Australian Government

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Maintenance, Training and an overview of Heavy Water Draining in the De-fuelled HIFAR Facility (DHF)

By

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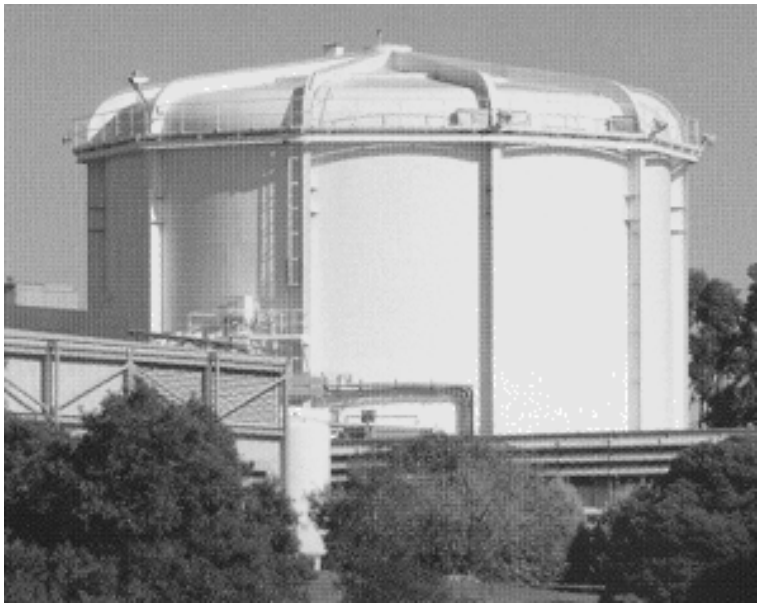
Contents

- Milestones
- HIFAR Maintenance
- DHF Maintenance
- DHF Staffing Arrangements
- Training
- Heavy Water Draining
- Health Physics and the Environment
- Diagrams/graphs



Milestones

- HIFAR reactor permanently shut down at 1025 hours on Tuesday, 30 January 2007 after almost 47 years of virtually trouble free operation
- Wednesday 7 February, 2007 – First fuel element removed from the core to the No.1 Storage Block
- Monday 26 Feb, 2007 - Final fuel element removed from the core to the No.1 Storage Block
- Thursday 29 March, 2007 – Core fully unloaded to the No.1 Storage Block (CCA's, safety rods, rigs and liners)
- Monday 2 April, 2007 – Fuel shearing commenced
- Tuesday 24 April, 2007 – Fuel shearing completed and all fuel removed from the Reactor Containment Building (RCB)

Milestones (continued)

- Monday 30 April, 2007 – Commenced draining heavy water from the reactor
- Wednesday 9 May, 2007 – Most of the heavy water removed from the reactor and RCB (10.38 tonne)
- As of today (15/11/07) 10.42 tonne of water has been removed from the reactor (a further 0.04 tonne yielded from low points in the 01/02 circuits)
- Monday 4 June, 2007 - 24 hour shift staffing ceased

HIFAR Maintenance

Pre Reactor De-fuelling

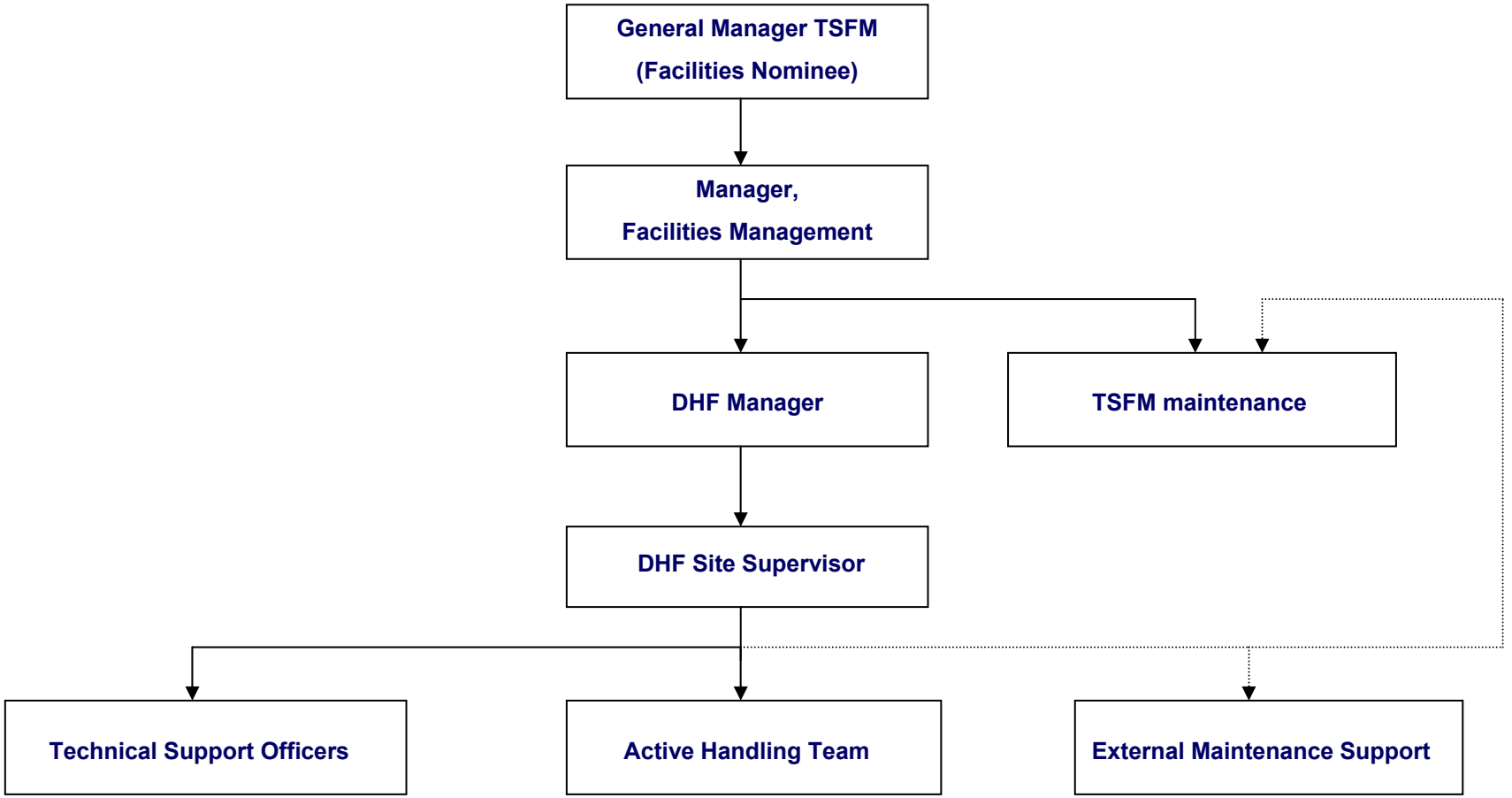
- Programmed preventative maintenance (MAINPAC)
- Emphasis placed on regular programmed testing of Engineered Safety provisions (ESPs) and safety related plant and equipment
- Dedicated Maintenance Staff (one accredited position)
- Minimum Plant Configuration (MPC) requirements for ESPs
- Effective defect reporting system (MAINPAC)
- Plant monitored 24/7 by operations staff

DHF Maintenance

Current Situation

- Programmed preventative maintenance (MAINPAC) continuing but at a reduced level (many pumps, fans etc permanently shut down)
- Most ESPs no longer relevant (Electrical Power Supply System still supporting radiation and airborne contamination monitoring equipment)
- New staffing arrangements
- MPC requirements not as stringent (ventilation important when work in progress)
- Effective defect reporting system (MAINPAC) still in place
- Plant monitored once a day (Monday to Friday) by Active Handling Staff

DHF Staffing Arrangements



Training

Pre Reactor De-fuelling

- Fully structured training system, classroom and practical, leading to accreditation of key staff:
  - Operations Engineers
  - Reactor Shift Superintendents
  - Reactor Operators
  - Active Handling supervisors
  - Active handlers
  - Reactor Physicists
  - Maintenance Superintendent (ESP Officer)
- Regular refresher training
- Re-accreditation training
- Corrective training
- Training on new plant and systems

Training

Pre Reactor De-fuelling (continued)

- Training and accreditation system for HIFAR developed in the early 1990s
- Training organised into Units (see NTP/TN 173)
- HIFAR Procedures developed outlining the training requirements for the various staff (NHP 18.1 to 18.10)
- Written examinations conducted at set stages of the training
- Practical check sheets completed for each phase of the training (NTP/TN 174)
- Accreditation achieved following a formal interview in front of a panel (representative from ARPANSA and S&RS invited to attend to audit the interview process)
- Training records kept both in hard copy and on the site wide training database (managed by HIFAR Training Officer)

Training

Current Arrangements

- New training procedures being developed to reflect current and future requirements eg DHF staff, TSFM staff, contractors, Site Operations Safety Supervisor (SOSS) etc
- Emphasis now on ensuring staff have appropriate licences rather than on accreditation (eg contract supervisor, crane driving, dogman, rigger, forklift, confined space, truck driving etc)
- Plant training being delivered to the Active Handling Staff who are operating the plant in lieu of accredited operators that have either left or moved on to the OPAL facility
- Plant training delivered to the Site Operations Safety Supervisors (SOSS) to enable them to respond to events in the silent hours when the DHF staff are not on site
- Training records, both hard copy and electronic, now managed by TSFM administration staff

Heavy Water Draining

Planning commenced months before……

Documentation

- Request for Safety Approval (SAC approval)
- Safe Work Method Statement
- Draining Procedure
- Daily work plan

Training

- Confined Space Training
- Radiological Protection Training
- Contractor Supervisor Training

Materials for the Job

- PPE (air wash masks, rubber gloves, Tyvek suits etc
- 200 litre stainless steel drums (60 off at ~$1,700 ea + GST)
- Set of scales, Hoses, fittings, pump, helium bottles etc

Co-ordinating Staff

- Operators, active handlers, health physics, waste management staff

Heavy Water Draining

The Process……

- The Reactor heavy water was circulated through an ion exchange column from 17 April, 2007 to 30 April, 2007 to remove activated particulates from the water
- Draining commenced on 30 April, 2007 via a drain valve (V1112) on the discharge header. Draining was initially by gravity until the water level in the circuit was at the same level as the 200 litre drum that was receiving the water; at this stage pumping was required
- Draining was also required from other points in the circuit eg expansion vessel, gasholder, heavy water storage vessels (1V3 and 1V4), drains tank, the RAT below the fuel element nozzles, ion exchange columns and instrument lines
- The major part of the drain concluded on 9 May, 2007
- To date 10,421.75 kg of water has been removed utilising 49 stainless steel drums

Health Physics and the Environment

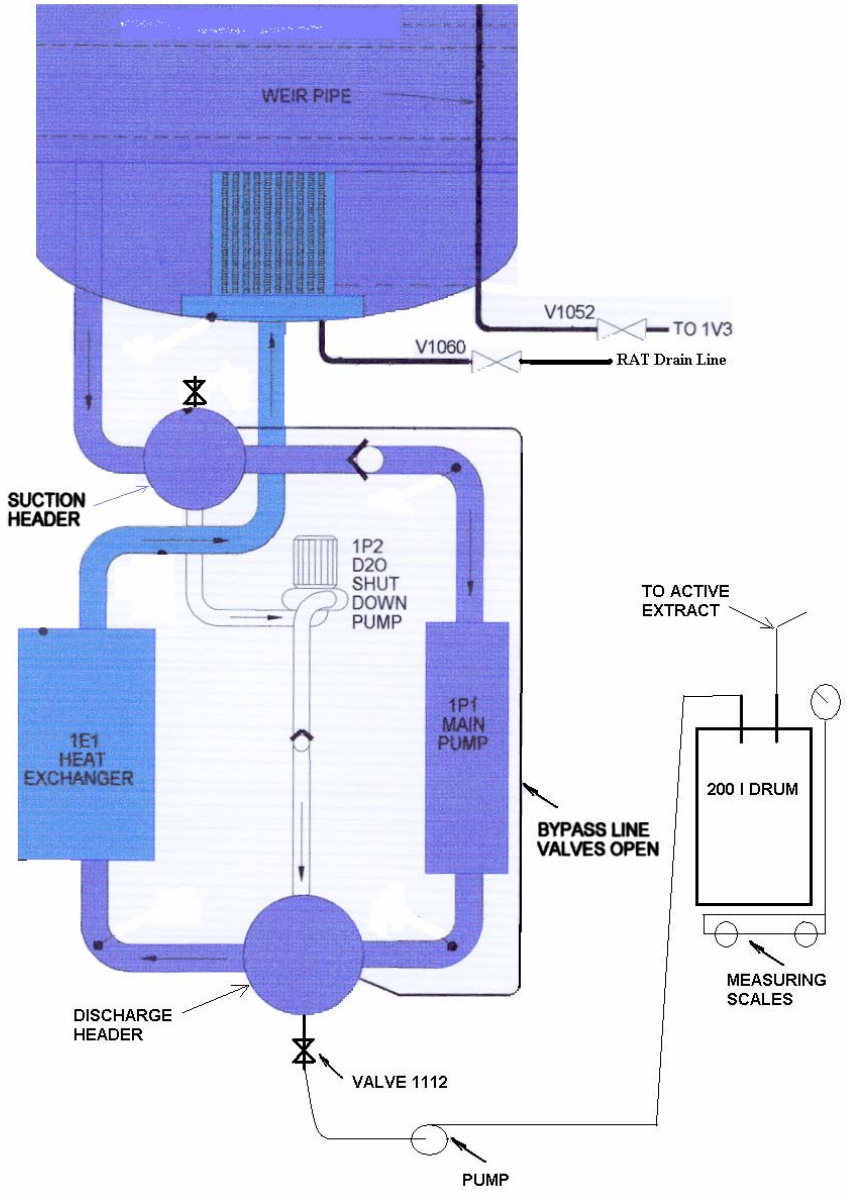
Doses

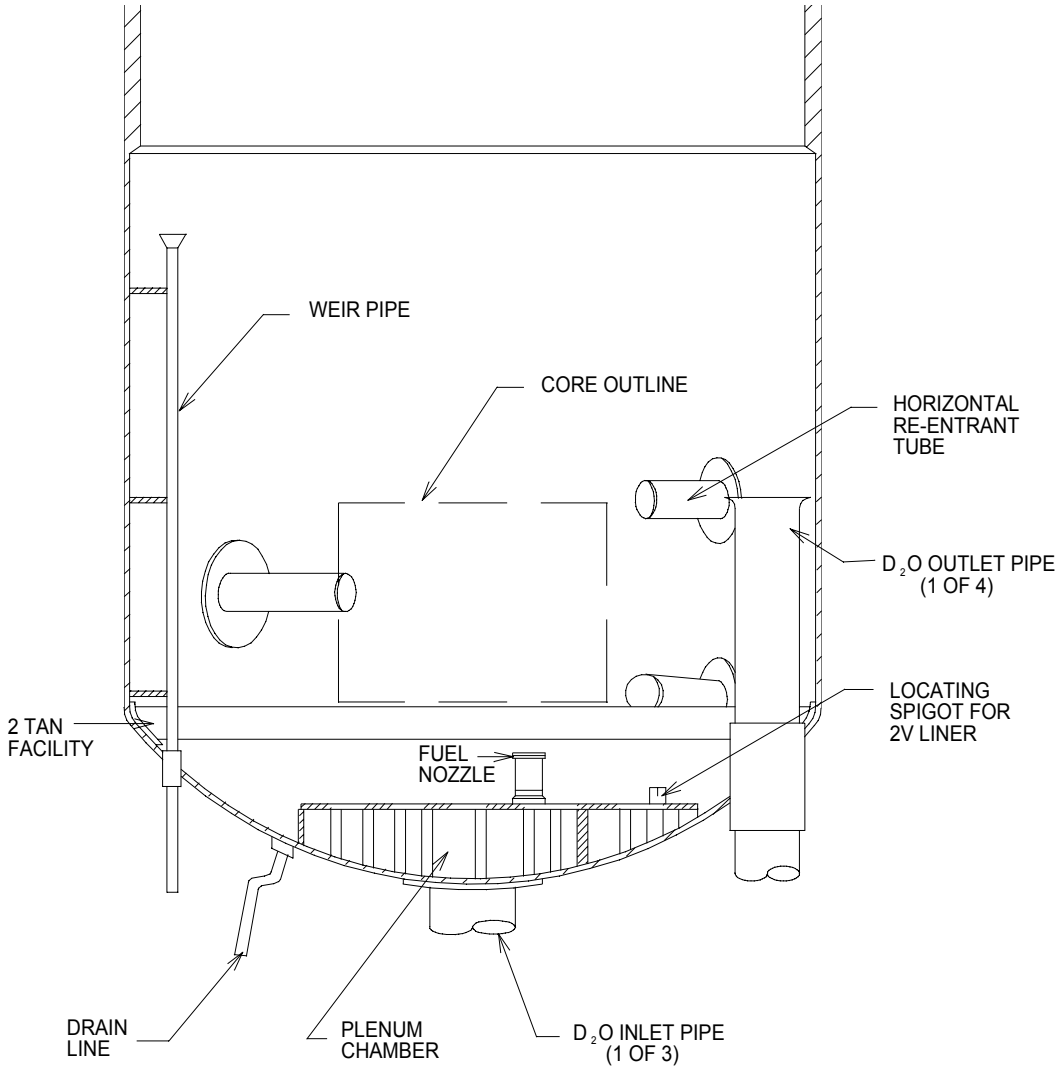
The radiation dose received by the principal operator for the 2 months that encompassed the draining process was 330 µSv (ANSTO investigation level is 1 mSv/month)

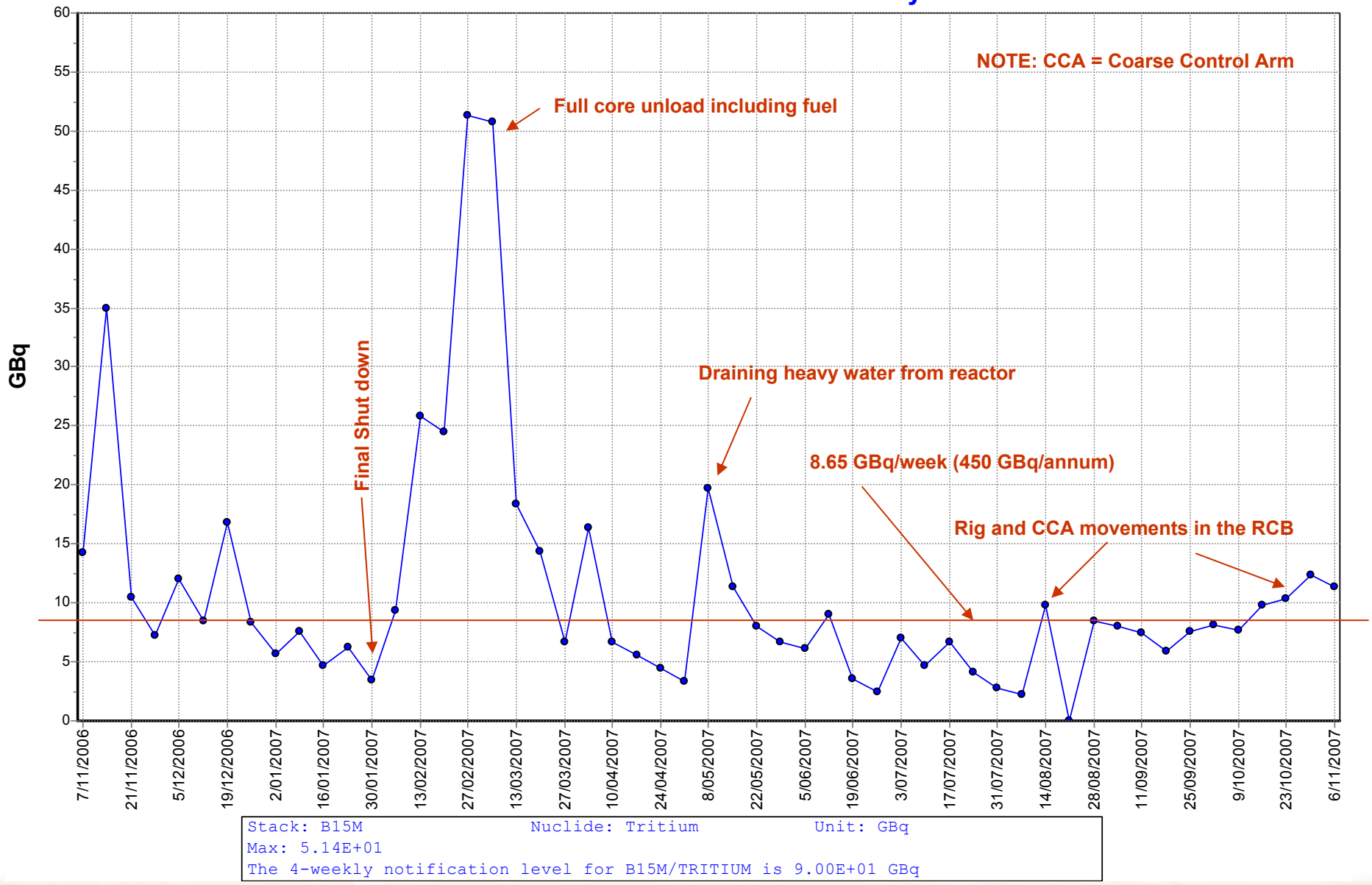
The Environment

For the month encompassing the heavy water draining process (2 weeks before and one week after) ~ 414 GBq of tritium was discharged from the active stack (monthly notification level is 2,000 GBq) (this included a trial 3 hour purge of the RAT)

During the same period ~42 GBq of tritium was discharged from the normal stack (monthly notification level is 90 GBq). This figure (42 GBq) also includes tritium discharges from the No.1 Storage Block to the RCB pit tank that is then vented to the normal extract system). At that time the tritium activity in the No.1 Storage Block water was ~10,000 Bq/ml

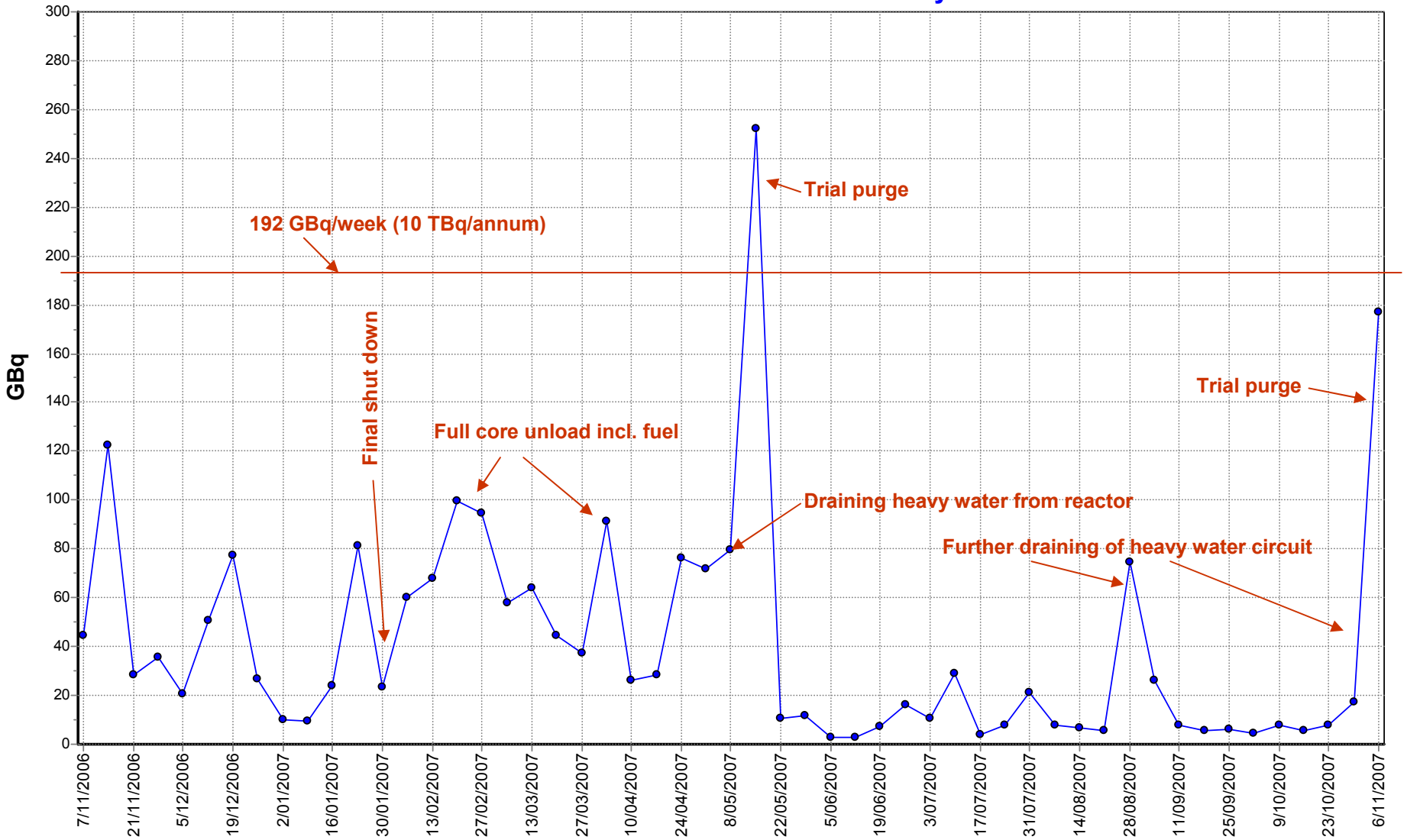

WEIR PIPE
V1052
TO 1V3
V1060
RAT Drain Line
SUCTION HEADER
1P2 D2O SHUT DOWN PUMP
TO ACTIVE EXTRACT
1E1 HEAT EXCHANGER
1P1 MAIN PUMP
200 l DRUM
BYPASS LINE VALVES OPEN
MEASURING SCALES
DISCHARGE HEADER
VALVE 1112
PUMP


WEIR PIPE
CORE OUTLINE
HORIZONTAL
RE-ENTRANT
TUBE
D2O OUTLET PIPE
(1 OF 4)
LOCATING
SPIGOT FOR
2V LINER
2 TAN
FACILITY
FUEL
NOZZLE
DRAIN
LINE
PLENUM
CHAMBER
D2O INLET PIPE
(1 OF 3)



Stack: B15M Nuclide: Tritium Unit: GBq
Max: 5.14E+01
The 4-weekly notification level for B15M/TRITIUM is 9.00E+01 GBq

Stack: 15A Nuclide: TRITIUM Weekly



Stack: B15A Nuclide: Tritium Unit: GBq
Max: 2.52E+02
The 4-weekly notification level for B15A/TRITIUM is 2.00E+03 GBq

Any Questions?