Resource Assessment of Frontier Basins

An example from the play-based Greenland assessment

Martin Sønderholm (GEUS) and colleagues from GEUS, NUNAOIL and MRA

NAALAKKERSUISUT
GOVERNMENT OF GREENLAND

NUNAOIL A/S

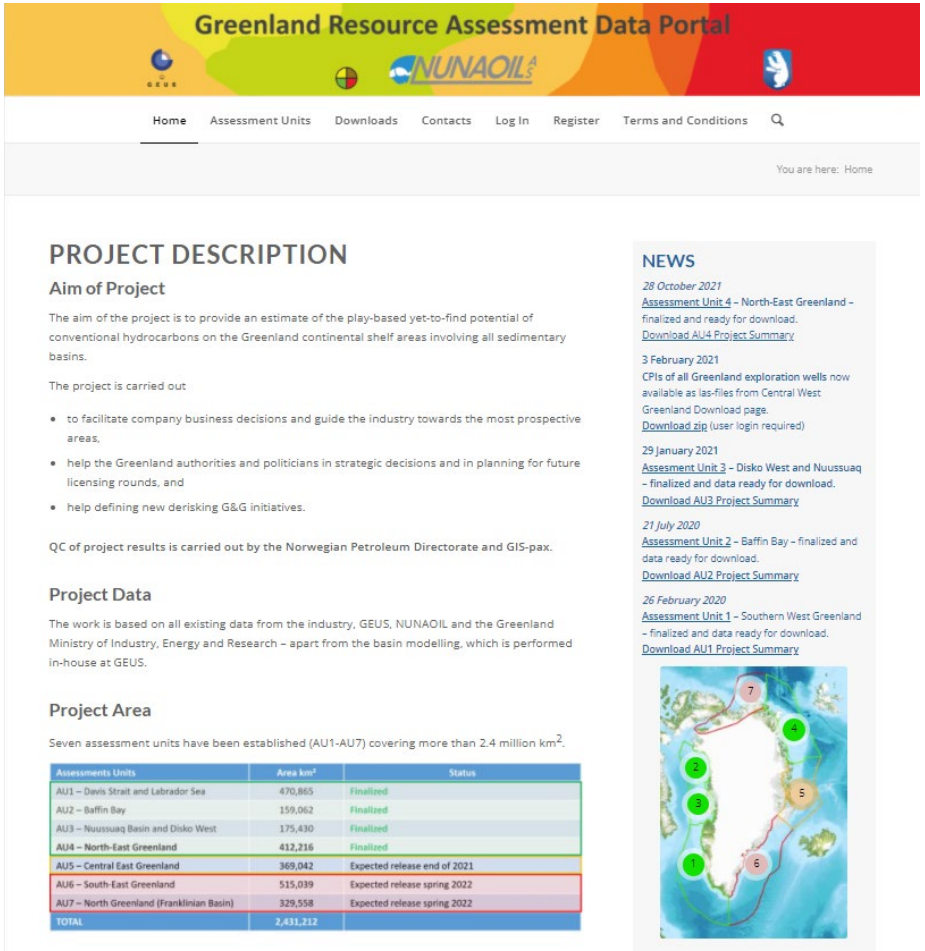
GEUS

The Aim

- Provide an estimate of the play-based yet-to-find potential of conventional hydrocarbons on the entire Greenland continental shelf and onshore areas

  QC of project results is carried out by the Norwegian Petroleum Directorate and GIS-pax

- Help the Greenland authorities and politicians in strategic decisions and in planning for future licensing rounds
- Facilitate company business decisions and guide the industry towards the most prospective areas, and
- Help defining new derisking G&G initiatives.



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PROJECT DESCRIPTION

Aim of Project

The aim of the project is to provide an estimate of the play-based yet-to-find potential of conventional hydrocarbons on the Greenland continental shelf areas involving all sedimentary basins.

The project is carried out

- to facilitate company business decisions and guide the industry towards the most prospective areas,
- help the Greenland authorities and politicians in strategic decisions and in planning for future licensing rounds, and
- help defining new derisking G&G initiatives.

QC of project results is carried out by the Norwegian Petroleum Directorate and GIS-pax.

Project Data

The work is based on all existing data from the industry, GEUS, NUNAOIL and the Greenland Ministry of Industry, Energy and Research – apart from the basin modelling, which is performed in-house at GEUS.

Project Area

Seven assessment units have been established (AU1-AU7) covering more than 2.4 million km^2.

Assessments Units	Area km^2	Status
AU1 – Davis Strait and Labrador Sea	470,865	Finalized
AU2 – Baffin Bay	159,062	Finalized
AU3 – Nuussuaq Basin and Disko West	175,430	Finalized
AU4 – North-East Greenland	412,216	Finalized
AU5 – Central East Greenland	369,042	Expected release end of 2021
AU6 – South-East Greenland	515,039	Expected release spring 2022
AU7 – North Greenland (Franklinian Basin)	329,558	Expected release spring 2022
TOTAL	2,431,212	

NEWS

28 October 2021
Assessment Unit 4 – North-East Greenland – finalized and ready for download.
Download AU4 Project Summary

3 February 2021
CPIs of all Greenland exploration wells now available as las-files from Central West Greenland Download page.
Download zip (user login required)

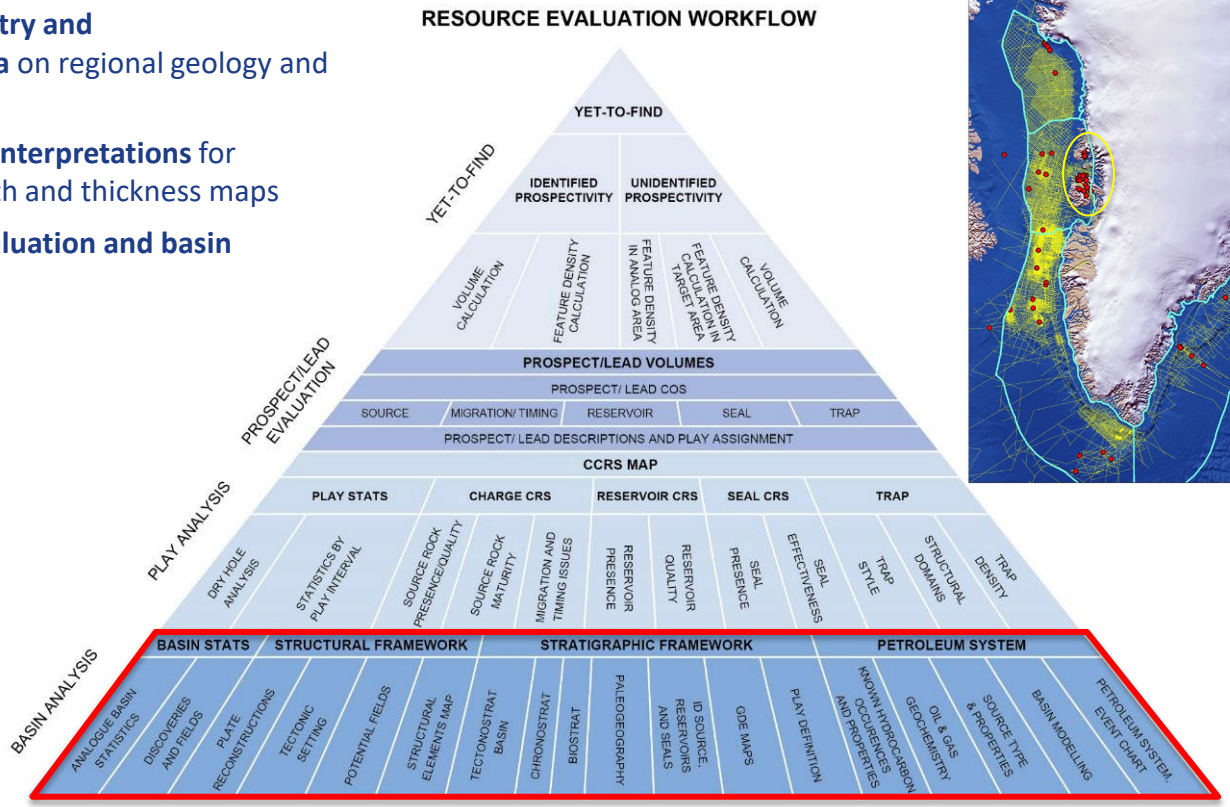
29 January 2021
Assesment Unit 3 – Disko West and Nuussuaq – finalized and data ready for download.
Download AU3 Project Summary

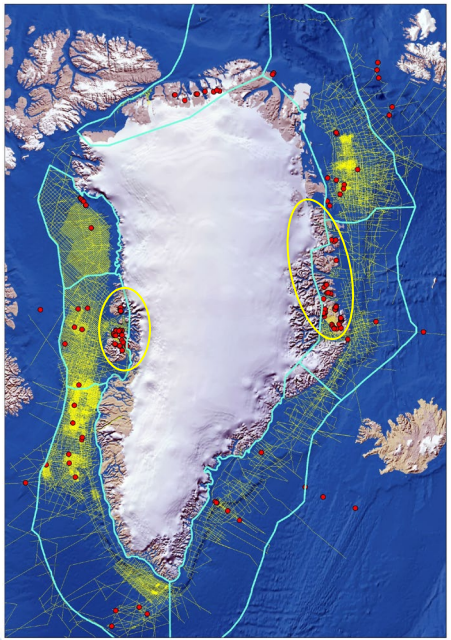
21 July 2020
Assessment Unit 2 – Baffin Bay – finalized and data ready for download.
Download AU2 Project Summary

26 February 2020
Assessment Unit 1 – Southern West Greenland – finalized and data ready for download.
Download AU1 Project Summary

The Methodology I:
Data compilation and basin modelling

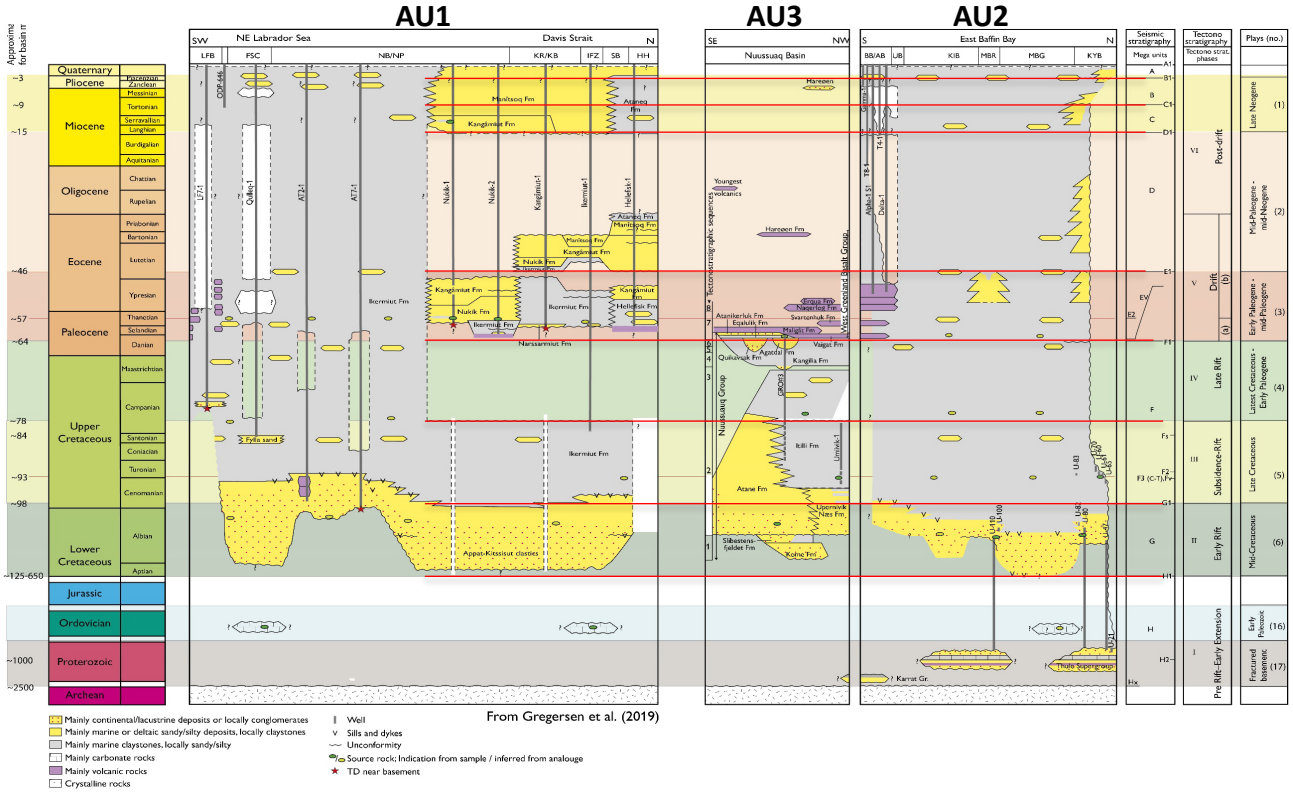
- **Compile all available industry and GEUS/MMR/NUNAOIL data** on regional geology and prospects/leads
- **Integrate regional seismic interpretations** for production of regional depth and thickness maps
- Perform in-house **basin evaluation and basin modelling**





The Methodology I:

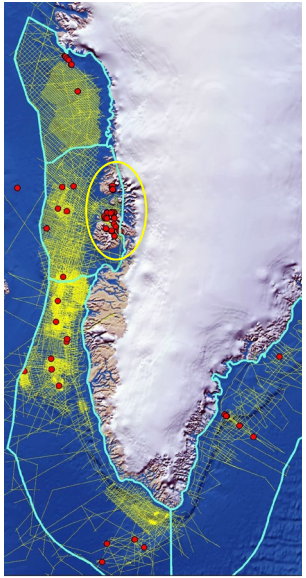
Regional stratigraphic data compilation



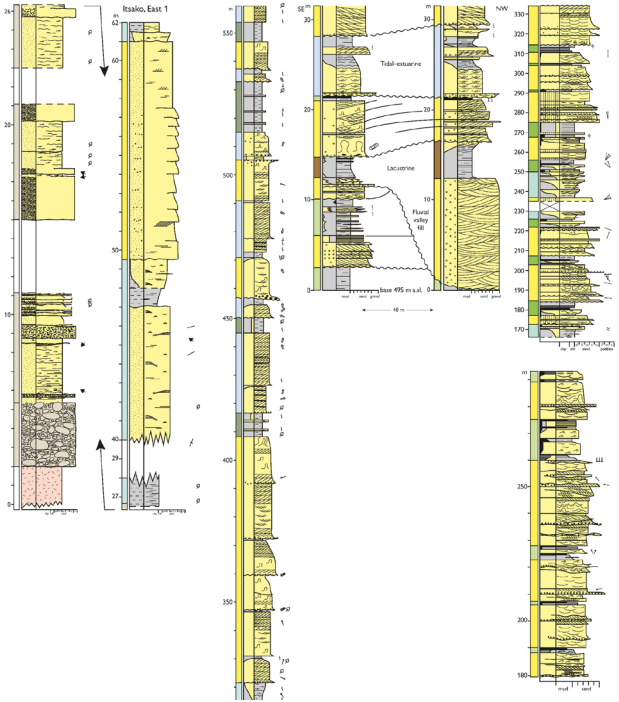
From Gregersen et al. (2019)

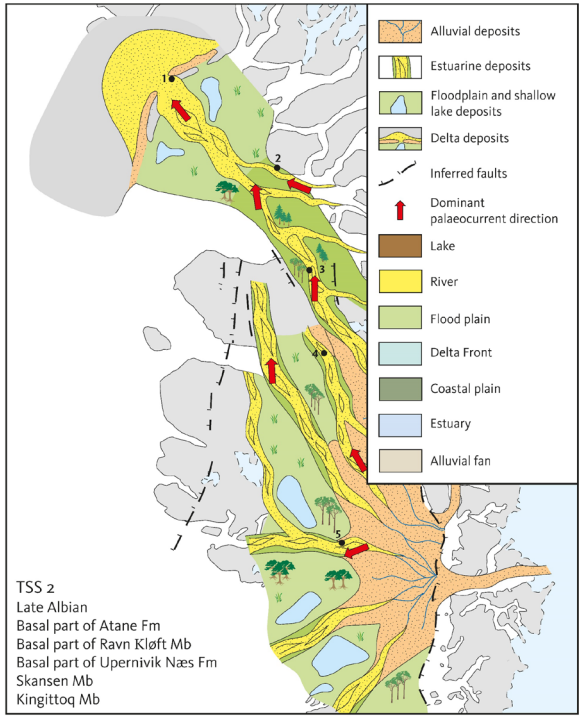
West Greenland

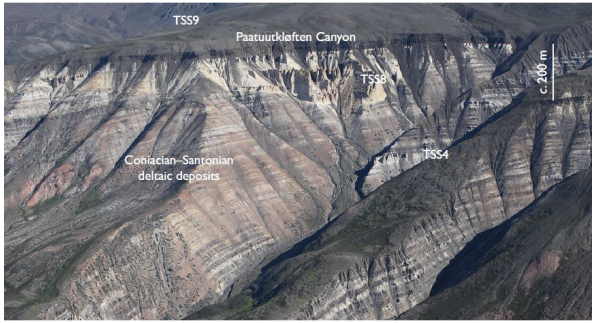
- 15 exploration wells
- 9 offshore stratigraphic boreholes
- 250.000 km 2D seismic
- 13.300 km^2 3D seismic
- World-class outcrop analogues

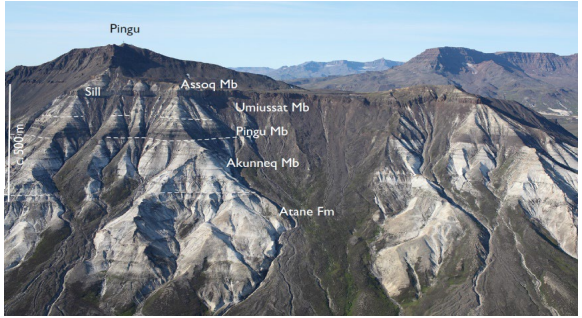


The Methodology I:
Regional stratigraphic data compilation

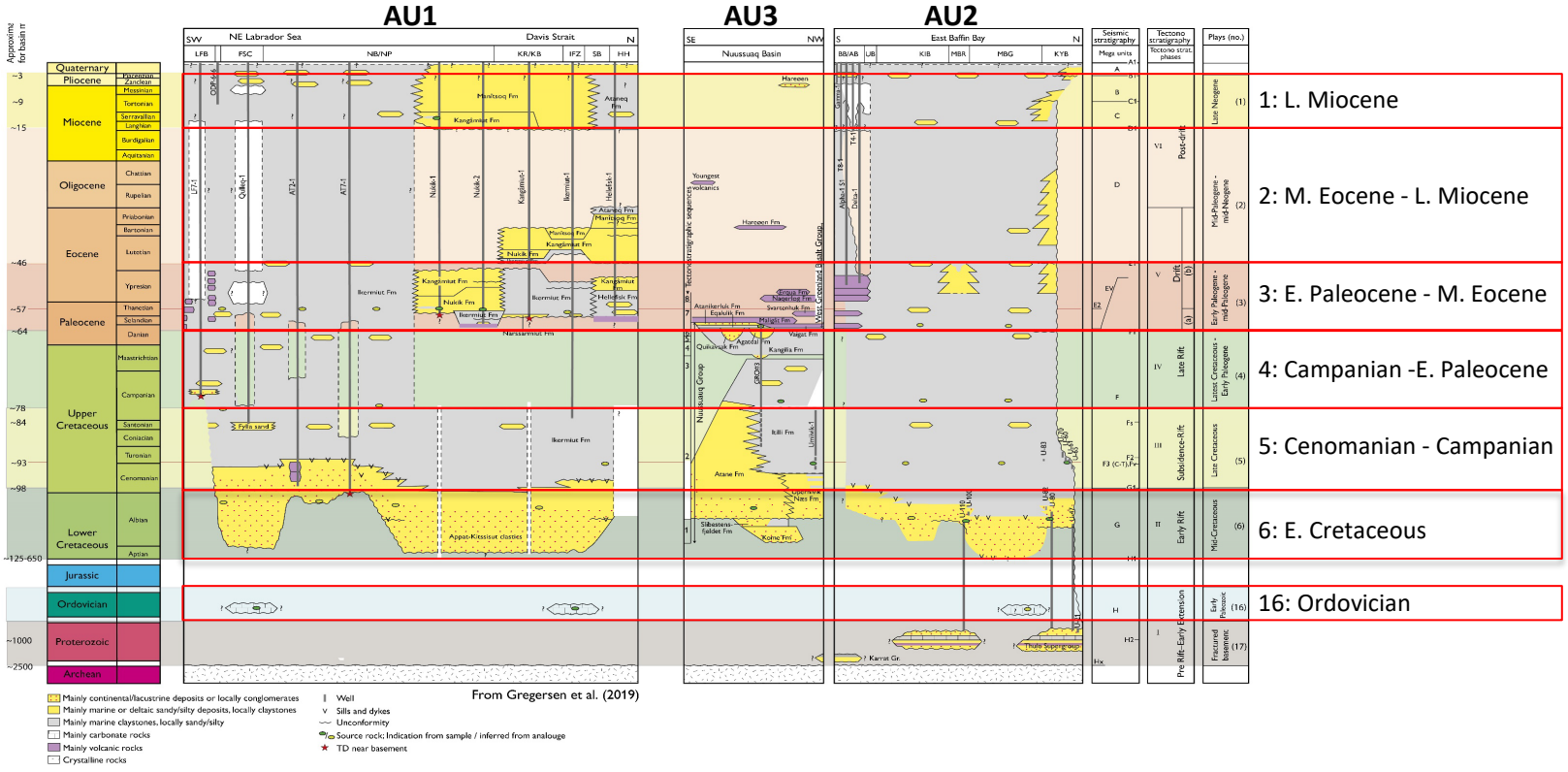






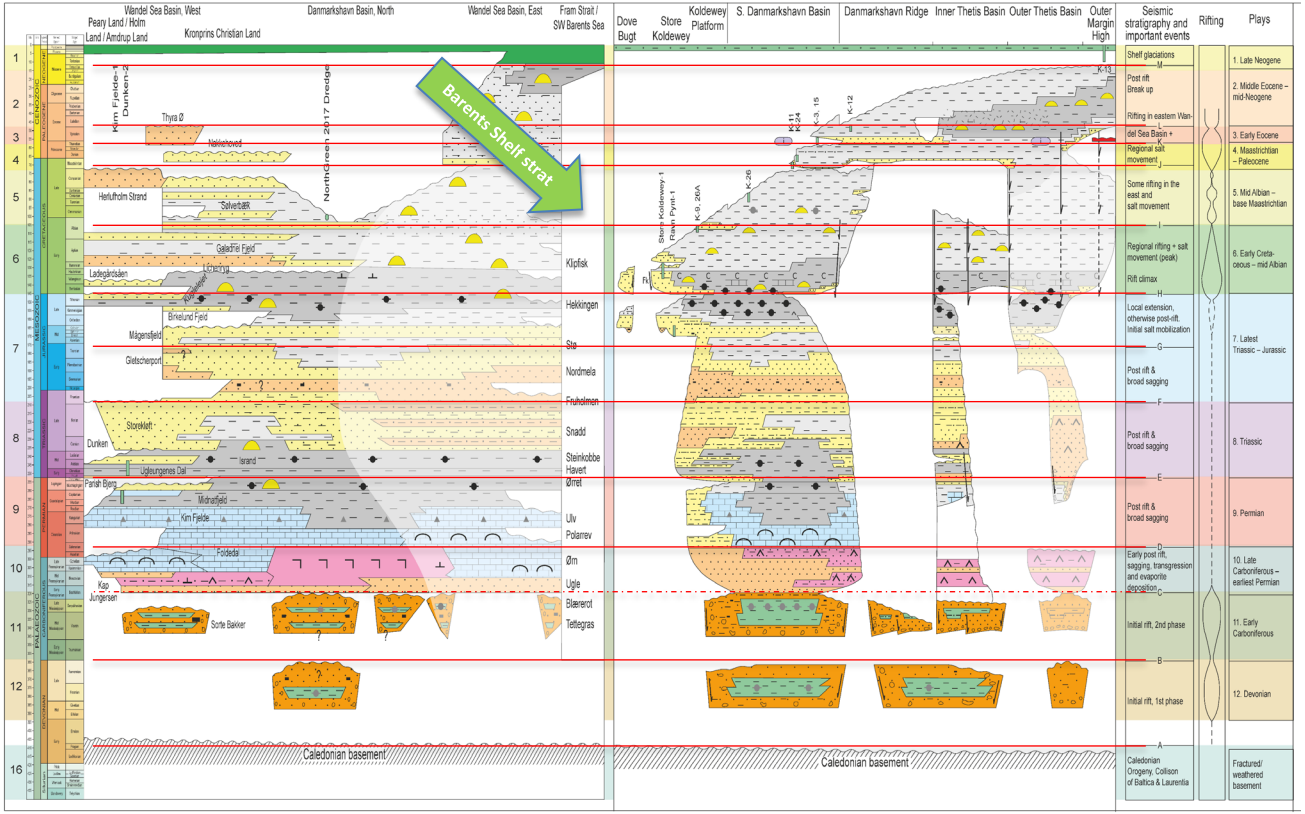


The Methodology I:
Play definition



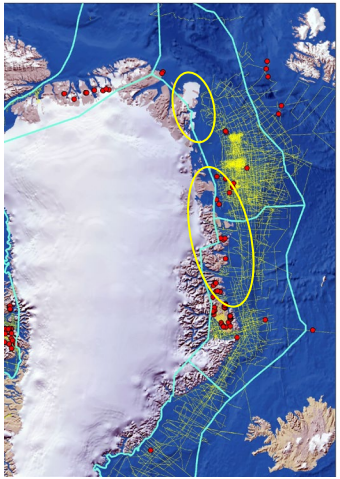
From Gregersen et al. (2019)

The Methodology I:
Regional stratigraphic data compilation



North-East and central East Greenland

- 9 offshore stratigraphic wells
- 59 onshore stratigraphic boreholes
- 115.000 km 2D seismic
- World-class outcrop analogues in central East Greenland
- Analogue data from Barents Sea and Norwegian Shelf



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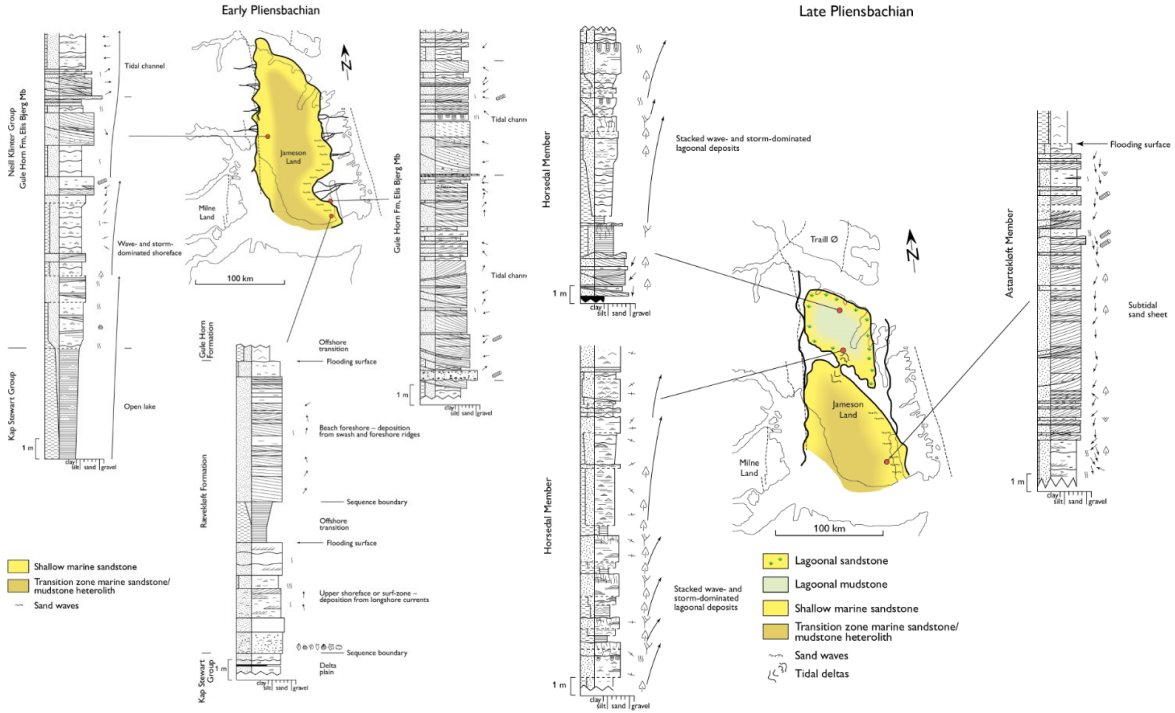
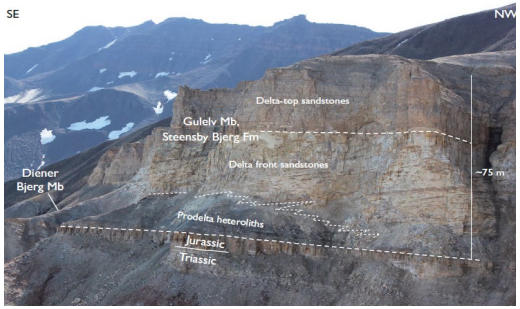
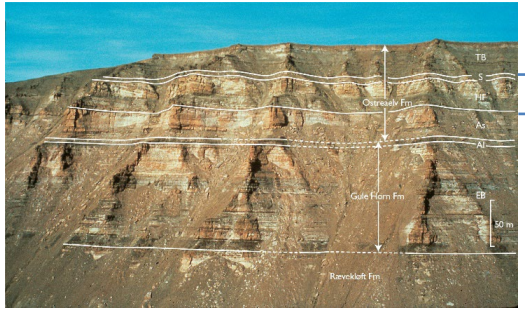
Regional stratigraphic data compilation





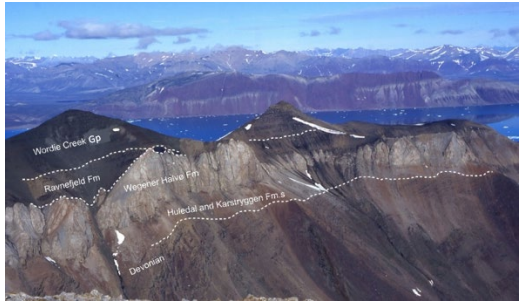
NO analogues



Ile Fm

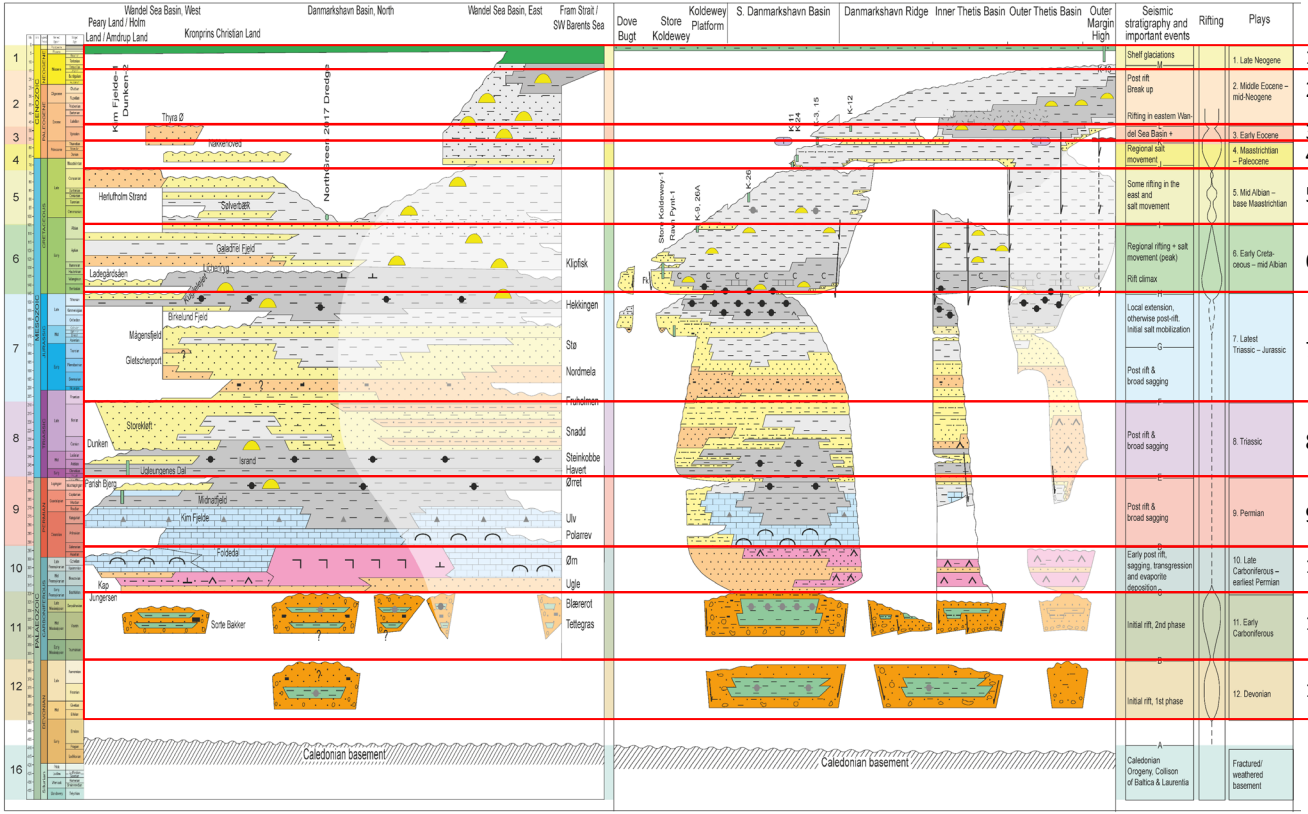
Ror Fm

Tilje Fm



The Methodology I:

Play definition



1: L. Neogene

2: M. Eocene - M. Neogene

3: E. Eocene

4: Maastrichtian - Paleocene

5: M. Albian - Campanian

6: E. Cretaceous – E. Albian

7: Jurassic

8: Triassic

9:Permian

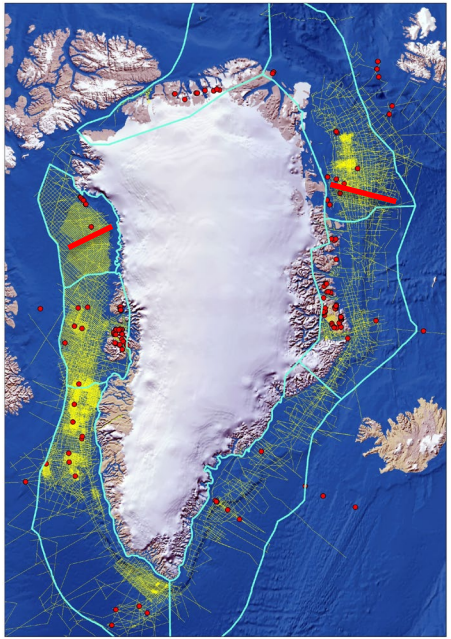
10: L. Carboniferous

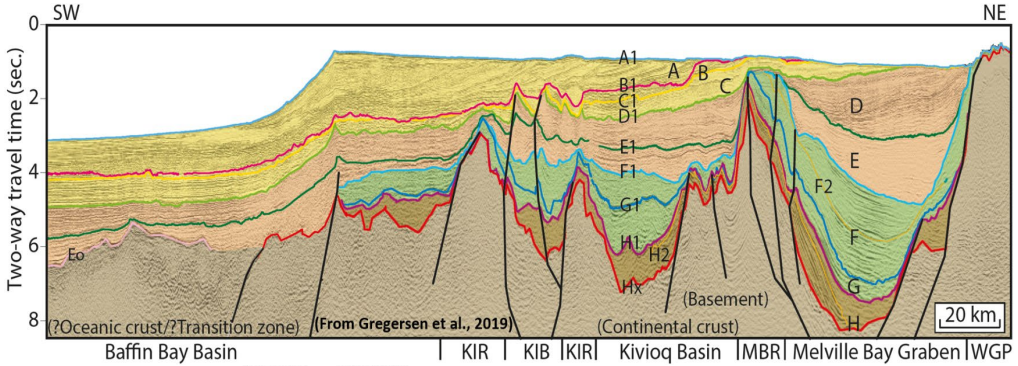
11: E. Carboniferous

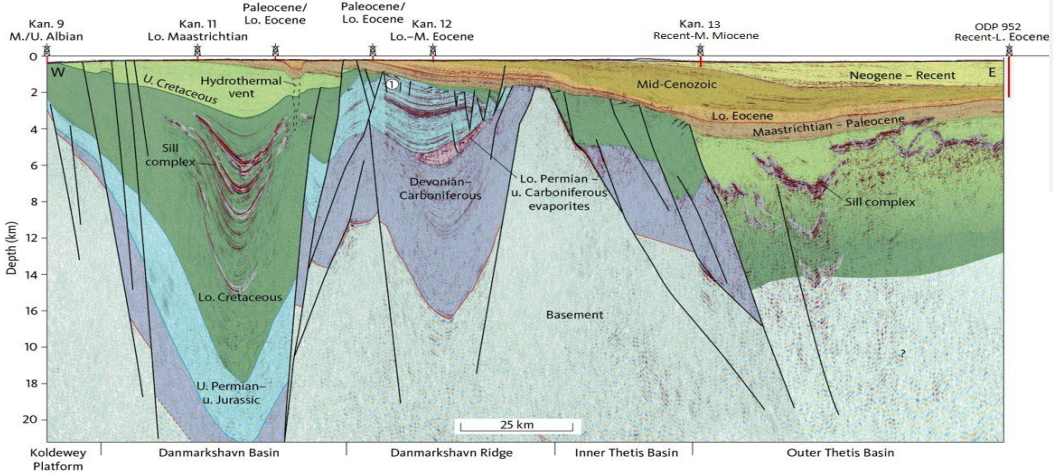
12: Devonian

The Methodology I:

Super-regional seismic stratigraphic interpretation

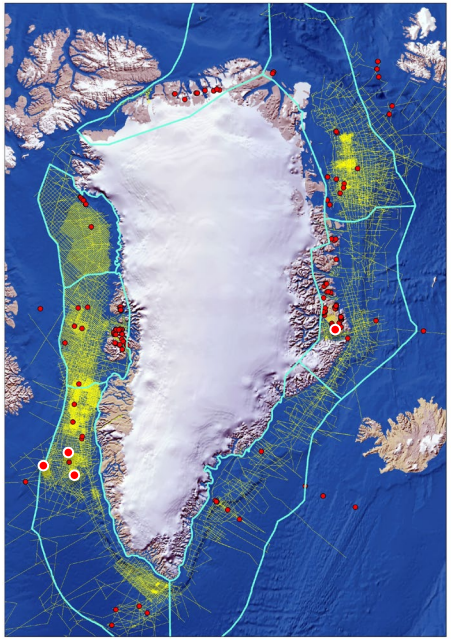


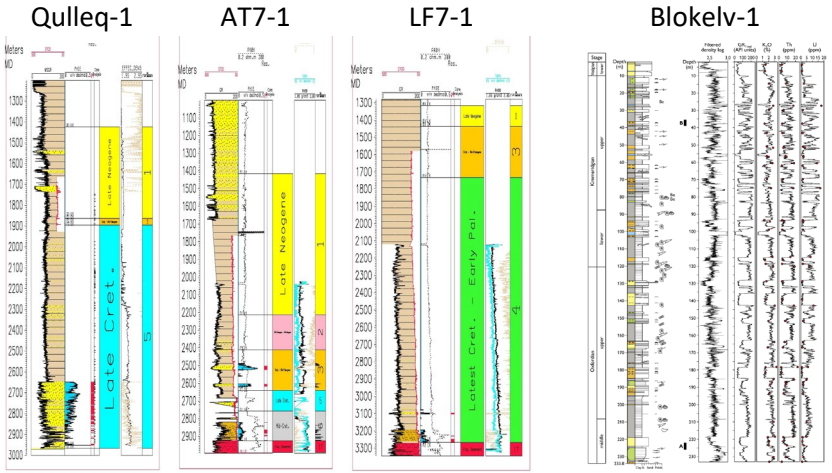




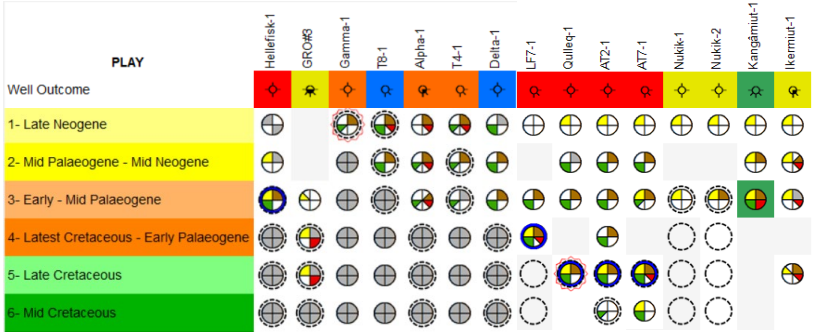
Assignment of super-regional seismic stratigraphic sequences and correlation with recognised plays

The Methodology I:
Well data compilation



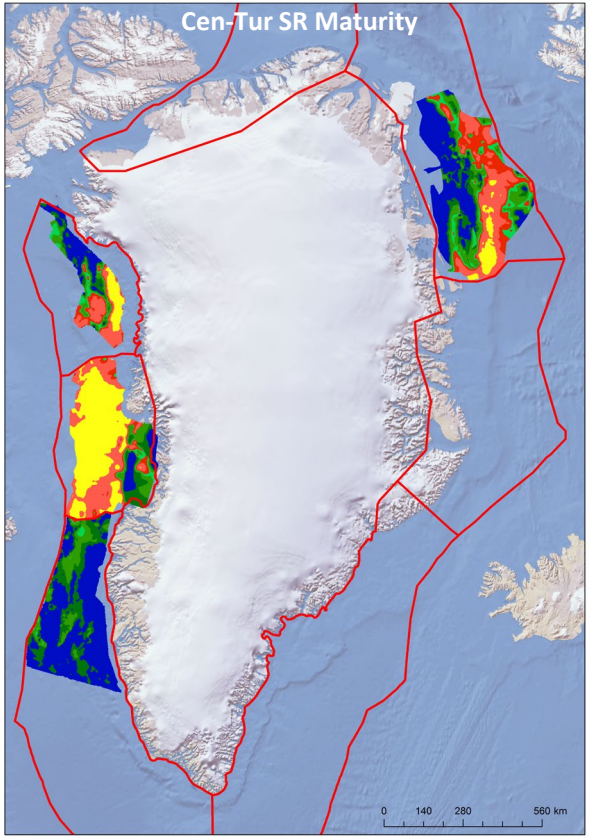


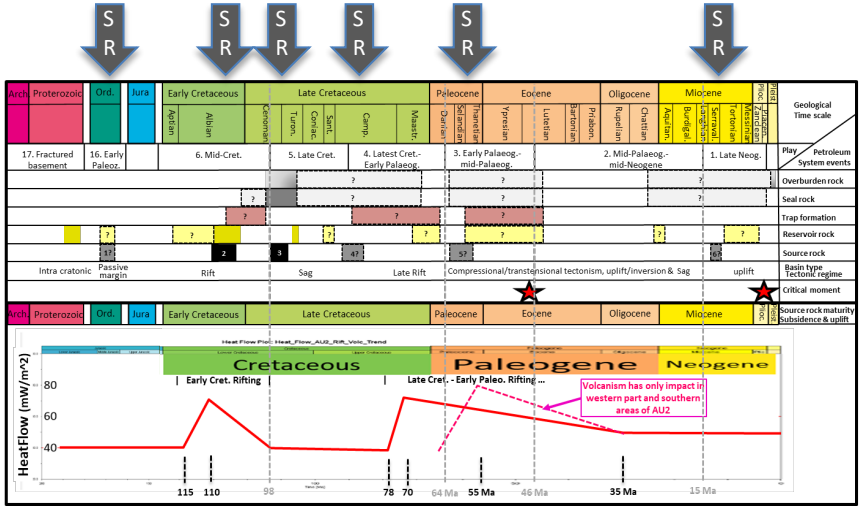
Reinterpretation of well data and play assignment



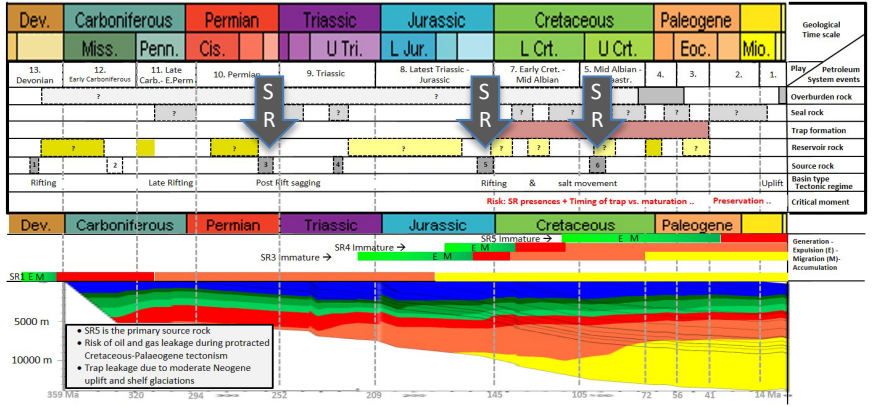
All wells (stratigraphic and exploration) added to the Player® post drill evaluation tool for quick play-based overview and dry-well analysis

The Methodology I:
Basin modelling





West Greenland Baffin Bay basin modelling example
3-6 SRs modelled in West Greenland

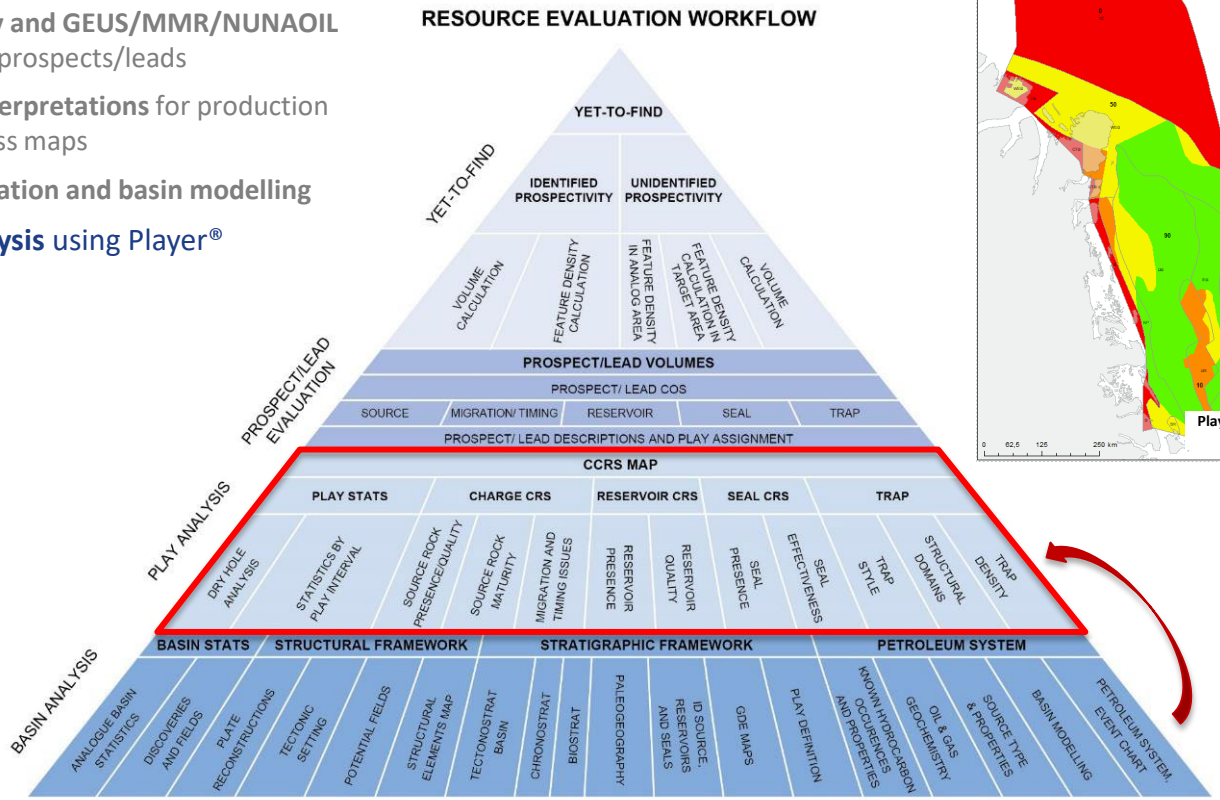


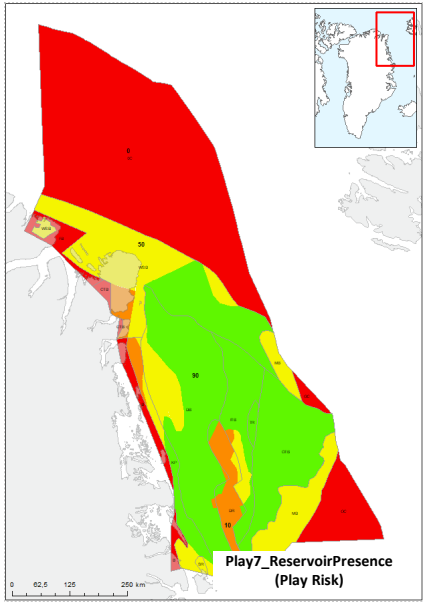
North-East Greenland Danmarkshavn Basin basin modelling example
2-3 SRs modelled in East Greenland

The Methodology II

Play analysis

- **Compile all available industry and GEUS/MMR/NUNAOIL data** on regional geology and prospects/leads
- **Integrate regional seismic interpretations** for production of regional depth and thickness maps
- Perform in-house **basin evaluation and basin modelling**
- Perform in-house **play analysis** using Player®





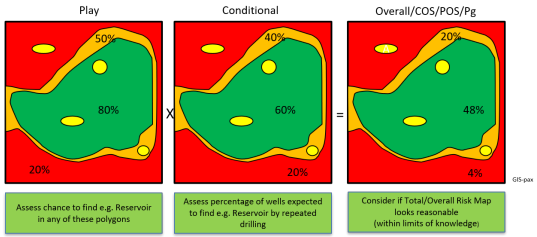
The Methodology II

Standardised risking schemes

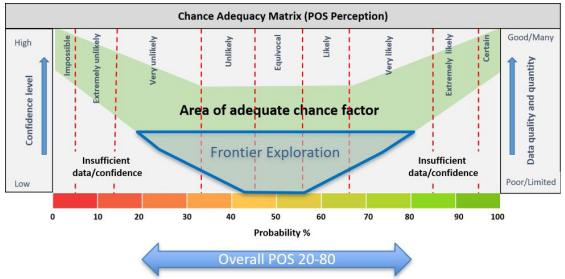
Standard risking schemes using a split risk approach are developed for:

– **Reservoir presence** – ***Proxy***: Analogue data, interpreted palaeogeography and play thickness

Risk depends on expected GDE in polygon



Reservoir Presence	Play	Cond
Outcrop data	100	90
Seismic data suggest Triassic – no well control	90	90
Assumed Triassic but below seismic resolution	60	90
Below seismic imaging (covered by volcanics)	50	90
No data coverage	50	50
Assumed eroded on highs	10	50
Not present (Eroded/Oceanic crust)	0	0



Frontier exploration is always associated with lower confidence levels than exploration in more mature areas – hence more restricted POS range

The Methodology II

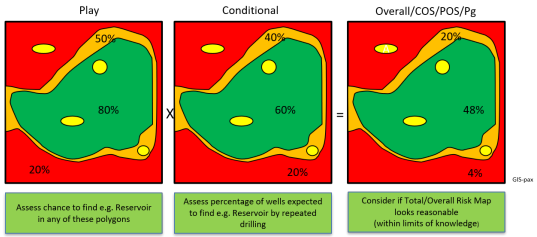
Standardised risking schemes

Standard risking schemes using a split risk approach are developed for:

- **Reservoir presence – *Proxy***: Analogue data, interpreted palaeogeography and play thickness
- **Reservoir effectiveness** – ***Proxy***: Burial depth corrected for possible uplift and modified if risk of intrusions is anticipated
- **Top seal effectiveness** – ***Proxy***: Overburden thickness, modified in areas with large amount of uplift
- Trap presence – ***Proxy***: Possibility to acquire high-quality data.
- **Source presence** – ***Proxy***: Analogue data, interpreted palaeogeography and play thickness
- **Source maturity** – ***Proxy***: Basin modelling data

The latter two provide input to **Charge risking**.

Total risk is defined by Reservoir Presence, Reservoir Effectiveness, Top Seal, Trap Presence and Charge.
Phase Risk and Timing Issues are NOT assessed.



Reservoir Presence	Play	Cond
Outcrop data	100	90
Seismic data suggest Triassic – no well control	90	90
Assumed Triassic but below seismic resolution		
Below seismic imaging (covered by volcanics)		
No data coverage	50	50
Assumed eroded on highs	10	50
Not present (Eroded/Oceanic crust)	0	0

Uplift

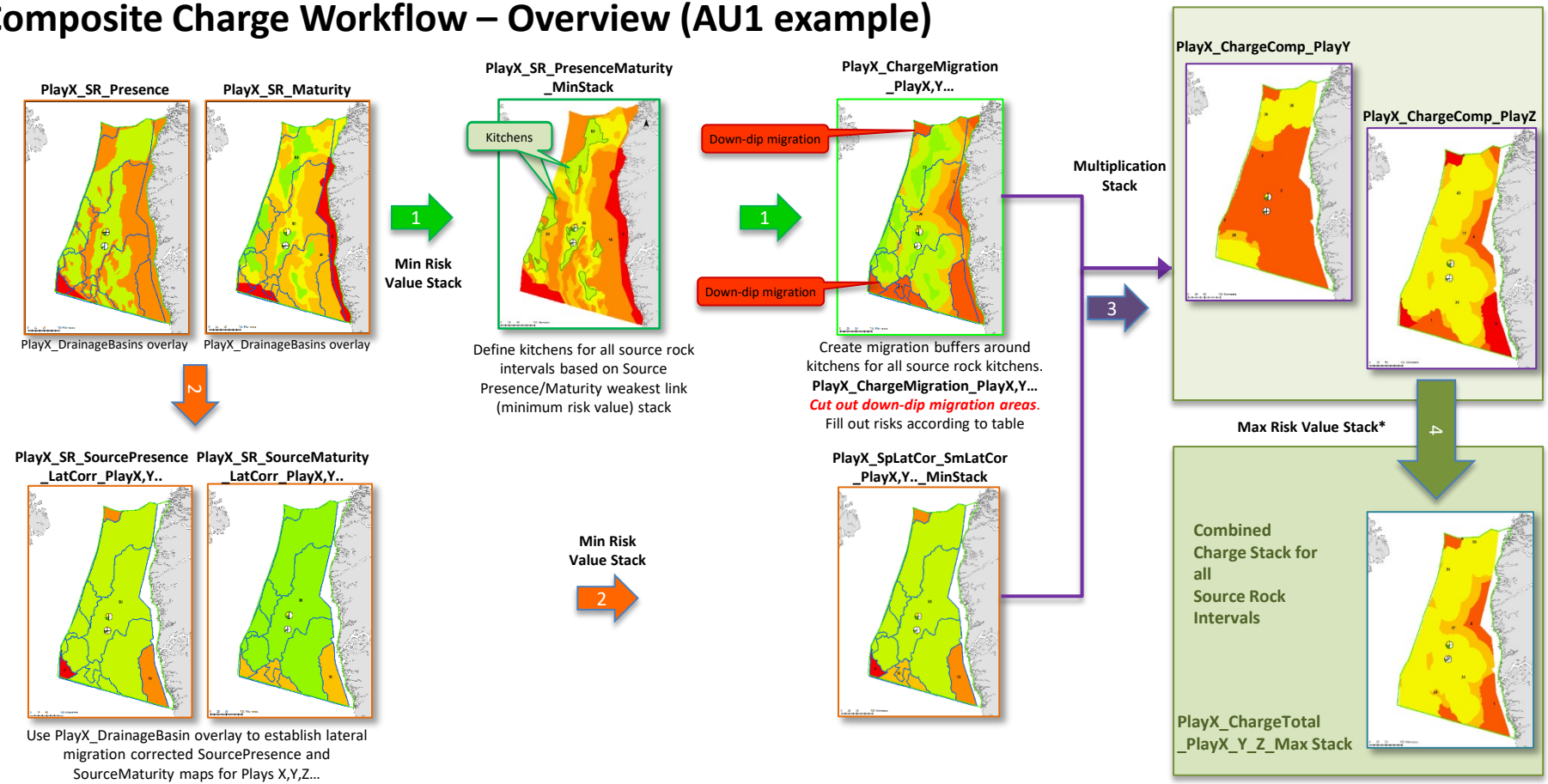
Top Seal	Play	Cond
Areas with more than 800 m overburden, proven	100	80
Areas with more than 800 m overburden, unproven	80	80
Areas with more than 1 km uplift*	50	80
Areas with less than 800 m overburden, unproven **	40	70
Only internal seal present	30	50
Outside play presence area	0	0

Reservoir Effectiveness	Play	Cond
<3km (<90°C) or documented by outcrop studies	100	90
3-4 km (90-120°C)	90	90
4-5 km (120-150°C)	60	70
5-6 km (>150°C and diagenesis)	50	60
>6 km (>150°C)	10	50
Areas with intrusions in play	50	60

Trap Presence	Play	Cond
Major fjords where seismic acquisition could produce high-quality data	100	90
Areas where 2D seismic acquisition or mapping could provide sufficient data	100	70
Areas covered by a thick volcanic succession preventing imaging of deeper successions	100	30
Oceanic crust or play not present	0	0

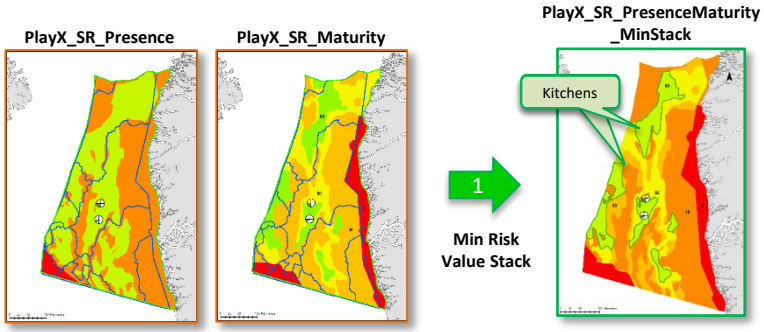
The Methodology II

Composite Charge Workflow – Overview (AU1 example)



The Methodology II

Composite Charge Workflow – Kitchen definition



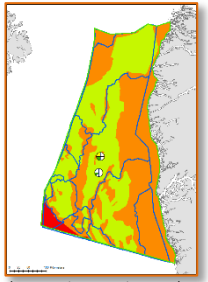
Source Presence	Comment	Play Risk
Proven by well data/oil seeps/oil and gas shows		100
Regional data suggests presence of a source rock but without well or outcrop calibration		30-90*
Presence unknown		50
Untested basement highs	Untested basement highs	30
Tested basement highs	Tested basement highs without presence in well	10
Not present	Outside play area	0

Maturity	Comment	Play Risk
Proven	Proven by seeps/oil and gas shows	100
0-0.55	Immature	30
0.55-0.7	Early oil mature	50
0.7-1.3	Oil Mature	80
1.3-4.0	Gas mature	80
4.0-5.0	Over-mature - intrusives	50

The Methodology II

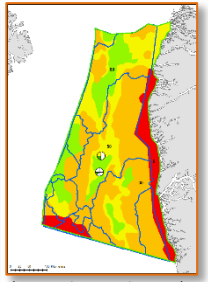
Composite Charge Workflow – Lateral migration

PlayX_SR_Presence



PlayX_DrainageBasins overlay

PlayX_SR_Maturity

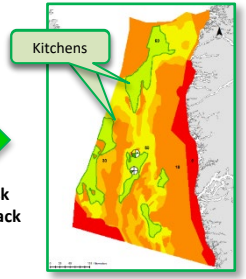


PlayX_DrainageBasins overlay

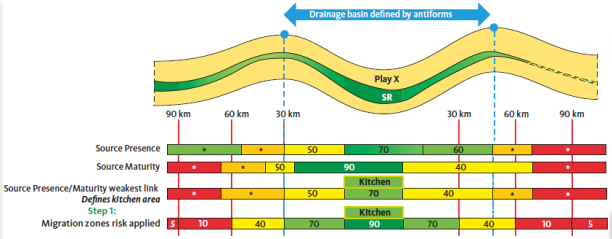
1

Min Risk Value Stack

PlayX_SR_PresenceMaturity _MinStack



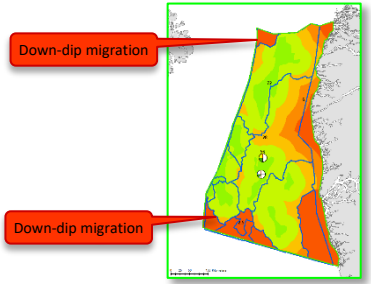
Define kitchens for all source rock intervals based on Source Presence/Maturity weakest link (minimum risk value) stack



1

Migration distance	Play Risk	Conditional Risk	Overall Risk
Vertically above kitchen w. proven charge	100	95	95
Vertically above kitchen	90 (X)	80	72
<30 km lateral migration	70 (X-20)*	80	56
30–60 km lateral migration	40 (X-50)*	70	28
60–90 km lateral migration	10 (X-80)*	60	6
>90 km lateral migration	5	50	2.5
Down-dip migration**	20	50	10
* Minimum value 5			
** Play risk reflects uncertainty on definition of down-dip migration areas			

PlayX_ChargeMigration _PlayX,Y…

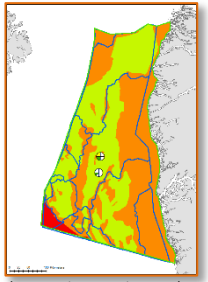


Create migration buffers around kitchens for all source rock kitchens.
PlayX_ChargeMigration_PlayX,Y…
Cut out down-dip migration areas.
Fill out risks according to table

The Methodology II

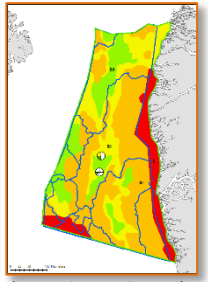
Composite Charge Workflow – Lateral migration from deeper source

PlayX_SR_Presence



PlayX_DrainageBasins overlay

PlayX_SR_Maturity

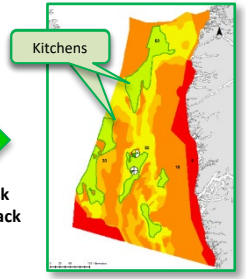


PlayX_DrainageBasins overlay

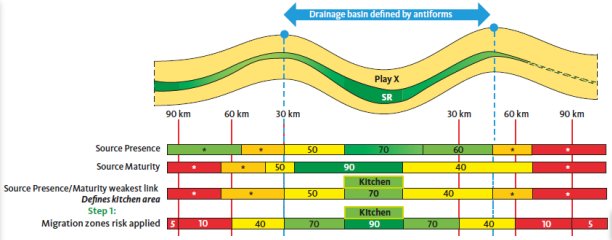
1

Min Risk Value Stack

PlayX_SR_PresenceMaturity _MinStack

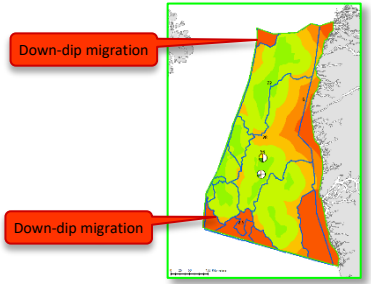


Define kitchens for all source rock intervals based on Source Presence/Maturity weakest link (minimum risk value) stack



1

PlayX_ChargeMigration _PlayX,Y…



Create migration buffers around kitchens for all source rock kitchens.
PlayX_ChargeMigration_PlayX,Y…
Cut out down-dip migration areas.
Fill out risks according to table

Migration from Play Y,Z … to Play X

Subtract 10 in Kitchen Play Risk (X) by adjusting Conditional Risk for each additional level of vertical migration, i.e.

10 for migration from Play 7 to Play 6 (Play Risk 80),

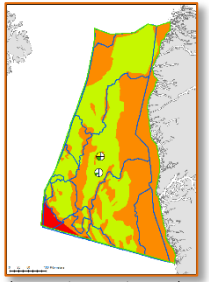
20 for migration from Play 7 to Play 5 (Play Risk 70) etc.

Migration distance	Play Risk	Conditional Risk	Overall Risk
Vertically above kitchen w. proven charge	**100**	95	**95**
Vertically above kitchen	**90 (X)**	80	**72**
<30 km lateral migration	**70 (X-20)***	80	**56**
30–60 km lateral migration	**40 (X-50)***	70	**28**
60–90 km lateral migration	**10 (X-80)***	60	**6**
>90 km lateral migration	**5**	50	**2.5**
Down-dip migration**	**20**	50	**10**
* Minimum value 5			
** Play risk reflects uncertainty on definition of down-dip migration areas			

The Methodology II

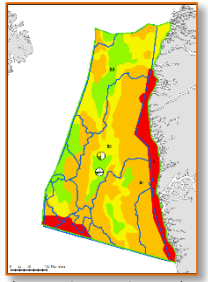
Composite Charge Workflow – Lateral correction

PlayX_SR_Presence



PlayX_DrainageBasins overlay

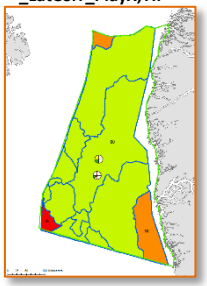
PlayX_SR_Maturity



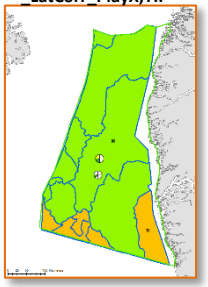
PlayX_DrainageBasins overlay

2

PlayX_SR_SourcePresence _LatCorr_PlayX,Y..



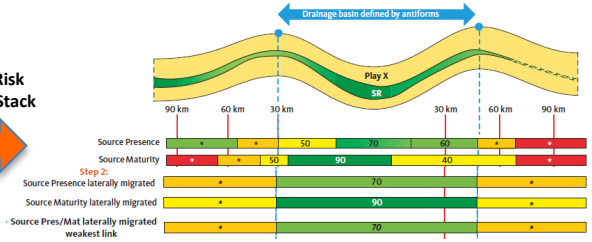
PlayX_SR_SourceMaturity _LatCorr_PlayX,Y..



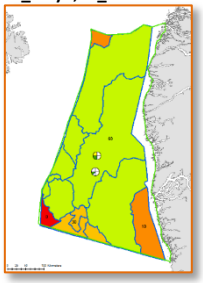
Use PlayX_DrainageBasin overlay to establish lateral migration corrected SourcePresence and SourceMaturity maps for Plays X,Y,Z…

Min Risk Value Stack

2

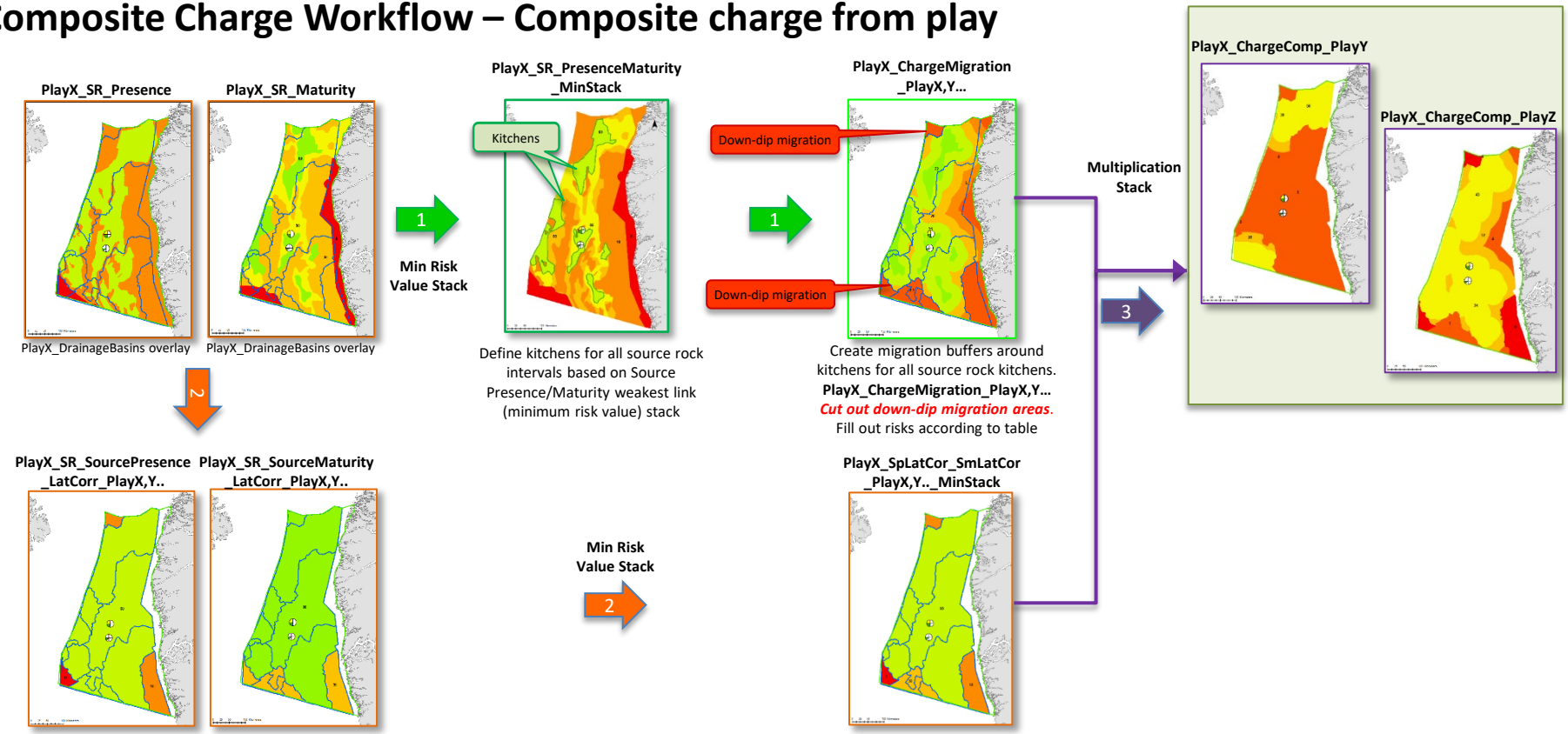


PlayX_SpLatCor_SmLatCor _PlayX,Y.._MinStack



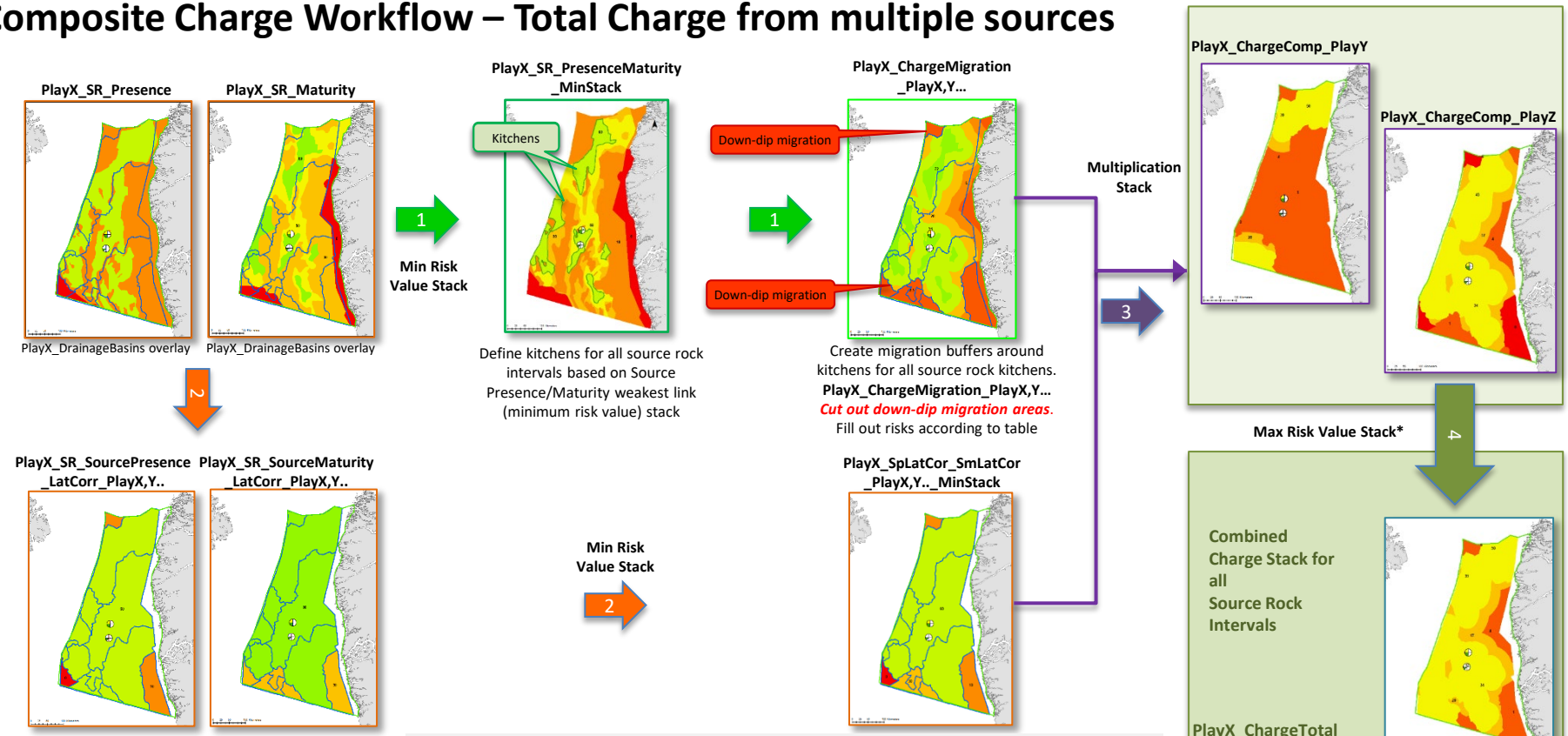
The Methodology II

Composite Charge Workflow – Composite charge from play



The Methodology II

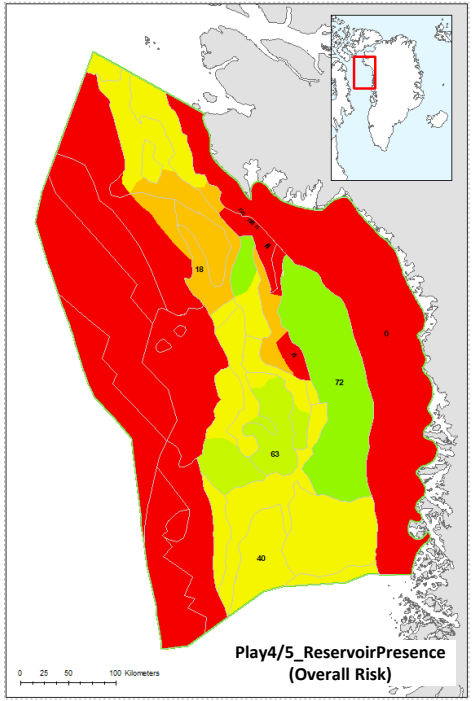
Composite Charge Workflow – Total Charge from multiple sources



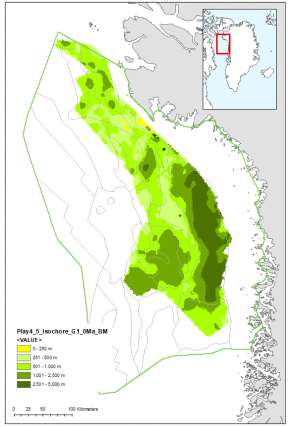
* The **Max Risk Value Stack** will be a slightly conservative figure since it only reflects one SR being effective at a time.
A **stochastic approach** would result in slightly higher values

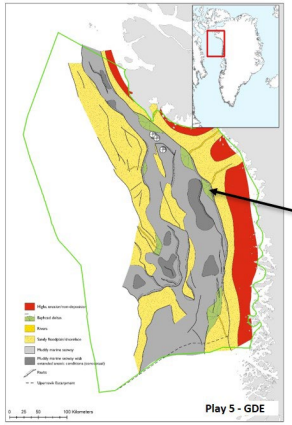
The Methodology II

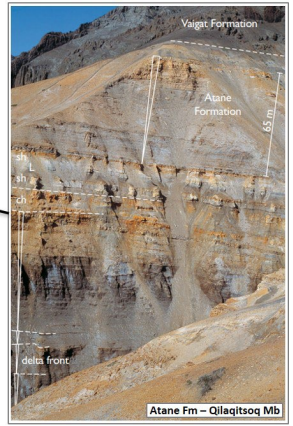
Mapping of Play Elements – Baffin Bay example



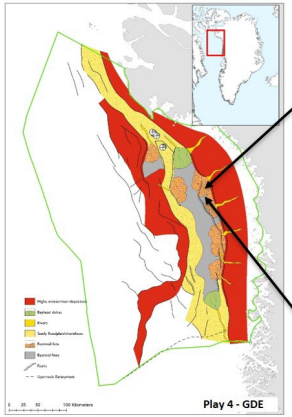
Play4/5_ReservoirPresence
(Overall Risk)







Atane Fm – Qilaqitsoq Mb

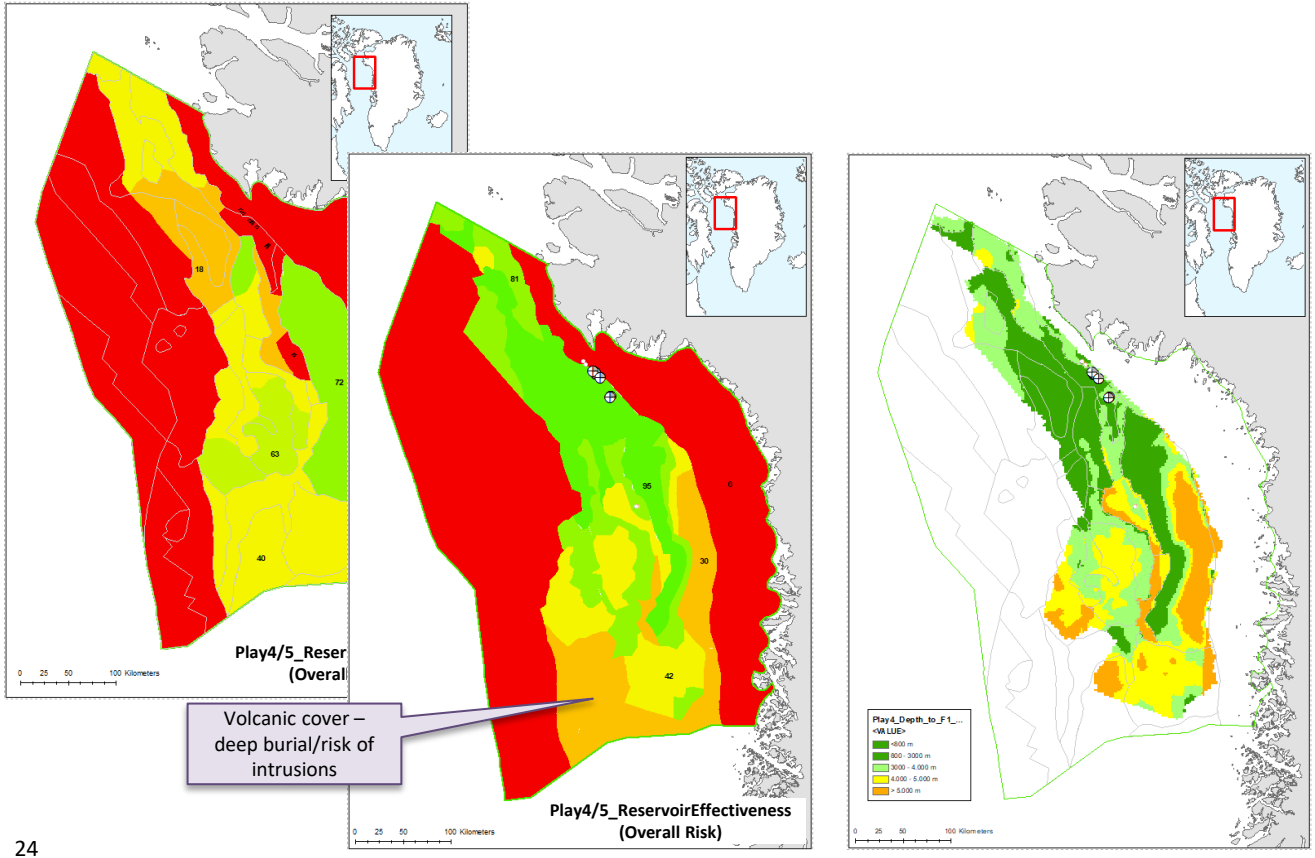


Itilli Fm – Aafarsuaq Mb

Contact Aafarsuaq Mb – Qilaqitsoq Mb

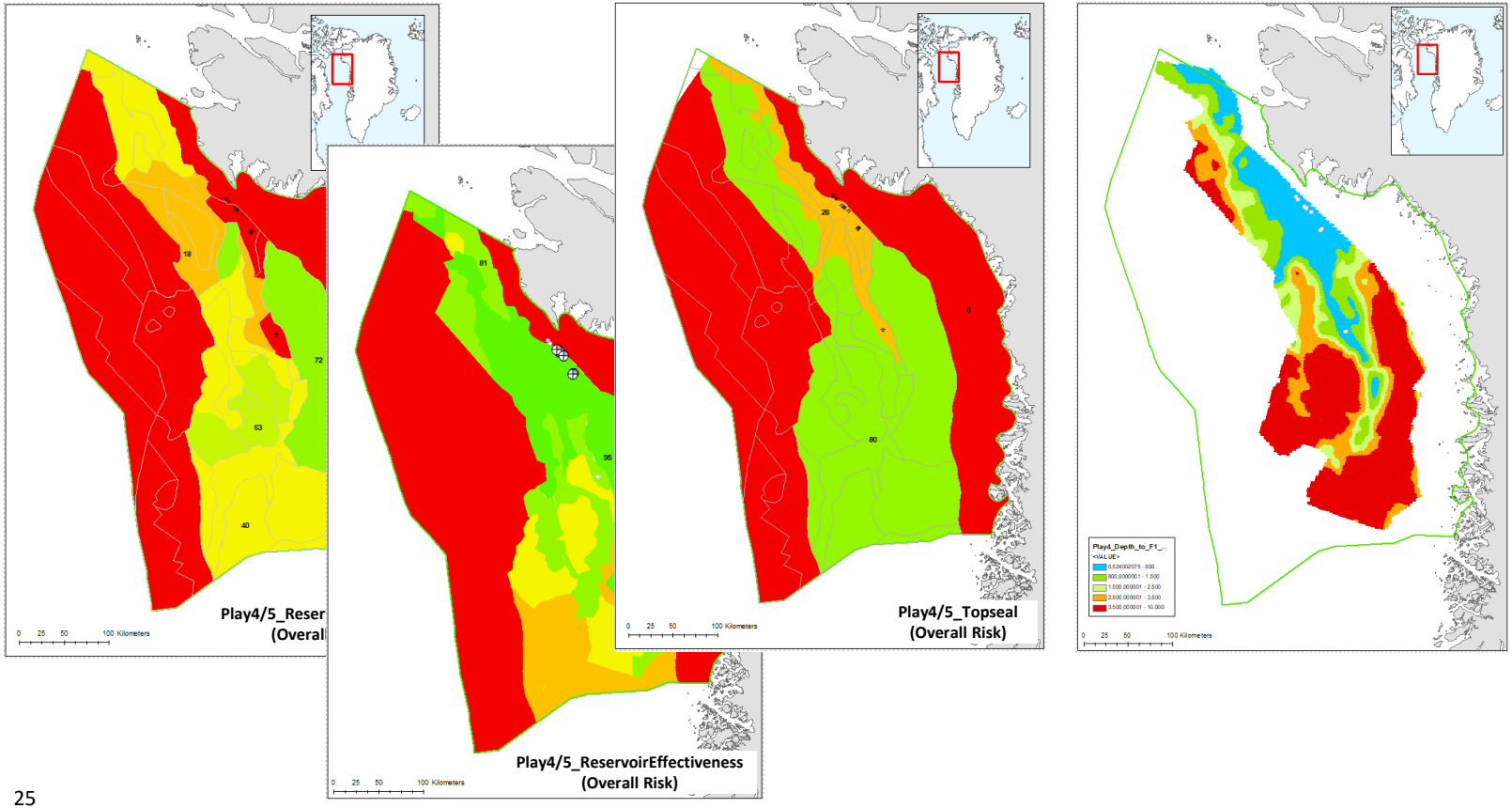
The Methodology II

Mapping of Play Elements – Baffin Bay example



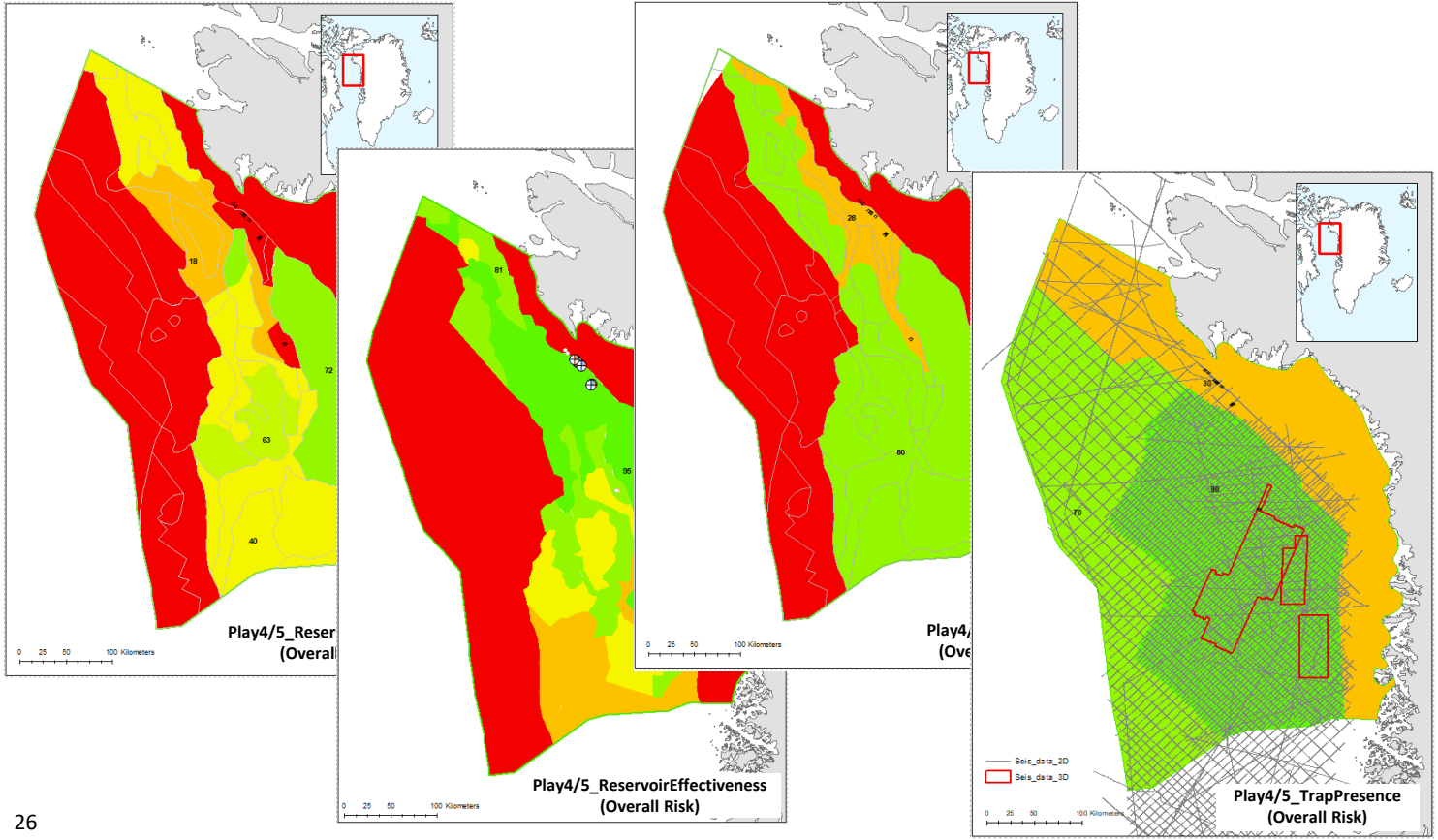
The Methodology II

Mapping of Play Elements – Baffin Bay example



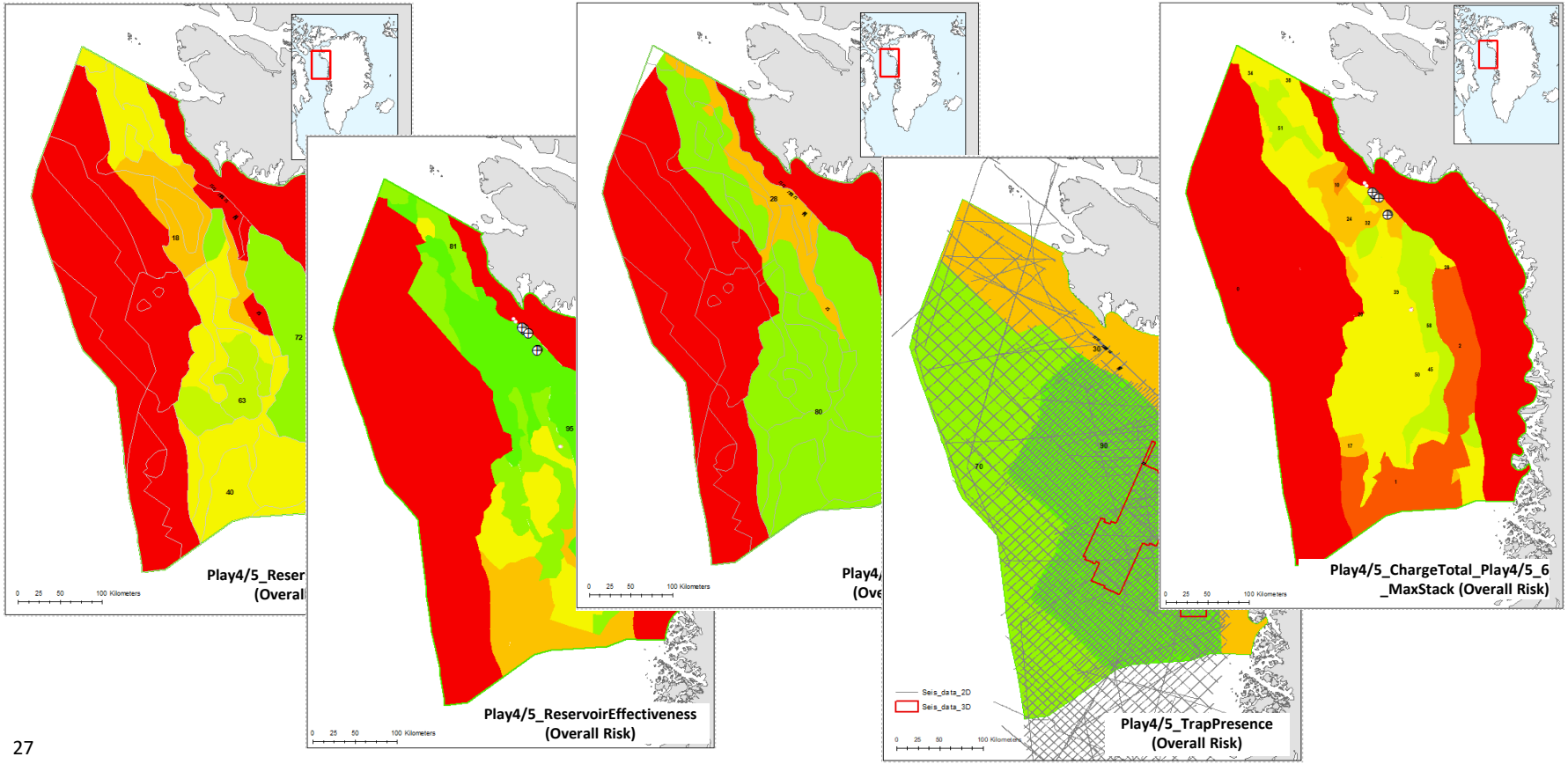
The Methodology II

Mapping of Play Elements – Baffin Bay example



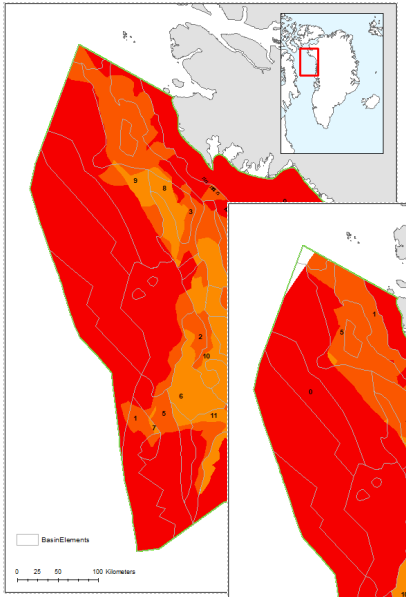
The Methodology II

Mapping of Play Elements – Baffin Bay example

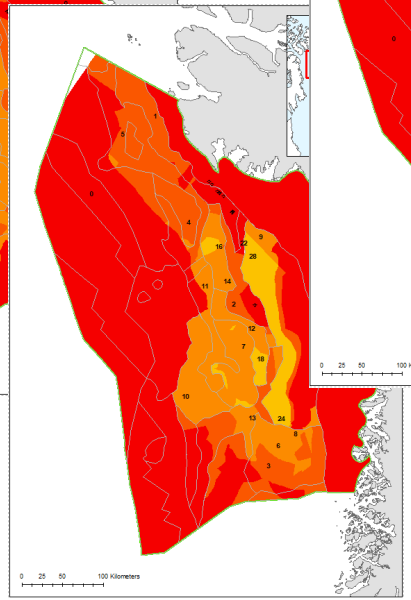


The Methodology II

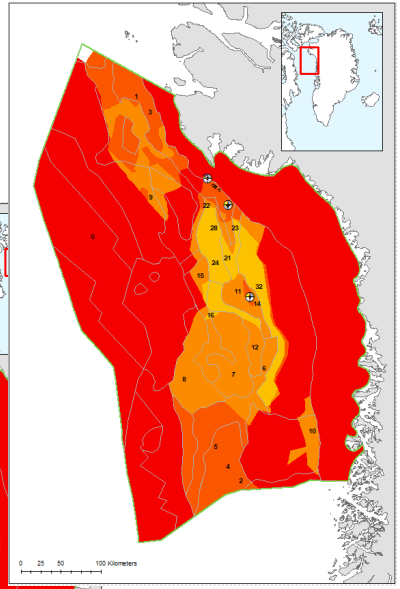
Mapping of Play Elements – Baffin Bay example



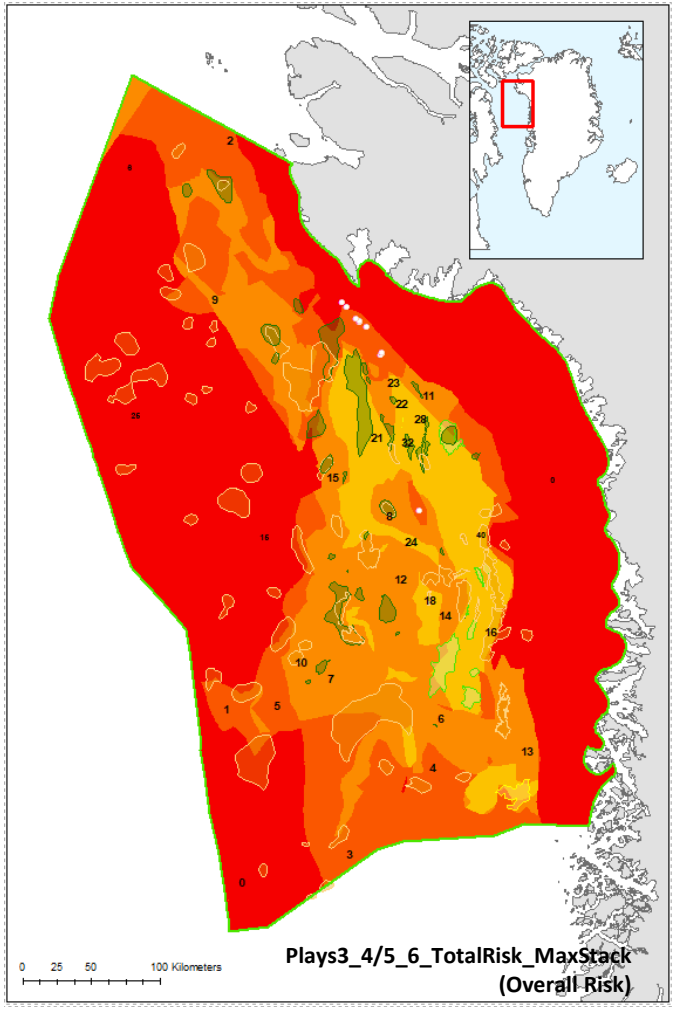
Play3_TotalRiskStack
(Overall Risk)



Play4/5_TotalRiskStack
(Overall Risk)



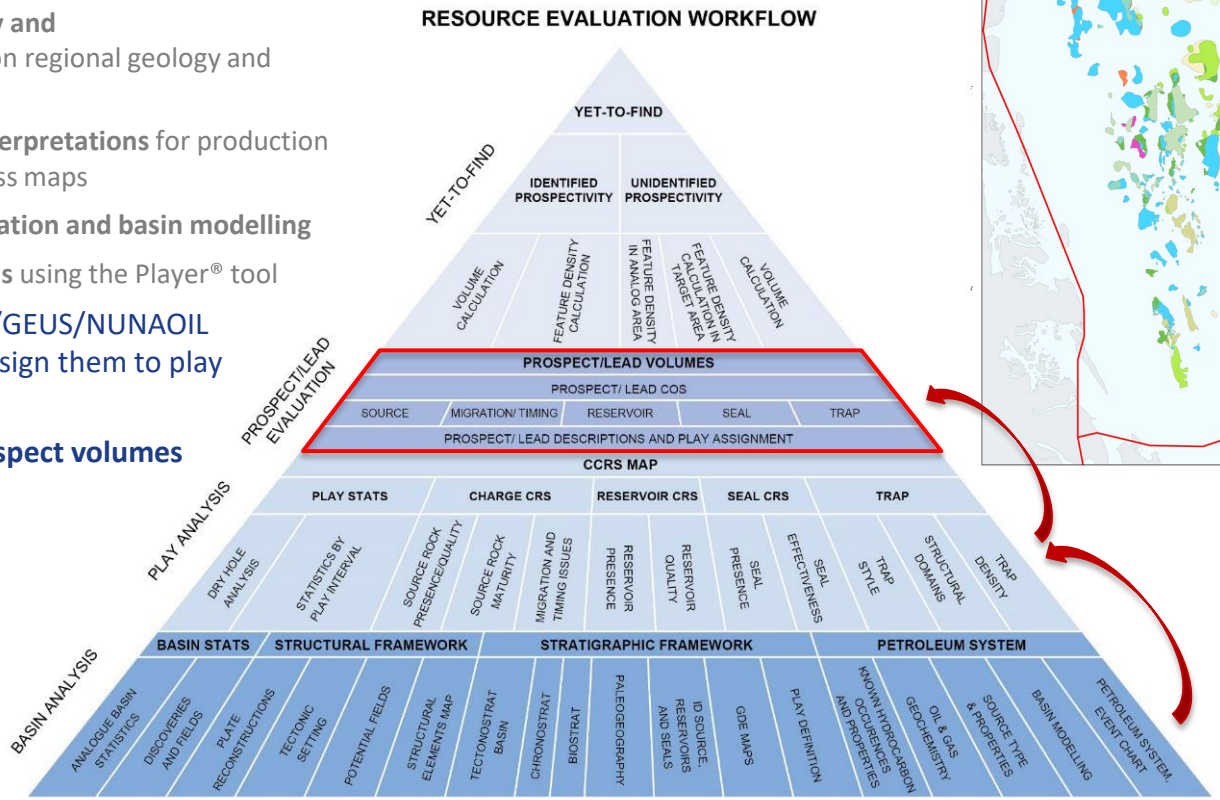
Play6_TotalRiskStack
(Overall Risk)

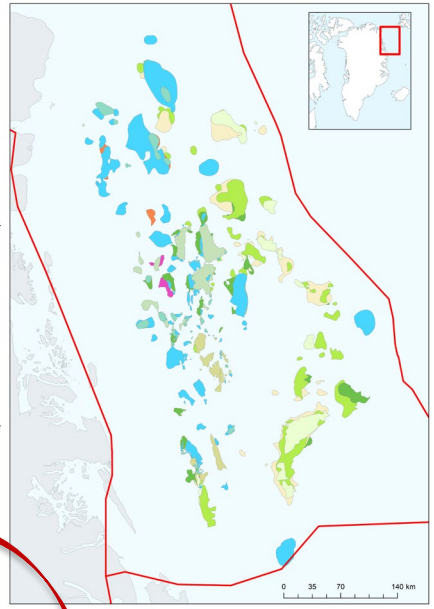


Plays3_4/5_6_TotalRisk_MaxStack
(Overall Risk)

The Methodology III
Lead evaluation

- **Compile all available industry and GEUS/MMR/NUNAOIL data** on regional geology and prospects/leads
- **Integrate regional seismic interpretations** for production of regional depth and thickness maps
- Perform in-house **basin evaluation and basin modelling**
- Perform in-house **play analysis** using the Player® tool
- QC of all reported industry/GEUS/NUNAOIL **leads and prospects** and assign them to play intervals
- Perform in-house **lead/prospect volumes and risking** using Player®

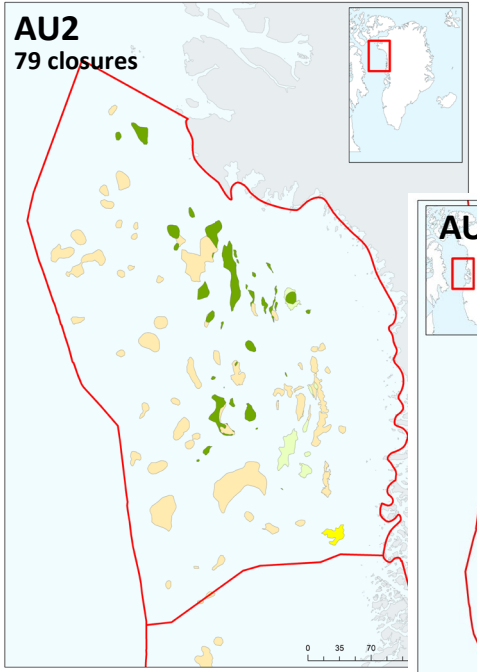


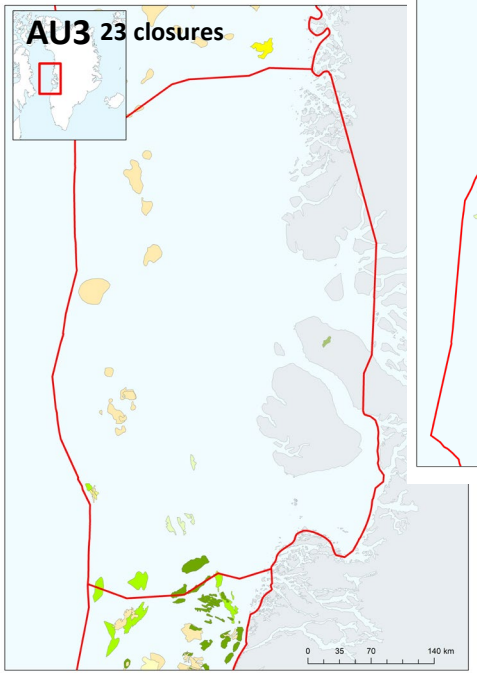


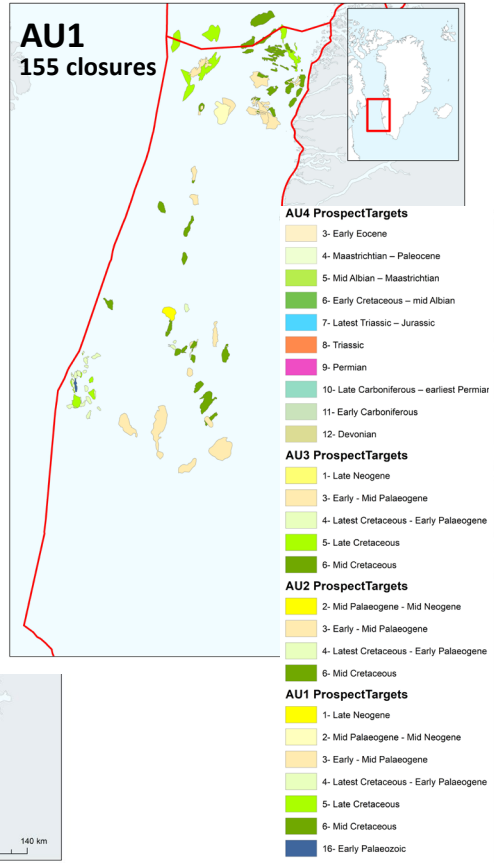
From the Greenland Resource Assessment Project (2019)

The Methodology III

Lead mapping

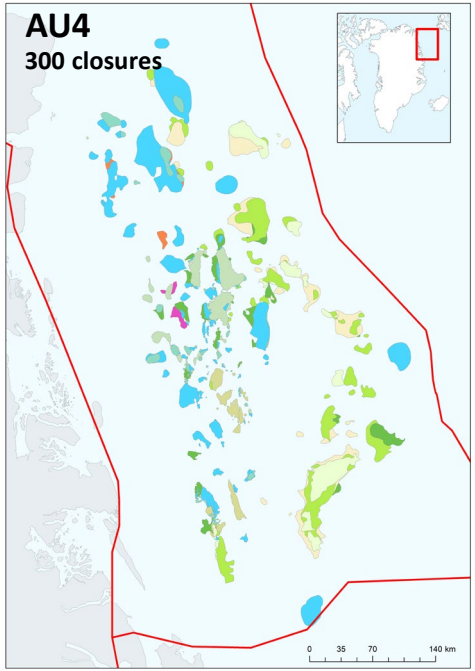






Only 3- and 4-way closures evaluated based on industry and own mapping

All assigned to play level



The Methodology III

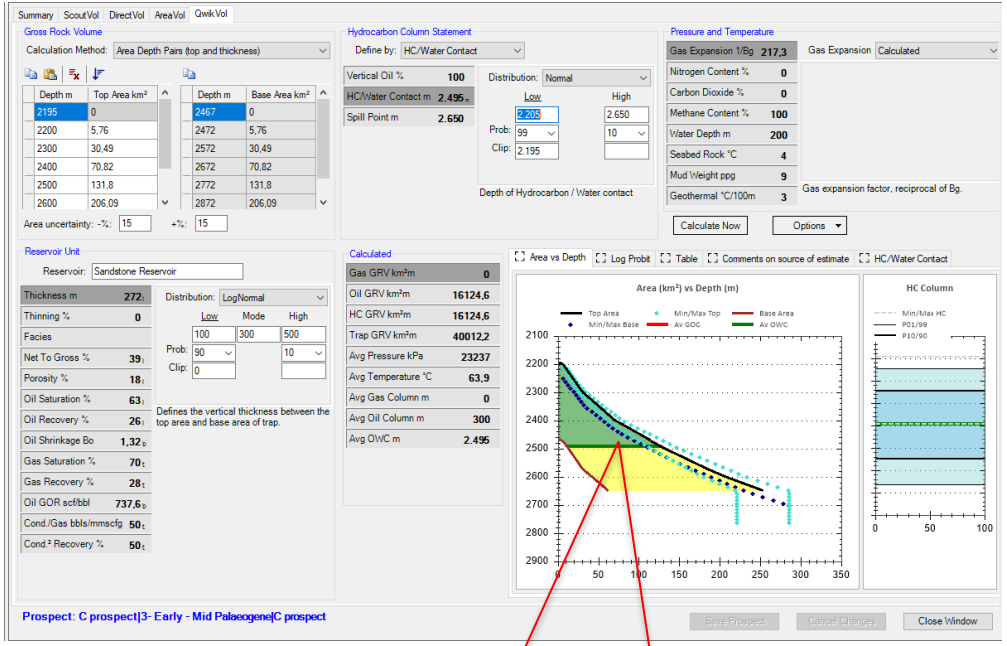
Methods of Volumetric Evaluation: Stochastic evaluation

Volumes of features (leads) where calculated using the most recent data and documented mapping from the industry, GEUS and NUNAOIL:

1) Volume calculations for **mapped leads** were made in Player® based on area-depth pairs from the top of structure to spill-point. Area-depth pairs were derived from either:
   a): Mapping of the structures in Petrel (GEUS), or
   b): Digitizing of closure and contour lines in ArcGIS from industry reports

2) Input to volume data is from the industry, typically from Licence Relinquishment Reports and TC Meeting Presentations, or in-house assessments

3) For **identified structures** without area/depth pairs (**unevaluated leads**), ***area yield values*** have been applied



Volume calculations for individual leads are based on a 50% ”top-to-base fill” distribution since source rock quality analyses do not support a fill-to-spill scenario

The Methodology III

Lead risk assessment and ‘identified’ volume calculation

Based on play maps, all leads are risked individually on:

- Reservoir Presence
- Reservoir Effectiveness
- Top Seal (4-way) or Fault Juxtaposition (3-way) – Weakest Link for Overall Risk
- Trap
- Charge – The overall, composite risk of charge and migration elements is reflected in the Charge risk

Prospect (Lead) Specific Chances must be assigned manually for each lead according to the scheme below
(PRC: Play Repeatability Chance):

Reservoir Presence = PRC
Reservoir Effectiveness = PRC
Top Seal = PRC
Trap = 50 due to poor seismic data
Migration = PRC

Summary | ScoutVol | DirectVol | AreaVol | QwikVol

Prospect Target

Play Name: 5- Mid Albian – Maastrichtian

Target Name: L7516/4-2 ID: 422 Target Evaluation Maturity: Lead

Target Properties

Target Objective Type: Primary objective (can only select one)

Nominal Drill Date: 01-12-2011 ☑ Same for all targets in this prospect.

Target Area: 525.4 sq km

Target Trap Type

C — Milton & Bertram scheme

Pre-Drill

Prospect Amplitude Supported: Unevaluated

Top Seal

◉ Is the overlying play. Age: 4- Maastrichtian – Paleocene

○ Is within the target play interval.

Base Seal

◉ Is an underlying play. Age:

○ Is within the target play interval.

Risks

Element	Sub-Element	Play Chance	Repeatability Chance	Overall Chance	Prospect Specific Chance	Total Chance
Reservoir Presence		10.00	60.00	6.00	60.00	6.00
Reservoir Effectiveness		100.00	90.00	90.00	90.00	90.00
Seal	Top Seal	100.00			80.00	
	Fault Juxtaposition/Lateral Seal				100.00	
	Fault Plane Seal				100.00	
	Base Seal				100.00	
	Seal Overall		80.00	80.00	80.00	80.00
Trap		100.00	90.00	90.00	90.00	90.00
Charge	Source Presence	100.00	100.00	100.00	100.00	100.00
	Source Maturity	100.00	100.00	100.00	100.00	100.00
	Charge Migration	40.00	80.00	32.00	80.00	32.00
	Charge Timing	100.00	100.00	100.00	100.00	100.00
	Charge Overall	40.00	80.00	32.00	80.00	32.00
HC Recovery		100.00	100.00	100.00	100.00	100.00
POS		4.00	31.10	1.24	31.10	1.24
Baysian Modification	Based on Amplitude Analysis					100.00
Final Prospect Pg/POS						1.24

Hide Play Columns | Set Prospect Risks | Update Play Risks

Links (0)...

Gross Structure

Select a Gross Structure: Unevaluated Code: 0

Paleogeography

Select a Paleogeography Setting: Unevaluated Code: 000000000

Extract from Map

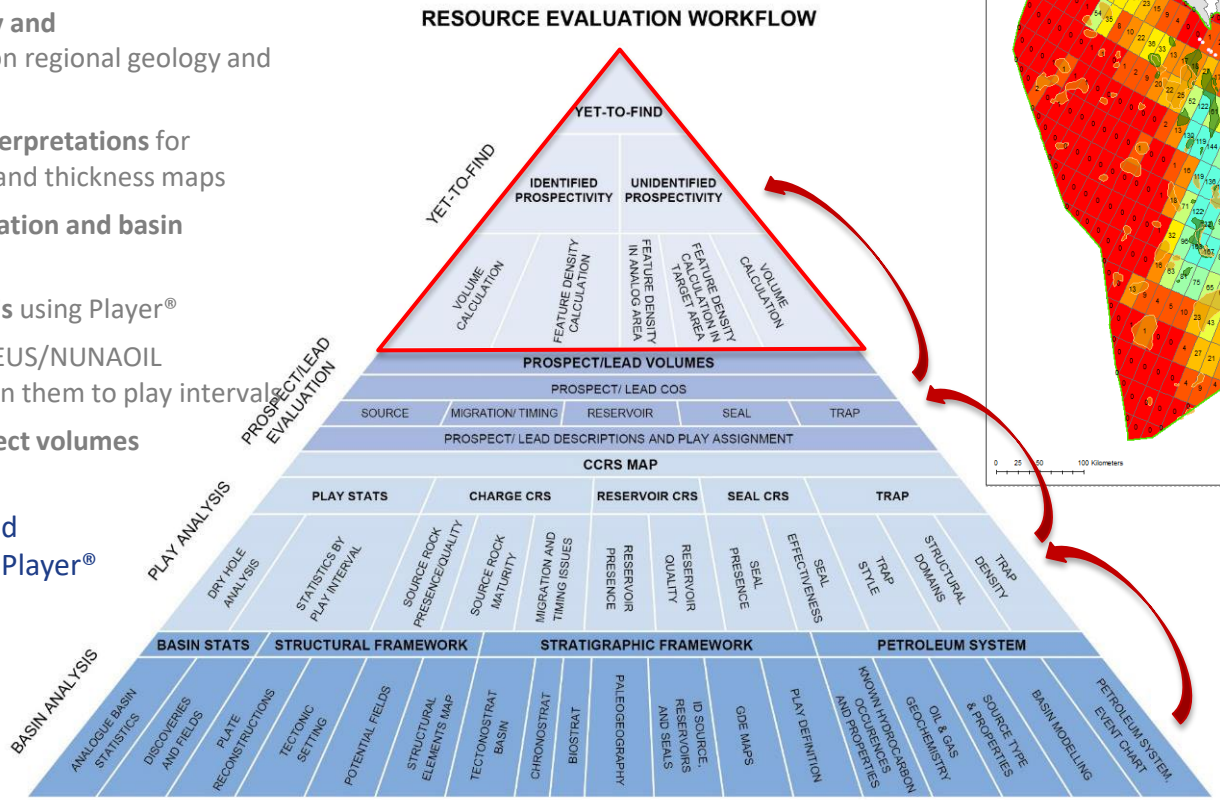
Estimated Ultimate Recoverable

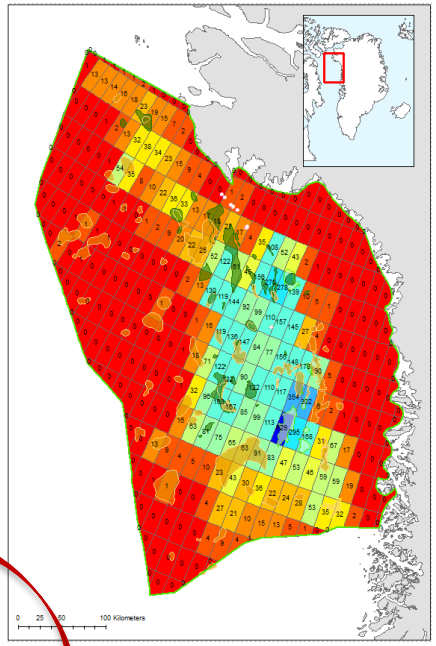
QwikEval method: QwikVol Open ...

Phase	P90	P50	Mean	P10	Risk	Mean Risked Volume
Oil (mmbbls)	4.9	106.8	359.1	978.0	1.24	4.47
Condensate (mmbbls)	0.0	0.0	0.0	0.0	1.24	0.00
Gas (bcf)	2.8	81.5	266.3	748.9	1.24	3.31
BOE (mmboe)	5.4	120.4	403.5	1,102.8	1.24	5.02

The Methodology IV
Yet-to-Find

- **Compile all available industry and GEUS/MMR/NUNAOIL data** on regional geology and prospects/leads
- **Integrate regional seismic interpretations** for production of regional depth and thickness maps
- Perform in-house **basin evaluation and basin modelling**
- Perform in-house **play analysis** using Player®
- QC of all reported industry/GEUS/NUNAOIL **leads and prospects** and assign them to play intervals
- Perform in-house **lead/prospect volumes and risking** using Player®
- Perform in-house play-based **resource assessment** using Player®



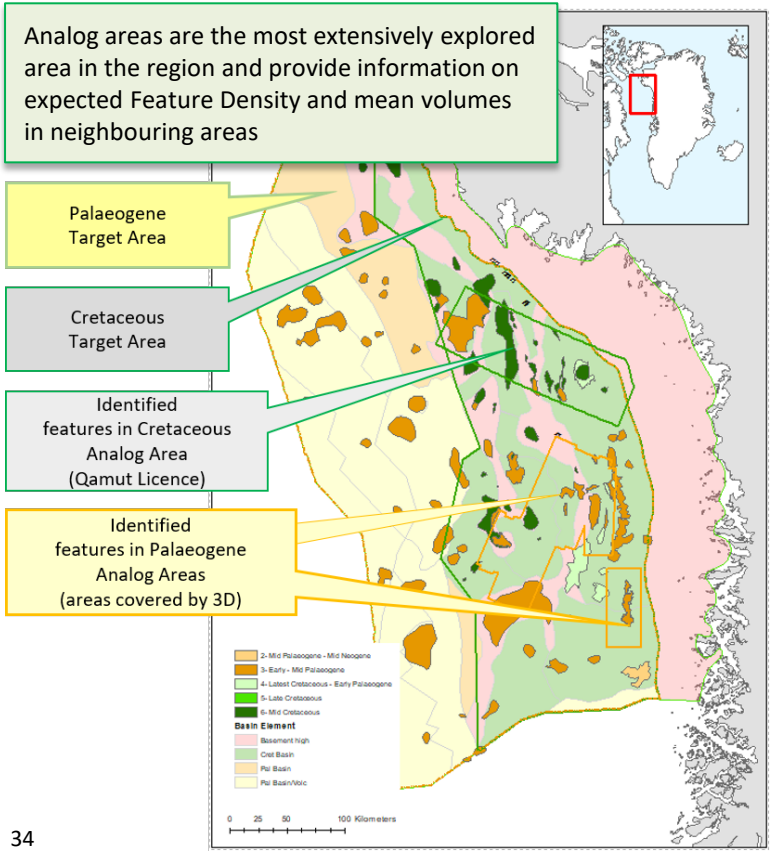


From the Greenland Resource Assessment Project (2019)

The Methodology IV

Feature density calculation Baffin Bay

Analog areas are the most extensively explored area in the region and provide information on expected Feature Density and mean volumes in neighbouring areas



Future Target Area FD (per Play) =
Analog Area FD - Identified Target Area FD

The identified feature density (prospects identified) in the YTF Target Areas is subtracted from the Analog Area FD, to provide the predicted density of the remaining, as yet unidentified, features

Play	Area	# Identified Features – Target Area	Target Area FD (#/1000 km^2)
6	Cret Basins Target Area (57,019 km^2)	24	**0.42**

Play	Area	IFD Analog (#/1000 km^2)	IFD Target Area (#/1000 km^2)	Future FD Target Area (#/1000 km^2)
6	Cret Basins	**15/9.493 1.58**	**0.42**	**1.16**

The Methodology IV

Feature volume calculation Baffin Bay

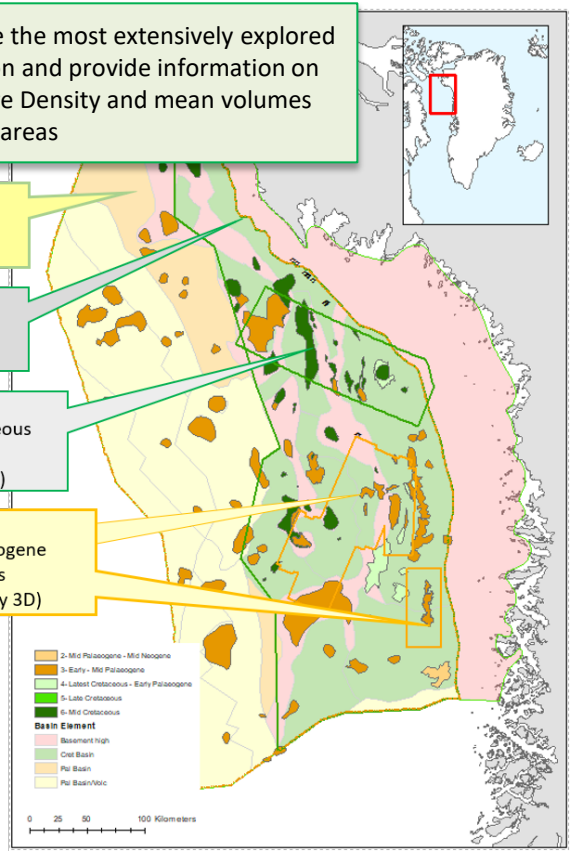
Analog areas are the most extensively explored area in the region and provide information on expected Feature Density and mean volumes in neighbouring areas

Palaeogene Target Area

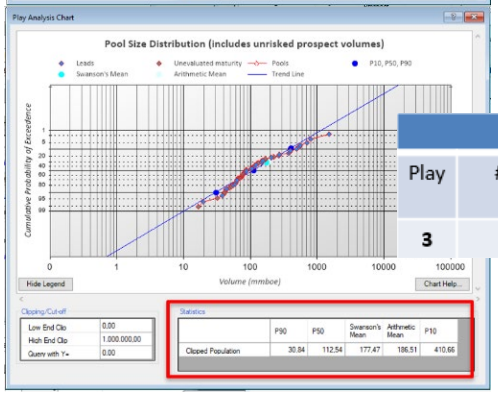
Cretaceous Target Area

Identified features in Cretaceous Analog Area (Qamut Licence)

Identified features in Palaeogene Analog Areas (areas covered by 3D)



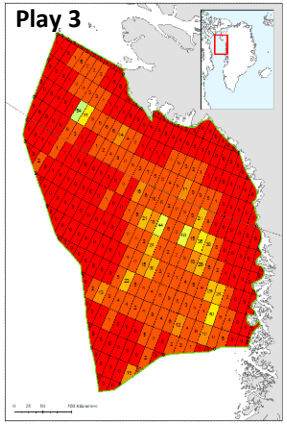
Volumes (MMBOE)					
Play	# of Features (Leads/Unevaluated)	P90	P50	Mean	P10
6, 5, 4	22/21	23	154	368	1054

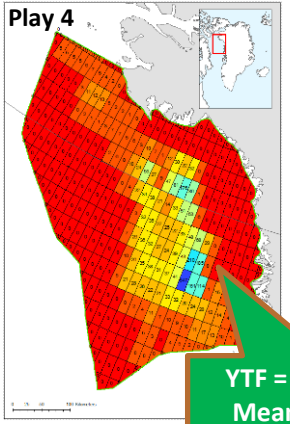


Volumes (MMBOE)					
Play	# of Features (Leads)	P90	P50	Mean	P10
3	28/30	11	113	187	410

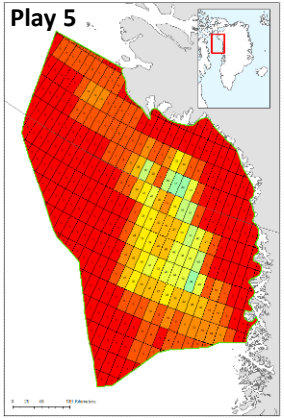
The Methodology IV

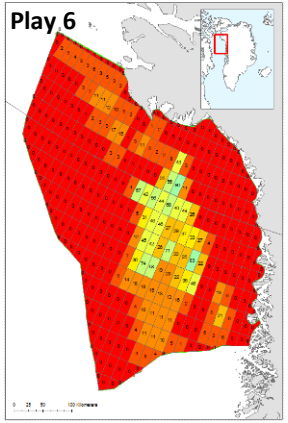
Yet-to-Find calculation Baffin Bay

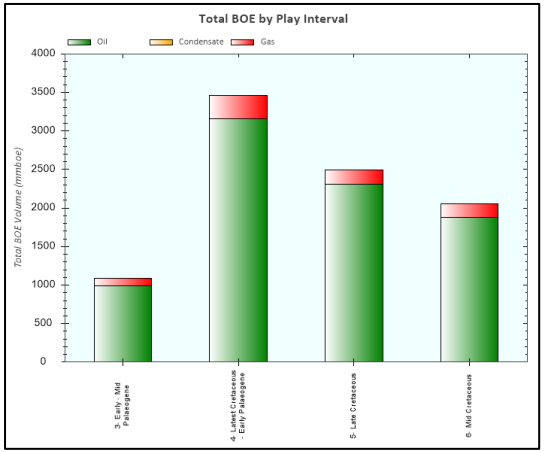




YTF = BlockSize x FD x MeanVol x TotalRisk







Summary of Results by Play Interval (Identified Prospects)

Play Interval	Number of Prospect Targets	Unrisked BOE (mmboe)	Risked BOE (mmboe)
3- Early - Mid Palaeogene	57,08	10.430,09	600,97
4- Latest Cretaceous - Early Palaeogene	8,00	6.431,64	1.151,39
5- Late Cretaceous	0,00	0,00	0,00
6- Mid Cretaceous	14,00	5.333,93	594,34
Totals:	79,1	22.195,7	2.346,7

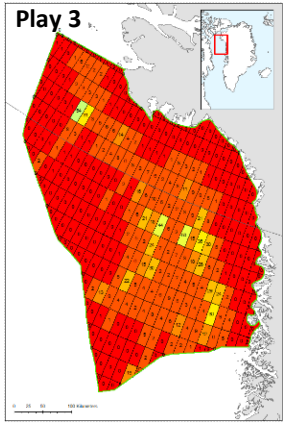
Summary of Results by Play Interval (Unidentified Prospectivity)

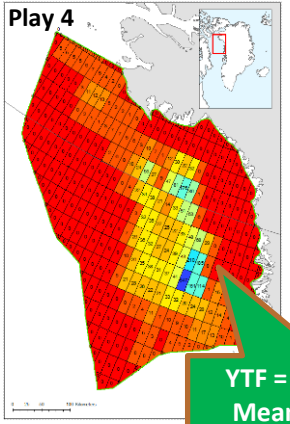
Play Interval	Number of Unidentified Features	Unrisked BOE (mmboe)	Risked BOE (mmboe)
3- Early - Mid Palaeogene	86,65	16.204,43	488,83
4- Latest Cretaceous - Early Palaeogene	95,77	35.244,62	2.310,80
5- Late Cretaceous	103,54	38.104,05	2.497,34
6- Mid Cretaceous	65,19	23.988,10	1.461,54
Totals:	351,2	113.541,2	6.758,5

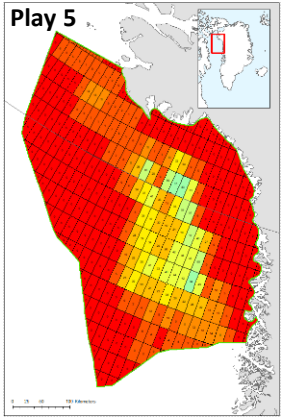
Numbers are Mean Risked Recoverables MMBOE

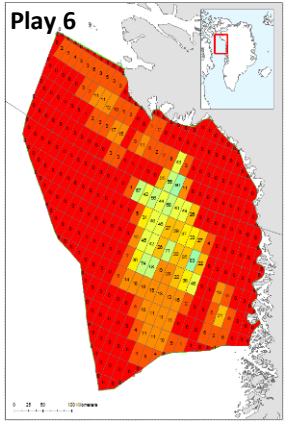
The Methodology IV

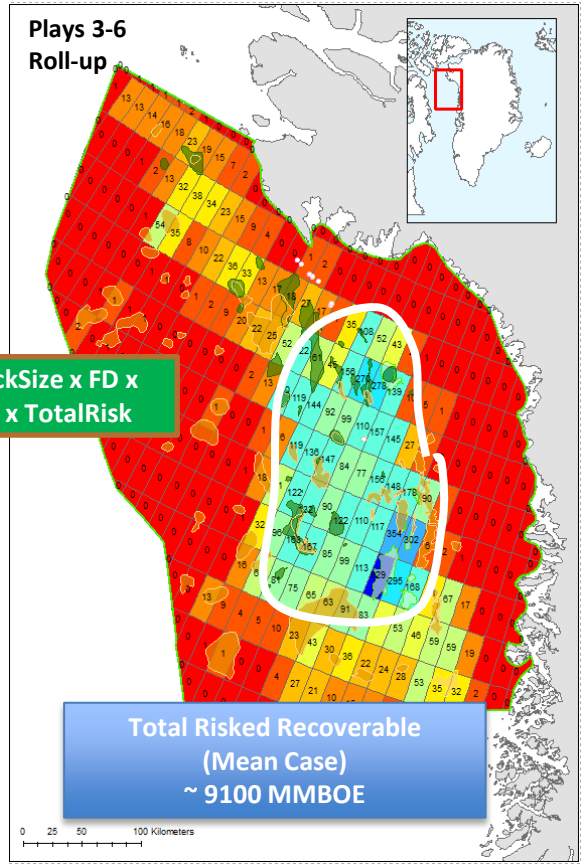
Yet-to-Find calculation Baffin Bay

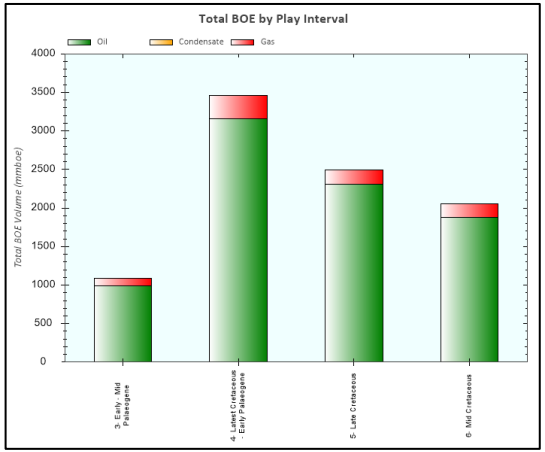












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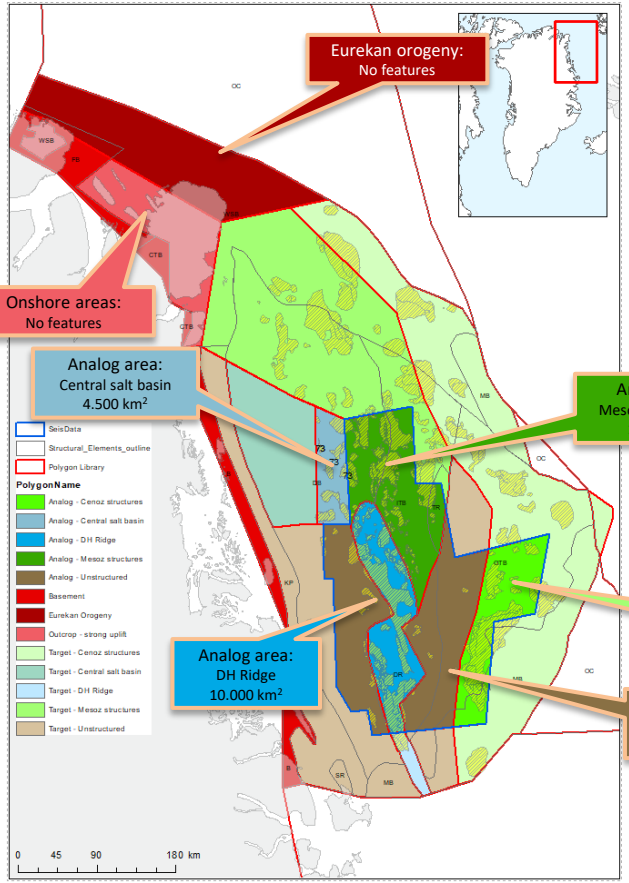
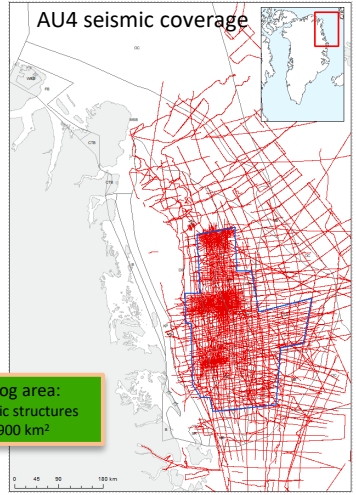
The Methodology IV

Feature density calculation North-East Greenland



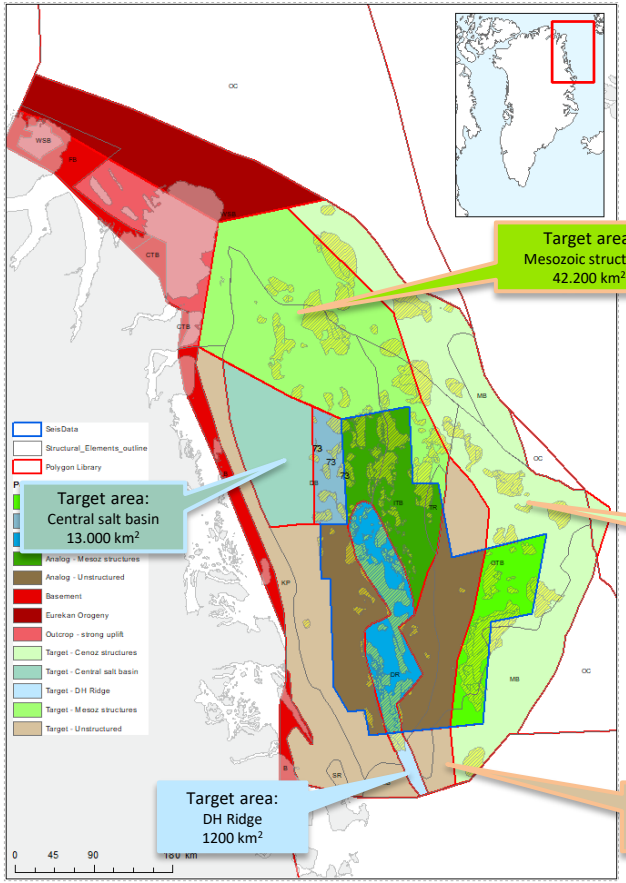


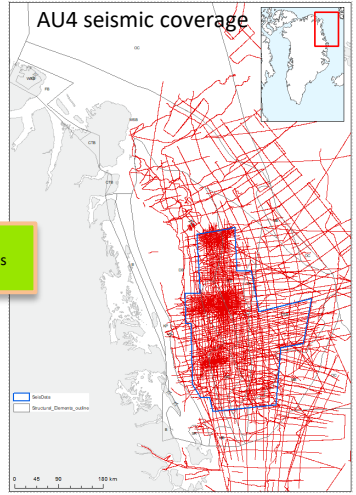
Analog areas are the most extensively explored area in the region and provide information on expected Feature Density and mean volumes in neighbouring areas

Analog Areas have also been defined based on difference in structural styles.

The Methodology IV

Feature density calculation North-East Greenland





Analog areas are the most extensively explored area in the region and provide information on expected Feature Density and mean volumes in neighbouring areas

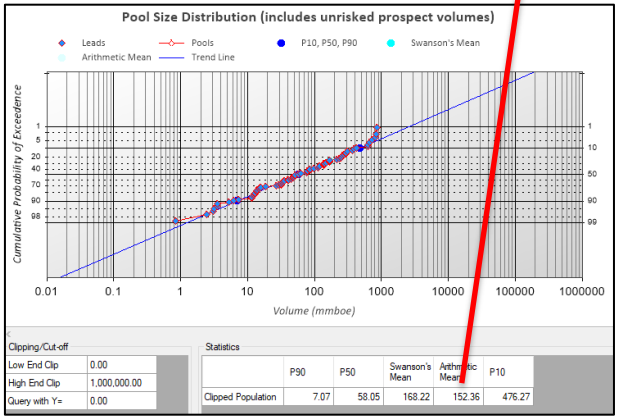
Analog Areas have also been defined based on difference in structural styles.

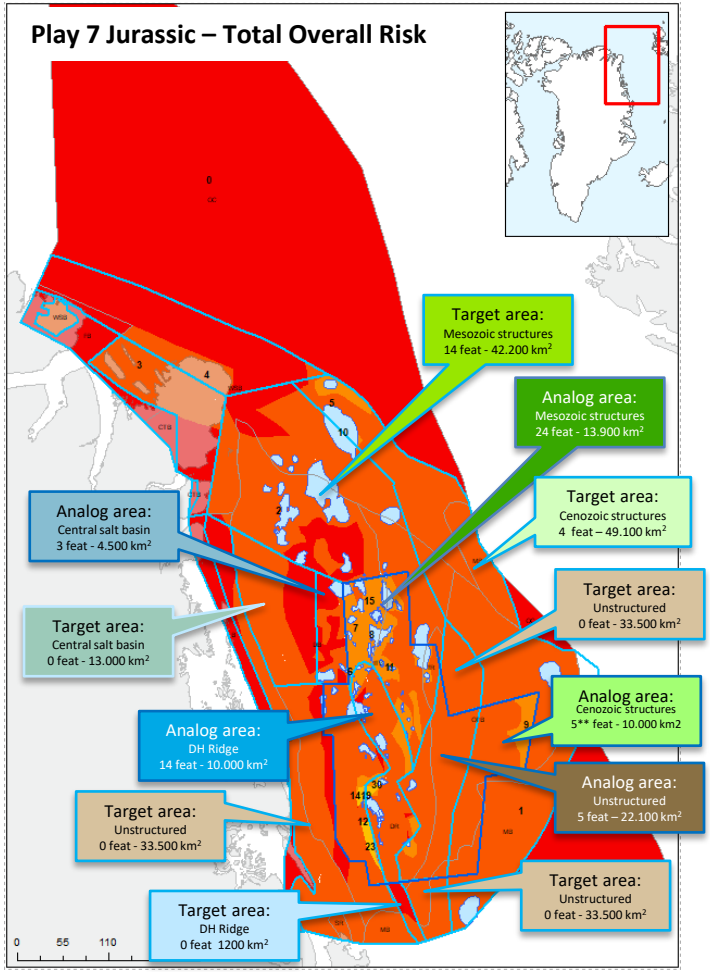
Target Areas also defined based on structural style

The Methodology IV

Yet-to-Find calculation North-East Greenland

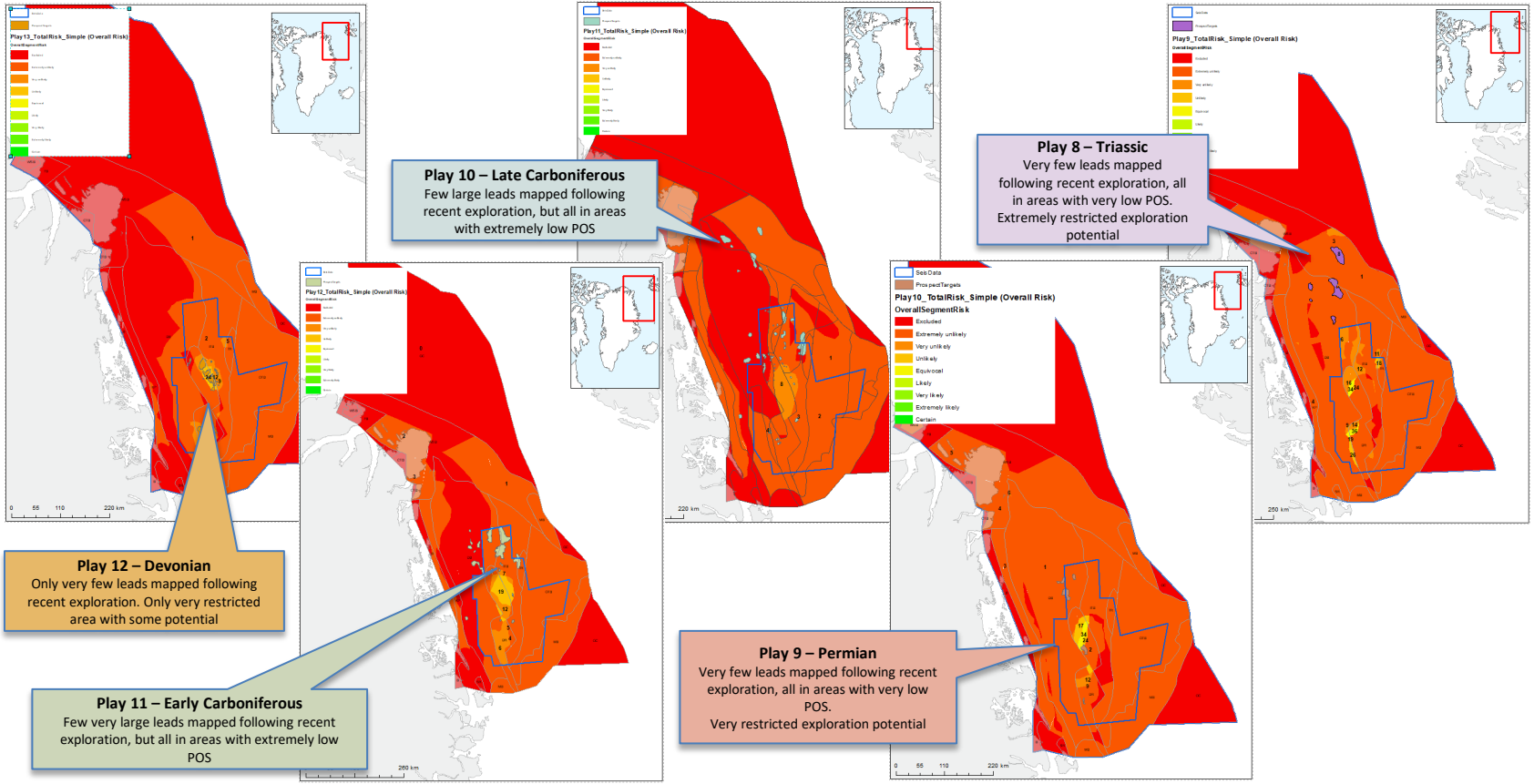
Play	Target Area	IFD Analog (#/1000 km²)	IFD Target Area (#/1000 km²)	Future FD Target Area (#/1000 km²)	Mean Volume per Feature (MMBOE)
7	Mesozoic structures	1.73	0.33	1.4	152
7	Central salt basin – analog rem pros	2.0*	0.67	1.33	152
7	Central salt basin - target	2.0*	0.0	2.0	152
7	Unstructured	0.23	0.0	0.23	152
7	DH Ridge	1.4	0.0	1.4	152
7	Cenozoic structures**	0.3**	0.08	0.22	152
*	Based on the presence of 9 separate mapped features related to salt domes – not all play levels have recognised leads in the area – but are expected to if better data would exist				
**	Difficult to map deeper play levels in this area. **FD for Play 5** in this area is used as proxy for presence of features at deeper levels				





The Methodology IV

Plays not considered in YTF – High Risk



The Methodology IV

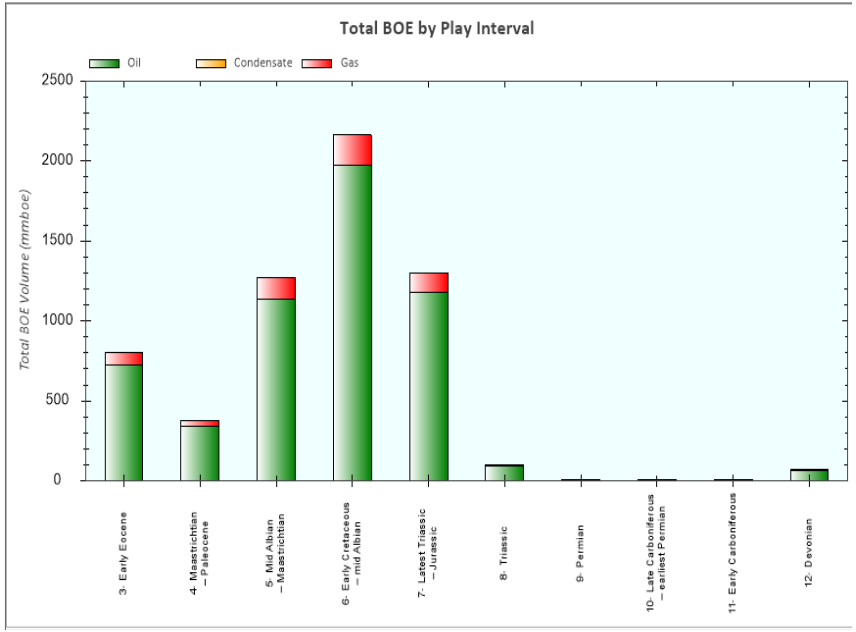
Yet-to-Find calculation North-East Greenland

Summary of Results by Play Interval (Identified Prospects)

Play Interval	Number of Prospect Targets	Unrisked BOE (mmboe)	Risked BOE (mmboe)
3- Early Eocene	25.94	6,455.46	528.76
4- Maastrichtian – Paleocene	18.35	2,522.28	291.50
5- Mid Albian – Maastrichtian	48.00	6,873.35	1,117.74
6- Early Cretaceous – mid Albian	26.01	3,085.27	607.45
7- Latest Triassic – Jurassic	71.95	10,696.56	677.49
8- Triassic	5.00	846.45	102.94
9- Permian	5.02	716.08	6.89
10- Late Carboniferous – earliest Permian	50.00	1,457.06	8.72
11- Early Carboniferous	20.01	1,045.16	11.00
12- Devonian	17.01	1,782.41	71.68
Totals:	287.3	35,480.1	3,424.2

Summary of Results by Play Interval (Unidentified Prospectivity)

Play Interval	Number of Unidentified Features	Unrisked BOE (mmboe)	Risked BOE (mmboe)
3- Early Eocene	52.42	13,051.73	274.84
4- Maastrichtian – Paleocene	32.32	4,299.14	86.70
5- Mid Albian – Maastrichtian	32.17	4,374.71	152.96
6- Early Cretaceous – mid Albian	87.31	12,454.13	1,554.01
7- Latest Triassic – Jurassic	121.28	18,435.02	622.78
Totals:	325.5	52,614.7	2,691.3



Mean Case Risked Risked Total Recoverable: 6100 MMBOE

The Result

Yet-to-Find calculation Greenland

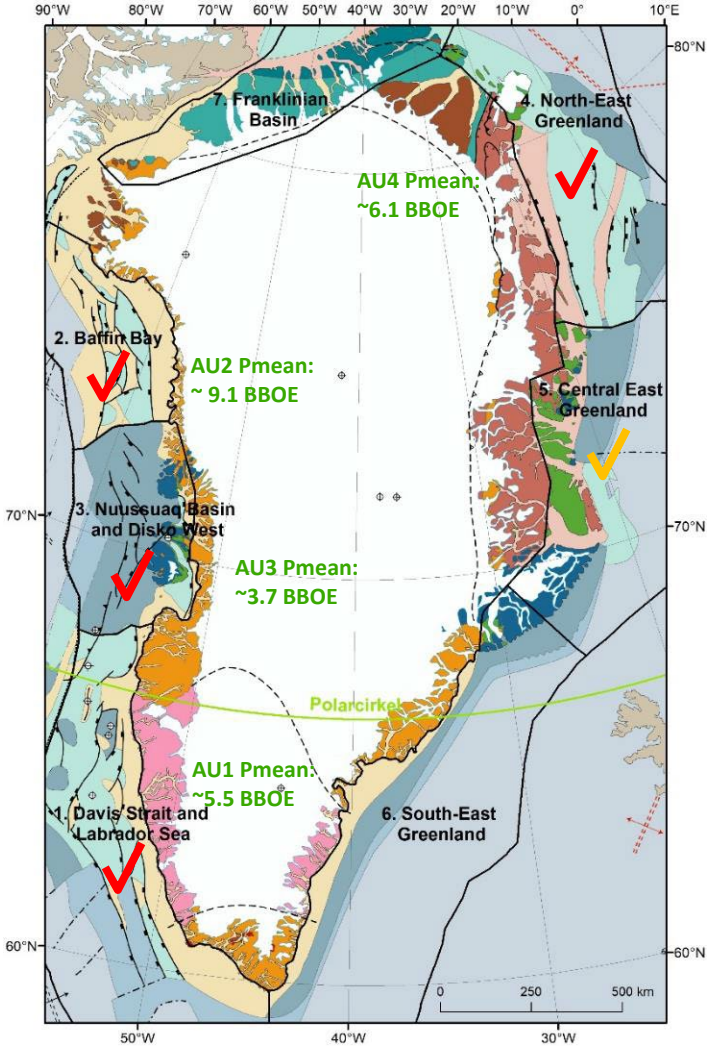
Risked, recoverable volumes

- YTF for **AU1** Davis Strait and Labrador Sea - **P_{mean}: ~5.5 BBOE**
- YTF for **AU3** Nuussuaq Basin and Disko West - **P_{mean}: ~3.7 BBOE**
- YTF for **AU2** Baffin Bay - **P_{mean}: ~9.1 BBOE**

USGS assessment for West Greenland P_{mean}: ~6.1 BBOE
Significant upgrade due to acquisition of new data

- YTF for **AU4** North-East Greenland - **P_{mean}: ~6.1 BBOE**

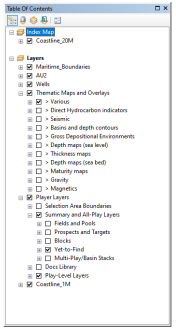
USGS assessment for North-East Greenland P_{mean}: ~31 BBOE
Major downgrade due to acquisition of new data and revised super-regional seismic stratigraphic interpretation

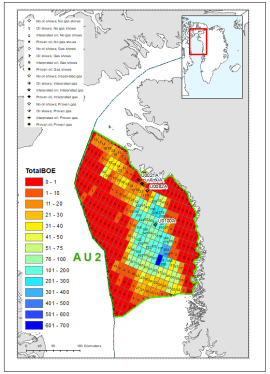


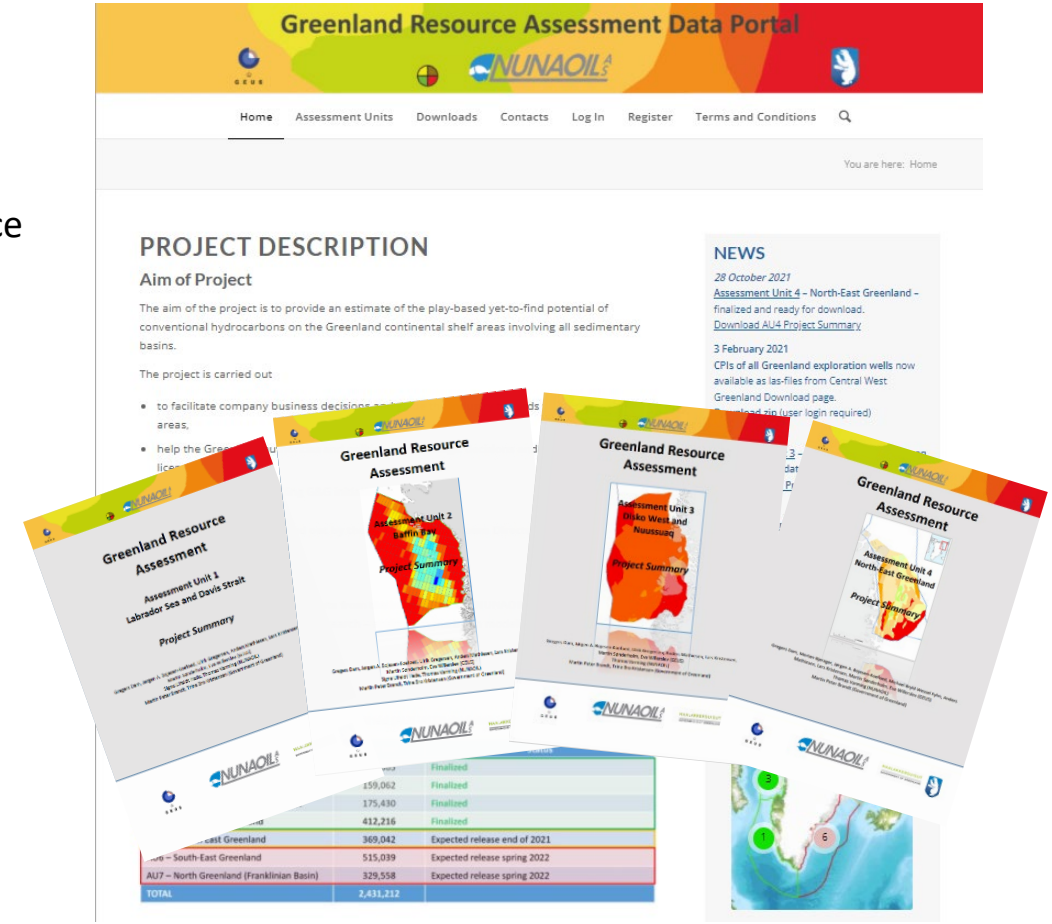
www.greenland-resource-assessment.gl

The portal provides :

- **All information** on assessment process
- Download of extensive **presentation material**
- Download of **ArcGIS projects** with all ressource assessment information and possibility of enhanced **GIS-Pax functionality**
- Download of extensive **document libraries**
- Download of updated **CPIs** of all Greenland exploration wells







Resource Assessment of Frontier Basins

An example from the play-based Greenland assessment

Martin Sønderholm (GEUS) and colleagues from GEUS, NUNAOIL and MRA

NAALAKKERSUISUT
GOVERNMENT OF GREENLAND

NUNAOIL A/S

GEUS