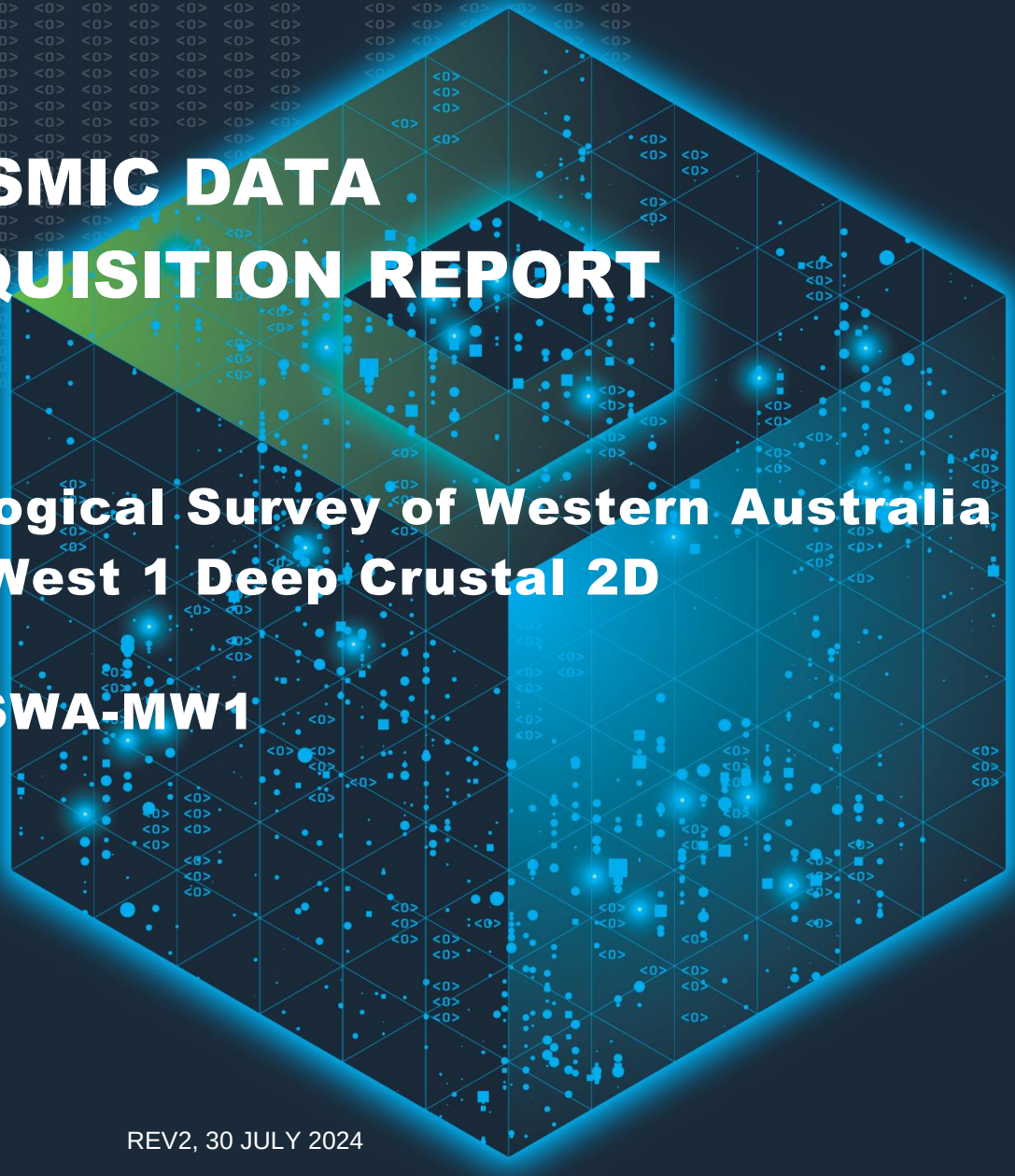
SEISMIC DATA ACQUISITION REPORT

Geological Survey of Western Australia Mid-West 1 Deep Crustal 2D

23GSWA-MW1



Rev, Date	REV2, 30 JULY 2024
Date:	5th January 2024
Prepared for:	GSWA
Prepared by:	Matt Lawrence, Reece Cunnold, Marc Wilkinson

140 Hay Street,
Subiaco, WA, 6008, Australia

Statement of Quality

The survey reported herein has been conducted according to the standards specified in the contract between GSWA & HiSeis, which outlined the scope and objectives of the work completed. In the absence of such contractual standards, the survey was conducted in accordance with the instructions of GSWA or by the technical operating standards of HiSeis Pty Ltd.

We implemented rigorous quality control measures throughout the survey to ensure the accuracy and reliability of data. Our team of qualified professionals, certified in relevant fields, executed the survey. Data collection and analysis were performed using INOVA software and machinery.

The survey was completed with no LTI incidents while all environmental and safety considerations were thoroughly addressed to meet GSWA, industry and legal standards.

We appreciate the collaboration with GSWA throughout this process, as the input and feedback from GSWA representatives was instrumental in the success of the survey. For more detailed information, please refer to the information provided in this report.

Marc Wilkinson
General Manager – Operations
HiSeis Pty Ltd

EXECUTIVE SUMMARY

HiSeis acquired a high-resolution 2D Land Vibroseis reflection seismic survey for GSWA on the Mid-West 1 line totalling 352 line kilometres. The project began on the 21st of November 2023 and ran for 29 days until the 19th of December 2023. It was broken up into two (2) phases: GPS surveying and, node layout/data acquisition/node retrieval/download.

The work was carried out under agreement between the GSWA and HiSeis Pty Ltd. Under the agreement HiSeis acquired seismic data on a turnkey basis, and directly controlled surveying/positioning, data acquisition, field data processing, and internal HSE.

Acquisition of the 2D seismic dataset utilised three 60,000 lb Vibroseis source vehicles utilising the 3-vibe array as a means of producing seismic energy, simultaneously delivering a single 24 second sweep/per vibe through a frequency range of 3-96 Hz. The INOVA Quantum wireless acquisition system was used to record the data on a rolling spread of up to 3200 5 Hz Quantum nodes.

Complete survey, recording, and geophysics departments were fielded and equipped with the required field systems, computer hardware, and processing software. Data quality was monitored daily, and seismic data was processed to a brute stacks stage near real time from HiSeis Perth processing house.

The data quality of the acquired 2D seismic dataset was excellent. Some stations were skipped due to restricted access within populated areas and infrastructure corridors. Throughout the project HiSeis field crew aimed to maintain full fold coverage. Skipped source points were compensated for by taking shots at 20m intervals before and after the buffer zones and on the rare occasion one of the 3 Vibroseis in array required down time. These measures proved to be valuable in enhancing the quality of the acquired seismic data and recovering most of the dropped fold due to townships, infrastructure, and vibe down. PPV monitoring was used through all areas of infrastructure.

Sweep testing was performed prior to the acquisition of 23GSWA-SW1, 4 different sweeps were tested, and it was agreed with GSWA representatives to utilise a Weibull base sweep for the 2D survey.

The survey was completed without any lost time injuries (LTIs).

CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 2D ACQUISITION

1.1 SUMMARY

The 23GSWA-MW1 2D reflection seismic survey was designed for deep crustal mapping over the mid-west of Western Australia. The purpose of the surveys is to image the crustal architecture in the project areas, and the structure, geometry, and relationships between the various geological domains from the surface to below the Moho. Acquisition commenced on the 28th of November 2023 and concluded on the 19th of December 2023.

1.2 SURVEY LOCATION

Commencing in the township of Mt Magnet, located 560 km north of Perth, the acquisition program progressed west and finished in Geraldton, 419 km north of Perth. A total of 352 line km of 2D seismic data was acquired along gazetted roads. The entire 2D line was shot along sealed roads. The road was a highly utilised road train route between Mt Magnet and Geraldton.

The blue line in Figure 1-1 illustrates the extent of the 2D line.

Figure 1-1 : Location of GSWA Midwest line 1

1.3 ACQUISITION

A moving full patch of no less 1600 receiver stations were used while shooting the 2D line, with up to 1600 additional receiver stations deployed as the spread progressed along the line. The shooting patch consisted of an 8000m active patch either side of the 3-vibe (end-on-end) array. Due to the nature of the wireless equipment, all geophones deployed were collecting data. All Vibroseis points (VPs) were acquired with a 24 second sweep plus 20 seconds of listening time, using the Weibull base 3-96 Hz sweep as used with previous GSWA 2D surveys. The 3-vibe array collected VPs at either 40m shot station intervals, or at 20m intervals where infill shots were required. The final shot count for the survey was 8,955.

The nominal survey parameters were as follows:

Table 1-1: Acquisition parameters

2D Acquisition Parameters	
Total Survey Size	351.98km
Total Number of Receiver stations	34629 including skips
Active Receiver Spread	1600 minimum
Receiver station spacing	10 m
Total Number of Source Points	8955 including killed stations (Culverts, roads etc)
Source Point Spacing	40 m with 20 m infill shots around buffer areas
Nominal Fold	~200
Nominal offset	Radial offset patch of 8km

Technical Survey Specifications:

Collect in System: MGA

Datum: GDA 2020

Zone: 50

Equipment Line lengths	351.98 line km
Total number of source points	8798 - skips + 20 m shots = 8955
Number of Receiver Stations	35191 – Skips = 34629
Sample Interval	2 ms
Record Length	20 s
Nominal Fold	Radial offset patch of 8 km
Format	SEG Y (REV 0) to USB hard drive in field.
Source	INOVA AHV-IV (60000 lb)
Source Array	3 x AHV IV in a single fleet
Source Number	1
Recording Filters:	
Hi-cut	0.8 Nyquist set to 219 Hz
Notch	Out
Diversity Stack	Yes
Source Parameters:	
Source Spacing	40 m and 20m for makeup shots.
Sweep Frequency	3 – 96Hz
Sweep Number	1
Sweep Length	24 secs + 20s listen time
Sweep Type -	Weibull
Source Array	3 Vibroseis
Start Taper	500 ms
End Taper	600 ms
Maximum Source Gaps	As required for safety/access
Receiver Parameters: QUANTUM	
Group Spacing	10 m
Geophone Type	Quantum 5Hz (PS-5GR)
Case	land
Frequency	5 Hz
Geophones per Group	One (1)

Figure 1-2: Vibe array shooting nightshift through Geraldton.

1.4 STATISTICS

The below statistics cover the 23GSWA-MW1 2D seismic survey

Table 1-2: 2D survey statistics

2D Survey Statistics	
Total Receivers	1600 Quantum Nodes (3200 nodes on crew)
Source Points (acquired)	8955
Days to Acquire (shooting days only)	18 days (excluding RDO and standdown day for nightshift)
Average shots per day	497

The images below denote the shot statistics for the survey.

Figure 1-3 : Acquisition statistics.

Total field production time for the acquisition crew was 240.02 hours, including 166.18 recording hours. Zero hours downtime, 17.50 hours for spread set up and 4.25 hours for pickup/packup and 16.50 hours of travel to and from site. Safety meeting accounted for 4.68 hours of the total time on the project.

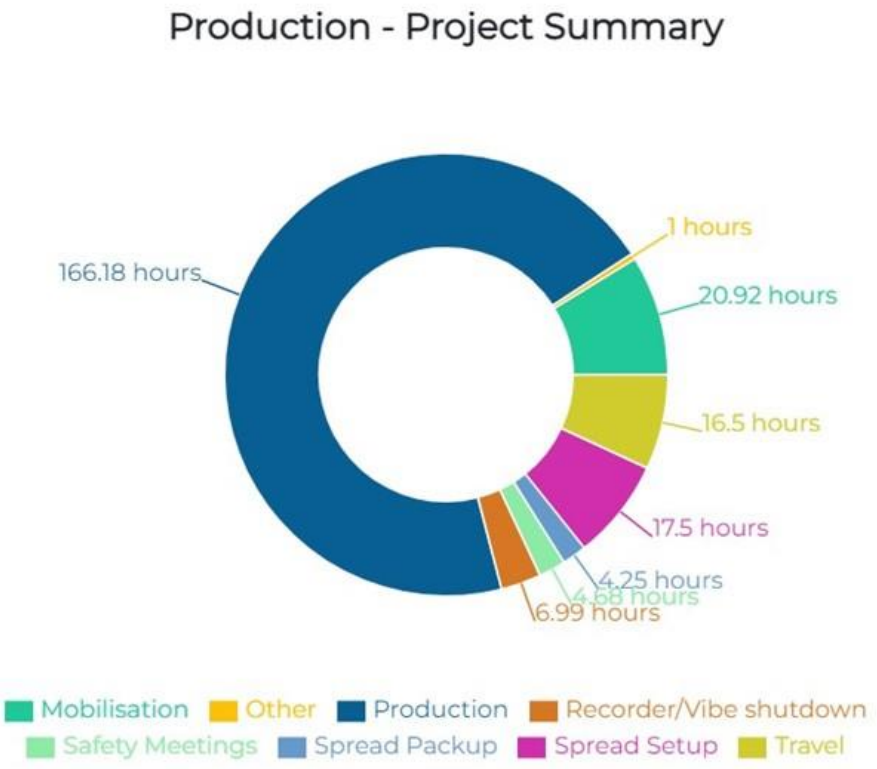


Figure 1-4 : Pie chart of hours spent on different activities for the entire project.

Table 1-3: Collected vs. expected shots.

Date	VP's collected	Expected	Comments
28/11/20233	0	0	Crew arrived to site nodes deployed
29/12/2023	367	479	
30/12/2023	515	479	
01/12/23	521	479	
02/12/2023	500	479	
03/12/2023	502	479	
04/12/.2023	540	479	
05/12/2023	503	479	
06/12/2023	502	479	
07/12/2023	502	479	

08/12/12023	502	479	
09/12/2023	0	0	RDO
10/12/2023	465	479	
11/12/2023	541	479	
12/12/2023	557	479	
13/12/2023	511	479	
14/12/2023	488	479	
15/12/2023	523	479	
16/12/2023	578	479	
17/12/2023	327	479	Nightshift
18/12/2023	44		Final shots of nightshift

2 OPERATIONAL COMMENTS

2.1 LOGISTICS

The survey crew arrived at Mt Magnet to start the eastern end of MW1 on the 21th of November 2023.

The acquisition crew arrived in Mt Magnet and commenced layout on the 28th of November 2023. Crew arrived at 1pm and the lay down was set up and nodes deployed from 3pm till end of the day. On the 29th of November the line crew completed deploying nodes at 1030am and acquisition commenced at 11am.

A 1 day 'rostered day off' was taken on the 9th December. Acquisition resumed and the survey was completed on the 19th of December.

2.2 EQUIPMENT DAMAGE

Over the course of the survey period there were 2 Quantum nodes which went missing, believed to be taken by members of the public. 6 nodes were damaged due to being driven over by vehicles.

2.3 TERRAIN

The terrain throughout the survey area is gently undulating as it follows the sealed roads. Terrain was consistent for the entirety of the 2 D line with low thin bush in surrounding areas. There were no communication issues between the vibes and recorder, meaning the recorder was only required to move once at the end of each day.

23GSWA-MW1 2D seismic field operations covered 352km, encountering 4 townships requiring buffer zones with no shooting allowed. Infill shots at 20m were used leading in and out of these areas in an attempt to maintain good fold coverage. There were also a substantial number of culverts, driveways and side roads in which nodes could not be placed so these stations were killed.

Data acquisition progressed under close consultation with GSWA representatives to ensure that all environmental, health and safety requirements were adhered to. Good planning with detailed and precise practice of procedures, and strict adherence to policies from all parties involved resulted in the best outcome given the ground conditions.

2.4 WEATHER

The weather for most of the project was ideal for acquisition with moderate winds and clear skies with temperatures of 32 – 43 degrees. Wind was monitored regularly, once gusts were over 20km/hr, nodes would be retrieved and analyzed for any wind interference. Acquisition was not required to halt at any point due to winds, the low-lying bush and placement of nodes helped to mitigate the wind interference.

2.5 CREW ACCOMMODATION

The HiSeis crew stayed in multiple locations for the project. Based on a production prediction of an average of 18km per day, accommodation was booked in advance to reflect the timeline. At times, there was up to 130km to travel to site. This was due to the large distances between the work area and nearest townships. Hotels, roadhouses, Airbnbs, and campgrounds were all utilized to accommodate the crew.

Mt Magnet

28/11 – 2/12 (16 crew)

28/12 – 6/12 (6 crew)

Yalgoo

02/12 – 07/12 (13 crew)

Mullewa

06/12 -13/12 (6 crew)

07/12 – 13/12 (13 crew)

Geraldton

13/12 – 17/12 (6 crew)

13/12 – 19/12 (13 crew)

Figure 2-1 : An example of accommodation facilities.

2.6 COMMUNICATIONS

Communication between HiSeis and GSWA was conducted via:

- Mobile phones
- Starlink satellite internet
- UHF radio

Land based operational communications were conducted via vehicle two-way, hand-held UHF radios, and WhatsApp groups to communicate with line crew due to the large work area. This worked exceptionally well for group notifications as most of the survey area had reasonable cell phone reception. All vehicles were fitted with UHF radios to ensure we could communicate with all other contractors that operated in and around the site. Traffic management controllers used multiple UHF radio channels to communicate with Hiseis personnel and channel 40 to communicate with heavy vehicles in the area.

Starlink high speed satellite internet was used in the recorder and to transfer data back to the Perth team for QC.

2.7 ADMINISTRATION

Most crew administration tasks were handled through the HiSeis main office in Subiaco by the Project Manager, Project Administrator, and the GIS Manager; all other administrative needs of the crew were managed by the Party Managers on site. All field personnel completed HiSeis Crew HSE inductions prior to arrival on site.

2.8 PERMITTING AND PUBLIC RELATIONS

Main Roads permits, Public Relations, stakeholders' interactions, and land access activities were handled by HiSeis and GSWA. Email and phone contact was established prior to HiSeis crew entering stakeholders' properties. All crew were briefed on public interactions and notices explaining the scope of work were placed in all vehicles to hand out to members of the public upon request.

3 RECORDING SYSTEM

Data collection saw the use of INOVA's Quantum IX1 wireless seismic acquisition system. The Quantum nodal system operates autonomously and is ideal for the operational conditions experienced on the GSWA–MW1 project. It is rugged and has a compact design allowing for deployment in challenging terrain and dense vegetation. Furthermore, the Quantum system is built with wireless technology and has advanced QC tools that provided crew with the ability to communicate with field stations and obtain valuable nodal information such as the hardware status of field stations, memory usage, battery voltage, GPS performance, and sensor operations wirelessly.

Once deployed, the node acquires GPS signal for timing and positioning which operated efficiently in the mostly thin vegetation and tree canopy experienced on MW1. Each of the nodes were programmed at the T3 (transcriber) with a configuration file. Once the wireless node was placed by field crew on previously surveyed locations, the node would commence a series of internal tests (BITS) before it starts continuous recording until the node is retrieved. QC and troubleshooting can be done at any time whilst the node is deployed and awake. After collection, the data from the node is downloaded in the T3 and then erased so that it is ready for the next deployment.

The Quantum system offered an efficient means for collecting seismic data over the acquisition project area.

Given the chosen Weibull base 3-96Hz sweep, the Quantum nodes equipped with the 5 Hz (PS-5GR) geophone element were ideal for recording the low frequencies produced by the source.

Table 3-1: Recording parameters

Field System Recording Parameters	
Instrument	iX1 (Nodal)
Tape Format	SEGY Rev. 0
Filters	Hi Cut 205 Hz
Sample Rate	2 ms
Correlated Record Length	20 000 ms
Node recording time	24 hrs/day

Table 3-2: 2D receiver parameters

2D Receivers	
Receiver Group Interval	10 m in-line interval
Geophones	Quantum 5 Hz (PS-5GR) Geophone Element
Array	10 m single point sensor

4 SEISMIC SOURCES

4.1 INOVA AHV-IV 60 0000 LB VIBROSEIS

The INOVA AHV-IV Vibroseis unit operates through the oscillation of a servo-hydraulic controlled 60,000 lb peak-force mass and baseplate ensemble. These units are designed to produce predominantly P-wave seismic energy over a variable sweep profile, defined by the operator.

For this 2D survey, 3 x AHV-IV vibrators were used simultaneously on a single source station to produce seismic energy.

4.2 SWEEP PROFILE

Sweep testing was performed prior to the acquisition of 23GSWA-SW1 using the profiles listed in Table 4-1 below. After analysing the data from the sweep tests, GSWA decided to proceed with the Weibull base sweep as defined in Table 4-2.

Table 4-1: Sweep test parameters

Test Sweeps			
Weibull Base sweep	3-96 Hz	500ms start and end taper.	Stored sweep
Weibull Mid Dwell sweep	3-96 Hz	500ms start and end taper.	Stored sweep
Linear sweep 1	3-96 Hz	500ms start and end taper.	Stored sweep
Linear sweep 2	3-60 Hz	1000ms start and 500ms end taper.	Stored sweep

Table 4-2: Standard sweep definition

Sweep Definition 2D	
Vibrators	INOVA AHV-IV (PLS 362) 60, 000 lb
Electronics	INOVA VibPro HD
Sweep Frequency Range	3 – 96 Hz (Weibull base sweep)
Sweep Duration	24 second
Sweep Type	Custom Weibull
Tapers	Start taper – 500ms, End taper – 600ms.
Vibrator Array	3 vibes shooting in array (Single fleet)
Operating Force	70%
Phase Locking	Ground force
Amplitude Control	Peak-to-peak

5 SURVEYING

Surveying of all receiver points was completed by subcontracted surveying company GSS. Surveying involved the surveyor and assistant, flagging and collecting receiver coordinates within an accuracy of 10cm along pre-designed survey lines. These personnel were also responsible for reconnaissance and reporting of obstacles and obstructions to typical survey design and plans. Coordinates were collected using Leica GS18, GS15 and GS14 survey equipment with 4 individual rovers connected to base station.

Please see accompanying Survey Report for more information.

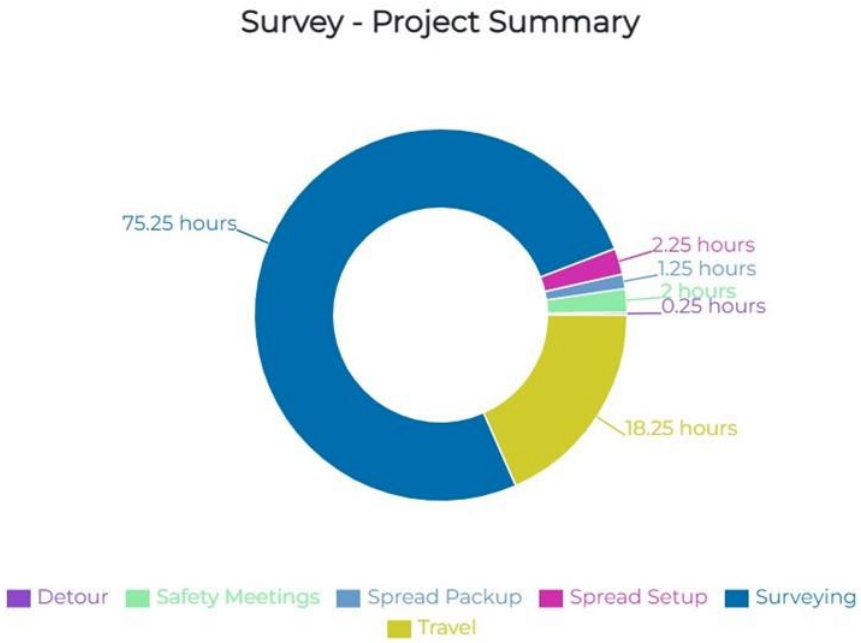


Figure 5-1 : Breakdown of surveyors' hours on the 23GSWA-MW1 2D Project.

6 HEALTH, SAFETY AND ENVIRONMENT (HSE)

This section describes the procedures, activities, and statistics related to HSE (Health, Safety, and Environment) for the GSWA – MW1 2D Seismic Survey. Throughout the project's duration, HSE played a vital role in reducing hazards and risks. HSE plans, risk assessments, emergency response plans, daily Toolbox meetings, and weekly safety meetings were conducted with the goal of minimizing project-related risks to a reasonably practicable level.

Furthermore, crew inductions, onsite orientations, and training were provided to all personnel and client representatives, and any site visitors. Incident reports and safety statistics were systematically compiled for in-depth analysis. The results of these assessments were reported in daily, weekly, and monthly reports. Additionally, this information was utilized at the crew level to further enhance the project's safety standards.

6.1 HSE STATISTICS

Crew safety is a core value for HiSeis. At no point during any survey has HiSeis put production before the safety of its personnel, and the GSWA – MW1 2D project was no different.

HiSeis and GSWA staff collaborated closely to ensure the survey was coordinated and executed in a safe manner with the highlight being 28,226 hours of work with ZERO LTI's.

Table 6-1: HSE Statistics

HSE Statistics	
Total Person Hours	4298
HSE Incidents	0
Lost Time Injuries	0
Total Safety Meetings	21
Breath Tests	387
Risk Assessments (JHA/Take 5's)	324
Pre-starts	411
Formal HiSeis Safety Observations	8

6.2 INDUCTIONS AND TRAINING

6.2.1 Inductions

Inductions and orientations were conducted for all HiSeis personnel and visitors. The site orientation consisted of a general walk through the HiSeis/GSWA office locations and laydown yard where the harvester trailer, technical and mechanical workshops were located. Information was relayed regarding where the HSE notice board and HiSeis corporate policies were posted, and emergency assembly areas and fire extinguisher locations.

All HiSeis and Traffic management personnel were informed of HSE requirements and updated as the project progressed.

- HiSeis HSE and Policies
- HSE Project Plan and Emergency Response Plan
- Hazard Reporting and Assessing Risks
- Emergency Resources
- Communication
- Journey Management
- Weed & Seed, Land and Fauna Interaction Logging
- Incident Reporting
- Asking for Help

6.2.2 Take 5's

HiSeis uses the Take 5 system as one means to identify, communicate, and control new hazards. This system was very successful and Take 5's was discussed daily at the toolbox meetings. This ensured that everyone was aware of new hazards as they were identified and advised of what control measures were put in place to control them.

All Take 5s were documented and added to the HiSeis WHS system. Action points arising from the documents would be issued a priority rating, assigned to a department, given a target date for close, and reviewed on a regular basis to ensure that all action points were followed up on and subsequently closed out.

There was a total of 324 Take 5's submitted during the project. The need for accurate and timely hazard reporting was reinforced at every opportunity. It was emphasised to the Crew to report all Unsafe Acts, Unsafe Conditions, Near Misses, Environmental Hazards – all of which were relayed to the crew at the next day's toolbox meeting. The Take 5's can be anonymous with only the date and department being required for reporting purposes.

6.3 HAZARDS

6.3.1 Traffic management/ Working on public roads.

Given the diverse conditions of the survey area, constant interactions with public vehicles were managed by traffic management controllers broken up into 3 teams.

1. 1 x TMC crew with node deployment.
2. 1 x TMC crew with nodes retrieval
3. 1 x crew of up to 3 TMC crew working with the vibes.

Land transport was the number one hazard to all personnel working on the project. There were no reported road traffic accidents for the duration of the survey.

The vehicles used on the crew included:

- 11 Toyota Hilux Utes
- 2 Isuzu MR trucks
- 2 HV trucks

6.3.2 Vehicle Maintenance

HiSeis staff were responsible for completing the daily vehicle inspection checklist each morning. These checklists documented vehicular deficiencies, vehicle kilometers, and driver details. A weekly mechanical and safety equipment exceptions list was compiled by the Journey Manager and distributed to the mechanic and HSE departments for resolution. If a deficiency was deemed to be a safety issue, the vehicle was taken off the road until it was repaired or had its safety equipment restored.

6.3.3 Journey management

Journey Management was critical for crew especially when mobilizing to/from Perth/Mt Magnet and when working on the spread. The JESI journey management app was utilized by HiSeis to safely manage and track personnel movements.

6.3.4 Working in heat / wet conditions

One of the most common hazards for the seismic crews was working outdoors with elements such as heat and wet weather. As the climate warmed up, the risk of heat illnesses increased, hydration was a regular topic at the daily toolbox meeting. Management ensured that the crew was aware of the importance of drinking plenty of water in addition to supplying hydrolyte supplements to replenish electrolytes. Information on heat stress management and the recognition of its signs / symptoms was reviewed on more than one occasion.

Each vehicle was outfitted with water containers ranging from 5 – 40 liters depending on the type of vehicle and number of crew members it supported. In addition, crew members utilized smaller 1 liter water containers and personal sport bottles that were topped up from the larger containers.

6.3.5 Snakes and Wildlife

Due to the location of the survey area, poisonous snakes known to inhabit the region were a concern. Over the course of the project several snake sightings occurred in various locations along the survey area. For this reason, the need for increased attention and awareness was raised at the toolbox meetings. First aid training was given to members of the crew so that the team would know how to attend to a snake bite victim. Snake bite kits and first aid kits were distributed to the crew and were also standard safety equipment within each vehicle. There were no occurrences of snake bites during the survey.

Another concern was the presence of livestock, kangaroos and other fauna that posed a threat to transportation on primary roads, service roads and access tracks throughout the survey area. The vehicle fleet is outfitted with bull-bars, daytime running lights, and the crew was restricted to daytime only operations to help reduce the exposure to wildlife.

6.4 HSE MANAGEMENT

The HSE Management System on this project was derived from the HiSeis inductions, safety management processes. A specific HSE Plan was written for the GSWA – MW1 2D seismic survey. The HSE Plan was developed with input from the crew for all HSE documentation, hazards, risks, and emergency response plans. The project specific HSE Plan was signed off by the HiSeis Operations Manager, Project Manager, and Senior Crew Manager.

6.4.1 HSE Management Process

Crew safety is driven as a 'top-down' approach – from the HiSeis CEO to the GM of Operations, down to the Project Manager, through to the Senior Crew Managers and finally to the individual workers.

The Safe Work System refers to the identification, assessment, control, and recovery from hazards. These steps are essential to the safe working of every crew where every incident is, in effect, a failure of the process. The risks that hazards presented were managed on this crew by sound policies, good procedures, good work instructions, and systematic planning, implementation, and monitoring activities.

6.4.2 Safe Work Procedures

The HSE Plan covers all relevant work procedures for this crew. New work procedures for the crew needed to be developed to ensure safe operations for the GSWA Midwest 1 line. Work procedures were developed based upon identifying hazards, assessing the risks, and placing controls to ensure a safe system of work. Sub-contractor work procedures had to be reviewed for suitability and ensure their work interfaced well with HiSeis work.

6.5 HSE COMMUNICATION

HSE Policies, Corporate, Regional, Country and Crew Organograms, Safety Alerts, various meeting minutes, crew rosters, and general issues were communicated through the HiSeis online WHS system, Epicentre daily reports, and meetings.

6.5.1 Toolbox Meetings

A total of 21 toolbox meetings were held during the survey and were an effective way to exchange information between the crew and managers. Each morning before the start of field operations, a general toolbox meeting was held with all crew members in attendance to discuss any safety concerns from the previous day. Take 5 cards were reviewed and discussed along with the previous day's operational information being exchanged.

There was good participation from the crew during these meetings, which allowed for open discussion on related safety points and subsequent suggestions for improvements. A random crew member was selected each day to speak on a safety related topic the following day to ensure the crew was actively participating in the meetings.

6.6 ENVIRONMENT

6.6.1 Environment Impact Minimisation

Throughout the duration of the project, a joint effort was made to minimize environmental impacts along the survey area. Some of the strategies used were:

- Coordinating with GSWA representative to have clear plans on each day's activities.
- Reviewing each laydown area to ensure that no waste or equipment was left behind.
- Working within the buffer zones along the seismic line.
- Minimising emissions by keeping motorised equipment maintained.
- Pre plotting of bridges, culverts, and other infrastructure.
- Abiding by and being familiar with sensitive fauna and flora.
- Avoiding wildlife interaction.
- Organising the shooting plan to minimise acquisition impact on roads.

7 KEY PERFOMANCE INDICATORS

Throughout the entirety of the seismic survey project, Hiseis maintained a high standard of safety and communication with GSWA. HiSeis is proud not only of meeting but also exceeding predicted acquisition goals for the seismic survey project. Notably, the team achieved an outstanding 99.34% trace yield which is significant in the pursuit of obtaining the best data possible. Despite the challenges posed by the terrain, working on public roads and operational complexities, HiSeis consistently delivered an impressive average of 448 shots per day. Furthermore, the company's commitment to diversity and inclusion was evident, with a notable 25% of the workforce consisting of female employees. HiSeis' dedication to excellence extended to issue resolution, where a flawless 100% resolution rate was achieved. These exceptional results underscore HiSeis' unwavering commitment to delivering high-quality seismic survey services while exceeding client expectations.

8 APPENDIX

8.1 SEGY HEADERS – FIELD SHOTS

See accompanying INOVA trace header specifications document.

INOVA Disk Tape and Tape Image Formats 7D.pdf

8.2 DELIVERABLES

Table 8-1. Deliverables

Item #	File name	Description
1.	Correlated shot gathers	SEGY
2.	Uncorrelated shot gathers	SEGY
3.	Passive data – 1 minute records	SEGY
4.	Sweep tests – correlated shots and brute stacks	SEGY
5.	Source and receiver locations in ASCII format (SPS).	ASCII
6.	Observers' logs	XLS
7.	Sweep files	SEGY

8.3 QUANTUM NODE SPECIFICATIONS

INOVA®

QUANTUM®

FEATURES

- All-in-one single component recording unit
- Lightweight node weighing only 650g
- 50 days typical, 24 Hr operation
- Local 16 GB data storage
- Optional HyperQ long range wireless QC using technology

GENERAL SPECIFICATIONS

No. of Analog Channels:	1
Data Storage Capacity:	16 GB non-volatile flash memory
Integrated Battery:	Rechargeable Li-ion
Battery Life:	50 days typical, 24 Hr operation
	42 days typical, 24 Hr operation (with HyperQ)
Wireless Communication:	Bluetooth LE, Optional HyperQ
GPS:	L1-GPS /QZSS, GLONASS,
	BeiDou, Galileo
Timing Accuracy:	+-5 µs
Sensor:	Vertical 5Hz or 10Hz
	high-sensitivity geophone
Charging Temperature:	+5 °C to + 40°C
Operating Temperature:	-40 °C to +70 °C
Water Immersion:	IP68

PHYSICAL

Size:	10.9 cm x 9.8 cm x 10.7cm
	(Excl. spike) (4.4" x 3.9" x 4.2")
Weight:	0.65 kg (1.43lbs) incl internal battery
	and geophone

ANALOG SPECIFICATIONS

A/D Converter:	24-bit
Sample Rates:	1 ms, 2 ms, or 4 ms
Gains:	0 dB, 6dB[1], 12 dB, 18dB[1], 24dB[1]
Maximum Input Signal (RMS):	3.535 V @ 0 dB , 1.768 V @ 6 dB
	0.884 V @ 12 dB, 0.442 V @18dB
	0.221 V @ 24 dB
Equivalent Input Noise* (RMS):	1.408 µV @ 0 dB
	0.712 µV @ 6 dB, 0.368 µV @ 12 dB
	0.202 µV @ 18 dB, 0.132 µV @ 24dB
Instantaneous Dynamic Range*:	128 dB @ 0 dB,128 dB @ 6 dB
	128 dB @ 12 dB,127dB @ 18 dB
	124 dB @ 24 dB
System Dynamic Range*:	148 dB
Total Harmonic Distortion:	<0.1% with 10Hz HS phone
	<0.2% with 5Hz HS phone
Channel Matching:	Better than 1%
Anti-Alias Filter:	3dB @ 0.876 *f*N (Nyquist)
Filter Options:	Minimum and Zero Phase

AUTOMATED TESTS

Unit temperature, sensor tilt, system equivalent input noise, sensor noise, dynamic range, geophone DC resistance, THD, natural frequency, damping, sensitivity

[1] Gain option when operating in hybrid with G3i® HD

*Typical specifications @ 2 ms @ 25°C

Corporate Headquarters: 13000 Executive Drive, Suite 100, Sugar Land, TX 77478 • p +1.281.568.2000 • www.inovageo.com

Figure 8-1. Quantum node specifications

HiSeis

hiseis.com

140 Hay Street, Subiaco WA 6008

+61 8 9470 9866