DAERA bTB Eradication Transformation Programme

Research Project

Full Format Proposal/Project Extension Proposal

1. Title of project
Bovine Tuberculosis Regionalisation Research Pilot

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[redacted]		[redacted]	
[redacted]	CLIMATE	[redacted]	GHG Inventory Refinement ☐ Climate Change Mitigation [redacted] Climate Change Adaptation ☐
[redacted]	SUSTAINABLE AND RESILIENT FOOD SYSTEMS ☐		Sustainable Agriculture Policy ☐ Sustainable Agriculture Improvement ☐
[redacted]	ONE HEALTH [redacted]		Protecting the Health of our Plants ☐ Understanding Antimicrobial Resistance ☐ Protecting the Health & Welfare of Our Animals [redacted]

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NATURAL ENVIRONMENT ☐	**Healthy Seas & Oceans** ☐ **Safeguarding Our Natural Wealth** ☐ **Pure Air, Clean Rivers & Resilient Water Supply** ☐ **Resource Efficiency & Waste Reduction** ☐
RURAL AFFAIRS [redacted]	**Thriving, Resilient Rural Economies & Communities** [redacted] **Rural Health & Well-being** [redacted] **Economic Modelling Frameworks to Develop & Test Policy Interventions & to Assess Their Impacts** ☐

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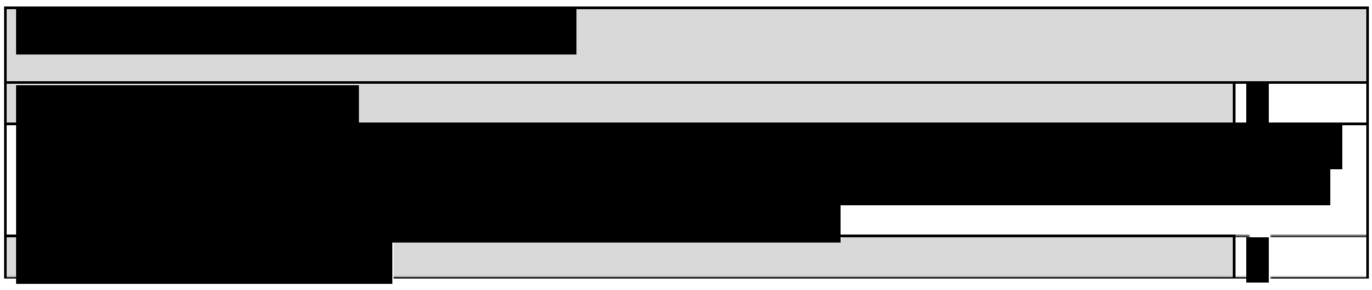

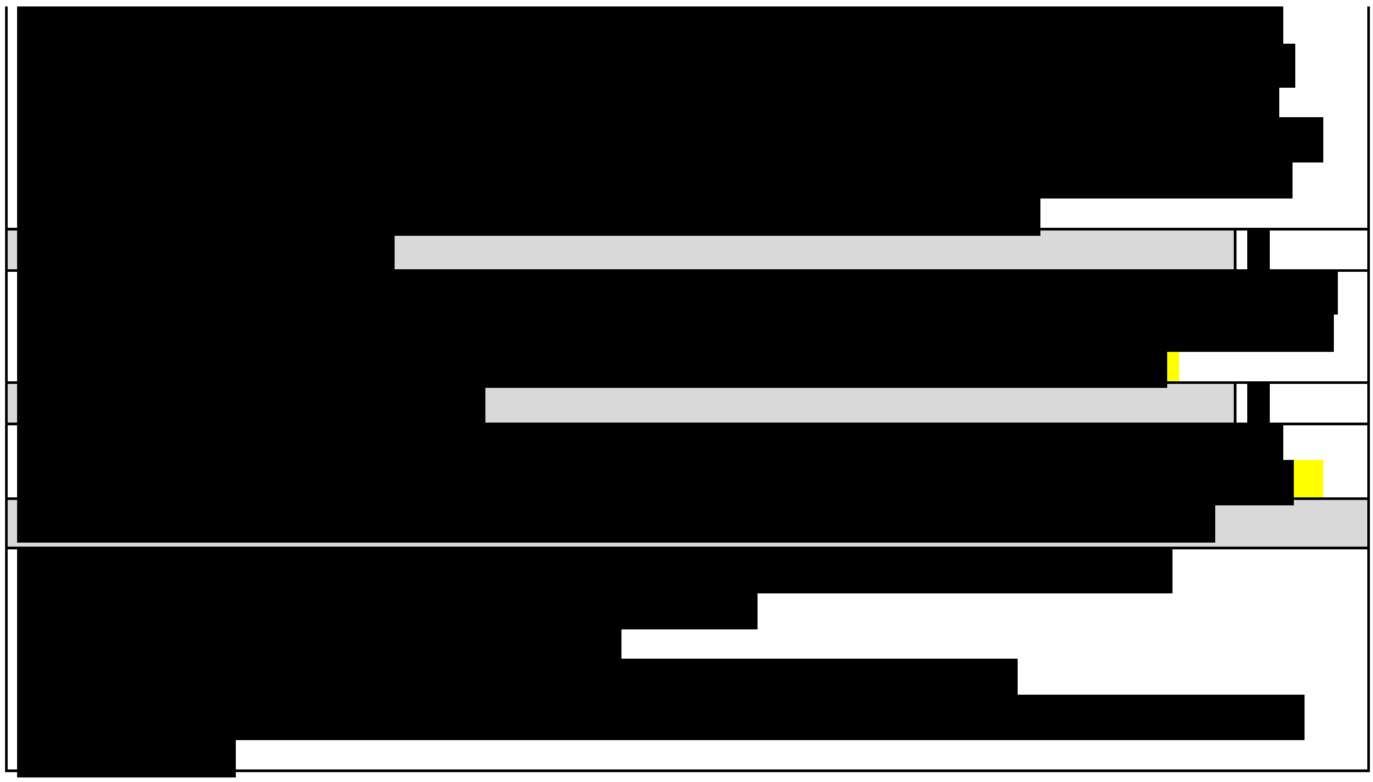

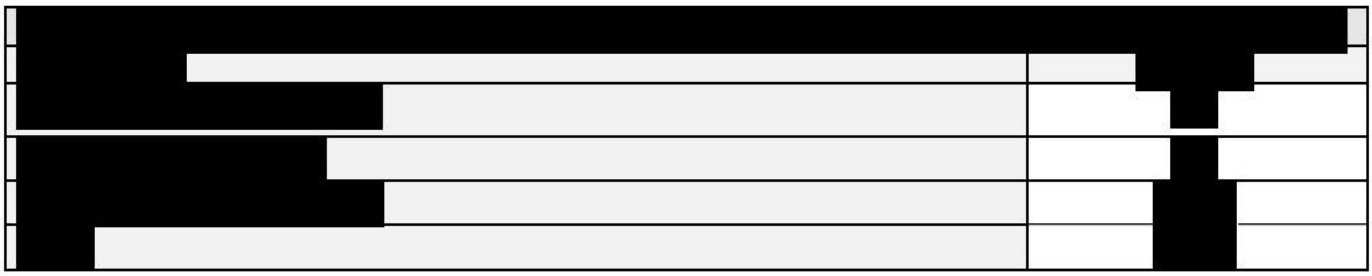

9. What scientific knowledge already exists in relation to this thematic area?
In completing this section you should provide concise and relevant background information on related projects undertaken by the (DAERA) (past and present) **AND** research published by **other groups** locally, nationally and internationally. List title, year, and publication (if relevant). It is recommended that this section does not exceed three A4 pages.

History of badger intervention

Bovine TB, caused mainly by *Mycobacterium bovis*, is an endemic zoonotic infection in the UK (excluding Scotland) and Ireland. In NI, the infection has persisted in its cattle population despite a protracted bTB eradication programme with the current bTB herd incidence being over 9% and the annual programme costs being over £60m (DAERA, 2024).

There are various factors that contribute to the recalcitrant nature of bTB including intensification of cattle production, infection dynamics/diagnostics, farm fragmentation, and wildlife (Broughan et al., 2016; Doyle et al., 2016, 2020, 2022; Milne et al., 2020). It is widely

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[1] **Fundamental research**: Experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any direct practical application or use in view.

[2] **Industrial Research**: Research aimed at the acquisition of new knowledge and skills for developing new products, processes or services or for bringing about a significant improvement in existing products, processes or services. It comprises the creation of component parts to complex systems, which is necessary for the industrial research, notably for generic technology validation, to the exclusion of prototypes.

[3] **Experimental research**: The acquiring, combining, shaping or using existing scientific, technological, business and other relevant knowledge and skills for the purpose of producing plans and arrangements or designs for new, altered, improved products, processes or services. This may include other activities aiming at the conceptual definition, planning and documentation of new products, processes or services.

accepted that bTB eradication will require all sources of infection to be tackled effectively (Broughan et al., 2016; Chang et al., 2023).
With respect to wildlife, the European badger, *Meles meles*, is commonly accepted as being a reservoir host for *M. bovis* (Godfray et al., 2013, 2025; Griffin et al., 2021). While cattle are still considered as the main driver of bTB infection in cattle, inter-species transmission can play a significant role even though they may be rare events. When badger-to-cattle transmission occurs, this is then compounded by onward cattle-to-cattle both within and between herds (Griffin et al., 2021).
Use of whole genomic sequencing has facilitated a better understanding of *M. bovis* infection dynamics in bTB hotspots (Crispell et al., 2019; Rossi et al., 2021; Akhmetova et al., 2023). It has enabled quantification of the directionality of intra-species and inter-species *M. bovis* transmission and demonstrated how this dynamic varies between bTB infection hotspots.

Badgers can live for several years with *M. bovis* infection thus acting as a potential source of the infection for both other badgers and cattle and occasionally humans over that time period. Attempts to control *M. bovis* infection of badgers have mainly focused on proactive badger culling over bTB hotspot areas. The main scientific studies on the field use of proactive culling were the Badger Randomised Culling Trial (RBCT) in England and the four-area trial in Ireland (Donnelly et al., 2006; Griffin et al., 2005). Both trials showed a beneficial effect with respect to a significant reduction in bTB cattle herd breakdowns in the proactive cull areas over the period of the trials. Furthermore, this benefit was observed to have a prolonged beneficial effect within the RBCT (Jenkins et al., 2010; Allen et al., 2018). Moreover, the RBCT showed a transient detrimental effect to the buffer areas surrounding the proactive cull areas. This buffer area effect was not observed in the four-area trial (Olea-Popelka et al., 2009). However, not all peers agree with these RBCT findings who reported no effect from the RBCT data, particularly if all (confirmed and unconfirmed) bTB herd breakdowns were considered (Langton et al., 2022, Torgerson et al., 2024). Conversely, a further re-evaluation of the RBCT data confirmed the original findings (Mills et al., 2024 a, b).
More recent analysis of farmer led proactive badger culls in England have also suggested a significant reduction in bTB cattle herd breakdowns although other cattle bTB control measures were also deployed in such areas (Brunton et al., 2017; Downs et al., 2019). However, badger proactive culling is indiscriminate and unpopular with the general public, potentially removing large numbers of uninfected badgers and disturbing social groupings. Badger vaccination trials using *Bacillus Calmette–Guérin* (BCG) vaccines have also been carried out with the Republic of Ireland (ROI) recently replacing culling with vaccination, although culling is being retained as an option in emerging bTB hotspot areas (Chambers et al., 2011; Carter et al., 2012; Gormley et al., 2017; Aznar et al., 2018; Benton et al., 2020; Martin et al., 2020).

Modelling of various badger intervention strategies using English and NI data has indicated that interventions that include a lethal badger component led to a more rapid reduction in infection levels compared to vaccination only (Smith et al., 2016; Smith and Budgey, 2021). Trap side badger testing enables real time decision making on the fate of each badger where test-positive badgers can be selectively culled while test-negative can be released directly (test and selective removal) or after vaccination with BCG (TVR). A TVR badger intervention was undertaken within a 100km^2 in NI during 2015-2018 (Menzies et al., 2021) (under ASPA PPL 2767). One of the outcomes from this research clearly demonstrated that trap side testing was practical (enabling real time decision making on the test result) and helped to validate the trap side use of the test in badgers (DPP test; Dual Path Platform VetTB assay for cervids) (Courcier et al., 2020; Arnold et al., 2021). This research project also

demonstrated a significant decrease in badger *M. bovis* prevalence (from 14% in year 1 to 1.9% in year 5) and highlighted the heterogeneous nature of both badger densities and test-positive badger densities within the area (Arnold et al., 2021; Menzies et al., 2021). However, this badger intervention appeared to have minimal impact on cattle herd bTB levels and cattle-to-cattle transmission was dominant in driving bTB infection in the area (Doyle et al., 2023; Akhmetova et al., 2023). This work indicated that effective transmission control is required in both cattle and badgers to reduce bTB levels in an area and more recent modelling outputs have also pointed to effective infection control within both species (Chang et al., 2025).

The TVR study also showed that over 80% less badgers were removed from an area compared to proactive cull approach and, more importantly, TVR did not appear to induce any perturbation/increased movement of badgers and indeed the badger population structure seemed to be unaffected by the intervention (Menzies et al., 2021; O'Hagan et al., 2021; Allen et al., 2022).

A comprehensive annotated bibliography of the recent peer reviewed literature (2015-2024) is available from DAERA, as are all papers published associated with the aforementioned TVR study (see Section 11 for publications relating to the previous TVR project).

A regionalised approach was the subject of an independent scientific working group (SWG) opinion paper requested by the ROI's TB Forum (Griffin et al., 2024), which was further developed in Tratalos et al. (2024). The SWG report indicated that an area/regional approach should be adopted to bTB control and could be successful at driving down disease levels but stressed that key measures are important with respect to achieving success and with respect to area selection. Namely, it identified five criteria that are of high priority; inward cattle movement, trade flows, administration of the region, effectiveness of the badger programme and stakeholder commitment with the latter considered the most important criterion.

The Regionalisation Project
Within the Chief Veterinary Officer's Bovine TB Review (DAERA, 2024), a hybrid badger intervention approach was outlined as a possible way of maximising resource and minimising disruption to the badger population within an area. This review also highlighted the substantive progress made in reducing bTB levels by those countries who had applied a regionalised approach, for e.g. Australia and New Zealand, a concept that has never been trialled before on the island of Ireland as part of bTB eradication measures.
Following on from the CVO review, the Bovine TB Blueprint (DAERA, 2025) proposed a regionalisation pilot project for NI.

The Regionalisation Project is a proof-of-concept research platform that lets DAERA and partners test a full set of interventions at the same time. Its first main aim is to reduce bTB levels in both cattle and badgers in the pilot area and international experience shows that regionalisation can speed up this progress. Its second main aim is to generate strong evidence about which control measures work and in what circumstances. The five-year programme provides sufficient time to detect real epidemiological change and produce robust research. The initial badger sett survey, which has been conducted in the selected region in preparation for the rest of the project, creates the essential baseline information needed for later logistics and analysis.

Measures in the Regionalisation project will be based on cattle, people and wildlife. Cattle and people/biosecurity measures include six-monthly herd testing, managing inconclusive reactors, providing guidance on sourcing stock, enhanced breakdown testing (Interferon gamma (IFNg) blood testing), bespoke vet biosecurity visits, promoting breeding for cattle with stronger genetic resistance to bTB, partnership working between farmers, vets and DAERA, and improved communication and advice. The cattle testing measures are part of the national bTB Eradication Programme

Figure 1: Lands within a delineated region (235 km^2) of North-West Northern Ireland as demarcated by red line in map below:

Project boundary description

As highlighted in previous papers, the SWG report (Griffin et al., 2024) recommended the use of a large area (>100km^2) with strong physical boundaries (where possible) to limit the inward movement of potential bTB infection particularly in relation to wildlife. The area chosen for the proposed study is shown in Figure 1. The northern boundary of this area is coastline, and the western boundary follows the national border between NI and ROI, with the River Foyle in close proximity. These features form strong boundaries to the NI area which will be re-enforced by a badger TVR intervention within the ROI region (replacing previous badger culling and vaccination interventions). The southern boundary has a series of towns along its mostly westerly part and also encroaches on the start of the Sperrin Mountains which both limit the attractiveness of the area to badger activity. To the north of the eastern boundary, the River Faughan forms the initial physical boundary while to the middle and southern parts of this eastern boundary roads are the only physical delimitation. However, this land is mostly higher ground and therefore a less suitable badger habitat. Given the softer boundaries that exist to the east and south of the project area, a 500-metre buffer area will be deployed

around those borders. For cattle farms within this buffer area additional cattle testing and biosecurity advice will be provided to minimize bTB levels and will also help to mitigate against farm fragmentation effects.
Analysis of cattle movements also indicated that the chosen area has a net outward movement of cattle from this area.
Griffin et al. (2024) stated that effective stakeholder engagement/commitment as the most important criteria influencing success of a regional approach. Several farmers/vets' meetings have been held in the area over recent months outlining the project and these have been well attended. Furthermore, an excellent response (>96%) was received to a request for DAERA to access their land to facilitate a preliminary badger survey. These positive observations along with ongoing communications with farmers and vets in the area bode well for a successful project outcome.

Wildlife element of project
The wildlife element of this research project will focus on TVR badger intervention based on cage trapped badgers in the first two years with an adaptable approach after that. In summary, during Years 1 and 2, the work will follow a TVR-only approach, allowing the team to establish baseline infection levels, removing infected badgers, while vaccinating and releasing the majority of badgers. This will give a robust picture of badger *M. bovis* prevalence across the study area. If these data show localised pockets of higher infection, then in Years 3 and 4 those specific sub-areas will move to a combined TVR plus GonaCon (i.e. fertility vaccine) approach, to stabilise local population structure while continuing to remove infected animals. However, currently we do not believe that badger *M. bovis* prevalence is, or will be, at the level that would require the use of GonaCon at scale. In subareas where low badger *M. bovis* prevalence is found, there will be a move to a vaccination only regime. Subareas with a medium badger bTB prevalence will remain to be subjected to TVR intervention only. In Year 5, the protocol will revert to TVR-only for the whole area, enabling a direct comparison with the baseline data from Years 1 and 2 to assess how prevalence has changed over the course of the intervention. During the duration of the project all trapped badgers will be individually micro-chipped, which will enable baseline information to be recorded on infection prevalence and various ecological measurements.

Initial two years of TVR
The TVR badger intervention project in Co. Down indicated that there was heterogeneity in both badger density and the proportion of badgers that were DPP-test positive within the 100km^2 area (Menzies et al., 2021). Within the current project, it is proposed to use this heterogeneity to identify areas which can be switched over to vaccination only at an early stage after initial TVR monitoring of the entire area.
Using the available published data regarding capture rates and DPP test performance (Menzies et al., 2021; Arnold et al., 2021; Jinks et al., 2025), 44-47% of the badger population would be DPP test-negative/BCG vaccinated at the end of Year 1 while 66-71% would be DPP test-negative/BCG vaccinated at the end of Year 2. The more informed evidence base provided by two years of TVR monitoring for implementation of different intervention strategies over different sub-divisions within the area is therefore going to be utilised within Years 3 and 4 (subareas with ≤5% bTB badger prevalence will switch to vaccination-only; sub-areas with 5–20% bTB badger prevalence remain being subjected to TVR intervention and subareas with >20% bTB badger prevalence switch to TVR and fertility vaccine (Gonacon; Cowan et al., 2019)). The thresholds are based on the epidemiological distribution of bTB in Northern Ireland badgers, where RTA surveys estimate an average prevalence of around 20%. This makes >20% a logical cut-off for identifying above-average, high-risk areas

requiring more intensive intervention, while the 5–20% range captures areas at or below the endemic baseline where TVR remains appropriate, and ≤5% represents low-prevalence areas approaching disease suppression where vaccination alone is sufficient to maintain control. A larger proportion of the badger population within sub-areas being switched to vaccination only will have a much higher level of immunity. The soft boundaries between the vaccination only sub-areas and those that will remain on a TVR intervention will provide more resilience to any *M. bovis* infection challenges posed by these bordering sub-areas.

Badgers will be microchipped upon first capture so that vaccination status can be monitored but will also enable badger population monitoring (capture/recapture methodologies). A detailed examination will be carried out on each trapped badger after it is anaesthetised. The study provides a valuable opportunity to obtain a comprehensive range of samples from each trapped badger which may be analysed or stored for use in other projects.
Plucked hair samples will also be obtained from badgers which would enable badger genetic profiling and also cortisol measurement where necessary. Whiskers (taken from dead badgers) will also be removed to facilitate stable isotope analysis on the whiskers for diet reconstruction. As badgers will be anaesthetised for blood sampling for testing (by the DPP test or suitable replacement test), the opportunity will be taken to obtain each badger's physical attributes (e.g. weight, condition, parasite burden, lactation status, injuries), which can then be made available to third parties. Note that badgers within a vaccination only sub-area (Years 3 & 4) would not be anaesthetised but simply scanned for presence of a microchip, vaccinated and released. (Only those found without a microchip would be anaesthetised to enable a microchip to be inserted and vaccination given). All procedures carried out on badgers will be detailed in agreed Standard Operating Procedures including any additional sampling for further laboratory analysis e.g. clotted and whole blood samples, swabs for *M. bovis* culture.

Badgers testing positive to the DPP test (or suitable replacement) will be submitted to a suitable laboratory for post-mortem examination/culture of *M. bovis* so that such isolates will be available for a potential project on *M. bovis* whole genomic sequencing along with cattle *M. bovis* isolates and those obtained from road traffic accident badger isolates.

The overall Regionalisation Pilot aims to decrease *M. bovis* infection in both cattle and badgers, targeting a badger prevalence below 5%, a 50% drop in annual bTB cattle herd incidence, a 40% reduction in bovine reactor numbers, and improved biosecurity behaviours.

Key wildlife related research questions, amongst several others, include how different sub-area interventions affect annual badger *M. bovis* prevalence, how badger populations change in response and what evidence can refine closed-season dates. The use of geodatabases, Northern Ireland Farm Animal Information System (NIFAIS) cattle data, and structured behavioural assessment tools will create a multi-layered research dataset that supports robust, integrated data analysis.

The research pilot is also structured to generate a suite of peer-reviewed outputs, cross-border comparators, integrated data systems, and long-term behavioural monitoring. Ongoing collaboration with others allows both jurisdictions to advance a coordinated, evidence-based approach. Joint research will include AFBI studies on bTB genetics, drivers of farmer behaviour in relation to bTB related biosecurity measures, and eDNA; University College Dublin (UCD) work on badger movement, trap-ability, cortisol levels and diet; and

Department of Agriculture, Food and the Marine (DAFM) cross-border studies comparing cattle bTB levels between NI and ROI sites.

This Regionalisation Pilot is fundamentally a research initiative designed to generate the evidence NI has lacked for decades. By integrating cattle measures (targeted use of measures already used within the NI wide bTB Eradication Programme), wildlife, and behavioural science, aligning with County Donegal, and applying adaptive methods informed by prior TVR experience, the project will deliver the robust evidence base needed to inform future policy and accelerate progress toward bTB eradication.

In relation to the badger research component of this project, DAERA's VSAHG has obtained an ASPA (Animals (Scientific Procedures) Act 1986) Establishment Licence (PEL Number 5037) and has submitted an ASPA Project Licence for this work.

Statistical analysis
As with the previous TVR study, the main statistical analysis will be using a before and after approach along with trend analysis of the five years of data from the different aspects of the study (badgers, cattle, biosecurity). It has proven problematical to identify comparable control areas of similar characteristics to the study area. Comparative studies relating to cattle bTB levels is therefore currently planned to contrast the NI study region to the rest of NI. The study region is considered to have cattle bTB levels and badger active main sett density levels that broadly equate to the NI averages for these parameters indicating that this may be the most suitable comparative analysis to complement the within region before and after analysis.

Although not an exhaustive list, specific wildlife outputs expected from the pilot project include the following outputs across the different themes of badgers, biosecurity and cattle.

Impact on annual badger M. bovis prevalence
While TVR was shown to be successful in significantly reducing the annual *M. bovis* prevalence in badgers (Arnold et al., 2021), it was a study in only one area so some form of replication of TVR will continue to build the evidence base for such an intervention. However, given the success of the previous TVR intervention in badgers, including the exponential decline in annual badger *M. bovis* prevalence and absence of social perturbation (O'Hagan et al., 2021), this study will monitor if it is feasible to accelerate the move to a vaccination only approach in appropriate situations. In this respect, it aims to take advantage of the spatial heterogeneity of *M. bovis* seroprevalence that was observed in the previous TVR study (Menzies et al., 2021). This is assuming that it also occurs in this study area, which is thought to have a different badger demographics/lower badger density.
The characteristics of the DPP test were elucidated during the previous TVR study (Menzies et al., 2021) and these can be used to provide an estimation of annual badger *M. bovis* prevalence in this area. If there is a need to use a suitable alternative test to DPP (in the event of any supply issue), then there will also be the need to characterise this test and the subsequent need for additional samples taken from the badgers.

Impact of badger demographics
Capture/recapture data from badgers will enable badger populations to be estimated annually to monitor for any changes; none were observed during the previous TVR project (O'Hagan et al., 2021). These data will enable monitoring of changes in badger social groups over the project timescale.

It is also proposed to place a Global Positioning System (GPS) collar (with a customised drop-off system) on a maximum of ten badgers, clustered in one area (neighbouring clans) in order to estimate territory size and contact rates across neighbouring clans. This will be paired with a similar area in Donegal (similar ecological conditions but heavy badger culling history).

Impact on farmer behaviour

The HerdSafe biosecurity app, developed through the Welsh Government-funded *Arwain DGC* programme, is a digital tool that enables farmers and veterinarians to carry out structured on-farm risk assessments, generating a weighted biosecurity score and tailored action plans to reduce disease transmission risks such as bTB (Mentera, 2025). This app provides a quantitative biosecurity assessment for a herd and will enable analytical comparisons between farms, as well as measurement of temporal changes. Trials across Welsh farms showed that the app improves biosecurity practices and strengthens vet–farmer communication by facilitating real-time, collaborative discussions and focusing on practical, achievable changes rather than overwhelming recommendations. Importantly, the scoring system allows farmers to visualise progress and encourages incremental behavioural change, with many farms implementing targeted measures to reduce infection risks. In NI, where farmer uptake of biosecurity measures has historically been inconsistent (O'Hagan et al., 2016; Lahuerta-Marin et al., 2018), this tool will be integrated into the Regionalisation Pilot to try and improve adoption of effective biosecurity measures. PVPs in the area will conduct the on-farm questionnaires and data obtained will be analysed by DAERA. Evidence suggests that farmer behaviour is strongly influenced by veterinary guidance and perceived practicality of interventions (Lahuerta-Marin et al., 2018), meaning a collaborative, feedback-based tool like HerdSafe could positively influence attitudes, increase engagement, and promote sustained adoption of biosecurity practices, contributing to improved bTB control outcomes. HerdSafe (adapted to the NI situation) will be therefore integrated into the Regionalisation Pilot in NI, where its implementation will be evaluated to determine how effectively it influences farmer behaviour, assess whether the tool leads to measurable improvements in biosecurity practices, and identify how it can be further refined and adapted to maximise behavioural change and support more effective bTB control. Behavioural change training is to be provided to both PVPs and DAERA staff working within the study area by Animal Health Ireland's social scientist. A further social science proposal lead by Teagasc to describe and evaluate the behaviours and attitudes of farmers over time within the study area is currently being considered.

Other indirect measures can be used to provide circumstantial evidence of changes in farmer behaviour such as changes in cattle purchasing patterns over the study period (using NIFAIS derived data).

Impact of cattle bTB levels

The enhanced cattle measures that will be employed are closely integrated with the biosecurity advice and these are broadly summarised below:

1. Six-monthly testing of herds (excluding bTB herd breakdowns)
2. Retention of inconclusive reactors in herds/early slaughter
3. Advice on sourcing replacement stock
4. Enhanced measures in bTB herd breakdowns (parallel IFNg blood testing & epidemiological investigations)
5. Bespoke biosecurity visits from PVPs
6. Encouraging use of TB Advantage in herds using artificial insemination.

7. Working in partnership (farmer, PVP, DAERA)
8. Better communications, information and advice.

All NI cattle data relating to bTB are recorded on NIFAIS and data relating to cattle herds in the area will be extracted and analysed using before (Year 1) and after (Year 5) approaches along with trend analysis. Regional cattle bTB statistics will also be compared to the rest of NI.

Study Aim
The primary aim of this project is to causally assess the effectiveness of an integrated, regionally applied intervention package (cattle measures, behavioural interventions, and wildlife management) in reducing *M. bovis* transmission in a defined geographic area. This will be achieved through longitudinal, multi-level measurement of epidemiological, ecological, and behavioural outcomes, enabling attribution of observed changes to specific intervention components. This mixed design improves causal inference in the absence of full randomisation.

The primary objectives are to assess if implementation of this regionally coordinated, multi-pillar intervention significantly reduce *M. bovis* prevalence in badgers and bTB incidence in cattle herds. The primary hypotheses being tested across the different themes are:

Wildlife**:** Adaptive badger intervention (TVR ± vaccination ± fertility control) will result in a statistically significant reduction in annual *M. bovis* prevalence in badgers, compared to baseline levels and expected counterfactual trends.

Cattle**:** The combined intervention package will result in a ≥50% reduction in herd-level bTB incidence, controlling for confounders such as herd size, movement patterns, and historical risk.

bTB transmission**:** Reduction in badger *M. bovis* prevalence will be associated with reduced cattle incidence, supporting a wildlife–cattle transmission pathway. This output will rely heavily on the associated DAERA-Directed AFBI Research Project 25/T3/02: Bovine TB pathogen genetic surveillance in an intensive action intervention area (see Section 10).

Behavioural change**:** Structured biosecurity interventions will produce measurable improvements in risk-reducing behaviours, which will be independently associated with reduced herd breakdown risk. This output will be supported by DAERA-Directed AFBI Research Project 25/T3/01 FFP: BASE bTB Behavioural Analysis of Societal and Economic Factors in Bovine Tuberculosis) Control (see Section 10).

The nested sub-area comparison included during Years 3 and 4 (mainly badger vaccination only compared to the benchmark TVR intervention as use of TVR plus fertility control is predicted likely to only occur in small sub-populations) will form an inferiority trial type analysis but is subject to allocation bias as only areas of lower seroprevalence and badger density will be subjected to a vaccination only approach. In ROI social science will also be researched in relation to farmer behaviour and attitudes towards bTB, with the aim of influencing practices to empower herd protection, improve wellbeing, and evaluate how such behavioural changes can be sustained and extended beyond the study areas in both jurisdictions. This research will be conducted by Teagasc and extension of a similar approach to the study area is under consideration.

Data recording
Badger data will be recorded in real time using a badger intervention app being developed by DAERA Digital Services Division which is currently be tested by field users. Cattle data will be extracted for NIFAIS on which all NI cattle movements and bTB test results and statuses are recorded as part of the current bTB Eradication Programme. Farm biosecurity data will be obtained from annual downloads for the HerdSafe app that will be used for recording farm biosecurity assessments.

Statistical power
The project is limited by resource availability and cost and the area selected needed to take geographical considerations into account. A power study is currently being worked upon in consultation with a statistician with the results expected in due course. However, it should be noted that the estimated badger population of this area is larger than that of the previous TVR study (690 cf 560) as is the actual area. The large number of influential peer reviewed publications arising from the previous TVR study gives confidence that this project will be no less successful (see Section 11).

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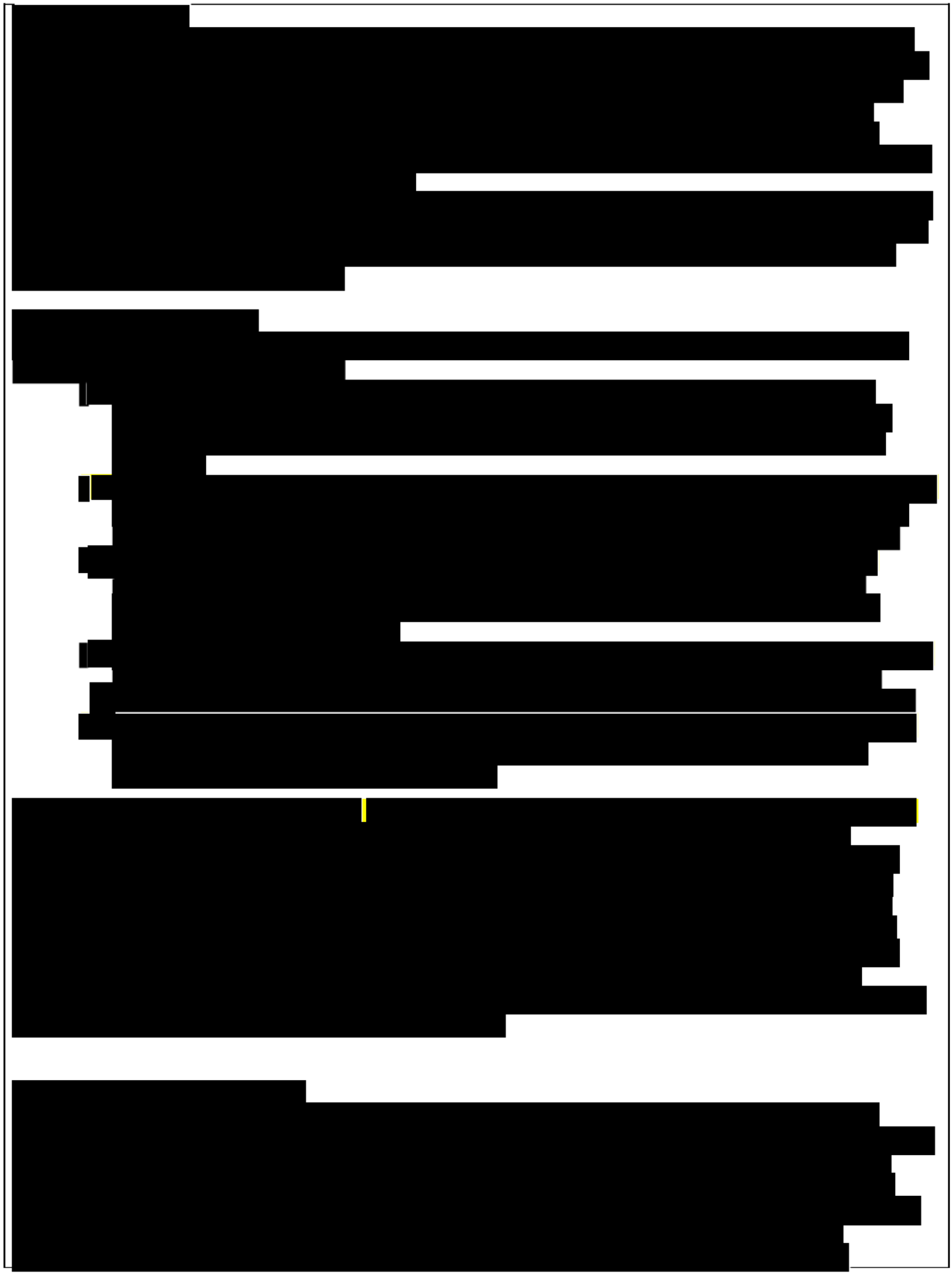

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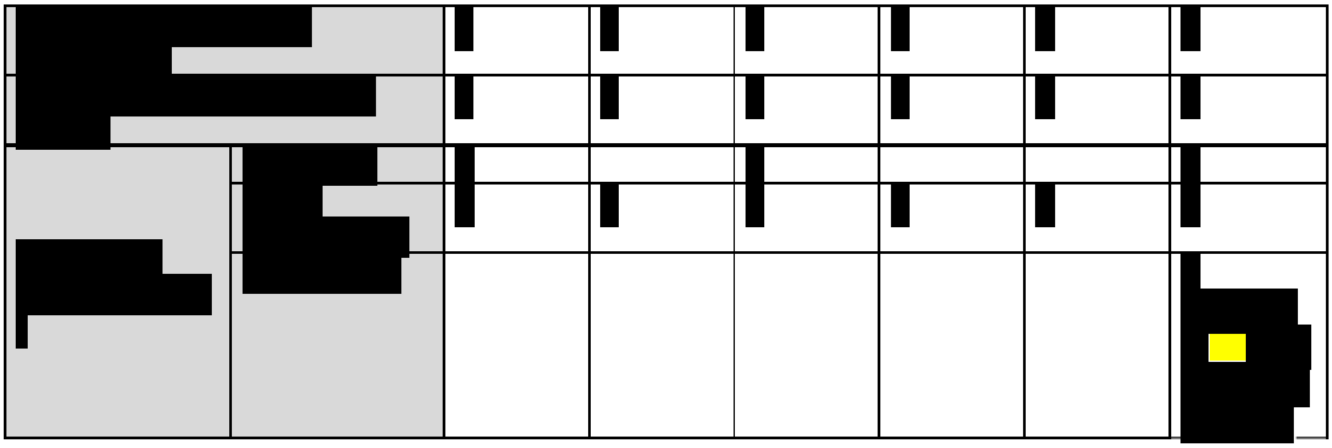

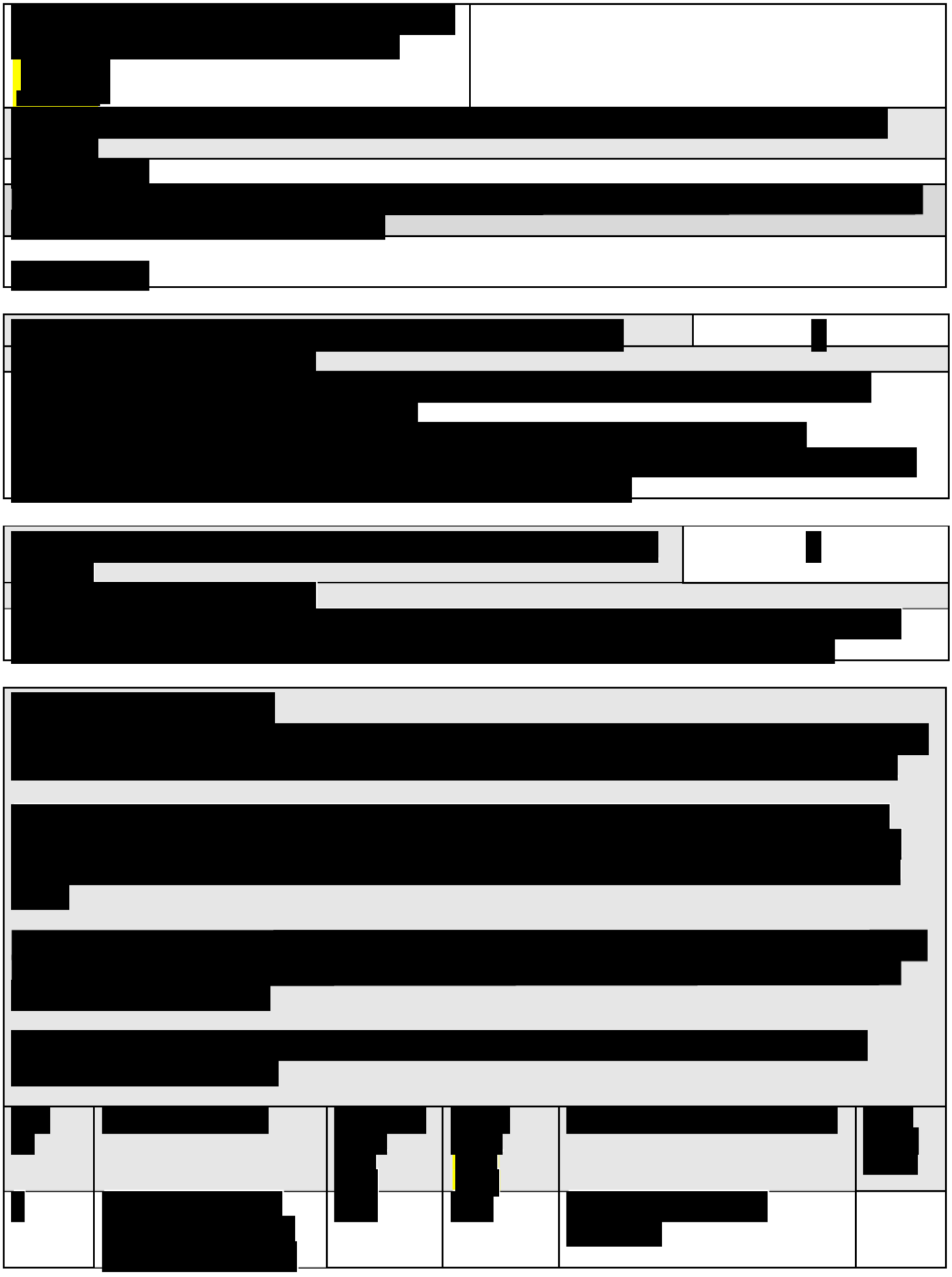

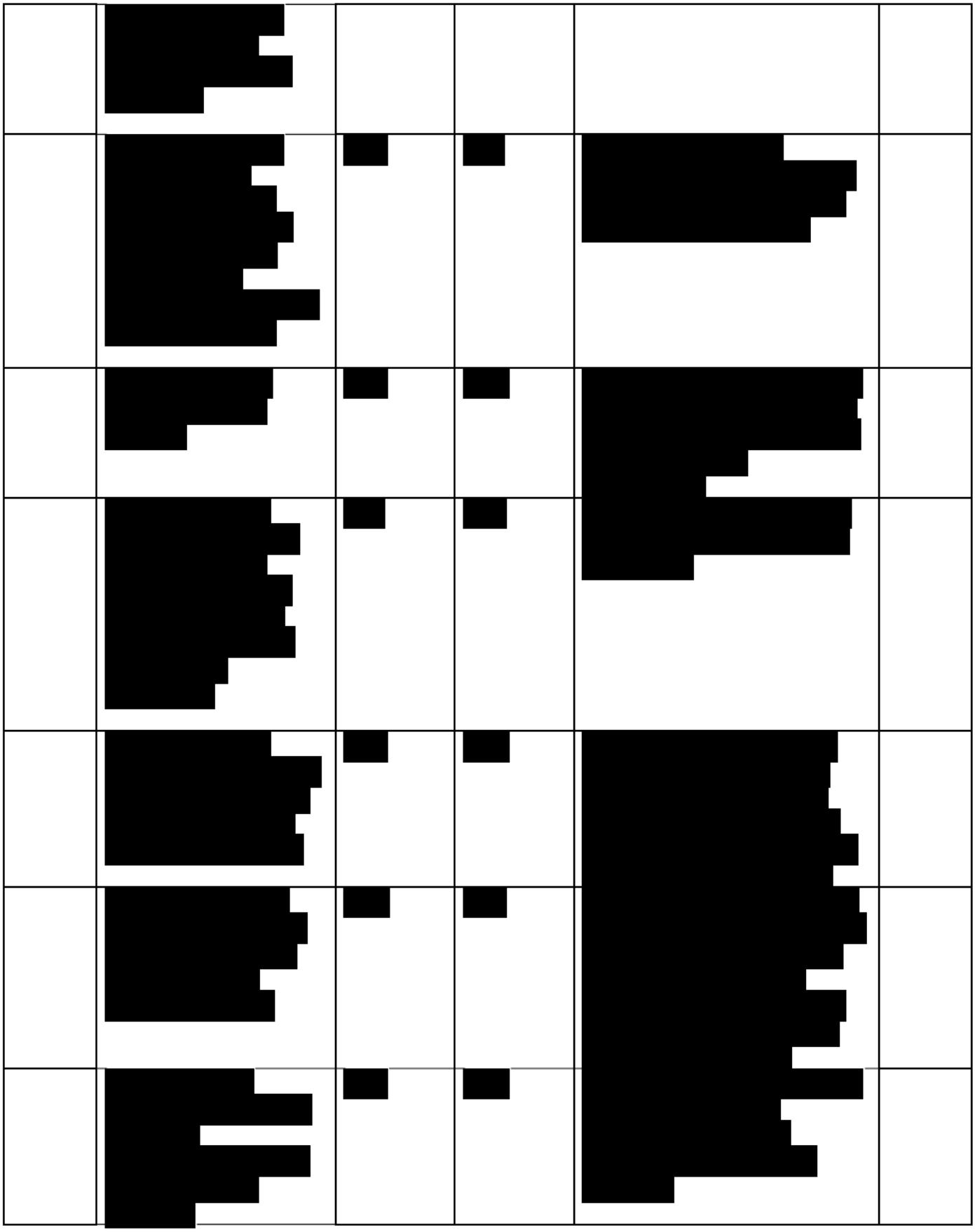

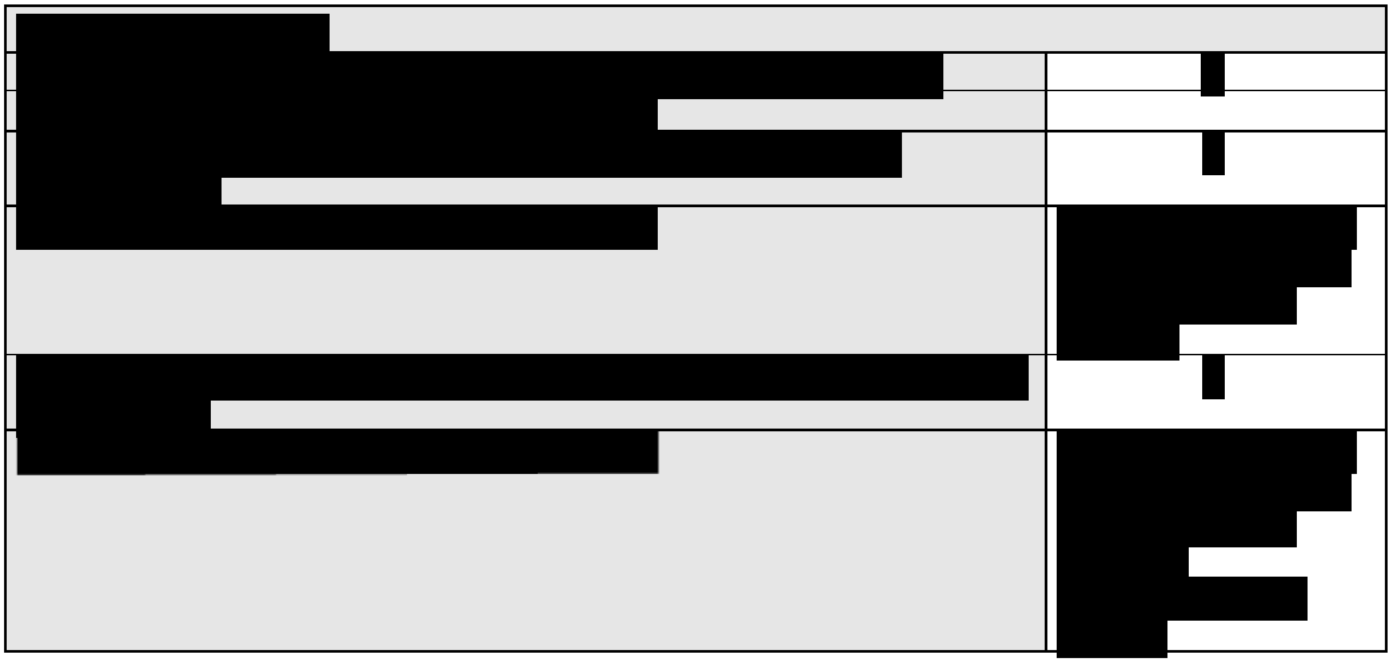

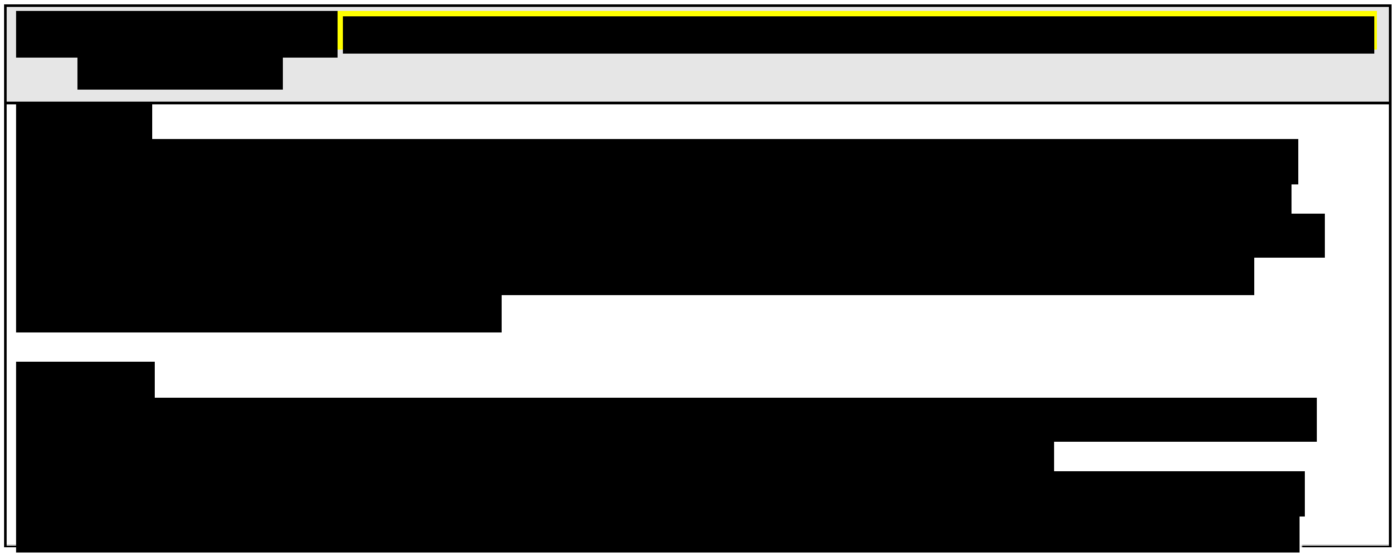

■ Outcomes - these are the eventual benefits to society that a project is intended to achieve.

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[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
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[redacted]			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]			

[redacted]

[redacted] – these are the eventual benefits to society that a project is intended to achieve.

[redacted]

[redacted]			
	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
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