Delicensing at Harwell

Authors name
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Outline

- Background to delicensing at Harwell
- Delicensing criteria
- Delicensing process
- Example area – EAF
- Drains characterisation
- Key Issues
- Lessons learned

Harwell Nuclear Licensed Site

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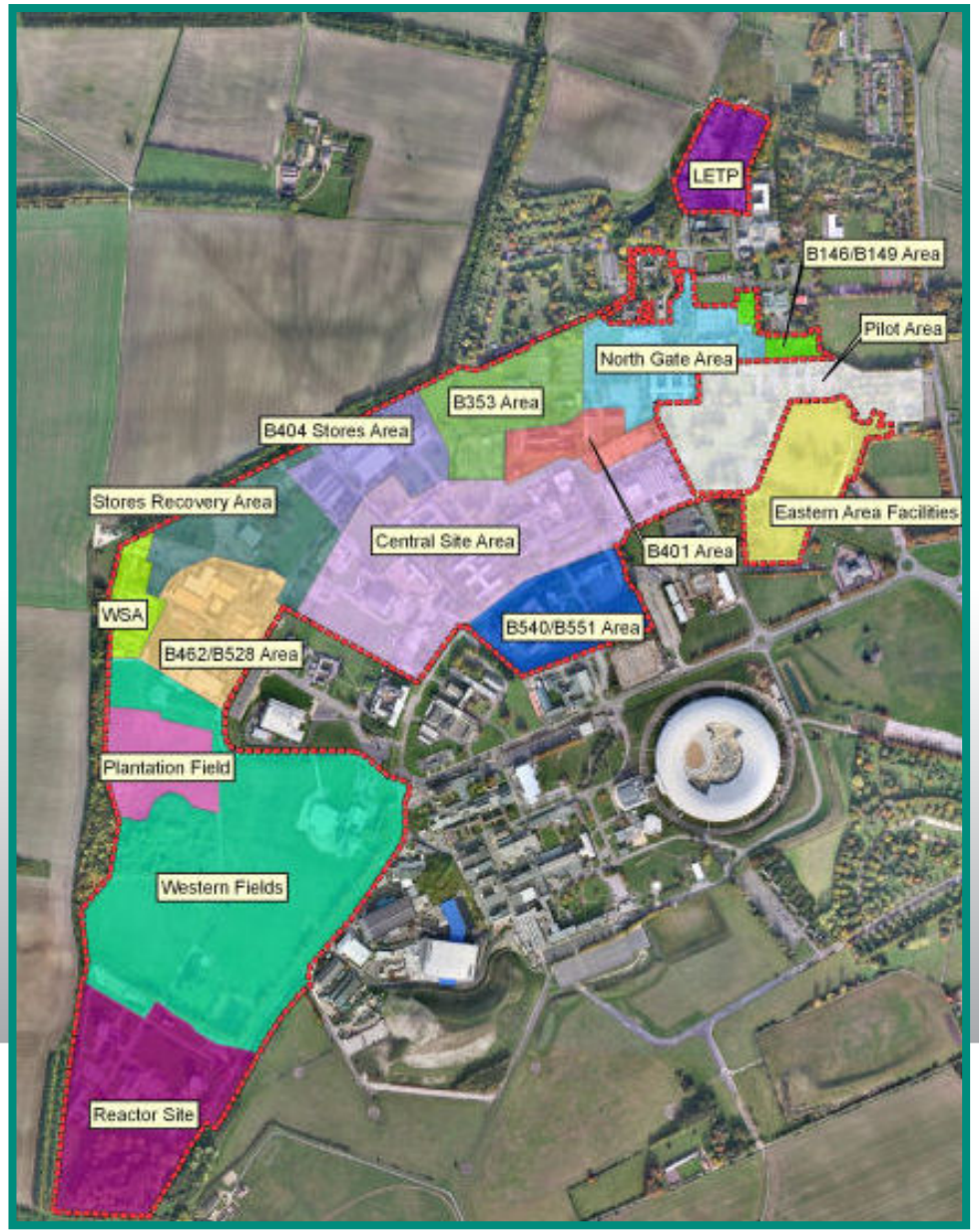
Site Endstate

- End state for Harwell is a fully delicensed site
- Drivers – clear NDA liability and release the site for redevelopment for major science projects
- For most areas of the site, delicensing logically follows on after decommissioning of the facilities
- Phased approach to delicensing to gain experience and competence

Harwell Delicensing Areas



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Harwell Site Delicensing Stages

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Delicensing Criteria

- Pre 2005 cases prepared were based upon:
  - Radioactivity below the levels of RSA 93 and its exemption levels,
  - Surface contamination <0.4 Bq/cm^2 alpha and 4 Bq/cm^2 beta
  - Radiation levels consistent with background as far as reasonably practicable

- Following issue of HSE Delicensing Policy May 2005
  - Additional risk of death to the individual meets a risk criteria of 10^{-6} /y for any foreseeable use (equivalent to 10-20 µSv/y)
  - No radioactive waste left on site

Meeting the Risk Criteria in HSE Policy

- The risk criteria given in the HSE Delicensing Policy can be met by either :
  - Demonstrating that residual, isotope specific, activity levels are below levels set in IAEA Safety Standard Series No.RS-G-1.7, ‘Applications of the Concepts of Exclusion, Exemption and Clearance, or
  - Carrying out a site specific risk assessment to demonstrate the risk level is met

Delicensing Process - What's involved?

- Historical survey of records and maps/drawings
- Define characterisation strategy
- Radiological and chemical surveys of the land
- Building/drains surveys
- Investigation/remediation of anomalies
- Prepare Delicensing Case
- Formal Submission to ONR
- ONR verification surveys
- Clarifications/discussions
- ONR Approval
- Mark the new boundary
- Issue of Licence Variation

- Telling the Story
- and
- Providing the Evidence

Generic Sampling And Surveying Programmes

- Decommissioning Phase
  - Pre demolition health physics surveys of all buildings
  - Concrete sampling from structures remaining
  - Samples collected on 10m grid under building footprints (25 m grid elsewhere)
  - Gamma survey of excavated surface where possible

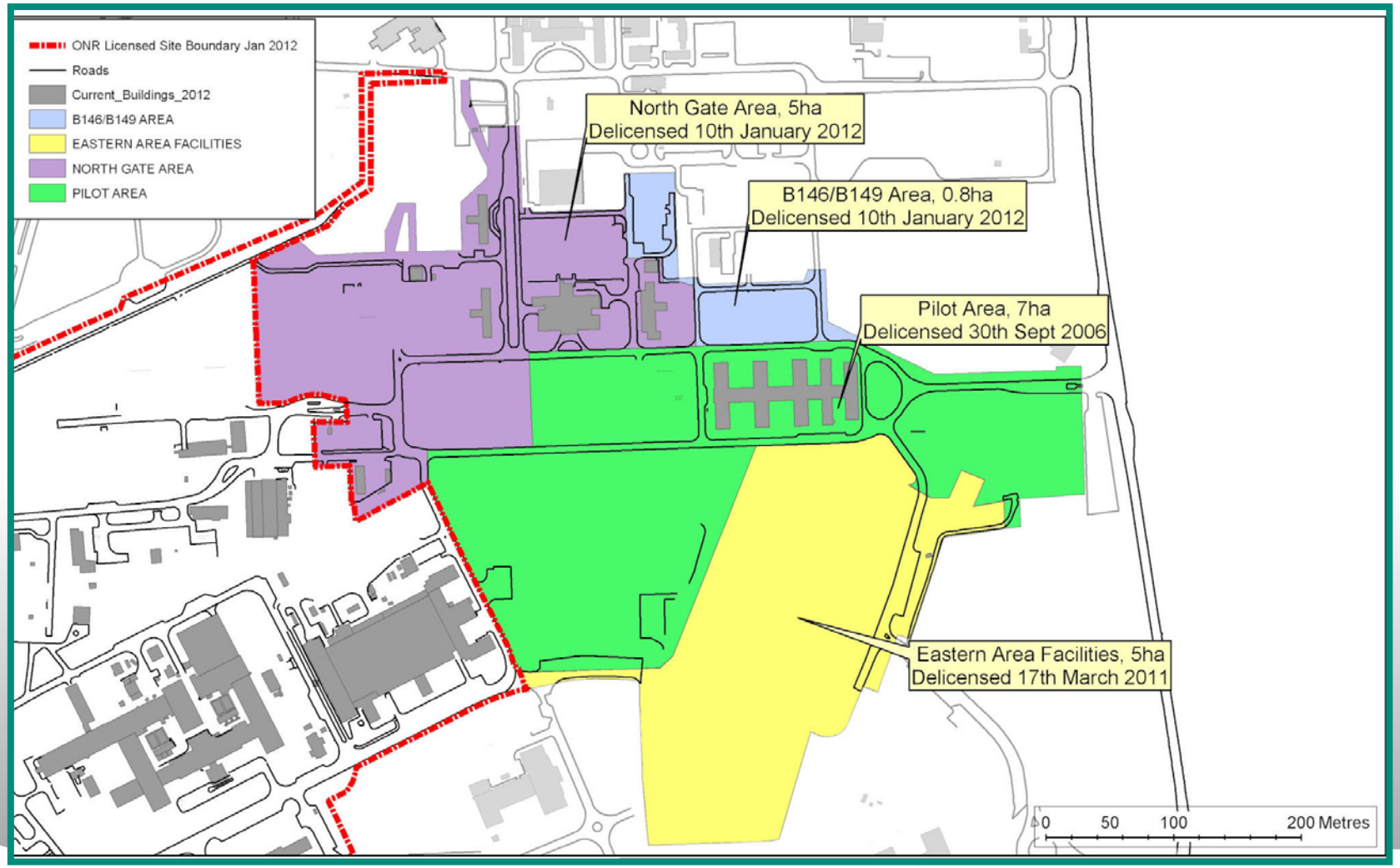
Generic Sampling And Surveying Programme (cont'd)

- Delicensing Validation Stage
  - Geophysical surveys
  - Visual inspections
  - Drain investigations Trial pitting over whole site
  - All samples analysed by gamma spectrometry and gross alpha/beta analysis
  - Selected isotopic analysis
  - Final Gamma survey after site reinstatement
  - Dose rate measurement grid

Areas Delicensed at Harwell

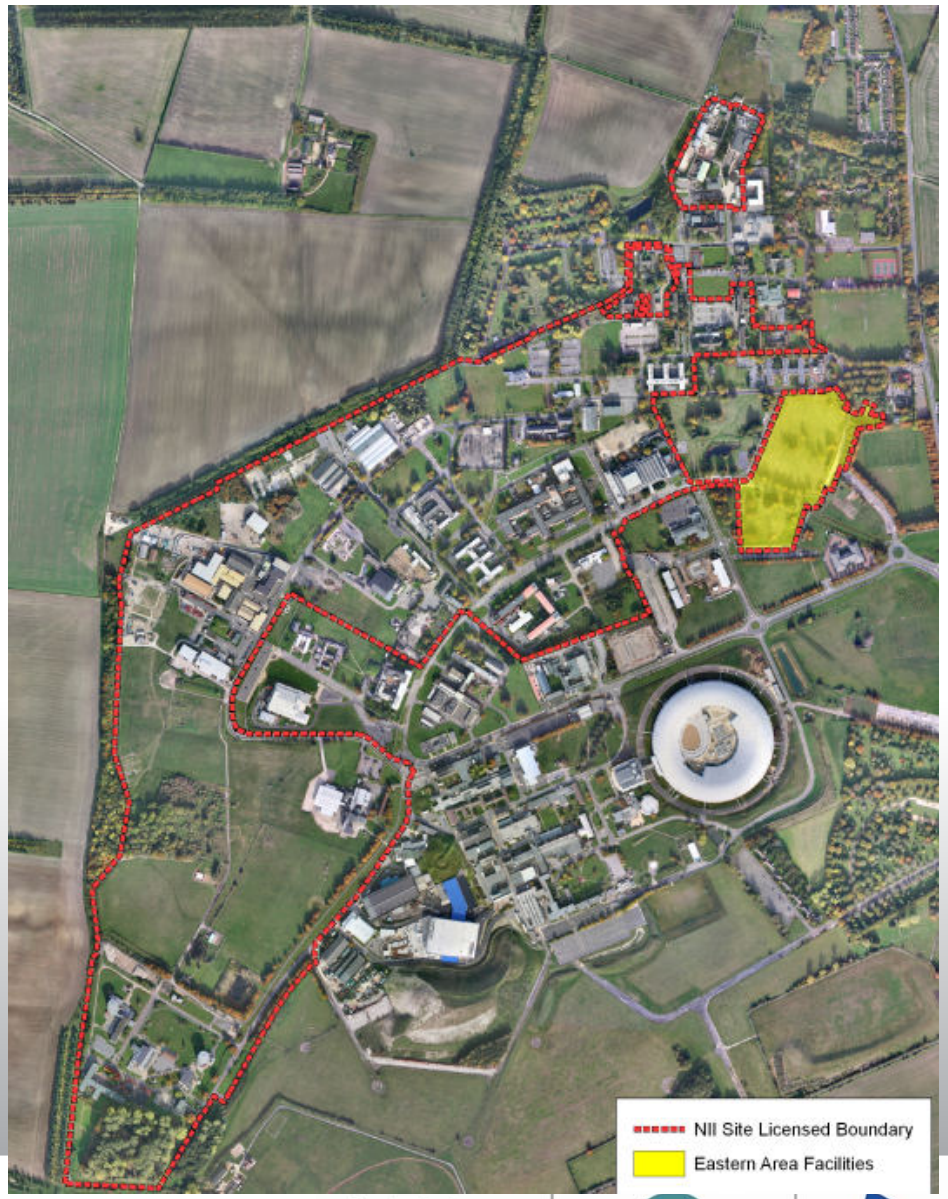
- ETSU Area, 5 hectares, delicensed 1992
- Pilot Area, 7 hectares, delicensed 2006
- Eastern Area Facilities, 5 hectares, delicensed 2010
- North Gate and B146/149 Areas, 5 hectares, delicensed 2012
- B353 Area works underway

Delicensing Areas



EAF

- 5.05 hectares
- Four major buildings existed
  - Hangar 7
  - Hangar 8
  - B477 (Tandem Generator)
  - B3
- 33 buildings existed
- 9 buildings with history of handling radioactive material
- All buildings demolished 2005
- Underground concrete structures remain



Hangars 7 and 8

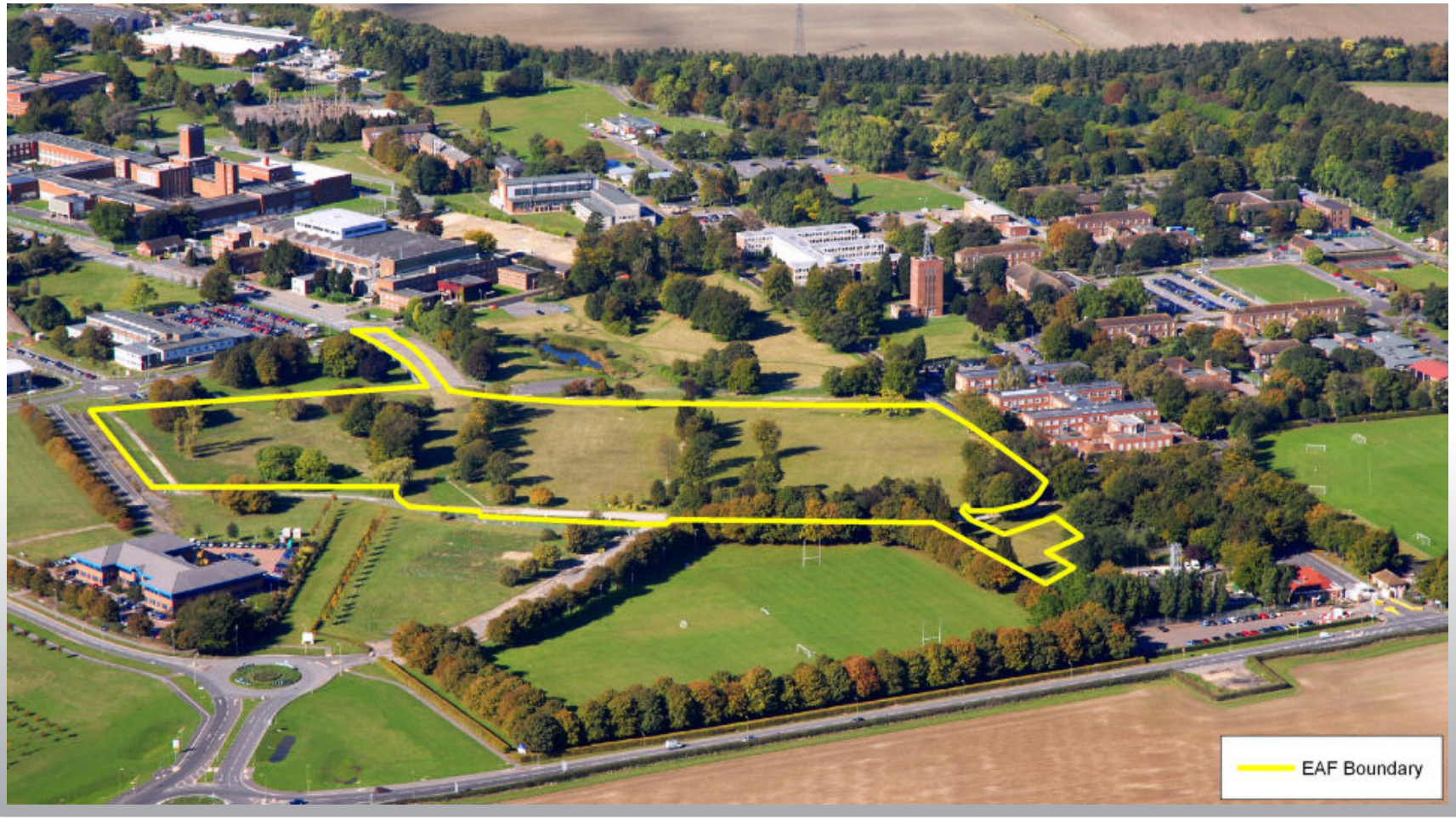
- Built for RAF Harwell prior to WWII
- Demolished 2005
- Key facilities
- Hangar 7
  - Synchrocyclotron
  - ZETA (Zero Energy Thermonuclear Assembly)
  - Range of laboratories some handling radiological materials
- Hangar 8
  - GLEEP (Graphite Low Energy Experimental Pile)
  - 5MeV Van de Graaf Generator
  - Range of nuclear physics experimental equipment

EAF Prior To Demolition

EAF – Tandem Generator, B477

EAF – Hangars 7 and 8

EAF As It Is Now



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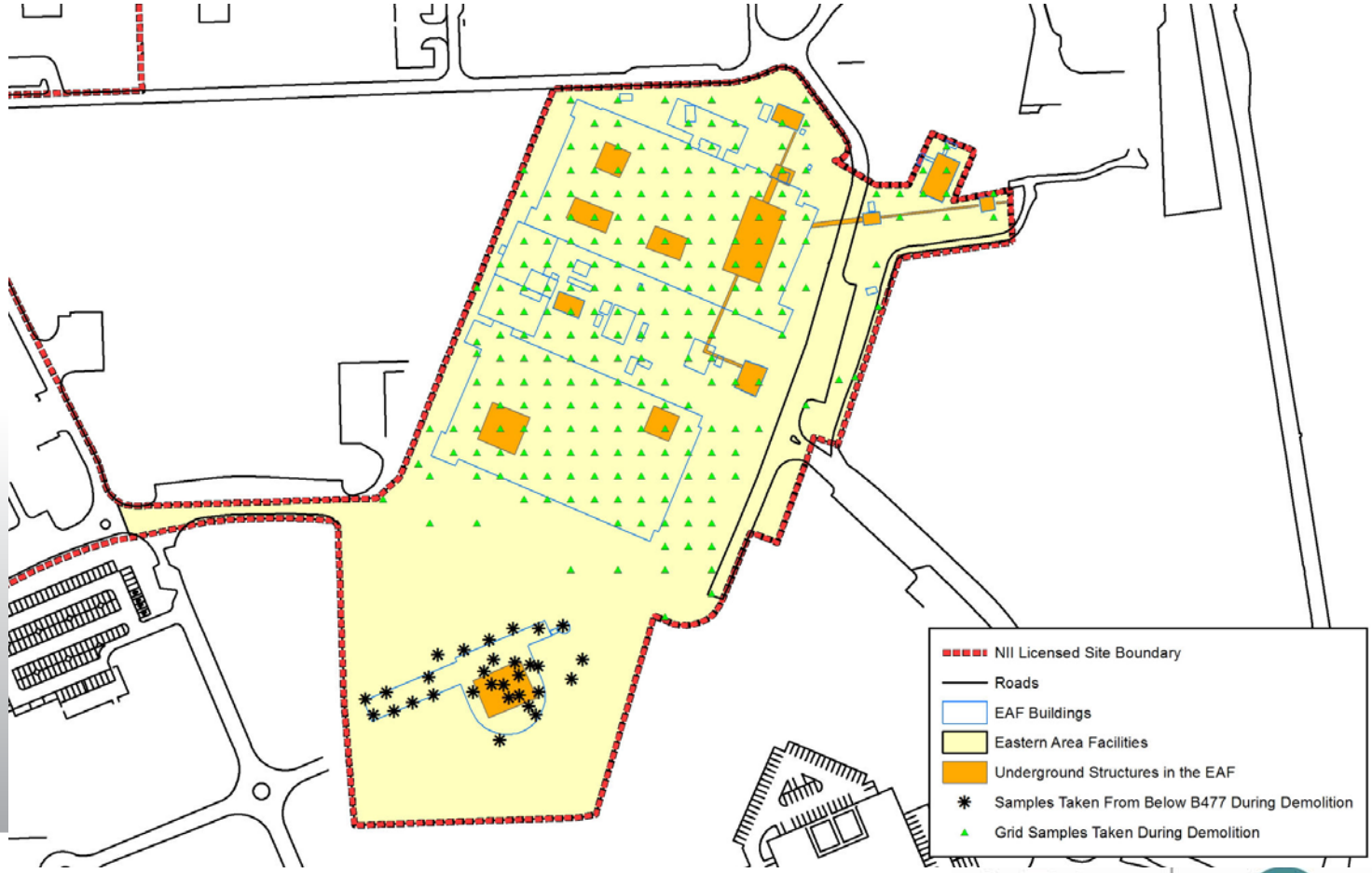
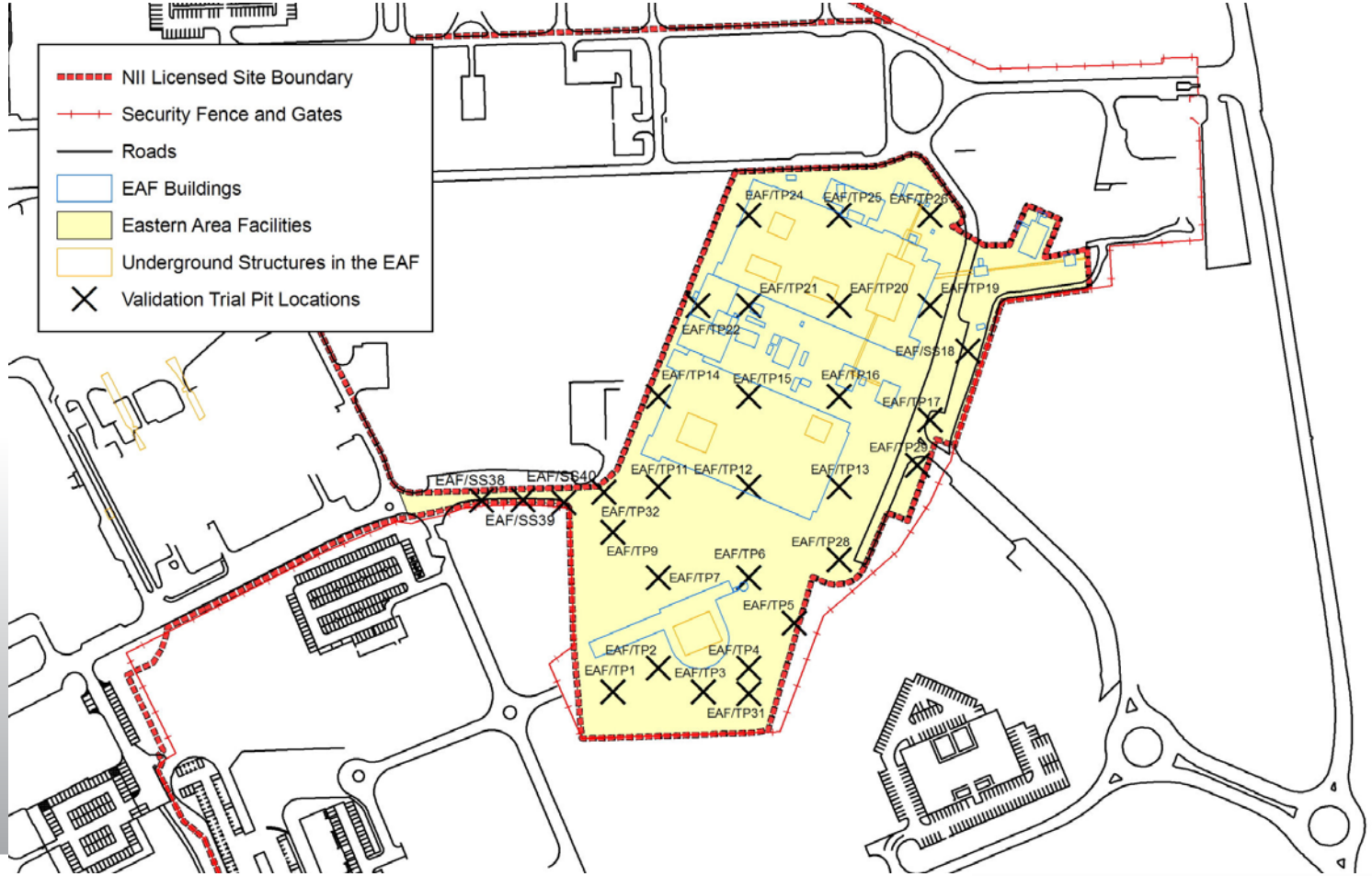
Sampling During Demolition



Post Demolition Trial Pit Locations



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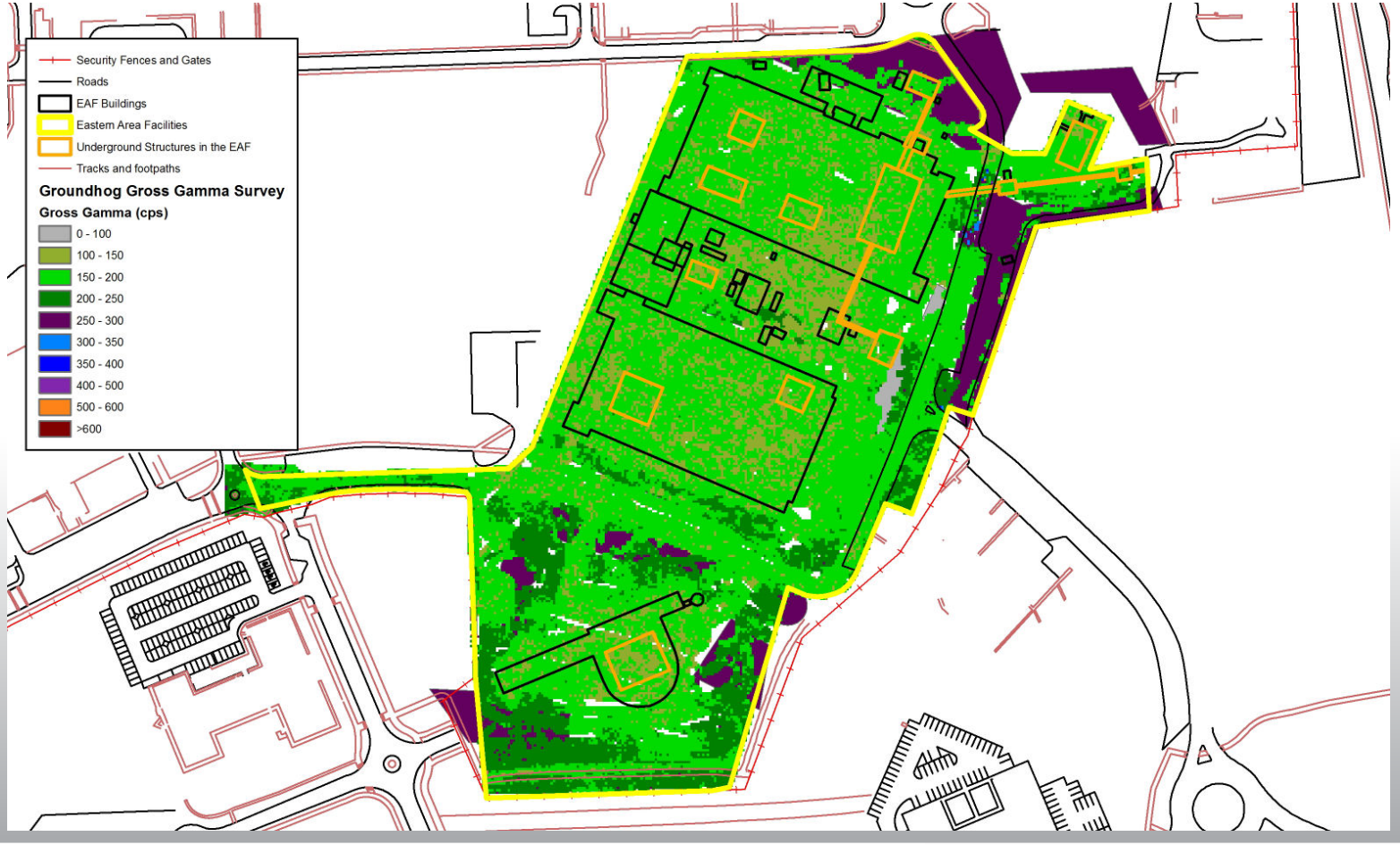
Final Groundhog Survey



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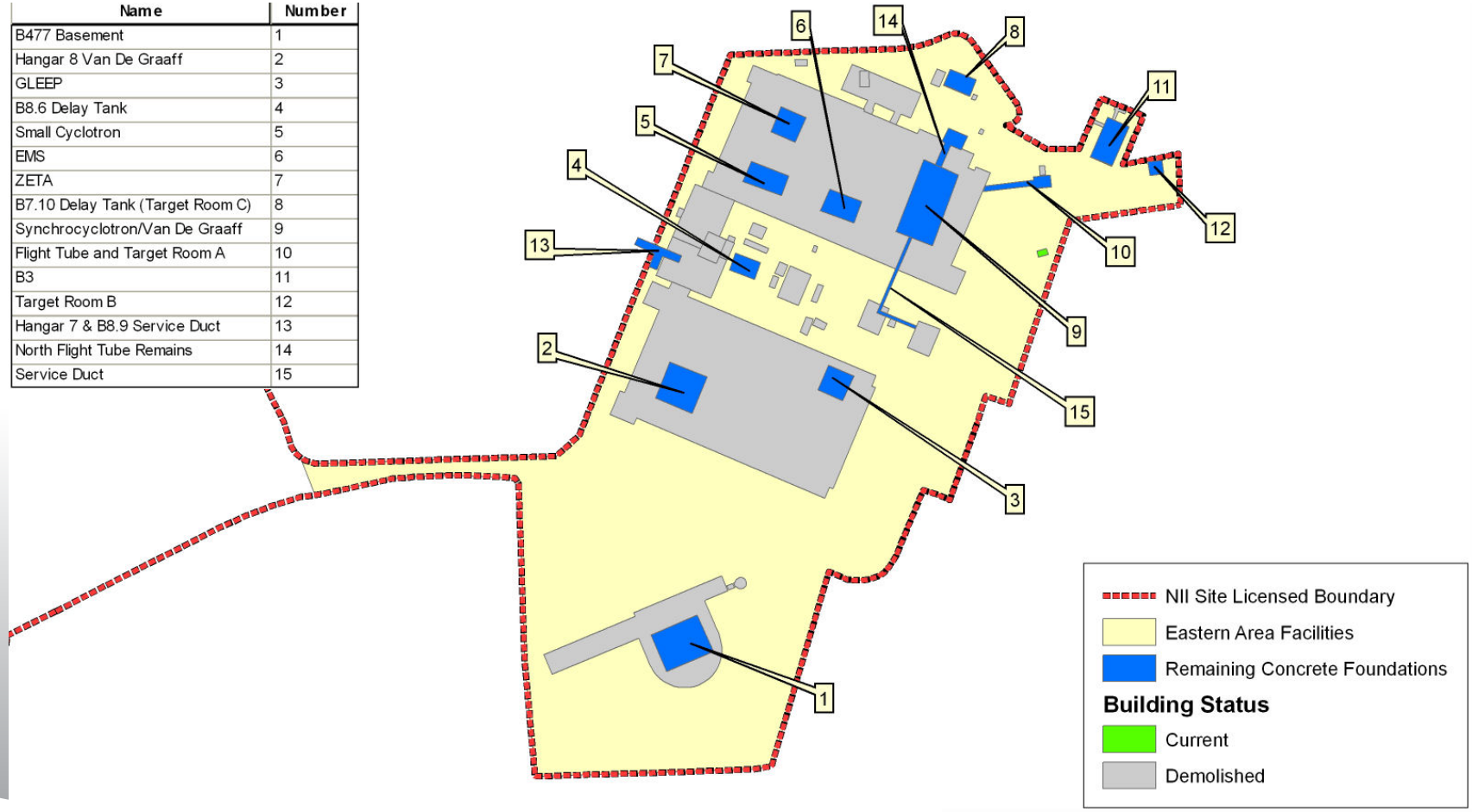
Concrete Foundations Remaining

Name	Number
B477 Basement	1
Hangar 8 Van De Graaff	2
GLEEP	3
B8.6 Delay Tank	4
Small Cyclotron	5
EMS	6
ZETA	7
B7.10 Delay Tank (Target Room C)	8
Synchrocyclotron/Van De Graaff	9
Flight Tube and Target Room A	10
B3	11
Target Room B	12
Hangar 7 & B8.9 Service Duct	13
North Flight Tube Remains	14
Service Duct	15



EAF Site Specific Risk Assessment

- Low levels of activity in activated concrete remained following demolition in deep underground structures
- Levels exceeded IAEA bulk activity levels
- Site specific risk assessment carried out to demonstrate the area met the delicensing risk criteria and ALARP
- Not everything has to be removed

- Delicensed 2010

Delicensing Issues

- Different areas with varying issues but always 3 main areas of concern:
  - Land
  - Buildings
  - Drains

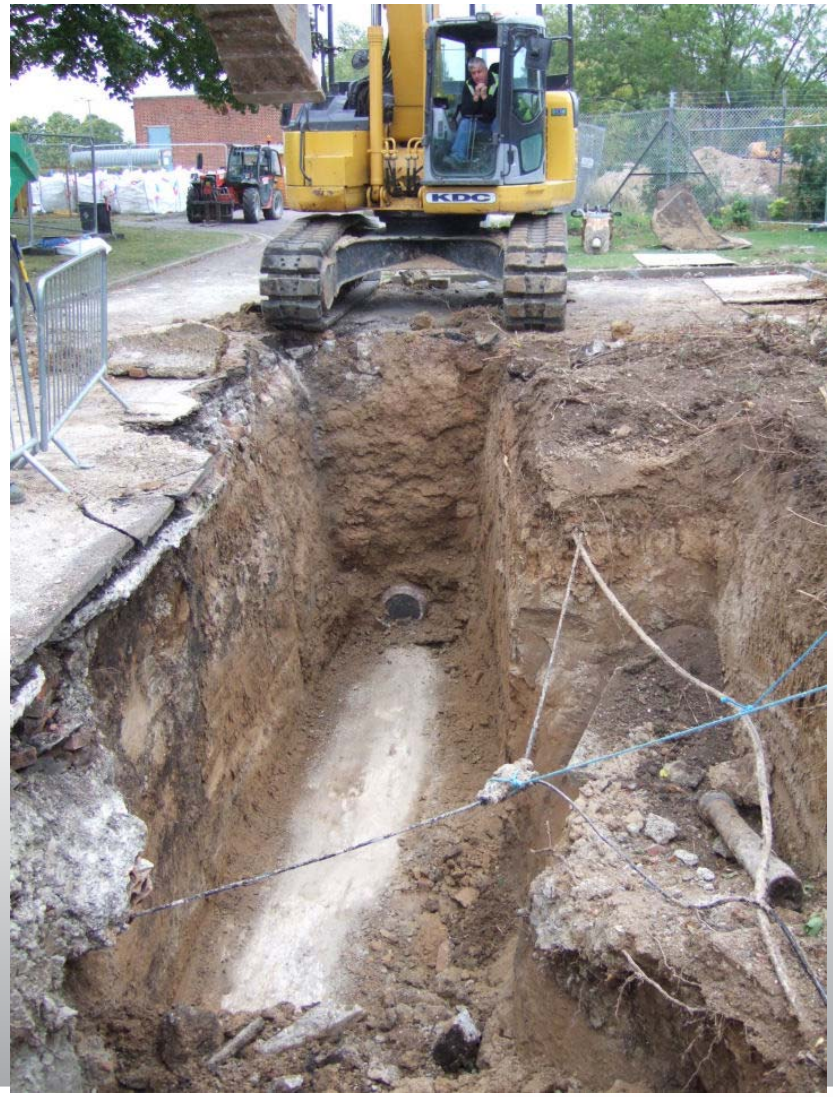
- Drains are a major issue for delicensing on the Harwell site

Drains

- Need to identify all the types of drain on the site:
  - Active Drains
  - Trade Waste Drains
  - Surface Water Drains
  - Foul Drains

- Approach has been to remove the active drains and characterise other categories

OMAD Removal



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Trade Waste Drains

- TWD on Harwell site is being decommissioned
  - Pressure washed
  - CCTV inspected
  - Faults and unknown sections to be removed
  - Gamma survey
  - grouted
- All drain sections exceeding delicensing criteria will be removed
- Separate document detailing delicensing criteria for drains

TWD Verification Process

- Theoretical modelling of gamma probe response
- Determination of maximum missable activities
- Determination of clearance levels for different categories of pipe
- Systematic review of all data
- Removal of sections drain if it does not meet clearance criteria
- Validation of model by excavation of selected sections

Key Issues in Delicensing at Harwell

- Drains
  - Finding drains or proving they have been removed
  - Characterisation and demonstration that they meet delicensing criteria
- Historical decommissioning works
  - Records
  - Quality
- Demonstrating residual activity meets delicensing criteria
- Demonstrating ALARP

Lessons Learned

- Demonstrating a thorough process is key
- Demonstrating drains meet delicensing criteria is not straightforward
- Build delicensing requirements into decommissioning works
- Keep good decommissioning records
- Liaise with the regulators
- It takes time to delicense!