Report after audit

Report	
Report title **Report after audit of Equinor and KCA Deutag *Askepott* Oseberg South – technology development and use of digital well planning, automated drilling and digital twins**	Activity number 001079012 419002006

Security grading		
☒ Public	☐ Restricted	☐ Strictly confidential
☐ Not publicly available	☐ Confidential	

Involved	
Main group T1, T-F	Assignment leader Kristian Solheim Teigen
Participants in audit team Arne Halvor Embergsrud, Fredrik S Dørum, Linn I V Bergh	Date 8 June 2022

1 Introduction

Supervision was exercised by the Petroleum Safety Authority Norway (PSA) through an audit of technology development and the implementation and use of digital well planning and automated drilling control (ADC) by Equinor and KCA Deutag (KCAD) on the *Askepott* mobile drilling facility, currently operating on the Oseberg field.

The audit was conducted with a virtual kick-off meeting by video conference on 24 March as well as interviews and inspections on the facility on 28-31 March 2022. Supplementary interviews with relevant personnel in Equinor were conducted on 5 April 2022.

Implementation of the audit was well organised by Equinor and KCAD. A good and open dialogue took place, while informative presentations were given.

2 Background

ADC comprises a number of sub-technologies with associated systems which seek to achieve automated control of the drilling process. This relates particularly to providing driller support. The overall system can comprise data acquisition from such sources as wired drillpipe, automated computations and measurements, data historians and calculations. A digital twin of the well is also created, which contributes to decision-making during operation on the basis of the data stream. This twin can also be used to control drilling equipment. The aim of ADC technologies is to improve operational safety and efficiency. The system has been developed by combining different technologies from MHWirth, National Oilwell Varco (NOV) and Sekal. Technology suppliers on *Askepott* are primarily NOV and Sekal. The system which binds the technologies together and realises the user interface for them is delivered by NOV and called Novos in this report.

Adopting digital solutions and ADC is not only about technologies. The PSA's follow-up is concerned with how the companies assess vulnerability and risk from a holistic perspective, including human, technological and organisational (HTO) aspects.

3 Goal

The goal of the audit was to follow up how Equinor, as operator of the Oseberg field, and KCAD, as holder of the acknowledgement of compliance (AoC) for *Askepott*, identified and followed up issues related to health, safety and the environment and complied with regulatory requirements related to developing, implementing and using ADC and digital well planning.

In its audit, the PSA team emphasised qualification of new technology, the decision base, criteria and processes, which risk assessments and analyses were carried out, and how these took care of and secured operations in a holistic HTO perspective.

Other key issues were:

- how new technology was applied in drilling and well operations
- which HSE effects this involved
- how risk was handled if the technology failed
- roles and responsibilities
- continuous improvement
- follow-up and performance management by the companies.

The team also investigated how implementing the new systems had affected work tasks and processes, and how those involved were put in a position to handle changes in technology, organisation and work execution.

4 Results

4.1 General

The results build on presentations by the companies, reviews of documentation and governing documents, interviews and verifications. Fourteen interviews were conducted with personnel in various position on board, at associated operation centres and with the safety service. In addition, applications for the technology were demonstrated and random samples taken from the management system related to the audit's subject. Supplementary interviews with personnel involved in implementing ADC technologies at Equinor were conducted at the PSA’s premises after the offshore visit. Questions for personnel involved in technology qualification were passed on in writing and answered by e-mail following the meting.

Equinor’s follow-up of elements in its own and other participants’ management systems has not been a topic for this audit. That is because Equinor’s response to the PSA’s report of 1 December 2021 notes that the company has taken measures to follow up the identified conditions with all vessel owners under contract to it. At the time the *Askepott* audit was conducted, the measures for increased follow-up were under implementation.

During the audit, the PSA team was informed that, even though the level of automation rises with the adoption of ADC systems, executing personnel were expected to have a monitoring role and to be able to intervene as and when required. It was therefore important to utilise a system which made provision for this to happen in an appropriate manner. However, the document review, interviews and verifications revealed that the ADC system failed in a number of cases to present information in a way which allowed executing personnel to intervene effectively and secure safe operation should the automated system fail.

The audit identified seven nonconformities:

- qualification of technology
- design of the human-machine interface (HMI)
- monitoring and control of alarms
- risk assessment and analysis
- handling of nonconformities
- design of work processes and procedures
- competency and training.

5 Observations

The PSA has two main categories of observations.

Nonconformities: observations where the PSA identifies breaches of/inadequate compliance with the regulations.

Improvement points: these relate to observations where breaches/inadequate compliance are thought to exist, but insufficient information is available to confirm this.

5.1 Nonconformities

5.1.1 Qualification of technology (Equinor)

Nonconformity
Equinor had not drawn up criteria for developing, testing and using the Novos ADC technology which ensured that requirements for health, safety and the environment were met. The technology was not adapted to already existing solutions. The ability to meet applicable requirements had not be demonstrated through qualification.

Grounds
The document review and interviews revealed that Equinor had not drawn up and concretised requirement specifications for the supplier or ensured through its own technological qualification that the technology was qualified and satisfied the regulatory requirements when procuring, installing and using the Novos system.

Equinor treated Novos initially as an upgrade rather than a development contract. A technology qualification process was nevertheless initiated two months after entering into a purchase contract for the system. However, Equinor was unable to show that its technology qualification established or applied criteria for development and testing which were representative of relevant conditions of use, and which demonstrated that applicable requirements could be met when using the technology.

Examples of this include the following.

- Hardware in the loop (HIL) testing, factory acceptance test (FAT), commissioning of the equipment and third-party design verification were conducted. These tests were largely directed at system integrity, technical functions of the system and technical interfaces. Equinor could not explain when and how the risk assessment described in the "ready for first use" technology qualification step was conducted. Risk assessments were made at facility level, as described under nonconformities 5.1.4 and 5.1.5 in this report, but experience from them was not followed up during technology qualification.
- Equinor could not refer to criteria for developing, testing and using which included operational or human factors in the technology qualification, other than explaining that user participation had taken place.
- Findings from third-party verification were not followed up in the technology qualification process.

The technology was installed and taken into use on a large number of facilities even though the technology qualification was inadequate. Several activities in the technology qualification process were carried out before supporting activities and the decision basis had been established and verified.

Examples of this include the following.

- The technology qualification plan was described as "multi use of proven technology after completed first use". Equinor based first use on the FAT, which is an integrity test of software and hardware, carried out for Johan Sverdrup in June 2019 and on the availability of installation procedures and user manuals. The system was not installed, tested or used on Johan Sverdrup before proceeding to scale out the system on several facilities. Experience with using the technology before it was scaled out was therefore lacking.
- According to documentation submitted on technology qualification, the system was also to be evaluated after use on the first three mobile facilities in 2019 before proceeding to install it on all facilities drilling for Equinor. These evaluations were not done.
- One question during the audit was when the use of Novos became a contractual requirement for rig intake. Overviews submitted to the PSA team show that installation and use of Novos was a requirement in contracts entered into with Odfjell and Transocean in 2018, Valaris (Rowan) in 2019 and Maersk in 2020. In other words, the technology was a contractual requirement for drilling contractors before it had been qualified.
- The audit identified several weaknesses related to the design of Novos and its adaptation to existing drilling control systems on *Askepott*. Sampling revealed that the development of the system was incomplete and that it was not adequately integrated. This meant operators had difficulties in simply and speedily obtaining necessary information and taking necessary action. See nonconformities 5.1.2 and 5.1.3.

These deficiencies showed that Equinor had not ensured the technology could meet the regulatory requirements before it was adopted on at least eight facilities.

Requirement
Section 9 of the facilities regulations on the qualification and use of new technology

5.1.2 Design of the human-machine interface (KCAD)

Nonconformity
Novos and the HMI equipment were not designed to reduce the risk of human mistakes which could have an impact on safety. Information transmitters and operating devices were not designed to provide simple and quick receipt of necessary information and the implementation of necessary actions.

Grounds
Inspection of the systems and the document review showed that integration of Novos in Cyberbase was inadequate. The product was also incomplete. See nonconformity 5.1.1. Technical descriptions and operating manuals failed to describe

which normative references had been utilised during the design phase to fulfil the regulatory requirements.

The following emerged from the document review and presentations related to design of the system.

- Novos and the existing drilling control system were not realised in a common user interface.
- Setup and configuration required entering parameters across the Cyberbase and Novos systems. The operator had to deal with many new parameters, where related parameters generally also had to be entered in one or both systems. This complicated the process for overcoming problems which arose with the automated drilling operations.
- The same information was presented differently in the various interfaces (such as the setting for weight on the drill bit and drilling speed).
- Alarms were not realised in a common system. See nonconformity 5.1.3.
- Design language, use of colours and design of the HMI between the systems were not uniform.
- It emerged from the audit that Novos' HMI is based on the material design framework. This is not a recognised industry standard for designing such interfaces. The documentation does not describe how the chosen solution similarly fulfils regulatory requirements.

The following problems related to the HMI emerged from interviews with executing personnel.

- The system produced error messages or performed unexpected actions which could be difficult for executing personnel to understand. It could also be challenging to identify the cause of system stoppages. In several operating modes, returning to automatic mode was difficult when Novos or the multimachine control for pipehandling failed.
- Where several operations were concerned, it could be difficult to predict or understand what consequences corrective commands by the operator might have.
- The purpose of the system was to provide operators with a better situational awareness. However, their experience was that the system created a distance from what was happening downhole. Some described it as losing their "feel", or making it difficult to "remember" the well when they were engaged more in monitoring rather than actively conducting the operation. See also the final bullet point under nonconformity 5.1.5.
- Going to manual mode was highlighted by supervisory and executing personnel as the solution they turned to when in doubt about whether the system was functioning as intended. Changing mode was also used when the system failed to perform sufficiently to reach key performance indicators (KPIs). That meant frequent changes between manual and automated modes.

Interviews revealed that personnel on board had limited awareness of the risk related to changing mode. Nor was this included in risk assessments or hazard and operability (Hazop) analyses.
- Over the period from installing Novos until the audit was conducted, several system updates were implemented to simplify use and to correct faults. Combined with training deficiencies described in nonconformity 5.1.7 (see nonconformity 5.1.6), however, this contributed to further problems with human-machine interaction.

These examples show that the operators had difficulties in receiving the necessary information and performing necessary actions simply and speedily. Several operators found it challenging to have the appropriate confidence in the systems so that the risk of mistakes which affected safety was reduced.

Requirement
Section 21 of the facilities regulations on human-machine interface and information presentation. See section 10, paragraph 1, litera a of the facilities regulations on installations, systems and equipment.

5.1.3 Monitoring and control of alarms (KCAD)

Nonconformity
Alarms in the drilling control system were not presented in a way which allowed them to be noted and acted upon in the time required for safe operation. The amount of new and standing alarms was such that understanding and handling deviations and hazards which occur proved demanding.

Grounds
It emerged from conversations that the alarm load in the driller's cabin was high. KCAD conducts annual alarm analyses. The PSA team has received and reviewed the latest analysis on the facility.

The following was observed for the Novos and Cyberbase alarm system.
- The alarm system in Novos was not configured in accordance with the norms referred to by KCAD or with standards referenced in the regulations.
- During inspection, the team observed that a large number of alarms were active in Novos and that these had been active for a long time without being acknowledged.
- Third-party applications developed by other suppliers which could be installed in Novos did not have access to the Novos alarm system. As a result, they could not alert the operator of deviations or faults significant for safety. In order to be notified of these, the operator was dependent on receiving oral messages by phone from the operation centre on land.

The following was observed with regard to alarm follow-up in the driller's cabin.

- KCAD conducted the annual alarm analysis by taking samples from a week's alarm load. The performance standard did not specify whether the facility should be involved in drilling operations when the analysis was conducted. It could not therefore be documented that the base data for the analysis reflected the various operations on the facility, individually or collectively.
- Results from the alarm analysis showed that the number of standing alarms exceeded the acceptance criterion. Nor did analysis take account of alarms from all the systems in the driller's cabin, or the acceptance criterion for peak alarm rates. Furthermore, the analysis showed the total number of alarms in the cabin, but not the load per operator as specified by KCAD in its performance standard.
- No alarm rationalisation measures were implemented after the facility became operational.

Information received during the audit therefore showed shortcomings in design and follow-up of the alarms systems, both individually and collectively.

Requirement
Section 34a of the facilities regulations on the control and monitoring system

5.1.4 Risk assessment and analysis (KCAD)

Nonconformity
Risk assessments carried out had deficiencies. KCAD had not conducted the necessary analyses intended to ensure a prudent working environment and to provide decision support in choosing technical, operational and organisational solutions when installing and using the ADC technologies.

Use of ADC technologies was not organised on the basis of an individual and overall assessment of acute and long-term effects from various working environment factors.

Grounds
Risk assessments for individual systems (Novos 2019, Wired Drillpipe (WDP) 2020 and Drilltronics 2022) had substantial deficiencies. Design verification conducted by DNV assumed in part that risk assessments were made which included operations using Novos, work procedures and interaction with safety systems so that the system is used safely. However, no systematic assessments – individual or collective – were conducted to reduce human, operational and organisational risk factors.

Examples included the following.

- The company had not conducted human factors (HF) or other analyses which addressed human and organisational conditions, such as task analysis, HMI design, function allocation analysis and workload analysis.

- No assessments have been made or guidance established for how long executing personnel should sit in the operator chair at a time. The PSA team was informed that it was up to the individual and their supervisor to assess when relief was needed. How long personnel remained in the chair depended on activity on board as well as the availability of competent personnel to take over.
- The workload for drillers was identified as a risk which could lead to human error. However, interviews and document reviews showed that this had not been followed up systematically over the past three years. For example:
    - several identified risk conditions related to operation – where measures involved formulation of work processes, work procedures and instructions – were inadequately closed without the effect being evaluated, see also nonconformity 5.1.6
    - measure 7 concerning increased workload was closed with a reference to reusing the configuration form and an HMI analysis scheduled for the fourth quarter of 2022
    - measure 8 on HF analysis (see first bullet point above) was cancelled.
    - measure 10 on changing from automated to manual mode was cancelled.

  Workload was also addressed as a topic in interviews. Several interviewees felt that product development was pursued in parallel with operation. This was said to be burdensome and could weaken the attention paid to the primary operation.
- Hazop for WDP and risk assessment for Drilltronics played only a small role in conditions related to operational risk and HF. The Hazop for WDP, for example, detailed technical failure modes where the consequences were largely described as loss of communication, Data from WDP are primarily translated into decision support for drillers from operation centres on land. Operational risks related to the consequences of drop-out, irregularities in data quality, or organisation and collaboration related to use of the data and decision support were not assessed in the Hazop or the risk assessment.
- Analyses in the alarm system were inadequate, as described in nonconformity 5.1.3.
- A deviation exists between the Hazop's purpose and result for Novos. Its purpose, to "identify new hazards, uncertainties and challenges as a result of the Novos system becoming an integrated part of the drilling control system together with the Cyberbase system", was therefore not adequately fulfilled, but instead altered to address provisions for efficient phasing-in. The Hazop's purpose was described as operational risk factors, HF and HMI. In the summary of the most important findings, however, the following was described as the most important recommendation from the Hazop: "Establish a close and binding collaboration between Equinor, KCAD, NOV and possible others with the aim in part to clarify and describe roles and responsibilities for operating Cyberbase Novos. Thereafter, this collaboration should organise an efficient phasing-in of the Novos system, so

that the potential of Cyberbase Novos as an integrated drilling control system can be realised".

Requirements
Section 18, paragraph 1 of the management regulations on working environment analysis
Section 33, paragraph 2 of the activities regulations on organisation of work, see paragraph 1

5.1.5 Handling of nonconformities (KCAD)

Nonconformity
Identified nonconformities were inadequately closed, the effect of corrective measures was not evaluated.

Grounds
Nonconformities related to design of the HMI were closed without measures and actions being implemented. DNV's design verification of Novos in 2019 highlighted nonconformities related to the HMI, and KCAD had registered a nonconformity for this. The latter was also handled in the 2019 Hazop. It was closed after a short time without measures, based on assurances from the supplier that the nonconformities would be closed over time through future Novos upgrades and with reference to a crisis intervention and operability (Criop) analysis conducted by NOV. KCAD did not know, and was unable to access, the content of the Criop analysis. A review of Novos updates so far related to the nonconformity showed that these were largely minor graphics adjustments which were not sufficient to close the nonconformity.

Requirement
Section 22, paragraphs 2 and 3 of the management regulations on handling of nonconformities.

5.1.6 Design of work processes and procedures (KCAD)

Nonconformity
KCAD had not ensured that procedures related to ADC systems were designed and applied in such a way that they fulfilled their intended functions. Interaction between HTO factors was not handled in the work processes.

Grounds
Deficiencies existed in work procedures which described processes and instructions for using the new technologies. The work procedures and associated work processes failed to describe how the interaction between HTO factors was taken care of.

- One-pagers, work procedures and work instructions for using Novos submitted to the PSA team largely comprised checklists for system setup before use. They did not describe what was required of the operator after the system was running – with regard to monitoring and control, for example. Several of these documents were not revision-checked or had internal control measures.
- The work processes did not describe interaction and interfaces between different roles and functions – such as interaction with various operation support functions on land, for example.
- It emerged from interviews that instructions for using the systems after changes and minor system upgrades which affected the work processes were passed to other shifts without the work procedures being updated.

Quality, applicability and systematics were therefore deficient in the work procedures, experience-transfer measures, one-pagers and hand-overs submitted.

Requirements
Section 24, paragraph 2 of the activities regulations on procedures
Section 13, paragraph 2 of the management regulations on work processes

5.1.7 Competency and training (KCAD)

Nonconformity
KCAD had failed to ensure that personnel on *Askepott* had the necessary competence to use the ADC systems in accordance with health, safety and environmental legislation.

Grounds
It emerged from the audit that training with Novos was inadequate. The courses provided were incomplete and inadequate. Training provided on board was largely confined to support for problem-solving on a case-by-case basis. This training was described as unsystematic, and no criteria were set for either the level of skill to be attained or when the training was considered complete. This meant employees were not put in a position to operate the systems independently and as intended. They relied on support from trainers via interactive digital services for system setup and use.

Examples of this included the following.

- Personnel who had not been part of the crew when the facility was new or the systems were installed received little planned and systematic practical education and training – such as simulator training. Nor were requirements established for such courses to be conducted before the systems were taken into use.

- When the Novos courses were conducted, neither the technology nor the user interface was fully developed and the systems did not function as intended. In addition, the PSA team was told that the course material also appeared to be unfinished and was not sufficiently relevant to the way the systems functioned when they were later encountered in practice on the facility.
- Long periods could pass between operations where the systems were used. That contributed to executing personnel failing to maintain their skills in utilising the ADC systems. No planned and systematic provision for skill training was made to compensate for this.
- A number of updates were implemented from installation of the systems until today. Several of these involved changes to functions and the HMI. Training and experience transfer related to system updates were inadequate. See nonconformity 5.1.6.
- Managers explained that education and training were to be largely provided by practical on-the-job training and KCAD's self-declaration system. The latter did not contain specific criteria and skill levels for using various ADC systems and were therefore inadequate.

Lack of education and training contributed to personnel on board knowing little about automation risk and how this could affect operational safety, directly or indirectly.

Requirement
Section 21, paragraph 1 of the activities regulations on competence

6 Other comments

During the audit, the PSA team was shown various KPIs which were largely directed at efficiency and speed. That included examples of KPIs and micro-KPIs where individual operations were measured to two decimal points, both for length in metres per hour and for time in minutes. The status of and progress with the KPIs were presented at the daily morning meeting. Conversations with managers revealed varying levels of understanding about how the use and communication of KPIs could contribute to pressures of time and affect safe working.

During the kick-off meeting, the PSA team was told it could expect to find that risk assessments performed and associated measures were known to personnel on board. However, interviews revealed that supervisory and executing personnel knew little about the risk assessments (Hazops) conducted or their follow-up and results.

7 Participants from the PSA

Kristian Solheim Teigen, process integrity, automation (assignment leader)
Arne Halvor Embergsrud, process integrity, automation
Linn Iren Vestly Bergh, occupational health and safety, organisational safety
Fredrik S Dørum, drilling and well technology

8 Documents

The following documents were used in planning and executing the audit.

103094599-Rev.02-103094599 - Rev. 02 - NCR-001- Non Conformance report
4.1 NOVOS Release Notes .pdf
4.2.5 NOVOS Release Notes
90003-FDS-002 Technical description
90003-TRN-003 NOVOS fra Sekal
Askeladden.docx Onepager Rev 01
CRIOP analysis NOVOS vs Cyberbase
DOP D10 - Drill 8.5in section First section with DrillTronics
DrillTronics Risk Assessment - External Report
DrillTronics Workflow Revision 1.4_KCAD
DrillTronics Workflow Revision 1.4_KCAD
DVR-33751-J-10332 - PRJ-13072 - NOVOS
EDOCS-#54951-v16-_LOGG_FOR_FEIL_PÅ_UTSTYR__Askepott_og_triks_i_ludo
EDOCS-#7094-v4-PS-14 Alarmrate kontroll xlsx.
EQ-13072-101A-OPM-001-Rev.02-Operation Manual
EQ-13072-101A-TD-001-Rev.01-Technical Description
EQ-13072-102A-OPM-001-Rev.04-EQ-13072-102A-OPM-001FID1442004
EQ-13072-102A-OPM-002-Rev.05-NOVOS Website UG - EQ-13072-102
EQ-13072-102A-OPM-003-Rev.04-NOVOS Rig Config EQ-13072-102A-
EQ-13072-102A-OPM-005-Rev.03-NAP User GuideFID144272371
EQ-13072-102A-TD-001-Rev.04-EQ-13072-102A-TD-001 Technical d
Equinor Annual One Team Management inspection plan Cat J 2022
Intelliserv System Overview Askepott
KCAD-KOM-04 Prosedyre kompetanseutvikling
KCAD-MM-ASP-BOR-1-1595 Bytte DWT rev 29.09.21
KCAD-MM-MF-BOR-24-1090 MMC oppsett tripping & offline bygging
KCAD-MM-MF-BOR-4-1460 Boring med MMC drill support NOVOS
KCAD-MM-MF-BOR-8-1436 NOVOS Operasjonell instruks ved opplastning av data
KCAD-PER-03 Prosedyre arbeidstid
Kursmatrise MODU.xlsx
Mail: Status.punch 29.03.2022
Mail: Aksjoner etter intervju ifm tilsyn Askepott 07.04.2022
Mail: Avklaring vedr tilsendt dokumentasjon ifm tilsyn på Askepott11.04.2022

Mail: Dokumentasjon alarm rate kontroll ifm tilsyn med Askepott 01.04.2022
Mail: KPI'er 29.03.2022
Mail: RE NOVOS support Askepott
Mail: Re Tiltak etter HAZOP for installering av NOVOS 2019.htm29.03.2022
Mail: Svar på spørsmål ifm tilsyn KCAD Equinor ADC uvikling og implementering - Askepott Oseberg Sør22.04.2022
Mail: Svar på spørsmål om MOC Ptil ADC audit.29.03.2022
MODU kom 01 egenerklæring
MODU-VDL-16 MOC
MODU-VDL-16 Styring av endringer på tekniske systemer og utstyr (MODU)
MODU-VDL-20 Drift av computerbaserte kontrollsystemer (MODU)
NOVOS 3.3.1 Release Notes.pdf
NOVOS Configs
NOVOS connection procedure 85 K-12 AH
NovosDrillApp_Autodriller.pdf
One pager ATP WDP
Presentasjon DrillTronics intro
Presentasjon oppstartsmøte 24032022 Equinor KCAD
Project experience - NOV sensor
Project experience - swab calc
Rheoscense - IMS-MAN-10811-1 Skid #5 Extended - Operations
S01L1854-TDO-004-Rev.5- Cyberbase HMI alarm signal index15.03.2022
Sekal - DrillScene prinsiples
Sekal - DS Trend Analysis-Modeling Theory
Sekal - Interpretation of curves in DrillScene
Sekal DOP onepager DrillTronics vs Novos
Skriftlig svar: Hazop - Utdyping av tiltak i synergi29.03.2022
Sluttrapport_HAZOP_oppstart Cyberbase NOVOS_ Askepott_r01
Sluttrapport_HAZOP_oppstart Cyberbase NOVOS_ Askepott_r0115.03.2022
Status kurs utstyr
Stillingsbeskrivelse Assisterende Borer Modu
Stillingsbeskrivelse Assisterende Boresjef Modu
Stillingsbeskrivelse Boredekksarbeider Modu
Stillingsbeskrivelse Borer Modu
Stillingsbeskrivelse Boresjef Modu
Stillingsbeskrivelse Ledende Elektriker MODU
Stillingsbeskrivelse operasjonsplanlegger offshore
Stillingsbeskrivelse Optimaliseringskoordinator
Stillingsbeskrivelse Teknisk sjef Modu
Stillingsbeskrivelse Tårnarbeider Modu
SW register ASP pr 19 mars 21
Synergi 1684634 - FG DWT weaklink
Synergi 18047749 - Lost wDP signal

Synergi 3462 - Aksjoner etter NOVOS HAZOP 31.07.2019
Telemetry and ASM Hand Over
Tilsyn - Bilder Askepott01.04.2022
WDP MOC Risk Assessment Askepott_Rev28102020
WDP Training Overview by Modules

Appendix A Overview of personnel interviewed