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Data Article

A survey dataset to identify industry practices and challenges for mine rehabilitation completion criteria in Western Australia

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ABSTRACT

The development of acceptable and achievable completion criteria is fundamental to the successful relinquishment of mined land to a post-mining use. Despite the central role of completion criteria, there is still a need to build capacity and understanding of how to set targets and develop measurable completion criteria that are accepted by all stakeholders involved. The work described in this paper aimed to elicit industry practice, barriers, and opportunities for the development of feasible and acceptable completion criteria. We developed a quantitative survey that was administered online. The target respondents consisted of mining companies, consulting businesses, and relevant regulators in Western Australia. The survey questionnaire, raw survey data, and summary statistics are provided in this paper to increase research transparency and facilitate reproducibility of the methods by researchers in other jurisdictions.

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Specifications Table

Subject	Management, Monitoring, Policy and Law
Specific subject area	Mine rehabilitation
Type of data	Table Chart
How data were acquired	Survey (survey questionnaire available at https://doi.org/10.26182/x2fw-s027)
Data format	Raw Analyzed
Parameters for data collection	The target sample consisted of mining industry professionals directly involved in the writing or assessing of mine completion criteria—or related planning and closure processes. Target stakeholders: i) Environmental managers or compliance officers within mining companies; ii) Consultants engaged with developing mine closure plans and completion criteria; and iii) State regulators with experience in assessing mine closure plans or mine completion processes.
Description of data collection	Data was collected between June 2018 and October 2018 through an online survey. Potential participants were identified through purposive sampling and chain referrals, using the researchers' professional networks, word-of-mouth, and publicly available information such as company and government websites, and published literature. Participants were approached via email, targeting managers in the rehabilitation and closure teams of mining companies, closure specialists at consulting businesses, and environmental officers or managers at State Government agencies involved in mine closure planning and approval ('regulators').
Data source location	Institutions: Mining companies, Consulting businesses, State Government agencies City/Town/Region: Western Australia Country: Australia
Data accessibility	Repository name: Pure, The University of Western Australia Research Repository Data identification number: https://doi.org/10.26182/x2fw-s027 Direct URL to data: https://research-repository.uwa.edu.au/en/datasets/a-survey-dataset-to-identify-industry-practices-and-challenges-fo
Related research article	M.E. Kragt and A. Manero, 2021, Identifying industry practice, barriers, and opportunities for mine rehabilitation completion criteria in Western Australia, J. Env. Manage., 287: 112258. DOI: 10.1016/j.jenvman.2021.112258.

Value of the Data

- Setting feasible, acceptable, and measurable targets forms the basis for successful rehabilitation of mined lands, but little guidance exists on how such targets ('completion criteria') should be developed. This survey dataset captures what barriers and challenges are faced by industry stakeholders (mining companies, consultants, regulators) when developing completion criteria for mine site rehabilitation.
- This dataset provides useful information for government agencies about what challenges mining proponents face. The data will also benefit researchers searching for information about mine rehabilitation and closure criteria.
- The data-set, and accompanying questionnaire, may be used by other researchers who aim to conduct a similar study in other jurisdictions.
- The authors are not aware of similar work that consulted with a large number of industry stakeholders and regulators about the processes followed and barriers encountered when developing mine completion criteria and closure plans.

1. Data Description

The data file contains the raw survey data of an industry survey conducted with mining company employees, consultants, and government agencies on how they develop or assess mine

rehabilitation completion criteria and mine closure plans, and the barriers encountered in that process. A total of 75 responses were collected.

The first column of the Excel spreadsheet captures the date on which the survey was completed (*Survey Date*); the second column screens whether the respondent is involved in developing, advising on, or approving mine completion criteria and/or closure plans (only 'yes' respondents are included); the third column captures which group of stakeholders the respondent most identifies with (Consulting, Mining Industry, or Government); and the fourth column is a respondent identifier (*ID*) that captures whether the respondent is an employee of a mining company (MC), a consultant (C) or a regulator (R). The remaining columns are results for each survey question. The phrasing and answer options of each question are detailed in the survey questionnaire accessible at https://doi.org/10.26182/x2fw-s027.

Due to human ethics requirements, some variables and responses that were collected in the questionnaire had to be removed from the raw survey data to ensure that responses are non-identifiable. The following information has been removed from the publically available data file:

- Any identifying information such as IP addresses, email addresses, and location of mine sites (Question S1-I2).
- Questions where answers revealed respondents' identifying information:
  - "*How do you make sure that your completion criteria* (MC question S3-I4) / *the completion criteria you develop* (C question S3-C2) *are SMART? (specific, measurable, achievable, resources, time-bound)?*"
  - "*Could you give one (or more) example(s) of measurable indicators that you use to assess progress towards your completion criteria?*" (Questions S3-I6 and S3-C4)
  - "*What regulatory body are you part of?*" (R question S1-G1)
  - "*The following teams are involved in advising on/assessing mine closure plans in your organisation*_____" (Questions S5-I5 and S5-G1)

Descriptive statistics of the sample and survey responses are provided below. For ease of formatting, these descriptive statistics are provided in tabulated form.

1.1. Sample description (Table 1)

The majority of surveyed mining companies and consultants were involved in iron ore, gold, mineral sands, or mining of basic raw materials (Table 2), with operations spread across all regions of WA. A range of small, medium, and large mining operators participated in the study, with 2016–17 operating revenues ranging from less than 1 million AUD ($n = 3$) to over 5 billion AUD ($n = 9$) (Table 3). Almost half of consulting businesses surveyed were small local business, with the rest sole traders and large international companies (Table 3). Government employees (henceforth 'Regulators') came from the Department of Biodiversity, Conservation and Attractions ($n = 6$); Department of Mines, Industry Regulation and Safety ($n = 3$); Department of Water and Environmental Regulation ($n = 3$); and the Department of Planning, Lands and Heritage ($n = 2$). Two government employees did not state which agency they were affiliated with.

Table 1
Surveyed stakeholder groups.

Stakeholder group	%	Count
Mining industry	54.7%	41
Consulting business	24.0%	18
Government agency	21.3%	16
TOTAL	**100%**	**75**

Table 2
Primary minerals relevant to mining companies and consulting business respondents.

	Mining industry: Predominantly mined mineral(s) by our organisation		Consulting: Type of mining industry that is primary client	
	%	Count	%	Count
Iron ore	27.1%	16	20.0%	16
Gold	13.6%	8	20.0%	16
Other (e.g. copper, lithium)	25.4%	15	13.8%	11
Mineral sands	10.2%	6	12.5%	10
Bauxite	6.8%	4	8.8%	7
Rare earths	–	0	8.8%	7
Diamonds	1.7%	1	6.3%	5
Coal	5.1%	3	5.0%	4
Salt	–	0	3.8%	3
Basic raw materials	10.2%	6	1.2%	1
TOTAL	**100%**	**59**	**100%**	**80**

Table 3
Size of mining companies and consulting businesses in survey responses.

What was your company's approximate operating revenue in the 2016–17 financial year?			*What is the approximate size of your company?*		
Mining industry operating revenue	%	Count	Consulting business size	%	Count
< 1 million	7.5%	3	Large consulting business with offices in multiple (intern)national locations	27.8%	5
1–9 million	7.5%	3			
10–49 million	7.5%	3	Large consulting business with several offices in Western Australia	–	0
50–99 million	5.0%	2			
100–499 million	10.0%	4	Small-medium consulting business with one office in Perth (or elsewhere in WA)	44.4%	8
500–999 million	2.5%	1			
1–5 billion	10.0%	4	Sole trader	22.2%	4
> 5 billion	22.5%	9	Other, namely	5.6%	1
Don't know	27.5%	11			
TOTAL	**100%**	**40**	**TOTAL**	**100%**	**18**

1.2. Land tenure and decisions about post-mining land use (Tables 4–6)

Table 4
Tenure at the site prior to the establishment of the mine lease (mining industry respondents only).

What was the tenure at the site prior to the establishment of the mine lease?	Mining industry	
Pastoral lease	35.7%	25
Unallocated crown land	25.7%	18
Private land	12.9%	9
Native title	11.4%	8
Forestry reserves	8.6%	6
Reserve land	5.7%	4
Other, namely	–	0
Don't know	–	0
TOTAL	**100%**	**70**

Table 5
Pre- and post-mining land use at sites selected by survey respondents[a].

Land use	Pre-mining land use (# of sites)	Post-mining land use (# of sites)	Pre-mining LU = Post-mining LU (# of sites)
Pastoral	25	25	24
Natural ecosystem	17	19	14
Forestry	6	4	4
Agriculture	5	6	5
Recreation	1	6	1
Other (e.g. industrial or commercial, residential, or energy generation)	3	12	–

[a] The number of pre- and post-mining land uses is larger than the 39 total received responses because all but three sites had multiple pre-mining land uses and/or multiple post-mining land uses.

Table 6
Decision making framework(s) used to choose the end land use (mining companies and consulting only).

What decision making framework(s) did you use to choose the end land use?	Mining industry		Consulting business	
Based on what was there before	37.3%	25	14.1%	9
Negotiated with the regulator	13.4%	9	18.8%	12
Negotiations with the client	–		18.8%	12
Negotiated with local communities	13.4%	9	15.6%	10
Specified by the regulator (e.g. in approval)	13.4%	9	4.7%	3
Multi-Criteria Analysis	11.9%	8	7.8%	5
Landscape capability assessments	7.5%	5	10.9%	7
Cost-Benefit Analysis	1.5%	1	4.7%	3
No decision-making framework	1.5%	1	–	0
Something else	–	0	4.7%	3
TOTAL	**100%**	**67**	**100%**	**64**

1.3. Development of completion criteria and associated challenges (Tables 7–11)

Table 7
Level of detail of completion criteria developed for specific site (mining industry only).

How refined are the completion criteria developed for the site?	Mining industry	
Criteria have not yet been developed for the site	2.7%	1
Criteria are generic and broadly indicative	40.5%	15
Criteria have been refined for the site	43.2%	16
Criteria are very detailed and specific	13.5%	5
TOTAL	**100%**	**37**

Table 8
Do completion criteria have measurable indicators? (Mining industry only).

Does each of your completion criteria have a measurable indicator?	Mining industry	
Yes, ALL of our criteria have measurable indicators against them	27.8%	10
Yes, SOME of our criteria have measurable indicators against them	47.2%	17
No, NONE of our criteria have measurable indicators against them	–	0
No, we are still in the process of determining indicators for our criteria	25.0%	9
TOTAL	**100%**	**36**

Table 9
Regulators' perception of completion criteria assessed in mine closure plans.

	In general, are the completion criteria in mine closure plans sufficiently detailed and site specific?		*In general, do the completion criteria in mine closure plans have measurable indicators against each criteria?*	
The majority of the plans I see have detailed and specific CC/measurable indicators	–	0	7%	1
This varies greatly between sites	13%	2	7%	1
This varies greatly between companies	53%	8	29%	4
The majority of the plans I see lack detail in their CC/measurable indicators	33%	5	57%	8
TOTAL	**100%**	**15**	**100%**	**14**

Table 10
Information source(s) used to guide the development of completion criteria (mining and consulting only).

What information source(s) do you use to guide the development of completion criteria?	Mining industry		Consulting business	
Guidelines for Preparing Mine Closure Plans	19%	31	16%	16
Rehab team's knowledge	16%	26	14%	14
Our previous closure plans	15%	24	12%	12
Internal guidelines	10%	17	4%	4
Closure plans from others	9%	14	5%	5
Approvals team's knowledge	7%	12	9%	9
Mine Closure Leading Practice Handbook	5%	8	8%	8
EPA Environmental Factor Guidelines	4%	7	8%	8
Mine Rehabilitation Leading Practice Handbook	4%	7	7%	7
EPA Guidance "Rehabilitation of Terrestrial Ecosystems"	4%	6	7%	7
SERA Standards for Ecological Restoration	1%	1	5%	5
Other	6%	9	4%	4
Don't know	1%	1	–	0
TOTAL	**100%**	**163**	**100%**	**99**

Table 11
Risks taken into account when developing/assessing completion criteria.

What risks do/did you take into account when developing/assessing completion criteria (for this site?) (select as many as apply)	Mining industry		Consulting business		Regulators		TOTAL
	%	#	%	#	%	#	count
Failure of vegetation establishment	7.2%	24	7.5%	11	8.3%	12	47
Erosion risks	7.2%	24	7.5%	11	7.6%	11	46
Impacts on groundwater	7.5%	25	6.1%	9	8.3%	12	46
Impacts on surface water	7.2%	24	6.8%	10	7.6%	11	45
Financial (e.g. company resources changing)	7.8%	26	6.1%	9	4.1%	6	41
Acid drainage	6.0%	20	6.1%	9	7.6%	11	40
Landforms not created to design standards	6.0%	20	6.1%	9	6.9%	10	39
Extreme weather (e.g. likelihood of cyclones, flood events, droughts)	5.7%	19	6.8%	10	6.9%	10	39
Impacts on threatened flora and fauna	5.4%	18	6.1%	9	7.6%	11	38
Ecological communities do not develop	5.4%	18	7.5%	11	6.2%	9	38
Human access to relinquished mine site (e.g. pit lakes)	5.7%	19	6.8%	10	5.5%	8	37
Regulatory changes	6.6%	22	5.4%	8	3.4%	5	35
Climate change effects on long term rehabilitation outcomes	4.8%	16	4.1%	6	6.2%	9	31
Cumulative risks across the catchment	3.6%	12	2.7%	4	5.5%	8	24
Litigation over environmental or social outcomes	4.5%	15	3.4%	5	2.8%	4	24
Community expectations being too high	3.6%	12	5.4%	8	2.1%	3	23
Community changing their preferences	4.8%	16	3.4%	5	1.4%	2	23
Other, namely	1.5%	5	2.0%	3	2.1%	3	11
TOTAL	**93%**	**335**	**93%**	**147**	**92%**	**145**	**627**

A few significant differences are observed in rankings (Table 12). 'Small' mining companies (with less than 100 million operating revenue) place more importance on the statement '*Regulator imposes additional standards on previously approved CC*' than medium- to large-sized mining companies ($p = 0.06$).

Table 12
Mean ranked importance of challenges when developing completion criteria (ranked from 1 = most important to 8 = least important). Standard deviations in parentheses. (n = number of responses received).

Challenge	Mining industry ($n = 35$)		Consultants ($n = 17$)		Regulators ($n = 12$)	
Insufficient data to develop evidence-based CC	3.23	(1.99)	2.24	(1.73)	1.58	(0.76)
Alternative post-mine land uses not adequately explored	3.97	(2.26)	3.88	(2.08)	3.67	(1.70)
No appropriate reference to benchmark achievement against	4.69	(1.88)	4.47	(1.85)	2.83	(1.28)
Government departments set different standards	3.49	(1.84)	4.65	(1.61)	5.58	(1.98)
Approved CC are impossible to achieve	5.40	(2.07)	4.00	(2.11)	4.25	(1.23)
Regulator imposes additional standards on previously approved CC	3.94	(1.84)	5.41	(1.46)	5.75	(1.09)
Proponents are required to monitor everything, instead of selectively	4.97	(1.72)	5.47	(1.79)	6.00	(1.22)
Something else	6.31	(2.80)	5.88	(3.07)	6.33	(2.90)

Comparing between stakeholders, the mining industry rates '*Insufficient data*' and '*Approved completion criteria are impossible to achieve*' as a less important challenge than consulting businesses and government agencies ($p = 0.07$ and $p = 0.03$ respectively). The mining industry places more importance than consulting businesses and government agencies on '*Government departments all set different standards*' ($p = 0.03$) and '*Regulator imposes additional standards on previously approved completion criteria*' ($p = 0.00$). Government agencies place a higher ranking on '*We have no appropriate reference to benchmark achievement against*' than the other two stakeholder groups ($p = 0.01$).

1.4. Monitoring and evaluation practices (Tables 13–17)

Table 13
Approaches to evaluating progress towards rehabilitation and meeting completion criteria.

How do you typically evaluate progress towards completion criteria?	Mining industry		Consulting business	
Compare against benchmarked analogue/reference sites	42.4%	25	39.5%	15
Monitoring whether the system's trajectory is towards a stable system	40.7%	24	39.5%	15
ISO or other standards	8.5%	5	5.3%	2
No stated benchmark	5.1%	3	–	0
Compare against agreed criteria/outcomes	1.7%	1	7.9%	3
Other	1.7%	1	7.9%	3
TOTAL	**100%**	**59**	**100%**	**38**

Table 14
Typical evaluation/monitoring methods used.

What evaluation/monitoring method(s) do you typically use to assess completion criteria?	Mining industry		Consulting business	
Vegetation transects	18.0%	23	20.3%	14
Ecosystem Function Analysis/ Landscape Function Analysis	14.8%	19	15.9%	11
Remote sensing	11.7%	15	17.4%	12
Soil and/or water testing	18.0%	23	10.1%	7
Erosion/landform stability plots	14.1%	18	13.0%	9
Permanent vegetation plots	11.7%	15	10.1%	7
Fauna trapping	7.0%	9	2.9%	2
Grazing / cropping trials	0.8%	1	2.9%	2
Other (visual monitoring, combination of methods, …)	3.9%	5	7.2%	5
TOTAL	**100%**	**128**	**100%**	**69**

Table 15
Reasons for using specific monitoring methods.

What are the main reasons for choosing that/those monitoring method(s)? Pick up to three options.	Mining industry		Consulting business	
To address our specific completion criteria	30.2%	26	28.6%	12
Based on our previous experiences	20.9%	18	23.8%	10
To detect early effectiveness of interventions	17.4%	15	19.0%	8
To improve statistical efficiency (e.g. power analysis)	9.3%	8	9.5%	4
Based on referenced best practice	7.0%	6	9.5%	4
Based on external guidelines	9.3%	8	–	0
Based on examples from other businesses	3.5%	3	2.4%	1
Other (e.g. based on approval processes)	1.2%	1	7.1%	3
Don't know	1.2%	1	–	0
TOTAL	**100%**	**86**	**100%**	**42**

Table 16
Key considerations when choosing a reference site.

What are the key considerations when choosing a reference site? Pick up to three	Mining industry		Consulting business	
Matches anticipated end land use	19%	13	26%	10
Matches pre-existing vegetation at mine site	29%	20	11%	4
Suitability to end land use	19%	13	18%	7
Based on what's achievable	7%	5	24%	9
Proximity to mine site	16%	11	8%	3
Similar disturbance history	3%	2	8%	3
Similar grazing pressure	1%	1	3%	1
Other, namely	4%	3	3%	1
Don't know	–	0	–	0
TOTAL	**100%**	**68**	**100%**	**38**

Table 17
Time points at which progress is monitored.

At what points in time do you monitor progress?	Mining industry		Consulting business	
Annually	40.0%	14	18.8%	3
Periodically	8.6%	3	12.5%	2
At pre-defined points in time, typically	37.1%	13	37.5%	6
Other, namely	11.4%	4	31.2%	5
Don't know	2.9%	1	–	0
TOTAL	**100%**	**35**	**0%**	**16**

1.5. Coordination and engagement with other organizations (Tables 18–20)

Table 18
Key regulators that respondents engage with.

Who is/are the key regulator(s) that you engage with when developing mine completion criteria and planning for closure? / Who is/are the other key regulator(s) that you engage/consult with when advising or assessing mine closure plans?	Mining industry		Consulting business		Regulators	
	%	#	%	#	%	#
DMIRS (Dep. Mines, Industry reg., Safety)	23%	29	24%	16	19%	9
DWER (Dep. Water and Environmental Regulation)	18%	22	13%	9	19%	9
EPA (Environmental Protection Agency)	12%	15	13%	9	15%	7
DBCA (Dep. Biodiversity, Conservation, Attractions)	12%	15	13%	9	6%	3
JTSI (Dep. Jobs, Tourism, Science, Innovation)	5%	6	7%	5	11%	5
DPLH (Dep. Planning, Lands, Heritage)	7%	9	3%	2	6%	3
Parks and Conservation Commission	2%	3	1%	1	9%	4
Pastoral Lands Board	1%	1	6%	4	4%	2
DPIRD (Dep. Primary Industries and Regional Development)	2%	3	3%	2	4%	2
Local government	7%	9	1%	1	–	0
Forest Product Commission	3%	4	1%	1	2%	1
We don't engage with regulators	2%	3	1%	1	–	0
WaterCorp	1%	1	1%	1	–	0
DLGSCI (Dep. Local Government, Sport and Cultural Industries)	–	0	1%	1	–	0
Pilbara Development Commission	–	0	1%	1	–	0
Other, namely	3%	4	6%	4	4%	2
TOTAL	**100%**	**124**	**100%**	**67**	**100%**	**47**

Table 19
Do you have one contact person in the department, or do you have multiple points of contact?

	Mining industry		Consulting business	
We have one consistent contact person	28.1%	9	–	0
We liaise with different persons at the department	71.9%	23	100%	16

Table 20
Key community stakeholders that respondents engage with.

What community stakeholders do you typically engage with when developing your completion criteria? (open answer question) (# of responses)	Mining industry (n = 35)		Consulting business (n = 17)		Regulators (n = 12)	
	%	#	%	#	%	#
None	11%	4	35%	6	53%	9
Pastoral owners/Pastoralists/Landholders	46%	16	59%	10	12%	2
Traditional owners/Aboriginal groups/Indigenous claimants/Native title groups	49%	17	53%	9	12%	2
Local Government/Shire	34%	12	41%	7	6%	1
Regional Government	6%	2	–			
Local communities	17%	6	35%	6		
Other tenement neighbours/Adjacent landowners	14%	5	6%	1		
NGO's (e.g. Wildflower Society)	3%	1	29%	5		
Catchment Council/NRM Groups	9%	3	6%	1		
Local businesses	–		12%	2		
Usually arrange by client	–		12%	2		
None for crown land	6%	2				
Research partners	3%	1				
Stakeholder engagement will occur as sites approach closure	3%	1				

1.6. Resources

The following two tables synthesise five open answer responses about the resources avaialble to meet, develop, or evaluate completion criteria (Tables 21 and 22).

Table 21
Resource availability to meet/develop/evaluate completion criteria.

Does your business have sufficient resources to meet/develop/evaluate mine completion criteria or provide input into mine closure planning? Please think of financial resources, knowledge, staff numbers, practical skills, etc.	Mining industry		Consulting business		Regulators	
	%	#	%	#	%	#
Yes we have sufficient resources	71%	27	41%	7	14%	2
We lack staff	11%	4			14%	2
We lack knowledge/data	5%	2	35%	6	7%	1
We lack financial resources	5%	2				
We lack practical skills	3%	1				
We lack guidance from regulator			12%	2		
We lack examples of successful mine closures			6%	1	7%	1
We don't have enough time available					14%	2
We don't have sufficient resources available (no explanation provided)	5%	2	6%	1	43%	6
TOTAL	**100%**	**38**	**100%**	**17**	**100%**	**14**

Table 22
Are current resources provided by the regulator(s) sufficient to help planning of completion criteria?.

Are the current resources provided by the regulator(s) sufficient to help your planning of completion criteria?	Mining industry		Consulting	
Yes, there is sufficient guidance available	33%	13	38%	6
We need access to consistent staff with the appropriate knowledge	18%	7	25%	4
We need guidelines for developing completion criteria	13%	5	6%	1
We need greater alignment between government departments	8%	3	13%	2
We need more realistic criteria expectations	5%	2	13%	2
We need faster response times to submissions	10%	4		
We need more policy guidance on mine relinquishment	8%	3		
We need defined examples of expectation and benchmarks	5%	2		
We need more sharing of rehab data	3%	1	6%	1
TOTAL	**100%**	**40**	**100%**	**16**

2. Experimental Design, Materials and Methods

This study used a two-phase exploratory research design [1] that consisted of (1) semi-structured qualitative interviews, which informed the development of (2) an online survey that is reported in this DIB paper. In-depth interviews were conducted to gain an understanding of the range of barriers and challenges faced by industry and regulatory stakeholders around mine rehabilitation, developing completion criteria, closure planning, monitoring and risk management. The interviews informed the development of a broad industry survey that was administered online and is reported here.

The survey data was collected between June and October 2018. The target sample consisted of WA mining industry professionals who are directly involved in the writing or assessing mine completion criteria—or related planning and closure processes. Three groups of stakeholders were targeted: i) environmental managers or compliance officers within mining companies, ii) consultants engaged with developing mine closure plans and completion criteria; and iii) State regulators with experience in assessing mine closure plans or mine completion processes [2].

Respondents were sampled through non-probability sampling techniques, including convenience sampling, expert sampling, and chain-referrals [3]. Potential participants were identified through professional networks of the project staff, word-of-mouth, and from publicly available information such as company websites (e.g. authors of company mine closure plans), government websites (e.g. Department of Mines' Mines and Mineral Deposits Database[1]), and published literature (e.g. Mine Closure Conference proceedings). Potential respondents were invited via email through an anonymous survey link. The initial survey invitation was sent to 100 valid email addresses.[2] Respondents were asked to distribute the link to other members of their team(s) involved in mine closure or in developing mine completion criteria. The industry survey was completed by 75 respondents: 41 mining companies' employees (survey IDs MC9-MC49), 18 consultants (survey IDs C6-C23), and 16 government employees (survey IDs R7-R22). Because the software system does not keep count of forwarded surveys (only those completed), we cannot identify the precise survey response or refusal rate.

Because some questions were phrased differently for different stakeholders, and depending on a respondent's answers to previous questions, the number of questions shown to respondents varied (see attached questionnaire). The survey employed a variety of question types, ranging from ranking and Likert scale questions to open answer text. The survey was administered and coded in Qualtrics online survey software [4] and consisted of six parts:

[1] https://minedex.dmirs.wa.gov.au/Web/home.
[2] Any email address that did not 'bounce' was considered a 'valid' address.

1. Questions about the respondent's organization
2. Land tenure and decisions about post-mining land use
3. Development of completion criteria and associated challenges
4. Monitoring and evaluation practices
5. Coordination within the organization and engagement with other organizations
6. Resources needed to define completion criteria

Ethics Statement

This research was conducted under the University of Western Australia ethics protocol RA/4/20/4241. All research participants provided informed consent.

CRediT Author Statement

Marit Kragt: Conceptualization, Methodology, Software, Formal analysis, Investigation, Data curation, Writing - Original Draft, Supervision, Project administration; **Ana Manero:** Methodology, Formal analysis, Investigation, Data Curation, Writing - Original Draft.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

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