RESTRICTED (when complete)
until prosecution concluded or "no prosecution" recommendation is approved

Investigation Report with Recommendations

Name(s) of Dutyholder(s)	[redacted]
Address(es) of Dutyholder(s)	[redacted]
Role of Dutyholder	[redacted]
Address/location of incident	Sellafield Limited (SL), Cumbria, Highly Active Liquor Evaporation and Storage Facility (HALES), High Active Storage Tank (HAST) 9.
Date(s) of investigation	15/01/14 – 16/01/14; 22/01/14 – 23/01/14; 30/01/14; 07/02/14; 26/02/14; 10/03/14; 13/03/14; 19/03/14.

Contents

Appendices *(Please tick (✓) when documents included in report)*

1.	EMM1	✓
2.	Draft information(s)	
3.	Summon(es)	
4.	Witnesses and others interviewed	✓
5.	Exhibits	
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Part A – Investigation Details

A1 - COIN case number *(Give the master or trigger case number from COIN)*

4357965

A2 - Matter under investigation *(Give a brief summary of the subject of this report)*

On 13 December 2013 a significant contamination event occurred in the HALES facility. The source of this contamination was the unauthorised removal of a highly contaminated malfunctioning resistance thermometer (RT) from the High Active Storage Tank (HAST) 9 pocket. This work was carried out in violation of the SL approved safe systems of work, by two SL employees, [redacted] Heavily contaminated items of clothing were also found in the [redacted] changeroom.

An assessment of the extremity and skin doses to both individuals concludes that these did not exceed 10 % of the relevant dose limits in The Ionising Radiations Regulations 1999. Assessment of the release of radioactive material from the resistance thermometer pocket, including surface contamination of the RT and its associated cable, comes to greater than three times the quantity specified as significant under The Ionising Radiation Regulations 1999, schedule 8, column 4. This release of contamination was into an area which is not designed, maintained and used to prevent the spread of radioactive contamination, thus it presented a serious health risk to both individuals and other persons.

A3 - Date of incident *(where applicable)*

13 December 2013

A4 - Name of duty holder(s) *(Give full name of legal entity)*

[redacted]

A5 - Role of duty holder(s) *(Employer, principal contractor, etc)*

Employees.
[redacted]

A6 - Address(es) of duty holder(s) *(Include registered office address, Companies House registration number and company search (Annex 11) if a company, or NI number of individual when prosecution under consideration) (Insert COIN site ID number)*

[redacted]

A7 - Location details *(Location of incident or other matter under investigation)*

Sellafield Limited, Cumbria, HALES Facility, HAST 9.

A8 - Name(s) and address(es) of IP(s), DP(s) *(Where applicable)*

N/A.

A9 - Name and full office address of lead HSE investigator *(The lead HSE investigator is equivalent to the 'investigator' for the purposes of CPIA)*

[redacted]
Office for Nuclear Regulation
4S2
Redgrave Court
Merton Road
Bootle, Merseyside
L20 7HS

A10 - Names of other HSE investigators *(Include the names of key HSE colleagues involved in the investigation)*

[redacted]

A11 - Name(s) and contact details for non-HSE investigators *(Other investigating authorities and key personnel involved)*

N/A

A12 - Date investigation commenced

14 January 2014

Criminal Procedure and Investigations Act 1996

Investigator	[redacted]	**Officer in charge of Inv (SIO)**	[redacted]
Disclosure Officer	N/A	**Prosecutor**	N/A

A13 - Brief Executive Summary
(This information should be copied from the mandatory investigation details note on COIN. Provide short summary of facts and any enforcement actions taken to date)

The Office for Nuclear Regulation (ONR) received an incident notification from Sellafield Limited (SL) on 20 December 2013. This reported that a significant contamination event occurred on 13 December 2013 in the HALES facility. The source of this contamination was the result of the unauthorised removal of a highly contaminated malfunctioning resistance thermometer (RT) from the HAST 9 pocket. This work was carried out in violation of the SL safe systems of work, by two SL employees, the HALES facility [redacted] Heavily contaminated items of clothing were also found in the [redacted] changeroom.

This event was solely due to the deliberate acts and omissions of [redacted] with the full knowledge of what was required to control the work safely, which if implemented, would have prevented the consequences of the event. This is a direct violation of the well-established, well-known and obvious risk control measures and arrangements for working with ionising radiation that have been implemented by the employer (SL).

ONR has found no evidence that the particular activities carried out on 13 December 2013 were authorised in any way by SL, or that the SL systems of work for controlling such work activities are deficient.

An assessment of the extremity and skin doses to both individuals concludes that these did not exceed 10 % of the relevant dose limits in The Ionising Radiations Regulations 1999. Assessment of the release of radioactive material from the resistance thermometer and pocket, including surface contamination of the thermometer and its associated cable, comes to greater than three times the quantity specified as significant under The Ionising Radiation Regulations 1999, schedule 8, column 4. This release of contamination was into an area which is not designed, maintained and used to prevent the spread of contamination. This presented a serious health risk to the individuals themselves and other persons.

This event included the combination of a potentially high risk activity with extreme and deliberate failure by persons in a managerial position, to meet explicit, obvious, well-known and clearly defined standards to control the risk from ionising radiation. Violation by employees of established and well-known arrangements and risk controls that results in placing themselves and others at risk from ionising radiation, is a matter of serious concern to everyone.

With reference to the EMM (Appendix 1) and Section C10 of this report, the recommended initial enforcement expectation is prosecution. There is evidence of a criminal offence that is sufficient to provide a realistic prospect of conviction, although not all public interest factors may be satisfied by a bringing a prosecution. Therefore due the unusual circumstances of the event and the fact that the individuals have been dismissed from their employment with SL, a reasonable alternative to prosecution is concluded to be the issue of a Formal (Simple) Caution to [redacted] This is for failing to discharge the duties to which they are subject by virtue of section 7 of The Health and safety at Work etc. Act 1974 and for contravention of Regulation 34 (1) of The Ionising Radiations Regulations 1999. This proposed action is consistent with principles of the HSE Enforcement Policy Statement (EPS).

Part B – Factual Report

B1 - Description of the facts and circumstances leading to the accident/event

This section should be confined to factual information, cross-referenced to relevant statements, documents, sketches or photographs. Provide a comprehensive account of the facts. Where conflicts of evidence exist do not comment on the merit of any particular version. Where appropriate, the account should be structured into sub-sections covering, for example:

- *Plant, equipment and substances- what, when, where, who R2A2*
- *Systems of work –what should be done; Risk assessment*
- *Training, instruction and supervision – state from training records etc.*
- *Outcome and consequences, eg extent of any injury*

3 December 2013
Resistance Thermometer (RT) 9/3 on HAST 9 located in the HALES facility at SL was reported as giving erratic readings during normal operator rounds. This is detailed in SL condition report BN1312A0336) [1].

References 2 and 3 provide key sources of evidence for the events described in this section.

4 December 2013
The RT 9/3 fault was discussed at the morning Plant Operations Control Centre (POCC) meeting. Investigation and repair of RT 9/3 was assigned as a P2 priority task in accordance with SL procedures [4] and was discussed in the POCC meeting as 'priority of the day'. This is the usual protocol in HALES for a new defect to allow initial fault-finding, investigation and repair if possible. [redacted] carried out the initial fault finding to determine what work was required to repair the fault. This is usual practice when defects are first reported and is in line SL procedures for work control and planning. During this initial fault finding, [redacted] identified that an electrical connector had become detached from RT 9/3. An attempted repair was made by [redacted] but it became evident that due to acid corrosion on RT 9/3 this would not be successful. [redacted] reported RT 9/3 as faulty and out of service. [redacted] then proceeded to put a work pack together and tried to obtain equipment for the HALES maintenance craft team to affect the repair later. As RT 9/3 is a Safety Mechanism (SM) the safety case substitution arrangements were initiated. The HALES Manufacturing Team Leader (MTL) log [5] recorded that the target to complete RT 9/3 was 10 December 2013, in line with the allowed safety case substitution time. The status of RT 9/3 was also recorded on the HALES Nuclear Safety Dashboard as 'amber' meaning 'operable with defect and a P2 task.

There was no safe system of work (SSoW) as this was an initial investigation and classed as non-intrusive work. This is line with SL procedures [7]. The usual practice is for Band 3 front-line managers to carry out initial fault finding and diagnostic investigations prior to a safe system of work being put in place to enable Band 5 craft team members to carry out the repairs [3, 7 - 10].

6 December 2013.
The work order, which includes the safe system of work [11], was prepared by [redacted] to investigate and repair RT 9/3 as a P2 task. This the necessary radiological risk controls identified by [redacted] to carry out the repair task, included:

- Electronic Personal Dosimeters (EPD) to be worn;
- Health Physics to carry out a pre-ops survey of the work area;
- Work area must be prepared with sisal craft underplayed with PVC sheeting covering the work platform;
- An undressing area must be prepared with sisal craft, allowing sufficient room for the 'doers' to undress;
- Barrier off the work area to prevent access to anyone not involved in the task;
- Health Physics must be in attendance for the removal of the RTD;
- A fixed or portable beta-in-air must be sampling the work area set to alarm at 8 DAC;
- Heavy duty shilo suit or PVC suit, hood, particulate respirator, ½ knee surgeons boots and 3 pairs of rubber gloves must be worn when removing the RTD. The PVC suit and hood must be subject to EH&S monitoring prior to being worn;
- The RTD must be withdrawn in a slow controlled manner, it must be continuously monitored upon leaving the pocket;
- If contamination levels exceed 40 Bq/cm^2, 200 cps BP13 then the task must be stopped immediately and reassessed, report to the EH&S team leader;
- All tools and equipment must be monitored before leaving the work area;
- Doers will receive a personal check prior to leaving the work area followed by a check at the health Physics office;
- Post ops survey of the work area on completion of work prior to lifting sisal and removing barriers.

9 December 2013
The HALES Safety Case Manager provided operational decision-making advice [12] recognising that the liquor in HAST 9 is low heat load and would not boil, concluding that failure of the RT 9/3 does not need to be considered as a SM failure. The lower heat load liquor in HAST 9 resulted in reduced dependency on RT 9/3 as a safety mechanism. This provided justification for extension of the SM28 outage time. The lower heat load liquor in HAST 9 resulted in reduced dependency on RT 9/3 as a safety mechanism. The HALES management team recognised the lower nuclear safety status of HAST 9 and concluded that a safety case argument for alternative substitution arrangements should be made to incorporate this safety case justification into a Plant Modification Proposal (PMP). This PMP was a contingency to further extend RT 9/3 outage time for sufficient period to allow any spares to be procured and the repair made [13]. This operational decision-making and preparation of the PMP was interpreted in HALES as the justification for extending the RT 9/3 allowable outage beyond 10 December 2014. Statement from the Senior Operation Manager identifies that this status of RT 9/3 was understood by all in HALES [14].

10 December 2013
[redacted] was told by the spares supplier Senate, that the required replacement spares could not be supplied. [redacted] informed HALES plant management of this and [redacted] stated '*I highlighted that it was going to be a struggle and therefore the allowable outage of the SM would need to be extended further*' [2].

11 December 2013
Alternative spares were found by [redacted] in the HALES plant store room which would enable repair of RT 9/3 to be carried out on 12 December 2013 in accordance with the Work Pack/SSoW. [redacted] as work planner, formally raised the SSoW/Work Plan through the Safe System Controllers (SSC) office in preparation for the repair work.

[redacted] stated [2] that the repair would involve partially withdrawing RT 9/3 from its pocket. This risk assessment [11] confirms this. The risk assessment prepared by [redacted] identified radiation and contamination as hazards with significant risks when RT 9/3 was being removed. Therefore, a temporary C3 area was set up, health physics were to be in attendance for the partial removal of RT 9/3 and PPE requirements were shilo/PVC suit, hood, particulate respirator, surgeons boots and three pairs of rubber gloves. A pre-ops survey was carried out identifying that the area was free of contamination before the task started.

12 December 2013
The approved Work Pack/SSoW was issued in accordance with correct procedure by the SSC to support the planned repair of RT 9/3. It was signed onto by [redacted] and the craft persons assigned to do the job. This repair was performed by the E & I maintenance craft personnel with [redacted] acting as the Person Organising the Work (POW) in compliance with SL's arrangements. The work involved removal of RT 9/3 by approximately 30 cm with Health Physics in attendance who recorded zero cps. The craft team attempted to repair the RT 9/3 end by making it off into the connector. This proved to be unsuccessful and was recorded on the Works Control Authorisation (WCA) [11]. The work area was then surveyed, found to be clear of contamination and returned back to C2 status.

13 December 2013 (am)
The [redacted] Management Team was off site and nominated deputies were in place. [redacted] was deputising for the [redacted] Manufacturing Manager, [redacted] for the Works Integration Manager and [redacted] was deputising for the Maintenance Manager. These deputy roles are part of their duties and responsibilities [9, 10].

At the morning POCC meeting, RT 9/3 was displayed on the Nuclear Safety Dashboard as 'amber', was still P2 status and unrepaired [15]. Witnesses recall RT 9/3 being discussed only as a standing item on the dashboard [16].

Sometime during the morning, [redacted] was asked by the PMP author of the status of RT 9/3 [2]. [redacted] asked if was possible to extend the PMP for two months as [redacted] was struggling to get hold of parts. [redacted] stated [2] that he was also asked by [redacted] at the morning POCC meeting '*to look again at the RT*'. [redacted] then asked [redacted] if [redacted] was available to help look at RT 9/3. [redacted] is reported by witnesses to have worked on RT 9/3 on12 December 2013 and that [redacted] stated at the POCC meeting on the morning of 13 December 2013 that '[redacted] *will have another look today*' [17].

[redacted] and [redacted] looked at the temperature reading on HAST 9 and noticed it was still reading incorrectly. The individuals thought that this could be due to a dry-joint and took the decision to carry out another repair. This repair attempt was carried out in the C2 area with no SSoW. Presumably because [redacted] considered this as further investigatory non-intrusive work, hence the SSoW was not required. However, this repair attempt actually involved withdrawing RT 9/3 approximately 1.5 feet, similar to

the work performed on 12 December 2013 when the full risk controls were used. [redacted] even stated [2] '*agree it was as the safe system of work raised on the 12th which talked about partial removal*'. This repair attempt was also unsuccessful.

[redacted] visited the HAST 9 area and asked [redacted] if RT 9/3 could be fixed. They both stated that they couldn't do anything with it. [redacted] then stated '*as far as he was concerned this was a done deal nothing else could be done*'. The repair being concluded as unsuccessful and a new RT was required, although it is unclear what was exactly meant by this statement. [redacted] then went to see the PMP author to advise [redacted] of the status [2].

13 December 2013 (pm)
Approximately 1300, [redacted] was asked by the PMP author for progress to which he told her to continue to write the PMP [2]. [redacted] went to the HALES Evaporator C store and found two spare RTs but these were of a different type. The intention of this was to check the suitability of either of these RTs to replace RT 9/3.

Conversations are reported to have taken place between [redacted]. However, there is unclear and conflicting evidence as to what conversations actually occurred during this part of the afternoon [2, 3]. There were no independent witnesses to this.

[redacted] identified that RT 9/3 had a different resistance to the spares that they had found. Due to this difference, they would have to modify the spare. The following is reported to have been stated by [redacted] [2], '*We* [redacted] *looked in the RT 9/3 panel to see how easy it would be to change the probe resistance*'. From the evidence, the precise order of events is unclear. However, it is clear that a decision was made at some point to fully withdraw RT 9/3. The is established from the evidence provide by the elevated doses shown on the EPD records for [redacted] [18] and the subsequent Dose Assessment carried out by SL [19, 20], where [redacted] explained to the HALES Area Safety Manager their sequence of actions confirming their involvement in the event. These are consistent with the EPD records. In addition, 'Borer' access records [21] are consistent with this, establishing their presence on plant at the specific time of the event. Witness statements also concur with this [14, 20].

[redacted] stated [2] '*we had got to the point where we were feeling pressured, we needed to know the length of RT 9/3 so we could fit the spare in. We decided that because it had come out this much that we got a bag and put gloves on and started to pull out the RT coiling it into a bag counting how long it was*'. [redacted] have admitted to SL that they had no work pack, health physics were not in attendance and that the only PPE worn was two of marigold gloves. [redacted] also stated [2] '*that it took less than five minutes to remove. It got to the end and it started to get crumbly, there was no indication of damp and nothing to indicate a breach of the RT pocket*'. *Towards the end of removing the RT, their EPD changed slightly but at a noticeable rate.* [redacted] *attempted to push the RT back into the pocket when the end of the RT fell off*.

[redacted] admitted to the SL investigation [2] '*We panicked, we already felt pressured. We had stupidly pulled out the RT so we could get a measurement and so we could end the Christmas week with the evaporator running. We were at the point of no return as the end of the RT had dropped off onto the PVC catch tray*' [redacted] also confirmed that their EPD's had started to 'chirp'. [redacted] bagged the RT and gloves into another PVC bag.

At around this time in the afternoon, [redacted] visited the HAST 9 area of plant on [redacted] way to check progress on another job that was underway. He stated [2], '*I walked around the corner and my EPD started to chirp,* [redacted] *were there,* [redacted] *said they had the RT and it had crumbled, they had it, radiation was going off, I said we need to make safe*'. [redacted] is quoted as having stated [2] '*We have f----d up. We have no safe system of work and no health physics here*'. [redacted] then stated [2] '*that this is where he didn't do the right thing*'. [redacted] got bags and was passing gloves to assist [redacted] to make the area safe.

The PVC bags containing RT 9/3, PVC catch-tray and gloves were placed into a further PVC bag. The individuals made a decision to place the bag behind the bulge-plate on HAST 9 to shield the radiation. This had the desired effect as the EPD stopped alarming. At this stage, [redacted] decided to place one of spare RTs into the HAST 9 RT 9/3 pocket, presumably to seal the pocket. This was as stated by [redacted] '*to cover up and to maintain containment as the RT lid has disappeared*' [2]. All three individuals decided that the PVC bag could not be left behind the bulge-plate and that the best place for it was the HAST 20 hoist well, which is shielded area of plant and was deemed this to be a safer storage location. From the evidence [2, 3, 22] it is unclear who carried the PVC bag to the HAST 20 hoist well, only that all three were involved at this stage.

Once the RT had been removed and placed in the HAST 20 hoist well, the evidence is conflicting regarding who said what and made what decisions. It does not provide any definitive explanation as to why the events immediately following this unfolded and why they failed to report it to their employer. Following placement of the bagged RT in the HAST 20 hoist well, from the Borer access records [21], [redacted] left [redacted] at 1433; [redacted] remained on plant. [redacted] left the plant area without contacting health physics for assistance. No monitoring of the work area took place.

The evidence establishes [2, 3, and 23] that [redacted] when in the [redacted] changeroom on the active side, discovered that [redacted] sweatshirt/jumper was contaminated and [redacted] mistakenly placed it in the damaged clothing bin. [redacted] stated '*that they panicked and went through the changeroom turnstile which was defective and free-wheel and did not pass through the Installed Personal Monitors (IPMs)*'. Passing through the IPMs is requirement of the local rules for the [redacted] changerooms. [redacted] also confirmed [2] that [2] when on the clean side of the changeroom '*put a towel on the floor by the showers and put the basics (clothing) on the towel, showered and dressed*' (in clean basics). *Wrapped the towel up, my shirt, trousers, underpants and socks, thought we needed put safe so took to the sorting area, if we sorted them no one else would have to touch them*'. [redacted] corroborates this [2]. At some point, one of individuals was seen by the [redacted] carrying the clothing through the clean side of the changeroom. The [redacted] later noticed that the same clothes had been placed in a vest bag which was incorrect but not unusual. [redacted] then sorted them into the correct bags [23].

[redacted] went back on plant at approximately 1510 and met up with [redacted] [2, 21]. [redacted] about [redacted] contaminated clothing and discussion was held regarding tidying around the HAST 9 area [2, 3]. At 1524, [redacted] left [redacted] and met up with [redacted]. At 1529 all three re-entered [redacted] [21] and carried out contamination monitoring of themselves using a handheld monitor in the engineering workshop. This monitoring concluded that they were free from contamination apart from [redacted] shoes. From what the individuals have reported [2, 3, 22] there again appears to be confusion over what happened to [redacted] shoes, although they ended up behind lockers in the workshop.

[redacted] reports being confused by the actual sequence of events that took place during this period of time [2, 3, and 22]). The evidence suggests that this was also the case for both [redacted]. All three left the plant at 1549 [21] following the normal procedures.

Between 13 and 15 December 2013 four condition reports [24] were raised in HALES as a result of contamination identified in the HAST 9 area and [redacted] changerooms.

15 December 2013

The HALES Area Safety Manager came into work on Sunday 15 December having been informed by the duty Manufacturing Team Leader that [redacted] shirt and shoes had become contaminated. The [redacted] had also given a description to the Shift Team Coordinator that [redacted] had seen someone who appeared to be carrying clothing wrapped in a towel through the clean side of the changeroom [20, 23]. The HALES Area Safety Manager was also made aware later that day that further items of contaminated clothing and shoes had been found. These corresponded to a HALES employee locker number. At approximately 1700 the HALES Area Safety Manager confirmed [redacted] received a telephone call informing [redacted] that the wearer of the shoes had been working in the HAST 9 area. The Area Safety Manager was then subsequently involved in a telephone conference with the HALES Operations Manager, Health Physics Shift Team Leader, Shift Coordinator and the Front-Line Support Manager/Duty Operations Manager ([redacted] were also contacted at home prior to this meeting about the contamination. [redacted] did not reveal any information regarding any involvement with work on RT 9/3 or contamination of their clothing. On 17 December 2013, [redacted] revealed information to the HALES Head of Manufacturing linking [redacted] and [redacted] to the contamination and HAST 9 RT work [3, 14, and 22].

During SL's investigation [2] and on two separate occasions prior to that investigation [3, 14, 20, 22] both [redacted] denied that the contaminated clothing belong to them. They confirmed it was theirs on 8 January 2014 ([redacted] 9 January 2014 ([redacted]).

On 17 December [redacted] revealed information to the HALES Head of Manufacturing linking [redacted] and [redacted] to the contamination and HAST 9 RT work [3, 14, and 22].

Systems of Work

The employer (SL) has made and implemented a suite of adequate arrangements and control measures in order that its employees can safely carry out work with ionising radiation and in accordance with legal requirements. The main arrangements and control measures in relation to the specific work that gave rise to the contamination event of 13 December 2013 are listed below. ONR inspectors examined these arrangements as

part of the investigation and were satisfied that they are adequate.

- Sellafield Procedure Safety Working at Sellafield SLP1.12 – Safe System of Work (SSoW). This defines the infrastructure which must be in place and the types of SSoW used to control non-intervention work (normal operations) and intervention work (Do-its and Work Control Authorisation). It details the key arrangements for the type of SSoW required for activities such as RT repair and removal. It also provides a route-map and reference to other SL work and risk control arrangements that should be followed by its employees.
- Sellafield Procedure SSP1.11 Work Planning.
- Sellafield Procedure 'How Do I Carry out a Task Risk Assessment SLP 2.13.20.01.
- Sellafield Limited Procedure SLP 1.05.01 Integrated Work Management.
- Sellafield Limited Procedure SLP 1.08.19.01 Fault Finding.
- Sellafield Limited Procedure SLP 1.08.20.01 Corrective Maintenance.
- [redacted] (HALES) Local Rules.
- Health Physics monitoring arrangements.

These are well-known and established arrangements at SL and within HALES for ensuring the correct risk controls are identified and safe systems of work prepared and used for work with ionising radiation. Employees receive relevant training in these arrangements and they are communicated on a daily basis in HALES, to one extent or another, through a number of meetings and work control practices. These include practices such as integrated work planning meetings, POCC meetings, SSC authorisation of work.

The safe system of work prepared for the attempted authorised repair of RT 9/3 on 12 December 2013 included a WCA and risk assessment to partially withdraw the RT from the pocket and repair the damaged end. These were both prepared (and followed on 12 December 2013) in compliance with SL arrangements. The risk assessment identified the extent of controls deemed necessary for partial removal of the RT (as listed above). The inspectors are satisfied that these controls are clearly defined, would be familiar to the individuals involved and meet the requirements of the Ionising Radiations Regulations 1999. In addition, previous risk assessments conducted in HALES for the full removal of an RT identified have required additional engineered controls to remove an RT [25].

During the event that took place on 13 December the only control measures used by the two individuals were two pairs of gloves, which was far below the standard of protection that was understood to be needed.

Training, instruction and supervision

SL has developed and implemented systematic training programmes to ensure all its employees are trained and competent to the extent necessary for their roles and responsibilities. These training programmes are consistent with the relevant good practice advocated by the IAEA Systematic Approach to Training. The particular training provided to [redacted] that is relevant to the offence that took place and which from their training records [26] was in date at the time of the event is:

- Classified Person
- Monitored Worker
- PMP Process and Control of Modifications
- IOSH Safety Management in the workplace
- Risk Assessment
- Control and Supervision of SSoW
- SSoW Person Organising Work
- Nuclear Safety Culture Training
- Changes to SSoW Process
- HAL Chemistry
- HALES Nuclear Safety Workshop
- Human Performance Tools
- [redacted]ocal Rules
- Nuclear Safety and Process Control
- Generic Safety Case Training
- SQEP Periodic Review.

Outcome and Consequences

The employer's assessment [19] of the extremity and skin doses to both individuals concludes that these did not exceed 10 % of the relevant dose limits in The Ionising Radiations Regulations 1999. Assessment of the release of radioactive material from the RT and pocket, including surface contamination of the RT and its associated cable, comes to greater than three times the quantity specified as significant under The Ionising

Radiation Regulations 1999, schedule 8, column 4. The ONR specialist inspector for radiological protection has reviewed the employer's dose and spillage assessment and concludes it to be reasonable with a degree of pessimism included so as to reduce the potential for underestimating the exposure [27].

ONR Investigation

The Office for Nuclear Regulation (ONR) received an incident notification from SL on 20 December 2013 [28, reporting that a significant contamination event had occurred on 13 December 2013 in the HALES facility.

Following initial enquiries on the SL site [29], ONR's decision to investigate and the level of resources allocated to it is consistent with the EPS. ONR has taken account of the various factors in the EPS which are used to decide which incidents, events and complaints to investigate. ONR considered the potential seriousness of the breaches, the risk of serious of health effect to the individuals and others, and public concern associated with incidents on nuclear licensed sites. These provided sufficient cause for ONR to formally investigate the event.

During the investigation the inspectors interviewed and took voluntary statements from various witnesses, examined documentary evidence in the form of the general SL procedures and risk controls for working with ionising radiation, as well as the specific procedures and risk assessment that were used / in place for the HSAT 9 RT 9/3 removal. The inspectors also requested and took possession of various sources of documentary evidence, obtained photographic evidence and issued a direction to leave RT 9/3 and the contaminated clothing undisturbed until such time as the investigation is disposed of.

As well gathering factual evidence regarding what actually happened, the inspectors took a 'local rationality' perspective to the investigation. This was judged to be important in order to try and understand why the actions and omissions of the individuals appeared to make sense to them at the time, and if there was any evidence of obvious organisational causal factors that set the context for this. All important investigatory decisions are recorded in the Key Decision Log [30].

References (Used Material)

[1] Sellafield Ltd. Condition Report Ref. BN1312A0336, 03/12/13.
[2] Sellafield Ltd. Case Management Investigation Report, [redacted] 21/01/14.
[3] Sellafield Ltd. Board of Enquiry Report, Unauthorised removal of resistance thermometer resulting in spread of contamination, 10 March 2014.
[4] Sellafield Ltd. Procedures SLP 1.05.01 Integrated Work Management and SSP 1.11 Work Safety Planning
[5] Sellafield Ltd. HALES Manufacturing Team Leader Log 03/12/13 – 04/12/13 (1800 – 0600).
[6] Sellafield Ltd. HALES Nuclear Safety Dashboard Summary – Issue 1, 04/12/13.
[7] Sellafield Ltd. Procedure SSP 1.12 Safe Working at Sellafield.
[8] HSE Inspectors Notebook 66884 pp. 21 & 24.
[9] Sellafield Limited Performance Management Agreements, [redacted] 01/04/13.
[10] Sellafield Ltd. Roles, Responsibilities, Accountabilities and Authorities, Role IWM03 – Lead Work Planner and Work Planner, SLF 4.01.01.
[11] Sellafield Ltd. HALES Work Pack/SSoW for repair to HAST 9 RT 9/3, incorporating: Safe System of Work signing form SLF1.05.23; Nuclear Safety Assessment; Work Control Authorisation W298510; Risk Assessment [redacted]RA/HAST9RT Issue 1 , To partially withdraw the RT from pocket and repair the damaged end.
[12] Email from HALES Safety Case Manager re HAST 9 SM 28, [redacted] 09/12/13.
[13]Sellafield Plant Modification Proposal (PMP) HALES/[redacted] Issue 0, 20/12/13.
[14] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 07/02/2014.
[15] Sellafield Ltd. HALES Nuclear Safety Dashboard Summary – Issue 1, 13/12/13.
[16] HSE Inspectors Notebook 66884 pp. 23, 25-26.
[17] HSE Inspectors Notebook 66884 pp. 26.
[18] Sellafield Ltd. EPD Profile at 13/12/2013, 1549 for [redacted]; Rad Access Management Records – [redacted], 13/12/13.
[19] Sellafield Ltd. Dose Assessment for [redacted] and [redacted] as a result of an event in [redacted] on 13 December 2013, 16/02/2014.
[20] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 23/01/2014.
[21] Remote Events Report for 13/12/13 (HALES Borer Access), 07/03/14.
[22] [redacted] Prepared Statement for ONR Interview on 13 March 2014, 21/01/14.
[23] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 10/03/2014.
[24] Sellafield Ltd. Condition Report Refs. BN1312A1823, BN1312A1841, BN1312A1933, BN1312A1930.
[25] HSE Inspectors Notebook 66884 pp. 15 – 17; Photographs of equipment and controls used for full removal of an RT (ONR-RT3-001 and 004).
[26] Sellafield Ltd. Central Training Management System, Team Training Status Report [redacted] (printed and received on 15/01/2014, Notebook 66884 p.14).

[27] Email [redacted] ONR, HAST 9 Event Skin/Dose Extremity Assessments, 18/03/14.
[28] ONR Incident Notification Form 54-13, 20/12/13; Sellafield Ltd. Condition Report Ref. BN1312A2780, 20/12/13.
[29] ONR Intervention Report XXXXXX
[30] HSE Key Decision Log, Sellafield Ltd., HALES HAST 9 Contamination Event 13 December 2013, COIN Case 4357965, 20/01/14.
[31] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 23/01/14.
[32] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 22/1/14.
[33] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 23/01/14.
[34] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 22/01/14.
[35] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 22/01/14.
[36] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 22/01/14.
[37] Statement of Witness Criminal Justice Act 1967 s9 (HSE Form LP70), [redacted], 23/01/14.
[38] Sellafield Ltd. Weekly Time Booking Records for [redacted] for week ending 14/12/13, email from [redacted], 20/03/14.
[39] Sellafield Ltd. HALES Manufacturing Team Leader Log 12/12/13 – 12/12/13 (0600 – 1800).
[40] Sellafield Ltd. HALES Manufacturing Team Leader Log 12/12/13 – 13/12/13 (1800 – 0600).
[41] Sellafield Ltd. HALES Manufacturing Team Leader Log 13/12/13 – 13/12/13 (0600 – 1800).
[42] Sellafield Ltd. HALES Detailed Schedules of Instruments for Tank 9 HAST Storage, email from [redacted], 24 March 2014.
[43] [redacted] Documentary Evidence, HSE Evidence Bag D00023726, 13/03/2014.
[44] Email from Walker Smith Way Legal, [redacted], 25/03/14 re [redacted] Simple Caution.
[45] HALES Management in the Field OU Expectations.
[46] HALES Basic Cause Investigation, [redacted] 19/12/13.

B2 - Preventative measures taken by the duty holder(s) <u>BEFORE</u> the incident *(Describe the health and safety risk control arrangements before the incident)*

SL as an employer, nuclear site licensee and radiation employer, is judged to have taken all reasonably practicable measures to ensure that persons employed in HALES to carry out work with ionising radiation and others, are not exposed to risks to their health and safety. These measures include the provision of adequate SSoW, information, instruction and training. In addition to the engineered controls and design features of the plant, the SL general and RT 9/3 task-specific preventative measures to ensure employees have sufficient knowledge and awareness of plant status, hazards, risks and to prevent exposure to ionising radiation are as follows:

- HALES Manufacturing Team Leader Logs – these summarise HALES plant status, configuration, general and operational conditions on a shift basis.
- HALES Nuclear Safety Dashboard – indicates the daily nuclear safety function control status in HALES;
- Daily Work Planning and POCC meetings – used to review emergent work, determine its priority and planning.
- Integrated Work Management Process and Procedures – Formal SL process used to plan all work in HALES, including training and other indirect work activities to ensure workload and resources are effectively managed and deployed.
- HALES Safety Case Review Memoranda – provides the initial justification that failure of RT 9/3 does not need to be considered as a failure of Safety Mechanism 028 on HAST 9.
- PMP HALES/[redacted]/1252 providing the justification to implement longer term substitution arrangements for RT-9/3; the safety case memo providing the initial outage extension.
- HALES SSC log which should be used to log all work to be carried out in HALES and its authorisation by the SSC.
- HALES Weekly Integrated Work Planning Schedules – list all the work planned for any particular week, including emergent work, the skills required and planned duration. For the HAST 9 RT repair the skills identified for this work are Instrument Mechanic and Health Physics Monitor.
- Work Control Authorisation (WCA) to carry out repair of [redacted]RT-9/3 12 December 2014 and Risk Assessment [redacted]/RA/HAST9RT 6 December 2013.
- Sellafield Procedure SSP 1.12 Safe Working at Sellafield, SL's Safe System of Work (SSoW) procedure. Defines the infrastructure which must be in place and the types of SSoW used to control non-intervention work (normal operations) and intervention work (Do-its and Work Control Authorisation). This details the key arrangements for the type of SSoW required for activities such as RT repair and removal. It also provides a route-map and reference to other SL work and risk control arrangements that should be followed by its employees.
- Sellafield Procedure SSP1.11 Work Safety Planning;

- Sellafield Procedure 'How Do I Carry out a Task Risk Assessment SLP 2.13.20.01;
- Sellafield Limited Procedure SLP 1.05.01 Integrated Work Management
- Sellafield Limited Procedure SLP 1.08.19.01 Fault Finding
- Sellafield Limited Procedure SLP 1.08.20.01 Corrective Maintenance
- Sellafield Limited Roles, Responsibilities, Accountabilities and Authority specifications (e.g. SLF 4.01.01 IWM03 – Lead Work Planner and Work Planner).
- Individual Performance Agreements that detail an individuals job purpose and key accountabilities which are agreed between an individual and their line manager and signed as being accepted and understood by the post-holder.
- Systematic Training Programmes to ensure individuals are trained and competent to safely carry out their duties. The training that SL has provided for [redacted] and the completion and currency status is documented in the SL Central Training Management System Team Training Status Reports (relevant training listed in Section B1).

These measures and arrangements were examined by the inspectors and judged to meet relevant good practice and provide an adequate suite of preventative measures that have been implemented by SL, to prevent so far as is reasonably practicable, unauthorised work.

To reinforce the above and encourage compliance, SL is judged to have established a positive nuclear safety and leadership culture within HALES. This is evidenced through various mechanisms such as a policy of open access to management for all personnel [31-37], established communication methods that allow staff to discuss and prioritise work, such as the daily planning and POCC meetings, work week planning and shift handover meetings, complemented by various accessible written plant status and safety information media.

ONR's investigation found that there is regular engagement between management and staff, both informally and formally, through the above meetings and also via briefings and plant visits. The latter have been established through use of regular 'safety pause' briefings and the HALES 'Manager in Field' process [45]. These involve Band 3 managers and above, prompting and providing 'safety pause' briefings if they feel standards are starting to drift, or to learn from events, and the provision of coaching and reinforcing of SL standards and expectations for work on a daily basis.

Open reporting systems exist and are readily accessible to all staff to encourage reporting of events to facilitate learning (the SL 'ATLAS' system). SL also provides continuous safety and technical training to help develop and maintain organisational competence, standards and expectations. This also includes behavioural / cultural aspects [26].

Statements from witness [14, 31 - 37] provide evidence that these safety culture promotion activities appear to be prevalent and working in HALES. Witnesses report routine successful and well-established use within HALES of the SL work control procedures. Individual performance management agreements and deliverables do not contain specific 'production' type' targets that could encourage perverse behaviours [9]. Plant operators and maintainers through to plant management, indicate that workload is reasonably managed on plant and is perceived to be manageable by individuals. There are no reports of undue pressure to get work done or reduce plant defects. People also feel that they get the right level of support from their line management to control their workload, defer and stop jobs if they feel over-loaded or if they believe safety issues to exist.

B3 - Health and safety management *(Where appropriate and to the extent not covered above, describe the health and safety management system before the incident, including any arrangements between duty holders that are relevant to the investigation)*

As section B2. SL is judged to have done all that is reasonably practicable to secure compliance by its employees with legal requirements, its own arrangements and safety systems of work for safely controlling and conducting work with ionising radiation.

B4 - Preventative measures taken by the duty holder(s) AFTER the incident *(Describe the measures taken post event to secure compliance. State where measures taken resulted from HSE intervention (including enforcement action)*

Following an internal investigation and disciplinary process, SL has dismissed the individuals for gross-misconduct.

B5 - Health and safety management changes AFTER the incident *(Describe any changes not covered above, stating where they resulted from HSE intervention (including enforcement action)*

Immediately following the event, HALES management conducted a 'safety pause' briefing to the shift teams outlining the event and reinforcing the need for and importance of compliance with SL standards and work access controls. In addition, HALES senior management have increased the 'manager in field' presence and requested an independent safety culture review to provide assurance that local 'mind-set' bias is not resulting in organisational drift being missed or other oversights. (It should be noted that ONR has not found any manifestation of this). This initial learning and action was however restricted to HALES. ONR had to prompt SL of the safety need to consider the nature of this event on a site-wide basis prior to waiting for the outcome of more formal investigations to be completed.

Between 16/12/13 and 19/12/13, a Basic Cause Investigation [46] was also conducted in HALES. This is identified necessary actions (that have been completed) such as undertaking a spillage and contamination assessment and to offer / provide re-assurance monitoring to all those potentially affected by the event.

SL has also identified additional learning from the event as a result of its internal investigations. These are:

- Use the event as a 'Case Study' for site-wide discussion by management and work teams to review and ensure that arrangements for managing work are fully sufficient to deter similar violations, and to identify any potential circumstances that may lead to impaired judgements and decision making by individuals.
- To conduct a review of the SL guidance for fault finding and corrective maintenance to ensure that is suitably clear and test this across the site.
- Provision of enhanced site-wide compliance inspections by the SL Site Inspection Team, focussed on implementation of arrangements for fault finding and repair.

These measures / actions are judged to be reasonably practicable changes and re-assurance measures that may offer opportunities for improvement to strengthen work control and safety culture, given that no obvious deficiencies exist within the employer's health and safety management arrangements.

Part C – Analysis of Compliance

(A separate analysis should be completed for each duty holder where appropriate)

C1 - Inspector's conclusions as to causation *(Describe immediate and underlying causes. Give details of any wider learning issues for HSE)*

The following represents the inspector's conclusion of the immediate causes of the event and likely underlying causes based on the evidence.

The immediate cause of the spread of contamination and over-exposure to ionising radiation was unauthorised intrusive fault-finding work and the subsequent full removal of RT 9/3 by two individuals. This was done without using SSoW and necessary radiological risk control measures, in compliance with the employer's arrangements for health and safety, and as identified in the risk assessment previously prepared by [redacted] for the job. This was solely due to the acts and omissions of [redacted], in full knowledge of what was required to safely control and carry out the work, which if implemented would have prevented the consequences of the event. This is a direct violation of the established, well-known and obvious risk control measures and arrangements for working with ionising radiation implemented by the employer (SL). This is a failure to discharge the duties to which an employee is subject by virtue of s.7 of The Health and Safety at Work etc. Act 1974 and contravention of the duties of employees imposed by Regulation 34 (1) of The Ionising Radiations Regulations 1999.

It is clear from the evidence that [redacted] are suitably trained, experienced and well-respected; both have a good understanding of the HALES facility, its hazards, risks, work and risk control arrangements. It is also clear from the evidence that they would of have had a good understanding of the conditions and priority of the work related to repair of RT 9/3. SL's own BOI [3] states that '*there is widespread knowledge within HALES of the potential for RT contamination as a result of previous HALES learning and learning from other plants*'. There is also evidence of a previous work activity in HALES detailing the extent of control measures that are required for the safe full removal of an RT [25].

The investigation (and that of the employer [2, 3]) have not been able to definitively determine why the individual's acts and omissions of 13 December 2013 occurred in the manner they did. This is in large part due to the fact that the individuals involved were unable to offer definitive explanations for their acts and omissions. There are also a number of discrepancies in the accounts given by those involved. This is likely to be the result of loss of memory for what actually happened due to stress and panic the individuals would have likely experienced. This can have a physiological effect on human cognitive functions leading to impairment of short-term memory. No shortfalls in the reasonable practicability of the employers work and risk control arrangements have been identified that could be attribute to casual factors.

Witness statements [14, 31 - 37] and various documentary evidence [5, 6, 11, 12, 15] do not offer any rational explanation for any causal factors that may have driven the individual's acts and omissions associated with the event. No tangible or corroborative evidence of causal factors has been identified that are judged to be sufficiently compelling to have forced the violations conducted by the individuals on the 13 December 2014.

Causal factors can often be perceptual in nature and associated with violations, even if there is no evidence of the existence of compelling and real factors e.g. inadequacies in procedures, training, work planning, plant and task design etc). This event appears to fit what is known as an 'emergence state'; the outcome being caused by some form of transient perceptual phenomena that existed at the particular point in space and time on 13/12/13. Such causal factors are often referred to as Violation Producing Conditions (VPC) and are usually linked to perceived benefits and dis-benefits of such acts and any incentives/disincentives to violate.
Some perceptual factors (VPCs) may be inferred from the investigation evidence, which provide some explanation of why the individuals did what they did and why they may have believed their acts and omissions made sense to them at the time. These inferred VPCs are judged to be:

1. Perceived time and work pressure to repair the RT to enable operation of the HALES Evaporator A over the Christmas period.

   Workload and time pressure is mentioned by the individuals [2, 3] as factors in their acts and omissions. [redacted] stated that [redacted] *felt under pressure as a result of being asked to take another look at the RT*' in the POCC on the morning of 13 December 2013. The request from [redacted] to '*have another look at the RT*' may have contributed to work pressure on both [redacted] but such requests are not unusual when an outstanding defect exists on plant. One witness reports that it was [redacted] who stated at the POCC that '[redacted] *would have another look at the RT*'. Hence, confusion exists over what was actually said regarding this.

Statements from various witnesses indicate that excess workload pressure is not considered to be an issue in HALES. Evidence also shows that both [redacted] workload for the week ending 13 December 2013 was normal, their timesheets record a normal working week of 37.0 hours [38]. [redacted] attempted to find spares and additional parts to affect the repair, as they could not be procured from the supply chain due to obsolescence issues, which took up some time. These acts appear at odds with the stated urgency/priority of the work.

There is widespread knowledge in HALES that repair of RT 9/3 was not a high priority after 4 December 2013 (when it was assigned 'priority of the day', the usual protocol in HALES for a new defect to allow initial fault-finding and investigation and repair if possible). On the 9 December 2013 the HALES Safety Case Manager provided operational decision-making advice [12], concluding that failure of the RT 9/3 did not need to be considered as a Safety Mechanism failure, providing justification for extension of the SM28 outage time. In addition, arrangements were made to formalise this safety case justification into a PMP to extend RT 9/3 outage for sufficient period to allow spares to be procured and the repair made. This operational decision-making and preparation of the PMP was interpreted in HALES as the justification for extending RT 9/3 allowable outage beyond 10 December 2014. The status of RT 9/3 was discussed daily at POCC meetings as an outstanding work item and coloured 'amber' on the HALES Nuclear Safety Dashboard ('operable with defect'), reflecting its outage justification. Witnesses confirm discussions about RT 9/3 occurred at the POCC on 13 December, in relation to it being a standing item on the Nuclear Safety Dashboard and its outage justified. The MTL logs of 12 and 13 December 2013 [39 - 41] do not include a return to service date, reflecting the extended outage of RT 9/3. These plant status information sources are visible to all in HALES and well-known and communicated. The POCC meetings throughout the week of 13 December 2014 were attended by [redacted]. The evidence therefore suggests that [redacted] should have had an adequate understanding of the safety status of RT 9/3 and the fact that its repair on 13 December 2013 was not urgent.

Indeed, prior to full removal of RT 9/3, [redacted] was asked by the PMP author of the status of RT 9/3 as the PMP. [redacted] also asked the PMP author if it was possible to extend the PMP for a longer outage period as the RT could not be repaired at this time. In addition, [redacted] was asked by the PMP author at a later point for progress to which [redacted] told [redacted] to continue to write the PMP. This provides another indication of [redacted] knowledge that longer term outage of RT 9/3 was necessary, as RT 9/3 could not be fixed and arrangements were being put in place for this. It would also have been known by both [redacted] that redundant temperature monitoring of HAST 9 also existed and was operational based the Nuclear Safety Dashboard, POCC meetings and their own experience and training in the HALES plant and processes.

The safety case review, PMP preparation and priority of RT 9/3 had removed actual time pressure to repair it. Nevertheless it is possible that there could have been some confusion on regarding the way forward regarding the fault on RT 9/3. This may have arisen due to mis-interpretation of the status of the PMP as a contingency option should a further repair attempt fail. However, no actual evidence has been established to verify this as a causal factor. From the evidence, any work pressure therefore appears to have been self-imposed.

2. Unavailability of engineered drawings and desire to know the length of RT 9/3.

[redacted] stated that [redacted] was unable to find a drawing for RT 9/3 that detailed its length, which [redacted] needed to know to be able to order the correct spare. This offers a potential reason why [redacted] felt the need to fully withdraw RT 9/3. However, such information is detailed on the HAST 9 Temperature Instrument Schedule [42], which would have been accessible to [redacted] on CIMAGE, SL's programme in which drawings can be viewed. This and the fact that is was known to both [redacted] that a safety case justification was in place to extended the outage of RT 9/3, does not offer any rational explanation as to why it was felt so urgent to determine its length by full removal. Moreover, both [redacted] clearly understood the risks from contamination associated with RT removal. It stands to reasonable to assume therefore that persons with the experience of [redacted], would know that at least similar risk controls would be needed for a full withdrawal of an RT.

3. The main perceptual factor (VPC) that can be deduced from the evidence that most likely explains why the event occurred, appears to be associated with loss of reputation and embarrassment of being unable to fix the RT following earlier attempts, and given their status in the HALES organisation. [redacted] is quoted as stating that [redacted] still believed the RT to be repairable and when the second attempted repair failed, [redacted] reported feeling stupid and that [redacted] confidence has been knocked [2, 3]. [redacted] also stated

that [redacted] was feeling frustrated because it looked fixable but [redacted] couldn't manage to fix and was having difficulties in ordering spares. The successful conduct of previous intrusive work by the individuals may also have led to an element of over-confidence and complacency. The absence of contamination during the partial removal of RT 9/3 on 12/12/12 may have contributed to a lowering of risk perception and a belief that the entire RT was 'radiologically' clean. These factors, coupled with a mind-set bias that the RT was fixable may have led to the violations that ultimately occurred.

It should be made clear that the actions and omissions of the individuals were non-malevolent. As with most violations, it was likely that there was valid and good intention to what took place in an attempt to fix a problem. So far as the evidence suggests, the individuals did not begin the day on 13 December 2013 with the intention of removing of RT 9/3 and causing a spread of contamination. Frustration, feeling of embarrassment and loss of reputation if they were seen as being unable to fix the RT, is the more likely prevalent causal factor.

Violations of approved procedures and arrangements move a person into unknown risk areas, which can lead to further violations (i.e. failure to report and failure to follow change-room and barrier protocols) and result in an irrational cognitive state. This provides some explanation for the behaviours in the aftermath of the event. The actions and omissions that occurred, whilst falling below the standards expected of radiation workers by their employer and the law, were carried out with the best intentions of making the area safe and preventing further risk to themselves and others. This can be attributed to the onset of feelings of high stress, limited experience of exposure to extreme conditions, panic and fear of repercussions. In turn, this can result in irrational decision-making. The inspectors are therefore of the opinion that whilst breaches of the employer's arrangements and legal requirements occurred during this stage of the event, this is understandable in such context, hence we do not consider it proportionate to propose enforcement action for these particular acts or omissions. In addition, loss of reputation and the belief by the individuals that they successfully cleaned up after themselves may have contributed to this.

In the case of [redacted] was not party to the actual unauthorised work or knew it was being undertaken, until when on [redacted] way to check progress on another job, when [redacted] EPD alarmed and [redacted] saw [redacted] with the RT in their hands [2, 3, 22].

Medical evidence [43] confirms that [redacted] was experiencing physical exhaustion prior to 13/12/13, a known precipitating factor for severe acute stress reactions. At the time of the event, [redacted] psychiatrist believes that [redacted] experienced an acute stress reaction which resulted in a dissociative cognitive state, lasting for at least 3 days. [redacted] also had limited experience of direct management of front line operations and exposure to extreme conditions. This provides explanation for the irrational decisions and behaviours of [redacted] failure to report the event until 17/12/13, at which point [redacted] did report to HALES senior management that work had been carried out on HAST 9 RT 9/3.

C2 - Legal provisions *(List the relevant legal provisions)*

The Health and Safety at Work etc. Act 1974 Section 7. General duties of employees at work
The Ionising Radiations Regulations 1999, Regulation 34 Duties of employees

C3 - Application of the law *For each of the relevant legal provisions listed above, discuss which have, in your opinion, been breached. Include comment on the following as appropriate:*

- *Foreseeability of the risk and reasonable practicability of effective preventative measures.*
- *Relevant standards and their source (eg ACoP, BS/EN standard, published HSE or industry guidance).*
- *Relevant case law.*
- *The effectiveness of control measures and management arrangements prior to the incident/investigation.*
- *The nature and extent of the breaches – how far below the expected standard the duty holder fell and whether the breach was an isolated occurrence.*

Fatals

- *Confirm Primacy lies with HSE and has been formally passed by police (refer to any handover document from police/CPS).*
- *When considering the extent of the breach(es), comment on culpability of the duty holder in terms of the death ie whether the breach(es) contributed significantly to, or was a substantial cause of the death (refer to any views of the police/CPS).*

- *Foreseeability of the risk and reasonable practicability of effective preventative measures.*
- *Relevant standards and their source (eg ACoP, BS/EN standard, published HSE or industry guidance).*
- *Relevant case law.*
- *The effectiveness of control measures and management arrangements prior to the incident/investigation.*
- *The nature and extent of the breaches – how far below the expected standard the duty holder fell and whether the breach was an isolated occurrence.*

Section B2 of this report discusses SL's arrangements hence these are not reproduced here. For each of the

legal provisions cited in Section C2, the discussion below presents the inspector's opinion, based on the evidence as to why they have been breached.

The Health and Safety at Work etc. Act 1974 s7 (a) and (b)
Regulation 34 (1) of The Ionising Radiations Regulations 1999

The cause of the spread of contamination and over-exposure to ionising radiation was the direct result of failure by [redacted] to discharge the duty to which an employee is subject by virtue of s7 of The Health and Safety at Work etc. Act 1974, and due to contravention of the duties of employees imposed by Regulation 34 (1) of The Ionising Radiations Regulations 1999. This was solely due to the deliberate acts and omissions of [redacted] in carrying unauthorised work with ionising radiation, in violation of their employers safe systems of work.

The Health and Safety at Work etc. Act 1974 offences are strict liability and do not require intention to do something wrong, a person is responsible for a breach regardless of intention. Therefore, it does not matter whether the individuals did or did not intend to cause the spread of contamination and over-exposure to ionising radiation by the unauthorised removal of RT 9/3. It only matters that their acts and omissions did result in this. [redacted] failed to take all reasonably practicable precautions to control the risk from their actions.

The extent of risk controls identified in the risk assessment and implemented by [redacted] on 12 December 2013 [Section B2, 11], establishes that [redacted] had full understanding of the hazards and risks to health and safety associated with RT removal. The evidence shows that the both [redacted] admitted to causing the event. They made the following statements:
[redacted] *'We panicked, we already felt pressured. We had stupidly pulled out the RT so we could get a measurement and so we could end the Christmas week with the evaporator running. We were at the point of no return as the end of the RT had dropped off onto the PVC catch tray'*
[redacted] stated, '*We have f----d up. We have no safe system of work and no health physics here'*.
These statements and other evidence establish that the event was caused by their acts and omissions in direct violation of their employer's arrangements and legal requirements.

The employer had done all that is reasonably practicable to secure compliance by its employees with its arrangements and the legal provisions (Section B2). Employees in HALES as a matter of course, do follow the SSoW and risk control arrangements put in place by SL and know about them. This is evidenced by the information and training provided, accessibility to procedures, SSoW arrangements etc. and daily meetings. Indeed [redacted] actually followed and complied with these arrangements on the days immediately preceding the event. The breaches, which were caused by violation of the employer's arrangements and risk controls, fall far below the expected standard and conduct of employees on a nuclear plant, and in particular of those who hold managerial positions. This is a matter of serious concern to everyone in an industry where scrupulous care for employee and public safety is required.

The employer's records and the employment record and reputation of the individuals indicate that this was an isolated occurrence.

There appears to have been an attempt to deceive by the individuals in the aftermath of the event. They deliberately withheld information regarding what happened and about their contaminated clothing and shoes without any reasonable explanation for this provided by themselves. Possible explanation for this is stress and panic and the belief that they had sufficiently cleaned the area, safely disposed of any contaminated items and clothing and self-monitoring showed that they were not contaminated.

[redacted] was not party to the actual unauthorised work involving removal of RT 9/3 or knew it was being undertaken. Following invitation to attend an interview under caution on 13 March 2014, prior to the interview commencing [redacted] legal representative presented the inspectors with medical evidence that confirms [redacted] suffered an acute stress reaction at the time of the event and experienced a dissociative cognitive state at which lasted for at least 3 days after. This provides explanation for [redacted] irrational decisions and failure to report the event until 17/12/13. On this basis, no action is being proposed against [redacted].

C4 - Evidential sufficiency *(Comment upon the admissibility of prosecution evidence, its weight, any conflicts of evidence, the reliability of witnesses, the results of any PNC checks completed at this stage, an assessment of any expert evidence obtained and any other matters that could affect the strength of prosecution evidence presented in court. Cross refer to the evidence matrix where appropriate.*

All the evidence as referenced in Section B2 is considered admissible and filed in TRIM folder 4.7.7116. The strength of evidence as contained in References [2, 3, 19] is considered particularly compelling, as this is where the individuals admit to their acts and omissions that led to the spread of contamination and over-exposure to ionising radiation. In addition, the plant Borer access records and EPD records for the individuals establish their involvement in the event.
Witness interviews and statements also corroborate the alleged offences.
The witnesses are reliable, suitably qualified and experienced employees of SL who know the roles and character of the individuals involved; fully understand their employers work arrangements and working conditions in HALES and the standards that are expected to be met and followed by employees.

C4 - Possible lines of defence *(Include any relevant case law)*

Some perceptual causal factors offer possible lines for defence, which could be claimed as organisational conditions that forced the acts and omissions of the individuals. These factors are discussed in Sect C1 and in summary are:

- The individuals may have felt under pressure to fix RT 9/3.
- Potential ambiguity or mis-interpretation over its priority.
- High work load.
- Lack of availability of plant drawings.

However, whilst these may be argued to have appeared real to the individuals at the time of the event, there is no actual evidence to establish the existence and strength of such factors.

C5 - Material satisfying the disclosure test *(You must draw attention to all material, whether used or unused, which has the potential to undermine the prosecution case or assist the defence)*

None identified.

C6 - Relevant previous enforcement and advice by HSE *(Provide details including inspection and enforcement history (letters, notices, prosecutions). Indicate where consideration could be given to using evidence of bad character. Refer to FOCUS/COIN etc reports where appropriate)*

Nil.

C7 - Duty holder's attitude *(Comment on the attitude of the duty holder towards health and safety management, the incident and HSE, including whether the duty holder co-operated with the investigation. Where not stated above, give the duty holder's explanation for any contravention(s).*

The individuals involved are professional suitably qualified and experienced managers in HALES and were well-respected by their colleagues. They have been clearly affected by the events and have showed remorse for their actions to their employer (SL). Following the aftermath of the event, they were open, honest and cooperative with their employer, admitting to their acts and omissions and in assisting with various investigations. The employees have been unable to provide any rational explanation for their actions.

C8 - Views of IP(s) or bereaved relative(s), where applicable *(Include reference to any Victim Personal Statements obtained)*

N/A

C9 - Any other aggravating, mitigating or other relevant factors *(Indicate any additional aggravating, mitigating or other factors not already identified above. Indicate any further Public Interest factors not identified in the preceding sections. Refer to the Enforcement Policy Statement (paragraph 40), the CPS Code for Crown Prosecutors (England and Wales) and the Howe judgement)*

Deliberate acts and omissions by employees that result in placing themselves and others at risk from ionising radiation, in an industry where scrupulous care for employee and public safety is required, is a matter of serious concern to everyone. The individuals have admitted the offences to their employer (SL) during the employer's internal disciplinary process, Dose Assessments and Board of Enquiry into the event of 13 December 2014. They have also agreed to accept a Caution [44].

The level of radiological dose to the individuals has been assessed as not exceeding 10 % of the relevant dose limits in The Ionising Radiations Regulations 1999. However, the release radioactive material as a result of the acts and omissions has been assessed as greater than three times the quantity specified as significant under The Ionising Radiations Regulations 1999, schedule 8, column 4.

Referring to the Enforcement Policy Statement, the following circumstances apply to this event, which satisfy the factors for when HSE should recommend prosecution:

- The gravity of the alleged offence, taken together with the seriousness of any actual or potential harm warrants it;
- There has been a reckless disregard of health and safety requirements;
- Work has been carried out without of serious non-compliance with a safety case;
- It is appropriate in the circumstances as a way to draw attention to the need for compliance with the law and the maintenance of standards required by law, and conviction may deter others from similar failures to comply with the law (the issue of a Formal (Simple) Caution would also achieve this).

Enforcement Policy Statement and Enforcement Management Model

C10 - Application of HSC's Enforcement Policy Statement and the Enforcement Management Model

*(Discuss the application of the EPS and the EMM to the circumstances – **completed EMM1s must be attached as Appendix 1***

EMM1 form is attached as Appendix 1.

In accordance with the Health and Safety Executive's EPS, the ultimate aim of the enforcing authority is to ensure that dutyholders manage and control risks effectively. One of the purposes of enforcement is to promote and achieve sustained compliance with the law to achieve this aim. The EPS also states that enforcement action will be directed against those dutyholders responsible for a breach, which in this case are the two employees.

The enforcement action has been decided considering the principles of the EPS, the circumstances of the case, the evidence obtained from the investigation and applying EMM. The standards that establish the benchmark for compliance are The Health and Safety at Work etc. Act 1974 and The Ionising Radiations Regulations 1999. The risk gap is assessed as Extreme giving an Initial Enforcement Expectation of prosecution. This enforcement action is not affected by moderating dutyholder factors specific to the circumstances of the case. The event was caused by acts and omissions of the individuals which were deliberate violations of established risk controls and procedures. The event involved the combination of a potentially high risk activity with extreme and deliberate failures by persons in managerial positions, to meet explicit, obvious, well-known and clearly defined standards and arrangements to control the risk from ionising radiation.

Taking into account the unusual circumstances of the case and strategic factors (see below), it is concluded that the recommended enforcement action, is the issue of a Formal (Simple) Caution to [redacted] for breaches of s.7 of The Health and Safety at Work etc. Act 1974. Section 7 being sufficiently bounding of the associated specific offence of contravention of Regulation 34 (1) of The Ionising Radiations Regulation 1999. Issue of a Formal (Simple) Caution is judged to be the appropriate course of action as there is evidence of a criminal offence that is judged to be sufficient to provide a realistic prospect of conviction, although not all public interest factors may be satisfied by a bringing a prosecution. ONR is satisfied that the individuals' employer has taken appropriately robust action against the individuals through their dismissal from employment. If ONR were to pursue a prosecution of the individuals through the courts, this could be considered as vindictive and dis-proportionate to the benefit to be gained regarding targeting of ONR resources. It could also have a significant detrimental effect on the welfare and well-being of the individual's and their families.

The issue of a Formal (Simple) Caution meets public expectations of ONR and is consistent with the EPS as a way to draw attention to employees in the industry of the need for compliance with the law and the maintenance of standards required by law, and may deter others from similar failures. ONR is satisfied that the employer has taken sufficiently robust action.

Strategic Factors:

There is a range of strategic factors which impact on the final enforcement decision and used to qualify the decision. These factors are:

<u>Public Interest</u>

That such deliberate acts and omissions were carried out by persons in managerial positions is a matter of

serious concern to everyone in an industry where scrupulous care for employee and public safety is required. The public interest in this respect is therefore satisfied by the recommended action.

The enforcement action results in a net benefit to the wider community in terms of targeting both regulatory resources on risk and taking into account the disciplinary actions of the employer. The action is considered to meet public expectations of ONR.

Vulnerable Groups Protected

The action results in control of risks to vulnerable groups and should deter others in the industry from similar failures that may be caused by violations. It reinforces the need for employees to comply with their duties under law and cooperate with their employer's arrangements to prevent risks to vulnerable groups as well as others who may be affected by their acts and omissions.

Sustained Compliance

The enforcement action is judged to be sufficient to result in sustained compliance across the range of risks associated with the dutyholder. It reinforces the need for compliance and that deliberate non-compliance with the law and dutyholders' arrangements is unacceptable in the nuclear industry where the most scrupulous standards of health and safety are required.

Effect on other Dutyholders

Similar dutyholders within the nuclear industry (and other high hazard industries) would be deterred from committing similar offences and be encouraged to adopt a more favourable view of health and safety requirements. The action taken broadcasts a positive message about ONR and is consistent with ONR's mission statement of 'efficient and effective regulation of the nuclear industry, holding it to account on behalf of the public'.

Benchmark Achieved

The enforcement action should ensure compliance with the relevant benchmarks.

Functional Impact

There is a net benefit to employees and others who might be affected from securing compliance with the legal provisions. The circumstances of the event and enforcement action are associated with deliberate violations that caused the offence as opposed to human error. It is of paramount importance that others are deterred from violation behaviours.

Enforcement Policy Statement

The principles of the EPS have been followed throughout the investigation, from the decision to investigate, the conduct of the investigation and in deciding the enforcement action.

The circumstances of the event are consistent with a number of those listed in the EPS for when HSE expects that enforcing authorities should normally prosecute, or recommend prosecution, these are:

- The gravity of the alleged offence, taken together with the seriousness of any actual or potential harm warrants it;
- There has been a reckless disregard of health and safety requirements;
- Work has been carried out without or in serious non-compliance with a safety case;
- It is appropriate in the circumstances as a way to draw attention to the need for compliance with the law and the maintenance of standards required by law, and conviction may deter others from similar failures to comply with the law (the issue of a Formal (Simple) Caution would also achieve this).

The enforcement action deals with serious risks in a proportionate and appropriate manner. It will send a strong message to deter the individuals and others from similar failures. Sufficient evidence has been obtained supporting the proposed action.

Consideration of strategic factors qualifies the enforcement decision of the issue of a Formal (Simple) Caution.

C11 - Recommended action *(Describe the action proposed with specific reference to the EMM (relevant duty holder/strategic factors and the Confirmed Enforcement Expectation), the EPS and the CPS Code for Crown Prosecutors (England and Wales). Where prosecution is proposed, comment on the preferred venue (Magistrates'/Crown Court) and prepare draft information(s), including as appendix 2.*

This event included the combination of a potentially high risk activity with extreme and deliberate failure by persons in a managerial position, to meet explicit, obvious, well-known and clearly defined standards and arrangements to control the risk from ionising radiation. Violation by employees of their employers established

and well-known arrangements and risk controls, resulting in placing themselves and others at risk from ionising radiation, is a matter of serious concern to everyone.

With reference to the Enforcement Policy Statement (EPS), EMM (Appendix 1) and Section C10 above, the recommended enforcement action is prosecution. There is evidence of a criminal offence that is sufficient to provide a realistic prospect of conviction, although not all public interest factors may be satisfied by a bringing a prosecution. Due the unusual circumstances of the event and the fact that the individuals have been dismissed from employment with SL, a reasonable alternative to prosecution is issue of a Formal (Simple) Caution to [redacted] This caution is for failing to discharge the duties to which they are subject by virtue of section 7 of The Health and safety at Work etc. Act 1974. This course of action is also consistent with the principles of the EPS:

- It is judged that there is sufficient evidence to provide a realistic prospect of conviction;
- Within the evidence the offenders have admitted to the offence, which is strict liability;
- The offenders are agreeable to being cautioned [44].

The matters in this report have been considered with regard to the Enforcement Management Model and following any Management Review an EMM1 form has been completed. Consequently, where prosecution has:

- **not been indicated**, the supporting appendices should only be completed as agreed with the investigator's line manager; or
- **been indicated**, the appendices should be completed as appropriate; or
- **been indicated** and charges are not being proposed, the reasons should be outlined above.

Investigator's name	[redacted]		
Investigator's signature		**Date**	09/04/2014
Line Manager's signature		**Date**	09/04/2014

Comments

Section not used.

Part D - Approval Officer's Considerations and Decision

(Approval Officer's consideration of the evidence, public interest factors, proposed defendants, proposed charge(s) and decision on prosecution)

Duty holder's name	[redacted]

Note: Separate Parts C and D should be prepared for each defendant.

D1 - Review the application of the Enforcement Policy Statement and Enforcement Management Model to the circumstances presented by the investigating inspector:

Fatals: *When reviewing the evidence and the extent of the breaches, consider the likelihood of the breaches being characterised as grossly negligent by a Coroner's Inquest jury.*

It is my opinion that the EPS and the EMM have been applied appropriately and I support the judgements made by the investigator in this report. The breaches of duty identified are very significant.

D2 - Review the application of the CPS Code for Crown Prosecutors in relation to each proposed case presented by the investigating inspector, giving reasons:

Evidential Stage:

Met: there is overwhelming evidence, including confessions, to support the case that each of the dutyholders committed a significant breach of their legal duties.

Public Interest Stage:

I support the decision of the investigator that, having due regard for the dismissal of the three dutyholders by Sellafield Ltd, prosecution of the two principals in this breach would not be in the public interest. It is my opinion that the Court would appreciate the devastating consequences that the loss of employment has had on the individuals, their previous excellent employment performance and impose only a token penalty.
For these reasons, I support the use of a Formal (Simple) Caution against [redacted] rather than prosecution. With regard to [redacted] it is my opinion that the case not to issue [redacted] a Formal (Simple) Caution is not overwhelming but I am supportive of the investigator's decision.

D3 - Decision on each of the proposed charges with the reasons for or against approval

[redacted] not supportive of prosecution, supportive of Formal (Simple) Caution for the public interest reasons given above.
[redacted] not supportive of prosecution, supportive of Formal (Simple) Caution for the public interest reasons given above.

D4 - Preferred venue (Magistrates'/Crown Court) and reasons

N/A

D5 - Post-approval action, including use of solicitor agent, referral for ILO

Fatals: *Confirm whether consideration to be given to commencing HSE Prosecution before inquest.*

N/A

Approval officer name, signature and date of decision

Name	[redacted]

Signature		**Date**	9/04/2014

RESTRICTED (when complete)
until prosecution concluded or “no prosecution” recommendation is approved

RESTRICTED (when complete)

Appendices

(where the file is being submitted for consideration by the approval officer, appendices 1, 2, 4, 5, 6, 7, 8 should be completed/included)

Appendix 1 – Form EMM1 (mandatory for all reports)

Enforcement Management Model

RESTRICTED (when complete)
until prosecution concluded or "no prosecution" recommendation is approved

Section 1 **Directorate:** FOD ☐ HID ☐ ONR ☒

Duty holder Customer No

Site/Premises Site No Case No

Brief description of circumstances, including the specific issue considered and the associated risk/failing.

Section 2

Risk of serious personal injury - HSWA Section 22 Prohibition notice Yes ☐ No ☒

Article / substance is cause of Imminent danger of serious personal injury - HSWA Section 25 powers Yes ☐ No ☒

Section 3 – Benchmark & Risk gap: see GRIP for further benchmark information

Specify the appropriate standard to be achieved. (Describe relevant requirements e.g. of Acts, Regulations or ACoPs; industry CoPs or standards etc.)

Risk Gap - (From Table 1, Table 2.1 and Table 2.2)

Actual risk	Consequence		Serious ☒	Significant ☐	Minor ☐
	Likelihood	Probable/significant ☐	Possible ☒	Remote ☐	Nil / negligible ☐
Benchmark	Consequence		Serious ☐	Significant ☐	Minor ☒
	Likelihood	Probable/significant ☐	Possible ☐	Remote ☐	Nil / negligible ☒
Risk gap (and table used)	**Single/low casualties** (Table 2.1)	Extreme ☒	Substantial ☐	Moderate ☐	Nominal ☐
	Multiple casualties (Table 2.2)	Extreme ☐	Substantial ☐	Moderate ☐	Nominal ☐
					No breach of law OR no risk gap ☐

Section 4 – Initial Enforcement Expectation (Tables 5.1, 5.2 or 5.3)

Standard *(Table 3)*			Defined ☒	Established ☐	Interpretative ☐	
Compliance / admin descriptor *(Table 4)*			Absent ☐	Inadequate ☐	Minor Deficiencies ☐	
Compliance with permissioning document			Contravention ☐	Irregularities ☐	Compliance ☐	
Initial Enforcement Expectation	Prosecution / Crown Censure ☒	IN / Direction / Specification ☐	Letter ☐	Verbal warning ☐	No enforcement action ☐	
Permissioning document impact (table 5.3 only)	Revocation / Refusal / Direction ☐	Amendment / Refusal / Variation ☐	Amendment ☐	Letter ☐	Letter / verbal warning ☐	Nil ☐

Section 5 – Dutyholder factors *(all elements do not always apply)* **See Table of definitions –** Table 6 and flowcharts

Is there a history of related incidents, accidents, ill health, etc?	Yes	☐	No	☒			
Is there a history of previous relevant enforcement?	Yes	☐	No	☒			
Did the dutyholder gain or deliberately seek economic advantage from non-compliance?	Yes	☐	No	☐			
Level of actual harm arising from the matter under consideration?	Serious personal injury or serious health effect	☐	No serious harm	☒	No harm	☐	
What is the inspection history of the dutyholder?	Poor	☐	Reasonable or N/A	☒	Good	☐	
What is the standard of general conditions?	Poor	☐	Reasonable or N/A	☒	Good	☐	
From the Inspector's assessment of the dutyholder, what is the level of confidence that the dutyholder can and will comply?	Little or no confidence	☐	Some Confidence	☒	Confident	☐	

Indicated enforcement action *(after considering dutyholder factors)*

Enforcement	Prosecution / Crown Censure	☒	IN / Direction / Specification	☐	Letter	☐	Verbal warning	☐	None	☐	
Permissioning	Revocation / Refusal / Direction	☐	Amendment / Refusal / Variation	☐	Amendment	☐	Letter	☐	Verbal warning	☐	Nil ☐

Section 6 - Strategic factors – See strategic factors table – Table 7 and flowcharts

Does indicated action coincide with public interest? *(refer to additional guidance)*	Yes	☒	No	☐
Are vulnerable groups protected by the action?	Yes	☒	No	☐
Will the action result in sustained compliance?	Yes	☒	No	☐
What is the effect of the action on other dutyholders?	Positive	☒	Negative	☐
Will the action result in the benchmark being achieved?	Yes	☒	No	☐
Is the functional impact of the action acceptable?	Yes	☒	No	☐
Have the principles and expectations of the Enforcement Policy been met?	Yes	☒	No	☐

Outcome of review *(To be completed when indicated enforcement action does not match proposed action, where dutyholder or strategic factors are not fully addressed or otherwise where instructed)*

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Enforcement action plan *(Priorities for action, and timescales)*

Name of inspector _____ Date _____

Name of line manager _____ Date _____

RESTRICTED (when complete)

Appendix 4 – Witnesses

All persons providing witness statement

		Role/Occupation	Type of statement (V/C)
1	[redacted]	[redacted]	V
2		[redacted]	V
3		[redacted]	V
4		[redacted]	V
5		[redacted]	V
6		[redacted]	V
7		[redacted]	V
8		[redacted]	V
9		[redacted]	V
10		[redacted]	V
11		[redacted]	V

Key: V = Voluntary Statement (s9 CJA) C = Compelled Statement (s20(2)(j) HSWA)

Others interviewed where witness statement not taken

	Witness Name	Role/Occupation	Location of interview record *(Provide the serial and page numbers of the notebook in which the interview is recorded)*
1	[redacted]	[redacted]	Inspectors Notebook 66884; pp 23 to 24
2			Inspectors Notebook 66884; pp 25
3		[redacted]	Inspectors Notebook 66884; pp 26 to 27
4		[redacted]	Inspectors Notebook 66884; pp 28 - 29
5		[redacted]	Inspectors Notebook 66884; pp 35 to 38
6		[redacted]	Inspectors Notebook 58861; pp 22 to 24 and 26; Inspectors Notebook 66888 pp 15 to 18
7		[redacted]	Inspectors Notebook 58861; pp 24 to 26
8		[redacted]	Inspectors Notebook 58861; pp 27 to 28
9		[redacted]	Inspectors Notebook 58861; pp 28 to 32
10		[redacted]	Inspectors Notebook 66888 pp 14 to 15