



Munitions Response Site Prioritization Protocol

Module 5. Chemical Warfare Materiel Hazard Evaluation

April 2007

CHE Outline

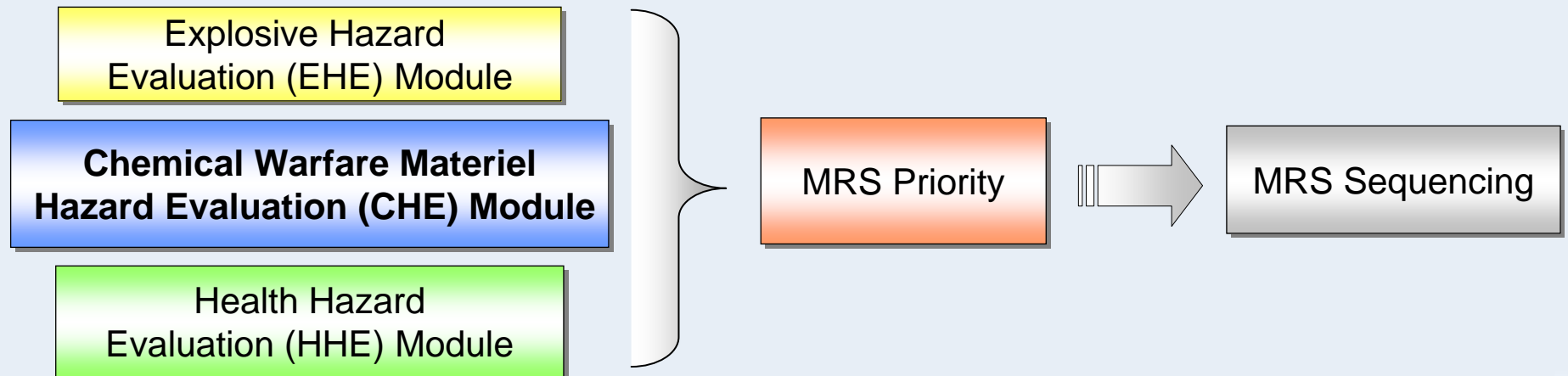
- Chemical Warfare Materiel Hazard Evaluation (CHE) Module
- Chemical Warfare Materiel (CWM)
- Structure of the CHE Module
- CWM Hazard Factor
- Accessibility Factor and Receptor Factor
- Determining CHE Module Rating



CHE Module

- Provides a consistent DoD-wide approach for assigning a relative priority to munitions response sites (MRSs) where potential CWM hazards are known or suspected to be present
- Used to conduct an evaluation of the potential chemical agent hazards associated with the physiological effects of CWM

Protocol Structure



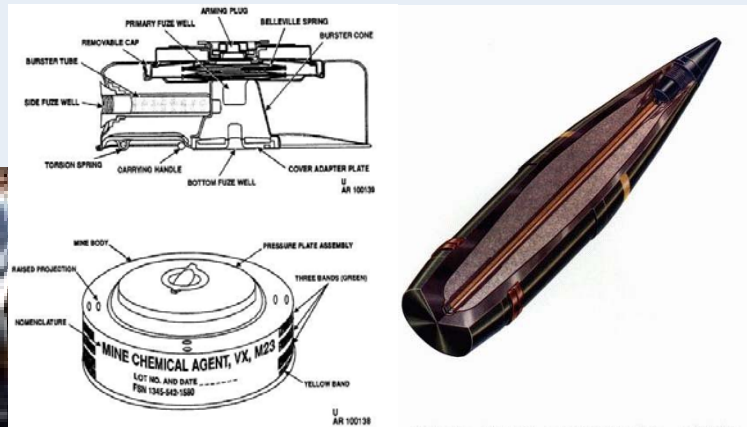
Chemical Warfare Materiel

- Chemical Agent (CA) –
 - ◆ A chemical compound (to include experimental compounds) that, through its chemical properties, produces lethal or other damaging effects on human beings, is intended for use in military operations to kill, seriously injure, or incapacitate persons through its physiological effects
– (32 CFR 179.3)
- CWM is generally configured as a munition containing a chemical compound that is intended for use in military operations to kill, seriously injure, or incapacitate a person through its physiological effects



CWM Subcategories Defined

- For the purposes of the Protocol, CWM encompasses four subcategories –
 - ◆ CWM, explosively configured –
 - Munitions that contain a CA fill and any explosive component
 - Examples include M-55 rockets, M23 VX mines, and M360105-mm GB artillery cartridges
 - ◆ CWM, nonexplosively configured –
 - Munitions that contain a CA fill but do not include any explosive
 - Examples would be a chemical munition that does not contain an explosive component and VX or mustard agent spray canisters



CWM, explosively configured



CWM Subcategories Defined (cont)

◆ CWM, bulk container –

- All nonmunitions-configured containers of CA
- An example would be ton containers



Bulk Container Examples

◆ CA identification sets (CAIS) –

- Military training aids containing small quantities of various chemical agents and other chemicals
- Examples include CAIS K941 and CAIS K942



CAIS Examples



CWM Use

- During the early part of the 20th century, CWM was produced for use in chemical warfare
- Because of past chemical warfare-related activities, CWM may remain on an MRS as –
 - ◆ Unexploded ordnance (UXO) or discarded military munitions (DMM) that are either –
 - Explosively configured
 - Non-explosively configured
 - ◆ Containers of CA
 - Bulk containers
 - Laboratory vials
 - ◆ CAIS



One-Ton Cylinders



K951/952 Pig



Items Considered CWM and not CWM

CWM	Not CWM
V- and G-series nerve agents regardless of configurations	Research, development, testing and evaluation (RDTE) solutions
H-series (mustard) regardless of configurations	Riot control devices (e.g., tear gas)
L-series (lewisite) blister agents in other-than-munition configurations	Chemical defoliants and herbicides (e.g., Agent Orange)
Certain industrial chemicals (e.g., hydrogen cyanide, cyanogen chloride, or carbonyl dichloride [called phosgene]) configured as a military munition	Industrial chemicals (e.g., hydrogen cyanide, cyanogen chloride, or carbonyl dichloride [called phosgene]) not configured as a munition
Chemical agent identification sets (CAIS)	Smoke and other obscuration-producing items
	Flame and incendiary-producing items
	Soil, water, debris, or other media contaminated with low concentrations of chemical agents where no CA hazards exist



CHE Module Structure

- The CHE Module Rating is determined using three factors –
 - ◆ CWM Hazard Factor – evaluates the unique characteristics of CWM
 - ◆ Accessibility Factor – characterizes the potential for the receptor to encounter the CWM hazard
 - ◆ Receptor Factor – characterizes the human and ecological populations that may be impacted by the presence of CWM
- A scoring system similar to the EHE Module is used in the CHE Module
- Some data elements in the EHE and CHE Modules are scored identically because of similar classifications
 - ◆ The major difference between the EHE and CHE Modules is the hazard factor
 - ◆ In both modules, the Accessibility Factor's data elements are very similar and the Receptor Factor's data elements are identical



CHE Module Scoring

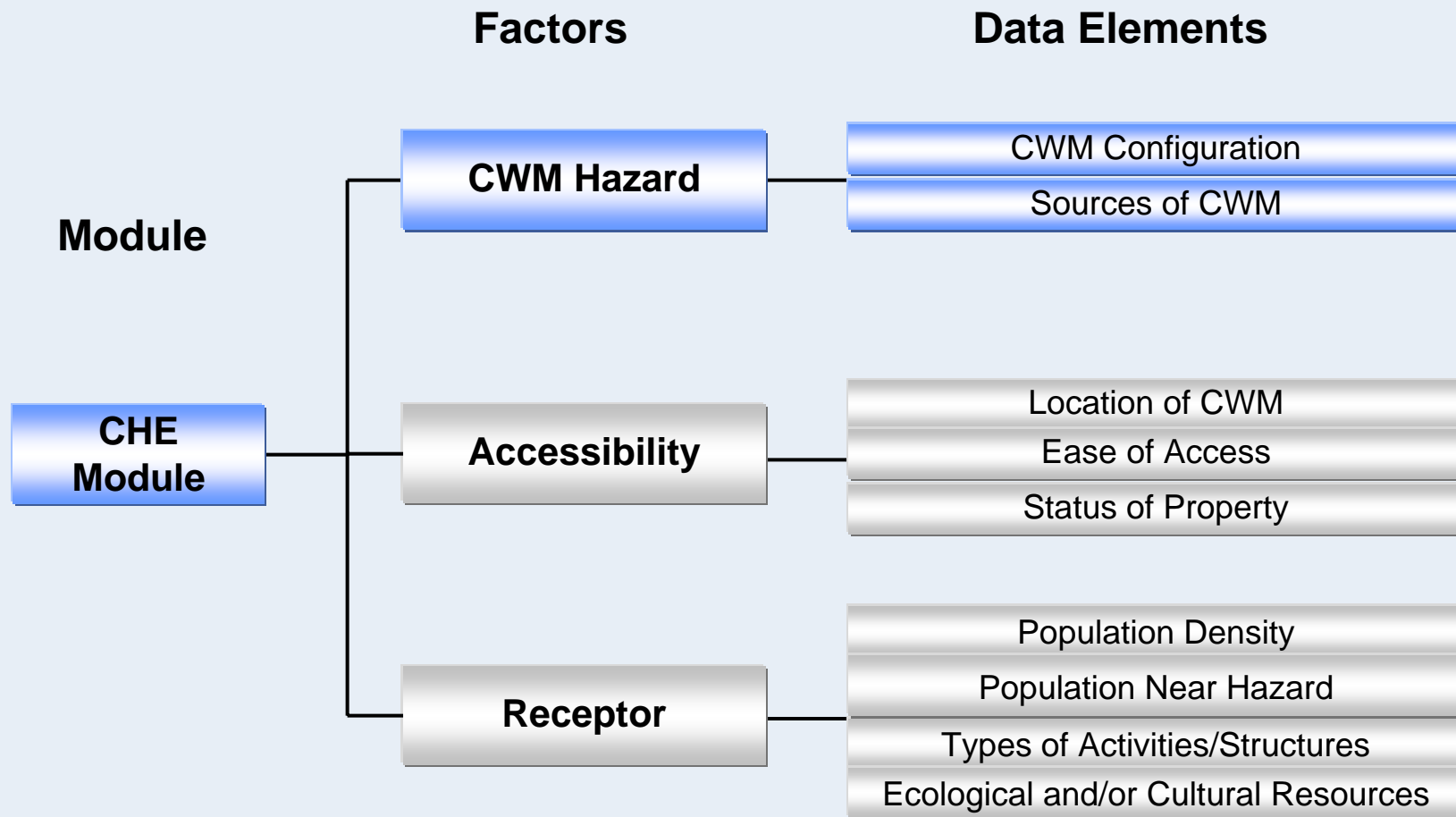
- The data elements of the three factors contribute to the CHE Module Rating

CWM Hazard Factor	40 pts
Accessibility Factor	40 pts
Receptor Factor	20 pts
Maximum Total	100 pts

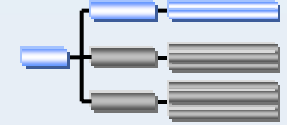
- Based on the sum the CHE factor values, the module is assigned one of seven ratings (letters A – G)
- There are also three alternative module ratings for when a letter rating is not appropriate –
 - ◆ Evaluation Pending
 - ◆ No Longer Required
 - ◆ No Known or Suspected CWM Hazard



Structure of CWM Hazard Factor



CWM Hazard Factor



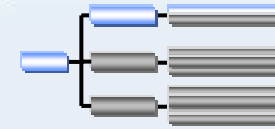
- Assesses the potential CWM hazard and characterizes the potential source
- Comprised of two data elements
 - ◆ CWM Configuration
 - ◆ Sources of CWM
- Constitutes 40% of the CHE Module Total

CWM Hazard Factor	40 pts
Accessibility Factor	40 pts
Receptor Factor	20 pts
Maximum Total	100 pts

CWM Configuration = ? out of 30 points
Sources of CWM = ? out of 10 points



CWM Configuration

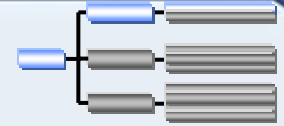


CWM Configuration Data Element Classifications (Max. 30 pts)

<u>Classification</u>	<u>Point Value</u>
CWM, that are either UXO, or explosive configured or damaged DMM	30
CWM mixed with UXO	25
CWM, explosive configuration that are undamaged DMM	20
CWM/DMM not explosively configured or CWM, bulk container	15
CAIS K941 and CAIS K942	12
CAIS	10
Evidence of no CWM	0



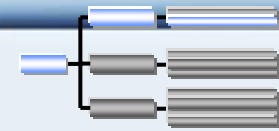
CWM Hazard Factor – CWM Configuration



- CWM Configuration is the data element with the highest potential score within the CHE Module (30 points possible)
- Classifies CWM according to its potential CA hazard and is based on –
 - ◆ CWM type (e.g., explosively configured, bulk container)
 - ◆ Condition (e.g., fired, unused)



Sources of CWM

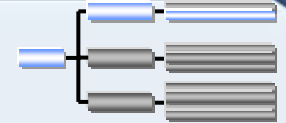


Sources of CWM Data Element Classifications (Max 10 pts)

<u>Classification</u>	<u>Point Value</u>
Live-fire involving CWM	10
Damaged CWM/DMM, surface or subsurface	10
Undamaged CWM/DMM surface	10
CAIS/DMM surface	10
Undamaged CWM/DMM subsurface	5
CAIS/DMM subsurface	5
Former CA or CWM Production Facilities	3
Former Research, Development, Testing, and Evaluation (RDT&E) facility using CWM	3
Former Training Facility using CWM or CAIS	2
Former Storage or Transfer points of CWM	1
Evidence of no CWM	0



CWM Hazard Factor – Sources of CWM



- Classifies common circumstances that lead to CWM being present on an MRS
- Addresses the type of CWM activities conducted, the extent CWM may be present, and its potential condition. For example –
 - ◆ Live-fire involving CWM
 - ◆ Damaged or undamaged CWM/DMM or CAIS/DMM, surface or subsurface
 - ◆ Former production or testing areas
 - ◆ Former training facilities
 - ◆ Former storage or transfer points of CWM



CWM Hazard Factor – Example

- CWM production, live-fire training, and storage was conducted at an installation
- CWM production at MRS 1A included the M55 rockets with CA and the M426 203mm 8-inch projectiles
- MRS 1B was used to dispose of damaged (e.g., leaking) M55 rockets by burial

What is the CWM Hazard Factor Value for MRS 1B?

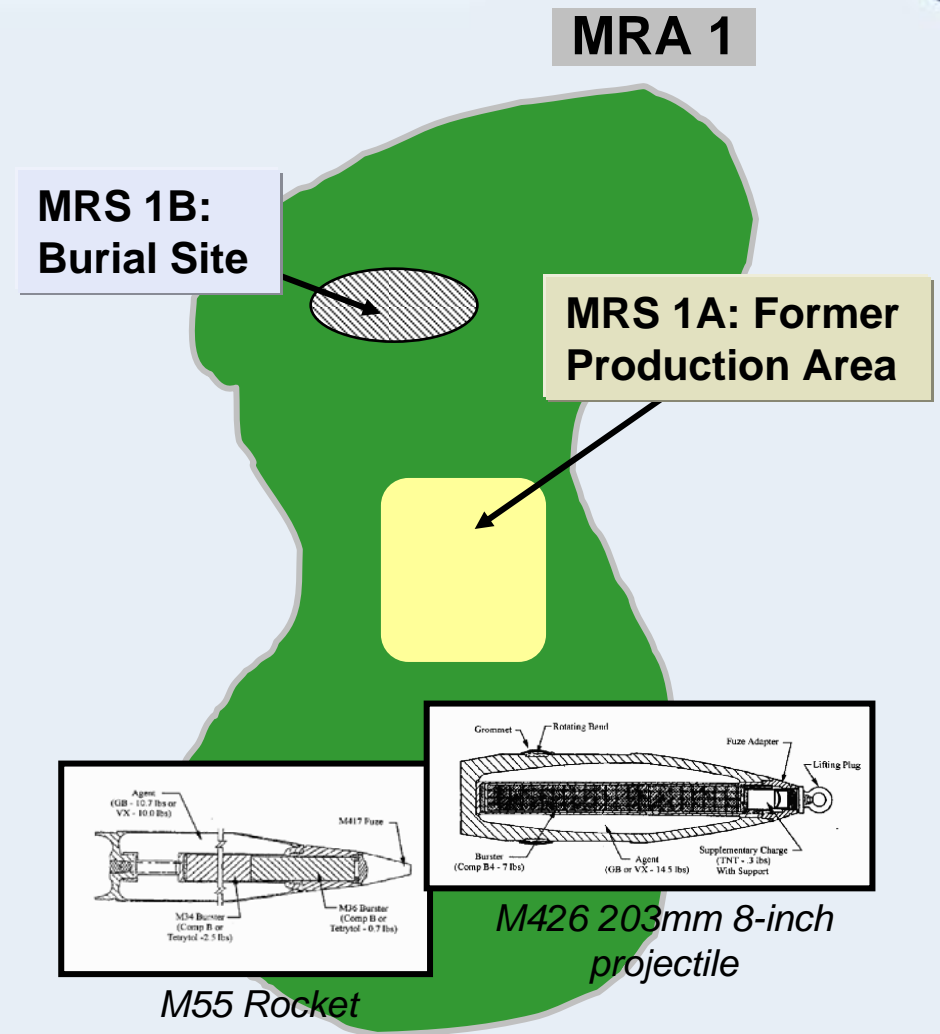


Table 11

CHE Module: CWM Configuration Data Element Table

DIRECTIONS: Below are seven classifications of CWM configuration and their descriptions. Circle the scores that correspond with all the CWM configurations known or suspected to be present at the MRS.

Note: The terms *CWM/UXO*, *CWM/DMM*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
CWM, that are either UXO, or explosively configured damaged DMM	The CWM known or suspected of being present at the MRS are: <ul style="list-style-type: none"> ♦ CWM that are UXO (i.e., CWM/UXO) ♦ Explosively configured CWM that are DMM (i.e., CWM/DMM) that have been damaged. 	30
CWM mixed with UXO	<ul style="list-style-type: none"> ♦ The CWM known or suspected of being present at the MRS are undamaged CWM/DMM or CWM not configured as a munition that are commingled with conventional munitions that are UXO. 	25
CWM, explosive configuration that are undamaged DMM	<ul style="list-style-type: none"> ♦ The CWM known or suspected of being present at the MRS are explosively configured CWM/DMM that have not been damaged. 	20
CWM/DMM, not explosively configured or CWM, bulk container	The CWM known or suspected of being present at the MRS are: <ul style="list-style-type: none"> ♦ Nonexplosively configured CWM/DMM either damaged or undamaged ♦ Bulk CWM (e.g., ton container). 	15
CAIS K941 and CAIS K942	<ul style="list-style-type: none"> ♦ The CWM/DMM known or suspected of being present at the MRS are CAIS K941t oxig gas set -1 or CAIS K942t oxig gas set - 2/E11. 	12
CAIS (chemical agent identification sets)	<ul style="list-style-type: none"> ♦ CAIS, other than CAIS K941 and K942, are known or suspected of being present at the MRS. 	10
Evidence of no CWM	<ul style="list-style-type: none"> ♦ Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS. 	0
CWM CONFIGURATION	DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 30).	30

Circle all data element classifications present at the MRS

Record only the largest classification score within each table in its corresponding box

DIRECTIONS: Document any MRS-specific data used in selecting the *CWM Configuration* classifications in the space provided.

Document any MRS-specific data used in selecting the classifications here

Table 12

CHE Module: Sources of CWM Data Element Table

DIRECTIONS: Below are 11 sources of CWM hazards and their descriptions. Review these classifications and circle the scores that correspond with all the sources of CWM hazards known or suspected to be present at the MRS.

Note: The terms *CWM/UXO*, *CWM/DMM*, *CAIS/DMM*, *surface*, *subsurface*, *physical evidence*, and *historical evidence* are defined in Appendix C of the Primer.

Classification	Description	Score
Live-fire involving CWM	<ul style="list-style-type: none"> The MRS is a former military range that supported live fire of explosively configured CWM and the CWM/UXO are known or suspected of being present on the surface or in the subsurface. The MRS is a former military range that supported live fire with conventional munitions, and CWM/DMM are on the surface or in the subsurface commingled with conventional munitions that are UXO. 	10
Damaged CWM/DMM surface or subsurface	<ul style="list-style-type: none"> There are damaged CWM/DMM on the surface or in the subsurface at the MRS. 	10
Undamaged CWM/DMM surface	<ul style="list-style-type: none"> There are undamaged CWM/DMM on the surface at the MRS. 	10
CAIS/DMM surface	<ul style="list-style-type: none"> There are CAIS/DMM on the surface. 	10
Undamaged CWM/DMM, subsurface	<ul style="list-style-type: none"> There are undamaged CWM/DMM in the subsurface at the MRS. 	5
CAIS/DMM subsurface	<ul style="list-style-type: none"> There are CAIS/DMM in the subsurface at the MRS. 	5
Former CA or CWM Production Facilities	<ul style="list-style-type: none"> The MRS is a facility that formerly engaged in production of CA or CWM, and CWM/DMM is suspected of being present on the surface or in the subsurface. 	3
Former Research, Development, Testing, and Evaluation (RDT&E) facility using CWM	<ul style="list-style-type: none"> The MRS is at a facility that formerly was involved in non live fire RDT&E activities (including static testing) involving CWM, and there are CWM/DMM suspected of being present on the surface or in the subsurface. 	3
Former Training Facility using CWM or CAIS	<ul style="list-style-type: none"> The MRS is a location that formerly was involved in training activities involving CWM and/or CAIS (e.g., training in recognition of CWM, decontamination training) and CWM/DMM or CAIS/DMM are suspected of being present on the surface or in the subsurface. 	2
Former Storage or Transfer points of CWM	<ul style="list-style-type: none"> The MRS is a former storage facility or transfer point (e.g., intermodal transfer) for CWM. 	1
Evidence of no CWM	<ul style="list-style-type: none"> Following investigation, the physical evidence indicates that CWM are not present at the MRS, or the historical evidence indicates that CWM are not present at the MRS. 	0
SOURCES OF CWM	DIRECTIONS: Record <u>the single highest score</u> from above in the box to the right (maximum score = 10).	10

Circle all data element classifications present at the MRS

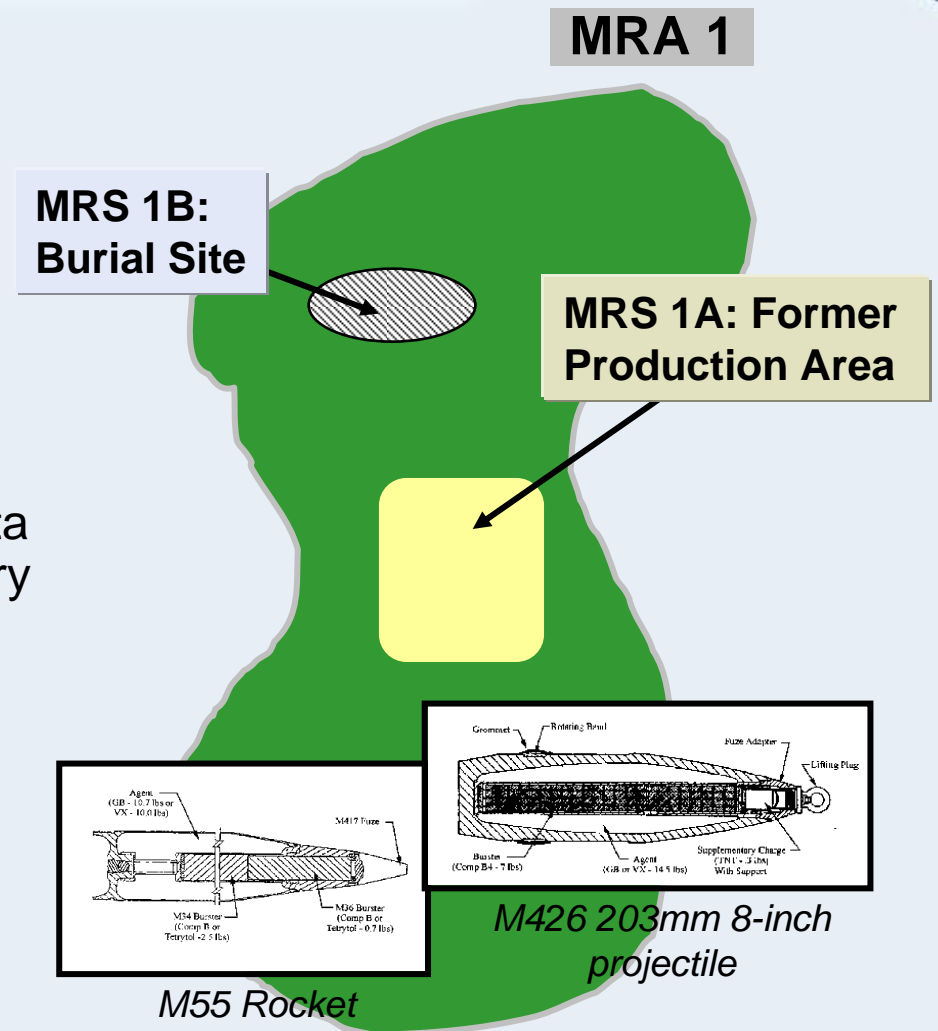
Record only the largest classification score within each table in its corresponding box

DIRECTIONS: Document any MR-s pecific data used in selecting the *Sources of CWM* classifications in the space provided.

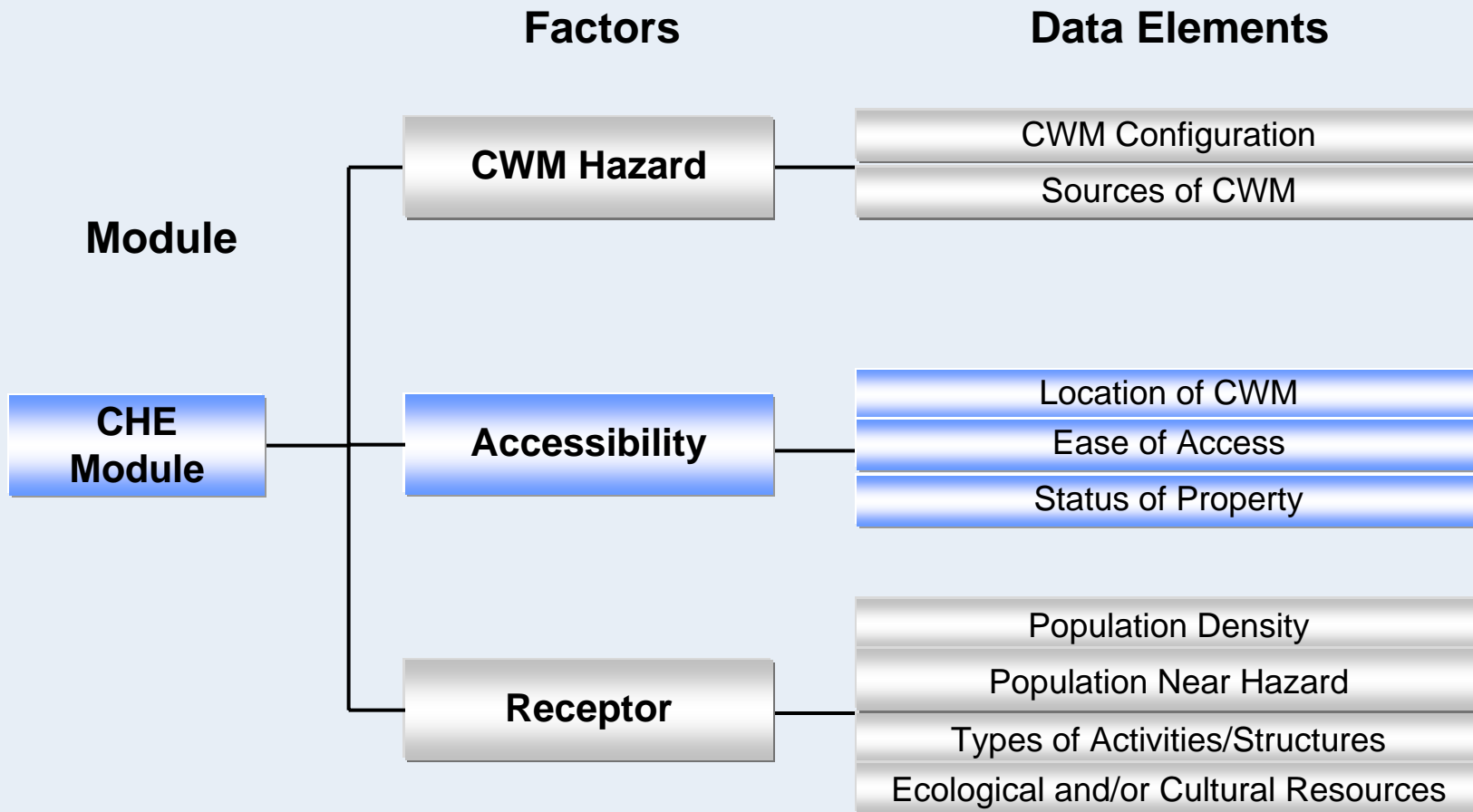
Document any specific data used in selecting the classification

CWM Hazard Factor – Review

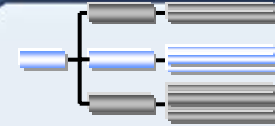
- To calculate the CWM Hazard Factor for MRS 1B, the highest data element classifications scores from Tables 11 and 12 are summed
- *CWM Hazard Factor Value: 40 Points*
 - ◆ Under the CWM Configuration data element, MRS 1B was used to bury rockets with CA fill (30 points)
 - ◆ Under the Source of Hazard data element, the rockets with CA fill buried in MRS 1B were damaged (10 points)
 - ◆ Sum only the highest classification score for each data element



Structure of the CHE Accessibility Factor



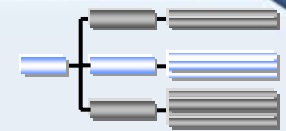
Accessibility Factor Data Element Classifications



Location of CWM (Max 25 pts)	<u>Classification</u>	<u>Point Value</u>
	Confirmed surface	25
	Confirmed subsurface, active	20
	Confirmed subsurface, stable	15
	Suspected (physical evidence)	10
	Suspected (historical evidence)	5
	Subsurface, physical constraint	2
	Evidence of no CWM	0
Ease of Access (Max 10 pts)	No barrier	10
	Barrier to MRS access is incomplete	8
	Barrier to MRS access is complete, but not monitored	5
	Barrier to MRS access is complete and monitored	0
Status of Property (Max 5 pts)	Non-DoD control	5
	Scheduled for transfer from DoD control	3
	DoD control	0



Accessibility Factor



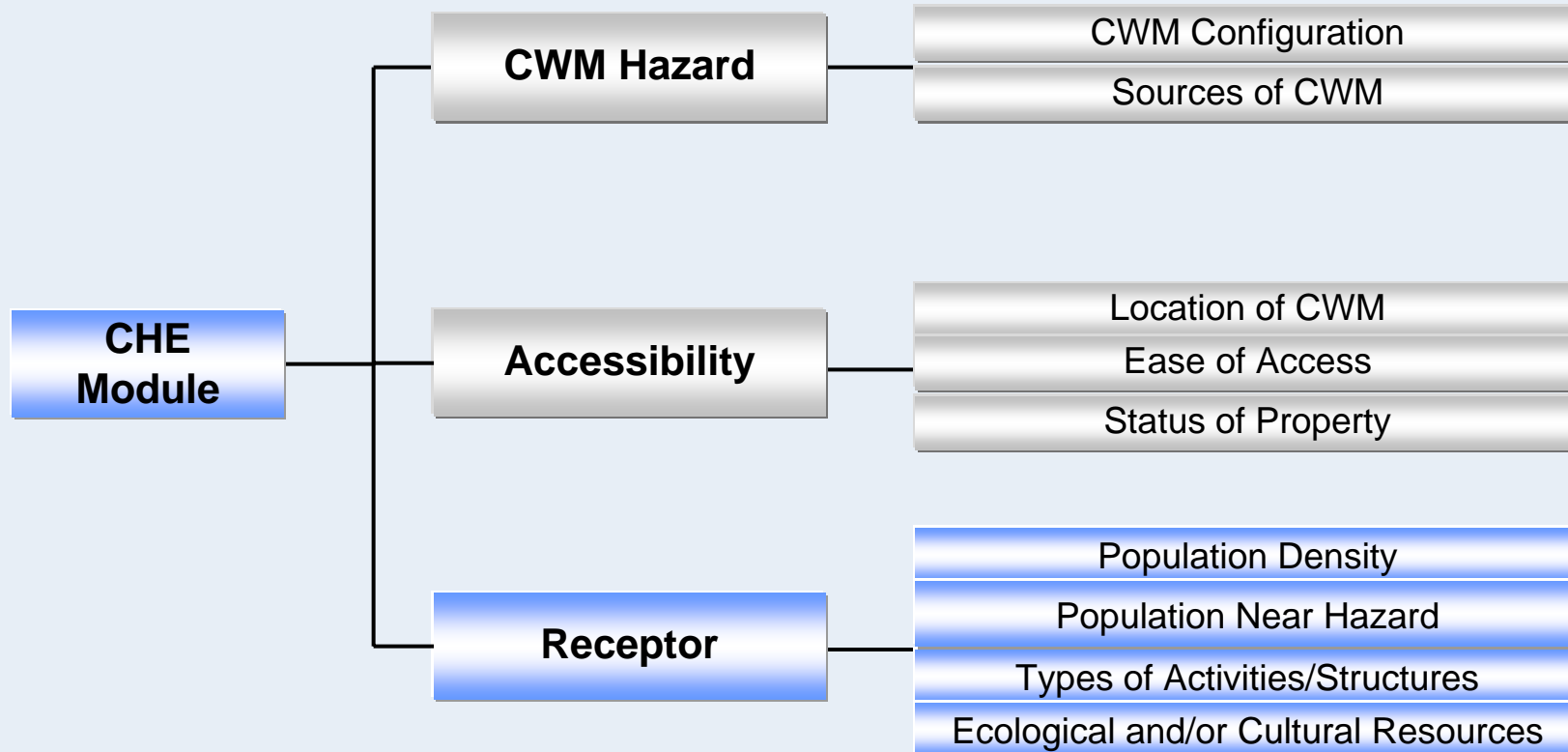
- Focuses on the potential to encounter CWM
- The Accessibility Factor is similar to the EHE Module
 - ◆ Location of CWM – confirmed or suspected presence of CWM based on physical or historical evidence (Table 13, Primer Appendix A)
 - ◆ Ease of Access – focuses on means for receptors to encounter CWM based on the extent of controls (barriers) preventing access or entry to the MRS (Table 14, Primer Appendix A)
 - ◆ Status of Property – differentiates between MRSs under DoD control, property transferring from DoD control within three years, and those not under DoD control (Table 15, Primer Appendix A)
- Constitutes 40% of the CHE Module numerical score

CWM Hazard Factor	40 pts
Accessibility Factor	40 pts
Receptor Factor	20 pts
Maximum Total	100 pts

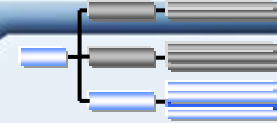
Location of CWM = ? out of 25 points
 Ease of Access = ? out of 10 points
 Status of Property = ? out of 5 points



Structure of the CHE Receptor Factor



Receptor Factor Data Element Classifications



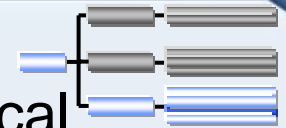
	<u>Classification</u>	<u>Point Value</u>
Population Density (Max 5 pts)	> 500 persons per square mile	5
	100 – 500 persons per square mile	3
	< 100 persons per square mile	1
Population Near Hazard (Max 5 pts)	26 or more inhabited structures	5
	16 to 25 inhabited structures	4
	11 to 15 inhabited structures	3
	6 to 10 inhabited structures	2
	1 to 5 inhabited structures	1
	0 inhabited structures	0
Types of Activities/ Structures (Max 5 pts)	Residential, educational, commercial, or subsistence	5
	Parks and recreational areas	4
	Agricultural, forestry	3
	Industrial or warehousing	2
	No known or recurring activities	1
Ecological and/or Cultural Resources (Max 5 pts)	Ecological and cultural resources present	5
	Ecological resource present	3
	Cultural resources present	3
	No ecological or cultural resources present	0



Receptor Factor

- Focuses on human and ecological populations that may be impacted by the presence of CWM and is identical to that in the EHE Module
 - ◆ Population Density – assesses the number of people that could be exposed to CWM (Table 16, Primer Appendix A)
 - ◆ Population Near Hazard – addresses the number of inhabited structures on the MRS and within two miles from boundary (Table 17, Primer Appendix A)
 - ◆ Types of Activities/Structures – assesses the population near the hazard by reviewing amount, type, and intrusiveness of activities (Table 18, Primer Appendix A)
 - ◆ Ecological and/or Cultural Resources – recognizes the importance of ecological and cultural resources present on an MRS (Table 19, Primer Appendix A)

- Constitutes 20% of the CHE Module numerical score



CWM Hazard Factor	40 pts
Accessibility Factor	40 pts
Receptor Factor	20 pts
Maximum Total	100 pts

Population Density = ? out of 5 points
 Population Near Hazard = ? out of 5 points
 Types of Activities/Structures = ? out of 5 points
 Ecological and/or Cultural Resources = ? out of 5 points



Table 20
Determining the CHE Module Rating

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	<input type="text"/>	<input type="text"/>
Sources of CWM	Table 12	<input type="text"/>	
Accessibility Factor Data Elements			
Location of CWM	Table 13	<input type="text"/>	<input type="text"/>
Ease of Access	Table 14	<input type="text"/>	
Status of Property	Table 15	<input type="text"/>	
Receptor Factor Data Elements			
Population Density	Table 16	<input type="text"/>	<input type="text"/>
Population Near Hazard	Table 17	<input type="text"/>	
Types of Activities/Structures	Table 18	<input type="text"/>	
Ecological and/or Cultural Resources	Table 19	<input type="text"/>	
CHE MODULE TOTAL			<input type="text"/>
CHE Module Total	CHE Module Rating		
92 to 100	A		
82 to 91	B		
71 to 81	C		
60 to 70	D		
48 to 59	E		
38 to 47	F		
less than 38	G		
Alternative Module Ratings	Evaluation Pending		
	No Longer Required		
	No Known or Suspected CWM Hazard		
CHE MODULE RATING	<input type="text"/>		

DIRECTIONS:

- From Tables 11–19, record the data element scores in the **Score** boxes to the right.
- Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
- Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
- Circle the appropriate range for the **CHE Module Total** below.
- Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:
An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

Enter the CWM Hazard Factor Value by summing the data element scores

Enter the Accessibility Factor Value by summing the data element scores

Enter the Receptor Factor Value by summing the data element scores

Add the three factor values

Select the Module Rating that corresponds with the Module Total calculated above or, if applicable, an Alternative Rating

Record the Module Rating in the CHE Module Rating box

CWM Hazard Evaluation Module

Questions?

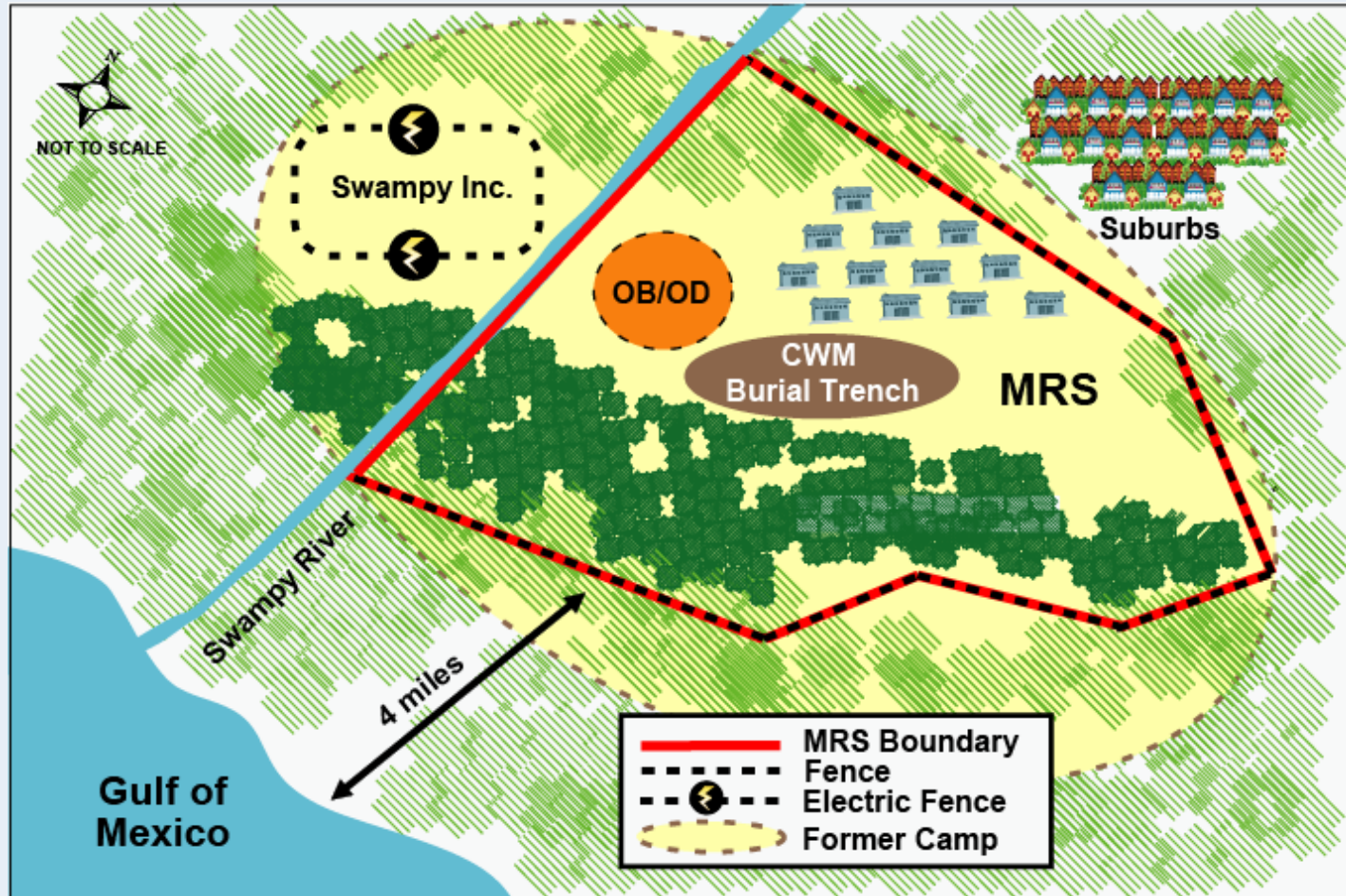


Camp Swampy Example

- Former Camp Swampy is located about four miles from the Gulf of Mexico. The Swampy River flows through the Camp and discharges into the Gulf. The river is frequently used for recreational purposes
- The MRS is located on the eastern portion of the former Camp Swampy. The MRS is a state wildlife refuge containing three endangered species. The MRS is partially fenced and unmonitored
- The western half of Camp Swampy was sold to Swampy Inc. in 1993 and is surrounded by an electric fence
- The northern half of the Camp Swampy MRS contains 12 unused buildings, but a town with 600 houses and a population density of 125 people per square mile is only 1 mile away



Camp Swampy Example



CHE Camp Swampy Example

- During World War II, the Camp included storage facilities of various types of CA-filled munitions
- Mustard agent was a common filler for these munitions
- Historical records indicate –
 - ◆ CA-filled munitions were buried at a burial site, east of the current OB/OD area
 - ◆ Prior to burial, an attempt using explosives was made to split open the munitions to expose any CA fill
- The condition of any buried munitions is unknown, but they are assumed to be damaged

What is the CHE Module Rating for Camp Swampy?



Table 20
Determining the CHE Module Rating

DIRECTIONS:

- From Tables 11–19, record the data element scores in the **Score** boxes to the right.
- Add the **Score** boxes for each of the three factors and record this number in the **Value** boxes to the right.
- Add the three **Value** boxes and record this number in the **CHE Module Total** box below.
- Circle the appropriate range for the **CHE Module Total** below.
- Circle the **CHE Module Rating** that corresponds to the range selected and record this value in the **CHE Module Rating** box found at the bottom of the table.

Note:

An alternative module rating may be assigned when a module letter rating is inappropriate. An alternative module rating is used when more information is needed to score one or more data elements, contamination at an MRS was previously addressed, or there is no reason to suspect contamination was ever present at an MRS.

	Source	Score	Value
CWM Hazard Factor Data Elements			
CWM Configuration	Table 11	30	40
Sources of CWM	Table 12	10	
Accessibility Factor Data Elements			
Location of CWM	Table 13	05	
Ease of Access	Table 14	08	18
Status of Property	Table 15	05	
Receptor Factor Data Elements			
Population Density	Table 16	03	
Population Near Hazard	Table 17	05	16
Types of Activities/Structures	Table 18	05	
Ecological and/or Cultural Resources	Table 19	03	
CHE MODULE TOTAL			74
CHE Module Total	CHE Module Rating		
92 to 100	A		
82 to 91	B		
71 to 81	C		
60 to 70	D		
48 to 59	E		
38 to 47	F		
less than 38	G		
Alternative Module Ratings	Evaluation Pending		
	No Longer Required		
	No Known or Suspected CWM Hazard		
CHE MODULE RATING	C		

- CWM, explosively configured
- Damaged CWM/DMM surface or subsurface
- Historical evidence
- Fence is incomplete
- Non-DoD Controlled
- Population Density= 100-500 p/sq mi
- Nearby suburbs >26 inhabited structures
- Residential area <2 miles away
- Ecological Resources - Endangered species
- Add the three factor values recorded above
- Select the Module Rating that corresponds with the module value calculated above
- Record the Module Rating in the CHE Module Rating box