# BORING LOG NO. 09-B110

| | | | |
|---|---|---|---|
| CLIENT: | USACE Galveston District<br>Galveston, Texas | PROJECT: | TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II |
| BORING LOCATION: | N: 688943.922<br>E: 3280303.892 | SITE: | Atkinson Island PA16<br>Texas |

**Approx. Surface Elevation: 7.3 feet**

| Graphic Log | DESCRIPTION | | | DEPTH, FEET | USCS SYMBOL | TYPE | RECOVERY, IN | SPT, BLOWS/FT | CALIBRATED HAND PENETROM., TSF | TORVANE, TSF | MOISTURE CONTENT, % | DRY DENSITY, PCF | LIQUID LIMIT, % | PLASTIC LIMIT, % | PLASTICITY INDEX | MINUS #200 SIEVE, % | COMPRESSIVE STRENGTH, TSF | FAILURE STRAIN, % | CONFINING PRESSURE, PSI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **FILL: FAT CLAY** brown, very stiff, with roots and sand pockets, dry, very high plasticity | 5.3 | 2.0 ▼ | 1 | CH | ST | 6 | | 3.0 | | 55 | | 89 | 30 | 59 | 90 | | | |
| | **FILL: SILTY SAND** gray and light brown, medium dense, fine grain, with shell and clay pockets, wet, none to slight plasticity | 3.3 | 4.0 | 3 | SM | ST | 12 | | 1.0 | 1.25 | 22 | | | | | 34 | | | |
| | **FILL: SANDY LEAN CLAY** light gray, dark gray and brown, stiff to very stiff, with sand pockets and layers, moist, high plasticity | -2.7 | 10.0 | 5 | CL | ST | 12 | | | 2 | 25 | | | | | | | | |
| | | | | 7 | | ST | 10 | | | 1.5 | 28 | | 49 | 18 | 31 | 61 | | | |
| | | | | 9 | | SS | 10 | 21 | | | 45 | | | | | | | | |
| | Boring terminated at 10 feet. | | | 10 | | | | | | | | | | | | | | | |

STRATIFICATION LINES REPRESENT APPROXIMATE BOUNDARIES BETWEEN SOIL TYPES. IN SITU, THE TRANSITION BETWEEN STRATA MAY BE MORE GRADUAL.

REMARKS: Dry augered to 2 feet; wet rotary thereafter.

| WATER LEVEL OBSERVATIONS | | | |
|---|---|---|---|
| ▽ 2 ft | WS | ▼ 2 ft | at 5 min |
| ▼ 2 ft | at 10 min | ▼ 2 ft | at 5 min |

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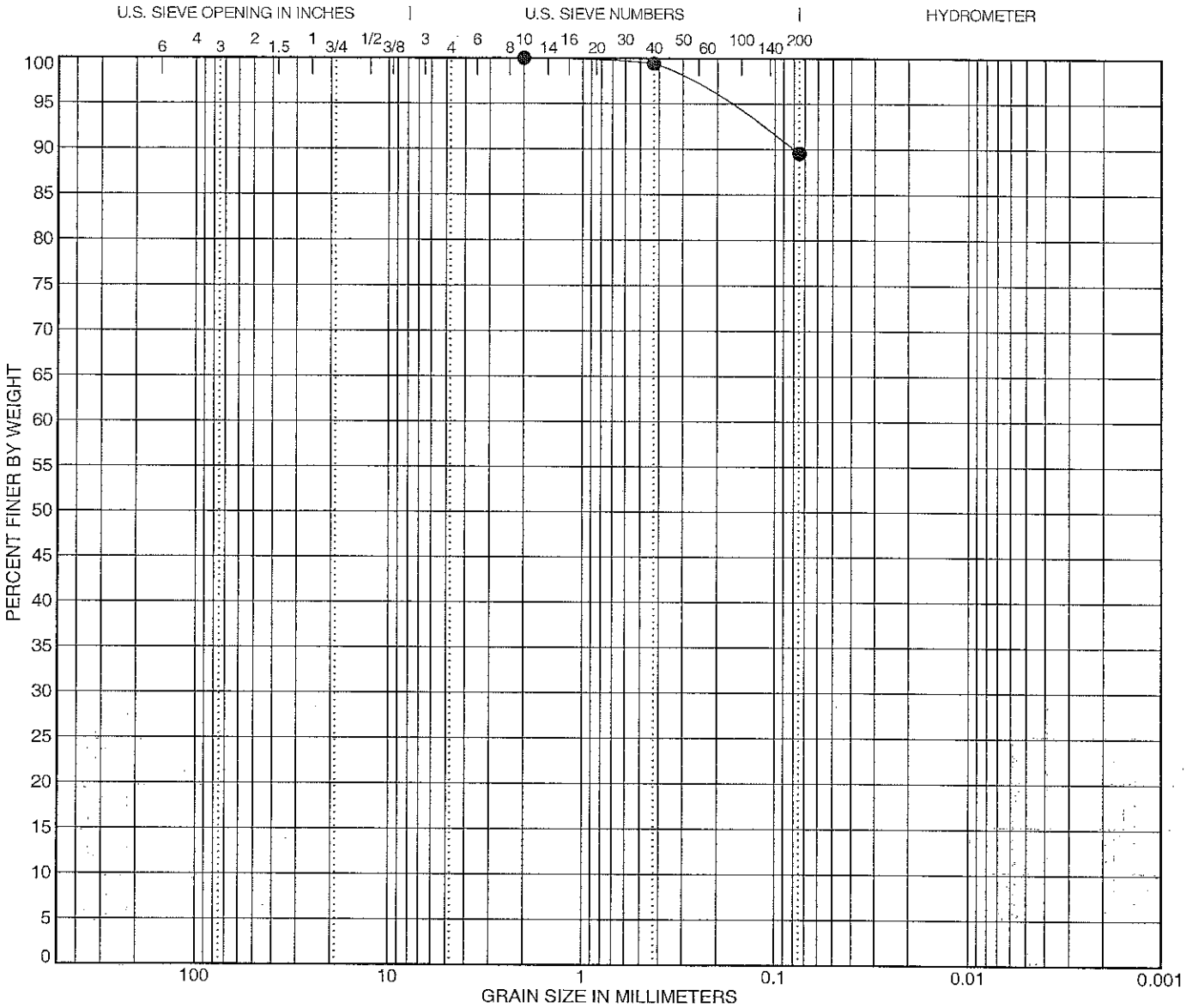
| DATE DRILLED | Page 1 of 1 |
|---|---|
| 3/20/2010 | 09-B110 |
| PROJECT NUMBER 92105186-B | EXHIBIT A- |




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | Specimen Identification | | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | **09-B110** | **0.0** | **FAT CLAY(CH)** | **89** | **30** | **59** | | |

| D100 | D50 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|
| **2** | | | | **0.0** | **10.5** | **89.5** | |

Percent Passing the Indicated Sieve

| 2" | 1-1/2" | 1" | 3/4" | 3/8" | #4 | #8 | #10 | #16 | #20 | #30 | #40 | #50 | #70 | #100 | #140 | #200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **100** | | | | **99.4** | | | | | **89.5** |

# GRAIN SIZE DISTRIBUTION

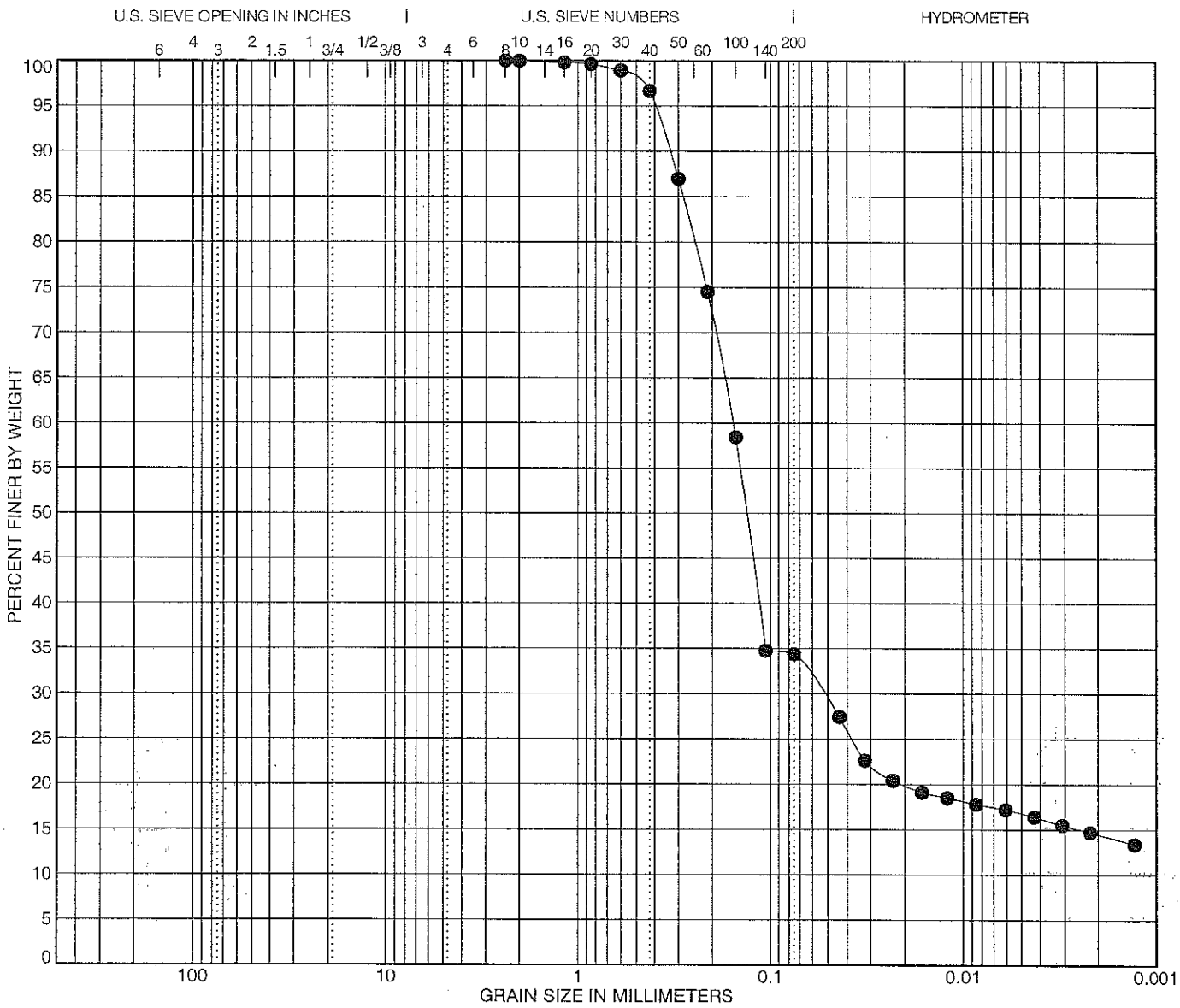
TO-0012 Pipeline Dredging, Cedar Bayou & Anahuac Channel, Volume II
, Texas
Project Number 92105186-B

Terracon

Terracon Consultants, Inc.
11555 Clay Road, Suite 100
Houston, Texas 77043
Telephone: 713-690-8989
Fax: 713-690-8787



**EXHIBIT**
**i**




| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| | Specimen Identification | | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | **09-B110** | **2.0** | | | | | | |

| D100 | D50 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|
| **2.36** | **0.133** | **0.054** | | **0.0** | **65.7** | **19.9** | **14.5** |

Percent Passing the Indicated Sieve

| 2" | 1-1/2" | 1" | 3/4" | 3/8" | #4 | #8 | #10 | #16 | #20 | #30 | #40 | #50 | #70 | #100 | #140 | #200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | **100** | **100** | **99.8** | **99.6** | **98.9** | **96.7** | **87** | **74.5** | **58.4** | **34.7** | **34.3** |

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**EXHIBIT**
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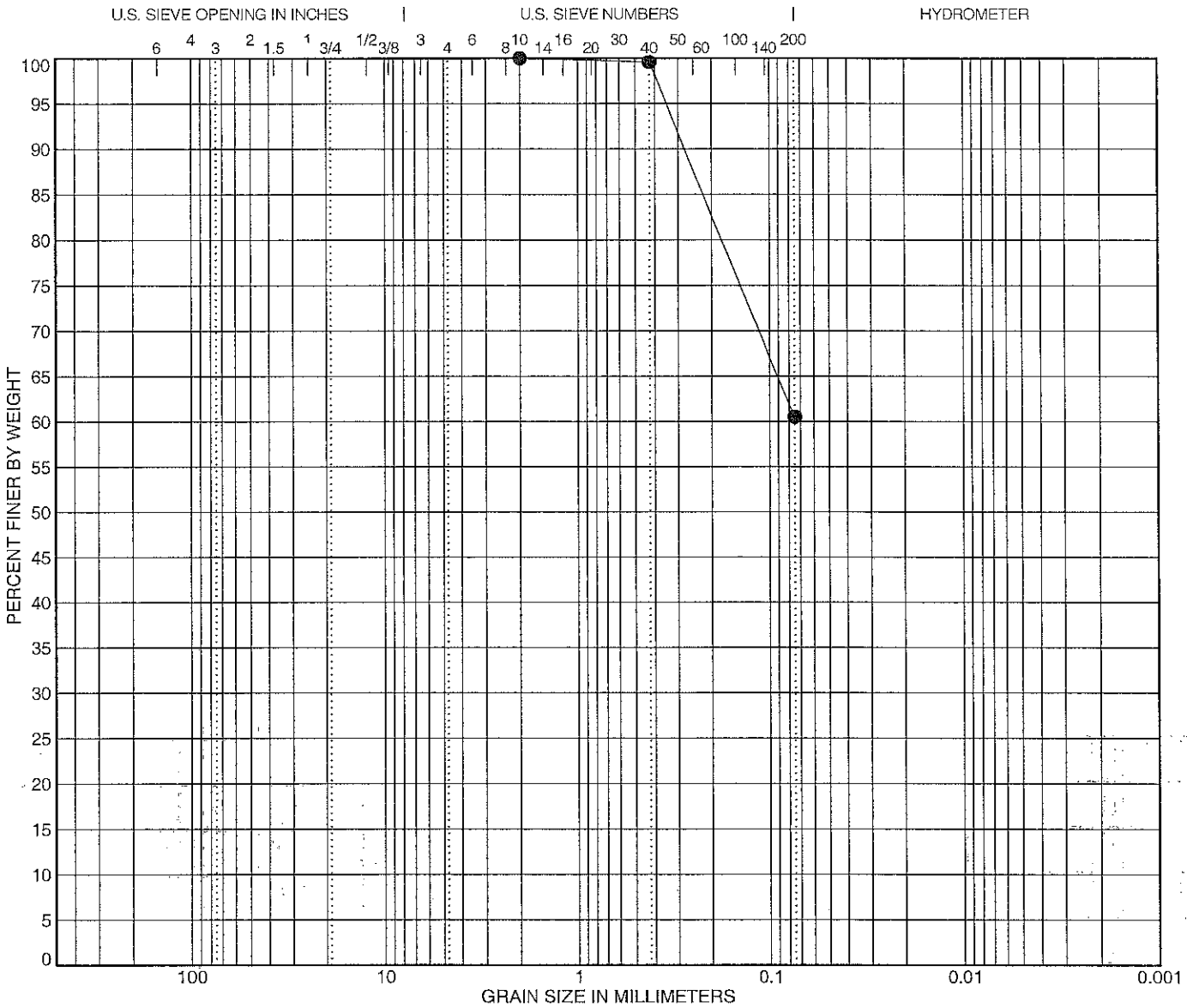


| COBBLES | GRAVEL | | SAND | | | SILT OR CLAY |
|---|---|---|---|---|---|---|
| | coarse | fine | coarse | medium | fine | |

| Specimen Identification | | | Classification | LL | PL | PI | Cc | Cu |
|---|---|---|---|---|---|---|---|---|
| ● | 09-B110 | 6.0 | **SANDY LEAN CLAY(CL)** | **49** | **18** | **31** | | |

| D100 | D50 | D30 | D10 | %Gravel | %Sand | %Silt | %Clay |
|---|---|---|---|---|---|---|---|
| **2** | | | | **0.0** | **39.5** | **60.5** | |

Percent Passing the Indicated Sieve

| 2" | 1-1/2" | 1" | 3/4" | 3/8" | #4 | #8 | #10 | #16 | #20 | #30 | #40 | #50 | #70 | #100 | #140 | #200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | **100** | | | | **99.6** | | | | | **60.5** |

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Project Number 92105186-B

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**EXHIBIT**
**£**

Project name: TO-0012 Pipeline Dredging, Volume II, Atkinson Island, PA 16 | Client: USACE, Galveston District | Terracon Project # : 92105186-B

| Boring | Depth | Field tests | | | Atterberg Limits | | | Grain Size Analysis | | | | | | | | | | | | | | USCS Symbol (ASTM 2487) | Wc | $\gamma_d$ | Strength tests | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Percent Pasing Sieve | | | | | | | | | | | | | | | | | Direct Shear Test | | | | | Unconfined Compression | | | | UU Triaxial Test | | | | CU Triaxial Test | | | | | | |
| | | PP | TV | SPTn | LL | PL | PI | 3/4" | 3/8" | 4 | 8 | 10 | 16 | 20 | 30 | 40 | 50 | 70 | 100 | 140 | 200 | | | | C | φ | Wc | $\gamma_d$ | Symbol | C | Wc | $\gamma_d$ | Symbol | C | Wc | $\gamma_d$ | Symbol | C | φ | c' | φ' | Wc | $\gamma_d$ | Symbol |
| | ft | tsf | tsf | bl/ft | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | | % | pcf | ksf | ° | % | pcf | | ksf | % | pcf | | ksf | % | pcf | | ksf | ° | ksf | ° | % | pcf | |
| 09-B106 | 0-2 | | | 16 | | | | | | | | | | | | | | | | | | SC** | 5 | | | | | | | | | | | | | | | | | | | | | | |
| | 2-4 | | | 13 | 24 | 16 | 8 | | 100 | 99 | 99 | 99 | 98 | 98 | 98 | 95 | 89 | 78 | 64 | 33 | 31 | SC | 7 | | | | | | | | | | | | | | | | | | | | | |
| | 4-6 | | | 10 | | | | | | | | | | | | | | | | | | SC** | 19 | | | | | | | | | | | | | | | | | | | | | |
| | 6-8 | | | 12 | | | | | | | | | | | | | | | | | | SC** | 27 | | | | | | | | | | | | | | | | | | | | | |
| | 8-10 | | | 10 | | | | | | | | | | | | | | | | | | SC** | 24 | | | | | | | | | | | | | | | | | | | | | |
| | 10-12 | | | 10 | | | | | | 100 | 100 | 100 | 100 | 100 | 99 | 92 | 91 | 80 | 66 | 35 | 35 | SC* | 23 | | | | | | | | | | | | | | | | | | | | | |
| | 12-14 | | | 7 | | | | | | | | | | | | | | | | | | CH** | 34 | | | | | | | | | | | | | | | | | | | | | |
| | 14-16 | | | 6 | 54 | 18 | 36 | | 100 | 100 | | 100 | | | | 99 | | | | | 98 | CH | 76 | | | | | | | | | | | | | | | | | | | | | |
| | 16-18 | | | 6 | | | | | | | | | | | | | | | | | | CH** | 52 | | | | | | | | | | | | | | | | | | | | | |
| | 18-20 | | | 7 | | | | | | | | | | | | | | | | | | CH** | 61 | | | | | | | | | | | | | | | | | | | | | |
| | 20-22 | | | 3 | | | | | | | | | | | | | | | | | | CH** | 64 | | | | | | | | | | | | | | | | | | | | | |
| | 22-24 | | | 5 | 107 | 20 | 87 | | | | | | | | | | | | | | | CH* | 58 | | | | | | | | | | | | | | | | | | | | | |
| | 24-26 | | | 10 | | | | | | | | | | | | | | | | | | CH** | 73 | | | | | | | | | | | | | | | | | | | | | |
| | 26-28 | | | 10 | | | | | | | | | | | | | | | | | | CH** | 32 | | | | | | | | | | | | | | | | | | | | | |
| | 28-30 | | | 11 | | | | | | | | | | | | | | | | | | CH** | 24 | | | | | | | | | | | | | | | | | | | | | |
| | 30-32 | | | 12 | 76 | 25 | 51 | | | 100 | | 100 | | | | 99 | | | | | 73 | CH | 55 | | | | | | | | | | | | | | | | | | | | | |
| | 32-34 | | | 5 | | | | | | | | | | | | | | | | | | CH** | 27 | | | | | | | | | | | | | | | | | | | | | |
| | 34-36 | | | 4 | | | | | | | | | | | | | | | | | | CH** | 21 | | | | | | | | | | | | | | | | | | | | | |
| | 36-38 | | | 5 | | | | | | | | | | | | | | | | | | CH** | 57 | | | | | | | | | | | | | | | | | | | | | |
| | 38-40 | | | 4 | | | | | | | | | | | | | | | | | | CH** | 25 | | | | | | | | | | | | | | | | | | | | | |
| | 40-42 | | | 8 | | | | | | | | | | | | | | | | | | CH** | 30 | | | | | | | | | | | | | | | | | | | | | |
| | 42-44 | | | 6 | | | | | | | | | | | | | | | | | | CH** | 43 | | | | | | | | | | | | | | | | | | | | | |
| | 44-46 | | | 14 | | | | | | | | | | | | | | | | | | CH** | 33 | | | | | | | | | | | | | | | | | | | | | |
| | 46-48 | | | 12 | 35 | 14 | 21 | | | | | | | | | | | | | | | CL* | 22 | | | | | | | | | | | | | | | | | | | | | |
| | 48-50 | | | 13 | | | | | | | | | | | | | | | | | | CL** | 27 | | | | | | | | | | | | | | | | | | | | | |
| 09-B107 | 0-2 | | | 14 | NP | NP | NP | | 100 | 83 | | 80 | | | | 74 | | | | | 43 | SM | 11 | | | | | | | | | | | | | | | | | | | | | |
| | 2-4 | | | 20 | | | | | | | | | | | | | | | | | | SM** | 21 | | | | | | | | | | | | | | | | | | | | | |
| | 4-6 | | | 18 | | | | | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 97 | 91 | 80 | 66 | 40 | 40 | SM* | 24 | | | | | | | | | | | | | | | | | | | | | |
| | 6-8 | | | 14 | | | | | | | | | | | | | | | | | | SM** | 18 | | | | | | | | | | | | | | | | | | | | | |
| | 8-10 | | | 12 | | | | | | | | | | | | | | | | | | SM** | 15 | | | | | | | | | | | | | | | | | | | | | |
| | 10-12 | | | 4 | | | | | | | | | | | | | | | | | | SM** | 21 | | | | | | | | | | | | | | | | | | | | | |
| | 12-14 | | | 5 | 38 | 15 | 23 | | | 100 | | 100 | | | | 99 | | | | | 50 | CL | 21 | | | | | | | | | | | | | | | | | | | | | |
| | 14-16 | | | 3 | | | | | | | | | | | | | | | | | | SM** | 25 | | | | | | | | | | | | | | | | | | | | | |
| 09-B108 | 0-2 | | | 5 | | | | | | | 100 | 100 | 100 | 100 | 100 | 99 | 98 | 94 | 66 | 50 | 49 | SM* | 8 | | | | | | | | | | | | | | | | | | | | | |
| | 2-4 | | | 23 | | | | | | | | | | | | | | | | | | SM** | 9 | | | | | | | | | | | | | | | | | | | | | |
| | 4-6 | | | 4 | 90 | 27 | 63 | | | | | 100 | | | | 99 | | | | | 92 | CH | 48 | | | | | | | | | | | | | | | | | | | | | |
| | 6-8 | | | 6 | | | | | | | | | | | | | | | | | | CH** | 43 | | | | | | | | | | | | | | | | | | | | | |
| | 8-10 | | | 9 | | | | | | | | | | | | | | | | | | CH** | 42 | | | | | | | | | | | | | | | | | | | | | |
| 09-B109 | 0-2 | | | 0 | 86 | 27 | 59 | | 100 | 99 | | 98 | | | | 56 | | | | | 34 | SC | 24 | | | | | | | | | | | | | | | | | | | | | |
| | 2-4 | | | 2 | | | | | | | | | | | | | | | | | | ML** | 34 | | | | | | | | | | | | | | | | | | | | | |
| | 4-6 | | | 10 | NP | NP | NP | | 100 | 100 | 100 | 100 | 100 | 100 | 99 | 99 | 96 | 91 | 80 | 61 | 60 | ML | 24 | | | | | | | | | | | | | | | | | | | | | |
| | 6-8 | | | 2 | | | | | | | | | | | | | | | | | | ML** | 41 | | | | | | | | | | | | | | | | | | | | | |
| | 8-10 | | | 3 | | | | | | | | | | | | | | | | | | ML** | 30 | | | | | | | | | | | | | | | | | | | | | |
| | 10-12 | | | 7 | | | | | | | | | | | | | | | | | | CH** | 45 | | | | | | | | | | | | | | | | | | | | | |
| | 12-14 | | | 0 | | | | | | | | | | | | | | | | | | CH** | 49 | | | | | | | | | | | | | | | | | | | | | |
| | 14-16 | | | 5 | 61 | 19 | 42 | | | 100 | | 100 | | | | 100 | | | | | 73 | CH | 41 | | | | | | | | | | | | | | | | | | | | | |
| 09-B110 | 0-2 | 3.00 | | | 89 | 30 | 59 | | | | | 100 | | | | 99 | | | | | 90 | CH | 55 | | | | | | | | | | | | | | | | | | | | | |
| | 2-4 | 1.00 | 1.25 | | | | | | | | | 100 | 100 | 100 | 99 | 97 | 87 | 75 | 58 | 35 | 34 | SM* | 22 | | | | | | | | | | | | | | | | | | | | | |
| | 4-6 | | 2.00 | | | | | | | | | | | | | | | | | | | CL** | 25 | | | | | | | | | | | | | | | | | | | | | |
| | 6-8 | | 1.50 | | 49 | 18 | 31 | | | | | 100 | | | | 100 | | | | | 61 | CL | 28 | | | | | | | | | | | | | | | | | | | | | |
| | 8-10 | | | 21 | | | | | | | | | | | | | | | | | | CL** | 45 | | | | | | | | | | | | | | | | | | | | | |