

Audit of the Prospective Resources of the West Shalva Prospect, Kazakhstan

Prepared for

Caspian Sunrise plc

10 April 2024

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Dear Mr. Carver,

Audit of the Prospective Resources of the West Shalva Prospect, Kazakhstan

Introduction

At the request of Caspian Sunrise plc (Caspian Sunrise), Gaffney, Cline & Associates Limited (GaffneyCline) has performed an audit of the Prospective Resources of the West Shalva Prospect, Kazakhstan.

The West Shalva Prospect has been mapped on 3D seismic data and is located adjacent to the Shalva and Zhangloi Fields in the Mangyshlak region of western Kazakhstan. The prospect was targeted in 1997 by the West Shalva-4 (WSH-4) exploration well. This well encountered reservoirs of Jurassic (as in the Shalva Field) and Triassic age. No well tests were undertaken at that time, however, oil shows and oil films were reported. The well was abandoned, but recently it has been reported that the well is leaking oil to surface.

The 3D seismic data covering the West Shalva Prospect was acquired in 2008 and interpretation of these data indicate that the WSH-4 well was drilled to the north and outside of the structural closure of the West Shalva Prospect.

GaffneyCline has reviewed and audited the data and information provided by Caspian Sunrise. This consists of legacy well and seismic data along with reports prepared by E&P companies, Kazakh Institute Reserves Reports and in-house presentations.

The West Shalva Prospect has potential in reservoirs of Jurassic and Triassic age. The Ju-IX, Ju-XI and Triassic reservoirs are oil-bearing in the nearby Shalva Field, and oil has been reported (but not tested) from cores in the Triassic reservoir in the WSH-4 well.

The results of this audit are reported in Table 1 and Table 2.

This report relates specifically and solely to the subject matter as defined in the scope of work (SOW), as set out herein, and is conditional upon the specified assumptions. The report must be considered in its entirety and must only be used for the purpose for which it is intended.

Summary

GaffneyCline has reviewed the data and information provided by Caspian Sunrise and has independently estimated the Gross Prospective Resources for the West Shalva Prospect. These volumes and associated geological chance of success (Pg) are reported in Table 1.

Table 1: Gross Prospective Resources of the West Shalva Prospect

Reservoir	Gross Prospective Resources			Geological Chance of Success (Pg)
	1U (MMT)	U2 (MMT)	3U (MMT)	
Ju-IX	0.94	2.04	4.38	0.54
Ju-XI	0.39	1.41	4.75	0.54
Triassic	0.87	2.01	4.27	0.23

Notes:

- Gross Prospective Resources are 100% of the volumes estimated to be recoverable from the West Shalva Prospect in the event that a discovery is made and subsequently developed.
- The Chance of Geologic Discovery (Pg) reported here represents an indicative estimate of the probability that drilling the West Shalva Prospect would result in a discovery. This does not include any assessment of the risk that the discovery, if made, may not be developed (i.e., it does not include a Chance of Development (Pd)).
- The volumes reported here are "unrisked" in the sense that no adjustment has been made for the risk that no discovery will be made or that any discovery would not be developed.
- Identification of Prospective Resources associated with a prospect is not indicative of any certainty that the Prospect will be drilled, or will be drilled in a timely manner.
- Prospective Resources should not be aggregated with each other, or with Reserves or Contingent Resources, because of the different levels of risk involved.

The West Shalva Prospect straddles the block boundary of the licence. Based on the area of the field inside the block GaffneyCline has estimated the on-block Prospective Resources for the West Shalva Prospect, these are reported in Table 2.

These Prospective Resource estimates (Tables 1 and 2) relate to the undrilled West Shalva Prospect. If this prospect is drilled and the well demonstrates the presence of hydrocarbons the resource volumes should be updated to incorporate the results of the well and, given success these updated volume estimates could be classified as Contingent Resources. Appraisal drilling would then be required to confirm the extent of the accumulation and to allow planning for the development of the West Shalva prospect.

Table 2: Gross On-Block Prospective Resources of the West Shalva Prospect

Reservoir	Gross Prospective Resources			Geological Chance of Success (Pg)
	1U (MMT)	2U (MMT)	3U (MMT)	
Ju-IX	0.94	1.35	2.89	0.54
Ju-XI	0.39	0.93	3.14	0.54
Triassic	0.57	1.33	2.82	0.23

Notes:

1. On-Block Prospective Resources in this table are the fraction of the gross Prospective Resources attributable to the Block; they do not represent actual Net Entitlement under the terms of the contract that governs the asset, which would be lower reflecting at least the equity in the Block.
2. The Chance of Geologic Discovery (Pg) reported here represents an indicative estimate of the probability that drilling the West Shalva Prospect would result in a discovery. This does not include any assessment of the risk that the discovery, if made, may not be developed (i.e., it does not include a Chance of Development (Pd)).
3. The volumes reported here are "unrisked" in the sense that no adjustment has been made for the risk that no discovery will be made or that any discovery would not be developed.
4. Identification of Prospective Resources associated with a prospect is not indicative of any certainty that the Prospect will be drilled, or will be drilled in a timely manner.
5. Prospective Resources should not be aggregated with each other, or with Reserves or Contingent Resources, because of the different levels of risk involved.

Discussion

1 Geological Description

The West Shalva (Black Turtle) Prospect is located in the Mangyshlak region of western Kazakhstan. The Prospect is partially located in Block XXXVII-12, but staddles the boundary with the adjacent blocks.

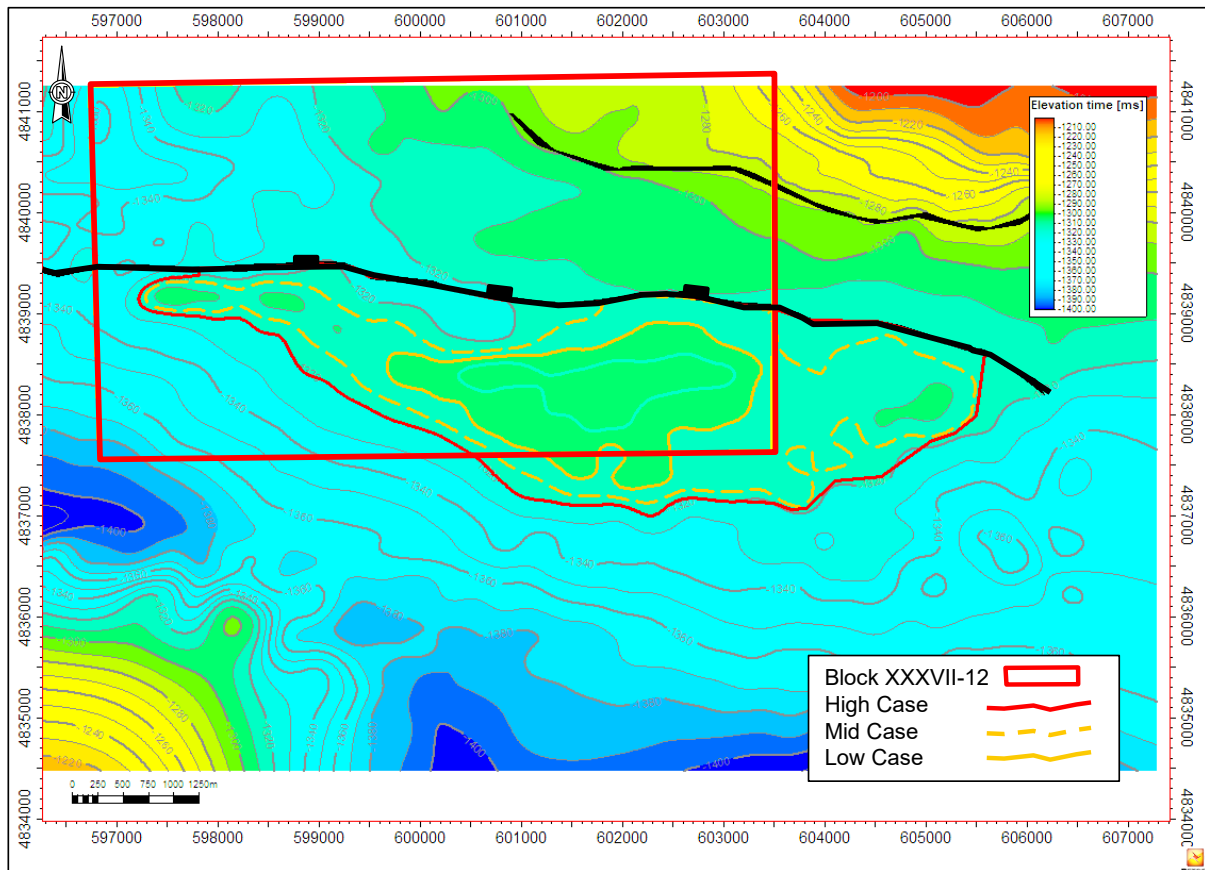
1.1 Trap

The prospect is mapped using a 3D seismic volume (2008) of moderate to poor quality that allows the mapping of key seismic events in the Jurassic and Triassic reservoir intervals.

Trap presence and effectiveness is the main geological risk for the Jurassic reservoirs of the prospect. The requirement for a sealing fault in the high-side mapping is incorporated into the geological chance of success for the prospect (Figure 1).

The trap geometry at the Triassic level is well defined and a clear anticlinal trap can be mapped. Seismic data quality and reflector confidence at the Jurassic level is lower and the geometry of the Jurassic trap at the Ju-IX and Ju-XI reservoirs is less clear. However, using seismic time slices it is possible to confirm the likely presence of a faulted anticline at this level.

Figure 1: Mid Jurassic Time Structure Map of the Black Turtle Prospect



1.2 Reservoirs

The main reservoirs of the West Shalva (Black Turtle) Prospect are the Jurassic IX and XI reservoirs. These are of Middle Jurassic (Bathonian / Bajocian) age and are productive in the nearby Shalva and Zhalganoy Fields. Reservoir quality is moderate and the analogue reservoir parameters from the analysis of wells in nearby fields have been used to condition GaffneyCline's volumetric estimates. The Middle Jurassic is proven in offset fields and is the primary objective of the West Shalva Prospect.

Reservoirs of Triassic age are developed in the area. These are characterised as carbonates with interbedded clastics. Prospective Resource estimates for two Triassic reservoirs (TR1 and TR3) are reported for the Prospect. GaffneyCline has been unable to identify the rationale for two separate reservoirs and considers a single reservoir interval in this evaluation. No oil production from the Triassic reservoir is reported in the area. However, oil has been recovered from a core cut in the Triassic in well WSH-4 and the Triassic reservoir flowed oil in the SH-1 well. GaffneyCline considers the Triassic reservoir to be a secondary target.

1.3 Seals

The Middle Jurassic sediments in the area consists of interbedded sandstones and shales. The shales provide the seals to the sandstone reservoirs. On a local scale these shales appear to be correlatable indicating a high probability of there being an effective top seal at

the West Shalva Prospect. However, the thickness and lithology of the shale varies and given the low amplitude of the trap at the Middle Jurassic at West Shalva and the presence of faults in the area, top and lateral seal is not a given.

1.4 Source Rock / Charge

The West Shalva (Black Turtle) lies in an area with several producing oil fields. The source rock for the prospect is considered to be Triassic marine shales that are interpreted to be the source of the oils in nearby fields. However, no direct correlation to this source has been demonstrated. Source rock and charge are deemed low risk due to the presence of nearby oil fields.

1.5 Previous Exploration

Exploration commenced in the Soviet Era and the West Shalva-4 (WSH-4) well was drilled in 1997. The WSH-4 well found reservoirs of Jurassic and Triassic age and the presence of oil and gas is reported. The well was not tested. Current mapping of the Black Turtle Prospect places the WSH-4 well out of structural closure. The well however, provides information on the presence of hydrocarbon bearing Jurassic and Triassic potential near to the West Shalva Prospect.

More recently wells have been drilled in the Shalva and Zhalganoy Fields. Details are shown in Table 3.

Table 3: Summary of Drilling Results in Selected Nearby Wells

Well Name	Spud Year	TD (m)	TD Formation	Well Test / result
West Shalva-4	1977	3,500	Triassic	Oil and gas shows reported, not tested.
Shalva-1	1985	>3,210	Triassic	Ju-XI Reservoir = 12.6 m ³ /d Triassic Reservoir = 2.4 m ³ /d
Shalva-PR2	2013	3,000	Triassic	No test reported
Shalva-3	2009	2,984	Triassic	Weak flow of oil from the Triassic following stimulation.
Zhalganoy-4		2,600	Triassic?	

1.6 Geological Chance of Success (Pg)

GaffneyCline has independently estimated the Geological Chance of Success (Pg) of each of the reservoirs in the West Shalva Prospect. The estimate uses an industry standard template to evaluate the Pg by ascribing a chance factor to each of the individual Chance Factors. The values are calibrated to the available data and level of knowledge. The inputs used in calculating the Pg are shown in Table 4.

Table 4: Geological Change of Success

Reservoir	Chance Factor	CF	Comment
Ju-IX	Trap and Seal	0.60	Trap mapped on 3D seismic, but definition poor at top reservoir level especially fault definition.
	Reservoir	1.00	Demonstrated in offset wells including WSH-4
	Hydrocarbon Source	1.00	Oil found in offset wells
	Geological Timing	0.90	Timing of trap relative to charge unclear
	Overall CF	0.54	
Ju-XI	Trap and Seal	0.60	Trap mapped on 3D seismic, but definition poor at top reservoir level especially fault definition
	Reservoir	1.00	Demonstrated in offset wells including WSH-4
	Hydrocarbon Source	1.00	Oil found in offset wells
	Geological Timing	0.90	Timing of trap relative to charge unclear
	Overall CF	0.54	
Triassic	Reservoir	0.65	Well defined on seismic data
	Reservoir	0.40	Reservoir present in offset well, effectiveness uncertain
	Hydrocarbon Source	1.00	Oil flowed at low rates in Triassic reservoir in offset wells
	Geological Timing	0.90	Reasonably confident.
	Overall CF	0.23	

2 Notional Exploration Work Programme

This audit has identified and classified the resource volumes as Prospective Resources using the PRMS. These are undiscovered resources. The next phase of a notional exploration work programme will be to plan and drill an exploration well to test at least the Jurassic Reservoirs. The exploration well should be located in such a way as to optimally encounter both the Ju-IX and Ju-XI reservoirs. In order to achieve this objective, the reprocessing of the 3D seismic data should be considered, as it is likely that a significant uplift in data quality and resolution could be achieved. This reprocessed data would provide an improved dataset for the location of the exploration well and in the appraisal of the discovery (given success).

If the exploration well encounters oil in the Jurassic reservoirs a well test of the reservoir could be considered to allow a characterisation of the hydrocarbon fluids and to develop an understanding of the flow performance of the reservoir(s). Following successful exploration drilling appraisal drilling may be required (to identify the extent and productivity of the reservoir) to allow calibration of the field development plan. The appraisal well may also be deepened to test the potential of the Triassic reservoir (if the location is appropriate). Therefore, the second well could have dual objectives.

Following the appraisal of the discovery a field development plan or test production scheme (Techschema) could be prepared and the field commence production.

Basis of Opinion

This document reflects GaffneyCline's informed professional judgment based on accepted standards of professional investigation and, as applicable, the data and information provided by the Client and available in the public domain, the limited scope of engagement, and the time permitted to conduct the evaluation.

In line with those accepted standards, this document does not in any way constitute or make a guarantee or prediction of results, and no warranty is implied or expressed that actual outcome will conform to the outcomes presented herein. GaffneyCline has not independently verified any information provided by, or at the direction of, the Client, and has accepted the accuracy and completeness of this data. GaffneyCline has no reason to believe that any material facts have been withheld, but does not warrant that its inquiries have revealed all of the matters that a more extensive examination might otherwise disclose.

The opinions expressed herein are subject to and fully qualified by the generally accepted uncertainties associated with the interpretation of Prospective Resources e.g., geoscience and engineering data and do not reflect the totality of circumstances, scenarios and information that could potentially affect decisions made by the report's recipients and/or actual results. The opinions and statements contained in this report are made in good faith and in the belief that such opinions and statements are representative of prevailing physical and economic circumstances.

In the preparation of this report, GaffneyCline has used definitions contained within the Petroleum Resources Management System (PRMS), which was approved by the Society of Petroleum Engineers, the World Petroleum Council, the American Association of Petroleum Geologists, the Society of Petroleum Evaluation Engineers, the Society of Exploration Geophysicists, the Society of Petrophysicists and Well Log Analysts, and the European Association of Geoscientists and Engineers in June 2018, Version 1.03 (see Appendix I).

There are numerous uncertainties inherent in estimating reserves and resources, and in projecting future production, development expenditures, operating expenses and cash flows. Oil and gas resources assessments must be recognized as a subjective process of estimating subsurface accumulations of oil and gas that cannot be measured in an exact way. Estimates of oil and gas resources prepared by other parties may differ, perhaps materially, from those contained within this report.

The accuracy of any resources estimate is a function of the quality of the available data and of engineering and geological interpretation. Results of drilling, testing and production that post-date the preparation of the estimates may justify revisions, some or all of which may be material. Accordingly, resources estimates are often different from the quantities of oil and gas that are ultimately recovered, and the timing and cost of those volumes that are recovered may vary from that assumed.

Oil and condensate volumes are reported in millions of tonnes. Standard conditions are defined as 14.7 psia and 60°F.

GaffneyCline's review and audit involved reviewing pertinent facts, interpretations and assumptions made by Caspian Sunrise or others in preparing estimates of reserves and resources. GaffneyCline performed procedures necessary to enable it to render an opinion on the appropriateness of the methodologies employed, adequacy and quality of the data relied on, depth and thoroughness of the reserves and resources estimation process,

classification and categorization of reserves and resources appropriate to the relevant definitions used, and reasonableness of the estimates.

Definition of Prospective Resources

Prospective Resources are those quantities of petroleum that are estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Potential accumulations are evaluated according to the chance of geologic discovery and, assuming a discovery, the estimated quantities that would be recoverable under defined development projects. It is recognized that the development programs will be of significantly less detail and depend more heavily on analogue developments in the earlier phases of exploration.

There is no certainty that any portion of the Prospective Resources will be discovered. If discovered, there is no certainty that it will be commercially viable to produce any portion of the resources. Prospective Resource volumes are presented as unrisks. GaffneyCline has estimated the Geological Chance of Success (Pg) for each of the reservoirs using industry common practise methods.

GaffneyCline has not undertaken a site visit and inspection as this is an exploration opportunity, and no surface facilities exist. As such, GaffneyCline is not in a position to comment on the operations or facilities in place, their appropriateness and condition, or whether they are in compliance with the regulations pertaining to such operations. Further, GaffneyCline is not in a position to comment on any aspect of health, safety, or environment of such operation.

Qualifications

In performing this study, GaffneyCline is not aware that any conflict of interest has existed. As an independent consultancy, GaffneyCline is providing impartial technical, commercial, and strategic advice within the energy sector. GaffneyCline's remuneration was not in any way contingent on the contents of this report.

In the preparation of this document, GaffneyCline has maintained, and continues to maintain, a strict independent consultant-client relationship with Caspian Sunrise. Furthermore, the management and employees of GaffneyCline have no interest in any of the assets evaluated or are related with the analysis performed, as part of this report.

Staff members who prepared this report hold appropriate professional and educational qualifications and have the necessary levels of experience and expertise to perform the work.

Notice

This document is confidential and has been prepared for the exclusive use of the Client or parties named herein. It may not be distributed or made available, in whole or in part, to any other company or person without the prior knowledge and written consent of GaffneyCline. No person or company other than those for whom it is intended may directly or indirectly rely upon its contents. GaffneyCline is acting in an advisory capacity only and, to the fullest extent permitted by law, disclaims all liability for actions or losses derived from any actual or purported reliance on this document (or any other statements or opinions of GaffneyCline) by the Client or by any other person or entity.

It has been a pleasure preparing this audit of the West Shalva Prospect for Caspian Sunrise plc. Please contact the undersigned if you have any questions.

Yours sincerely,

Gaffney, Cline & Associates Limited



Project Manager
David Jarrett, Senior Advisor



Reviewed by
Rob Cook, Principal Advisor

Appendices

Appendix I SPE PRMS Definitions

Appendix I SPE PRMS Definitions

**Society of Petroleum Engineers, World Petroleum Council,
American Association of Petroleum Geologists, Society of Petroleum Evaluation Engineers,
Society of Exploration Geophysicists, Society of Petrophysicists and Well Log Analysts,
and European Association of Geoscientists & Engineers**

Petroleum Resources Management System

Definitions and Guidelines ⁽¹⁾

Revised 2018 (v. 1.03)

Table 1—Recoverable Resources Classes and Sub-Classes

Class/Sub-Class	Definition	Guidelines
Reserves	Reserves are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions.	<p>Reserves must satisfy four criteria: discovered, recoverable, commercial, and remaining based on the development project(s) applied. Reserves are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by the development and production status.</p> <p>To be included in the Reserves class, a project must be sufficiently defined to establish its commercial viability (see Section 2.1.2, Determination of Commerciality). This includes the requirement that there is evidence of firm intention to proceed with development within a reasonable time-frame.</p> <p>A reasonable time-frame for the initiation of development depends on the specific circumstances and varies according to the scope of the project. While five years is recommended as a benchmark, a longer time-frame could be applied where, for example, development of an economic project is deferred at the option of the producer for, among other things, market-related reasons or to meet contractual or strategic objectives. In all cases, the justification for classification as Reserves should be clearly documented.</p> <p>To be included in the Reserves class, there must be a high confidence in the commercial maturity and economic producibility of the reservoir as supported by actual production or formation tests. In certain cases, Reserves may be assigned on the basis of well logs and/or core analysis that indicate that the subject reservoir is hydrocarbon-bearing and is analogous to reservoirs in the same area that are producing or have demonstrated the ability to produce on formation tests.</p>
On Production	The development project is currently producing or capable of producing and selling petroleum to market.	<p>The key criterion is that the project is receiving income from sales, rather than that the approved development project is necessarily complete. Includes Developed Producing Reserves.</p> <p>The project decision gate is the decision to initiate or continue economic production from the project.</p>

¹ These Definitions and Guidelines are extracted from the full Petroleum Resources Management System (revised 2018 (v. 1.03)) document.

Class/Sub-Class	Definition	Guidelines
Approved for Development	All necessary approvals have been obtained, capital funds have been committed, and implementation of the development project is ready to begin or is under way.	<p>At this point, it must be certain that the development project is going ahead. The project must not be subject to any contingencies, such as outstanding regulatory approvals or sales contracts. Forecast capital expenditures should be included in the reporting entity's current or following year's approved budget.</p> <p>The project decision gate is the decision to start investing capital in the construction of production facilities and/or drilling development wells.</p>
Justified for Development	Implementation of the development project is justified on the basis of reasonable forecast commercial conditions at the time of reporting, and there are reasonable expectations that all necessary approvals/contracts will be obtained.	<p>To move to this level of project maturity, and hence have Reserves associated with it, the development project must be commercially viable at the time of reporting (see Section 2.1.2, Determination of Commerciality) and the specific circumstances of the project. All participating entities have agreed and there is evidence of a committed project (firm intention to proceed with development within a reasonable time-frame)) There must be no known contingencies that could preclude the development from proceeding (see Reserves class).</p> <p>The project decision gate is the decision by the reporting entity and its partners, if any, that the project has reached a level of technical and commercial maturity sufficient to justify proceeding with development at that point in time.</p>
Contingent Resources	Those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations by application of development projects, but which are not currently considered to be commercially recoverable owing to one or more contingencies.	<p>Contingent Resources may include, for example, projects for which there are currently no viable markets, where commercial recovery is dependent on technology under development, where evaluation of the accumulation is insufficient to clearly assess commerciality, where the development plan is not yet approved, or where regulatory or social acceptance issues may exist.</p> <p>Contingent Resources are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by the economic status.</p>
Development Pending	A discovered accumulation where project activities are ongoing to justify commercial development in the foreseeable future.	<p>The project is seen to have reasonable potential for eventual commercial development, to the extent that further data acquisition (e.g., drilling, seismic data) and/or evaluations are currently ongoing with a view to confirming that the project is commercially viable and providing the basis for selection of an appropriate development plan. The critical contingencies have been identified and are reasonably expected to be resolved within a reasonable time-frame. Note that disappointing appraisal/evaluation results could lead to a reclassification of the project to On Hold or Not Viable status.</p> <p>The project decision gate is the decision to undertake further data acquisition and/or studies designed to move the project to a level of technical and commercial maturity at which a decision can be made to proceed with development and production.</p>

Class/Sub-Class	Definition	Guidelines
Development on Hold	A discovered accumulation where project activities are on hold and/or where justification as a commercial development may be subject to significant delay.	<p>The project is seen to have potential for commercial development. Development may be subject to a significant time delay. Note that a change in circumstances, such that there is no longer a probable chance that a critical contingency can be removed in the foreseeable future, could lead to a reclassification of the project to Not Viable status.</p> <p>The project decision gate is the decision to either proceed with additional evaluation designed to clarify the potential for eventual commercial development or to temporarily suspend or delay further activities pending resolution of external contingencies.</p>
Development Unclarified	A discovered accumulation where project activities are under evaluation and where justification as a commercial development is unknown based on available information.	<p>The project is seen to have potential for eventual commercial development, but further appraisal/evaluation activities are ongoing to clarify the potential for eventual commercial development.</p> <p>This sub-class requires active appraisal or evaluation and should not be maintained without a plan for future evaluation. The sub-class should reflect the actions required to move a project toward commercial maturity and economic production.</p>
Development Not Viable	A discovered accumulation for which there are no current plans to develop or to acquire additional data at the time because of limited commercial potential.	<p>The project is not seen to have potential for eventual commercial development at the time of reporting, but the theoretically recoverable quantities are recorded so that the potential opportunity will be recognized in the event of a major change in technology or commercial conditions.</p> <p>The project decision gate is the decision not to undertake further data acquisition or studies on the project for the foreseeable future.</p>
Prospective Resources	Those quantities of petroleum that are estimated, as of a given date, to be potentially recoverable from undiscovered accumulations.	Potential accumulations are evaluated according to the chance of geologic discovery and, assuming a discovery, the estimated quantities that would be recoverable under defined development projects. It is recognized that the development programs will be of significantly less detail and depend more heavily on analog developments in the earlier phases of exploration.
Prospect	A project associated with a potential accumulation that is sufficiently well defined to represent a viable drilling target.	Project activities are focused on assessing the chance of geologic discovery and, assuming discovery, the range of potential recoverable quantities under a commercial development program.
Lead	A project associated with a potential accumulation that is currently poorly defined and requires more data acquisition and/or evaluation to be classified as a Prospect.	Project activities are focused on acquiring additional data and/or undertaking further evaluation designed to confirm whether or not the Lead can be matured into a Prospect. Such evaluation includes the assessment of the chance of geologic discovery and, assuming discovery, the range of potential recovery under feasible development scenarios.
Play	A project associated with a prospective trend of potential prospects, but that requires more data acquisition and/or evaluation to define specific Leads or Prospects.	Project activities are focused on acquiring additional data and/or undertaking further evaluation designed to define specific Leads or Prospects for more detailed analysis of their chance of geologic discovery and, assuming discovery, the range of potential recovery under hypothetical development scenarios.

Table 2—Reserves Status Definitions and Guidelines

Status	Definition	Guidelines
Developed Reserves	Expected quantities to be recovered from existing wells and facilities.	Reserves are considered developed only after the necessary equipment has been installed, or when the costs to do so are relatively minor compared to the cost of a well. Where required facilities become unavailable, it may be necessary to reclassify Developed Reserves as Undeveloped. Developed Reserves may be further sub-classified as Producing or Non-producing.
Developed Producing Reserves	Expected quantities to be recovered from completion intervals that are open and producing at the effective date of the estimate.	Improved recovery Reserves are considered producing only after the improved recovery project is in operation.
Developed Non-Producing Reserves	Shut-in and behind-pipe Reserves.	<p>Shut-in Reserves are expected to be recovered from (1) completion intervals that are open at the time of the estimate but which have not yet started producing, (2) wells which were shut-in for market conditions or pipeline connections, or (3) wells not capable of production for mechanical reasons. Behind-pipe Reserves are expected to be recovered from zones in existing wells that will require additional completion work or future re-completion before start of production with minor cost to access these reserves.</p> <p>In all cases, production can be initiated or restored with relatively low expenditure compared to the cost of drilling a new well.</p>
Undeveloped Reserves	Quantities expected to be recovered through future significant investments.	Undeveloped Reserves are to be produced (1) from new wells on undrilled acreage in known accumulations, (2) from deepening existing wells to a different (but known) reservoir, (3) from infill wells that will increase recovery, or (4) where a relatively large expenditure (e.g., when compared to the cost of drilling a new well) is required to (a) recomplete an existing well or (b) install production or transportation facilities for primary or improved recovery projects.

Table 3—Reserves Category Definitions and Guidelines

Category	Definition	Guidelines
Proved Reserves	<p>Those quantities of petroleum that, by analysis of geoscience and engineering data, can be estimated with reasonable certainty to be commercially recoverable from a given date forward from known reservoirs and under defined economic conditions, operating methods, and government regulations.</p>	<p>If deterministic methods are used, the term “reasonable certainty” is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability (P90) that the quantities actually recovered will equal or exceed the estimate.</p> <p>The area of the reservoir considered as Proved includes (1) the area delineated by drilling and defined by fluid contacts, if any, and (2) adjacent undrilled portions of the reservoir that can reasonably be judged as continuous with it and commercially productive on the basis of available geoscience and engineering data.</p> <p>In the absence of data on fluid contacts, Proved quantities in a reservoir are limited by the LKH as seen in a well penetration unless otherwise indicated by definitive geoscience, engineering, or performance data. Such definitive information may include pressure gradient analysis and seismic indicators. Seismic data alone may not be sufficient to define fluid contacts for Proved reserves.</p> <p>Reserves in undeveloped locations may be classified as Proved provided that:</p> <ul style="list-style-type: none"> A. The locations are in undrilled areas of the reservoir that can be judged with reasonable certainty to be commercially mature and economically productive. B. Interpretations of available geoscience and engineering data indicate with reasonable certainty that the objective formation is laterally continuous with drilled Proved locations. <p>For Proved Reserves, the recovery efficiency applied to these reservoirs should be defined based on a range of possibilities supported by analogs and sound engineering judgment considering the characteristics of the Proved area and the applied development program.</p>
Probable Reserves	<p>Those additional Reserves that analysis of geoscience and engineering data indicates are less likely to be recovered than Proved Reserves but more certain to be recovered than Possible Reserves.</p>	<p>It is equally likely that actual remaining quantities recovered will be greater than or less than the sum of the estimated Proved plus Probable Reserves (2P). In this context, when probabilistic methods are used, there should be at least a 50% probability that the actual quantities recovered will equal or exceed the 2P estimate.</p> <p>Probable Reserves may be assigned to areas of a reservoir adjacent to Proved where data control or interpretations of available data are less certain. The interpreted reservoir continuity may not meet the reasonable certainty criteria.</p> <p>Probable estimates also include incremental recoveries associated with project recovery efficiencies beyond that assumed for Proved.</p>

Category	Definition	Guidelines
Possible Reserves	Those additional reserves that analysis of geoscience and engineering data indicates are less likely to be recoverable than Probable Reserves.	<p>The total quantities ultimately recovered from the project have a low probability to exceed the sum of Proved plus Probable plus Possible (3P), which is equivalent to the high-estimate scenario. When probabilistic methods are used, there should be at least a 10% probability (P10) that the actual quantities recovered will equal or exceed the 3P estimate.</p> <p>Possible Reserves may be assigned to areas of a reservoir adjacent to Probable where data control and interpretations of available data are progressively less certain. Frequently, this may be in areas where geoscience and engineering data are unable to clearly define the area and vertical reservoir limits of economic production from the reservoir by a defined, commercially mature project.</p> <p>Possible estimates also include incremental quantities associated with project recovery efficiencies beyond that assumed for Probable.</p>
Probable and Possible Reserves	See above for separate criteria for Probable Reserves and Possible Reserves.	<p>The 2P and 3P estimates may be based on reasonable alternative technical interpretations within the reservoir and/or subject project that are clearly documented, including comparisons to results in successful similar projects.</p> <p>In conventional accumulations, Probable and/or Possible Reserves may be assigned where geoscience and engineering data identify directly adjacent portions of a reservoir within the same accumulation that may be separated from Proved areas by minor faulting or other geological discontinuities and have not been penetrated by a wellbore but are interpreted to be in communication with the known (Proved) reservoir. Probable or Possible Reserves may be assigned to areas that are structurally higher than the Proved area. Possible (and in some cases, Probable) Reserves may be assigned to areas that are structurally lower than the adjacent Proved or 2P area.</p> <p>Caution should be exercised in assigning Reserves to adjacent reservoirs isolated by major, potentially sealing faults until this reservoir is penetrated and evaluated as commercially mature and economically productive. Justification for assigning Reserves in such cases should be clearly documented. Reserves should not be assigned to areas that are clearly separated from a known accumulation by non-productive reservoir (i.e., absence of reservoir, structurally low reservoir, or negative test results); such areas may contain Prospective Resources.</p> <p>In conventional accumulations, where drilling has defined a highest known oil elevation and there exists the potential for an associated gas cap, Proved Reserves of oil should only be assigned in the structurally higher portions of the reservoir if there is reasonable certainty that such portions are initially above bubble point pressure based on documented engineering analyses. Reservoir portions that do not meet this certainty may be assigned as Probable and Possible oil and/or gas based on reservoir fluid properties and pressure gradient interpretations.</p>

Figure 1.1—Resources classification framework

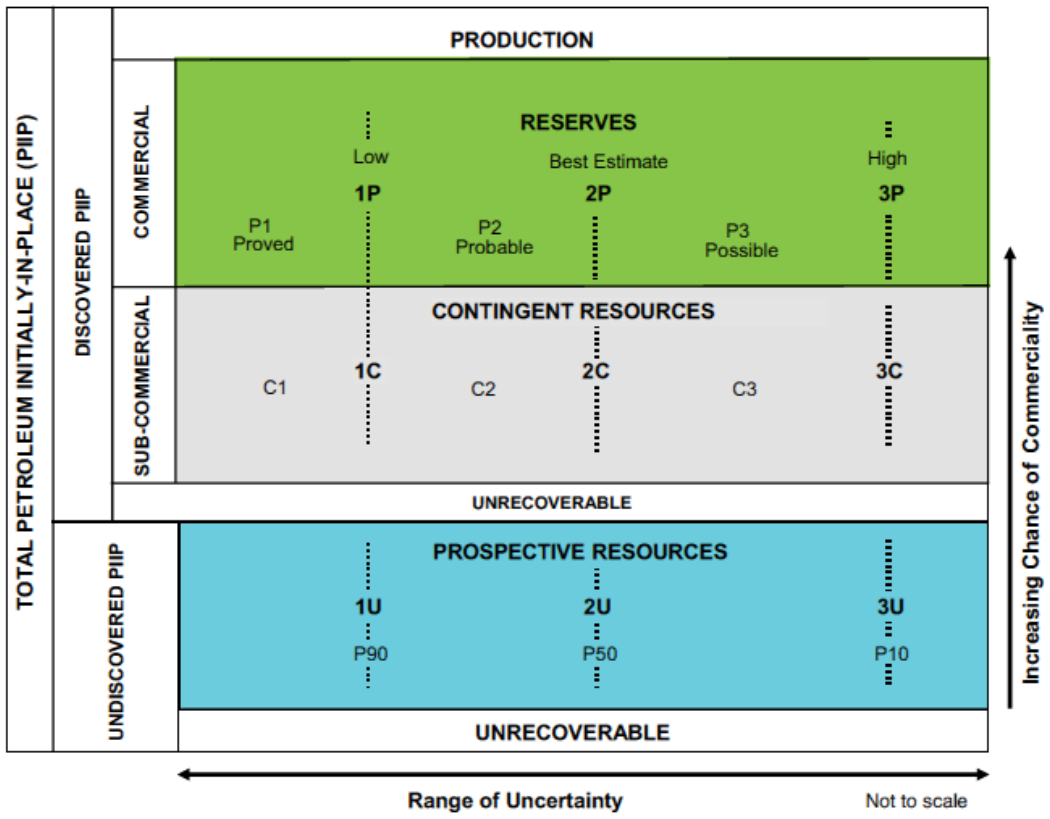


Figure 2.1—Sub-classes based on project maturity

