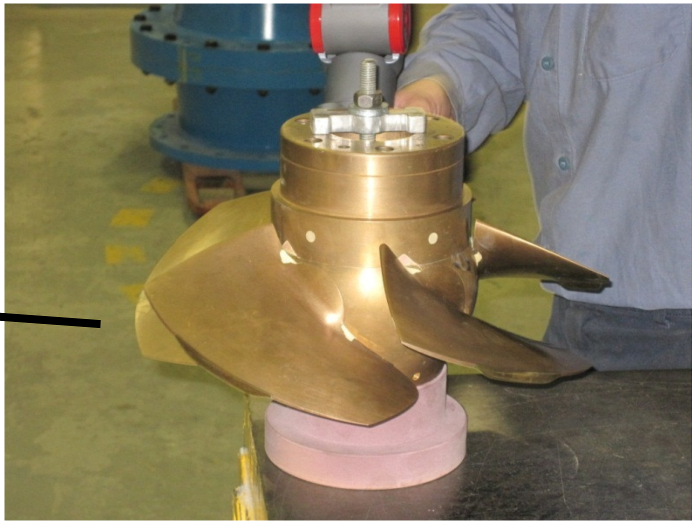


Operational and Schedule Risk Reduction

Turbine Model Testing



Scroll Case

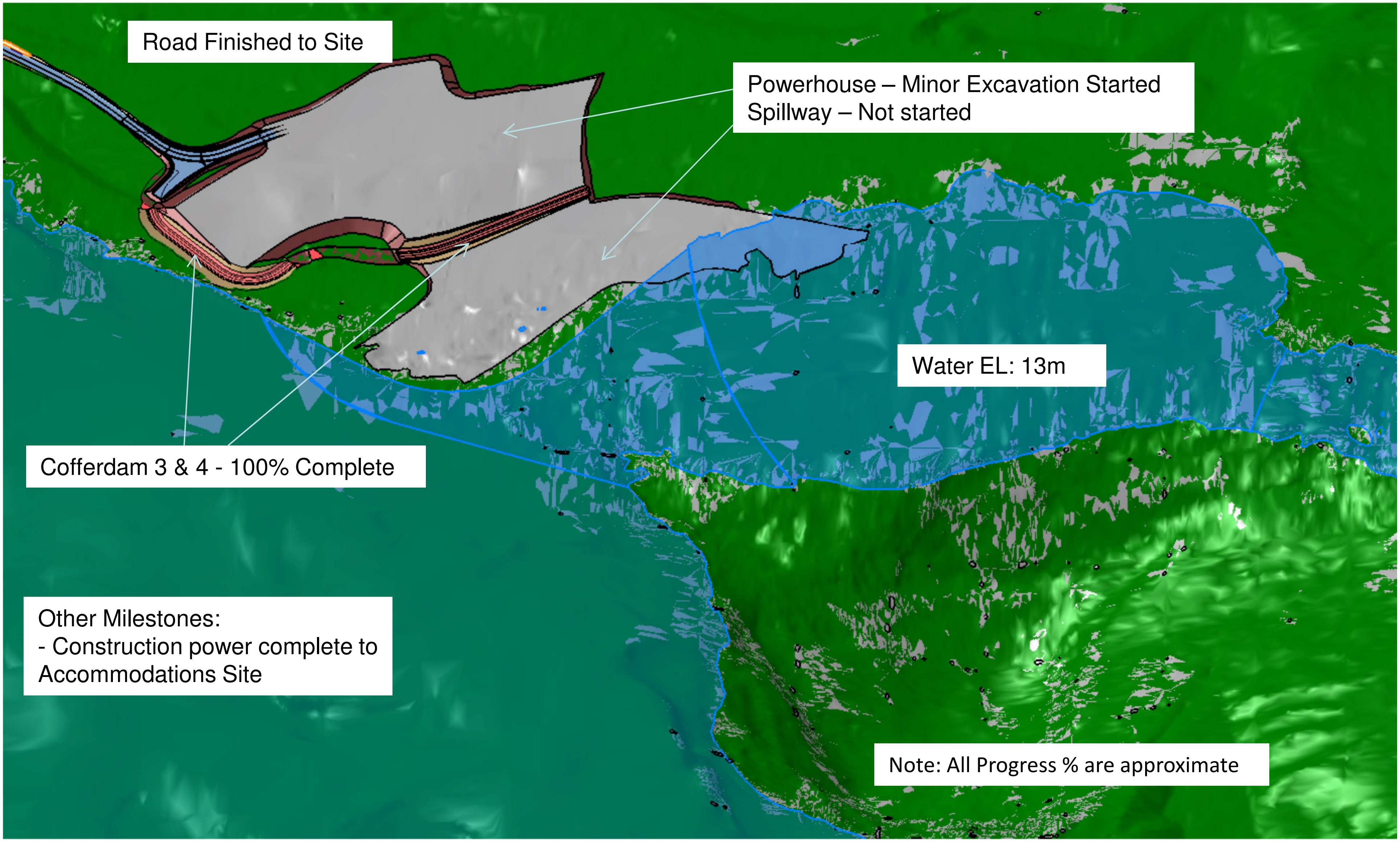


Runner Model (Diameter = 0.380m)

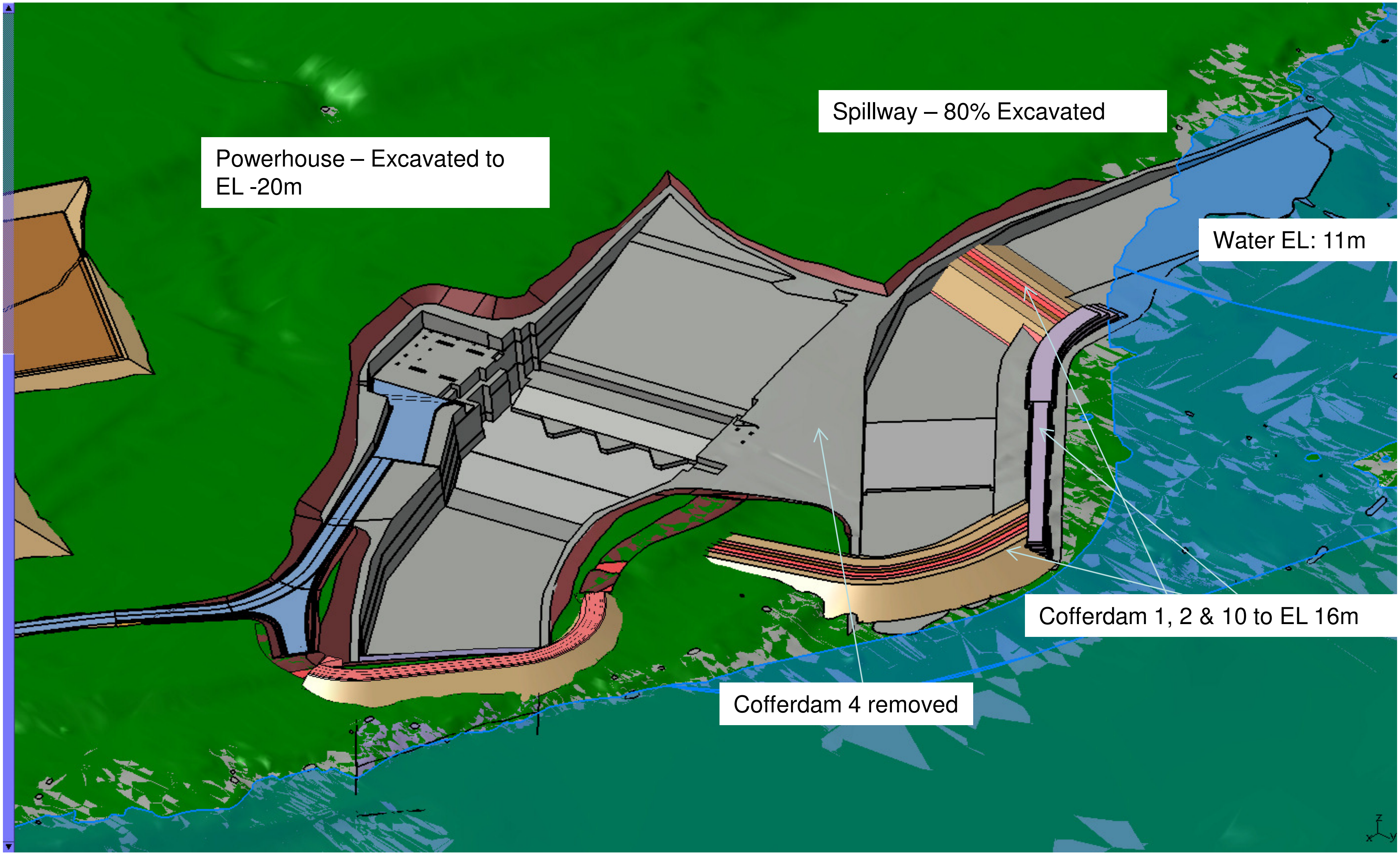
Draft Tube

Muskrat Falls Construction Sequence

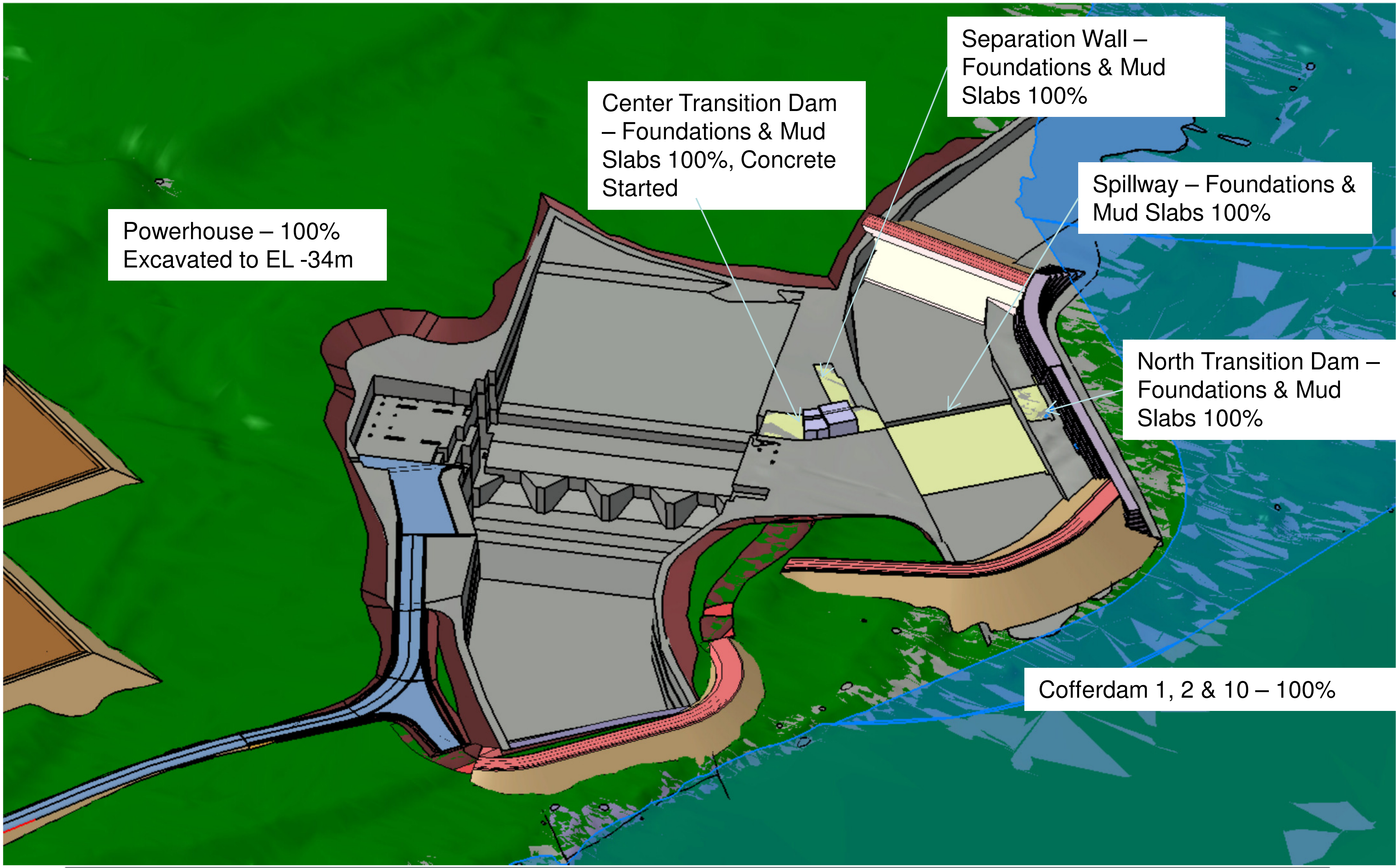
2012 – December: Mass Excavation Commenced



2013 – September: Excavation Well Progressed

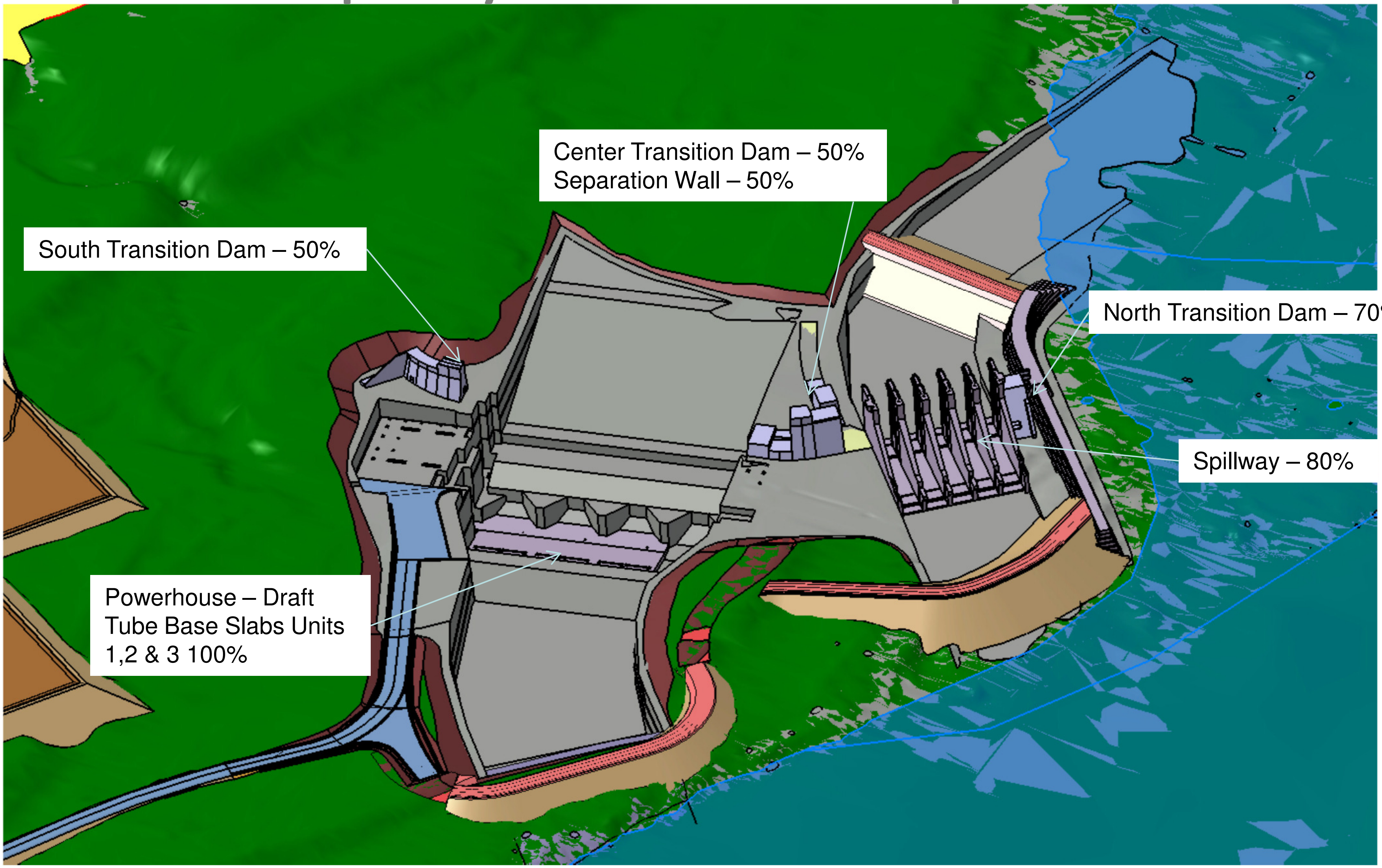


2013 – December: Focus on Spillway Foundation

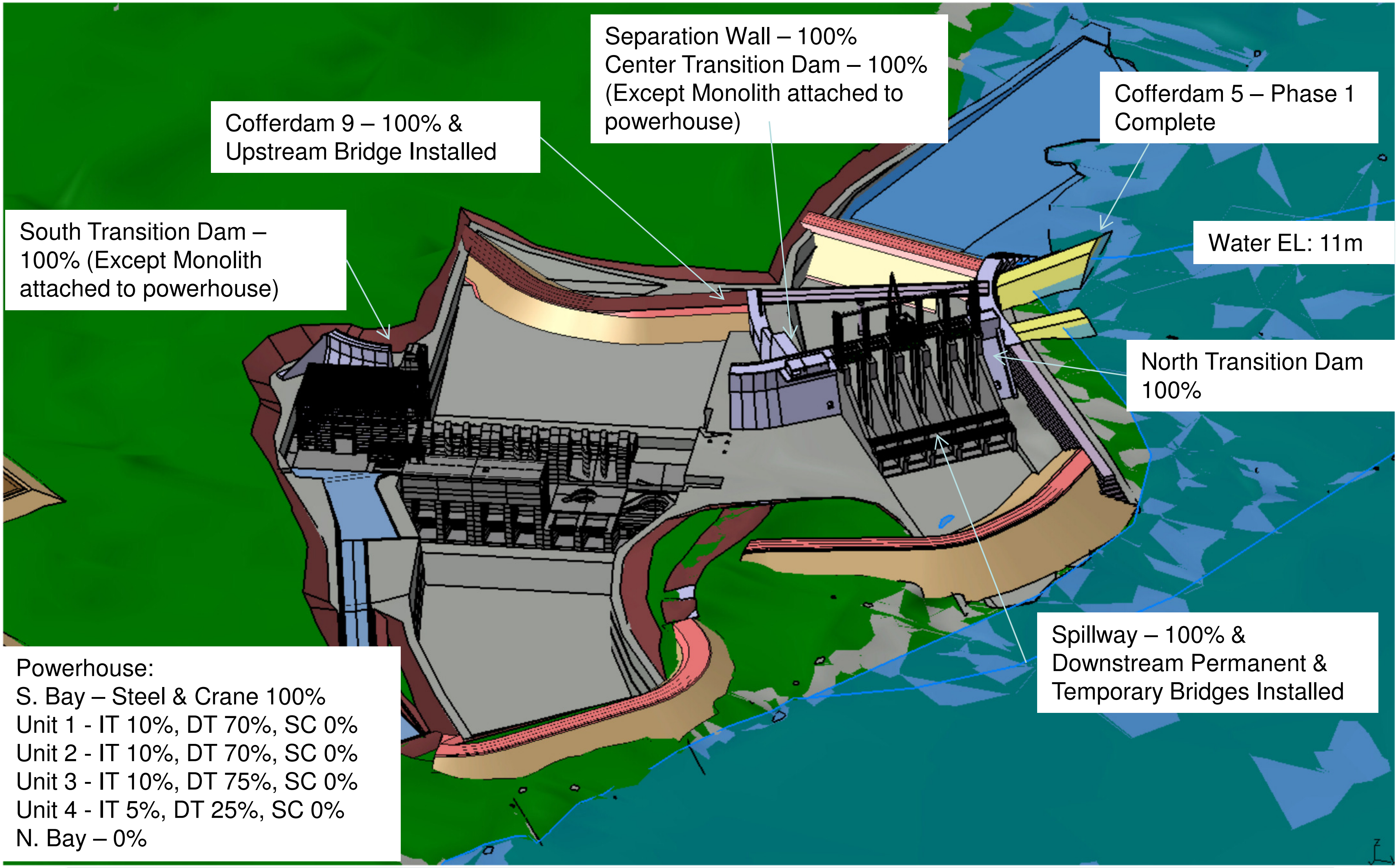


2013 – December: North Spur Stabilization Works Started

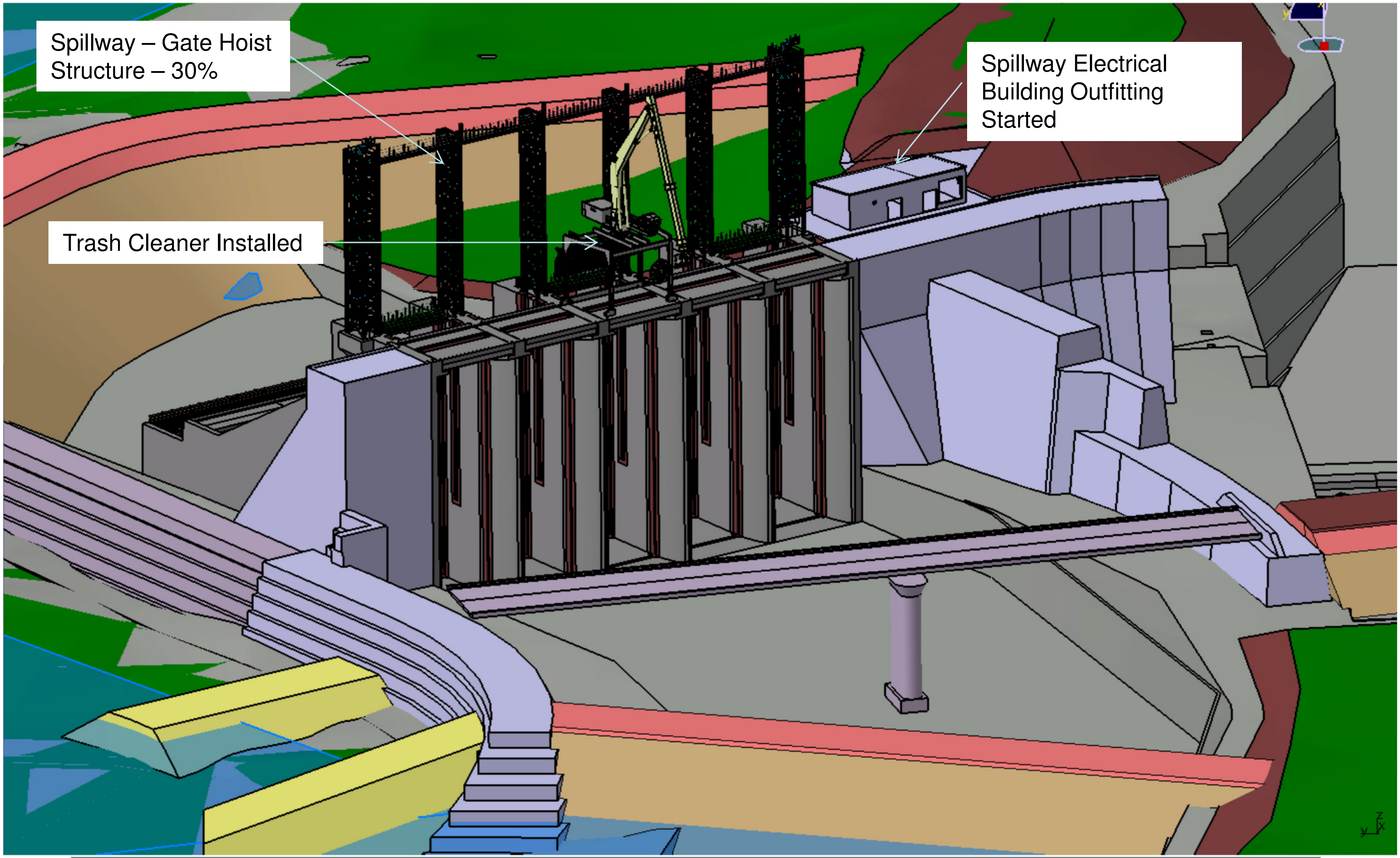
2014 – June: Spillway Concrete 80% Complete



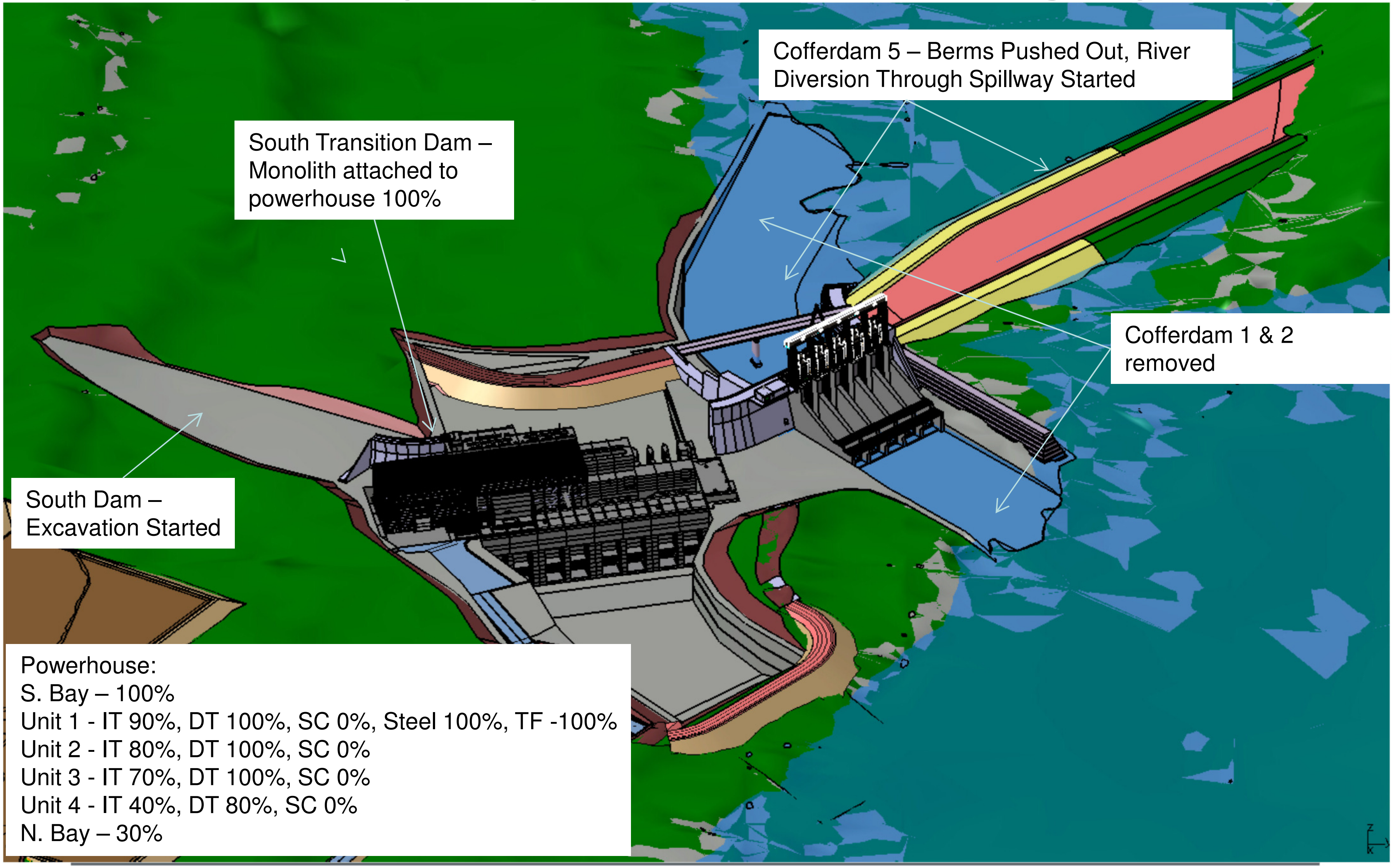
2014 – December: Spillway Complete, Prep for Diversion



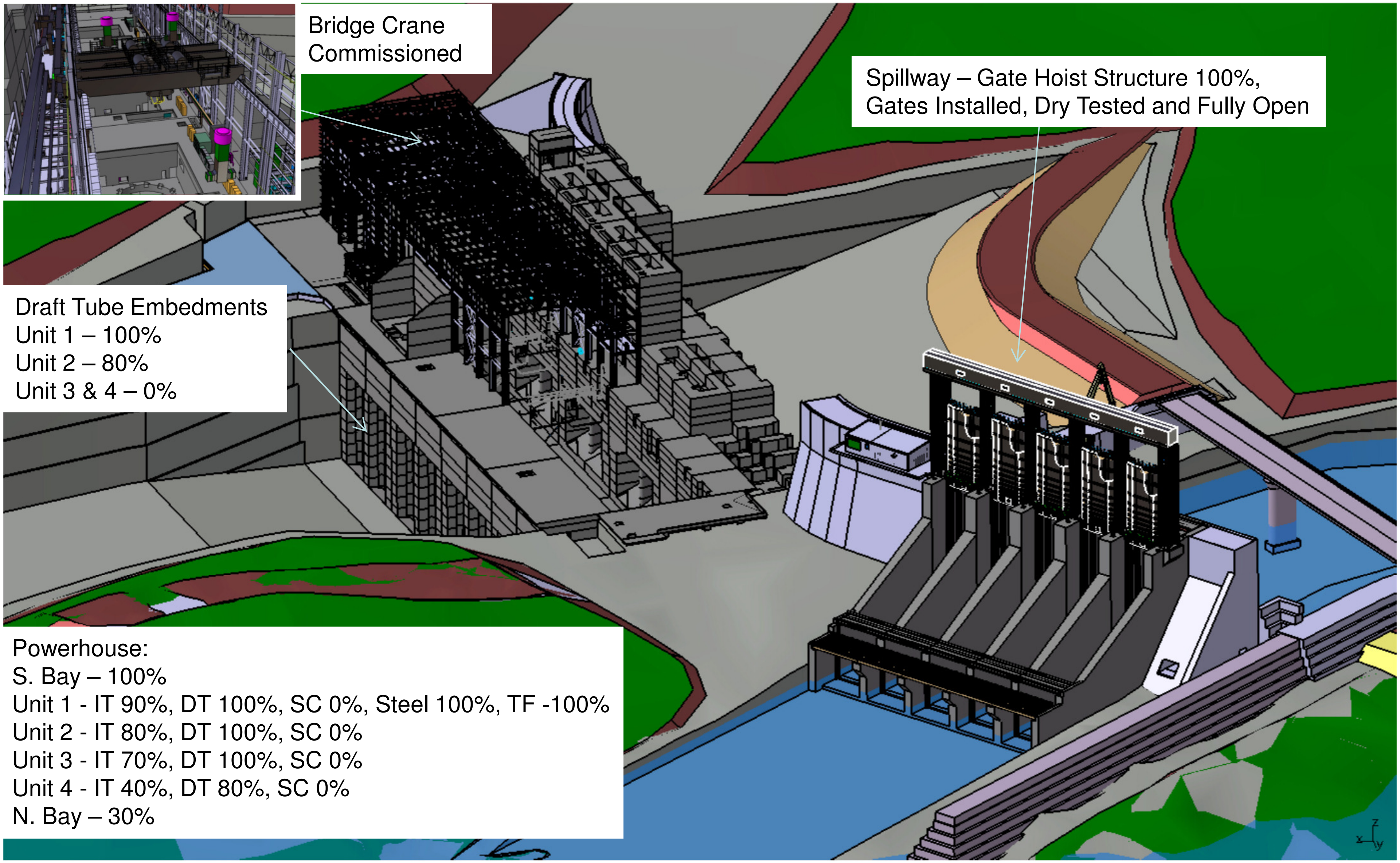
2014 – December: Trash Rack Cleaner Installed



2015 – June: Temporary River Diversion through Spillway

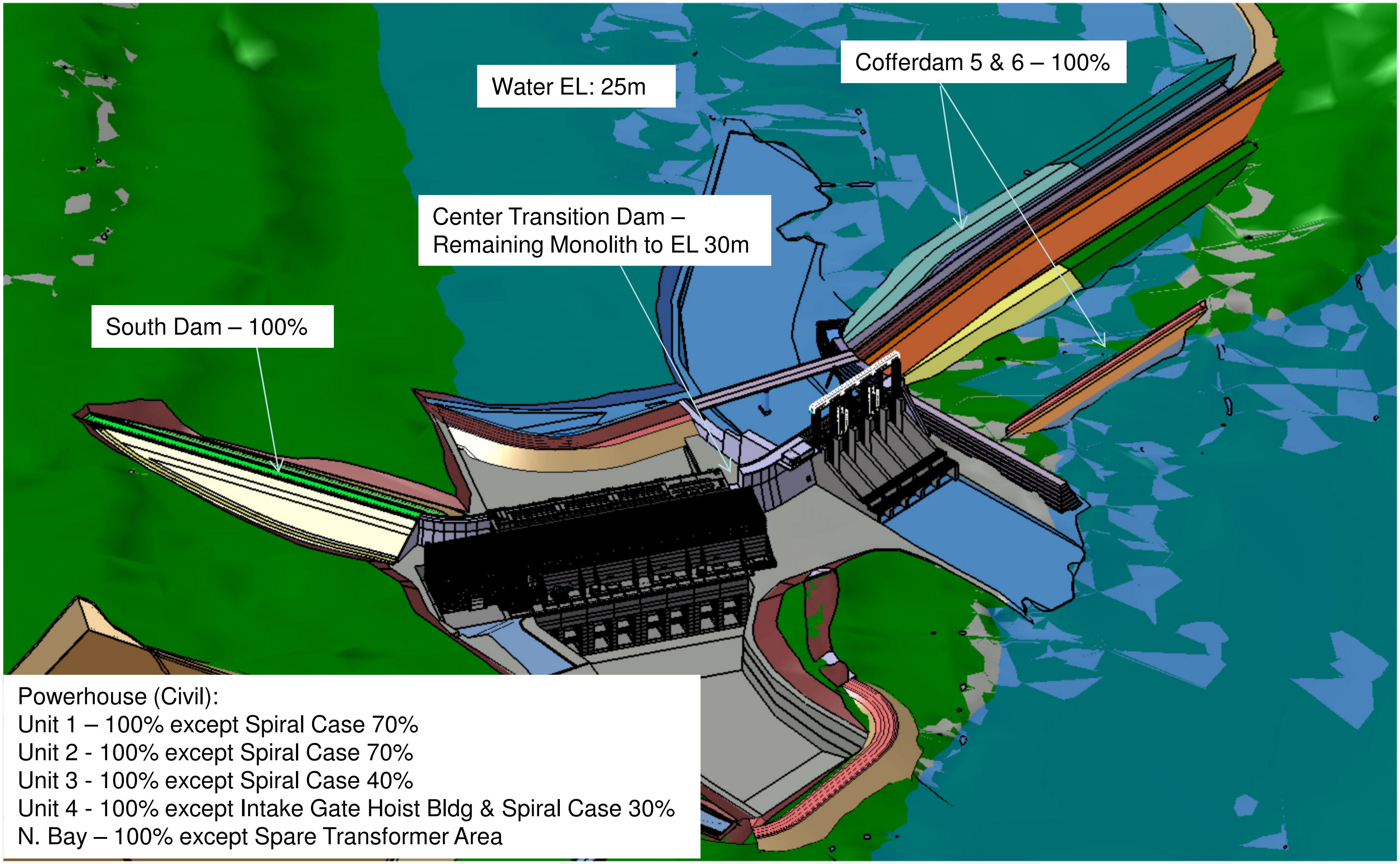


2015 – June: Powerhouse Superstructure Erection

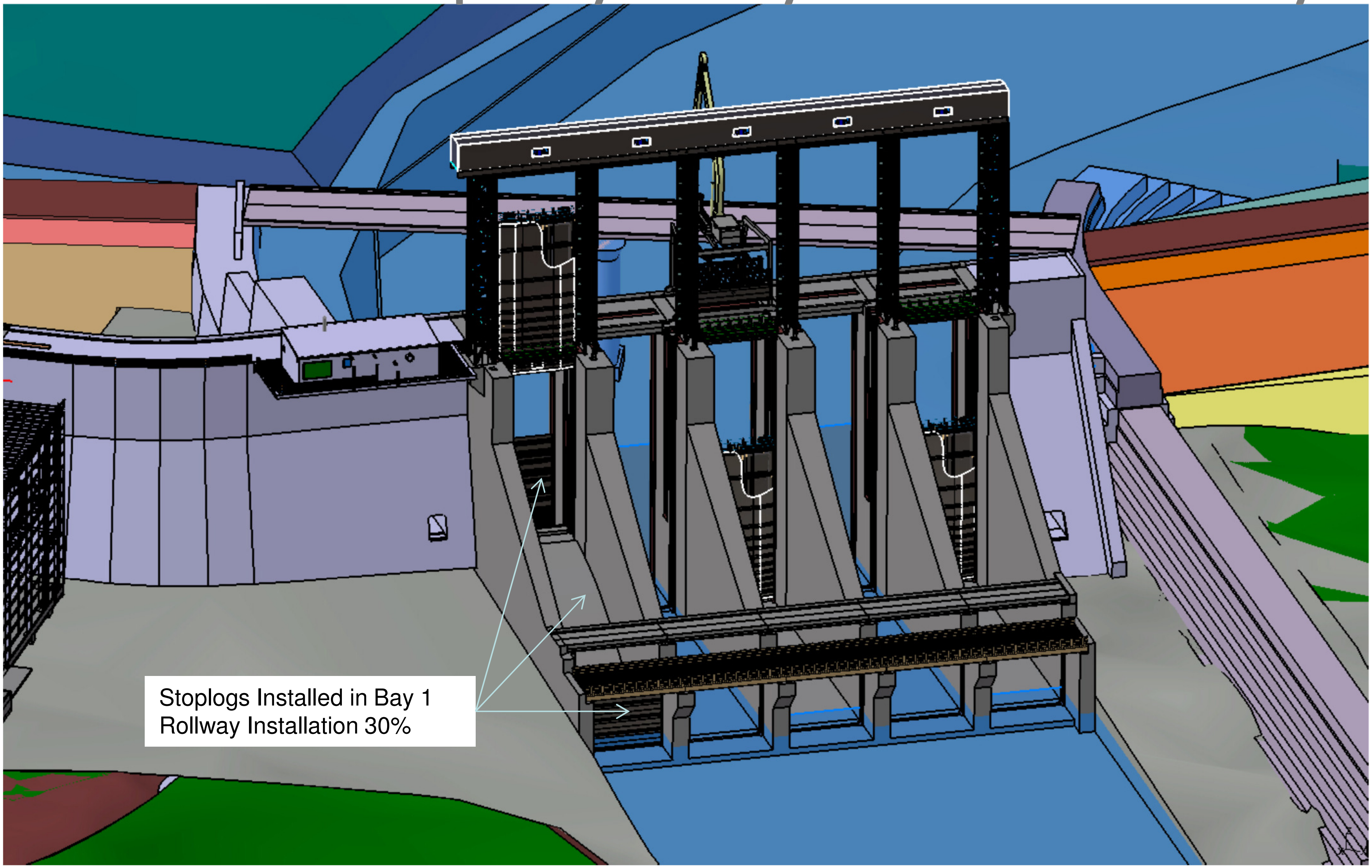


2015 – June: North Spur Ready for Diversion

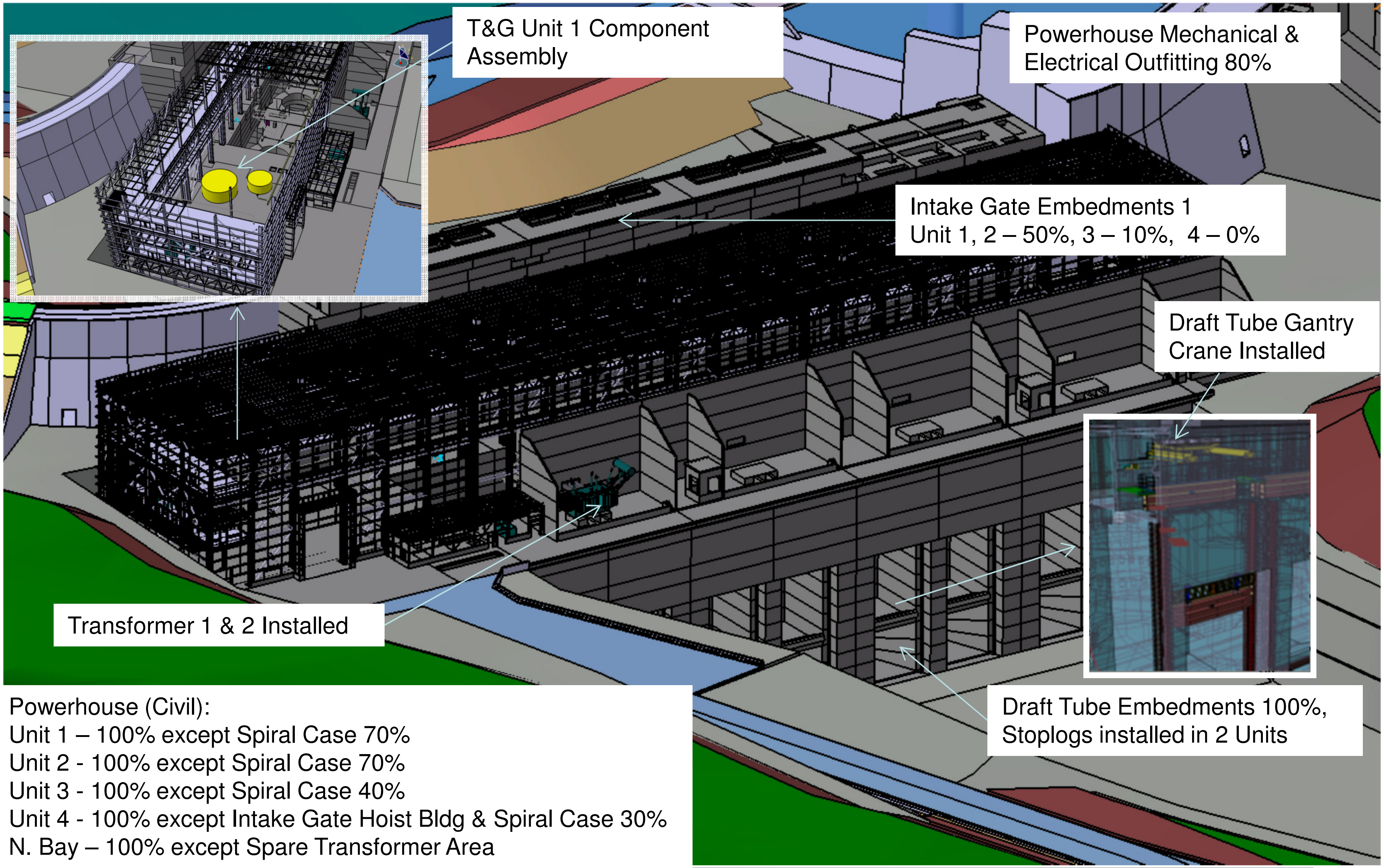
2015 – December: North Side Cofferdams Complete



2015 – December: Spillway Rollway Installation Underway

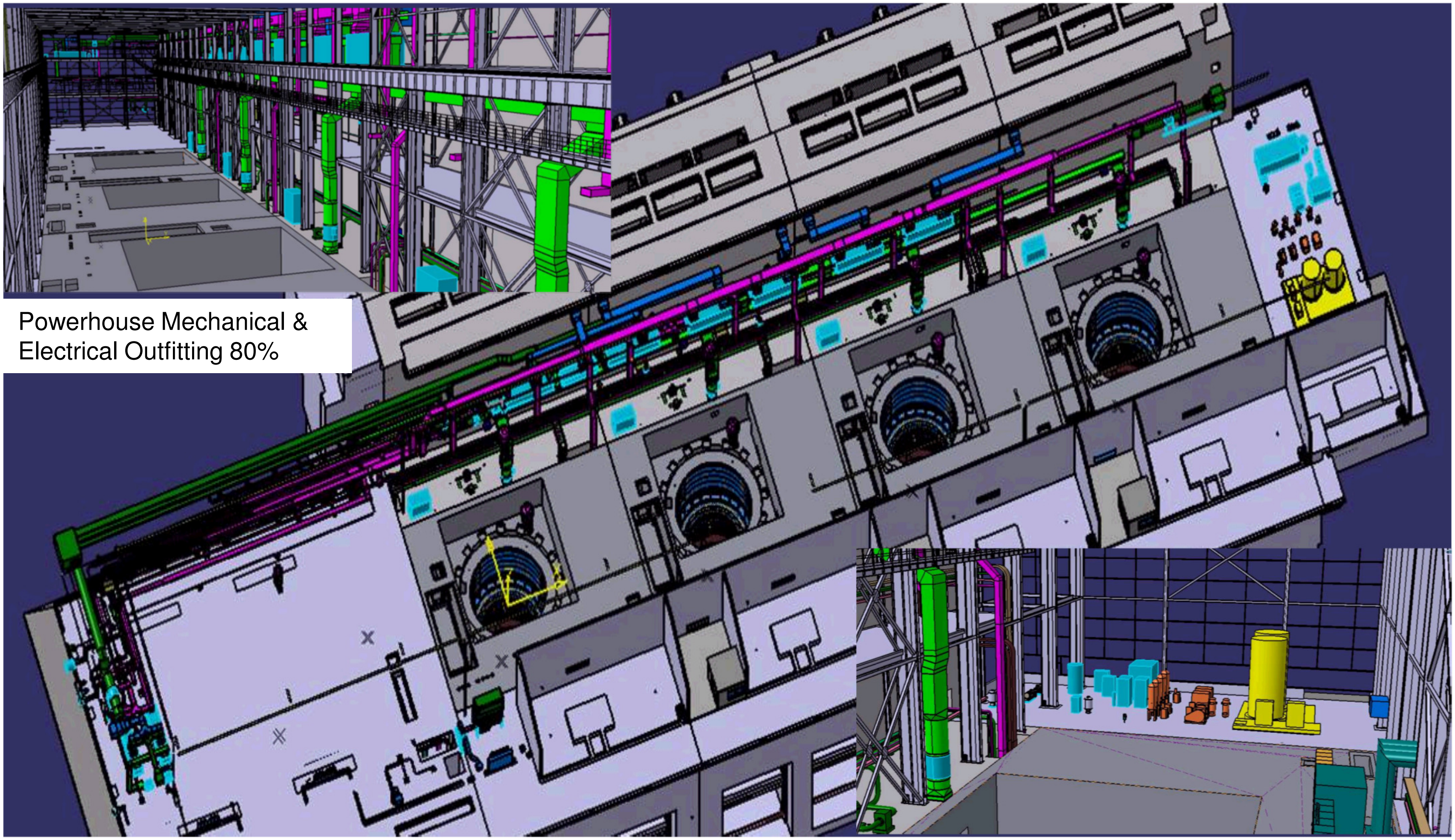


2015 – December: Concrete Nearly Complete



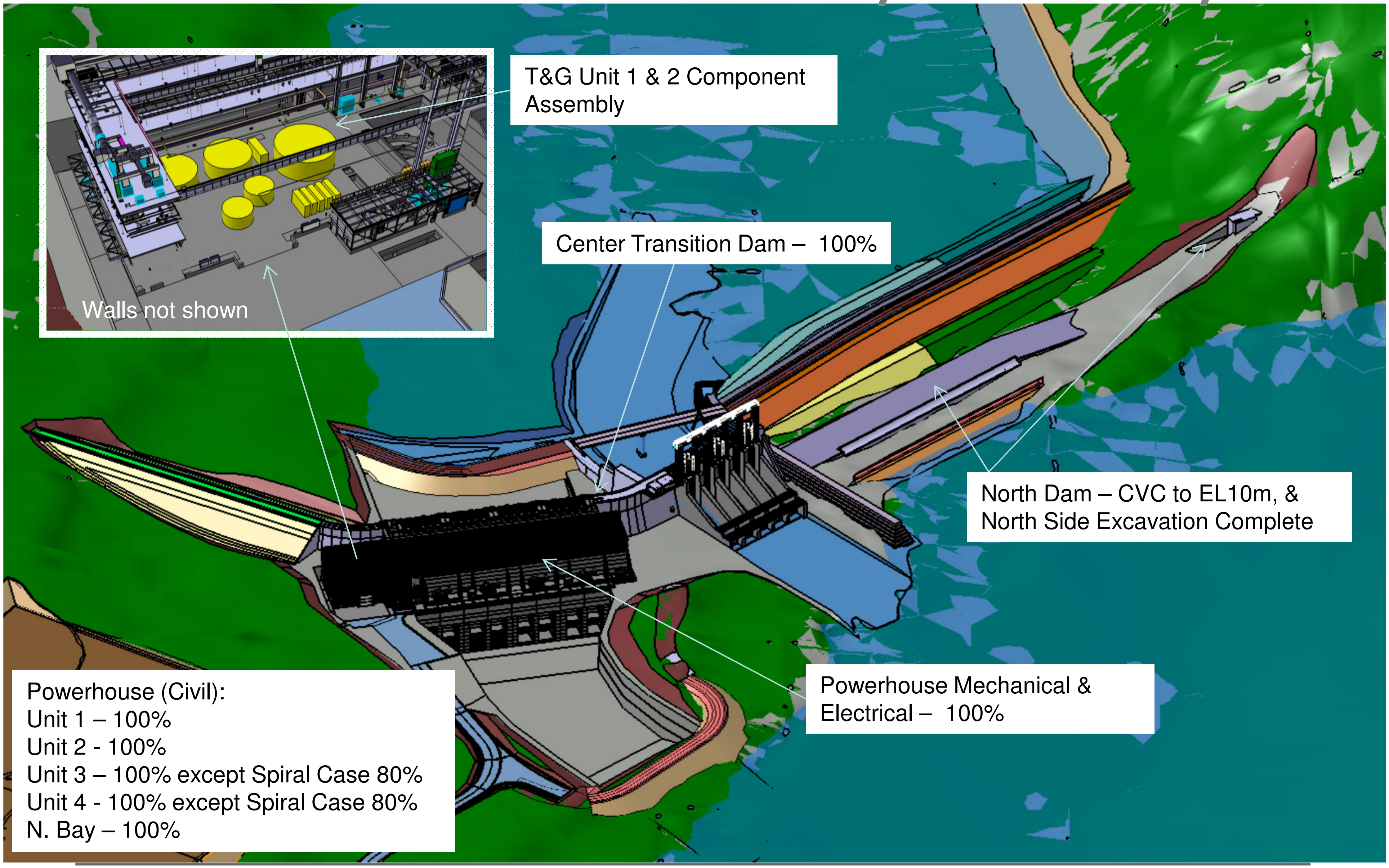
Powerhouse (Civil):
Unit 1 – 100% except Spiral Case 70%
Unit 2 - 100% except Spiral Case 70%
Unit 3 - 100% except Spiral Case 40%
Unit 4 - 100% except Intake Gate Hoist Bldg & Spiral Case 30%
N. Bay – 100% except Spare Transformer Area

2015 – December: Powerhouse Outfitting 80% Complete

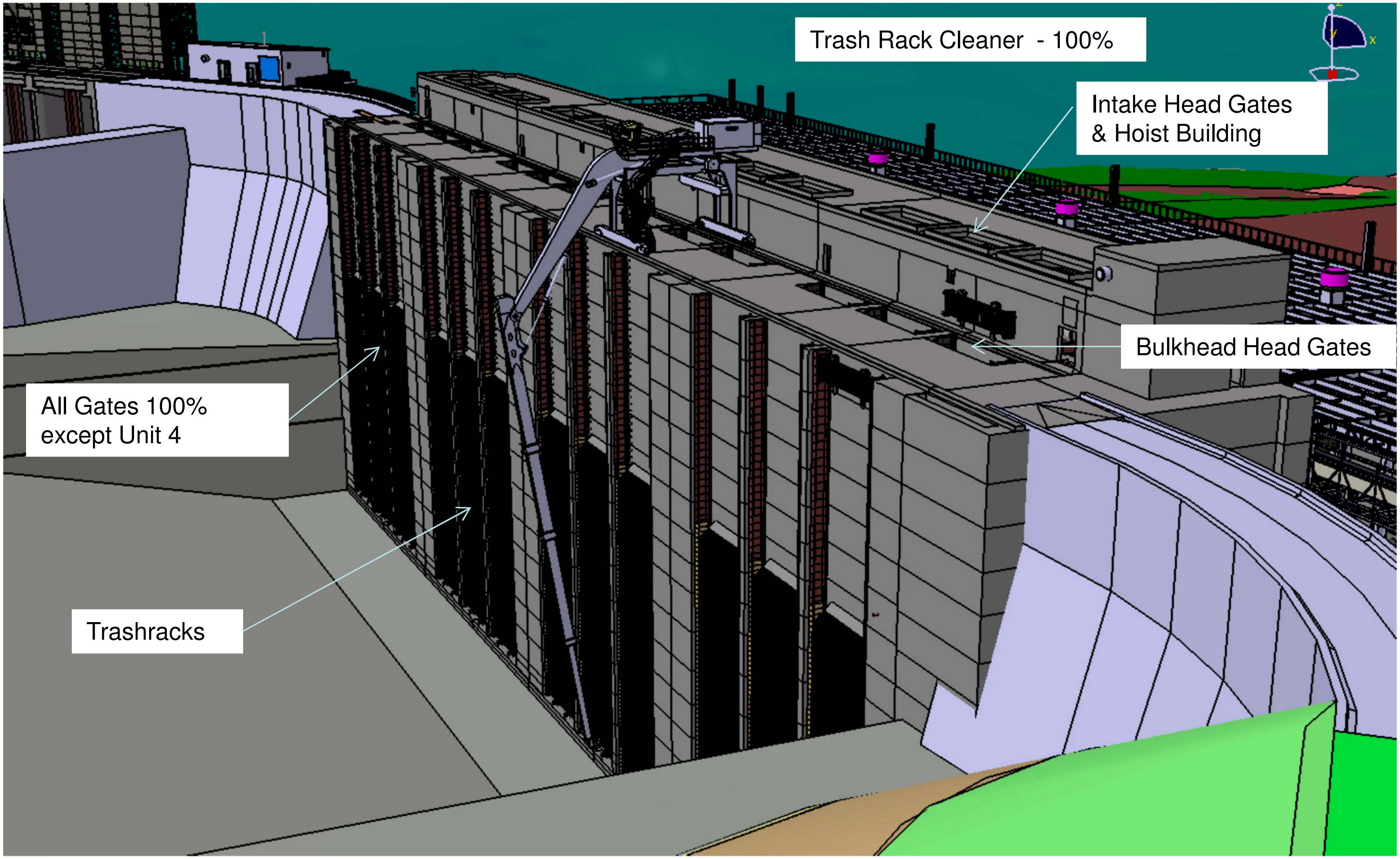


2015 – December: North Spur Stabilization Complete

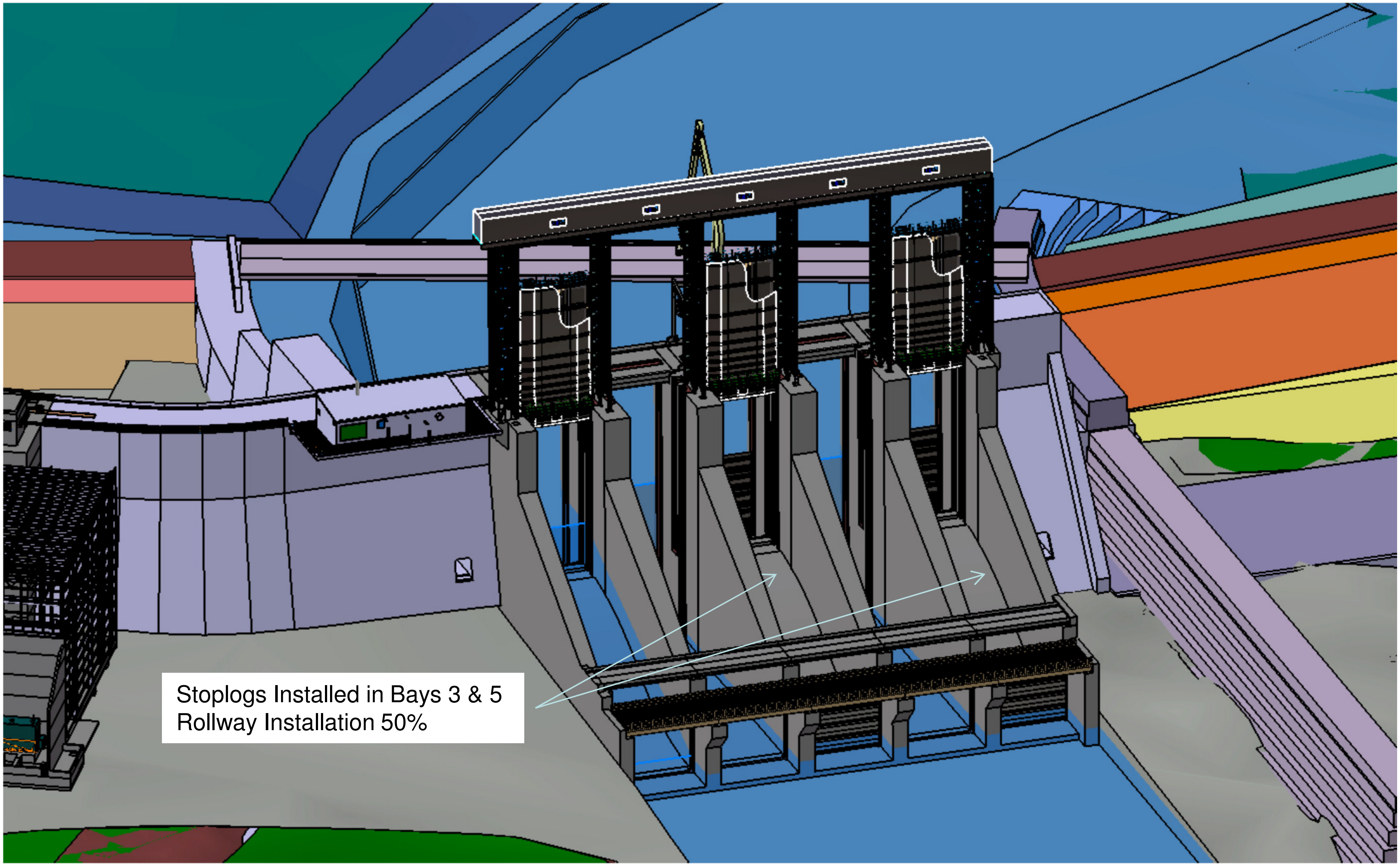
2016 – June: T&G Units 1 & 2 Assembly In Service Bay



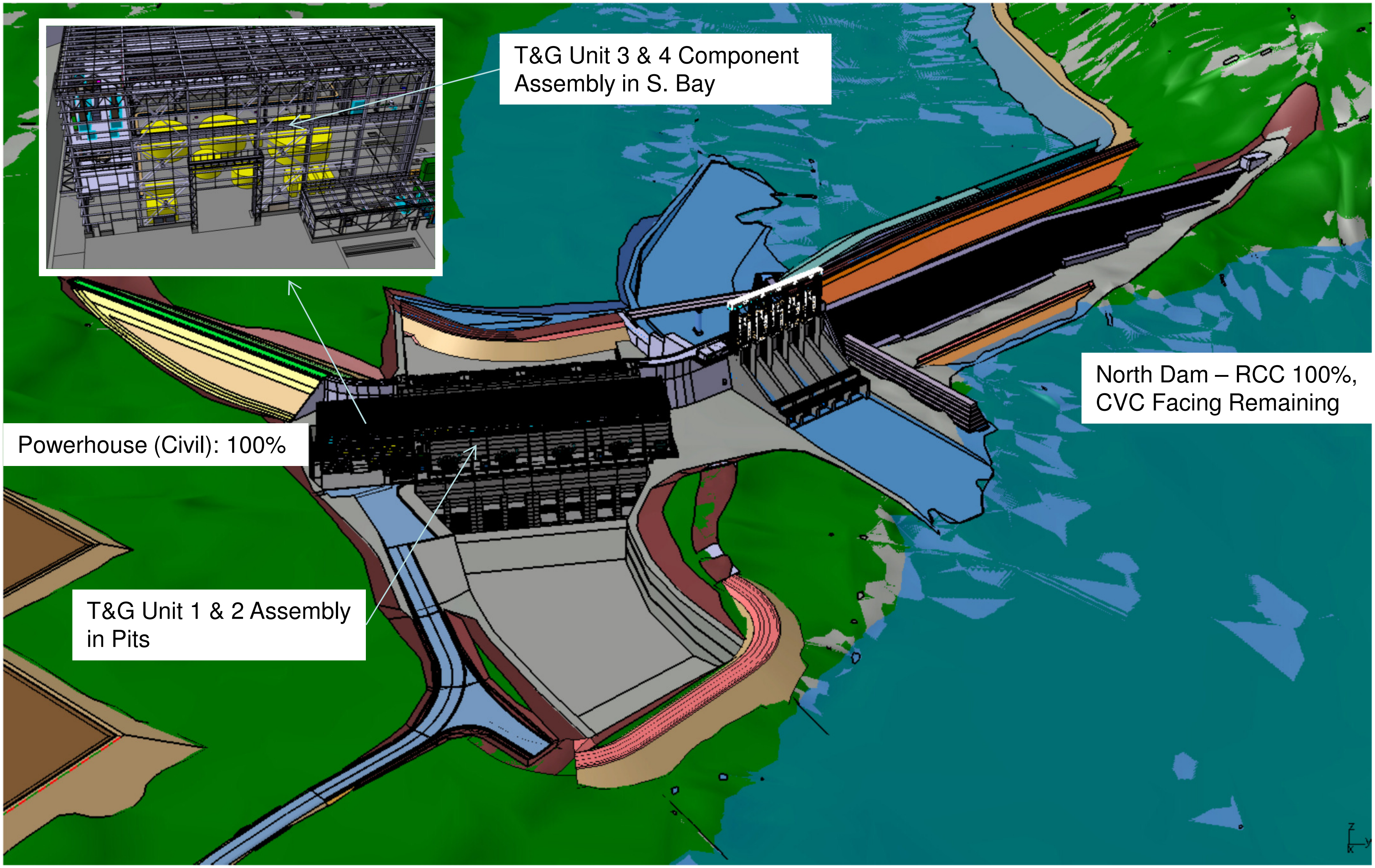
2016 – June: Intake Gates 1, 2 & 3 Complete



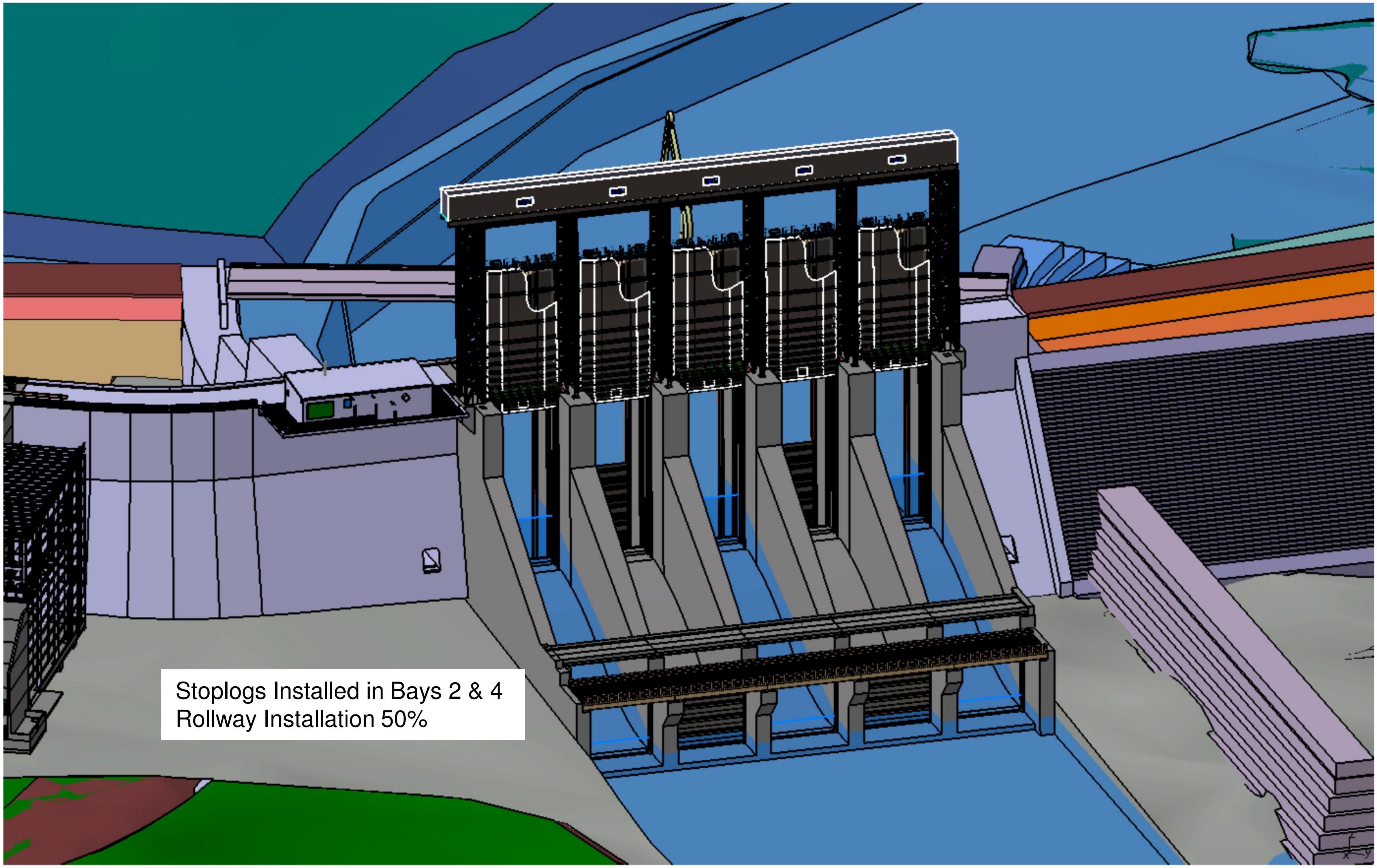
2016 – June: Rollway Installation Bays 3 & 5



2016 – December: Turbine Unit 1 & 2 Assembly in Pit

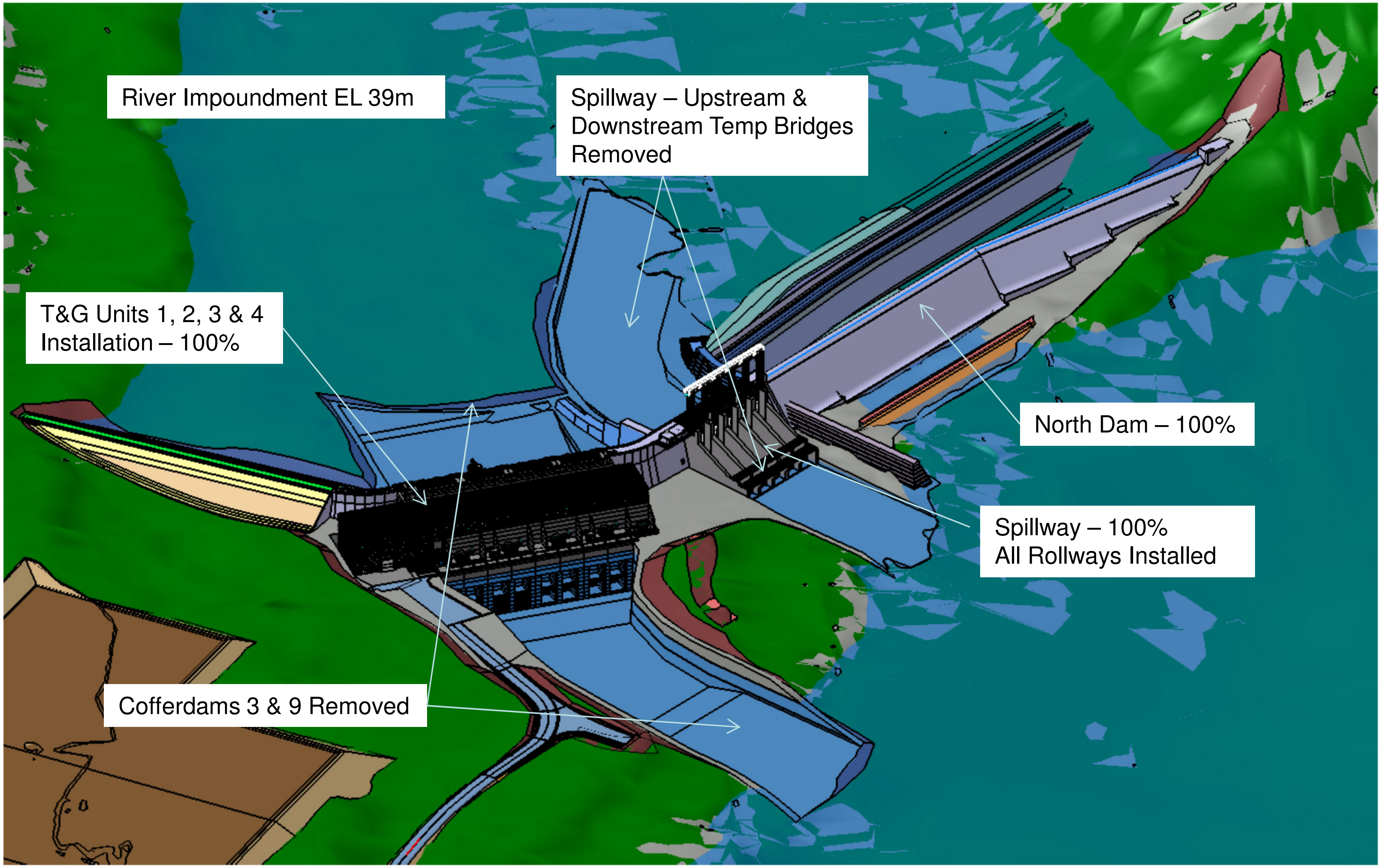


2016 – December: Rollway Installation Bays 2 & 4

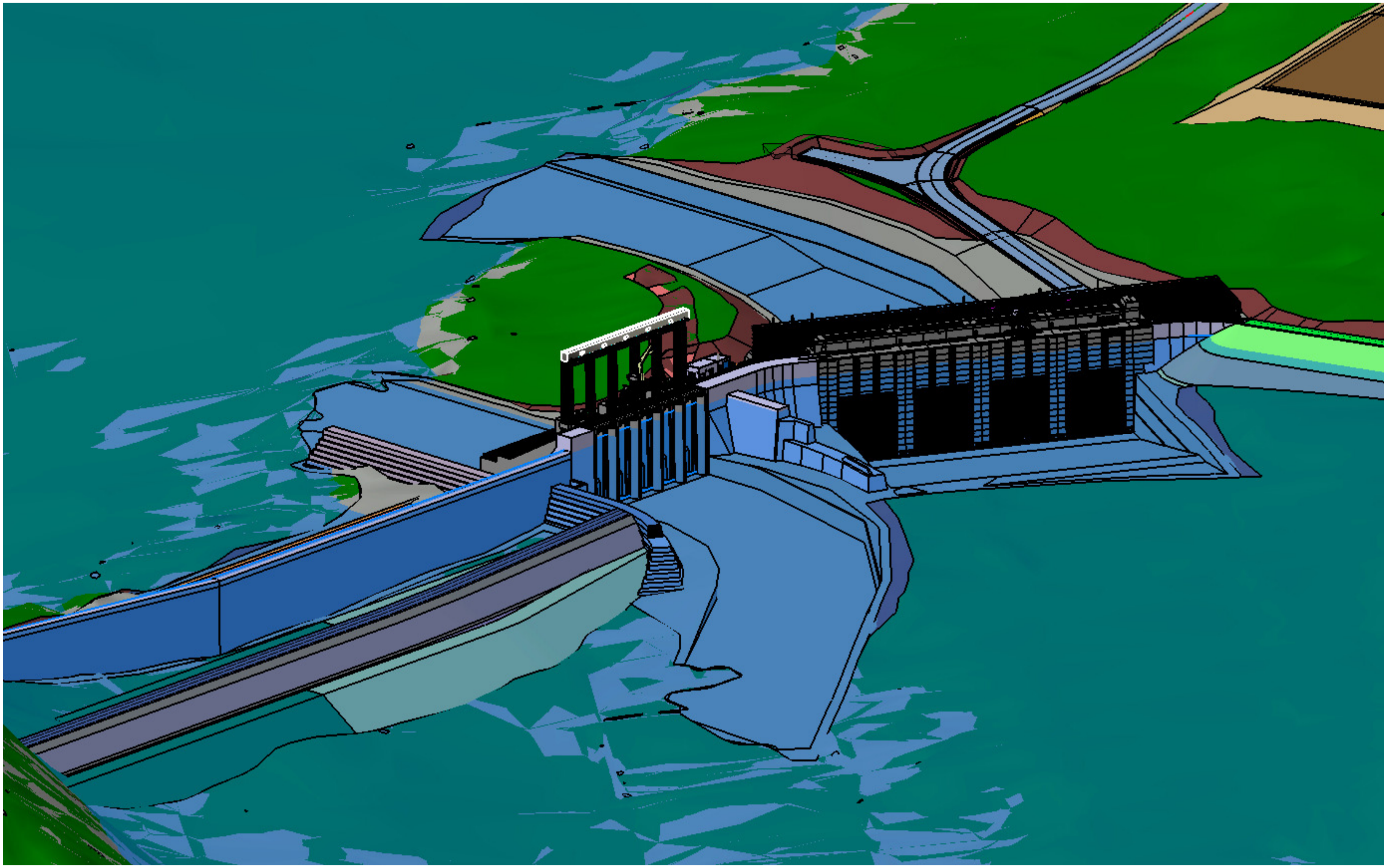


Stoplogs Installed in Bays 2 & 4
Rollway Installation 50%

2017 – June: Unit 1 Commissioned & Ready for First Power



2017 – June – First Power Achieved



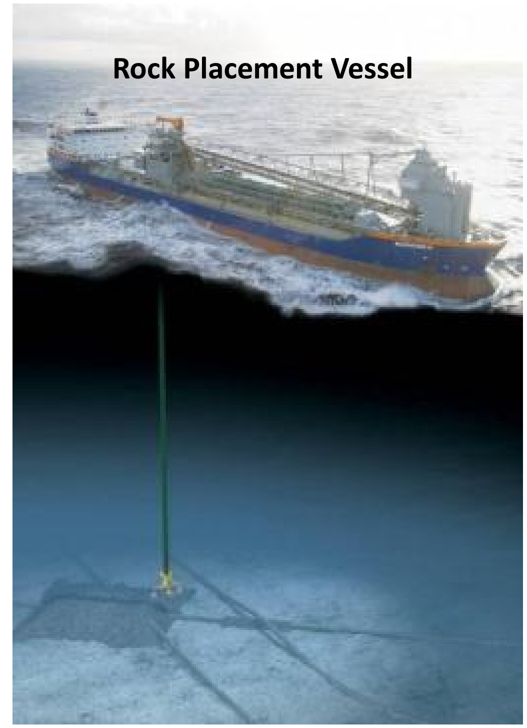
Project Definition – SOBI Crossing

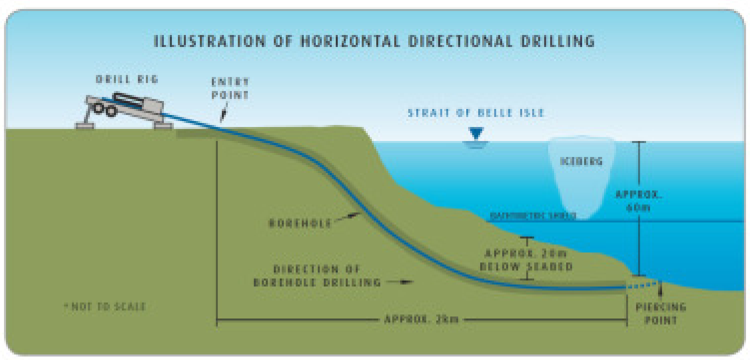
SOBI Crossing Overview

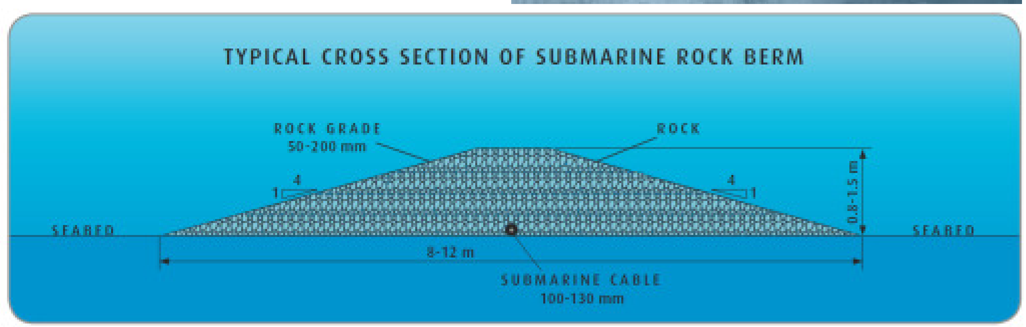
SOBI Crossing: A "deeper" look

Selected solution for the SOBI cable crossing builds upon team's extensive experience in the design and installation of subsea infrastructure in harsh environments combined with lessons from similar projects

- Each of the 3 submarine cables will each have a dedicated horizontally directionally drilled (HDD) conduit to protect the cable from shore and pack ice at the landfall points
- The conduits will take each cable to a water depth of between 60 to 80m, thus avoiding iceberg scour
- The cables will then be laid on the sea bed and each protected with a separate rock berm which will protect against fishing gear and dropped objects







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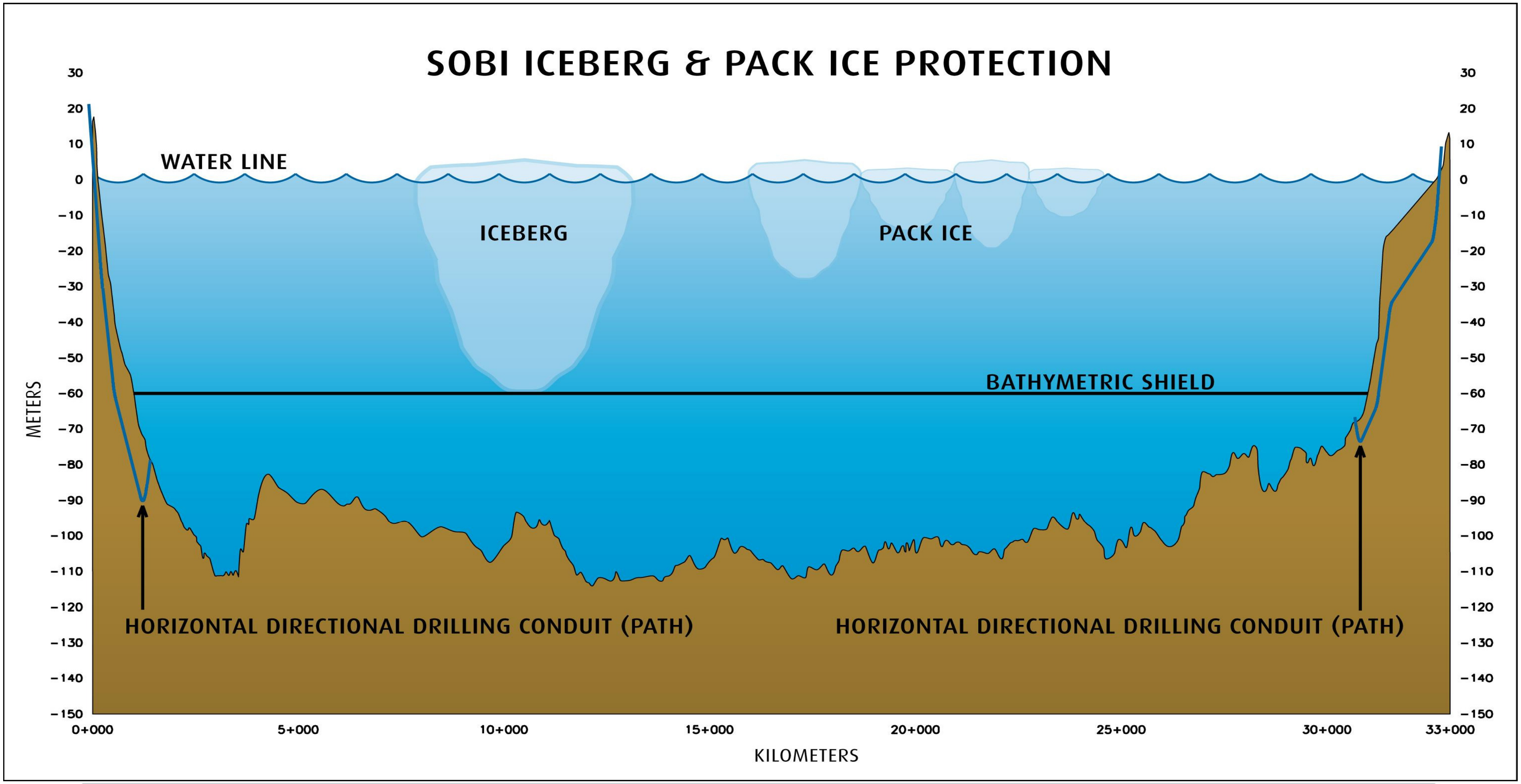
SOBI – Iceberg Risk



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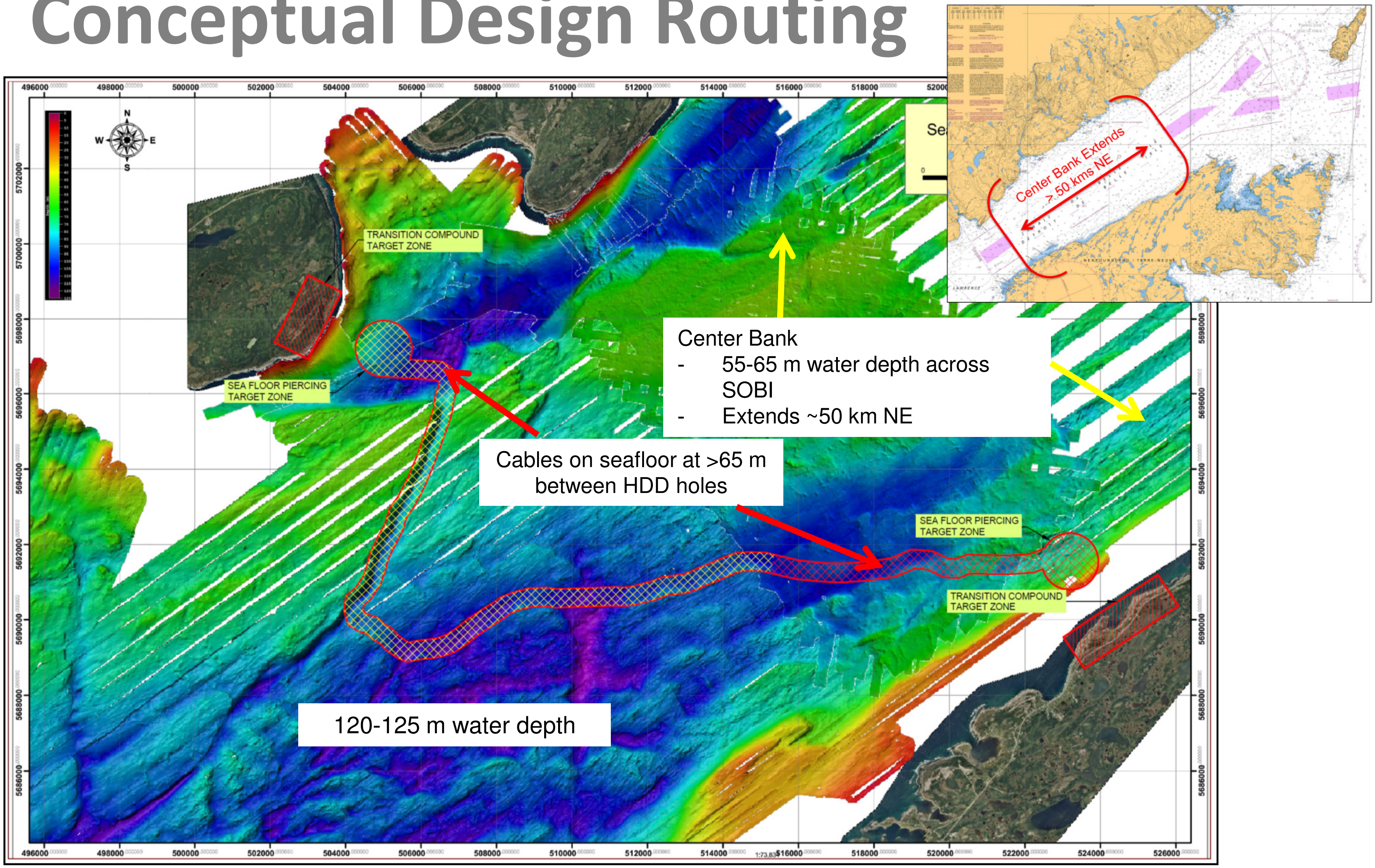
Conceptual Design Routing



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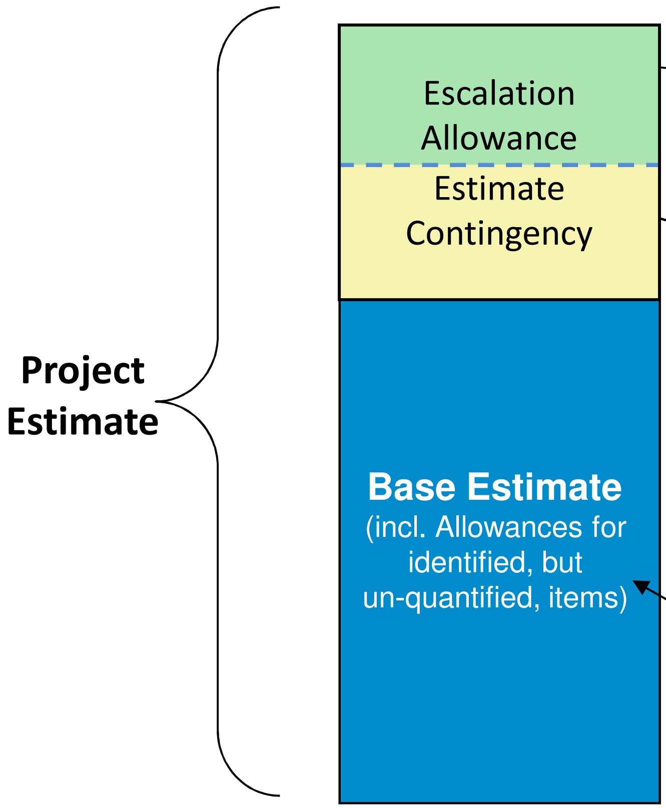
Nalcor's Estimating Approach

Nalcor's Estimating Approach

- Adopt industry recommended practice
  - Association for Advancement of Cost Engineering (AACE) International
- Focus on key cost drivers
- Fully engage project team
  - Combined Nalcor / SNC-Lavalin >400 FTEs
- Understand and apply lessons learnt from other projects
- Gather external and independent input

Cost Estimate Components



Escalation Allowance
Provision for changes in price levels driven by economic conditions, including inflation. Estimated using economic indices weighted against base estimate components.

Estimate Contingency
Provision made for variations to the basis of an estimate of time or cost that are likely to occur, that cannot be specifically identified at the time the estimate is prepared but, experience shows, will likely occur. It is not meant to cover scope changes outside the Projects' parameters (i.e., events such as strikes or natural disasters, escalation or foreign currency impact), or changes that alter the basis upon which the control point for management of change has been established (e.g., basis of design, project execution plan).

Base Estimate
Reflects most likely costs for known and defined scope associated with project's specifications and execution plan as produced by the estimator.

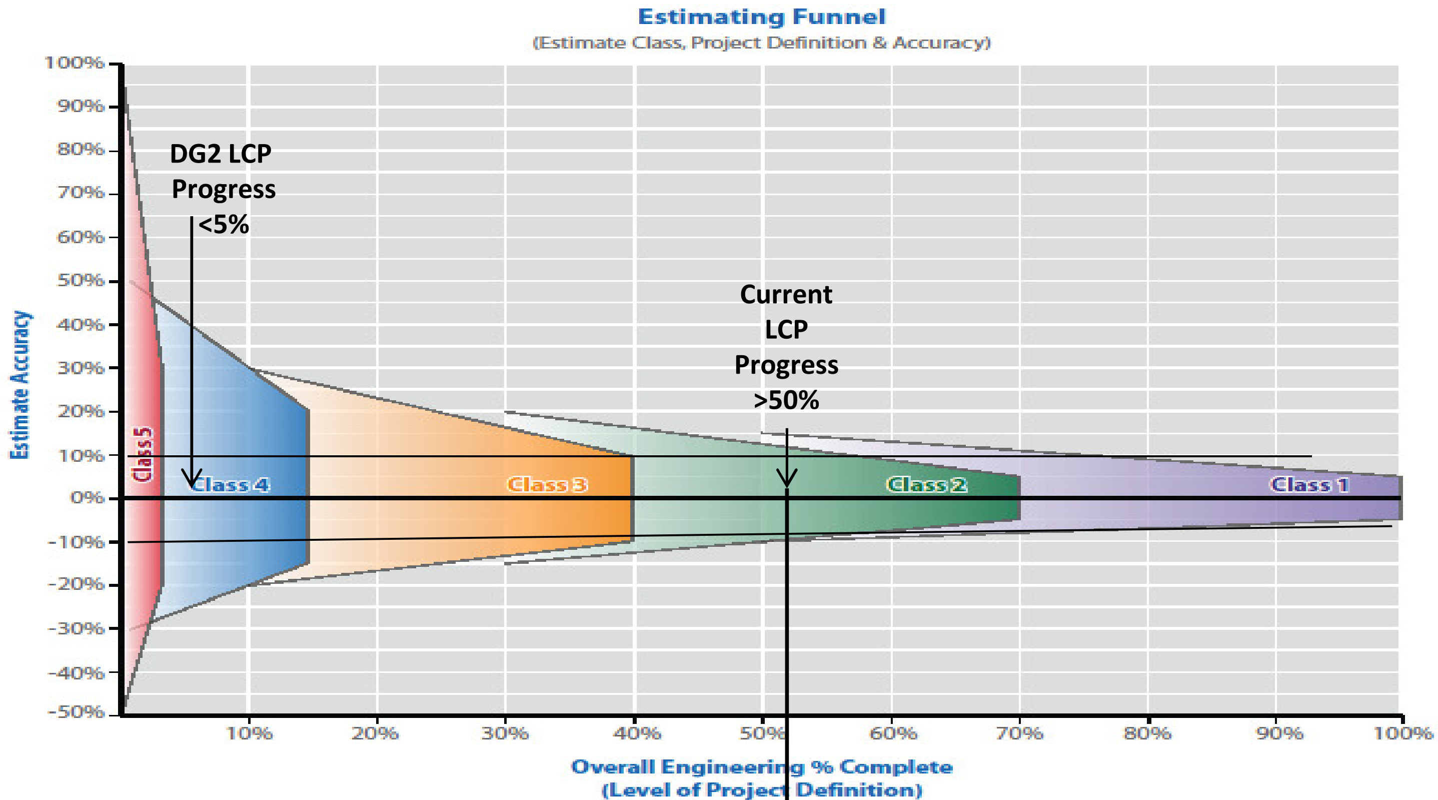
Establishing a High Quality DG3 Cost Estimate

- Estimate accuracy is the degree of confidence that the estimated cost will be close to the final project cost.
- As a project becomes better defined and less likely to change the more confidence there is that the estimate will accurately predict the final project cost.
- The accuracy of a project's cost estimate is a function of the:
  - level of Front-End Loading (i.e. project definition) completed
  - understanding and mitigating project's risk exposure

Estimate Accuracy
Shaping Characteristics for Lower Churchill

- AACE International has identified two drivers that influence estimate accuracy:
  - Primary Driver:
    - High degree of project definition (i.e. represented by amount of engineering completed)
  - Secondary Drivers:
    - Non-technically complex Project
    - Significant amount of effort expended to prepare estimate
    - High quality reference cost data available

Estimate Accuracy Evolution



Required for	Decision Gate 1	Decision Gate 2	Decision Gate 3	Financial Close	Mid-Point Check
Class	AACEI Class 5	AACEI Class 4	AACEI Class 3	AACEI Class 2	AACEI Class 1
Estimate Purpose	Opportunity Screening	Alternative Selection	Sanction / Control	Financing	Check Estimate
Project Definition	0% to 2%	1% to 15%	10% to 40%	30% to 70%	50% to 70%

DG3 Estimate – How it was produced

- Owner-led estimate team comprised of SNC-Lavalin and various third parties
- Developed over a 12-month period
- Leveraged extensive historical data for hydro and transmission projects throughout Canada
- Reflects what a construction contractor would need to do to evaluate project costs for which a bid is being prepared
  - This approach could be best described as a bottom-up, first principle estimate as opposed to a parametric or stochastic method
- Concurrent “check” or validation estimates and estimate process check completed by expert consultants

Establishing the Cost Estimate

The accuracy of the cost estimate is a function of the engineering, procurement and contracting carried out as shown below:

- AACEI Class 4 Estimate
- Some site investigation work
- Concept selected and feasibility work complete
- Project scope defined
- Quantities estimated based on previous studies
- Estimate based on earlier feasibility studies escalated and updated with latest data
- The estimate reflects the Basis of Design approved at DG2

- AACEI Class 3 Estimate
- Includes latest geotechnical analysis
- Quantities based on 3D model and detailed engineering work
- Includes actual bid costs for SOBI cable contract, T&G sets, tower steel, early infrastructure works plus updated market intelligence and quotes
- Labour rates will be updated based on Labour Agreement
- The estimate reflects the Basis of Design at DG3

- AACEI Class 2 Estimate
- Includes 100% of all critical / complex PO's and contracts which amount to 80% of all contracts
- Firm quantities with EPC, Lump sum and fixed unit price contracts as appropriate
- The estimate reflects the DG3 Basis of Design plus any approved project changes as per Management of Change process

Estimate Leverages Extensive Information

What is to be built → **Definition Factors (Scope)**

+

How it will be done → **Construction Methodology & Timeline Factors**

+

Per unit material / labour cost → **Price Factors**

+

Time to complete each work activity → **Performance Factors**

=

Base Estimate

Definition Factors (Scope)

- Design Criteria & Specifications
- General Arrangements & Layouts
- Design Drawings for major components – towers and hardware
- MF rock and concrete quantities from 3D CAD
- Master Equipment List
- Cable List
- Material Take-offs for Construction Bulks
- Equipment Specifications
- Geotech surveys
- WBS & Cost Codes

Construction Methodology & Timeline Factors

- Construction Philosophies
- Construction Execution Plan
- Constructability Reviews
- Construction Schedule
- Logistics and Access, incl. freight forwarding & marshaling yards
- Contract Package Dictionary
- Org. Design and Staff Plans
- Construction Equip. Types
- Labour Demand
- Labour Demarcation
- In-directs Strategies
- Site Services
- Pre-Fabrication Plans
- Crane & Access Studies
- Support Facilities
- Material Sourcing Strategies
- Seasonality Constraints
- Permit Register

Price Factors

- Labour Agreement
- Construction Equip. Rates
- Bid Analysis – T/G, SOBI Cable, Tower Steel, Accommodations, Road
- Budgetary Quotes – various equipment
- Site Services Costs – catering, air transport
- Construction Bulks Prices – Rebar, Cement, Diesel, etc.
- Helicopters and Aircrane
- Contracting Market Intelligence – overhead and profit
- Foreign Exchange Rates

Performance Factors

- Crew Make-up and Assignments
- Task durations
- Workface Restrictions
- Labour Productivity & Benchmarks
- Mobilization Constraints
- Work Front Stacking
- Seasonality Impacts
- Equipment Productivity
- In-Directs Usage
- Offsite Fabrication

Base Estimate

- Estimate organized by Project, Physical Component and by Contract Package
- Documented Basis of Estimate
- Foreign Currency Demand
- Person hours
- Trade demands
- Cash flows

Key Quantities

- Powerhouse, Intake and Spillway
  - Mass Excavation of 2.5M m^3
  - 390,000 m^3 of concrete
  - 200,000 m^2 of formwork
  - 57,000 tonnes of rebar
  - 88 m high and 225m wide (the Peace Tower is 92.2 m high)
- Dams and Cofferdams
  - 895,000 m^3 material
- Roller Compacted Concrete:
  - 226,000 m^3 RCC
- North Spur:
  - Overburden and rock excavation of 700,000 m^3
  - Rockfill of 1M m^3
- HVac LTA Transmission
  - 490 km in length
  - 1,280 towers
- HVdc LIL Transmission
  - 1,079 km in length
  - 3,642 towers
- MF Reservoir
  - 1,800 hectares
  - 157 kms of roads
  - 390,000 m^3 of saleable wood

Estimate Contingency Setting

- Nalcor follows the AACEI Recommended Practice to establish contingency
- Nalcor uses the Westney proprietary risk resolution process
- Deterministic cost ranges are established for identified cost risks
- Following Monte Carlo analysis a probabilistic cost curve is generated
- The difference between the actual estimate and the P50 probability point is the contingency

Independent Findings

- Westney engaged to conduct risk assessment in late May / early June with Project Team. Key findings:

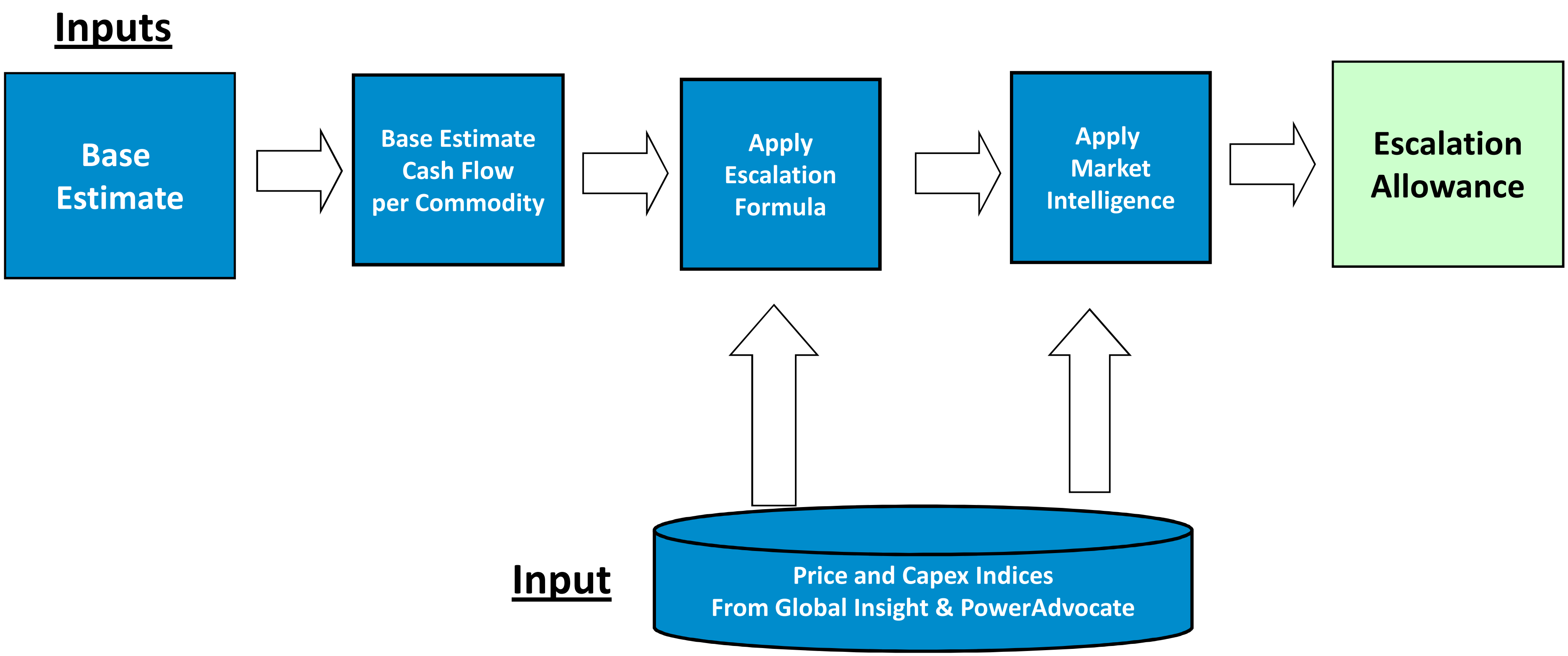
1. *The scope for the project is well defined and represents design development consistent with project sanction. Considerations, such as likely geotechnical conditions and quantity variations due to further design development, were quantified based on the experience of the project team and used as a basis for assessing the possible outcomes.*

2. *The estimate and quantification are consistent with the requirements of project sanction. In many cases, pricing was based on actual bids and budgetary quotes. "Check" estimates were developed by industry experts for key areas, including the Muskrat Falls powerhouse and dam works. Other pricing was benchmarked against representative projects. The effects of weather, labour /skills availability, and supervision were also considered and/or benchmarked. Overall, this project's degree of design development, definition, and methodology is consistent with an AACEI Class 2 estimate.*

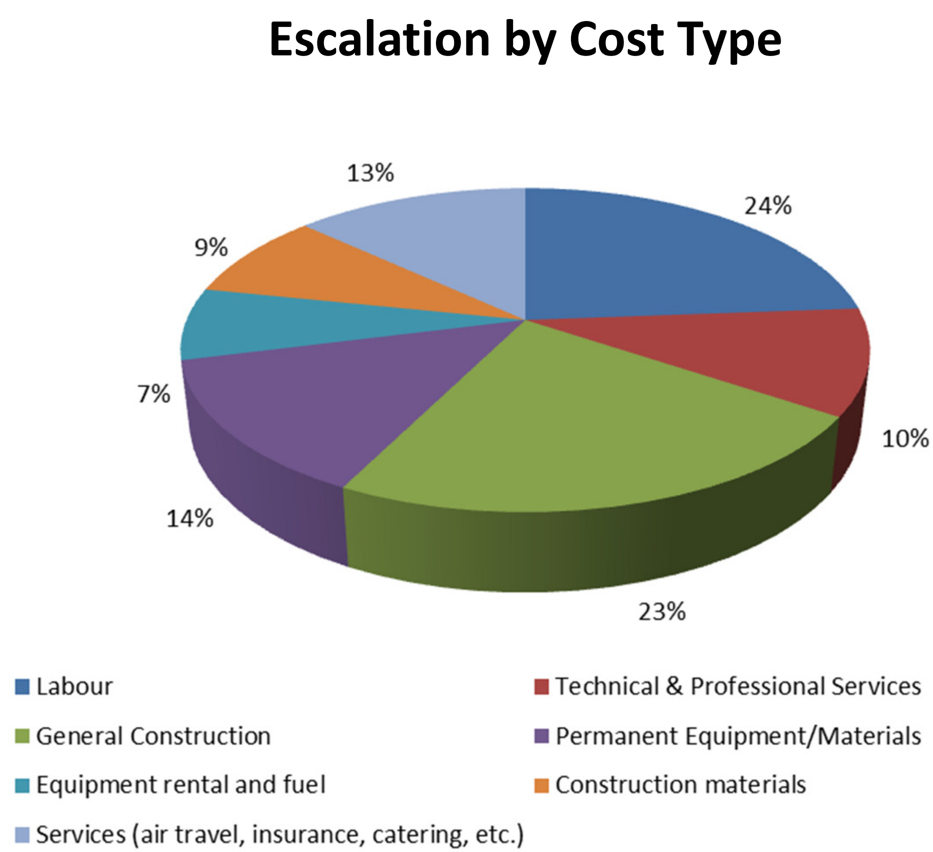
3. *The estimate, plus an amount to reach the P50 on the results curve, should represent the cost at which the project can be executed according to the plan exclusive of external uncertainties.*

Escalation Estimating Process

Nalcor follows principles of AACEI Recommended Practice No. 58R-10



Escalation Allowance



- Custom project-specific model developed
- Used a combination of Global Insight, Power Advocate and LCP market intelligence
- Costs broken down into 30 categories
- Contract pricing provides greater certainty for some project components

MHI Review – Findings

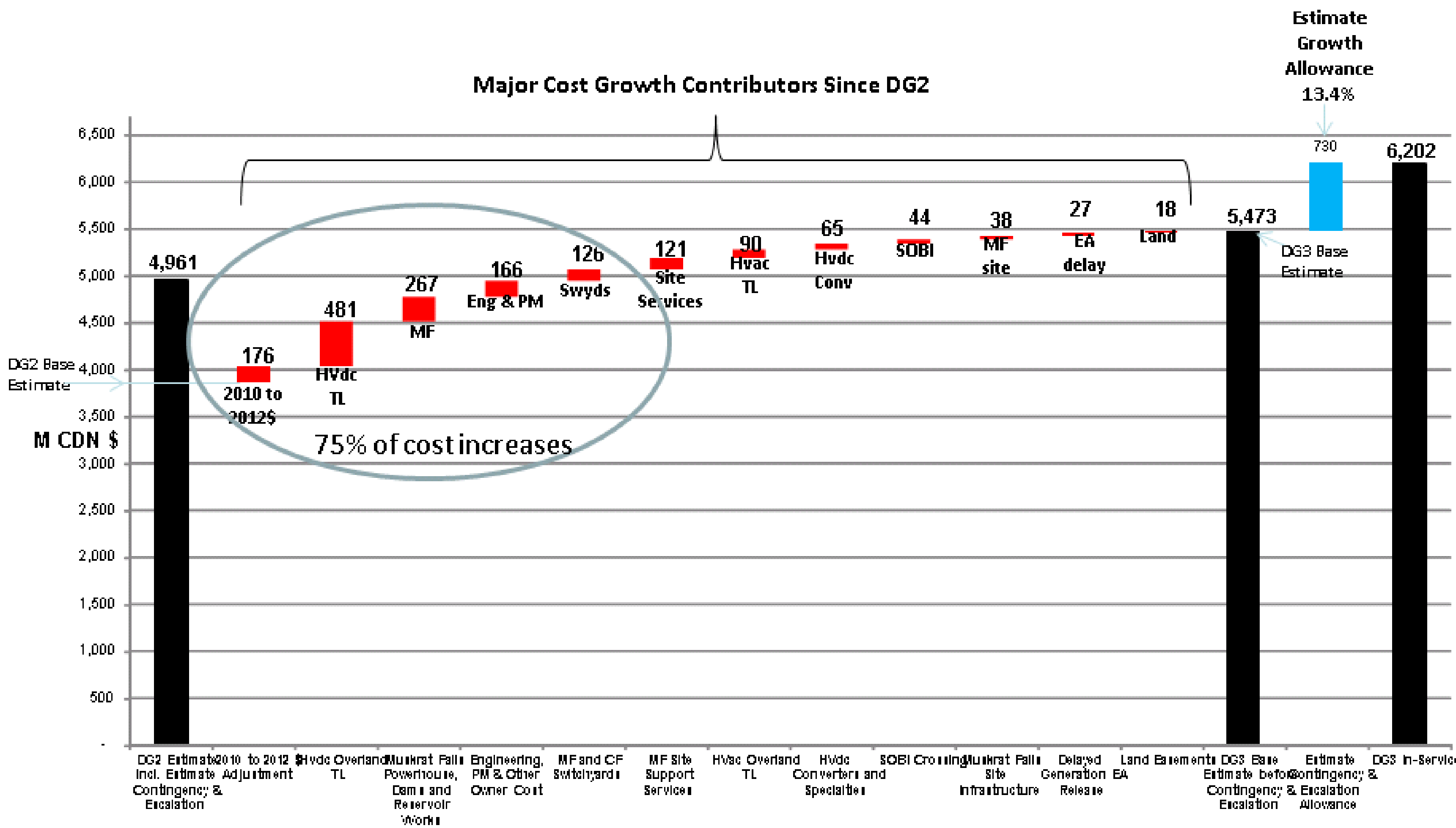
- *"From a review of the information provided, Nalcor has performed the design, scheduling and cost-estimating work for the Muskrat Falls Generating Station and the Labrador Transmission Assets with the degree of skill and diligence required by customarily accepted practices and procedures utilized in the performance of similar work. The current Lower Churchill Project design, schedules and cost estimates are considered consistent with good utility practice. The design, construction planning, cost estimate and schedule are comprehensive and sufficiently detailed to support a Decision Gate 3 project sanction…"* [page 56]

- *"The costs of the Strait of Belle Isle marine crossing have increased marginally but are considered to be reasonable and within the AACE Class 3 estimate range for Decision Gate 3. MHI is of the opinion that there is an equal likelihood that the costs will decrease, as a result of opportunities through optimized design."* [page 52]

- ***"Nothing was found in any of the technical or financial reviews that would substantially change MHI's findings under the existing assumptions."*** **[page 8]**

Key Drivers of DG3 Estimate

Cost Estimate Update Since DG2



HVdc Overland Transmission (1/2)

- Operability / Reliability Driven Change
  - Operating voltage optimization (320 to 350kV) – less losses – results higher towers and different conductor
  - Detailed tower models based on final meteorological loading and PLS CADD models meant increased weight and quantity
- Constructability Driven Change
  - Access for remote Southern Labrador and LRM sections
  - Several significant river crossings identified, requiring large bridges or ice bridges
  - Detailed line routing and construction methods, longer route (30 km) and more difficult access (e.g. helicopter construction)
  - Definition of ROW Clearing Scope – approx. $130M
  - Supporting infrastructure – marshalling yards, camps, etc.
- Market Driven Change
  - Increased Labor cost
  - Increased Material cost – budgetary prices or bids for all material
  - Consideration for the need to attract international contractors given project size

HVdc Overland Transmission (1/2)

Parameter	DG2	DG3	Change (%)
Operating Voltage (kV)	320	350	+10%
# of Towers	~3,900	3,633	-6.5%
Tower per km	~3.34	3.38	-
Tonnes of Steel (MT) – Towers and Foundations	~14,730	37,112	150%
Total Construction Person hours (millions)	3.0	4.5	+50%

MF Powerhouse, Intake, Dams and Reservoir (1/2)

- Operability / Reliability Driven Change influencing overall layout
  - Hydraulic flow conditions for T/G Unit 1
  - Stability of Intake Structure
  - Operability of Spillway Gates in winter
  - Flow conditions downstream of spillway – erosion mitigating
  - Results in significant increase in concrete quantities, thus materials and person-hours which is the major cost driver for MF
  - Changes identified with computer model were subsequently confirmed with Physical Model built in Edmonton (Northwest Hydraulics)
- Constructability Driven Change
  - Reservoir Clearing Execution
  - Winter Construction Constraints
  - River Management (i.e. riverside RCC cofferdam)
  - Site Indirect Services – power, batch plant, general services

MF Powerhouse, Intake, Dams and Reservoir (2/2)

Parameter	DG2	DG3	Change (%)
Excavation (Overburden & Rock) (Mm^3)	5.0	4.1	-18%
Structural / Conventional Concrete (CVC) (m^3)	180,000	450,000	+150%
Reinforcing Steel / Rebar (MT)	14,750	24,000	+63%
Formwork (Intake/PH/Spillway) (m^2)	103,000	237,000	+130%
Structural Steel (MT)	4,000	3,200	-20%
Cofferdam Fill Structures (m^3)	600,000	895,000	+50%
Roller-Compacted Concrete (RCC) (m^3)	307,000	225,000	-27%
Spillway Gates	4	5	1 Gate
Total Construction Person hours (millions)	7.0	9.3	+33%

Engineering, PM & Other Owner Cost

- Significant increases in EPCM and owner costs
  - EPCM contract awarded after DG2
  - Benefits strategy negotiated after DG2
  - 95% of engineering completed in NL. Significant premium to attract and retain workforce in St. John's
  - Strong competition for experienced personnel from Hebron, Vale Inco and across Canada
  - Release from generation EA two years later than expected resulting in delays to sanctioning, increased carrying costs for Nalcor
  - Additional unplanned reviews by PUB and MHI

MF and CF Switchyards

- Operability / Reliability Change:
  - Finalization of Single-Line Diagrams resulted in significantly larger footprint at Churchill Falls which could not be accommodated by simply expanding existing CF yard – hence large civil scope growth
  - Addition of 138kV capacity at MF Switchyard to facilitate future HVGB connection

- Constructability Driven Change
  - Site services support at CF for 2+ years
  - Poor foundation conditions at Muskrat Falls require material replacement
  - Logistics / transport cost for heavy lift items (i.e. transformers)

MF Site Support Services

- Primarily driven by the highly competitive market in Camps and services that has developed in Canada and NL since DG2 Including:
  - Operating costs for increased person-hours of construction effort for Muskrat Falls
  - Market costs for services such as catering and housekeeping
  - Laboratory and Surveying Scope increase for larger, more complex MF plant
  - Medical and security requirements
  - Increased Cost of services such as ground transportation, drug and alcohol testing, pre-employment medical screening, road maintenance, vehicles

HVac Overland Transmission (1/2)

- Constructability Driven Change
  - Detailed line routing and construction methods resulted in detailed understanding of ROW clearing scope
  - Increased support services costs driven by highly competitive market in Canada regarding– marshalling yards, catering, camp, travel, medical support, etc.
- Market Driven Change
  - Increased Labor cost
  - Increased Material cost – budgetary prices or bids for all material are now in hand and are higher than estimated at DG2

HVac Overland Transmission (2/2)

Parameter	DG2	DG3	Change (%)
Operating Voltage (kV)	345	315	-9%
# of Towers	~1,200	1,278	+7%
Tower per km	4.85	5.17	+7%
Tonnes of Steel (MT) – Towers and Foundations	~10,000	10,370	+4%
Total Construction Person hours (millions)	1.2	1.7	+40%

HVdc Converters & Specialties, and Island Upgrades

- Operability / Reliability Driven Change
  - Operating voltage optimization (320 to 350kV) resulted in required stability with existing island system, less line losses which followed detailed system planning studies carried out post DG2
  - Requirement for Indoor Cable Transition compounds to reduce salt contamination risk
  - Redundancy/reliability requirements resulting in additional cable switching facilities to facilitate remote energization of the spare cable
- Design Evolution Driven Change
  - Increased scope of Holyrood Conversion for Synchronous Condenser support
  - Finalization of Electrodes Sites
    - The electrode line length in Labrador was increased to the SOBI in order to achieve the required technical grounding requirements, site investigation work to determine this was post DG2.

SOBI Crossing

- Market Driven Change
  - Confirmed cable supply / install prices from RFP
- Design Evolution Driven Change
  - Final project definition and cable routing
  - Confirmed ice protection requirements for shoreline and seabed
- Constructability Driven Change
  - Actual HDD drilling rates from 2011/12 pilot program were favorable compared to as-planned

MF Site Infrastructure

- Constructability Driven Change
  - Requirement to replace existing forestry access road, the condition of this road was found to be unsuitable when work started
  - Increase in construction power load following study work
  - Construction telecommunications
  - Movement of MF Accommodations Complex due to poor geotechnical issues at DG2 location
  - Allowances for offsite access upgrades – port facilities and bridging for movement of heavy items
- Market-Driven Change
  - The highly competitive market conditions for accommodation complexes across Canada

Questions