REFINITIV

DELTA REPORT

10-Q

HBIO - HARVARD BIOSCIENCE INC

10-Q - SEPTEMBER 30, 2023 COMPARED TO 10-Q - JUNE 30, 2023

The following comparison report has been automatically generated

TOTAL DELTAS	931
CHANGES	206
DELETIONS	325
ADDITIONS	400

UNITED STATES

SECURITIES AND EXCHANGE COMMISSION WASHINGTON, DC 20549

FORM 10-Q

  Quarterly report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

For the quarterly period ended June 30, 2023 September 30, 2023

  Transition report pursuant to Section 13 or 15(d) of the Securities Exchange Act of 1934

For the transition period from ____to ____

Commission file number 001-33957

HARVARD BIOSCIENCE, INC.

(Exact Name of Registrant as Specified in Its Charter)

Delaware	04-3306140
(State or other jurisdiction of Incorporation or organization)	(I.R.S. Employer Identification No.)

84 October Hill Road, Holliston, Massachusetts 01746

(Address of Principal Executive Offices, including zip code)

(508) 893-8999

(Registrant's telephone number, including area code)

Securities registered pursuant to Section 12(b) of the Act:

Title of each class	Trading Symbol(s)	Name of each exchange on which registered
Common Stock, $0.01 par value	HBIO	The Nasdaq Global Market

Indicate by check mark whether the registrant (1) has filed all reports required to be filed by Section 13 or 15(d) of the Securities Exchange Act of 1934 during the preceding 12 months (or for such shorter period that the registrant was required to file such reports), and (2) has been subject to such filing requirements for the past 90 days. Yes No

Indicate by check mark whether the registrant has submitted electronically every Interactive Data File required to be submitted pursuant to Rule 405 of Regulation S- T (§232.405 of this chapter) during the preceding 12 months (or for such shorter period that the registrant was required to submit such files). Yes No

Indicate by check mark whether the registrant is a large accelerated filer, an accelerated filer, a non-accelerated filer, a smaller reporting company, or an emerging growth company. See the definitions of "large accelerated filer," "accelerated filer," "smaller reporting company," and "emerging growth company" in Rule 12b-2 of the Exchange Act.

Large accelerated filer	Accelerated filer
Non-accelerated filer	Smaller reporting company
	Emerging growth company

If an emerging growth company, indicate by check mark if the registrant has elected not to use the extended transition period for complying with any new or revised financial accounting standards provided pursuant to Section 13(a) of the Exchange Act.

Indicate by check mark whether the registrant is a shell company (as defined in Rule 12b-2 of the Exchange Act). Yes No

As of July 31, 2023 October 31, 2023, there were 42,688,246 shares of the registrant's common stock issued and outstanding.

HARVARD BIOSCIENCE, INC.

FORM 10-Q

INDEX

PART I. FINANCIAL INFORMATION

Item 1.Financial Statements.

HARVARD BIOSCIENCE, INC. Item 1.

Financial Statements.CONSOLIDATED BALANCE SHEETS

(Unaudited, in thousands, except share and per share data)

HARVARD BIOSCIENCE, INC.

CONSOLIDATED BALANCE SHEETS

(Unaudited, in thousands, except share and per share data)

	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022
Assets				
Current assets:				
Cash and cash equivalents	$ 4,324	$ 4,508	$ 5,340	$ 4,508
Accounts receivable, net	16,903	16,705	14,983	16,705
Inventories	26,089	26,439	25,818	26,439
Other current assets	5,301	3,472	4,345	3,472
Total current assets	52,617	51,124	50,486	51,124
Property, plant and equipment, net	3,491	3,366	3,358	3,366
Operating lease right-of-use assets	5,253	5,816	5,061	5,816
Goodwill	56,771	56,260	56,222	56,260
Intangible assets, net	18,356	21,014	17,095	21,014
Other long-term assets	6,411	7,780	7,513	7,780
Total assets	$ 142,899	$ 145,360	$ 139,735	$ 145,360
Liabilities and Stockholders' Equity				
Current liabilities:				
Current portion of long-term debt	$ 3,220	$ 3,811	$ 3,470	$ 3,811
Current portion of operating lease liabilities	2,125	2,135	2,125	2,135
Accounts payable	4,716	6,447	6,269	6,447
Deferred revenue	3,835	3,370	4,005	3,370
Other current liabilities	9,046	7,486	8,336	7,486
Total current liabilities	22,942	23,249	24,205	23,249
Long-term debt, net	38,203	43,013	35,273	43,013
Deferred tax liability	667	590	661	590
Operating lease liabilities	4,653	5,282	4,418	5,282
Other long-term liabilities	1,046	1,006	892	1,006
Total liabilities	67,511	73,140	65,449	73,140
Commitments and contingencies - Note 13				
Stockholders' equity:				
Preferred stock, par value $0.01 per share, 5,000,000 shares authorized	-	-	-	-
Common stock, par value $0.01 per share, 80,000,000 shares authorized: 42,688,246 shares issued and outstanding at June 30, 2023; 42,081,707 shares issued and outstanding at December 31, 2022	457	454		
Common stock, par value $0.01 per share, 80,000,000 shares authorized: 42,688,246 shares issued and outstanding at September 30, 2023; 42,081,707 shares issued and outstanding at December 31, 2022			457	454
Additional paid-in-capital	231,533	229,008	232,896	229,008

Accumulated deficit	(142,548)	(142,190)	(143,787)	(142,190)
Accumulated other comprehensive loss	(14,054)	(15,052)	(15,280)	(15,052)
Total stockholders' equity	75,388	72,220	74,286	72,220
Total liabilities and stockholders' equity	$ 142,899	$ 145,360	$ 139,735	$ 145,360

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF OPERATIONS

(Unaudited, in thousands, except per share data)

	Three Months Ended September 30,		**Nine Months Ended September 30,**	
	2023	**2022**	**2023**	**2022**
Revenues	$ 25,363	$ 26,922	$ 84,097	$ 84,908
Cost of revenues	10,636	14,750	34,351	39,922
Gross profit	14,727	12,172	49,746	44,986
Sales and marketing expenses	5,732	5,819	17,888	19,093
General and administrative expenses	5,807	6,324	17,494	18,630
Research and development expenses	2,760	2,763	8,614	9,480
Amortization of intangible assets	1,361	1,572	4,138	4,492
Litigation settlement - Note 14	-	(544)	-	(233)
Total operating expenses	15,660	15,934	48,134	51,462
Operating (loss) income	(933)	(3,762)	1,612	(6,476)
Other income (expense):				
Unrealized gain (loss) on equity securities - Note 14	1,208	-	(373)	-
Interest expense	(882)	(749)	(2,797)	(1,648)
Other income (expense), net	45	(179)	105	(163)
Total other income (expense)	371	(928)	(3,065)	(1,811)
Loss before income taxes	(562)	(4,690)	(1,453)	(8,287)
Income tax expense (benefit)	677	(1,285)	144	(437)
Net loss	$ (1,239)	$ (3,405)	$ (1,597)	$ (7,850)
Loss per share:				
Basic and diluted loss per share	$ (0.03)	$ (0.08)	$ (0.04)	$ (0.19)
Weighted-average common shares:				
Basic and diluted	42,688	41,637	42,345	41,353

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

(Unaudited, in thousands)

CONSOLIDATED STATEMENTS OF OPERATIONS

(Unaudited, in thousands, except per share data)

	Three Months Ended June 30, 2023	Three Months Ended June 30, 2022	Six Months Ended June 30, 2023	Six Months Ended June 30, 2022
Revenues	$ 28,759	$ 29,208	$ 58,734	$ 57,986
Cost of revenues	12,086	12,571	23,715	25,172
Gross profit	16,673	16,637	35,019	32,814
Sales and marketing expenses	6,178	6,587	12,156	13,274
General and administrative expenses	5,353	5,981	11,687	12,306
Research and development expenses	2,957	3,497	5,854	6,717
Amortization of intangible assets	1,389	1,454	2,777	2,920
Litigation settlement - Note 14	-	(4,880)	-	311
Total operating expenses	15,877	12,639	32,474	35,528
Operating income (loss)	796	3,998	2,545	(2,714)
Other expense:				
Unrealized loss on equity securities - Note 14	(1,581)	-	(1,581)	-
Interest expense	(941)	(515)	(1,915)	(899)
Other (expense) income, net	(372)	(62)	60	16
Total other expense	(2,894)	(577)	(3,436)	(883)
(Loss) income before income taxes	(2,098)	3,421	(891)	(3,597)
Income tax (benefit) expense	(1,118)	986	(533)	848
Net (loss) income	$ (980)	$ 2,435	$ (358)	$ (4,445)
(Loss) income per share:				
Basic (loss) income per share	$ (0.02)	$ 0.06	$ (0.01)	$ (0.11)
Diluted (loss) income per share	$ (0.02)	$ 0.06	$ (0.01)	$ (0.11)
Weighted-average common shares:				
Basic	42,354	41,304	42,204	41,256
Diluted	42,354	42,560	42,204	41,256

	Three Months Ended September 30, 2023	Three Months Ended September 30, 2022	Nine Months Ended September 30, 2023	Nine Months Ended September 30, 2022
Net loss	$ (1,239)	$ (3,405)	$ (1,597)	$ (7,850)
Other comprehensive (loss) income:				
Foreign currency translation adjustments	(1,343)	(2,936)	(354)	(6,152)
Derivatives qualifying as hedges, net of tax	117	-	126	-
Other comprehensive loss	(1,226)	(2,936)	(228)	(6,152)
Comprehensive loss	$ (2,465)	$ (6,341)	$ (1,825)	$ (14,002)

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF COMPREHENSIVE LOSS

(Unaudited, in thousands)

	Three Months Ended June 30,		Six Months Ended June 30,	
	2023	2022	2023	2022
Net (loss) income	$ (980)	$ 2,435	$ (358)	$ (4,445)
Other comprehensive income (loss):				
Foreign currency translation adjustments	152	(2,517)	989	(3,216)
Derivatives qualifying as hedges, net of tax	449	-	9	-
Other comprehensive income (loss)	601	(2,517)	998	(3,216)
Comprehensive (loss) income	$ (379)	$ (82)	$ 640	$ (7,661)

See accompanying notes to condensed consolidated financial statements.

HARVARD BIOSCIENCE, INC.

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

CONSOLIDATED STATEMENTS OF STOCKHOLDERS' EQUITY

(Unaudited, in thousands)

Three Months Ended June 30, 2023	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
Balance at March 31, 2023	42,190	$ 455	$ 230,108	$ (141,568)	$ (14,655)	$ 74,340
Stock option exercises	173	2	403	-	-	405
Stock purchase plan	91	-	215	-	-	215
Vesting of restricted stock units	287	-	-	-	-	-
Shares withheld for taxes	(54)	-	(295)	-	-	(295)
Stock-based compensation expense	-	-	1,102	-	-	1,102
Net loss	-	-	-	(980)	-	(980)
Other comprehensive income	-	-	-	-	601	601
Balance at June 30, 2023	42,687	$ 457	$ 231,533	$ (142,548)	$ (14,054)	$ 75,388

Three Months Ended September 30, 2023	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity
Balance at June 30, 2023	42,688	$ 457	$ 231,533	$ (142,548)	$ (14,054)	$ 75,388

Stock-based compensation expense	-	-	1,363	-	-	1,363
Net loss	-	-	-	(1,239)	-	(1,239)
Other comprehensive loss	-	-	-	-	(1,226)	(1,226)
Balance at September 30, 2023	42,688	$ 457	$ 232,896	$ (143,787)	$ (15,280)	$ 74,286

Three Months Ended June 30, 2022 / September 30, 2022	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensiv Loss
Balance at March 31, 2022	41,241	$ 452	$ 226,203	$ (139,554)	$ (10,726)	$ 76,375					
Balance at June 30, 2022							41,500	$ 453	$ 227,413	$ (137,119)	$ (13,24
Stock option exercises	5	1	11	-	-	12	24	-	64	-	
Stock purchase plan	78	-	239	-	-	239					
Vesting of restricted stock units	244	-	-	-	-	-	233	-	-	-	
Shares withheld for taxes	(68)	-	(279)	-	-	(279)	(100)	-	(387)	-	
Stock-based compensation expense	-	-	1,239	-	-	1,239	-	-	1,139	-	
Net income	-	-	-	2,435	-	2,435					
Net loss							-	-	-	(3,405)	
Other comprehensive loss	-	-	-	-	(2,517)	(2,517)	-	-	-	-	(2,93
Balance at June 30, 2022	41,500	$ 453	$ 227,413	$ (137,119)	$ (13,243)	$ 77,504					
Balance at September 30, 2022							41,657	$ 453	$ 228,229	$ (140,524)	$ (16,17

Six Months Ended June 30, 2023 / Nine Months Ended September 30, 2023	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensiv Loss

Balance at December 31, 2022	42,082	$ 454	$ 229,008	$ (142,190)	$ (15,052)	$ 72,220	42,082	$ 454	$ 229,008	$ (142,190)	$ (15,05
Stock option exercises	212	3	506	-	-	509	214	3	506	-	
Stock purchase plan	91	-	215	-	-	215	91	-	215	-	
Vesting of restricted stock units	412	-	-	-	-	-	413	-	-	-	
Shares withheld for taxes	(110)	-	(451)	-	-	(451)	(112)	-	(451)	-	
Stock-based compensation expense	-	-	2,255	-	-	2,255	-	-	3,618	-	
Net loss	-	-	-	(358)	-	(358)	-	-	-	(1,597)	
Other comprehensive income	-	-	-	-	998	998					
Balance at June 30, 2023	42,687	$ 457	$ 231,533	$ (142,548)	$ (14,054)	$ 75,388					
Other comprehensive loss							-	-	-	-	(228
Balance at September 30, 2023							42,688	$ 457	$ 232,896	$ (143,787)	$ (15,280

Six Months Ended June 30, 2022 / Nine Months Ended September 30, 2022	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss	Total Stockholders' Equity	Number of Shares Issued	Common Stock	Additional Paid-in Capital	Accumulated Deficit	Accumulated Other Comprehensive Loss
Balance at December 31, 2021	41,143	$ 452	$ 225,650	$ (132,674)	$ (10,027)	$ 83,401	41,143	$ 452	$ 225,650	$ (132,674)	$ (10,02
Stock option exercises	16	1	42	-	-	43	40	1	106	-	
Stock purchase plan	78	-	239	-	-	239	78	-	239	-	
Vesting of restricted stock units	395	-	-	-	-	-	628	-	-	-	
Shares withheld for taxes	(132)	-	(780)	-	-	(780)	(232)	-	(1,167)	-	

Stock-based compensation expense	-	-	2,262	-	-	2,262	-	-	3,401	-	
Net loss	-	-	-	(4,445)	-	(4,445)	-	-	-	(7,850)	
Other comprehensive loss	-	-	-	-	(3,216)	(3,216)	-	-	-	-	(6,15
Balance at June 30, 2022	41,500	$ 453	$ 227,413	$ (137,119)	$ (13,243)	$ 77,504					
Balance at September 30, 2022							41,657	$ 453	$ 228,229	$ (140,524)	$ (16,17

See accompanying notes to condensed consolidated financial statements

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

(Unaudited, in thousands)

	Nine Months Ended September 30,	
	2023	**2022**
Cash flows from operating activities:		
Net loss	$ (1,597)	$ (7,850)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:		
Depreciation	1,083	1,122
Amortization of intangible assets	4,138	4,492
Amortization of deferred financing costs	210	210
Stock-based compensation expense	3,618	3,401
Deferred income taxes and other	92	(160)
Unrealized loss on equity securities - Note 14	373	-
Convertible Preferred Stock received in Biostage settlement - Note 14	-	(3,900)
Gain on sale of product line	(403)	-
Changes in operating assets and liabilities:		
Accounts receivable	1,751	6,060
Inventories	173	(329)
Other assets	(50)	(811)
Accounts payable and other current liabilities	695	(2,379)
Deferred revenue	635	(551)
Other liabilities	(993)	(832)
Net cash provided by (used in) operating activities	9,725	(1,527)
Cash flows from investing activities:		
Additions to property, plant and equipment	(958)	(1,355)
Acquisition of intangible assets	(292)	-
Proceeds from sale of product line	512	-
Net cash used in investing activities	(738)	(1,355)
Cash flows from financing activities:		
Borrowing from revolving line of credit	3,500	7,800
Repayment of revolving line of credit	(8,450)	(4,650)
Repayment of term debt	(3,341)	(2,436)
Proceeds from exercise of stock options and employee stock purchase plan	724	346
Taxes paid related to net share settlement of equity awards	(451)	(1,167)

Net cash used in financing activities	(8,018)	(107)
Effect of exchange rate changes on cash	(137)	312
Increase (decrease) in cash and cash equivalents	832	(2,677)
Cash and cash equivalents at beginning of period	4,508	7,821
Cash and cash equivalents at end of period	$ 5,340	$ 5,144
Supplemental disclosures of cash flow information:		
Cash paid for interest	$ 3,006	$ 1,529
Cash paid for income taxes, net of refunds	$ 168	$ 493

See accompanying notes to condensed consolidated financial statements.

7

HARVARD BIOSCIENCE, INC.

CONSOLIDATED STATEMENTS OF CASH FLOWS

(Unaudited, in thousands)

	Six Months Ended June 30,	
	2023	**2022**
Cash flows from operating activities:		
Net loss	$ (358)	$ (4,445)
Adjustments to reconcile net loss to net cash provided by (used in) operating activities:		
Depreciation	665	758
Amortization of intangible assets	2,777	2,920
Amortization of deferred financing costs	140	140
Stock-based compensation expense	2,255	2,262
Deferred income taxes and other	86	1,040
Unrealized loss on equity securities - Note 14	1,581	-
Convertible Preferred Stock received in Biostage Settlement - Note 14	-	(3,900)
Gain on sale of product line	(403)	-
Changes in operating assets and liabilities:		
Accounts receivable	(68)	3,587
Inventories	398	(2,667)
Other assets	(1,268)	(250)
Accounts payable and accrued expenses	(270)	(435)
Deferred revenue	445	(611)
Other liabilities	(616)	(575)
Net cash provided by (used in) operating activities	5,364	(2,176)
Cash flows from investing activities:		
Additions to property, plant and equipment	(741)	(913)
Acquisition of intangible assets	(108)	-
Proceeds from sale of product line	512	-
Net cash used in investing activities	(337)	(913)
Cash flows from financing activities:		
Borrowing from revolving line of credit	2,500	5,300
Repayment of revolving line of credit	(5,450)	(3,600)
Repayment of term debt	(2,591)	(1,686)
Proceeds from exercise of stock options and employee stock purchase plan	724	282
Taxes paid related to net share settlement of equity awards	(451)	(780)
Net cash used in financing activities	(5,268)	(484)

Effect of exchange rate changes on cash	57	11
Decrease in cash and cash equivalents	(184)	(3,562)
Cash and cash equivalents at beginning of period	4,508	7,821
Cash and cash equivalents at end of period	$ 4,324	$ 4,259
Supplemental disclosures of cash flow information:		
Cash paid for interest	$ 2,148	$ 845
Cash paid for income taxes, net of refunds	$ 115	$ 352

See accompanying notes to condensed consolidated financial statements.

NOTES TO UNAUDITED CONDENSED CONSOLIDATED FINANCIAL STATEMENTS (Unaudited)

1. Basis of Presentation and Summary of Significant Accounting Policies, and Risks and Uncertainties

Basis of Presentation and Summary of Significant Accounting Policies

The unaudited consolidated financial statements of Harvard Bioscience, Inc. and its wholly-owned subsidiaries (collectively, the "Company") as of June September 30, 2023 and for the three and six nine months ended June September 30, 2023 and 2022, have been prepared by the Company pursuant to the rules and regulations of the Securities and Exchange Commission (the "SEC"). Certain information and footnote disclosures normally included in financial statements prepared in accordance with U.S. generally accepted accounting principles ("U.S. GAAP") have been condensed or omitted pursuant to such rules and regulations. The December 31, 2022 consolidated balance sheet was derived from audited financial statements but does not include all disclosures required by U.S. GAAP. However, the Company believes that the disclosures are adequate to make the information presented not misleading. These unaudited consolidated financial statements should be read in conjunction with the consolidated financial statements and the notes thereto included in the Company's Annual Report on Form 10-K for the fiscal year ended December 31, 2022.

In the opinion of management, all adjustments, which include normal recurring adjustments necessary to present a fair statement of financial position as of June September 30, 2023, results of operations and comprehensive income (loss) and cash flows for the three and six nine months ended June September 30, 2023 and 2022, as applicable, have been made. The results of operations for the three and six nine months ended June September 30, 2023, are not necessarily indicative of the operating results for the full fiscal year or any future periods.

The accounting policies underlying the accompanying unaudited consolidated financial statements are set forth in Note 2 to the consolidated financial statements included in the Company's Annual Report on Form 10-K for the year ended December 31, 2022. Except as described below, there have been no material changes in the Company's significant accounting policies during the three and six nine months ended June September 30, 2023.

Marketable Equity Securities

Equity securities traded in active markets are marked to market at each balance sheet date based on their prices as quoted on the relevant stock exchange. Fair value mark-to-market adjustments are recorded as non-operating gains (losses) in the consolidated statement of operations. The Company's investments in marketable equity securities are classified in the consolidated balance sheet based on the nature of the securities and their availability for use in current operations.

Risks and Uncertainties

The global supply chain has experienced significant disruptions over the last few years due to electronic component and labor shortages and other macroeconomic factors which have emerged since the onset of COVID-19. This has led to increased cost of freight, purchased materials, and manufacturing labor costs, while also delaying customer shipments. Additionally, the global economy has recently experienced increasing economic uncertainty, including inflationary pressure, rising interest rates, and significant fluctuations in exchange rates. These conditions have negatively impacted the Company's past business, results of operations, and cash flow. The Company believes that these global Recent events in Ukraine and the Middle East, as well as delays in U.S. government funding may lead to additional economic uncertainties will continue through 2023.uncertainties. If these factors are prolonged or are more severe than anticipated, the Company's business, results of operations, and cash flow may be materially impacted.

2. **Recently Issued Adopted Accounting Pronouncements**

In January 2017, the Financial Accounting Standards Board ("FASB") issued Accounting Standards Update ("ASU") 2017-04, *Intangibles—Goodwill and Other (Topic 350): Simplifying the Test for Goodwill Impairment* ("ASU 2017-04"), which eliminates the performance of Step 2 from the goodwill impairment test. In performing its annual or interim impairment testing, an entity will instead compare the fair value of the reporting unit with its carrying amount and recognize any impairment charge for the amount by which the carrying amount exceeds the reporting unit's fair value. Additionally, an entity should consider income tax effects from any tax-deductible goodwill on the carrying amount of the reporting unit when measuring the goodwill impairment loss. The Company adopted ASU 2016-13 effective January 1, 2023 with no impact to the consolidated financial statements. The Company will perform future goodwill impairment test according to ASU 2017-04.

In September 2016, the FASB issued ASU No. 2016-13, *Financial Instruments—Credit Losses (Topic 326): Measurement of Credit Losses on Financial Instruments* ("ASU 2016-13"), which amends the impairment model by requiring entities to use a forward-looking approach based on expected losses rather than incurred losses to estimate credit losses on certain types of financial instruments, including trade receivables. This may result in the earlier recognition of allowances for losses. The FASB issued several ASUs after ASU 2016-13 to clarify implementation guidance and to provide transition relief for certain entities. The Company adopted ASU 2016-13 effective January 1, 2023, which resulted in an immaterial impact to the consolidated financial statements.

3. Goodwill and Intangible Assets

The change in the carrying amount of goodwill for the six nine months ended June September 30, 2023 is as follows:

(in thousands)		
Carrying amount at December 31, 2022	$ 56,260	$ 56,260
Effect of change in currency translation	511	(38)
Carrying amount at June 30, 2023	$ 56,771	
Carrying amount at September 30, 2023		$ 56,222

Identifiable intangible Intangible assets at June September 30, 2023 and December 31, 2022 consist of the following:

(in thousands)		June 30, 2023			December 31, 2022				September 30, 2023			December 31, 2022		
Amortizable intangible assets:	Average Life*	Gross	Accumulated Amortization	Net	Gross	Accumulated Amortization	Net	Average Life*	Gross	Accumulated Amortization	Net	Gross	Accumulated Amortization	Ne
Distribution agreements/customer relationships	7	$ 16,185	$ (9,323)	$ 6,862	$ 16,124	$ (8,727)	$ 7,397	6	$ 16,017	$ (9,467)	$ 6,550	$ 16,124	$ (8,727)	$ 7,3
Existing technology and software development	3	37,512	(28,140)	9,372	37,549	(26,482)	11,067							
Existing technology & software development								2	37,490	(28,851)	8,639	37,549	(26,482)	11,0
Trade names and patents	3	7,539	(5,619)	1,920	7,523	(5,197)	2,326	3	7,484	(5,774)	1,710	7,523	(5,197)	2,3
Total amortizable intangible assets		$ 61,236	$ (43,082)	$ 18,154	$ 61,196	$ (40,406)	$ 20,790		$ 60,991	$ (44,092)	$ 16,899	$ 61,196	$ (40,406)	$ 20,7
Indefinite-lived intangible assets:				202			224				196			2
Total intangible assets				$ 18,356			$ 21,014				$ 17,095			$ 21,0

*Weighted average life in years as of June September 30, 2023

Intangible asset amortization expense was $1.4 million and $1.5 million $1.6 million for the three months ended June September 30, 2023 and 2022, respectively, and $2.8 million $4.1 million and $2.9 million $4.5 million for the six nine months ended June September 30, 2023 and 2022, respectively. Estimated amortization expense of existing amortizable intangible assets for each of the five succeeding years and thereafter as of June September 30, 2023, is as follows:

(in thousands)		
2023 (remainder of the year)	$ 2,777	$ 1,383
2024	5,255	5,234
2025	4,024	4,019
2026	2,363	2,358
2027	1,266	1,261
2028	1,127	1,308
Thereafter	1,342	1,336
Total	$ 18,154	$ 16,899

4. Balance Sheet Information

The following tables provide details of selected balance sheet items as of the periods indicated:

Inventories:

(in thousands)	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022
Finished goods	$ 5,748	$ 5,223	$ 6,047	$ 5,223
Work in process	4,607	3,776	4,642	3,776
Raw materials	15,734	17,440	15,129	17,440
Total	$ 26,089	$ 26,439	$ 25,818	$ 26,439

9

Other Current Liabilities:

(in thousands)	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022
Compensation	$ 3,796	$ 3,476	$ 3,373	$ 3,476
Customer credits			3,111	2,368
Professional fees	552	392	599	392
Warranty costs	301	268	308	268
Customer credits	2,664	2,368		
Accrued income taxes	398	-		
Other	1,335	982	945	982
Total	$ 9,046	$ 7,486	$ 8,336	$ 7,486

5. Restructuring and Other Exit Costs

On an ongoing basis, the Company reviews the global economy, the healthcare industry, and the markets in which it competes to identify operational efficiencies, enhance commercial capabilities, and align its cost base and infrastructure with customer needs and its strategic plans. In order to realize these opportunities, the Company undertakes restructuring-type activities from time to time to transform its business. A portion of these transformation activities are considered restructuring costs under ASC 420 – *Exit or Disposal Cost Obligations* and are discussed below.

During the three months ended September 30, 2022, the Company completed a review of its product portfolio in which the Company identified certain non-strategic products for discontinuation, and recorded charges of $1.3 million included in cost of revenues, in connection with excess and obsolete inventory, and $0.6 million in severance expense included in general and administrative expense, in connection with headcount reductions in Europe and North America.

6. Leases

The Company has noncancelable operating leases for offices, manufacturing facilities, warehouse space, automobiles and equipment expiring at various dates through 2030.

The components of lease expense for the three and six nine months ended June September 30, 2023 and 2022, are as follows:

(in thousands)	Three Months Ended June 30, 2023	Three Months Ended June 30, 2022	Six Months Ended June 30, 2023	Six Months Ended June 30, 2022	Three Months Ended September 30, 2023	Three Months Ended September 30, 2022	Nine Months Ended September 30, 2023	Nine Months Ended September 30, 2022
Operating lease cost	$ 483	$ 493	$ 1,026	$ 997	$ 491	$ 486	$ 1,517	$ 1,483
Short-term lease cost	64	58	131	122	19	58	150	180
Sublease income	(26)	(26)	(51)	(51)	(25)	(25)	(76)	(76)
Total lease cost	$ 521	$ 525	$ 1,106	$ 1,068	$ 485	$ 519	$ 1,591	$ 1,587

Supplemental cash flow information related to the Company's operating leases is as follows:

(in thousands)	Six Months Ended June 30, 2023	Six Months Ended June 30, 2022
Cash paid for amounts included in the measurement of lease liabilities:	$ 1,201	$ 1,173
Right-of-use assets obtained in exchange for lease obligations:	$ 95	$ 65

(in thousands)	Nine Months Ended September 30, 2023	Nine Months Ended September 30, 2022
Cash paid for amounts included in the measurement of lease liabilities	$ 1,764	$ 1,759
Right-of-use assets obtained in exchange for lease obligations	277	248

Supplemental balance sheet information related to the Company's operating leases are as follows:

(in thousands)	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022
Operating lease right-of-use assets	$ 5,253	$ 5,816	$ 5,061	$ 5,816
Current portion, operating lease liabilities	$ 2,125	$ 2,135	$ 2,125	$ 2,135
Operating lease liabilities, long-term	4,653	5,282	4,418	5,282
Total operating lease liabilities	$ 6,778	$ 7,417	$ 6,543	$ 7,417
Weighted average remaining lease term (years)	6.0	6.2	5.8	6.2
Weighted average discount rate	9.3%	9.4%	9.4%	9.4%

10

Future minimum lease payments for operating leases, with initial terms in excess of one year at June September 30, 2023, are as follows:

Year Ending December 31,		
(in thousands)		
2023 (remainder of the year)	$ 1,075	$ 550
2024	1,831	1,909
2025	1,096	1,155
2026	1,047	1,052
2027	1,042	1,046
Thereafter	2,964	2,963
Total lease payments	9,055	8,675
Less imputed interest	(2,277)	(2,132)
Total operating lease liabilities	$ 6,778	$ 6,543

6. 7. Long-Term Debt

As of June September 30, 2023 and December 31, 2022, the Company's borrowings are as follows:

(in thousands)	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022
Long-term debt:				
Term loan	$ 32,223	$ 34,814	$ 31,473	$ 34,814
Revolving line	9,900	12,850	7,900	12,850
Less: unamortized deferred financing costs	(700)	(840)	(630)	(840)
Total debt	41,423	46,824	38,743	46,824
Less: current portion of long-term debt	(3,500)	(4,091)	(3,750)	(4,091)
Current unamortized deferred financing costs	280	280	280	280
Long-term debt	$ 38,203	$ 43,013	$ 35,273	$ 43,013

In December, 2020, the Company entered into a Credit Agreement (the "Credit Agreement") with Citizens Bank, N.A., Wells Fargo Bank, National Association, and Silicon Valley Bank (together, the "Lenders"). All Effective March 27, 2023, all commitments and obligations under the Credit Agreement previously held by Silicon Valley Bank have now been were assumed by First-Citizens Bank & Trust Company. The Credit Agreement provides for a term loan of $40.0 million and a $25.0 million senior revolving credit facility (including a $10.0 million sub-facility for the issuance of letters of credit and a $10.0 million swingline loan sub facility) (collectively, the "Credit Facility"). The Company's obligations under the Credit Agreement are guaranteed by certain of the Company's direct, domestic wholly-owned subsidiaries; none of the Company's direct or indirect foreign subsidiaries has guaranteed the Credit Facility. The Company's obligations under the Credit Agreement are secured by substantially all of the assets of Harvard Bioscience, Inc., and each guarantor (including all or a portion of the equity interests in certain of the Company's domestic and foreign subsidiaries). The Credit Facility matures on December 22, 2025. Issuance costs of $1.4 million are amortized over the contractual term to maturity date on a straight-line basis, which approximates the effective interest method. Available and unused borrowing capacity under the revolving line of credit was $12.4 million $13.0 million as of June September 30, 2023 based on the Credit Agreement, as amended. Total revolver borrowing capacity is limited by the consolidated net leverage ratio as defined under the amended Credit Agreement.

Borrowings under the amended Credit Facility will, at the option of the Company, bear interest at either (i) a rate per annum based on the Secured Overnight Financing Rate ("SOFR") for an interest period of one, two, three or six months, plus an applicable interest rate margin determined as provided in the Credit Agreement, as amended (a "SOFR Loan"), or (ii) an alternative base rate plus an applicable interest rate margin, each as determined as provided in the Credit Agreement (an "ABR Loan"). SOFR interest under the Credit Agreement is subject to applicable market rates and a floor of 0.50%. The alternative base rate is based on the Citizens Bank prime rate or the federal funds effective rate of the Federal Reserve Bank of New York and is subject to a floor of 1.0%. The applicable interest rate margin varies from 2.0% per annum to 3.25% per annum for SOFR Loans, and from 1.5% per annum to 3.0% per annum for ABR Loans, in each case depending on the Company's consolidated leverage ratio and is determined in accordance with a pricing grid set forth in the Credit Agreement. Interest on SOFR Loans is payable in arrears on the last day of each applicable interest period, and interest on ABR Loans is payable in arrears at the end of each calendar quarter. There are no prepayment penalties in the event the Company elects to prepay and terminate the Credit Facility prior to its scheduled maturity date, subject to SOFR Loan breakage and redeployment costs in certain circumstances.

The effective interest rate on the Company borrowings for the three months ended June September 30, 2023 and 2022, was 8.3% and 4.0% 5.8%, respectively, and for the six nine months ended June September 30, 2023 and 2022, was 8.1% 8.2% and 3.6% 4.3%, respectively. The weighted average interest rate as of June September 30, 2023, inclusive of the effect of the Company's interest rate swaps, was 8.1% 7.7%. The carrying value of the debt approximates fair value because the interest rate under the obligation approximates market rates of interest available to the Company for similar instruments.

The term loan amortizes in quarterly installments of $0.75 million per for the quarter for each of the next ended two December 31, 2023 quarters and $1.0 million per quarter during the next seven quarters thereafter, with a balloon payment at maturity. Furthermore, within ninety days after the end of the Company's fiscal year, the term loan may be permanently reduced pursuant to certain mandatory prepayment events including an annual "excess cash flow sweep" of 50% of the consolidated excess cash flow, as defined in the agreement; provided that, in any fiscal year, any voluntary prepayments of the term loans shall be credited against the Company's "excess cash flow" prepayment obligations on a dollar-for-dollar basis for such fiscal year. As of December 31, 2022, the current portion of long-term debt included an excess cash flow sweep of $1.1 million which was paid during the quarter ended March 31, 2023. Amounts outstanding under the revolving credit facility can be repaid at any time but are due in full at maturity.

The Credit Agreement, as amended, includes customary affirmative, negative, and financial covenants binding on the Company. The negative covenants limit the ability of the Company, among other things, to incur debt, incur liens, make investments, sell assets and pay dividends on its capital stock. The financial covenants include a maximum consolidated net leverage ratio and a minimum consolidated fixed charge coverage ratio. The Credit Agreement, as amended, also includes customary events of default.

On In April, 28, 2022, the Company entered into an amendment to the Credit Agreement (the “April 2022 Amendment”) pursuant to which the Lenders and administrative agent, modified, among other things, modified the financial covenant relating to the consolidated net leverage ratio, and consented to also provided consent for the Biostage Settlement (as defined below), including without limitation the receipt by the Company of convertible preferred stock in Biostage, Inc. (“Biostage”) and the securities issuable upon conversion thereof, as partial payment for Biostage’s indemnification obligations in connection with the Biostage Settlement. See Note 13 14 for information regarding the Biostage Settlement.). In consideration for the April 2022 Amendment, the Company paid fees of $0.2 million to the Lenders and administrative agent.

On November, 8, 2022, the Company entered into a subsequent amendment to the Credit Agreement (the “November 2022 Amendment”) pursuant to which modified, among other things, the Lenders and administrative agent modified the financial covenant relating to the consolidated net leverage ratio, and the definition of Consolidated EBITDA used in the calculation of certain financial covenants, including to exclude non-cash inventory charges related to the Company’s decision to discontinue non-strategic products. In consideration for the November 2022 Amendment, the Company paid fees of $0.2 million to the Lenders and administrative agent. covenants. The Company was in compliance with the covenants of the Credit Agreement, as amended, as of June September 30, 2023.

7. 8. Derivatives

The Company monitors interest rate risk attributable to both its outstanding and forecasted debt obligations by the use of cash flow sensitivity analysis, which estimates the expected impact of changes in interest rates on the Company’s future cash. The Company uses interest-rate-related derivative instruments to manage its exposure related to changes in interest rates on its variable-rate debt instruments. The Company does not enter into derivative instruments for any purpose other than cash flow hedging.

By using derivative financial instruments to hedge exposure to changes in interest rates, the Company exposes itself to credit risk and market risk. Credit risk is the failure of the counterparty to perform under the terms of the derivative contract. When the fair value of a derivative contract is positive, the counterparty owes the Company, which creates credit risk for the Company. When the fair value of a derivative contract is negative, the Company owes the counterparty and, therefore, the Company is not exposed to the counterparty’s credit risk in those circumstances. The Company minimizes counterparty credit risk in derivative instruments by entering into transactions with carefully selected major financial institutions based upon their credit profile.

Market risk is the adverse effect on the value of a derivative instrument that results from a change in interest rates. The market risk associated with interest-rate contracts is managed by establishing and monitoring parameters that limit the types and degree of market risk that may be undertaken. The Company monitors interest rate risk attributable to both its outstanding and forecasted debt obligations by the use of cash flow sensitivity analysis, which estimates the expected impact of changes in interest rates on the Company’s future cash flows.

12

On February 28, 2023, the Company entered into an interest rate swap contract to improve the predictability of cash flows from interest payments related to its variable, SOFR-based debt. The swap contract has a notional amount of $30.3 million $28.8 million as of June September 30, 2023 and matures on December 22, 2025. This swap contract effectively converts the SOFR-based variable portion of the interest payable under the Credit Agreement into fixed-rate debt at an annual rate of 4.75%. The swap contract does not impact the additional interest related to the applicable interest rate margin as discussed above in Note 6, 7, Long-Term Debt. The interest rate swap is considered an effective cash flow hedge, and as a result, the net gains or losses on such instrument are reported as a component of other comprehensive income (loss) (“OCI”) in the consolidated financial statements and are reclassified as net income when the underlying hedged interest impacts earnings. A qualitative and quantitative An assessment over the hedge effectiveness is performed on a quarterly basis unless facts and circumstances indicate that to evaluate the ongoing hedge may no longer be highly effective. effectiveness.

12

The following table presents the notional amount and fair value of the Company’s derivative instrument as of June September 30, 2023:

(in thousands)	(in thousands)	June 30, 2023		(in thousands)	September 30, 2023	
Derivatives instruments	Balance sheet classification	Notional Amount	Fair Value (a)	Balance sheet classification	Notional Amount	Fair Value (a)
Interest rate swap	Other long term assets	$ 30,336	$ 9	Other long term assets	$ 28,847	$ 126

(a) See Note 8 9 for the fair value measurements related to this financial instrument.

The following table summarizes the effect of derivatives designated as cash flow hedging instruments for the three and six nine months ended June September 30, 2023:

	Three Months Ended	Six Months Ended	Three Months Ended	Nine Months Ended
Derivatives in Hedging Relationships (in thousands)	June 30, 2023	June 30, 2023		
Derivatives qualifying as hedges, net of tax (in thousands)			September 30, 2023	September 30, 2023
Amount of gain recognized in OCI on derivatives (effective portion)	$ 475	$ 35	$ 163	$ 198
Amounts reclassifed from accumulated other comprehensive loss to interest expense	(26)	(26)		
Amounts reclassified from accumulated other comprehensive loss to interest expense			(46)	(72)
Total	$ 449	$ 9	$ 117	$ 126

8. 9. Fair Value Measurements

The following tables present the fair value hierarchy for those assets or liabilities measured at fair value on a recurring basis:

	Fair Value as of June 30, 2023				Fair Value as of September 30, 2023			
Assets (in thousands)	Level 1	Level 2	Level 3	Total	Level 1	Level 2	Level 3	Total
Equity securities - common stock	$ 2,579	$ -	$ -	$ 2,579	$ 3,788	$ -	$ -	$ 3,788
Interest rate swap agreements	$ -	$ 9	$ -	$ 9	-	126	-	126

The Company uses the market approach technique to value its financial assets and liabilities. The Company's financial assets and liabilities carried at fair value include, when applicable, investments in common stock and derivative instruments used to hedge the Company's interest rate risks. The fair value of the Company's investment in common stock of Harvard Apparatus Regenerative Technologies ("HART" formerly known as Biostage, Inc.) (see Note 14 for information regarding the Biostage Settlement) was based on the closing price as quoted on the OTCQB Marketplace at the reporting date. The fair value of the Company's interest rate swap agreements was based on SOFR yield SOFR-yield curves at the reporting date.

9. 10. Capital Stock and Stock-Based Compensation

Stock-Based Payment Awards

Stock-based awards consist of stock options, time-based restricted stock units, market condition restricted stock units, and shares issued under the Company's employee stock purchase plan. Activity under the Company's equity incentive plans for the six nine months ended June September 30, 2023 is as follows:

	Stock Options	Weighted Average Exercise Price	Restricted Stock Units	Grant Date Fair Value	Market Condition Restricted Stock Units	Grant Date Fair Value	Stock Options	Weighted Average Exercise Price	Restricted Stock Units	Grant Date Fair Value	Market Condition Restricted Stock Units	Grant Date Fair Value
Outstanding at December 31, 2022	1,238,776	$ 3.15	1,093,801	$ 3.94	646,235	$ 4.51						
Balance at December 31, 2022							1,238,776	$ 3.15	1,093,801	$ 3.94	646,235	$ 4.51
Granted	-	-	1,296,379	2.81	558,958	2.61	-	-	1,306,445	2.82	558,958	2.61
Exercised	(213,644)	2.38	-	-	-	-	(213,644)	2.38	-	-	-	-
Vested (RSUs)	-	-	(295,531)	2.97	(115,976)	2.98	-	-	(295,531)	2.97	(115,976)	2.98
Cancelled/Forfeited	(99,483)	2.45	(54,396)	4.31	(87,138)	4.64	(101,065)	2.47	(86,440)	3.90	(87,138)	4.64

Outstanding at June 30, 2023	925,649	$	3.37	2,040,253	$	3.35	1,002,079	$	3.62					
Balance at September 30, 2023										924,067	3.37	2,018,275	3.36	1,002,079	3.62

Stock-based compensation expense for the three and six nine months ended June September 30, 2023 and 2022 is allocated as follows:

	Three Months Ended June 30,		Six Months Ended June 30,		Three Months Ended September 30,		Nine Months Ended September 30,	
(in thousands)	2023	2022	2023	2022	2023	2022	2023	2022
Cost of revenues	$ 95	$ 52	$ 164	$ 88	$ 58	$ -	$ 222	$ 88
Sales and marketing expenses	195	192	340	346	193	147	533	493
General and administrative expenses	704	923	1,573	1,714	1,012	919	2,585	2,633
Research and development expenses	108	72	178	114	100	73	278	187
Total stock-based compensation expenses	$ 1,102	$ 1,239	$ 2,255	$ 2,262	$ 1,363	$ 1,139	$ 3,618	$ 3,401

As of June September 30, 2023, the total compensation costs related to unvested awards not yet recognized is $7.4 million $6.0 million and the weighted average period over which it is expected to be recognized is approximately 1.9 1.7 years. The Company did not capitalize any stock-based compensation. compensation during the three and nine month periods ended September 30, 2023.

The weighted average estimated fair value of the market condition restricted stock awards that were granted during the six nine months ended June September 30, 2023 was $2.61 per unit. The estimate of the fair value was determined using a Monte-Carlo valuation simulation, which included the following assumptions:

Volatility	56.8 %
Risk-free interest rate	4.6 %
Correlation coefficient	41.7 %
Dividend yield	- %

Earnings (Loss) Per Share

Basic earnings (loss) per share (EPS) is calculated by dividing net income (loss) by the number of weighted average shares of common stock outstanding during the period. The calculation of diluted earnings per share assumes conversion of stock options and restricted stock units into common stock using the treasury method. The weighted average number of shares used to compute basic and diluted EPS consisted of the following:

	Three Months Ended June 30,		Six Months Ended June 30,		Three Months Ended September 30,		Nine Months Ended September 30,	
(in thousands, except per share data)	2023	2022	2023	2022	2023	2022	2023	2022
Net (loss) income available to common stockholders	$ (980)	$ 2,435	$ (358)	$ (4,445)				
Net loss available to common stockholders					$ (1,239)	$ (3,405)	$ (1,597)	$ (7,850)
Weighted average shares outstanding - basic	42,354	41,304	42,204	41,256	42,688	41,637	42,345	41,353
Dilutive effect of equity awards	-	1,256	-	-	-	-	-	-
Weighted average shares outstanding - diluted	42,354	42,560	42,204	41,256	42,688	41,637	42,345	41,353
Basic (loss) earnings per share	$ (0.02)	$ 0.06	$ (0.01)	$ (0.11)				
Diluted (loss) earnings per share	$ (0.02)	$ 0.06	$ (0.01)	$ (0.11)				
Shares excluded from diluted (loss) income per share due to their anti-dilutive effect	4,286	910	3,795	3,717				
Basic loss per share					$ (0.03)	$ (0.08)	$ (0.04)	$ (0.19)

Diluted loss per share	$ (0.03)	$ (0.08)	$ (0.04)	$ (0.19)
Shares excluded from diluted loss per share due to their anti-dilutive effect	3,952	3,594	3,847	3,676

10. 11. Revenues

The following tables represent a disaggregation of revenue from contracts with customers for the three and six nine months ended June September 30, 2023 and 2022:

(in thousands)	Three Months Ended June 30,		Six Months Ended June 30,		Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022	2023	2022	2023	2022
Instruments, equipment, software and accessories	$ 27,268	$ 27,765	$ 55,761	$ 55,303	$ 23,500	$ 25,705	$ 79,261	$ 81,008
Service, maintenance and warranty contracts	1,491	1,443	2,973	2,683	1,863	1,217	4,836	3,900
Total revenues	$ 28,759	$ 29,208	$ 58,734	$ 57,986	$ 25,363	$ 26,922	$ 84,097	$ 84,908

The following tables represent a disaggregation of revenue by geographic destination for the three and six nine months ended June September 30, 2023 and 2022:

(in thousands)	Three Months Ended June 30,		Six Months Ended June 30,		Three Months Ended September 30,		Nine Months Ended September 30,	
	2023	2022	2023	2022	2023	2022	2023	2022
United States	$ 12,336	$ 14,075	$ 24,638	$ 26,314	$ 12,017	$ 11,511	$ 36,655	$ 38,278
Europe	9,332	7,194	16,773	15,017	7,063	7,344	23,836	22,361
Greater China	4,136	3,396	10,335	7,127	3,489	4,497	13,824	11,624
Rest of the world	2,955	4,543	6,988	9,528	2,794	3,570	9,782	12,645
Total revenues	$ 28,759	$ 29,208	$ 58,734	$ 57,986	$ 25,363	$ 26,922	$ 84,097	$ 84,908

Concentrations

No customer accounts for more than 10% of revenues for the three and six nine months ended June September 30, 2023 and 2022. At June September 30, 2023 and December 21, 2022, no customer accounts for more than 10% of net accounts receivable.

Deferred Revenue Contract Liabilities

The following tables provide details of deferred revenue contract liabilities as of the periods indicated:

(in thousands)	June 30, 2023	December 31, 2022	September 30, 2023	December 31, 2022	Change	% Change
Service contracts	$ 2,327	$ 1,530	$ 2,234	$ 1,530	$ 704	46 %
Customer advances	1,508	1,840	1,771	1,840	(69)	-4 %
Total deferred revenue	$ 3,835	$ 3,370	$ 4,005	$ 3,370	$ 635	19 %

The overall increase in contract liabilities was primarily due to receipt of payments under service and warranty contracts. During each of the three months ended June September 30, 2023 and 2022, the Company recognized revenue of $0.6 million $1.0 million and $0.8 million from deferred revenue existing at December 31, 2022 and 2021, respectively. During the six nine months ended June September 30, 2023 and 2022, the Company recognized revenue of $1.6 million $2.3 million and $1.3 million $2.1 million from deferred revenue existing at December 31, 2022 and 2021, respectively.

Allowance for Expected Credit Losses on Receivables

The allowance for expected credit losses on receivables is used to present accounts receivable, net at an amount that represents the Company's estimate of the related transaction price recognized as revenue. The allowance represents an estimate of expected credit losses over the lifetime of the receivables, even if the loss is considered remote, and reflects expected recoveries of amounts previously written-off. The Company estimates the allowance on the basis of specifically identified receivables that are evaluated individually for impairment and an analysis of the remaining receivables determined by reference to past default experience. The Company considers the need to adjust historical information to reflect the extent to which current conditions and reasonable forecasts are expected to differ from the conditions that existed for the historical period considered. Losses on receivables have not historically been significant.

Management judgments are used to determine when to charge off uncollectible trade accounts receivable. The Company bases these judgments on the age of the receivable, credit quality of the customer, current economic conditions, and other factors that may affect a customer's ability and intent to pay. Customers are generally not required to provide collateral for purchases.

Activity in the allowance for expected losses on receivables is as follows:

	Six Months Ended June 30,		Nine Months Ended September 30,	
(in thousands)	2023	2022	2023	2022
Balance, beginning of period	$ 191	$ 136	$ 191	$ 136
Provision for bad debts	18	107	9	103
Charge-offs and other	(55)	(48)	(56)	(60)
Balance, end of period	$ 154	$ 195	$ 144	$ 179

11. 12. Income Tax

Income tax expense (benefit) was $0.7 million and $(1.3) million for the three months ended September 30, 2023 and 2022, respectively, and was $0.1 million and $(0.4) million for the nine months ended September 30, 2023 and 2022, respectively. The effective tax rates for the three months ended September 30, 2023 and 2022, were (120.2)% and 27.4%, respectively. The effective tax rates for the nine months ended September 30, 2023 and 2022, were (9.9)% and 5.3%, respectively.

The difference between the Company's effective tax rates in 2023 compared to the U.S. statutory tax rate of 21% was primarily due to the mix of forecasted income or losses in the U.S. and foreign tax jurisdictions and a Global Intangible Low-Taxed Income ("GILTI") inclusion to taxable income. The effective tax rates in both the three and nine months ended September 30, 2023 and 2022, were also impacted by changes in valuation allowances associated with the Company's assessment of the likelihood of the recoverability of deferred tax assets. The Company has valuation allowances against substantially all of its net operating loss carryforwards and tax credit carryforwards.

The determination of the annual effective tax rate is based upon a number of significant estimates and judgments, including the estimated annual pretax income in each tax jurisdiction in which the Company operates and the development of tax planning strategies during the year. In addition, as a global commercial enterprise, the Company's tax expense can be impacted by changes in tax rates or laws, the finalization of tax audits and reviews and other factors that cannot be predicted with certainty. As such, there can be significant volatility in interim tax provisions.

Income tax (benefit) expense is $(1.1) million and $1.0 million for the three months ended June 30, 2023 and 2022, respectively, and is $(0.5) million and $0.8 million for the six months ended June 30, 2023 and 2022, respectively. The effective tax rates for the three months ended June 30, 2023 and 2022, are 53.3% and 28.8%, respectively. The effective tax rates for the six months ended June 30, 2023 and 2022, are 59.8% and (23.6)%, respectively.

The difference between the Company's effective tax rates in 2023 and 2022 compared to the U.S. statutory tax rate of 21% is primarily due to a Global Intangible Low-Taxed Income ("GILTI") inclusion to taxable income and changes in valuation allowances associated with the Company's assessment of the likelihood of the recoverability of deferred tax assets. The Company has valuation allowances against substantially all of its net operating loss carryforwards and tax credit carryforwards.

12. 13. Commitments and Contingent Liabilities

On April 27, 2022, the Company and Biostage, Inc. ("Biostage") executed a settlement with the plaintiffs in the Biostage Litigation (as defined below) which resolved all claims relating to the litigation as described in Note 13 14, – Litigation Settlement.

The Company is involved in various other claims and legal proceedings arising in the ordinary course of business. After consultation with legal counsel, the Company has determined that the ultimate disposition of such proceedings is not likely to have a material adverse effect on its business, financial condition, results of operations or cash flows.

Although unfavorable outcomes in the proceedings are possible, the Company has not accrued loss contingencies relating to any such matters as they are not considered to be probable and reasonably estimable. If one or more of these matters are resolved in a manner adverse to the Company, the impact on the Company's business, financial condition, results of operations and cash flows could be material.

In addition, the Company has entered into indemnification agreements with its directors. It is not possible to determine the maximum potential liability amount under these indemnification agreements due to the limited history of prior indemnification claims and the unique facts and circumstances involved in each particular agreement. The Company has not recorded any liability for costs related to contingent indemnification obligations as of June September 30, 2023.

16

The Company is subject to unclaimed property laws in the ordinary course of its business. State escheat laws generally require entities to report and remit abandoned and unclaimed property to the state. Failure to timely report and remit the property can result in assessments that could include interest and penalties, in addition to the payment of the escheat liability itself. The Company is currently undergoing unclaimed property audits conducted in various states. Based on the current stage of the audits, the Company has not accrued any loss contingencies significant losses related to these audits as of June September 30, 2023.

13. 14. Litigation Settlement

On April 14, 2017, representatives for the estate of an individual plaintiff filed a wrongful death complaint with the Suffolk Superior Court, in the County of Suffolk, Massachusetts, against the Company and other defendants, including Biostage, a former subsidiary of the Company that was spun off in 2013, as well as another third party (the "Biostage Litigation"). The complaint sought payment for an unspecified amount of damages and alleged that the plaintiff sustained terminal injuries allegedly caused by products, including one synthetic trachea scaffold and two bioreactors, provided by certain of the named defendants and utilized in connection with surgeries performed by third parties in Europe in 2012 and 2013.

On April 27, 2022, the Company and Biostage executed a settlement with the plaintiffs of the Biostage Litigation and Biostage's products liability insurance carriers (the "Biostage Settlement"), which resolved all claims by and between the parties and Biostage's product liability insurance carriers and resulted in the dismissal with prejudice of the wrongful death claim and all claims between the Company, Biostage and the insurance carriers. The Biostage Settlement was entered into solely by way of compromise and settlement and is was not in any way an admission of liability or fault by the Company or Biostage. Biostage has indemnified the Company for all losses and expenses, including legal expenses that the Company incurred in connection with the Biostage Litigation and the Biostage Settlement.

16

During the three nine months ended March 31, 2022, the Company accrued $5.2 million of costs related to legal fees and the Biostage Settlement. Due to the financial condition of Biostage, the Company determined that it was uncertain as to whether Biostage would be able to meet its indemnification obligation and had fully reserved any receivable from Biostage.

During the three months ended June September 30, 2022, the Company recorded credits a net credit of $0.2 million related to the Biostage Settlement consisting of charges (credits) as follows:

- During the three months ended March 31, 2022, the Company accrued $5.2 million of costs related to legal fees and the Biostage Settlement. Additionally, during the year ended December 31, 2021, the Company had incurred $0.3 million in legal fees in connection with the Biostage Litigation. Due to the financial condition of Biostage, the Company determined that it was uncertain as to whether Biostage would be able to meet its indemnification obligation and had fully reserved any receivable from Biostage.
- During the three months ended June 30, 2022, the Company recorded credit adjustments of $4.9 million to the reserve against the indemnification receivable from Biostage. These adjustments reflected: i) the issuance by Biostage of 4,000 shares of its Series E Convertible Preferred Stock (the "Series E Preferred Stock") to the Company on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligation, ii) the payment by Biostage of a portion of the legal fees associated with the Biostage Settlement, and iii) other accrual adjustments. The Series E Preferred Stock accrued dividends at a rate of 8% per annum that are payable in additional shares of Series E Preferred Stock. The Series E Preferred Stock was initially recorded at an estimated fair value of $3.9 million using a Monte Carlo valuation simulation incorporating information from selected guideline companies.
- During the three months ended September 30, 2022, the Company recorded a credit adjustment of $0.5 million to the reserve against the indemnification receivable from Biostage due to the final payment by Biostage of the legal fees associated with the Biostage Settlement.

As of December 31, 2022, the book value of the shares of Series E Preferred Stock, inclusive of accrued dividends, was $4.0 million and was included in the consolidated balance sheet as a component of Other long-term assets. The Company elected the provisions within ASC 321, *Investment Securities*, to subsequently measure the Series E Preferred Stock at its original cost minus impairment, if any, plus or minus changes resulting from observable price changes in orderly transactions for the identical or a similar investment of Biostage. As of December 31, 2022, there were no observable price changes or indicators of impairment and therefore, there was no measurement adjustments to the carrying value of the Series E Preferred Stock.

On January 18, 2023, the Company voluntarily converted 200 shares of its Series E Preferred Stock into 31,933 shares of Biostage common stock.

On April 6, 2023, Biostage disclosed that it had completed a private placement of its common stock for an aggregate offering amount of approximately $6.0 million at a purchase price of $6.00 per share. As the proceeds of the private placements were in excess of $4.0 million, the This transaction triggered a mandatory conversion of the Company's remaining Series E Preferred Stock into shares of Biostage common stock at the offering price of $6.00 per share.

On July 20, 2023, Biostage, Inc. changed its corporate name to Harvard Apparatus Regenerative Technology, Inc. ("HART") and began to trade under the OTCQB Marketplace symbol HRGN.

As of June September 30, 2023, the Company held 707,626 706,626 shares of Biostage HART common stock with an estimated fair value of $2.6 million $3.8 million, which has have been included in the consolidated balance sheet as a component of Other long-term assets due assets. During the three and nine months ended September 30, 2023, the Company recorded an unrealized gain (loss) related to these shares of $1.2 million and $(0.4) million, respectively, which were recorded in the limited trading volumes Other income (expense) section in the consolidated statements of Biostage's common stock on the OTCQB Marketplace. operations.

The Company determines the fair value of its shares of Biostage HART common stock at each reporting period using prices based on the closing price as quoted on the OTCQB Marketplace. Marketplace at the reporting date. Due to Biostage's HART's limited operating history, its overall financial condition and the limited trading volumes and liquidity of its common stock, the value of the Company's investment in Biostage's this common stock could fluctuate considerably or become worthless. During the three months ended June 30, 2023, the Company recorded unrealized losses related to its investment in Biostage common stock of $1.6 million, which was recorded in the Other expense section in the consolidated statements of operations.

14. 15. Product Line Disposition

On February 17, 2023, the Company completed the disposition of its Hoefer product line for cash consideration of $0.5 million. The carrying value of assets sold was $0.1 million resulting in a gain on disposition of $0.4 million which is recorded in Other income, net in the consolidated statement of operations for the six nine months ended June September 30, 2023. Revenue and gross profit of this disposed product line included in the condensed consolidated statement of operations for the six nine months ended June September 30, 2023, and for the three and six nine months ended June September 30, 2022, were not significant.

16. Financial Statement Reclassifications

During the three months ended September 30, 2023, the Company identified immaterial misclassification errors in the financial statement footnote describing the components of accumulated other comprehensive loss as of December 31, 2022 and 2021. These misclassifications overstated the amount attributed to the defined benefit pension plans, net of tax, by $5.4 million and $5.1 million and understated the amount attributed to foreign currency translation adjustments by $(5.4) million and $(5.1) million as of December 31, 2022 and 2021, respectively. This had no impact on total other comprehensive income (loss) for the years ended December 31, 2022 and 2021, included in the Consolidated Statements of Comprehensive Income (Loss), or the total accumulated other comprehensive loss included in the Consolidated Balance Sheets as of December 31, 2022, and 2021. This also had no impact on any of the Company's previously reported Consolidated Statements of Operations, Stockholders' Equity, or Cash Flows. These offsetting misclassifications had no impact on any of the periods presented in the interim financial statements and disclosures in this Quarterly Report on Form 10-Q as of September 30, 2023, and applicable corrections will be included in the annual financial statements and disclosures in the Company's Annual Report on Form 10-K as of December 31, 2023 and for the year then ended.

Item 2. **Item 2. Management's Discussion and Analysis of Financial Condition and Results of Operations.**

Forward-Looking Statements

This Quarterly Report on Form 10-Q contains statements that are not statements of historical fact and are forward-looking statements within the meaning of Section 27A of the Securities Act of 1933 and Section 21E of the Securities Exchange Act of 1934 (the "Exchange Act"). The forward-looking statements are principally, but not exclusively, contained in "Item 2: Management's Discussion and Analysis of Financial Condition and Results of Operations." These statements involve known and unknown risks, uncertainties and other factors that may cause our actual results, performance, or achievements to be materially different from any future results, performance or achievements expressed or implied by the forward-looking statements. Forward-looking statements include, but are not limited to, statements about management's confidence or expectations, and our plans, objectives, expectations, and intentions that are not historical facts. In some cases, you can identify forward-looking statements by terms such as "may," "will," "should," "could," "would," "seek," "expects," "plans," "aim," "anticipates," "believes," "estimates," "projects," "predicts," "intends," "think," "potential," "objectives," "optimistic," "strategy," "goals," "sees," "new," "guidance," "future," "continue," "drive," "growth," "long-term," "projects," "develop," "possible," "emerging," "opportunity," "pursue" and similar expressions intended to identify forward-looking statements. These statements reflect our current views with respect to future events and are based on assumptions and subject to risks and uncertainties. Given these uncertainties, you should not place undue reliance on these forward-looking statements. We discuss many of these risks in detail in our Annual Report on Form 10-K for the year ended December 31, 2022 and our other filings with the SEC. You should carefully review all of these factors, as well as other risks described in our public filings, and you should be aware that there may be other factors, including factors of which we are not currently aware, that could cause these differences. Also, these forward-looking statements represent our estimates and assumptions only as of the date of this report. We may not update these forward-looking statements, even though our situation may change in the future, unless we have obligations under the federal securities laws to update and disclose material developments related to previously disclosed information. Harvard Bioscience, Inc. is referred to herein as "we," "our," "us," and "the Company."

Recent Developments

Global Supply Chain and Economic Environment

The global supply chain has experienced significant disruptions over the last few years due to electronic component and labor shortages and other macroeconomic factors which have emerged since the onset of COVID-19. This has led to increased cost of freight, purchased materials, and manufacturing labor costs, while also delaying customer shipments. Additionally, the global economy has recently experienced increasing economic uncertainty, including inflationary pressure, rising interest rates, and significant fluctuations in exchange rates. These conditions have negatively impacted our past business, results of operations, and cash flow.

We believe that these global Recent events in Ukraine and the Middle East, as well as delays in U.S. government funding may lead to additional economic uncertainties will continue through 2023. uncertainties. If these factors are prolonged or are more severe than anticipated, our business, results of operations, and cash flow may be materially impacted.

Selected Results of Operations

Three months ended June 30, 2023 September 30, 2023 compared to three months ended June 30, 2022 September 30, 2022.

	Three Months Ended June 30,				**Three Months Ended September 30,**			
(dollars in thousands)	**2023**	**% of revenue**	**2022**	**% of revenue**	**2023**	**% of revenue**	**2022**	**% of revenue**
Revenues	$ 28,759		$ 29,208		$ 25,363		$ 26,922	
Gross profit	16,673	58.0 %	16,637	57.0 %	14,727	58.1 %	12,172	45.2 %
Sales and marketing expenses	6,178	21.5 %	6,587	22.6 %	5,732	22.6 %	5,819	21.6 %
General and administrative expenses	5,353	18.6 %	5,981	20.5 %	5,807	22.9 %	6,324	23.5 %
Research and development expenses	2,957	10.3 %	3,497	12.0 %	2,760	10.9 %	2,763	10.3 %
Amortization of intangible assets	1,389	4.8 %	1,454	5.0 %	1,361	5.4 %	1,572	5.8 %
Litigation settlement	-	-	(4,880)	-16.7 %	-	-	(544)	-2.0 %
Unrealized loss on equity securities	1,581	5.5 %	-	-				
Unrealized gain on equity securities					(1,208)	-4.8 %	-	-
Interest expense	941	3.3 %	515	1.8 %	882	3.5 %	749	2.8 %
Income tax (benefit) expense	(1,118)	-3.9 %	986	3.4 %				
Income tax expense (benefit)					677	2.7 %	(1,285)	-4.8 %

Revenue

Revenue decreased $0.4 million, or 1.5%, to $28.8 million was $25.4 million for the three months ended June 30, 2023 September 30, 2023, compared to $29.2 million $26.9 million for the three months ended June 30, 2022 September 30, 2022, a decrease of $1.5 million, or 5.8%. This decline included a net decrease of $1.6 million in revenue $1.3 million from the discontinuation of non-strategic cellular and molecular products discontinued in the second half of 2022 and decreases in cellular and molecular product revenue, which were largely offset by growth in preclinical products and services. Revenue declines in Asia were partially offset by revenue growth in preclinical products. North America.

Gross profit

Gross profit was $16.7 million for three months ended June 30, 2023, compared with $16.6 million $14.7 million for the three months ended June 30, 2022 September 30, 2023, compared with $12.2 million for the three months ended September 30, 2022. Gross margin increased to 58.0% 58.1% for the three months ended June 30, 2023 September 30, 2023, compared with 57.0% 45.2% for the three months ended June 30, 2022 September 30, 2022. The increase in gross margin was due primarily to a higher mix of preclinical products, service and software, which generally have higher gross margin margins than our other product lines, and as well as reduced revenue from lower margin products discontinued during the second half of 2022. Additionally, during Costs of goods sold for the three months ended June 30, 2023 September 30, 2022, we aligned our global also included a $1.3 million inventory costing process, which had an unfavorable impact reserve related to gross margin. the discontinuation of certain non-strategic products.

Sales and marketing expenses

Sales and marketing expenses decreased $0.4 million $0.1 million, or 6.2% 1.5%, to $6.2 million $5.7 million for the three months ended June 30, 2023 September 30, 2023, compared to $6.6 million $5.8 million for the three months ended June 30, 2022 September 30, 2022. The decrease was primarily A reduction in salaries due to reduced salaries lower headcount was mostly offset by increases in variable compensation and travel expenses.

General and administrative expenses

General and administrative expenses decreased $0.6 million $0.5 million, or 10.5% 8.2%, to $5.4 million $5.8 million for the three months ended June 30, 2023 September 30, 2023, compared with $6.0 million $6.3 million for the three months ended June 30, 2022 September 30, 2022. This decrease was primarily due to reduced consulting We undertook a restructuring during the three months ended September 30, 2022, which resulted in higher severance costs partially offset by increases in salaries and variable compensation. the prior period.

Research and development expenses

Research and development expenses decreased $0.5 million, or 15.4%, to $3.0 million were $2.8 million for both the three months ended June 30, 2023 September 30, 2023, compared with $3.5 million for the three months ended June 30, 2022. The decrease was primarily and 2022. A reduction in salaries due to reduced salaries lower headcount and a reduction in consulting costs partially were mostly offset by increases in variable compensation.

Amortization of intangible assets

Amortization of intangible asset expenses were $1.4 million for the three months ended June 30, 2023 September 30, 2023, compared with $1.5 million $1.6 million for the three months ended June 30, 2022 September 30, 2022. Amortization expense decreased as we completed due to the amortization completion of amortizing certain intangible assets during 2022.

Litigation settlement (2022)

During the three months ended March 31, 2022 September 30, 2022, we accrued $5.2 million released a reserve of costs related to legal fees in connection with $0.5 million against the Biostage Litigation and the Biostage Settlement. Due to the financial condition of Biostage, we determined that it was uncertain as to whether Biostage would be able to meet its indemnification obligation and had fully reserved any receivable from Biostage.

During the three months ended June 30, 2022, we recorded a credit of $4.9 million consisting of adjustments to the reserve against an indemnification receivable from Biostage to reflect: i) reflect the issuance final payment by Biostage of Series E Preferred Stock to us on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligations, ii) the payment by Biostage of legal fees associated with the Biostage Settlement, and iii) other accrual adjustments. The Series E Preferred Stock was initially recorded at an estimated fair value of $3.9 million using a Monte Carlo valuation simulation incorporating information from selected guideline companies. Settlement.

Unrealized loss gain on equity securities

On April 6, 2023, Biostage disclosed that it had completed a private placement of its common stock for an aggregate offering amount of approximately $6.0 million at a purchase price of $6.00 per share. As the proceeds of the private placements were in excess of $4.0 million, the transaction triggered a mandatory conversion of our Series E Preferred Stock into shares of Biostage common stock at the offering price of $6.00 per share. On July 20, 2023, Biostage, Inc. changed its corporate name to Harvard Apparatus Regenerative Technology ("HART") and began to trade under the OTCQB Marketplace symbol HRGN. As of June 30, 2023 September 30, 2023, we held 707,626 706,626 shares of

Biostage HART common stock with an estimated fair value of $2.6 million $3.8 million. During the three months ended September 30, 2023, we recorded an unrealized gain of $1.2 million related to these shares.

We determine the fair value of our shares of Biostage HART common stock at each reporting period using prices based on the closing price as quoted on the OTCQB Marketplace. During Marketplace at the three months ended June 30, 2023, we recorded unrealized losses related to our investment in Biostage common stock of $1.6 million. reporting date. Due to Biostage's HART's limited operating history, its overall financial condition and the limited trading volumes and liquidity of its common stock, the value of our investment in Biostage's this common stock could fluctuate considerably or become worthless.

Interest expense

Interest expense increased $0.4 million, or 82.7%, to was $0.9 million and $0.7 million for the three months ended June 30, 2023, compared with $0.5 million for the three months ended June 30, 2022. September 30, 2023 and 2022, respectively. The increase was the result of higher interest costs in a rising rate environment, which was partially offset by lower average borrowings during the period.

Income tax

Income tax expense (benefit) expense for the three months ended June 30, 2023 September 30, 2023 was $(1.1) million $0.7 million and for the three months ended June 30, 2022 September 30, 2022 was $1.0 million. $(1.3) million. The effective tax rates for the three months ended June 30, 2023 September 30, 2023 and 2022 were 53.3% (120.2)% and 28.8% 27.4%, respectively. The difference between our effective tax rates for the three months ended June 30, 2023 and 2022, September 30, 2023, compared to the U.S. statutory tax rate of 21% is primarily due to the mix of forecasted income or losses in our U.S. and foreign tax jurisdictions and a Global Intangible Low-Taxed Income ("GILTI") inclusion to taxable income income. The effective tax rates in both the three months ended September 30, 2023 and 2022, were also impacted by changes in valuation allowances associated with our assessment of the likelihood of the recoverability of our deferred tax assets. We have valuation allowances against substantially all of our net operating loss carryforwards and tax credit carryforwards.

Six Nine months ended June 30, 2023 September 30, 2023 compared to six nine months ended June 30, 2022 September 30, 2022.

	Six Months Ended June 30,				Nine Months Ended September 30,			
(dollars in thousands)	2023	% of revenue	2022	% of revenue	2023	% of revenue	2022	% of revenue
Revenues	$ 58,734		$ 57,986		$ 84,097		$ 84,908	
Gross profit	35,019	59.6%	32,814	56.6%	49,746	59.2%	44,986	53.0%
Sales and marketing expenses	12,156	20.7%	13,274	22.9%	17,888	21.3%	19,093	22.5%
General and administrative expenses	11,687	19.9%	12,306	21.2%	17,494	20.8%	18,630	21.9%
Research and development expenses	5,854	10.0%	6,717	11.6%	8,614	10.2%	9,480	11.2%
Amortization of intangible assets	2,777	4.7%	2,920	5.0%	4,138	4.9%	4,492	5.3%
Litigation settlement	-	-	311	0.5%	-	-	(233)	-0.3%
Unrealized loss on equity securities	1,581	2.7%	-	-	373	0.4%	-	-
Interest expense	1,915	3.3%	899	1.6%	2,797	3.3%	1,648	1.9%
Income tax (benefit) expense	(533)	-0.9%	848	1.5%				
Income tax expense (benefit)					144	0.2%	(437)	-0.5%

Revenue

Revenue increased $0.7 million, or 1.3%, to $58.7 million was $84.1 million for the six nine months ended June 30, 2023 September 30, 2023, compared to $58.0 million $84.9 million for the six nine months ended June 30, 2022 September 30, 2022, a decrease of $0.8 million, or 1.0%. The increase in revenue was primarily due to revenue growth in preclinical products, which was partially offset by decreases Revenue included a net decrease of $4.1 million from the discontinuation of non-strategic cellular products which was largely offset by growth in preclinical product and molecular products of $2.8M. service revenue.

Gross profit

Gross profit was $35.0 million $49.7 million for six nine months ended June 30, 2023 September 30, 2023, compared with $32.8 million $45.0 million for the six nine months ended June 30, 2022 September 30, 2022. Gross margin increased to 59.6% 59.2% for the six nine months ended June 30, 2023 September 30, 2023, compared with 56.6% 53.0% for the six nine months ended June 30, 2022 September 30, 2022. The increase in gross margin was due primarily to the increase in revenue, a higher mix of preclinical products, services and software, which generally have higher gross margin margins than our other product lines, and as well as reduced revenue from lower margin products discontinued during the second half of 2022. Costs of goods sold for the three months ended September 30, 2022, also included a $1.3 million inventory reserve related to the discontinuation of certain non-strategic products.

Sales and marketing expenses

Sales and marketing expenses decreased $1.1 million $1.2 million, or 8.4% 6.3%, to $12.2 million $17.9 million for the six nine months ended June 30, 2023 September 30, 2023, compared to $13.3 million $19.1 million for the six nine months ended June 30, 2022 September 30, 2022. The decrease was primarily A reduction in salaries due to reduced salaries and travel expenses lower headcount was partially offset by increases in variable compensation.

General and administrative expenses

General and administrative expenses decreased $0.6 million $1.1 million, or 5.0% 6.1%, to $11.7 million $17.5 million for the six nine months ended June 30, 2023 September 30, 2023, compared with $12.3 million $18.6 million for the six nine months ended June 30, 2022 September 30, 2022. The decrease was primarily due to reduced consulting costs and severance costs incurred with restructuring activities in the prior period, partially offset by increases in salaries and variable compensation. compensation in the current period.

Research and development expenses

Research and development expenses decreased $0.9 million, or 12.8% 9.1%, to $5.9 million $8.6 million for the six nine months ended June 30, 2023 September 30, 2023, compared with $6.7 million $9.5 million for the six nine months ended June 30, 2022 September 30, 2022. The decrease was primarily due to reduced salaries and consulting costs, partially offset by increases in variable compensation.

Amortization of intangible assets

Amortization of intangible asset expenses were $2.8 million $4.1 million for the six nine months ended June 30, 2023 September 30, 2023, compared with $2.9 million $4.5 million for the six nine months ended June 30, 2022 September 30, 2022. Amortization expense decreased as we completed the amortization of certain intangible assets during 2022.

Litigation settlement (2022)

During the six nine months ended June 30, 2022 September 30, 2022, we incurred recorded a net expense credit of $0.3 million $0.2 million related to the Biostage Settlement consisting of $5.2 million in settlement and legal expenses accrued during the three months ended March 31, 2022, offset by a credit credits of $4.9 million and $0.5 million recorded during the three months ended June 30, 2022 as discussed above, related to and September 30, 2022, respectively. The credits consisted of adjustments to the reserves reserve against the indemnification receivable from Biostage. Biostage to reflect: i) the issuance by Biostage of Series E Convertible Preferred Stock to us on June 10, 2022, in satisfaction of $4.0 million of Biostage's total indemnification obligations, ii) the payment by Biostage of legal fees associated with the Biostage Settlement, and iii) other accrual adjustments.

Unrealized loss on equity securities

On April 6, 2023, Biostage disclosed that it had completed a private placement of its common stock for an aggregate offering amount of approximately $6.0 million at a purchase price of $6.00 per share. As the proceeds of the private placements were in excess of $4.0 million, the transaction triggered a mandatory conversion of our Series E Preferred Stock into discussed above, we held 706,626 shares of Biostage common stock at the offering price of $6.00 per share. As of June 30, 2023, we held 707,626 shares of Biostage HART common stock with an estimated fair value of $2.6 million $3.8 million as of September 30, 2023. During the nine months ended September 30, 2023, we recorded an unrealized loss of $0.4 million related to these shares.

We determine the fair value of our shares of Biostage HART common stock at each reporting period using prices based on the closing price as quoted on the OTCQB Marketplace. During Marketplace at the six months ended June 30, 2023, we recorded unrealized losses related to our investment in Biostage common stock of $1.6 million. reporting date. Due to Biostage's HART's limited operating history, its overall financial condition and the limited trading volumes and liquidity of its common stock, the value of our investment in Biostage's this common stock could fluctuate considerably or become worthless.

Interest expense

Interest expense increased $1.0 million $1.2 million, or 113.0 %, 69.7%, to $1.9 million $2.8 million for the six nine months ended June 30, 2023 September 30, 2023, compared with $0.9 million $1.6 million for the six nine months ended June 30, 2022 September 30, 2022. The increase was the result of higher interest costs in a rising rate environment, which was partially offset by lower average borrowings during the period.

Income tax

Income tax expense (benefit) expense for the six nine months ended June 30, 2023 September 30, 2023 was $(0.5) million $0.1 million and for the six nine months ended June 30, 2022 September 30, 2022 was $0.8 million. $(0.4) million. The effective tax rates for the six nine months ended June 30, 2023 September 30, 2023 and 2022 were 59.8% (9.9)% and (23.6)% 5.3%, respectively. The difference between our effective tax rates for the six nine months ended June 30, 2023 and 2022, September 30, 2023, compared to the U.S. statutory tax rate of 21% is was primarily due to the mix of forecasted income or losses in our U.S. and foreign tax jurisdictions and a GILTI inclusion to taxable income income. The effective tax rates in both the nine months ended September 30, 2023 and 2022, were also impacted by changes in valuation allowances associated with our assessment of the likelihood of the recoverability of our deferred tax assets. We have valuation allowances against substantially all of our net operating loss carryforwards and tax credit carryforwards.

Liquidity and Capital Resources

Our primary sources of liquidity are cash and cash equivalents, internally generated cash flow from operations and our revolving credit facility. Our expected cash outlays relate primarily to cash payments due under our Credit Agreement described below, salaries as well as capital expenditures.

As of June 30, 2023 September 30, 2023, we held cash and cash equivalents of $4.3 million $5.3 million, compared with $4.5 million at December 31, 2022. Borrowings outstanding were $42.1 million $39.4 million and $47.7 million as of June 30, 2023 September 30, 2023 and December 31, 2022, respectively.

On December 22, 2020, we entered into a Credit Agreement which provides for a term loan of $40.0 million and a $25.0 million senior revolving credit facility both maturing on December 22, 2025. As of June 30, 2023 September 30, 2023, the weighted average interest rate on our borrowings, inclusive of the effect of the our interest rate swaps, was 8.1% 7.7%, and the available and unused borrowing capacity was $12.4 million $13.0 million. Total revolver borrowing capacity is limited by our consolidated net leverage ratio as defined under the Credit Agreement, as amended. As of June 30, 2023 September 30, 2023, we were in compliance with the covenants of the Credit Agreement, as amended.

Based on our current operating plans, we expect that our available cash, cash generated from current operations and debt capacity will be sufficient to finance current operations, and capital expenditures for at least the next 12 months. This assessment includes consideration of our best estimates of the impact of macroeconomic conditions and the COVID-19 pandemic on our financial results described above. Our forecast of the period of time through which our financial resources will be adequate to support our operations is a forward-looking statement that involves risks and uncertainties, and actual results could vary as a result of a number of factors.

CONDENSED CONSOLIDATED CASH FLOW STATEMENTS

	Six Months Ended June 30,		Nine Months Ended September 30,	
(in thousands)	2023	2022	2023	2022
Cash provided by (used in) operating activities	$ 5,364	$ (2,176)	$ 9,725	$ (1,527)
Cash used in investing activities	(337)	(913)	(738)	(1,355)
Cash used in financing activities	(5,268)	(484)	(8,018)	(107)
Effect of exchange rate changes on cash	57	11	(137)	312
Decrease in cash and cash equivalents	$ (184)	$ (3,562)		
Increase (decrease) in cash and cash equivalents			$ 832	$ (2,677)

Cash provided by (used in) operating activities was $5.4 million and $(2.2) million $9.7 million for the six nine months ended June 30, 2023 and 2022, respectively. Cash flow from operations September 30, 2023, compared with cash used in operating activities of $1.5 million for the six nine months ended June 30, 2023, was greater than September 30, 2022. Cash provided by operating activities for the comparable period in the prior year reflecting improved operating results. Also, during the six nine months ended June 30, 2022 September 30, 2023 improved due to reductions in our net loss adjusted for non-cash items and increases in deferred revenue for service contracts. During the nine months ended September 30, 2022, we paid cash used in operating activities was negatively impacted by the payment of approximately $4.0 million in connection with the Biostage Settlement.

Cash used in investing activities was $0.3 million $0.7 million for the six nine months ended June 30, 2023 September 30, 2023, and primarily consisted of $0.8 million $1.2 million of capital expenditures in manufacturing, information technology infrastructure, and intangible asset acquisitions, offset by $0.5 million from proceeds of the sale our Hoefer product line. Cash used in investing activities was $0.9 million $1.4 million for the six nine months ended June 30, 2022 September 30, 2022, and primarily consisted of capital expenditures in manufacturing and information technology infrastructure.

REFINITIV

Cash used in financing activities was $5.3 million $8.0 million and $0.5 million $0.1 million for the six nine months ended June 30, 2023 September 30, 2023 and 2022, respectively. During the six nine months ended June 30, 2023 September 30, 2023, debt outstanding under our credit facility decreased by $5.5 million $8.3 million, consisting of net payments against our revolving line of credit of $2.9 million $5.0 million, and payments of $2.6 million $3.3 million against the term loan. We also received proceeds of $0.7 million from the exercise of stock options and employee stock purchases and paid $0.5 million for taxes related to net share settlement of equity awards. During the six nine months ended June 30, 2022 September 30, 2022, we made payments debt outstanding under our credit facility increased by $0.7 million, consisting of $1.7 million against our term loan, which were offset by net drawings against our revolving credit facility revolver of $1.7 million. $3.1 million, offset by payments of $2.4 million against the term loan. We also paid $0.8 million $1.2 million for taxes related to net share settlement of equity awards.

Impact of Foreign Currencies

Our international operations in some instances operate in a natural hedge, as we sell our products in many countries and a substantial portion of our revenues, costs and expenses are denominated in foreign currencies, primarily the euro and British pound.

During the three months ended June 30, 2023, the impact of foreign currency exchange rates on our consolidated revenues and expense was not significant. During the six months ended June 30, 2023 September 30, 2023, changes in foreign currency exchange rates resulted in an unfavorable a favorable translation effect on our consolidated revenues of approximately $0.4 million $0.7 million and a favorable an unfavorable effect on expense of approximately $0.4 million $0.5 million. During the nine months ended September 30, 2023, changes in foreign currency exchange rates resulted in a favorable translation effect on our consolidated revenues of approximately $0.3 million and a unfavorable effect on expense of approximately $0.1 million.

The gain (loss) loss associated with the translation of foreign equity into U.S. dollars included as a component of comprehensive income loss was $0.2 million $1.3 million and $(2.5) million $2.9 million for the three months ended June 30, 2023 September 30, 2023 and June 30, 2022, 2022, respectively, and was $1.0 million $0.4 million and $(3.2) million $6.2 million for the six nine months ended June 30, 2023 September 30, 2023 and June 30, 2022, 2022, respectively.

In addition, currency exchange rate fluctuations included as a component of net income (loss) loss resulted in currency losses gains (losses) of approximately $0.1 million $0.2 million and $0.2 million $(0.3) million for each of the three months ended June 30, 2023 September 30, 2023 and 2022, respectively, and $0.1 million and $0.2 million $(0.6) million for each of the six nine months ended June 30, 2023 September 30, 2023 and 2022, respectively.

Critical Accounting Policies

The critical accounting policies underlying the accompanying unaudited consolidated financial statements are those set forth in Part II, Item 7 included in our Annual Report on Form 10-K for the fiscal year ended December 31, 2022.

Recent Accounting Pronouncements

For information on recent accounting pronouncements impacting our business, see “Recently Issued Accounting Pronouncements” included in Note 2 to our Condensed Consolidated Financial Statements included in “Part I, Item 1. Financial Statements” of this report.

Item 3. **Item 3.Quantitative and Qualitative Disclosures about Market Risk**

Not Applicable.

Item 4. **Item 4.Controls and Procedures.**

Evaluation of Disclosure Controls and Procedures

As of June 30, 2023 September 30, 2023, the end of the period covered by this report, our management, including our Chief Executive Officer and our Chief Financial Officer, reviewed and evaluated the effectiveness of our disclosure controls and procedures (as defined in Rule 13a-15(e) or 15d-15(e) of the Exchange Act). Based upon management's review and evaluation, our Chief Executive Officer and Chief Financial Officer have concluded that, as of the end of the period covered by this Quarterly Report on Form 10-Q, our disclosure controls and procedures were effective to provide reasonable assurance that information required to be disclosed in our Exchange Act reports is recorded, processed, summarized and reported within the time periods specified by the SEC and is accumulated and communicated to management, including the Chief Executive Officer and Chief Financial Officer, as appropriate, to allow timely decisions regarding required disclosure.

Changes in Internal Control over Financial Reporting

There were no changes in our internal control over financial reporting during the second third quarter of fiscal 2023 that have materially affected, or are reasonably likely to materially affect, our internal control over financial reporting.

Limitations on Effectiveness of Controls and Procedures

In designing and evaluating our controls and procedures, management recognizes that any controls and procedures, no matter how well designed and operated, can provide only reasonable assurance of achieving the desired control objectives, and management is required to apply its judgment in evaluating the cost-benefit relationship of possible controls and procedures. Because of the inherent limitations in all control systems, no evaluation of controls can provide absolute assurance that all control issues and instances of fraud within the Company have been detected.

PART II. OTHER INFORMATION

Item 1. **Item 1Legal Proceedings.**

The information included in Note 13 and Note 14 to the Condensed Consolidated Financial Statements (Unaudited) included in “Part I, Item 1 Financial Statements” of this quarterly report is incorporated herein by reference.

Item 1A. **Item 1A.Risk Factors.**

You should carefully consider the risk factors discussed in Part I, “Item 1A. Risk Factors” in our Annual Report on Form 10-K for the fiscal year ended December 31, 2022, which could materially affect our business, financial position, or future results of operations. The risks described in our Annual Report on Form 10-K are not the only risks we face. Additional risks and uncertainties not currently known to us or that we currently deem to be immaterial may also materially adversely affect our business, financial position, or future results of operations.

Item 2. **Item 2.Unregistered Sales of Equity Securities and Use of Proceeds.**

There were no unregistered sales of equity securities during the period covered by this report.

Item 3. **Item 3.Defaults Upon Senior Securities.**

None.

Item 4. **Item 4.Mine Safety Disclosures.**

Not applicable.

Item 5. **Item 5.Other Information.**

None.

Item 6. **ExhibitsItem 6.Exhibits**

10.1	Employment Agreement between Jennifer Cote and the Company dated June 19, 2023 (previously filed as an exhibit to the Company’s Current Report on Form 8-K on June 20, 2023 and incorporated by reference thereto).

31.1	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
31.2	Certification of Chief Executive Officer of Harvard Bioscience, Inc., pursuant to Rules 13a-14(a) and 15d-14(a), as adopted pursuant to Section 302 of the Sarbanes-Oxley Act of 2002.
32.1*	Certification of Chief Financial Officer of Harvard Bioscience, Inc., pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
32.2*	Certification of Chief Executive Officer of Harvard Bioscience, Inc., pursuant to 18 U.S.C. Section 1350, as adopted pursuant to Section 906 of the Sarbanes-Oxley Act of 2002.
101.INS	Inline XBRL Instance Document
101.SCH	Inline XBRL Taxonomy Extension Schema Document
101.CAL	Inline XBRL Taxonomy Extension Calculation Linkbase Document
101.DEF	Inline XBRL Taxonomy Extension Definition Linkbase Document
101.LAB	Inline XBRL Taxonomy Extension Labels Linkbase Document
101.PRE	Inline XBRL Taxonomy Extension Presentation Linkbase Document
104	Cover Page Interactive Data File (formatted in Inline XBRL and contained in Exhibit 101)

*	This certification shall not be deemed “filed” for purposes of Section 18 of the Securities Exchange Act of 1934, or otherwise subject to the liability of that section, nor shall it be deemed to be incorporated by reference into any filing under the Securities Act of 1933 or the Securities Exchange Act of 1934

27

SIGNATURES

Pursuant to the requirements of the Securities Exchange Act of 1934, the registrant has duly caused this report to be signed on its behalf by undersigned thereunto duly authorized.

HARVARD BIOSCIENCE, INC.

Date: August 8, 2023 November 7, 2023

By: /s/ JAMES GREEN
James Green
Chief Executive Officer

By: /s/ JENNIFER COTE
Jennifer Cote
Chief Financial Officer

28
27

Exhibit EXHIBIT 31.1

Certification

I, Jennifer Cote, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, Inc.

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)), and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

   a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

   b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

   c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

   d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

   a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

   b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date August 8, 2023 November 7, 2023

/s/ JENNIFER COTE

Jennifer Cote
Chief Financial Officer

Exhibit EXHIBIT 31.2

Certification

I, James Green, certify that:

1. I have reviewed this Quarterly Report on Form 10-Q of Harvard Bioscience, Inc.

2. Based on my knowledge, this report does not contain any untrue statement of a material fact or omit to state a material fact necessary to make the statements made, in light of the circumstances under which such statements were made, not misleading with respect to the period covered by this report;

3. Based on my knowledge, the financial statements, and other financial information included in this report, fairly present in all material respects the financial condition, results of operations and cash flows of the registrant as of, and for, the periods presented in this report;

4. The registrant's other certifying officer(s) and I are responsible for establishing and maintaining disclosure controls and procedures (as defined in Exchange Act Rules 13a-15(e) and 15d-15(e)), and internal control over financial reporting (as defined in Exchange Act Rules 13a-15(f) and 15d-15(f)) for the registrant and have:

a. Designed such disclosure controls and procedures, or caused such disclosure controls and procedures to be designed under our supervision, to ensure that material information relating to the registrant, including its consolidated subsidiaries, is made known to us by others within those entities, particularly during the period in which this report is being prepared;

b. Designed such internal control over financial reporting, or caused such internal control over financial reporting to be designed under our supervision, to provide reasonable assurance regarding the reliability of financial reporting and the preparation of financial statements for external purposes in accordance with generally accepted accounting principles;

c. Evaluated the effectiveness of the registrant's disclosure controls and procedures and presented in this report our conclusions about the effectiveness of the disclosure controls and procedures, as of the end of the period covered by this report based on such evaluation; and

d. Disclosed in this report any change in the registrant's internal control over financial reporting that occurred during the registrant's most recent fiscal quarter (the registrant's fourth fiscal quarter in the case of an annual report) that has materially affected, or is reasonably likely to materially affect, the registrant's internal control over financial reporting; and

5. The registrant's other certifying officer(s) and I have disclosed, based on our most recent evaluation of internal control over financial reporting, to the registrant's auditors and the audit committee of the registrant's board of directors (or persons performing the equivalent functions):

a. All significant deficiencies and material weaknesses in the design or operation of internal control over financial reporting which are reasonably likely to adversely affect the registrant's ability to record, process, summarize and report financial information; and

b. Any fraud, whether or not material, that involves management or other employees who have a significant role in the registrant's internal control over financial reporting.

Date: August 8, 2023 November 7, 2023

/s/ JAMES GREEN

James Green
Chief Executive Officer

Exhibit EXHIBIT 32.1

CERTIFICATION OF PERIODIC FINANCIAL REPORT PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the "Company") hereby certifies to her knowledge that the Company's Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2023 September 30, 2023 (the "Report") to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b) (32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the "Securities Act"), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: August 8, 2023 November 7, 2023

/s/ JENNIFER COTE

Name: Jennifer Cote
Title: Chief Financial Officer

Exhibit EXHIBIT 32.2

CERTIFICATION OF PERIODIC FINANCIAL REPORT PURSUANT TO 18 U.S.C. SECTION 1350

The undersigned officer of Harvard Bioscience, Inc. (the "Company") hereby certifies to his knowledge that the Company's Quarterly Report on Form 10-Q for the quarterly period ended June 30, 2023 September 30, 2023 (the "Report") to which this certification is being furnished as an exhibit, as filed with the Securities and Exchange Commission on the date hereof, fully complies with the requirements of Section 13(a) or 15(d), as applicable, of the Securities Exchange Act of 1934, as amended (the "Exchange Act"), and that the information contained in the Report fairly presents, in all material respects, the financial condition and results of operations of the Company. This certification is provided solely pursuant to 18 U.S.C. Section 1350 and Item 601(b)(32) of Regulation S-K (Item 601(b)(32)) promulgated under the Securities Act of 1933, as amended (the "Securities Act"), and the Exchange Act. In accordance with clause (ii) of Item 601(b)(32), this certification (A) shall not be deemed "filed" for purposes of Section 18 of the Exchange Act, or otherwise subject to the liability of that section, and (B) shall not be deemed to be incorporated by reference into any filing under the Securities Act or the Exchange Act, except to the extent that the Company specifically incorporates it by reference.

Date: August 8, 2023 November 7, 2023

/s/ JAMES GREEN

Name: James Green

Title: Chief Executive Officer

REFINITIV